

Using GIS to Create Efficiencies in Water Policy: California Basin Plan Project

Presenters:

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CENTER FOR
GEOGRAPHICAL STUDIES
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presentation outline

- project overview and objectives
- related efforts
- creating efficiencies with GIS
- project design
- tributary rule
- database design
- project status
- future direction and considerations

Funding provided by:



State Water
Resources
Control Board

overview and objectives

Create a geodatabase using National Hydrography Dataset (NHD) map layers updated with associated attributes of Basin Plan elements and other related Water Quality Control Plans.

Incorporates:

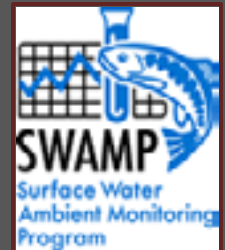
- Regional & Statewide Water Quality Objectives
- Beneficial Uses
- Applicable TMDL's
- Statewide and regional policies (CTR, NTR, NRWQC, Ocean, Delta and Thermal Plans, etc.)



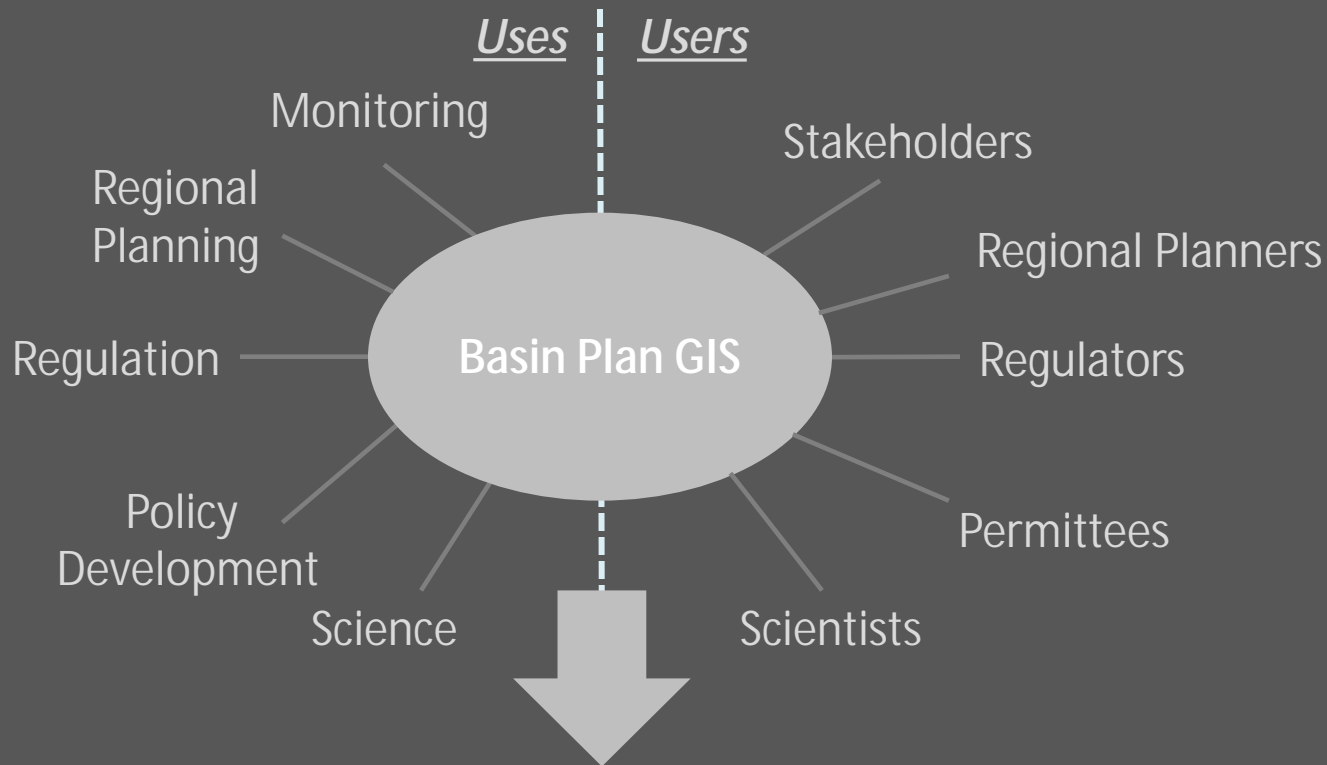
Related Efforts

Pre-existing Datasets\Related Efforts:

- CIWQS
- eWRIMS
- CalWQA
- SWAMP
- NHD (and associated CDFG updates)
- CA State Wetland Inventory
- CEDEN
- CARI
- Statewide Wetland Mapping and Classification Standards



creating efficiencies with GIS

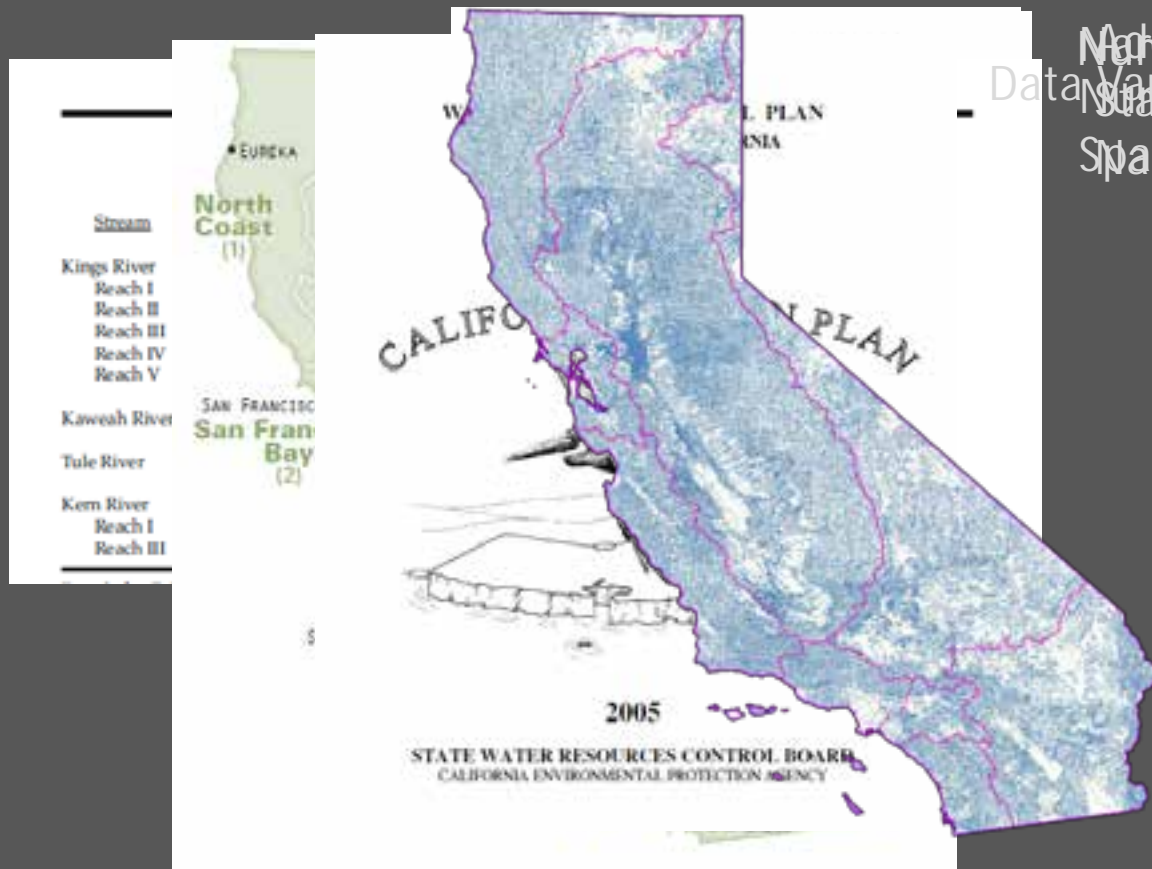


Opportunity:

- Standardize Basin Plans (reporting format, data, etc.)
- Share associated information in a more intuitive format (particularly in web-based portal)
- Develop statewide "buy-in" on maintaining data in a standardized and spatial format
- Demonstrate the value of managing water quality data geospatially
- Provide useful tool for stakeholders

creating efficiencies with GIS

Ultimately, the goal is to create a more efficient and intuitive system for tracking water quality policies in the state of California.



Additional Data:
Data Varies By Region
(Statewide Data, Ocean,...)
Spatial Variability Within Region

project design

- Relational database using Oracle and ArcSDE software.
- Spatial data entered and updated using ArcGIS software and USGS NHD Edit and HEM tools.
- Non-spatial data entered into an Oracle relational database using a web-based User Interface (UI).
- Unique ID's provide a relationship between the 2 components.



project design

translating basin plan data into our database

Region 6 Basin Plan:

TABLE 2-1. BENEFICIAL USES OF SURFACE WATERS OF THE LAHONTAN REGION
 Unless otherwise specified, beneficial uses also apply to all tributaries of surface waters identified in Table 2-1.

HU No.	HYDROLOGIC UNIT/SUBUNIT DRAINAGE FEATURE	WATERBODY CLASS MODIFIER	BENEFICIAL USES														RECEIVING WATER			
			MUN	ARG	NAV	REC-1	REC-2	COMM	ACQUA	WARM	COLD	SAL	WILD	BOA	BAFE	MOON		SWIM	WOL	RLO
604.20	NORTH TAHOE NR (continued)																			
	GRIFT CREEK	PERENNIAL STREAM	X					X	X	I			X	X				X		LAKE TAHOE
	MINOR SURFACE WATERS		X	X		X	X		X	X	I		X	X				X		LAKE TAHOE
	MINOR WETLANDS	SPRING/SEEP/STREAM/POUGH/SHEDS	X	X		X	X		X	X	I		X	X				X	X	
634.30	LAKE TAHOE BODY HYDROLOGIC AREA																			
	LAKE TAHOE	LAKE	X	X		X	X		X	X	I		X	X	X		X	X	TRUCKEE RIVER	

**Table 3-12
 WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
 LAKE TAHOE HYDROLOGIC UNIT**

See Fig. 3-6	Surface Waters	Objective (mg/L except as noted) ^{1,2}						
		TDS	Cl	SO ₄	B	N	P	Fe
1	Lake Tahoe	60/65	3.0/4.0	1.0/2.0	0.01/-	0.15/-	0.008/-	-

Project Database:

GIS Spatial Data:



Lake Tahoe
Unique Key

Oracle Tabular Data:

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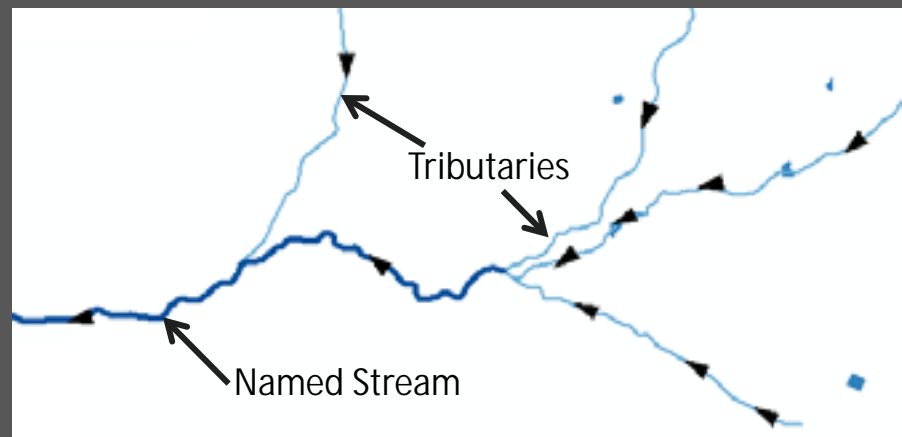
WATERBODY NAME: Lake Tahoe
TYPE: Main
REFKEY: G6L025600000000
BENEFICIAL USES
MUN  ARG  NAV  REC-1  REC-2  COMM
E    E    E    E      E      E
WATER QUALITY OBJECTIVES
TDS  Cl    SO4   B      N
60/65 3.0/4.0 1.0/2.0 0.01/- 0.15/-
    
```


Tributary Rule

Tributary: A surface waterbody whose water flows into another (typically) larger surface waterbody.

Tributary Rule: Any surface waterbody that *is not* specifically identified or listed in a regional basin plan **AND** is an upstream tributary of another surface waterbody that *is* identified and assigned water quality designations in a regional basin plan acquire the same set of designations as that identified waterbody.

Challenges: Establishing a comprehensive and region-specific tributary rule methodology while considering assigned priority, overlap, and conflicts between: site-specific waterbody designations, reach/event designations, grouped waterbody designations and others.



database design non-spatial data

- Beneficial Uses
- Water Quality Objectives (WQO's):
 - Basin Plans
 - NTR (National Toxics Rule)
 - CTR (California Toxics Rule)
 - Others....
- TMDL's
- Thermal Plan
- Ocean Plan
- State and Regional Board policies
- Water Body Type
- WBD Watersheds
- CalWater Watersheds

Table 2-1: Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region

Water Body Type	Grid 1	Grid 2	Grid 3	Grid 4	Grid 5	Grid 6	Grid 7	Grid 8	Grid 9	Grid 10
NONPP Watersheds	1	1	1	1	1	1	1	1	1	1
Urban Centers										
Public Open Space	1	1	1	1	1	1	1	1	1	1
Urban Types										
Urban Uses	1	1	1	1	1	1	1	1	1	1
Use Intensity Code										

Table 3-8: WATER QUALITY OBJECTIVES

**Table 3-8
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SUISUNVILLE HYDROLOGIC UNIT**

ID	Water Body	Objective (mg/L, except as noted)						
		TSS	Cl	NO ₃	amNH ₄	B	N	P
1	Whitew Creek at Mendocino Rd	110	8.0	0.4	—	0.01	0.7	0.10
2	Whitew Creek at Co. Road 276	100	8.0	—	—	0.01	0.7	0.10
3	Willard Creek	60	14	—	—	0.01	0.01	0.05
4	Choney Creek	70	10	—	—	0.01	0.01	0.10
5	Suzan River above Willard Creek	80	12	1.0	—	0.01	0.7	0.10
6	Suzan River at Larkin Street	100	10	0.1	0.1	0.01	0.70	0.10
7	Suzan River near Larkin St at Hwy 101	180	14	0.1	0.1	0.01	0.70	0.10
8	Hull Creek	100	10	—	—	0.01	0.7	0.10
9	Dual Run Creek	80	12	—	—	0.01	0.7	0.10
10	Larkin Creek	80	12	—	—	0.01	0.7	0.10

2. BENEFICIAL USES

- **Quality of habitat of subwater intrusion into freshwater aquifers**
- **Freshwater Replenishment (FRM)** Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
- **Navigable (NAV)** Uses of water for shipping, travel, or other transportation by private, military or commercial vessels.
- **Hydropower Generation (POW)** Uses of water for hydropower generation.
- **Water Contact Recreation (REC-1)** Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white-water activities, fishing, or use

**TABLE 9
WATER QUALITY OBJECTIVES**

Objective	Units of Measurement	6-Month Maximum	12-Month Maximum
OBJECTIVES FOR PROTECTION OF MARINE AQUATIC LIFE			
Arsenic	ug/l	1	1
Cadmium	ug/l	1	1
Chromium (Hexavalent) (see table 8)	ug/l	2	2
Copper	ug/l	2	2
Lead	ug/l	2	2
Mercury	ug/l	0.04	0.04
Nickel	ug/l	5	5

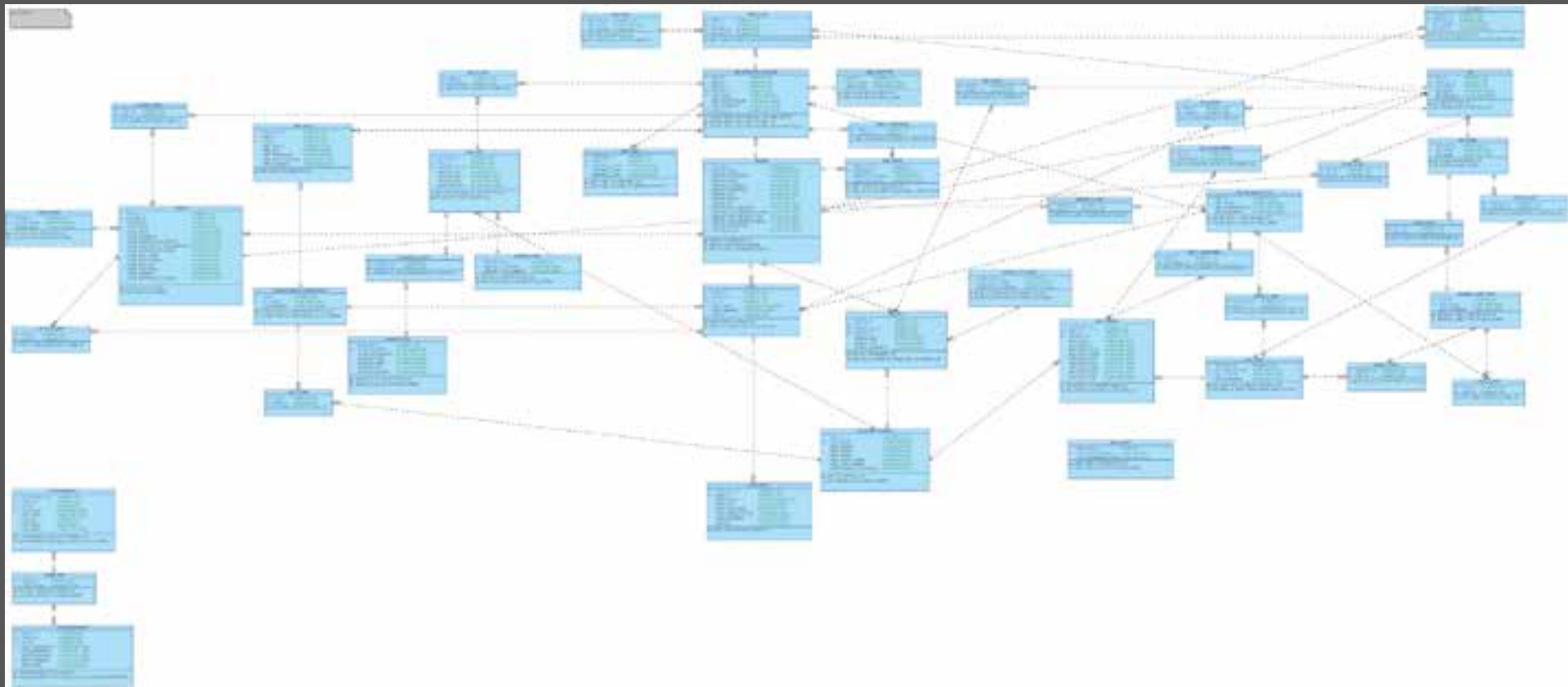
TABLE 2-1: DEFINITIONS OF THE BENEFICIAL USES OF WATER

CATEGORY	DEFINITION	
MDN	Municipal and Domestic Supply	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
AGR	Agriculture Supply	Uses of water for farming, horticulture, or rearing including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
ACQU	Aquaculture	Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.
IND	Industrial Service Supply	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

ü The current database design will incorporate components for surface waters, bays and estuaries and wetlands. Design will be flexible enough to allow for the future inclusion of groundwater features.

database design

draft database design



database design

spatial data: overview

- Base Data: NHD Dataset
- Collateral Datasets:
 - Regional Board datasets and input
 - Most recent NAIP digital orthophotos
 - Assessed/303D water body layer
 - USGS Topographic Maps
 - And more...
- GIS Design:
 - Data will be contained in an SDE Geodatabase.
 - 1 feature class for linear water bodies.
 - 2 feature classes for polygonal water bodies.
 - 1 feature class for points features (i.e. springs).
 - Multiple event FCs for polygonal, linear, and point features.
- Linear Referencing/Dynamic Segmentation will be applied to the linear water bodies. Events will also be created for point and polygon features.



database design

spatial data: linear referencing

Why?

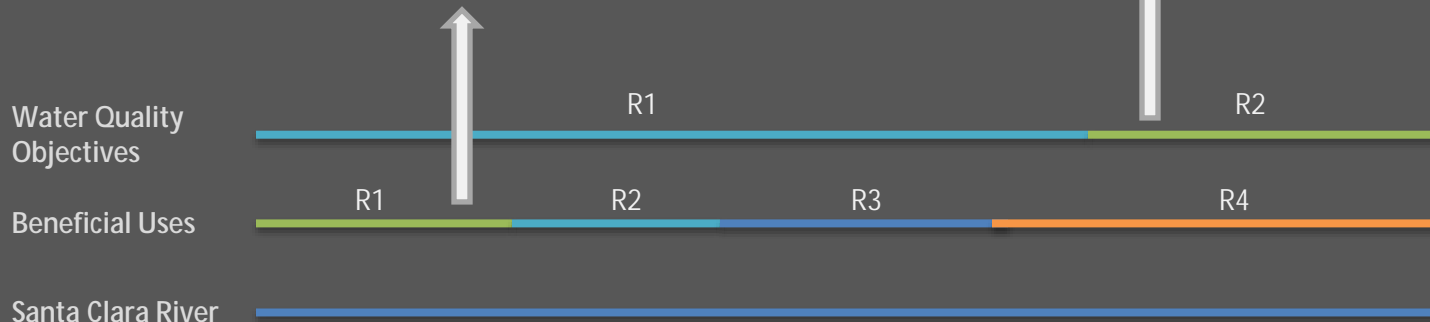
- Differences in *reach* locations between site specific beneficial uses and site specific water quality objectives.
- Prevents overly segmented data and complex attribution.

Beneficial Uses

Water body	Reach	AGR	GWR	FRSH
Santa Clara River	R1	E	E	E
Santa Clara River	R2	E		E
Santa Clara River	R3	E	E	I
Santa Clara River	R4		E	E

Water Quality Objectives

Water body	Reach	TDS	Sulfate	Chloride	Boron
Santa Clara River	R1	500	100	50	.5
Santa Clara River	R2	800	150	100	1.0



project status

- Approximately 85% complete
- Target Completion Date: September 2014
- Next Steps: Web Portal Development

future direction and considerations

- GIS can improve efficiencies when enacting environmental policy at local, regional, statewide, and federal scales.
- Increase transparency for government agencies and the public.
- Database design, integration with GIS and web-based visualization are powerful tools.
- Modeling and analysis tools (potentially online)
- Attribution with other associated data such as climate, infrastructure, land use, land ownership, etc.

Questions?



<http://www.csun.edu/~centergs>

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