Water Resources Management and Modeling

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University of California
Agriculture and Natural Resources

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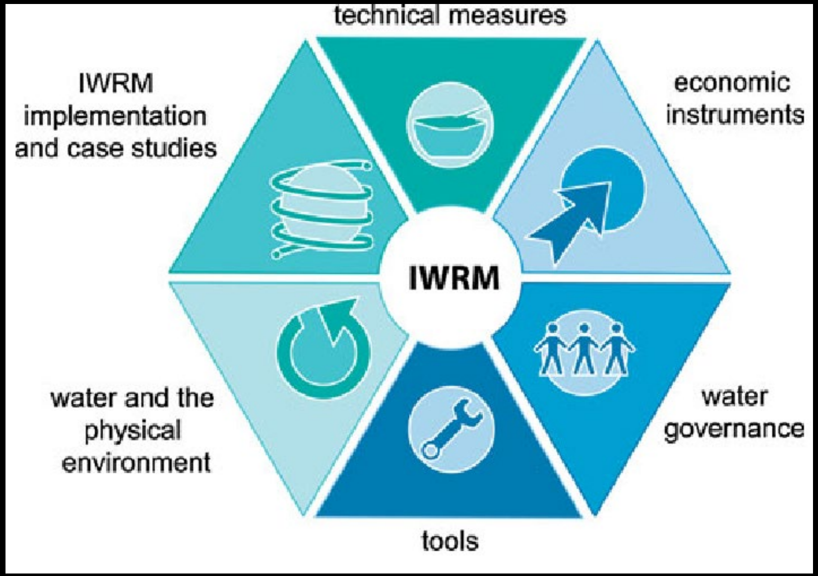
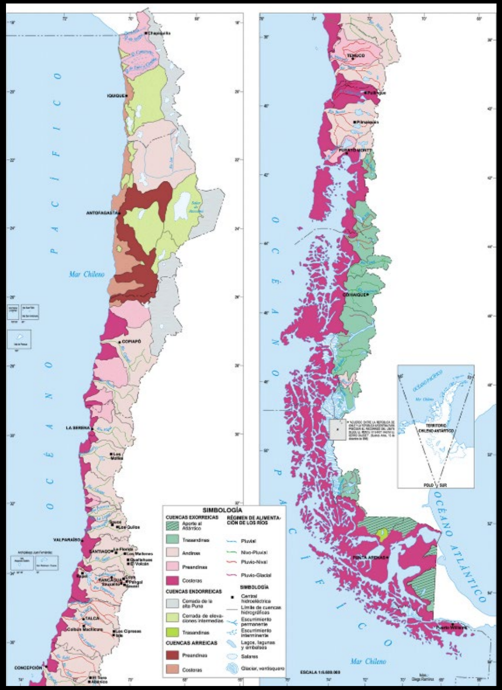
Indice

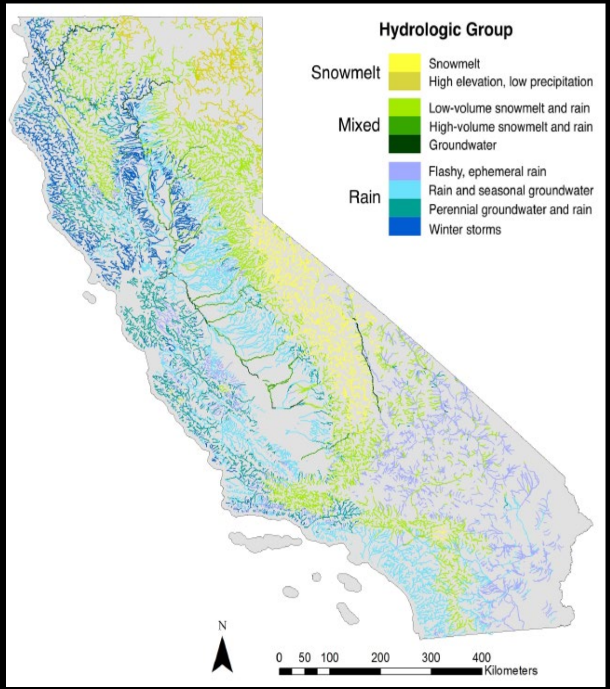
- Expectativas
- Gestion del agua
- Gobernanza del agua
- Modelos de planeacion
- Casos de estudio
  - Eel River
  - Rio Aconcagua
- Recomendaciones

Expectativas

- Comunicar un vision general
- Water Resources Management
- Relacionar proyectos de California y Chile
- Discusion







Road map

Water Resources Planning and Management

Spatial and temporal characterization

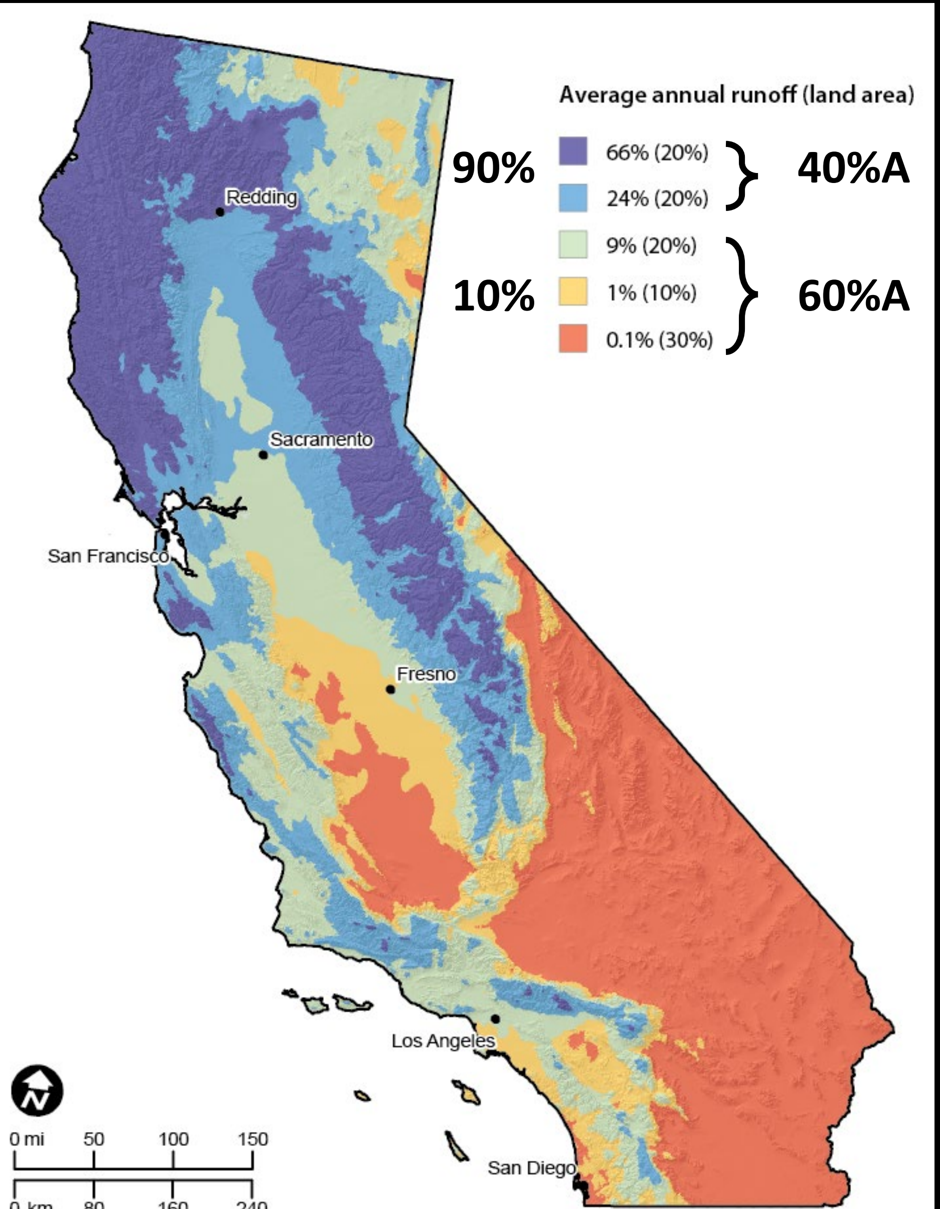
River Basin Management

Water Governance
and
Decision Making Processes

Characterization of governance
- Roles and responsibilities
- Bottom up vs Top-down

Water Resources Modeling

Water Planning and Management

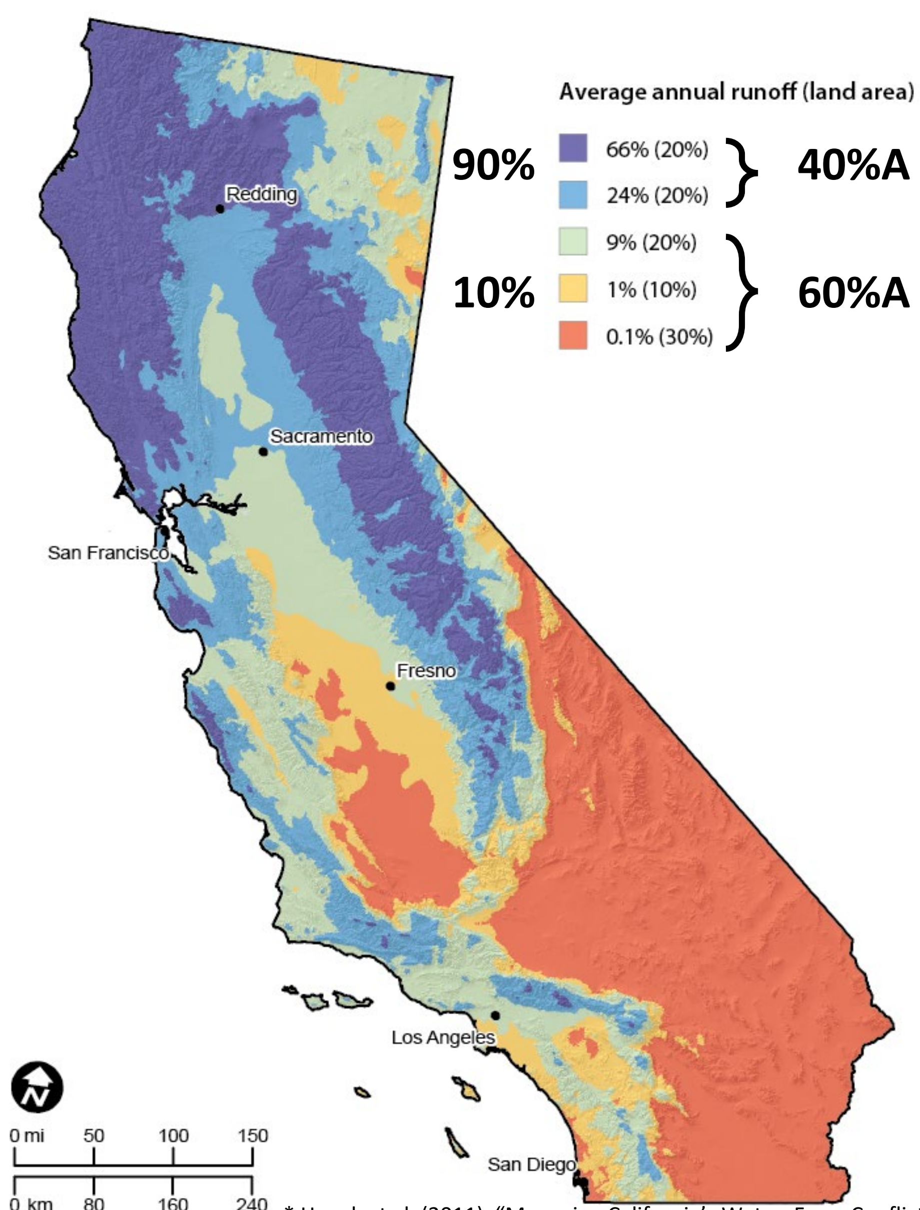


* Hanak et al. (2011). “Managing California’s Water. From Conflict t

Because water is not equitably distributed in time and place, in the right quantity with the adequate quality, **a discipline called water resources planning and management** is used to redistribute the resource in a way that satisfies the needs of water users, including the environment, today and in the future”

Discipline: Systematic instruction, series of techniques and methods

Water Planning and Management



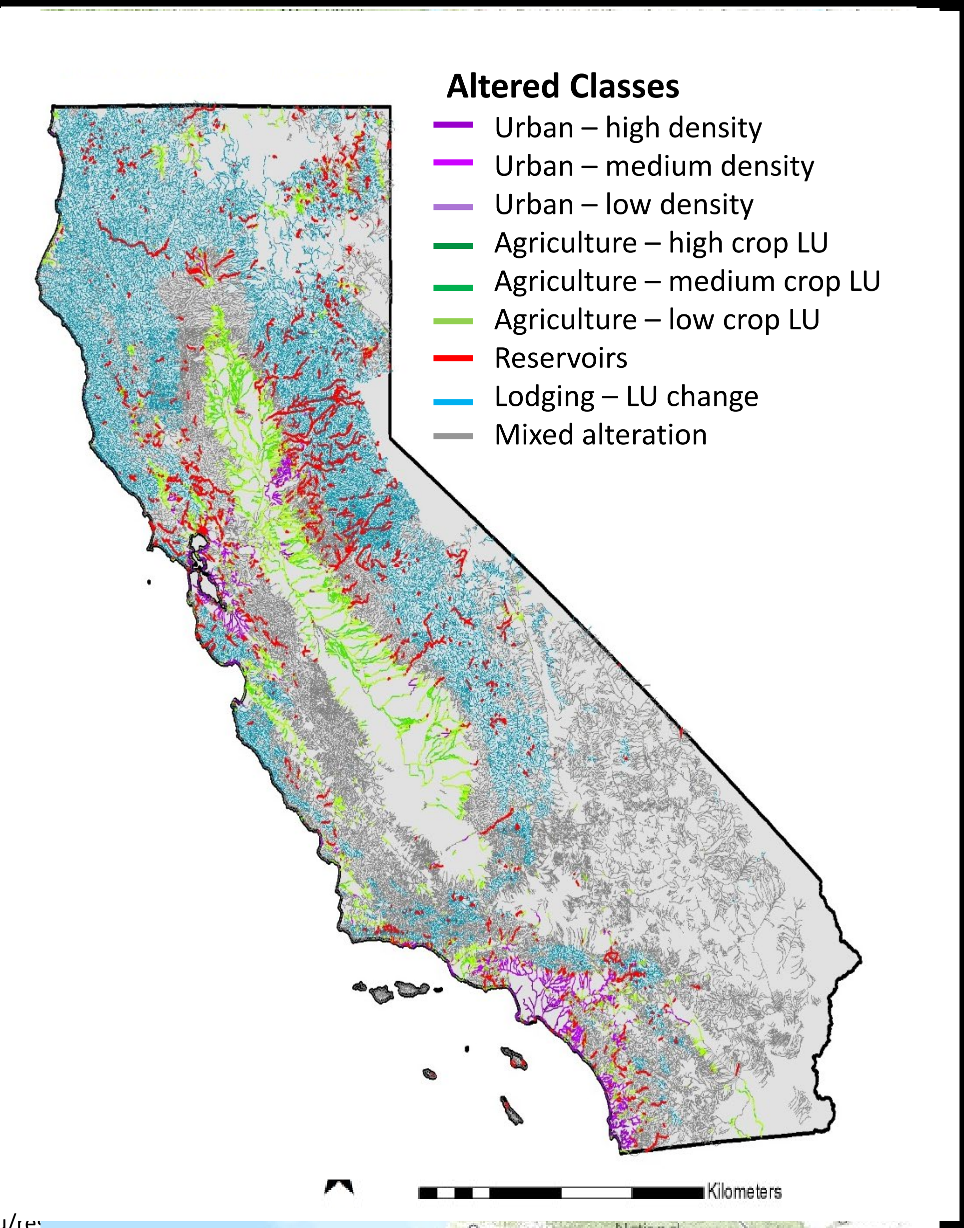
Water Supplies
- Mostly in Wet Season
- Mostly in north & east

Water Demands
- Mostly in Dry Season
- Mostly central, west and south

Disconnections

Time
- Reservoirs, & groundwater use

Space
- Aqueducts, canals, and pipes
- Water Imports - Exports



* Hanak et al. (2011). “Managing California’s Water. From Conflict to Reconciliation” <http://watershed.ucdavis.edu/re

Road map

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Spatial and temporal
characterization
(what)

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and
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Characterization of
governance
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Water Resources Modeling

Scales (t,s)

- Flood (Minutes & decades)
- Operation (days, weeks)
- Planning (months decades)
- Agriculture (Days, season years)
- Environment (Days, season, decade)
- Energy (hour, seasons)

Type of Decisions

Operation

Standard operation procedures

Detailed instructions

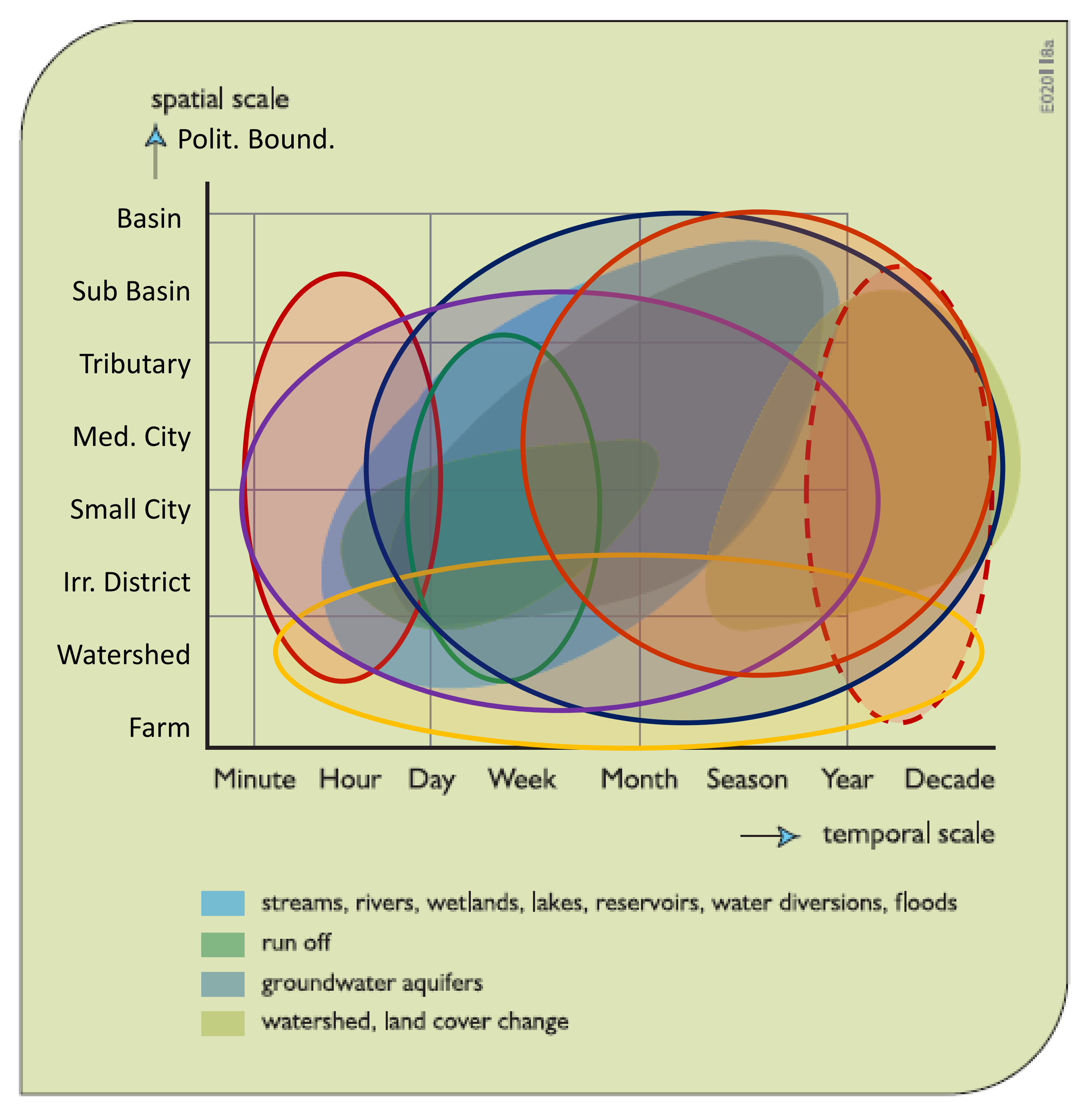
Day to day operation

Planning

Overall rules

Medium to long term planning

Definition of investments



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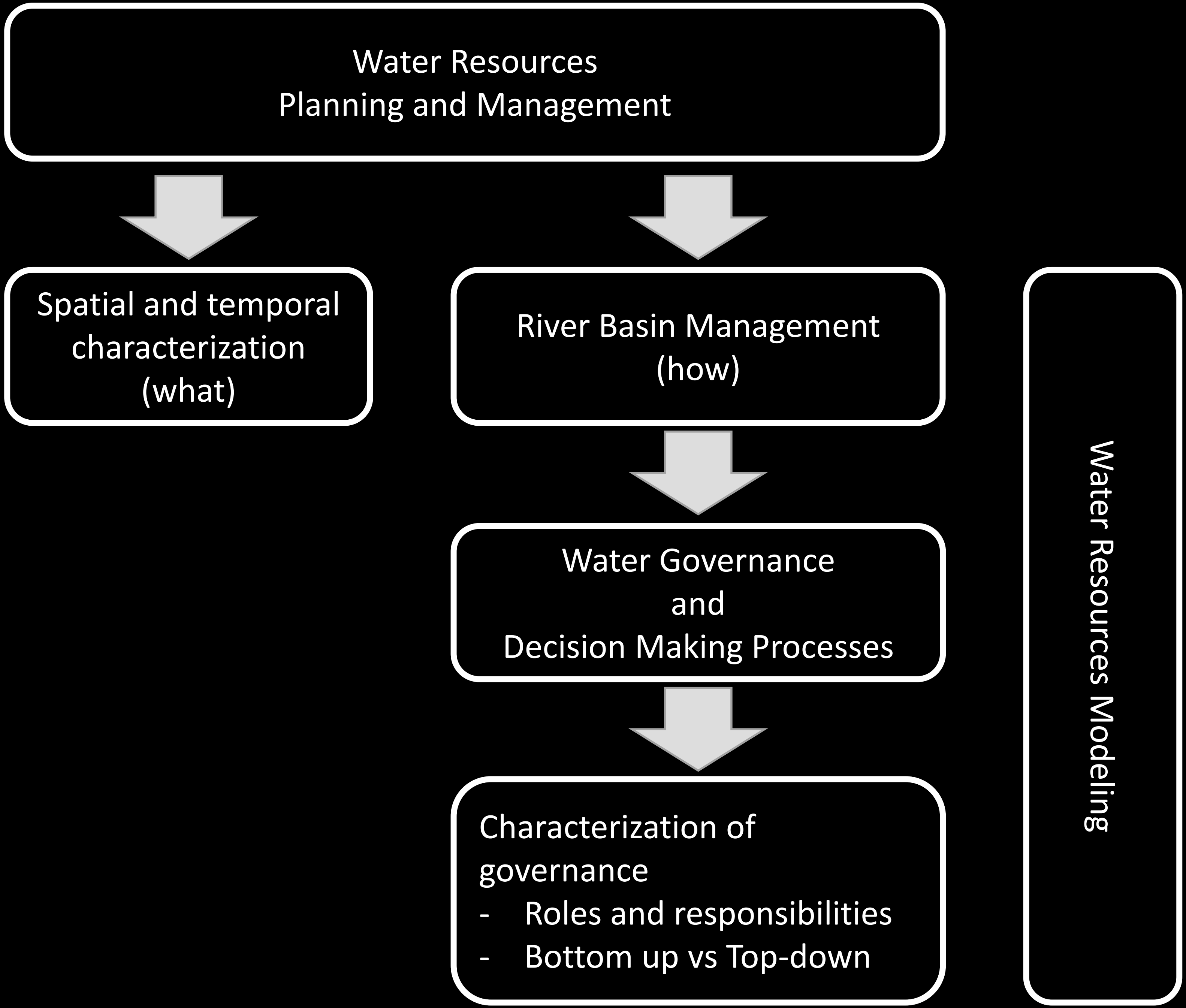
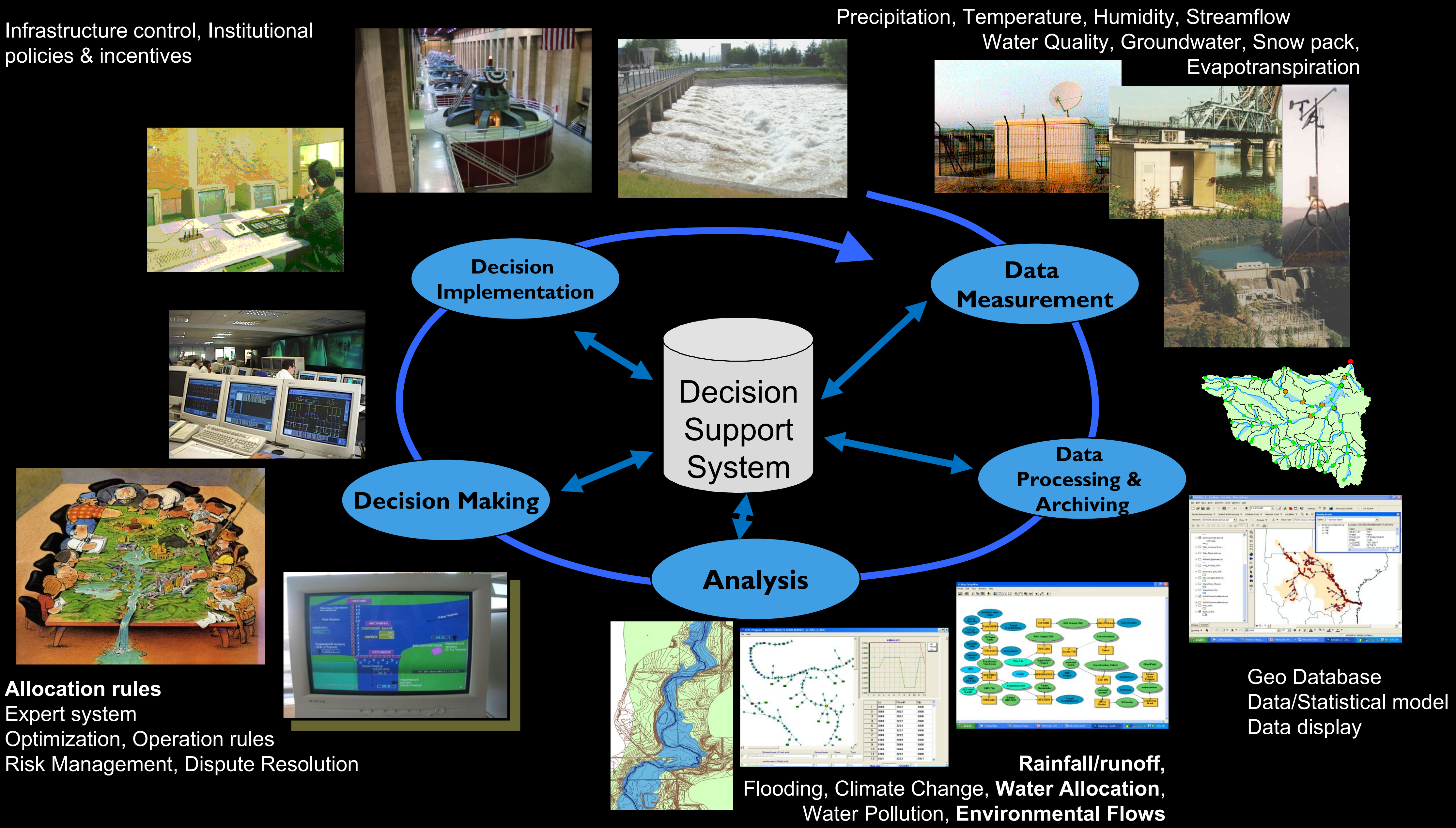

Water Resources
Planning and Management
Spatial and temporal characterization (what)
River Basin Management (how)
Water Governance and Decision Making Processes
Characterization of governance
- Roles and responsibilities
- Bottom up vs Top-down
Water Resources Modeling

River Basin Management



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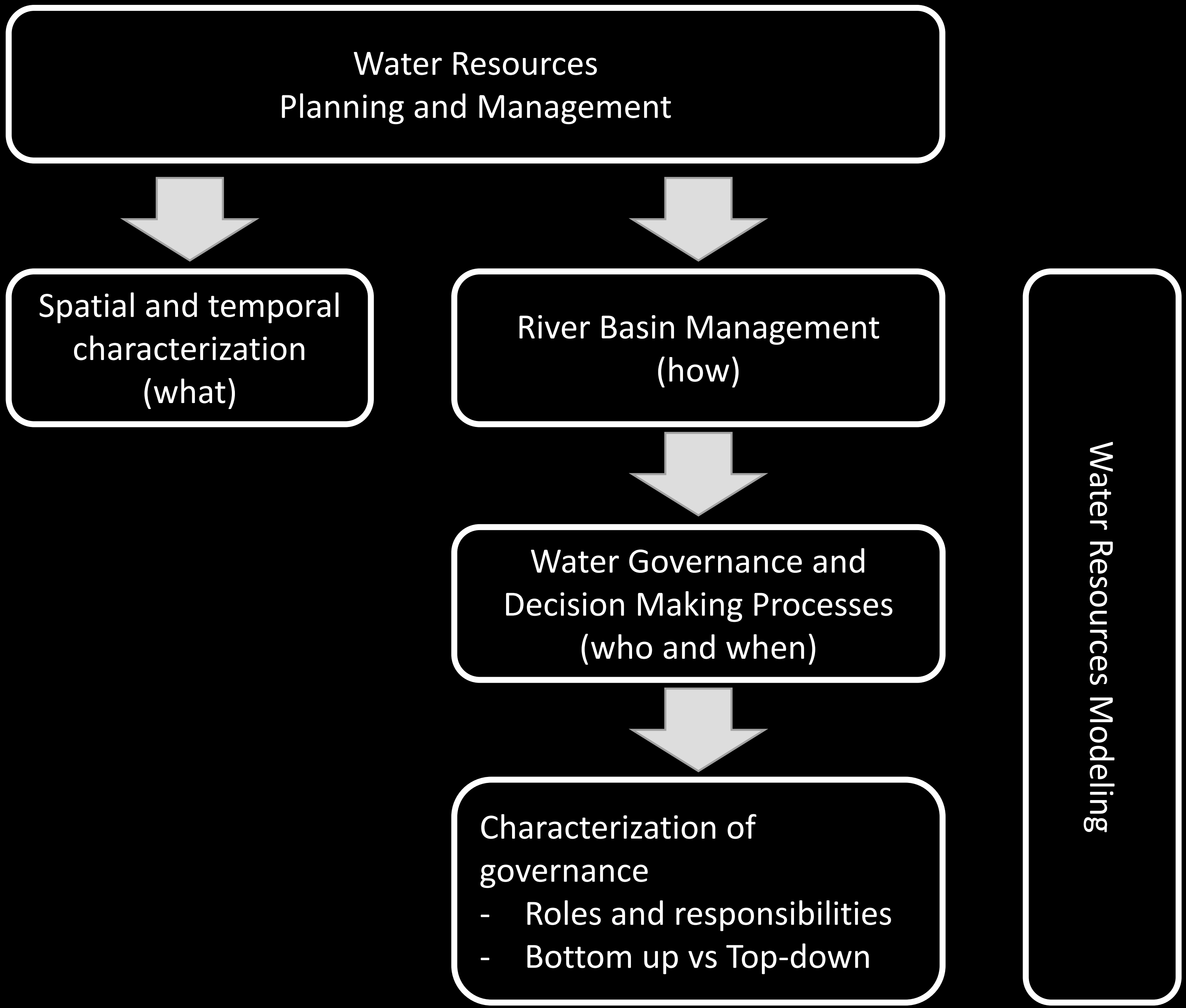
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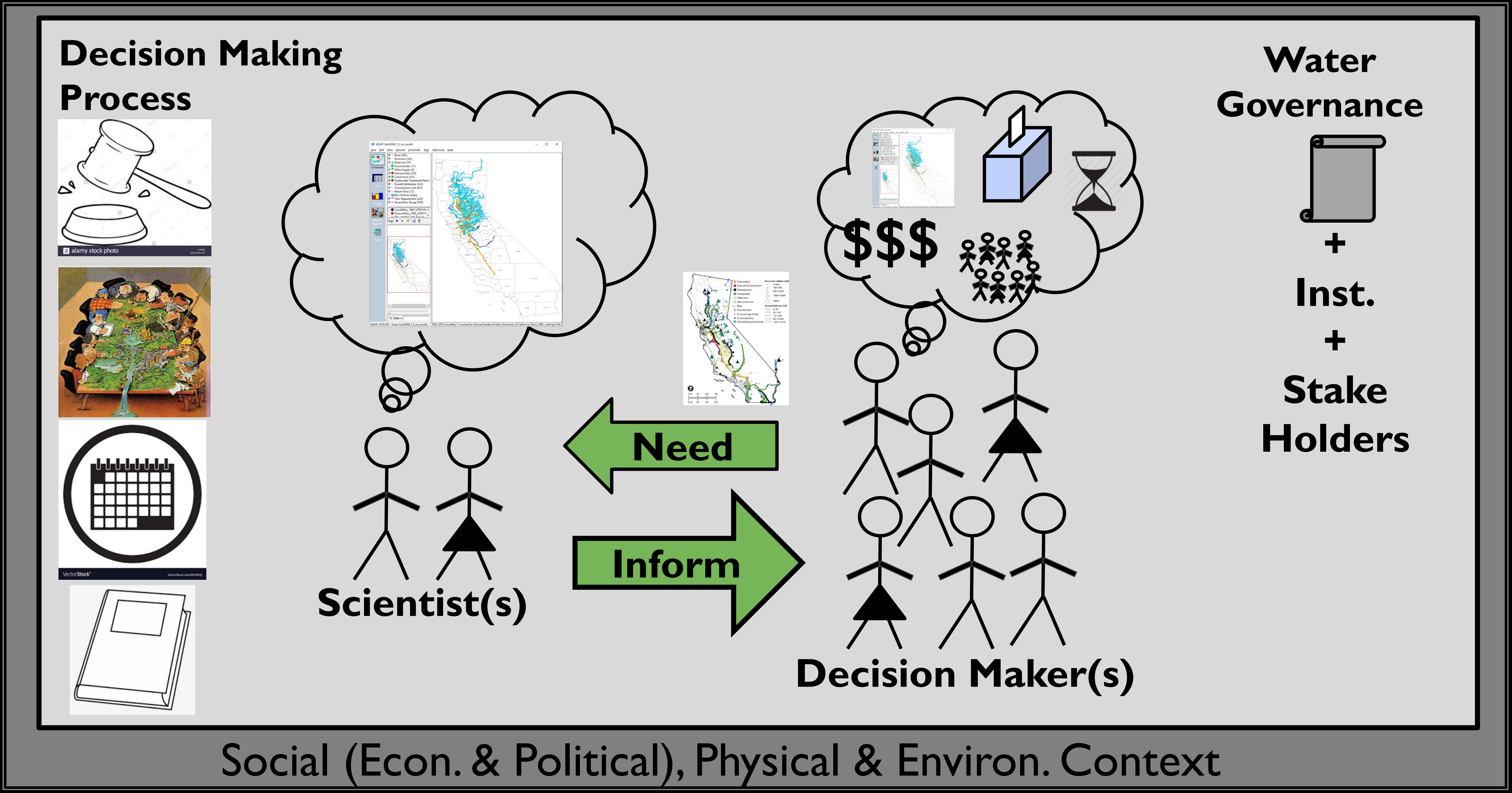
Water Governance and Decision Making Process



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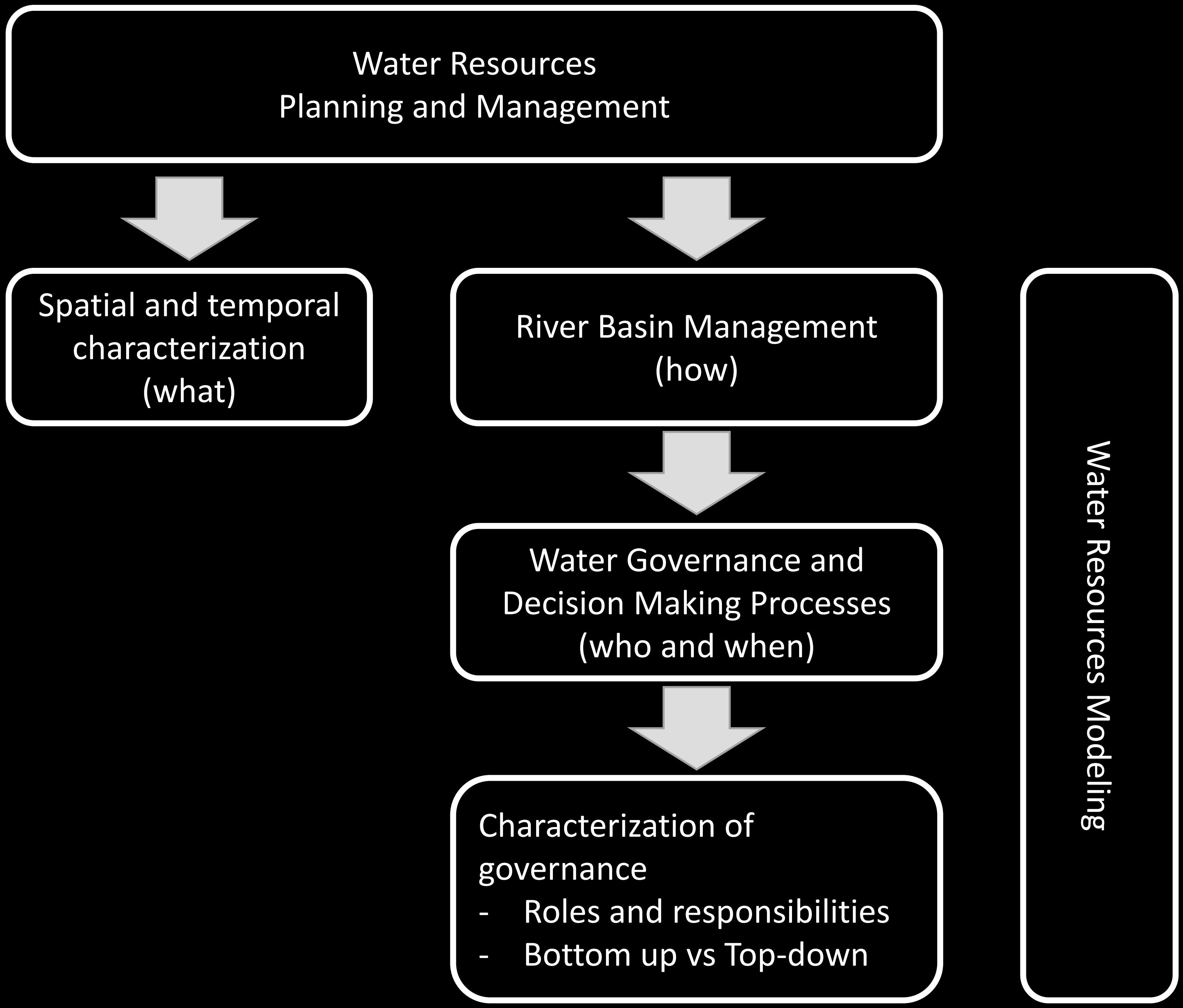
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Water Resources Modeling

Roles

- *Water Supply Agency*
- *Gov. institution*
- *Financial Institution*
- *Science-based*
- *Organization*
- *Water Users*

Responsibilities

- *Water Allocation*
- *Water Operation*
- *Water Planning*
- *Regulators*
- *Finance*
- *Irrigation*
- *Communication of Knowledge*

Mexico

		WWF	IDs-RB	CCRB	CONANP	SEDATU	SEDESOL	SAGARPA	PROFEPA	INE	SEMARNAT	CONAGUA
Location	Upstream Fort Quitman	x	x									x
Location	Downstream Fort Quitman	x	x	x	x	x	x	x	x	x	x	x
Roles	Water Supply Agency											x
Roles	Governmental Institution			x	x	x	x	x	x		x	
Roles	Finantial Institution											
Roles	Science-based Institution	x		x	x					x		
Roles	Non-Governmental Organizations											
Roles	Water Users		x									
Responsibilities	Water Allocation			x								x
Responsibilities	Water Operation		x									x
Responsibilities	Water Planning			x	x			x		x	x	x
Responsibilities	Regulators			x					x		x	x
Responsibilities	Finance					x	x	x				
Responsibilities	Irrigation		x									
Responsibilities	Communication of Scientific Knowledge	x			x					x		

Binational

		CEC	BECC	NADBank	IBWC
Location	Upstream Fort Quitman	x	x	x	x
Location	Downstream Fort Quitman	x	x	x	x
Roles	Water Supply Agency				
Roles	Governmental Institution				x
Roles	Finantial Institution		x	x	
Roles	Science-based Institution	x	x		x
Roles	Non-Governmental Organizations				
Roles	Water Users				
Responsibilities	Water Allocation				x
Responsibilities	Water Operation				
Responsibilities	Water Planning				x
Responsibilities	Regulators				x
Responsibilities	Finance		x	x	
Responsibilities	Irrigation				
Responsibilities	Communication of Scientific Knowledge	x			

United States

		TBBNP	TPWD	TCRP	TWDB	EPCWID	RGWMS13	RGWMP	TCEQ	PDNWC	MRGBI	MRGCD	EBID	NMED	ISC	OSE	SLVID	CRGCC	CWCB	CWD3A	CO-DWR	NMTXWC	RGCC	FWS	USGS	EPA	USACE	BOR
Location	Upstream Fort Quitman					x				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Location	Downstream Fort Quitman	x	x	x	x		x	x	x																	x	x	
Roles	Water Supply Agency							x				x								x								x
Roles	Governmental Institution	x	x	x	x				x		x			x	x	x		x	x		x		x	x		x		
Roles	Finantial Institution																											
Roles	Science-based Institution																					x		x	x		x	
Roles	Non-Governmental Organizations									x																		
Roles	Water Users					x	x						x				x											
Responsibilities	Water Allocation				x			x	x			x						x		x	x		x					x
Responsibilities	Water Operation					x	x	x				x	x				x			x								x
Responsibilities	Water Planning	x	x	x	x			x	x	x	x	x		x	x	x		x	x	x	x	x	x				x	x
Responsibilities	Regulators			x	x				x					x	x	x		x	x		x	x	x	x		x	x	
Responsibilities	Finance																											
Responsibilities	Irrigation					x	x						x				x											
Responsibilities	Communication of Scientific Knowledge	x	x							x	x													x	x			

EXPLOTACIÓN DE RECURSOS HÍDRICOS

DIRECCION GENERAL DE AGUAS (DGA)

- Control de extracciones
- Patente por no uso
- Análisis de disponibilidad hídrica (estaciones monitoreo)
- Conservación (apelando a la sustentabilidad del recurso)

DIRECCIÓN DE OBRAS HIDRÁULICAS (DOH)

- Estudio de obras
- Proyectos y construcción de obras hidráulicas mayores
- Construcción y mantención de sistemas de agua potable rural

EXPLOTACIÓN DE RECURSOS HÍDRICOS

DIRECCIÓN DE OBRAS HIDRÁULICAS (DOH)

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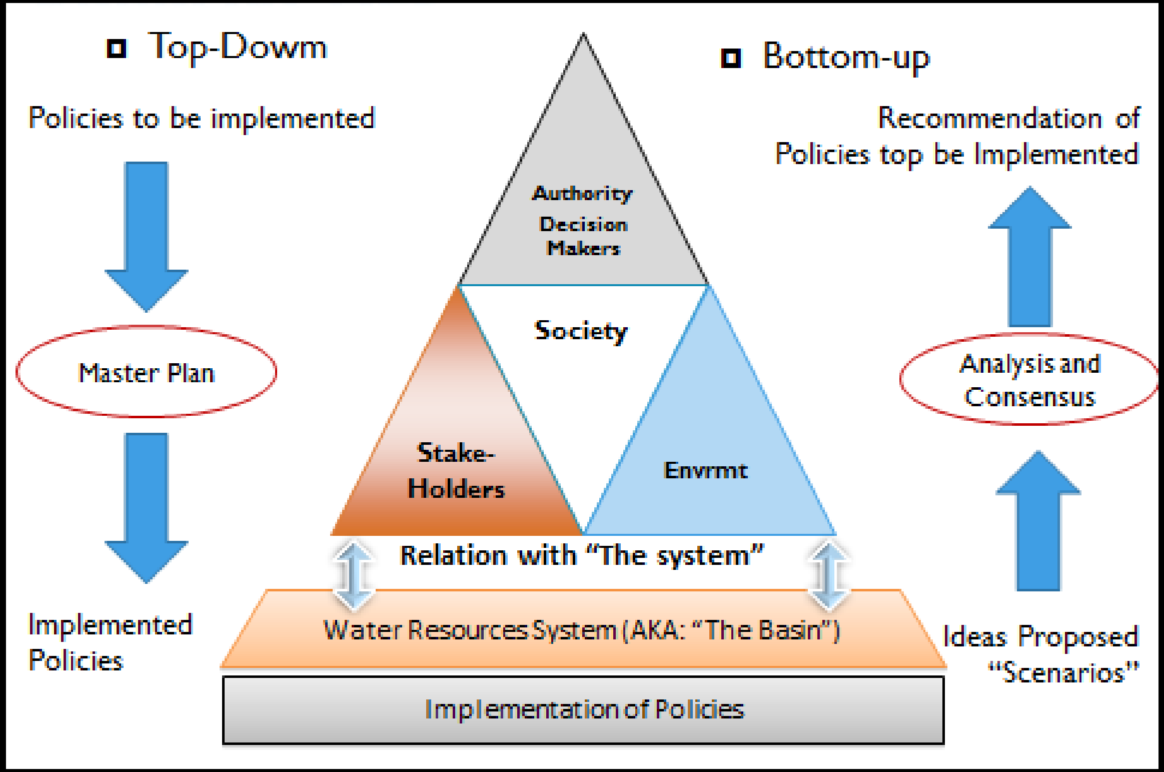
INSTITUTO DE DESARROLLO AGROPECUARIO (INDAP)

Facilita, gestiona postulación a subsidios para proyectos de riego principalmente pequeños agricultores

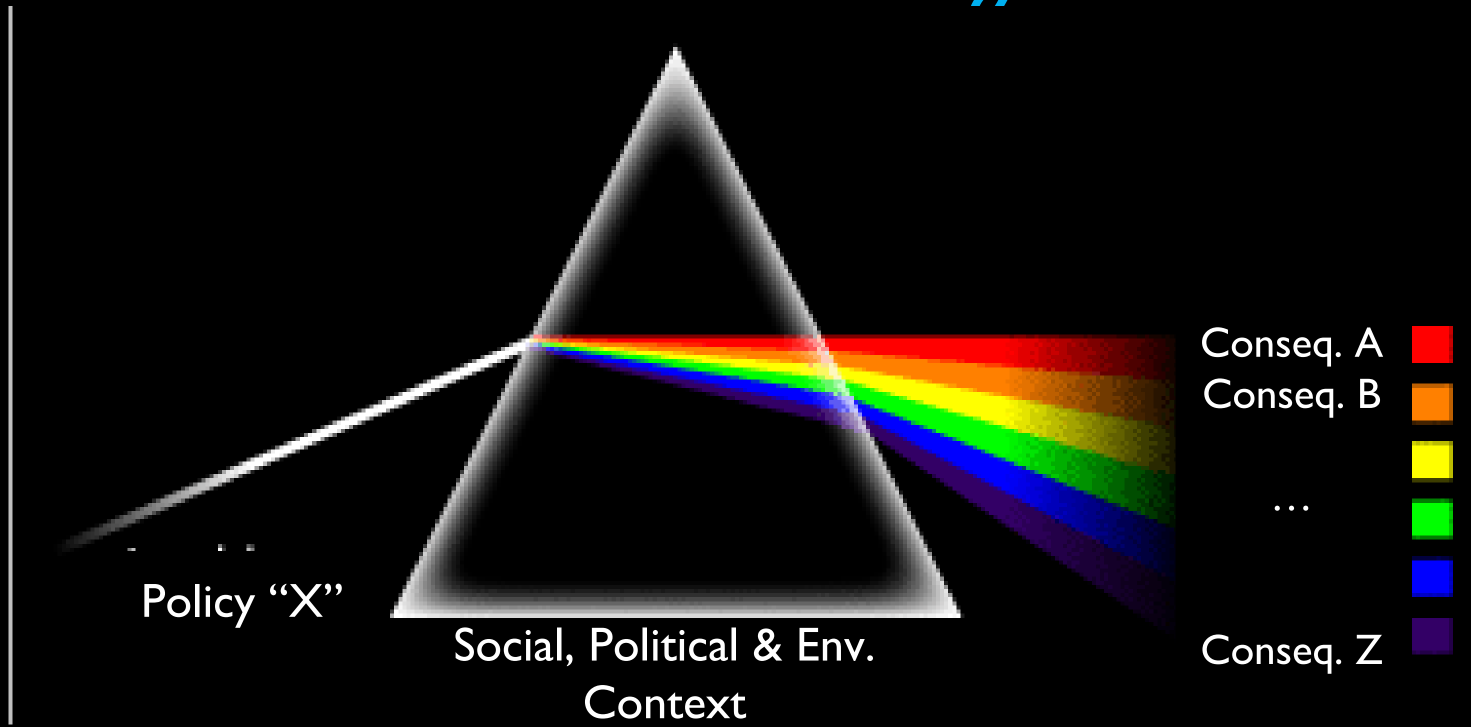
Acuña A. (2015). Diagrama Institucional gestión del agua en la comuna de Salamanca. Reporte.

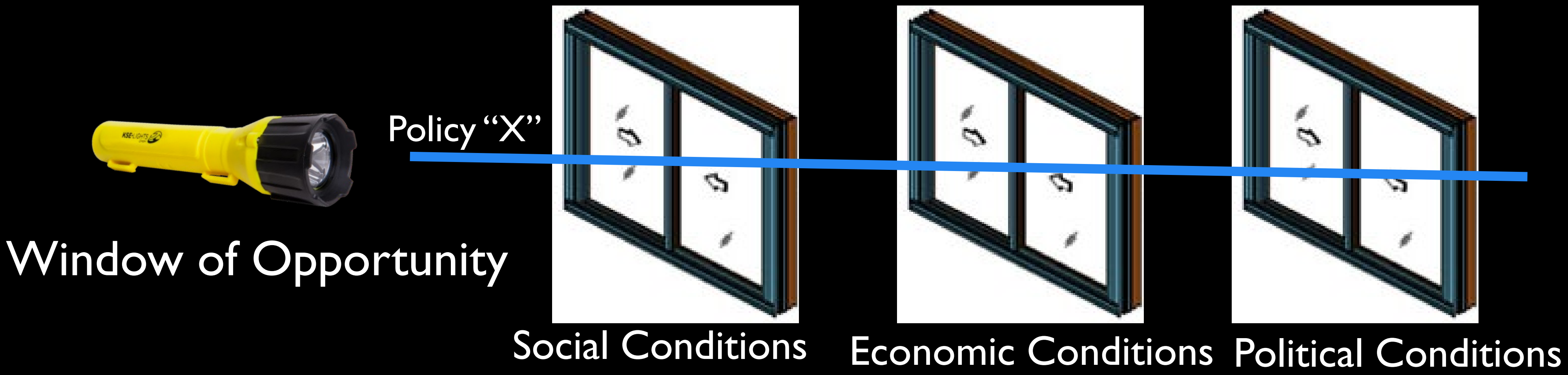
Stakeholder Involvement

- Bottom-up or Top-Down
- Participatory or Non-participatory
- Centralized or Decentralized
- Single Vs. Multiple laws and regulations



Policies & Policy Outcomes





Eel River Basin

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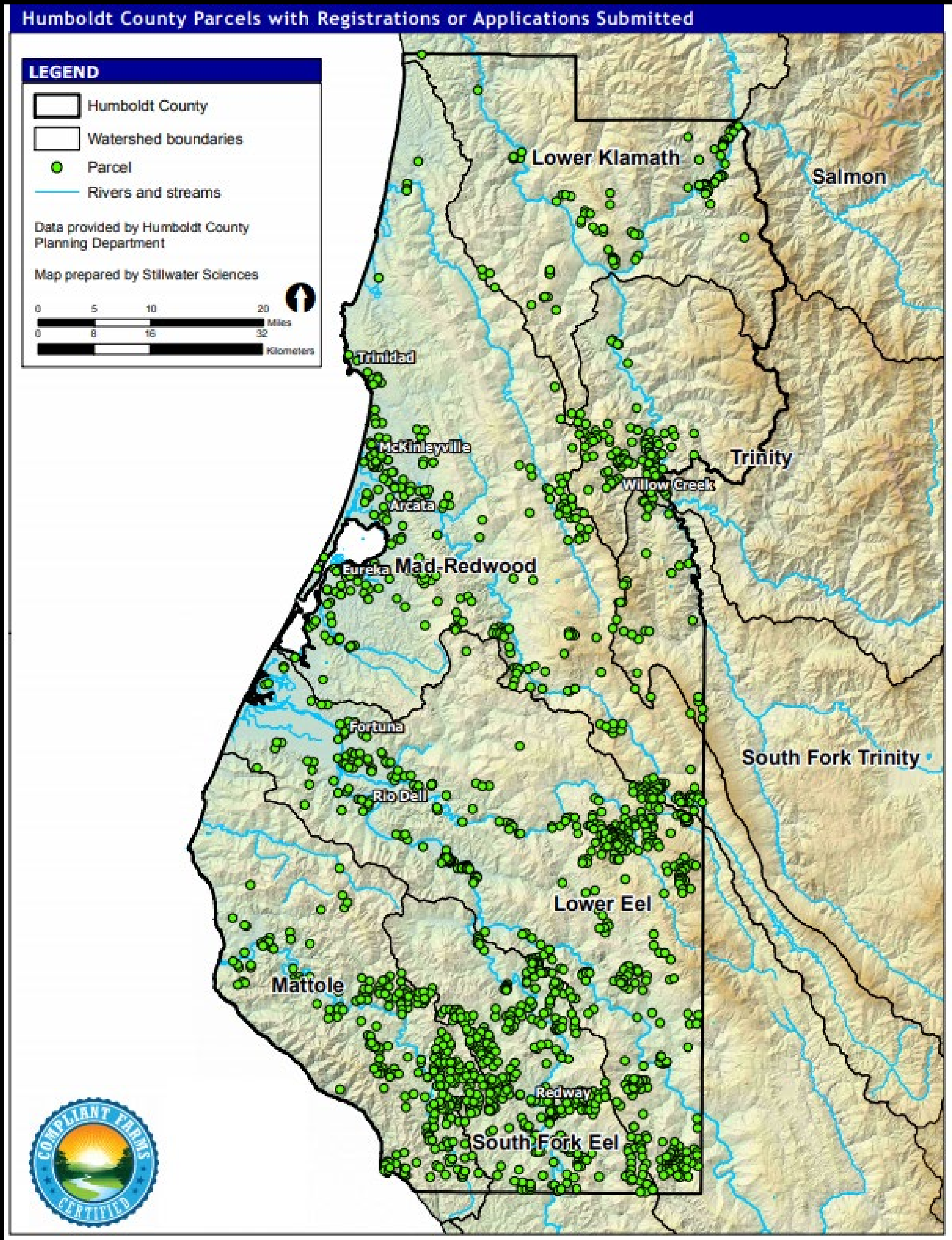
Context

- Cannabis has been grown in CA since 1795
- Cannabis was legal for medicinal (1996) and recreational (2016)
- 79% production in US (2010)
- $10-$15 billion



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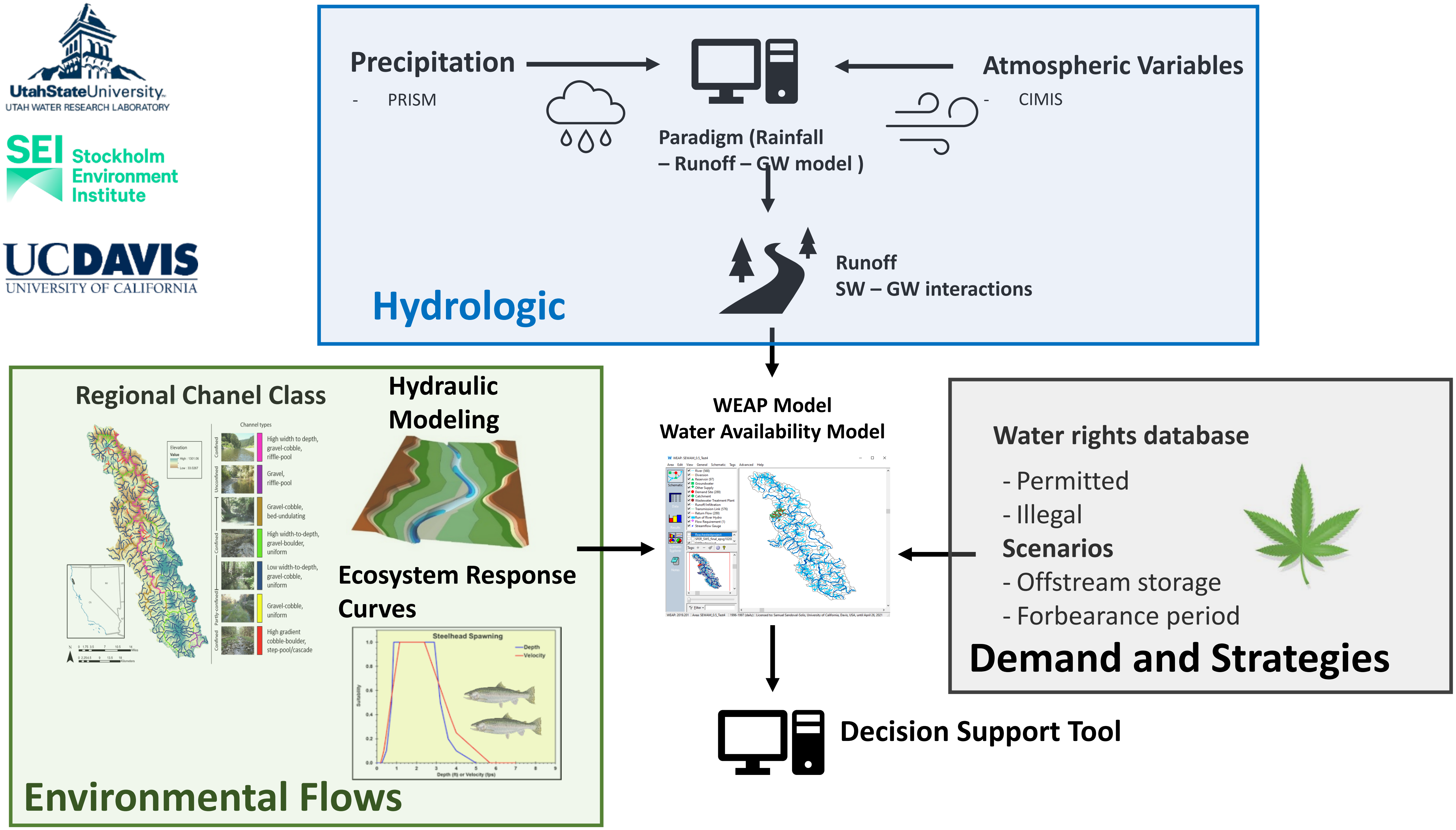
Objectives of the study

- Inform decision makers for determining Ecological Flow Criteria (“e-flows”)
- Develop a regional method for e-flows
- Develop guidelines and materials for their implementation in CA

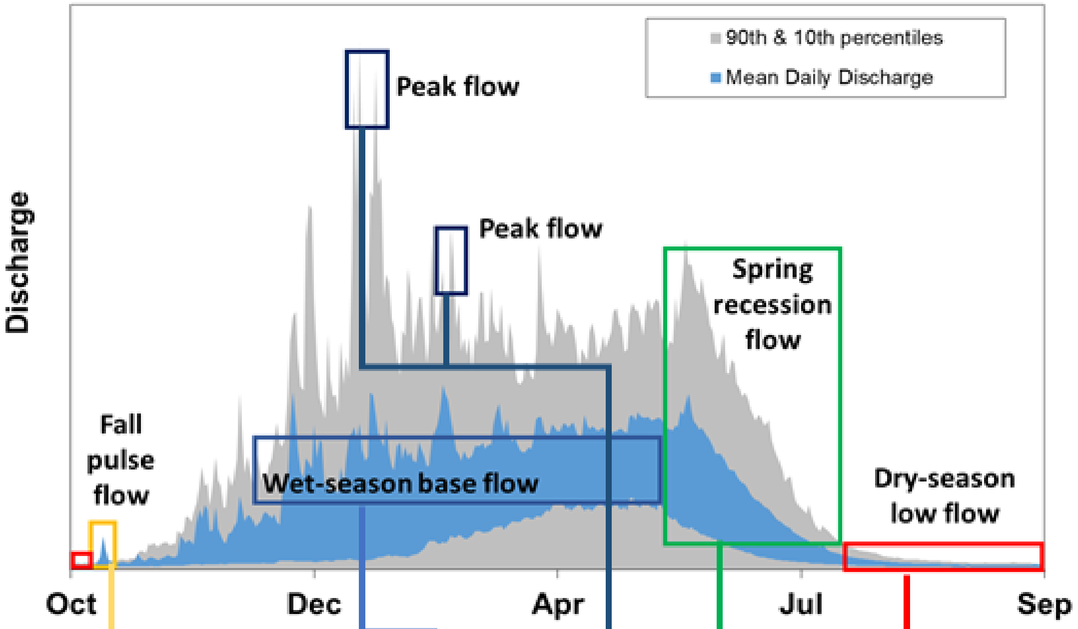


Precipitation
- PRISM
Paradigm (Rainfall – Runoff – GW model)
Atmospheric Variables
- CIMIS
Runoff
SW – GW interactions
Hydrologic
Regional Chanel Class
Channel types
High width to depth, gravel-cobble, riffle-pool
Gravel, riffle-pool
Gravel-cobble, bed-undulating
High width-to-depth, gravel-boulder, uniform
Low width-to-depth, gravel-cobble, uniform
Gravel-cobble, uniform
High gradient cobble-boulder, step-pool/cascade
Confined
Unconfined
Partly-confined
Hydraulic Modeling
Ecosystem Response Curves
Steelhead Spawning
Depth
Velocity
Suitability
Depth (ft) or Velocity (fps)
Environmental Flows
WEAP Model
Water Availability Model
Water rights database
- Permitted
- Illegal
Scenarios
- Offstream storage
- Forbearance period
Demand and Strategies
Decision Support Tool

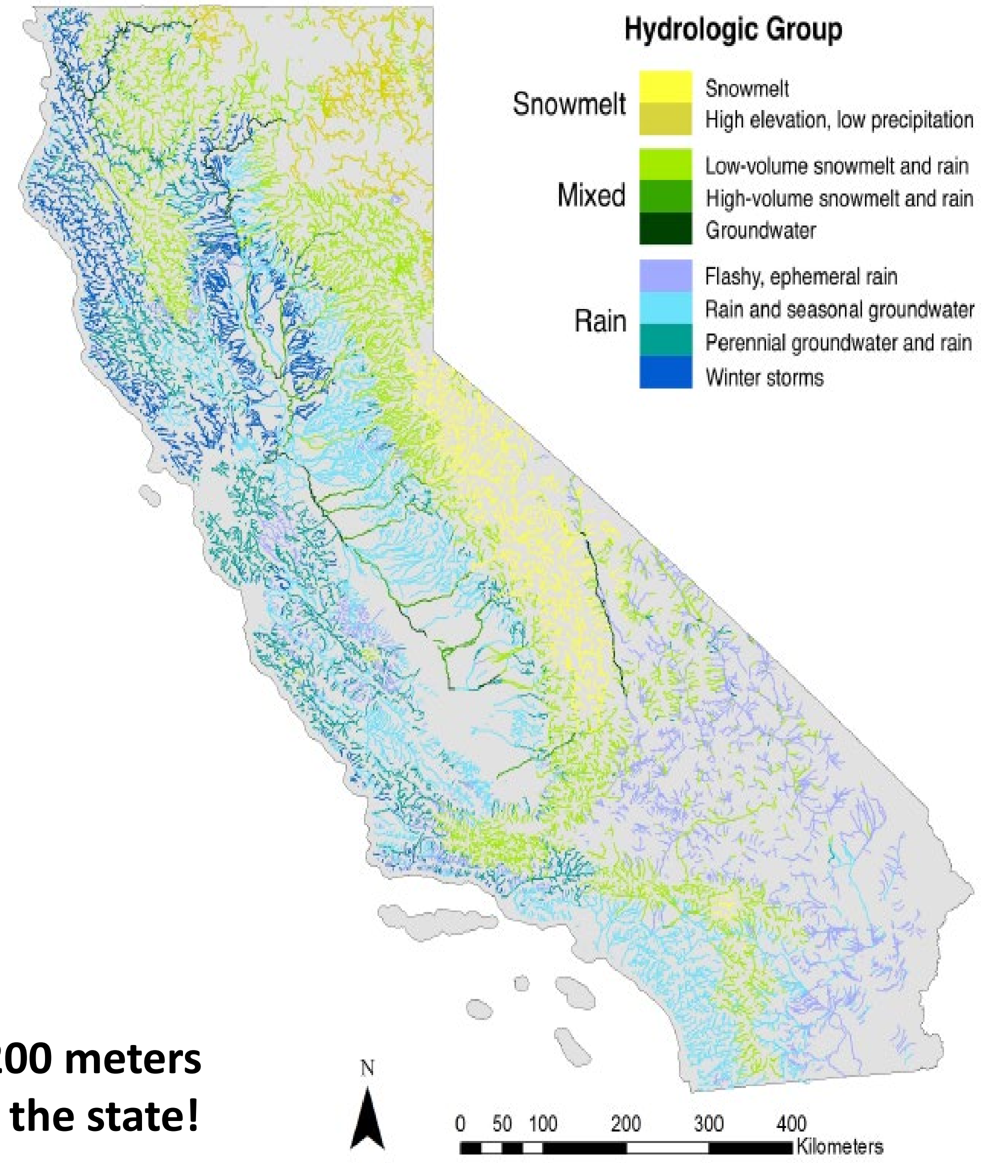
Environmental Flows in California

Reference-based Flow Criteria

Functional Flow Components



	Functional Flow Components				
Flow Characteristics	Fall Pulse	Wet Baseflow	Peak Flow	Spring Recession	Dry Low Flow
Magnitude	X	X	X	X	X
Timing	X	X	X	X	X
Duration		X	X	X	X
Frequency			X		
Rate of Change				X	X



Metrics @ 200 meters
Throughout the state!

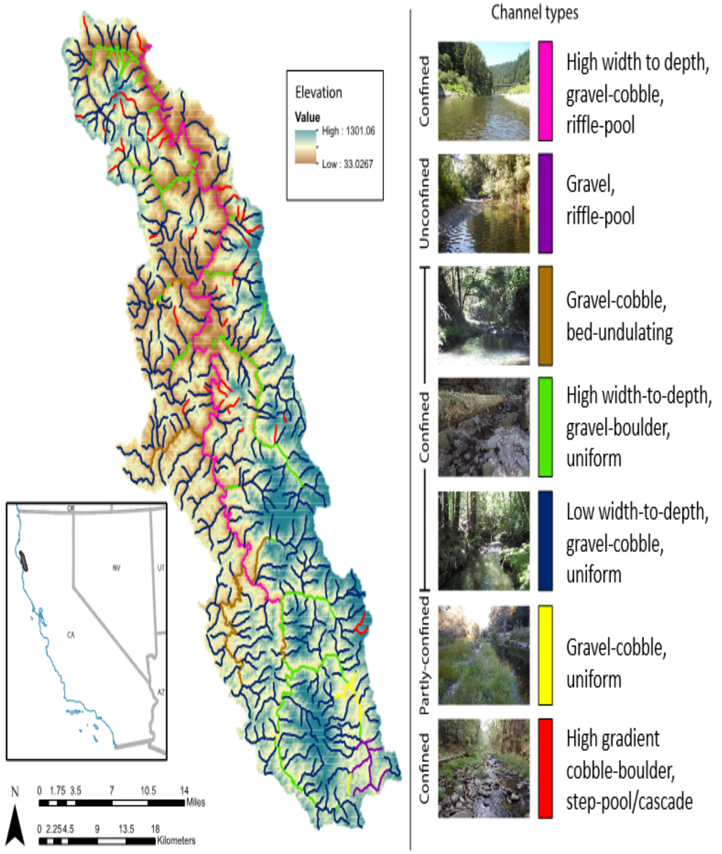
Environmental Flows in the Age of AI

Refined Flow Criteria

Flow – Form - Function

Flows → Geomorphology → Flow Ecology Response

Flow Regimes



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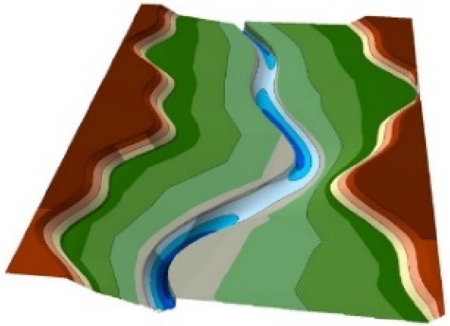
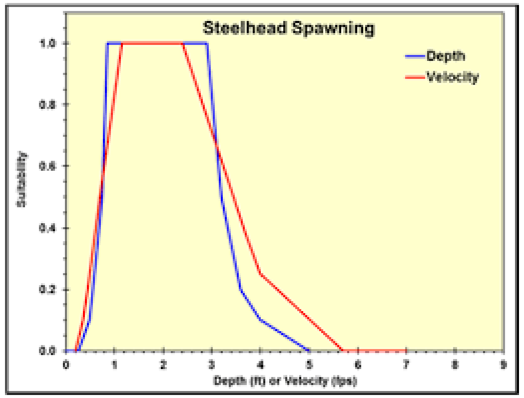
Geomorphology



Species Preference



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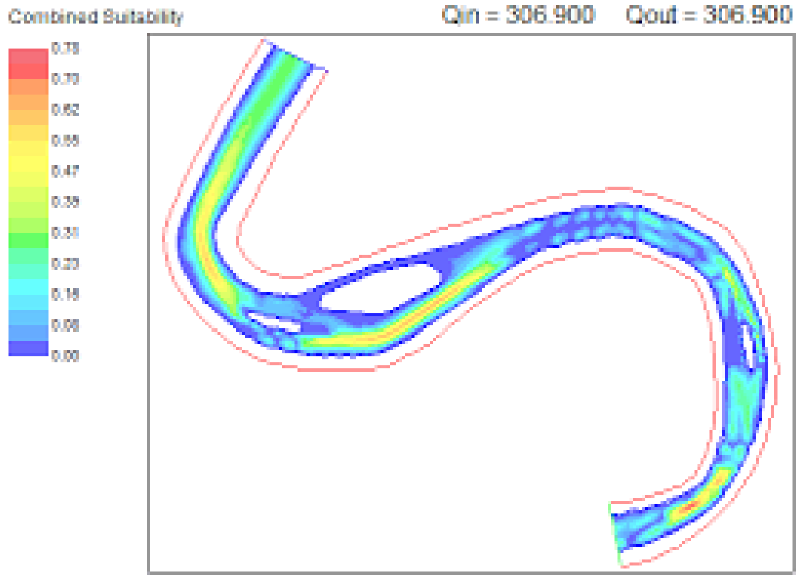
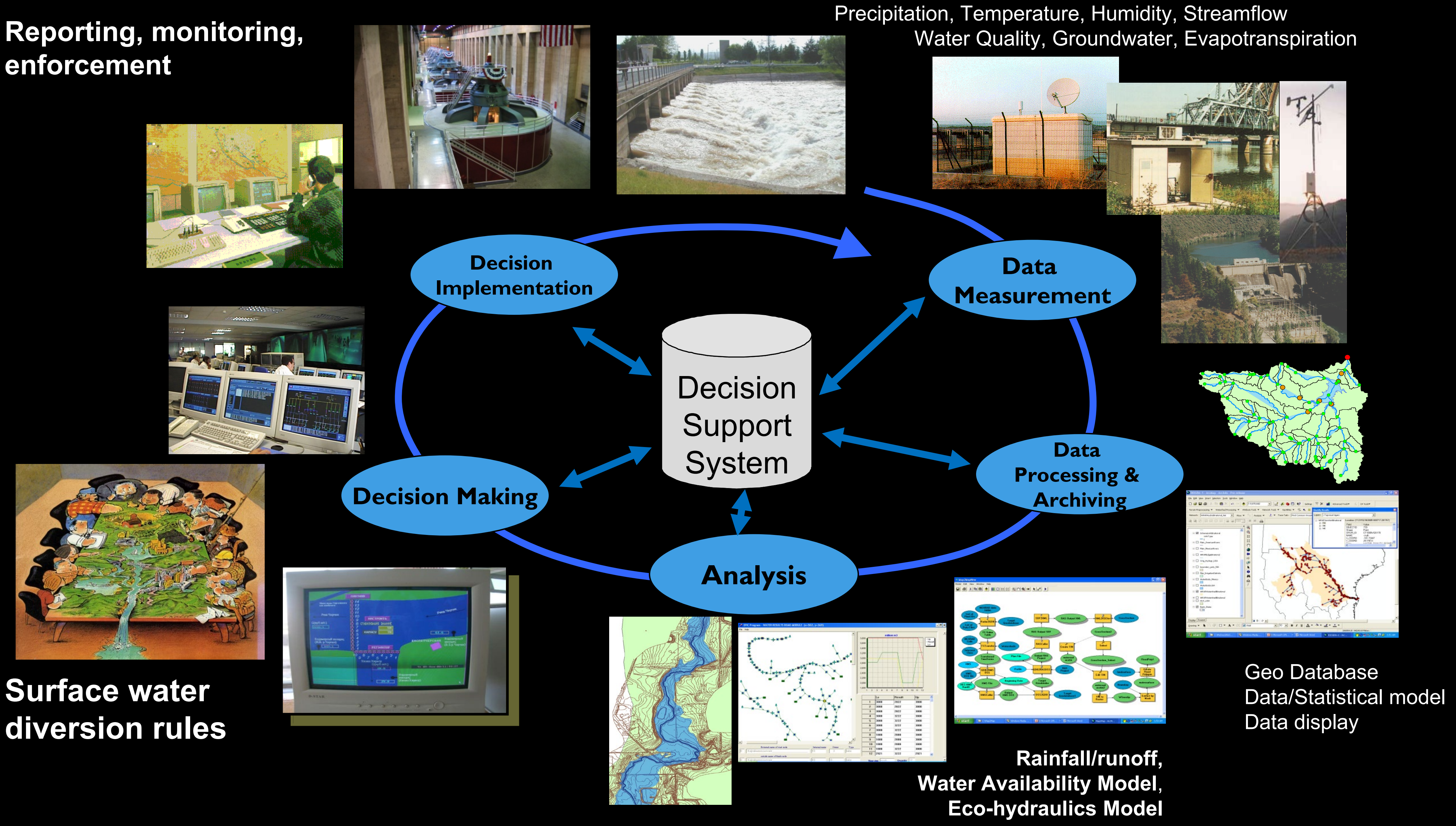
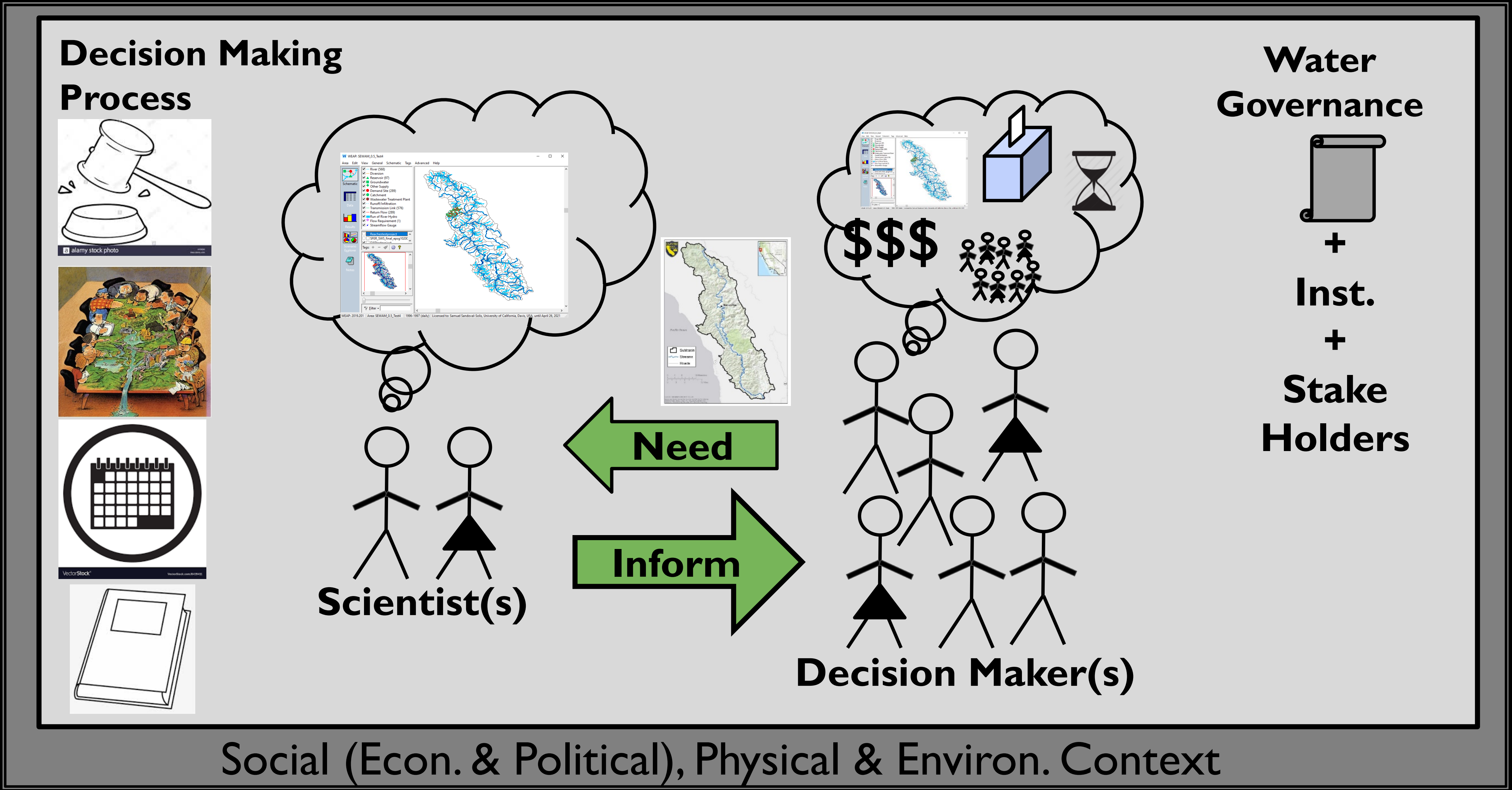
Flow – Ecology Response



River Basin Management



Water Governance and Decision Making Process



Most importantly …

"People don't care how much you know …
people want to know how much you care"

Thank you

samsandoval@ucdavis.edu

watermanagement.ucdavis.edu

eflows.ucdavis.edu

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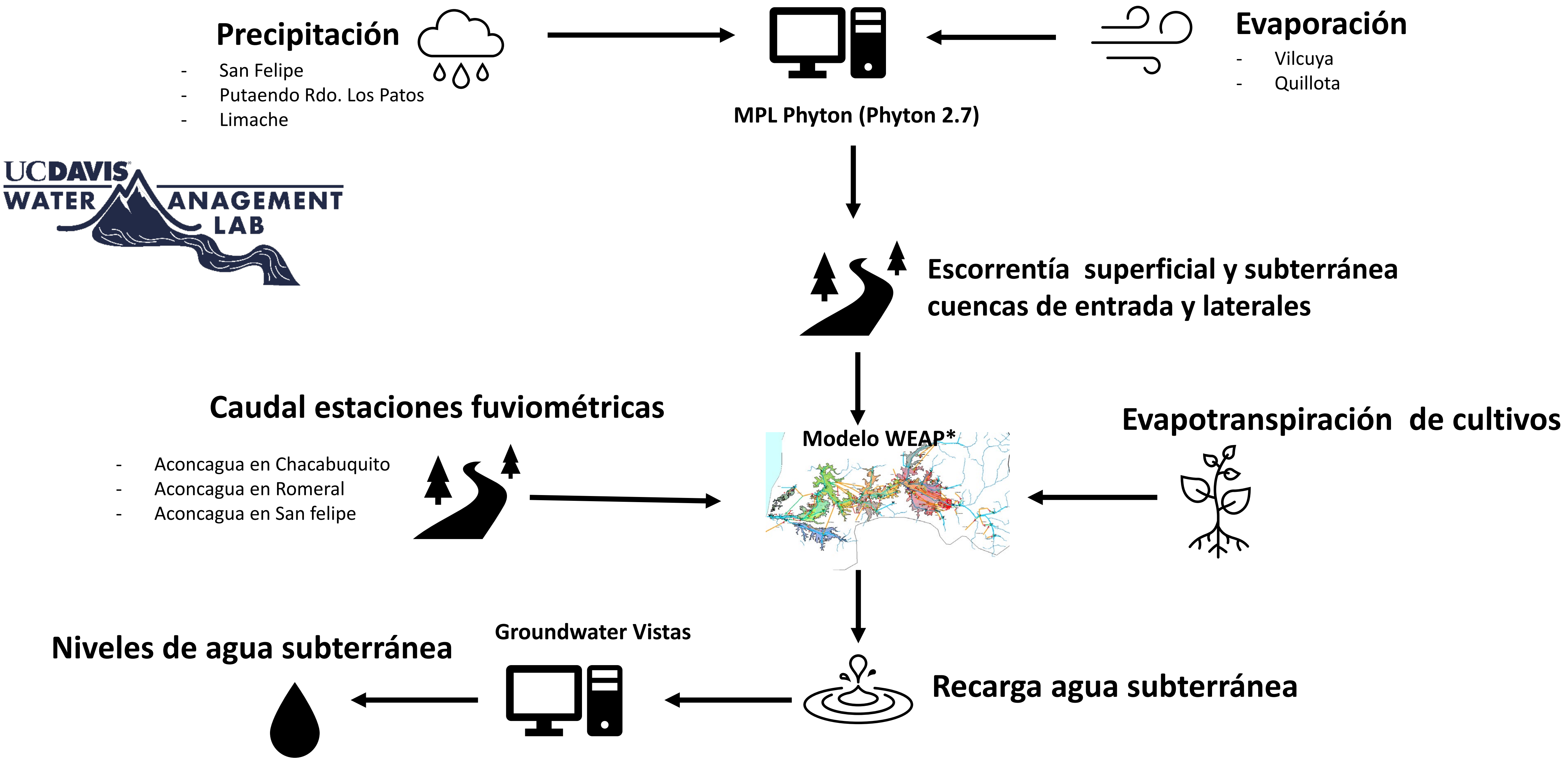

* El modelo WEAP utiliza la metodología del balance de masas y asigna agua para satisfacer las distintas demandas