State Summary for Oregon

Information on population density, use of domestic-water supply, land use, and distribution of the 11 selected contaminants (arsenic, atrazine, benzene, deethylatrazine (CIAT), manganese, nitrate (data for nitrate consists of analyses for nitrite plus nitrate, as N, by the laboratory), perchloroethene (PCE), radon, strontium, trichloroethene (TCE), and uranium) for domestic well data for Oregon is shown in figures OR1–OR16. The percentage of samples with concentrations greater than U.S. Environmental Protection Agency (USEPA) human-health benchmarks for National Water-Quality Assessment (NAWQA) Program major-aquifer studies in Oregon is given in table OR1. The "Selected References" section at the end of this summary lists previous Oregon studies that are relevant to the 11 contaminants.

In Oregon, the largest areas with the highest population density are located in the western parts of the State (fig. OR1). No data are available for Oregon on the percentage of the domestic (private) supply obtained from ground water, and only about 20 percent of the public supply is obtained from ground water. The population (by census-block group for 1990) using a domestic-water supply from ground water was most prevalent in the western part of the State (fig. OR2). Oregon is not a heavily populated State, and most of the land use is rangeland and forest lands (fig. OR3). Most of the forest areas are located in the western part of Oregon, whereas most of the rangeland is in the eastern part of the State (fig. OR3).

One major-aquifer study was conducted in one principal aquifer (Willamette Lowland basin-fill aquifers) in Oregon (fig. OR4). The Willamette Lowland basin-fill aquifers are contained in unconsolidated-deposits and Miocene basaltic-rock deposits that are more than 800 feet thick in the northern part of the basin and thin rapidly southward and towards the margins of the basins (Whitehead, 1994). Sand and gravel in the unconsolidated-deposit aquifers can yield as much as 10,000 gallons per minute, whereas yields from the Miocene basaltic-rock aquifers range from less than 10 to 1,000 gallons per minute (Whitehead, 1994).

Water-quality data for 11 selected contaminants (table 2) in samples from domestic-water supplies were compiled and summarized. The concentrations relative to USEPA human-health benchmarks (table 2, fig. OR5) and the number of major-aquifer studies with concentrations greater than human-health benchmarks were both considered in evaluating the potential concern to human health. This analysis assumes that current USEPA benchmarks (U.S. Environmental Protection Agency, 2006) are the most relevant and accurate measure of human-health risk.

Radon, manganese, nitrate, arsenic, and PCE had concentrations greater than USEPA human-health benchmarks (table OR1). Radon had the greatest potential human-health concern among the major-aquifer study wells because it had the largest percentage of samples with concentrations greater than the human-health benchmark of 300 picocuries per liter (pCi/L). Radon concentrations were greater than 300 pCi/L,

Table OR1. Percentage of samples with concentrations greater than U.S. Environmental Protection Agency human-health benchmarks for National Water-Quality Assessment (NAWQA) Program major-aquifer studies in Oregon.

Study-Unit code for NAWQA major-aquifer study	Principal aquifer	Contaminant	Number of samples	Percentage of samples with concentrations greater than human-health benchmark
willsus1	Willamette Lowland basin-fill aquifers	Radon	49	[1]86/0.0
willsus1	Willamette Lowland basin-fill aquifers	Manganese	66	15
willsus1	Willamette Lowland basin-fill aquifers	Nitrite plus nitrate	66	7.6
willsus1	Willamette Lowland basin-fill aquifers	Arsenic	66	3.0
willsus1	Willamette Lowland basin-fill aquifers	Perchloroethene (PCE)	61	1.6

[1]First number is the percentage greater than 300 picocuries per liter (proposed Maximum Contaminant Level), and second number is the percentage greater than 4,000 picocuries per liter (alternate proposed Maximum Contaminant Level).

which is the proposed Maximum Contaminant Level (MCL) for radon, in about 86 percent of the samples of the Willamette Lowland basin-fill aquifers, and median radon concentrations were about 400 pCi/L (table OR1, fig. OR5). None of the radon concentrations were greater than the alternative proposed MCL of 4,000 pCi/L. No additional U.S. Geological Survey (USGS) State data were available for radon in Oregon. Radon-222 is a decay product of radium-226, and radon concentrations greater than the human-health benchmark are widespread and can be attributed to natural sources in the soil and rock material in Oregon.

About 15 percent of the samples in the Willamette Lowland basin-fill aquifers had manganese concentrations greater than the USEPA human-health benchmark for manganese (Lifetime Health Advisory (HA) of 300 µg/L) (table OR1). USGS State data also showed manganese concentrations to be greater than the human-health benchmark in the same general areas and also in other areas along the west coast (fig. OR10). These manganese concentrations appear coincident with three primary areas in the State, and land use or geologic setting may be factors for the concentrations.

Nitrate concentrations were greater than the human-health benchmark (MCL of 10 milligrams per liter (mg/L) as N) in about 8 percent of the samples from the Willamette Lowland basin-fill aquifers (table OR1). USGS State data also showed that these same areas have nitrate concentrations greater than the human-health benchmark (fig. OR11). These nitrate concentrations appear coincident with agricultural land use, and many people could be using domestic-water supplies in these areas.

Two samples (about 3 percent) from the Willamette Lowland basin-fill aquifers had arsenic concentrations greater than the human-health benchmark (MCL of 10 µg/L) (table OR1). USGS State data also showed arsenic concentrations to be greater than the human-health benchmark in the same general area, but included more samples (fig. OR6). These arsenic concentrations appear coincident with the location in the State where people tend to rely more on self-supplied domestic wells (fig. OR2).

NAWQA data showed one PCE concentration was greater than the human-health benchmark (MCL of 5 µg/L) in the Willamette Lowland basin-fill aquifers (table OR1, fig. OR12). No additional PCE data were available from USGS State data.

For the entire Oregon data set, atrazine (fig. OR7), benzene (fig. OR8), CIAT (fig. OR9), strontium (fig. OR14), TCE (fig. OR15), and uranium (fig. OR16) did not have concentrations larger than USEPA human-health benchmarks for either NAWQA or USGS State data. CIAT is a degradation product of atrazine and does not have a human-health benchmark; however, for this report, the MCL for atrazine is used as a benchmark for CIAT because their toxicities are considered equivalent.

Selected References

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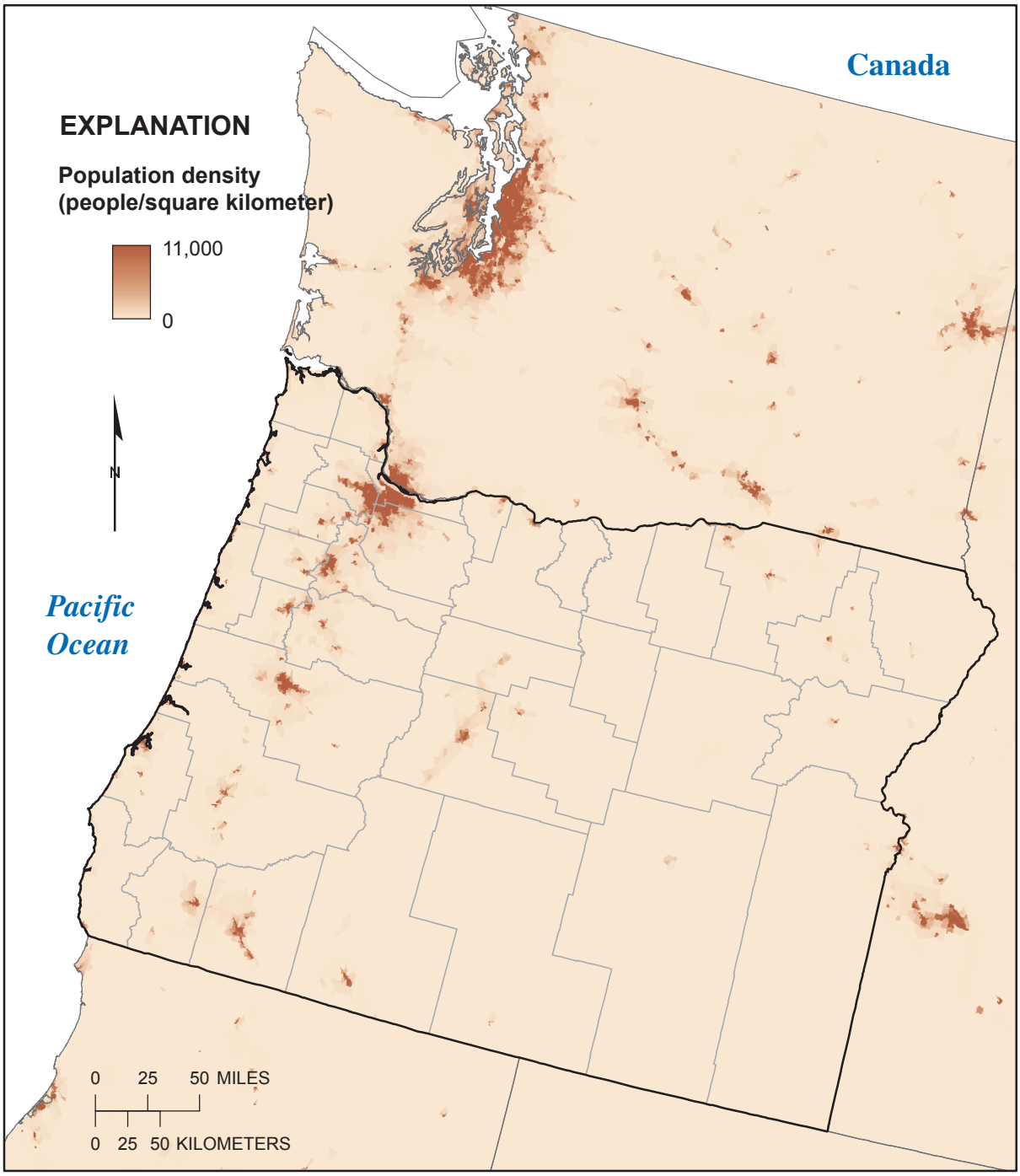
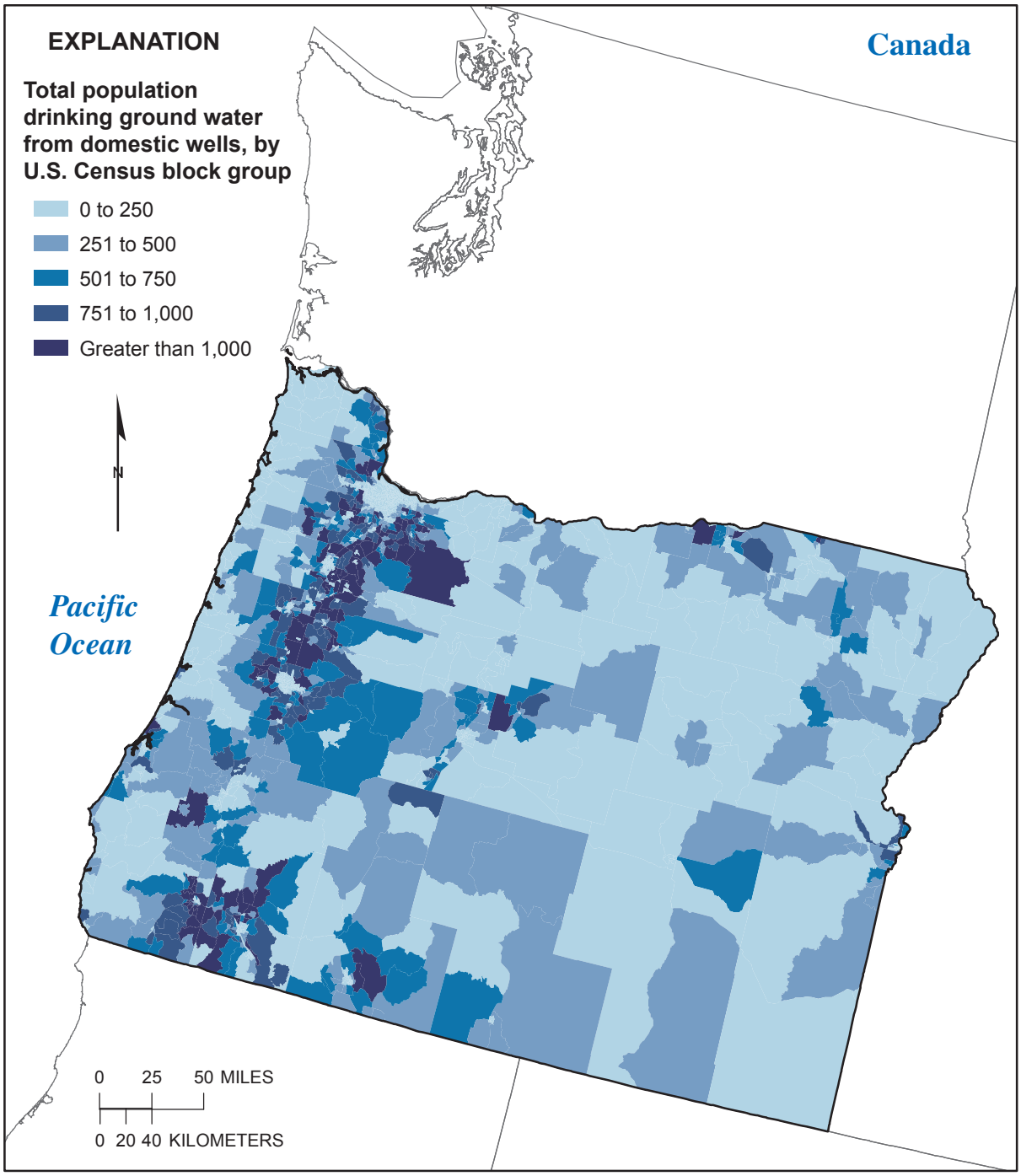


Base information from U.S. Geological Survey digital data, 1:2,000,000
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Figure OR1. Population density for Oregon and nearby States. (Data from Hitt, 2003.)



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Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Figure OR2. Population using domestic-water supply (from ground water) for Oregon. (Data from 1990 U.S. Census block group, Kerie Hitt, U.S. Geological Survey, written commun., 1997.)

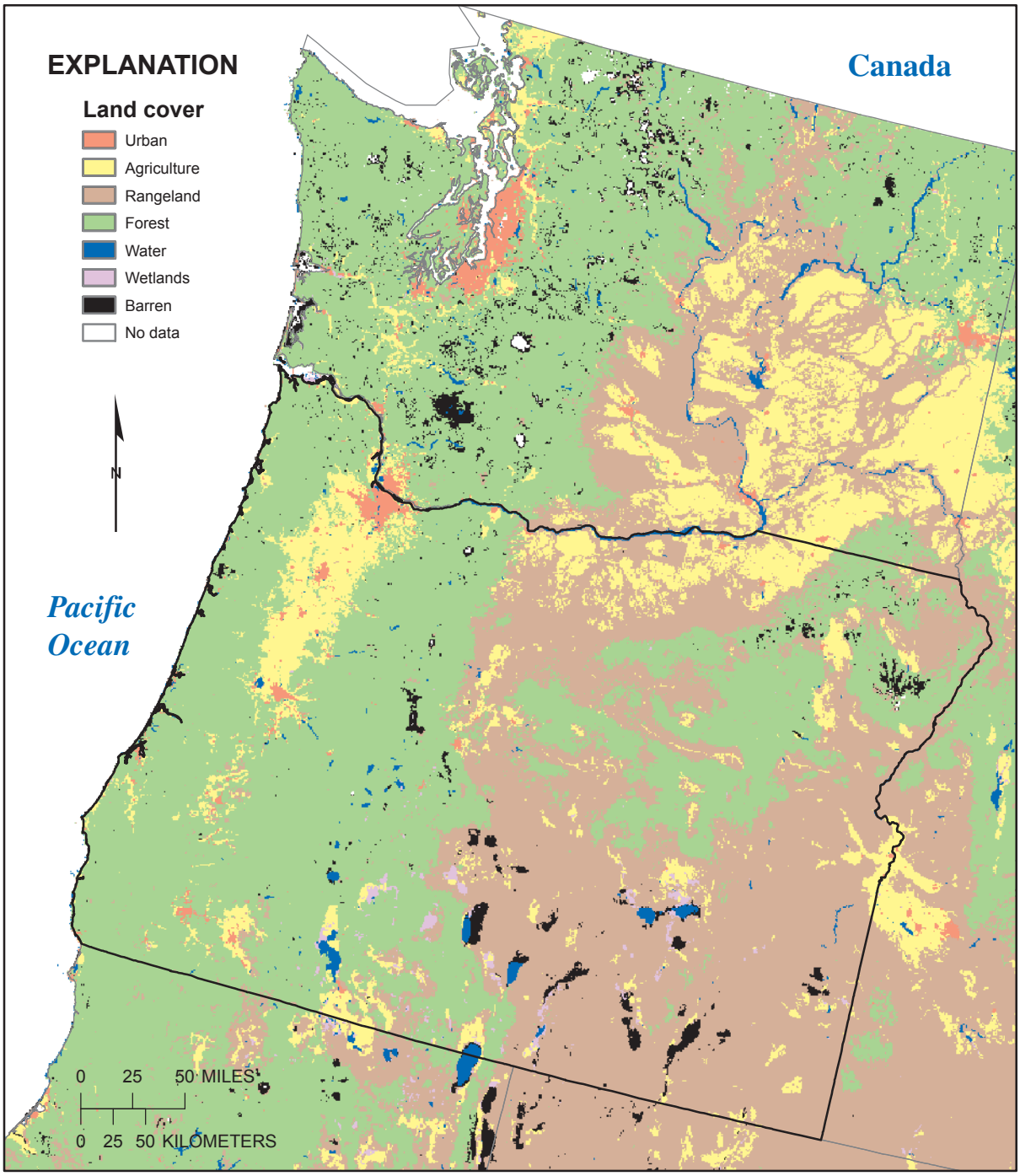

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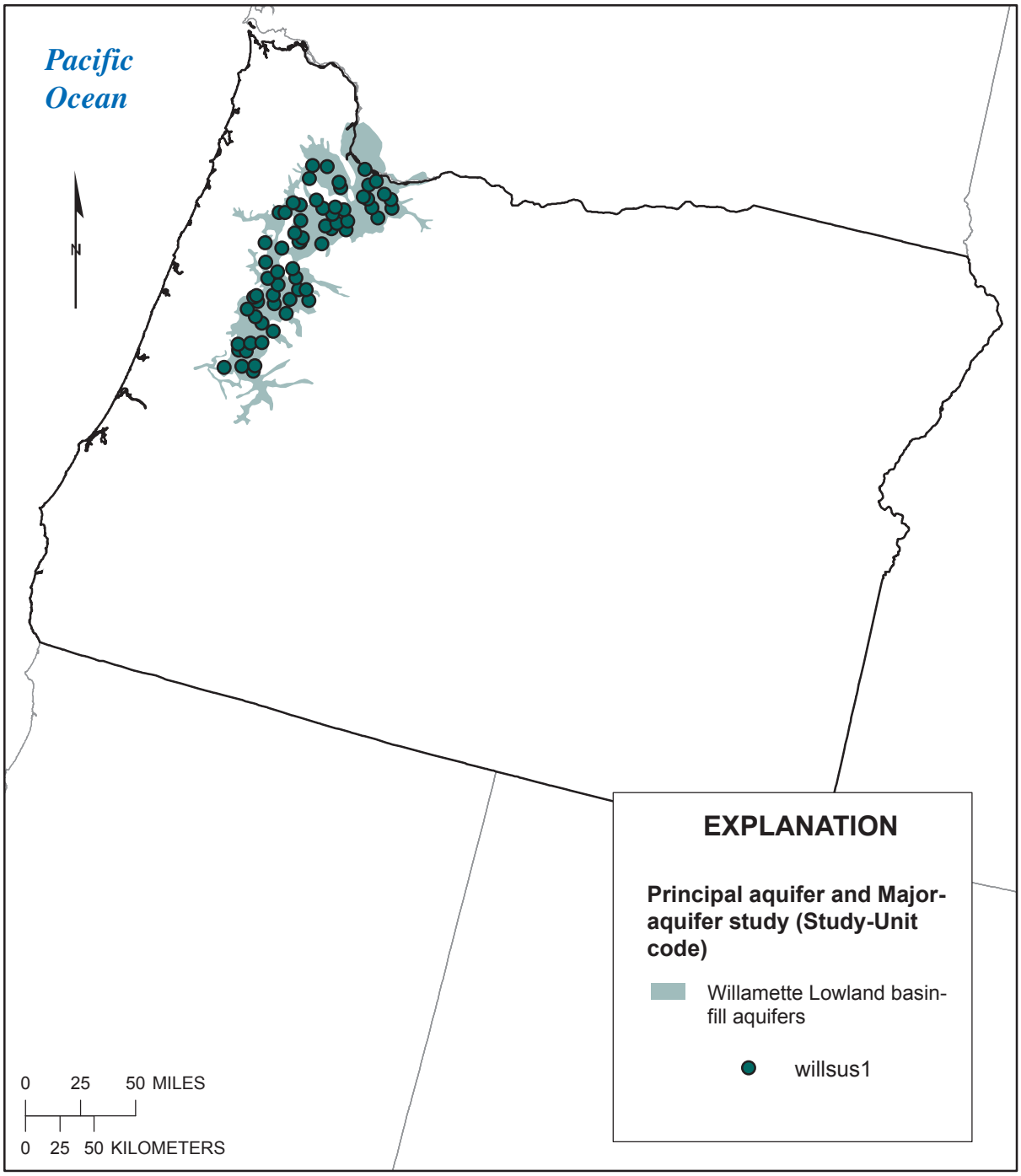
Figure OR3. Land use/land cover for Oregon and nearby States. (Data from Naomi Nakagaki, U.S. Geological Survey, written commun., 2005.)



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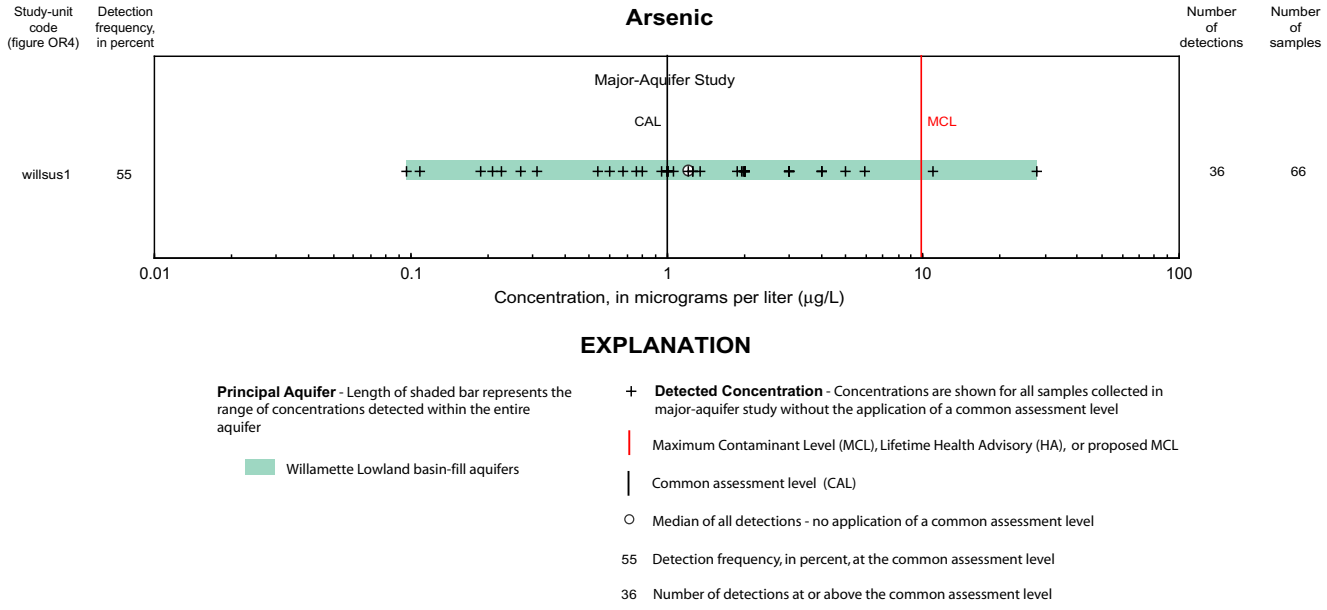
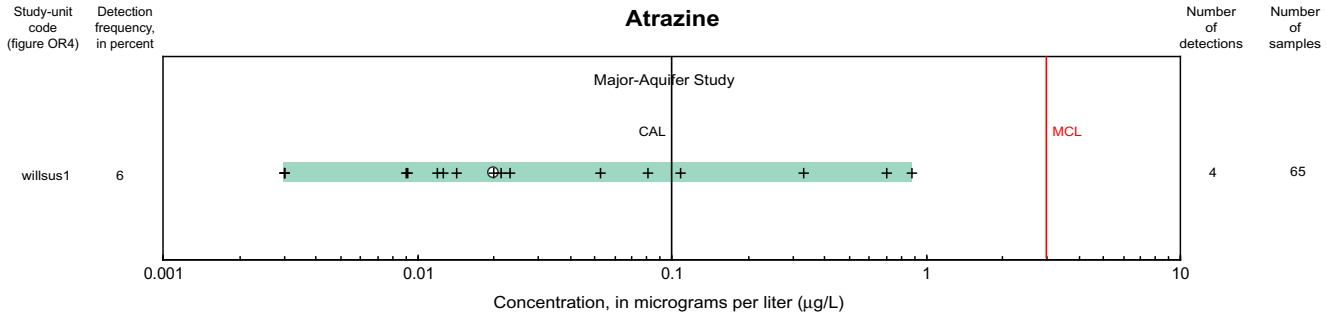
Principal aquifer data from U.S. Geological Survey, 2003

Figure OR4. Location of domestic wells sampled for National Water-Quality Assessment (NAWQA) major-aquifer studies that included Oregon.





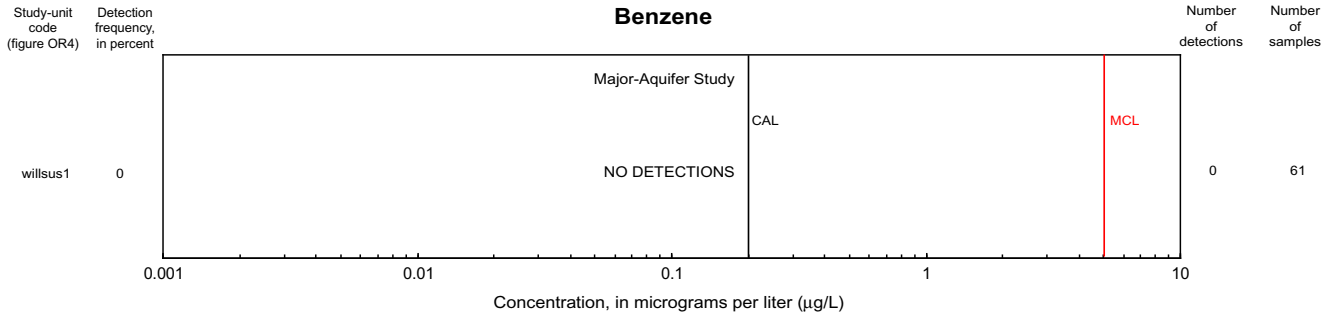
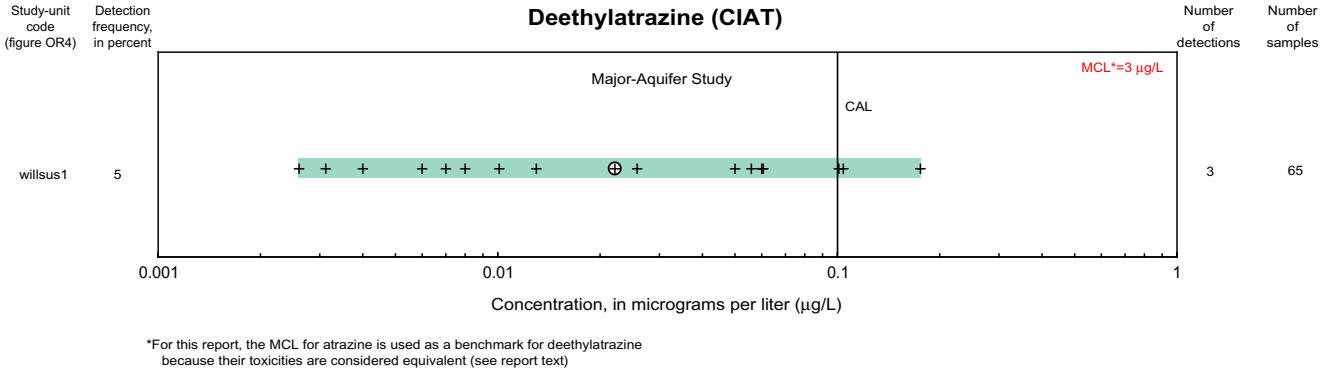
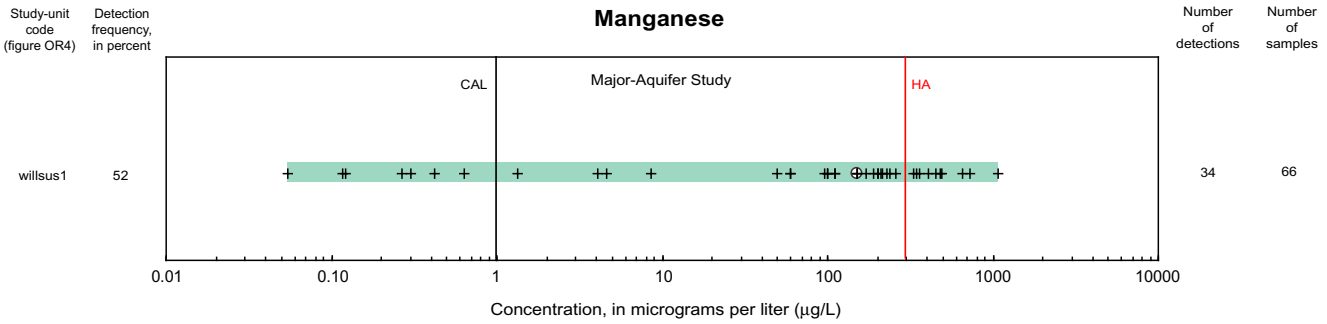
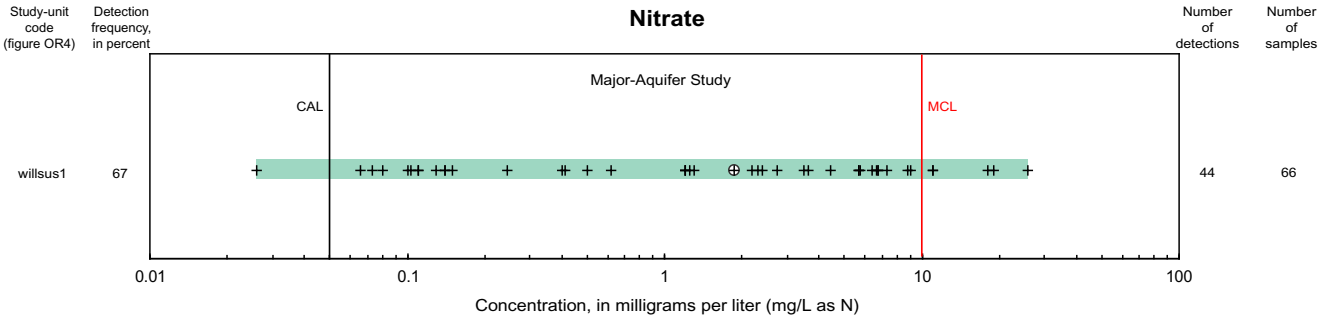


Figure OR5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Oregon (includes studies for which at least 10 analyses were available).



*For this report, the MCL for atrazine is used as a benchmark for deethylatrazine because their toxicities are considered equivalent (see report text)





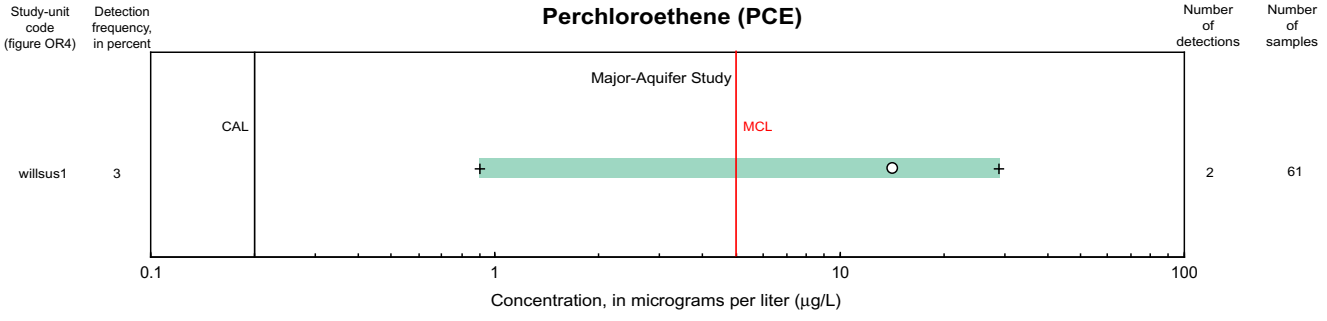
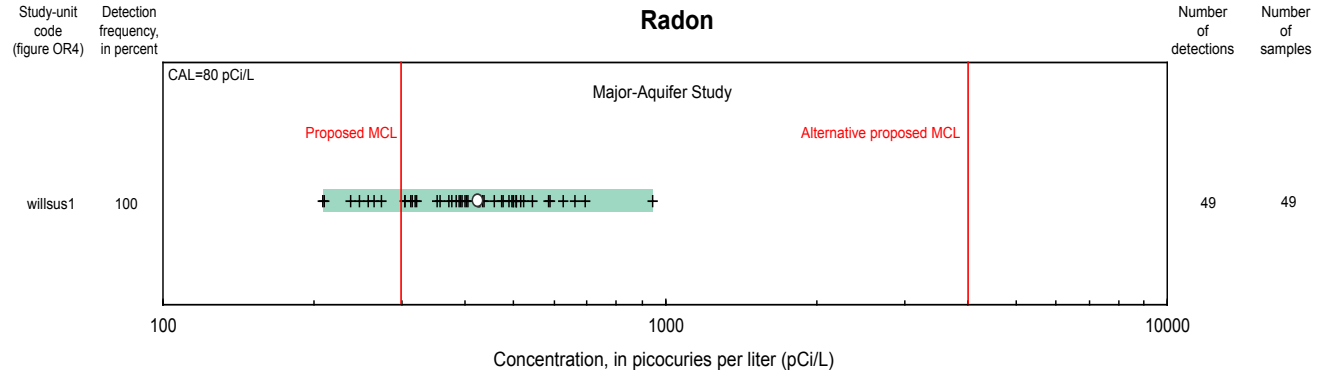
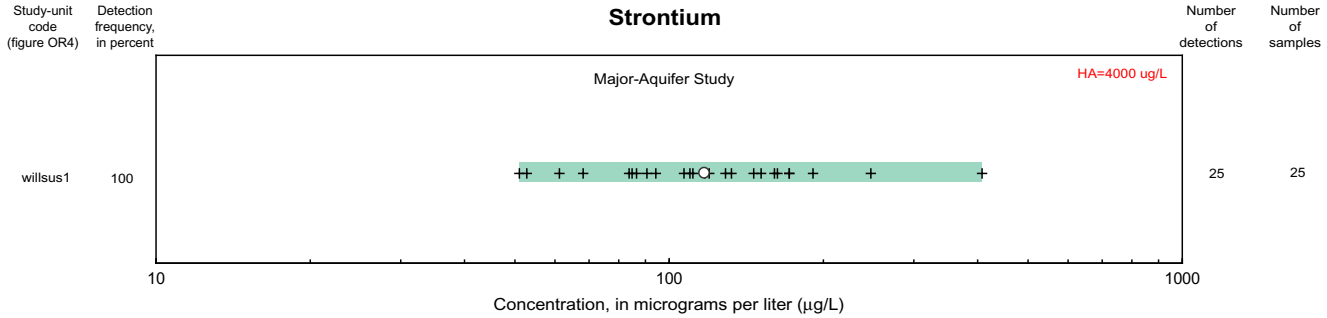
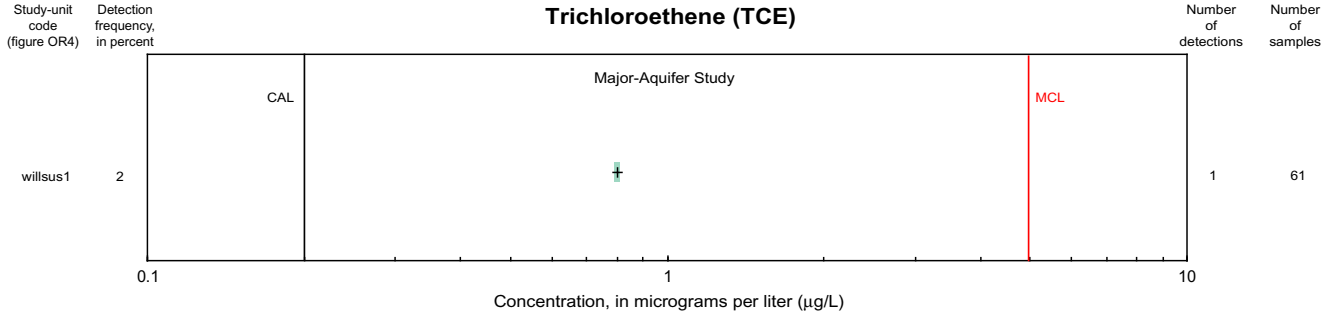


Figure OR5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Oregon (includes studies for which at least 10 analyses were available). —Continued







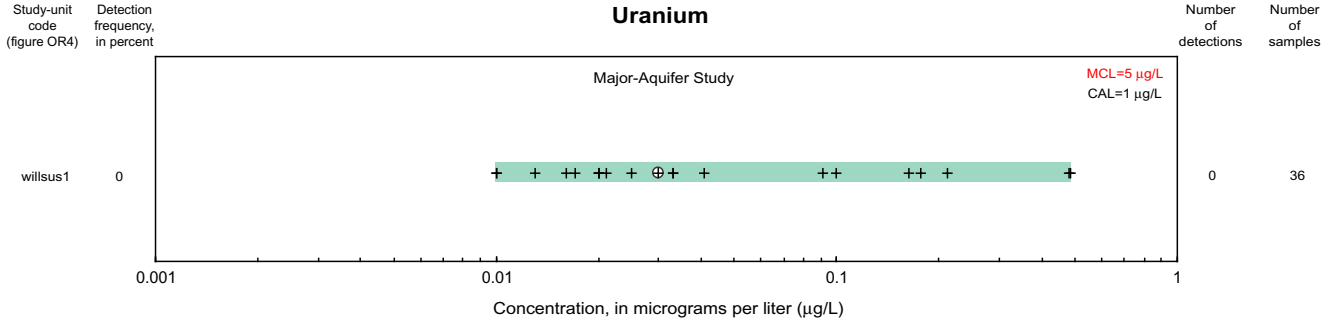
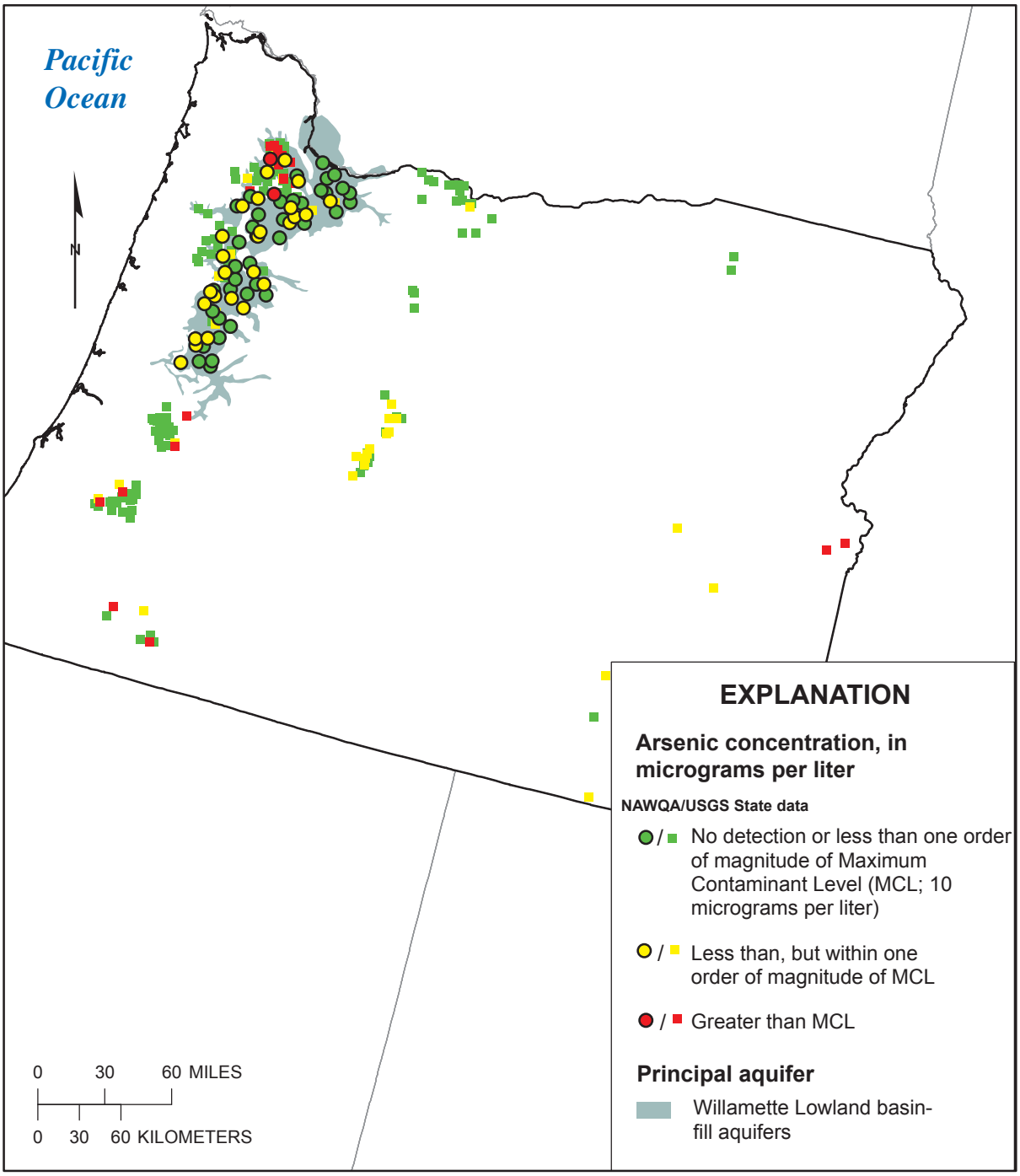


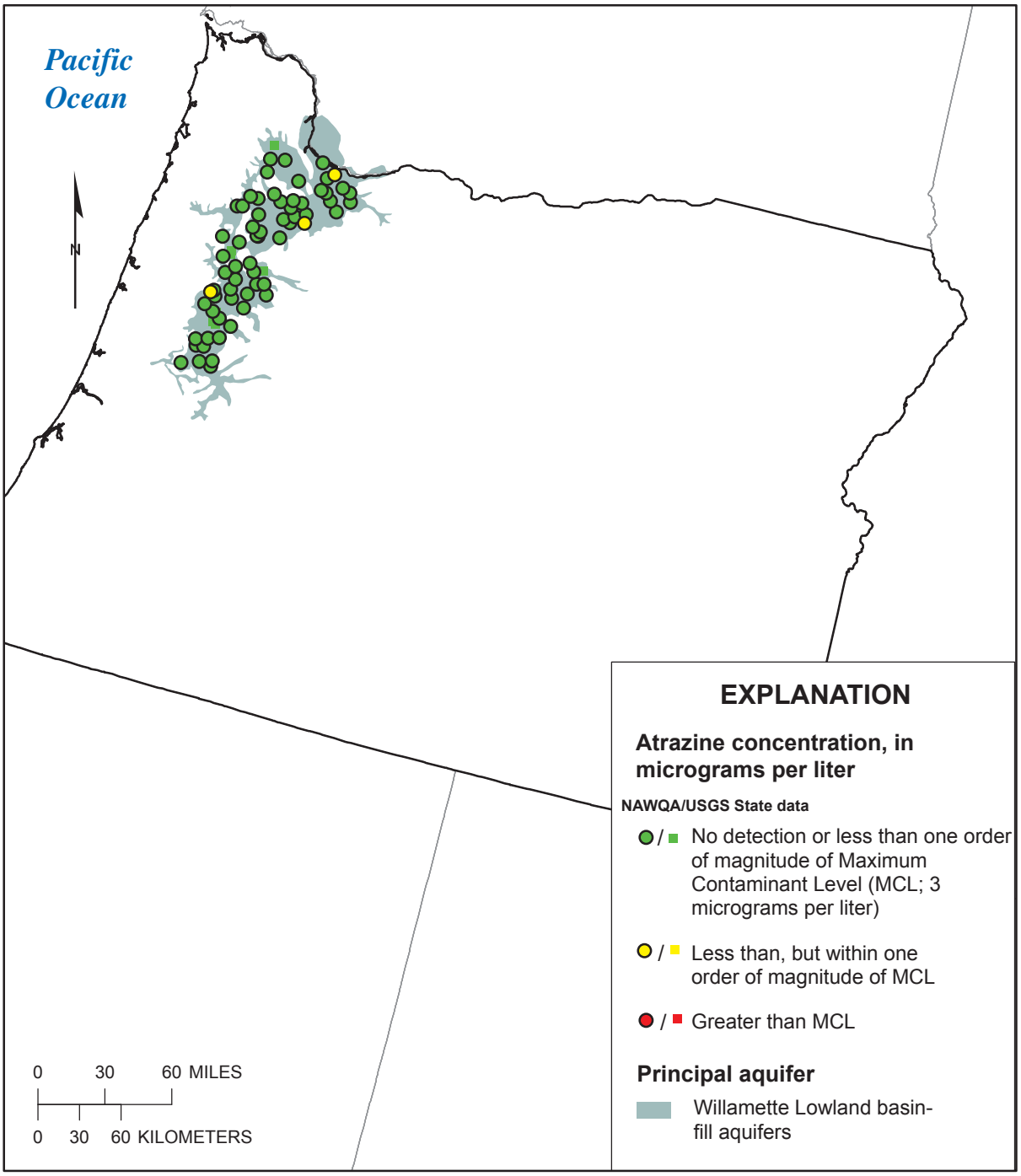
Figure OR5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Oregon (includes studies for which at least 10 analyses were available). —Continued



Base information from U.S. Geological Survey digital data, 1:2,000,000
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR6. Concentration of arsenic in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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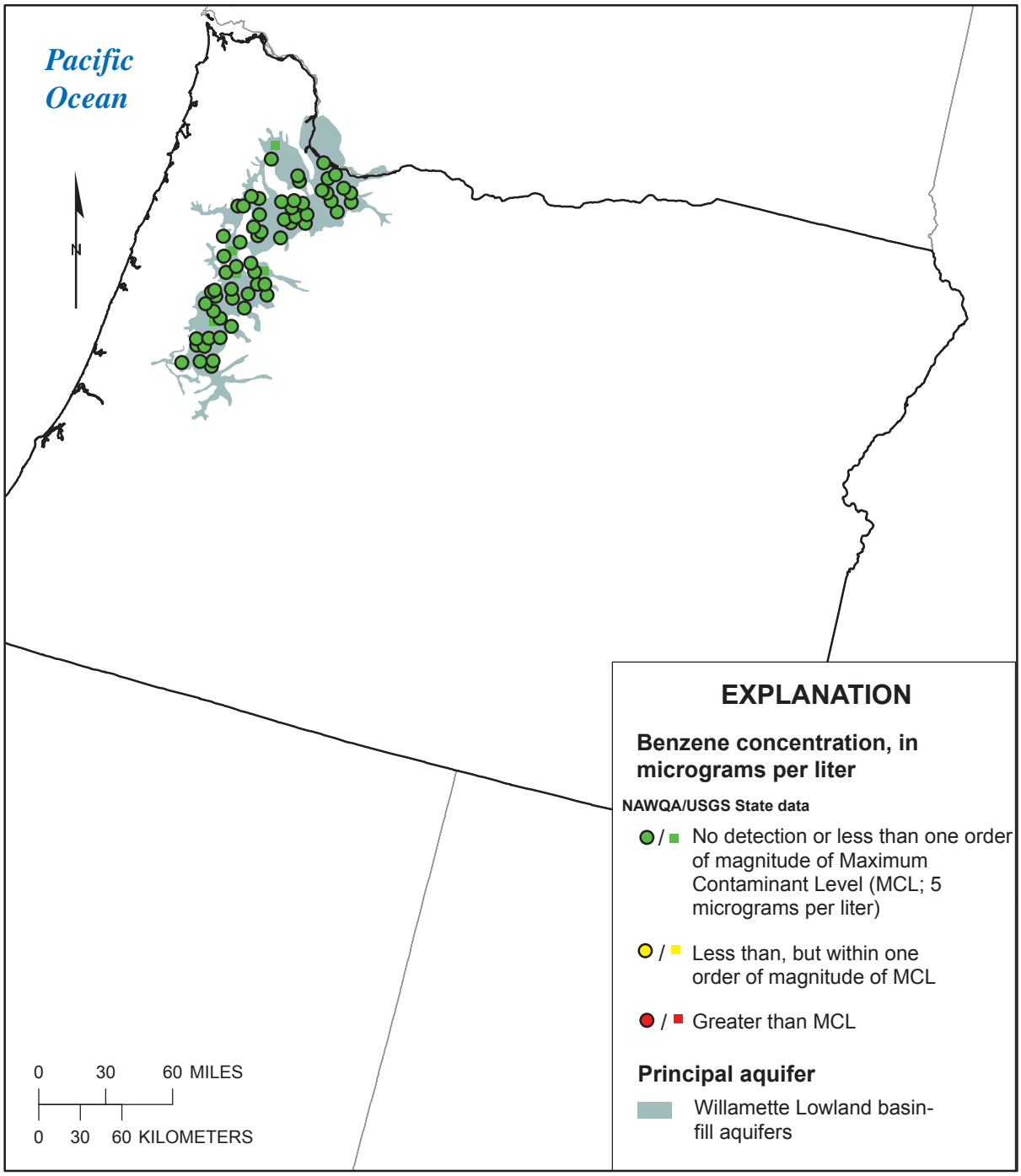
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR7. Concentration of atrazine in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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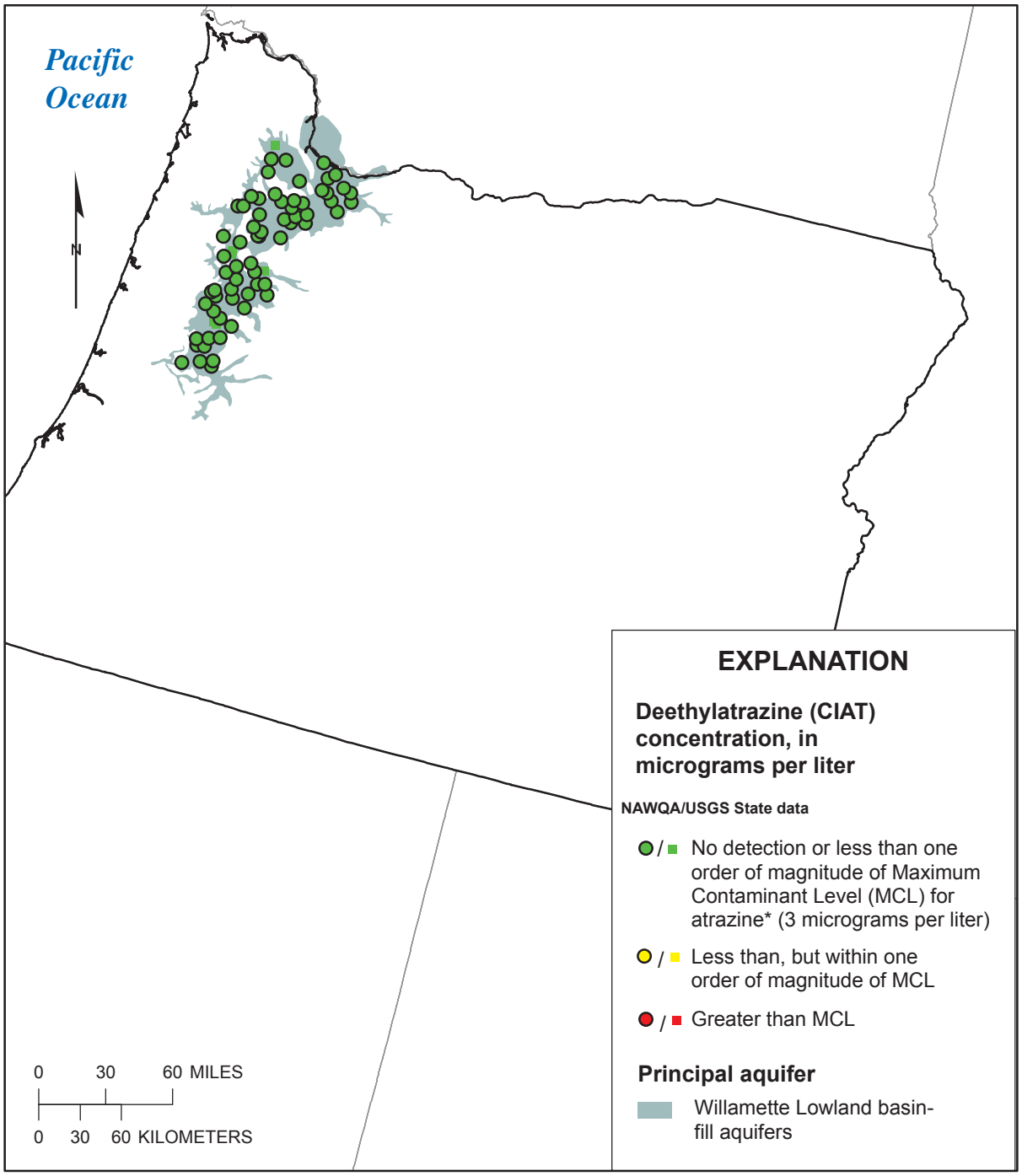
Principal aquifer data from U.S. Geological Survey, 2003

Figure OR8. Concentration of benzene in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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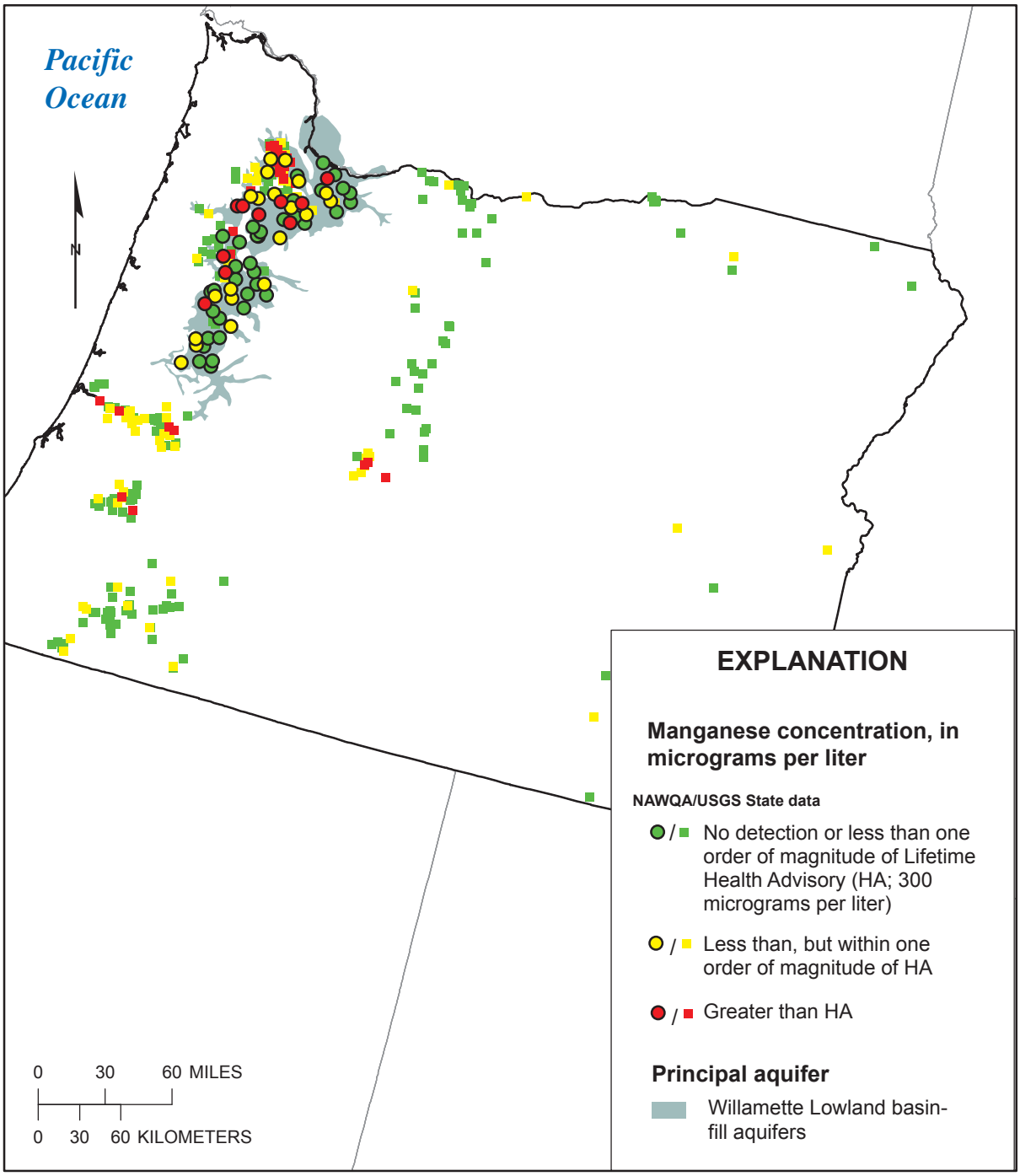
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

* For this report, the MCL for atrazine is used as benchmark for deethylatrazine because their toxicities are considered equivalent (see report text).

Figure OR9. Concentration of deethylatrazine (CIAT) in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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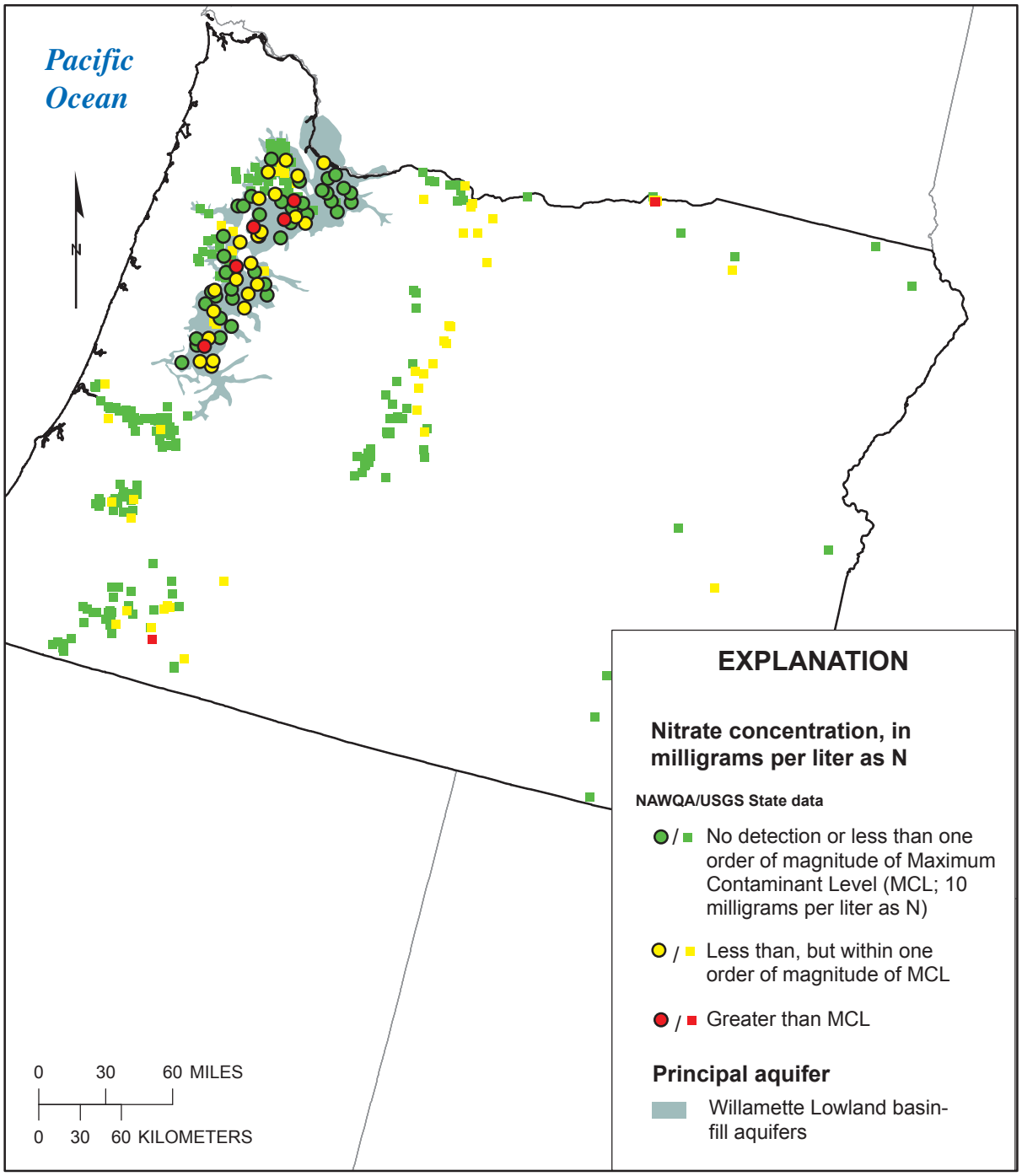
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR10. Concentration of manganese in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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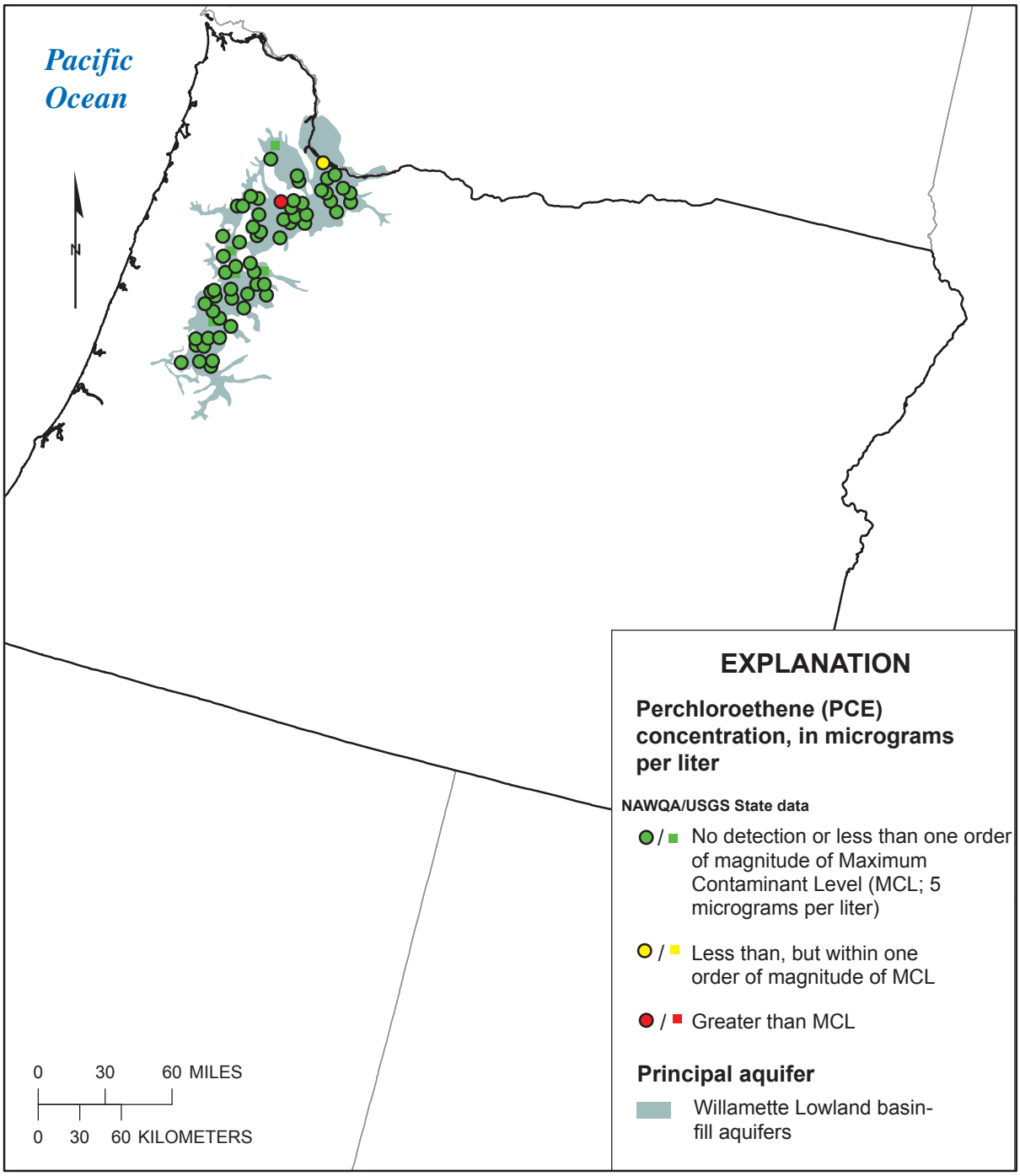
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR11. Concentration of nitrate in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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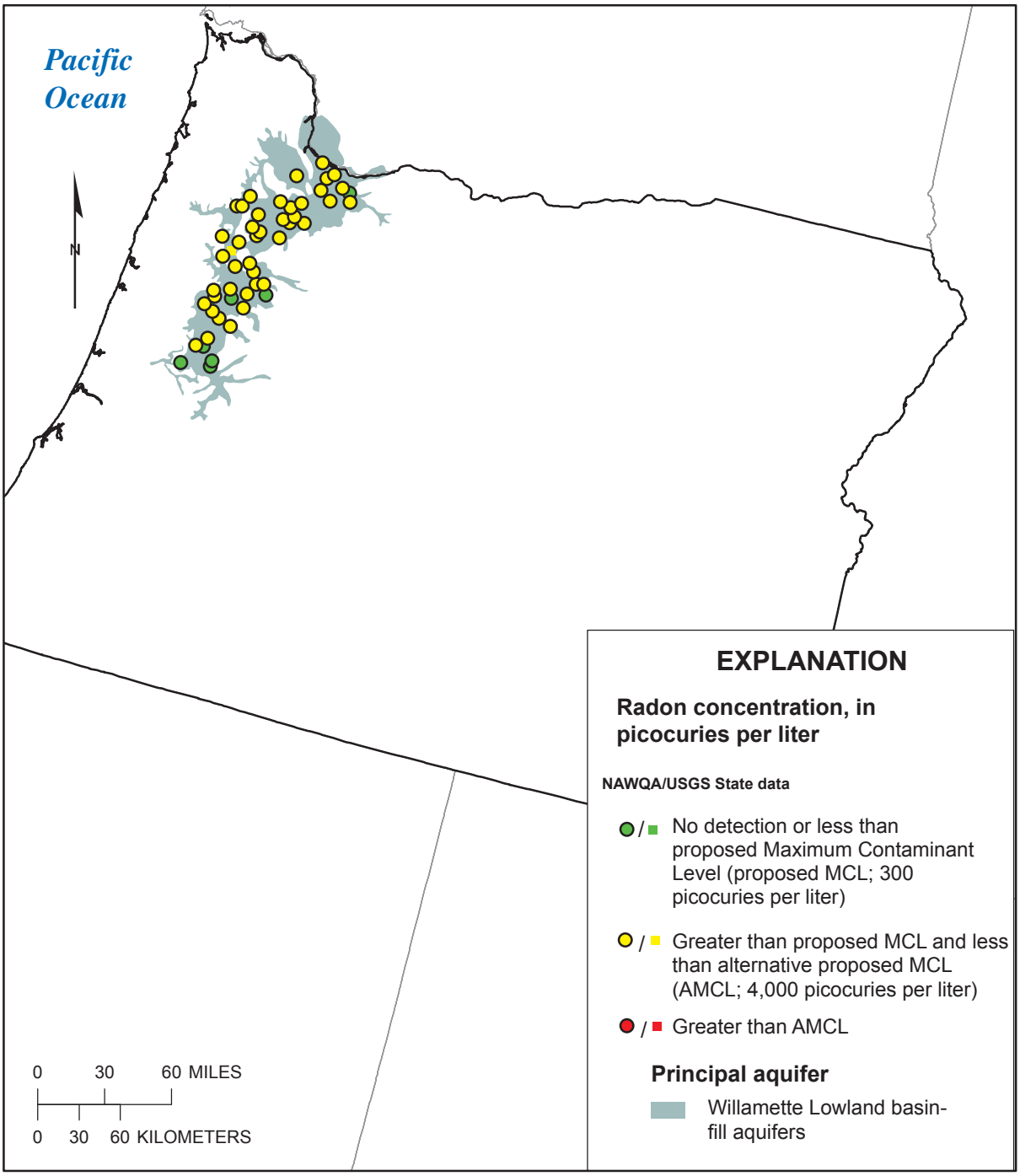
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR12. Concentration of perchloroethene (PCE) in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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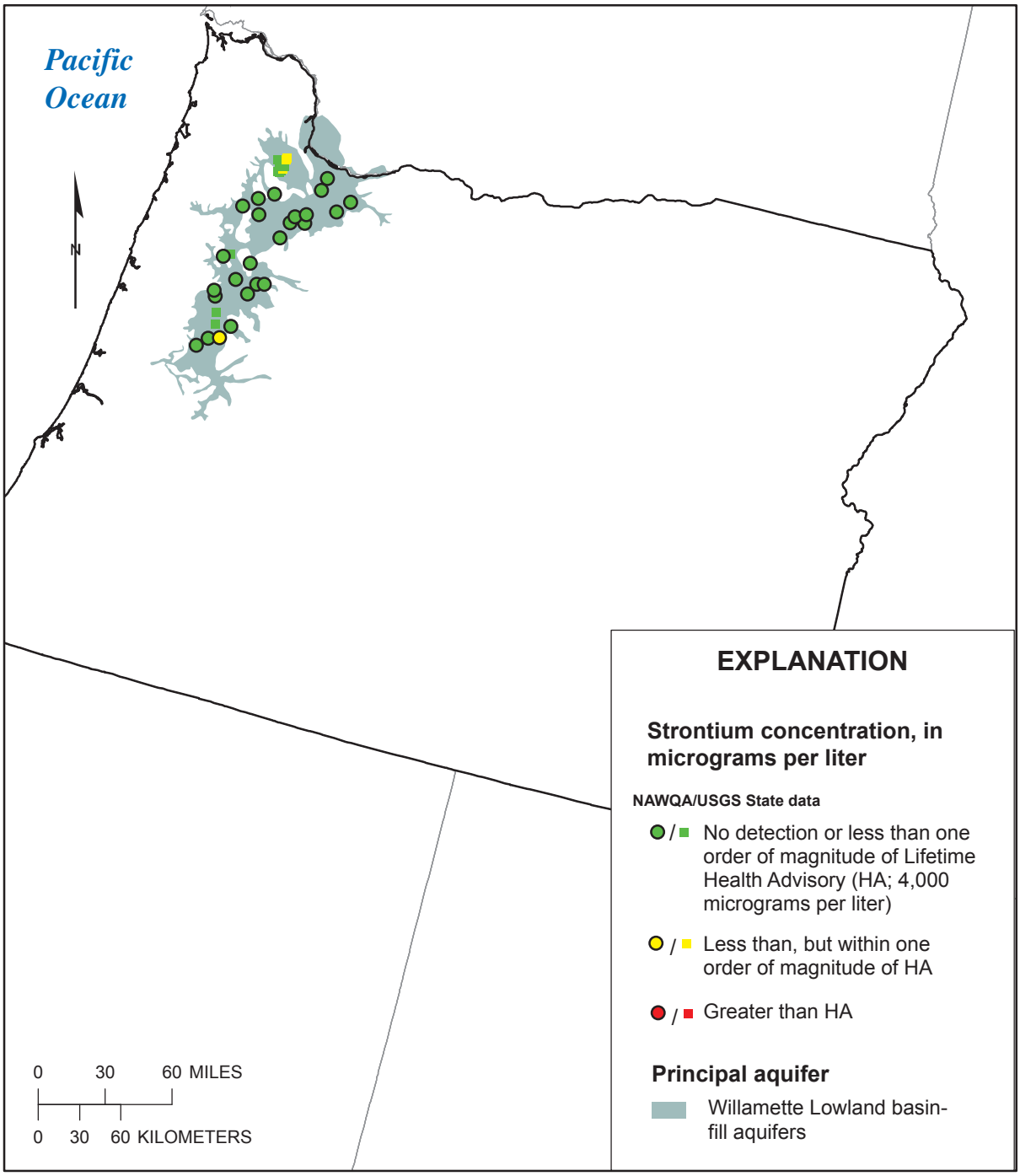
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR13. Concentration of radon in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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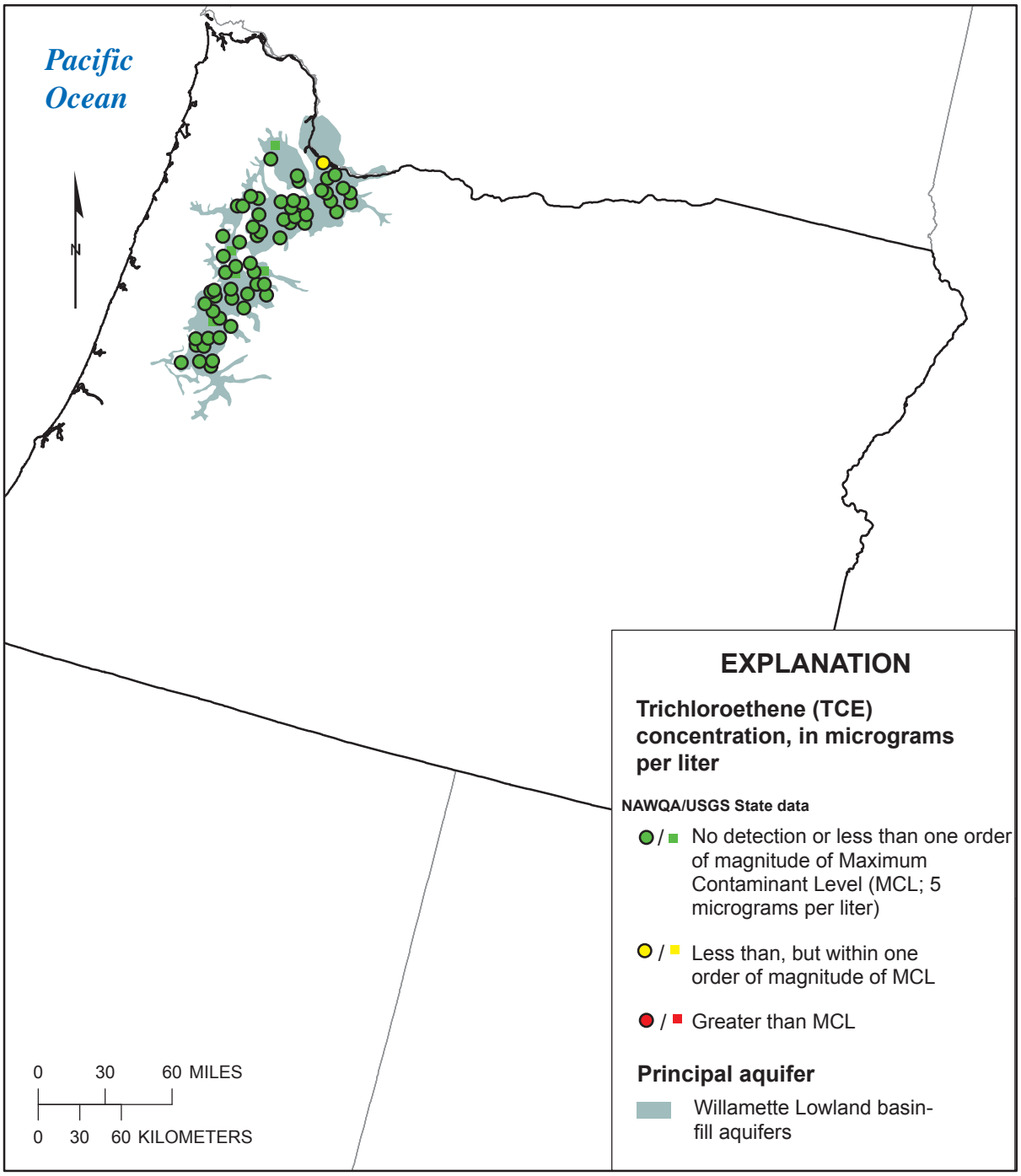
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR14. Concentration of strontium in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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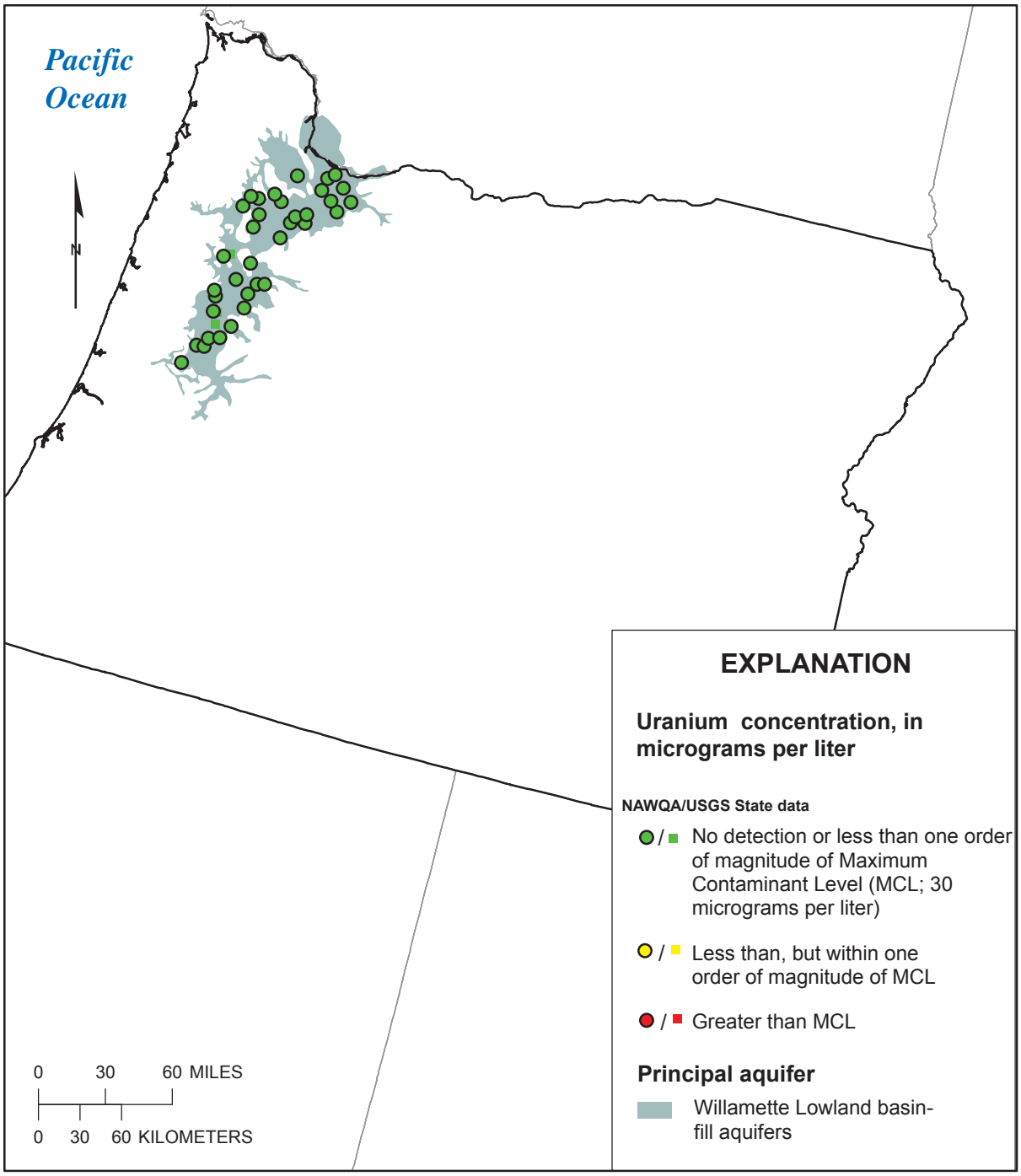
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR15. Concentration of trichloroethene (TCE) in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

Figure OR16. Concentration of uranium in samples from domestic wells in Oregon (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).