National Water-Quality Assessment Program

National Synthesis on Volatile Organic Compounds

Occurrence and Implications of MTBE and Gasoline Hydrocarbons in Ground Water and Source Water in the United States

by
Michael Moran

MTBE in the News

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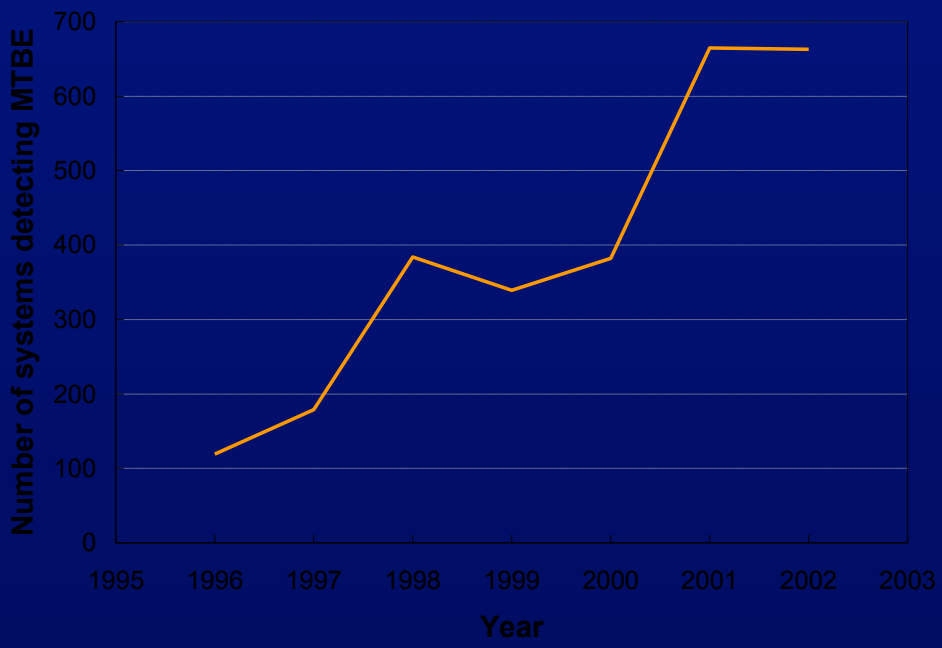
MTBE Effect on Drinking Water

Detections of MTBE in drinking water systems increased from 1996 to 2002



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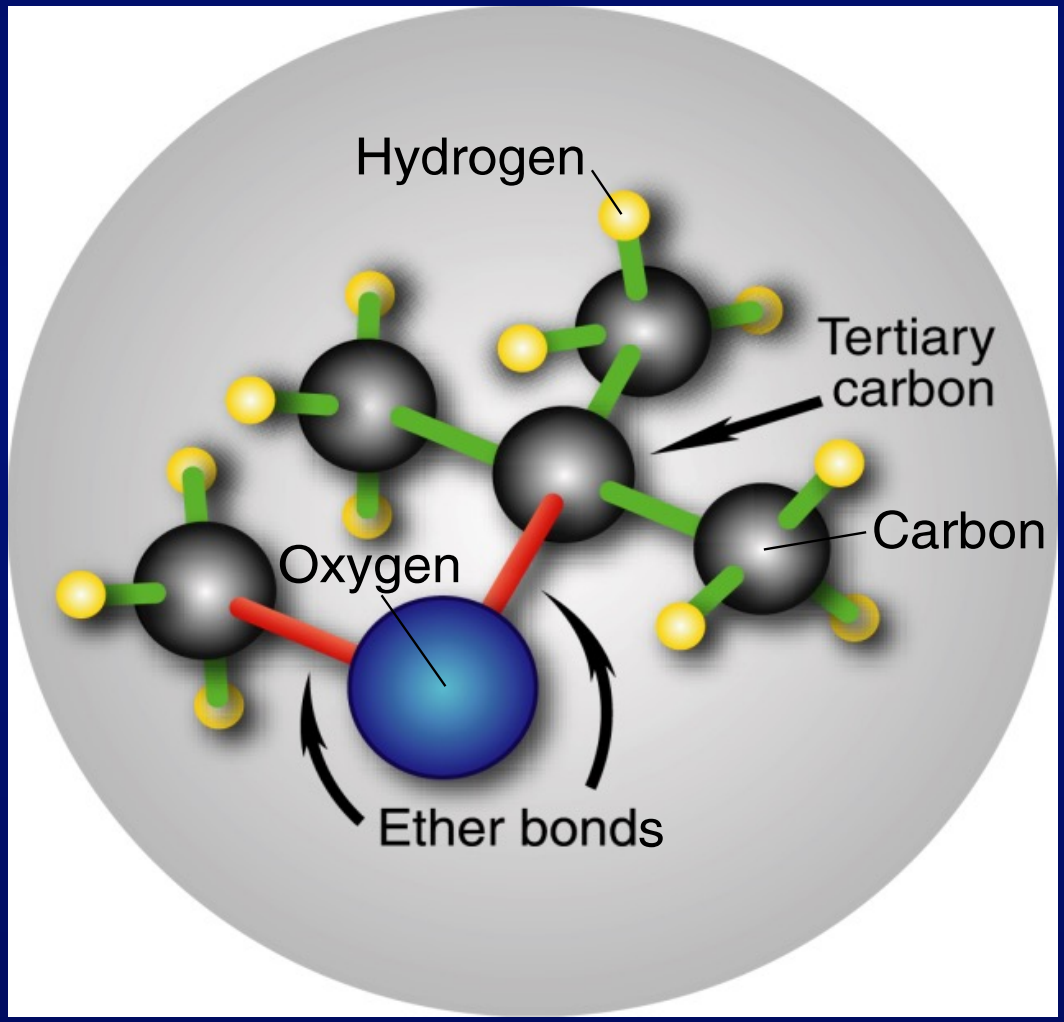
What is MTBE?



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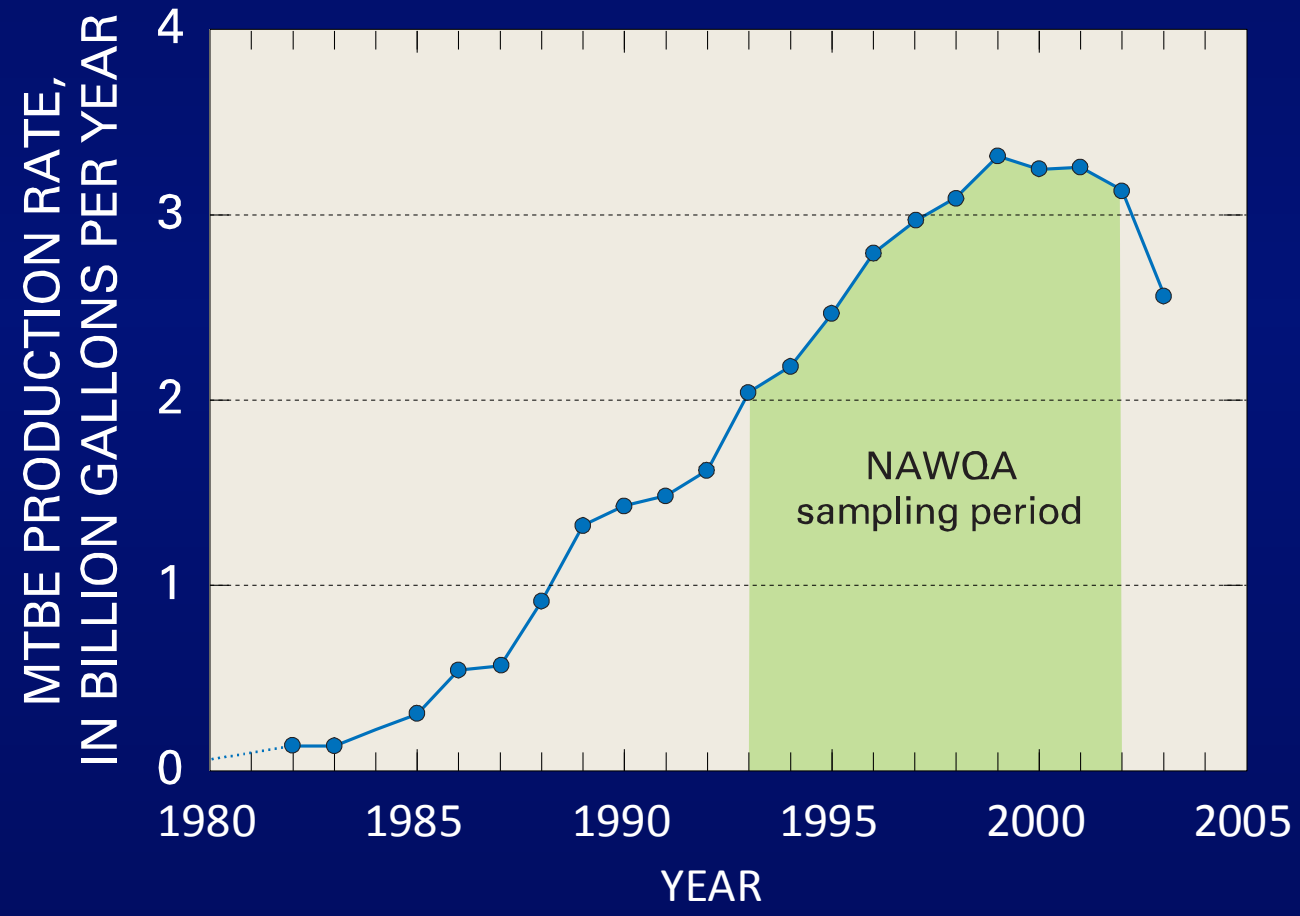
MTBE Use in the United States

Used as an octane enhancer in 1970's

Use increased in early 1990's due to clean air regulations

Oxygen requirement was removed in 2005

MTBE Production in the United States



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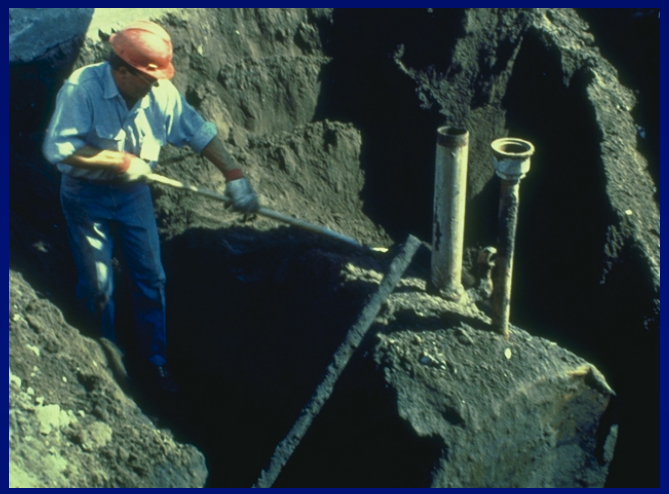
Sources of MTBE

Point Sources
- Storage tanks
- Transport accidents
- Pipelines
- Overfills
- Large consumer spills



Non-Point Sources
- Incomplete combustion
- Evaporative losses
- Storm-water runoff
- Small consumer spills

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USGS Work on MTBE

1. Ground Water
   a) NAWQA Studies
      i. Major Aquifer Studies
      ii. Land-Use Studies
         - Agricultural
         - Urban
   b) Retrospective Studies

2. Source Water
   a) AWWARF Study

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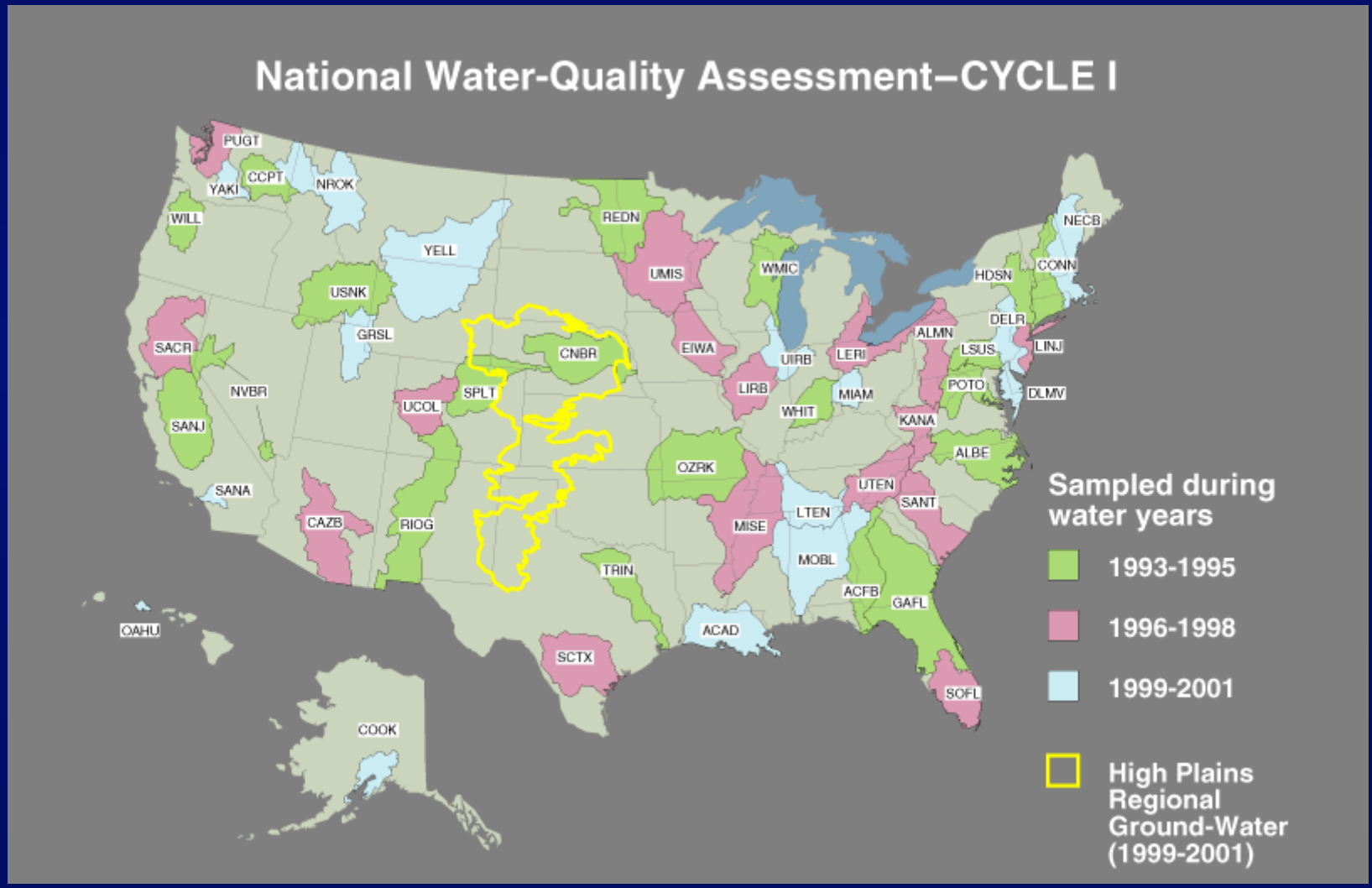
USGS NAWQA Progam



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AWWARF Study

National survey of MTBE and other VOCs in drinking-water sources

Random survey sampled 570+ Community Water Systems throughout the US

Wells were sampled prior to treatment

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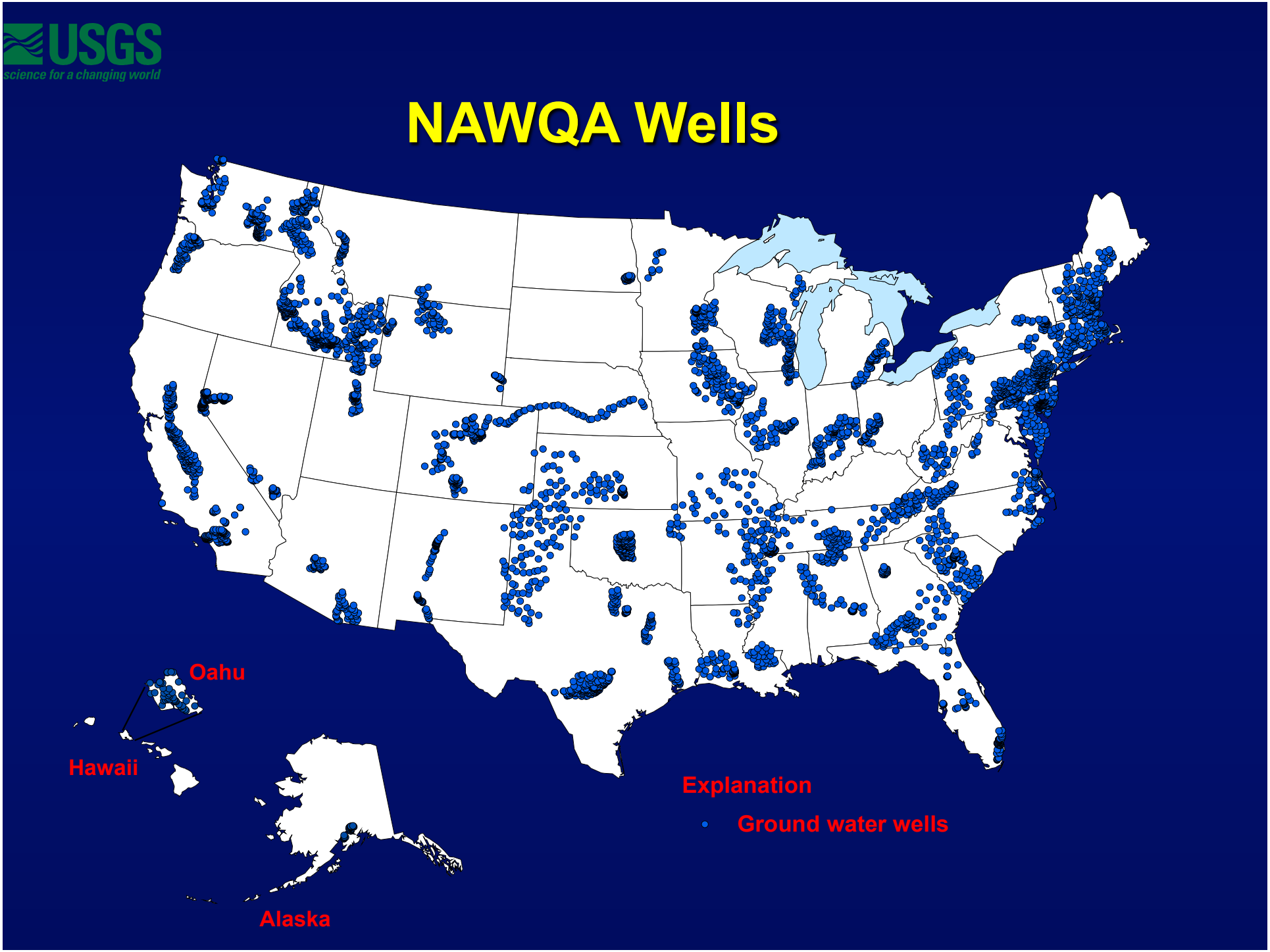
NAWQA Wells



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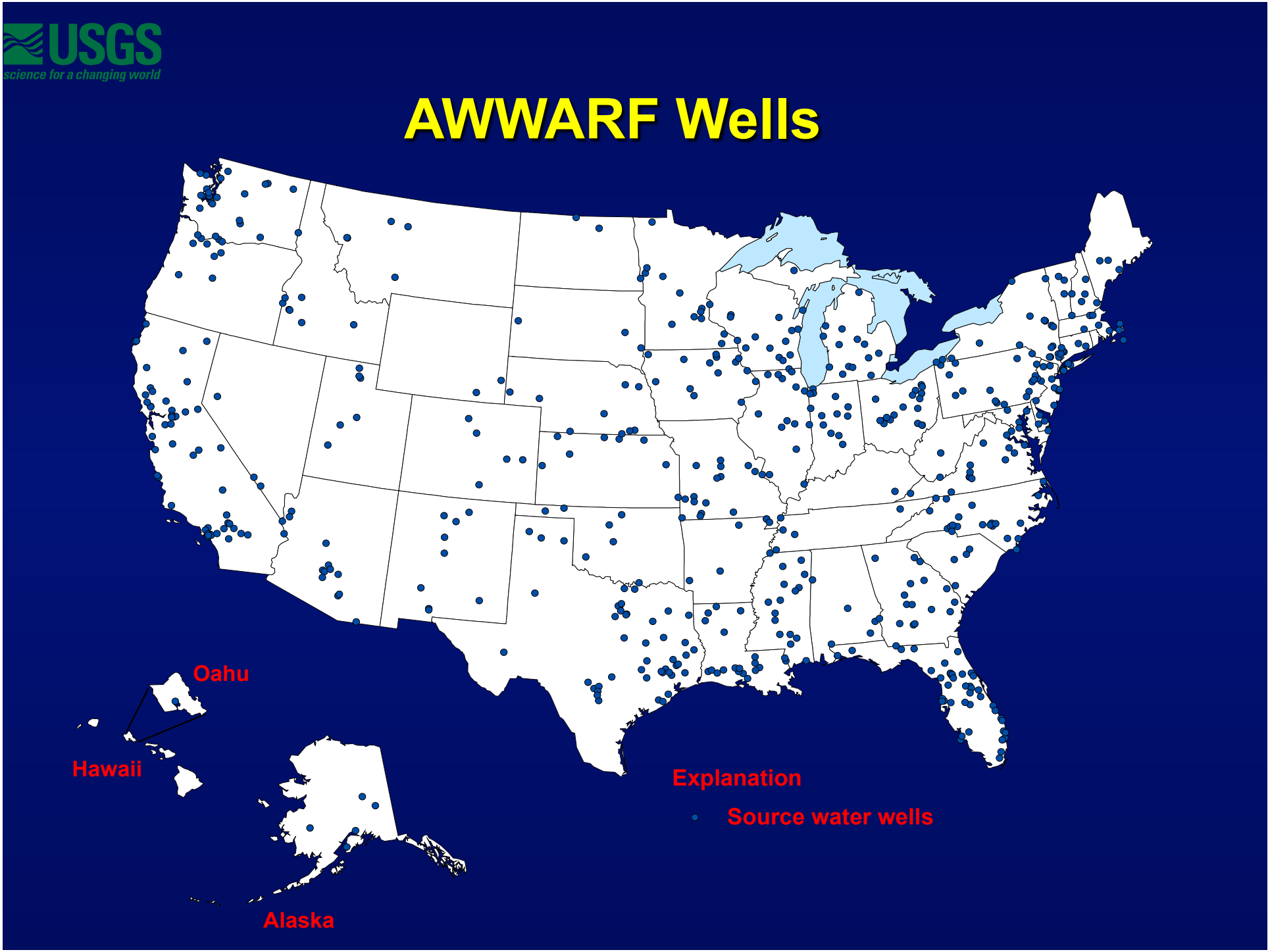
AWWARF Wells



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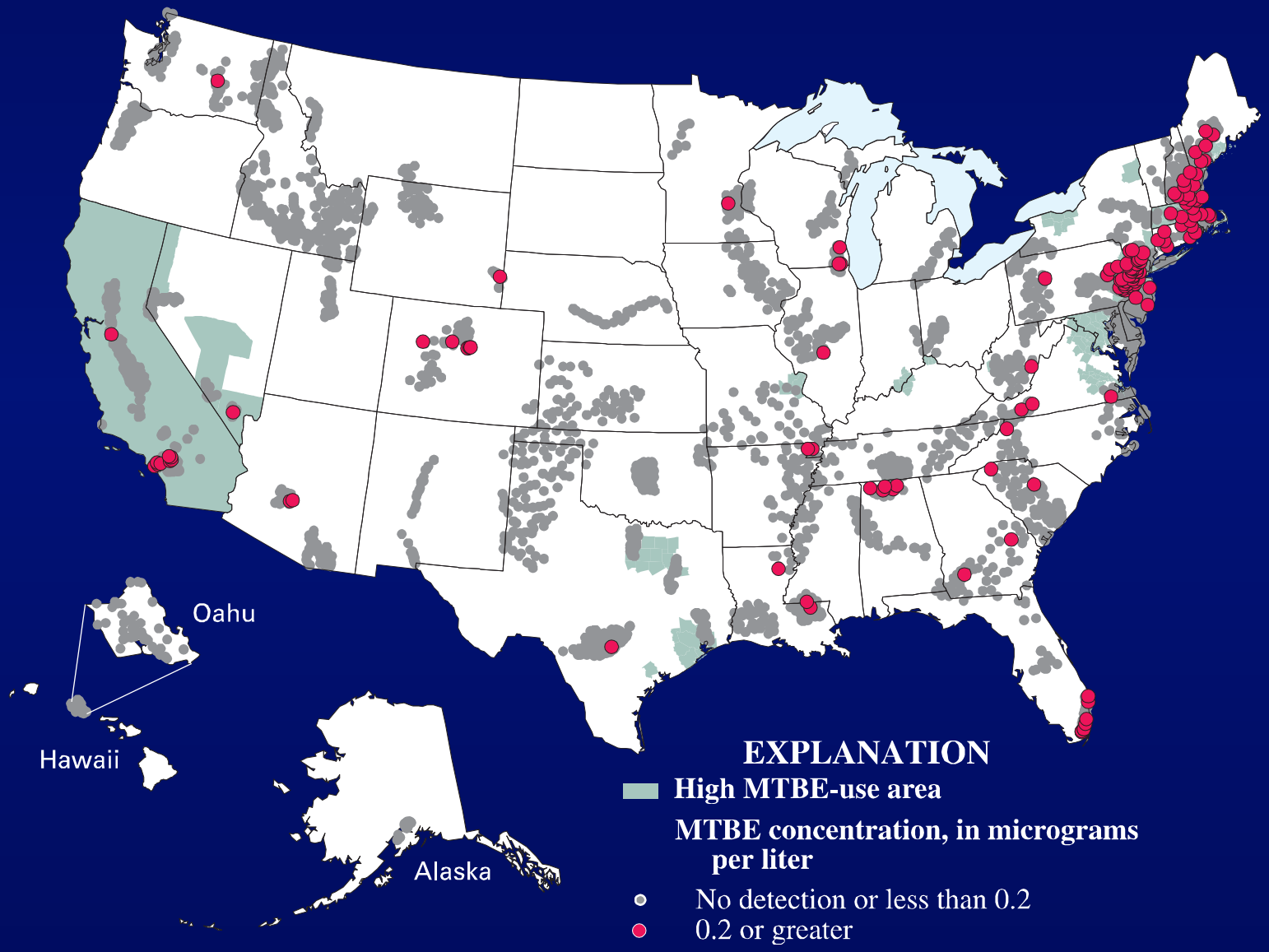
Results Occurrence



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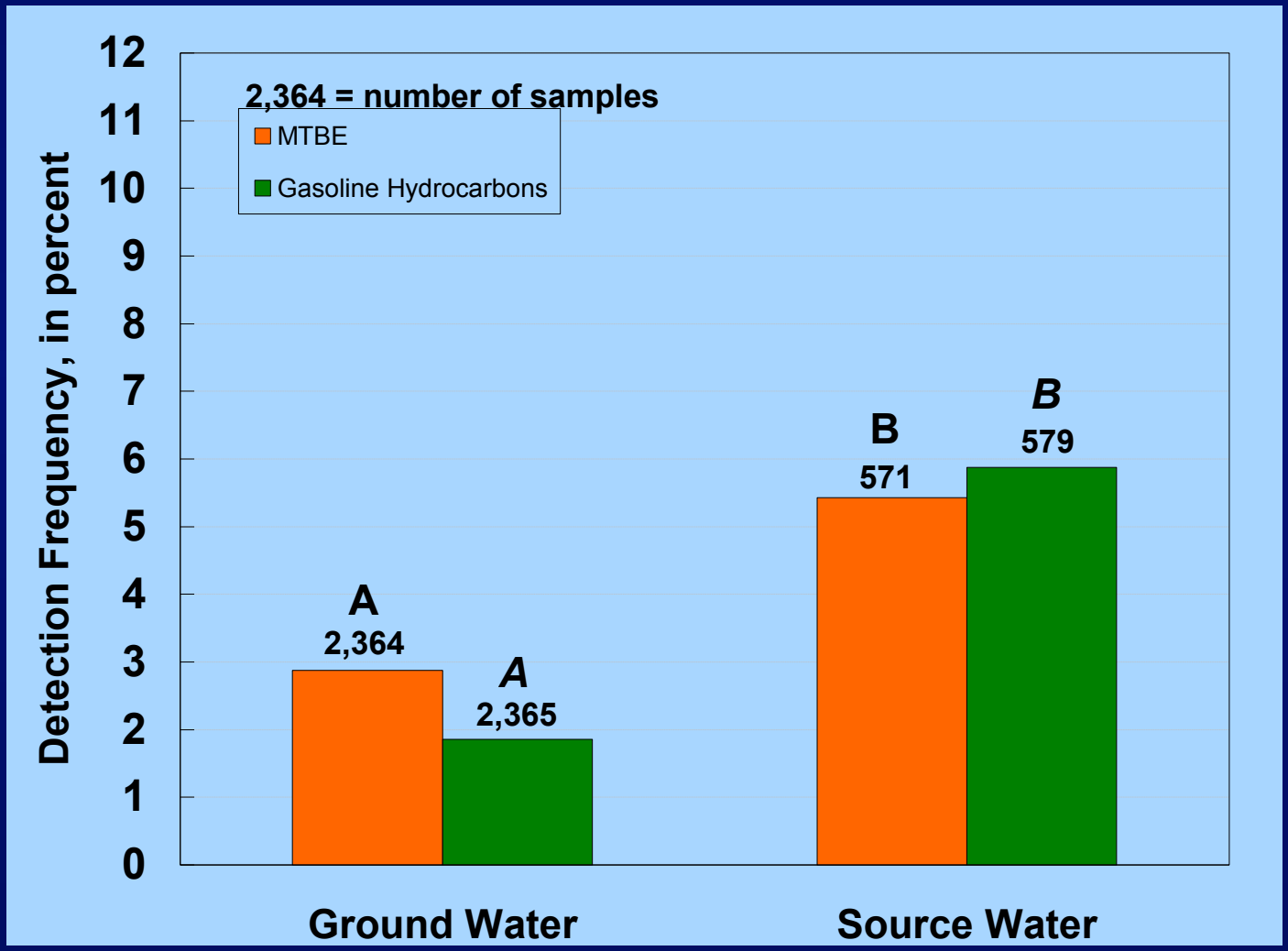
Results Occurrence



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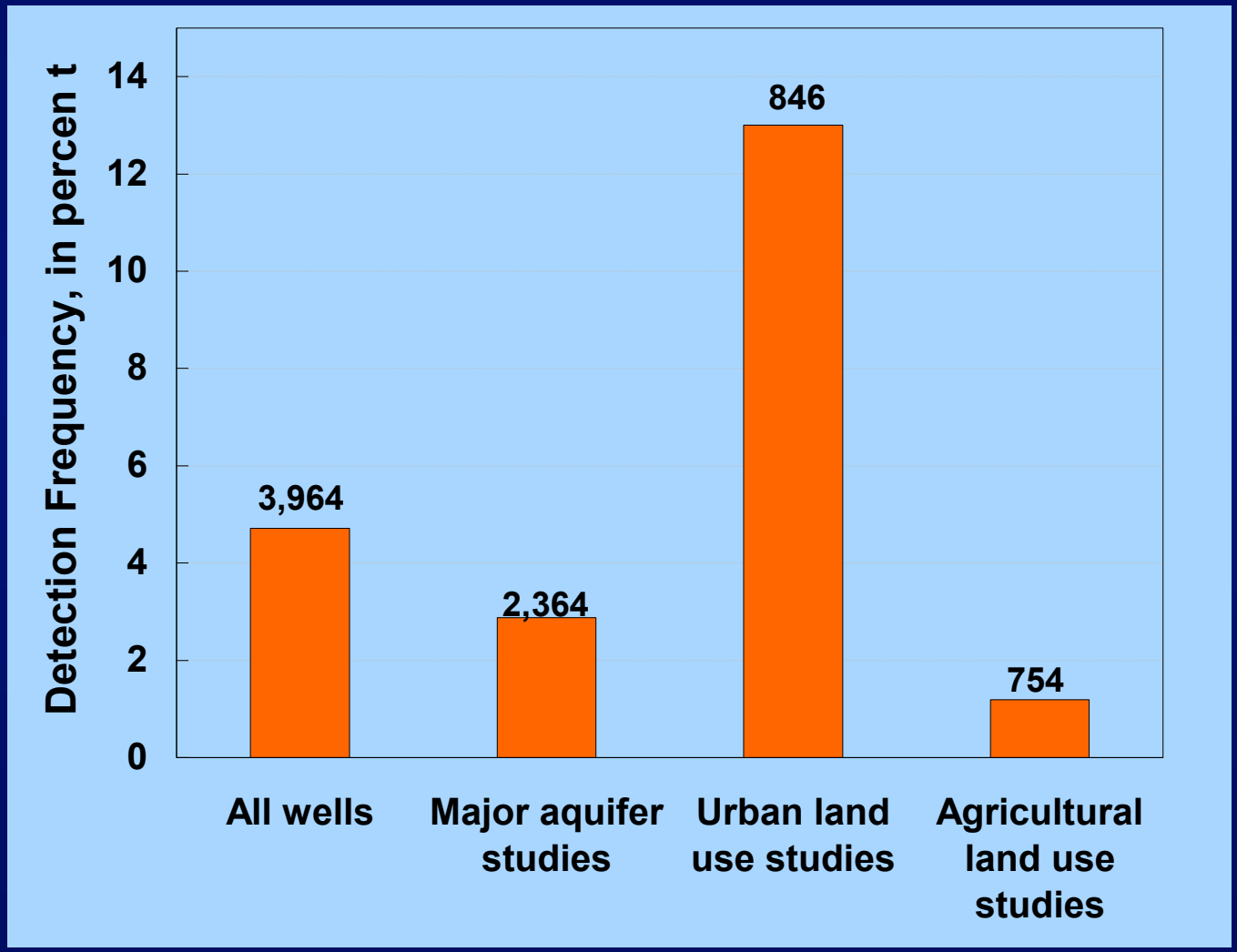
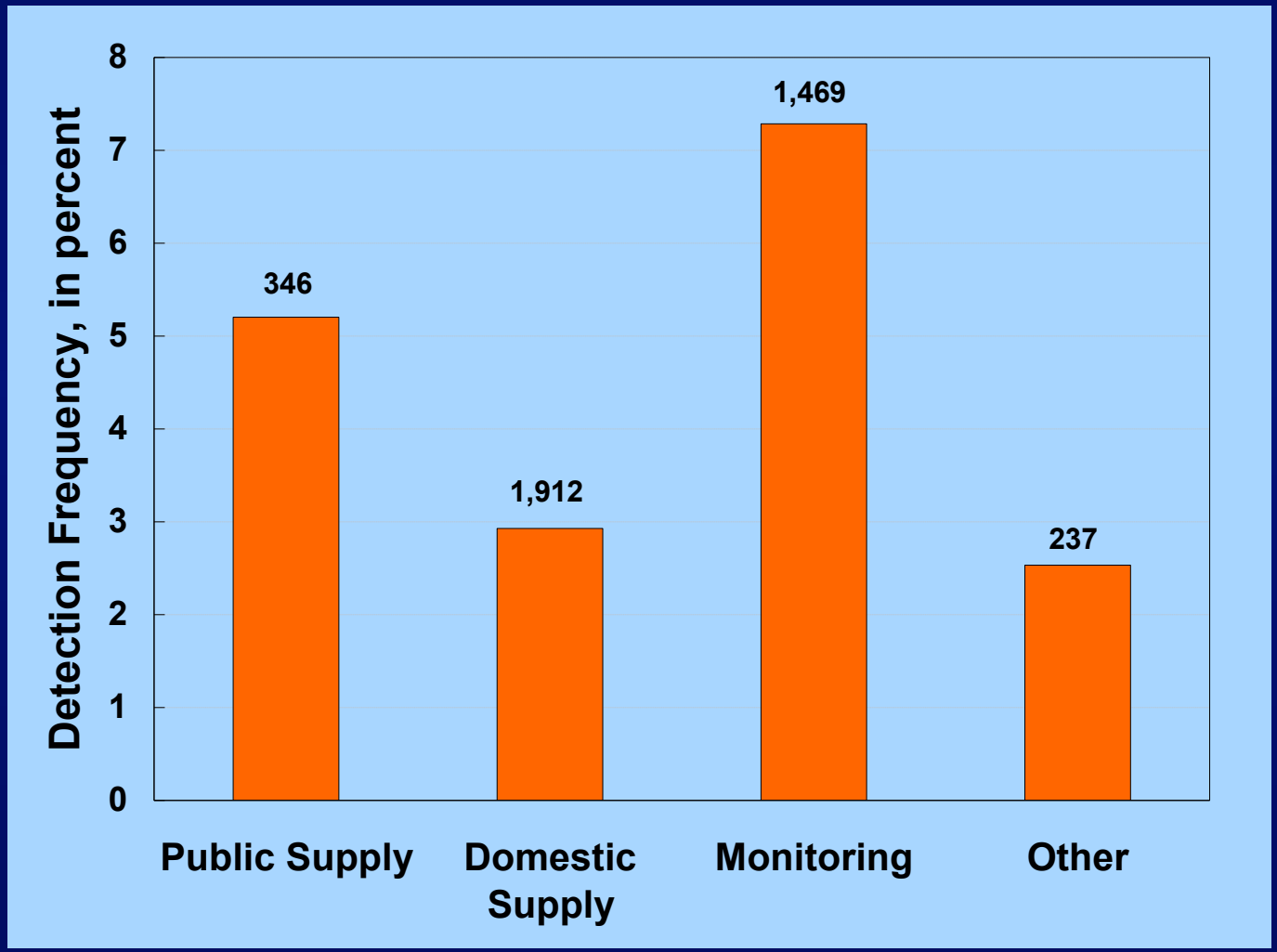
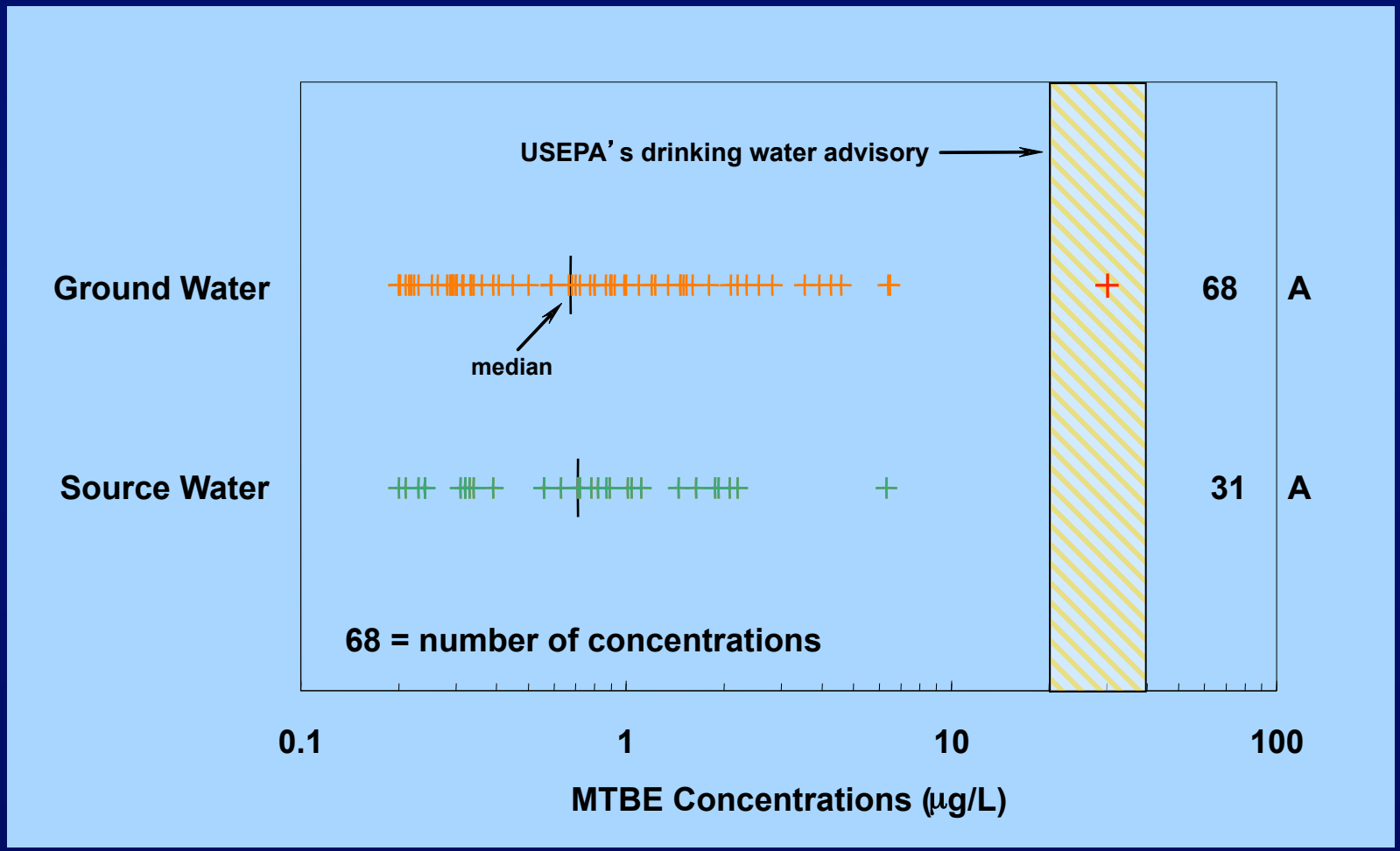
Occurrence by Land Use



Occurrence by Well Type



Results Concentrations



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USEPA Drinking-Water Advisory

Used for guidance and not legally enforceable

Keeping MTBE concentrations in drinking water in the range of 20-40 μg/L will avert unpleasant taste and odor

Will also protect consumers from potential health effects

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Associations with MTBE

MTBE occurrence most strongly associated with population density

Use of MTBE in gasoline also strongly associated

MTBE occurrence 5.8 times more likely in areas of high MTBE use in gasoline

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Associations with MTBE

Explanatory variable	Estimated coefficient	Standardized estimated coefficient
Anthropogenic Variables		
Population density	0.367	0.24
Use of MTBE in gasoline	1.765	0.21
Leaking underground storage tanks	0.463	0.04
Hydrogeologic Variables		
Recharge	0.005	0.17
Aquifer consolidation	-0.582	-0.08
Soil permeability	0.043	0.05

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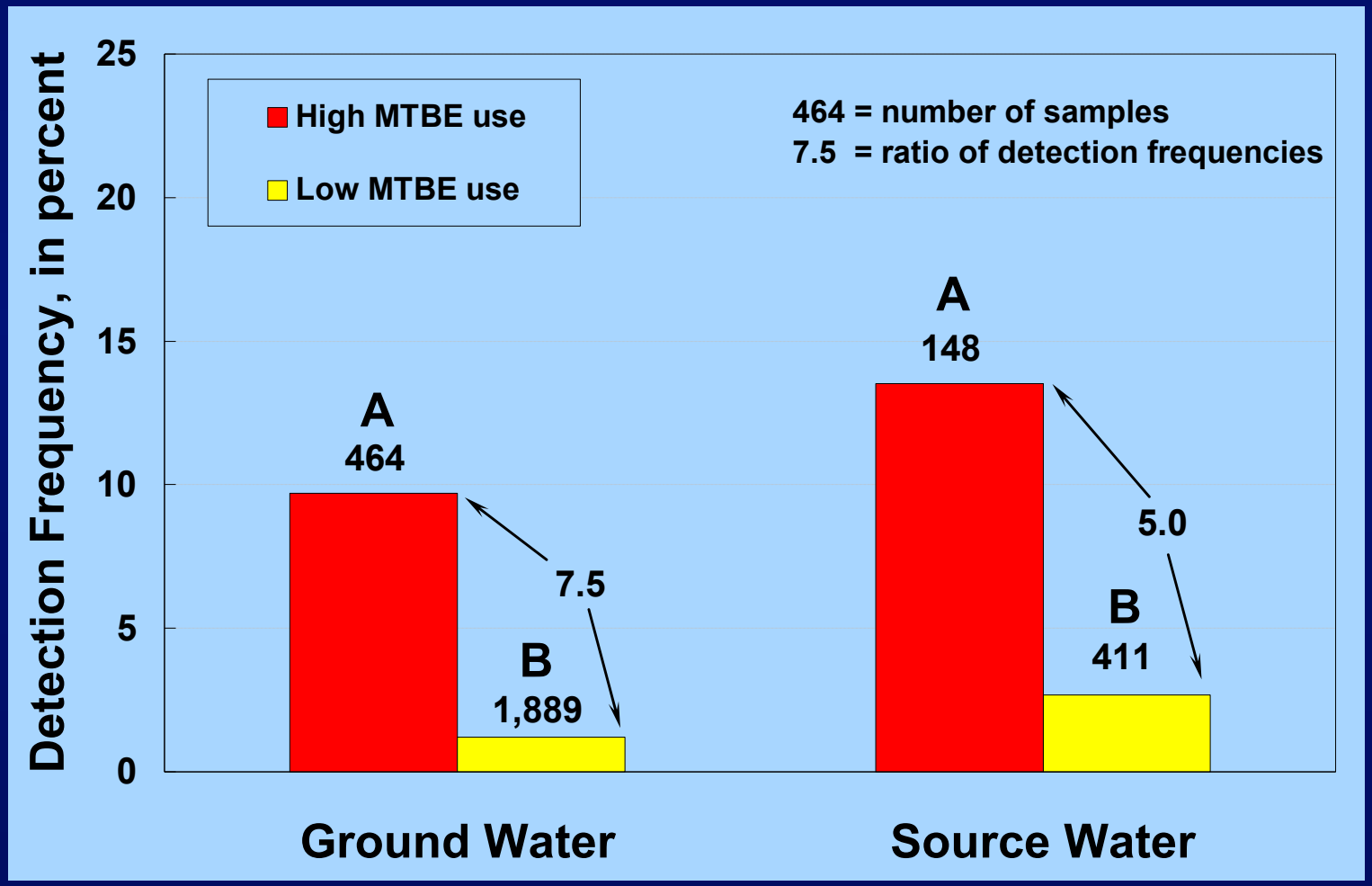
MTBE Use in Gasoline



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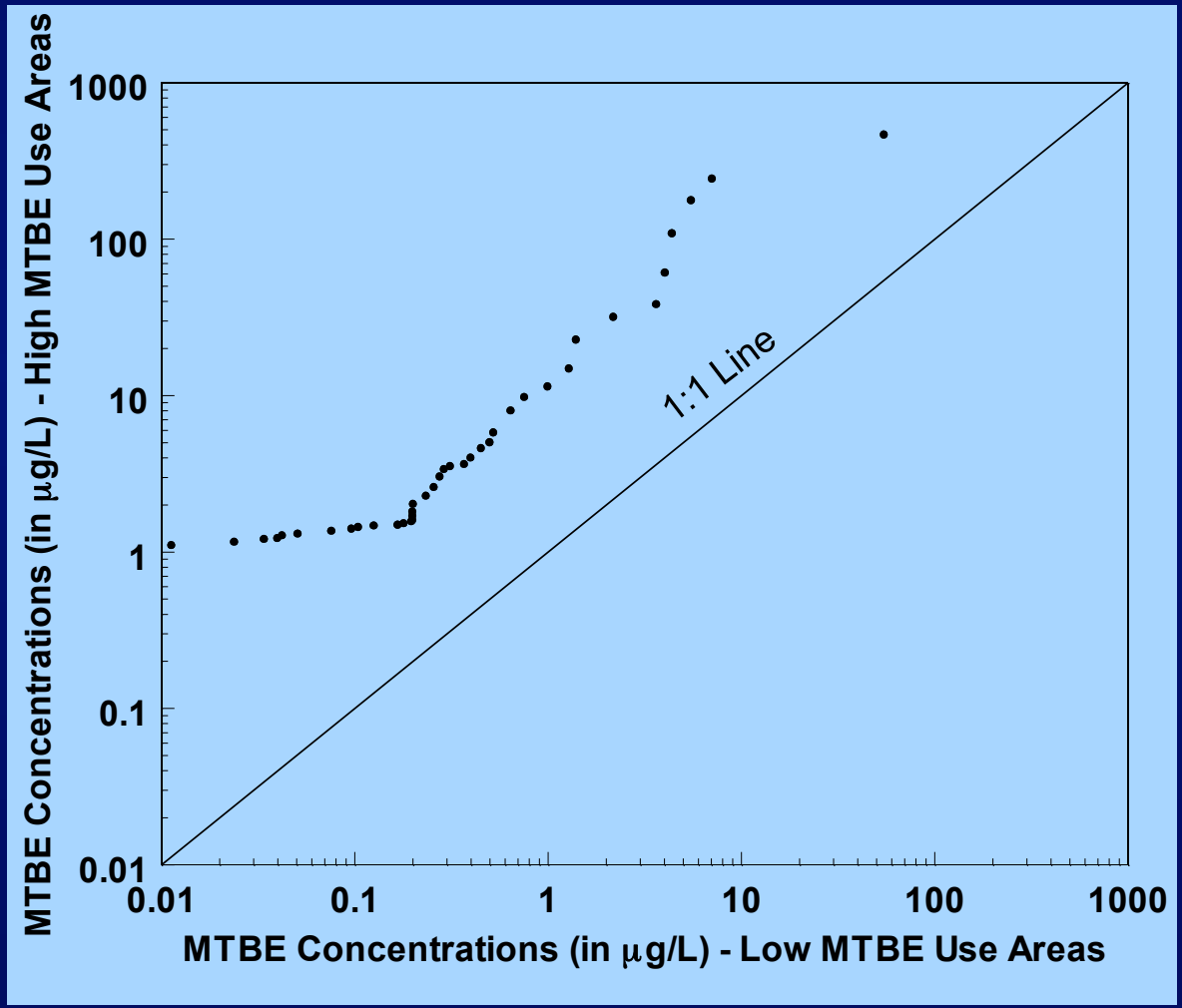
MTBE Use in Gasoline



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Trends in MTBE Occurrence

USGS is studying this

Initially, focus is on MTBE occurrence in PWSs in the Northeast

MTBE occurrence and concentrations may decrease

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Future of MTBE

Energy Policy Act of 2005 removed oxygen requirement from gasoline

Use of MTBE in gasoline will probably decrease sharply

MTBE will still probably be used for octane enhancement

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Conclusions

MTBE was third most commonly detected VOC in ground water

This is surprising since MTBE has only been used intensively for 15 years

MTBE has affected many public and private wells

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Conclusions

MTBE should continue to be monitored, especially in drinking water supplies

MTBE may persist in some ground water systems for many years

Future regulations should consider a chemical's properties prior to use