

# MAPS

## ON



## THE

## HIGHLIGHTS

# 2017

**JANUARY 25, 2017  
UTAH STATE CAPITOL**

# WELCOME TO MAPS ON THE HILL

Welcome to this year's annual *Maps on the Hill* on Wednesday, January 25th from 10:00am-1:00pm in the Capitol Rotunda.

The Maps on the Hill event and this accompanying map book showcase the amazing geographic data, spatial mapping and GIS (Geographic Information Systems) resources available in Utah. Utah has developed a strong national reputation as a leader in geospatial data development and technology. The willingness of organizations to work together towards common data goals and to readily share data sets Utah apart. The resulting extensive spatial data resources allows decision makers at all levels of government, private sector and non-profits to make more informed transparent data based decisions.

Utilizing the spatial data resources, which contain identifying and descriptive information as well as location, GIS provides the tools to produce powerful visualizations and perform a wide variety of spatial analyses to assist decision makers. Today, GIS is used extensively to help visualize, analyze, and interpret data which helps with decision making and increases efficiency by saving both time and money. This year's Maps on the Hill event focuses on "How to Tell the Story of GIS".

To highlight a couple of the GIS stories featured in this year's book:

*Protecting the Central Wasatch Story Map* (Salt Lake County Surveyor's Office) – As the population along the Wasatch Front continues to grow, the impacts on the Central Wasatch Mountains are increasing. This story map helps citizens spatially visualize and learn more about the planning initiatives that are currently in development for the Central Wasatch.

*Grooming Report Online and Mobile App* (Snyderville Basin Special Recreation District) – Outdoor recreation is a vital part of living in or visiting Utah in the winter. Knowing the current status of winter trails plays an important role in the decision making process of trail users. Snyderville Basin Special Recreation District developed an Online Map and Mobile App to keep trail users updated on the status of their groomed trails while at the same time increasing personnel productivity.

Please look through this book for many more examples of the extensive geospatial resources available in Utah. And, please take a few minutes to join us in the Capitol Rotunda to visit with a variety of professionals that are excited to show you how they use GIS to integrate and manage geographic data to best support the missions of their organizations.

Phoebe McNeally, Chair  
Utah Geographic Information Council



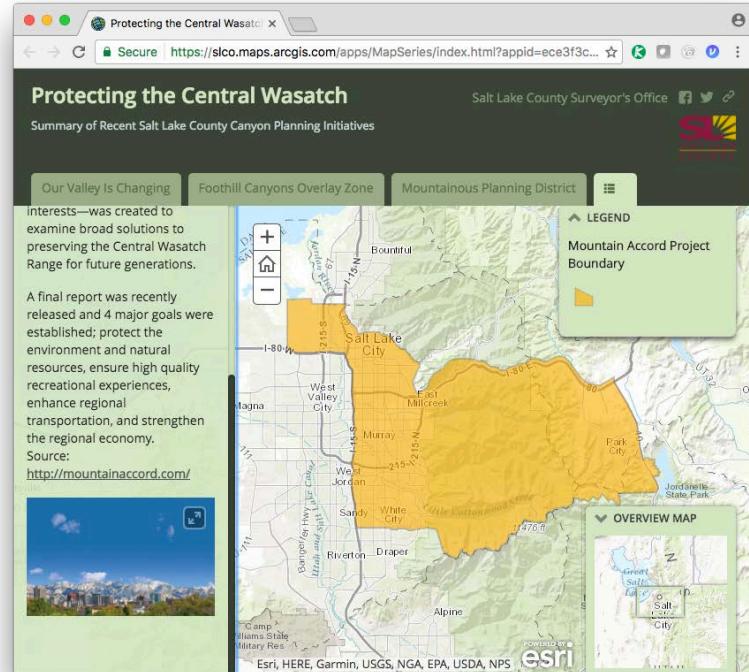
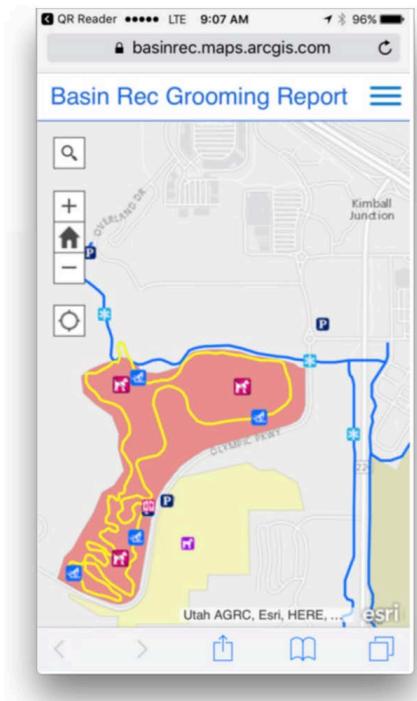
# MESSAGE TO LEGISLATORS

Digital map technology, more commonly known as geographic information systems (GIS), is used extensively across government and industry to organize, visualize, and analyze data based on location.

Recent years have seen a rapid expansion in the use of GIS to solve problems and increase efficiencies in government. GIS has evolved from a niche application first deployed by expert practitioners working on Utah's public lands issues in the 80s and 90s, to one that is leveraged by thousands of knowledge workers across all subject areas, levels of government, and economic sectors. And, of course, the vast majority of citizens and visitors carry a small but critical sample of the power of GIS in the maps and apps on their mobile devices. GIS technology will increasingly be employed to engage citizens in their communities.

Innovative use of GIS in Utah is saving taxpayer money, improving service delivery, promoting strong economies, and creating healthier, safer, and more engaged and resilient communities. The theme of this year's Maps on the Hill event, *Telling the Story of GIS*, showcases how GIS is applied by Utah organizations to meet these goals. We are proud of the range of excellent work that has been contributed to this year's Map Book. From relatively simple applications such as collecting the location of assets in the field or optimizing vehicle routing, to more complex applications of visual and spatial analysis in support of data-driven decision making, GIS is becoming increasingly central to public and private sector functions at every level.

It's our hope that this Map Book will encourage you to learn more about GIS and how it's being applied to meet current and future Utah needs. We hope that you will, as desired, engage with the Utah GIS community -- at the city, county, or state agency level -- to leverage the power of this technology to work on the issues and outcomes for which you are most concerned.





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# WHAT CAN GIS WEB APPS DO FOR YOU?

Collaborate, Foster, Optimize, and Integrate

Matt Peters, Keaton Walker, Scott Davis, Steve Gourley, Automated Geographic Reference Center (AGRC)

Incorporating maps into web and mobile applications elevates the user experience by allowing for improved visualization and understanding of spatial patterns. AGRC's in-house development team designs, builds, and hosts custom mapping applications to meet specific agency/program requirements.

**Examples:**

- The Watershed Restoration Initiative realizes great cost savings by incorporating strong mapping components into their multiagency, collaborative project tracking application.
- UDOT and Public Safety use a web map to visualize crash patterns to inform their efforts to keep Utah's roadways safe.
- The Lt. Governor's Elections Office manages voter registration, ballot assignment, and listings of the elected officials for any address in the state using GIS.
- GOED created the locate.utah.gov map app to provide business site selectors with the ability to make smart relocation decisions taking into consideration proximity to high speed broadband, natural gas and other utility availability, transportation infrastructure, schools, incentive zones, recreation sites, and other amenities.

The graphic consists of four quadrants of a map of Salt Lake City, each illustrating a different GIS application:

- Top Left (Tools for Informed Decisions):** Shows a map of Salt Lake City with various data layers. Overlaid text reads "crashmapping.utah.gov". Markers include a yellow circle with "565", an orange circle with "2732", a green circle with "86", and a red circle with "SLC GO".
- Top Right (Boost the Economy):** Shows a map of Salt Lake City with various data layers. Overlaid text reads "locate.utah.gov". Markers include a green circle with a tree, several red circles with white symbols, and green circles with white crosses.
- Bottom Left (Make Your Vote Count):** Shows a map of Salt Lake City with various data layers. Overlaid text reads "vote.utah.gov". Markers include numerous small red dots.
- Bottom Right (Cost Saving Collaboration):** Shows a map of Salt Lake City with various data layers. Overlaid text reads "wri.utah.gov". Markers include a black factory icon and a white train icon.

**Bottom Left Logo:** UTAH AGRC LOCATION MATTERS gis.utah.gov

# CONNECTING COMMUNITIES TO THEIR PUBLIC LANDS USING GEO-REFERENCED MAPS

Stephanie Cooper and Jonny Jew – Bureau of Land Management/Great Basin Institute

While cell phone navigation has revolutionized travel in developed areas, lack of cell service and less documentation of primitive trails and routes have stunted utilizing cell phone's GPS in back county travel. The BLM in Utah has worked to bridge that gap by producing georeferenced maps of recreation areas on Utah's public lands. These maps can be downloaded by anyone for free. In addition to including the most up to date trails, local regulations, and facilities, users can utilize 3<sup>rd</sup> party apps on their phone to view their current location on the map even without cell phone coverage. Easy to use and free access to spatial data can enhance the experience and safety of visitors to Utah's public land.

**Land Manager & Visitor Information**

- Bureau of Land Management (BLM)
- BLM Wilderness Study Area
- Forest Service
- Fish & Wildlife Service
- State
- Parking
- Private
- Campsite
- Restroom
- Boat Ramp
- Rapids
- Point of Interest
- Gas Station
- Food Service

**Special Designations**

Area of Critical Environmental Concern (ACEC)

What is an ACEC? An area where significant environmental information is needed for protection and prevention of irreparable damage to natural resources or habitat. ACECs are areas where significant differences in natural resources or potential hazards to human health and safety from natural hazards.

Spillway just below dam  
Little Hole 7 miles below dam  
Indian Crossing 15.4 miles  
Bridge Hollow (AKA Taylor Flat Bridge) 16.2 miles  
Bridgeport (AKA Cowboy) 17.3 miles  
Swallow Canyon 26.2 miles  
Swinging Bridge 29.6 miles

This map is geo-referenced  
BLM Vernal Field Office  
170 S. 500 E. Vernal, UT | 435-781-4400  
Flaming Gorge Ranger District, Ashley National Forest  
25 W. Hwy 49 Manila, UT | 435-784-3445

**How to get there**

**Recreation Use Fee**

A Flaming Gorge Use Pass is required and must be visibly displayed in vehicle windshields for anyone using the river corridor or the river access boat ramps and day use areas at Spillway and Little Hole.

Pick up a pass at any of the following locations:

- Forest Service Offices in Manila and Vernal, UT and Green River, WY.
- Flaming Gorge Dam Visitor Center
- Local vendors near Flaming Gorge

National Passes are honored in lieu of the Flaming Gorge Pass: Annual, Senior, Access, and Volunteer.

**Camping**

**Restrictions**

A Section – No camping allowed.

B Section – Camp only in designated float-in or hike-in campsites. Registration for campsites must be made the day of use at Little Hole on the Camp Registration Board. Some campsites may be reserved in advance online at recreation.gov (search for Green River Float-In Campsites, UT). All others are first come, first served.

C Section – Developed campsites are highlighted on the map, but campers are not restricted to only those sites. Campsites at Indian Crossing and Bridge Hollow can be reserved by calling the BLM at (435) 885-3307.

**Trails**

**Little Hole National Recreation Trail**

Of the many trails enjoyed near the Green River, the most traveled is the Little Hole National Recreation Trail. Meandering beside the Green River from the Spillway to Little Hole for 7.2 miles, hikers will enjoy this trail for fishing access, wildlife watching, and beautiful scenery.

Mountain biking is permitted on this trail from Labor Day to Memorial Day weeks. Camping, fires, and horses are not allowed on this trail.

**Likely Catches**

Brown Trout  
Rainbow Trout

**In the Blink of an Eye...**

The flow of the Green River through the dam can vary daily. For river flow information call (435) 885-3106 or visit waterdata.usgs.gov/ut/nwis/r.

**River Requirements**

- Personal flotation devices (PFDs) must be worn properly at all times. Inflatable PFDs are not allowed.
- Canoes must have flotation devices equivalent to one-third inside volume.
- Motorized crafts are not allowed on the river.
- Flotation tubes are not recommended on any section of the river.

**Each watercraft should be equipped with a:**

- spare oar or paddle compatible to the craft being used.
- bailing device.
- throw rope (for watercraft 16 feet or longer).
- self-contained toilet for overnight camping.

**Permits**

Permits are only required for commercial outfitters and guides floating on the A, B, and C sections of the river.

**Leave No Trace Principles**

The following is a selection from the Leave No Trace principles. To view the full principles go to [leavenotrace.org/](http://leavenotrace.org/).

**Travel and Camp on Durable Surfaces**

- durable surfaces include established trails and campsites; rock, sand, gravel, snow, and hardpan.
- Good campsites are found, not made. Altering a site is not necessary.
- Proper campsite
- Conserve use on existing trails and campsites.
- Walk single file in the middle of the trail even when crowded.
- Keep campfires small. Fires activity in areas where vegetation is absent is allowed.
- Disperse use to prevent the creation of campsites and trails.
- Avoid places where impacts are just beginning.

**Dispose of Waste Properly**

- Pack it in, pack it out. Inspect your campsite and rest areas for trash before leaving.
- Use a trash can or bury trash, leftover food, and litter.
- Deposit solid human waste in catholes dug 6 to 8 inches deep, at least 200 feet from water, camp, and trails. Cover and disguise the cathole when finished.
- Pack out toilet paper and hygiene products.
- To wash yourself or your dishes, carry water 200 feet away from streams or lakes and deposit small amounts of biodegradable soap. Scatter strained dishwater.

**Horse Friendly Trails**

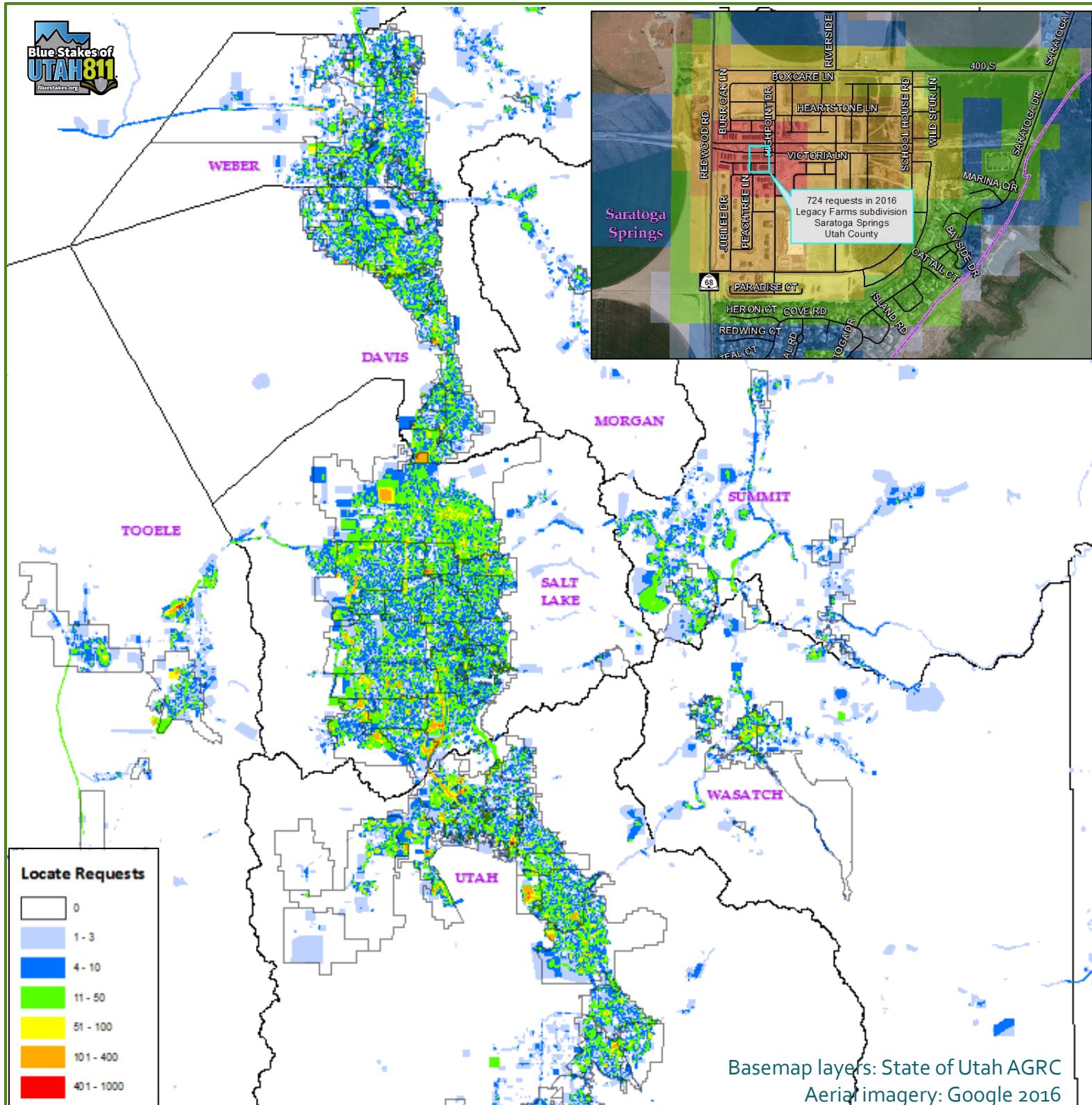
Horses are welcome on BLM managed lands but are not permitted at campsites or on Forest Service managed lands. However, public horse corrals near stream crossings are available for overnight stay through the BLM, call (435) 885-3307. Popular horse riding trails include Fisherman, Green River, Home Mountain, and Sears Creek.

## EXCAVATION ACTIVITY IN UTAH 2016

Is this an indicator of Utah's economic health?

James Wingate, Blue Stakes of Utah 811

In 2016, Blue Stakes of Utah 811 received almost 387,000 "call before you dig" requests to have underground utility lines located and marked prior to excavation. This density map shows the locations of these locate requests. The excavation area involved made up only 3.24% of Utah's total land area; no excavation was reported for over 96% of Utah's land in 2016. See [www.bluestakes.org](http://www.bluestakes.org) for more information about Blue Stakes of Utah 811. Stop by the Blue Stakes display table for an interactive version of this map. See where excavation took place in your area of interest!

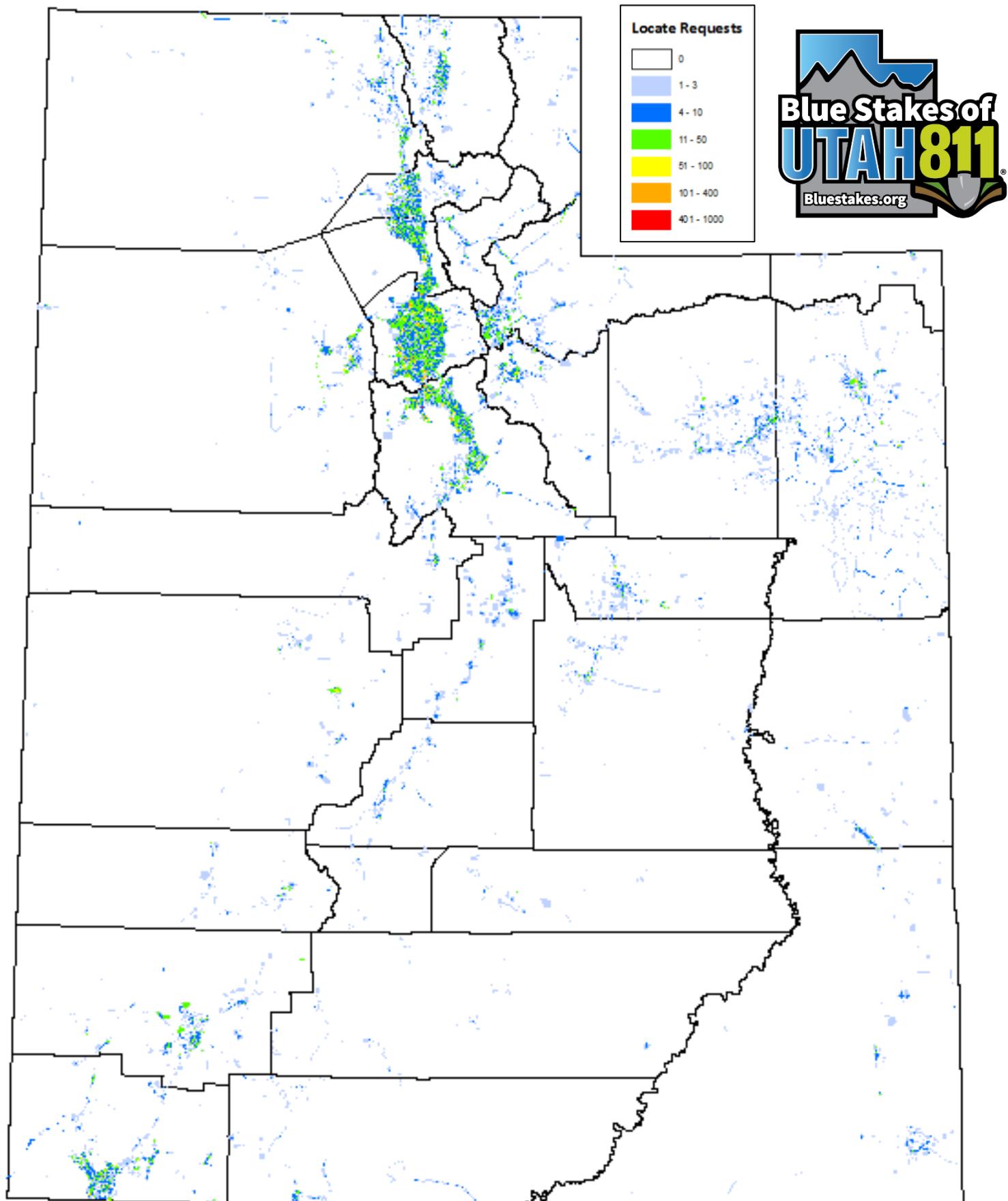


# EXCAVATION ACTIVITY IN UTAH 2016 (continued from previous page)

Is this an indicator of Utah's economic health?

James Wingate, Blue Stakes of Utah 811

Basemap layers: State of Utah AGRC



# VETERANS MEMORIALS IN UTAH

Find a memorial near you!

Christina Epperson, GIS Analyst, Utah Division of State History - Antiquities

The Utah Division of State History has created a database showing the locations of veterans' memorials located in the state. There are approximately 180 memorial sites dedicated to over 20 wars, conflicts, and terrorist attacks that occurred since 1775. An interactive map is available to search for memorials. The interactive map also includes photos, war descriptions and memorial dedication dates. Check out our web gallery here:

[www.heritage.utah.gov/history/history-maps](http://www.heritage.utah.gov/history/history-maps)



## GROOMING REPORT ONLINE AND MOBILE APP

### Winter Recreation Information for the Snyderville Basin within Greater Park City

Jessica Kirby, Snyderville Basin Special Recreation District (Summit County)

The Grooming Report is designed to allow public users of the District's Winter Trail system to locate the latest groomed Nordic and multi-use trails maintained by Snyderville Basin Special Recreation District. This application replaced an outdated spreadsheet that required trail crew employees to manually update the status of groomed trails on several different online portals. The addition of GIS technology has allowed for near real time updates, as crews can change the status while still on the grooming machines, all while increasing productivity and reliability.



## BASIN RECREATION

### Winter Recreation & Grooming Status App

- Most Recent Groomed (Corduroy Skiing)
- Recently Groomed (Still Good Skiing)
- Not Groomed (Not Enough Snow)
- Packed Single Track
- Trail (No Winter Maintenance)
- Plowed Path

- |  |                    |
|--|--------------------|
|  | Parking            |
|  | Multi Use Winter   |
|  | No Dogs            |
|  | Snowshoe           |
|  | Restroom           |
|  | Ice Rink           |
|  | Ski Only           |
|  | Fatbike            |
|  | Off Leash Dog Area |

## ZERO FATALITIES & STORY MAPS

UDOT is using Story Maps to tell the stories of the Zero Fatalities program.

Kaitlin Barklow, GIS Manager, Utah Department of Transportation

Zero Fatalities is a UDOT Program aimed at eliminating the five deadly driving behaviors - drowsy, distracted, aggressive, impaired driving, and not buckling up. Human error is the critical reason for 94% of traffic accidents, so by focusing on prevention, UDOT hopes to reach the ultimate goal of Zero Fatalities on Utah roadways. The Teen Memoriam project is part of the teenager-focused "Don't Drive Stupid" campaign, and the seat belt usage statistics support the effort to make Utah's Primary Seat Belt Law a permanent law.



### UTAH'S LAW TO SAVE LIVES

Over the last five years, almost half of all people (45%) who died on Utah's roads weren't buckled. All of the crashes in this video, however, have one thing in common - everyone survived because they were wearing their seat belt.



# zero® Fatalities

*A Goal We Can All Live With*



## DON'T DRIVE STUPID

**zero Fatalities** A Goal We Can All Live With

**Kaitlyn Hansen, 15**  
Please protect your precious lives  
and wear a seat belt. Always.  
[Full Story](#)



## Utah's Primary Seat Belt Law

Seat belts are the single most effective traffic safety device for preventing death and injury.

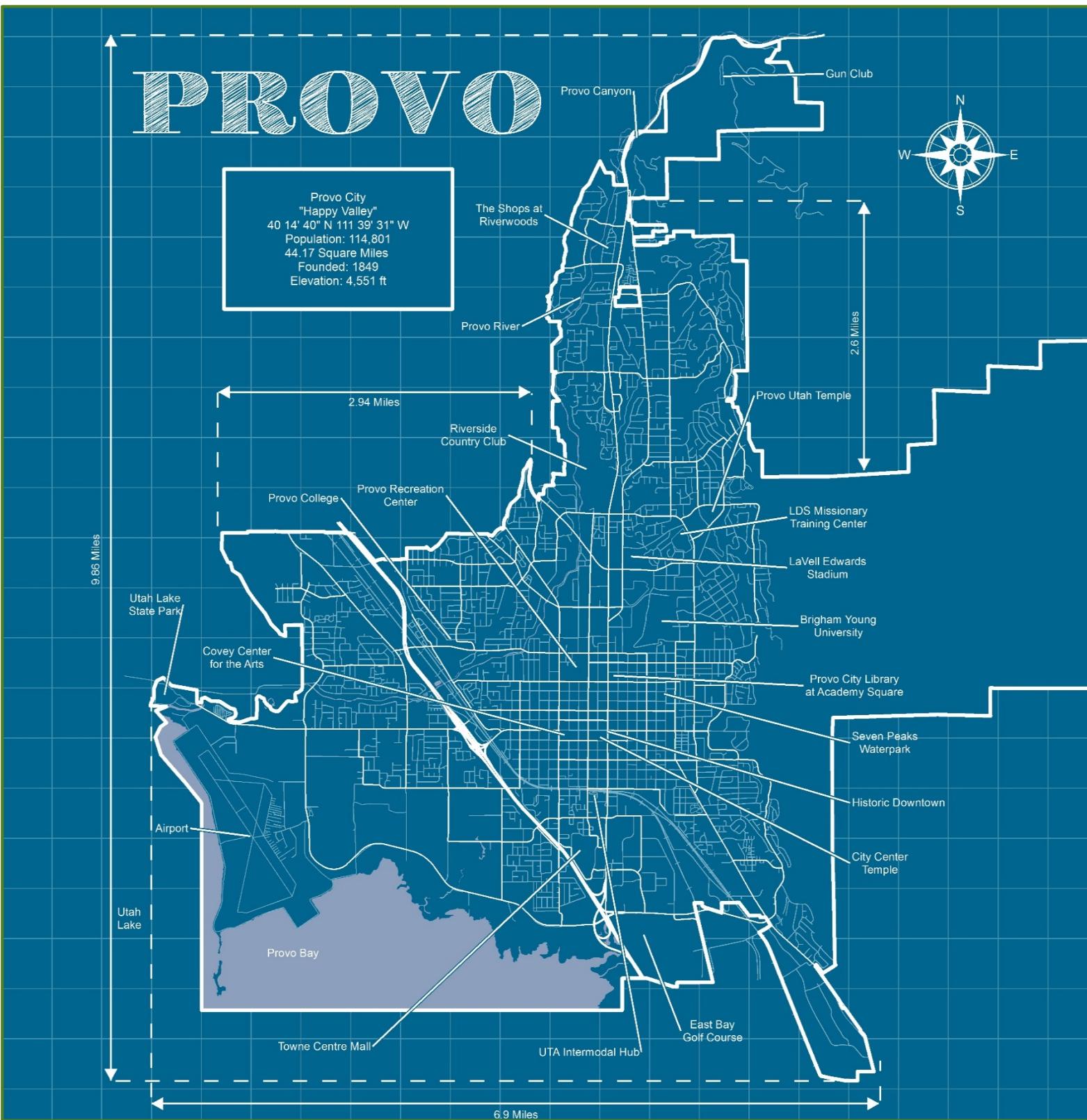
**MISSING MOMENTS**  
2015 Teen Memoriam  
Remembering 10 Lives Lost On Utah Roads



## A BLUEPRINT OF PROVO

Stan McShinsky, Provo City

Many people don't know the shape of their own city and are surprised by all the area it covers. The goal of this map was to create an artistic view of the city that someone would want to have on their wall. The blueprint format created a nice theme and a challenge to replicate. By having a simplified design makes it easier to highlight points of interest without looking overcrowded.



# TREES AND SIDEWALKS – CAN'T WE ALL JUST GET ALONG?

## Pedestrian Safety and GIS

Mike Smith and McKenzie Wood – Centerville City, UT

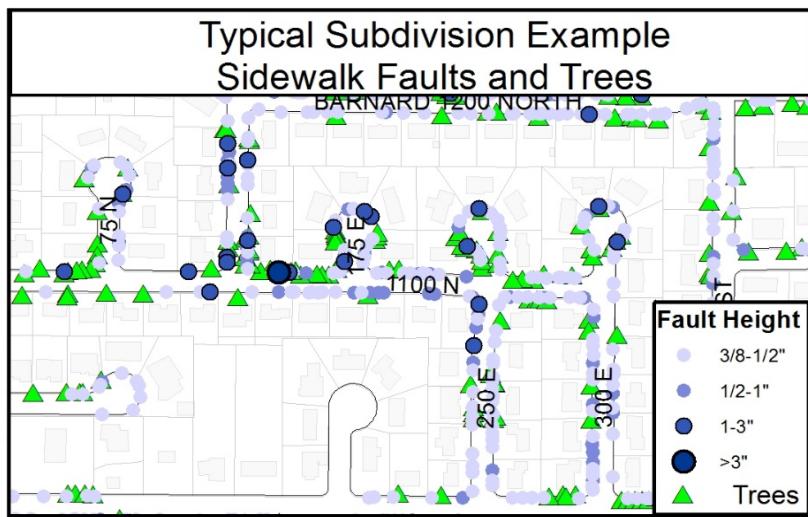
Interactive web map: <http://arcg.is/2jcVVHk>

Using GIS, Centerville City conducted a sidewalk & tree survey. After two days of collection, the map was already populated with several hundred points representing sidewalk faults! Management quickly asked “why” there were so many problems. Once the survey was completed, spatial correlation analysis in the GIS indicated a significant correlation between faults and proximity of trees. This quantifiable data was presented to council and is currently in discussion for directing policy regarding trees near sidewalks and how to budget for sidewalk repairs in Centerville City.

Trees & Faults Correlation		
Number of faults per 1,000 linear feet		
	Sidewalk Near Park Strip Trees	Sidewalk Far from Park Strip Trees
Major Faults	2.4	0.7
Minor Faults	16.3	15.6
Total Faults	18.8	16.3

Total Sidewalk Costs		
	Fault Occurrences	Repair Cost
<u>Minor Faults</u>	<u>7,622</u>	<u>\$399,714</u>
3/8"-1/2"	6,047	\$276,817
1/2"-1"	1,575	\$122,897
<u>Major Faults</u>	<u>427</u>	<u>\$141,444</u>
Cracking/Spalling	31	\$13,899
Total:	8,080	\$555,057

Council authorized to spend approx. \$25,000 to repair the 8 major Faults >3" Amount also includes removal of trees



### Short term Action:

- Remove trees near faults over three inches
- Remove and replace faults over three inches
- Remove and replace all other major faults after first removing trees, if related
- Establish criteria for determining which minor faults to paint and repair

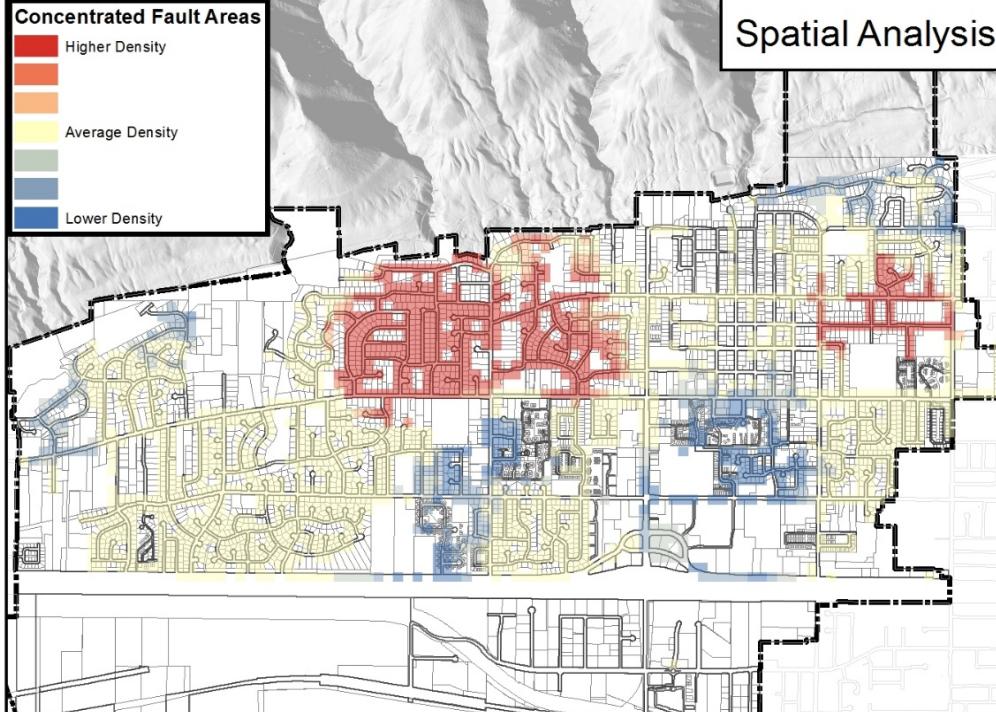
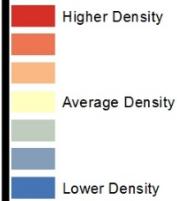
### Long term Action:

- Define acceptable uses for the right of way, including whether trees will be permitted in the park strip, and if so, under what conditions
- Maintain paint on unrepainted faults
- Schedule and fund repairs and replacements for unrepainted faults
- Incorporate GIS sidewalk database updates into department procedures

**Major Fault >3"**  
**Requires Replacement & Tree Removal**



### Concentrated Fault Areas



**Major Fault 1" - 3" Previously Ground**  
**Requires Replacement & Possible Tree Removal**



**Minor Fault 1/2" - 1"**  
**Requires Grinding**



# BUILDING RESILIENCE THROUGH MITIGATION

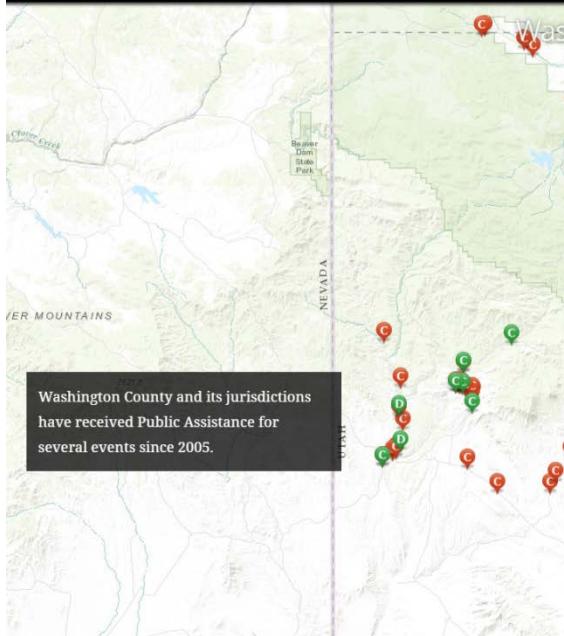
Josh Groeneveld, Utah Division of Emergency Management

Resilience is the capacity of systems, whether they are individuals, communities, institutions or businesses, to survive, adapt and thrive through any kind of chronic stress or shock. One of the key functions in emergency management is to mitigate the effects of potential disasters before they happen. Mitigation helps make communities more resilient. This map began as a blog post that has been transformed into an interactive application enhancing the text of the blog post with relevant photos and maps to tell a complete story of the power of mitigation. The maps demonstrate the need for mitigation based on previous damaged areas as well as communities participating in the National Flood Insurance Program.

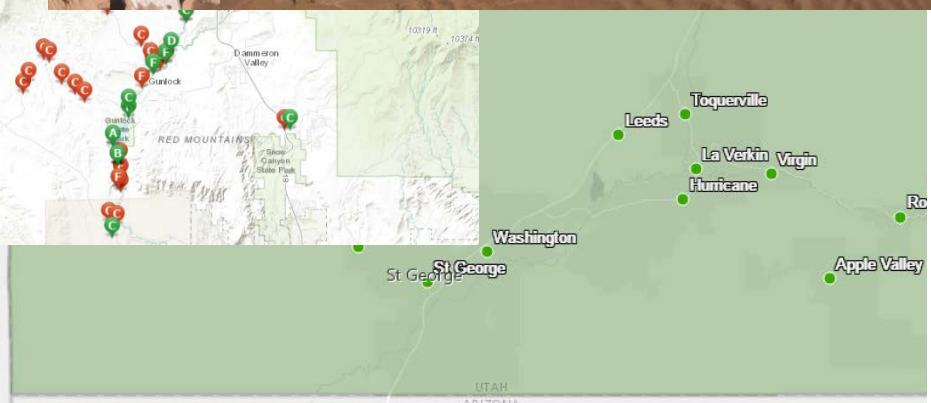


Washington County Public Assistance

Building Resilience Through Mitigation



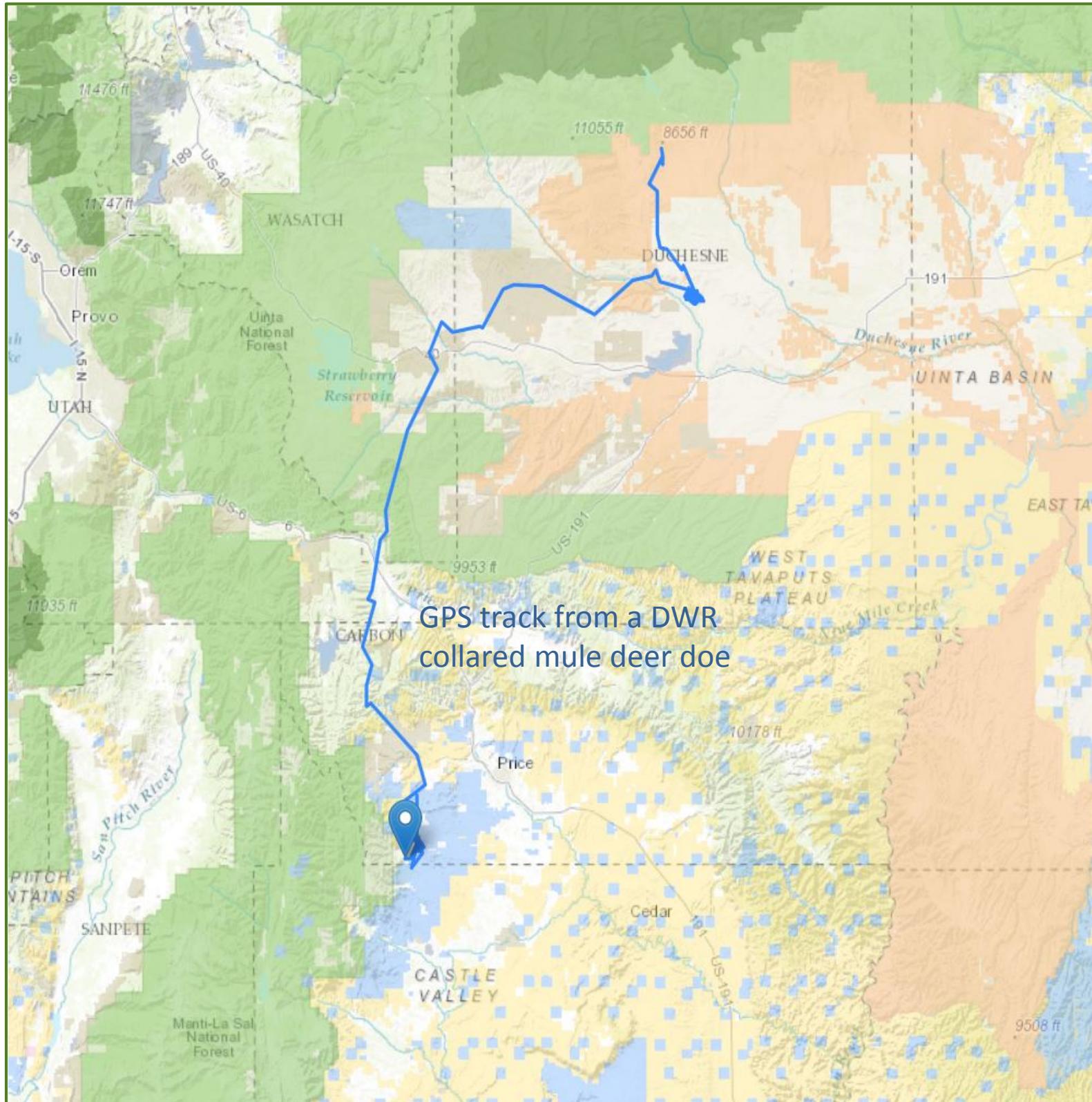
See the original blog post here:  
<https://uthazardmitigation.wordpress.com/2016/03/10/building-resilience-through-mitigation/>



# WILDLIFE GPS TRACKING CONTRIBUTES TO BETTER MANAGEMENT

Eric Edgley, Gary Ogborn, and Nathan Kota, Utah Division of Wildlife Resources

In recent years, the cost of GPS tracking devices has decreased substantially. This has enabled the Utah Division of Wildlife Resources to greatly expand their research to better understand key wildlife characteristics, including wildlife home ranges, movement patterns, migration routes, and seasonal crucial habitats, to better inform managers how they can better conserve wildlife species in Utah. These devices are being deployed on several species, from big game to small birds. The path of a mule deer doe is depicted below.



# EVALUATING WILDFIRE RISK IN UTAH

A new tool for the public, communities, and professionals

Utah Division of Forestry, Fire and State Lands

Last summer, the Utah Division of Forestry, Fire and State Lands launched a new web portal to help our citizens, communities, and land management professionals evaluate the wildfire risk to their homes, communities, and lands. The Utah Wildfire Risk Assessment Portal (uWRAP) can be found at [utahwildfirerisk.utah.gov](http://utahwildfirerisk.utah.gov) and offers a public viewer for house and lot evaluations and a professional viewer for communities, planners, and management professionals. Since its launch the uWRAP has been used to tell the story of wildfire risk in Utah.

**Assessment Report for Your Location**

**Corner Canyon**

**Introduction**

Welcome to the Utah Wildfire Risk Assessment Portal (UtWRAP) and Assessment Report. The Internet portal is a component of the Utah Wildfire Risk Assessment Project (Utah WRA). This Report provides two key pieces of information for the location you have selected. These are the Wildfire Threat and the Characteristic (Expected) Fire Intensity expressed as the flame length.

**Location**

The information in this Assessment Report is based on an area that is approximately 45 acres in size centered at your location with the GPS coordinates of 40.4984° N 111.8391° W.

**Wildfire Threat**

Wildfire Threat is a measure of the likelihood of a fire starting and spreading to a location. The Wildfire Threat Level map in Figure 1 is centered at your location. The colors on the map shown in Figure 1 are based on the nine categories for the Wildfire Threat Level map with the legend shown on the left side of Figure 2. The three Wildfire Threat Assess Groups are shown on the right side of Figure 2 and are an aggregate of the nine Wildfire Threat Levels. The Assess Group Wildfire Threat for your location is High. Collectively, areas with High Wildfire Threat (High, Very High, Extreme Levels) are defined to support decision-making and occupy about 8.0% of the state. High Wildfire Threat is approximately 12 times greater than Moderate Wildfire Threat and 53 times greater than Low Wildfire Threat.

**Figure 1**

**Figure 2**

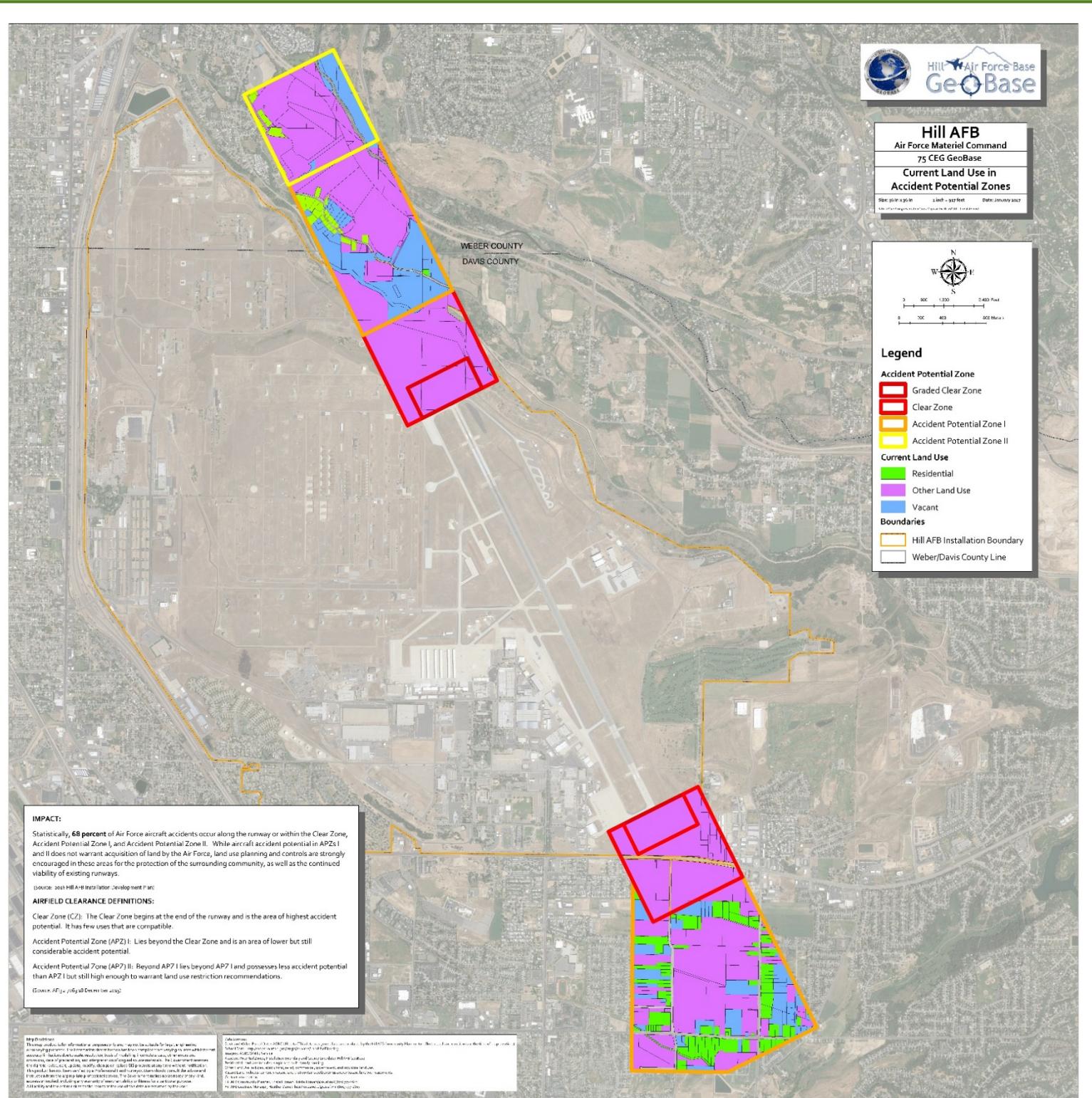
Wildfire Threat Level	Assess Group
0 Urban, Agriculture, Barren or Water	
1 Very Very Low	
2 Very Low	LOW
3 Low	
4 Low to Moderate	
5 Moderate	MODERATE
6 Moderate to High	
7 High	
8 Very High	
9 Extreme	HIGH

## CURRENT LAND USE IN ACCIDENT POTENTIAL ZONES

Hill Air Force Base

Krista Ligman and Heather Dauel, Hill AFB 75 CEG/CENPP

Statistically, 68 percent of Air Force aircraft accidents occur along the runway or within the Clear Zone, Accident Potential Zone I, and Accident Potential Zone II. While aircraft accident potential in APZs I and II does not warrant acquisition of land by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the surrounding community, as well as the continued viability of existing runways.



# PRICE RIVER RIPARIAN LAND COVER MAPPING

A Dataset to Support Restoration of the Price River in East Central Utah

Ellie Leydsman-McGinty, Christopher McGinty, Wally Macfarlane, Brian Laub, Phaedra Budy, and R. Douglas Ramsey

The Remote Sensing/GIS Laboratory was contracted to work with state and federal agencies to develop a riparian land cover dataset for the Price River riparian corridor from Wellington, Utah to the confluence of the Green River. The Price River riparian land cover dataset will support restoration planning efforts. The lower elevations of the Price River have become dominated by invasive plants species, including tamarisk and Russian olive. These species have impacted the river by narrowing the channel, contributing to dewatering and sedimentation and affecting native aquatic species.

## PRICE RIVER

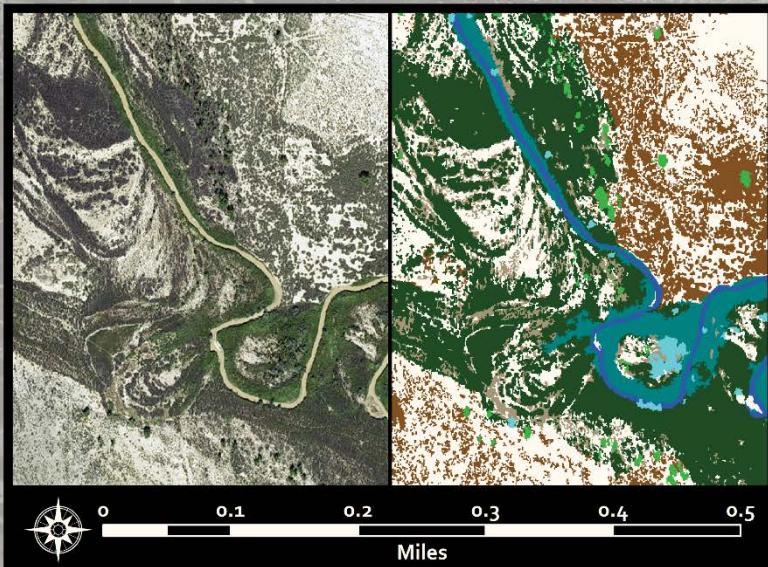
Agriculture
Barren/Bedrock
Cottonwood
Desert Shrub
Developed
Herbaceous/Invasive
Russian Olive
Shadow
Tamarisk
Water
Wetland
Willow/Phragmites



S.J. & JESSIE E. QUINNEY  
COLLEGE OF  
NATURAL RESOURCES  
**UtahStateUniversity**



Photos by Chris McGinty

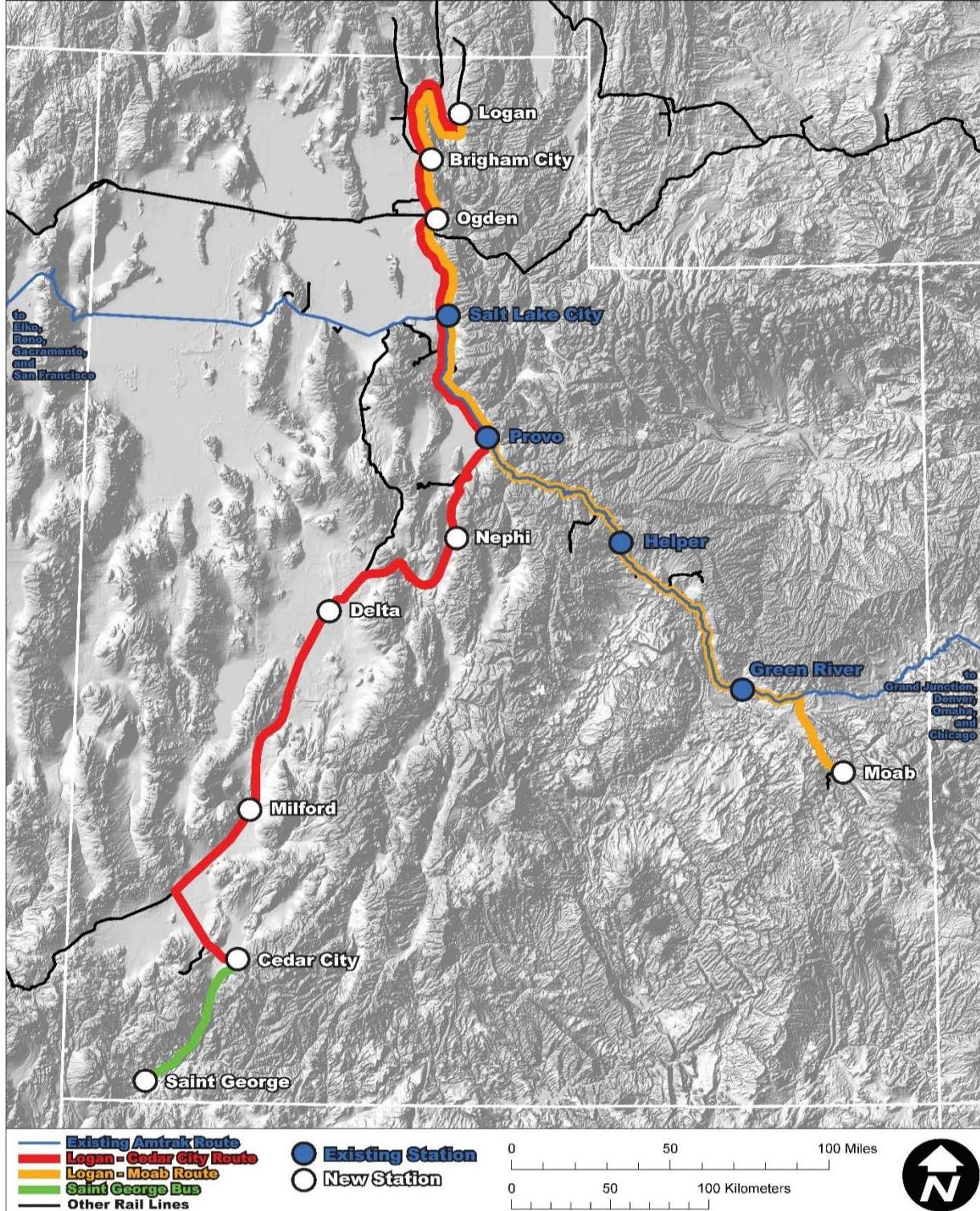


# BEEHIVE STATE: AN INTRASTATE PASSENGER RAIL SYSTEM FOR UTAH USING EXISTING UNION PACIFIC TRACKS

Mike Christensen, Department of City and Metropolitan Planning, University of Utah, Keith Bartholomew, Advisor

This study examines the feasibility of passenger rail routes within Utah, which would run on existing Union Pacific tracks. Two *Beehive State* routes are proposed: the first from Logan to Cedar City, and the second from Logan to Moab. The map shows the two proposed routes, the route of the existing Amtrak *California Zephyr*, other rail lines in Utah, and also connecting bus service between Cedar City and Saint George. Download the full poster:

<https://goo.gl/EEpXEn>

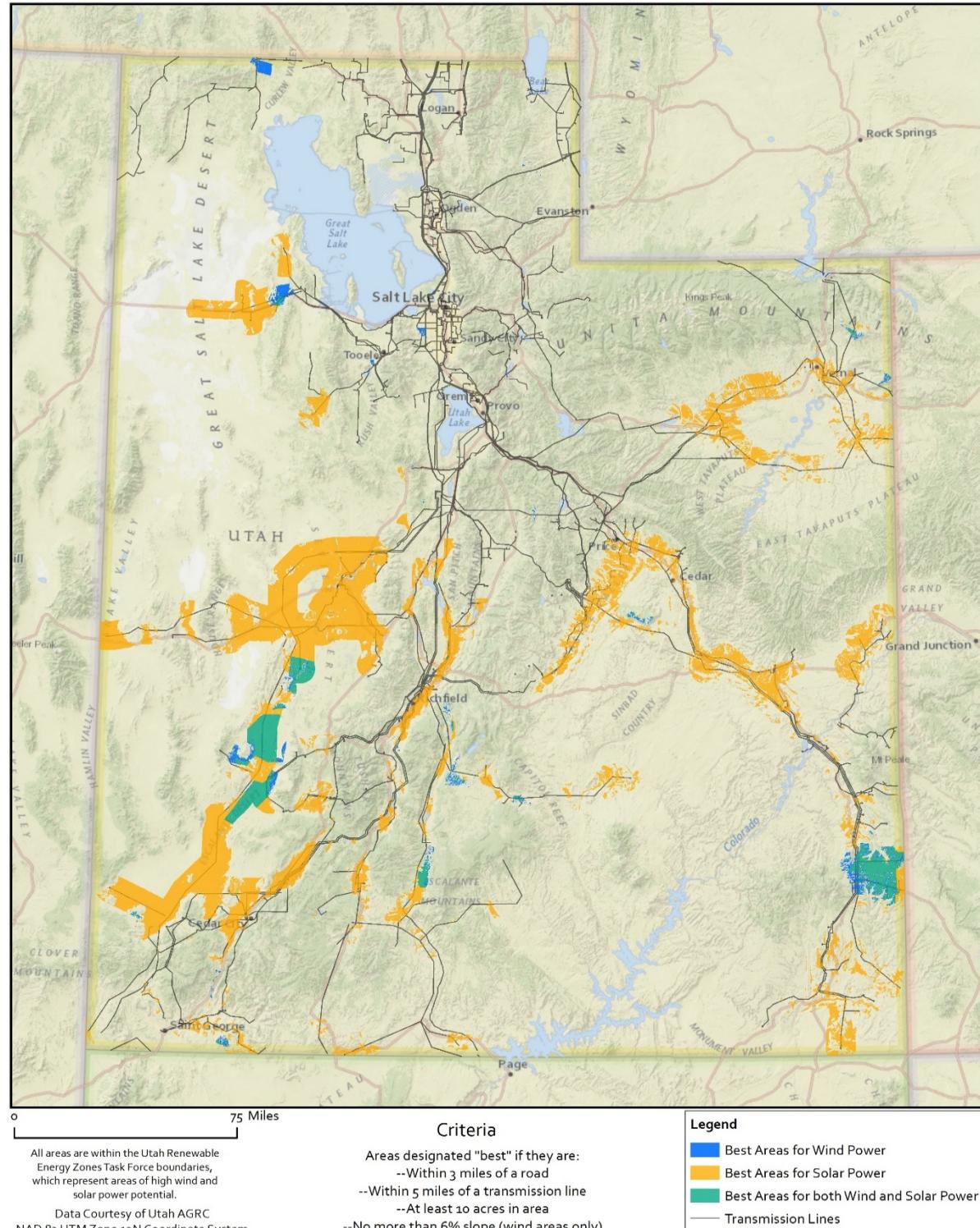


# MOST ACCESSION AREAS FOR WIND & SOLAR POWER GENERATION IN UTAH

Analyzing infrastructure and geography to determine suitable locations

Anders Hart, Student Organization for Society and Natural Resources club at Utah State University

Utah has enormous potential to become a leader in renewable energy. This map shows areas in Utah that are most accessible for wind and solar electricity generation. Based on a report by the Utah Renewable Energy Zones Task Force, this presentation shows which areas are most accessible for development, using several criteria: distance to roads, distance to transmission lines, slope, and area. This information demonstrates that large parts of Utah are located favorably with respect to infrastructure and geography.



# WASATCH FRONT CYANOBACTERIA BLOOMS – 2016

Alex Rudowski, Salt Lake County Public Works – Flood Control Engineering

Communities along the Wasatch front will likely recall the summer of 2016 when environmental conditions produced toxic algal blooms throughout the region's waterways. Warnings, issued at local and state levels, urged residents to stay out of the water and not to use impacted water for irrigation. Contact with high levels of cyanobacteria can result in sickness and even death. The figure below is a timeline illustrating cyanobacteria levels at sample sites and the corresponding risk posed to humans who come in contact with the bacteria.

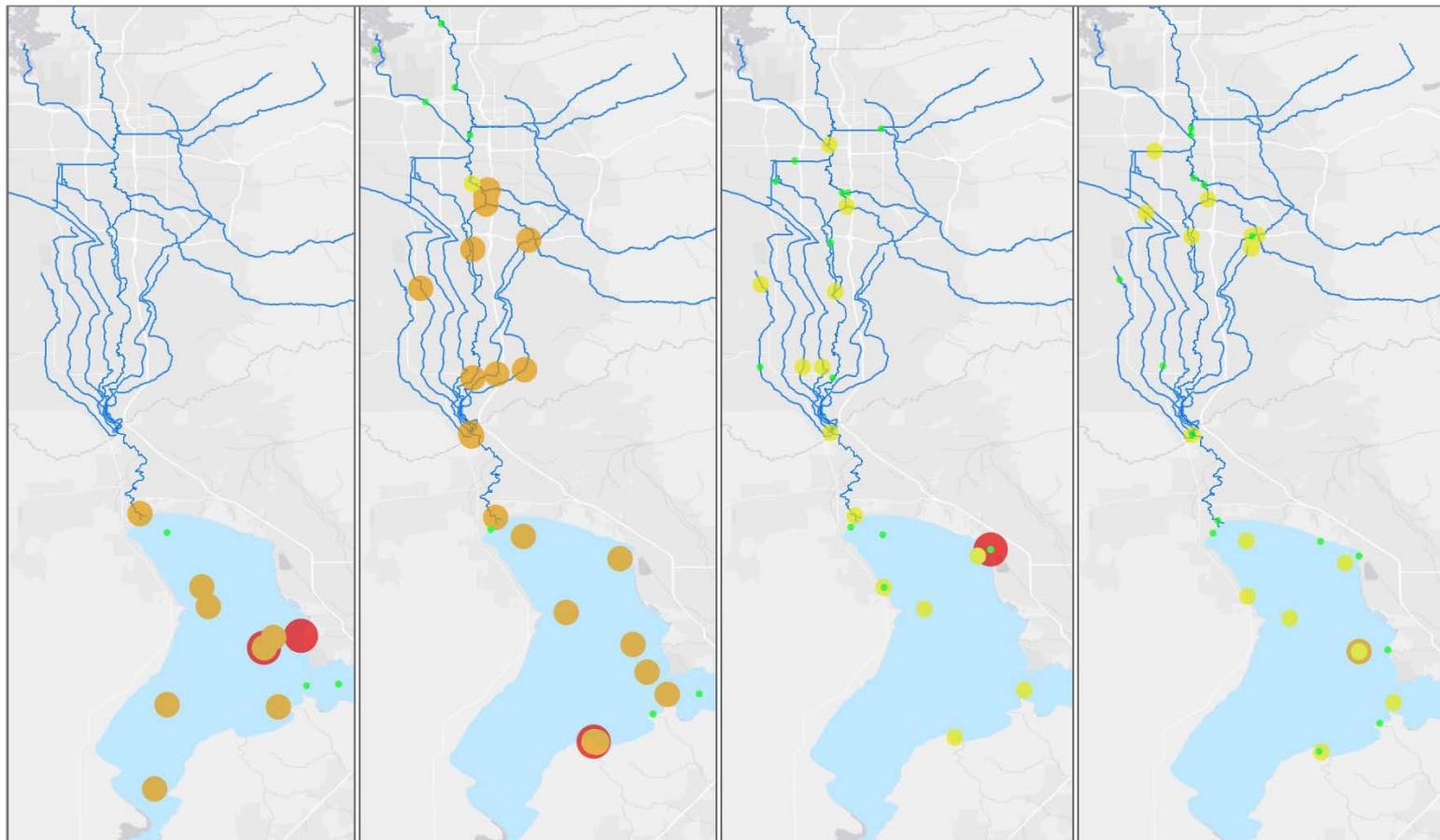
## July Timeline

**13<sup>th</sup> – 14<sup>th</sup>**

**15<sup>th</sup> – 18<sup>th</sup>**

**20<sup>th</sup>**

**26<sup>th</sup>**



Sample Site	Cyanobacteria Cell totals (cells/mL)	Health Risks	Relative probability of Health Risk
●	>10,000,000	Potential for acute poisoning Long term effects; skin irritation, gastrointestinal illness	Very High
○	100,000-10,000,000	Short term effects; skin irritation, gastrointestinal illness	Moderate to High
■	20,000-100,000		Low to Moderate
●	<20,000	Negligible	Low

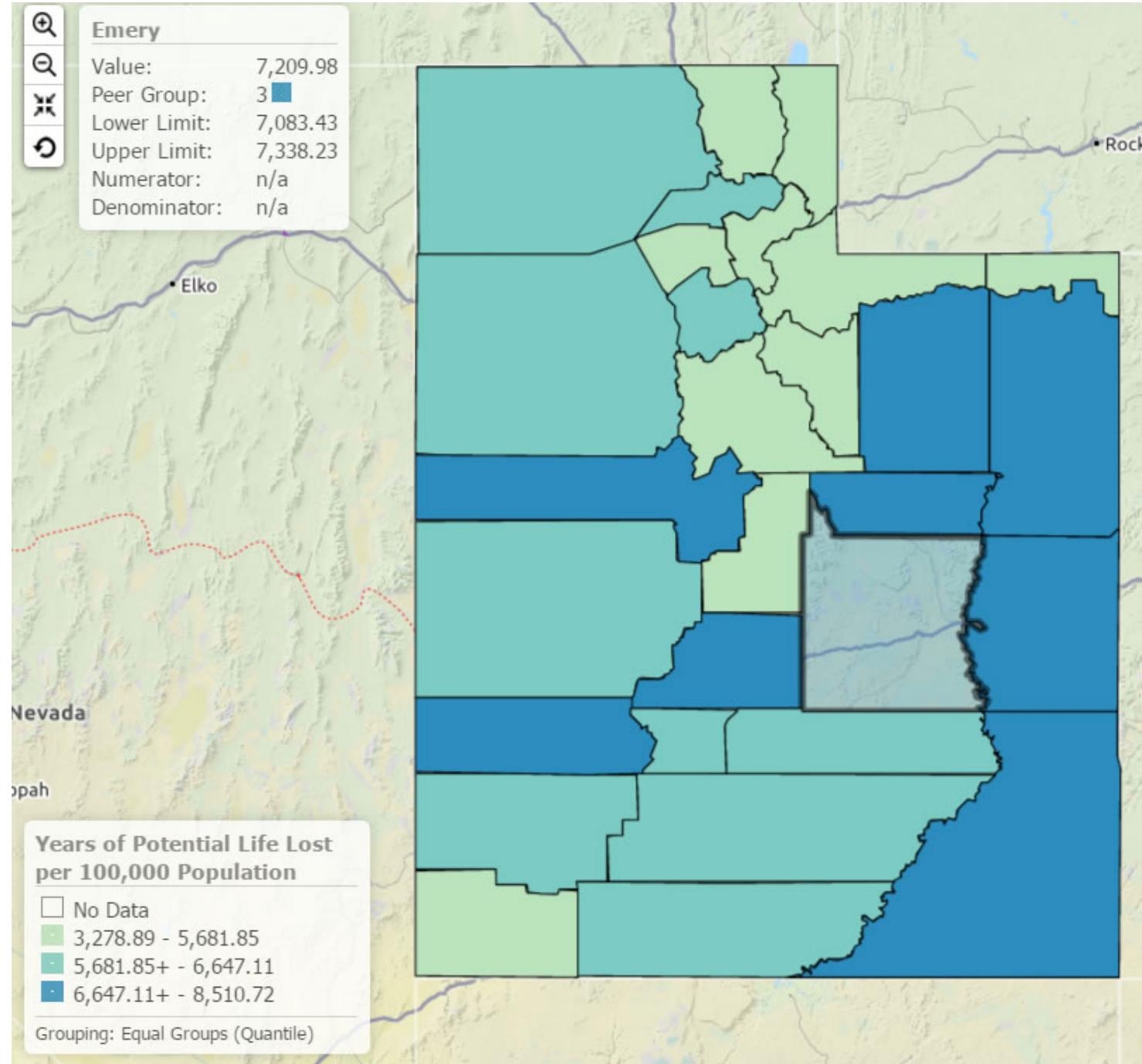
\*Sample data and table diagram adapted from Utah DEQ

# YEARS OF POTENTIAL LIFE LOST IN UTAH

Distinguishing the burden of premature death in Utah populations  
Utah Environmental Public Health Tracking Network | Utah Department of Health

Years of potential life lost (YPLL) can be used to distinguish the burden of premature death in populations. YPLL emphasizes underlying causes of premature death in a population. Deaths at younger ages are more likely due to preventable causes and may be decreased by intervention and education efforts. Interactive mapping of YPLL allows for visual examination of disparity across counties in Utah. Doing so can guide prevention and education efforts, and raise public awareness about the underlying causes of premature death in Utah communities.

## Years of Potential Life Lost per 100,000 Population by Utah Counties and Small Areas (1999-2014)



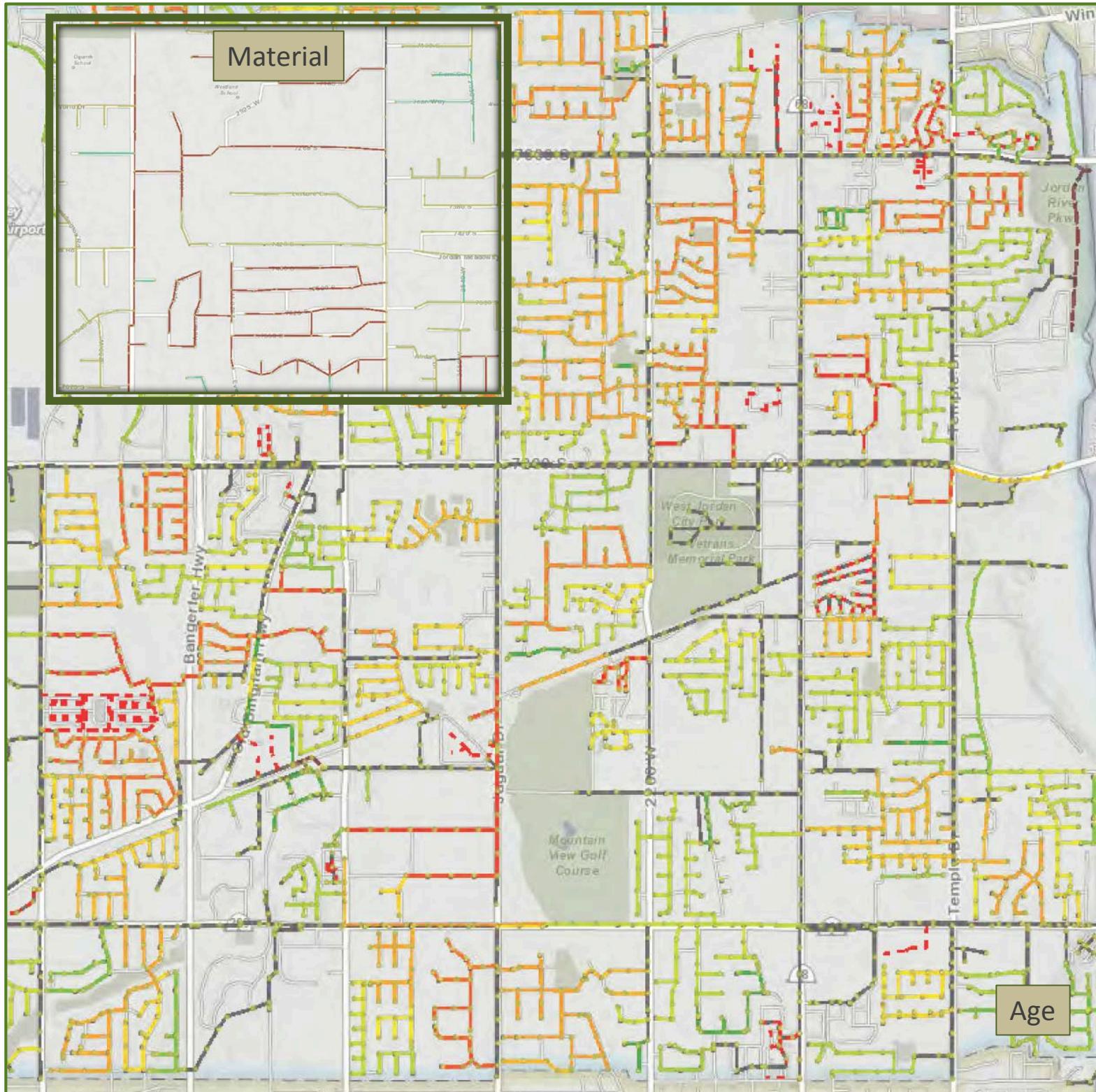
Source: epht.health.utah.gov

## SEWER MATERIAL & AGE VIEWER

Web mapping application used for updating West Jordan's sewer assets.

West Jordan GIS Department

Sewer lines made out of concrete and clay continually deteriorate due to the gases that build up inside of them. Because of this, West Jordan has made it a priority to protect against deterioration by using CIPP (cured-in-place pipe). To help the city make a more informed decision on where to deploy CIPP, West Jordan GIS created this web application using date installed and material. This allows for easy visualization of the data, as well as the opportunity to query based off of certain attributes, giving decision makers another tool to help allocate resources to where they are used best.

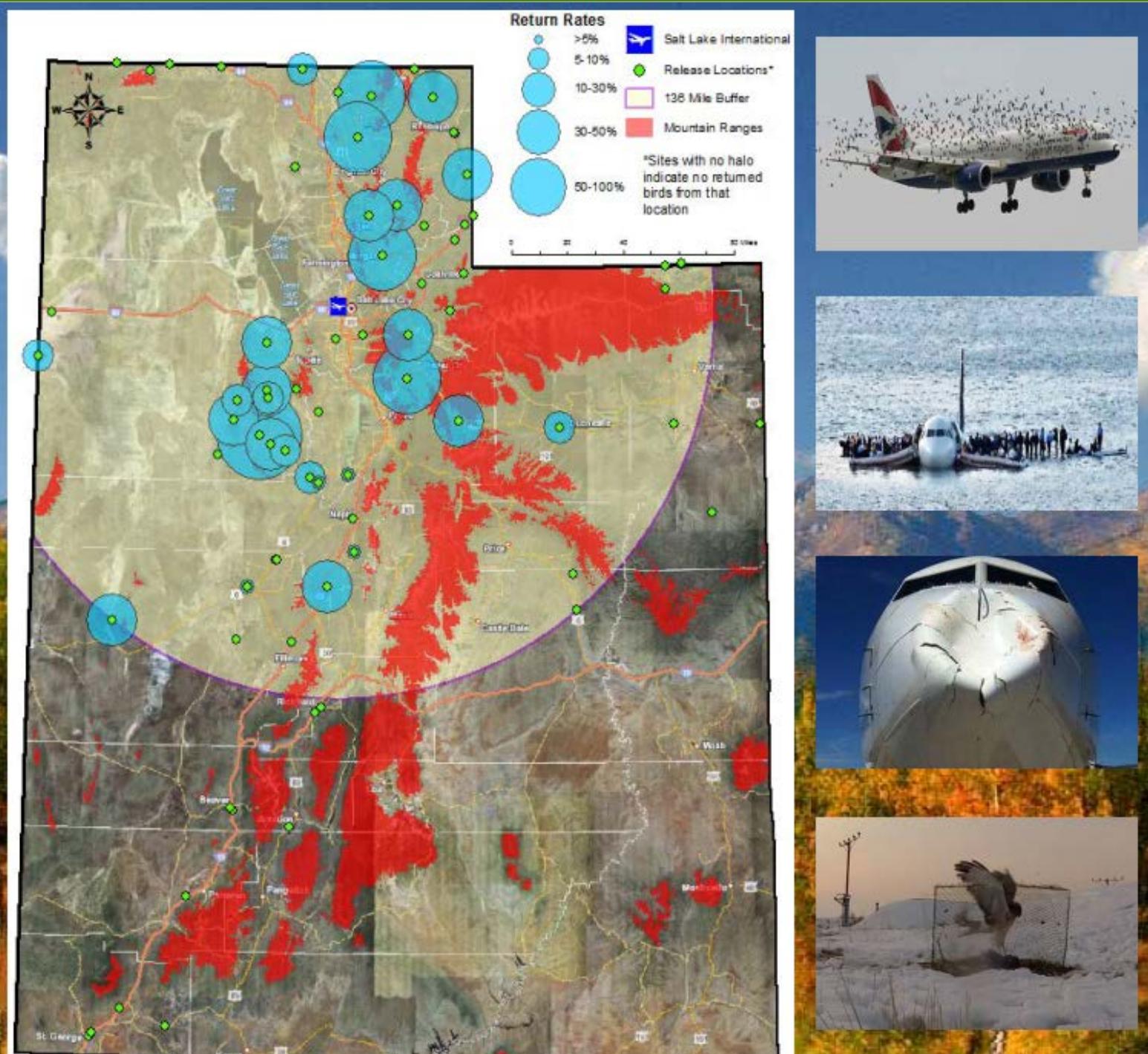


# AIRPORT SAFETY: RETURN RATES OF TRAPPED AND RELOCATED RAPTORS

Mapping detailed trapping logs for the Salt Lake City International Airport

Joshua Call, Epic Engineering, Salt Lake City International Airport

Keeping detailed records of release locations and time of year shows us that to date, a bird has never returned from a Euclidean distance of 136 miles from the airport. However, various other factors may affect these return rates, such as natural barriers to movement (e.g., mountains, storm systems), movement corridors, migration patterns, and resource availability. Using the power of GIS, we can map and better understand patterns in data and present that data in an easy-to-understand format.



Salt Lake City International Airport



Joshua Call  
Epic Engineering  
[jcall@epiceng.net](mailto:jcall@epiceng.net)

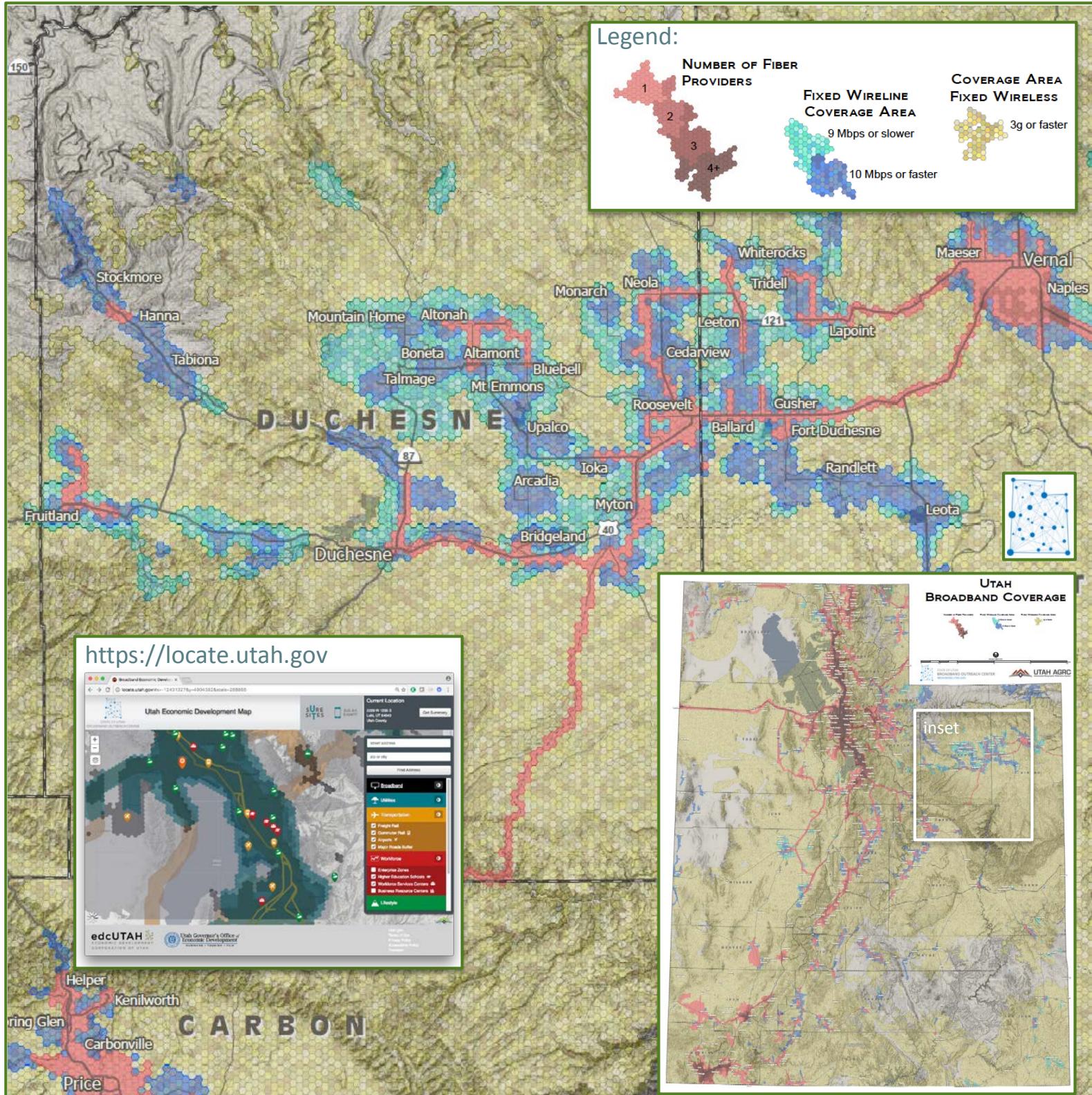
435-654-6600 | [www.epiceng.net](http://www.epiceng.net)

# UTAH'S BROADBAND LANDSCAPE, MAPPED FOR ECONOMIC DEVELOPMENT

Speed and Number of Providers for Fiber and Other High Speed Internet

Governor's Office of Economic Development - Broadband Outreach Center and AGRC

High speed broadband is a key factor for attracting businesses to all areas of Utah. This map shows fiber and other broadband availability that providers have reported to GOED for inclusion on Utah's economic development map app (<https://locate.utah.gov>). Depicting broadband coverage for a public audience, using generalized hexagons, balances the protection of proprietary information with the goal of creating a most-informed marketplace. And, a reliable map of existing services allows both the private and public sector to focus on service enhancements in areas of most need.

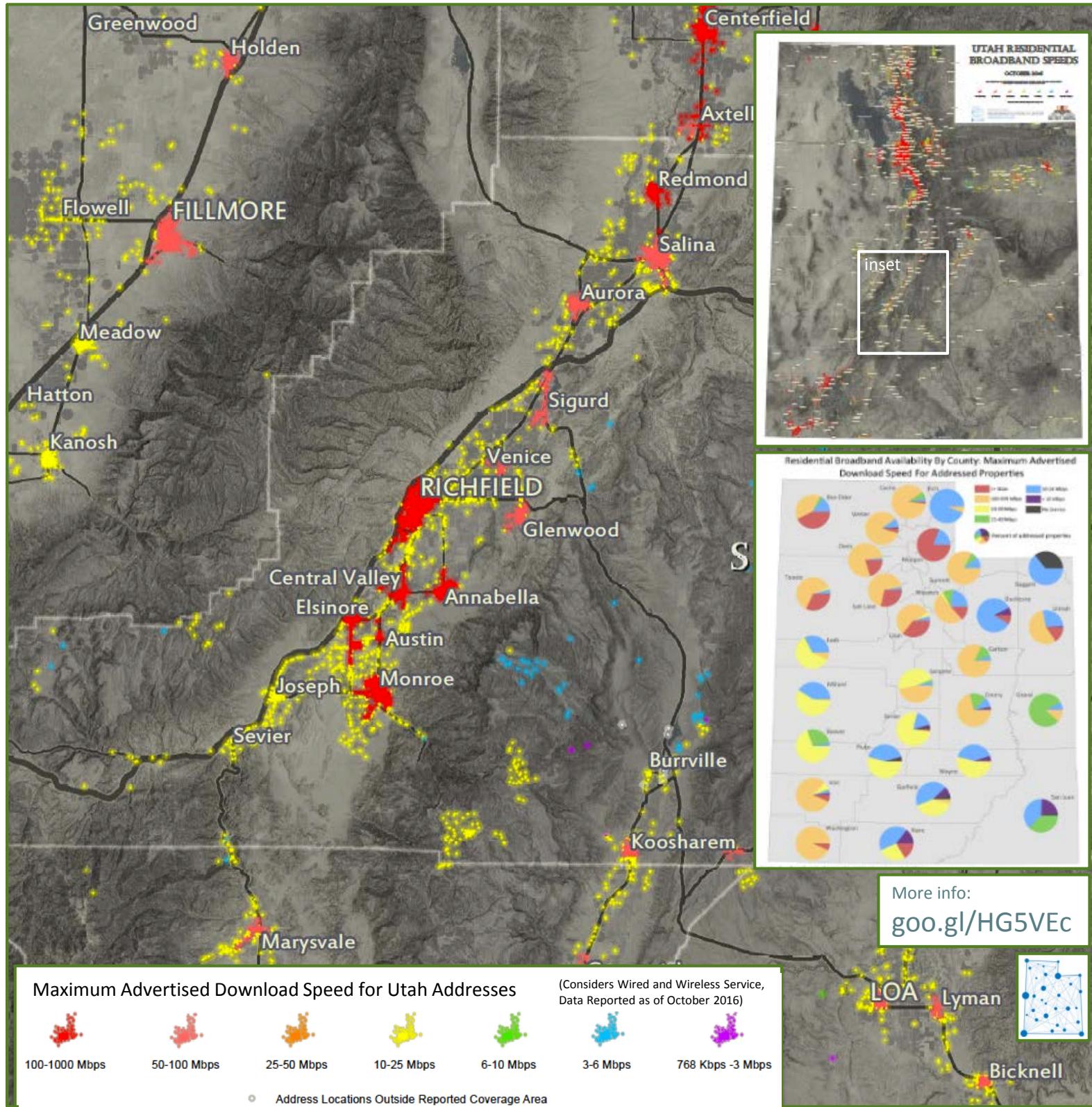


# MEASURING RESIDENTIAL ACCESS TO HIGH SPEED BROADBAND

Statewide Address Points Prove a Useful Input for Analyses

Governor's Office of Economic Development - Broadband Outreach Center and AGRC

Utah's settlement is a unique combination of ultra urban and very rural. This combined with Utah's dynamic economic growth, make traditional population-related analyses that use census block geography less meaningful, especially in the latter years of a decade. The GOED Broadband Outreach Center switched in 2014 from census blocks to address points for the key unit of analysis. This allows for a much more granular view of existing and future residential broadband service needs. AGRC sources address points updates from county GIS and address authorities.



# DANIEL IRRIGATION: IMPROVING WATER EFFICIENCY

Kim Coburn (Epic Engineering) and Doug Crittenden (Daniel Irrigation)

After nearly 100 years of use, the Daniel Canal liner had eroded and was susceptible to high seepage losses (4.7 cfs), which has led to an average loss of 33% during high flow and up to 50% during low flow due to seepage and evaporation in the canal. This also raised safety concerns over slope stability along some sections of the canal due to the deteriorating conditions. Epic Engineering worked with Daniel Irrigation on the Design, Bidding, and CMS of a 30" HDPE Pipe to replace over 2 miles of an existing 100 year old canal through the utilization of USBR WaterSMART grant to fund over \$450,000 of work. GIS was utilized to develop the optimum alignment and evaluate environmental concerns.

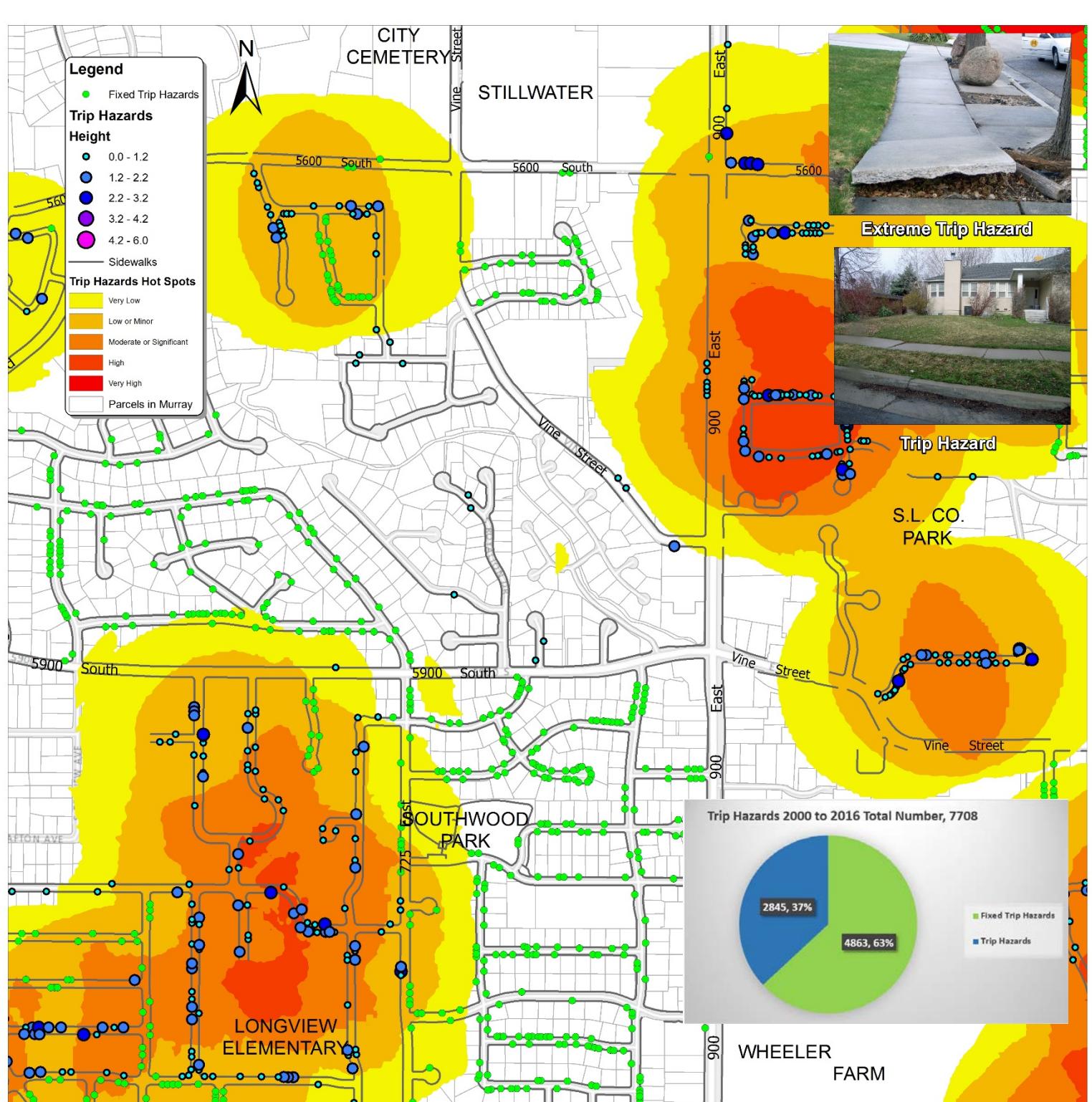


# MURRAY CITY TRIP HAZARD ELIMINATION PROGRAM

Prioritizing funding for effectively eliminating trip hazards

Matt McQuiston, Murray City GIS

Murray City has an established program to bring sidewalk ramps into compliance with the Americans with Disabilities Act (ADA). GIS plays an integral role in collecting and categorizing sidewalk inventory, then prioritizing areas most in need of rehabilitation. Each year this GIS analysis is used to determine how to best utilize funding for this project. The areas with the highest concentration of trip hazards and high pedestrian use will be repaired first. Data source: Murray City GIS

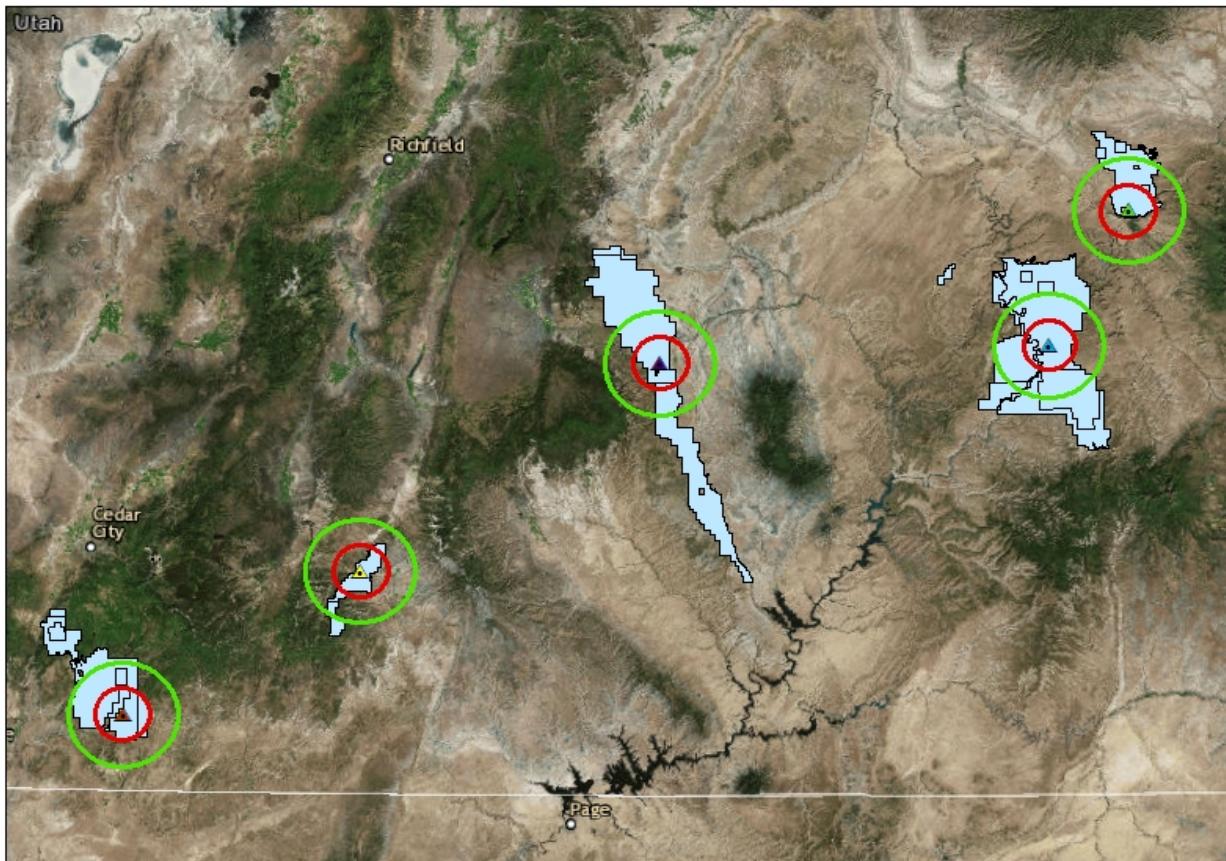


# VISIBILITY FROM UTAH NATIONAL PARK LOOKOUT POINTS ON GOOD AND BAD AIR QUALITY DAYS

Logan Christian – Co-President of Student Organization for Society and Natural Resources  
 Utah State University – Quinney College of Natural Resources

This map was created using popular lookout points from Utah's five national parks where regional air quality impairment can inhibit visibility. The size of the buffers was determined with a visibility ratio of the distance that it is possible to see on good air quality days versus poor air quality days. Air quality not only impacts our health, but also the quality of our National Parks, one of Utah's most economically and culturally important resources. The data used to make these ratios can be found at the sources listed below.

**Visibility from Utah National Park Lookout Points on Good and Bad Air Quality Days**



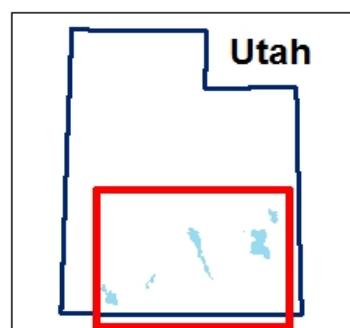
## Legend

- ▲ Arches NP Lookout Point
- ▲ Canyonlands NP Lookout Point
- ▲ Capitol Reef NP Lookout Point
- ▲ Bryce Canyon NP Lookout Point
- ▲ Zions NP Lookout Point
- National Park Boundaries
- Poor Visibility
- Good Visibility

Map By: Logan Christian  
 1/17/2017

Utah State University  
 Quinney College of  
 Natural Resources  
 Data Credits: Utah AGRC,  
[nature.nps.gov/air](http://nature.nps.gov/air), DEQ Idaho  
 NAD 1983 UTM Zone 12N

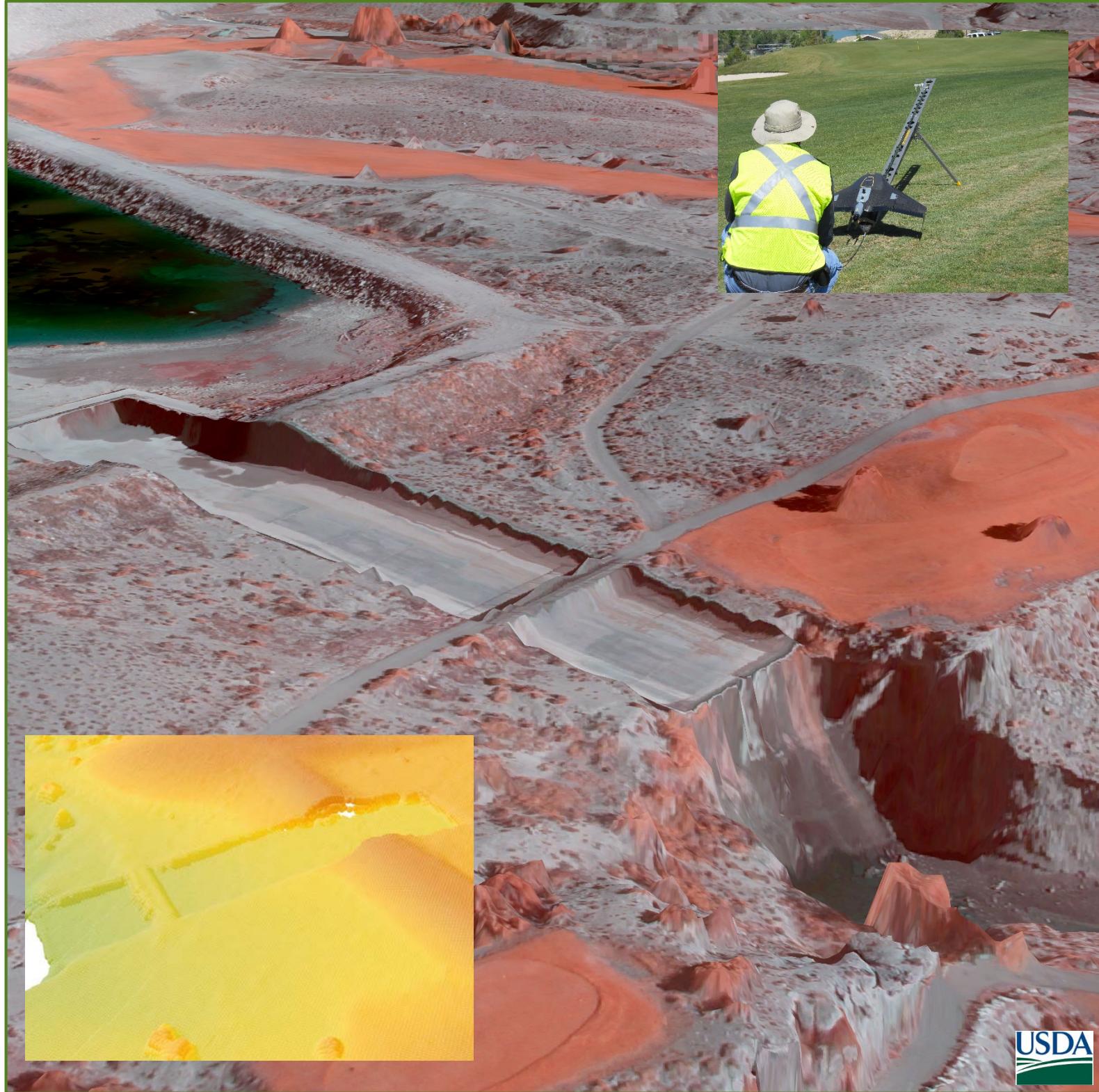
0 12.5 25 50 Miles



## MILLSITE DAM UNOCCUPIED AERIAL VEHICLE (UAS) SURVEY

Unmanned Aerial Systems (UAS) to collect imagery and elevation data to support dam rehabilitation  
Ryan Pierce, United States Department of Agriculture – Natural Resources Conservation Service (NRCS)

High-resolution infrared and color sensor data, acquired from a UAS, provides a highly precise detection of vegetation types and, potentially detection of individual threatened and endangered species. Another product that can be acquired through UAS technology is a point-cloud model that can be used to create a 3D model of the dam embankment, spillway, and channel. This data can be used for archival comparison and monitoring as the structures age and/or if a safety issue like seepage or erosion develops over time. Source: National Geospatial Center of Excellence. Photo: Norm Evanstad



# MOBILE GIS FOR WATER METER REPLACEMENT

## Radio Read Meter Replacement

Salt Lake City Department of Public Utilities

In 2015, Salt Lake City Public Utilities installed 5 Sensus Gateway Base Station Units throughout our water system. These units allow for radio reads on water meters that are equipped with AMI (Automated Meter Infrastructure) providing real-time hourly reads. We use this data to monitor usage and leaks in our system which allows for quicker response times. We are currently installing these new meters and should have 10,000 AMI meters in place within 2 years. Using mobile mapping applications employees can see which meters to replace for the day and upload the data straight to our billing system making the process smooth and paperless.

**Meter Info**

From PUBS Database

Service 3312048  
Address 1019 E 2100 S  
Assign Date 9/29/2016 7:37:38 AM  
Meter Loc 1S%WK 17W%EBL BBX INFNT%1021  
Meter Size 0.75  
Make S  
Meter # 52223352  
Register  
MXU  
Class Code 0  
Meter Comment 2/28/2013 (Retford, Tina) Corrected Bill - meter was o/c in Jan with rd-569

**Service Info**

Service: 3312048 Address: 1019 E 2100 S (2100 S) Last Read: 682  
Meter Location: 1S%WK 17W%EBL BBX INFNT%1021 [Show Meter Comments](#)

Info	Current	Meter Out	Meter In
Meter Number	52223352		
ECR Number			
MXU Number			
Make	Sensus		
Register	1		
Style	Standard		
Compound			
Size	3/4"		
Detector Check			
Hands	4		
Radio Type	FLX		
Port Number	1		
Install Date	7/31/1997		
Reading	682		
Meter Photo	There is no meter photo.		
Class Code: 0	<input type="checkbox"/> Galvanized <input type="checkbox"/> Curb Box <input type="checkbox"/> Hazard <input type="checkbox"/> Ring and Cover		
<b>Meter Replacement Monthly Work Order: 1055318</b>			
Need WO?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
Meter On?	<input type="radio"/> Yes <input type="radio"/> No		
<b>Comments</b>			

Above: An example of what the Employee sees when they open the map on a mobile device.

Left: Meter change out form opens. This form automatically updates our billing system with the new meter information and the dot disappears from the map.

# SALT LAKE CITY SEWER LATERAL INFORMATION AVAILABLE THROUGH WEB GIS

To access the public maps go to: [slcgov.maps.arcgis.com](http://slcgov.maps.arcgis.com)  
 Salt Lake City Department of Public Utilities

SLC Department of Public Utilities has been surveying and recording sewer lateral locations from 1890 to the present. This information is important for the customers repairing laterals, digging near these laterals, or boring for other utilities. The original documents have been scanned and are available to the public at the website listed above. The customer just has to zoom to the address of interest and click on the map so to see the original survey notes. Before being able to use this website, the customer could only get the information in the office during business hours. Now they can find the information easily on the web at any time of the day and employees' time can be used more efficiently.

The screenshot displays a map of the Utah State Capitol grounds with several green lines representing sewer laterals. A callout box provides details for Permitpoly: 30610, including TEXT 30610, LINK More info, and LINK2 30610.pdf. Below the map is a historical survey document from 1915, showing a table of survey data and a hand-drawn map of the area around the State Capital. The map includes labels like "State Capital" and "Ballroom".

**Web Map Directions:**  
 Zoom to an address and click on the permit text. This brings up a link to "More Info" which shows the original survey of the sewer lateral. The example on the left shows a survey from 1915.

# MT DELL DAM CONDITION 3D SURVEY

Using 3D scan for dam condition assessment

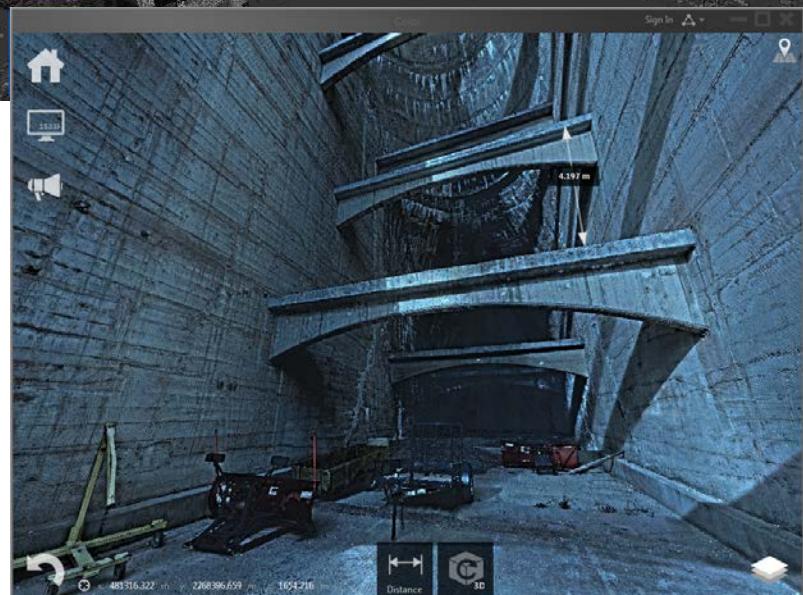
Salt Lake City Department of Public Utilities

Mountain Dell Dam is an important dam for storing water for Salt Lake City. The first stage of the dam was completed 100 years ago in 1917, and the dam was completely finished by 1925. As with all aging infrastructure, it is important to do condition assessments, but this is difficult when dealing with such a large feature. To help with this, SLC Department of Public Utilities used a laser 3D scan survey with millimeter accuracy to scan the dam. This scan can be used to look for small damage to the concrete, but also can be used year after year to look at any differences in the dam over time.



Above: 3D scan of Mt. Dell Dam drawn in AutoCad RCP

Right: Zoomed in 3D scan with photo overlay of cross supports at Mt. Dell Dam



# UTAH COUNTY ROAD ASSET MANAGEMENT

GIS with Mobile Devices Saves Time and Money.

Patrick Wawro, Jerry Chapman, Dave Henrie, Darin Sleight, Curtis Wursten, Utah County

Utah County's GIS Division developed a road asset management system for the County's Public Works Department to help save money, improve reporting and streamline workflows. This asset management system includes both a mobile application, for in the field asset inspections, and an office desktop application, for generating reports, creating work orders and visualizing road surface conditions. This system allows local elected officials, administrators and employees to use map-based visualization tools to more efficiently utilize limited funds for road maintenance.

Project ID:  Search

Roads Signs Bridges Culverts RR Trails Settings

**4000 WEST**

Project POB: 715+022377 Project ID Length: 4.4 Road Type: Local

**8 of 8** Segment ID: 715+022377 Segment Length: 0.2 Miles Last Inspection: 01-13-2017 Last Inspector: UNKNOWN

Surface Type: Asphalt	Original Estimated Lifespan: 0	Drainage Condition: Excellent
Resurface Date: 03-13-1905	Last Estimated Service Year: 0	
Resurface Type: Unknown		
Ridability Condition: Fair		
Left Clear Zone: 1 to 3 ft Clear	Right Clear Zone: 1 to 3 ft Clear	
Horizontal Alignment: 30-34 mph	Grade: 30-34 mph	
Access Point Safety: No Issues	Safety Features: No Issues	
Danger Zones: Mitigated Danger Zones	Speed Limit: 40 MPH	

Vehicle ADT: 6 Truck ADT: Unknown 85% of Traffic Speed: Unknown  
% Trucks: Unknown Last ADT Date: 03-02-2016 Last ADT Source: Estimate

Accidents in Last 3 Years: 0 Combined Lane Width: 0.0 Feet Road Surface Width: Unknown  
Not including shoulders Including shoulders

Median Width: 0.0 Feet Left Shoulder Width: 1.0 inches Right Shoulder Width: 1.0 inches  
Left Curb Type: NA Right Curb Type: Unknown

Left Drainage Type: Unknown Right Drainage Type: Unknown

Left ROW Width: 0.0 inches Right ROW Width: 0.0 inches  
Left ROW Type: Unknown Right ROW Type: Unknown

  
**01-10-2017**

  
**01-10-2017**

Road Classification: Edit

**LAST OBSERVED SURFACE DISTRESSES**

Distresses	Severity	Density
Alligator Cracks	Medium	Extensive: 65-85%
Edge Cracks	Low	Intermediate: 15-34%
Polished Aggregate	Minimal	Few: < 15%
Pot Holes	Low	Few: < 15%
Rutting	Low	Intermediate: 15-34%
Transverse Cracks	Minimal	Few: < 15%

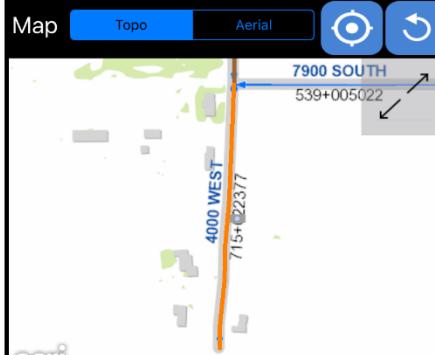
Inspections

Road Details

Work Orders

Add Photo

**Map** Topo Aerial



7900 SOUTH  
539+005022

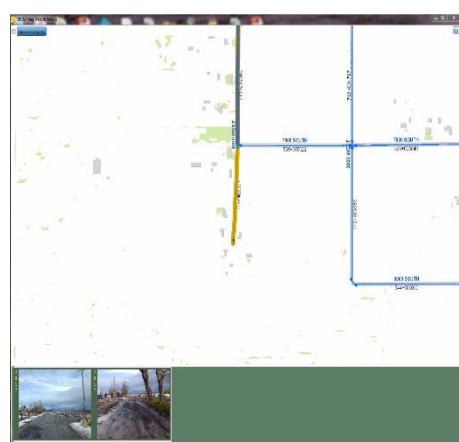
4000 WEST  
715+022377

esri

The mobile application is developed for an iPad and allows field inspectors to take pictures and perform yearly inspection paperwork away from the office.



The computer desktop application allows road segment information to be updated, visualized on a map, and to generate a road score interactively.



**4000 WEST**

Project ID: **715** Project POB: End of Road Project Length: 4.41 miles Road Class: Local Road Classification: B

**8 of 8** Segment ID: 715+022377 Segment Length: 0.17 miles Lanes: Owned By: Utah County Maintained By: Utah County

Resource Date	3/14/1905	Resurface Type	Alligator or Block Cracks
Original Est Lifespan	0	Asphalt	Bedding - Asphalt (or binder)
Current Est Lifespan	0	Concrete	Concavities/Shoving/Heaving
Rideability	Fair	Dirt	Depressions/Sink Holes
Drainage	Excellent	Gavel	Edge Cracks

**Severity of Distress**

	None	Medium	Low	High	Very High
Alligator or Block Cracks	●	●	●	●	●
Bedding - Asphalt (or binder)	●	●	●	●	●
Concavities/Shoving/Heaving	●	●	●	●	●
Depressions/Sink Holes	●	●	●	●	●
Edge Cracks	●	●	●	●	●
Excavation Failures	●	●	●	●	●
Longitudinal (Sag) Cracks	●	●	●	●	●
Polished Aggregate	●	●	●	●	●
Pot Holes	●	●	●	●	●
Raveling	●	●	●	●	●
Rutting	●	●	●	●	●
Siding (Peeling) Cracks	●	●	●	●	●
Transverse Cracks	●	●	●	●	●
Upheaval	●	●	●	●	●

**Alignment** **Access Safety** **Left Clear Zone** **Right Clear Zone** **Speed Limit**

SCI	No Issues	1 to 3 ft Clear	Continuous Hazard	15 20 25 30
Grade	30-34 mph	Safety Features	35 40 45 50	
Danger Zones	Mitigated Danger Zones	75 80		

**ADT Studies** **3 Yr Accident History** **Road Access Points**

ADT:	Study Date:	All Accidents: 0	Use Level Property: Agriculture - Field
Truck ADT:	Study Source:	Fatal Accidents: 0	Agriculture - Primary
% Trucks:	85th Speed:	Bus Route: Yes	Residential - Secondary
Location/Comments:		No	Industrial - Primary
			Recreational (Cars, Trucks, Boats, Trailers, etc)
			Industrial - Commercial Trucks

**GASB** **Roads** **Traffic Control** **Other** **Segment Total** **Project ID**

Years: 5	\$566,990	\$1,326	\$31,974	\$ 600,292	\$ 600,292
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Last Inspection: 1/13/2017 Inspector: TRAVIS TAYLOR

Last Inspection Comments: 2015 all signs inspected. 2014 All signs inspected. 2013 All signs inspected. 2012 All signs inspected. 2011 all signs inspected.

ID: 715+022377+002 9/13/2016 9:32 PM

Comments: 2015 all signs inspected. 2014 All signs inspected. 2013 All signs inspected. 2012 All signs inspected. 2011 all signs inspected.

**4000 WEST** Lanes View from POB: End of Road

Total ROW: 22 ft. Roadway Surface: 20 ft. Total Lane Surface: 18 ft.

Left Curb Type: Concrete Barrier, Steel Rail Barrier, Curb, Grade Shoulder, Other

Right Curb Type: Concrete Barrier, Steel Rail Barrier, Curb, Grade Shoulder, Other

Left Shoulder: Paved: Yes, No. Surface Thickness: Inches, Base Thickness: Inches, Structure Thickness: Inches

Right Shoulder: Paved: Yes, No. Surface Type: Concrete, Road Base: Native / No Base, Structure Type: Engineered Fill, Bank Run: Native / No Base

Left Drainage: Sealed, Ditch, Culvert, Other

Right Drainage: Sealed, Ditch, Culvert, Other

MAPS ON THE HILL 2017

29

# MAPPING WEBER STATE CAMPUSES WITH GIS

Paul Kuehne and Assad Reichdan, Weber State University Campus Planning and Construction

Utah System of Higher Education has projected that Weber State University in Northern Utah will be one of the fastest growing universities in Utah over the next 8-10 years, with a growth rate of 4%, and it will be a challenge for Campus Planning and Construction to manage that growth. GIS has become a part of that planning, and transferring campus maps into GIS has been integral in asset management. We have been able to transfer both WSU Ogden and Davis campus maps into GIS to show where our facilities are now, and help to plan for our future.

## Weber State University Ogden



## Weber State University Davis



**WEBER STATE  
UNIVERSITY**

Facilities Management



**WEBER STATE  
UNIVERSITY**

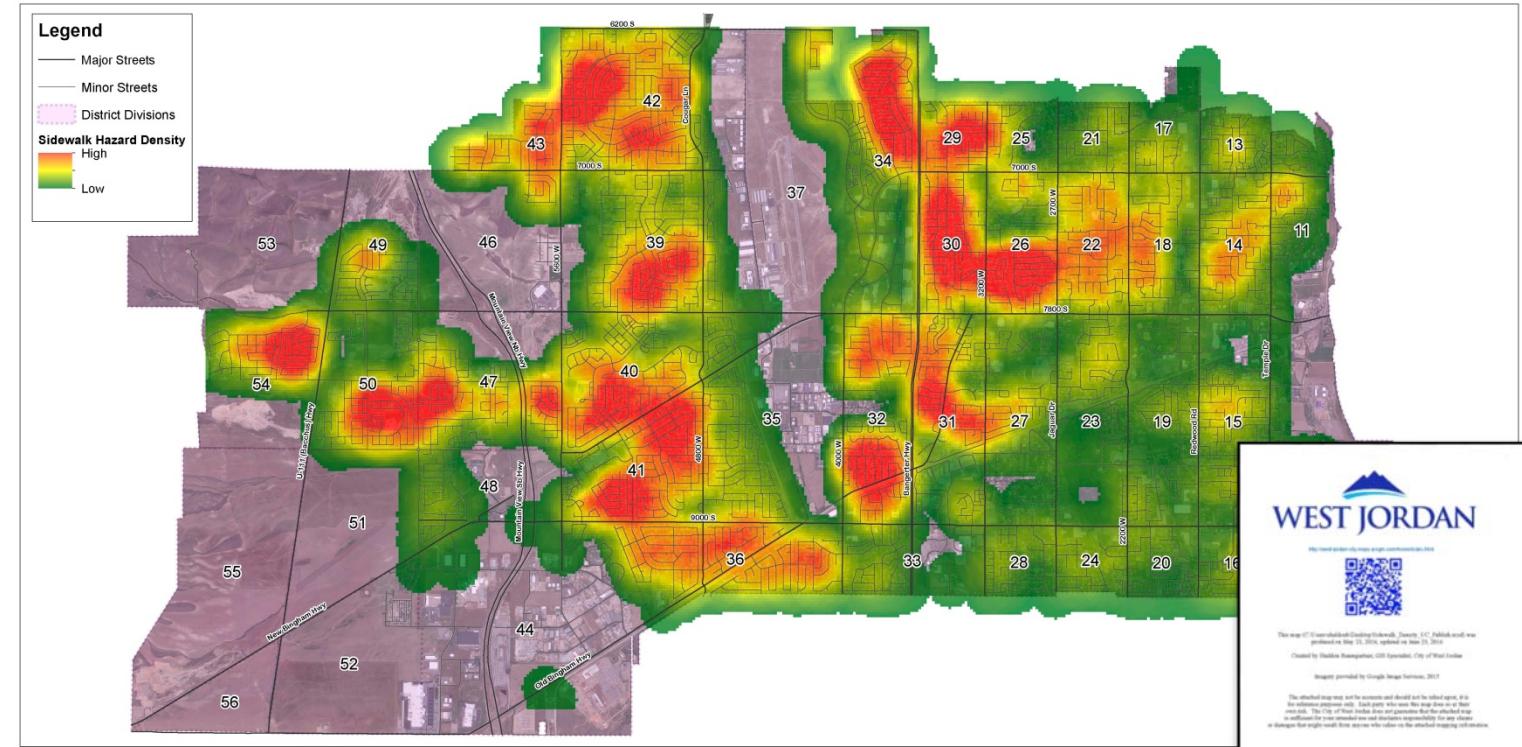
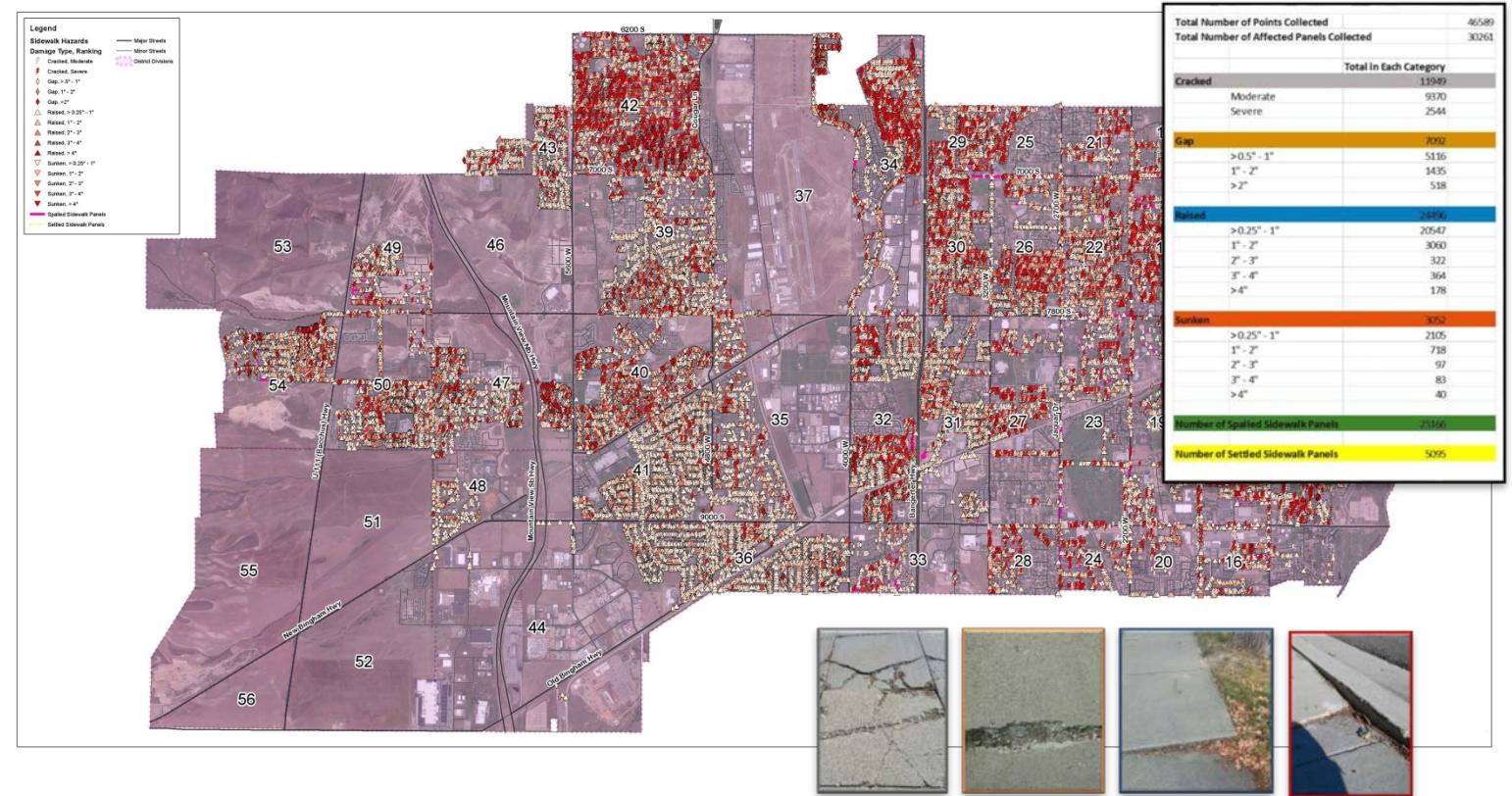
Make *your dream* happen.

# SIDEWALK HAZARD DATA COLLECTION

CITY OF WEST JORDAN, UTAH

Sheldon Baumgartner, GIS Specialist, City of West Jordan

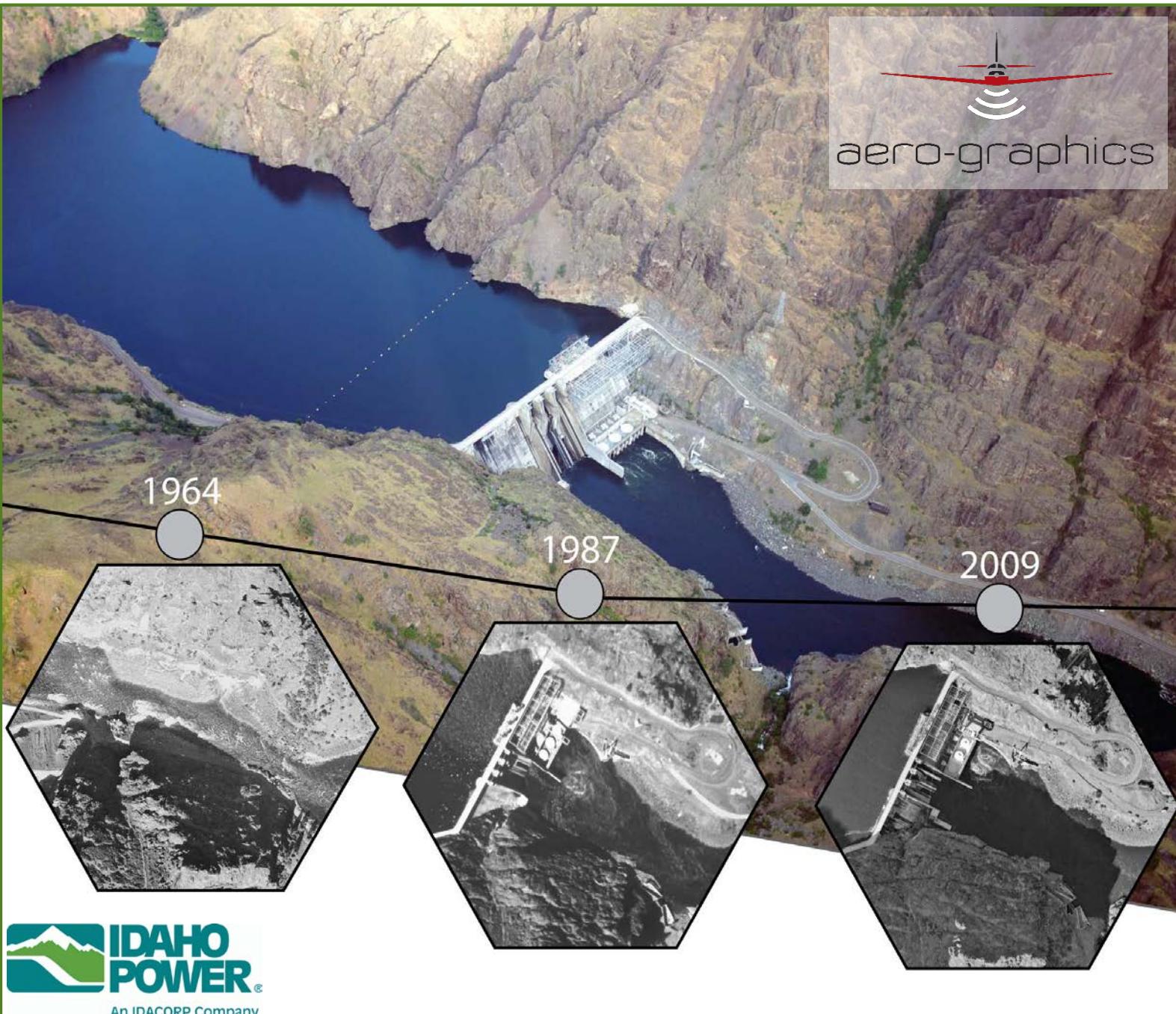
The objective of this project is for the City of West Jordan to analyze walkways to identify tripping hazards for pedestrian safety. West Jordan is concerned with identifying these hazards in an effort to repair city sidewalks and to limit the city's liability. The GIS Department was able to create a hotspot map to show areas with a higher concentration of hazards collected. This will help the Capital Improvements Project group prioritize areas to fix and improve our sidewalks for the citizens of our city.



# HELLS CANYON HISTORICAL IMAGERY PROJECT

Lisa Ly, Aero-Graphics, Inc.

Throughout the years, Idaho Power engineers have contracted numerous aerial photography missions to document geological changes in the canyon. They now possess a large inventory of film canisters from past projects dating back to the 1950's. The 9" x 9" film negatives are degrading due to their age and it was determined they should be scanned to preserve the valuable aerial time-record. Idaho Power's business objective for this effort included acquiring, scanning and orthorectifying imagery from the Aerial Photo Field Office (APFO) in Salt Lake City, Utah. The final orthorectified imagery will be used in GIS for Hells Canyon relicensing studies, including evaluating sediment changes along the Snake River in Hells Canyon to prepare for consultation of the Sediment Monitoring Plan, per the Hells Canyon Final Environmental Impact Statement (FEIS).



# SUPPORTING NEXTGEN 911: REQUIRED & RECOMMENDED GIS MAP LAYERS

Statewide Goals and Status, *as of January 2017*

AGRC and the Utah 911 Advisory Committee

Coordinated state and local GIS efforts continue to position Utah as a lead state in implementing Next Generation (NG) 9-1-1 services. The NG platform replaces legacy telephone-address tables with modern GIS-based location resources.

In NG 9-1-1, GIS data will determine and verify all incident locations, route calls to the correct 9-1-1 PSAP, and provide dispatchers with robust map views. GIS data quality and completeness will become even more critical to public safety.

Prepared  
for the



by



Not Yet Begun  
Begin, but Incomplete  
Locally Complete  
Updated Periodically  
Updated Bi-Annually  
Updated Monthly  
Updated Continuously

NENA GIS  
Data Model\*

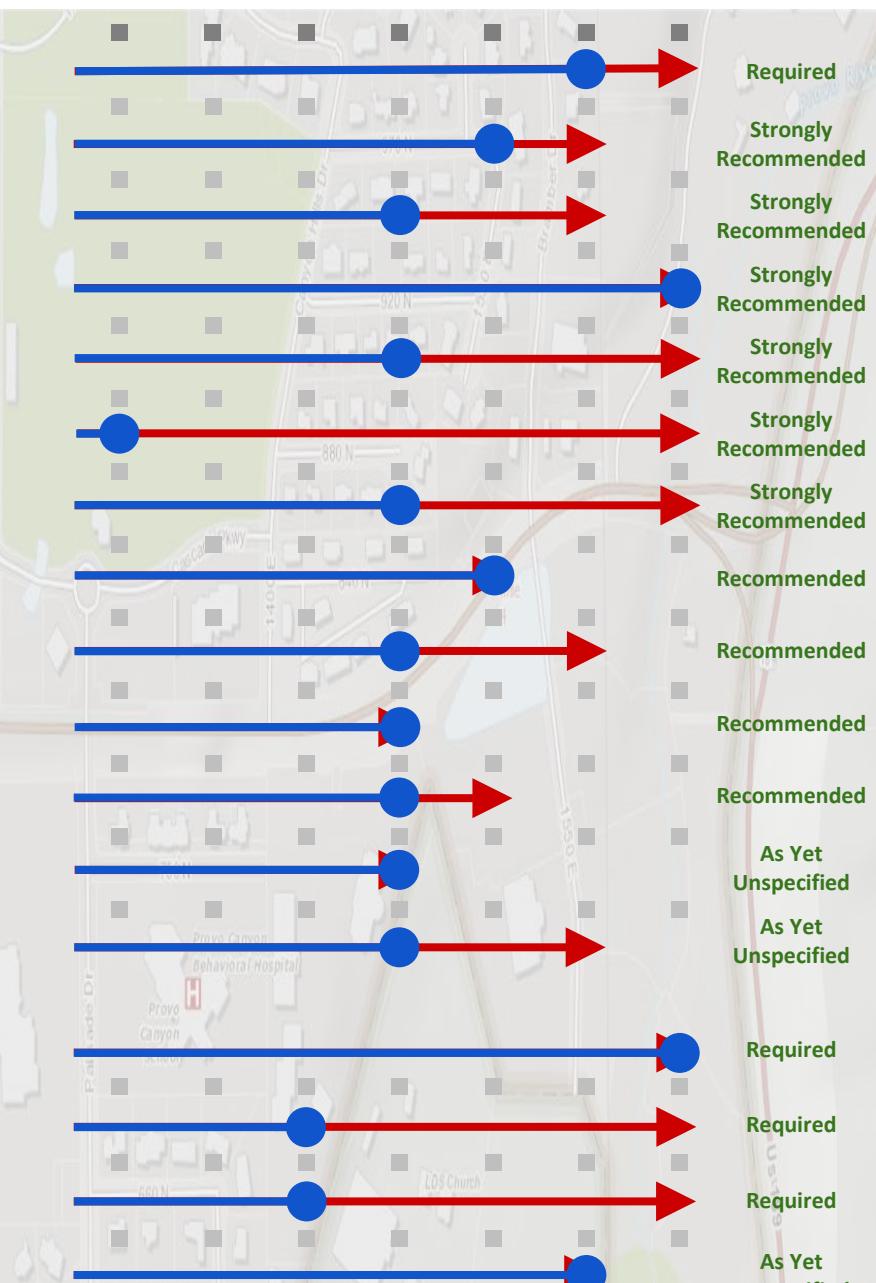
Indicates Jan 2017  
GIS Status Level

Indicates Utah  
GIS Goal Level

Location Finding: "Where Is...?"

Jurisdictional:  
"Who responds?"

- Road Centerlines w/ Street Address Aliases
- Address Points & Assignment Areas
- Landmark Points (bldgs & locations)
- Municipal and County Boundaries
- Unincorporated Areas
- Neighborhoods & Named Subdivisions
- Parks and Campuses
- Highway System: Mileposting and Exits
- Cell Tower Antenna Sectors
- Railroad Centerlines & Mileposts
- Lakes and Streams
- High Resolution Aerial Photography
- Composite Base Maps
- 9-1-1 PSAP Boundaries
- Law, Fire, EMS Service Boundaries
- Other Emergency Service Boundaries
- GIS Data Maintenance Responsibilities

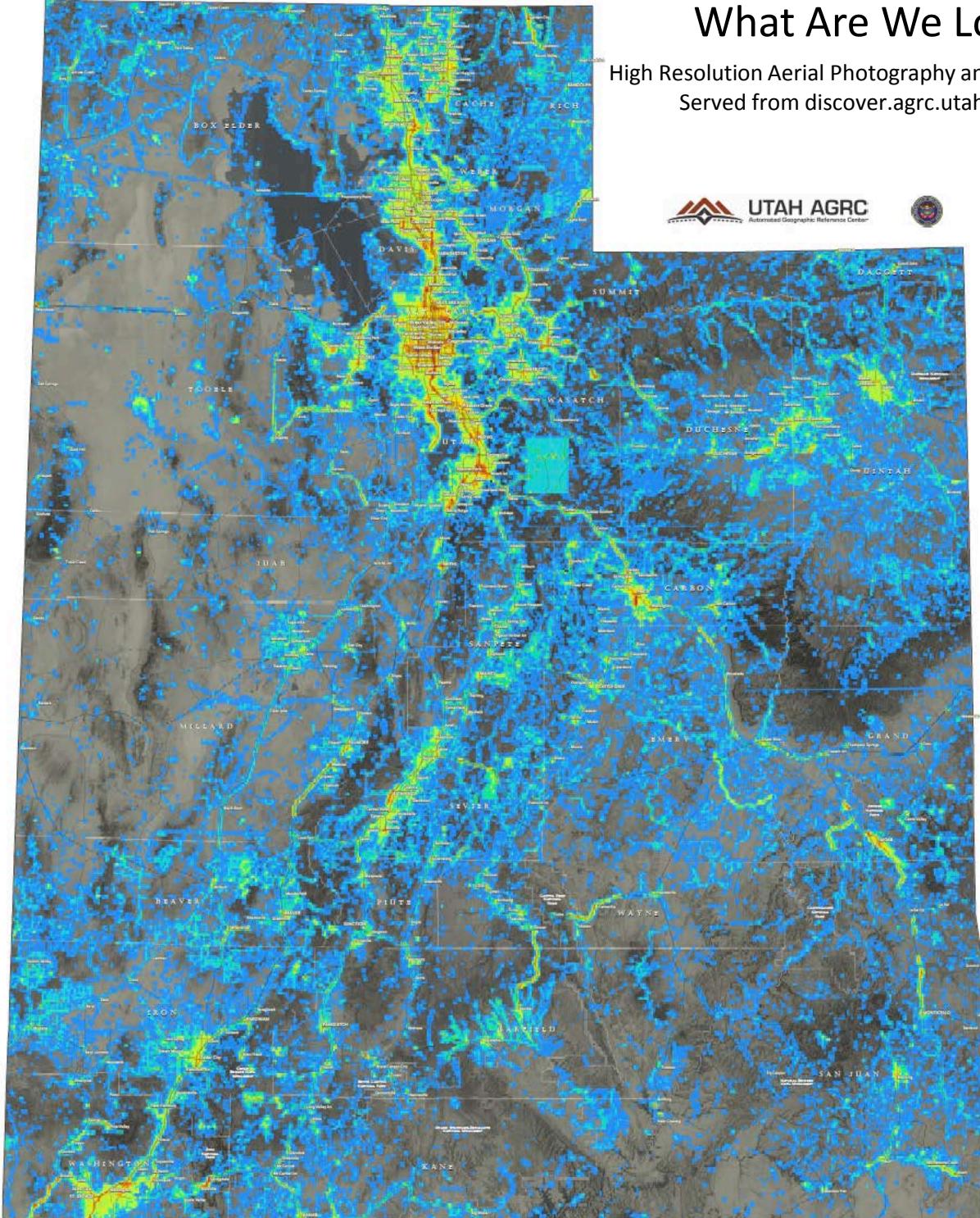


\* the National Emergency Number Association's (NENA) NG911 GIS Data Model is currently published as a draft for public review and comment

## WHAT ARE WE LOOKING AT?

The Most-Viewed High Resolution Aerial Photography and Base Map Locations in Utah Since 2015  
AGRC and the Utah Mapping Information Partnership (UMIP)

Since 2015, state, local, and tribal government agencies, and their partners, have accessed high resolution aerial photography, licensed from Google, thanks to 14 entities in the Utah Mapping Information Partnership funding coalition. Usage of this imagery, from the cloud-based [discover.agrc.utah.gov](http://discover.agrc.utah.gov) webserver, has been tracked, providing a great picture of where this information resource is most valued by 250+ organizational users. This map shows aerial photography and base map requests, by desktop software and web application users, at the finest zoom scales (where 6" imagery is impactful, about 1:2000 or finer), summed for each square mile in the state.



## What Are We Looking At?

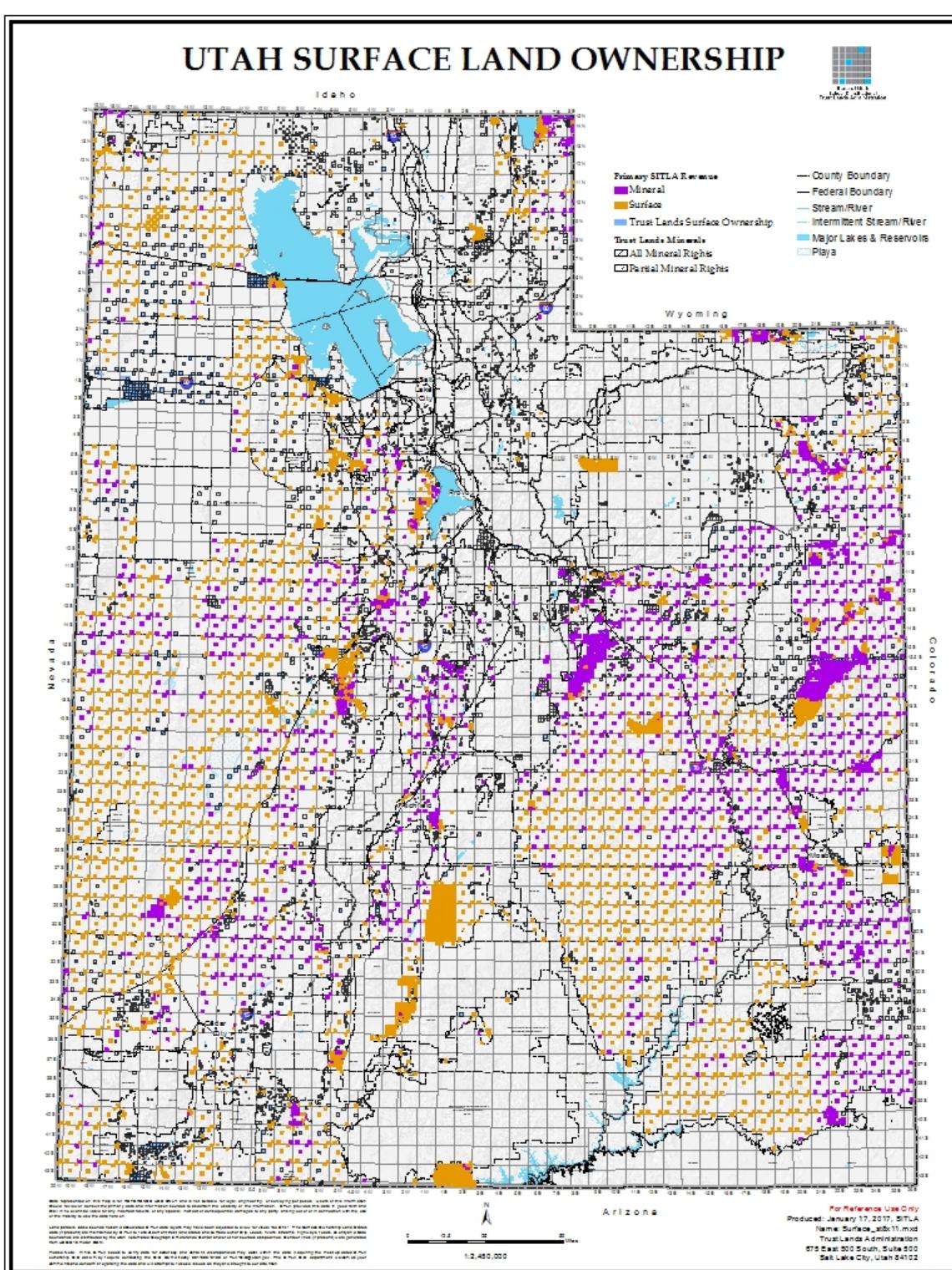


## SITLA REVENUE BY SOURCE

## Trust Land Ownership

Brady Johnson, GIS Analyst, State of Utah Trust Lands Administration

The State of Utah School and Institutional Trust Lands Administration (SITLA) manages land across the State of Utah in which it earns various types of revenue to fund permanent endowments that support state institutions, such as public schools. Although there are a variety of income sources SITLA uses to increase the fund, they can primarily be placed in general categories to show what the main source of income is on a particular piece of Trust Land.



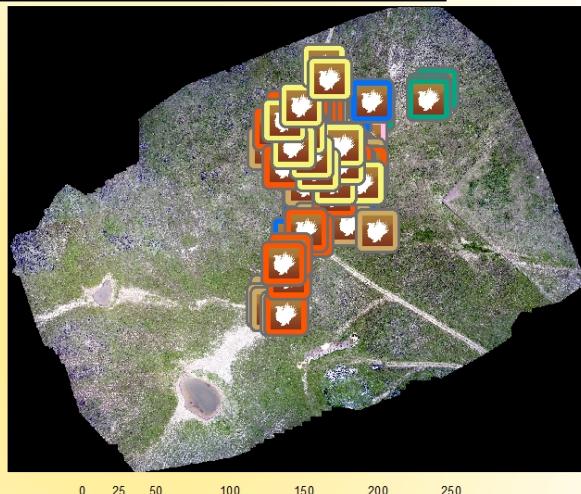
# USING REMOTELY PILOTED AIRCRAFT TO DETECT SAGE GROUSE

Determining the Thermographic Difference Between Males and Females

Tommy Thompson, Dr. Ramsey, Quinney College of Natural Resources, Utah State University

This exploratory study examines the use of a Remotely Piloted Aircraft (RPA) and thermal imagery (thermography) as a potential method to determine the sex of sage grouse individuals in a known lek (mating area). Land managers and wildlife biologists use population counts of male sage grouse to help determine the health of sage grouse populations. Additionally, as a bioindicator, sage grouse populations provide qualitative assessments regarding the health of sagebrush ecosystems. This study demonstrates a new approach of conducting a sage grouse population census. Using technology such as RPA and thermography, land managers will be able to collect and archive digital census images that will provide a visual dataset that may be revisited by others in the scientific community.

## Hardware Ranch Lek Site: Northern Utah



### Legend SG Location by date

	3/5/2016
	3/12/2016
	3/26/2016
	4/2/2016
	4/5/2016
	4/12/2016

Sage grouse locations were determined by using ArcGIS, FLIR ResearchIR software, and Pix4D. Digital surface model (DSM) and flight lines were used in conjunction with ResearchIR and ArcGIS to place points where the hottest pixel of the sage grouse individual as observed. Sage grouse counts were documented by ground observers, and aerial infrared AIR survey. The sage grouse on this map are only representative of the AIR sage grouse counts.

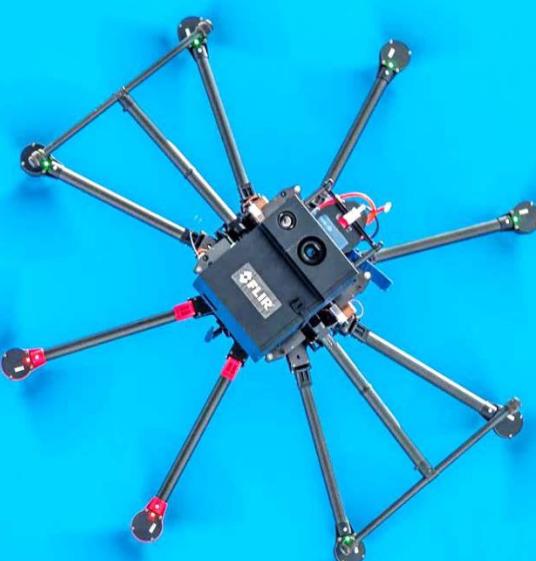
Map Created By: Thomas Thompson  
Service Layer Credit: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

## Displaying Behavior:

### Females



### Male



## Non- Displaying Male

### Females



### Male



66.5

61.4

59.9

59.2

58.4

57.7

57.0

56.2

55.5

### Statistic [units]

Mean [°F]	59.1	55.0	55.0	55.1
-----------	------	------	------	------

Std. Dev. [°F]	1.5	1.3	1.4	0.9
----------------	-----	-----	-----	-----

Center [°F]	60.1	53.4	54.1	54.2
-------------	------	------	------	------

a-b	62.4	57.9	58.3	57.1
-----	------	------	------	------

Maximum [°F]	56.3	53.1	53.4	53.5
--------------	------	------	------	------

Minimum [°F]	56.3	53.1	53.4	53.5
--------------	------	------	------	------

Rec\_41\_Frame\_3408

## Displaying Male

### Females



### Male



76.1

74.5

72.5

70.5

68.5

66.5

64.5

62.5

### Statistic [units]

Mean [°F]	64.1	55.0	55.6	55.6
-----------	------	------	------	------

Std. Dev. [°F]	4.8	1.1	1.6	1.5
----------------	-----	-----	-----	-----

Center [°F]	68.0	54.4	54.9	54.7
-------------	------	------	------	------

a-b	76.2	58.7	58.8	59.3
-----	------	------	------	------

Maximum [°F]	57.1	53.7	53.5	53.6
--------------	------	------	------	------

Minimum [°F]	57.1	53.7	53.5	53.6
--------------	------	------	------	------

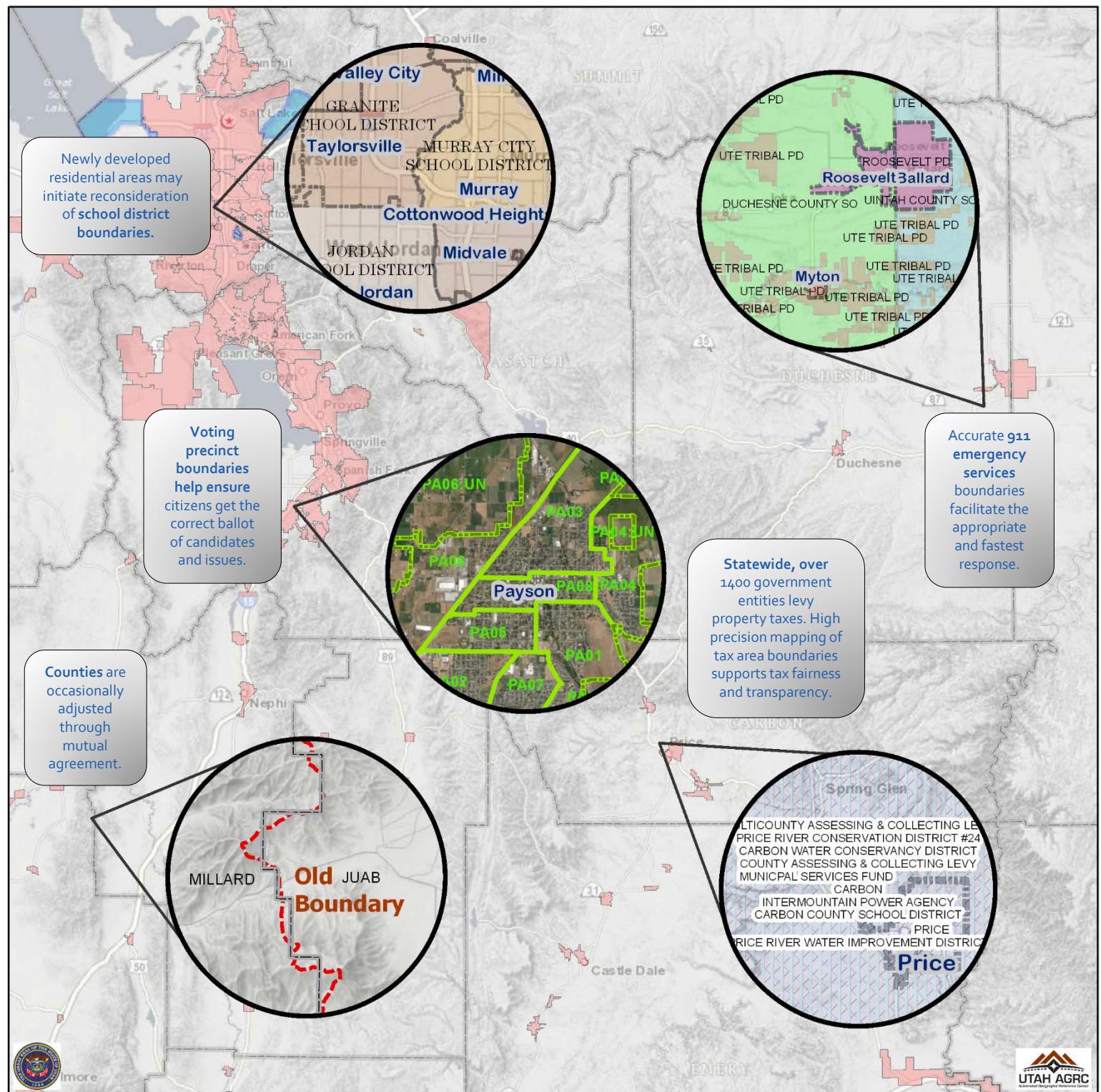
Rec\_41\_Frame\_3443

## ADMINISTRATIVE BOUNDARIES

Administrative Boundaries a Foundation for Related Boundaries

Mike Heagin, Automated Geographic Reference Center (AGRC) gis.utah.gov

In addition to its state boundary, Utah has 29 Counties, 246 Incorporated Cities, 5 Metro Townships and 1166 other Tax Entities (2016). These form the basis for the State of Utah's administrative boundaries. All boundaries are required to have documentation, including a metes and bounds description, which is accessible at municert.utah.gov. Because administrative boundaries are building blocks for other map layers, AGRC makes weekly boundary edits to the State Geographical Information Database (SGID), and publishes updates to gis.utah.gov on a quarterly basis.



## EFFECTS OF CLIMATE CHANGE ON CENTRAL U.S. CROPS

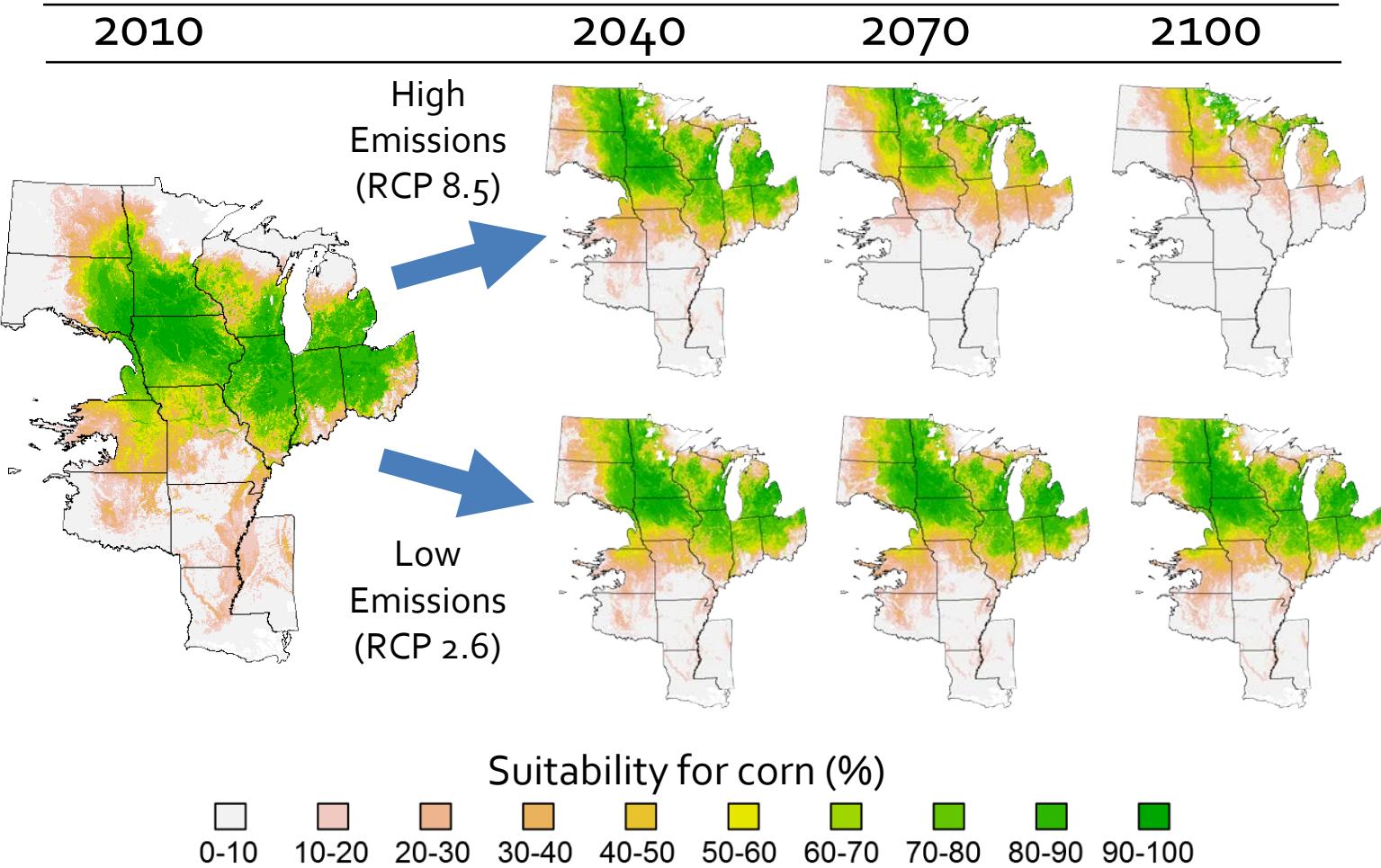
Chris Lant (Utah State U.), Tim Stoebner (Esri), Justin Schoof (S. Illinois U.), Ben Crabb (Utah State U.)

Adaptation to climate changes will alter the geography of rural land uses, with implications for agricultural productivity. This study examined the likely geographic response of eight rural land covers in the Central U.S. to future climates based on low, medium, and high greenhouse gas emissions scenarios. We found all crop covers highly sensitive to the trajectory of emissions over the coming years. Economically important corn and soybeans shift northward, suggesting the potential for new production possibilities in cotton and other crops in the Central U.S.

A database of occurrence and nonoccurrence locations for the eight land covers (corn, soybeans, spring wheat, winter wheat, cotton, soybean/winter wheat double crop, forest, and grassland) was compiled by sampling the USDA Cropland Data Layer<sup>1</sup>, which maps individual crops nationwide at 30m spatial resolution. Values of climatic, topographic, and soils variables were extracted to each sampled location. Non-linear relationships between crop occurrence and predictor variables were assessed using the multivariate fractional polynomials (MFP) modeling technique<sup>2</sup> in a logistic regression context.

Five predictors were used to train the models: topographic slope, soil available water capacity (a measure of the ability of soil to hold water), soil pH, summer growing degree days (a measure of temperatures above a threshold and below a maximum, accumulated on a daily basis, June - August) and growing season water surplus (calculated as precipitation minus potential evapotranspiration, April - October).

The models performed well in predicting the current spatial distribution of rural land covers, correctly classifying 66 – 91% of the training data locations.



<sup>1</sup>Han W, Yang Z, Di L, Mueller R (2012) CropScape: A Web service based application for exploring and disseminating US conterminous geospatial cropland data products for decision support. *Computers and Electronics in Agriculture* 84:111-123

<sup>2</sup>Sauerbrei W, Royston P (1999) Building multivariable prognostic and diagnostic models: Transformation of the predictors by using fractional polynomials. *Journal of the Royal Statistical Society. Series A (Statistics in Society)*. 162:73-94

This material is based upon work supported by the National Science Foundation under Grant No. 1009925. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation (NSF).

# MAPPING FLOOD RISKS

## An Overview to Floodplain Management and Flood Insurance

Jamie Huff, Utah Division of Emergency Management

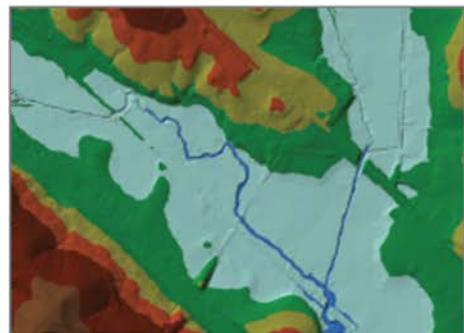
Flooding is one of the most common hazards in the United States. FEMA flood hazard data, maps and other products developed as part of the Risk MAP program help to communicate a community's flood risk. This information can help communities plan to reduce flood risk, educate residents and create a dialogue with neighboring communities about ways to work together to reduce risk. Mapping floodplains is vital for implementing all floodplain management strategies. It creates broad-based awareness of flood risk; provides the data necessary for floodplain management and land-use regulations, hazard mitigation programs, and rating flood insurance for new construction on an actuarial basis; and supports the decision making process with respect to the natural values of floodplains.



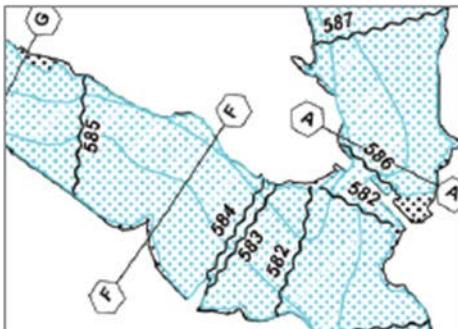
Sample of Digital Flood Hazard Data



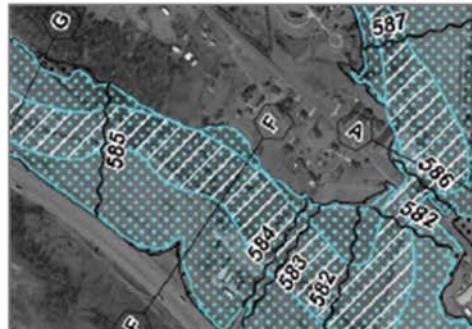
Base Map Data



Topographical Data



Flood Data



Final Composed  
FIRM

Data Source: Federal Emergency Management Agency, L-257, April 2014

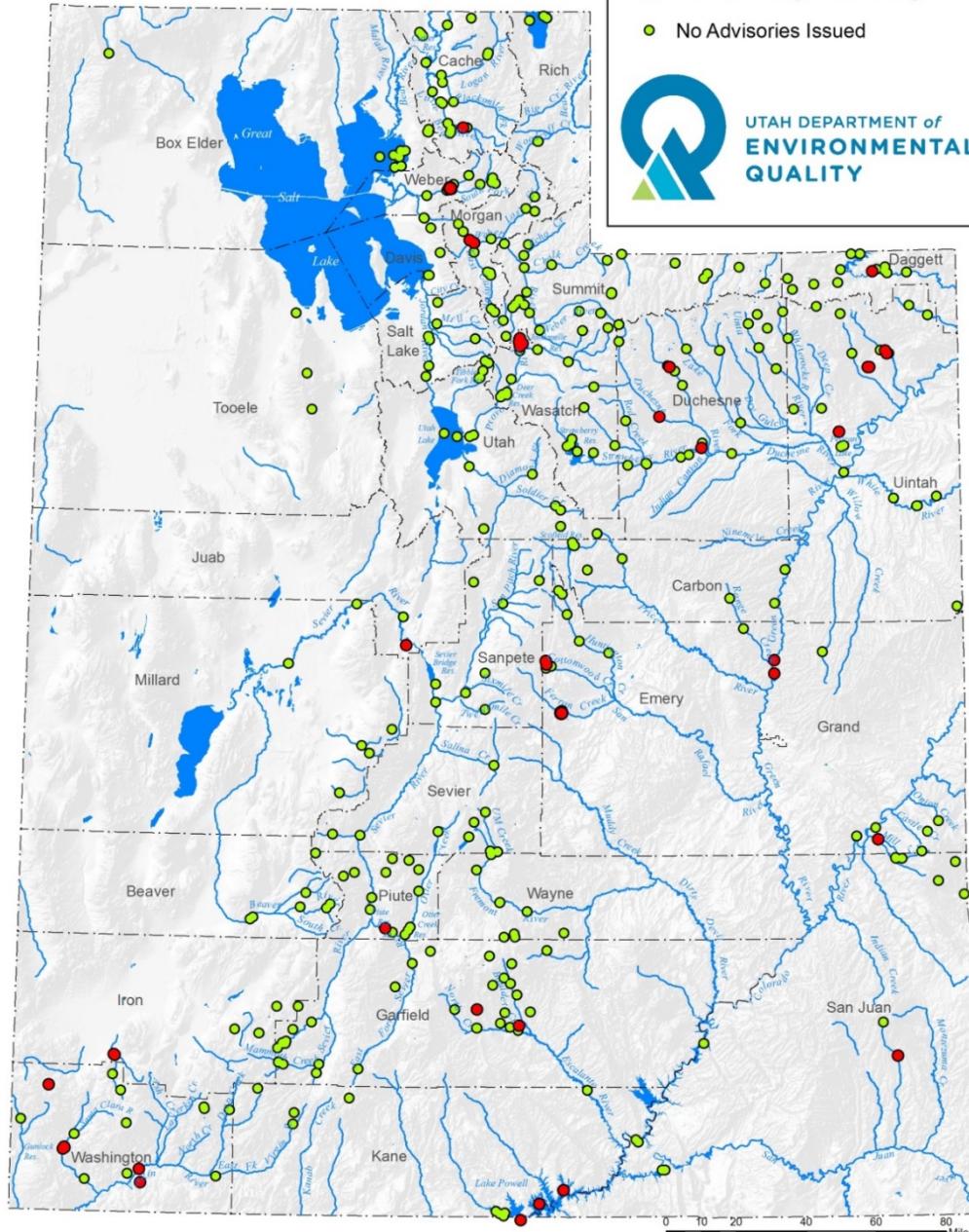
# DEPARTMENT OF ENVIRONMENTAL QUALITY INTERACTIVE MAP

Providing updated information about Utah's air, land, and water resources

Mark Stanger, Environmental Scientist and GIS, Utah Division of Water Quality

DEQ, in cooperation with the Utah Automated Geographic Reference Center (AGRC), has developed an online application to help Utah's citizens and stakeholders quickly and easily find the environmental information they need. The geographically referenced data describes the current environmental conditions of Utah's air, land, and water resources. Users can view, download, and analyze geographically referenced information. Online information includes water quality and air quality monitoring site locations, water quality status and designated beneficial uses, permitted discharges to Utah's waters, fish consumption advisories, public water systems and groundwater protection zones, industrial and oil/gas extraction source emissions, air quality compliance, environmental cleanup sites, environmental incidents, underground storage tanks, solid waste facilities, hazardous waste treatment facilities, and low level waste disposal sites. View the map at [enviro.deq.utah.gov](http://enviro.deq.utah.gov)

## Utah Environmental Interactive Map



### Select Query Layers

Drinking Water

Water Quality

Assessed Lakes ?

Assessed Waters ?

Groundwater Permits ?

Mercury in Fish Tissue ?

Monitoring Locations ?

NPDES Dischargers ?

Underground Injection Control ?

Air Quality

Environmental Response & Remediation

Waste Management and Radiation Control

### Define Search Criteria

Search

Clear Search

Hide Grid

Download Search Results (648)

select format

Process Download

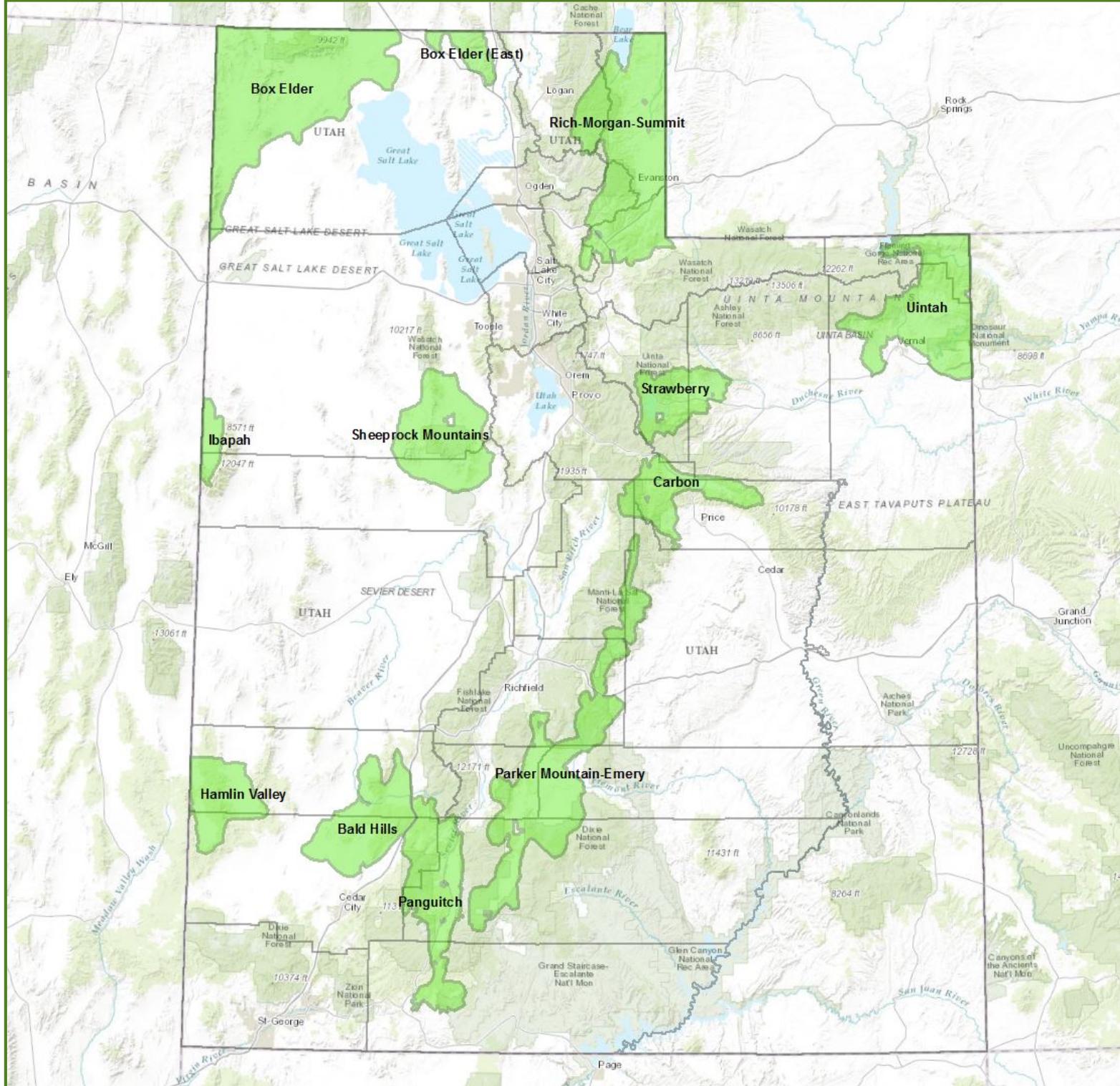
Utah Department of  
Environmental Quality  
Interactive Map:  
[enviro.deq.utah.gov](http://enviro.deq.utah.gov)

Air Quality  
Drinking Water  
Environmental Response  
and Remediation  
Waste Management and  
Radiation Control  
Water Quality

# UTAH SAGE GROUSE MANAGEMENT AREAS AND CONSERVATION

Eric Edgley, Gary Ogborn, and Nathan Kota; Utah Division of Wildlife Resources

Utah's Sage Grouse Management Areas (SGMAs) encompass the highest sage grouse breeding density areas, which together currently support greater than 94% of the Utah aggregate population of greater sage grouse. These areas were delineated by a collaborative Working Group organized by Governor Herbert in 2012 to develop recommendations for the conservation of sage grouse, while also providing for the continued economic health of the state. The Working Group met in open, public meetings from February 2012 to October 2012. The SGMAs represent the best opportunity for high-value, focused conservation efforts for the species in Utah.



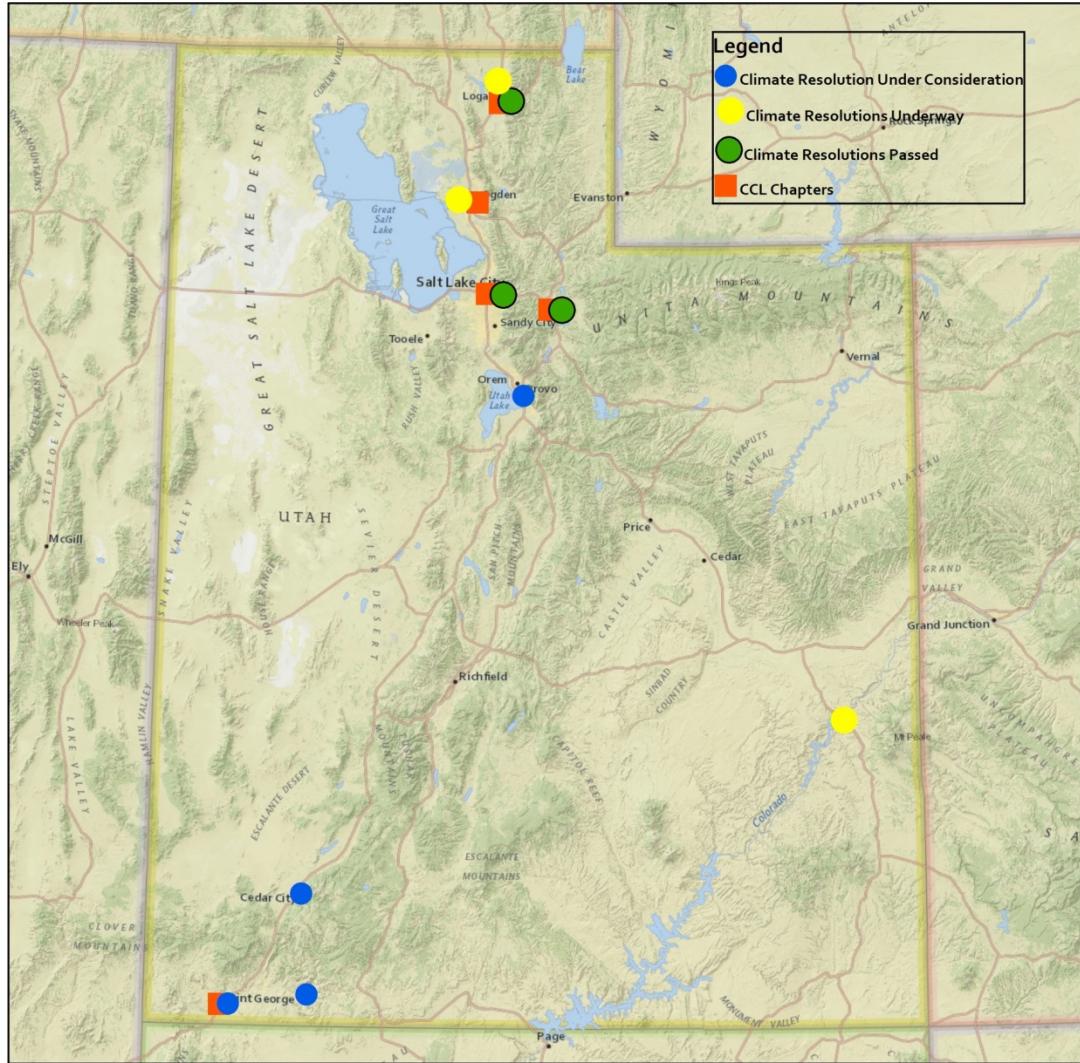
# STUDENT AND CIVIC ENVIRONMENTAL ACTION IN UTAH

A Diagram of Clean Air Resolutions and Citizens Climate Lobby Chapters in Utah

Piper Christian, Anders Hart and Logan Christian; Logan High School, Logan Environmental Action Force

Our map outlines civic and grassroots efforts for environmental stewardship throughout Utah. In 2016, Salt Lake City and Park City signed Resolutions agreeing to transition to 100% renewable energy sources by 2032. To expand environmental sustainability to other cities, the Logan Environmental Action Force passed a Clean Air Resolution in Logan City and is working with city councils and grassroots groups to pass similar resolutions around the state. Additionally, our map identifies four Citizens Climate Lobby (CCL) chapters in Utah. CCL aims to pass Carbon Fee and Dividend legislation for a revenue-neutral carbon tax with 100% of the net revenue returned directly to households, which will reduce greenhouse gas emissions 52% below 1990 levels within 20 years.

## Climate Resolutions and Citizens' Climate Lobby Chapters of Utah



Climate Resolutions Under Consideration: Provo, Cedar City, Springdale and St. George (these cities are the places where we will propose climate resolutions soon). Climate resolutions Underway: Smithfield, Ogden and Moab (these cities are working on passing a climate resolution). Climate Resolutions Passed: Logan, Salt Lake City and Park City (these cities have passed a climate resolution). Citizens' Climate Lobby Chapters: Logan, Ogden, Salt Lake City, Park City, St. George (these cities have a CCL chapter currently)

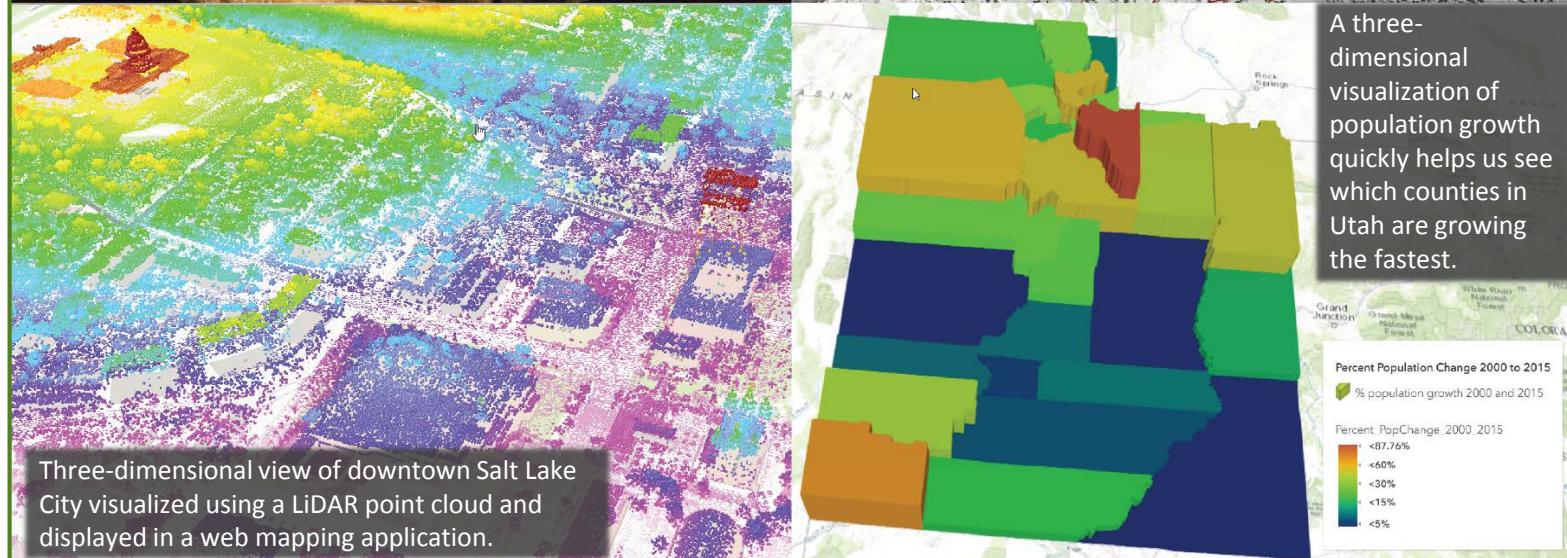
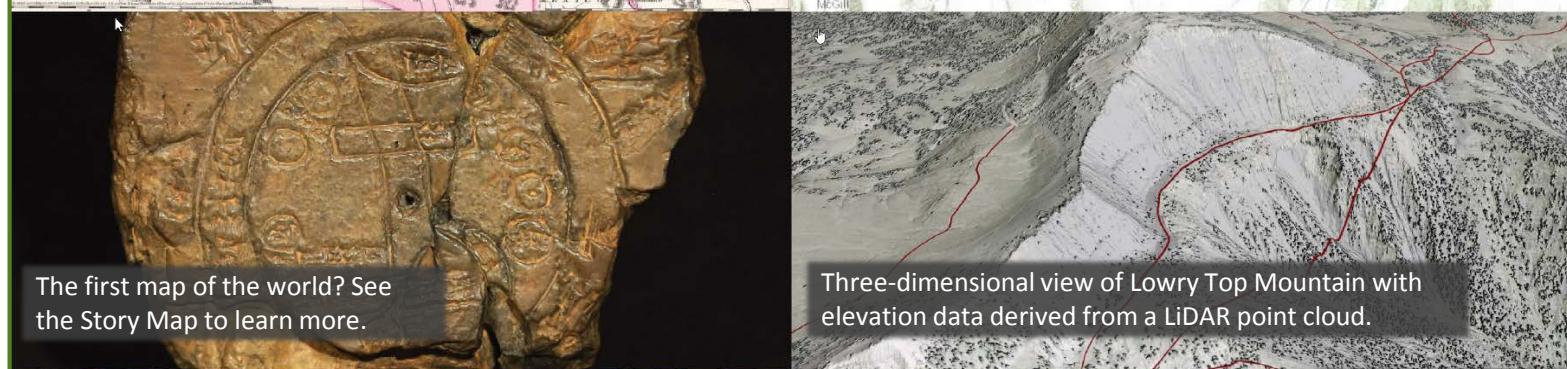
Map created by: Piper Christian - Logan High School  
 Logan Environmental Action Force - President  
 With help from: Anders Hart and Logan Christian  
 Data from: CCL.org and Jack Greene  
 NAD 1983 UTM Zone 12N

# AN INTERACTIVE HISTORY OF GIS

The power behind the map in the 21<sup>st</sup> Century

Joseph P. Peters, Esri

Although recent technological advancements have greatly broadened the scope of geographic applications, the foundations of GIS and use of location information to make decisions date back thousands of years. Created with the Esri Story Map Cascade template, this online interactive map communicates an abbreviated history of maps and the evolution of GIS toward more complex analyses using many layers of information, contributing to better and more well-informed decisions. Data provided by the State of Utah Automated Geographic Reference Center and Esri. View the Story Map at <http://arcg.is/2jHJrry>

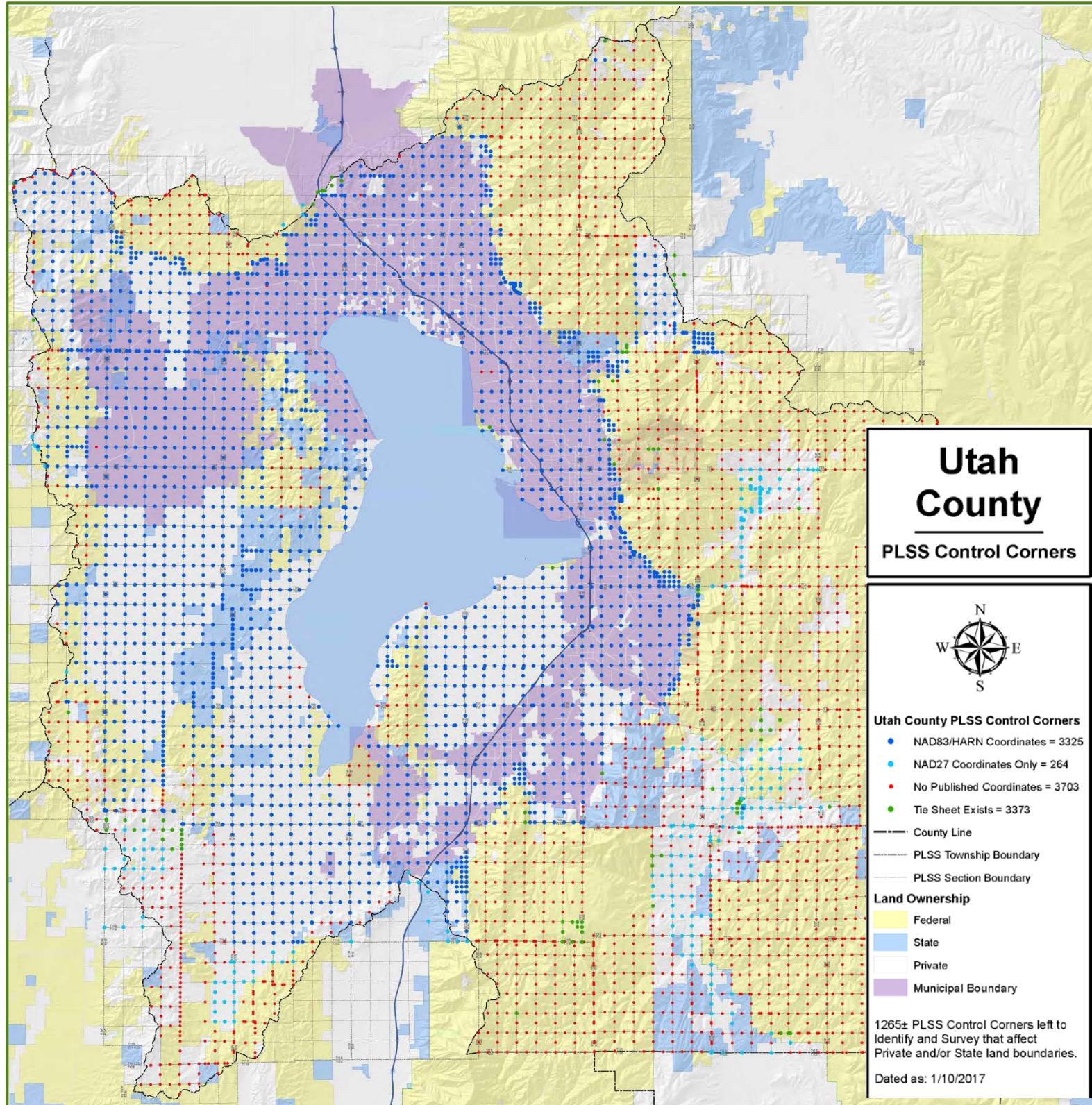


## PUBLIC LAND SURVEY SYSTEM CONTROL CORNERS

GIS is used to track progress in reestablishing corner monuments.

Melanie Rainey, Utah County

The Utah County Surveyor has the responsibility of establishing, reestablishing and protecting PLSS corner monuments used to establish private property boundaries. GIS has been useful in maintaining a record of work performed, storing spatial and tabular information about each monument, and providing a foundation for delivering information about monuments through web maps and tie sheets. In addition, this map is kept current for the County Surveyor to help in planning and communicating progress in reestablishing PLSS monuments.

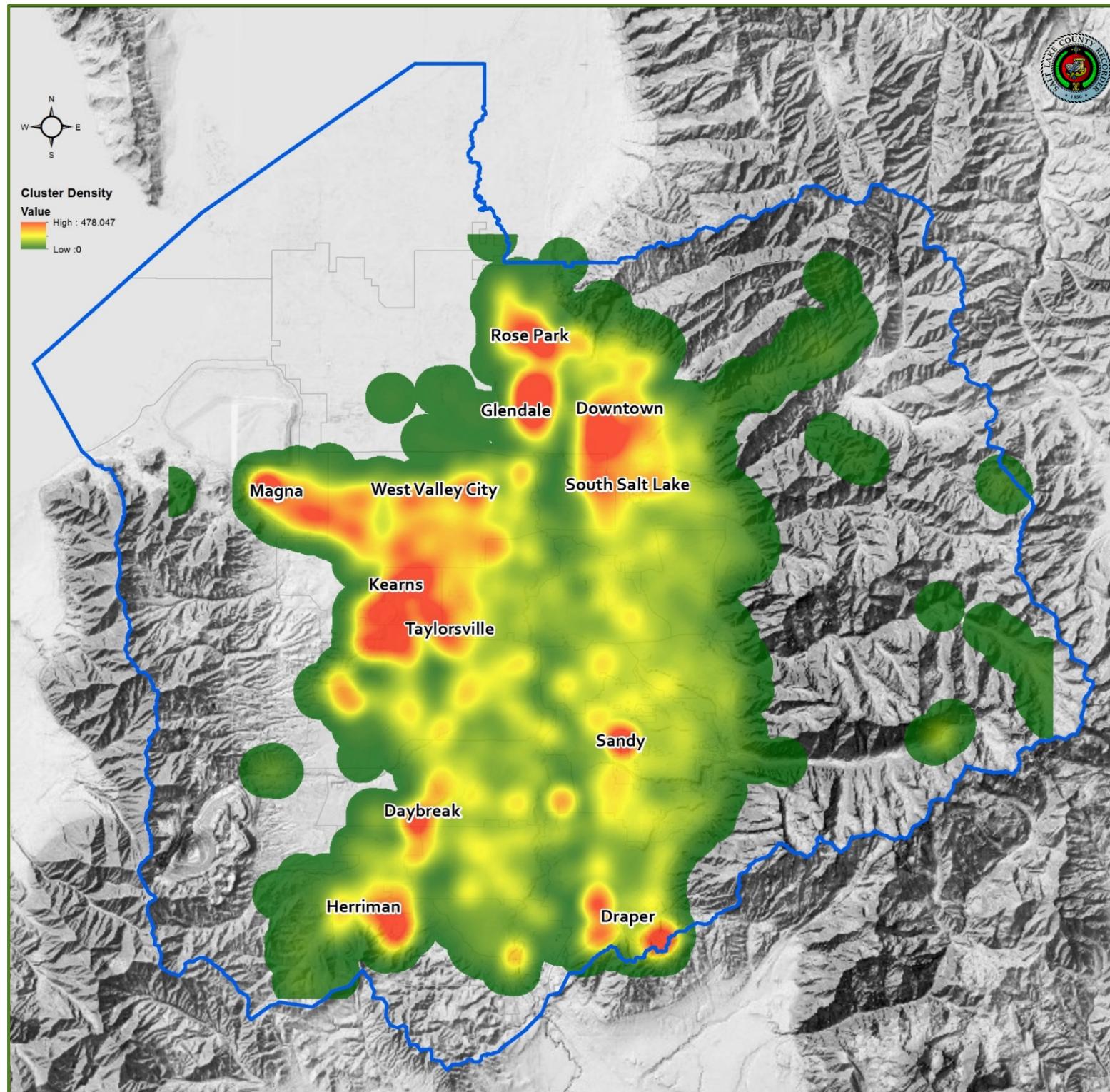


## AREAS IMPACTED BY THE HOUSING MARKET CRISIS

A Study of Parcels with a Notice of Default filed in Salt Lake County 2007-2010

Gary Ott - Salt Lake County Recorder, Julie Dole - Chief Deputy Recorder, created by the staff of the Recorder's Office

When a property owner falls behind on their payments to a lender, the lender will typically file a document called a Notice of Default with the county Recorder. During the housing market crisis, the volume of these documents skyrocketed. By finding the parcels associated with defaults, we have created a map to determine the geographical areas most affected by the recession. What caused certain areas to be impacted more than others? If we can identify those factors, can we prevent future downward housing trends from having such a large effect?



# PROTECTING THE CENTRAL WASATCH STORY MAP

Mapping Current Canyon Initiatives in Salt Lake County

Salt Lake County Surveyor's Office

The Central Wasatch Mountains are the distinguishing feature of Salt Lake County. As the County's million-plus population continues to grow, we must find balanced solutions that will preserve the watershed and ensure the Wasatch Mountains remain available for residents and visitors to enjoy. There are canyon initiatives coming this 2017 legislative session and the County Surveyor's Office created a story map to help visualize and bring the supporting information into one place. <http://arcg.is/2iN7pSg>

## Protecting the Central Wasatch

Summary of Recent Salt Lake County Canyon Planning Initiatives

Salt Lake County Surveyor's Office [Facebook](#) [Twitter](#)



[Our Valley Is Changing](#)

[Foothill Canyons Overlay Zone](#)

[Mountainous Planning District](#)

[Mountain Resort Zone](#)

[Mountain Accord](#)

The Central Wasatch Mountains are the distinguishing feature of Salt Lake County. As the County's million-plus population continues to grow, we must find balanced solutions that will preserve the watershed and ensure the Wasatch Mountains remain available for residents and visitors to enjoy.

Almost 5 million people per year visit the area from Parley's Canyon on the north to Little Cottonwood Canyon on the south, more than any of Utah's National Parks! More people are using this area for high-impact activities like mountain biking, homes are getting larger, and cities are moving up to the mountains' edge. These changes bring challenges: decreased air and water quality, conflicts with residents and landowners, increased development pressures, and a dwindling municipal tax base in the valley to support the services necessary in the canyons.

The Foothill Canyons Overlay Zone (FCOZ), the Mountain Resort Zone (MRZ), and Mountain Accord are efforts to update ordinance and regulations at the local and federal levels governing land use decisions. The Mountain Planning District (MPD) is an effort to help better enforce and design those regulations and laws.

Use the tabs to learn more about current planning initiatives that are underway to help protect this area. The maps are interactive and users can zoom to areas of interest.

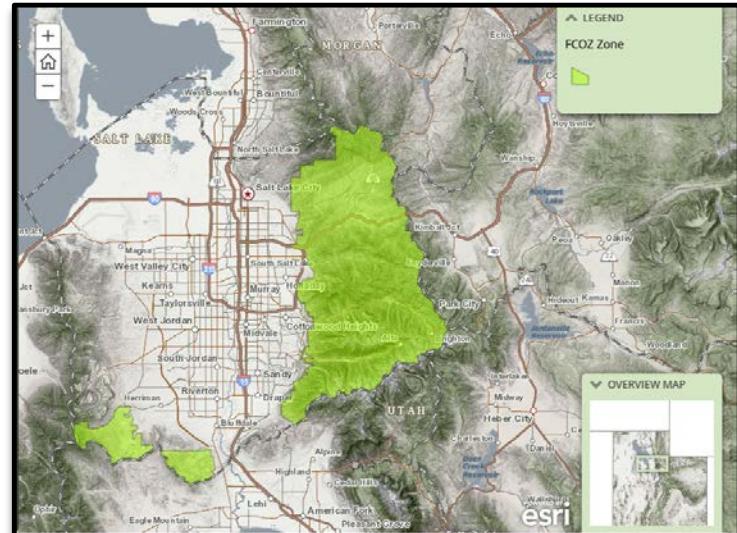


Interactive map of the Mountainous Planning District (MPD)



Data Source: Salt Lake County Surveyor's Office

Interactive map of the Foothill Canyons Overlay Zone (FCOZ)



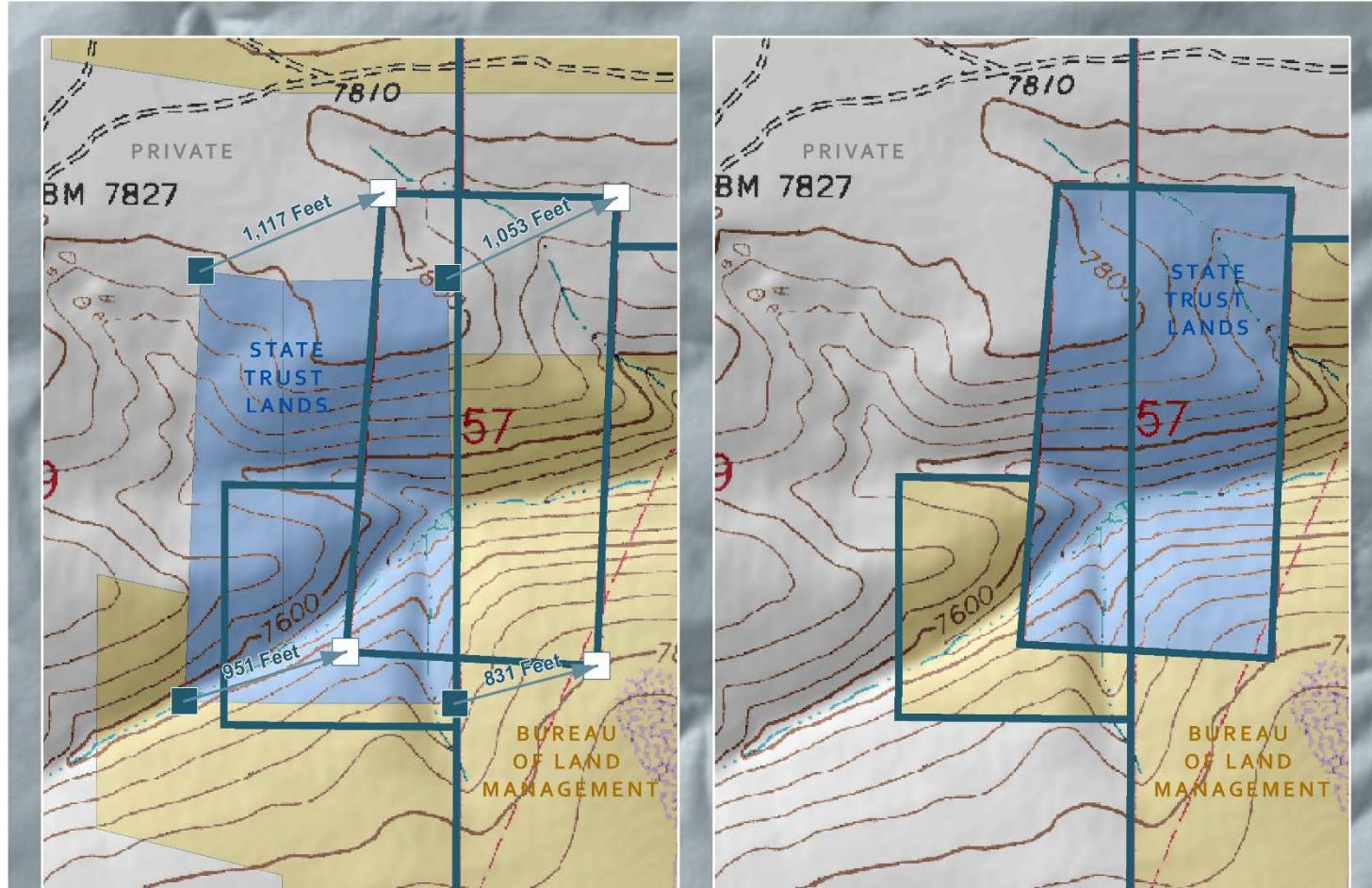
Data Source: Salt Lake County Public Works

# UTAH PLSS FABRIC v1.0

Utah Land Ownership

Kate Staley, GISP, GIS Manager, State of Utah Trust Lands Administration

The State of Utah School and Institutional Trust Lands Administration (SITLA) continues to work with the Automated Geographic Reference Center (AGRC) to migrate the Utah land ownership data into the Utah PLSS Fabric v1.0. The land ownership data is currently aligned to the 2006 version of GCDB and is out of date, which can lead to incorrect information and boundary disputes. Vigilant maintenance of the parcel fabric between SITLA and the AGRC will yield a clean and quality product for everyone to enjoy and rely on.









Publication of the map book was made possible by the Utah Geographic Information Council ([ugic.org](http://ugic.org)) in partnership with the Utah Automated Geographic Reference Center ([gis.utah.gov](http://gis.utah.gov)).

Thanks to all participants and volunteers that have made the 6th annual Maps on the Hill 2017 event a success!

The exhibit pages in this 2017 map book provide a snapshot and description of the map displays presented in the Rotunda by GIS professionals and students from around the state.

Each map, description, and layout was contributed directly for this document by the map authors using a powerpoint slide template.

