

Web Services and Cloud Resources for Federal Environmental Reviews

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I. USDA Natural Resources Conservation Service (NRCS)

II. Federal Environmental Reviews

- a) Past
- b) Present
- c) Future

III. Web Services

IV. Cloud Resources

V. Web Resources and the Future

USDA Natural Resources Conservation Service

- Mission: Helping People Help the Land
- NRCS provides technical assistance to *private* landowners to help conserve soil, water, and natural resources.
- Background
 - 1935-1993 Soil Conservation Service (SCS)
 - 1994 reorganized as NRCS; combines the authorities of SCS and additional programs that provide financial assistance for natural resource conservation
- Soil Scientists, Conservationists, Biologists, Foresters, Economists, Engineers, GIS specialists
 - 70 NRCS employees at 8 locations in New Jersey

NRCS in New Jersey

75 employees:

71 technical staff

14 admin staff

6 field offices

Soil Survey Office

Plant Materials Center

State Office

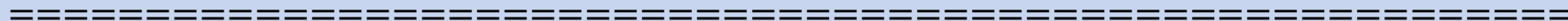


NRCS Operations

Field Offices or Service Centers: provide technical assistance to customers for conservation planning and design

State Office: manages programs and coordinates activities with State agencies and other Federal agencies

Customers: people who make decisions about natural resource use and management on *non-Federal* lands (e.g, farmers, non-profit organizations, units of government, and others who support production agriculture and natural resource conservation)



Geospatial technology users: ~80% of NRCS staff in NJ, includes engineers, soil conservationists, managers, soil scientists

Customer Service Toolkit: A custom GIS interface used by ~8,000 NRCS employees nationwide;

Toolkit version 1 ~2001

My Perspective

| Agency | | Years Employed |
|------------------------------|------------|----------------|
| Soil Conservation Service | Federal | 1991-1992 |
| NJ DEP | State (NJ) | 1993 |
| National Park Service | Federal | 1994-1997 |
| WI Dept of Natural Resources | State (WI) | 1997 |
| NJ Office of State Planning | State (NJ) | 1998-2003 |
| City of Trenton | Municipal | 2003-2010 |
| NRCS | Federal | 2010 |

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Federal Environmental Reviews

- Required by the National Environmental Policy Act of 1969
- NRCS: Conservation Planning and Assistance
- NRCS-CPA-52 Environmental Evaluation Worksheet

Special Environmental Concerns: Environmental Laws, Executive Orders, policies, etc.

In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "•" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.

| G. Special Environmental Concerns (Document existing/ benchmark conditions) | J. Impacts to Special Environmental Concerns | | | | | |
|---|--|------------------------------------|--|------------------------------------|--|------------------------------------|
| | <i>No Action</i> | | <i>Alternative 1</i> | | <i>Alternative 2</i> | |
| | Document all impacts (Attach Guide Sheets as applicable) | √ if needs further action | Document all impacts (Attach Guide Sheets as applicable) | √ if needs further action | Document all impacts (Attach Guide Sheets as applicable) | √ if needs further action |
| •Clean Air Act <i>Guide Sheet FS1 FS-2</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| •Clean Water Act / Waters of the U.S. <i>Guide Sheet Fact Sheet</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| •Coastal Zone Management <i>Guide Sheet Fact Sheet</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| Coral Reefs <i>Guide Sheet Fact Sheet</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| •Cultural Resources / Historic Properties <i>Guide Sheet Fact Sheet</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| •Endangered and Threatened Species <i>Guide Sheet Fact Sheet</i> | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |

The Past

The Old Days (2010)

- Service Center servers
- GIS users at the Service Centers use a “geodata” file folder and naming convention to store national, state and local geospatial data
- Customer Service Toolkit (~8,000 users nationwide)
- Agency standards established in 1998

Catalog Tree

- [-] geodata
 - [+] air_quality
 - [+] cadastral
 - [+] census
 - [+] climate
 - [+] common_land_unit
 - [+] conservation
 - [+] cpa52_2012
 - [+] cpa52_2014_test
 - [+] cultural_resources
 - [+] disaster_events
 - [+] ecological
 - [+] elevation
 - [+] endangered_habitat
 - [+] environmental_easements
 - [+] geographic_names
 - [+] geology
 - [+] government_units
 - [+] hazard_site
 - [+] hydrography
 - [+] hydrologic_units
 - [+] imagery
 - [+] land_site
 - [+] land_use_land_cover
 - [+] landmarks
 - [+] map_indexes
 - [+] measurement_services
 - [+] ortho_imagery
 - [+] project_data
 - [+] public_utilities
 - [+] soils
 - [+] topographic_images
 - [+] transportation
 - [+] wetlands
 - [+] wildlife
 - [+] zoning

Customer
Service
Toolkit



- [-] cpa52_2012
 - [+] Clean_Water_Act
 - [+] Coastal_Zone_Management
 - [+] Cultural_Resources_Historic_Properties
 - [+] Endangered_and_Threatened_Species
 - [+] Floodplain_Management
 - [+] Invasive_species
 - [+] Prime_and_Unique_Farmland
 - [+] Riparian_Area
 - [+] Wetlands
 - [+] Wild_and_Scenic
 - ◆ CPA52_Atl.lyr
 - ◆ CPA52_Ber.lyr
 - ◆ CPA52_Bur.lyr
 - ◆ CPA52_Cam.lyr
 - ◆ CPA52_Cap.lyr
 - ◆ CPA52_Cum.lyr
 - ◆ CPA52_Ess.lyr
 - ◆ CPA52_Glo.lyr
 - ◆ CPA52_Hud.lyr
 - ◆ CPA52_Hun.lyr
 - ◆ CPA52_Mer.lyr
 - ◆ CPA52_Mid.lyr
 - ◆ CPA52_Mon.lyr
 - ◆ CPA52_Mor.lyr
 - ◆ CPA52_Oce.lyr
 - ◆ CPA52_Pas.lyr
 - ◆ CPA52_Sal.lyr
 - ◆ CPA52_Som.lyr
 - ◆ CPA52_Sus.lyr
 - ◆ CPA52_Uni.lyr
 - ◆ CPA52_War.lyr

The Present

Current Conditions

- Field Office staff use Customer Service Toolkit which accesses data on the server at their location.
- NRCS has national standards for managing data on the servers.
- “Thousands of people manage thousands of files on thousands of servers across the agency.”

Today (2013)

What has changed?

A LOT!!!

Example Program Change

- A new program... “Working Lands For Wildlife”
- GIS was used to identify specific wildlife habitat
- “Can we make this available on the Internet so that foresters who need the information can use it?”
- LOTS of ways to respond to this question...

What has changed?

Web Services



| Title | Theme | Coverage | Source | Data Type | Status | Explanatory Notes | Data Service(s) | General Website |
|---|------------------------------|----------|-----------|-----------|--------|--|---|---|
| <i>Abandoned Mined Lands Inventory System (AMLIS)</i> | Energy and Natural Resources | National | OSM | WMS | Have | A national system for recording health, safety, general welfare, and environmental impacts associated with abandoned coal mines. It also contains limited information on non-coal mine related problems. | http://geomine.osmre.gov/ArcGIS/rest/services/DOI_Landscape/AbandonedMinedLands/MapServer | http://geomine.osmre.gov/ |
| <i>Acid Sensitive Waters</i> | Water Quality | National | EPA | WMS | Have | This map generates EPA's Acid Sensitive Waters web service | http://geodata.epa.gov/ArcGIS/rest/services/ORD/DOE_AcidSensitiveWaters/MapServer | http://geodata.epa.gov/ArcGIS/rest/services |
| <i>Concluded EPA Enforcement Cases: 2011 Fiscal Year</i> | Historical | National | EPA | WMS | Have | This interactive map shows information on enforcement actions and cases from 2011. They include civil enforcement actions taken by EPA at facilities, criminal cases prosecuted by EPA under federal statutes and the U.S. Criminal Code, and cases in which EPA provided significant support to cases prosecuted under state criminal laws. The indicators on the map generally mark the location of the site or facility where the violations occurred or were discovered. | http://geodata.epa.gov/ArcGIS/rest/services/OECA/Annual_Report/MapServer | http://geodata.epa.gov/ArcGIS/rest/services |
| <i>Critical Habitat for Threatened and Endangered Species</i> | Ecological | National | DOI-USFWS | WMS | Have | This data service identifies, in general, the areas where final critical habitat exist for species that are endangered or threatened. Special protections and/or restrictions are possible in areas where federal funding, permits, licenses, authorizations or actions occur or are required. Critical habitat are areas considered essential for the conservation of a listed | http://criticalhabitat.fws.gov/arcgis/rest/services/crithab/crithabMapServer/MapServer | http://criticalhabitat.fws.gov/crithab/ |
| <i>DOE-NREL Development Risk</i> | Energy and Natural Resources | National | DOE-NREL | WMS | Have | This map depicts housing density for the coterminous US in 2030 and 2000, respectively, and are based on 2000 US Census Bureau block (SF3) datasets. Development Risk is one of seven standard input layers which support the USFS State and Private Forestry Potential Assessment Redesign Project. Development | http://maps1.arcgisonline.com/ArcGIS/rest/services/DOI-NREL_Development_Risk/MapServer | http://www.arcgis.com/home/item.html?id=6a9f0c0d265480e8f86d514609e307a |

Review 2010-2013

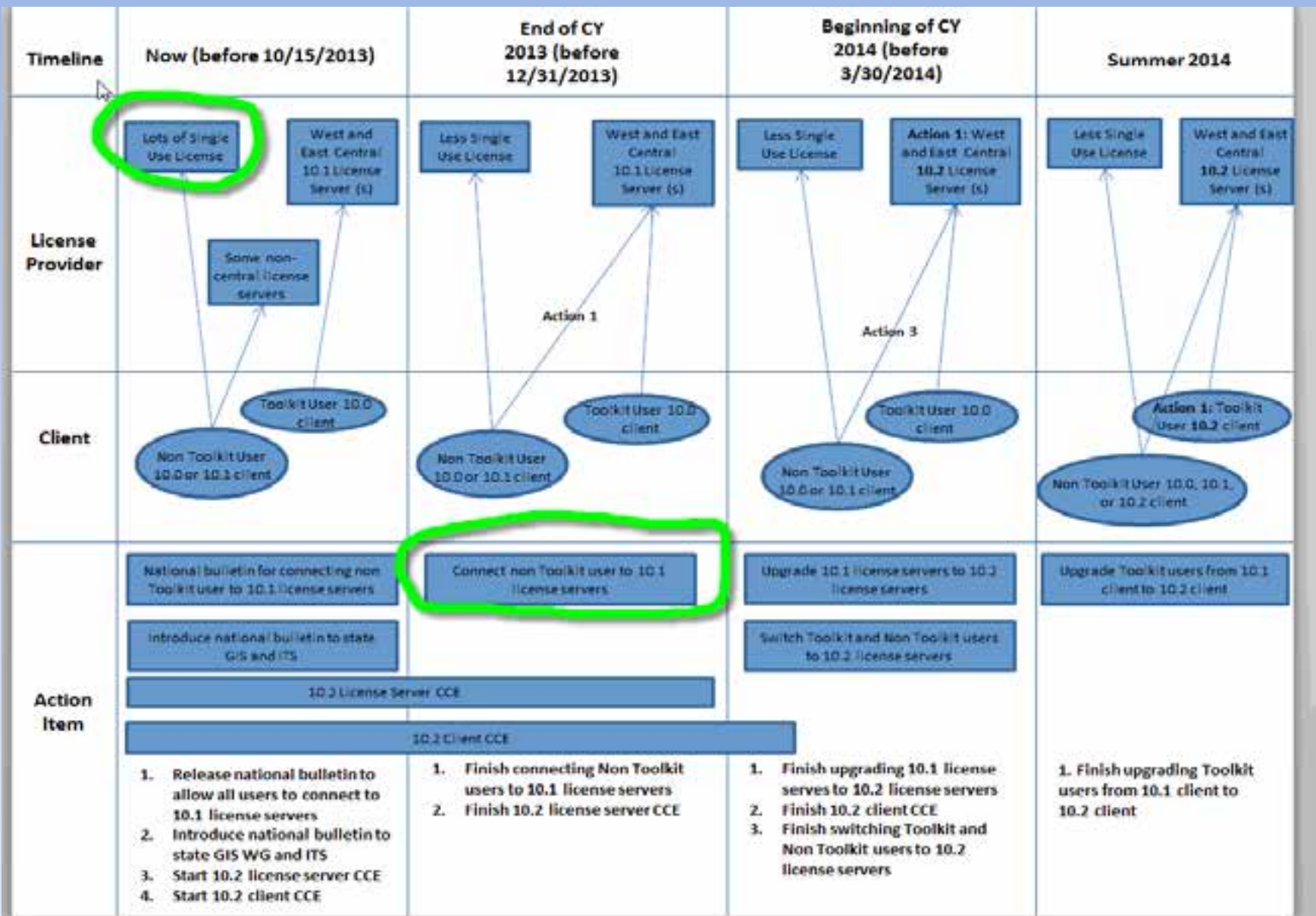
- Slow progress...
- All users upgraded from Arc GIS 9.2 to 10.0.
(Many users have 10.1)
- The goal: transition from “Toolkit” to
“Conservation Desktop” and “Mobile Planner”

Future Conditions

- Long-term goal: State GIS Specialists will publish their state and local geodata as web services directly to USDA's Enterprise Data Center (in Kansas City, MO)
- National and state geodata will be stored at the Enterprise Data Center
- Web services will be accessible by all NRCS personnel
- "Geospatial services will be published once and consumed many times."

What's Ahead

Coming in January 2014...

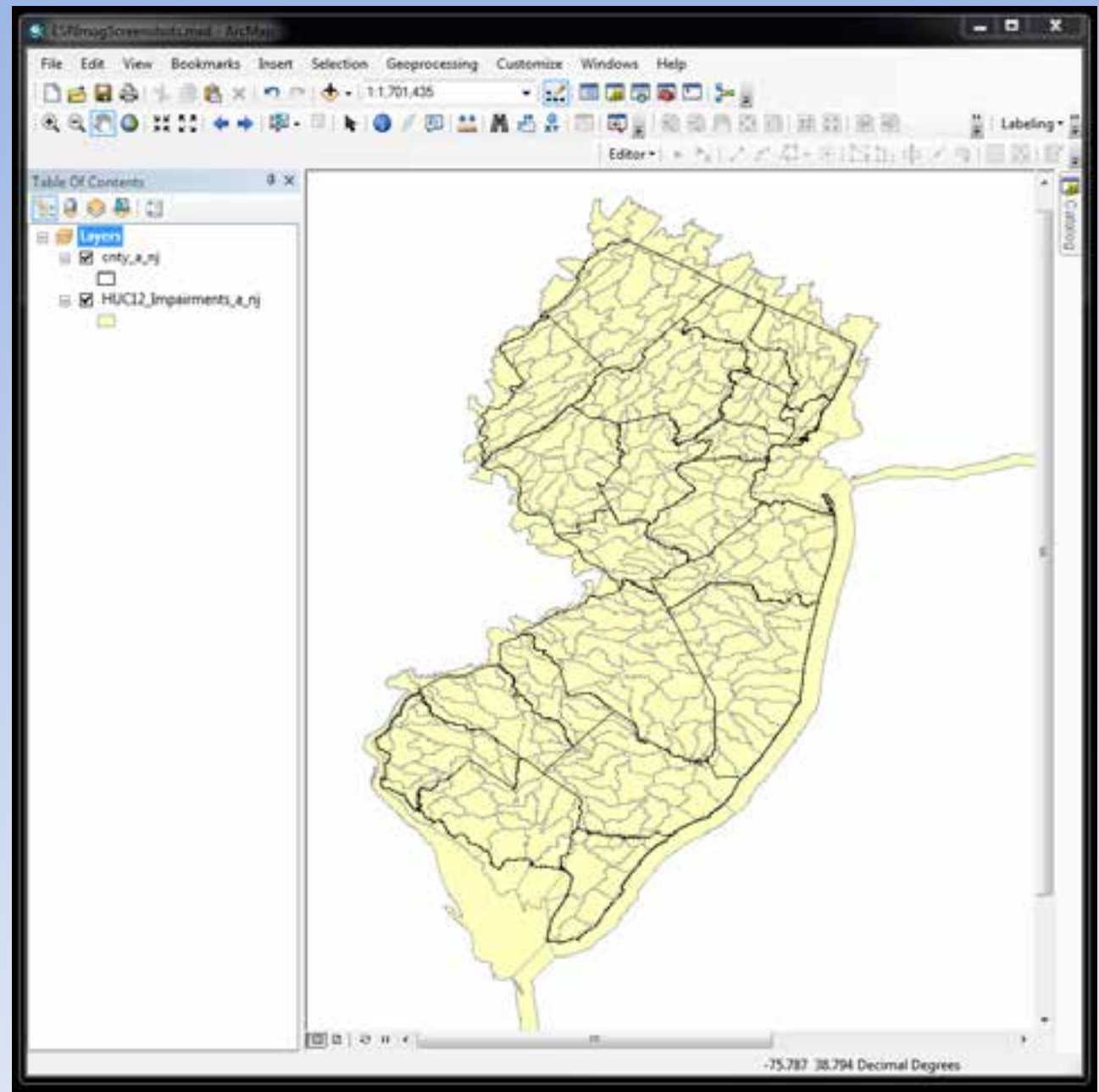


What's Ahead (January 2014)

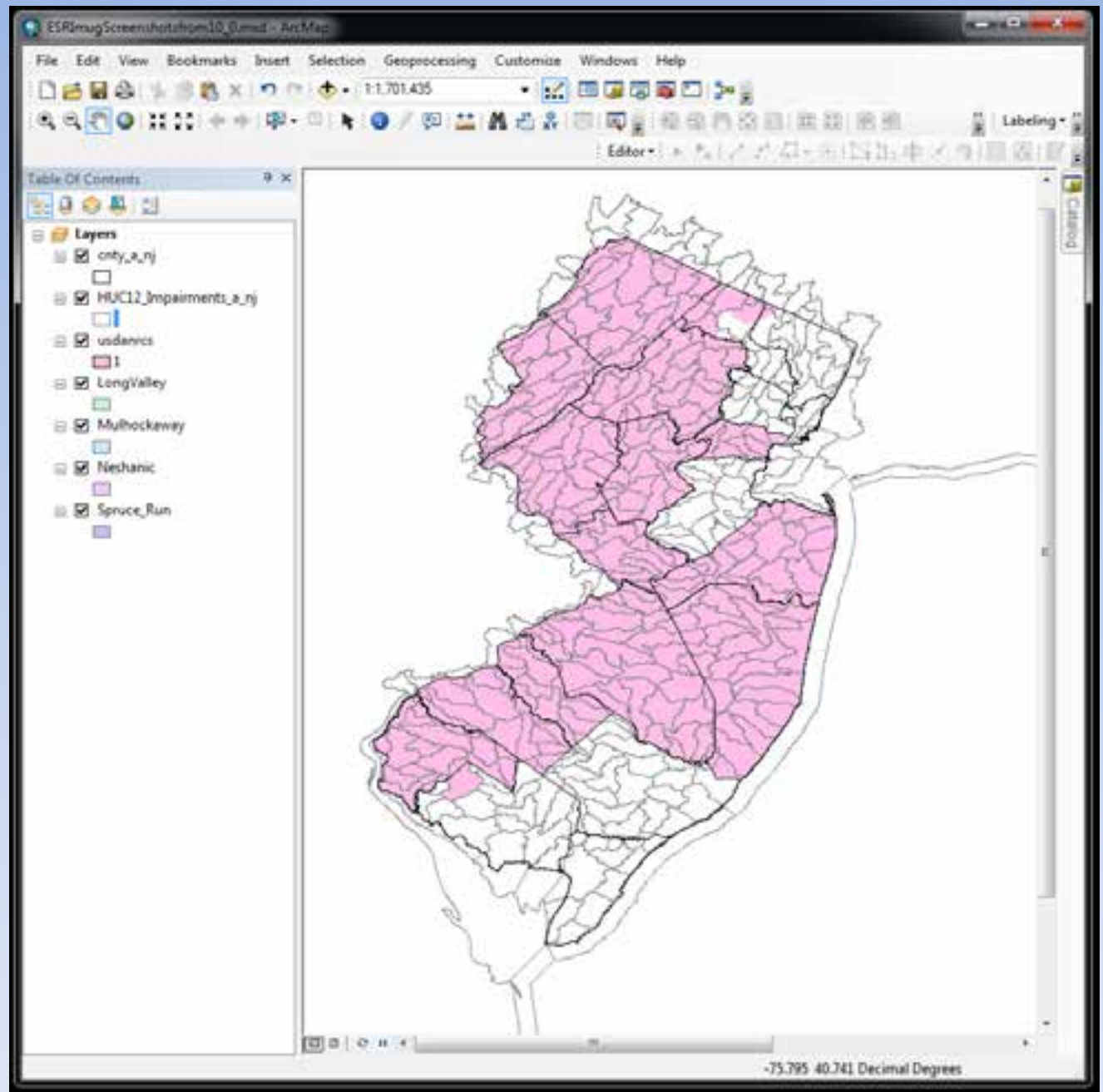
- Migration (where appropriate) of state and local content to web services
- Phase 1
 - State GIS Specialists will publish their content as web services to the USDA Enterprise Data Center
 - Streamline geospatial data management at the national, regional, state and local levels
 - Enable state and local geospatial content to be accessible for national and regional applications
 - Provide an architecture and framework for enterprise geospatial services to support web applications
- What kind of data can be published as part of Phase I?
 - Geospatial data designed to support Toolkit business, inventory and assessments. *Only public domain data can be published at this time.*

Original
Impaired
Watersheds
Data for NJ

(provided by
NRCS HQ at
HUC12 level)



New Jersey High Priority Impaired Watersheds



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Why Use Web Services?

- Servers at agency Service Centers are at end of life
- Maintaining authoritative data in the current state and local configuration is labor intensive
- **To standardize geospatial data mgmt & build a consistent & authoritative geospatial library for analysis**

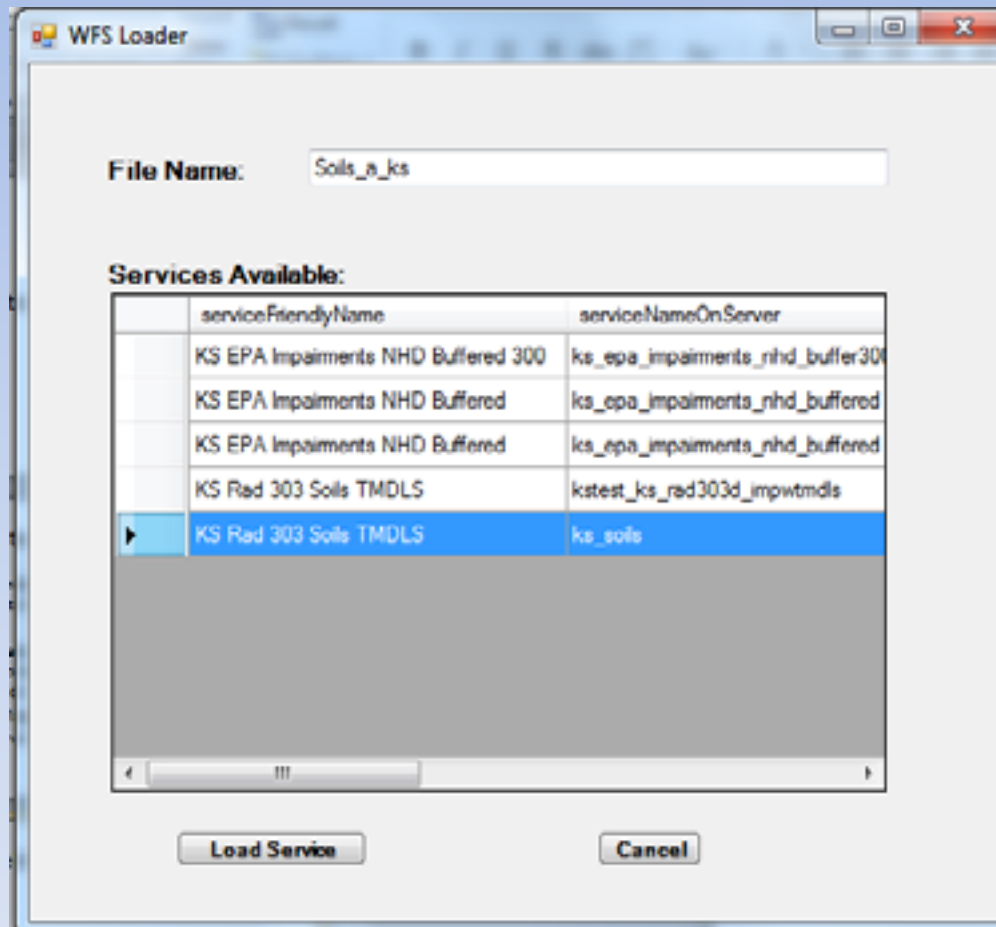
How will Web Services work?

- Field office applications will migrate to utilize enterprise Web services for analysis and reporting

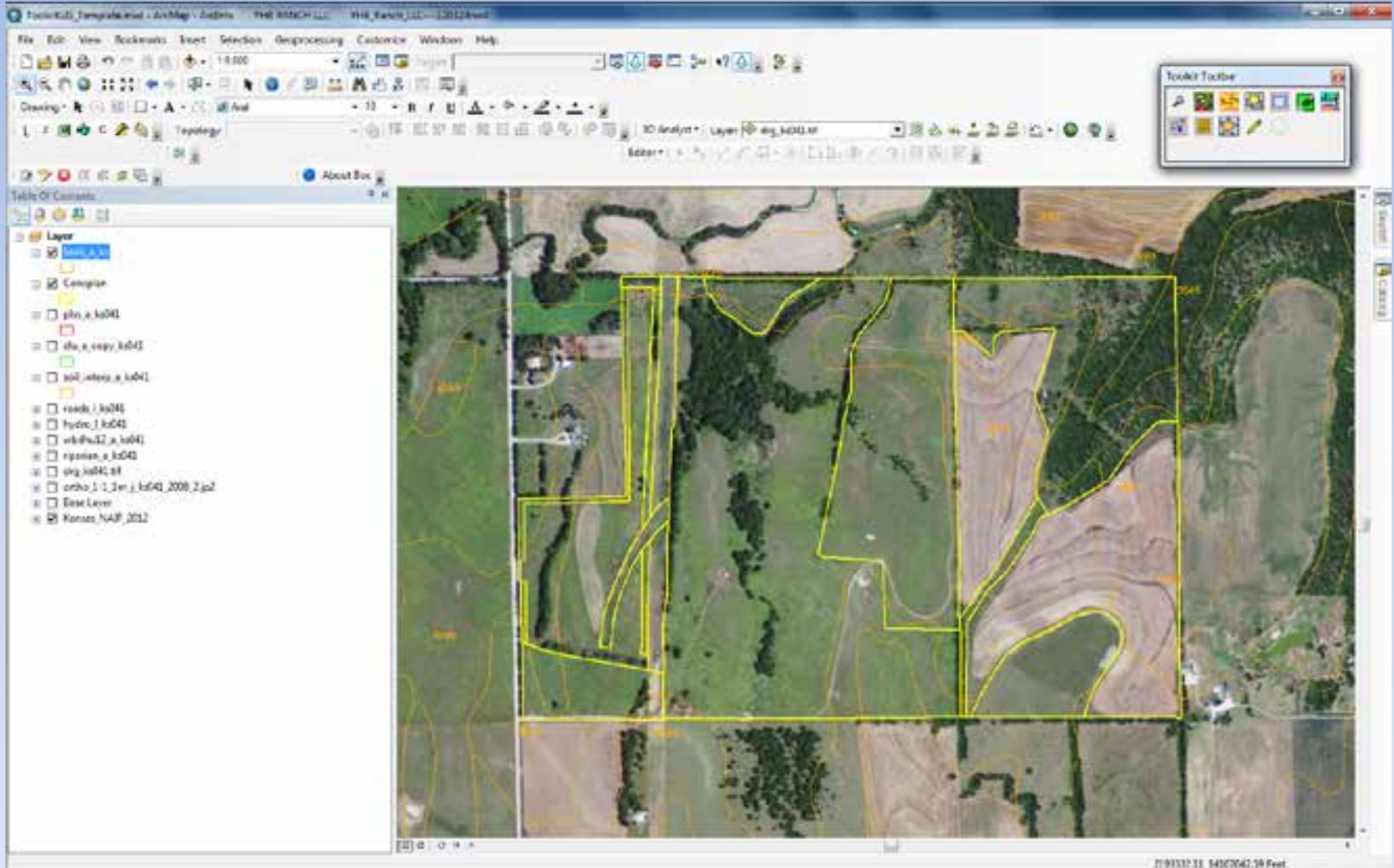
State and Local Web Services

- Web Feature Services (WFS) will be accessed through the Data Interoperability Extension in ArcGIS 10.0
- WFS Data Loader Tool has been developed for NRCS that works with the Data Interoperability Extension.
- Web Mapping Services can be accessed like any other WMS.

Web Feature Service Access



Soils Data



Zoomed out View

The screenshot displays the ArcMap interface with a map of a watershed. A yellow polygon highlights a specific area within the watershed. The interface includes a menu bar, a toolbar, a Table of Contents on the left, and a Table window at the bottom.

Table of Contents:

- Layer
 - Soils_x.tin
 - Complex
 - phs_x.tin
 - ch_x.tin
 - wl_x.tin
 - roads_x.tin
 - hydro_x.tin
 - hills_x.tin
 - riparian_x.tin
 - shg_x.tin
 - ortho_2-1_1m_x.tin
 - Base Layer
 - Kansas_NAD_2011

Table:

| MUSY | MURLEY | MURLEY | gnl_geometry_property | OILC.FID | MURLEY | LEACH | LSFAC1 | HF.FACT | CF.FACT | LI_CLASS | RHLS.C | RHLS.T | CI.T | WATERCLAS | Cont.FSG | Hgt.Hod.FY | Hgt.Hod.FY |
|------|---------|---|-----------------------|----------|---------|-------|--------|---------|---------|----------|----------|--------|------|-----------|----------|------------|------------|
| 3020 | 1454041 | Grass city clay loam, 1 to 3 percent slopes | Shape | 3000 | 1454041 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 4522 | 4001 |
| 4671 | 2625760 | Iron city clay loam, 1 to 3 percent slopes | Shape | 5419 | 2625760 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 5525 | 3825 |
| 4671 | 2625760 | Iron city clay loam, 1 to 3 percent slopes | Shape | 5419 | 2625760 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 5525 | 3825 |
| 4990 | 2667740 | Clare loam complex, 0 to 2 percent slopes | Shape | 3640 | 2667740 | 1 | 2.18 | 180 | 20 | Low | 23.96736 | 33.038 | 5 | High | 6 | 2878 | 2942 |
| 4671 | 2625760 | Iron city clay loam, 1 to 3 percent slopes | Shape | 5419 | 2625760 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 5525 | 3825 |
| 3628 | 1454041 | Grass city clay loam, 1 to 3 percent slopes | Shape | 3000 | 1454041 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 4522 | 4001 |
| 3545 | 1454020 | Hills at loam, channelled, seasonally flooded | Shape | 3040 | 1454020 | 2 | 0.1 | 180 | 20 | Medium | 1.4552 | 3.216 | 1 | Low | 1 | 4000 | 4116 |
| 4219 | 3098761 | Iron city clay loam, 1 to 3 percent slopes | Shape | 5419 | 3098761 | 1 | 0.35 | 180 | 20 | Low | 5.5052 | 4.921 | 1 | Medium | 4 | 4522 | 4001 |

1 out of 25 Selected

Web Feature Service Access

- The WFS loader searches for features that touch the current extent in the view window of ArcMap, and provides only those features to the user's C: drive.
- Each time the users selects a theme from the WFS loader and loads the data it will overwrite the previously provided data for that theme.

WMS Identify results

The screenshot displays the ArcGIS Desktop interface with a WMS Identify window open. The main map shows a satellite view of a rural area with a yellow polygon highlighting a specific parcel. A green winding line, likely a water feature, is visible on the right side of the map. The Identify window provides detailed metadata for the selected feature.

Identify Results:

| Property | Value |
|-------------------|--|
| OBJECTID | 2117 |
| SHAPE | Polygon |
| Source_Catag.BI | http://pub.arcgis.com/rest/services/catalog/00000148 |
| URI_Orj | http://pub.arcgis.com/rest/services/catalog/00000148 |
| URI_Orj2 | http://pub.arcgis.com/rest/services/catalog/00000148 |
| Source_Catagm_1 | Full |
| Source_Catagm_2 | Full |
| Source_Catagm_3 | Full |
| Source_Catagm_4 | Full |
| Source_Catagm_5 | Full |
| Source_Catagm_6 | Full |
| Source_Catagm_7 | Full |
| Source_Catagm_8 | Full |
| Source_Catagm_9 | Full |
| Source_Catagm_10 | Full |
| Source_Catagm_11 | Full |
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| Source_Catagm_98 | Full |
| Source_Catagm_99 | Full |
| Source_Catagm_100 | Full |

Identified 2 features

Results of clicking on the hyperlink provided in the Identify tool

The screenshot shows a web browser window displaying the EPA's Watershed Assessment, Tracking & Environmental Results page. The page title is "2002 Waterbody Report for Smoky Hill River". The URL in the address bar is "http://www.epa.gov/waters/inter/waterbody/control/facility/KS-05-08-R006_6_2015072006a_report_typeTSP_cycle2002". The page features a navigation bar with the EPA logo and the text "Watershed Assessment, Tracking & Environmental Results". Below the navigation bar, there is a search bar and a breadcrumb trail: "You are here: EPA Home > Water > WATERS > Water Quality Assessment and TMDL Information > Waterbody Quality Assessment Report".

2002 Waterbody Report for Smoky Hill River
Waterbody Map Not Available

On This Page

- [Causes of Impairment](#)
- [TMDLs That Apply to This Waterbody](#)
- [Previous Causes of Impairment from Attainment of 1992](#)

State: [Kansas](#)
Waterbody ID:
Other ID: KS-05-08-R006_6
State List ID: KS-05-08-265_6
Location: Station/Segment: 265_6
State Waterbody Type: Streams/Creek/River
EPA Waterbody Type: Rivers and Streams
Water Size: 46.5
Units: miles
Watershed Name: [Lower Smoky Hill](#)

[Waterbody History Report](#)

Data are also available for these years:
[1998](#) [1999](#)

Causes of Impairment for Reporting Year 2002

[Description of this table](#)

| Cause of Impairment | Cause of Impairment Group | State TMDL Development Status |
|---------------------|--|-------------------------------|
| Chloride | Salinity/Total Dissolved Solids/Chlorides/Sulfates | TMDL completed |
| Fecal Coliforms | Pathogens | TMDL needed |
| Sulfate | Salinity/Total Dissolved Solids/Chlorides/Sulfates | TMDL completed |

1 Top of page

U.S. ENVIRONMENTAL PROTECTION AGENCY

Features

- About This Database (Integrated Report)
- Assessing Water Quality (Questions and Answers)
- Integrated Reporting Guidance
- Previous National Water Quality Reports
- EnviroMapper for Water
- AkaWATERS
- EPA WATERS Homepage
- Exchange Network
- Assessment Database
- Statewide Statistical Surveys
- How's My Waterway? Local Search Tool
- Pollution Categories Summary Document

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What is “Cloud Computing”?

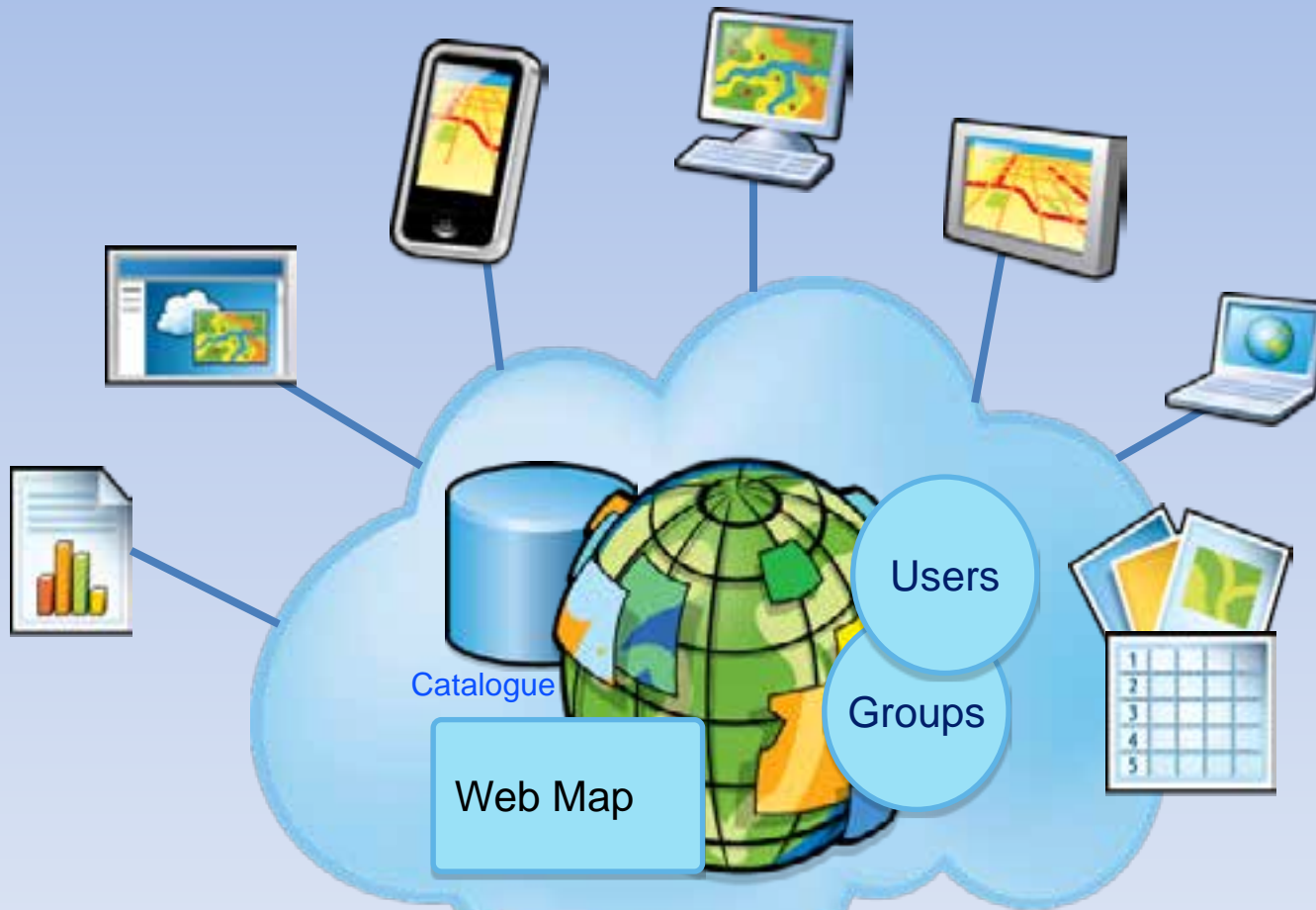
Computing resources you acquire by subscribing to a service, accessed over the internet

- IaaS – Infrastructure as a Service – a virtual machine, maybe an OS, you do the rest
- PaaS – Platform as a Service – virtual machine with platform software (web server, database)
- SaaS – Software as a Service – entire system is provided, ready for end-users to sign in
- (Other models in addition to these)

Cloud Resources at NRCS

- ArcGIS Online (AGOL)
- subject of NRCS GIS Specialist teleconference on 12/6/13

ArcGIS Online: SaaS + GIS content

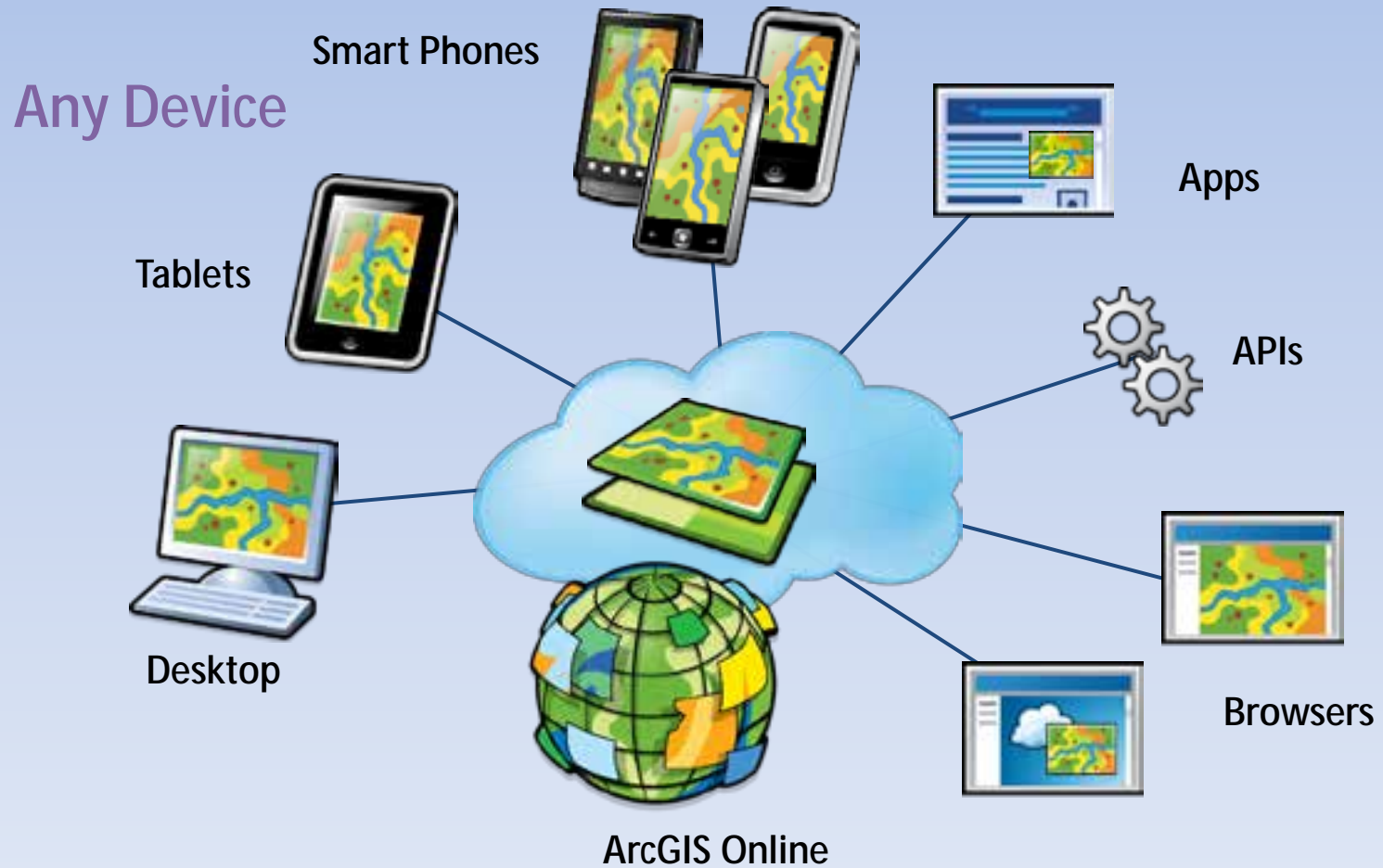


(GIS as a Service? GaaS?)

What Does ArcGIS Online Offer?

- Users can publish their own web maps
 - Public, limited sharing, or private
- Users can publish their own data layers
- Ready-made basemaps
- Access to content shared by others
- Support for various client devices
- Maps easily embeddable in websites
- Apps, templates, etc.

The "Web Map" Is the Key



Need to Consider What NRCS Already Has:

- Server Infrastructure
- Lots of data layers
- Metadata

Why use GIS in the Cloud?

- ArcGIS Online benefits
 - Eliminates publishing bottleneck
 - Easy to throw versions back and forth before finalizing
 - Web apps without custom programming
 - Broad device support
- The challenge is how to support it in a way that doesn't mess up what you already have

Issues to Watch

- Security?
 - How secure is your server now? Are you sure?
 - USDA CIO & ITS responsibility
- User Management
- Data Management and Metadata

Three Levels of Privilege

User

- Create web maps
- Share web maps (unless disabled)
- Participate in groups

Publisher

- As above, plus:
- Publish hosted data services
- Publish hosted cached maps

Administrator

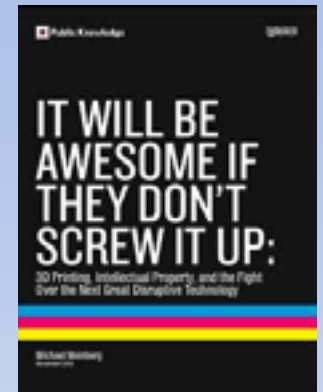
- As above, plus:
- Manage users, groups, and content of the organization
- Share maps and data services even if sharing is disabled for other users

User Management

- Provisioning (and de-provisioning) of user accounts is disconnected from in-house accounts
 - Consider integration with an in-house directory
- Users cost money
 - Overseen by USDA National Geospatial Management Center

Data Management

- ArcGIS Online puts the publishing capability into everyone's hands – including people with really sloppy habits
- Guarantees broader reach, but you need to keep it all organized.



vs.



Issues to Watch – Data Management

- Data uploaded and shared as an AGOL feature service can be made available for use in multiple web maps
- Data uploaded directly into a web map is available only through that web map (any user can do this)
- Uploaded data is disconnected from the original source; manual process for keeping it up to date is required
- Version control and documentation becomes VERY important

Key is Keeping It Organized!



vs.

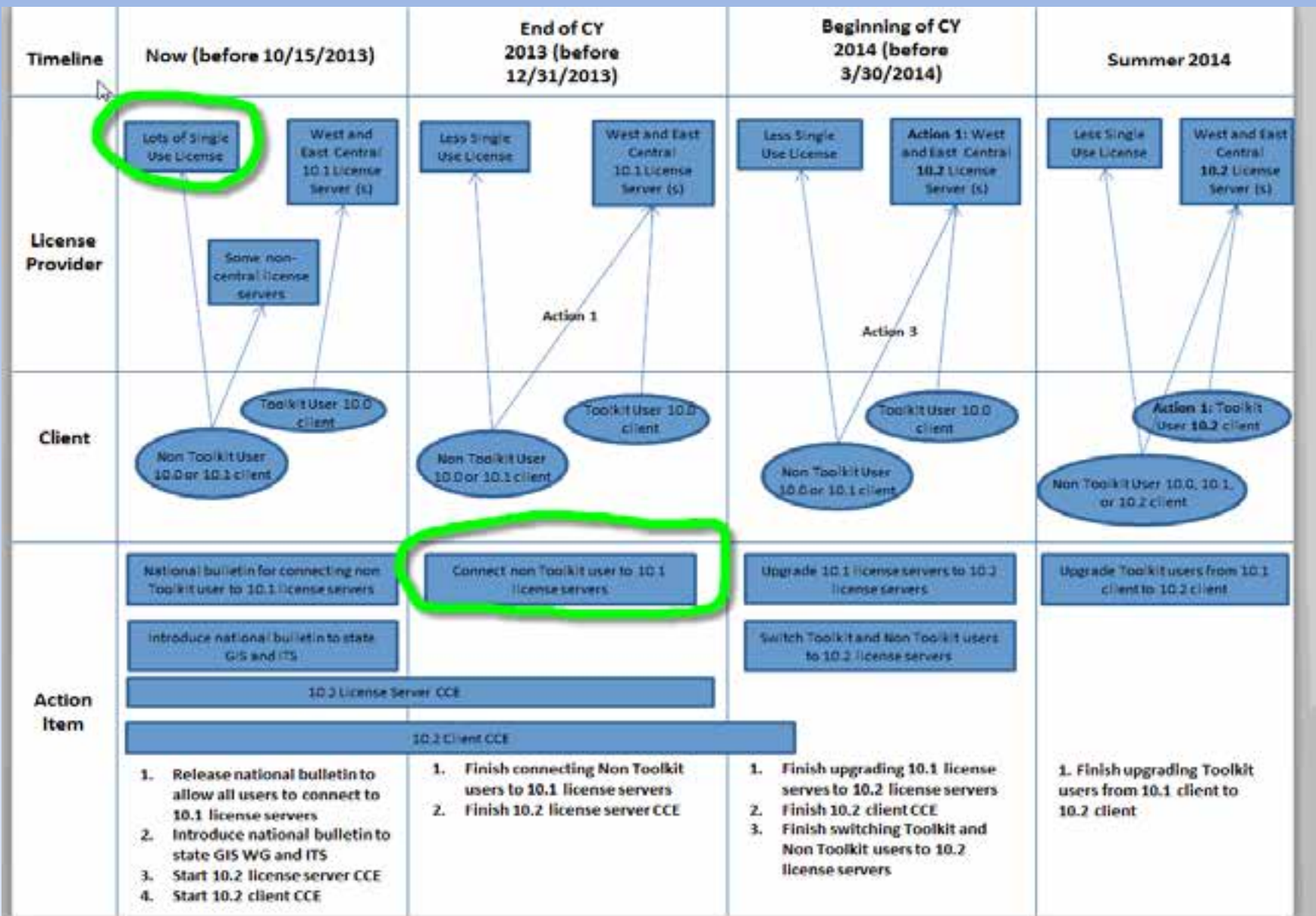


In-House Data Hosting

- Feature services driven directly off the enterprise data store can be registered in AGOL
- Same is true for cached base maps, live map services
- **Eliminates update issues**
- Data hosting consumes no AGOL credits
- **Users know they are getting data from authoritative source**

How Will It Work?





I. USDA Natural Resources Conservation Service (NRCS)

II. Federal Environmental Reviews

- a) Past**
- b) Present**
- c) Future**

III. Web Services

IV. Cloud Resources

V. Web Resources and the Future

Web Resources and the Future

- www.nj.nrcs.usda.gov
- What's ahead for NRCS:
 - Conservation Desktop and Mobile Mapper
 - Lots of uncertainty... many Farm Bill programs under which NRCS operates have not been reauthorized.

Questions? Contact me at Trish.Long@nj.usda.gov

GIS ANALYST



What my friends think I do.



What my mom thinks I do.



What society thinks I do.



What surveyors think I do.



What I think I do.



What I really do.