

What is the climate science telling us about impacts and nature-based solutions for the region?

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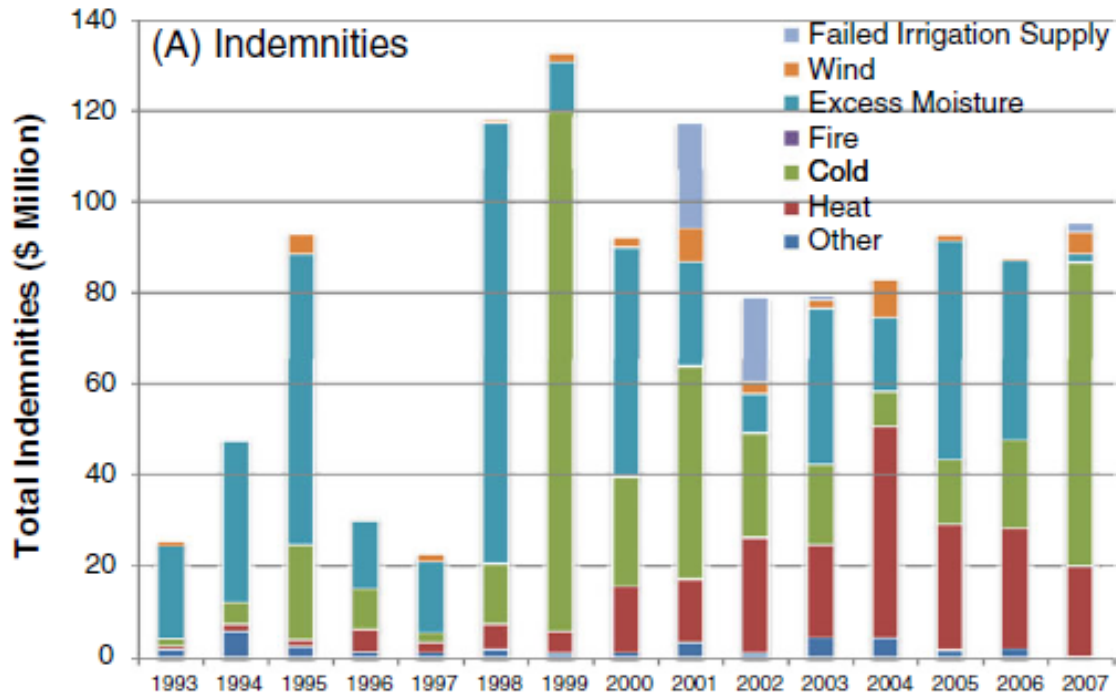
Climate vulnerabilities for CA agricultural production



- California in 2017: >400 commodities, \$50 billion cash receipts, 25 million acres
- Historical legacy of dynamic and innovative change in types of crops and livestock
 - Many drivers: new markets, land use change, labor issues...
 - Few definitive effects from gradual increase in temperature (exception is ↓ chill hours for fruit trees)
 - Breeding programs for diseases, pests and quality may have inadvertently contributed to environmental adaptation
- Adaptation to more extreme events is our new challenge
 - Heat waves
 - Drought
 - Intense rain and flooding
 - Wind
 - Fire
- Without climate change adaptation on croplands and rangelands, more urban conversion is likely
 - Croplands have much lower GHG emissions than urban lands
 - Farmland preservation and urban in-fill development will reduce GHG emissions, e.g., due to ↓ vehicle emissions



Evaluating severity of extreme events on CA agriculture



Total amount of indemnity payments from disasters for each year by type of extreme event (USDA Risk Management)

Most costly overall:

- 1) Excess moisture
- 2) Cold spells
- 3) Heat waves

- Typical metrics of severity do not include other ramifications for the farmer
 - e.g., drilling new wells, replanting perennial crops, buying animal feed, diversifying income
- Environmental costs may accrue through time, and solutions often demand energy use
 - e.g., ↑groundwater depletion, ↑soil salinity, ↑soil erosion during fallow, ↓water quality
- Impacts on families, communities and public health must be considered

Striving for adaptation/mitigation and resilience



- Resilience: multi-benefit approaches to resist damage and respond to perturbation
- Healthy Soils Initiative (CDFA)
 - Conservation management to improve soil health, sequester carbon and reduce GHG emissions
 - \$15 million in 2018, partly from California Climate Investments
- Water Resilience Portfolio (EO N-10-19) (CA Natural Resources Agency)
 - ‘Complementary actions to ensure safe and dependable water supplies, flood protection and healthy waterways for the state’s communities, economy and environment’
 - SGMA: halt overdraft; balance pumping and recharge
 - SWEEP: practices to ↓water use and ↓GHG emissions
- 2030 Natural and Working Lands Climate Change Implementation Plan
 - Conservation, restoration and management activities 2 to 5 times above current levels in 2030
- Partnerships: state and federal agencies, NGOs, UC, land managers and stakeholders
- Ahead... A bigger role for agroecology?
 - Reliance on biodiversity and ecological processes
 - Use of renewable inputs to support ecological intensification
 - Deal with complex problems with complex solutions



Specific examples of opportunities for nature-based solutions



- **Crop and livestock adaptation:**
 - Explore the use of biodiversity for farm and rangeland management so that new options become available, e.g., crop varieties with enhanced yield and quality in ‘healthy soils’
- **Soil health and soil quality:**
 - Include practices to minimize soil erosion since soil loss will increase with more precipitation as atmospheric rivers, and with more drought-induced fallows and overgrazing
- **Resilient water systems:**
 - Investigate how forest health can promote the capacity of reservoirs, e.g., potential for less sedimentation after wildfire and atmospheric rivers
- **Watershed and landscape collaborations:**
 - Support local initiatives to map marginal and riparian lands for ecosystem restoration
- **Farmland preservation:**
 - Survey multi-generational and multi-decade farms and ranches to discover factors that favor longevity

