State Summary for Utah

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 Utah is shown in figures UT1–UT16. 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 that included Utah and had at least 10 samples is given in table UT1. The areal extent of the NAWQA major-aquifer study goes slightly beyond the State boundary (fig. UT4). All data associated with the major-aquifer study are provided and are used in contaminant summaries even if the sampled well was located outside the State boundary. The "Selected References" section at the end of this summary lists previous Utah studies that are relevant to the 11 contaminants.

In Utah, the largest area with the highest population density is located in the north-central part of the State (fig. UT1). In general, the population density in Utah is low except in urban centers (fig. UT1). No data are available for Utah on the percentage of the domestic (private) supply obtained from ground water, and about 57 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 variable throughout the State, and less than 250 people per census block group were using ground water as a domestic water supply in some of the less populated areas of the State (fig. UT2). Most of the land use in Utah is rangeland, forest land, and barren (fig. UT3).

One major-aquifer study in one principal aquifer (Basin and Range basin-fill aquifers) was conducted in Utah (fig. UT4). The Basin and Range basin-fill aquifers are located in western Utah and consist of thick deposits of basin fill in valleys bounded by mountain ranges. The basin fill primarily consists of unconsolidated to moderately consolidated, well- to poorly sorted beds of gravel, sand, silt, and clay deposited on alluvial fans, pediments, flood plains, and playas (Robson and Banta, 1995). Recharge primarily is derived from precipitation in the mountains surrounding the basins, and discharge primarily is from pumping wells used mostly for irrigation (Robson and Banta, 1995).

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. UT5) 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, arsenic, uranium, and manganese had concentrations greater than USEPA human-health benchmarks in some of the water samples (table UT1). Radon had the greatest potential human-health concern because it had the largest percentage of samples with concentrations greater than the human-health benchmark of 300 picocuries per liter (pCi/L), which is the proposed Maximum Contaminant Level (MCL). Radon concentrations were greater than the proposed MCL in about 94 percent of the samples (table UT1) collected from the grslsus1 major-aquifer study in the Basin and Range basin-fill aquifers. Median radon concentrations were about 700 pCi/L (fig. UT5), and none of the radon concentrations were greater than the alternative proposed MCL of 4,000 pCi/L (table UT1). Radon-222 is a decay product of radium-226, and radon concentrations greater than the human-health benchmark are widespread and probably can be attributed to natural sources in the soil and rock material in Utah.

Arsenic had the next largest potential concern to human health. Arsenic concentrations were greater than the human-health benchmark (MCL of 10 micrograms per liter (µg/L)) in about 16 percent of the samples from the grslsus1 major-aquifer study in the Basin and Range basin-fill aquifers

Table UT1. 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 that included Utah and had at least 10 samples.

Study-Unit code for NAWQA major-aquifer study	Principal aquifer	Contaminant	Number of samples	Percentage of samples with concentrations greater than human-health benchmark
grslsus1	Basin and Range basin-fill aquifers	Radon	32	[1]94/0.0
grslsus1	Basin and Range basin-fill aquifers	Arsenic	32	16
grslsus1	Basin and Range basin-fill aquifers	Uranium	32	3.1
grslsus1	Basin and Range basin-fill aquifers	Manganese	33	3.0

[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).

(table UT1). Median arsenic concentrations were within an order of magnitude of the human-health benchmark (fig. UT5). The USGS State data includes samples from aquifers other than the Basin and Range basin-fill aquifers sampled by NAWQA. U.S. Geological Survey (USGS) State data showed that arsenic concentrations were greater than the human-health benchmark in sporadic samples throughout the State (fig. UT6).

NAWQA data showed manganese concentrations to be greater than the human-health benchmark (Lifetime Heath Advisory (HA) of 300 µg/L) in one sample in north-central Utah in the Basin and Range basin-fill aquifers (fig. UT10). More samples were available from USGS State data than the NAWQA data set, and USGS State data better defined the geographical extent of manganese concentrations greater than the human-health benchmark (fig. UT10).

NAWQA data did not show any nitrate concentrations greater than the human-health benchmark, which is the MCL of 10 milligrams per liter (mg/L) (fig. UT11); however, median nitrate concentrations were within an order of magnitude of the human-health benchmark (fig. UT5). USGS State data had several sporadic samples with nitrate concentrations greater than the human-health benchmark (fig. UT11). These nitrate concentrations appear coincident with the sparse agricultural land use.

Uranium concentrations were greater than the human-health benchmarks in one sample (about 3 percent) from the grslsus1 major-aquifer study in the Basin and Range basin-fill aquifers (table UT1). The MCL for uranium is 30 pCi/L.

NAWQA data did not show any strontium concentrations greater than the human-health benchmark (Lifetime Health Advisory (HA) of 4,000 µg/L) (fig. UT14). However, USGS State data had several sporadic samples that contained strontium at concentrations greater than the human-health benchmark (fig. UT14).

For the entire Utah data set, no concentrations of atrazine (fig. UT7), benzene (fig. UT8), CIAT (fig. UT9), PCE (fig. UT12), and TCE (fig. UT15) were greater 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.

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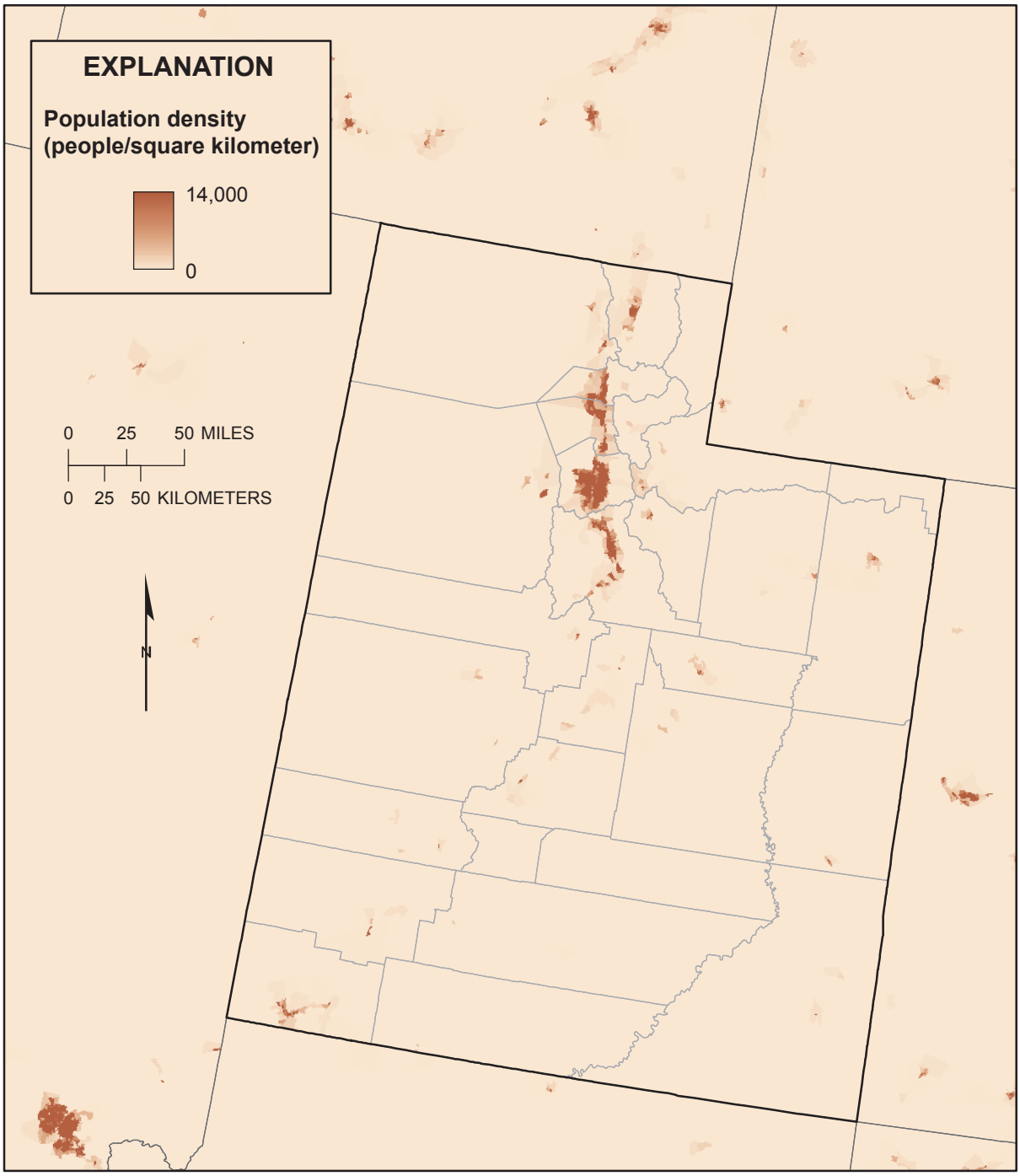
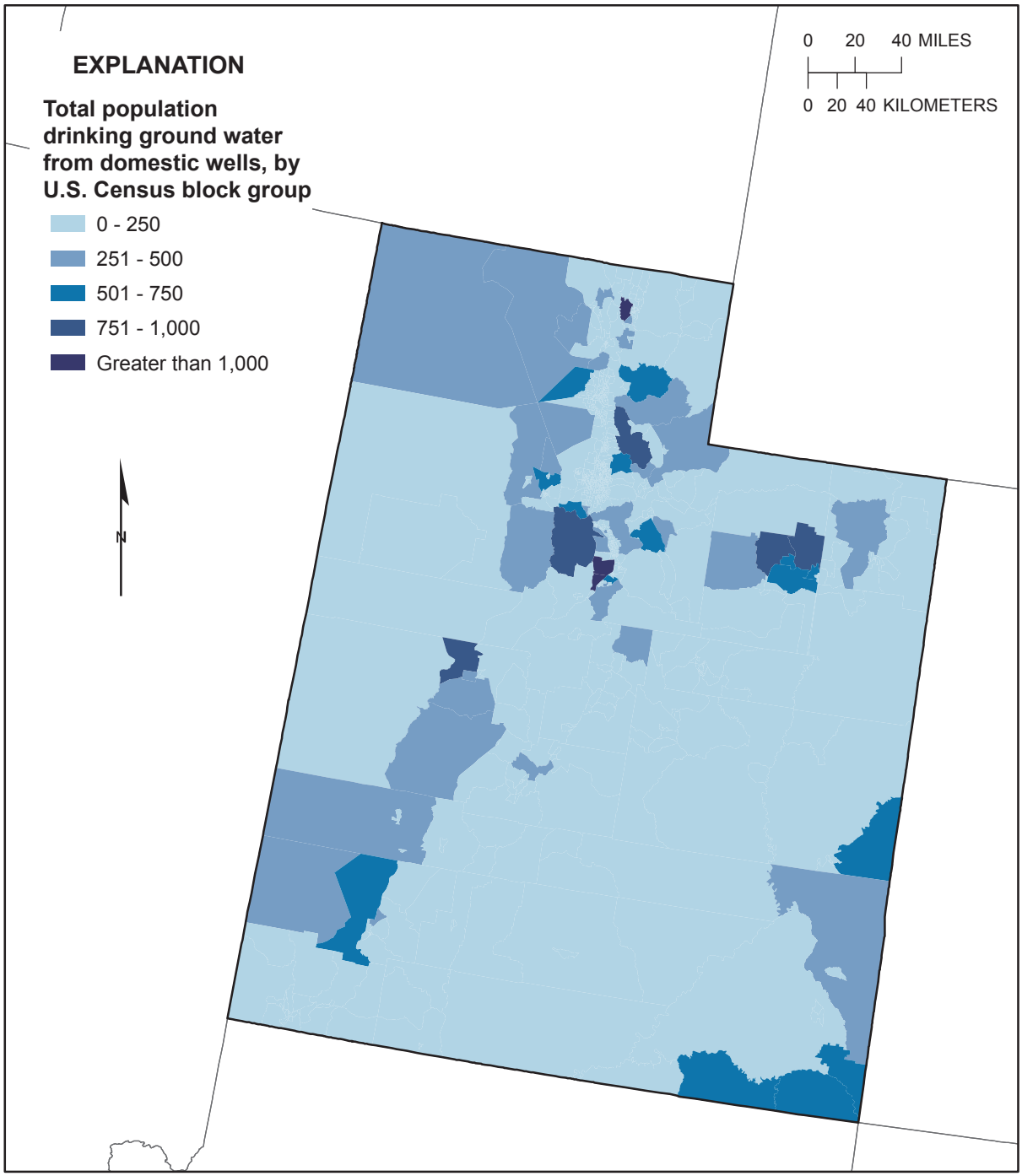


Base information from U.S. Geological Survey digital data, 1:2,000,000
Albers Equal-Area projection
Standard Parallels 29º30' and 45º30', central meridian -96º

Figure UT1. Population density for Utah and nearby States. (Data from Hitt, 2003.)



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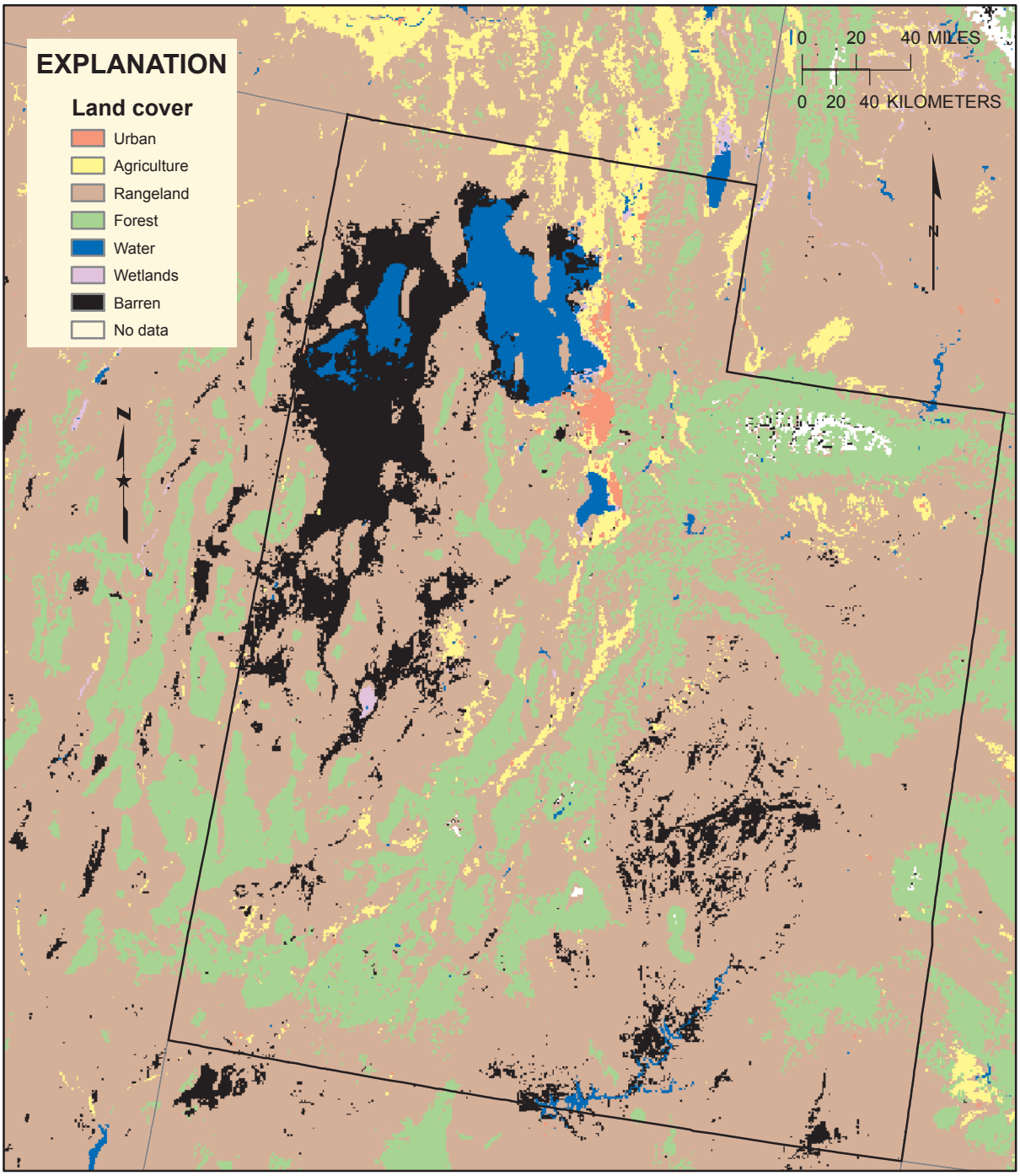
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Figure UT2. Population using domestic-water supply (from ground water) for Utah. (Data from 1990 U.S. Census block group, Kerie Hitt, U.S. Geological Survey, written commun., 1997.)



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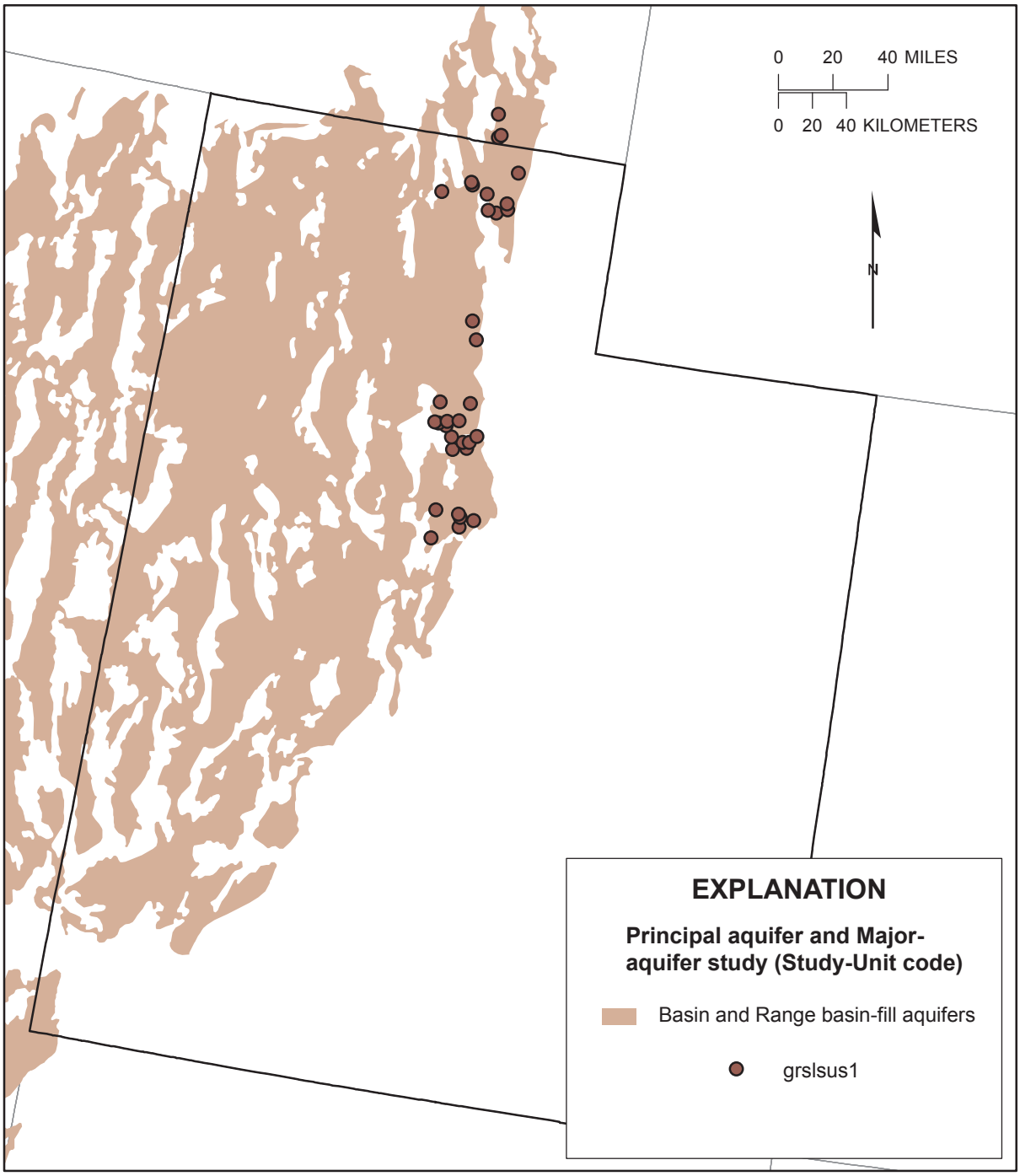
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

Figure UT3. Land use/land cover for Utah and nearby States. (Data from Naomi Nakagaki, U.S. Geological Survey, written commun., 2005.)



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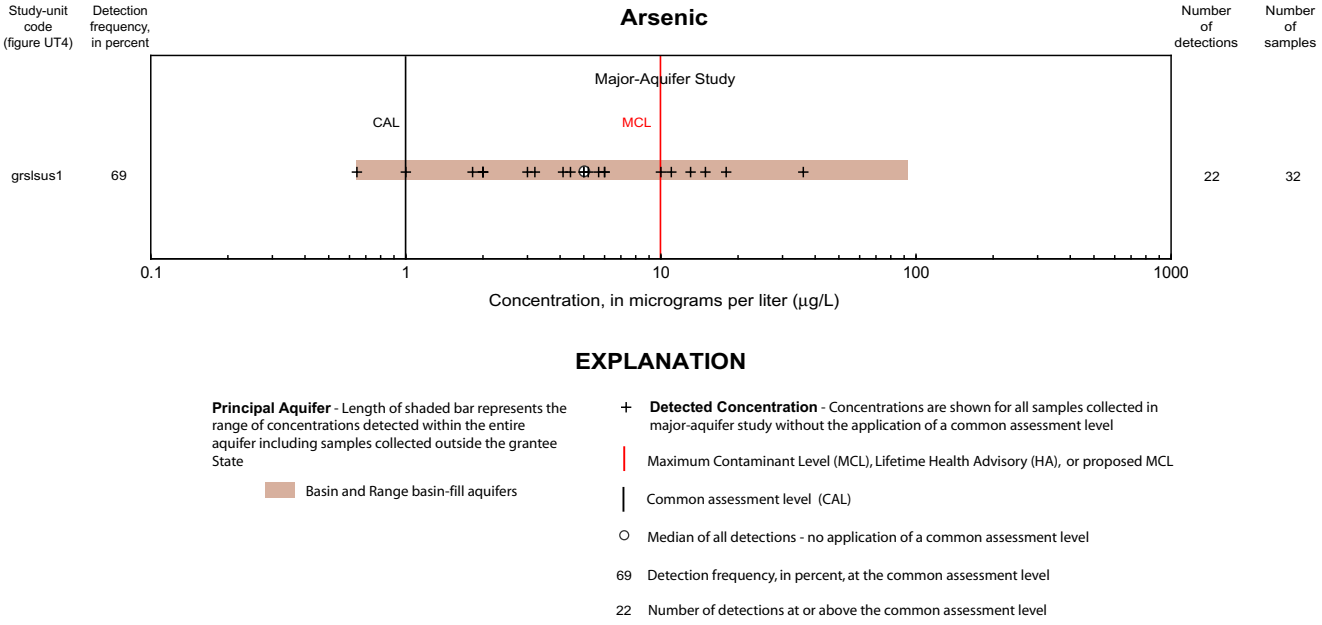
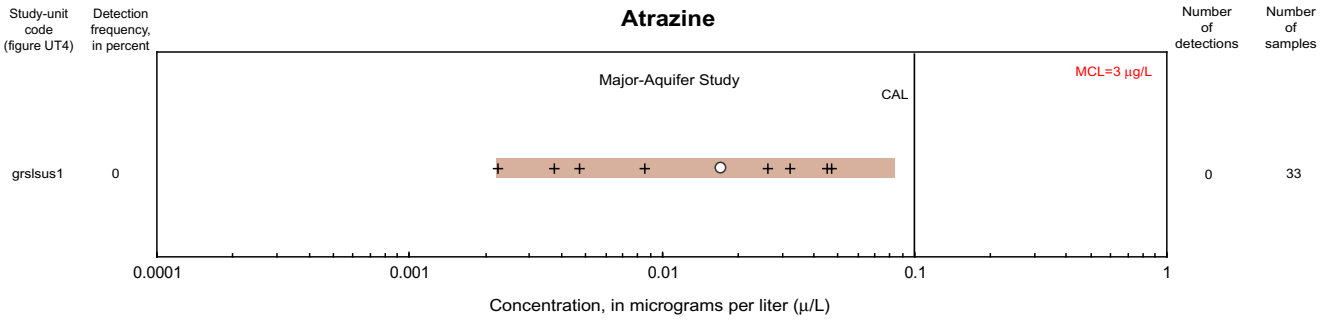
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

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

Figure UT4. Location of domestic wells sampled for National Water-Quality Assessment (NAWQA) major-aquifer studies that included Utah.





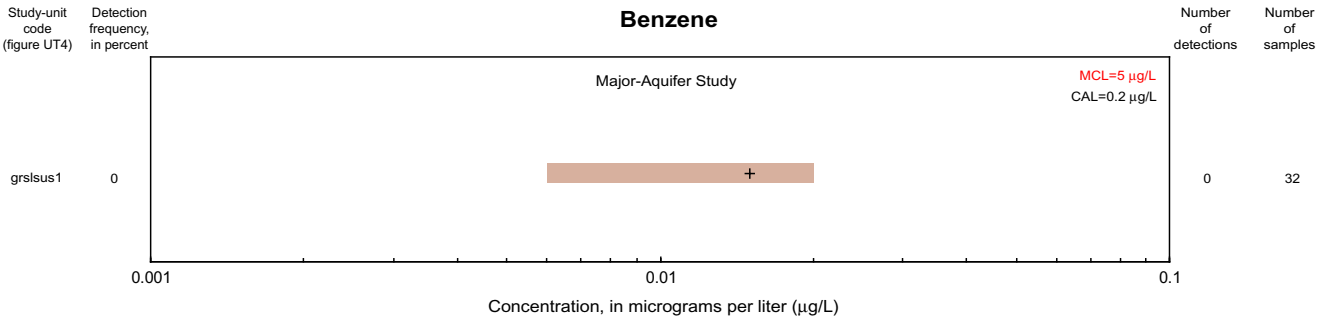


Figure UT5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Utah (includes studies for which at least 10 analyses were available).

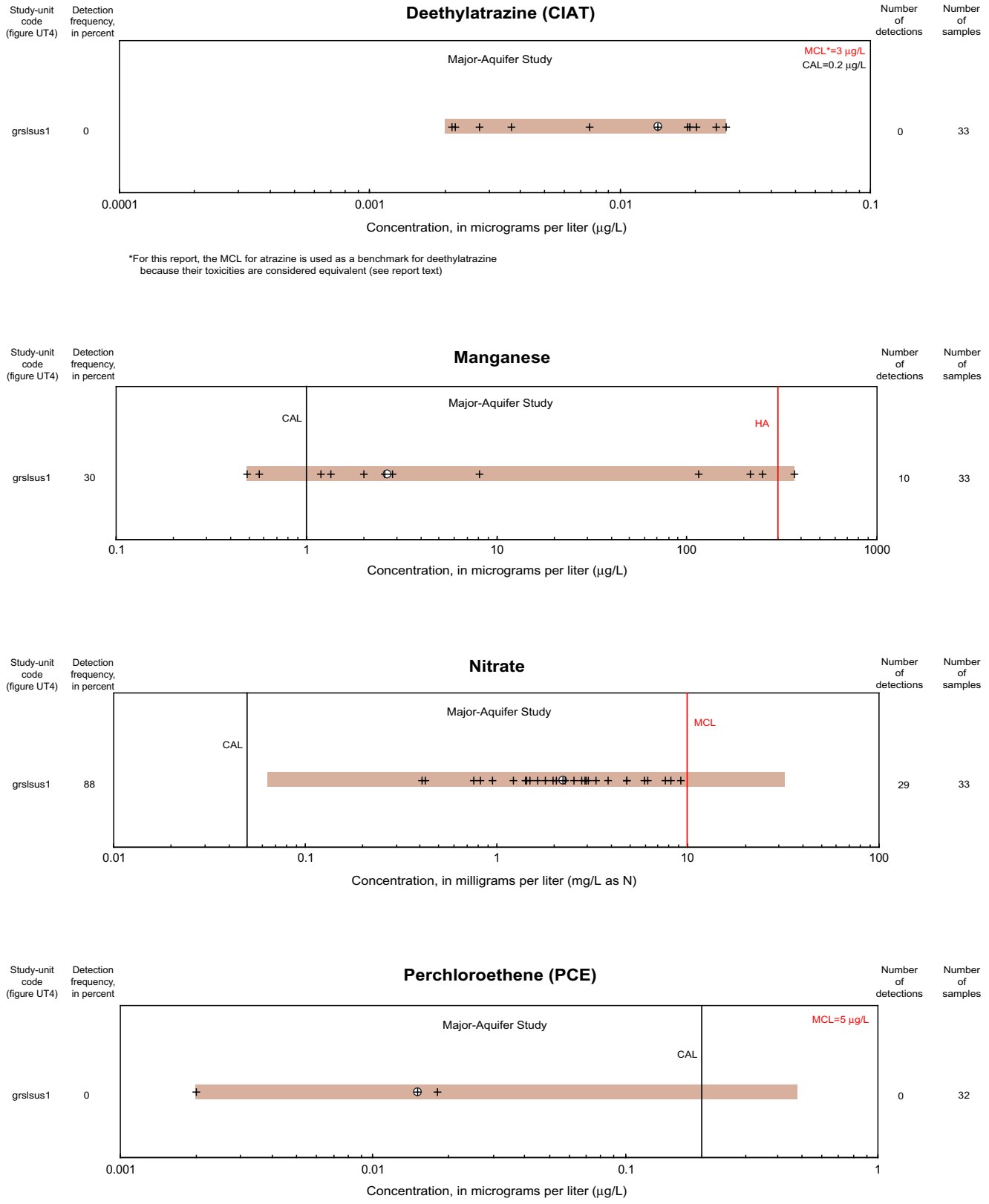
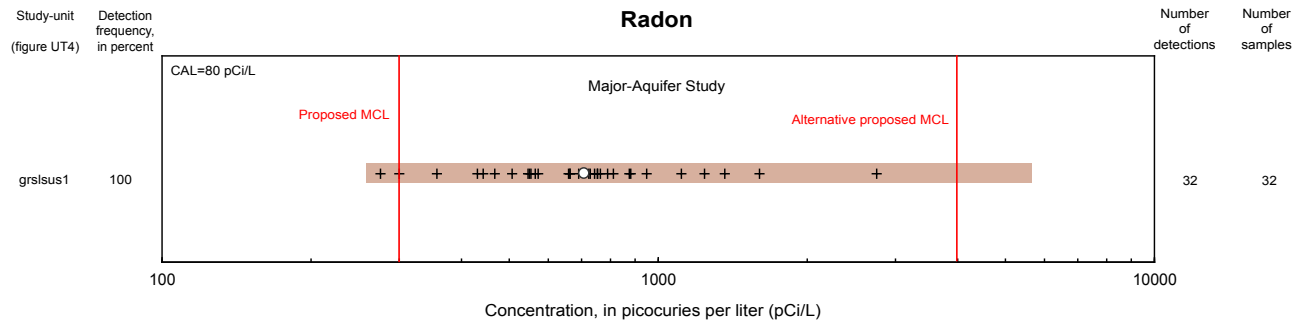
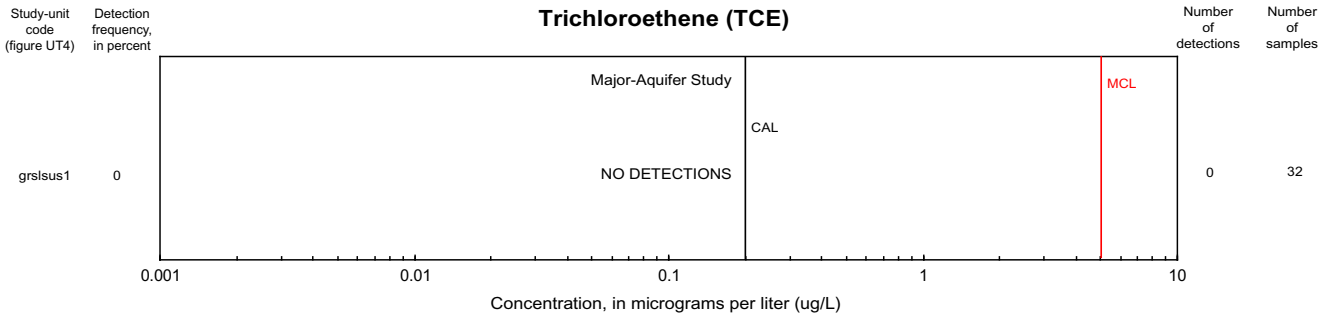


Figure UT5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Utah (includes studies for which at least 10 analyses were available).—Continued



There are less than 10 strontium analyses for Utah.



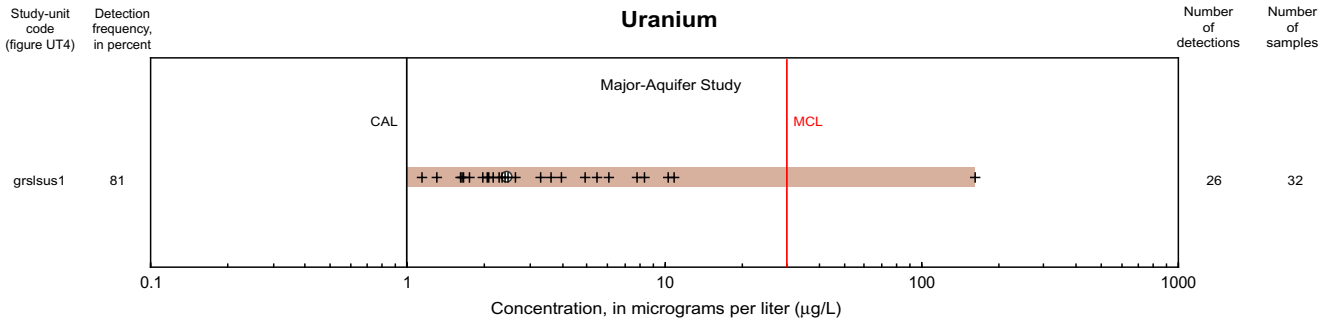
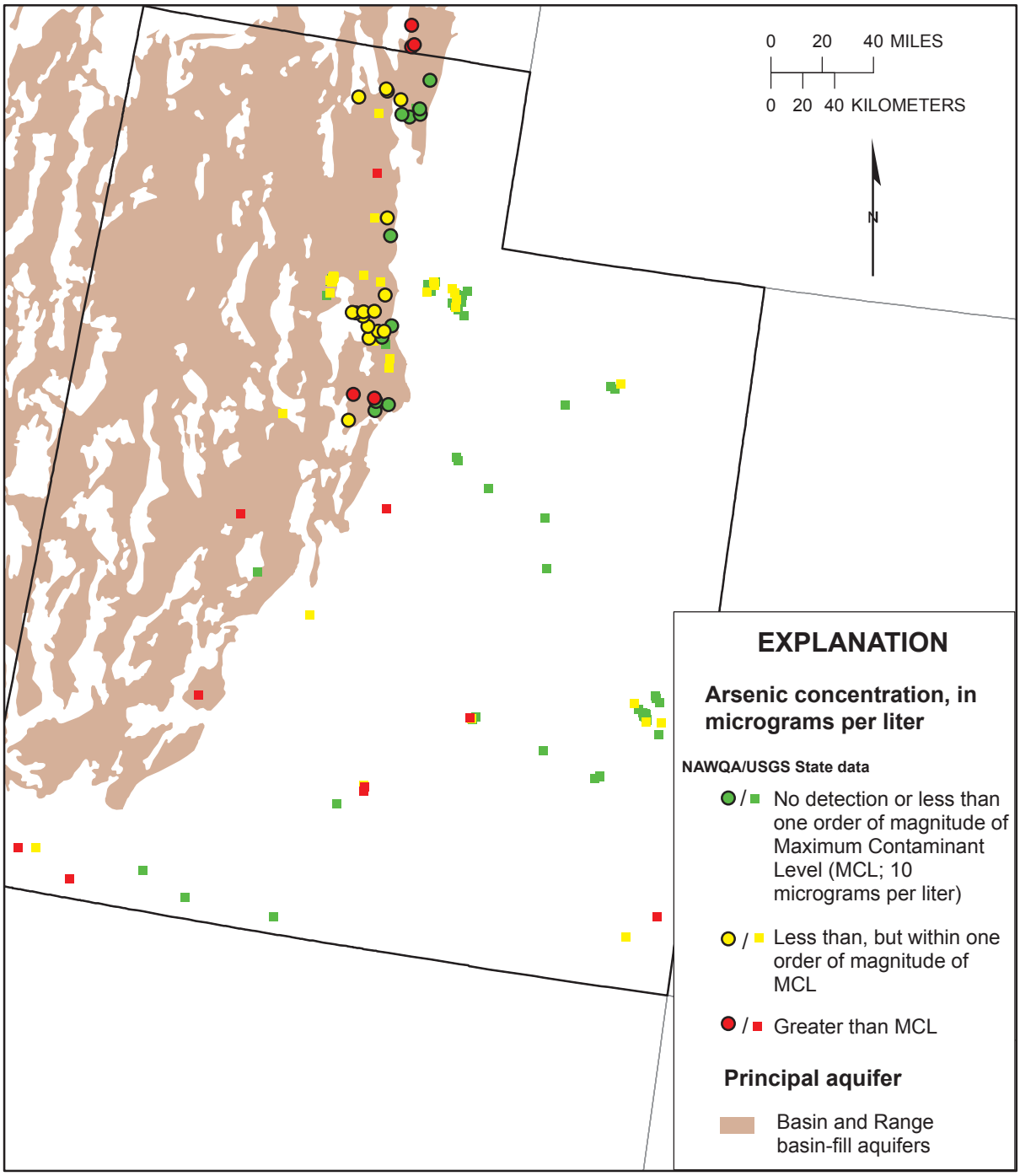


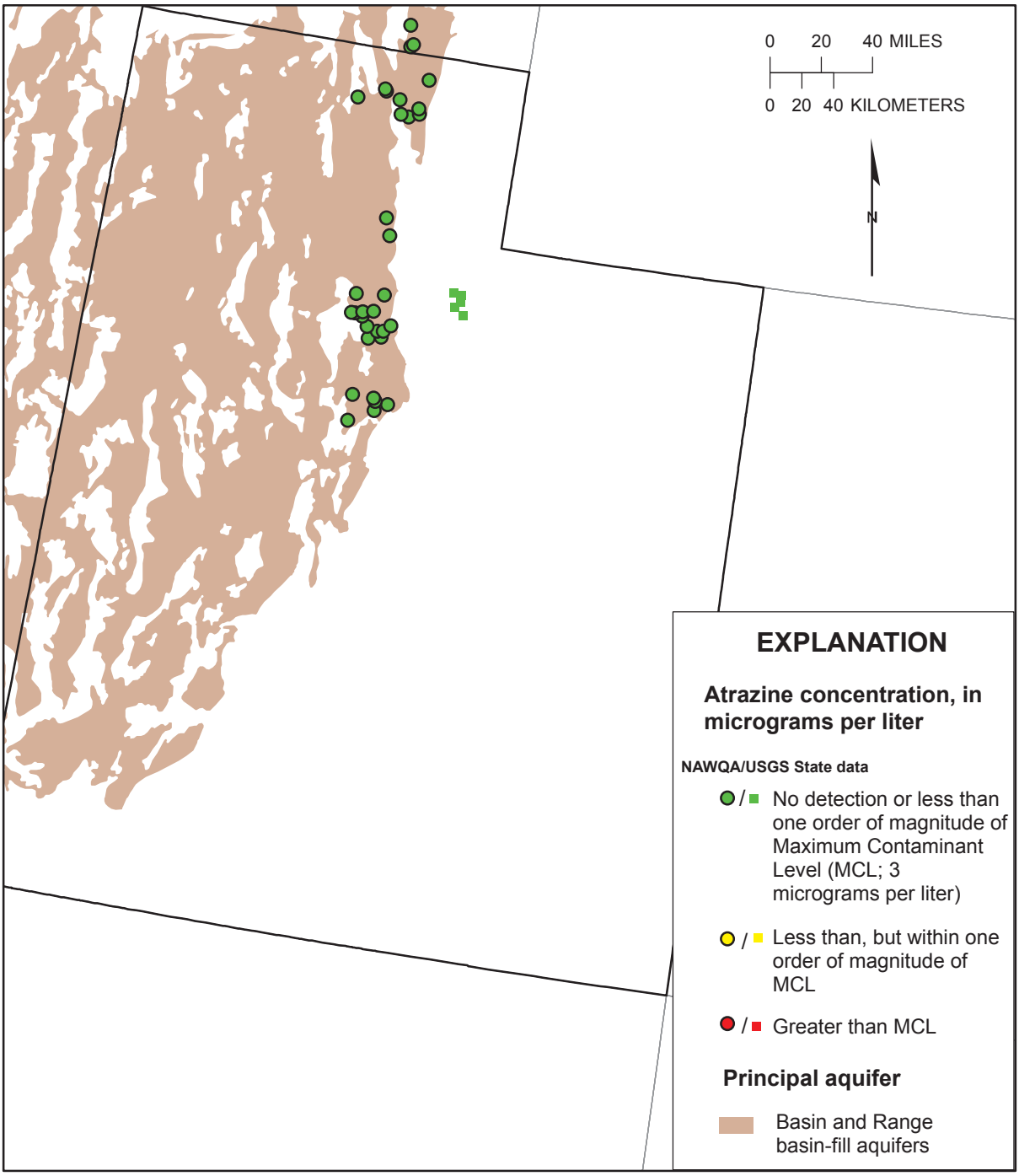
Figure UT5. Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Utah (includes studies for which at least 10 analyses were available).—Continued



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

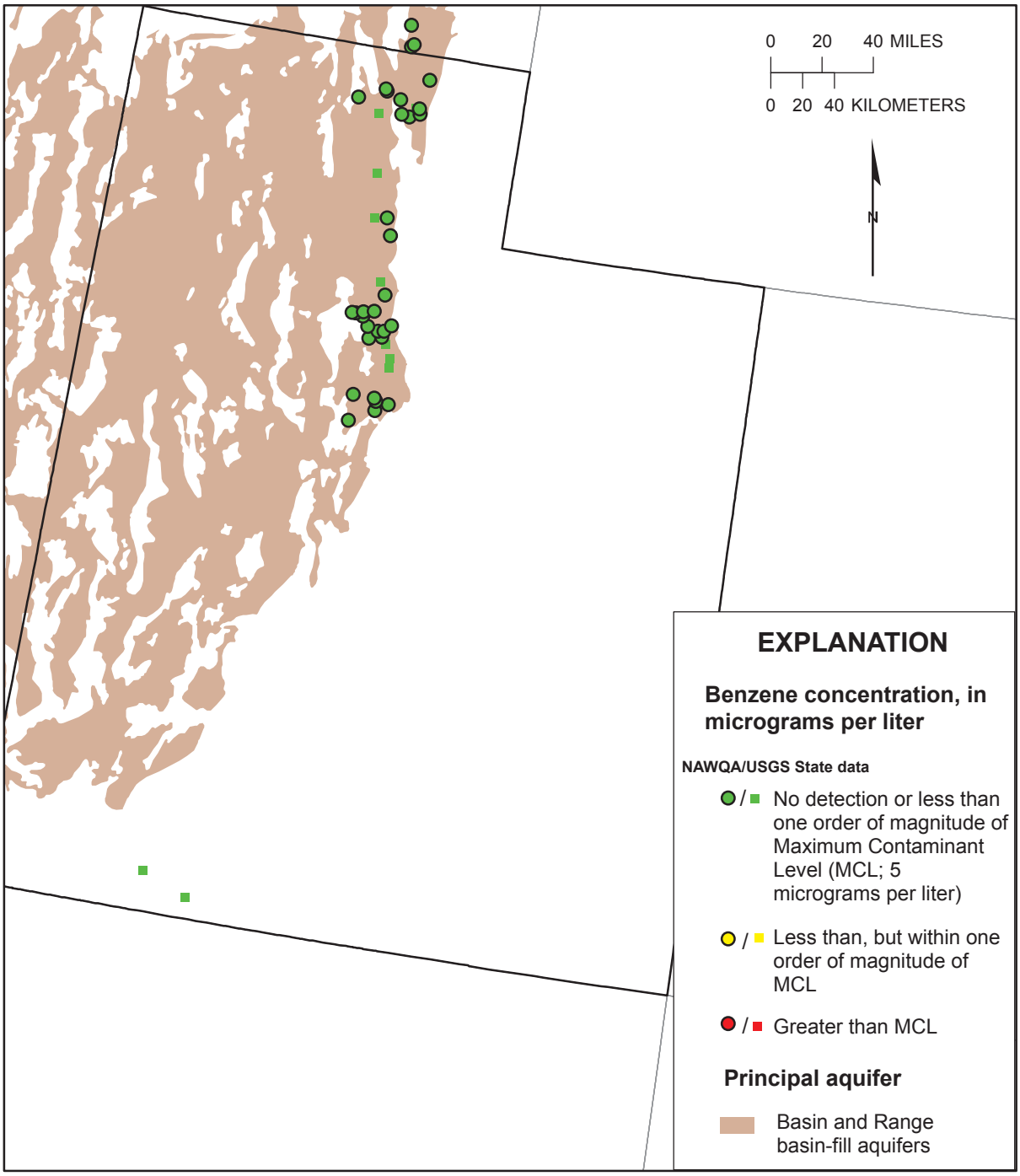
Figure UT6. Concentration of arsenic in samples from domestic wells in Utah and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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 UT7. Concentration of atrazine in samples from domestic wells in Utah and nearby States (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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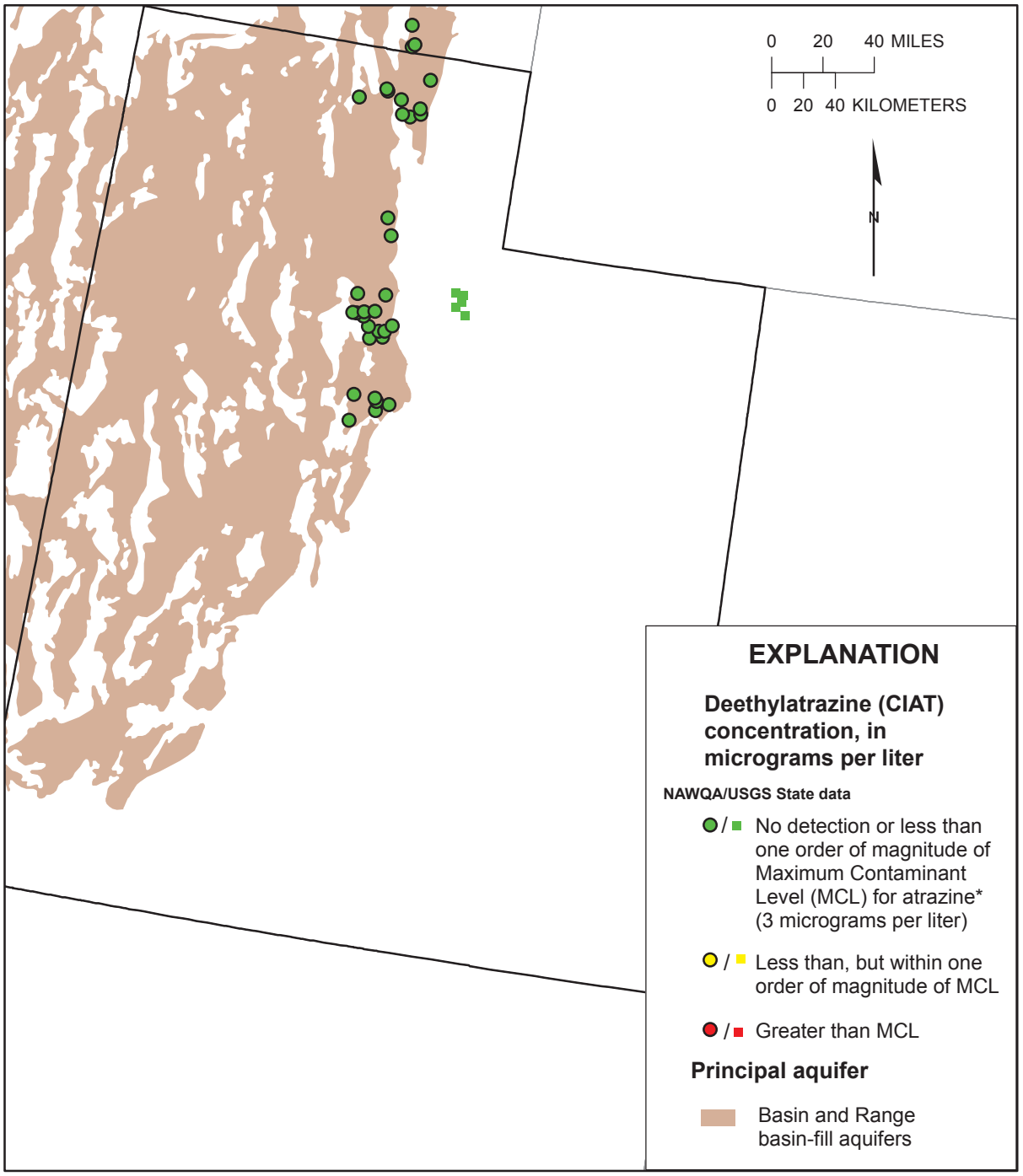
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

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

Figure UT8. Concentration of benzene in samples from domestic wells in Utah and nearby States (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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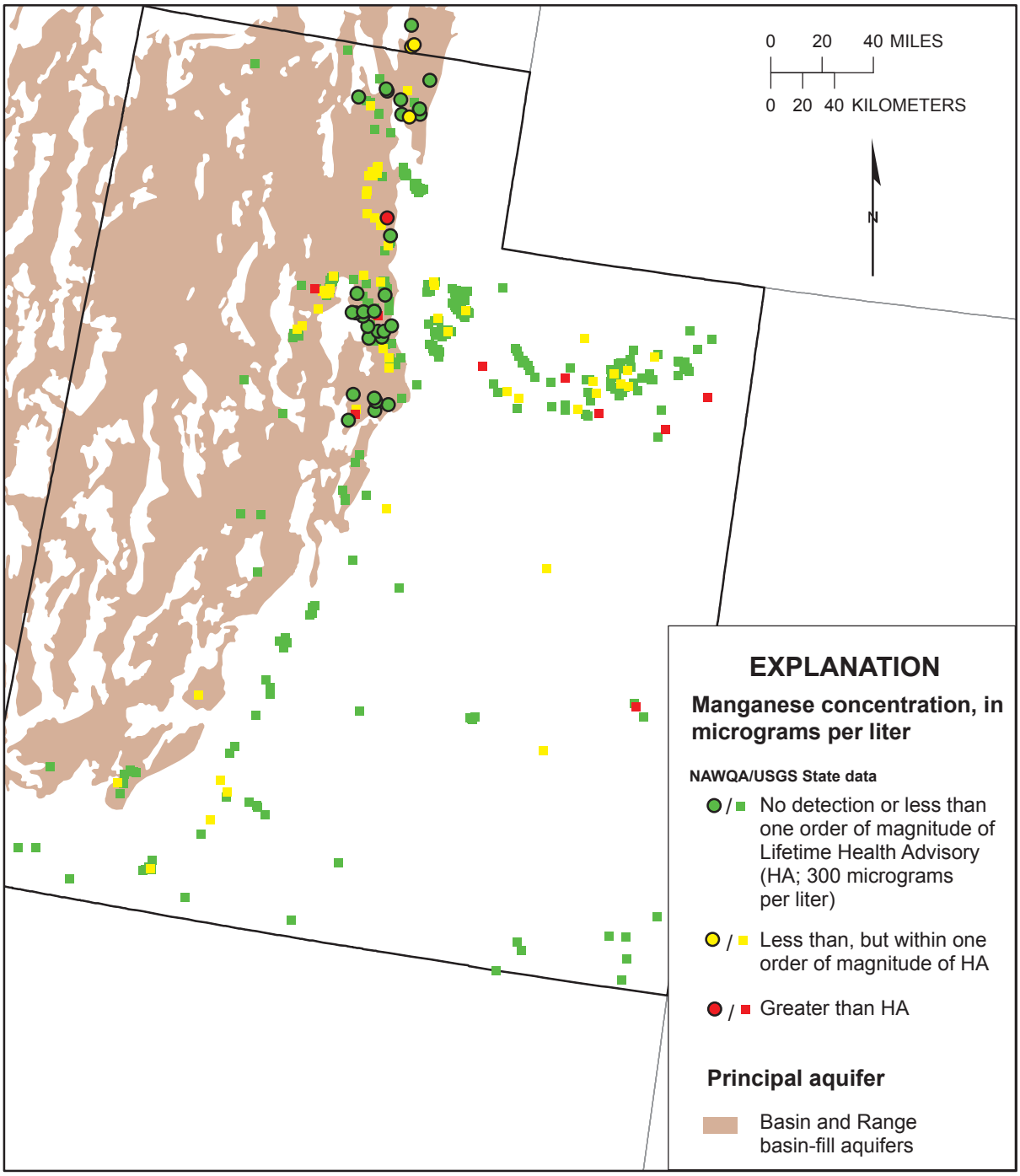
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

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

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

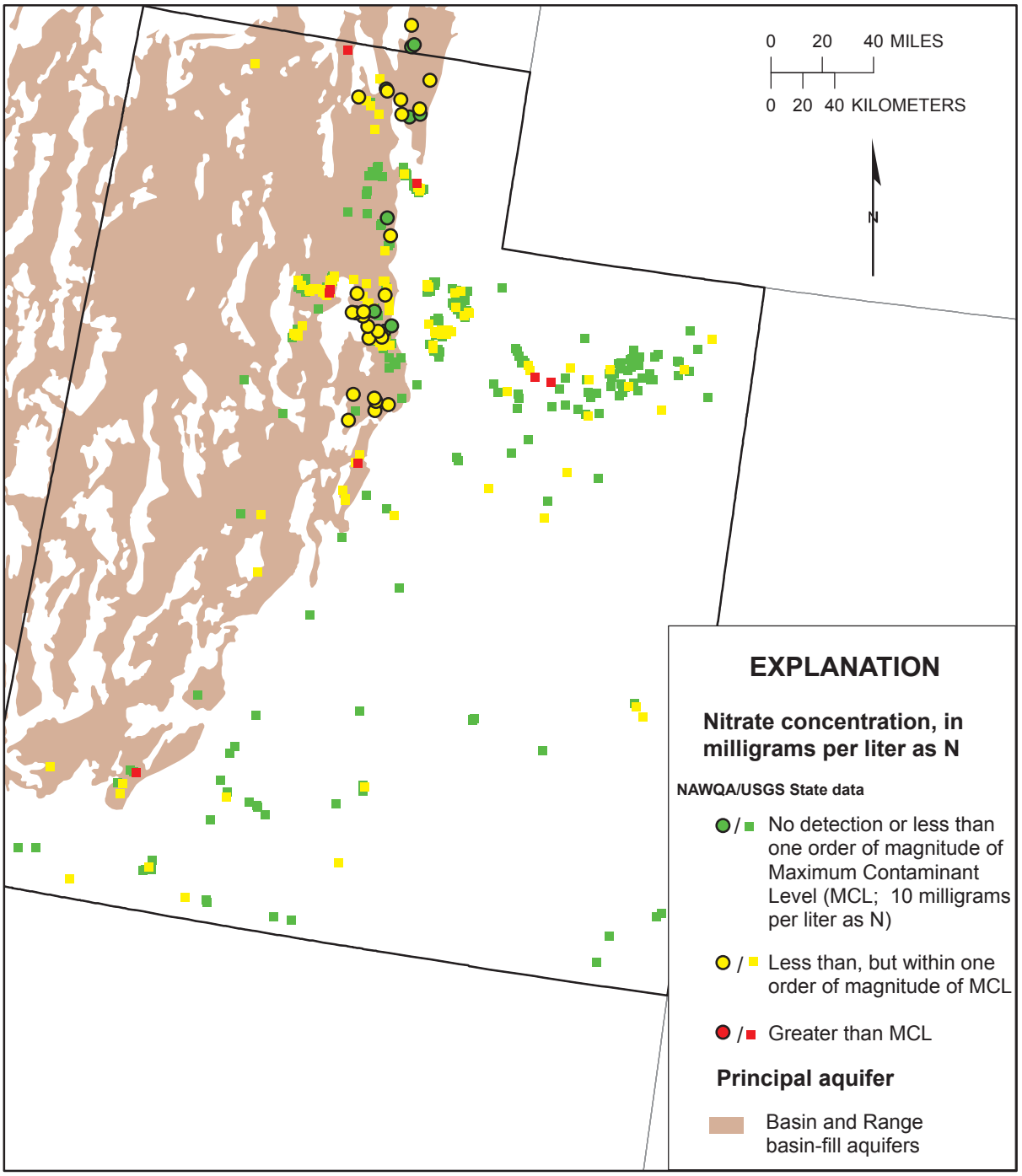
Figure UT9. Concentration of deethylatrazine (CIAT) in samples from domestic wells in Utah (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey State data in the National Water Information System (NWIS)).



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 UT10. Concentration of manganese in samples from domestic wells in Utah and nearby States (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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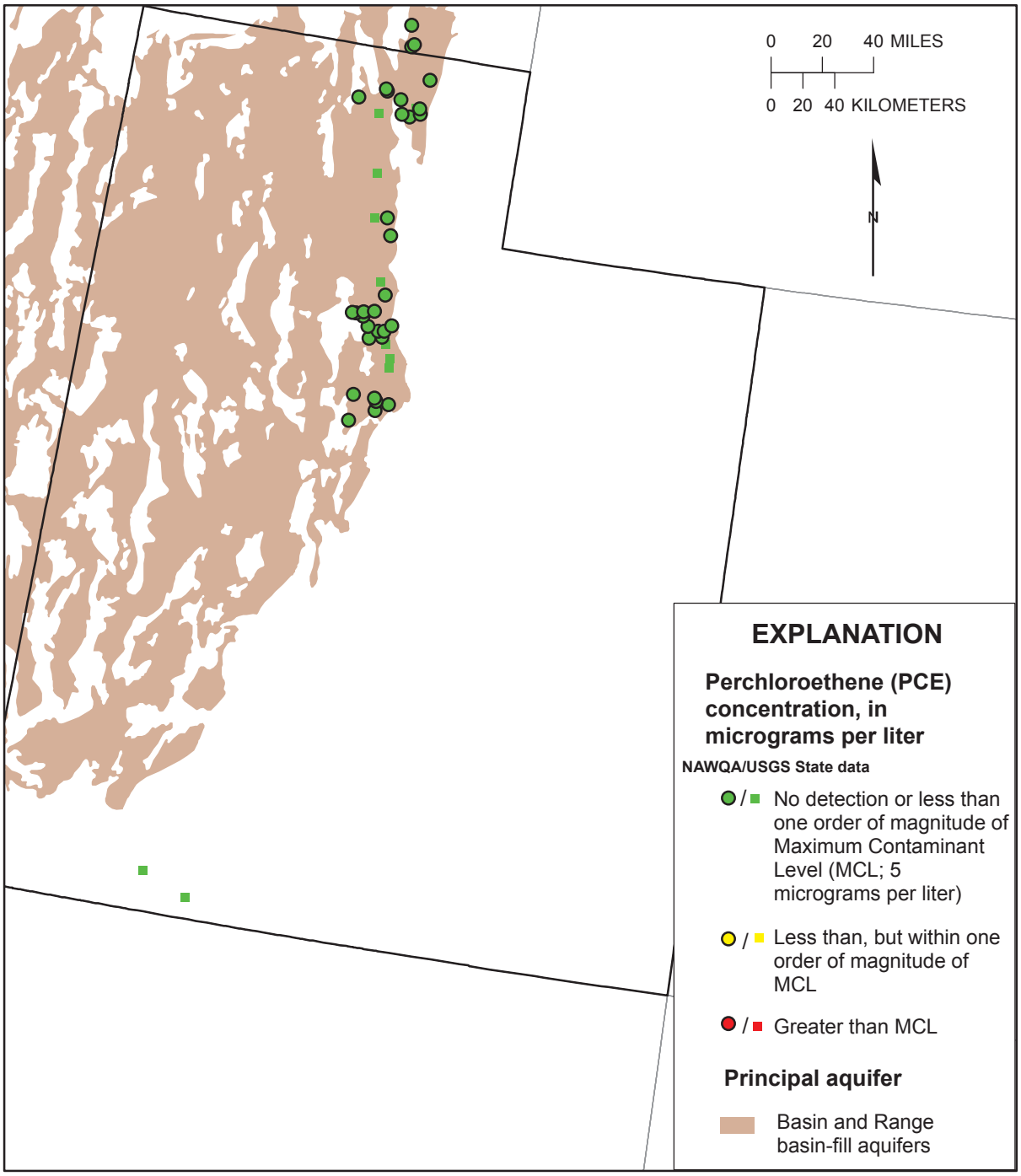
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

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

Figure UT11. Concentration of nitrate in samples from domestic wells in Utah and nearby States (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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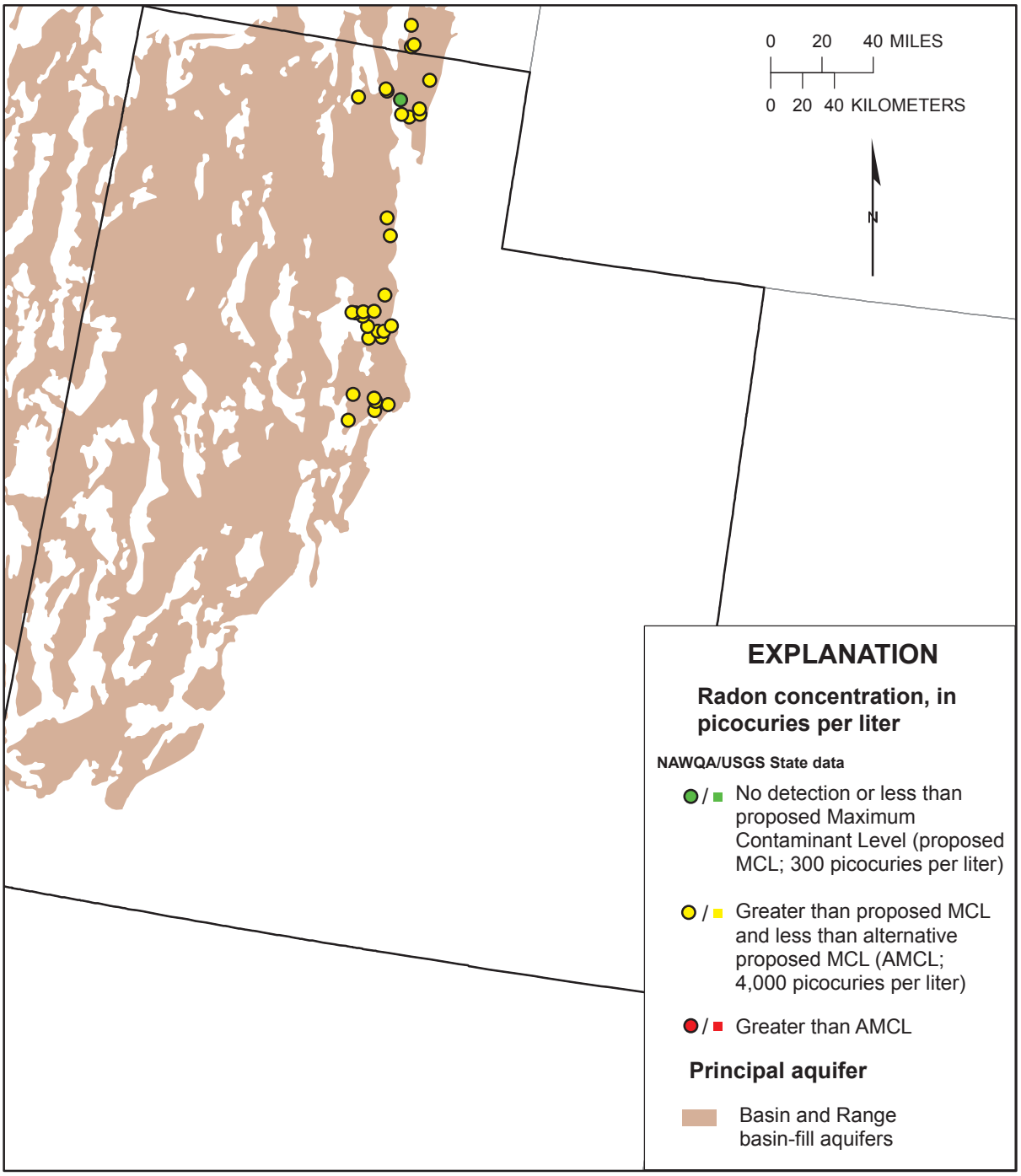
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian -96°

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

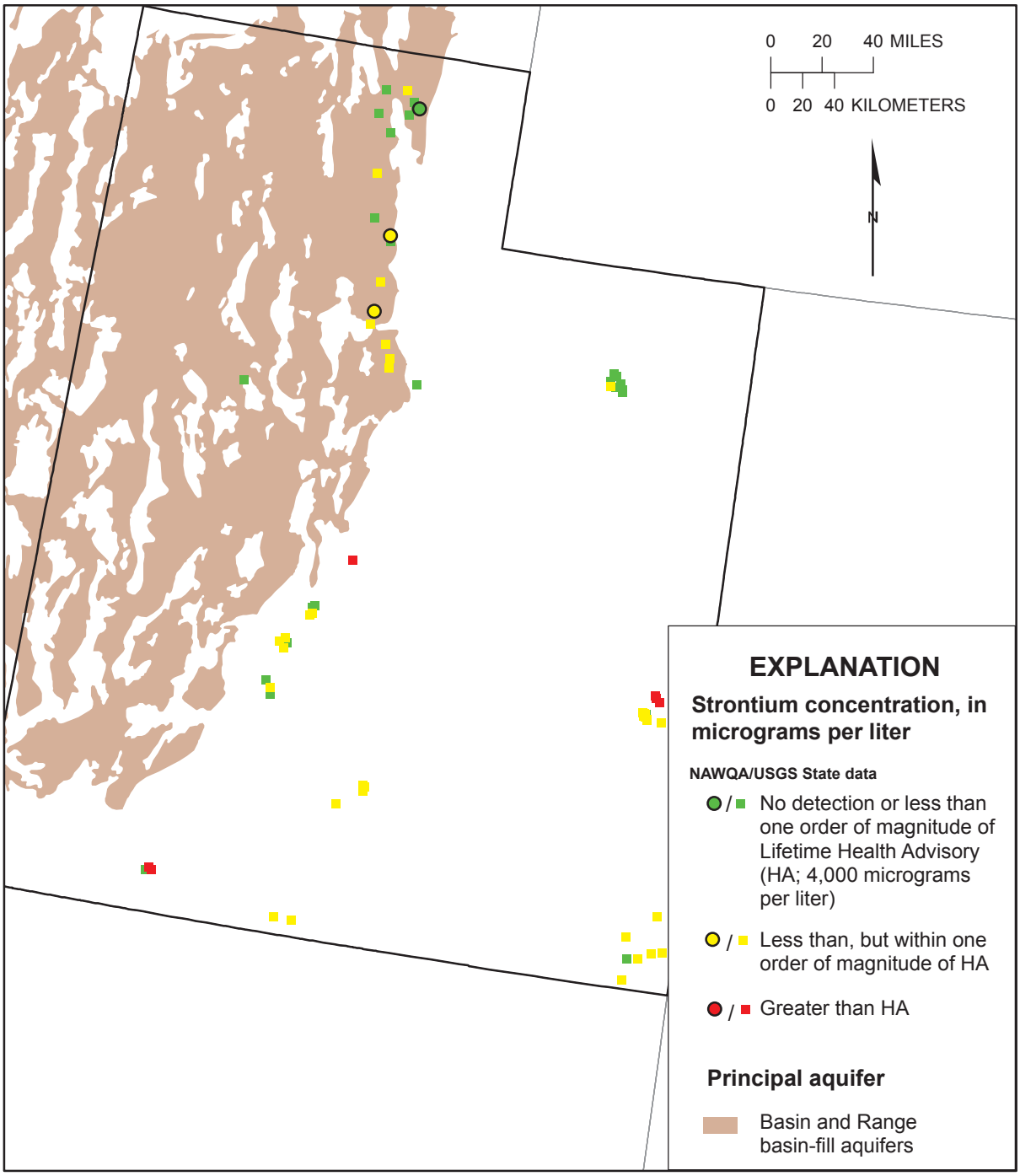
Figure UT12. Concentration of perchloroethene (PCE) in samples from domestic wells in Utah and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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

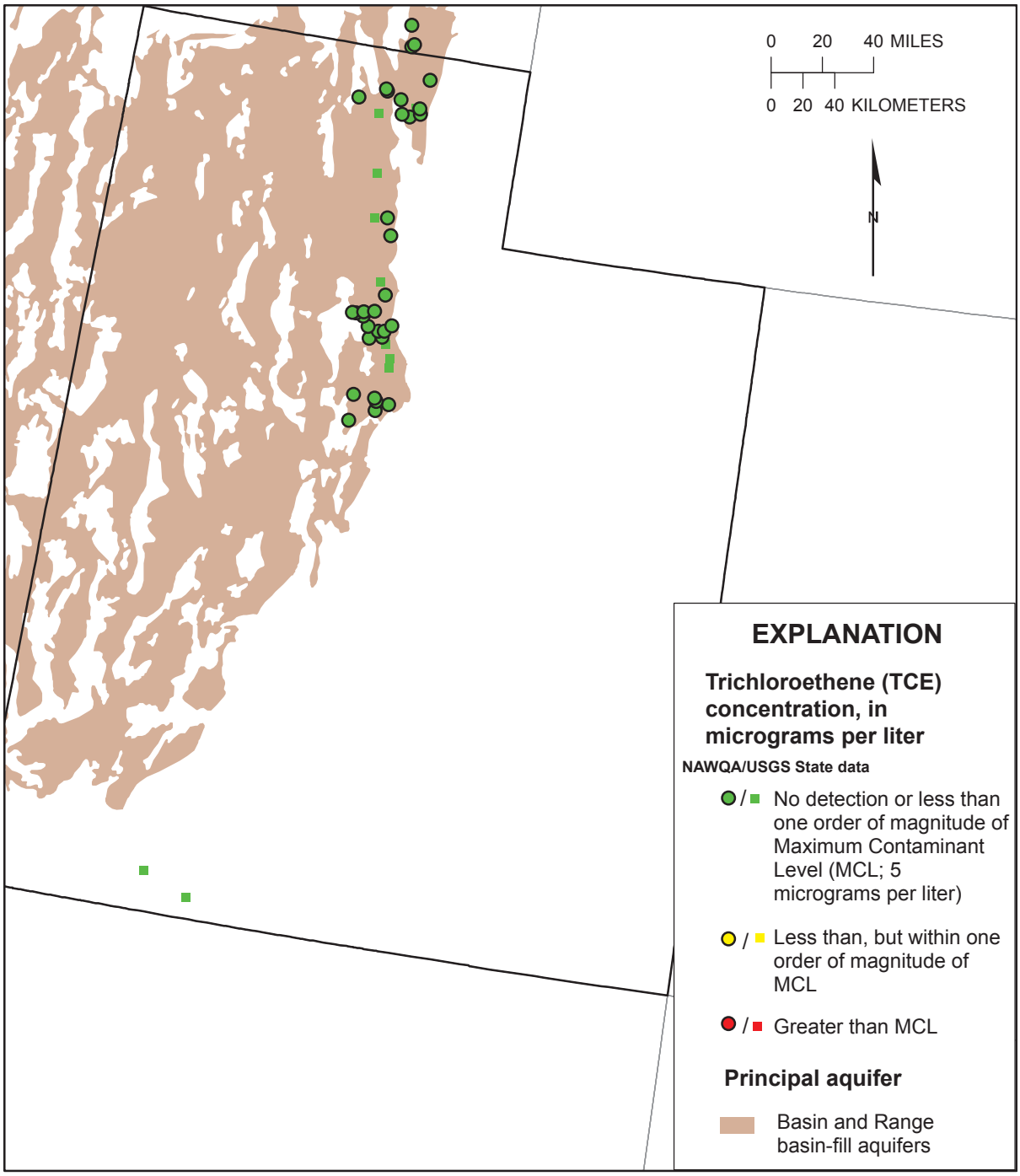
Figure UT13. Concentration of radon in samples from domestic wells in Utah and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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

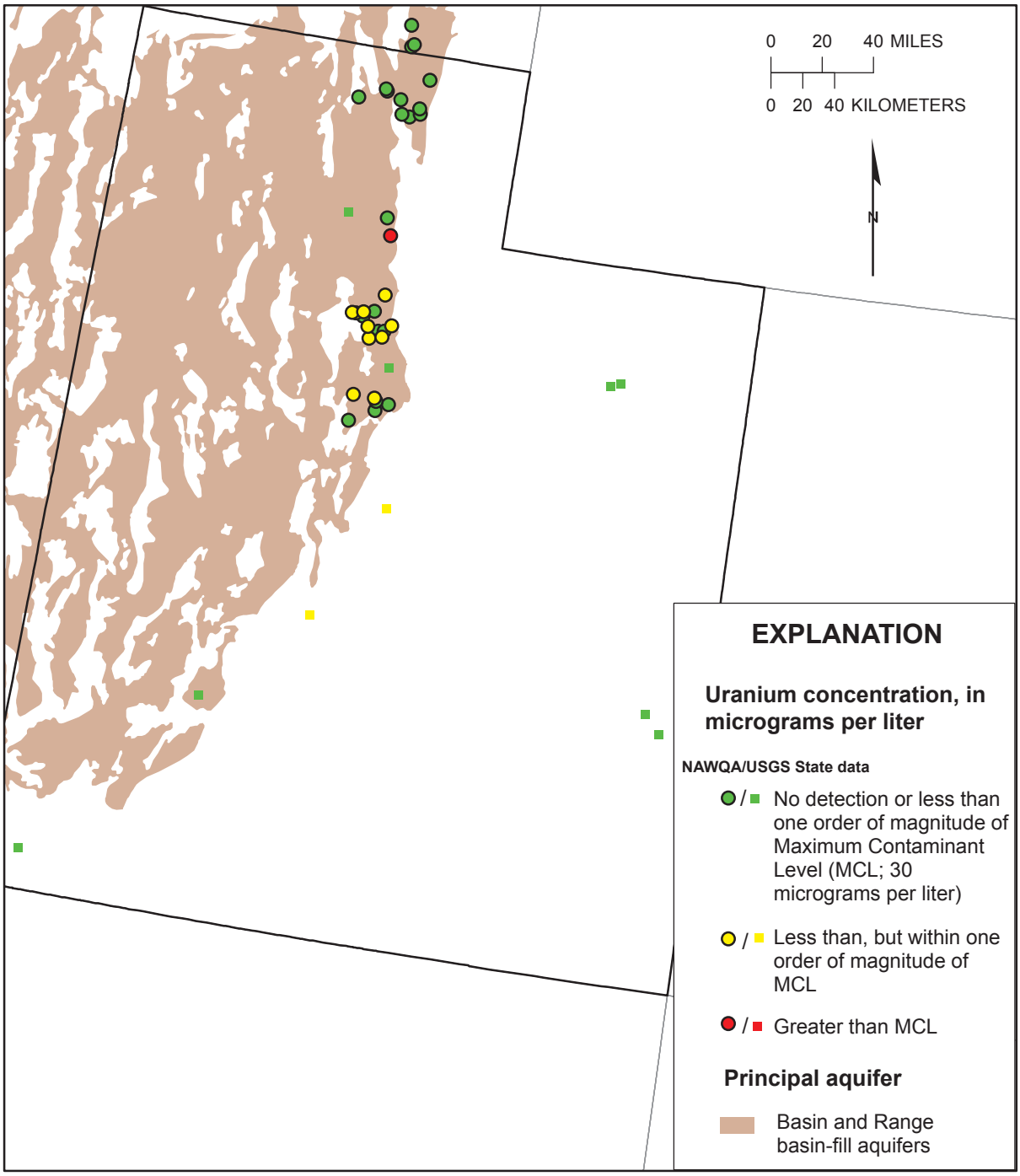
Figure UT14. Concentration of strontium in samples from domestic wells in Utah (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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 UT15. Concentration of trichloroethene (TCE) in samples from domestic wells in Utah and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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 UT16. Concentration of uranium in samples from domestic wells in Utah and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).