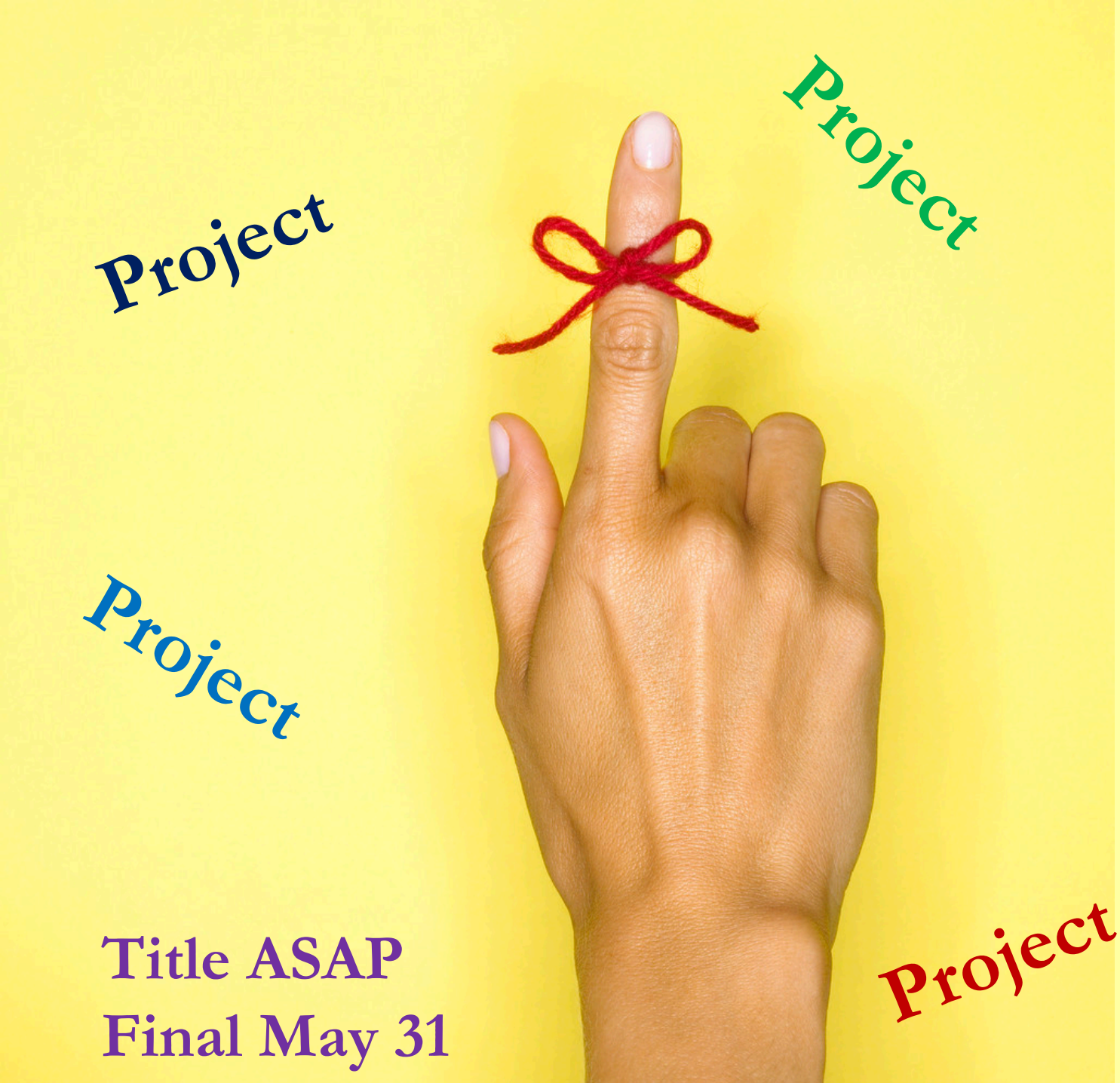
CDFW Climate College: Lecture #7

Ashley Conrad-Saydah

Cal EPA

March 12, 2013
1:30 - 2:30PM

Energy-Climate-Human Nexus:
Climate Action co-benefits for
Natural Resource Conservation


Project
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Title ASAP
Final May 31

Story Hour on Climate Change

ABDO Publishers http://www.abdopub.com/shop/pc/configureprd.asp?idproduct=29265

October 8-9, 2013

Call for Oral & Poster submission

DUE June 30, 2013

http://dfgintranet/portal/Training/ScientificCommunityDevelopmentSCDProgram/ScienceSymposium2013/tabid/1966/Default.aspx

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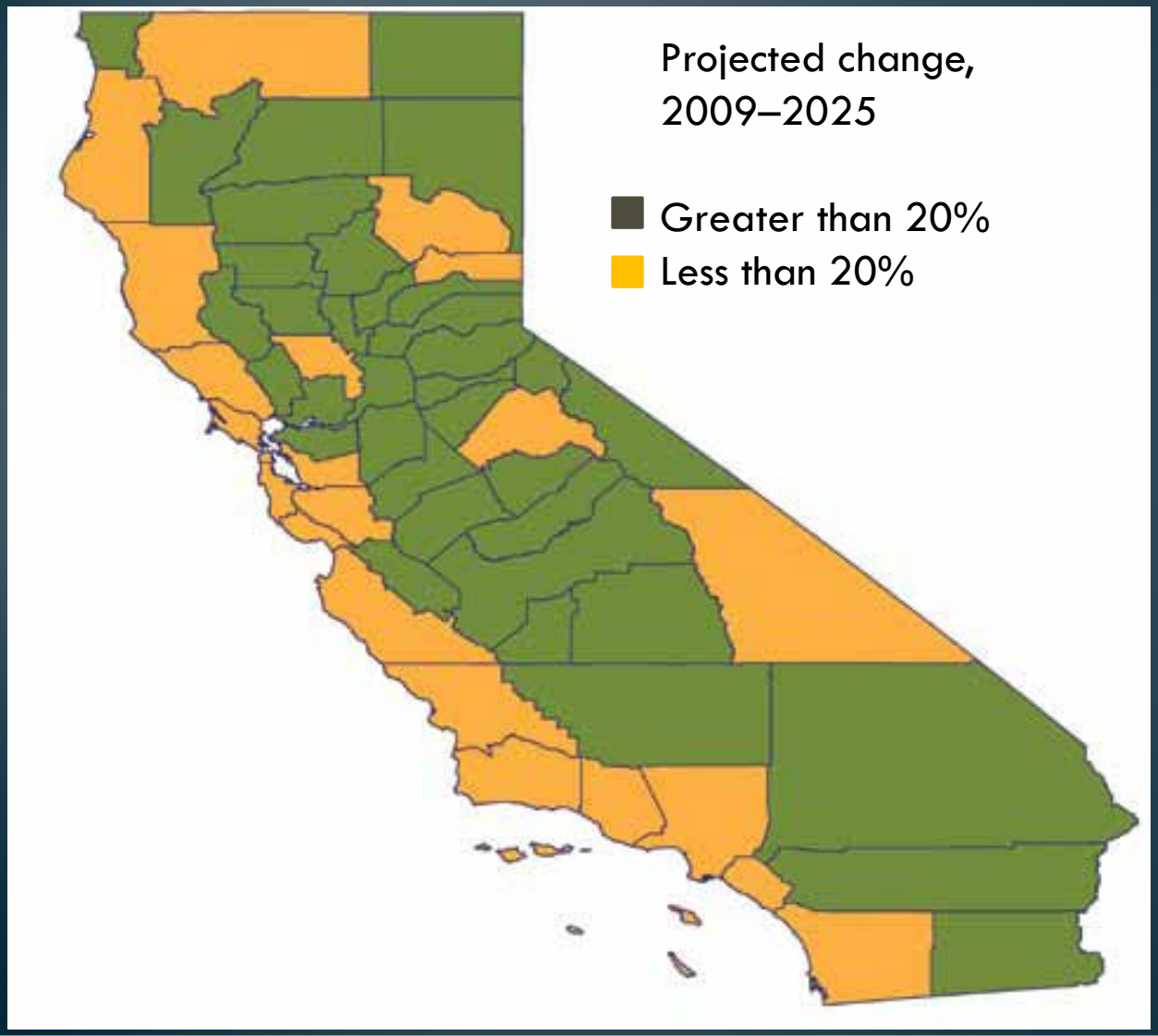
Objectives

- Humans have altered every natural system on Earth
- Humans can repair or protect some natural systems
- Opportunities for adaptation exist today
- Academic context
  - Wedges
- Conservation today
- Opportunities in policy
  - Renewable energy
  - Climate policy (AB 32)
- Where do we go from here?
  - Find opportunity for resource betterment in every proposed decision

A growing population: are people part of the solution or threats to ecosystem success?



Data from DOF, map from PPIC (Johnson, 2011)

Encroachment and sprawl

Encroachment and sprawl

Deforestation

Water management

2004 – Pacala and Socolow, stabilization wedges

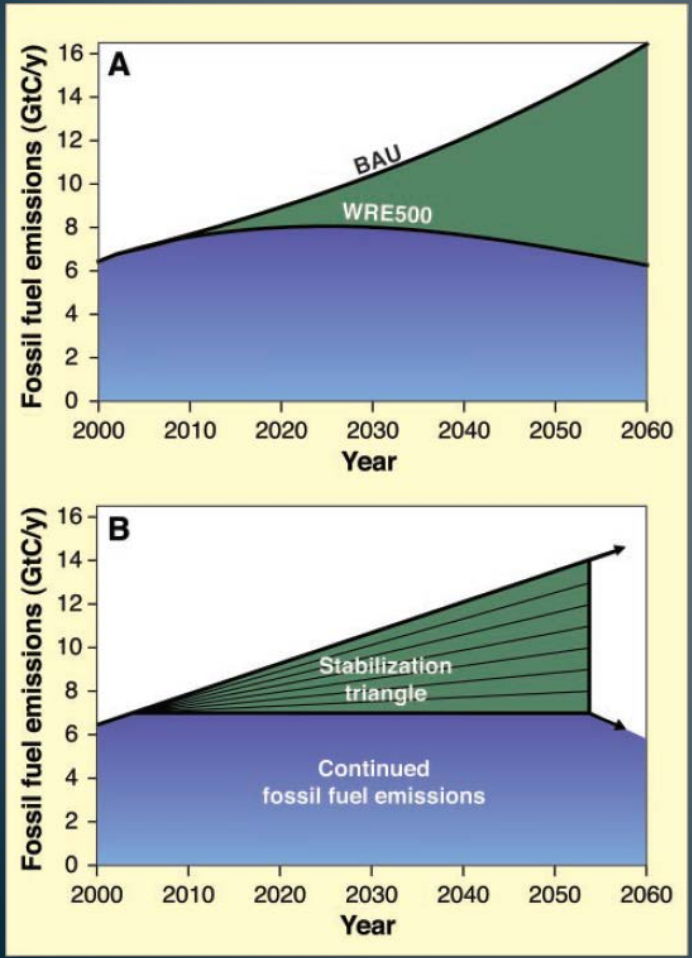
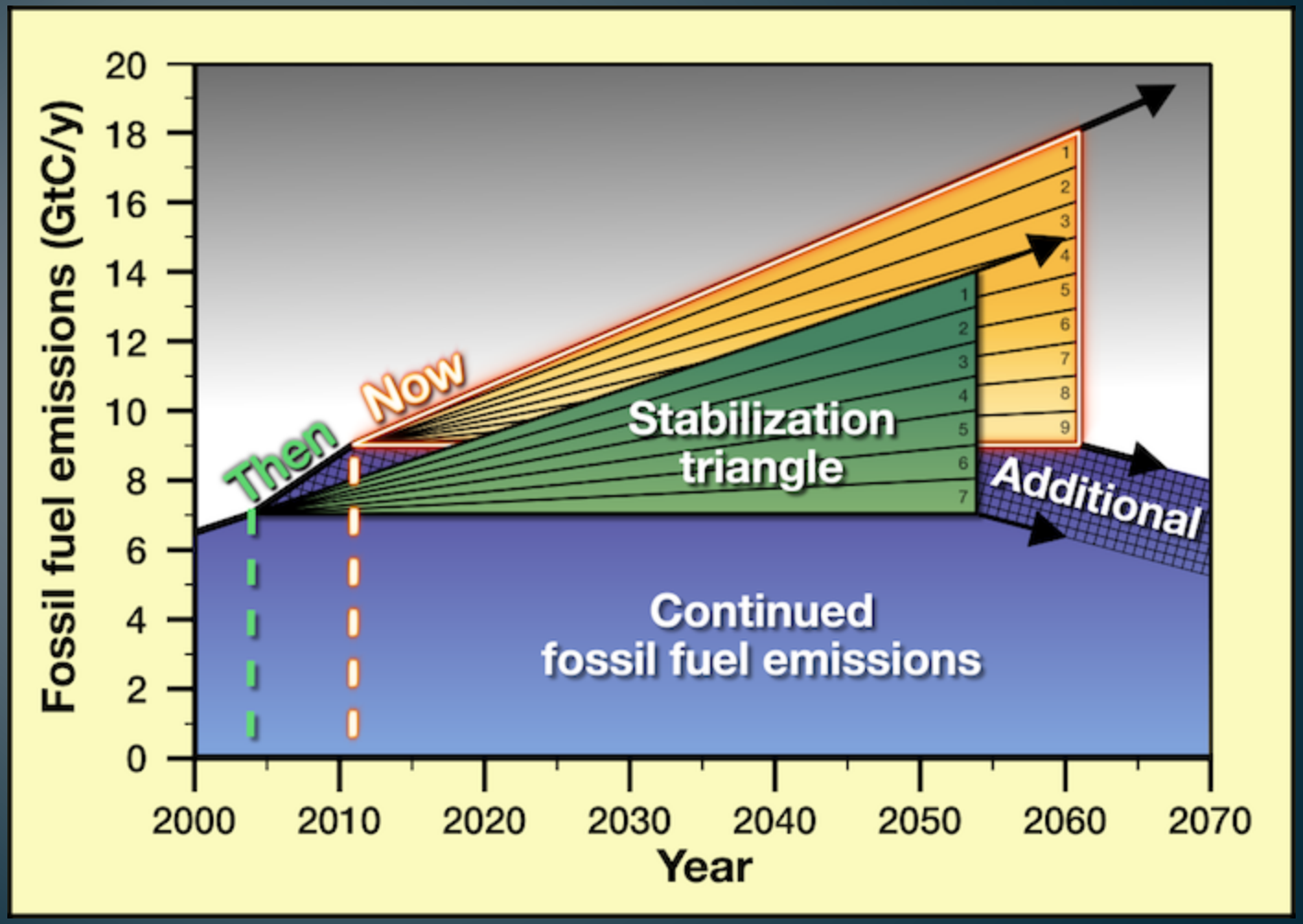


Table 1. Potential wedges: Strategies available to reduce the carbon emission rate in 2054 by 1 GtC/year or to reduce carbon emissions from 2004 to 2054 by 25 GtC.

Option	Effort by 2054 for one wedge, relative to 14 GtC/year BAU	Comments, issues
	Energy efficiency and conservation	
Economy-wide carbon-intensity reduction (emissions/$GDP)	Increase reduction by additional 0.15% per year (e.g., increase U.S. goal of 1.96% reduction per year to 2.11% per year)	Can be tuned by carbon policy
1. Efficient vehicles	Increase fuel economy for 2 billion cars from 30 to 60 mpg	Car size, power
2. Reduced use of vehicles	Decrease car travel for 2 billion 30-mpg cars from 10,000 to 5000 miles per year	Urban design, mass transit, telecommuting
3. Efficient buildings	Cut carbon emissions by one-fourth in buildings and appliances projected for 2054	Weak incentives
4. Efficient baseload coal plants	Produce twice today's coal power output at 60% instead of 40% efficiency (compared with 32% today)	Advanced high-temperature materials
	Fuel shift	
5. Gas baseload power for coal baseload power	Replace 1400 GW 50%-efficient coal plants with gas plants (four times the current production of gas-based power)	Competing demands for natural gas
	CO_2 Capture and Storage (CCS)	
6. Capture CO_2 at baseload power plant	Introduce CCS at 800 GW coal or 1600 GW natural gas (compared with 1060 GW coal in 1999)	Technology already in use for H_2 production
7. Capture CO_2 at H_2 plant	Introduce CCS at plants producing 250 MtH_2/year from coal or 500 MtH_2/year from natural gas (compared with 40 MtH_2/year today from all sources)	H_2 safety, infrastructure
8. Capture CO_2 at coal-to-synfuels plant	Introduce CCS at synfuels plants producing 30 million barrels a day from coal (200 times Sasol), if half of feedstock carbon is available for capture	Increased CO_2 emissions, if synfuels are produced without CCS
Geological storage	Create 3500 Sleipners	Durable storage, successful permitting
	Nuclear fission	
9. Nuclear power for coal power	Add 700 GW (twice the current capacity)	Nuclear proliferation, terrorism, waste
	Renewable electricity and fuels	
10. Wind power for coal power	Add 2 million 1-MW-peak windmills (50 times the current capacity) "occupying" 30×10^6 ha, on land or offshore	Multiple uses of land because windmills are widely spaced
11. PV power for coal power	Add 2000 GW-peak PV (700 times the current capacity) on 2×10^6 ha	PV production cost
12. Wind H_2 in fuel-cell car for gasoline in hybrid car	Add 4 million 1-MW-peak windmills (100 times the current capacity)	H_2 safety, infrastructure
13. Biomass fuel for fossil fuel	Add 100 times the current Brazil or U.S. ethanol production, with the use of 250×10^6 ha (one-sixth of world cropland)	Biodiversity, competing land use
	Forests and agricultural soils	
14. Reduced deforestation, plus reforestation, afforestation, and new plantations.	Decrease tropical deforestation to zero instead of 0.5 GtC/year, and establish 300 Mha of new tree plantations (twice the current rate)	Land demands of agriculture, benefits to biodiversity from reduced deforestation
15. Conservation tillage	Apply to all cropland (10 times the current usage)	Reversibility, verification

2011: Socolow update and reaffirmation



2012 – Davis, et al: we need much more!

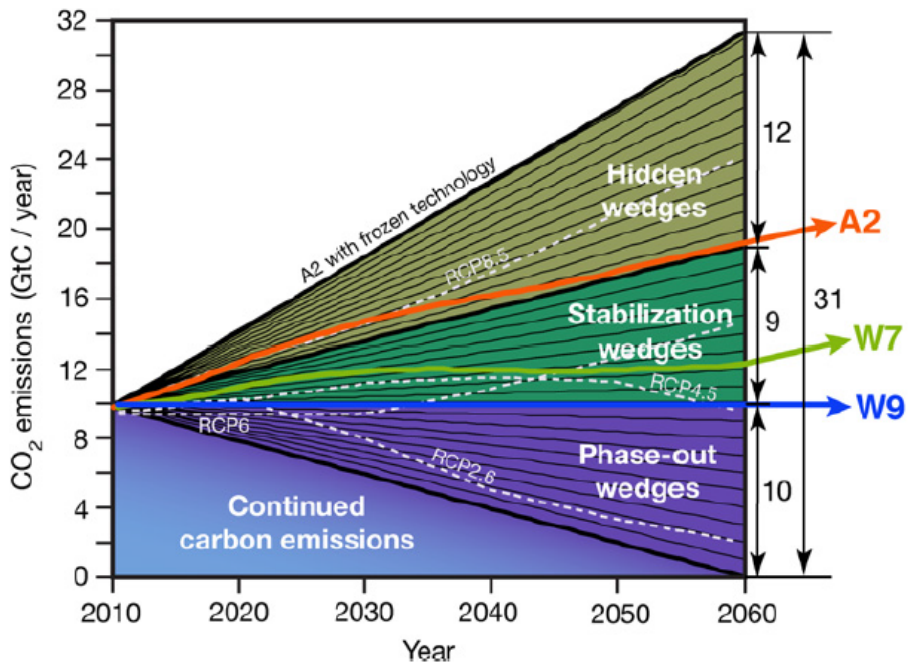


Figure 2. Idealization of future CO_2 emissions under the business-as-usual SRES A2 marker scenario. Future emissions are divided into *hidden* (sometimes called 'virtual') wedges (brown) of emissions avoided by expected decreases in the carbon intensity of GDP by ~1% per year, *stabilization* wedges (green) of emissions avoided through mitigation efforts that hold emissions constant at 9.8 GtC y^{-1} beginning in 2010, phase-out wedges (purple) of emissions avoided through complete transition of technologies and practices that emit CO_2 to the atmosphere to ones that do not, and allowed emissions (blue). Wedges expand linearly from 0 to 1 GtC y^{-1} from 2010 to 2060. The total avoided emissions per wedge is 25 GtC, such that altogether the hidden, stabilization and phase-out wedges represent 775 GtC of cumulative emissions.

What role does conservation play in these climate change solution wedges?

- How do we conceive of conservation?
  - Conservation easements
  - Infill development
  - Urban envelope
  - Greenways
  - Integrated land use management
  - Sustainable agriculture
  - Management for ecosystem services
  - Others?

Full protection, for now

Protection with management

Water provisioning

Rangeland management

Conservation benefits?

Active management?

Where do opportunities for conservation exist in climate policy?

- Renewable energy
  - Desert renewable energy conservation plan
  - Solar programmatic environmental impact statement
  - Individual projects
- Conservation opportunities
  - Wildlife connectivity
  - Island interconnections
  - Climate considerations
  - Others?
- What is the mechanism for collaboration on these solutions?

Where do opportunities for conservation exist in climate policy?

- California's Global Warming Solutions Act (AB 32)
  - Cap and trade
    - Investment plan
  - Low carbon fuels
  - Waste diversion
  - Forestry (offsets)
- Conservation opportunities
  - Soil carbon sequestration – active management
  - Conservation easements
  - Treed streets

Our nexus: how practitioners make a difference

- Education – Climate College!
- Experimentation
- Innovation
- Optimism
- Collaboration

Thank you…

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CDFW Climate College: Lecture #8

In it for the long haul: CDFW Going Green Sustainability Initiative

Crilly Butler
CDFW

Whitney Albright
CDFW

April 11, 1:30 - 2:30PM