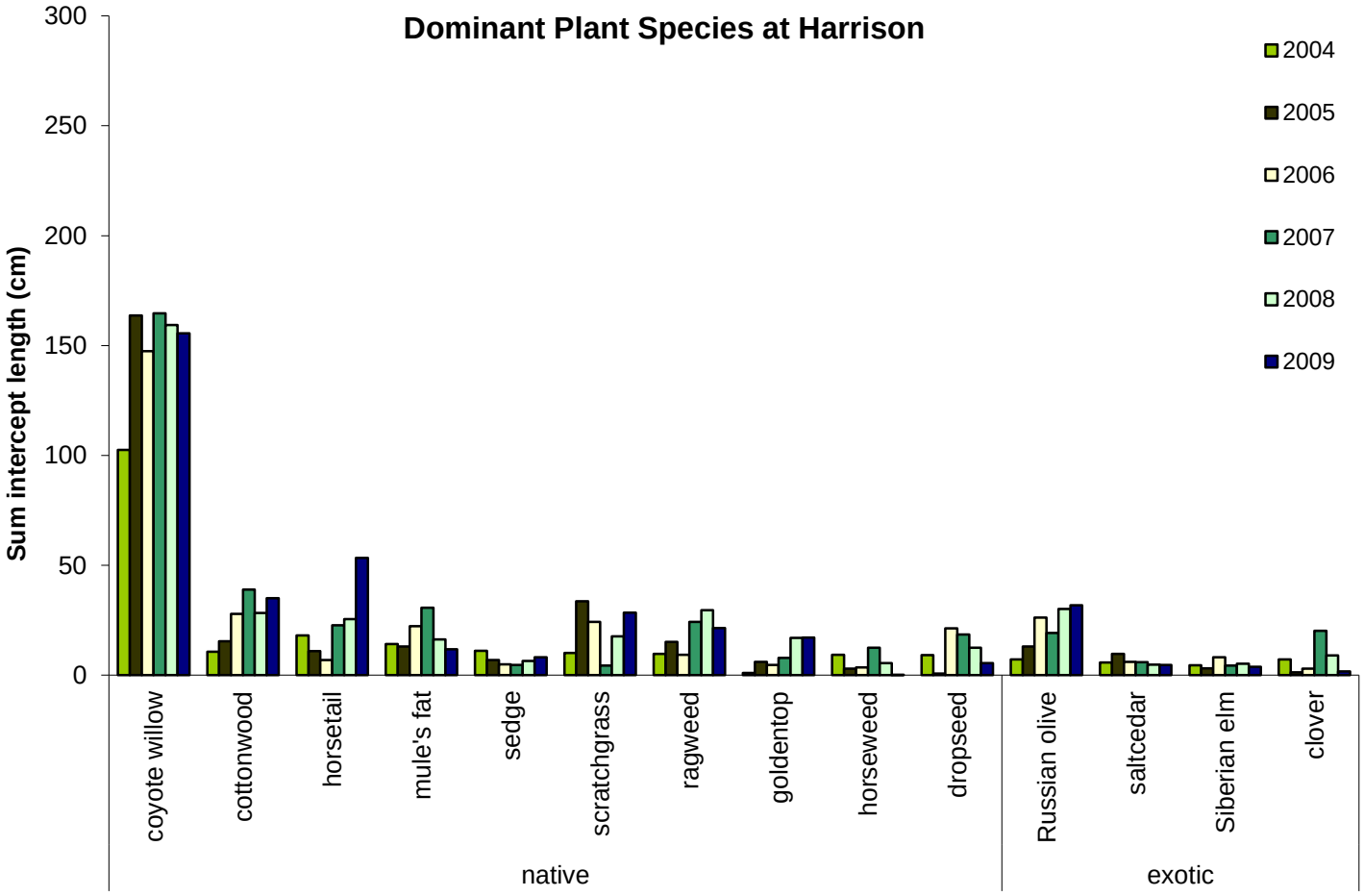
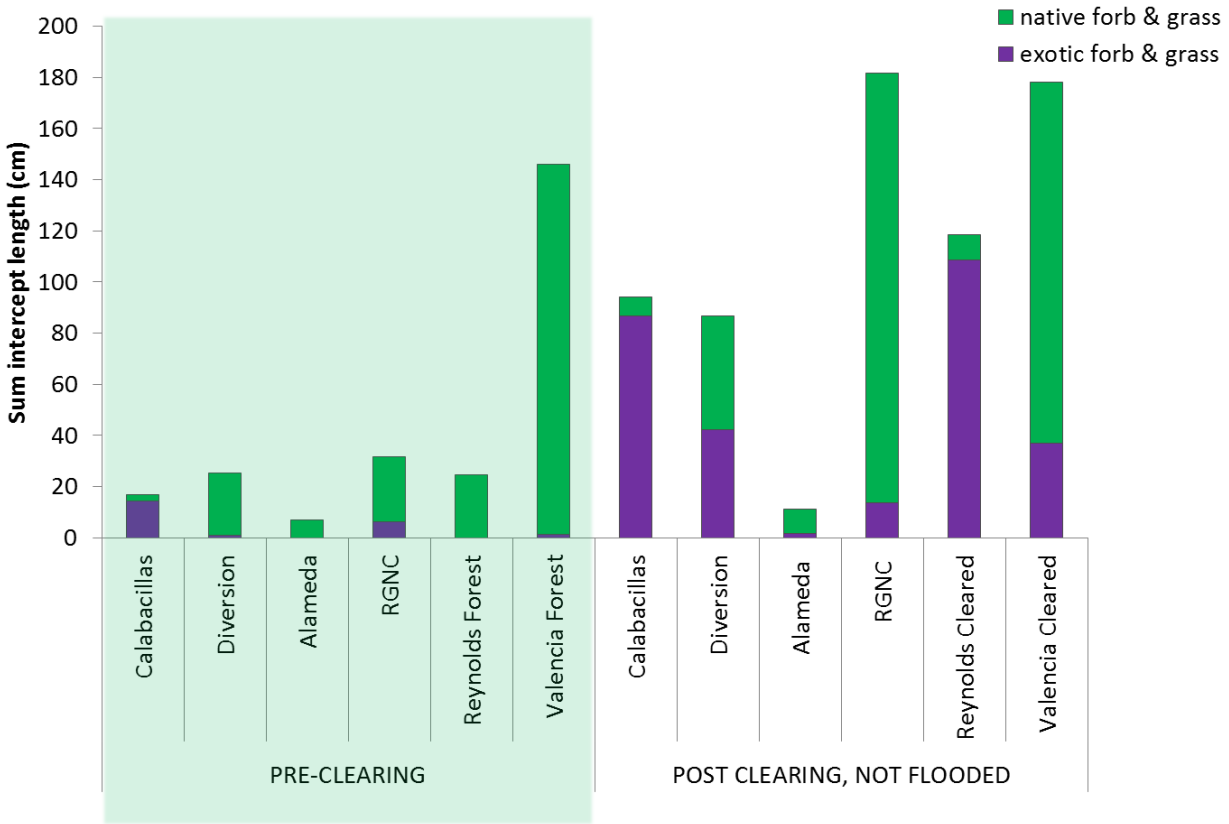
Bosque Disturbance Ecology:

The Future of Flooding, Fire, Clearing, and “Restoration” in the Bosque

Sites that Experience Overbank Floods; High Native Diversity and Cover

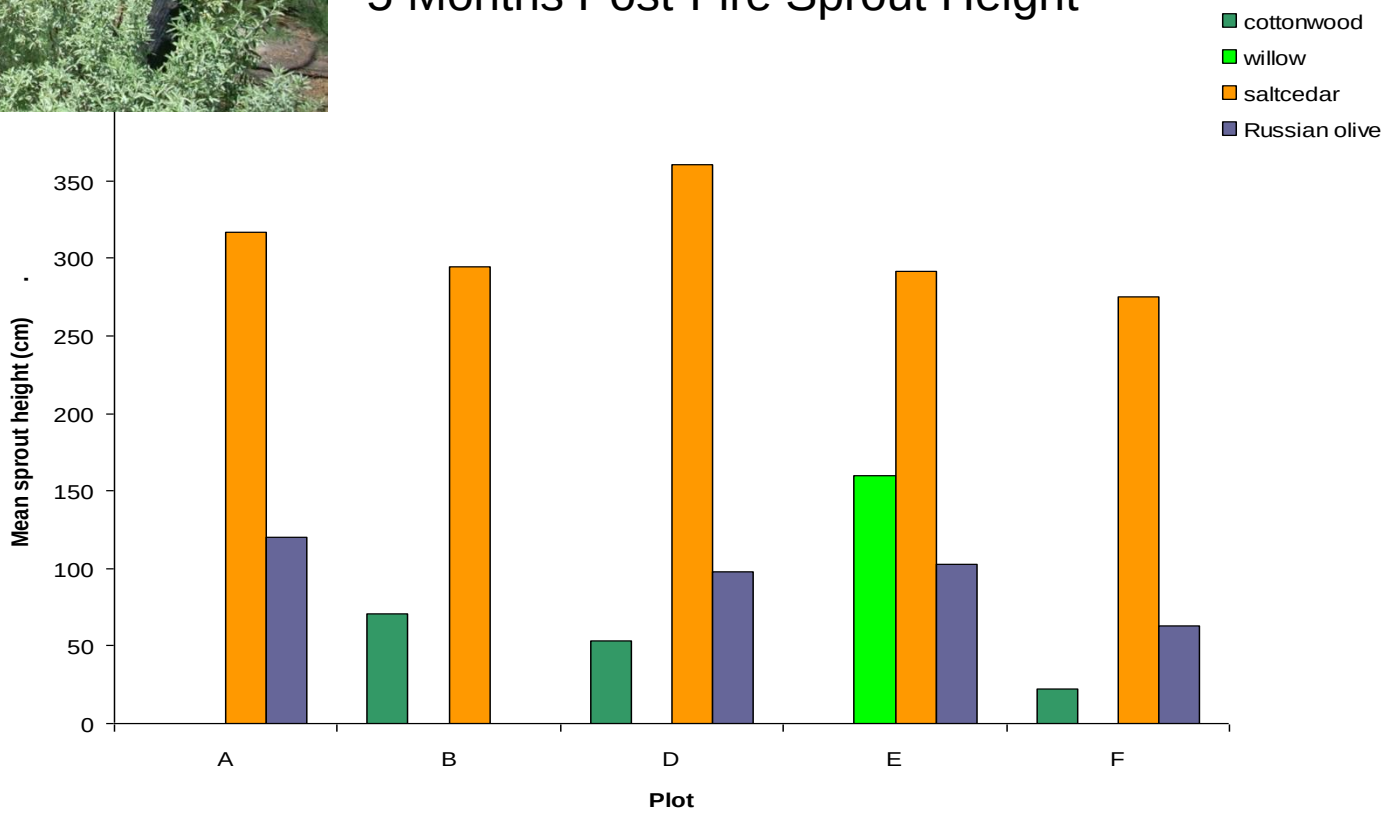


Clearing without Subsequent Flooding Leads to Increased Exotic Understory



Exotics Dominating Post-Fire, No Flooding

5 Months Post-Fire Sprout Height



Valencia Forest – August 2012

Valencia Forest – 5 years post fire


12/30/2006
1991
2011
Crawford
Image U.S. Geological Survey
Google earth
Imagery Date: 12/31/2005 34°38'08.93" N 106°44'55.71" W elev 4801 ft eye alt 6701 ft


8/2/2011
Crawford
Image USDA Farm Service Agency
Google earth
Imagery Date: 7/24/2011 34°38'07.44" N 106°44'55.07" W elev 4802 ft eye alt 6701 ft


8/18/2009
Crawford
Image USDA Farm Service Agency
Google earth
Imagery Date: 5/8/2009 34°38'06.70" N 106°44'49.13" W elev 4803 ft eye alt 6701 ft

Crawford Post-Fire Recovery

February 28, 2009


April 21, 2009


May 7, 2009


May 19, 2009

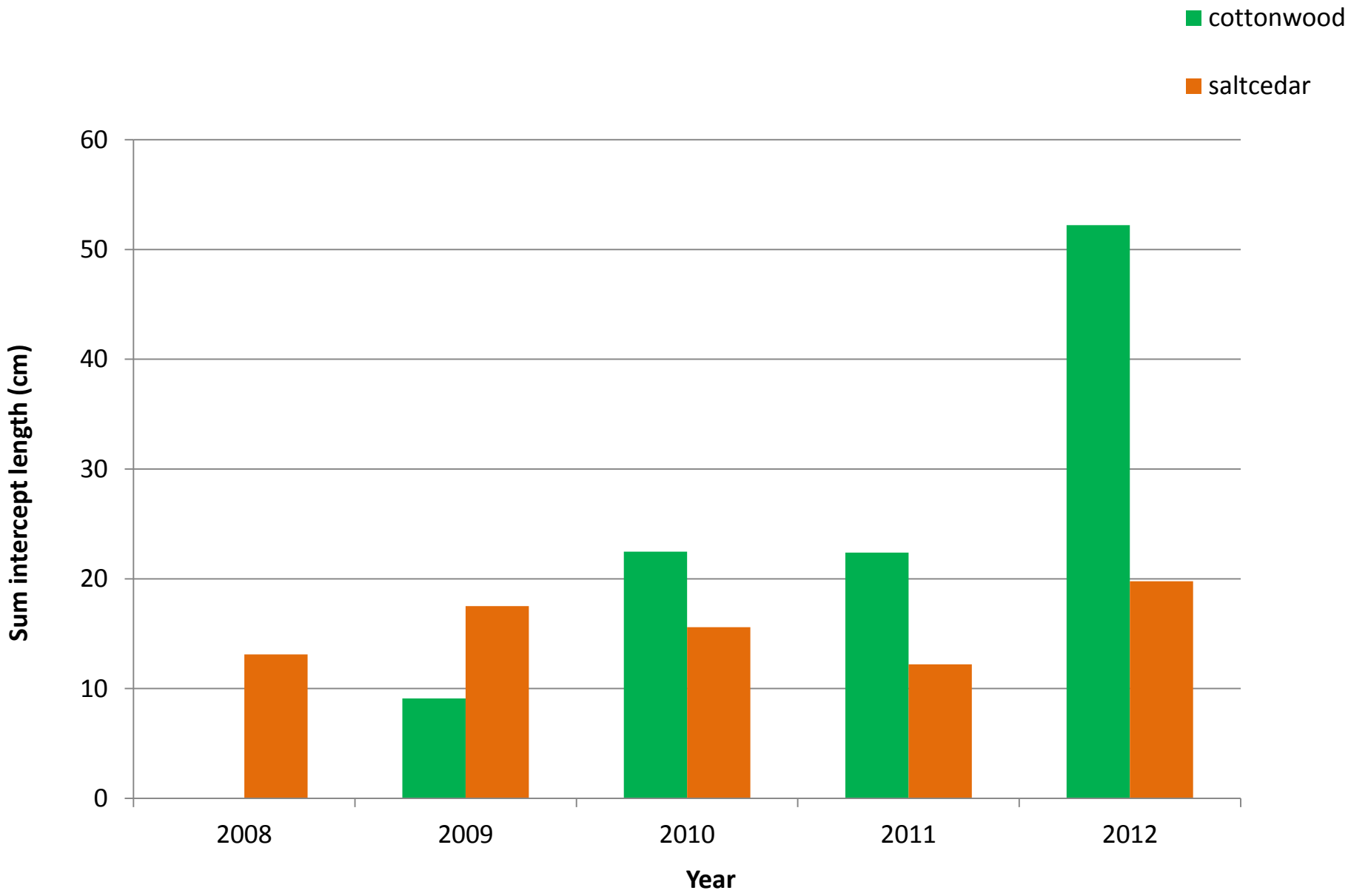

July 21, 2009


August 18, 2009

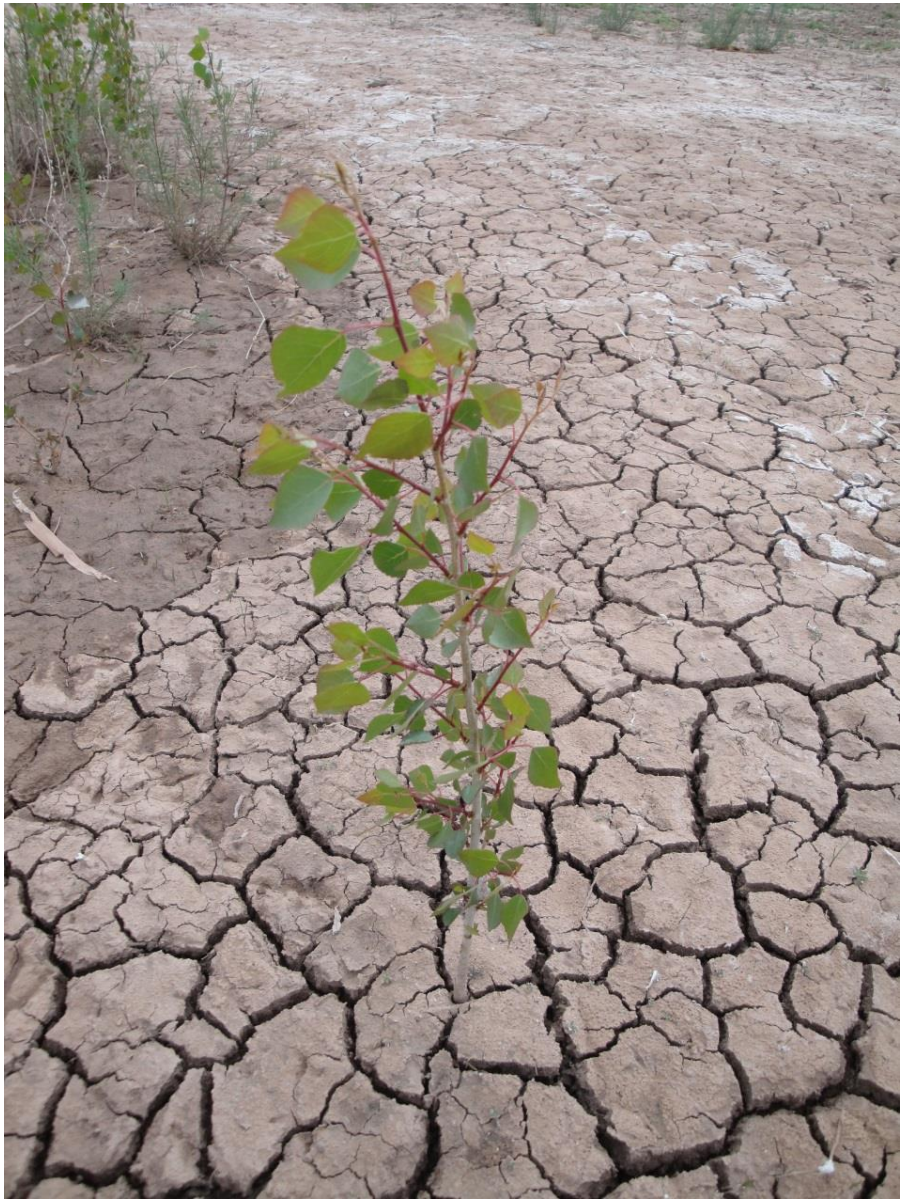
September 2010

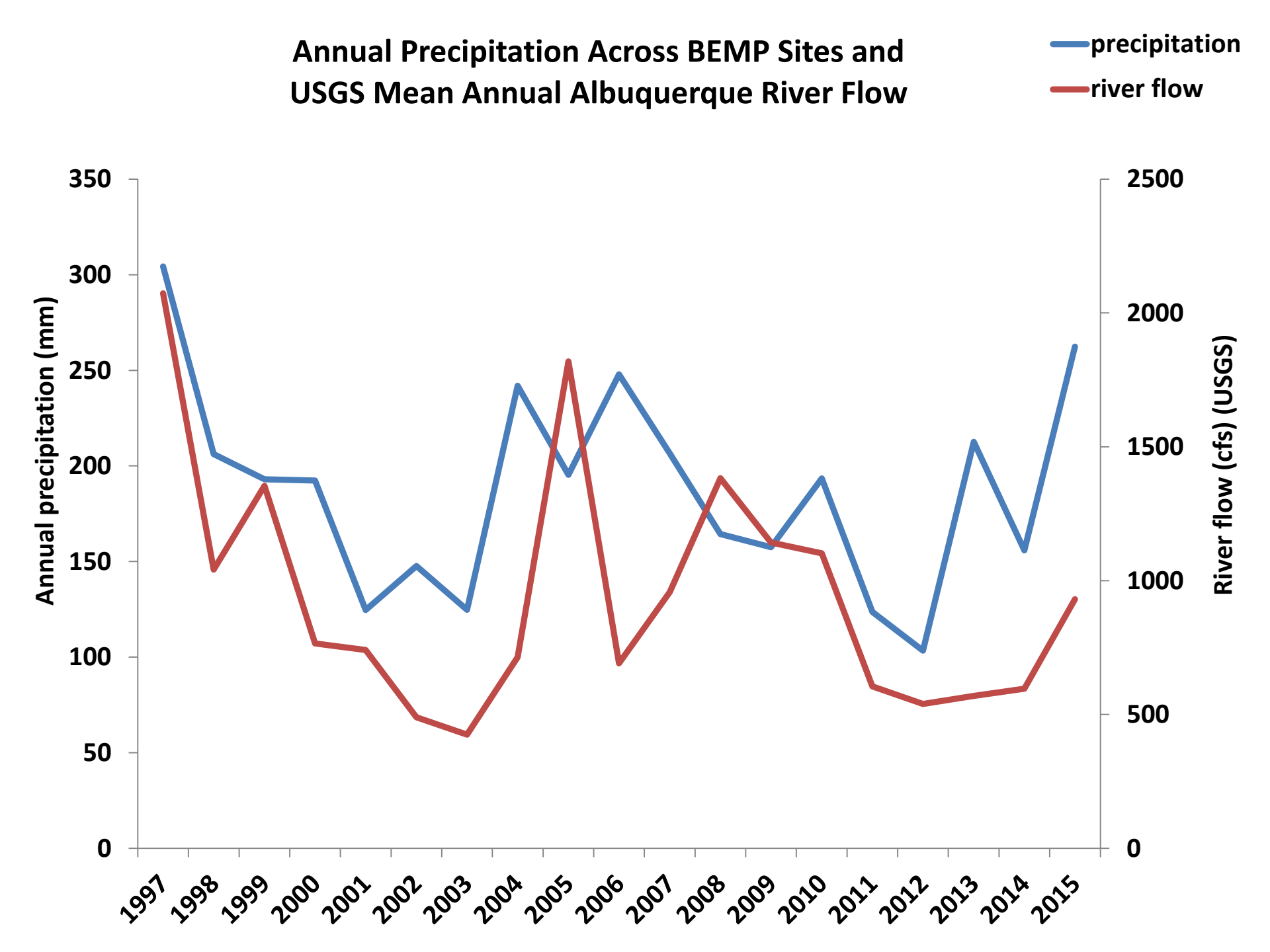
August 2013

Cottonwood and Saltcedar Cover

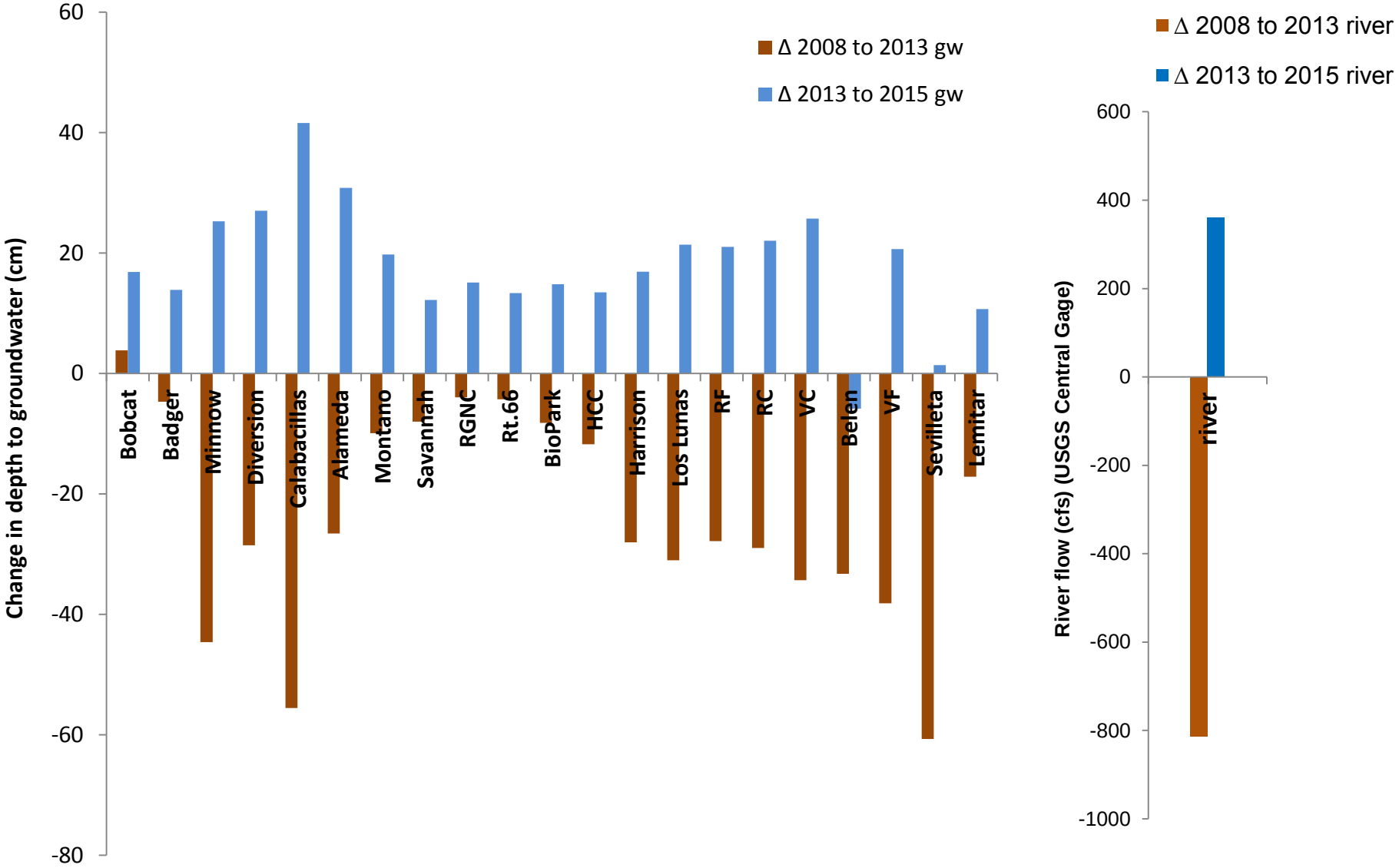


Response to Drought

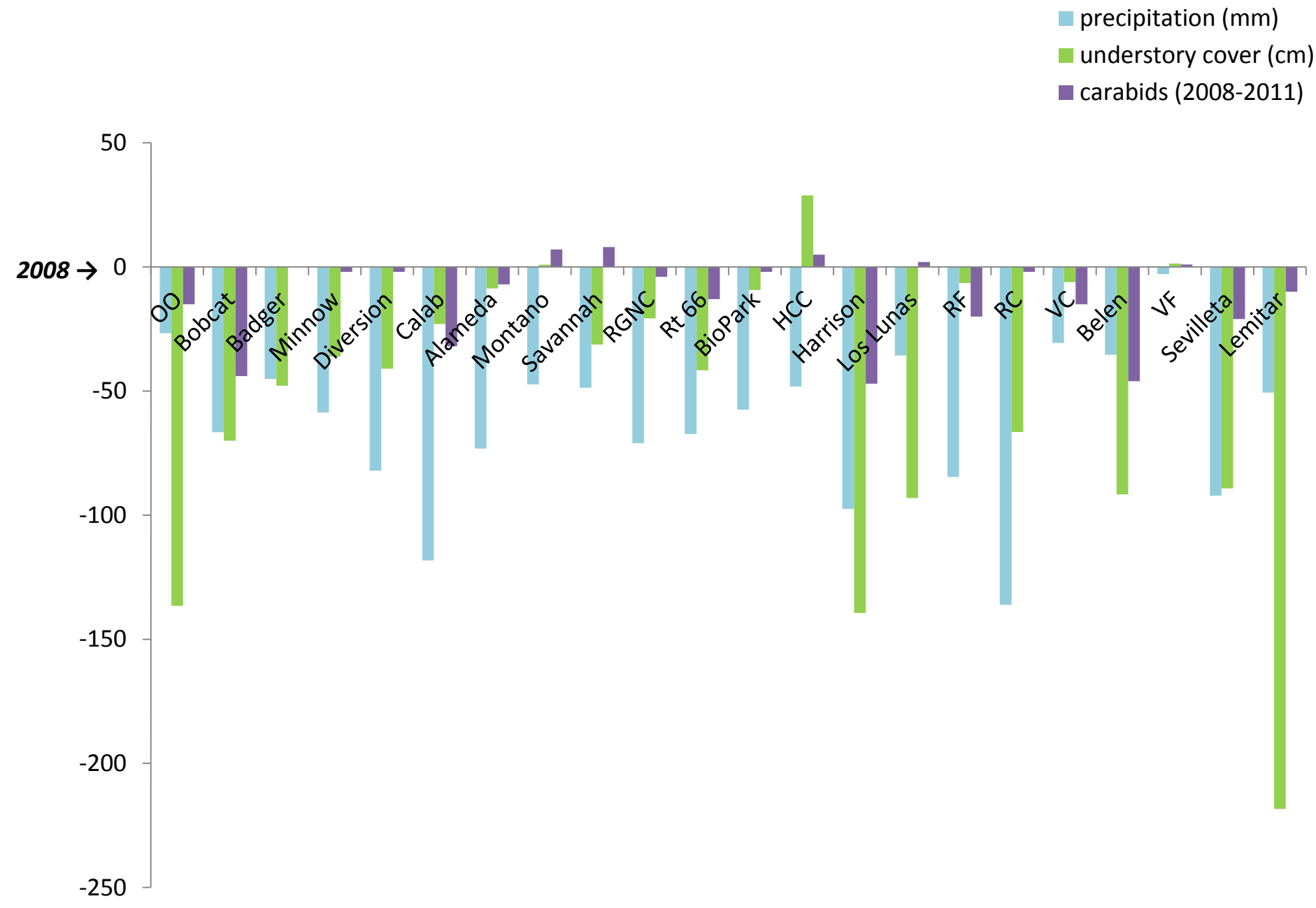



Annual Precipitation Across BEMP Sites and
USGS Mean Annual Albuquerque River Flow
precipitation
river flow
Annual precipitation (mm)
River flow (cfs) (USGS)
350
300
250
200
150
100
50
0
2500
2000
1500
1000
500
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

Change in Depth to Groundwater and River Flow During Drought Years (2008-2013) and Recovery Years (2013-2015)



Change from 2008 to 2012



Prolonged drought leads to ↓ river flows and ↓ groundwater

↑ cottonwood limb and tree mortality

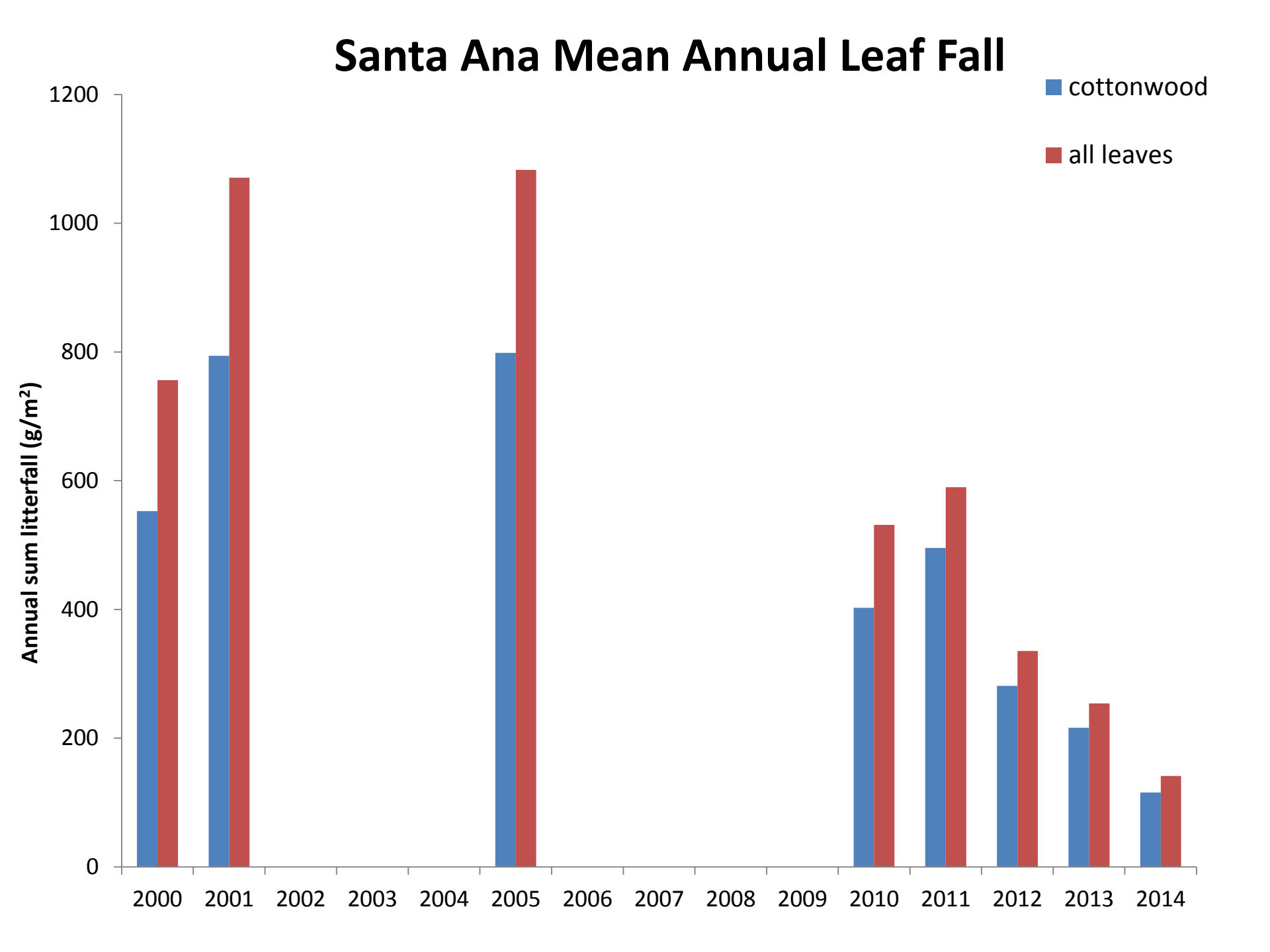
↑ shrub mortality

↑ wood fall and fuel load

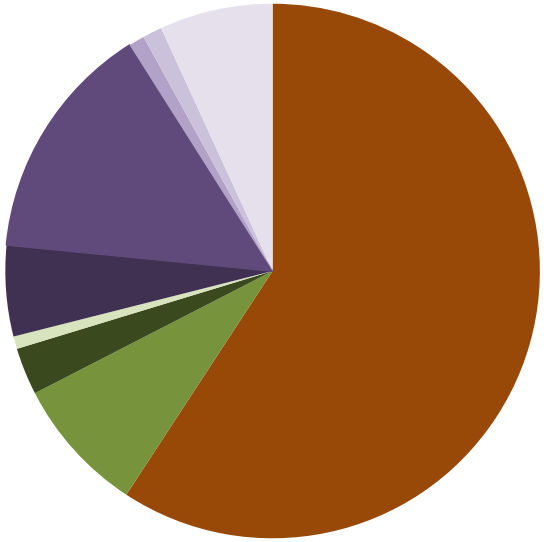
↑ fire hazard

↓ opportunity for restoration projects based on restored river function

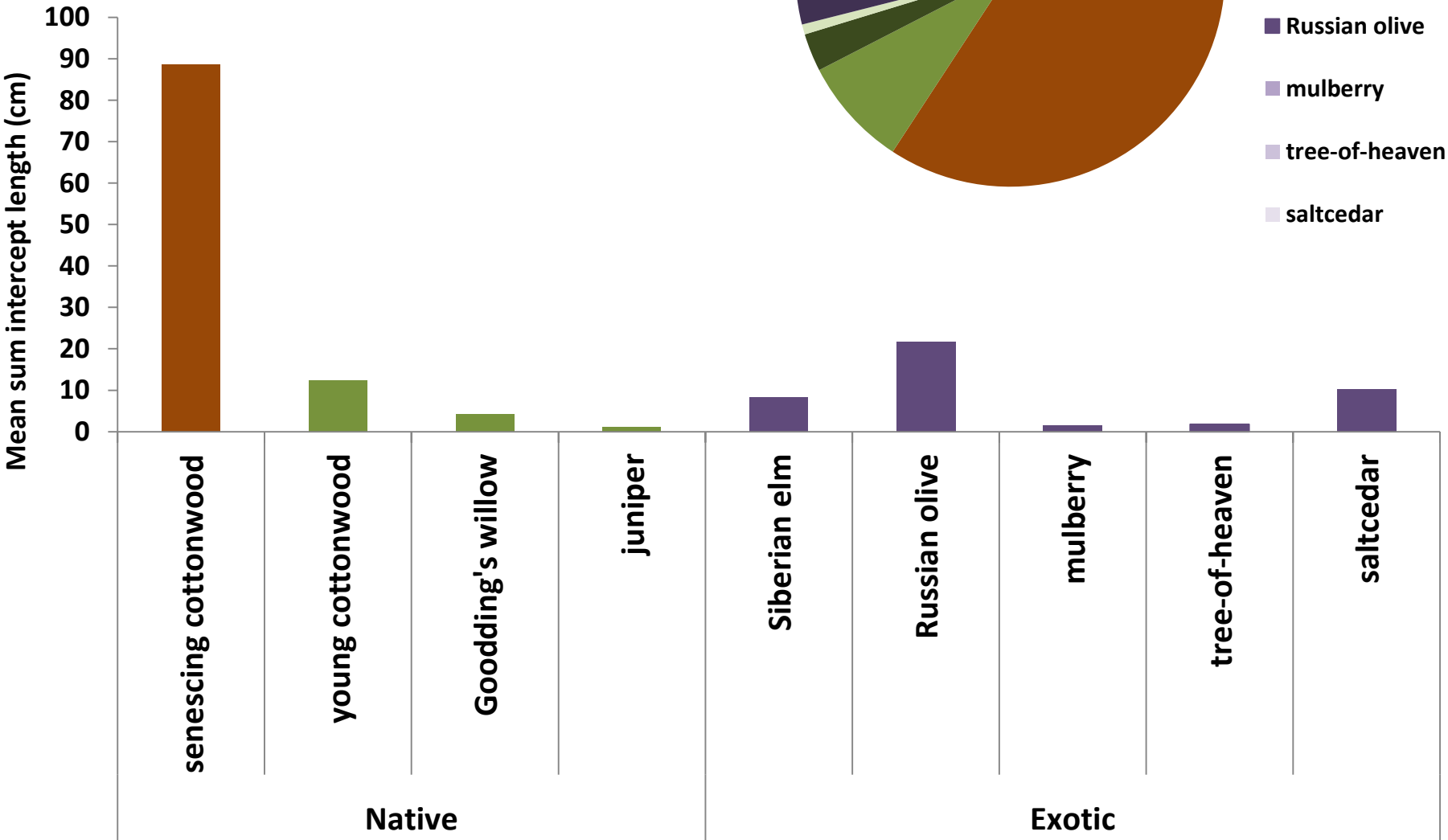
Santa Ana 2014


Santa Ana Mean Annual Leaf Fall
cottonwood
all leaves
Annual sum litterfall (g/m²)
1200
1000
800
600
400
200
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

Mean 2015 Tree Cover Across BEMP Sites



- senescing cottonwood
- young cottonwood
- Goodding's willow
- juniper
- Siberian elm
- Russian olive
- mulberry
- tree-of-heaven
- saltcedar



Restored Wetlands Below Cottonwood Canopy

Take-Home Messages:

It's all about the water

- Clearing and/or fire in the bosque without subsequent flooding leads to:
- Clearing and/or fire in the bosque followed by flooding leads to:
- The mosaic allows for resiliency in response to stresses on the ecosystem