Status and Benefits of Open Water Data
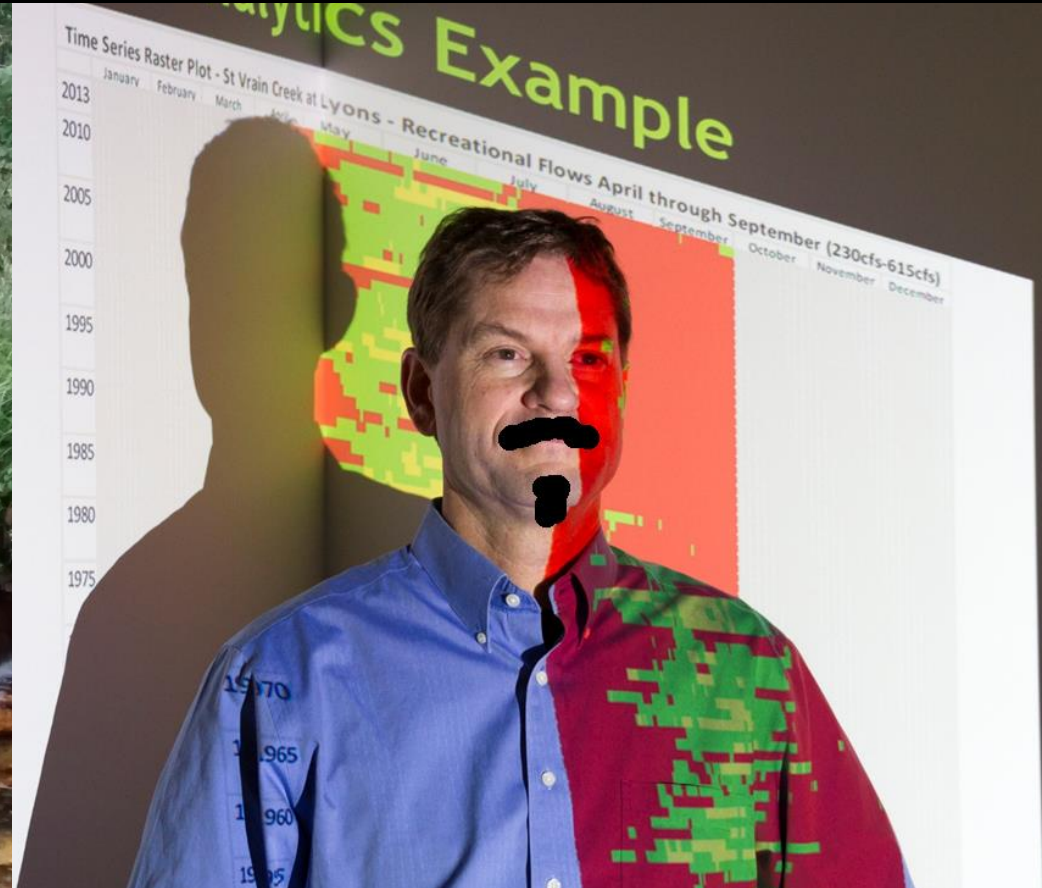
Colorado Water Congress, January 24, 2018
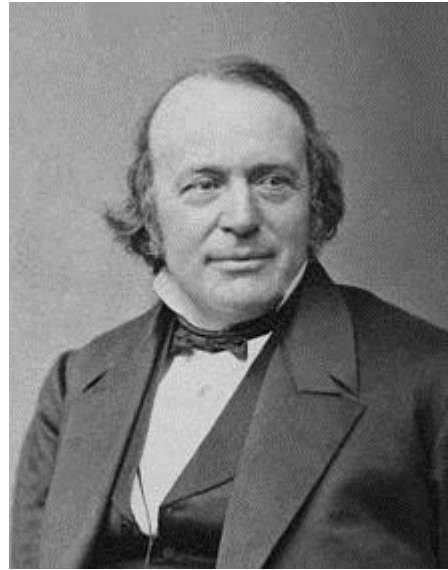

Steve Malers, Open Water Foundation

steve.malers@openwaterfoundation.org

www.openwaterfoundation.org

"Facts are stupid until brought into connection with some general law"

- Louis Agassiz (1807-1873)

http://ice.lindahall.org/section4.shtml

https://en.wikipedia.org/wiki/Louis_Agassiz

Context – Climate Change

Topics | Missions | Galleries | NASA TV | Follow NASA | Downloads | About | NASA Audiences | Search

Latest | **Related**

NASA Pinpoints Cause of Earth's Recent Record Carbon Dioxide Spike
3 months ago

NASA, NOAA Data Show 2016 Warmest Year on Record Globally
a year ago

NASA, NOAA to Announce 2016 Global Temperatures, Climate Conditions
a year ago

NASA Plans Another Busy Year for Earth Science Fieldwork
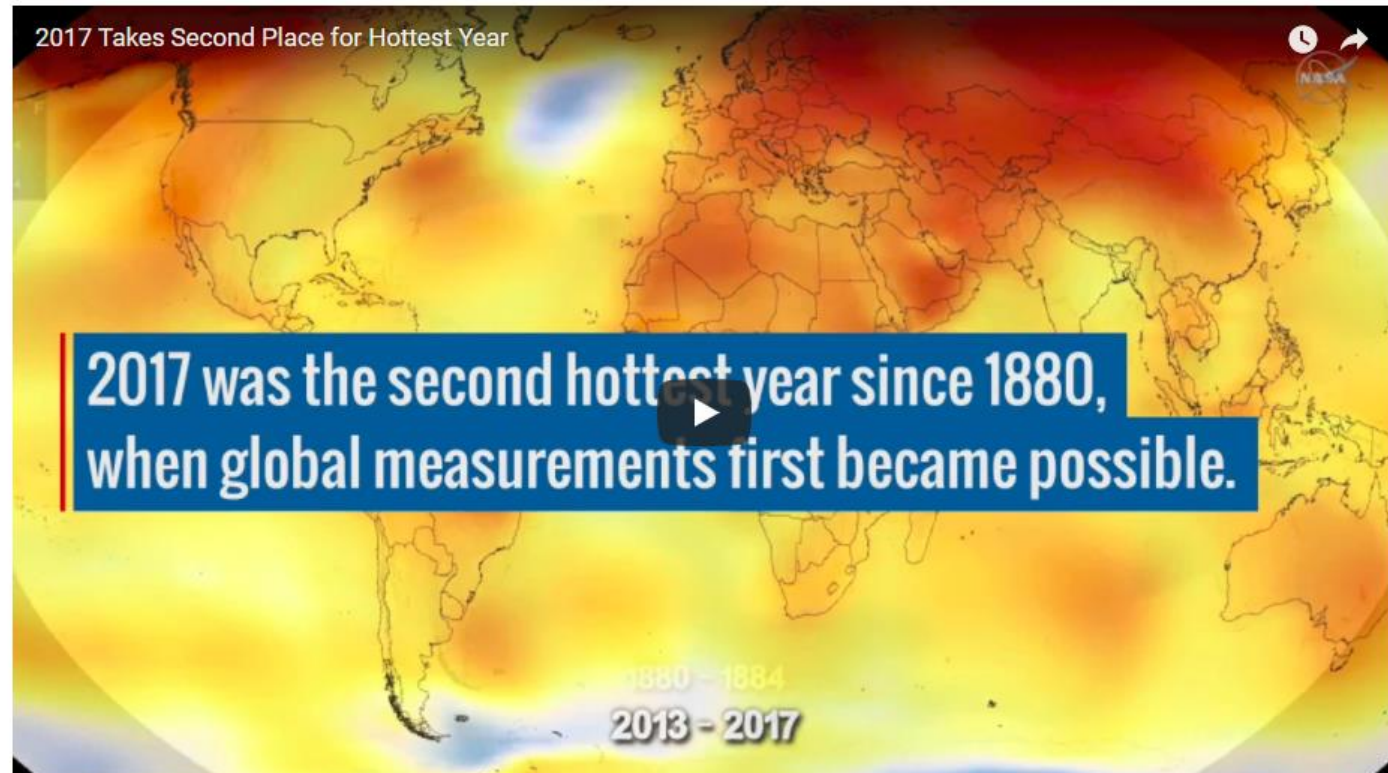*a year ago*

NASA Successfully Launches NOAA Advanced Geostationary Weather Satellite
a year ago

From NYC to Rio: NASA Helps Cities Address Climate Risks
a year ago

Climate

Jan. 18, 2018
RELEASE   18-003

Long-Term Warming Trend Continued in 2017: NASA, NOAA

2017 Takes Second Place for Hottest Year

2017 was the second hottest year since 1880, when global measurements first became possible.

1880 – 1884

2013 – 2017

Context - Natural Disasters

abcnews.go.com/US/federal-report-2017-shattered-us-damage-record-natural/story?id=52507313

abcNEWS   VIDEO   LIVE   SHOWS

Federal report says 2017 shattered US damage record for natural disasters

$306.2B (does not consider loss of work?)

By BILL HUTCHINSON · Jan 21, 2018, 7:37 PM ET

f Share   Tweet

2016 State GDP

14	14	Washington	476,770	2.58
15	15	Maryland	382,437	2.07
16	16	Indiana	347,249	1.88
17	17	Minnesota	339,096	1.83
18	18	Tennessee	331,868	1.79
19	19	Colorado	322,644	1.74
20	20	Wisconsin	313,088	1.69
21	21	Arizona	305,849	1.65
22	22	Missouri	299,113	1.62
23	23	Connecticut	259,918	1.40
24	24	Louisiana	236,999	1.28
25	25			1.24
26	26	South Carolina	209,859	1.13
27	27	Alabama	205,625	1.1
28	28	Kentucky	196,681	

CO 2017 budget: $26.8 B
CO Water Plan Needs: $40B ?
Amazon HQ2 = $5B construction

WATCH | Federal report says 2017 shattered US damage record for natural

Context - Commerce

The Big Ditch had so far been a colossal flop, and Teddy Roosevelt desperately needed an engineering genius who could take over the job and "make the dirt fly."

- David McCullough

"There are three diseases on the Isthmus," he told them, "yellow fever, malaria, and cold feet. And the worst of these is **cold feet**."

- John Frank Stevens, Chief Engineer, Panama Canal

"100 years on Panama Canal still vital to ag economy"

http://mashable.com/2015/11/15/panama-canal-construction

http://netnebraska.org/article/news/924495/100-years-panama-canal-still-vital-ag-economy

Context – Social Trends

Has the smart phone destroyed a generation?

https://www.theatlantic.com/magazine/archive/2017/09/has-the-smartphone-destroyed-a-generation/534198/
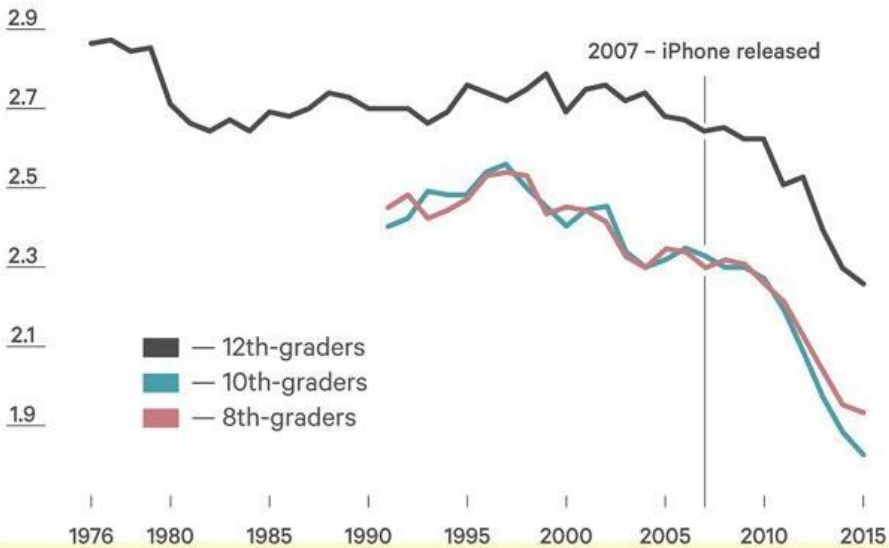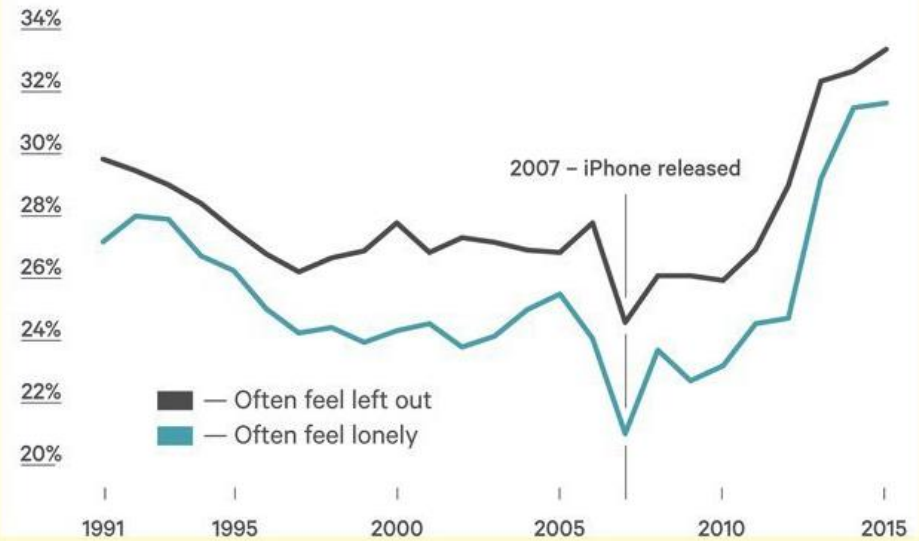
Context - Farming

Beginning Farmers as Percent of All Farmers, by County, 2012
(percent on current operation ten years or less)

U.S. = 25%

percent
- 0 - 20
- 21 - 25
- 26 - 31
- 32 - 46
- 47 - 85
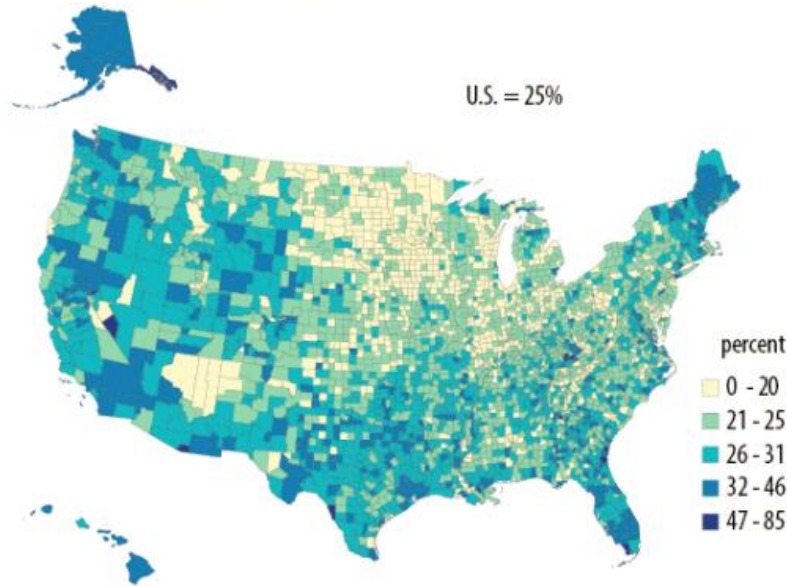
Source: USDA NASS, 2012 Census of Agriculture.

Figure 1
Farms with Female Principal Operator, by County, 2012

percent
- < 10
- 10 - 14
- 15 - 19
- 20 - 24
- 25 +

Source: USDA NASS, 2012 Census of Agriculture.

https://www.theatlantic.com/magazine/archive/2017/09/has-the-smartphone-destroyed-a-generation/534198/

Visualizations as Insight

DECISIONS
change, movement

FUTURE
WHAT ACTION?
reveals direction

WHAT IS BEST?
reveals principles

given purpose, becomes

WISDOM
understanding, integrated, actionable

given insight, becomes

KNOWLEDGE
contextual, synthesized, learning

PAST
WHY?
reveals patterns

given meaning, becomes

INFORMATION
useful, organized, structured

WHAT?
reveals relationships

given context, becomes

DATA
signals, know-nothing

https://www.pursuant.com/blog/redefining-fundraising-data/

Data as Infrastructure

water

All   Images   News   Videos   Shopping   More   Settings   Tools

Who provides context and perspective?

About 4,500,000,000 results (0.76 seconds)

Water News

Top stories

Scientists Discover Clean Water Ice Just Below Mars' Surface

Wired
2 days ago

Water is not only available on Mars, it's easily accessible, NASA finds

Digital Trends
2 hours ago

Raw water is a dangerous 'natural food' fad that promises health but gives...

NBC News
14 hours ago

→   More for water

Google loves Wikipedia

Water - Wikipedia
https://en.wikipedia.org/wiki/Water ▾
Water is a transparent and nearly colorless chemical substance that is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. Its chemical formula is H2O, meaning that each of its molecules contains one oxygen and two hydrogen atoms that are connected by covalent bonds.
Properties of water · Drinking water · Water pollution · Water resources

Water Quality | Fort Collins Utilities - City of Fort Collins
https://www.fcgov.com/utilities/what-we-do/water/water-quality ▾
View public notice regarding the recent Treatment Technique Violation issued by the Colorado Department of Public Health and Environment (CDPHE). Vea el aviso público en español aquí. Fort Collins Utilities does not solicit water quality testing at homes or businesses, though some private companies do. Utilities' ...

Local Information

More images

Water
Chemical compound

What is it?

Water is a transparent and nearly colorless chemical substance that is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. Wikipedia

Boiling point: 212°F (100°C)
Density: 1 g/cm³
Molar mass: 18.01528 g/mol
Melting point: 32°F (0°C)
IUPAC ID: Water, Oxidane

People also search for   View 10+ more

Milk   Sugar   Fruit   Vegetable   Table salt

More about Water

Sources include: USDA   Feedback

Open Data Definition

- **Accessible to all** – the data becomes accessible outside of the organization that generated or collected it
- **Machine-readable** – data must be usable, which means it must be made available in formats that are easily used by third-party applications
- **Free – zero or low costs** for data access and openness
- **Unrestricted rights to use** – data that is unencumbered by contractual or other restrictions leads to the maximum potential of innovation

    - "Generating Economic Value through Open Data" in "Beyond Transparency"

Observations on Status of Open Data

- Demands for access to data and transparency are increasing… for all data.
- Many government entities are making progress on open data

  …but at the same time data access is being cut back at some levels.
- There are still many barriers and resistance to publishing open data.

Medical science / Your medical data
Laws and legal rulings / Your court case
Science in general / Your intellectual property
Water as a public resource / Your customer and system data
Government budgets / Your tax records
Public process / Private process
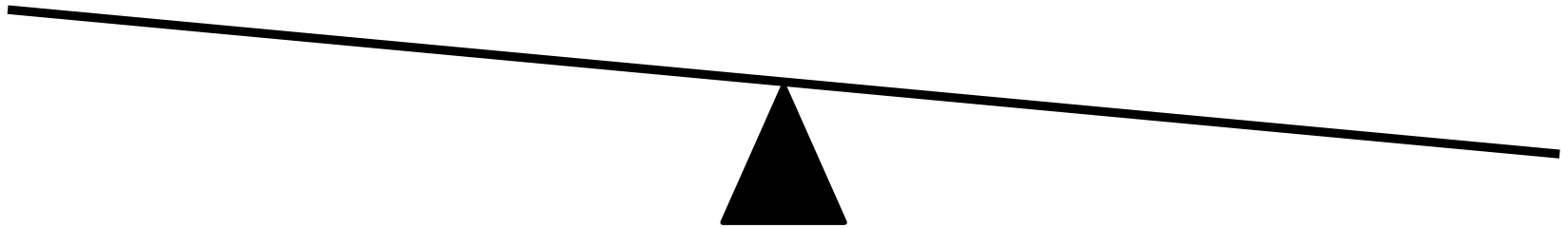
Benefits of Open Data

- Open access
- Collaboration (break down silos)
- Transparency
- Reduce costs
- Innovation

Increased Access to Data in Colorado

- Water Efficiency Data Portal data now public: http://cwcb.state.co.us/water-management/waterEfficiency/Pages/ReportingWaterUseWaterConservationData.aspx
- Colorado Open Records Act updates to require machine-readable formats (2017) https://leg.colorado.gov/bills/sb17-040
- Federal Open Water Data Initiative https://acwi.gov/spatial/owdi/
- Bureau of Reclamation Web Services

  https://water.usbr.gov/
- CO DWR Updated Web Services Coming soon (see other Colorado Water Congress presentation)

USGS – National Water Census

USGS - NHDPlus High Resolution
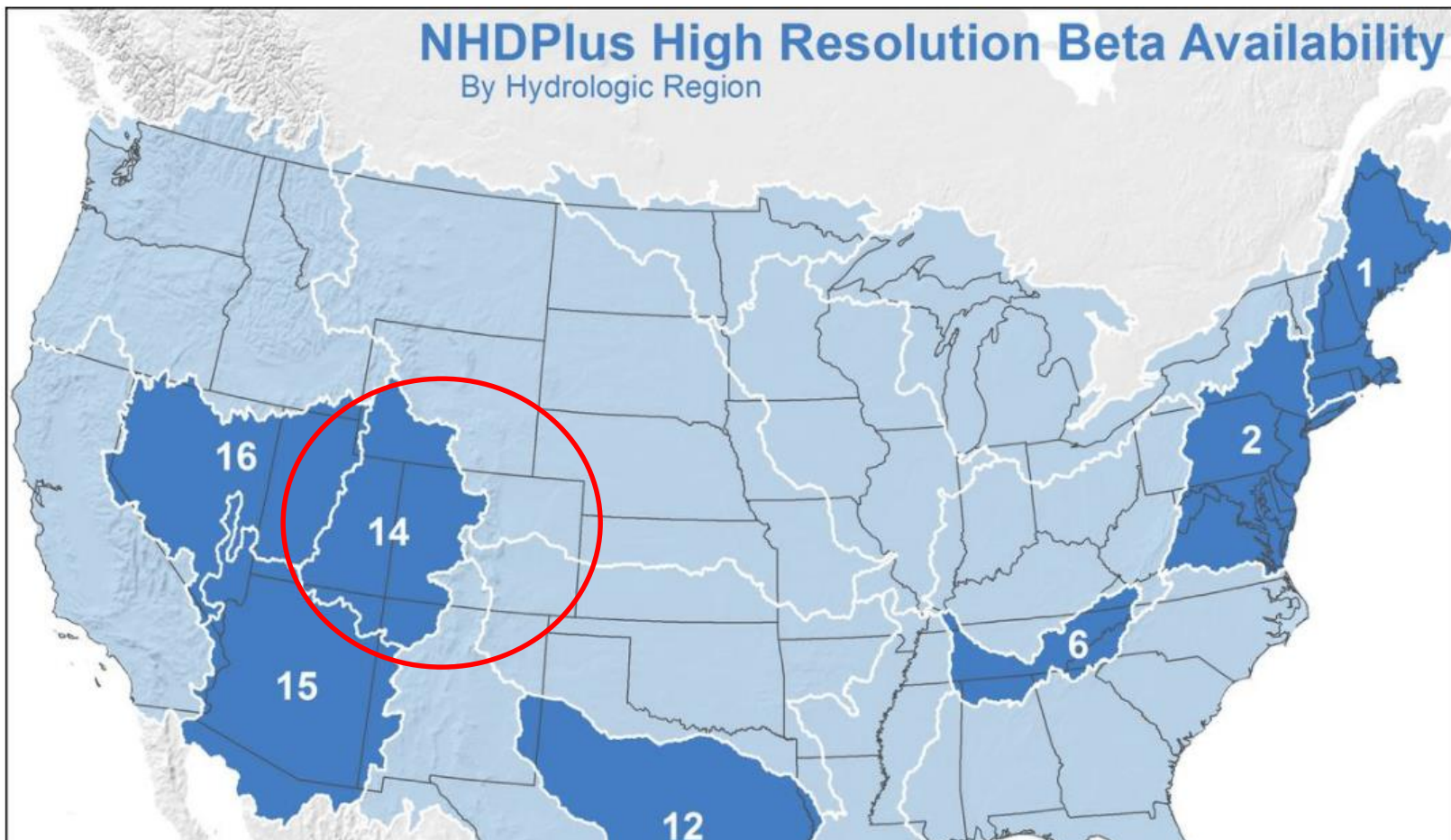
Reclamation Water Information System

Colorado Information Marketplace (data.colorado.gov)

OpenColorado.org

New DWR Web Services

ASP.NET Web API Help Page

Introduction

Data provided by the Colorado Division of Water Resources.

For additional help in creating URLs to retrieve values based on resource fields see the following help documents:

Ground Water Levels
Ground Water Measurement Time Series
Administrative Calls

AdministrativeCalls

Returns administrative calls. See documentation for optional query parameters and output formats

API	Description
GET api/v2/admincalls/active	Return list of active administrative calls
GET api/v2/admincalls/active/{div}	Returns list of active administrative calls by water division
GET api/v2/admincalls/historic	Returns list of historic administrative calls (see documentation for optional query parameters)
GET api/v2/admincalls/{call_id}	Return administrative call by call ID

GroundWater

Retrieve groundwater level related data. See documentation for optional query parameters and output formats

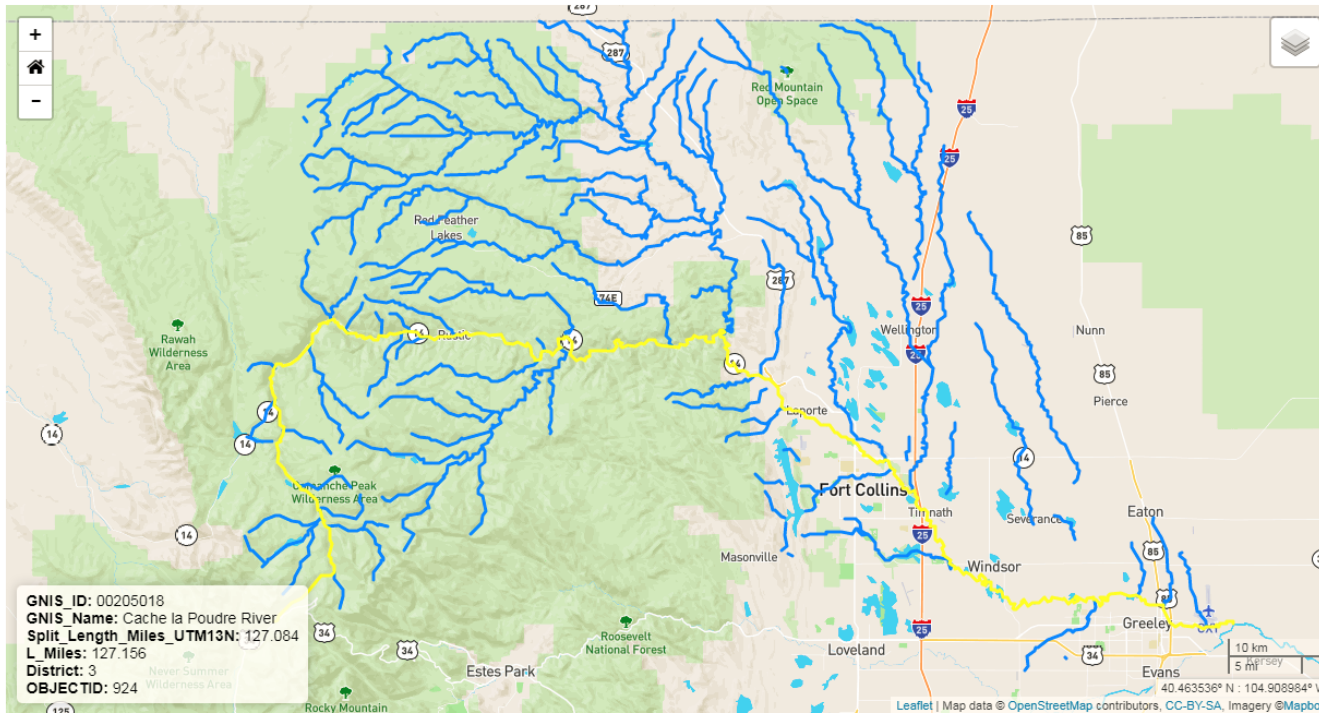| API	Description
GET api/v2/groundwater/waterlevels	Returns GroundWaterSearchResult from filters - See documentation for optional querystring parameters
GET api/v2/groundwater/waterlevels/{wellId}	Return groundwater search by well ID
GET api/v2/groundwater/wellmeasurements	Return list of GroundWaterMeasurements - See documentation for optional querystring parameters

Source Water Route Framework

Open Data Standards

- comma-separated-value
- JSON, GeoJSON
- XML
- Excel is a start!

Observations

- We need more open water-related datasets that are maintained over time and are available for projects … **need ongoing investment in open datasets**.
- Major water resources studies often spend a lot of time finding and processing data (or reusing outdated data)…**can be more efficient**.
- Datasets from major studies are often not published in an accessible and understandable way… **need to publish machine-readable datasets**.

Example – Municipal Water Providers
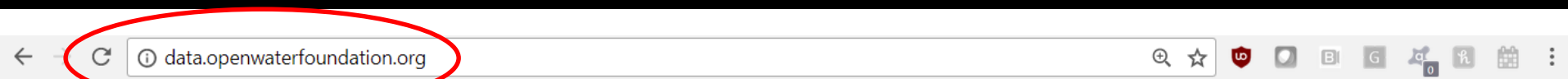
Open Water Foundation / Data

See also other Open Water Foundation websites:

- **data.openwaterfoundation.org (this website) - useful datasets related to water resources**
- learn.openwaterfoundation.org - learning resources
- models.openwaterfoundation.org - models and analyses (may include visualizations)
- projects.openwaterfoundation.org - OWF project pages to demonstrate and archive project work
- software.openwaterfoundation.org - software tool projects
- viz.openwaterfoundation.org - interesting and useful data visualizations

Value-added datasets based on public data

Dataset ID	Focus	Spatial Extent	Preview Image	Description	Related Visualization	Dataset Link
owf-data-co-municipalities	Municipal	Colorado	DATA	multiple sources. This dataset facilitates relating detailed data from multiple sources. The dataset is maintained under version control in GitHub. Use the link on the right to access data and use the GitHub repository Issues to provide feedback.	working on data visualization for municipal data.	Colorado municipalities dataset on GitHub
owf-data-co-municipal-water-providers	Municipal	Colorado	DATA	OWF has created a dataset containing all **Colorado municipal water providers** (utilities, water districts, etc.), cross-referencing identifiers from multiple sources. This dataset facilitates relating detailed data from multiple sources. The dataset is maintained under version control in GitHub. Use the link on the right to access data and use the GitHub repository Issues to provide feedback.	OWF is working on data visualization for municipal water provider data.	Colorado municipal water providers dataset on GitHub
				Colorado Roundtable basins, corresponding to		

Data Management - Excel on GitHub

Dataset Documentation

owf-data-co-municipal-water-providers

This repository contains the Open Water Foundation (OWF) dataset for Colorado municipal water providers. This is a foundational dataset that provides unique identifiers and other data for municipal water providers. The identifiers can be used to link other datasets, such as municipalities. OWF has created and is maintaining this dataset to facilitate work on various data analysis and visualization projects in Colorado.

> **Documentation itself is versioned**

Repository Contents

The repository contains the following:

```
analysis/                              TSTool software command files to process data into useful forms.
  Process-xlsx-to-csv.TSTool           TSTool command file that processes the core dataset from .xlsx to .csv.
  Process-xlsx-to-geojson.TSTool       TSTool command file that processes the core dataset from .xlsx to .geojso
data-orig/                             Folder containing original data files downloaded from agency websites.
  Colorado-FIPS-Places.xlsx            The data file containing original data download from the U.S. Census Bure
  Colorado-GNIS-Civil.csv              The data file containing original data download from the Geographic Names
  Colorado-LocalGovernment-IDs.csv     The data file that is the attribute table of the GIS shapefile downloaded
  Colorado-Municipal-Boundaries.geojson  Exported spatial data file from the Colorado Information Marketplace's Mu
  Colorado-Municipality-PointLocation.csv  Saved attribute table of Colorado-Municipal-Boundaries.geojson that conta
  Colorado-PWS-IDs.csv                 The data file containing original data download from the EPA's Safe Drink
  Colorado-Special-Districts.geojson   Exported spatial data file from the Colorado Information Marketplace's Al
  Colorado-WaterProvider-PointLocation.csv  Saved attribute table of Colorado-Special-Districts.geojson that contains
  README.md                            Explanation of folder contents, description of data files, and the methoc
```

Access to Original Dataset File

Original dataset file is versioned and alternate formats and analyses are generated using automation

open water

Cross-referenced Identifiers

csv and other file formats can be viewed online

Unique identifiers are key to using the dataset

Useful Data, Including Spatial Data

This repository | Search   Pull requests   Issues   Marketplace   Explore

OpenWaterFoundation / **owf-data-co-municipal-water-providers**   ⊙ Unwatch ▾ | 1   ★ Star | 0   ⑂ Fork | 0

<> Code   ⊘ Issues 4   ⑂ Pull requests 0   ▥ Projects 0   ▦ Wiki   ⅲ Insights   ⚙ Settings

Branch: master ▾   owf-data-co-municipal-water-providers / data / **Colorado-Municipal-Water-Providers.csv**   Find file | Copy path

kswaim Add in website URLs for over half of providers   876880c 23 days ago

1 contributor

532 lines (531 sloc) | 93 KB   Raw | Blame | History

Search this file...

Other useful properties, temporal data, and spatial data, from various sources

| D	OWF_ID_Flag	LocalGovtType	EntityStartYear	EntityStartYear_Flag	EntityEndYear	EntityEndYear_Flag	County_CSV
WC	G	Company		x		x	Crowley
nyWSD	G	Water and Sanitation District		x		x	El Paso
	G	Municipality		x		x	Las Animas
	G	Municipality		x		x	Washington
daWSD	G	Water and Sanitation District		x		x	Jefferson
sa	G	Municipality		x		x	Alamosa
roWS	G	Company		x		x	San Miguel

Simple Spatial Data Visualization

GeoJSON (geojson) files are an open spatial data format, can also provide shapefiles and other spatial data formats

Simple Spatial Data Visualization
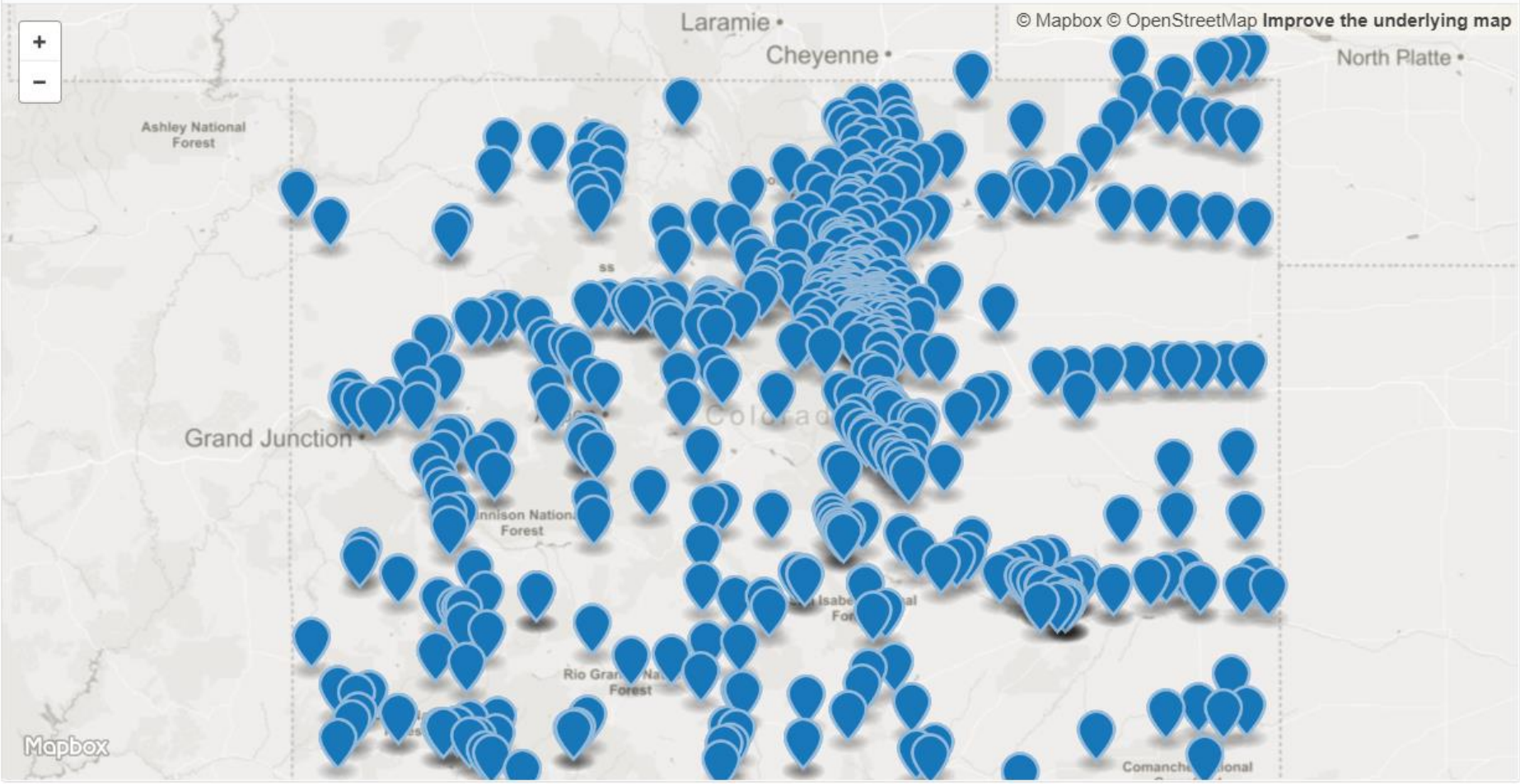
Using the Datasets

- The dataset files can be downloaded and used directly (Excel) or by other software such as geographic information systems (GIS) or models
- Automate processing

One option: Publish to an Open Data Portal

Use Software for Automation

- Access data on web
- Automate workflows using software
- Implement quality control

Crowdsourced Datasets

www.citsci.org/cwis438/websites/citsci/home.php?WebSiteID=7

CitSci.org

Login   Donate

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How It Works

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Create your own projects. Choose open, member-based, public, or private - it's up to you.

COLLECT DATA
Build custom datasheets. Collect any data you want.

Need to have a steward to manage the dataset.

Cloud-hosted Publishing Platforms

Focused App: Enhanced Snowpack Products

Visualization - GapMinder

SNODAS Data   Sep-2016

SWE Cumulative(x), SWE Cumulative % of Mean(y), SWE Cumulative Upstream Total(size), Basin(color)

Basin
■ - ABRFC
■ - CBRFC
■ - MBRFC
■ - NCWCD
■ - WGRFC

Select All Markers

Select Individual Marker...

Turn Tracer On

Turn Annotations On

SWE Cumulative % of Mean (acft)

SWE Cumulative (acft)
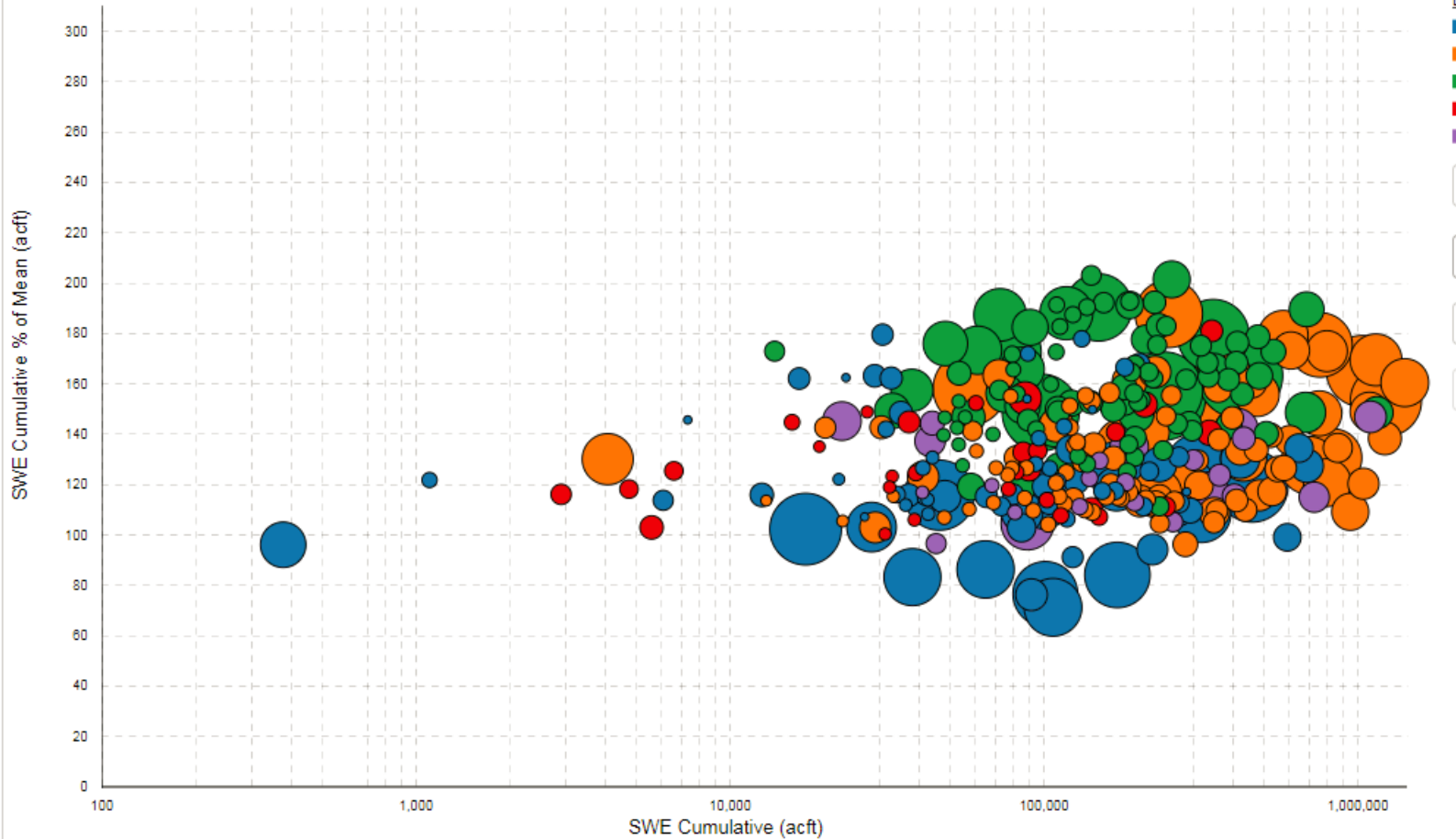
September-30

Oct-2015 Nov-2015 Dec-2015 Jan-2016 Feb-2016 Mar-2016 Apr-2016 May-2016 Jun-2016 Jul-2016 Aug-2016 Sep-2016

Speed:

LOCAL_ID: GBYC2LO
Date: Sep-2016
SWE Cumulative (acft): 90056.00
SWE Cumulative % of Mean (acft): 125.81
SWE_UpstreamTotal_Cumulative: 456315.00

Stream Network Visualization

NodeName: 44_ADY019_YampaRnrMa_DIV
NodeType: Diversion
GWMax: -999
Comment: 44_ADY019
Connected entities: MAYBELL CANAL _FLO, Five Pines-Roberts D_DIV

Source: YAMPA RIVER AT DEERL_FLO
Target: 55_ADY026_YampaR@Gre_DIV
GWMax: -999

River Health

A Little Political Data

Current congressional district map

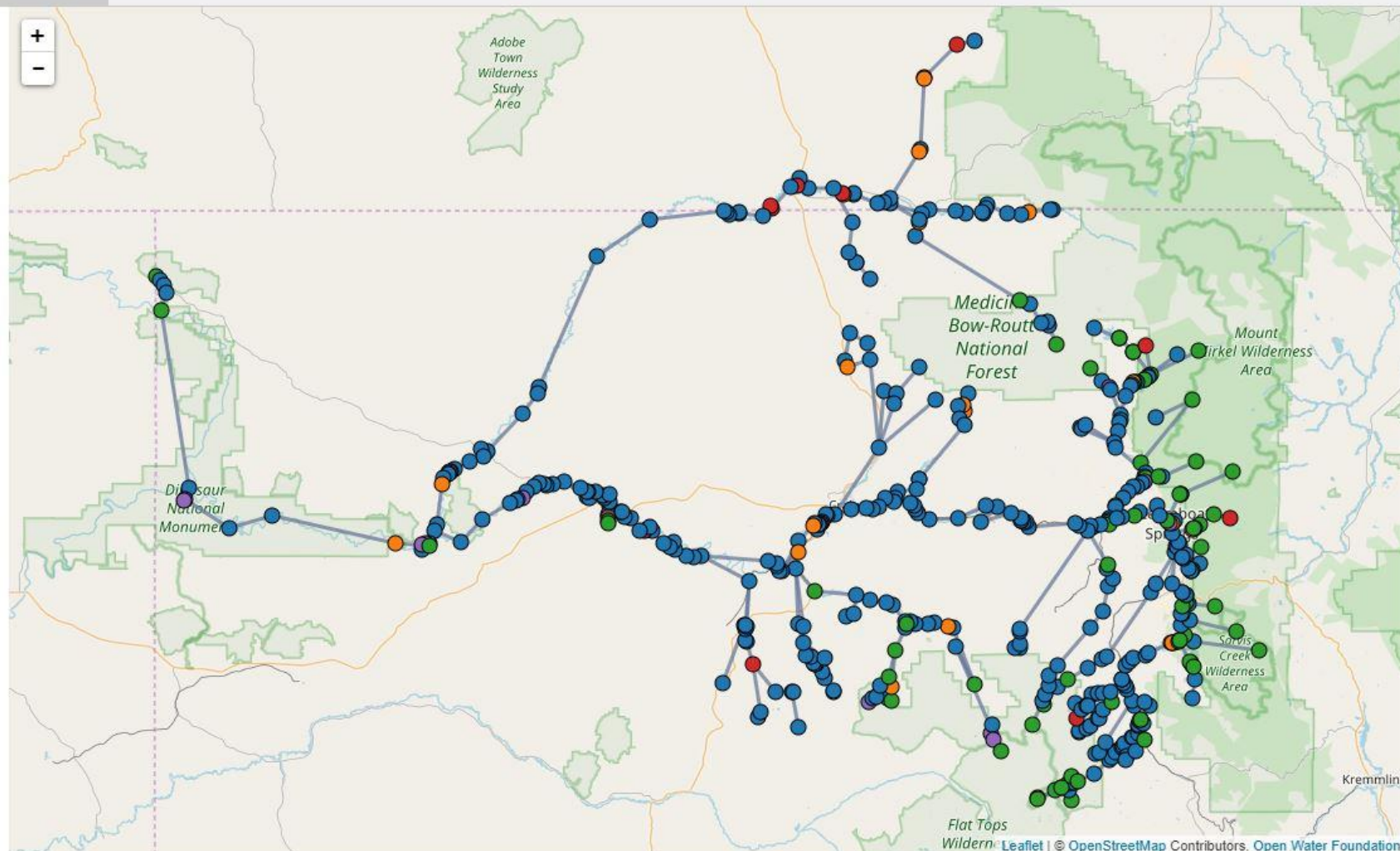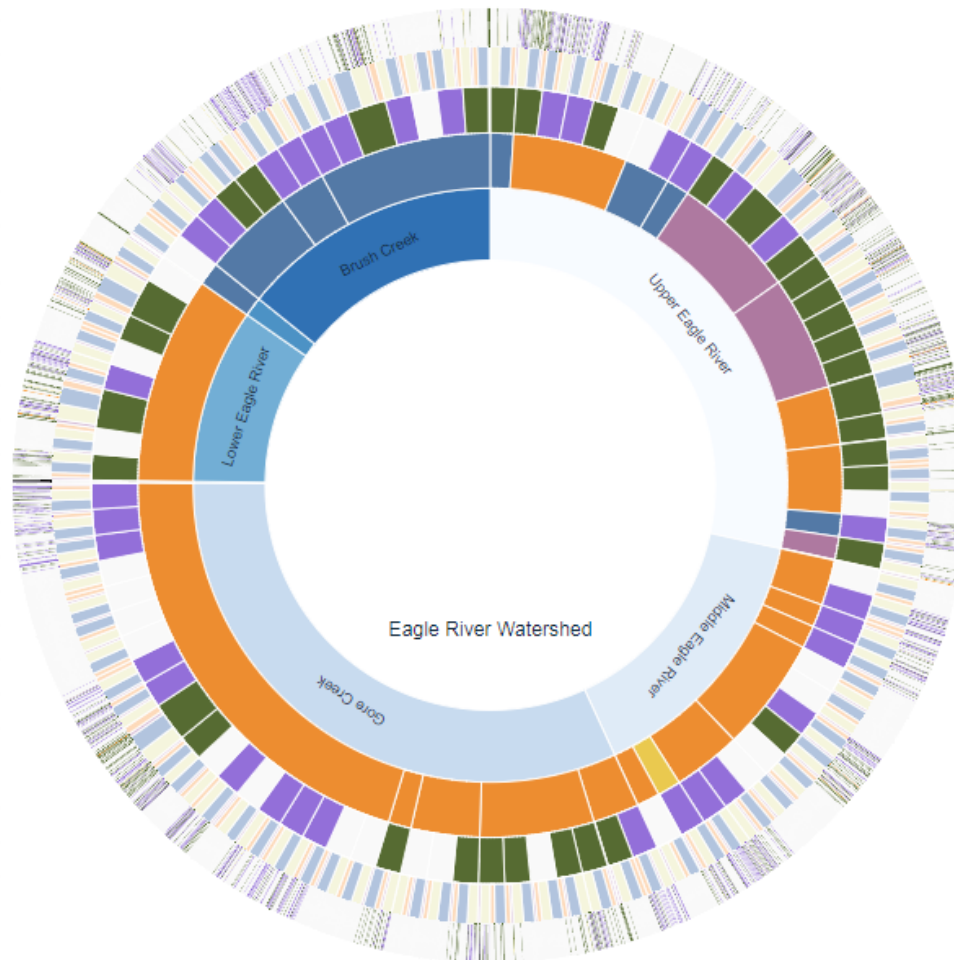**Computer-drawn map to optimize compactness**

https://www.reddit.com/r/MapPorn/comments/40tlhb/us_c
ongressional_districts_redrawn_by_a_computer/

WAPO.ST/**WONKBLOG**   Source: U.S. Census Bureau (top), Brian Olson (bo)

open water
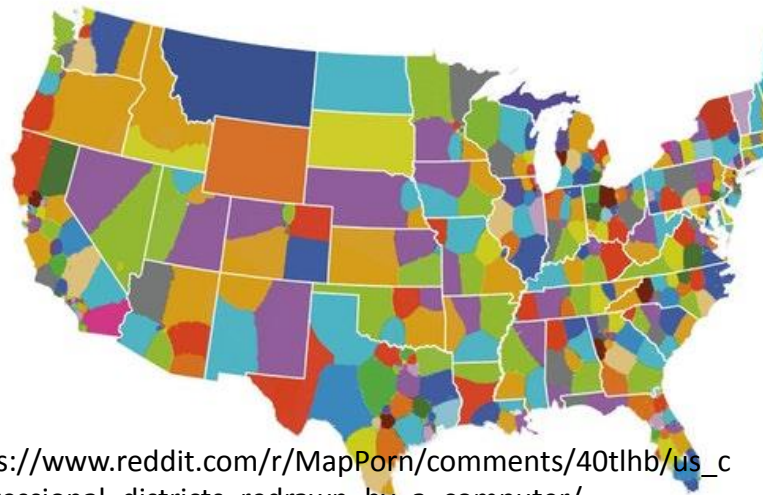
← → C ⓘ bdistricting.com/2010/CO/

Colorado Redistricting

From 2010 data

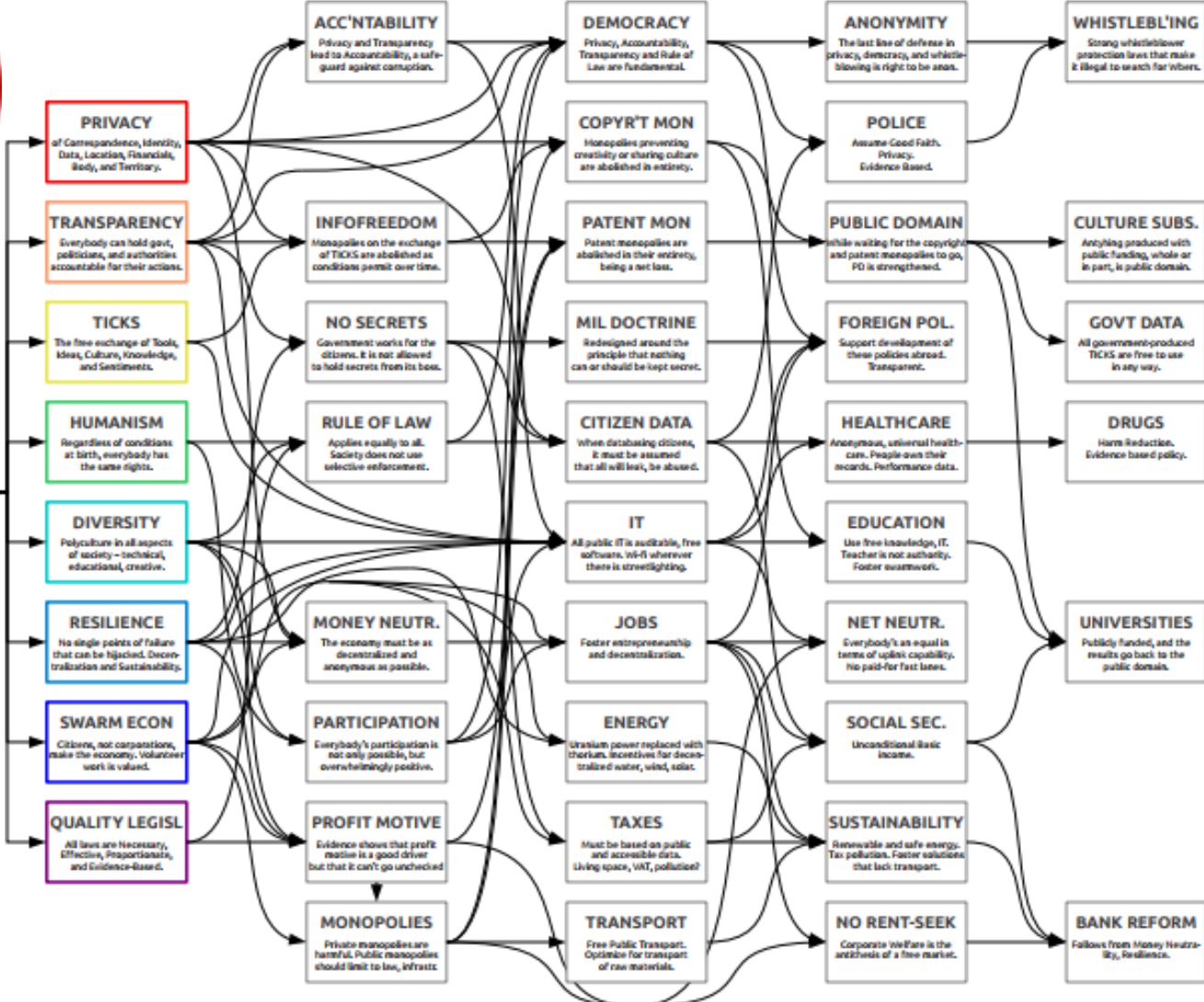| 2010 Redistricting Home				Colorado Congress
Alabama	Congress	House	Senate	
Alaska	-	House	Senate	
Arizona	Congress	House	Senate	
Arkansas	Congress	House	Senate	
California	Congress	Assembly	Senate	
Colorado	Congress	House	Senate	
Connecticut	Congress	House	Senate	
Delaware	-	Senate	House	7 districts
Florida	Congress	House	Senate	Colorado House of Representatives
Georgia	Congress	House	Senate	
Hawaii	Congress	House	Senate	
Idaho	Congress	House	Senate	
Illinois	Congress	House	Senate	
Indiana	Congress	House	Senate	
Iowa	Congress	House	Senate	
Kansas	Congress	House	Senate	
Kentucky	Congress	House	Senate	
Louisiana	Congress	House	Senate	
Maine	Congress	Senate		
Maryland	Congress	House	Senate	65 districts
Massachusetts	Congress	House	Senate	
Michigan	Congress	House	Senate	Colorado Senate
Minnesota	Congress	House	Senate	
Mississippi	Congress	House	Senate	
Missouri	Congress	House	Senate	
Montana	-	Senate	House	
Nebraska	Congress	Legislature		
Nevada	Congress	Assembly	Senate	
New Hampshire	Congress	Senate		
New Jersey	Congress	General	Senate	
New Mexico	Congress	House	Senate	
New York	Congress	Assembly	Senate	35 districts

United States Pirate Party

Philosophies and Policies of the Pirate Wheel

Boxes under Foundation and Principles are clickable for more information, with the rest coming later

http://falkvinge.net/files/2012/manual/PirateWheel-2012-11-10.pdf

https://en.wikipedia.org/wiki/United_States_Pirate_Party

Predictions for 2018

- Transparency will be a national political issue.
- There will be significant progress publishing, accessing, and using open water data in Colorado.
- Key projects and organizations will catalyze the use of open data.
- Organizations will increasingly use open data and data-driven stories to present issues through the lens of each organization.

Share It

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open data | open software | open decisions

openwaterfoundation.org