

Open Data to Open Indicators

EPA Exchange Network Project

UC Davis, Southern California Tribal Chairmen's Association, Round
Valley Indian Tribes, California Department of Water Resources

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Acknowledgments

UCD: David Waetjen, Hongfei Wang, Cameron Denney

Round Valley Indian Tribes: Paula Britton

Southern California Tribal Chairmen's Association: Dr. Claudine Montes and 19 member tribes

CDWR: Rich Juricich, Abdul Khan, Kamyar Guivetchi

USEPA: Vance Fong, project/contract managers

SWRCB, CWQMC, RTOC participant tribes

Partnership

- Indicator development among partners
- Tribe involvement in defining needs that the system should meet and indicator selection
- Indicator selection informed by CDWR current indicator palette for California Water Plan 2018

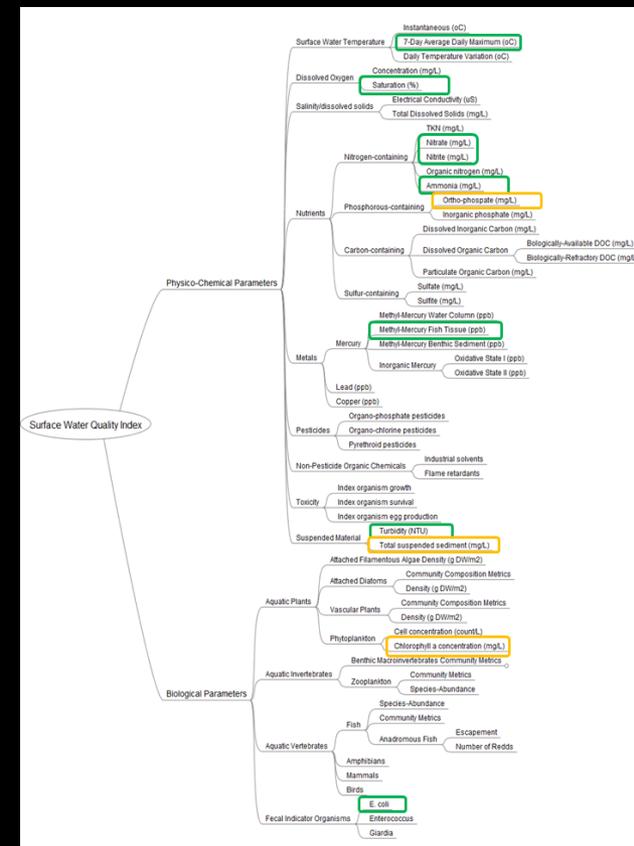
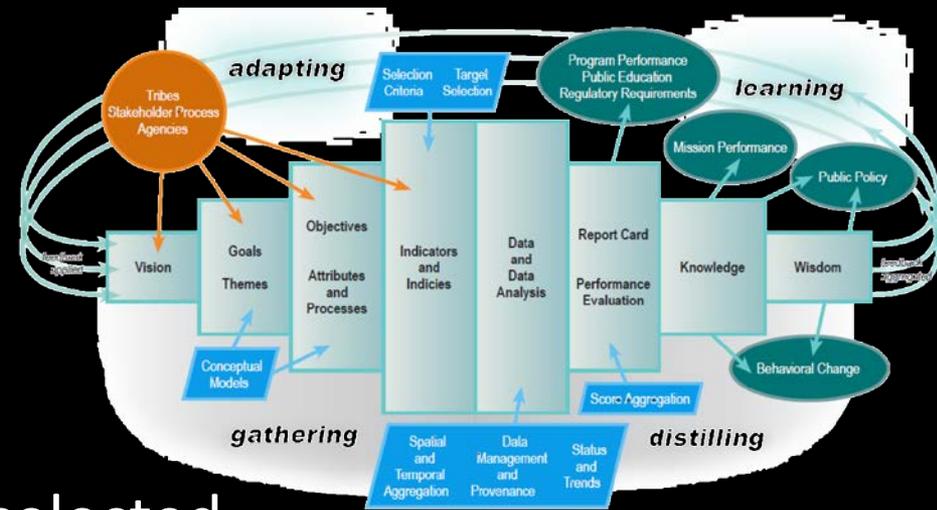
Indicators

System is based on indicators, selected in open process

Indicators correspond to social objectives for valued attributes

Indicators are quantitative measures of how well we are meeting objectives

Thus, they require data and a clear evaluation protocol



Indicators

California Tribes and Water Plan Goals	Indicators
Reliable Drinking Water Supply	Groundwater use Surface water use/supply Change in depth to groundwater Waterway threatened by climate change
Reliable Drinking Water Quality	Groundwater quality Surface water quality Pathogenic organisms Ag/wastewater pollutants Industrial pollutants
Environmental Quality	Mercury in edible fish Flows relative to goals Water temperature Waterway fragmentation Invasive species by basin
Maintenance of Traditional Activities	Tribal cultural use

Process

Met with reps from Southern California Tribal Chairmen's Association, Round Valley Indian Tribe, RTOC-participating tribes

Discussed possible indicators important to tribes and that tribes thought were regionally important

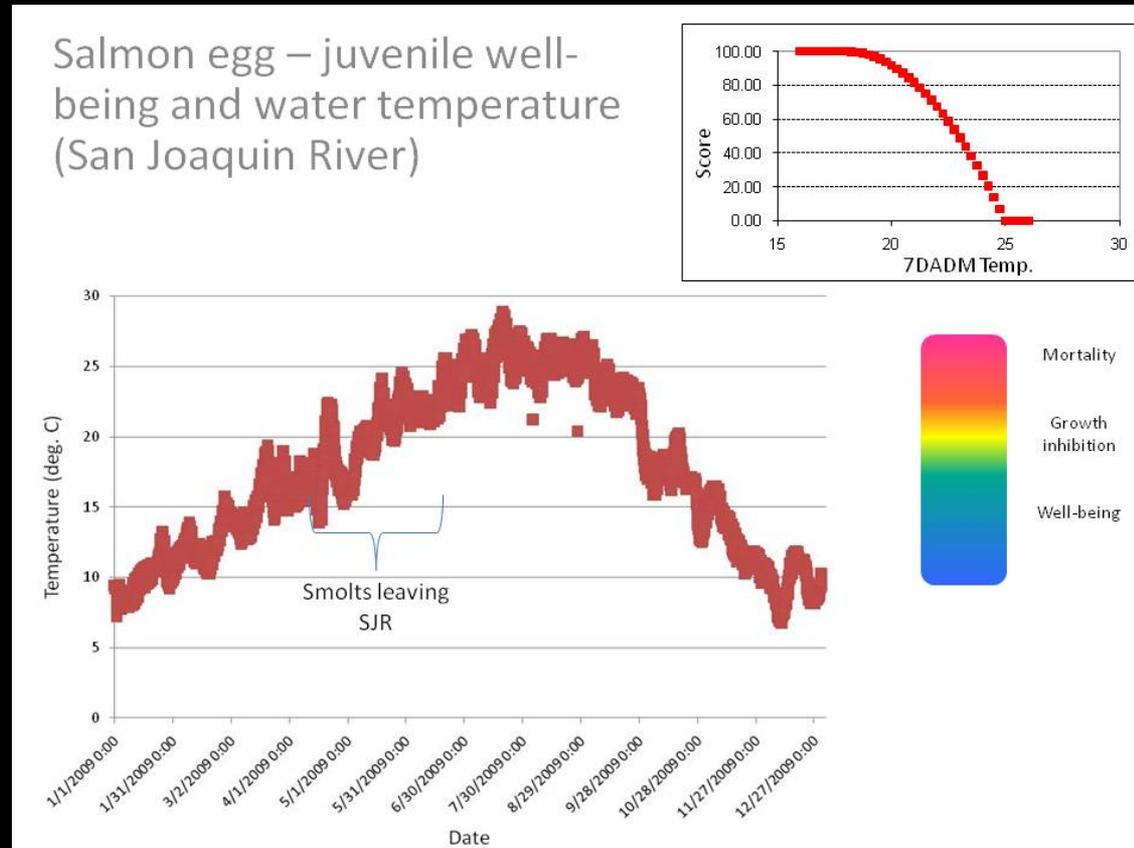
Met with DWR staff and reviewed draft CWP 2018 documents

Participated in CWQMC meetings and workgroups

Developed sets of indicators

Indicator Score Conversion

Data for environmental conditions are converted to a score using rules specific to the indicator and data



Open Data

Water Quality Portal (USGS/USEPA)

State/AB1755 Resources

California Water Indicators Portal

Data Hosts and their Sources

California Environmental Health Tracking Program
The California Environmental Health Tracking Program (CEHTP) is a program of the Public Health Institute, in partnership with the California Department of Public Health. CEHTP is primarily funded by the Centers for Disease Control (CDC) National Environmental Public Health Tracking Program. CEHTP works to make environmental health data and information publicly-available through the development of a web-based data query system, state-of-the-art data displays, and innovative web tools and... [more](#)

Data Sources
The following are data sources found on this data host. Click on the icon or title to visit the data source page for more information.

Water Systems Geographic Reporting Tool (June 2009 - May 2018)
Welcome to the California Environmental Health Tracking Program's Drinking Water Systems Geographic Reporting Tool, also known as the Water Boundary Tool (WBT). The WBT facilitates the creation and collection of customer service area boundaries for public water systems in California.

California Natural Resources Agency Open Data
The mission of the California Natural Resources Agency (CNRA) is to restore, protect and manage the state's natural, historical and cultural resources for current and future generations using creative approaches and solutions based on science, collaboration, and respect for all the communities and interests involved.
The CNRA Open Data Platform has been developed to provide data to State of California citizens, agencies, and interested stakeholders in a transparent and useful manner... [more](#)

Data Sources
The following are data sources found on this data host. Click on the icon or title to visit the data source page for more information.

Continuous Groundwater Level Measurements (1992 - Present)
California Department of Water Resources (DWR) continuous groundwater level measurements contains continuous time-series data from automated recorders at sites operated by the Department of Water Resources. Readings are taken at 15-minute to one-hour intervals. Some of the readings are relayed... [more](#)

Periodic Groundwater Level Measurements (1900 - Present)
The DWR Periodic Groundwater Levels dataset contains seasonal and long-term groundwater level measurements collected by the Department of Water Resources and cooperating agencies in groundwater basins statewide. It also includes data collected through the CASGEM (California Statewide Groundwater... [more](#)

California Open Data Portal
California believes in the power of unlocking government data. We invite all to search and explore our open data portal and engage with our data to create innovative solutions. We believe the California open data portal will bring government closer to citizens and start a new shared conversation for growth and progress in our great state.

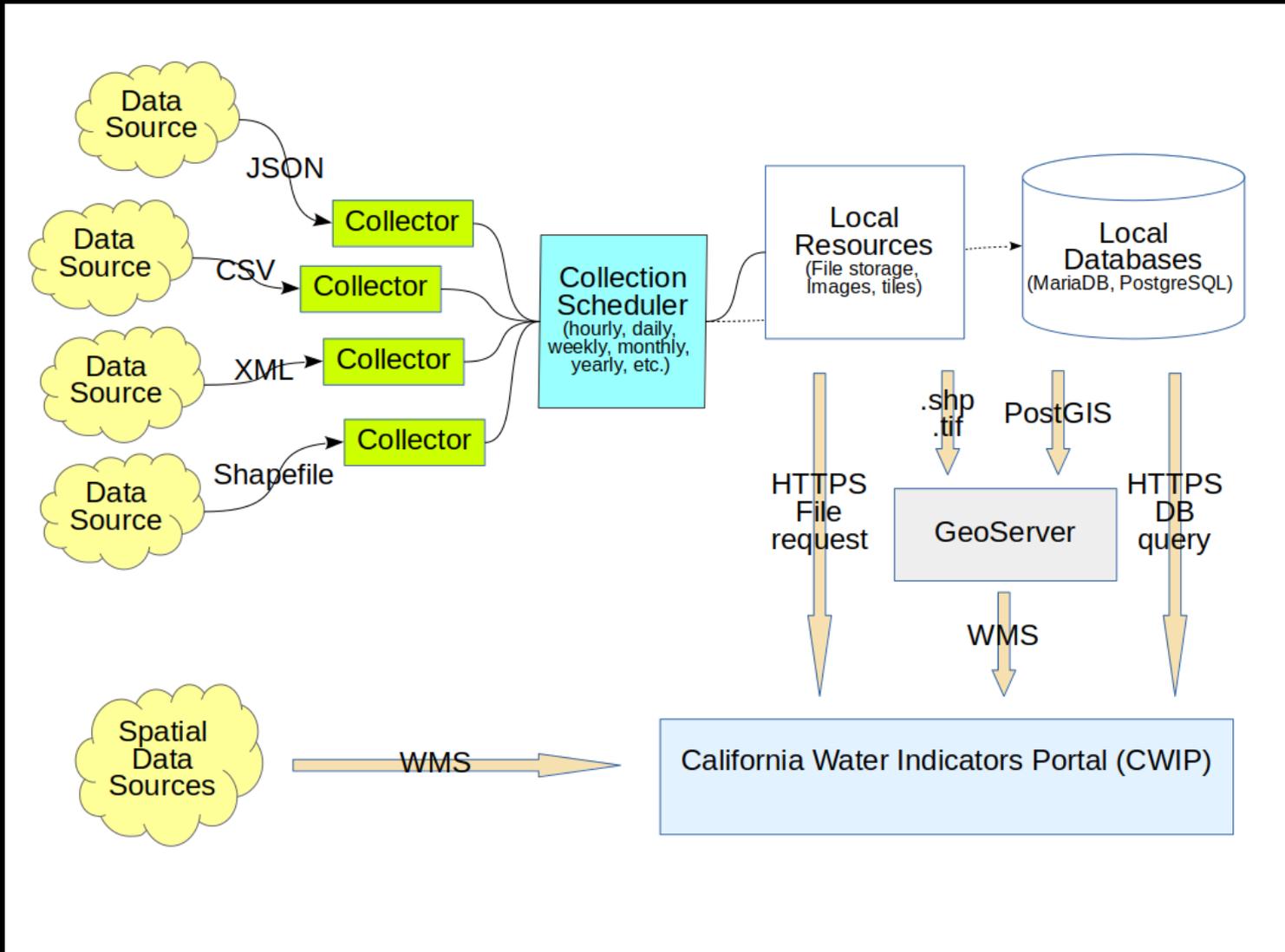
Data Sources
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Surface Water - Chemistry - CEDEN
This data provides results from chemistry and field analyses, from the California Environmental Data Exchange Network (CEDEN).
The data set contains two provisionally assigned values ("DataQuality" and "DataQualityIndicator") to help users interpret the data quality metadata provided with... [more](#)

CEDEN
The California Environmental Data Exchange Network (CEDEN) is a central location to find and share information about California's water bodies, including streams, lakes, rivers, and the coastal ocean. Many groups in California monitor water quality, aquatic habitat, and wildlife health to ensure good stewardship of our ecological resources. CEDEN aggregates this data and makes it accessible to environmental managers and the public.

Water Quality Portal (WQP)
The Water Quality Portal (WQP) is a cooperative service sponsored by the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). It serves data collected by over 400 state, federal, tribal, and local agencies.

Overall Scheme



“Grab” Corresponding Data

Three primary mechanisms:

1) Local database query:

Periodically access data and query locally

2) APIs:

Query data that are online (e.g., WQP) using URL

Query data using agency interface

3) “Scrape” data only available as online tables

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/*
 * Build the query based on class values which are set based on the
 * type of data being extracted.
 */
protected function createURL() {
    if ($this->queryType == 'station') {
        $url = "https://www.waterqualitydata.us/data/Station/search?";
    } else if ($this->queryType == 'result') {
        $url = "https://www.waterqualitydata.us/data/Result/search?";
    } else {
        $this->error = "Error: Incorrect query type";
        return "";
    }

    $url .= "countrycode=".$this->countryCode;
    $url .= "&statecode=".$this->stateCode;
    $url .= "&siteType=".$this->siteType;
    if ($this->siteID) {
        $url .= "&siteid=".$this->siteID;
    }
    $url .= "&minactivities=".$this->minActivities;
    $url .= "&sampleMedia=".$this->sampleMedia;
    $url .= "&characteristicType=".$this->characteristicType;
    $url .= "&characteristicName=".$this->characteristicName;
    $url .= "&minresults=".$this->minResults;
    $url .= "&startDateLo=".$this->startDate;
    $url .= "&startDateHi=".$this->endDate;
    $url .= "&mimeType=".$this->mimeType;
    $url .= "&zip=".$this->zip;
    $url .= "&sorted=".$this->sorted;

    return $url;
}
```

California Data Exchange Center X

cdec.water.ca.gov/cgi-progs

TUOLUMNE R-LA GRANGE DAM (TLG)

Elevation: 170' · TUOLUMNE R basin · Operator: Turlock Irrigation District

Provisional data, subject to change.
Query executed Thursday at 16:13:22

Earlier

Date	MON FLO AF	MON FNF AF
08/1987	134477	8082
09/1987	74608	2725
10/1987	35835	10966
11/1987	39890	26144
12/1987	13617	50314
01/1988	7323	70422
02/1988	6216	57053
03/1988	95240	104925
04/1988	61208	159417
05/1988	38297	212874
06/1988	60530	98221
07/1988	127831	23503
08/1988	57300	6396
09/1988	29096	915
10/1988	6254	3854
11/1988	6732	21228
12/1988	5697	28800
01/1989	4272	36544
02/1989	4510	61500
03/1989	42270	285046
04/1989	63227	309418
05/1989	86446	320768
06/1989	112802	207384
07/1989	162744	28061
08/1989	134122	2106

<http://cdec.water.ca.gov/cgi-progs/queryMonth.html?span=30&start=1987-07-01&end=1989-07-01>

Visualization

Maps

CWIP About Indicators **Maps** Regions Data Acknowledgements

Maps

View Edit Delete Revisions

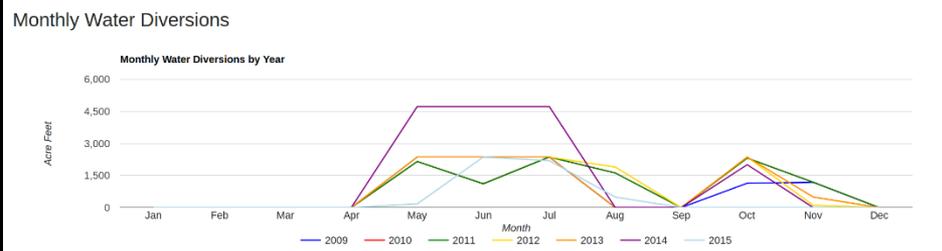
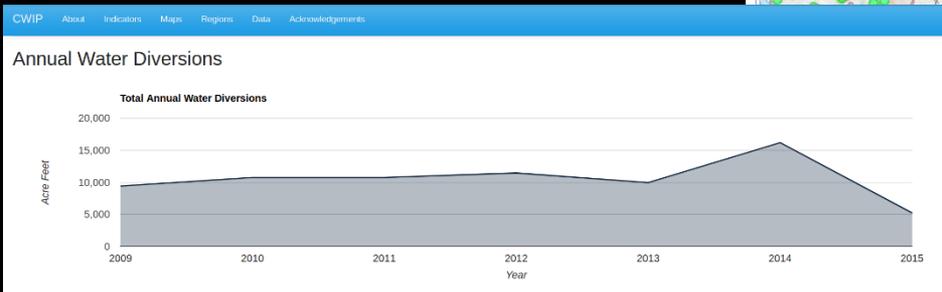
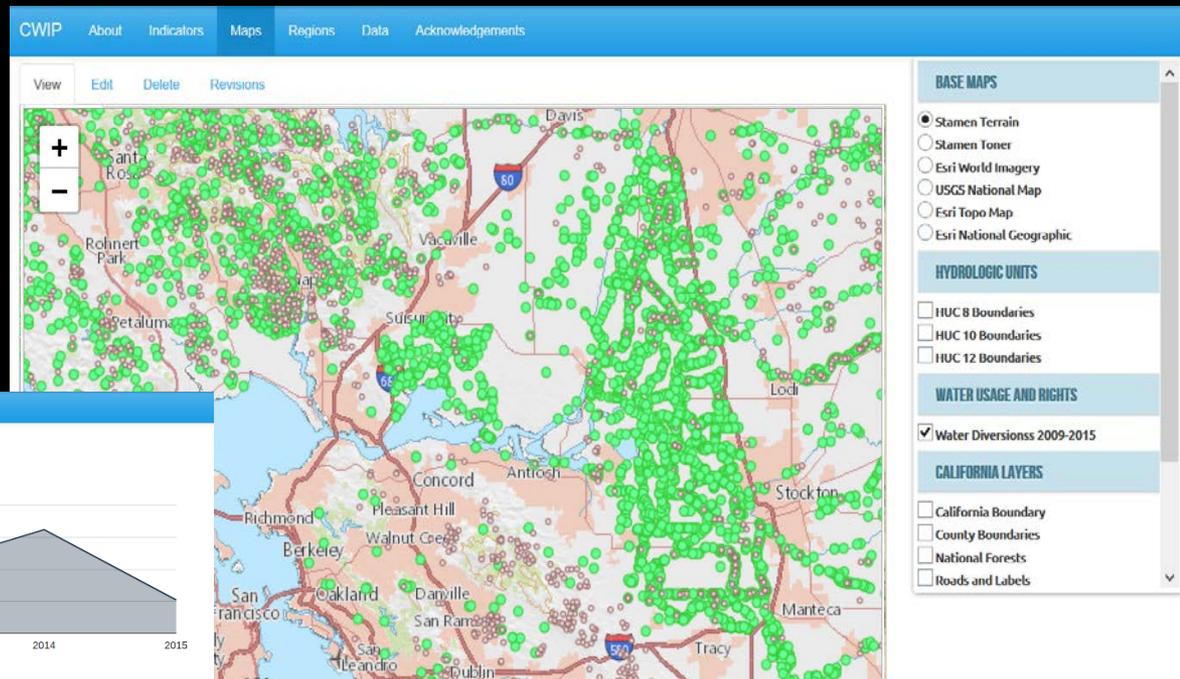
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Map Layers

- BASE MAPS**
 - Stamen Terrain
 - Stamen Toner
 - Esri World Imagery
 - USGS National Map
 - Esri Topo Map
 - Esri National Geographic
- HYDROLOGIC UNITS**
 - HUC 8 Boundaries
 - HUC 10 Boundaries
 - HUC 12 Boundaries
- WATER USAGE AND RIGHTS**
 - Water Diversions 2009-2015
- CALIFORNIA LAYERS**
 - California Boundary
 - County Boundaries
 - National Forests
 - Roads and Labels

Visualization

Maps – select indicator in legend to right, zoom into points



Visualization

Regions

CWIP [About](#) [Indicators](#) [Maps](#) [Regions](#) [Data](#) [Acknowledgements](#)

HU Name: Indian Wells-Searles Valleys

View Edit Delete

Regional Information	Physical Attributes
Code: 18090205 Scale: HUC 8 HUType: S	Area (sq km.): 5,230.13 Area Acres: 1,292,391.50 State(s): CA

Regional Water Diversions Map

Parent Region

Scale: State

- California

Nearby Regions

These regions are at the same spatial scale as the current region, and are nearby to each other (have the same parent region).

Scale: HUC 8

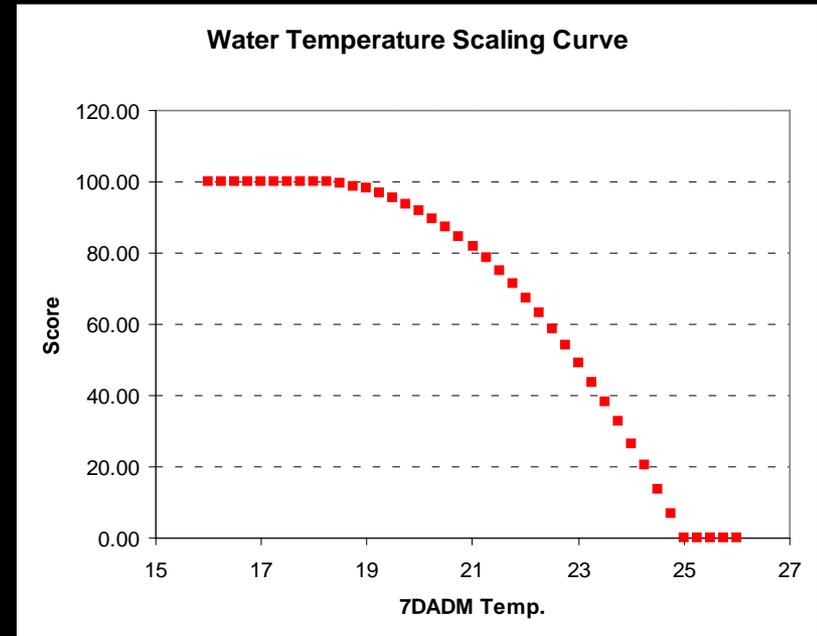
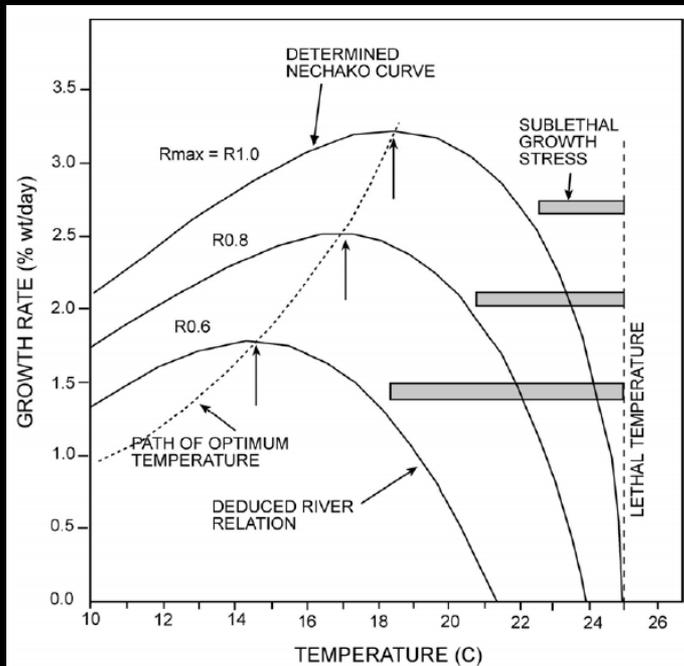
- Aliso-San Onofre
- Antelope-Fremont Valleys
- Applegate
- Battle Creek
- Big Chico Creek-Sacramento River
- Big-Navarro-Garcia
- Butte
- Butte Creek
- Calleguas
- Carrizo Creek
- Carrizo Plain
- Central Coastal
- Chetco
- Clear Creek-Sacramento River
- Cottonwood Creek
- Cottonwood-Tijuana
- Cow Creek
- Coyote
- Coyote-Cuddeback Lakes
- Crowley Lake
- Cuyama
- Death Valley-Lower Amargosa
- East Branch North Fork Feather

Regional Water Diversions

Application	Source	Watershed	County
A004682	East Sacatar Creek	Indian Wells	Inyo
A007411	Cabin Spring	Trona	Inyo

Example: Water Temperature

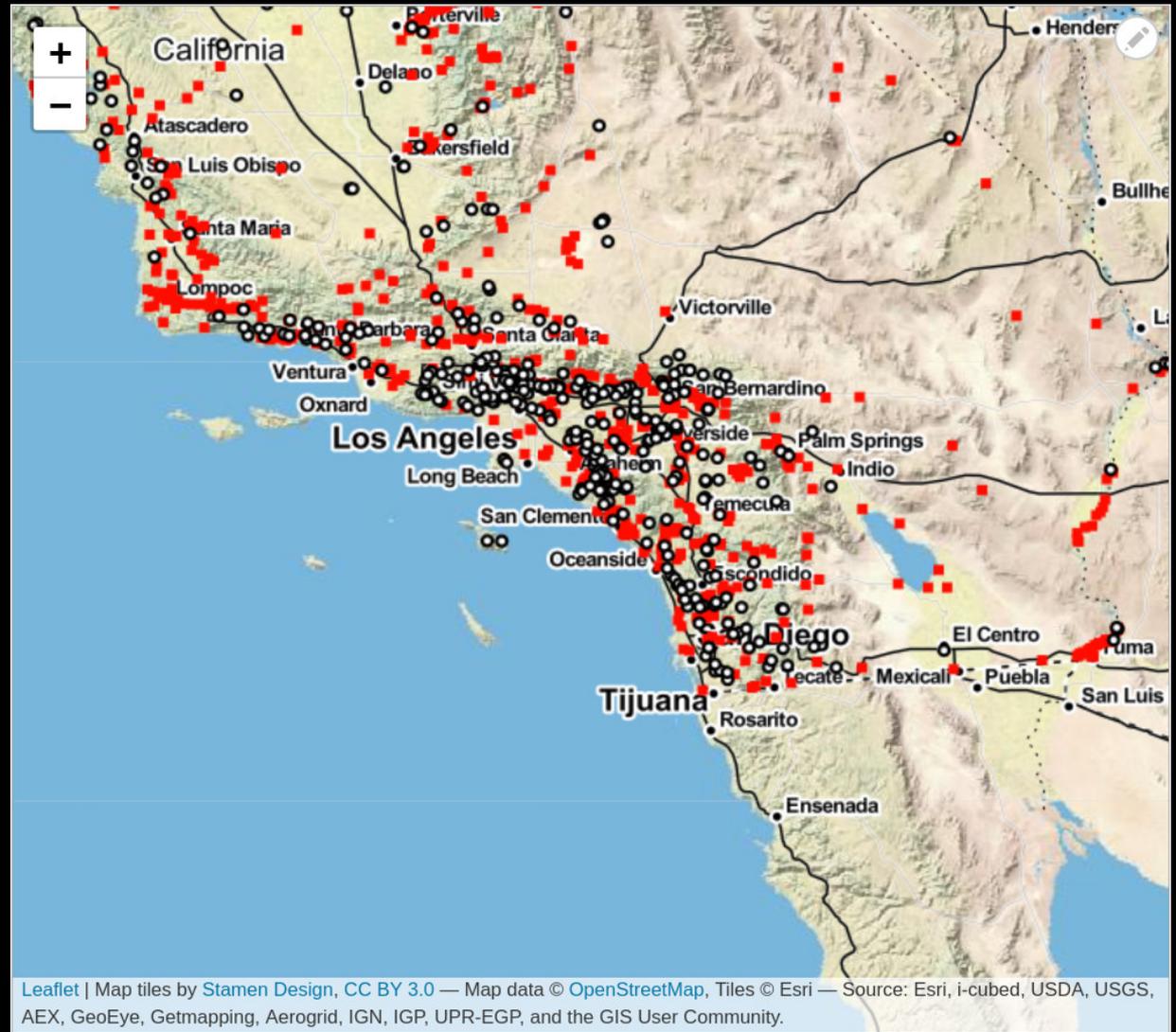
Chinook salmon growth curve (Brett et al. 1982). Growth rates at different temperatures for three feeding levels ($R=0.6, 0.8,$ and 1.0). R_{max} ($R=1.0$) represents satiation feeding, with $R=0.6$ closer to natural feeding levels.



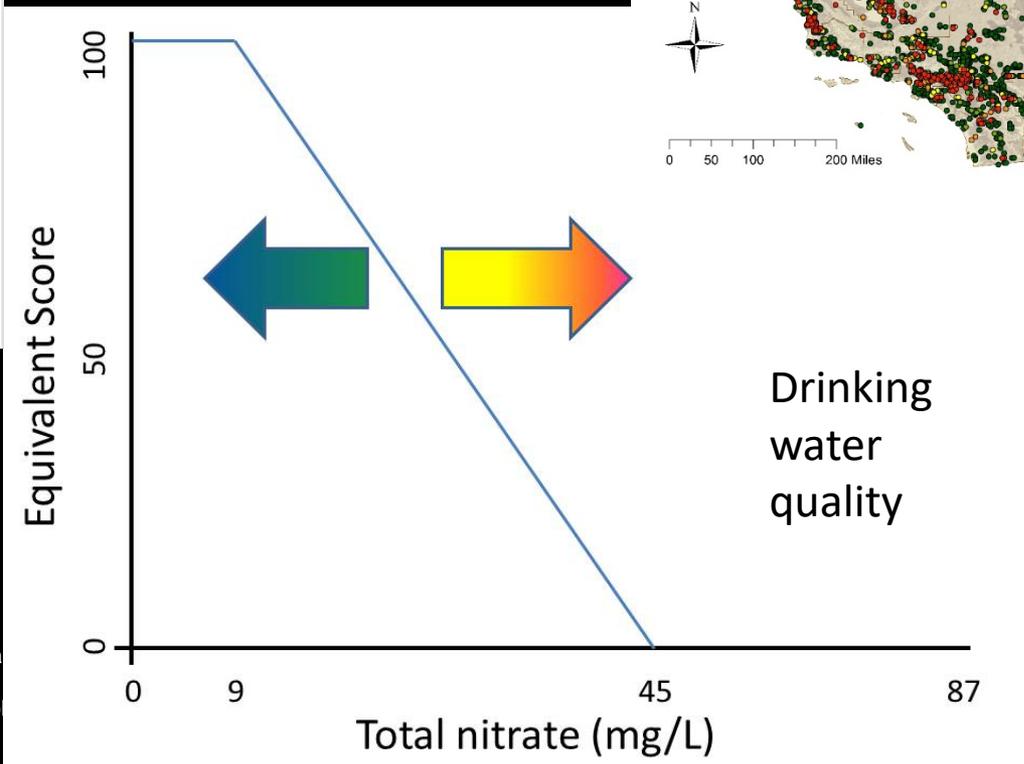
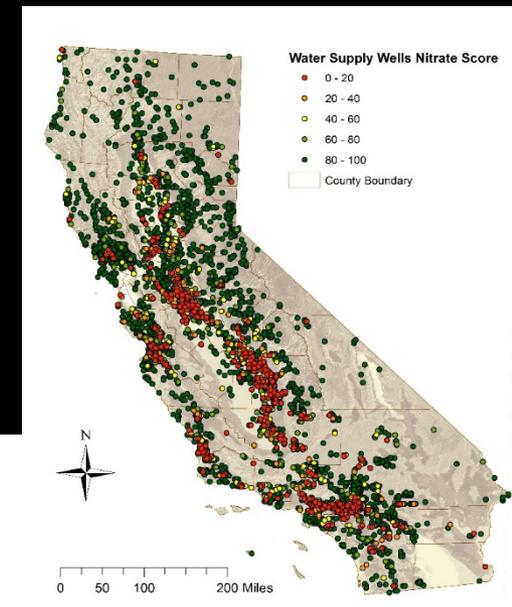
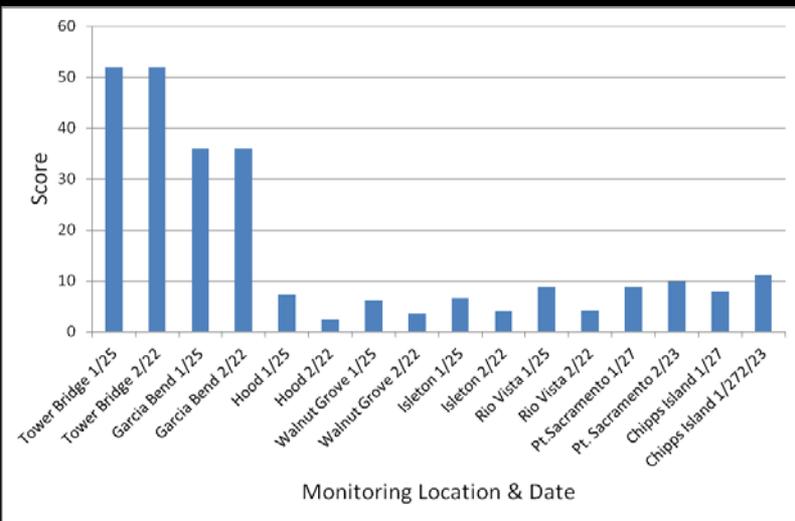
Water temperature scaling curve, converts 7-day average daily maximum temperature to a 0 to 100 score. The formula is $100 - r(x-K)^2$, where $r = 2.041$ and $K = 18^\circ\text{C}$.

Or instantaneous equation $Y = 1 - 1/(1 + e^{-(12 - .56T)})$ (chinook salmon juvenile, Delta smelt; Bennett (2005); Nobriga et al. (2008); Moyle (2002))

Surface and ground water



Example: N (Ammonium, Nitrate)

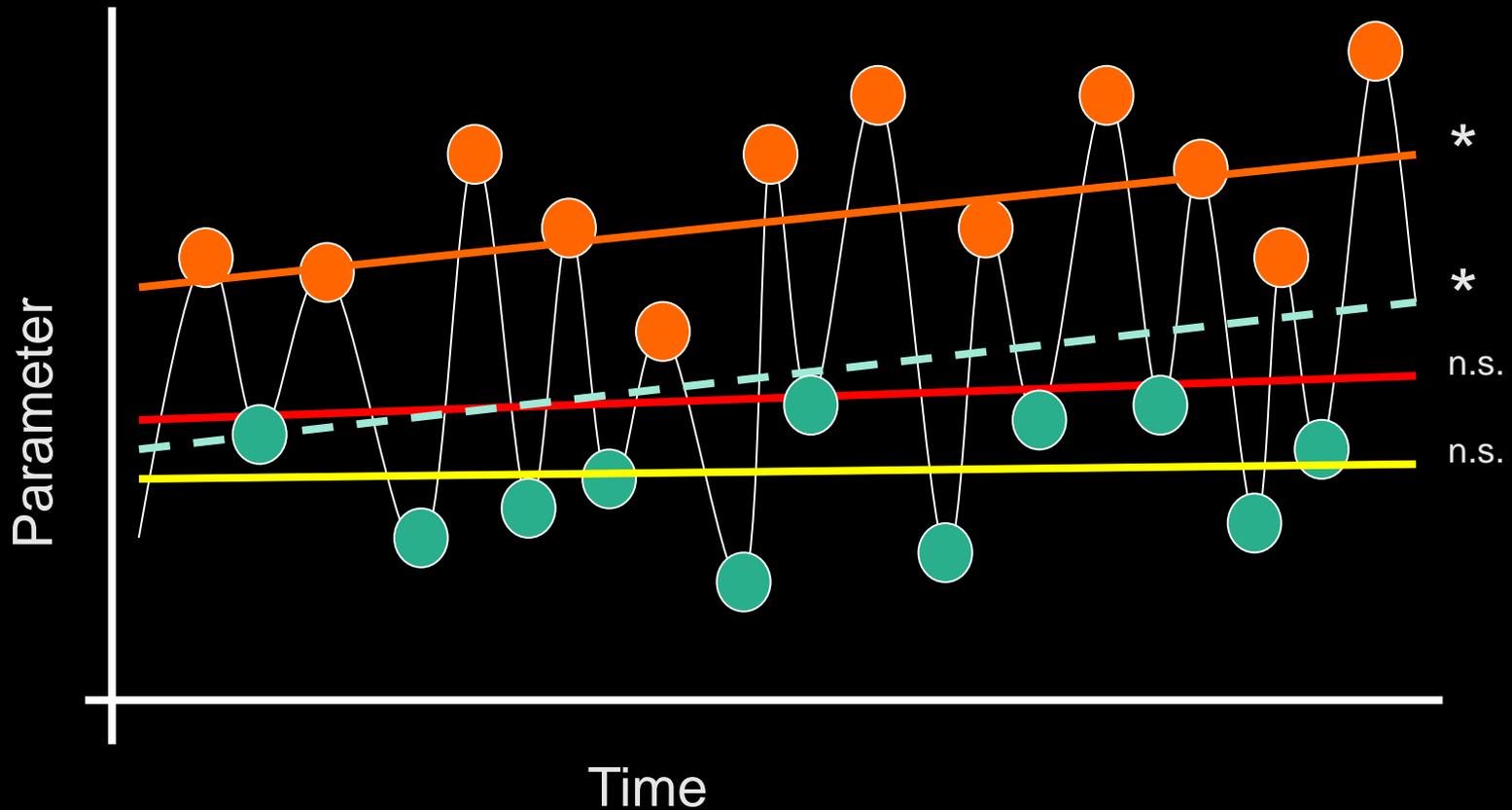


Score based on Dugdale et al., 2007, ammonium suppression of nitrate uptake
 formula = $\ln(Y) = -1.28 \cdot \ln(X) - 4.26$
 Suppression begins at 1 micromolar = score of 100. Score of 1 at 36 micromolar (no true 0)

Next Steps

- Finalizing indicator data collection and score calculation
- Associating sites with each other
- Communicate with stakeholders
- Finishing 9/2018

Automated Features: Trends Analysis



Contact

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