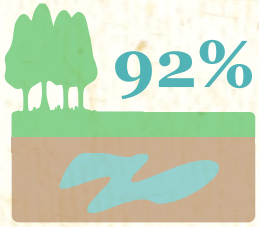
A Closer Look

Drinking Water - Source to Tap

Over 2.8 million Iowans (90%) receive water from 1,874 PWS systems, while private water systems serve the remaining 230,000 Iowans.



Nearly all of Iowa's PWS systems, 92%, rely on groundwater supplies. The remaining systems rely on surface water or groundwater that is heavily influenced by surface water.

DID YOU KNOW?

While the vast majority of Iowa's PWSs draw water from groundwater sources, many of the largest PWSs in the state use surface water.

From a population perspective, around 55% of Iowans get water from PWSs that rely on groundwater while PWSs that rely on surface water serve the other 45%.

WHERE DOES YOUR DRINKING WATER COME FROM?

Iowa households receive their drinking water from one of two sources: a public water supply system (PWS) or a private source such as a well.

PUBLIC WATER SUPPLY SYSTEMS

PWS systems are regulated by state and federal authorities who set and enforce drinking water standards under the Safe Drinking Water Act. The law requires the United States Environmental Protection Agency to set standards for a variety of water contaminants that all PWSs must meet.

MAXIMUM CONTAMINANT LEVELS

Many standards, including those for nitrate, are set as maximum contaminant levels (MCLs)—the maximum limits on the concentration of contaminants in drinking water. If water tests below the MCL for all contaminants, it is determined to be safe for human consumption. The MCL for nitrate is 10 milligrams of nitrate per liter of water (mg/L).

Every PWS in Iowa is required to periodically send treated water samples to certified state laboratories for nitrate testing.

PRIVATE WELLS

Unlike PWS systems, the Iowans that rely on private water supplies are not required to monitor the quality of their drinking water. Private wells fall outside the scope of the Safe Drinking Water Act, so landowners with private wells are on their own in ensuring that contaminants in their wells are at safe levels.

HEALTH RISKS

Methemoglobinemia (Blue Baby Syndrome)

Methemoglobinemia is a fatal condition in which red blood cells become unable to bind to oxygen, causing hypoxia in tissues (infants are particularly susceptible).

There is a small but established body of public health literature documenting other associations between nitrate exposure in drinking water and additional adverse health impacts.

Additional risks include:

- Elevated risk of bladder cancer
- Elevated risk of thyroid cancer
- Elevated risk of birth defects with prenatal exposure

Good science dictates the need for continued research on the association between nitrate exposure and specific health outcomes.

Nitrates and Drinking Water

PUBLIC WATER SUPPLY SYSTEMS

10
mg/L

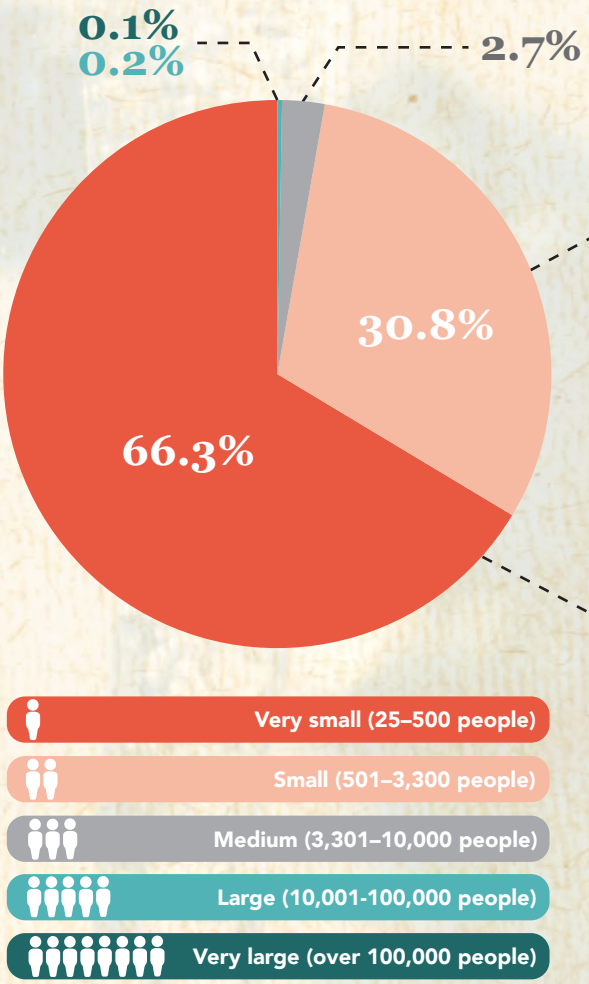
PWS systems are required to regularly send treated water samples to certified state laboratories for nitrate testing, to see how their outputs compare to the standard of 10 milligrams of nitrate per liter of water (mg/L).

70%

DID YOU KNOW?

Most PWSs in Iowa are considered very small—1,285 systems, 70% of PWSs in Iowa—serve less than 500 people.

Iowa PWS Nitrate Violations by System Size
Source: Safe Drinking Water Information System Federal Reporting Services, 1980-2017.



Health-based nitrate drinking water violations are concentrated among **very small and small public water supply systems**.

Many of these very small and small PWSs are in rural areas relying on **shallow wells that are especially susceptible to nitrate pollution**.

The vast majority of violations in all periods are for very small and small systems, **often lacking the budget to invest in costly nitrate treatment technologies**. As such, nitrate often remains a systemic problem for these utilities.

Nitrates and Drinking Water

PRIVATE WELLS

In Iowa,

7.6%

of the population relies on private well water. While the state offers water quality testing services for all homes with a private well, well owners are ultimately responsible for the safety of their water.

State programs such as the Grants to Counties Water Well Program help provide financial assistance to homeowners for these tests.

AS FEW AS **7%** AND AS MANY AS **25%**

OF IOWA'S PRIVATE WELLS MAY CONTAIN UNHEALTHY NITRATE LEVELS.

VULNERABLE WELLS

Wells less than 50 feet deep are considered highly vulnerable wells – and are much more likely to contain high nitrate concentrations. *Data from Iowa DNR Private Well Tracking System, 1989-2017.*

High vulnerability
(less than 50 feet deep)

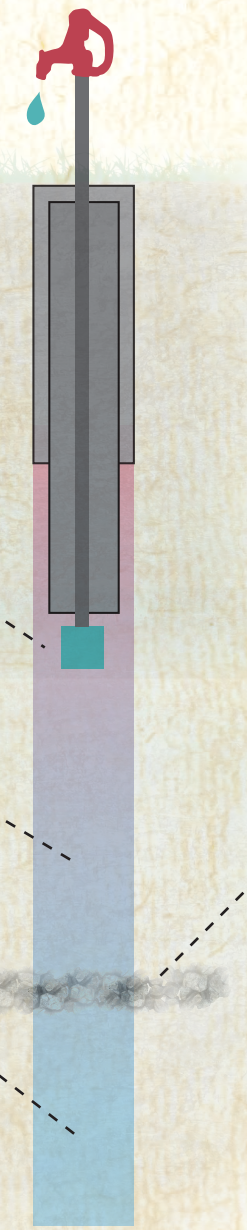
25% have nitrate levels exceeding the maximum contaminant level

Intermediate vulnerability
(50–150 feet deep)

12% have nitrate levels exceeding the maximum contaminant level

Low vulnerability
(greater than 150 feet deep)

7% have nitrate levels exceeding the maximum contaminant level



EPA

DID YOU KNOW?

The Safe Drinking Water Act does not regulate drinking water from private wells.

10 mg/L

On average, private wells in this database contain nitrate levels well below the EPA MCL requirements.

However, average concentrations in private wells have been steadily increasing. In 2001 average nitrate concentrations were just over 3 mg/L, but rose to 4 to 5 mg/L in 2016 and 2017.

Data from Iowa DNR Private Well Tracking System.

Depth is an important determinant of a well's vulnerability to nitrate pollution.

Deep wells normally draw groundwater from an aquifer covered by a more impermeable rock layer, providing a natural barrier to nitrate leaching from the surface into the aquifer. In contrast, shallow wells lack this natural advantage.

A Closer Look

Treating Nitrates

PUBLIC WATER SUPPLY SYSTEMS

Treating elevated nitrate levels in water involves either blending water and/or investing in nitrate removal technologies. For PWSs with access to multiple water sources, water blending is easiest and most cost effective.

For PWSs without a secondary water source, suppliers must invest in costly nitrate removal technologies.

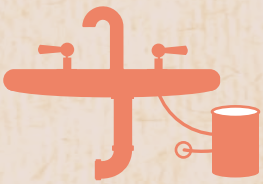
ACROSS IOWA TODAY:

32 PWSs are utilizing ion exchange for nitrate removal.

9 are utilizing reverse osmosis technologies for nitrate removal.

ALL OF THESE TECHNOLOGIES ARE EXPENSIVE.

PRIVATE WELLS



Private well owners rarely have access to multiple water sources, and are unable to blend water with elevated nitrate levels. Thus, owners with high nitrate levels in their wells must install nitrate removal systems.

Point of entry devices treat all well water before it enters the home. In contrast, point-of-use devices are typically smaller and need to be installed on every tap that the home uses for drinking water.

THESE TECHNOLOGIES ARE COSTLY AND REQUIRE REGULAR MAINTENANCE AND UPKEEP.

SOLUTIONS

An alternative to treating polluted source water is to protect source water from nitrate pollution. Because most nitrate in Iowa results from agricultural activities, this involves investing in practices to control or remove nitrate.

The Iowa DNR's Source Water Protection program works with communities to determine the source of nitrate contamination and provide grant support to implement practices to reduce contamination:

Land out of production

New zoning/ordinances

Low impact development

Estimated Annual Cost Range of Alternative Water Supply Options

(Adapted from Vivian B. Jensen et al. 2012)

	Single Household	Small PWS
Water Blending	N/A	$200,000 - $365,000
Well Reconstruction	$860 - $ 3,300	$80,000 - $100,000
Drill New Well	$2,100 - $3,300	$40,000 - $290,000
Install POU/Reverse Osmosis Unit	$250 - $360	$223,000
Pipeline Connection to Existing System	$52,400 - $185,500	$59,700 - $192,800
Trucked Water	$950	$2,850
Bottled Water	$1,339	$1.34 M

CONSERVATION LEARNING GROUP

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