RMC water and environment

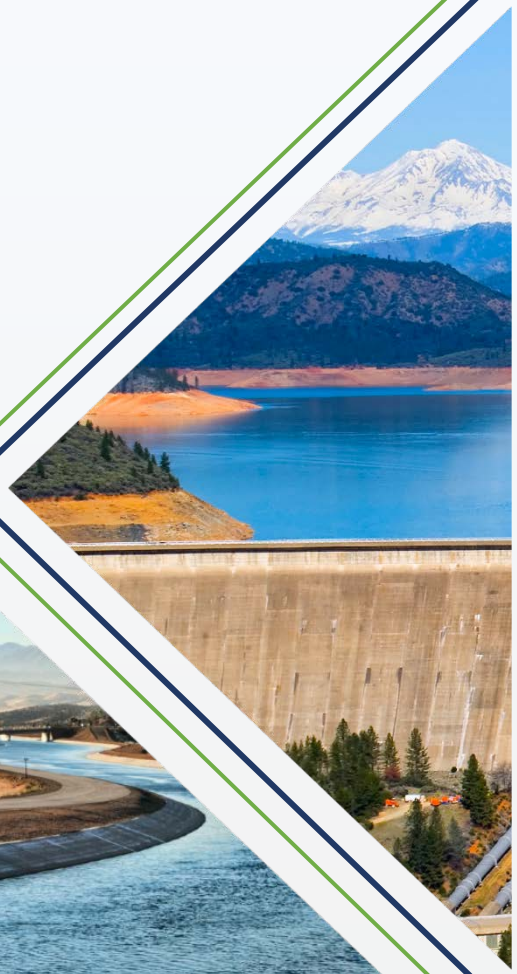
WOODARD &CURRAN

National Experience. Local Focus.

Addressing Inconsistency of MODFLOW and IWFM Water Budgets for SGMA Modeling

GRA Annual Conference
October 3, 2017

Reza Namvar



Regulation for GSPs - Water Budgets

CALIFORNIA CODE OF REGULATIONS

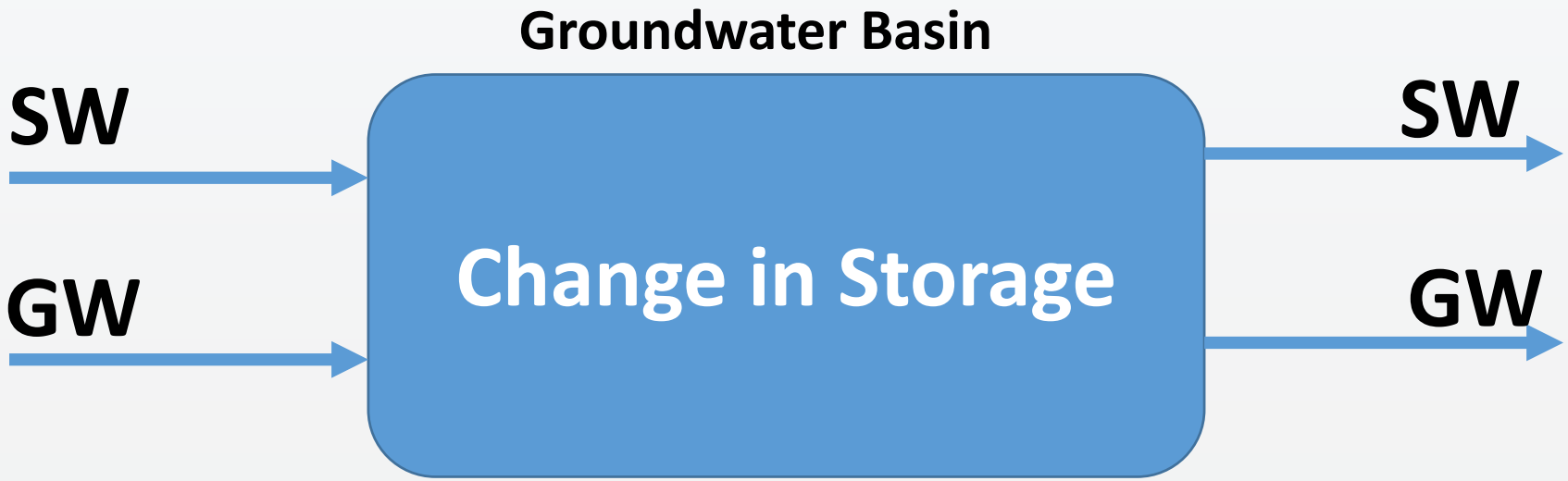
TITLE 23. WATERS

DIVISION 2. DEPARTMENT OF WATER RESOURCES

CHAPTER 1.5. GROUNDWATER MANAGEMENT

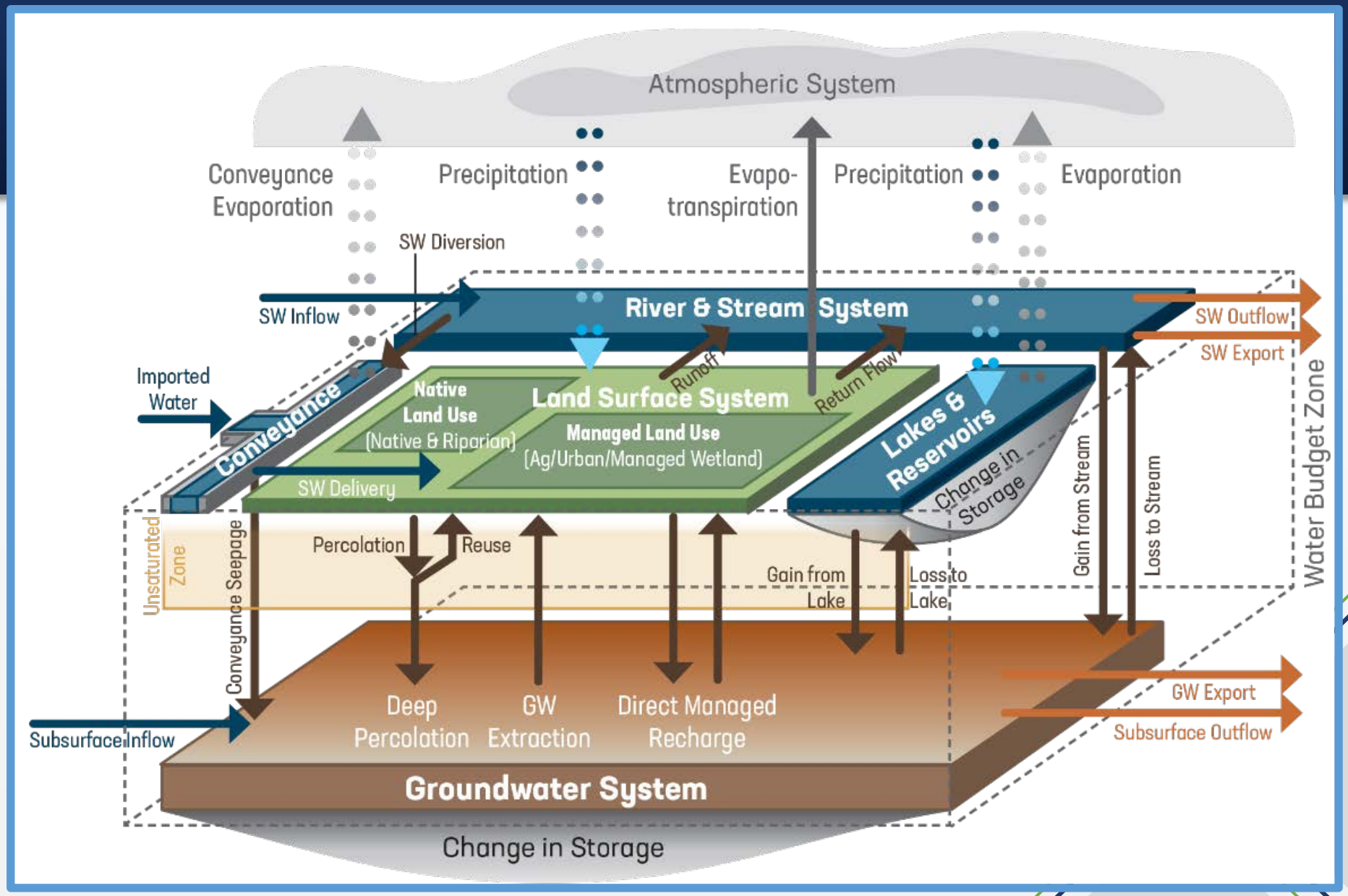
SUBCHAPTER 2. GROUNDWATER SUSTAINABILITY PLANS

- § 354.18. Water Budget



Regulation for GSPs - Water Budgets

- § 354.18. Water Budget
- Water budget should include an estimate of sustainable yield for the basin



Regulation for GSPs - Water Budgets

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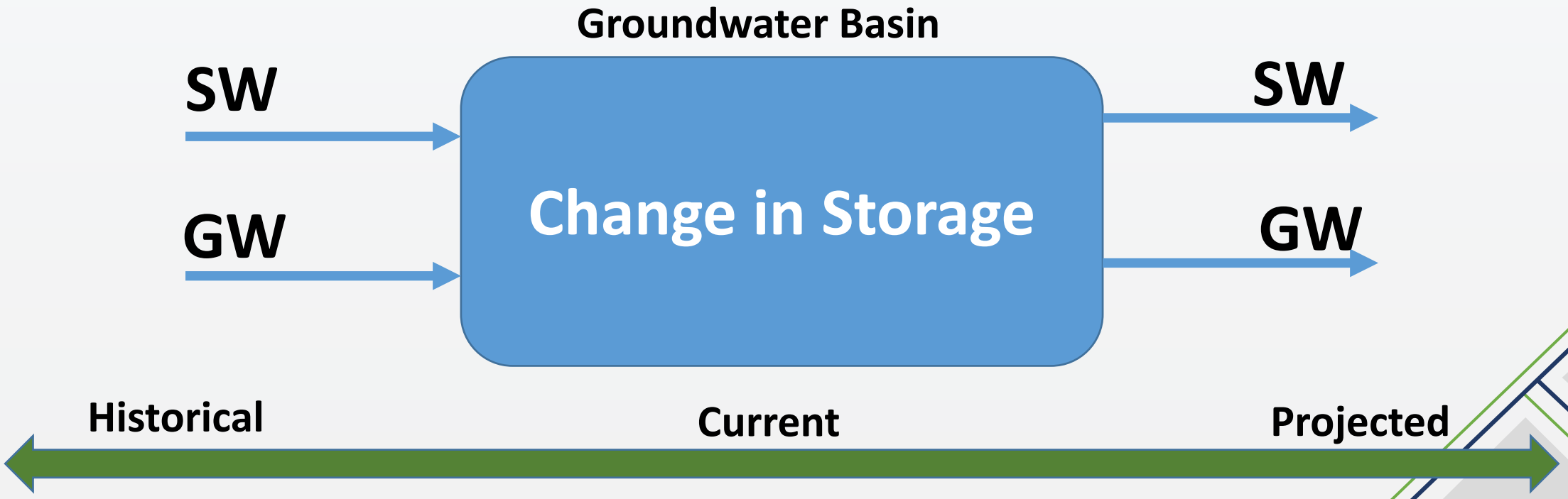

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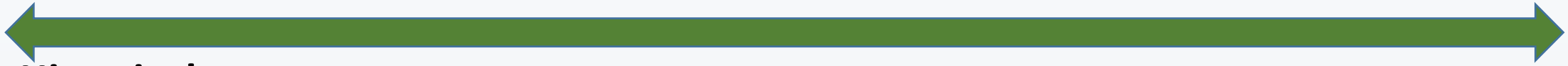

Historical
(extend back a minimum of 10 years)

- Most recent ten years of sw supply
- How basin was operated within sustainable yield

Current

Most recent:

- Hydrology
- Water Supply
- Water Demand
- Land Use

Projected

Future Conditions of:

- Supply
- Demand
- Aquifer Response to Plan Implementation

Utilize 50 years of historical hydrology

Regulation for GSPs - Water Budgets

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- § 354.18. Water Budget

- Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin.
- If a numerical model is not used, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.

Regulation for GSPs - Water Budgets

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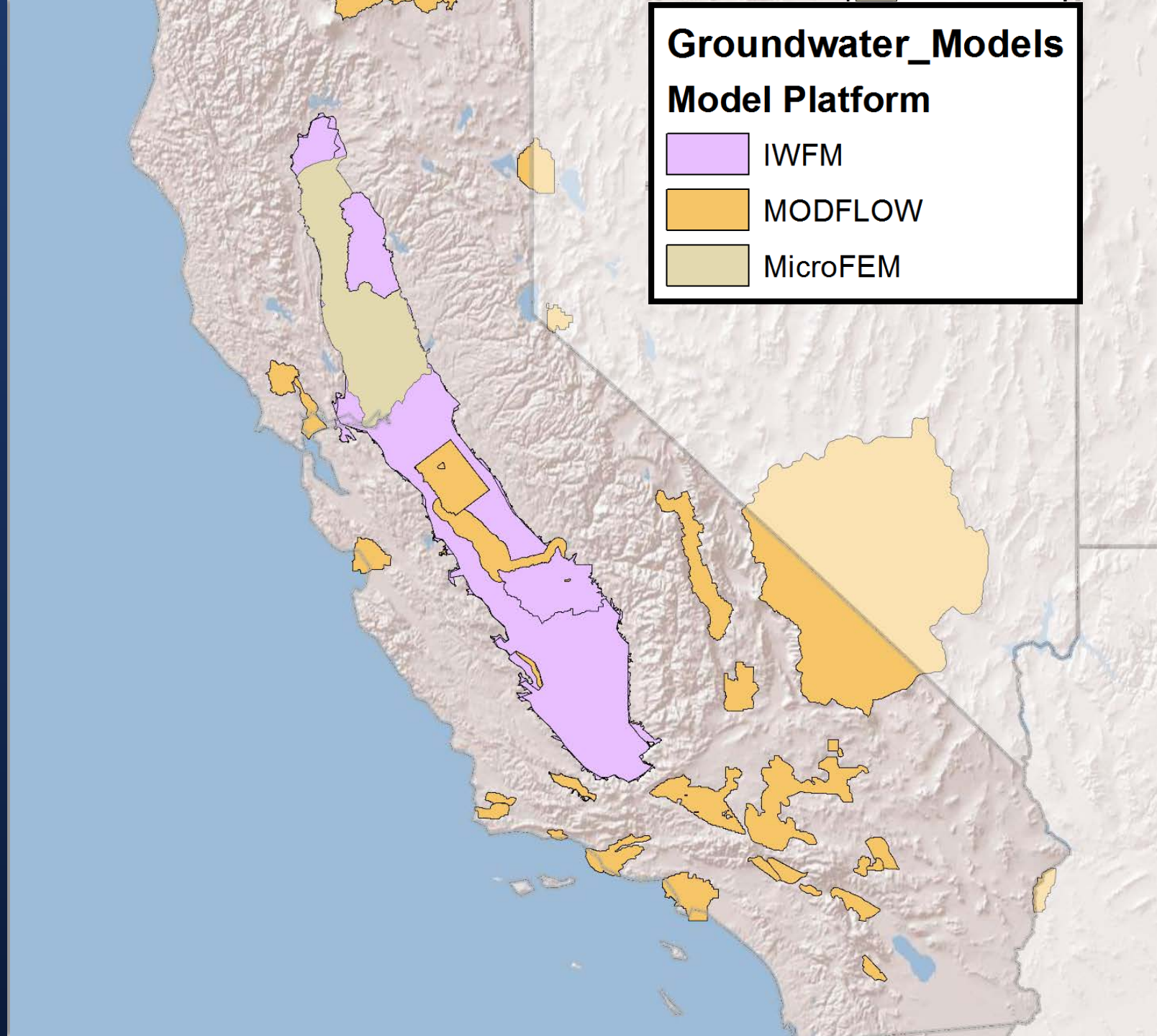
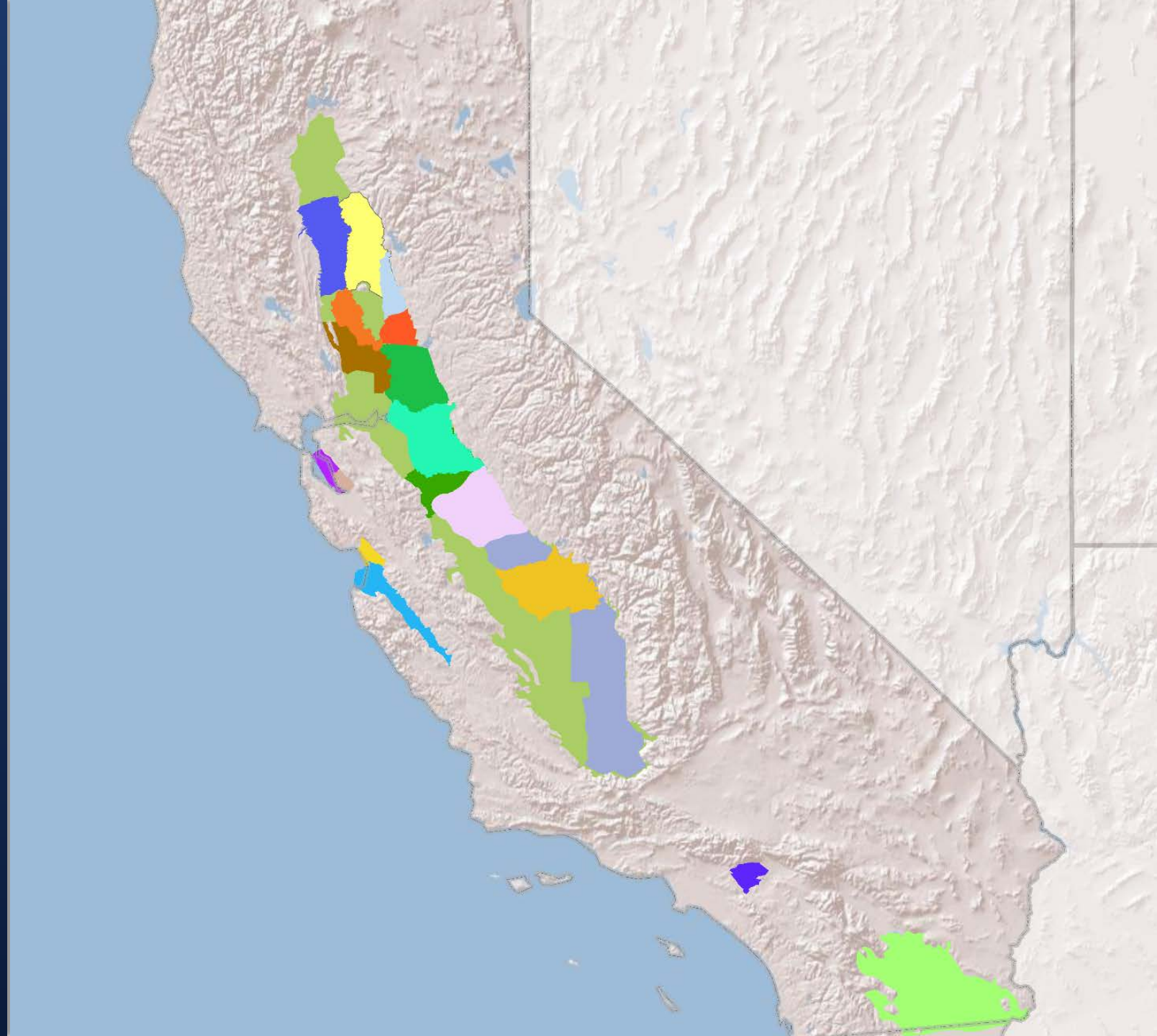
- § 354.18. Water Budget
  - The Department shall provide the C2VSim and the IWFM for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model.

DWR and USGS Models

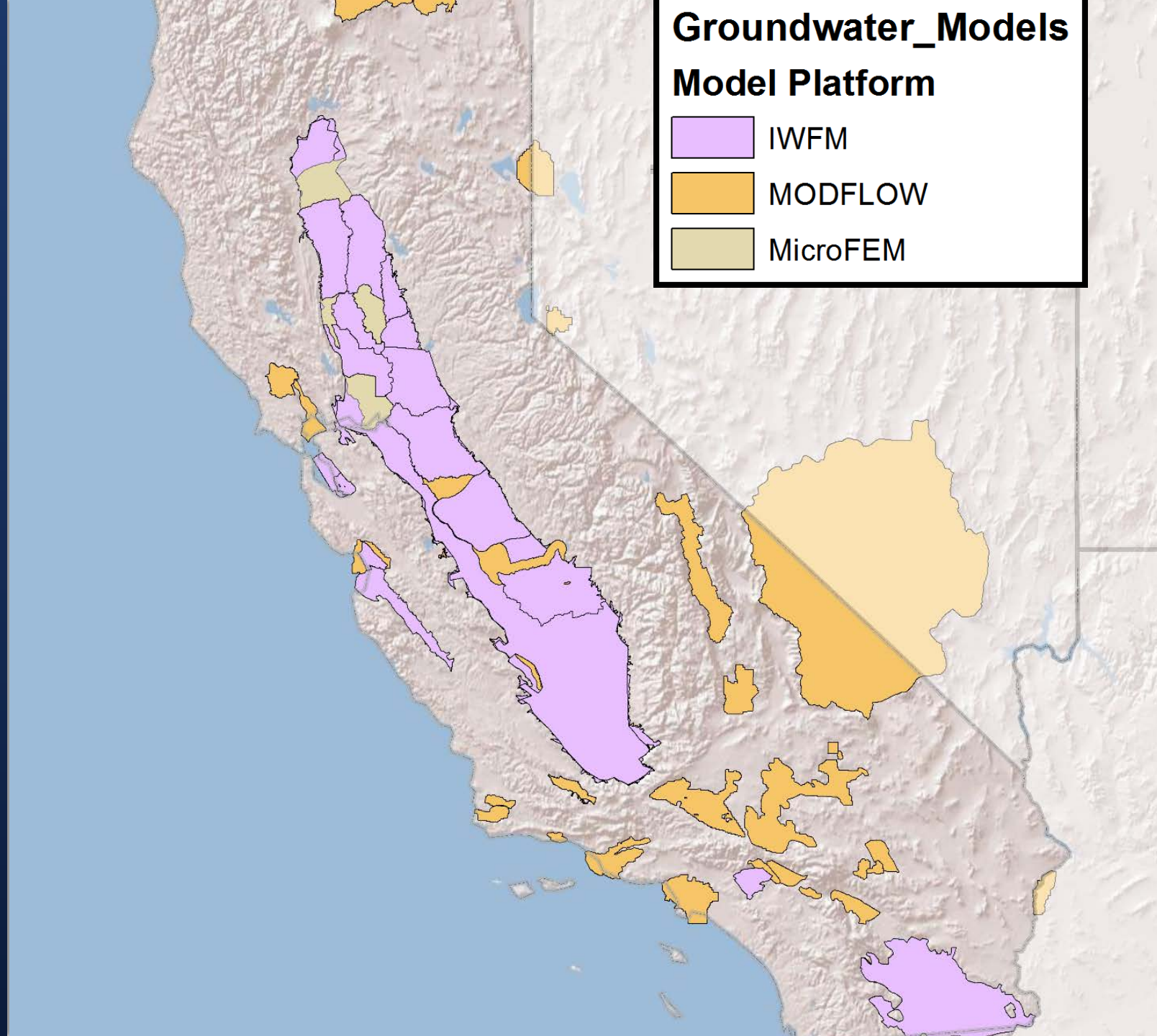
USGS Models – Year Published:
2010-2017: 12
2000-2009: 12
Before 2000: 11



IGSM/IWFM Models



Available Models



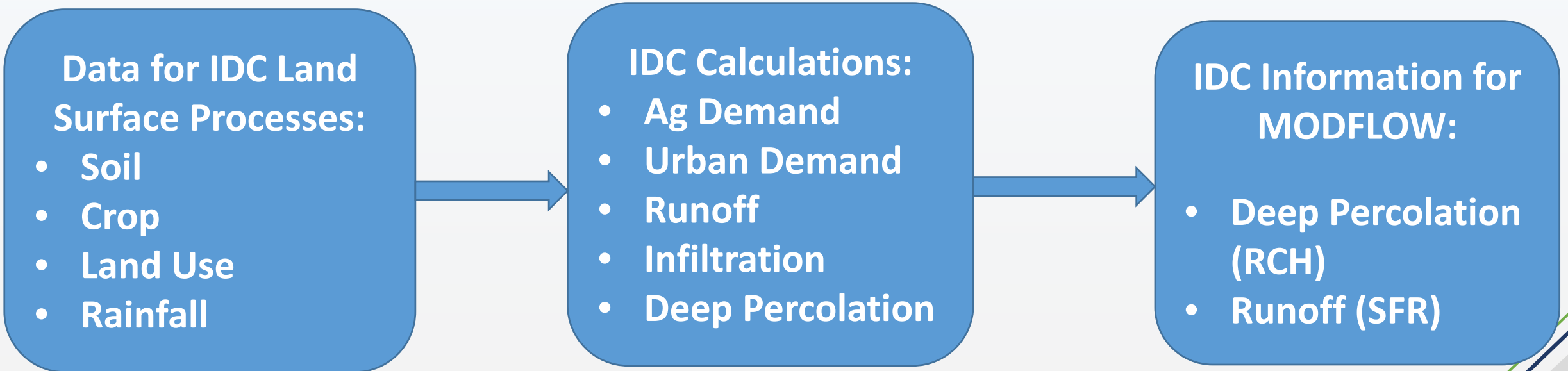
Consistency of MODFLOW and IWFM Water Budgets for SGMA Modeling

- Data:
  - Consistent Data Results in Consistent Water Budgets by MODFLOW and IWFM
- Modeling Tools:
  - Most Basins Use either MODFLOW or IWFM
  - IDC Module of IWFM Could be Used with Any Model
  - Using IDC with MODFLOW Results in Higher Consistency of Water Budgets

IWFM Demand Calculator (IDC)

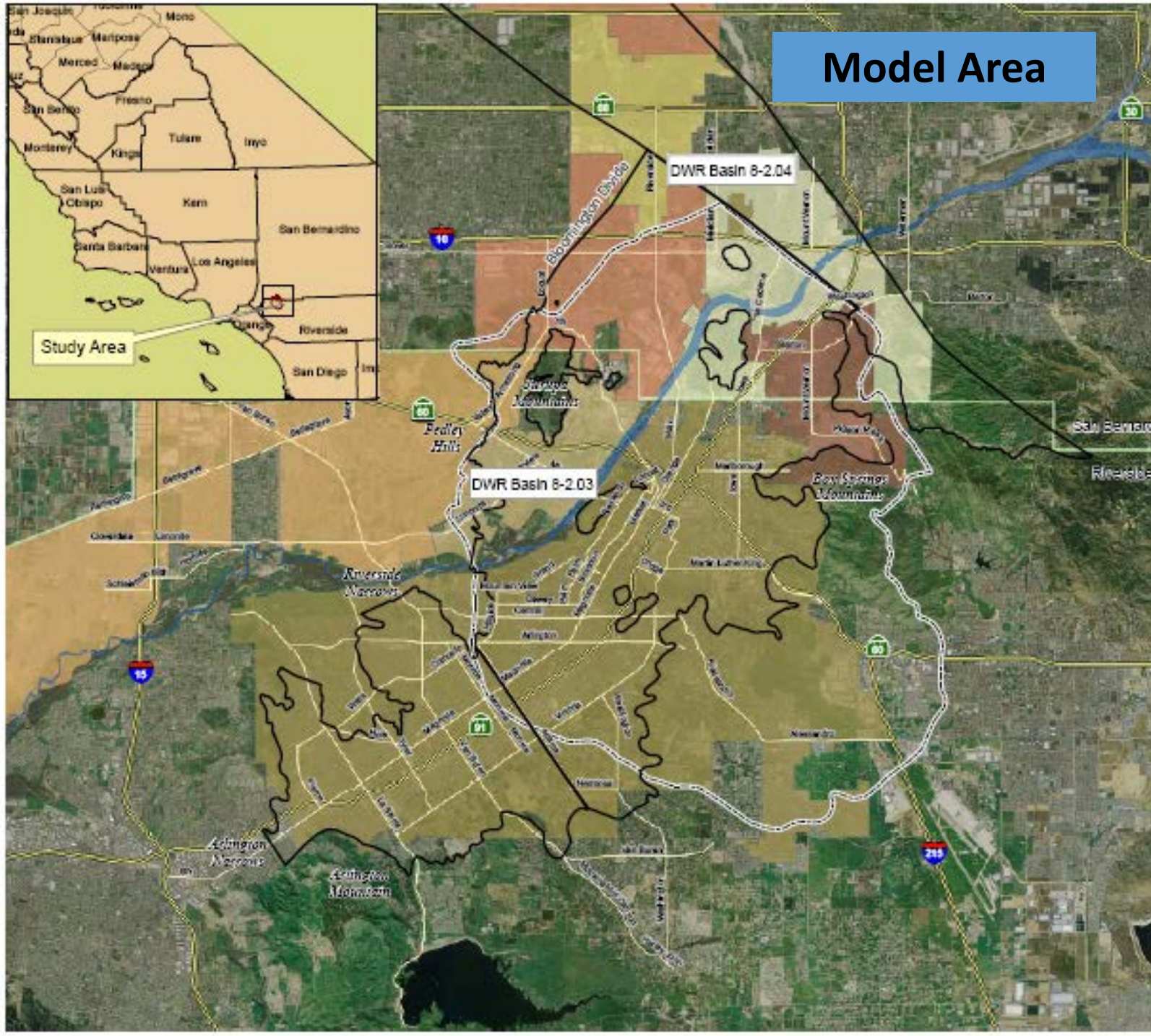
- IDC calculates demands based upon soil and crop types and climate data
- IDC works either with or independently of IWFM
- IDC could be used to estimate demands for other models
- IDC could be integrated directly into other models (e.g. MODFLOW 6 and previous core versions)

How to Use IDC with MODFLOW

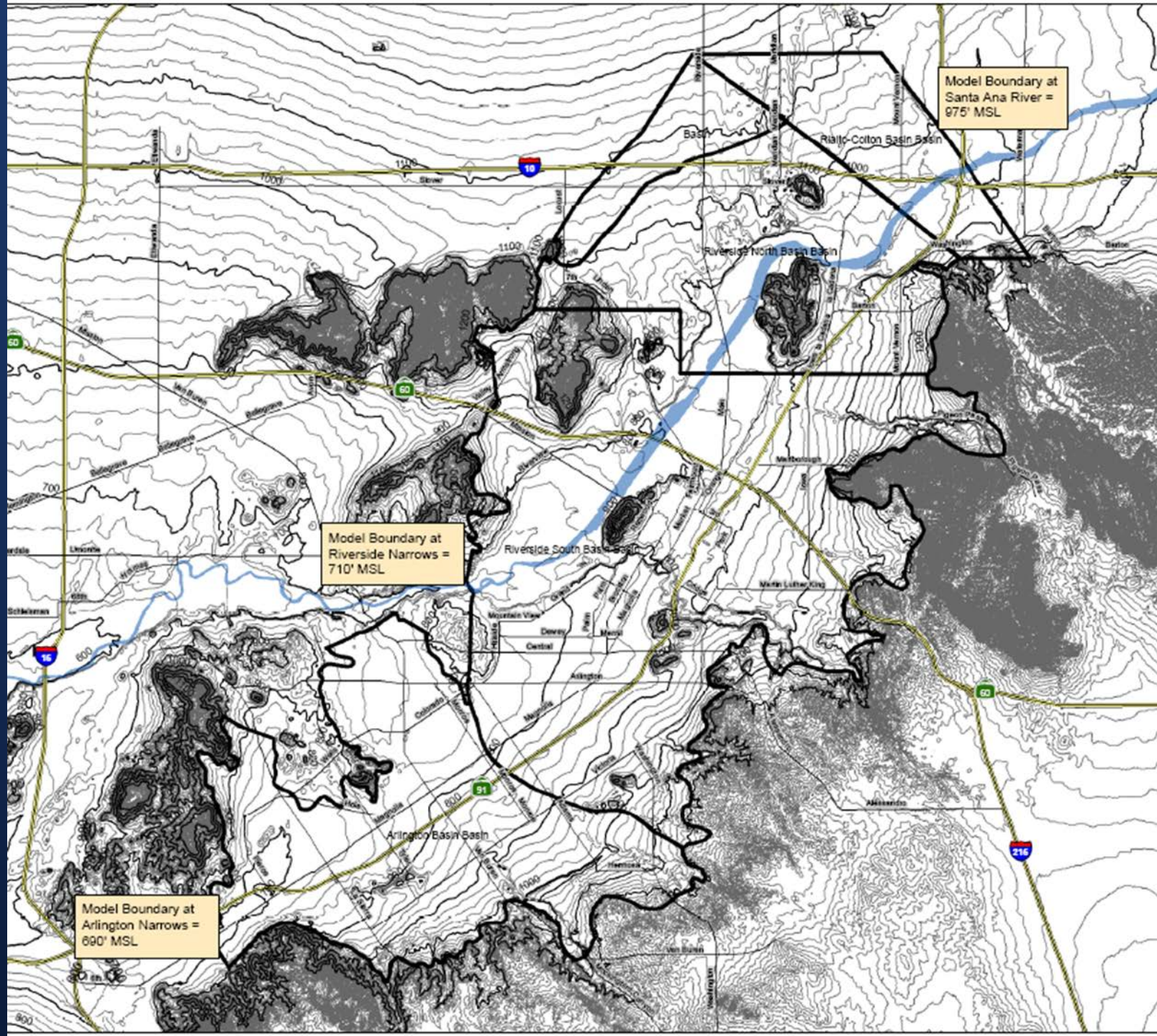


How to Use IDC with MODFLOW – A Case Study

Riverside-Arlington Groundwater Basin

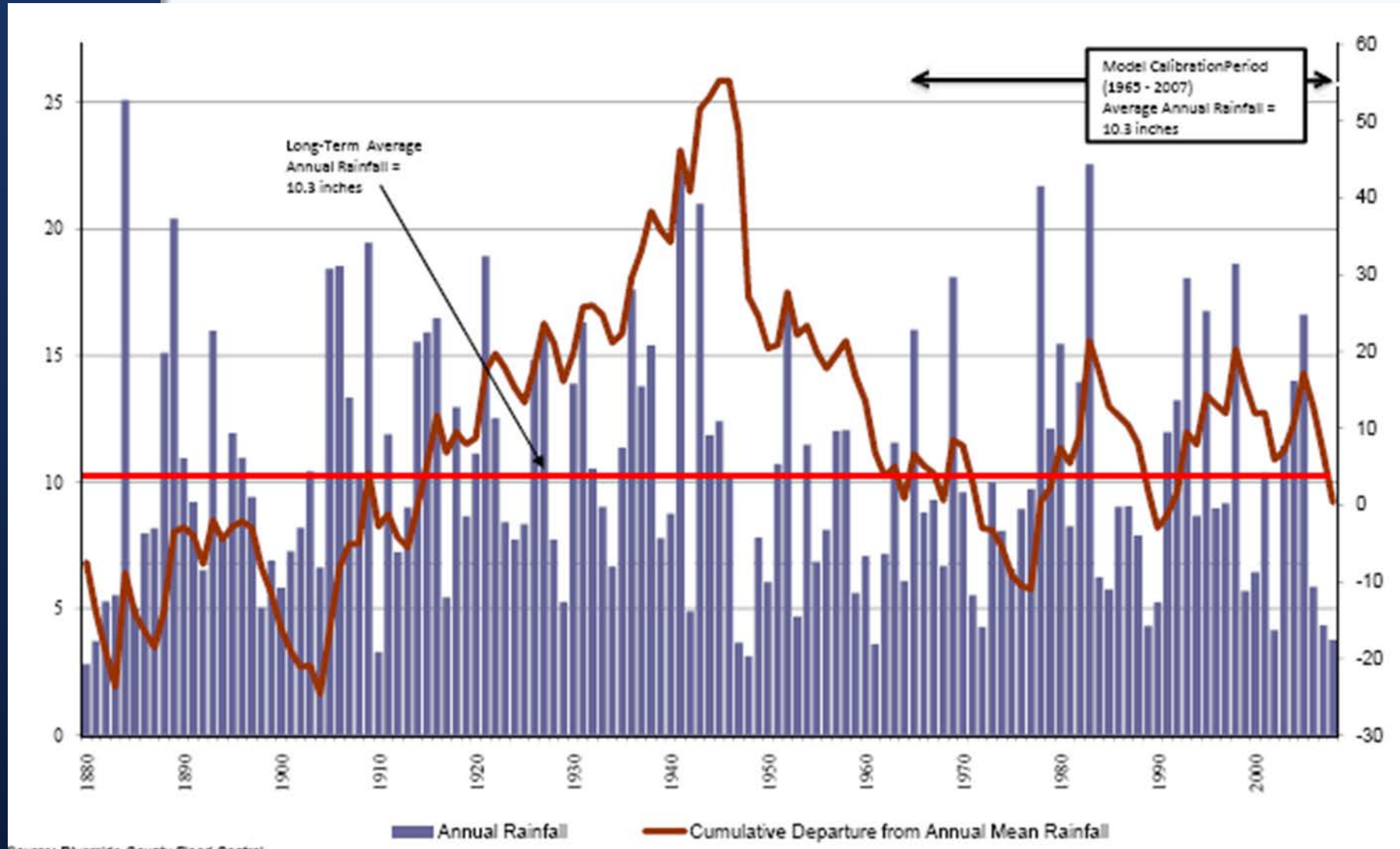


Ground Surface Elevation



Annual Rainfall:

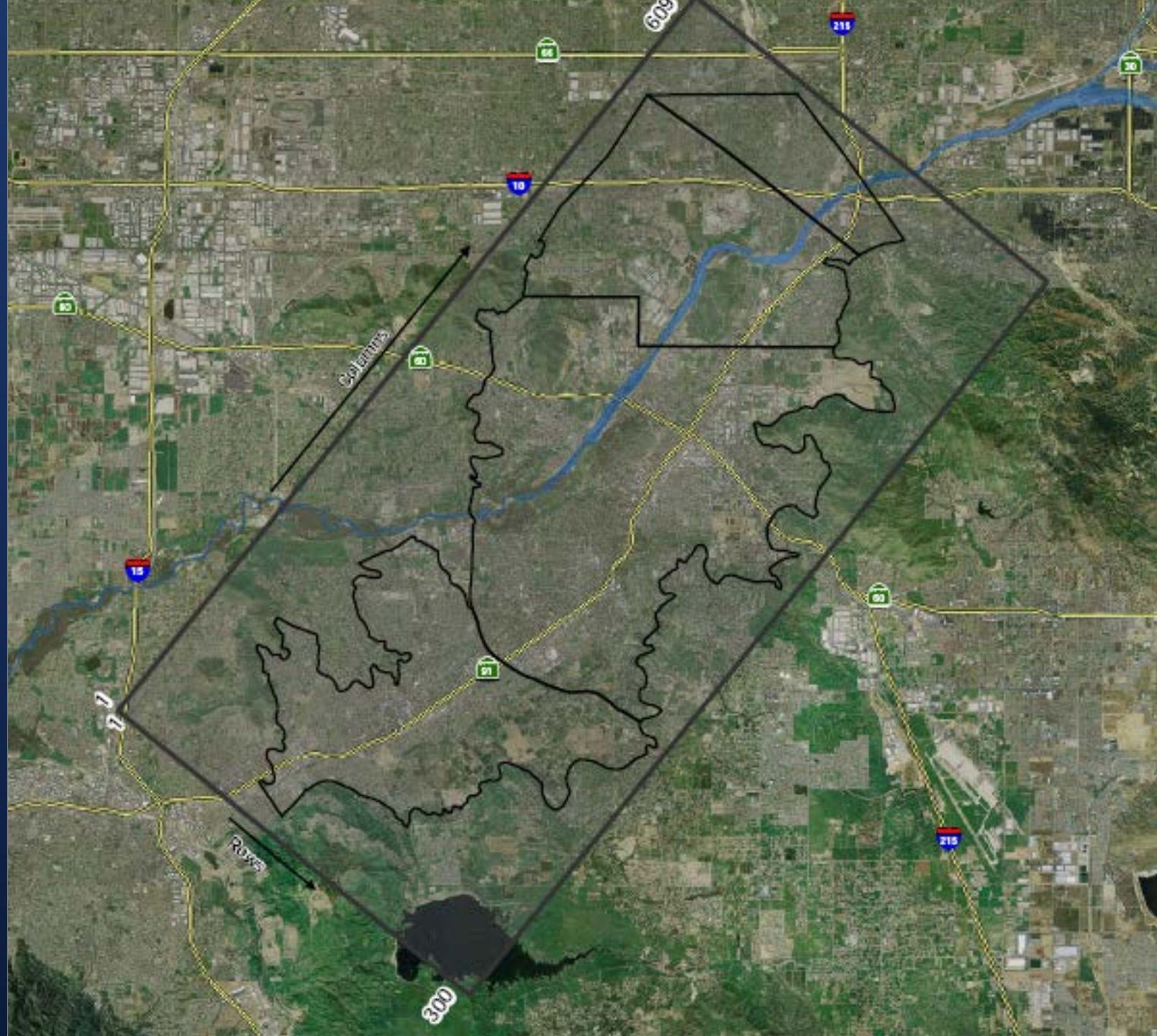
10.3 inches



Source: Riverside County Flood Control
Water Conservation District

MODFLOW Model Grid:

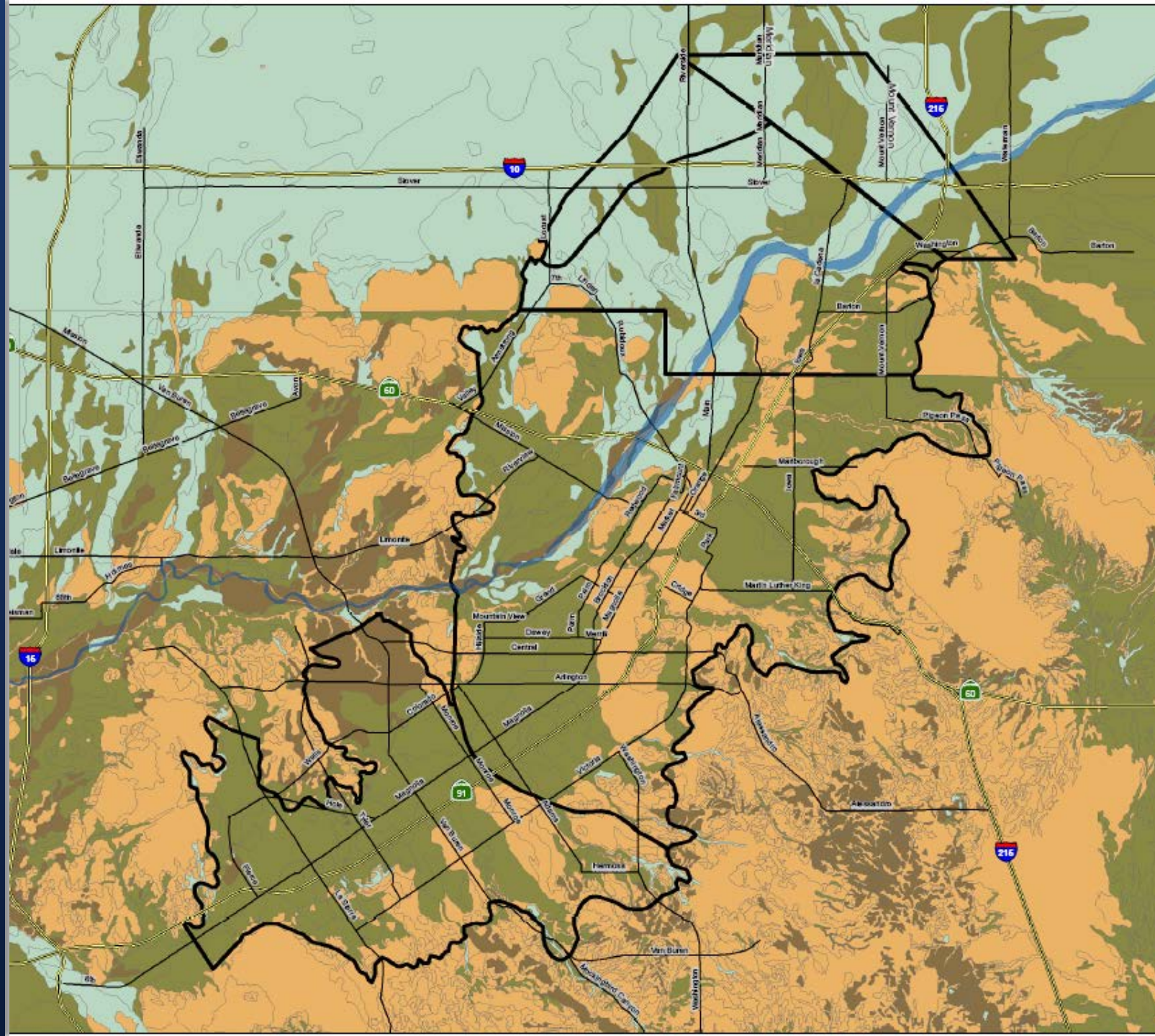
95 square miles
Uniform cell size
(50 m x 50 m)



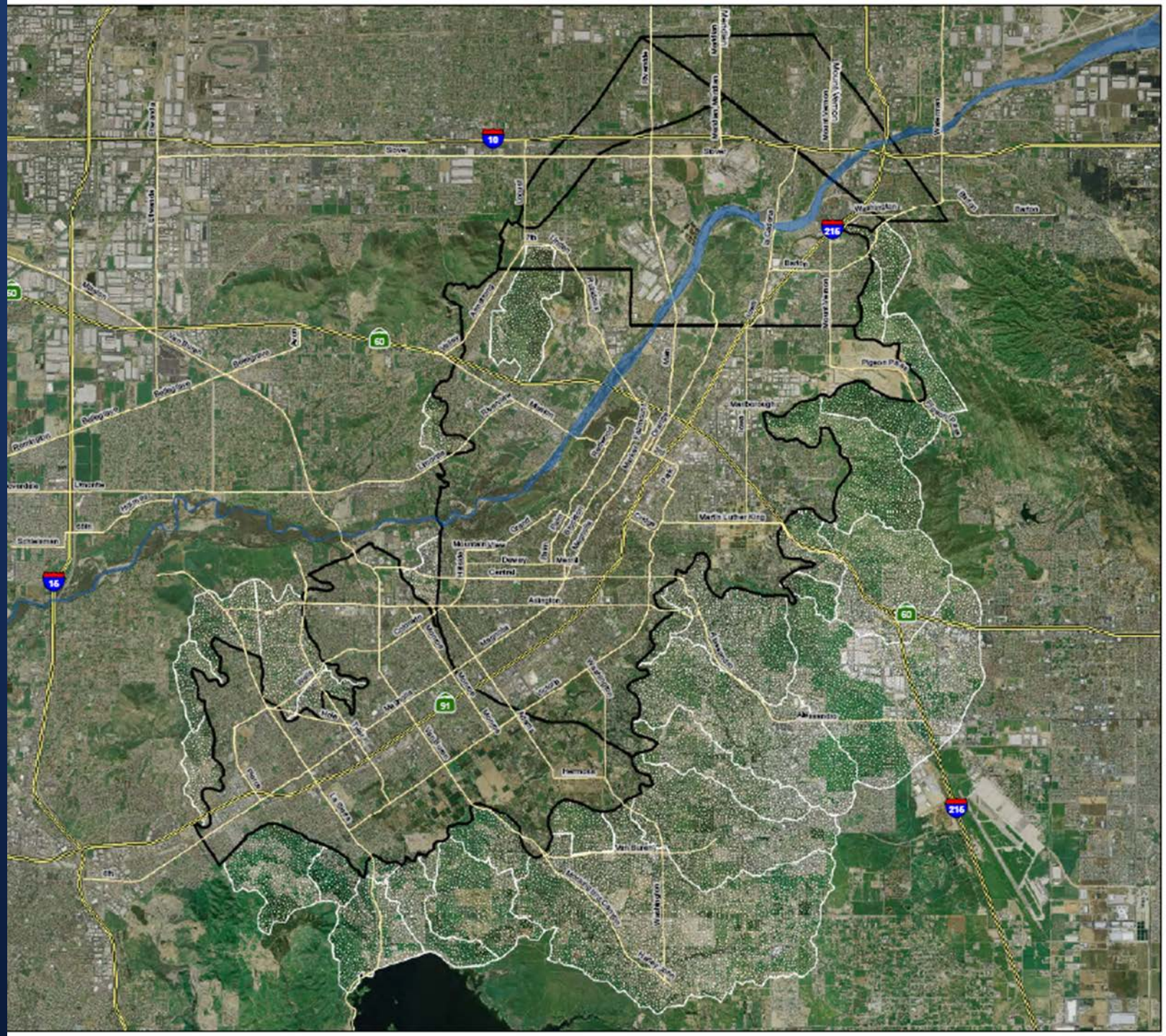
Active Model Cells

14,000 in Layer 1
72,000 in Layer 2
45,000 in Layer 3
131,000 Total

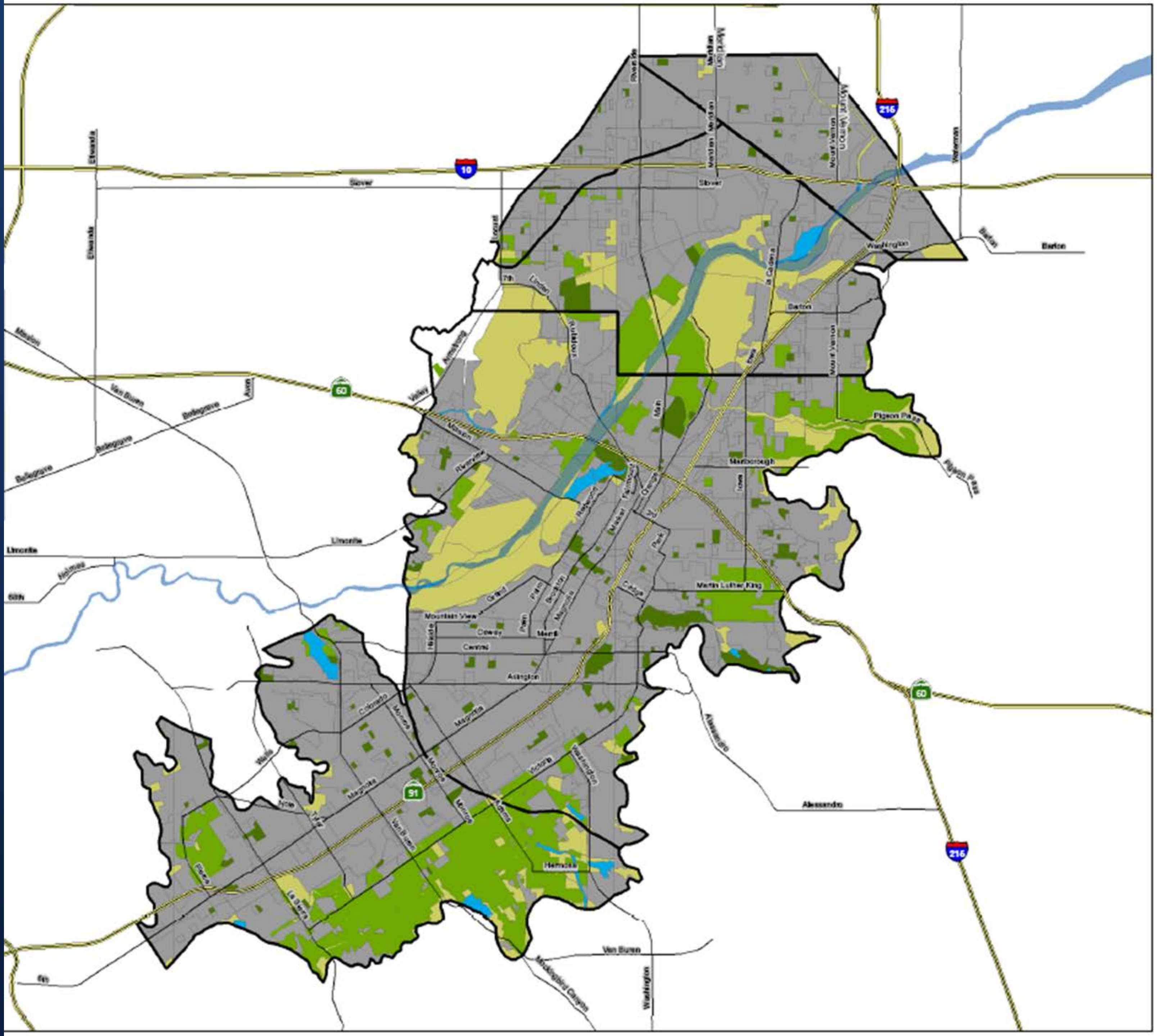
Hydrologic Soil Groups



29 Small Watersheds



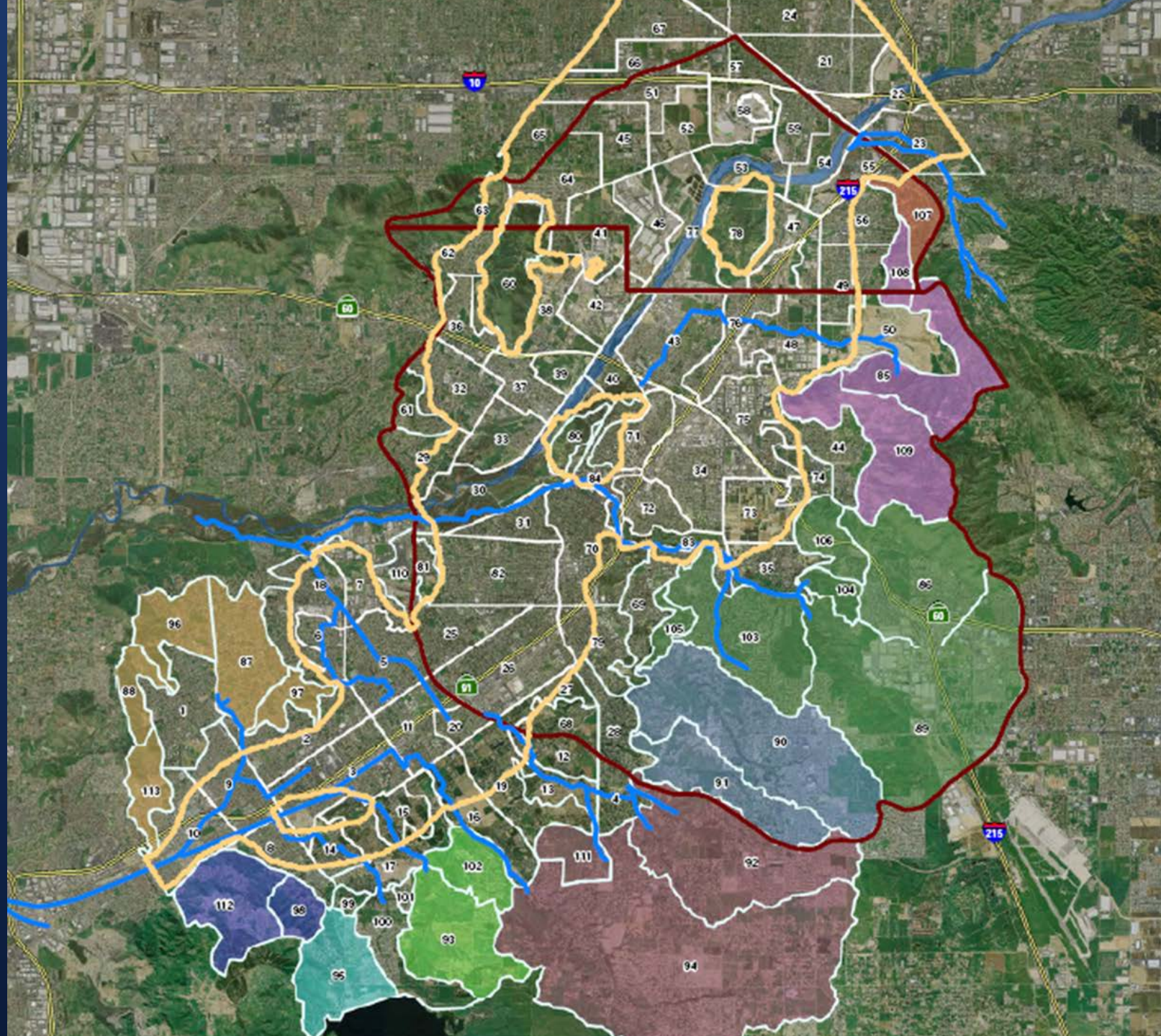
Land Use



Pigeon Pass
Marlborough
Martin Luther King
Limonite
Alessandro
Van Buren
Washington
Mountain View
Arlington
Central
Barton

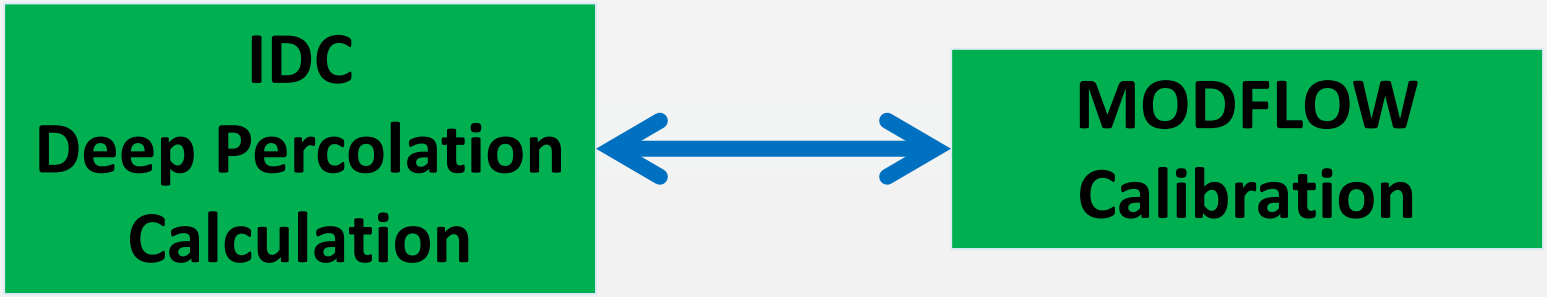
IDC Subregions

113 subregions

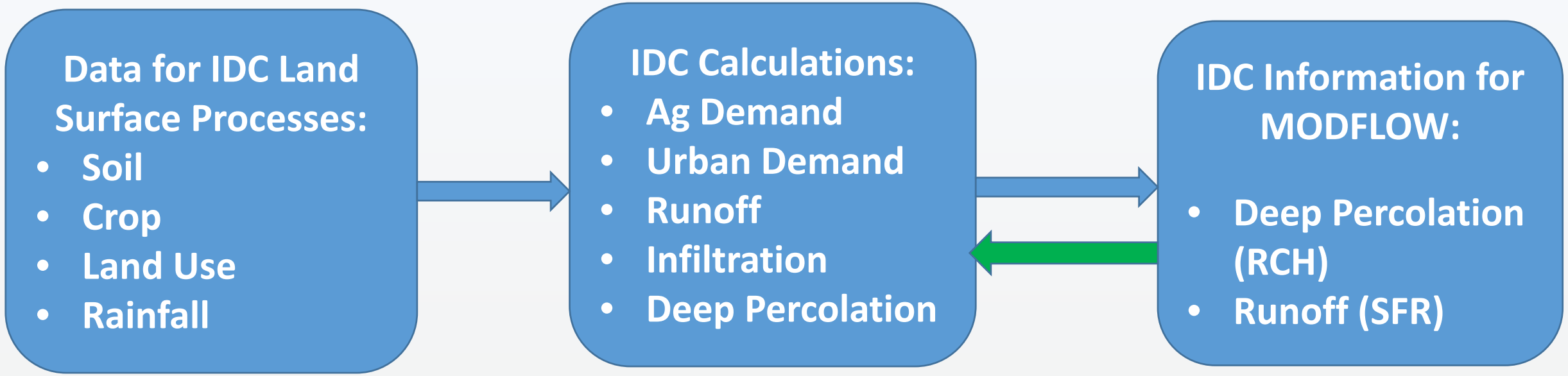


Calculation of Deep Percolation using IDC

- IDC calculates deep percolation / groundwater recharge from rainfall and applied water
- IDC calculation are performed for subregions (areas with similar land use and soil type)
- Simulation Period: 40 years, Daily Time Steps
- Using GIS, IDC recharge rates are applied to MODFLOW model cells



How to Use IDC with MODFLOW – Next Steps



Surface Water Diversion
Groundwater Extraction