Assessment of Climate Change in the Southwest United States: Key Findings

PAG AIR QUALITY FORUM
Tucson, Arizona
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Assessment of Climate Change in the Southwest United States

A Report Prepared for the National Climate Assessment

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ISLANDPRESS
Annual Temperature Trends 1901-2010

Region: 1.6°F
UT, CO: 4.5°F

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Precipitation: No Trend
Wallow Fire
White Mountains, 2011
A Word About Models
The Climate System

Changes in the Atmosphere: Composition, Circulation

Changes in the Hydrological Cycle

Atmosphere

Clouds

Volcanic Activity

Human Influences

Glacier

Biosphere

Land Surface

Changes in the Cryosphere: Snow, Frozen Ground, Sea Ice, Ice Sheets, Glaciers

Changes in the Ocean: Circulation, Sea Level, Biogeochemistry

Changes in/on the Land Surface: Orography, Land Use, Vegetation, Ecosystems

Atmosphere-Ocean Interaction

Heat Exchange

Wind Stress
Average Global Temperature Projections

Adapted from: Draft National Climate Assessment, 2013
Average Annual Temperature

High emissions

A2
2041-2070
A2 Scenario

34 more days per year

Preliminary analysis by Carlos Carrillo and Gregg Garfin, Univ. of Arizona
Not peer-reviewed

25 more days per year
High emissions

Change in the Length of the Frost

2070 as compared to 1971

2099 as compared to 2000

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Statistically downscaled precipitation changes (%) for high emission scenario A2 High Emissions Scenario

2021–2050

2041–2070

2070–2099

Change (%)

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Atmospheric Rivers
Less Snow
Less Runoff
Less Soil Moisture

A2 High Emissions Scenario

High emission scenario
2041-2070

-40 -20 0 20 40
Change (%)
AZ & NM Mountains: 4x area burned
Intersecting Challenges

Erosion

Fire

Mortality

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Carbon Sequestration

Central NM above-ground plant biomass

Temperature
Precipitation

Spring uptake of C
Precipitation in prior fall and winter

Non-native grasses

Sagebrush → cheatgrass

Non-native grasses + Fire
Buffelgrass

$120 Billion

Yellow star thistle

Cheatgrass

globalchange.gov
Electricity Generation in the Southwest

2009 Percentages

- Natural Gas: 42%
- Coal: 30%
- Nuclear Electric Power: 13%
- Other Renewables: 6%
- Hydroelectric: 8%
- Other Gases: < 1%
- Petroleum: < 1%

Percentages of total energy generated in the Southwest region
<table>
<thead>
<tr>
<th>Precipitation Event</th>
<th>Impacts on Land Transportation Operations</th>
<th>Impacts on Air Transportation Operations</th>
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</thead>
</table>
| Increase in precipitation intensity and stormwater runoff | ● Increased delays  
● Increased traffic disruption  
● Reduced safety and maintenance | ● Increased delays  
● Increased  
   ▪ stormwater flooding, delays,  
   ▪ airport closings  
● Emergency evacuation planning  
● facility maintenance  
● safety management |
| Increase in drought conditions                          | ● Wildfires  
● Visibility | ● Wildfires  
● Visibility |
Increased particulate matter → respiratory health

Aspen Fire, Tucson, AZ - 2003
Extreme Heat →
Increased illness & deaths

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Photo: Los Angeles Times
Disaster

Have to Pee

Have to Sneeze

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Assessment of Climate Change in the Southwest U.S.

Assessment of Climate Change in the Southwest United States speaks broadly and clearly about climate and its effects on the people and landscapes of Arizona, California, Colorado, Nevada, New Mexico, Utah, the U.S.–Mexico border region, and the lands of Native Nations.

A landmark study in terms of its coverage and analysis (and a synthesis of knowledge from some 120 contributing experts), the book offers decision makers and stakeholders a substantial basis from which to make informed choices that will affect the well-being of the region’s inhabitants in the decades to come.