Siting and Transmission Strategy

RETI Environmental Stakeholder Workshop

Riverside, California

February 29, 2008

Goal

- Develop an approach for evaluating and expediting appropriately sited solar, wind, and geothermal resources in California, and the transmission capacity needed to bring these resources to market in a timeframe to both meet California's leadership goals and reduce greenhouse gas emissions from fossil sources nationally.

Appropriate Siting

- Appropriate siting means:
  - fewest environmental impacts possible
  - Efficient use of existing infrastructure
  - Not in any protected areas
  - Takes into account priority areas not in protected areas

Agenda

1. Overview of the situation
2. Projects we are already engaged in
3. Getting heard, participation needs
4. Strategy for 2008
5. Communications

Overview

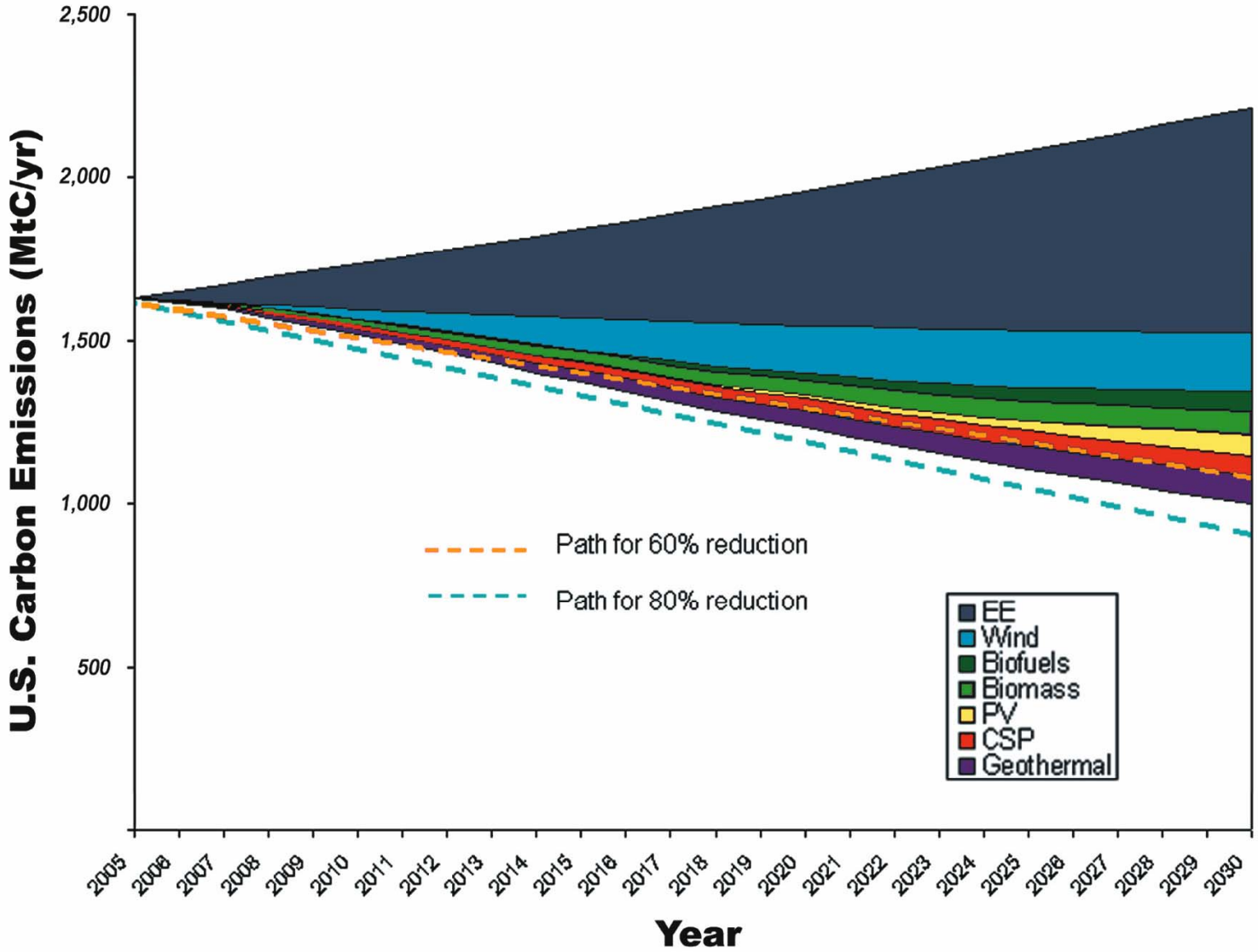
- The situation is complicated with numerous agencies, siting and transmission proposals
- Stakeholder participation is being taken seriously
- We need to decide where to focus most of our efforts and prioritize
- Key question: What gets us the best opportunity to influence final outcomes?

Players involved with Powerlines and Siting issues

- DOE
- BLM
- FERC
- CEC
- CPUC
- Cal ISO
- USFS
- USFWS (consultative)
- Utilities
- Generators
- Environmental Groups
- Communities

Environmental Goals

- Fight Global Warming
- Rely on efficiency, solar, wind, geothermal, biomass, biofuels, etc.
  - No Nuclear component
- Block Coal Plants
- Resilient Habitats


U.S. Carbon Emissions (MtC/yr)
2,500
2,000
1,500
1,000
500
Path for 60% reduction
Path for 80% reduction
EE
Wind
Biofuels
Biomass
PV
CSP
Geothermal
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year

Stopping the Coal Rush

Coal-fired power plants produce about half of our electricity. There are plans on the drawing board to build over 150 new plants in the next few years. With new laws to fight global warming expected on the horizon, the coal industry is rushing to build as many new plants as possible before pollution safeguards are in place. In an industry motivated by the bottom line, it's not surprising that 85% of this "new generation" of proposed plants would use the same old technology of your grandparent's era—the same technology that creates the global warming pollution.

Overview: Consequences…

"If global emissions of carbon dioxide continue to rise at the rate of the past decade...there will be disastrous effects, including increasingly rapid sea level rise, increased frequency of droughts and floods, and increased stress on wildlife and plants due to rapidly shifting climate zones." -- James Hansen, one of America's leading climate scientists, NASA

From NPCA “Unnatural Disasters”

“From melting glaciers at Glacier National Park to disappearing Joshua trees at Joshua Tree National Park, climate change threatens to radically alter our national parks. But our parks also can help us understand the extent of climate change, how to minimize its effects, and how to protect natural treasures for the enjoyment of generations to come.”

From "Losing Ground" NRDC and RMCO (2006)

"Desert bighorn sheep are in danger of extinction across their range, including in California's **Death Valley** and **Joshua Tree national parks** and **Mojave National Preserve**"...

"Projections of future warming by the end of the century range from, on the low end, 3 to 7 degrees Fahrenheit for the entire West to, on the high end, as much as a 14-degree Fahrenheit warming in the Southwest….In the arid and semi-arid West, changes of these magnitudes would fundamentally disrupt the region's ecosystems." ...

From “Losing Ground” NRDC and RMCO (2006)

Researchers have documented substantial mortality of Joshua trees in California’s high desert and project that because of climate warming the trees “will be unable to persist much longer within Joshua Tree National Park.”

“I honestly believe that we are standing at the edge of a very, very large mass extinction, and top-of-mountain species are going to be the first to go.”

DR. TERRY ROOT, STANFORD UNIVERSITY (2005)

New Uranium Rush Threatens Deserts

Uranium Exploration Near Grand Canyon

- By FELICITY BARRINGER

Published: February 7, 2008

With minimal public notice and no formal environmental review, the Forest Service has approved a permit allowing a British mining company to explore for uranium just outside Grand Canyon National Park, less than three miles from a popular lookout over the canyon's southern rim.

California Impacts

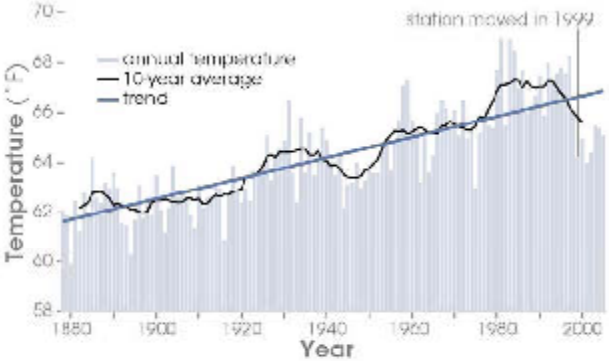
- Shifting ranges for flora and fauna
- Reduced snowpack
- Spring floods and summer droughts
- Changes in migratory behavior
- Increased extinctions
- Increased pest infestations and wildfires
- Sea level rise

KEY POINTS

- California's climate is already rapidly changing
- Expect greater stress on species and habitats
- Species/habitats will respond in different, perhaps surprising, ways
- We can take action now to help them adapt and survive

From a presentation by Marc Hoshovsky, CDFG, with help from CEC's PIER program

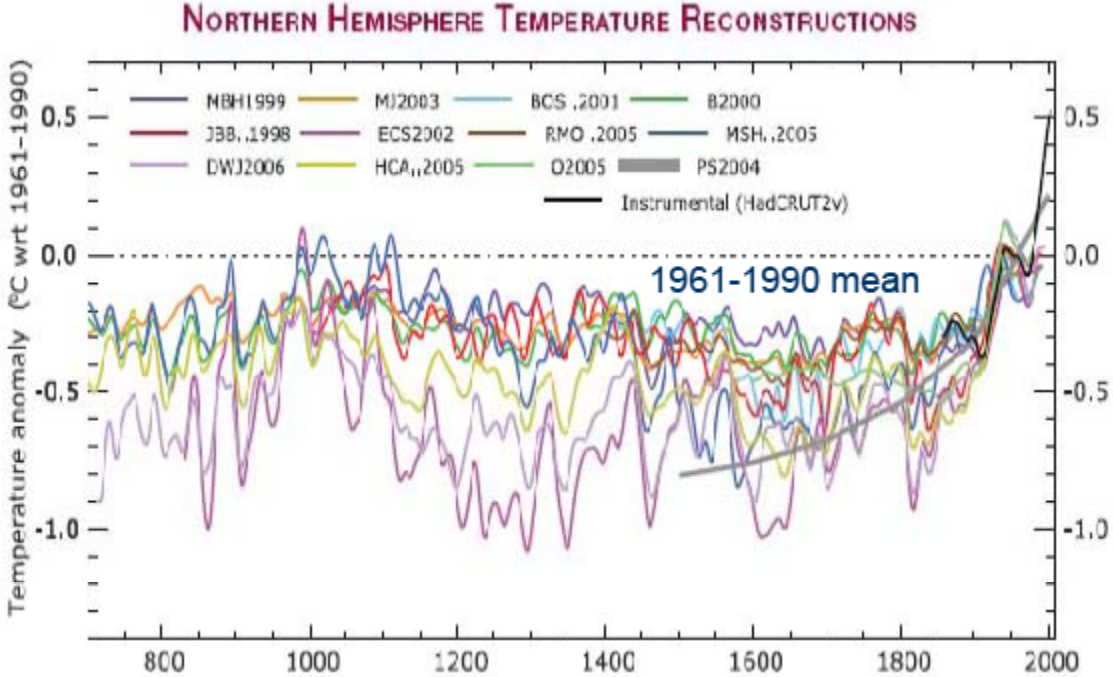
CALIFORNIA IS ALREADY WARMING 1950-2000



Los Angeles Temperature Trend 1880-2007

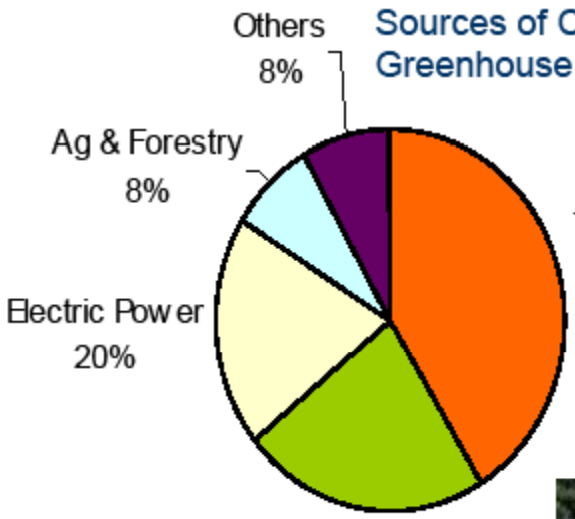
earthobservatory.nasa.gov

Northern Hemisphere is warmer than past 1300 years



IPCC (2007)

Warming is due to increased greenhouse gases



Mostly motor gasoline burned in light duty vehicles.

CEC 2005

How will temperature change in the future?

Depends on our choices

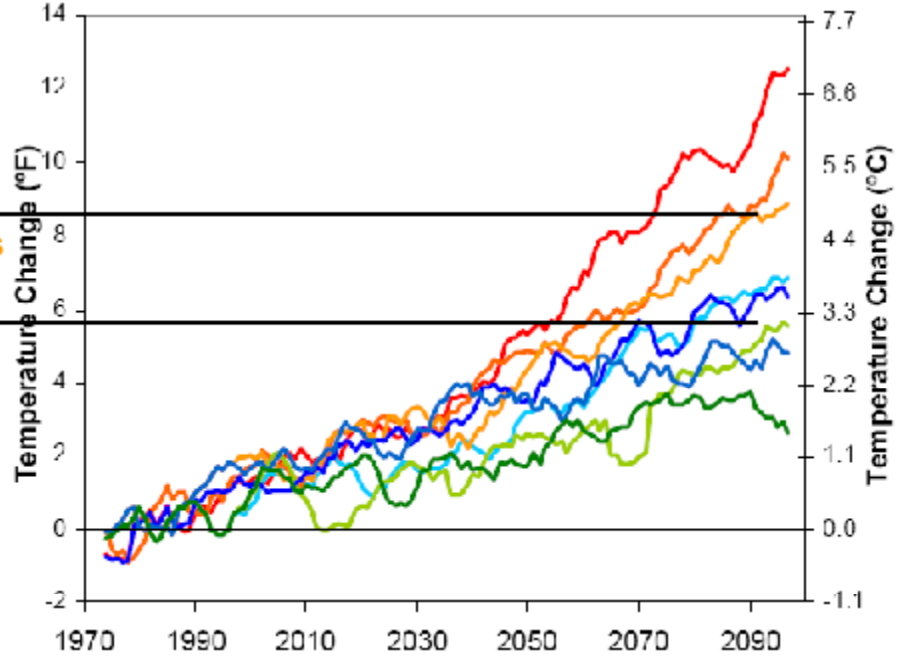
- High emissions
  - **Rapid, fossil-fuel intensive growth**
- Moderate emissions
  - **Primarily fossil-fuel dependent growth**
  - **Some green technology**
- Lowest emissions
  - **Shift to service & information economy**
  - **Lots of green technology**

How will temperature change in the future?

High Emissions
+8.1 to 10.4 °F

Medium Emissions
+5.6 to 7.0 °F

Lowest Emissions
+3.0 to 4.7 °F



Cayan et al. 2006a

EXPECT THREE KEY PHYSICAL IMPACTS

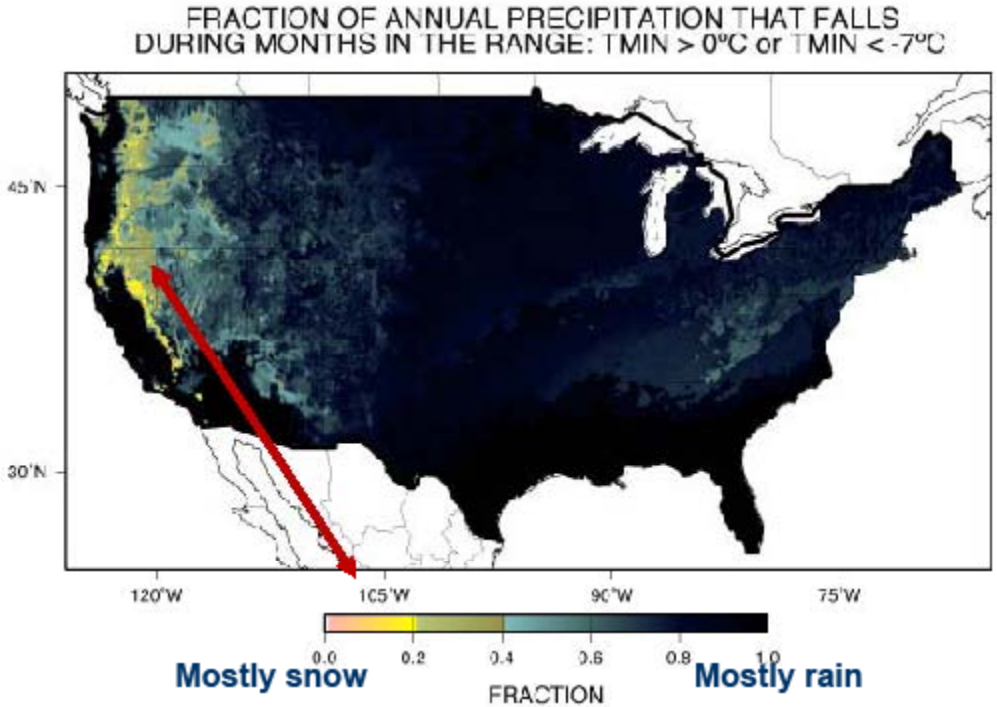
- Greater seasonality in precipitation
  - Less winter snow in mountains
  - More summer drought
- Risk of large wildfires
- Sea level rise

PHYSICAL IMPACTS VARY WITH EMISSION LEVELS

	Temp Change	Sierra snowpack	Critically dry years	Large fire risk	Sea level rise
High Emissions	8-10.4ºF	90% loss	2.5x	*not evaluated*	22-33"
Medium Emissions	5.5-7.9ºF	78-80% loss	2-2.5x	55% increase	14-22"
Lower Emissions	3.0-5.4ºF	30-60% loss	1-1.5x	10-35% increase	6-14"

California Climate Change Center 2006

Most of California's Water Depends on Snow



"Rain vs Snow"

Derived from OSU's PRISM monthly mean climatologies, 1971-2000

Dettinger, USGS

SNOWPACK ALREADY REDUCING IN SIERRA

Dana Glacier

1883 I.C. Russell

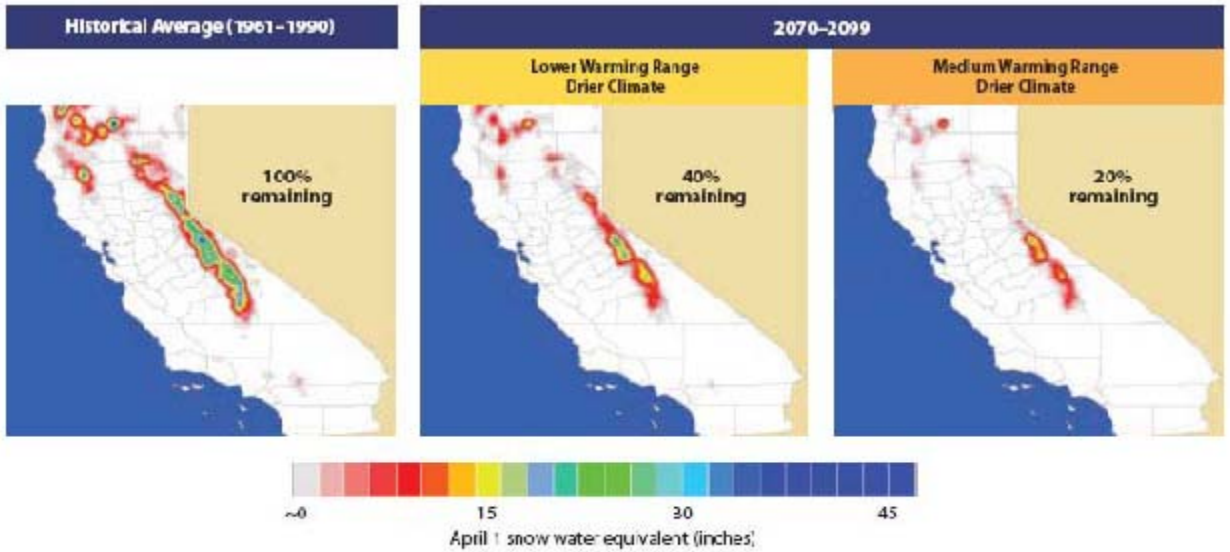
September 5, 2004 H. Basagic

Darwin Glacier

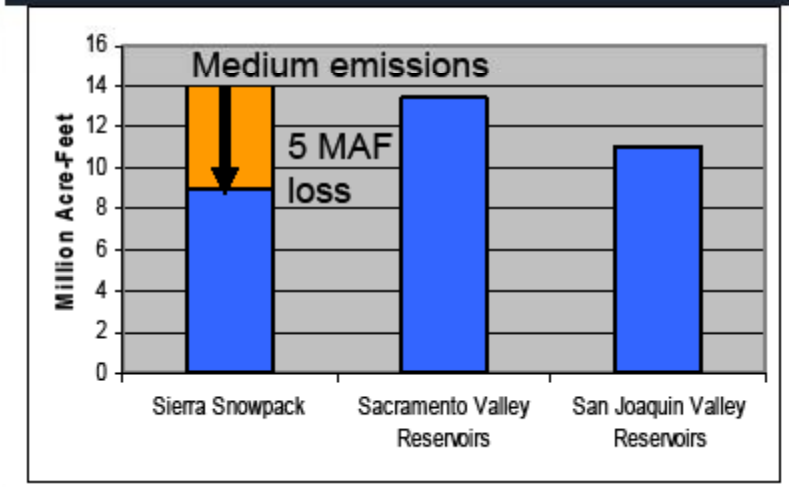
August 14, 1908 G.K. Gilbert

August 14, 2004 H. Basagic

SNOWPACK WILL CONTINUE TO SHRINK



MUCH LESS WATER STORAGE AS SNOW

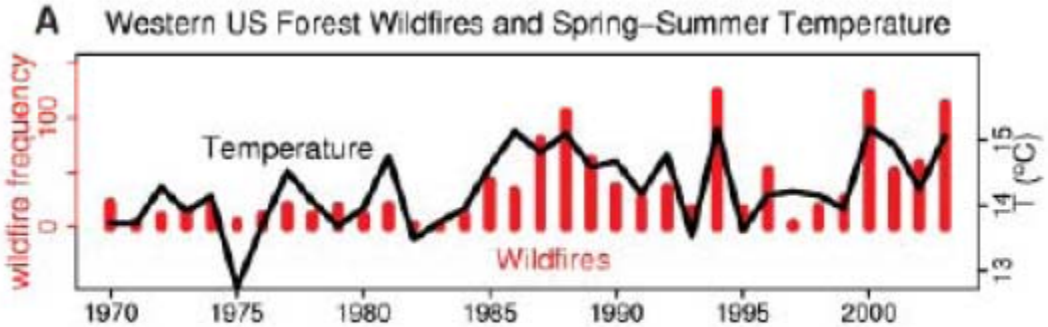


SNOWPACK – ECOLOGICAL LINKS

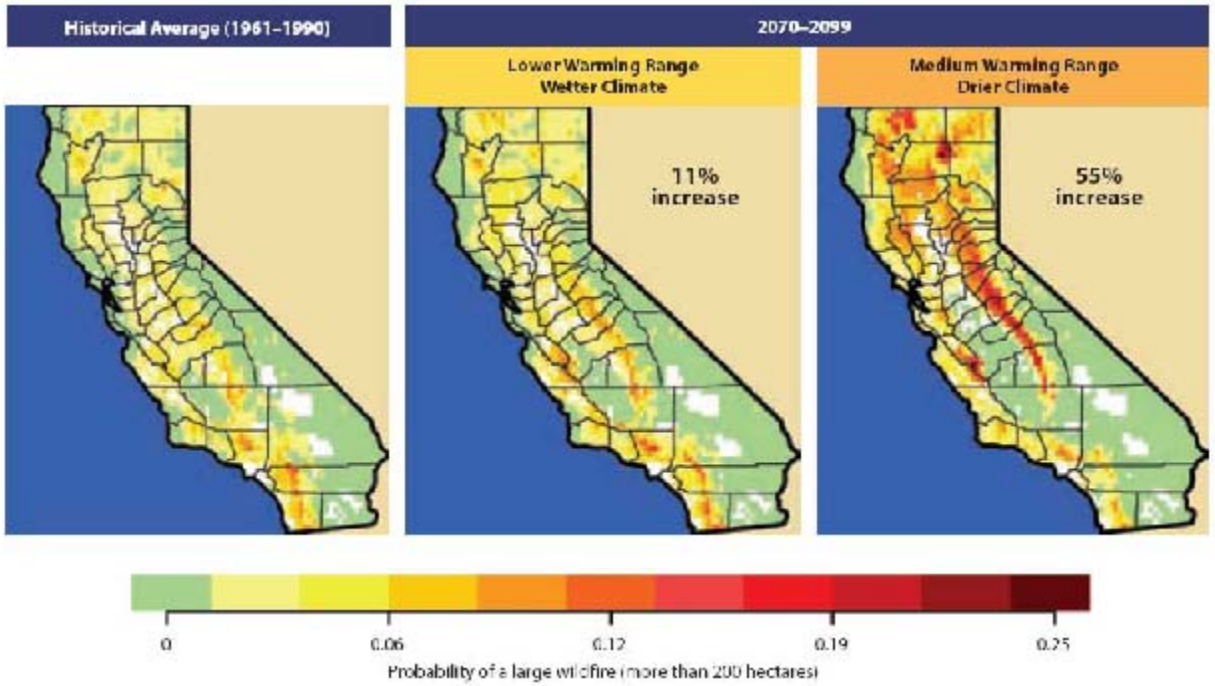
- Expect
  - More violent winter flooding
  - Increased riparian erosion
  - Calls for more water storage and flood control
  - Less water for species and water-dependent habitats (rivers, wetlands)
- Consider
  - Wider floodplains, meander belts
  - Creative water storage ideas

Fire Risk is Already Increasing

As temperatures increases, wildfire frequency increases



FIRE WILL CONTINUE TO INCREASE

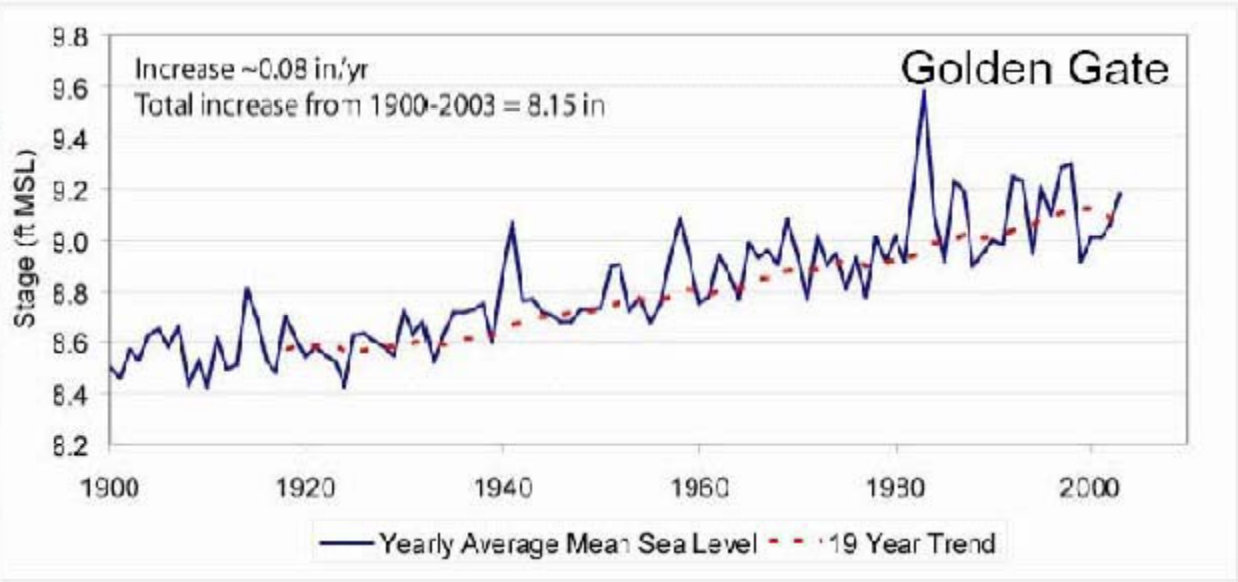


Fire Risk – Ecological Links

- Expect:
  - More frequent, large wildfires
  - Longer wildfire seasons
  - Changes in vegetation types and distribution
    - *More shrublands, less forest*
- Consider:
  - Reducing fuel loads
    - *Limits on prescribed burning, though*

SEA LEVEL IS ALREADY RISING

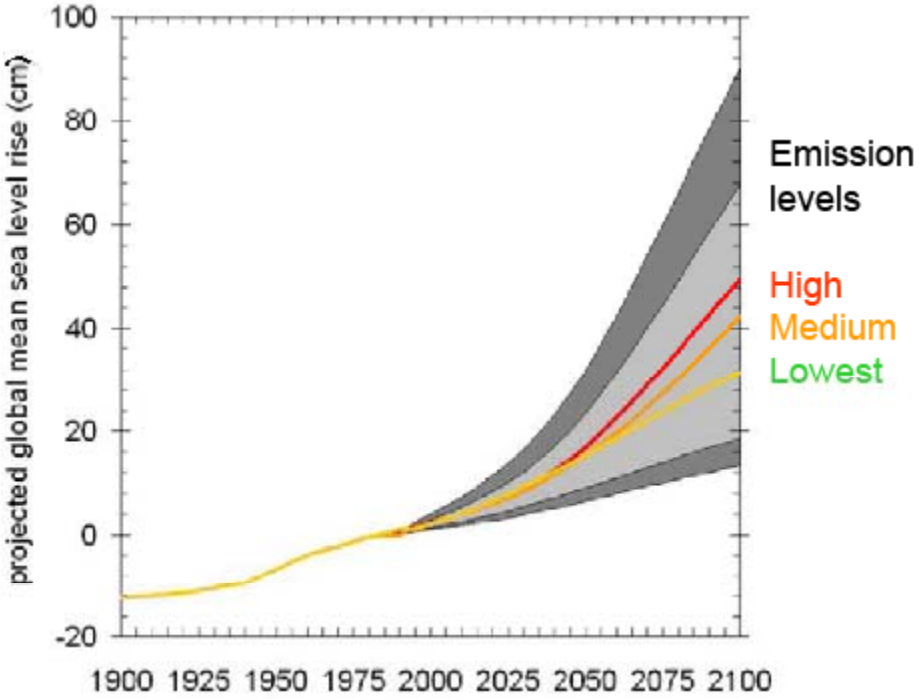
More than 8" rise at Golden Gate in last 100 years

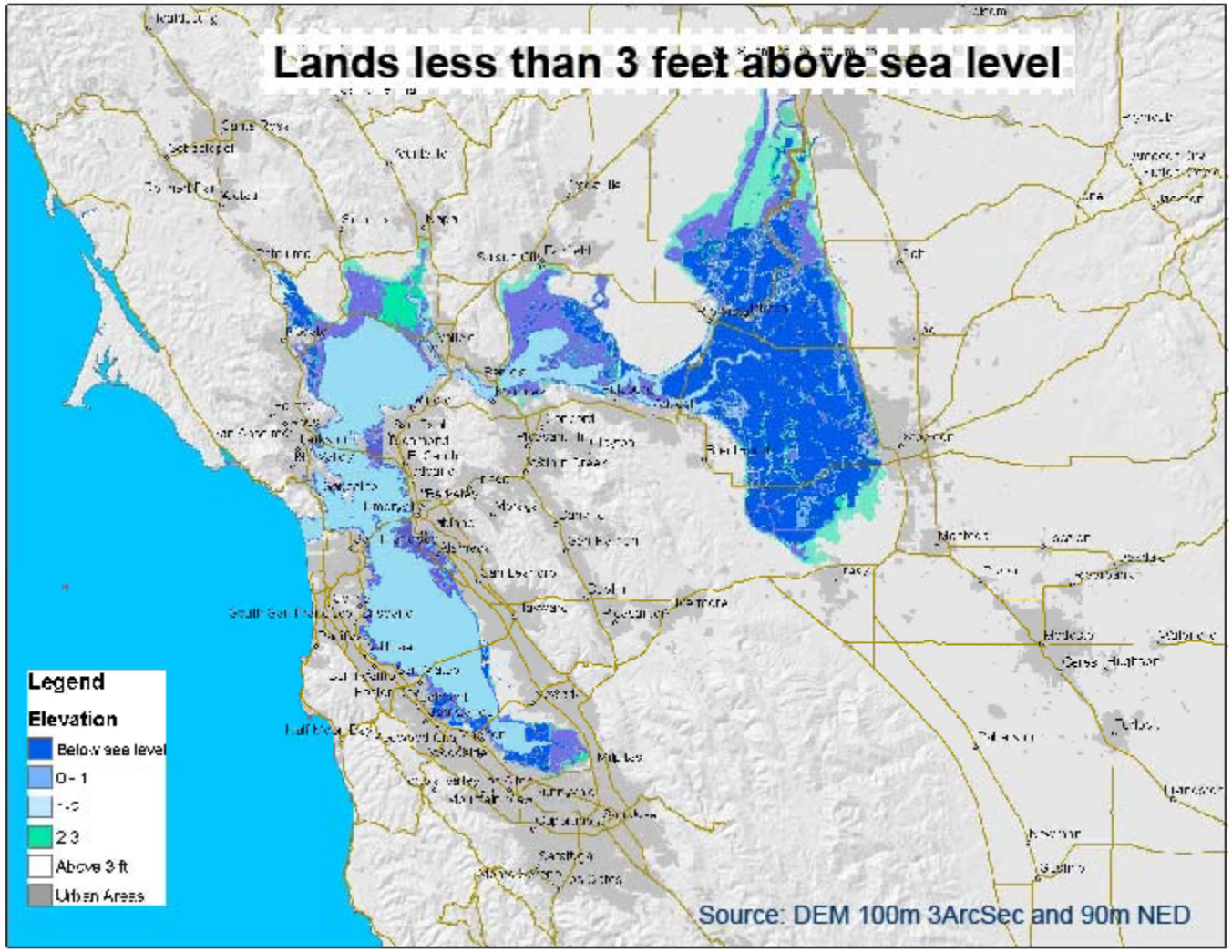


Roos 2005

SEA LEVEL WILL CONTINUE TO RISE

12" to 36" rise expected by 2100




Lands less than 3 feet above sea level
Legend
Elevation
Below sea level
0 - 1
2-3
Above 3 ft
Urban Areas
Source: DEM 100m 3ArcSec and 90m NED

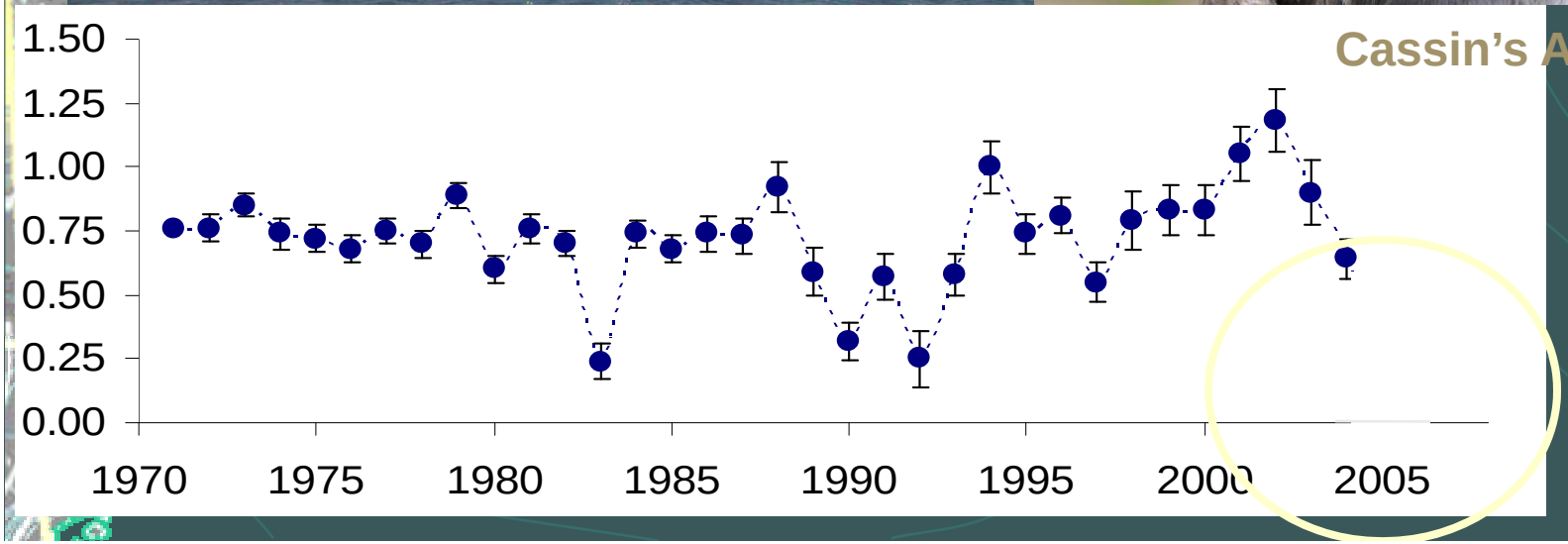
SEA LEVEL RISE – ECOLOGICAL LINKS

- Expect:
  - Permanent marine flooding of low-lying areas
  - Calls for alternative Delta water transfer
  - Much less freshwater in Delta area
  - Upslope migration of coastal urban areas
- Consider:
  - Protect upslope areas around coastal habitats (wetlands)
  - Rely less on terrestrial reserves in low-lying areas

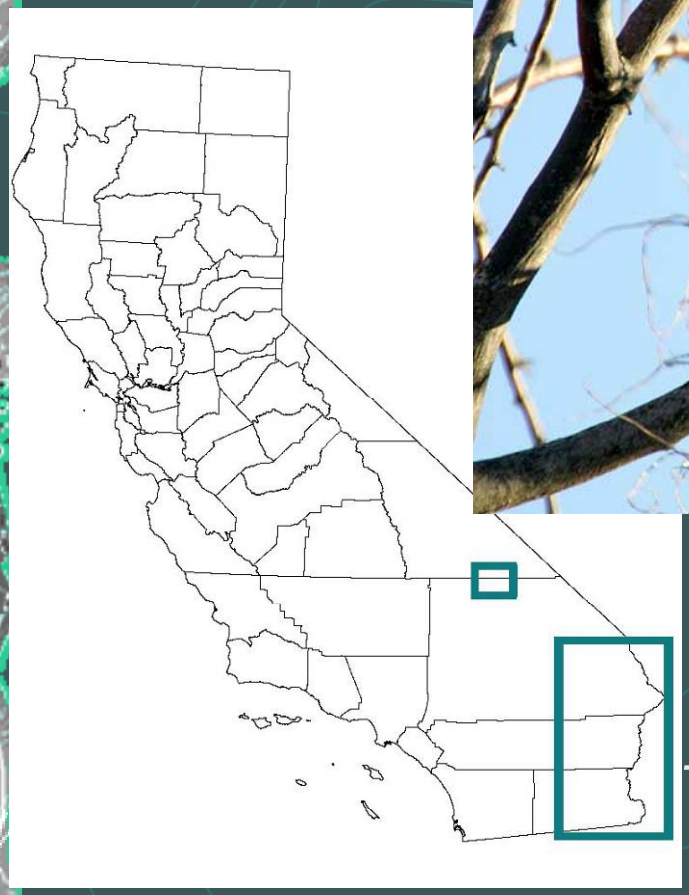
EXPECT ECOLOGICAL RESPONSES

- Earlier spring events (phenology)
- Species shifting to cooler areas
- Habitat type shifts
  - Changes in amount and distribution
- Different responses by different species

Seabird Breeding Failure



Drought = No Breeding



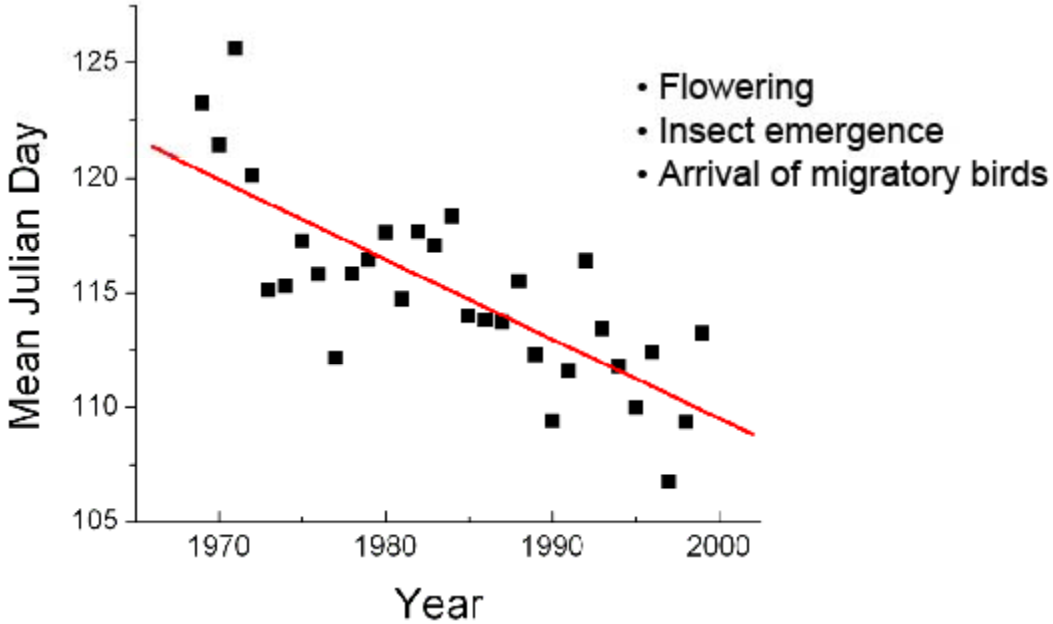
–Sonoran Desert

Changes in Arrival Dates

Ruby Crowned Kinglet
Fall arrival - 2 weeks later than 25 years ago

Spring Events Already Occurring Earlier

3.2 days earlier each decade



•Averages for 130 bird, plant, insect species

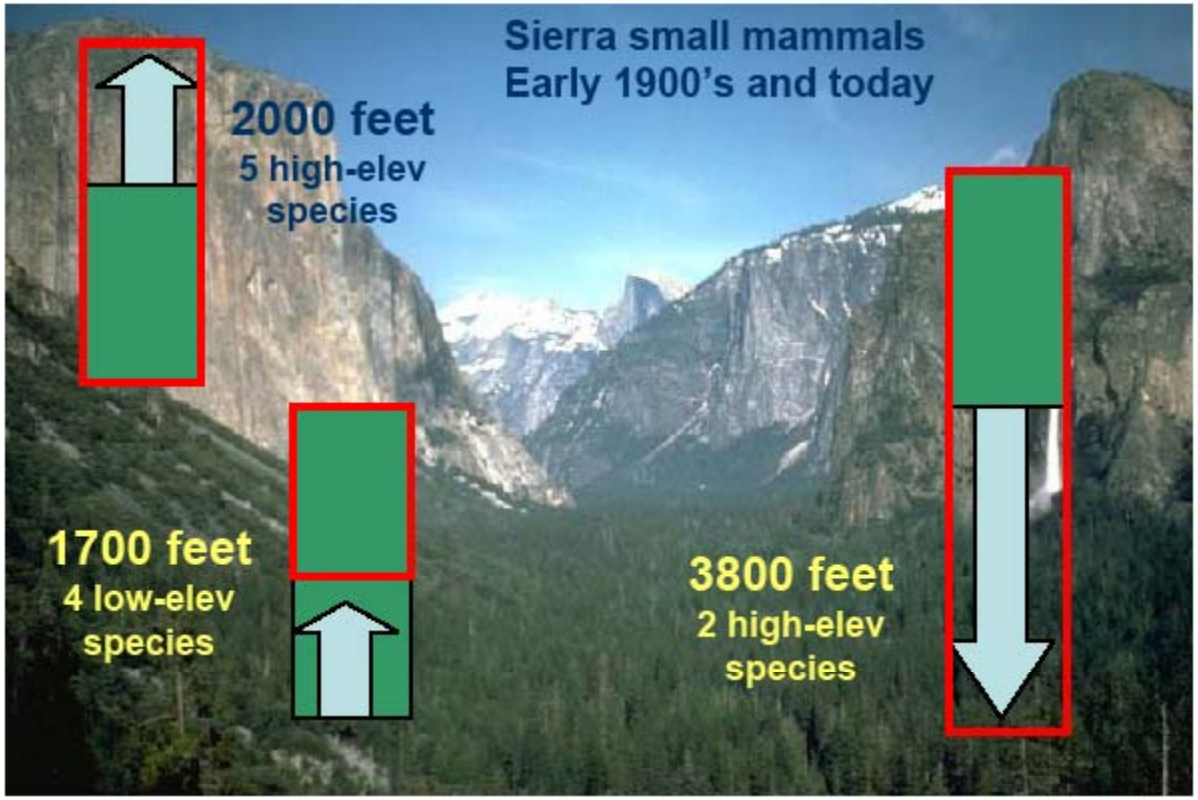
Root et al. (2005)

Earlier Spring Events – California Examples

- 12 of 22 bird species (55%) show change
- Different responses by species
  - 7 arrived earlier
  - 2 arrived later
- Four species with strong link to temp
  - Wilson's Warbler
  - Swainson's Thrush
  - Black-headed Grosbeak
  - Warbling Vireo

MacMynowski & Root (2006)

SPECIES SHIFTS TO COOLER AREAS



SPECIES SHIFTS – PINON MOUSE

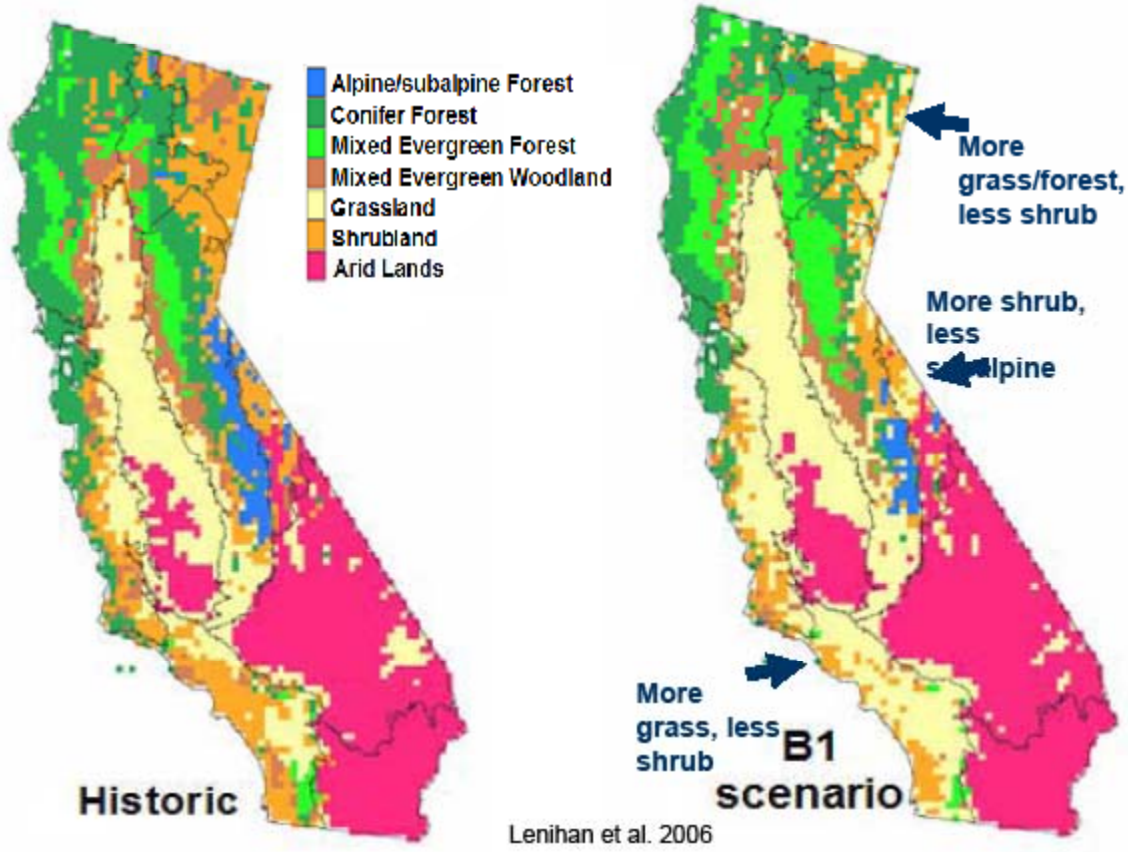
Piñon mouse
Peromyscus truei

habitat expansion associated with elevational increase in distribution

lodgepole - whitebark pine,
upper Lyell Canyon, 10,200 ft

piñon-juniper woodland, sage and rabbitbrush understory, east slope
Sierra Nevada, 8000 ft

HABITAT SHIFTS IN AMOUNT AND LOCATION



Lenihan et al. 2006

Different Species, Different Responses

- More habitat generalists
  - invasive plants, insects and pathogens
- Greater survival of heat-tolerant species
- Mismatches in timing or distribution among species
  - Pollinators and flowers
  - Insectivores and hatching of insect prey
  - Migrating birds and mammals
- Changes in ecosystem functioning?

Moving will be difficult or impossible

- No room upslope (hilltop or mountaintop)
- Impassable migration routes
- Climate warming faster than trees can relocate
- New areas unsuitable for other reasons
  - Wrong soil type
  - No symbiotic species (fungi) for establishment
  - High competition from more hardy exotic species

WHAT DO WE NEED TO DO?

- Most important action
  - Reduce greenhouse gas emissions
- Biological conservation actions
  - Reduce existing stressors on species
  - Buy time for species to adapt

KEY POINTS TO REMEMBER

- Climate is already rapidly changing
- Expect greater stress on species
- Species/habitats will respond in different, perhaps surprising, ways
- We can take action now to help them adapt and survive

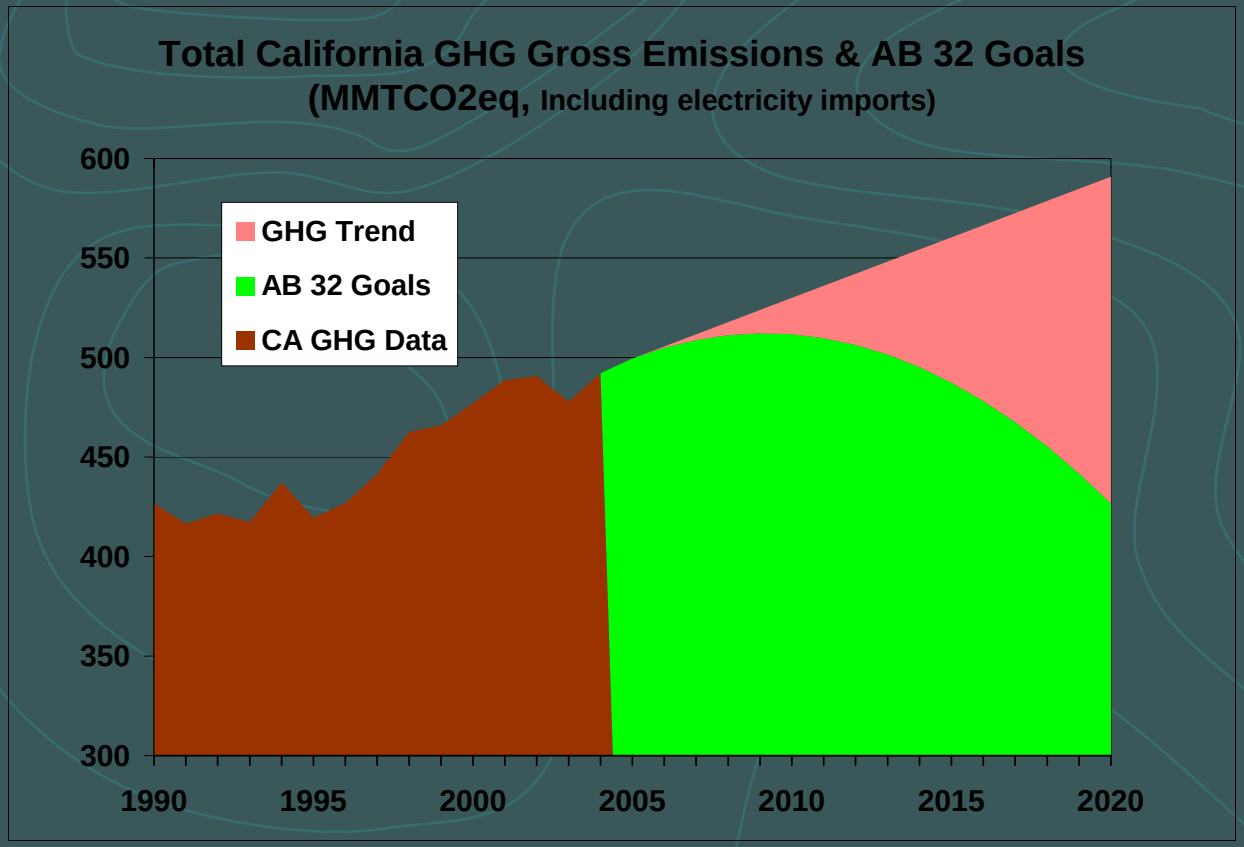
California's challenge: Continue to lead

- Strongest laws on climate change
  - AB 32
  - RPS
  - AB 1493 (Pavley)
  - Million Solar Roofs
- Appliance and building efficiency standards
- Loading order
- Feed-in Tariffs?
- Executive Orders
- Climate Registry

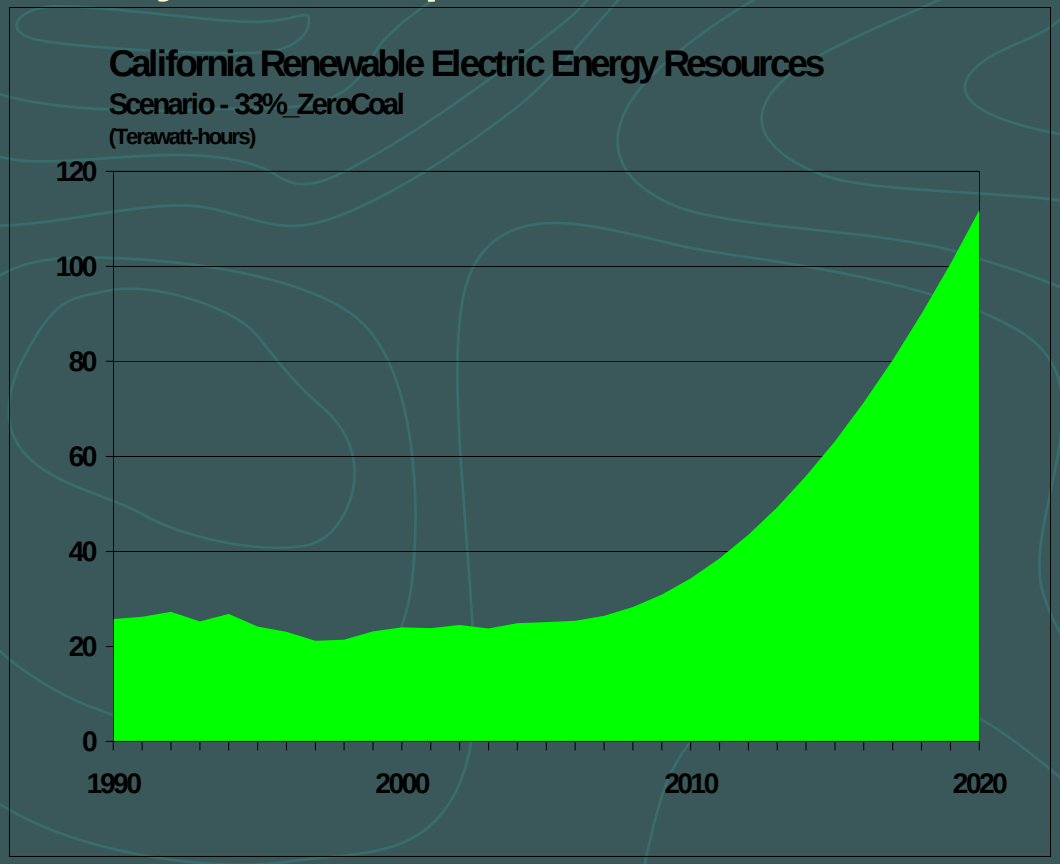
California's Challenge

- California is a global leader
  - 26 states now with RPS
  - Other states adopting AB 32 (Hawaii in 2007)
  - 16 states adopted Pavley (40% of US auto market)
  - Regional Climate Initiatives, US and Canada
  - 37 states adopt common climate registry
  - Federal and state legislation patterned on California Strategies
  - RETI/WGA processes

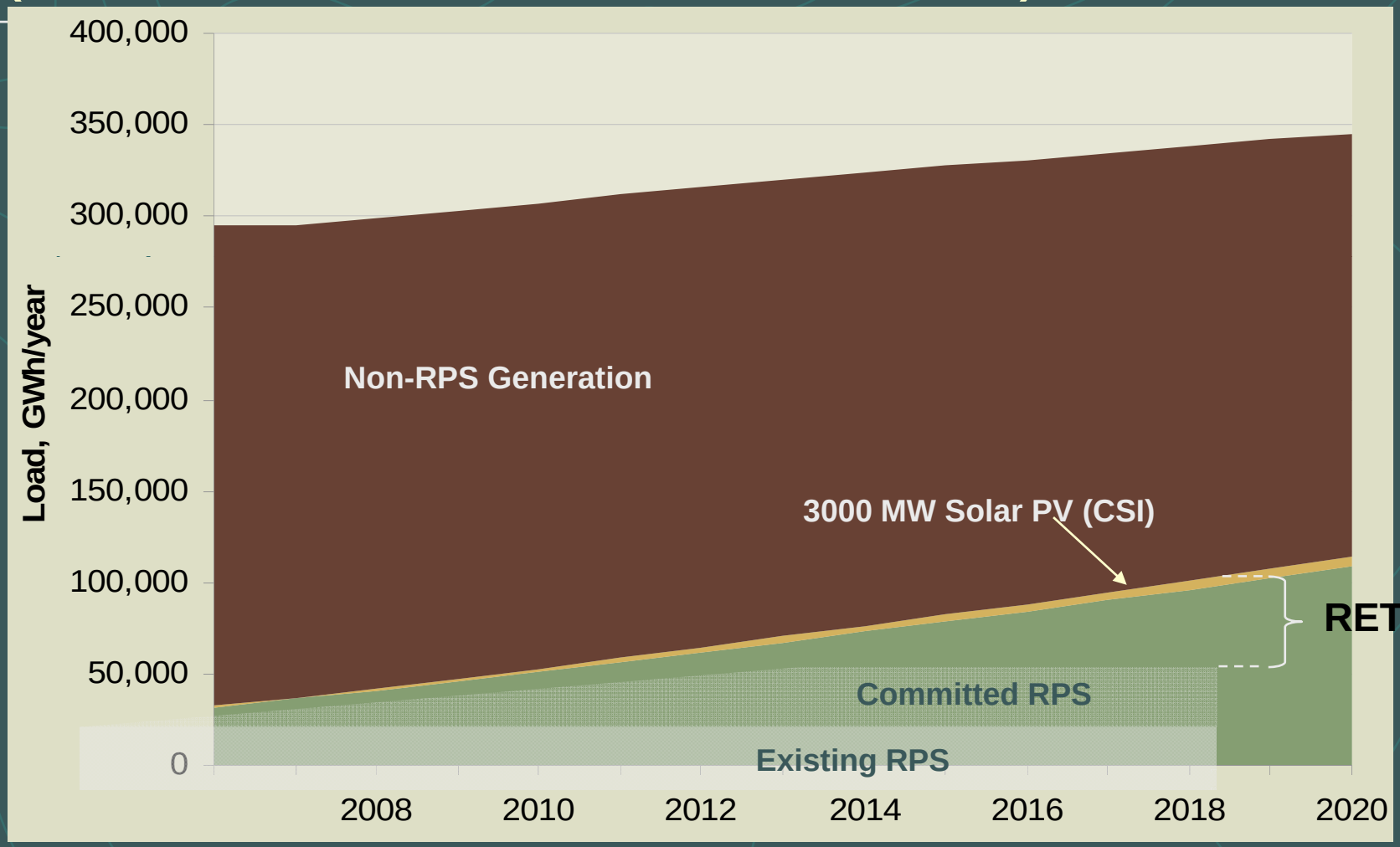
California policies may require large reductions in CO_2 emissions from the electricity sector.



Large increases in renewable energy for electric generation may be required to meet state goals.



Total California Load (Nov. 2007 CEC Load Forecast)



We need it all

- Global Warming is <u>not</u> a local supply issue
- Need to build capacity to replace nuclear plants
- Need to build capacity to block new coal plants
- To do this:
  - We need all the efficiency we can get
  - We need all the distributed generation we can get
  - We need large-scale wind, solar and geothermal

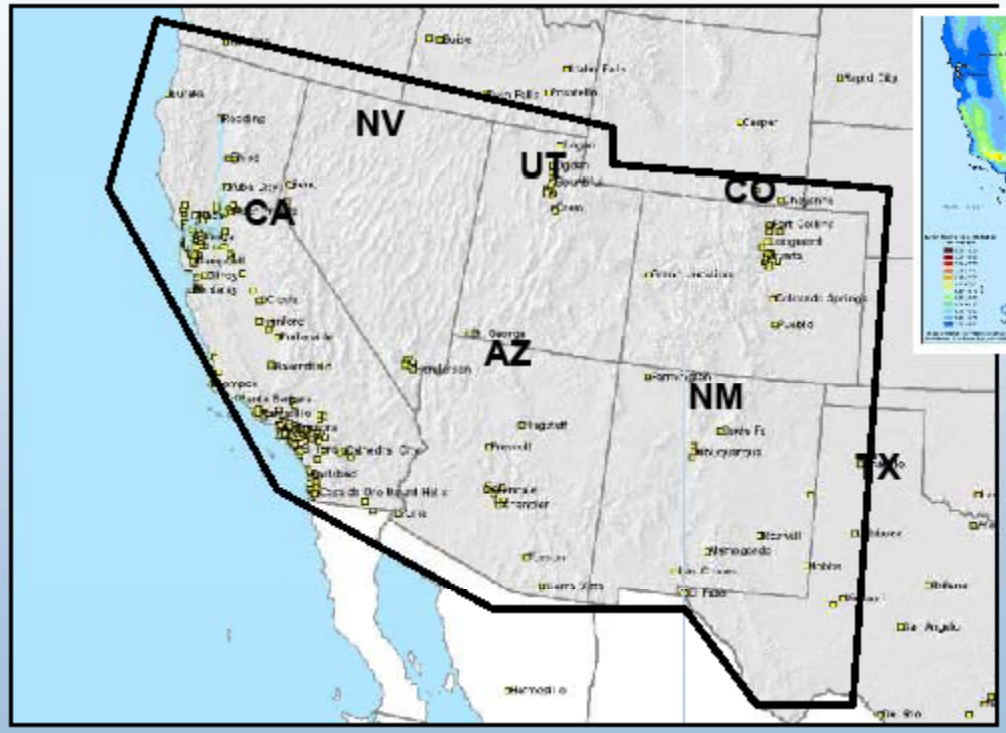
We need it all

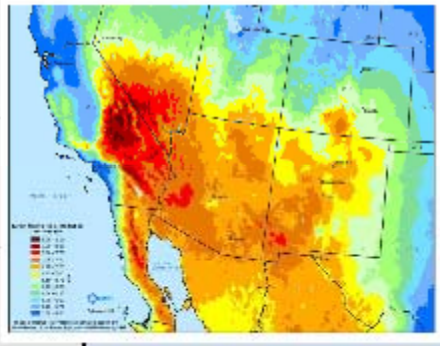
- 120-150 new coal plants proposed
- 103 nuclear plants, approaching or exceeding 30 years of age
- Energy Demand growing
  - Population growth
  - Migration to warmer parts of California and US

64 MWe Solargenix Solar Electric Plant: Boulder City, NV

Solucar PS10
Sevilla, Spain

1000MW Analysis Focused on the Southwest Region

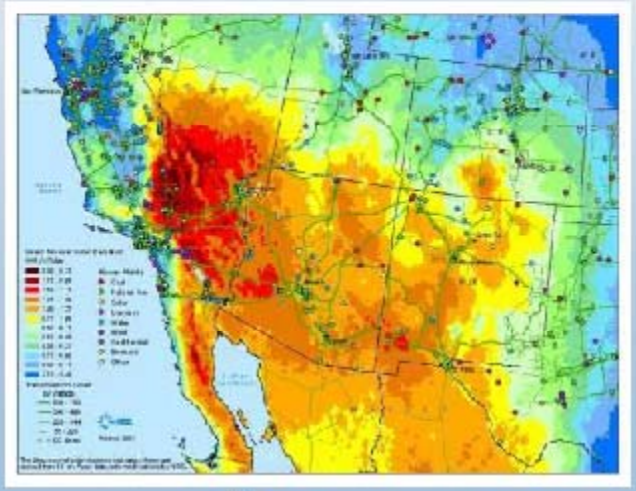




U.S. Southwest GIS Screening Analysis for CSP Generation

Screening Approach

- Initial GIS screening analysis used to identify regions most economically favorable to construction of large-scale CSP systems.
- GIS analysis used in conjunction with transmission and market analysis to identify favorable regions in four southwest states.



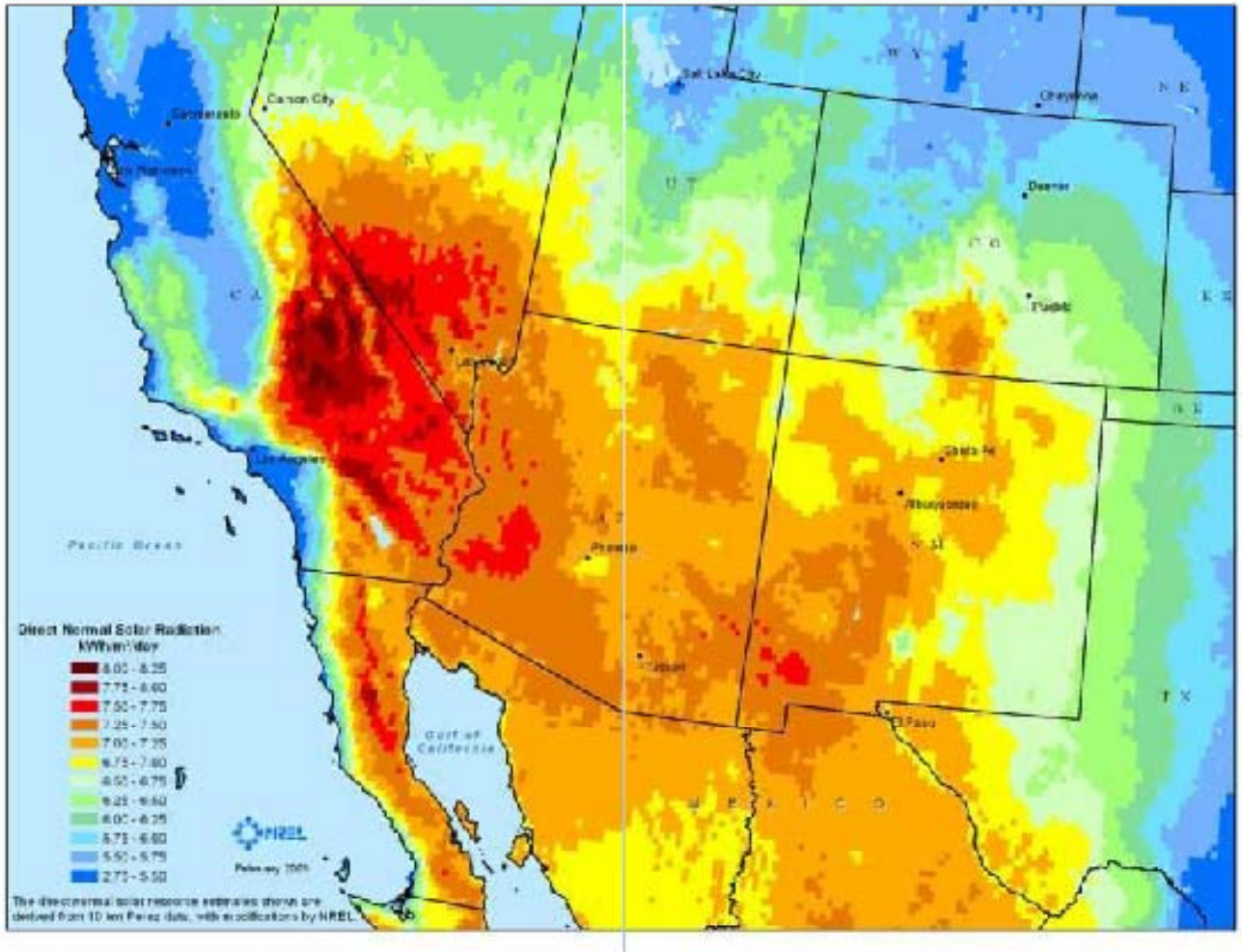
Southwest Solar Resources: Which Locations Are Suitable for CSP Development?

All Solar Resources

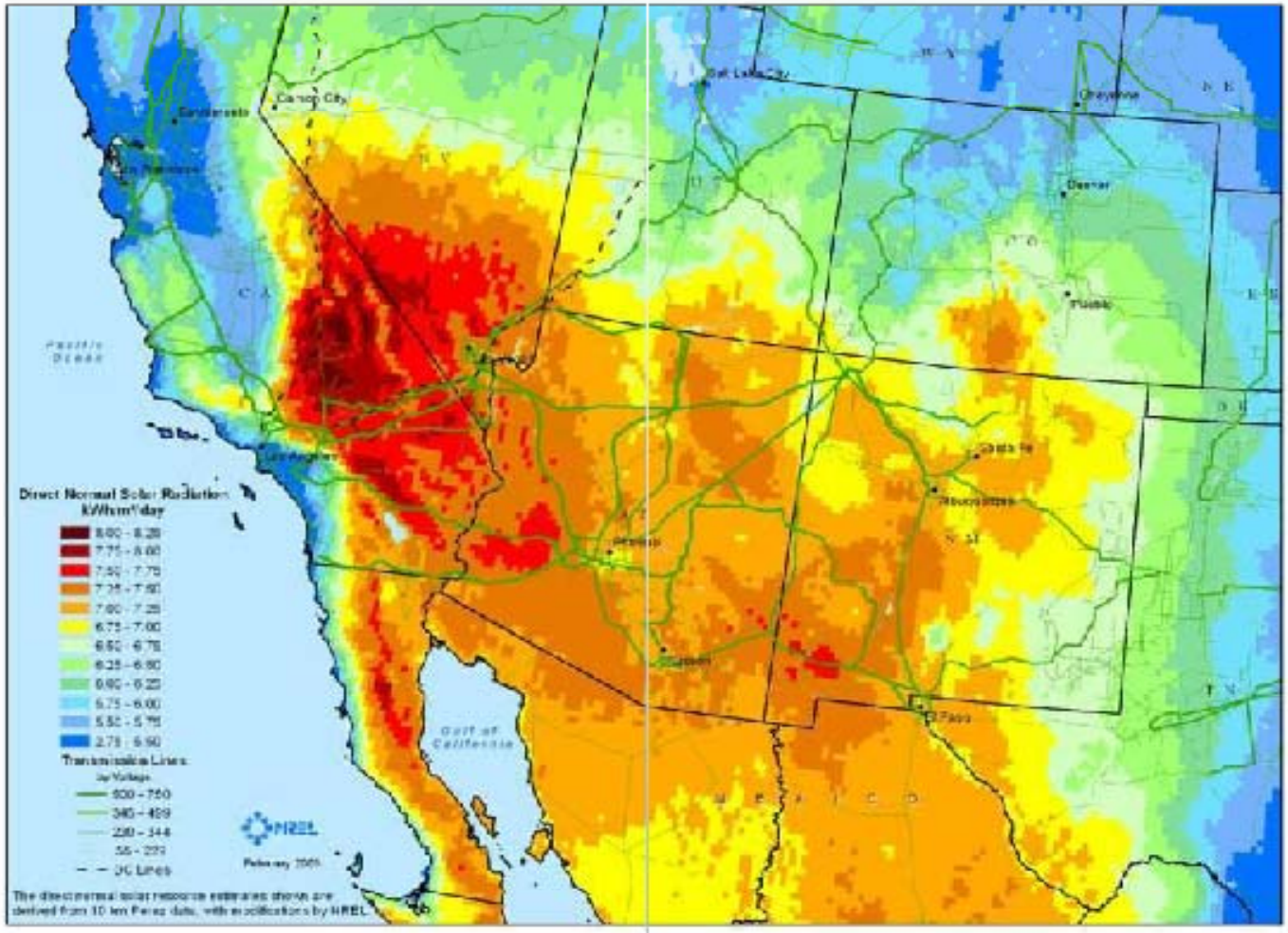
Locations Suitable for Development

1. Start with direct normal solar resource estimates derived from 10 km satellite data.
2. Eliminate locations with less than 6.75 kwh/m^2/day.
3. Exclude environmentally sensitive lands, major urban areas, and water features.
4. Remove land areas with greater than 1% (and 3%) average land slope.
5. Eliminate areas with a minimum contiguous area of less than 5 square kilometers.

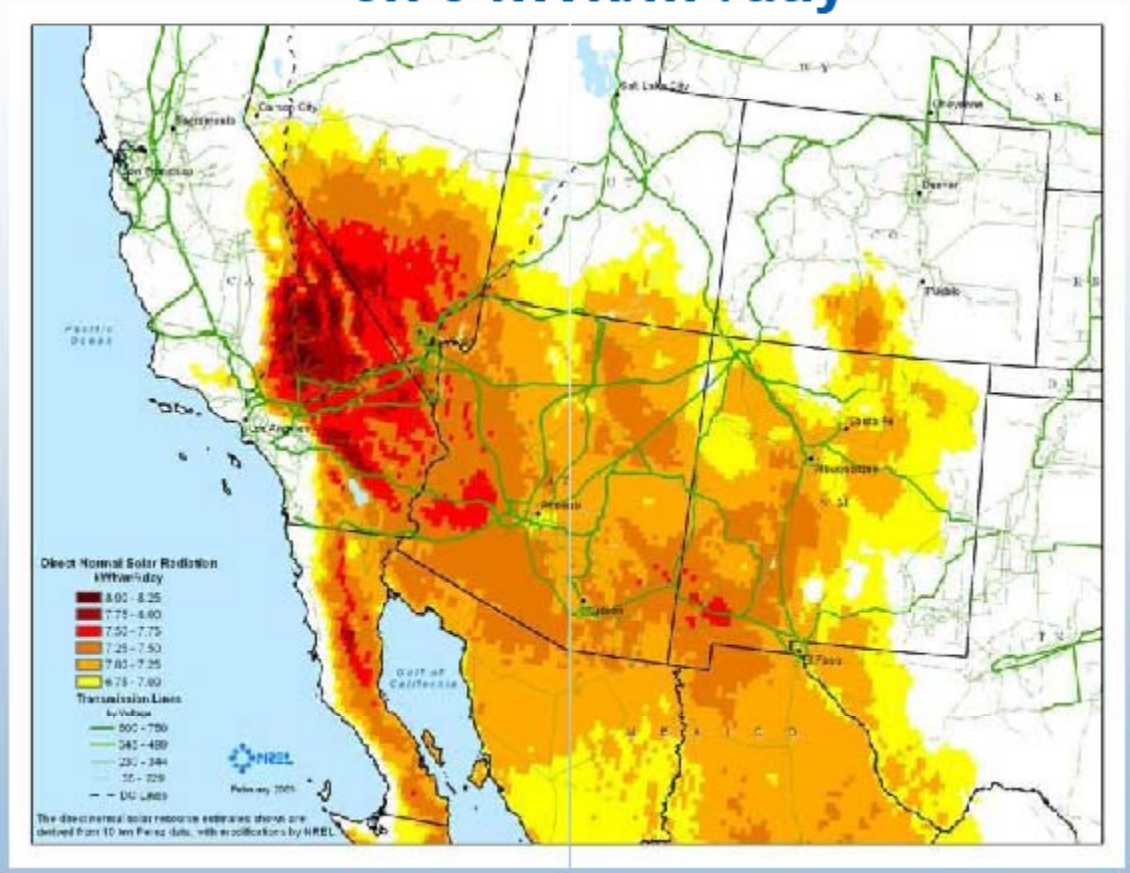
Southwest Solar Resources
Unfiltered Data



Southwest Solar Resources Transmission Overlay

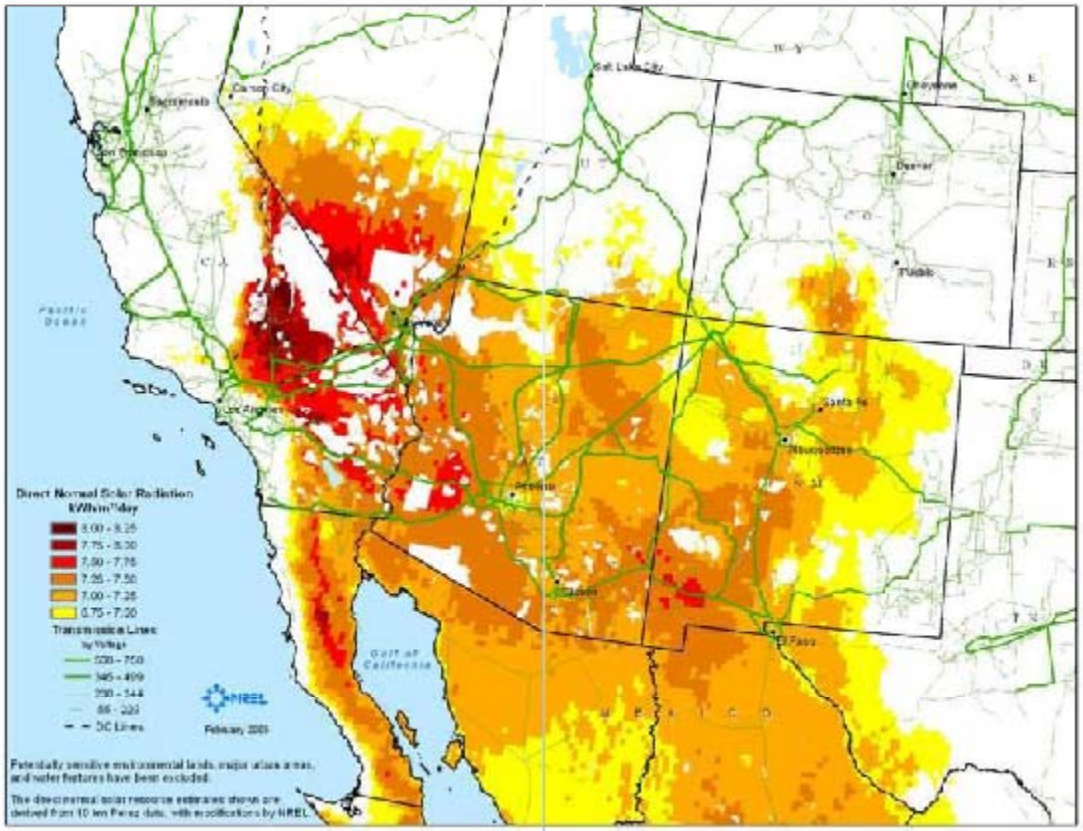


Southwest Solar Resources
> 6.75 kWh/m^2/day



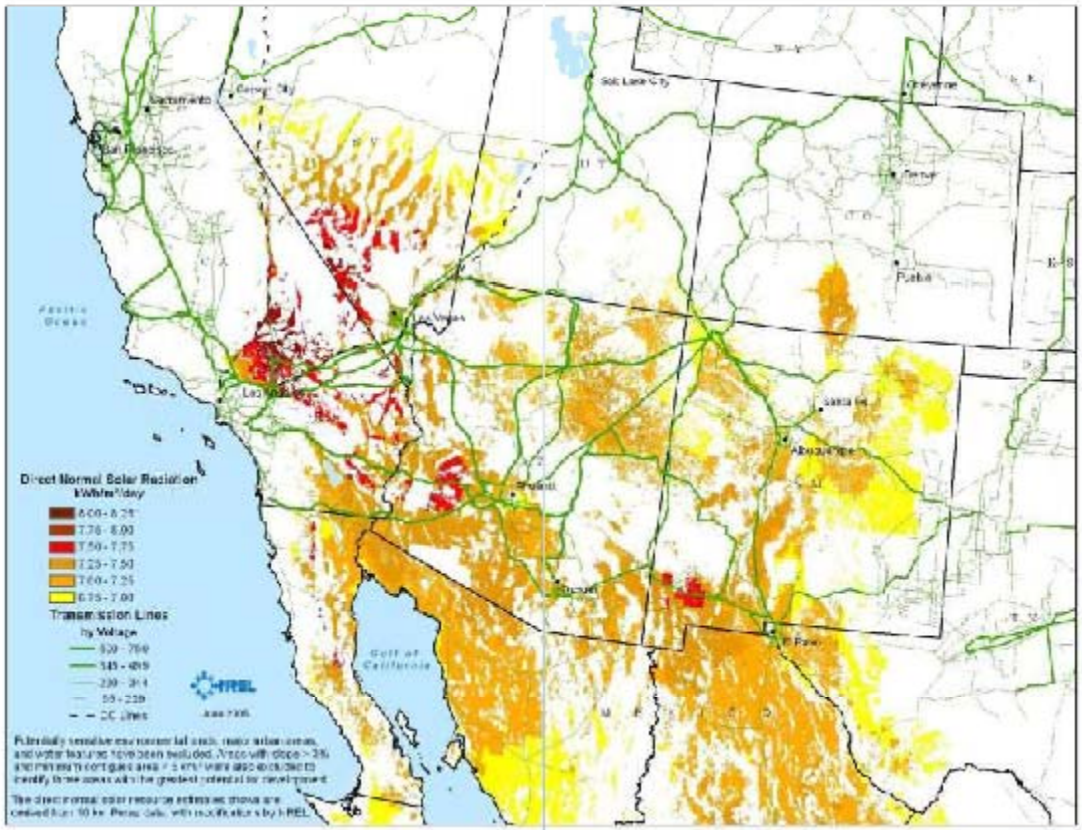
Southwest Solar Resources

Prior plus Environmental and Land Use Exclusions



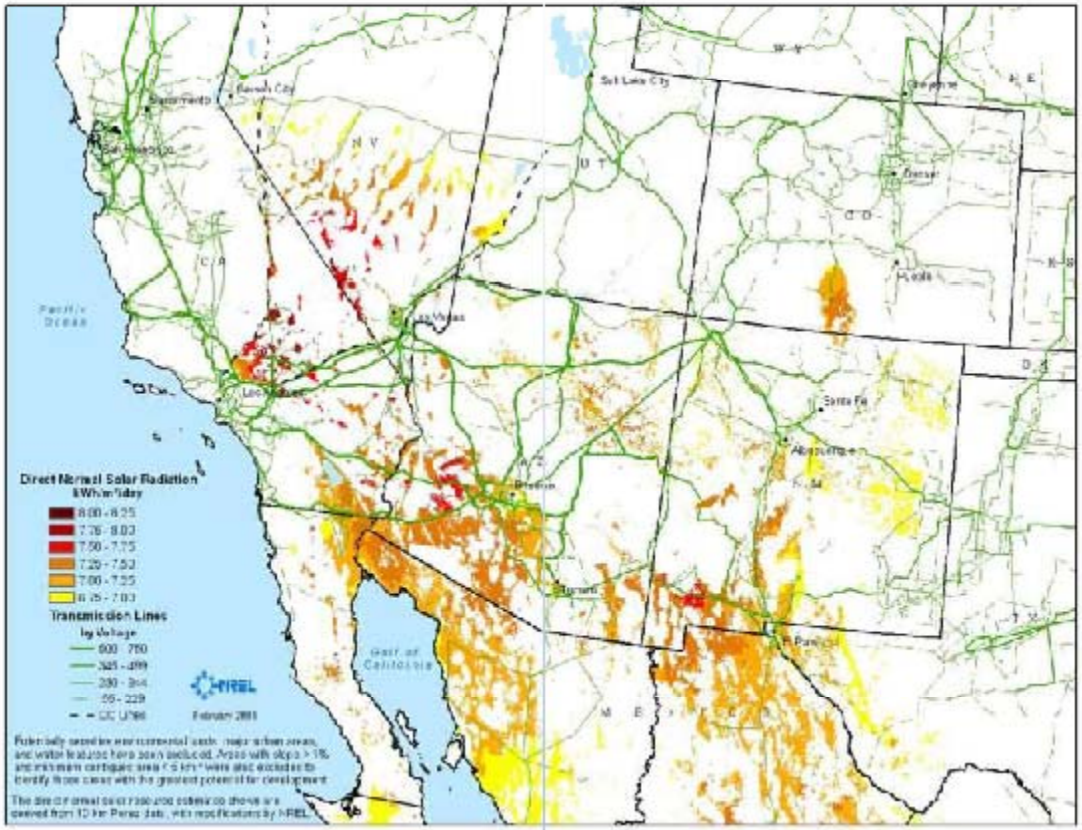
Southwest Solar Resources

Prior plus Slope < 3%



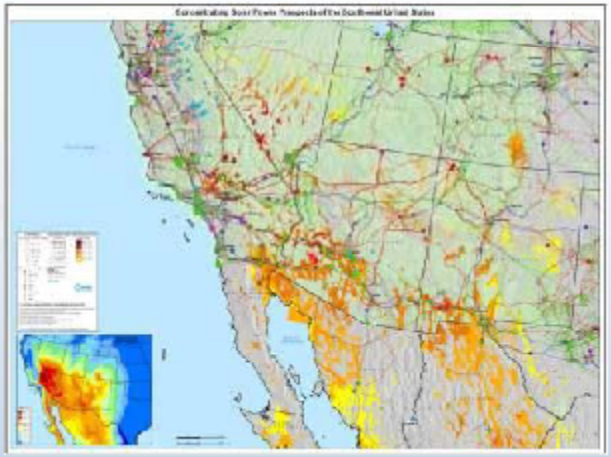
Southwest Solar Resources

Prior plus Slope < 1%



Energy Benefits
Southwest Solar Energy Potential

State	Land Area (mi^2)	Solar Capacity (MW)	Solar Generation Capacity GWh
AZ	19,279	2,467,663	5,836,517
CA	6,853	877,204	2,074,763
CO	2,124	271,903	643,105
NV	5,589	715,438	1,692,154
NM	15,156	1,939,970	4,588,417
TX	1,162	148,729	351,774
UT	3,564	456,147	1,078,879
Total	53,727	6,877,055	16,265,611



The table and map represent land that has no primary use today, exclude land with slope > 1%, and do not count sensitive lands.
Solar Energy Resource ≥ 6.75
Capacity assumes 5 acres/MW
Generation assumes 27% annual capacity factor

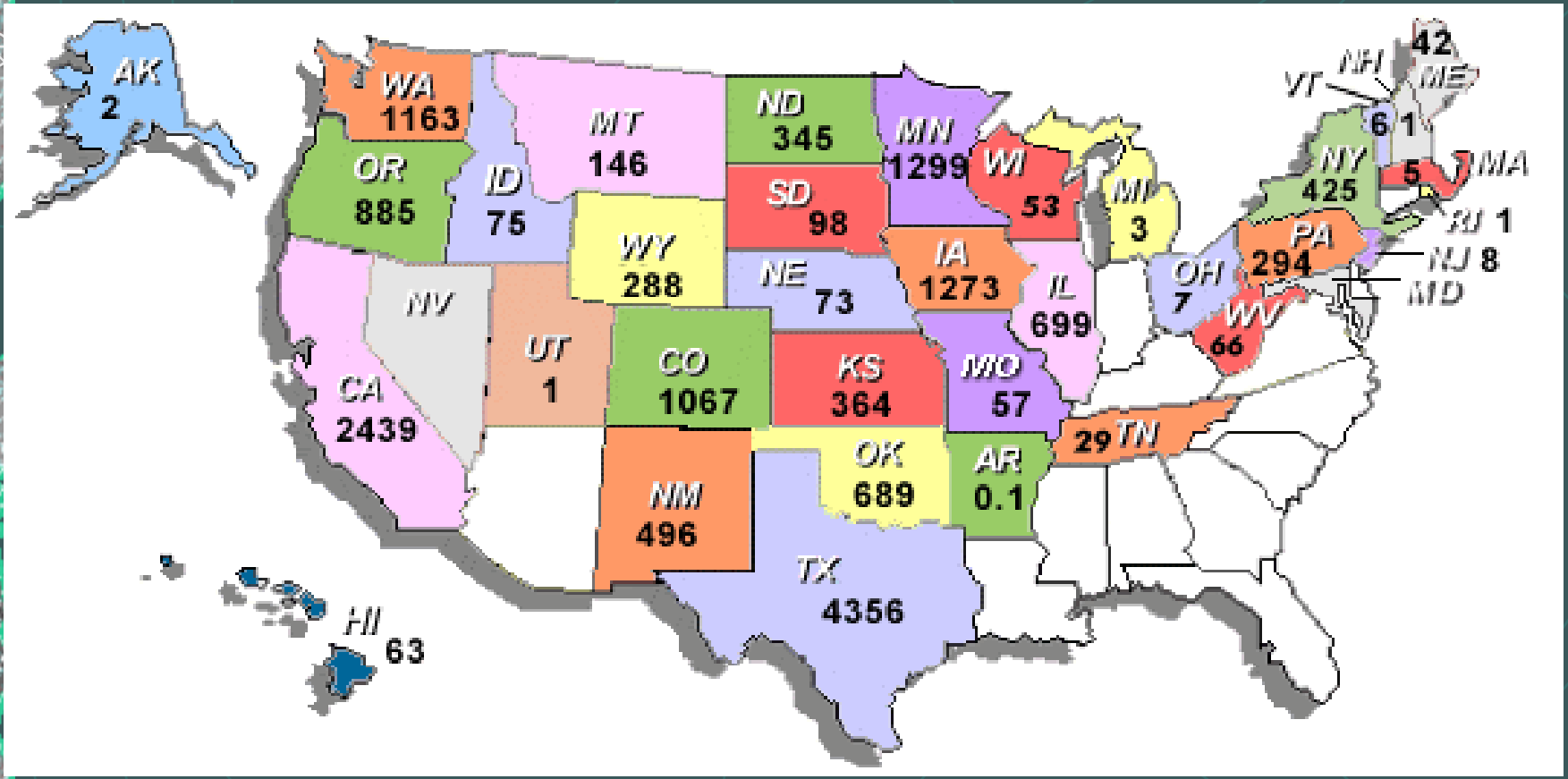
- **Current total generation in the U.S. is 1,000GW w/ generation approximately 3,800 TWh**

Regional Potential in the West

(*estimated, subject to change*)

- Approximately 10,000 MW Solar in CA
- Approximately 8K MW wind from Tehachapi
- Approximately 20K MW wind in Wyoming
- Approximately 5-7K MW wind in Colorado
- Approximately 3K MW wind in New Mexico
- Approximately 2600 MW solar in AZ

Sources: BLM, ASES, AWEA, WGA

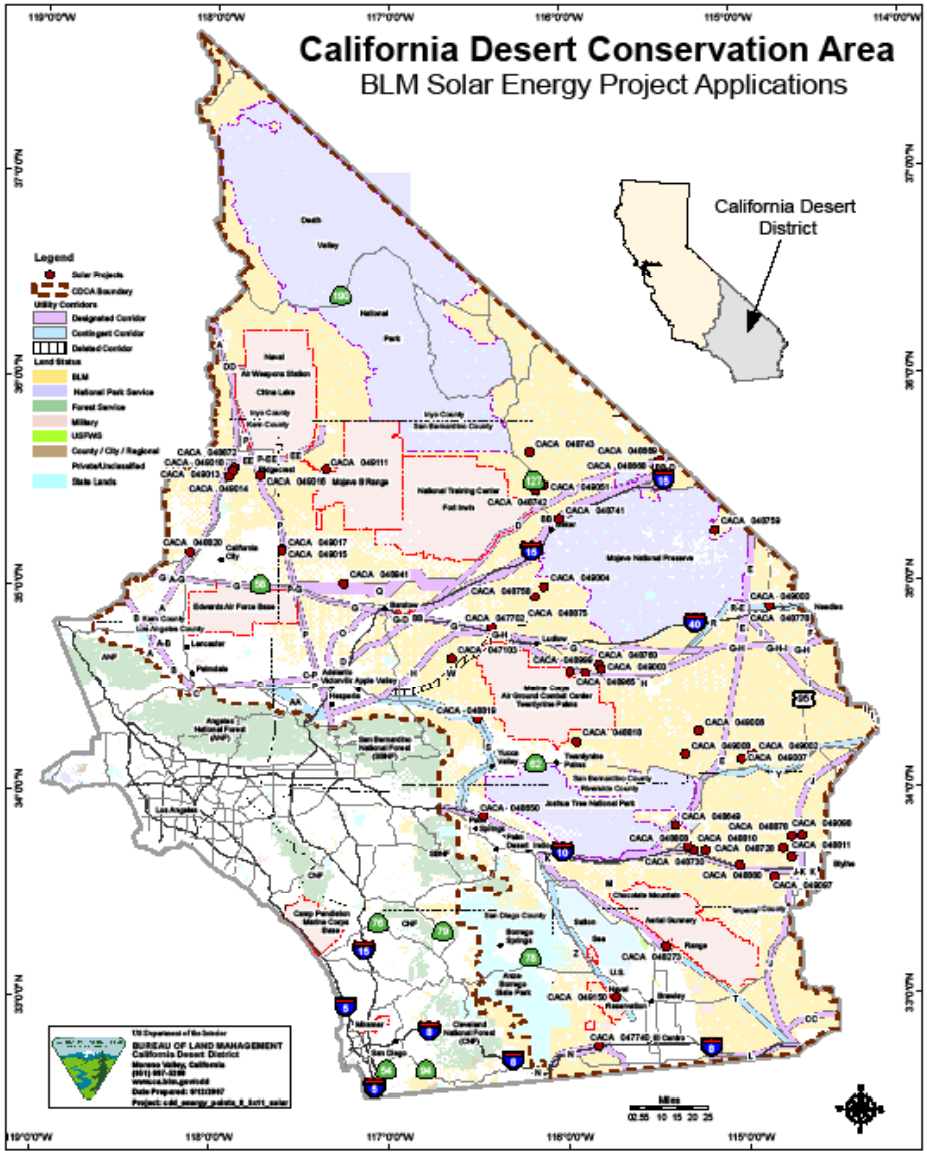


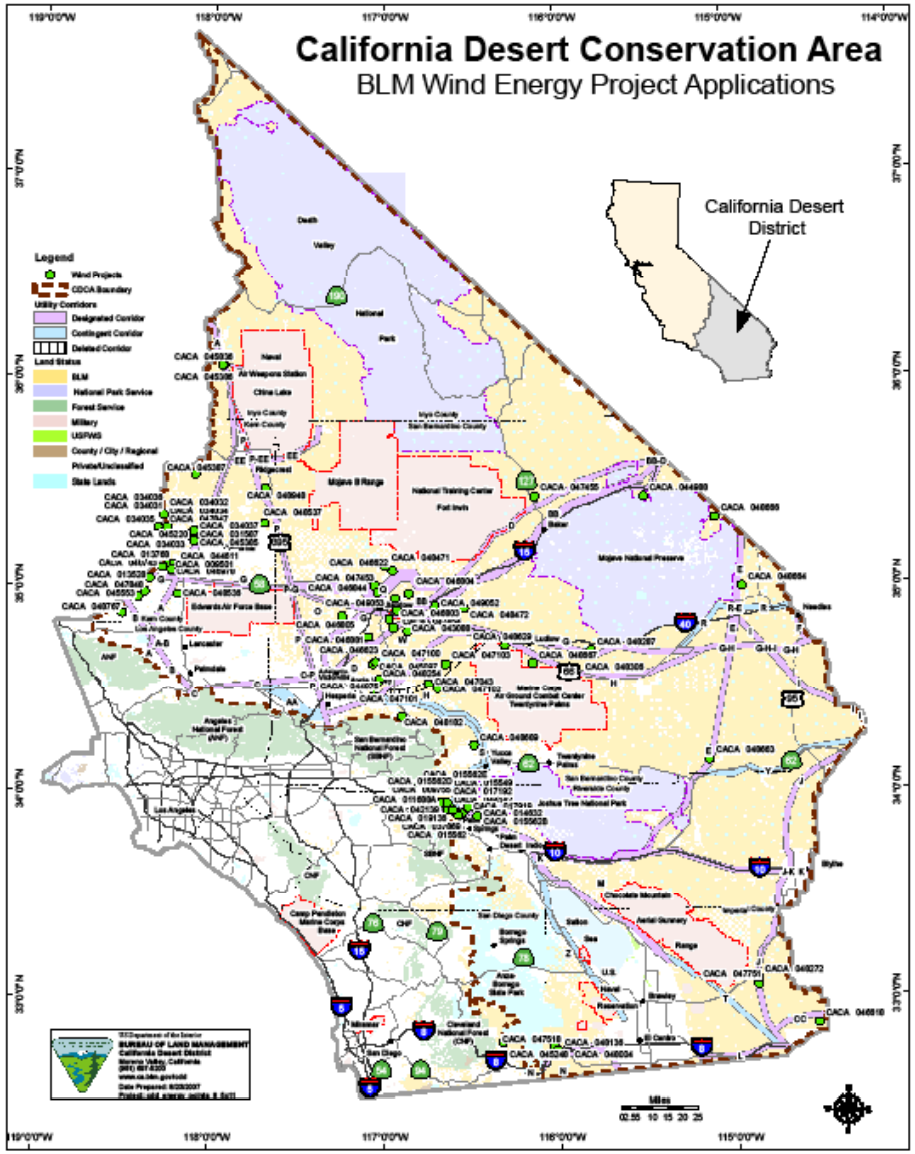
Installed MW wind capacity, Source: American Wind Energy Association, 2007

BLM Estimates

(snapshot, subject to change up or down)

- 10,000 MW solar potential and applications
- 110 square miles =70,400 acres
- BLM believes approximately 33% are viable applications, numerous denials already
- Most near roads or existing infrastructure
- Could be more or fewer applications


California Desert Conservation Area
BLM Solar Energy Project Applications
California Desert District
Legend
Solar Projects
CDCA Boundary
Utility Corridors
Designated Corridor
Contingent Corridor
Deleted Corridor
Land Status
BLM
National Park Service
Forest Service
Military
USFWS
County / City / Regional
Private/Unclassified
State Lands
Miles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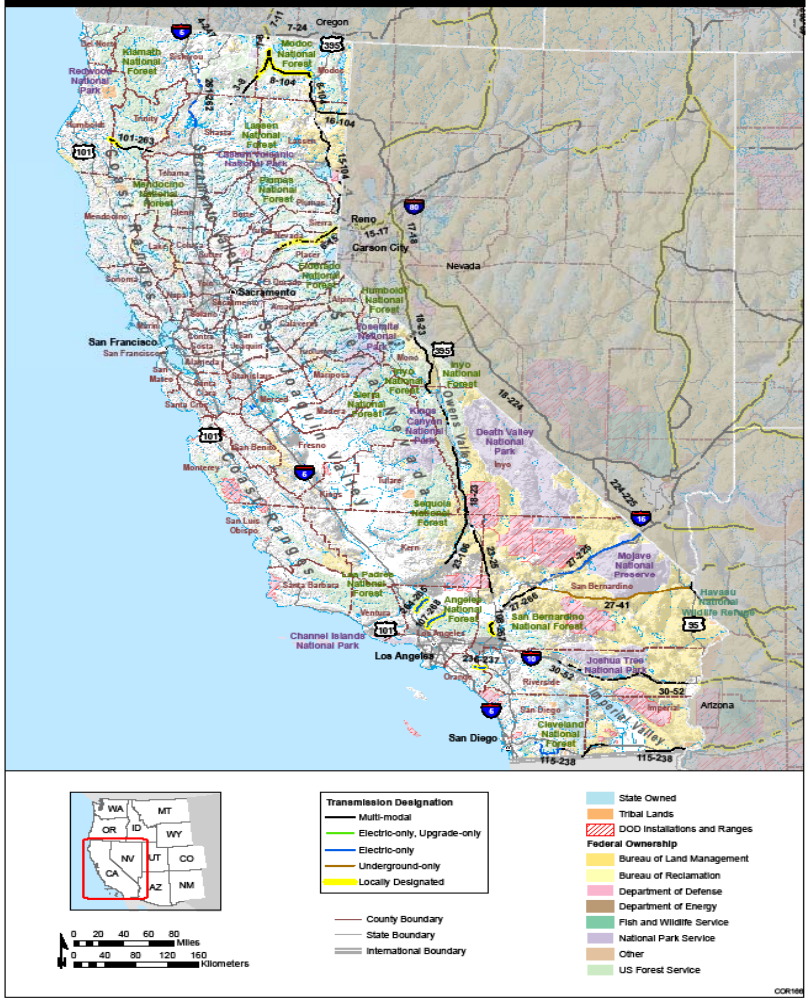
Proposed Section 368 Energy Corridors - CALIFORNIA -



Engaging on this issue

- Choose venue to maximize influence
  - RETI
  - WGA
  - “Trump” FERC preemption
- Timely provision of information
- Direct participation
- Communication and policy advocacy
- Comment in other processes to preserve standing

Choose favorable venue

- Select processes that enable us to show progress on development of resources and lines
  - This makes it harder for FERC to designate lines under EP Act of 2005, NIETC or WWC
- Select Process with most ability to influence
  - Level as possible playing field with utilities, regulators and generators
- RETI and WGA provide these advantages

FERC will likely defer to States that move forward ...

"I would be very reluctant to impose my judgment over reasonable efforts made by states and stakeholders."

-- *Marc Spitzer, FERC Commissioner, Speech to the Energy Bar Association, Feb 15, 2008.*

“Tell us where not to go”

- Timely provision of information about areas we want off limits is critical
- Generators willing to work with us to avoid these areas
- BLM is being diligent
- We need to be seen as providing a solution to siting quandaries

Direct Participation Tasks

- We need to be at the key meetings of RETI and WGA
- We need to engage in work assignments to ensure our perspective is included
- We need to communicate with other key players in California and in neighboring states especially Nevada

Communication and advocacy

- We need to identify and communicate policy needs to representatives, regulators (FERC), and land management agencies
- We need to act as advocates for the best plans
- Delay is not an option (FERC's clock runs for a year from a designation request)

Commenting in WWC, NIETC, etc

- Preserve standing
- Improve the record
- Show and promote progress in other policies
- Avoid preemption
- Did I mention avoid preemption?

Program elements

- Participate in RETI and WGA
- Identify and lobby for policies we need
- Advocate for proposals we prefer
- Feedback loop for environmental concerns
- Promote good plans via media, etc.

Timeline

- FERC can begin designating lines within a year if no progress is shown
- First cut at energy zones this spring, 2008 (RETI)
- WGA process begins, late spring to early summer 2008
- Approximately 12-18 months to get to designating actual lines
- 24- 60 months before solar projects begin construction
- 60-72 months projects get electrified
- Delay is not an option

Plan timeline

- RETI stakeholder workshops – March-April
- Monthly call?
- Meetings as needed? One per quarter?
- Comments as per deadlines
- Attend RETI, WGA, ongoing
- Develop Web page (internal use, password protected) March-April