Groundwater Availability and Time

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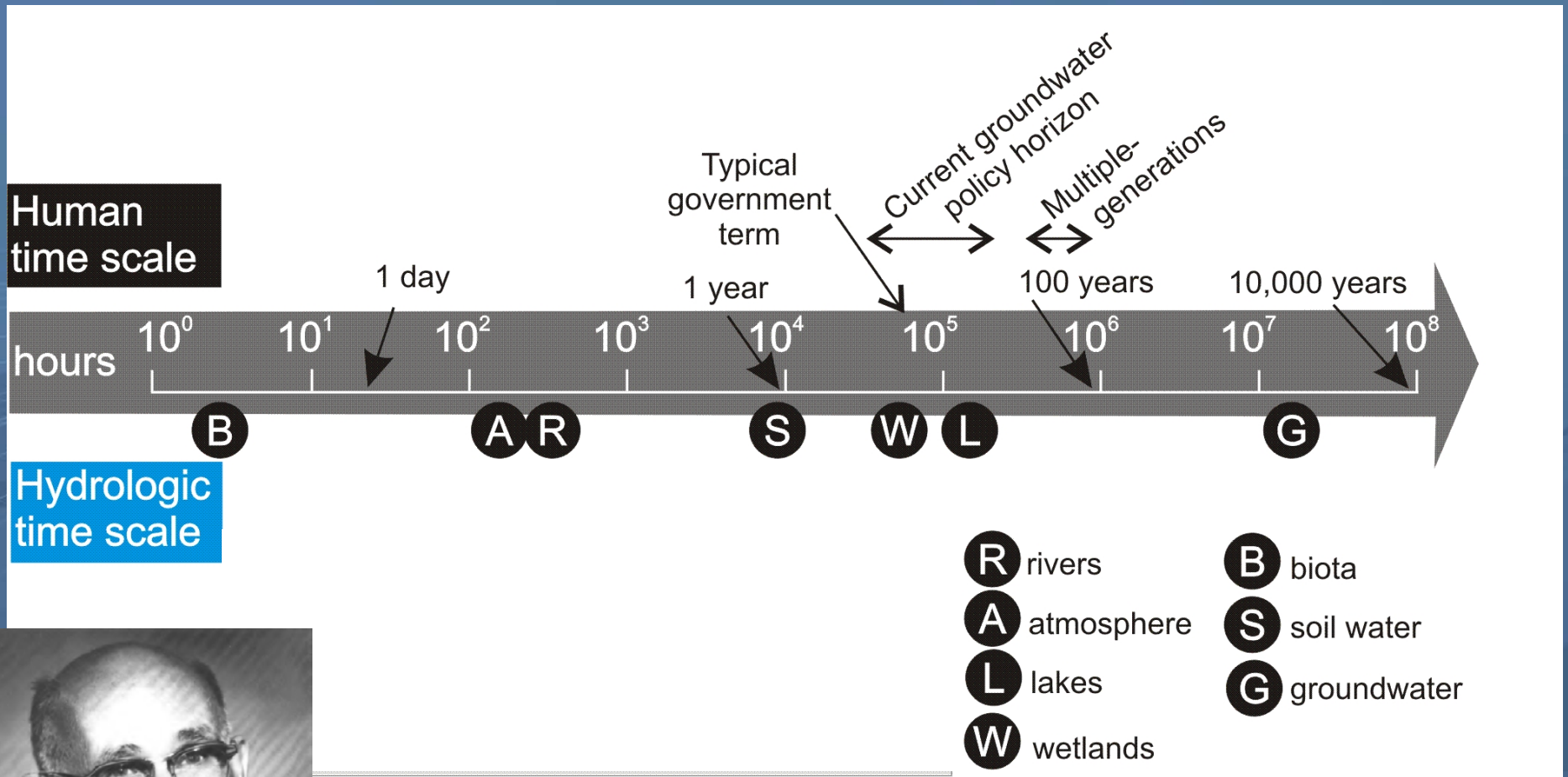
Human vs Hydrologic Time Scales



Gleeson et al. (2012)

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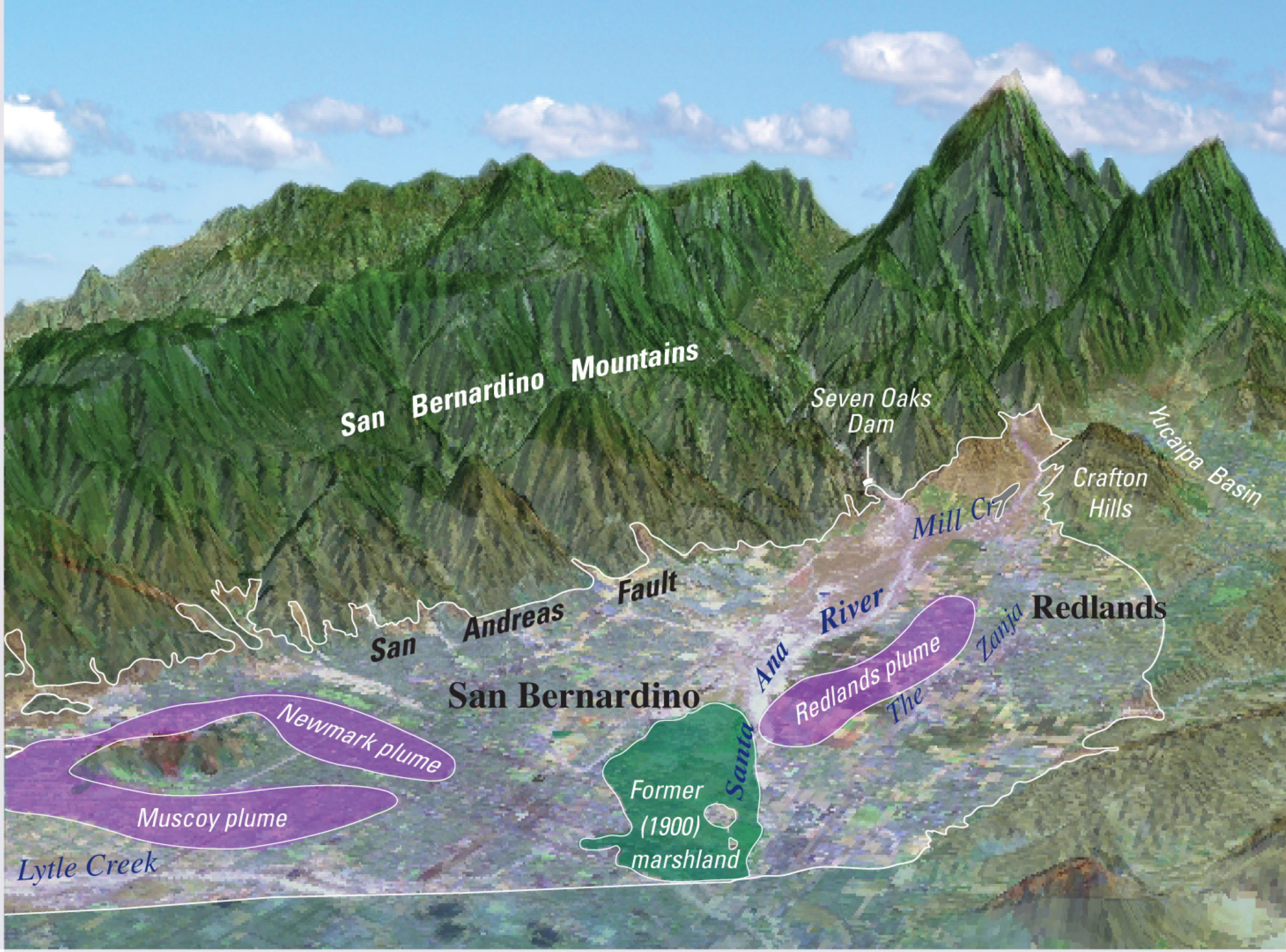


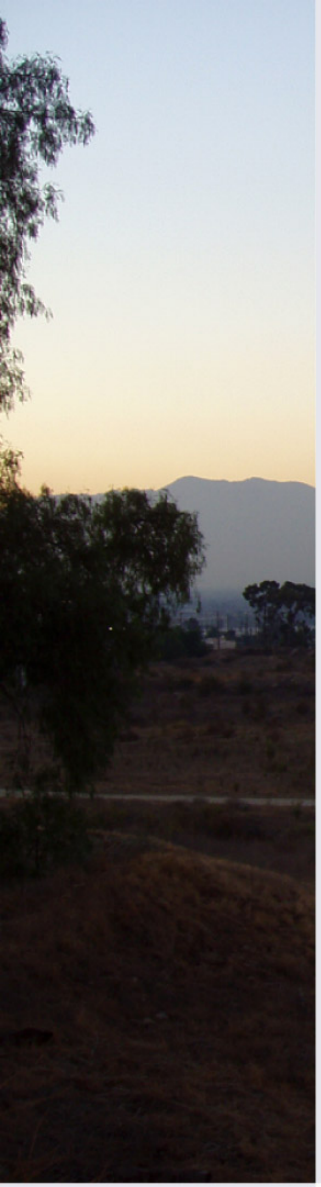
Introduction

San Bernardino Study Area

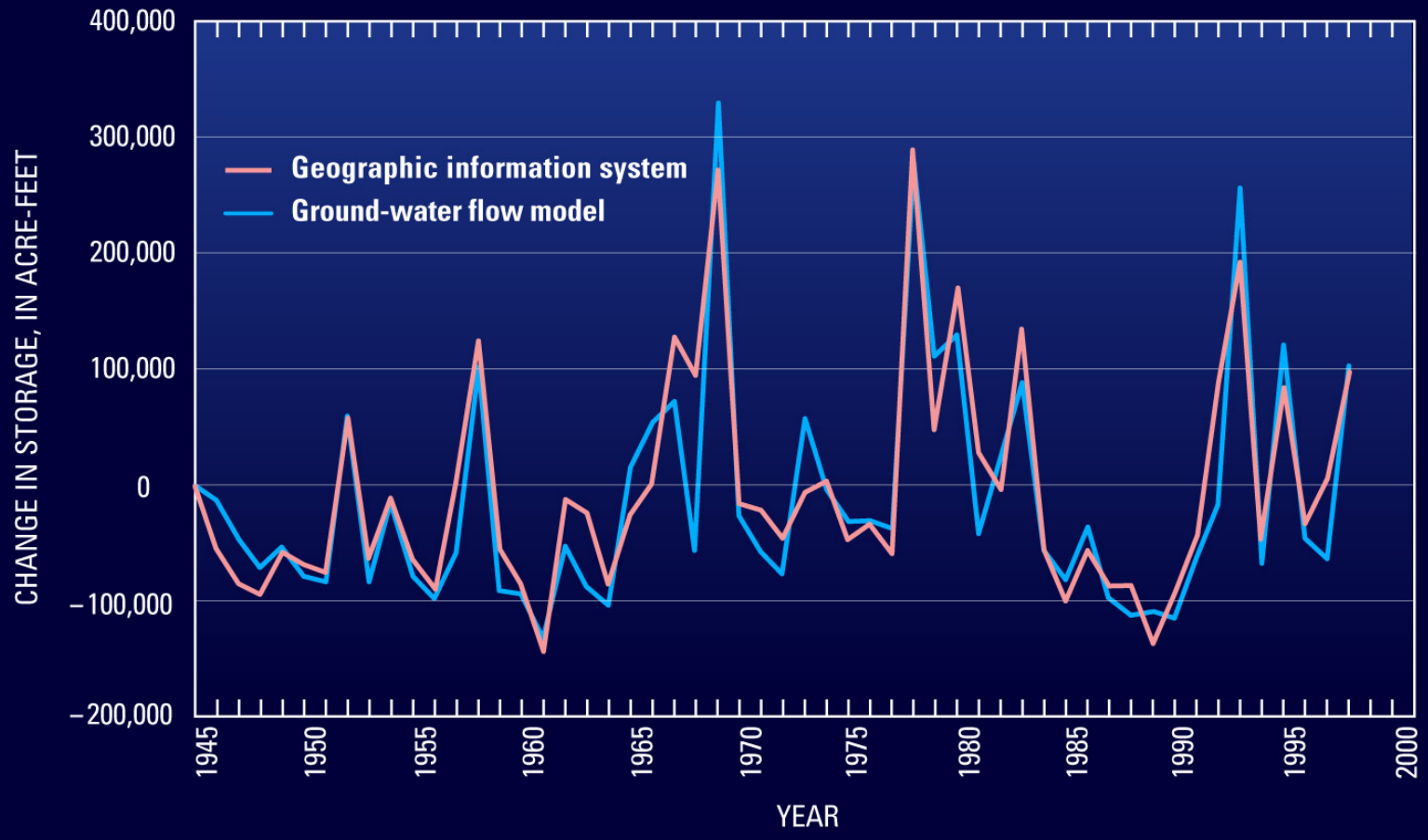
Hydrology, Description of Computer Models, and Evaluation of Selected Water-Management Alternatives in the San Bernardino Area, California

Danskin and others, 2006
Illustrations, Phil Contreras

USGS
science for a changing world



Estimated change in ground-water storage in the San Bernardino area, 1945-98



Computer Models

Calibration

Hydrology, Description of Computer Models, and Evaluation of Selected Water-Management Alternatives in the San Bernardino Area, California

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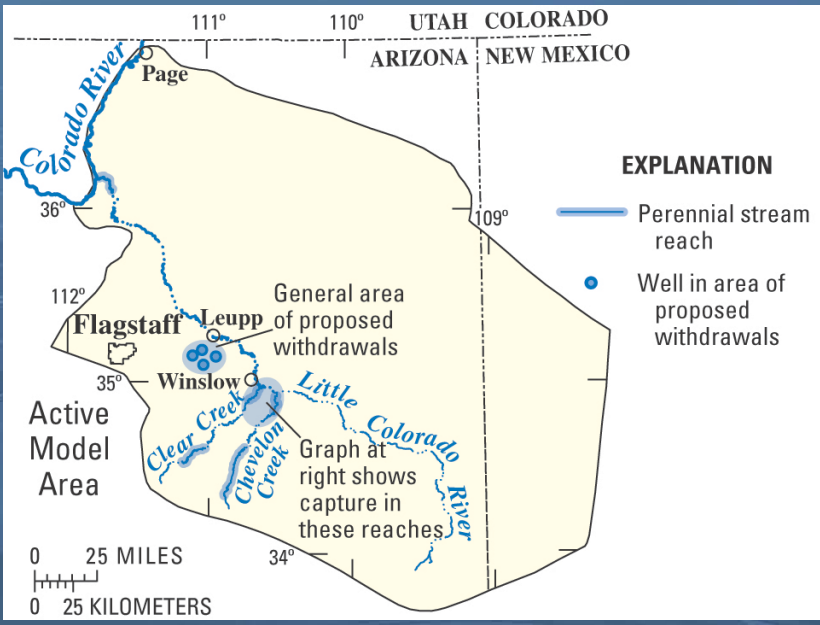
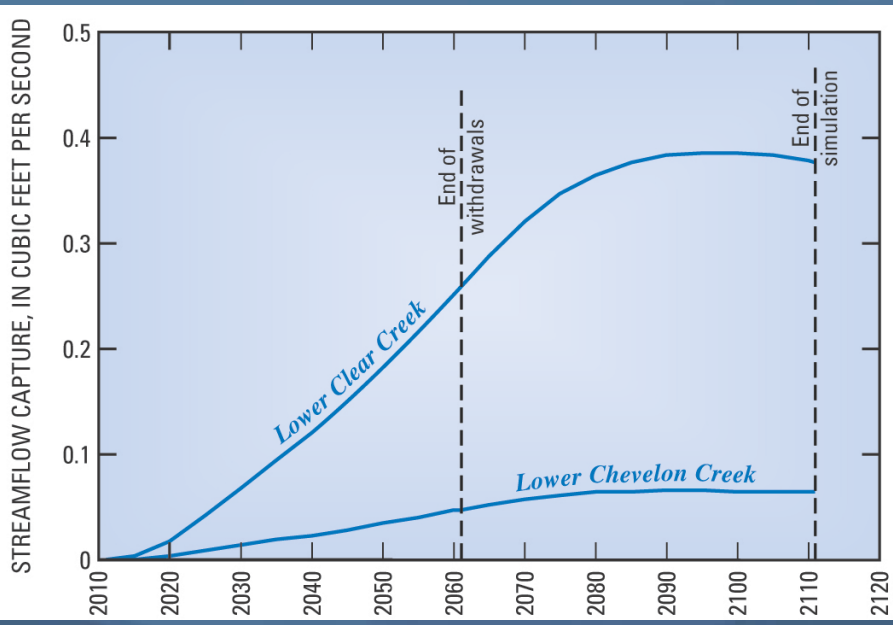
Streamflow Capture





Leake, Hoffmann, and Dickinson, 2005

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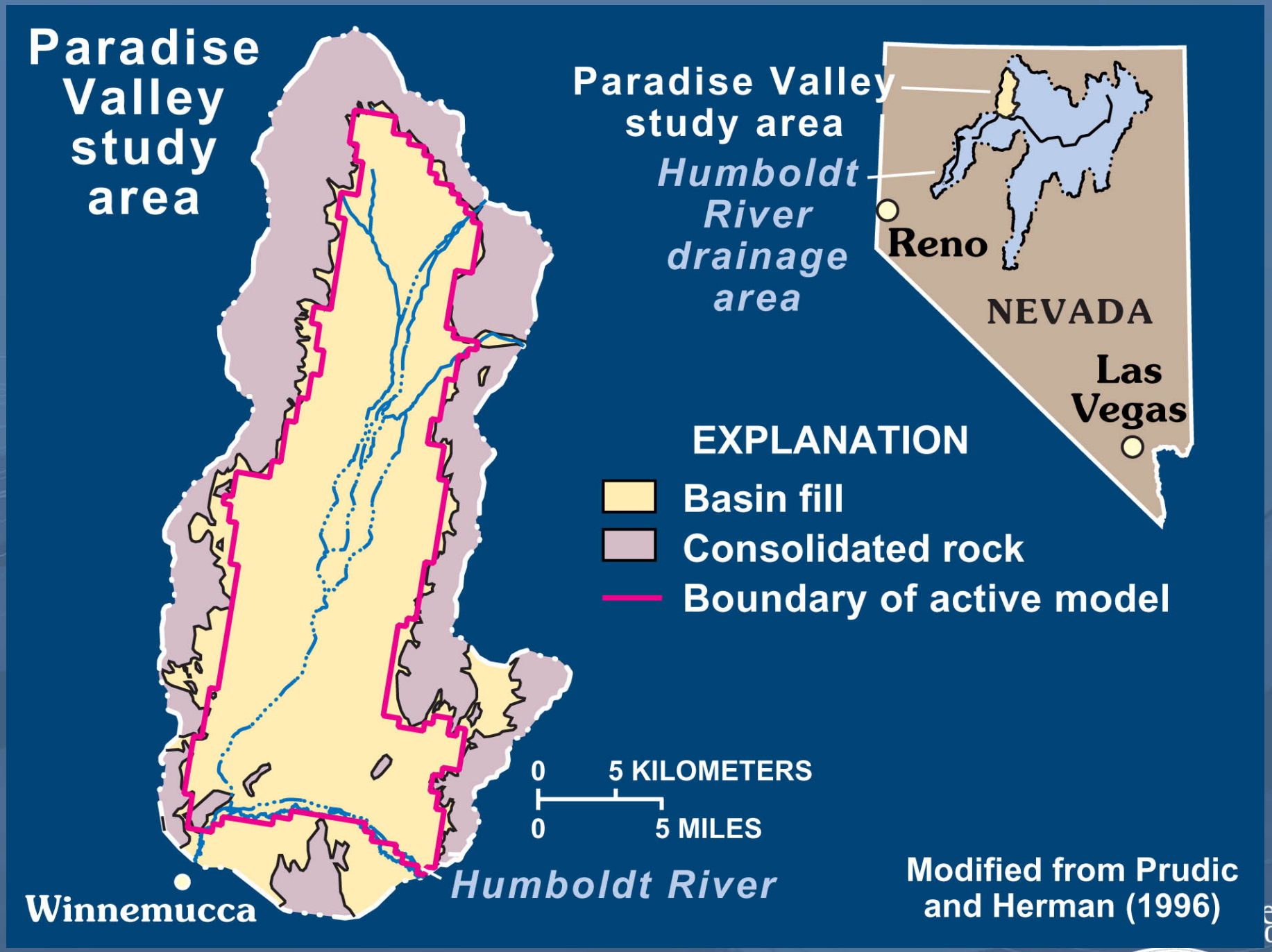
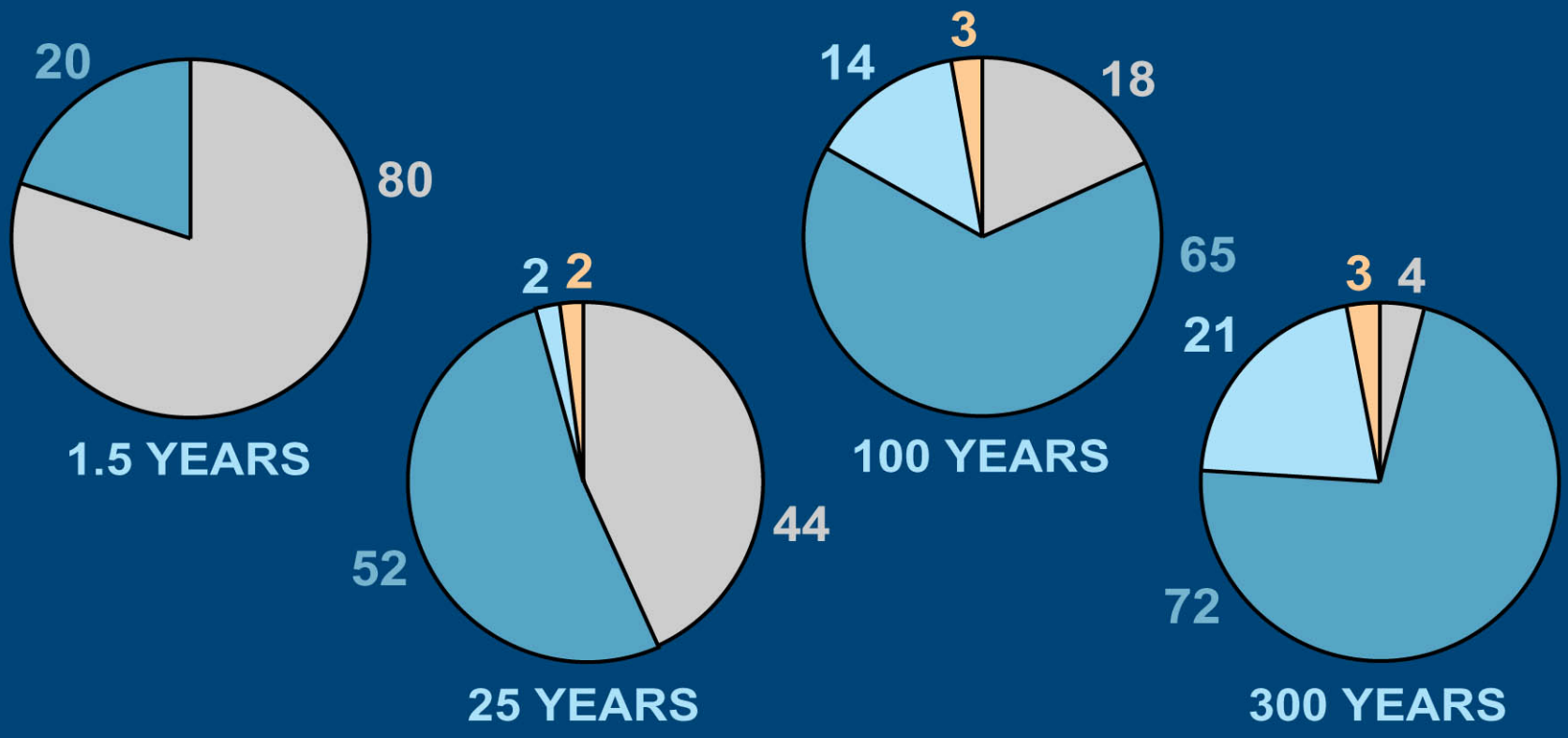

Paradise Valley study area
Paradise Valley study area
Humboldt River drainage area
Reno
NEVADA
Las Vegas
EXPLANATION
Basin fill
Consolidated rock
Boundary of active model
0 5 KILOMETERS
0 5 MILES
Humboldt River
Winnemucca
Modified from Prudic and Herman (1996)

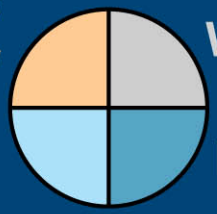


EXPLANATION

Sources of pumped water, in percent, at end of selected time periods

Decreased outflow to Humboldt River Valley

Increased inflow from Humboldt River Valley

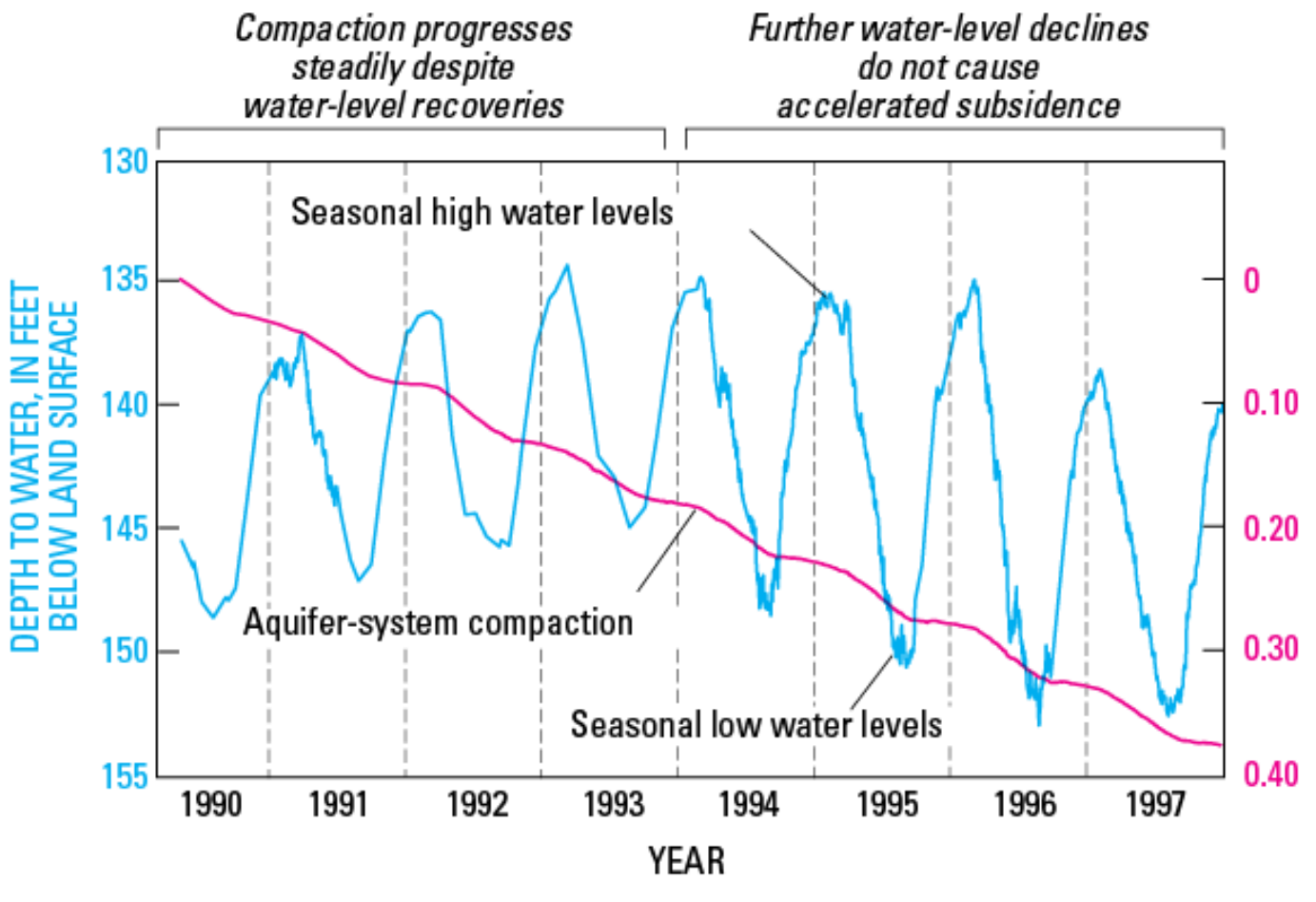


Water from storage

Reduction in evapotranspiration

Modified from Prudic and Herman (1996)

Land Subsidence



Sneed and Galloway (2000)

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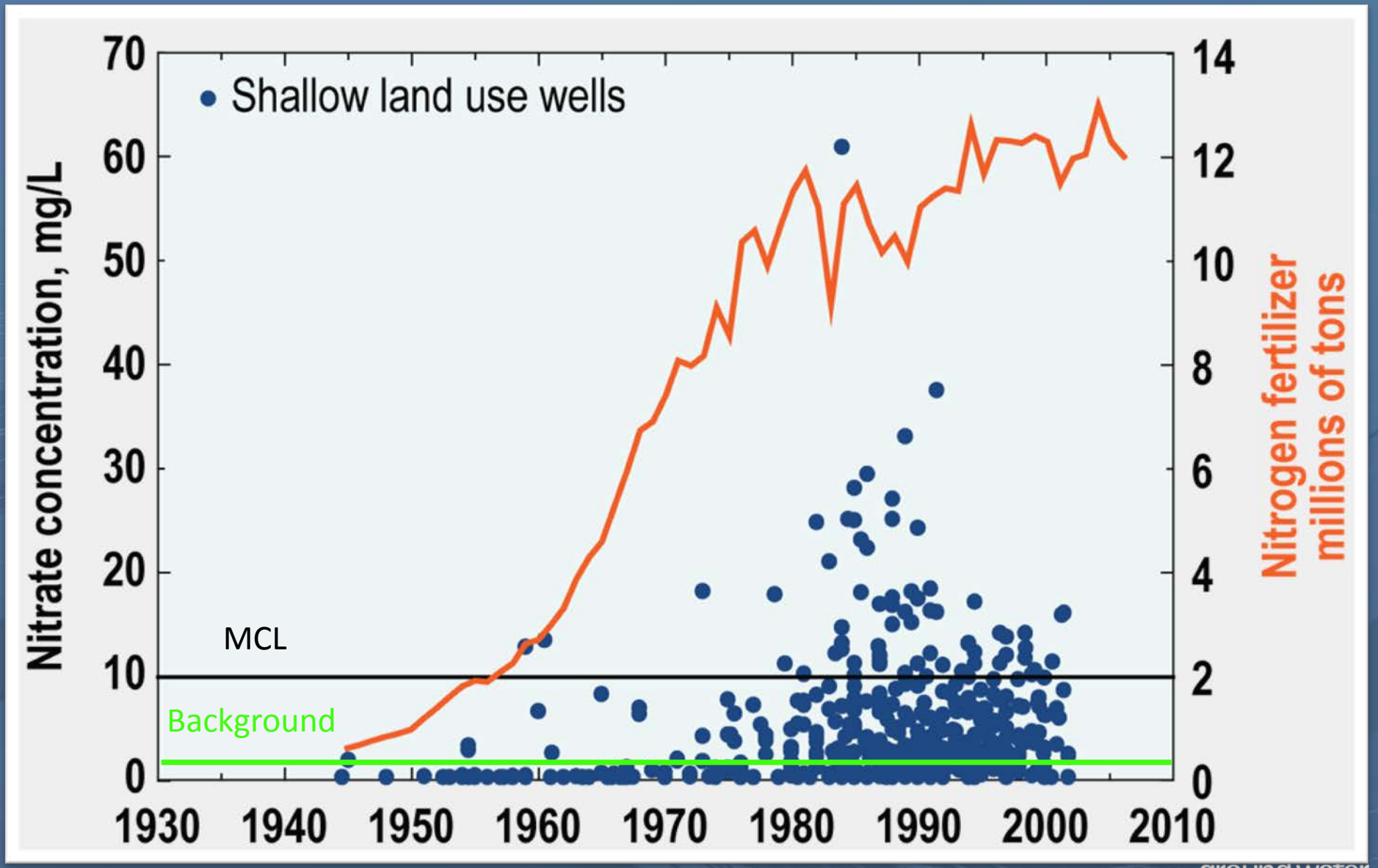
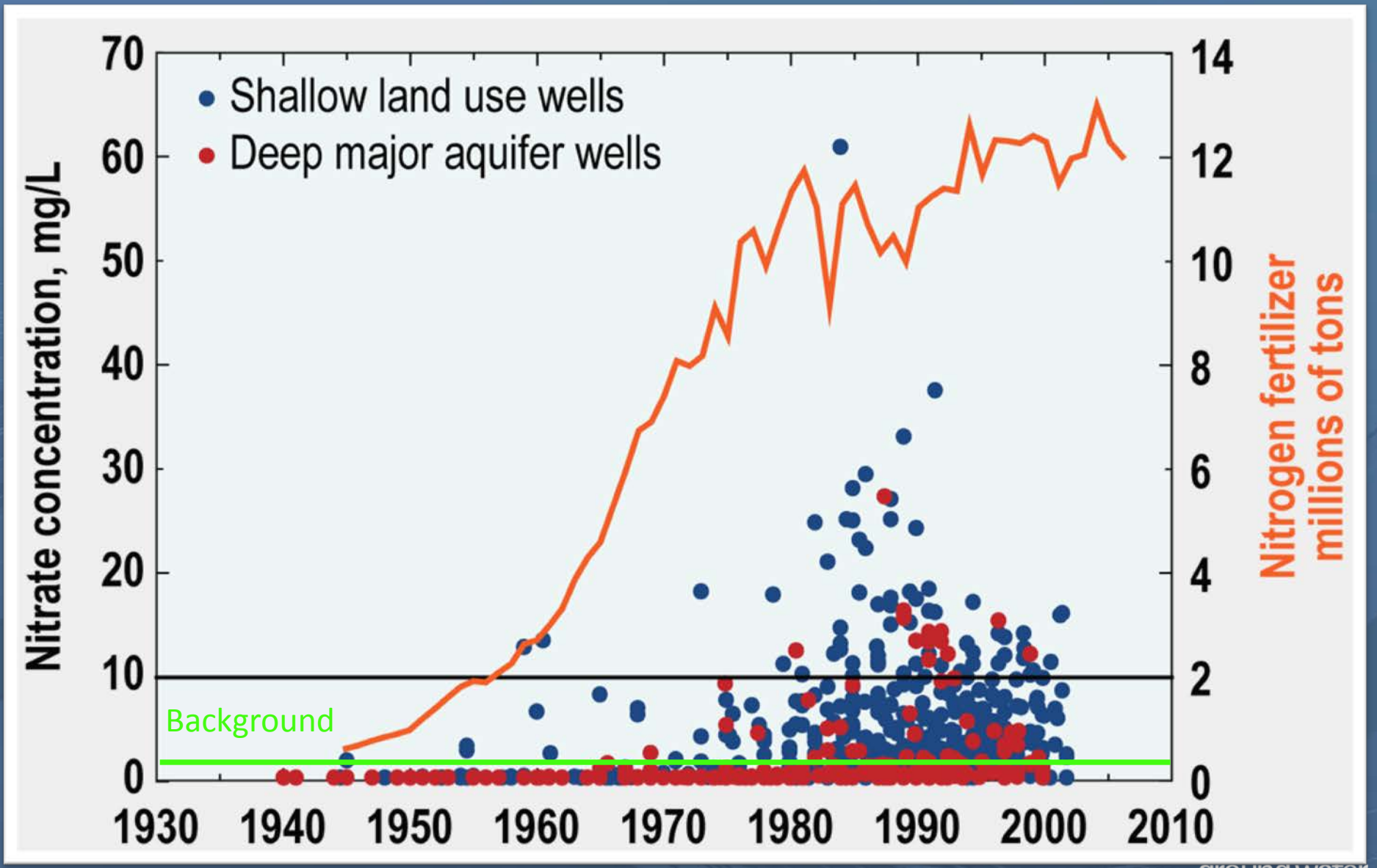
Nitrate Concentration in Groundwater

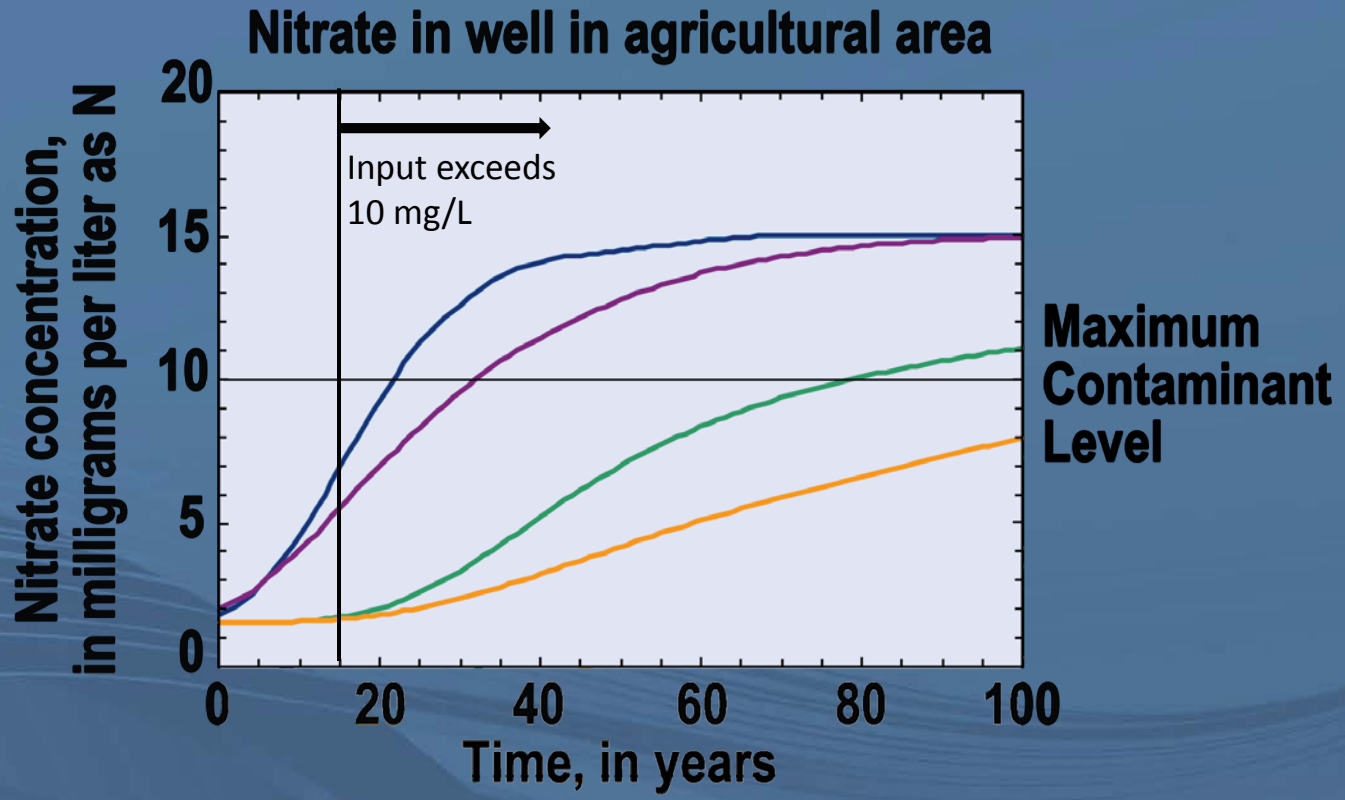


Dubrovsky et al. (2010)

Nitrate Concentration in Groundwater



Dubrovsky et al. (2010)

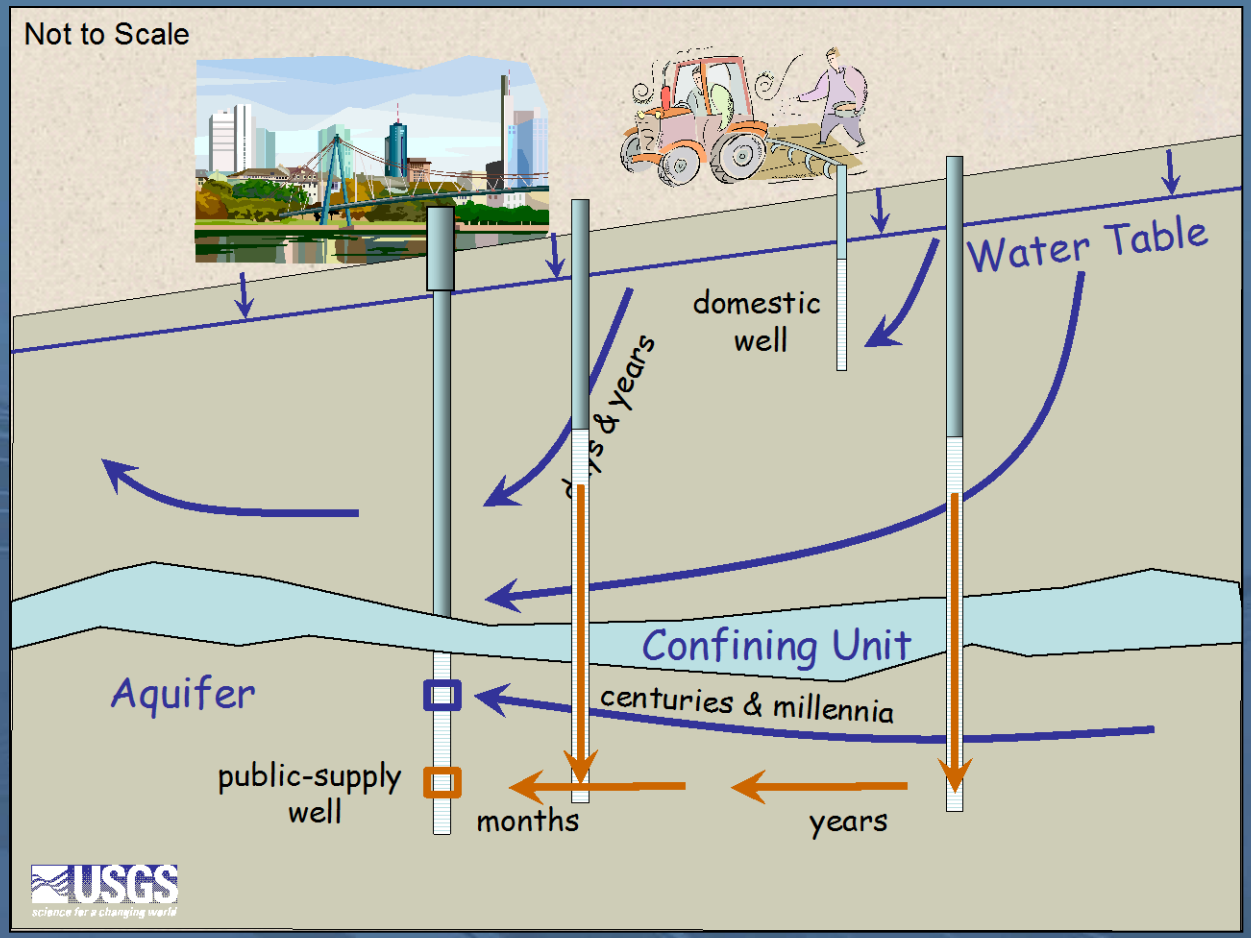


Time-series nitrate concentration in well in selected principal aquifers

- Thick unconsolidated sand and gravel—Central Valley
- Thick unconsolidated sand and gravel—High Plains
- Thin unconsolidated sand and gravel—Glacial
- Carbonate rock—Floridan

Dubrovsky et al. (2010)
Burow and Green (2008)
McMahon et al. (2008)

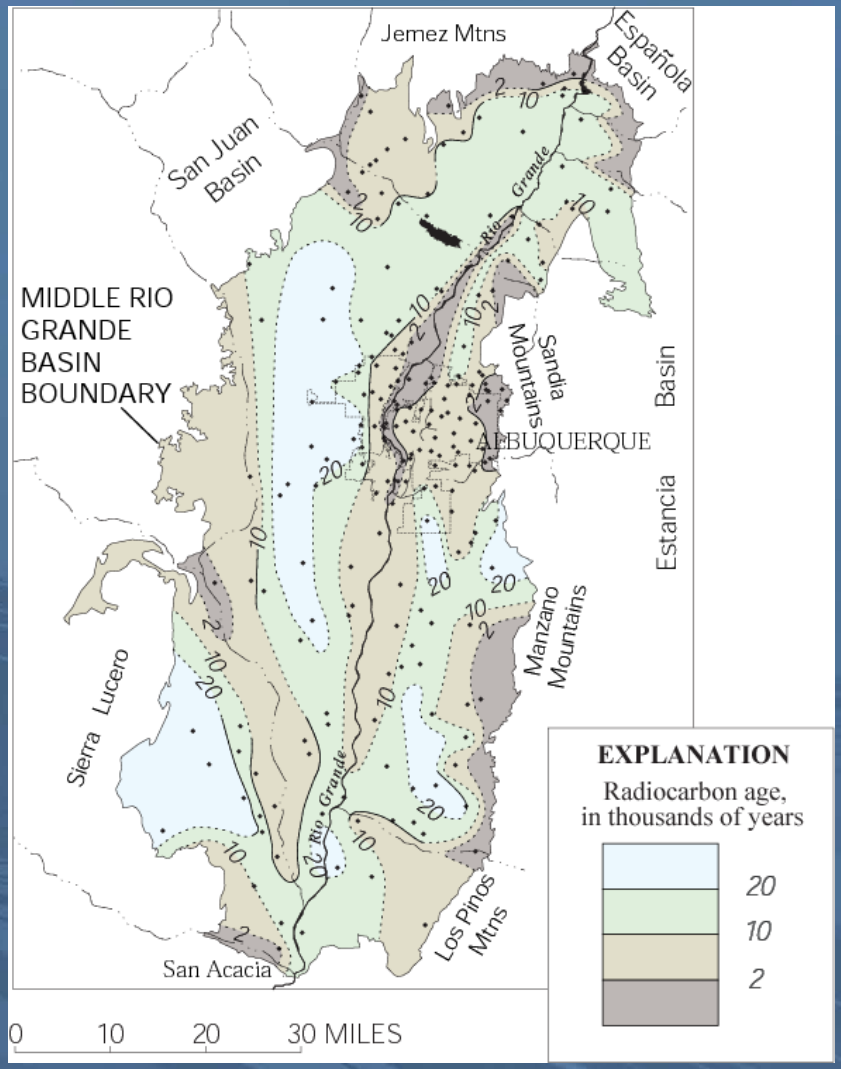
Many systems have "short circuits" that result in rapid movement of contaminants to public wells



Source: S. Eberts, USGS

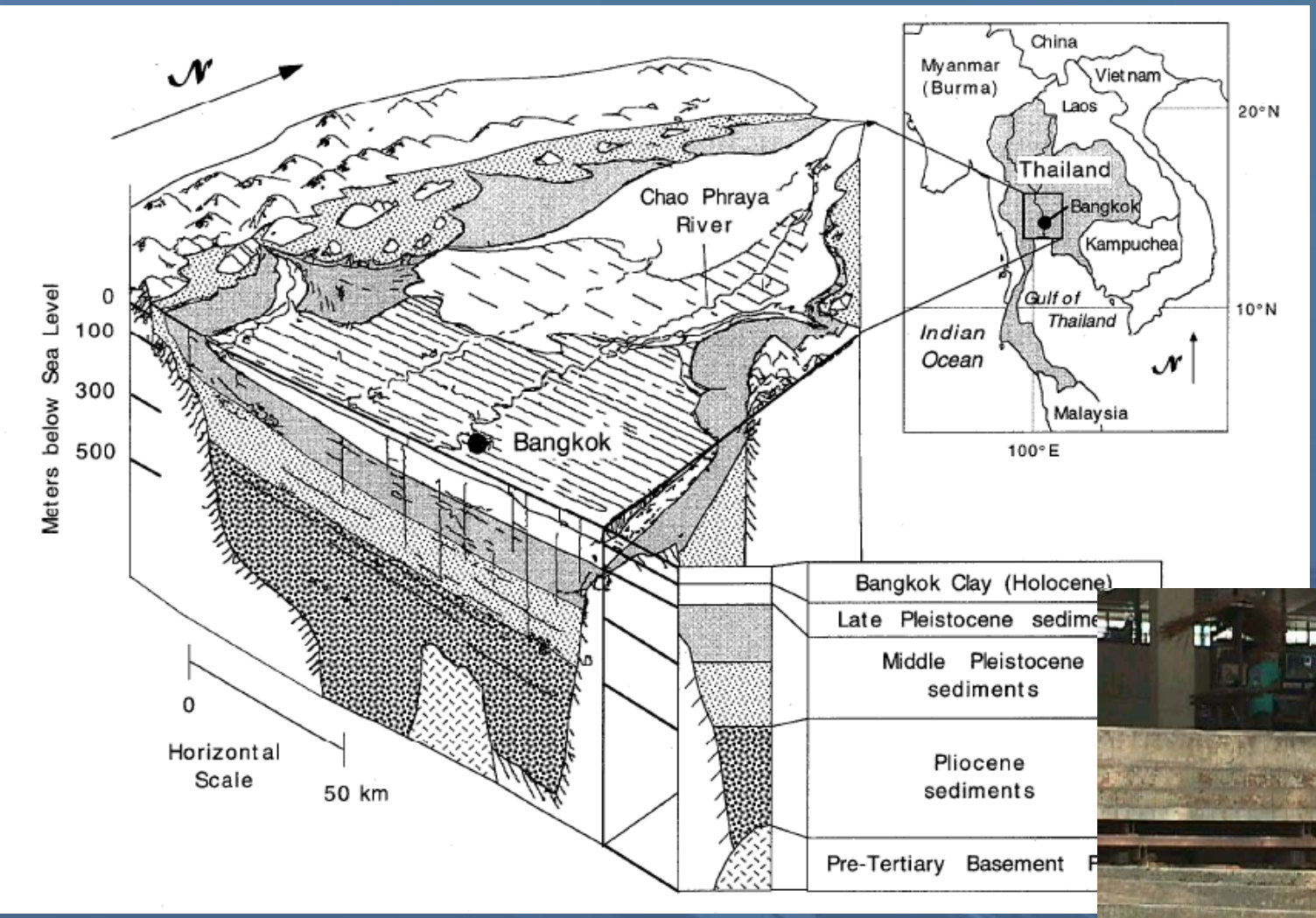
http://oh.water.usgs.gov/tanc/NAWQATANC.htm

Middle Rio Grande Basin



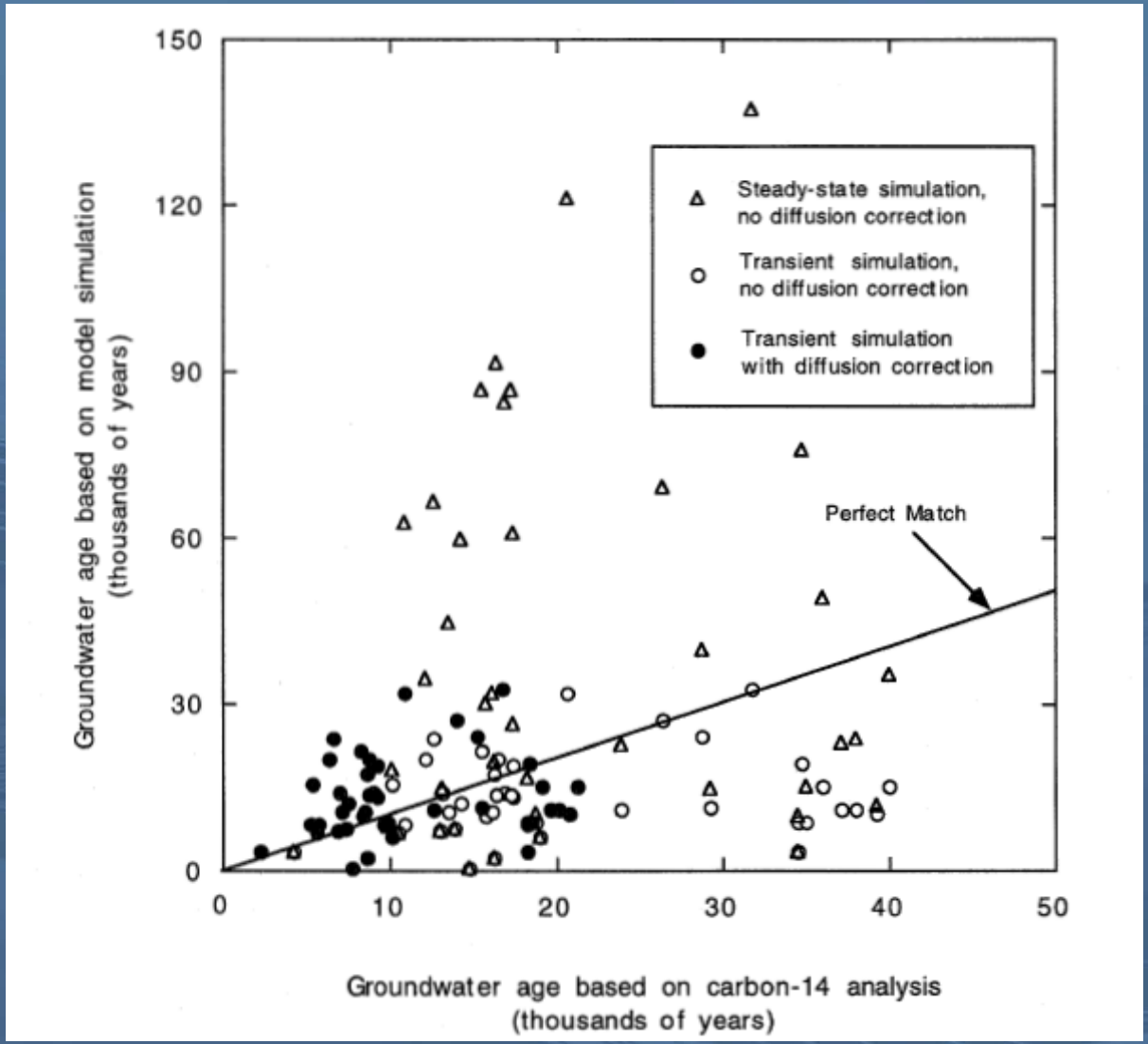
Plummer and others (2004)

Bangkok Basin, Thailand



Sanford and Buapeng (1996)

Bangkok Basin: Importance of Paleoclimatology and Geologic Change



Sanford and Buapeng (1996)

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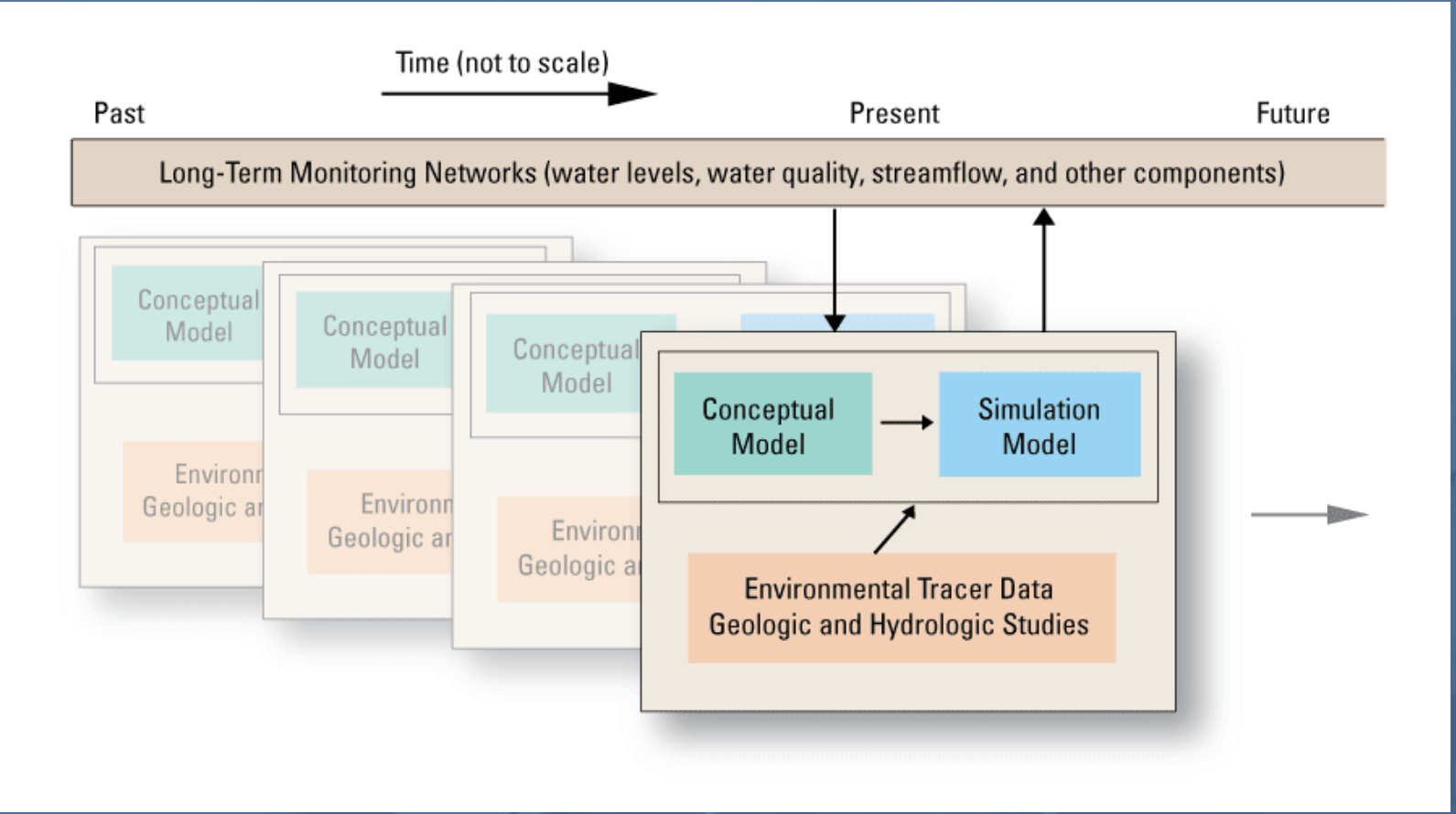
Integrated Monitoring and Modeling



Alley (2006)