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Declining Rainwater Recharge in the Chino Basin

Implications for the Watershed and Beyond

January 29, 2009

Outline

- Impact of Urbanization on storm water recharge to the Chino Basin
- Implication to other Basins that are managed to a “safe” yield
- Chino Basin parties response to projected decline in yield
- GHG emissions associated with the loss in storm water recharge

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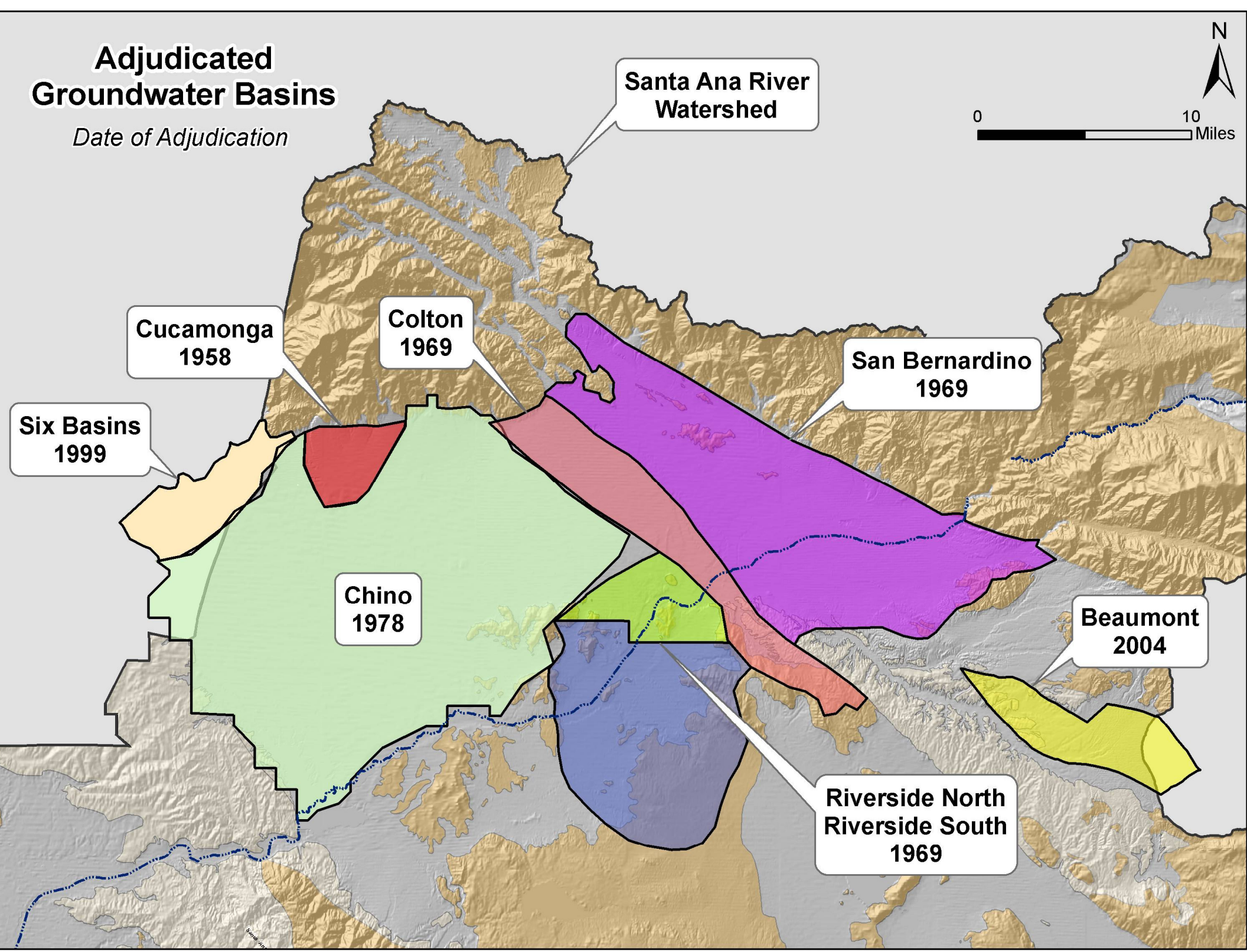

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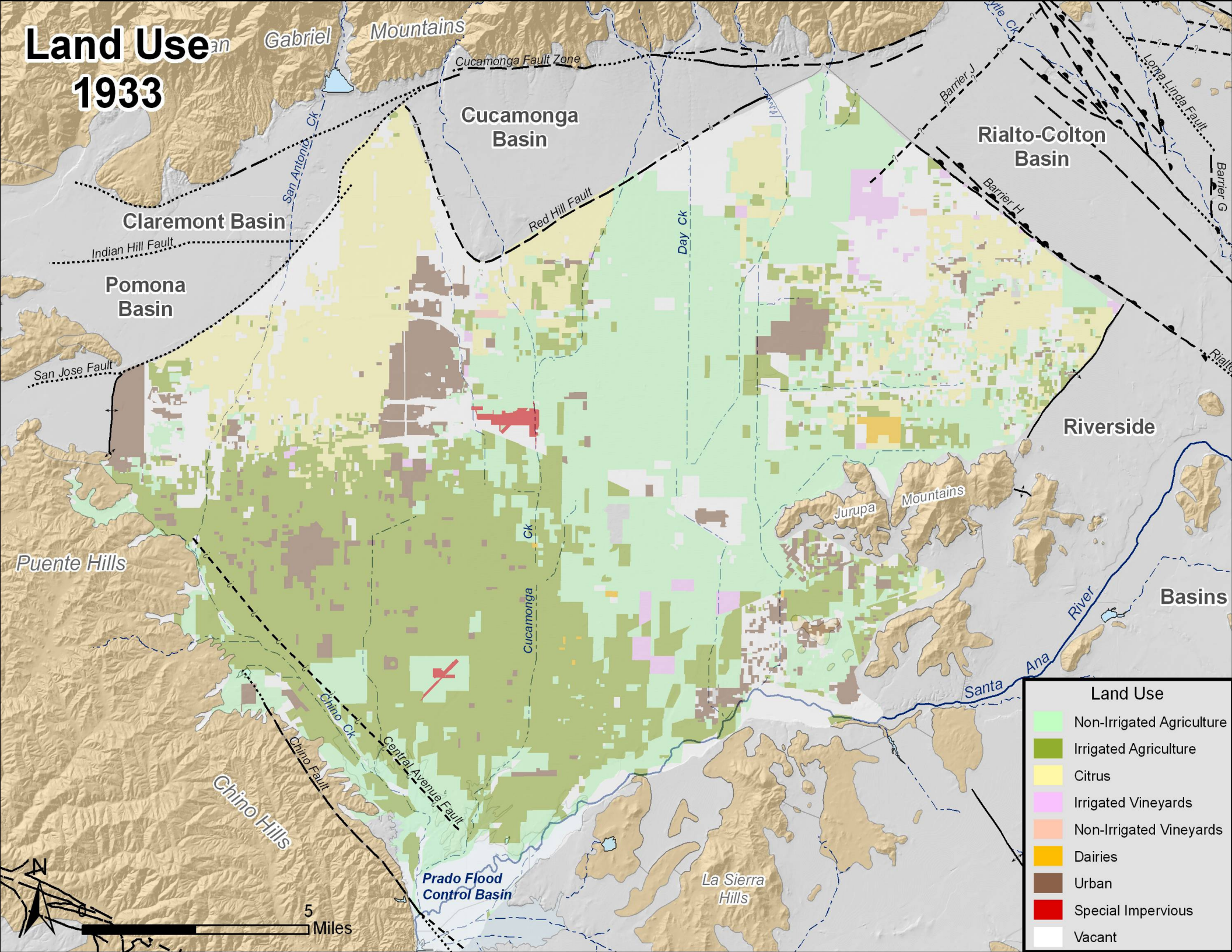
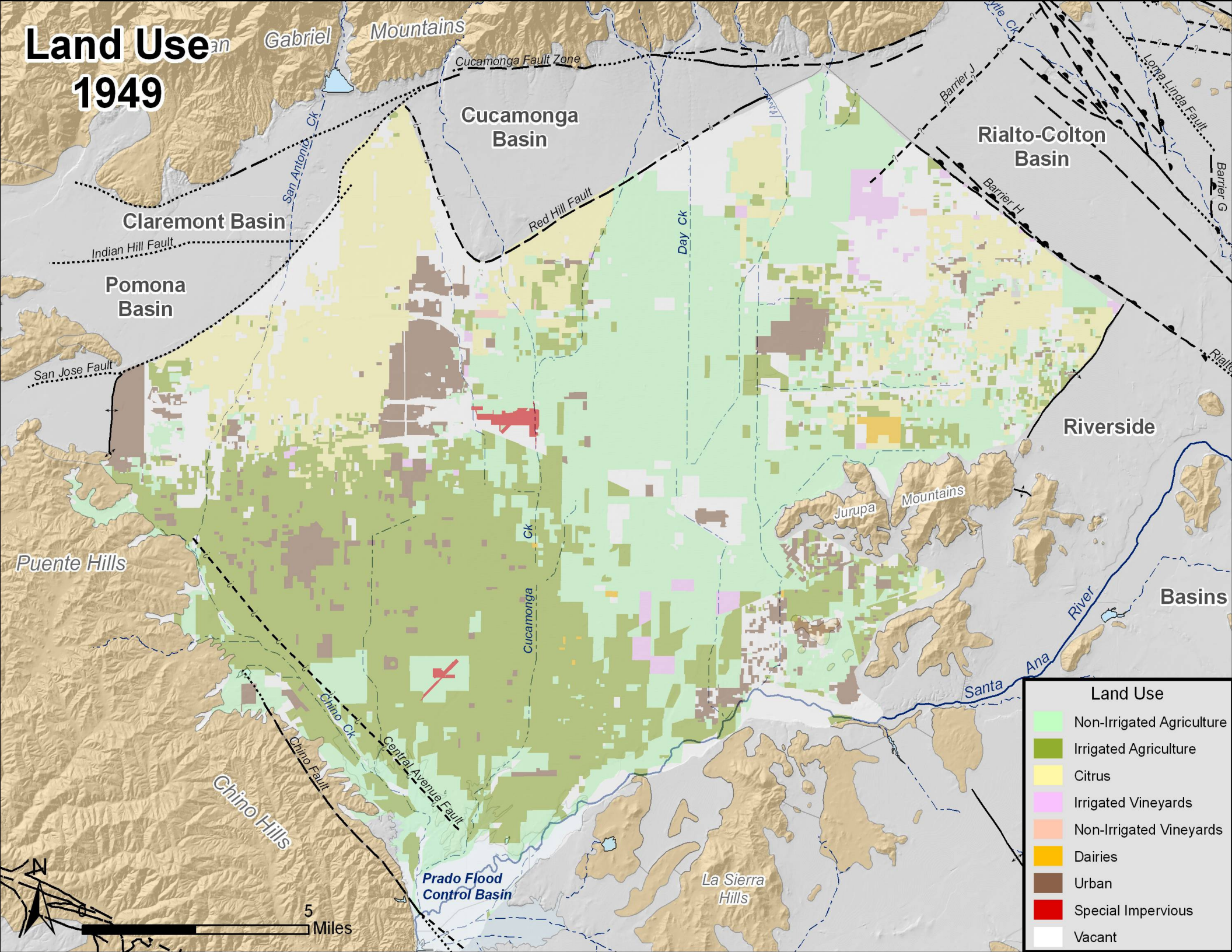

Land Use
1933
Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
San Antonio Ck
Red Hill Fault
Day Ck
Barrier J
Barrier H
Barrier G
Loma Linda Fault
Indian Hill Fault
San Jose Fault
Riverside
Jurupa Mountains
Puente Hills
Cucamonga Ck
Chino Ck
Chino Fault
Central Avenue Fault
Chino Hills
Prado Flood Control Basin
La Sierra Hills
Santa Ana River
Basins
N
0
5
Miles
Land Use
Non-Irrigated Agriculture
Irrigated Agriculture
Citrus
Irrigated Vineyards
Non-Irrigated Vineyards
Dairies
Urban
Special Impervious
Vacant


Land Use
1949
Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
San Antonio Ck
Red Hill Fault
Day Ck
Barrier J
Barrier H
Barrier G
Loma Linda Fault
Indian Hill Fault
San Jose Fault
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Chino Fault
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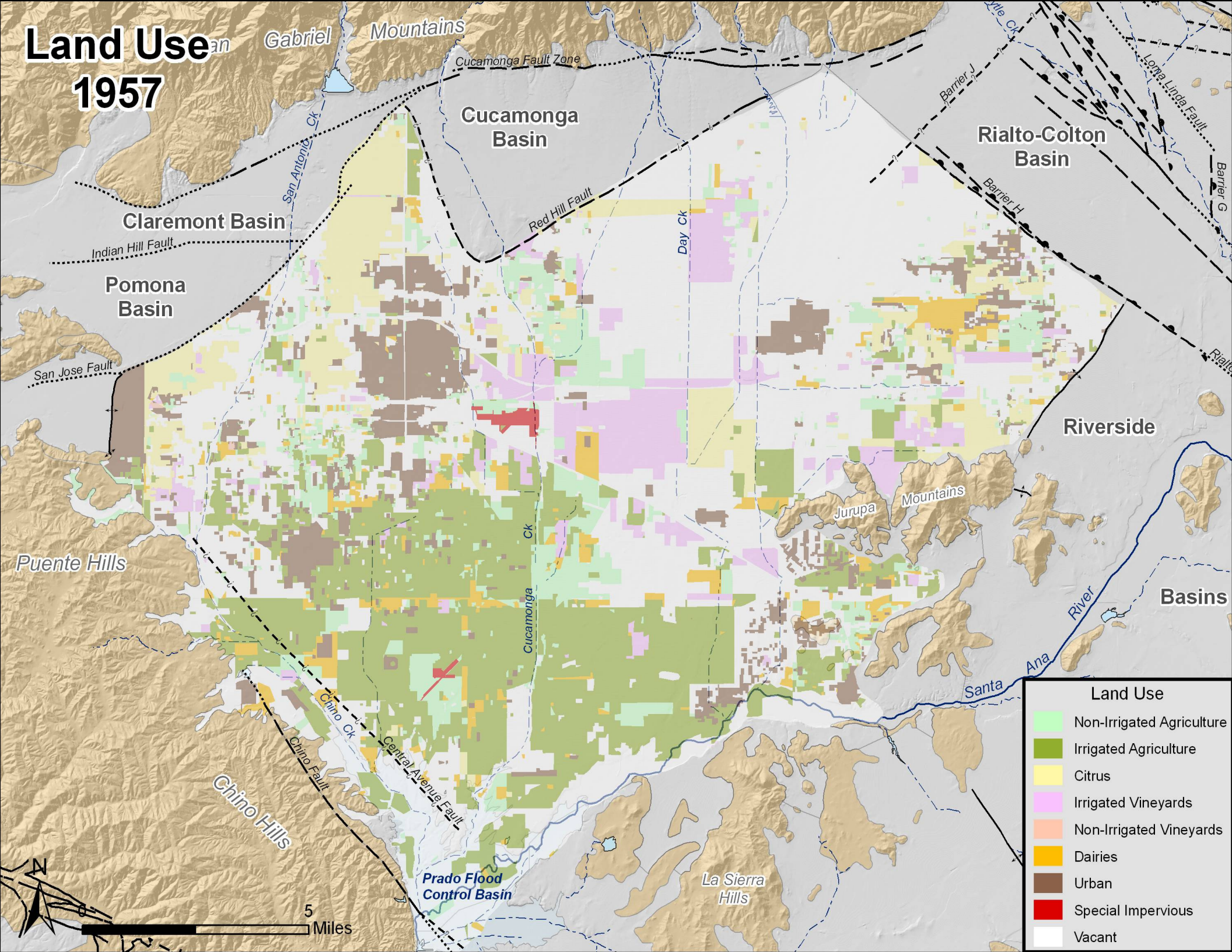
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Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
Riverside
Basins
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Red Hill Fault
Day Ck
Barrier J
Barrier H
Barrier G
Loma Linda Fault
Indian Hill Fault
San Jose Fault
Puente Hills
Jurupa Mountains
Cucamonga Ck
Santa Ana River
Chino Ck
Chino Fault
Central Avenue Fault
Chino Hills
Prado Flood Control Basin
La Sierra Hills
N
5
Miles
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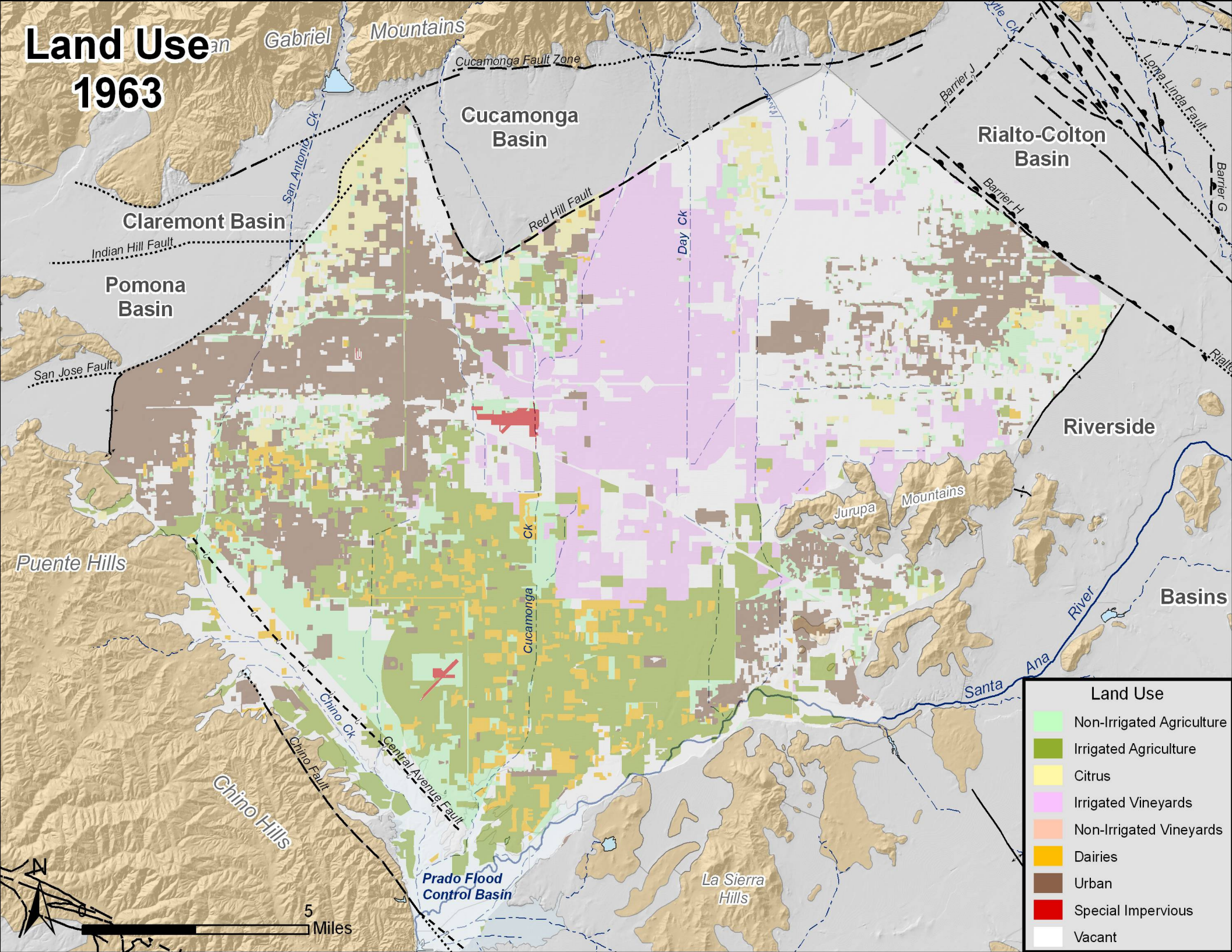
Land Use
1963
Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
Riverside
Basins
San Antonio Ck
Red Hill Fault
Day Ck
Barrier J
Barrier H
Barrier G
Loma Linda Fault
Indian Hill Fault
San Jose Fault
Jurupa Mountains
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Santa Ana River
Puente Hills
Chino Ck
Chino Fault
Central Avenue Fault
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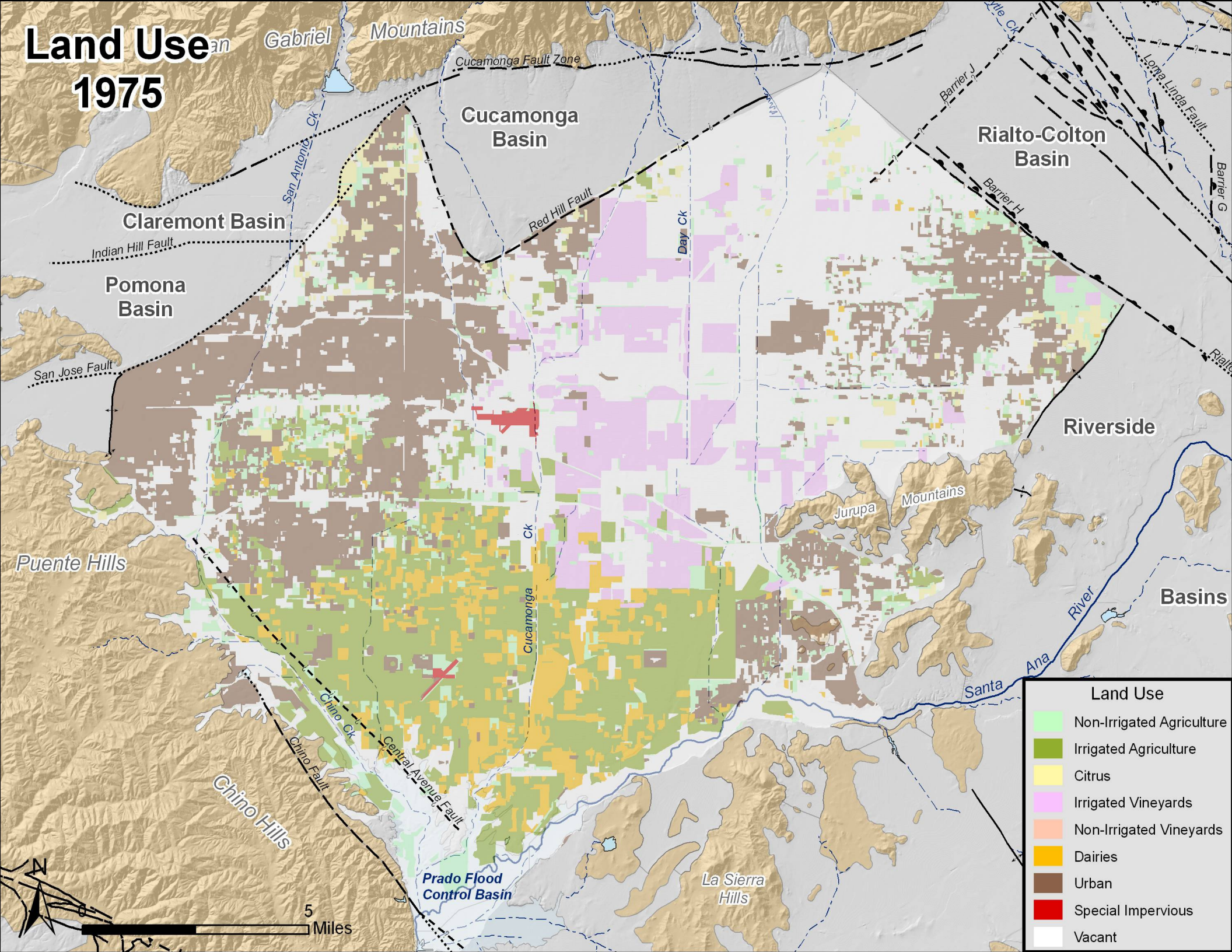
Land Use
1975
Gabriel Mountains
Cucamonga Fault Zone
Cucamonga Basin
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Claremont Basin
Pomona Basin
Riverside
Basins
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Chino Hills
San Antonio Ck
Red Hill Fault
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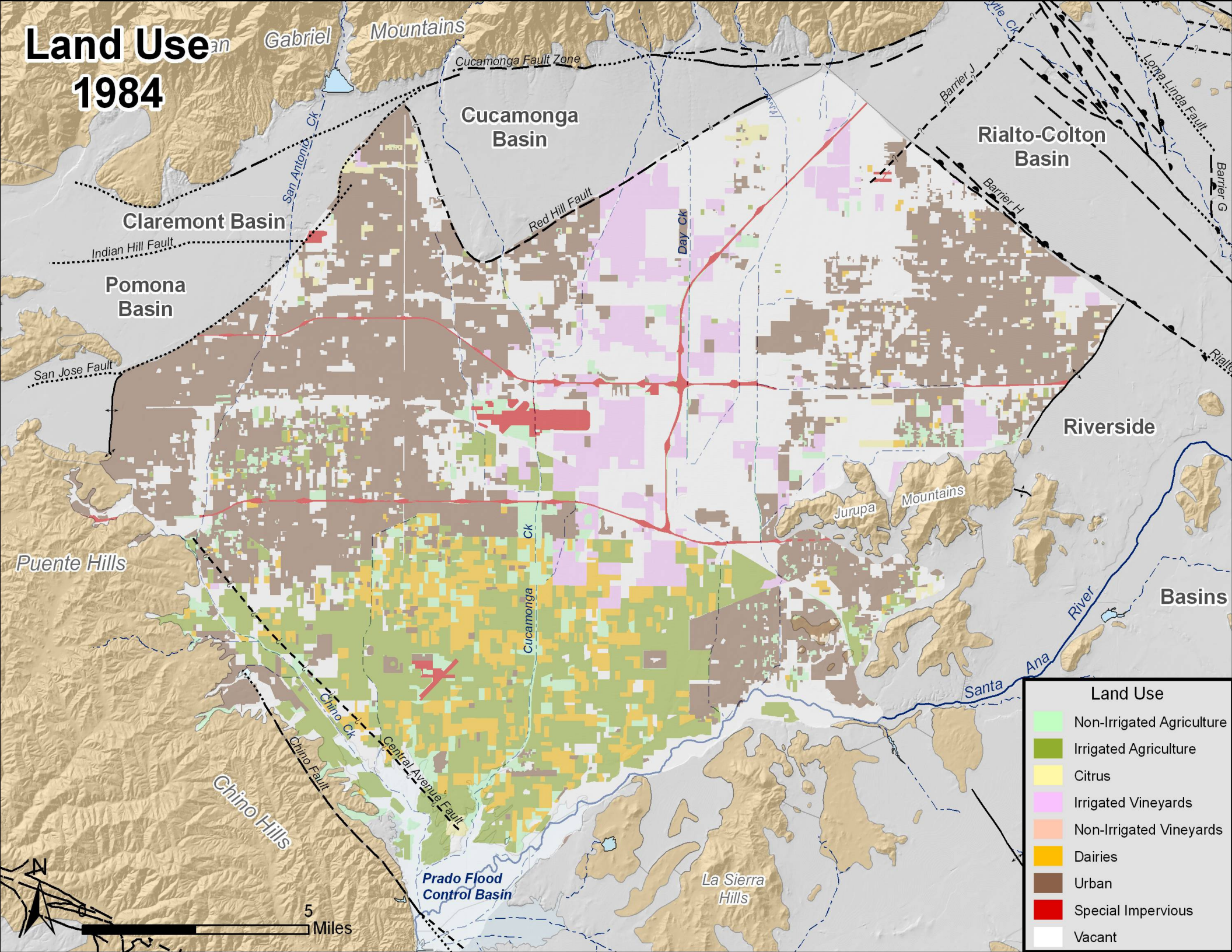
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1984
Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
Riverside
Basins
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Red Hill Fault
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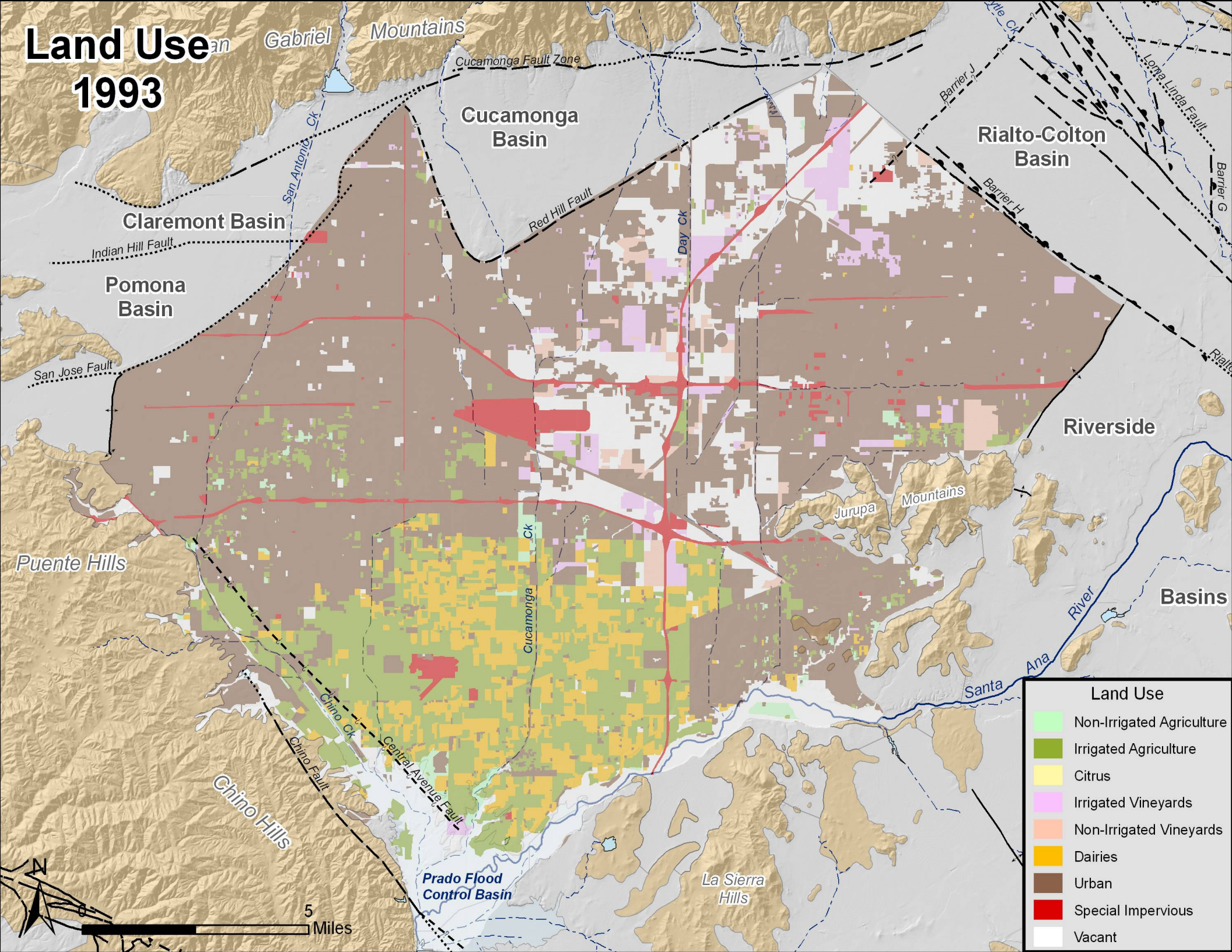
Land Use
1993
Gabriel
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Claremont Basin
Pomona Basin
San Antonio Ck
Red Hill Fault
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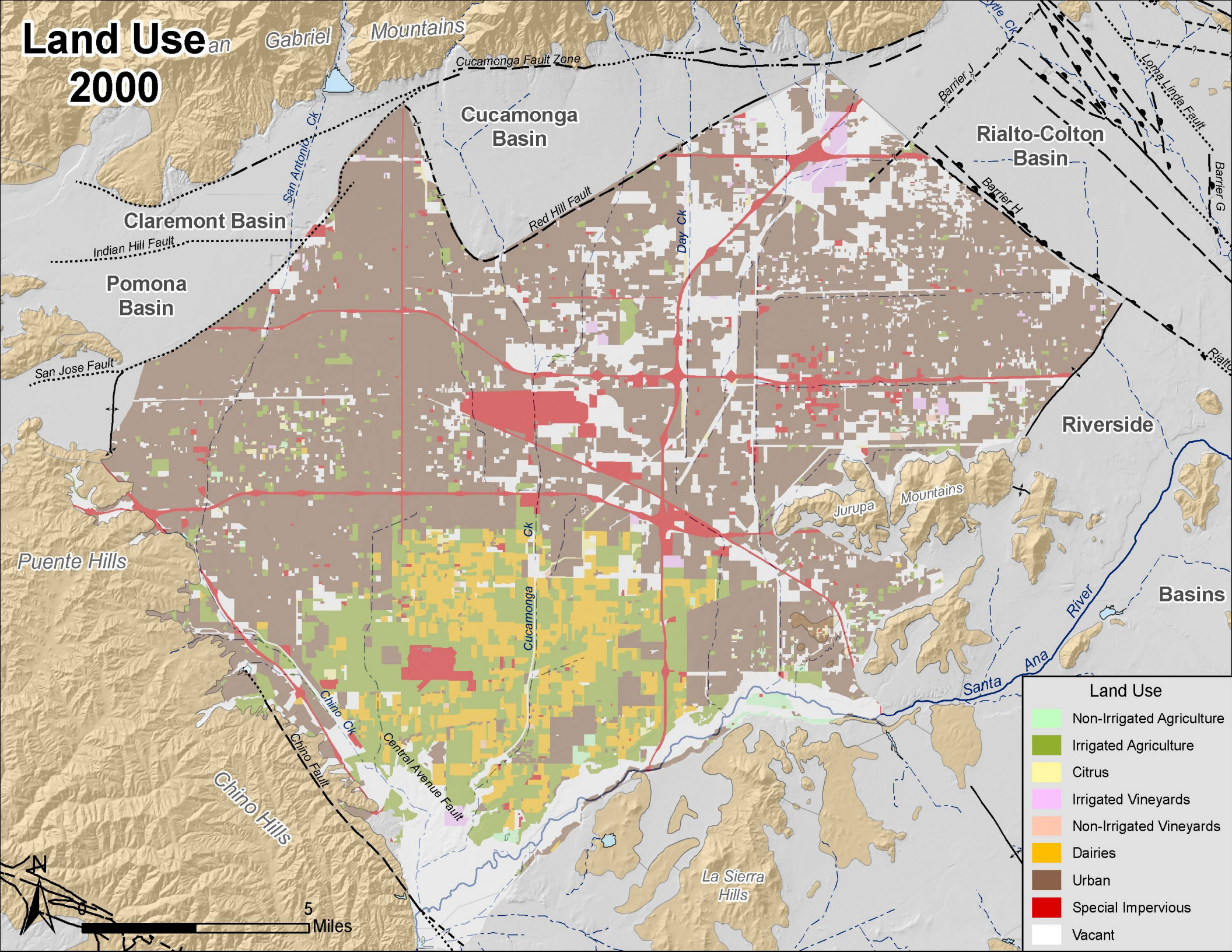
Land Use
2000
an Gabriel Mountains
Cucamonga Fault Zone
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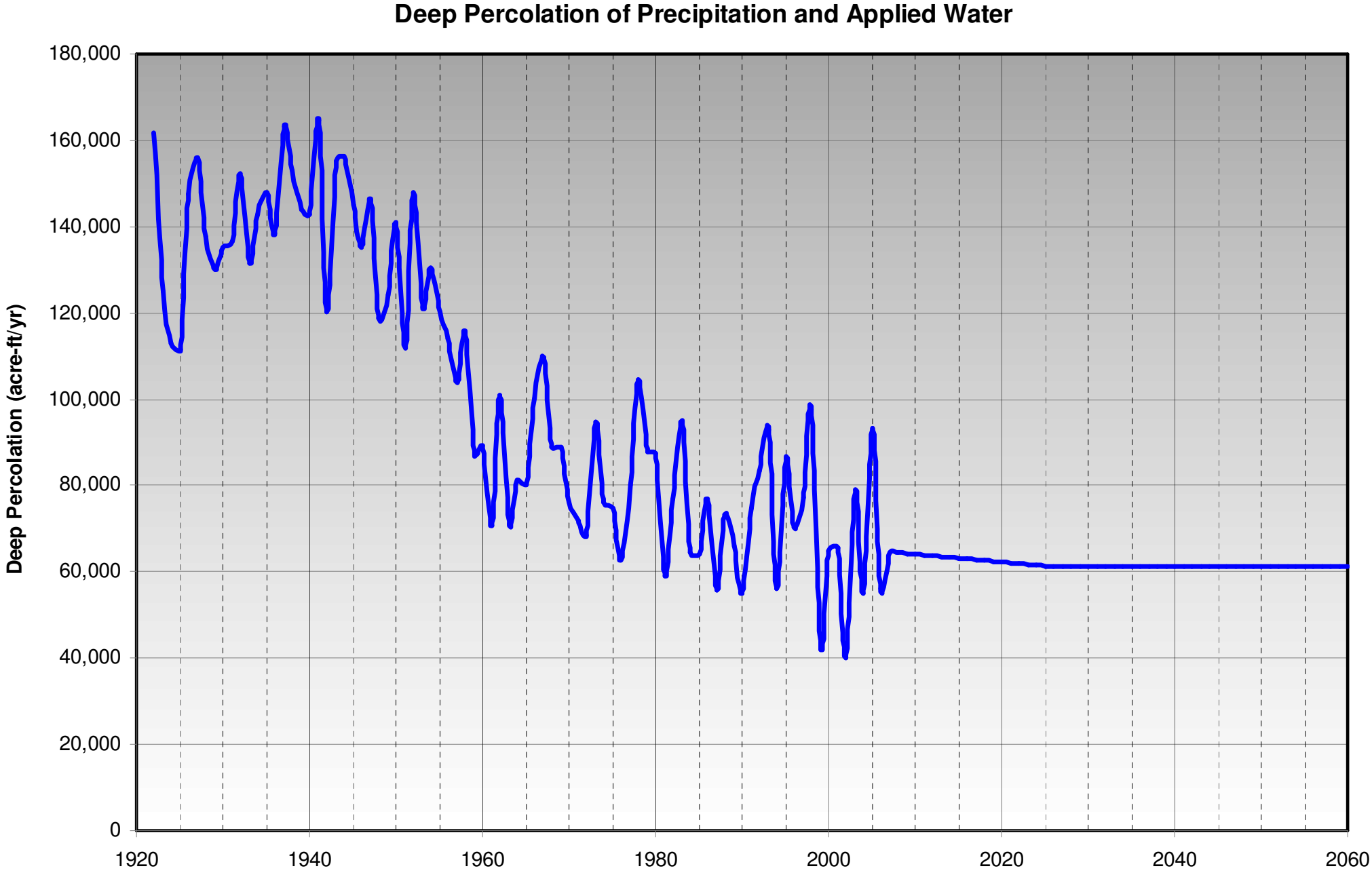
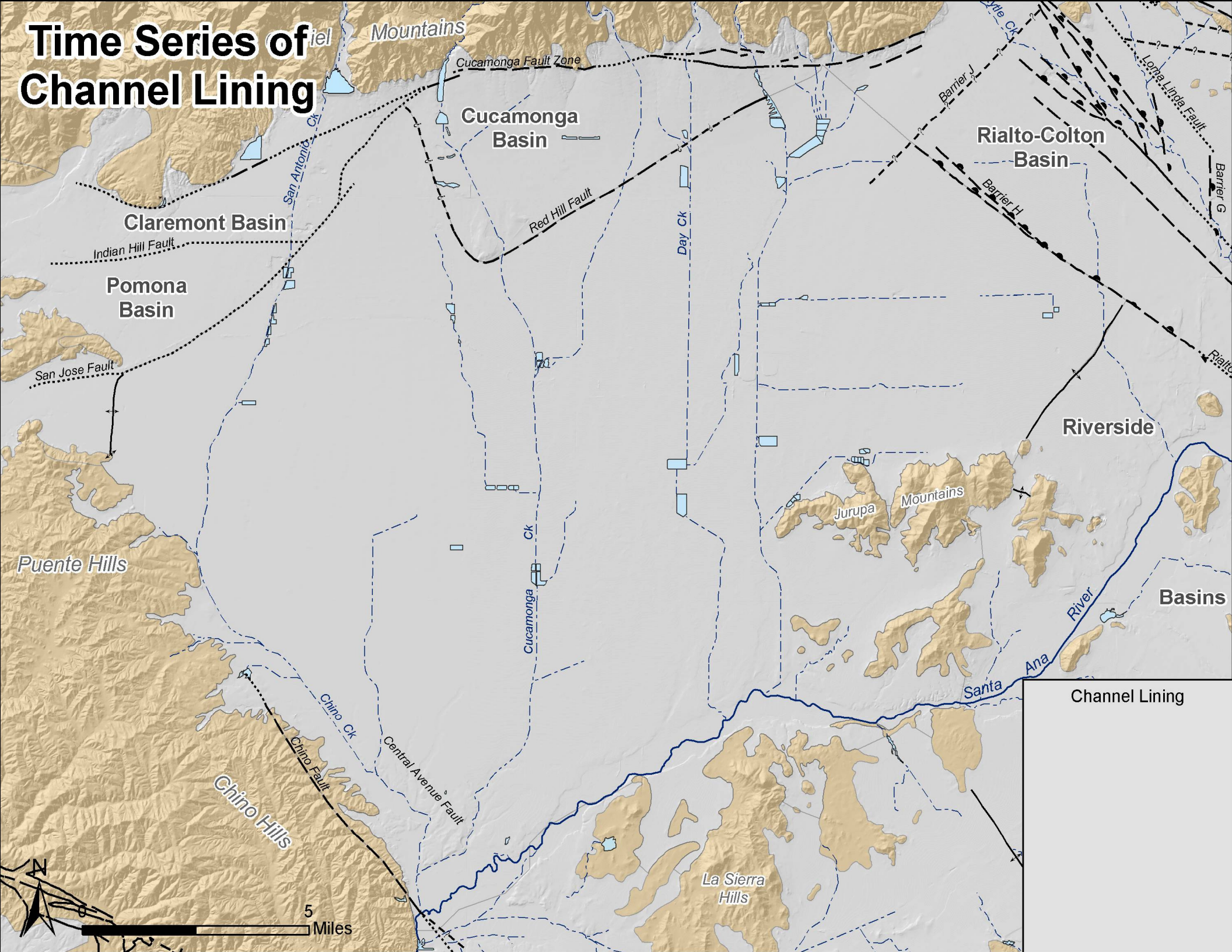

Deep Percolation of Precipitation and Applied Water
Deep Percolation (acre-ft/yr)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1920
1940
1960
1980
2000
2020
2040
2060


Time Series of Channel Lining
Mountains
Cucamonga Fault Zone
Cucamonga Basin
Rialto-Colton Basin
Barrier J
Lorna Linda Fault
Barrier G
Barrier H
San Antonio Ck
Claremont Basin
Red Hill Fault
Day Ck
Indian Hill Fault
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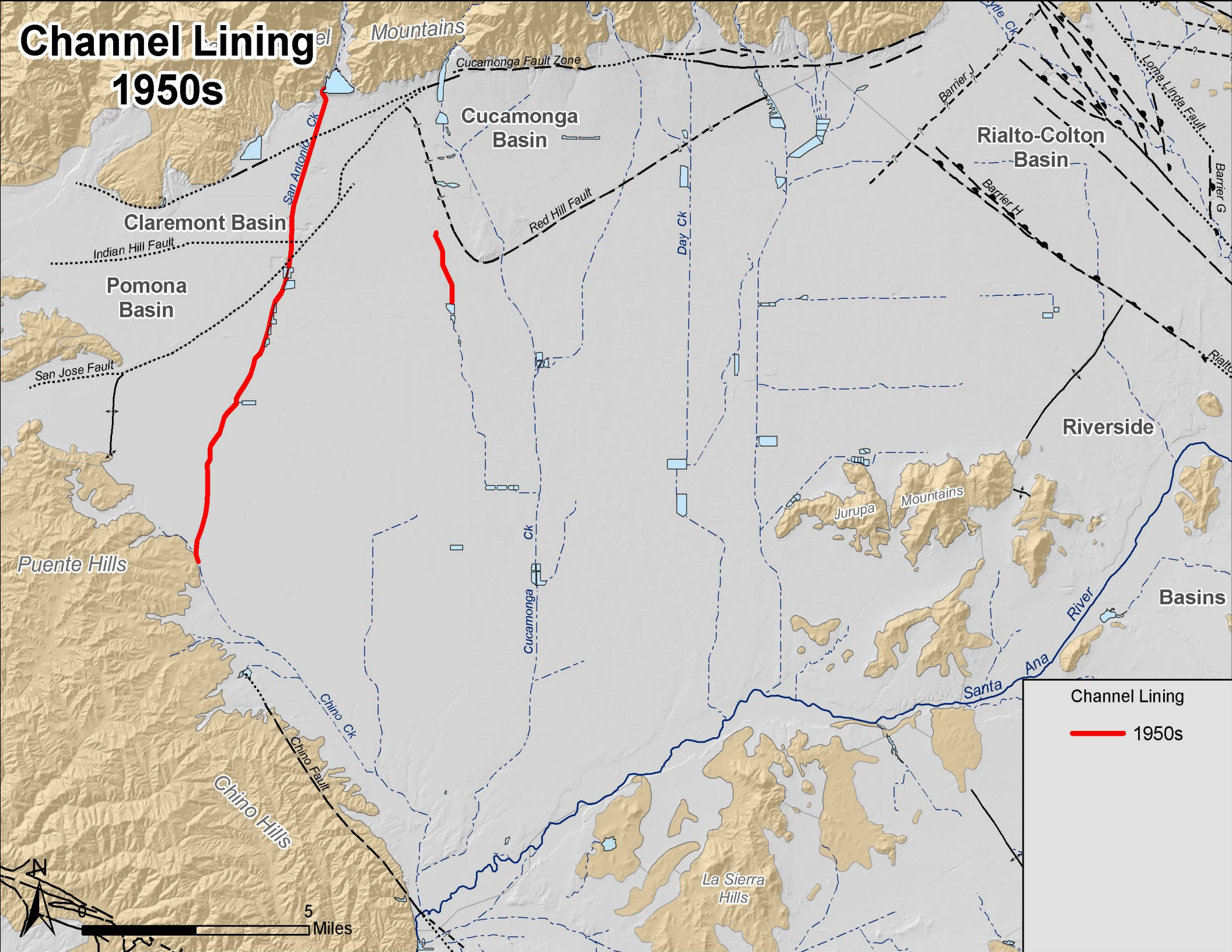
Channel Lining


Channel Lining
1950s
Mountains
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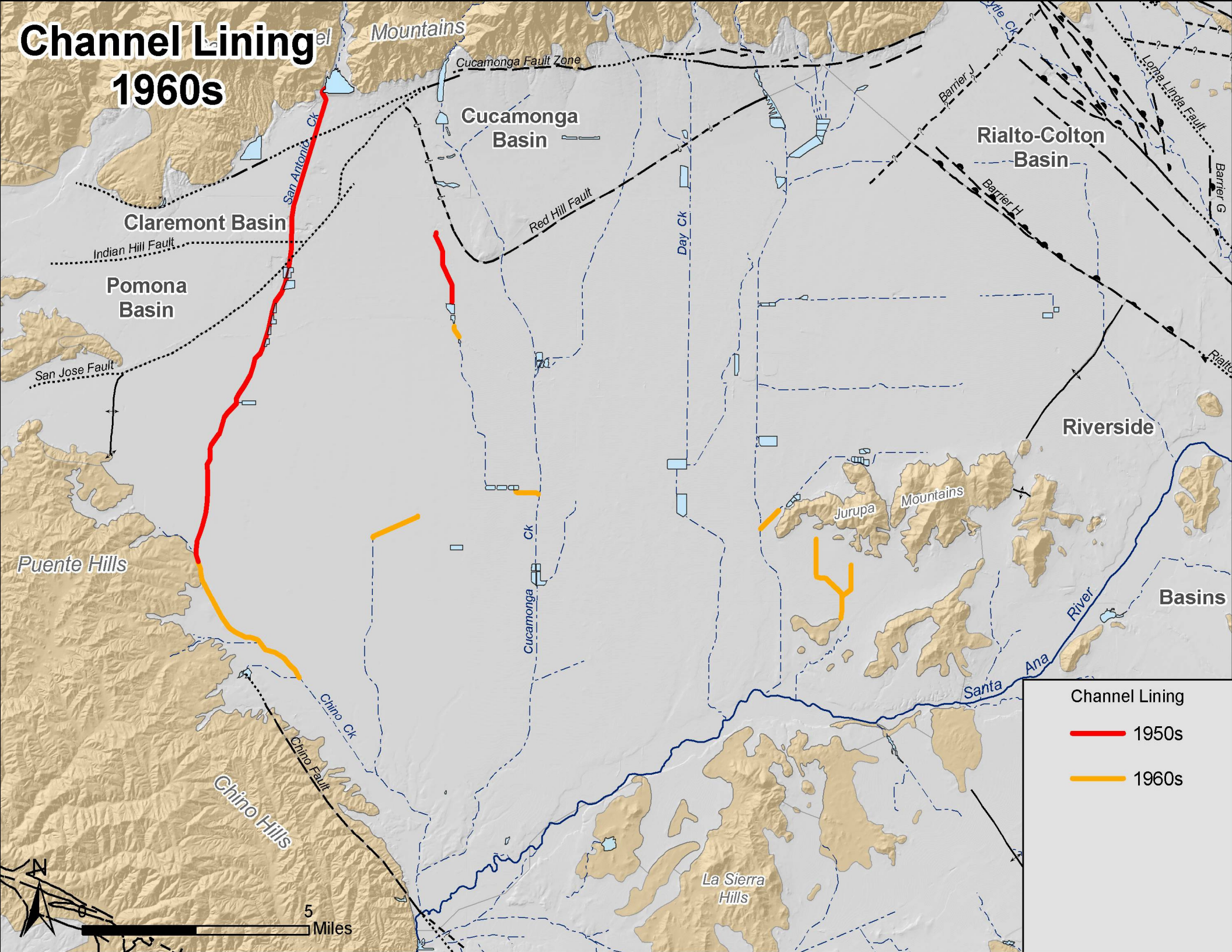
Channel Lining
1950s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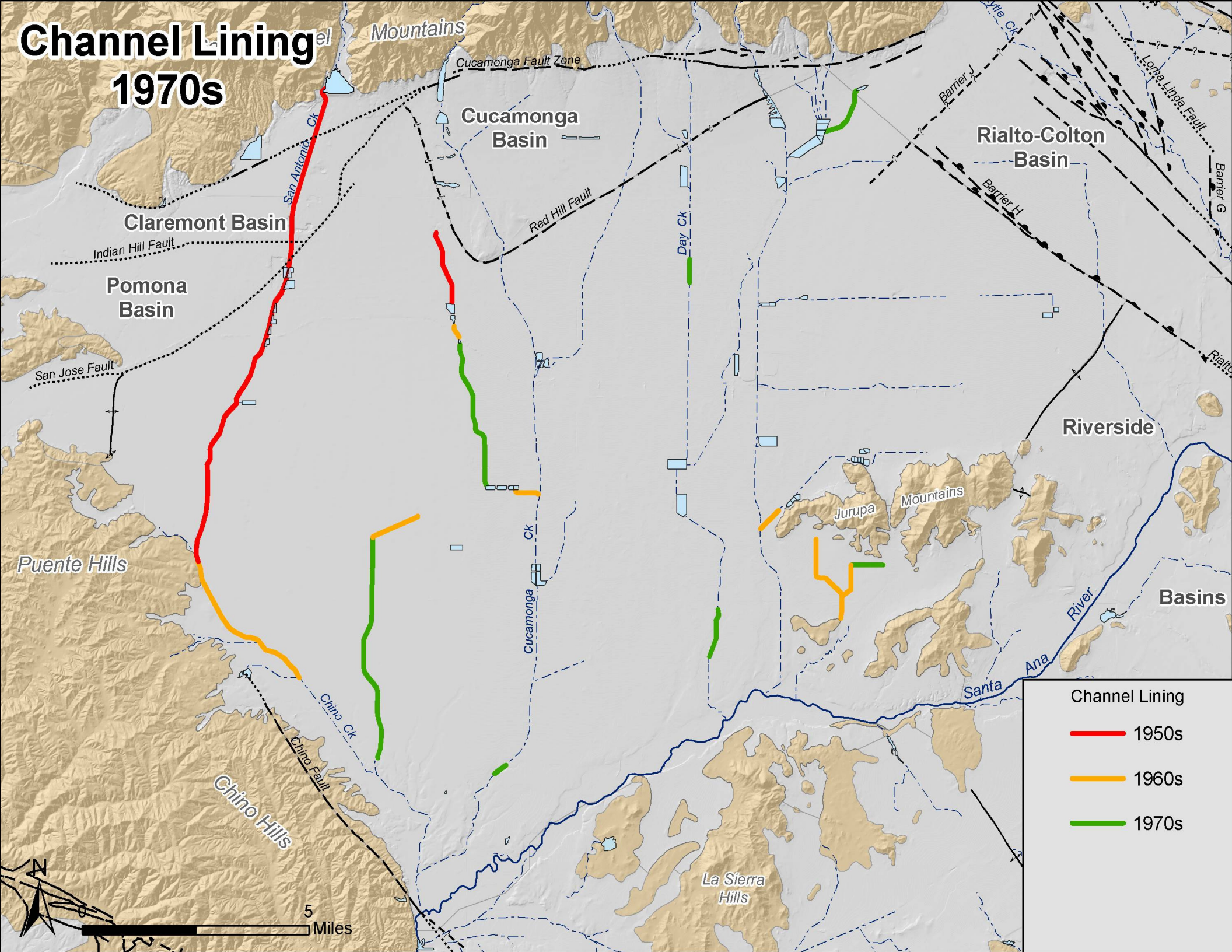
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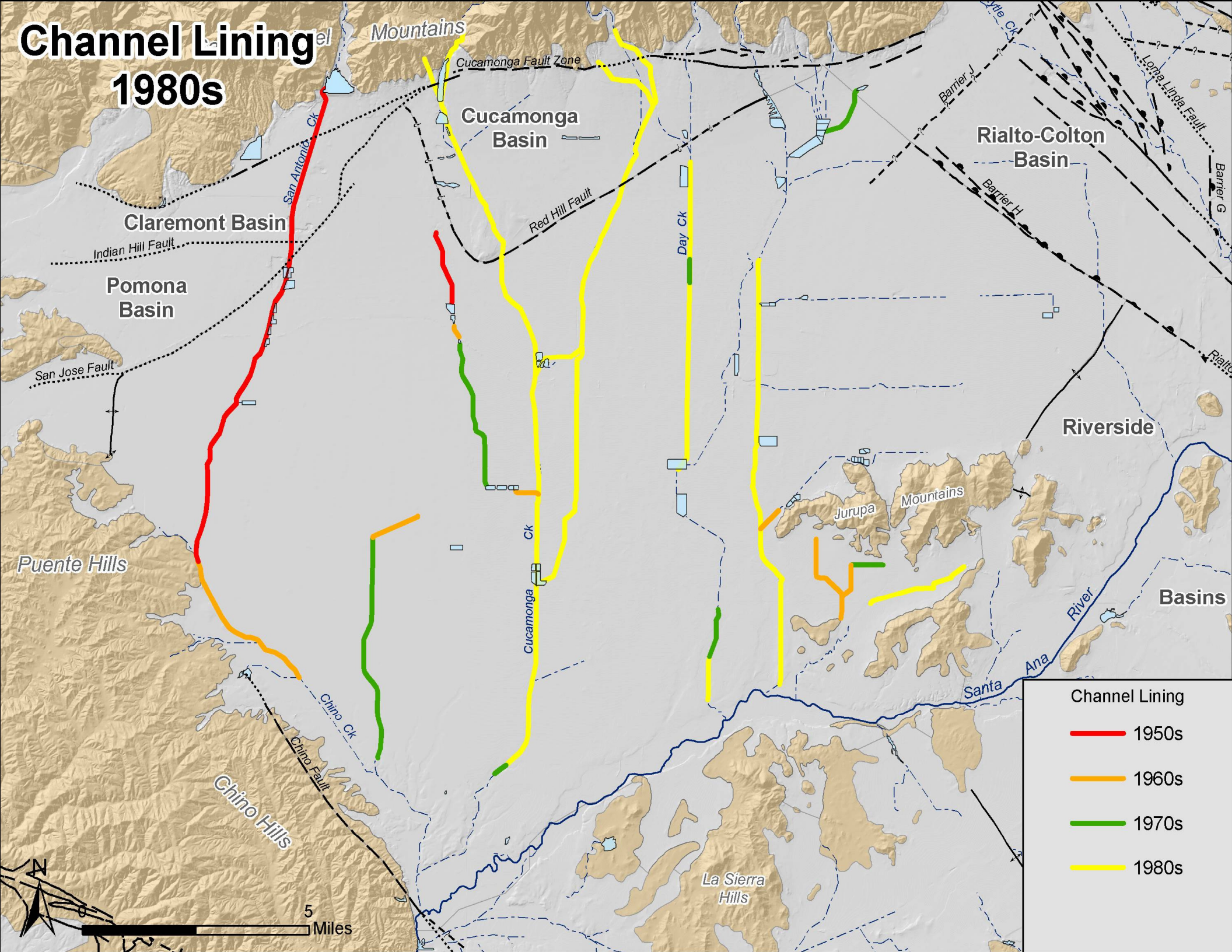
1960s
1970s


Channel Lining
1980s
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San Jose Fault
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Santa Ana River
Chino Ck
Chino Fault
Chino Hills
La Sierra Hills
N
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5
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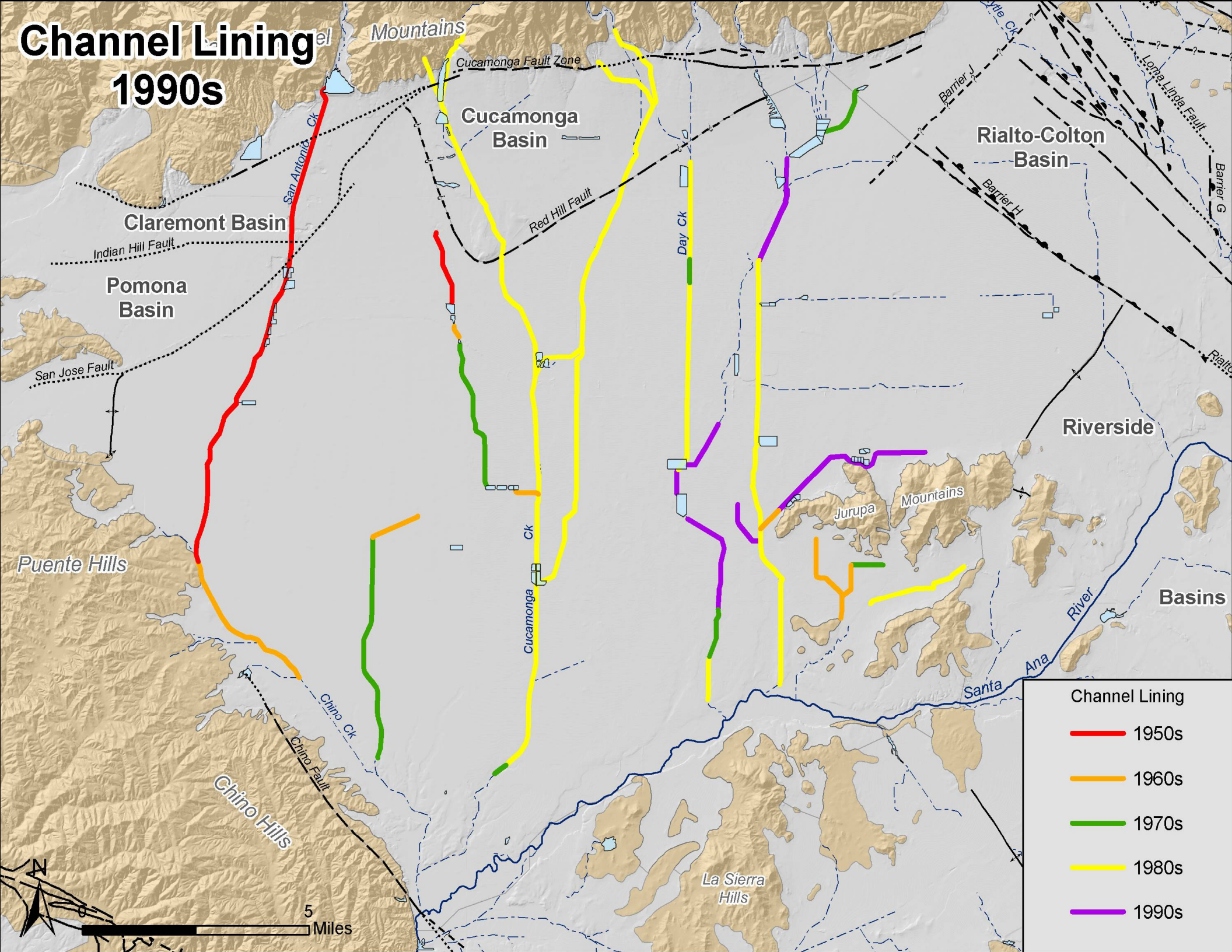
Channel Lining
1950s
1960s
1970s
1980s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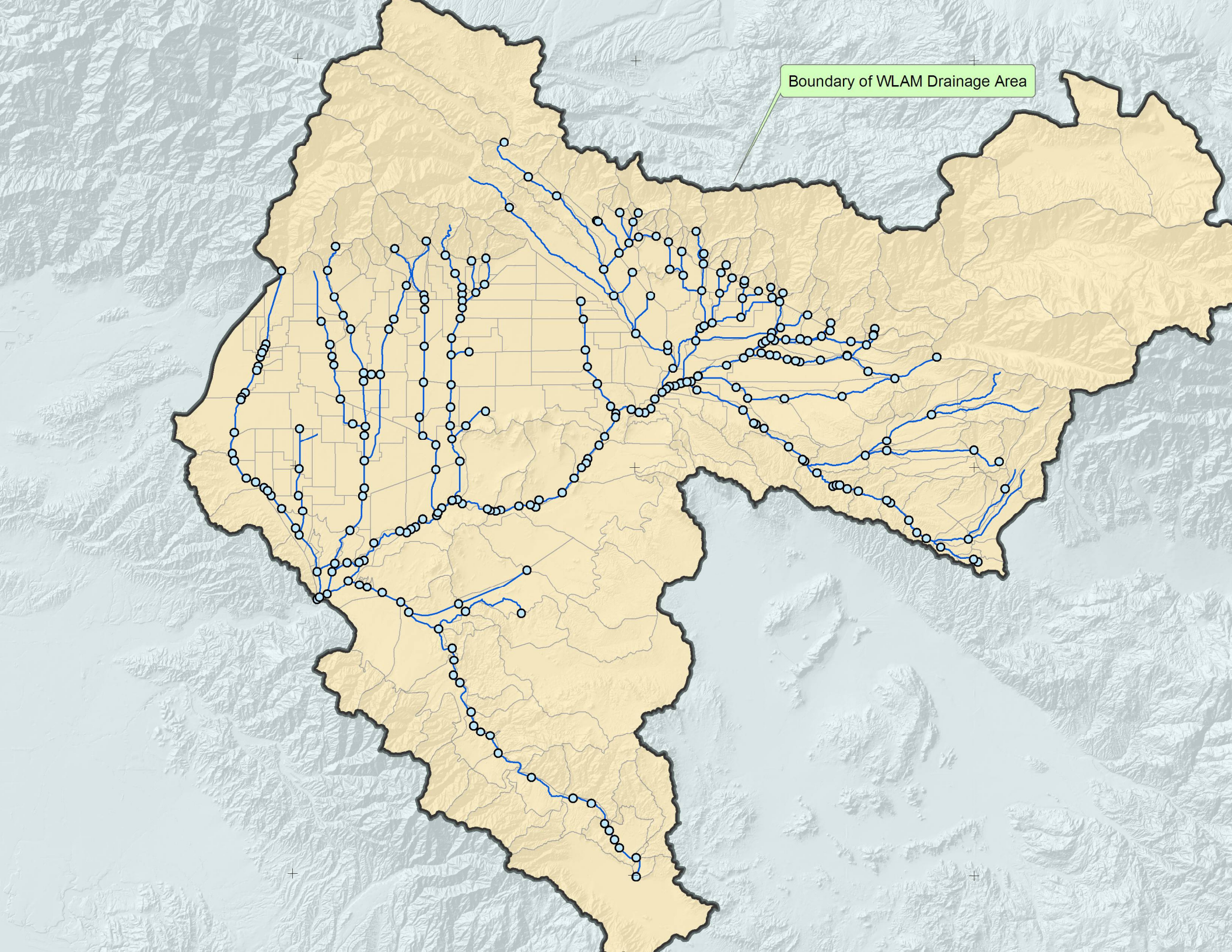
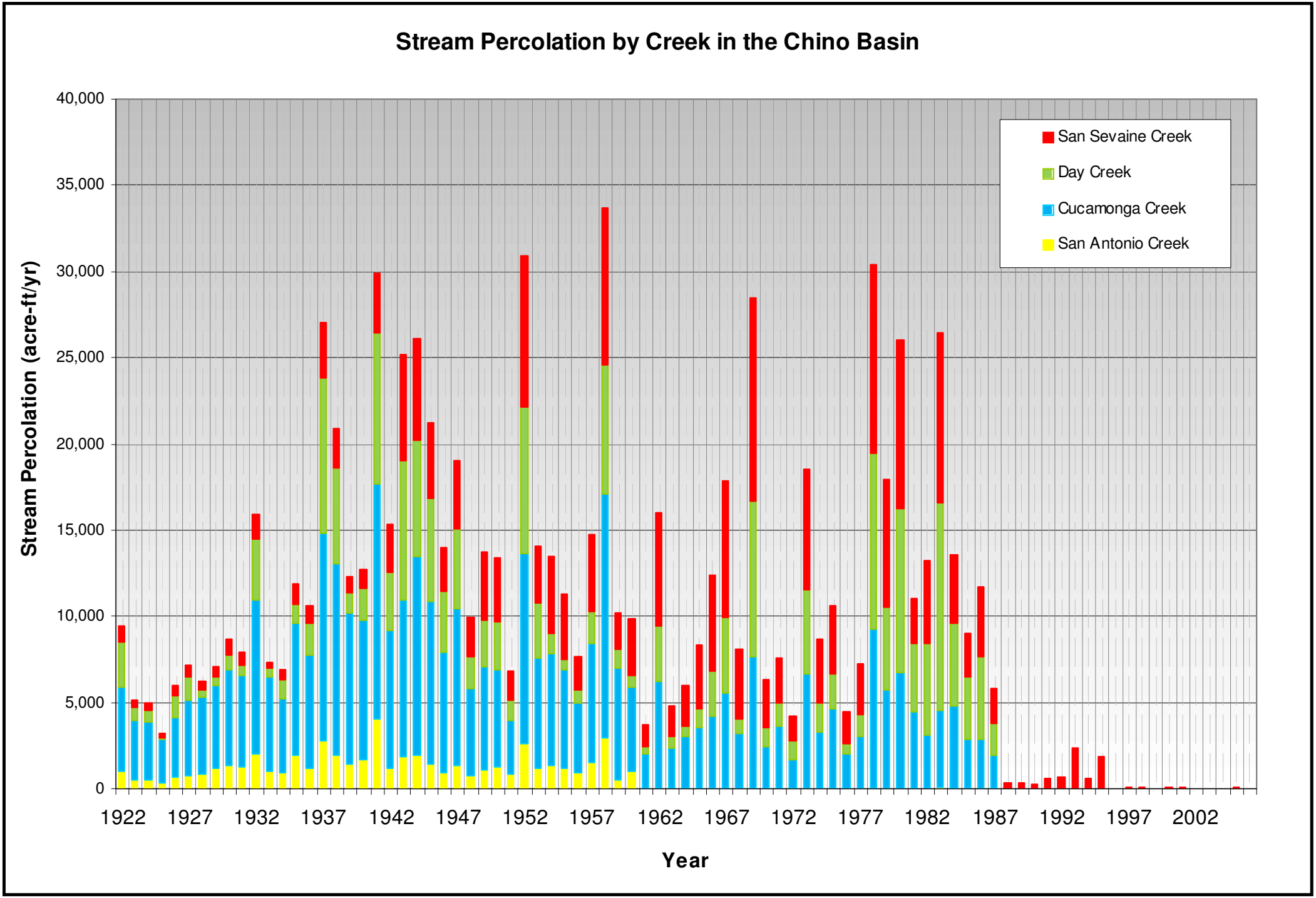
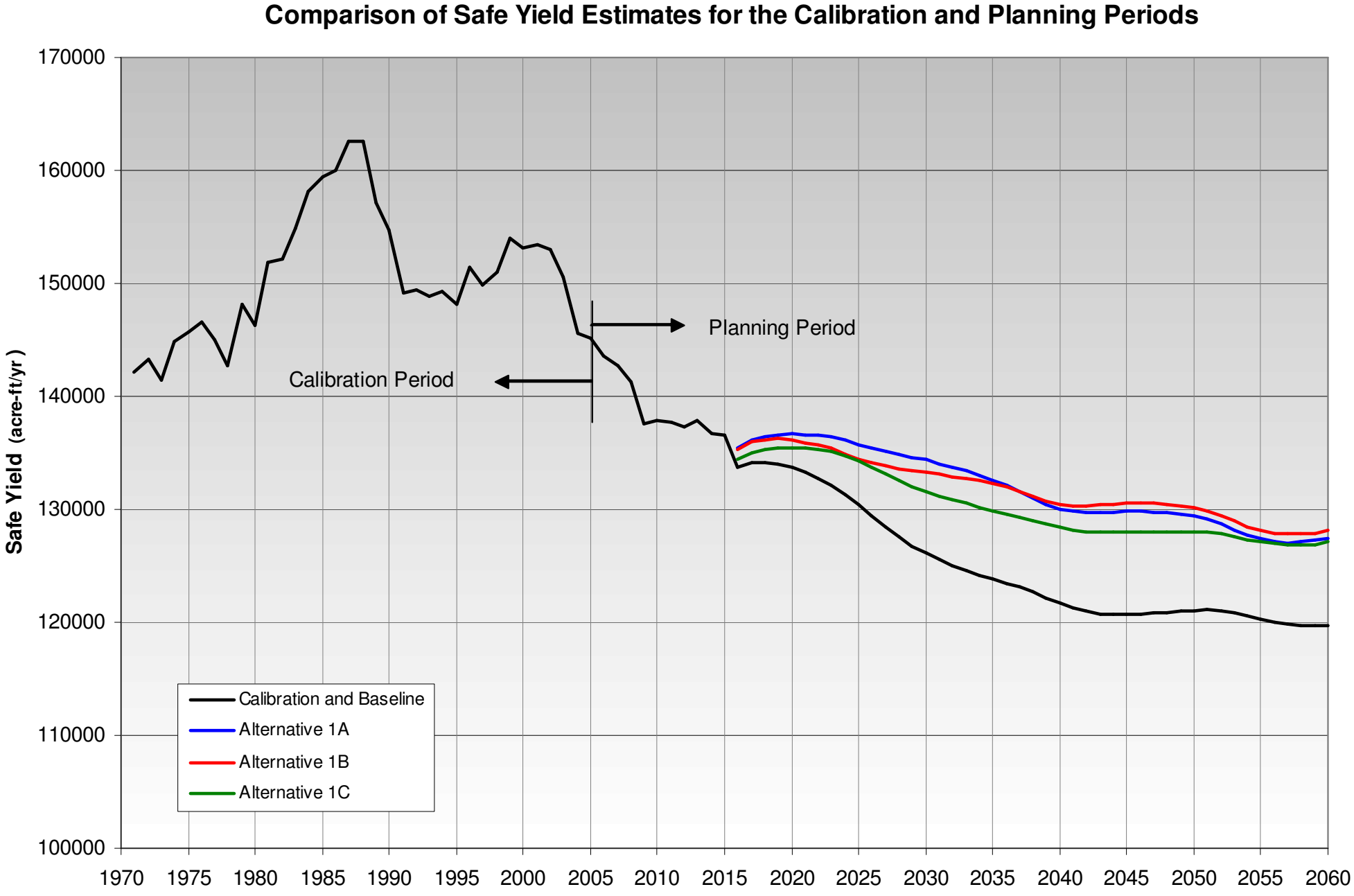
Channel Lining
1950s
1960s
1970s
1980s
1990s


Boundary of WLAM Drainage Area


Stream Percolation by Creek in the Chino Basin
Stream Percolation (acre-ft/yr)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
San Sevaine Creek
Day Creek
Cucamonga Creek
San Antonio Creek


Comparison of Safe Yield Estimates for the Calibration and Planning Periods
Safe Yield (acre-ft/yr)
170000
160000
150000
140000
130000
120000
110000
100000
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
Planning Period
Calibration Period
Calibration and Baseline
Alternative 1A
Alternative 1B
Alternative 1C

Implications for the Watershed and Beyond
Water Supply Reliability

- Landuse and drainage decisions have resulted in reduced groundwater recharge
  - Stormwater recharge in Chino Basin declined by 14,000 acre-ft/yr
  - Stormwater recharge in the Upper Watershed has probably declined by ~ 30,000 acre-ft/yr
- Groundwater yields are declining – more imported water is required to meet existing and future demands

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Implications for the Watershed and Beyond
Additional GHG Emissions

- For Chino Basin, flood control decisions that have lead to reduced storm water recharge will cause a discharge of about 37,000 metric tons of CO_2 per year
- For the Upper Watershed, flood control decisions that have lead to reduced storm water recharge will cause a discharge of about 79,000 metric tons of CO_2 per year

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Implications for the Watershed and Beyond
Potential Reduction in GHG Emissions

- Chino Basin Recharge Master Plan (July 2010)
  - Tentative goal is to increase storm water recharge by an average of 20,000 acre-ft/yr through combination of local and regional improvements
  - Achieving this goal will more than offset the loss due to channelization

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Questions?

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