

# Reorganizing Around Web Services

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UTAH **AGRC**  
Automated Geographic Reference Center

- **Mission:**

- *“Encouraging and facilitating the effective use of geospatial information and technology for Utah”*

- **Activities:**

- State Geographic Information Database (SGID)
- Geospatial Infrastructure for:
  - Data and Imagery Acquisition, Sharing, Distribution
  - **Internet-enabled web and mapping services**
  - **Map-based web applications**
  - GPS base station network
- Coordination of local government, state & federal agencies geospatial activities and resources for optimal ROI

- **Hybrid Business Model**

- Cost Recovery & Appropriation



# Web & Map Services

- **Definition:**

- **Web Service:** *"a software system designed to support interoperable machine-to-machine interaction over a network."* (WC3)
- **Usually:** Client – Server (Request – Response)
- **Good terms to know:**
  - **WSDL** – protocol describing how to use WS
  - **UDDI** – Registry/Catalog of WS
  - **Formats:** SOAP, JSON, WMS, REST, etc

- **WS/MS Intended Audience – App developers**

- **Web services run in the background of applications**
- **Thin (browser) and Thick clients (ArcMap,etc)**
  - GIS and Non-Spatial Audience
- **.NET, java, php, python, ruby, etc**



# Web & Map Services

- **Example: Elevation lookup**
  - Request: SGID Dataset Name, x, y
  - Response: Elevation

here for a complete list of operations.' The section 'GetRasterValue' is highlighted. Underneath, there is a 'Test' section with instructions: 'To test the operation using the HTTP POST protocol, click the 'Invoke' button.' A table with two columns, 'Parameter' and 'Value', contains the following data: 'userName: demo', 'SGIDLayerName: SGID.SGIDRAS.DEM\_10METER', 'utmX: 430567', and 'utmY: 4495489'. The 'utmY' field is highlighted with a red box. An 'Invoke' button is located at the bottom right of the form."/>

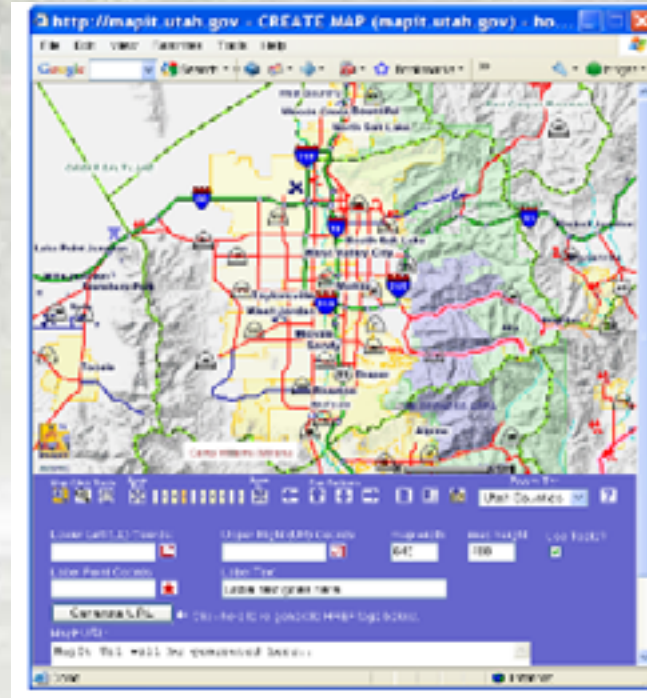
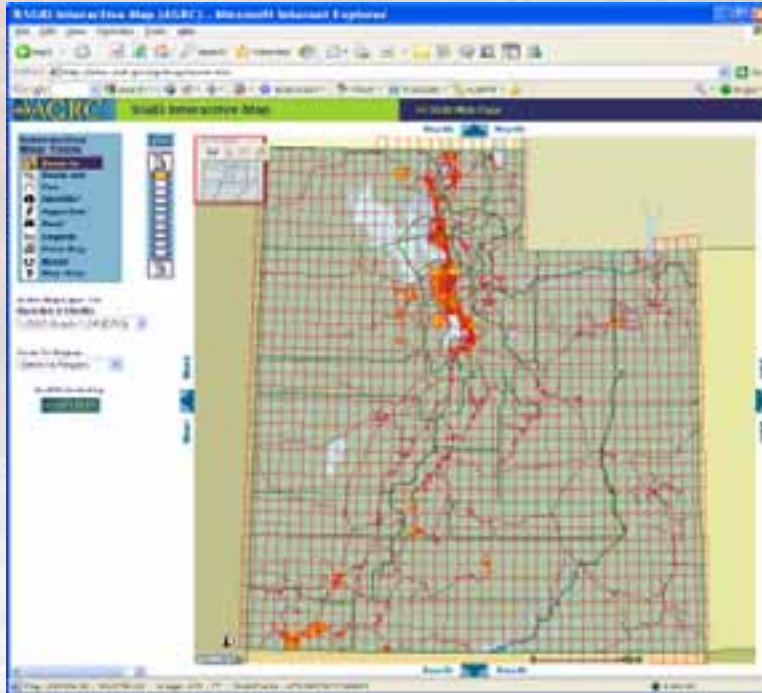
Parameter	Value
userName:	demo
SGIDLayerName:	SGID.SGIDRAS.DEM_10METER
utmX:	430567
utmY:	4495489

```
<?xml version="1.0"
encoding="utf-8" ?>
<string
xmlns="http://mapserv.utah.gov
/WSUTSGID_RasterValues">
1454|meters</string>
```



# Utah Map and Web Services:

- **From Exploration:** ArcIMS 2000- 2007 (~15 services, ArcAXL)



- **To Business Solutions:** ArcGIS Server, 2008 →



# Utah Geospatial Infrastructure


- **2008 Strategic Plan Addresses Geospatial Services**
  - Goal 4.2: “Services Are Effective, Accessible and Reliable”.
  - Objectives:
    - Create a common **infrastructure** for delivering geospatial **services**
    - Create exemplary services
    - Develop services for **data integration**.
    - Adopt **management** and control processes



# Utah SGID Data Reorganization

- **State Geographic Information Database**
  - SDE: 450+ Vector Layers
  - ImageServer: 20+ Raster Layers
- Services Focus and Geospatial Archiving Needs Drive Reorganization



 As of July 7th, 2pm MST, all shapefile and geodatabase download files now carry the new SGID93 name and category conventions.

- ISO Topic Categories
- Easy of update/maintenance
- Attributes for map & web services
  - Ease of use
  - Cartography
- Performance

#### The SGID 9.3 categories are as follows:

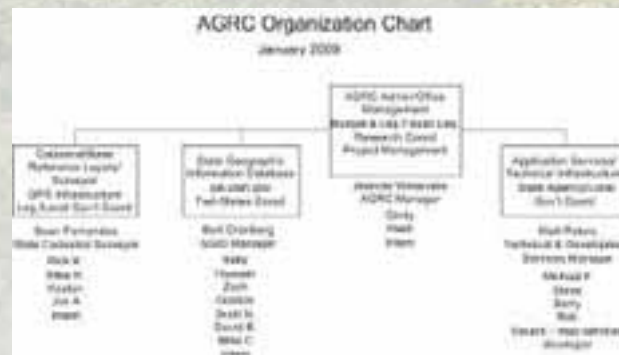
- |              |               |                  |
|--------------|---------------|------------------|
| • Bioscience | • Environment | • Planning       |
| • Boundaries | • Geoscience  | • Political      |
| • Cadastre   | • Health      | • Recreation     |
| • Economy    | • History     | • Transportation |
| • Elevation  | • Indices     | • Utilities      |
| • Energy     | • Location    | • Water          |



# AGRC Office Reorganization

- **Organizational**

- Preexisting Model
  - Horizontal
  - Project Focus
  - 1 Supervisor
- New Model
  - Operational Groups, 4 Section Managers
    - Administration
    - SGID Data
    - Cadastral
    - Tech/App Development (Web/Map Services)



- **Physical**

- Designed for collaboration:
  - by group
  - shared spaces
  - low walls



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UTAH **AGRC** OFFICE **DIRECTORY**





## Core Web Services:

- Address Location
  - Address/Zip
  - Address/Placename
  - Milepost/Route
- Features At/Near Point
- Get Feature Attributes
- Elevation Lookup
- Keyword lists
  - Cities, placenames, GNIS
- Base Map Services

## About:

- mapserv.utah.gov
- SOAP, JSON, Map services info
- User accounts
  - Track usage
  - Communicate with users



# Componentizing Strategy:

- 1<sup>st</sup> Gen: Design web service to specific use
  - District Lookup
    - Address → legislators, tax districts, etc.
    - Easy for application developers



# District Lookup Web Service:

**Request:**

## GeocodeAddress

### Test

To test the operation using the HTTP POST protocol, click the 'Invoke' button.

Parameter	Value
userName:	<input type="text" value="demo"/>
streetAddress:	<input type="text" value="2473 S Nantucket Dr"/>
zipCodeOrCity:	<input type="text" value="Cottonwood Heights"/>

**Response:**

```
- <ArrayOfResults>
- <Results>
  <MatchAddress>2473 E Nantucket Dr, 84121</MatchAddress>
  <Geocoder>U024.GC_StatewideStreets</Geocoder>
  <GeocodeScore>100</GeocodeScore>
  <UTM_X>430567.08</UTM_X>
  <UTM_Y>4495488.76</UTM_Y>
  <LONG_X>-111.8207283</LONG_X>
  <LAT_Y>40.6072995</LAT_Y>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.AdjustedUSHouseDistricts2002</DistrictLayer>
  <DistrictValue>2</DistrictValue>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.Municipalities</DistrictLayer>
  <DistrictValue>Cottonwood Heights</DistrictValue>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.SalesTaxAreas</DistrictLayer>
  <TaxDistrict>18020</TaxDistrict>
  <MetroName>Cottonwood Heights</MetroName>
  <FIPS>16270</FIPS>
  <CurrRate>0.0685</CurrRate>
  <RateDate>JAN09</RateDate>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.SchoolDistricts</DistrictLayer>
  <DistrictValue>JORDAN SCHOOL DISTRICT</DistrictValue>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.AdjustedUtahHouseDistricts2002</DistrictLayer>
  <DistrictValue>49</DistrictValue>
  <EMail>jseegmiller@utah.gov</EMail>
  <Name>F. Jay Seegmiller</Name>
  <Party>D</Party>
</Results>
- <Results>
  <DistrictLayer>SGID.U024.VotingPrecincts</DistrictLayer>
  <DistrictValue>4946</DistrictValue>
</Results>
```



# Componentizing Strategy:

- 2<sup>nd</sup> Gen: Design services as building blocks
  - ~~District Lookup~~
  - Address Locator + Feature At Point
    - Application developers have to chain services ☹️
      - First find address location
      - Then find districts at address location
    - Faster, easier to maintain, more flexible 😊



# Web Service Advantages

- Get more from investment, reach wider audience
- Application Developers don't need to maintain own geospatial infrastructure, licenses, & data
- Contract with end user defined by request and response definitions
  - Frontend Input/Output parameters must stay the same
  - Backend methodology & data can be changed without breaking contract
- Custom handling of tasks
- Example: Address Locator



## Ex. Address Locator Web Service

- Seamless updates: no files, data, parameters, software to be managed by application developers
- Customized Location Methods:
  - Backend is all zipcode-based geocoding
  - But place name input is also allowed
    - Place name to zipcode alias table
  - Three levels of street name aliasing
  - Milepost/Route handled by same service
  - Next? NENA DB direct GC

### UTSGID\_GeoLocator

Click [here](#) for a complete list of operations.

#### GeocodeAddress

##### Test

To test the operation using the HTTP POST protocol, click the 'Invoke' button.

Parameter	Value
userName:	<input type="text"/>
streetOrMilePost:	<input type="text"/>
zipCityOrRoute:	<input type="text"/>

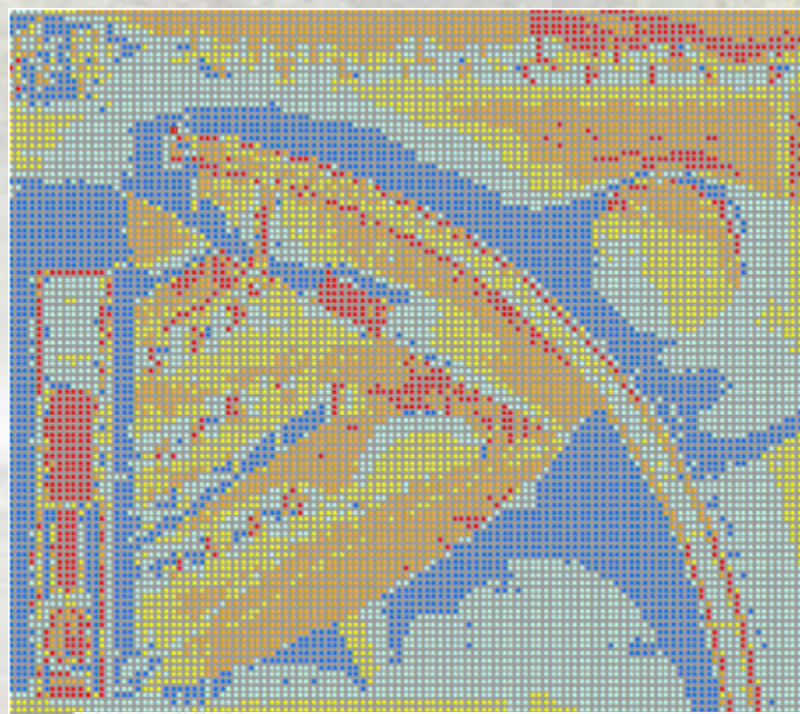
Invoke



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## Ex. Solar Energy Web Service

- Input: Polygon (list of coordinate pairs)
- Returns Monthly Averages
  - Solar Energy (watts)
  - Sunlit Hours
- 400 million points each w/ 24 preprocessed attributes derived from LIDAR data w/ ESRI solar tools & custom scripts
  - 1 meter resolution, extent = Salt Lake City
  - Custom python, VBA scripts:
    - Tiled solar tools processing
    - Aggregating tiles & layers



Solar Results

### SolarValues

Direct Duration: 264,264,333,362,425,402,417,388,324,317,260,217  
Direct Radiation:  
70787.83095,124962.160385,192270,170092,158290,134406,85667,60947  
Direct Area: 11295  
Time: 24.148



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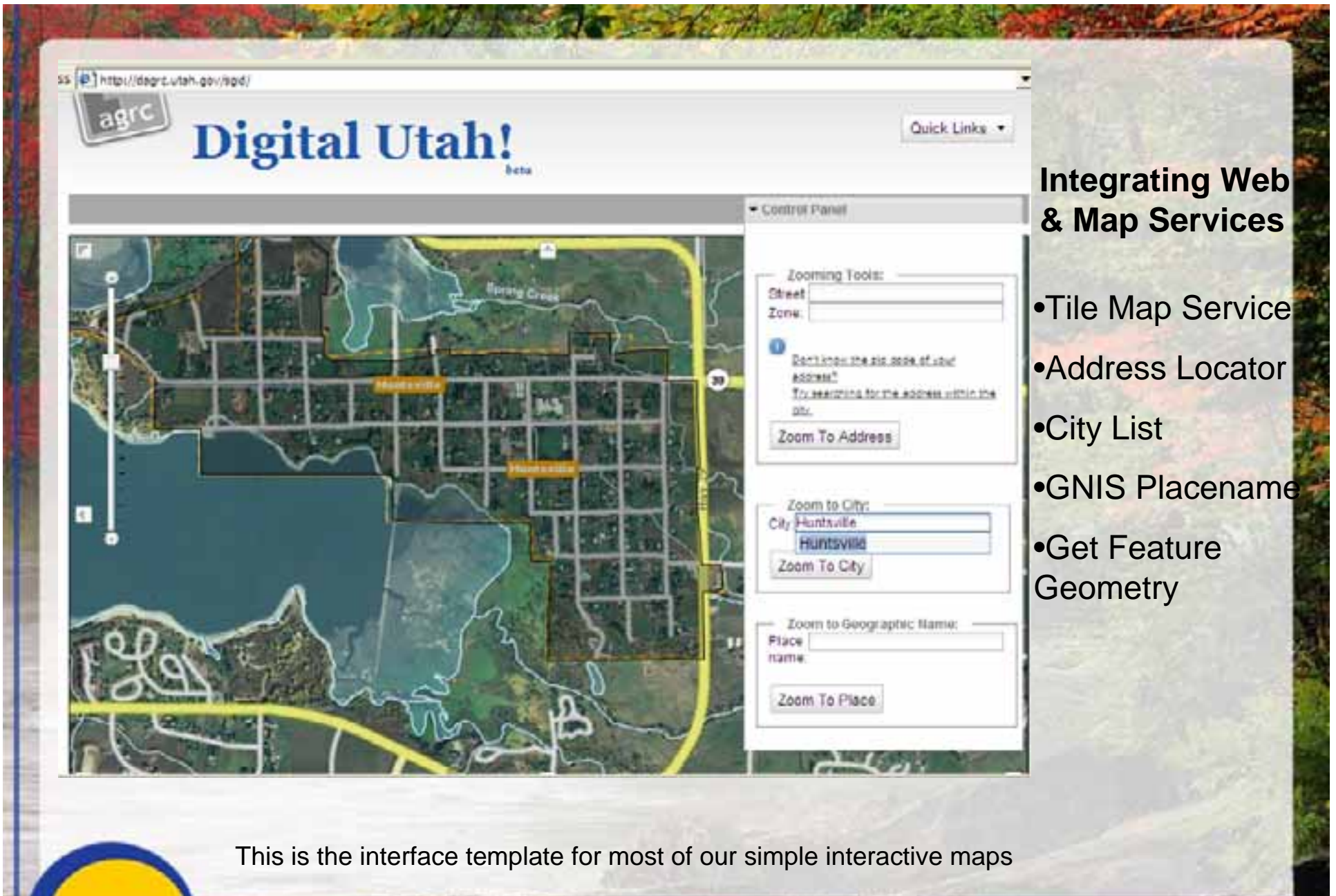


# Core Statewide Map Services:

- Publish once, integrate into applications
  - WMS base map services
    - Imagery (via Image Server)
    - Imagery/Streets Hybrid (tile cache)
  - ImageServer
    - Aerial Photography, CIR, (vintages available)
    - Scanned Maps
      - USGS topo series
      - Geology base maps
    - Hillshades







## Integrating Web & Map Services

- Tile Map Service
- Address Locator
- City List
- GNIS Placename
- Get Feature Geometry

This is the interface template for most of our simple interactive maps



Address <http://diagc.utah.gov/ieq/> Go

**DEQ Interactive Map** User Login

Download Data in Map | View Data Details (metadata and data quality) | AGRC | Help

Show Wizard | Hide Wizard | Select Layers | Query Methods | Search Results | Tools

**Step 1: Select Layers to Search**

This step allows you to select specific data layers to search. Your search results will only contain/display data from the layers you have selected.

Depending on your selection, there may be multiple layers of filtering available. Once you have made a selection, use the scrollbar to see all the options.

**Wizard**

- Sections
- Townships
- Hydrologic Units
- Land Ownership & Designation
  - Designation
  - Land Ownership
    - BUM
    - BUR RECLAMATION
    - FISH WILDLIFE
    - FOREST SERVICE
    - MILITARY
    - PRIVATE
    - STATE DNR
    - STATE DOT
    - STATE PARKS
    - STATE SITLA
    - STATE SOVEREIGN
    - TRIBAL

**Options**

Select Layers to Query

Categories  
Land

Layers in Category  
Underground Storage Tank Facility Search Filter

- Filter by Tank Status
- Filter by Release Status
- Open Tanks
- Has Release(s)
- Closed Tanks
- Open Release(s)
- Closed Release(s)
- Brownfields Other
- RCRA Large Quantity Generators
- Brownfields Targeted
- TRIQ

[Go to next step](#)

## Environmental Quality Public Information Site

### Basic Display/Query

- Wizard or GIS style interface
- Search/view cleanup sites and related data
- Make FOIA request and/or link to document management system

Uses web services for: base map, geocoding, city/placename lists





# Utah's Watershed RESTORATION INITIATIVE

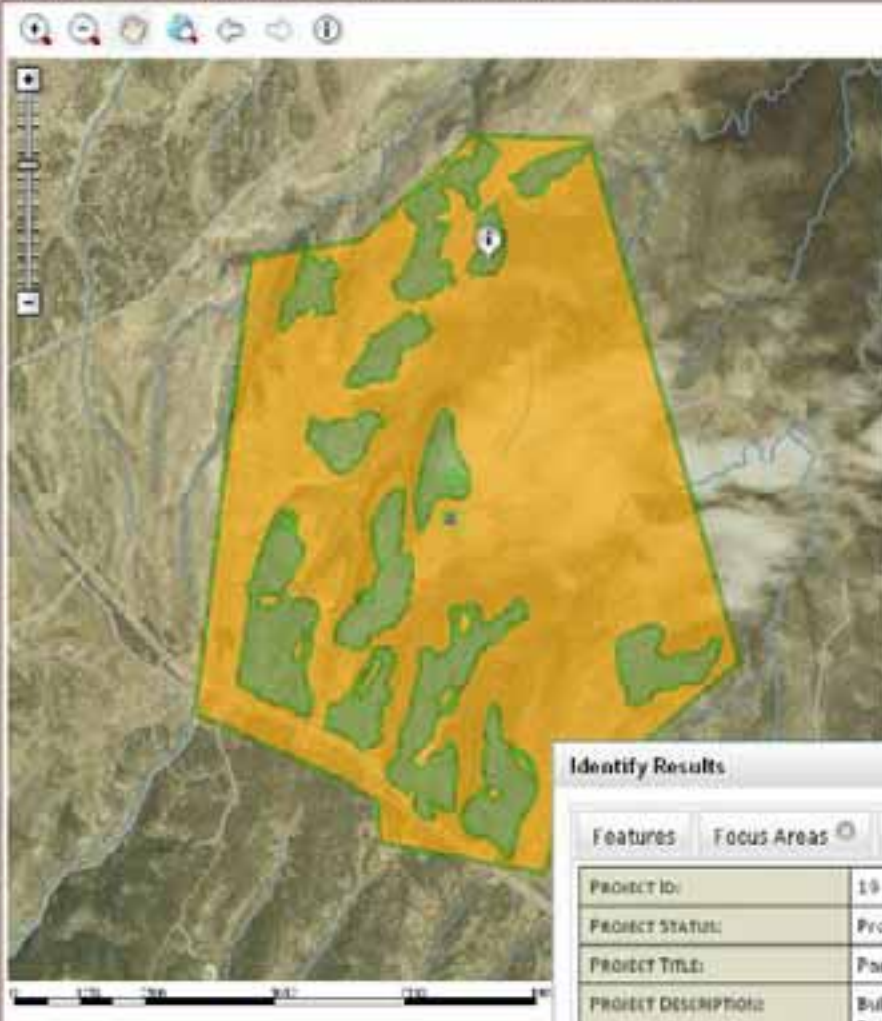
Projects

Map

Query Builder

User Profiles

Project ID: 19 Project Title: Park Ridge Bullhog (return to project portal)



Layers Base Legend Zoom Tools

- Project
  - Project Other Points
  - Project Water Control Stru
  - Project Troughs
  - Project Guzzlers
  - Project Fences
  - Project Pipelines
  - Project Dams
  - Project Aquatic Treatment
  - Project Terrestrial Treatme
  - Project Affected Area
- Completed

Create Project Features  
Modify Existing Project Features  
Terrestrial Treatment Areas  
Treatment Area [Instructions](#)  
Other Point Structures

### Identify Results

Features Focus Areas Land Owners Project Information

PROJECT ID:	19
PROJECT STATUS:	Project
PROJECT TITLE:	Park Ridge Bullhog
PROJECT DESCRIPTION:	Bullhog 500 Acres Of Encroaching Pinyon And Juniper From An Old Chaining In The Book Cliffs.
PROJECT MANAGER:	Nathan Kota
LEAD AGENCY/ORGANIZATION:	Utah Division Of Wildlife Resources
PROPOSED TERRESTRIAL ACRES:	479.00

Welcome, Steve Gourley

### Logout

- Title Page
- Justification
- Equipment
- Seed
- Archaeology
- NEPA
- Species
- Budget
- Funding
- Monitoring
- Images &
- Attachments
- Project Log
- Expenses
- Proposed
- Features
- Admin
- Project
- Comments
- Final Features

- Completion
- Form
- Submit
- Completed
- Project Data
- Submit a bug



# DNR Watershed Restoration Initiative: Web-Based Feature Editing

The screenshot displays the web-based feature editing interface for the Utah's Watershed Restoration Initiative. At the top, the logo features a stylized water drop with a green leaf inside. The main title reads "Utah's Watershed RESTORATION INITIATIVE". Below the title, navigation tabs include "Projects", "Map", "Query Builder", and "User Profiles". The current page shows "Project ID: 19" and "Project Title: Park Ridge Bullhog (return to project portal)". A central prompt asks, "What type of feature would you like to create, edit, or delete?".


The interface is divided into three main sections for feature selection:

- Treatment Areas:** Includes "Aquatic / Riparian" (represented by a river and trees) and "Terrestrial" (represented by a landscape with hills).
- Affected Area:** Includes "Affected Area" (represented by a field with a red shape).
- Structure:** Includes "Dam", "Fence", "Pipeline", "Guzler", "Trough", "Water Control Structure", and "Other Point Feature" (represented by a field with a red dot).

A left sidebar contains a menu with items such as "Title Page", "Justification", "Equipment", "Seed", "Archaeology", "NEPA", "Species", "Budget", "Funding", "Monitoring", "Images & Attachments", "Project Log", "Expenses", "Proposed Features", "Admin", "Project Comments", "Final Features", "Completion Form", "Submit", "Completed", and "Project Data". The "Final Features" item is highlighted.

On the right side, there is a user greeting "Welcome, Steve Gourley", a "Logout" button, and a "Submit a bug" button with a ladybug icon.

# DNR Watershed Restoration Initiative: Document Management



## Utah's Watershed RESTORATION INITIATIVE

[Title Page](#)  
[Justification](#)  
[Equipment](#)  
[Seed](#)  
[Archaeology](#)  
[NEPA](#)  
[Species](#)  
[Budget](#)  
[Funding](#)  
[Monitoring](#)  
**[Images & Attachments](#)**  
[Project Log](#)  
[Expenses](#)  
[Proposed](#)  
[Features](#)  
[Admin](#)  
[Project](#)  
[Comments](#)  
[Final Features](#)

[Projects](#) | [Map](#) | [Query Builder](#) | [User Profiles](#)



[User Login](#)  
[Create User Account](#)

Project ID: 19 Project Title: [Park Ridge Bullhog \(return to project portal\)](#)

### Images & Attachments

Images

1 Page 1 of 1

Type	Comments	Thumbnail
Before	Bullhog area, taken 8-24-07	
During	bullhog in action	


### Attachments

Attach supporting documents, except for the following:


<a href="#">Document</a>	<a href="#">Link</a>
<a href="#">Seed Documents</a>	<a href="#">Seed</a>
<a href="#">NEPA Documents</a>	<a href="#">NEPA</a>
<a href="#">Monitoring reports</a>	<a href="#">Monitoring</a>

Attachment	Comment
No comments have been added.	

[Submit a bug](#)



# DNR Watershed Restoration Initiative: Budget Mgmt Interface



## Utah's Watershed RESTORATION INITIATIVE

[Title Page](#)  
[Justification](#)  
[Equipment](#)  
[Seed](#)  
[Archaeology](#)  
[NEPA](#)  
[Species](#)  
**[Budget](#)**  
[Funding](#)  
[Monitoring](#)  
[Images & Attachments](#)  
[Project Log](#)  
[Expenses](#)  
[Proposed](#)  
[Features](#)  
[Admin](#)  
[Project](#)  
[Comments](#)  
[Final Features](#)

**Projects** | **Map** | **Query Builder** | **User Profiles**

Project ID: 19 Project Title: Park Ridge Bullhog (return to project portal)

**Budget**

Budget

1 Page 1 of 1


Item	Description	UWRI	Partner	In-Kind	FY
Contractual Services	Bullhog Contract @ \$275/acre	\$137,500.00	\$0.00	\$0.00	2010
Personal Services (seasonal employee)	Seasonal employee	\$0.00	\$500.00	\$0.00	2010
Motor Pool	Vehicle Mileage	\$0.00	\$2,000.00	\$0.00	2010
NEPA	BLM EA	\$0.00	\$0.00	\$1,500.00	2010
Seed (OERC)	Seed Mix @ \$50/acre	\$0.00	\$50,000.00	\$0.00	2010
Contractual Services	Aerial Seeding Contract @ 15/acre	\$0.00	\$7,500.00	\$0.00	2010

**Budget Totals**

	UWRI Total	Partner Total	Net Total	
Totals	\$137,500.00	\$40,000.00	\$177,500.00	
			\$1,500.00	In-Kind Total
			<b>Grand Total</b>	\$179,000.00

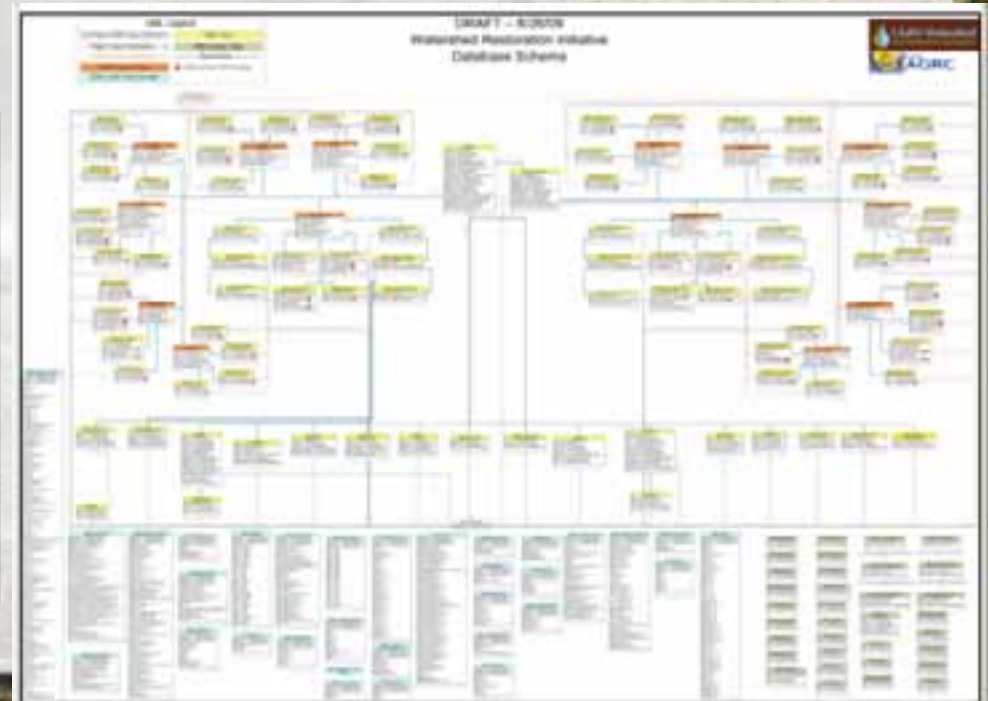
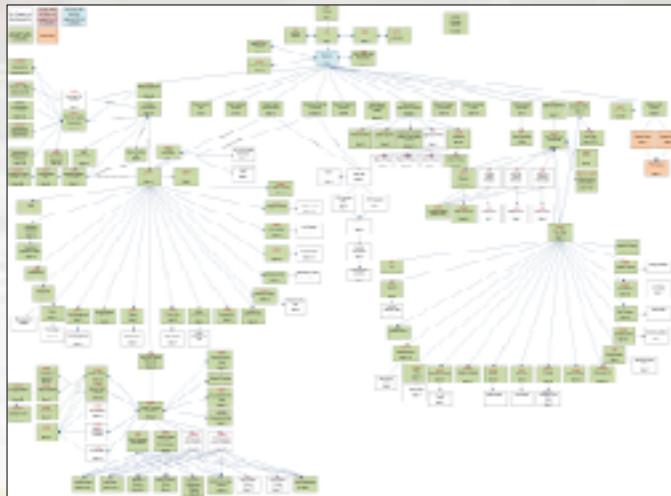
[User Login](#)  
[Create User Account](#)

[Submit a bug](#)



# New technical requirements:

- Enterprise apps require skill sets, specializations database design, use cases, flow diagramming
- CS/IT skill set can quickly become more important than geospatial



## What's next:

- Refine management processes for web/map services
- More core web & map services
- Outreach to developers
- App Dev Projects
  - Agriculture - salinity
  - Oil & Gas
  - Biotics - T & E species
  - Regional 3 fish DB
  - Health info integration (IBIS, flu)





# Summary: SSDI Geospatial Web Services

- Extend benefits of geospatial investment
- Takes commitment, forethought, resources
- Important focus areas
  - Geography → CS, IT
  - Industry standards
  - Performance orientation, focus can't be on the size of the data pile
  - Reaching non-GIS audiences with GIS data and maps



# Comments/Questions

- [mpeters@utah.gov](mailto:mpeters@utah.gov) @mattagrc
- [mapserv.utah.gov](http://mapserv.utah.gov)



# Where have we been?

We have all been building databases

Geospatial Database are primarily used by Geospatial folks

You must have certain software/hardware to interact with the data

We needed to develop core services/components so we could build once and use many times

Rely on existing data already developed and stored in a database

AGRC needed to look at its personnel structure and decide what the focus should be

Refer to strategic plan.....does this fit



# The Problem

You need to have good data, bad data really shows up bad!

The value of a data set is a direct porportion to the amount of use it gets

Deq screen shots

WRI Screen Shots (3 Slides)

Or 5 or six slides with functionality

