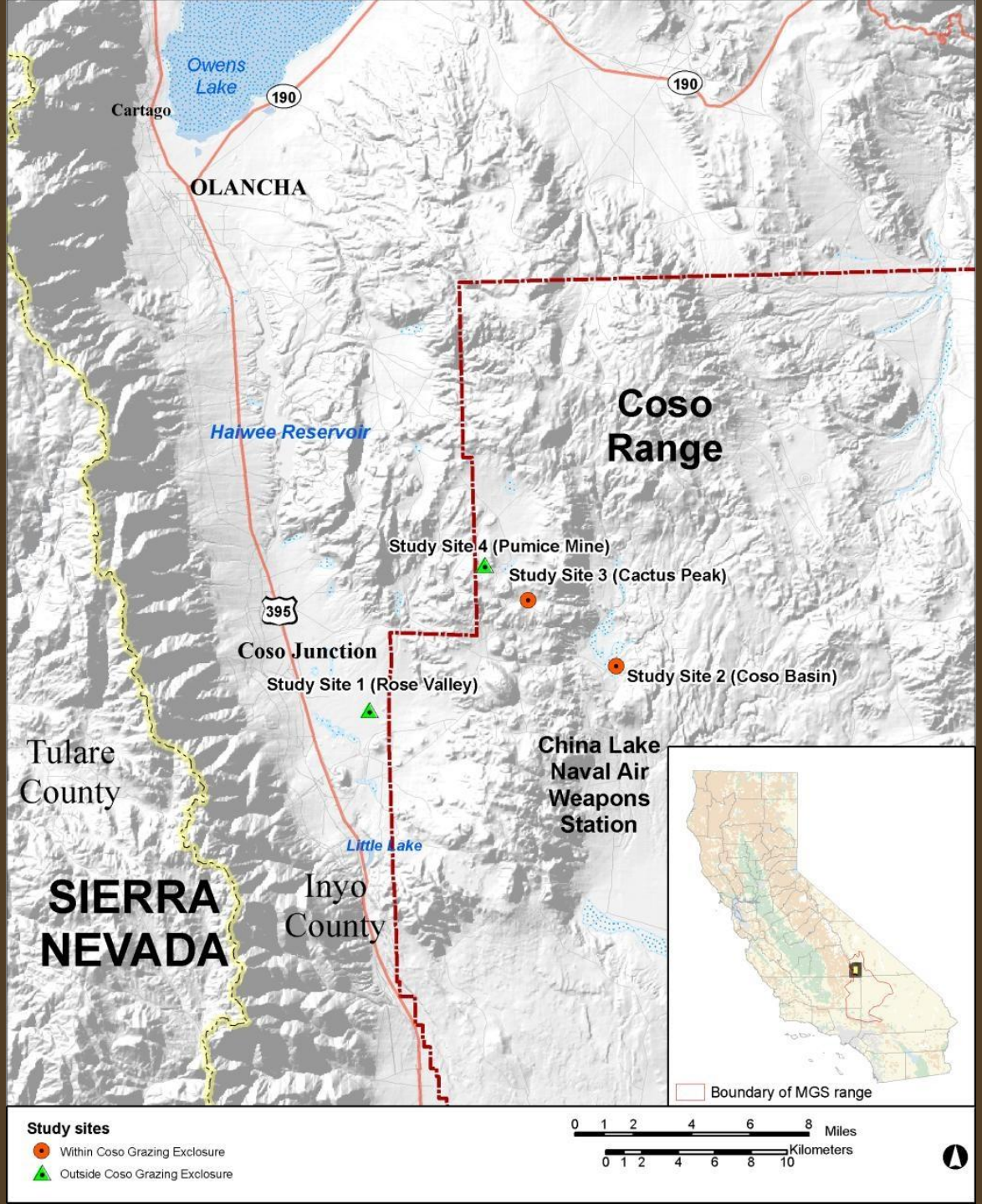
Monitoring MGS Populations at Coso Study Sites

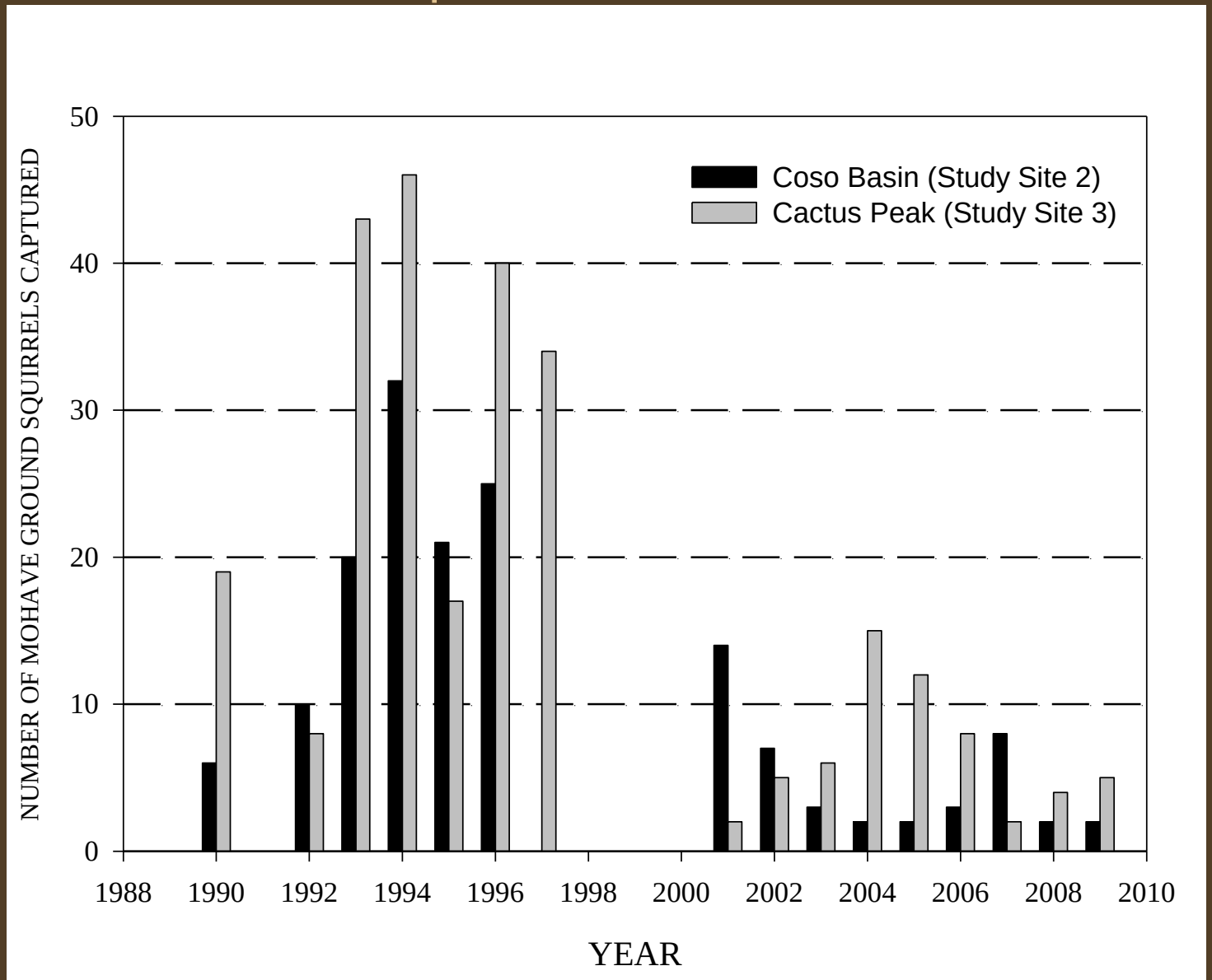
- MGS populations have been studied in the Coso region of Inyo County since 1978
- Geothermal development triggered long-term monitoring starting in 1988
- Coso Grazing Exclosure Study used 4 study sites from 1988-1996
- Monitoring has continued at 2 sites since 2001


Owens Lake
Cartago
190
OLANCHA
190
Haiwee Reservoir
Coso Range
Study Site 4 (Pumice Mine)
Study Site 3 (Cactus Peak)
395
Coso Junction
Study Site 2 (Coso Basin)
Study Site 1 (Rose Valley)
China Lake Naval Air Weapons Station
Tulare County
Little Lake
SIERRA NEVADA
Inyo County
Boundary of MGS range
Study sites
Within Coso Grazing Exclosure
Outside Coso Grazing Exclosure
0 1 2 4 6 8 Miles
0 1 2 4 6 8 10 Kilometers

Consistent Methods

- Study sites are 500 x 500 m with an area of 25 hectares (62 acres)
- Two days of pre-baiting followed by 5 days of trapping
- Trapping period 19 March – 19 April
- Grids are 21 x 21 using 441 traps at 25 meter spacing
- Traps use same bait and are open same number of hours per day

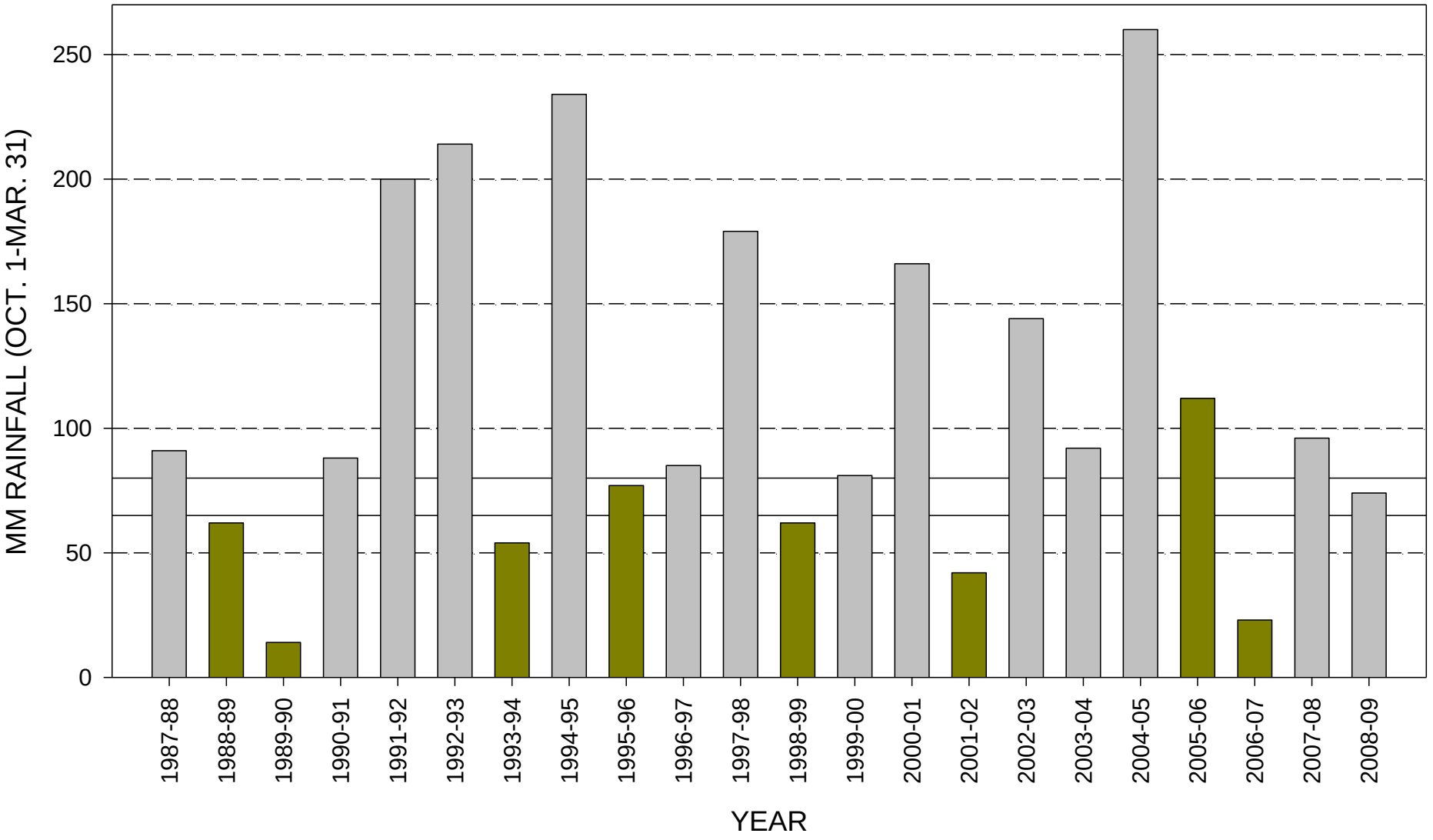
Adult MGS Captured at 2 Coso Study Sites in March and April from 1990-2009



Why the Drastic Difference Between Decades?

- Two sites are on secure military facility and are reserved for research
- No land use changes or human disturbance
- Winter rainfall is the prime driver of biological phenomena in the Mojave
- So what have rainfall patterns been like?

1988-2009 WINTER PRECIPITATION AT HAIWEE POWER PLANT, APPROXIMATELY 15-20 KILOMETERS WNW OF STUDY SITES 2 & 3.



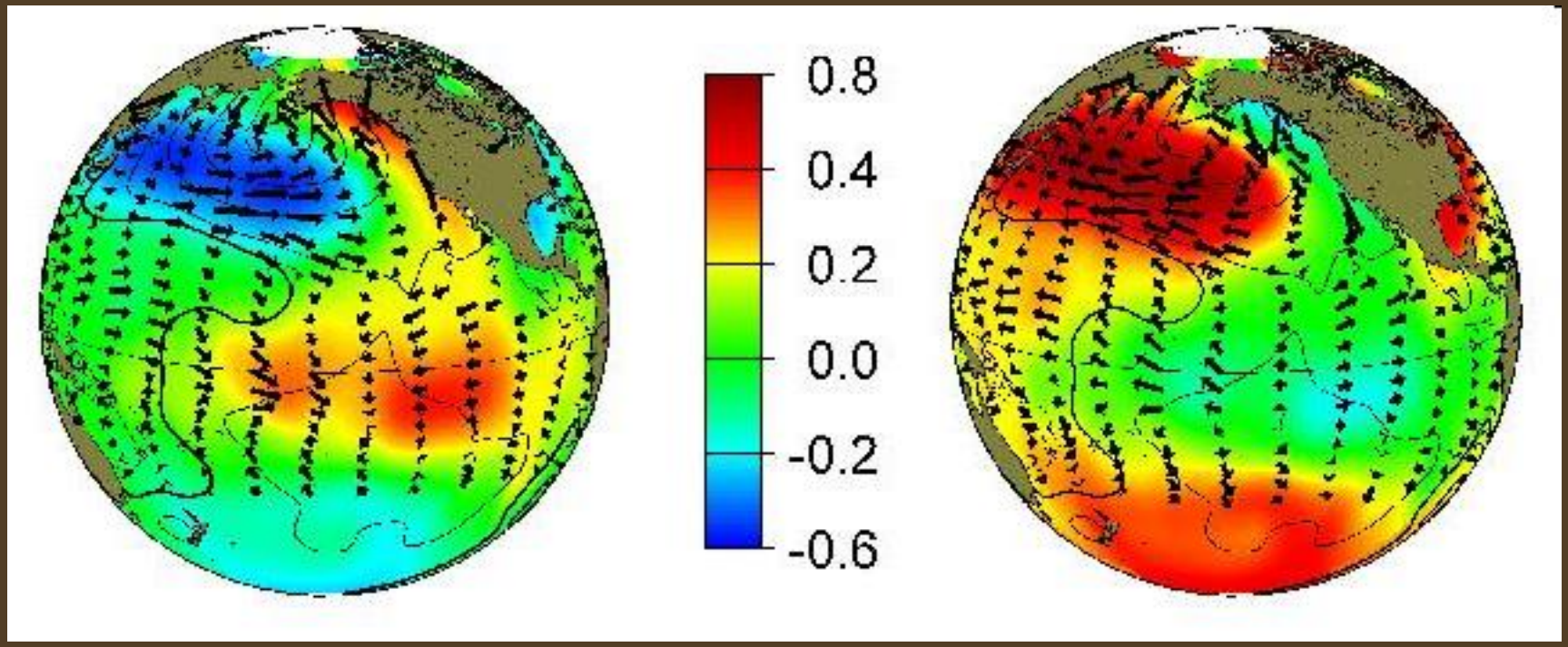
Winter Rainfall Patterns

- Haiwee Power Plant is 15-20 kilometers distant so not a perfect indicator
- Generally 1 dry year alternating with 1-2 wet years
- Each decade has 3 wet years in a row
  - 1991-93 resulted in 3-4x population increase
  - 2003-05 resulted in almost no response
- Maybe local rainfall conditions at the 2 sites were less favorable than at Haiwee PP

Pacific Decadal Oscillation

Warm phase

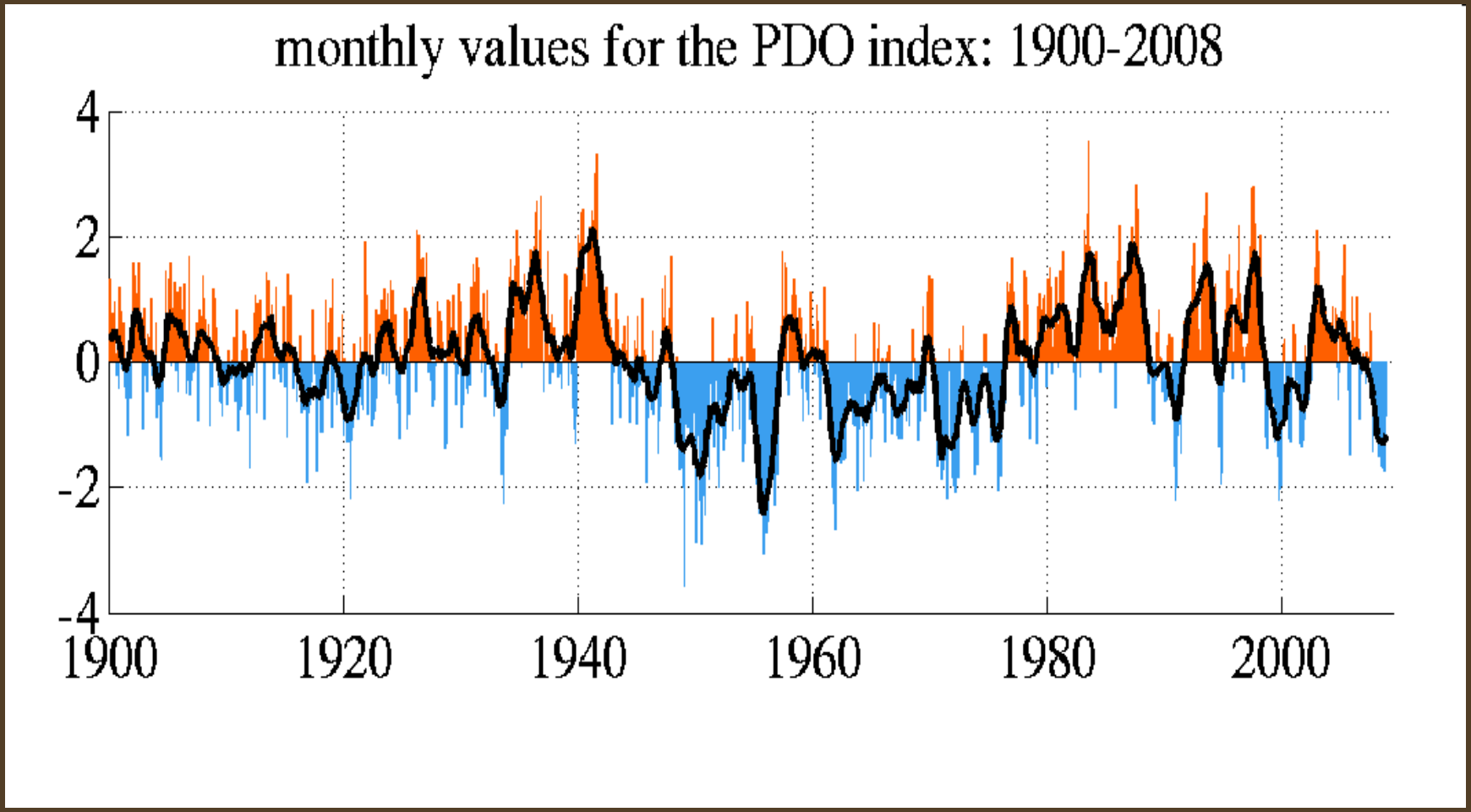
Cool phase



Pacific Decadal Oscillation

- Warm and cool phases refer to SST off western North America
- Phase alternation usually 20-30 yr cycle
- Warm phase means more winter rain to southwestern USA; cool phase means less
- Cool phase 1947-1976; warm phase 1977-1998
- Average western Mojave winter rain was ~50% higher during 1977-1998 than in preceding 31 years

Another Way of Looking at Long-Term Patterns



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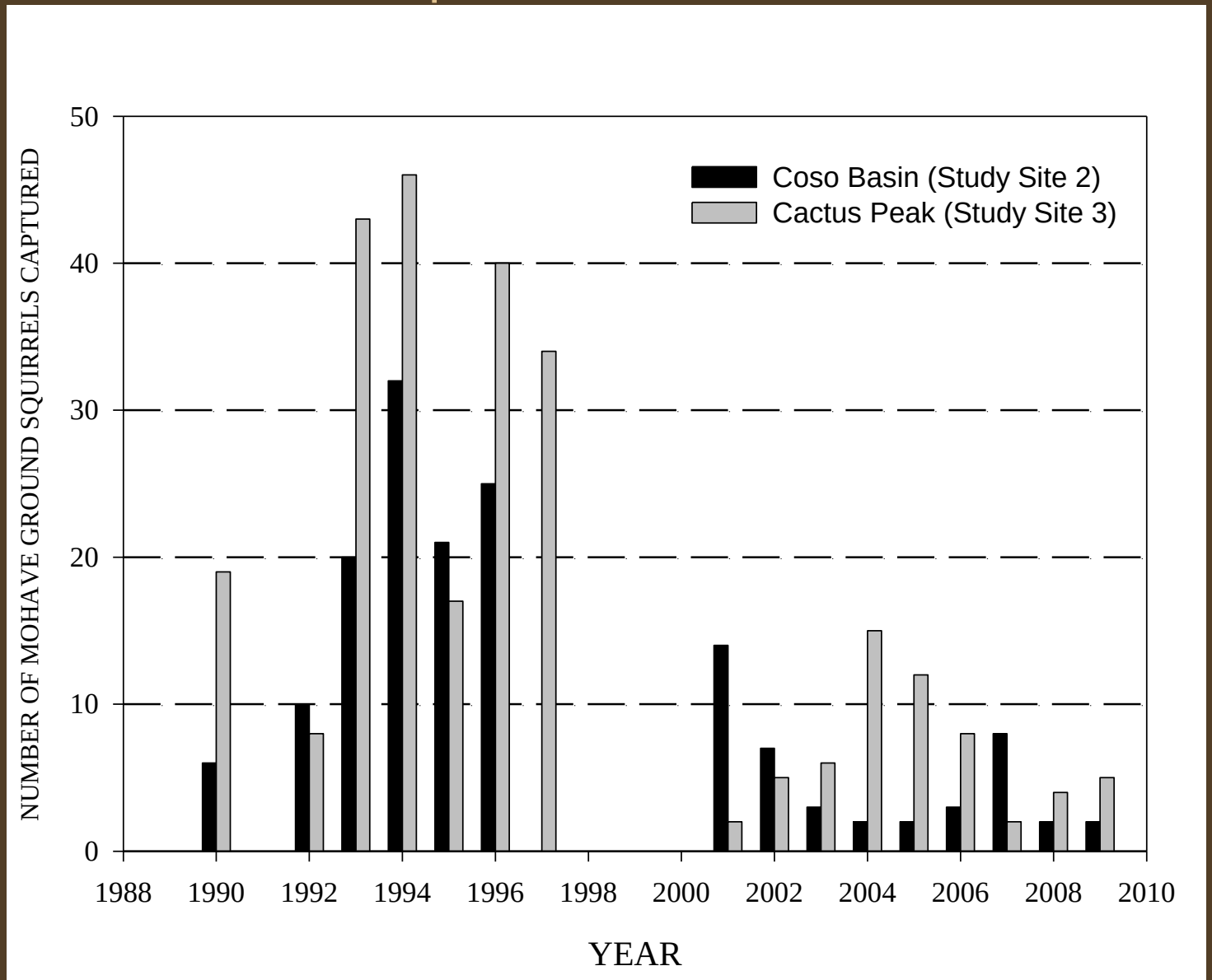

Where does PDO stand now?

- The current decade has been peculiar
- 1998-99 looked like shift to cool phase, but then switch back to warm phase 2002-06
- Now the index is at lowest (coolest) value since 1956
- Interactions with ENSO may be important explanation for some of the variability

Winter Rainfall Patterns and Mohave Ground Squirrel Conservation

- Correlations between long-term winter rain patterns and MGS abundance and distribution are interesting but not perfect
- If we are in a long-term dry period it is even more critical to protect known core populations and connections between them
- Too bad we don’t have more long-term records of MGS numbers!!