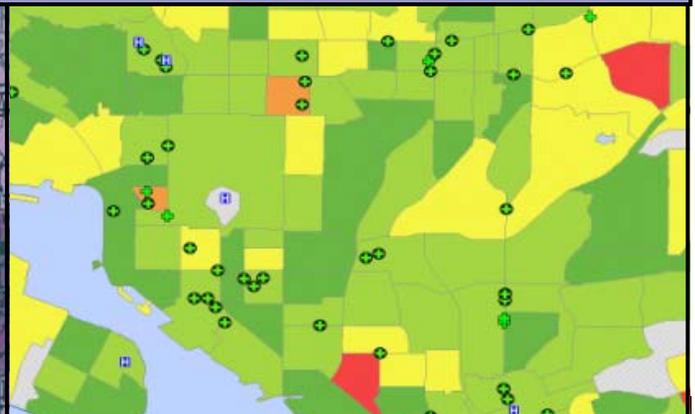
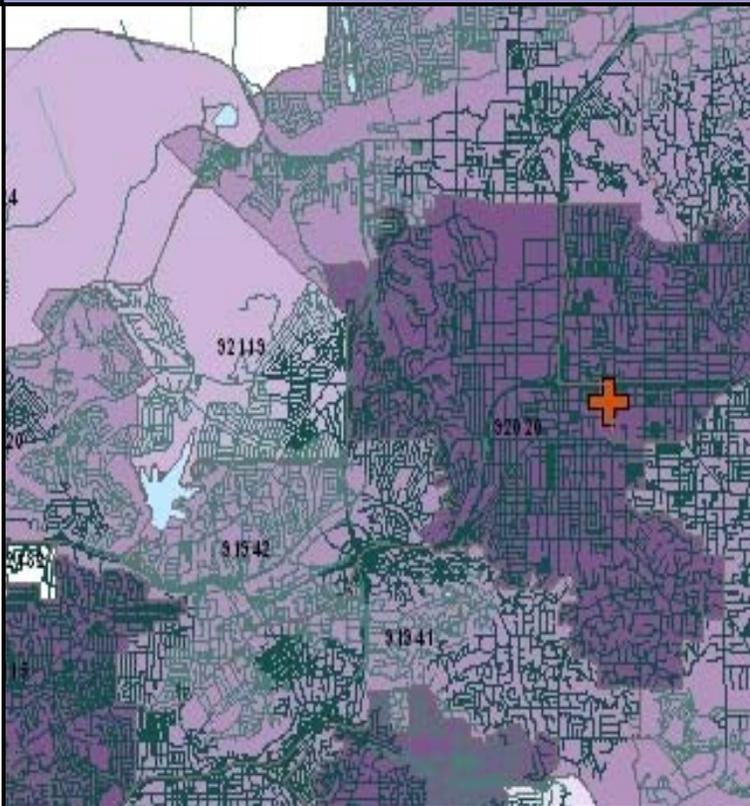


Heat Vulnerability Atlas San Diego County



AUGUST, 2012

Heat Vulnerability Atlas, San Diego County, 2012

Heat Vulnerability Atlas, San Diego County, 2012

Purpose: The purpose of this atlas is to describe areas of San Diego County where residents are at increased risk for heat-related illness. These maps may assist public health professionals in formulating and implementing plans to prevent or ameliorate bad health outcomes during heat-related emergencies.

Heat-related illness describes a variety of symptoms which occur when a person's core temperature rises, but the body's ability to cool is impaired. Typically, this occurs due to physical exertion and/or environmental heat (high temperatures, often including high relative humidity). Symptoms can be range from cramps, nausea, fainting, edema and weakness to seizures, hallucinations and life-threatening stroke.¹

Anyone can suffer heat-related illness due to weather patterns, the climate, and other environmental features where they live, but certain individuals are more at risk than others. At highest risk for poor medical outcomes due to heat-related illness include those individuals who are:

- Elderly (65+ years) or children (0-4 years)
- Poor or medically underserved
- Chronically ill
- Socially isolated
- Participants in athletic events or working outdoors

In addition, a critical feature is the ability to adapt to higher temperatures; acclimation to higher temperatures is dependent on both personal characteristics (physiology and behaviors), environmental factors (built environment, housing, availability of air conditioning) and community planning (heat emergency preparedness, availability and access to "cool zones" where people can congregate to escape hot weather).²

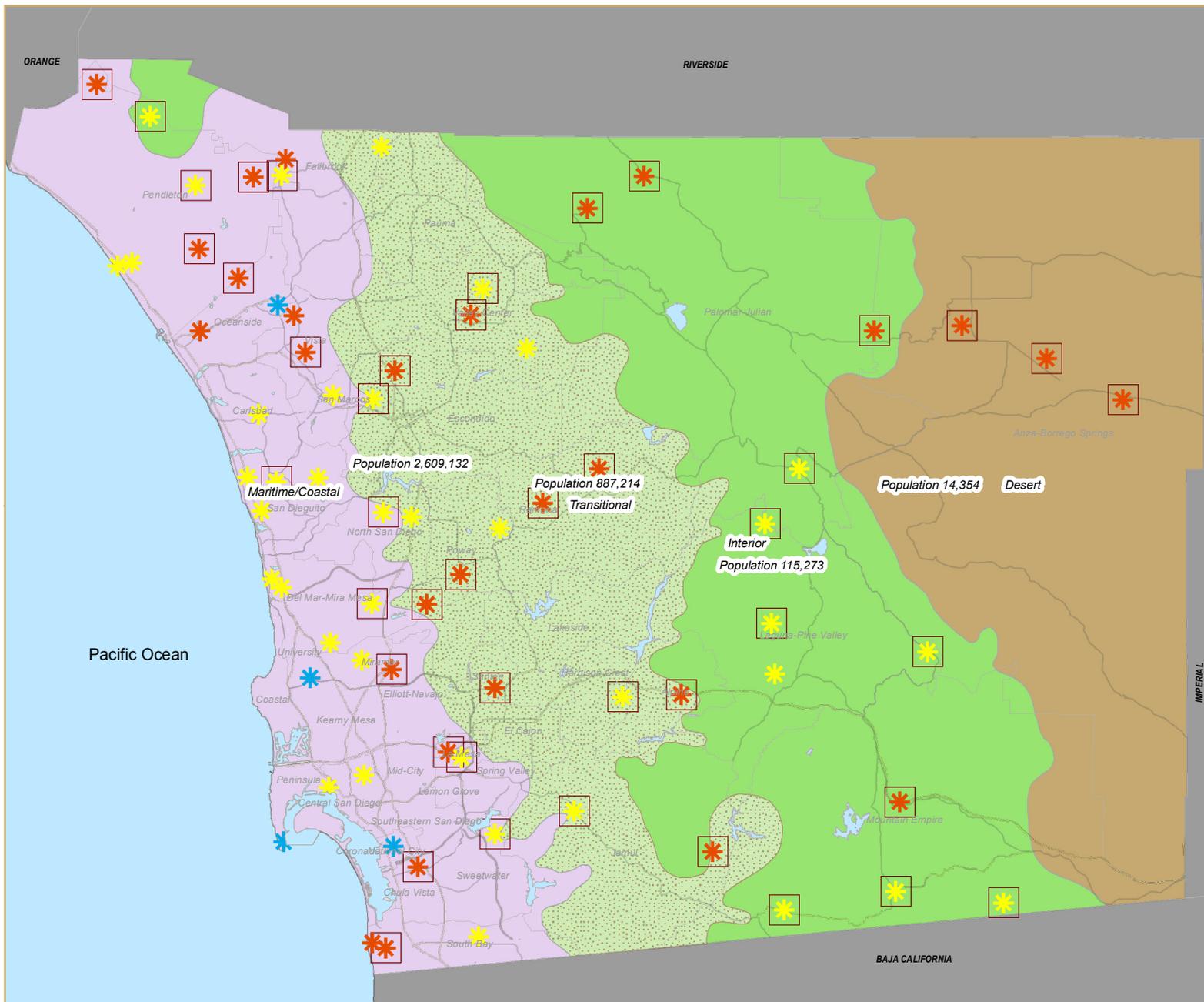
References:

¹California Department of Public Health, Environmental Health Investigations Branch,
http://www.ehib.org/page.jsp?page_key=173.

² California Department of Public Health, Environmental Health Investigations Branch,
http://www.ehib.org/page.jsp?page_key=173#heat_risk.

Maps included in this Atlas

1. San Diego County Climate Zones with Estimated Population (2010), Weather Station Hot Spots, and Areas of Sustained Heat.
2. San Diego County Total Population, Climate Zones.
3. Heat Vulnerability in San Diego County by Selected Demographics: Age 65+y.
4. Heat Vulnerability in San Diego County by Selected Demographics: Age 85+y.
5. Heat Vulnerability in San Diego County by Selected Demographics: Children 0-4y.
6. Heat Vulnerability in San Diego County by Selected Demographics: Median Income.
7. Heat Vulnerability in San Diego County by Selected Demographics: Income Less than 100% of Federal Poverty Level (FPL).
8. Heat Vulnerability in San Diego County by Selected Demographics: Householder Lives Alone.
9. Heat Vulnerability in San Diego County by Selected Demographics: Householder Lives Alone, Age 65+y.
10. Heat Vulnerability in San Diego County by Selected Demographics: Householder Lives Alone, No Vehicle.
11. Composite Vulnerability to Heat-related Illness Due to Chronic Diseases: COPD, CHD, Diabetes, Asthma
12. Heat Vulnerability in San Diego County by Areas of Outdoor Activity



San Diego County Climate Zones with Estimated Population (2010), Weather Station Hot Spots, and Areas of Sustained Heat

Weather Station Hot Spot*

Temp (F)

- ✱ 80 - 89 Caution
- ✱ 90 - 104 Extreme Caution
- ✱ 105 - 120 Danger

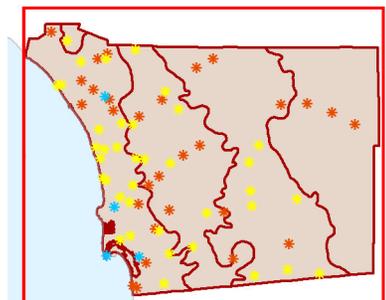
Area of Sustained Heat*

- 90+F for 3 or more days

Climate Zone

- Maritime/Coastal
- Transitional
- Interior
- Desert
- SRA

Inset map:
Weather Station Hot Spots*
and Climate Zones

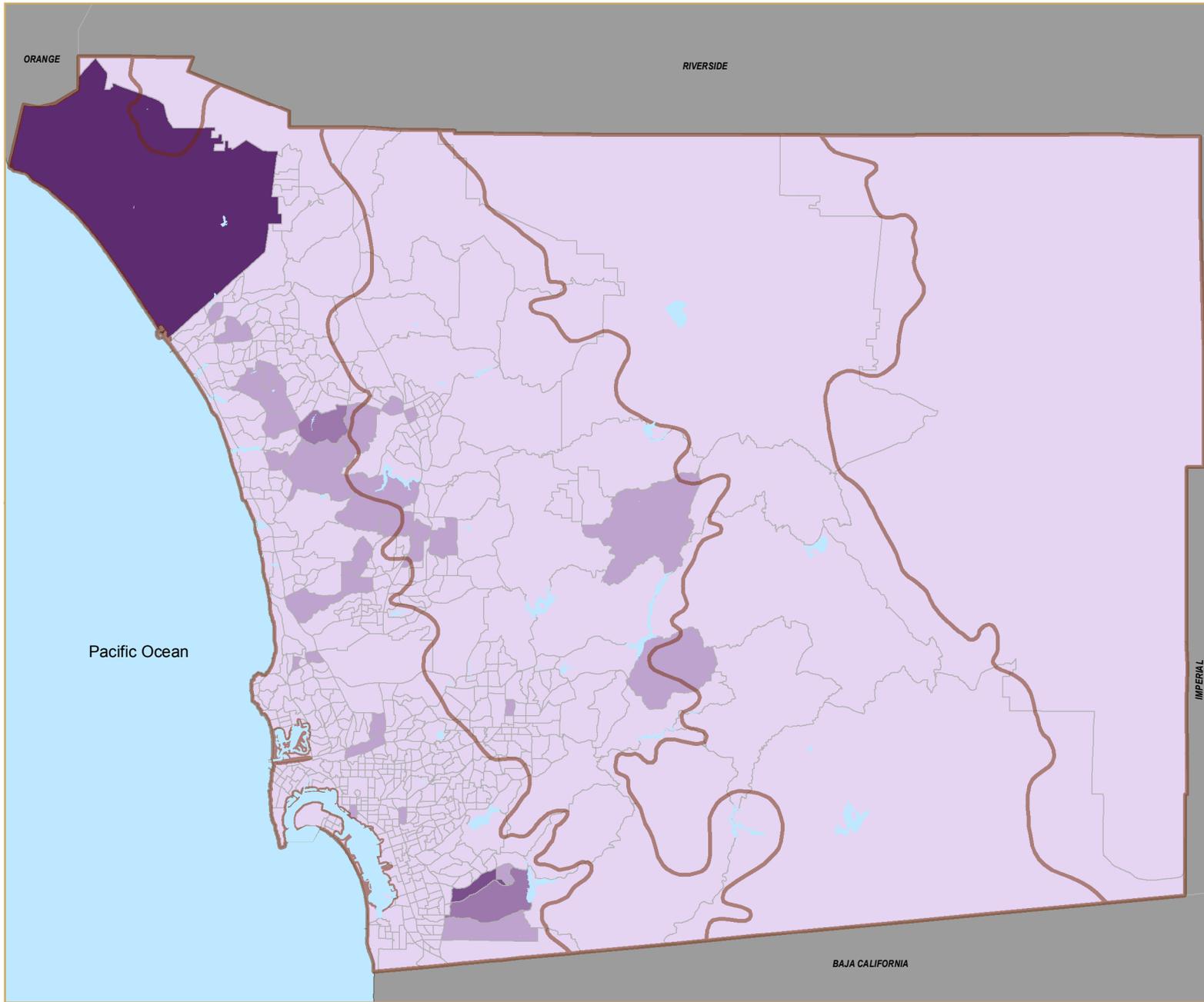


Map Date: February, 2011
Contact: Isabel Corcos or Leslie Ray,
County of San Diego Emergency Medical Services
619.285.6429

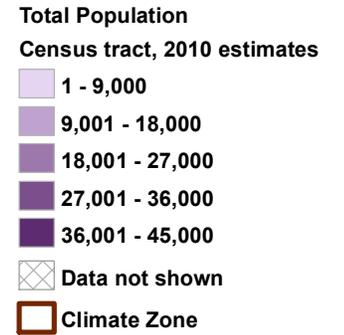


*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008-2010. Areas of sustained heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wrh.noaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

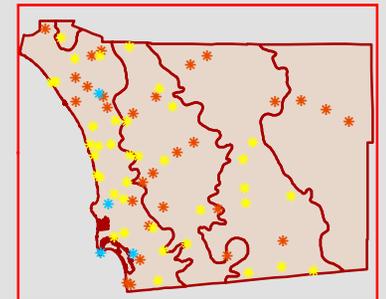
NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US



San Diego County Estimated Population, Climate Zones



Inset map:
Weather Station Hot Spots*
and Climate Zones



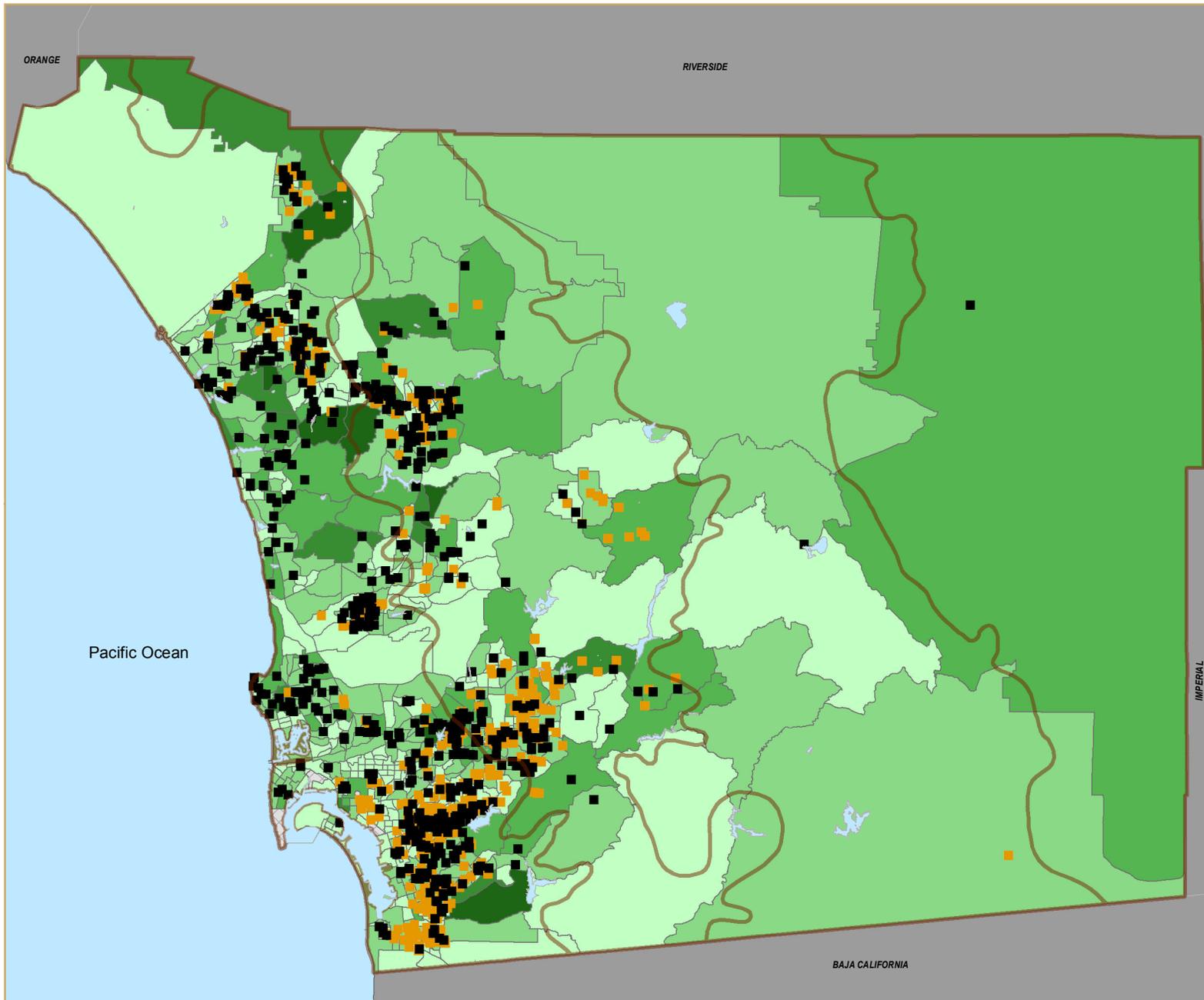
Map Date: February, 2011
 Contact: Isabel Corcos or Leslie Ray,
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 619.285.6429



*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 - October 31, 2008-2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 ° F for 3 or more days. Source: NWS Mesowest, <http://www.wrh.noaa.gov/mesowest/mwmap.php?map=gx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
 D_North_American_1983, Foot_US

Heat Vulnerability in San Diego County by Selected Demographics



Facility

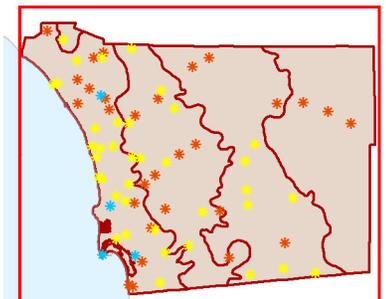
- Residential Care, Elderly
- Adult Residential

Ages 65+

Census tract, 2010 estimates

- 1 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- > 2,000
- ▨ Data not shown
- ▭ Climate Zone

Inset map:
Weather Station Hot Spots*
and Climate Zones



Map Date: February, 2011
Contact: Isabel Corcos or Leslie Ray,
County of San Diego Emergency Medical Services
619.285.6429

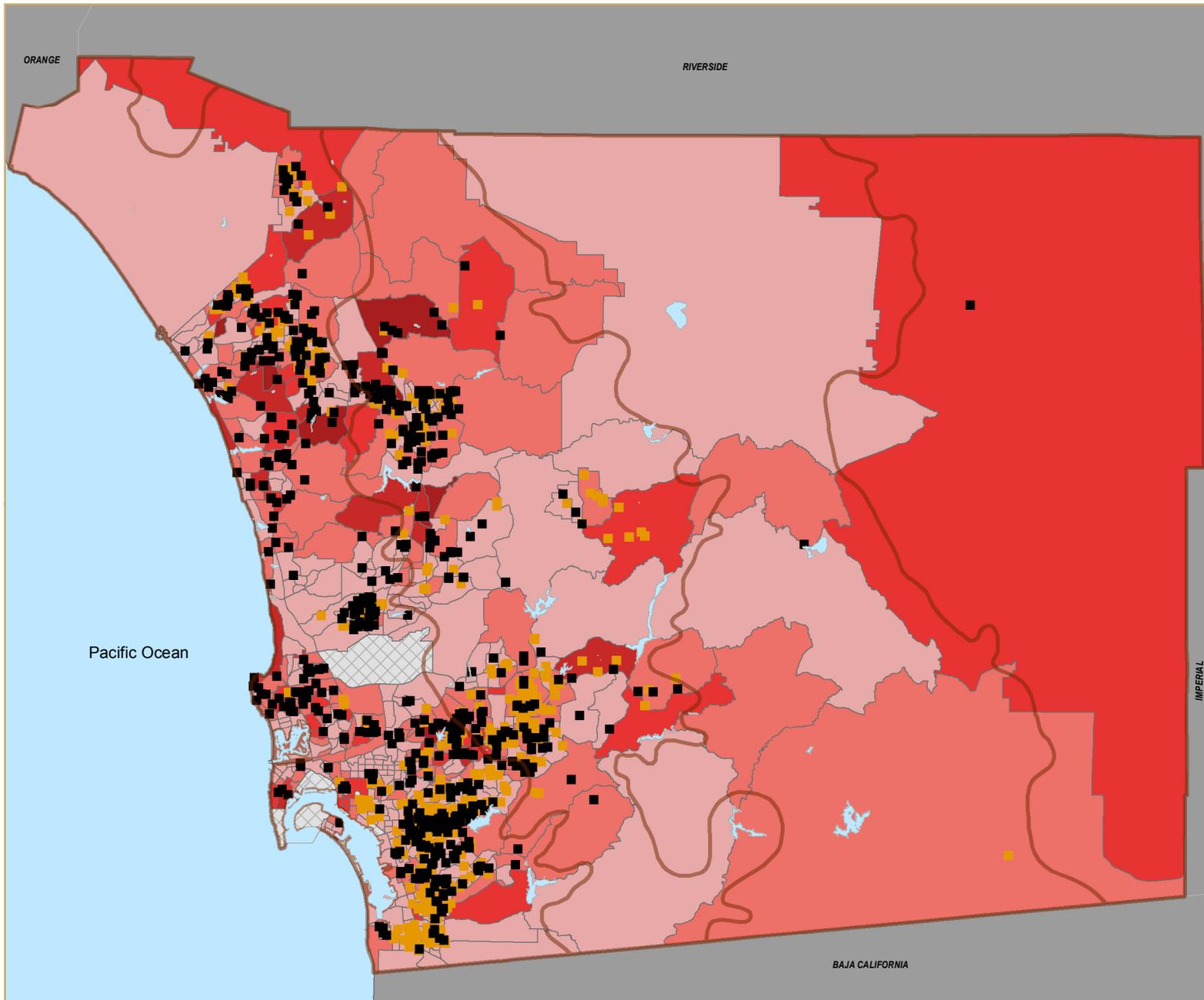


30 15 0 30
Miles

*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 - October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US





Heat Vulnerability in San Diego County by Selected Demographics

Facility

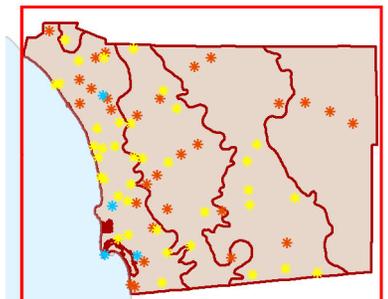
- Residential Care, Elderly
- Adult Residential

Ages 85+y

Census tract, 2010 estimates

- 1 - 100
- 101 - 200
- 201 - 300
- 301 - 400
- > 400
- ▨ Data not shown
- ▭ Climate Zone

Inset map:
Weather Station Hot Spots*
and Climate Zones



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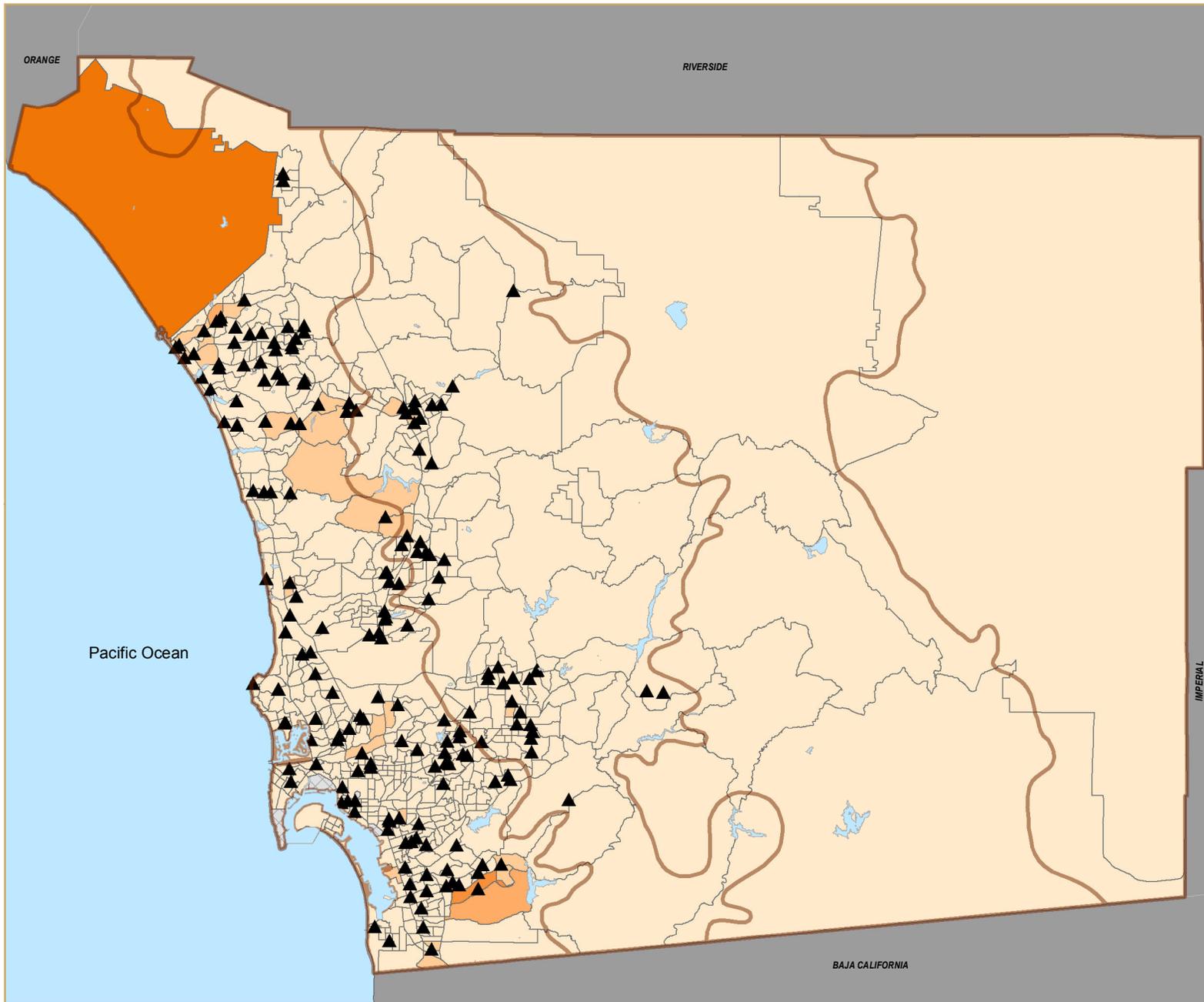


30 15 0 30
Miles

*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 - October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

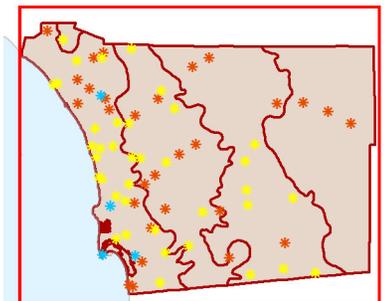
NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US

Heat Vulnerability in San Diego County by Selected Demographics



- ▲ Child Care, Infants
Ages 0-4y
Census tract, 2010 estimates
- 1 - 800
- 801 - 1,600
- 1,601 - 2,400
- 2,401 - 3,200
- 3,201 - 4,000
- Data not shown
- Climate Zone

Inset map:
Weather Station Hot Spots*
and Climate Zones



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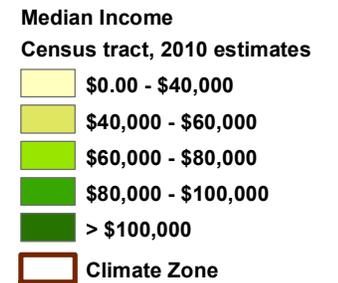
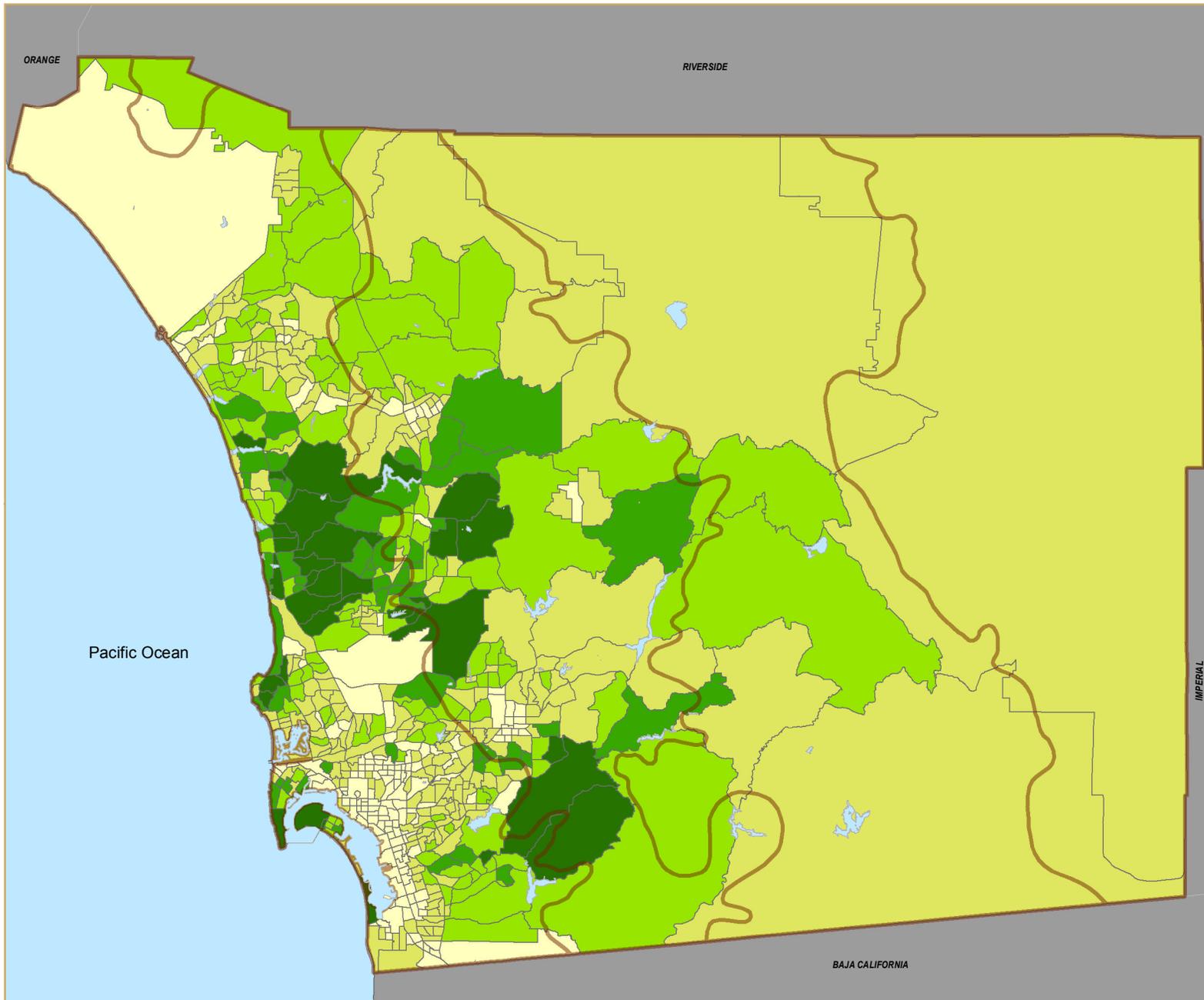


*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 - October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sg&limit=1&list=1>.

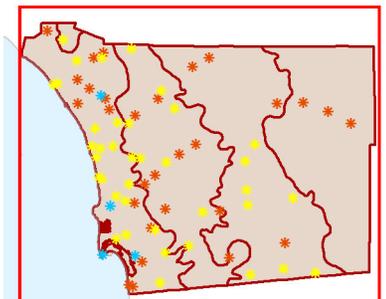
NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US



Heat Vulnerability in San Diego County by Selected Demographics



Inset map:
Weather Station Hot Spots*
and Climate Zones



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619.285.6429

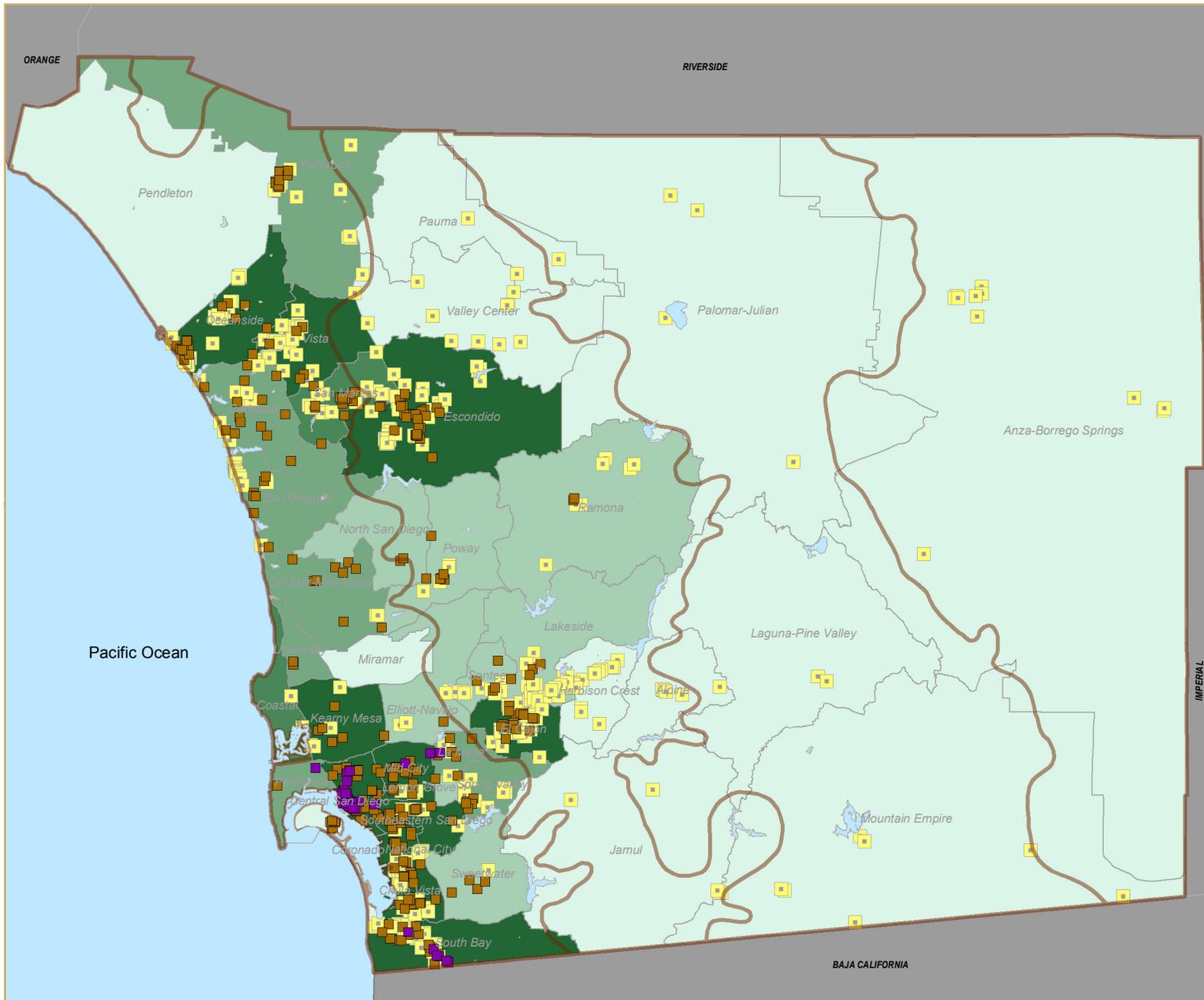


*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sg&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US

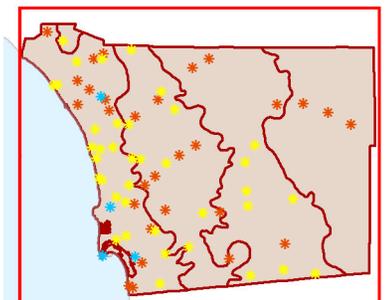


Heat Vulnerability in San Diego County by Selected Demographics



- Affordable Housing Apartments
 - Mobile Home Parks
 - Single Room Occupancy
- Income < 100% FPL
SRA, 2010 estimates**
- 1 - 2,500
 - 2,501 - 5,000
 - 5,001 - 7,500
 - 7,501 - 10,000
 - > 10,000
- Climate Zone

Inset map:
Weather Station Hot Spots*
and Climate Zones



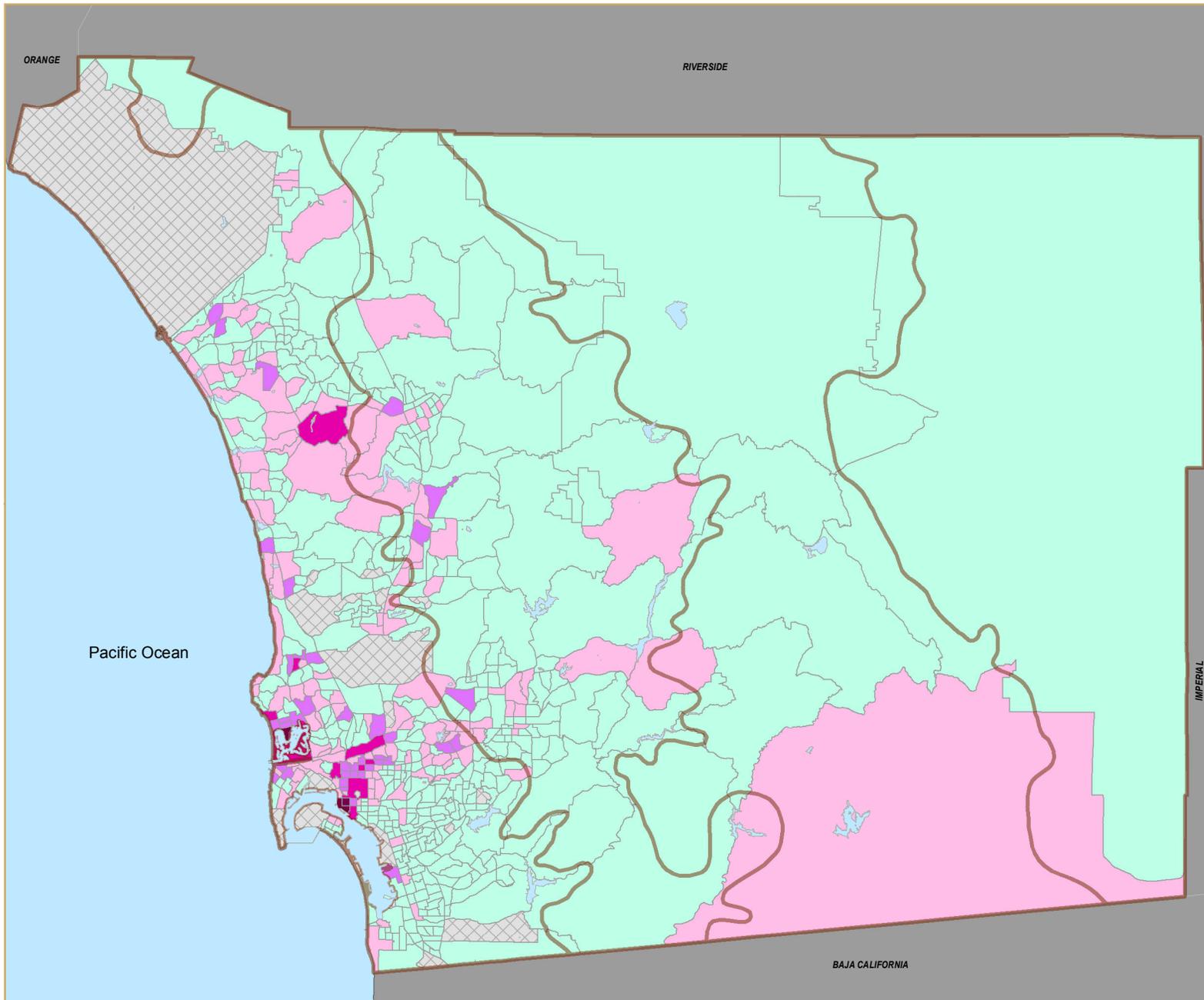
Map Date: February, 2011
Contact: Isabel Corcos or Leslie Ray,
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619.285.6429



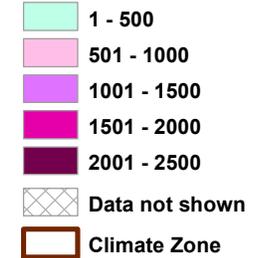
*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=spx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US

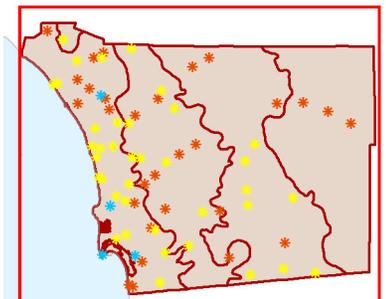
Heat Vulnerability in San Diego County by Selected Demographics



Householder Lives Alone Census tract, ACS 05-09**



Inset map: Weather Station Hot Spots* and Climate Zones



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 Contact: Isabel Corcos or Leslie Ray,
 County of San Diego Emergency Medical Services
 619.285.6429



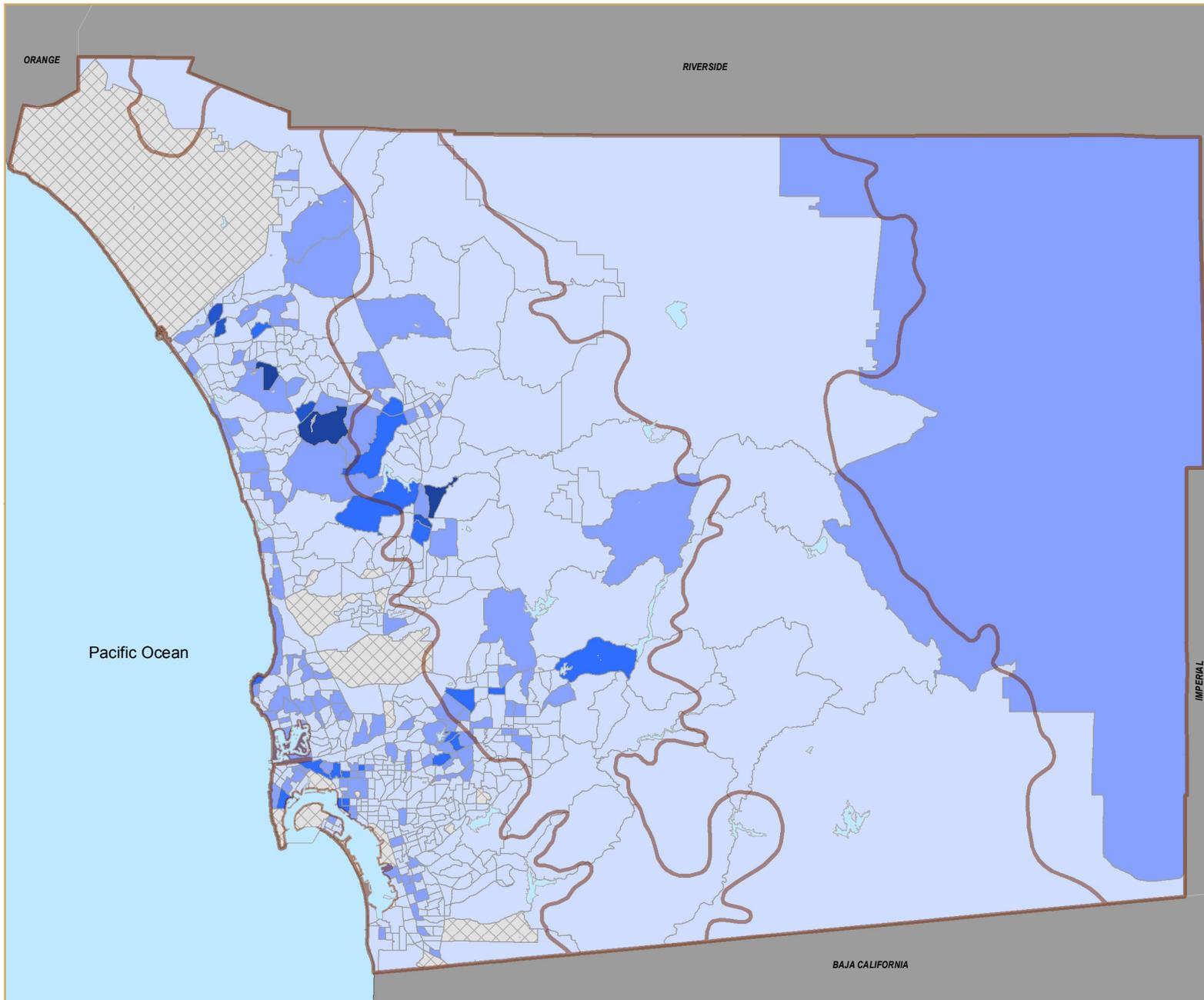
*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sg&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
 D_North_American_1983, Foot_US

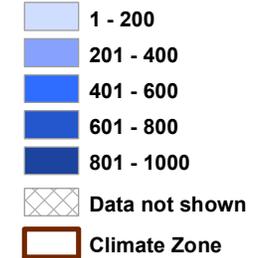
**American Community Survey, 2005-9



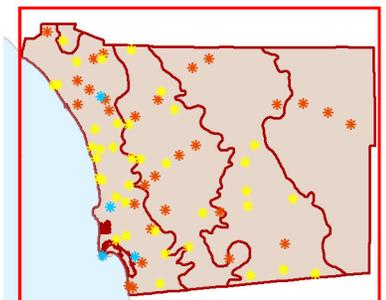
Heat Vulnerability in San Diego County by Selected Demographics



Householder Lives Alone, 65+y Census tract, ACS 05-09



Inset map: Weather Station Hot Spots* and Climate Zones



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 County of San Diego Emergency Medical Services
 619.285.6429

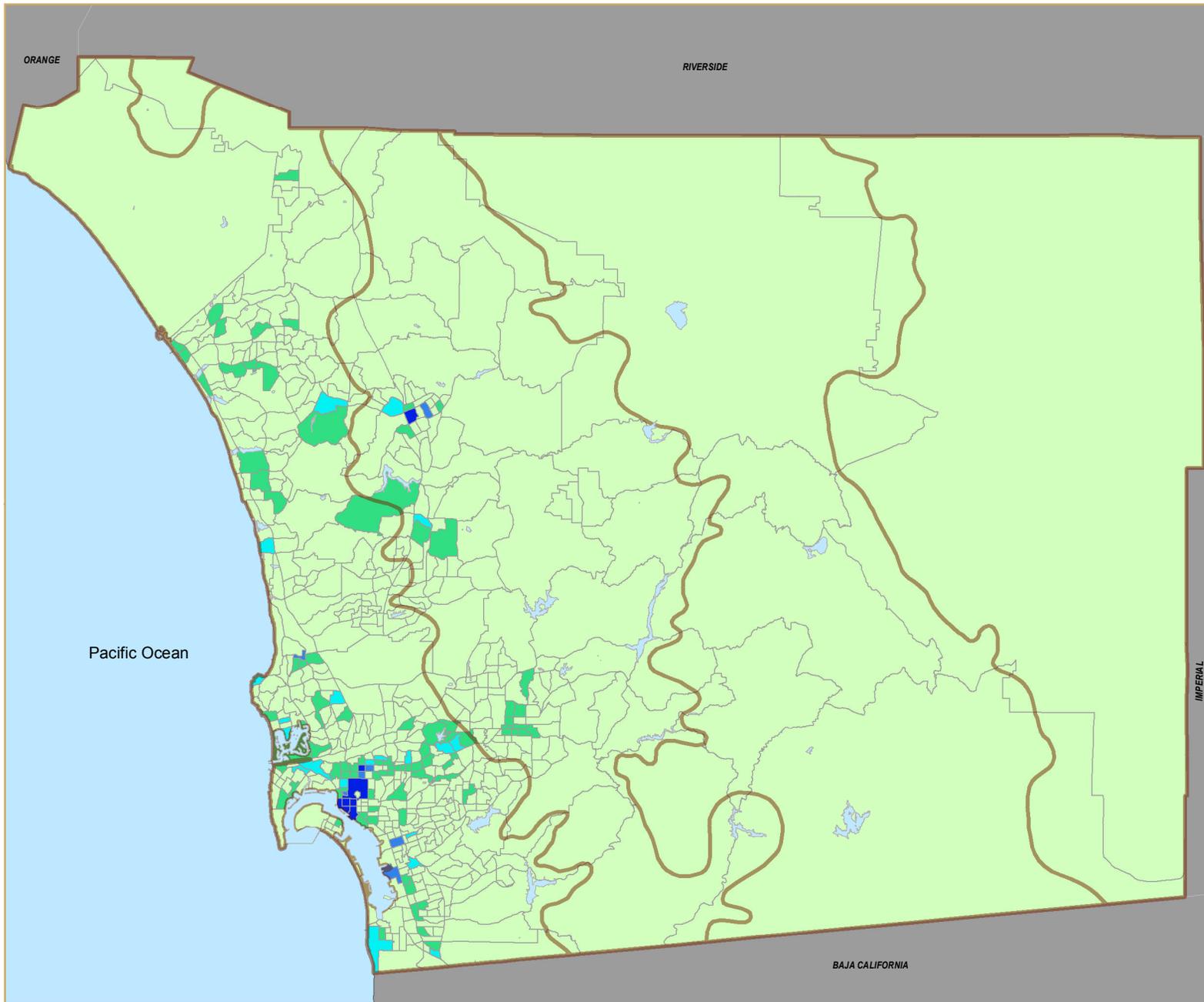


*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

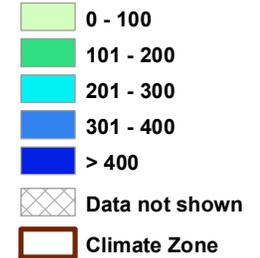
NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
 D_North_American_1983, Foot_US

**American Community Survey, 2005-9

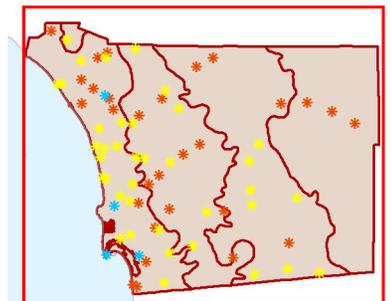
Heat Vulnerability in San Diego County by Selected Demographics



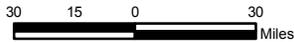
Householder Lives Alone, No Vehicle Census tract, ACS 05-09



Inset map: Weather Station Hot Spots* and Climate Zones



Map Date: February, 2011
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 619.285.6429

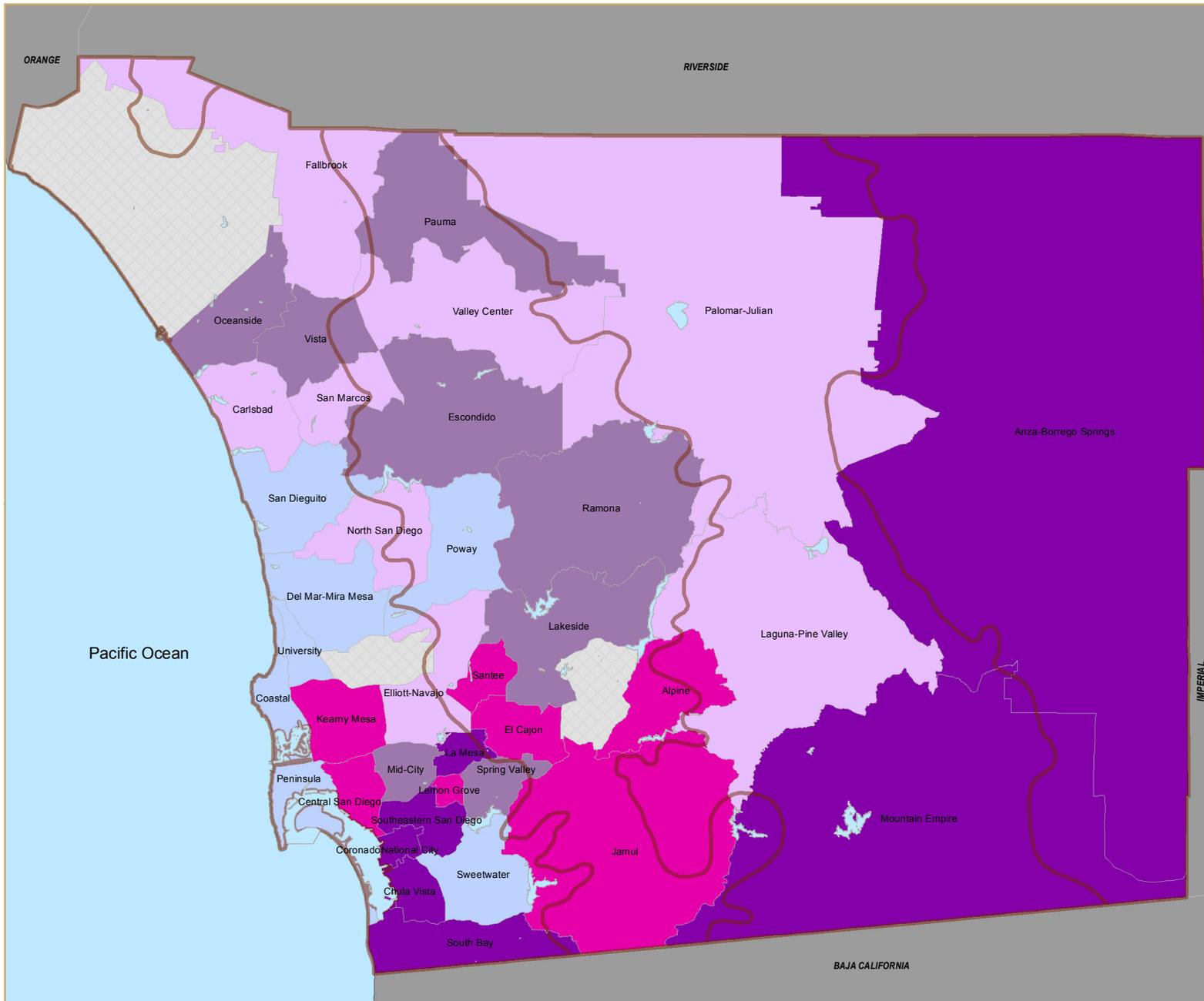


*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008 -2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.ncaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
 D_North_American_1983, Foot_US

**American Community Survey, 2005-9

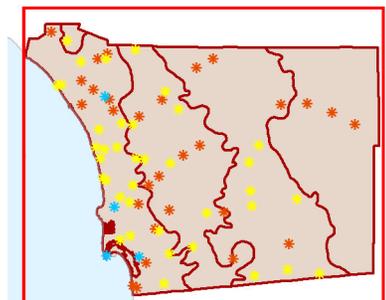
Composite Vulnerability to Heat-related Illness due to Chronic Diseases: COPD, CHD, Diabetes and Asthma



Composite Disease Vulnerability**
SRA, Quintile

- 1st, Lower risk
- 2nd
- 3rd
- 4th
- 5th, Higher risk
- Data not shown
- Climate Zone

Inset map:
Weather Station Hot Spots*
and Climate Zones



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Contact: Isabel Corcos or Leslie Ray,
County of San Diego Emergency Medical Services
619.285.6429

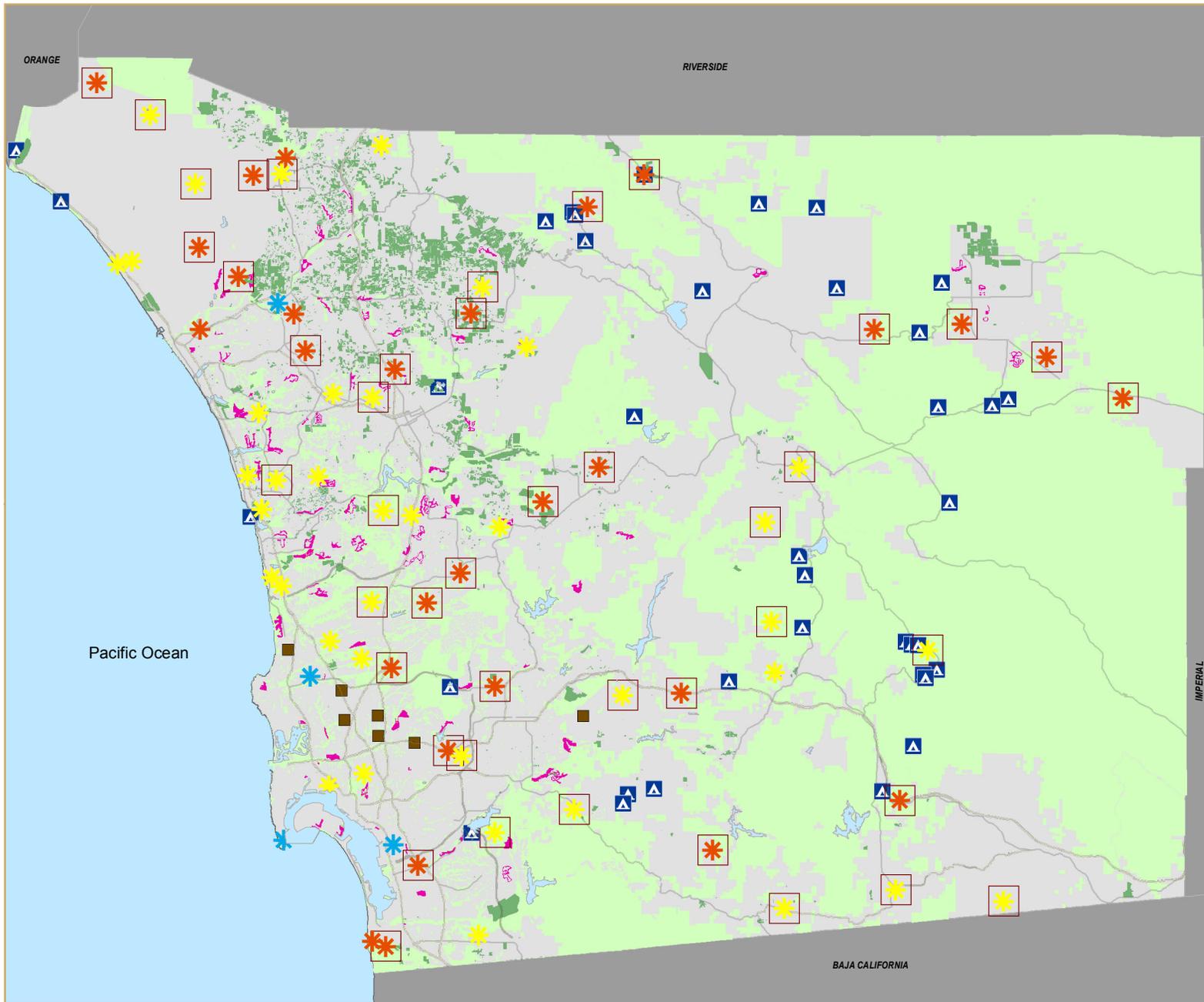


30 15 0 30
Miles

*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 -October 31, 2008-2010. Areas of sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.noaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US

** Composite chronic disease risk based on rates of hospitalization and emergency department (ED) discharge data for 2008. Rates for each disease medical encounter were ranked for 41 SRAs. Overall "chronic disease risk" was created by summing the ranks for each SRA. Source: County of San Diego, Community Health Statistics Unit, (http://www.sdcounty.ca.gov/hhsa/programs/phs/documents/CHS-33_SRADataSupplement9-2010.pdf).



Heat Vulnerability in San Diego County by Areas of Outdoor Activity

- Athletic Field
- Campgrounds
- Golf Course
- Park/Preserve/Open Space
- Agriculture

Weather Station Hot Spot*

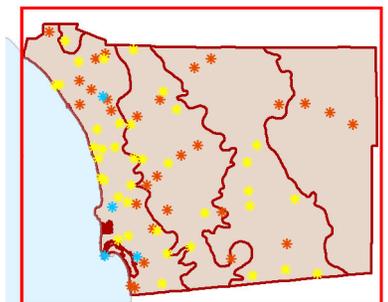
Temp (F)

- 80 - 89 Caution
- 90 - 104 Extreme Caution
- 105 - 120 Danger

Area of Sustained Heat*

- 90+F for 3 or more days

Inset map:
Weather Station Hot Spots*
and Climate Zones



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619.285.6429



*Weather Station Hot Spot: Highest temperature measured at selected weather stations in San Diego County. Data were collected daily June 1 - October 31, 2008-2010. Areas of Sustained Heat are those where weather stations reported temperatures, or heat index of 90 °F for 3 or more days. Source: NWS Mesowest, <http://www.wr.h.noaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

NAD_1983_StatePlane_California_VI_FIPS_0406_Feet,
D_North_American_1983, Foot_US

Data Guide

Area of Sustained Heat: These are areas where the temperature measured at the selected weather station was 90°F or higher for at least 3 consecutive days. Highest daily temperature measured at selected weather stations in San Diego County. Data were accessed from the NWS Mesowest website on most days from June 1 through October 31, over a three year interval, 2008-2010. These data are a convenience sample of temperature readings, and are shown to describe areas that may reach temperatures high enough to pose some risk to health. **Source:** County of San Diego, Emergency Medical Services, daily temperature data collected from NWS Mesowest, <http://www.wrh.noaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

Affordable housing; apartments and single room occupancy hotels (SROs). There are a variety of programs that offer assistance to individuals and families in need of lower cost housing. SRO hotels typically provide single room units with a bed, small refrigerator and a microwave. **Source:** Affordable housing: County of San Diego Dept. of Housing and Community Development, *Housing Resources Directory 2008-2010*.

Child care, infants

Child care centers, group homes, small family homes providing day care to infants and children (2010). **Source:** California Community Care Licensing Division, http://www.cclcd.ca.gov/docs/cclcd_search/cclcd_search.aspx

Chronic Disease Composite Rates:

The composite chronic disease risk maps were based on rates of hospitalization and emergency department (ED) discharge data for 2008. Rates for each disease and medical encounter (hospitalization or ED discharge) were ranked for 41 SRAs. An index of overall “chronic disease risk” was created by summing the ranks for each SRA. The relative ranking of each SRA by its composite score was mapped (by quintile) to show which SRAs had residents with the lowest to greatest vulnerability to heat-related illness due to chronic disease. **Source:** County of San Diego, Community Health Statistics Unit, (http://www.sdcountry.ca.gov/hhsa/programs/phs/documents/CHS-33_SRADDataSupplement9-2010.pdf).

Climate Zone: There are 5 climatic zones in San Diego County: maritime, coastal, transitional, interior, and desert. The maritime and coastal climate zones (combined for the purposes of this atlas) are mild due to close proximity to the Pacific Ocean, and have relatively cool summer and warm winters compared with other regions. Valleys and foothills are comprise much of the transitional and interior zones, with broad variation in summer temperatures, and much lower relative humidity the further the distance from the ocean. The desert zone is very hot and dry in summer, often with temperatures over 100F and relative humidity below 15%. **Source:** San Diego Geographic Information Source (SanGIS), http://www.sangis.org/Contact_Us.htm.

Population Demographics by census tract

Total Population

Total number of residents per area. **Source:** San Diego Association of Governments (SANDAG), 2010 estimates, extracted 01/31/11, <http://sandag.org/index.asp?fuseaction=home.home>.

Population age distribution, 2010 estimates

Total number of residents per area by age group. **Source:** San Diego Association of Governments (SANDAG), 2010 estimates, extracted 01/31/11, <http://sandag.org/index.asp?fuseaction=home.home>.

Median Income: Divides the income distribution into two equal parts; half of all persons have income above and below the median value. **Source:** San Diego Association of Governments (SANDAG), 2010 estimates, extracted 01/31/11, <http://sandag.org/index.asp?fuseaction=home.home>.

Income Percent of Poverty Level: The percentage of the Federal Poverty Level threshold that is met by the individual or family’s household income, according to family size and composition, 2000. **Source:** San Diego Association of Governments (SANDAG), 2010 estimates, extracted 01/31/11, <http://sandag.org/index.asp?fuseaction=home.home>.

Household with no vehicle.

Household where there is no private vehicle available for use. **Source:** U.S. Census Bureau, American Community Survey summary results, 2005-9, <http://www.census.gov/acs/www/>.

Single person household, by age group.

A household includes all the people who occupy a housing unit. (People not living in households are classified as living in group quarters.) A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. **Source:** U.S. Census Bureau, American Community Survey summary results, 2005-9, <http://www.census.gov/acs/www/>.

Residential care facility for the elderly

Adult residential care facilities (2010). **Source:** California Community Care Licensing Division, http://www.cclid.ca.gov/docs/cclid_search/cclid_search.aspx.

Weather Station Hot Spot: Highest daily temperature measured at selected weather stations in San Diego County. Data were accessed from the NWS Mesowest website on most days from June 1 through October 31, over a three year interval, 2008-2010. These data are a convenience sample of temperature readings, and are shown to describe areas that may reach temperatures high enough to pose some risk to health. **Source:** County of San Diego, Emergency Medical Services, daily temperature data collected from NWS Mesowest, <http://www.wrh.noaa.gov/mesowest/mwmap.php?map=sgx&limit=1&list=1>.

For more information contact:

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Leslie Upledger Ray, Senior Epidemiologist

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http://www.sdcounty.ca.gov/hhsa/programs/phs/emergency_medical_services/

San Diego County Board of Supervisors



Greg Cox
District One



Dianne Jacob
District Two



Pam Slater-Price
District Three



Ron Roberts
District Four



Bill Horn
District Five

Chief Administrative Officer
Walter F. Ekard

Assistant Chief Administrative Officer
Helen Robbins-Meyer

General Managers

David Estrella General Manager Community Services Group	Don Steuer Chief Financial Officer/General Manager Finance & General Government Group	Nick Macchione Agency Director Health and Human Services Agency	Sarah E. Aghassi General Manager Land Use & Environment Group	Ron Lane General Manager Public Safety Group
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