



Connecting world class research with real-world water challenges

Colorado State University

Promoting Data Literacy through Data Visualization Storyboards

*Presented by Colorado Watershed Assembly and
One Water Solutions Institute at CSU*

OVERVIEW



Data Products

Analysis Tools

Data Visualization

DATA LITERACY



INDIVIDUAL INTRODUCTIONS

Introduce Your:

- Association/Group
- Focus Level
 - Reach, Watershed, State
- Data Interests (type)
 - Water Quantity, Water Quality, Land Use Maps, etc.

COLORADO WATER ENTITIES

Colorado Water Conservation Board (CWCB)

- State Agency
- Mission: To Conserve, Develop, Protect, and Manage Colorado's Water for Present and Future Generations

Colorado Department of Public Health and Environment

- State Agency
- Mission: To protect and improve the health of Colorado's people and the quality of its environment

COLORADO WATER ENTITIES

Colorado Division of Water Resources (DWR)

- State Agency
- Mission: Provide competent and dependable distribution of water in accordance with statutes, decrees and interstate compacts

DATA PRODUCTS – NATIONAL

- United States Geological Survey (USGS)
 - National Water Information System (NWIS)
- United States Environmental Protection Agency (EPA)
 - Water Quality Exchange (WQX)
 - STORET vs. Water Quality Data Portal
- Other Federal Agencies
 - FEMA, USFS, USDA, US Census

USGS – NATIONAL WATER INFORMATION SYSTEM (NWIS)

www.waterdata.usgs.gov/nwis

- NWIS: Nation Water Information System
- Stream Gage Data
 - Stage
 - Flow
 - Water Quality

The screenshot shows the USGS National Water Information System (NWIS) web interface. At the top, there is a banner with the USGS logo and the tagline "science for a changing world". Below the banner, the text "National Water Information System: Web Interface" is displayed. A navigation bar contains "USGS Water Resources" and search filters for "Data Category" (set to "Home") and "Geographic Area" (set to "United States"), with a "GO" button. A yellow banner below the navigation bar contains a "Click to hide News Bulletins" link and two bullet points: "Please see news on new formats" and "Full News" with a social media icon. The main content area is titled "USGS Water Data for the Nation" and is divided into two columns. The left column, "Search for Sites With Data", includes three buttons: "Current Conditions" (described as "Sites with real-time or recent surface-water, groundwater, or water-quality data."), "Site Information" (described as "Descriptive site information for all sites with links to all available water data for individual sites."), and a map of the United States (described as "Map of all sites with links to all available water data for individual sites."). The right column, "Introduction", contains a paragraph of text and three buttons: "About Us", "Help", and "Tutorial". Below the "Search for Sites With Data" section, there is a "Frequent Searches By Data Category" section with four buttons: "Surface Water" (described as "Water flow and levels in streams and lakes."), "Groundwater" (described as "Water levels in wells."), "Water Quality" (described as "Chemical and physical data for streams, lakes, springs, wells and other sites."), and "Water Use" (described as "Water use information.").

EPA –STORET

- STORET: STOrage and RETrieval
 - Old WQX Data Access

STORET Decommission

The STORET Warehouse was decommissioned on June 29, 2018. WQX, the mechanism for publishing monitoring data, has remained unchanged and data will continue to be available through the [Water Quality Portal](#). The STORET Dashboard will be temporarily unavailable, starting June 29th. An alternative application with similar functionality will be deployed within a few months. Please email: wqx@epa.gov if you have questions.

EPA – WATER QUALITY DATA PORTAL

www.waterqualitydata.us.portal

- Water Quality Data Portal
 - New WQX Data Access
- Stream Gage Data
 - Water Quality
- Other Data

The screenshot shows the National Water Quality Monitoring Council (NWQMC) website. The header includes the NWQMC logo and the tagline "Working together for clean water". Below the header is a navigation bar with links: "WQP Home", "Download Data", "How to use the WQP", "National Results Coverage", and "About the WQP". The main content area is titled "Water Quality Data" and features a "Reset form" button. The "LOCATION" section contains a "Place:" label and three dropdown menus for "Country:", "State:", and "County:". The "County:" dropdown is currently set to "All". To the right of the "Place:" section are two columns of input fields: "Point Location: ?" and "Bounding Box: ?". The "Point Location" column includes "Within" (with a "miles of" label), "Lat:", and "Long:". The "Bounding Box" column includes "North:", "South:", "East:", and "West:". A "Use my location" button is located below the "Point Location" fields. Below the "LOCATION" section are two tabs: "SITE PARAMETERS" and "SAMPLING PARAMETERS". The "SITE PARAMETERS" tab is active, showing a "Site Type:" dropdown menu. The "SAMPLING PARAMETERS" tab is inactive, showing a "Sample Media:" dropdown menu.

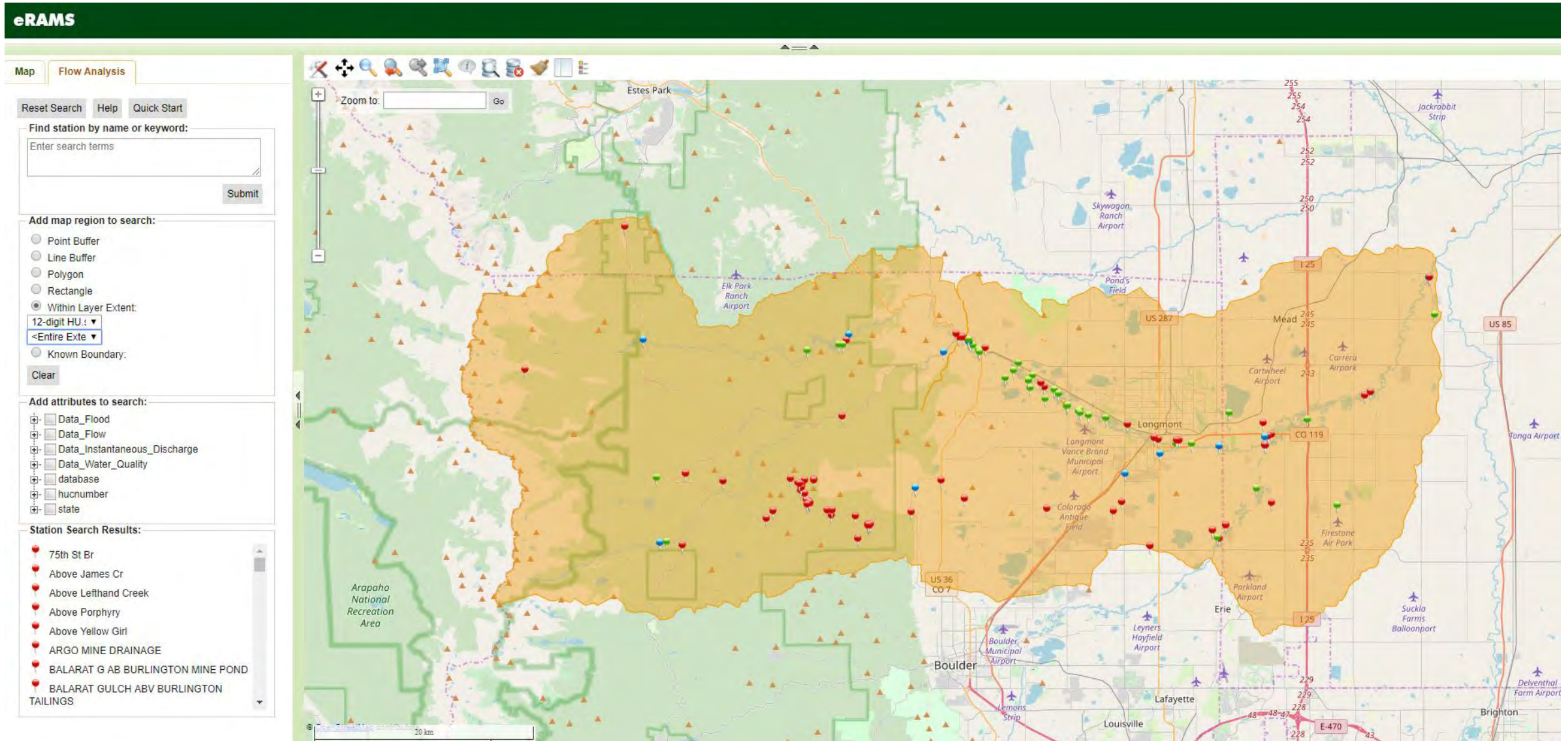
DATA PRODUCTS - LOCAL

- Colorado Data Sharing Network (CDSN)
- Colorado Decision Support System (CDSS)
 - By Colorado Water Conservation Board (CWCB)
- Watershed Specific Non-Public Datasets
 - Cherry Creek
 - Big Dry Creek

ANALYSIS TOOLS

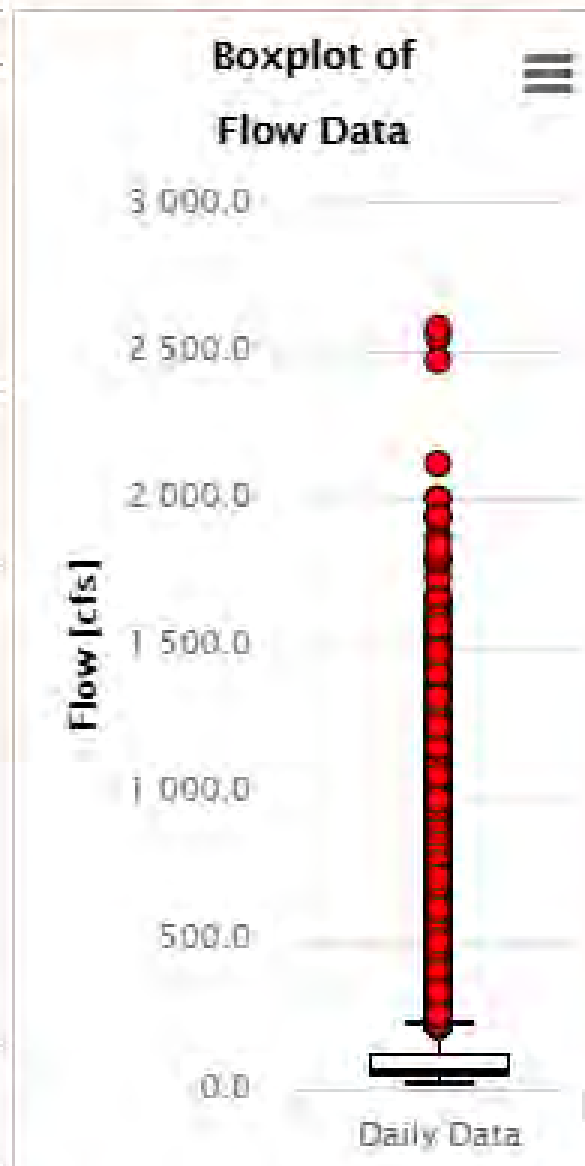
- Microsoft Excel
 - Min, Max, Average, Median
- Software Packages (R, Matlab, etc.)
- eRAMS Flow Analysis Tool
- eRAMS Watershed Rapid Assessment Tool (WRAP)

ANALYSIS TOOLS: ERAMS FLOW ANALYSIS



ANALYSIS TOOLS: SIMPLE STATISTICS

General	All Data
- Total Observations:	13570
- Start Date:	1976-09-13
- End Date:	2015-09-30
- Start of 'Season' Day:	04-01
- End of 'Season' Day:	09-01
- Units:	cfs
Measures of Central Tendency	
- Mean:	117.367
- Median:	65.6
Measures of Dispersion	
- Max:	2580.0
- Min:	20.0
- Standard Deviation:	180.36
- Variance:	32529.88
- Coefficient of Variation:	1.537
- First Quartile:	45.0
- Third Quartile:	119.0
- Inter Quartile Range:	68
Measures of Skewness	
- Skew:	9.2E-7

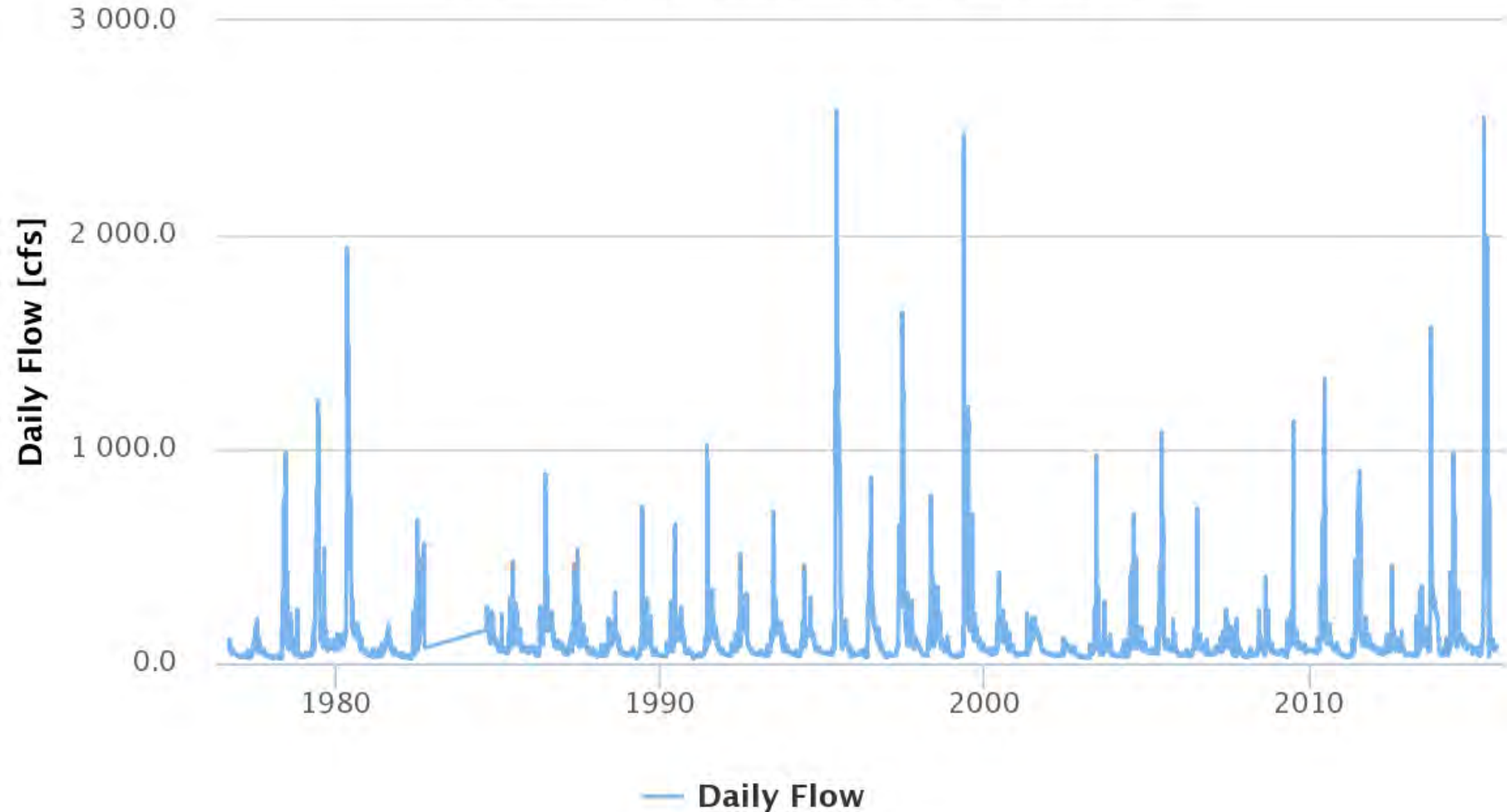


ANALYSIS TOOLS: SIMPLE STATISTICS

	USGS 06723400;	USGS 06724970;	USGS 06724500;	USGS 06721500;	USGS 06725000;	USGS 06725100;	USGS 06722000;	USGS 06722500;	USGS 06725450;	USGS 06731000;	USGS 06724000;
General											
- Total Observations:	1471	1678	5666	6170	6563	1460	10226	8792	13570	26151	37376
- Start Date:	1976-09-29	2014-03-05	1929-05-16	1925-10-01	1927-03-01	1964-10-01	1925-10-01	1925-10-01	1976-09-13	1927-02-24	1895-10-01
- End Date:	1980-10-08	2018-10-07	1989-09-29	2007-09-29	1955-12-31	1968-09-29	1953-09-29	1973-09-29	2015-09-30	1998-09-29	1998-09-29
- Units:	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
Central Tendency											
- Mean:	61.801	26.941	39.817	54.995	13.033	67.901	89.589	28.08	117.367	221.059	128.512
- Median:	17.0	6.9	11.0	17.0	5.4	36.0	31.0	8.0	65.6	135.0	39.5
Measures of Dispersion											
- Max:	834.0	566.0	758.0	503.0	432.0	1570.0	902.0	328.0	2580.0	6700.0	2120.0
- Min:	3.0	0.71	0.0	4.0	0.4	12.0	3.3	1.1	20.0	12.0	0.0
- Standard Deviation:	97.891	48.072	56.07	78.403	27.537	140.939	122.095	43.224	180.36	353.638	194.283
- Variance:	9582.639	2310.962	3143.823	6146.98	758.304	19863.813	14907.077	1868.342	32529.88	125059.975	37746.07
- Coefficient of Variation:	1.584	1.784	1.408	1.426	2.113	2.076	1.363	1.539	1.537	1.6	1.512
- First Quartile:	9.1	3.955	4.5	8.0	3.3	26.0	13.0	3.1	45.0	87.0	16.0
- Third Quartile:	67.0	22.75	56.0	67.0	9.5	52.0	117.0	33.0	113.0	206.0	159.0
- Inter Quartile Range:	57.9	18.8	51.5	59	6.2	26	104	29.9	68	119	143
Measures of Skewness											
- Skew:	3.12E-6	3.238E-5	1.593E-5	4.56E-6	2.7829E-4	2.11E-6	1.17E-6	3.01E-5	9.2E-7	1.4E-7	3.8E-7

ANALYSIS TOOLS: SIMPLE TIME SERIES

ST. VRAIN CREEK BELOW LONGMONT, CO



DATA VISUALIZATION

*The combination
of art and science
with some
statistics and maps
blended in*

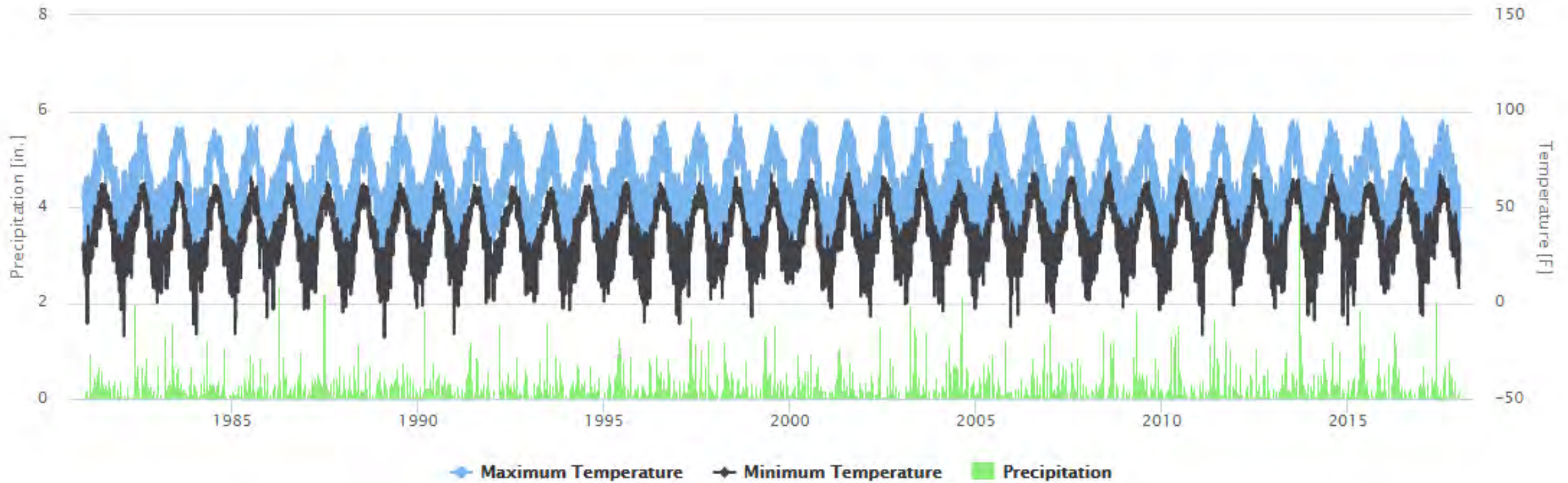
An Old Dog Learning New Tricks

“We are demanding the visual
aspect of the data” –David
McCandless

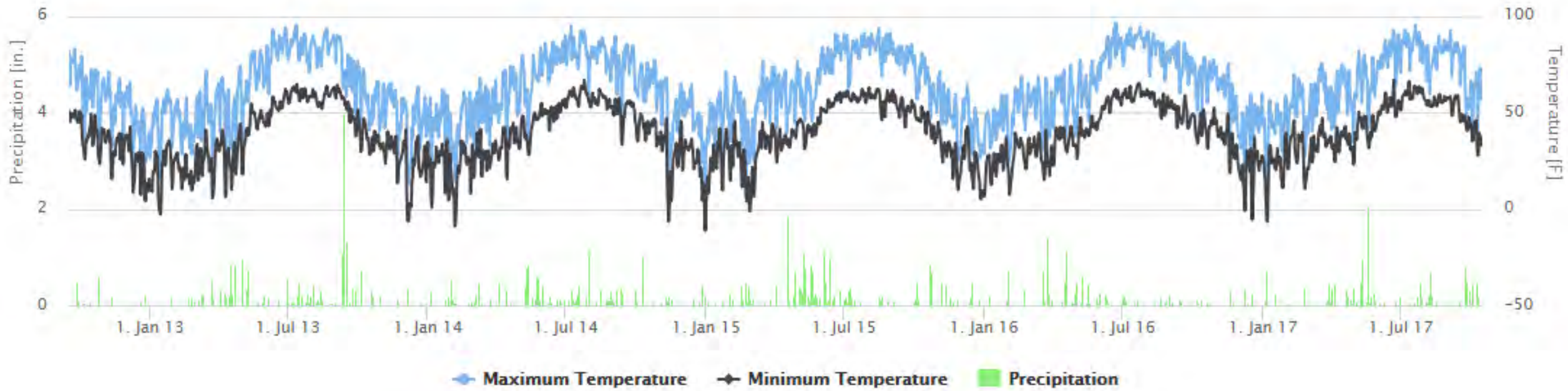
DATA VISUALIZATION: TIME SERIES

- Microsoft Excel
- eRAMS Flow Analysis
- eRAMS WRAP Tool
- CDSN Data Viewer

BAD TIME SERIES

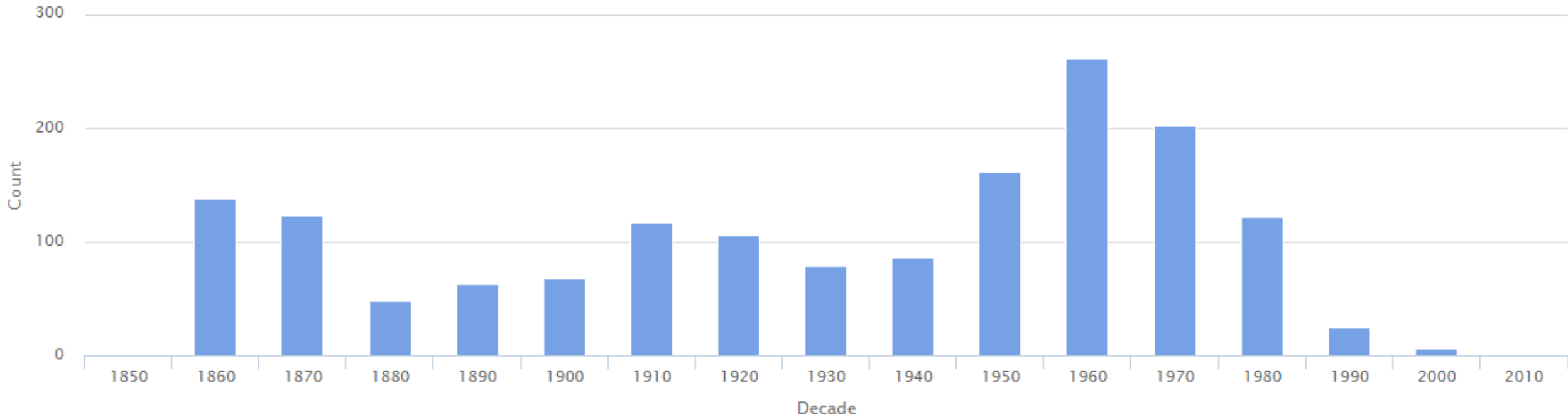


GOOD TIME SERIES



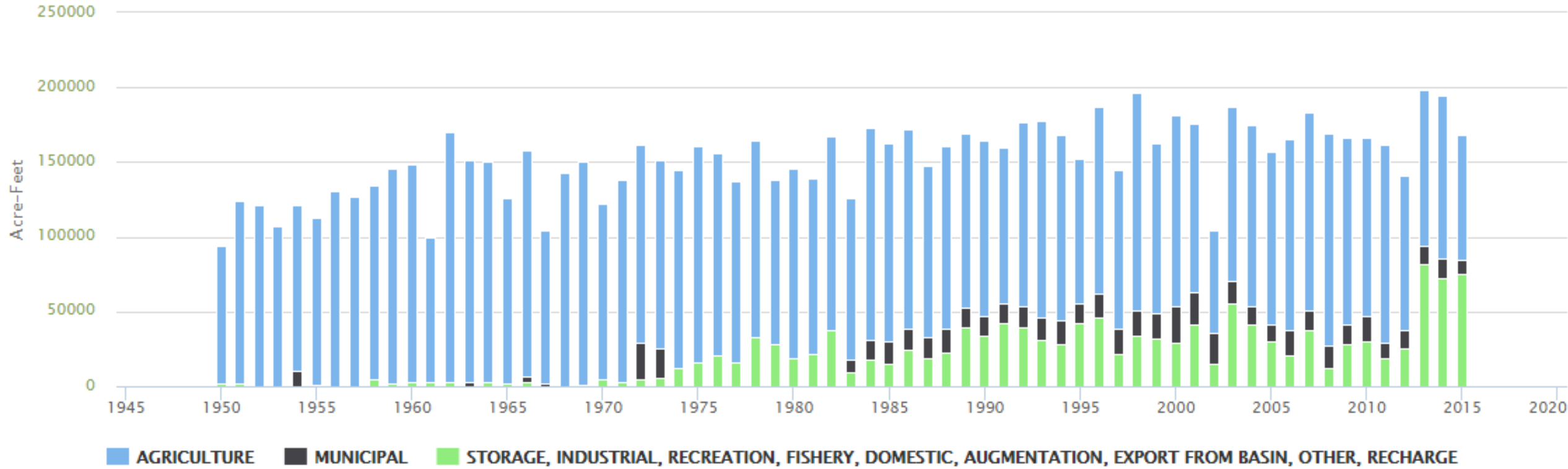
BAD BAR CHART

Count of Water Rights by Year



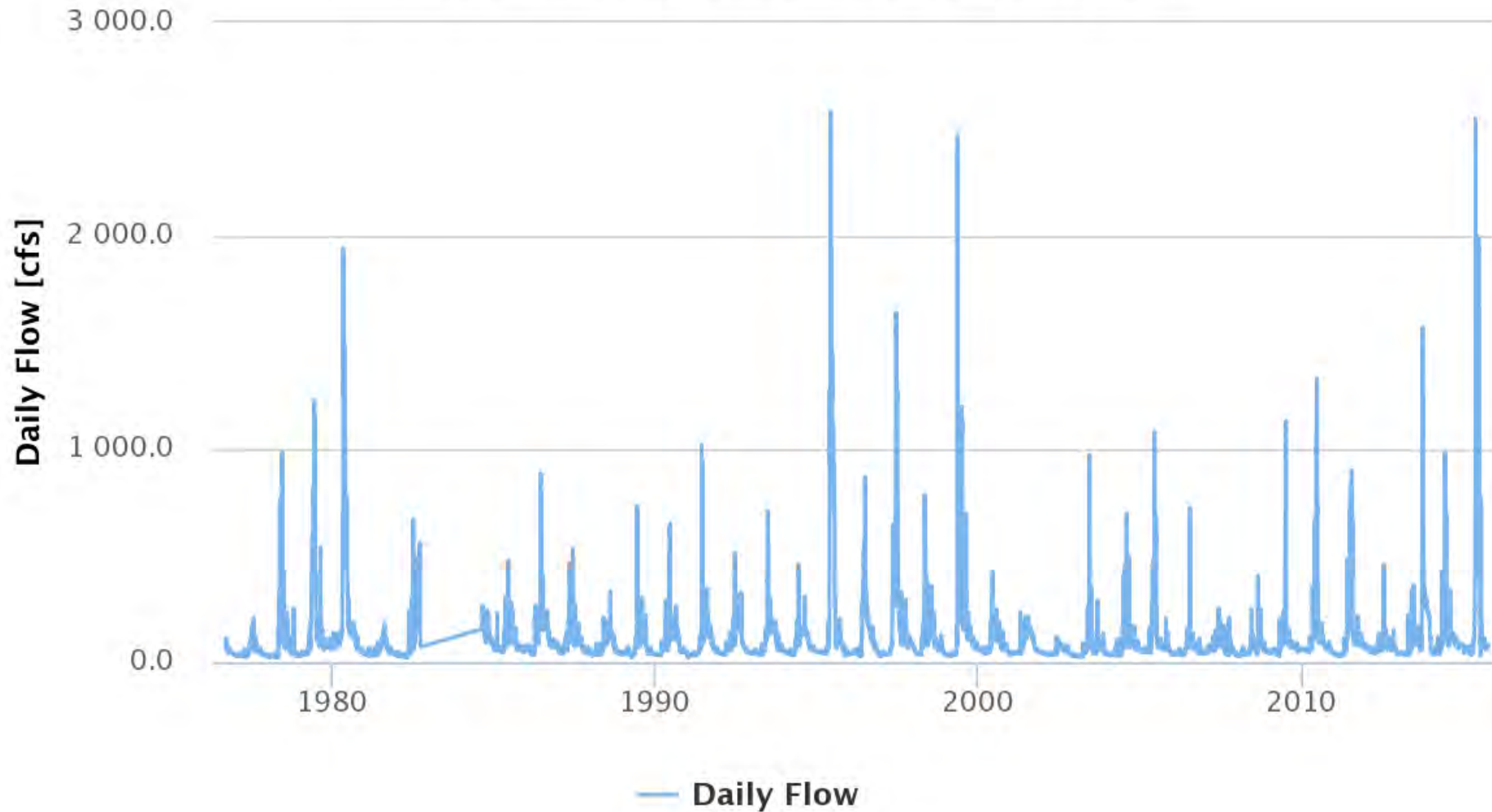
GOOD BAR CHART

Historic Diversion Volume by Year

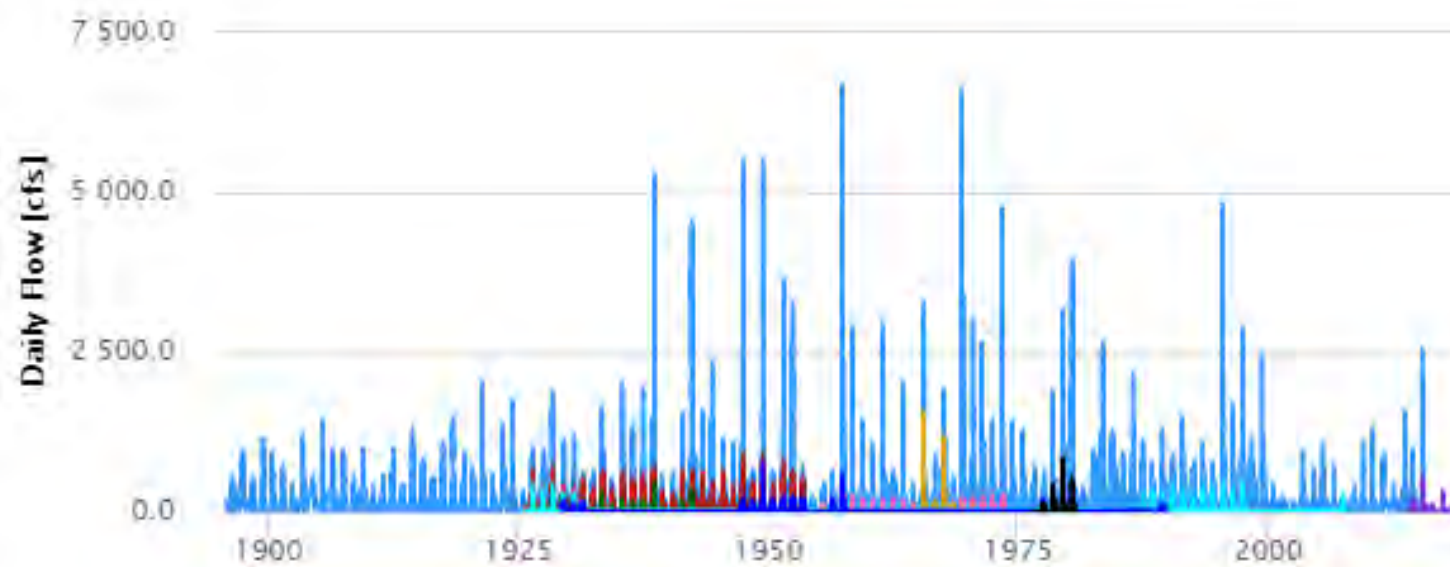


SIMPLE TIME SERIES

ST. VRAIN CREEK BELOW LONGMONT, CO

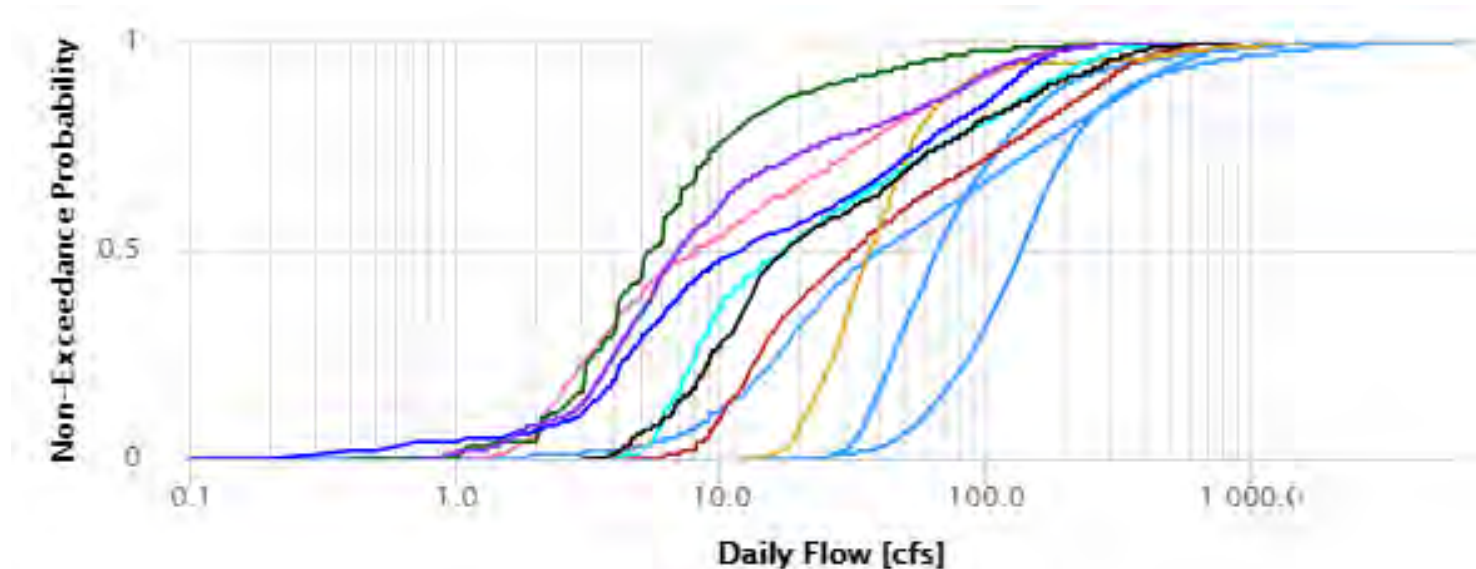


SIMPLE TIME SERIES: MULTIPLE SITES



- USGS Station: 06724000; ST. VRAIN CREEK AT LYONS, CO.
- USGS Station: 06731000; ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE, CO.
- USGS Station: 06725450; ST. VRAIN CREEK BELOW LONGMONT, CO.
- USGS Station: 06722500; SOUTH ST. VRAIN CREEK NEAR WARD, CO.
- USGS Station: 06722000; N ST. VRAIN CREEK AT LONGMONT DAM, NR LYONS, CO.
- USGS Station: 06725100; ST. VRAIN CREEK NEAR LONGMONT, CO.
- USGS Station: 06725000; LEFT HAND CREEK AT MOUTH, AT LONGMONT, CO.
- USGS Station: 06721500; NORTH ST. VRAIN CREEK NEAR ALLENS PARK, CO.
- USGS Station: 06724500; LEFT HAND CREEK NEAR BOULDER, CO.
- USGS Station: 06724970; LEFT HAND CREEK AT HOVER ROAD NEAR LONGMONT, CO.
- USGS Station: 06723400; SOUTH ST. VRAIN CREEK ABOVE LYONS, CO.

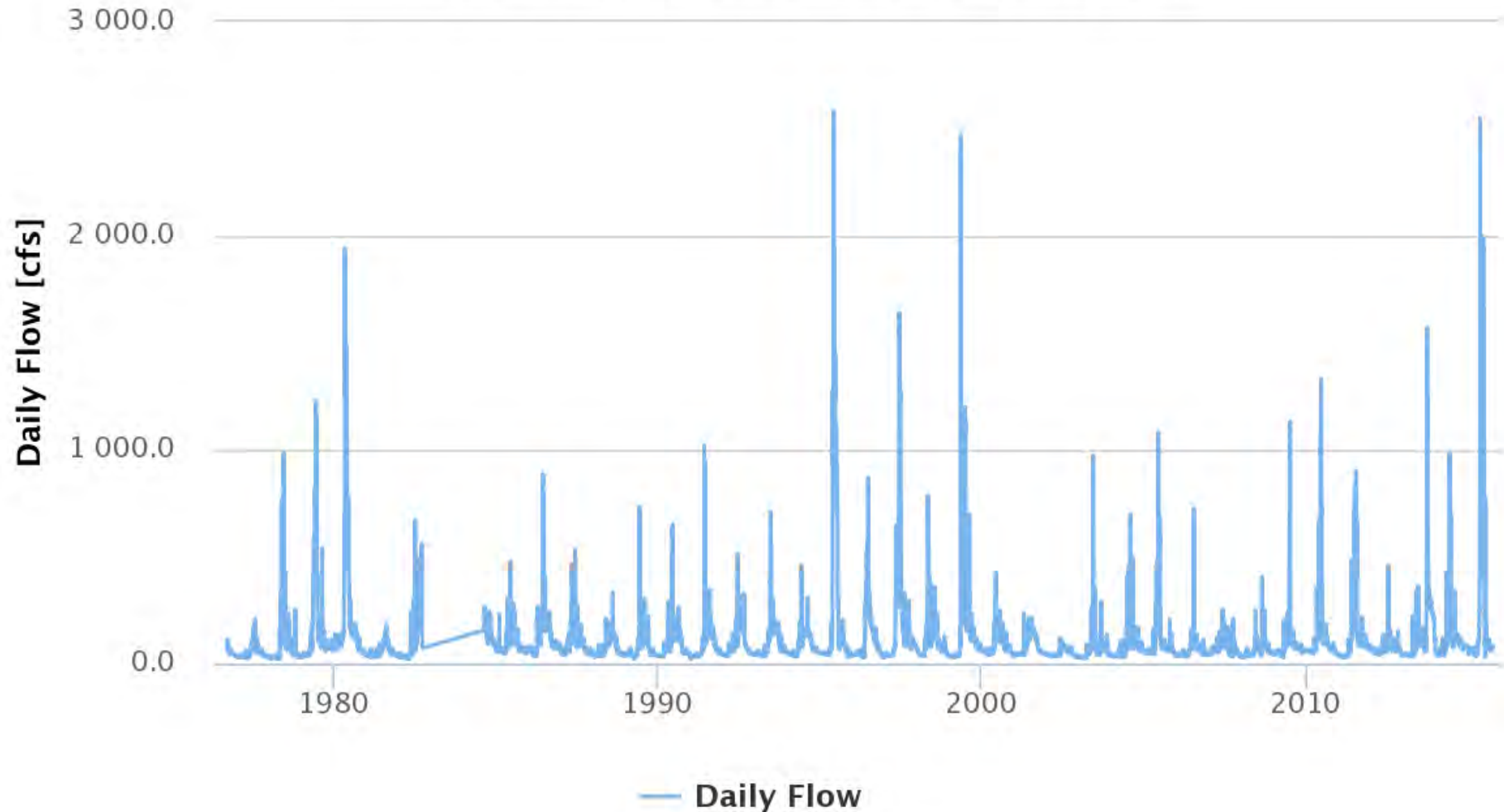
COMPLEX TIME SERIES: MULTIPLE SITES



- USGS Station: 06724000; ST. VRAIN CREEK AT LYONS, CO. (n=37376)
- USGS Station: 06731000; ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE, CO. (n=26151)
- USGS Station: 06725450; ST. VRAIN CREEK BELOW LONGMONT, CO (n=13570)
- USGS Station: 06722500; SOUTH ST. VRAIN CREEK NEAR WARD, CO. (n=8792)
- USGS Station: 06722000; N ST. VRAIN CREEK AT LONGMONT DAM, NR LYONS, CO. (n=10226)
- USGS Station: 06725100; ST. VRAIN CREEK NEAR LONGMONT, CO. (n=1460)
- USGS Station: 06725000; LEFT HAND CREEK AT MOUTH, AT LONGMONT, CO. (n=6563)
- USGS Station: 06721500; NORTH ST. VRAIN CREEK NEAR ALLENS PARK, CO. (n=6170)
- USGS Station: 06724500; LEFT HAND CREEK NEAR BOULDER, CO. (n=5666)
- USGS Station: 06724970; LEFT HAND CREEK AT HOVER ROAD NEAR LONGMONT, CO (n=1678)
- USGS Station: 06723400; SOUTH ST. VRAIN CREEK ABOVE LYONS, CO. (n=1471)

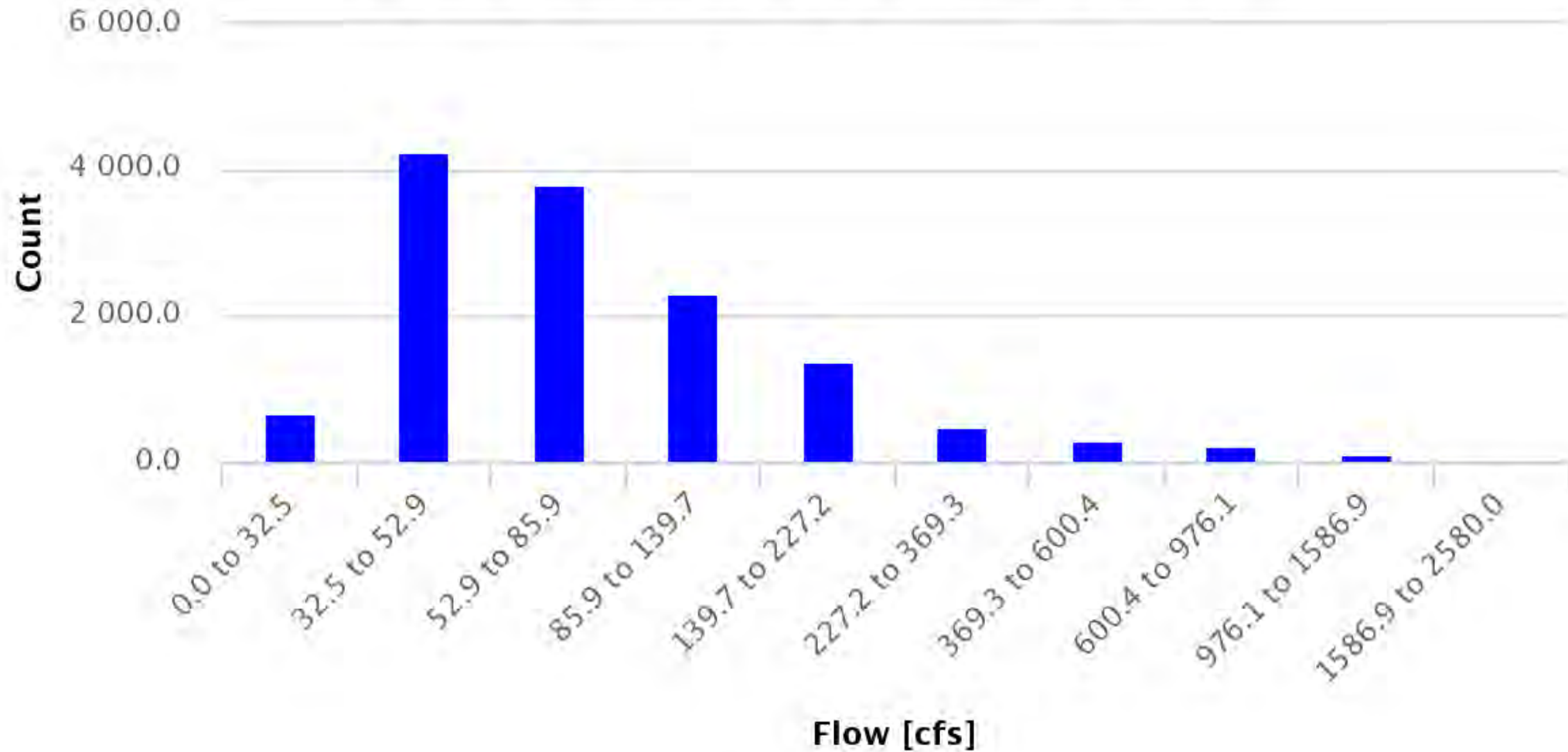
SIMPLE TIME SERIES

ST. VRAIN CREEK BELOW LONGMONT, CO



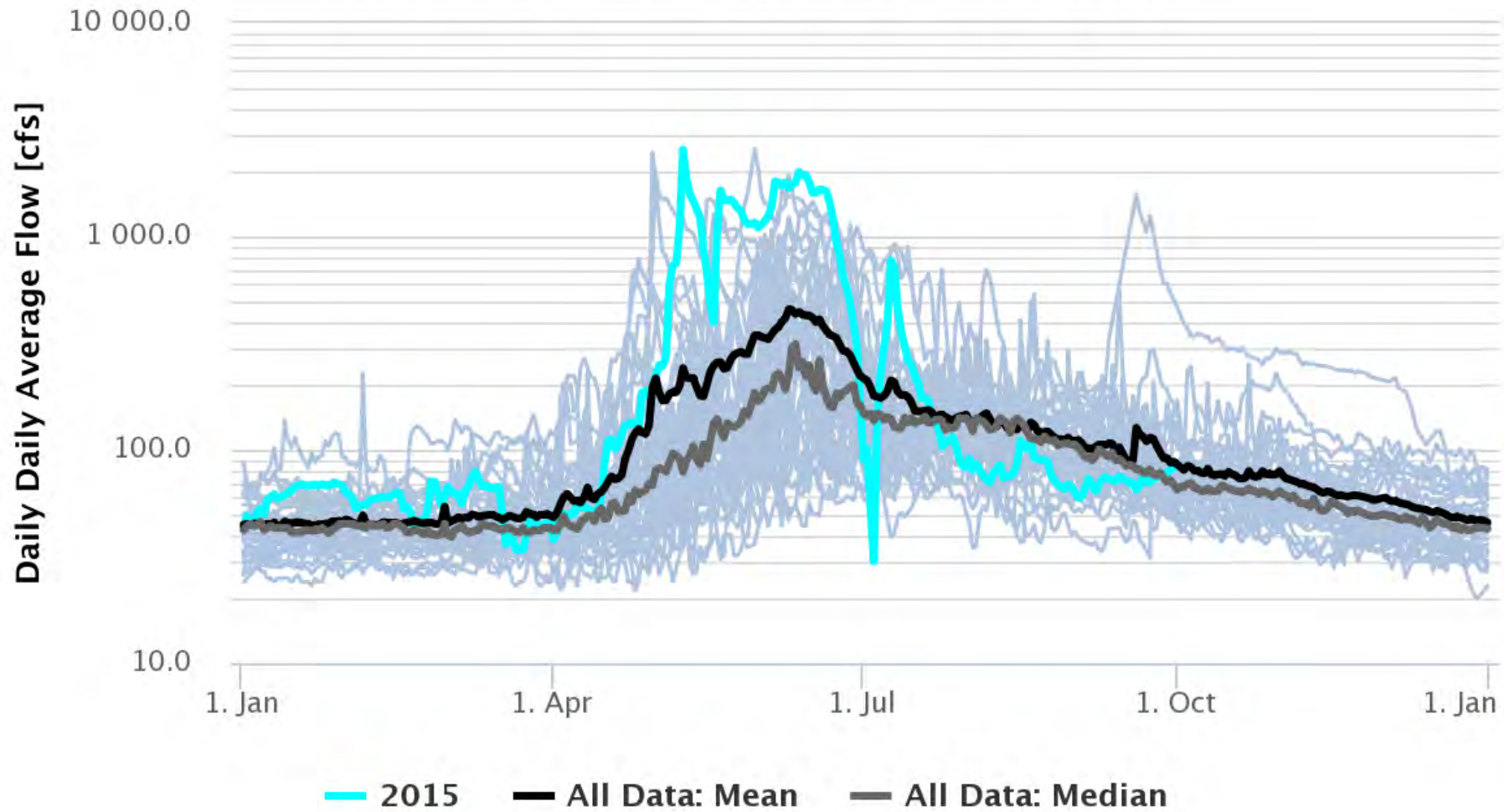
COMPLEX TIME SERIES: HISTOGRAM

ST. VRAIN CREEK BELOW LONGMONT, CO



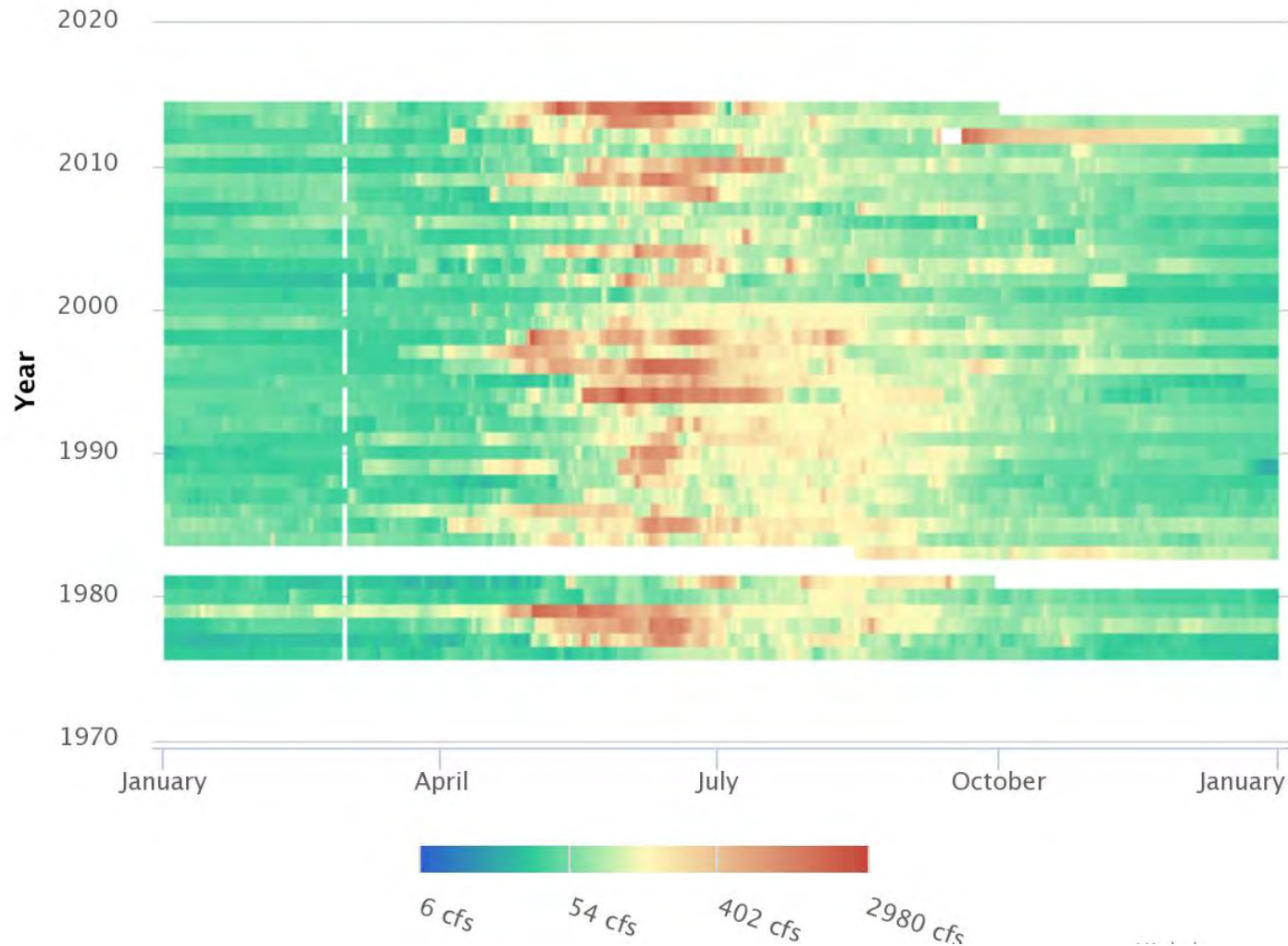
COMPLEX TIME SERIES: ENVELOPE

ST. VRAIN CREEK BELOW LONGMONT, CO

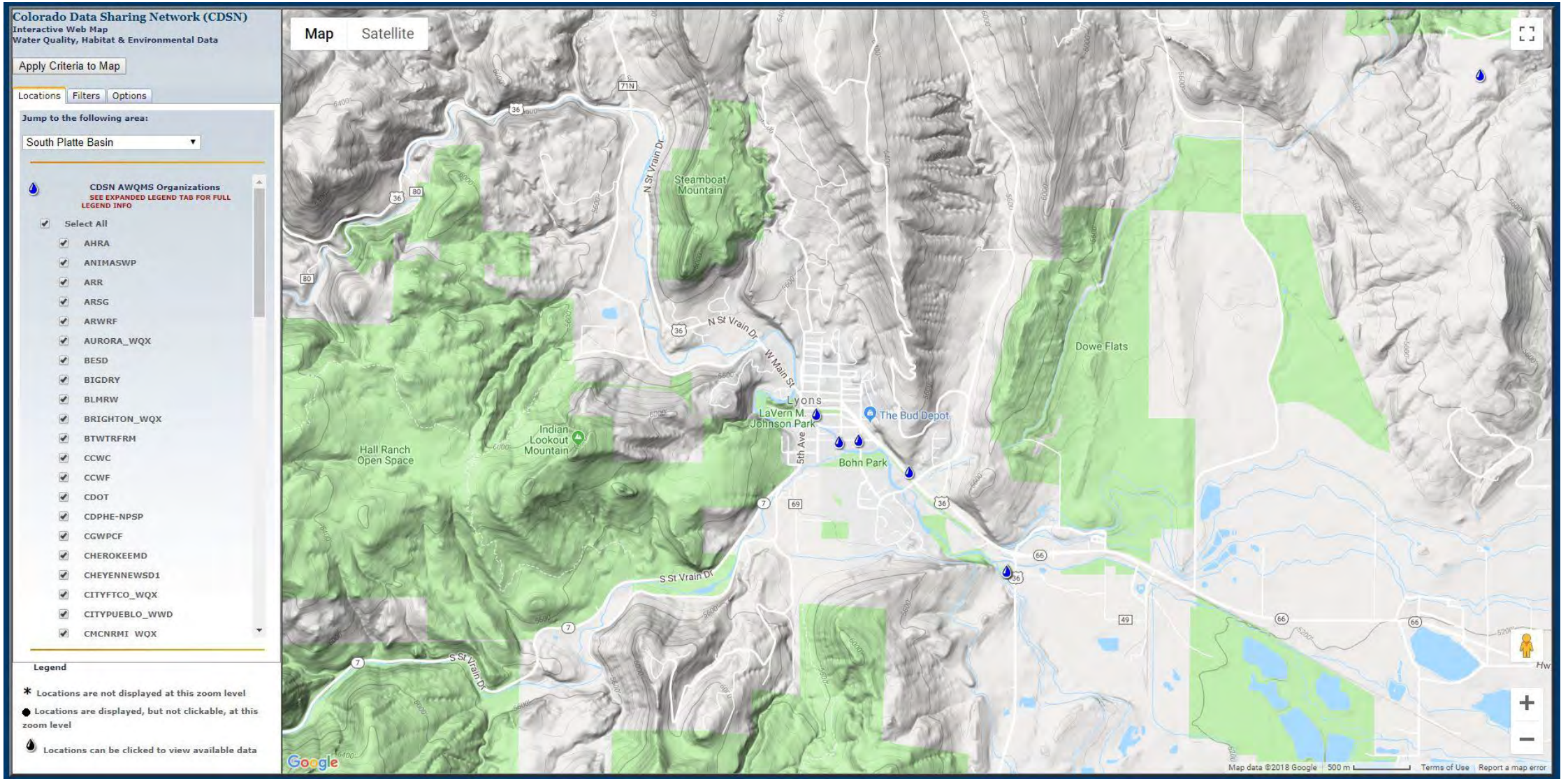


COMPLEX TIME SERIES: RASTER

ST. VRAIN CREEK BELOW LONGMONT, CO



DATA VISUALIZATION: TIME SERIES



DATA VISUALIZATION: TIME SERIES

Colorado Data Sharing Network (CDSN)
Interactive Web Map
Water Quality, Habitat & Environmental Data

Map Satellite

Apply Criteria to Map

Locations Filters Options

Jump to the following area:
South Platte Basin

CDSN AWQMS Organizations
SEE EXPANDED LEGEND TAB FOR FULL LEGEND INFO

- Select All
- AHRA
- ANIHASWP
- ARR
- ARSG
- ARWRF
- AURORA_WQX
- BESD
- BIGDRY
- BLMRW
- BRIGHTON_WQX
- BTWTRFRM
- CCWC
- CCWF
- CDOT
- CDPHE-NPSP
- CGWPCF
- CHEROKEEMD
- CHEYENNEWSD1
- CITYFTCO_WQX
- CITYPUEBLO_WWD
- CMCNRM1 WOX

Legend

- * Locations are not displayed at this zoom
- Locations are displayed, but not clickable at this zoom level
- 🔍 Locations can be clicked to view available data

Results - Google Chrome

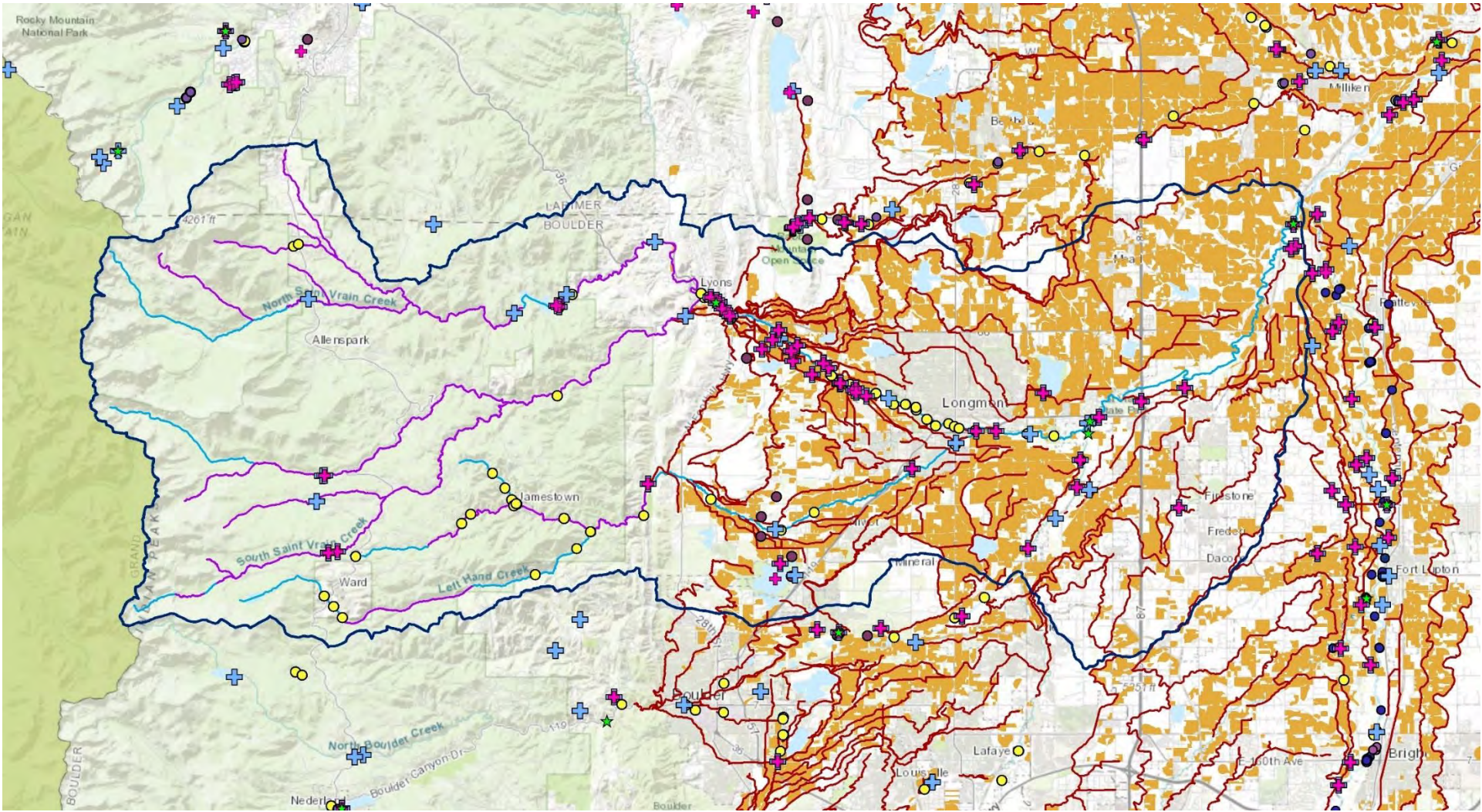
ID	Location	Latitude	Longitude	Count	Sample ID	Sample Type	Date	Time	Timezone	Medium	Parameter
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.016M	Sample-Routine	01-19-1994	12:30:00 PM	MST	Water	Zinc
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.016M	Sample-Routine	01-19-1994	12:30:00 PM	MST	Water	Manganese
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Hardness, Ca, Mg
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Dissolved oxygen (DO)
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	pH
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Alkalinity, Phenolphthalein (total hydroxide+1
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Alkalinity, total
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Lead
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Iron
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Copper
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Cadmium
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Manganese
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.017M	Sample-Routine	02-14-1994	12:50:00 PM	MST	Water	Zinc
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Alkalinity, total
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Alkalinity, Phenolphthalein (total hydroxide+1
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Dissolved oxygen (DO)
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Hardness, Ca, Mg
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	pH
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Temperature, sample
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Copper
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Cadmium
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Iron
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Lead
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Manganese
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.018M	Sample-Routine	03-17-1994	12:50:00 PM	MST	Water	Zinc
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.019	Sample-Routine	03-30-1994	12:40:00 PM	MST	Water	pH
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.019	Sample-Routine	03-30-1994	12:40:00 PM	MST	Water	Hardness, Ca, Mg
106	Lyons Town Hall	40.2226893	-105.2700694	1	106.019	Sample-Routine	03-30-1994	12:40:00 PM	MST	Water	Temperature, sample

Map data ©2018 Google | 500 m | Terms of Use | Report a map error

DATA VISUALIZATION: SPATIAL

- Maps and maps and maps, oh my!
 - ArcGIS, Google Maps, Google Earth, QGIS, Global Mapper...
- Map Clutter – Less Clutter, More Information
- Data Display – The Good and The Better

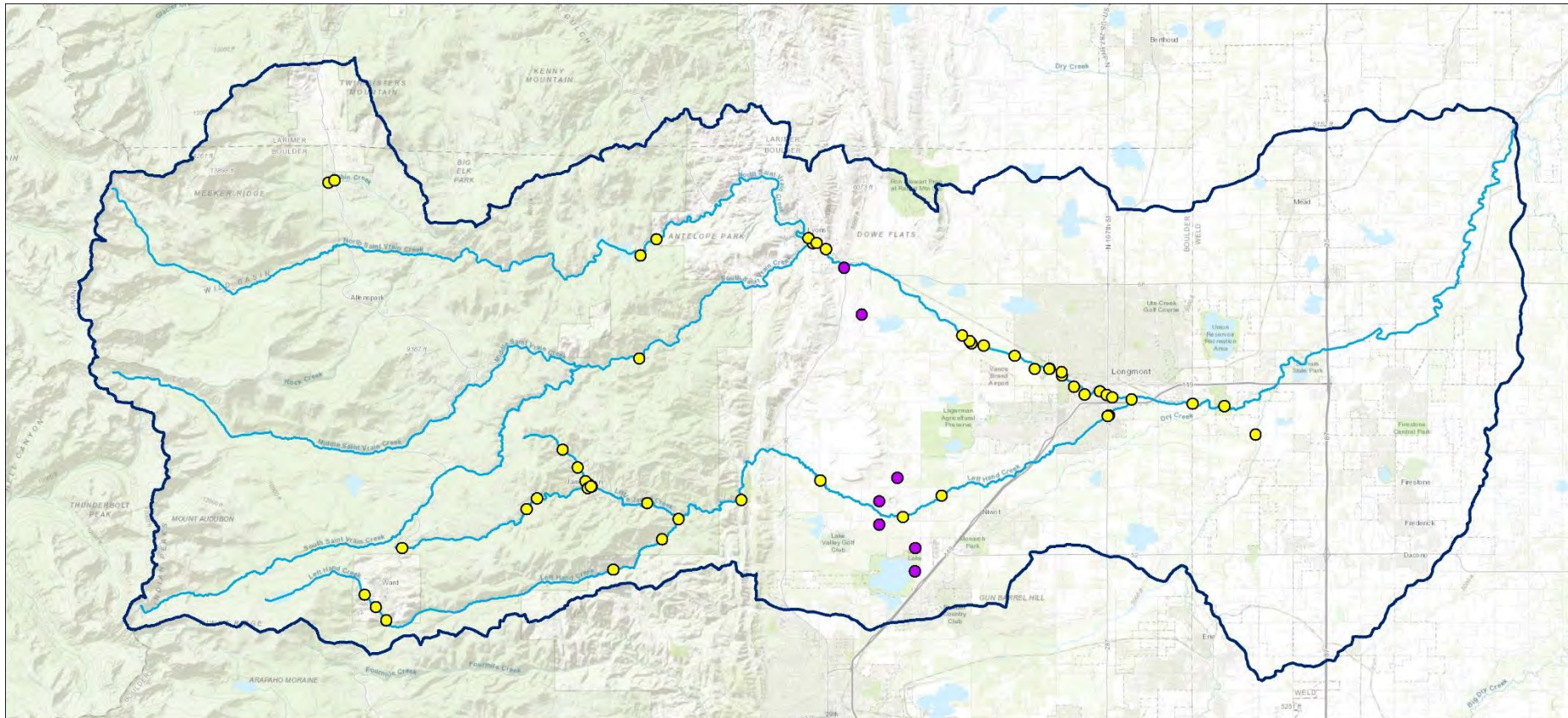
BAD MAP EXAMPLE – LOOK AT ALL MY DATA!



LOOK AT ALL MY DATA!

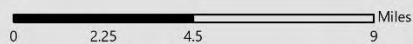
What Story are You Telling?

MAP EXAMPLE: WATER QUALITY DATA POINTS



**Colorado Data Sharing Network (CDSN)
Water Quality Data Points**

Saint Vrain/Left Hand Creek Watershed



Map Explanation

*Source Organization of
Data Collection*

- Colorado River Watch
- Northern Colorado Water Conservancy District

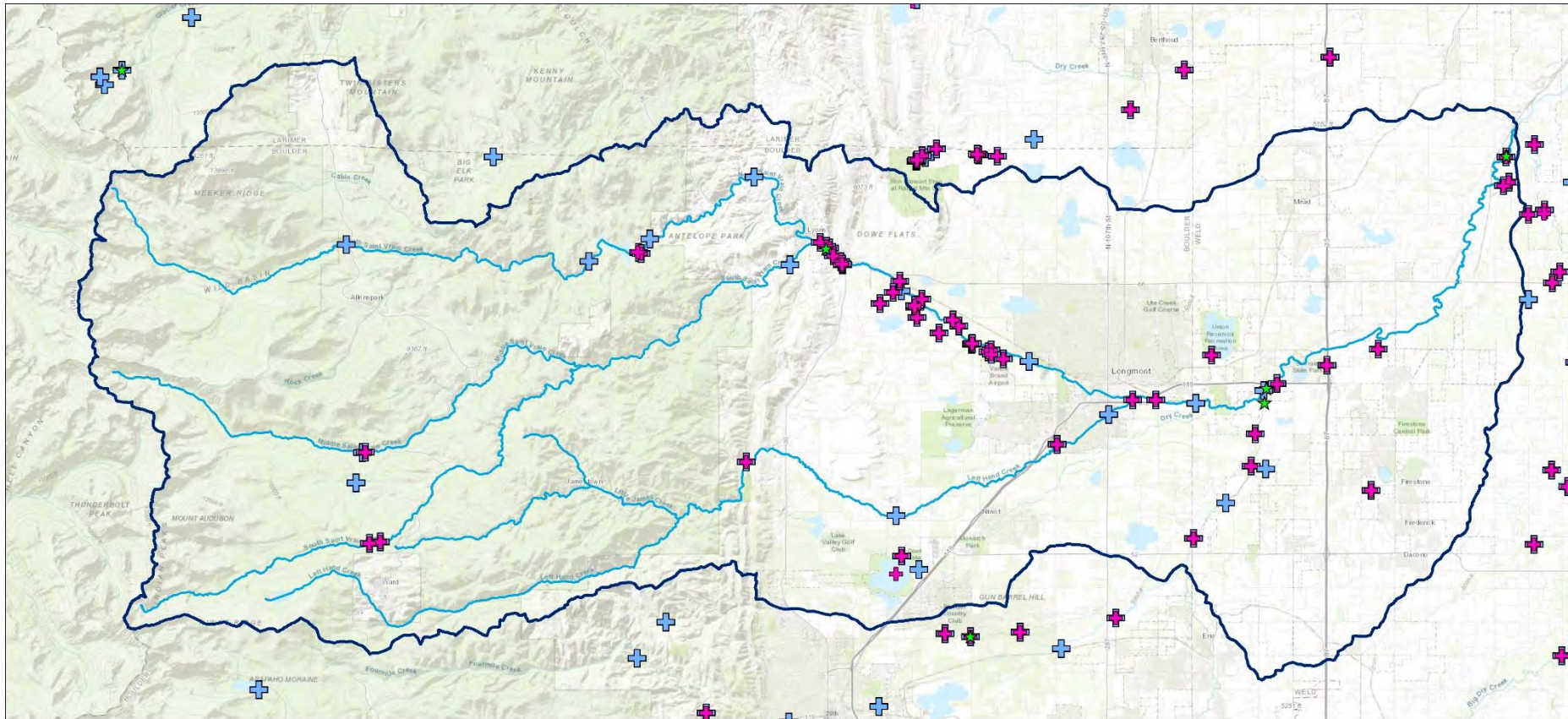
- St. Vrain/Left Hand Creek Watershed
- Creek/River



Date: October 9, 2018

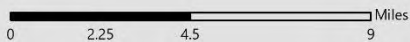
Source: www.coloradowaterdata.org

MAP EXAMPLE: DWR & USGS STREAM GAGES






Real Time & Historic Stream Flow Gages



Saint Vrain/Left Hand Creek Watershed



Map Explanation

Source Organization of Stream Gage

-  United States Geological Survey
-  Division of Water Resources - Real Time
-  Division of Water Resources - Historic

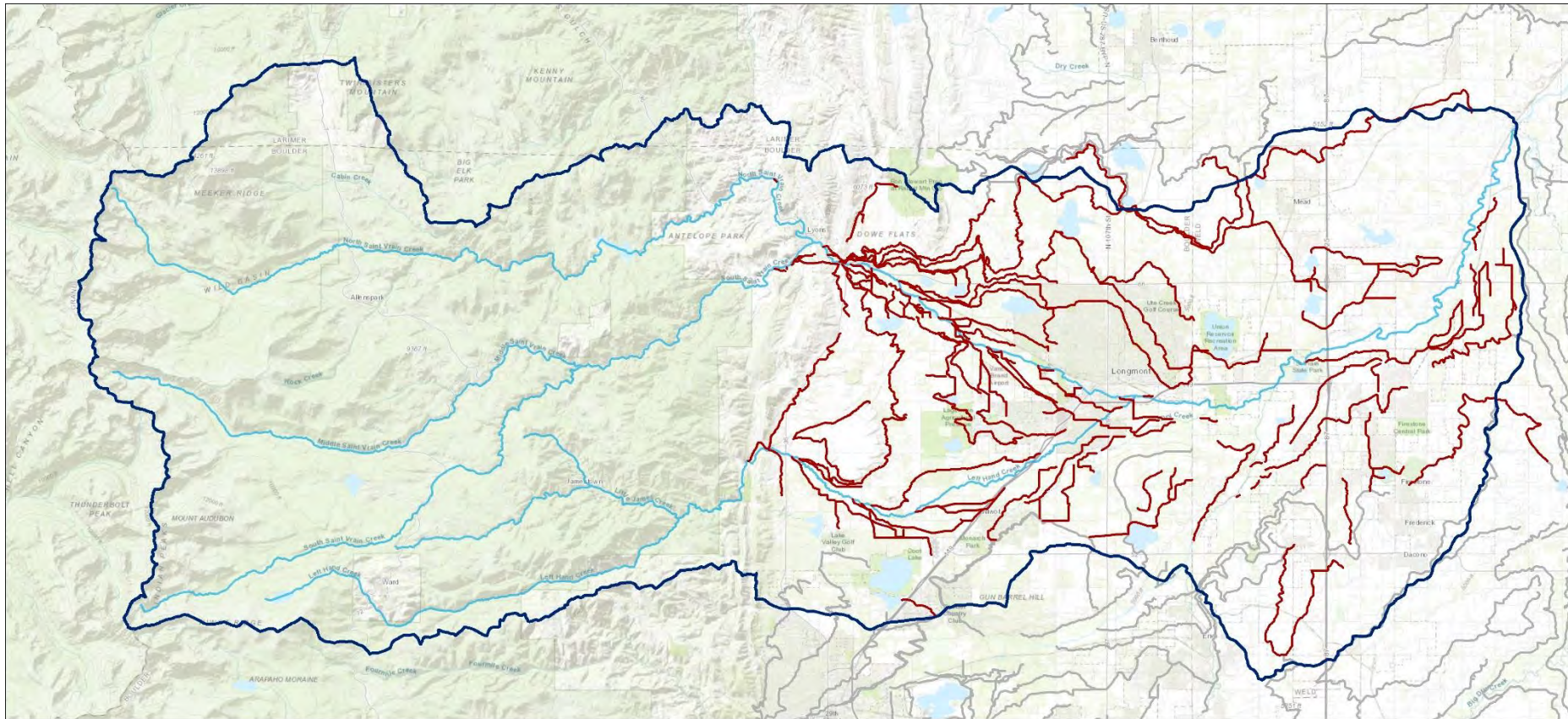
-  St. Vrain/Left Hand Creek Watershed
-  Creek/River



Date: October 9, 2018

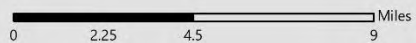
Sources: USGS, Colorado Decision Support System

MAP EXAMPLE: IRRIGATION DITCHES





Irrigation Ditches and Canals



Saint Vrain/Left Hand Creek Watershed



Map Explanation

Irrigation Canal/Ditch Type

-  Ditch/Canal Originating within Watershed
-  Ditch/Canal Outside Watershed

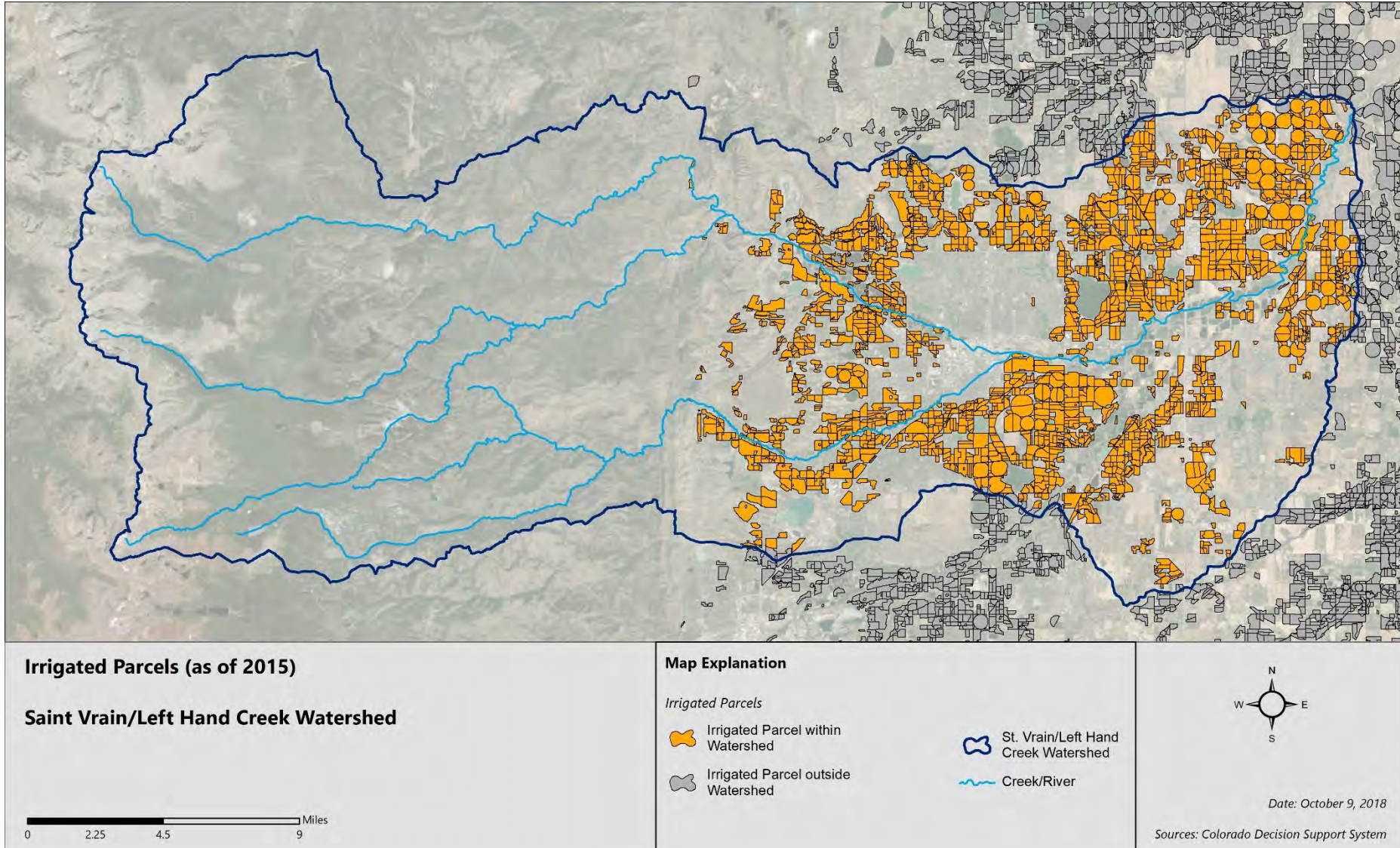
-  St. Vrain/Left Hand Creek Watershed
-  Creek/River



Date: October 9, 2018

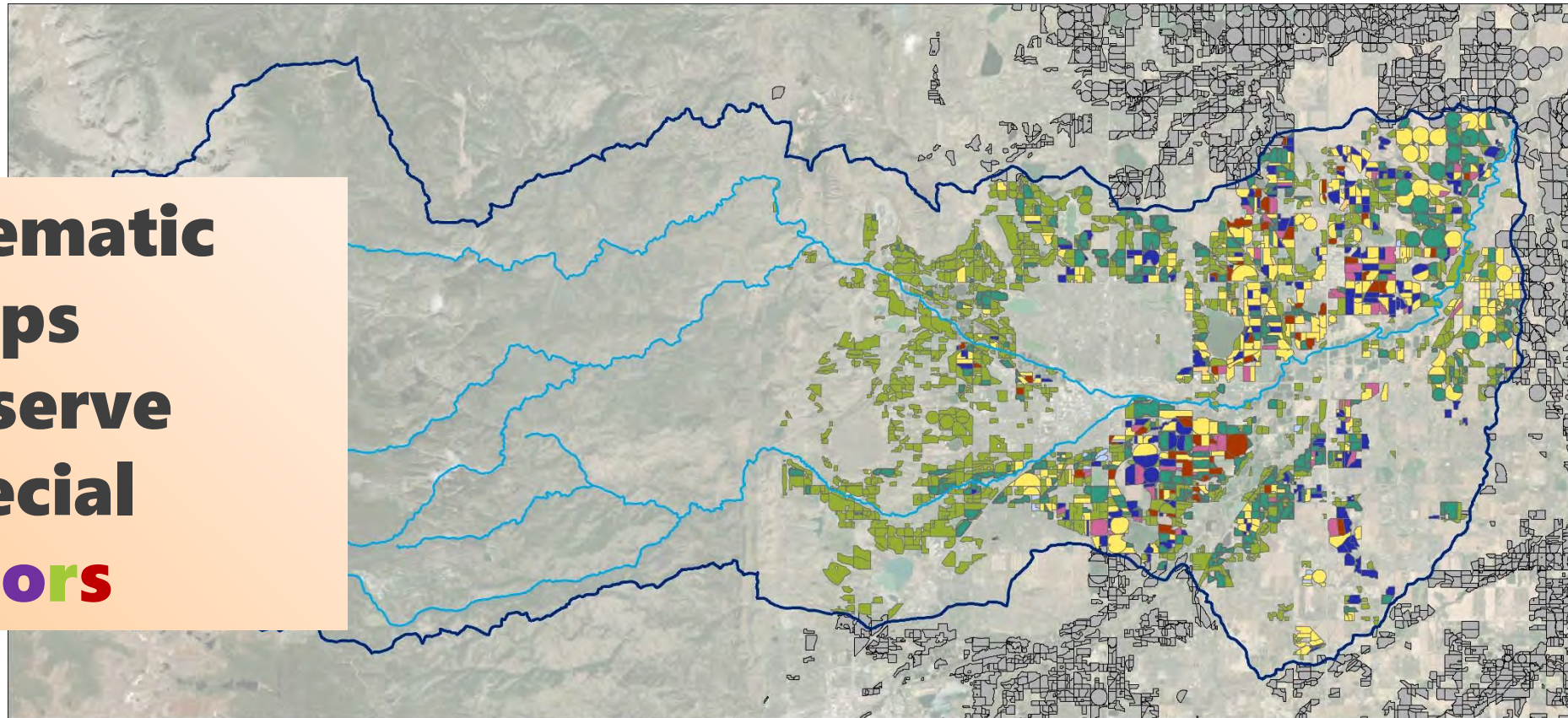
Source: Colorado Decision Support System

MAP EXAMPLE: IRRIGATED PARCELS



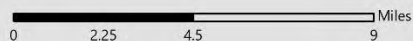
MAP EXAMPLE: IRRIGATED PARCELS (AGAIN)

**Thematic
Maps
Deserve
Special
Colors**



Irrigated Parcels (as of 2015)

Saint Vrain/Left Hand Creek Watershed



Map Explanation

Irrigated Parcels

- | | |
|-----------|---------------|
| ALFALFA | GRASS PASTURE |
| BARLEY | SMALL GRAINS |
| CORN | SUGAR BEETS |
| DRY BEANS | WHEAT SPRING |

St. Vrain/Left Hand
Creek Watershed

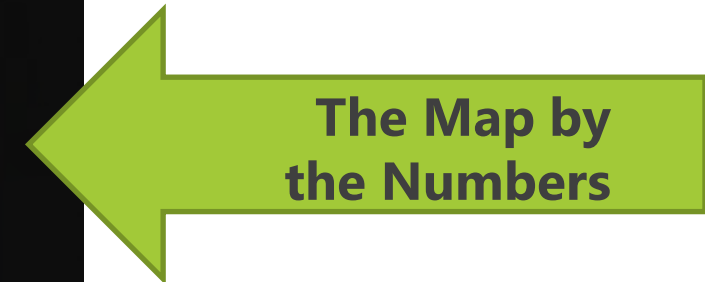
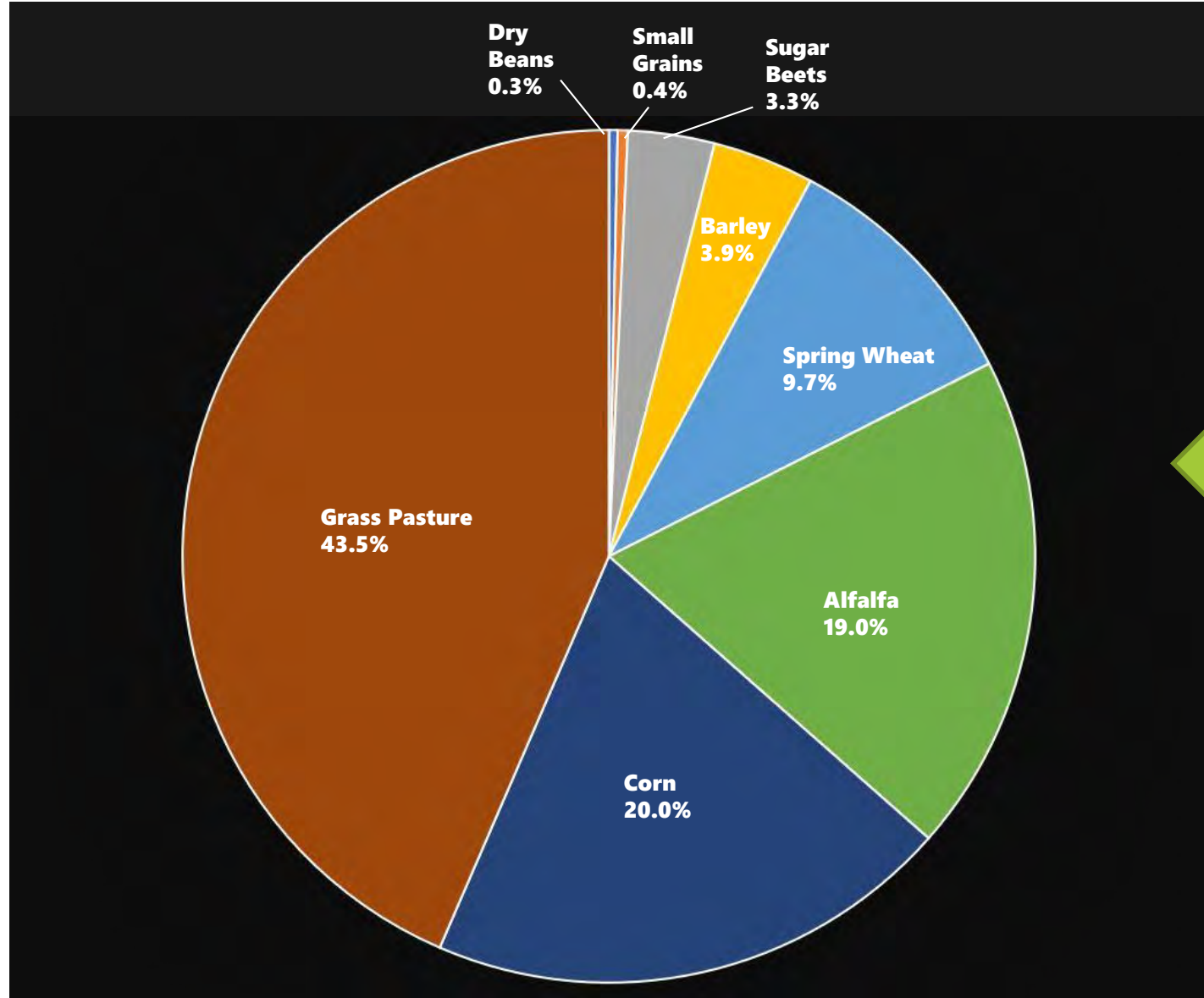
Creek/River



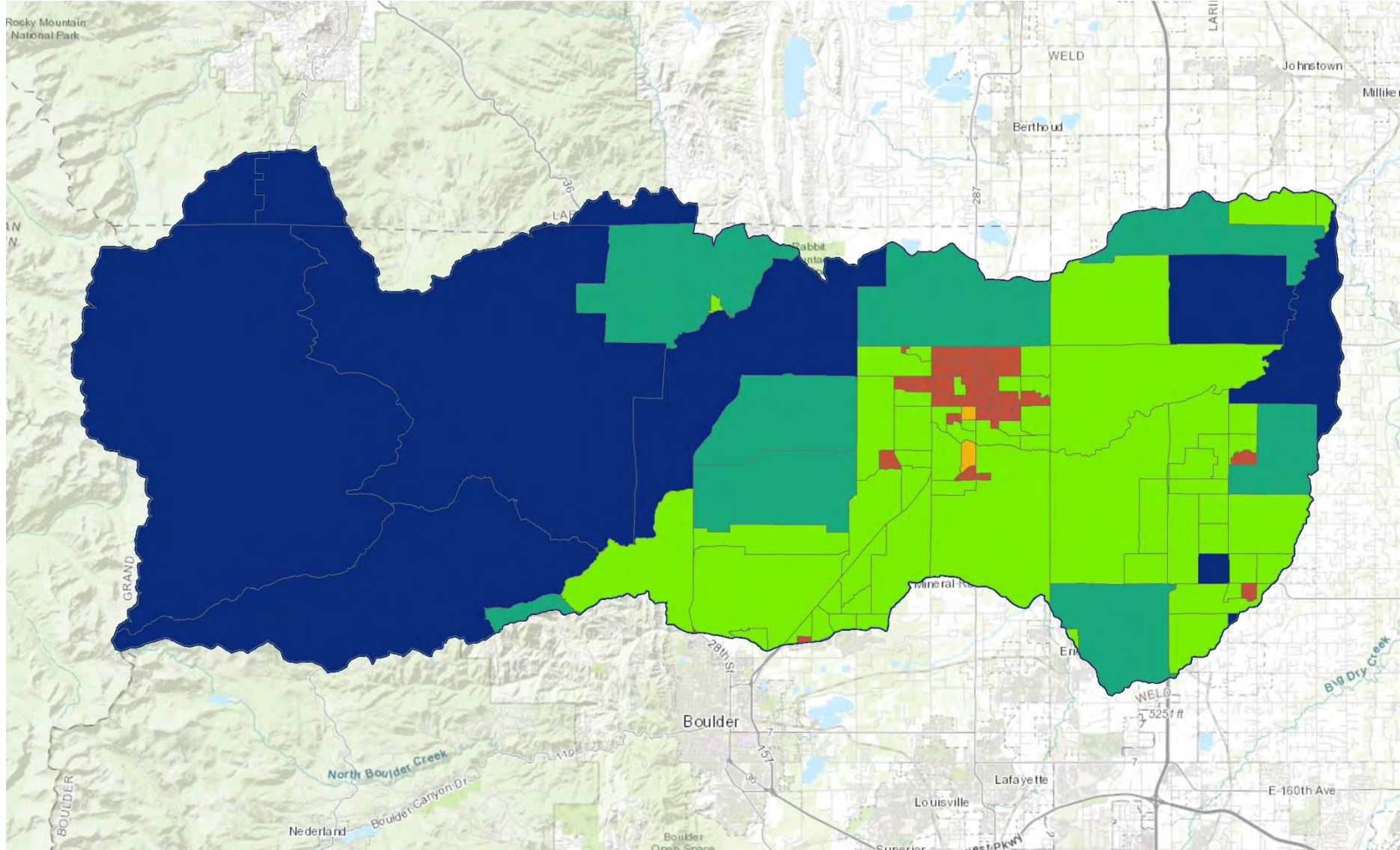
Date: October 9, 2018

Sources: Colorado Decision Support System

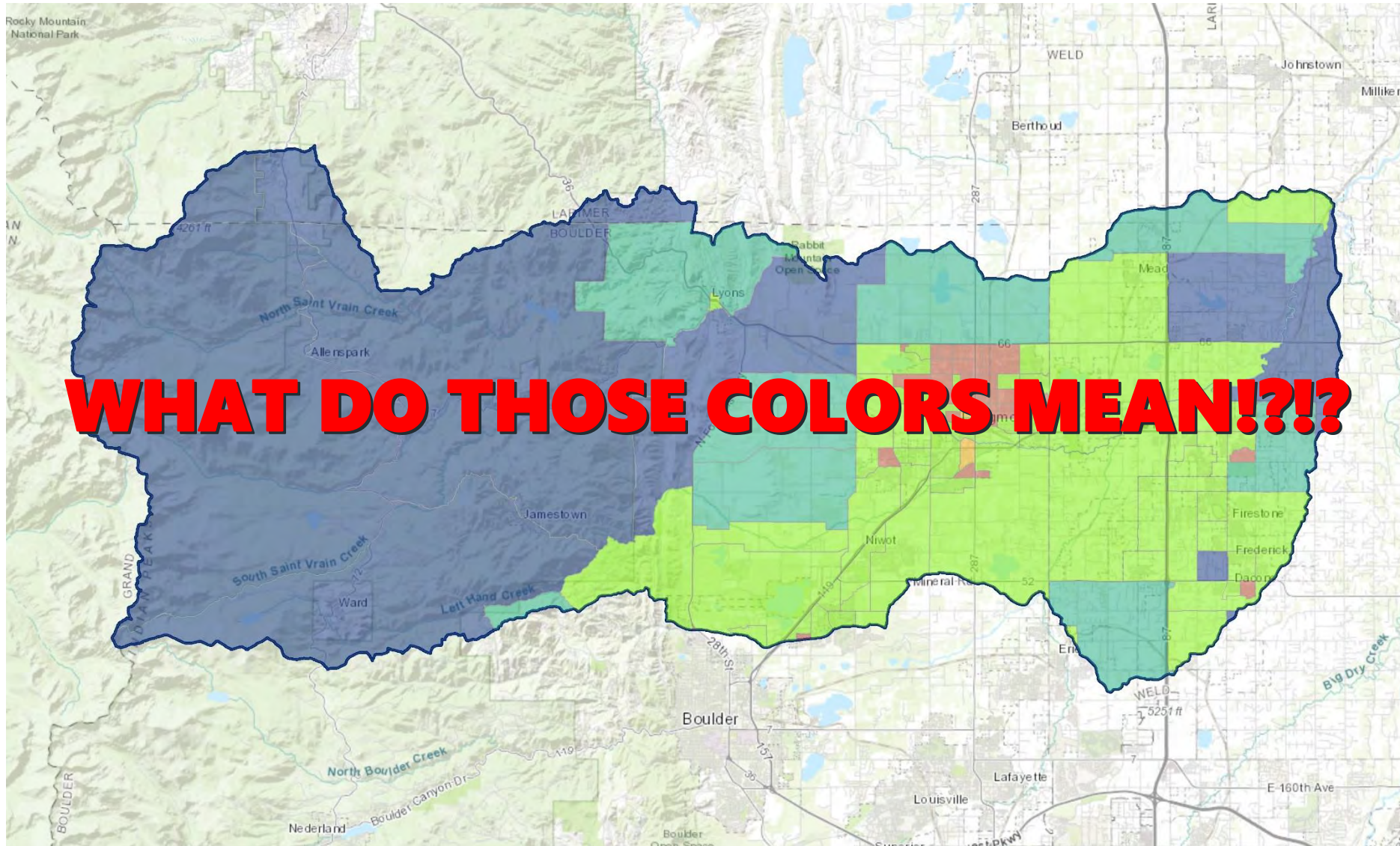
MAP EXAMPLE: IRRIGATED PARCELS BY THE #S



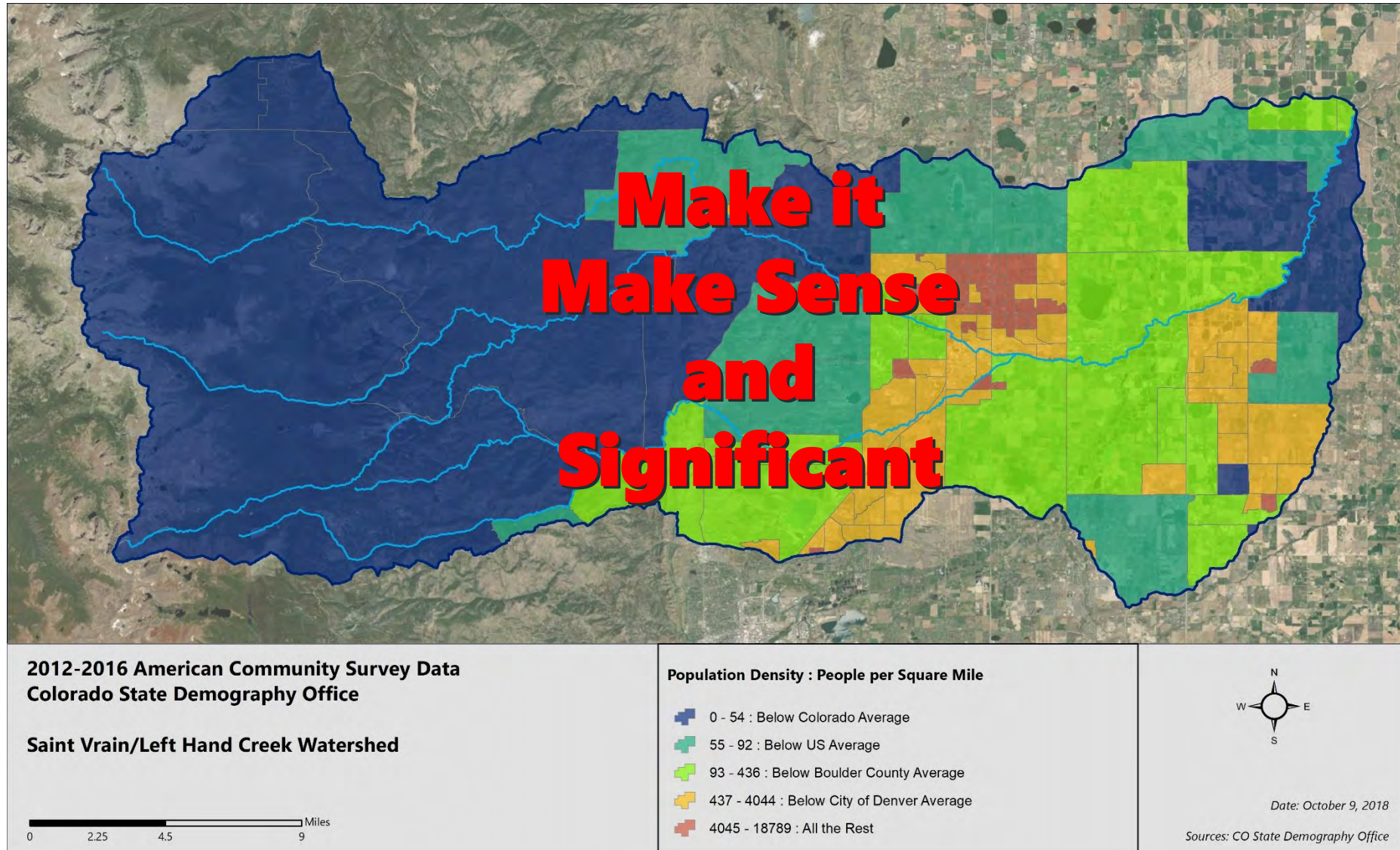
MAP EXAMPLE: US CENSUS DATA



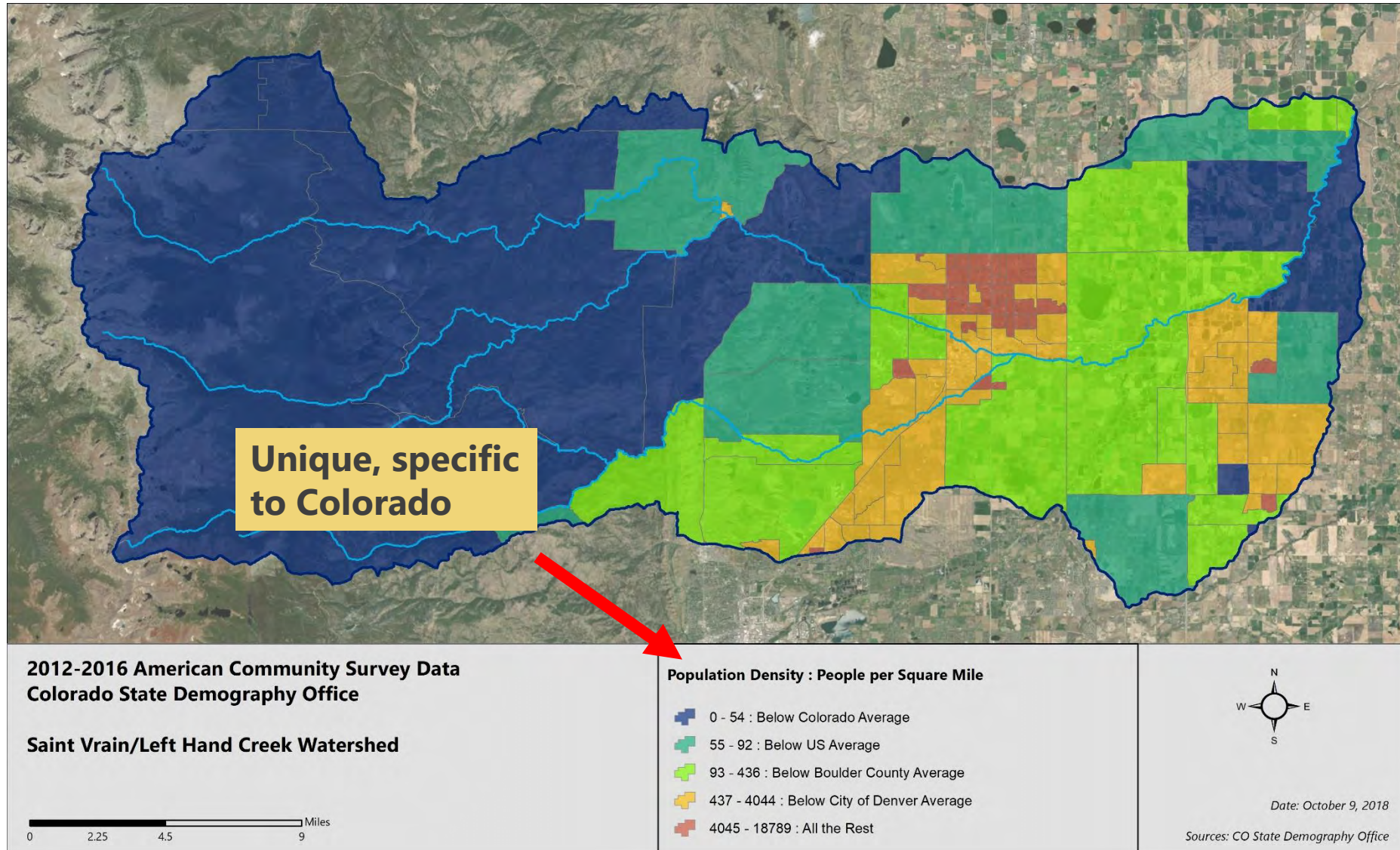
MAP EXAMPLE: US CENSUS DATA



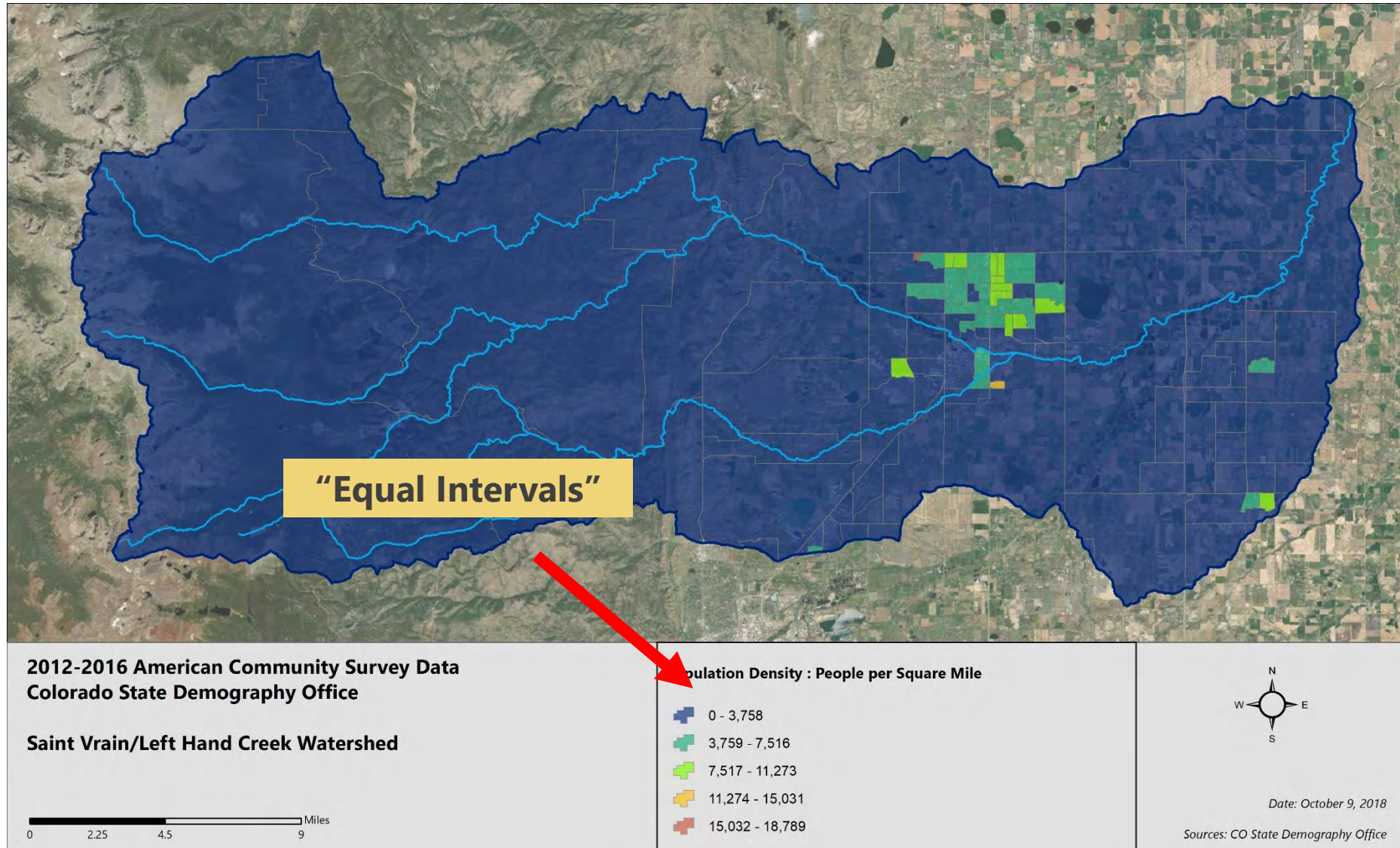
MAP EXAMPLE: US CENSUS DATA



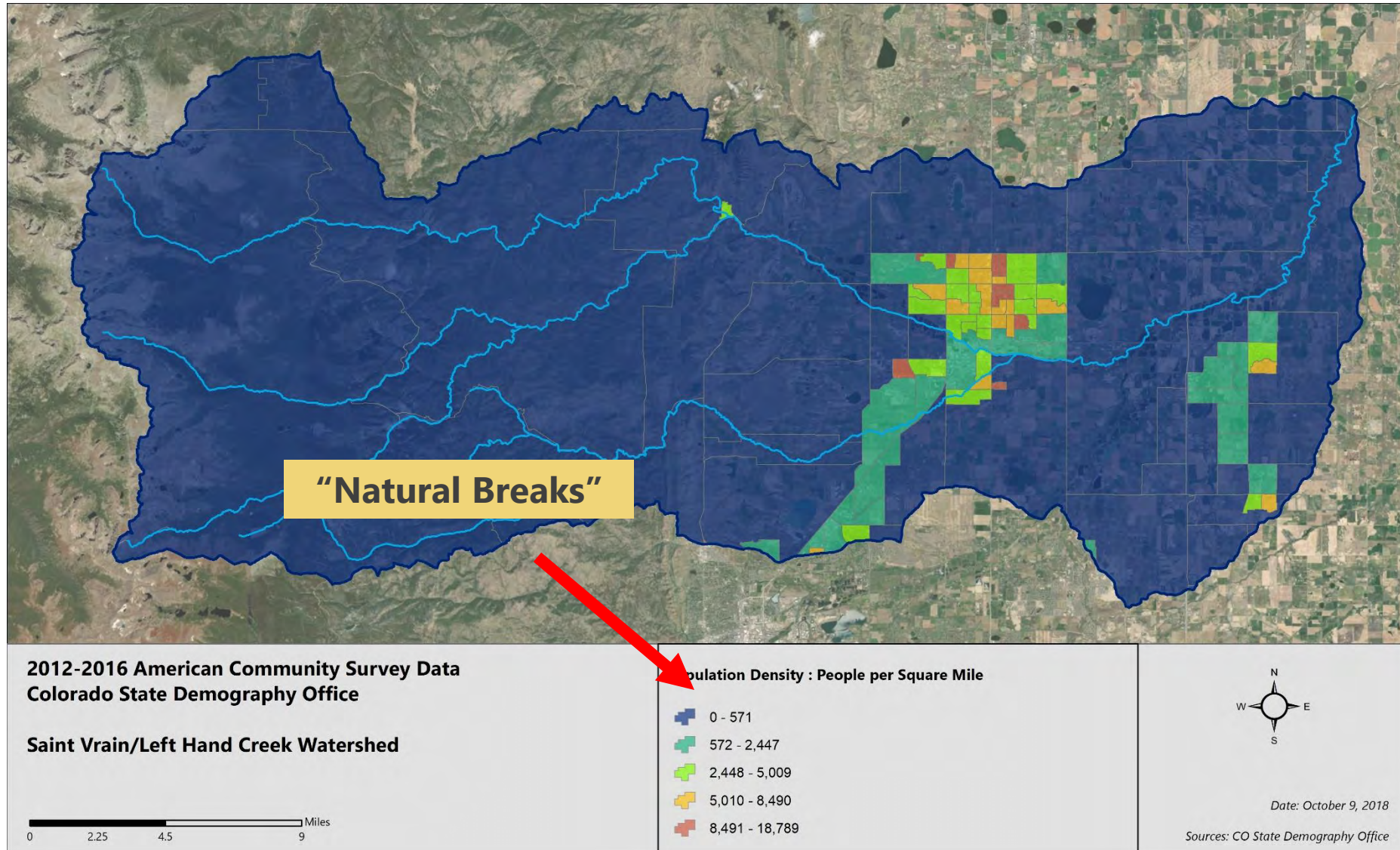
MAP EXAMPLE: US CENSUS DATA



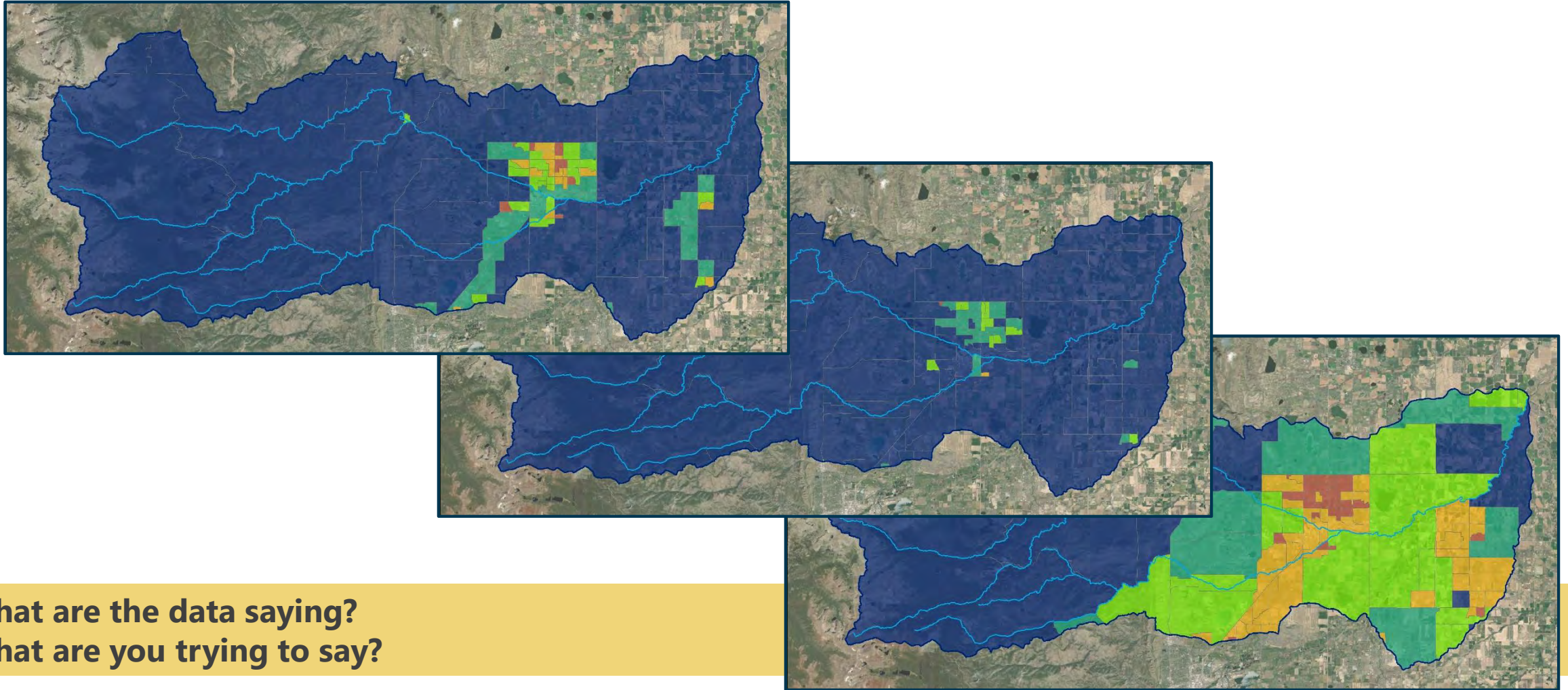
MAP EXAMPLE: US CENSUS DATA



MAP EXAMPLE: US CENSUS DATA



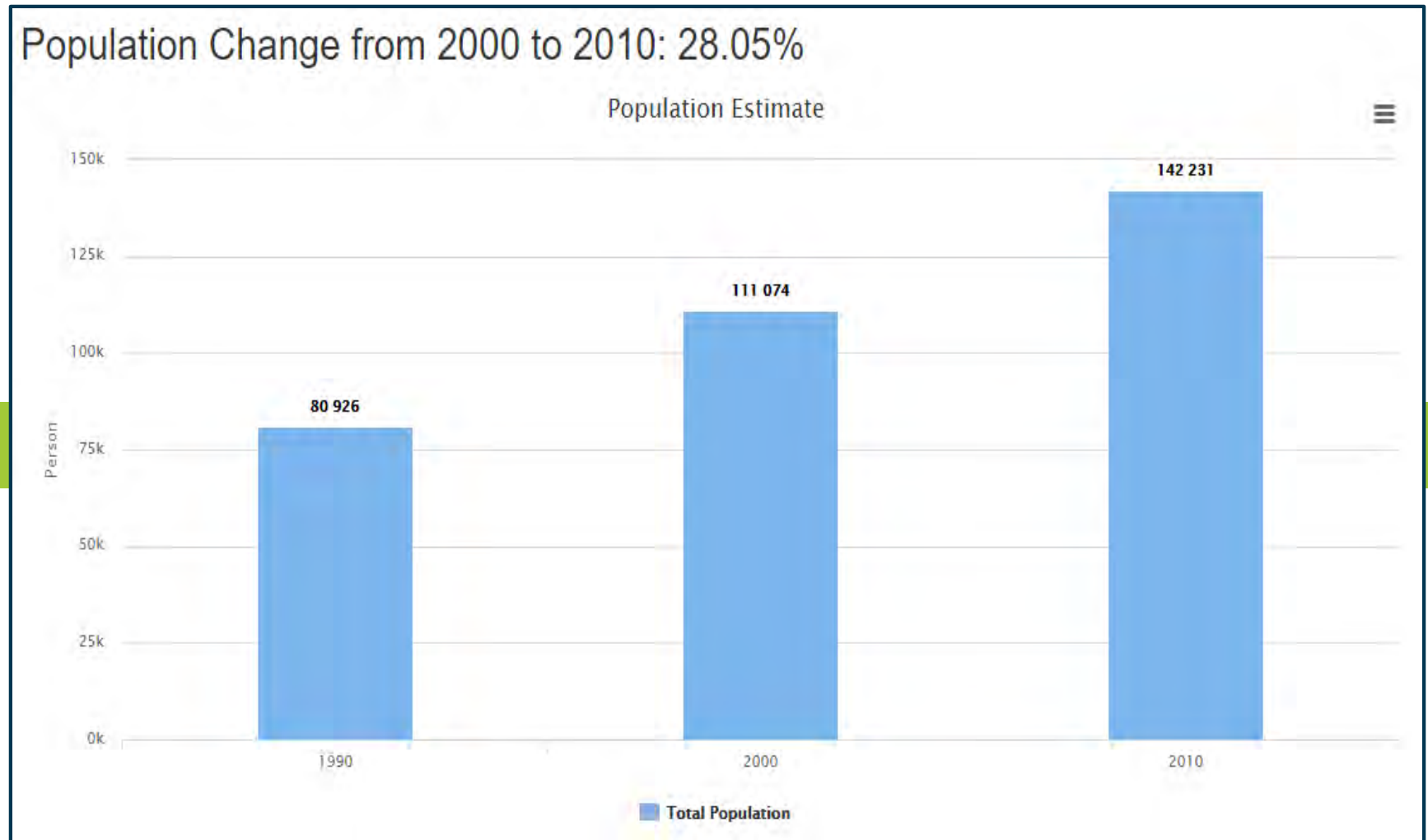
MAP EXAMPLE: US CENSUS DATA



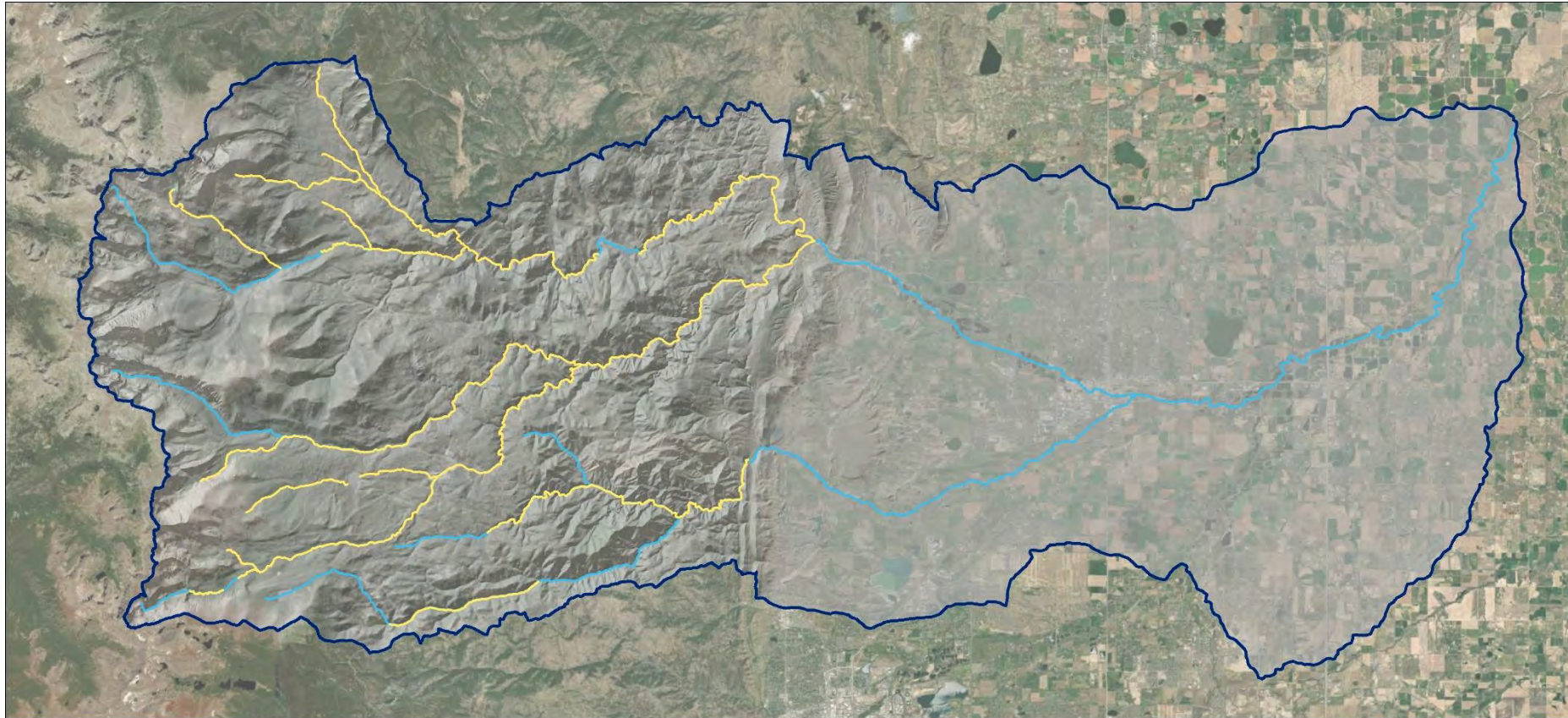
What are the data saying?
What are you trying to say?

MAP EXAMPLE: US CENSUS DATA

Spatial Data...to
Time Series Bar Graph

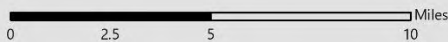


MAP EXAMPLE: INSTREAM FLOWS






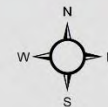
Instream Flow Rights

Saint Vrain/Left Hand Creek Watershed



Map Explanation

-  Instream Flow Right
-  St. Vrain/Left Hand Creek Watershed
-  Creek/River



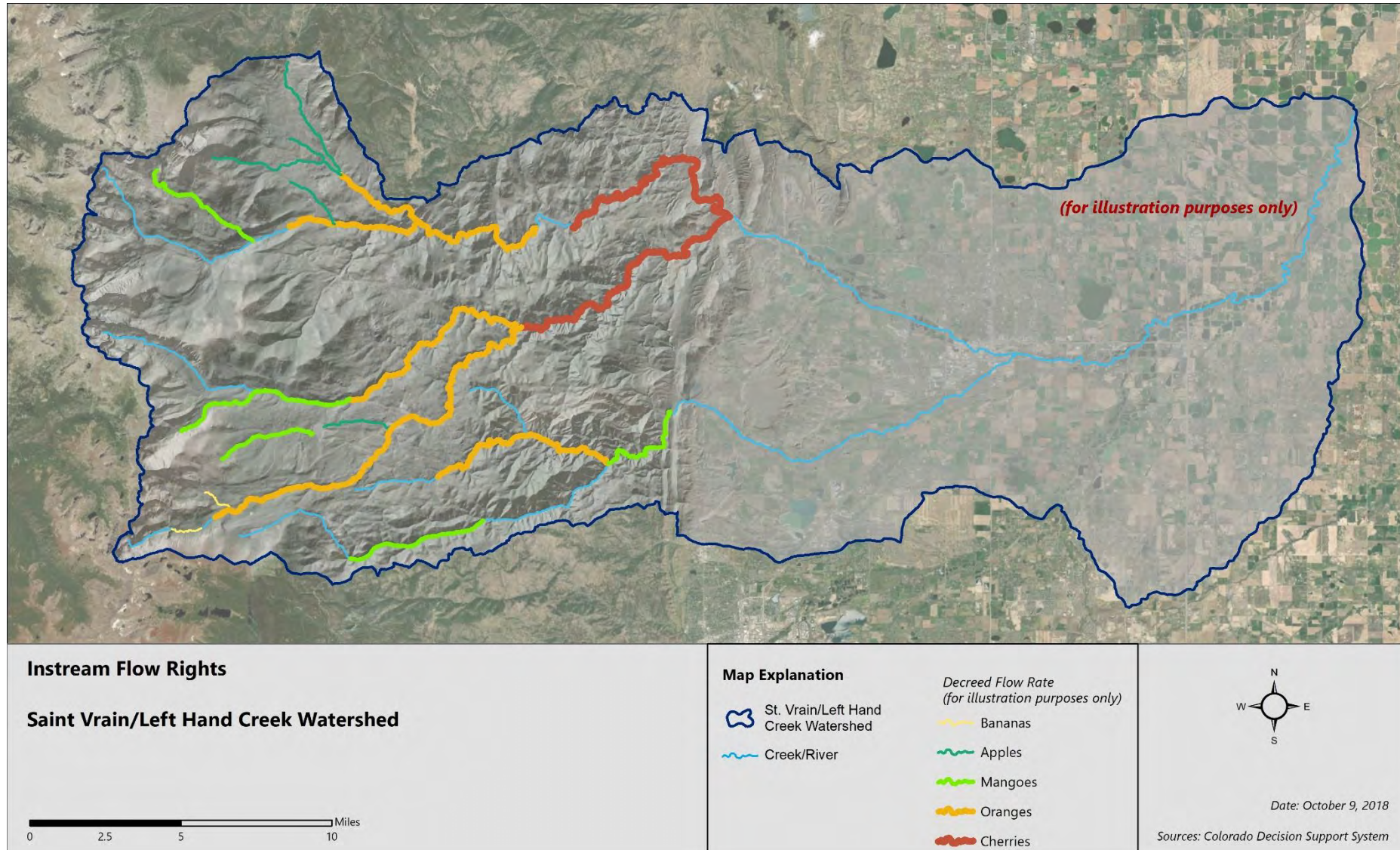
Date: October 9, 2018

Sources: Colorado Decision Support System

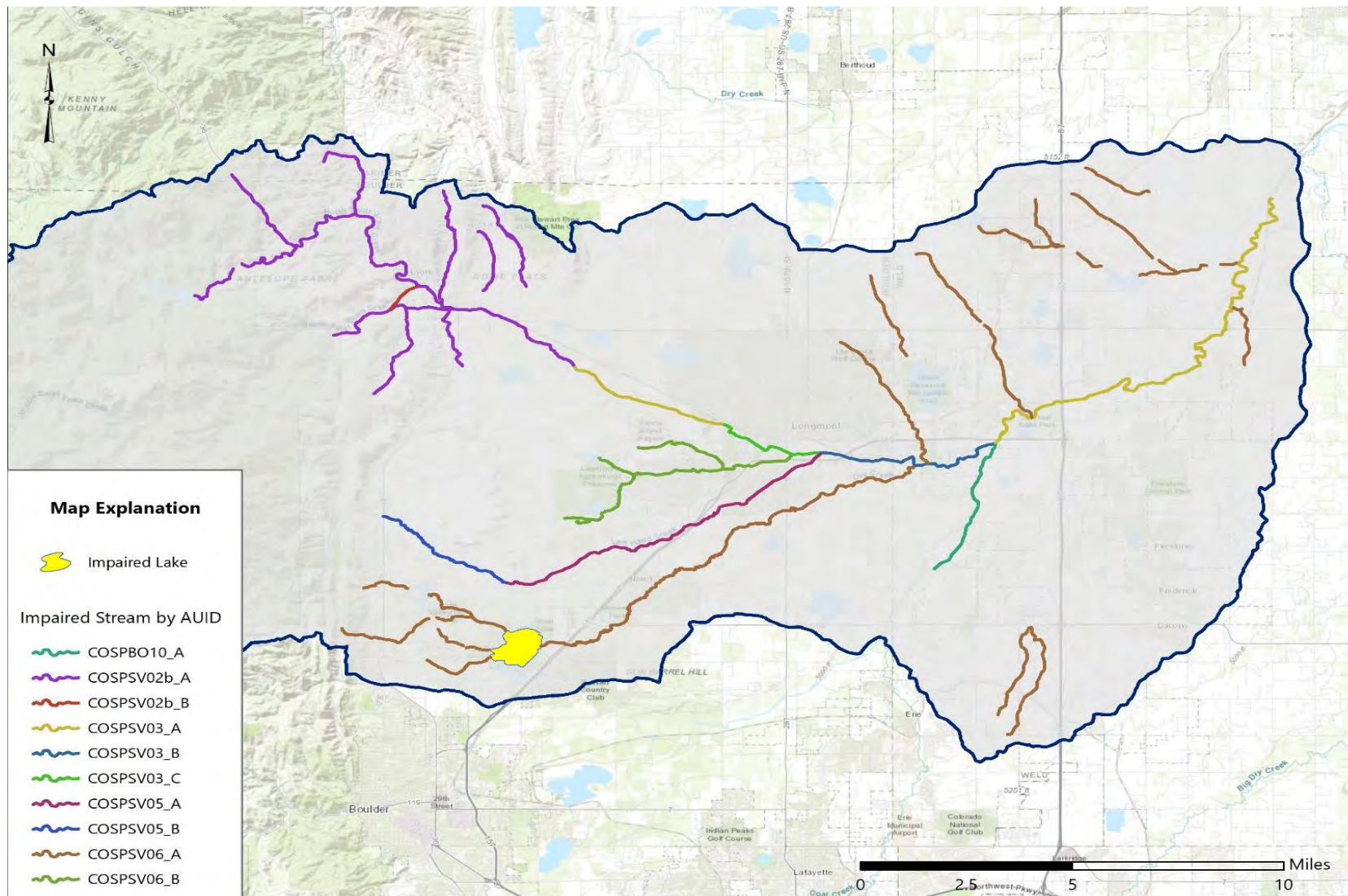
MAP EXAMPLE: INSTREAM FLOWS



MAP EXAMPLE: INSTREAM FLOWS

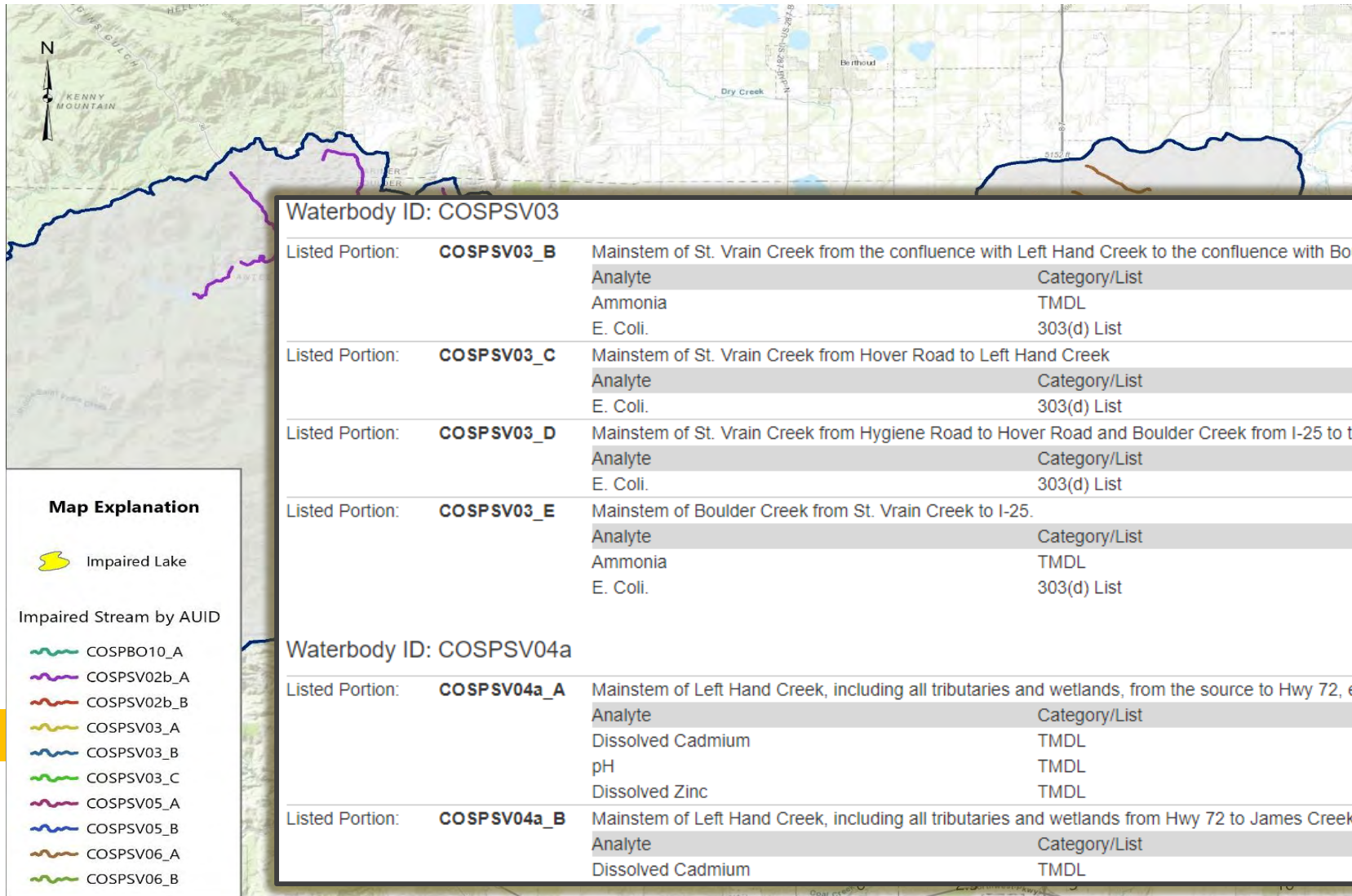


MAP EXAMPLE: 303D IMPAIRED STREAMS

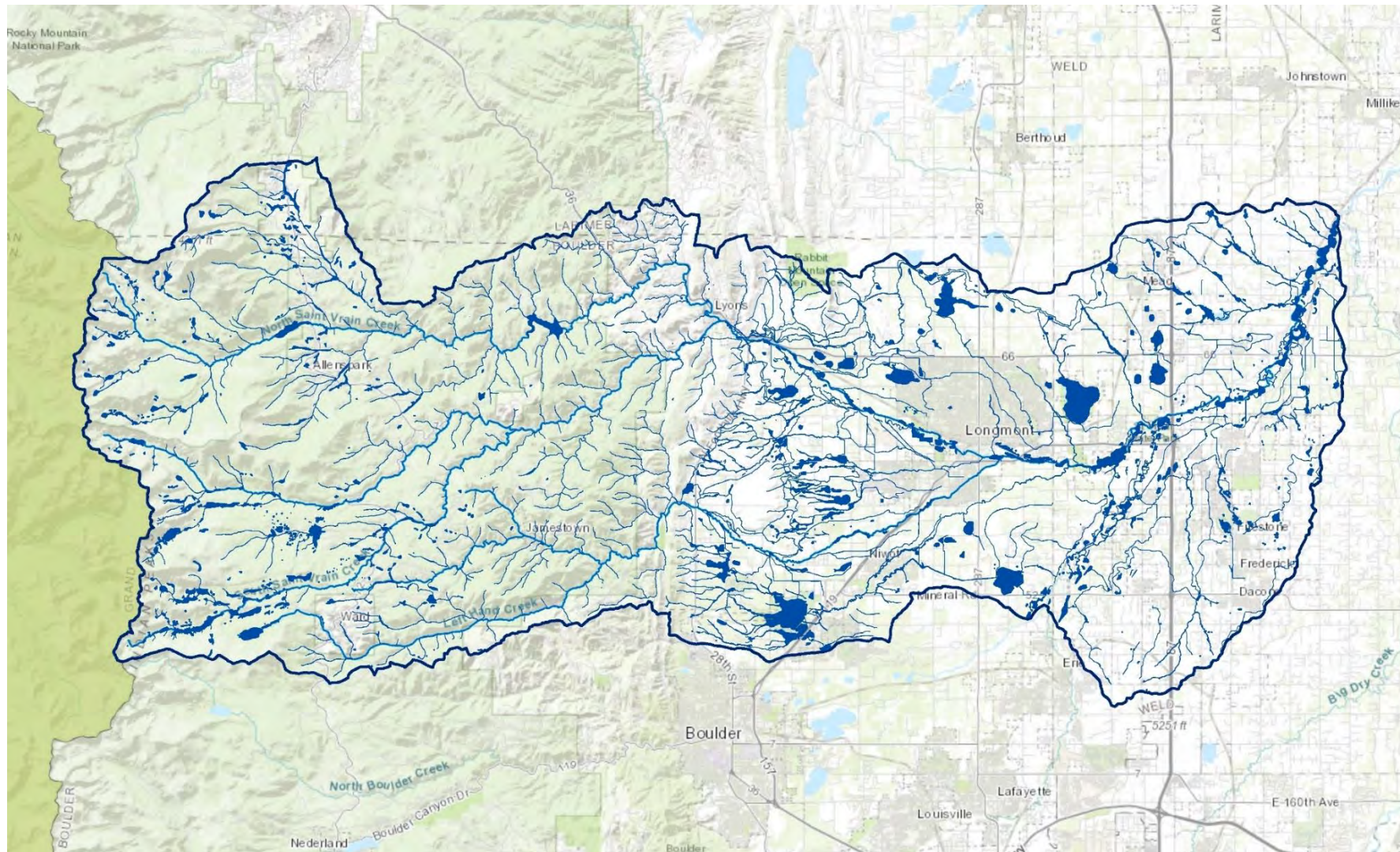


MAP EXAMPLE: 303D IMPAIRED STREAMS

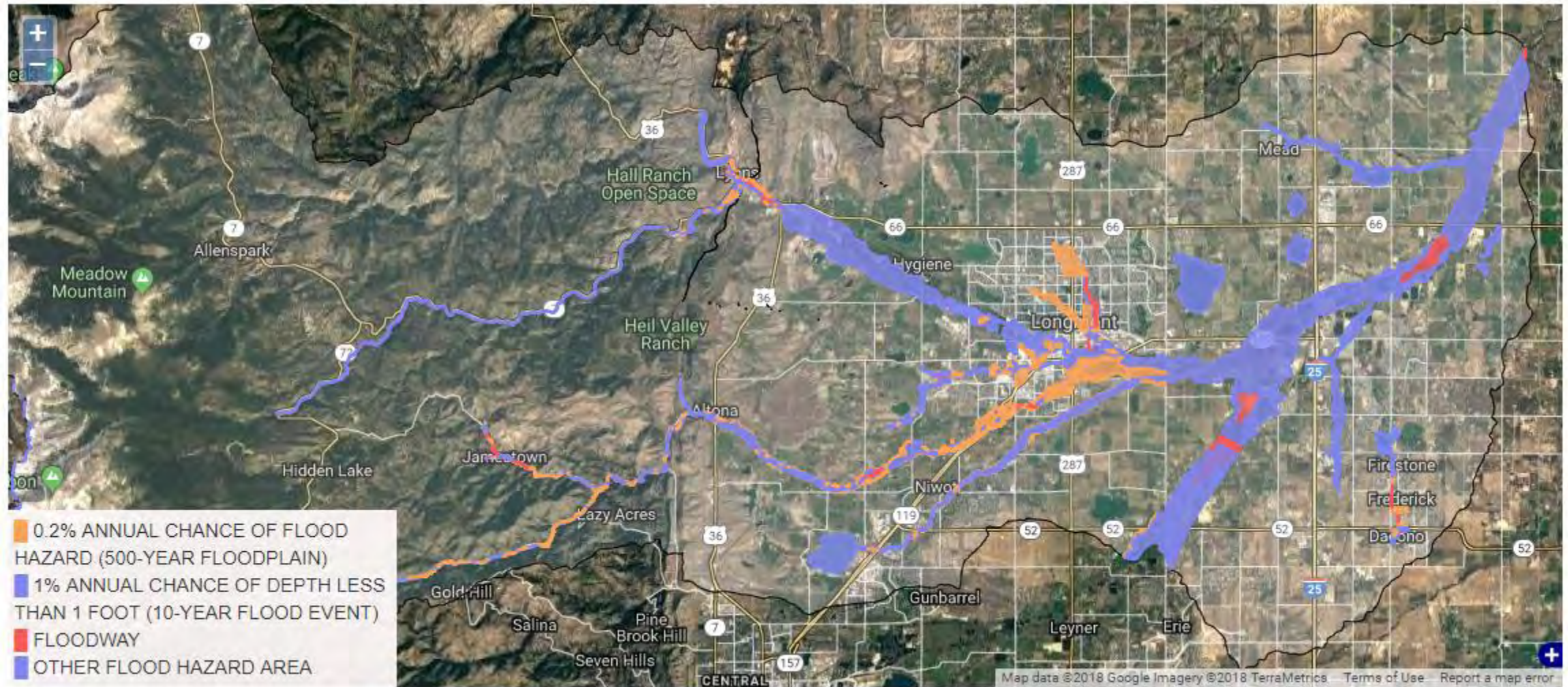
Know
the
Data
Behind
the
Data



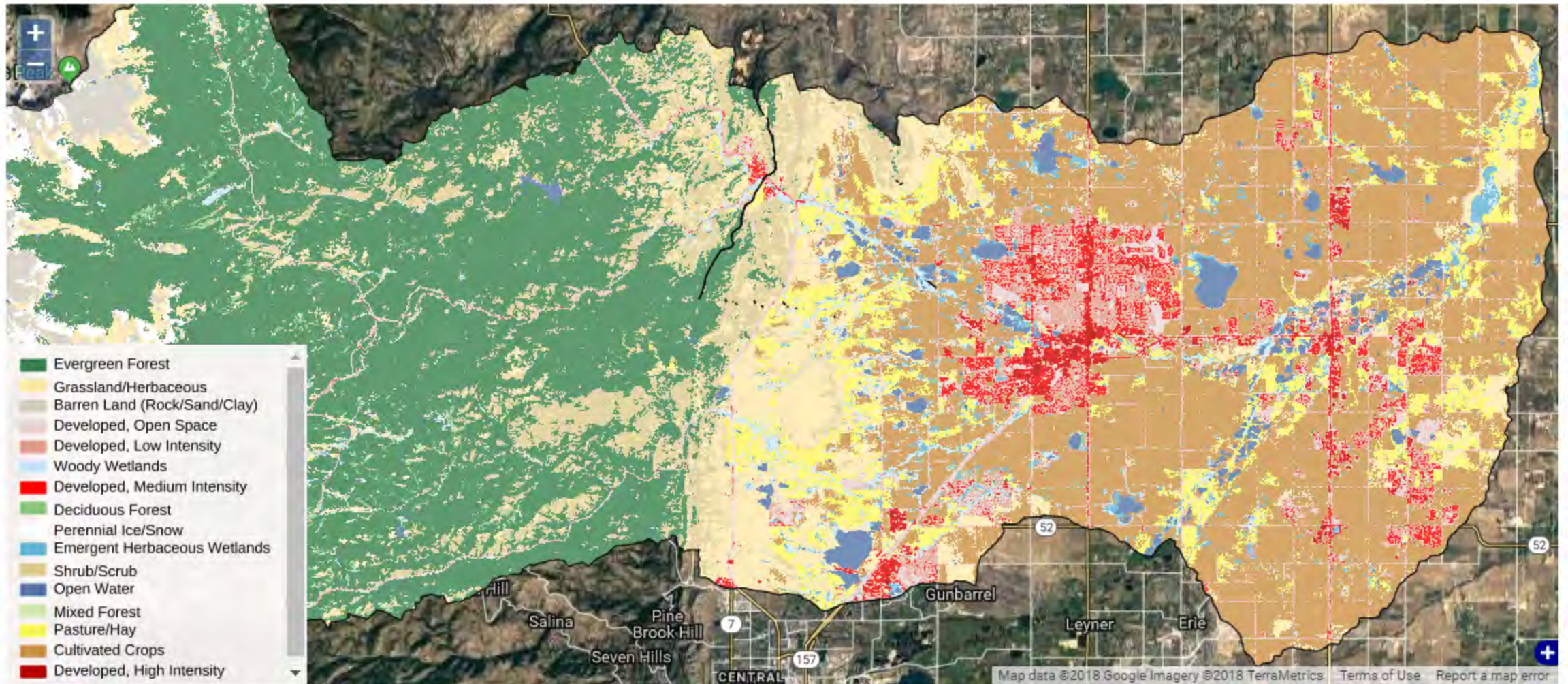
MORE MAP DATA, DATA, DATA, DATA



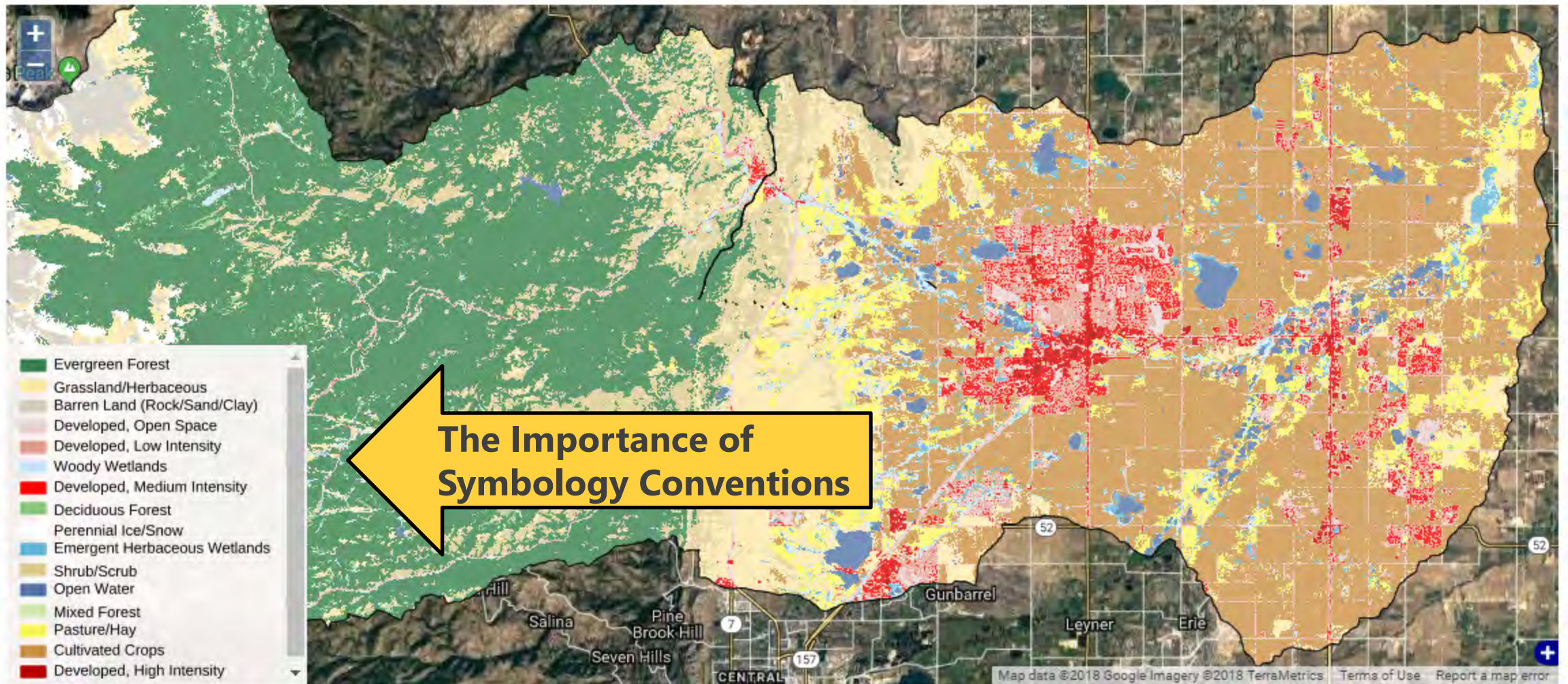
MORE MAP DATA, DATA, DATA, DATA



MORE MAP DATA, DATA, DATA, DATA

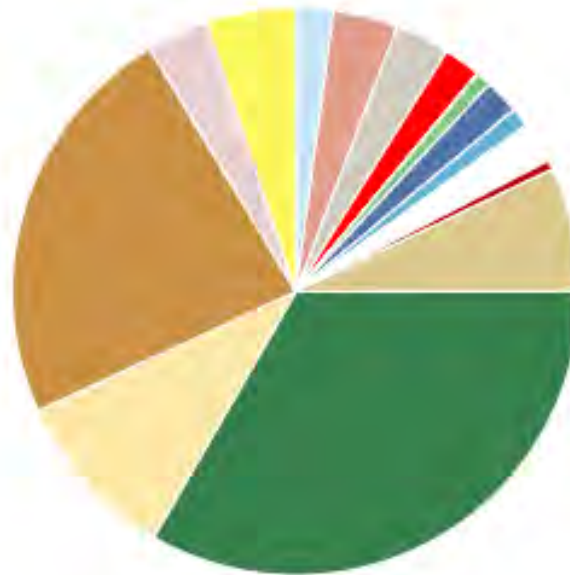


MORE MAP DATA, DATA, DATA, DATA



MAP EXAMPLE: NLCD LAND USE

Land Use Percentage



The Map by
the Numbers

- Woody Wetlands
- Open Water
- Grassland/Herbaceous
- Developed, Low Intensity
- Emergent Herbaceous Wetlands
- Cultivated Crops
- Barren Land (Rock/Sand/Clay)
- Perennial Ice/Snow
- Developed, Open Space
- Developed, Medium Intensity
- Developed, High Intensity
- Pasture/Hay
- Mixed Forest
- Shrub/Scrub
- Deciduous Forest
- Evergreen Forest

MAP EXAMPLE: NLCD LAND USE

NLCD 2011

Natural Land Cover:
61.8%

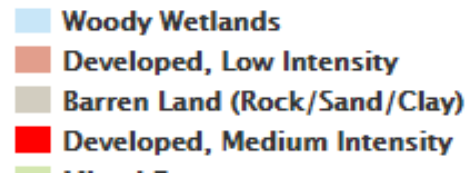
Land Use Percentage ≡



NLCD 2006

Natural Land Cover:
61.7%

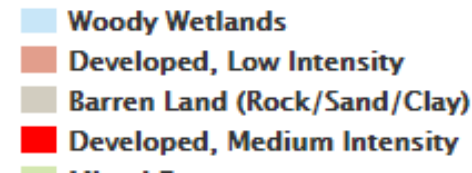
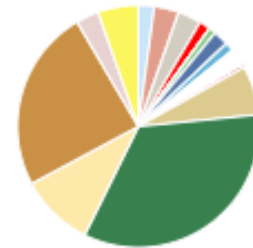
Land Use Percentage ≡



NLCD 2001

Natural Land Cover:
62.0%

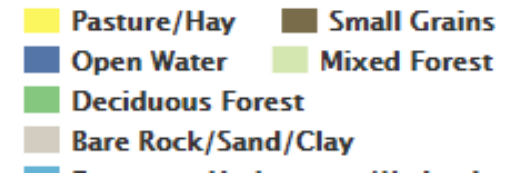
Land Use Percentage ≡



NLCD 1992

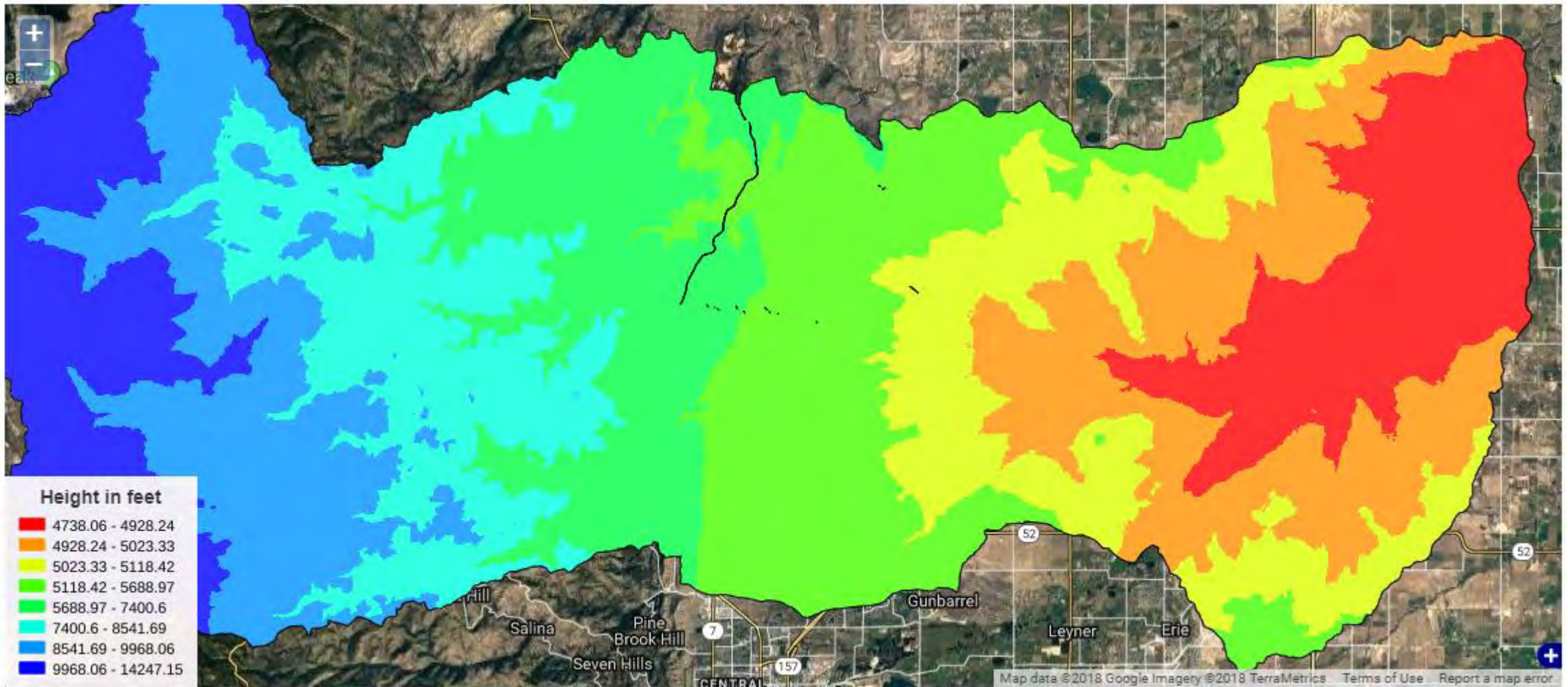
Natural Land Cover:
59.8%

Land Use Percentage ≡

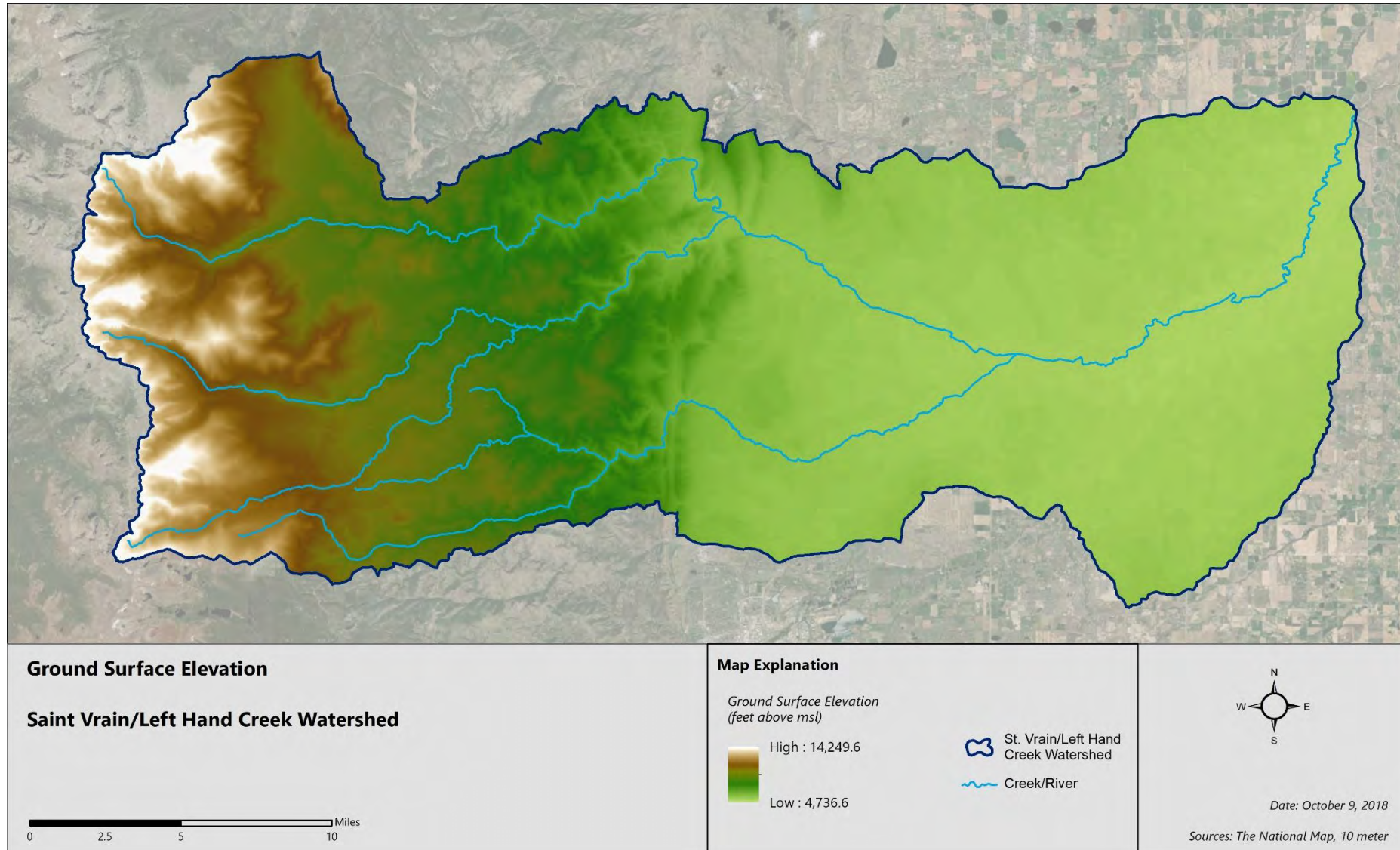


From Maps...to Time Series Pie

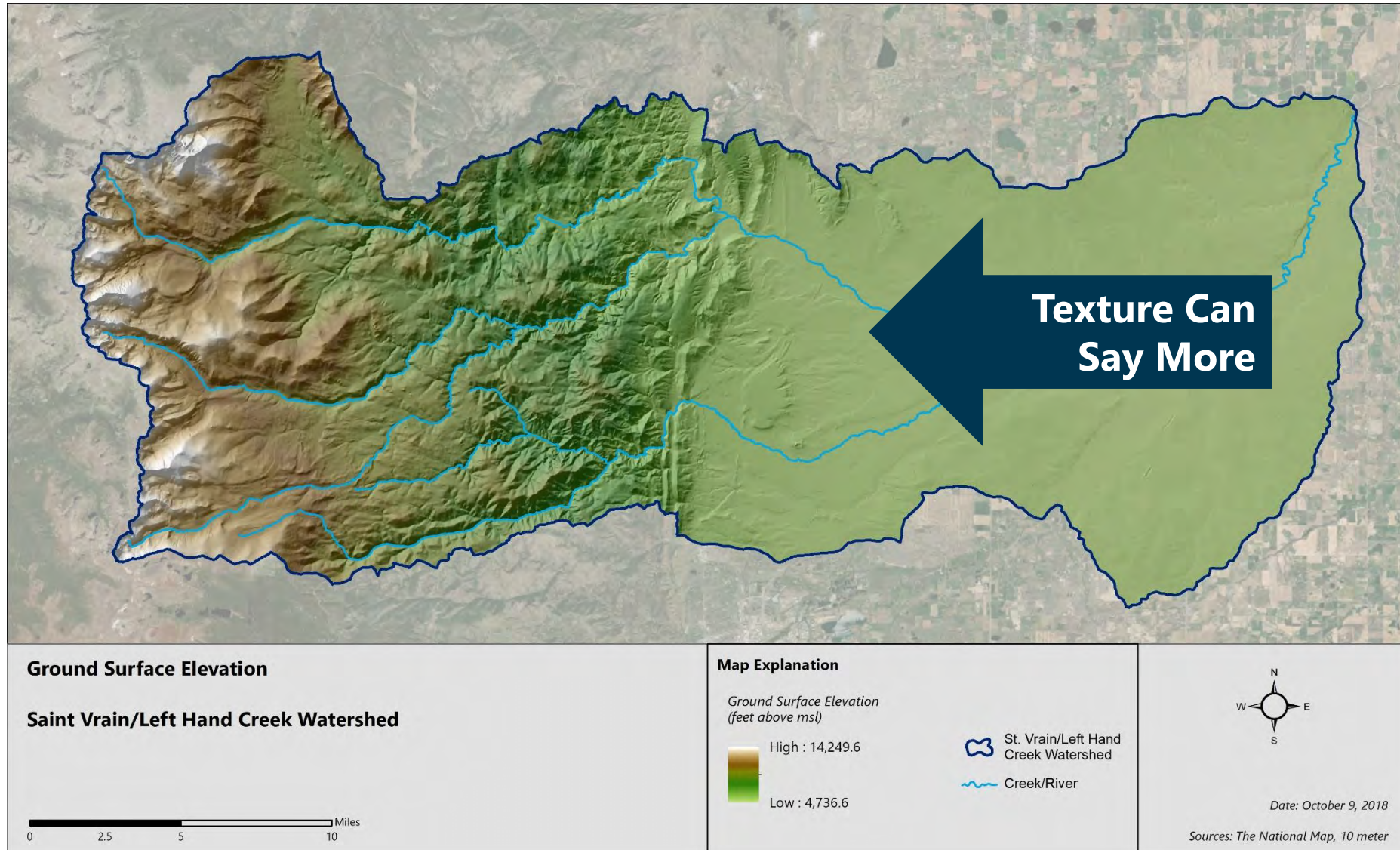
MAP EXAMPLE: DIGITAL ELEVATION MAPS (DEM)



MAP EXAMPLE: DIGITAL ELEVATION MAPS (DEM)



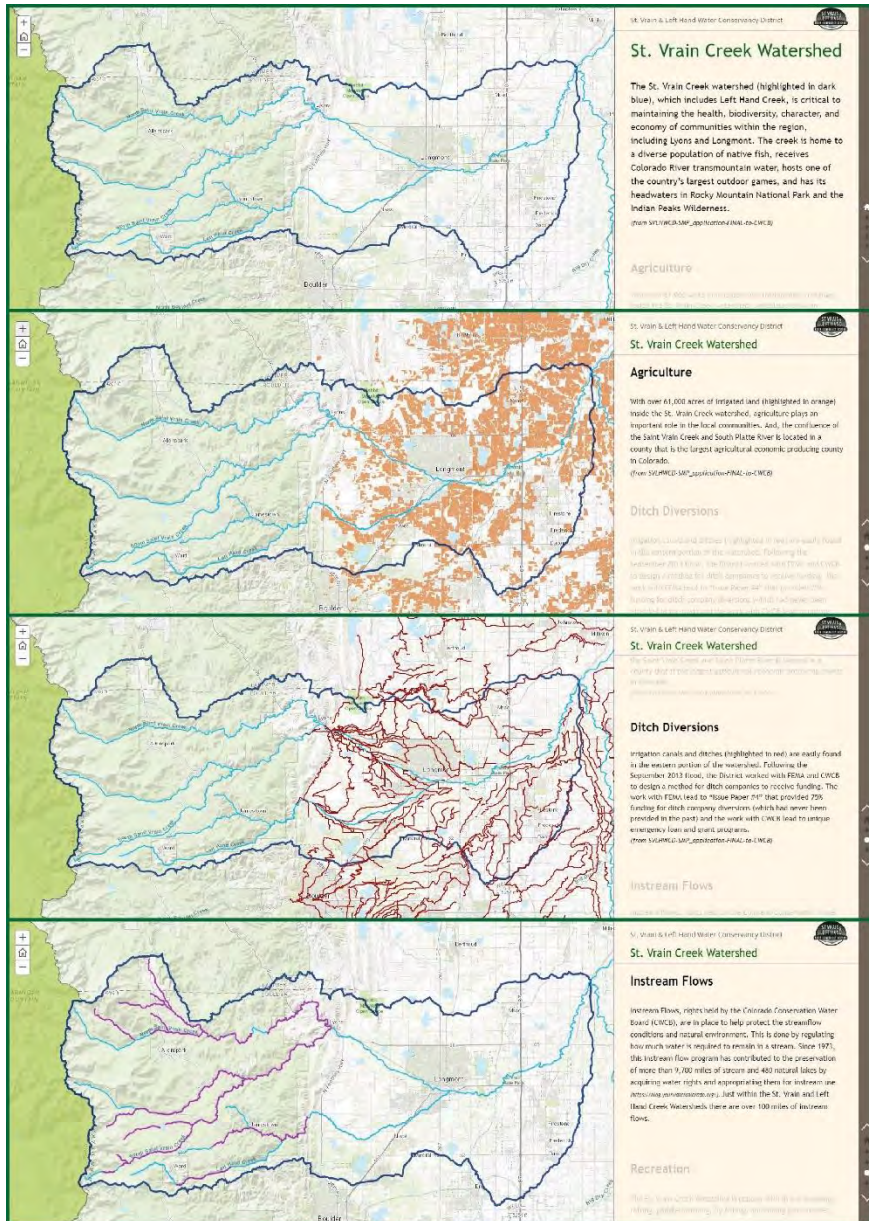
MAP EXAMPLE: DIGITAL ELEVATION MAPS (DEM)



STORYBOARDS

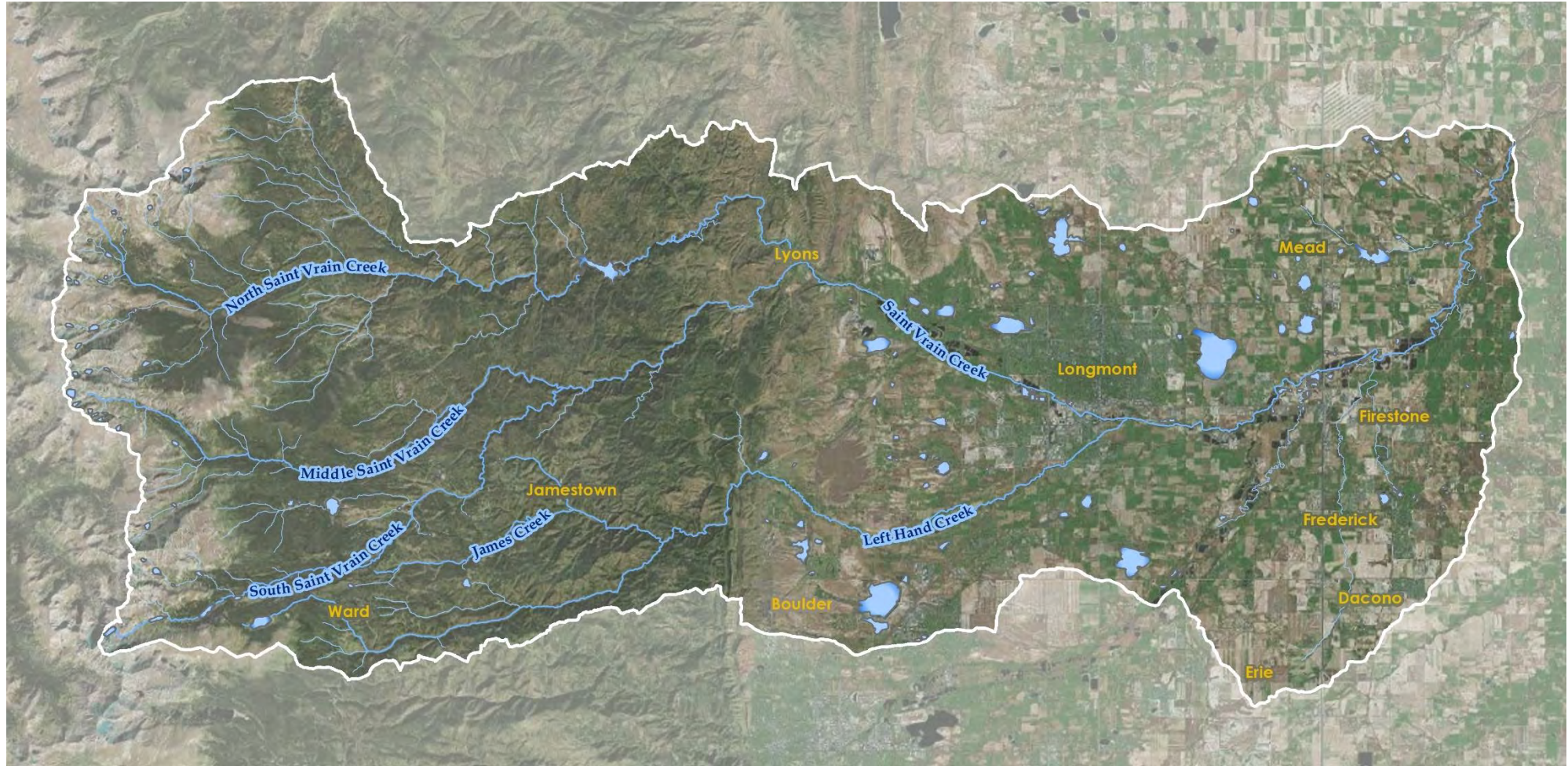
- Now what??
- What's the Data? Where's the data?
- Who's the Audience?
- How are we going to display it all?

STORYBOARD: ...WITH STORYMAPS

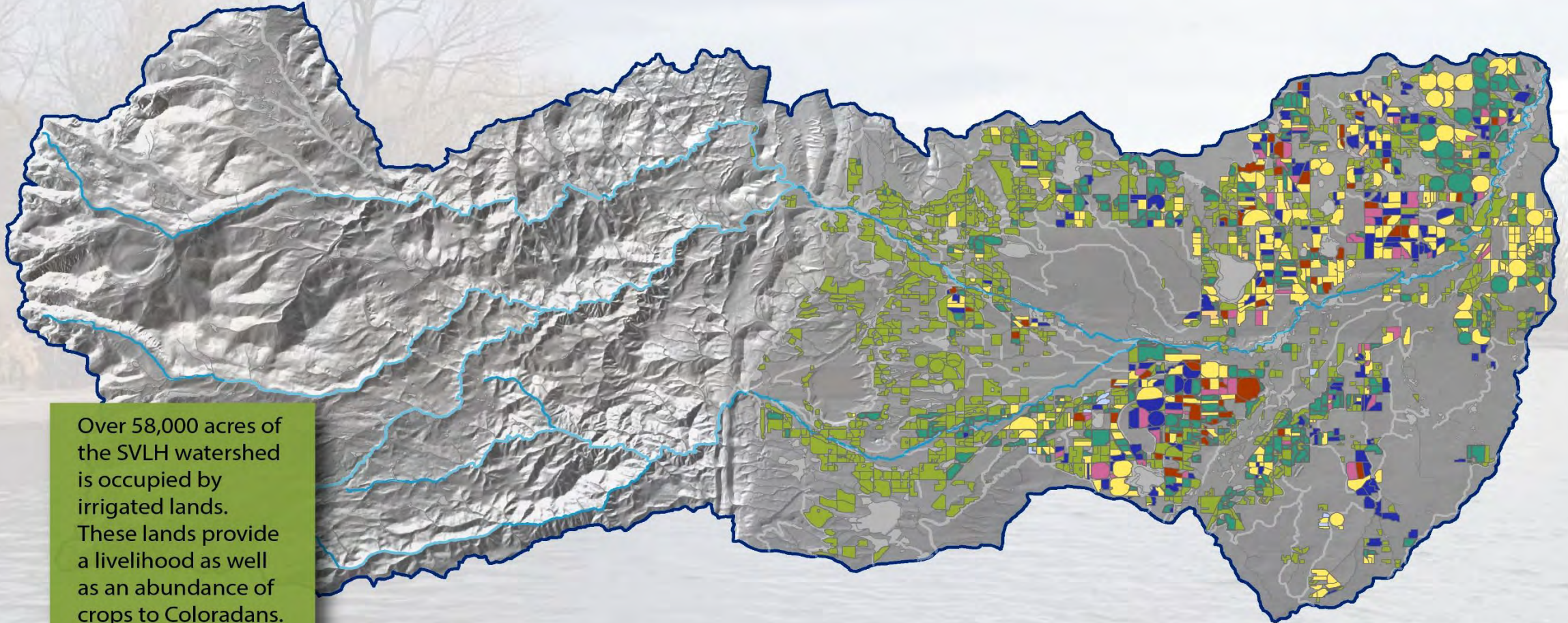


A Great Tool at Low Cost
(relatively)

STORYBOARD: LET'S TELL A DATA STORY

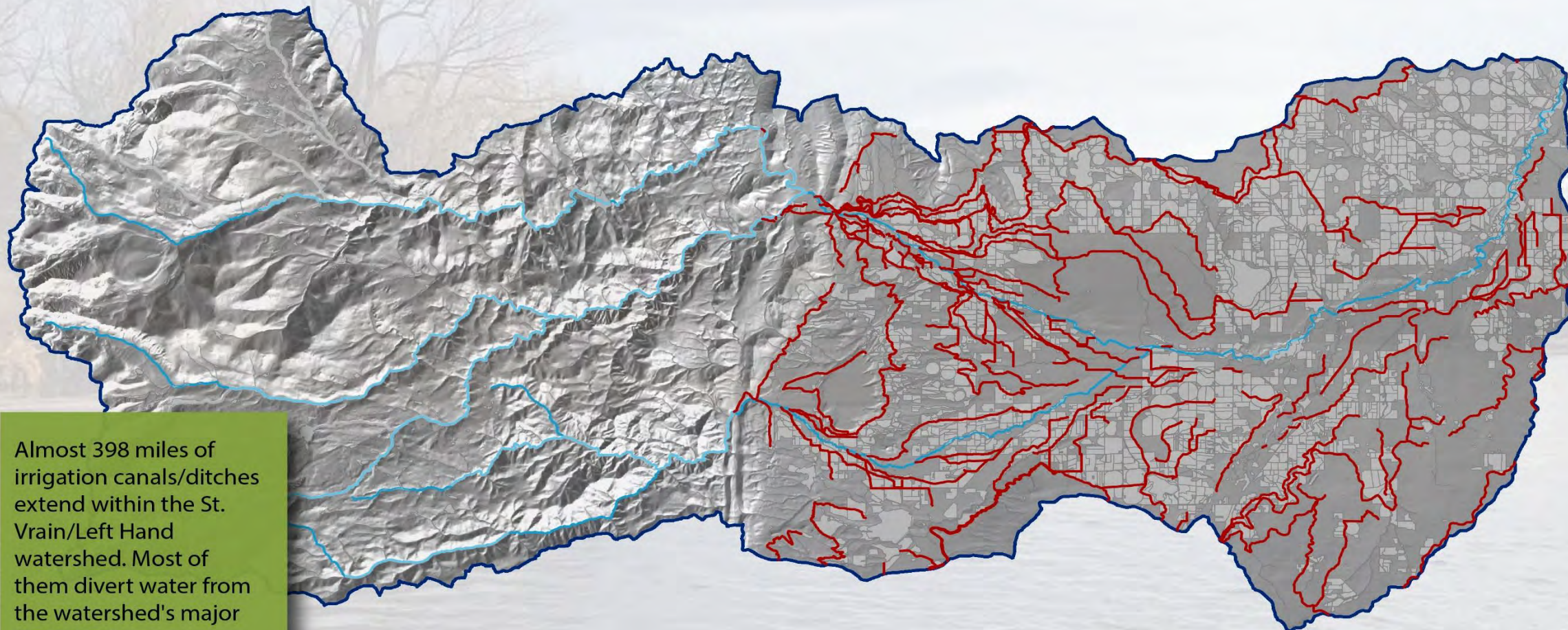


Irrigated Parcels



Over 58,000 acres of the SVLH watershed is occupied by irrigated lands. These lands provide a livelihood as well as an abundance of crops to Coloradans.

Irrigation Canals/Ditches



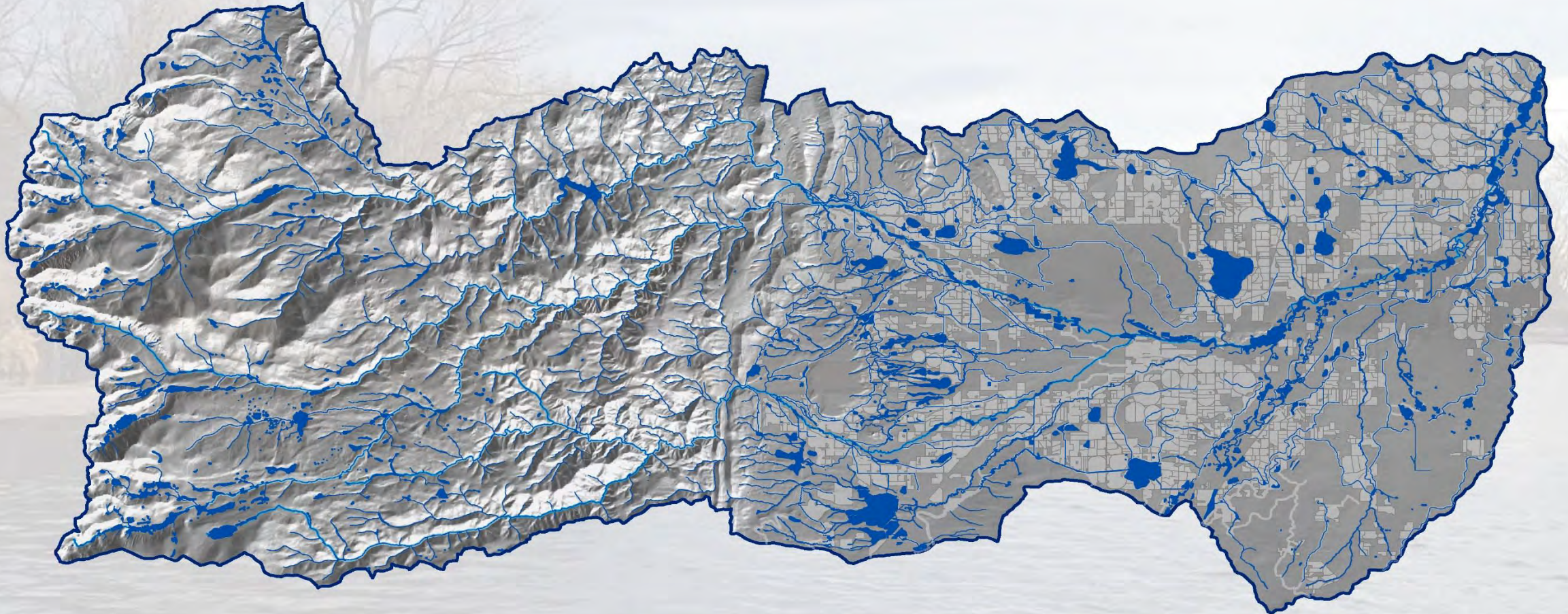
Almost 398 miles of irrigation canals/ditches extend within the St. Vrain/Left Hand watershed. Most of them divert water from the watershed's major waterways.

Instream Flow



"The need to correlate the activities of mankind with some reasonable preservation of the natural environment"
(Senate Bill 97)

Wetlands



Almost 14,000 acres of mapped ponds, lakes, and wetland areas creates a diverse ecosystem for Colorado's native (and non-native) species.

STORYBOARD EXAMPLE

How are We Connected?
HOW ARE WE CONNECTED?

What Type of Watershed User Are You?

Irrigation Canals/Ditches



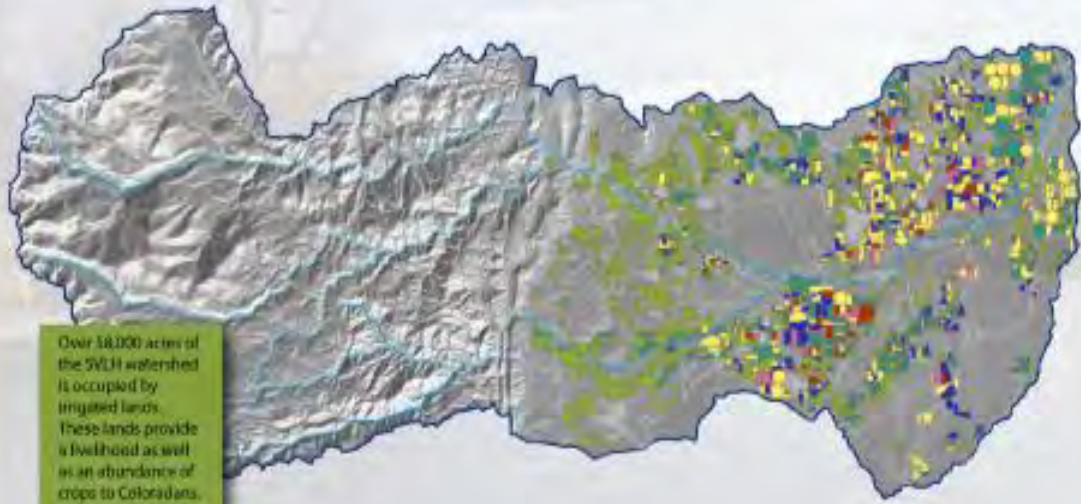
Approx. 300 miles of irrigation canals/ditches extend within the St. Vrain/Left Hand watershed. Most of them divert water from the watershed's major waterways.



RANCHER

Depends on healthy stream flow for irrigation ditches to irrigate crops

Irrigated Parcels



Over 18,000 acres of the SVLH watershed is occupied by irrigated lands. These lands provide a livelihood as well as an abundance of crops to Coloradans.

CONSUMER OF FOOD

Depends on healthy stream flow so that the rancher can irrigate the crops that will be consumed either raw or cooked in either the home, restaurant, picnic, or other

Instream Flow



"The need to correlate
the activities of mankind
with some reasonable
preservation of the
natural environment"

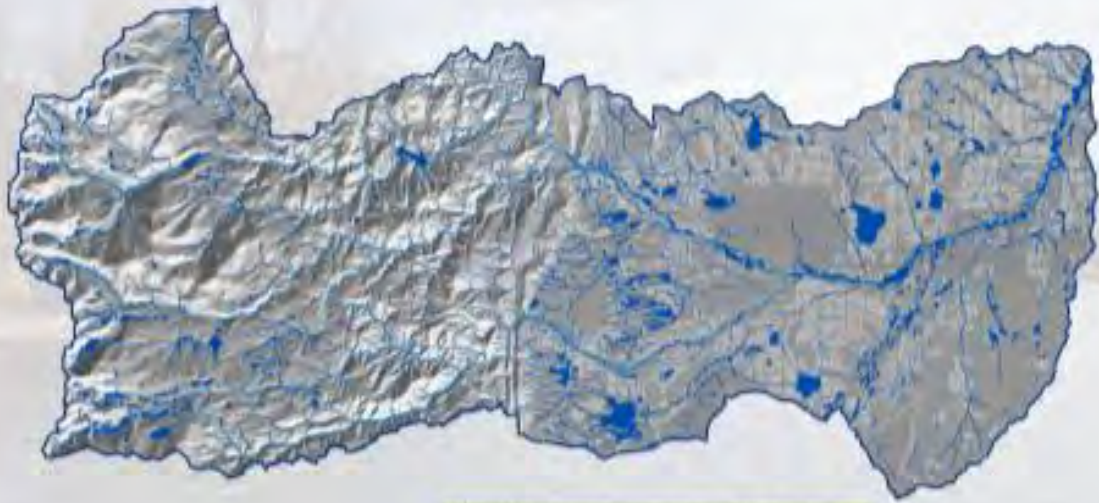
(Senate Bill 97)



**FISHERMAN,
KAYAKER, RAFTER,
TUBER, FEET-SOAKER**

Depends on healthy stream
quality and quantity to reach
maximum enjoyment while
partaking in sport

Wetlands



Almost 14,000 acres of mapped ponds, lakes, and wetland areas create a diverse ecosystem for Colorado's native (and non-native) species.



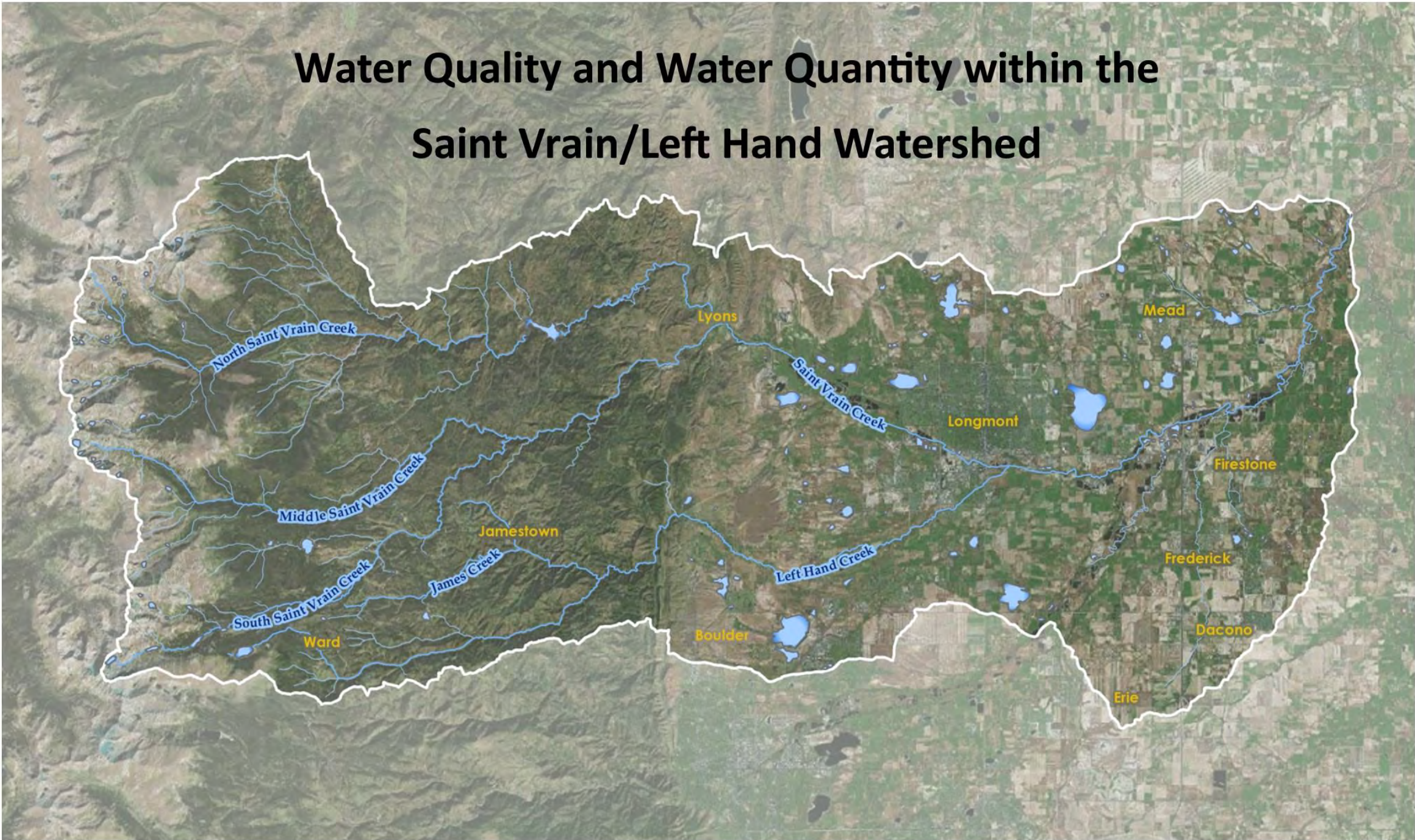
Bird, Insect, Amphibian

Depends on healthy stream
quality and quantity to reach
maximum life span

STORYBOARD EXAMPLE

Water Quality & Water Quantity A Case Study

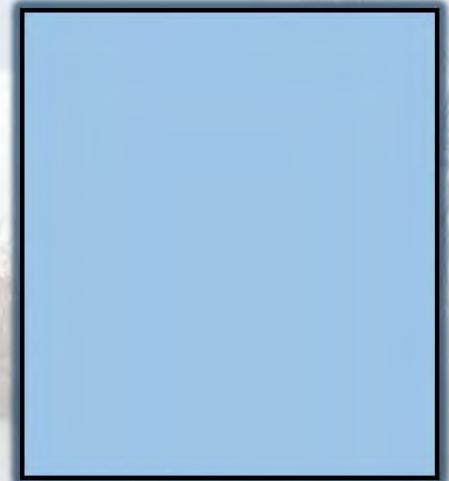
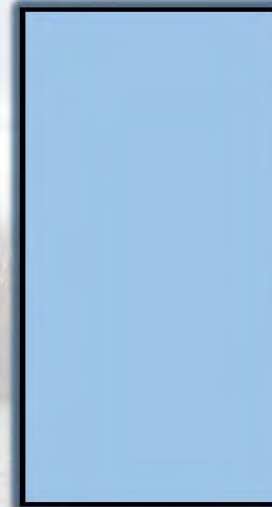
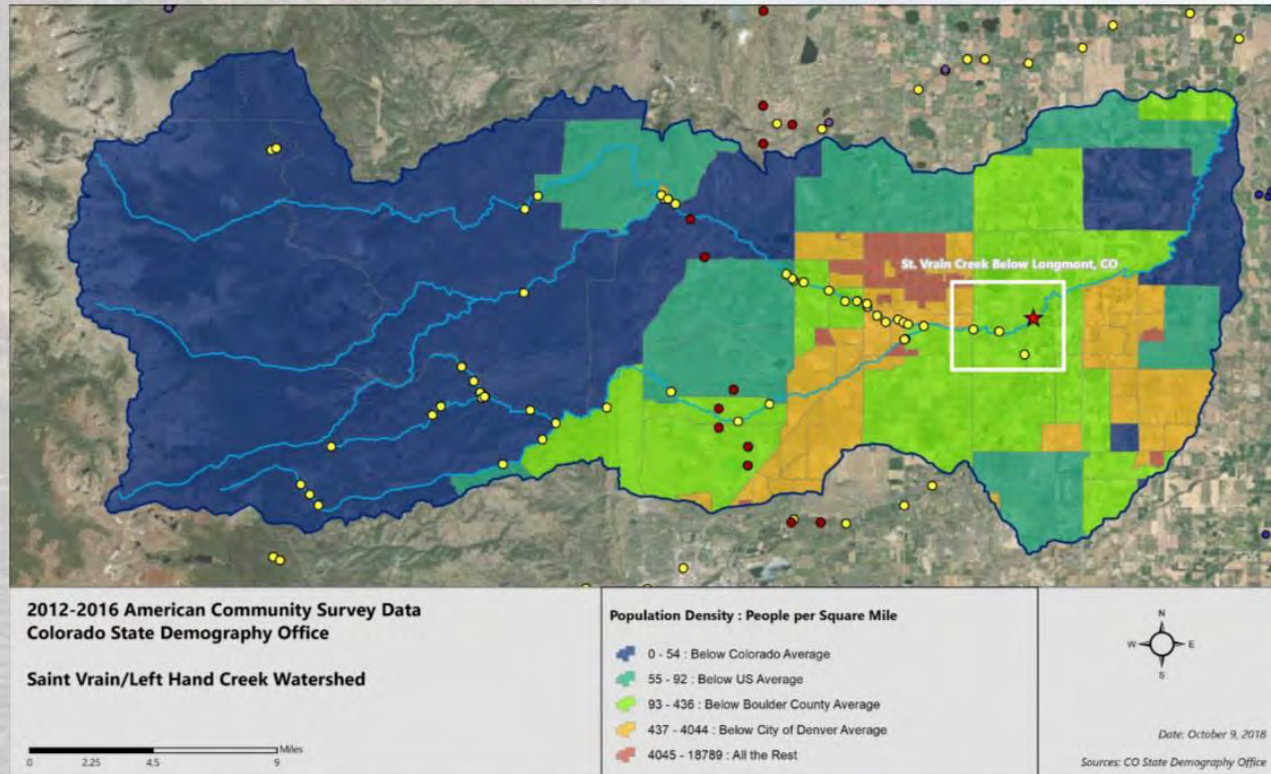
Water Quality and Water Quantity within the Saint Vrain/Left Hand Watershed



A (small) Case Study East of the Confluence of the Saint Vrain and Left Hand Creeks



Case Study



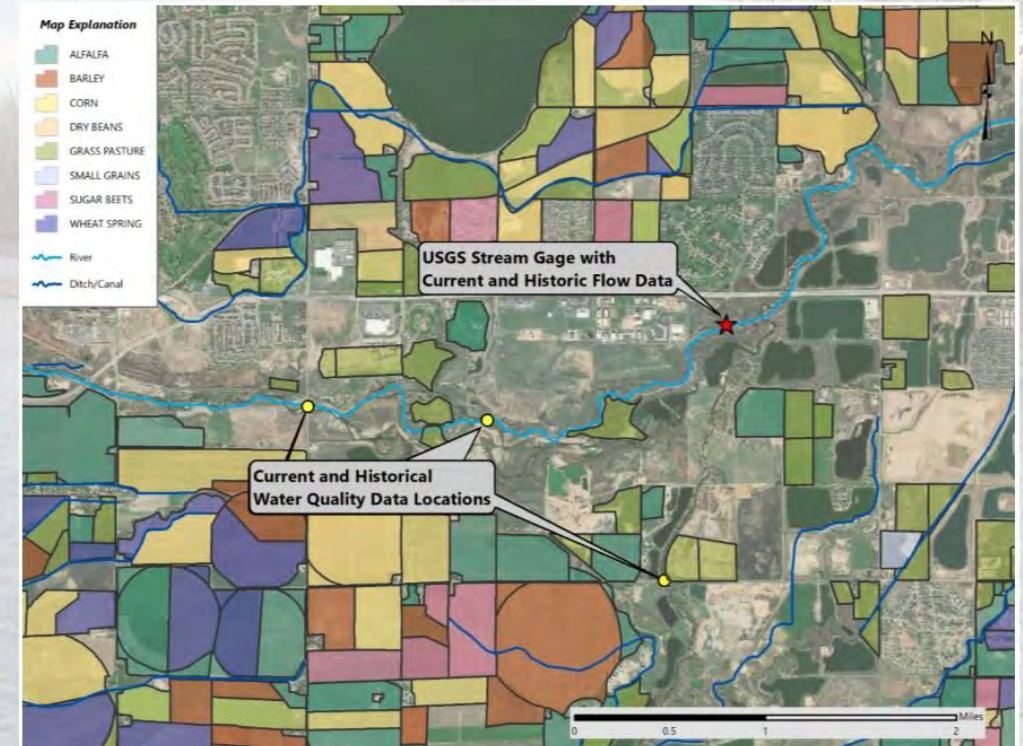
The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto. Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

Wetlands



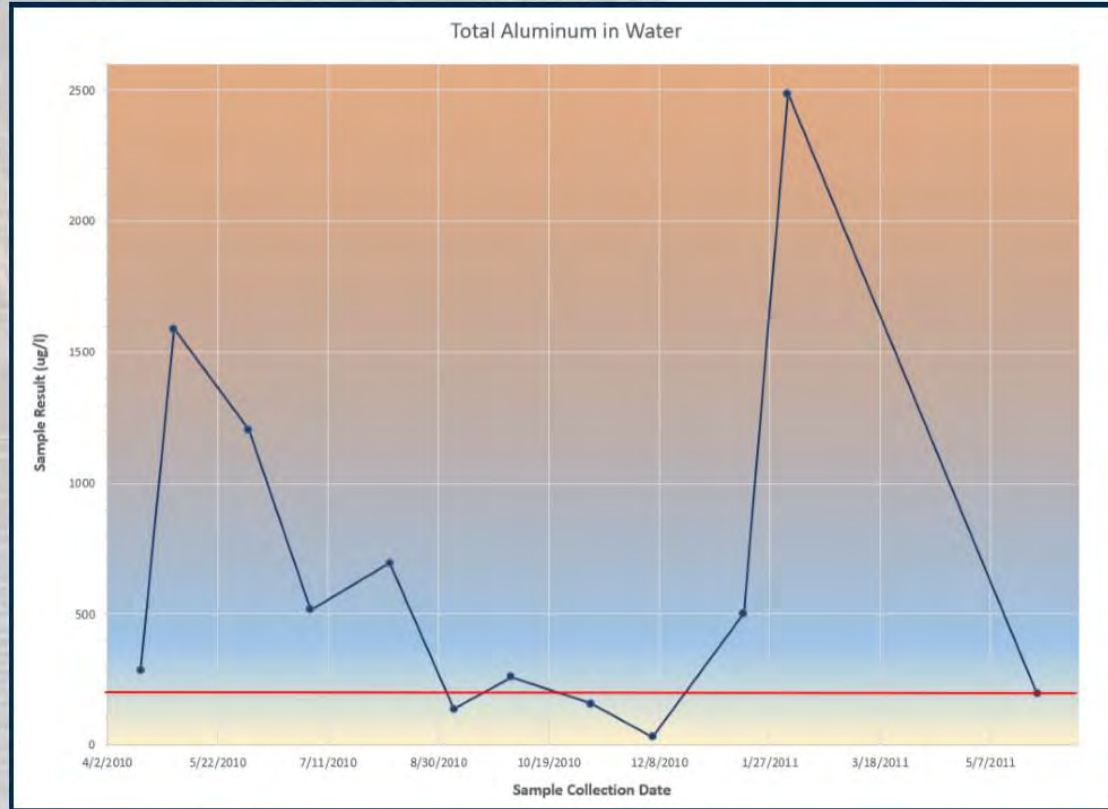
The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

Irrigated parcels



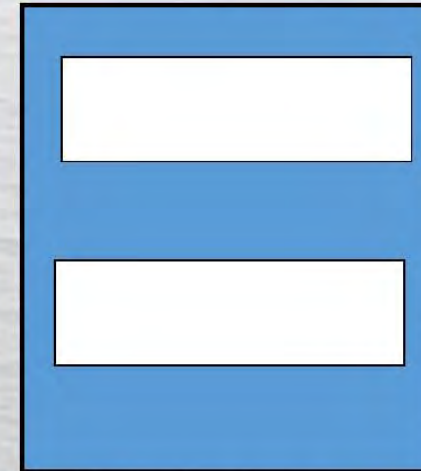
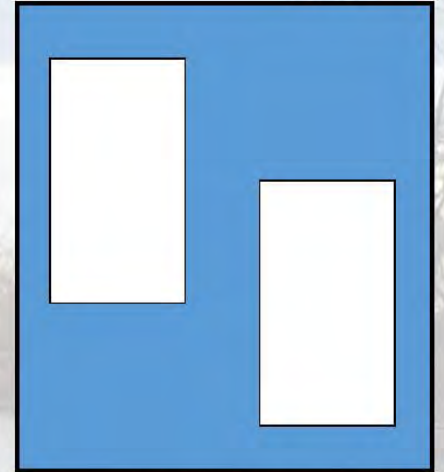
The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

Water Quality-Aluminum

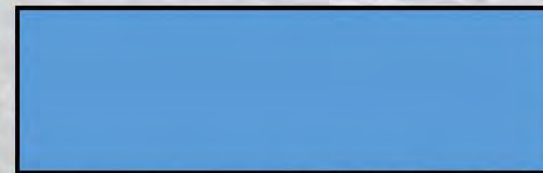


Aluminum in water Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto

The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et

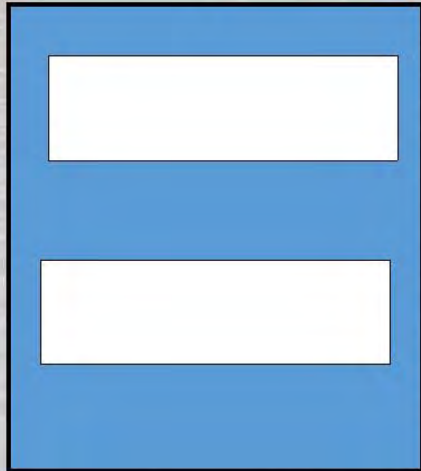
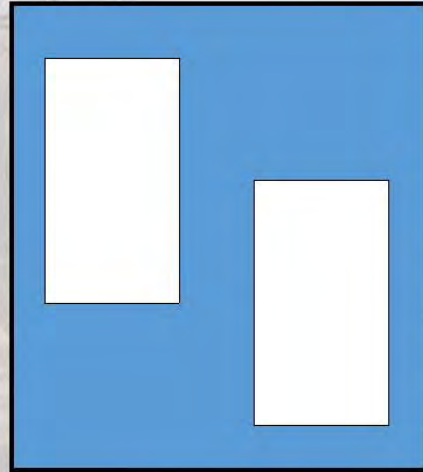


The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

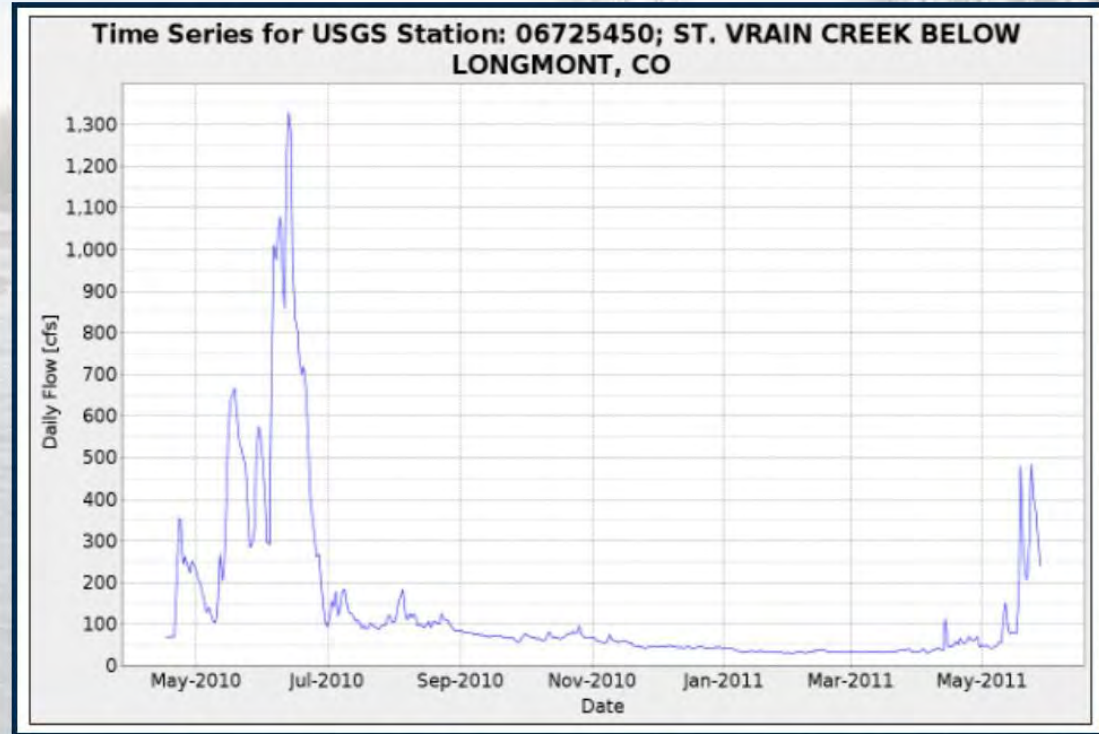
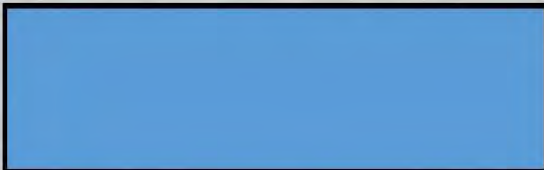


Water Quantity

The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et



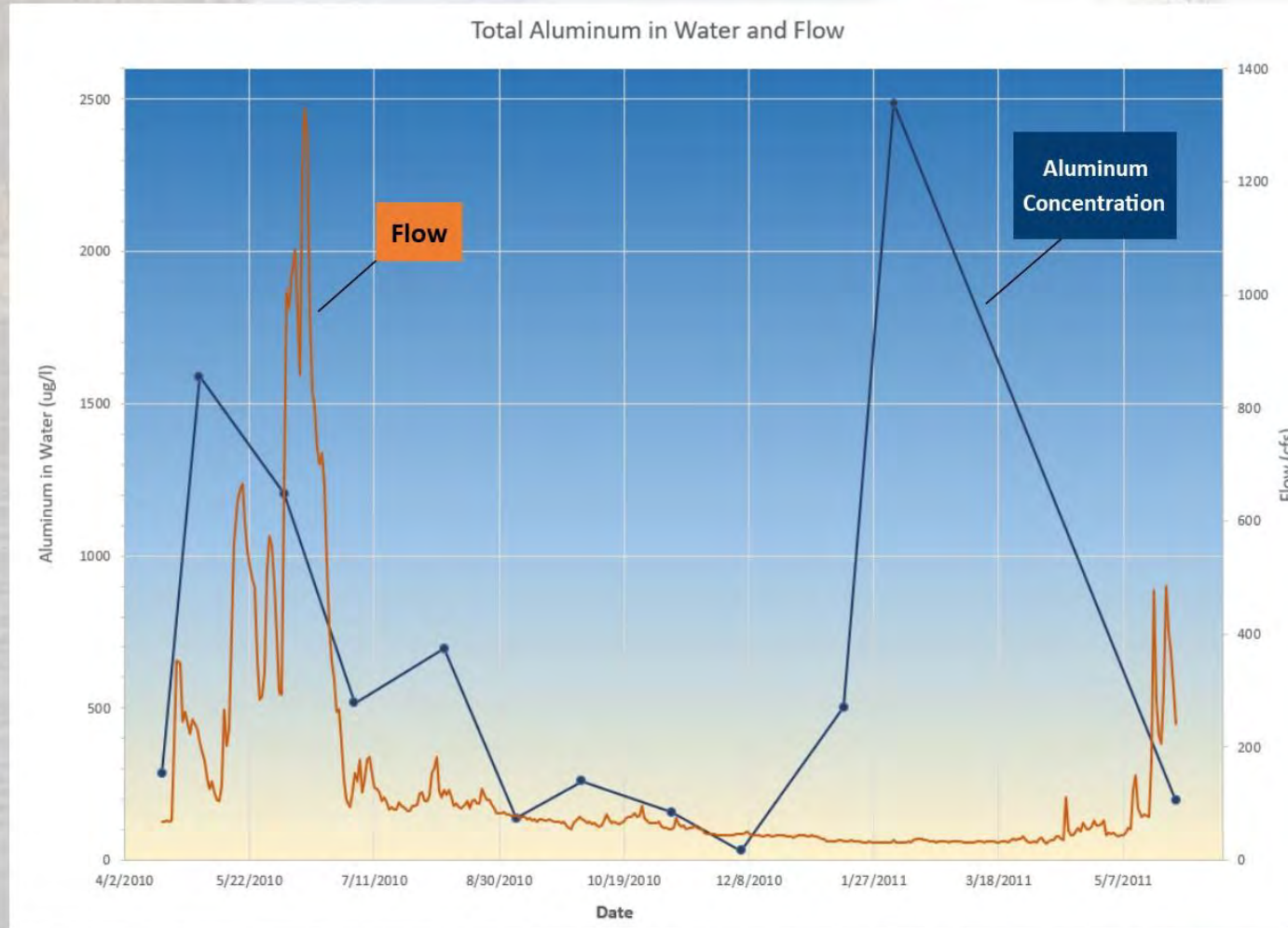
The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egeestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.



The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egeestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

Water Quality & Water Quantity

How do they Compare?



The St. Vrain Creek below Longmont, Coloradoall about the area here...Lorem Ipsum dolor sit amet, consectetur adipiscing elit. Duit tellus. Donec ante dolor, iaculis nec, gravida ac, cursus in, eros. Mauris vestibulum, felis et egestas ullamcorper, purus mibh vehicular sem, eu egestas ante nisl on njusto.

DATA LITERACY



Thank you.

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🌐 elephantfishco.com

• **Tyler Wible**

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🌐 owsi.colostate.edu



**ONE WATER
SOLUTIONS
INSTITUTE**

Connecting world
class research with
real world water
challenges

Home to eRAMS.com



Urban Water Systems

Integrating
management of
water systems with
urban planning



Water for Agriculture

Sustaining
agricultural
production in a
changing world



Water and Energy

Exploring tradeoffs
among interconnected
water and energy
systems



Ecosystem Services

Improving physical,
chemical, and
biological integrity
of water systems

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