

Southwestern Willow Flycatcher Studies, Lower Colorado River and Tributaries

Microclimate



Biological Opinions

1997 – Lower Colorado River Operations and Maintenance

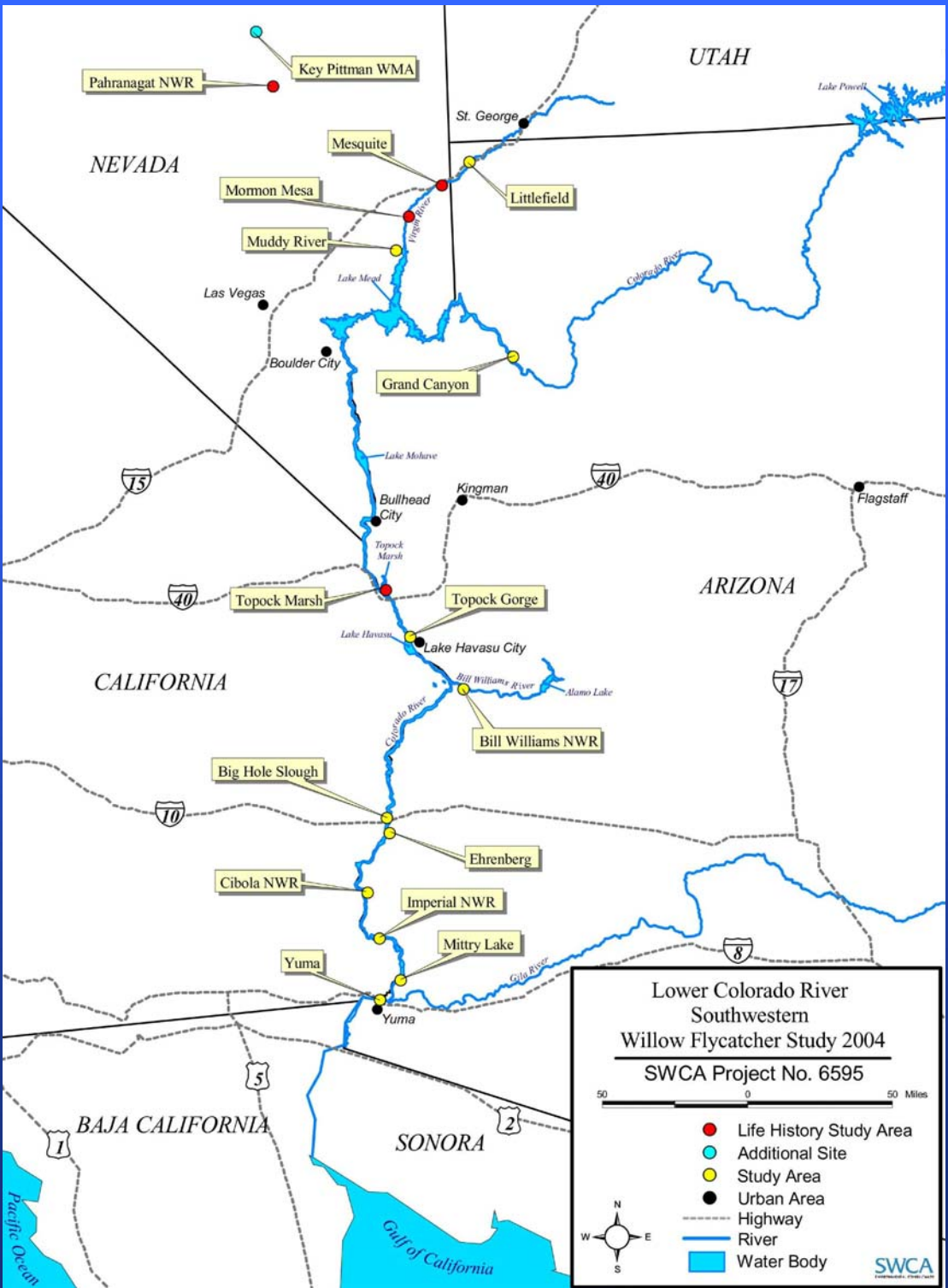
- 5-year survey, monitoring, and research program
- 1997-2002 San Bernardino County Museum

2001 – Interim Surplus Criteria

- Survey between Parker and Imperial Dams and surrounding Lake Mead for 15 years after implementation (signed Oct. 2003)
- Microclimate, groundwater, and habitat monitoring

2002 – Continued Operations and Maintenance

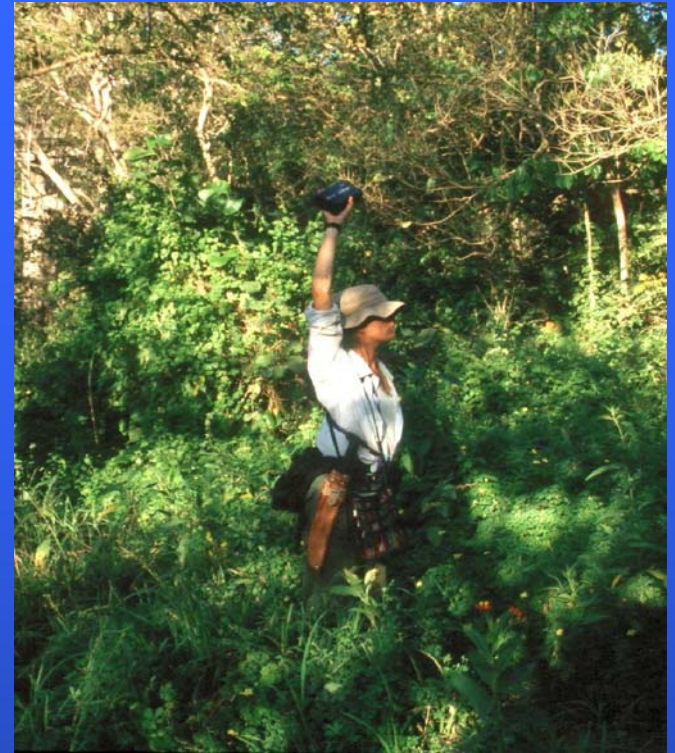
- Continue survey, monitoring, and research program for an additional 3 years (2003-2005)
- Implement cowbird trapping



USFWS Regions 1 and 2
 Federal Bird Banding Laboratory
 Arizona Game and Fish Dept.
 Nevada Division of Wildlife
 California Dept. of Fish and Game
 Pahrangat NWR
 Grand Canyon National Park
 Hualapai Tribe
 Lake Mead NRA
 Havasu National Wildlife Refuge
 Bill Williams River NWR
 Cibola National Wildlife Refuge
 Imperial National Wildlife Refuge
 Bureau of Land Management
 Cocopah Indian Tribe
 Key Pittman WMA
 Overton WMA
 Private landowners

Presence/absence Surveys

- Broadcast surveys
 - 10-survey protocol
- 100 sites



Life History Studies

- Find and monitor nests
- Measure vegetation at nests and non-use sites
- Monitor microclimate at nests and non-use sites
- Band adult and juvenile flycatchers
- Resight banded flycatchers
- Trap Brown-headed Cowbirds



Harry M. Walker



Microclimate Measurement

Temperature and Relative Humidity

- HOBO H8 Pro data logger



Soil Moisture

- HH2 reader and ML2 probe



When & Where We Measure Microclimate

- SV = Seasonal Variation
 - May–August
 - HOBO loggers at 3 riparian locations and 2 upland locations
 - Periodic soil moisture readings at riparian locations



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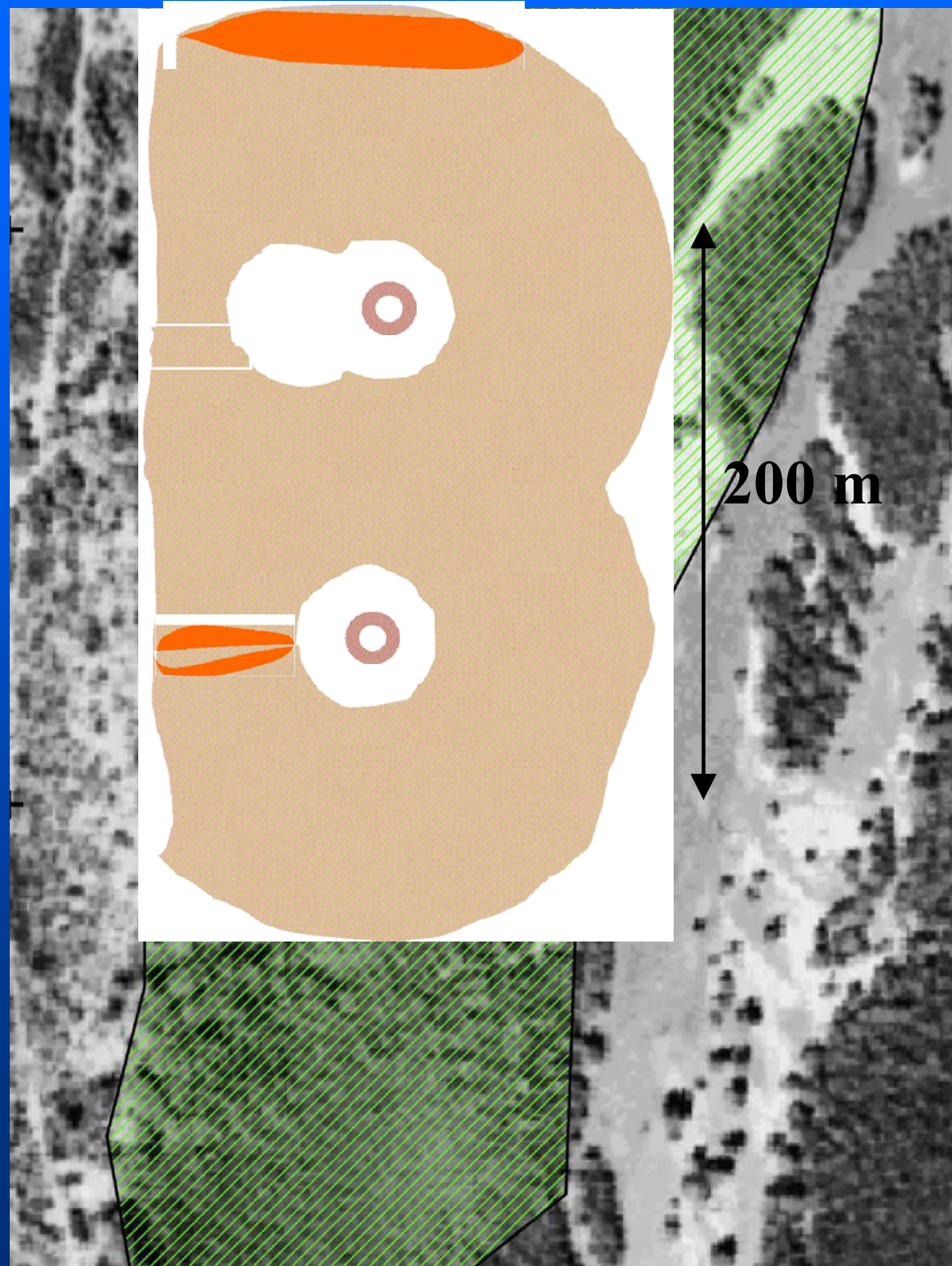


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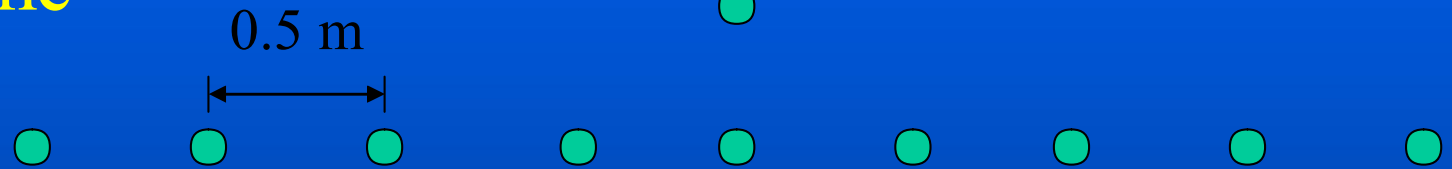
When & Where We Measure Microclimate

- NS = Nest Site
 - WT = Within Territory
 - NU = Non-use
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- Within 72 hours after nest is vacated
 - Leave in place for two weeks
 - Reading every 15 minutes



Soil Moisture Measurements

- At NS, WT, and NU sites
- When HOBOT is deployed and taken down
- Percent volume



Additional Information

- Habitat type (native, exotic, or mixed)
- Approximate canopy closure
- Height of vegetation
- Detailed vegetation plot at NS and NU sites



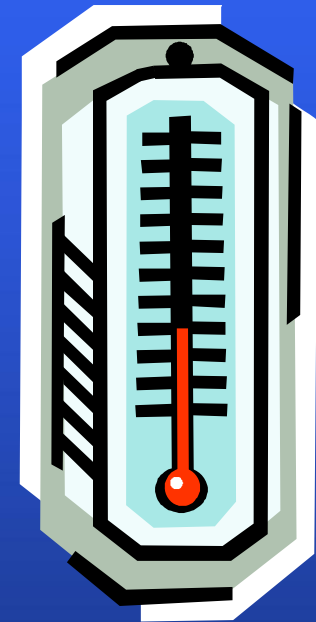
Microclimate Analysis

- MANOVA
 - Tests differences by location type (NS, WT, NU)
 - Controls for variation by study area, habitat type, canopy closure

- Variables
 - Mean diurnal T/Rh
 - Mean nocturnal T/Rh
 - Mean daily temperature range
 - Mean maximum diurnal T
 - Mean minimum nocturnal T
 - Mean soil moisture

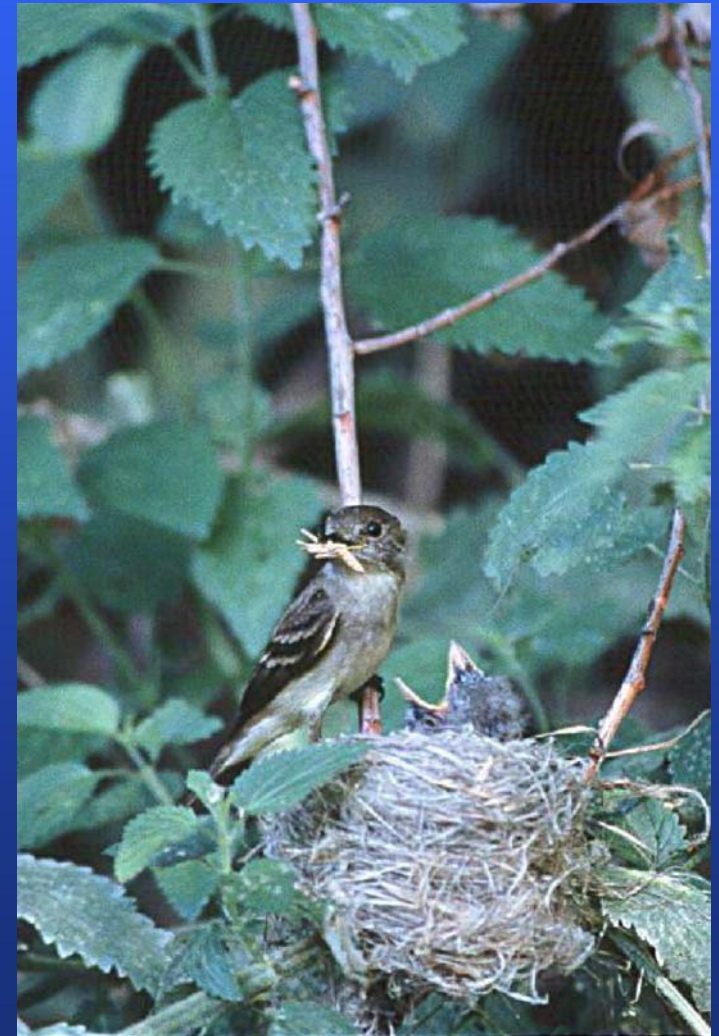
Microclimate Results

- $NS < WT < NU$
 - Mean maximum diurnal temp ($\sim 3^{\circ}\text{C}$)
 - Mean diurnal temp ($1+^{\circ}\text{C}$)
 - Mean daily temp range ($\sim 3^{\circ}\text{C}$)
- $NS > WT > NU$
 - Mean diurnal relative humidity ($\sim 3\%$)
- $NS > NU$
 - Soil moisture (13%)

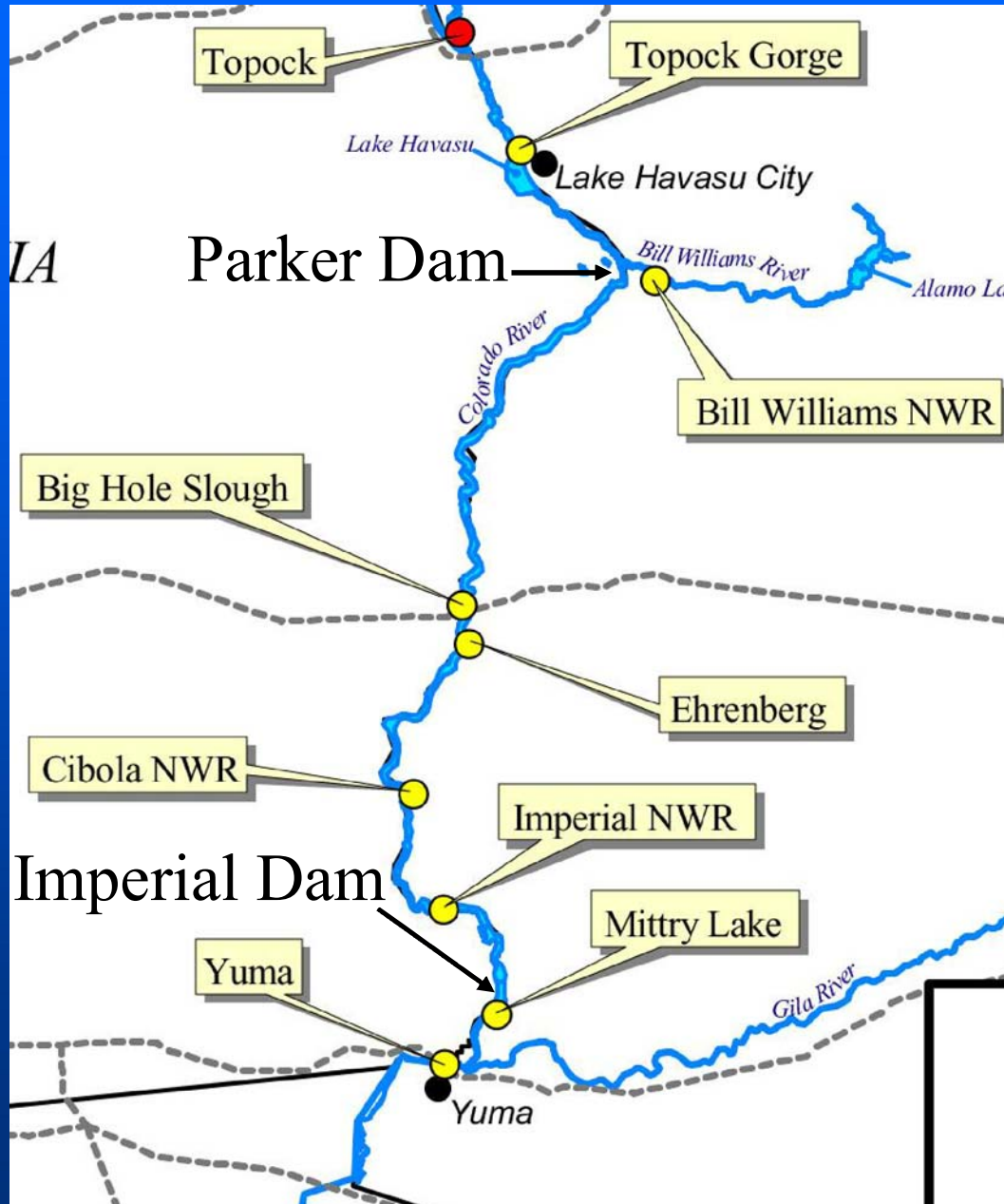


Microclimate Results

- Energy expenditure
- Lethal temperatures?
 - Webb (1987) $\sim 41^{\circ}\text{C}$
 - NS: 39.9°C
 - WT: 43.1°C
 - NU: 46.1°C

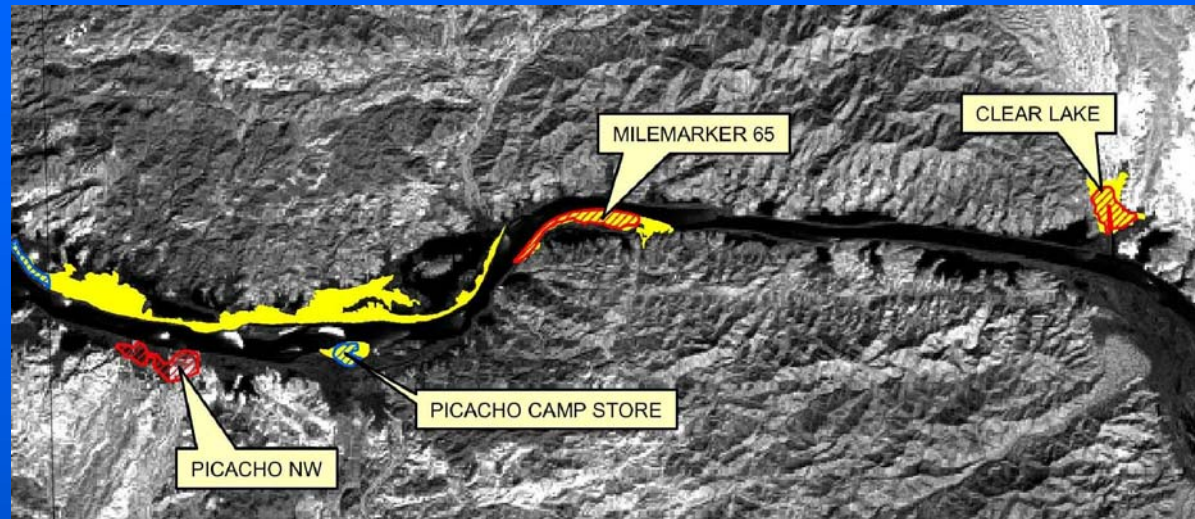


Additional Microclimate Studies



- Under Interim Surplus Criteria, water removed at Parker instead of Imperial
- Study the effect of reduced water availability between Parker and Imperial
- Temporal changes in vegetation, microclimate, and groundwater
- Differences between these sites and breeding sites
- Regional trends in microclimate

Additional Microclimate Studies



- 15 sites between Parker & Imperial
- 2 control sites above Parker and 2 below Imperial
- Delineate areas likely to be affected
- 3-5 HOBO data loggers at each site; year-round
- Piezometer; year-round
- Soil moisture readings at each HOBO location 10 times during breeding season
- Vegetation plot yearly

Additional Microclimate – Data Analysis

- With multi-year data, look for temporal changes in microclimate, groundwater, and vegetation
- Analyze microclimate data in conjunction with veg and groundwater data
- Compare microclimate at sites along lower river to that at breeding sites
- Analyze microclimate data in conjunction with veg data (all sites) to identify characteristics influencing microclimate
- Use logistic regression to see if any microclimate and vegetation variables we've identified influence nest success or productivity

Restoration Applications

- Identify microclimate and vegetation characteristics that influence suitability of habitat for flycatchers
- Create model for restoration – stem density, amount and persistence of soil moisture, canopy closure, size of stand.



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Field crews of 2003 and 2004