A Point-Source Method of Estimating Evapotranspiration along the San Timoteo Riparian Corridor

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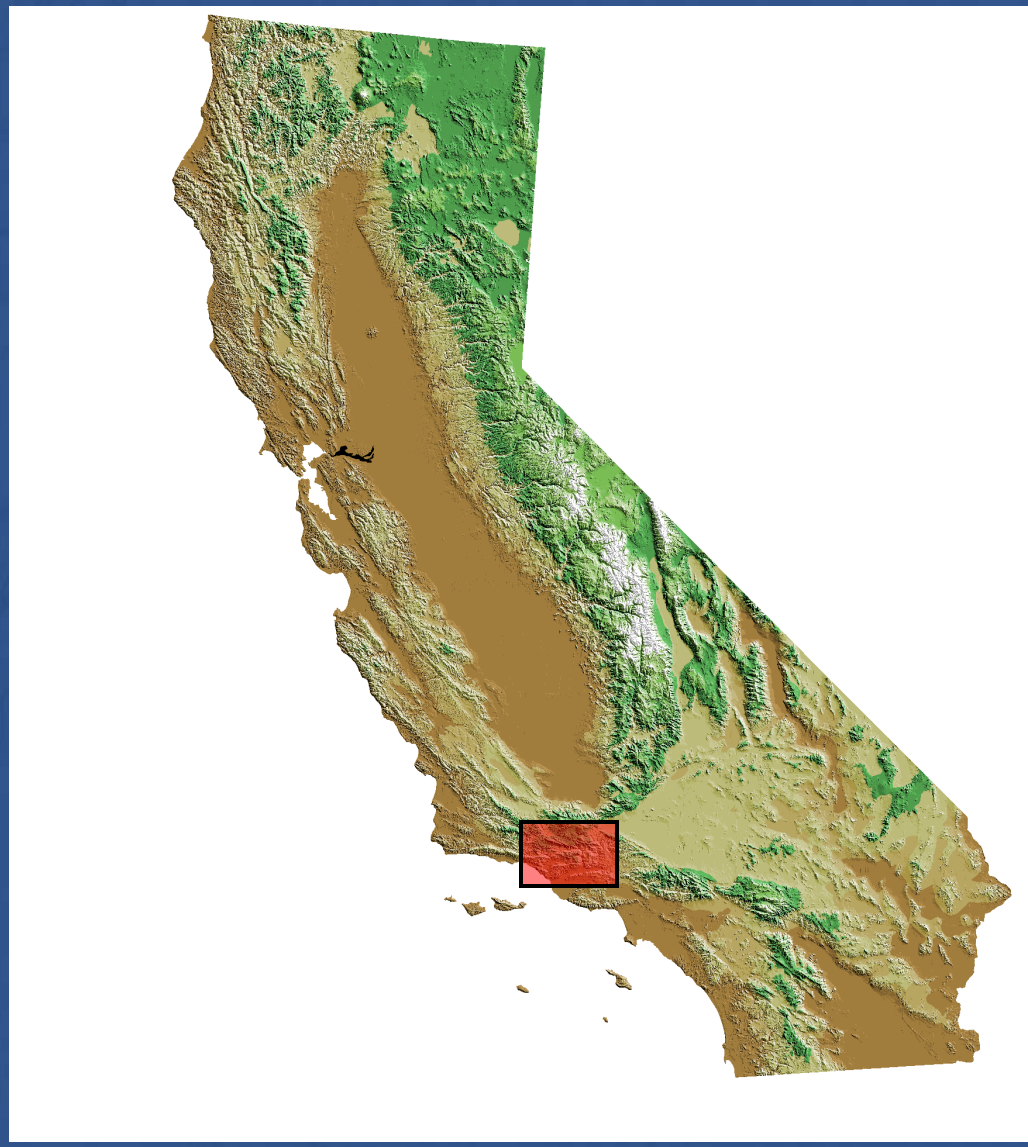

San Timoteo Creek

- Incised stream channel, up to ½-mile wide
- Discharge of tertiary effluent began in 1987
- Currently 3 MGD
- Supports a 3-4 mile stretch of dense riparian vegetation. Approximately 170 acres of primarily cottonwood, willow, and mulefat

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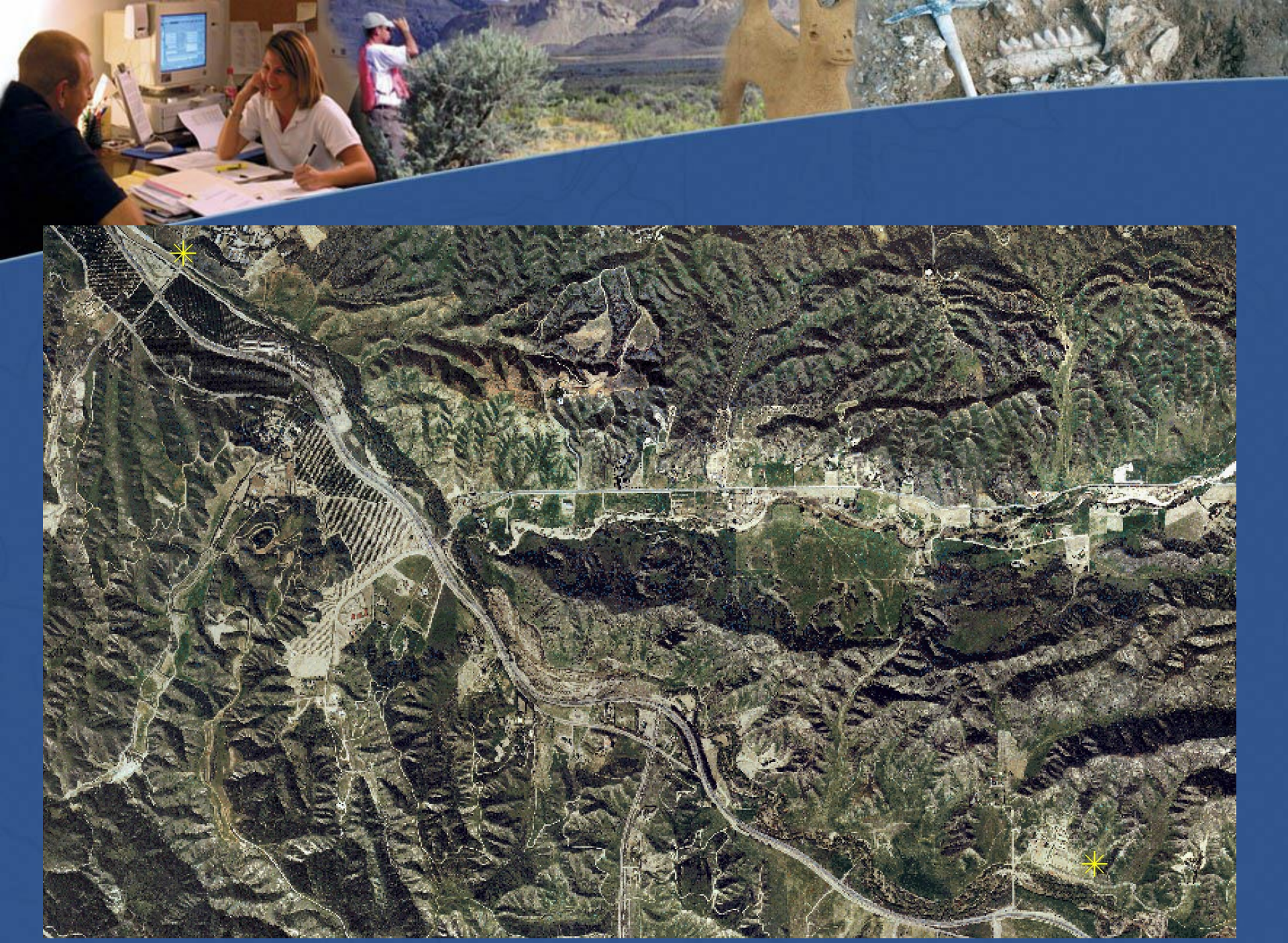

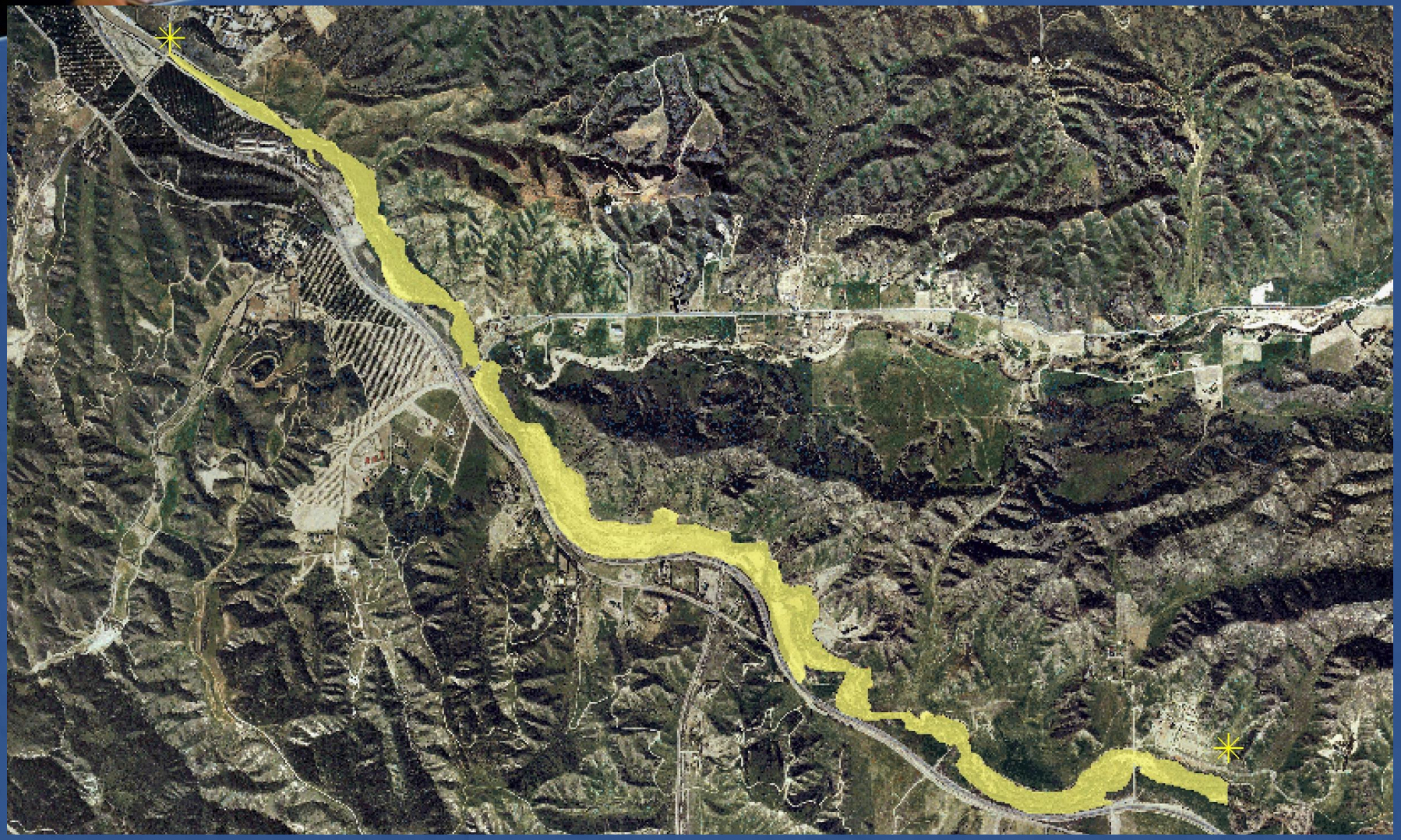

T&E Species

- Variety of Threatened & Endangered Species
  - Least Bell's Vireo
  - Southwestern Willow Flycatcher
- Regulatory framework
  - NEPA (nexus from EPA funding)
  - CEQA

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Project Approach

- Effluent discharge will be halted and replaced with imported groundwater
- Into the future, habitat will be monitored and water increased as needed
- However, a baseline discharge amount needed to complete NEPA/CEQA

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How much water should be discharged initally?

- Ideal solution would be to construct a water balance of the shallow aquifer system
- Too many unknowns
- Time was of the essence
- Backup plan: how much water is used directly by evapotranspiration?

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Transpiration Well Method

- Install shallow piezometers or wells
  - 9 installed along a 1-mile stretch of Creek
- Monitor water level fluctuations in the shallow aquifer
  - Water levels measured every 15 minutes throughout the 2004 growing season

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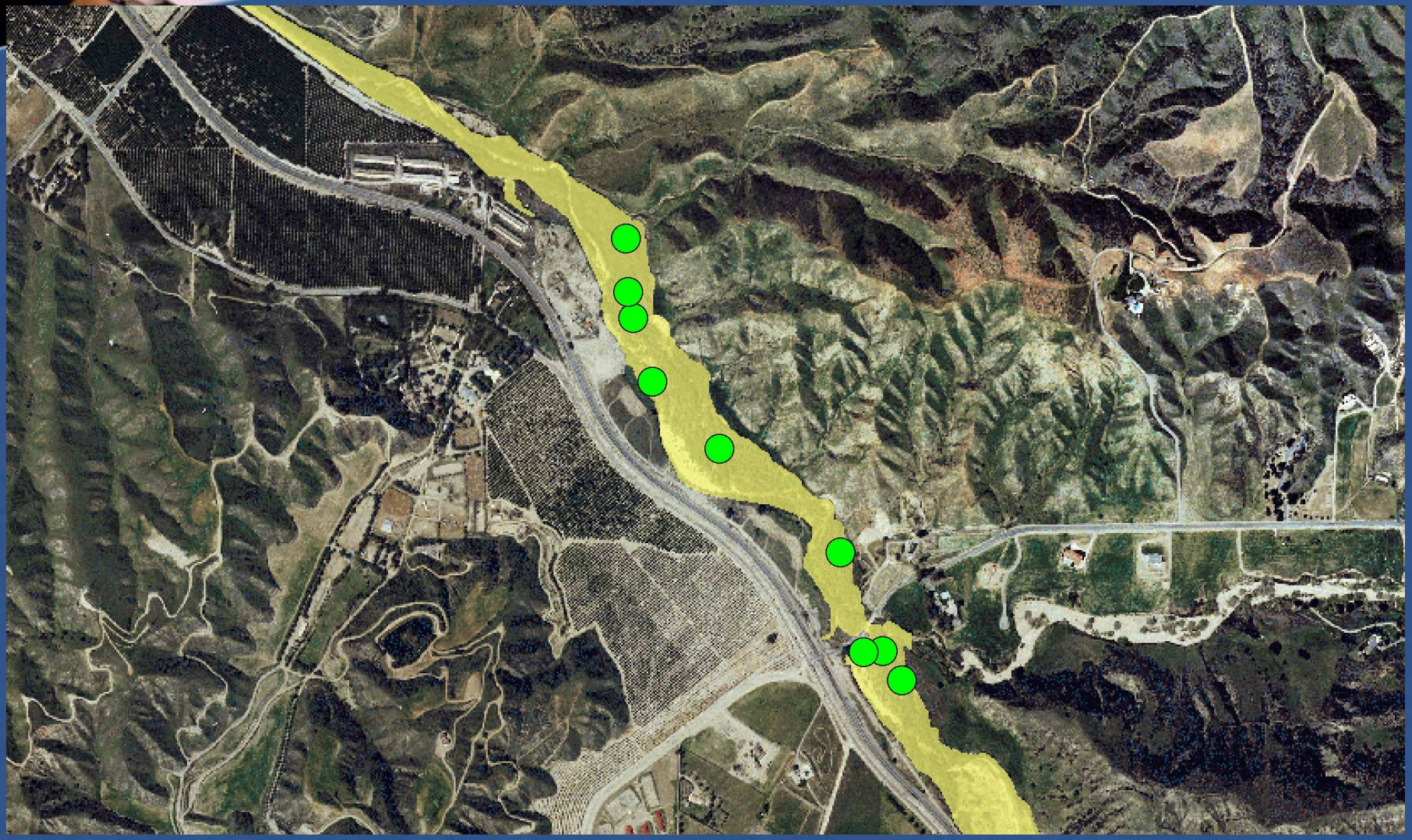

The Theory

- An old idea – first proposed by White (1932)
- More thoroughly investigated by Bowie and Kam (1968)
- Unused in favor of remote sensing and mass balance approaches

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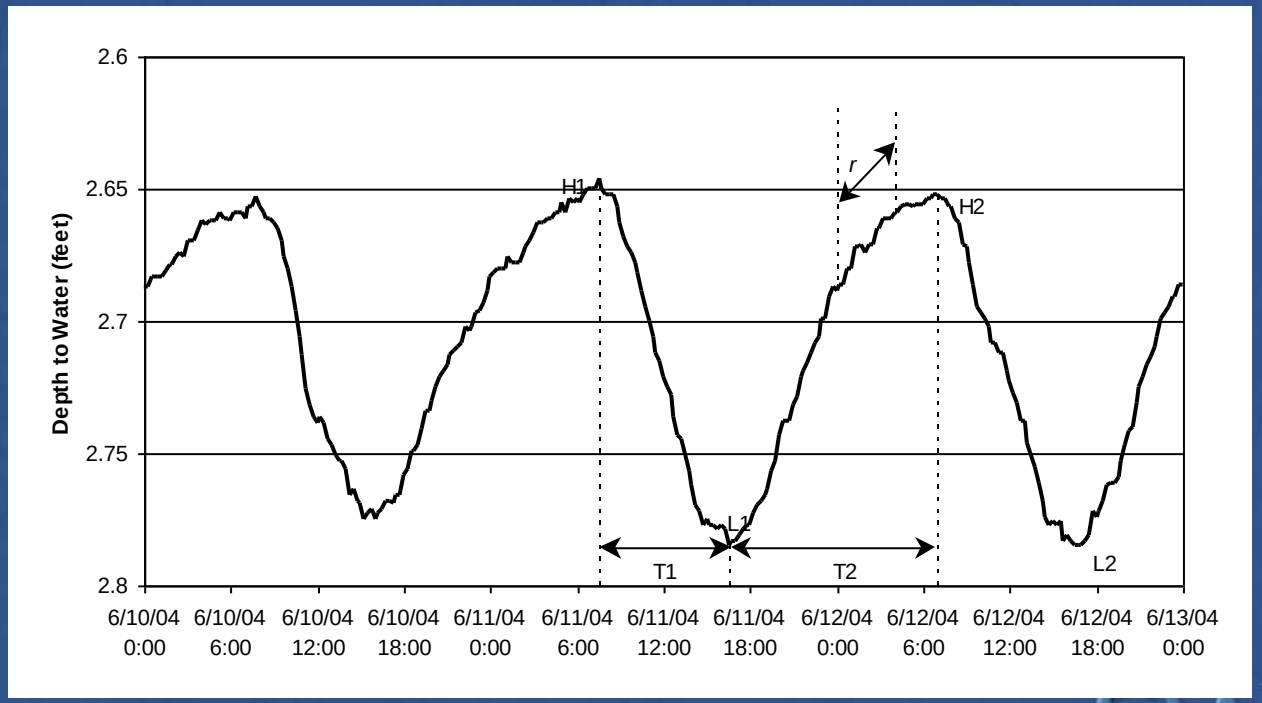
The Theory

- Typical hydrograph shows diurnal fluctuation



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The Theory

- The amount of water level decline during the daylight hours represents:
  - Water lost to evapotranspiration, minus
  - Natural recharge of the aquifer
- The amount of water level recovery during the nighttime hours represents:
  - Natural recharge of the aquifer
- Estimated accuracy of 20%

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Results

- Each piezometer represents an independent point estimates of evapotranspiration rate (in feet/day)
- Multiplied by area of vegetation yields a volumetric water use (in acre-feet/day)
- Offers great detail on seasonal water use

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Results

- Total water use for San Timoteo Creek calculated as 1,800 acre-feet per year
- Average of 1.6 MGD (compared to 3.0 MGD effluent discharge)
- Peak of 2.4 MGD in July

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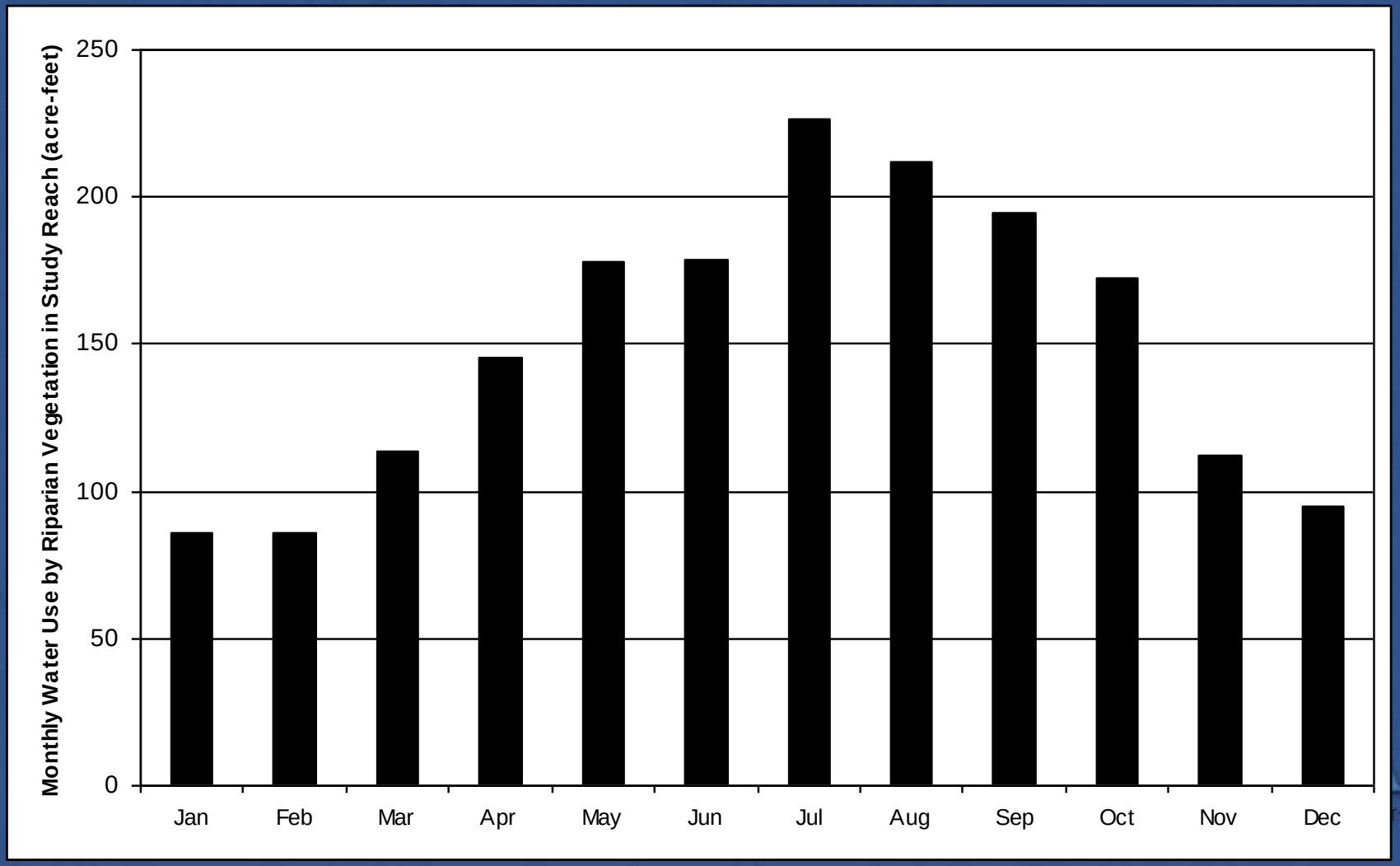
Monthly Water Use by Riparian Vegetation in Study Reach (acre-feet)
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Lessons Learned

- A viable technique, but better if supported by other independent techniques.
- Soil data is key! Needed better data.
- Careful selection of project area required.

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