Incorporating Climate Change Adaptation into NRDA Restoration Planning

Raymond Martinez, Director, Department of Environmental and Cultural Preservation (DECP), Pueblo de San Ildefonso

Kaylene Ritter, PhD, Principal, Abt Associates

December 16, 2019

Outline

The Pueblo de San Ildefonso

Los Alamos National Laboratory NRDA

Climate Change Impacts and Implications for the Pueblo

Anticipating Climate Impacts in NRD Restoration Planning

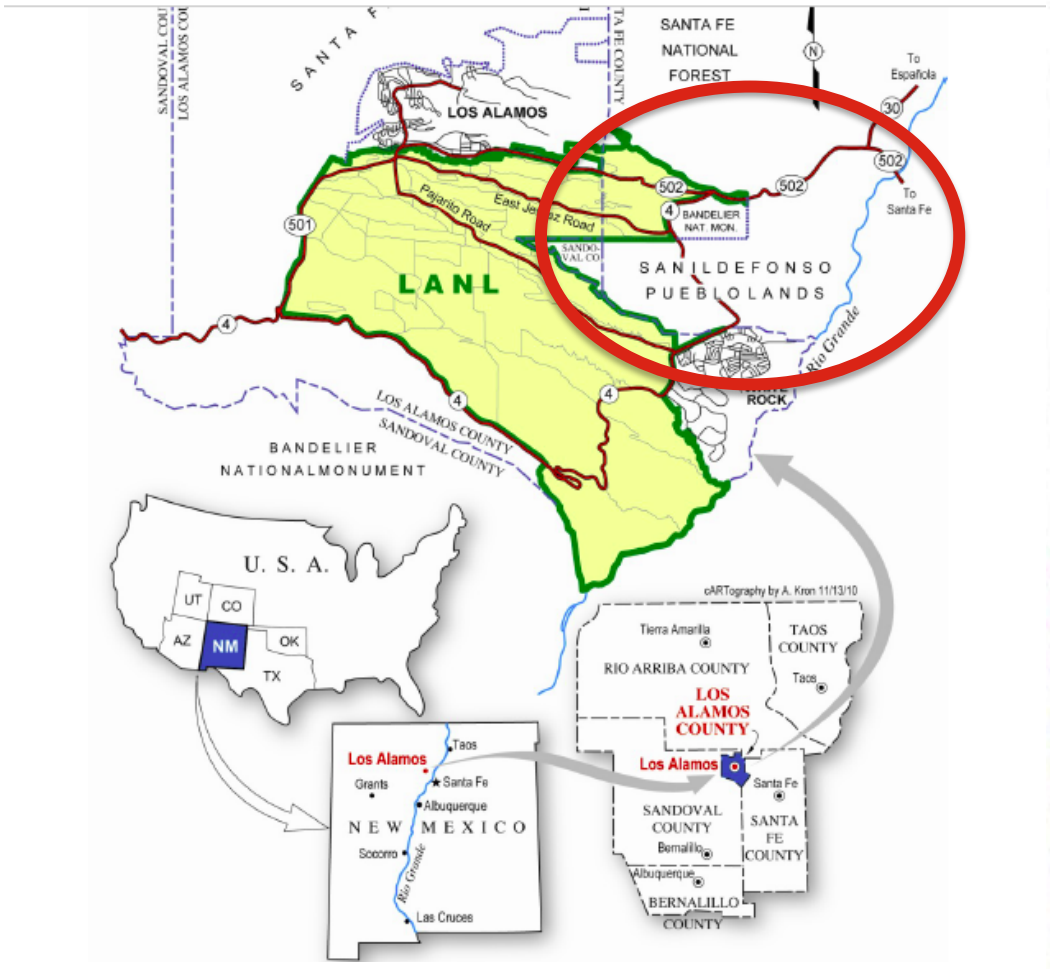
Pueblo de San Ildefonso: The Place and People

Key message #4 Chapter 25 – Southwest, NCA (2018)

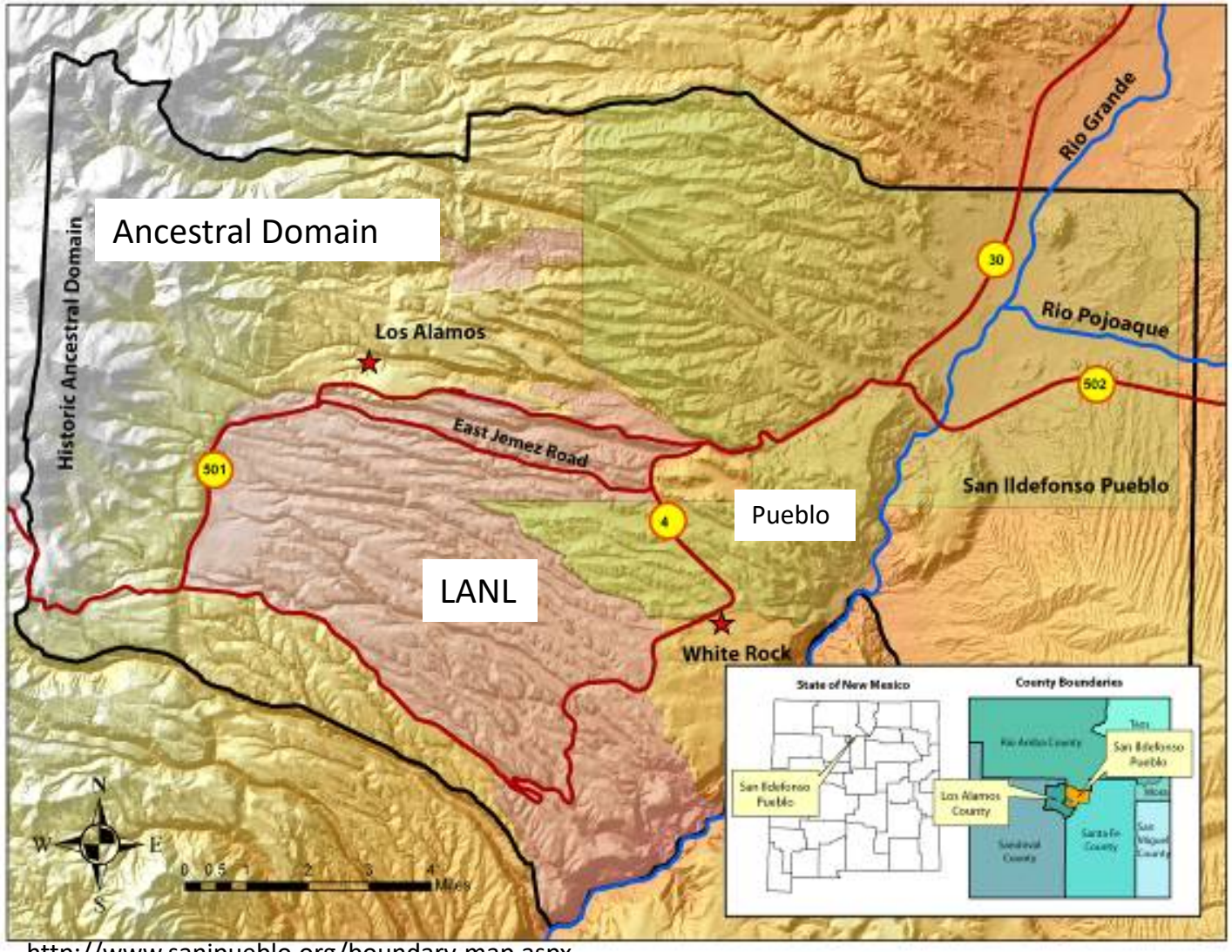
"Traditional foods, natural resource-based livelihoods, cultural resources, and spiritual well-being of Indigenous peoples in the Southwest are increasingly affected by drought, wildfire, and changing ocean conditions. Because future changes would further disrupt the ecosystems on which Indigenous peoples depend, tribes are implementing adaptation measures and emissions reduction actions."

Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

Pueblo de San Ildefonso: Location

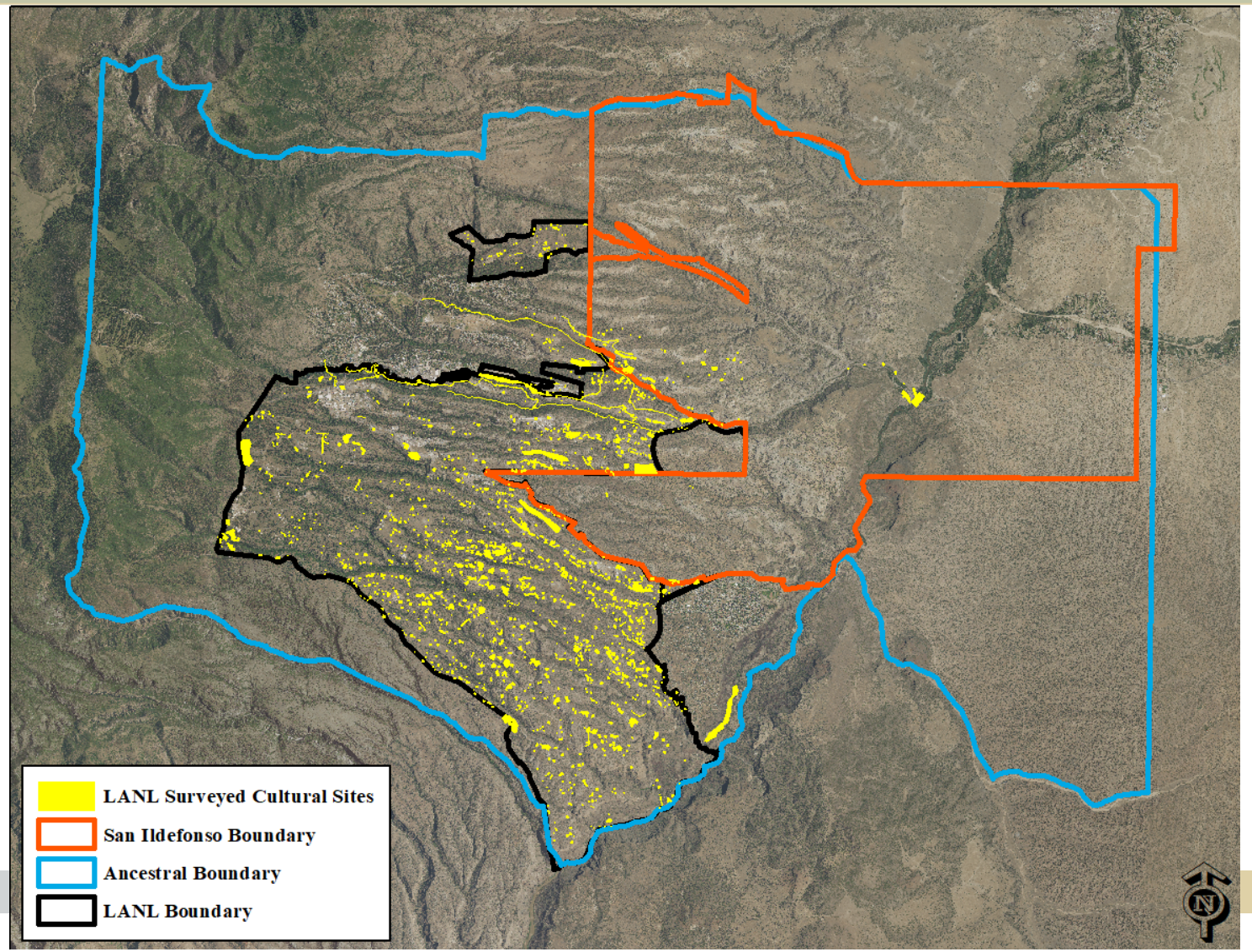


The Pueblo de San Ildefonso is located adjacent to and downstream of the Los Alamos National Lab (LANL), New Mexico

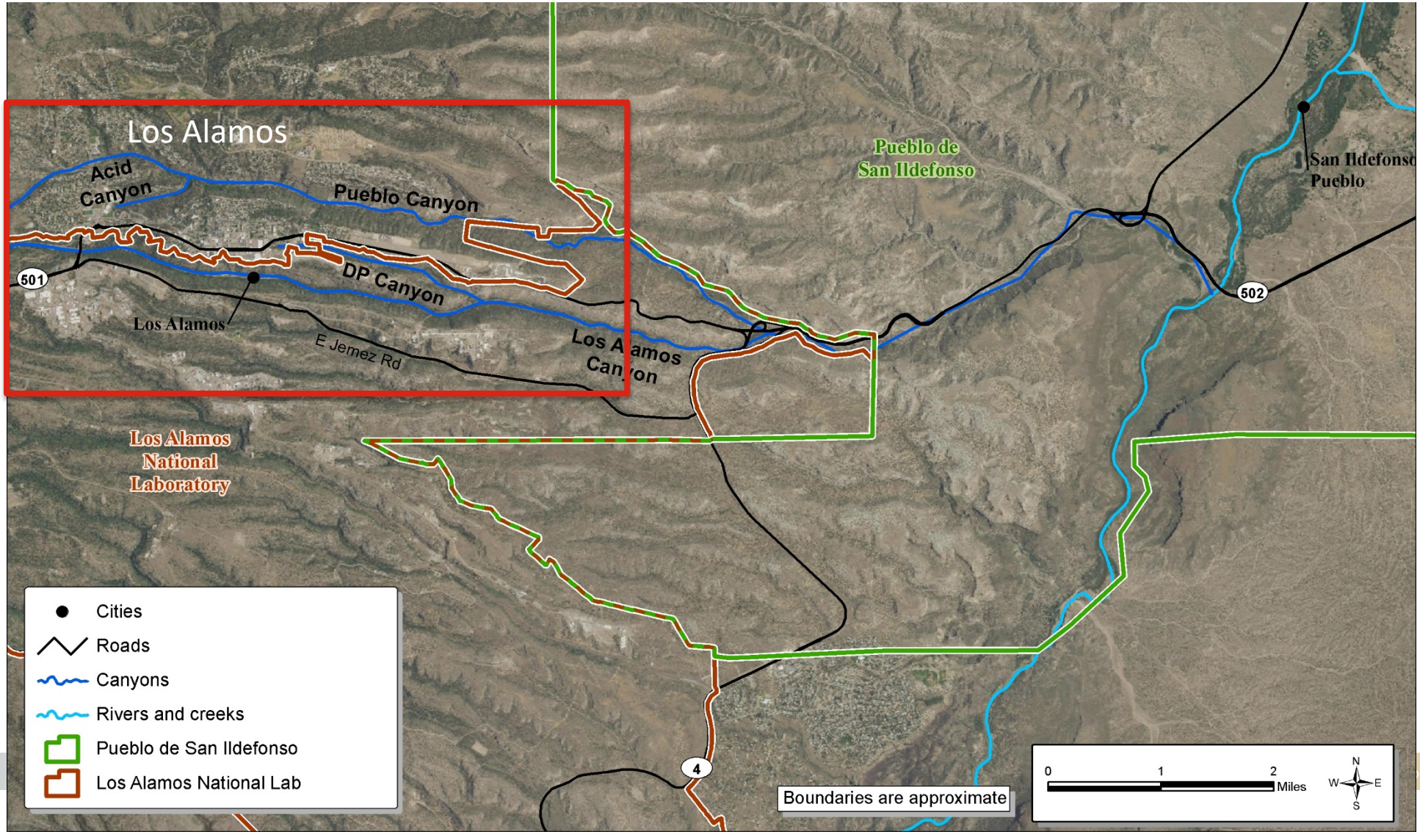


http://www.sanipueblo.org/boundary-map.aspx

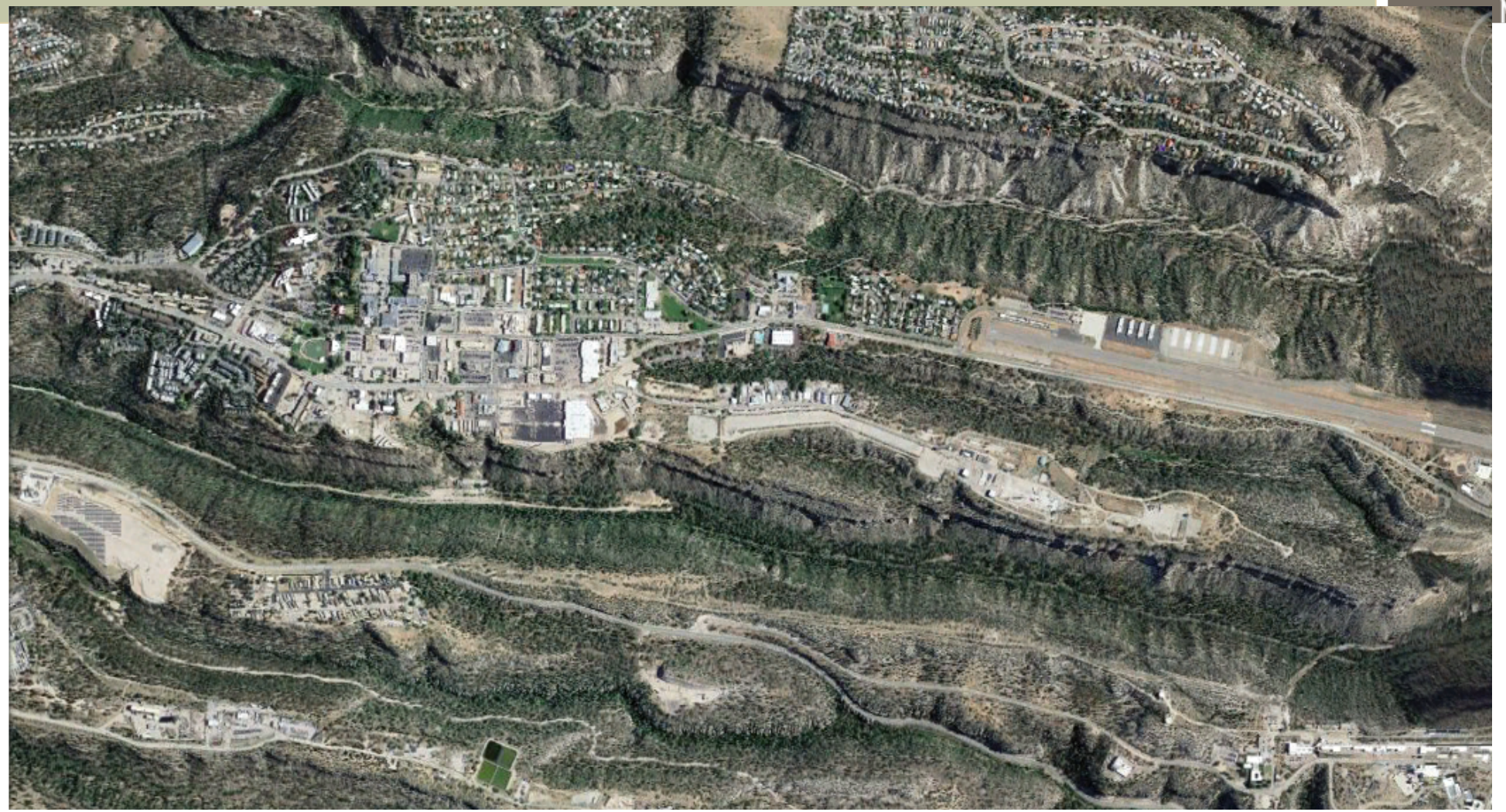
Surveyed Cultural Sites



LANL NRDA


Los Alamos
Acid Canyon
Pueblo Canyon
DP Canyon
Los Alamos
E Jemez Rd
Los Alamos Canyon
Pueblo de San Ildefonso
San Ildefonso Pueblo
Los Alamos National Laboratory
501
502
4
Cities
Roads
Canyons
Rivers and creeks
Pueblo de San Ildefonso
Los Alamos National Lab
Boundaries are approximate
0
1
2
Miles
N
W
E
S

LANL NRDA



LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004)

LANL NRDA – Legacy Source Areas

Manhattan Project - Original Technical Area (TA1), located within the Town of Los Alamos

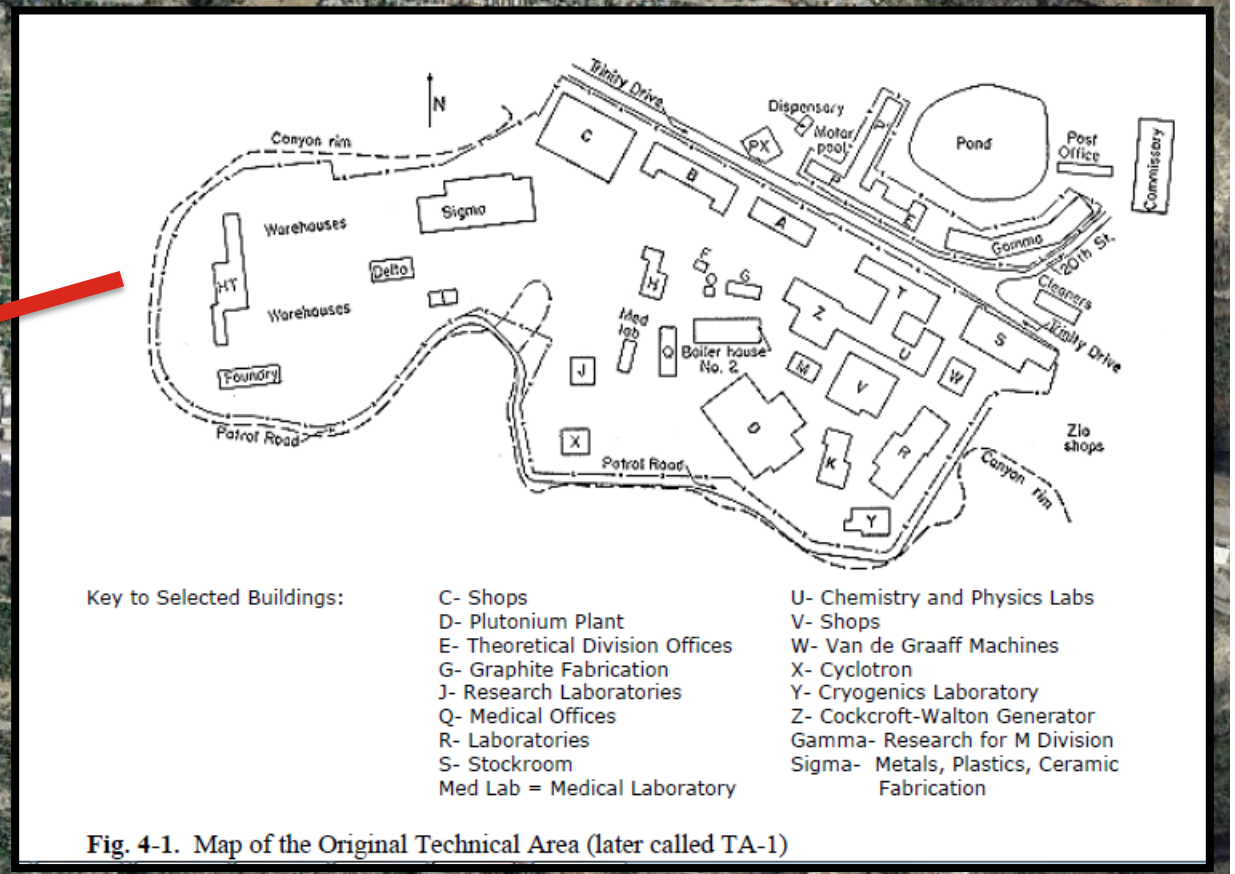
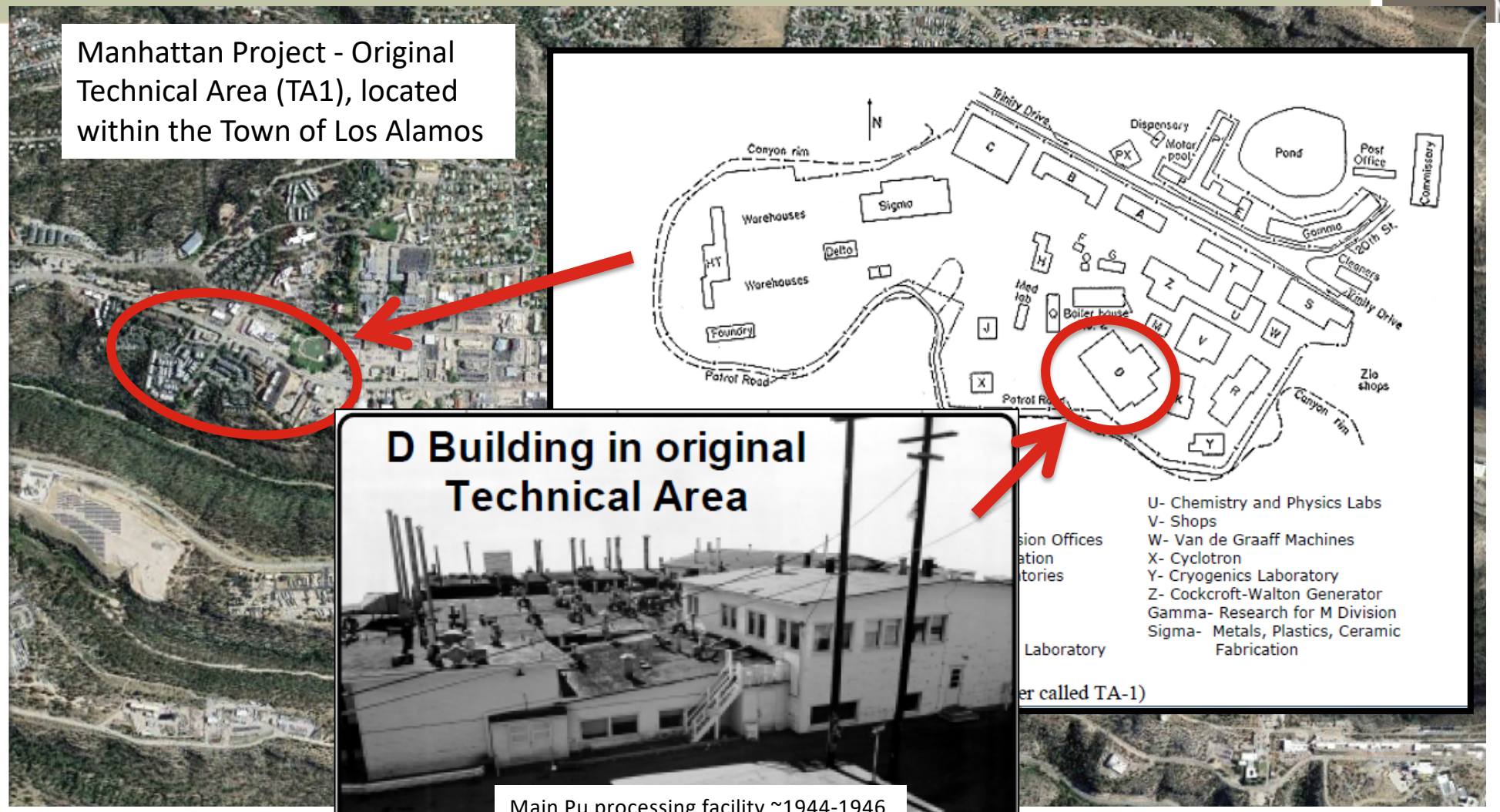


Fig. 4-1. Map of the Original Technical Area (later called TA-1)

LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004)

LANL NRDA – Legacy Source Areas

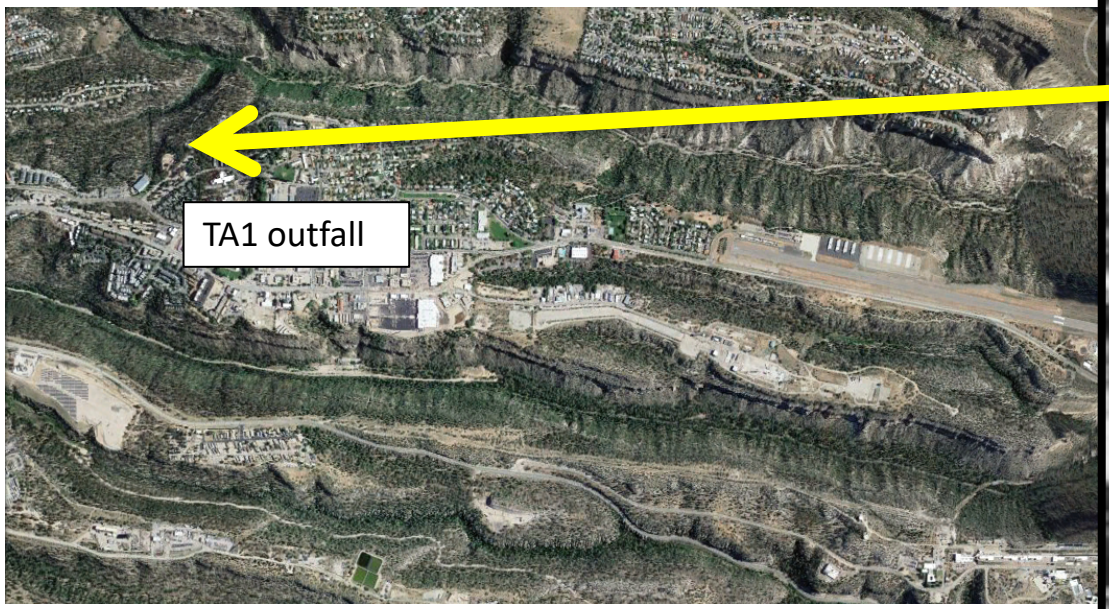
Manhattan Project - Original Technical Area (TA1), located within the Town of Los Alamos



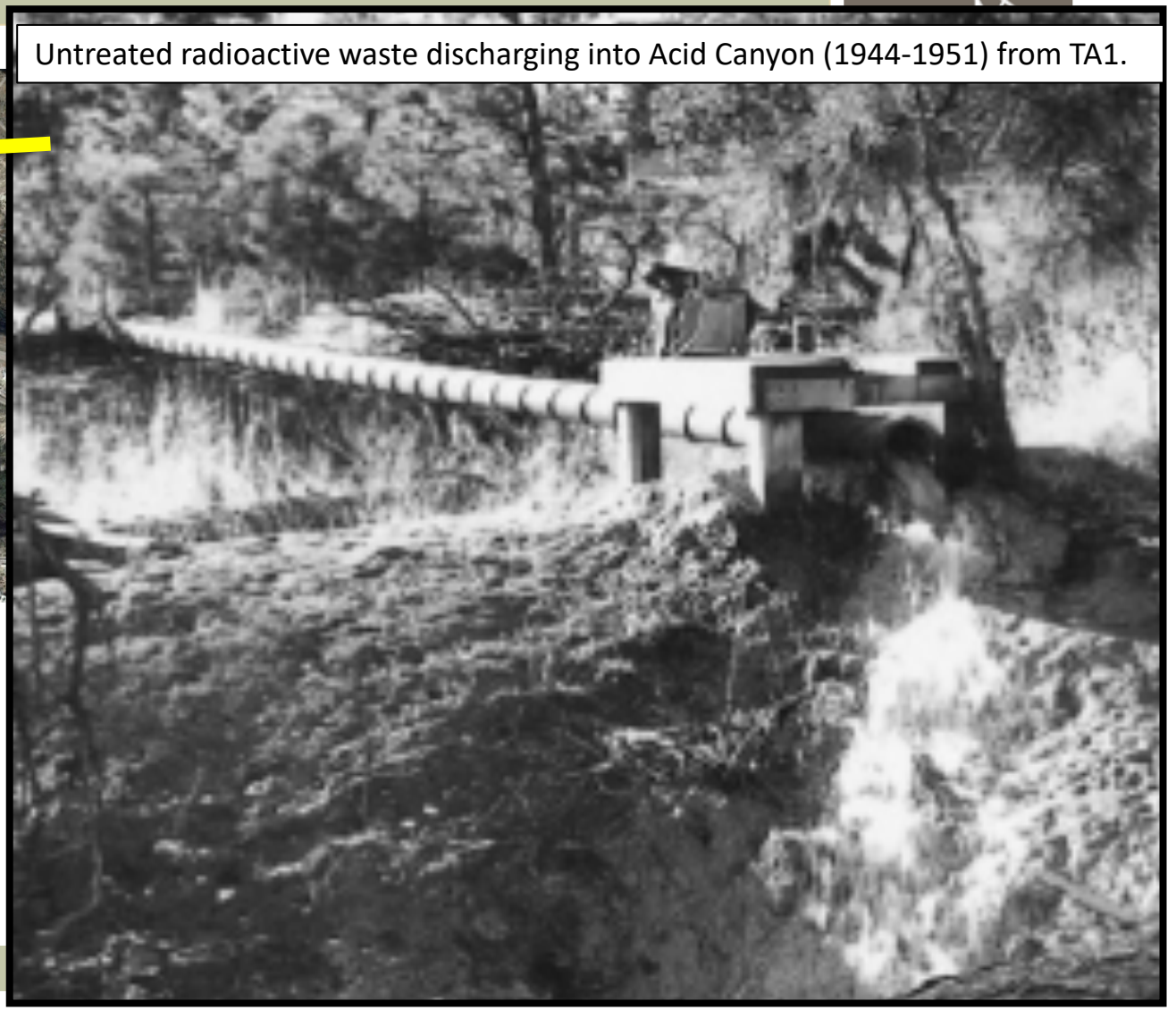
Main Pu processing facility ~1944-1946

LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004)

LANL NRDA – Legacy Source Areas



Untreated radioactive waste discharging into Acid Canyon (1944-1951) from TA1.



TA-1:

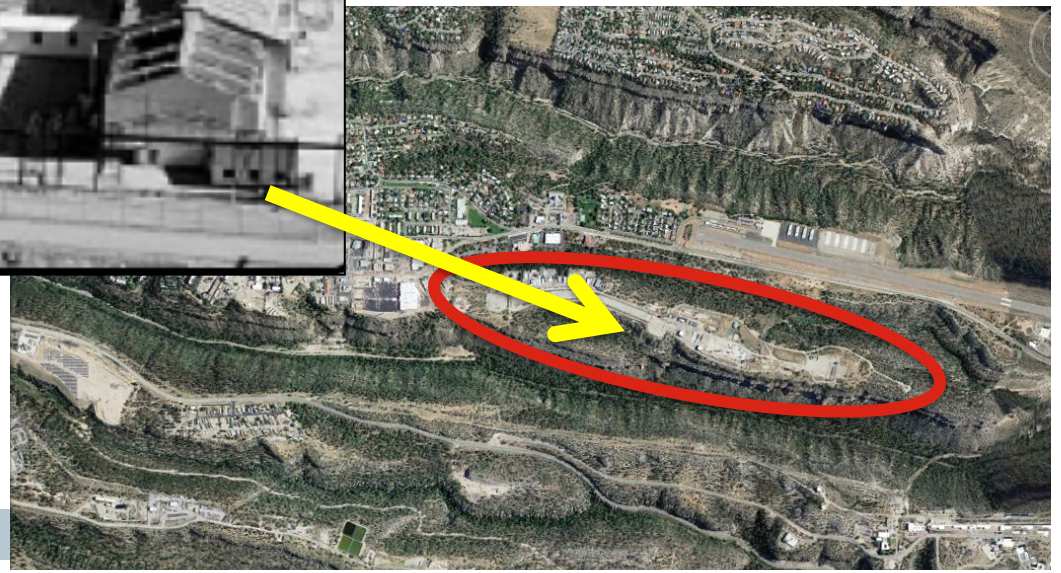
- Original TA of the Manhattan Project (1944-65)
- 1944 – 1951: Untreated radioactive waste discharged into South Fork of Acid Canyon
- Main COC = Pu 239/240
- Other COCs = U-234/238, Am-241, Po-210, Ba, La

LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004); LA & Pueblo Canyons GW Investigation Report (LANL, 2009)

LANL NRDA – Legacy Source Areas

DP Mesa (TA-21)

- Main Pu processing facility from 1945 – 1978
- Remained in use as a research facility until 1986

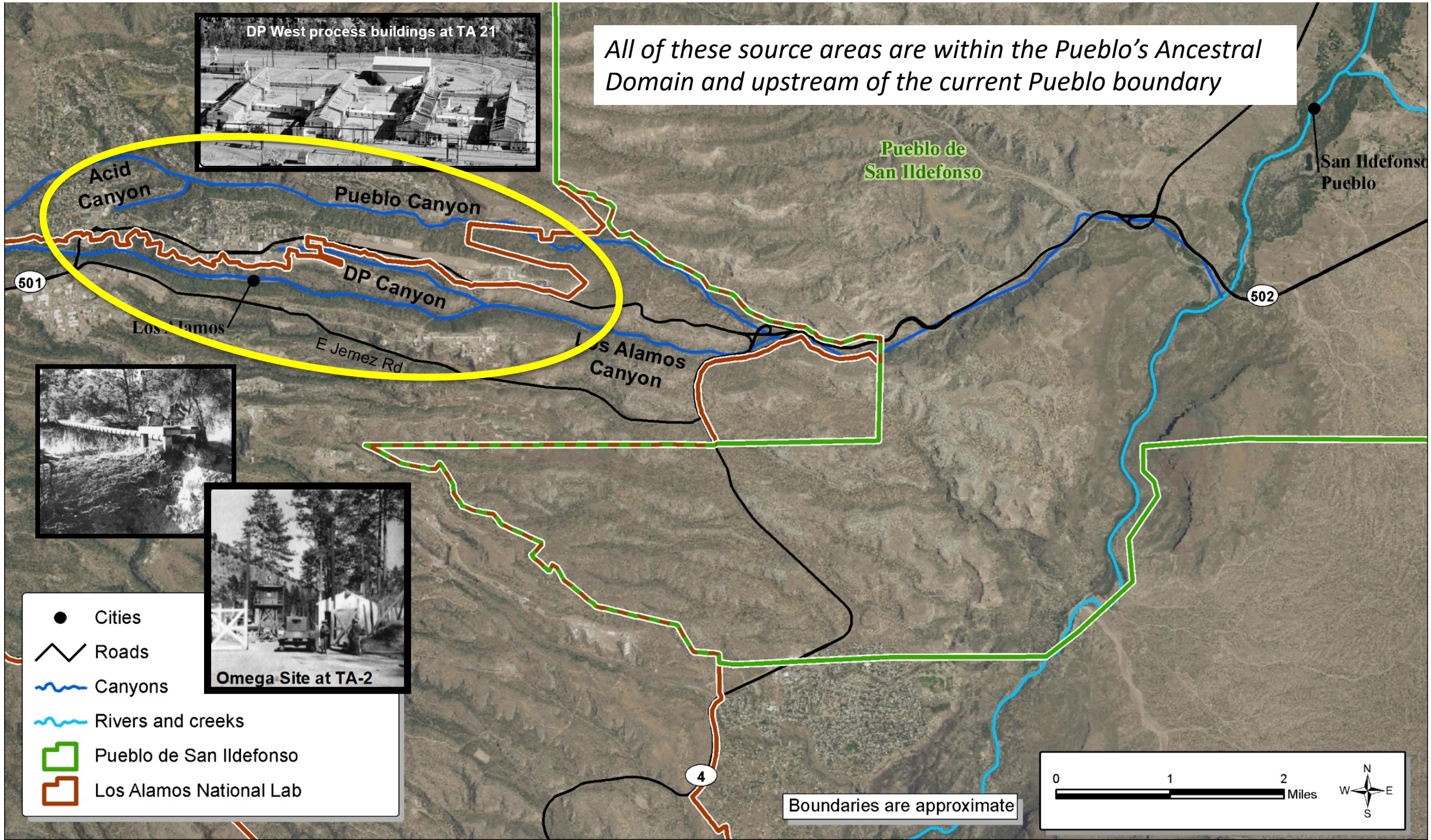


LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004); LA & Pueblo Canyons GW Investigation Report (LANL, 2009)

LANL NRDA – Legacy Source Areas

- Water boiler reactors – liquid-fueled reactors - U and Pu (1943-1974)
- Clementine – fast reactor for Pu production (1946-1950)
- Omega West Reactor – research reactor (1956 – 1993); decommissioned in 2002-03

LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004)


DP West process buildings at TA 21
All of these source areas are within the Pueblo's Ancestral Domain and upstream of the current Pueblo boundary
Acid Canyon
Pueblo Canyon
DP Canyon
501
Los Alamos
E Jemez Rd
Los Alamos Canyon
Pueblo de San Ildefonso
San Ildefonso Pueblo
502
4
Omega Site at TA-2
Cities
Roads
Canyons
Rivers and creeks
Pueblo de San Ildefonso
Los Alamos National Lab
Boundaries are approximate
0
1
2
Miles
N
W
E
S

Climate Change in the Southwest

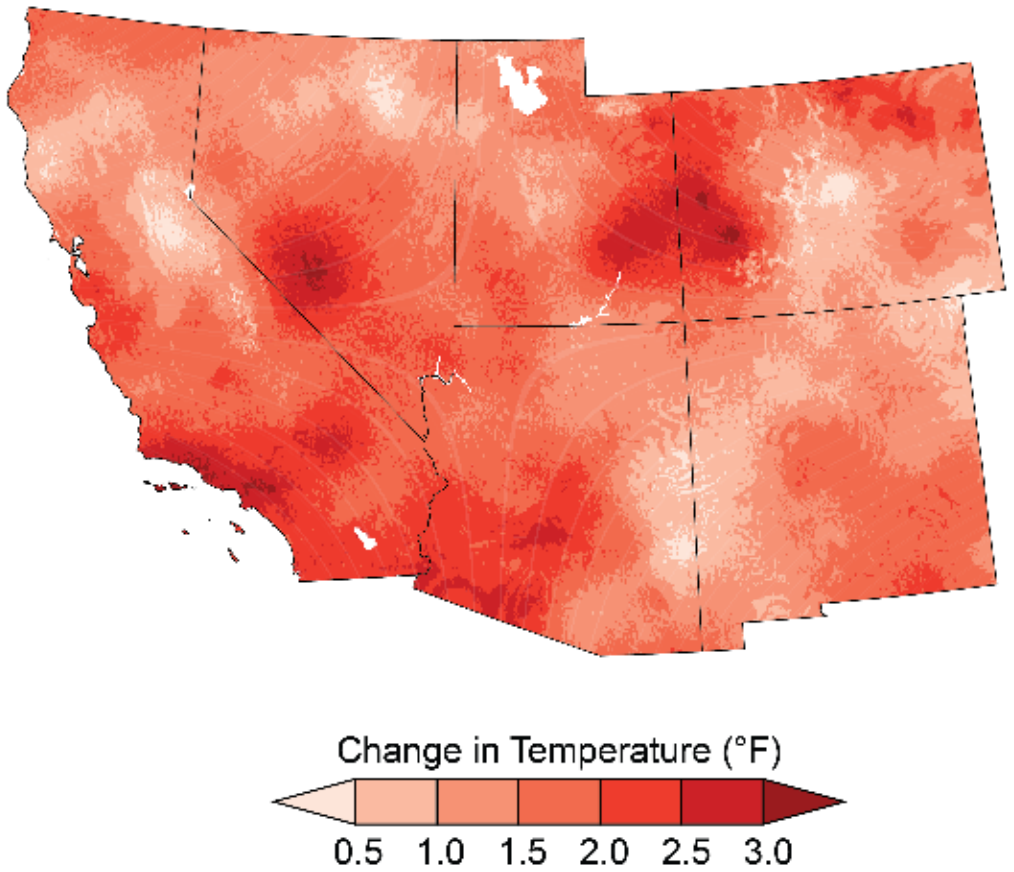
Temperature Changes

The average annual temperature of the Southwest increased 1.6°F (0.9ºC) between 1901 and 2016 (Figure 25.1).

The region recorded more warm nights and fewer cold nights between 1990 and 2016, including an increase of 4.1°F (2.3°C) for the coldest day of the year.

Parts of the Southwest recorded the highest temperatures since 1895, in 2012, 2014, 2015, 2016, and 2017.

Observed change in temperature in the Southwest from 1901 to 2016



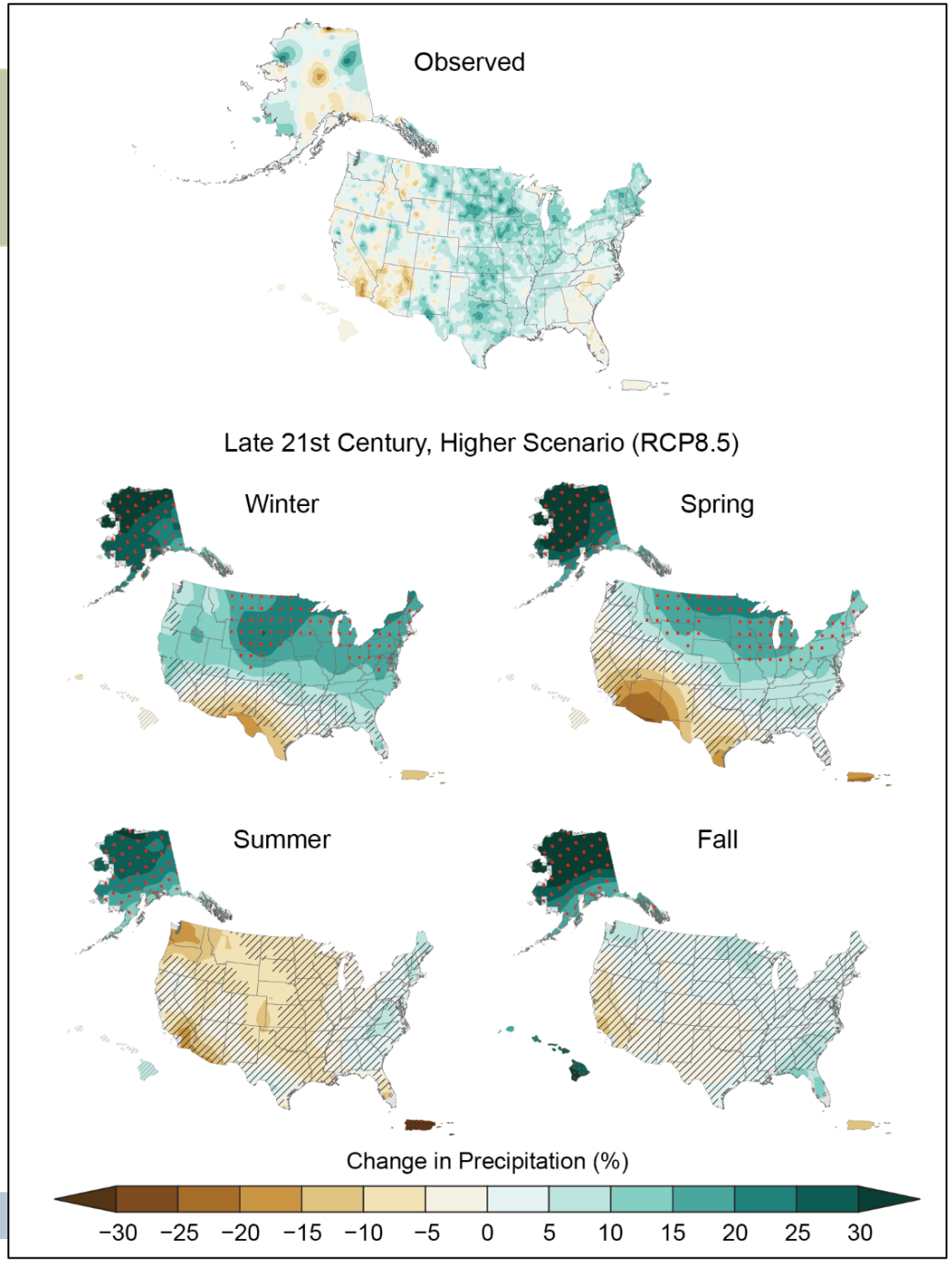
Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

Precipitation Changes

Observed and projected precipitation changes vary by region and season.

Historically, the Southwest has experienced a decrease for the period 1986–2015 relative to 1901–1960 (top figure).

Parts of the southwestern United States are projected to receive less precipitation in the winter and spring.



Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

Increased Drought

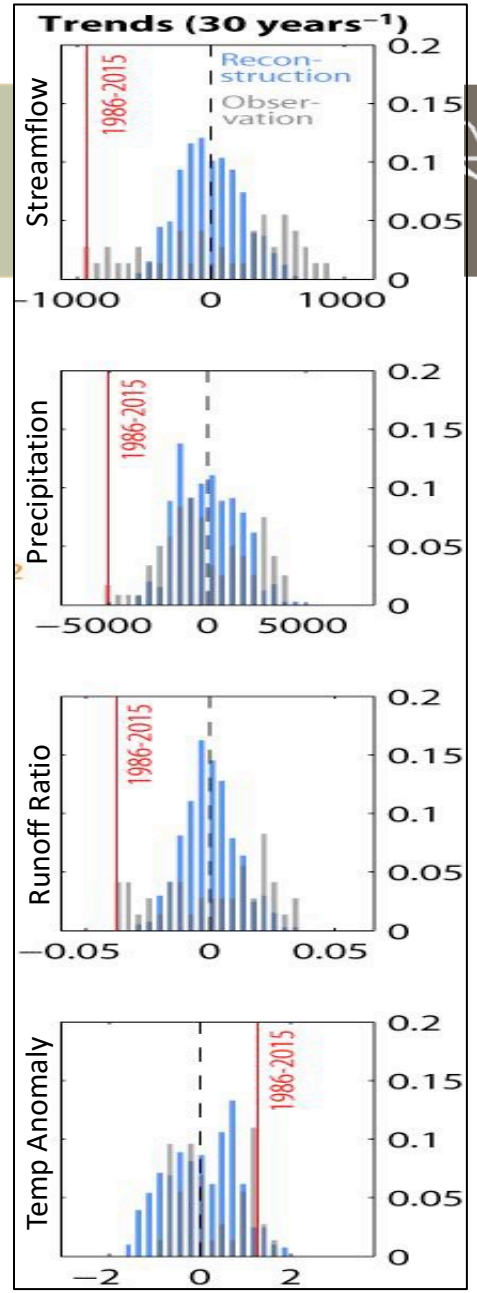
Fourth National Climate Assessment (NCA, 2018):
"Rising air and water temperatures and changes in precipitation are intensifying droughts, increasing heavy downpours, reducing snowpack, and causing declines in surface water quality"

Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

Climate Change in the Southwest – Implications for the Pueblo

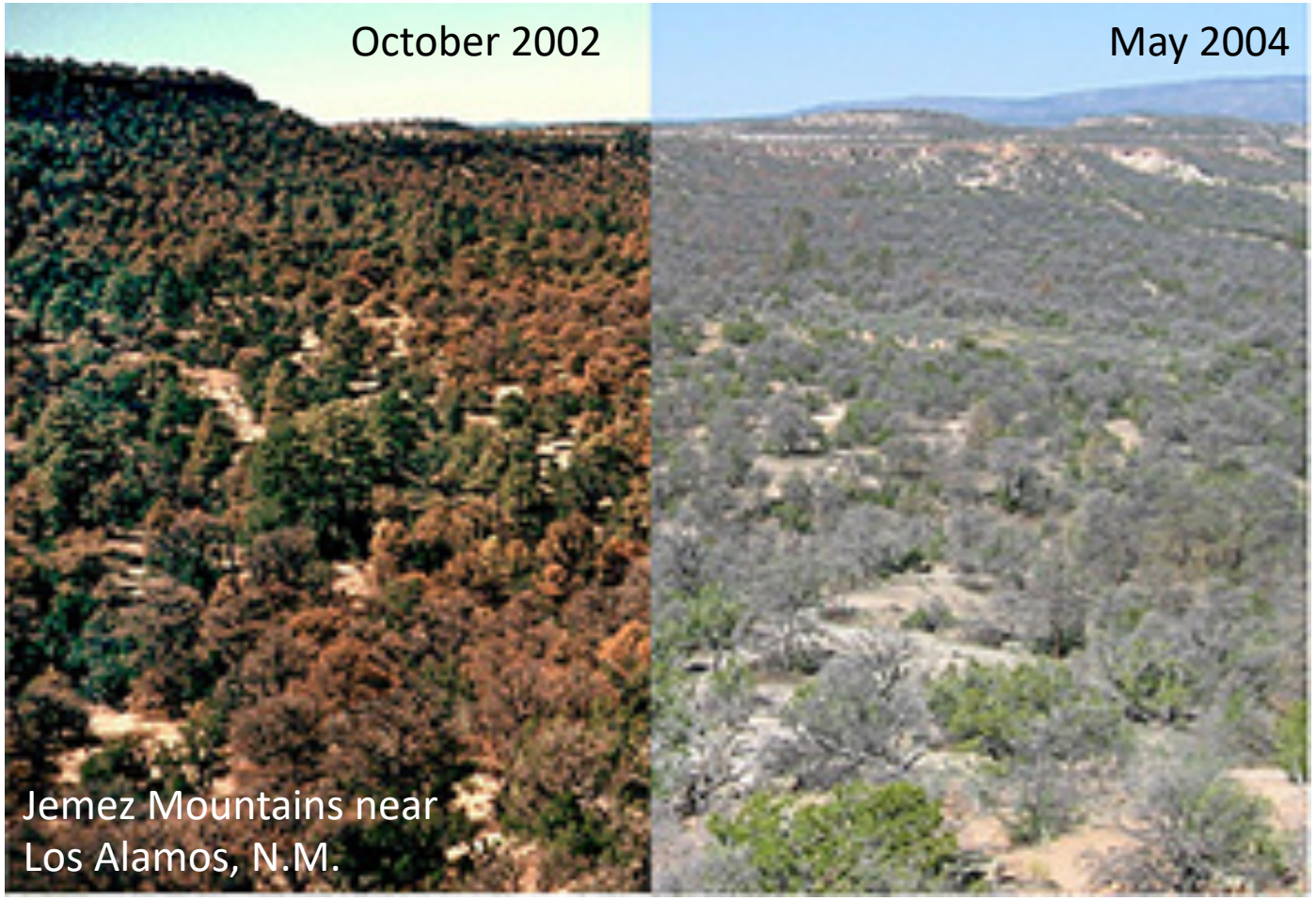
Observed Decreased Precipitation and Runoff

"…decreasing runoff efficiency trend from 1986-2015 in the Upper Rio Grande River basin is unprecedented in the last 445 years…" Lehner et al., 2017



Lehner, F. et al., 2017. Assessing recent declines in Upper Rio Grande runoff efficiency from a paleoclimate perspective. Geophysical Research Letters. Volume 44, Issue 9.

Observed Piñon on Tree Die-Off

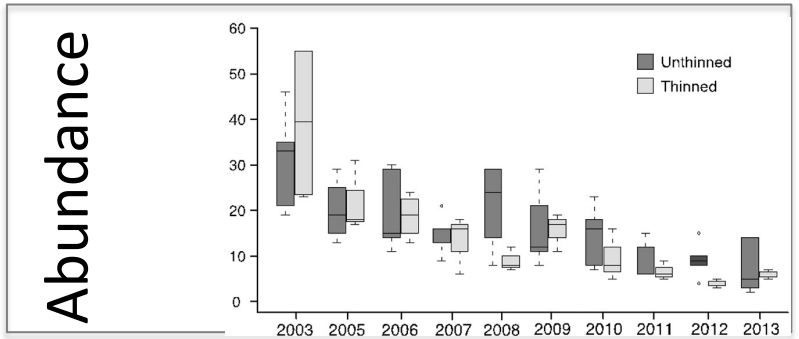


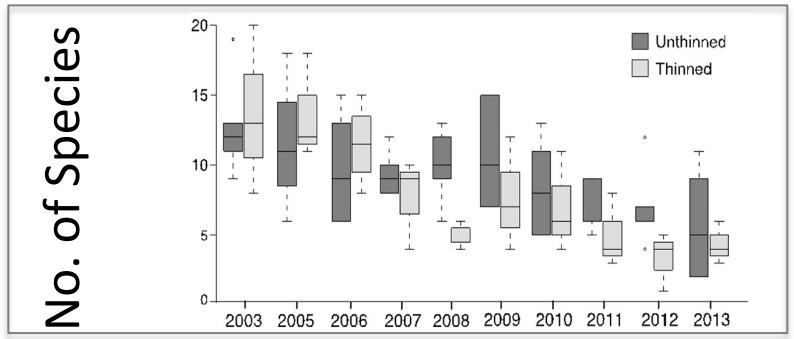
At study sites in Arizona, Colorado, New Mexico and Utah, 40% to 80% of the piñon trees died between 2002 and 2003.

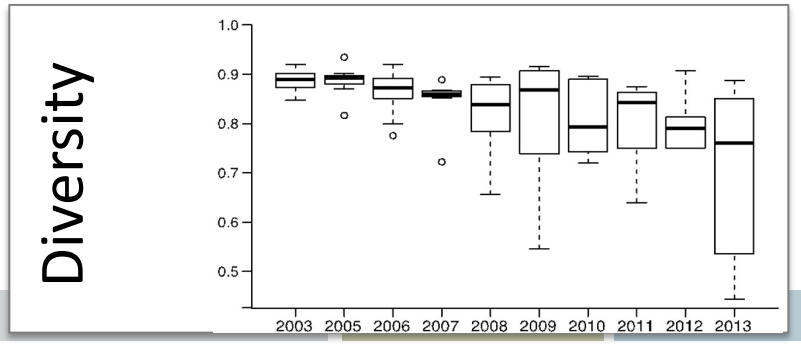
Breshears, B.B., et al. 2009. Tree die-off in response to global change-type drought: mortality insights from a decade of plant water potential measurements. Research Communications. *Front Ecol Environ* 7(4): 185-189.

Projected Conifer Tree Mortality

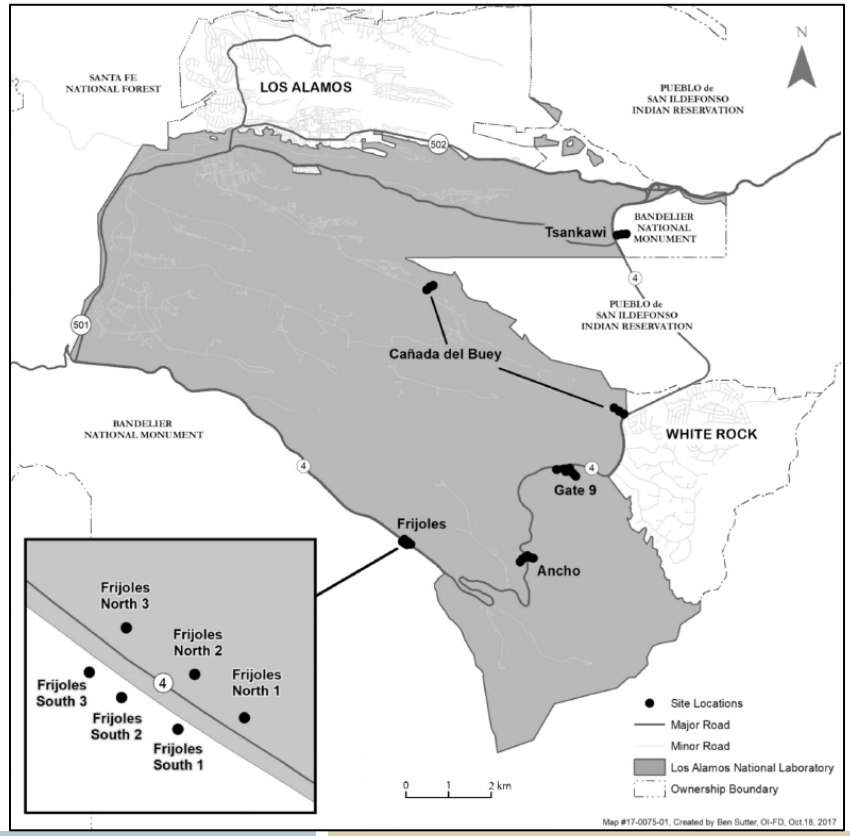
Observed Avian Declines







Fair et al (2018) report a 73% reduction in bird abundance & 45% reduction in richness at LANL study sites, 2003-2013



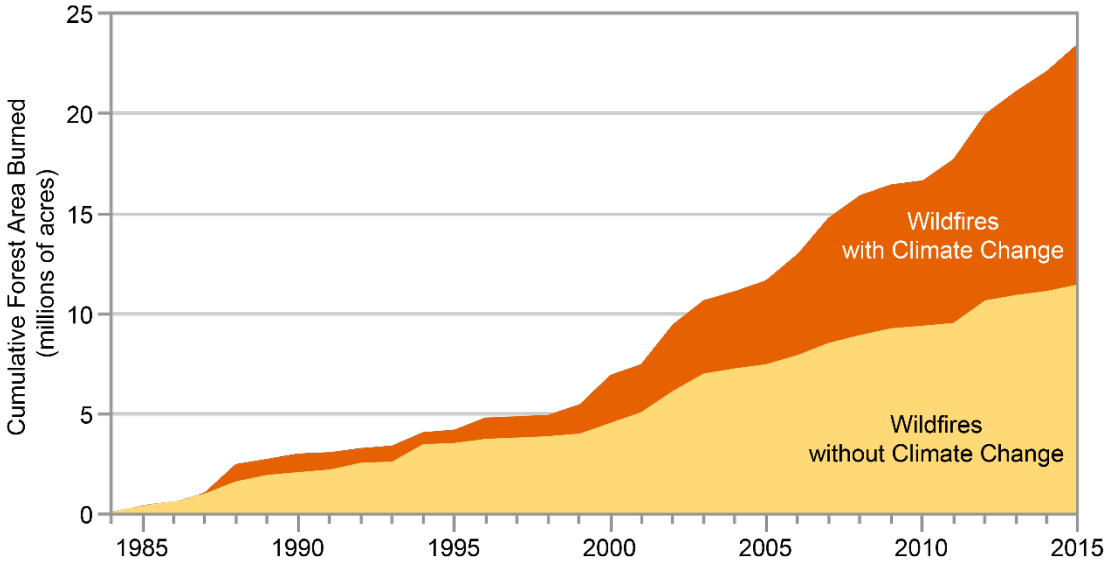
Fair, J.M., et al. 2018. Avian Communities are decreasing with pinon pine mortality in the southwest. *Biological Conservation* 226: 186-195.

Observed Increased Wildfires

- May 4, 2000
- Burned 43,000 acres
- Largest Fire in NM up to that time
- 43% of LAP watershed burned

- June 26 – Aug 1, 2011
- Jemez Mtns 10 mi west of LANL
- Burned 156,600 acres
- No burn within LANL

"…the area burned by wildfire across the western United States (1984-2015) is estimated to be twice what would have burned had climate change not occurred"
- NCA (2018), Chapter 25 - Southwest

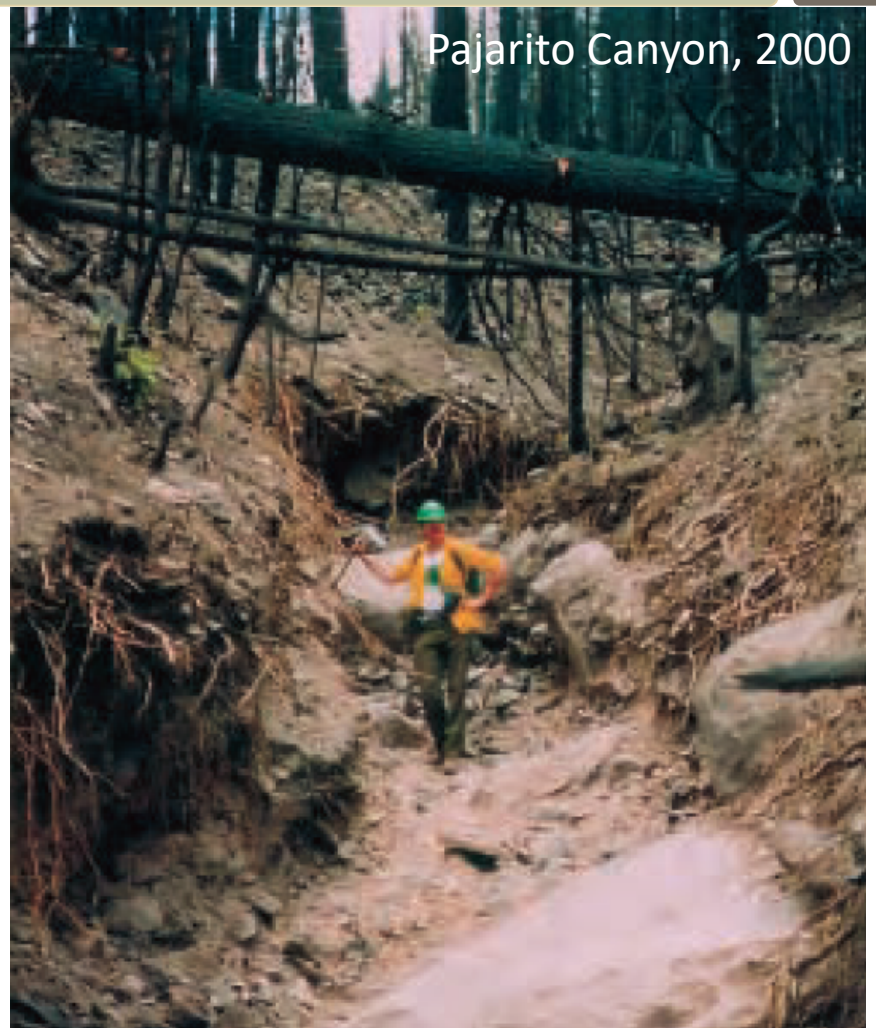


Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

Observed Increased Storm Intensity

Fourth National Climate Assessment (NCA):
"Rising air and water temperatures and changes in precipitation are intensifying droughts, increasing heavy downpours, reducing snowpack, and causing declines in surface water quality"


Pueblo Canyon, 2013


Pajarito Canyon, 2000

Source: Fourth National Climate Assessment, Vol II – Impacts, Risk and Adaptation in the United States. https://nca2018.globalchange.gov

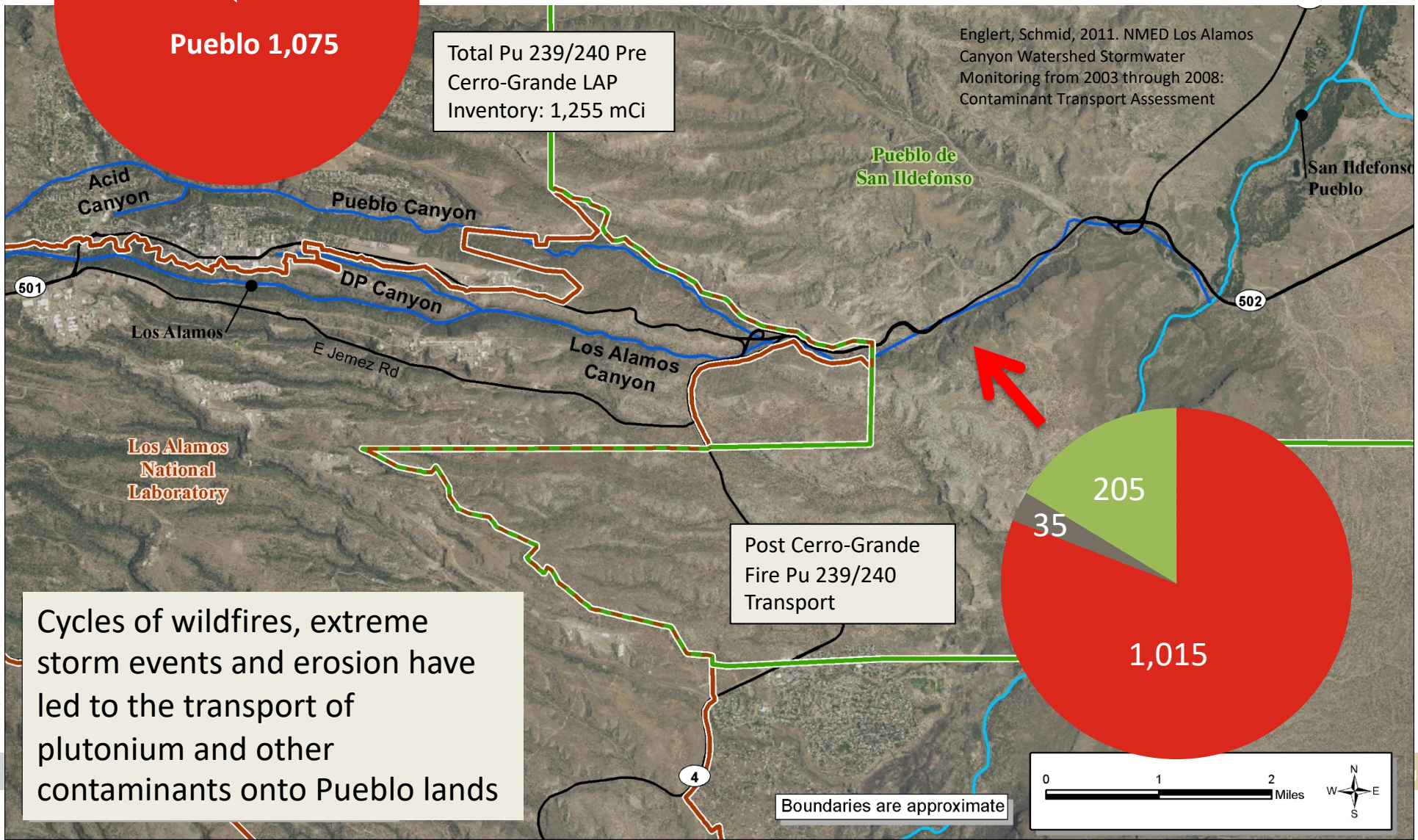
Observed Contaminant Movement

Legacy of contamination + wild fires + storm events & erosion = increased contaminant transport

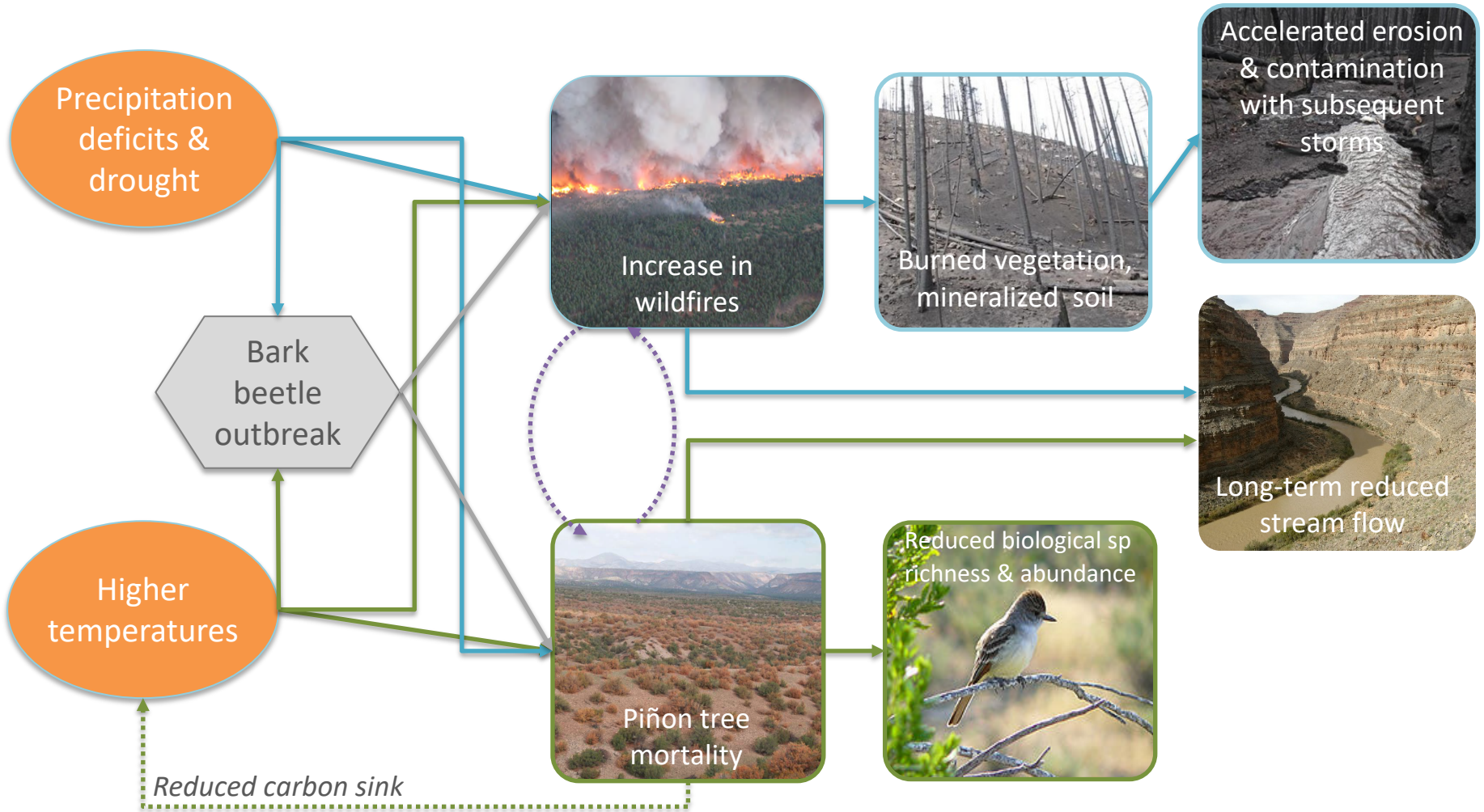
LAHDRA report (CDC, 2010); LA &Pueblo Canyons Investigation Report (LANL, 2004)
https://www.energy.gov/sites/prod/files/2016/04/f30/CC_at%20LANLCase%20Study2-23-15final.pdf

Katzman, et al. 2001. Cerro Grande Ash as a Source of Elevated Rads and metals

Observed Contaminant Movement

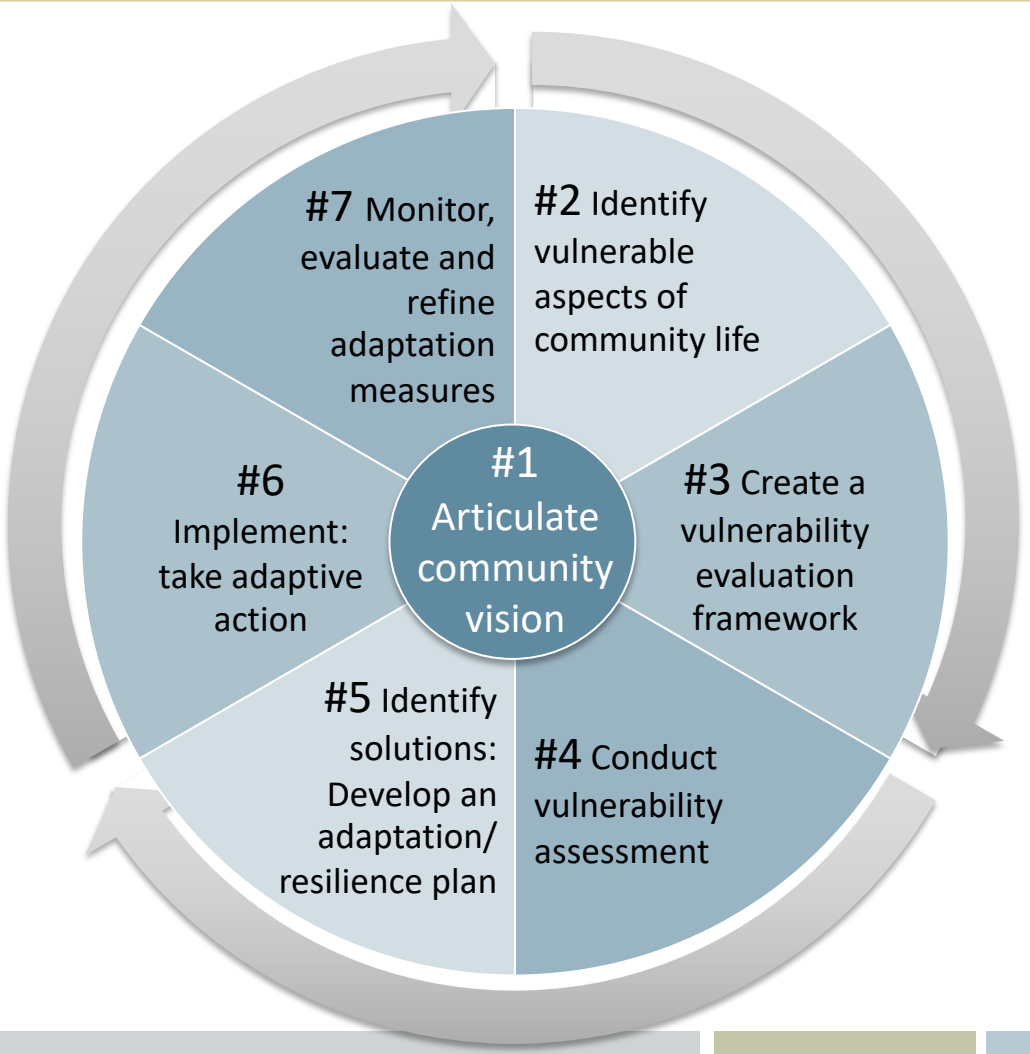


Summary of Implications for the Pueblo



The Pueblo's Climate Adaptation/Resiliency Planning

Climate Resiliency Planning: Process

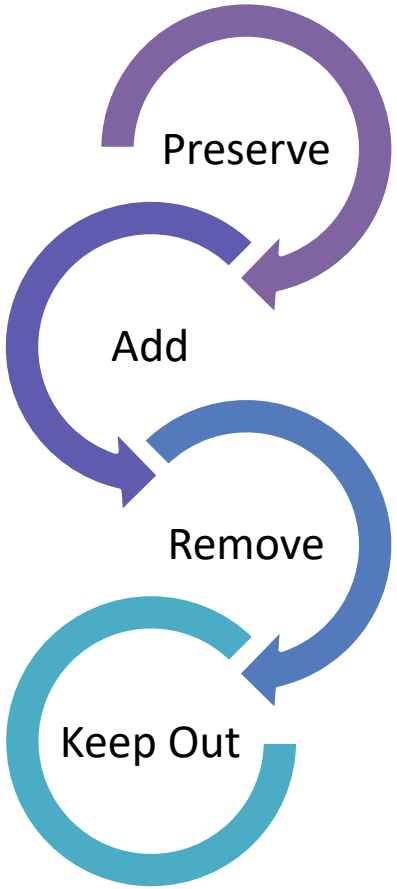


1. Identify key aspects of Pueblo life (community vision)

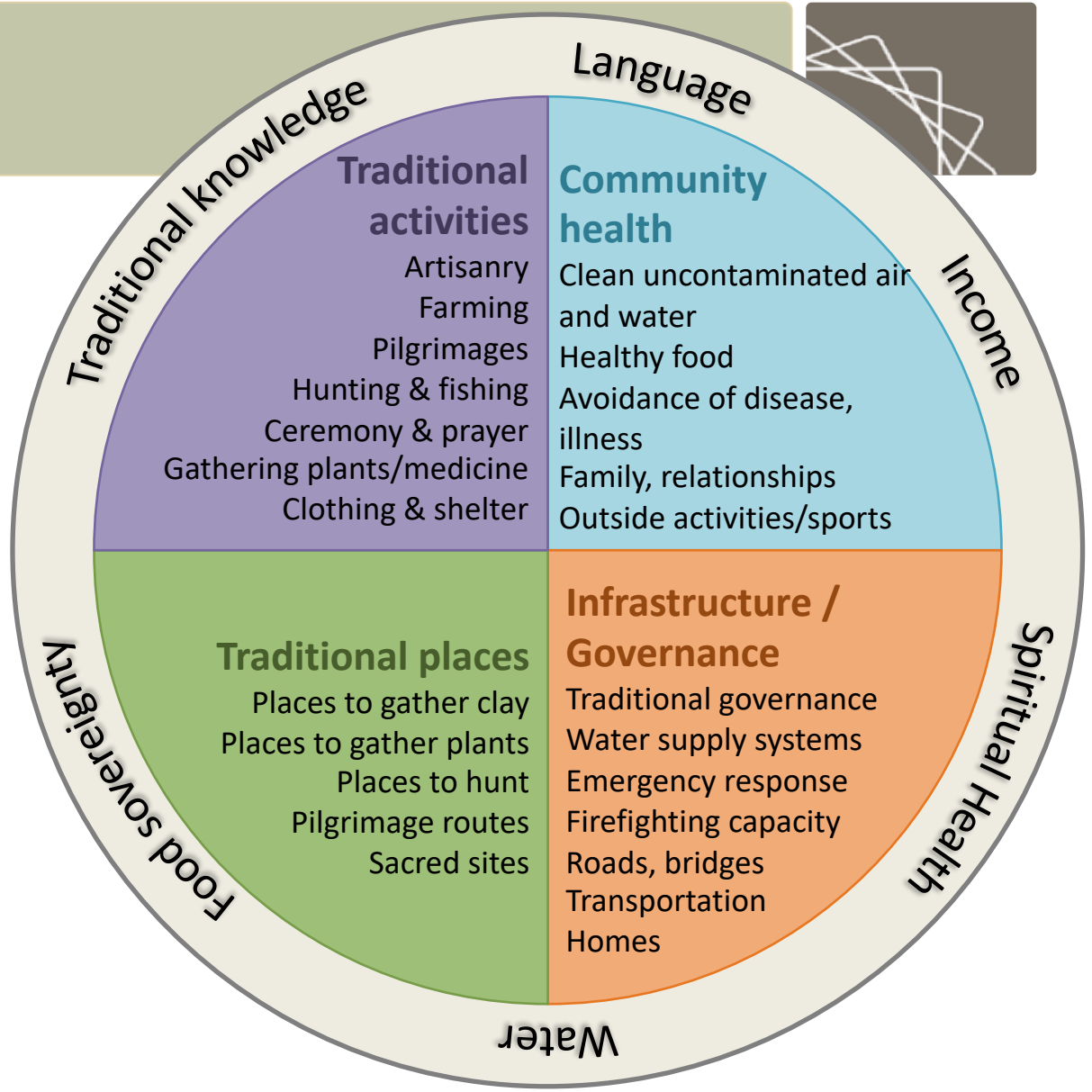
2. Identify aspects of Pueblo life with high vulnerability to climate change

3. Identify climate adaptation strategies & incorporate into all aspects of Pueblo governance, including NRDAR

Community Vision



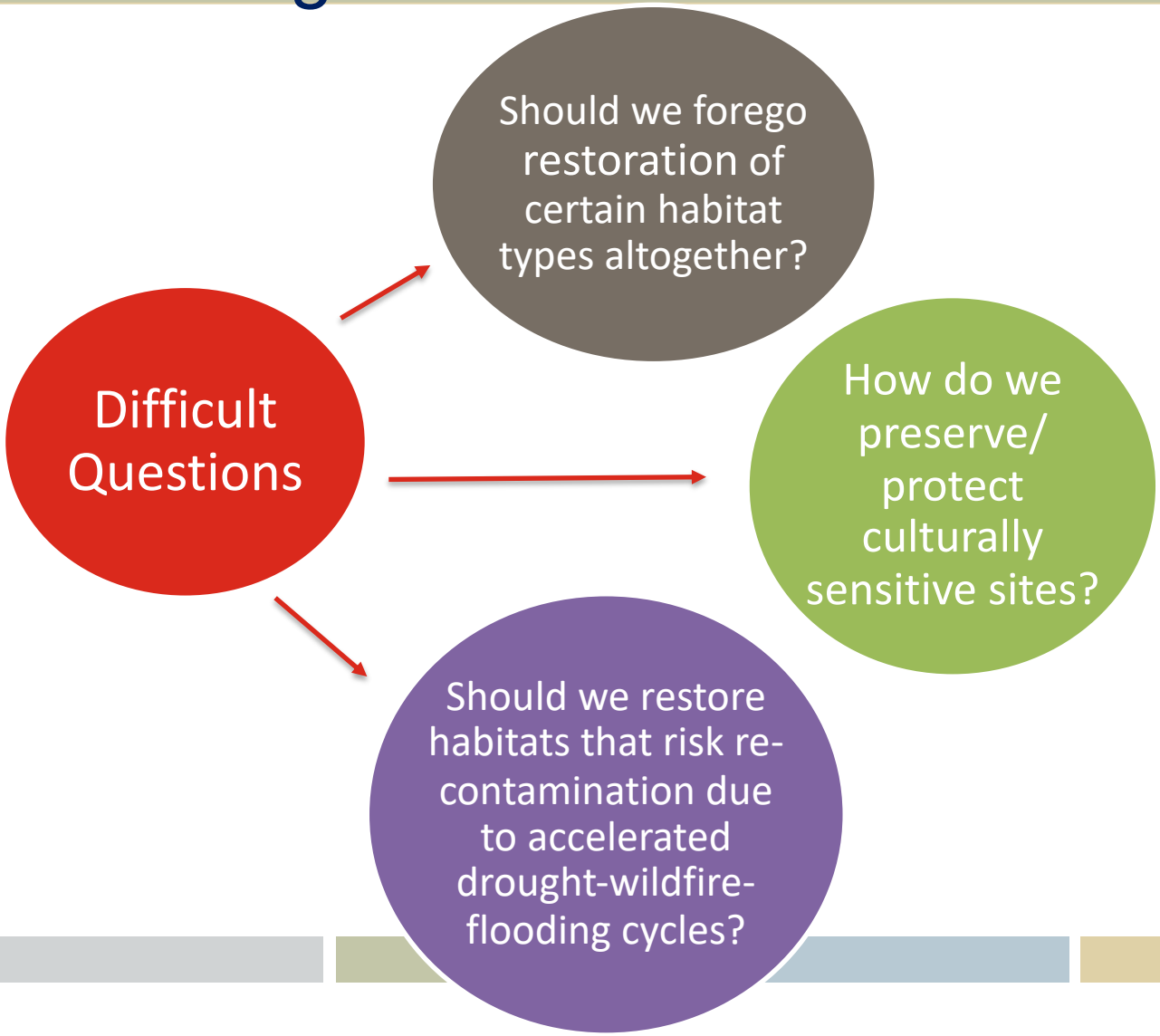
What are the key aspects of community life that are essential components of the community's vision?



Adaptation Strategy: Overarching Theme

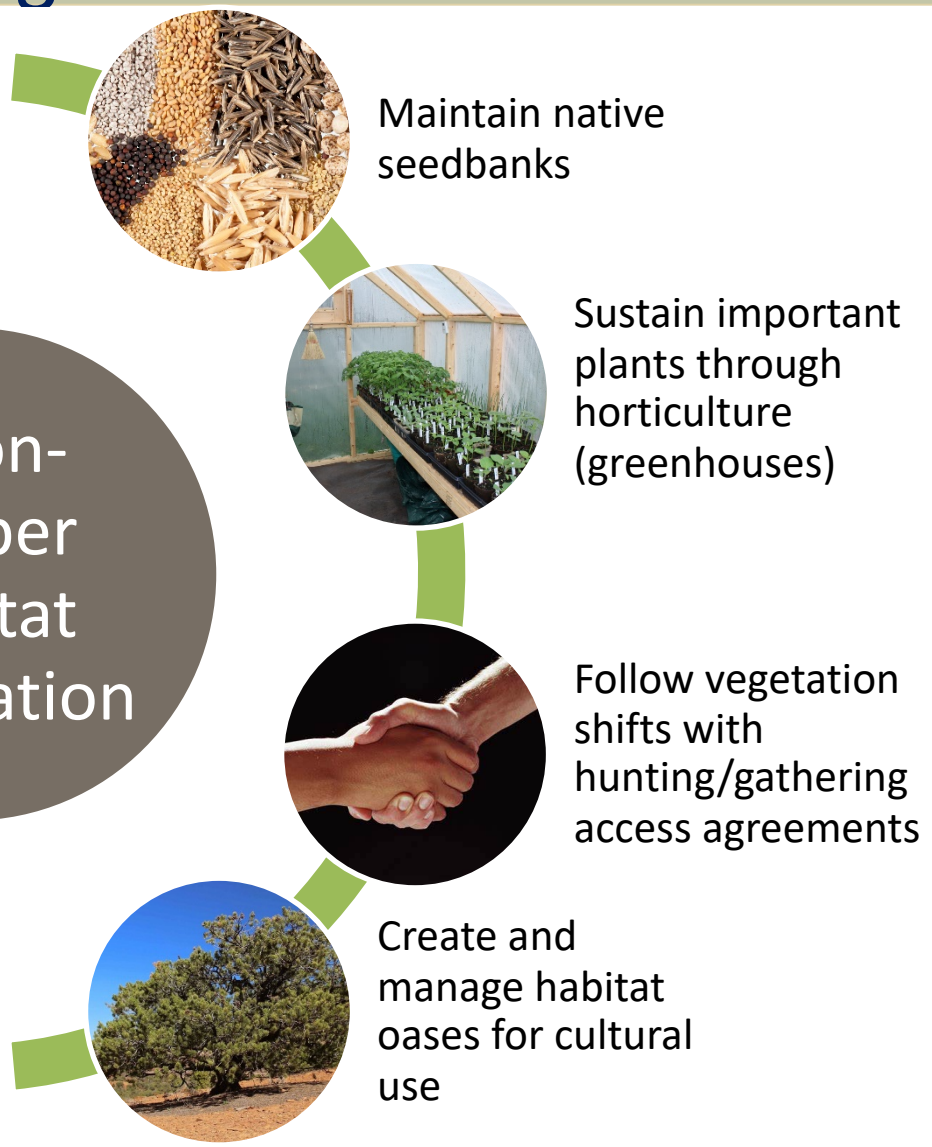
Anticipating Climate Impacts in NRDA Restoration Planning

Anticipating Climate Impacts in NRDA Restoration Planning



Anticipating Climate Impacts in NRDA Restoration Planning

Question:
How can we (should we?) restore pinon-juniper habitats when the climate is projected to no longer sustain them within the timeframe of restoration?



Propose Approach:
Build in resilience by creating a portfolio of restoration concepts that restore different functions of the forest and represent complementary adaptation strategies

Anticipating Climate Impacts in NRDA Restoration Planning

Question:
How can we protect/preserve TCPs within the Ancestral Domain when they are at risk from floods, wildfires, erosion?

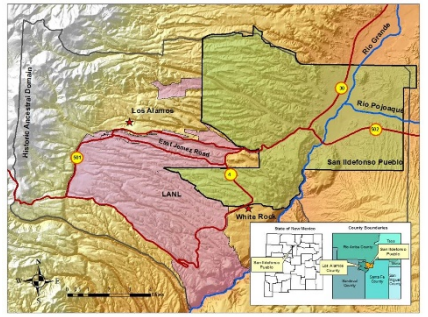
Prioritize and develop protection plans for highest vulnerability TCPs

Involve the Pueblo in emergency response decisions

Protection of TCPs within the Ancestral Domain

Develop access agreements

Create cultural learning programs

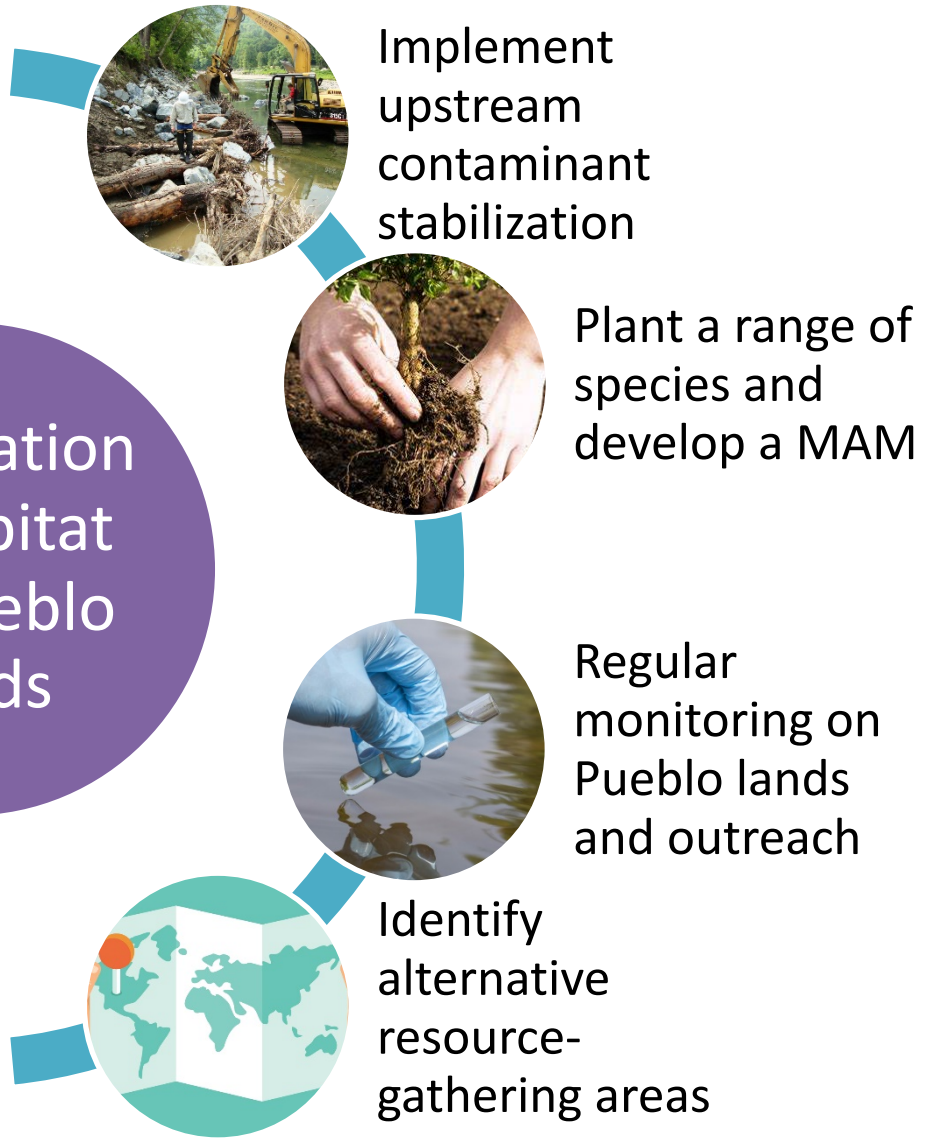


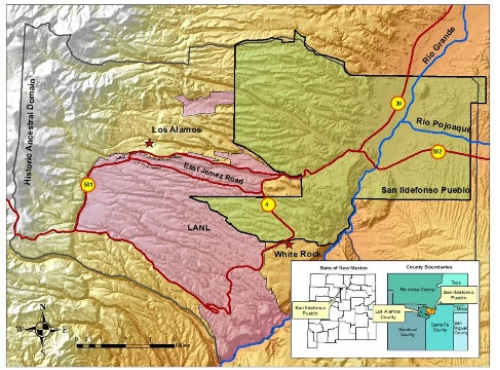
Proposed Approach:
Build in resilience by creating a portfolio of restoration concepts that restore different aspects (the physical structure; access; cultural significance), and combine complementary adaptation strategies

TCP = Traditional Cultural Properties

Anticipating Climate Impacts in NRDA Restoration Planning

Question:
How can we restore habitat and traditional use within Pueblo lands when there is continued risk of increased contaminant transport due to drought-wildfire-flood cycles?





Proposed Approach:
Build in resilience by creating a portfolio of restoration concepts that restore different functions, and combine complementary adaptation strategies

Thank you

Contact info:
Raymond Martinez rmartinez@sanipueblo.org
Kaylene Ritter kayene_ritter@abtassoc.com