

Colorado Basin Integrated Water Management Planning Stakeholder Committee Meeting, August 17, 2017

Task 2 Information synthesis

Colorado Basin Round Table



Ruth Powell Hutchins
Water Center



REVIEW

IWMP Goals

“identify ways to meet environmental flow needs along with the needs of other water users”

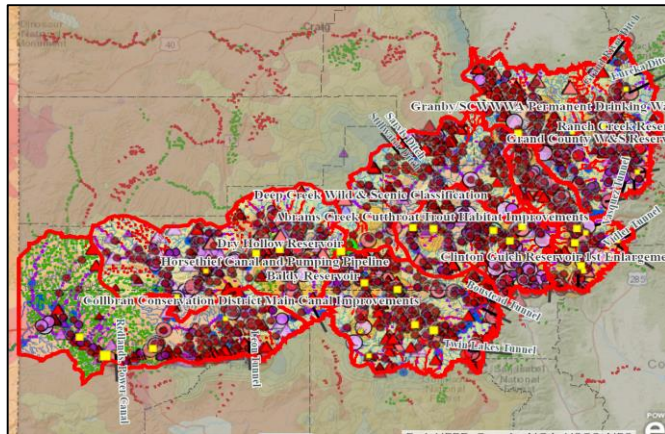
Task 2 Goals

“development of a publicly-accessible geospatial database in GIS format to inform integrated water management planning”

Task 2 Deliverables (*From original RFP*)

“A detailed GIS map to depict what available data shows about stream health in each stream segment in the basin.”

REVIEW



Sub-region	Stream	Topic	Year	Title/link	Author	Notes
Across Sub-Regions	Multiple	Aquatic Biology	2015	Modeling Whitewater Park Hydrology and Fish Habitat in Colorado	Department of Civil and Environmental Engineering, Colorado State University, US Bureau of Reclamation, Aquatic Wildlife Research Section, Colorado Parks and	Addresses impacts of whitewater park features on fish.
Across Sub-Regions	Multiple	Aquatic Biology	2014	Population Trends of Smallmouth Bass in the Upper Colorado River Basin with an Evaluation of Removal Effects	Bretton, A. R., D. L. Winkelman, J. A. Hawkins, and K. R. Benign	Smallmouth bass <i>Micropterus dolomieu</i> were rare in the upper Colorado River basin until the early 1990's when their abundance dramatically increased in the Yampa River sub-basin. Increased abundance was due primarily to colonization from Elkhead Reservoir, which was rapidly drawn down twice, first to make improvements to the dam (1992) and a second time for reservoir expansion (2005), and allowed escapement of resident bass to the river through an unscreened outlet.
Across Sub-Regions	Multiple	Aquatic Biology	2014	Colorado River Aquatic Resource Investigations Federal Aid Project F-237-R23	Colorado Parks & Wildlife Aquatic Research Section	This project evaluated biological and ecological factors impacting sport fish populations in coldwater streams and rivers in Colorado.
Across Sub-Regions	Multiple	Aquatic Biology	2014	Population Structure, Abundance and Recruitment of Colorado Pikeminnow of the	D.B. Osmundson, Fish and Wildlife Service, G.C. White	Mark-Recapture studies from 1991 through 2010 were used to assess population trends of Colorado pikeminnow <i> Ptychocheilus lucius </i> in the upper Colorado River
Across Sub-Regions	Multiple	Aquatic Biology	2013	-	James J. Roberts, Kurt D. Fausch, Douglas P. Peterson, Mevin B. Hooten. In Global Change Biology, May, 2013	...We developed an empirical model to predict stream temperatures at the fragment scale from downscaled climate projections along with geomorphic and landscape variables. We coupled these spatially explicit predictions of stream temperature with a Bayesian Network (BN) model that integrates stochastic risks from fragmentation to project persistence of CRCT populations across the upper Colorado

Task 2 faced a very problematic implementation due to significant disparities in:

- Spatial and temporal coverage of existing work
- Variable data resolution
- Methodologies
- Deliverable types

Data Rich, Information Poor

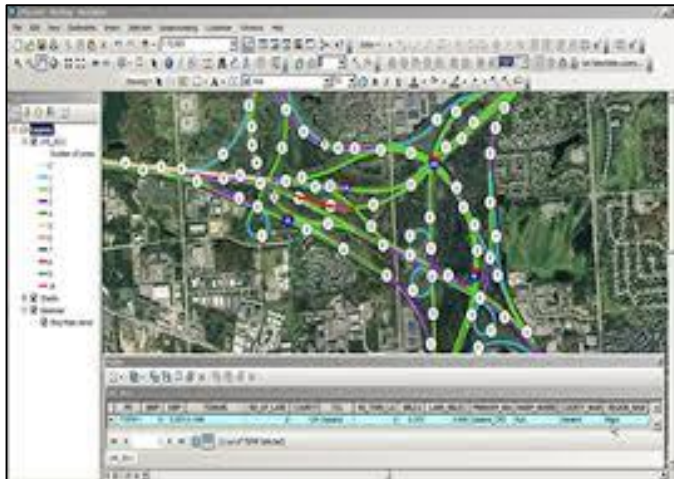
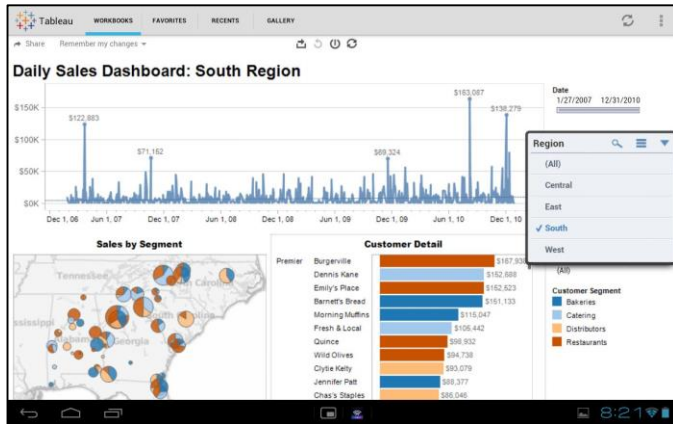
Many accumulated resources for stream health questions, yet decision makers may not always know how to access or appropriately utilize them.

= Data Rich, Information Poor syndrome
(and sub-optimal water resource decision making)



REVIEW

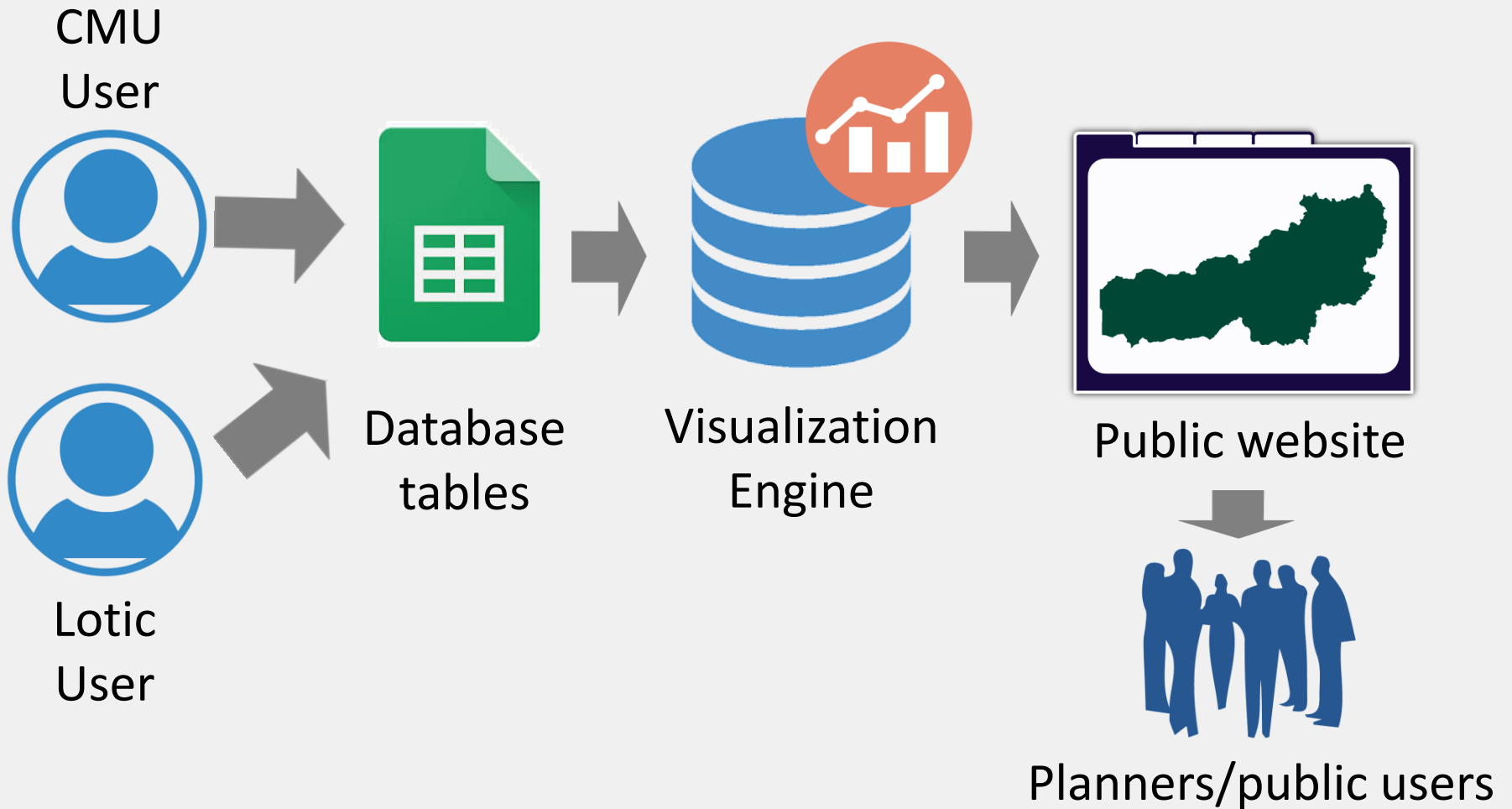
“Information-centered” vs “Map-centered” visualizations



Data Rich, Information Poor



REVIEW



Water Information Dashboards

Dashboard links and demos

[Hydrology](#)

[Water Use](#)

[Hydrologic Alteration](#)

[Water Quality](#)

[Water Regulation](#)

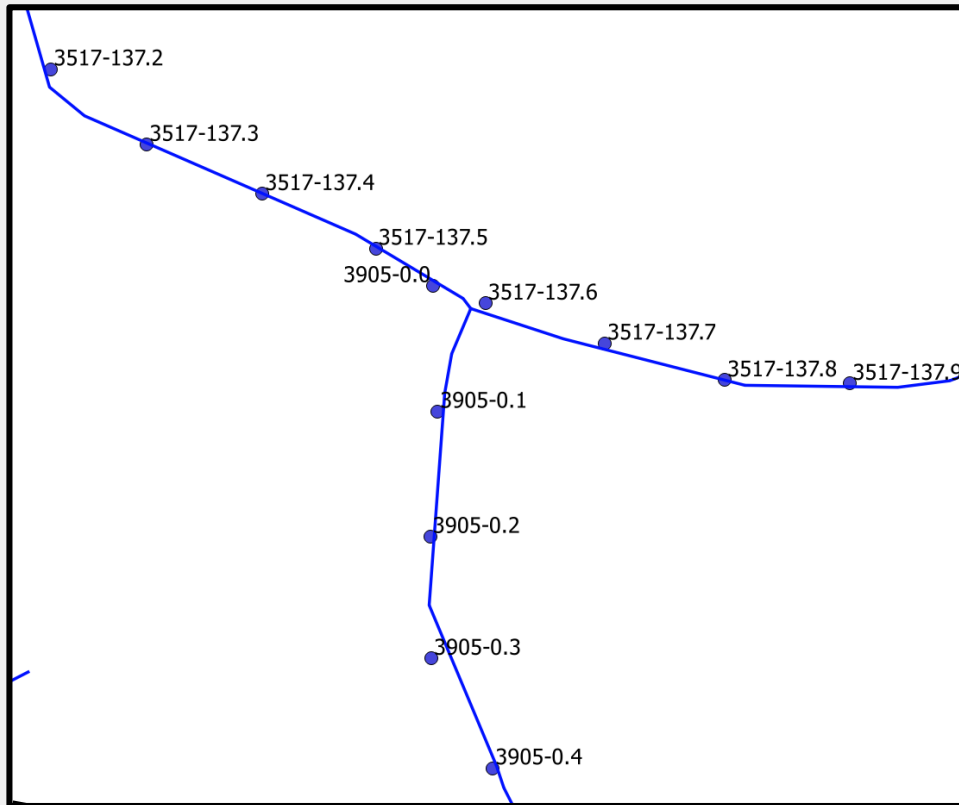
[Studies Library](#)

Stream Mile Segmentation Framework

Purpose

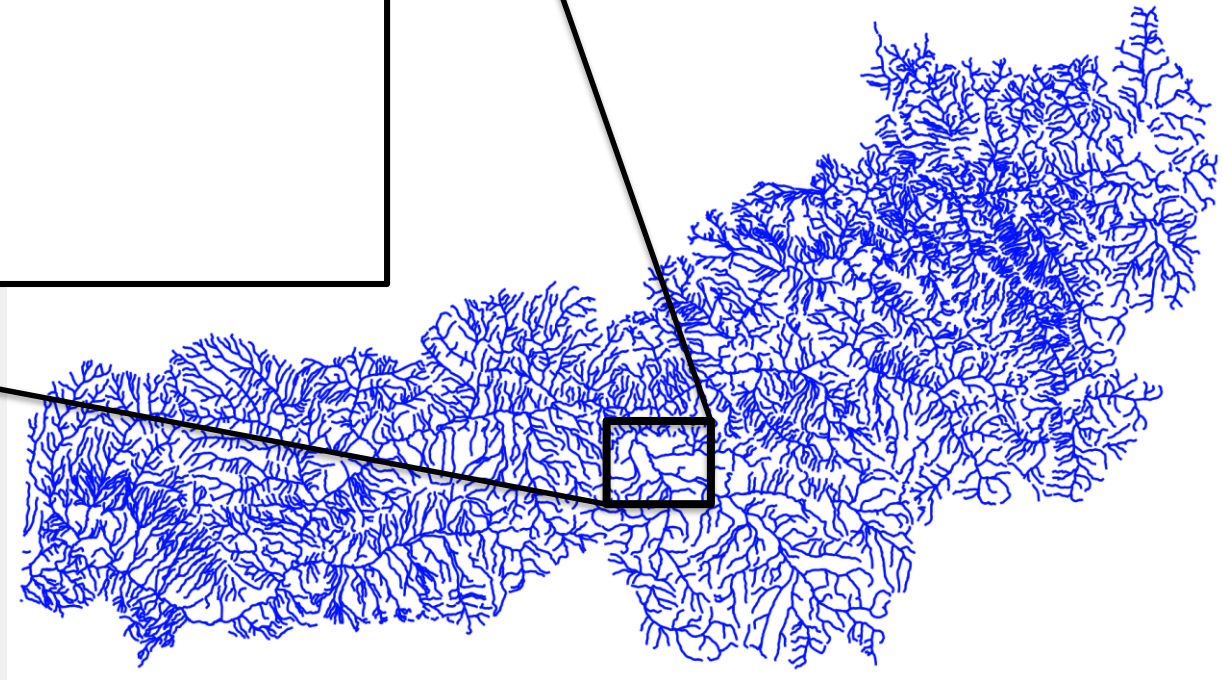
- Provide a context for continued aggregation of information in a way that aligns with the water dashboards and goals of CBRT IWMP
- Provides a pathway for planners to develop questions about watershed conditions, use, etc., and answer those by developing and applying queries to a spatial database

Stream Mile Route Framework



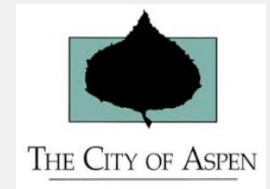
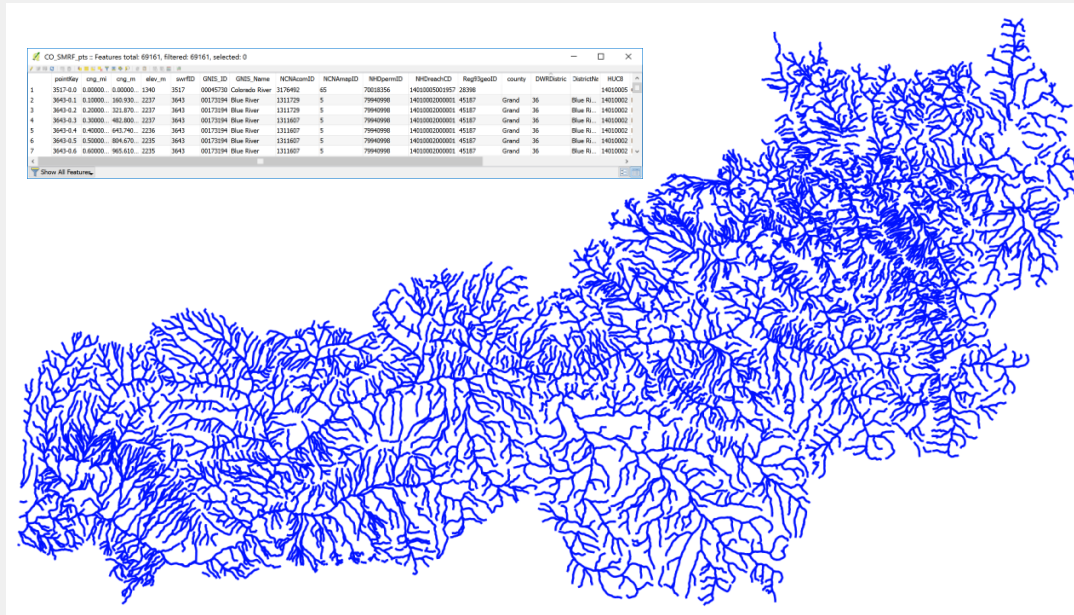
0.1 Mile Segment

- CO SWRF ID + Distance from Mouth
- 3905-0.1, 3905-0.2, ...

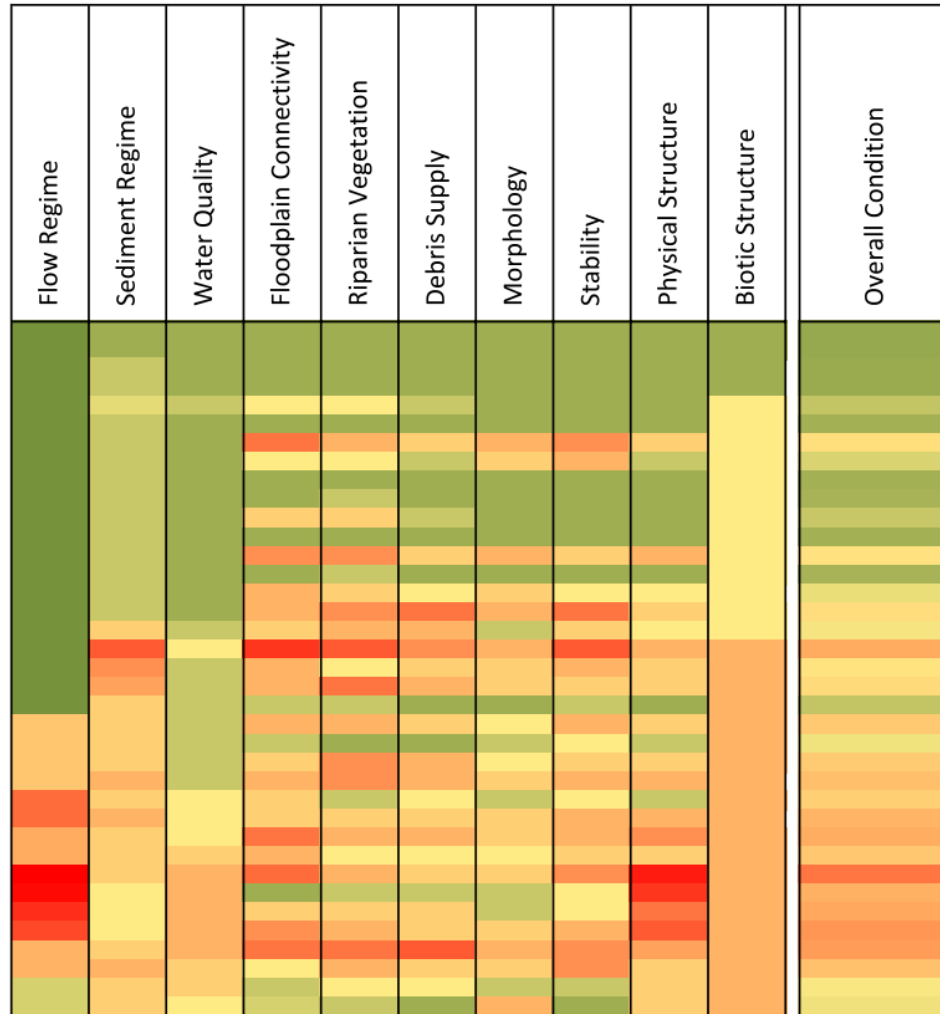


Stream Mile Segmentation Framework

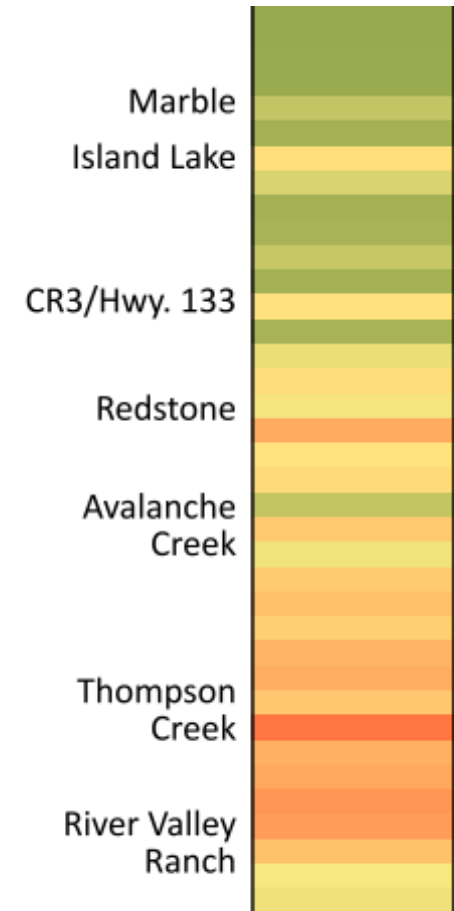
Accommodate diverse information at federal, state, and local levels



Stream Mile Segmentation Framework

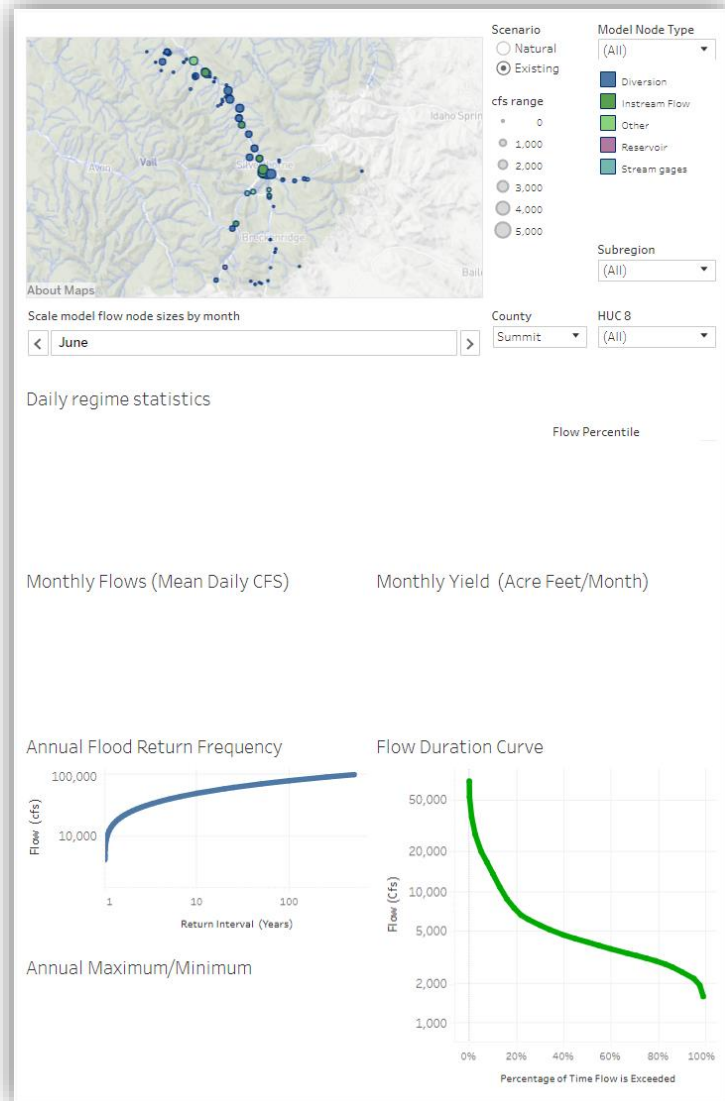
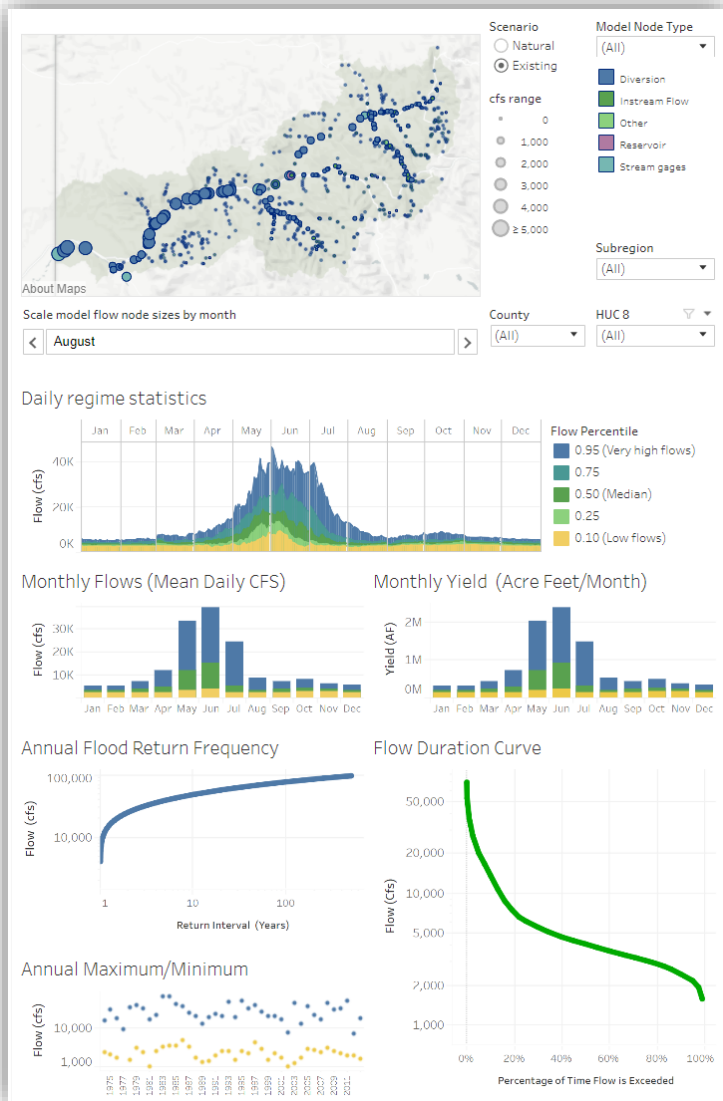


Grade	Score	Level of Impairment
A	90-100	Negligible
B	80-90	Mild
C	70-80	Significant
D	60-70	Severe
F	50-60	Profound/Unsustainable

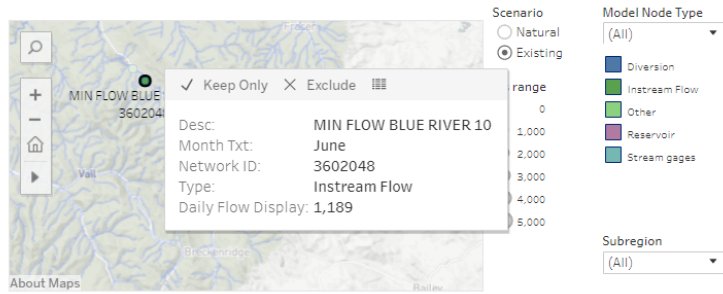


Offline Slide Demo Screenshots

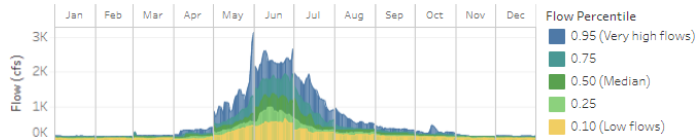
Hydrology



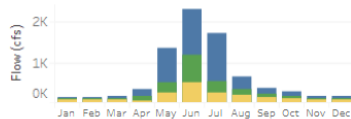
Hydrology



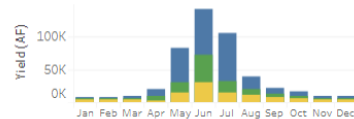
Daily regime statistics



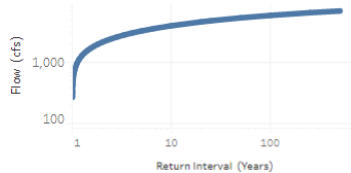
Monthly Flows (Mean Daily CFS)



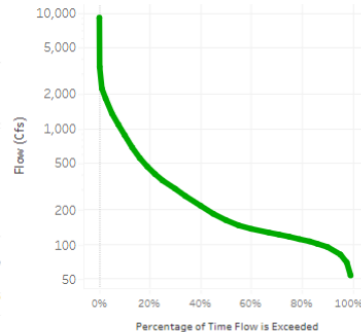
Monthly Yield (Acre Feet/Month)



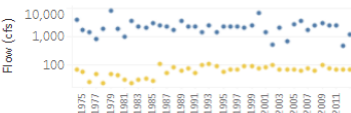
Annual Flood Return Frequency



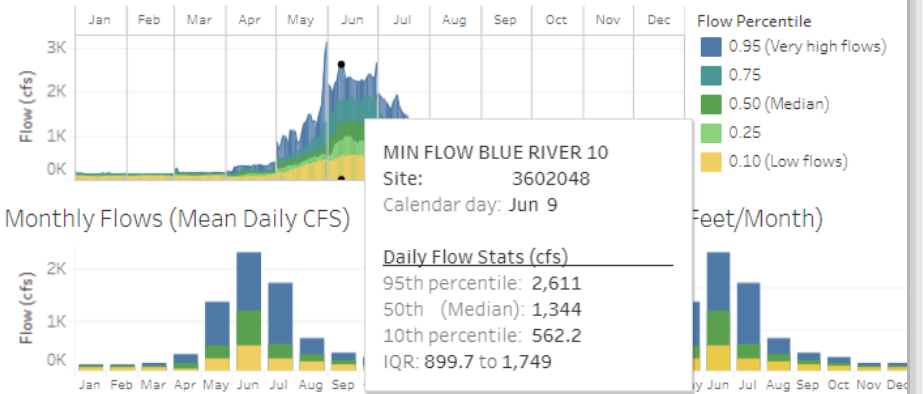
Flow Duration Curve



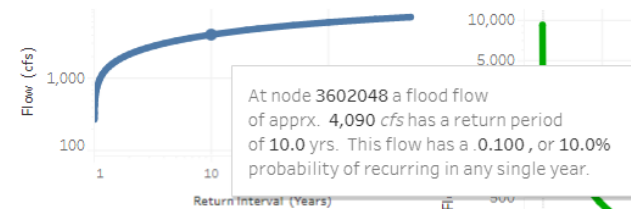
Annual Maximum/Minimum



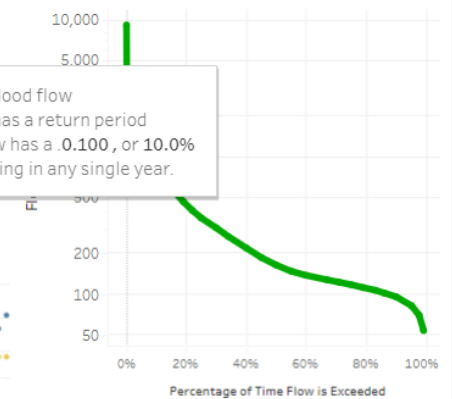
Daily regime statistics



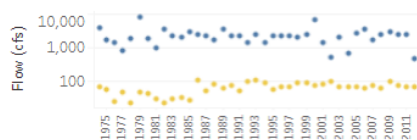
Annual Flood Return Frequency



Flow Duration Curve



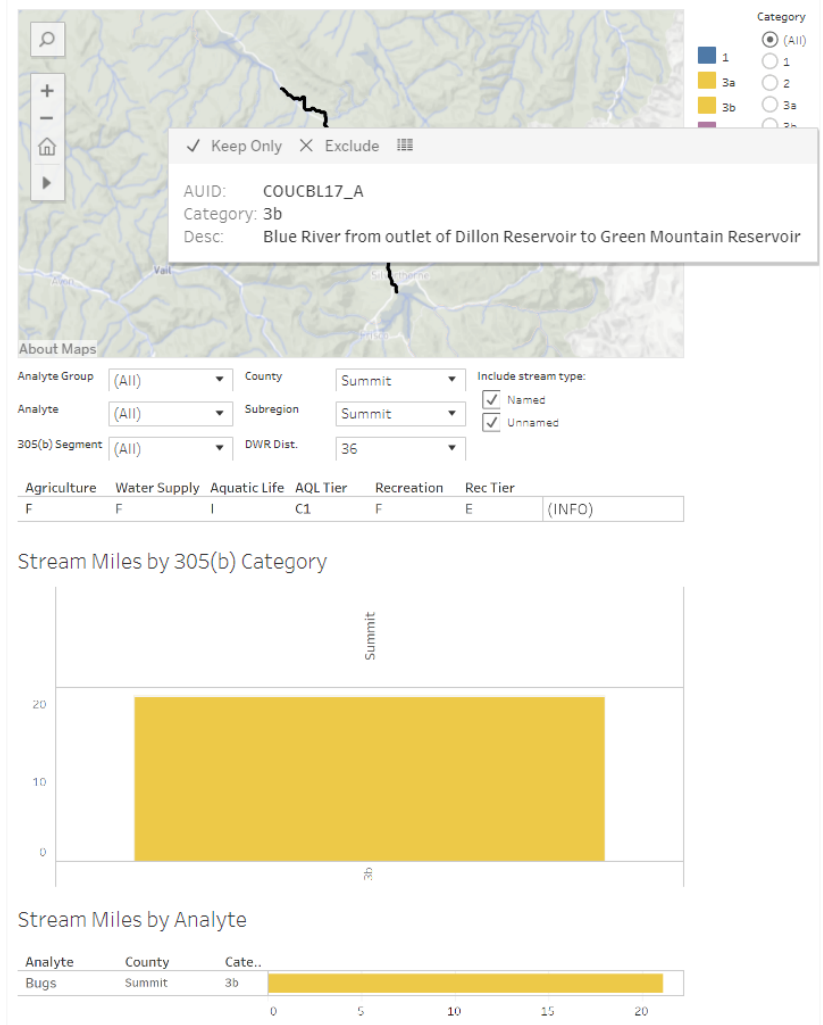
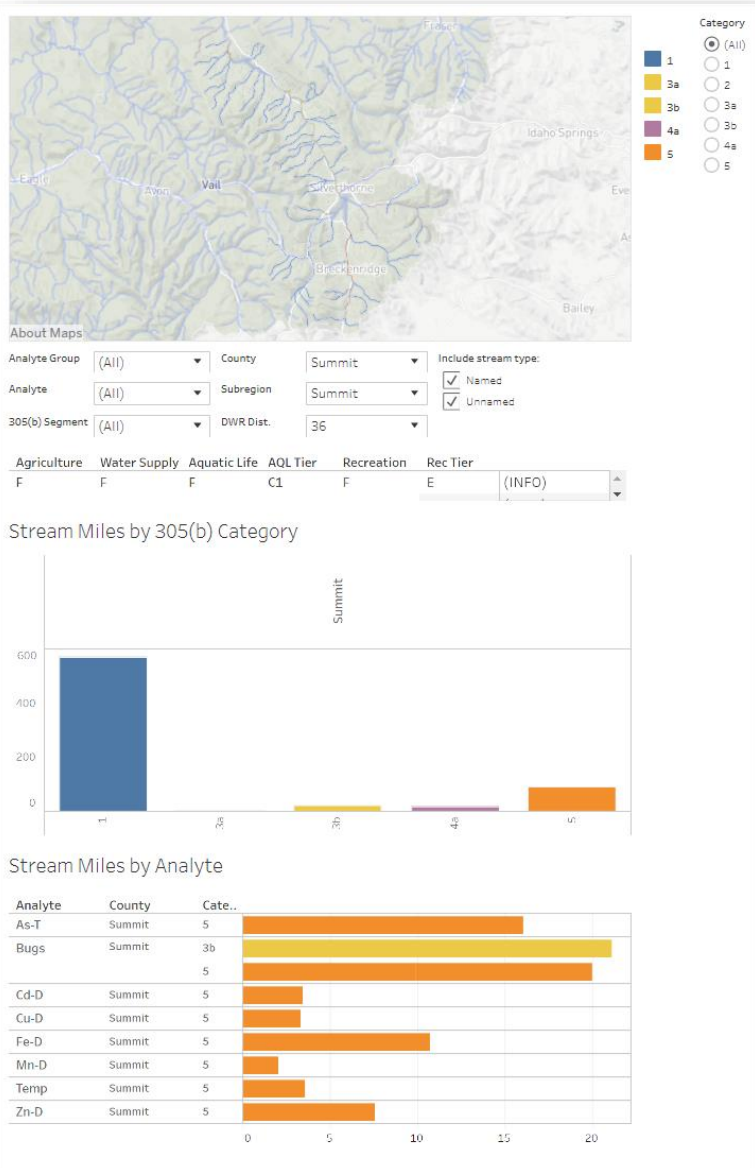
Annual Maximum/Minimum



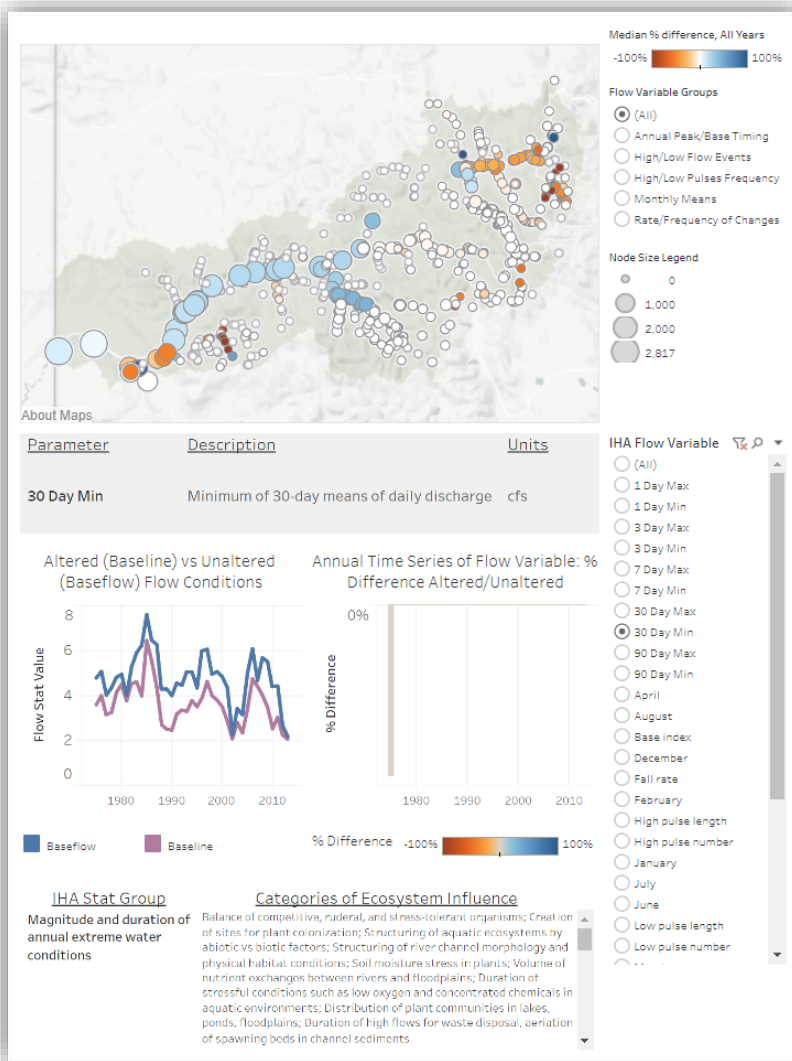
Water Quality Regulation



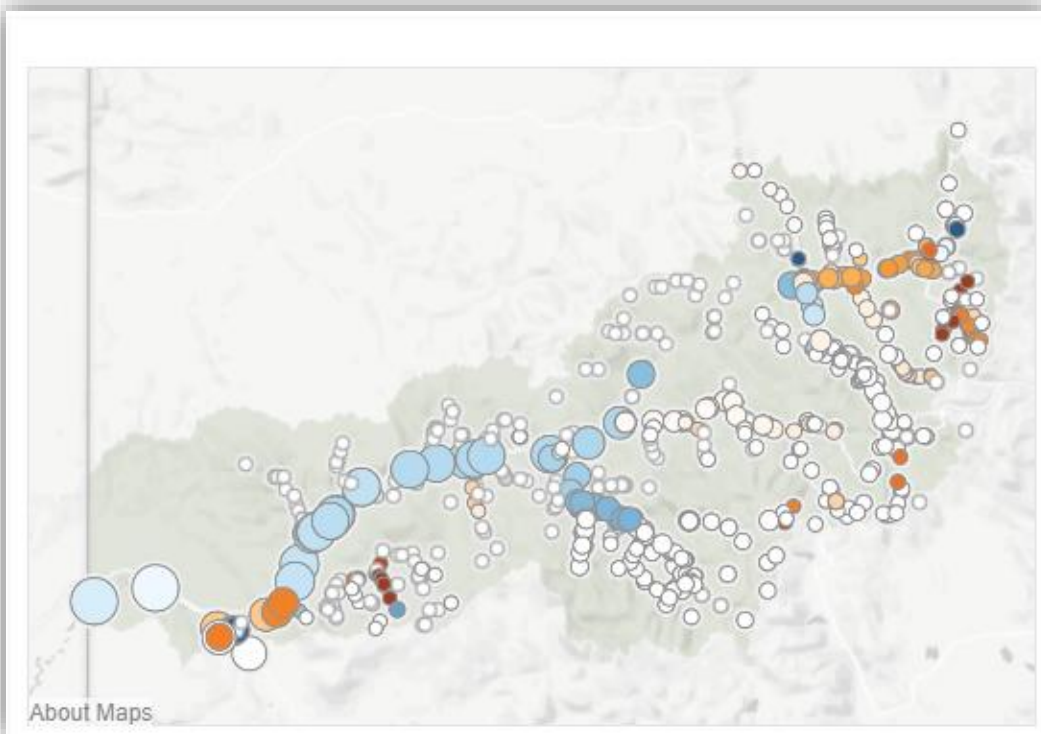
Water Quality Regulation



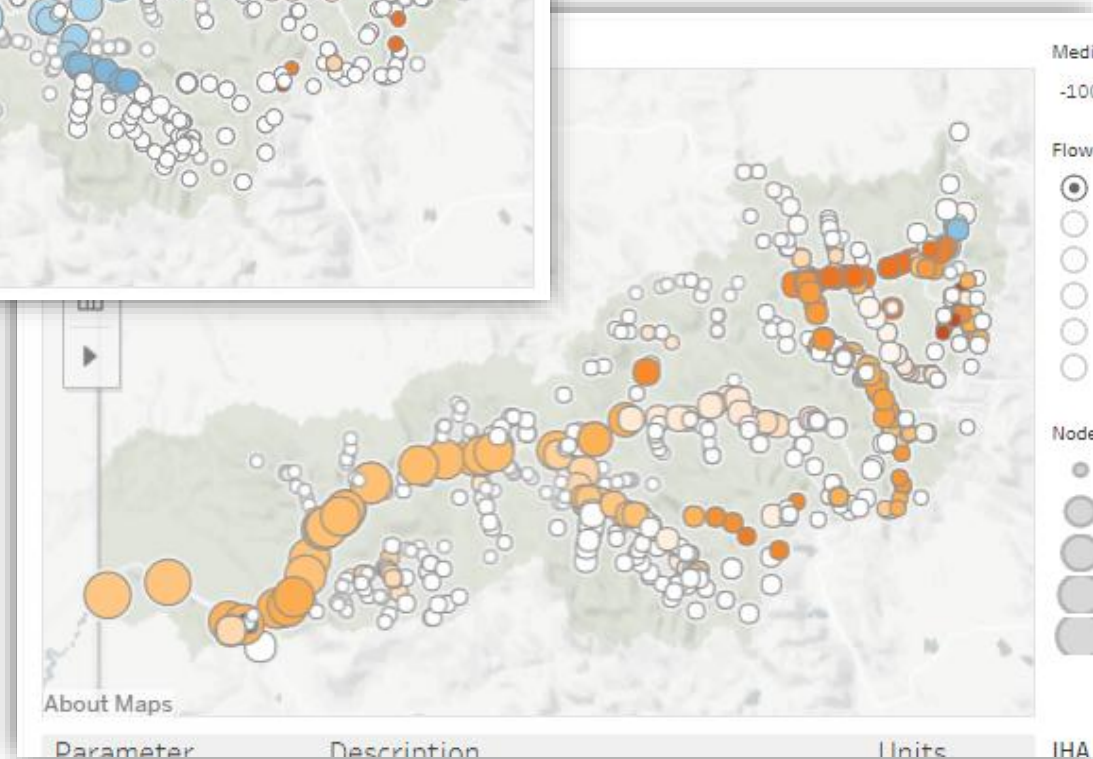
Hydrologic Alteration



Hydrologic Alteration



Mean of 30 day
minimums



Location: COLO R NR KREMMLING
Network ID: 09058000
Water source: Colorado River

Flow Variable values, pre- and post-alteration scenarios
Stat: September Units: cfs
 Median Value, *undiverted* river scenario: 558
 Median Value, *diverted* river scenario: 916

Percent difference stats between altered (existing baseline) and unaltered (natural baseflows) across all years:
 Max: 115%
 Median: 58%
 Min: -4%

Parameter	Description	Units
September	September mean daily discharge	cfs

Altered (Baseline) vs Unaltered (Baseflow) Flow Conditions

This line chart shows the Flow Stat Value (Y-axis, 0 to 1500) from 1980 to 2010 (X-axis). The Baseline (pink line) is consistently higher than the Baseflow (blue line). Both show significant seasonal fluctuations.

Annual Time Series of Flow Variable: % Difference Altered/Unaltered

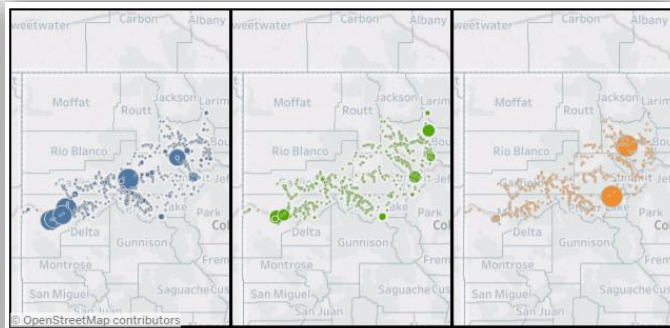
This bar chart shows the % Difference (Y-axis, 0% to 100%) from 1980 to 2010 (X-axis). The bars are colored by the percentage difference, with a color scale from -100% (blue) to 100% (red). Most years show a positive difference, indicating that the altered flow is higher than the unaltered flow.

IHA Stat...
Magnitude of monthly water conditions

Categories of Ecosystem Influence
 Habitat availability for aquatic organisms; Influences water temperature, oxygen levels, photosynthesis in water column; Soil moisture availability for plants; Availability of water for terrestrial animals; Availability of food/cover for fur-bearing mammals; Reliability of water supplies for terrestrial animals; Access by predators to nesting sites



Water Use



Diverted Flow

Consumptive Use

Total Short

Map Controls

Monthly time slider



Map Display Stats

- ☐ Max
- ☒ Median
- ☐ Min

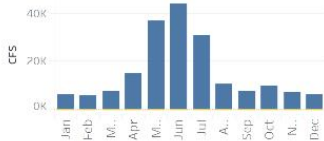
HUC 8 Name

(All)

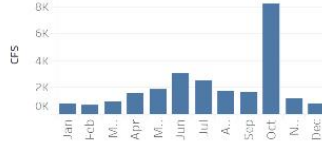
County

(All)

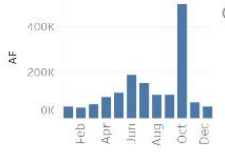
Total Available Streamflow



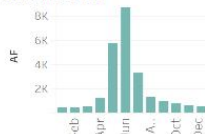
Total diverted flow



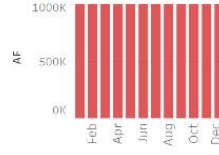
Total diverted yield



Return Flow Contributions



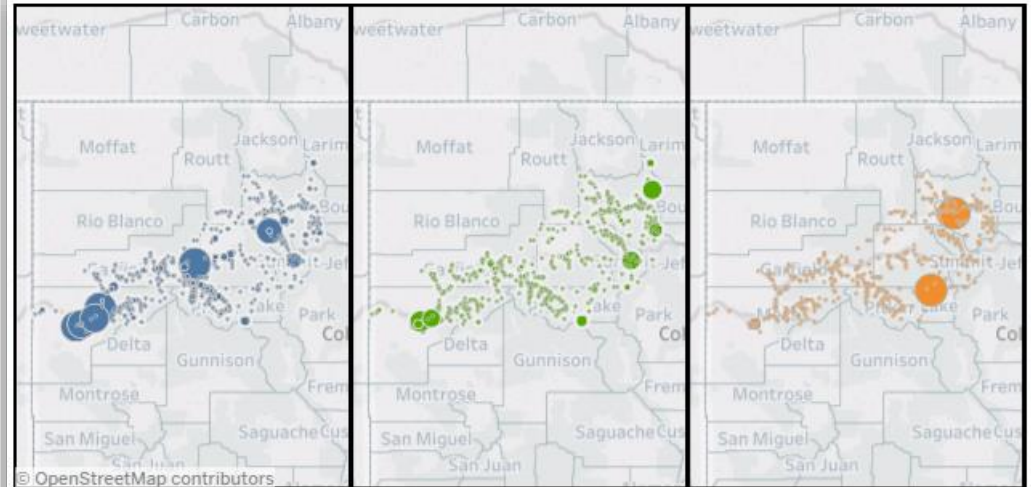
Monthly Shortage



Annual Use at Point of Diversion



Annual Consumptive Use



Diverted Flow

Consumptive Use

Total Short

Map Controls

Monthly time slider



Map Display Stats

- ☐ Max
- ☒ Median
- ☐ Min

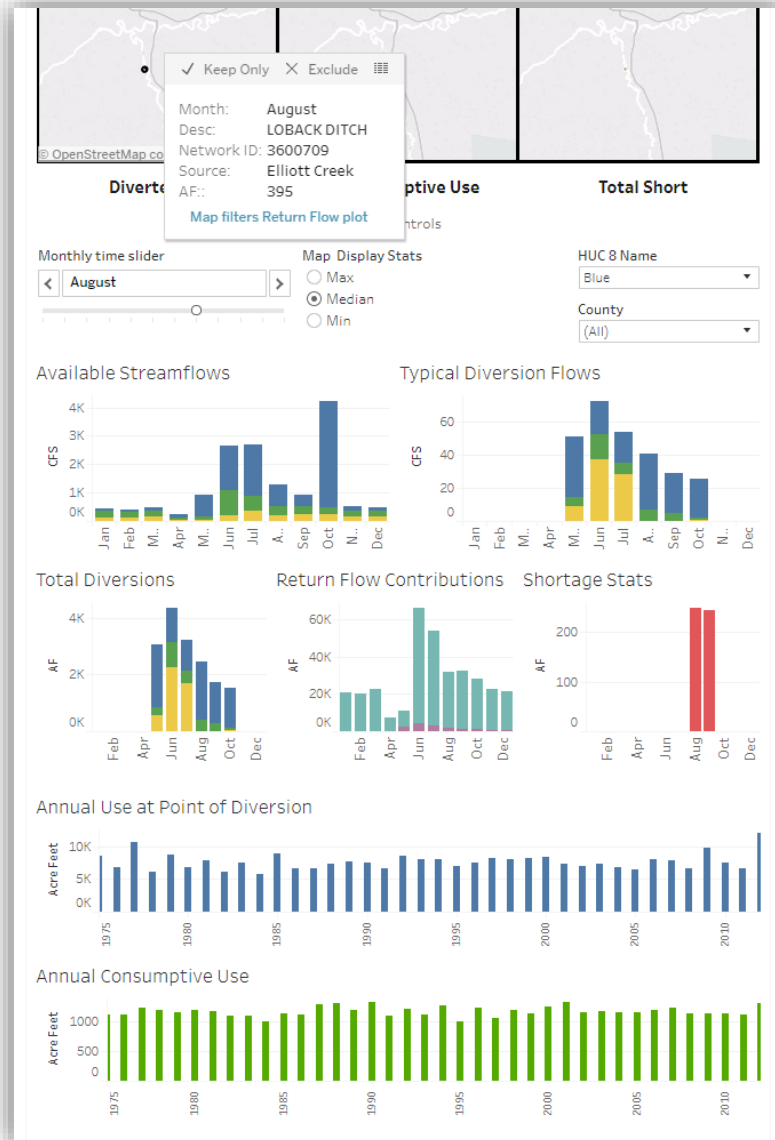
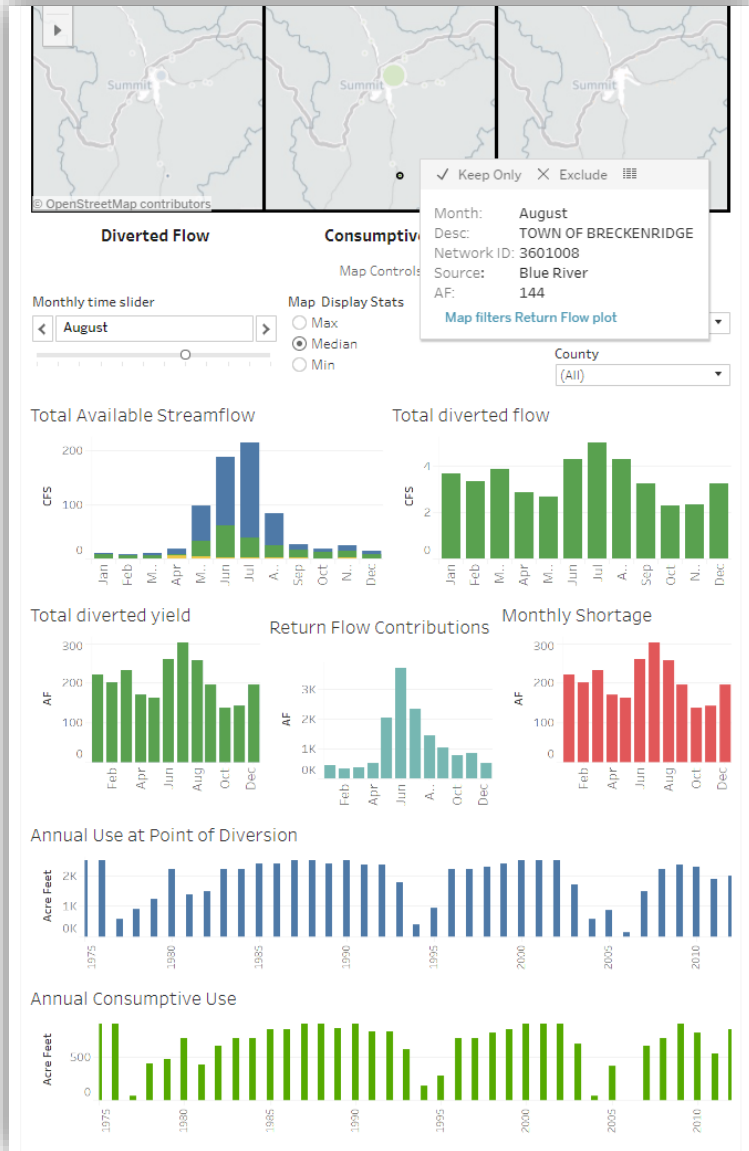
HUC 8 Name

(All)

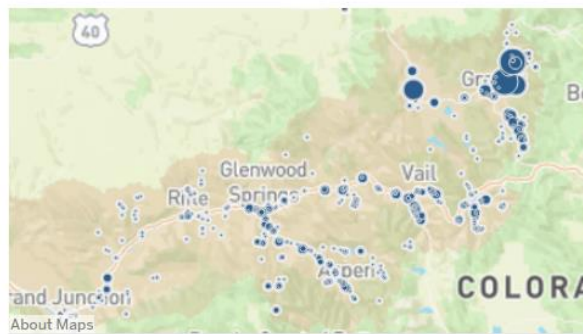
County

(All)

Water Use



Water Quality



Analyte Name (Required)
(All)

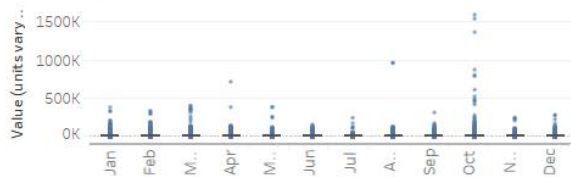
Analyte Group (Speeds search)
(All)

Agency Name
(All)

Sample Site ID
(All)

Median Value
0 2.275

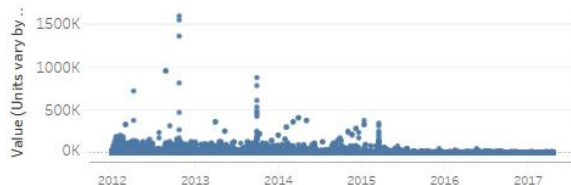
Seasonal patterns



Select a single analyte and site on map to activate plots

Reference Line On/Off
☐ On
☒ Off

Period of Record Time Series

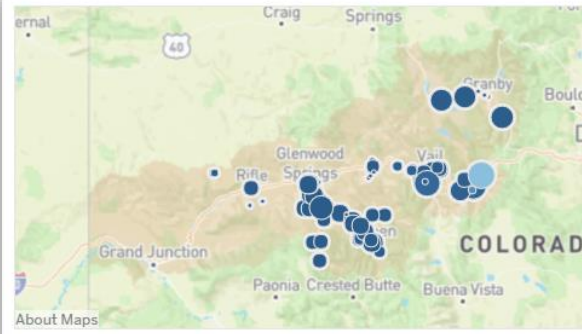


Reference Line Value
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Enter local WQ standard or other comparison value. You may need to convert your reference units to those reported at site. Mouse-over a point to show site units.

212,343	34,819	21%	1,000	0.02700	7,000	130.0
n Obs.	ND Count	ND %	Quant. Lim..	15%	Median	85%

(The metadata values to the left are only valid when a single site and collector name or agency is being displayed in the plots)



Analyte Group (Speeds search)
Metals and trace elements

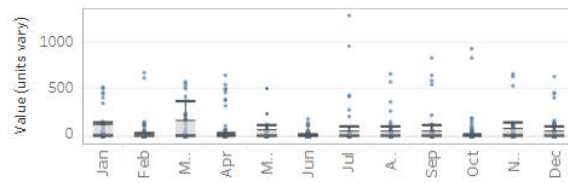
Analyte Name (Required)
Zinc Dissolved

Agency Name
The Rivers of Colorado Water ...

Sample Site ID
(All)

Median Value
0 1.262

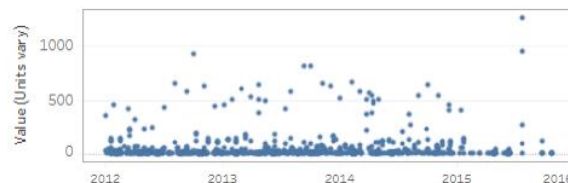
Seasonal patterns



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☐ On
☒ Off

Period of Record Time Series



Reference Line Value
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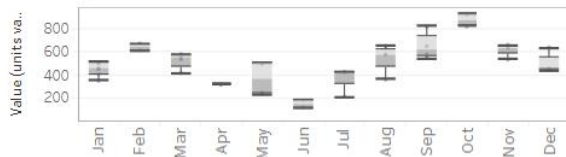
833	0	0%	3,000	0	4,400	70.88
n Obs.	ND Count	ND %	Quant. Lim..	15%	Median	85%

(The metadata values to the left are only valid when a single site and collector name or agency is being displayed in the plots)

Water Quality



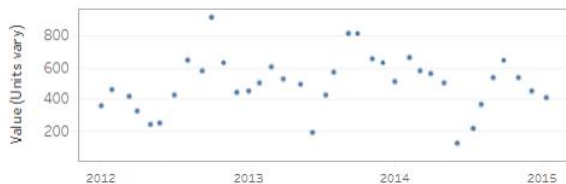
Seasonal patterns



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Reference Line On/Off
☐ On
☒ Off

Period of Record Time Series

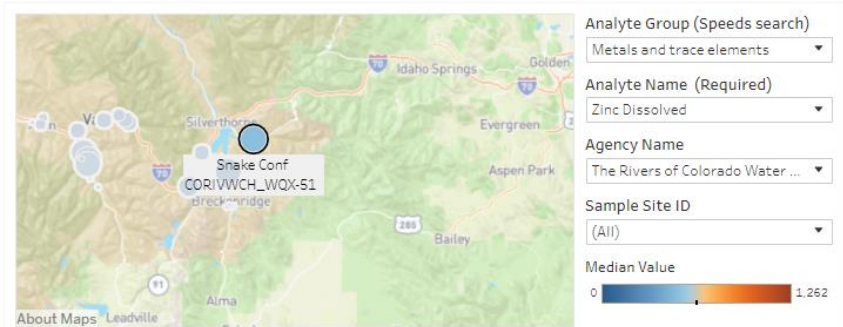


Reference Line Value
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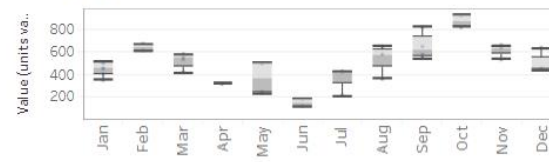
Enter local WQ standard or other comparison value. You may need to convert your reference units to those reported at site. Mouse-over a point to show site units.

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37			3.000	331.2	498.5	645.3
n Obs.	ND Count	ND %	Quant. Lim..	15%	Median	85%



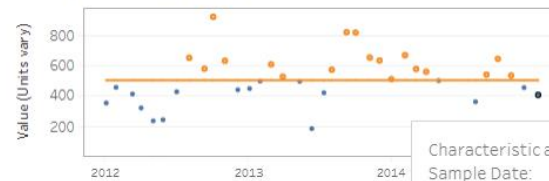
Seasonal patterns



Select a single analyte and site on map to activate plots

Reference Line On/Off
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Period of Record Time Series



Reference Line Value
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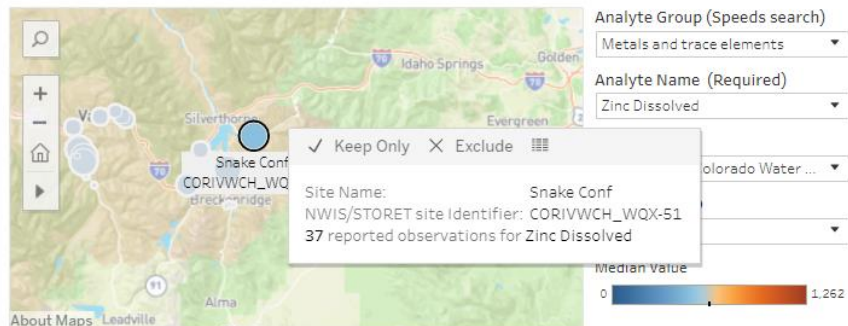
Enter local WQ standard or other comparison value. You may need to convert your reference units to those reported at site. Mouse-over a point to show site units.

Characteristic and Fraction: Zinc Dissolved
Sample Date: 1/11/2015
NWIS/STORET site ID: CORIVWCH_WQX-51
Desc: Snake Conf

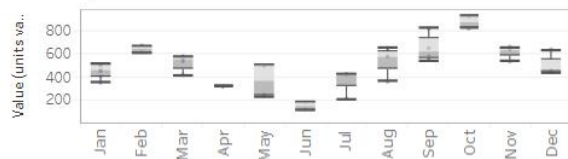
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37			3.000	331.2
n Obs.	ND Count	ND %	Quant. Lim..	15%

Water Quality



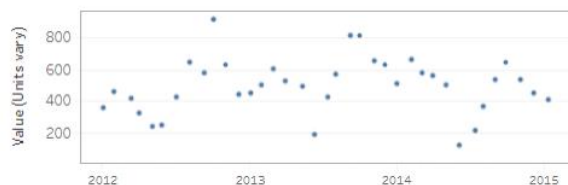
Seasonal patterns



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Reference Line On/Off
☐ On
☒ Off

Period of Record Time Series



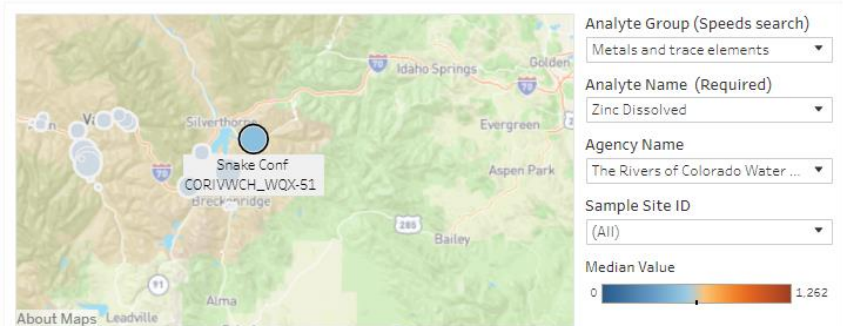
Reference Line Value

121

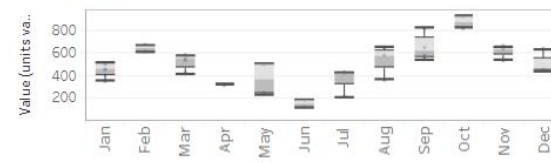
Enter local WQ standard or other comparison value. You may need to convert your reference units to those reported at site. Mouse-over a point to show site units.

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37			3.000	331.2	498.5	645.3
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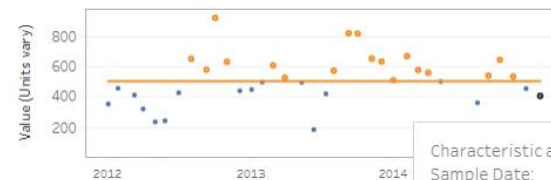
Seasonal patterns



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Characteristic and Fraction: Zinc Dissolved
Sample Date: 1/11/2015
NWIS/STORET site ID: CORIVWCH_WQX-51
Desc: Snake Conf

37			3.000	331.2
n Obs.	ND Count	ND %	Quant. Lim..	15%

Value: 403.8 ug/l
(Non-transformed results and units: 403.8 ug/l)

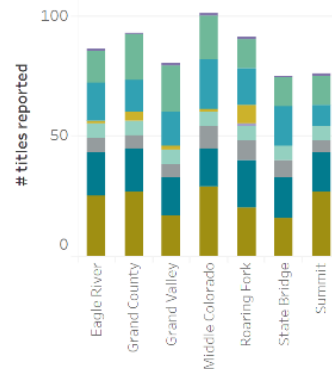
Studies Library

Year	Title	Topic
Ongoing	Blue River Water Quality Data	(All)
	Colorado Decision Support System	Subtopic (All)
	Colorado Rapid Watershed Assessments	Subregion (All)
	Colorado Water Quality Control Division GIS data	Huc8 (All)
	Grand County Stream Management Plan: Monitoring Reports for 2015, 2014, 2013	Stream (All)
	NorWest Stream Temps - Regional Database and Modeled Stream Temperatures	Wildcard title search
	QuarterQuad Maps of Noxious Weed Distribution and Abundance in Colorado	Enter search string:
	Tamarix Cooperative Mapping Initiative (T-Map)	Year Range

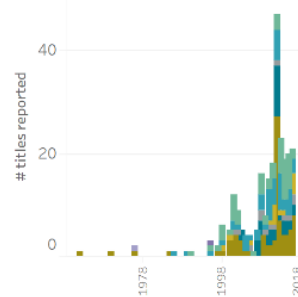
Click on a study title above to show links and additional info. Click title again to unselect.

- Topic
- All
 - Aquatic Biology
 - Flow
 - Geomorphology
 - Groundwater
 - Mapping Resource
 - Riparian Biology
 - Supply
 - Water Quality

Titles by subregion



Completion timeline

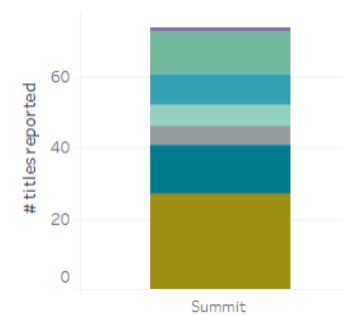


Year	Title	Topic
Ongoing	Blue River Water-Quality Data	(All)
	Colorado Decision Support System	Subtopic (All)
	Colorado Rapid Watershed Assessments	Subregion Summit
	Colorado Water Quality Control Division GIS data	Huc8 14010002
	NorWest Stream Temps - Regional Database and Modeled Stream Temperatures	Stream (All)
	QuarterQuad Maps of Noxious Weed Distribution and Abundance in Colorado	Wildcard title search
	Tamarix Cooperative Mapping Initiative (T-Map)	Enter search string:
	STODET - Watershed Summary Report	Year Range

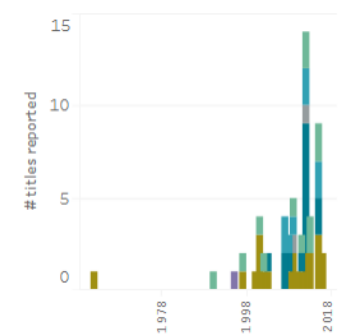
Click on a study title above to show links and additional info. Click title again to unselect.

- Topic
- All
 - Aquatic Biology
 - Flow
 - Mapping Resource
 - Riparian Biology
 - Supply
 - Water Quality

Titles by subregion



Completion timeline



Studies Library

Year

Ongoing

2015

2012

2009

2008

2007

Title

Colorado Decision Support System

Evaluation of Mean-Monthly Streamflow-Regression Equations for Colorado, 201

Moffat Collection System Project Request for Clean Water Act Section 401 Water

Colorado Basin Roundtable Watershed Flow Evaluation Tool

FONSI NO. 2012-031 Colorado Water Users' Commitment to Provide 10,825 acre

The White River National Forest 5-Year Monitoring and Evaluation Report Octobe

10825 Water Supply Alternatives Summary

10825 Water Supply Alternatives Summary - Phase 2 Assessment

Topic

(All)

Subtopic

(All)

Subregion

Summit

Huc8

(All)

Stream

Multiple

Wildcard title search

Enter search string:

Year Range

1/1/2007 1/1/2015

Click on a study title above to show links and additional info. Click title again to unselect.

<https://www.colorado.gov/pacific/sites/default/files/DenverWaterMoffat>
Denver Water, CDM Smith for Colorado Water Quality Control Division, June 2015
The Proposed Action has the potential to impact surface waters in seven major watersheds in out of each watershed. In general, the four impacted watersheds on the west side of the Com watershed) will see an overall increase in water being diverted out of the basin, with flows i

Topic

All

Aquatic Biology

Flow

Mapping Resource

Riparian Biology

Supply

Water Quality

Titles by subregion

Topic	# titles reported
Flow	20
Water Quality	25
Supply	15
Riparian Biology	10
Mapping Resource	5
Aquatic Biology	5

Completion timeline

Year	# titles reported
2007	2
2008	1
2009	1
2010	1
2011	2
2012	2
2013	2
2014	2
2015	2

Secure | https://www.colorado.gov/pacific/sites/default/files/DenverWaterMoffat%20401_06-30-2015_Final.pdf

Apps | streamod | GIS Data | Music | Telenor | Log Out

DenverWaterMoffat 401_06-30-2015_Final.pdf

FINAL REPORT

Moffat Collection System Project Request for Clean Water Act Section 401 Water Quality Certification

Prepared for:
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June 2015

Table of Contents

THANKS
FOR YOUR ATTENTION

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