Response of Invasive Weeds in Southern California to the Historic California State-wide Drought

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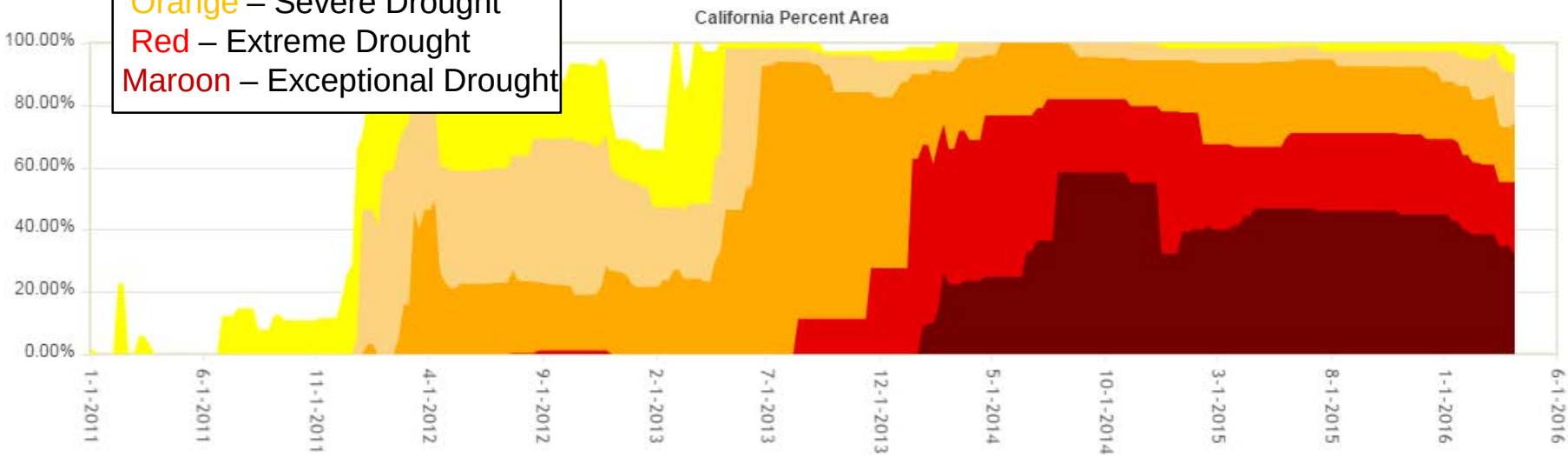
Presentation Outline

1. California Drought
2. Project Data
3. Research Questions
4. Methods and Analyses
5. Patterns Found
6. What does it mean?

California Drought

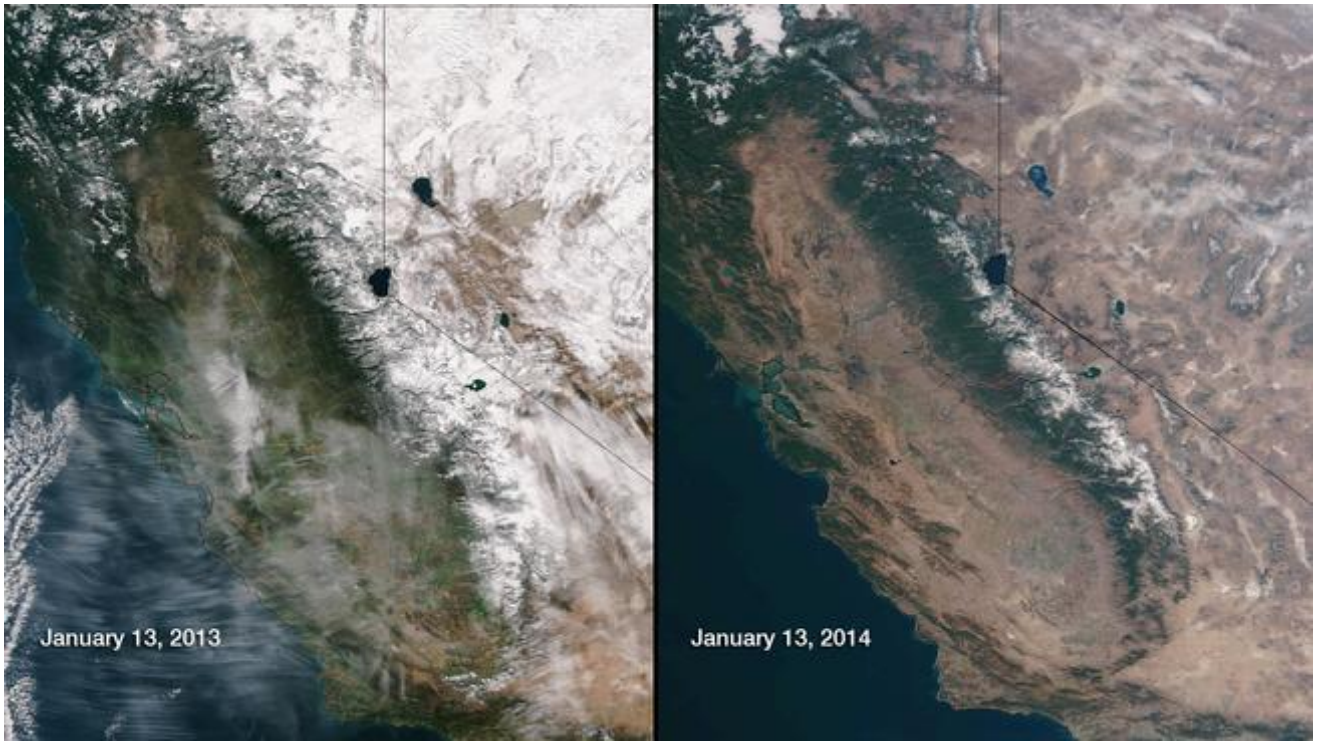
California Drought

Yellow - Abnormally Dry
Tan – Moderate Drought
Orange – Severe Drought
Red – Extreme Drought
Maroon – Exceptional Drought



- Began fall of 2011(rain years measured October 1 – Sept 30)
- Worst in 2014
- 40% CA - Exceptional drought since 2014
- 60% CA - Extreme drought since 2014
- 80% CA - Severe drought since 2014
- 100% CA affected in some way

California Drought

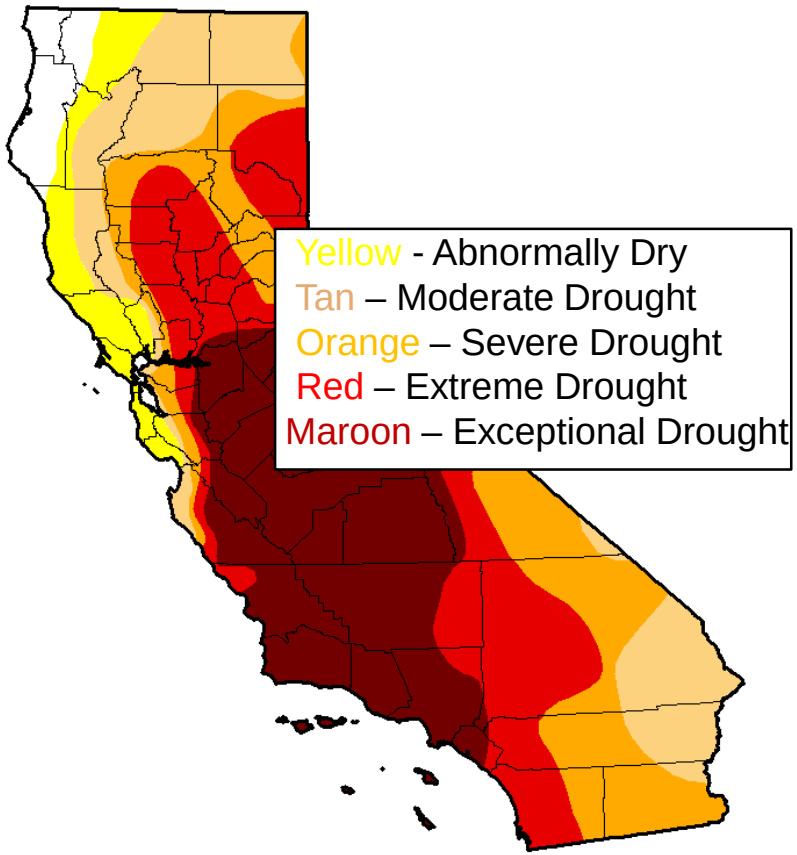


- 2014 was 3rd driest year on record for CA
- 2015 had lowest snowpack in 500 years
- 2014 was hottest year on record for CA
- 2015 was 2nd hottest year on record for CA

Drought in Southern California

- 2014 hottest year on record in San Diego
- 2014 was 10th driest year on record in San Diego
- Most of Imperial County has been in Severe Drought since 2013

Drought in Southern California-Current Conditions



- Current drought conditions (April 12, 2016)
- San Diego County in Severe to Extreme Drought
- Imperial County in Moderate to Severe Drought
- El Nino (warming of equatorial eastern and central Pacific Ocean, can bring extra moisture to CA) did not produce expected precipitation

Project Data

Project Data

- 118-mile-long transmission line
- Spans Imperial and San Diego Counties
- AECOM team is restoring temporary impact locations
- Pre-Construction through Year 3
- Project is in Year 4 of 5-Year Maintenance and Monitoring Period
- Data from 2011- 2015 (coincides with drought)

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Project Data

Project Data

– 234 Restoration Sites

– 4 Sections
  - Coast
  - Mountains West
  - Mountains East
  - Desert

– 21 Habitat Types

– 50 Reference Sites

– At least one reference site for each habitat type in each section

Research Questions

Research Questions

- How do nonnative weed species respond to changes in precipitation?
  - Total amount
  - Timing
  - Magnitude
- Are the patterns different for nonnative grasses versus nonnative forbs?

Methods and Analyses

Methods and Analyses: Precipitation

– Total Annual Precipitation

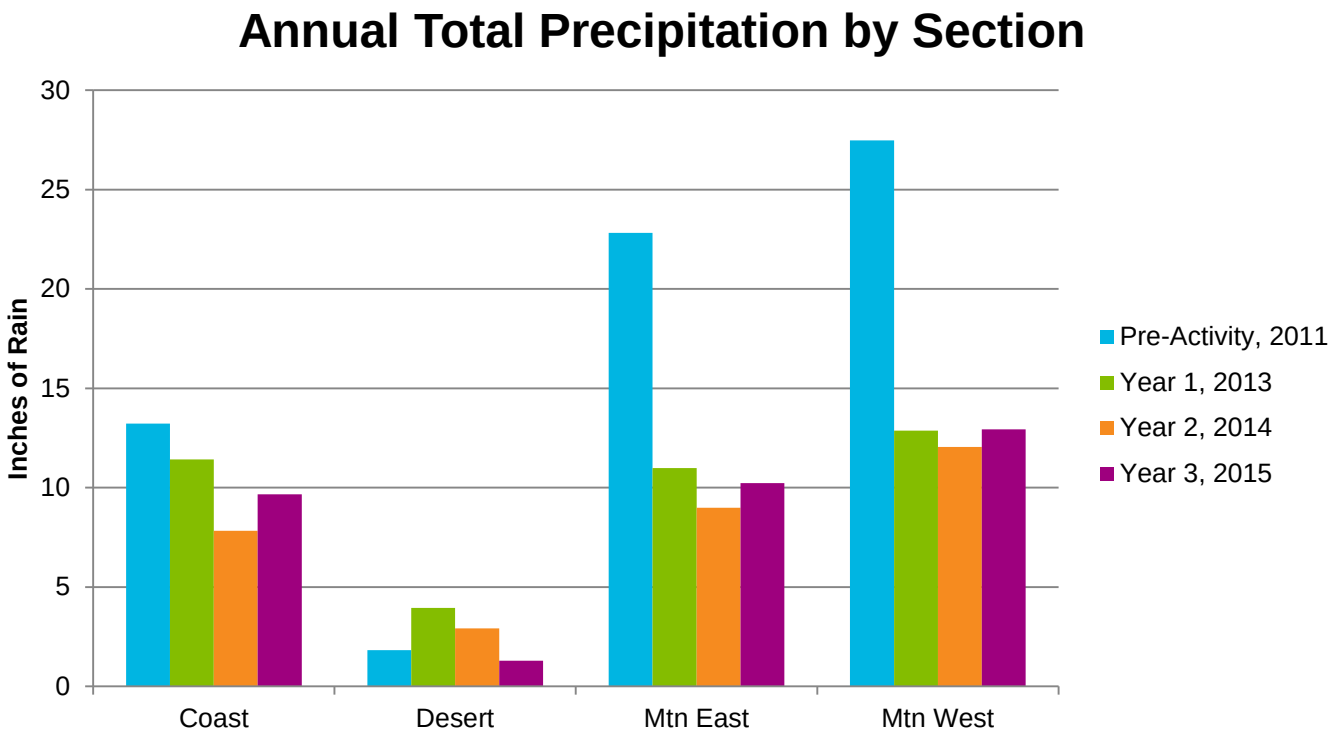
- Weather Station for each Section
  - o Desert – EL CENTRO NAF CA US
  - o Mtns East – CAMPO CA US
  - o Mtns West – JAMUL 9.9ESE CA US
  - o Coast – EL CAPITAN DAM CA US

- Precipitation Year - captures year prior to annual monitoring

Section	Data Collection	Precipitation Year
Desert	March	March 1 – Feb 28
Mtns East	May	May 1 – April 30
Mtns West	May	May 1 – April 30
Coast	April	April 1 – March 31

- Pre-Construction – Year 3 (2010-2015)

Methods and Analyses: Precipitation



- Average for Coast ~10 inches
- Average for Desert ~ 3 inches
- Average for Mtns ~ 25 inches

Methods and Analyses: Precipitation

– Precipitation Timing

- Early (Sept-Oct)
- Typical (Nov – Feb)
- Late (March – May)
- Summer (June – August)

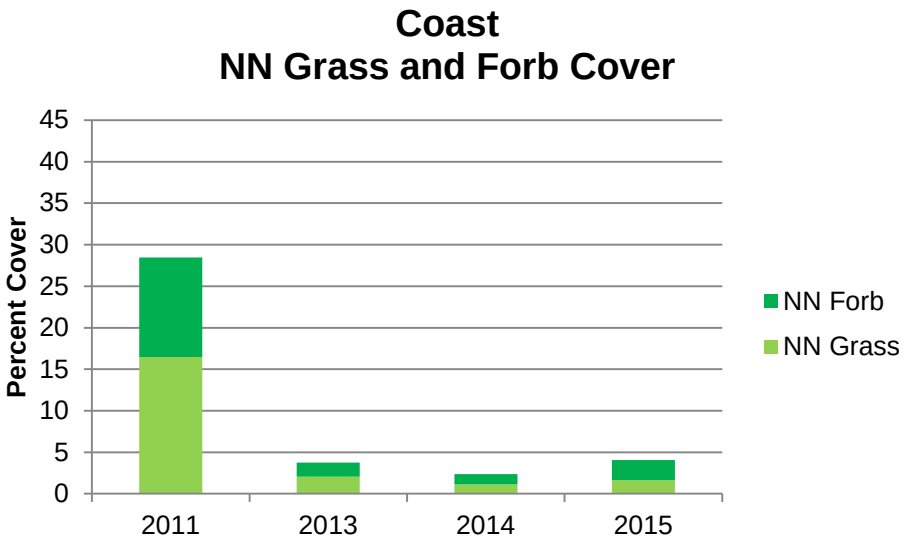
– Precipitation Magnitude

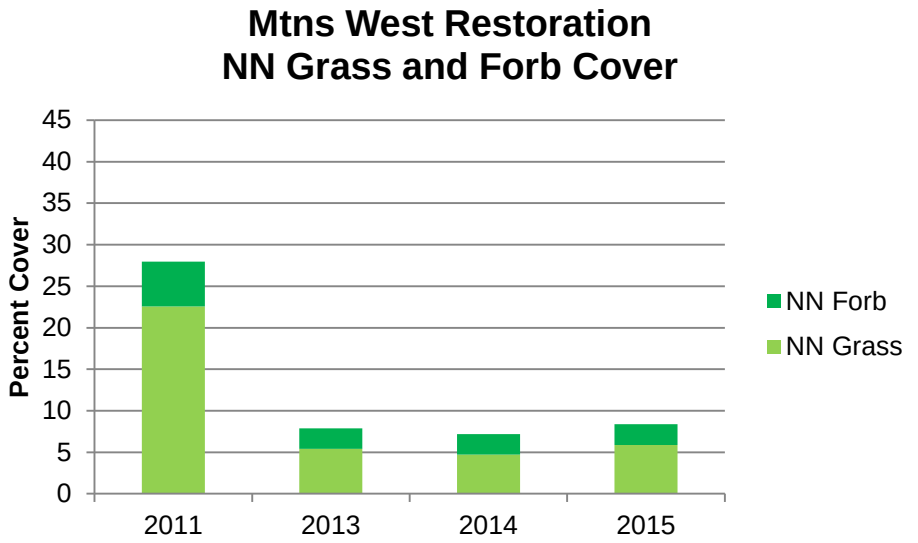
- Calculated Storm Totals for each weather station (summed consecutive days of precipitation)
- Number (count) of “Big Storms”
  - o Desert > 0.5”
  - o Mtns East and Mtns West > 1.5”
  - o Coast > 1”

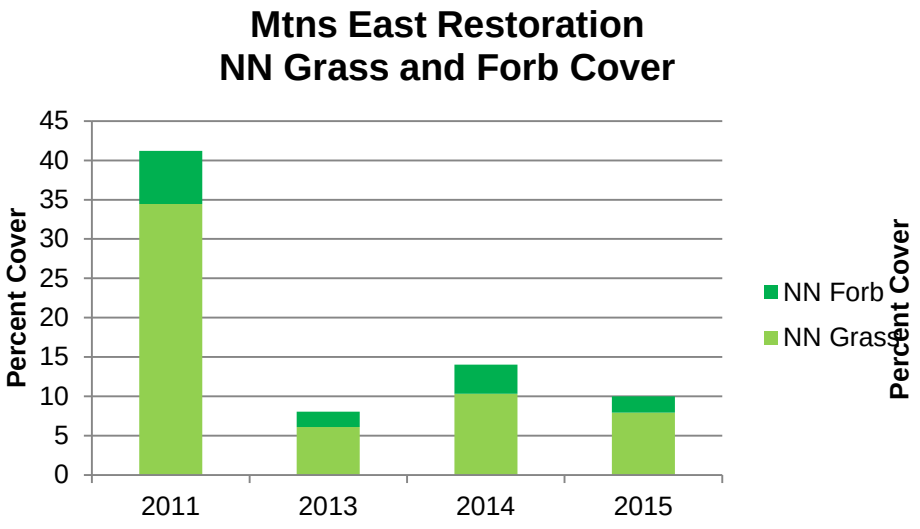
Methods and Analyses: Nonnative Cover

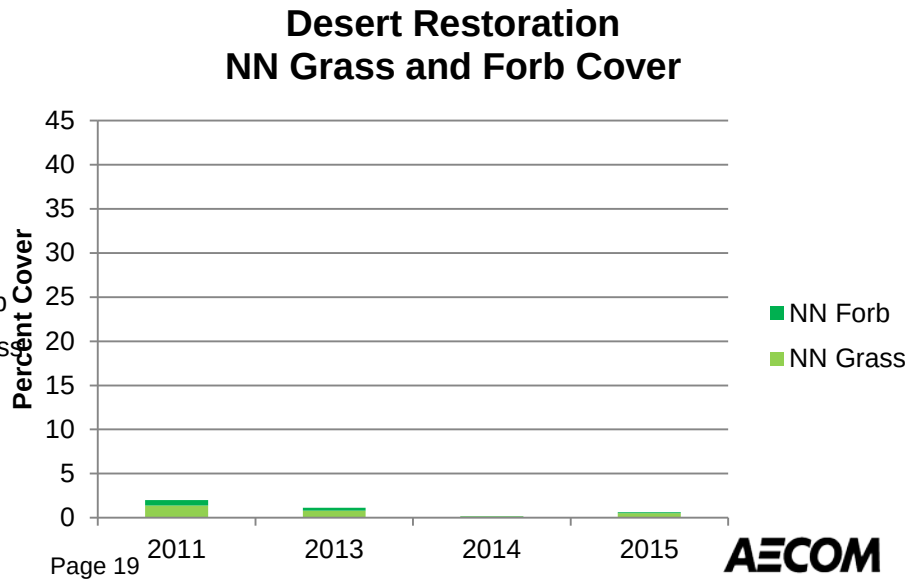
- Total nonnative cover
- Total nonnative grass cover
- Total nonnative forb cover
- Separate analysis by Section
- Restoration Sites
- Reference Sites

Methods and Analyses: Nonnative Cover – Restoration Sites

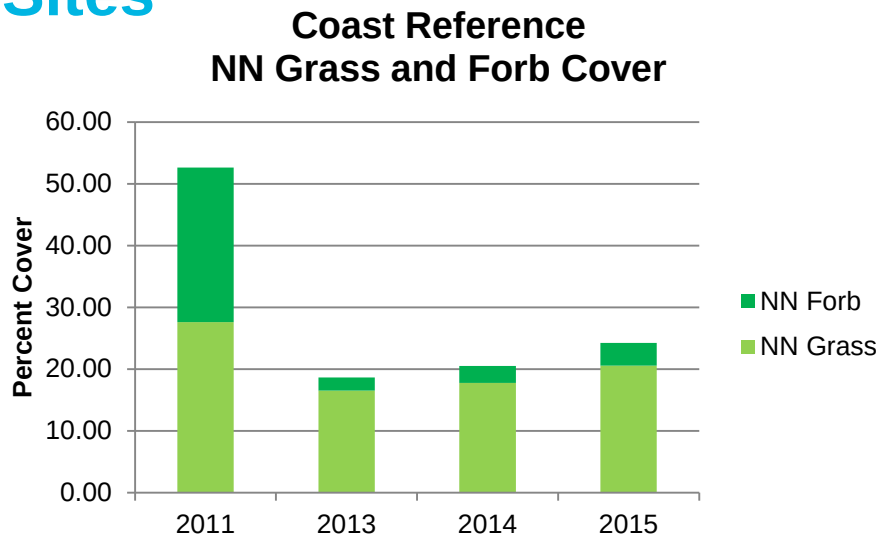


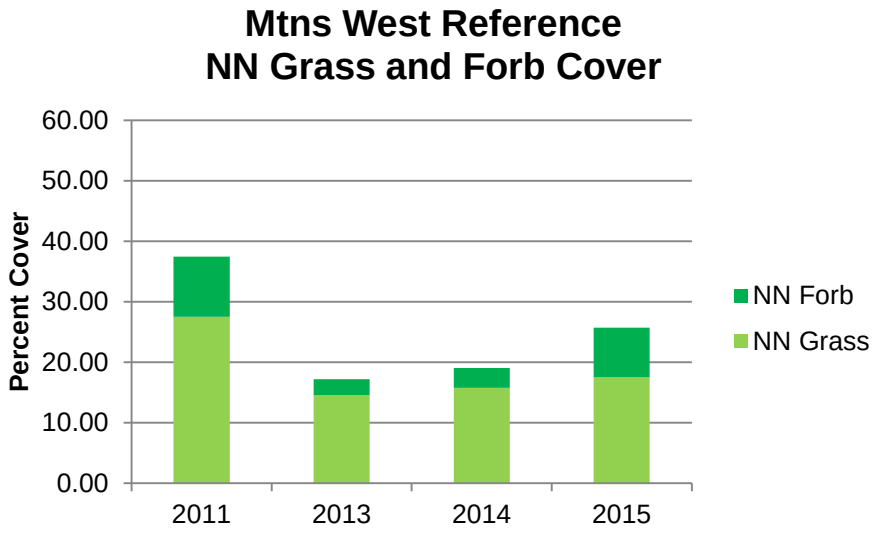


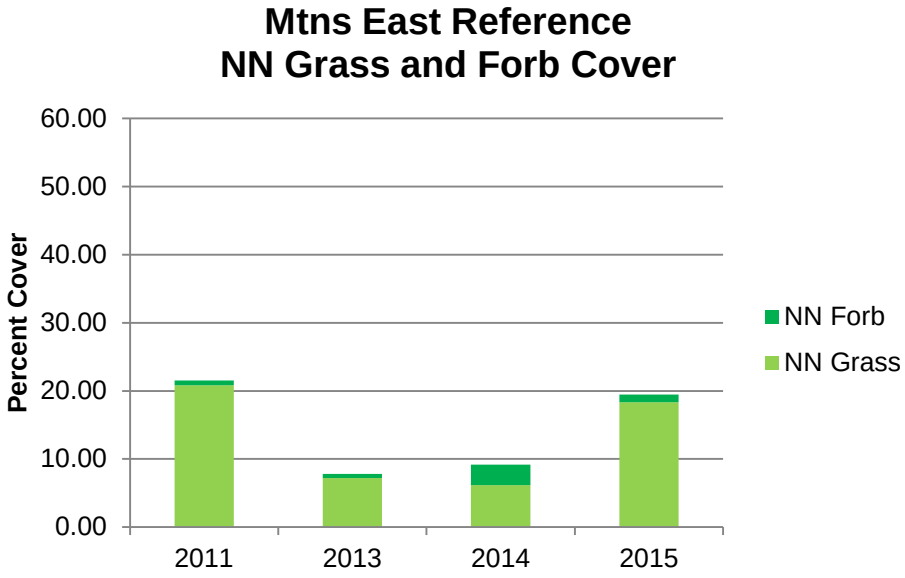


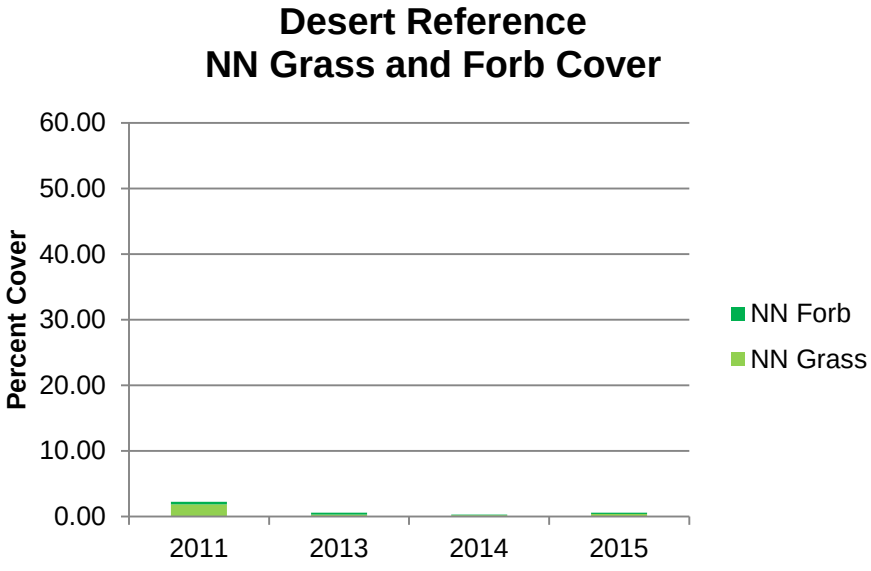


Methods and Analyses: Nonnative Cover – Reference Sites









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Patterns Found

Patterns Found – Coast

– Total Precipitation

- Significantly related to Total NN Cover, NN Grass, and NN Forb
- As total precip increases, cover of weeds increases
- Reaction of NN Forbs to decrease in rainfall is greater than NN Grasses

– Timing

- Typical Season only significant relationship with Total NN Cover, NN Grass, and NN Forb
- As total precip in Typical Season increases, cover of weeds increases

– Magnitude

- # of Big Storms had a significant negative effect on Total NN Cover, NN Grass, and NN Forb
- More large storms, less weed cover

Patterns Found – Mtns West

– Total Precipitation

- Significantly related to Total NN Cover, NN Grass, and NN Forb
- As total precip increases, cover of weeds increases
- Reaction of NN Forbs to decrease in rainfall is greater than NN Grasses

– Timing

- Typical Season rain significantly related to Total NN Cover, NN Grass, and NN Forb

– Magnitude

- # of Big Storms had a significant positive effect on Total NN Cover, NN Grass, and NN Forb
- More large storms, more weed cover

Patterns Found – Mtns East

– Total Precipitation

- Significantly related to Total NN Cover, NN Grass, and NN Forb
- As total precip increases, cover of weeds increases
- Reaction of NN Forbs to decrease in rainfall is greater than NN Grasses

– Timing

- Typical Season rain significantly related to Total NN Cover, NN Grass, and NN Forb

– Magnitude

- # of Big Storms had a significant positive effect on Total NN Cover, NN Grass, and NN Forb
- More large storms, more weed cover

Patterns Found – Desert

– Total Precipitation

- Not related to Total NN Cover, NN Grass, or NN Forb

– Timing

- Late Season rain had significant positive effect on Total NN Cover, NN Grass, and NN Forb

– Magnitude

- # of Big Storms not related to Total NN Cover, NN Grass, or NN Forb

What does it mean?

What does it mean?

With climate change Southern California can expect:

- more drought
- more intense (bigger) storms
- more heat waves

NN grasses will be bigger issue than NN forbs with continued drought

If timing of rainfall shifts outside of the Typical season, response of NN grasses vs NN forbs may change

Bigger storms will favor both NN grasses and NN forbs in some areas of Southern California (mountains, inland valleys)

Additional research questions

How do native species react to same variables?

Interaction of nonnatives and natives to same variables?

Additional ways at quantifying change in precipitation patterns?
- Time between storms
- Precipitation pattern category (consistent vs sporadic)

Questions?

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