STAFF REPORT

for

North Coast Hydrologic Region Salt and Nutrient Management Planning Groundwater Basin Evaluation and Prioritization

Public Review DRAFT

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North Coast Regional Water Quality Control Board

5550 Skylane Boulevard, Suite A

Santa Rosa, California 95403

707-576-2220

www.waterboards.ca.gov/northcoast

Contact Person:

Christopher J. Watt, CEG, CHG

Senior Engineering Geologist

Groundwater Specialist, Point Source Control and Groundwater Protection Division

Email: Chris.Watt@waterboards.ca.gov

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Executive Summary

Groundwater is a vital yet nearly invisible resource and the primary reserve of stored freshwater in our Region. The primary beneficial uses of groundwater are domestic, municipal, agricultural, and industrial supply. Groundwater also supplies base flow to streams and supports groundwater-dependent ecosystems. Increased reliance on groundwater typically follows population growth and reductions in surface water flows and storage - particularly, during periods of drought. Advances in drilling and pumping technology have lowered the cost of groundwater extraction and only recently has regulation of groundwater pumping expanded in California. With the increase in discharges of waste to land and groundwater extraction/use has come a reduction in the quality of groundwater across the state, particularly shallow groundwater. In many North Coast groundwater basins, there is significant lack of data and associated scientific uncertainty about the status (quality and quantity) of groundwater.

Over the last decade and a half, the North Coast Regional Water Quality Control Board (Regional Water Board) supported the development of a Groundwater Protection Strategy (Strategy) informed by statewide policies, in particular the State Water Resources Control Board (State Water Board) Resolution 68-16 "*Statement of Policy with Respect to Maintaining High Quality of Waters in California"* and the State Water Board *Policy for Water Quality Control for Recycled Water* (Recycled Water Policy). The purpose of the Strategy is to (1) establish water quality objectives, (2) identify priority basins, and (3) identify and implement strategies to protect high groundwater quality of the region and improve groundwater quality in areas where it is degraded. In support of the protection of groundwater, in 2015 the Regional Water Board adopted new Water Quality Objectives for groundwater and continues to adopt individual and general waste discharge permits for both point source and non-point source discharge control. While many point source dischargers, like municipal wastewater treatment plants, must monitor groundwater quality as part of their waste discharge requirements, groundwater monitoring is less common with non-point source dischargers such as irrigated agriculture and small onsite wastewater treatment systems.

In more than one-third of the 62 North Coast groundwater basins, the primary threats to groundwater quality and the beneficial uses of groundwater are excessive salts and nutrients. The Recycled Water Policy requires each Region to conduct basin evaluations and to provide the State Water Board basin priorities for Salt and Nutrient Management Planning. Informed by the Recycled Water Policy and the Department of Water Resources California Statewide Groundwater Elevation Monitoring (CASGEM) Priority Basin Program, Regional Water Board staff developed a prioritization process to identify groundwater basins having an elevated threat from salts and nutrients. Identifying the groundwater basins under an elevated threat to water quality degradation will help meet the Recycled Water Policy objective of salt and nutrient management planning.

This staff report provides a summary of groundwater occurrence, quality, and use within the North Coast Region, followed by a description of the technical process developed to conduct the basin evaluations. Adaptive management pathways and implementation options are also presented. Finally, this report makes recommendations for basin prioritization along with proposed Resolution No. R1-2021-0006 to accept staff recommendations.

Background

Groundwater Occurrence and Quality

Groundwater is defined as subsurface water in soils and geologic formations that are fully saturated during all or part of the year. Aquifers are groundwater bearing formations sufficiently permeable to transmit and yield significant quantities of water – they are the layers of sediment, soils, and fractured rock. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. For an example, where an aquifer or several aquifers are surrounded or nearly surrounded by hills or mountains, they form a groundwater basin. Groundwater basins do not always follow the same boundaries as surface waters and groundwater also occurs in aquifers external to groundwater basins identified by the Department of Water Resources. Water-bearing geologic units that do not meet the exact definition of an aquifer occur throughout the Region. Therefore, the term "groundwater" includes all subsurface waters, whether these waters meet the classic definition of an aquifer or occur within identified groundwater basins.

The Department of Water Resources (DWR) identified 62 groundwater basins or subbasins in the North Coast Region (Figure 1). Subbasins are hydrogeologically distinct areas within a larger groundwater basin. Four major categories of groundwater basins occur within the Region: 1) Alluvial River Valley; 2) Coastal Plain/River Valley; 3) Coastal Terrace; 4) Intermontane Alluvial and/or Volcanic Valley. DWR Bulletin 118 Update 2003 describes California groundwater basins and subbasins. The 2003 Basin Descriptions include information (where available) on basin boundaries, summaries of the hydrologic and hydrogeologic setting, groundwater storage capacity and water budget, groundwater level and quality trends, well yields, basin management, and references. However, Bulletin 118 Update 2003 does not include hydrogeologic information such as aquifer characteristics, groundwater level, and storage for many North Coast groundwater basins, given the lack of data and/or DWR focus on more populated basins.

The basin prioritization process described in this report focuses on evaluating alluvial (with some volcanic rock) aquifers within those groundwater basins designated in DWR Bulletin 118 Update 2003; however, using well completion reports from the DWR database, Regional Water Board staff preliminarily identified several areas not served by public water systems which draw groundwater from fractured rock or small alluvial aquifers external to DWR groundwater basins. Table 1 presents a preliminary list of these areas, which based on future direction from the North Coast Board, may be evaluated by staff through the same process as the DWR groundwater basins.

Table 1: Preliminary List of Areas Reliant on Groundwater external to DWR Basins

Area	County	Domestic Wells (estimated quantity)	Area (sq. mi.)
North of Yreka	Siskiyou	77	5
East of Hornbrook	Siskiyou	459	24
Between Douglas City and Lewiston	Trinity	225	13
Junction City Area	Trinity	201	24
Hayfork	Trinity	257	22
East of Forest Glen	Trinity	338	9
North of Laytonville	Mendocino	60	3

Generally, groundwater in the North Coast region is the least degraded, or highest quality, compared to other regions in the state. As discussed within this report and based on available data, staff considers the threat to groundwater quality as low in about one quarter of North Coast groundwater basins. In the remaining groundwater basins, salts and nutrients[1] are the most common pollutant and in about one-quarter of

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[1] Evaporation of irrigation water will remove water and leave salts behind. More salt can be dissolved from soil as irrigation water percolates downward. Plants can naturally increase soil salinity as they uptake water and exclude salts. Application of synthetic fertilizers can increase nitrate concentrations in surface and groundwater. Manure from confined animal facilities is enriched in nutrients and other salts, and can also increase salinity levels in receiving waters. Detergents, water softeners, and industrial processes all use salts. Wastewater discharged to wastewater treatment facilities and septic systems is often saltier than the original source water. Discharges from wastewater treatment facilities and septic systems can increase the salinity and nutrient content of groundwater. Overwatering of lawns and residential use can also contribute to salinity. Many industrial processes can increase salinity in process wastewater. Cooling towers,

the basins have caused or threaten to cause an exceedance of water quality objectives and impacts to beneficial uses. Waste discharges from Onsite Wastewater Treatment Systems (OWTS), agricultural operations, and municipal and industrial wastewater treatment facilities are believed to be the primary threats to groundwater quality and a significant source of salts and nutrients found in groundwater. In some basins, high density residential areas reliant on OWTS for wastewater disposal and domestic wells for domestic water supply may compound impacts. Irrigation using imported water, surface water, groundwater, or recycled water, and indirect potable reuse for groundwater recharge may increase salt and nutrient loading. Saltwater intrusion induced by sea level rise and falling groundwater elevations in coastal aquifers will reduce the capacity of an aquifer to assimilate salt loads and support beneficial uses.

Existing and potential beneficial uses applicable to groundwater in the North Coast Region include Municipal and Domestic Water Supply (MUN), reflecting the importance of groundwater as a source of drinking water in the Region and as required by the State Board's Sources of Drinking Water Policy. Other beneficial uses for groundwater include: Industrial Water Supply (IND), Industrial Process Water Supply (PRO), and Agricultural Water Supply (AGR), Aquaculture (AQUA), and Native American Culture (CUL).

Groundwater Use and Reliance

Land area of the North Coast Region is almost 20,000 square miles and as of the 2010 Census, the population was about 675,000. Land area of the 62 groundwater basins or subbasins area makes up less than 10 percent of the land area of the Region and more than 82 percent of the population lives within a DWR groundwater basin. More than one-third of the total population of the Region lives within the Santa Rosa Plain subbasin which occupies less than one percent of the land area of the Region. Groundwater accounts for about one-third of water supply in the Region; however, in about half of the basins, groundwater comprises more than two-thirds of the water supply. There are about 1,000 active public supply wells regulated by the State Water Resources Control Board - Division of Drinking Water and a minimum of 38,000 private domestic wells supply groundwater used for drinking water[2]. The supply of groundwater varies annually with precipitation, infiltration, and withdrawals from groundwater basins. Withdrawals are dependent on several factors, such as changes in surface water availability, urban and agricultural growth, market fluctuations, and water use efficiency practices. The Department of Water Resources ranked 8 of the 62 groundwater basins medium priority as part of the Priority Basin Process required by the Sustainable

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power plants, food processors, and canning facilities can contribute to salinity. Groundwater contains naturally occurring salts from dissolving rocks and organic material. Some rocks dissolve very easily; groundwater in these areas can naturally be of very high salinity.

[2] Based on Department of Water Resources Well Completion Reports.

Groundwater Management Act. The Sustainable Groundwater Management Act (SGMA) was enacted to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. SGMA requires local agencies adopt sustainability plans for high- and medium-priority groundwater basins. Under SGMA, basins must reach sustainability within 20 years of implementing their plans. The long-term planning required by SGMA will provide a buffer against drought and climate change and contribute to reliable water supplies regardless of weather patterns in the State. Table 2 provides general information for North Coast groundwater basins by county.

Table 2: Groundwater Basin Information by County

County	Basins	Basin Pop. (2010)	Total Basins Area (sq. mi.)
Modoc	2	2,407	178
Siskiyou	8	19,030	717
Trinity	4.5	977	12
Lake	1	11	5
Del Norte	2	25,410	74
Humboldt	14.5	118,102	331
Mendocino	19.5	57,770	208
Sonoma	10.5	330,346	349

Groundwater Protection Strategy Chronology

In 2004 and 2007, as part of the Triennial Review process, staff planned for a two-part Groundwater Protection Strategy beginning with the need to translate narrative water quality objectives into numeric water quality objectives. The second phase was anticipated to consist of an implementation approach to protect high groundwater quality and improve degraded groundwater quality within the region. This implementation approach could take the form of a Basin Plan Amendment and/or a Policy Statement. In 2009, the State Water Board adopted the Recycled Water Policy which included a requirement for stakeholder funded Salt and Nutrient Management Plans for each of the 515 groundwater basins/subbasins within California. In 2010, the State Water Board concurred with the North Coast Region's vision for a Groundwater Protection Strategy incorporating a programmatic approach to managing salts and nutrients. During the adoption of the 2014 Triennial Review of the Basin Plan in March 2015, the Regional Water Board identified the second phase of the Groundwater Protection Strategy[3], making the short list of projects that would be funded with staff resources. In 2015, the Regional Water Board adopted a Basin Plan Amendment incorporating numeric water

[3] Triennial Review Project No. 5 included the development of a groundwater protection policy, policy to promote groundwater recharge, programmatic approach to managing salts and nutrients in groundwater and the update of Table 2-1 to include beneficial uses for individual groundwater basins, where appropriate.

quality objectives for groundwater. The 2018 Triennial Review retained the Groundwater Protection Strategy as a priority project to address potential impacts to the beneficial uses of receiving waters (groundwater) from the discharge of waste by identifying management measures and monitoring program requirements to ensure that all land disposal projects are designed to protect applicable beneficial uses and water quality objectives. Then in 2019, the State Water Board amended the Recycled Water Policy for a second time which incorporated the basin evaluation and prioritization approach to managing salts and nutrients promoted by the Regional Water Board. This staff report provides a description of the technical approach to basin evaluation and prioritization. In the near future (2021-2022) staff recommends development of a *Policy Statement* describing an approach and direction to staff with respect to groundwater protection which would itself have no new regulatory effect, rather make reference to existing policies and provide an approach to inform staff and the public when considering permit requirements.

Basin Evaluation– Technical Process

Existing Groundwater Basin Prioritization Frameworks for California

The State Water Board and the Department of Water Resources (DWR) have both spent substantial resources and efforts into prioritizing the management of California's 515 groundwater basins and sub-basins[4] .While initial efforts began as far back as 2001, priority determinations are currently active with both agencies.

2001: State Water Board Comprehensive Groundwater Quality Monitoring Program

The Groundwater Quality Monitoring Act of 2001 California Water Code (CWC §10780-10782.3), otherwise known as AB 599, resulted in a publicly accepted framework to monitor and assess the quality of all priority groundwater basins that account for over 90% of all groundwater used in the state. The framework was developed in conjunction with the United States Geological Survey (USGS), a Public Advisory Committee (PAC) and Interagency Task Force (ITF), and the State Water Board and prioritizes groundwater basins for assessment based on groundwater use across the state. While the need to prioritize basins was identified by Regional Water Board staff, coordination with the State Water Board has uncovered an established methodology for a Comprehensive Groundwater Quality Monitoring Program that includes a statewide prioritization of groundwater basins. This effort was the birth of the State Water Board Groundwater Ambient Monitoring and Assessment (GAMA) Program.

[4] As defined by DWR Bulletin 118

2009: Department of Water Resources California Statewide Groundwater Elevation Monitoring

DWR implemented the California Statewide Groundwater Elevation Monitoring (CASGEM) Program in response to legislation enacted in California's 2009 Comprehensive Water package. As part of the CASGEM Program and pursuant to the California Water Code (CWC §10933), DWR is required to prioritize California groundwater basins, to help identify, evaluate, and determine the need for additional groundwater level monitoring. The CASGEM Groundwater Basin Prioritization (Basin Prioritization)[5] is a statewide ranking of groundwater basin importance that incorporates groundwater reliance and focuses on basins producing greater than 90% of California's annual groundwater.

2009 & 2013: State Water Resources Control Board Recycled Water Policy

In 2009[6], the State Water Board adopted the Recycled Water Policy and subsequently provided the Regional Water Boards with priority basins to develop Salt and Nutrient Management Plans (SNMPs). Following several years of implementation, the State Water Board concluded another revision to the Recycled Water Policy is necessary. This effort resulted in the expansion of the list of priority groundwater basins[7] within the Regions.

2014: Department of Water Resources Act SGMA Basin Prioritization

The Sustainable Groundwater Management Act (SGMA) revised the Water Code to direct the DWR to develop the initial groundwater basin priority by January 31, 2015. DWR concluded the basin prioritization in June 2014 under the CASGEM Program would be the initial prioritization when SGMA went into effect on January 1, 2015. DWR worked to revise the initial prioritization and provided further considerations for several criteria including impacts to water quality.

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[5] The CWC requires a statewide prioritization of California's groundwater basins using the following eight criteria: (1) Overlying population; (2) Projected growth of overlying population; (3) Public supply wells; (4) Total wells; (5) Overlying irrigated acreage; (6) Reliance on groundwater as the primary source of water; (7) Impacts on the groundwater; including overdraft, subsidence, saline intrusion, and other water quality degradation; and (8) any other information determined to be relevant by the Department.

[6] Modified in 2013

[7] As defined by the SWRCB/USGS Comprehensive Groundwater Quality Monitoring Program

2018: State Water Board Recycled Water Policy

In 2018, the Recycled Water Policy was amended for the second time and incorporated groundwater basin prioritization (referred as Basin Evaluation) to implement the Salt and Nutrient Management Planning provision of the Recycled Water Policy. The Amendment includes language requiring regional water boards to evaluate groundwater basins within their region for the potential threat from salts and nutrients to groundwater quality. Based on that evaluation, the regional water boards prioritize the need for salt and nutrient management planning.

2019: Department of Water Resources SGMA Basin Prioritization

The SGMA 2019 Basin Prioritization process was conducted to reassess the priority of the groundwater basins following the 2016 basin boundary modification, as required by the Water Code. For the SGMA 2019 Basin Prioritization, DWR followed the process and methodology developed for the CASGEM 2014 Basin Prioritization, adjusted as required by SGMA and related legislation. DWR is required to prioritize basins for the purposes of SGMA, which was enacted, among other things, to provide for the sustainable management of groundwater basins. This entailed a reassessment of factors that had been utilized in the CASGEM program to prioritize basins based on groundwater elevation monitoring.

2020: North Coast Basin Evaluation and Prioritization

Regional Water Board staff evaluated and prioritized basins based on the seven factors described in the Salt and Nutrient Management Planning Section of the 2018 Recycled Water Policy. Factors used by staff to evaluate and prioritize the basins consisted of the following:

Factor 1) status and trends in the concentrations of nitrate and salts (as total dissolved solids -TDS) in groundwater

Factor 2) contribution of imported water and recycled water to the basin water supply

Factor 3) reliance on groundwater

Factor 4) population and growth

Factor 5) number and density of on-site wastewater treatment systems

Factor 6) acres of irrigated agriculture and density of confined animal facilities

Factor 7) basin specific factors (depth to water, aquifer thickness, surface water impairment from nutrients and/or pathogens, hydrogeologically vulnerable areas, and number of open groundwater cleanup cases)

Staff modeled the technical process after the Department of Water Resources (DWR) 2019 Basin Prioritization Process of the Sustainable Groundwater Management Act (SGMA). DWR results were used where Factors considered in the 2019 DWR process and this process were similar, i.e. reliance on groundwater, population and growth, and acres of irrigated agriculture. For the remaining factors, the data sources and processes used to calculate priority points for each basin are described in the following sections. Based on total accumulated priority points, each of the 62 basins within the North Coast Region were assigned a priority category, i.e., low, medium, high, or critical. A worksheet presenting the priority points assigned to each basin is included as Appendix 1.

Factor 1: Status and trends in the concentrations of salts and nutrients.

Readily accessible salt (as total dissolved solids) and nutrient (nitrate) groundwater data collected between 2009 and 2020 is relatively robust (n>100) for about 20 percent of the 62 North Coast groundwater basins. However, within the same period, one-third of groundwater basins have no groundwater samples for TDS and nitrate in a readily accessible database. The Santa Rosa Plain subbasin has the highest number of samples (n=2,479) with the Wilson Grove Formation Highlands basin (n=866) and Lower Russian River Valley basin (n=586) a distant second and third.

Data Sources: 1) State Water Board (GAMA) database (wells with data between 2010-2020); and 2) water quality data (2012-2019) submitted by dairy operators in the North Coast Region as part of Waste Discharge Requirements for Dairies (Order No. R1-2012-0002).

Process: Subfactor 1A: Calculate the percentage of wells in a basin with groundwater samples that exceed half of the maximum contaminant level (MCL) for nitrate as nitrogen (NO3-N) and total dissolved solids (TDS) of 10 and 500 milligrams per liter, respectively. Subfactor 1B: Perform statistical analysis of the magnitude and trend in concentration of NO3-N and TDS for groundwater samples collected from a basin. Staff used a Regional Mann-Kendall Test (RKT), which is a non-parametric (i.e. the data distributions were not known) statistical analysis to test whether time-series data for a geographic area show a statistically significant trend (p value<0.05) and, if significant, the magnitude of that trend. RKT requires at least four samples from each well in a basin for inclusion in the analysis. Priority points for trend are based on statistical significance and the slope of the trend. Sum Priority Points for Subfactor 1A (status) and 1B (trend) for each basin/subbasin.

Approximately 50 percent of basins recorded less than three groundwater data points for NO3-N and TDS between 2009 and 2020, with more than 20 basins lacking any data points within the same period. The remaining basins recorded over 11,000 data points for NO3-N and TDS combined, with about 30 percent of data points from wells in the Santa Rosa Plain subbasin.

Table 3 lists priority points for Subfactor 1A and 1B and the associated ranges for status and trend. Refer to Figures 2-7 for comparison by basin/subbasin.

Table 3 Factor 1: Salt/Nutrient Concentration Status and Trend

Priority Points	Status	Priority Points	Trend x=slope
	Wells with samples exceeding ½ MCL	0	negative
1	<3 samples	1	not stat. sig.
2	0-25%	2	flat
3	>25-50%	3	x<5%
4	>50-75%	4	5%≥x>10%
5	>75-100%	5	x≥10%

Factor 2: Contribution of Imported water and Recycled water to the basin water supply.

Irrigation using imported water and/or recycled water can contribute to increased salt and nutrient loading to shallow groundwater. No consideration was given to the difference in basin thickness, quality of imported or recycled water, or the relative effect on volume of water used in a basin.

Data Source: various technical studies, public water district reports, and local planning documents were used to estimate the volume of imported water used in the basins. For purposes of this analysis, water is considered imported if it originated outside the watershed(s) draining to the groundwater basin. Recycled water use was estimated using the average of the last 3 years of discharger volumetric reporting.

Process: Estimate the annual volume of imported and recycled water for basin. Calculate the volume of imported and recycled water (gallons) per unit area of groundwater basin (acre).

Table 4 lists priority points and the associated ranges for the relative use of imported and recycled water per unit area of groundwater basin.

Table 4 Factor 2: Contribution of Imported and Recycled Water

Priority Points	Imported/Recycled Water Use (gallons/basin acre)
0	<500
1	500>x>5,000
2	5,000>x>10,000
3	10,000>50,000
4	50,000<x<100,000
5	>100,000

Factor 3: Reliance on Groundwater to Supply the Basin or Subbasin.

The degree to which water users in a basin rely on groundwater increases the potential for degraded water quality to affect the beneficial use for those users. The 2019 DWR Basin Prioritization Process used information from DWR well completion reports, the SWRCB Division of Drinking Water, a variety of agricultural and municipal water supply databases, and other publicly available reports.

Data Source: SGMA Components 3, 4, and 6 from the 2019 DWR Basin Prioritization Process. Component 3: the number of public supply wells that draw from the basin or subbasin. Component 4: the total number of wells that draw from the basin or subbasin. Component 6: the degree to which persons overlying the basin or subbasin rely on groundwater as their primary source of water.

Process: Sum priority points for SGMA Components 3, 4, and 6 for each basin/subbasin.

Table 5 lists priority points and the associated ranges for SGMA Components 3 and 4. Table 6 lists priority points and the associated ranges for the two sub-parts of SGMA Component 6 which is the average of the two sub-parts.

Table 5 Factor 3: Number of Public Supply Wells and Number of Total Wells

Priority Points	Public Supply Well Density (x = wells per square mile)	Production Well Density (x = production wells per square mile)
0	x=0	x=0
1	0<x<0.1	0<x<2
2	0.1≤x<0.25	2≤x<5
3	0.25≤x<0.5	5≤x<10
4	0.5≤x<1.0	10≤x<20
5	x≥1.0	x≥20

Table 6 Factor 3: Groundwater Reliance Sub-parts (Use per Acre and Total Supply)

Priority Points	Groundwater Use per Acre (x = acre-ft / acre)	Total Supply Met by Groundwater (x = Groundwater Percent)
0	x<0.03	x=0
1	0.03<x<0.1	0<x<20
2	0.1≤x<0.25	20≤x<40
3	0.25≤x<0.5	40≤x<60
4	0.5≤x<0.75	60≤x<80
5	x≥0.75	8≥20

Factor 4: Population

Population density and population growth are associated within increases in the discharge of pollutants which can impair groundwater quality. The 2019 2019 DWR Basin Prioritization Process used data from the 2000 and 2010 censuses.

Data Source: SGMA Components 1 and 2 from the 2019 DWR Basin Prioritization Process. Component 1: the population (as density) overlying the basin or subbasin. Component 2: the rate of current and projected growth of the population overlying the basin or subbasin.

Process: Sum priority points for SGMA Components 1 and 2 for each basin/subbasin. Table 7 list the priority points and associated ranges SGMA Components 1 and 2.

Table 7 Factor 4: Population Density and Population Growth

Priority Points	Population Density (people per square mile) x = population density	Population Growth (percent) x = population growth percentage
0	x<7	x≤0
1	7≤x250	0<x<x
2	250≤x<1000	6≤x<15
3	1000≤x<2500	15≤x<25
4	2500≤x4000	25≤x40
5	x≥4000	x≥40

Factor 5: Number and density of on-site wastewater treatment systems

The Water Quality Control Policy for Siting, Design, Operation and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy) provides a technical analysis of the threat to groundwater quality from OWTS discharges. The OWTS Policy proposed an acceptable density of residential development served by Tier 1[8] compliant OWTS as a function of OWTS discharge dilution from rainfall. The density calculation is described by Hantzsche and Finnemore in their 1992 paper. Using these same methods, staff derived a “low” OWTS density using conservative input values and assuming one-half the increase in nitrate concentration proposed by the OWTS policy. The density value is expressed as the ratio of I/R, where I = infiltration from rainfall and

[8] Tier 1 covers low-risk new and replacement OWTS up to 3,500 gallons of discharge per day with conservative, largely prescriptive standards, which allow for a modest level of nitrate increase in groundwater

R = rechange from septic discharges. The priority point system ranges from zero OWTS to the highest density calculated in a groundwater basin.

Data Sources: 1) city or county provided sewer district maps; 2) Local Agency Formation Commission (LAFCO) Municipal Service Review (MSR) maps; 3) municipal boundaries; 4) Census Designated Places (CDP); 5) drinking water system maps; 6) private sewer district maps; 7) city and county parcel zoning designations; and 8) PRISM Climate Data. All data used were acquired in August 2020.

Process: Determine the locations of residential properties. The definition of "residential" includes any parcel with a land use description that contains language approximating active full- or part-time residential use. Examples include single-family residences; mobile homes; apartment complexes; and non-commercially run vacation rentals. Eliminate residential parcels within the boundary of sewer service areas. Sewer service boundaries were not standardized across counties and municipalities, and staff made additional assumptions based on data availability. Estimate which residential properties contain an OWTS using building footprint data from the Sonoma County Veg Map as well as computer-generated building footprints via aerial imagery from Microsoft Corporation for the other counties in the Region. Parcels predicted to have a building were assumed to contain an OWTS. Calculate the average annual precipitation for each groundwater basin. Assume groundwater recharge for a residential parcel is 25 percent[9] of the average annual precipitation depth for a basin. Assume 200 gallons per day OWTS discharge rate. Calculate ratio of OWTS discharge (I) to precipitation recharge (R) for the median sized residential parcel for a basin. The median parcel size was used because the filtering process may have inadvertently included large parcels, which could skew I/R ratio if using an arithmetic mean.

Table 8 lists priority points and the associated ranges for the number and density of OWTS in groundwater basins. For the number of OWTS, priority points 1 through 3 represent lowest three quartiles the range in groundwater basin OWTS count with priority points 4 and 5 representing an even split of the highest quartile. Refer to figures 8-10 for a comparison of OWTS and domestic well densities and to Figures 11-13 for nitrate exceedances using well data from GAMA and North Coast Dairy program.

[9] The OWTS policy appears to have assumed 1/3 of annual precipitation depth recharges groundwater in determine Tier 1 OWTS maximum density; however, to account for evapotranspiration, staff reduced the value to 1/4 of annual precipitation depth.

Table 8 Factor 5: Number and density of on-site wastewater treatment systems

Number of OWTS (x=number of OWTS basin-wide)		Ratio of OWTS/ Groundwater Recharge (x=I/R)	
Priority Points	Number	Priority Points	I/R
0	0	0	x<0.01
1	0<x<20	1	0.01<x<0.05
2	20<x<85	2	0.05<x<0.15
3	85<x<384	3	0.15<x<0.25
4	384<x<3026	4	0.25<x<0.35
5	>3026	5	x>0.35

Factor 6: Other sources of salts and nutrients, including irrigated agriculture and confined animal facilities

Within North Coast groundwater basins, non-point sources such as irrigated agriculture (>250,000 acres) and dairies (>65,000 animals) have salt and nutrient loads with the potential to pollute groundwater. Two subfactors were used: subfactor A - the density of irrigated agriculture and subfactor B - the density of dairy animals per acre of dairy ranch. Dairies meeting the quantity threshold for certain animals are required to obtain coverage under Waste Discharge Requirements for Dairies (R1-2019-0001).

Subfactor 6A Data Source: SGMA Component 5 from the 2019 DWR Basin Prioritization Process; Component 5 - Density of Irrigated Agriculture. Subfactor 6A Process: Use SGMA Component 5 priority points. Table 9 lists the priority points and associated ranges for SGMA Component 5.

Table 9 Subfactor 6A: Density of Irrigated Agriculture

Priority Points	Density of Irrigated Acres (x = acres of irrigation per square mile)
0	x<1
1	1≤x25
2	25≤x<100
3	100≤x<200
4	200≤x<350
5	x≥350

Subfactor 6B Data Source: Dairy operator provided dairy ranch acreage and animal counts (2012-2019) including both milking animals and non-milking animals. Subfactor

6B Process: Sum animal counts for each year and average over the eight-year reporting period per basin. Sum acres of dairy ranch per basin. Calculate density of animals per acre of dairy ranch for each basin.
Table 10 lists priority points and associated ranges for the density of dairy animals per acre of dairy ranch. Refer to Figures 14-16 for the distribution of agricultural crops in groundwater basins and to Figures 17-19 for the number and average density of dairy animals per acre of dairy ranch in each basin/subbasin.

Table 10 Subfactor 6B: Confined Animal Facilities

Density of Confined Animals x=animals per dairy ranch acre	
Priority Points	Density
0	None
1	$0<x\leq0.90$
2	$0.90<x\leq1.01$
3	$1.01<x\leq1.28$
4	$1.28<x\leq1.64$

Factor 7: Hydrogeologic factors, such as regional aquitards, depth to water, and other basin- or subbasin-specific factors

The 2018 Recycled Water Policy Salt and Nutrient Management Planning Section includes a Factor for basin specific hydrogeology. Staff identified five Subfactors which may compound the impacts of salt and nutrient loading on water quality and were reasonably discernable from accessible data sets. Subfactor 7A – Depth to groundwater. Subfactor 7B – Aquifer thickness. Subfactor 7C – Basin watershed pathogen or nutrient impairment 303(d) listing. Subfactor 7D – Hydrogeologically Vulnerable Areas. Subfactor 7E – Open cleanup cases.

Data Sources: 1) California Statewide Groundwater Elevation Monitoring online program system; 2) DWR Bulletin 118; 3) DWR Well Completion Report Map Application; 4) State Water Resources Control Board GeoTracker Data Management System; 5) EPA 303(d) Listing of Impaired Waters; and 6) SWRCB Hydrogeologically Vulnerable Area Map (2000).

Subfactor 7A Process: for 31 groundwater basins, depth to water collected from wells between August 26, 2010 to October 1, 2020 was accessed from the CASGEM online system from 293 private (voluntary) and public groundwater wells. Staff assumed groundwater levels in the basins would reach the seasonal high in Spring and reach seasonal low in Fall. The data were grouped into seasons. Spring ranged from March 20 to June 20, Summer from June 20 to September 22, Fall from September 23 to December 21, and Winter from December 21 to March 20. If possible, datasets were selected from mid-April and Mid-October to represent the seasonal high and seasonal low. The seasonal high and low depth to water data was averaged over the 10-year period to generate an average depth to water for a basin.

For basins without CASGEM depth to water data, DWR well logs, Bulletin 118, and GeoTracker were accessed and using professional judgement, a typical depth to groundwater was estimated.

Subfactor 7B Process: aquifer thickness was estimated using narrative descriptions from Bulletin 118 and professional judgement interpreted from a review of select DWR well completion reports.

Subfactors 7C and 7D Process: staff reviewed the above listed data sources for nutrient and pathogen impairment listing and the Hydrogeologically Vulnerable Area map.

Subfactor 7E Process: a list of open Cleanup Cases was extracted from the GeoTracker database. Staff grouped the basins into tertiles; lowest, middle, and highest count of open cleanup cases per square mile of basin.

Tables 11A through 11E list the priority points and associated ranges for the five Subfactors of Factor 7.

Table 11A Subfactor 7A: Depth to Groundwater

Priority Points	x = feet
0	$x \geq 50$
1	$25 \geq x > 50$
2	$x < 25$

Table 11B Subfactor 7B: Aquifer Thickness

Priority Points	x = feet
0	$x \geq 200$
1	$50 \leq x < 200$
2	$x < 50$

Table 11C Subfactor 7C: Pathogen or Nutrient 303(d) listing

Priority Points	Result
0	Null
1	Single
2	Both

Table 11D Subfactor 7D: Hydrogeologically Vulnerable Area

Priority Points	Result
0	No
2	Yes

Table 11E Subfactor 7E: Open Cleanup Cases

Priority Points	Rank
0	Lowest
1	Middle
2	Highest

Basin Prioritization – Results

Priority points for each Factor were calculated for each basin. The sum of priority points for each basin determined the priority category. Refer to the worksheet in Appendix 1 for priority points for each Factor for each basin.
Total priority points calculated for the basins ranged from 3 to 50 with a potential maximum of 69. The priority category point ranges are shown in Table 12.

Table 12: Priority Category Point Range

Category	Critical	High	Medium	Low
Range	x>45	30≤x<45	15≤x<30	x<15

Table 13 presents a summary of basin prioritization results. Figures 2 through 19 included with this staff report provide a geospatial representation of several Factors. Figure 20 presents a regional map color coded by groundwater basin priority.

Table 13: Summary of Basin Prioritization

Priority Category	Quantity	Area [10](%)	Basin or Subbasin
Critical	1	7	Santa Rosa Plain
High	16	34	Smith River Plain, Scott River Valley, Mad River Lowland, Eureka Plain, Eel River Valley, Covelo Round Valley, Anderson Valley, Fort Bragg Terrace

[10] Percent of total area of all North Coast groundwater basins combined

Priority Category	Quantity	Area [10](%)	Basin or Subbasin
			Area, Big Lagoon Area, Ukiah Valley, Alexander Area, Cloverdale Area, Healdsburg Area, Rincon Valley, Lower Russian River Valley, Fort Ross Terrace Deposits
Medium	30	54	Dows Prairie School Area, Tule Lake, Lower Klamath, Butte Valley, Shasta Valley, Hayfork Valley, Hoopa Valley, Laytonville Valley, Little Lake Valley, Lower Klamath River Valley, Seiad Valley, Garcia River Valley, Redwood Creek Area, Mattole River Valley, Honeydew Town Area, Pepperwood Town Area, Weott Town Area, Garberville Town Area, Dinsmore Town Area, Hyampom Valley, Branscomb Town Area, Ten Mile River Valley, Rig River Valley, Gravelly Valley, Annapolis Ohlson Ranch Fm. Highlands, Knights Valley, Potter Valley, Sanel Valley, McDowell Valley, Bodega Bay Area, Wilson Grove Formation Highlands
Low	15	5	Happy Camp Town Area, Bray Town Area, Red Rock Valley, Fairchild Swamp Valley, Prairie Creek Area, Larabee Valley, Hettenshaw Valley, Cotteneva Creek Valley, Little Valley, Sherwood Valley, Williams, Valley, Eden Valley, Navarro River Valley, Wilson Point Area

Adaptive Management Pathways and Potential Implementation Options

Staff have identified four (not mutually exclusive) components of an approach to addressing the results of this groundwater basin evaluation: 1) additional technical analysis; 2) implementation of existing regulatory tools; 3) stewardship actions; and 4) possible amendments to the Basin Plan.

Additional technical analysis is needed, particularly for Critical, High, and Medium priority groundwater basins. This additional technical analysis may consist of repeated use of the basin evaluation process for salts and nutrients presented in this Staff Report to assess changes over time to basin risk and priority with respect to salts and nutrients. In addition, this same basic evaluation process can also be used to evaluate the potential for groundwater impairment from other pollutants. Further, Regional Water Board staff intend to implement a salt and nutrient loading risk model for Critical and High priority groundwater basins to assist in identifying priority zones within these basins.

A simpler, more qualitative approach would be utilized to identify priority zones within Medium priority basins. These priority zones are areas within the groundwater basins where salt and nutrient loading is predicted to degrade groundwater quality and impact its beneficial uses and where enhanced groundwater monitoring is warranted. Such groundwater monitoring may be accomplished through various mechanisms, including voluntary (and possibly anonymous) domestic well sampling, monitoring and reporting programs required in waste discharge permits, the Water Quality Assessment Programs of Local Agency Management Plans, monitoring associated with Salt and Nutrient Management Plans, where applicable, and possibly through regional monitoring programs such as the Russian River Regional Monitoring Program (R3MP). The cycle of these adaptive management technical analysis pathways is presented, as a function of basin priority, in Table 14.

Table 14: Recommended Adaptive Management Pathways

Basin Priority	Salt and Nutrient Loading Risk Model	Identify Priority Zones	Expanded Groundwater Monitoring	Frequency of Re-Evaluation (years)
Critical	Y	Y	Y	2
High	Y	Y	Y	3
Medium	N	Y	Y	4
Low	N	N	N	5

Waste discharge requirements (WDRs), as well as Waivers of WDRs are the regulatory tools used to control/minimize discharges from activities or facilities subject to such regulation. These regulatory permits may also include effluent limitations, prohibitions, and anti-degradation analyses necessary to protect groundwater. Further, monitoring and reporting programs (MRPs) implemented as part of WDRs and Waivers may include groundwater monitoring to the extent necessary to assess a discharges potential impacts to groundwater. These are the existing regulatory tools available to the Regional Water Board to protect groundwater quality. Where groundwater basin evaluations identify Critical and High priority basins, then individual and/or general WDRs and/or Waivers, and associated MRPs will be utilized to control further degradation and return the groundwater basin to a trajectory of recovery.

The third strategic component of the approach for protecting groundwater quality can generally be called stewardship, which includes nonregulatory actions, including stakeholder engagement, Best Management Practice development, voluntary regional groundwater monitoring programs, and technical and financial assistance to small disadvantaged communities for pollution reduction projects and projects that support the Human Right to Water.

Implementation of these adaptive management pathways can be utilized within the existing regulatory authorities of the Regional Water Board. In some Critical and High priority groundwater basins, however, these adaptive management pathways may not be sufficient to address existing and potential threats to groundwater quality and may require different regulatory schemes to reverse trends in salt and nutrient loading (as well as other contaminants). In these cases, new regulatory tools or options may be needed, or a comprehensive groundwater basin-wide strategy may be necessary. These new regulatory options or strategies may require amendment to the Basin Plan. Regional Water Board staff are still assessing whether a Basin Plan amendment describing a Groundwater Protection Strategy is necessary for the North Coast Region.

Under Water Code section 13224, the Regional Water Board is authorized to issue policy statements relating to any water quality matter within its jurisdiction. A policy statement expresses in a resolution an opinion of the Regional Water Board without having effect as regulation. A policy statement can encourage certain actions, give general direction to staff, or make other non-regulatory statements. Regional Water Board staff recommend development of a policy statement for the Regional Water Board's consideration at a future meeting of the Regional Water Board; this policy statement would outline a Groundwater Protection Strategy to protect high groundwater quality of the region and improve groundwater quality in areas where it is degraded.

Recommended Action

Staff recommend the Regional Water Board adopt, via the attached Resolution No. R1-2021-0006 included as Appendix 2, the Groundwater Basin Priorities presented in and developed through the technical process described in this staff report.

References

Belitz, Kenneth, Dubrovsky, N.M., Burow, Karen, Jurgens, Bryant, and Johnson, Tyler, (2003), Framework for a ground-water quality monitoring and assessment program for California: U.S. Geological Survey Water-Resources Investigations Report 03-4166, 78p. https://pubs.usgs.gov/wri/wri034166/pdf/wri034166.pdf

Verstraeten, Ingrid & Fetterman, Greg & Sebree, Sonja & Meyer, Michael & Bullen, T.. (2004). Is Septic Waste Affecting Drinking Water From Shallow Domestic Wells Along the Platte River in Eastern Nebraska?.https://pubs.usgs.gov/fs/fs07203/pdf/fs07203l.pdf

California Department of Water Resources (2003), California's groundwater: California Department of Water Resources, Bulletin 118, Update 2003. https://cawaterlibrary.net/wp-content/uploads/2003/10/Bulletin_118_Update_2003.pdf

California Department of Water Resources (2020), Sustainable Groundwater Management Act 2019 Basin Prioritization, Process and Results. https://data.cnra.ca.gov/dataset/13ebd2d3-4e62-4fee-9342-d7c3ef3e0079/resource/ffafd27b-5e7e-4db3-b846-e7b3cb5c614c/download/sgma_bp_process_document.pdf

Hantzsche, N.N. and Finnemore, E.J. (1992), Predicting Ground-Water Nitrate-Nitrogen Impacts. Groundwater, 30: 490-499. doi:10.1111/j.1745-6584.1992.tb01524.x

State Water Resource Control Board (2000), Hydrogeologically Vulnerable Areas Map. https://www.waterboards.ca.gov/gama/docs/hva_map_table.pdf

United States Environmental Protection Agency (2016), California 303(d) Listed Waters for Reporting Year 2016. https://ofmpub.epa.gov/waters10/attains_impaired_waters.impaired_waters_list?p_state=CA&p_cycle=2016

Figures

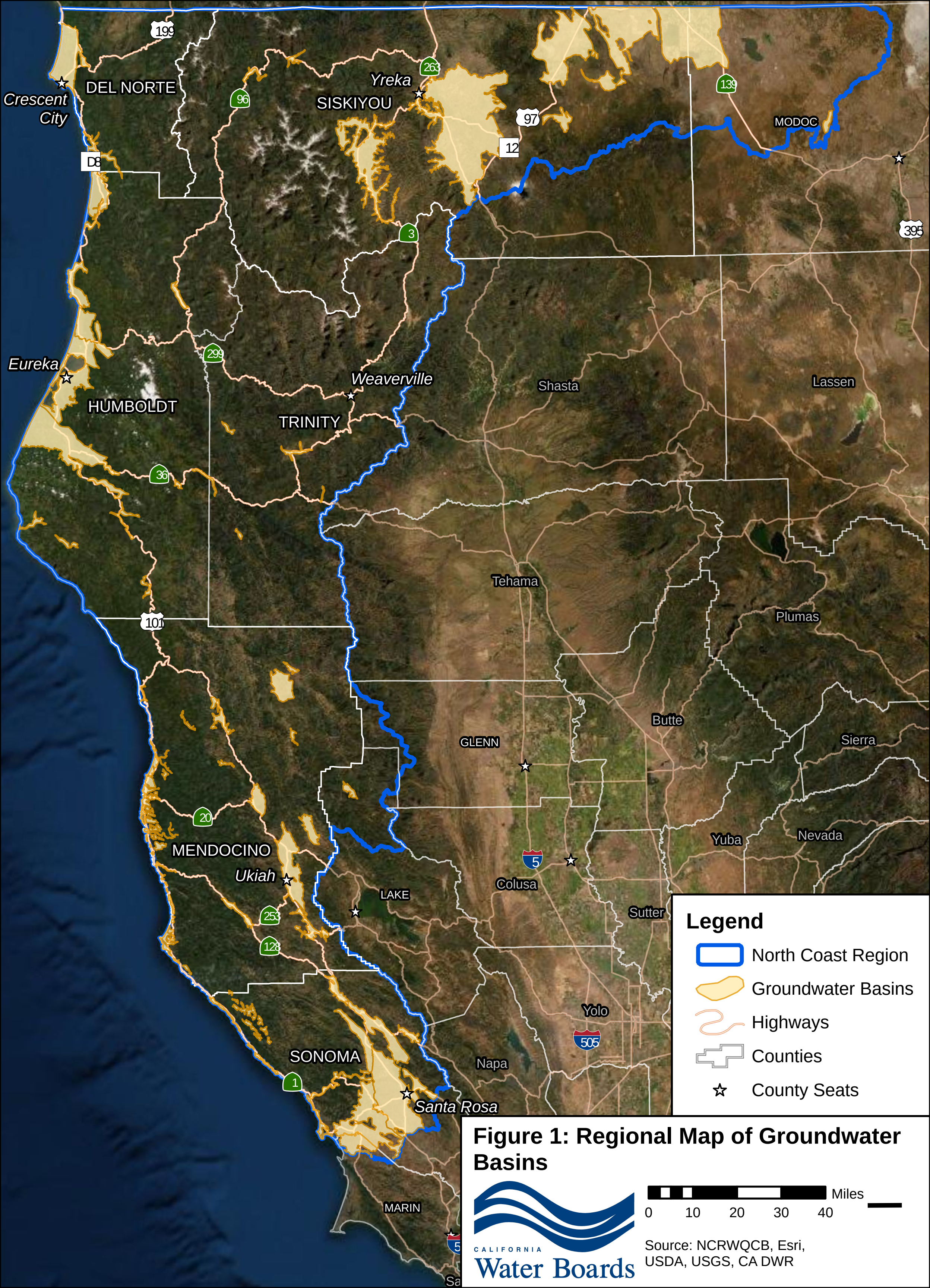


Figure 1: Regional Map of Groundwater Basins

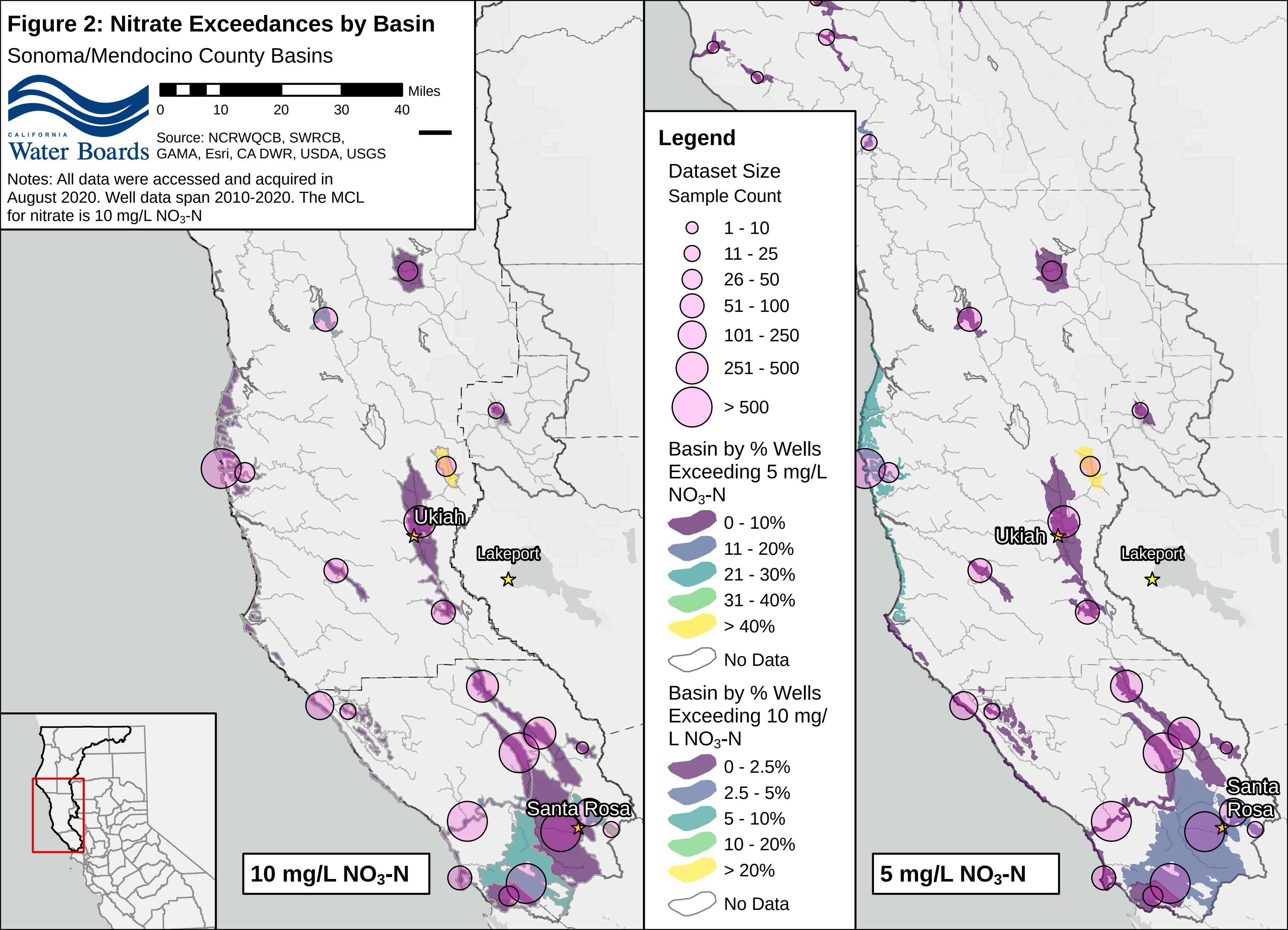
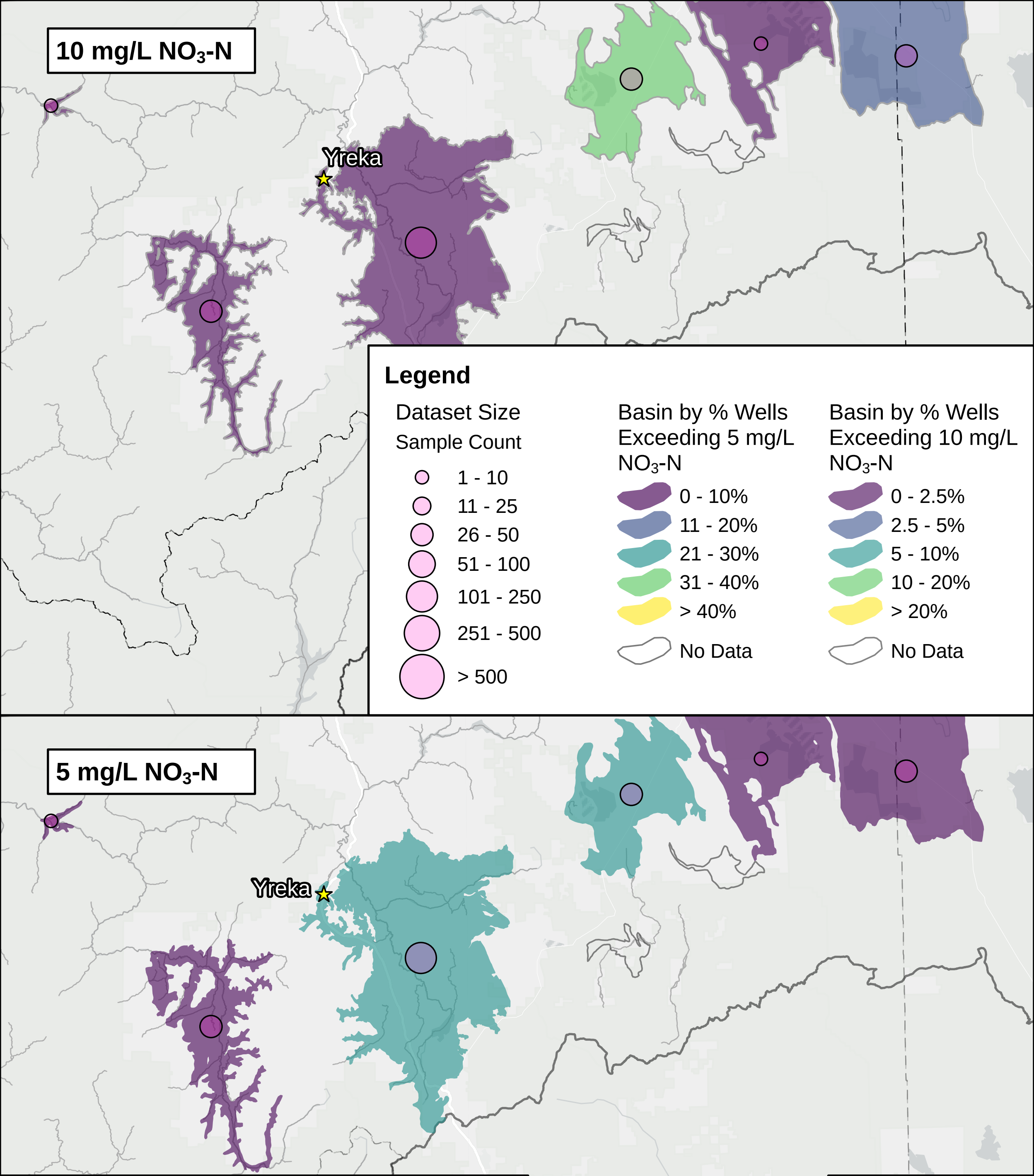


Figure 2: Nitrate Exceedances by Basin
Sonoma/Mendocino County Basins
CALIFORNIA Water Boards
0 10 20 30 40 Miles
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for nitrate is 10 mg/L NO3-N
Ukiah
Lakeport
Santa Rosa
10 mg/L NO3-N
Legend
Dataset Size
Sample Count
1 - 10
11 - 25
26 - 50
51 - 100
101 - 250
251 - 500
> 500
Basin by % Wells Exceeding 5 mg/L NO3-N
0 - 10%
11 - 20%
21 - 30%
31 - 40%
> 40%
No Data
Basin by % Wells Exceeding 10 mg/L NO3-N
0 - 2.5%
2.5 - 5%
5 - 10%
10 - 20%
> 20%
No Data
Ukiah
Lakeport
Santa Rosa
5 mg/L NO3-N



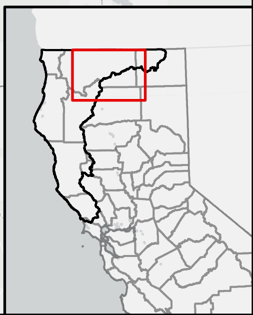


Figure 3: Nitrate Exceedances by Basin

Siskiyou/Modoc County Basins

0 10 20 30 Miles

CALIFORNIA Water Boards

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for nitrate is 10 mg/L NO_3-N

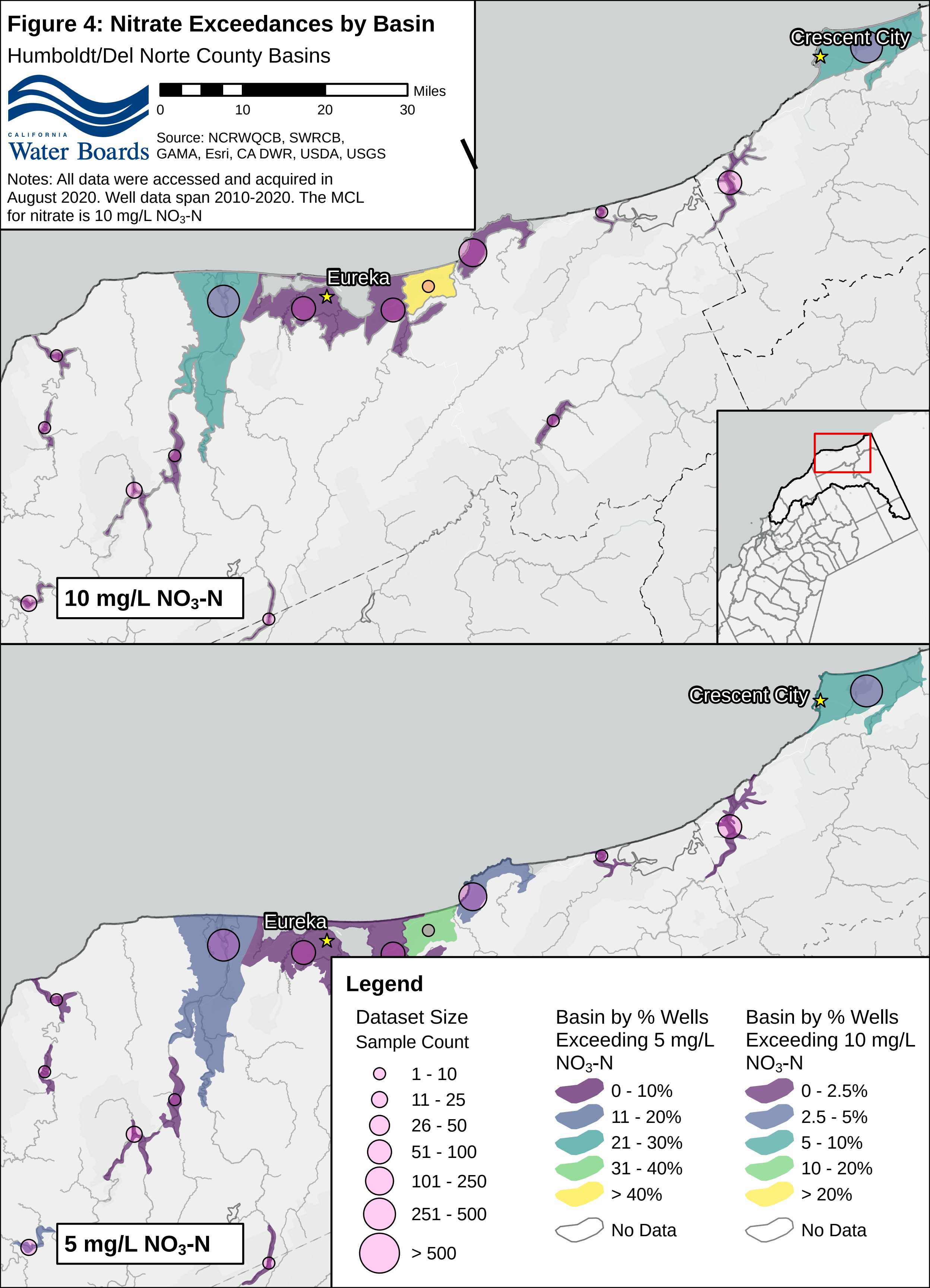


Figure 4: Nitrate Exceedances by Basin
Humboldt/Del Norte County Basins
CALIFORNIA Water Boards
Miles
0
10
20
30
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for nitrate is 10 mg/L NO_3-N
Crescent City
Eureka
10 mg/L NO_3-N
5 mg/L NO_3-N
Legend
Dataset Size
Sample Count
1 - 10
11 - 25
26 - 50
51 - 100
101 - 250
251 - 500
> 500
Basin by % Wells Exceeding 5 mg/L NO_3-N
0 - 10%
11 - 20%
21 - 30%
31 - 40%
> 40%
No Data
Basin by % Wells Exceeding 10 mg/L NO_3-N
0 - 2.5%
2.5 - 5%
5 - 10%
10 - 20%
> 20%
No Data

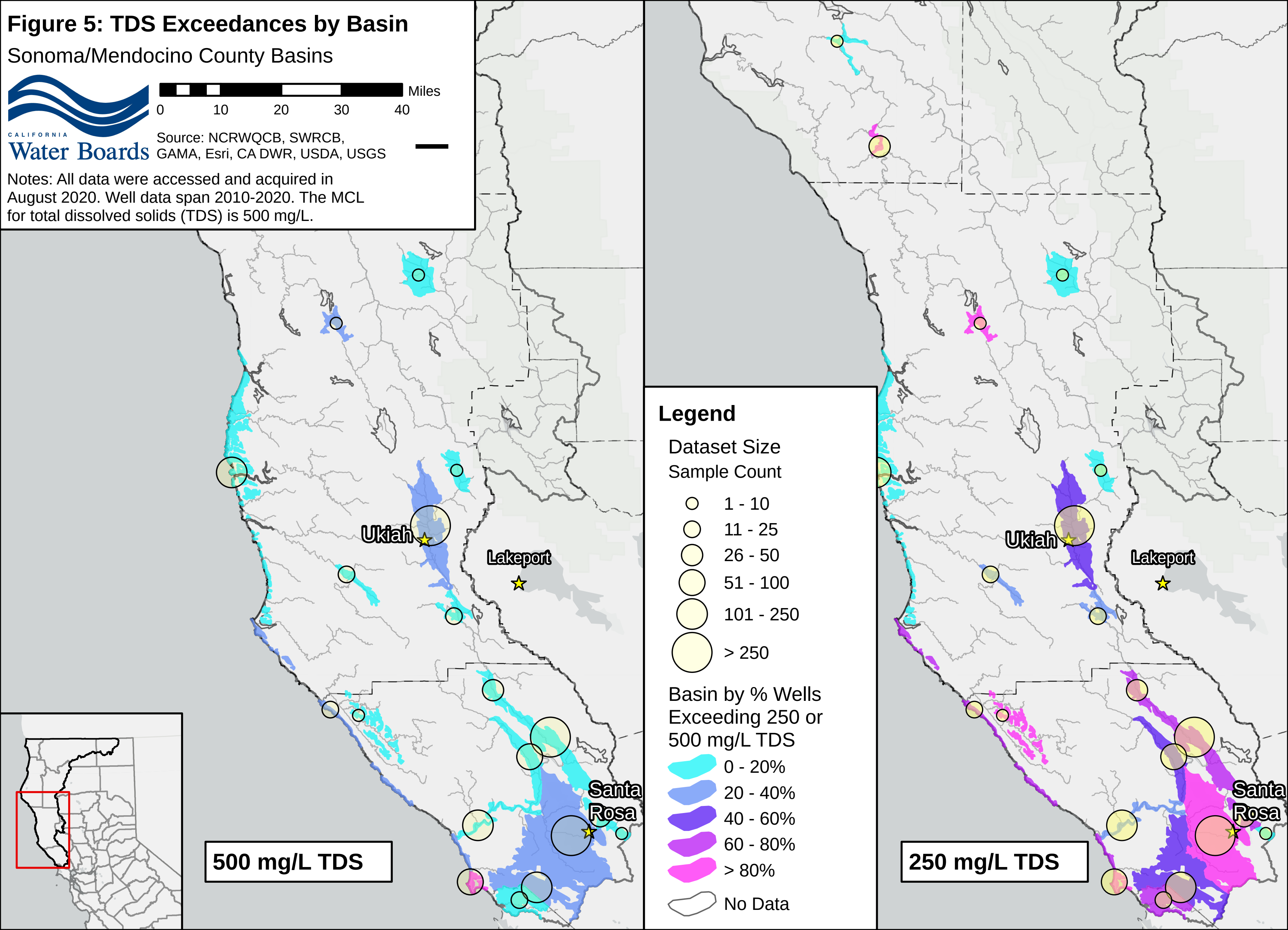


Figure 5: TDS Exceedances by Basin
Sonoma/Mendocino County Basins
CALIFORNIA Water Boards
Miles
0
10
20
30
40
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for total dissolved solids (TDS) is 500 mg/L.
Ukiah
Lakeport
Santa Rosa
500 mg/L TDS
Legend
Dataset Size
Sample Count
1 - 10
11 - 25
26 - 50
51 - 100
101 - 250
> 250
Basin by % Wells Exceeding 250 or 500 mg/L TDS
0 - 20%
20 - 40%
40 - 60%
60 - 80%
> 80%
No Data
Ukiah
Lakeport
Santa Rosa
250 mg/L TDS

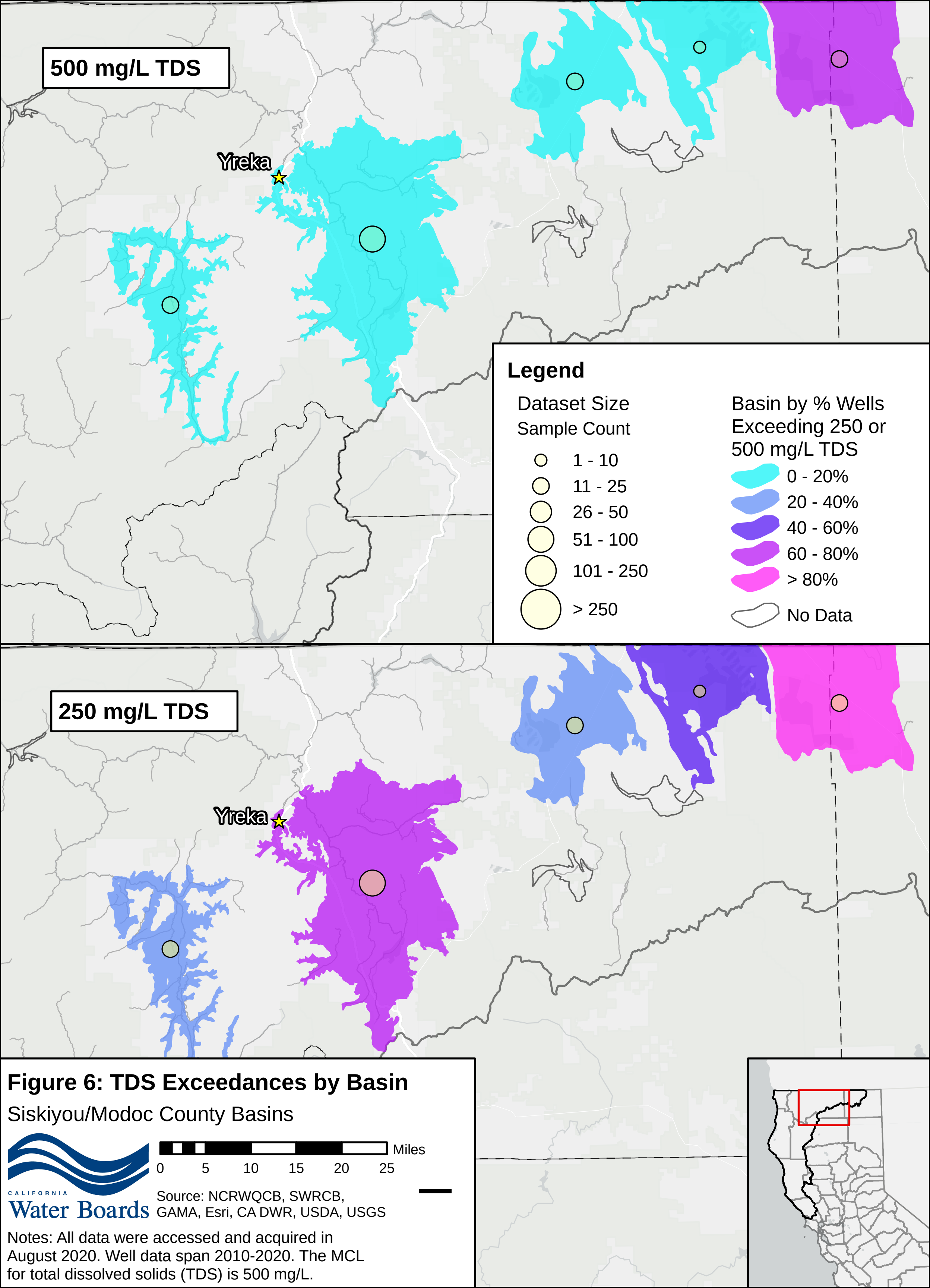


Figure 6: TDS Exceedances by Basin

Siskiyou/Modoc County Basins

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for total dissolved solids (TDS) is 500 mg/L.

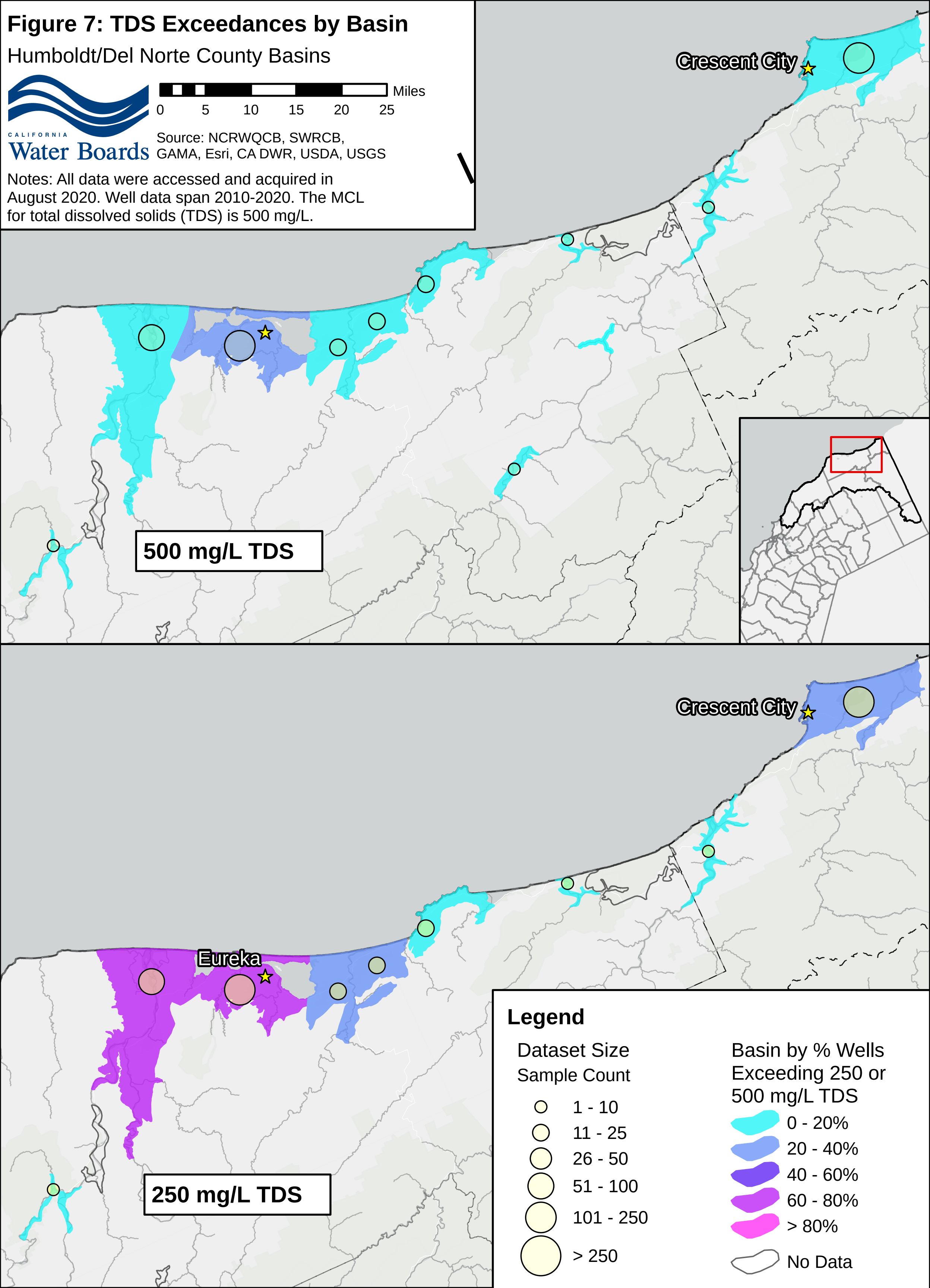
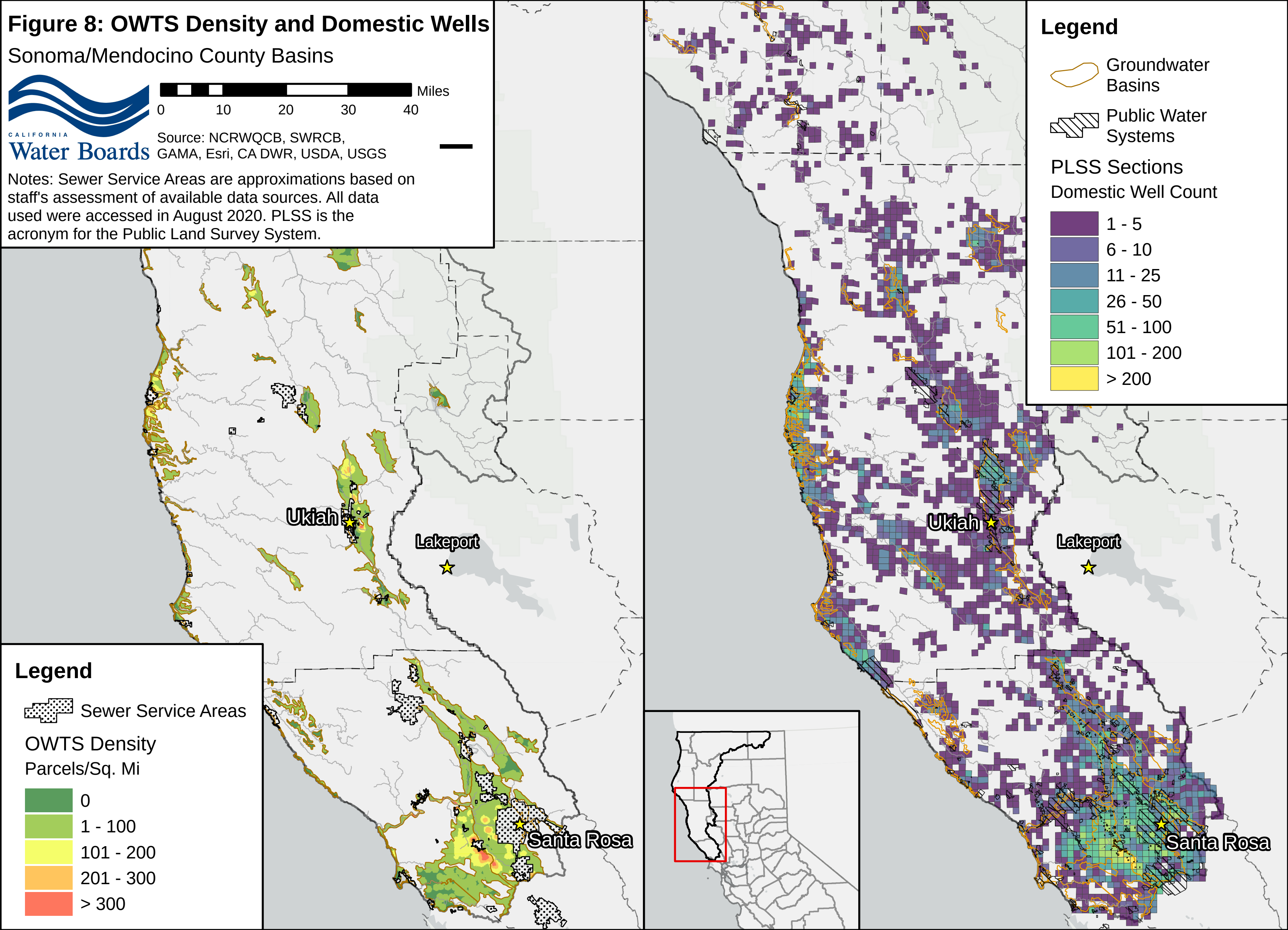


Figure 7: TDS Exceedances by Basin
Humboldt/Del Norte County Basins
CALIFORNIA
Water Boards
0 5 10 15 20 25 Miles
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for total dissolved solids (TDS) is 500 mg/L.
Crescent City
500 mg/L TDS
Crescent City
Eureka
250 mg/L TDS
Legend
Dataset Size
Sample Count
1 - 10
11 - 25
26 - 50
51 - 100
101 - 250
> 250
Basin by % Wells Exceeding 250 or 500 mg/L TDS
0 - 20%
20 - 40%
40 - 60%
60 - 80%
> 80%
No Data

Figure 8: OWTS Density and Domestic Wells

Sonoma/Mendocino County Basins



Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: Sewer Service Areas are approximations based on staff's assessment of available data sources. All data used were accessed in August 2020. PLSS is the acronym for the Public Land Survey System.

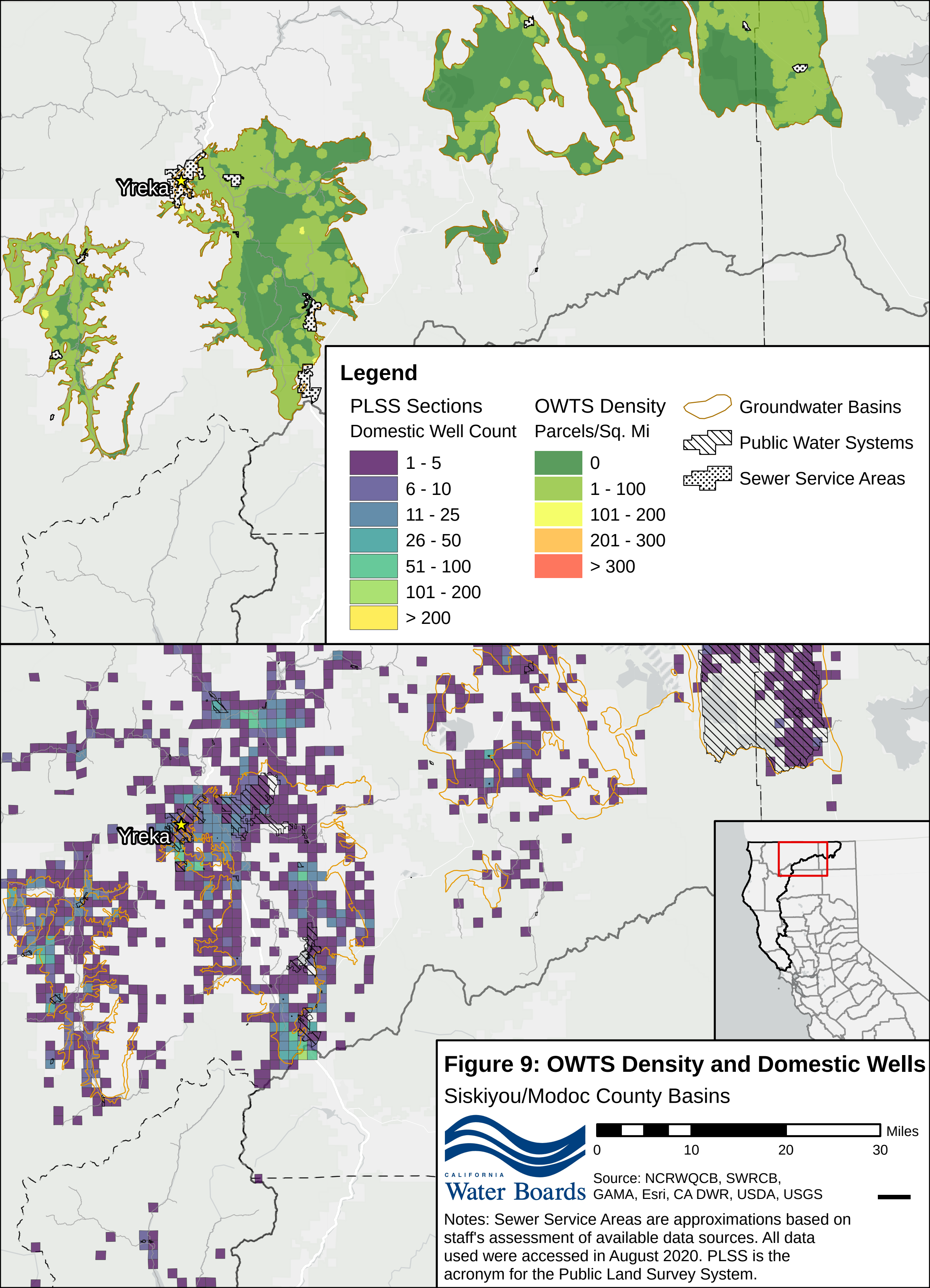


Figure 9: OWTS Density and Domestic Wells

Siskiyou/Modoc County Basins

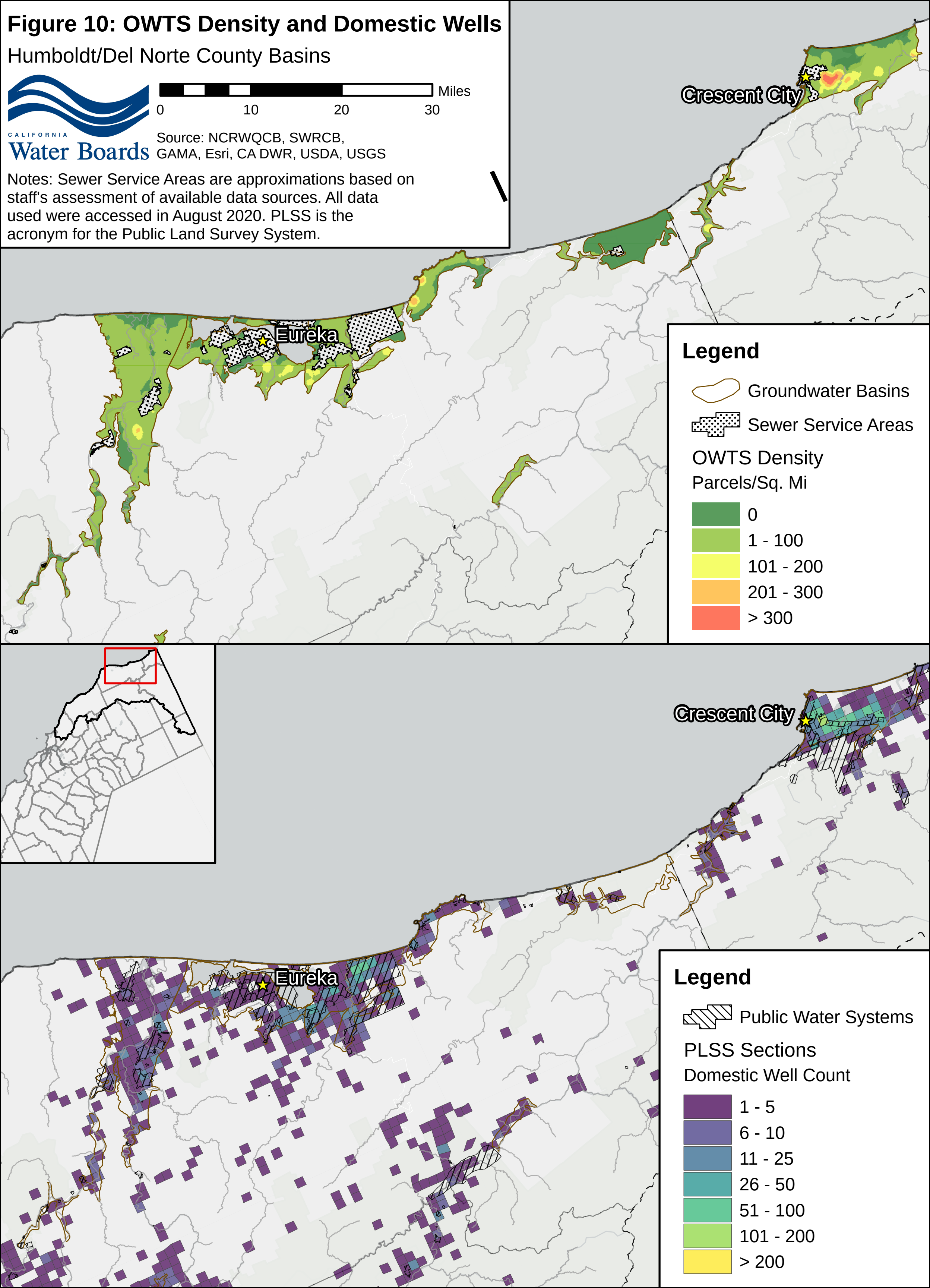
Notes: Sewer Service Areas are approximations based on staff's assessment of available data sources. All data used were accessed in August 2020. PLSS is the acronym for the Public Land Survey System.

Figure 10: OWTS Density and Domestic Wells

Humboldt/Del Norte County Basins

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: Sewer Service Areas are approximations based on staff's assessment of available data sources. All data used were accessed in August 2020. PLSS is the acronym for the Public Land Survey System.



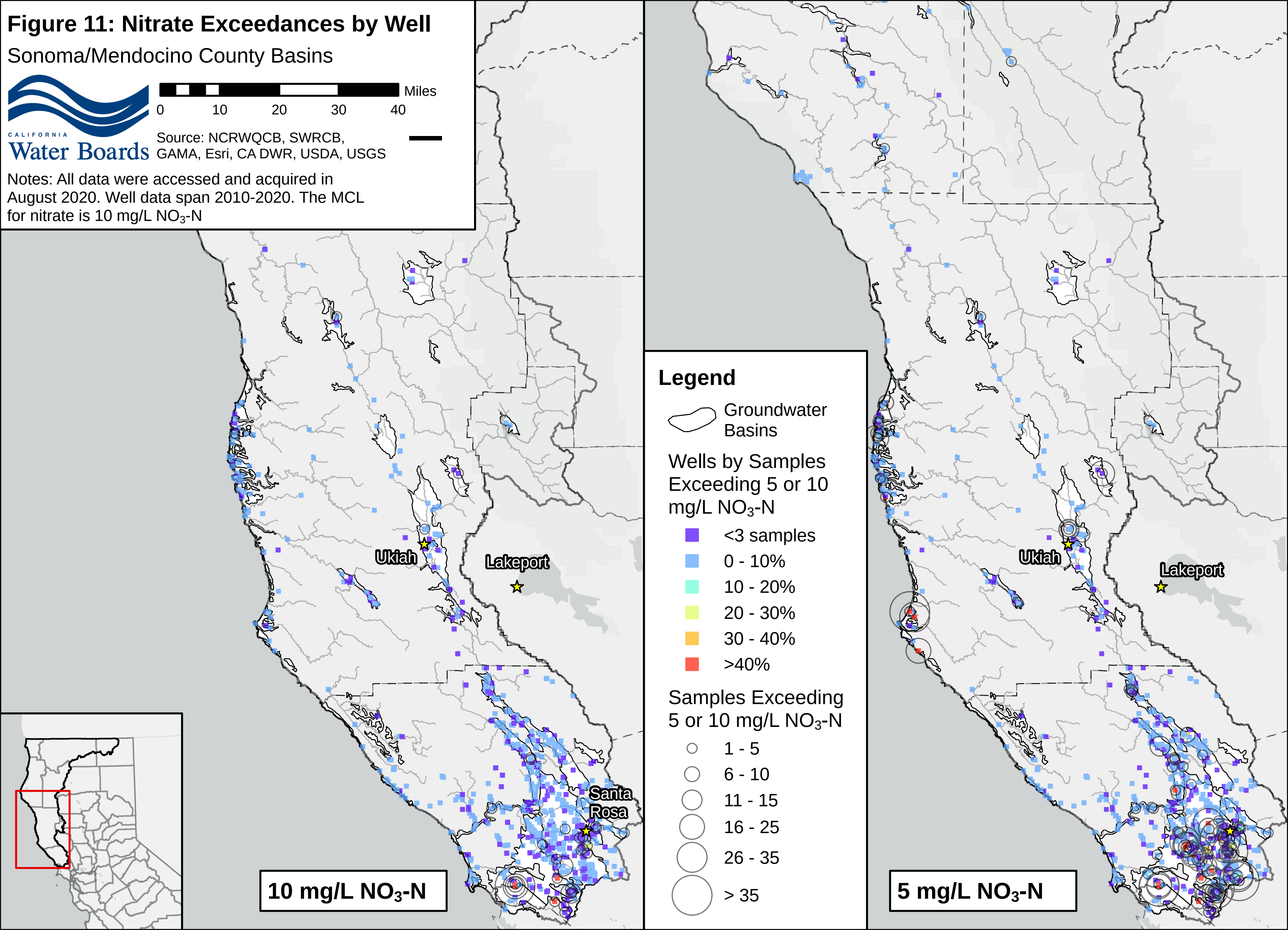


Figure 11: Nitrate Exceedances by Well

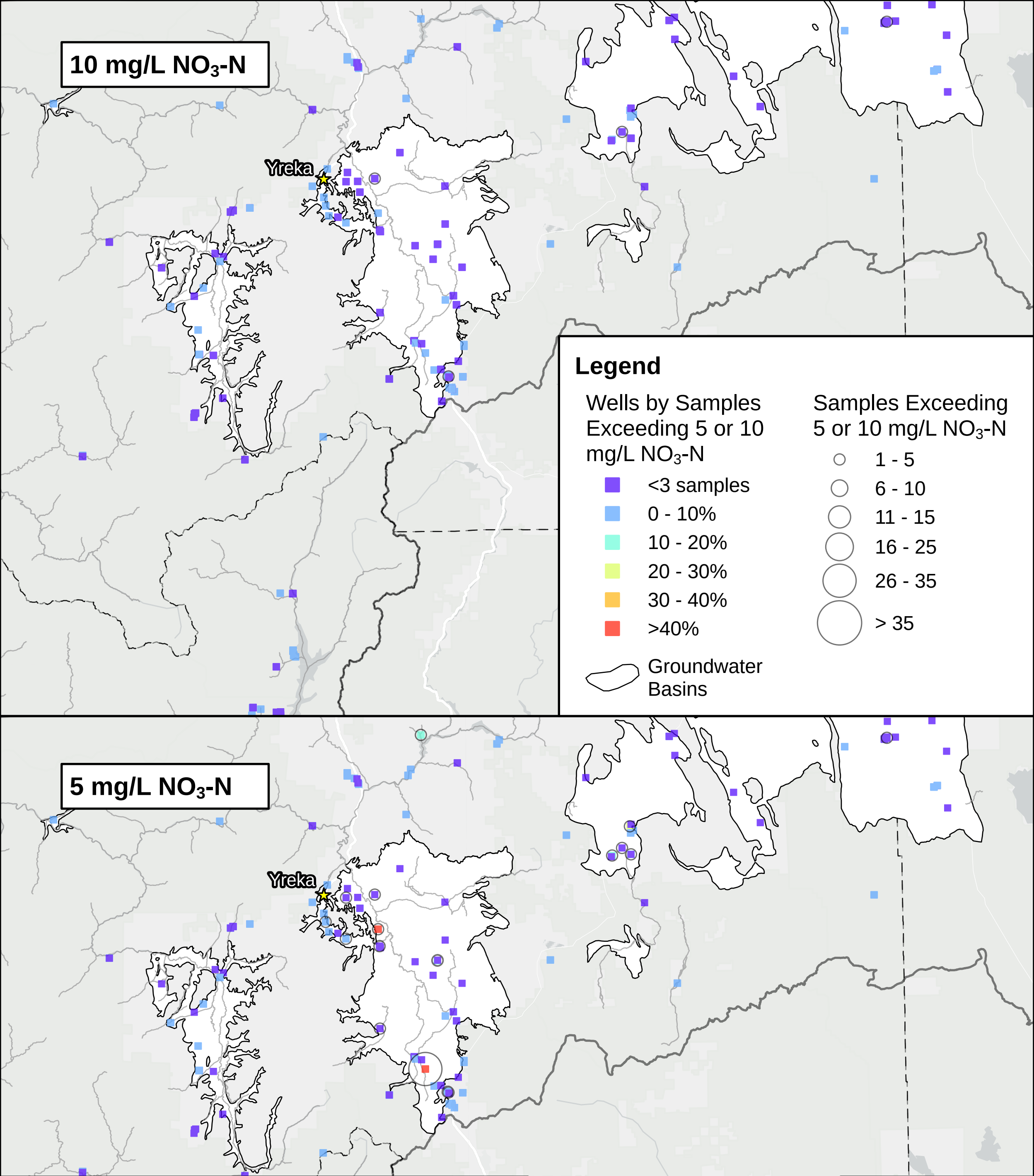


Figure 12: Nitrate Exceedances by Well

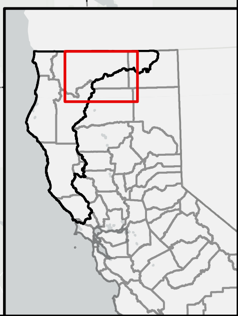
Siskiyou/Modoc County Basins

CALIFORNIA Water Boards

Miles
0 10 20 30

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. The MCL for nitrate is 10 mg/L NO_3-N.



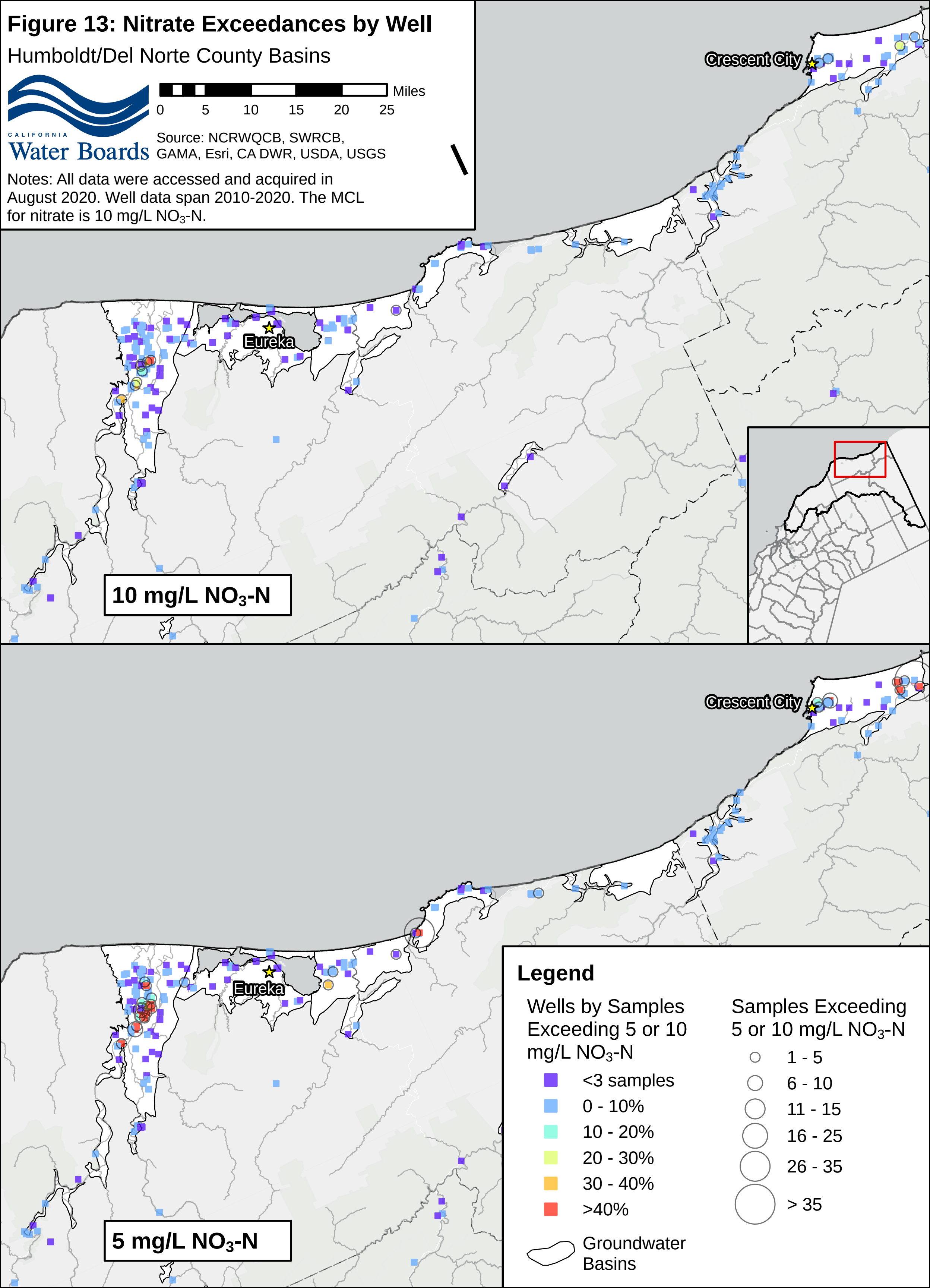


Figure 13: Nitrate Exceedances by Well

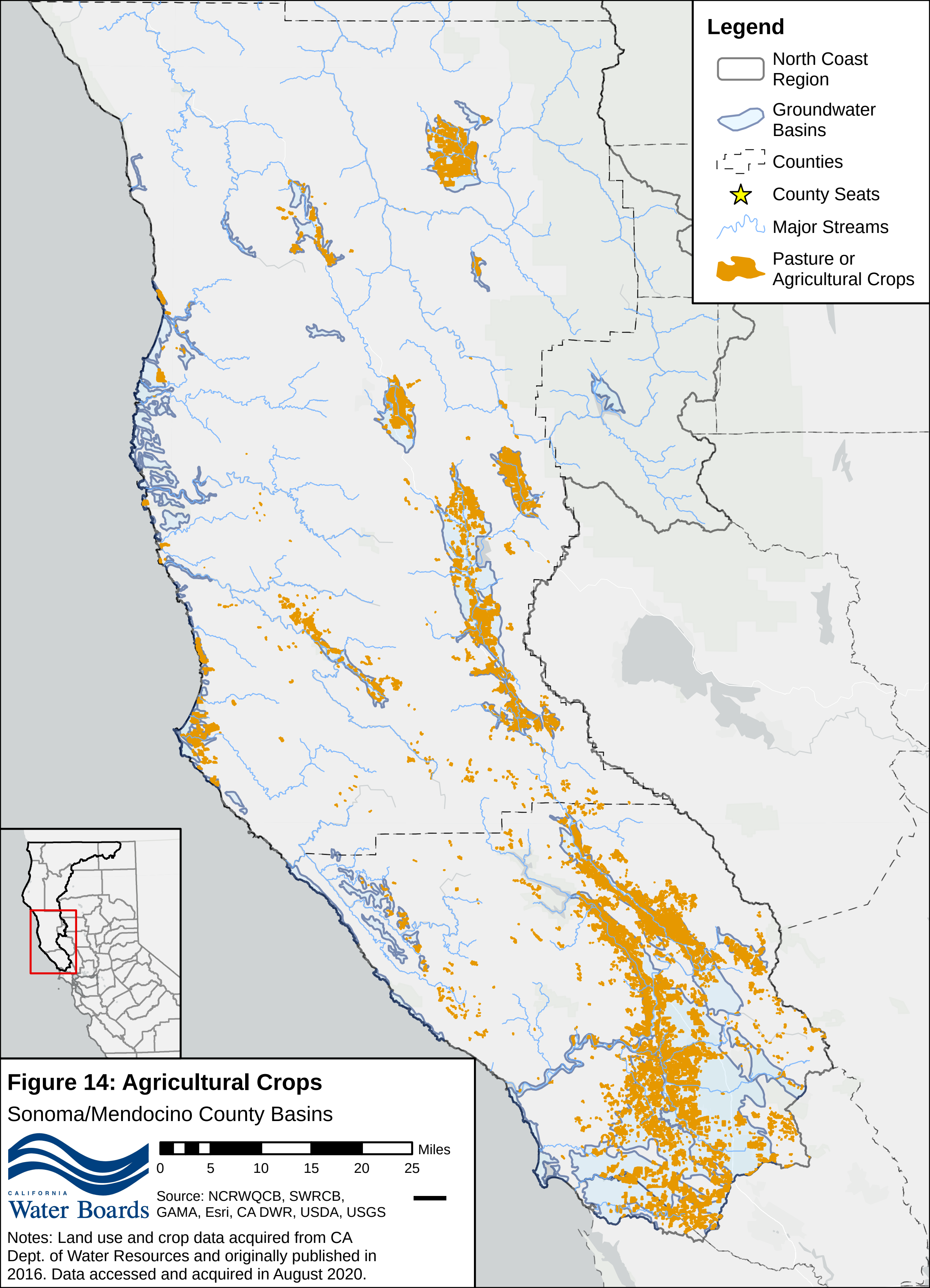


Figure 14: Agricultural Crops

Sonoma/Mendocino County Basins

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: Land use and crop data acquired from CA Dept. of Water Resources and originally published in 2016. Data accessed and acquired in August 2020.

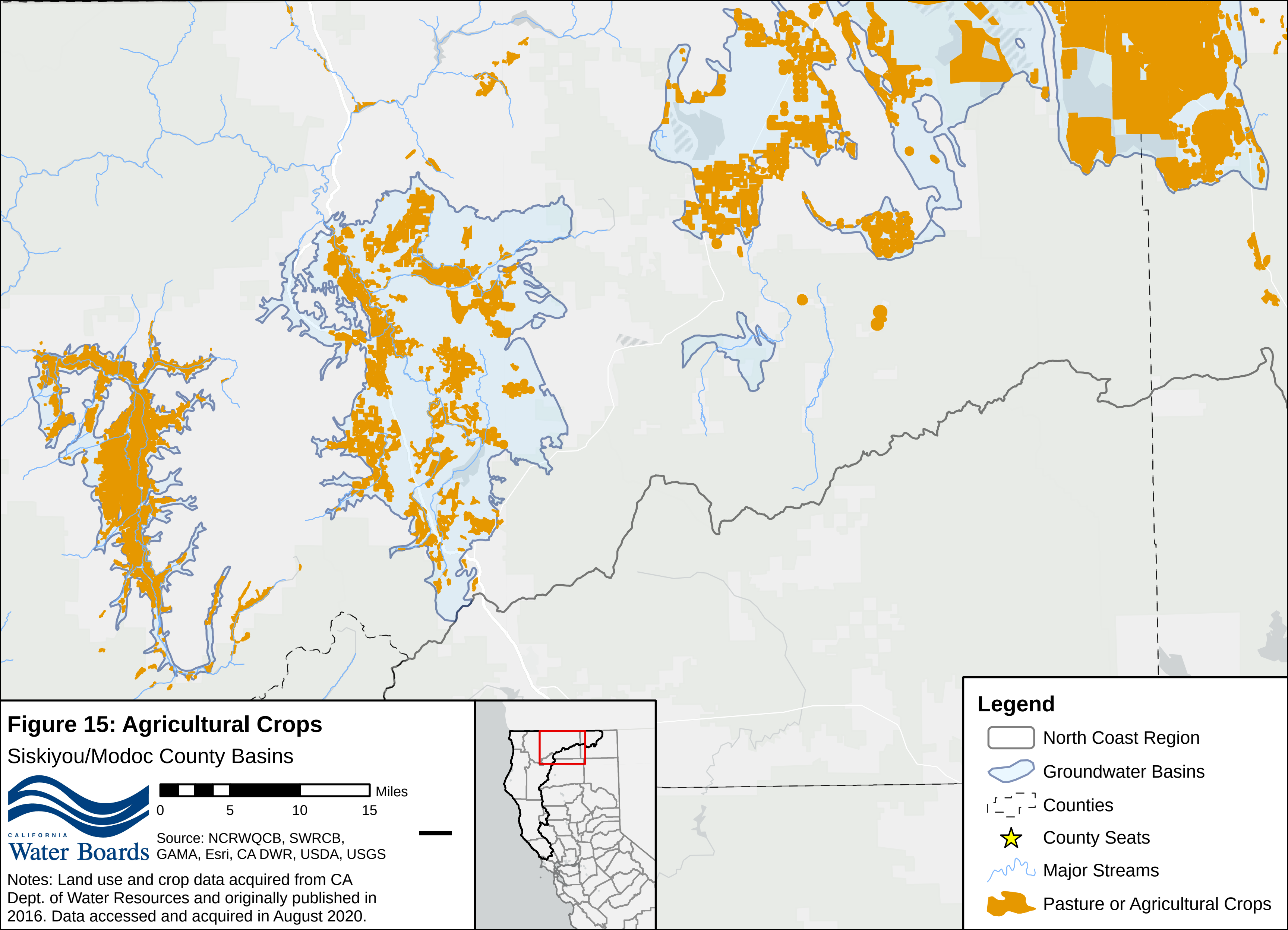


Figure 15: Agricultural Crops

Siskiyou/Modoc County Basins

Miles
0 5 10 15

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: Land use and crop data acquired from CA Dept. of Water Resources and originally published in 2016. Data accessed and acquired in August 2020.

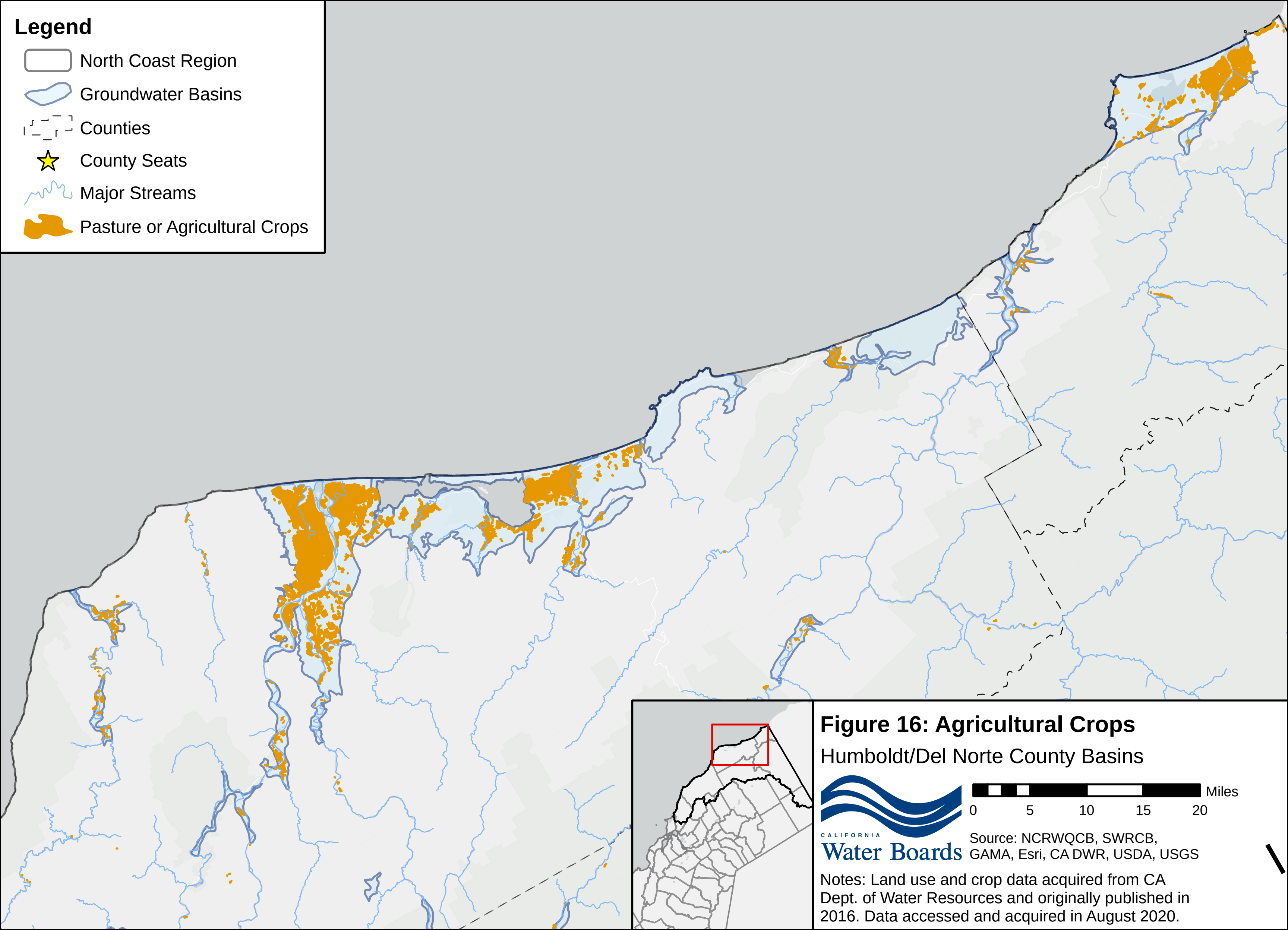


Figure 16: Agricultural Crops

Humboldt/Del Norte County Basins

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: Land use and crop data acquired from CA Dept. of Water Resources and originally published in 2016. Data accessed and acquired in August 2020.

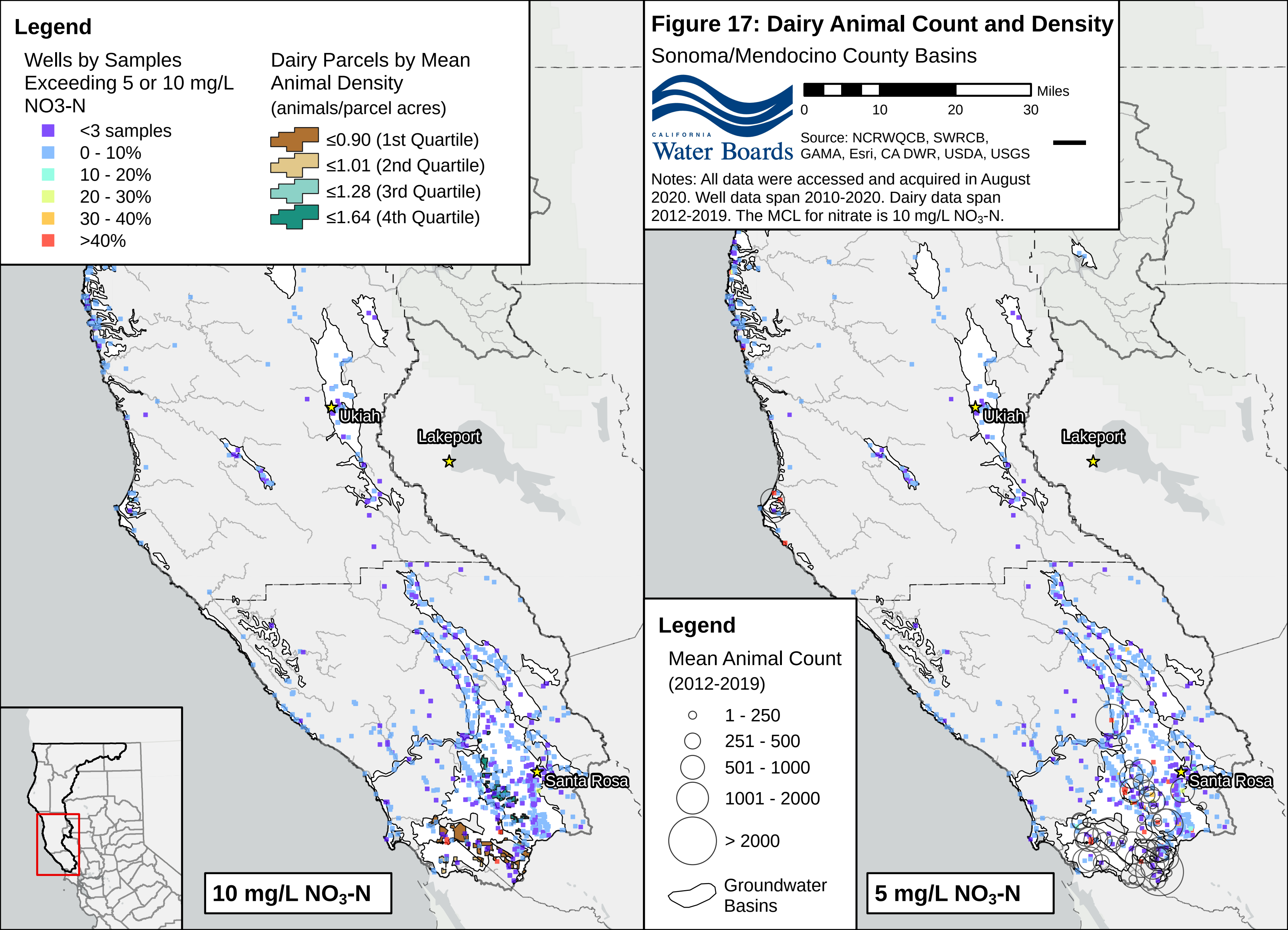


Figure 17: Dairy Animal Count and Density
Sonoma/Mendocino County Basins
CALIFORNIA Water Boards
Miles
0 10 20 30
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. Dairy data span 2012-2019. The MCL for nitrate is 10 mg/L NO_3-N.
Legend
Wells by Samples Exceeding 5 or 10 mg/L NO3-N
<3 samples
0 - 10%
10 - 20%
20 - 30%
30 - 40%
>40%
Dairy Parcels by Mean Animal Density (animals/parcel acres)
≤0.90 (1st Quartile)
≤1.01 (2nd Quartile)
≤1.28 (3rd Quartile)
≤1.64 (4th Quartile)
Legend
Mean Animal Count (2012-2019)
1 - 250
251 - 500
501 - 1000
1001 - 2000
> 2000
Groundwater Basins
Ukiah
Lakeport
Santa Rosa
10 mg/L NO_3-N
5 mg/L NO_3-N

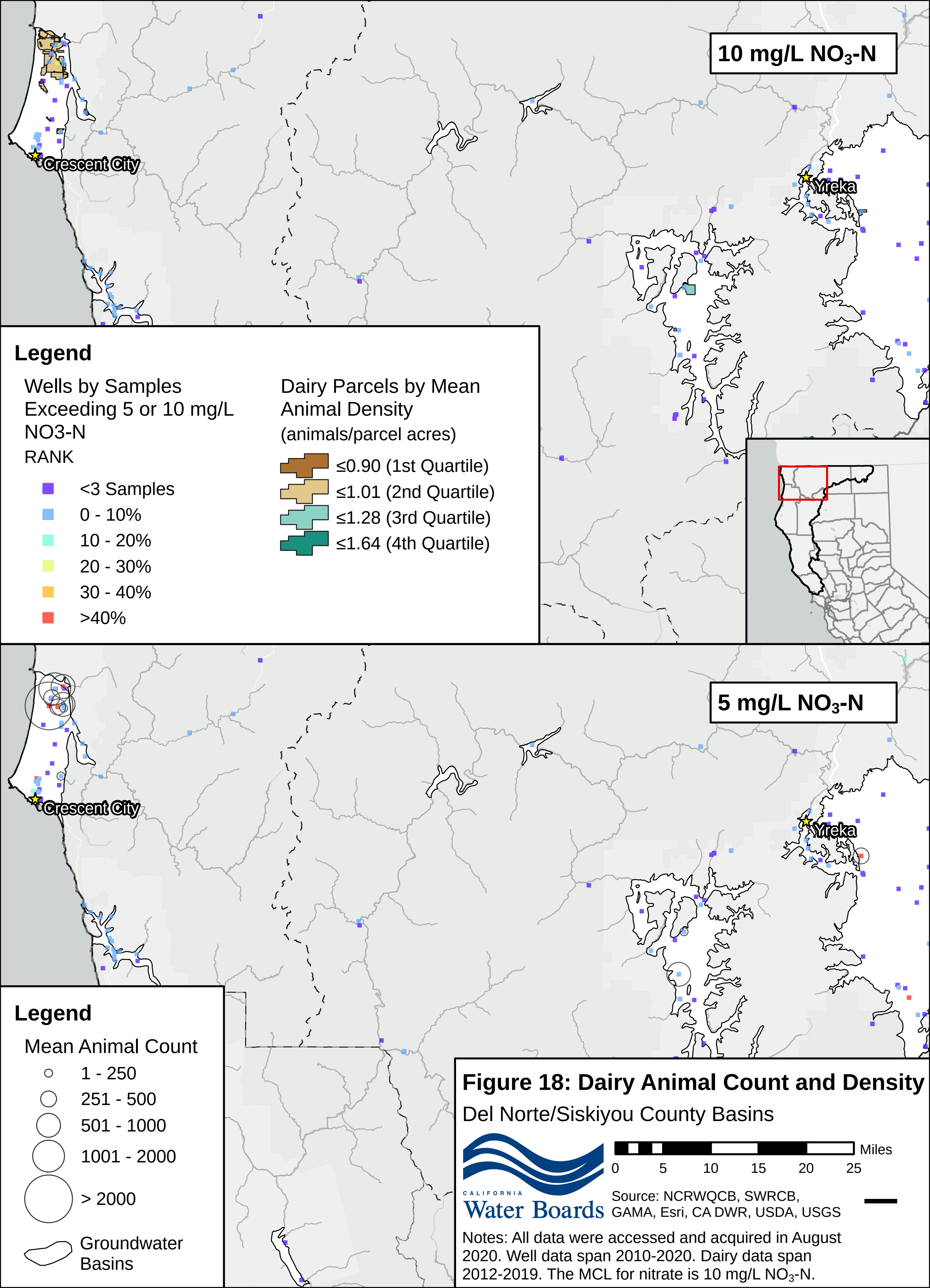


Figure 18: Dairy Animal Count and Density

Del Norte/Siskiyou County Basins

Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS

Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. Dairy data span 2012-2019. The MCL for nitrate is 10 mg/L NO_3-N.

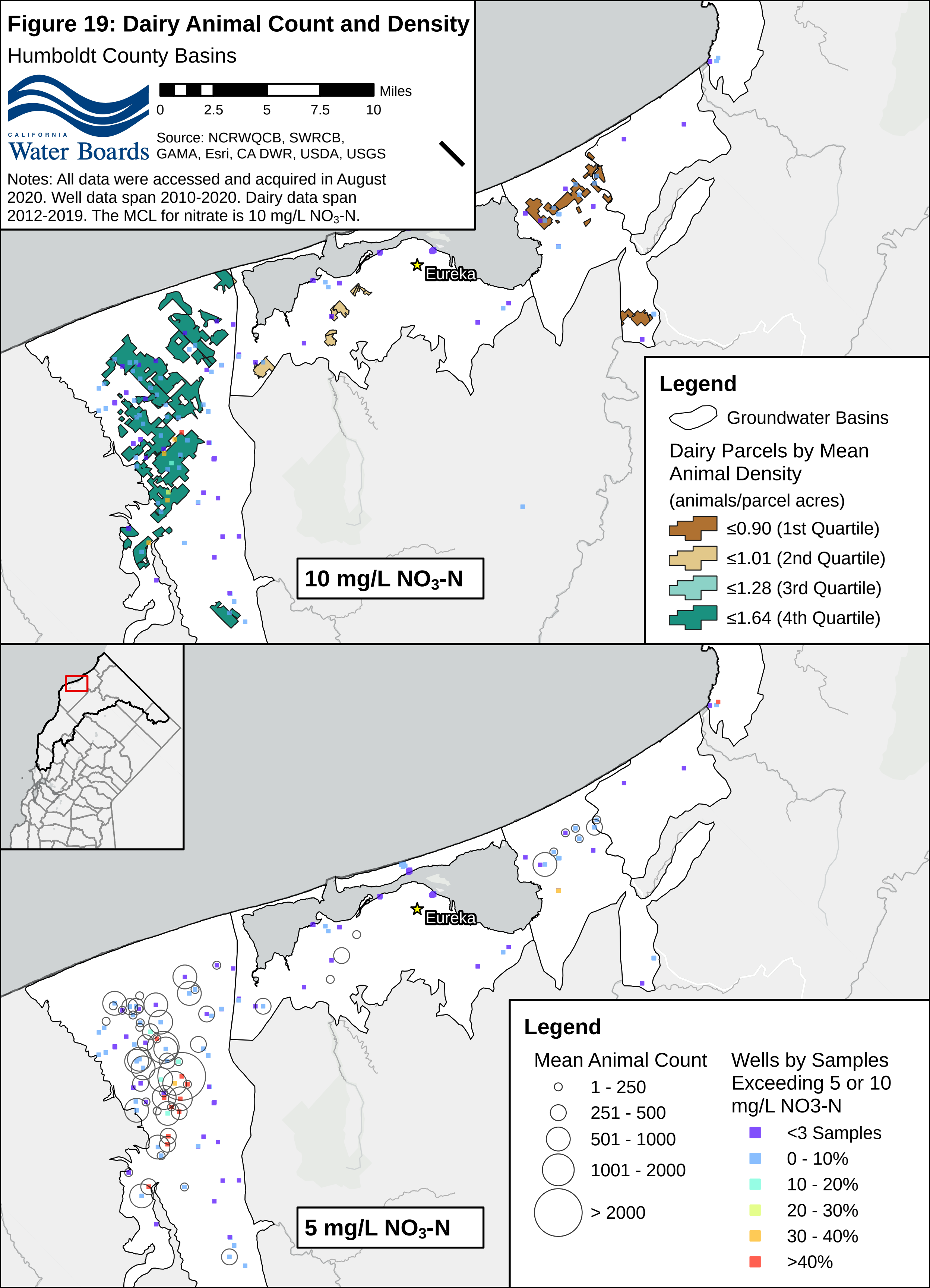


Figure 19: Dairy Animal Count and Density
Humboldt County Basins
CALIFORNIA Water Boards
Miles
0
2.5
5
7.5
10
Source: NCRWQCB, SWRCB, GAMA, Esri, CA DWR, USDA, USGS
Notes: All data were accessed and acquired in August 2020. Well data span 2010-2020. Dairy data span 2012-2019. The MCL for nitrate is 10 mg/L NO3-N.
Eureka
10 mg/L NO3-N
Legend
Groundwater Basins
Dairy Parcels by Mean Animal Density
(animals/parcel acres)
≤0.90 (1st Quartile)
≤1.01 (2nd Quartile)
≤1.28 (3rd Quartile)
≤1.64 (4th Quartile)
Eureka
5 mg/L NO3-N
Legend
Mean Animal Count
1 - 250
251 - 500
501 - 1000
1001 - 2000
> 2000
Wells by Samples Exceeding 5 or 10 mg/L NO3-N
<3 Samples
0 - 10%
10 - 20%
20 - 30%
30 - 40%
>40%

Figure 20: Regional Map and Groundwater Basin Priorities

Appendix 1 – Basin Prioritization Worksheet

Basin ID	Basin Name	Basin Area (Square Mile)	1. Status and trends in the concentrations of salts and nutrients in groundwater (1-10)	2. Contribution of imported water and recycled water to the basin water supply (0-5)	3. Reliance on groundwater to supply the basin or subbasin (0-15)	4. Population (0-10)	5. Number and density of on-site wastewater treatment systems (0-10)	6. Other sources of salts and		7. Hydrogeologic factors - basin- or subbasin-specific factors (0-10)						Total Priority Points	Priority
								6a. Irrigated Ag (0-5)	6b. CAFO/Dairy (0-5)	7a. Depth to groundwater (0-2)	7b. Aquifer Thickness (0-2)	7c. Pathogen or nutrient imparied watershed (0-2)	7d. Hydrogeologically vulnerable area (0-2)	7e. Open Cleanup Cases (0-2)	7. Hydrogeo/ Basin Factor		
1-001	Smith River Plain	63.2	5	0	11	4	6	2	2	2	1	0	2	0	5	35	high
1-002.01	Klamath River Valley-Tulelake	172.7	3	3	4.5	1	6	4	0	2	1	1	0	0	4	25.5	medium
1-002.02	Klamath River Valley-Lower Klamath	117.7	2	3	2	0	2	3	0	2	0	1	0	0	3	15	medium
1-003	Butte Valley	124.6	3	0	7.5	1	8	3	0	2	0	1	2	0	5	27.5	medium
1-004	Shasta Valley-Shasta Valley	341.0	2	3	6	1	7	3	3	2	0	1	0	0	3	28	medium
1-005	Scott River Valley	99.7	5	0	8	1	6	4	4	2	0	1	2	0	5	33	high
1-006	Hayfork Valley	5.2	2	0	6.5	1	7	3	0	2	2	0	0	0	4	23.5	medium
1-007	Hoopa Valley	6.1	2	0	5	2	5	1	0	1	2	0	0	0	3	18	medium
1-008.01	Mad River Valley-Mad River Lowland	38.5	6	2	8.5	3	7	2	1	2	0	0	2	2	6	35.5	high
1-008.02	Mad River Valley-Dows Prairie School A	24.1	2	5	5.5	4	3	2	2	2	1	0	2	1	6	29.5	medium
1-009	Eureka Plain	60.6	5	5	5.5	4	6	2	2	2	0	0	2	2	6	35.5	high
1-010	Eel River Valley	114.0	4	0	8.5	3	6	3	4	2	0	0	2	1	5	33.5	high
1-011	Covelo Round Valley	25.6	6	0	8	6	5	2	0	2	0	0	0	1	3	30	high
1-012	Laytonville Valley	7.8	2	0	8.5	1	5	3	0	2	0	0	2	2	6	25.5	medium
1-013	Little Lake Valley	15.7	2	0	9	2	6	2	0	2	0	0	2	2	6	27	medium
1-014	Lower Klamath River Valley	11.0	2	0	8.5	1	8	2	0	2	1	1	0	0	4	25.5	medium
1-015	Happy Camp Town Area	4.3	2	0	4.5	1	2	0	0	2	2	1	0	0	5	14.5	low
1-016	Seiad Valley	3.5	2	0	8.5	1	3	0	0	2	2	2	0	0	6	20.5	medium
1-017	Bray Town Area	12.6	2	0	1	0	0	0	0	0	0	0	0	0	0	3	low
1-018	Red Rock Valley	14.1	2	0	6	0	2	4	0	0	0	0	0	0	0	14	low
1-019	Anderson Valley	7.8	6	0	14	4	6	3	0	2	1	0	2	2	7	40	high
1-020	Garcia River Valley	3.4	2	0	7	1	2	3	3	2	1	0	2	0	5	23	medium
1-021	Fort Bragg Terrace Area	37.3	6	3	13	4	6	2	0	2	1	0	2	2	7	41	high
1-022	Fairchild Swamp Valley	5.1	2	0	0	0	0	0	0	1	1	1	0	0	3	5	low
1-025	Prairie Creek Area	32.6	2	0	1	0	0	0	0	2	2	0	0	0	4	7	low
1-026	Redwood Creek Area	3.1	6	0	9	1	6	3	0	2	1	0	0	1	4	29	medium
1-027	Big Lagoon Area	20.7	6	0	7.5	4	8	0	0	2	2	1	0	0	5	30.5	high
1-028	Mattole River Valley	4.9	2	0	7.5	1	4	2	0	2	2	0	0	0	4	20.5	medium
1-029	Honeydew Town Area	3.7	3	0	5	0	2	1	0	2	2	0	0	0	4	15	medium
1-030	Pepperwood Town Area	9.8	2	0	7	1	5	2	0	2	1	0	0	0	3	20	medium
1-031	Weott Town Area	5.7	2	0	7	1	6	1	0	2	2	0	0	1	5	22	medium
1-032	Garberville Town Area	3.3	5	3	4.5	5	5	0	0	2	1	0	0	1	4	26.5	medium
1-033	Larabee Valley	1.5	2	0	2	0	2	0	0	2	2	0	0	0	4	10	low
1-034	Dinsmores Town Area	3.6	2	0	6.5	1	5	1	0	2	2	0	0	0	4	19.5	medium
1-035	Hyampom Valley	2.1	2	0	5	1	3	2	0	1	1	0	0	0	2	15	medium
1-036	Hettenshaw Valley	1.3	2	0	1	0	2	5	0	2	2	0	0	0	4	14	low
1-037	Cottoneva Creek Valley	1.2	2	0	0	0	2	0	0	2	2	0	0	0	4	8	low
1-038	Lower Laytonville Valley	3.4	2	0	4.5	1	3	1	0	2	0	0	0	0	2	13.5	low
1-039	Branscomb Town Area	2.2	2	0	4.5	1	3	0	0	2	2	0	0	2	6	16.5	medium
1-040	Ten Mile River Valley	2.3	2	0	5.5	1	5	1	0	2	2	0	2	0	6	20.5	medium
1-041	Little Valley	1.3	2	0	3.5	1	2	1	0	2	2	0	0	0	4	13.5	low
1-042	Sherwood Valley	1.8	2	0	1	1	2	0	0	2	1	0	0	0	3	9	low
1-043	Williams Valley	2.6	2	0	1	0	2	2	0	1	1	0	0	0	2	9	low
1-044	Eden Valley	2.2	2	0	4.5	0	0	3	0	2	1	0	0	0	3	12.5	low
1-045	Big River Valley	2.6	2	0	9	1	2	0	0	2	1	0	2	0	5	19	medium
1-046	Navarro River Valley	1.2	2	0	4	1	4	0	0	2	1	0	0	0	3	14	low
1-048	Gravelly Valley	4.7	2	0	7.5	0	5	0	0	1	1	0	0	0	2	16.5	medium
1-049	Annapolis Ohlson Ranch Fm Highlands	13.5	4	0	4.5	1	3	1	0	2	1	0	0	1	4	17.5	medium
1-050	Knights Valley	6.4	2	0	7	1	2	4	0	2	1	0	0	0	3	19	medium
1-051	Potter Valley	12.9	3	5	5.5	1	5	4	0	2	2	0	0	0	4	27.5	medium
1-052	Ukiah Valley	58.7	4	4	11.5	5	7	3	0	2	0	1	2	2	7	41.5	high
1-053	Sanel Valley	8.7	2	1	11	1	3	4	0	2	0	1	2	1	6	28	medium
1-054.01	Alexander Valley-Alexander Area	38.3	4	2	13.5	1	5	4	0	2	0	1	0	0	3	32.5	high
1-054.02	Alexander Valley-Cloverdale Area	10.2	5	3	12.5	6	6	3	0	2	2	1	2	2	9	44.5	high
1-055.01	Santa Rosa Valley-Santa Rosa Plain	127.0	6	5	13	6	6	2	4	2	0	2	2	2	8	50	critical
1-055.02	Santa Rosa Valley-Healdsburg Area	24.1	4	3	13.5	2	6	4	0	2	0	1	2	1	6	38.5	high
1-055.03	Santa Rosa Valley-Rincon Valley	8.7	4	2	11	7	8	1	0	2	0	1	2	2	7	40	high
1-056	Mcdowell Valley	2.3	2	0	6	1	4	4	0	2	0	1	0	0	3	20	medium
1-057	Bodega Bay Area	4.2	5	0	10	1	7	0	0	2	0	0	0	2	4	27	medium
1-059	Wilson Grove Formation Highlands	99.7	3	0	12	1	7	2	1	2	0	1	0	0	3	29	medium
1-060	Lower Russian River Valley	10.4	3	1	12	5	9	2	0	2	1	1	0	1	5	37	high
1-061	Fort Ross Terrace Deposits	13.1	5	0	11	4	8	1	0	2	2	0	0	1	5	34	high
1-062	Wilson Point Area	1.1	2	0	4	1	3	1	0	1	1	0	0	0	2	13	low

Appendix 2 – Resolution No. R1-2021-0006

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION
RESOLUTION NO. R1-2021-0006

GROUNDWATER BASIN EVALUATION AND PRIORITZATION RESULTS SUPPORTING SALT AND NUTRIENT MANAGEMENT PLANNING AS REQUIRED BY STATE WATER RESOURCES CONTROL BOARD RECYCLED WATER POLICY

WHEREAS: the California Regional Water Quality Control Board North Coast Region, (Regional Water Board) finds that:

1. The Water Quality Control Plan for the North Coast Region (hereinafter the Basin Plan) designates the beneficial uses of groundwater within the North Coast Region. Existing and potential beneficial uses applicable to groundwater in the Region include, Municipal and Domestic Water Supply, Agricultural Supply, Industrial Service Supply, Industrial Process Supply, Native American Culture, and Aquaculture. The Basin Plan also establishes water quality objectives for the protection of these beneficial uses. Groundwater water quality objectives in the North Coast Region include objectives for bacteria, chemical constituents, radioactivity, taste and odors, and toxicity. The Basin Plan also requires a program of implementation needed for achieving water quality objectives.

2. The North Coast Region is abundant in high quality groundwater resources and includes 62 groundwater basins or subbasins designated by the Department of Water Resources (DWR). A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. Groundwater is defined as subsurface water in soils and geologic formations that are fully saturated all or part of the year. Groundwater may also exist even where groundwater basins have not been identified. It includes areas where saturation of the soils and geology fluctuate, including areas of capillary fringe. Groundwater bearing formations sufficiently permeable to transmit and yield significant quantities of water are called aquifers. In the context of water quality protection, groundwater includes all subsurface waters, whether these waters occur within the classic definition of an aquifer or identified groundwater basins.

3. As stated in the California 2020 Water Resilience Portfolio, the North Coast Region encompasses nearly 20,000 square miles with about half of the region protected as open space. The population totaled about 690,000 in 2017, less than two percent of the state's population, with the highest percentage of Native American tribal members. Groundwater accounts for about one-third of water supply in the Region; however, in about half of the groundwater basins, groundwater comprises more than two-thirds of the water supply. About 1,000 active public supply wells are regulated by the State Water Resources Control Board - Division of Drinking Water and approximately 38,000 private domestic wells supply groundwater used for drinking water. Within North Coast groundwater basins, groundwater is approximately 50

percent of the water supply for about 250,000 acres of irrigated land. Generally, groundwater in the North Coast Region is the least degraded in the state. Statewide, salts and nutrients are the most common groundwater pollutants. Naturally occurring manganese, iron, and arsenic commonly occur in groundwater at concentrations requiring treatment before use as drinking water.

4. In about a quarter of North Coast groundwater basins, salts and nutrients are the most common pollutant and have caused or threaten to cause an exceedance of water quality objectives and impacts to beneficial uses. Salts are typically measured as total dissolved solids and nitrate is the predominate nutrient of concern. Waste discharges from Onsite Wastewater Treatment Systems (OWTS), agricultural operations, and municipal and industrial wastewater treatment facilities are believed to be the primary threats to groundwater quality and the sources of salts and nutrients found in groundwater. In some basins, high density residential areas reliant on OWTS for wastewater disposal and domestic wells for domestic water supply may compound impacts. Irrigation using imported water, surface water, groundwater, or recycled water, and indirect potable reuse for groundwater recharge may increase salt and nutrient loading. Saltwater intrusion induced by sea level rise and falling groundwater elevations in coastal aquifers will reduce the capacity of an aquifer to assimilate salt loads and support beneficial uses.

5. State Water Resource Control Board (State Water Board) Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California (state Antidegradation Policy), requires that whenever the existing quality of water is better than the quality established in plans and policies as of the date on which such polices became effective,(e.g. water quality objectives established in such plans and policies) such existing water quality shall be maintained unless otherwise provided by the provisions of the state Antidegradation Policy. The state Antidegradation Policy allows a discharge that may degrade high quality water if the change in water quality is: 1) consistent with the maximum benefit to the people of the State, 2) will not unreasonably affect present and anticipated beneficial use of such water, and 3) will not result in water quality less than that prescribed in water quality control policies and plans. Further, any activities that result in discharges to such high quality waters are required to use: the best practical treatment or control necessary to avoid pollution or nuisance and maintain the highest water quality consistent with the maximum benefit to the people of the State.

6. Many small and disadvantaged communities in the North Coast rely on onsite wastewater treatment systems (i.e., septic systems) for wastewater treatment and disposal, which are prone to failure if not properly operated and maintained. Nearly 70 percent of North Coast communities are considered disadvantaged. Some of these communities have old and undersized wastewater collection and treatment facilities. These wastewater facilities can pose significant public health and safety threats and adversely affect beneficial uses of surface water and groundwater.

7. Several water supply facilities serving small and disadvantaged communities in the North Coast were installed decades ago and need upgrades to meet current demand. Meeting increasing demand for water has further elevated the need to augment water supplies and restore watershed processes, and to further incentivize groundwater sustainability, storm water capture for beneficial reuse, and wastewater recycling. Many small and disadvantaged communities, however, lack the resources to plan and construct wastewater recycling projects; storm water capture, infiltration and reuse projects; or to develop and implement groundwater management plans.

8. On February 16, 2016, the State Water Resources Control Board (State Water Board) adopted Resolution No. 2016-0010 declaring the Human Right to Water as a core value and directing its implementation in Water Board programs and day-to-day activities. The resolution directs State Water Board staff and encourages Regional Water Boards, as resources allow, to meaningfully engage with communities that lack adequate, affordable, or safe drinking water, including providing community outreach, technical assistance and financial resources, as part of the Water Boards' administration of programs or project funding pertinent to the human right to water. The Regional Water Board on April 18, 2019, adopted Resolution No. R1-2019-0024 also declaring the Human Right to Water as a core value and directing its implementation in board activities.

9. On December 11, 2018, the State Water Board adopted a Water Quality Control Policy for Recycled Water (Recycled Water Policy) to encourage the safe use of recycled water from wastewater sources that meets the definition in California Water Code (Water Code) section 13050(n), in a manner that implements state and federal water quality laws and protects public health and the environment. The intent of the Recycled Water Policy is that salts and nutrients from all sources be managed on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives, protection of beneficial uses and supports sustainable land use practices.

10. From 2007 to 2018, through the Basin Plan Triennial review process, development of a two-phase Groundwater Protection Strategy evolved as a high priority project of the Regional Water Board. Phase I, completed in 2015, was a Basin Plan Amendment for the update of water quality objectives for groundwater. The goal of Phase II is to organize with strategic purpose all existing Regional Water Board tools and developing statewide tools for the protection of groundwater quality on a basin wide scale to protect ecosystem function and the Human Right to Water now and under future changed climatic conditions. A significant part of the Groundwater Protection Strategy is developing a programmatic approach to salt and nutrient management throughout the 62 groundwater basins or subbasins in the North Coast Region.

11. To sustain the ongoing development of salt and nutrient management plans in groundwater basins and subbasins where plans are needed and to clarify where salt and nutrient management planning is not needed, the Recycled Water Policy

requires each regional water board to evaluate each basin or subbasin in its region before April 8, 2021, and identify basins through a resolution or executive officer determination where salts and/or nutrients are a threat to water quality and therefore need salt and nutrient management planning to achieve water quality objectives in the long term. Each regional water board shall review and update this evaluation every five years to consider any changes in these factors that have occurred that would change the findings from the initial evaluation. Regional water boards shall consider the following factors in this determination, as well as any additional region-specific factors: a) magnitude of and trends in the concentrations of salts and nutrients in groundwater; b) contribution of imported water and recycled water to the basin water supply; c) reliance on groundwater to supply the basin or subbasin; d) population; e) number and density of on-site wastewater treatment systems; f) other sources of salts and nutrients, including irrigated agriculture and confined animal facilities; and g) hydrogeologic factors, such as regional aquitards, depth to water, and other basin- or subbasin-specific factors.

12. In response to legislation enacted in California's 2009 Comprehensive Water Package, the Department of Water Resource (DWR) completed groundwater basin prioritization based on population and groundwater use through implementation of the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. In September 2014, Governor Brown signed into law three bills that formed the Sustainable Groundwater Management Act (SGMA) which required DWR to update the priority of each groundwater basin. In 2019, the SGMA Basin Prioritization process was conducted to reassess basin priority using the process and methodology developed for the CASGEM 2014 Basin Prioritization, adjusted as required by SGMA and related legislation.

13. Basin Prioritization components specified in the Water Code Section 10933(b) consist of the following: a) the population overlying the basin or subbasin; b) the rate of current and projected growth of the population overlying the basin or subbasin; c) the number of public supply wells that draw from the basin or subbasin; d) the total number of wells that draw from the basin or subbasin; e) the irrigated acreage overlying the basin or subbasin; f) the degree to which persons overlying the basin or subbasin rely on groundwater as their primary source of water; g) any documented impacts on the groundwater within the basin or subbasin, including overdraft, subsidence, saline intrusion, and other water quality degradation; and h) any other information determined to be relevant by DWR, including adverse impacts on local habitat and local streamflows.

14. Regional Water Board staff developed a Groundwater Basin Evaluation and Prioritization Process consistent with the Recycled Water Policy to inform salt and nutrient management planning within North Coast groundwater basins. Where evaluation Factors of the Recycled Water Policy are similar to SGMA Basin Prioritization Components, staff utilized the 2019 SGMA Basin Prioritization Process and Results. Technical process for the remaining evaluation factors was informed by SGMA, the Recycled Water Policy, the State Water Board Onsite Wastewater

Treatment System Policy, Groundwater Ambient Monitoring and Assessment Program, DWR Bulletin 118, Waste Discharge Permittee Reports, and publicly available GIS information.

15. The Final Staff Report *North Coast Hydrologic Region Salt and Nutrient Management Planning Groundwater Basin Evaluation and Prioritization* (Staff Report) identifies the priority basins for salt and nutrient management planning within the North Coast Region and provides potential regulatory and non-regulatory implementation strategies to protect groundwater quality.

16. The State Water Board prepared a “substitute environmental document” (SED) for the Recycled Water Policy that contains the required environmental documentation under the State Water Board’s California Environmental Quality Act (CEQA) regulations. (California Code of Regulations, title 23, section 3777.) The substitute environmental documentation produced for the Recycled Water Policy includes consideration of any environmental impacts that may result from a Regional Water Board’s identification of priority basins. The adoption of this Resolution will not result in any additional impacts beyond those addressed in the SED such that supplemental CEQA documentation is required. In addition, this action is categorically exempt from CEQA pursuant to California Code of Regulations, title 14, section 15306 as it involves data collection, research and resource evaluation activities which do not result in any serious or major disturbance to an environmental resource.

THEREFORE, BE IT RESOLVED THAT:

The Regional Water Board:

1. Accepts the technical process for evaluating and developing priority basins described in the Final Staff Report.

2. Accepts the Critical and High Priority Category basins listed below as Priority Basins having a relatively high threat from salts and nutrients and thus would benefit from salt and nutrient management planning.

Priority Category	Basin or Subbasin
Critical	Santa Rosa Plain
High	Smith River Plain, Scott River Valley, Mad River Lowland, Eureka Plain, Eel River Valley, Covelo Round Valley, Anderson Valley, Fort Bragg Terrace Area, Big Lagoon Area, Ukiah Valley, Alexander Area, Cloverdale Area, Healdsburg Area, Rincon Valley, Lower Russian River Valley, Fort Ross Terrace Deposits

3. Directs staff to proceed with developing a Policy Statement for Groundwater Protection which outlines a range of strategies to protect high groundwater quality and improve degraded groundwater quality within the region and to present the Policy Statement for Board consideration within the shortest time frame practicable.

Certification:

I, Matthias St. John, Executive Officer do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, North Coast Region, on April 15-16, 2021.

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Matthias St. John
Executive Officer