State Water Resources Control Board

~~DRAFT~~

Cannabis Cultivation Policy

Staff Report

Appendix 1
Regional Descriptions

~~July 7~~October 17, 2017

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1.0 ~~PRIORITY REGION~~REGIONAL DESCRIPTIONS

This appendix to the Cannabis Cultivation Policy (Policy) Staff Report provides an overview of the ~~nine priority~~14 regions for which instream flow Requirements and associated gage implementation plans have been developed. ~~The nine priority regions are: Klamath, North Coast, North Central Coast, Upper Sacramento, Middle Sacramento, South Sacramento, San Joaquin, South Central Coast, and South Coast. Maps and figures for each priority~~Maps and figures for each region are located at the end of each regional description and include maps of the regional areas, elevation, climate, precipitation, hydrologic classifications, and anadromous fish distribution, and graphs of monthly average temperature and precipitation patterns.

For the purposes of the Policy, the term special-status refers to species or distinct populations that are federally listed as threatened or endangered, listed as threatened or endangered by the state of California, listed as a species of concern by the National Marine Fisheries Service (NMFS), or listed as species of special concern by the California Department of Fish and Wildlife (CDFW)[1]. The presence of special-status anadromous salmonid populations within the nine cannabis policy regions was determined based on anadromous salmonid population distribution information obtained from the University of California, Davis (UC Davis) PISCES database, a compilation of data describing California's native fishes (Santos et al. 2014).

1.1 Klamath Region

The Klamath Region covers approximately 10,897 square miles in northern California and southern Oregon (Figure A-1). Elevations in this region range from sea level to over 7,500 feet in the Klamath Mountains and Trinity Alps, and over 14,000 feet at the peak of Mount Shasta (Figure A-2). The region includes the major watersheds of the Smith River, as well as the Klamath River and its main tributaries, the Trinity, Salmon, Scott, and Shasta Rivers. Although the Klamath Region spans portions of northern California and southern Oregon, only the portion of the Klamath Region located in California will be subject to this cannabis policy.

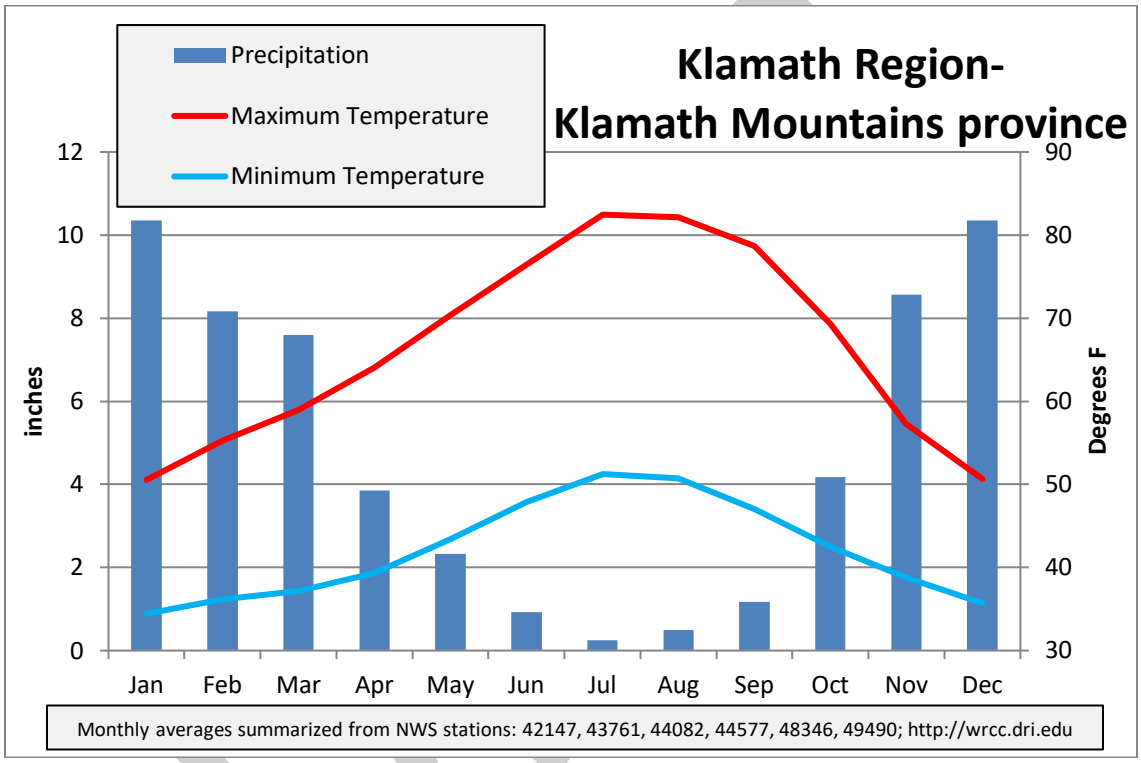
1.1.1 Climate and Precipitation

The climate of the Klamath Region varies according to the two major terrain types: mountains and plateau. The western portion of the Klamath Region is generally characterized by a Mediterranean climate, and the eastern portion of the Klamath Region is generally characterized by a Cool Interior climate (Figure A-3). The western portion of the Klamath Mountains are characterized by a Mediterranean climate with cool summers, coastal areas and the lower Smith River watershed are characterized by a Mediterranean climate with summer coastal fog, and the upper Trinity River watershed is characterized by a Mediterranean climate with hot summers. The Modoc Plateau geomorphic province and the mountain ranges flanking the Scott River watershed are characterized by cool continental climates with dry summers.
Temperatures patterns vary within the Klamath Region, and inland areas tend to exhibit more significant temperature extremes compared to coastal areas. The lower Klamath and Trinity River watersheds exhibit average annual maximum temperatures above 75 degrees Fahrenheit, while the Modoc Plateau and coastal areas in this region remain cooler, with average annual maximum temperatures of 60 degrees Fahrenheit in most locations, or 40 degrees Fahrenheit at high elevations. Average annual minimum temperatures near the Klamath Region coast and in low lying areas are tempered by the ocean influence and remain above freezing, while

[1] No California salmonids were federally proposed for listing as threatened or endangered or designated as a State Candidate for threatened or endangered listing by the state of California at the time of the preparation of this report (CDFW 2017b).

average annual minimum temperatures further inland and at high elevations drop below freezing.

Precipitation patterns also vary within the Klamath Region, and the Klamath Mountains tend to receive a much larger amount of precipitation annually compared to the Modoc Plateau. The Klamath Mountains tend to receive an average of over 120 inches of precipitation annually, while the Modoc Plateau tends to receive an average of less than 15 inches of precipitation annually (Figure A-4). The Modoc Plateau receives a significant portion of precipitation as snowfall, and snow also falls in high elevation areas in the central Klamath Mountains. Precipitation generally falls in the Klamath Mountains from October to May, and peaks in December and January (Chart A-1). Precipitation generally falls in the Modoc Plateau from November to March (Chart A-2). (WRCC 2016)



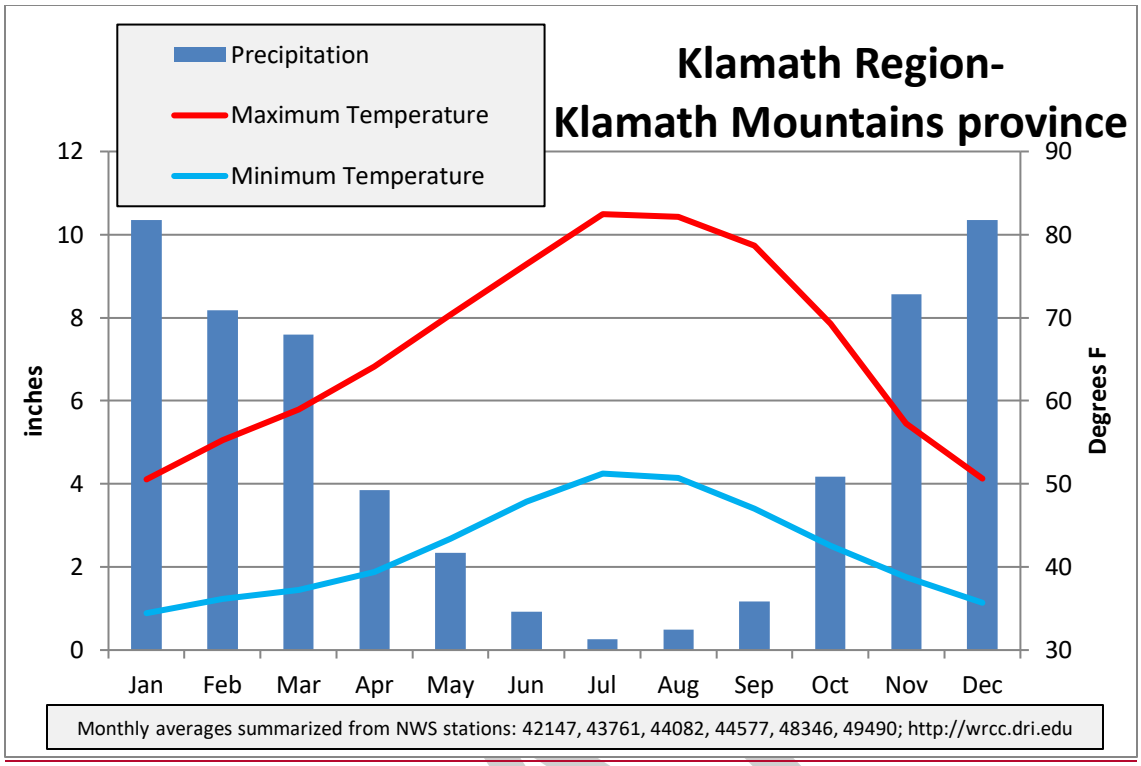
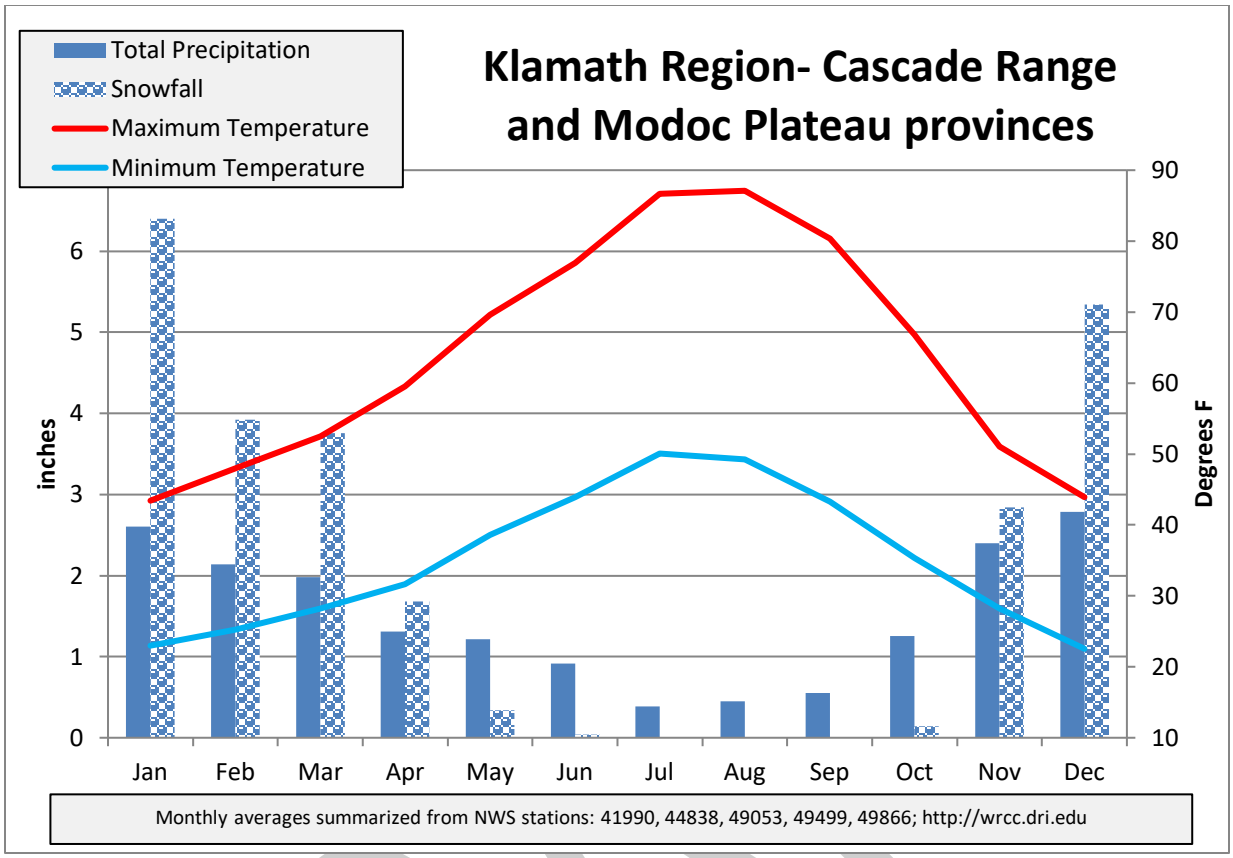


Chart A-1. Average annual patterns of temperature and precipitation in the Klamath Region, Klamath Mountains province.


Klamath Region- Cascade Range and Modoc Plateau provinces
Total Precipitation
Snowfall
Maximum Temperature
Minimum Temperature
inches
Degrees F
0
1
2
3
4
5
6
10
20
30
40
50
60
70
80
90
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Monthly averages summarized from NWS stations: 41990, 44838, 49053, 49499, 49866; http://wrcc.dri.edu

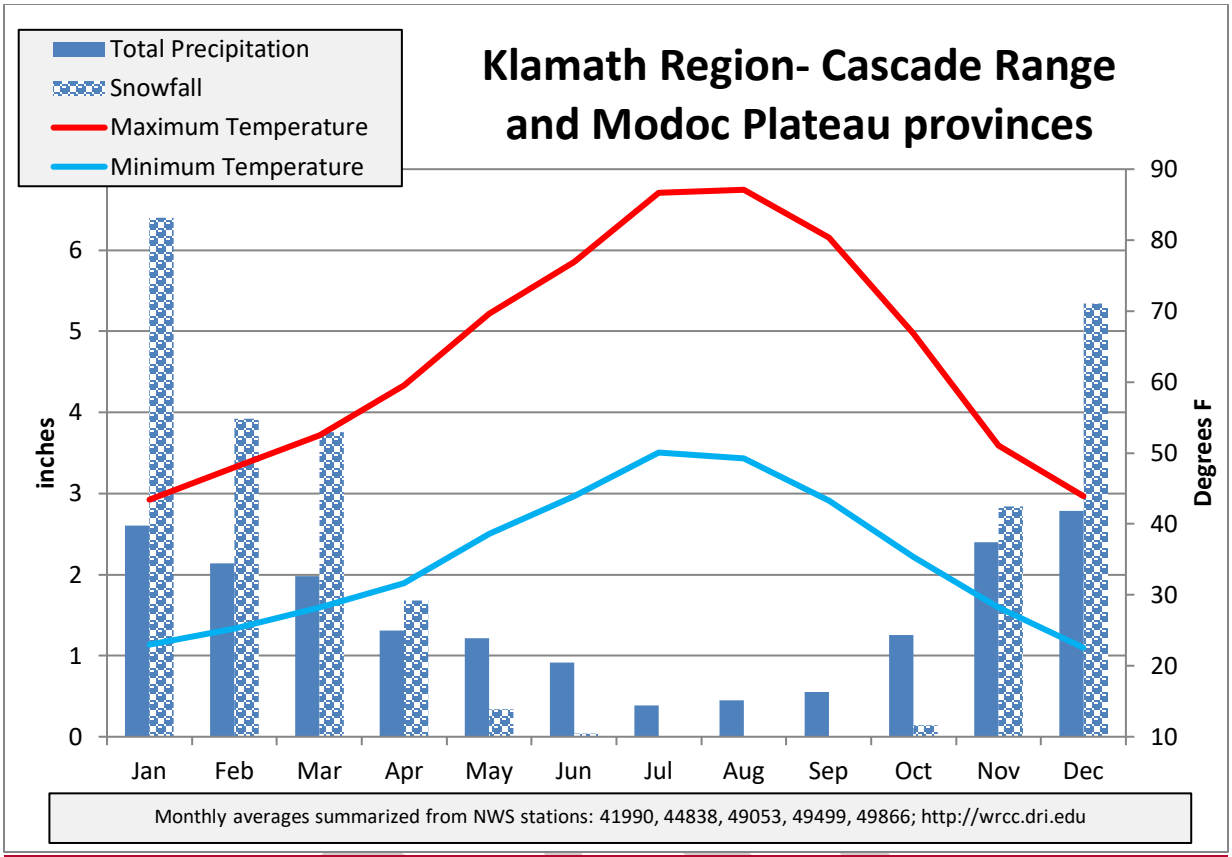


Chart A-2. Average annual patterns of temperature and precipitation in the Klamath Region, Cascade Range and Modoc Plateau provinces.

1.1.2 Hydrology

The hydrology of Klamath Region streams varies greatly from west to east, and several UC Davis hydrologic classifications exist for stream reaches in this region (Lane et al 2016). Many stream reaches located near the coast, within the Smith and lower Klamath River watersheds, are primarily classified as Winter Storm (WS) systems. Further inland, most tributaries to the Klamath River are classified as Low-Volume Snowmelt and Rain (LSR) systems. The mainstem Trinity River, located in the southern portion of the Klamath Region, is classified as High-Volume Snowmelt and Rain (HSR) system, and some tributaries in the Trinity River watersheds are classified as Perennial Groundwater and Rain (PGR) systems. Most stream reaches on the Modoc Plateau are classified as High Elevation and Low Precipitation (HELP) systems; however, Modoc Plateau streams generally exhibit low stream densities due to the Modoc Plateau's underlying porous volcanic geology.

Please refer to ~~(~~Figure A-5~~)~~ for a stream classification map of the Klamath Region.

1.1.3 Geology

The Klamath Region is predominantly located in the Klamath Mountains, Cascade Range, and Modoc Plateau geomorphic provinces. The Klamath Mountains and Cascade Range are rugged mountain ranges, and the Modoc Plateau is an elevated volcanic plateau located in the northeastern corner of California. The western portion of the Klamath Mountains are underlain by marine sedimentary units with areas of igneous intrusive units, the central Klamath

Mountains are underlain primarily by metamorphosed sedimentary and volcanic rock, and the upper Trinity, Scott and Salmon watersheds are underlain by intrusive igneous rock. The portion of the Cascade Range located in the Klamath Region contains the stratovolcano Mount Shasta. The Cascade Range is generally underlain by igneous rock, including lava flows, pyroclastic flows, and alluvium eroded from volcanic features. The Modoc Plateau is a volcanic table land consisting of lava flows, tuff beds and small volcanic cones. Significant subterranean streamflows occur through porous volcanic features in the Modoc Plateau (CGS 2002).

1.1.4 ~~Anadramous~~Anadromous Salmonid Population

Five special-status evolutionarily significant units (ESUs), distinct population segments (DPSes), or distinct taxonomic entities[2] (DTEs) are currently extant within the Klamath Region (Figure A-6):

- the Southern Oregon/Northern California Coastal (SONCC) Chinook salmon ESU,
- the Upper Klamath-Trinity fall-run (UKTR FR) Chinook salmon DTE[3],
- the Upper Klamath-Trinity spring-run (UKTR SR) Chinook salmon DTE,
- the Klamath Mountains Province (KMP) steelhead DPS, and
- the Southern Oregon/Northern California Coast (SONCC) coho salmon ESU.

The SONCC coho salmon ESU is currently listed as threatened under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) (CDFW 2017b). The SONCC Chinook salmon, UKTR FR Chinook salmon, UKTR SR Chinook salmon, and the KMP steelhead populations are listed as species of special concern by CDFW (Moyle et al. 2015).

[2] The term Distinct Taxonomic Entity (DTE) is applied in this document in reference to salmonid populations given consideration by CDFW as distinct, or separate, taxa, but that are not currently designated as individual ESUs or DPSes by NMFS.

[3] UKTR FR and UKTR SR Chinook salmon together constitute a single ESU; however, CDFW treats the two runs as distinct taxonomic entities based upon their distinct life-history strategies and in consideration of the unique management concerns of each run (Moyle et al. 2015).

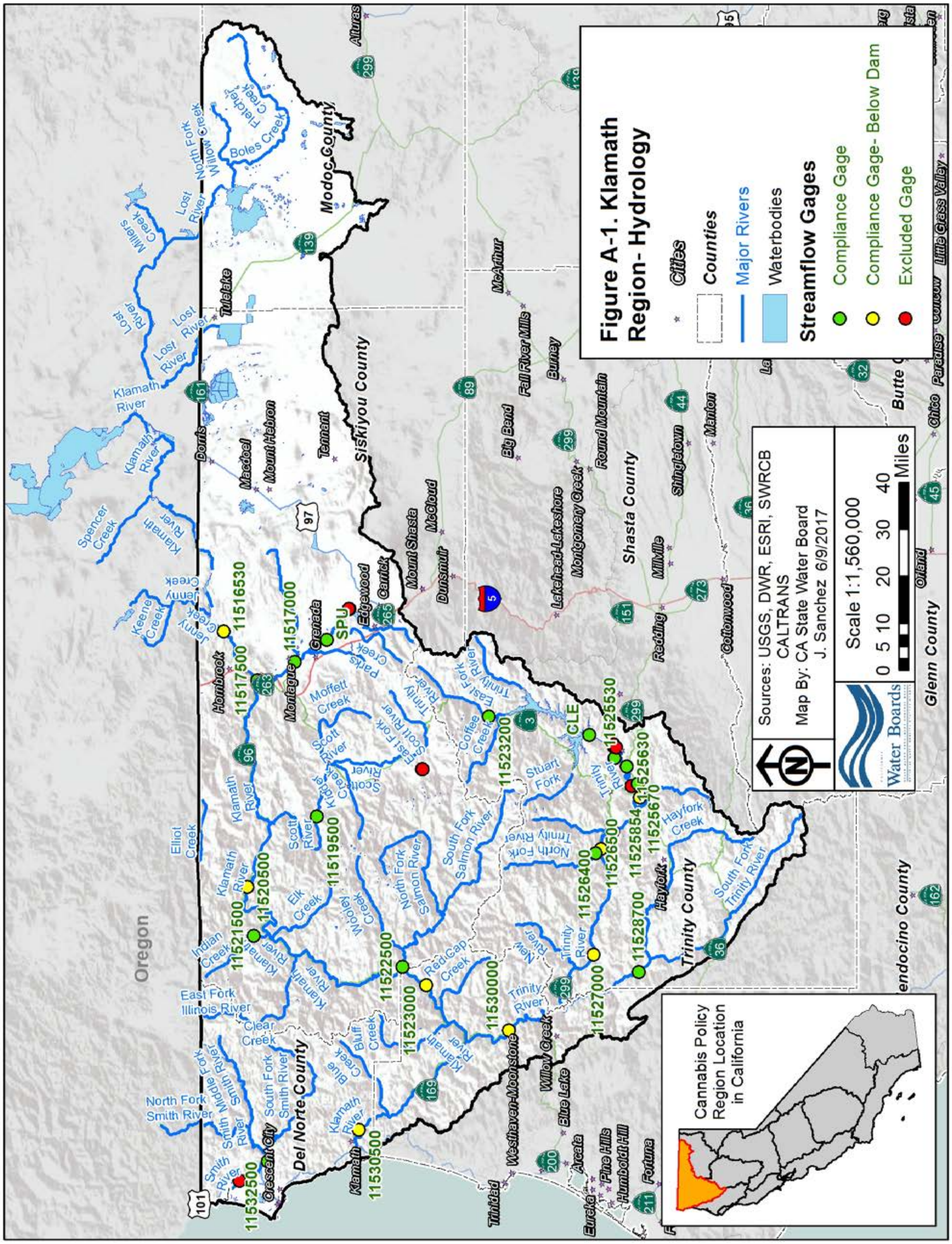


Figure A-1. Klamath Region- Hydrology
Cities
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,560,000
0 5 10 20 30 40 Miles
Cannabis Policy Region Location in California
Oregon
Siskiyou County
Modoc County
Del Norte County
Trinity County
Shasta County
Glenn County
Mendocino County
Klamath River
Lost River
Trinity River
Scott River
Salmon River
Smith River
11516530
11517000
11517500
11519500
11520500
11521500
11522500
11523000
11523200
11525530
11525630
11525670
11525854
11526400
11526500
11527000
11528700
11530000
11530500
11532500
SPU
CLE

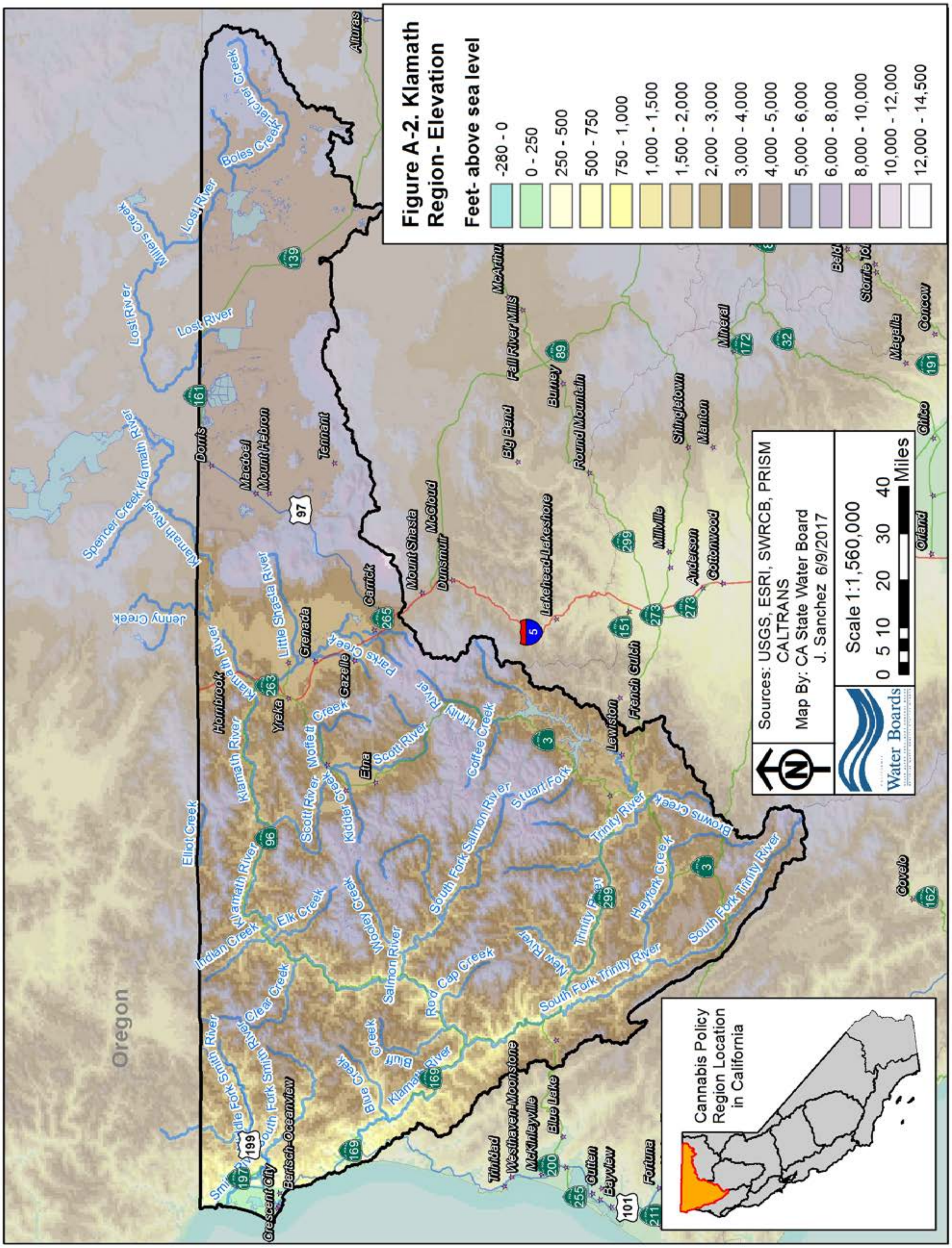


Figure A-2. Klamath Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,560,000
0 5 10 20 30 40 Miles
Water Boards
Cannabis Policy Region Location in California
Oregon

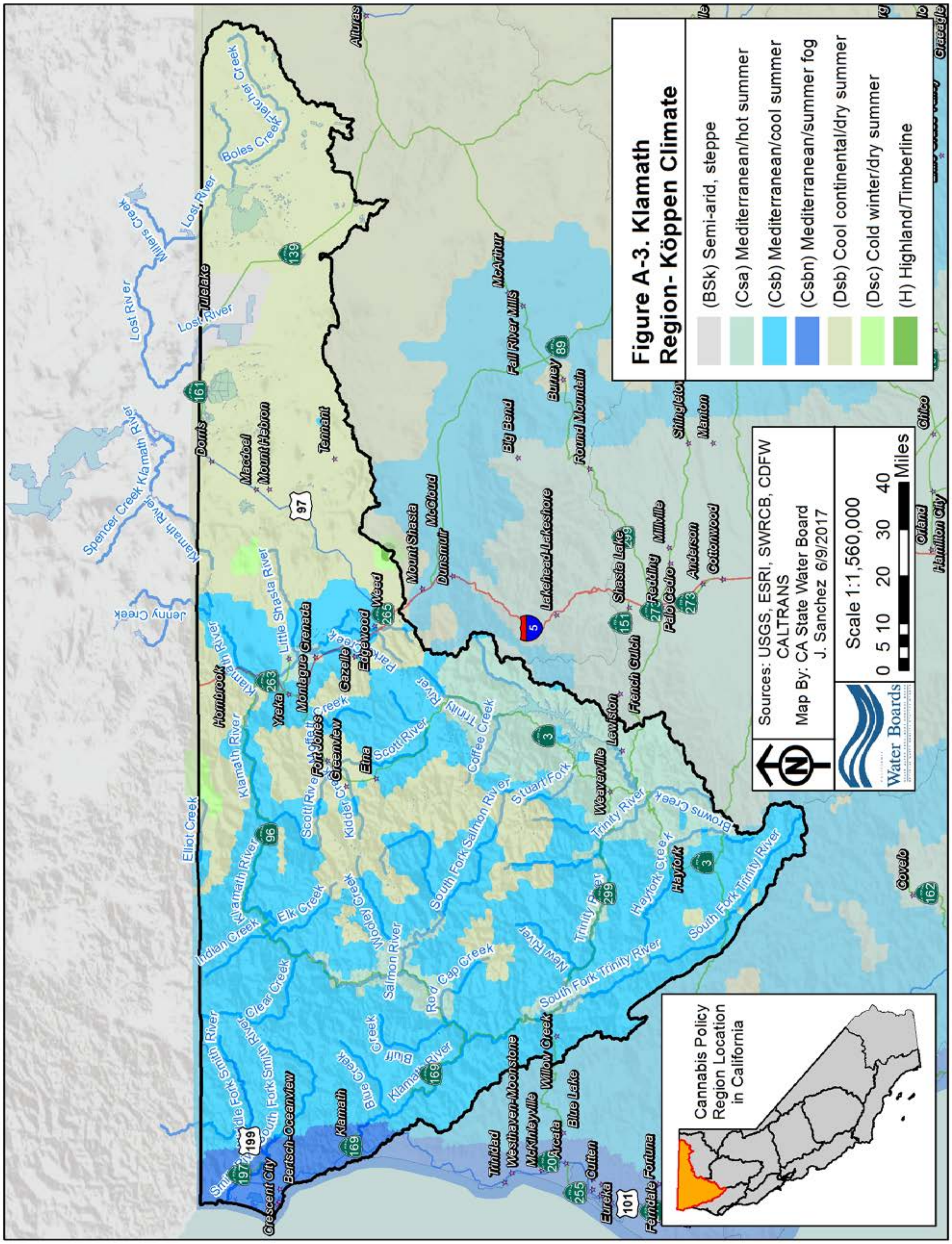


Figure A-3. Klamath Region- Köppen Climate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Sources: USGS, ESRI, SWRCB, CDFW
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,560,000
0 5 10 20 30 40 Miles
Cannabis Policy
Region Location
in California
Water Boards

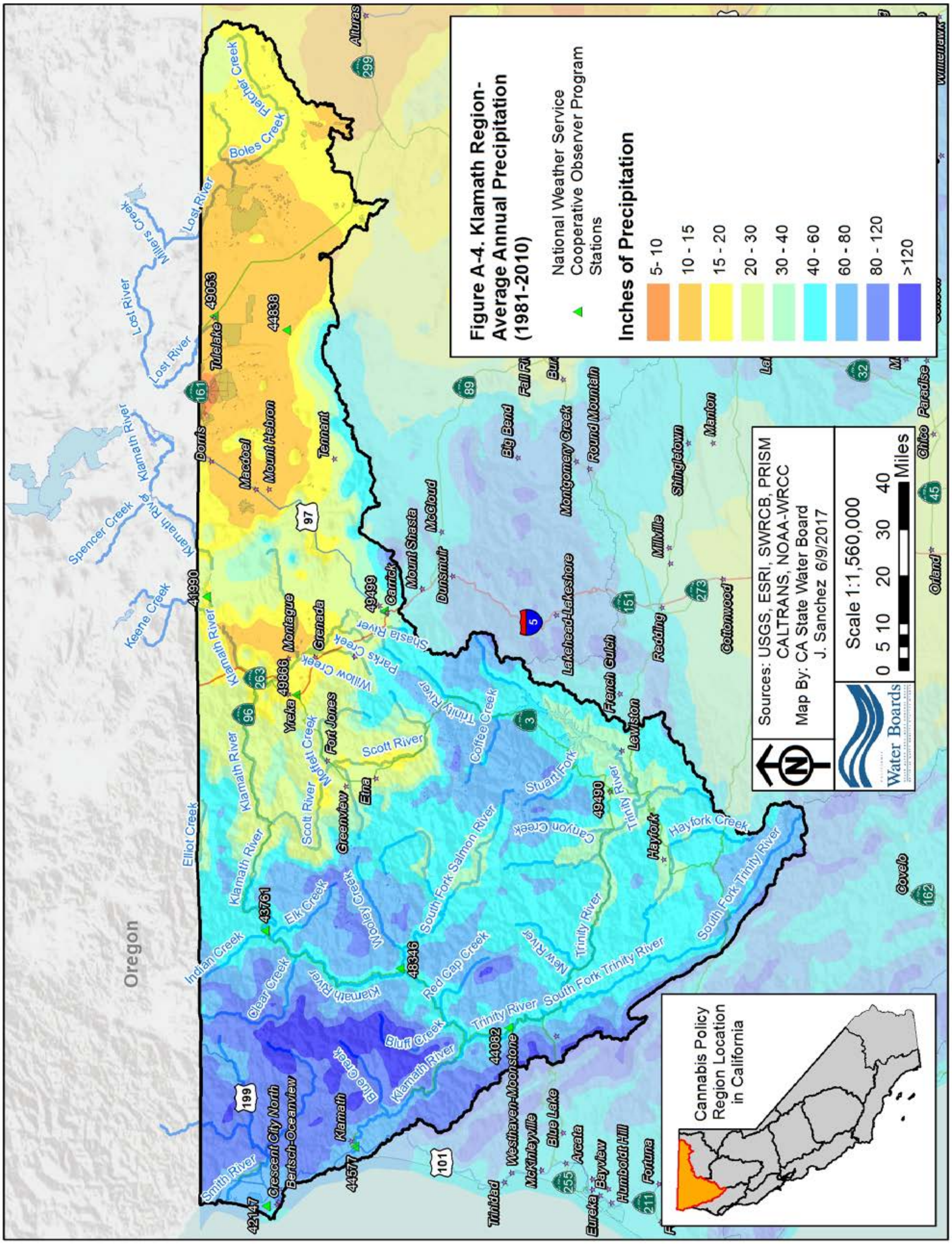


Figure A-4. Klamath Region-Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
5-10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,560,000
0 5 10 20 30 40 Miles
Cannabis Policy Region Location in California
Oregon
Water Boards

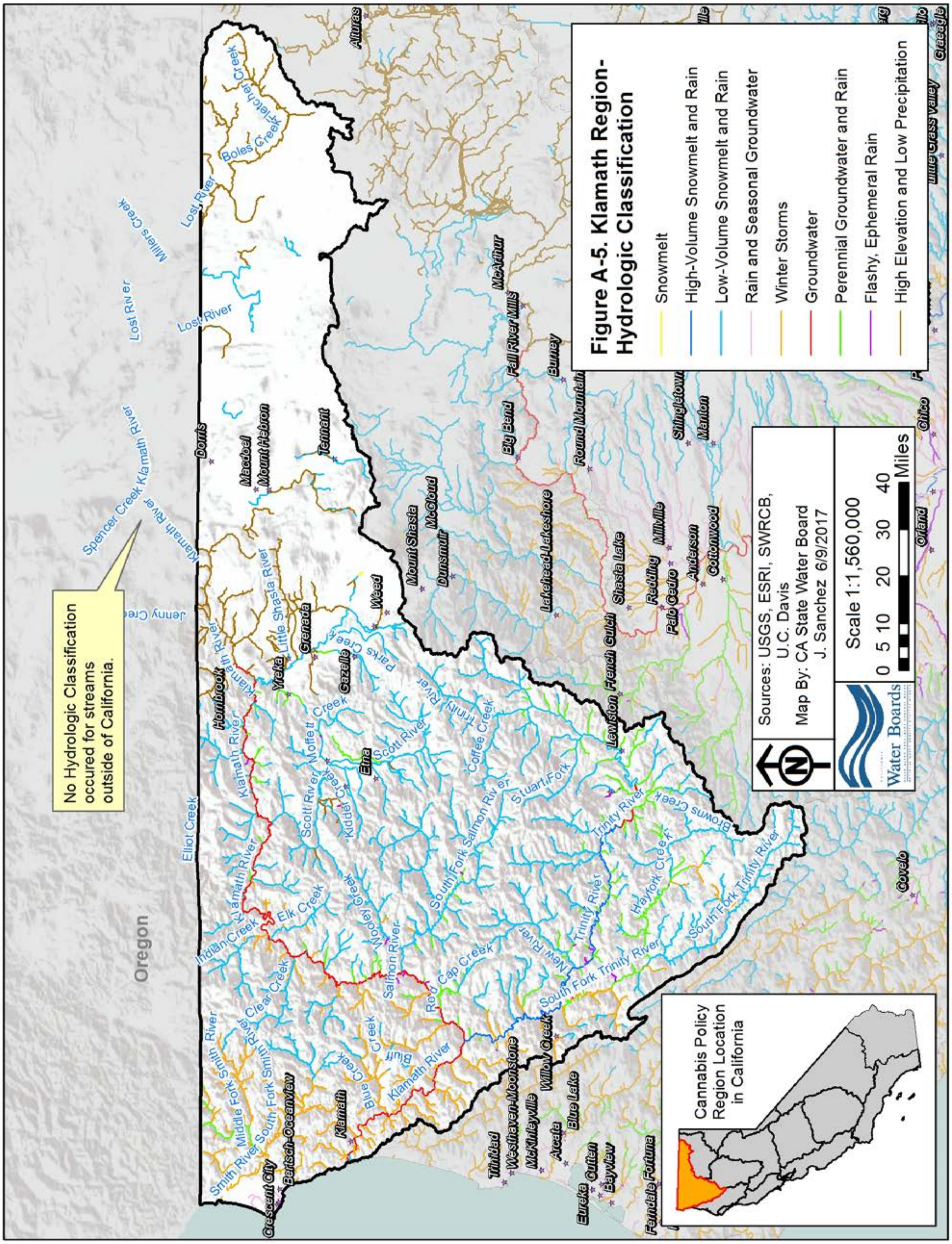


Figure A-5. Klamath Region-
Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Sources: USGS, ESRI, SWRCB,
U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,560,000
0 5 10 20 30 40
Miles
Water Boards
No Hydrologic Classification
occured for streams
outside of California.
Cannabis Policy
Region Location
in California
Oregon

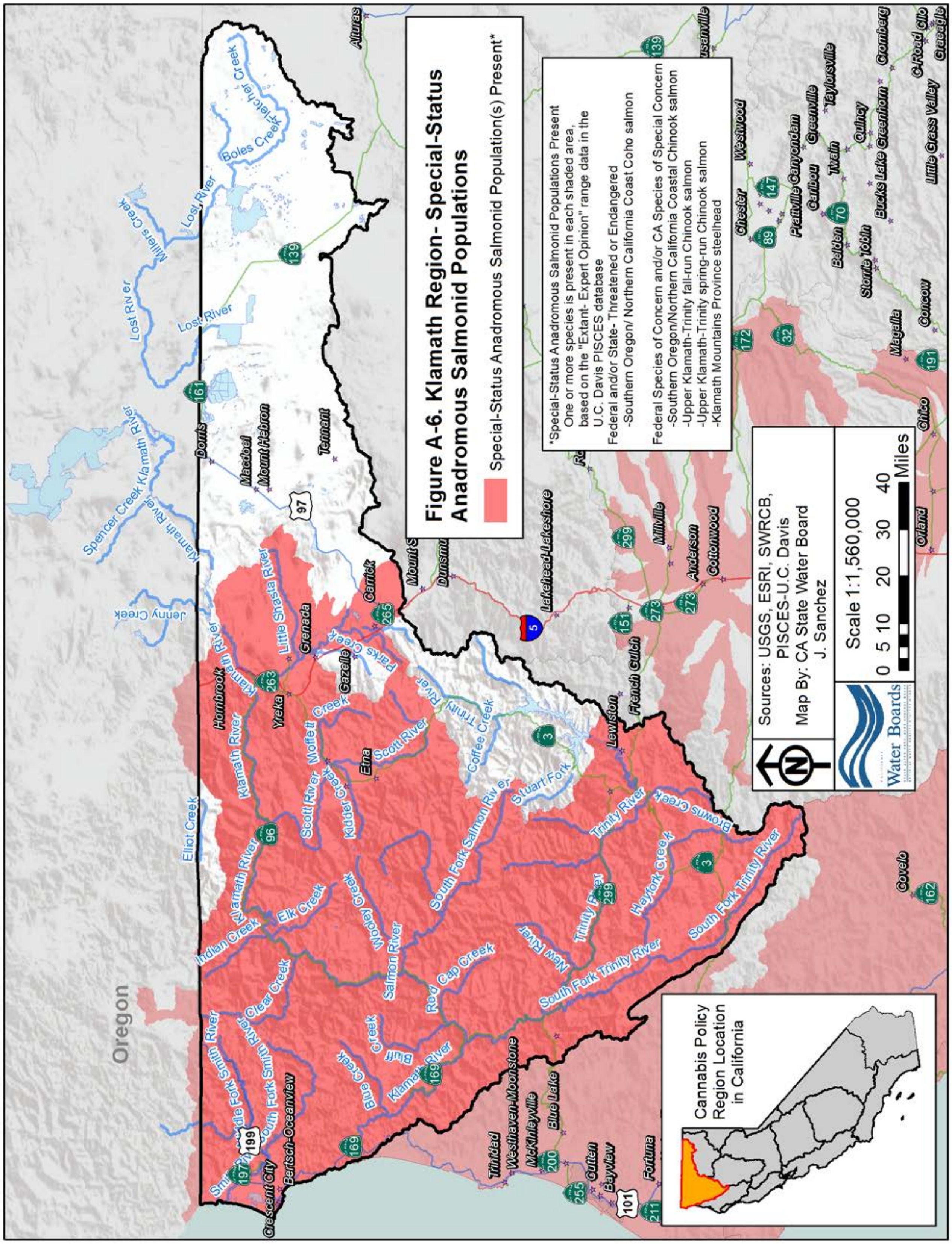


Figure A-6. Klamath Region- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area, based on the "Extant- Expert Opinion" range data in the U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Southern Oregon/ Northern California Coast Coho salmon
Federal Species of Concern and/or CA Species of Special Concern
-Southern Oregon/Northern California Coastal Chinook salmon
-Upper Klamath-Trinity fall-run Chinook salmon
-Upper Klamath-Trinity spring-run Chinook salmon
-Klamath Mountains Province steelhead
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board J. Sanchez
Scale 1:1,560,000
0 5 10 20 30 40 Miles
Water Boards
Cannabis Policy Region Location in California
Oregon
Klamath River
Trinity River
South Fork Trinity River
Salmon River
Scott River
Shasta River
Lost River
Crescent City
Yreka
Weaverville
Eureka

1.2 Upper Sacramento Region

The Upper Sacramento Region covers approximately 6,956 square miles in north-central California, as shown in attached (Figure A-7). Elevations in the region range from 1,000 feet near Lake Shasta, to over 6,000 feet in the mountains bordering the Modoc Plateau. The elevation of Mount Lassen, located on a southern boundary of the region, exceeds 10,400 feet, while the peak of Mount Shasta, located on a northern boundary of the region, reaches over 14,000 feet. Please refer to ~~(~~Figure A-8~~)~~ for an elevation map of the Upper Sacramento Region. The major watershed comprising the region is the Sacramento River and its significant tributaries of the Upper Sacramento, McCloud and Pit Rivers.

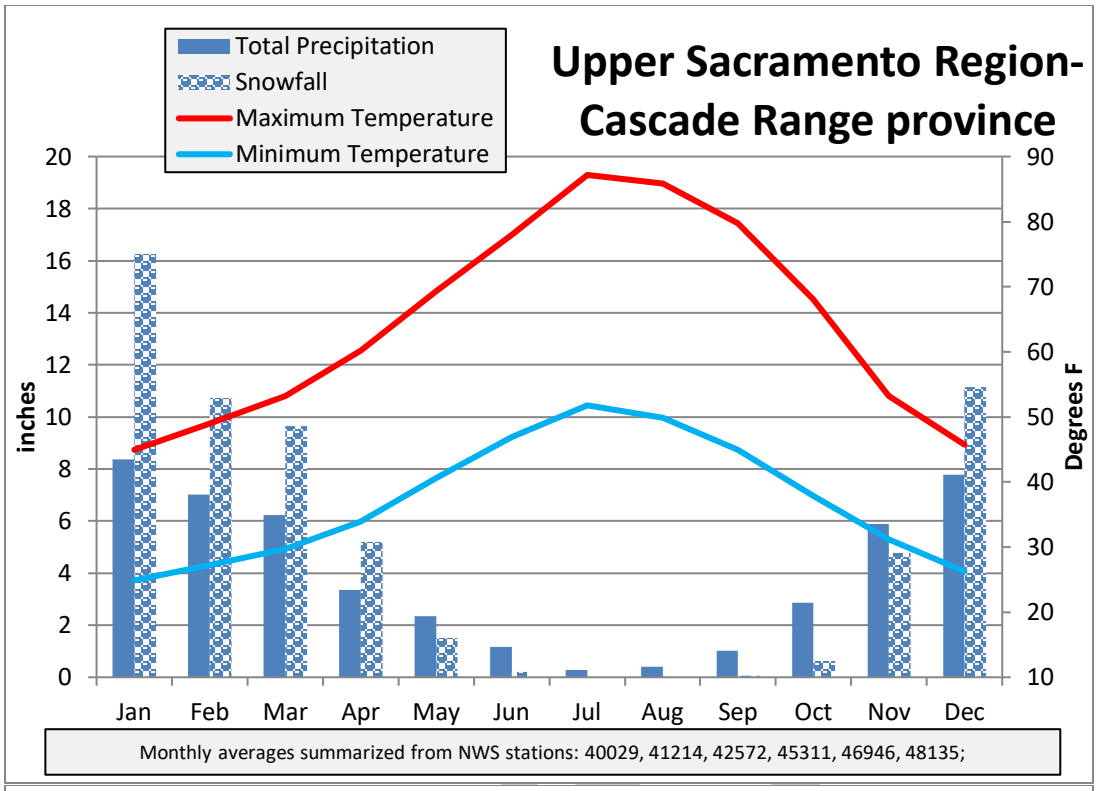
1.2.1 Climate and Precipitation

The climate of the Upper Sacramento Region varies substantially between the western and eastern portions of the region. The western portion of the Upper Sacramento Region, located in the Cascade Range geomorphic province, is characterized by a Mediterranean climate, while the eastern portion of the region, located in the Modoc Plateau geomorphic province, is characterized by a Cool Interior climate. The areas surrounding Shasta Lake and the lower tributary canyons are characterized by Mediterranean climates with hot summers. Between Mount Shasta and the town of Burney, the Cascade Range transitions to the Modoc Plateau, and the climate in this transitional area is characterized as Mediterranean with cool summers. The Modoc Plateau geomorphic province is characterized by a Cool Interior climate; specifically, cool, continental climate with dry summers. Please refer to ~~(FigureA~~Figure A-9~~)~~ for a climatic map of the Upper Sacramento Region.

Temperature conditions also vary greatly from southwest to northeast within the Upper Sacramento Region. Temperatures tend to be higher in the Cascade Range, located in the western portion of the Upper Sacramento Region, compared to the Modoc Plateau, located in the eastern portion of the region. Average annual maximum temperatures near Shasta Lake, in the southwestern portion of the Upper Sacramento Region, exceed 70 degrees Fahrenheit. To contrast, average annual maximum temperatures on the Modoc Plateau exceed 60 degrees Fahrenheit and high elevation temperatures exceed 50 degrees Fahrenheit. Average annual minimum temperatures near Lake Shasta typically fall below 50 degrees Fahrenheit, while average annual minimum temperatures on the Modoc Plateau and at high elevations are typically below freezing.

Average annual precipitation amounts and snowfall patterns also vary greatly from west to east within the Upper Sacramento Region. The western portion of the Upper Sacramento Region tends to receive higher precipitation amounts than the eastern portion of the Upper Sacramento Region; nearly 120 inches of annual precipitation tends to fall around Mount Lassen and Mount Shasta in the central portion of the region, while under 15 inches of annual precipitation tends to fall on the Modoc Plateau. The Cascade Range typically receives moderate amounts snowfall during the winter months, extreme amounts of snowfall tend to occur further east and near Mount Lassen, and the Modoc Plateau typically receives a moderate amount of snowfall. Precipitation events generally occur from November to April in both the Cascade Range and Modoc Plateau provinces.

Please refer to ~~(~~Figure A-10~~)~~ for a precipitation map of the Upper Sacramento Region. Charts A-3 and A-4 below, illustrate precipitation and temperature patterns in the Upper Sacramento Region for the Cascade Range geomorphic province and for the Modoc Plateau geomorphic province, and illustrate the key differences in precipitation and temperature conditions between the two regions.



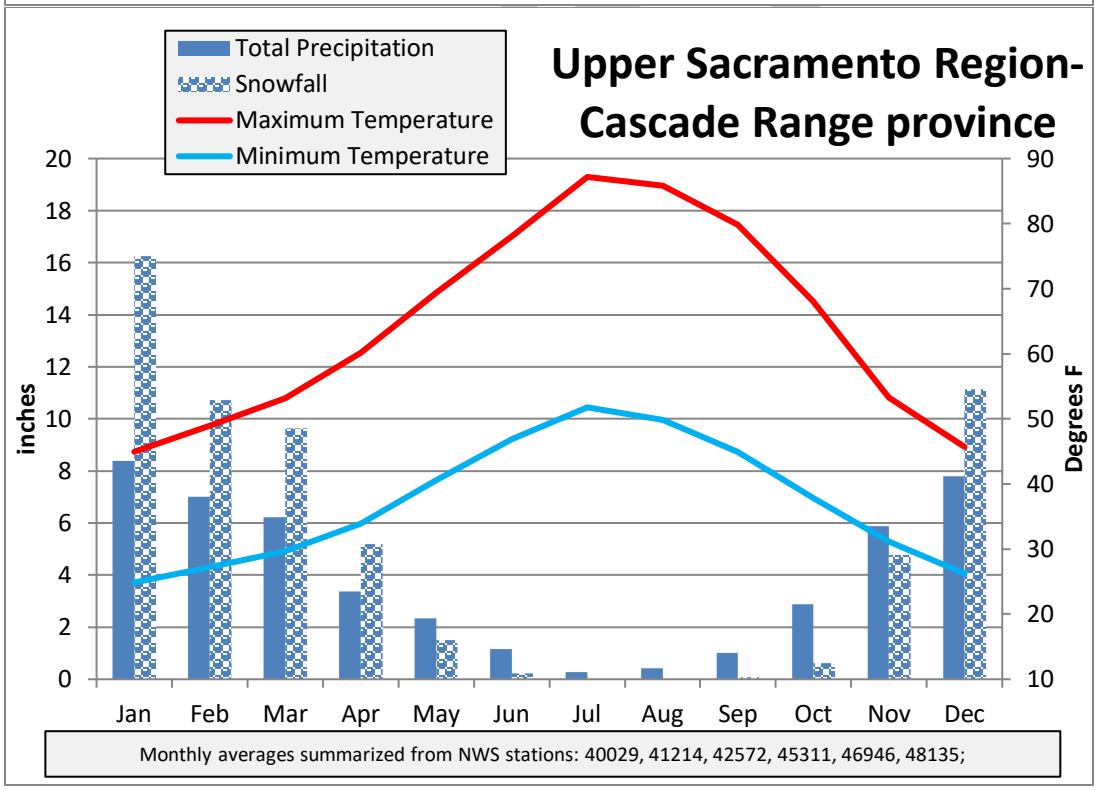
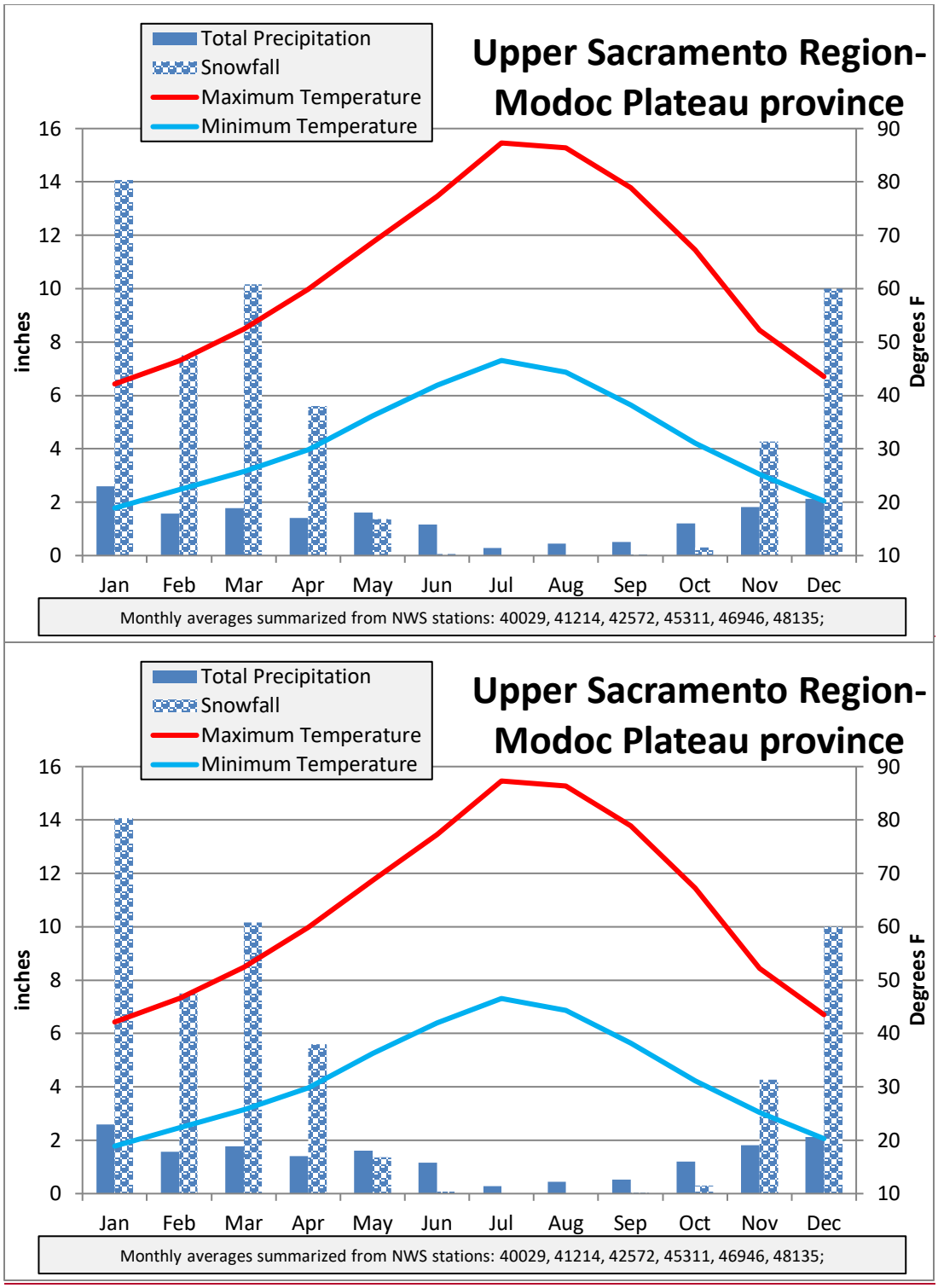

Total Precipitation
Snowfall
Maximum Temperature
Minimum Temperature
Upper Sacramento Region-
Cascade Range province
inches
Degrees F
Monthly averages summarized from NWS stations: 40029, 41214, 42572, 45311, 46946, 48135;

Chart A-3. Average annual patterns of temperature and precipitation in the Upper Sacramento Region, Cascade Range province.



Total Precipitation
Snowfall
Maximum Temperature
Minimum Temperature
Upper Sacramento Region-
Modoc Plateau province
inches
Degrees F
Monthly averages summarized from NWS stations: 40029, 41214, 42572, 45311, 46946, 48135;

Chart A-4. Average annual patterns of temperature and precipitation in the Upper Sacramento Region, Modoc Plateau province.

1.2.2 Hydrology

The hydrology of stream reaches in the Upper Sacramento Region varies from west to east, and stream reaches in this region are described by several UC Davis hydrologic classifications. Stream reaches in the Cascade Range geomorphic province are generally categorized by

Winter Storms (WS) and Low-Volume Snowmelt and Rain (LSR) hydrologic classifications. Small tributaries surrounding Shasta Lake, in the southwest portion of the Upper Sacramento Region, are primarily classified as WS systems. The Upper Sacramento and McCloud River watersheds, located in the Cascade Range geomorphic province, primarily contain stream reaches that are classified as LSR systems. Most stream reaches on the Modoc Plateau, including tributaries in the middle and upper Pit River watershed, are classified as High Elevation and Low Precipitation (HELP) stream reaches. The mainstem Pit River below Lake Briton is classified as a Groundwater (GW) system. Please refer to ~~(~~Figure A-11~~)~~ for a depiction of the stream classifications within the Upper Sacramento Region. (Lane et al 2016)

1.2.3 Geology

The Upper Sacramento Region is primarily underlain by the Cascade Range geomorphic province in the western portion of the region, and by the Modoc Plateau geomorphic province in the eastern portion of the region. Very small areas of the Klamath Mountains and the Basin and Range geomorphic provinces are located at the western and eastern margins of the Upper Sacramento Region, respectively. (CGS 2002).

Volcanic geology dominates the Upper Sacramento Region. The Cascade Range geomorphic province is characterized by extrusive volcanic activity, and the active volcano Mount Lassen and the potentially active Mount Shasta are located on the boundaries of the Upper Sacramento Region. The Cascade Range is generally underlain by igneous rock, including lava flows, pyroclastic flows and alluvium eroded from volcanic features. The Modoc Plateau is a volcanic table land underlain by lava flows, tuff beds and small volcanic cones. Significant subterranean streamflows occur through porous volcanic features of the Modoc Plateau. (CGS 2002)

1.2.4 Anadromous Salmonid Population

No anadromous salmonid populations are currently extant within the Upper Sacramento Region. Keswick Dam, located on the mainstem Sacramento River near Redding, currently blocks upstream migration into the Upper Sacramento Region. Historically, populations of Sacramento River Winter Run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-run Chinook salmon, Central Valley late fall-run Chinook salmon, and California Central Valley steelhead inhabited the Upper Sacramento Region.

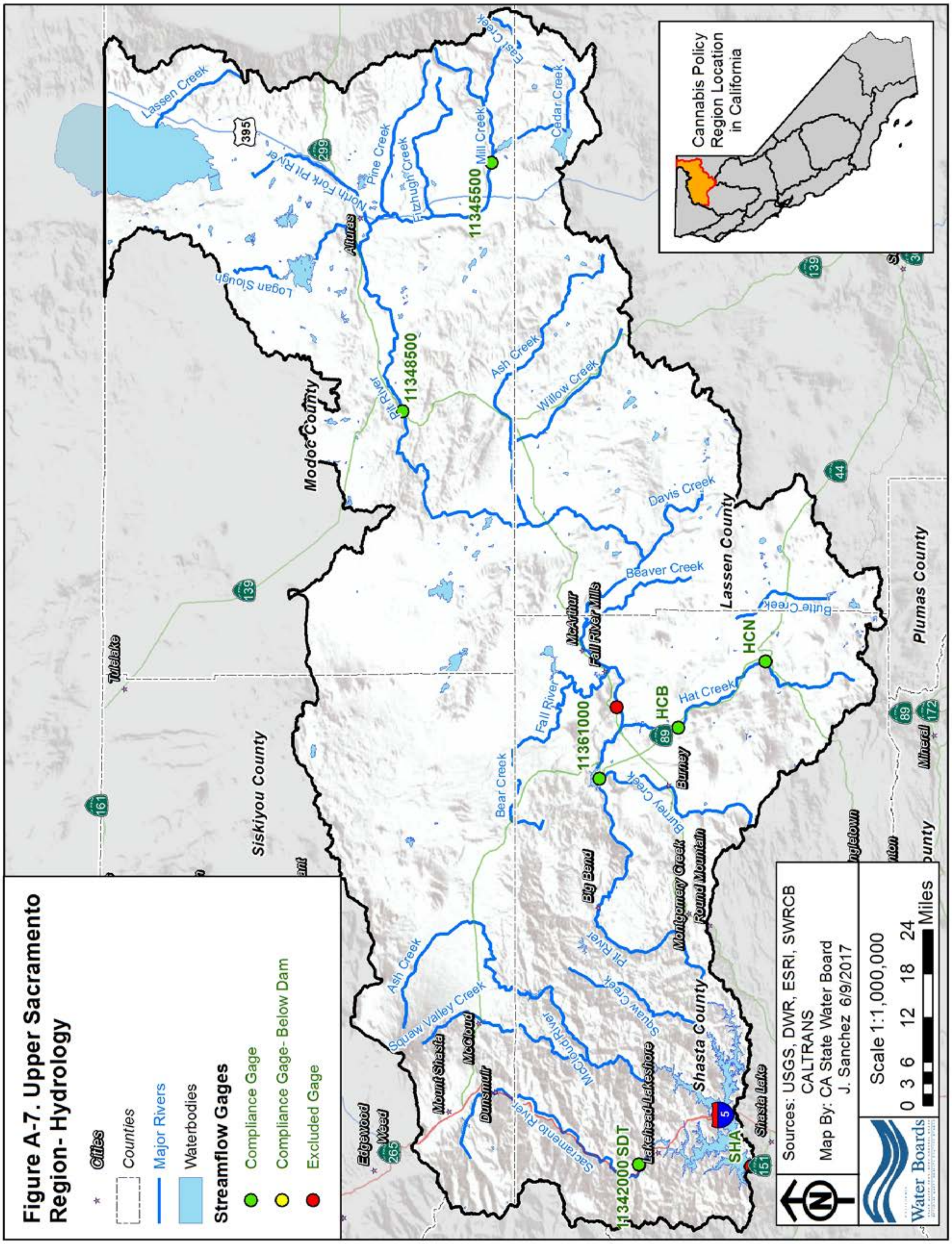


Figure A-7. Upper Sacramento Region- Hydrology
Cities
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24 Miles
Cannabis Policy Region Location in California
Modoc County
Siskiyou County
Lassen County
Shasta County
Plumas County
11345500
11348500
11361000
11342000
SDT
SHA
HCB
HCN
Pit River
Sacramento River
McCloud River
Hat Creek
Fall River
Burney Creek
Squaw Creek
Squaw Valley Creek
Ash Creek
Bear Creek
Beaver Creek
Davis Creek
Willow Creek
Butte Creek
Mill Creek
Pine Creek
Cedar Creek
Lassen Creek
Logan Slough
North Fork Pit River
Fitzhugh Creek
East Creek
Alturas
Tulelake
McArthur
Fall River Mills
Burney
Big Bend
Montgomery Creek
Round Mountain
Mount Shasta
McCloud
Dunsmuir
Lakehead-Lakeshore
Shasta Lake
Edgewood
Weed
Mineral

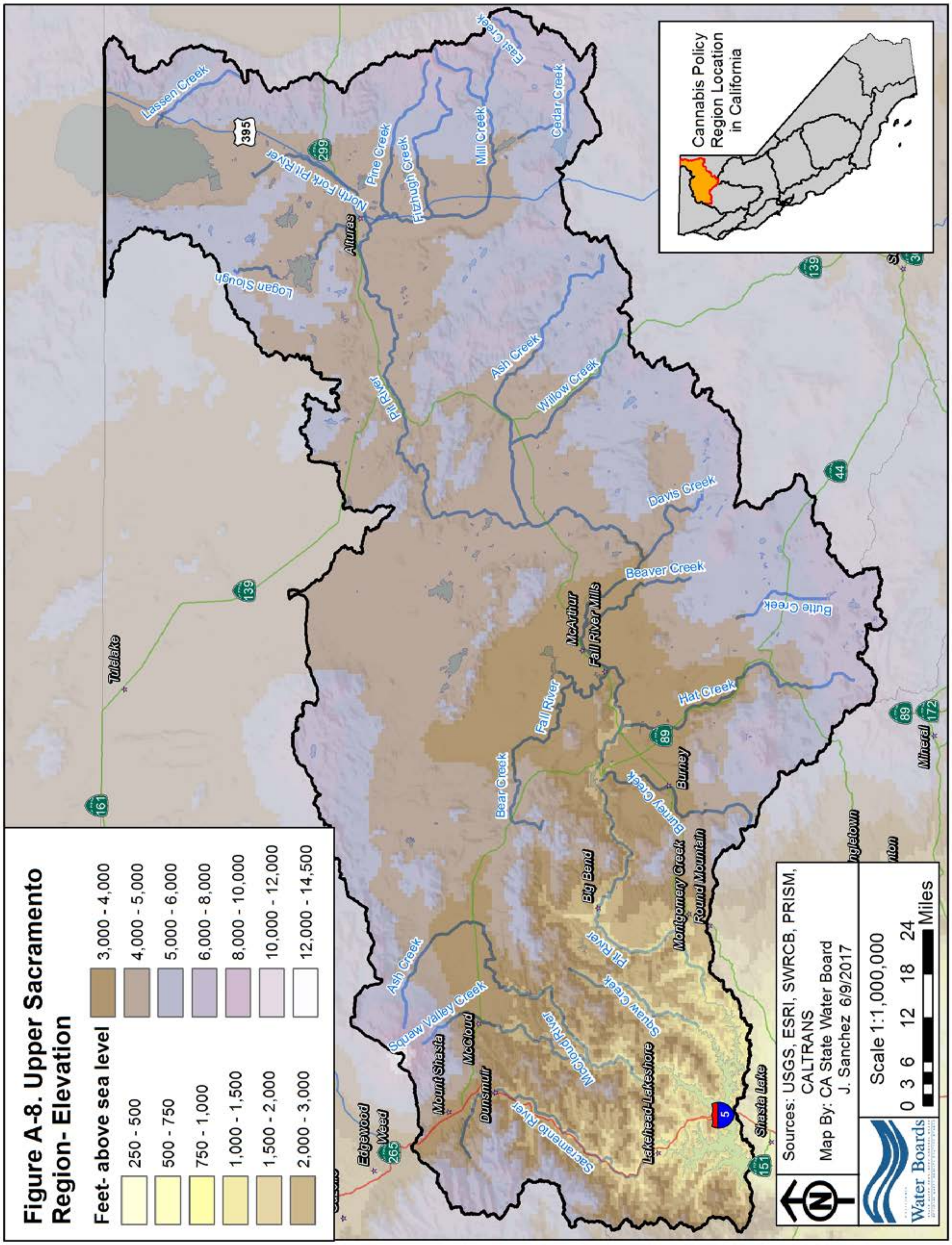


Figure A-8. Upper Sacramento Region- Elevation
Feet- above sea level
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24 Miles
Water Boards
Lassen Creek
East Creek
Cedar Creek
Mill Creek
Pine Creek
Fitzhugh Creek
North Fork Pit River
Alturas
Logan Slough
Ash Creek
Willow Creek
Pit River
Davis Creek
Beaver Creek
Butte Creek
McArthur
Fall River Mills
Tulelake
Fall River
Hat Creek
Bear Creek
Burney
Burney Creek
Big Bend
Montgomery Creek
Round Mountain
Squaw Valley Creek
Mount Shasta
McCloud
Dunsmuir
McCloud River
Squaw Creek
Lakehead-Lakeshore
Sacramento River
Shasta Lake
Edgewood
Weed
Mineral

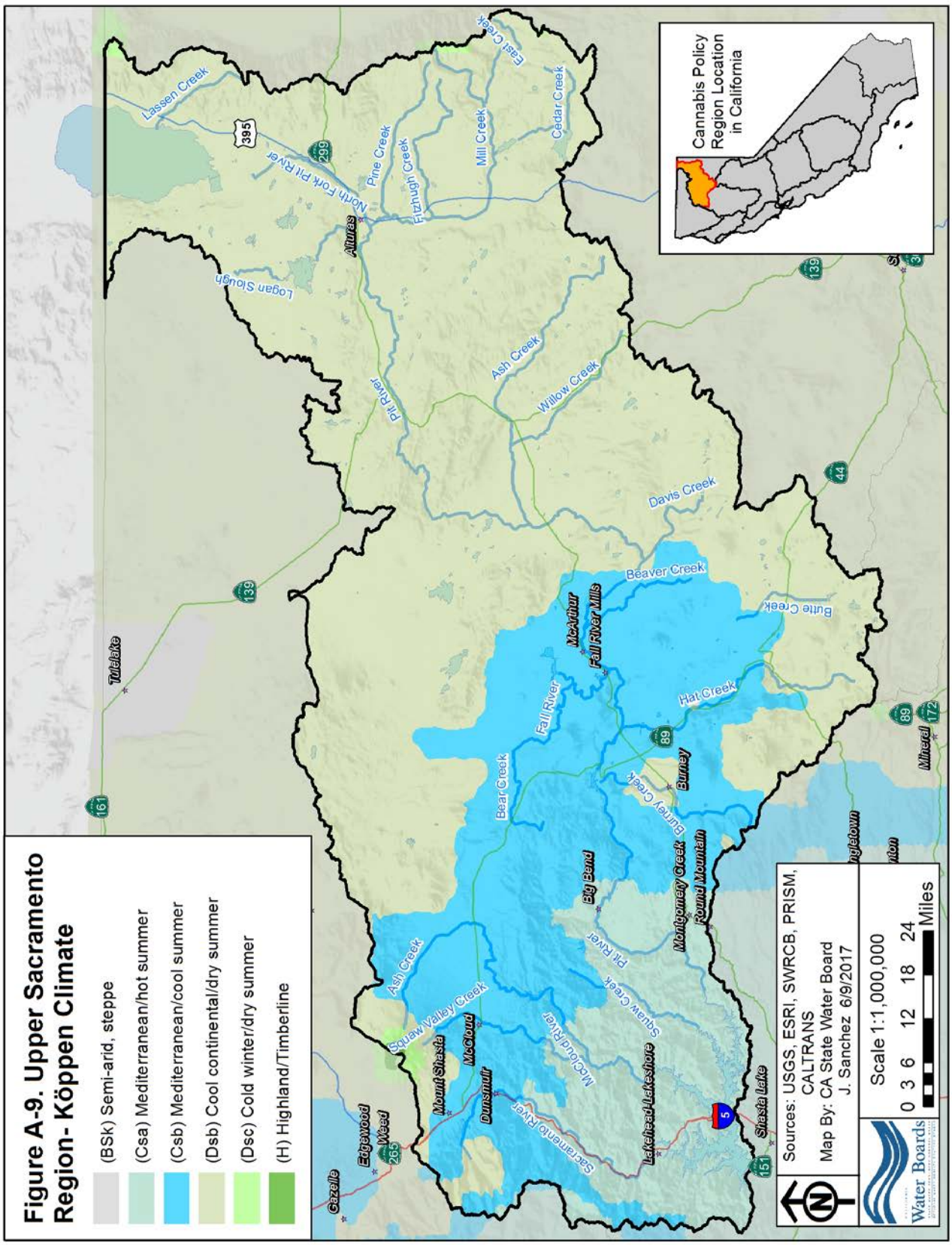


Figure A-9. Upper Sacramento Region- Köppen Climate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards
Lassen Creek
North Fork Pit River
Pine Creek
Fitzhugh Creek
Mill Creek
Cedar Creek
East Creek
Alturas
Logan Slough
Pit River
Ash Creek
Willow Creek
Davis Creek
Beaver Creek
Butte Creek
Hat Creek
Fall River
McArthur
Fall River Mills
Burney
Burney Creek
Bear Creek
Big Bend
Montgomery Creek
Round Mountain
Pit River
Squaw Creek
McCloud River
Squaw Valley Creek
Ash Creek
Mount Shasta
McCloud
Dunsmuir
Lakehead Lakeshore
Sacramento River
Shasta Lake
Tulelake
Gazelle
Edgewood
Weed
Mineral
Middletown
139
161
395
299
89
44
5
265
151
172

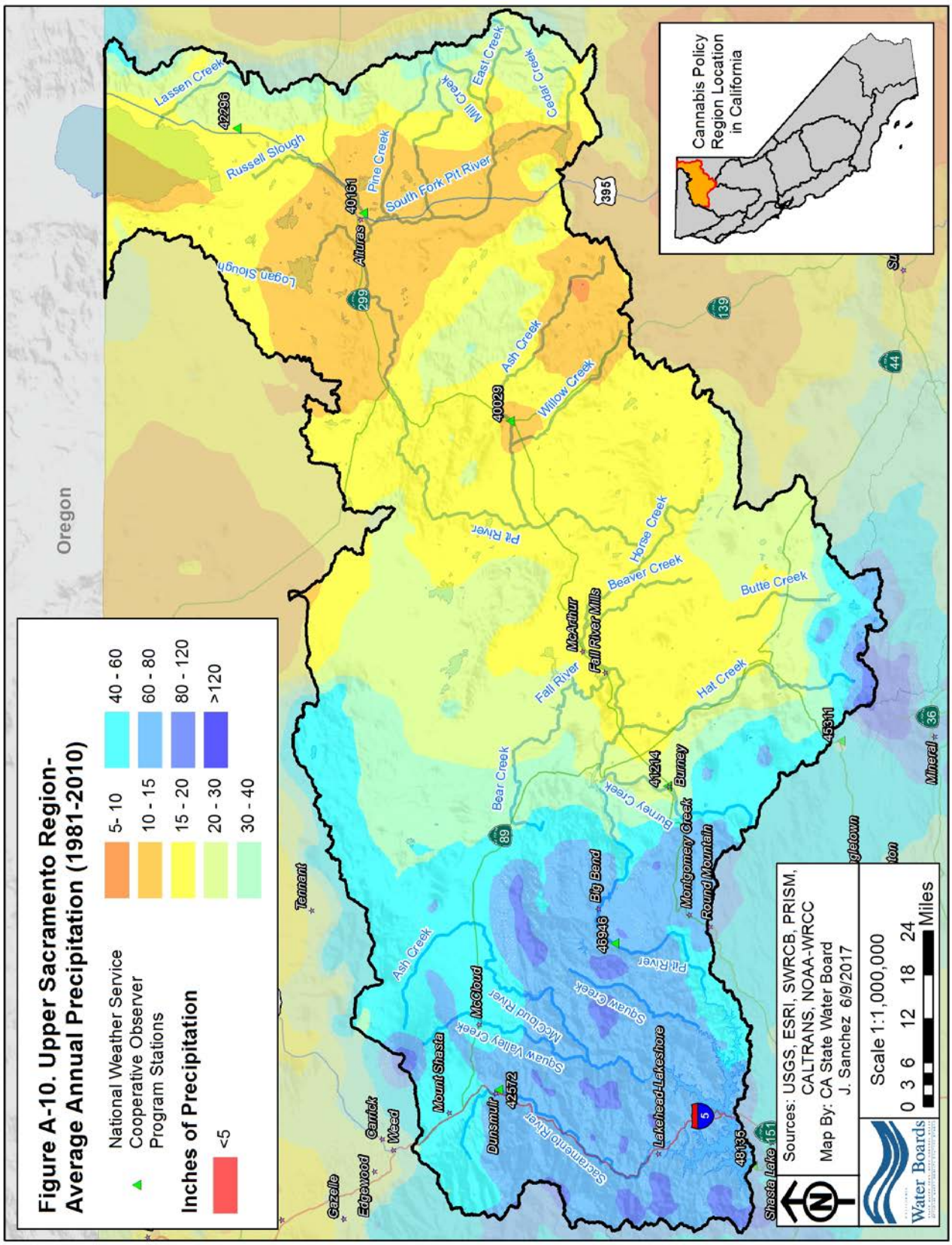


Figure A-10. Upper Sacramento Region-
Average Annual Precipitation (1981-2010)
National Weather Service
Cooperative Observer
Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Cannabis Policy
Region Location
in California
Oregon
Lassen Creek
Russell Slough
Logan Slough
Mill Creek
East Creek
Cedar Creek
Pine Creek
South Fork Pit River
Alturas
Ash Creek
Willow Creek
Pit River
Horse Creek
Beaver Creek
Butte Creek
Fall River
Fall River Mills
McArthur
Hat Creek
Burney
Burney Creek
Bear Creek
Montgomery Creek
Round Mountain
Big Bend
Squaw Creek
McCloud River
Squaw Valley Creek
McCloud
Mount Shasta
Dunsmuir
Sacramento River
Lakehead-Lakeshore
Shasta Lake
Tennant
Cantelk
Weed
Edgewood
Cazelle
Mineral
42296
40161
40029
46946
41214
45311
48135
42572
395
299
89
5
151
139
44
36
Sources: USGS, ESRI, SWRCB, PRISM,
CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards

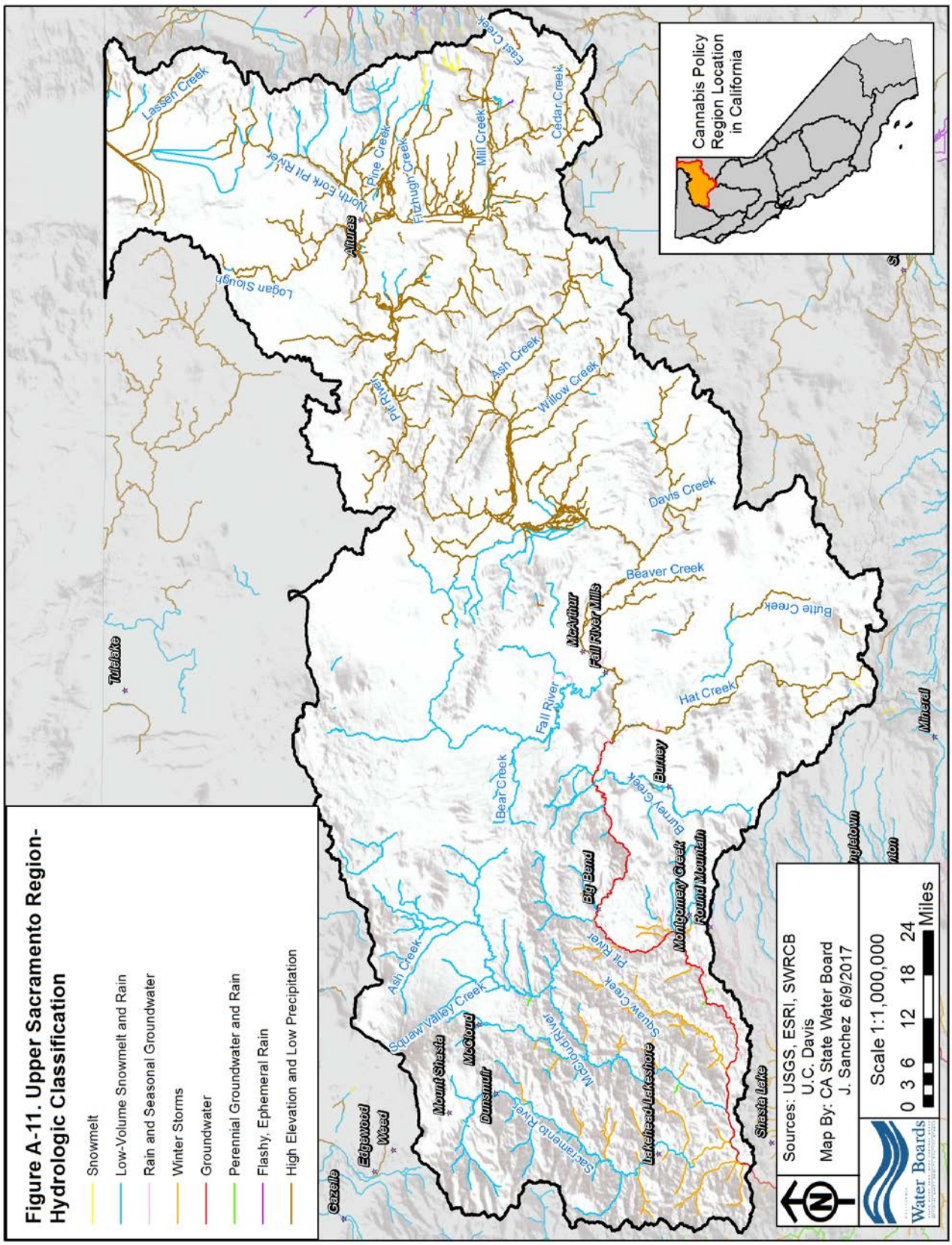


Figure A-11. Upper Sacramento Region-Hydrologic Classification
Snowmelt
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards
Lassen Creek
North Fork Pit River
Pine Creek
Fitzhugh Creek
Mill Creek
East Creek
Cedar Creek
Alturas
Logan Slough
Pit River
Ash Creek
Willow Creek
Davis Creek
Beaver Creek
Butte Creek
McArthur
Fall River Mills
Hat Creek
Fall River
Bear Creek
Burney
Burney Creek
Big Bend
Montgomery Creek
Round Mountain
Squaw Creek
McCloud River
Lakehead Lakeshore
Shasta Lake
Mineral
Trinity Lake
Ash Creek
Squaw Valley Creek
Mount Shasta
McCloud
Dunsmuir
Sacramento River
Edgewood
Weed
Gazelle

1.3 North Coast Region

The North Coast Region covers approximately 4,947 square miles along the northern coast of California, as shown in attached (Figure A-12). Elevations in the North Coast Region range from sea level to over 7,000 feet along the eastern margin of the region; please refer to (Figure A-13) for an elevation map of the North Coast Region. The North Coast Region includes the major watersheds of Redwood Creek in the north, the Mad River near the middle of the region, and the Eel River and its tributaries in the south.

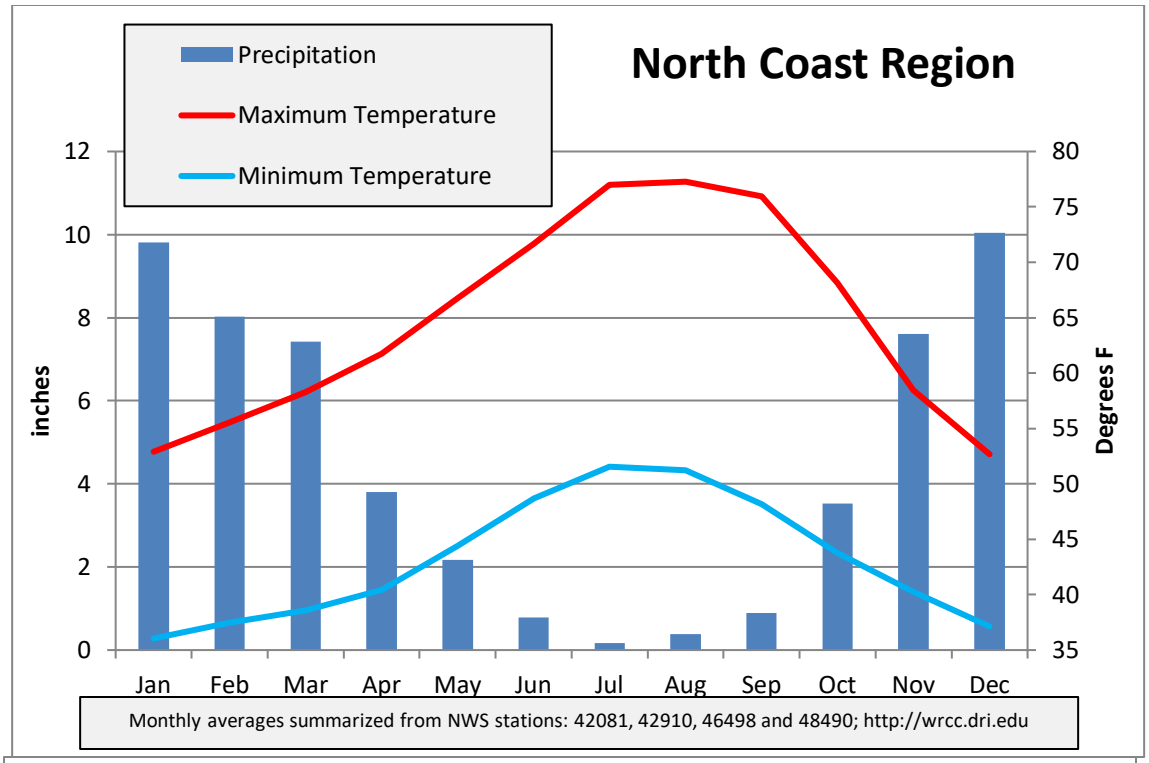
1.3.1 Climate and Precipitation

The climate of the North Coast Region is described as Mediterranean, with dry summers and moist to wet winters. Please refer to ~~(~~Figure A-14~~)~~ for a climatic map of the North Coast Region.

Precipitation and temperatures patterns vary within the North Coast Region based on proximity to the coast and on elevation. Temperatures in coastal areas of the North Coast Region are generally less variable compared to temperatures in areas further inland, and the ocean influence in the coastal areas tends to buffer temperature variations. Temperatures also tend to be cooler overall at higher elevation in the North Coast Region compared to lower elevations. Average annual maximum temperatures in the North Coast Region range from over 60 degrees Fahrenheit near the coast to over 70 degrees Fahrenheit inland, with slightly cooler maximum temperatures at the higher elevations. Average annual minimum temperatures in the North Coast Region range from below 40 degrees Fahrenheit at high elevations to below 50 degrees Fahrenheit in coastal areas and at lower elevation areas further inland.

The North Coast Region tends to receive precipitation during the months of October through May, and typically receives the largest amounts of precipitation in December and January. Average annual precipitation in the North Coast Region ranges from 40 inches in valleys and at lower elevations to over 120 inches in the Coast Range mountains. Precipitation falls primarily as rain in the North Coast Region, although small amounts of snow occasionally fall at peak elevations. (WRCC 2016)

Please refer to ~~(~~Figure A-15~~)~~ for a precipitation map of the North Coast Region. Please refer to Chart A-6 below, for an illustration of typical precipitation and temperature patterns in the North Coast Region.



North Coast Region
Precipitation
Maximum Temperature
Minimum Temperature
inches
Degrees F
Monthly averages summarized from NWS stations: 42081, 42910, 46498 and 48490; http://wrcc.dri.edu

Chart A-5. Average annual patterns of temperature and precipitation in the North Coast Region.

1.3.2 Hydrology

The North Coast Region contains many stream reaches that are hydrologically classified as Winter Storm (WS) systems, although several other UC Davis hydrologic classifications exist for stream reaches in the North Coast Region. WS stream reaches are generally found at lower

elevations in the North Coast Region. Several additional hydrologic classifications are also present in the North Coast Region. Many higher elevation stream reaches fall into the Low-Volume Snowmelt and Rain (LSR) class. Some stream reaches in the southern portion of the North Coast Region are hydrologically classified under the Flashy, Ephemeral Rain (FER) classification. Finally, a smaller number of stream reaches located throughout the North Coast Region fall into the Perennial Groundwater and Rain (PGR) stream class. ~~Please refer to (Figure A-16) for a hydrologic classification map for the North Coast Region.~~ (Lane et al 2016~~).~~)

Please refer to Figure A-16 for a hydrologic classification map for the North Coast Region.

1.3.3 Geology

The North Coast Region is located in the Coast Ranges geomorphic province. The San Andreas Fault is a prominent feature in the Coast Ranges and is the driving force responsible for much of the existing topography. The Coast Ranges in the North Coast Region are dominated by irregular, knobby, landslide topography. The North Coast Region is comprised of sedimentary and metamorphic rock, with areas of unconsolidated alluvium in valley floors and along the coastline. (CGS 2002) The region also contains soft, easily eroded soils, allowing the rivers to carry high sediment loads and carve extensive floodplains that support riparian habitats.

1.3.4 Anadromous Salmonid Population

Three special-status ESUs, DPSes, or DTEs are currently extant within the North Coast Region (Figure A-17):

- the California Coastal (CC) Chinook salmon ESU,
- the Northern California (NC) steelhead DPS, and
- the SONCC coho salmon ESU.

The CC Chinook salmon ESU, NC steelhead DPS, and SONCC coho salmon ESU are all currently listed as threatened under the ESA (CDFW 2017b). In addition, the SONCC coho salmon ESU is currently listed as threatened under the CESA (CDFW 2017b).

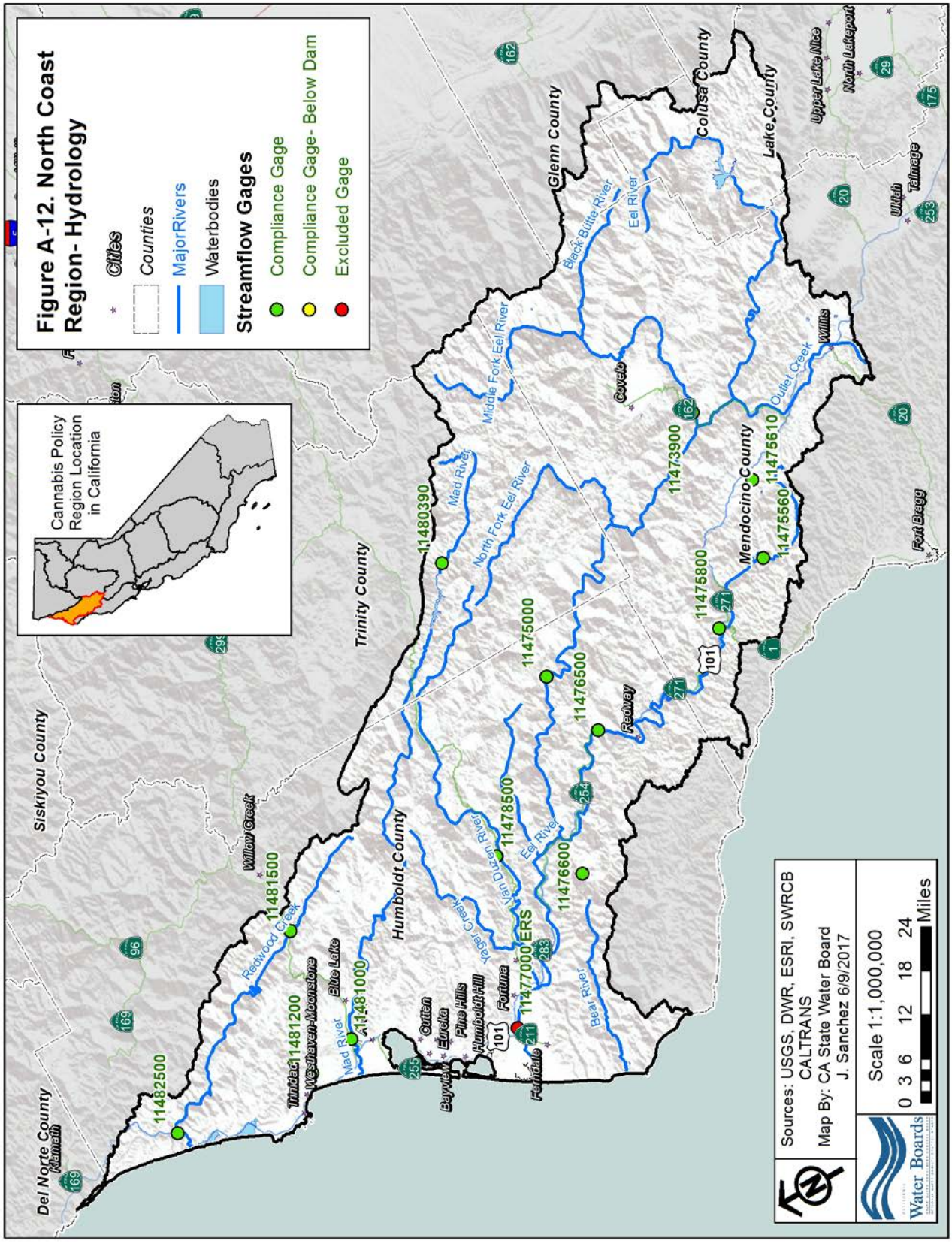


Figure A-12. North Coast Region- Hydrology
Cities
Counties
MajorRivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Cannabis Policy Region Location in California
Del Norte County
Siskiyou County
Trinity County
Humboldt County
Glenn County
Colusa County
Lake County
Mendocino County
Klamath
Willow Creek
Redwood Creek
Mad River
Blue Lake
Westhaven-Moonstone
Trinidad
Arcata
Eureka
Fortuna
Ferndale
Rio Dell
Scotia
Van Duzen River
Yager Creek
Eel River
Bear River
Middle Fork Eel River
North Fork Eel River
Black Butte River
Covelo
Willits
Outlet Creek
Ukiah
Talmage
Upper Lake
Nice
North Lakeport
Fort Bragg
Redway
11481500
11481000
11482500
11480390
11475000
11476500
11476600
11477000 ERS
11478500
11473900
11475800
11475560
11475610
Sources: USGS, DWR, ESRI, SWRCB
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards

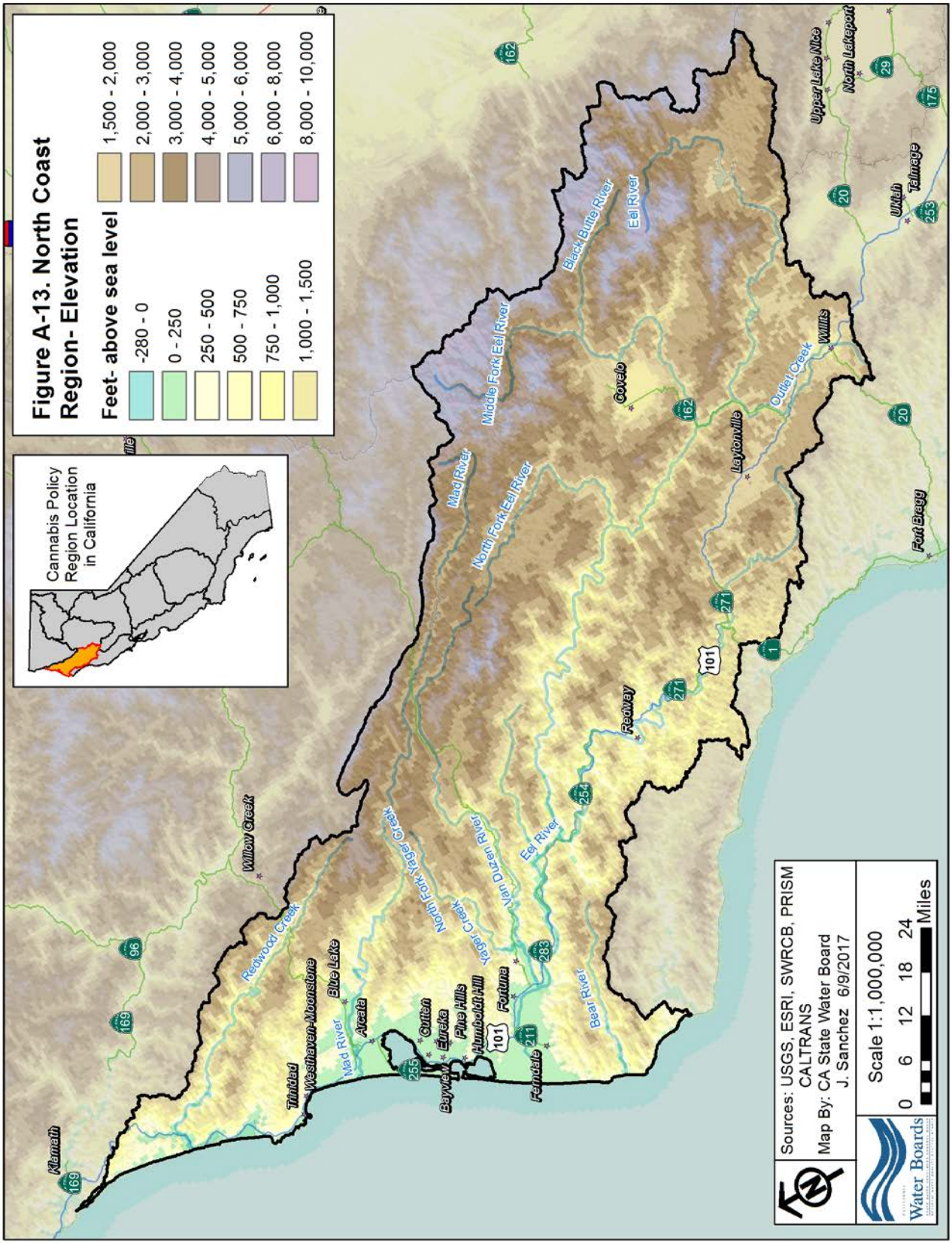


Figure A-13. North Coast Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 6 12 18 24
Miles
Water Boards
Klamath
Willow Creek
Redwood Creek
Trinidad
Westhaven-Moonstone
Blue Lake
Mad River
Arcata
Cutten
Eureka
Bayview
Pine Hills
Humboldt Hill
Fortuna
Ferndale
North Fork Yager Creek
Yager Creek
Van Duzen River
Eel River
Bear River
Mad River
Middle Fork Eel River
North Fork Eel River
Black Butte River
Eel River
Covelo
Redway
Laytonville
Outlet Creek
Willits
Upper Lake Nice
North Lakeport
Ukiah
Talmage
Fort Bragg

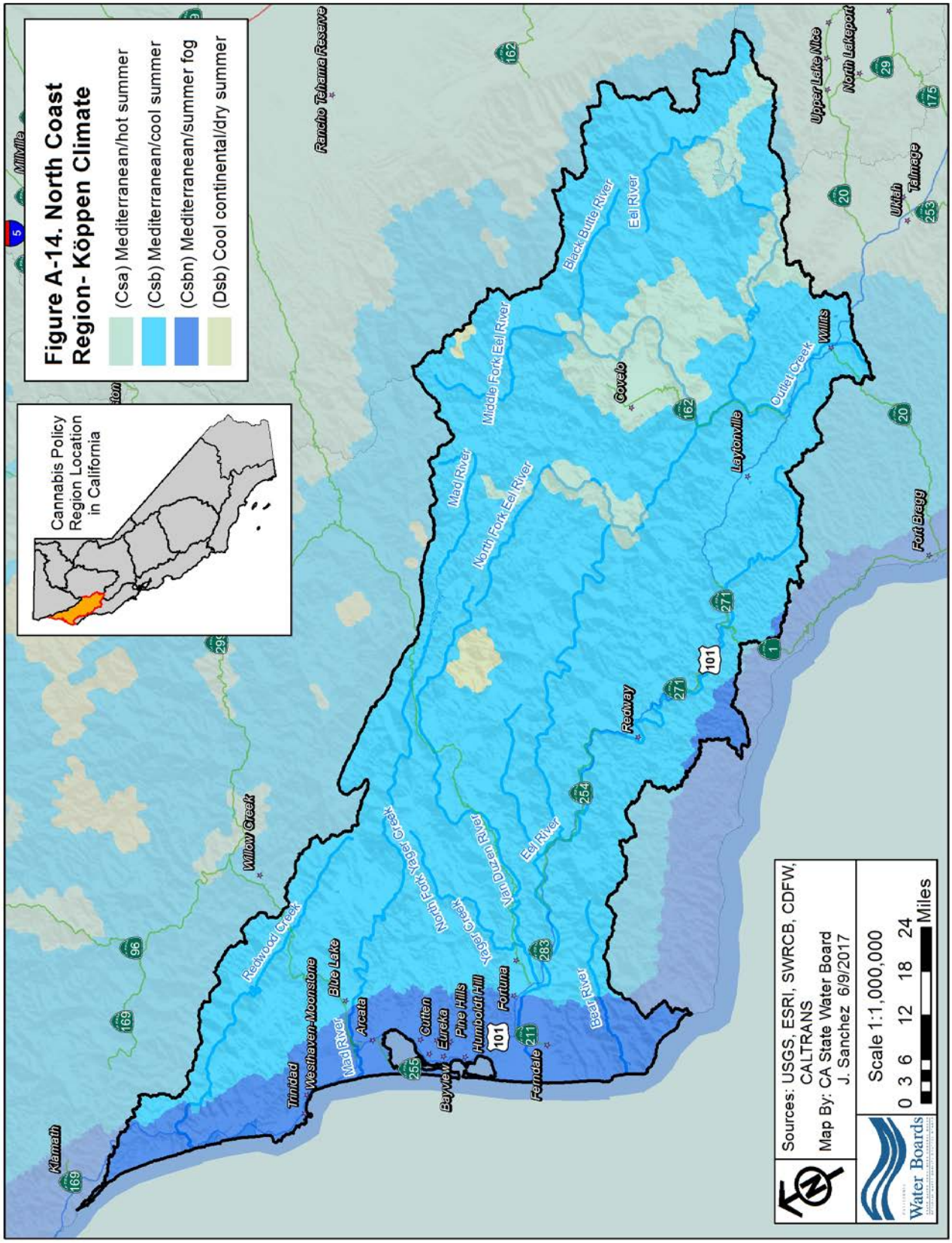


Figure A-14. North Coast Region- Köppen Climate
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CDFW, CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards
Rancho Tehama Reserve
Willow Creek
Redwood Creek
Trinidad
Westhaven-Moonstone
Blue Lake
Mad River
Arcata
Eureka
Cutten
Bayview
Pine Hills
Humboldt Hill
Fortuna
Ferndale
Bear River
Yager Creek
North Fork Yager Creek
Van Duzen River
Eel River
Redway
Mad River
North Fork Eel River
Middle Fork Eel River
Black Butte River
Eel River
Covelo
Laytonville
Outlet Creek
Willits
Upper Lake Nice
North Lakeport
Ukiah
Talmage
Fort Bragg
Klamath
Milville

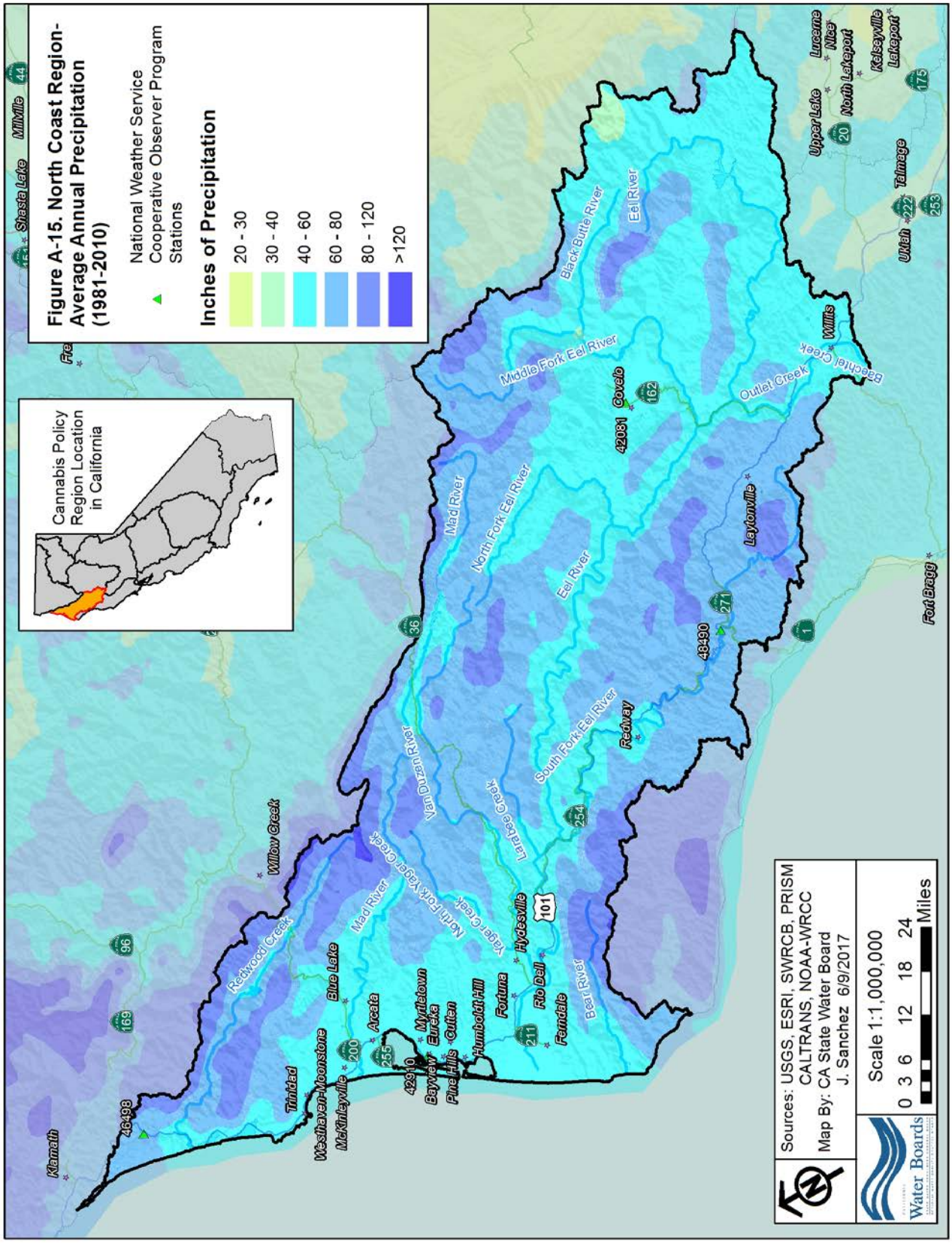


Figure A-15. North Coast Region-Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM
CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24
Miles
Water Boards
Shasta Lake
Mtnville
Upper Lake
Lucerne
Nice
North Lakeport
Kelseyville
Lakeport
Ukiah
Talmage
Willits
Outlet Creek
Middle Fork Eel River
Black Butte River
Eel River
Covelo
Mad River
North Fork Eel River
Eel River
Laytonville
Fort Bragg
Van Duzen River
South Fork Eel River
Redway
Hydesville
Rio Dell
Fortune
Ferndale
Bear River
Yager Creek
North Fork Yager Creek
Mad River
Blue Lake
Arcata
Eureka
Myrtletown
Cutten
Humboldt Hill
Bayview
Pine Hills
Trinidad
Westhaven-Moonstone
McKinleyville
Redwood Creek
Willow Creek
Klamath
26498
42910
48390
42081

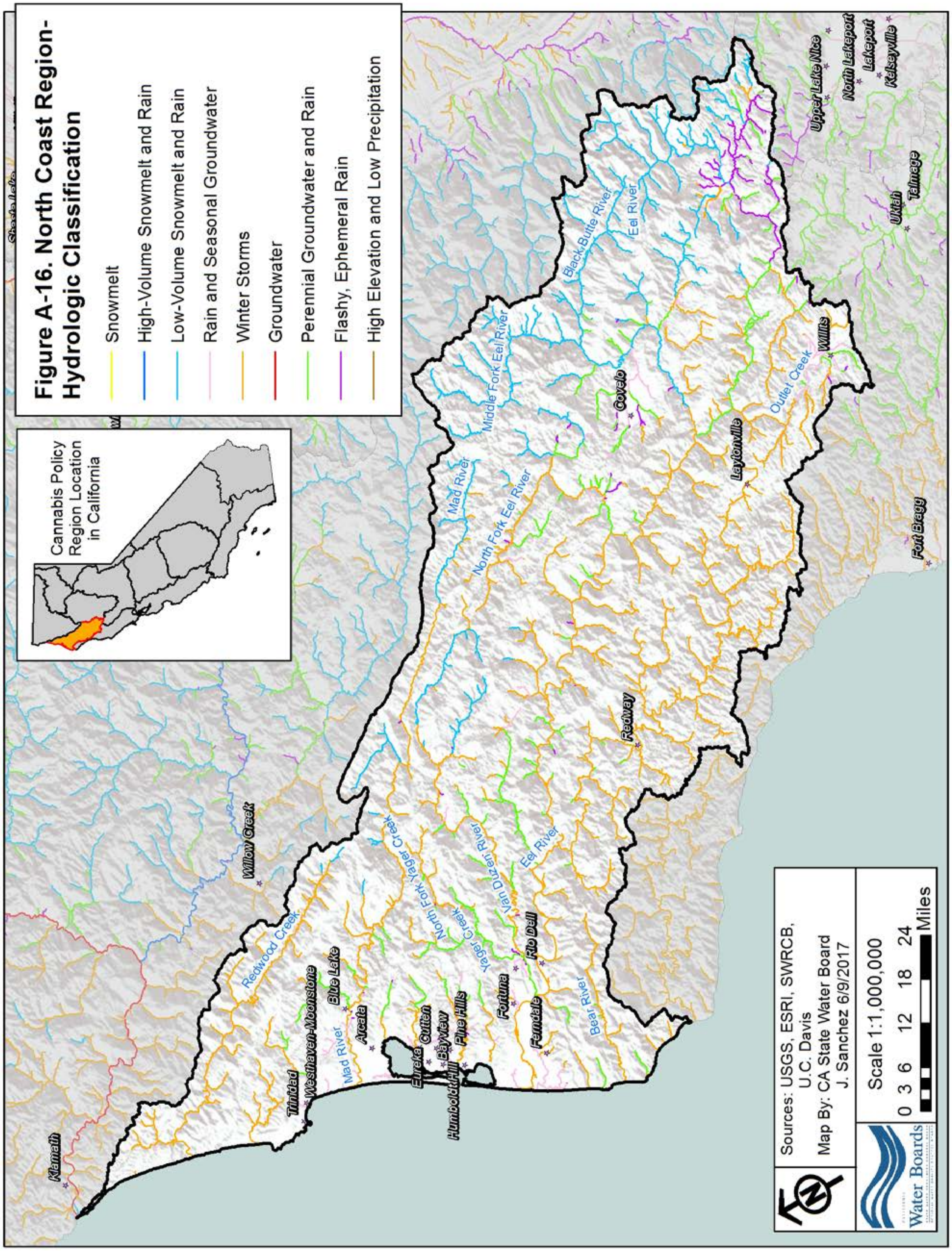


Figure A-16. North Coast Region-Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,000,000
0 3 6 12 18 24 Miles
Klamath
Trinidad
Westhaven-Moonstone
Blue Lake
Arcata
Mad River
Eureka
Cutten
Bayview
Humboldt Hill
Pine Hills
Fortuna
Ferndale
Rio Dell
Bear River
Eel River
Van Duzen River
Yager Creek
North Fork Yager Creek
Redwood Creek
Willow Creek
Redway
Mad River
North Fork Eel River
Middle Fork Eel River
Black Butte River
Eel River
Covelo
Laytonville
Outlet Creek
Willits
Fort Bragg
Ukiah
Talmage
Upper Lake Nice
North Lakeport
Lakeport
Kelseyville

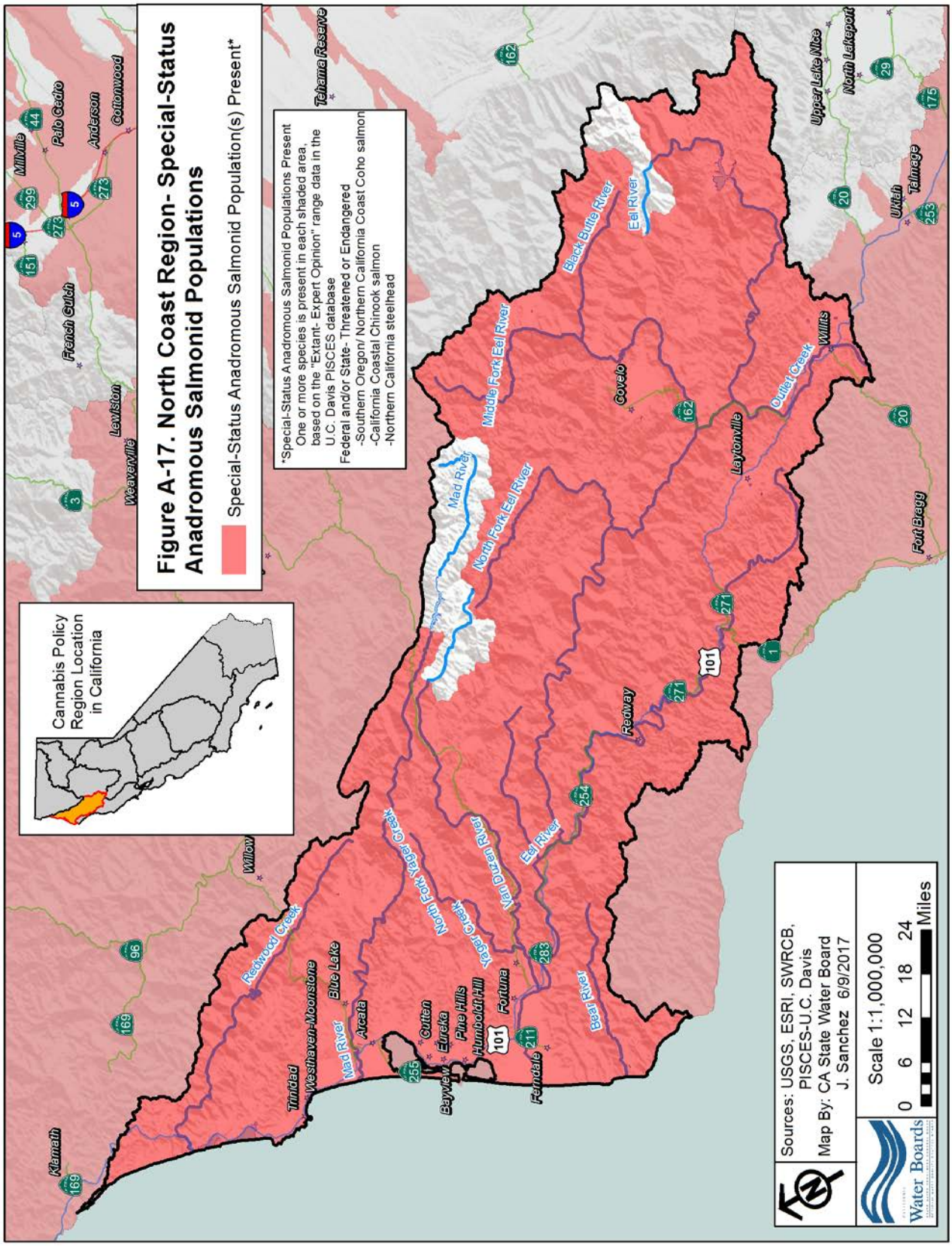


Figure A-17. North Coast Region- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area,
based on the "Extant- Expert Opinion" range data in the
U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Southern Oregon/ Northern California Coast Coho salmon
-California Coastal Chinook salmon
-Northern California steelhead
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,000,000
0 6 12 18 24 Miles
Water Boards
Klamath
Trinidad
Westhaven-Moonstone
Blue Lake
Arcata
Mad River
Redwood Creek
North Fork Yager Creek
Yager Creek
Van Duzen River
Eel River
Bear River
Cutten
Eureka
Pine Hills
Humboldt Hill
Fortuna
Ferndale
Bayview
Willow
Redway
Garberville
Laytonville
Covelo
Willits
Outlet Creek
Middle Fork Eel River
North Fork Eel River
Mad River
Black Butte River
Eel River
Upper Lake
Nice
North Lakeport
Ukiah
Talmage
Fort Bragg
Tehama Reserve
Lewiston
Weaverville
French Gulch
Millville
Palo Cedro
Anderson
Cottonwood

1.4 Middle Sacramento Region

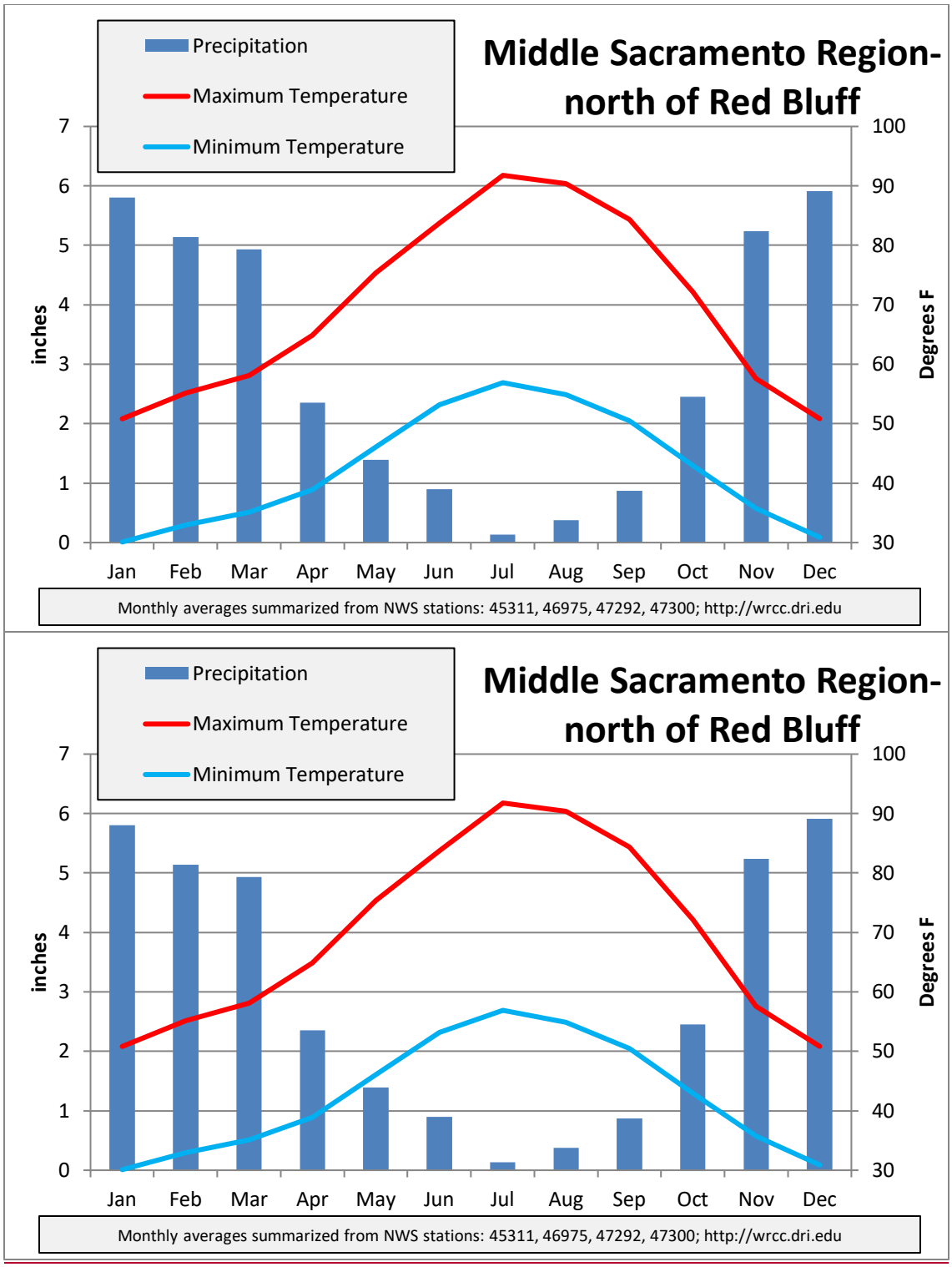
The Middle Sacramento Region covers approximately 8,562 square miles in northern and central California, as shown in attached (Figure A-18). Elevations in this region range from 40 feet near Knights Landing and the confluence of the Sacramento and Feather Rivers, to over 10,400 feet at the peak of Mount Lassen; please refer to (Figure A-19) for an elevation map of the Middle Sacramento Region. The Middle Sacramento Region contains the Coast Ranges in the western portion of the region, the Central Valley in the center of the region, and the Cascade Range in the eastern portion of the region. The Middle Sacramento Region also contains the Sutter Buttes. A portion of the Sacramento River watershed is located in this region, including several significant Sacramento River tributaries. Clear Creek, Cottonwood Creek, Thomes Creek, and Stony Creek drain the east side of the Coast Ranges and Klamath Mountains, and enter the Sacramento River from the west. Battle Creek, Antelope Creek, Mill Creek, Deer Creek, Big Chico Creek, and Butte Creek drain the west side of the Sierra Nevada and Cascade Range, and enter the Sacramento River from the east.

1.4.1 Climate and Precipitation

The Middle Sacramento Region is characterized by a Mediterranean climate, with hot summers and moist to wet winters. Please refer to ~~(~~Figure A-20~~)~~ for a climatic map of the Middle Sacramento Region. In general, lower elevation areas in the Middle Sacramento Region exhibit higher average annual maximum and higher average annual minimum temperatures compared to higher elevation areas. At lower elevations and in the northern portion of this region, average annual maximum temperatures exceed 75 degrees Fahrenheit, while average annual maximum temperatures exceed 50 degrees Fahrenheit at high elevation areas in this region. Average annual minimum temperatures tend to drop below 50 degrees Fahrenheit in the Central Valley portion of the Middle Sacramento Region, while average annual minimum temperatures at higher elevation areas in the Middle Sacramento Region drop below freezing.

In the Middle Sacramento Region, precipitation tends to fall from October through April. The majority of precipitation in this region falls as rain, and significant snowfall tends to fall only at the high elevation margins of the region. Average annual precipitation amounts vary significantly within the Middle Sacramento Region, and the northern portion of the Middle Sacramento Region tends to receive a larger amount of precipitation compared to the southern portion of the region. Over 120 inches of annual precipitation tends to fall near Mount Lassen in the northern portion of the region, while under 20 inches of annual precipitation tends to fall in the southern portion of the region, south of the Sutter Buttes.

Please refer to ~~(~~Figure A-21~~)~~ for a precipitation map of the Middle Sacramento Region. Please refer to Chart A-6 and A-7, below, for illustrations of typical precipitation patterns in the northern and southern portions of the Middle Sacramento Region.



Middle Sacramento Region-
north of Red Bluff
Precipitation
Maximum Temperature
Minimum Temperature
inches
Degrees F
Monthly averages summarized from NWS stations: 45311, 46975, 47292, 47300; http://wrcc.dri.edu

Chart A-6. Average annual patterns of temperature and precipitation in the Middle Sacramento Region, north of Red Bluff.

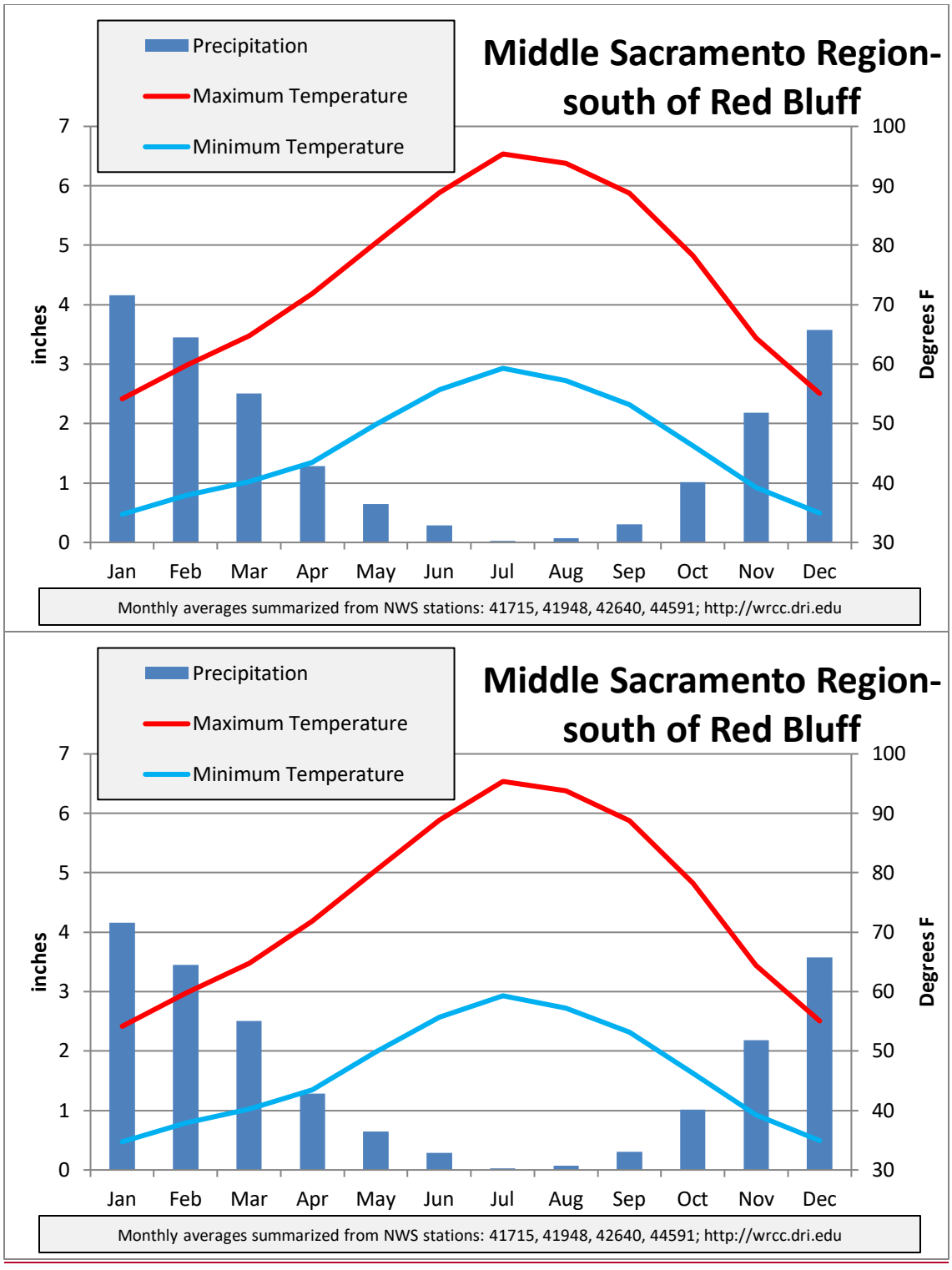


Chart A-7. Average annual patterns of temperature and precipitation in the Middle Sacramento Region, south of Red Bluff.

1.4.2 Hydrology

The hydrology of Middle Sacramento Region streams varies greatly from west to east, and several UC Davis hydrologic classifications exist for stream reaches in this region. The eastern and western margins of the Middle Sacramento Region, which correspond to high elevation

mountains, are dominated by Low-Volume Snowmelt and Rain (LSR) stream reaches. The central portion of the region, which corresponds to the Sacramento Valley, contains many Winter Storms (WS) stream reaches. Additionally, Perennial Groundwater and Rain (PGR) stream reaches are located primarily in the northwestern portion of the Middle Sacramento Region, and correspond with mid-elevation areas in the Coast Ranges. Finally, Rain and Seasonal Groundwater (RSG) stream reaches are located at mid-elevation areas in the northern Cascade Range. Other UC Davis hydrologic classifications also exist in the Middle Sacramento Region in smaller numbers. ~~Please refer to (Figure A-22) for a stream classification map of the Middle Sacramento Region.~~ (Lane et al 2016)

Please refer to Figure A-22 for a stream classification map of the Middle Sacramento Region.

1.4.3 Geology

The Middle Sacramento Region is located in the Coast Ranges, Great Valley, and Cascade Range geomorphic provinces. The Cascade Range geomorphic province, located in the northeastern portion of the Middle Sacramento Region, is characterized by extrusive volcanic activity, and the active volcano Mount Lassen is located on the edge of the Middle Sacramento Region. The Cascade Range is generally underlain by igneous rock, including lava flows, pyroclastic flows, and alluvium eroded from volcanic features. The Great Valley geomorphic province, located in the Central Valley and in the middle portion of the Middle Sacramento Region, contains a large alluvial plain and unconsolidated sedimentary deposits. The Coast Ranges, located in the western portion of the Middle Sacramento Region, contain irregular, knobby, landslide topography. The Coast Ranges are primarily comprised of sedimentary and metamorphic rock, and alluvial deposits in valley areas. (CGS 2002)

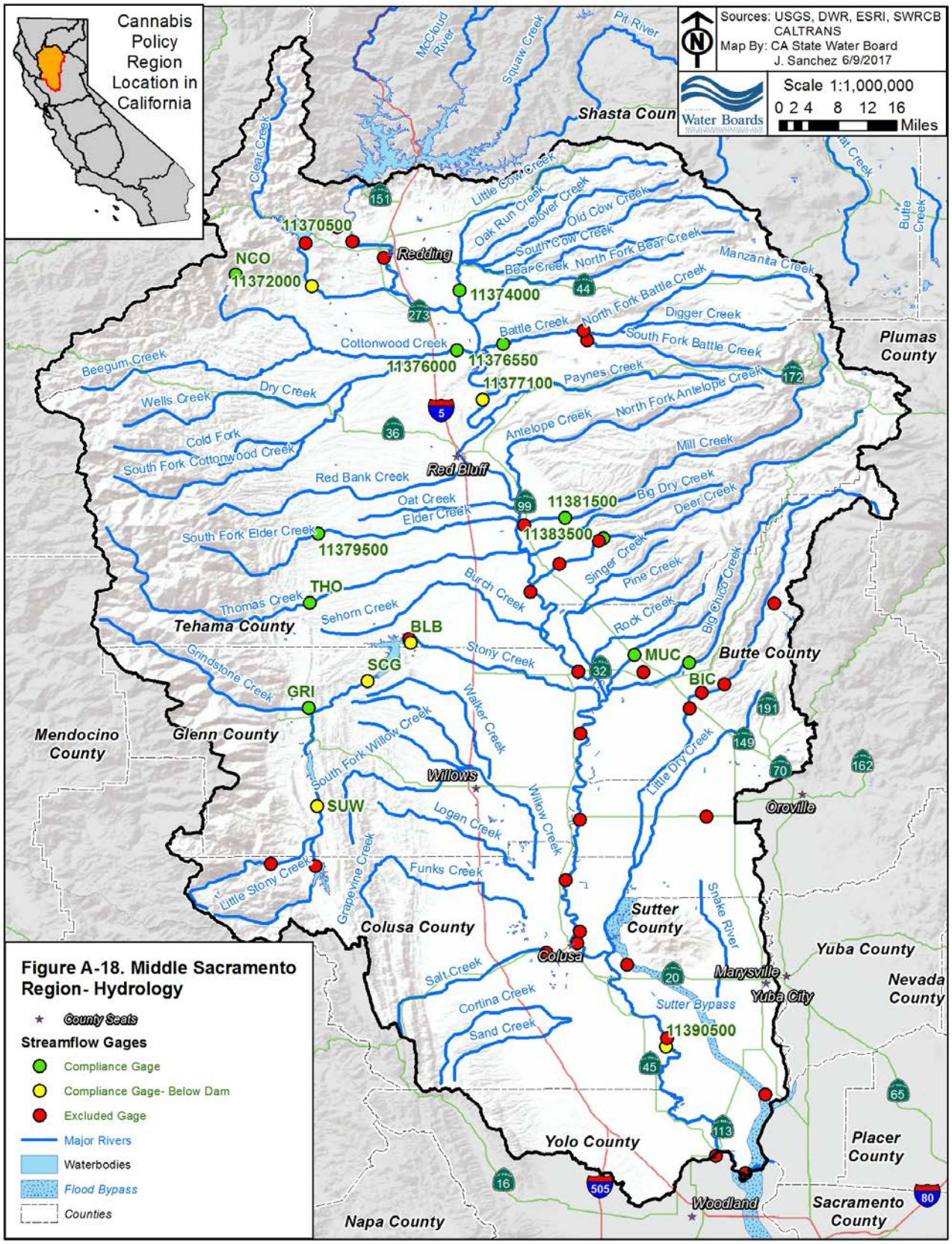
1.4.4 Anadromous Salmonid Population

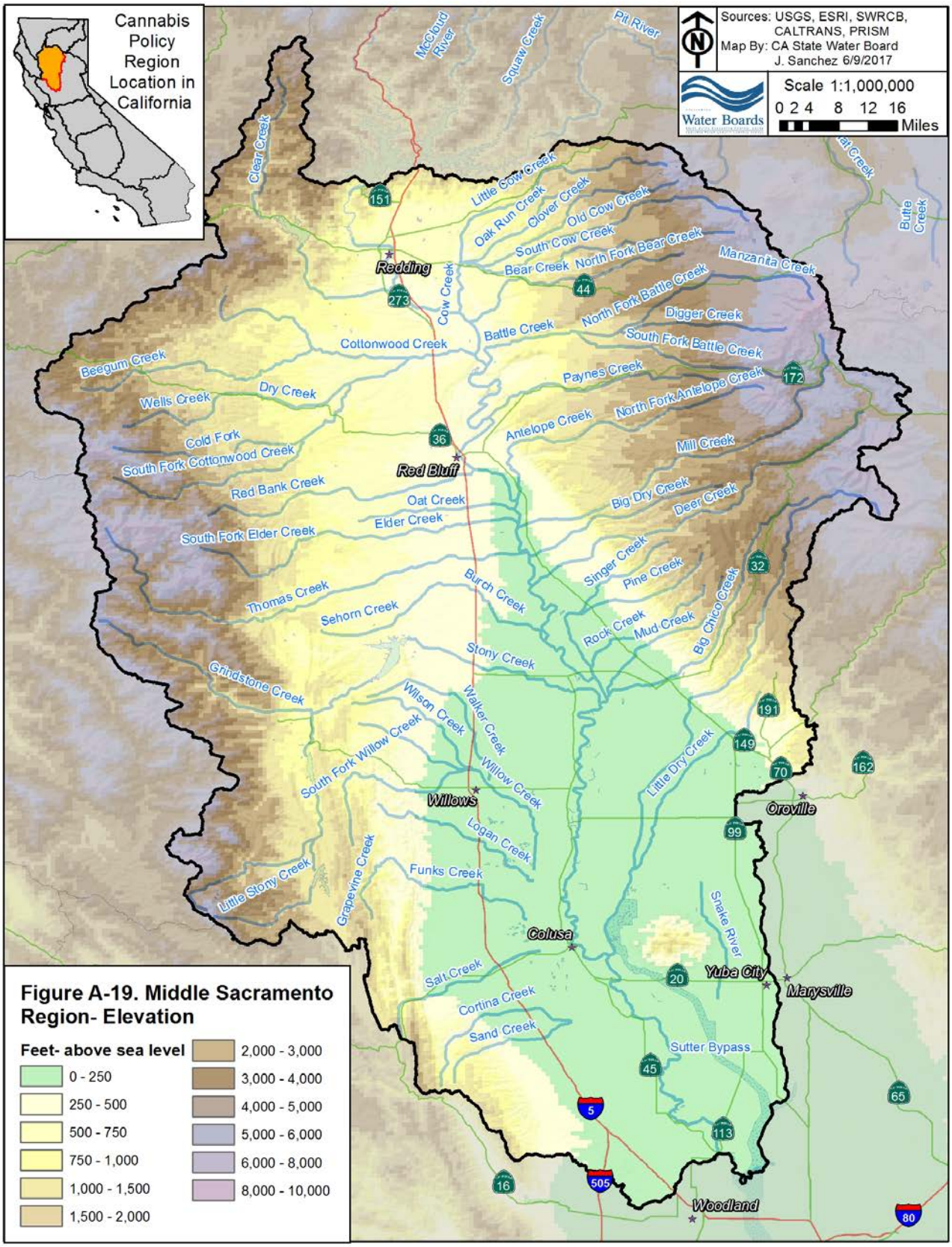
Five special-status ESUs, DPSes, or DTEs are currently extant within the Middle Sacramento Region (Figure A-23):

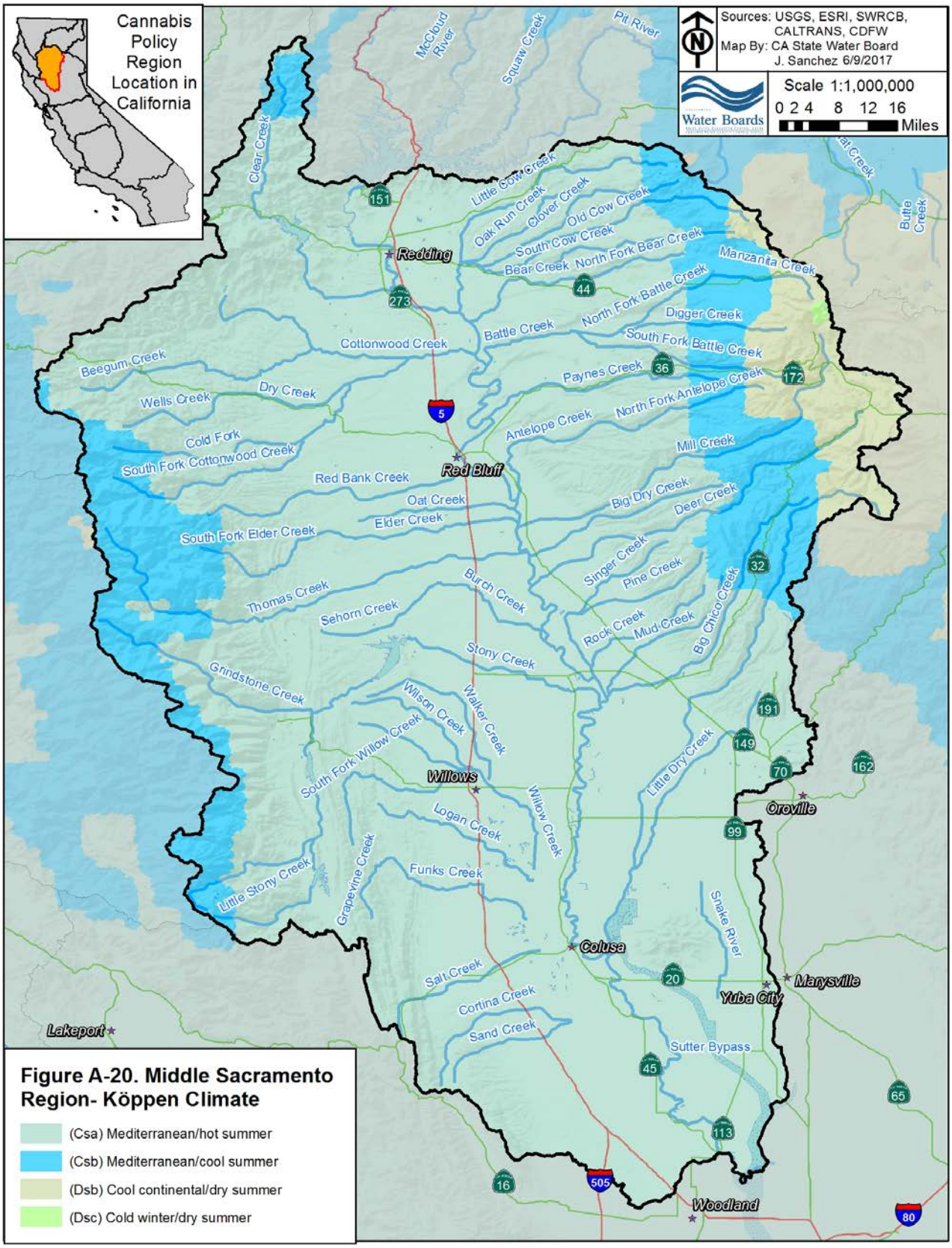
- the Sacramento River winter-run (SRWR) Chinook salmon ESU,
- the Central Valley spring-run (CV SR) Chinook salmon ESU,
- the Central Valley fall-run (CV FR) Chinook salmon DTE[4],
- the Central Valley late fall-run (CV LFR) Chinook salmon DTE, and
- the California Central Valley (CCV) steelhead DPS.

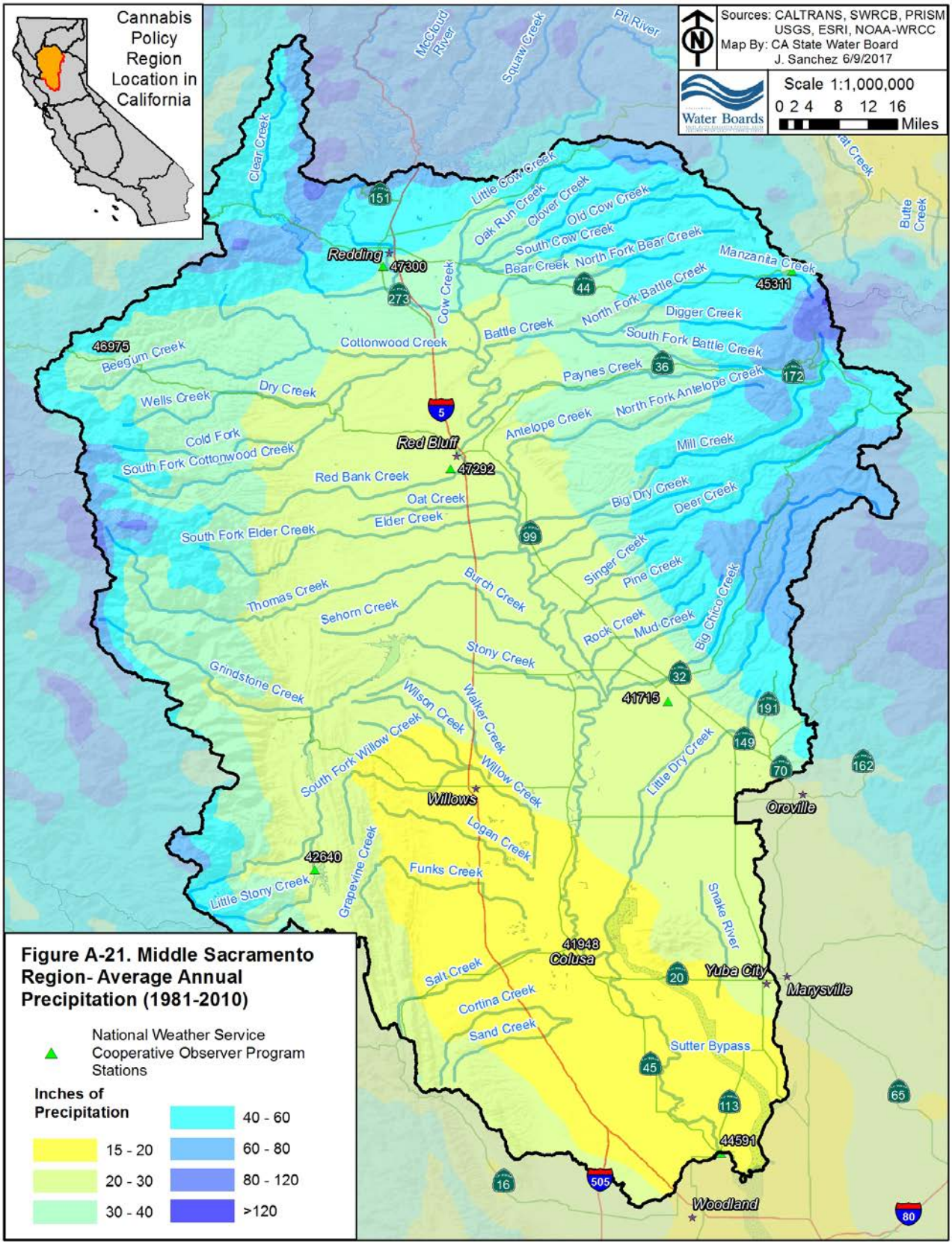
The SRWR Chinook salmon ESU is currently listed as endangered under the ESA and the CESA (CDFW 2017b). The CV SR Chinook salmon ESU and the CCV steelhead DPS are currently listed as threatened under the ESA (CDFW 2017b). The CV SR Chinook salmon ESU is also listed as threatened under the CESA (CDFW 2017b). The CV FR and CV LFR Chinook salmon populations are each listed as species of special concern by CDFW and, jointly, as a species of concern by NMFS (Moyle et al. 2015, NMFS 2017).

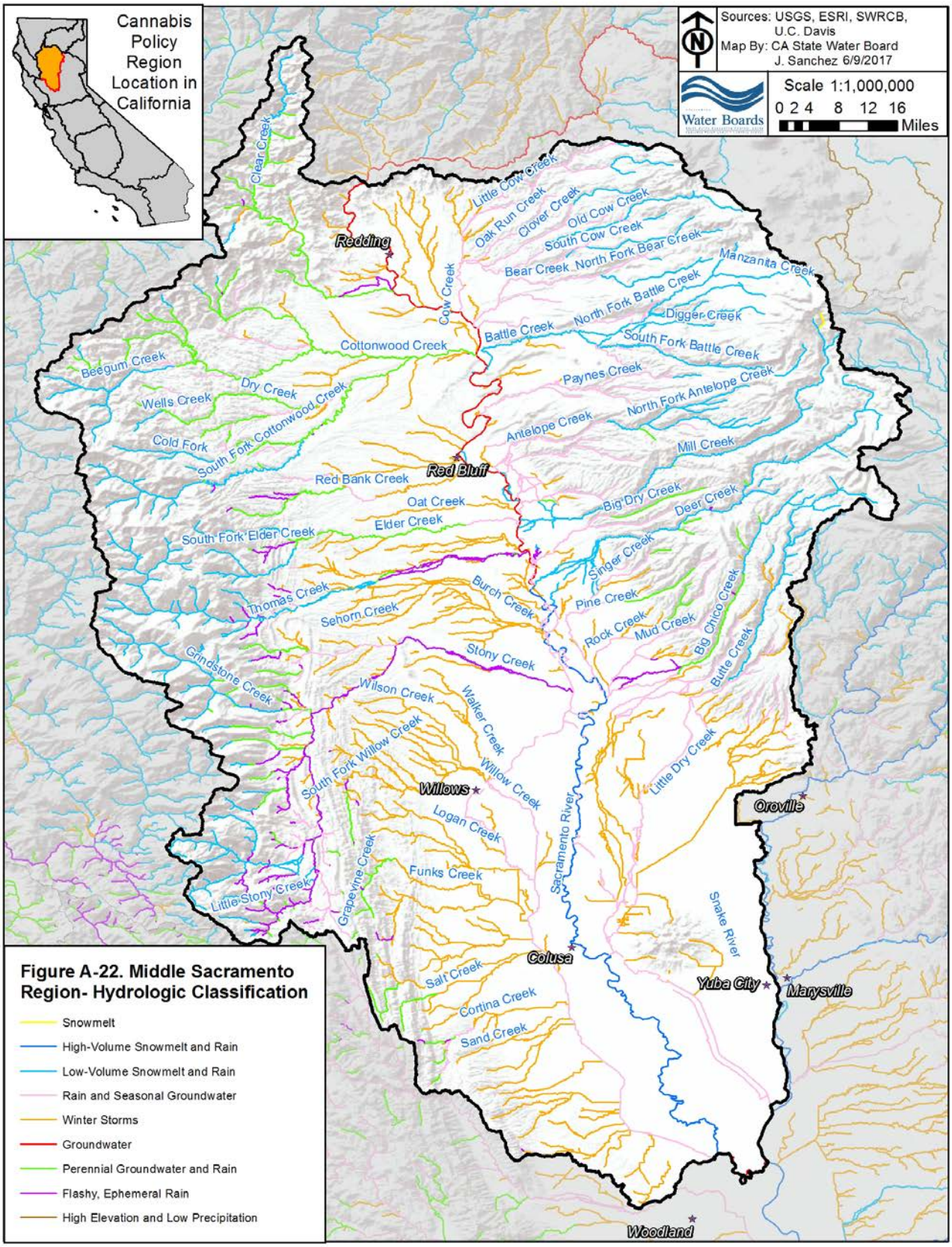
[4] CV FR and CV LFR Chinook salmon together constitute a single ESU; however, CDFW treats the two runs as distinct taxonomic entities based upon their distinct life-history strategies and in consideration of the unique management concerns of each run (Moyle et al. 2015).

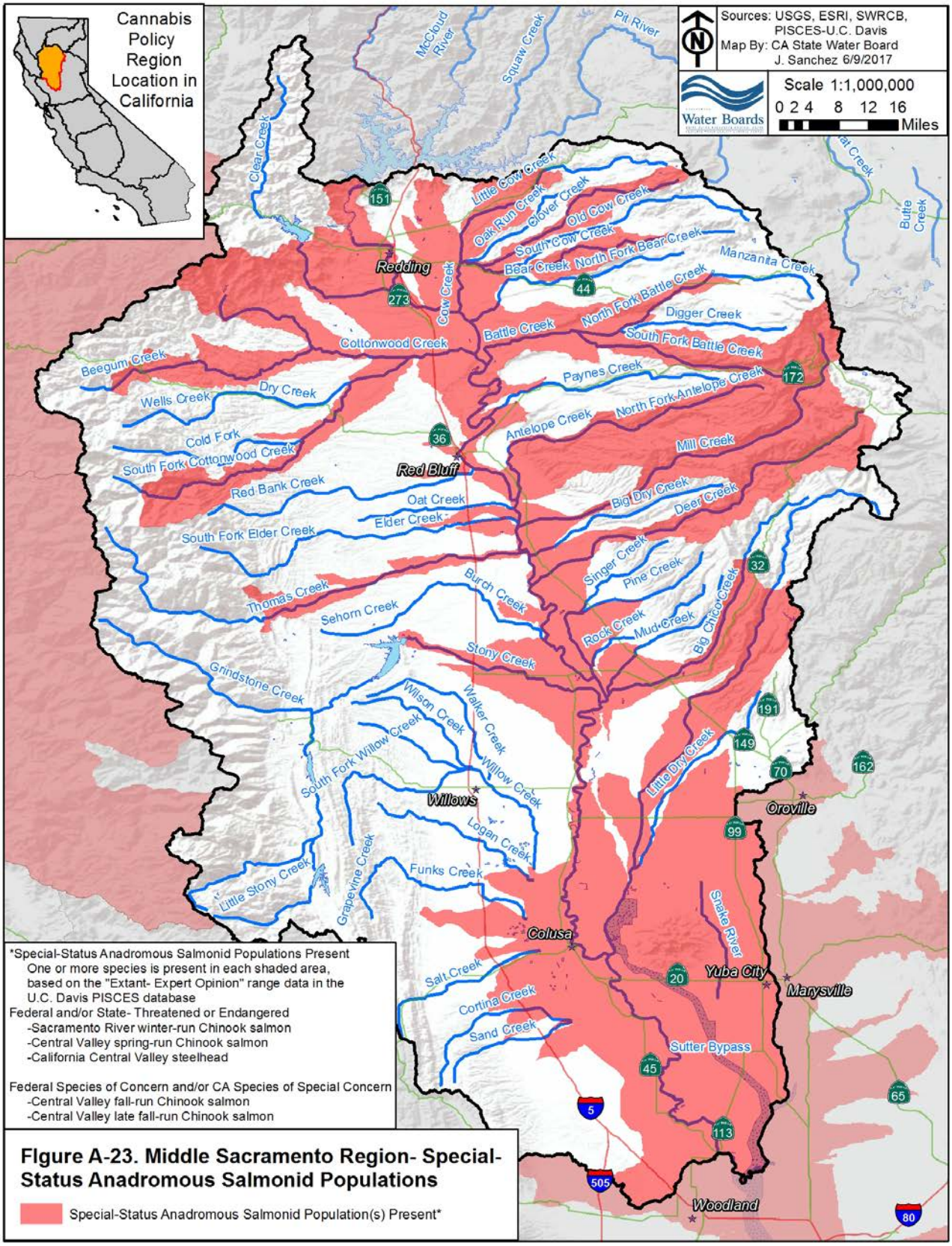

Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16 Miles
Shasta Coun
Plumas County
Butte County
Tehama County
Glenn County
Mendocino County
Colusa County
Sutter County
Yuba County
Nevada County
Placer County
Yolo County
Napa County
Sacramento County
Red Bluff
Redding
Willows
Oroville
Marysville
Yuba City
Woodland
Colusa
11370500
NCO
11372000
11374000
11376000
11376550
11377100
11379500
THO
11381500
11383500
BLB
SCG
GRI
SUW
MUC
BIC
11390500
McCloud River
Pit River
Squaw Creek
Clear Creek
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Butte Creek
Cottonwood Creek
Battle Creek
North Fork Battle Creek
Digger Creek
South Fork Battle Creek
Beegum Creek
Wells Creek
Dry Creek
Paynes Creek
Cold Fork
South Fork Cottonwood Creek
Antelope Creek
North Fork Antelope Creek
Mill Creek
Red Bank Creek
Oat Creek
Elder Creek
Big Dry Creek
Deer Creek
South Fork Elder Creek
Singer Creek
Pine Creek
Thomas Creek
Sehorn Creek
Burch Creek
Rock Creek
Big Chico Creek
Grindstone Creek
Stony Creek
Walker Creek
South Fork Willow Creek
Willow Creek
Logan Creek
Little Dry Creek
Little Stony Creek
Grapevine Creek
Funks Creek
Snake River
Salt Creek
Cortina Creek
Sand Creek
Sutter Bypass
Figure A-18. Middle Sacramento Region- Hydrology
County Seats
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Major Rivers
Waterbodies
Flood Bypass
Counties


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CALTRANS, PRISM
Map By: CA State Water Board
J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16
Miles
Redding
Red Bluff
Willows
Colusa
Oroville
Yuba City
Marysville
Woodland
McCloud River
Squaw Creek
Pit River
Clear Creek
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Cow Creek
North Fork Battle Creek
Digger Creek
Battle Creek
South Fork Battle Creek
Cottonwood Creek
Beegum Creek
Paynes Creek
Dry Creek
Wells Creek
North Fork Antelope Creek
Antelope Creek
Cold Fork
South Fork Cottonwood Creek
Mill Creek
Red Bank Creek
Oat Creek
Big Dry Creek
Deer Creek
Elder Creek
South Fork Elder Creek
Singer Creek
Pine Creek
Thomas Creek
Burch Creek
Sehorn Creek
Rock Creek
Mud Creek
Big Chico Creek
Stony Creek
Grindstone Creek
Wilson Creek
Walker Creek
South Fork Willow Creek
Willow Creek
Little Dry Creek
Logan Creek
Funks Creek
Grapevine Creek
Little Stony Creek
Snake River
Salt Creek
Cortina Creek
Sand Creek
Sutter Bypass
Butte Creek
151
273
44
36
32
191
149
70
162
99
20
45
5
65
113
16
505
80
Figure A-19. Middle Sacramento Region- Elevation
Feet- above sea level
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CALTRANS, CDFW
Map By: CA State Water Board
J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16
Miles
Redding
Red Bluff
Willows
Colusa
Oroville
Marysville
Yuba City
Woodland
Lakeport
Pit River
McCloud River
Squaw Creek
Clear Creek
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Butte Creek
North Fork Battle Creek
Digger Creek
Battle Creek
South Fork Battle Creek
Cottonwood Creek
Beegum Creek
Paynes Creek
Dry Creek
Wells Creek
North Fork Antelope Creek
Antelope Creek
Cold Fork
South Fork Cottonwood Creek
Mill Creek
Red Bank Creek
Big Dry Creek
Deer Creek
Oat Creek
Elder Creek
South Fork Elder Creek
Singer Creek
Pine Creek
Thomas Creek
Burch Creek
Sehorn Creek
Rock Creek
Mud Creek
Big Chico Creek
Stony Creek
Grindstone Creek
Wilson Creek
Walker Creek
South Fork Willow Creek
Little Dry Creek
Logan Creek
Willow Creek
Funks Creek
Little Stony Creek
Grapevine Creek
Snake River
Salt Creek
Cortina Creek
Sand Creek
Sutter Bypass
Figure A-20. Middle Sacramento Region- Köppen Climate
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer


Cannabis Policy Region Location in California
Sources: CALTRANS, SWRCB, PRISM
USGS, ESRI, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16
Miles
McCloud River
Squaw Creek
Pit River
Clear Creek
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Redding
47300
Cow Creek
Butte Creek
North Fork Battle Creek
Digger Creek
South Fork Battle Creek
Battle Creek
Cottonwood Creek
Beegum Creek
46975
Paynes Creek
North Fork Antelope Creek
Antelope Creek
Wells Creek
Dry Creek
Cold Fork
South Fork Cottonwood Creek
Red Bluff
47292
Mill Creek
Red Bank Creek
Oat Creek
Elder Creek
Big Dry Creek
Deer Creek
South Fork Elder Creek
Singer Creek
Pine Creek
Thomas Creek
Burch Creek
Sehorn Creek
Rock Creek
Mud Creek
Big Chico Creek
Stony Creek
Grindstone Creek
41716
Wilson Creek
Walker Creek
South Fork Willow Creek
Willow Creek
Little Dry Creek
Willows
Oroville
Logan Creek
42640
Funks Creek
Grapevine Creek
Little Stony Creek
Snake River
41948
Colusa
Yuba City
Marysville
Salt Creek
Cortina Creek
Sand Creek
Sutter Bypass
44591
Woodland
Figure A-21. Middle Sacramento Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16
Miles
Clear Creek
Redding
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Cow Creek
North Fork Battle Creek
Digger Creek
Battle Creek
South Fork Battle Creek
Cottonwood Creek
Beegum Creek
Paynes Creek
Dry Creek
Wells Creek
North Fork Antelope Creek
South Fork Cottonwood Creek
Antelope Creek
Cold Fork
Mill Creek
Red Bluff
Red Bank Creek
Big Dry Creek
Deer Creek
Oat Creek
Elder Creek
South Fork Elder Creek
Singer Creek
Thomas Creek
Burch Creek
Pine Creek
Sehorn Creek
Rock Creek
Mud Creek
Big Chico Creek
Stony Creek
Butte Creek
Grindstone Creek
Wilson Creek
Walker Creek
South Fork Willow Creek
Willow Creek
Little Dry Creek
Willows
Oroville
Logan Creek
Sacramento River
Grapevine Creek
Funks Creek
Snake River
Little Stony Creek
Colusa
Salt Creek
Yuba City
Marysville
Cortina Creek
Sand Creek
Woodland
Figure A-22. Middle Sacramento Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Water Boards
Scale 1:1,000,000
0 2 4 8 12 16
Miles
Pit River
McCloud River
Squaw Creek
Clear Creek
Little Cow Creek
Oak Run Creek
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
North Fork Bear Creek
Manzanita Creek
Butte Creek
Redding
Cow Creek
Cottonwood Creek
Battle Creek
North Fork Battle Creek
Digger Creek
South Fork Battle Creek
Beegum Creek
Wells Creek
Dry Creek
Paynes Creek
North Fork Antelope Creek
Antelope Creek
Mill Creek
Cold Fork
South Fork Cottonwood Creek
Red Bluff
Red Bank Creek
Oat Creek
Elder Creek
Big Dry Creek
Deer Creek
South Fork Elder Creek
Singer Creek
Pine Creek
Thomas Creek
Burch Creek
Sehorn Creek
Rock Creek
Mud Creek
Big Chico Creek
Stony Creek
Grindstone Creek
Wilson Creek
Walker Creek
South Fork Willow Creek
Willow Creek
Willows
Little Dry Creek
Oroville
Logan Creek
Funks Creek
Grapevine Creek
Little Stony Creek
Snake River
Colusa
Salt Creek
Yuba City
Marysville
Cortina Creek
Sand Creek
Sutter Bypass
Woodland
151
273
44
36
172
32
191
149
70
162
99
20
45
5
65
113
505
80
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area, based on the "Extant- Expert Opinion" range data in the U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Sacramento River winter-run Chinook salmon
-Central Valley spring-run Chinook salmon
-California Central Valley steelhead
Federal Species of Concern and/or CA Species of Special Concern
-Central Valley fall-run Chinook salmon
-Central Valley late fall-run Chinook salmon
Figure A-23. Middle Sacramento Region- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*

1.5 South Sacramento Region

The South Sacramento Region covers approximately 14,195 square miles in central California, as shown in attached (Figure A-24). Elevations in this region range from below sea level in the Sacramento-San Joaquin River Delta, to over 8,000 feet along the crest of the Sierra Nevada mountains~~; please~~. Please refer to ~~over 10,400 feet at the peak of Mt. Lassen (~~Figure A-25~~)~~ for an elevation map of the region. The Middle Sacramento region includes the lower Sacramento River watershed, from its confluence with the Feather River to confluence of the Sacramento-San Joaquin River Delta and the San Francisco Bay. Several major tributaries to the Sacramento River are located in this region, including Putah Creek and Cache Creek, which drain the eastern side of the Coast Ranges and enter the Sacramento River from the west, and the Feather, Yuba, and American Rivers, which drain the western side of the Sierra Nevada and enter the Sacramento River from the east.

1.5.1 Climate and Precipitation

The climate of the South Sacramento Region varies with elevation, and generally grades from west to east. There are significant climatic, temperature, and precipitation differences between the Coast Ranges, Central Valley, western side of the Sierra Nevada mountains, and eastern side of the Sierra Nevada mountains. The Coast Ranges and Central Valley, located in the western and central portion of the South Sacramento Region, are characterized by a Mediterranean climate with hot summers. The Sierra Nevada foothills, located to the east of the Central Valley, are characterized by a Mediterranean climate with cool summers. The northern and eastern margins of the Sierra Nevada mountains are characterized as cool continental with dry summers. Please refer to ~~(~~Figure A-26~~)~~ for a climatic map of the South Sacramento Region.

In general, the western portion of the South Sacramento Region, which includes the Coast Ranges and Central Valley, exhibit higher average annual maximum and higher average annual minimum temperatures compared to the eastern portion of the region, which includes the Sierra Nevada. The western portion of the Sierra Nevada mountains also exhibits higher average annual maximum and higher average annual minimum temperatures compared to the eastern portion of the Sierra Nevada mountains. Average annual maximum temperatures in the Central Valley and Coast Ranges portions of the South Sacramento Region tend to exceed 75 degrees Fahrenheit, while average annual maximum temperatures at higher elevations in the Sierra Nevada mountains tend to exceed 50 degrees Fahrenheit. Average annual minimum temperatures tend to remain above 45 degrees Fahrenheit throughout the Central Valley and Sierra Nevada foothills, while average annual minimum temperatures tend to remain below freezing at high elevation areas in the Sierra Nevada.

In the South Sacramento Region, precipitation generally falls from November through April. Average annual precipitation amounts in the South Sacramento Region vary greatly between the Coast Ranges, Central Valley, and Sierra Nevada mountains. Up to 60 inches of precipitation tends to fall annually in the Coast Ranges, less than 15 inches of precipitation tends to fall annually in the southern portion of the South Sacramento Region, and over 80 inches of precipitation tends to fall annually along the Sierra Nevada crest. East of the Sierra Nevada crest, less than 15 inches of precipitation tends to fall annually, which is a result of the rain shadow effect. Significant amounts of precipitation tend to fall as snow in the Sierra Nevada mountains, and snowfall depths are typically higher in the northern Sierra Nevada mountains compared to the southern Sierra Nevada mountains. Average snowfall totals in the Sierra Nevada mountain portion of the Southern Sacramento Region vary from nearly 190 inches at Mount Lassen, located at the northern boundary of the region, to nearly 400 inches at Echo Summit south of Lake Tahoe. (WRCC 2016)

Please refer to ~~(~~Figure A-27~~)~~ for a precipitation map of the Southern Sacramento Region. Please refer to Charts A-8, A-9 and A-10, below, for illustrations of the typical precipitation and temperature patterns across the region.

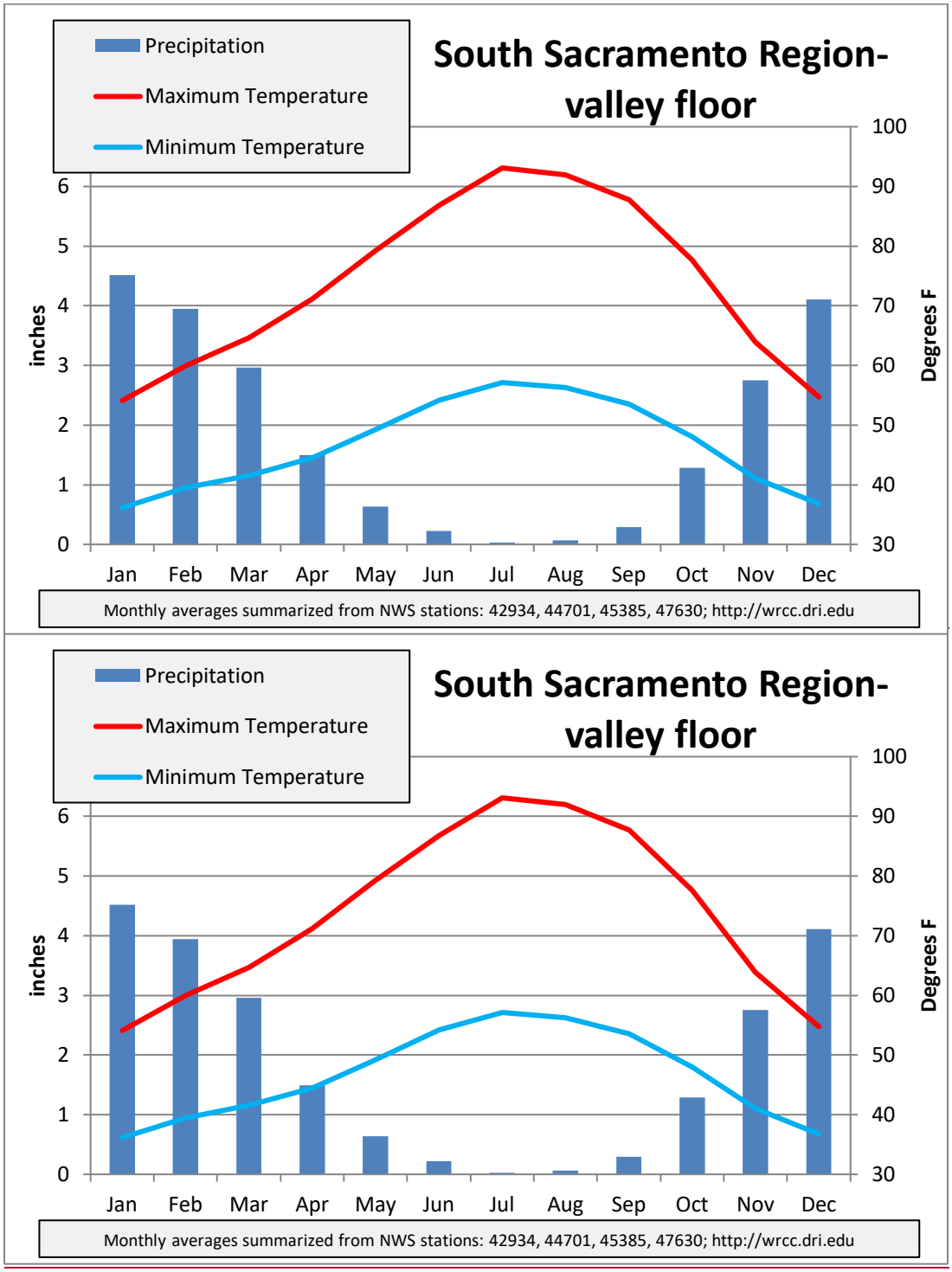
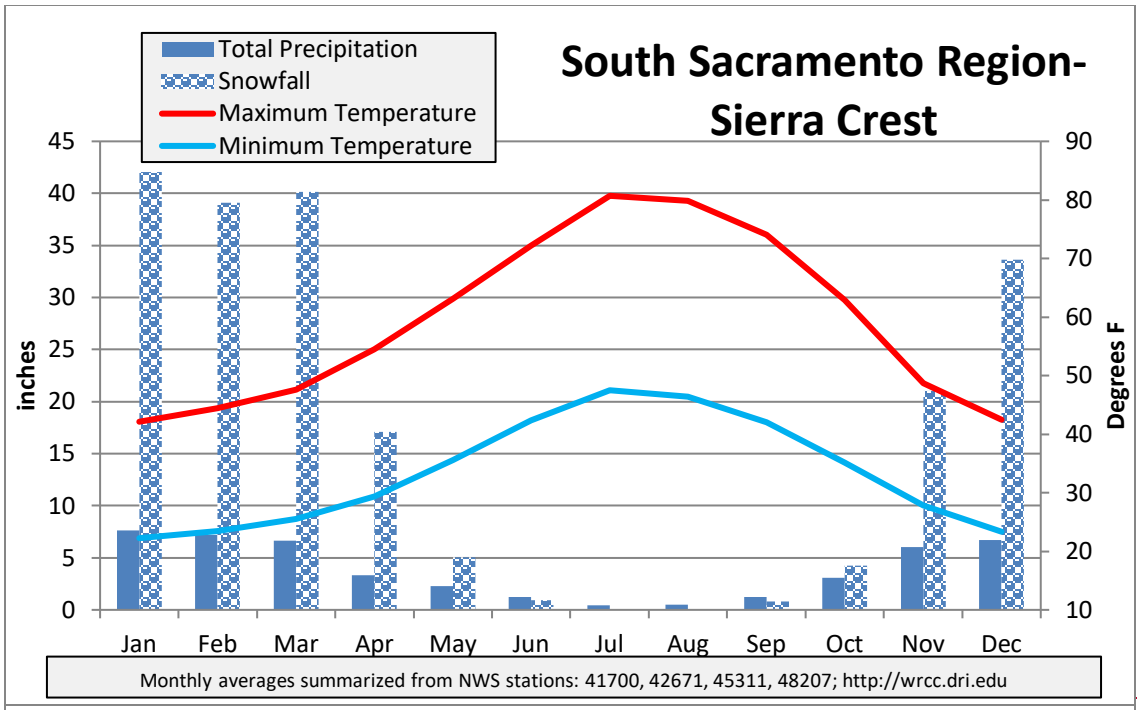


Chart A-8. Average annual patterns of temperature and precipitation in the South Sacramento Region, valley floor.



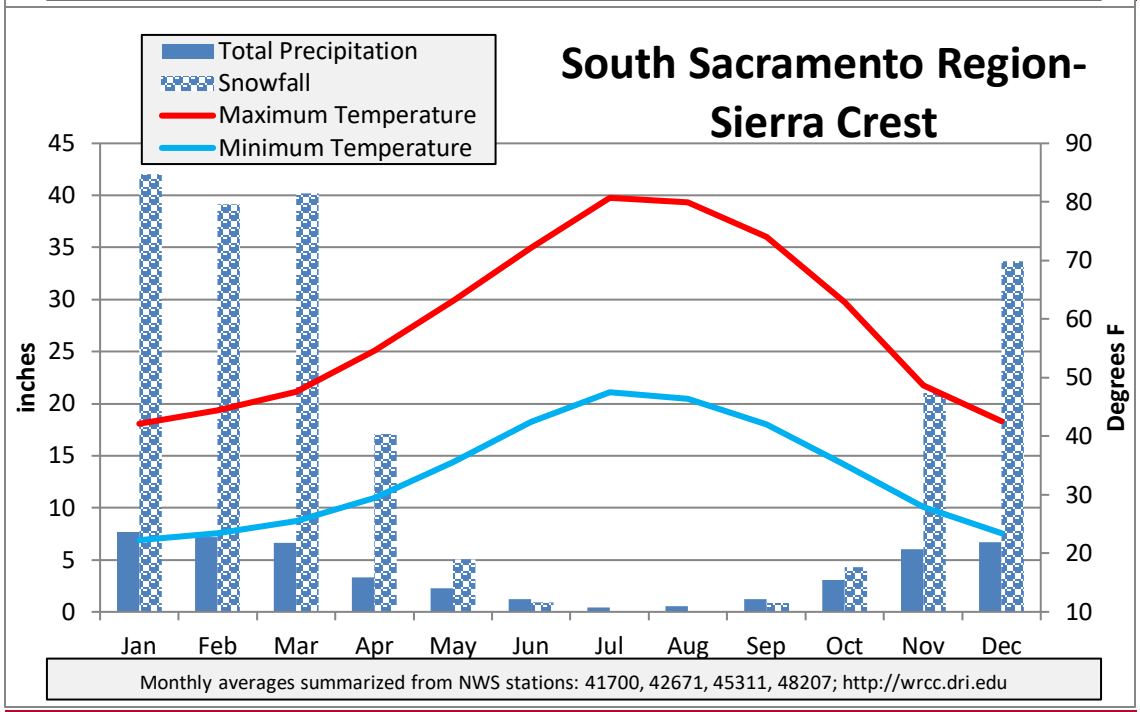
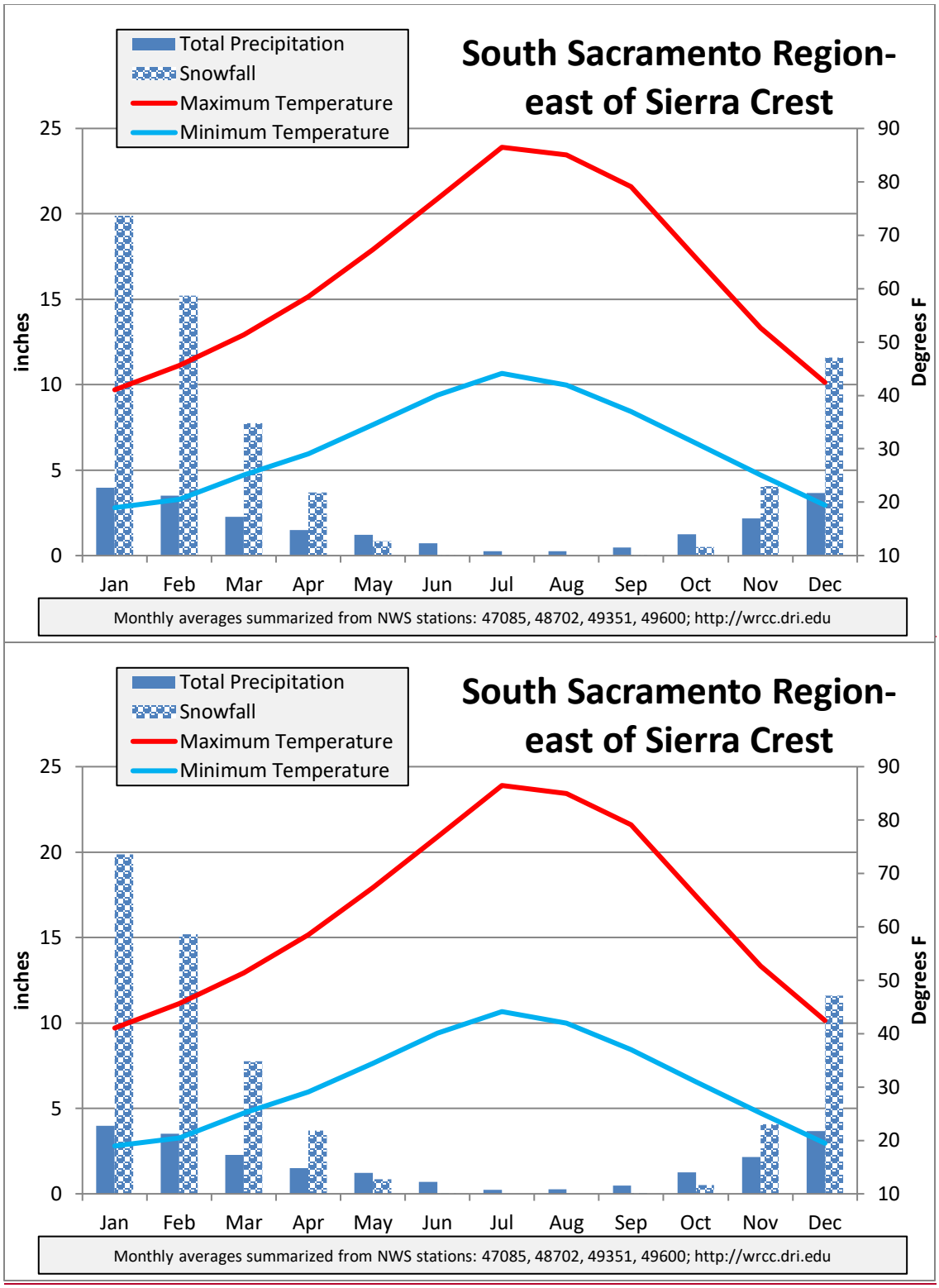


Chart A-9. Average annual patterns of temperature and precipitation in the South Sacramento Region, Sierra Crest.



Total Precipitation
Snowfall
Maximum Temperature
Minimum Temperature
South Sacramento Region-
east of Sierra Crest
inches
Degrees F
0
5
10
15
20
25
10
20
30
40
50
60
70
80
90
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Monthly averages summarized from NWS stations: 47085, 48702, 49351, 49600; http://wrcc.dri.edu

Chart A-10. Average annual patterns of temperature and precipitation in the South Sacramento Region, east of Sierra Crest.

1.5.2 Hydrology

The hydrology of South Sacramento Region stream reaches varies greatly from west to east, and several UC Davis hydrologic classifications exist for stream reaches in this region. Streams in the northwestern portion of the South Sacramento Region, which includes the Coast Ranges, are primarily classified as Rain and Seasonal Groundwater (RSG) or Perennial Groundwater and Rain (PGR) systems. The central portion of the South Sacramento Region, which includes the Central Valley and Sierra Nevada foothills, are dominated by Winter Storms (WS) and Rain and Seasonal Groundwater (RSG) systems. The eastern portion of the South Sacramento Region, which includes the Sierra Nevada, is dominated by Low-Volume Snowmelt and Rain (LSR) systems. Several main rivers, including the Sacramento River on the valley floor, are characterized as High-Volume Snowmelt and Rain (HSR) systems. ~~Please refer to (Figure A-28) for a depiction of the stream classifications within the Southern Sacramento Region. (Lane et al 2016)~~(Lane et al 2016)

Please refer to Figure A-28 for a depiction of the stream classifications within the Southern Sacramento Region.

1.5.3 Geology

The South Sacramento Region is primarily located in the Coast Ranges, Great Valley, and Sierra Nevada geomorphic provinces. The Coast Ranges, located in the western portion of the South Sacramento Region, contain irregular, knobby, landslide topography. The Coast Ranges contain sedimentary and metamorphic rock, and alluvial deposits in valley areas. The Great Valley geomorphic province, located in the center of this region and corresponding to the Sacramento Valley, consists of a large alluvial plain. The Sierra Nevada geomorphic province, located in the eastern portion of this region, contains steep mountains underlain by a granitic batholith. The foothill region of the Sierra Nevada geomorphic province are comprised of metamorphic rocks. Small portions of the northeastern portion of the South Sacramento Region are also located in the Cascade Range and the Basin and Range geomorphic provinces. (CGS, 2002)

1.5.4 Anadromous Salmonid Population

Six special-status ESUs, DPSes, or DTEs are currently extant within the South Sacramento Region (Figure A-29):

- the SRWR Chinook salmon ESU,
- the CV SR Chinook salmon ESU,
- the CV FR of Chinook salmon DTE[5],
- the CV LFR of Chinook salmon DTE,
- the CCV steelhead DPS, and
- the Central California Coast (CCC) steelhead DPS.

The SRWR Chinook salmon ESU is currently listed as endangered under the ESA and the CESA (CDFW 2017b). The CV SR Chinook salmon ESU, CCV steelhead DPS, and the CCC steelhead DPS are currently listed as threatened under the ESA (CDFW 2017b). In addition, the CV SR Chinook salmon ESU is listed as threatened under the CESA (CDFW 2017b). The CV FR and CV LFR Chinook salmon populations are each listed as species of special concern by CDFW and, jointly, as a species of concern by NMFS (Moyle et al. 2015, NMFS 2017).

[5] CV FR and CV LFR Chinook salmon together constitute a single ESU; however, CDFW treats the two runs as distinct taxonomic entities based upon their distinct life-history strategies and in consideration of the unique management concerns of each run (Moyle et al. 2015).

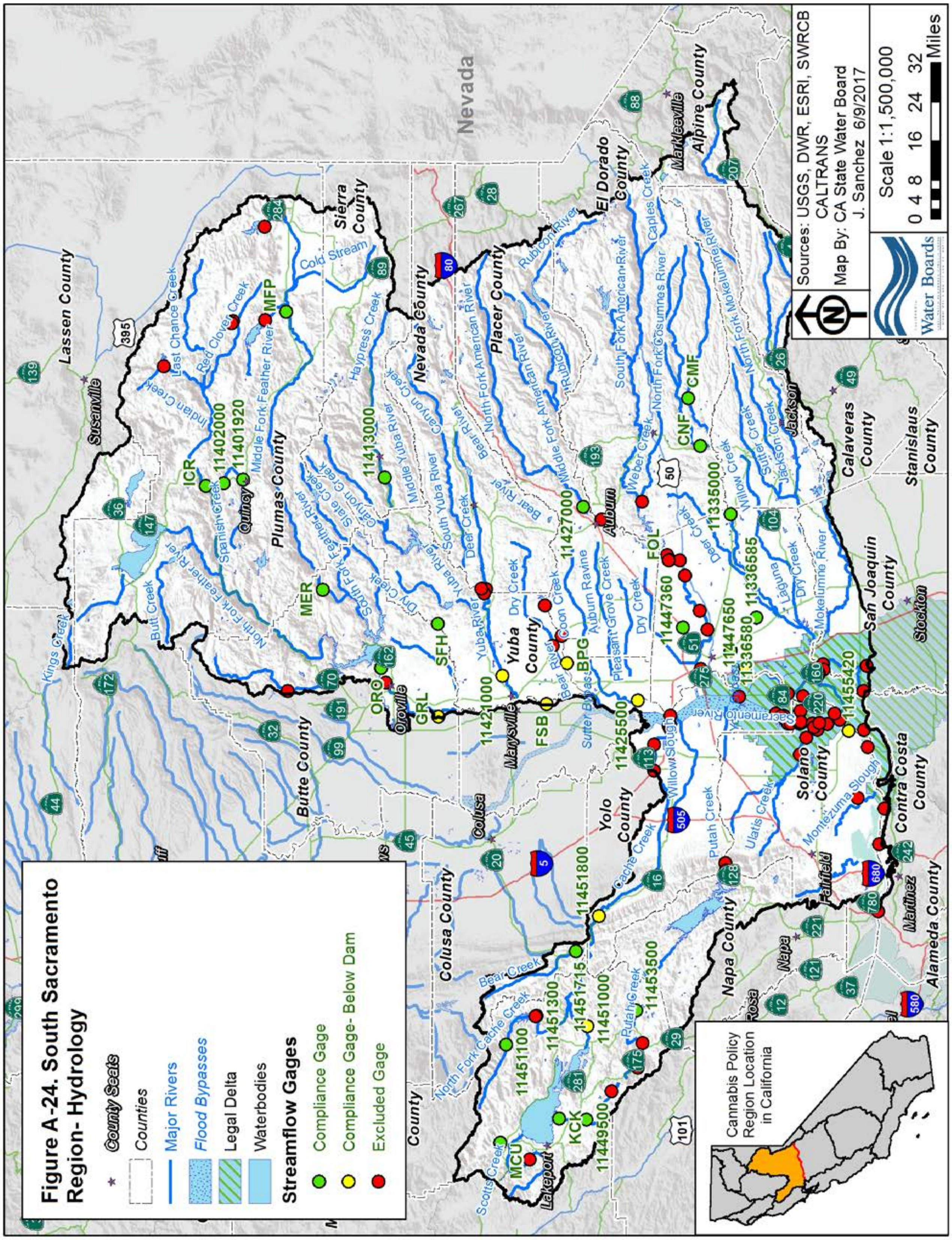


Figure A-24. South Sacramento Region- Hydrology
County Seats
Counties
Major Rivers
Flood Bypasses
Legal Delta
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Cannabis Policy Region Location in California
Water Boards

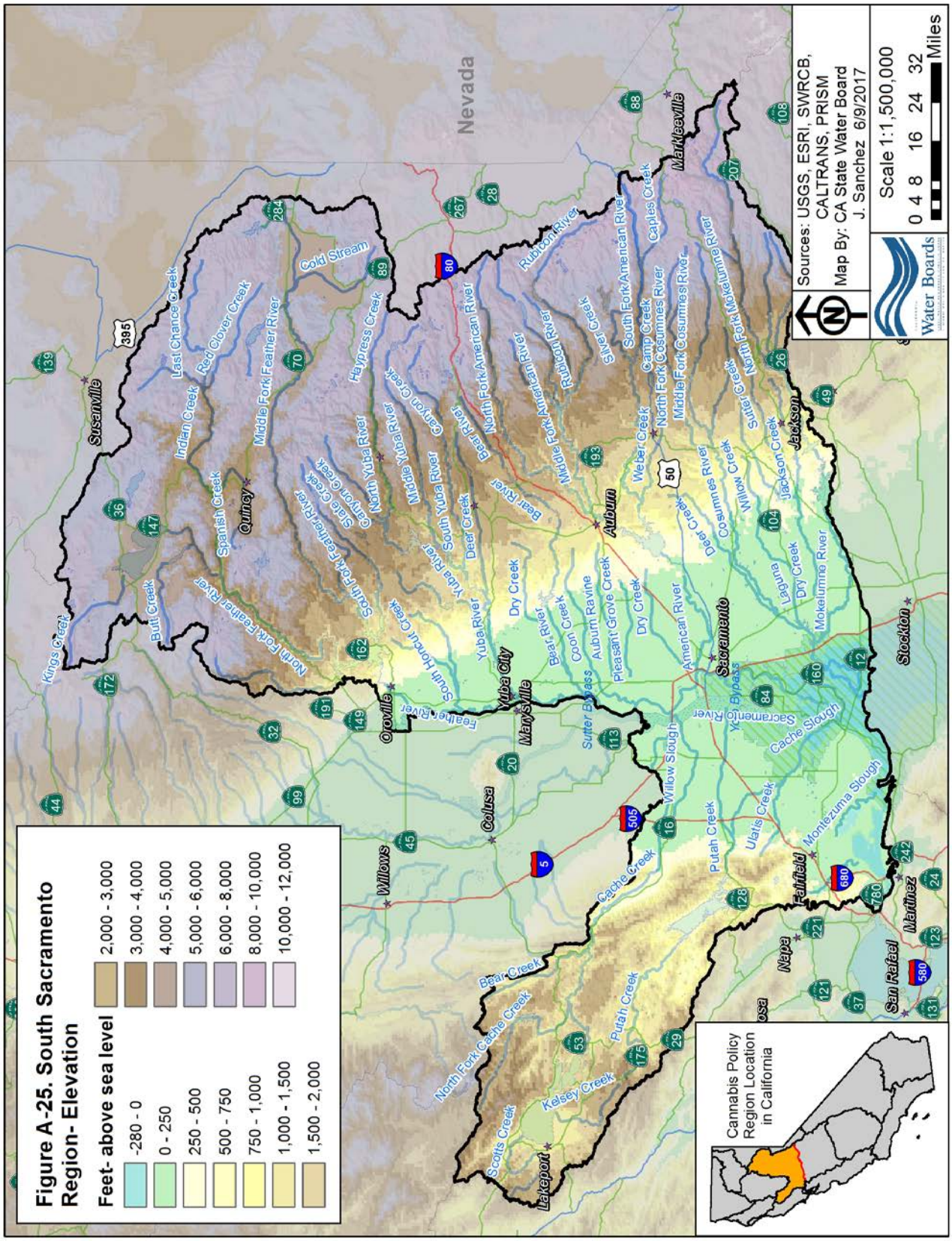


Figure A-25. South Sacramento Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
Nevada
Susanville
Quincy
Oroville
Yuba City
Marysville
Auburn
Sacramento
Stockton
Jackson
Markleeville
Colusa
Willows
Lakeport
Fairfield
Napa
San Rafael
Martinez
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CALTRANS, PRISM
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32
Miles
Water Boards

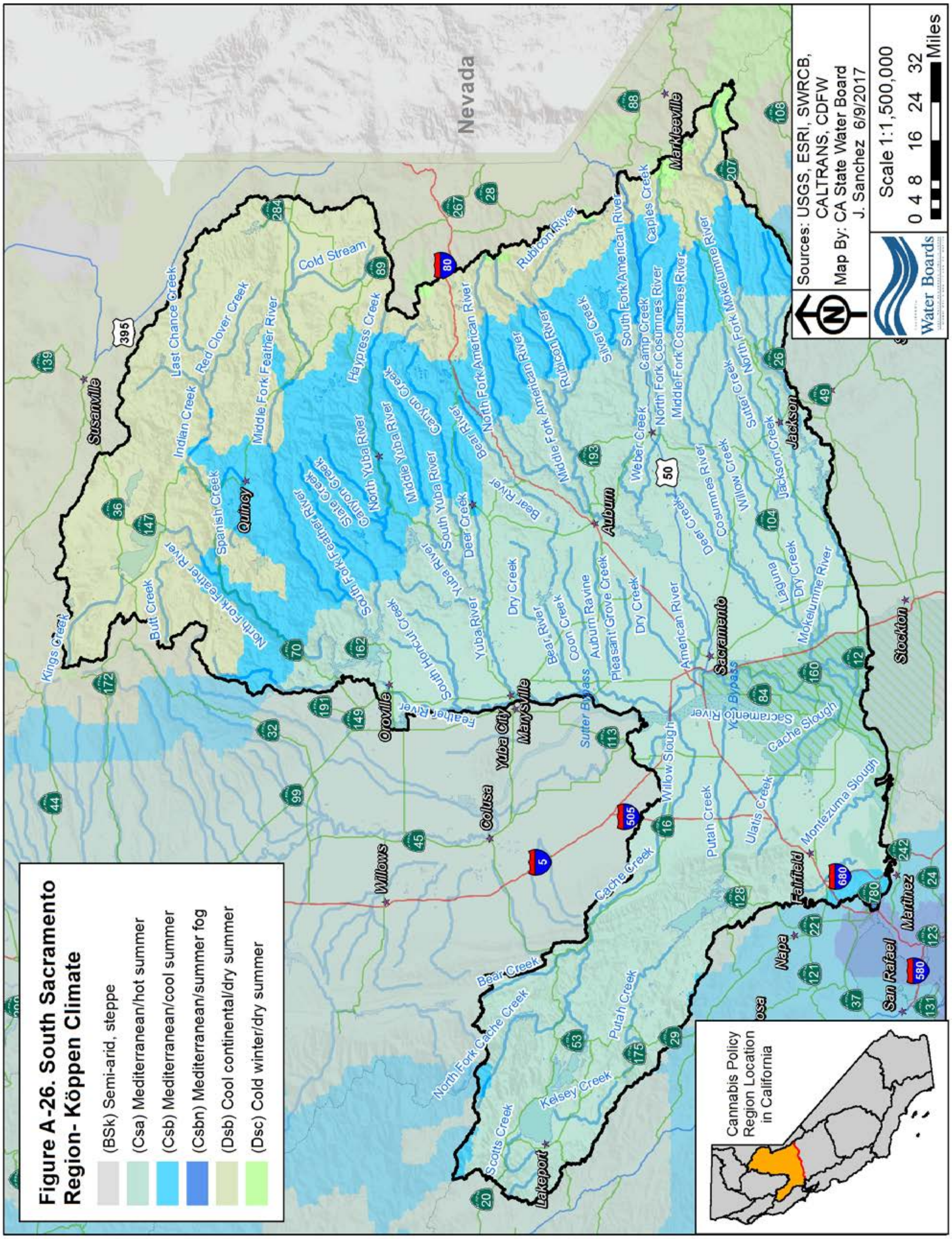


Figure A-26. South Sacramento Region- Köppen Climate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
Sources: USGS, ESRI, SWRCB, CALTRANS, CDFW
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Water Boards
Cannabis Policy Region Location in California
Nevada
Sacramento
Stockton
Auburn
Marysville
Yuba City
Oroville
Colusa
Willows
Quincy
Susanville
Lakeport
Fairfield
Napa
Martinez
San Rafael
Jackson
Markleeville

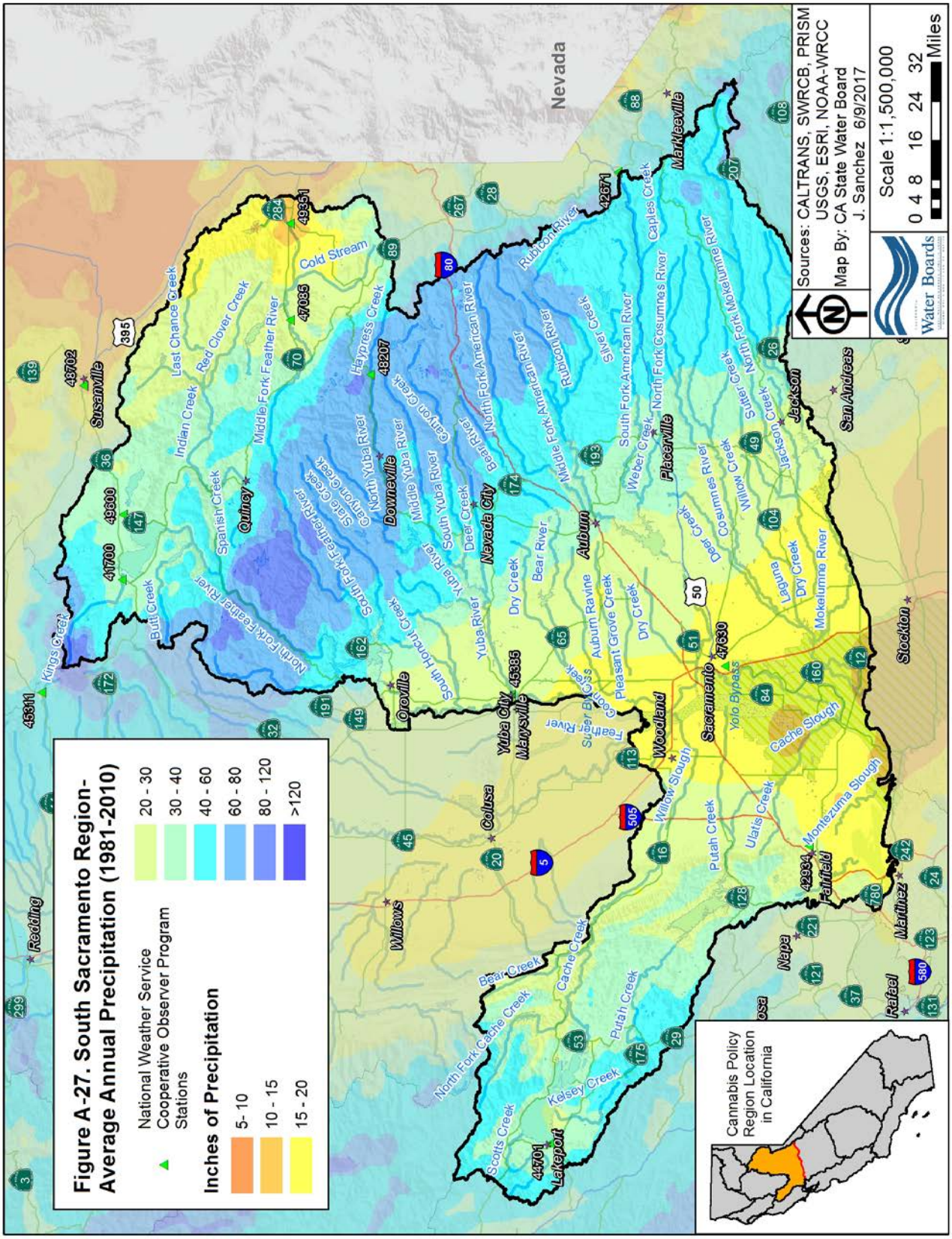


Figure A-27. South Sacramento Region-
Average Annual Precipitation (1981-2010)
National Weather Service
Cooperative Observer Program
Stations
Inches of Precipitation
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Nevada
Redding
Susanville
Quincy
Downieville
Nevada City
Auburn
Placerville
Markleeville
Jackson
San Andreas
Oroville
Yuba City
Marysville
Woodland
Sacramento
Stockton
Colusa
Willows
Fairfield
Napa
Martinez
Rafael
Lakeport
Kings Creek
Butt Creek
North Fork Feather River
Spanish Creek
Last Chance Creek
Indian Creek
Red Clover Creek
Middle Fork Feather River
Cold Stream
Haypress Creek
Slate Creek
Sanyon Creek
South Fork Feather River
North Yuba River
Canyon Creek
Middle Yuba River
South Yuba River
Yuba River
South Honcut Creek
Deer Creek
Bear River
North Fork American River
Rubicon River
Middle Fork American River
Silver Creek
South Fork American River
Weber Creek
North Fork Cosumnes River
Caples Creek
Rubicon River
Auburn Ravine
Pleasant Grove Creek
Dry Creek
Bear River
Dry Creek
Cosumnes River
Deer Creek
Willow Creek
Sutter Creek
North Fork Mokelumne River
Jackson Creek
Laguna
Dry Creek
Mokelumne River
Cache Slough
Yolo Bypass
Willow Slough
Putah Creek
Ulatis Creek
Montezuma Slough
Bear Creek
Cache Creek
North Fork Cache Creek
Putah Creek
Kelsey Creek
Scotts Creek
Sutter Bypass
Feather River
Sources: CALTRANS, SWRCB, PRISM
USGS, ESRI, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32
Miles
Water Boards
Cannabis Policy
Region Location
in California

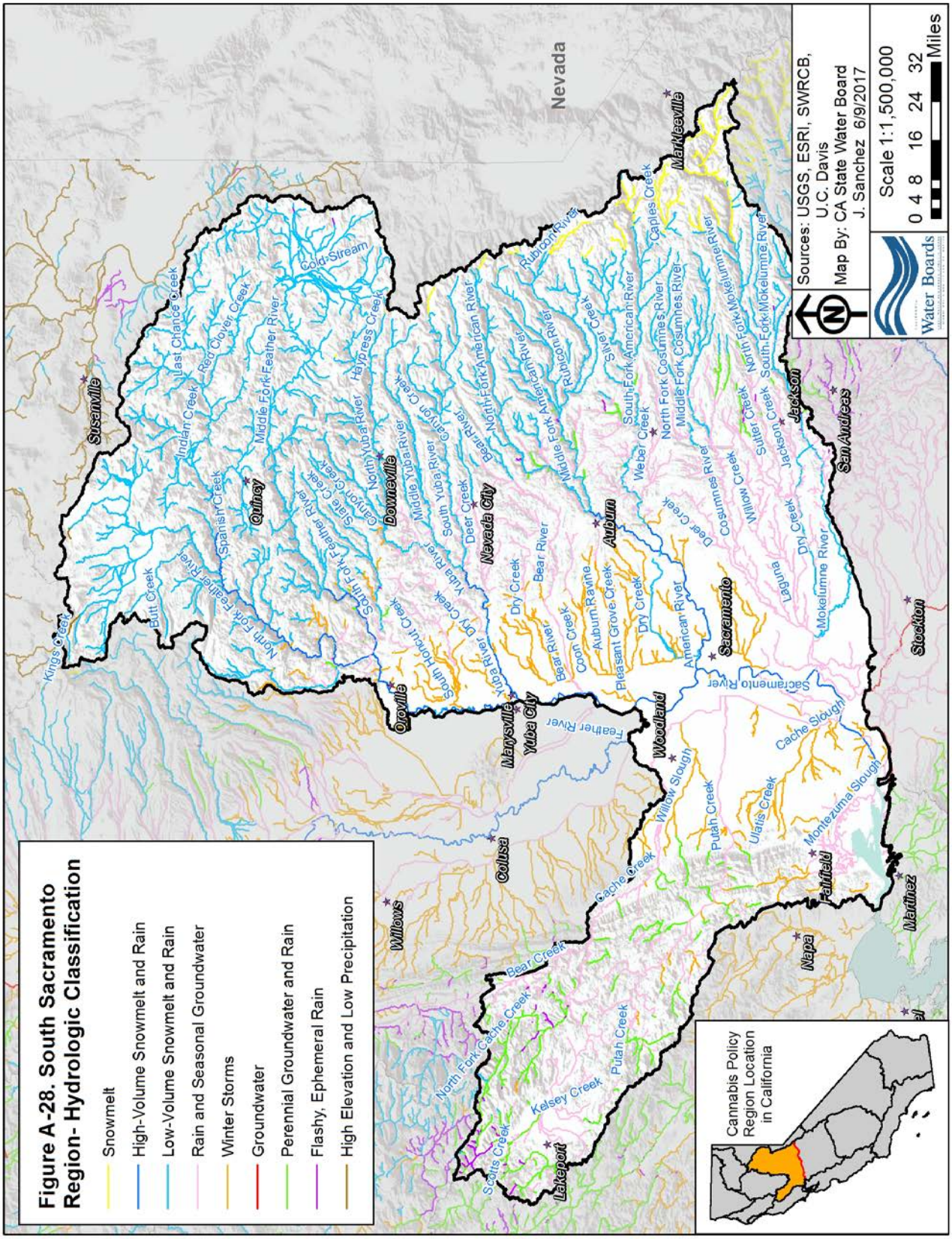


Figure A-28. South Sacramento Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Nevada
Susanville
Quincy
Downieville
Nevada City
Auburn
Markleeville
Jackson
San Andreas
Oroville
Marysville
Yuba City
Woodland
Sacramento
Stockton
Colusa
Willows
Fairfield
Napa
Martinez
Lakeport
Kings Creek
Butt Creek
North Fork Feather River
Spanish Creek
Indian Creek
Last Chance Creek
Red Clover Creek
Middle Fork Feather River
Cold Stream
Haypress Creek
North Yuba River
Canyon Creek
South Fork Feather River
State Creek
Middle Yuba River
South Yuba River
Oregon Creek
Deer Creek
Yuba River
South Fork Yuba River
Dry Creek
Bear River
North Fork American River
Middle Fork American River
Rubicon River
Silver Creek
South Fork American River
Weber Creek
Caples Creek
North Fork Cosumnes River
Middle Fork Cosumnes River
Cosumnes River
Deer Creek
Willow Creek
Sutter Creek
North Fork Mokelumne River
South Fork Mokelumne River
Jackson Creek
Dry Creek
Laguna
Mokelumne River
Auburn Ravine
Coon Creek
Pleasant Grove Creek
American River
Feather River
Sacramento River
Cache Slough
Willow Slough
Putah Creek
Ulatis Creek
Montezuma Slough
Cache Creek
Bear Creek
North Fork Cache Creek
Kelsey Creek
Scotts Creek
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Water Boards
Scale 1:1,500,000
0 4 8 16 24 32
Miles

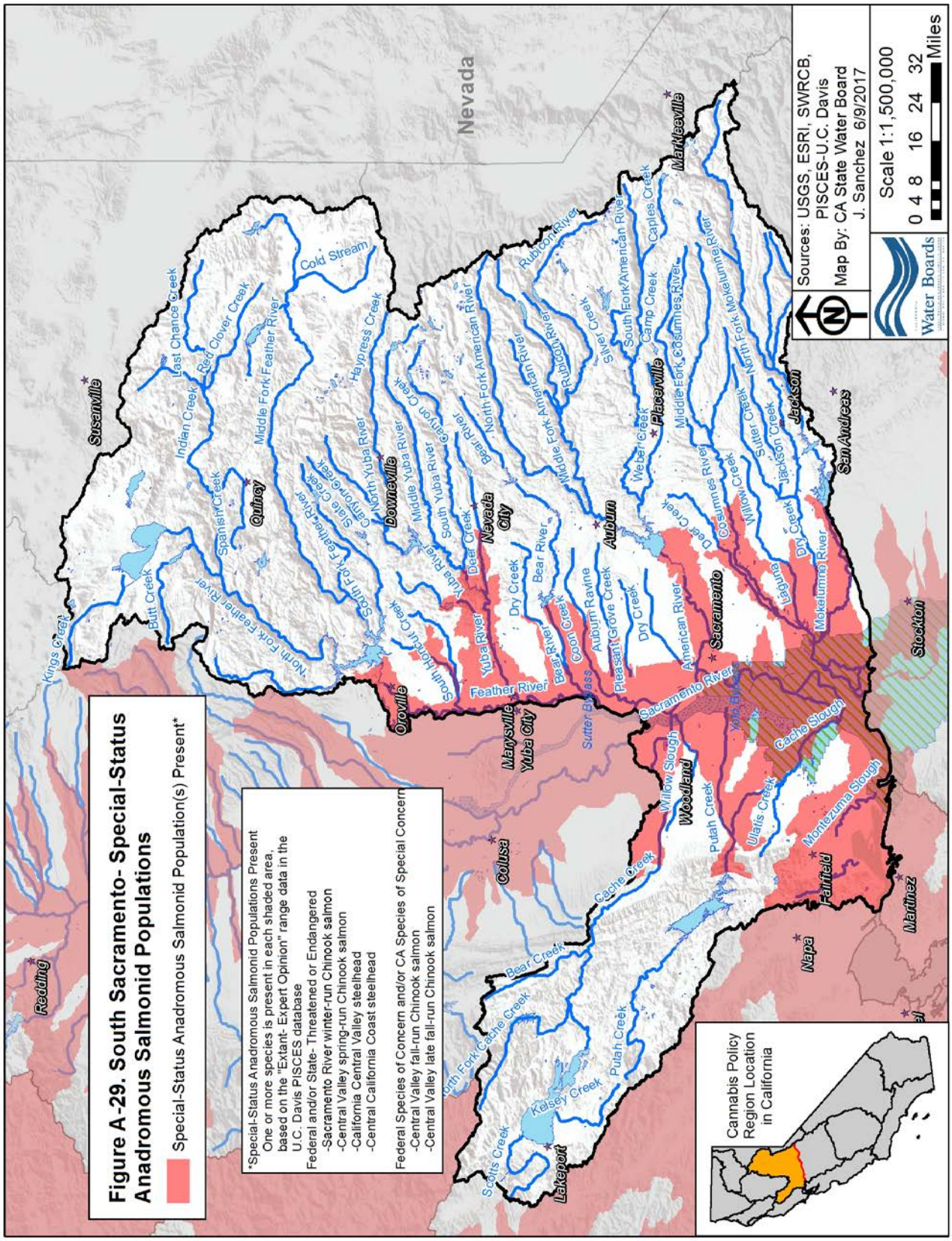


Figure A-29. South Sacramento- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area,
based on the "Extant- Expert Opinion" range data in the
U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Sacramento River winter-run Chinook salmon
-Central Valley spring-run Chinook salmon
-California Central Valley steelhead
-Central California Coast steelhead
Federal Species of Concern and/or CA Species of Special Concern
-Central Valley fall-run Chinook salmon
-Central Valley late fall-run Chinook salmon
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Water Boards
Nevada
Susanville
Redding
Quincy
Downieville
Nevada City
Auburn
Placerville
Markleeville
Jackson
San Andreas
Oroville
Marysville
Yuba City
Sacramento
Stockton
Woodland
Colusa
Fairfield
Napa
Martinez
Lakeport
Feather River
Yuba River
American River
Bear River
Cache Slough
Sacramento River

1.6 North Central Coast Region

The North Central Coast Region covers approximately 4,785 square miles along the north-central coast of California, as shown in attached (Figure A-30). This region is bordered by the San Francisco Bay to the south and by the Eel River to the north. Elevations in the North Central Coast Region range from sea level along the coast and near the San Francisco Bay, to over 2,000 feet in the Coast Ranges along the northeastern boundary of the region~~; please~~. Please refer to ~~(~~Figure A-31~~)~~ for an elevation map of the North Central Coast Region. Several watersheds are located in the North Central Coast Region, including the Russian, Mattole, Noyo, Big, Navarro, Garcia, and Gualala River watersheds which drain directly to the Pacific Ocean, and the Napa, and Petaluma River watersheds which drain into San Francisco Bay. The Russian River watershed is the largest watershed in the North Central Coast Region.

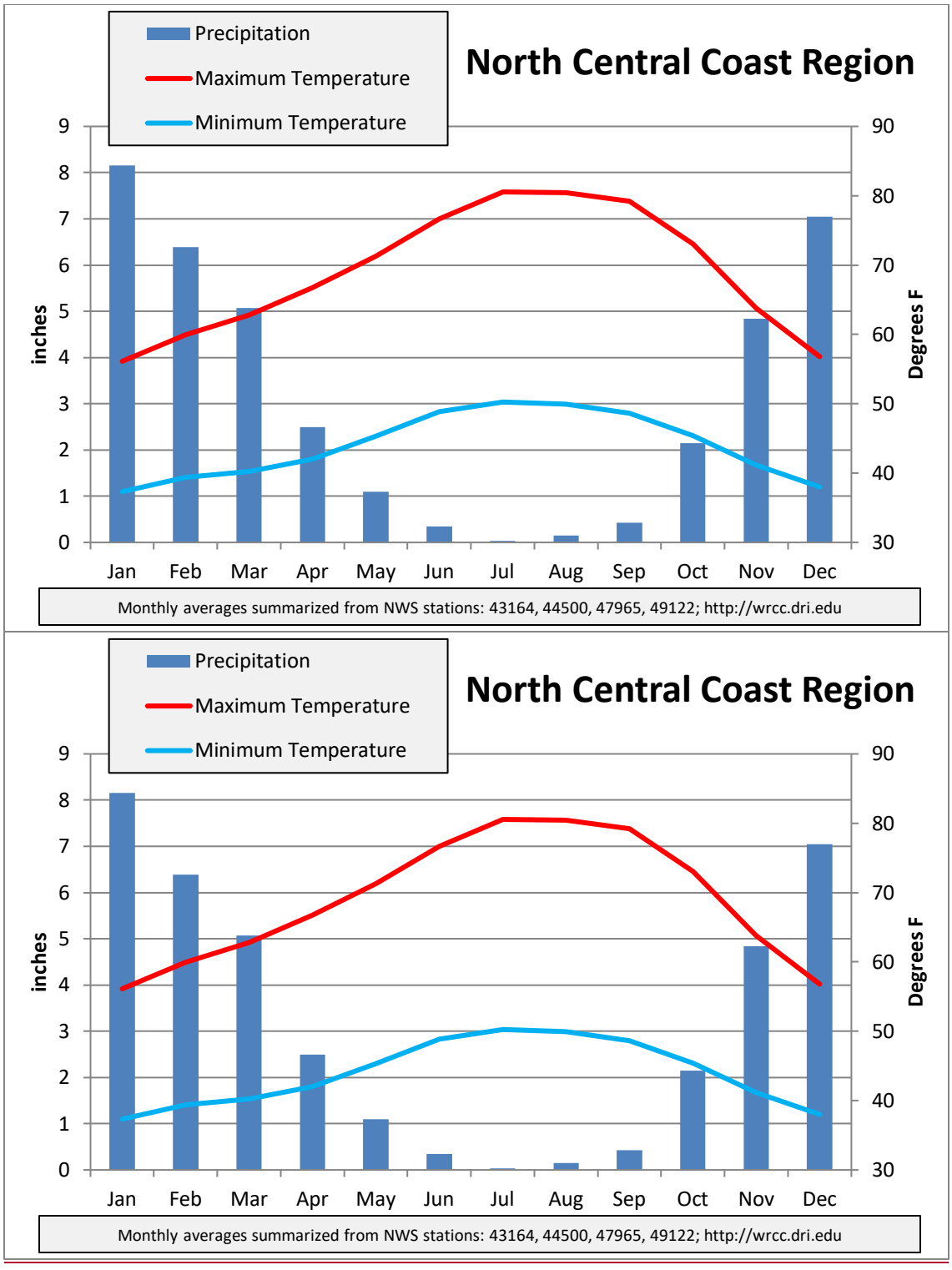
1.6.1 Climate and Precipitation

The climate of the North Central Coast Region is described as Mediterranean with hot summers in inland areas, and Mediterranean with cooler summers in the coastal portions of the region. Summer fog is common along the coast in this region. Please refer to ~~(~~Figure A-32~~)~~ for a climate map of this region.

Temperature conditions tend to be more variable in the inland portion of the North Central Coast Region compared to areas near the coast. Average annual maximum temperatures in the North Central Coast Region exceed 70 degrees Fahrenheit in inland areas, and remain slightly cooler near the coast. Average annual minimum temperatures in the North Central Coast Region remain above 40-45 degrees Fahrenheit in both coastal and inland areas.

Precipitation in the North Central Coast Region tends to fall during October through April, and the greatest amounts of precipitation tend to fall in December and January. Average annual precipitation amounts in the North Central Coast Region vary from over 60 inches near the northern coast, to under 30 inches in the southeast portion of the region. Snow does not comprise a significant portion of precipitation to the region. (WRCC 2016)

Please refer to ~~(~~Figure A-33~~)~~ for a precipitation map of the region. Please refer to Chart A-11, below, for an illustration of temperature and precipitation patterns for the North Central Coast Region.



Precipitation
Maximum Temperature
Minimum Temperature
North Central Coast Region
inches
Degrees F
Monthly averages summarized from NWS stations: 43164, 44500, 47965, 49122; http://wrcc.dri.edu

Chart A-11. Average annual patterns of temperature and precipitation in the North Central Coast Region.

1.6.2 Hydrology

Stream reaches in the North Central Coast Region are generally classified under UC Davis' hydrologic classification system as Winter Storms (WS), Perennial Groundwater and Rain

(PGR), or Rain and Seasonal Groundwater (RSG) systems. Many North Central Coast Region stream reaches located near the coast, including tributaries to San Francisco Bay, are classified under the Winter Storm (WS) hydrologic regime. Many stream reaches located in the eastern, inland portion of the North Central Coast Region are classified under the PGR hydrologic regime, and a smaller amount of streams in this inland region are classified as RSG stream systems. (Lane et al 2016)

Please refer to (Figure A-34) for a stream classification map of the North Central Coast Region.

1.6.3 Geology

The North Central Coast Region is located in the Coast Ranges geomorphic province. The Coast Ranges in the North Coast Region are dominated by irregular, knobby, landslide topography. The Coast Ranges are underlain by sedimentary and metamorphic rock, with alluvial deposits in valley floors and along the coastline. The San Andreas Fault system is located near the western margin of the North Central Coast Region, and extends off of the California coast in the northern section of the region. (CGS 2002)

1.6.4 Anadromous Salmonid Population

Six special-status ESUs, DPSes, or DTEs are currently extant within the North Central Coast Region (Figure A-35):

- the CC Chinook salmon ESU,
- the CV SR Chinook salmon ESU,
- the NC steelhead DPS,
- the CCC steelhead DPS,
- the SONCC coho salmon ESU, and
- the Central California Coast (CCC) coho salmon ESU.

The CCC coho salmon ESU is currently listed as endangered under the ESA and the CESA (CDFW 2017b). The CC Chinook salmon ESU, CV SR Chinook salmon ESU, NC steelhead DPS, CCC steelhead DPS, and SONCC coho salmon ESU are all currently listed as threatened under the ESA (CDFW 2017b). In addition, the CV SR Chinook and SONCC coho salmon ESUs are currently listed as threatened under the CESA (CDFW 2017b).

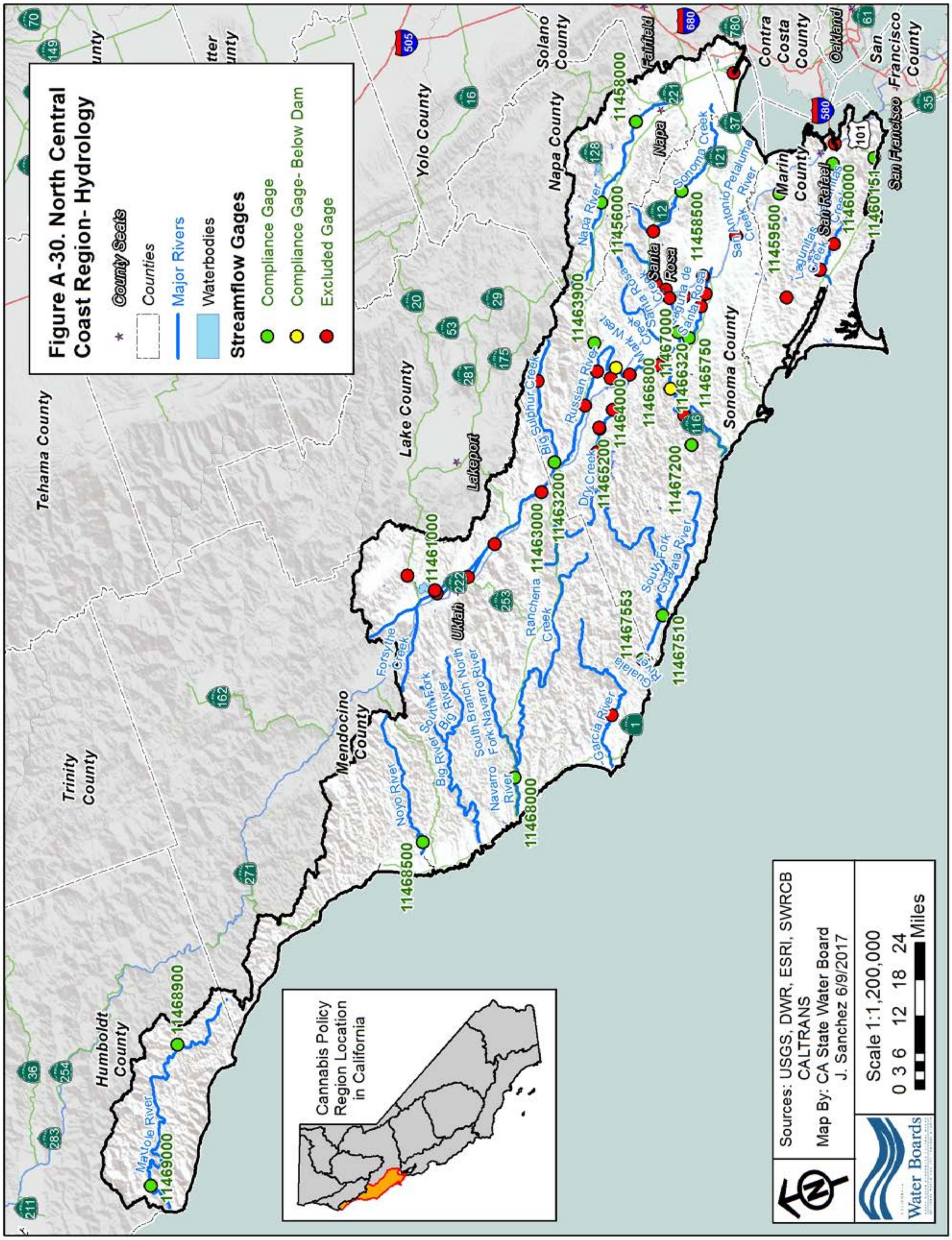


Figure A-30. North Central Coast Region- Hydrology
County Seats
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24 Miles
Water Boards
Tehama County
Trinity County
Humboldt County
Mendocino County
Lake County
Yolo County
Napa County
Solano County
Sonoma County
Marin County
Contra Costa County
San Francisco County
Lakeport
Ukiah
Santa Rosa
Napa
San Rafael
Fairfield
Oakland
San Francisco
11469000
11468900
11468500
11468000
11467510
11467553
11461000
11463000
11463200
11465200
11464000
11463900
11466800
11467000
11466320
11465750
11467200
11458500
11456000
11458000
11459500
11460000
11460151
Mattole River
Noyo River
Big River
South Fork Big River
Navarro River
South Branch North Fork Navarro River
Garcia River
Gualala River
South Fork Gualala River
Rancheria Creek
Forsythe Creek
Big Sulphur Creek
Russian River
Dry Creek
Mark West Creek
Santa Rosa Creek
Laguna de Santa Rosa
Napa River
Sonoma Creek
Petaluma River
San Antonio Creek
Lagunitas Creek

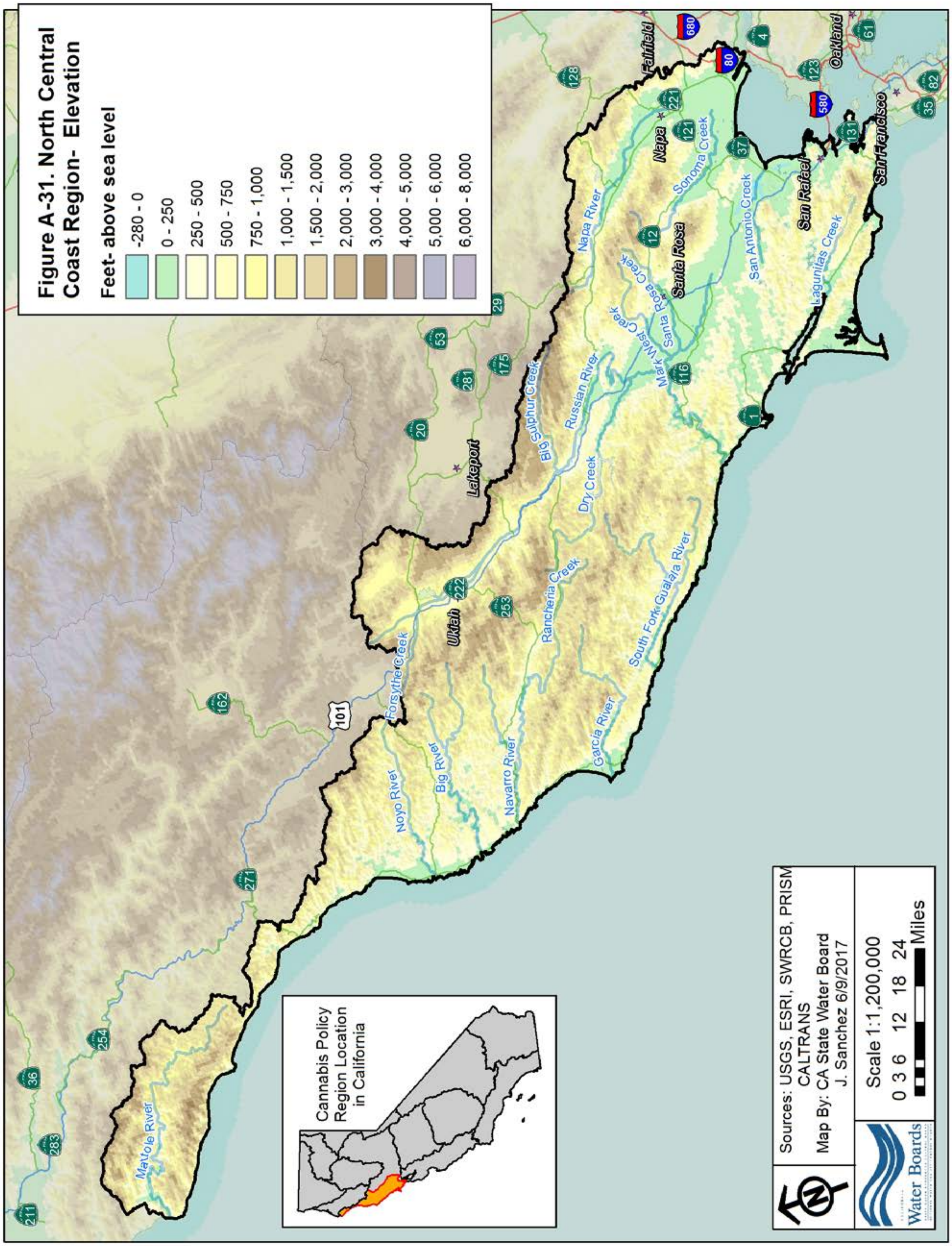


Figure A-31. North Central Coast Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24
Miles
Water Boards
Fairfield
Oakland
Napa
San Francisco
San Rafael
Santa Rosa
Lakeport
Ukiah
Napa River
Sonoma Creek
San Antonio Creek
Lagunitas Creek
Santa Rosa Creek
Mark West Creek
Russian River
Big Sulphur Creek
Dry Creek
Rancheria Creek
South Fork Gualala River
Garcia River
Navarro River
Big River
Noyo River
Forsythe Creek
Mattole River

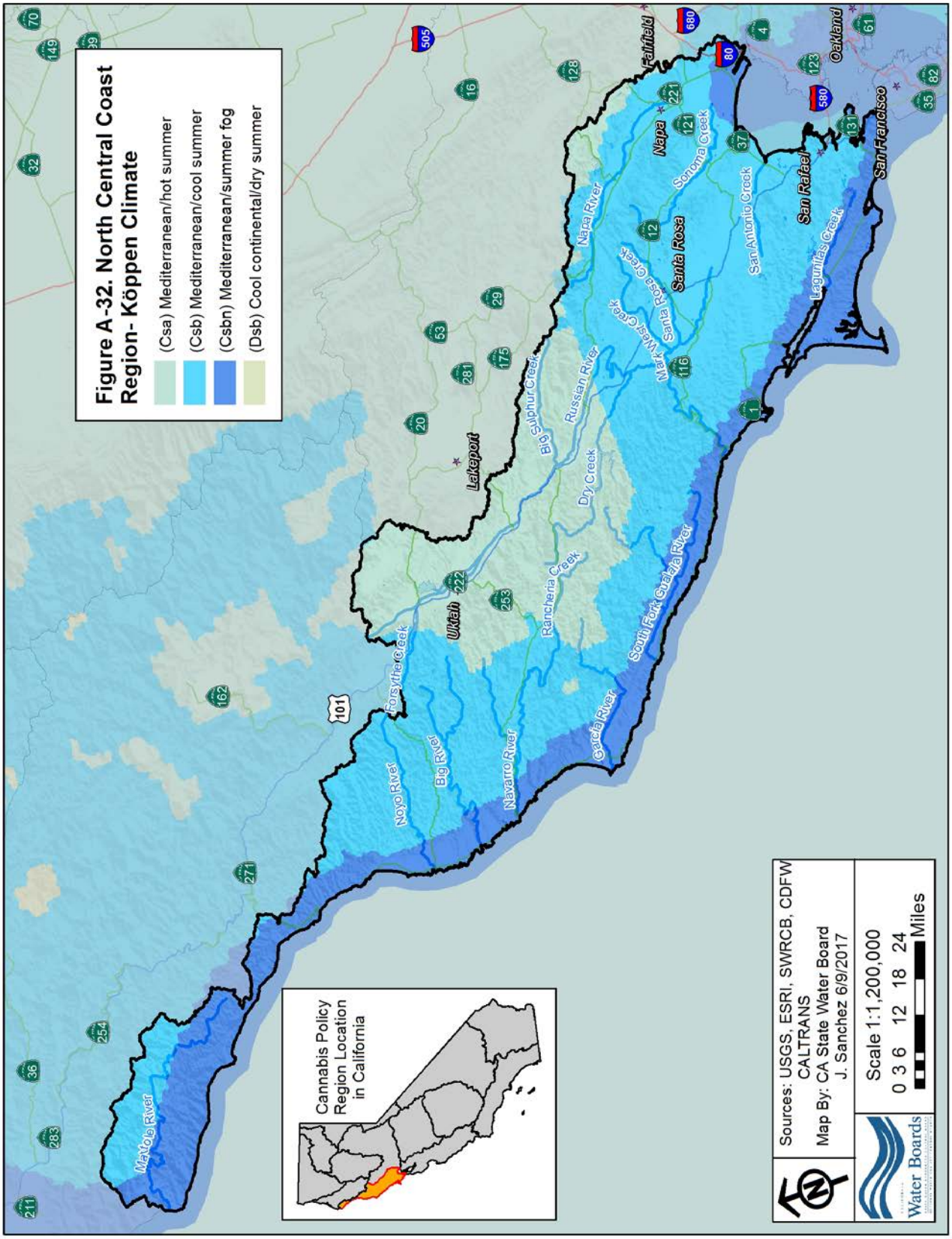


Figure A-32. North Central Coast Region- Köppen Climate
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CDFW CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24 Miles
Water Boards
Lakeport
Ukiah
Fairfield
Napa
Santa Rosa
San Rafael
Oakland
San Francisco
Russian River
Big Sulphur Creek
Dry Creek
Rancheria Creek
Forsythe Creek
Big River
Noyo River
Navarro River
Garcia River
South Fork Gualala River
Mark West Creek
Santa Rosa Creek
Napa River
Sonoma Creek
San Antonio Creek
Lagunitas Creek
Mattole River
101

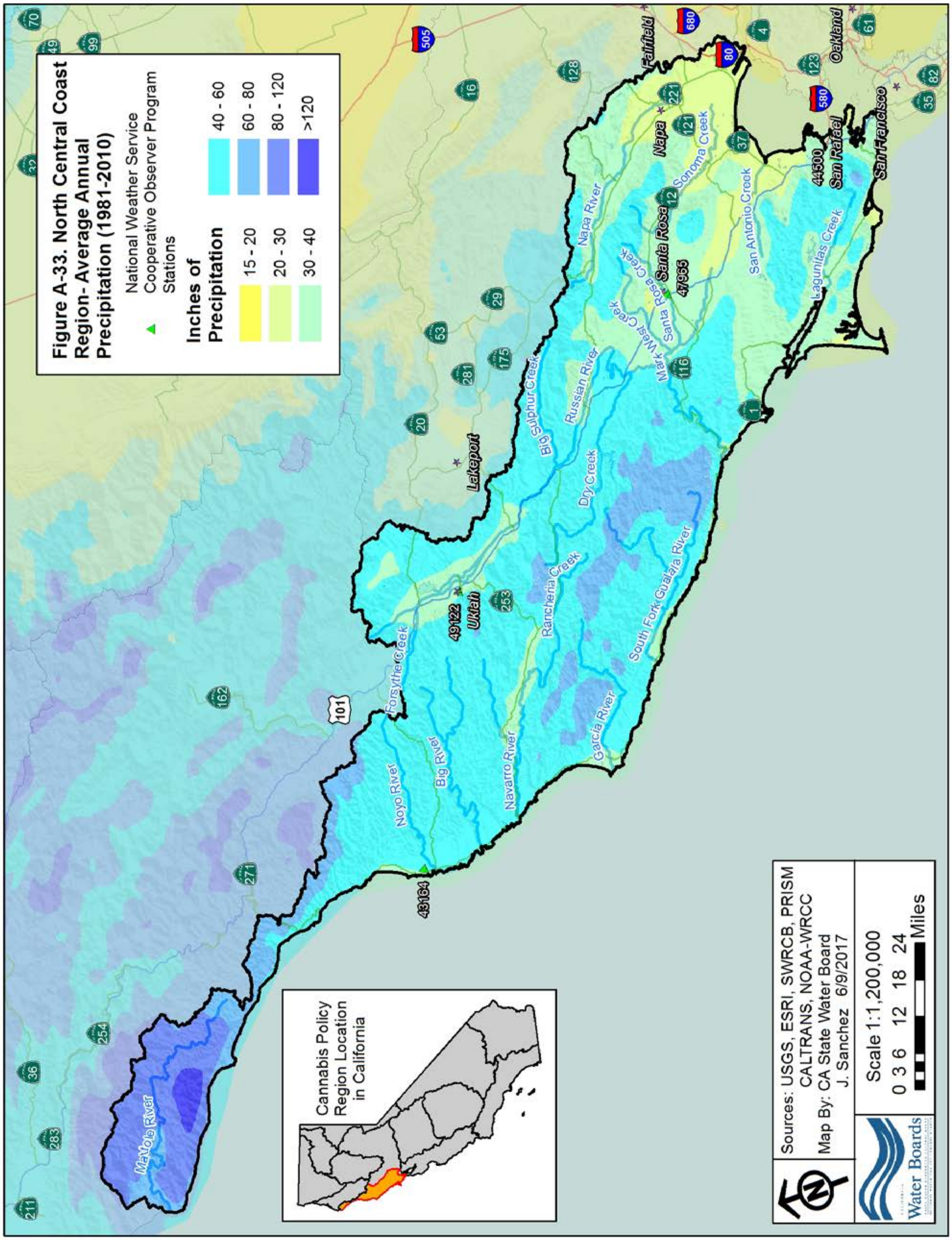


Figure A-33. North Central Coast Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS, NOAA-WRCC
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24 Miles
Water Boards
Mattole River
Noyo River
Big River
Navarro River
Garcia River
Forsythe Creek
Rancheria Creek
South Fork Gualala River
Dry Creek
Big Sulphur Creek
Russian River
Mark West Creek
Santa Rosa Creek
Laguna de Santa Rosa
Napa River
Sonoma Creek
San Antonio Creek
Lagunitas Creek
Ukiah
Lakeport
Santa Rosa
Napa
Fairfield
San Rafael
San Francisco
Oakland
43164
49122
47965
44500

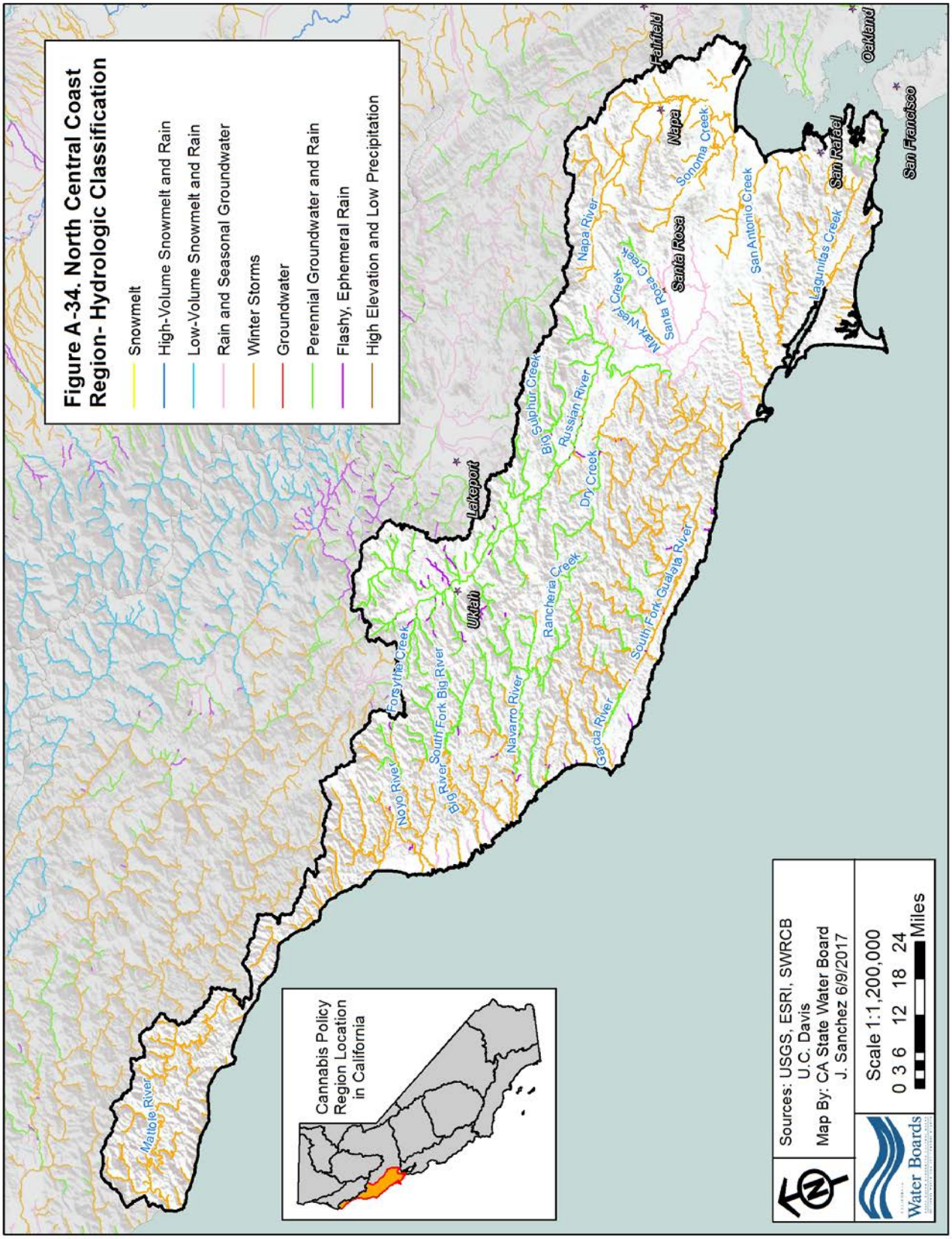


Figure A-34. North Central Coast Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24
Miles
Water Boards
Fairfield
Napa
Oakland
San Rafael
San Francisco
Santa Rosa
Lakeport
Ukiah
Napa River
Sonoma Creek
Mark West Creek
Santa Rosa Creek
San Antonio Creek
Lagunitas Creek
Big Sulphur Creek
Russian River
Dry Creek
Rancheria Creek
South Fork Gualala River
Gualala River
Navarro River
South Fork Big River
Big River
Noyo River
Forsythe Creek
Mattole River

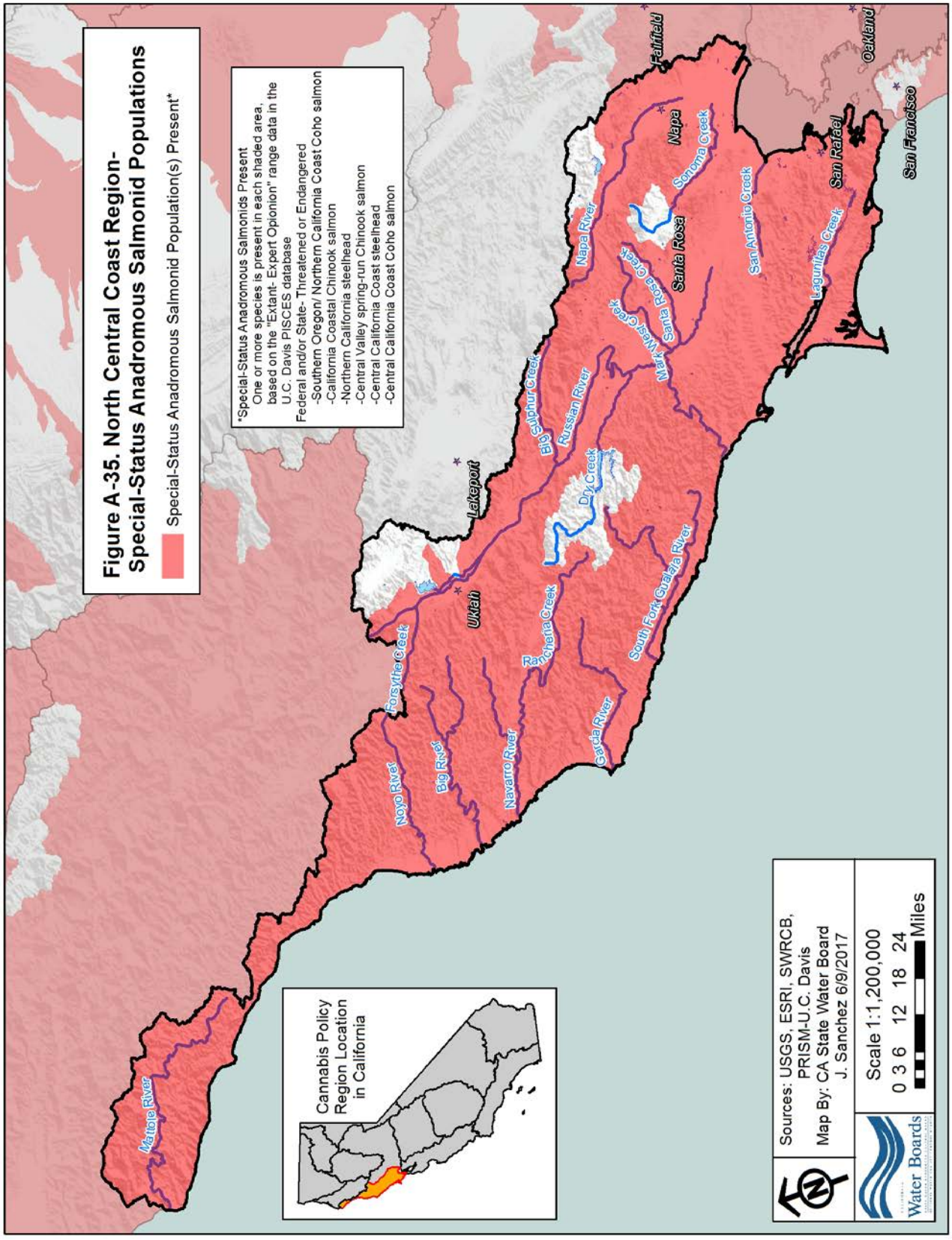


Figure A-35. North Central Coast Region-
Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonids Present
One or more species is present in each shaded area,
based on the "Extant- Expert Opionion" range data in the
U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Southern Oregon/ Northern California Coast Coho salmon
-California Coastal Chinook salmon
-Northern California steelhead
-Central Valley spring-run Chinook salmon
-Central California Coast steelhead
-Central California Coast Coho salmon
Cannabis Policy
Region Location
in California
Sources: USGS, ESRI, SWRCB,
PRISM-U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,200,000
0 3 6 12 18 24
Miles
Water Boards
Mattole River
Noyo River
Big River
Navarro River
Garcia River
Forsythe Creek
Ukiah
Lakeport
Russian River
Big Sulphur Creek
Dry Creek
Mark West Creek
Santa Rosa Creek
Santa Rosa
Napa River
Napa
Sonoma Creek
San Antonio Creek
Lagunitas Creek
San Rafael
Fairfield
Oakland
San Francisco

1.7 South Central Coast Region

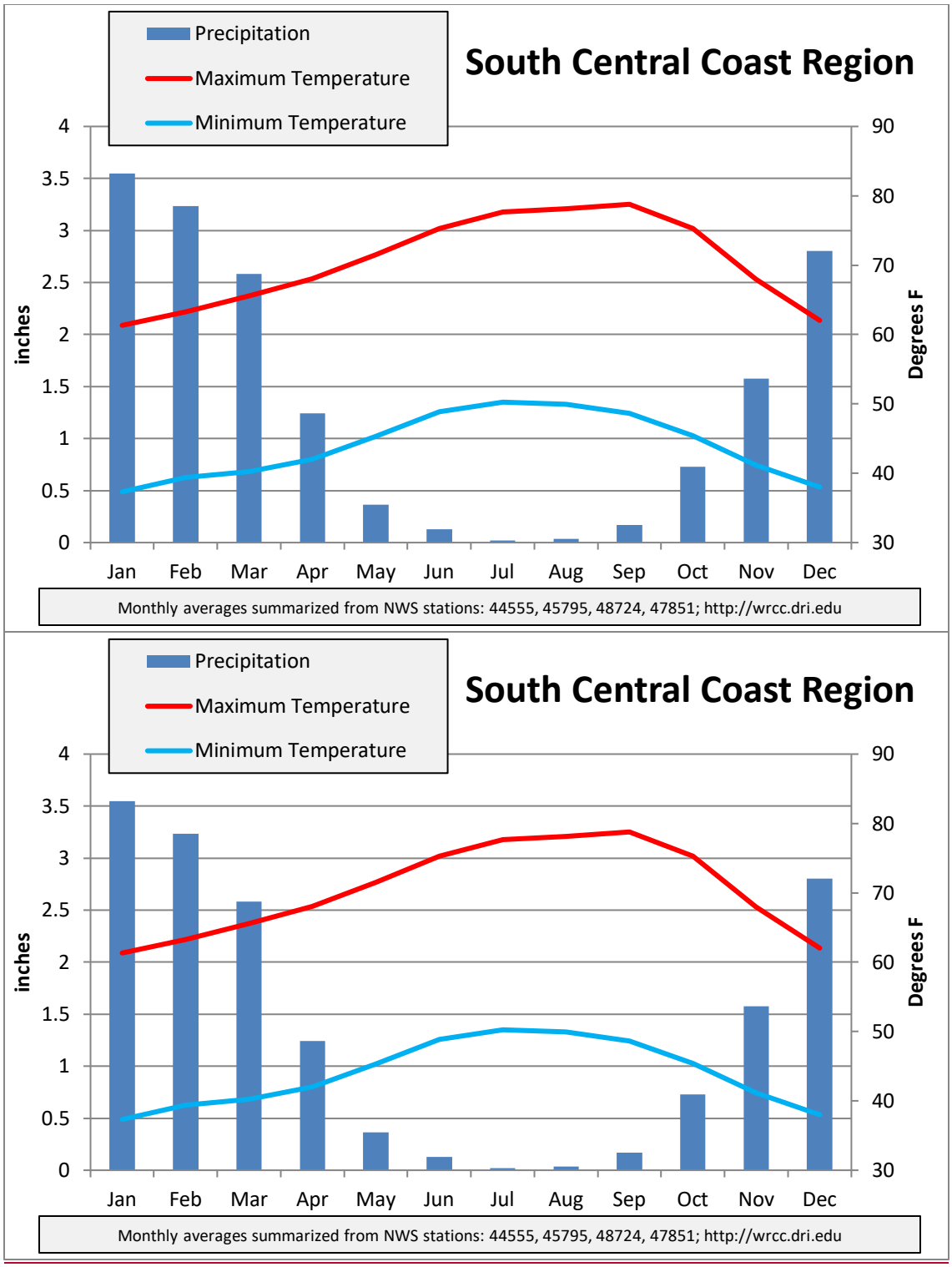
The South Central Coast Region covers approximately 10,050 square miles along the south-central coast of California, as shown in attached (Figure A-36). The South Central Coast Region is bordered by the Santa Maria River to the south and by San Francisco Bay to the north. Elevations in the South Central Coast Region range from sea level along the coast and near the San Francisco Bay, to 2,000-3,000 feet along the eastern regional boundary in the Coast Ranges; please refer to (Figure A-37) for an elevation map of the South Central Coast Region. The Salinas River is the largest watershed in the South Central Coast Region, and the region also contains numerous San Francisco Bay and Pacific Ocean tributaries.

1.7.1 Climate and Precipitation

The South Central Coast Region is characterized by a Mediterranean climate. The eastern portion of the South Central Coast Region, which is furthest from the Pacific Ocean, is characterized by a Mediterranean climate with hot summers. The central portion of the region is generally characterized by a Mediterranean climate with cooler summers. Coastal areas in the South Central Coast Region are characterized by a Mediterranean climate with summer fog. Please refer to (Figure A-38) for a climatic map of the South Central Coast Region.

Precipitation and temperature patterns tend to vary between coastal and inland areas in the South Central Region. Average annual maximum temperatures in the South Central Coast Region tend to exceed 75 degrees Fahrenheit in inland areas, while coastal areas tend to exhibit slightly cooler average annual maximum temperatures. Average annual minimum temperatures in the South Central Coast Region tend to remain above 40-45 degrees Fahrenheit in both coastal and inland areas. The South Central Coast Region tends to receive an average of over 40 inches of precipitation along the coast, and under 15 inches of precipitation in the inland and southeast portions of the region. Precipitation generally falls from November to April, and peaks in December and January. Snow does not contribute a significant proportion of precipitation to the region. (WRCC 2016)

Please refer to (Figure A-39) for a precipitation map of the South Central Coast Region. Please refer to Chart A-12 below, for a graphic illustration of general South Central Coast Region precipitation and temperature.



Precipitation
Maximum Temperature
Minimum Temperature
South Central Coast Region
inches
Degrees F
Monthly averages summarized from NWS stations: 44555, 45795, 48724, 47851; http://wrcc.dri.edu

Chart A-12. Average annual patterns of temperature and precipitation in the South Central Coast Region.

1.7.2 Hydrology

The South Central Coast Region contains many streams that are classified as Perennial Groundwater and Rain (PGR) or as Rain and Seasonal Groundwater (RSG) streams under UC

Davis' hydrologic classification system. Many coastal streams and tributaries to San Francisco Bay in this region are classified as PGR streams. Many streams in the southeastern portion of the South Central Coast Region and some tributaries to Monterey Bay are classified as RSG stream system. A small number of Winter Storm (WS) stream and Flashy, Ephemeral Rain streams are found in the South Central Coast Region. (Lane et al 2016)

Please refer to (Figure A-40) for a stream classification map of the South Central Coast Region.

1.7.3 Geology

The South Central Coast Region is located in the Coast Ranges geomorphic province, and is dissected by the San Andreas Fault system. The San Andreas Fault system runs through the South Central Coast Region, from the northwestern edge to the southeastern portion of the region. The San Andreas Fault is generally located in the mountain range between the Salinas and San Benito River valleys. The San Andreas Fault system separates oceanic crust from continental crust, and regional geology differs on the two sides of the San Andreas Fault. Granitic outcrops, marine sedimentary, and metamorphosed sedimentary rock underlay the South Central Coast Region west of the San Andreas Fault, whereas marine sedimentary rock underlays the South Central Coast Region east of the San Andreas Fault. Alluvial deposits are characteristic of the valleys throughout the South Central Coast Region. (CGS, 2002)

1.7.4 Anadromous Salmonid Population

Three special-status ESUs, DPSes, or DTEs are currently extant within the South Central Coast Region (Figure A-41):

- the CCC steelhead DPS,
- the South-Central California Coast (SCCC) steelhead DPS, and
- the CCC coho salmon ESU.

The CCC coho salmon ESU is currently listed as endangered under the ESA and the CESA (CDFW 2017b). The CCC and SCCC steelhead DPSes are currently listed as threatened under the ESA (CDFW 2017b).

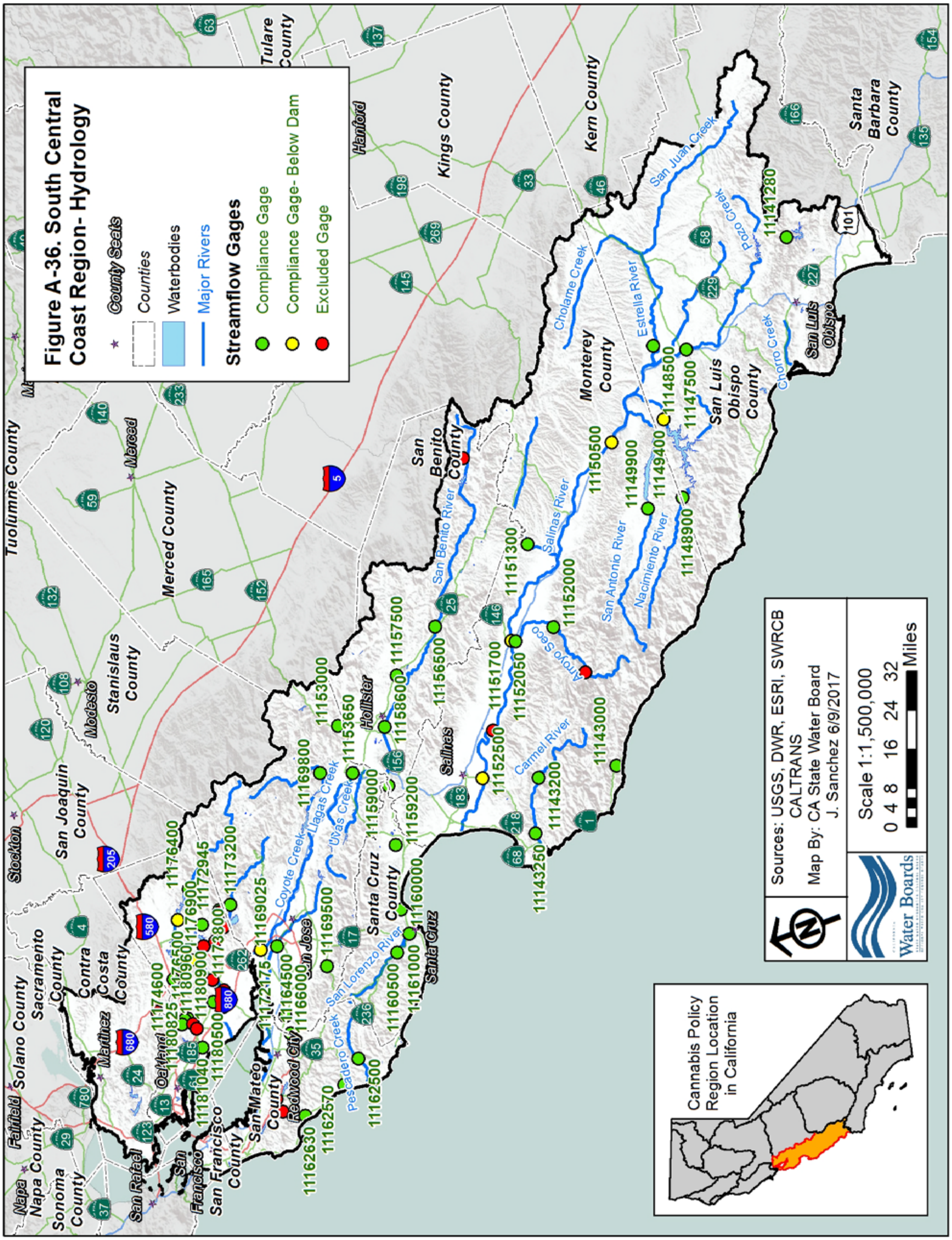


Figure A-36. South Central Coast Region- Hydrology
County Seats
Counties
Waterbodies
Major Rivers
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Cannabis Policy Region Location in California
Water Boards

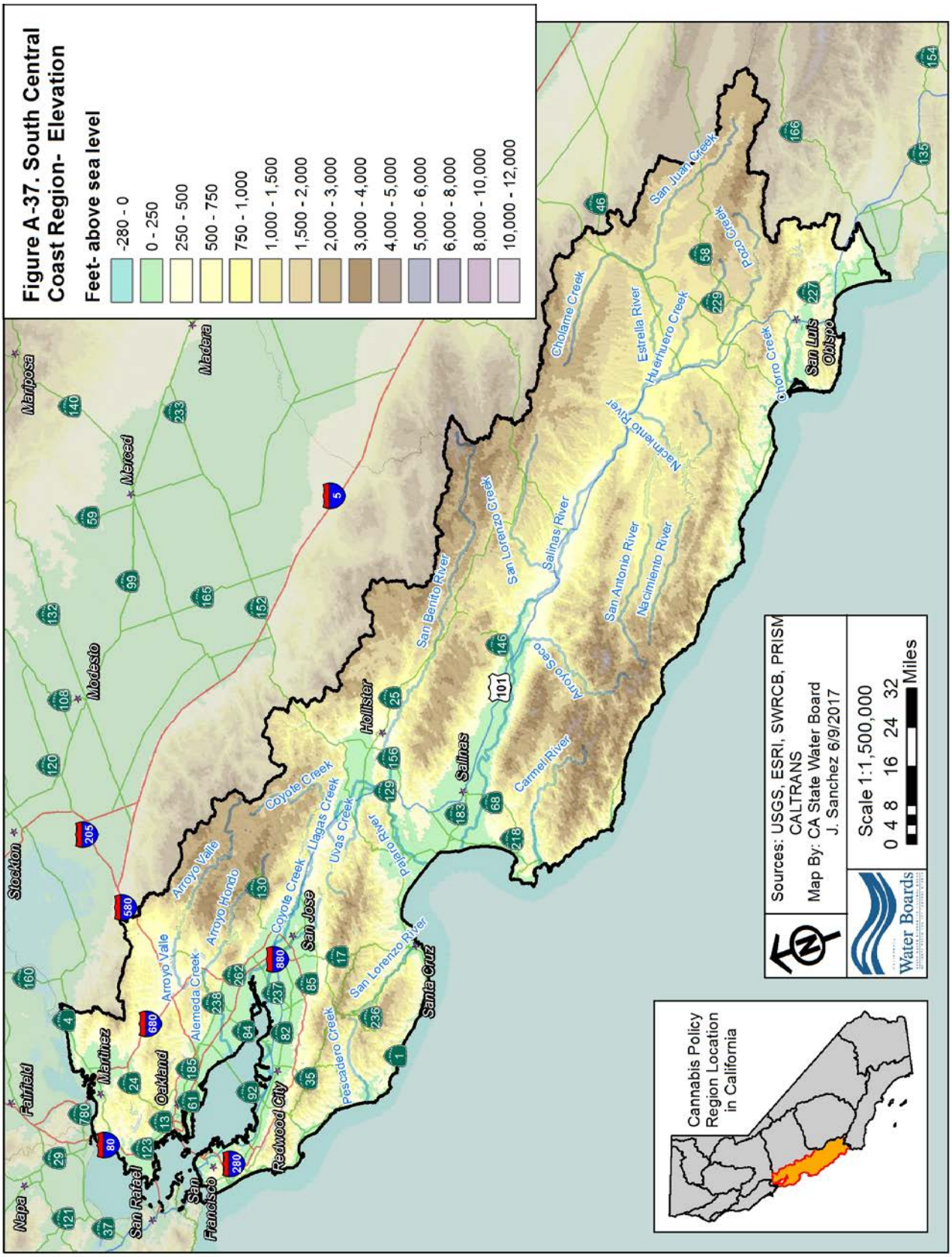


Figure A-37. South Central Coast Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Water Boards
Cannabis Policy Region Location in California
Stockton
Modesto
Merced
Madera
Mariposa
Fairfield
Napa
San Rafael
San Francisco
Oakland
Martinez
Redwood City
San Jose
Santa Cruz
Hollister
Salinas
San Luis Obispo
Arroyo Valle
Arroyo Hondo
Alameda Creek
Coyote Creek
Llagas Creek
Uvas Creek
Pescadero Creek
San Lorenzo River
San Benito River
San Lorenzo Creek
Salinas River
Arroyo Seco
Carmel River
San Antonio River
Nacimiento River
Nacimiento River
Cholame Creek
Estrella River
Huerhuero Creek
Pozo Creek
San Juan Creek
Chorro Creek

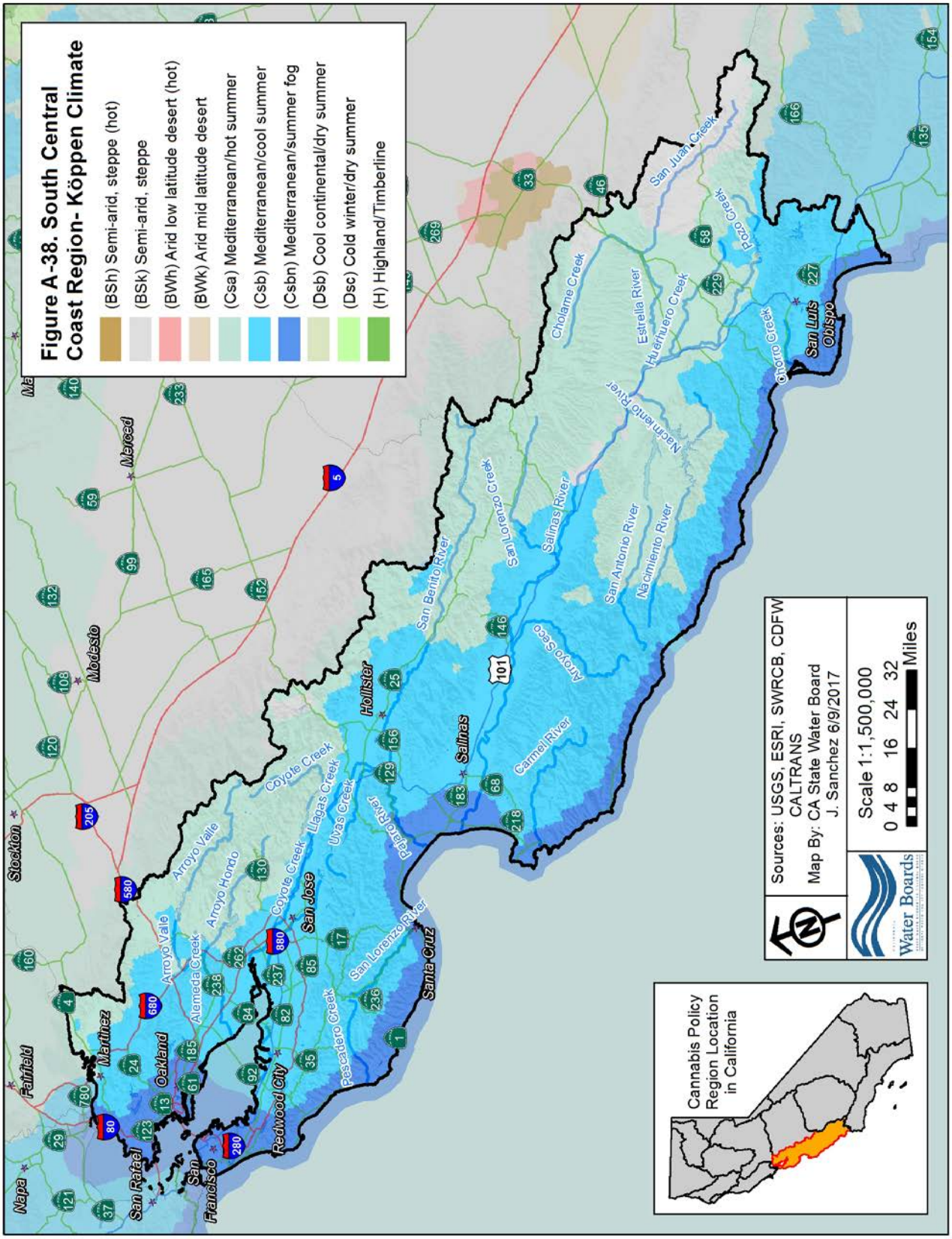


Figure A-38. South Central Coast Region- Köppen Climate
(BSh) Semi-arid, steppe (hot)
(BSk) Semi-arid, steppe
(BWh) Arid low latitude desert (hot)
(BWk) Arid mid latitude desert
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Sources: USGS, ESRI, SWRCB, CDFW, CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32
Miles
Water Boards
Cannabis Policy Region Location in California
Napa
Fairfield
Martinez
Oakland
San Rafael
San Francisco
Redwood City
San Jose
Santa Cruz
Stockton
Modesto
Merced
Hollister
Salinas
San Luis Obispo
Arroyo Valle
Alameda Creek
Arroyo Hondo
Coyote Creek
Llagas Creek
Uvas Creek
Pescadero Creek
San Lorenzo River
San Benito River
San Lorenzo Creek
Salinas River
Arroyo Seco
Carmel River
San Antonio River
Nacimiento River
Nacimiento River
Cholame Creek
Estrella River
Huerhuero Creek
San Juan Creek
Pozo Creek
Chorro Creek

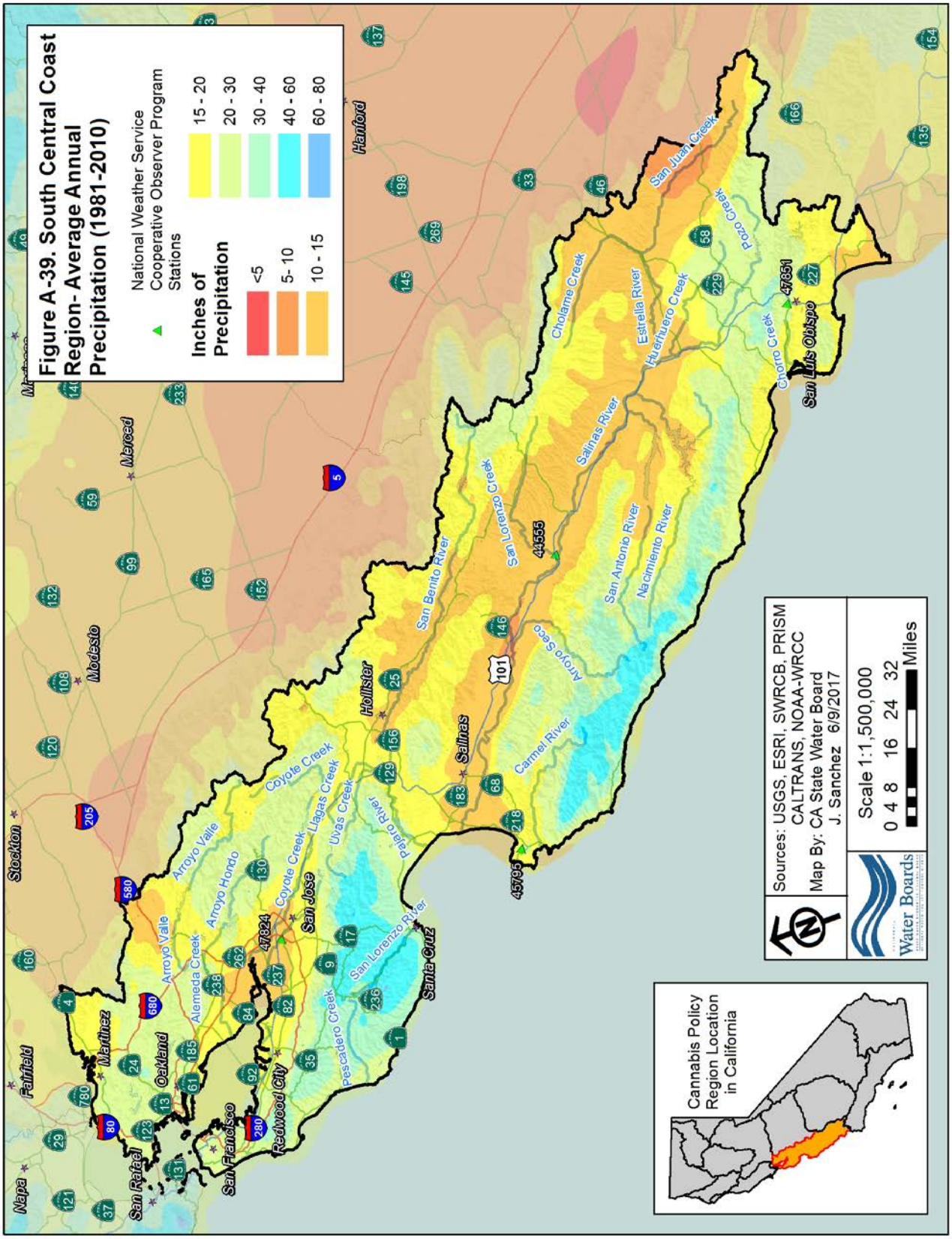


Figure A-39. South Central Coast Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS, NOAA-WRCC
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32 Miles
Water Boards
Cannabis Policy Region Location in California
Stockton
Modesto
Merced
Hanford
Hollister
Salinas
San Jose
Santa Cruz
Fairfield
Napa
San Rafael
San Francisco
Oakland
Martinez
Redwood City
San Luis Obispo
Arroyo Valle
Arroyo Hondo
Alameda Creek
Coyote Creek
Llagas Creek
Uvas Creek
Pescadero Creek
San Lorenzo River
San Benito River
San Lorenzo Creek
Salinas River
Arroyo Seco
Carmel River
San Antonio River
Nacimiento River
Cholame Creek
Estrella River
Huerhuero Creek
Pozo Creek
San Juan Creek
Chorro Creek
47824
44555
45795
47851

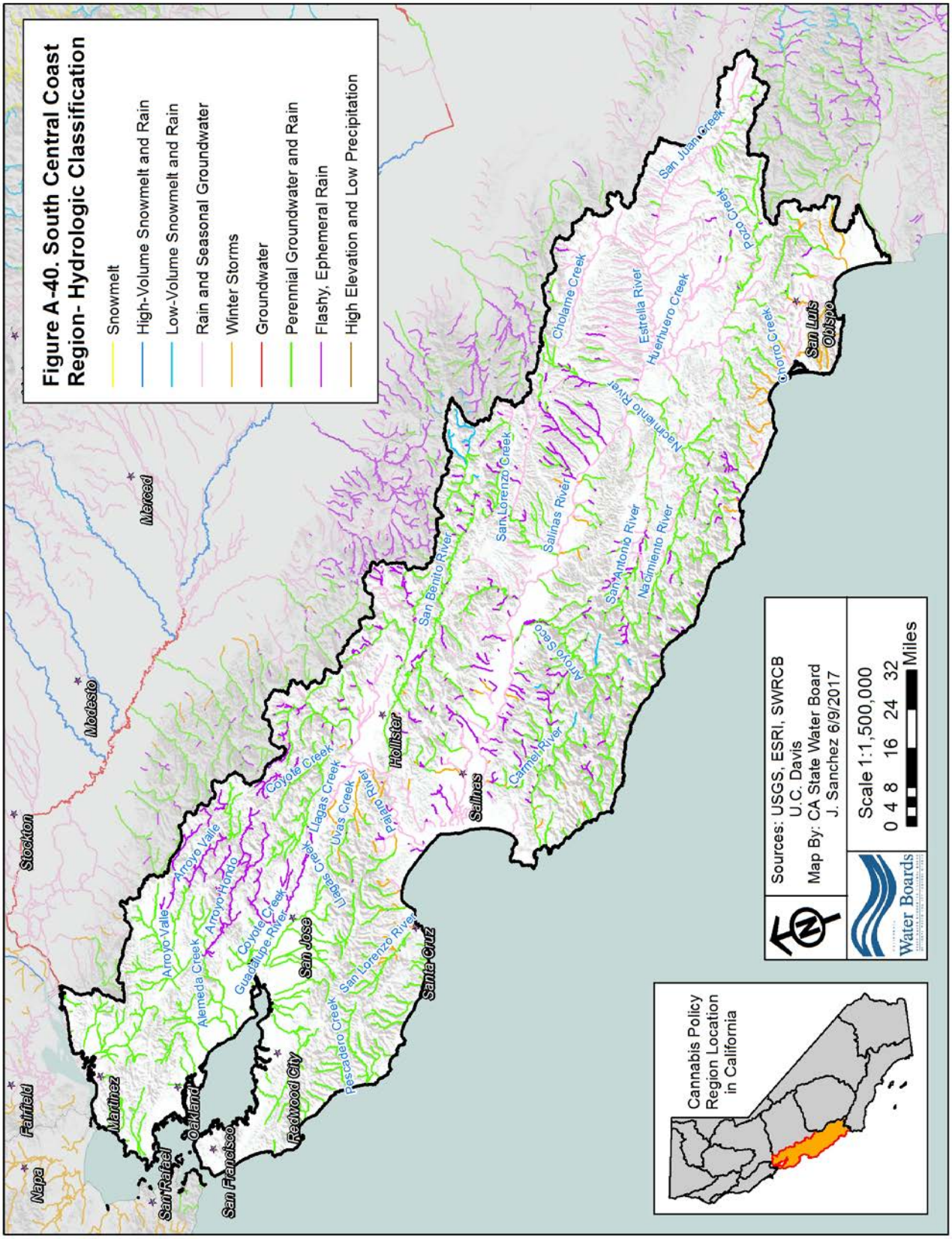


Figure A-40. South Central Coast Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 4 8 16 24 32
Miles
Water Boards
Cannabis Policy Region Location in California
Stockton
Modesto
Merced
Hollister
Salinas
San Jose
Santa Cruz
Redwood City
Oakland
San Francisco
San Rafael
Fairfield
Napa
Martinez
San Luis Obispo
Arroyo Valle
Alameda Creek
Arroyo Hondo
Coyote Creek
Guadalupe River
Llagas Creek
Uvas Creek
Pajaro River
San Lorenzo River
Pescadero Creek
San Benito River
San Lorenzo Creek
Salinas River
Carmel River
Arroyo Seco
San Antonio River
Nacimiento River
Nacimiento River
Cholame Creek
Estrella River
Huerhuero Creek
Pozo Creek
San Juan Creek
Chorro Creek

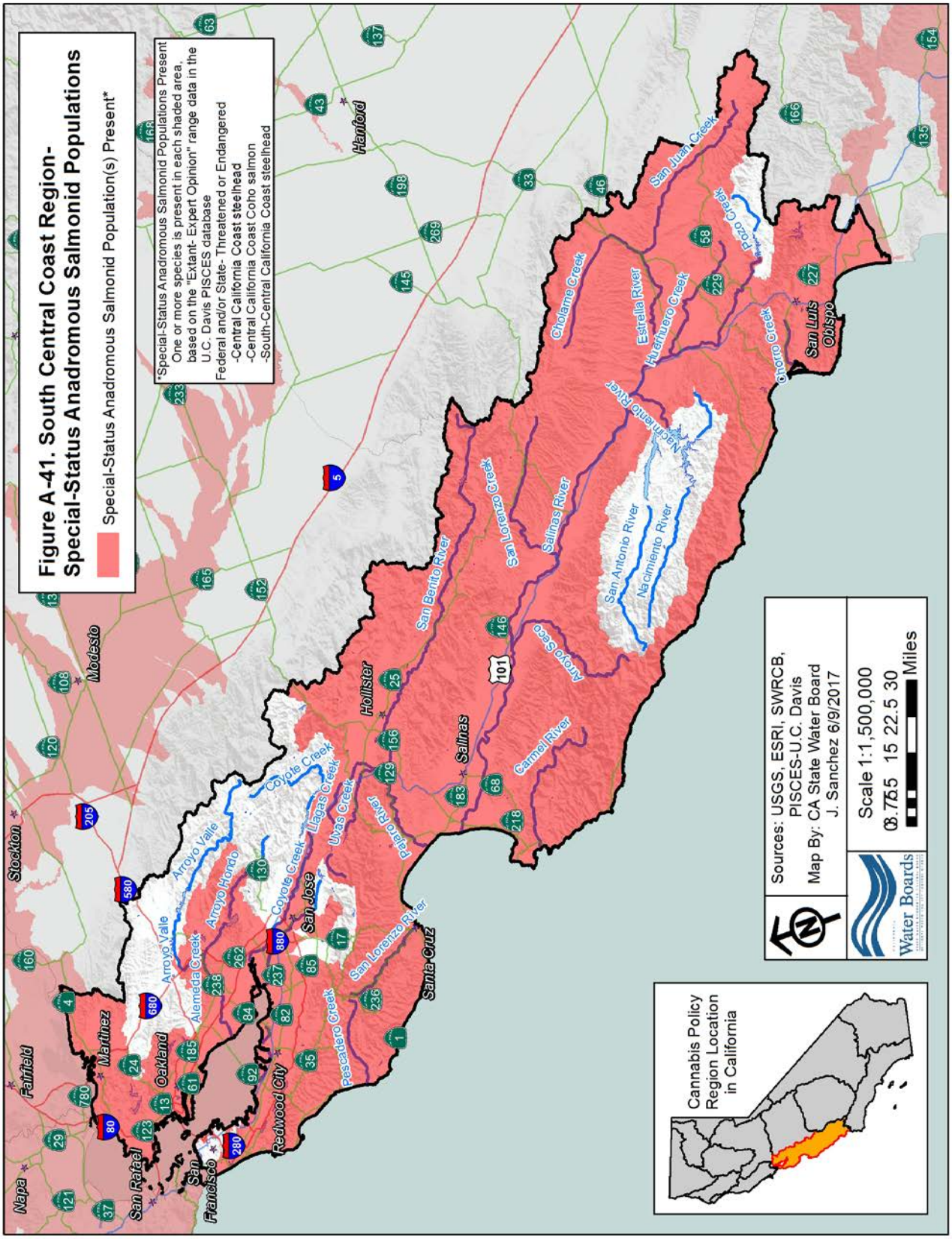


Figure A-41. South Central Coast Region-
Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area,
based on the "Extant- Expert Opinion" range data in the
U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Central California Coast steelhead
-Central California Coast Coho salmon
-South-Central California Coast steelhead
Cannabis Policy
Region Location
in California
Sources: USGS, ESRI, SWRCB,
PISCES-U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,500,000
0 7.5 15 22.5 30
Miles
Water Boards
Napa
Fairfield
Stockton
Modesto
Martinez
Oakland
San Rafael
San Francisco
Redwood City
San Jose
Santa Cruz
Hollister
Salinas
Hanford
San Luis Obispo
Arroyo Valle
Arroyo Hondo
Alameda Creek
Coyote Creek
Llagas Creek
Uvas Creek
Pescadero Creek
San Lorenzo River
Pajaro River
San Benito River
San Lorenzo Creek
Salinas River
Arroyo Seco
Carmel River
San Antonio River
Nacimiento River
Nacimiento River
Cholame Creek
Estrella River
Huerhuero Creek
San Juan Creek
Pozo Creek
Chorro Creek

1.8 San Joaquin Region

The San Joaquin Region covers approximately 13,609 square miles in central California, as shown in attached (Figure A-42). Elevations in this region range from below sea level in the Sacramento-San Joaquin River Delta, to over 9,000 feet at the crest of the Sierra Nevada mountains at the northern end of the region, and to over 12,000 feet at the crest of the Sierra Nevada mountains at the southern end of the region (Figure A-43). The region includes the San Joaquin River watershed, including the San Joaquin River and its major tributaries: the Calaveras River, Stanislaus River, Tuolumne River, and Merced River.

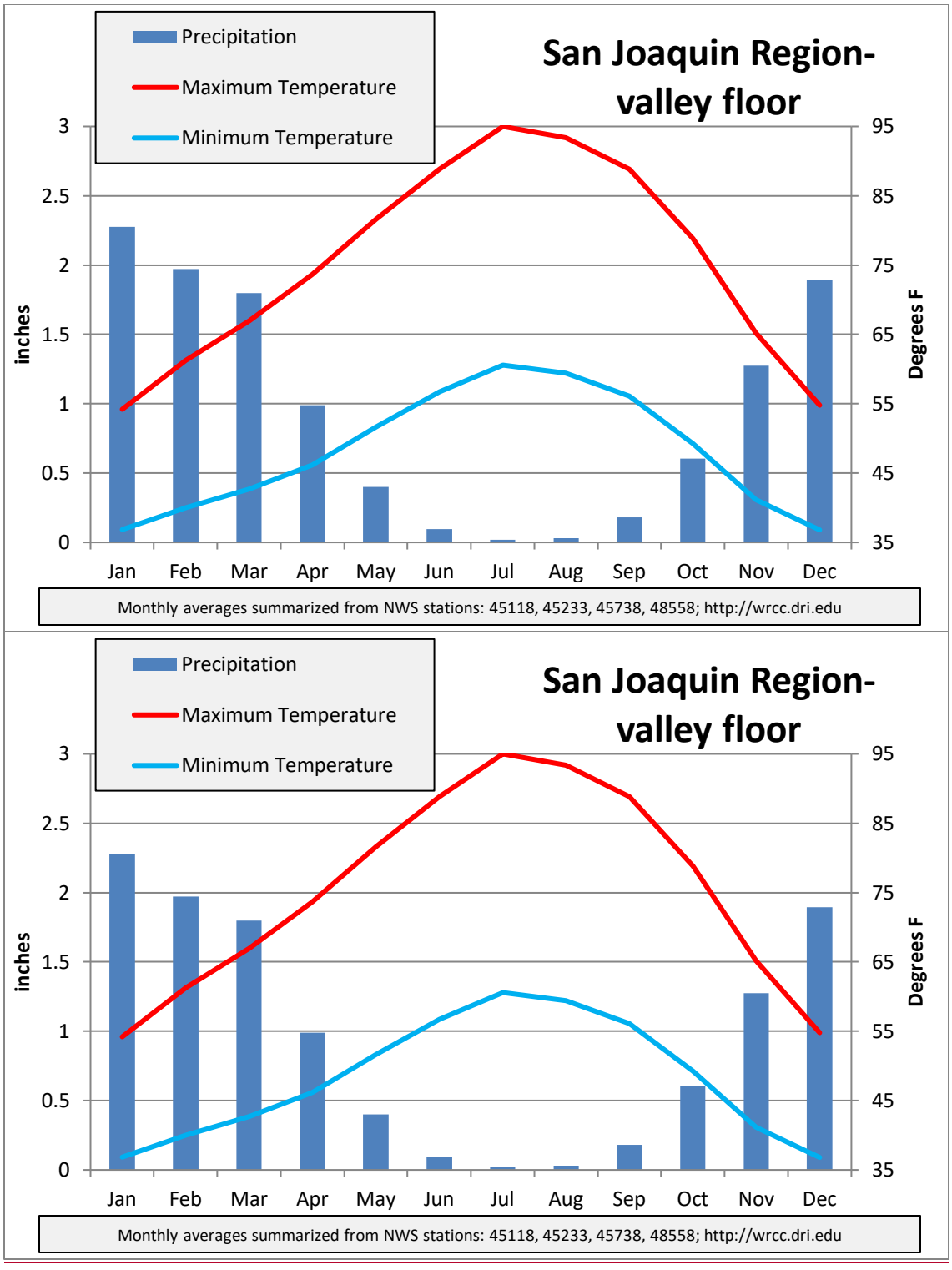
1.8.1 Climate and Precipitation

The climate of the San Joaquin Region varies by elevation. The southwestern valley floor portion of the San Joaquin Region exhibits a Steppe (semi-arid, steppe) climate. Much of the center of the San Joaquin Region is characterized by a Mediterranean climate with hot summers. The northeastern margin of the San Joaquin Region is characterized by a Mediterranean climate with cool summers at lower elevations, by a cool continental climate with dry summers at mid- elevations, by cold winters and dry summers at the norther Sierra Nevada crest, and by a Highland/Timberline climate along the southern Sierra Nevada crest. Please refer to ~~(~~Figure A-44~~)~~ for a climatic map of the San Joaquin Region.

In general, the Central Valley portion of the San Joaquin Region tends to exhibit higher average annual maximum and average annual minimum temperatures compared to the Sierra Nevada mountain portion of the region. Average annual maximum temperatures in the San Joaquin Region exceed 70-75 degrees Fahrenheit on the valley floor, 60 degrees Fahrenheit at mid-elevations in the Sierra Nevada, and 35-40 degrees Fahrenheit at high elevations in the Sierra Nevada. Average annual minimum temperatures in the San Joaquin Region remain above 45 degrees Fahrenheit throughout the Central Valley and Sierra Nevada foothills, and are well below freezing at many high-elevation locations in the Sierra Nevada mountains.

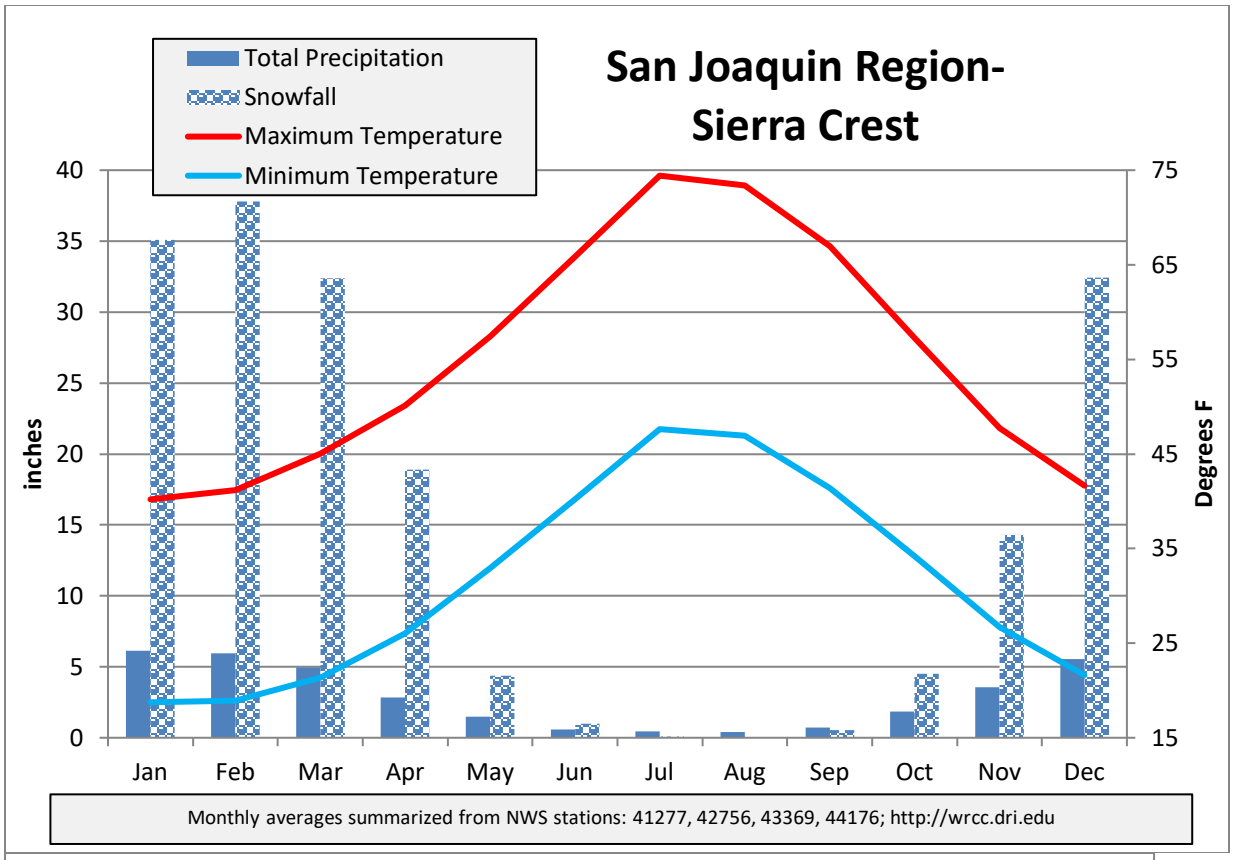
Precipitation patterns vary spatially within the San Joaquin Region, and higher amounts of precipitation tend to fall at the northern end of the region and at higher elevations. In the San Joaquin Region, 15-20 inches of rain typically falls in the northern portion of the Central Valley, and 10 inches or less typically falls in the southern portion of the Central Valley. Precipitation typically exceeds 80 inches along the Sierra Nevada crest, in the eastern portion of the San Joaquin Region. Significant amounts of precipitation tend to fall as snow in the Sierra Nevada mountains, and snowfall depths exceed 200 inches annually in many high-elevation areas. In the San Joaquin Region, precipitation generally lasts from November to April. (WRCC 2016)

Please refer to ~~(~~Figure A-45~~)~~ for a precipitation map of the San Joaquin Region. Please refer to Charts A-13 and A-14, below, for a comparison of precipitation and temperature conditions for the valley floor and Sierra Nevada crest portions of the San Joaquin Region.



Precipitation
Maximum Temperature
Minimum Temperature
San Joaquin Region-valley floor
inches
Degrees F
3
2.5
2
1.5
1
0.5
0
95
85
75
65
55
45
35
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Monthly averages summarized from NWS stations: 45118, 45233, 45738, 48558; http://wrcc.dri.edu

Chart A-13. Average annual patterns of temperature and precipitation, San Joaquin Region, valley floor.



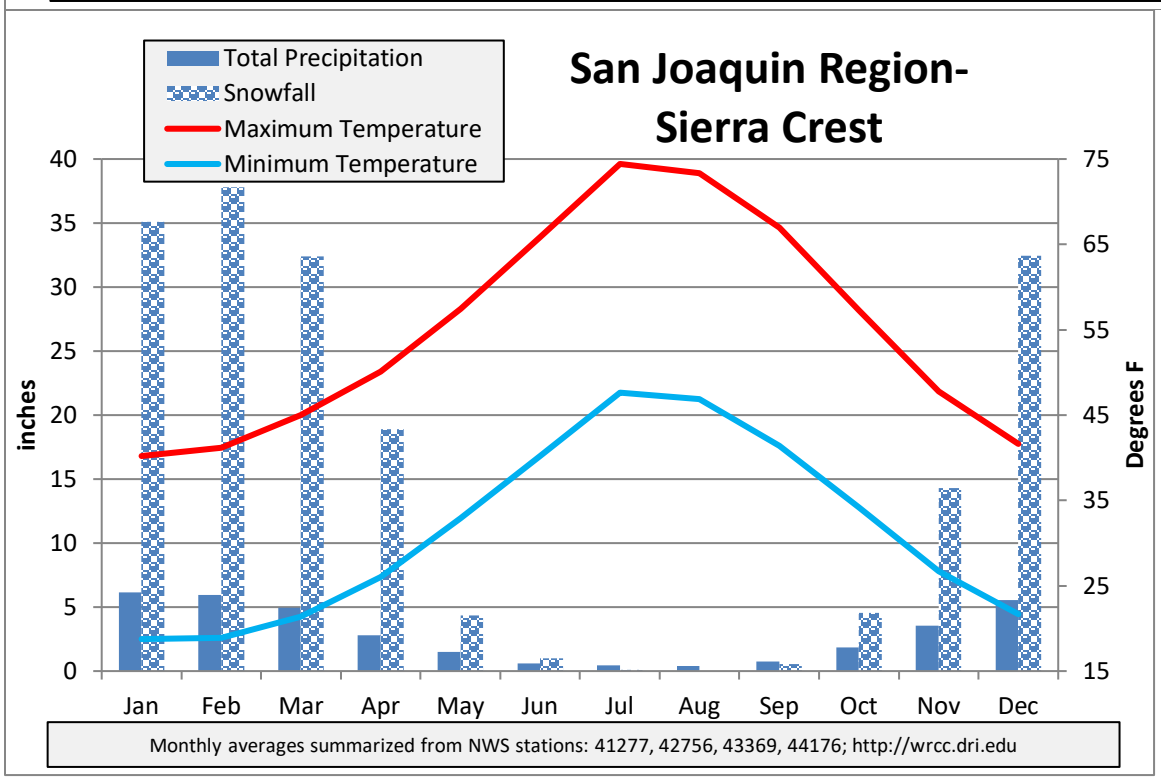


Chart A-14. Average annual patterns of temperature and precipitation, San Joaquin Region, Sierra Crest.

1.8.2 Hydrology

Stream reaches in the San Joaquin Region are generally classified under UC Davis' hydrologic classification system as Rain and Seasonal Groundwater (RSG), Low-Volume Snowmelt and Rain (LSR), and Snowmelt (SM) systems. The western and central portion of the region contains primarily RSG stream reaches. Mid-elevation areas in the Sierra Nevada mountains contain primarily LSR stream reaches. At high elevations in the Sierra Nevada mountains, many stream reaches are classified as SM systems.

Other streams in the San Joaquin Region are classified by Perennial Groundwater and Rain (PGR), Groundwater (GW), High-Volume Snowmelt and Rain (HSR), or the Flashy, Ephemeral Rain (FER) hydrologic classifications. For example, portions of the mainstem San Joaquin River and its major tributaries are classified as High-Volume Snowmelt and Rain (HSR) systems. The lower San Joaquin River is classified by a GW hydrologic regime. (Lane et al 2016)

Please refer to ~~(~~Figure A-46~~)~~ for a depiction of the stream classifications within the San Joaquin Region.

1.8.3 Geology

The San Joaquin Region is underlain by the Coast Ranges on the western margin of the region, the Great Valley geomorphic provinces in the center of the region, and the Sierra Nevada geomorphic province in the eastern half of the region. The Coast Ranges geomorphic province is comprised of sedimentary and metamorphic rock and alluvial deposits in valleys and along the coastline. The Great Valley geomorphic province, which consists of a large alluvial plain, underlays the Central Valley. The Sierra Nevada geomorphic province, located in the eastern portion of this region, contains steep mountains underlain by a granitic batholith. Metamorphic rocks comprise the foothill region of the Sierra Nevada geomorphic province. (CGS, 2002)

1.8.4 Anadromous Salmonid Population

Three special-status ESUs, DPSes, or DTEs are currently extant within the San Joaquin Region (Figure A-47):

- the CV FR Chinook salmon DTE,
- the CV LFR Chinook salmon DTE, and
- the CCV steelhead DPS.

The CCV steelhead DPS is currently listed as threatened under the ESA (CDFW 2017b). The CV FR and CV LFR Chinook salmon populations are each listed as species of special concern by CDFW and, jointly, as a species of concern by NMFS (Moyle et al. 2015, NMFS 2017).

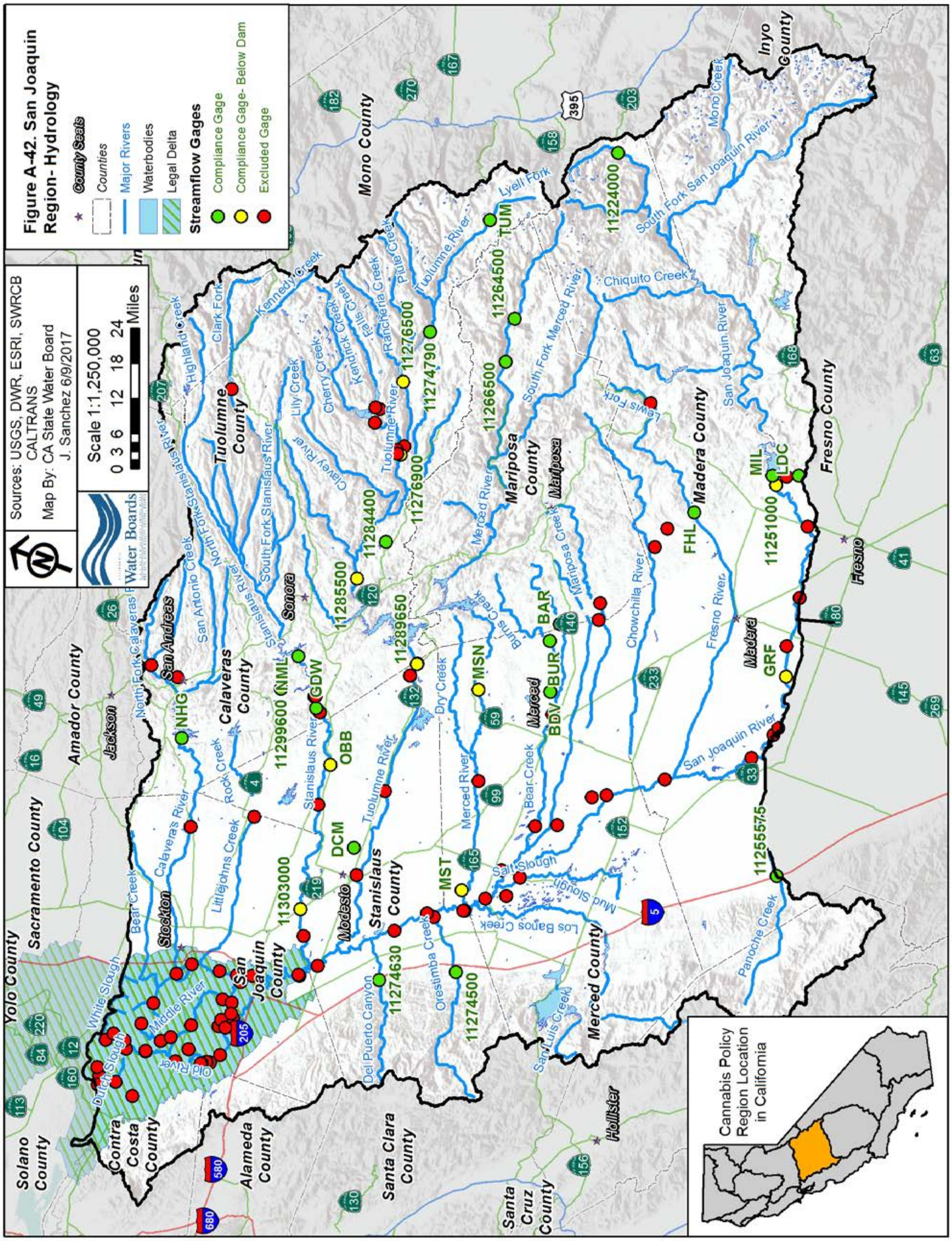


Figure A-42. San Joaquin Region- Hydrology
County Seats
Counties
Major Rivers
Waterbodies
Legal Delta
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,250,000
0 3 6 12 18 24 Miles
Water Boards
Cannabis Policy Region Location in California

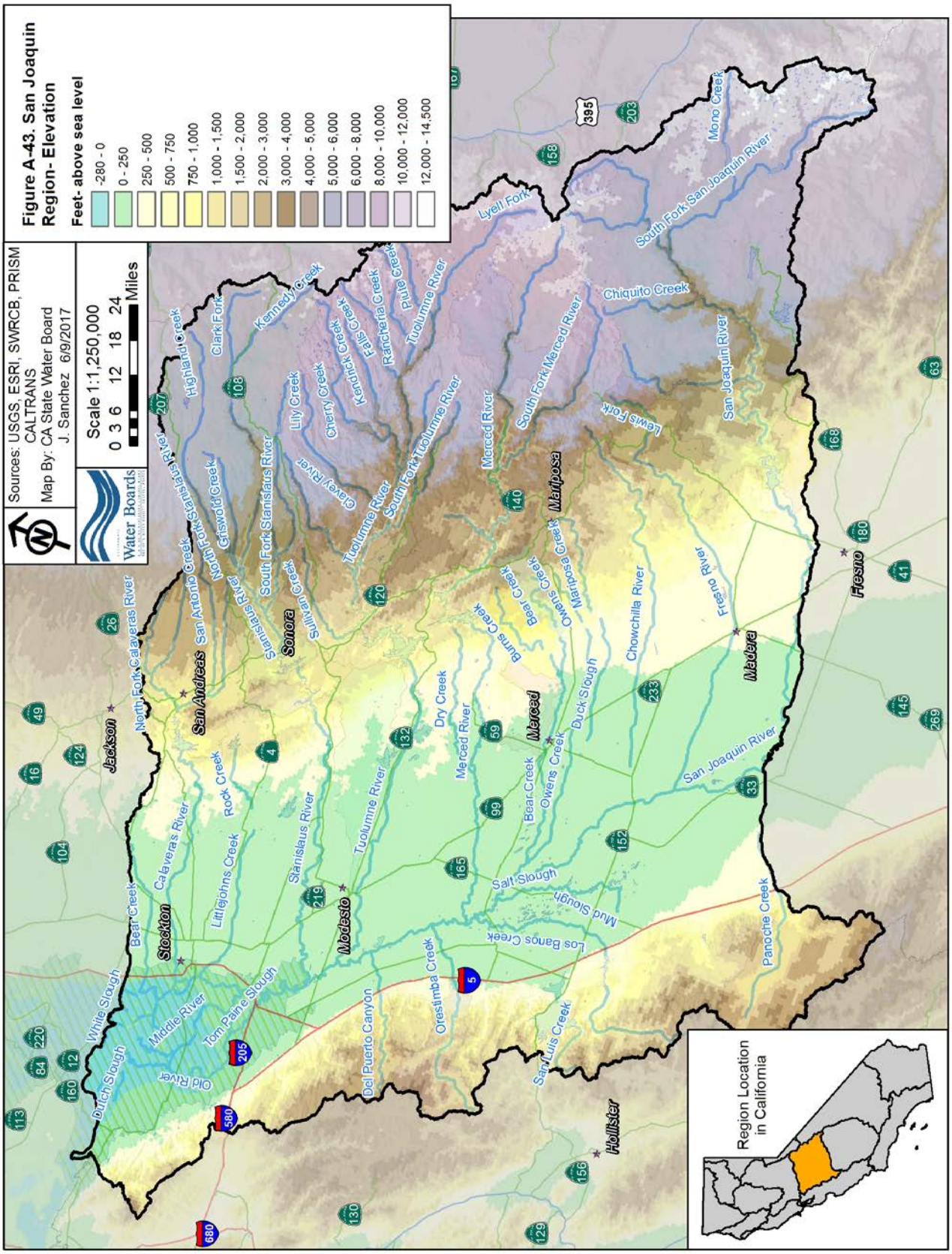


Figure A-43. San Joaquin Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,250,000
0 3 6 12 18 24 Miles
Water Boards
Region Location in California
Stockton
Modesto
Merced
Madera
Fresno
Hollister
San Andreas
Sonora
Mariposa
Jackson
Lyell Fork
South Fork San Joaquin River
Mono Creek
Chiquito Creek
San Joaquin River
Lewis Fork
South Fork Merced River
Merced River
Tuolumne River
South Fork Tuolumne River
Kennedy Creek
Clark Fork
Highland Creek
Stanislaus River
North Fork Stanislaus River
Gunsold Creek
San Antonio Creek
North Fork Calaveras River
Sullivan Creek
South Fork Stanislaus River
Lily Creek
Cherry Creek
Kendrick Creek
Falls Creek
Rancheria Creek
Piute Creek
Tuolumne River
Grey River
Burns Creek
Bear Creek
Owens Creek
Mariposa Creek
Chowchilla River
Fresno River
Duck Slough
Dry Creek
Merced River
Tuolumne River
Stanislaus River
Rock Creek
Littlejohns Creek
Calaveras River
Bear Creek
White Slough
Ditch Slough
Middle River
Old River
Tom Paine Slough
Del Puerto Canyon
Orestimba Creek
Los Banos Creek
Salt Slough
Mud Slough
San Luis Creek
Panoche Creek
San Joaquin River
Bear Creek
Owens Creek
Duck Slough

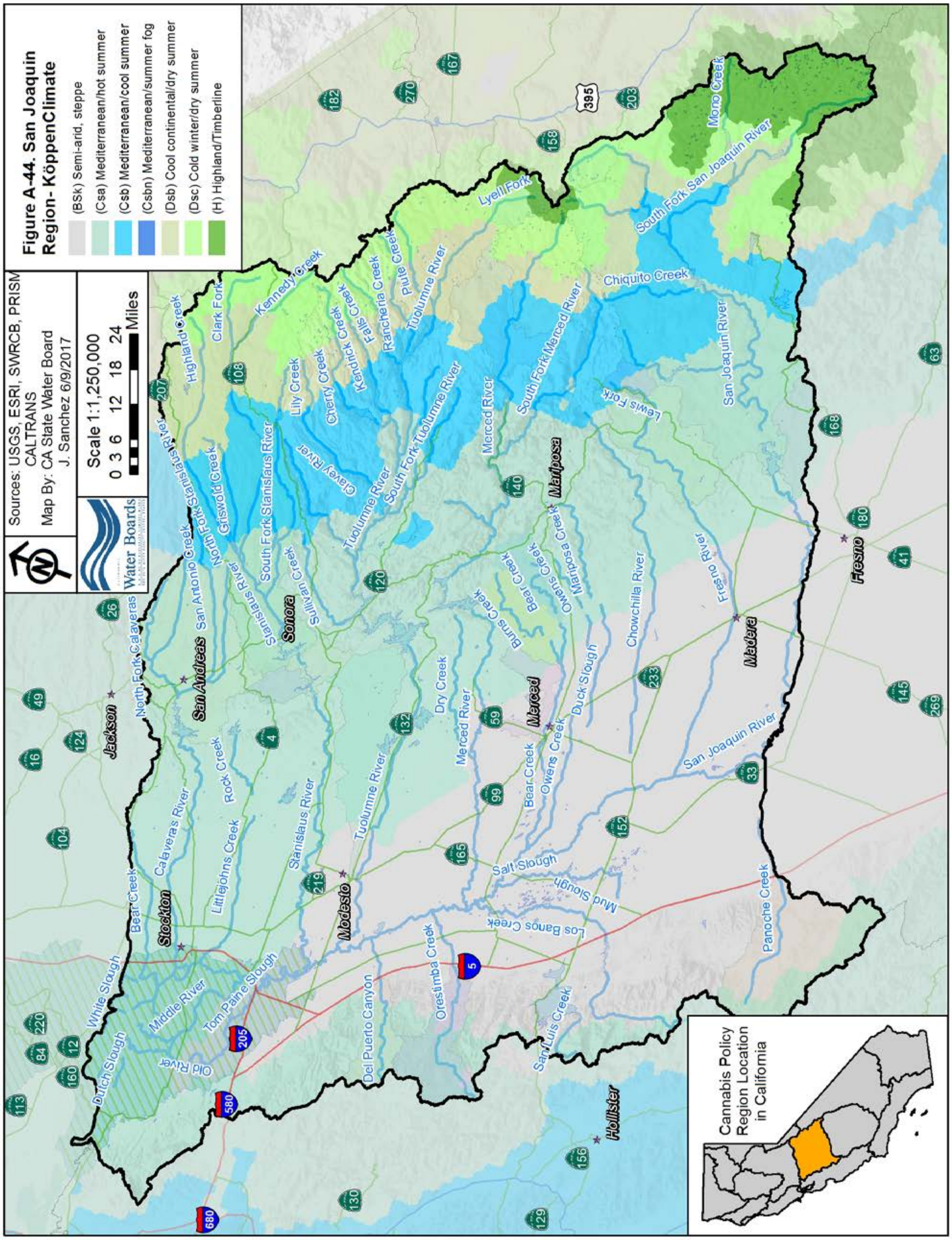


Figure A-44. San Joaquin Region- KöppenClimate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Sources: USGS, ESRI, SWRCB, PRISM
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,250,000
0 3 6 12 18 24
Miles
Water Boards
Cannabis Policy
Region Location
in California

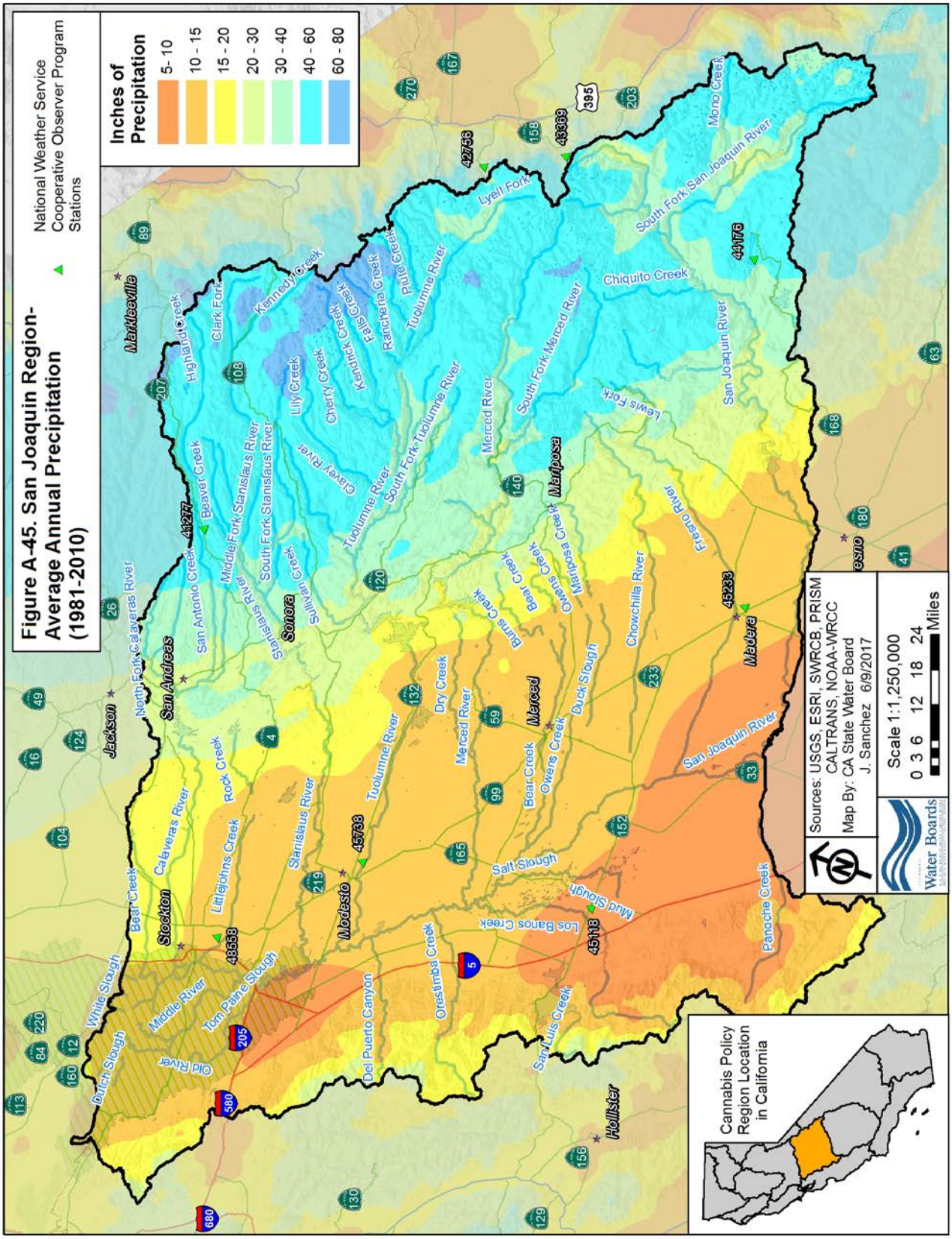


Figure A-45. San Joaquin Region-Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
Markleeville
Jackson
San Andreas
Sonora
Stockton
Modesto
Merced
Mariposa
Madera
Hollister
Lyell Fork
Clark Fork
Kennedy Creek
Highland Creek
San Antonio Creek
Beaver Creek
Middle Fork Stanislaus River
South Fork Stanislaus River
Stanislaus River
Sullivan Creek
Lily Creek
Cherry Creek
Clavey River
Kendrick Creek
Falls Creek
Rancharia Creek
Piute Creek
Tuolumne River
South Fork Tuolumne River
Merced River
South Fork Merced River
Chiquito Creek
South Fork San Joaquin River
San Joaquin River
Lewis Fork
Mono Creek
North Fork Calaveras River
Calaveras River
Bear Creek
Littlejohns Creek
Rock Creek
White Slough
Ditch Slough
Old River
Middle River
Tom Paine Slough
Del Puerto Canyon
Orestimba Creek
San Luis Creek
Los Banos Creek
Mud Slough
Salt Slough
Dry Creek
Burns Creek
Bear Creek
Owens Creek
Mariposa Creek
Duck Slough
Chowchilla River
Fresno River
Panoche Creek
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS, NOAA-WRCC
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,250,000
0 3 6 12 18 24 Miles
Water Boards
Cannabis Policy Region Location in California

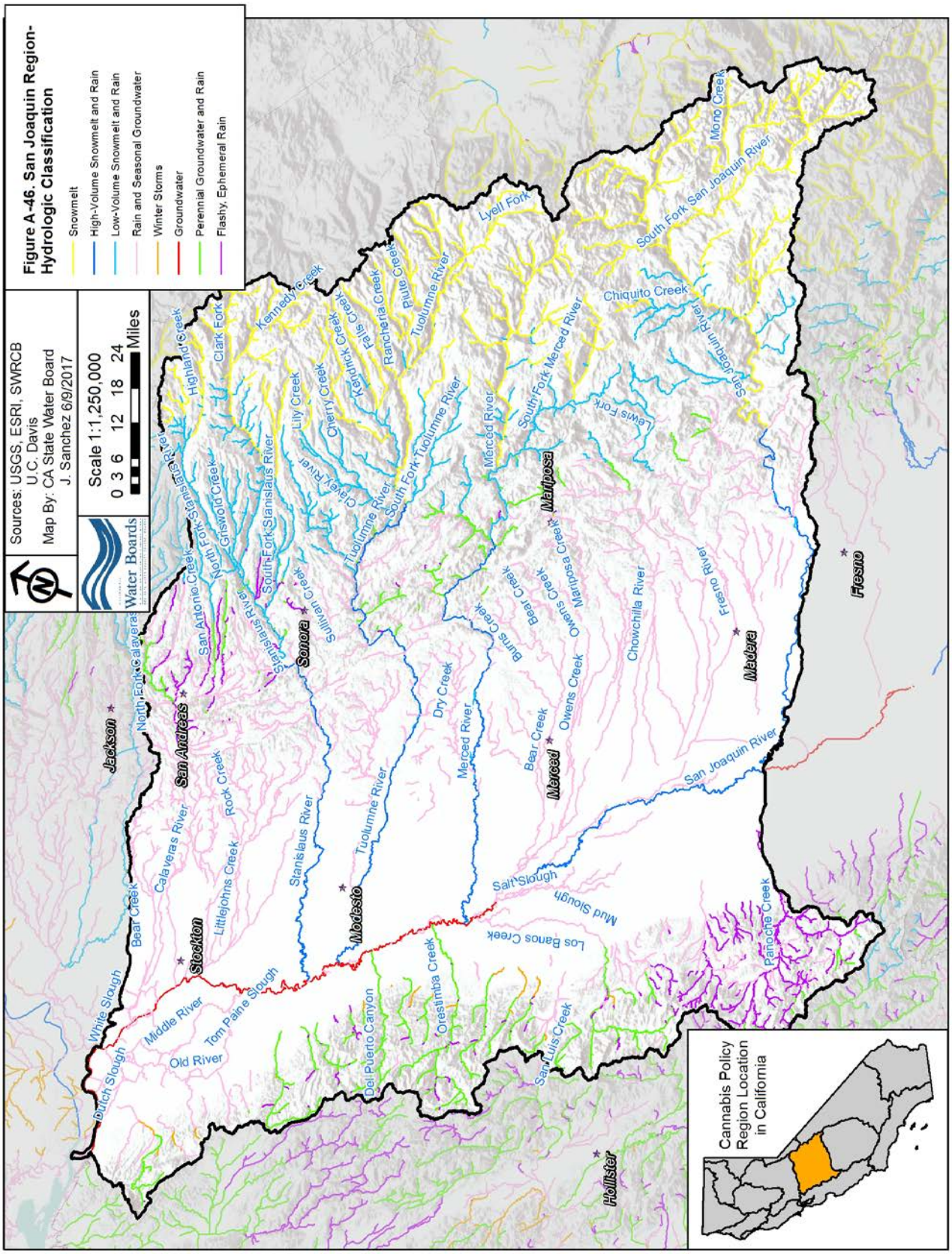


Figure A-46. San Joaquin Region-Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,250,000
0 3 6 12 18 24 Miles
Water Boards
Cannabis Policy Region Location in California
Jackson
San Andreas
Stockton
Modesto
Sonora
Mariposa
Merced
Madera
Fresno
Hollister
Mono Creek
South Fork San Joaquin River
Lyell Fork
Chiquito Creek
San Joaquin River
Lewis Fork
South Fork Merced River
Merced River
Kennedy Creek
Clark Fork
Highland Creek
Kendrick Creek
Falls Creek
Cherry Creek
Lily Creek
Piute Creek
Rancheria Creek
Tuolumne River
South Fork Tuolumne River
Tuolumne River
Stanislaus River
North Fork Stanislaus River
South Fork Stanislaus River
Griswold Creek
San Antonio Creek
North Fork Calaveras River
Calaveras River
Bear Creek
Rock Creek
Littlejohns Creek
White Slough
Ditch Slough
Middle River
Old River
Tom Paine Slough
Del Puerto Canyon
Orestimba Creek
San Luis Creek
Los Banos Creek
Mud Slough
Salt Slough
San Joaquin River
Panoche Creek
Chowchilla River
Fresno River
Owens Creek
Mariposa Creek
Bear Creek
Burns Creek
Dry Creek
Merced River
Tuolumne River
Stanislaus River
Bear Creek
Owens Creek
Chowchilla River
Fresno River

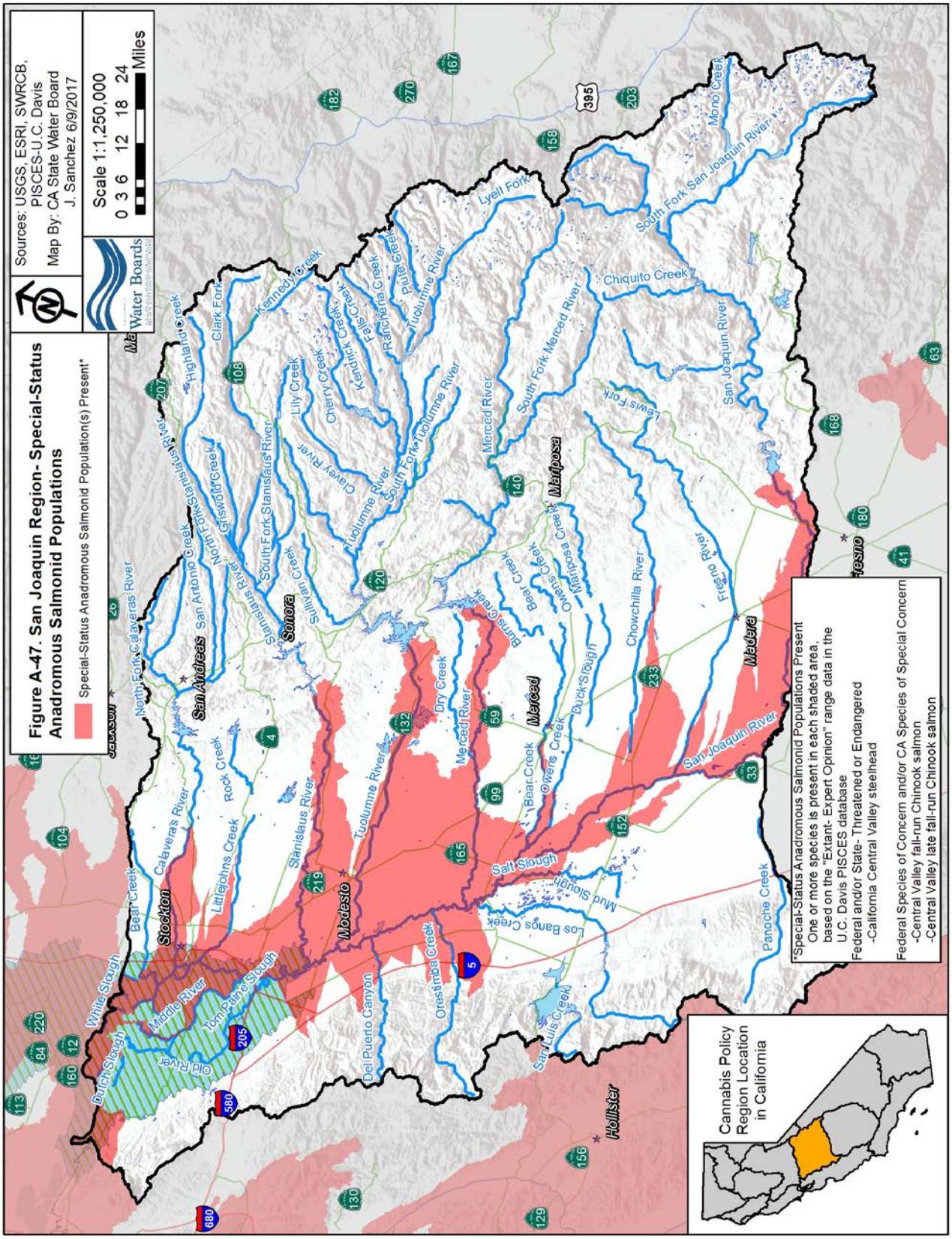


Figure A-47. San Joaquin Region- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Water Boards
Scale 1:1,250,000
0 3 6 12 18 24
Miles
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area,
based on the "Extant- Expert Opinion" range data in the
U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-California Central Valley steelhead
Federal Species of Concern and/or CA Species of Special Concern
-Central Valley fall-run Chinook salmon
-Central Valley late fall-run Chinook salmon
Cannabis Policy Region Location in California
Stockton
Modesto
Merced
Madera
Hollister
San Andreas
Sonora
Mariposa
Fresno
Tuolumne River
Stanislaus River
Merced River
San Joaquin River
Calaveras River
Bear Creek
Littlejohns Creek
Rock Creek
White Slough
Ditch Slough
Middle River
Old River
Tom Paine Slough
Salt Slough
Mud Slough
Los Banos Creek
Orestimba Creek
Del Puerto Canyon
San Luis Creek
Dry Creek
Owens Creek
Duck Slough
Chowchilla River
Fresno River
Panoche Creek
North Fork Calaveras River
San Antonio Creek
North Fork Stanislaus River
Highland Creek
Clark Fork
Kennedy Creek
Ghsworth Creek
South Fork Stanislaus River
Sullivan Creek
Lily Creek
Cherry Creek
Kendrick Creek
Falls Creek
Rancheria Creek
Piute Creek
Lyell Fork
Grey River
South Fork Tuolumne River
Burns Creek
Bear Creek
Owens Creek
Mariposa Creek
Merced River
South Fork Merced River
Lewis Fork
Chiquito Creek
San Joaquin River
South Fork San Joaquin River
Mono Creek

1.9 South Coast Region

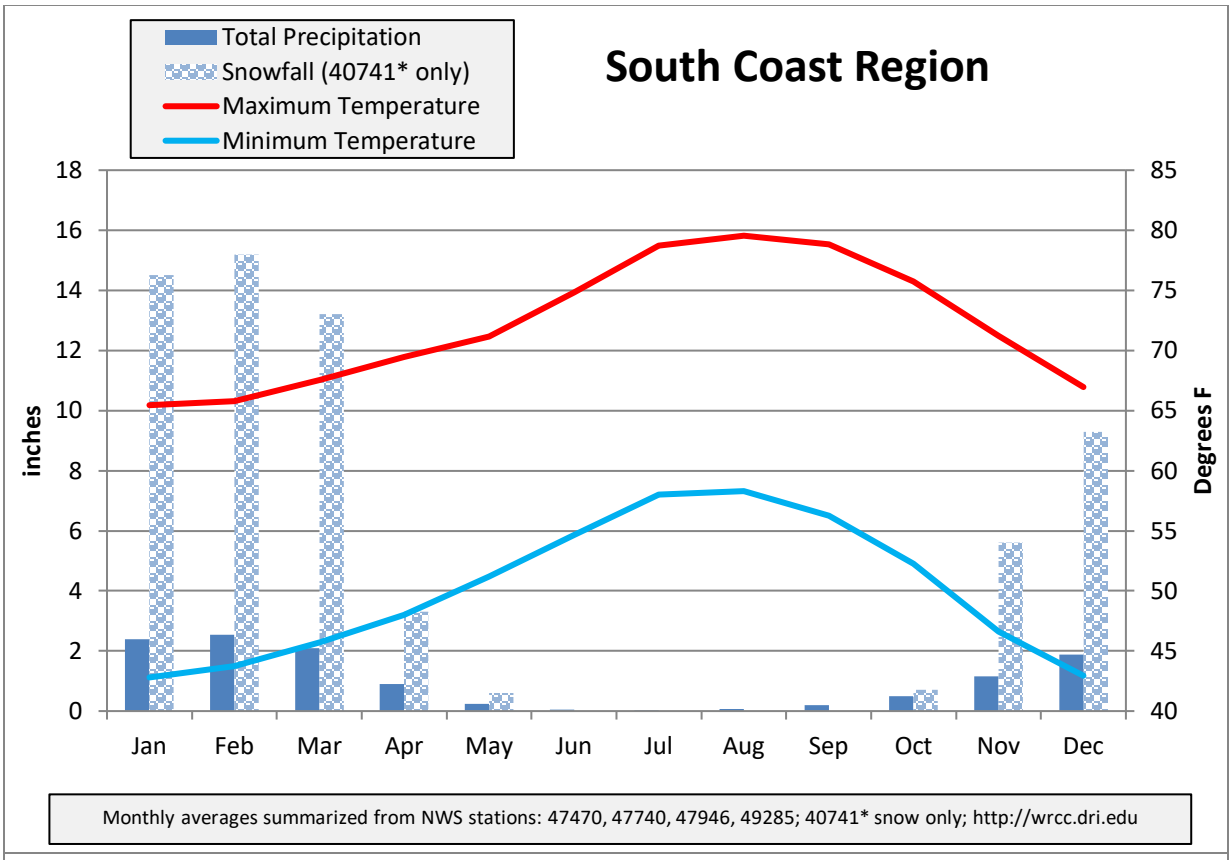
The South Coast Region covers approximately 14,431 square miles along the southern coast of California, as shown in ~~attached (~~Figure A-48~~).~~ Elevations in the South Coast Region range from sea level along the coast, to over 6,000 feet in the Los Padres and San Bernardino National Forests~~; please~~. Please refer to ~~(~~Figure A-49~~)~~ for an elevation map of the region. Numerous watersheds of small and moderate size are located in the South Coast Region, including the Santa Maria River, Santa Ynez River, Ventura River, Santa Clara River, Los Angeles River, Santa Ana River, San Luis Rey River, and San Diego River. These coastal watersheds drain to the Pacific Ocean.

1.9.1 Climate and Precipitation

Much of the South Coast Region is described by Mediterranean and Steppe climates. The northern portion of the South Coast Region is generally characterized by a Mediterranean climate, with cool summers. Temperatures in the South Coast Region tend to be cooler near the coast, which is a result of the marine influence. Much of the central and southern portion of the South Coast Region is characterized by a Mediterranean climate with hot summers, or by a Semi-arid, steppe climate. Please refer to ~~(~~Figure A-50~~)~~ for a climatic map of this region.

Temperature conditions and precipitation patterns in the South Coast Region tend to be mild. Average annual maximum temperatures in the South Coast Region tend to exceed 75 degrees Fahrenheit in inland areas, and coastal and high elevation areas tend to exhibit slightly cooler maximum temperatures. Average annual minimum temperatures in the South Central Coast Region tend to remain above 45 degrees Fahrenheit, although average annual minimum temperatures are cooler at the highest elevations. Average annual precipitation in the South Coast Region tends to range from 5 and 20 inches in most coastal and inland areas, but can exceed 40 inches at mountain peaks). Precipitation events tend to occur from November to April, with precipitation peaks in December and January. Nearly all precipitation in the South Coast Region falls as rain, and snow only contributes significant precipitation to the region in the vicinity of Big Bear Lake. (WRCC 2016)

Please refer to ~~(~~Figure A-51~~)~~ for a precipitation map of the region. Please refer to Chart A-15, below, for an illustration of precipitation and temperature conditions in the South Coast Region.


Total Precipitation
Snowfall (40741* only)
Maximum Temperature
Minimum Temperature
South Coast Region
inches
Degrees F
18
16
14
12
10
8
6
4
2
0
85
80
75
70
65
60
55
50
45
40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Monthly averages summarized from NWS stations: 47470, 47740, 47946, 49285; 40741* snow only; http://wrcc.dri.edu

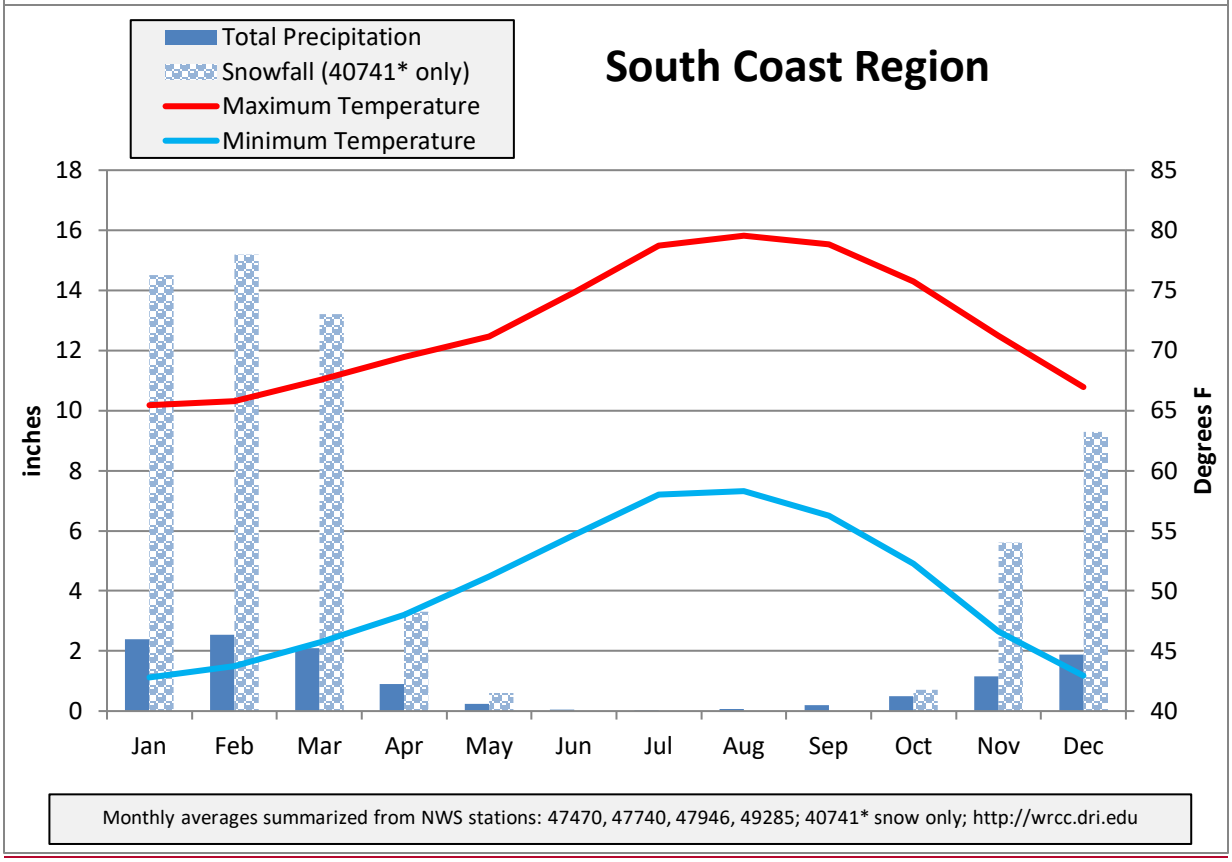

Total Precipitation
Snowfall (40741* only)
Maximum Temperature
Minimum Temperature
South Coast Region
inches
Degrees F
18
16
14
12
10
8
6
4
2
0
85
80
75
70
65
60
55
50
45
40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Monthly averages summarized from NWS stations: 47470, 47740, 47946, 49285; 40741* snow only; http://wrcc.dri.edu

Chart A-15. Average annual patterns of temperature and precipitation in the South Coast Region.

1.9.2 Hydrology

Stream reaches in the South Coast Region are characterized by several classes described under UC Davis' hydrologic classification system. The majority of stream reaches located in the southern half of the South Coast Region are classified as Rain and Seasonal Groundwater (RSG) systems. Many streams located in the northern half of the South Coast Region and located along the eastern margin of the region are classified as Low-Volume Snowmelt and Rain (LSR) systems. The South Coast Region also contains several Perennial Groundwater and Rain (PGR), and Flashy, Ephemeral Rain (FER) stream systems. A small number of Winter Storm (WS) and Snowmelt (SM) stream reaches are also located in this region. (Lane et al 2016)

Please refer to ~~(~~Figure A-52~~)~~ for a depiction of the stream classifications within the South Coast Region.

1.9.3 Geology

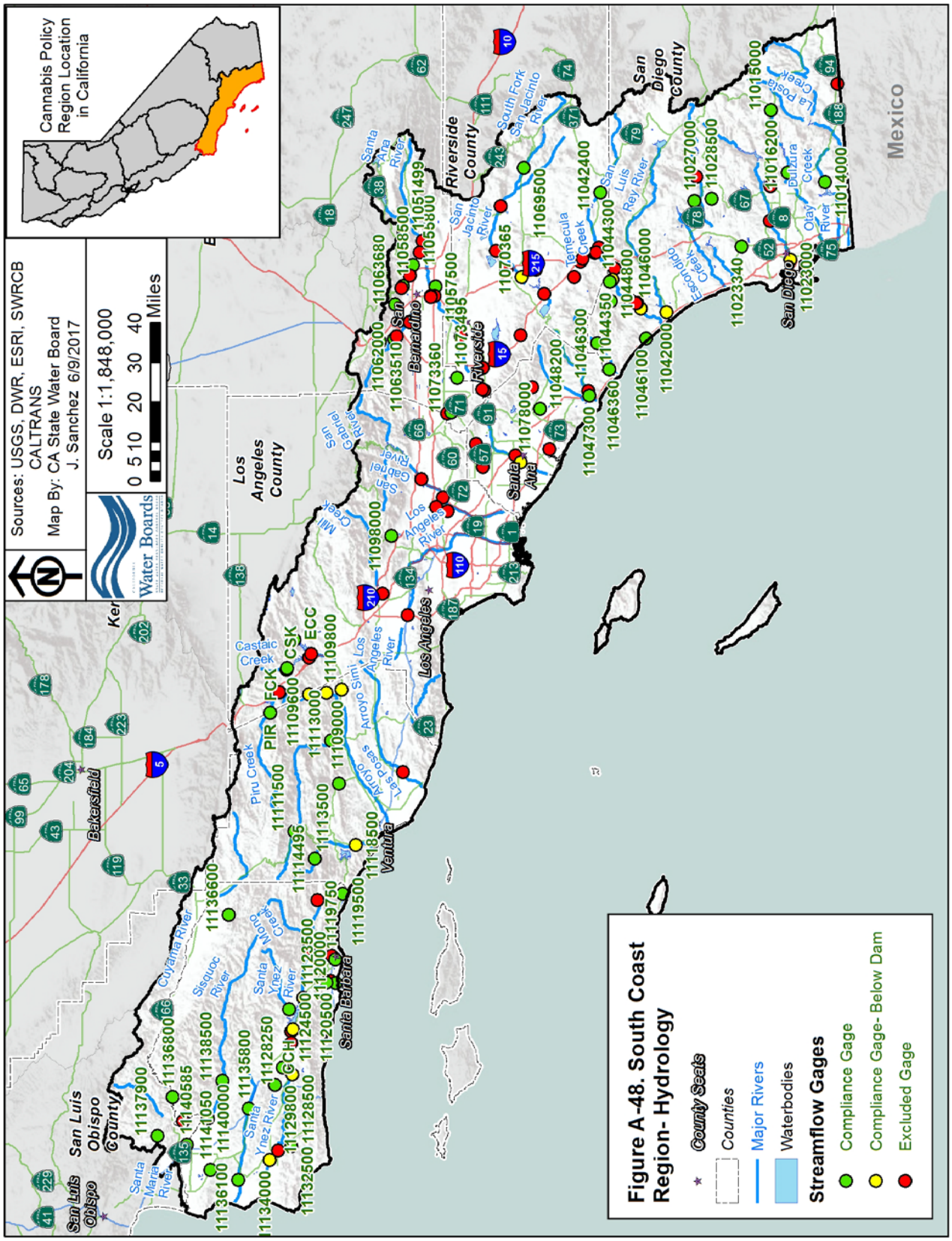
The South Coast Region is located in the Coast Ranges, Transverse Ranges, and Peninsular Ranges geomorphic provinces. The Coast Ranges, located in the northern portion of the region, are characterized by irregular, knobby, landslide topography, and contain sedimentary and metamorphic rock. The Transverse Ranges geomorphic province, located in the central portion of the region, contains steep mountain ranges and valleys oriented perpendicular to the other coastal mountain ranges. The Peninsular Ranges geomorphic province, located in the southern portion of the region, is characterized by topography similar to the Coast Ranges, but with rock types more similar to the Sierra Nevada mountains. Alluvial deposits are found in valleys throughout the South Coast Region. (CGS, 2002)

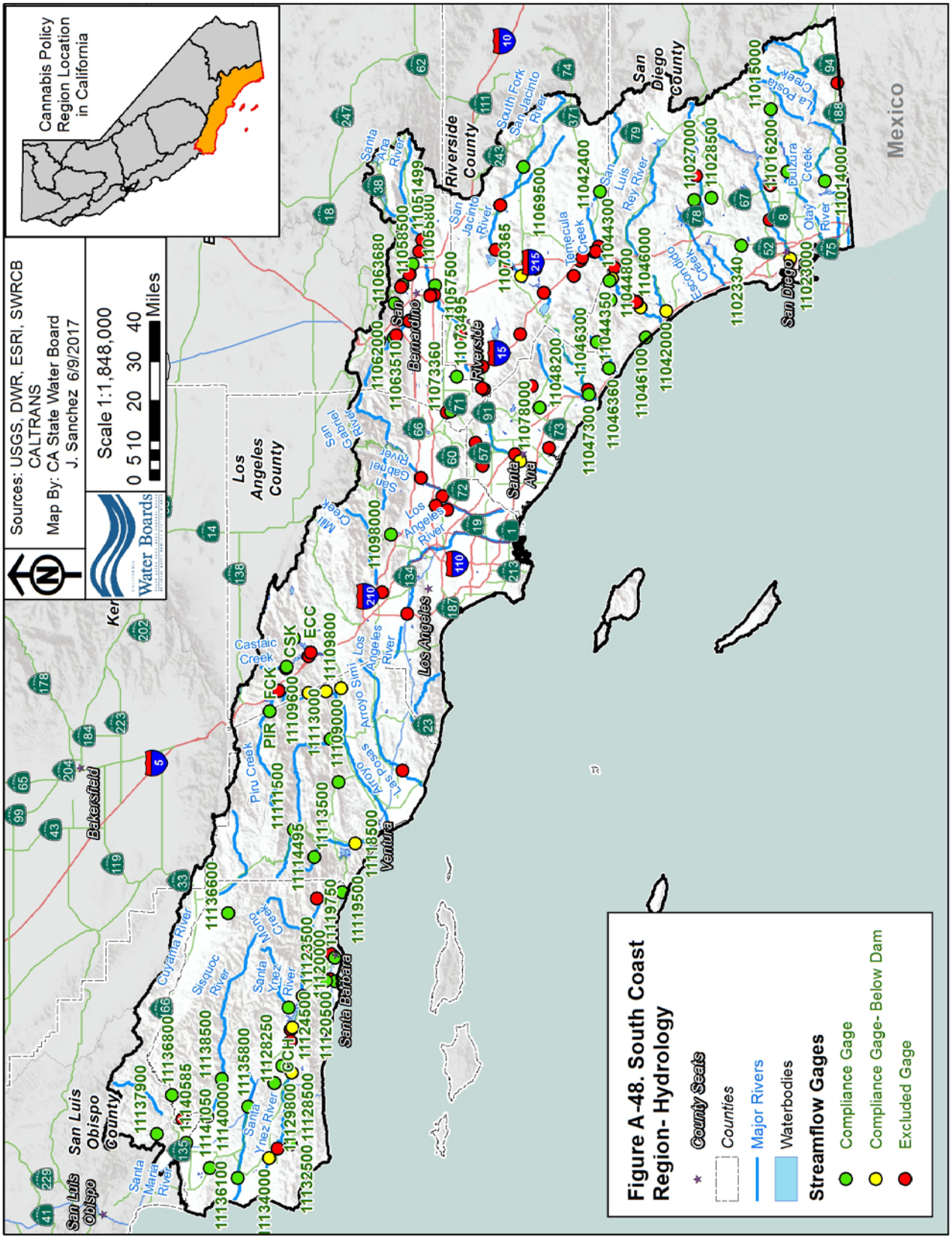
1.9.4 Anadromous Salmonid Population

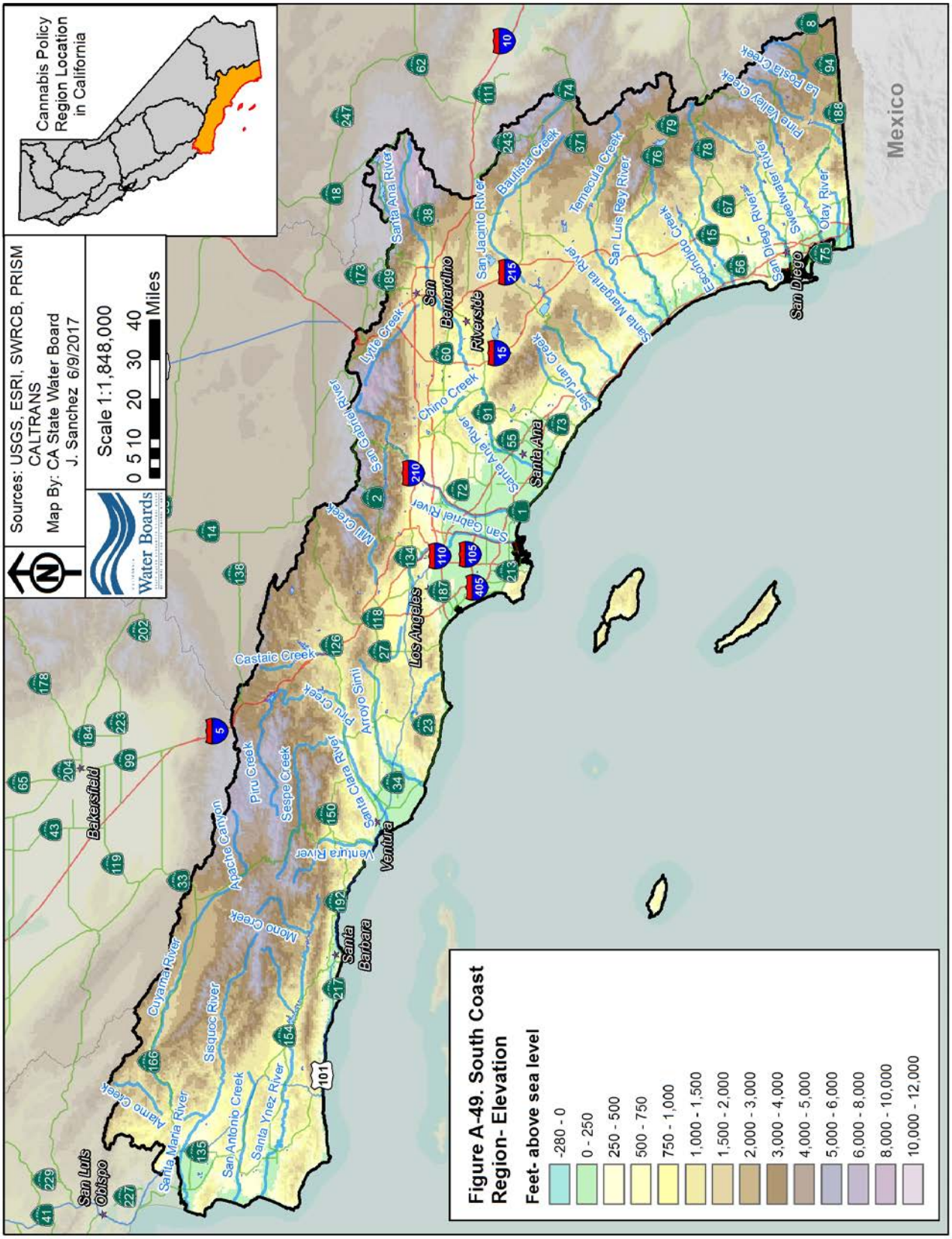
One special-status ESU, DPS, or DTE is currently extant within the South Coast Region (Figure A-53):

- the Southern California Coast (SCC) steelhead DPS.

The SCC steelhead DPS is currently listed as endangered under the ESA (CDFW 2017b).


Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB
CALTRANS
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Figure A-48. South Coast Region- Hydrology
County Seats
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Mexico
Los Angeles County
Riverside County
San Diego County
San Luis Obispo County
Santa Barbara
Ventura
Bakersfield
Los Angeles
San Bernardino
Riverside
Santa Ana
San Diego
11137900
11136800
11140585
11141050
11138500
11140000
11135800
11128250
11129800
11132500
11128500
11134000
11136100
11136600
11123500
11120000
11120500
11119750
11119500
11118500
11114495
11111500
11113500
11113000
11109800
11109600
11109000
11098000
11063680
11062000
11063510
11058500
11055800
11051499
11057500
11073495
11073360
11078000
11048200
11047300
11046360
11046300
11044350
11044800
11046000
11046100
11042000
11042400
11044300
11069500
11070365
11027000
11028500
11023340
11023000
11016200
11015000
11014000
PIR
FCK
CSK
ECC
CCH


Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Figure A-48. South Coast Region- Hydrology
County Seats
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Los Angeles County
Riverside County
San Diego County
San Luis Obispo County
Santa Barbara
Ventura
Mexico


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Figure A-49. South Coast Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
Mexico
San Diego
Riverside
San Bernardino
Santa Ana
Los Angeles
Ventura
Santa Barbara
Bakersfield
San Luis Obispo
Santa Ana River
Lytle Creek
Chino Creek
San Gabriel River
Mill Creek
Castaic Creek
Piru Creek
Sespe Creek
Arroyo Simi
Santa Clara River
Ventura River
Apache Canyon
Mono Creek
Cuyama River
Sisquoc River
Alamo Creek
Santa Maria River
San Antonio Creek
Santa Ynez River
Bautista Creek
Temecula Creek
San Luis Rey River
Santa Margarita River
San Diego River
Sweetwater River
Otay River
Pine Valley Creek
La Posta Creek
San Jacinto River
San Juan Creek
Escondido Creek

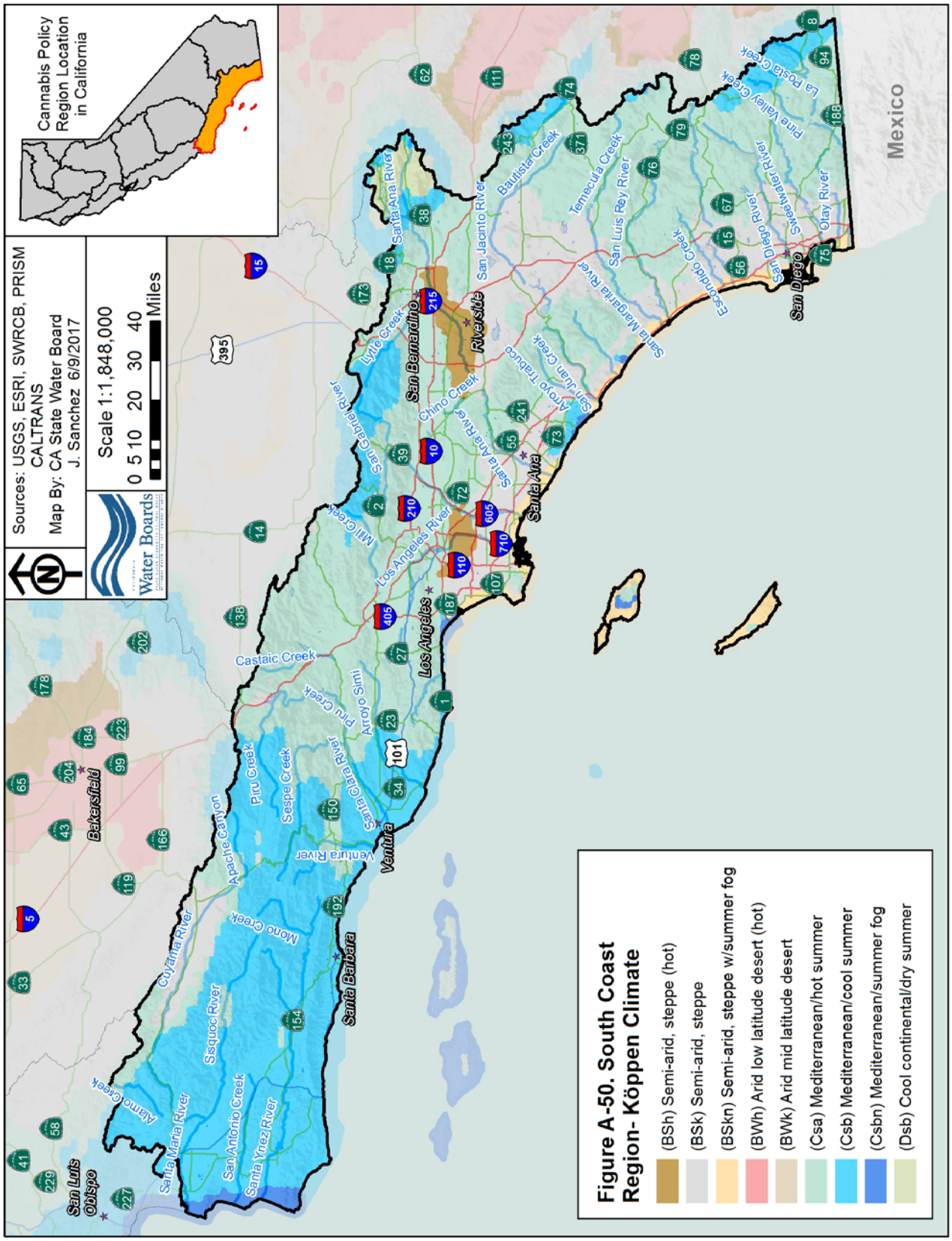


Figure A-50. South Coast Region- Köppen Climate
(BSh) Semi-arid, steppe (hot)
(BSk) Semi-arid, steppe
(BSkn) Semi-arid, steppe w/summer fog
(BWh) Arid low latitude desert (hot)
(BWk) Arid mid latitude desert
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Cannabis Policy Region Location in California
Mexico
Los Angeles
Riverside
San Bernardino
Santa Ana
San Diego
Ventura
Santa Barbara
Bakersfield
San Luis Obispo
Los Angeles River
Santa Ana River
Santa Clara River
Ventura River
Cuyama River
Sespe Creek
Piru Creek
Castaic Creek
Arroyo Simi
Mill Creek
Lytle Creek
Chino Creek
San Jacinto River
Temecula Creek
Santa Margarita River
San Luis Rey River
San Diego River
Sweetwater River
Otay River
Pine Valley Creek
La Posta Creek
Escondido Creek
Arroyo Trabuco
San Juan Creek
Bautista Creek
Mono Creek
Apache Canyon
Santa Maria River
San Antonio Creek
Santa Ynez River
Sisquoc River
Alamo Creek

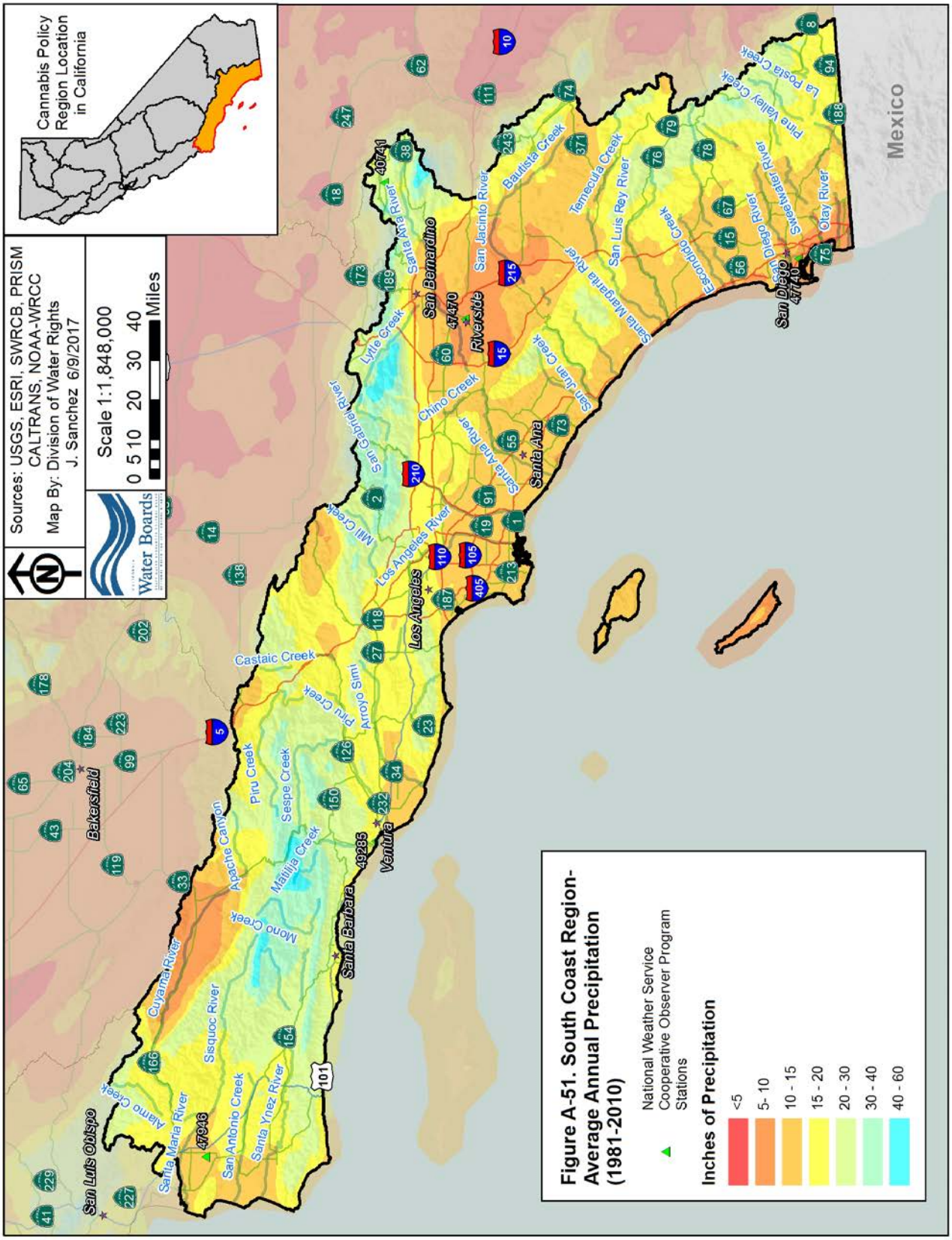
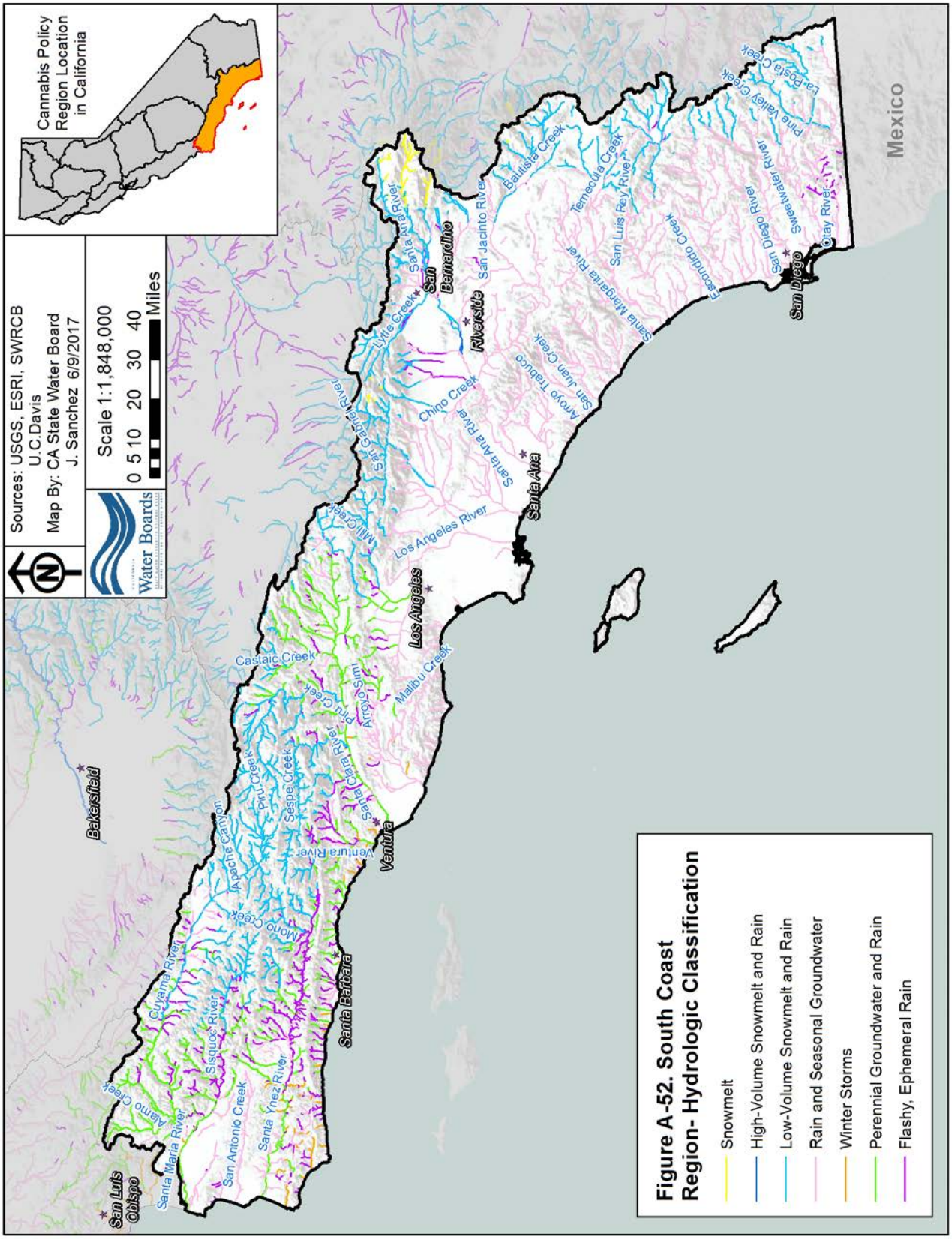
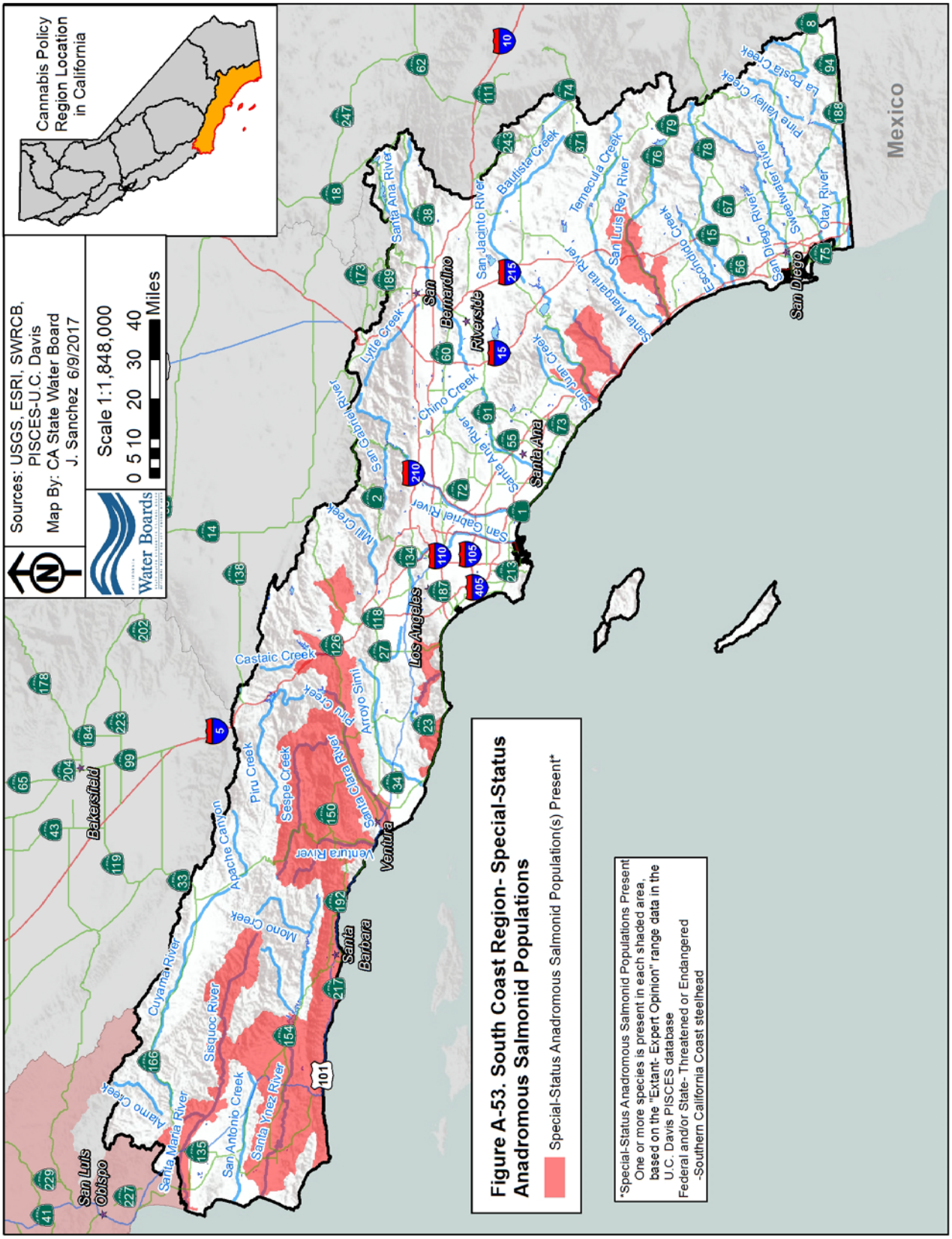


Figure A-51. South Coast Region-Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS, NOAA-WRCC
Map By: Division of Water Rights
J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Cannabis Policy Region Location in California
Mexico
San Luis Obispo
Santa Maria River
Alamo Creek
San Antonio Creek
Santa Ynez River
Sisquoc River
Cuyama River
Apache Canyon
Mono Creek
Matilija Creek
Sespe Creek
Piru Creek
Castaic Creek
Arroyo Simi
Bakersfield
Santa Barbara
Ventura
Los Angeles
Mill Creek
San Gabriel River
Los Angeles River
Lytle Creek
Santa Ana River
San Bernardino
Riverside
Chino Creek
Santa Ana River
San Jacinto River
Bautista Creek
Temecula Creek
San Luis Rey River
Santa Margarita River
San Juan Creek
Santa Ana
Escondido Creek
San Diego River
Sweetwater River
Pine Valley Creek
La Posta Creek
Otay River
San Diego


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB
U.C.Davis
Map By: CA State Water Board
J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Figure A-52. South Coast Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
Mexico
San Diego
Riverside
San Bernardino
Santa Ana
Los Angeles
Ventura
Santa Barbara
Bakersfield
San Luis Obispo
Cuyama River
Santa Maria River
Sisquoc River
Santa Ynez River
Ventura River
Santa Clara River
Los Angeles River
Santa Ana River
San Jacinto River
Temecula Creek
San Luis Rey River
Santa Margarita River
San Diego River
Sweetwater River
Otay River
Malibu Creek
Castaic Creek
Chino Creek
Lytle Creek
Baldwin Creek
Escondido Creek
Pine Valley Creek
La Posta Creek


Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board J. Sanchez 6/9/2017
Scale 1:1,848,000
0 5 10 20 30 40 Miles
Water Boards
Figure A-53. South Coast Region- Special-Status Anadromous Salmonid Populations
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area, based on the "Extant- Expert Opinion" range data in the U.C. Davis PISCES database
Federal and/or State- Threatened or Endangered
-Southern California Coast steelhead
Mexico
San Diego
Santa Ana
Los Angeles
Ventura
Santa Barbara
San Luis Obispo
Bakersfield
San Bernardino
Riverside
Castaic Creek
Piru Creek
Sespe Creek
Santa Clara River
Ventura River
Arroyo Simi
Mono Creek
Apache Canyon
Cuyama River
Sisquoc River
Santa Maria River
Alamo Creek
San Antonio Creek
Santa Ynez River
Mill Creek
Lytle Creek
Chino Creek
Santa Ana River
San Gabriel River
Santa Margarita River
San Luis Rey River
Temecula Creek
Bautista Creek
San Jacinto River
Escondido Creek
San Diego River
Sweetwater River
Otay River
Pine Valley Creek
La Posta Creek

1.10 North East Desert Region

The North East Desert Region covers approximately 3,951 square miles in the northeastern corner of California (Figure A-54). Elevations in this region range from approximately 3,000 feet above sea level to over 8,700 feet above sea level at Hat Mountain. Please refer to Figure A-55 for an elevation map of the region. The region includes the watersheds of the Susan River, Pine Creek, Willow Creek, Red Rock Creek, Long Valley Creek, Bidwell Creek, Bare Creek, and Dry Valley Creek.

1.10.1 Climate and Precipitation

The climate of the North East Desert Region is generally characterized by a cool continental climate with dry summers, and with areas of Semi-arid, steppe climate. Please refer to Figure A-56 for a climatic map of the North East Desert Region.

Temperatures patterns within the North East Desert Region have very little variation. Most of the region exhibits average annual maximum temperatures of 65 degrees Fahrenheit and average annual minimum temperatures of 32 degrees Fahrenheit. Some of the southern portions of the region exhibit slightly higher average annual minimum temperatures of 40 degrees Fahrenheit.

Most of the North East Desert Region receives between 5 to 20 inches of precipitation annually. However, there are a few areas in the most western parts of the region that receive between 40 to 60 inches annually. The amount of precipitation tends to decrease at higher elevations.

Please refer to Figure A-57 for a precipitation map of the region. Please refer to Chart A-16, below, for an illustration of precipitation and temperature conditions in the North East Desert Region.

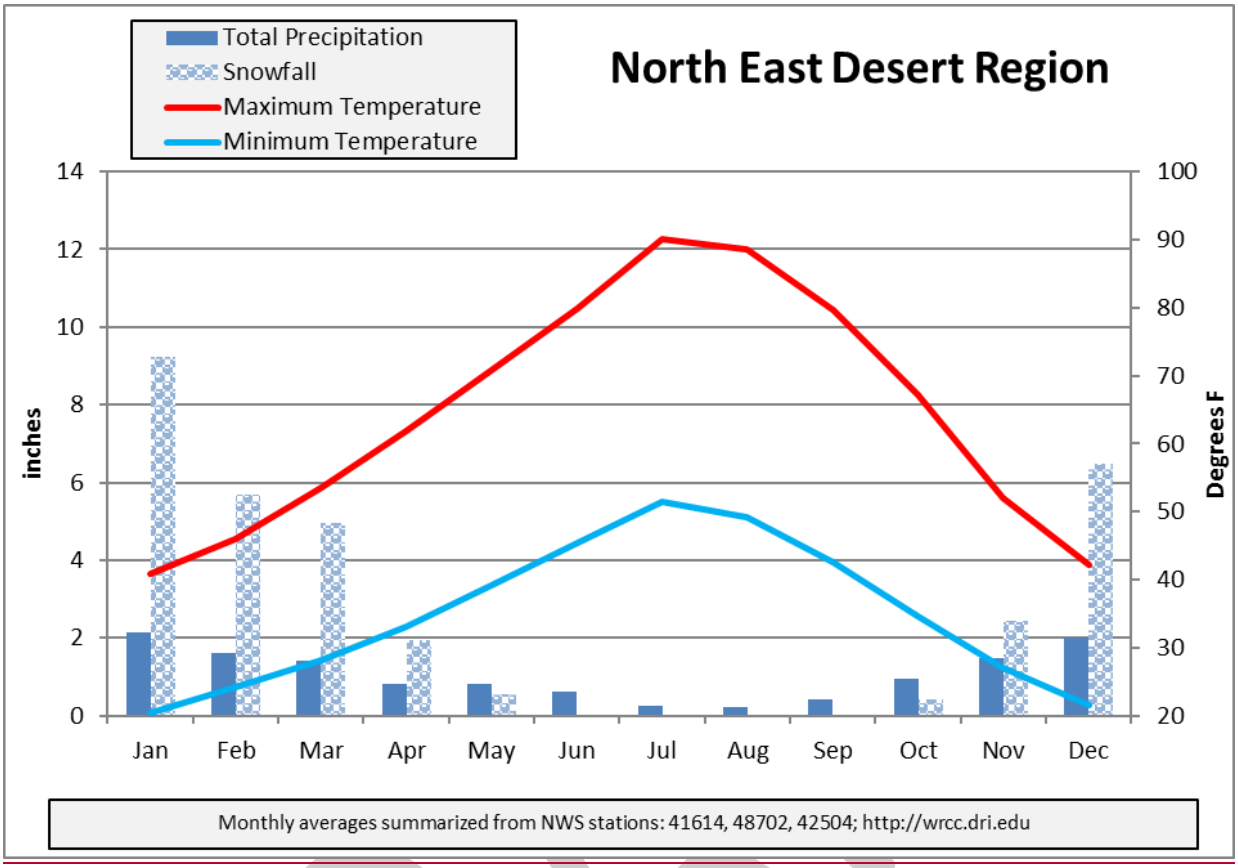


Chart A-16. Average annual patterns of temperature and precipitation in the North East Desert Region.

1.10.2 Hydrology

The hydrology of North East Desert Region streams is dominated by High Elevation and Low Precipitation (HELP) systems. There are a smaller number of streams classified as Flashy, Ephemeral Rain (FER), Perennial Groundwater and Rain (PGR), Snowmelt (SM), and Low-Volume Snowmelt and Rain (LSR) systems. (Lane et al 2016)

Please refer to Figure A-58 for a depiction of the stream classifications within the South Coast Region.

1.10.3 Geology

The North East Desert Region is located in the Basin and Range, Cascade Range, and Modoc Plateau geomorphic provinces. The Cascade Range is a rugged mountain range, and the Modoc Plateau is an elevated volcanic plateau located in the northeastern corner of California. The Cascade Range is generally underlain by igneous rock, including lava flows, pyroclastic flows, and alluvium eroded from volcanic features. The Modoc Plateau is a volcanic table land consisting of lava flows, tuff beds and small volcanic cones. Significant subterranean streamflows occur through porous volcanic features in the Modoc Plateau (CGS 2002).

1.10.4 Anadromous Salmonid Population

No anadromous salmonids are present in the North East Desert Region.

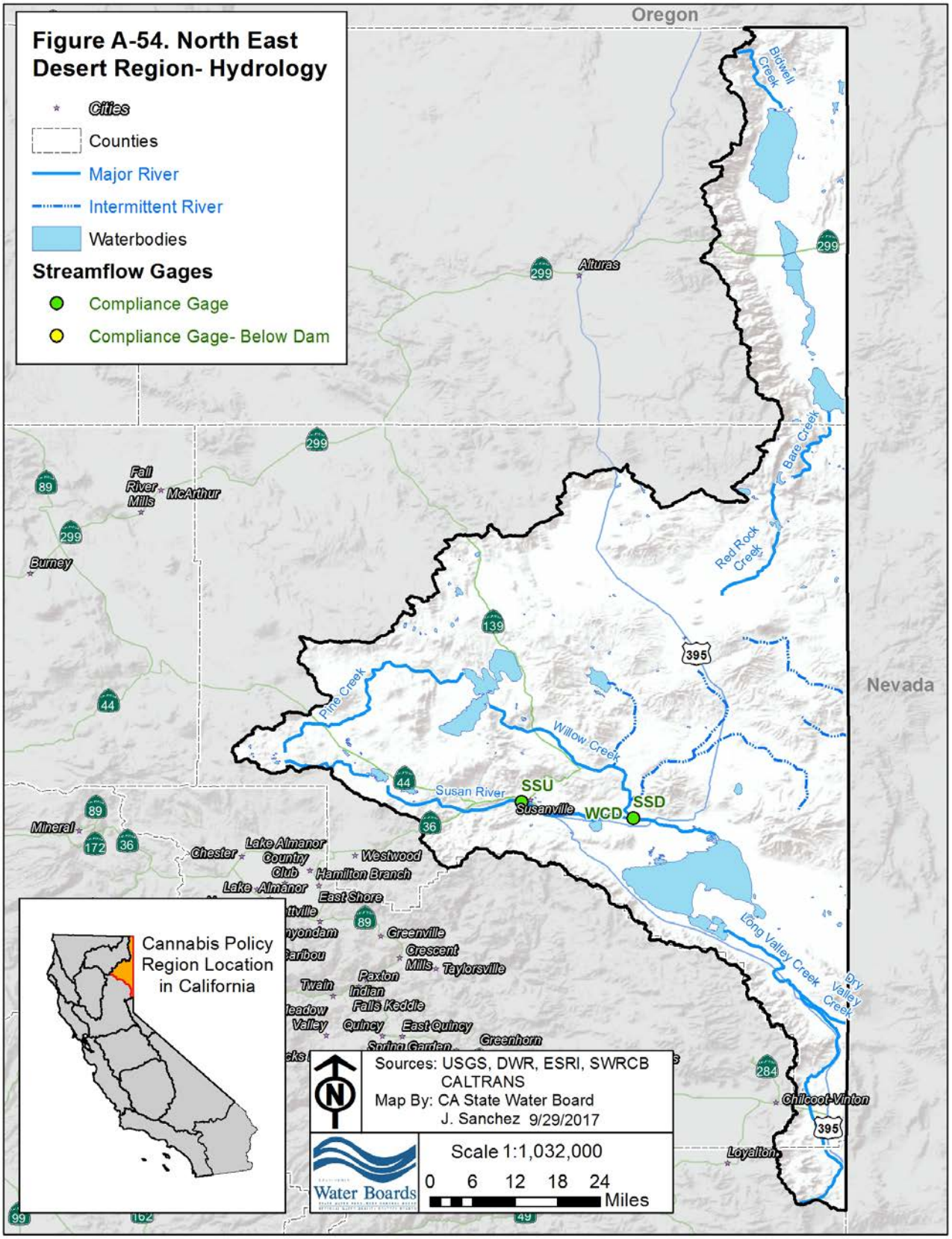


Figure A-54. North East Desert Region- Hydrology
Cities
Counties
Major River
Intermittent River
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Oregon
Nevada
Alturas
Fall River Mills
McArthur
Burney
Bidwell Creek
Bare Creek
Red Rock Creek
Pine Creek
Willow Creek
Susan River
SSU
Susanville
WCD
SSD
Long Valley Creek
Dry Valley Creek
Mineral
Chester
Lake Almanor Country Club
Lake Almanor
Hamilton Branch
Westwood
East Shore
Greenville
Crescent Mills
Taylorsville
Paxton
Indian Falls
Keddie
Twain
Quincy
East Quincy
Greenhorn
Chilcoot-Vinton
Loyalton
Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,032,000
0 6 12 18 24
Miles

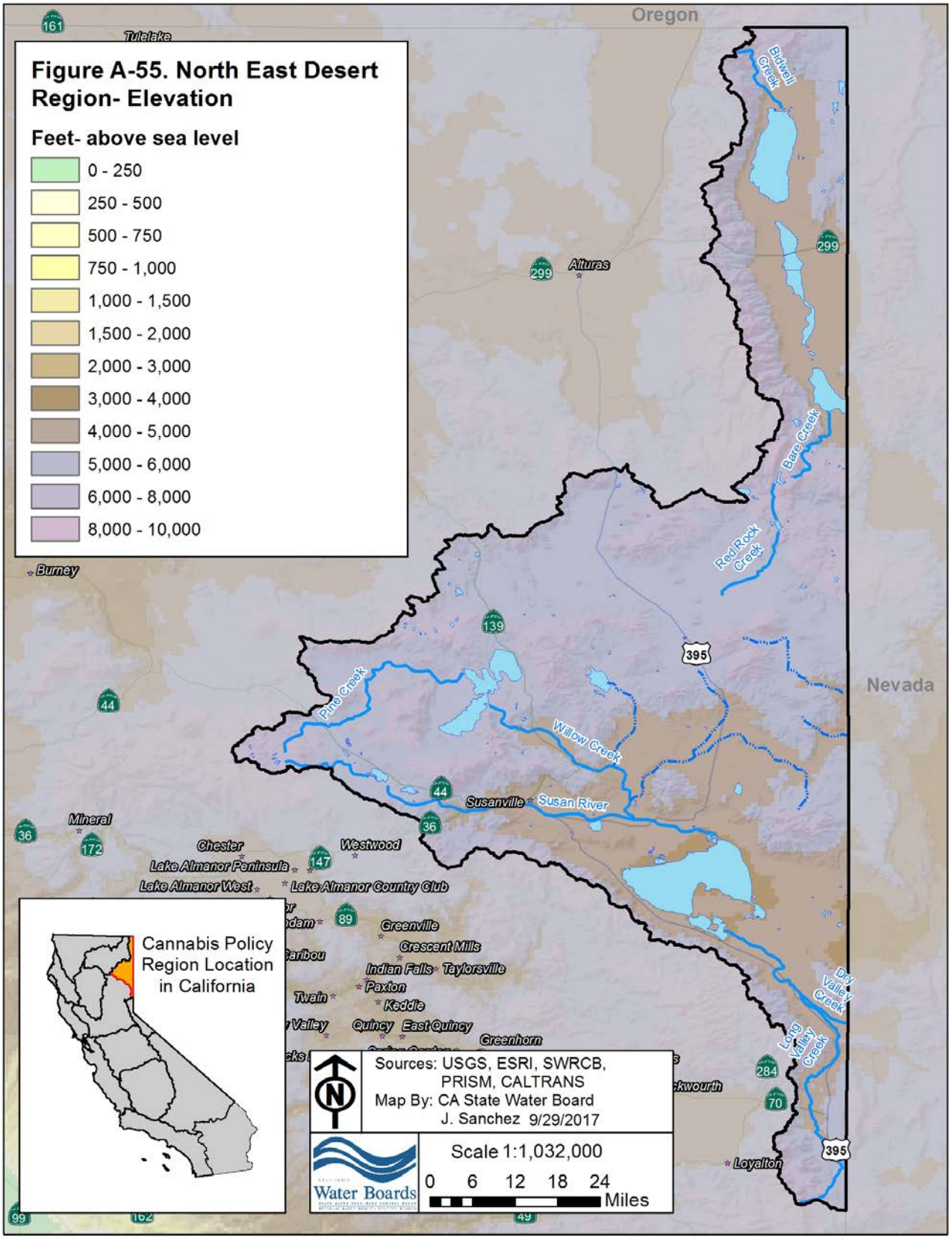


Figure A-55. North East Desert Region- Elevation
Feet- above sea level
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
Oregon
Nevada
Tulelake
Alturas
Burney
Bidwell Creek
Bare Creek
Red Rock Creek
Pine Creek
Willow Creek
Susanville
Susan River
Mineral
Chester
Lake Almanor Peninsula
Lake Almanor West
Lake Almanor Country Club
Westwood
Greenville
Crescent Mills
Indian Falls
Taylorsville
Paxton
Keddie
Twain
Quincy
East Quincy
Greenhorn
Dry Valley Creek
Long Valley Creek
Loyalton
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Scale 1:1,032,000
0 6 12 18 24
Miles
Water Boards

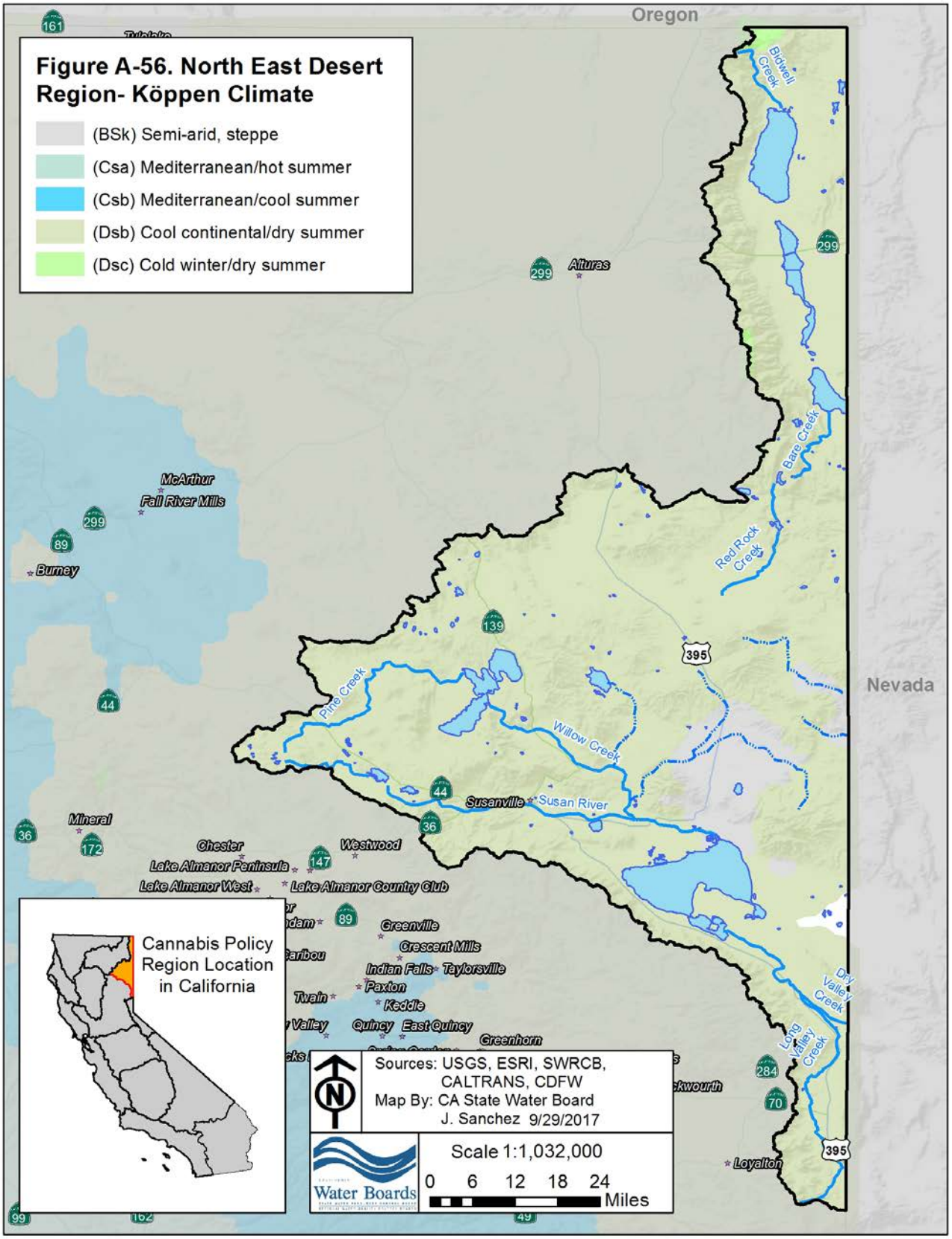


Figure A-56. North East Desert Region- Köppen Climate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
Oregon
Nevada
Alturas
McArthur
Fall River Mills
Burney
Mineral
Chester
Lake Almanor Peninsula
Lake Almanor West
Lake Almanor Country Club
Westwood
Greenville
Crescent Mills
Indian Falls
Taylorsville
Paxton
Keddie
Twain
Quincy
East Quincy
Greenhorn
Susanville
Susan River
Willow Creek
Pine Creek
Red Rock Creek
Bare Creek
Bidwell Creek
Dry Valley Creek
Long Valley Creek
Loyalton
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, CALTRANS, CDFW
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,032,000
0 6 12 18 24
Miles

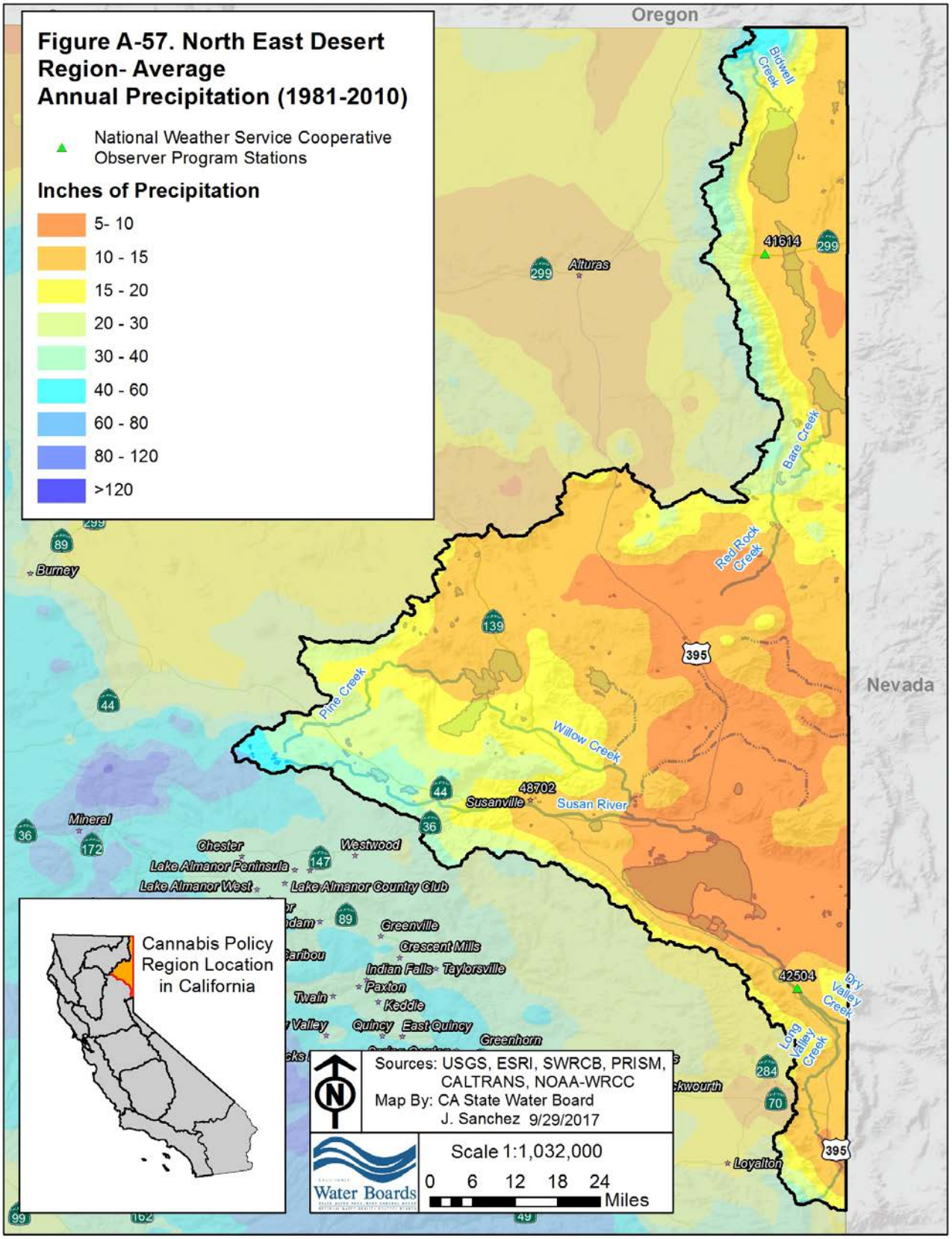


Figure A-57. North East Desert Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
>120
Oregon
Nevada
Alturas
Bidwell Creek
Bare Creek
Red Rock Creek
Pine Creek
Willow Creek
Susan River
Susanville
Burney
Mineral
Chester
Lake Almanor Peninsula
Lake Almanor West
Lake Almanor Country Club
Westwood
Greenville
Crescent Mills
Indian Falls
Taylorsville
Paxton
Keddie
Twain
Quincy
East Quincy
Greenhorn
Loyalton
Dry Valley Creek
Long Valley Creek
41614
48702
42504
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,032,000
0 6 12 18 24
Miles

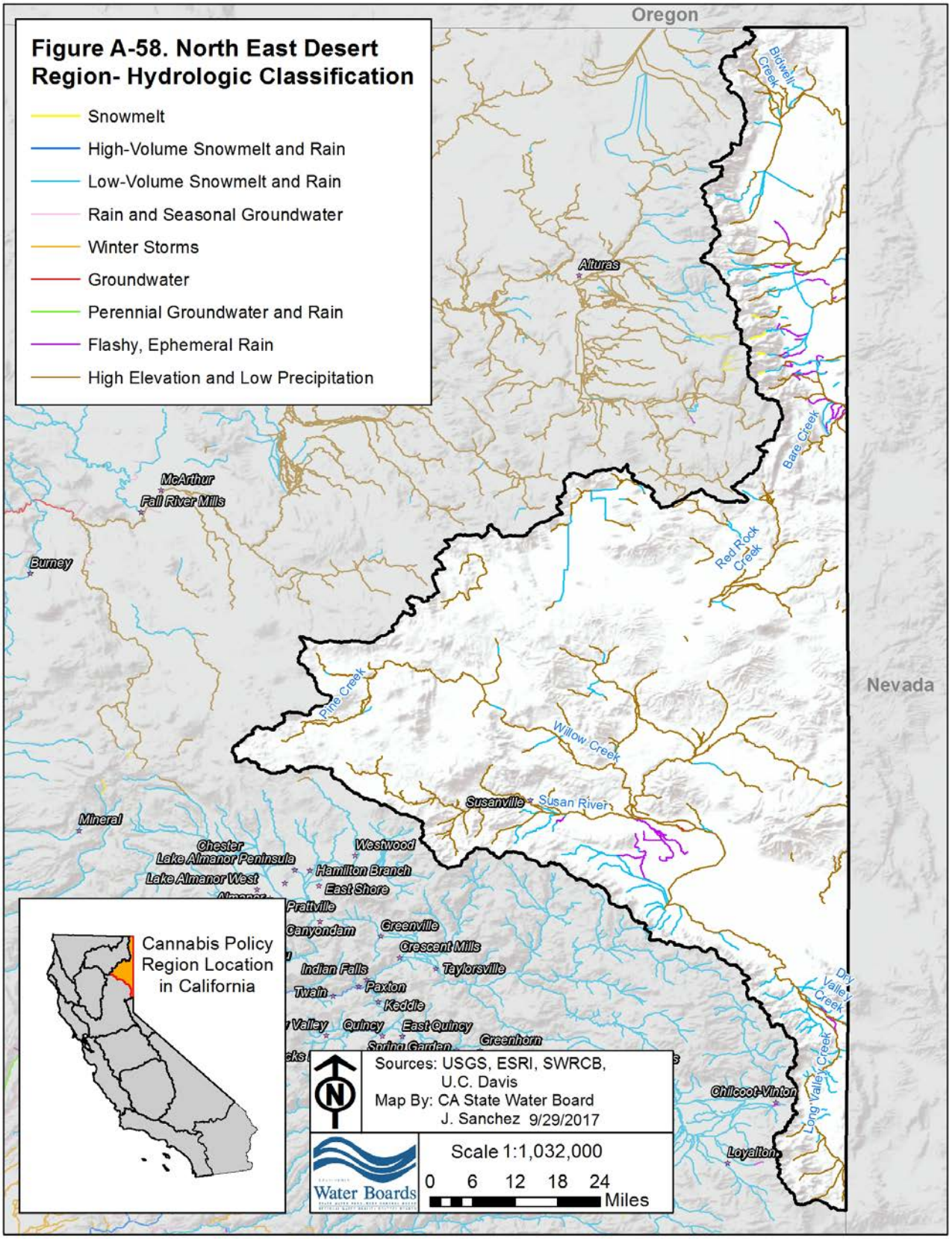


Figure A-58. North East Desert Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
High Elevation and Low Precipitation
Oregon
Nevada
Alturas
Bidwell Creek
Bare Creek
Red Rock Creek
McArthur
Fall River Mills
Burney
Pine Creek
Willow Creek
Susanville
Susan River
Mineral
Chester
Lake Almanor Peninsula
Lake Almanor West
Westwood
Hamilton Branch
East Shore
Prattville
Canyondam
Greenville
Crescent Mills
Indian Falls
Taylorsville
Twain
Paxton
Keddie
Quincy
East Quincy
Greenhorn
Dry Valley Creek
Long Valley Creek
Chilcoot-Vinton
Loyalton
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, U.C. Davis
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,032,000
0 6 12 18 24
Miles

1.11 Tahoe Region

The Tahoe Region covers approximately 2,169 square miles along the eastern boarder of California (Figure A-59). Elevations in this region range from approximately 5,000 to 12,000 feet above sea level. Please refer to Figure A-60 for an elevation map of the region. The region includes the watersheds of the Truckee River, Little Truckee River, Carson River, Walker River, Virginia Creek, Markleeville Creek, Pleasant Valley Creek, and Trout Creek.

1.11.1 Climate and Precipitation

The climate of the Tahoe Region is generally characterized by a cool continental with dry summer climate, with pockets of cold winter with dry summer climate at higher elevations. Please refer to Figure A-61 for a climatic map of the Tahoe Region.

Temperatures patterns within the Tahoe Region have very little variation. Most of the region exhibit average annual maximum temperatures of 65 degrees Fahrenheit and average annual minimum temperatures of 15 degrees Fahrenheit. Some of the higher elevations have cooler annual maximum temperatures around 50 degrees Fahrenheit.

Precipitation patterns vary within the Tahoe Region, with the western side of the Tahoe Region near the Sierra Nevada mountains crest receiving a much larger amount of precipitation annually compared to the eastern side of the region. The western side of the Tahoe Region receives between 60-80 inches of precipitation annually. The amount of precipitation received annually decreases as you move to the east and to the south, with the lowest amounts occurring in the West Walker River and East Walker River watersheds. These two areas receive between 5 and 10 inches of precipitation annually.

Please refer to Figure A-62 for a precipitation map of the region. . Please refer to Charts A-17 and A-18, below, for a comparison of precipitation and temperature conditions for the Nevada Desert area and Sierra Mountains portions of the Tahoe Region

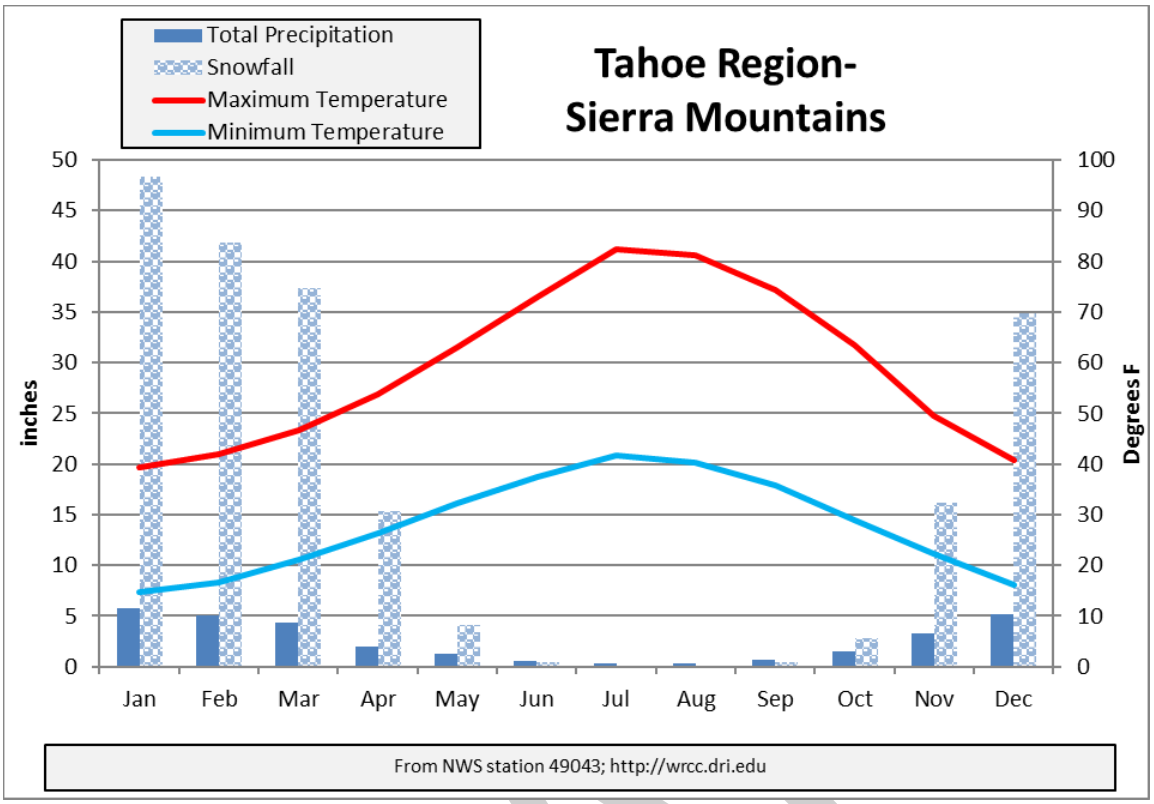


Chart A-17. Average annual patterns of temperature and precipitation, Tahoe Region, Sierra Mountains

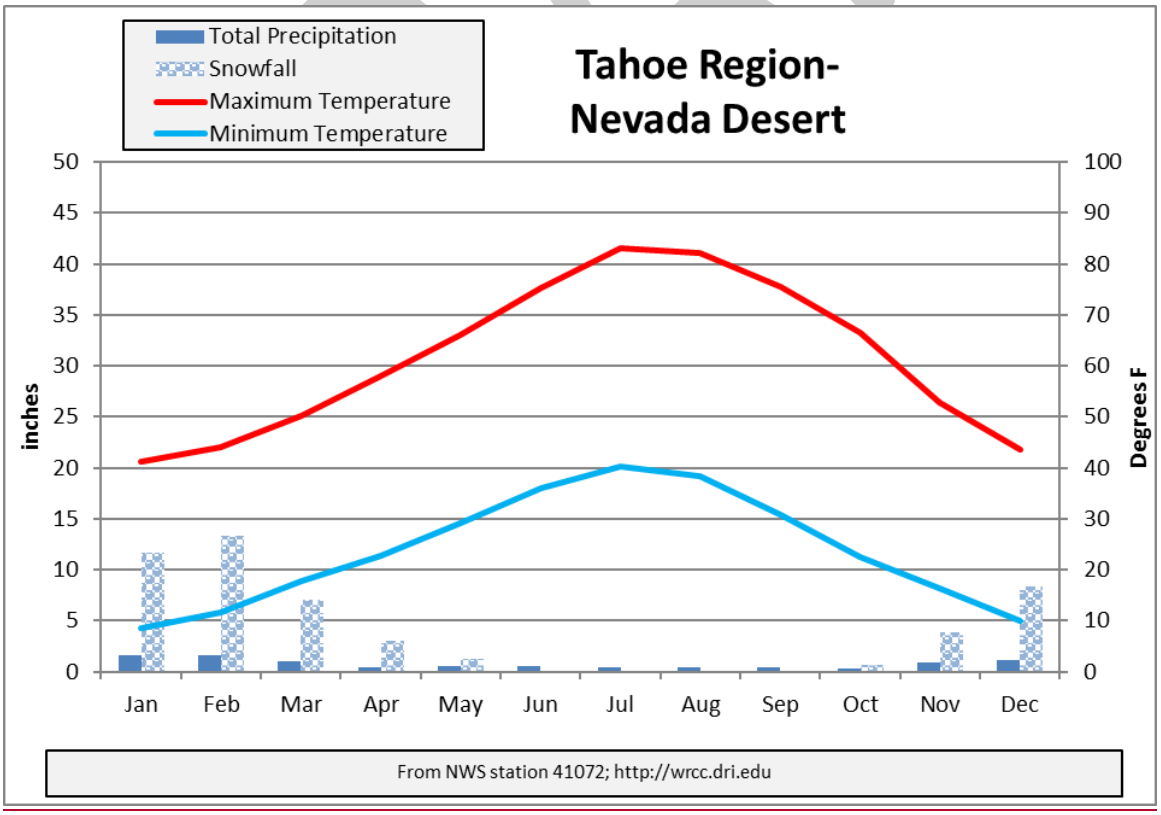


Chart A-18. Average annual patterns of temperature and precipitation, Tahoe Region, Nevada Desert.

1.1.2 Hydrology

The hydrology of Tahoe Region is dependent upon elevation, with higher elevation areas containing streams classified as Snowmelt (SM) systems and lower elevation areas containing Low-Volume Snowmelt and Rain (LSR) streams. (Lane et al 2016)

1.1.3 Geology

The Tahoe Region is predominantly located in the Sierra Nevada Range geomorphic province with the south west corner located in the Basin and Range province. The Sierra Nevada geomorphic province contains steep mountains underlain by a granitic batholith. The foothill regions of the Sierra Nevada geomorphic province are comprised of metamorphic rocks.

1.1.4 Anadromous Salmonid Population

No anadromous salmonids are present in the Tahoe Region.

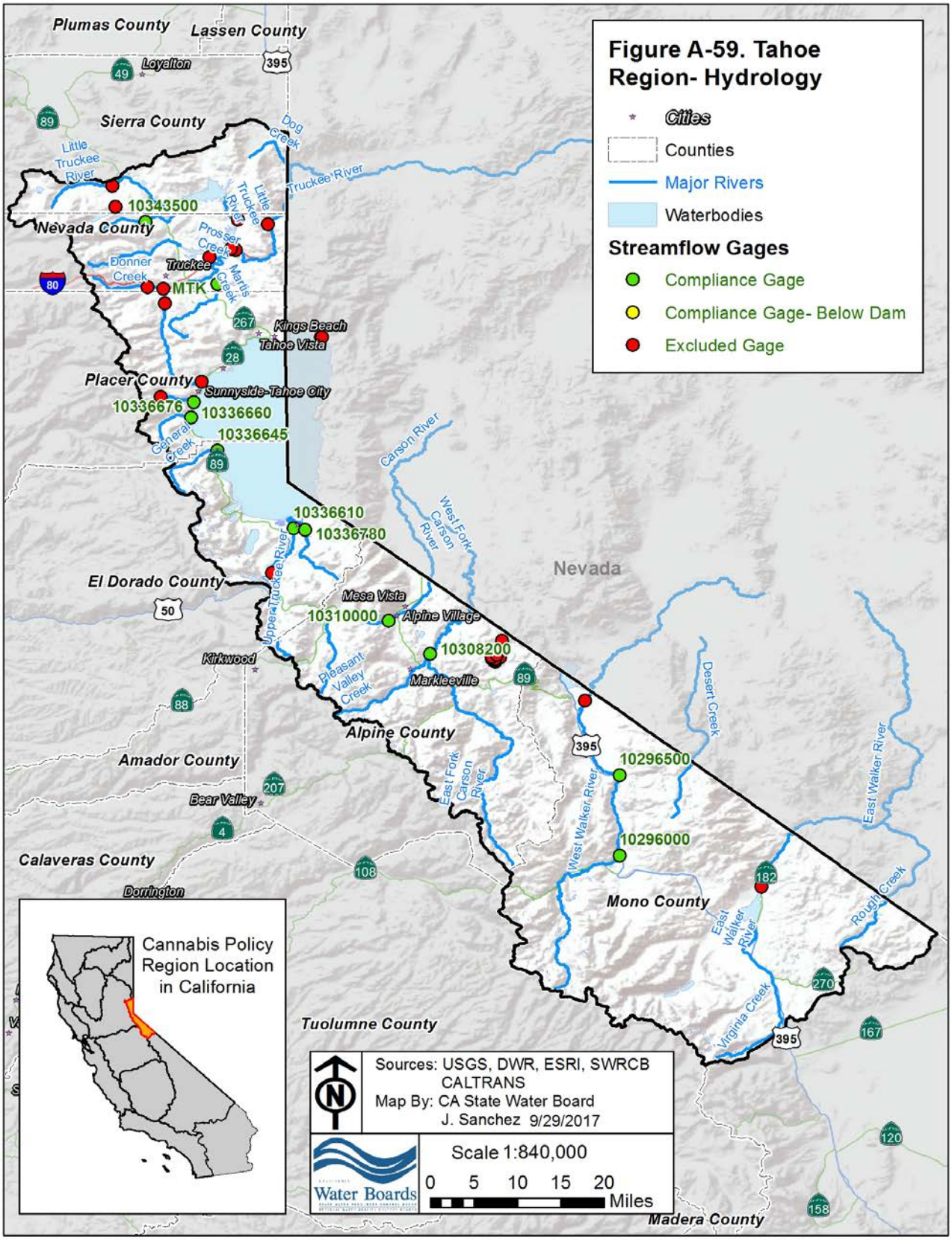


Figure A-59. Tahoe Region- Hydrology
Cities
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Plumas County
Lassen County
Sierra County
Nevada County
Placer County
El Dorado County
Alpine County
Amador County
Calaveras County
Tuolumne County
Mono County
Madera County
Nevada
Loyalton
Truckee
Kings Beach
Tahoe Vista
Sunnyside-Tahoe City
Mesa Vista
Alpine Village
Kirkwood
Markleeville
Bear Valley
Dorrington
10343500
MTK
10336676
10336660
10336645
10336610
10336780
10310000
10308200
10296500
10296000
Little Truckee River
Truckee River
Dog Creek
Prosser Creek
Donner Creek
Martis Creek
General Creek
Upper Truckee River
Carson River
West Fork Carson River
Pleasant Valley Creek
East Fork Carson River
West Walker River
Desert Creek
East Walker River
Rough Creek
Virginia Creek
Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:840,000
0 5 10 15 20
Miles

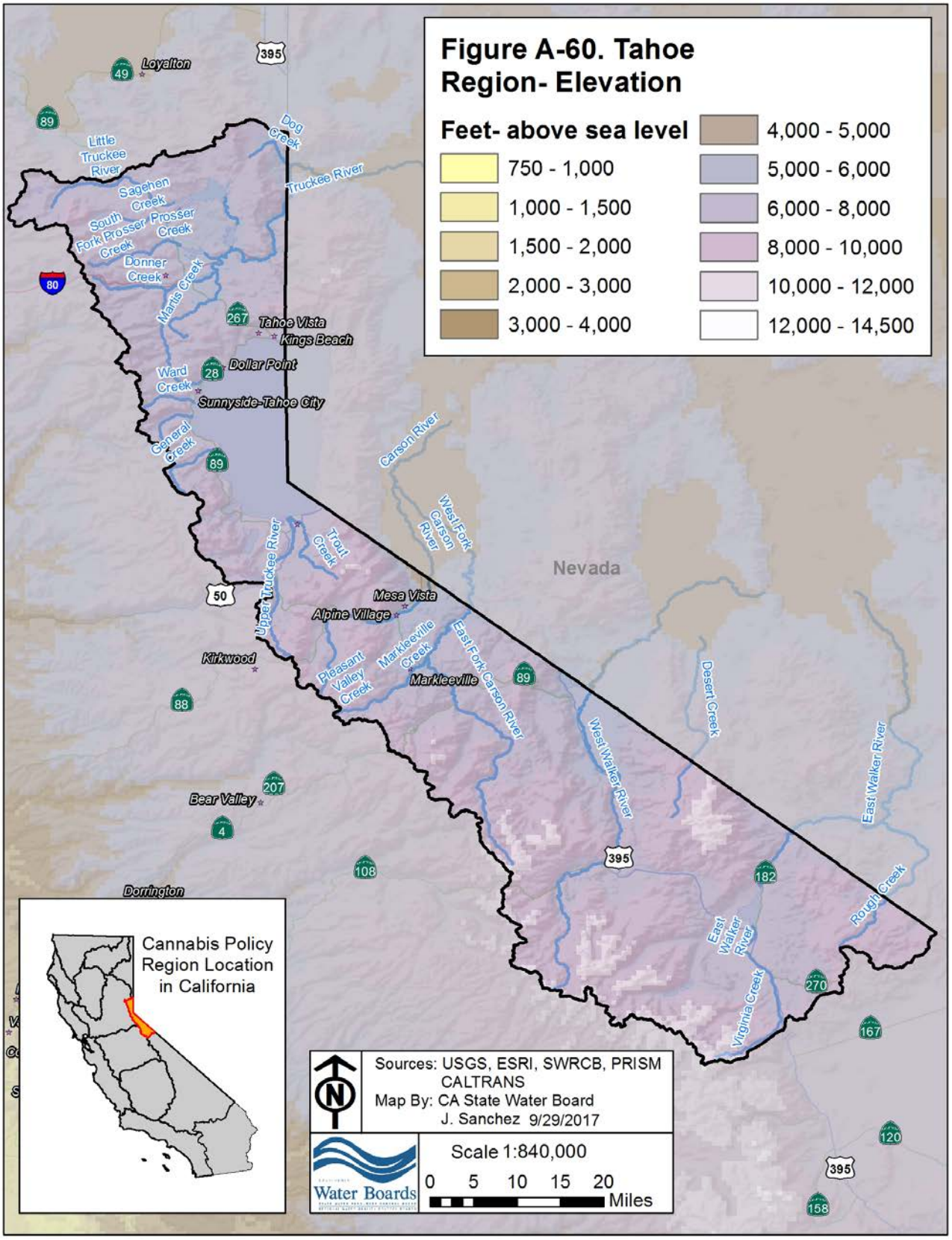


Figure A-60. Tahoe Region- Elevation
Feet- above sea level
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Loyalton
Little Truckee River
Dog Creek
Truckee River
Sagehen Creek
South Fork Prosser Creek
Prosser Creek
Donner Creek
Martis Creek
Tahoe Vista
Kings Beach
Dollar Point
Ward Creek
Sunnyside-Tahoe City
General Creek
Carson River
West Fork Carson River
Trout Creek
Upper Truckee River
Nevada
Mesa Vista
Alpine Village
Kirkwood
Markleeville Creek
Pleasant Valley Creek
Markleeville
East Fork Carson River
Desert Creek
West Walker River
East Walker River
Rough Creek
Virginia Creek
Bear Valley
Dorrington
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:840,000
0 5 10 15 20
Miles

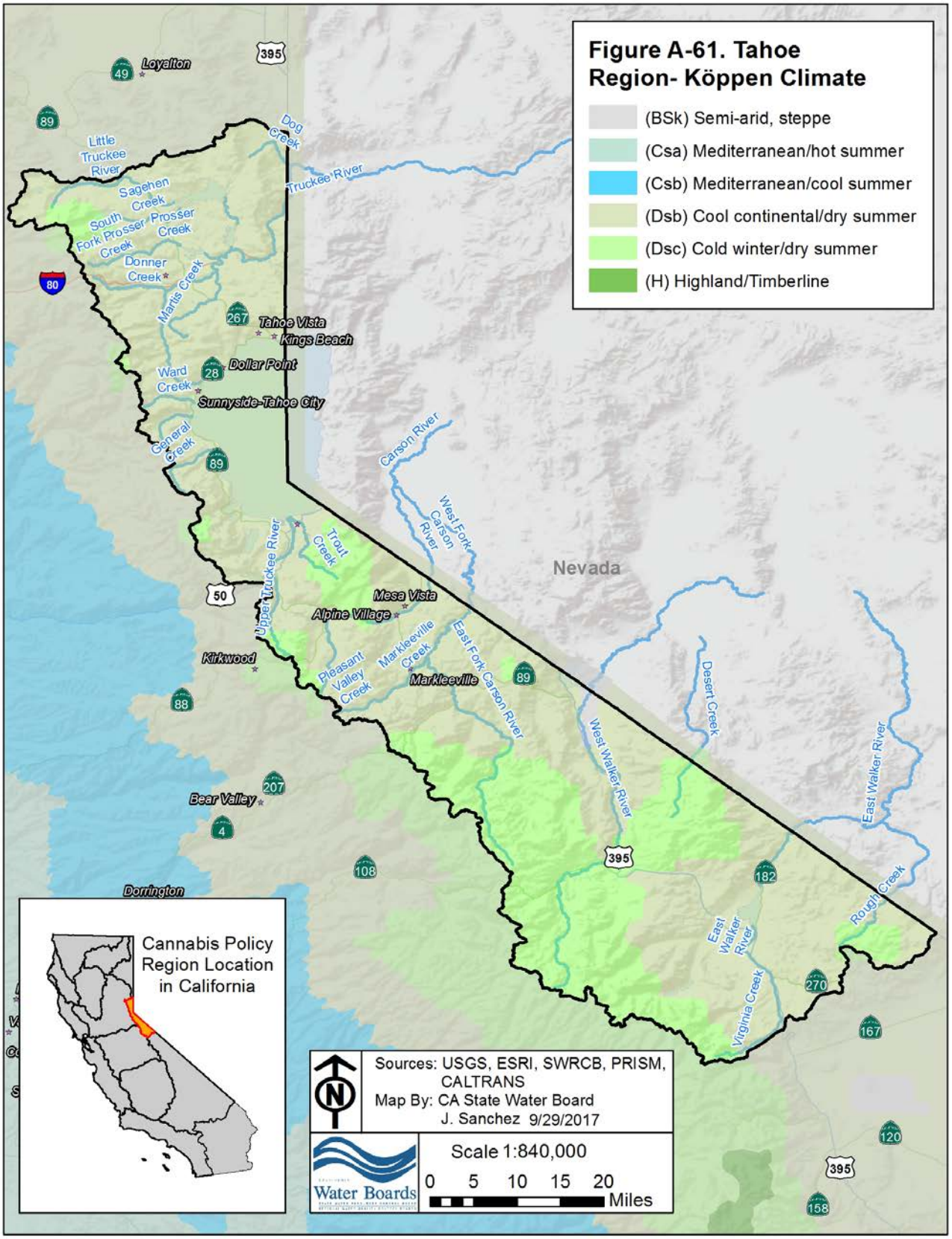


Figure A-61. Tahoe Region- Köppen Climate
(BSk) Semi-arid, steppe
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Loyalton
Little Truckee River
Dog Creek
Truckee River
Sagehen Creek
South Fork Prosser Creek
Prosser Creek
Donner Creek
Martis Creek
Tahoe Vista
Kings Beach
Dollar Point
Ward Creek
Sunnyside-Tahoe City
General Creek
Carson River
West Fork Carson River
Nevada
Upper Truckee River
Trout Creek
Mesa Vista
Alpine Village
Kirkwood
Pleasant Valley Creek
Markleeville Creek
Markleeville
East Fork Carson River
Desert Creek
West Walker River
East Walker River
Rough Creek
Virginia Creek
Bear Valley
Dorrington
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:840,000
0 5 10 15 20
Miles

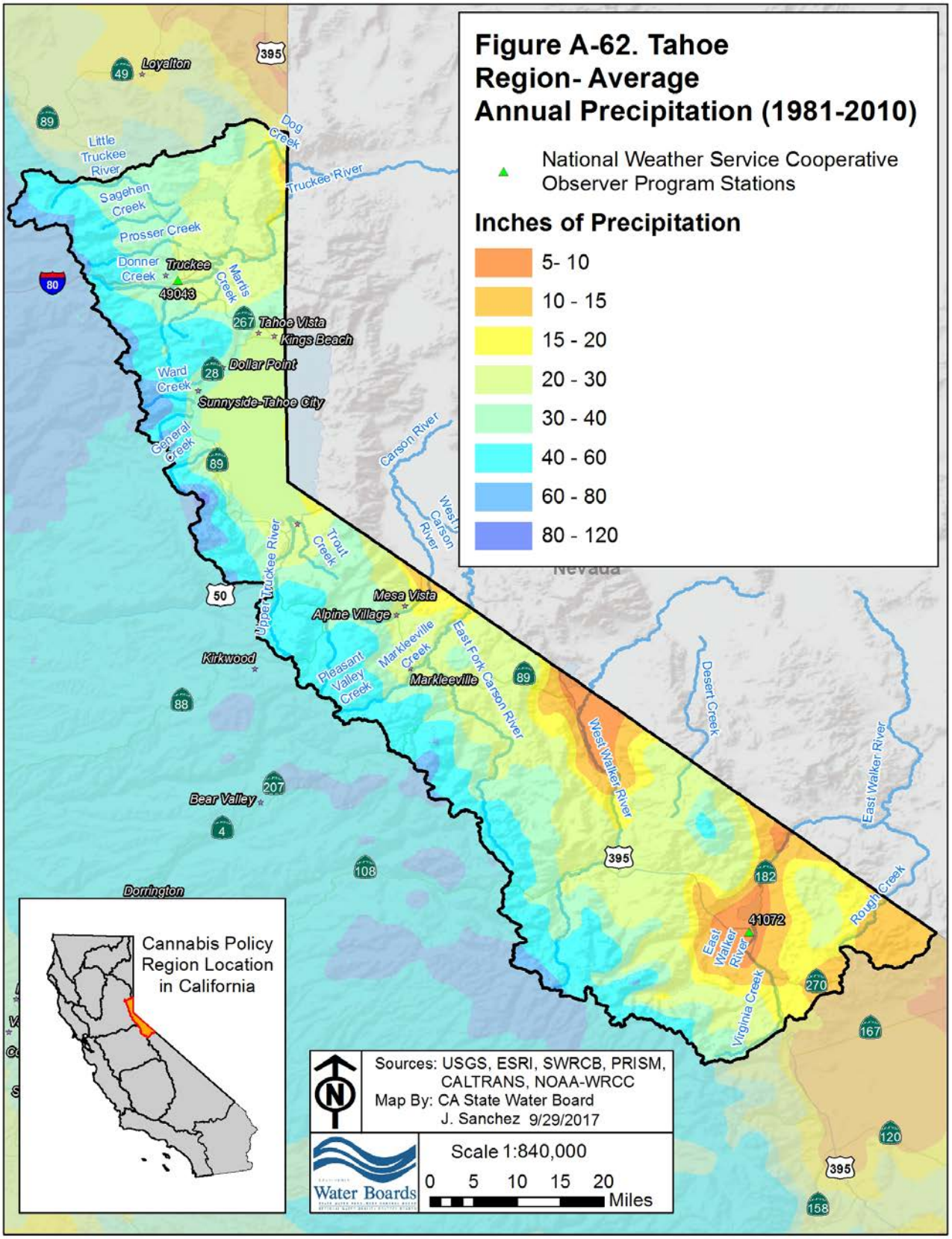


Figure A-62. Tahoe Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
80 - 120
Loyalton
Truckee
49043
Tahoe Vista
Kings Beach
Dollar Point
Sunnyside-Tahoe City
Kirkwood
Mesa Vista
Alpine Village
Markleeville
Bear Valley
Dorrington
41072
Little Truckee River
Truckee River
Sagehen Creek
Prosser Creek
Donner Creek
Martis Creek
Dog Creek
Ward Creek
General Creek
Trout Creek
Upper Truckee River
Pleasant Valley Creek
Markleeville Creek
East Fork Carson River
Carson River
West Walker River
East Walker River
Desert Creek
Rough Creek
Virginia Creek
Nevada
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 9/29/2017
Scale 1:840,000
0 5 10 15 20
Miles
Water Boards

1.12 Mono Region

The Mono Region covers approximately 26,673 square miles along the eastern boarder of California (Figure A-63). Elevations in the Mono Region range from 282 feet below sea level at Badwater Basin to over 14,000 feet above sea level at White Mountain Peak. Please refer to Figure A-64 for an elevation map of the region. The region includes the watersheds of Owens River, Bishop Creek, Mill Creek, Rush Creek, Big Pine Creek, and Cottonwood Creek.

1.12.1 Climate and Precipitation

The climate of the Mono Region varies greatly depending upon elevation. The lower elevations are predominately arid low latitude desert and arid mid latitude desert climates. The climate transitions between Semi-arid, steppe; Cold winter with dry summer; and Highland/Timberline as the elevation increases. Please refer to Figure A-65 for a climatic map of the Mono Region.

Temperatures patterns within the Mono Region greatly vary depending upon elevation and location. The southern part of the Mono Region is much warmer with average annual maximum between 75 and 85 degrees Fahrenheit and the average annual minimum temperature between 50 and 60 degrees Fahrenheit. The lowest elevations are the warmest with average annual maximum temperatures reaching 90 degrees Fahrenheit and average annual minimum temperatures between 65 and 72 degrees Fahrenheit. The higher elevations to the north have much cooler temperature patterns with average annual minimum temperatures between 25 and 32 degrees Fahrenheit and average annual maximum temperatures between 40 and 45 degrees Fahrenheit.

Precipitation patterns in the Mono Region are also dependent upon elevation. The low elevation areas to the west and south within the Mono Region receive less than five inches of precipitation annually, while the northern areas of high elevation can receive up to 40 inches of precipitation annually.

Please refer to Figure A-66 for a precipitation map of the region. Please refer to Chart A-19, below, for an illustration of precipitation and temperature conditions in the Mono Region.

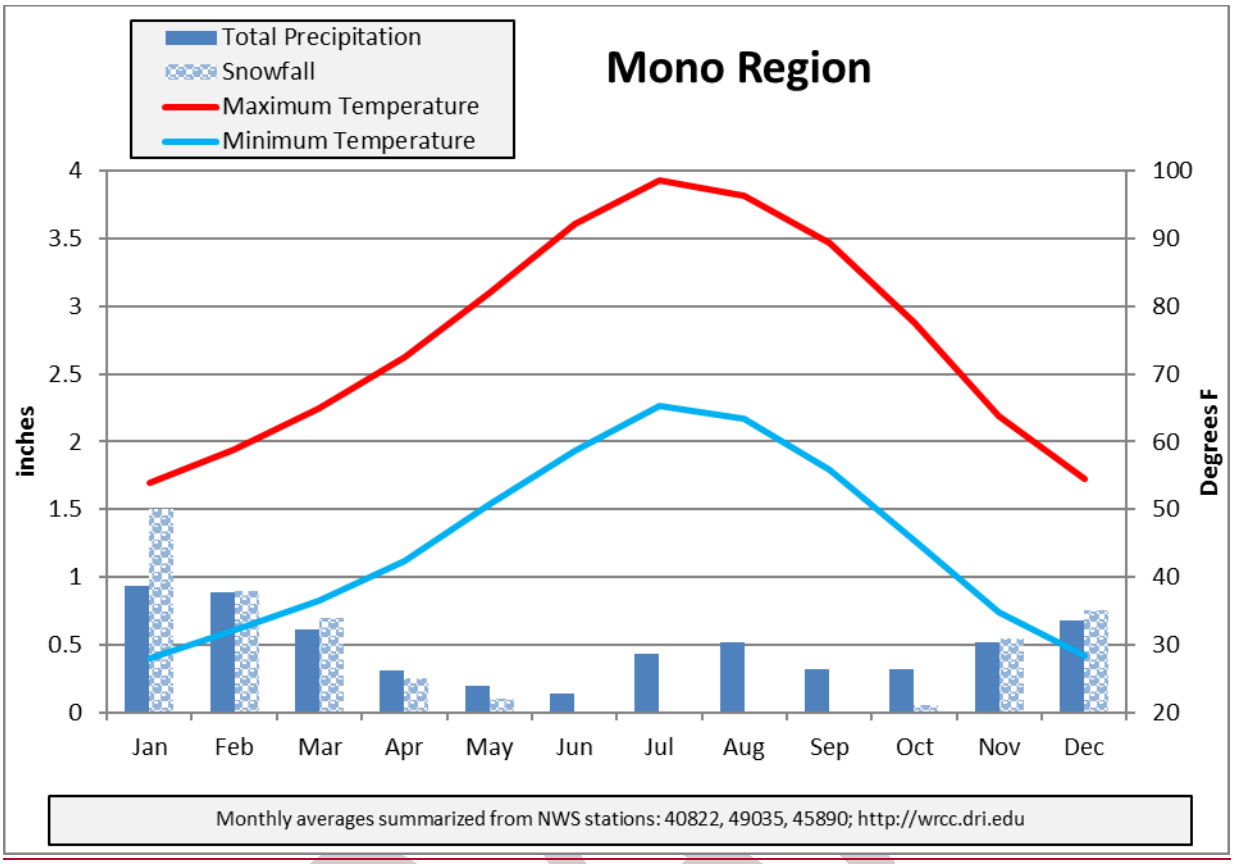


Chart A-19. Average annual patterns of temperature and precipitation, Mono Region.

1.12.2 Hydrology

The hydrology of Mono Region is dependent upon elevation. The lower elevation areas contain streams that are classified as Flashy, Ephemeral Rain (FER) or Low-Volume Snowmelt and Rain (LSR) systems. The streams found at the higher elevations in the northern part of the Mono Region are classified as Snowmelt (SM) systems. There is also an influence of Groundwater (GW) systems within the Owens River watershed. (Lane et al 2016)

Please refer to Figure A-67 for a depiction of the stream classifications within the Mono Region.

1.12.3 Geology

The Mono Region is located in the Sierra Nevada, Basin and Range, and Mojave Desert geomorphic provinces. The Sierra Nevada geomorphic province contains steep mountains underlain by a granitic batholith. The foothill regions of the Sierra Nevada geomorphic province are comprised of metamorphic rocks.

1.12.4 Anadromous Salmonid Population

No anadromous salmonids are present in the Mono Region.

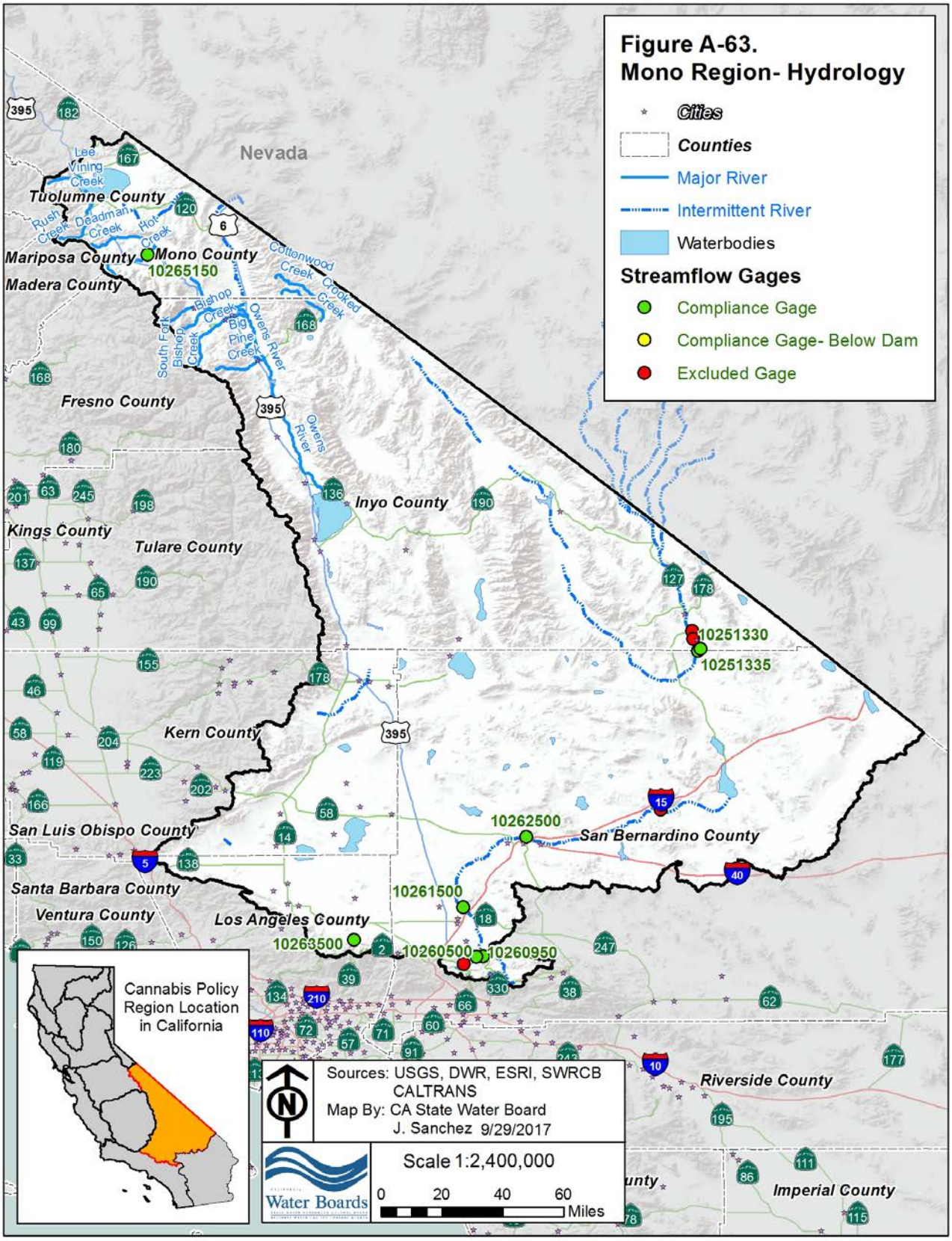


Figure A-63.
Mono Region- Hydrology
Cities
Counties
Major River
Intermittent River
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Nevada
Tuolumne County
Mariposa County
Mono County
10265150
Madera County
Fresno County
Kings County
Tulare County
Inyo County
Kern County
San Luis Obispo County
Santa Barbara County
Ventura County
Los Angeles County
San Bernardino County
Riverside County
Imperial County
10251330
10251335
10262500
10261500
10263500
10260500
10260950
Lee Vining Creek
Rush Creek
Deadman Creek
Hot Creek
Cottonwood Creek
Crooked Creek
Bishop Creek
South Fork Bishop Creek
Big Pine Creek
Owens River
Cannabis Policy Region Location in California
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:2,400,000
0 20 40 60
Miles

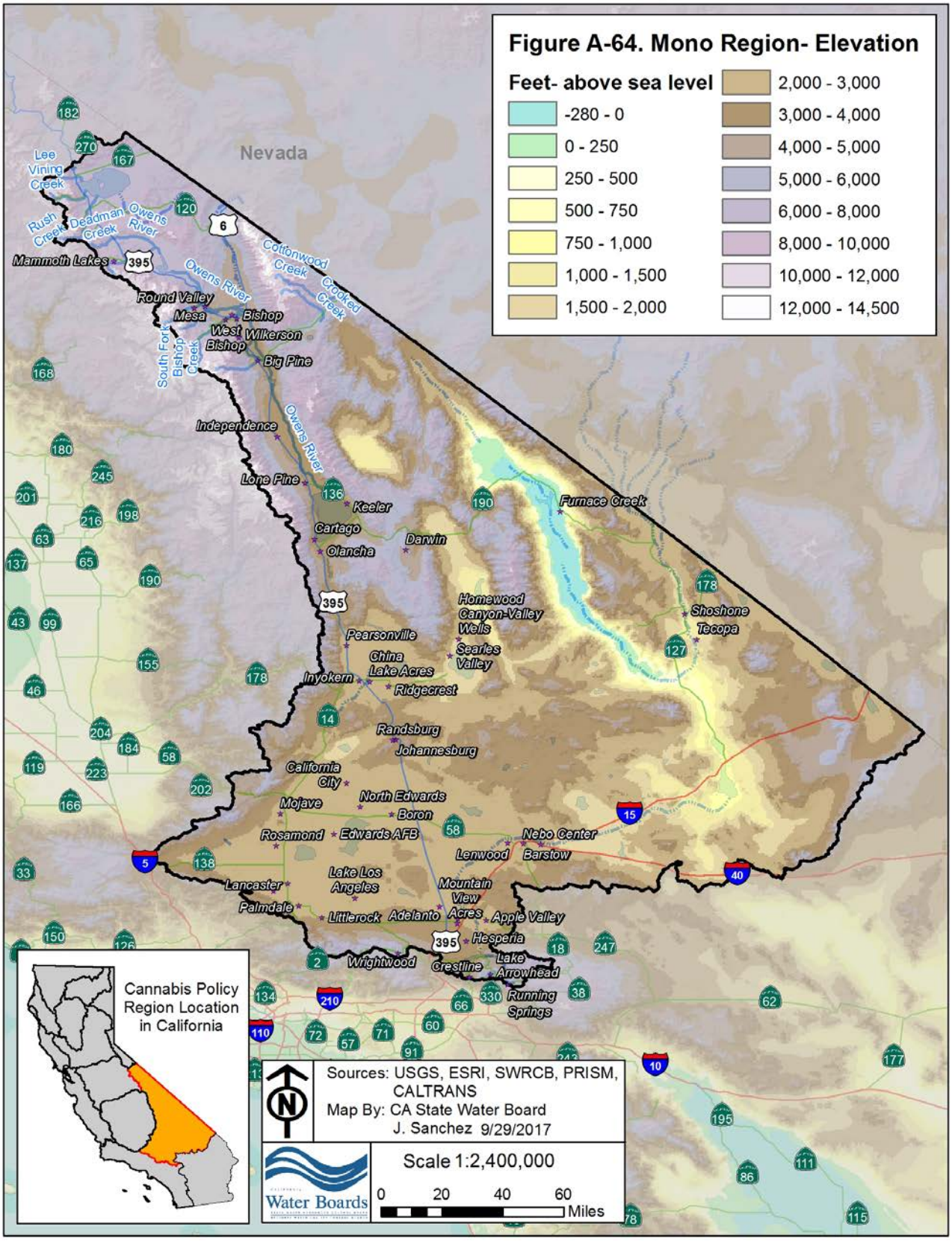


Figure A-64. Mono Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Nevada
Lee Vining Creek
Rush Creek
Deadman Creek
Owens River
Mammoth Lakes
Cottonwood Creek
Crooked Creek
Round Valley
Mesa
Bishop
West Bishop
Wilkerson
South Fork Bishop Creek
Big Pine
Independence
Lone Pine
Keeler
Cartago
Olancha
Darwin
Furnace Creek
Homewood Canyon-Valley Wells
Shoshone
Tecopa
Pearsonville
China Lake Acres
Searles Valley
Inyokern
Ridgecrest
Randsburg
Johannesburg
California City
Mojave
North Edwards
Boron
Rosamond
Edwards AFB
Nebo Center
Lenwood
Barstow
Lancaster
Lake Los Angeles
Mountain View Acres
Palmdale
Littlerock
Adelanto
Apple Valley
Hesperia
Wrightwood
Crestline
Lake Arrowhead
Running Springs
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Scale 1:2,400,000
0 20 40 60
Miles
Water Boards

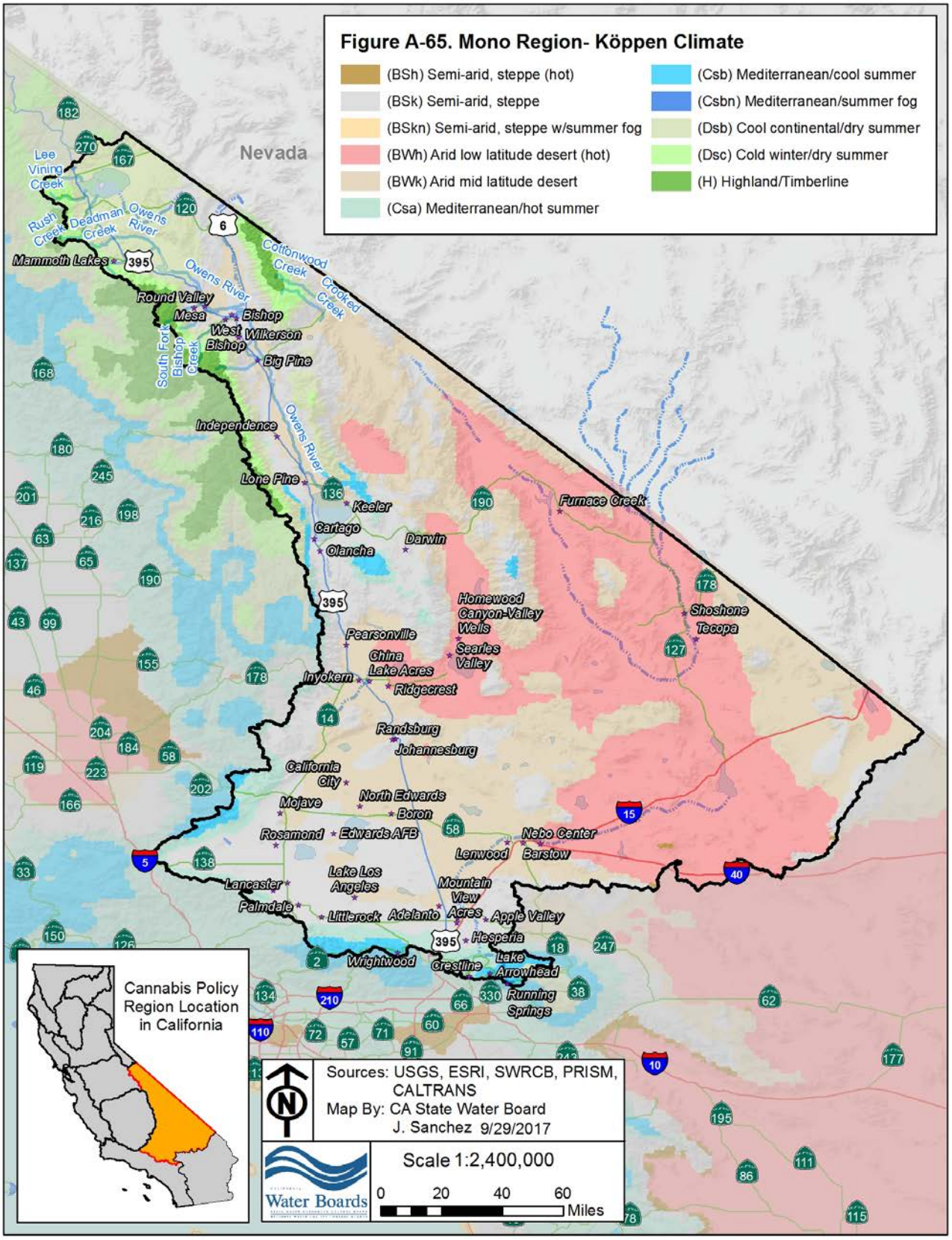


Figure A-65. Mono Region- Köppen Climate
(BSh) Semi-arid, steppe (hot)
(BSk) Semi-arid, steppe
(BSkn) Semi-arid, steppe w/summer fog
(BWh) Arid low latitude desert (hot)
(BWk) Arid mid latitude desert
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Nevada
Lee Vining Creek
Rush Creek
Deadman Creek
Owens River
Mammoth Lakes
Cottonwood Creek
Crooked Creek
Round Valley
Mesa
Bishop
West Bishop
Wilkerson
South Fork Bishop Creek
Big Pine
Independence
Lone Pine
Keeler
Cartago
Olancha
Darwin
Furnace Creek
Homewood Canyon-Valley Wells
Shoshone
Tecopa
Pearsonville
China Lake Acres
Searles Valley
Inyokern
Ridgecrest
Randsburg
Johannesburg
California City
Mojave
North Edwards
Boron
Rosamond
Edwards AFB
Nebo Center
Lenwood
Barstow
Lancaster
Lake Los Angeles
Mountain View Acres
Palmdale
Littlerock
Adelanto
Apple Valley
Hesperia
Wrightwood
Cresttline
Lake Arrowhead
Running Springs
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:2,400,000
0 20 40 60
Miles

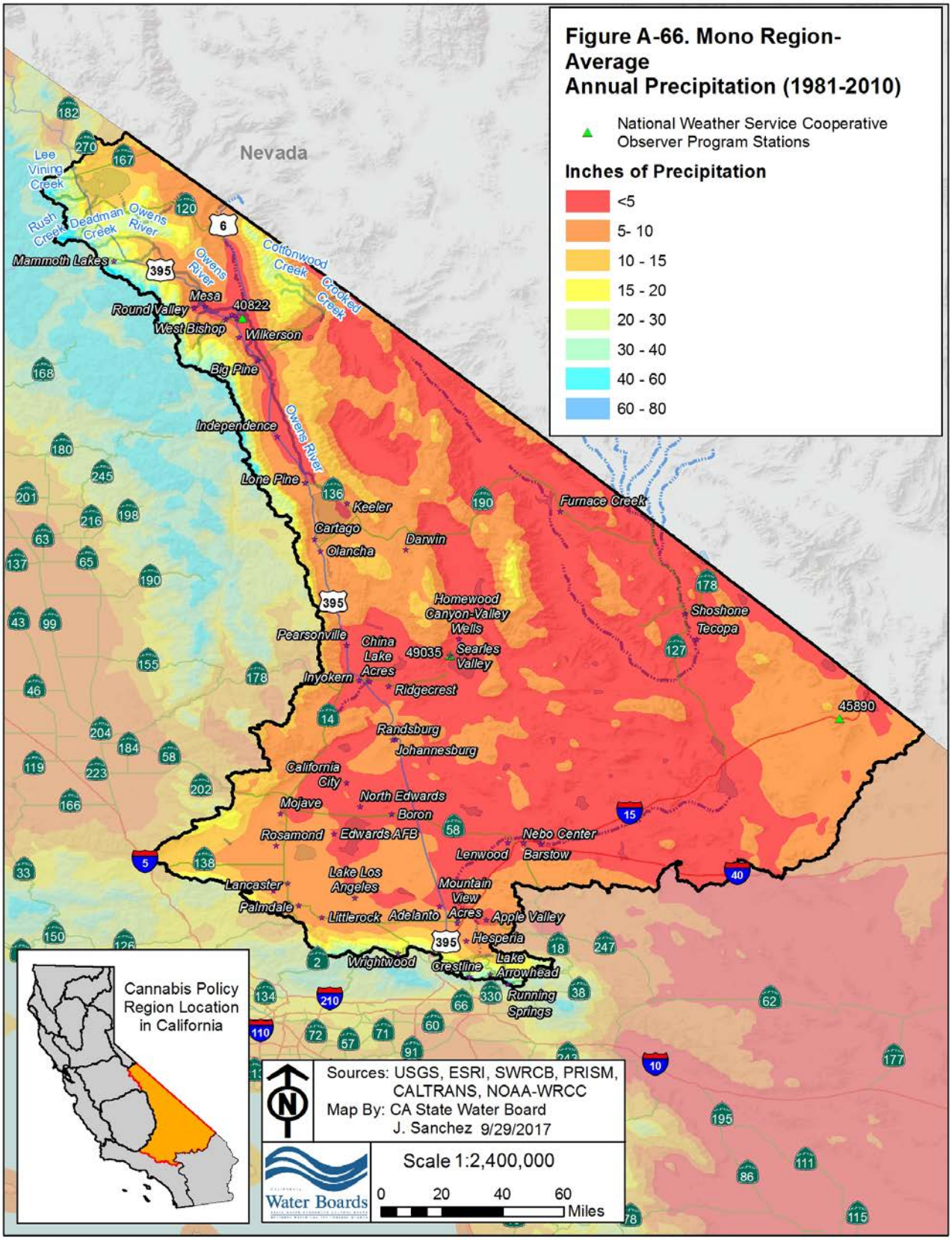


Figure A-66. Mono Region-Average
Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
Nevada
Lee Vining Creek
Rush Creek
Deadman Creek
Owens River
Mammoth Lakes
Mesa
Round Valley
West Bishop
40822
Wilkerson
Cottonwood Creek
Crooked Creek
Big Pine
Independence
Lone Pine
Keeler
Cartago
Olancha
Darwin
Furnace Creek
Homewood Canyon-Valley Wells
Shoshone
Tecopa
Pearsonville
China Lake Acres
49035
Searles Valley
Inyokern
Ridgecrest
45890
Randsburg
Johannesburg
California City
Mojave
North Edwards
Boron
Rosamond
Edwards AFB
Nebo Center
Lenwood
Barstow
Lake Los Angeles
Lancaster
Palmdale
Littlerock
Adelanto
Mountain View Acres
Apple Valley
Hesperia
Wrightwood
Crestline
Lake Arrowhead
Running Springs
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 9/29/2017
Scale 1:2,400,000
0 20 40 60
Miles
Water Boards

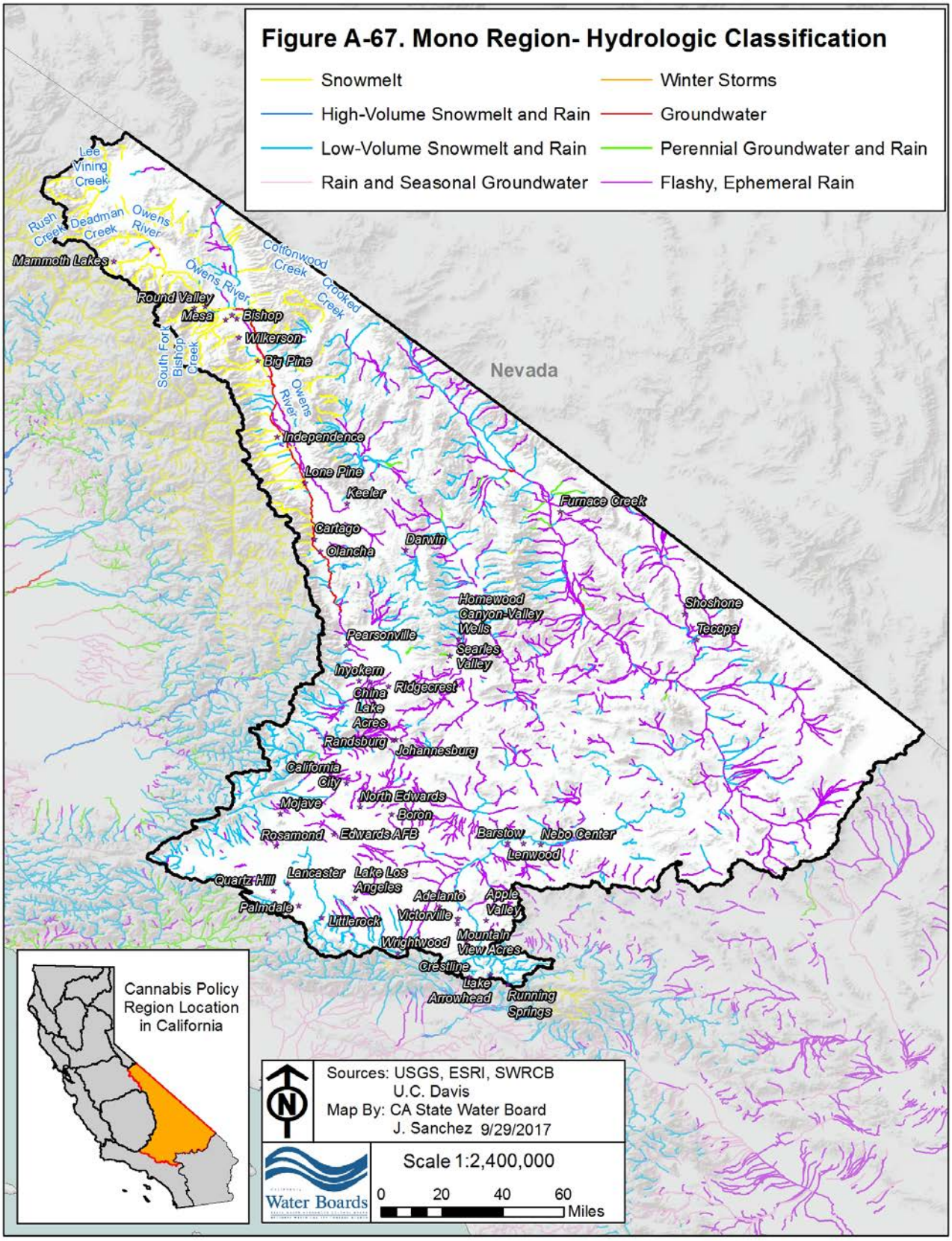


Figure A-67. Mono Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
Nevada
Lee Vining Creek
Rush Creek
Deadman Creek
Owens River
Mammoth Lakes
Cottonwood Creek
Crooked Creek
Round Valley
Mesa
Bishop
Wilkerson
Big Pine
South Fork Bishop Creek
Independence
Lone Pine
Keeler
Furnace Creek
Cartago
Olancha
Darwin
Homewood Canyon-Valley Wells
Shoshone
Tecopa
Pearsonville
Searles Valley
Inyokern
China Lake Acres
Ridgecrest
Randsburg
Johannesburg
California City
Mojave
North Edwards
Boron
Rosamond
Edwards AFB
Barstow
Nebo Center
Lenwood
Quartz Hill
Lancaster
Lake Los Angeles
Adelanto
Apple Valley
Palmdale
Victorville
Littlerock
Wrightwood
Mountain View Acres
Crestline
Lake Arrowhead
Running Springs
Cannabis Policy Region Location in California
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:2,400,000
0 20 40 60
Miles

1.13 Kern Region

The Kern Region covers approximately 16,859 square miles in central southern California (Figure A-68). The Kern Region covers the southernmost part of the San Joaquin Valley. Elevations of the Kern Region vary greatly with elevations in the valley floor being near sea level and the highest elevation of 14,505 feet above sea level at Mount Whitney, the highest peak in the contiguous United States. Please refer to Figure A-69 for an elevation map of the region. The region includes the watersheds of the Kings River, Tule River, Kaweah River, Deer Creek, Poso Creek, and Kern River.

1.13.1 Climate and Precipitation

The climate of the Kern Region varies greatly with most changes related to changes in elevation. The valley area is dominated by Semi-arid, steppe climate with some Arid low latitude desert areas in the south and to the west. The climate transitions to Mediterranean with hot summers; Mediterranean with cool summers; Semi-arid, steppe, cold winter with dry summer; and Highland/Timberline in the eastern part of the region and at higher elevations of the Sierra Nevada Mountain Range. Please refer to Figure A-70 for a climatic map of the Kern Region.

Temperature patterns in the Kern Region are also driven by elevation, with cooler temperatures being found at the higher elevations at the eastern part of the region. At the higher elevations, average annual minimum temperatures are between 15 and 25 degrees Fahrenheit, and average annual maximum temperatures can reach between 40 and 45 degrees Fahrenheit. The lowest elevations experience average annual minimum temperatures between 50 and 55 degrees Fahrenheit and average annual maximum temperatures up to 85 degrees Fahrenheit.

Precipitation also varies greatly within the Kern Region. The highest annual average precipitation occurs in the eastern portion of the region at higher elevations of the Sierra Nevada Mountain Range with up to 60 inches of precipitation occurring on an annual average. The least amount of annual average precipitation occurs at the southern part of the valley floor where less than five inches of precipitation falls on an annual basis.

Please refer to Figure A-71 for a precipitation map of the region. Please refer to Charts A-20 and A-21, below, for a comparison of precipitation and temperature conditions for the valley floor and Sierra Mountains portions of the Kern Region

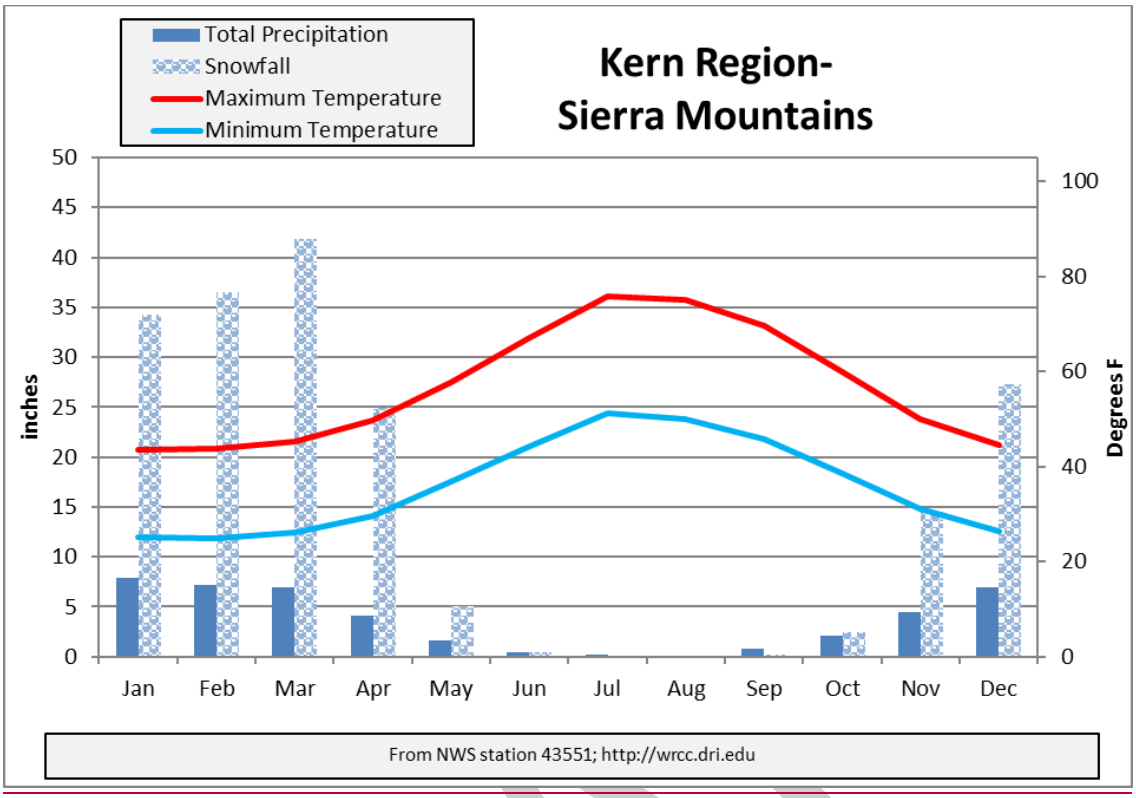


Chart A-20. Average annual patterns of temperature and precipitation, Kern Region, Sierra Mountains

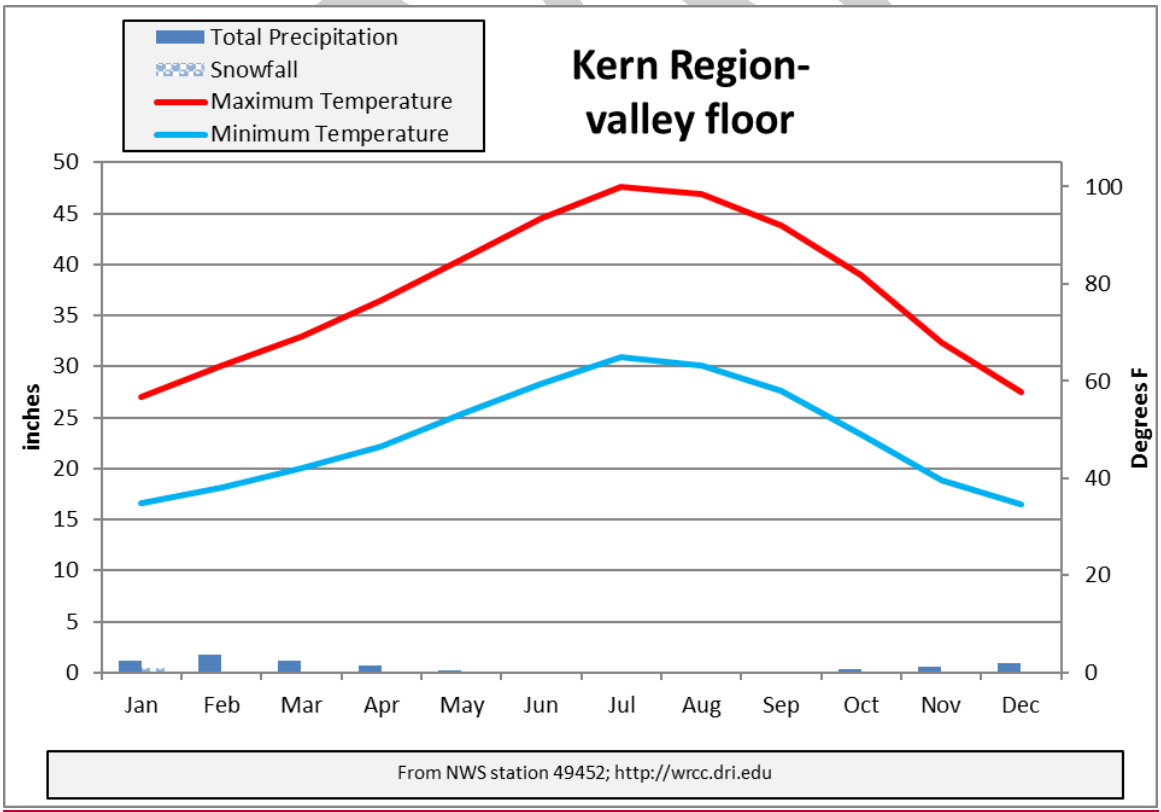


Chart A-21. Average annual patterns of temperature and precipitation, Kern Region, valley floor.

1.13.2 Hydrology

The hydrology of Kern Region streams varies greatly depending upon elevation. The major streams at the valley floor are classified as High Volume Snowmelt and Rain (HSR) systems. In the lower foothills to the east, the streams are a mix of Low-Volume Snowmelt and Rain (LSR) and Perennial Groundwater and Rain (PGR) systems. The highest elevations in the eastern part of the Kern Region are dominated by Snowmelt (SM) systems. The higher elevations located in the western part of the region contain a mix of PGR and Flashy, Ephemeral Rain (FER) systems. (Lane et al 2016)

Please refer to Figure A-72 for a depiction of the stream classifications within the South Coast Region.

1.13.3 Geology

The Kern Region is located in the Sierra Nevada, Great Valley, and Coastal Ranges geomorphic provinces. The Sierra Nevada geomorphic province contains steep mountains underlain by a granitic batholith. The foothill regions of the Sierra Nevada geomorphic province are comprised of metamorphic rocks. The Coast Ranges geomorphic province is comprised of sedimentary and metamorphic rock and alluvial deposits in valleys and along the coastline. The Great Valley geomorphic province consist of a large alluvial plain.

1.13.4 Anadromous Salmonid Population

Two special-status ESU, DPS, or DTE are currently extant within the Kern Region (Figure A-53):

- CV FR Chinook salmon.
- CV LFR Chinook salmon.

The CV FR and CV LFR Chinook salmon populations are each listed as species of special concern by CDFW and, jointly, as a species of concern by NMFS (Moyle et al. 2015, NMFS 2017).

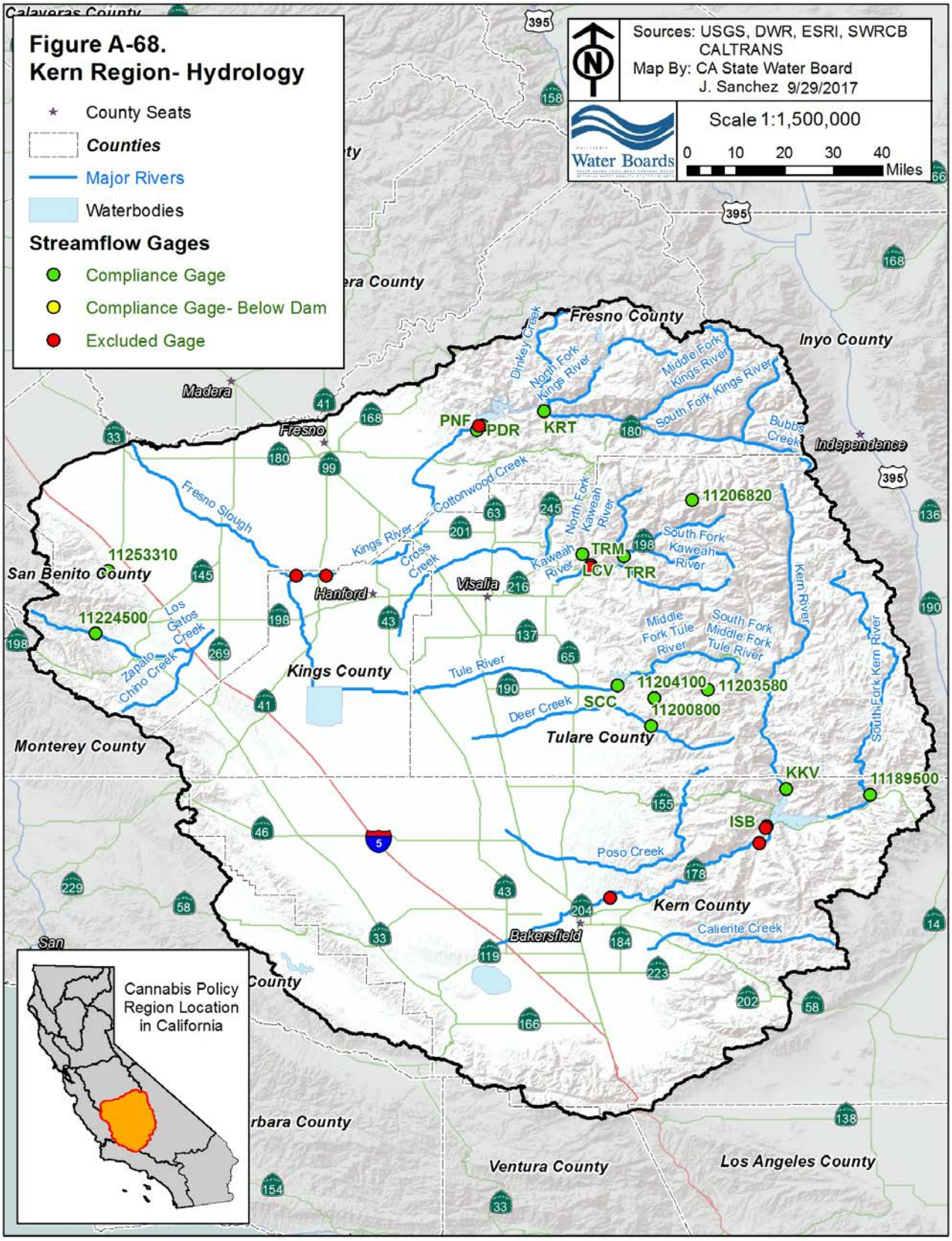


Figure A-68.
Kern Region- Hydrology
County Seats
Counties
Major Rivers
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Sources: USGS, DWR, ESRI, SWRCB
CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40
Miles
Fresno County
Inyo County
Madera
Fresno
Independance
San Benito County
Hanford
Visalia
Kings County
Monterey County
Tulare County
Kern County
Bakersfield
Ventura County
Los Angeles County
PNF
PDR
KRT
TRM
LCV
TRR
SCC
KKV
ISB
11253310
11224500
11206820
11204100
11203580
11200800
11189500
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
Cottonwood Creek
Fresno Slough
Kings River
Cross Creek
North Fork Kaweah River
Kaweah River
South Fork Kaweah River
Los Gatos Creek
Zapato Chino Creek
Tule River
Deer Creek
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Poso Creek
Caliente Creek
Cannabis Policy Region Location in California

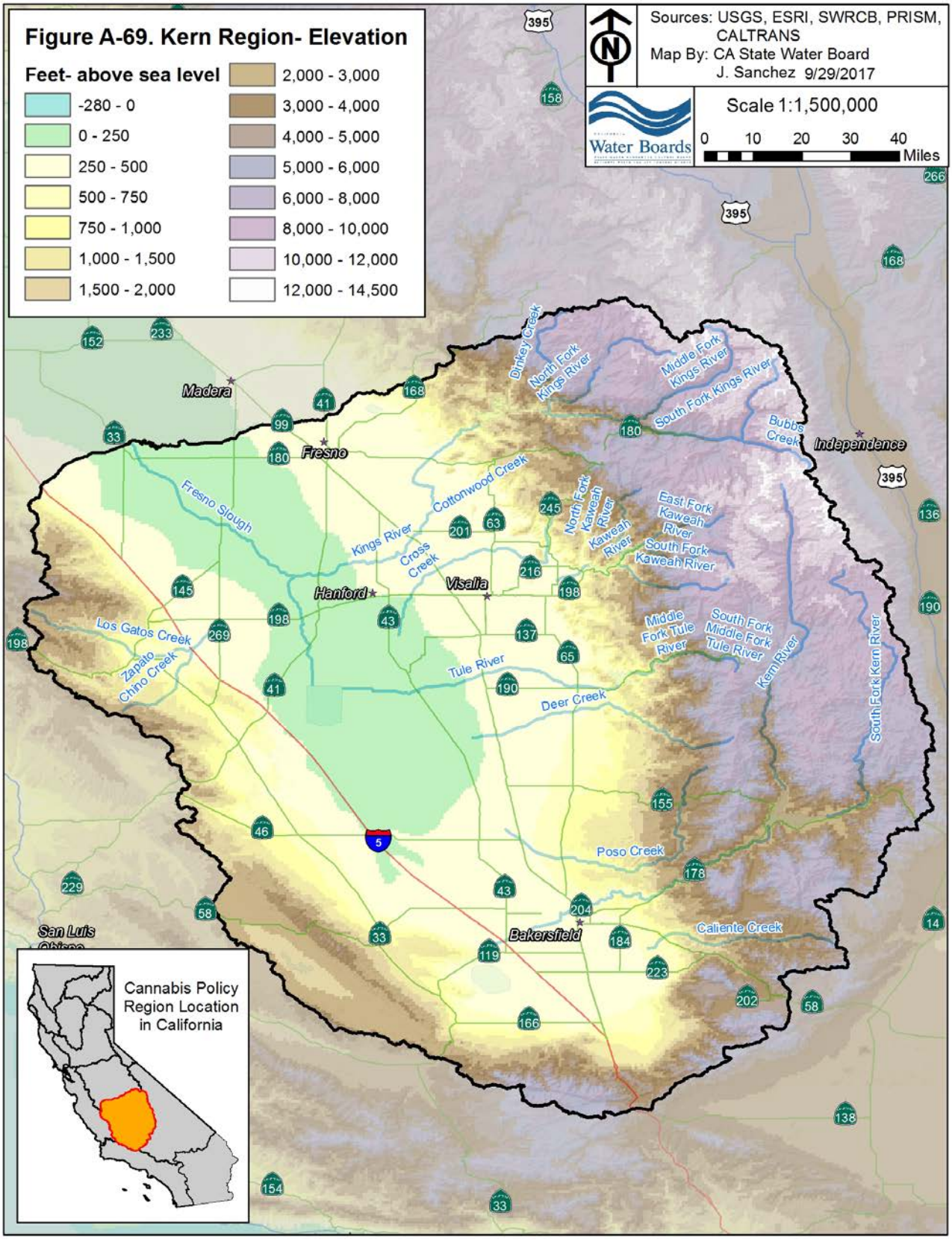


Figure A-69. Kern Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
12,000 - 14,500
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40
Miles
Cannabis Policy Region Location in California
Madera
Fresno
Hanford
Visalia
Bakersfield
Independence
San Luis
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
Fresno Slough
Cottonwood Creek
Kings River
Cross Creek
North Fork Kaweah River
East Fork Kaweah River
Kaweah River
South Fork Kaweah River
Los Gatos Creek
Zapato Chino Creek
Tule River
Deer Creek
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Poso Creek
Caliente Creek

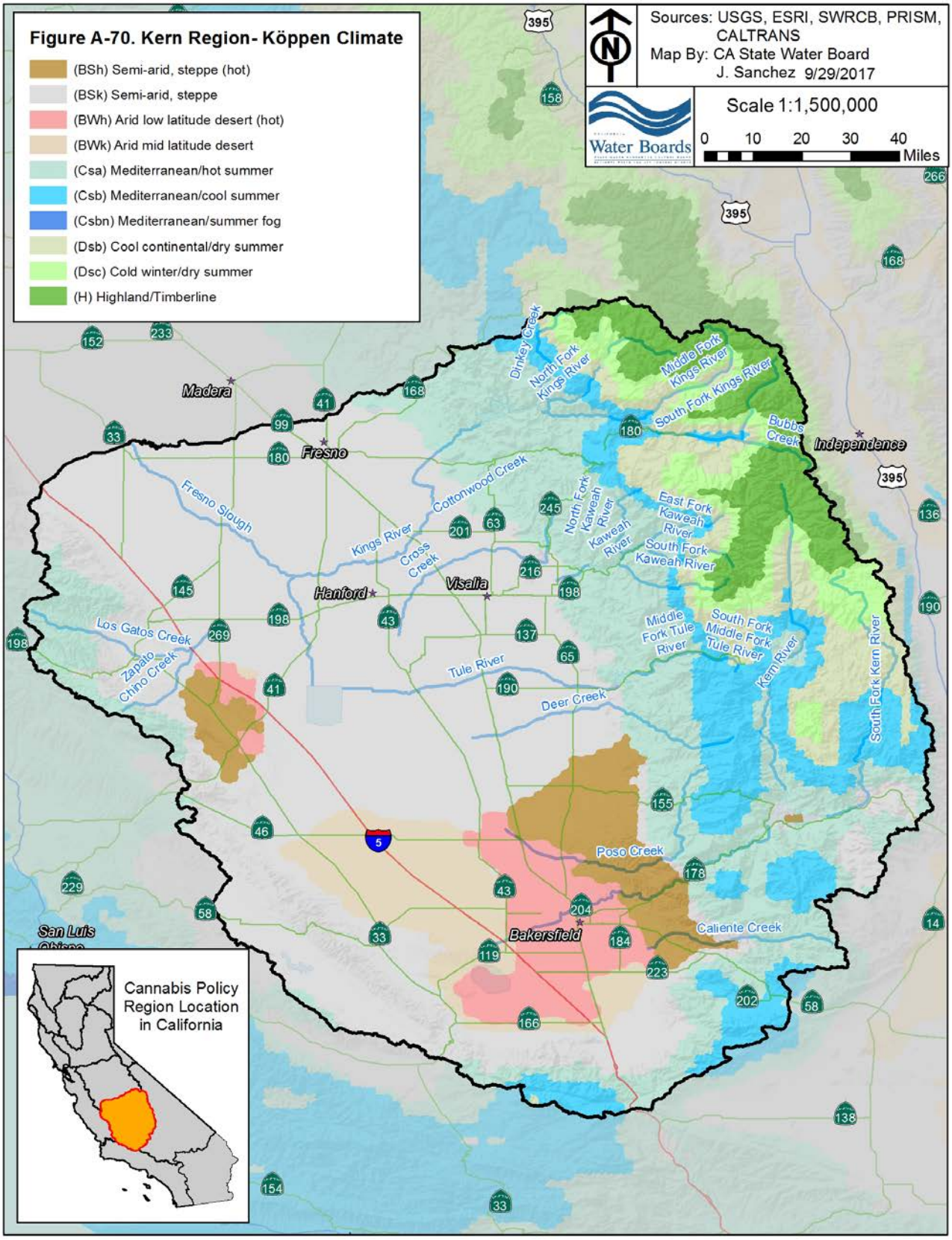


Figure A-70. Kern Region- Köppen Climate
(BSh) Semi-arid, steppe (hot)
(BSk) Semi-arid, steppe
(BWh) Arid low latitude desert (hot)
(BWk) Arid mid latitude desert
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Csbn) Mediterranean/summer fog
(Dsb) Cool continental/dry summer
(Dsc) Cold winter/dry summer
(H) Highland/Timberline
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40
Miles
Madera
Fresno
Hanford
Visalia
Bakersfield
Independence
San Luis
Fresno Slough
Cottonwood Creek
Kings River
Cross Creek
Los Gatos Creek
Zapato Chino Creek
Tule River
Deer Creek
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
North Fork Kaweah River
Kaweah River
East Fork Kaweah River
South Fork Kaweah River
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Poso Creek
Caliente Creek
Cannabis Policy Region Location in California

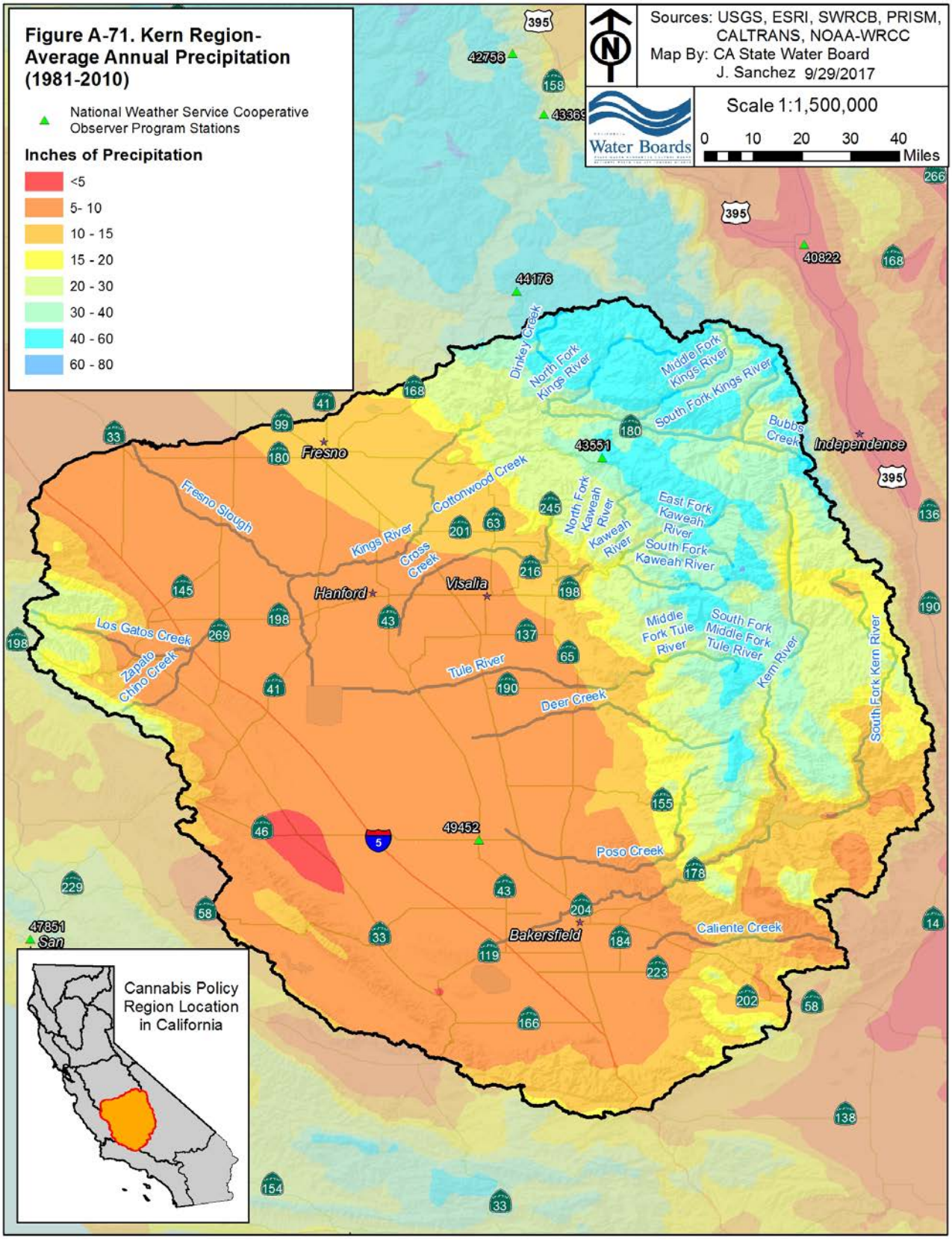


Figure A-71. Kern Region-Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
60 - 80
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40 Miles
Cannabis Policy Region Location in California
Fresno
Visalia
Hanford
Bakersfield
Independence
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
Cottonwood Creek
Fresno Slough
Kings River
Cross Creek
North Fork Kaweah River
Kaweah River
East Fork Kaweah River
South Fork Kaweah River
Los Gatos Creek
Zapato Chino Creek
Tule River
Deer Creek
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Poso Creek
Caliente Creek
42756
43369
44176
40822
43551
49452
47851
San
395
99
41
168
33
180
145
198
269
43
63
201
245
216
137
65
190
155
46
5
178
204
184
119
223
202
58
14
166
138
154
266
136

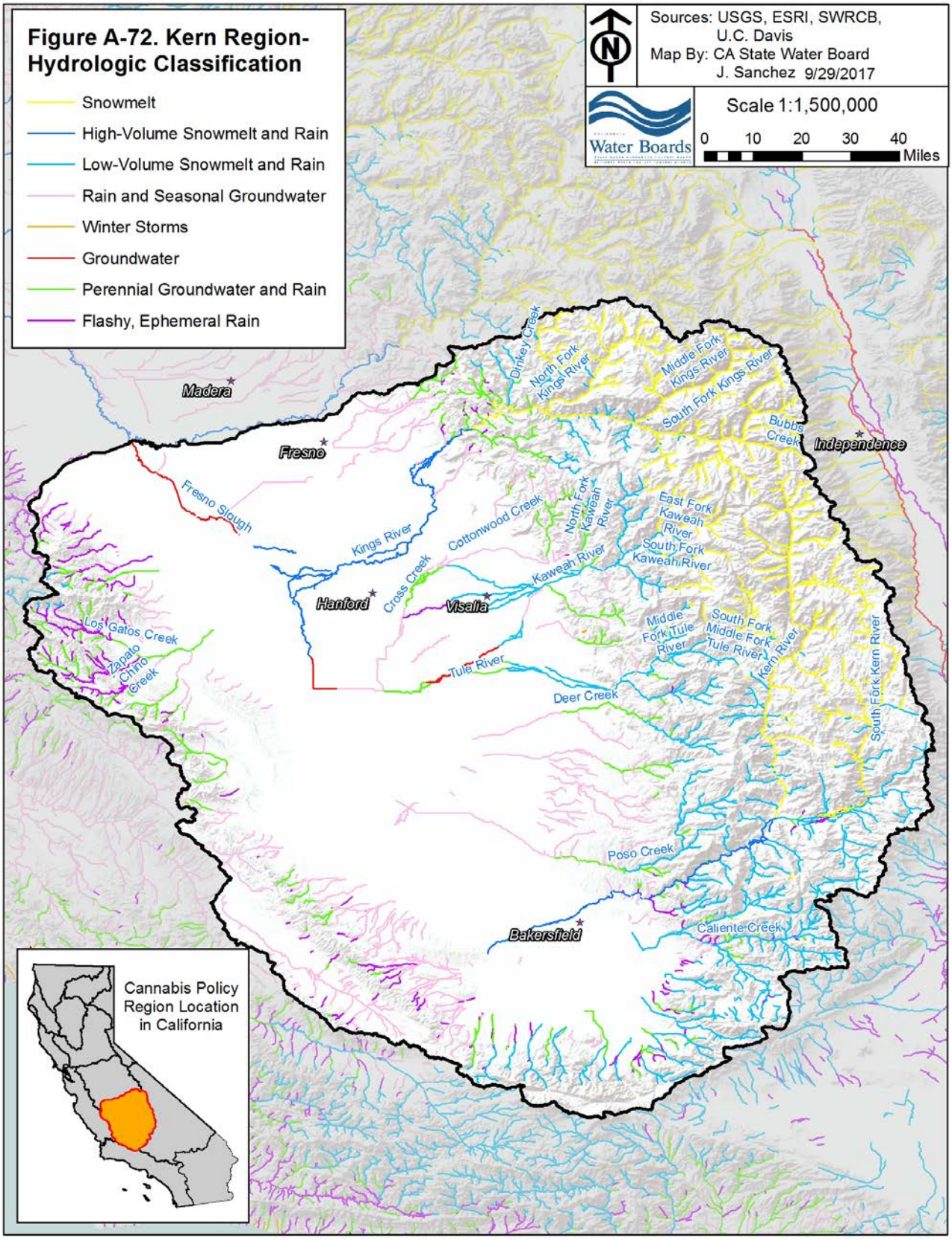


Figure A-72. Kern Region-Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Winter Storms
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
Sources: USGS, ESRI, SWRCB, U.C. Davis
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40 Miles
Madera
Fresno
Hanford
Visalia
Bakersfield
Independance
Fresno Slough
Kings River
Cottonwood Creek
Cross Creek
Los Gatos Creek
Zapato Chino Creek
Tule River
Deer Creek
Poso Creek
Caliente Creek
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
North Fork Kaweah River
East Fork Kaweah River
South Fork Kaweah River
Kaweah River
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Cannabis Policy Region Location in California

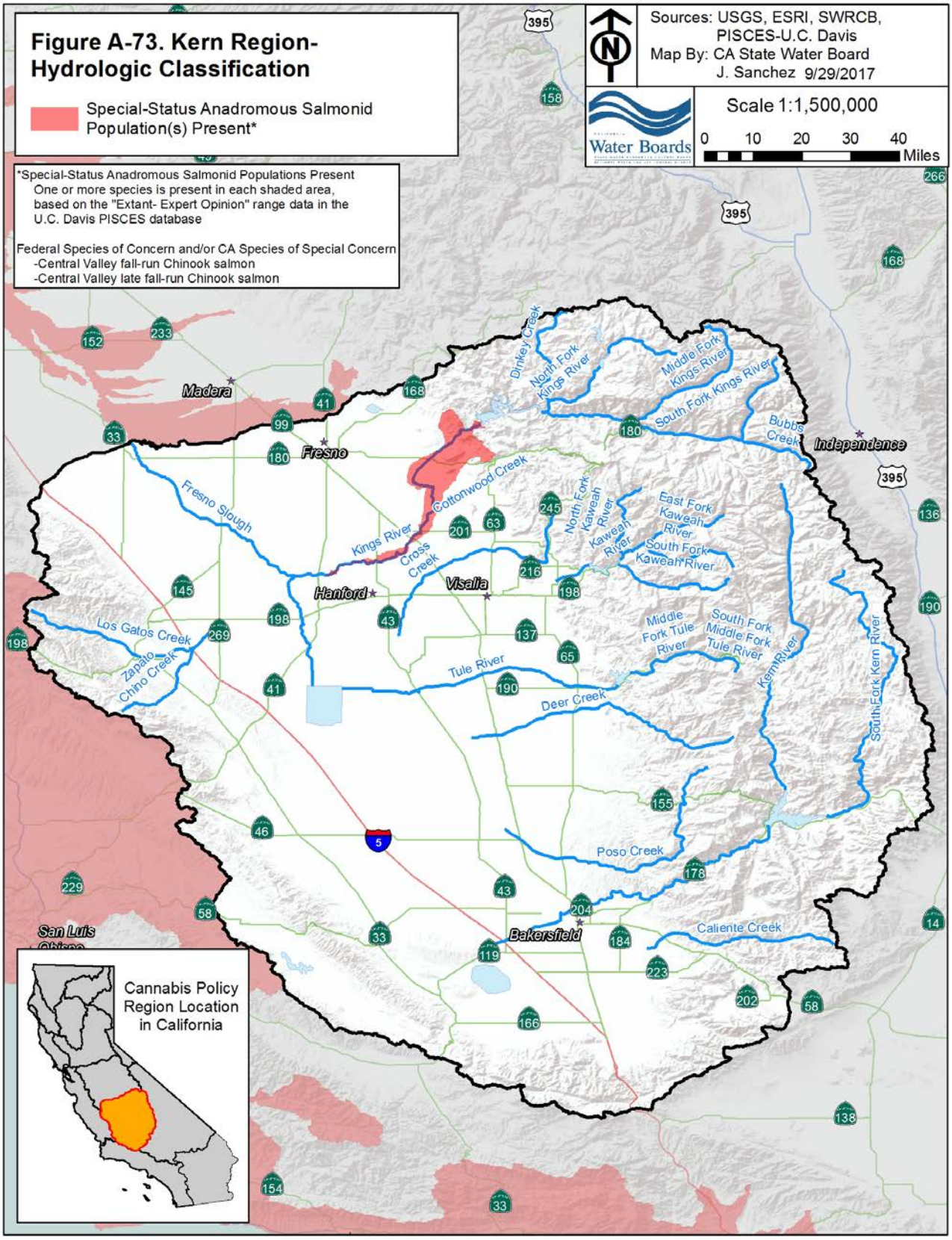


Figure A-73. Kern Region-
Hydrologic Classification
Special-Status Anadromous Salmonid Population(s) Present*
*Special-Status Anadromous Salmonid Populations Present
One or more species is present in each shaded area, based on the "Extant- Expert Opinion" range data in the U.C. Davis PISCES database
Federal Species of Concern and/or CA Species of Special Concern
-Central Valley fall-run Chinook salmon
-Central Valley late fall-run Chinook salmon
Sources: USGS, ESRI, SWRCB, PISCES-U.C. Davis
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,500,000
0 10 20 30 40 Miles
Cannabis Policy Region Location in California
Madera
Fresno
Hanford
Visalia
Bakersfield
Independance
San Luis
Dinkey Creek
North Fork Kings River
Middle Fork Kings River
South Fork Kings River
Bubbs Creek
Fresno Slough
Cottonwood Creek
Kings River
Cross Creek
North Fork Kaweah River
Kaweah River
East Fork Kaweah River
South Fork Kaweah River
Los Gatos Creek
Zapato Chino Creek
Tule River
Middle Fork Tule River
South Fork Middle Fork Tule River
Kern River
South Fork Kern River
Deer Creek
Poso Creek
Caliente Creek

1.14 South East Desert Region

The South East Desert Region covers approximately 19,859 square miles in the southeastern corner of California (Figure A-74). Elevations in this region range from approximately 226 feet below sea level at Bombay Beach to over 11,000 feet above sea level at San Gorgonio Mountain. Please refer to Figure A-75 for an elevation map of the region. The region includes the watersheds of the Alamo River, New River, and Colorado River.

1.14.1 Climate and Precipitation

The climate of the South East Desert Region is generally characterized by an Arid low latitude desert climate (hot). There are small micro climates at the higher elevations of the western part of the region. These consist of Semi-arid steppe, Mediterranean with cool summer, Mediterranean with hot summer, and Arid mid latitude desert. Please refer to Figure A-76 for a climatic map of the South East Desert Region.

Temperatures patterns within the South East Desert Region vary only slightly with most of the region seeing very high annual maximum temperatures. The higher elevations of the western part of the South East Desert region exhibit average annual maximum temperatures over 80 degrees Fahrenheit and annual minimum temperatures of 45 degrees Fahrenheit. The inner areas of the South East Desert Region have average annual maximum temperatures of 90 degrees Fahrenheit and average minimum temperatures of 60 degrees Fahrenheit.

Annual average precipitation throughout the South East Desert Region is minimal, with most areas receiving less than five inches of precipitation annually. The western part of the South East Desert Region receives a little more with some areas receiving between 5 and 20 inches of precipitation annually. The areas of higher precipitation tend to be in areas of higher elevation.

Please refer to Figure A-77 for a precipitation map of the region. Please refer to Chart A-22, below, for an illustration of precipitation and temperature conditions in the South East Desert Region.

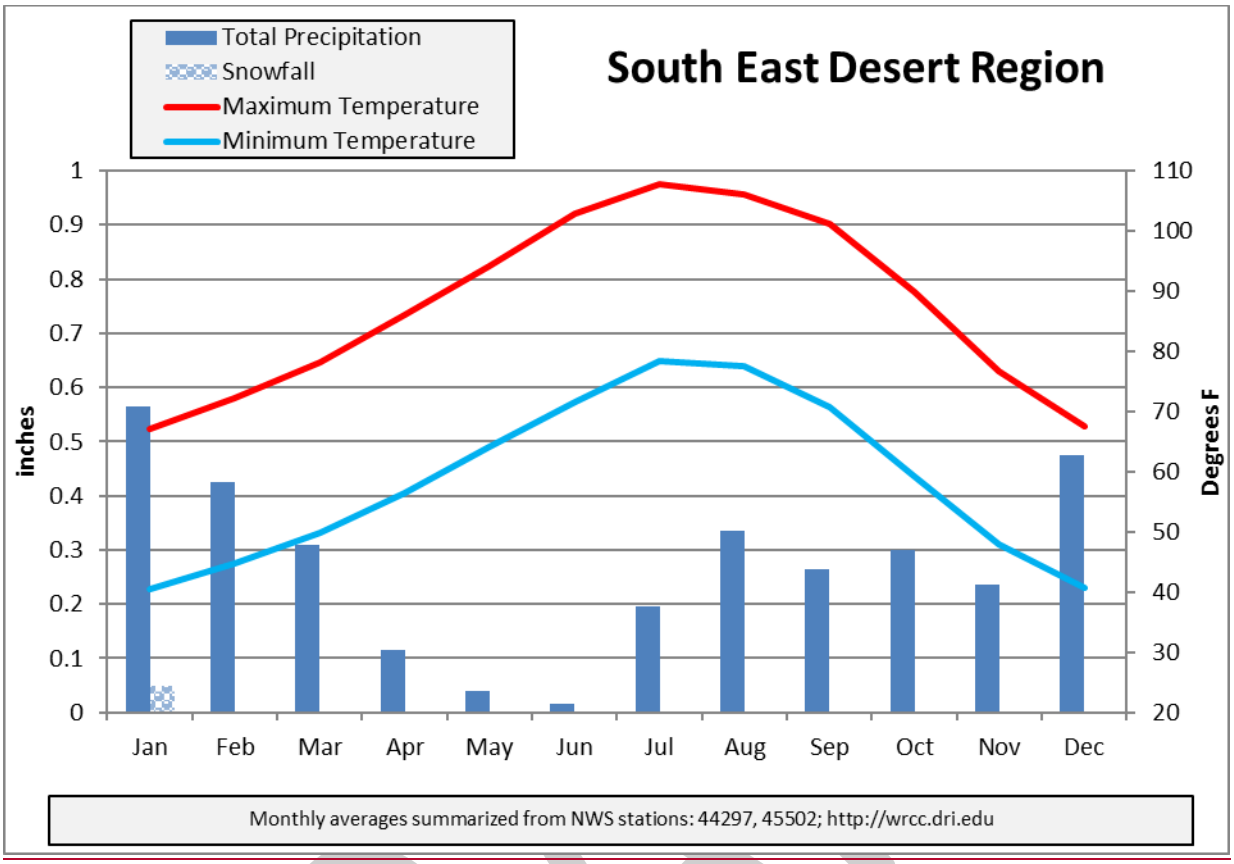


Chart A-22. Average annual patterns of temperature and precipitation, South East Desert Region.

1.14.2 Hydrology

The hydrology of South East Desert Region streams is dominated by Flashy, Ephemeral Rain (FER) systems. At higher elevations in the western part of the South East Desert Region there are streams characterized as Low-Volume Snowmelt and Rain (LSR) systems. (Lane et al 2016)

Please refer to Figure A-78 for a depiction of the stream classifications within the South Coast Region.

1.14.3 Geology

The South East Desert Region is located in the Mojave Desert, Colorado Desert, Peninsular Ranges, and Transverse Ranges geomorphic provinces. The Transverse Ranges geomorphic province contains steep mountain ranges and valleys oriented perpendicular to the other coastal mountain ranges. The Peninsular Ranges geomorphic province is characterized by topography similar to the Coast Ranges, but with rock types more similar to the Sierra Nevada mountains.

1.14.4 Anadromous Salmonid Population

No anadromous salmonids are present in the South East Desert Region.

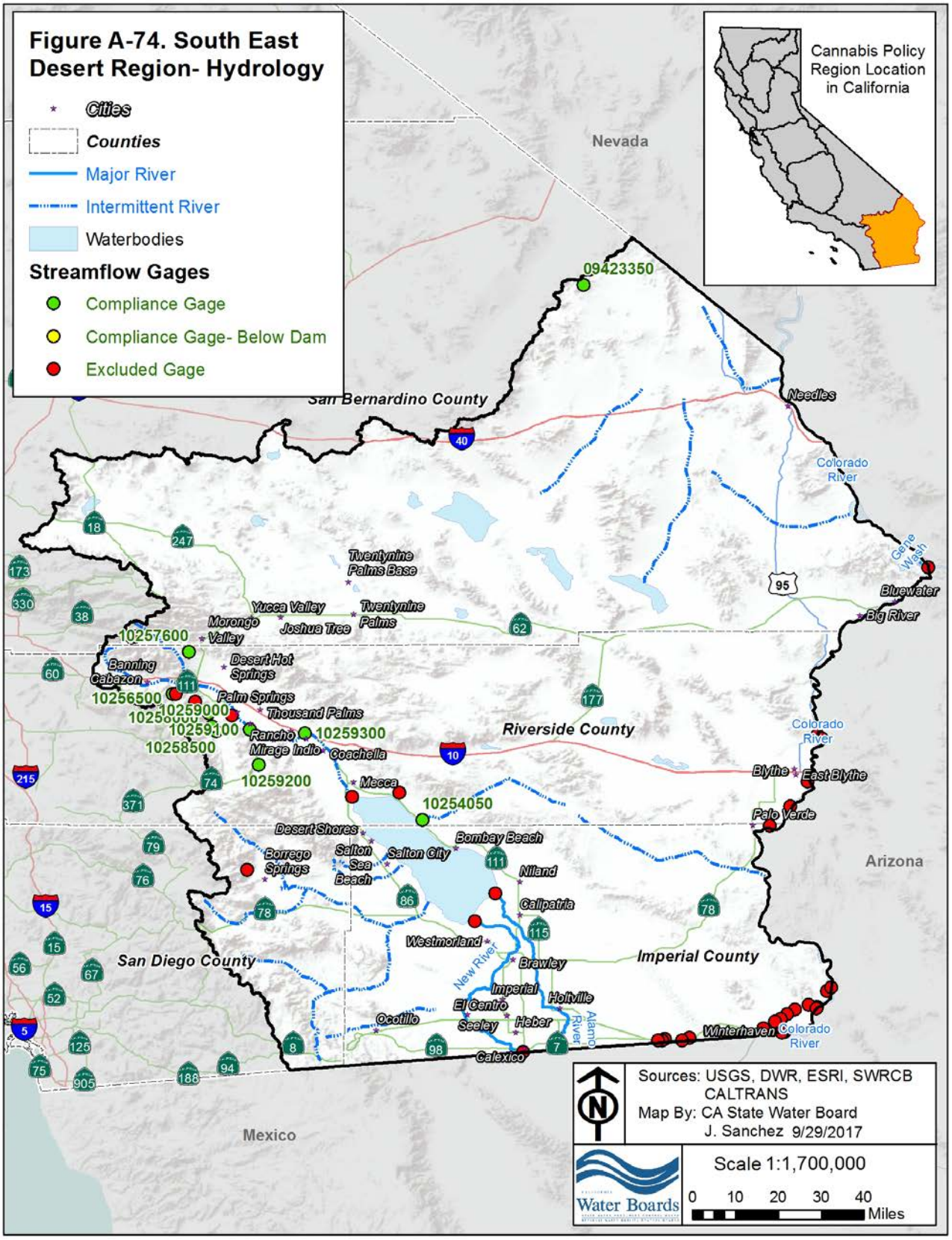


Figure A-74. South East Desert Region- Hydrology
Cities
Counties
Major River
Intermittent River
Waterbodies
Streamflow Gages
Compliance Gage
Compliance Gage- Below Dam
Excluded Gage
Cannabis Policy Region Location in California
Nevada
09423350
San Bernardino County
Needles
Colorado River
Twentynine Palms Base
Yucca Valley
Twentynine Palms
Morongo Valley
Joshua Tree
10257600
Desert Hot Springs
Banning
Cabazon
10256500
Palm Springs
Thousand Palms
10259000
10259100
Rancho Mirage
Indio
10259300
Coachella
10258500
10259200
Riverside County
Mecca
10254050
Desert Shores
Bombay Beach
Salton Sea
Salton City
Borrego Springs
Niland
Calipatria
Westmorland
Brawley
Imperial
El Centro
Holtville
Ocotillo
Seeley
Heber
Calexico
New River
Alamo River
San Diego County
Imperial County
Arizona
Gene Wash
Bluewater
Big River
Blythe
East Blythe
Palo Verde
Winterhaven
Colorado River
Mexico
Sources: USGS, DWR, ESRI, SWRCB CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,700,000
0 10 20 30 40
Miles

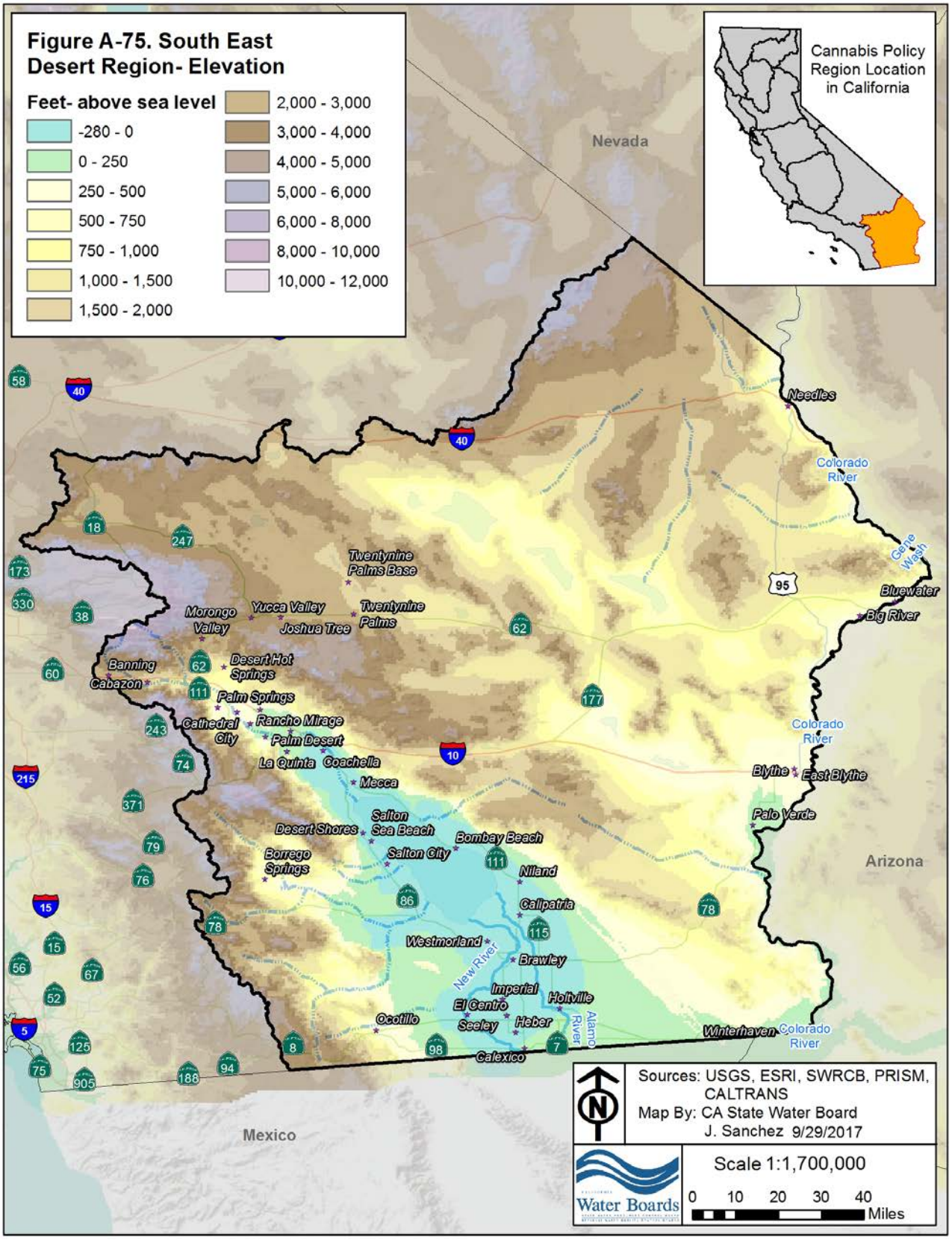


Figure A-75. South East Desert Region- Elevation
Feet- above sea level
-280 - 0
0 - 250
250 - 500
500 - 750
750 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 8,000
8,000 - 10,000
10,000 - 12,000
Cannabis Policy Region Location in California
Nevada
Arizona
Mexico
Needles
Colorado River
Gene Wash
Bluewater
Big River
Twentynine Palms Base
Twentynine Palms
Morongo Valley
Yucca Valley
Joshua Tree
Desert Hot Springs
Banning
Cabazon
Palm Springs
Cathedral City
Rancho Mirage
Palm Desert
La Quinta
Coachella
Mecca
Blythe
East Blythe
Palo Verde
Salton Sea Beach
Desert Shores
Bombay Beach
Salton City
Borrego Springs
Niland
Calipatria
Westmorland
Brawley
New River
Imperial
El Centro
Holtville
Ocotillo
Seeley
Heber
Alamo River
Calexico
Winterhaven
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,700,000
0 10 20 30 40
Miles

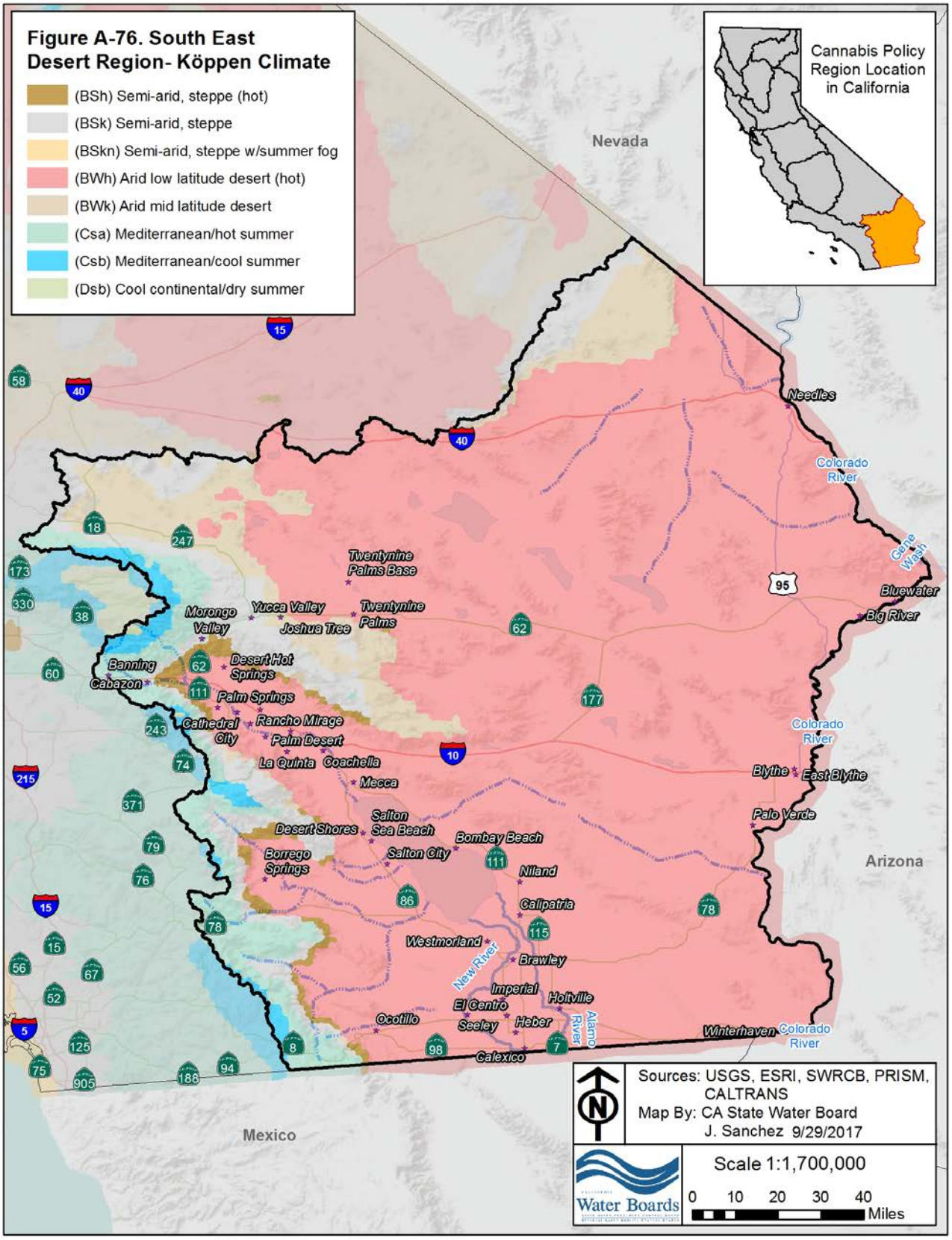


Figure A-76. South East Desert Region- Köppen Climate
(BSh) Semi-arid, steppe (hot)
(BSk) Semi-arid, steppe
(BSkn) Semi-arid, steppe w/summer fog
(BWh) Arid low latitude desert (hot)
(BWk) Arid mid latitude desert
(Csa) Mediterranean/hot summer
(Csb) Mediterranean/cool summer
(Dsb) Cool continental/dry summer
Cannabis Policy Region Location in California
Nevada
Arizona
Mexico
Needles
Colorado River
Gene Wash
Bluewater
Big River
Twentynine Palms Base
Twentynine Palms
Yucca Valley
Joshua Tree
Morongo Valley
Banning
Cabazon
Desert Hot Springs
Palm Springs
Cathedral City
Rancho Mirage
Palm Desert
La Quinta
Coachella
Mecca
Blythe
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Palo Verde
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Bombay Beach
Salton City
Borrego Springs
Niland
Calipatria
Westmorland
Brawley
New River
Imperial
Holtville
El Centro
Ocotillo
Seeley
Heber
Alamo River
Winterhaven
Calexico
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS
Map By: CA State Water Board
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Water Boards
Scale 1:1,700,000
0 10 20 30 40
Miles

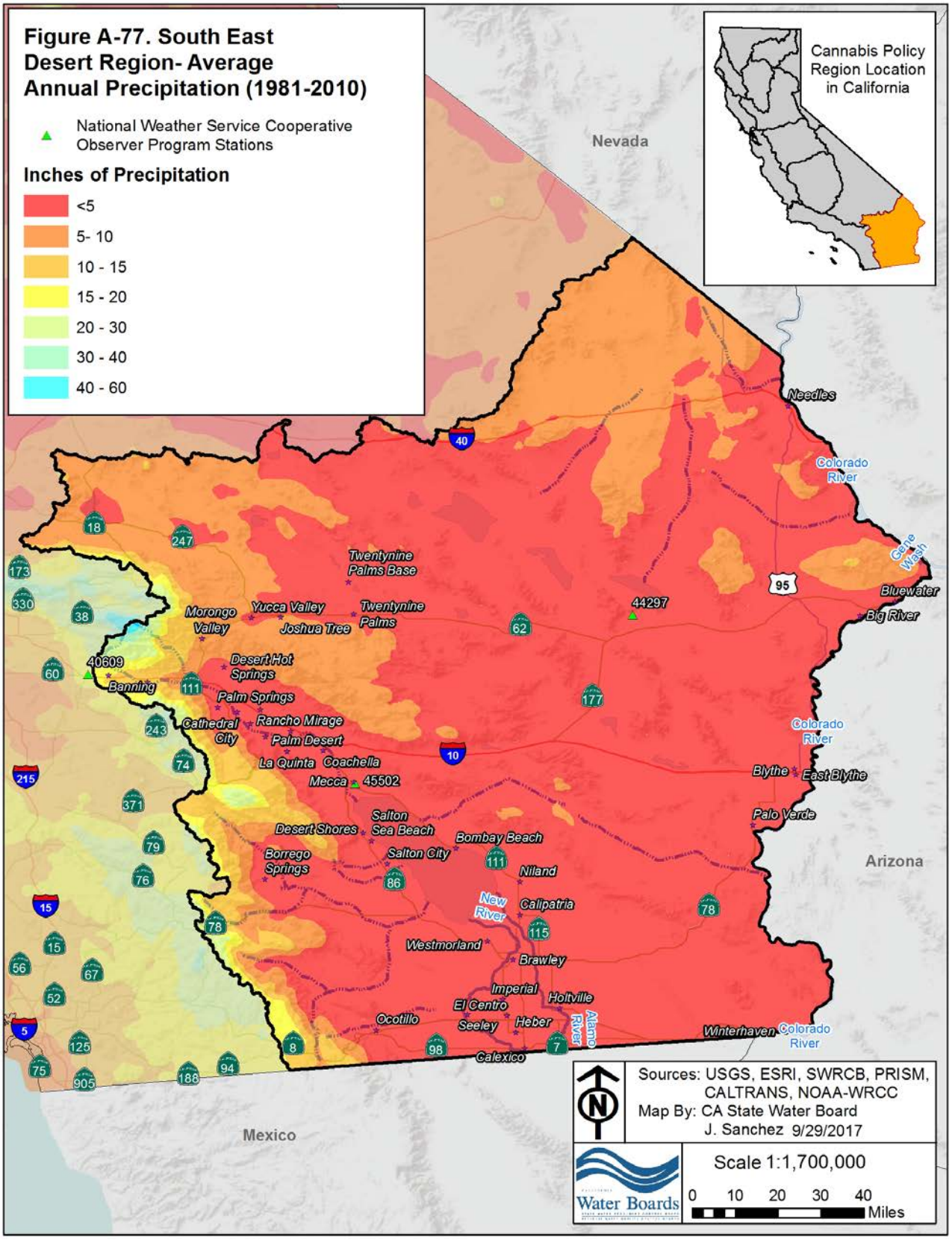
Figure A-77. South East Desert Region- Average Annual Precipitation (1981-2010)
National Weather Service Cooperative Observer Program Stations
Inches of Precipitation
<5
5- 10
10 - 15
15 - 20
20 - 30
30 - 40
40 - 60
Cannabis Policy Region Location in California
Nevada
Arizona
Mexico
Needles
Colorado River
Twentynine Palms Base
Morongo Valley
Yucca Valley
Twentynine Palms
Joshua Tree
44297
Desert Hot Springs
40609
Banning
Palm Springs
Cathedral City
Rancho Mirage
Palm Desert
La Quinta
Coachella
Mecca
45502
Blythe
East Blythe
Palo Verde
Salton Sea Beach
Desert Shores
Bombay Beach
Salton City
Borrego Springs
Niland
Calipatria
New River
Westmorland
Brawley
Imperial
Holtville
El Centro
Ocotillo
Seeley
Heber
Alamo River
Winterhaven
Calexico
Sources: USGS, ESRI, SWRCB, PRISM, CALTRANS, NOAA-WRCC
Map By: CA State Water Board
J. Sanchez 9/29/2017
Water Boards
Scale 1:1,700,000
0 10 20 30 40
Miles

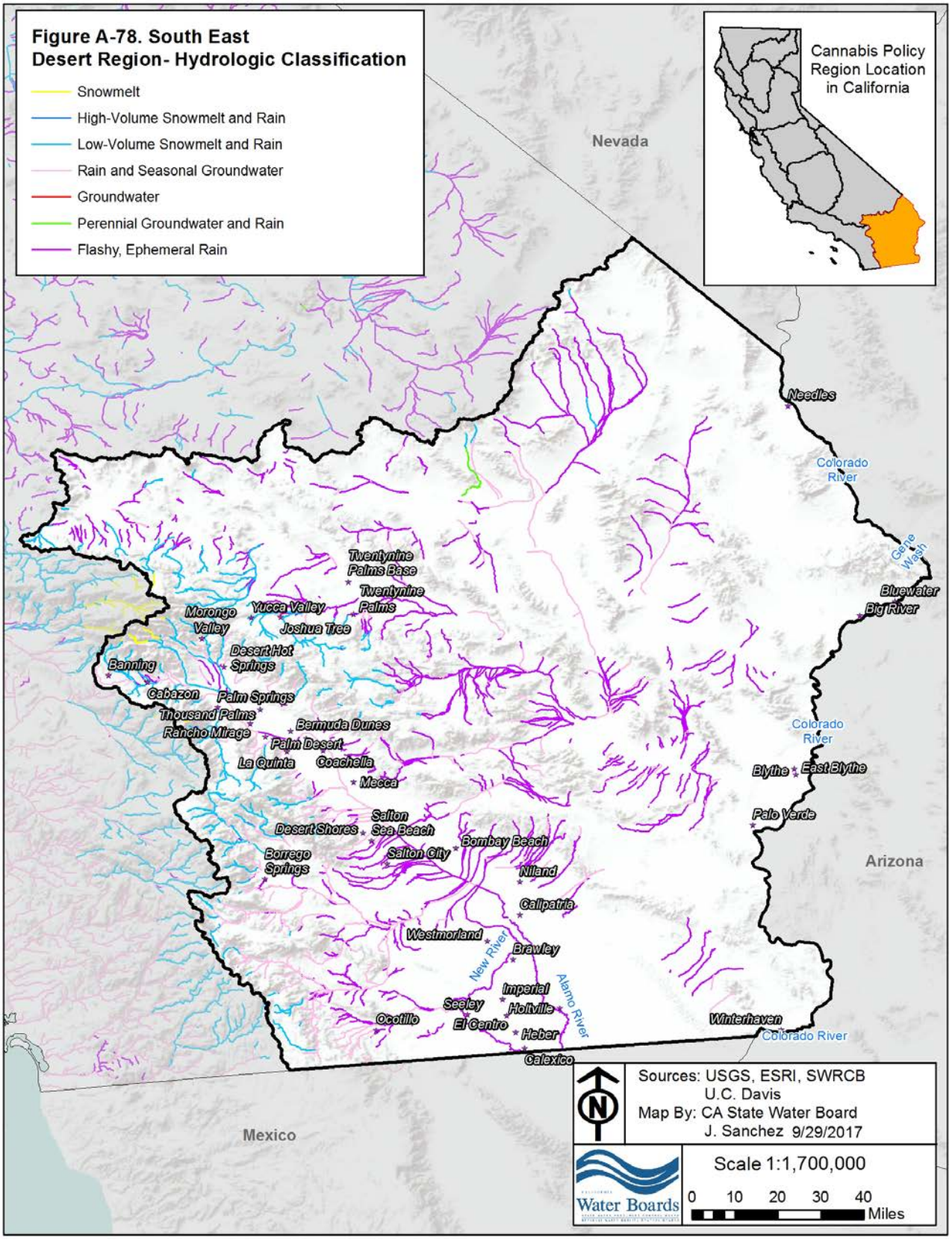
Figure A-78. South East Desert Region- Hydrologic Classification
Snowmelt
High-Volume Snowmelt and Rain
Low-Volume Snowmelt and Rain
Rain and Seasonal Groundwater
Groundwater
Perennial Groundwater and Rain
Flashy, Ephemeral Rain
Cannabis Policy Region Location in California
Nevada
Arizona
Mexico
Needles
Colorado River
Gene Wash
Bluewater
Big River
Twentynine Palms Base
Twentynine Palms
Morongo Valley
Yucca Valley
Joshua Tree
Desert Hot Springs
Banning
Cabazon
Palm Springs
Thousand Palms
Rancho Mirage
Bermuda Dunes
Palm Desert
La Quinta
Coachella
Mecca
Blythe
East Blythe
Palo Verde
Salton Sea Beach
Desert Shores
Salton City
Bombay Beach
Borrego Springs
Niland
Calipatria
Westmorland
Brawley
New River
Imperial
Alamo River
Seeley
Holtville
Ocotillo
El Centro
Heber
Calexico
Winterhaven
Sources: USGS, ESRI, SWRCB
U.C. Davis
Map By: CA State Water Board
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Water Boards
Scale 1:1,700,000
0 10 20 30 40
Miles