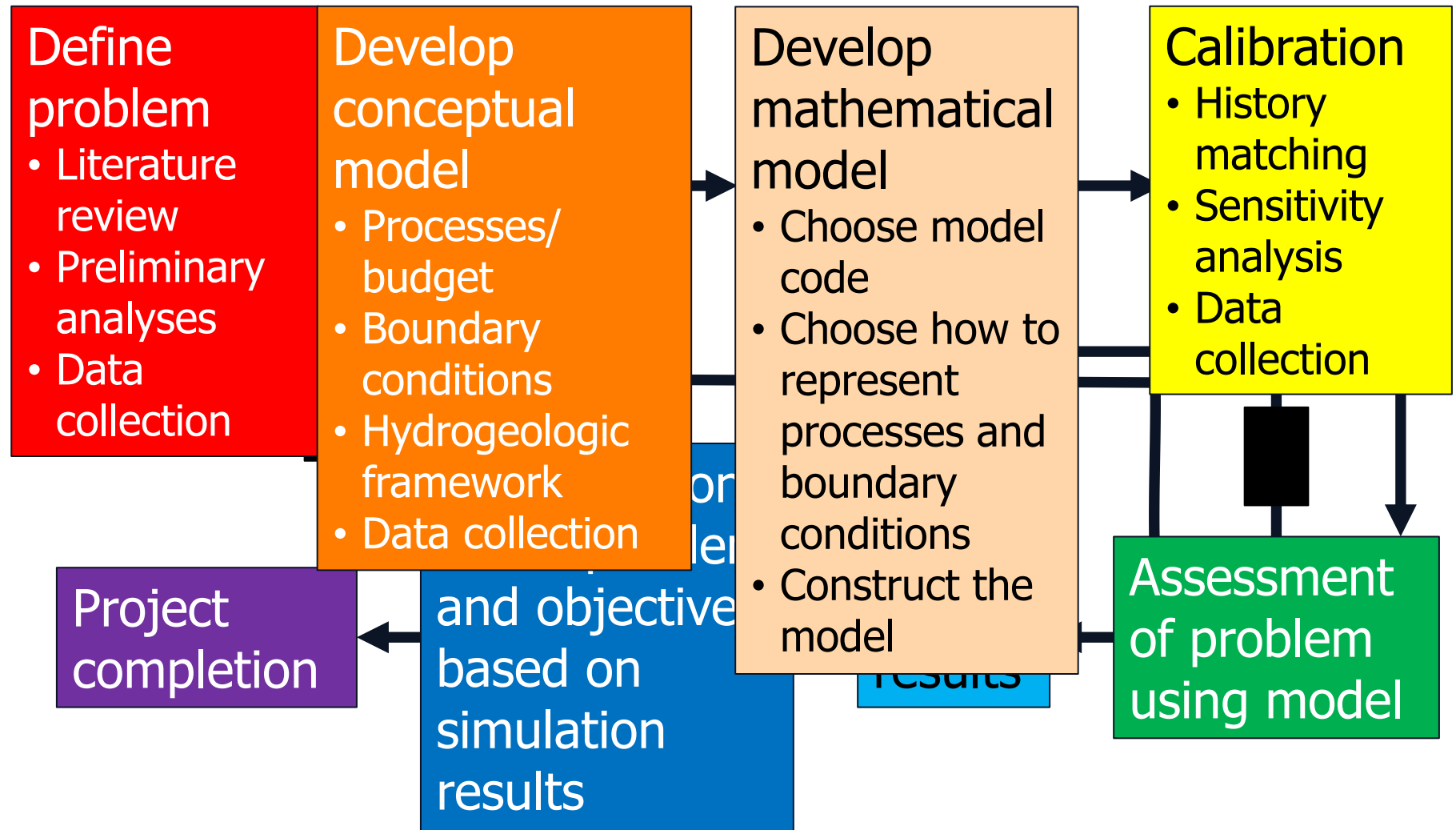


Balancing Weights on Calibration Targets

Stephen Hundt

Context

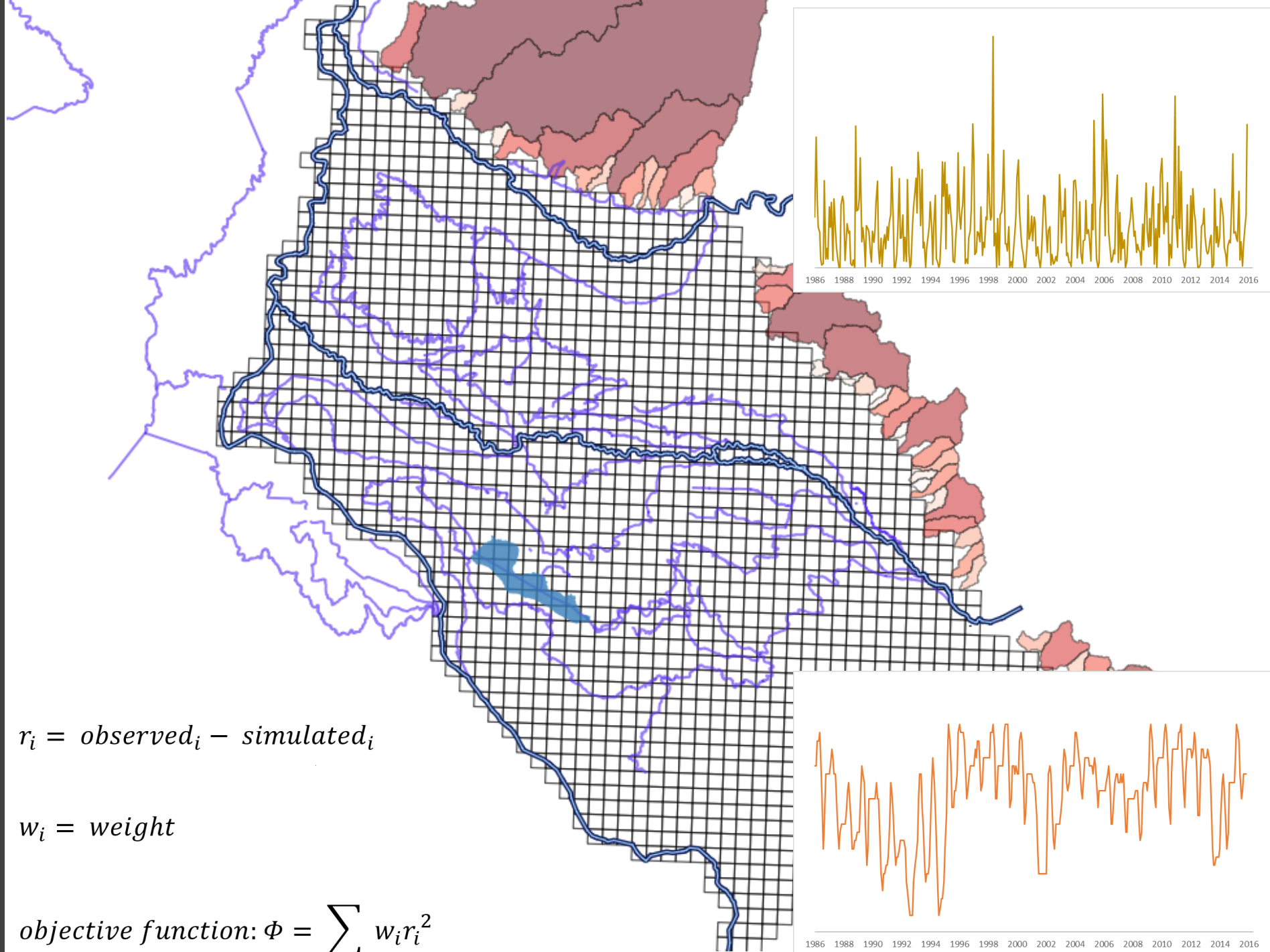
The modeling process



After Reilly (2001) TWRI 3,B8

Observation Targets and Residuals

Calibration & Objective Function



$$r_i = \text{observed}_i - \text{simulated}_i$$

$$w_i = \text{weight}$$

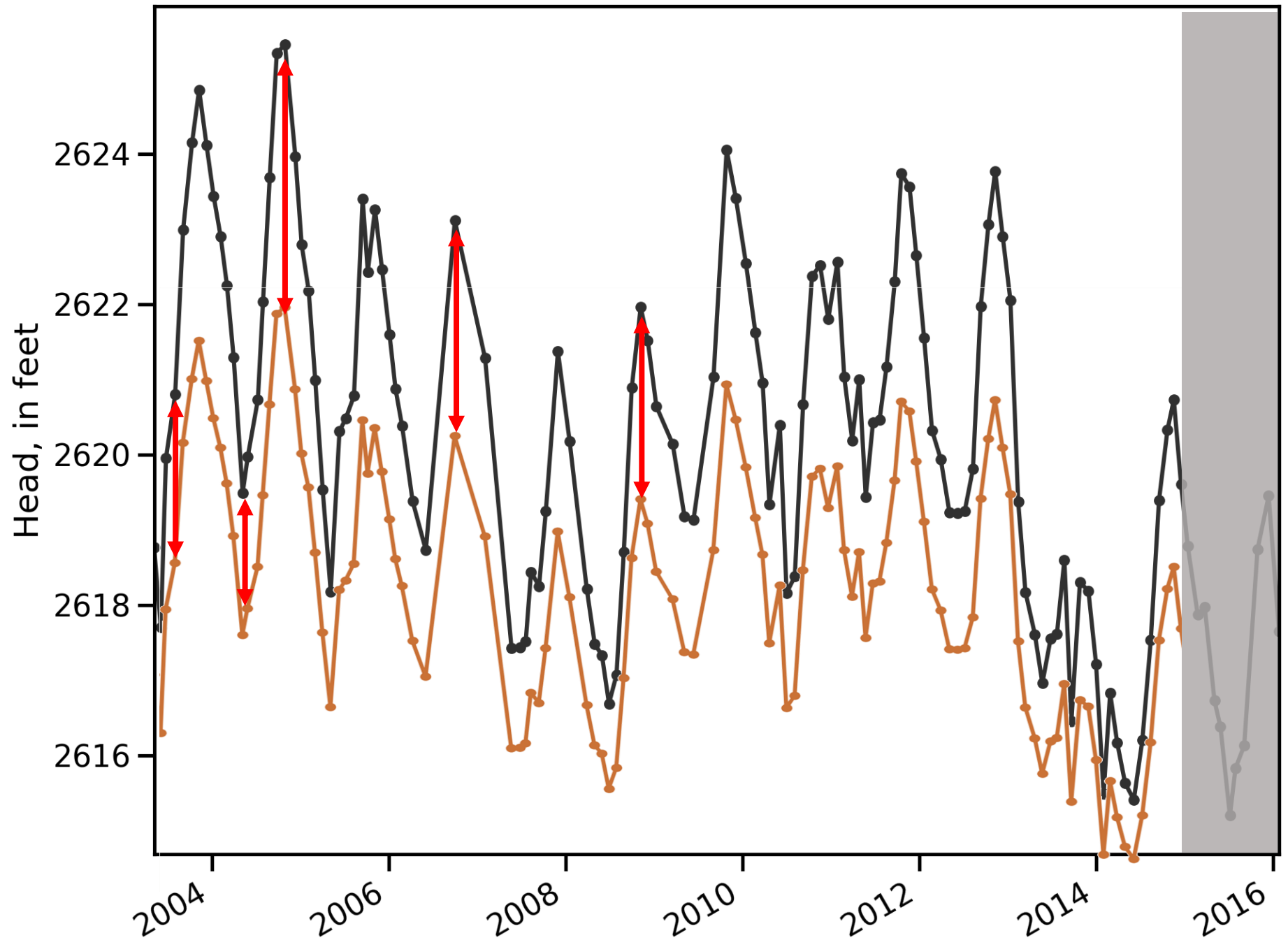
$$\text{objective function: } \Phi = \sum w_i r_i^2$$

Residuals

$r_i = \text{observed}_i - \text{simulated}_i$

$w_i = \text{weight}$

objective function: $\Phi = \sum w_i r_i^2$



TVGWFM Observation Types

| Observation Type | Approximate Number |
|----------------------------------|--------------------|
| Water Levels | 10,000's |
| Drain Flows | 100's |
| Lowell Seepage | 100's |
| River Seepage | 100's |
| Temporal Differences | 10,000's |
| Vertical Water Level Differences | 1,000's |
| Net Water Budget Values* | <10 |
| Preferred Parameters* | -- |

Why Weight?

| Observation Type | Approximate Number |
|----------------------------------|--------------------|
| Water Levels | 10,000's |
| Drain Flows | 100's |
| Lowell Seepage | 100's |
| River Seepage | 100's |
| Temporal Differences | 10,000's |
| Vertical Water Level Differences | 1,000's |
| Net Water Budget Values* | <10 |
| Preferred Parameters* | -- |

$$\text{Residual } \phi = \sum r_i^2$$

10 ft ~1e6

Approaches to Weighting

Weight By: Measurement Error

$$\Phi = \sum w_i r_i^2$$



Weight By: Measurement Error

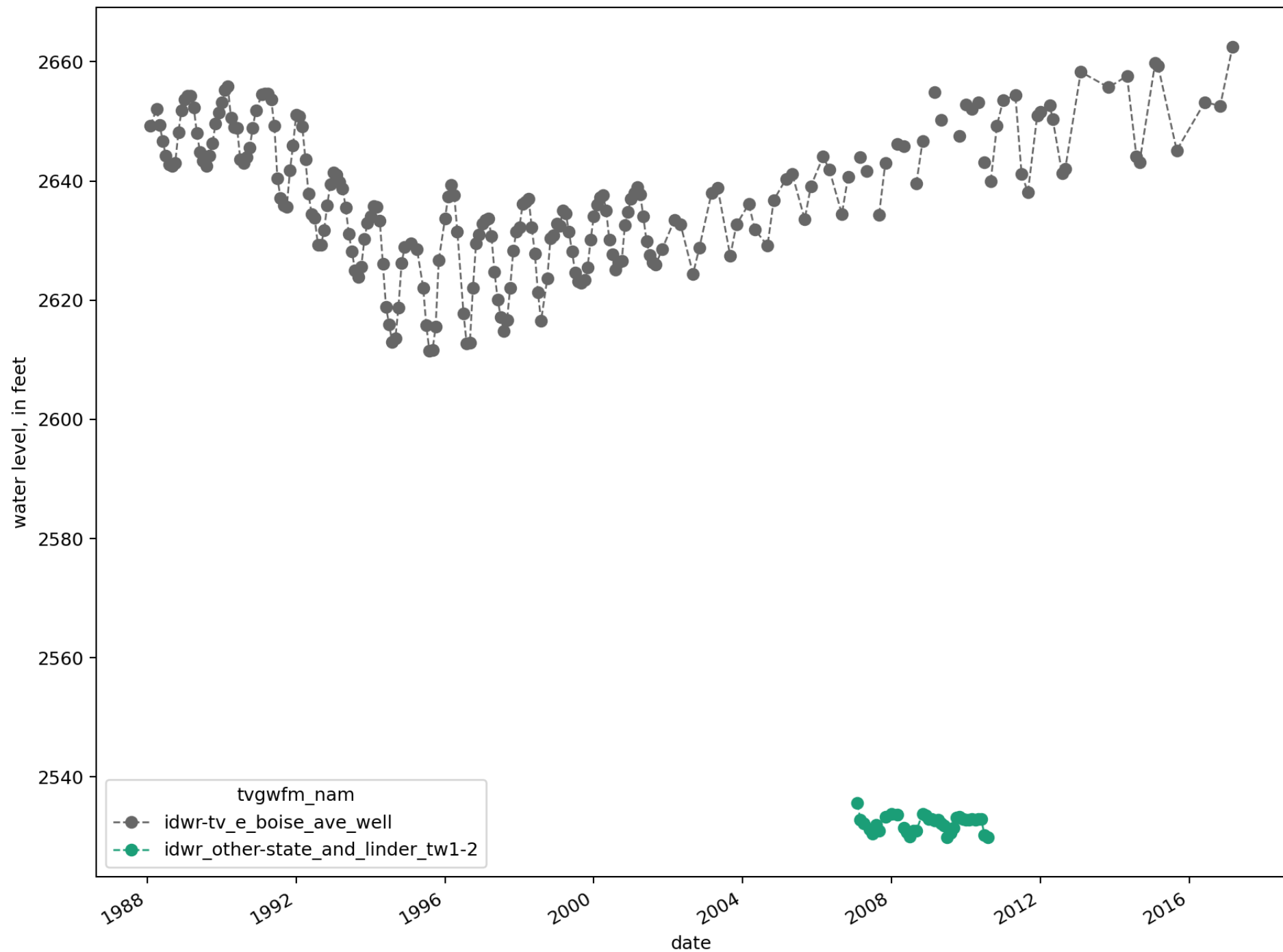
$$\phi = \sum w_i r_i^2$$



Weight By: Number of Measurements

$$\Phi = \sum w_i r_i^2$$

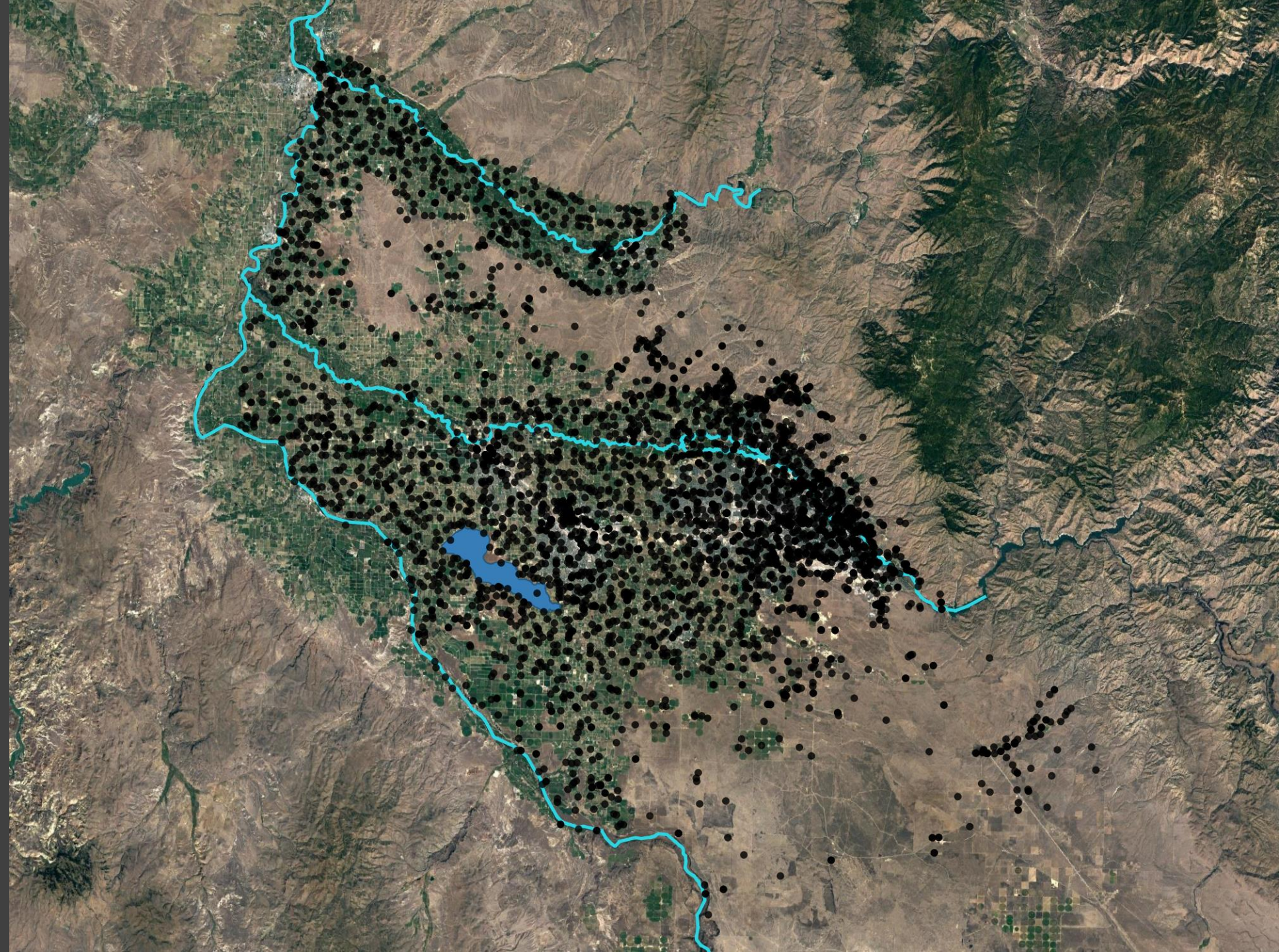
Managing tradeoffs



Weight By: Spatial Density

$$\Phi = \sum w_i r_i^2$$

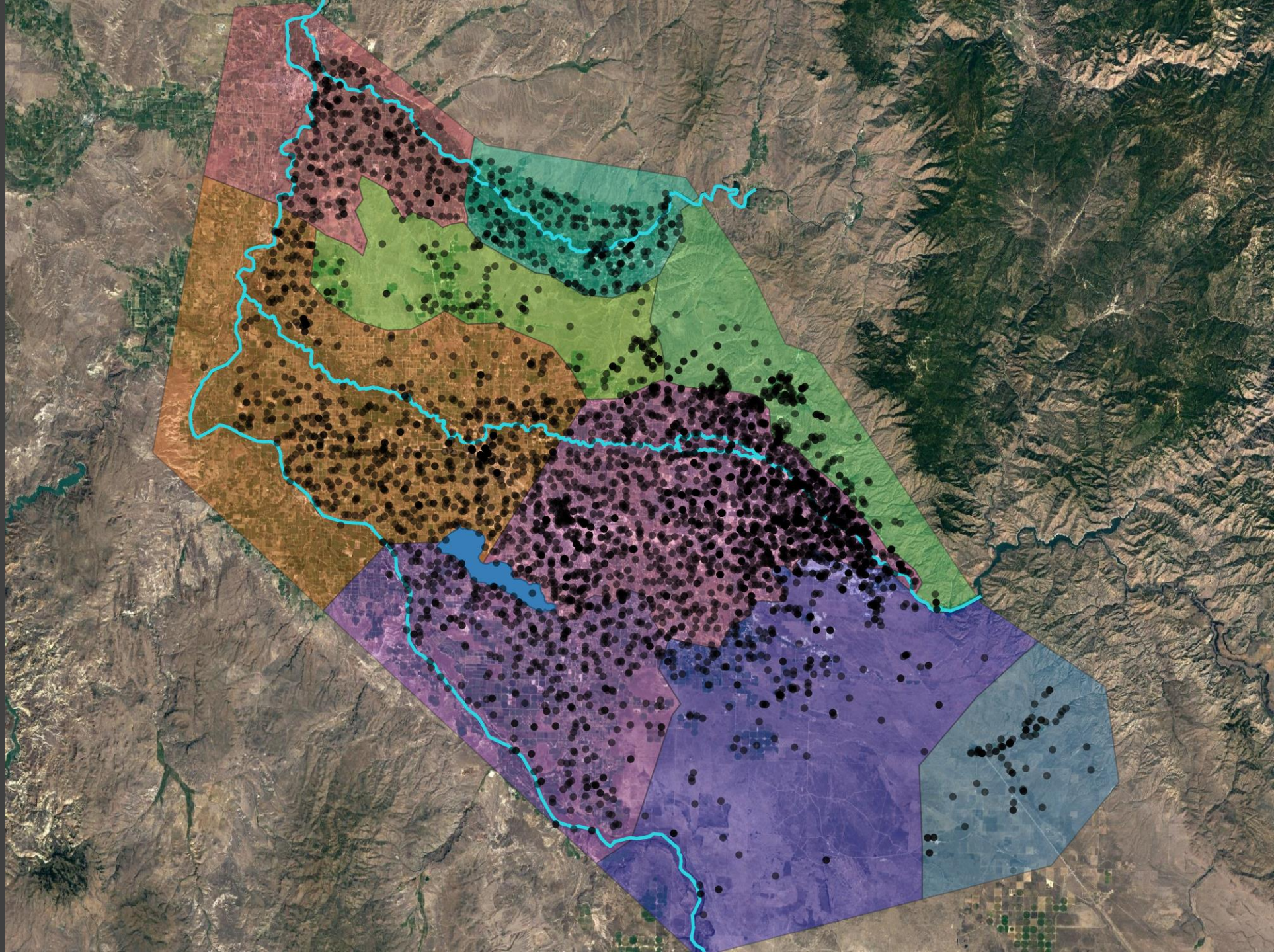
Managing tradeoffs



Weight By: Spatial Density

$$\Phi = \sum w_i r_i^2$$

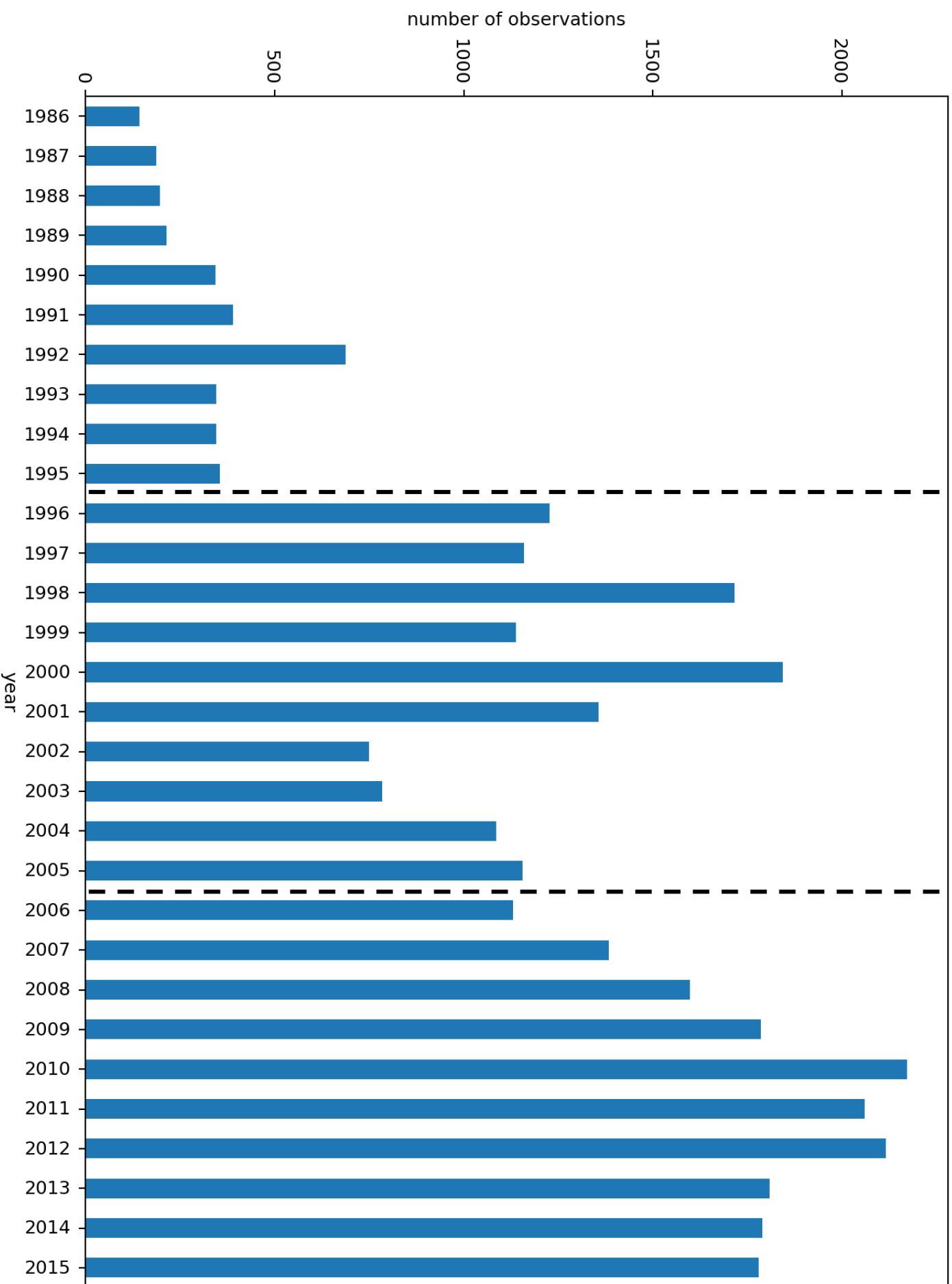
Managing tradeoffs



Weight By: Temporal Density

$$\phi = \sum w_i r_i^2$$

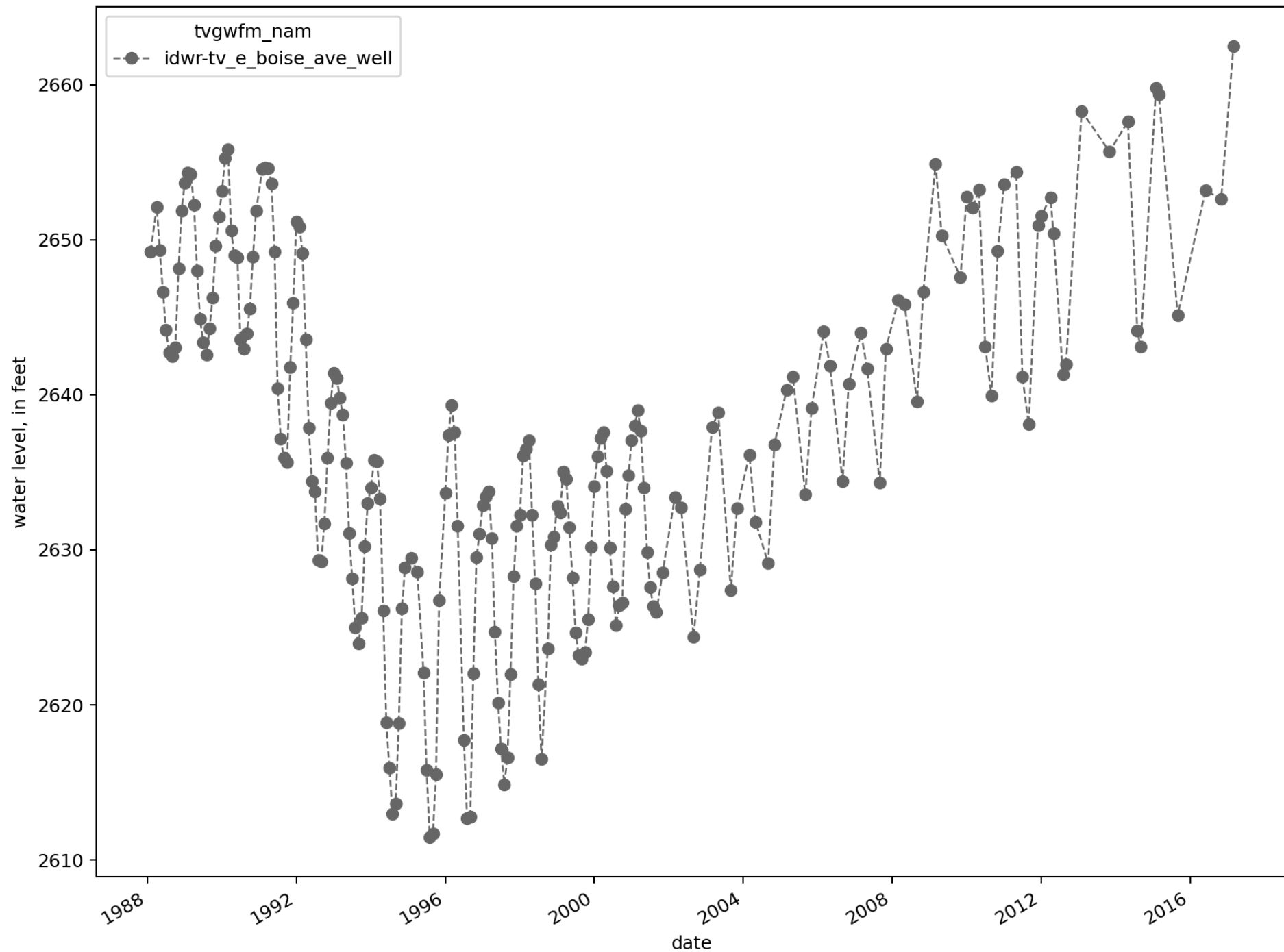
Managing tradeoffs



Weight By: Events or Behavior

$$\Phi = \sum w_i r_i^2$$

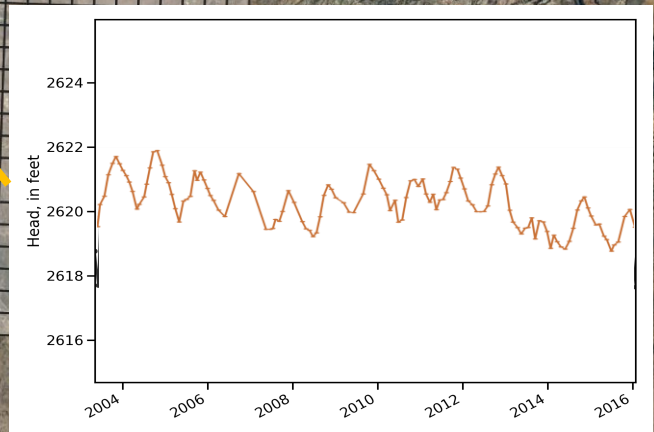
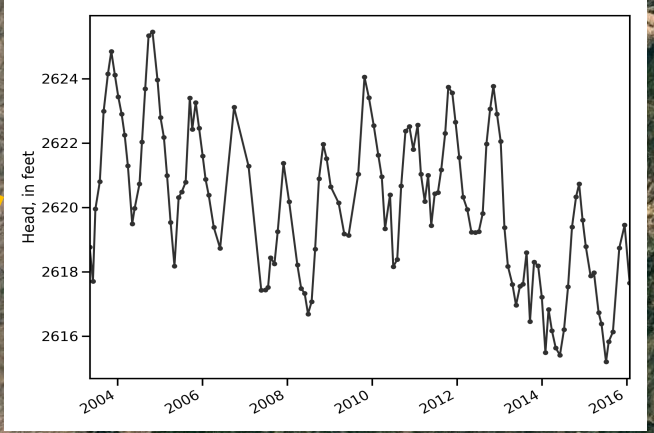
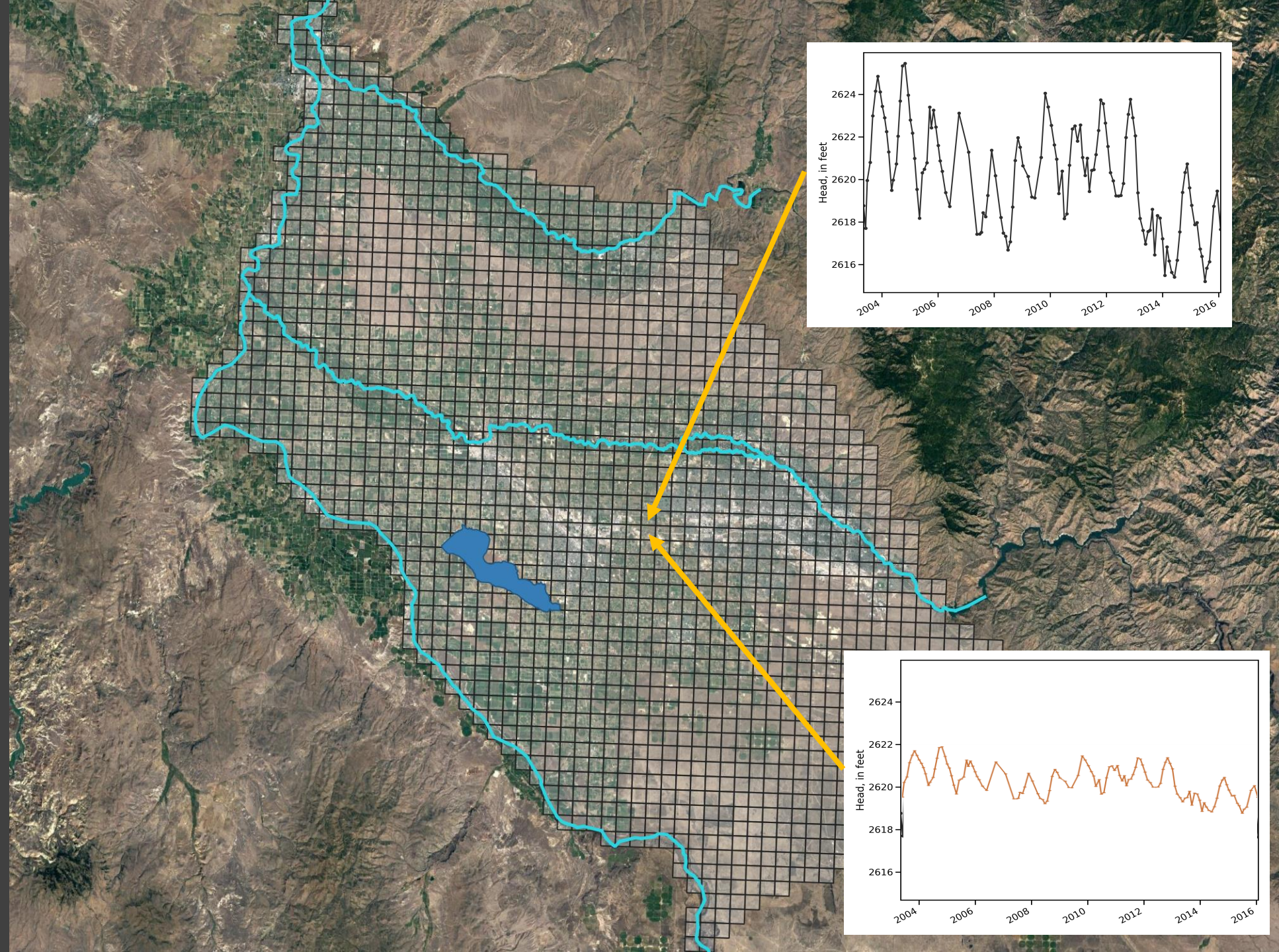
Managing tradeoffs



Weight By: Model Structural Error

$$\Phi = \sum w_i r_i^2$$

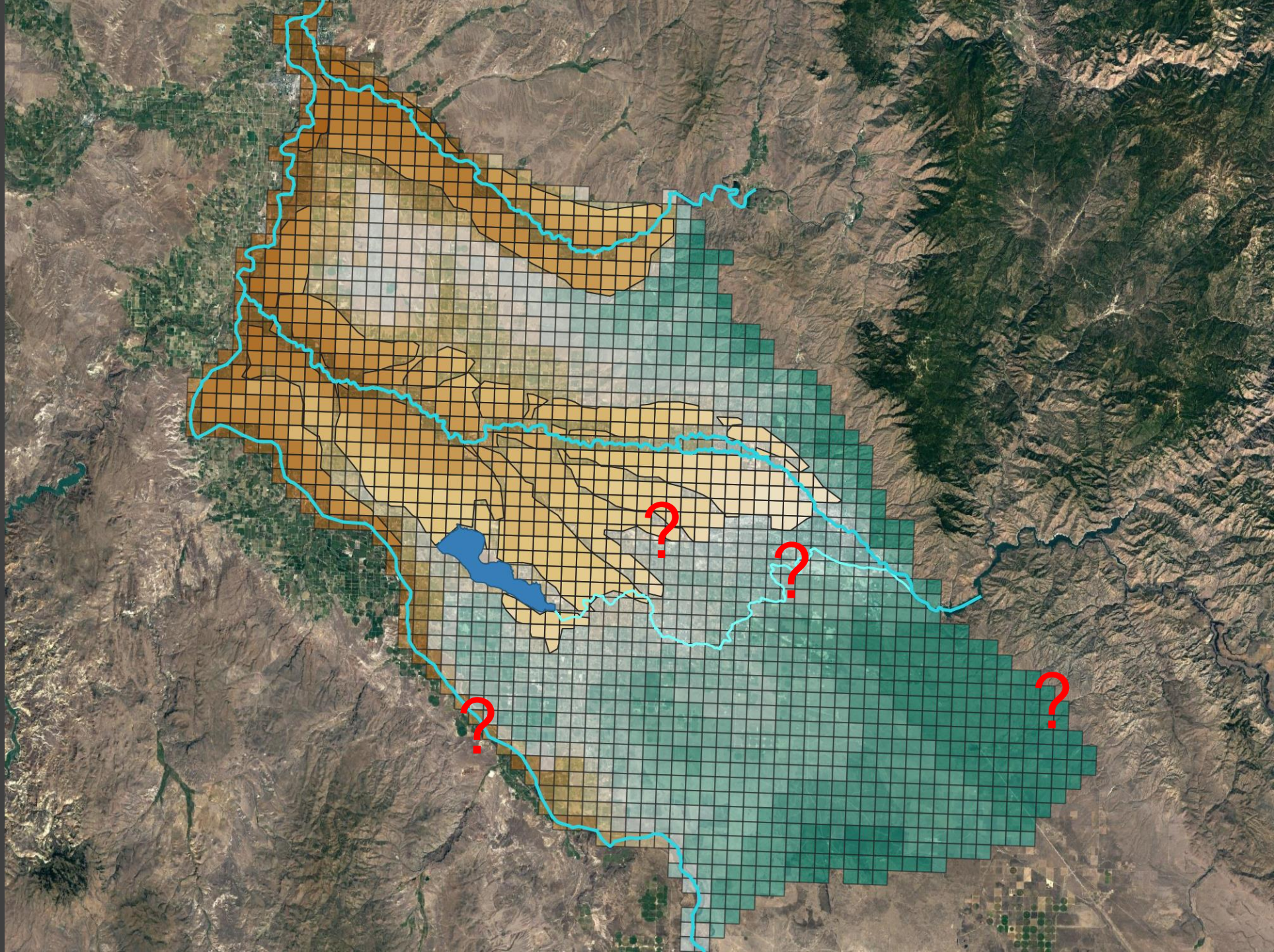
Managing tradeoffs



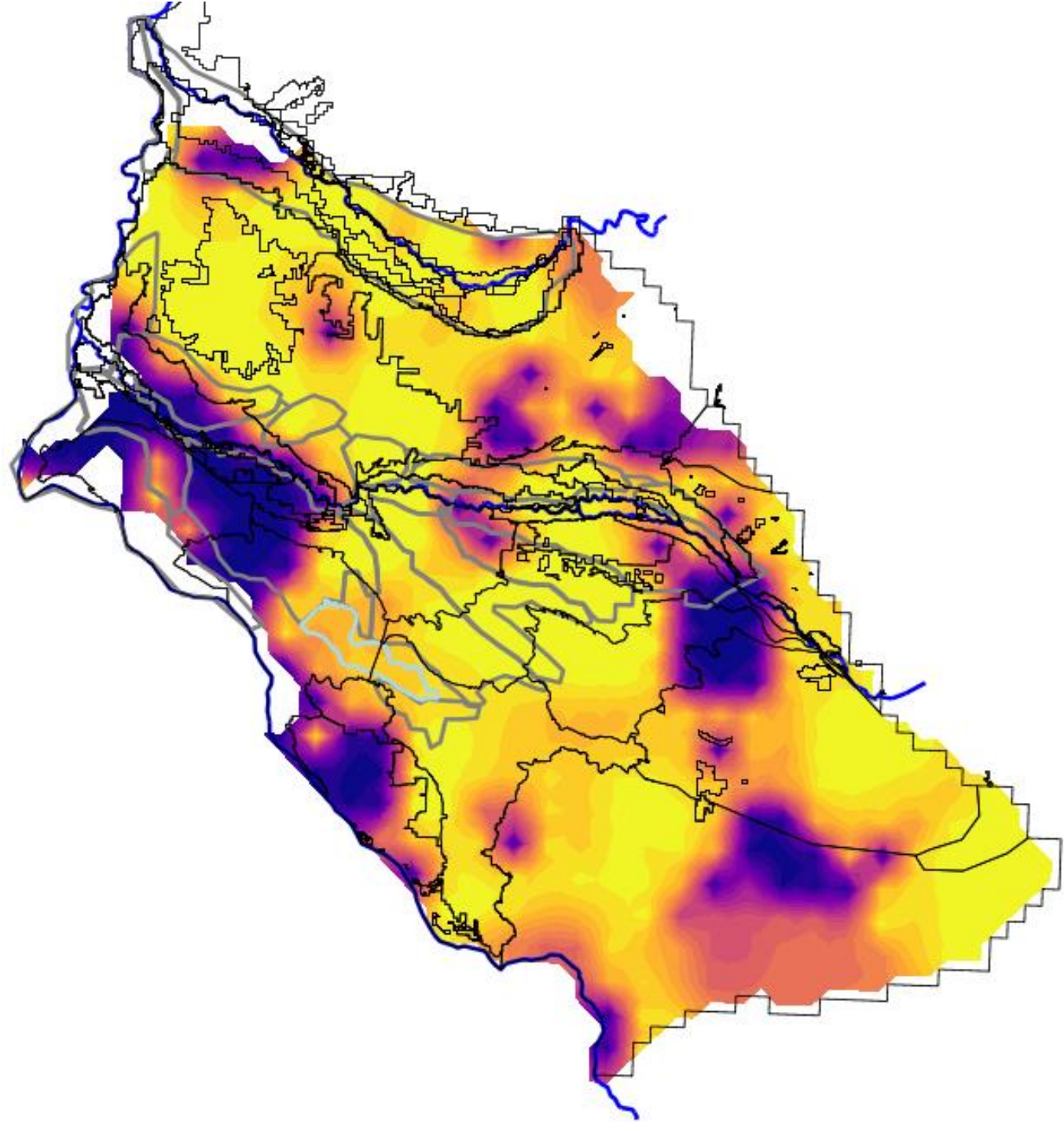
Weight By: Model Structural Error

$$\Phi = \sum w_i r_i^2$$

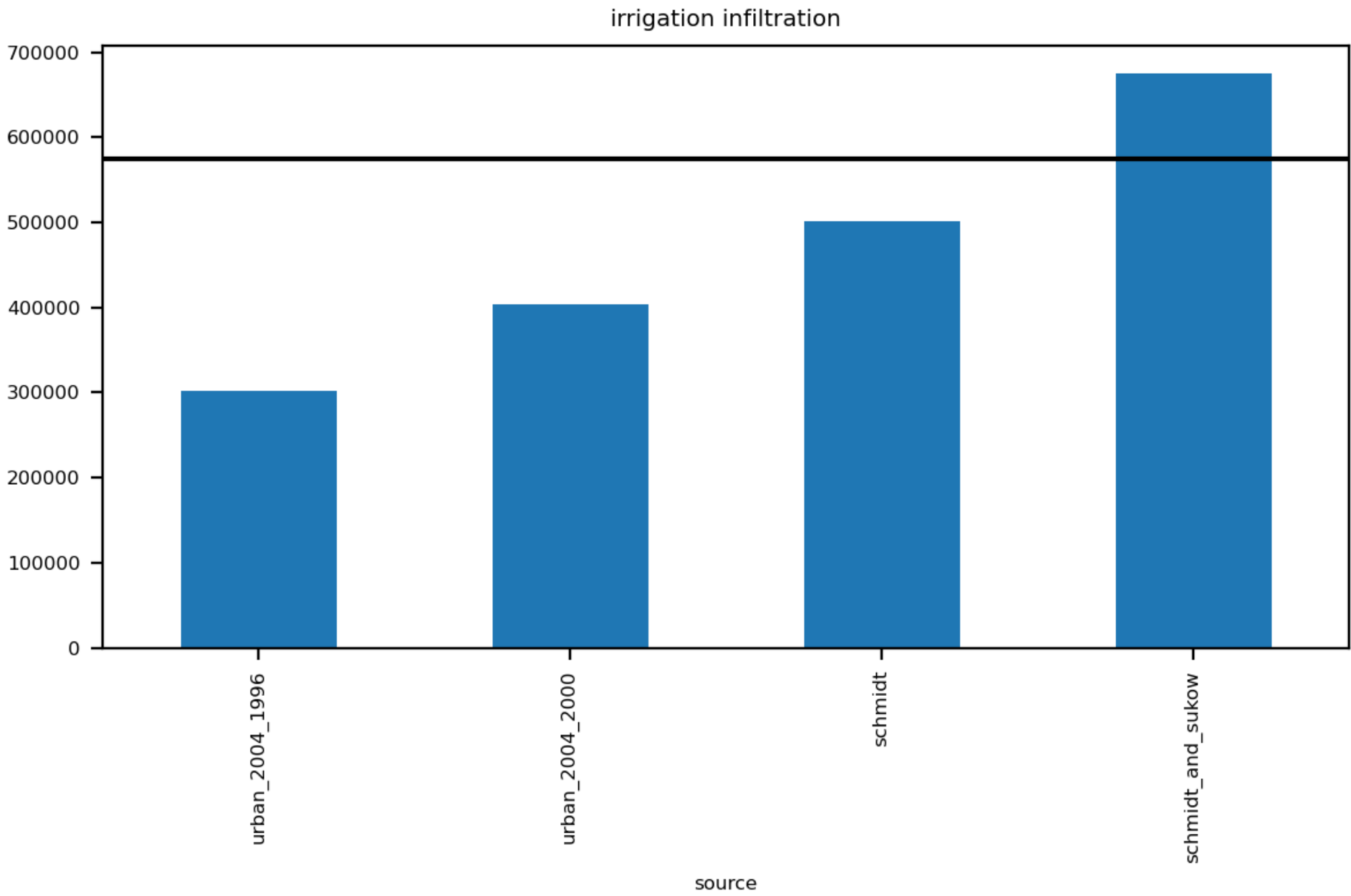
Managing tradeoffs



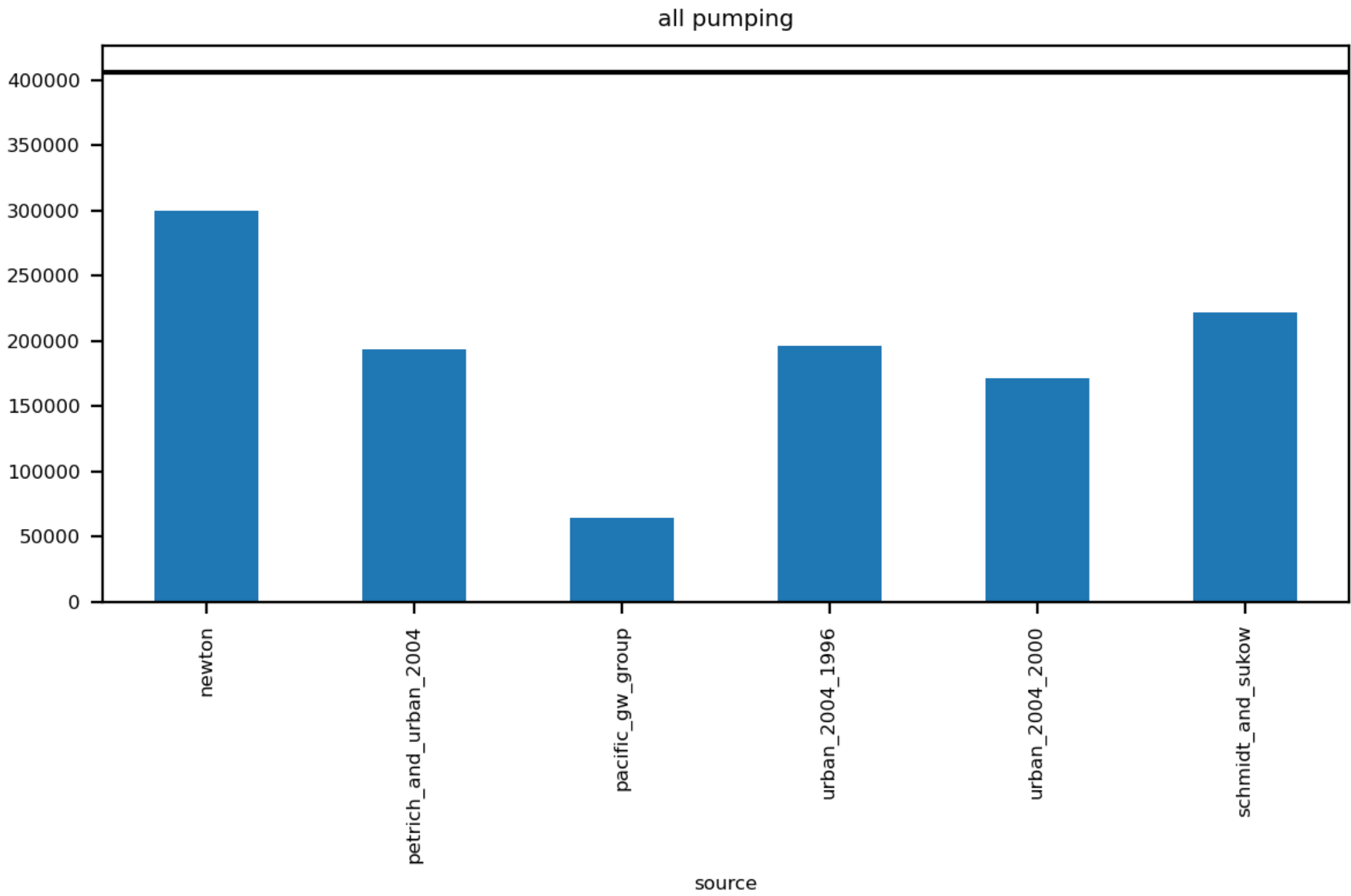
* Expert Information



*Water Balance Components



*Water Balance Components



Implementation

Weights $\neq \phi$

| Observation Type | Approximate Number |
|----------------------------------|--------------------|
| Water Levels | 10,000 's |
| Drain Flows | 100's |
| Lowell Seepage | 100's |
| River Seepage | 100's |
| Temporal Differences | 10,000 |
| Vertical Water Level Differences | 1,000's |
| Net Water Budget Values* | <10 |
| Preferred Parameters* | -- |

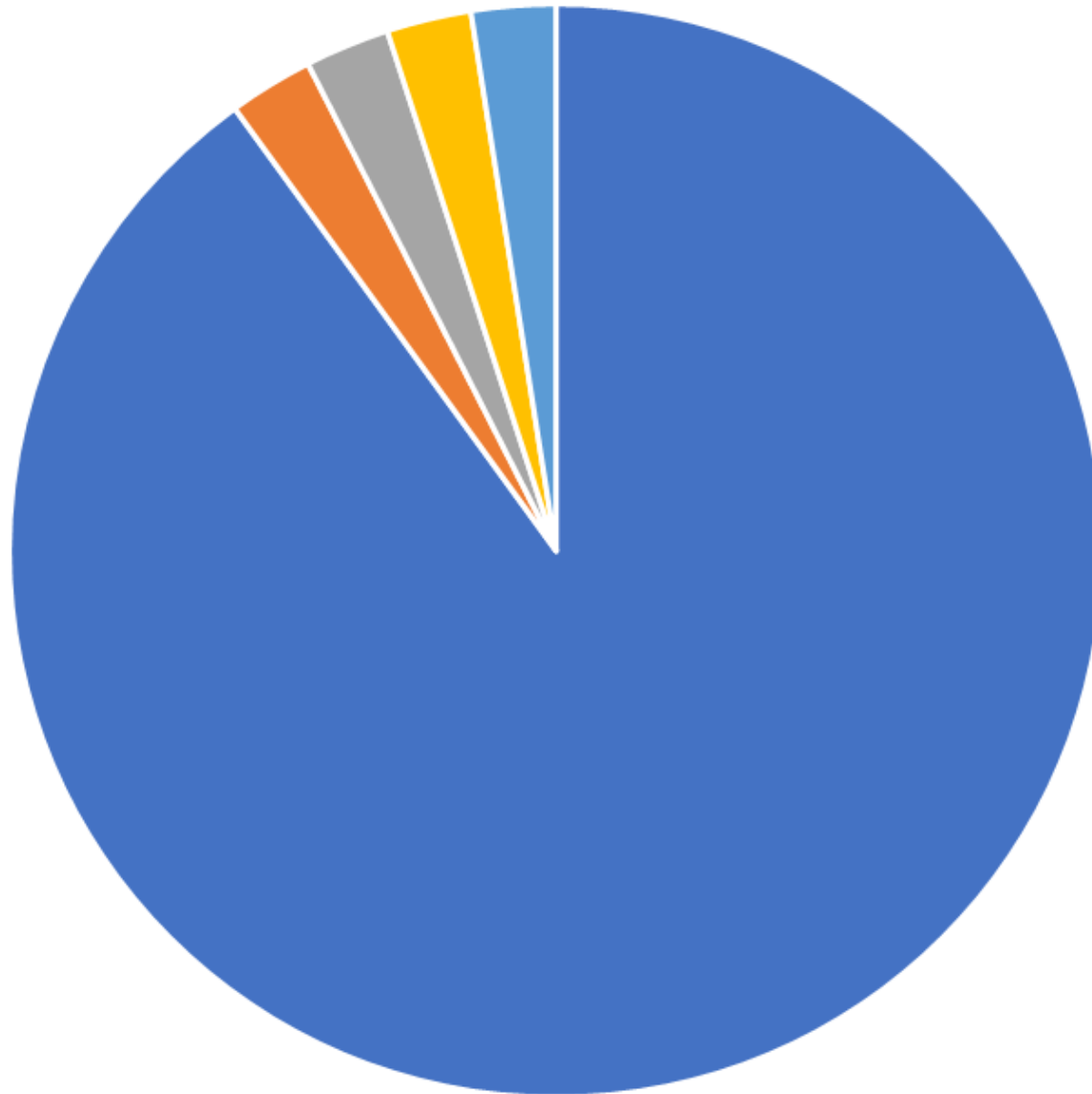
$$\text{Residual } \phi = \sum w_i r_i^2$$

10 ft ~1e6

1cfs ~~w=1e-10~~ 1e' 6i
(2,678,400
ft3/mon)

TVGWFM Balance?

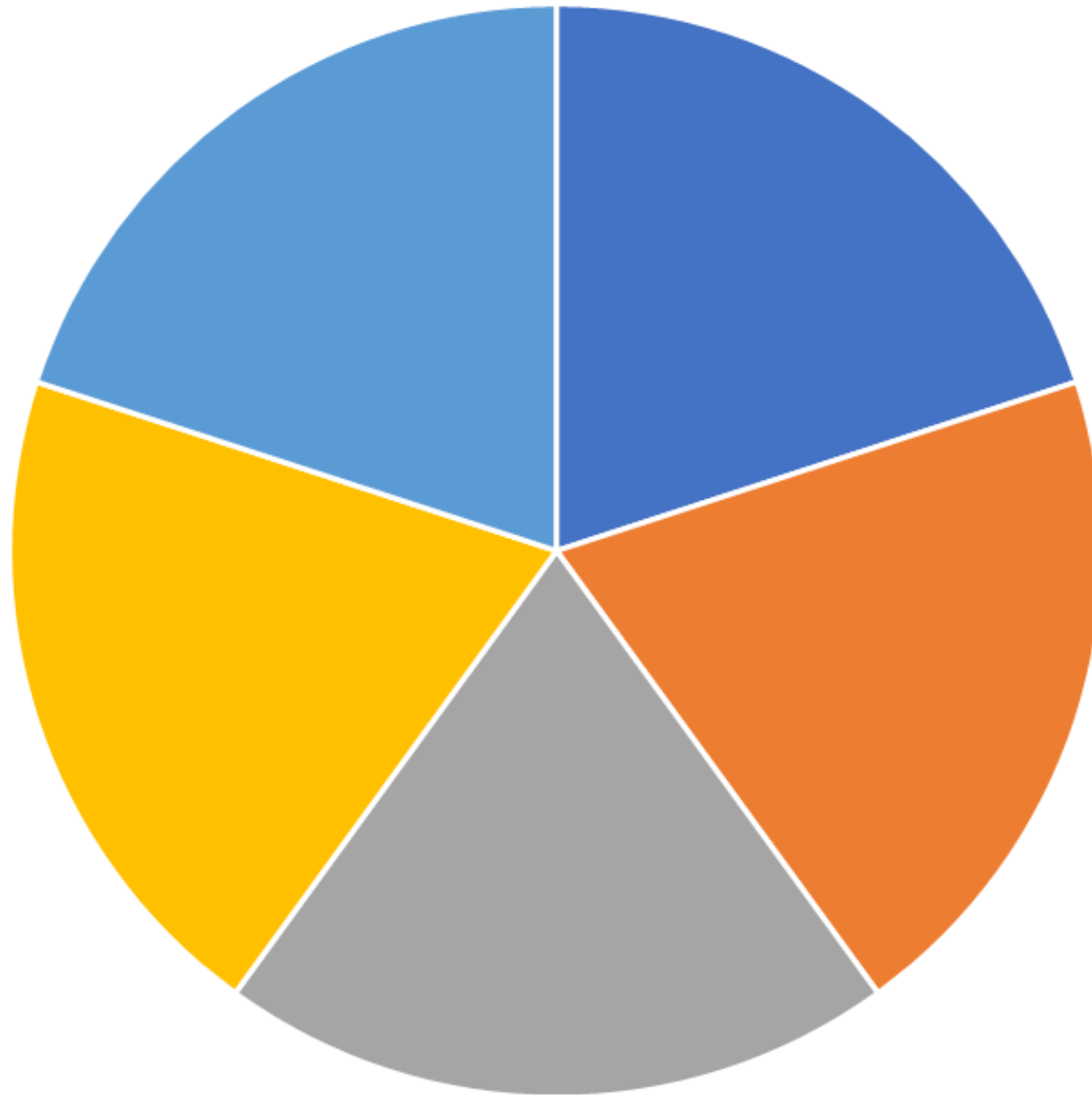
objective function



■ heads ■ temp diff ■ vert diff ■ drains ■ lowell

TVGWFM Balance?

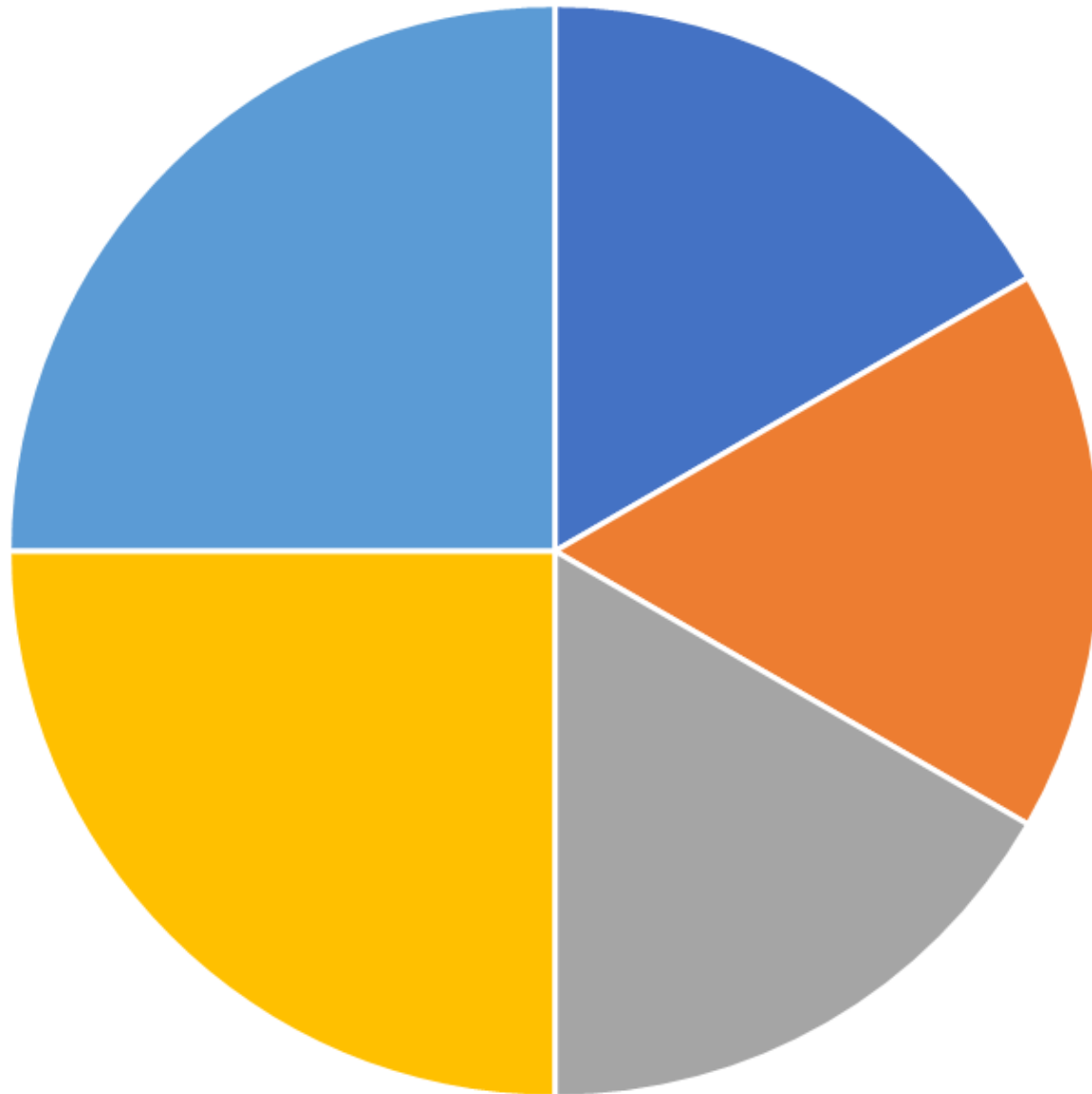
objective function



■ heads ■ temp diff ■ vert diff ■ drains ■ lowell

TVGWFM Balance?

objective function



■ heads ■ temp diff ■ vert diff ■ drains ■ lowell

Any strong feelings?

| Observation Type | Approximate Number |
|----------------------------------|--------------------|
| Water Levels | 10,000 's |
| Drain Flows | 100's |
| Lowell Seepage | 100's |
| River Seepage | 100's |
| Temporal Differences | 10,000 |
| Vertical Water Level Differences | 1,000's |
| Net Water Budget Values* | <10 |
| Preferred Parameters* | -- |

- Number of measurements at location
- Spatial density
- Temporal density
- "Events"
- Structural error
- Preferred parameters
- Overall budget
- Others???

Thanks for listening!