

# **WATERSHED ANALYSIS OF RUNOFF AND EROSION POTENTIAL ON SANTA CRUZ WATERSHED: IMPACT OF CLIMATE AND LAND COVER CHANGES**

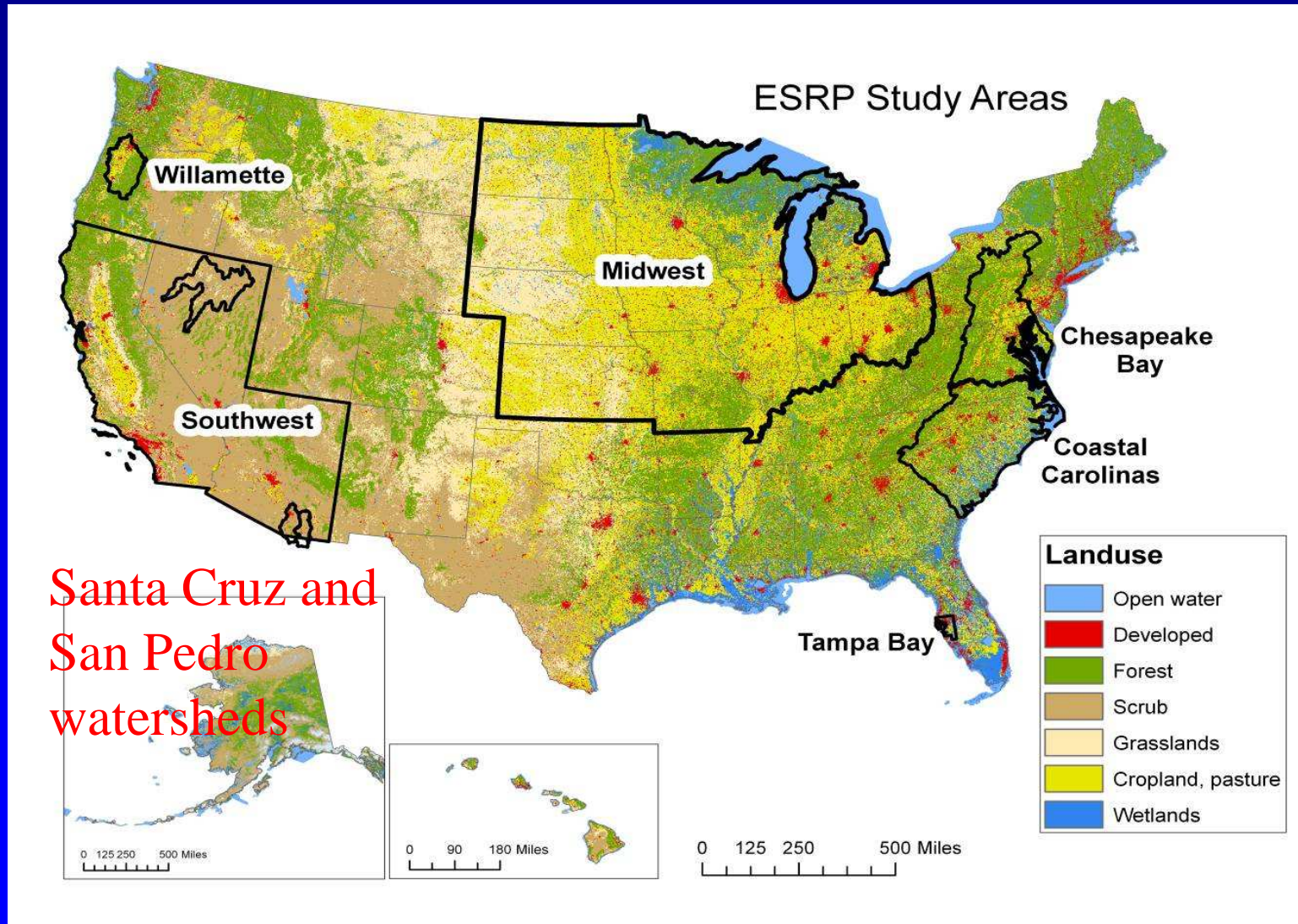
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**USEPA-Office of Research and  
Development, Las Vegas, NV**

# **Ecosystem Services Research Project (ESRP) in EPA**

- **To study the science to protect and restore the goods and services of nature.**
- **To advance ecosystem services research and improve knowledge to protect, and restore the services of nature.**

# Ecosystem Services Research Project (ESRP) in EPA

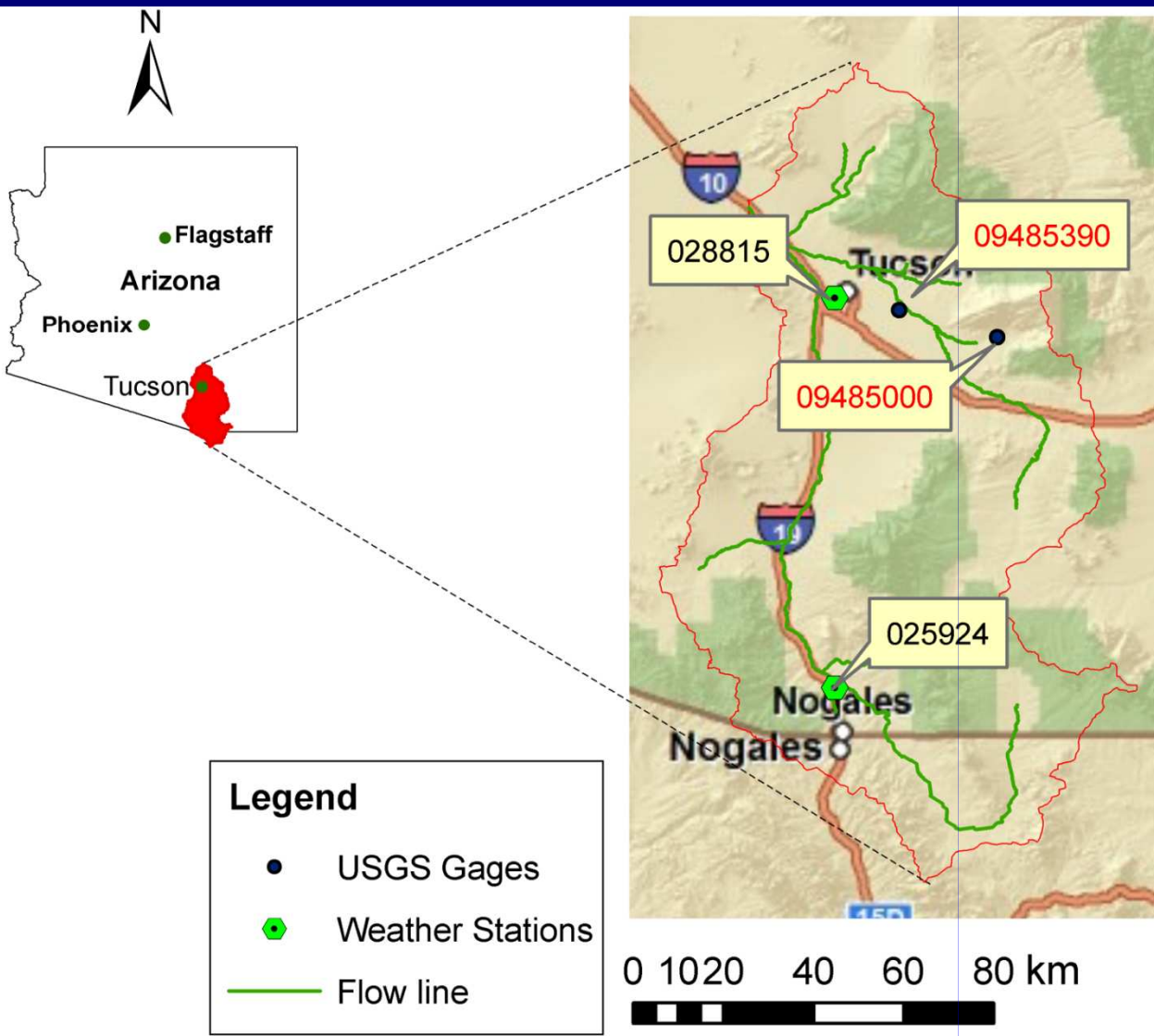


# **Southwest ESRP**

- **The goal of the Southwest ESRP is to quantify current and future ecosystem services across the Southwest region and to examine changes expected to occur as a result of the landuse and climate changes.**
- **Demand for water is growing due to population growth.**
- **Precipitation is likely decreasing and temperature is likely increasing due to climate change.**
- **Water availability has become a dominant issue in arid and semi-arid Southwest US.**
- **Increased erosion potential due to landuse and climate changes is of a particular concern.**

# **Objectives**

- **Examine historical climate and streamflow changes.**
- **Analyze potential threats to water quality and quantity.**



# Upper Santa Cruz Watershed

## Area

*9,073 km<sup>2</sup>*

## Elevations

*496 - 2883 m*

## Annual Rainfall

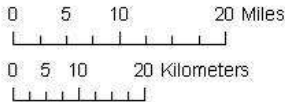
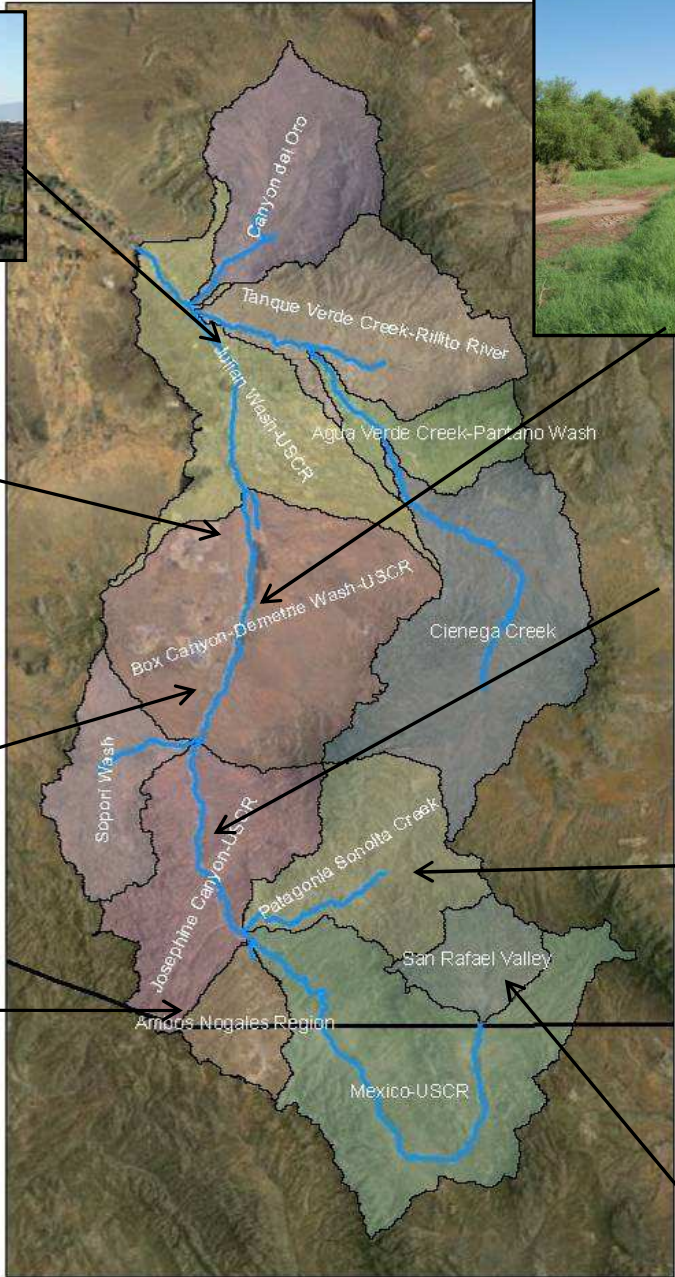
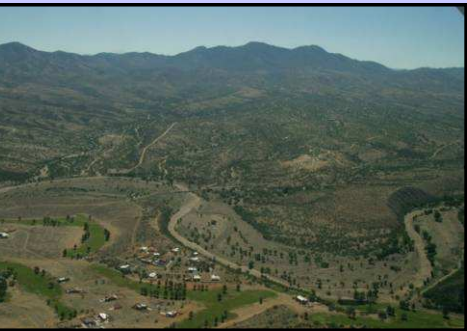
*200 - 800 mm*

## Dominant Vegetation

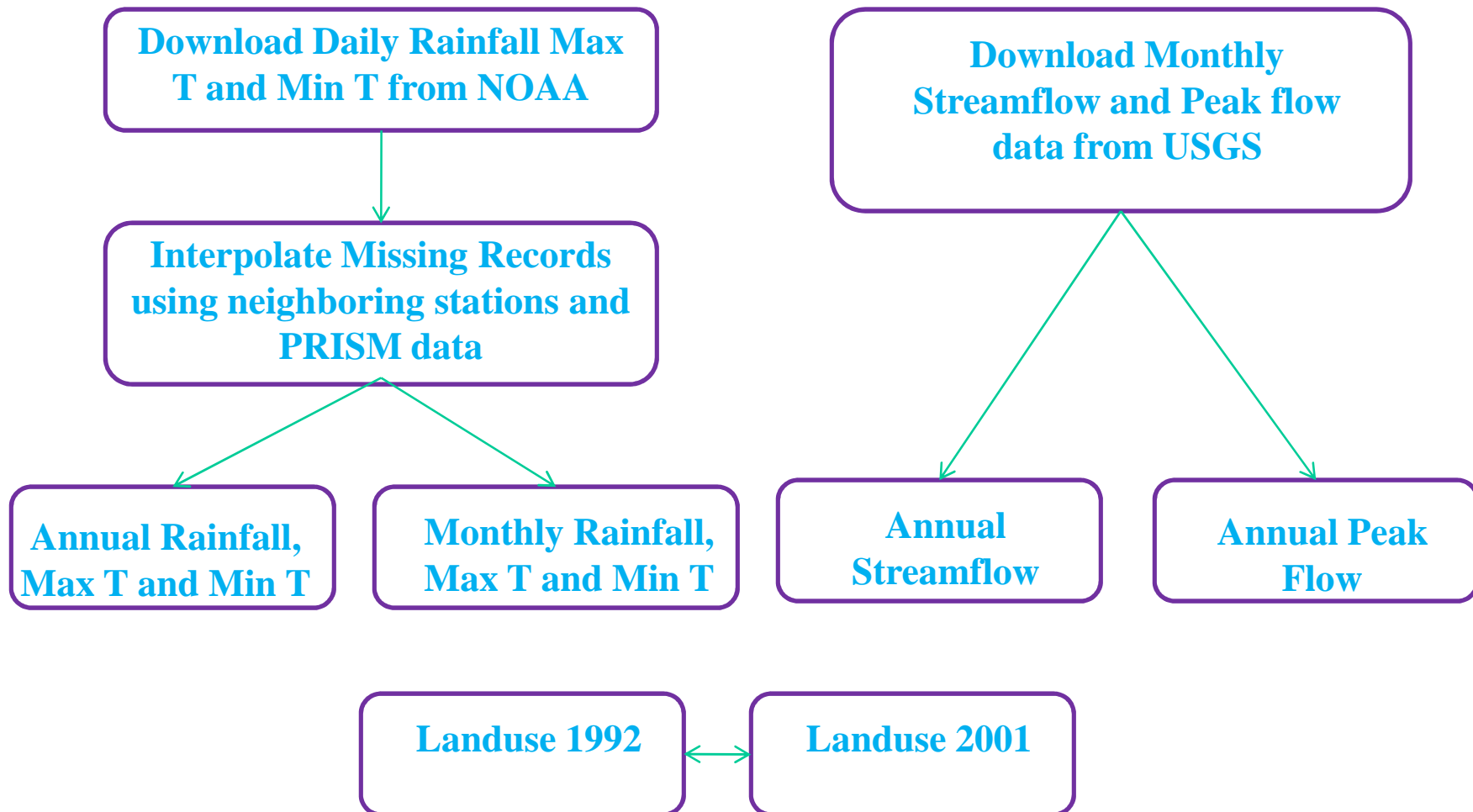
*Desert shrub (70%)*

Location of the Upper Santa Cruz Watershed (Arizona/Mexico)





# Data Analysis





## Two Weather Stations

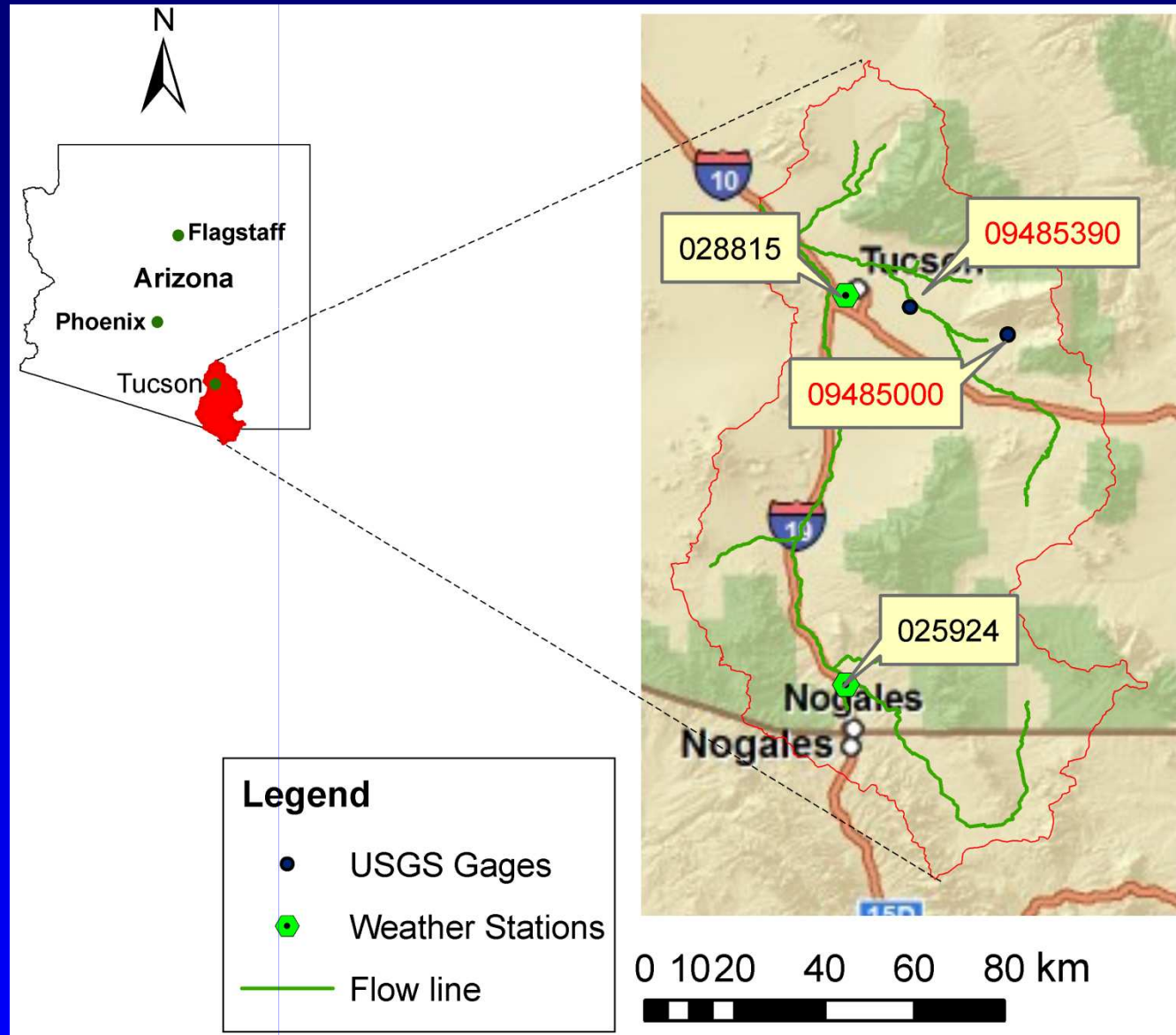
028815 (742 m)

025924 (1055 m)

## Two USGS Gauges

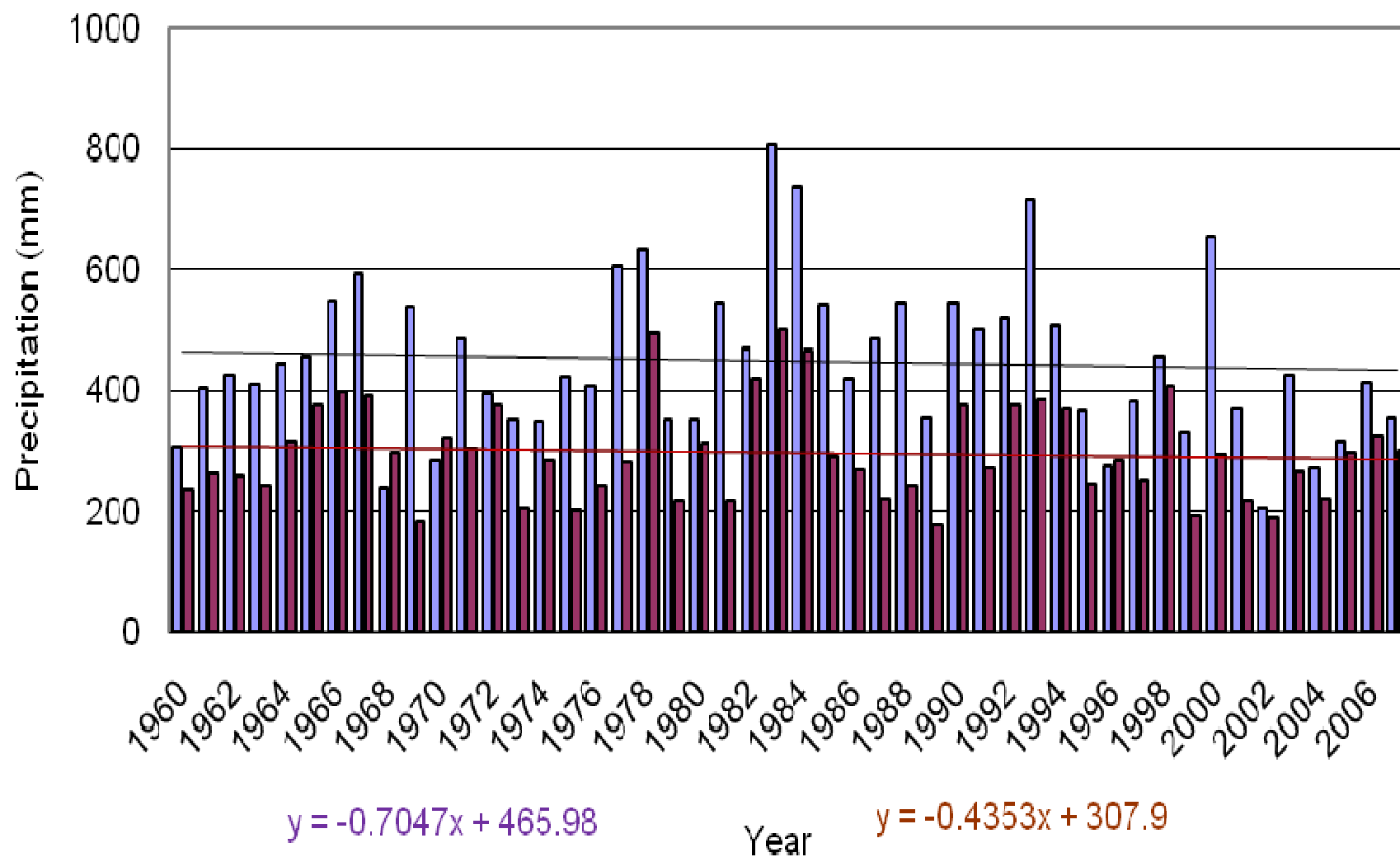
09485000

09485390



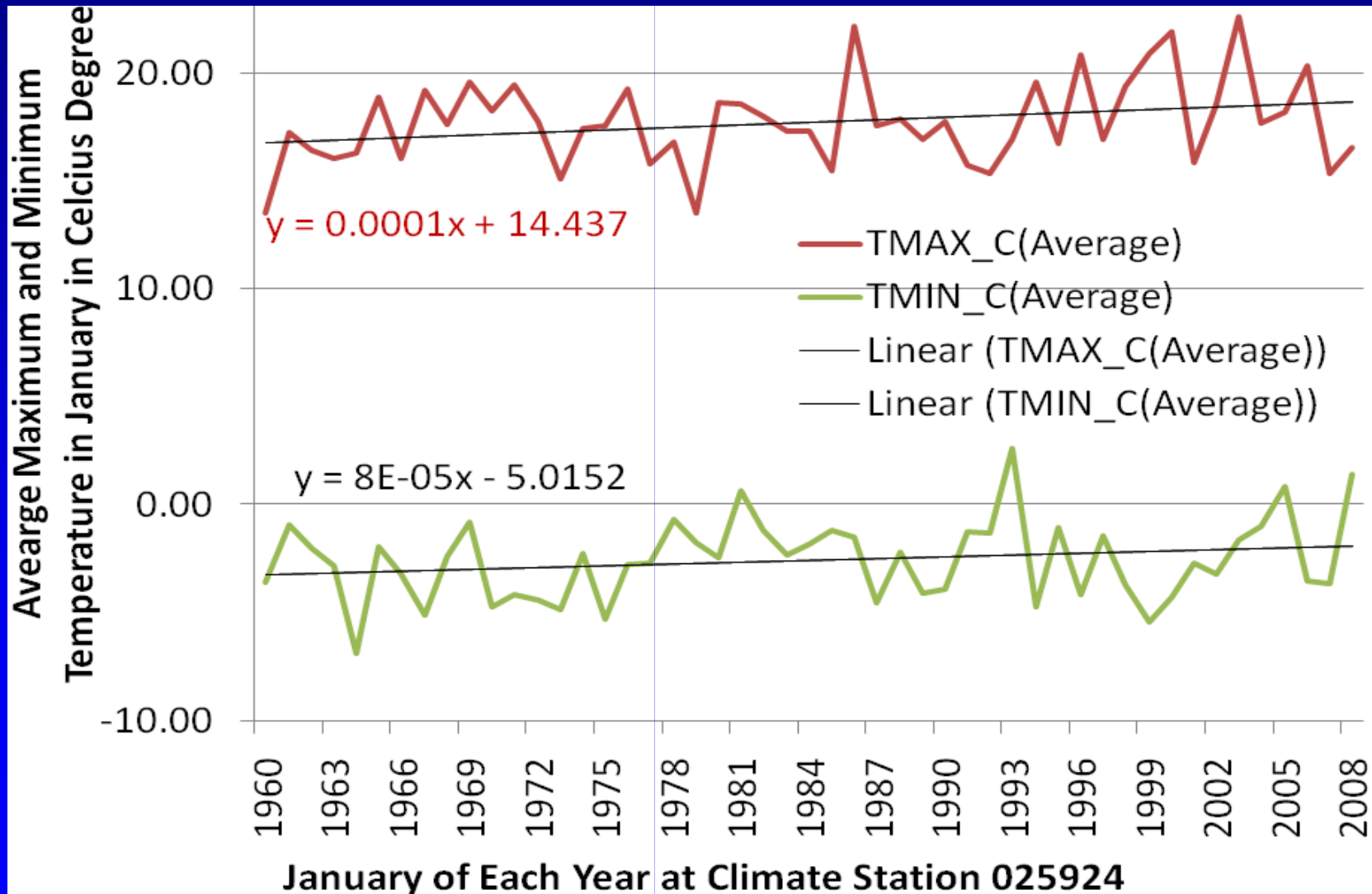
Location of Weather Stations and USGS Gauges

# Annual Rainfall

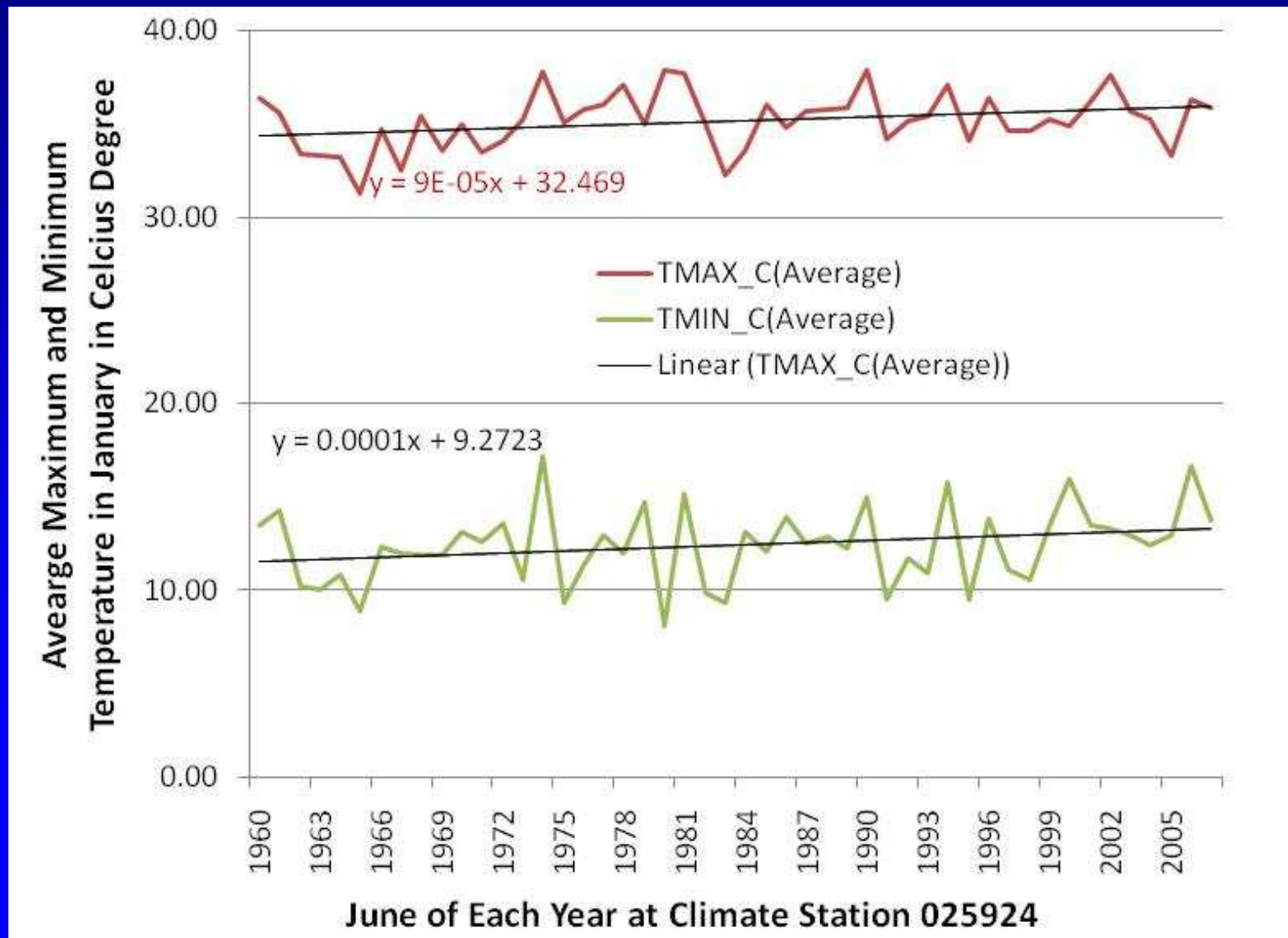


Station\_025924 station\_028815 Linear (Station\_025924) Linear (station\_028815)

# Average Maximum and Minimum Temperature in January at Station 025924 (1055 m)

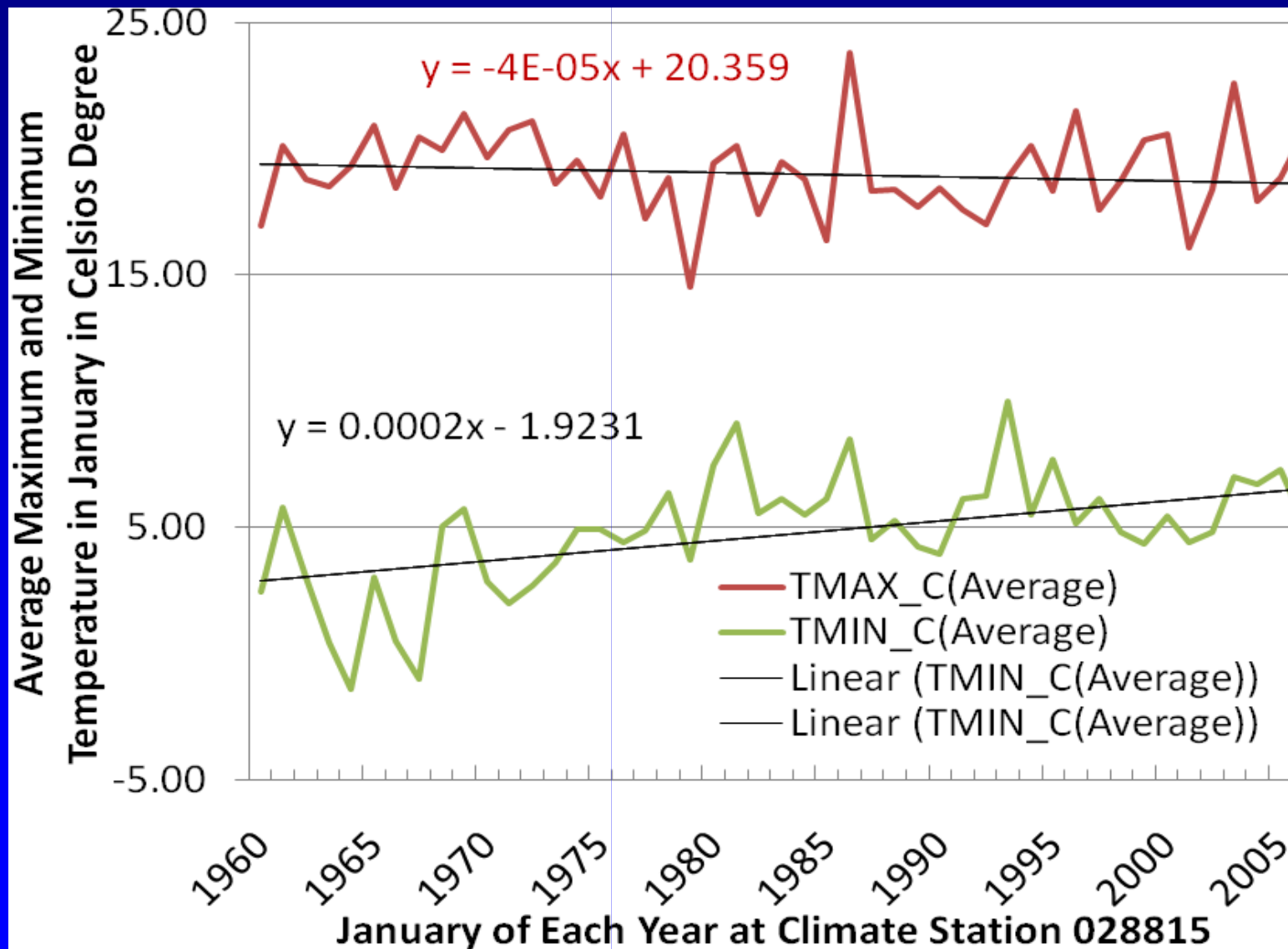


# Average Maximum and Minimum Temperature in June at Station 025924 (1055 m)

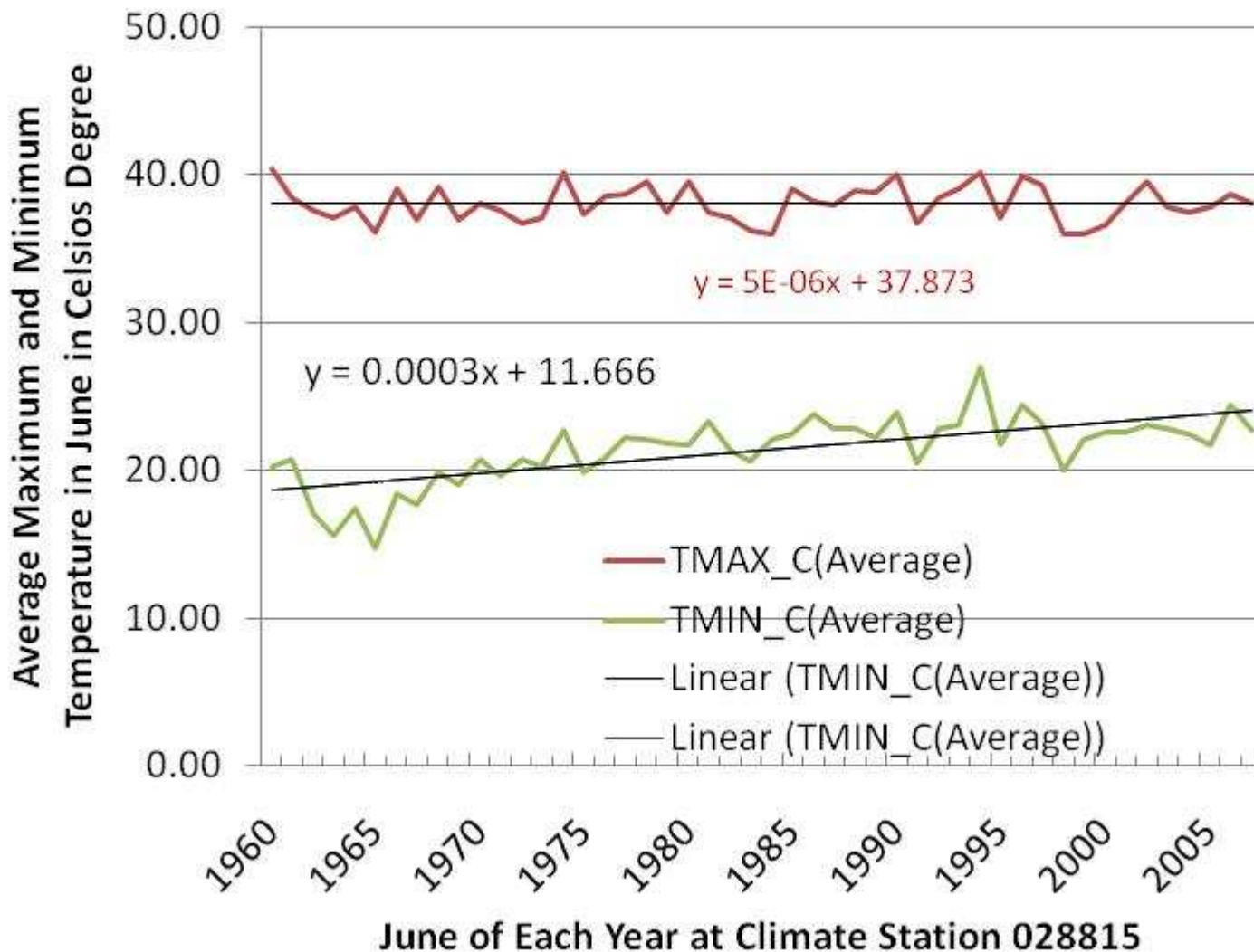




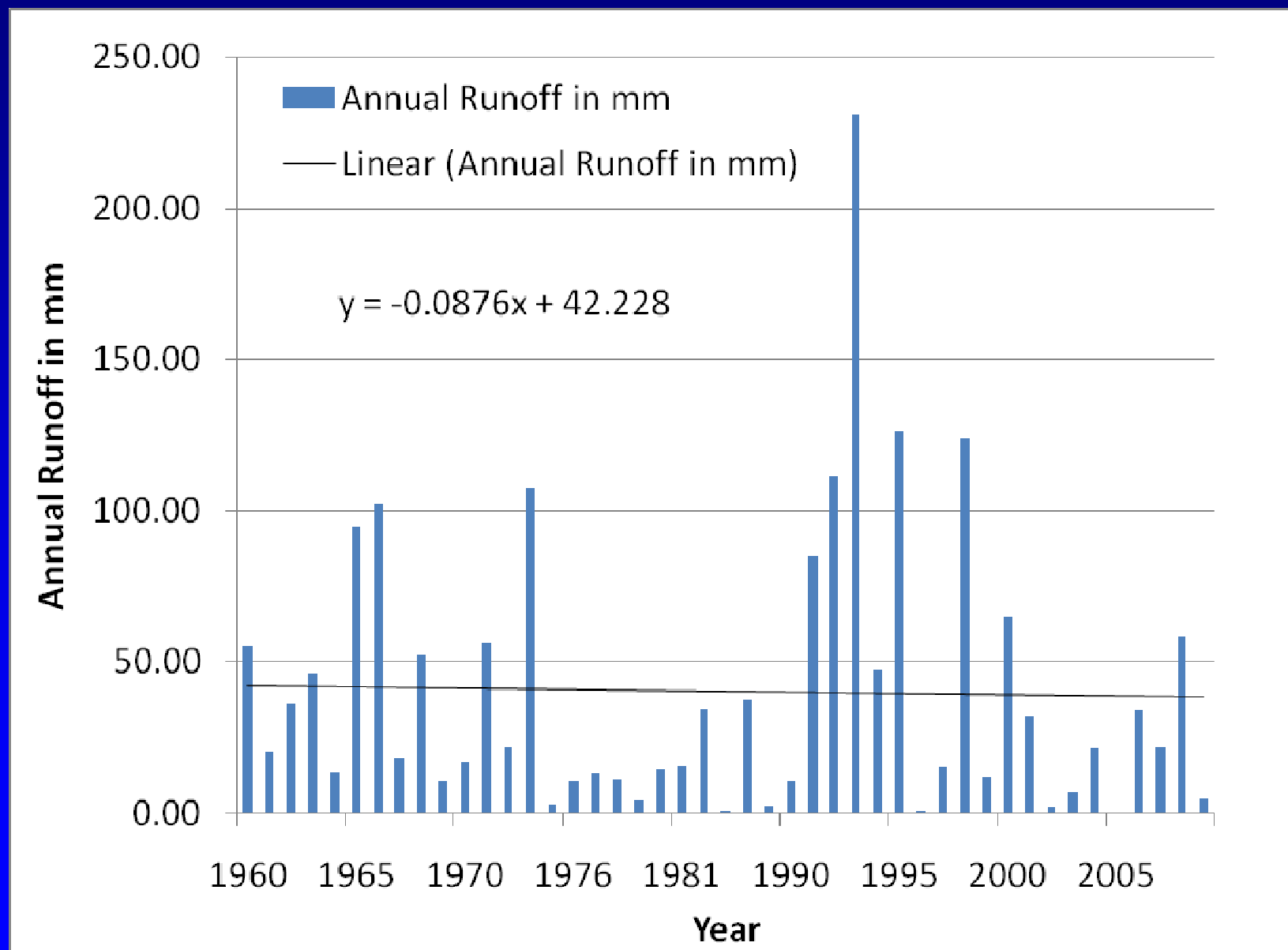
# Average Maximum and Minimum Temperature in January at Station 028815 (742 m)



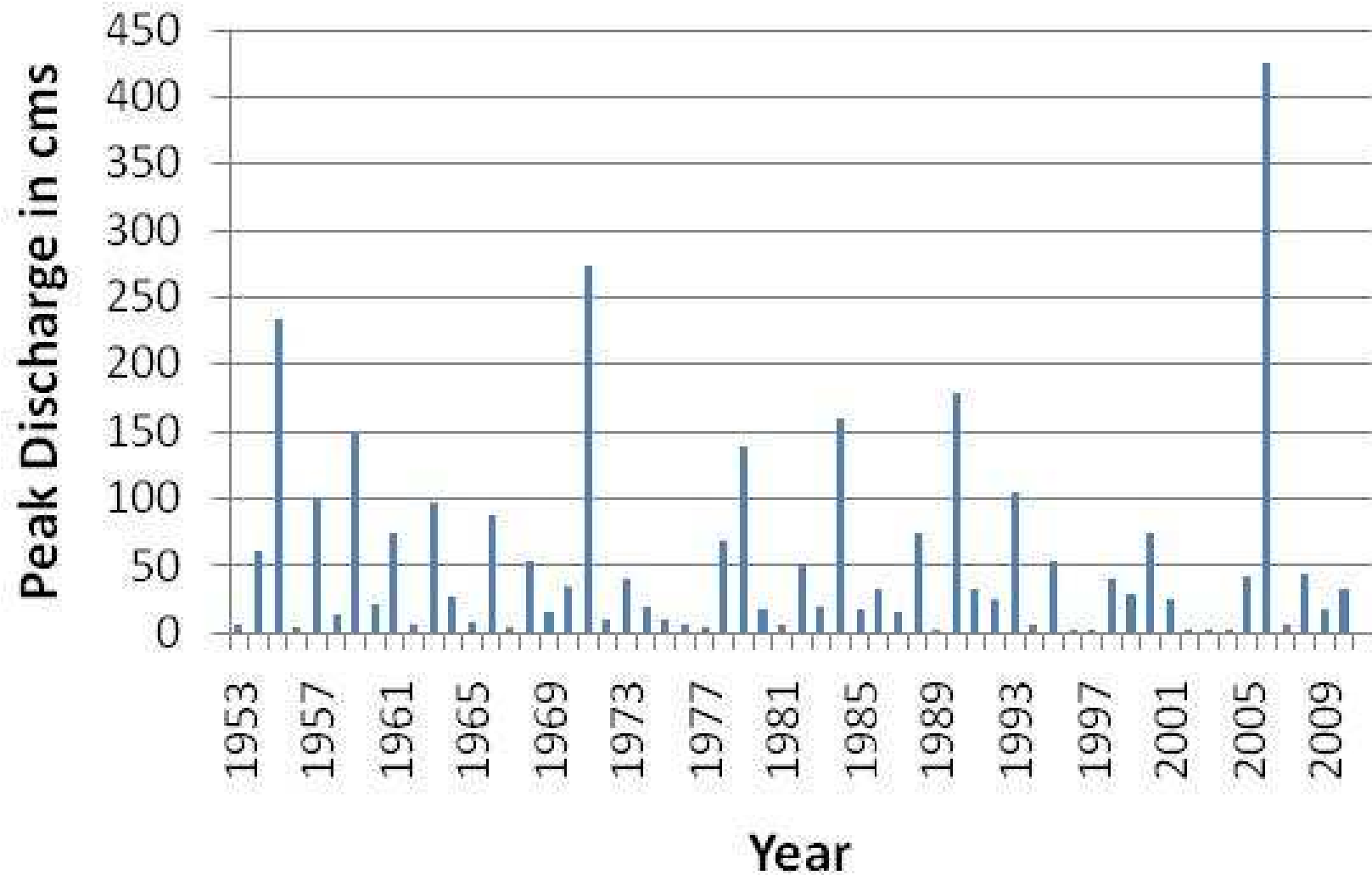
# Average Maximum and Minimum Temperature in June at Station 028815 (742 m)



# Annual Stream flow from 1960 to 2010



# Peak Discharge





# Landuse and Landcover between 1992 and 2001

	Area (Hectare)			Percent
Land Use	1992	2001	2001-1992	2001-1992
Developed	45782	66528	<b>20746</b>	<b>45.31</b>
Agriculture	8552	4657	-3895	-45.55
Forest	102297	98079	-4218	-4.12
Shrub	655382	652377	-3004	-0.46
Water	613	245	-368	-59.99
Barren	13007	14429	1422	10.93
Grassland/Pasture	67875	56284	<b>-11591</b>	<b>-17.08</b>
Wetland	42	951	909	2165.36

# **Conclusions**

- **Annual precipitation and runoff have a decreasing trend.**
- **The monthly minimum temperature is increasing.**
- **The monthly maximum temperature can be increasing or decreasing depending on elevation of monitoring station.**
- **Although total annual runoff is decreasing, high peak discharge from individual events was observed which indicates the occurrence of higher intensity rainfall.**
- **Increased peak discharge potentially results in more soil erosion which leads to increases in sediment loading.**
- **The watershed is likely more vulnerable to flooding risk and degraded water quality.**

# Thank You!

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# Questions?

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