Tulare Lake Basin Data Collaborative

ESRI UC 2019

Tuesday 10 am Room SDCC 29c

Michael Hickey Tulare County GIS

Overview of the TLB GeoDatabase

There is a wealth of GIS data available to study water issues in California.
Unfortunately, this data is in a number of “data silos” using different conventions.

Tulare County GIS has tried to collect this data in a single geodatabase, using a consistent set of naming conventions, symbology, etc.

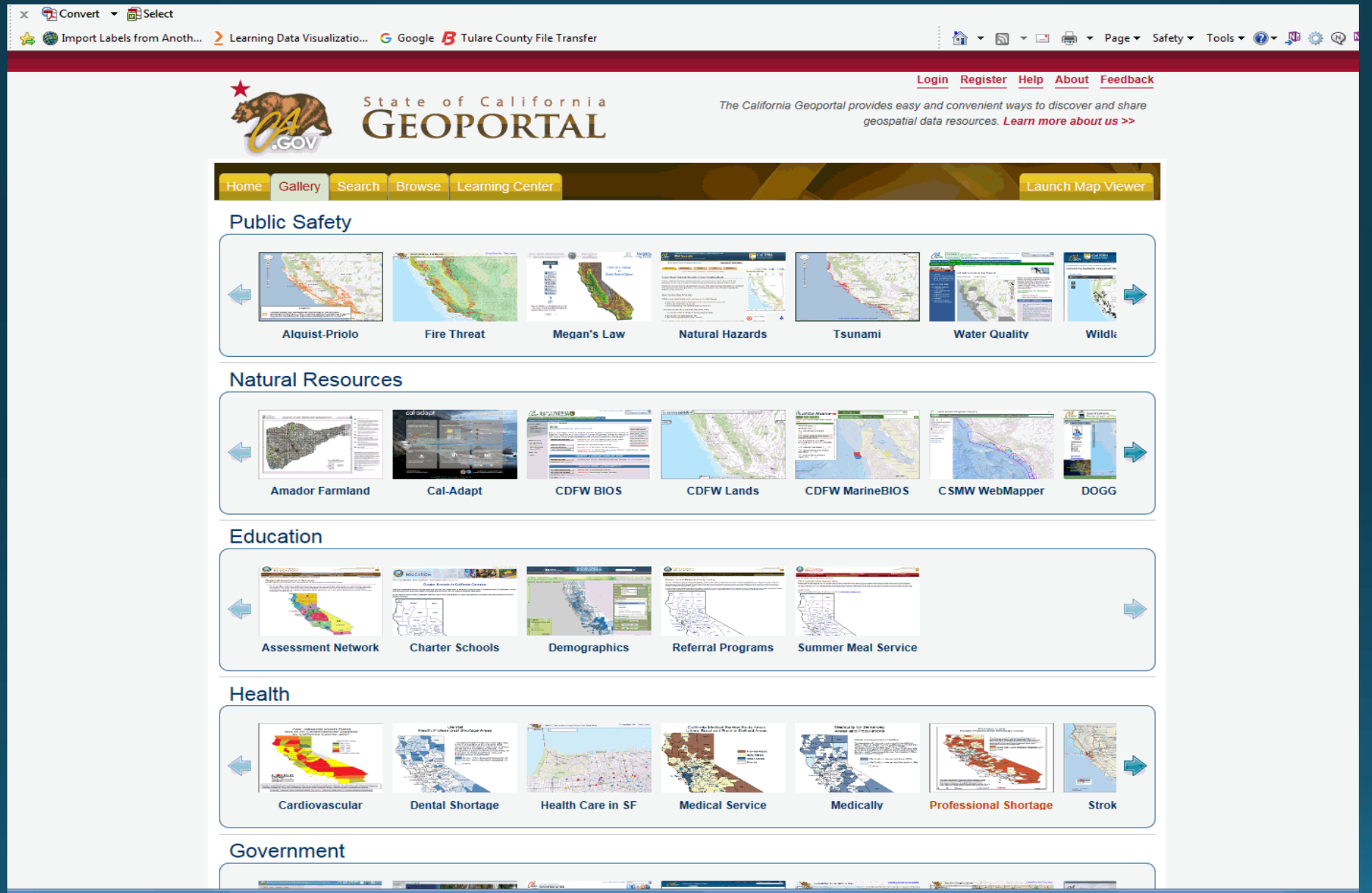
It is time to release this “work in process” so that others may point out imperfections & data gaps. It is hoped that others in our region will participate by becoming “Data Stewards”

Major Issues Encountered:

Why is data so hard to find?
How is the data kept current?
What does the data mean?
How is the data shared?

Why is data so hard to find?

Data is kept in many SILOS



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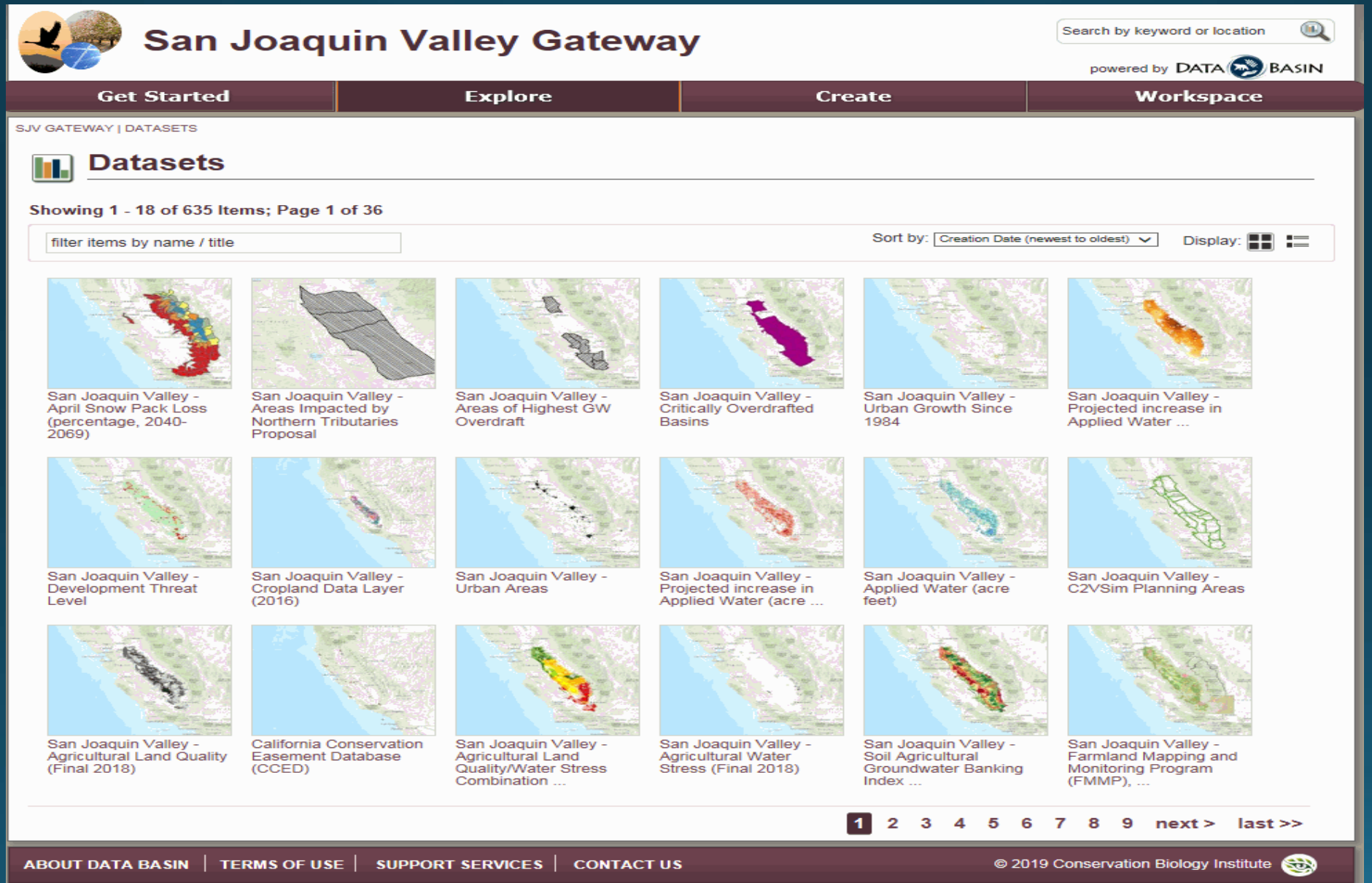


Why is data so hard to find?

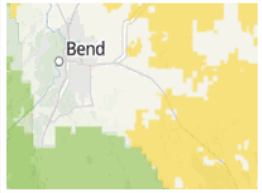
Data is kept in many SILOS

All | Trending | Basemaps | Imagery | Boundaries | People | Infrastructure | Environment

Filters: Layers | All time | United States | Esri-only content

Sort by: Relevance

168 Results



USA Federal Lands

Imagery Layer By: esri

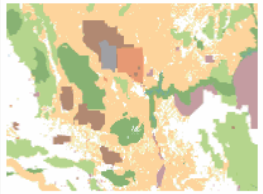
This layer displays lands in the United States managed by six federal agencies.

Subscriber | Authoritative

U.S. National Grid

Map Image Layer By: Federal_User_Community

This map layer portrays U.S. National Grid data. It provides a nationally consistent grid reference system.



USA Generalized Federal Lands

Map Image Layer By: esri

Lands owned or administered by the federal government. Derived from the National Map Small Scale, National Atlas of the United States.

Authoritative

Watershed Boundaries

Map Image Layer By: Federal_User_Community

This U.S. Geological Survey (USGS) map layer displays the National Watershed Boundary Dataset (WBD)

Shale Gas Plays

Map Image Layer By: Federal_User_Community

This map layer, derived from Energy Information Administration data, depicts current shale gas resource areas within the continental U.S.

Charted Territory

Tile Layer By: esri

This (v2) vector tile layer provides a detailed basemap for the world featuring a geopolitical style reminiscent of a printed atlas plate or a school classroom wall map. This layer is designed for use with shaded relief.

Authoritative

Why is data so hard to find?

Data is kept in many SILOS

The National Map

From Wikipedia, the free encyclopedia

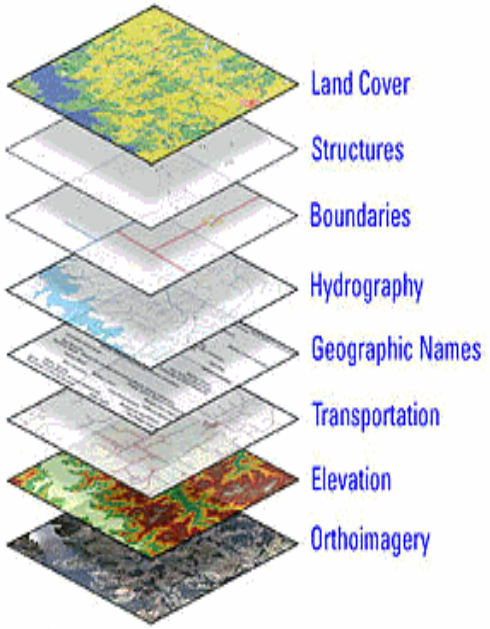
The National Map is a collaborative effort of the United States Geological Survey (USGS) and other federal, state, and local agencies to improve and deliver topographic information for the United States.[1] The purpose of the effort is to provide "...a seamless, continuously maintained set of public domain geographic base information that will serve as a foundation for integrating, sharing, and using other data easily and consistently".[2]

The National Map is part of the USGS National Geospatial Program.[3] The geographic information available includes orthoimagery (aerial photographs), elevation, geographic names, hydrography, boundaries, transportation, structures and land cover. *The National Map* is accessible via the Web, as products and services, and as downloadable data. Its uses range from recreation to scientific analysis to emergency response.[1]

The National Map is a significant contribution to the National Spatial Data Infrastructure (NSDI) and currently is being transformed to better serve the geospatial community by providing high quality, integrated geospatial data and improved products and services including new generation digital topographic maps. In addition, the National Map is foundational to implementation of the U.S. Department of the Interior (DOI) Geospatial Modernization Blueprint.[1]

The USGS also utilizes data from *The National Map* Corps, which consists of volunteers who devote some of their time to provide cartographic information on structures.[4]

The National Map is the official replacement for the USGS topographic map program.[5]

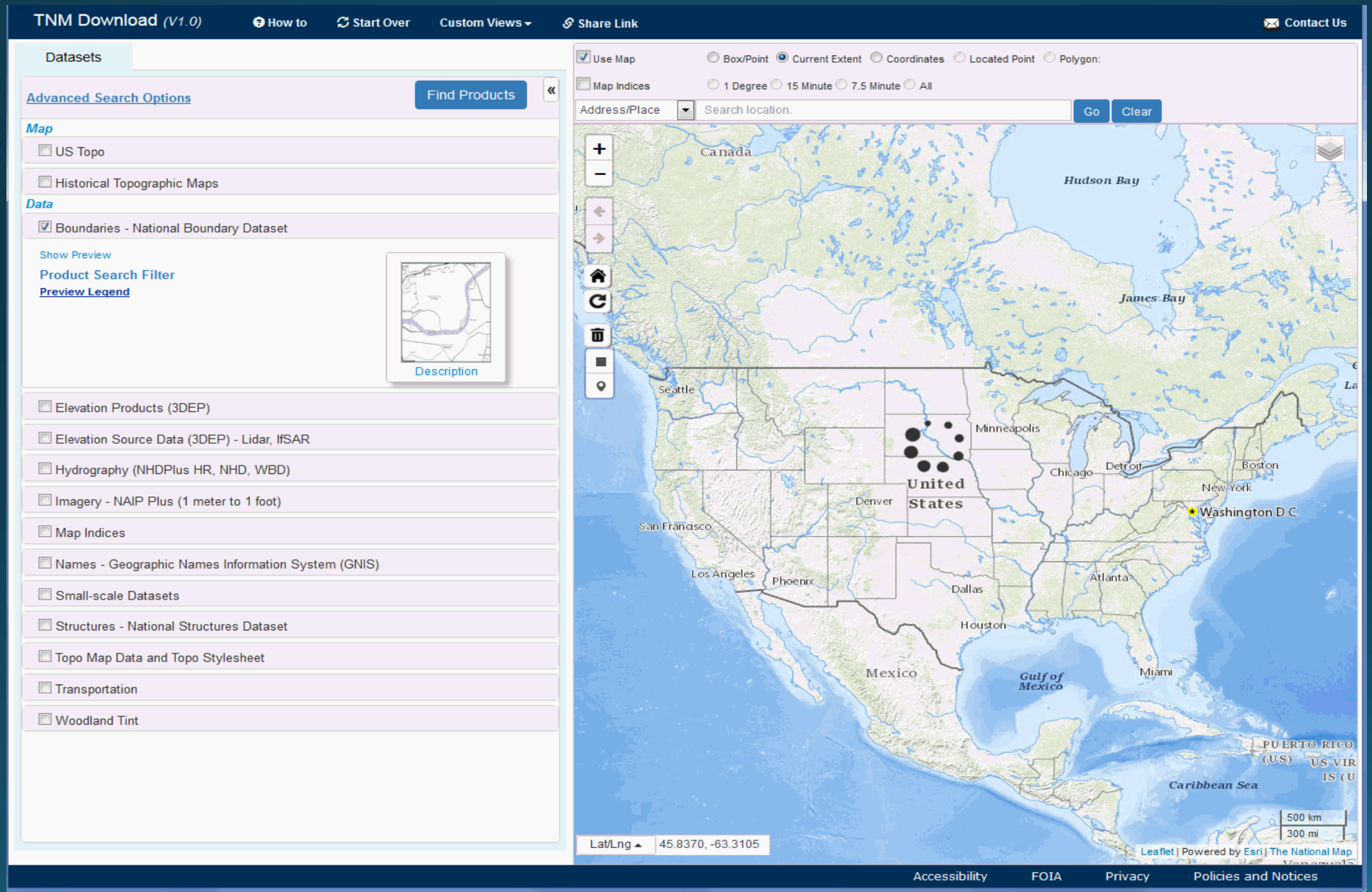


The National Map

USGS
science for a changing world

Why is data so hard to find?

Data is kept in many SILOS



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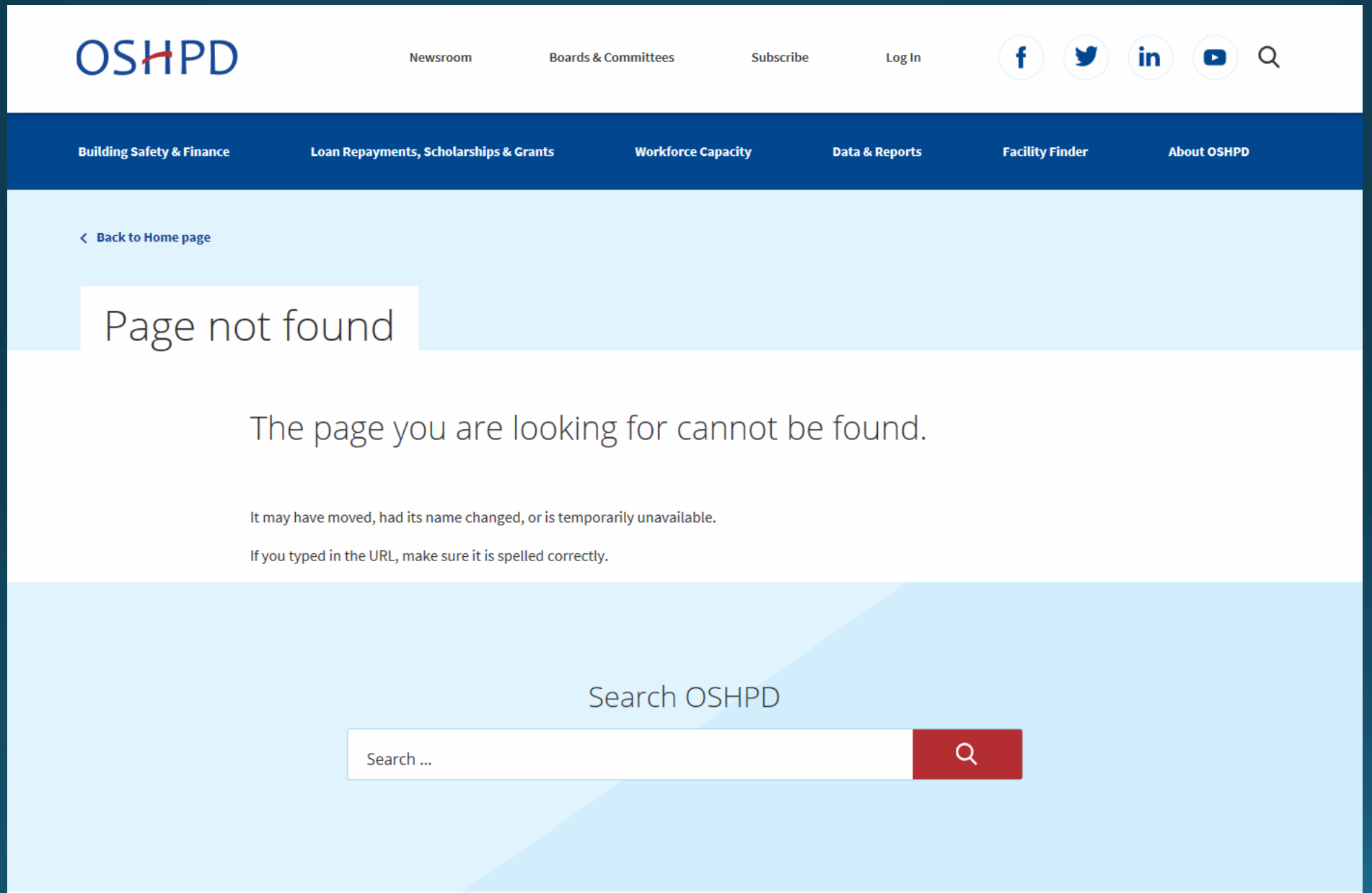


Why is data so hard to find?

The Alphabet is a poor organizing concept

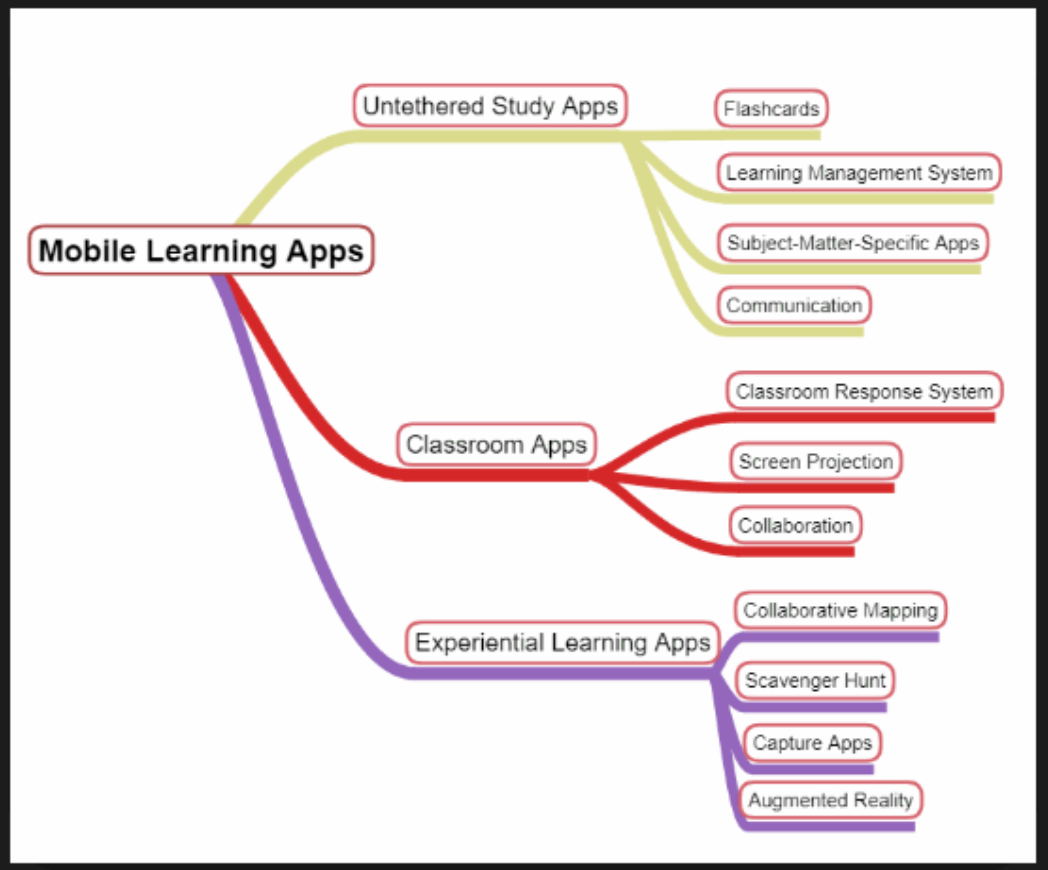
STUDENT: “How do spell ‘Sy Kohl Oh Gee’?”
TEACHER: “Sound the word out, and look it up in the dictionary!”

The student will NOT be rewarded for his efforts!

Most data silos lack a coherent TAXONOMY and rely using “keywords” … But am I looking for STREET, ROAD, HIGHWAY?
(Do you really need to use a thesaurus to search for data?)

Why is data so hard to find?

GIS lacks TAXONOMY



544 × 453 - Images may be subject to copyright. Learn More

tax·on·o·my

/takˈsänəmē/

noun BIOLOGY

the branch of science concerned with classification, especially of organisms; systematics.

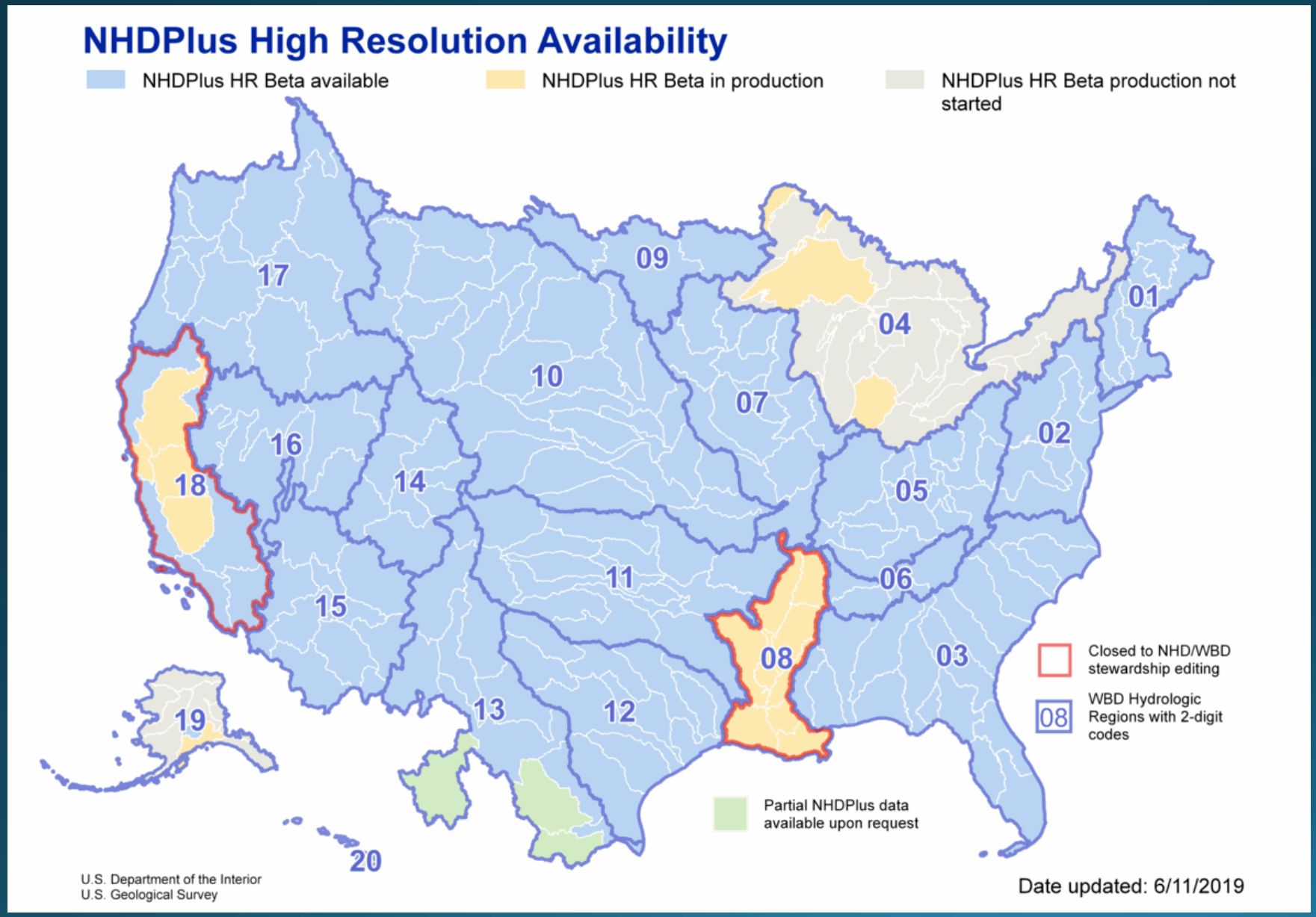
- the classification of something, especially organisms.
  "the taxonomy of these fossils"
- a scheme of classification.
  plural noun: taxonomies
  "a taxonomy of smells"

Taxonomy clusters similar things together.

One way to view TAXONOMY is that it is little more that an consistent set of naming conventions.

TAXONOMY CUBE FOR GIS

Why is data so hard to find?



The NHD is organized into a hierarchical set of areas, from small local areas to the nation as a whole.

Surface water drainage areas is the organizing principle.

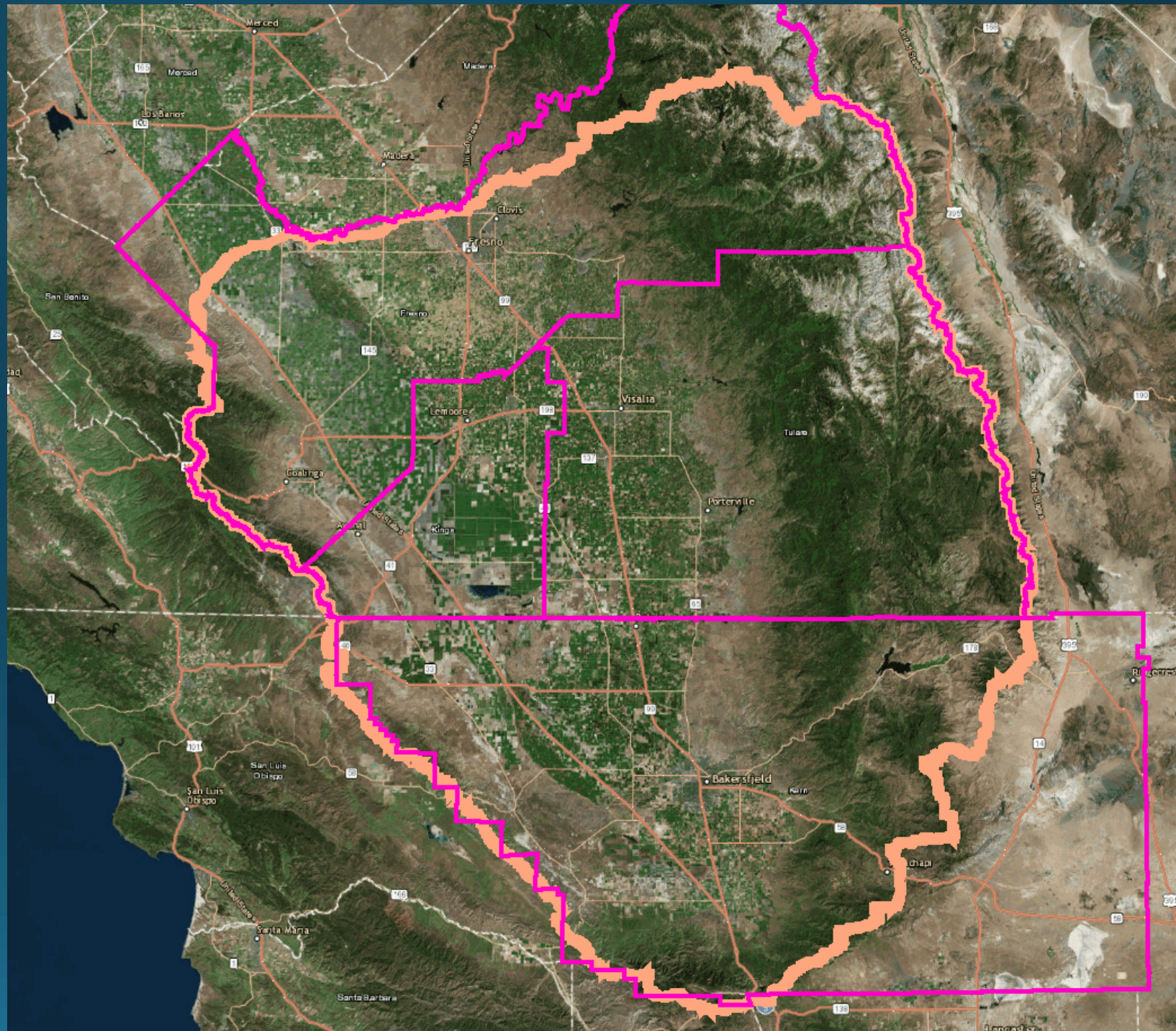
Why is data so hard to find?

The Tulare Lake Basin (TLB) GeoDataBase is a collection of GIS data focusing on the four counties of Fresno, Kern, Kings, and Tulare.

All data is in Web Mercator projection;

follows of consistent set of naming conventions;

and is made available through web services.



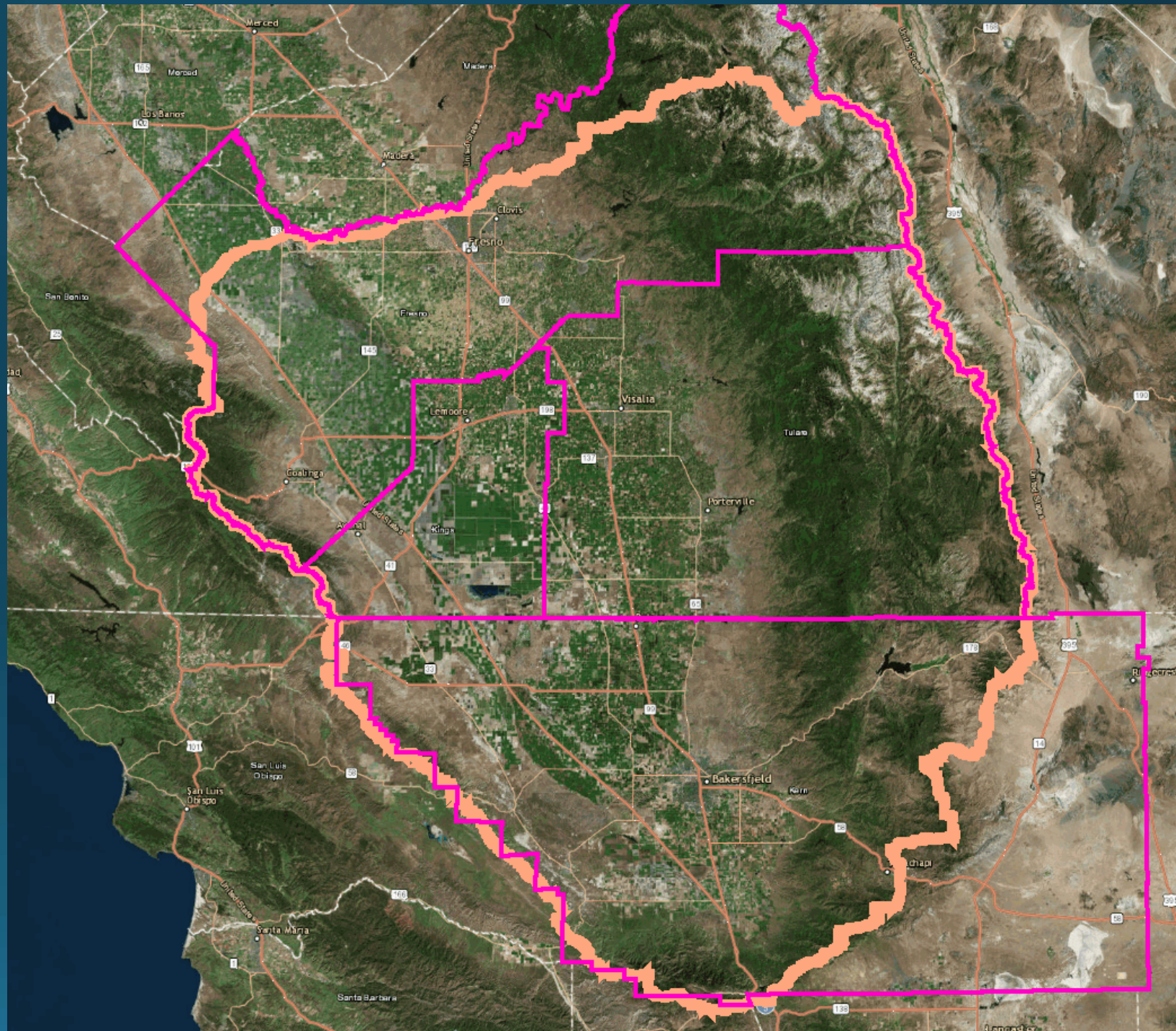
Why Web Mercator?

Most Web Services have standardized on Web Mercator projection.

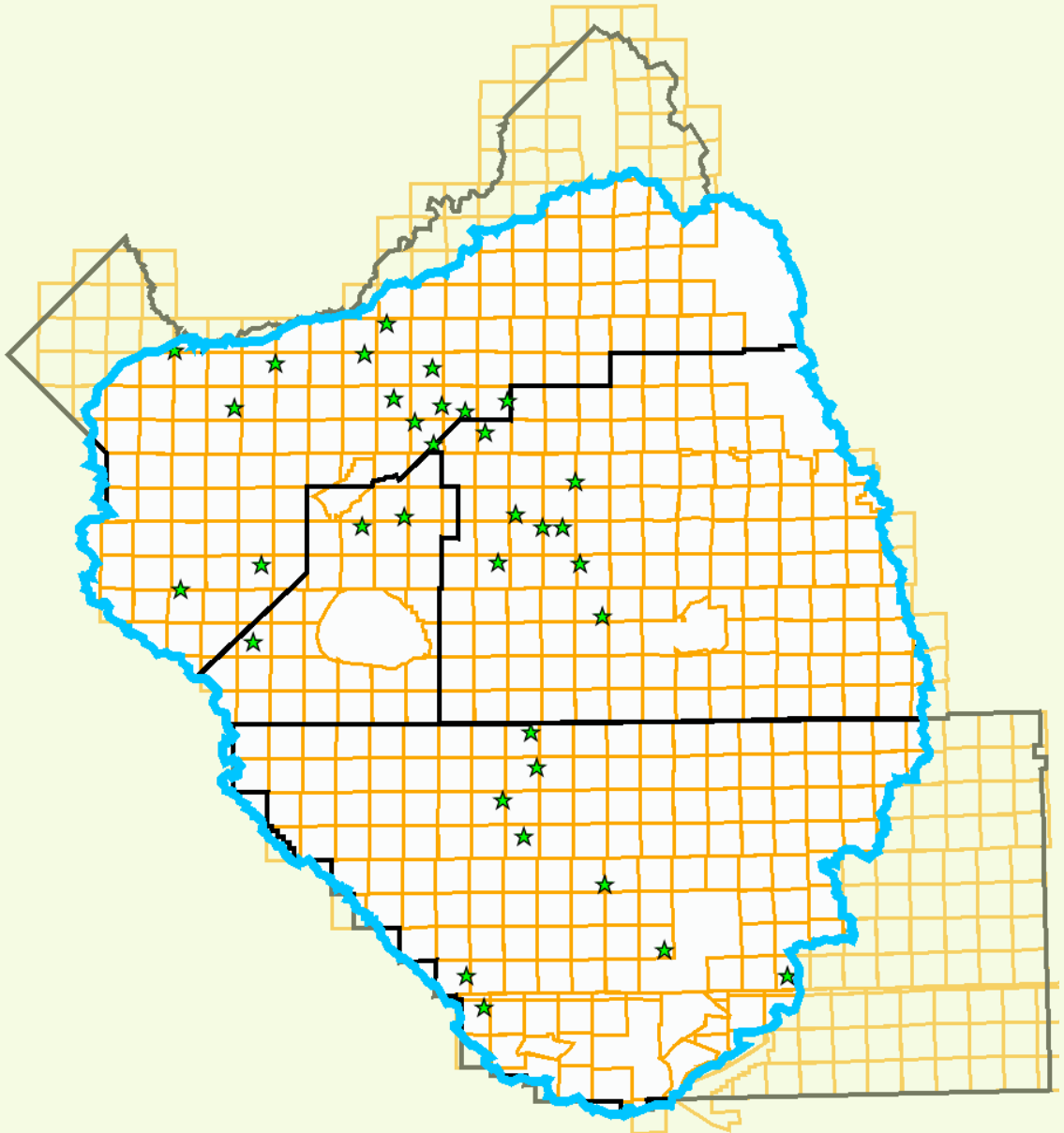
For a long time my reaction was “UGH!” … because Mercator data is so distorted.

Some how Web Mercator avoids this problem.

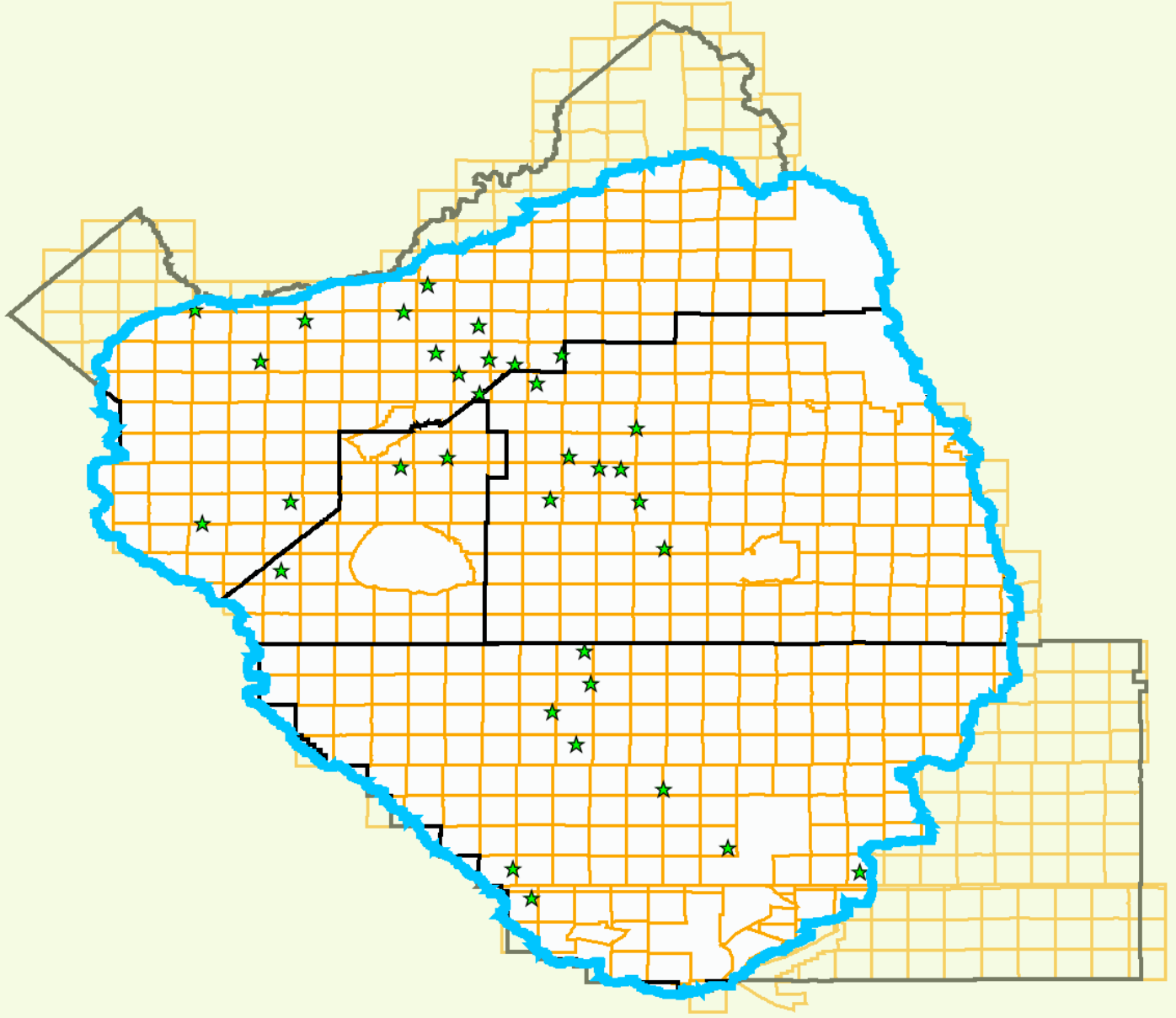
Web Mercator data is NOT in Decimal Degrees!



TLB in Teale Albers Projection
- the preferred projection for state-wide data in California -



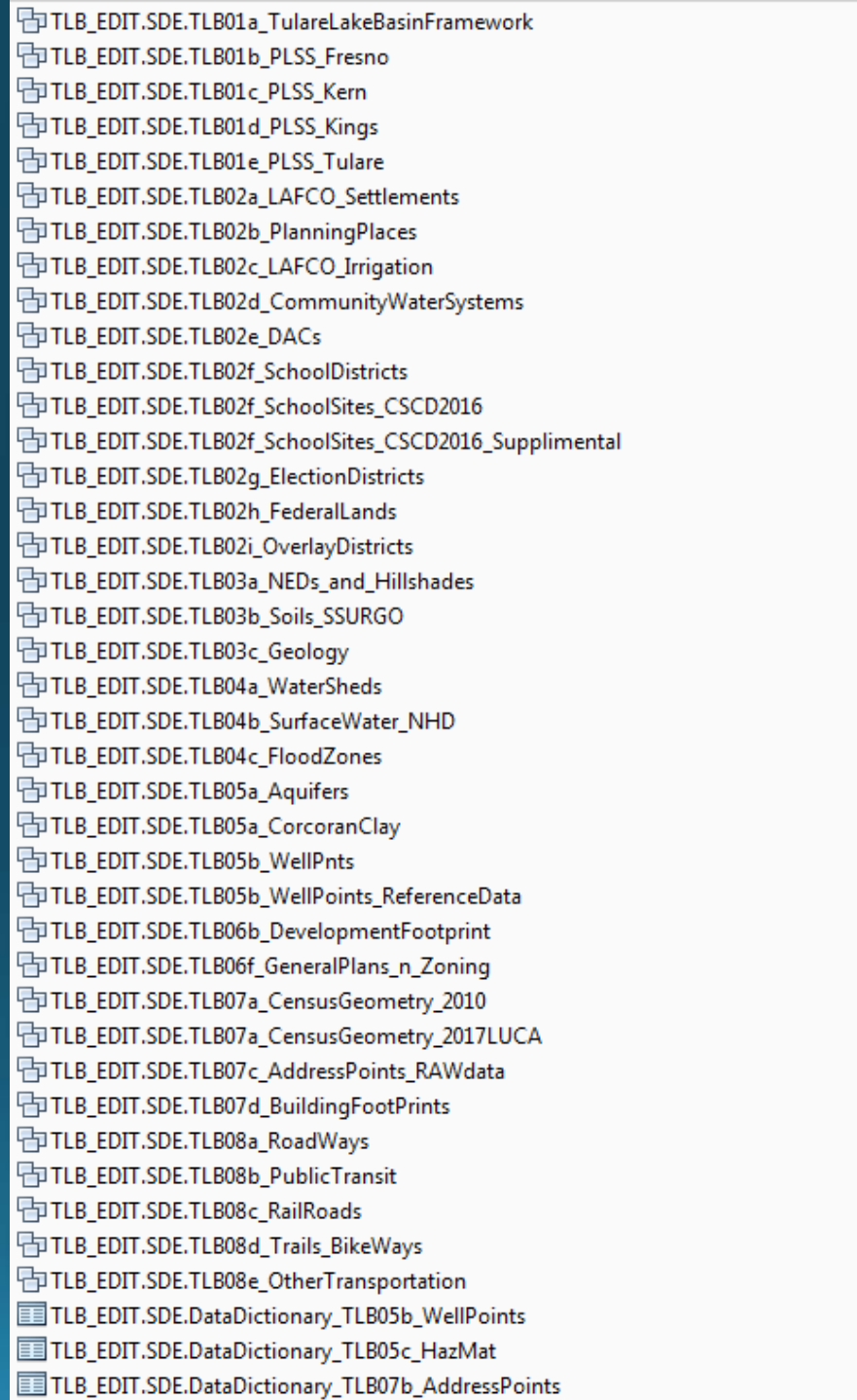
TLB in Standard Mercator Projection
- GPS data (decimal degrees) is ALWAYS Standard Mercator -



TLB GeoDataBase Taxonomy (shapes / tables / raster)

TLB01 – PLSS Framework
TLB02 – Districts
TLB03 – Topography
TLB04 – Surface Water
TLB05 – Ground Water
TLB06 – Land Cover / Land Use
TLB07 – Demography / Address Points
TLB08 – Transportation
TLB09 – Climate

(and possible additions)



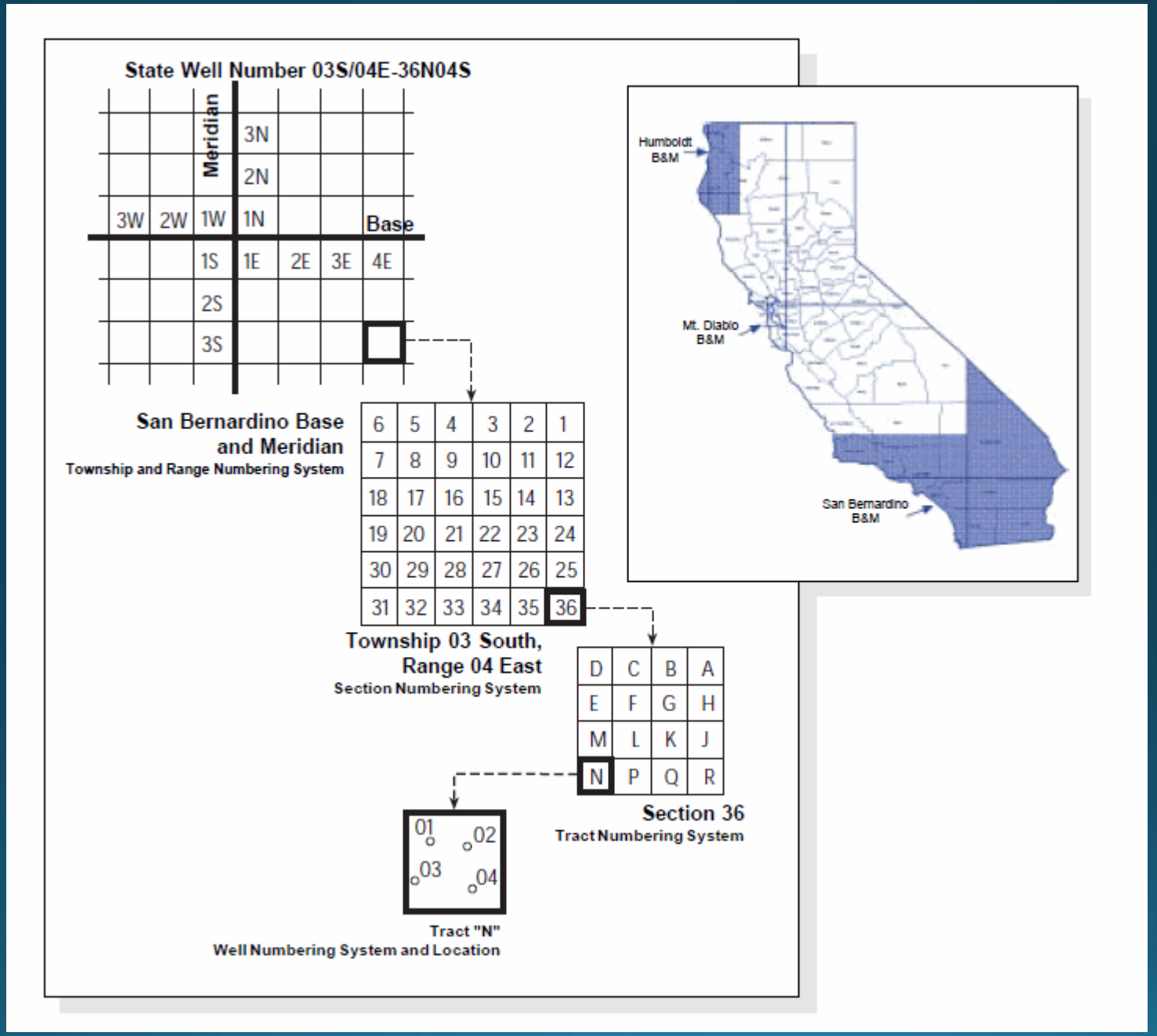
TLB01_Framework

The Public Lands Survey System has been used in all states admitted to the Union after 1800.

Each state has exceptions

In California these exceptions are old Spanish land grants & Indian Reservations

This system is also used as a coding system to locate places,
such as wells.



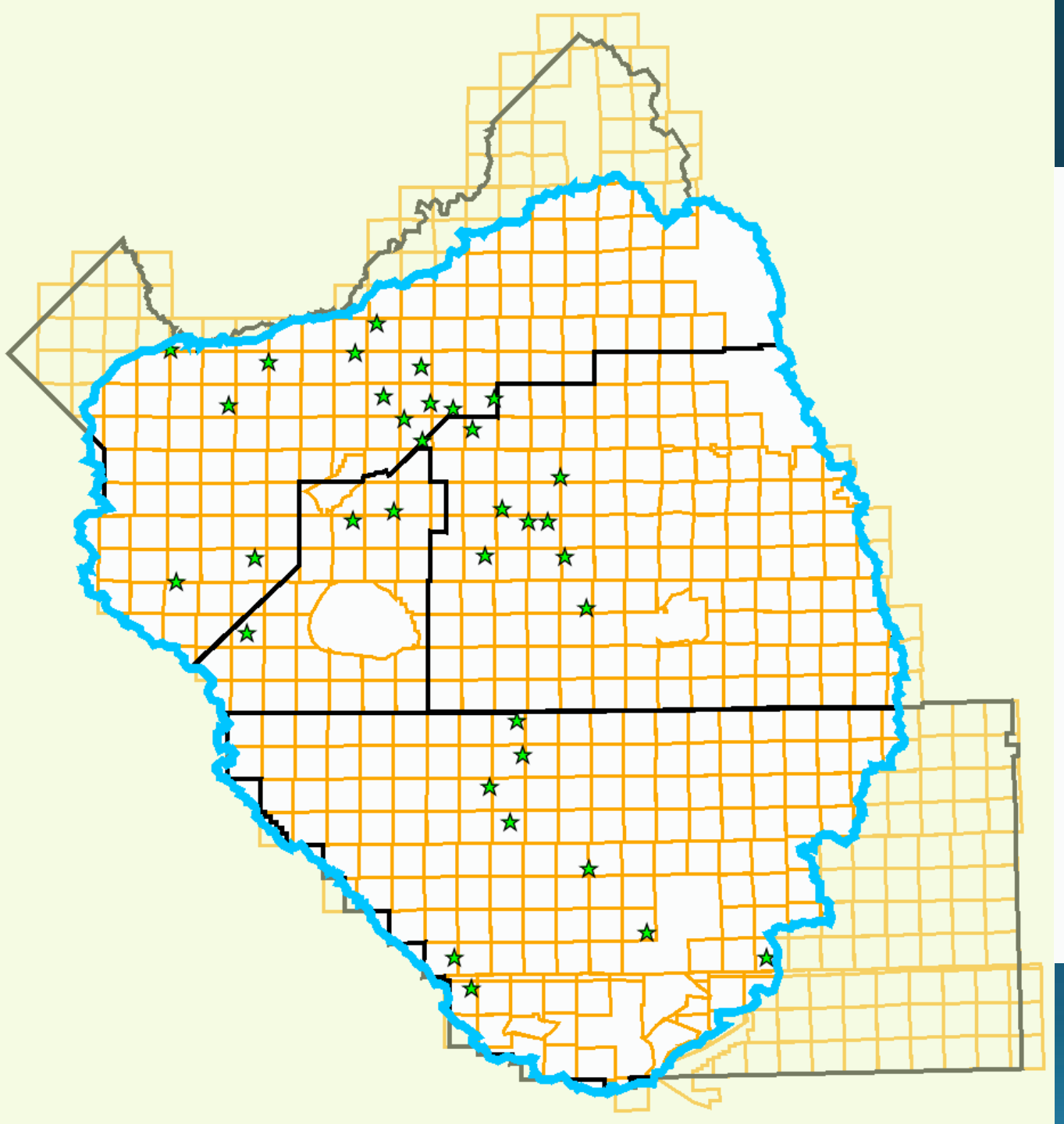
TLB01_Framework

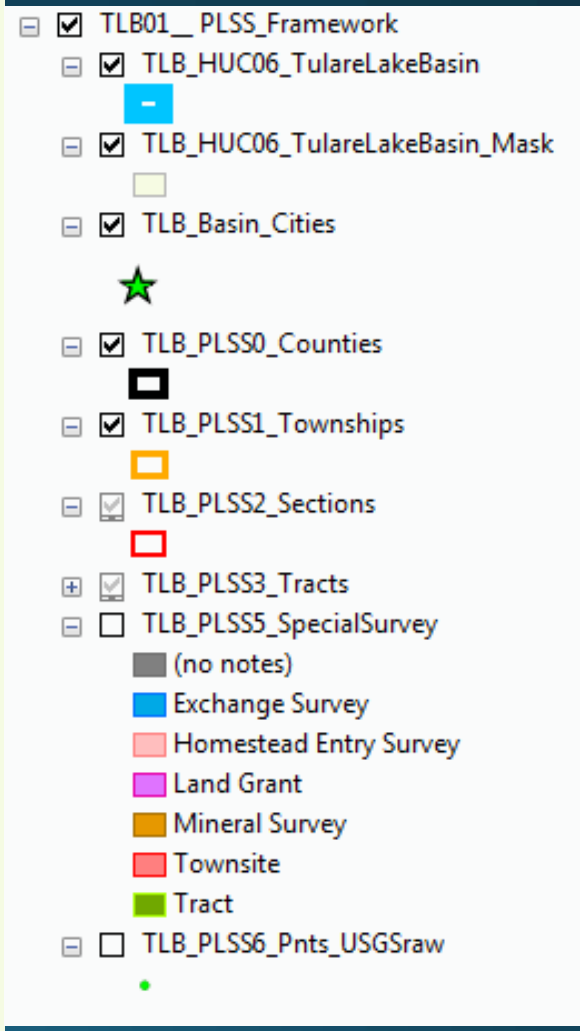
Data Stewards:

PLSS:
BLM: National PLSS grid
County GIS(s): Fill in gaps

County Boundaries
Each County is on its own (no state standard)

Parcels
County Assessors/GIS





TLB01_Framework

All GIS data is flawed, if you look too close…

In time, these inconsistencies will be resolved.

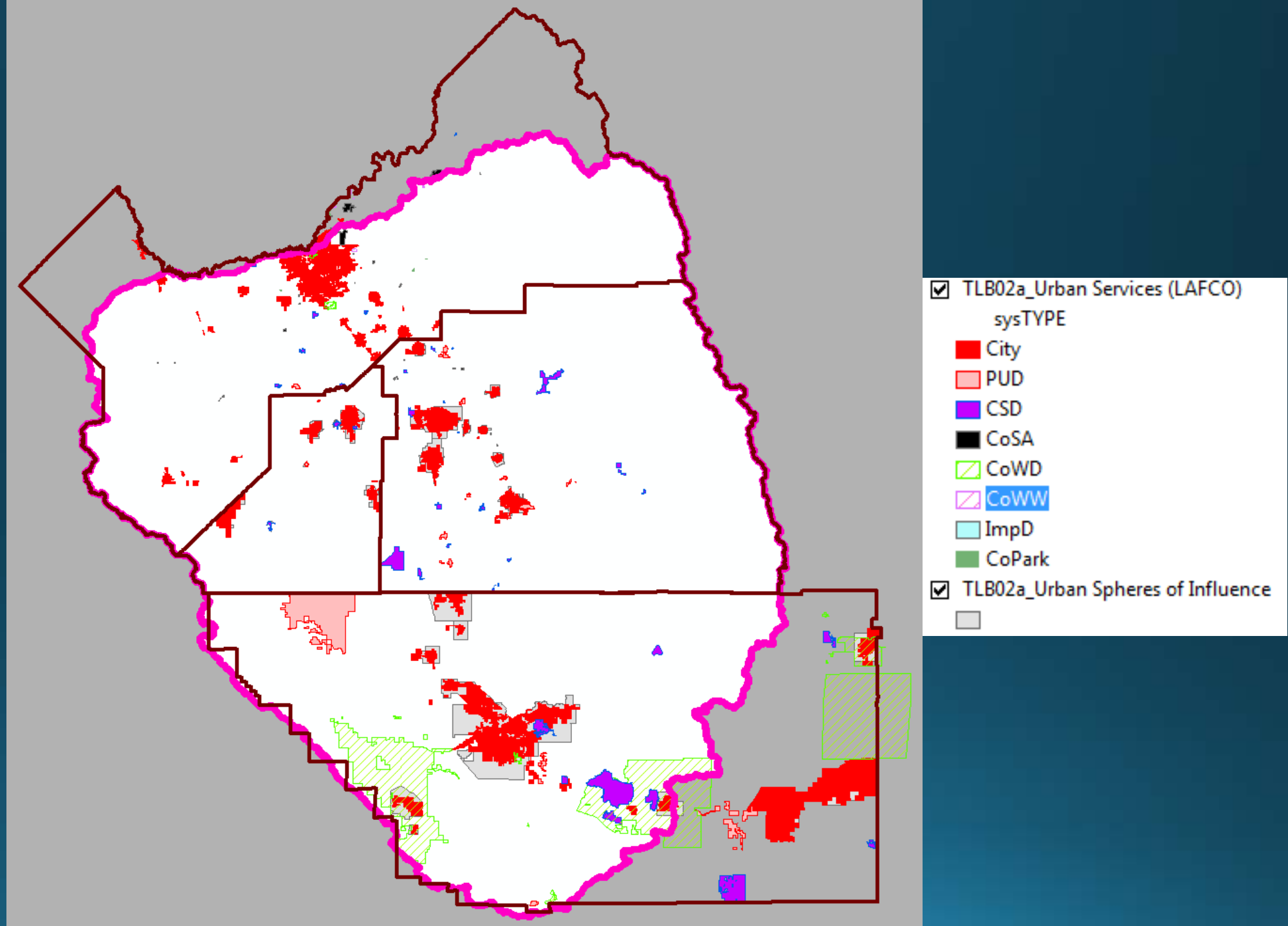
Currently, most PARCELS are drawn from assessor's pages, which were developed without the benefit of valid electronic PLSS data.

TLB02_Districts

TLB02a_LAFCO Settlements

An assemblage of the boundaries of local governments that provide Urban Services within their district.

County LAFCOs are the Data Stewards of such data.

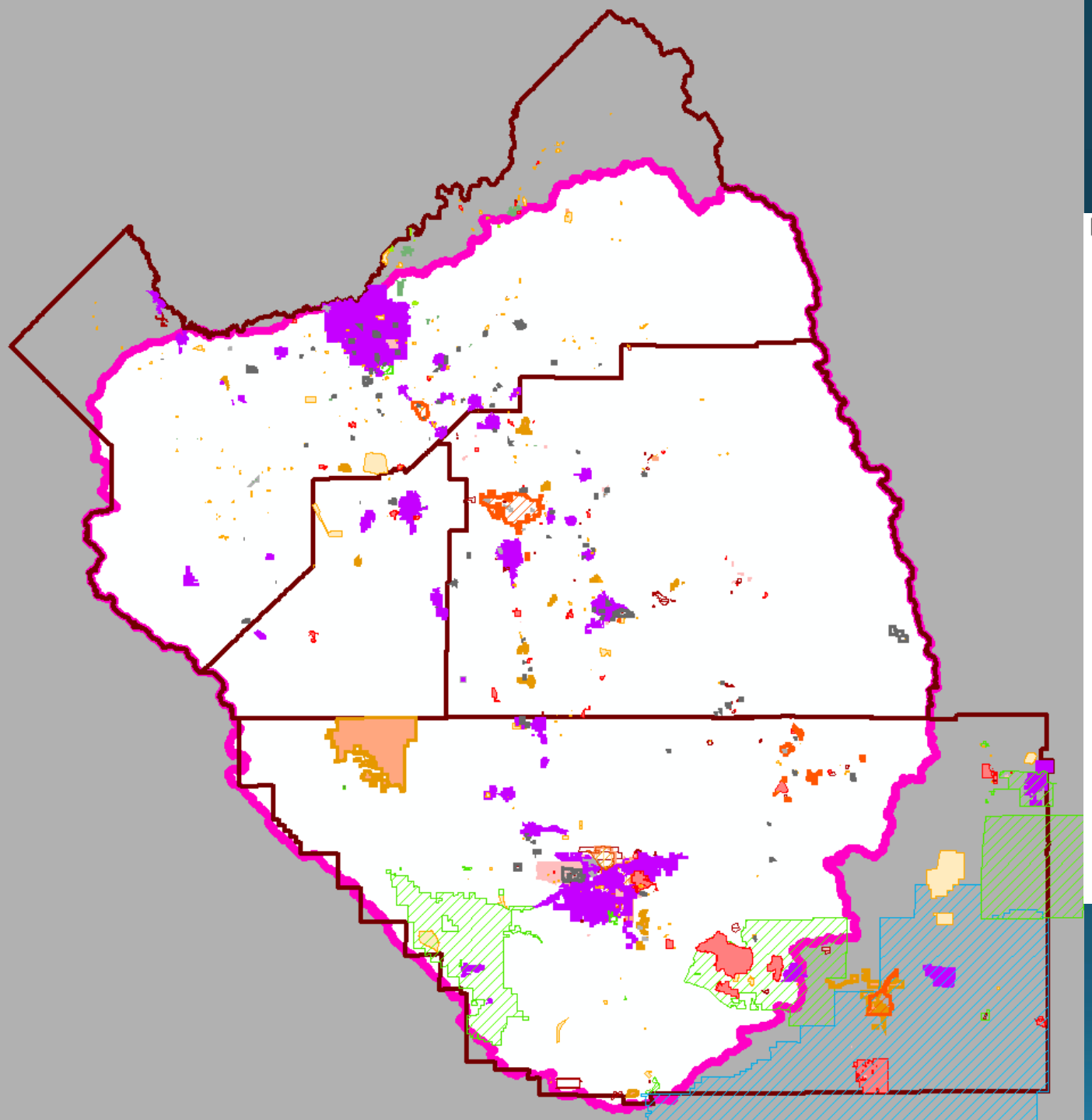


TLB02_Districts

TLB02d_PWS

The “Public Water Systems” layer is an assemblage of agencies that provide drinking water to the population of a designated area.

Some of these agencies of local governments, some are private corporations. These water service agencies are NOT under the jurisdiction of LAFCOs.

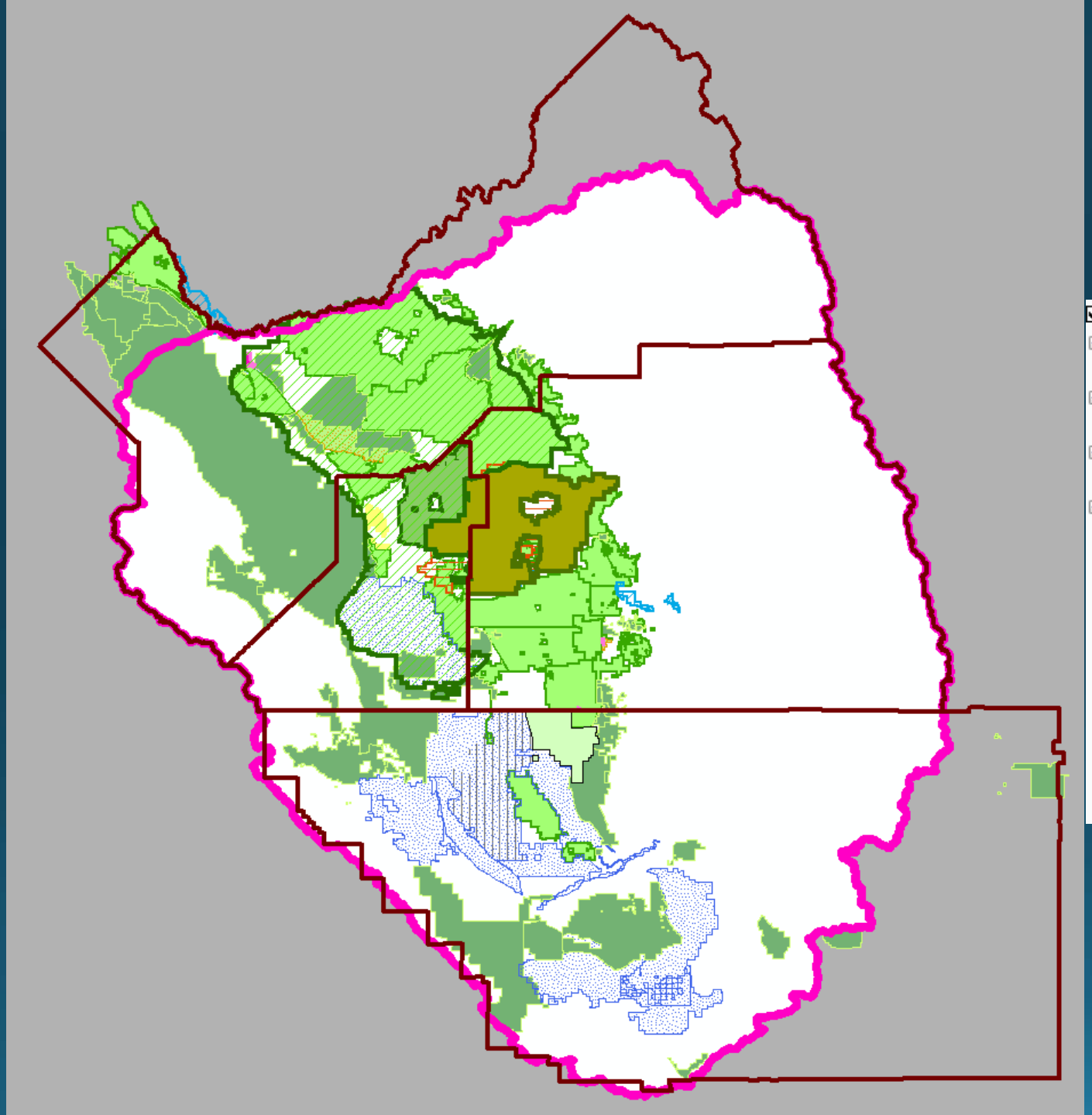


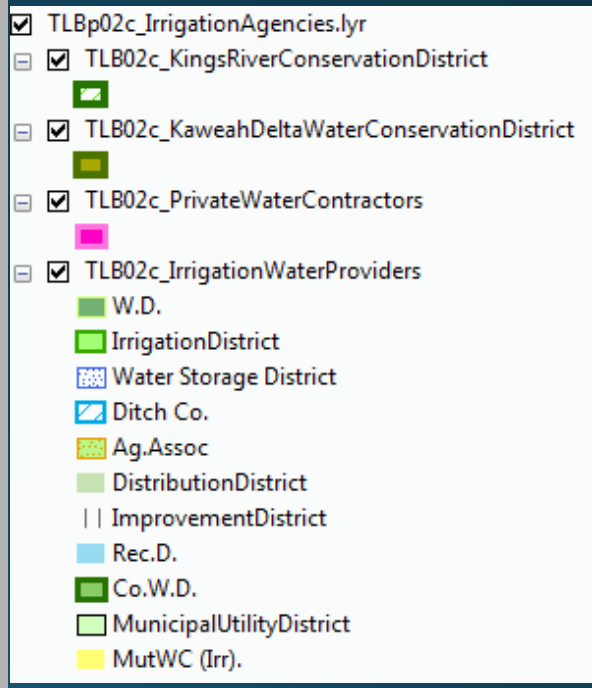
TLB02_Districts

TLB02d_Irrigation

An assemblage of the boundaries of local governments that provide Irrigation Water to farmers within their district.

There are also private ditch companies that still operate. If the service areas of these companies are known, they are included in the database.





TLB03_Topography

Topography is divided into three subsets:

TLB03a … Surface, represented by contour lines, DEMS, & Lidar data

TLB03b … Soils
The “Near Surface”

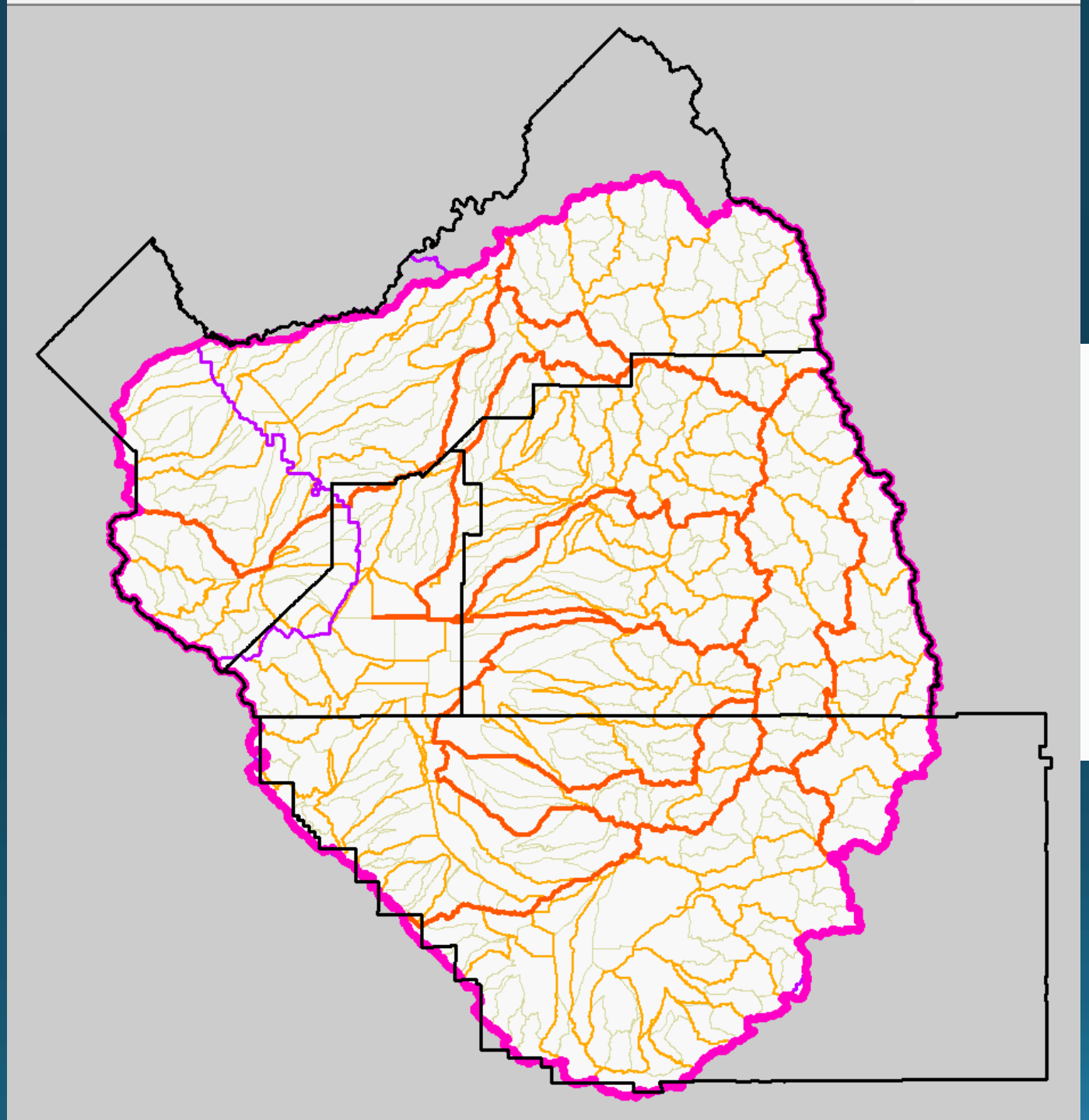
TLB03c … Geology
The “Deep Surface”

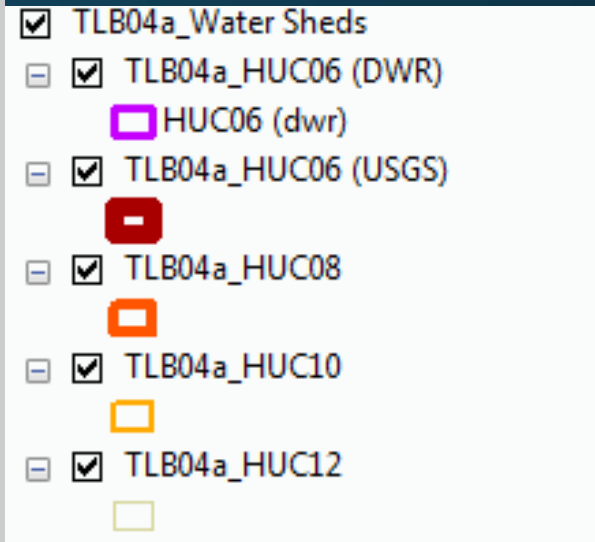
TLB04_Surface Water

TLB04a_Water Shed

The drainage area of each “water reach” is a part of the NHD (National Hydrological Database)

These drainage areas are organized into a hierarchical set of “drainage regions”.

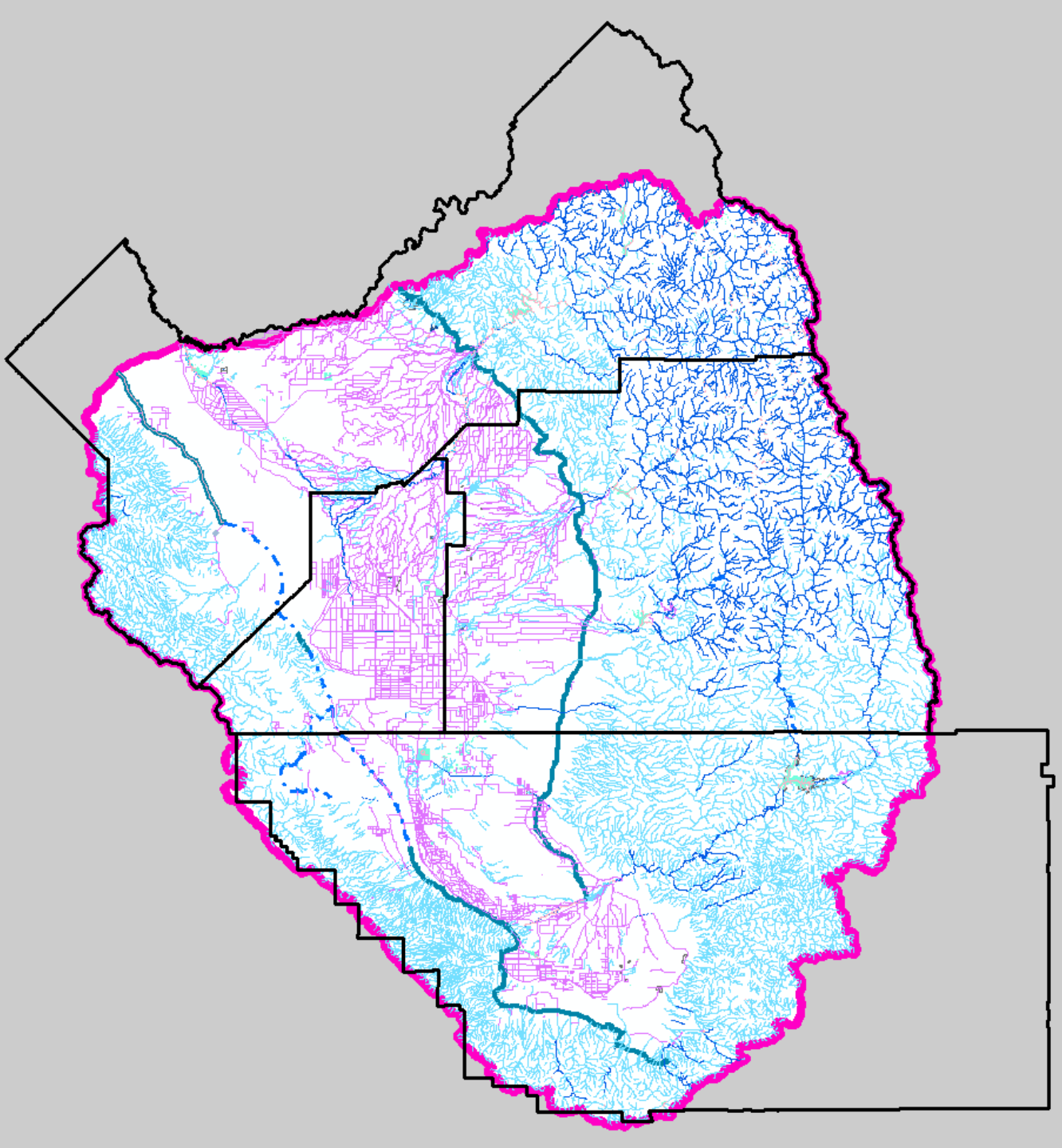




TLB04_Surface Water

TLB04b_Surface Water

This is the core of the NHD

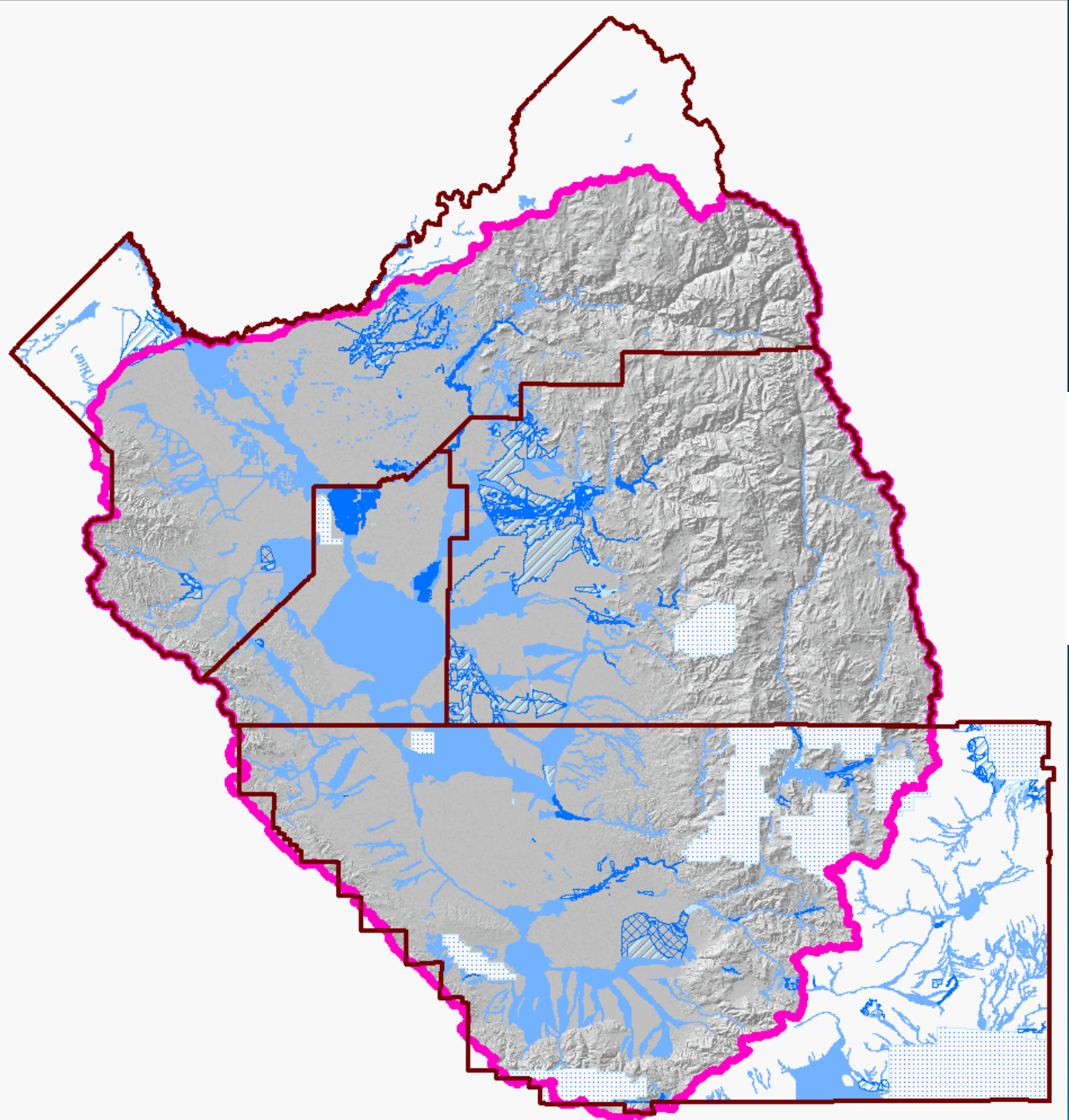


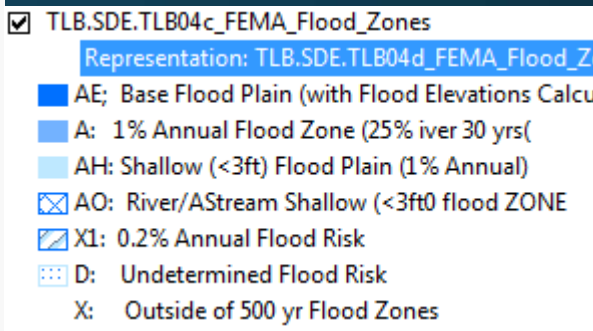
- TLB04_Surface Water (NHD)
  - TLB04b_NHD_FlowLines
    - <all other values>
    - 33400: Connector
    - 33600: Canal Ditch
    - 33601: Aquaduct
    - 42801: Aquaduct (pipeline at surface)
    - 42803: Aquaduct (pipeline underground)
    - 42813: Aquaduct (siphon)
    - 46003: Stream (intermittent)
    - 46006: Stream (perennial)
    - 46013: River (intermittent)
    - 55800: Artificial Path
  - TLB04b_NHD_WaterAreas
    - 33600: Irrigation Ditch
    - 33601: Acquaduct
    - 40307: Inundation Area (uncontrolled)
    - 40308: Inundation Area (controlled)
    - 46003: Rivers (Intermittent)
    - 46006: Rivers (Perennial)
    - 48400: Wash
  - TLB04b_NHD_WaterBodies
    - 37800: Ice Mass
    - 39001: Pond (Intermittent)
    - 39004: Lake/Pond (Perennial)
    - 39009: Lake/Resevoir (Perennial)
    - 39010: Resevoir (Perennial)
    - 43600: Resevoir
    - 43606: Resevoir - Disposal
    - 43624: Waste Water Treatment Pond
    - 46600: Swamp/Marsh

TLB04_Surface Water

TLB04c_FEMA Flood Zones

An evaluation of the “flood risk” of all lands in the USA…





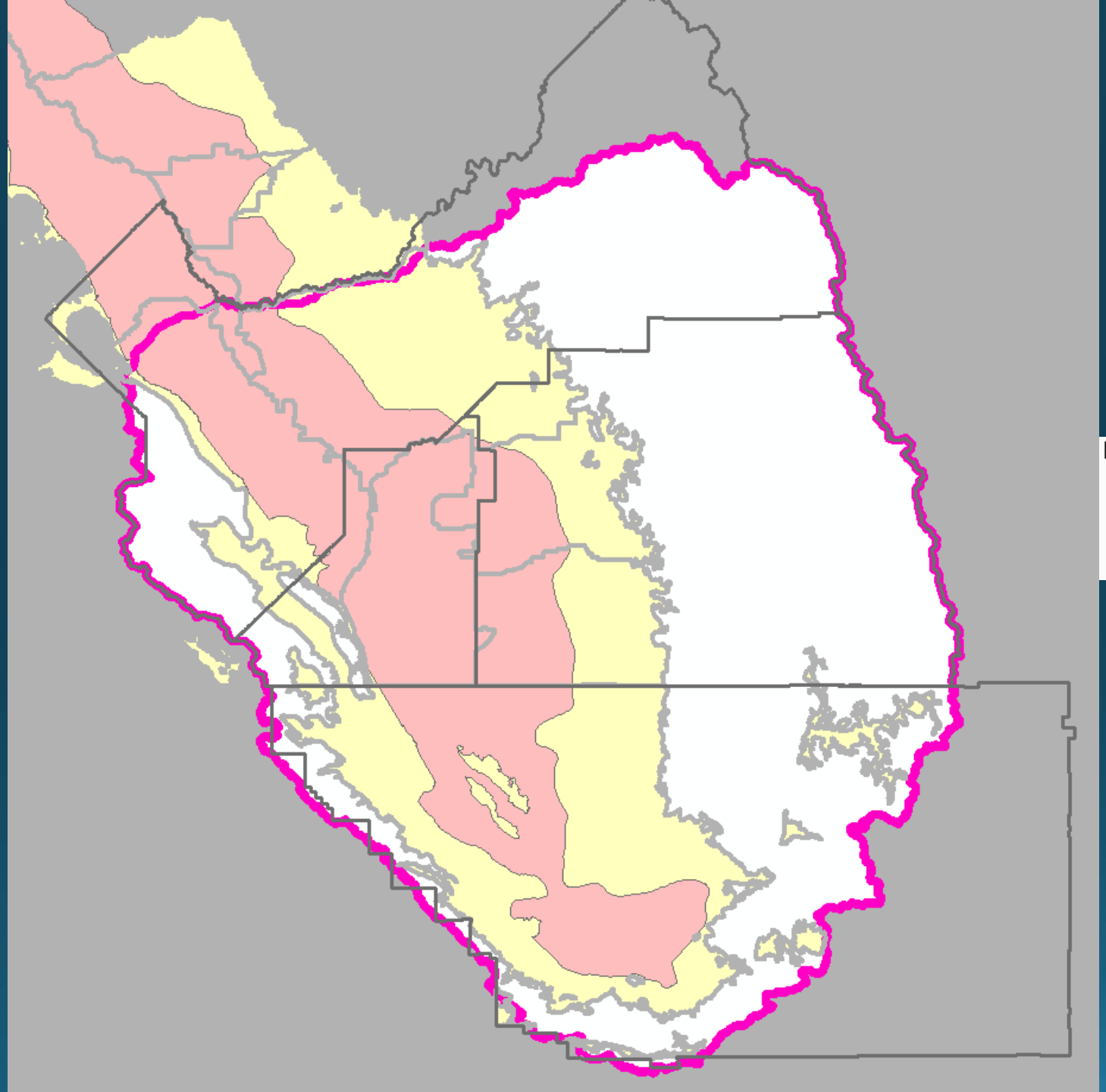
TLB05_Ground Water

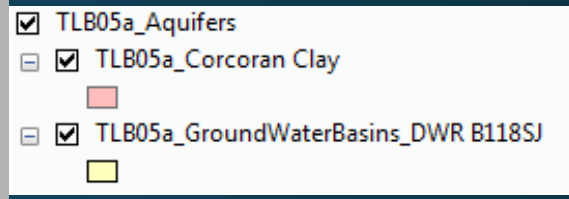
TLB05a_Aquifers

The San Joaquin Valley Aquifer is divided into a number of sub basins (based on surface water sources).

The SJV Aquifer can also be divided into four regions:

* West of Corcoran Clay
* Above Corcoran Clay
* Below Corcoran Clay
* East of Corcoran Clay



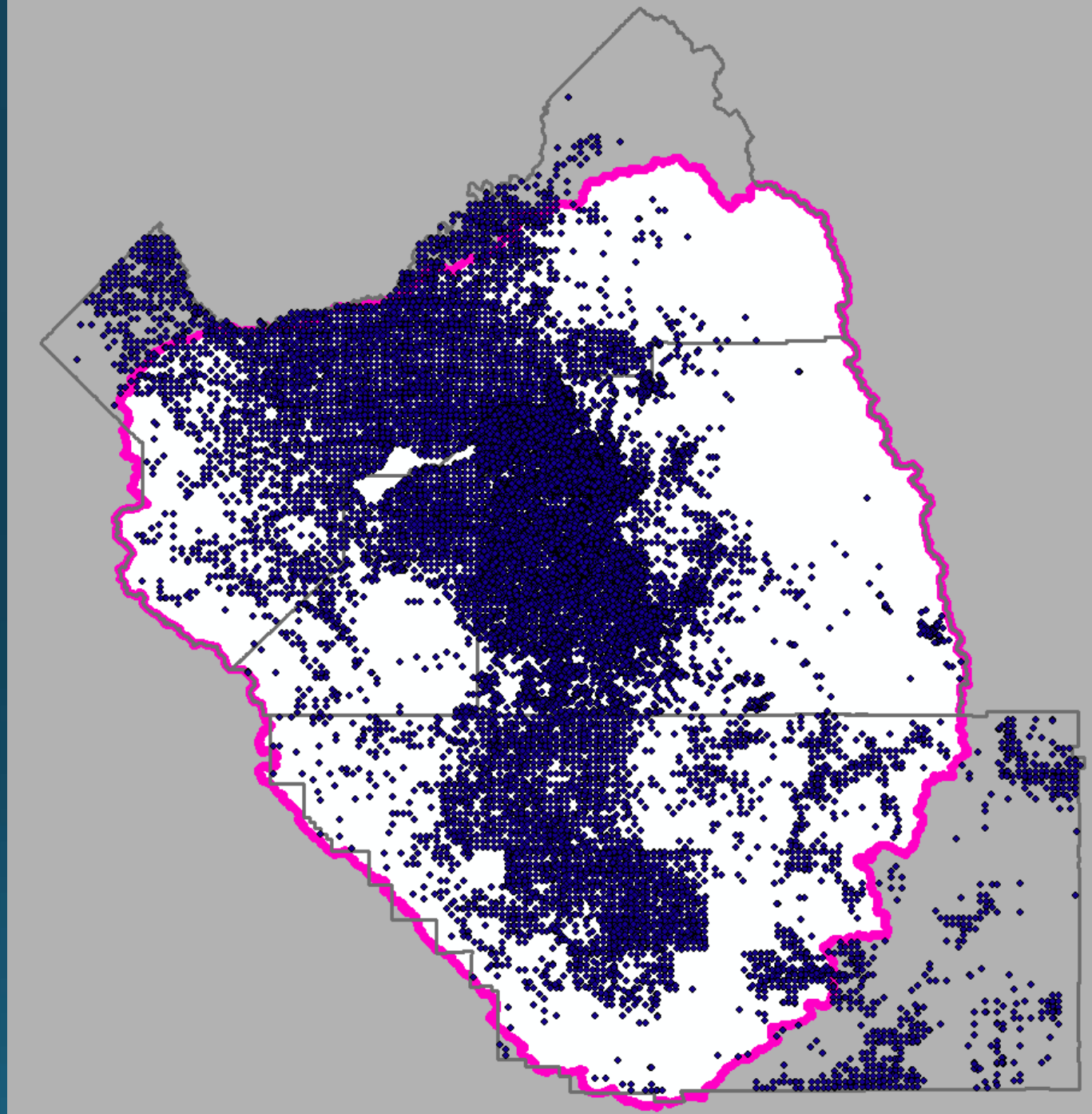


TLB05_Ground Water

TLB05b_Wells

There are 78242 wells with unique WCR_ID (1970-2015), with each well linked to a single Well Log image. This is the “low hanging fruit”.

There are thousands of other wells that are more confusing, and will take effort to sort out, and include in the Master DataBase…



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Thur 10 am Rm 29c

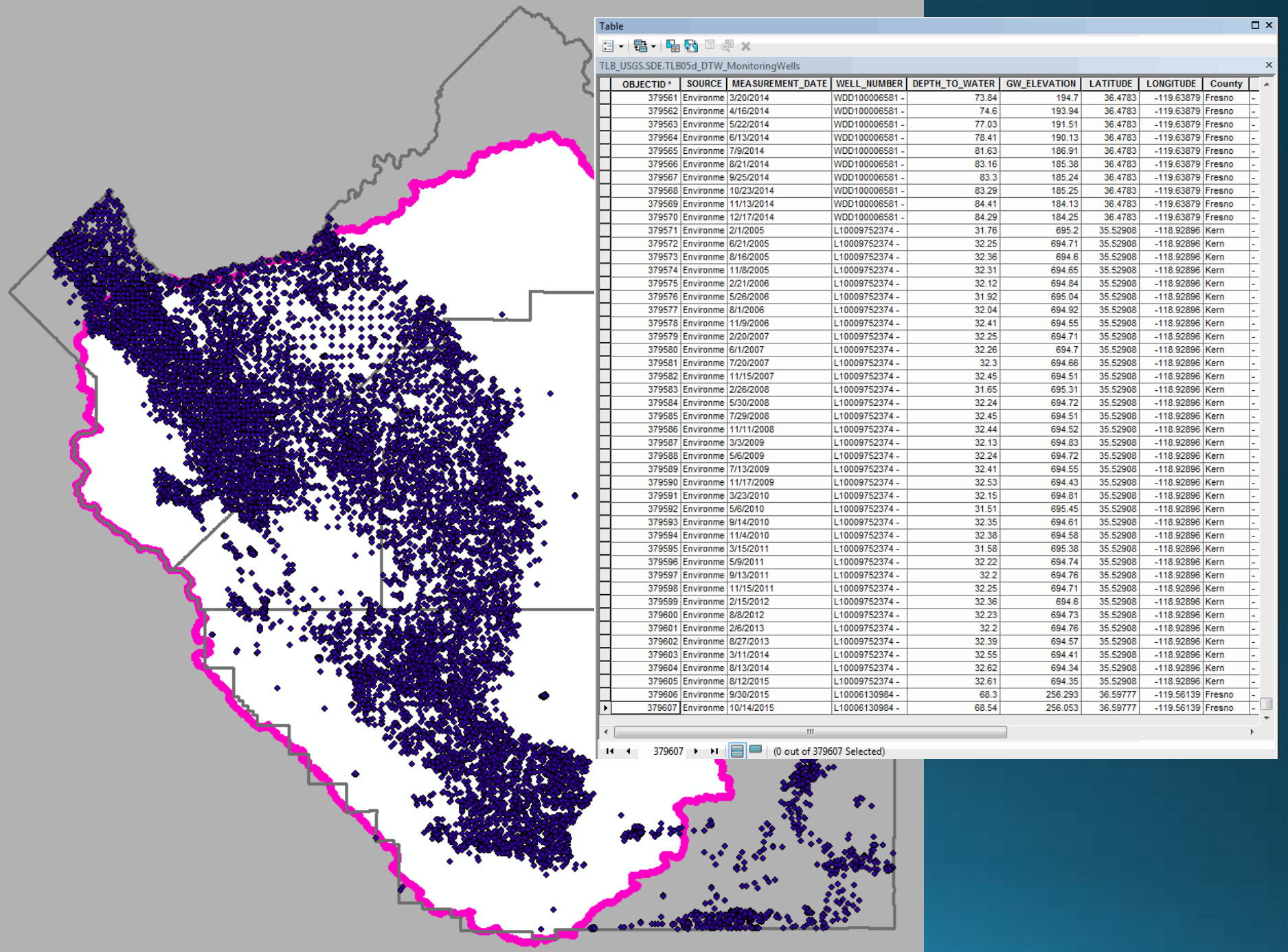
Well Editing Web Tool

TLB05_Ground Water

TLB05d_Water Supply

Water Supply in the SJV Aquifer is calculated from the volume of “wet aquifer”. Knowing the “depth to groundwater” is a critical variable…

For the TLB, the “old” DWR DataBase had 15290 DTW monitoring wells with 319607 samples (1917-2015). These monitoring wells not linked to Well Logs.



Table

TLB_USGS.SDE.TLB05d_DTW_MonitoringWells

OBJECTID *	SOURCE	MEASUREMENT_DATE	WELL_NUMBER	DEPTH_TO_WATER	GW_ELEVATION	LATITUDE	LONGITUDE	County
379561	Environme	3/20/2014	WDD100006581 -	73.84	194.7	36.4783	-119.63879	Fresno
379562	Environme	4/16/2014	WDD100006581 -	74.6	193.94	36.4783	-119.63879	Fresno
379563	Environme	5/22/2014	WDD100006581 -	77.03	191.51	36.4783	-119.63879	Fresno
379564	Environme	6/13/2014	WDD100006581 -	78.41	190.13	36.4783	-119.63879	Fresno
379565	Environme	7/9/2014	WDD100006581 -	81.63	186.91	36.4783	-119.63879	Fresno
379566	Environme	8/21/2014	WDD100006581 -	83.16	185.38	36.4783	-119.63879	Fresno
379567	Environme	9/25/2014	WDD100006581 -	83.3	185.24	36.4783	-119.63879	Fresno
379568	Environme	10/23/2014	WDD100006581 -	83.29	185.25	36.4783	-119.63879	Fresno
379569	Environme	11/13/2014	WDD100006581 -	84.41	184.13	36.4783	-119.63879	Fresno
379570	Environme	12/17/2014	WDD100006581 -	84.29	184.25	36.4783	-119.63879	Fresno
379571	Environme	2/1/2005	L10009752374 -	31.76	695.2	35.52908	-118.92896	Kern
379572	Environme	6/21/2005	L10009752374 -	32.25	694.71	35.52908	-118.92896	Kern
379573	Environme	8/16/2005	L10009752374 -	32.36	694.6	35.52908	-118.92896	Kern
379574	Environme	11/8/2005	L10009752374 -	32.31	694.65	35.52908	-118.92896	Kern
379575	Environme	2/21/2006	L10009752374 -	32.12	694.84	35.52908	-118.92896	Kern
379576	Environme	5/26/2006	L10009752374 -	31.92	695.04	35.52908	-118.92896	Kern
379577	Environme	8/1/2006	L10009752374 -	32.04	694.92	35.52908	-118.92896	Kern
379578	Environme	11/9/2006	L10009752374 -	32.41	694.55	35.52908	-118.92896	Kern
379579	Environme	2/20/2007	L10009752374 -	32.25	694.71	35.52908	-118.92896	Kern
379580	Environme	6/1/2007	L10009752374 -	32.26	694.7	35.52908	-118.92896	Kern
379581	Environme	7/20/2007	L10009752374 -	32.3	694.66	35.52908	-118.92896	Kern
379582	Environme	11/15/2007	L10009752374 -	32.45	694.51	35.52908	-118.92896	Kern
379583	Environme	2/26/2008	L10009752374 -	31.65	695.31	35.52908	-118.92896	Kern
379584	Environme	5/30/2008	L10009752374 -	32.24	694.72	35.52908	-118.92896	Kern
379585	Environme	7/29/2008	L10009752374 -	32.45	694.51	35.52908	-118.92896	Kern
379586	Environme	11/11/2008	L10009752374 -	32.44	694.52	35.52908	-118.92896	Kern
379587	Environme	3/3/2009	L10009752374 -	32.13	694.83	35.52908	-118.92896	Kern
379588	Environme	5/6/2009	L10009752374 -	32.24	694.72	35.52908	-118.92896	Kern
379589	Environme	7/13/2009	L10009752374 -	32.41	694.55	35.52908	-118.92896	Kern
379590	Environme	11/17/2009	L10009752374 -	32.53	694.43	35.52908	-118.92896	Kern
379591	Environme	3/23/2010	L10009752374 -	32.15	694.81	35.52908	-118.92896	Kern
379592	Environme	5/6/2010	L10009752374 -	31.51	695.45	35.52908	-118.92896	Kern
379593	Environme	9/14/2010	L10009752374 -	32.35	694.61	35.52908	-118.92896	Kern
379594	Environme	11/4/2010	L10009752374 -	32.38	694.58	35.52908	-118.92896	Kern
379595	Environme	3/15/2011	L10009752374 -	31.58	695.38	35.52908	-118.92896	Kern
379596	Environme	5/9/2011	L10009752374 -	32.22	694.74	35.52908	-118.92896	Kern
379597	Environme	9/13/2011	L10009752374 -	32.2	694.76	35.52908	-118.92896	Kern
379598	Environme	11/15/2011	L10009752374 -	32.25	694.71	35.52908	-118.92896	Kern
379599	Environme	2/15/2012	L10009752374 -	32.36	694.6	35.52908	-118.92896	Kern
379600	Environme	8/8/2012	L10009752374 -	32.23	694.73	35.52908	-118.92896	Kern
379601	Environme	2/6/2013	L10009752374 -	32.2	694.76	35.52908	-118.92896	Kern
379602	Environme	8/27/2013	L10009752374 -	32.39	694.57	35.52908	-118.92896	Kern
379603	Environme	3/11/2014	L10009752374 -	32.55	694.41	35.52908	-118.92896	Kern
379604	Environme	8/13/2014	L10009752374 -	32.62	694.34	35.52908	-118.92896	Kern
379605	Environme	8/12/2015	L10009752374 -	32.61	694.35	35.52908	-118.92896	Kern
379606	Environme	9/30/2015	L10006130984 -	68.3	256.293	36.59777	-119.56139	Fresno
379607	Environme	10/14/2015	L10006130984 -	68.54	256.053	36.59777	-119.56139	Fresno

379607 (0 out of 379607 Selected)

TLB05_Ground Water

TLB05d_Water Supply

Water Supply in the SJV Aquifer is calculated from the volume of “wet aquifer”. Knowing the “depth to groundwater” is a critical variable…

Creating a continuous ‘surface’ of Ground Water Levels by Kriging monitored data. This allowed a time series (1948-2008) to be developed.

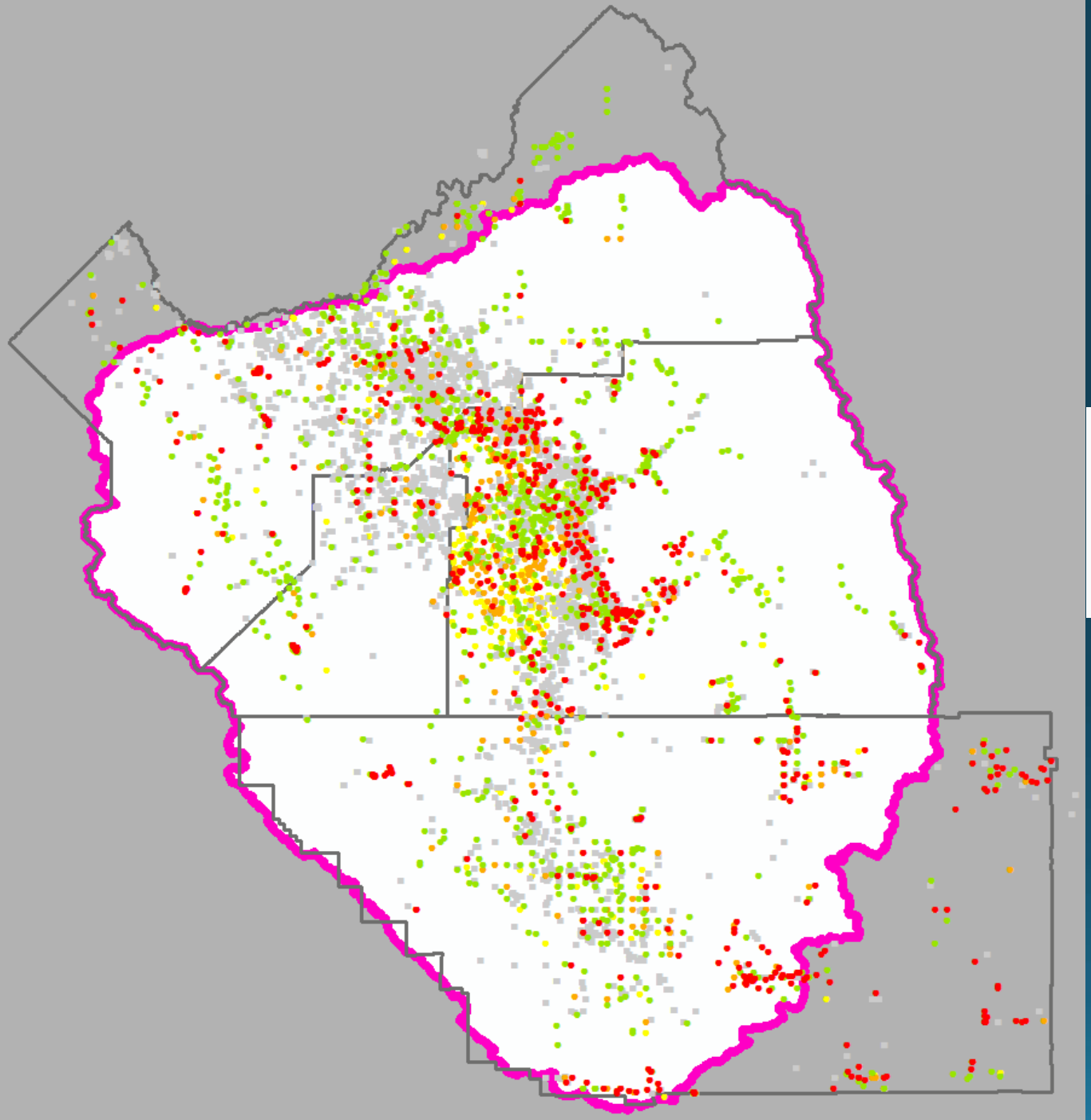
TLB05_Ground Water

TLB05e_Water Quality

The TLB Water Quality DataBase has 3.5 million samples of over 500 “analytes” (1975-2015).

There are 6122 Water Quality Systems with 12662 monitored wells.

Each well has a PWS_ID (which is NOT linked to a well log).



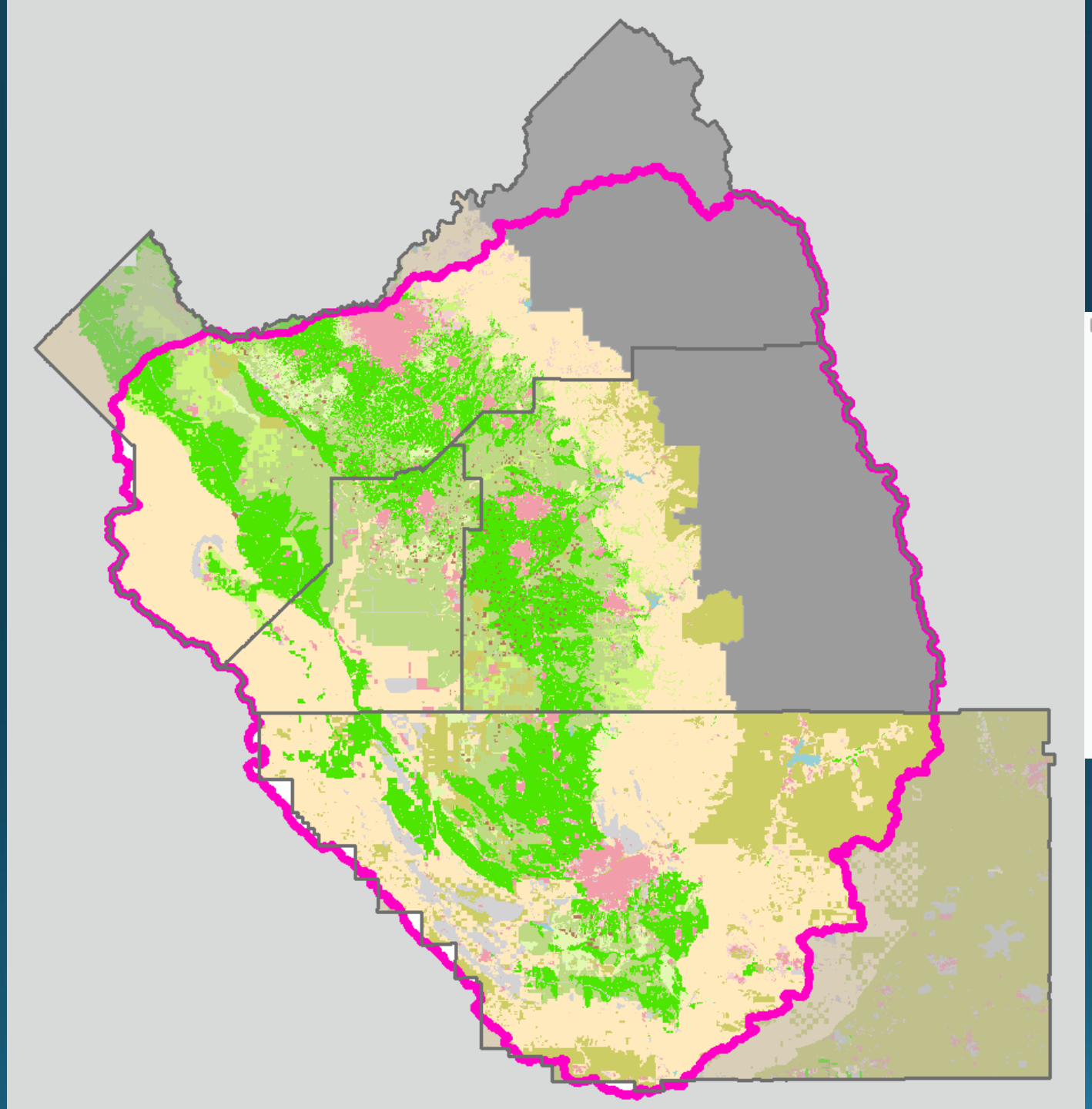
ESRI UC2019
Tue 10 am Rm 29b

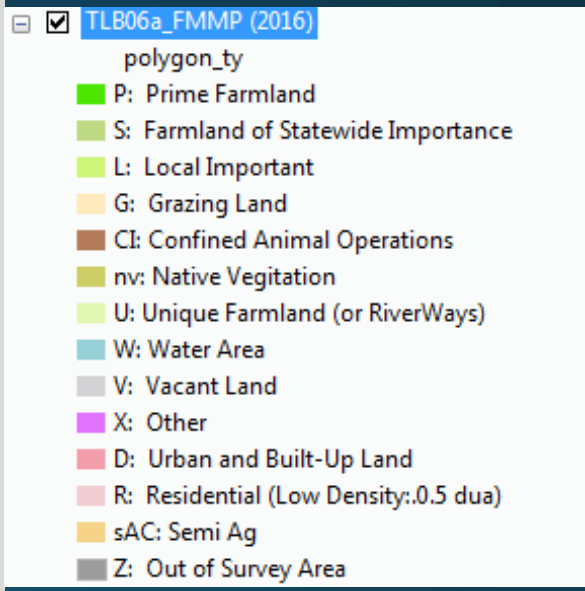
TLB Water Quality Analysis Using ArcGIS INSIGHTS

TLB06_Land Cover

TLB06a_FMMP Maps

The “Farmland Monitoring and Mapping Program” has developed a bi-annual series of Land Cover Maps dating back to 1984.



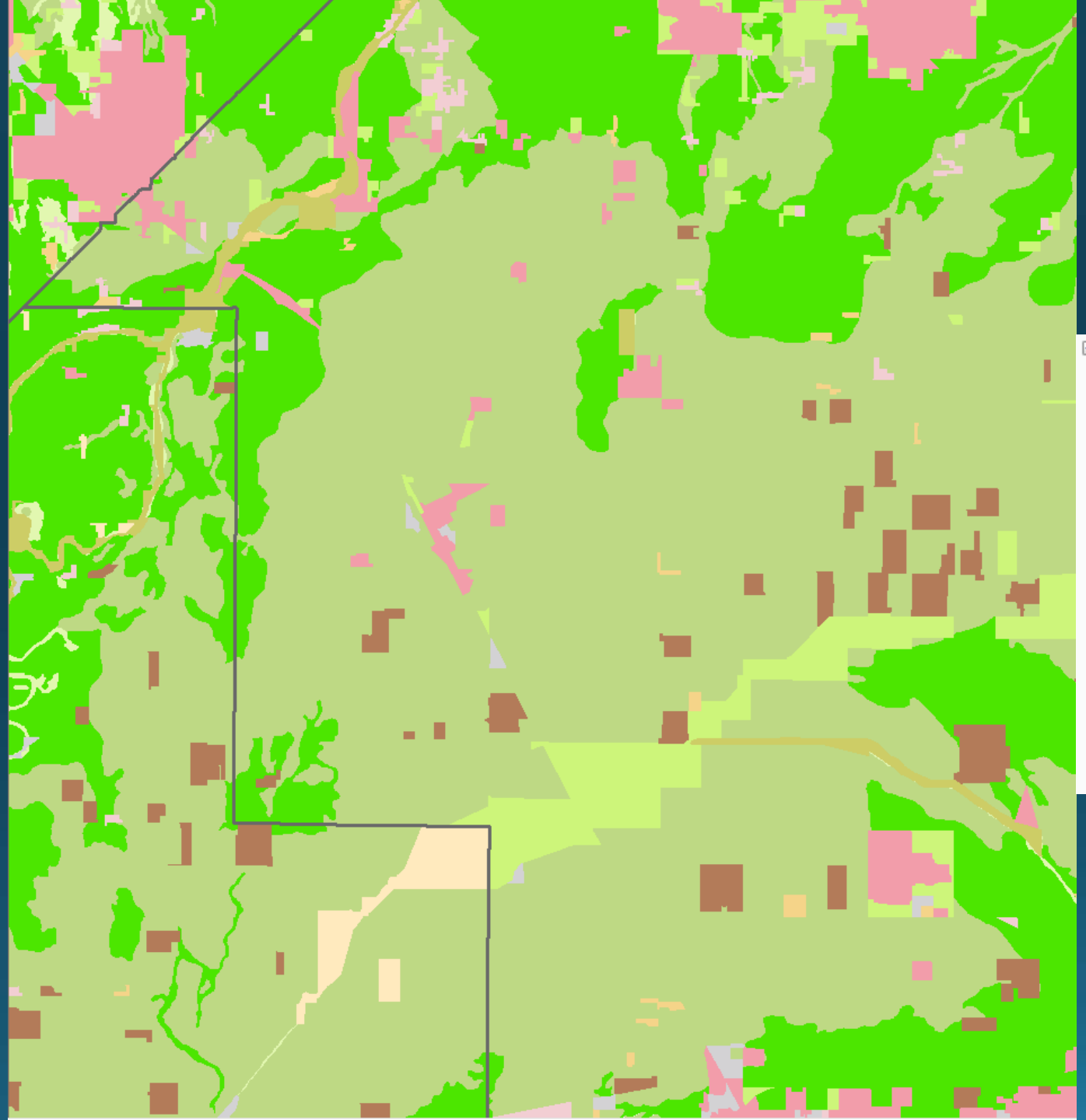


TLB06_Land Cover

TLB06a_FMMP Maps

The “Farmland Monitoring and Mapping Program” has developed a bi-annual series of Land Cover Maps dating back to 1984.

(ZOOM!)

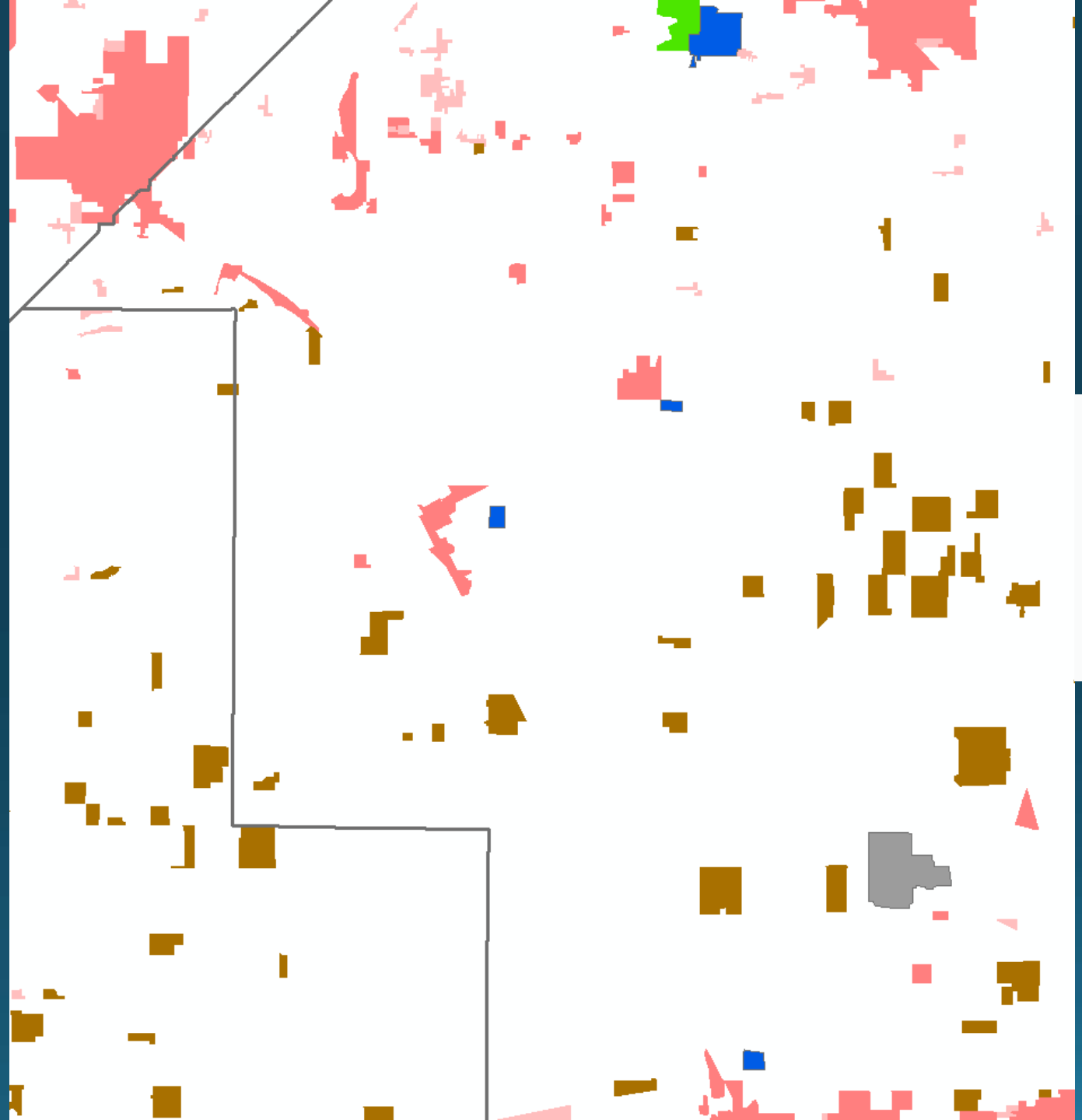


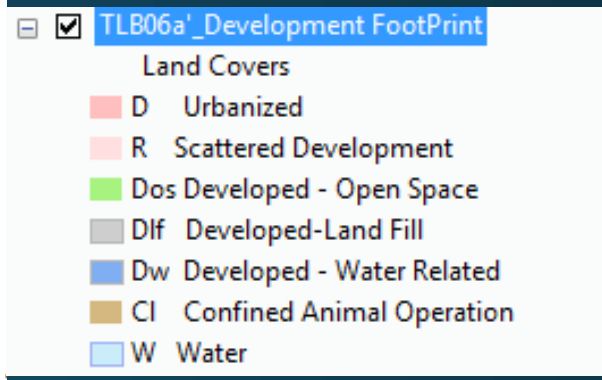
TLB06_Land Cover

TLB06a'_Development Foot Print

The FMMP Maps can be reclassified to identify changes in irrigated lands … & … "Development Foot Print" (Lands removed from crop production.

FMMP "D" needs to be reclassified into additional categories in order to not overstate urbanized areas.

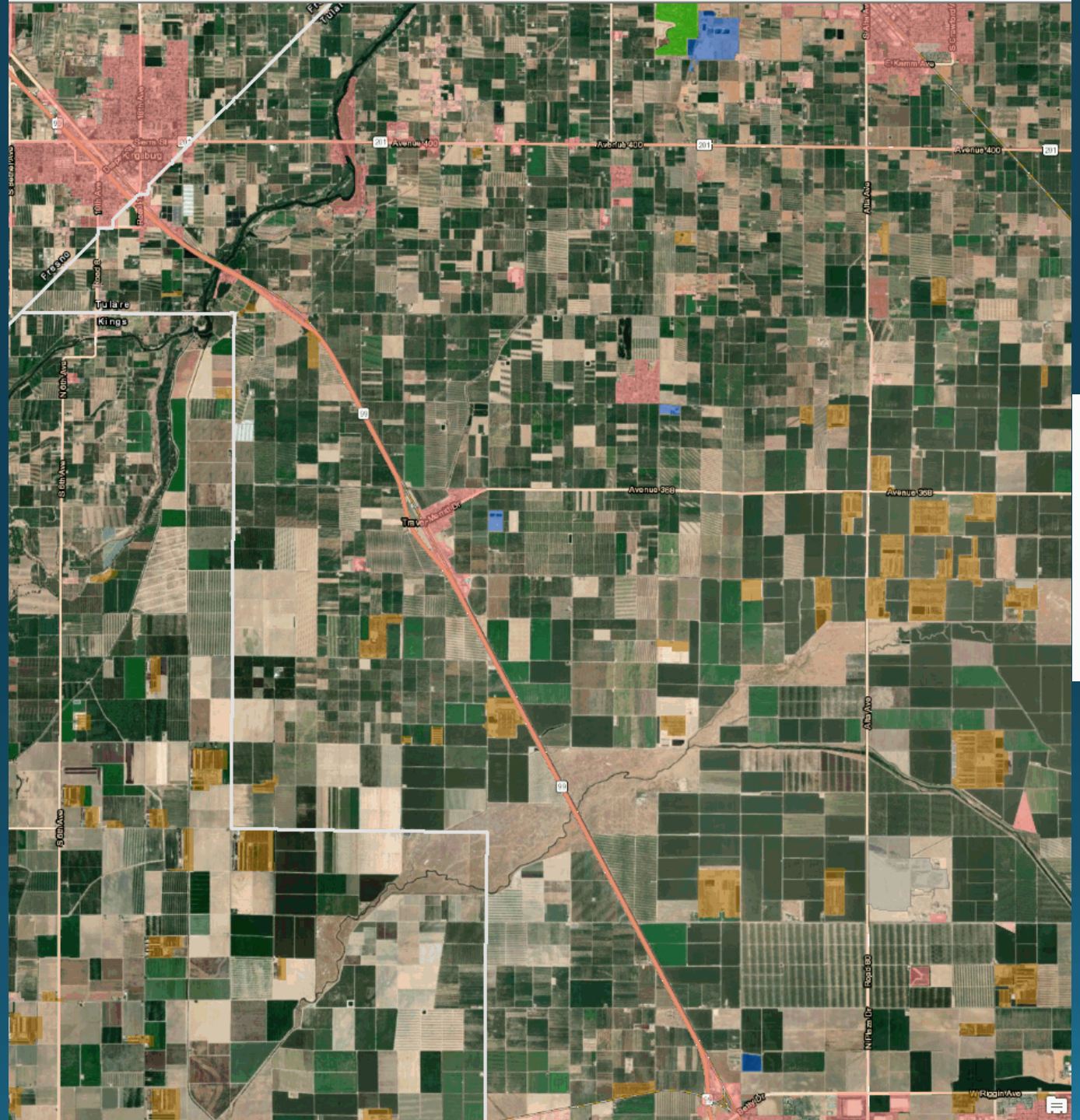




TLB06_Land Cover

TLB06a'_Development Foot Print & Aerial Photos

FMMP Development Foot Print matches Aerial Photos to an amazing degree…



TLB06a'_Development FootPrint

Land Covers

- D Urbanized
- R Scattered Development
- Dos Developed - Open Space
- Dlf Developed-Land Fill
- Dw Developed - Water Related
- CI Confined Animal Operation
- W Water

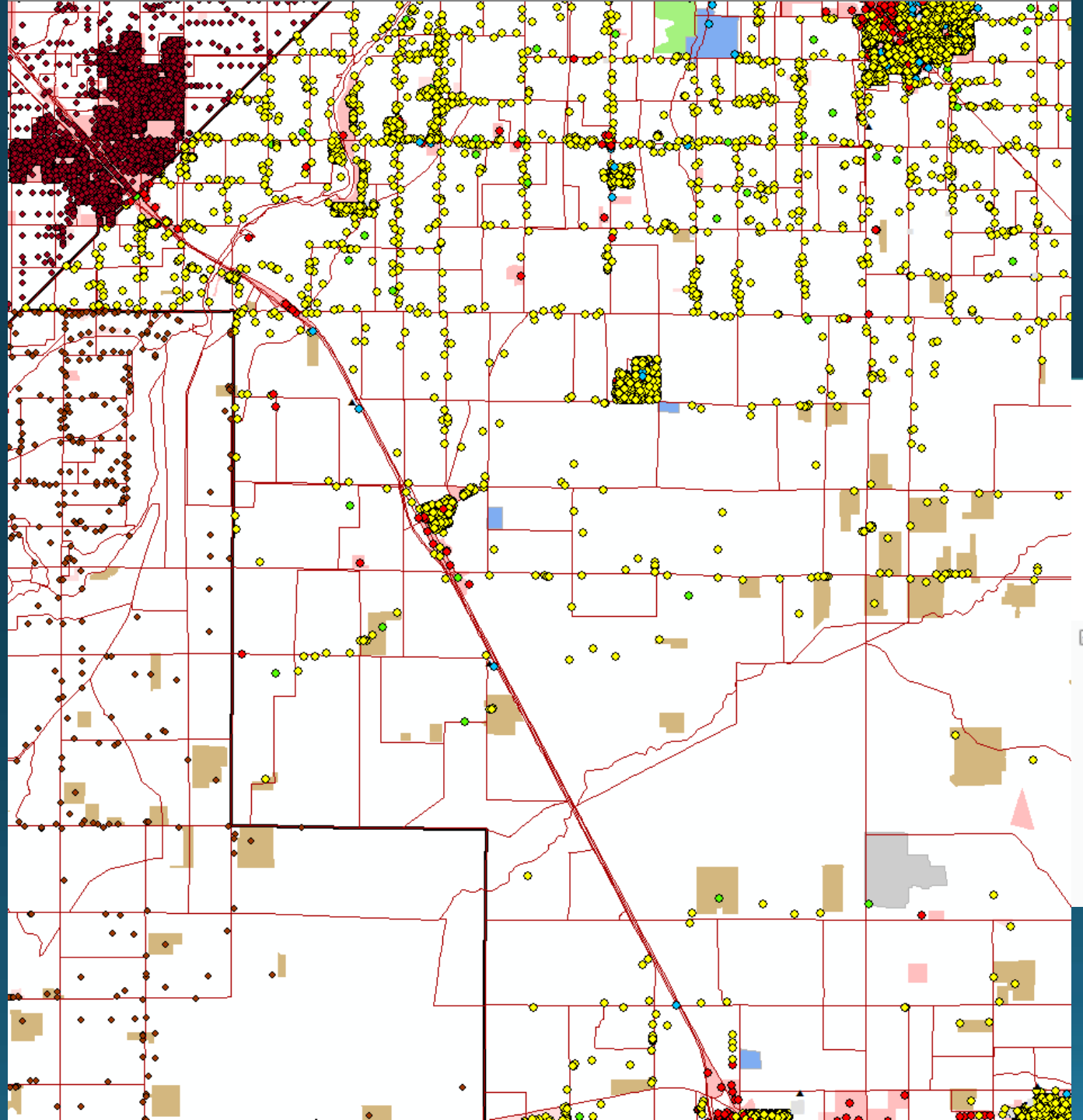
TLB06_Land Cover
TLB07_Demographics

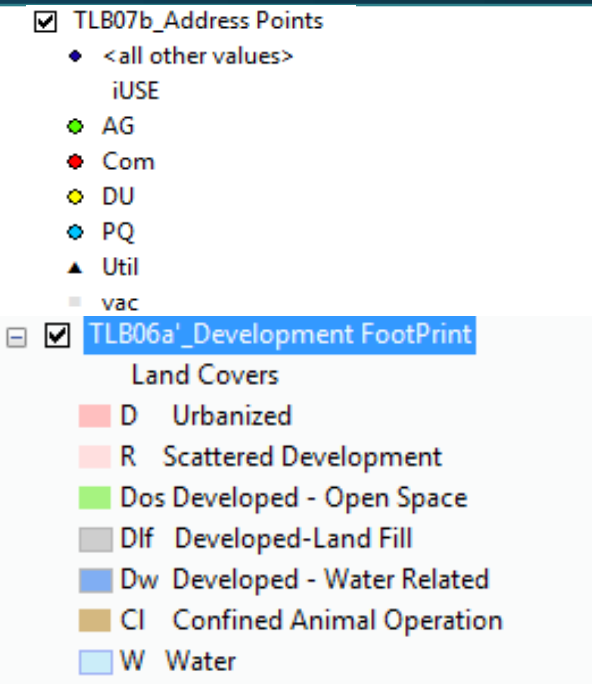
TLB06a'_Development Foot Print

TLB07a_Census Geometry

TLB07b_Address Pnts

It is possible to count the number of residential address points in a census block and compare that count to the LUCA 2017 count … To identify errors





What does the DATA mean?

Every dataset needs metadata (this is lacking)

Every dataset needs documentation of its source and maintenance schedule

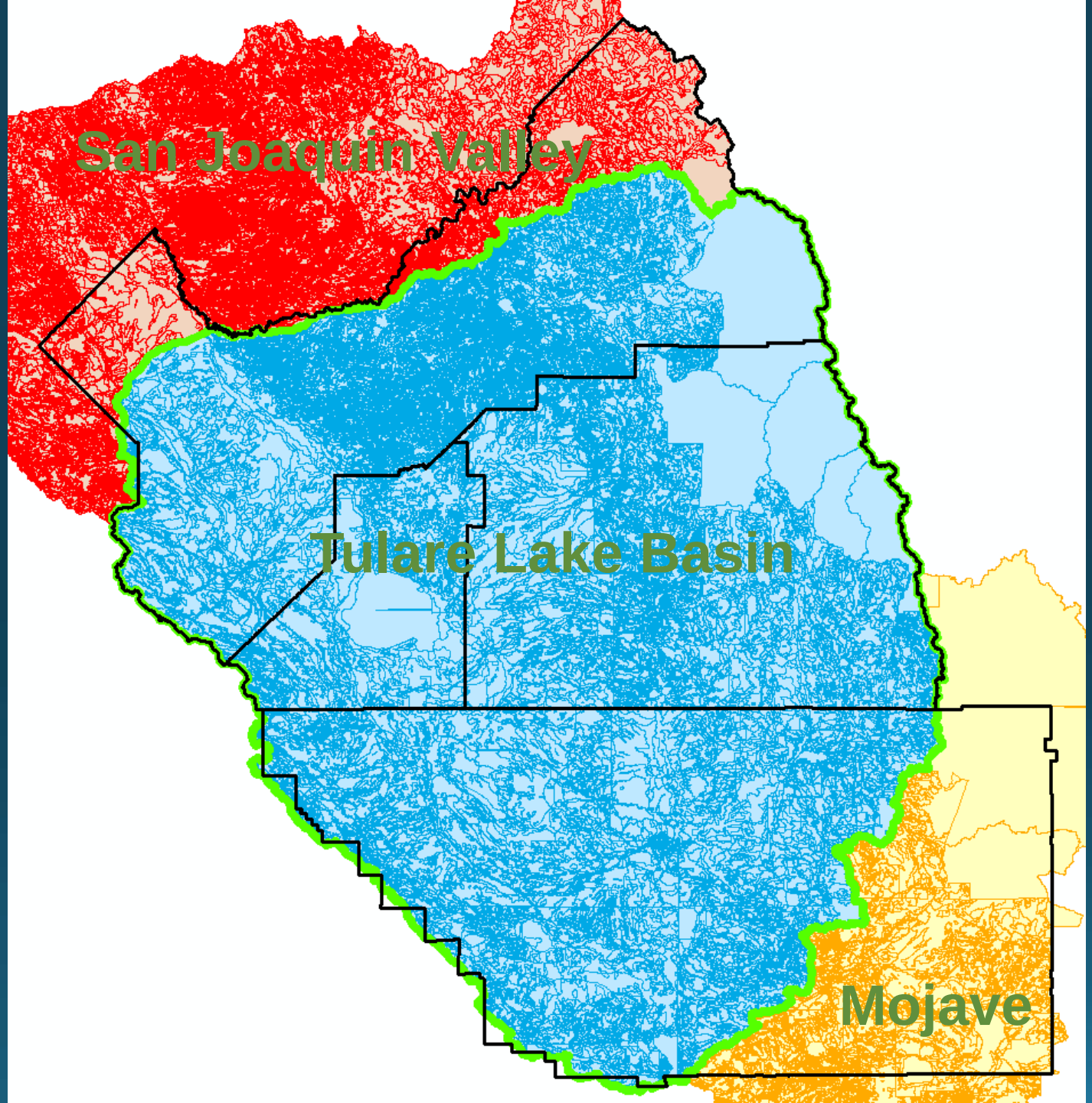
Every dataset needs appropriate symbology (in ONE or MORE ways)

What does the DATA mean?

TLB03b_SSURGO Soils

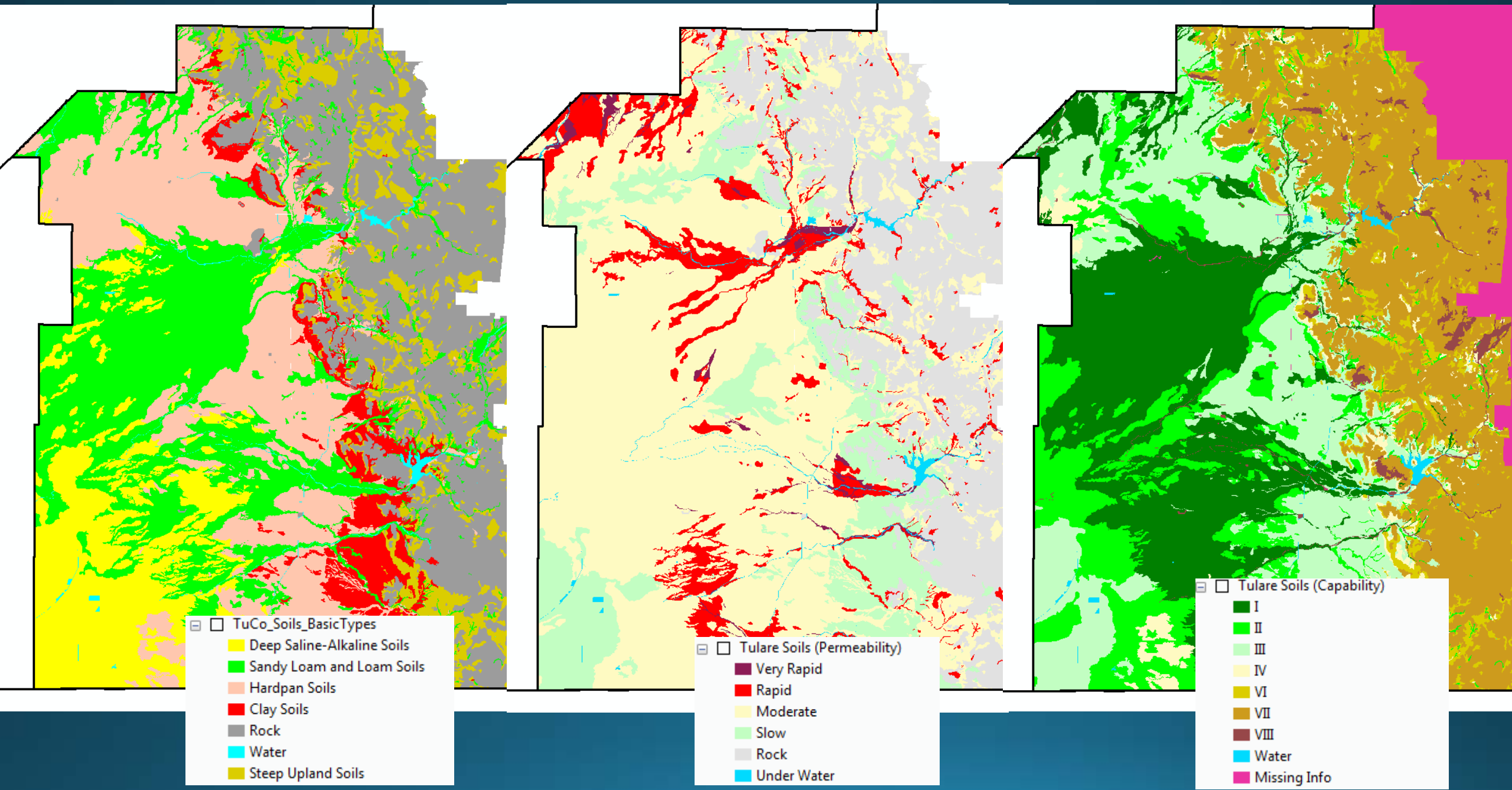
There are 159 data fields in the SSURGO database(s). Such a complex dataset can be viewed MANY ways.

Users ought to be provided with a few alternative ways of seeing the data & the ability to create new ways of seeing the data.



The current SSURGO Data is released using HUC08 boundaries.

This data uses the same classification system, nation-wide.

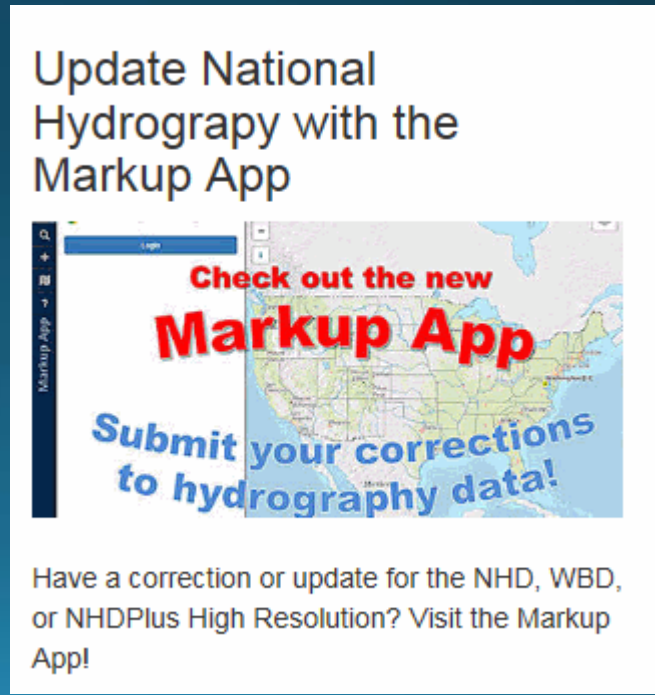

TuCo_Soils_BasicTypes
Deep Saline-Alkaline Soils
Sandy Loam and Loam Soils
Hardpan Soils
Clay Soils
Rock
Water
Steep Upland Soils
Tulare Soils (Permeability)
Very Rapid
Rapid
Moderate
Slow
Rock
Under Water
Tulare Soils (Capability)
I
II
III
IV
VI
VII
VIII
Water
Missing Info

Is the data current?

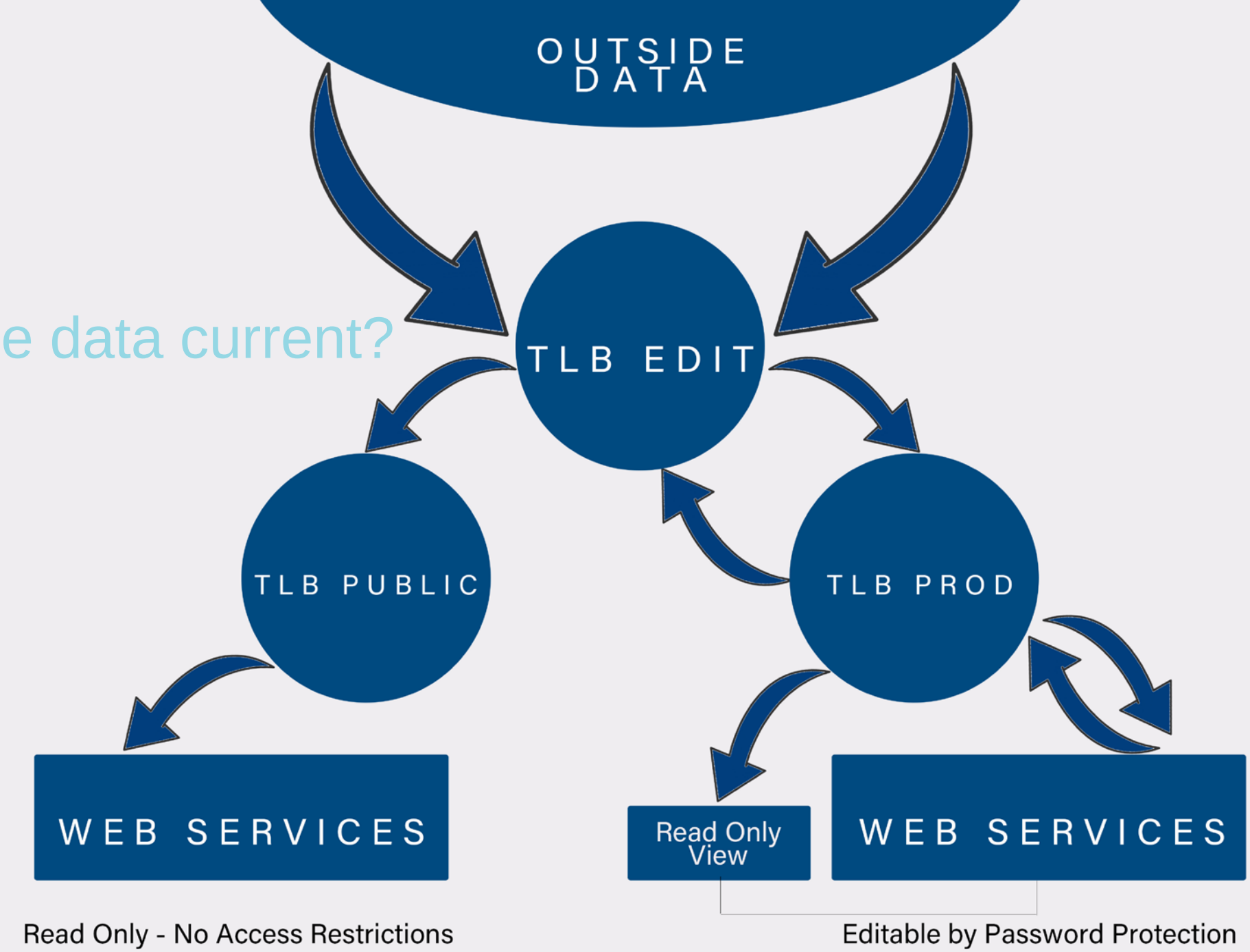
Each dataset should have one or more “data stewards”

LOAD data from “data steward” and transform it to TLB standards
-or-
CONNECT “data stewards” to a Web Service (Well Points / Address Points)

Provide the General Public with the ability to “mark-up” / comment on the data

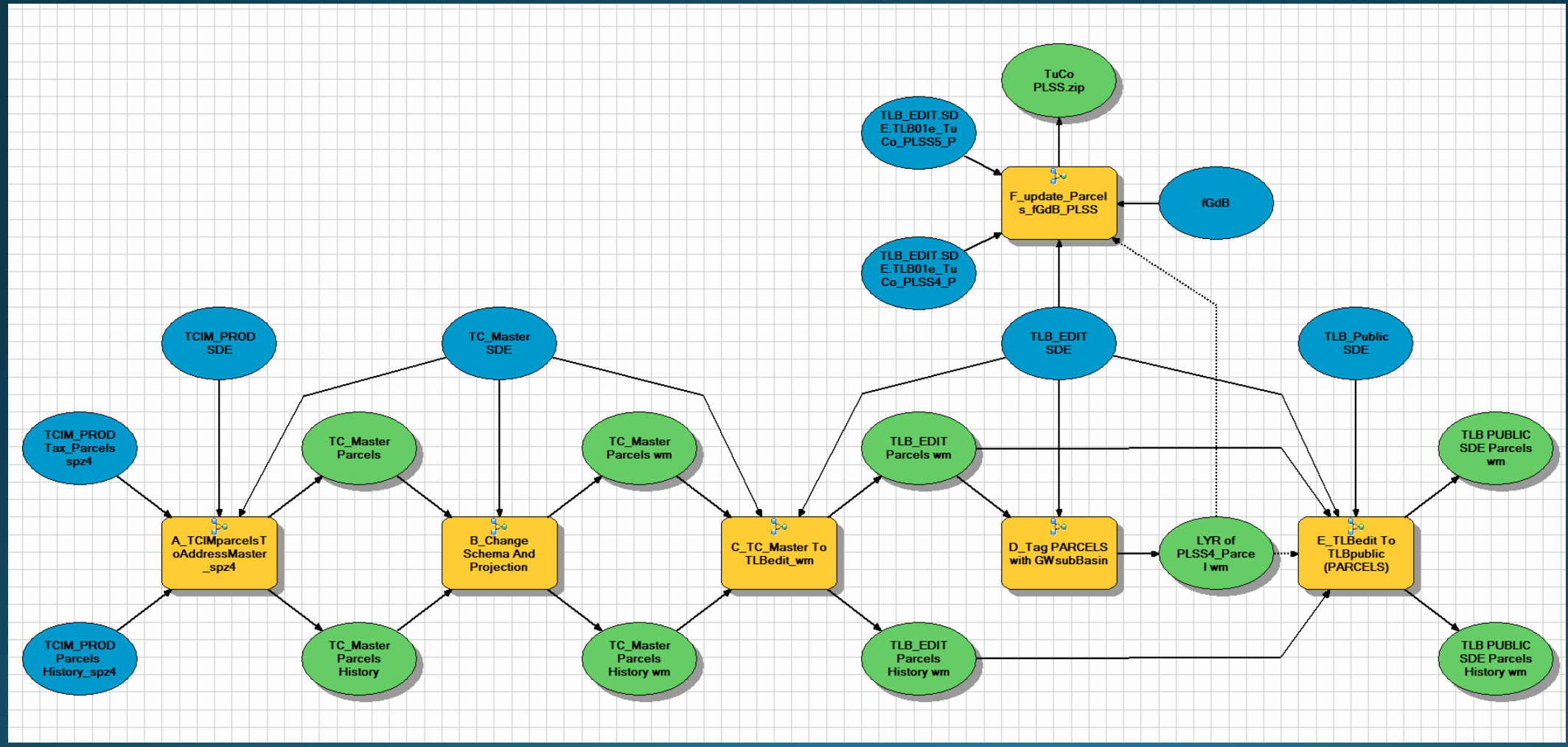


Is the data current?



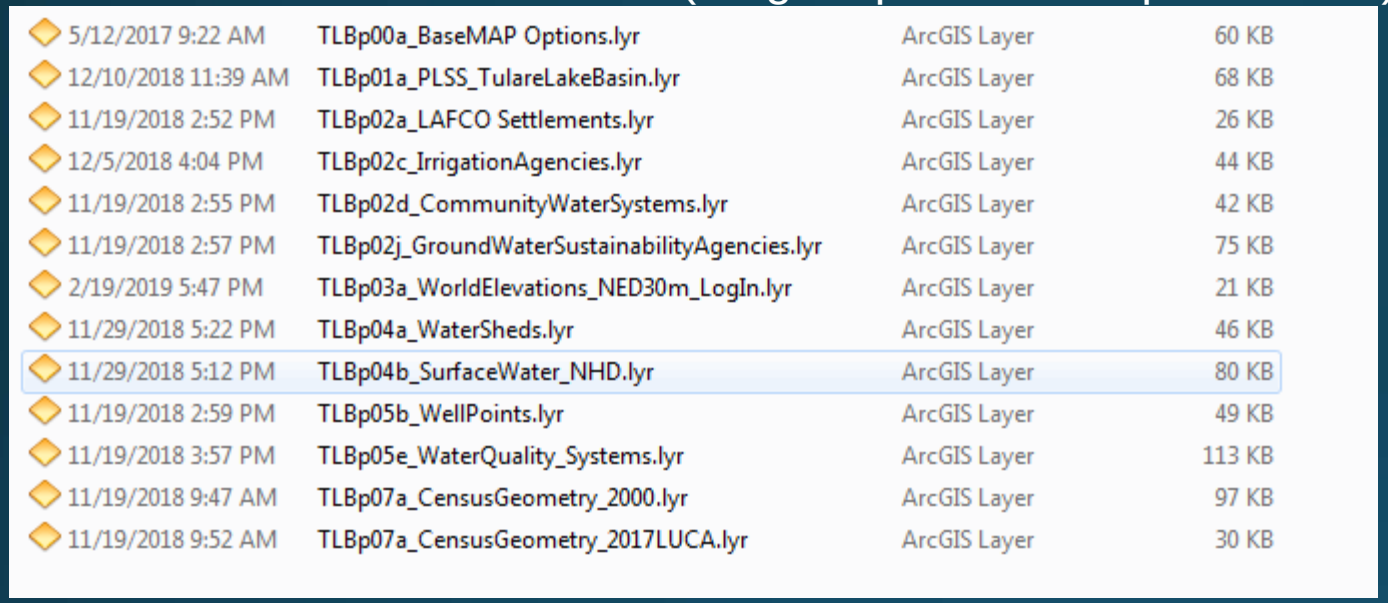
Is the data current?

Tulare County PARCELS is modified to conform to TLB schema weekly, using a geoprocessing model (It runs for 4 hours at 3 AM Saturday morning)



How is the data shared?

For the General Public - .LYR files (drag/drop into ArcMap or ArcPro)



5/12/2017 9:22 AM	TLBp00a_BaseMAP Options.lyr	ArcGIS Layer	60 KB
12/10/2018 11:39 AM	TLBp01a_PLSS_TulareLakeBasin.lyr	ArcGIS Layer	68 KB
11/19/2018 2:52 PM	TLBp02a_LAFCO Settlements.lyr	ArcGIS Layer	26 KB
12/5/2018 4:04 PM	TLBp02c_IrrigationAgencies.lyr	ArcGIS Layer	44 KB
11/19/2018 2:55 PM	TLBp02d_CommunityWaterSystems.lyr	ArcGIS Layer	42 KB
11/19/2018 2:57 PM	TLBp02j_GroundWaterSustainabilityAgencies.lyr	ArcGIS Layer	75 KB
2/19/2019 5:47 PM	TLBp03a_WorldElevations_NED30m_LogIn.lyr	ArcGIS Layer	21 KB
11/29/2018 5:22 PM	TLBp04a_WaterSheds.lyr	ArcGIS Layer	46 KB
11/29/2018 5:12 PM	TLBp04b_SurfaceWater_NHD.lyr	ArcGIS Layer	80 KB
11/19/2018 2:59 PM	TLBp05b_WellPoints.lyr	ArcGIS Layer	49 KB
11/19/2018 3:57 PM	TLBp05e_WaterQuality_Systems.lyr	ArcGIS Layer	113 KB
11/19/2018 9:47 AM	TLBp07a_CensusGeometry_2000.lyr	ArcGIS Layer	97 KB
11/19/2018 9:52 AM	TLBp07a_CensusGeometry_2017LUCA.lyr	ArcGIS Layer	30 KB

These .LYR files allow access to
the tabular data and provide standardized symbology.

These .LYR files are building blocks to permit the creation of detailed maps easily.

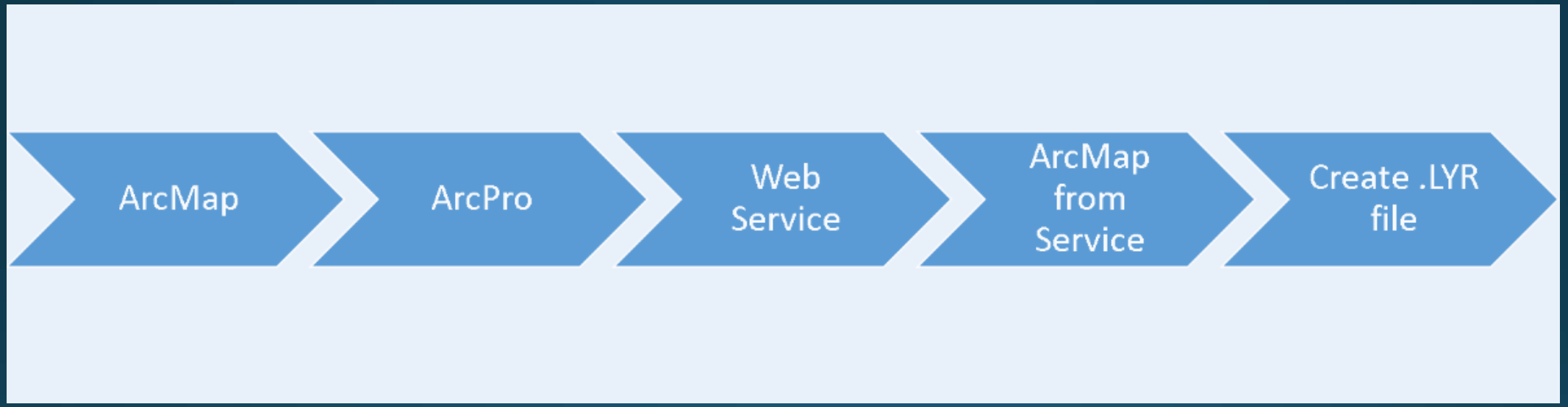
For Public Agencies - .LYR files (drag/drop into ArcMap or ArcPro)

- This version of LAYER FILES is un-redacted data
- This version requires an MOU and a named-user LOG-IN

For Data Stewards – a WEB APP designed to allow the editing of data

- Requires an MOU and a named-user LOG-IN

ArcMap .LYR files are compatible with ArcMap & ArcPro



These ArcMap .LYR files encapsulate the Web Service & Symbology
Into a SMALL file that is easy to distribute

Looking for Collaborators

For More Info

Contact Mike Hickey
(559) 622-7241

mhickey@co.tulare.ca.us