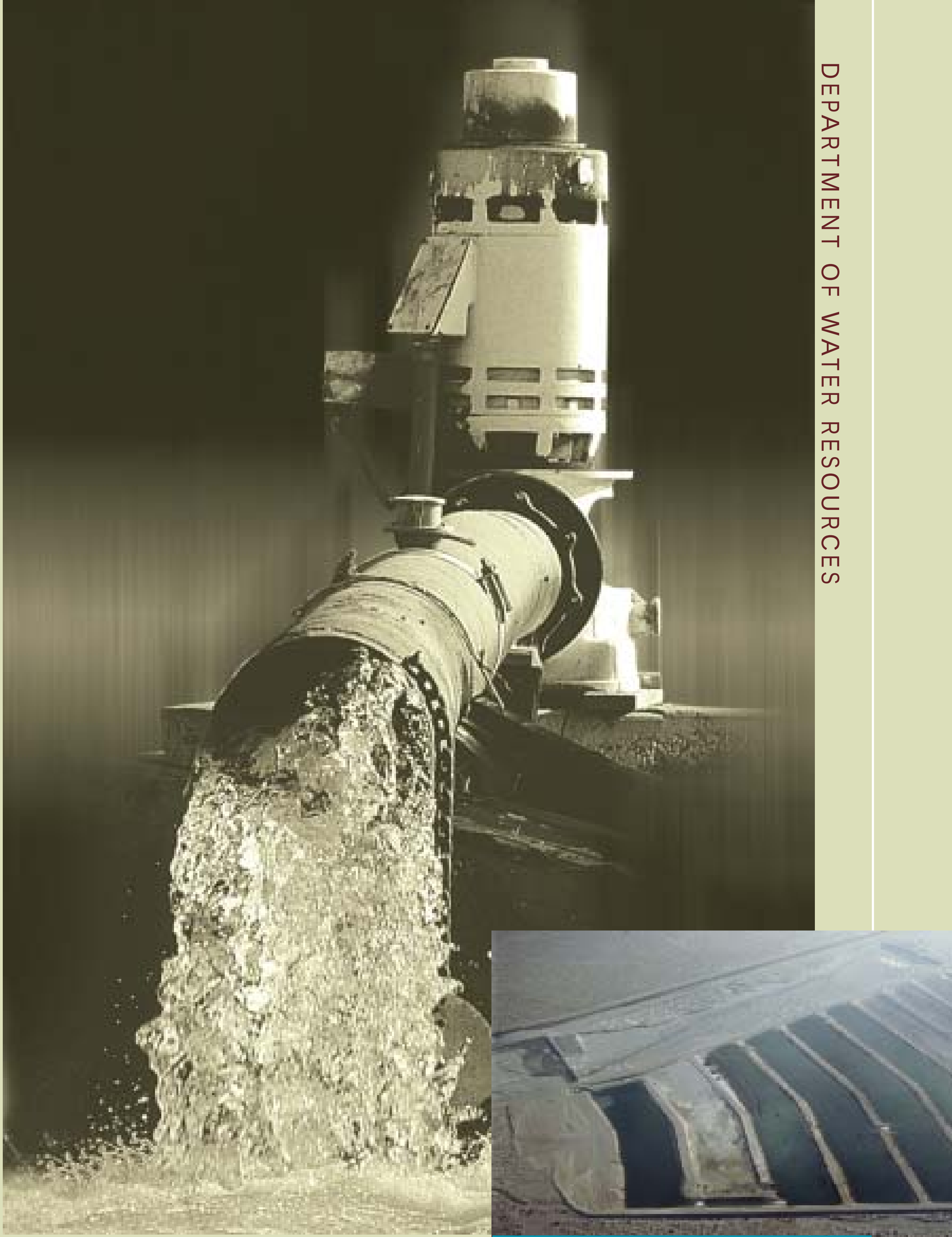
Appendix G: Supplemental Water Supply Information

- DWR Groundwater Bulletin 118

DEPARTMENT OF WATER RESOURCES



BULLETIN 118 - UPDATE 2003

CALIFORNIA'S GROUNDWATER

North Coast Hydrologic Region

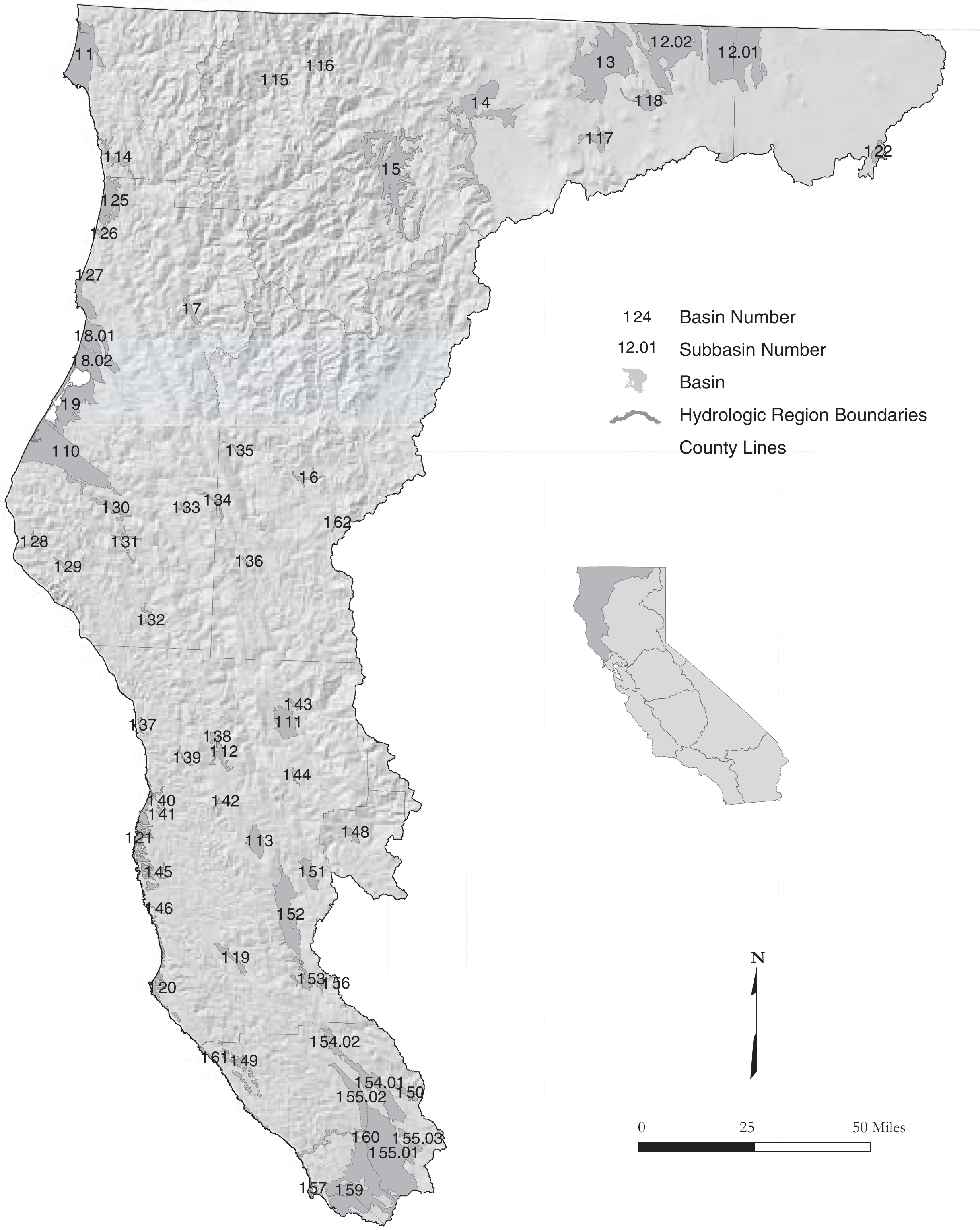


Figure 25 North Coast Hydrologic Region

Basins and Subbasins of the North Coast Hydrologic Region

Basin/subbasin	Basin name
1-1	Smith River Plain
1-2	Klamath River Valley
1-2.01	Tule Lake
1-2.02	Lower Klamath
1-3	Butte Valley
1-4	Shasta Valley
1-5	Scott River Valley
1-6	Hayfork Valley
1-7	Hoopa Valley
1-8	Mad River Valley
1-8.01	Mad River Lowland
1-8.02	Dows Prairie School Area
1-9	Eureka Plain
1-10	Eel River Valley
1-11	Covelo Round Valley
1-12	Laytonville Valley
1-13	Little Lake Valley
1-14	Lower Klamath River Valley
1-15	Happy Camp Town Area
1-16	Seiad Valley
1-17	Bray Town Area
1-18	Red Rock Valley
1-19	Anderson Valley
1-20	Garcia River Valley
1-21	Fort Bragg Terrace Area
1-22	Fairchild Swamp Valley
1-25	Prairie Creek Area
1-26	Redwood Creek Area
1-27	Big Lagoon Area
1-28	Mattole River Valley
1-29	Honeydew Town Area
1-30	Pepperwood Town Area
1-31	Weott Town Area
1-32	Garberville Town Area
1-33	Larabee Valley
1-34	Dinsmores Town Area
1-35	Hyampom Valley
1-36	Hettenshaw Valley
1-37	Cottoneva Creek Valley
1-38	Lower Laytonville Valley
1-39	Branscomb Town Area
1-40	Ten Mile River Valley
1-41	Little Valley

Basin/subbasin	Basin name
1-42	Sherwood Valley
1-43	Williams Valley
1-44	Eden Valley
1-45	Big River Valley
1-46	Navarro River Valley
1-48	Gravelley Valley
1-49	Annapolis Ohlson Ranch Formation Highlands
1-50	Knights Valley
1-51	Potter Valley
1-52	Ukiah Valley
1-53	Sanel Valley
1-54	Alexander Valley
1-54.01	Alexander Area
1-54.02	Cloverdale Area
1-55	Santa Rosa Valley
1-55.01	Santa Rosa Plain
1-55.02	Healdsburg Area
1-55.03	Rincon Valley
1-56	McDowell Valley
1-57	Bodega Bay Area
1-59	Wilson Grove Formation Highlands
1-60	Lower Russian River Valley
1-61	Fort Ross Terrace Deposits
1-62	Wilson Point Area

Description of the Region

The North Coast HR covers approximately 12.46 million acres (19,470 square miles) and includes all or portions of Modoc, Siskiyou, Del Norte, Trinity, Humboldt, Mendocino, Lake, and Sonoma counties (Figure 25). Small areas of Shasta, Tehama, Glenn, Colusa, and Marin counties are also within the region. Extending from the Oregon border south to Tomales Bay, the region includes portions of four geomorphic provinces. The northern Coast Range forms the portion of the region extending from the southern boundary north to the Mad River drainage and the fault contact with the metamorphic rocks of the Klamath Mountains, which continue north into Oregon. East of the Klamath terrane along the State border are the volcanic terranes of the Cascades and the Modoc Plateau. In the coastal mountains, most of the basins are along the narrow coastal strip between the Pacific Ocean and the rugged Coast Range and Klamath Mountains and along inland river valleys; alluviated basin areas are very sparse in the steep Klamath Mountains. In the volcanic terrane to the east, most of the basins are in block faulted valleys that once held Pleistocene-age lakes. The North Coast HR corresponds to the boundary of RWQCB 1. Significant geographic features include basin areas such as the Klamath River Basin, the Eureka/Arcata area, Hoopa Valley, Anderson Valley, and the Santa Rosa Plain. Other significant features include Mount Shasta, forming the southern border of Shasta Valley, and the rugged north coastal shoreline. The 1995 population of the entire region was about 606,000, with most being centered along the Pacific Coast and in the inland valleys north of the San Francisco Bay Area.

The northern mountainous portion of the region is rural and sparsely populated, primarily because of the rugged terrain. Most of the area is heavily forested. Some irrigated agriculture occurs in the narrow river valleys, but most occurs in the broader valleys on the Modoc Plateau where pasture, grain and alfalfa predominate. In the southern portion of the region, closer to urban centers, crops like wine grapes, nursery stock, orchards, and truck crops are common.

A majority of the surface water in the North Coast HR goes to environmental uses because of the “wild and scenic” designation of most of the region’s rivers. Average annual precipitation ranges from 100 inches in the Smith River drainage to 29 inches in the Santa Rosa area and about 10 inches in the Klamath drainage; as a result, drought is likely to affect the Klamath Basin more than other portions of the region. Communities that are not served by the area’s surface water projects also tend to experience shortages. Surface water development in the region includes the U.S. Bureau of Reclamation (USBR) Klamath Project, Humboldt Bay Municipal Water District’s Ruth Lake, and U.S. Army Corps of Engineer’s Russian River Project. An important factor concerning water demand in the Klamath Project area is water allocation for endangered fish species in the upper and lower basin. Surface water deliveries for agriculture in 2001, a severe drought year, were only about 20 percent of normal.

Groundwater Development

Groundwater development in the North Coast HR occurs along the coast, near the mouths of some of the region’s major rivers, on the adjacent narrow marine terraces, or in the inland river valleys and basins. Reliability of these supplies varies significantly from area to area. There are 63 groundwater basins/subbasins delineated in the region, two of which are shared with Oregon. These basins underlie approximately 1.022 million acres (1,600 square miles).

Along the coast, most groundwater is developed from shallow wells installed in the sand and gravel beds of several of the region’s rivers. Under California law, the water produced in these areas is considered surface water underflow. Water from Ranney collectors installed in the Klamath River, Rowdy Creek, the Smith

River, and the Mad River supply the towns of Klamath, Smith River and Crescent City in Del Norte County and most of the Humboldt Bay area in Humboldt County. Except on the Mad River, which has continuous supply via releases from Ruth Reservoir, these supplies are dependent on adequate precipitation and flows throughout the season. In drought years when streamflows are low, seawater intrusion can occur causing brackish or saline water to enter these systems. This has been a problem in the town of Klamath, which in 1995 had to obtain community water from a private well source. Toward the southern portion of the region, along the Mendocino coast, the Town of Mendocino typifies the problems related to groundwater development in the shallow marine terrace aquifers. Groundwater supply is limited by the aquifer storage capacity, and surveys done in the Town of Mendocino in the mid-1980s indicate that about 10 percent of wells go dry every year and up to 40 percent go dry during drought years.

Groundwater development in the inland coastal valleys north of the divide between the Russian and Eel Rivers is generally of limited extent. Most problems stemming from reliance on groundwater in these areas is a lack of alluvial aquifer storage capacity. Many groundwater wells rely on hydrologic connection to the rivers and streams of the valleys. The City of Rio Dell has experienced water supply problems in community wells and, as a result, recently developed plans to install a Ranney collector near the Eel River. South of the divide, in the Russian River drainage, a significant amount of groundwater development has occurred on the Santa Rosa Plain and surrounding areas. The groundwater supplies augment surface supplies from the Russian River Project.

In the north-central part of the North Coast HR, the major groundwater basins include the Klamath River Valley, Shasta Valley, Scott River Valley, and Butte Valley. The Klamath River Valley is shared with Oregon. Of these groundwater basins, Butte Valley has the most stable water supply conditions. The historical annual agricultural surface water supply has been about 20,000 acre-feet. As farming in the valley expanded from the early 1950s to the early 1990s, bringing nearly all the arable land in the valley into production, groundwater was developed to farm the additional acres. It has been estimated that current, fully developed demands are only about 80 percent of the available groundwater supply. By contrast, water supply issues in the other three basins are contingent upon pending management decisions regarding restoration of fish populations in the Klamath River and the Upper Klamath Basin system. The Endangered Species Act (ESA) fishery issues include lake level requirements for two sucker fish species and in-stream flow requirements for coho salmon and steelhead trout. Since about 1905, the Klamath Project has provided surface water to the agricultural community, which in turn has provided water to the wildlife refuges. Since the early 1990s, it has been recognized that surface water in the Klamath Project is over-allocated, but very little groundwater development had occurred. In 2001, which was a severe drought year, USBR delivered a total of about 75,000 acre-feet of water to agriculture in California, about 20 percent of normal. In the Klamath River Groundwater Basin this translated to a drought disaster, both for agriculture and the wildlife refuges. In addition, there were significant impacts for both coho salmon and sucker fisheries in the Klamath River watershed. As a result of the reduced surface water deliveries, significant groundwater development occurred, and groundwater extraction increased from an estimated 6,000 acre-feet in 1997 to roughly 60,000 acre-feet in 2001. Because of the complexity of the basin's water issues, a long-term Klamath Project Operation plan has not yet been finalized. Since 1995, USBR has issued an annual operation plan based on estimates of available supply. The Scott River Valley and Shasta Valley rely to a significant extent on surface water diversions. In most years, surface water supplies the majority of demand, and groundwater extraction supplements supply as needed depending on wet or dry conditions. Discussions are under way to develop strategies to conjunctively use surface water and groundwater to meet environmental, agricultural, and other demands.

Groundwater Quality

Groundwater quality characteristics and specific local impairments vary with regional setting within the North Coast HR. In general, seawater intrusion and nitrates in shallow aquifers are problems in the coastal groundwater basins; high total dissolved solids (TDS) content and general alkalinity are problems in the lake sediments of the Modoc Plateau basins; and iron, boron, and manganese can be problems in the inland basins of Mendocino and Sonoma counties.

Water Quality in Public Supply Wells

From 1994 through 2000, 584 public supply water wells were sampled in 32 of the 63 basins and subbasins in the North Coast HR. Analyzed samples indicate that 553 wells, or 95%, met the state primary Maximum Contaminant Levels (MCL) for drinking water. Thirty-one wells, or 5%, sampled have constituents that exceed one or more MCL. Figure 26 shows the percentage of each contaminant group that exceeded MCLs in the 31 wells.

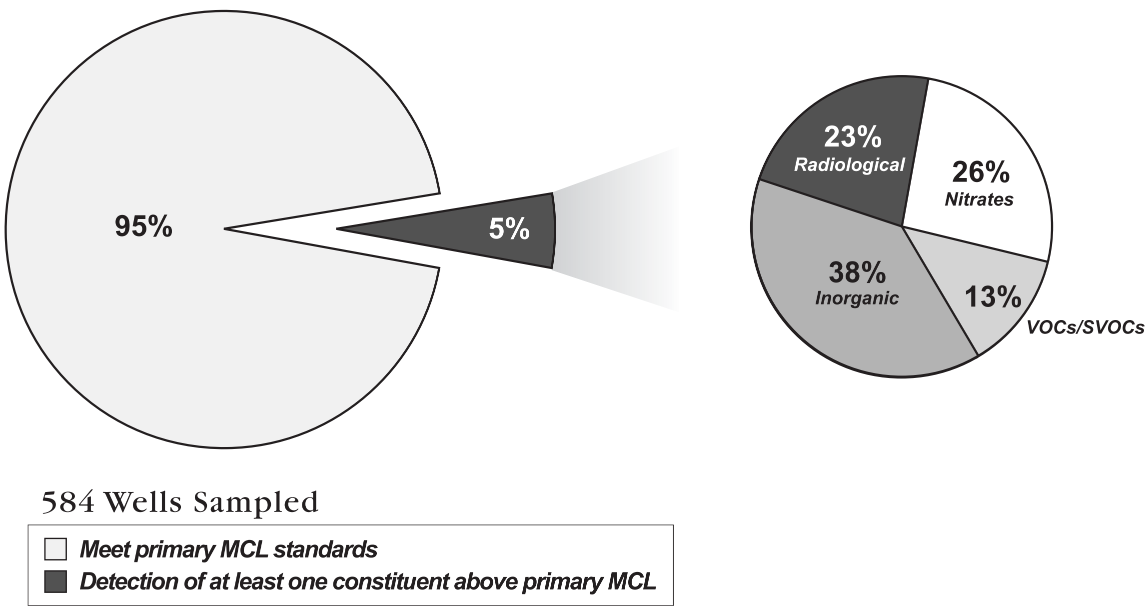


Figure 26 MCL exceedances in public supply wells in the North Coast Hydrologic Region

Table 13 lists the three most frequently occurring individual contaminants in each of the five contaminant groups and shows the number of wells in the HR that exceeded the MCL for those contaminants.

Table 13 Most frequently occurring contaminants by contaminant group in the North Coast Hydrologic Region

Contaminant group	Contaminant - # of wells	Contaminant - # of wells	Contaminant - # of wells
Inorganics – Primary	Aluminum – 4	Arsenic – 4	4 tied at 1 exceedance
Inorganics – Secondary	Manganese – 150	Iron – 108	Copper – 2
Radiological	Radium 228 – 3	Combined RA226 + RA228 – 3	Radium 226 – 1
Nitrates	Nitrate(as NO_3) – 7	Nitrite(as N) – 1	
VOCs/SVOCs	TCE – 2	3 tied at 1 exceedance	

TCE = Trichloroethylene
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound

Changes from Bulletin 118-80

Since Bulletin 118-80 was published, RWQCB 2 boundary has been modified. This resulted in several basins being reassigned to RWQCB 1. These are listed in Table 14, along with other modifications to North Coast HR.

Table 14 Modifications since Bulletin 118-80 of groundwater basins in North Coast Hydrologic Region

Basin name	New number	Old number
McDowell Valley	1-56	2-12
Knights Valley	1-50	2-13
Potter Valley	1-51	2-14
Ukiah Valley	1-52	2-15
Sanel Valley	1-53	2-16
Alexander Valley	1-54	2-17
Santa Rosa Valley	1-55	2-18
Lower Russian River Valley	1-60	2-20
Bodega Bay Area	1-57	2-21
Modoc Plateau Recent Volcanic Area	deleted	1-23
Modoc Plateau Pleistocene Volcanic Area	deleted	1-24
Gualala River Valley	deleted	1-47
Wilson Grove Formation Highlands	1-59	2-25
Fort Ross Terrace Deposits	1-61	
Wilson Point Area	1-62	

Fort Ross Terrace Deposits (1-61) and Wilson Point Area (1-62) have been defined since B118-80 and are included in this update. Mad River Valley Groundwater Basin (1-8) has been subdivided into two subbasins. Sebastopol Merced Formation (2-25) merged into Basin 1-59 and was renamed Wilson Grove Formation Highlands.

There are a couple of deletions of groundwater basins from Bulletin 118-80. The Modoc Plateau Recent Volcanic Area (1-23) and the Modoc Plateau Pleistocene Volcanic Area (1-24) are volcanic aquifers and were not assigned basin numbers in this bulletin. These are considered to be groundwater source areas as discussed in Chapter 6. Gualala River Valley (1-47) was deleted because the State Water Resources Control Board determined the water being extracted in this area as surface water within a subterranean stream.

Table 15 North Coast Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
1-1	SMITH RIVER PLAIN	40,450	B	500	50	7	10	33	164	32 - 496
1-2	KLAMATH RIVER VALLEY									
1-2.01	UPPER KLAMATH LAKE BASIN - Tule Lake	85,930	B	3,380	1,208	40	8	5	721	140 - 2,200
1-2.02	UPPER KLAMATH LAKE BASIN - Lower Klamath	73,330	B	2,600	1,550	4	-	-	-	-
1-3	BUTTE VALLEY	79,700	B	5,000	2,358	28	13	9	310	55 - 1,110
1-4	SHASTA VALLEY	52,640	B	1,200	273	9	15	24	-	-
1-5	SCOTT RIVER VALLEY	63,900	B	3,000	794	6	10	5	258	47 - 1,510
1-6	HAYFORK VALLEY	3,300	B	200	-	-	5	-	-	-
1-7	HOOPA VALLEY	3,900	B	300	-	-	4	-	125	95 - 159
1-8	MAD RIVER VALLEY									
1-8.01	MAD RIVER VALLEY LOWLAND	25,600	B	120	72	4	9	2	184	55 - 280
1-8.02	DOWS PRAIRIE SCHOOL AREA	14,000	B	-	-	-	3	-	-	-
1-9	EUREKA PLAIN	37,400	B	1,200	-	4	4	6	177	97 - 460
1-10	EEL RIVER VALLEY	73,700	B	1,200	-	8	11	29	237	110 - 340
1-11	COVELO ROUND VALLEY	16,400	C	850	193	9	5	29	239	116 - 381
1-12	LAYTONVILLE VALLEY	5,020	A	700	7	4	3	-	149	53 - 251
1-13	LITTLE LAKE VALLEY	10,000	A	1,000	45	7	7	-	340	97 - 1,710
1-14	LOWER KLAMATH RIVER VALLEY	7,030	B	-	-	-	-	-	-	43 - 150
1-15	HAPPY CAMP TOWN AREA	2,770	B	-	-	-	-	17	-	-
1-16	SEIAD VALLEY	2,250	B	-	-	-	2	2	-	-
1-17	BRAY TOWN AREA	8,030	B	-	-	-	-	-	-	-
1-18	RED ROCK VALLEY	9,000	B	-	-	-	-	-	-	-
1-19	ANDERSON VALLEY	4,970	C	300	30	7	5	7	-	80 - 400
1-20	GARCIA RIVER VALLEY	2,240	C	-	-	-	-	-	-	-
1-21	FORT BRAGG TERRACE AREA	24,100	C	75	14	-	-	51	185	26 - 650
1-22	FAIRCHILD SWAMP VALLEY	3,300	B	-	-	-	-	-	-	-
1-25	PRAIRIE CREEK AREA	20,000	B	-	-	-	-	1	106	-
1-26	REDWOOD CREEK AREA	2,000	B	-	-	1	0	4	-	102 - 332
1-27	BIG LAGOON AREA	13,400	B	-	-	1	0	31	174	-
1-28	MATTOLE RIVER VALLEY	3,150	B	-	-	-	-	2	-	-
1-29	HONEYDEW TOWN AREA	2,370	B	-	-	-	-	1	-	-
1-30	PEPPERWOOD TOWN AREA	6,290	B	-	-	-	-	1	-	-
1-31	WEOTT TOWN AREA	3,650	B	-	-	-	-	2	-	-
1-32	GARBERVILLE TOWN AREA	2,100	B	-	-	-	-	5	-	-
1-33	LARABEE VALLEY	970	B	-	-	-	-	-	-	-
1-34	DINSMORES TOWN AREA	2,300	B	-	-	-	-	3	-	-
1-35	HYAMPOM VALLEY	1,350	B	-	-	-	-	1	-	-
1-36	HETTENSHAW VALLEY	850	B	-	-	-	-	-	-	-
1-37	COTTONEVA CREEK VALLEY	760	C	-	-	-	-	-	118	118
1-38	LOWER LAYTONVILLE VALLEY	2,150	C	-	-	-	-	-	-	-
1-39	BRANSCOMB TOWN AREA	1,320	C	-	-	-	-	-	130	80 - 179
1-40	TEN MILE RIVER VALLEY	1,490	C	-	-	-	-	-	-	-
1-41	LITTLE VALLEY	810	C	-	-	-	-	-	-	-

Table 15 North Coast Hydrologic Region groundwater data (continued)

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
1-42	SHERWOOD VALLEY	1,150	C	-	-	-	-	-	-	-
1-43	WILLIAMS VALLEY	1,640	C	-	-	-	-	-	-	-
1-44	EDEN VALLEY	1,380	C	-	-	-	-	-	140	140
1-45	BIG RIVER VALLEY	1,690	C	-	-	-	-	2	-	-
1-46	NAVARRO RIVER VALLEY	770	C	-	-	-	-	-	-	-
1-48	GRAVELLEY VALLEY	3,000	C	-	-	-	-	3	-	-
1-49	ANAPOLIS OHLSON RANCH FOR. HIGHLANDS	8,650	C	36	-	-	0	1	260	260
1-50	KNIGHTS VALLEY	4,090	C	-	-	-	-	-	-	-
1-51	POTTER VALLEY	8,240	C	100	-	2	0	1	-	140 - 395
1-52	UKIAH VALLEY									
1-53	SANEL VALLEY	5,570	C	1,250	-	5	8	6	-	174 - 306
1-54	ALEXANDER VALLEY									
1-54.01	ALEXANDER AREA									
1-54.02	CLOVERDALE AREA	6,500	C	-	500	3	-	13	-	130 - 304
1-55	SANTA ROSA VALLEY									
1-55.01	SANTA ROSA PLAIN	80,000	A	1,500	-	43	-	155	-	-
1-55.02	HEALDSBURG AREA	15,400	C	500	-	8	-	28	-	90 - 500
1-55.03	RINCON VALLEY	5,600	C	-	-	2	-	12	-	-
1-56	McDOWELL VALLEY	1,500	C	1,200	-	-	-	-	145	143 - 146
1-57	BODEGA BAY AREA	2,680	A	150	-	-	-	6	-	-
1-59	WILSON GROVE FORMATION HIGHLANDS	81,500	C	-	-	14	-	68	-	-
1-60	LOWER RUSSIAN RIVER VALLEY	6,600	C	500 +	-	1	-	32	-	120 - 210
1-61	FORT ROSS TERRACE DEPOSITS	8,490	C	75	27	-	-	13	320	230 - 380
1-62	WILSON POINT AREA	700	B	-	-	-	-	-	-	-

gpm - gallons per minute
mg/L - milligram per liter
TDS = total dissolved solids