

# Nitrate Inputs from Groundwater

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# GW Nitrate Inputs and Sources: Background

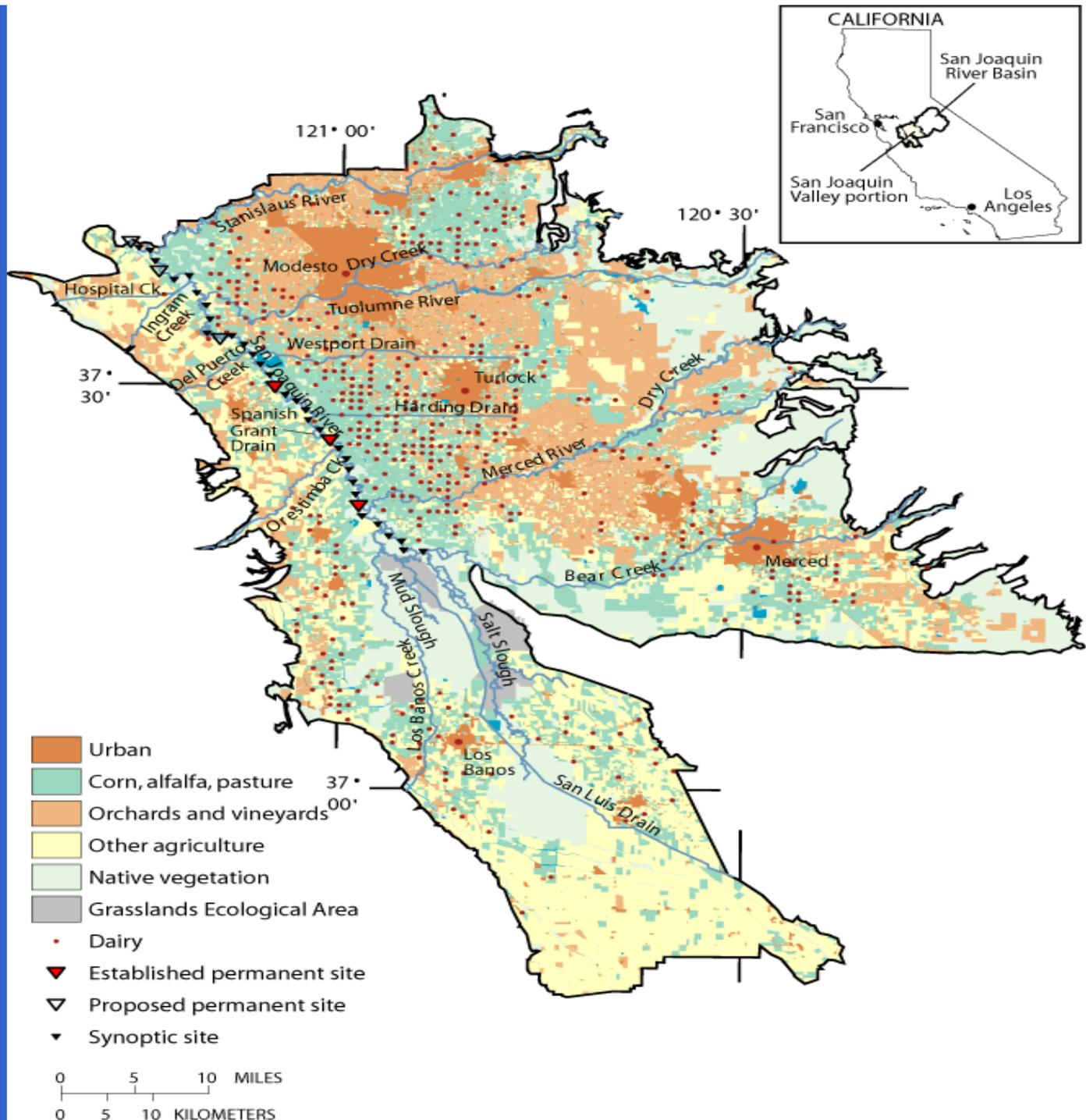
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- SJR concentrations have increased steadily since 1950's
- Tile Drainage – increased in 1960's and 1970's
- WWTPs – increase in discharge over time has been largely offset by improved treatment
- Fertilizer Application – increased in 1950's - 70's
- Manure Production – increased steadily since 1950's
- Soils – increased dramatically since 1950's
- Groundwater – concentrations in regional aquifer have increased steadily since 1950's; high concentrations under Merced River in NAWQA sampling
- $^{15}\text{N}$  and  $^{18}\text{O}$  values of nitrate in SJR and tributaries suggest a significant GW source

# GW Nitrate Inputs and Sources: 3 approaches

- (1) Boat reconnaissance with continuous measurement of temperature, EC, and optical properties of water just above streambed. Collect samples and analyze for C, N, and O isotopes and other tracers – compare with samples from source areas.
- (2) Nested monitoring wells on banks (3) and in SJR (6). Two years of continuous temperature and water level and monthly nutrients. GW inflow rates will be based on 2 numerical methods: simulation of vertical flow and heat flux beneath the streambed at 6 sites; and simulation of 2-D GW flow at the 3 existing transects.
- (3) NAWQA-style synoptic sampling at 30 sites between the 6 monitoring-well sites twice per year (in Spring and Fall, coordinated with the boat recons). At each site -- measure gradients using a manometer with a drivepoint; measure temperature differences between river and below streambed; measure nitrate in river and below streambed.

# GW Nitrate Inputs and Sources: Study Area



**GW  
Nitrate  
Inputs  
and  
Sources:  
NAWQA-  
style  
synoptic  
sampling**



