Colorado's Water Resources Database (HydroBase)
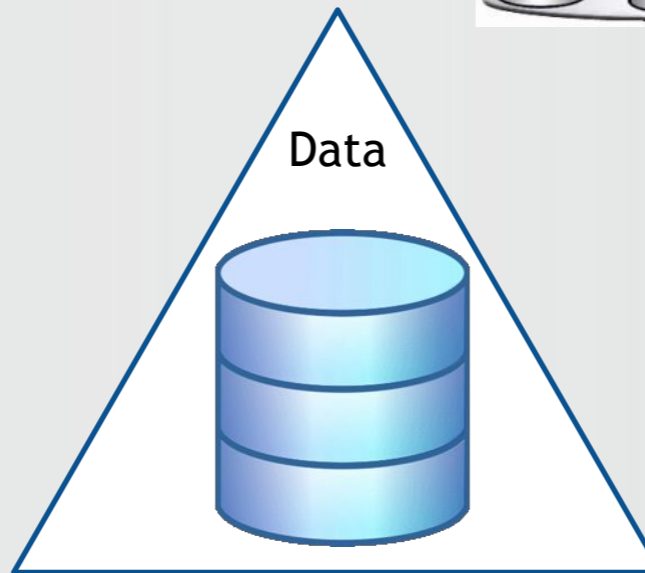
New Mexico water data meeting April 28th, 2020

Doug Stenzel - Chief of Water Information
Division of Water Resources

What data did we integrate?

Tabular Data
(HydroBase)

Data

Electronic Content

Spatial Data

Tabular data

- Administrative Calls
- Climate Stations *(NOAA, NRCS, other)*
  - Evap
  - Temperature
  - Precipitation
  - Solar
  - Snow (Depth, SWE)
  - Vapor Pressure
  - Wind
- Dam Safety
  - Jurisdictional
  - Non-Jurisdictional
  - Livestock Water Tank / Erosion Control (LSWTECD)
- Final Permits
- Ground Water
  - Geophysical Logs
  - Water Levels *(DWR, USGS)*

- Irrigated Lands
- Stations - Telemetry *(DWR, USGS, Cooperator)*
  - Ditches
  - Reservoirs
  - Streamflow
  - Wells
- Structure
  - Diversion Records
  - Water Rights
  - Well Metering
- Surface Water Stations *(DWR, USGS)*
- Well Applications / Permits

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GIS Layers

Polygon / Line
- Admin Boundary
  - City
  - County
  - Designated Basin
  - etc...
- Climate Isohyet
- DWR Admin Data
  - Well encumbrance parcels
- Ground Water
  - Alluvial
  - Bedrock
- Instream Flow Reaches
- Irrigation Canals
- Irrigated Lands
- Soils Information
- Surface Water Supply Index
- Water Source Hydrography

Point
- Climate Stations
- Dam Safety
- Final Permits
- Ground Water
- Structures
- Surface Water
  - Stations - Telemetry
  - Historic Steamflows
- Well Applications / Permits

Raster/Imagery
- Aerial Photos
- NAIP

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Electronic Content

- Abandonment Listings
- Board and Commission Meetings
- Consent Maps
- Dam Safety
- Diversion Records
- Division Filings
- Geophysical Logs
- Guidance Documents
- Hearings
- Historical Court Actions
- LSWTECD
- Map and Filing Statements
- Official Tabulations
- Pre-213 Worksheets
- Publications and Reports
- Reference Library

- Referrals
- Rulemaking
- State Archive Inventory Lists
- State Engineer Filing
- Straight Line Diagrams
- Substitute Water Supply Plans
- Water Court
- Water Court Resumes
- Well Permit Information

Description of all document types

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Data Integration

CDSS Vision
- Build singular repository for all data (internal and external)
- DSS tools all data centered

Started by created HydroBase schema/framework. Imported data from:
- dBase
- MS Access
- Spreadsheets (Excel, Quattro Pro, etc.)
- Text files

Data Sources
- DWR business teams
- Federal agencies (USGS, NOAA, NRCS, etc)
- Conservation Districts

Refreshed data annually

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Data Integration today

- **Administrative data**
  - Integrated all DWR data entry directly into HydroBase.
  - Added ability for Water Users to enter/upload Diversion Record, Meter Readings, and Water Levels via Online tools - pending DWR approval

- **Telemetry Data (near real time)**
  - Satellite (DECODES)
  - Cellular
  - REST services pull (USGS, several larger Conservation Districts)
  - REST services push (user provided)

- **Climate Data / Streamflow / Snow Pack (monthly)**
  - Use data provider web services (USGS, NOAA, etc)

- **CDSS Basin projects (special project)**
  - typically one time digitization of historic records, modeling data

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Products

- **CDSS Modeling Tools**
  - *Planning Tools*

- **CDSS Online Tools**
  - *User Research / Report focus*

- **CDSS REST Services**
  - *Consumable by other programs*

- **Colorado Information Marketplace**
  - *Socrata Open Data platform*
    - *API*
    - *User visualization tools*

- **Map Viewer**
  - *Spatial search/analysis tools*
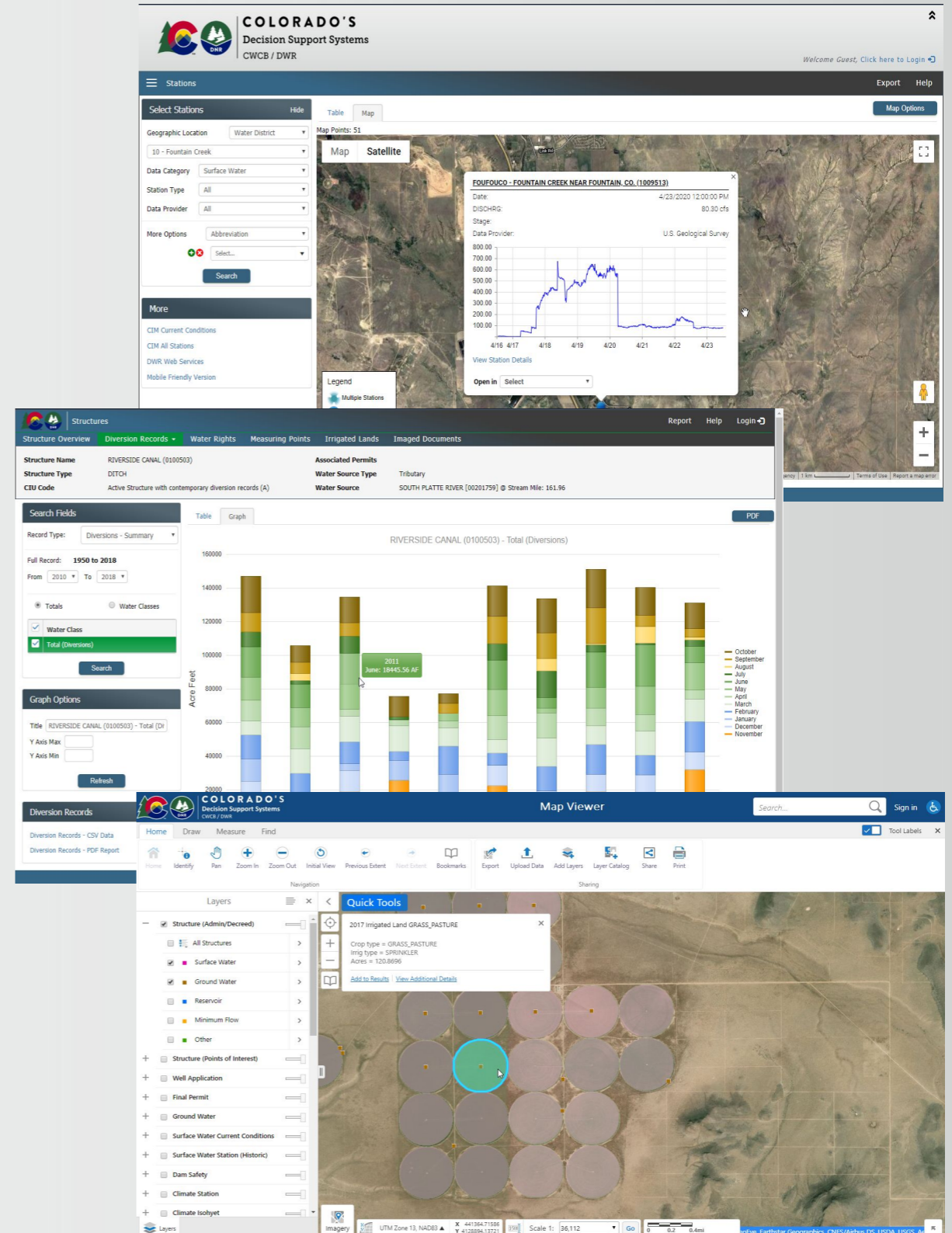
All accessible via:
https://www.colorado.gov/cdss
and/or
https://dwr.state.co.us/tools/

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CDSS RESTful Services

Exports formats
- json
- xml
- csv

DSS Site has usage examples for
- Excel
- Google Sheets
- Javascript
- OpenCDSS repository
  - Even more examples

Technology Stack

Application Development
- SQL Server
- Full Stack .NET
  - MVC Framework
  - .NET Core
  - Entity Framework
- AJAX
- HTML5
- Razor
- jQuery

- Android/Xamarin

GIS Environment
- ArcGIS
- Geocortex

Electronic Content Management
- Laserfiche

Hosting
- State of Colorado OIT
  - Network
  - Virtual Servers

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What did it take to get here?

A Team

Water Information Team
- ECM group (8)
- GIS group (2)
- HydroBase Dev. group (2)

IT Team
- 3-5 developers
- 1 Tester + Business UAT
- DBA support
- Network and Server support

Partners

- **Colorado Water Conservation Board**
- Active Water Community

Ongoing Commitment

- Started in 1990s
- Now on 3rd technology port of some tools
  - Newest port of online tools has taken approximately 6-7 FTE years

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Benefits Recognized

- **Accessibility**
  - 24-hour access to data
  - Essentially all of our data is viewable by public via tools
  - Eliminates conflicting <u>data</u> results
  - Builds trust

- **Better data**
  - Essentially crowdsourced QA QC

- **Decision Making**
  - Quicker, better informed administration of water

- **More administration / data**
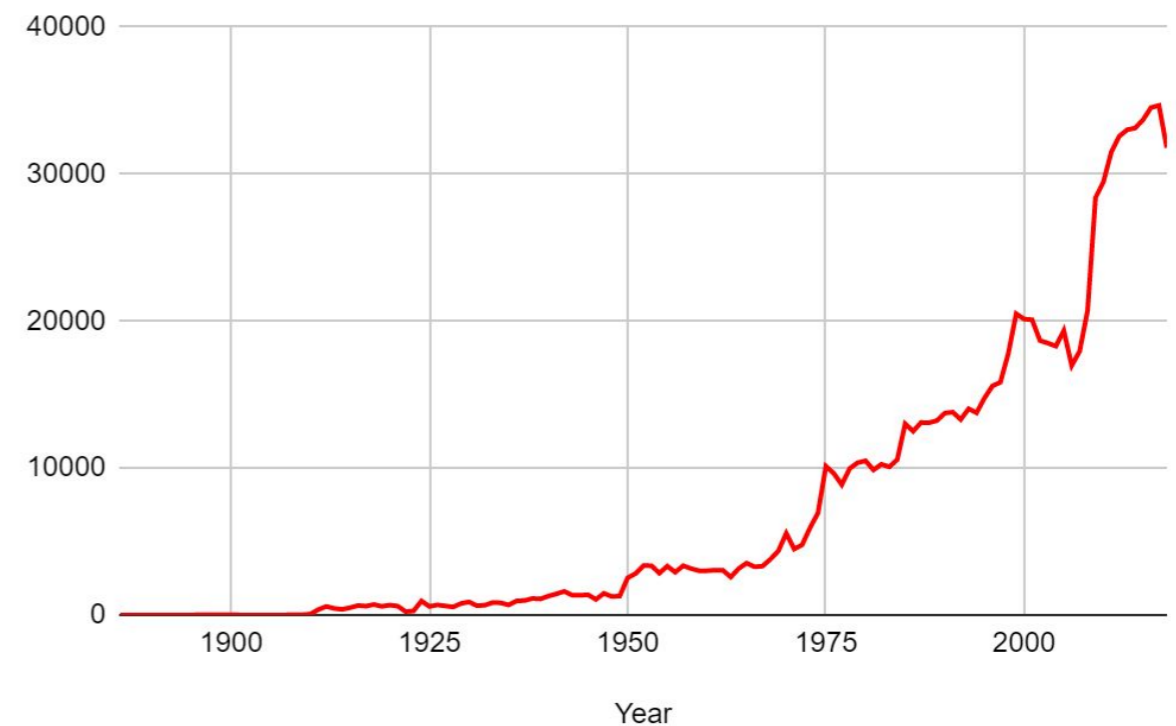 - Less time answering generic data questions, more time for administration for maximum beneficial use

The numbers…

Diversion Records   POR: 1886-Current   69,164,297 values   *(2 GB)*

Diversion Records "Observations" By Year
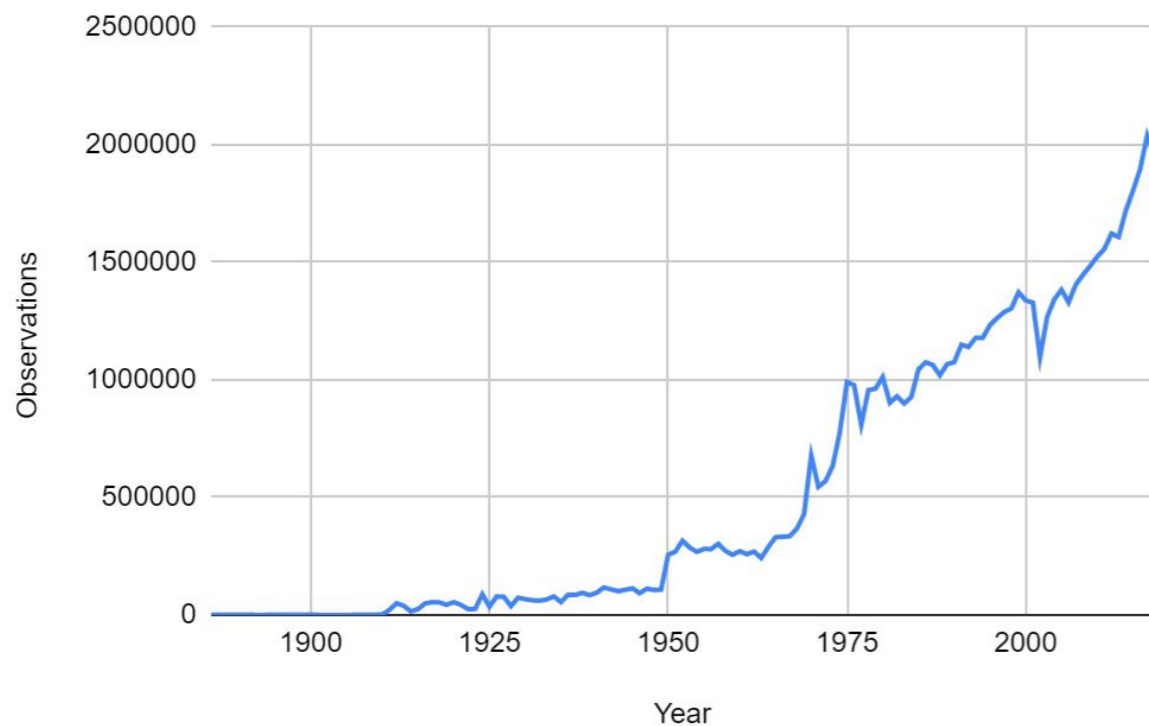
Diversion Record Structures By Year

- DWR had complete electronic records from mid-1970's
- CDSS basin projects responsible for most of data digitization back to 1950's
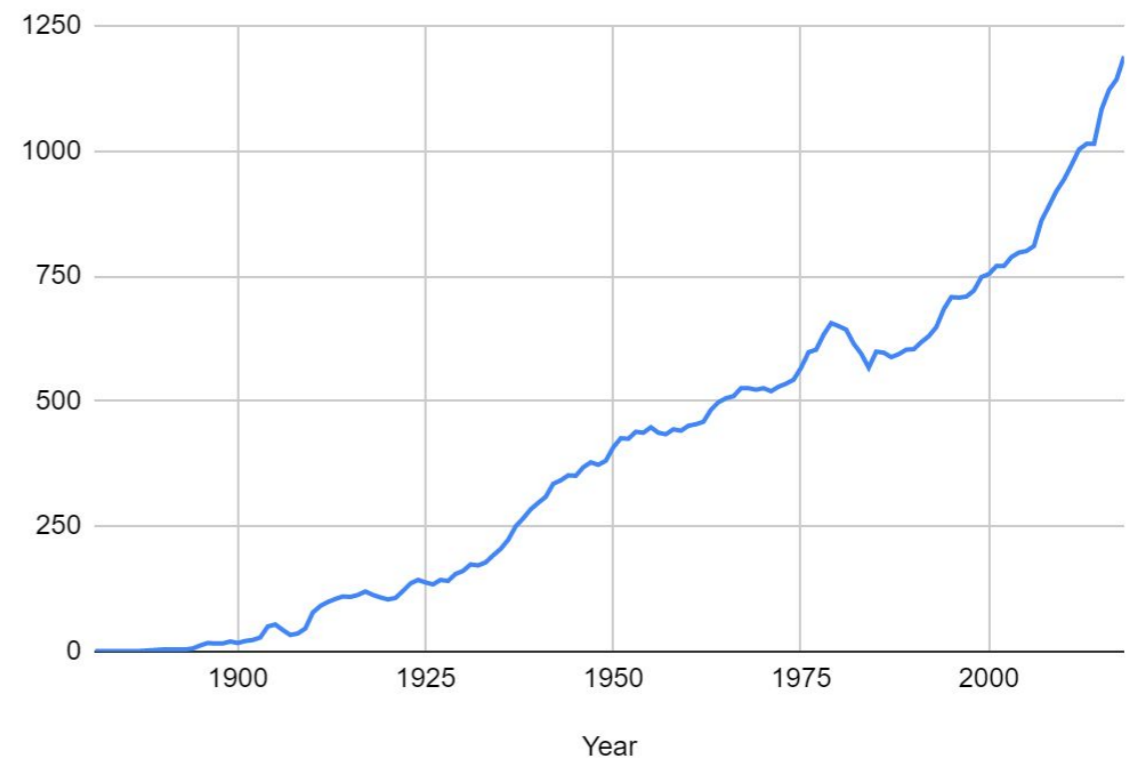- Pre-1950 typically digitized for water court actions

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The numbers…

Surface Water Stations   POR: 1881-Current   18,418,998 values
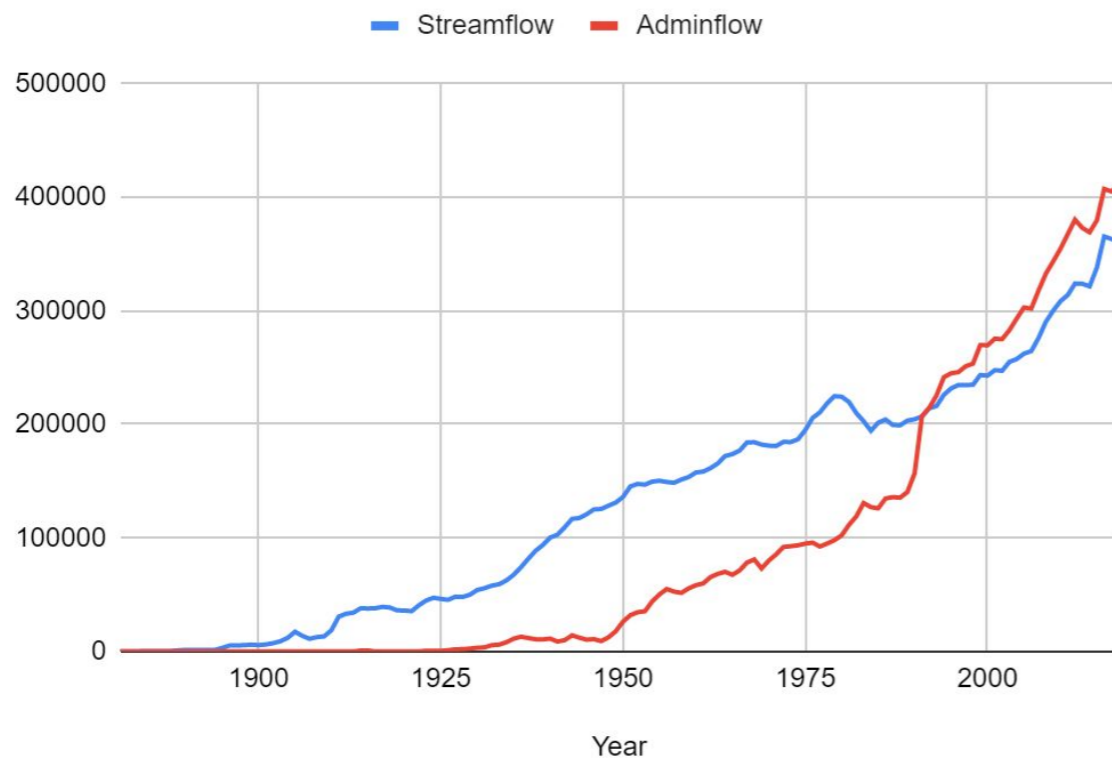
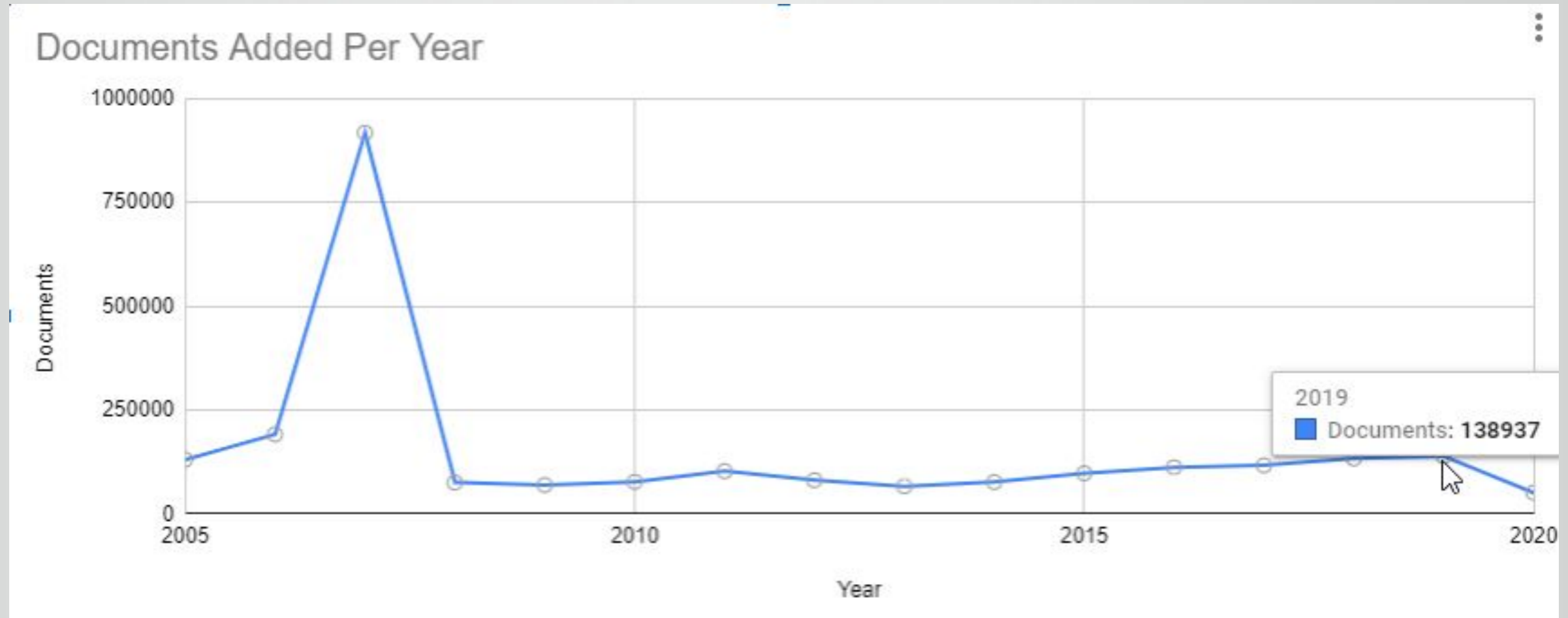# The numbers…

Telemetry Stations   POR: 1985-Current   1,273,492,611 values   *(233 GB)*

Telemetry Data received by year
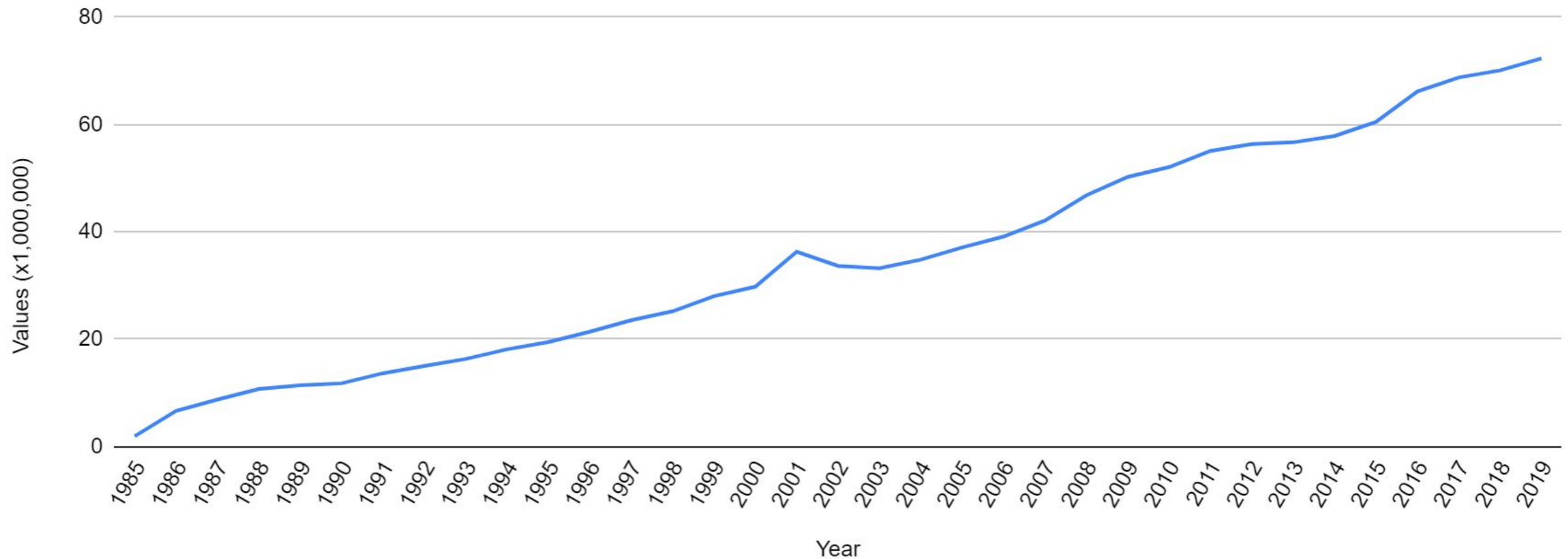
The numbers…

Electronic Documents   POR 1850-Current   2,438,979 documents *(2.1 TB)*

- DWR began digitizing document into a ECM solution in 2000
- Move to Laserfiche ECM solution in 2005
- 2006-2007 Loaded all Water Court actions
- Still a long ways from having everything in backfile imaged

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Questions?

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Useful Links:

[Beginner's Guild to DWR's Use of Techology for Water Information](#)

[CDSS Website](#)

[CDSS Online Tools](#)

[Colorado Information MarketPlace](#)

[CDSS REST Web Services](#)

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