



Iowa
Environmental
Council

Rural Water Systems in Iowa: Analysis of Opportunities and Challenges



February 2021

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Background: Rural water systems and rural areas

Iowa has nineteen rural water systems. These rural water systems were established or incorporated in the 1970s with assistance from the Farmers Home Administration (now known as the Office of Rural Development) through the U.S. Department of Agriculture (USDA) to fill the need for dependable, safe water for rural residents after passage of the Safe Drinking Water Act in 1974.

Since that time, rural water systems have grown to serve more of the rural population in their service areas. However, changes affecting Iowa, such as rural depopulation, urban growth, aging communities, aging infrastructure, and water pollution have affected system operations, finances, and their outlook for the future.

According to Iowa State University's Iowa Community Indicators Program (Iowa State University, 2020), the state population increased by 12.5% between 1969 and 2019. In the same period, population in the U.S. as a whole increased by 63%. Iowa's state-level increase in population masks the reality of depopulation of rural areas while urban areas and counties saw substantial population increases (Figure 1).

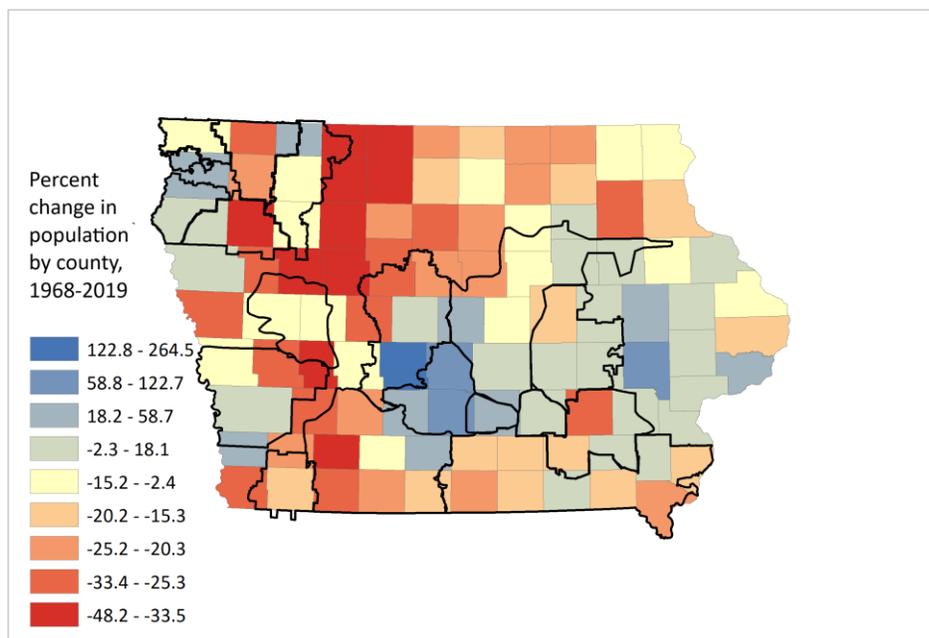


Figure 1- Percent change in population by county, 1968-2019. Rural water system service areas are outlined.

Further, while 16% of Iowa's population is 65 or older, that percentage approaches a quarter of the population in five western counties. Rural water systems serve four of these western counties: Audubon, Cherokee, Dickinson, and Ringgold.

These population changes have consequences for water systems, which are disproportionately located in rural counties: according to the U.S. Environmental Protection Agency (EPA), more than 92% of 153,000 public drinking water systems nationwide serve fewer than 10,000 people, and 56% serve less than 500 people (U.S. Environmental Protection Agency, 2011). In 2010, just over a third of Iowans lived outside urban areas, down from 43% in 1970. However, in more than 25% of Iowa counties, only a quarter of the population or less lives in urban areas (Figure 2). For most of these counties, rural water systems are a critical infrastructure component (U.S. Environmental Protection Agency, 2011).

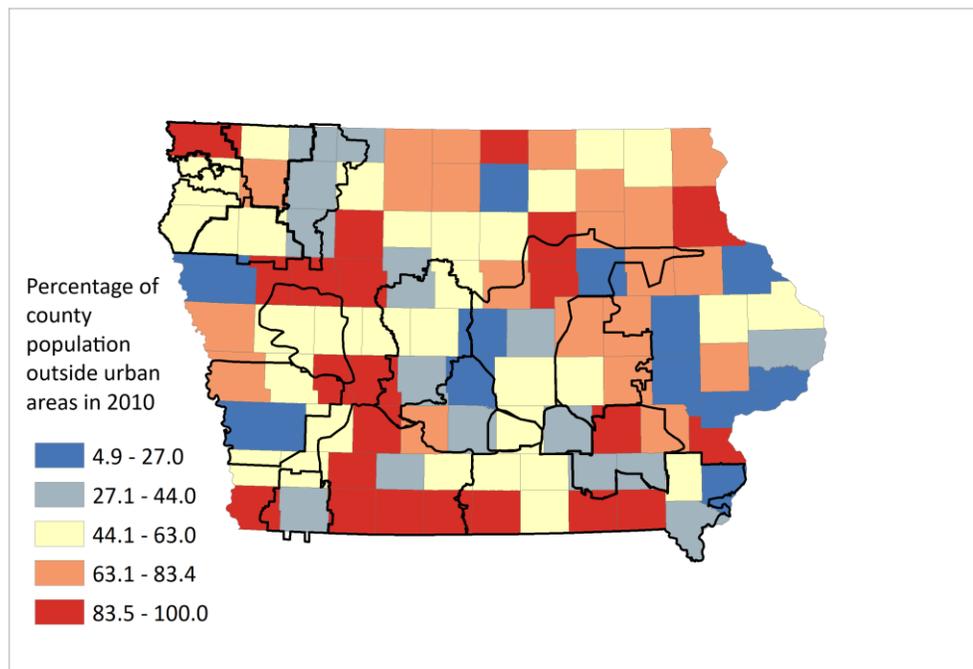


Figure 2 - Percent of county population outside urban areas in 2010. Rural water system service areas are outlined.

According to the last EPA Report to Congress on Drinking Water Infrastructure (EPA, 2018), the vast majority of the almost \$8 billion need for drinking water infrastructure in Iowa is for medium and small community water systems (71% and 23% respectively), mostly for transmission and distribution (74%). Recent information on rural water systems specifically is difficult to obtain. The 1974 Safe Drinking Water Act mandated the development of a rural water survey, which resulted in a National Statistical

Assessment of Rural Water Conditions in 1984 (Francis et al., 1984). The U.S. Census stopped asking questions on drinking water sources in 1990.

This report and survey fill an important gap in understanding the needs and challenges of a critical component of water infrastructure in a rural state such as Iowa.

Methodology

Research for this study began in April 2020. Data on public water systems was obtained from the Iowa Department of Natural Resources and U.S. Environmental Protection Agency including population served, miles of pipe, active wells, consecutive connections to and from other water systems, and the source water for each intake, well, or consecutive connection that supplies water to the system. Information on the leadership of all rural water utilities was assembled from publicly available documents and websites. A summary of this data for rural water systems and whether they participated in this study is in Table 1. Two-thirds of rural water systems participated in the survey, representing 77% of the population served and 74% of the miles of pipe.



Table 1: Rural water systems data.

Rural Water System	Principal Counties Served	Year Founded/ Incorporated	Population Served	Miles of Pipe	Participated in Study
Cherokee County Rural Water District	Cherokee	1972	4,625	866	Yes
Iowa Lakes Regional Water	Clay, Dickinson, Buena Vista	1977	11,153	1,400	Yes
Iowa Regional Utilities Association (formerly known as Central Iowa Water Association)	Black Hawk, Grundy, Jasper, Marshall, Story	1977	36,343	4,656	Yes
Lyon & Sioux Rural Water System	Lyon	1970	4,790	810	Yes
Mahaska Rural Water System	Mahaska	1974	9,460	640	Yes
Marion County Rural Water District	Marion		5,408	575	No
Osceola County Rural Water System	Obrien, Osceola	1978	7,787	1,300	Yes
Poweshiek Water Association	Benton, Iowa, Poweshiek, Tama	1977	22,836	3,200	Yes
Rathbun Regional Water Association	Appanoose, Davis, Des Moines, Henry, Lee, Lucas, Monroe, Van Buren, Wayne	1972	49,840	6,500	Yes
Regional Water	Audubon, Pottawattamie, Shelby	1972	4,065	769	Yes
Rock Valley Rural Water District	Sioux	n/a	2,235	320	No
Rural Water System #1	Sioux	1969	18,510	900	No
Southern Iowa Rural Water Association	Adair, Adams, Clarke, Decatur, Ringgold, Taylor, Union	1975	5,089	4,000	No
Southern Sioux County Rural Water System	Plymouth, Sioux	1977	15,601	907	Yes
Southwest Regional Water District	Fremont, Montgomery, Page	n/a	3,252	919	No
Wapello Rural Water Association	Keokuk, Jefferson, Wapello, Washington	1976	24,898	2,500	No
Warren Water District	Madison, Warren	1978	4,690	1,425	Yes
West Central Iowa Rural Water Association	Carroll, Crawford, Ida, Sac	1970	18,838	1,600	Yes
Xenia Rural Water District	Boone, Dallas, Greene, Guthrie, Hamilton, Story, Webster	1978	7,691	2,700	Yes

There is not a large amount of literature on rural water utilities in the United States, and, as noted above, national statistics are outdated. The National Rural Water Association serves as a clearinghouse for state-level organizations but does not collect information on their characteristics. There is some literature on small drinking water systems in Canada that focuses on cost considerations (Janzen, Achari, Dore, & Langford, 2017) and on performance indicators and compliance (Husnain, Rehan, & Solomon, 2014; Kot, Gagnon, & Castleden, 2015). A driver for considerations of appropriate governance of small water systems in Canada is the intense challenges faced by First Nations (Alcantara, Longboat, & Vanhooren, 2020). For the purposes of this study, a recent review of governance challenges provided ideas for the focus of a rural water systems survey in Iowa (McFarlane & Harris, 2018).

Initial phone calls to key contacts in the drinking water industry in Iowa were made to identify knowledge gaps in the rural water industry and the most important questions to ask in a survey. Iowa Environmental Council staff and Dr. Silvia Secchi from the University of Iowa spoke with rural water system representatives and the Iowa Rural Water Association to understand the issues and industry landscape.

The survey for rural water systems was developed in May and June of 2020. Sections of the survey included background information, water quality, water quantity, private wells, and the future of rural water. The private wells and future of rural water sections relied on the survey respondent's professional opinions and experience. Several members of the industry reviewed the survey for clarity and relevance before it was sent out to the 19 rural water systems.

The survey was emailed in July to the water system manager, president, or CEO of each rural water system. Survey results were collected in July and August 2020. Results were analyzed in September 2020. Of the nineteen rural water systems, thirteen responded (68%). On the submitted surveys, the completion rate was 92%. Survey questions can be found in Appendix A.

Results: Survey responses

Based on the survey and interview results, we identified five critical areas for rural water utilities. Several of the issues affecting rural water systems are also challenges facing other sectors of the industry and rural areas of Iowa more generally (Figure 3).

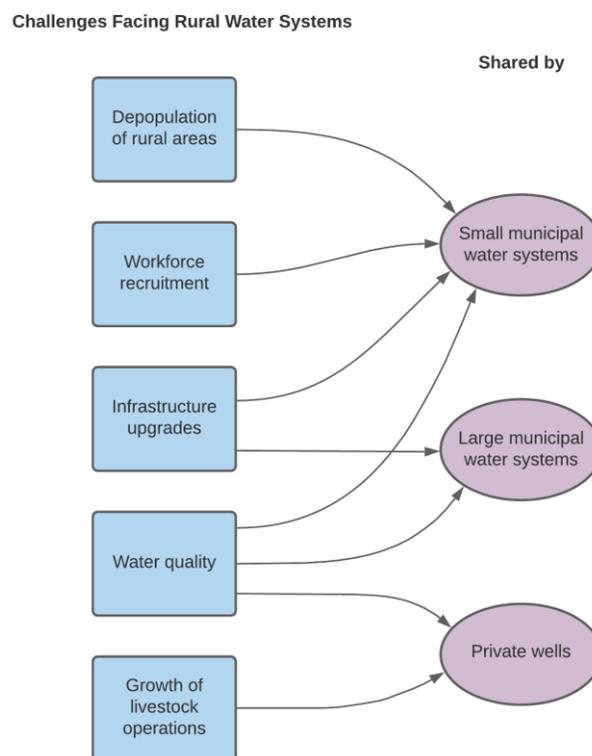


Figure 3 - Conceptual diagram of challenges facing rural water systems and others. Many of the challenges facing rural water systems are the result of larger issues or trends affecting the state of Iowa.

System Operations

Rural water systems identified several issues related to system operations, including water quality, water quantity, aging infrastructure, and a retiring workforce.

Respondents identified nitrate and water age/chlorine residual as top water quality concerns (Table 2). In addition to causing blue baby syndrome, nitrate in drinking water has been linked to multiple health issues such as birth defects, cancers, and thyroid problems (Iowa Environmental Council, 2016). The EPA drinking water standard for nitrate is 10 milligrams per liter. Regarding water age and chlorine

residual, water retained in pipes for an extended period, especially old pipes, may have to be flushed to ensure water that reaches customers has the appropriate amount of residual chlorine. The systems that cited water age/chlorine residual have on average more than 2,300 miles of pipe.

Table 2: Rural water systems' water quality concerns.

Q: What are your system's main water quality concerns?	
Concern	Number of responses
Nitrate	4
Water age and chlorine residual	4
Hardness	2
Other concerns: phosphorus and sediment, iron and manganese removal, trihalomethanes, reliability, price, and general quality.	

Water quantity was also identified as a concern for all rural water systems that participated in the survey (Table 3).

Table 3: Rural water systems' concern about water quantity.

Q: Is water quantity a concern for your system?	
Rating	Number of responses
3 – Very much	5
2 – Somewhat	7
1 – Not at all	0
Average: 2.4	

Most systems reported increased water demand over time. The top reasons listed for increased demand were: increase due to system expansion (10); increase in saturation of service area (10); increase in community franchises or wholesale (8); and increase in per customer usage rate (7). Notably, no system rated water quantity as “not at all” a concern.

Almost half (42%) of responding water systems cited increased water demand due to new and expanding livestock operations. These systems are primarily located in northwest and central Iowa. Not only has growth in the number of livestock operations across the state increased demand for water, but some systems attributed increases in the per customer usage rate to expansion of existing livestock operations. Livestock operations create large and unpredictable demands for water. One respondent wrote, “These types of customers are difficult to plan and predict, and can create challenges to adequately supply.”

Many systems cited aging infrastructure as a challenge to continuing to provide safe drinking water to customers. In general, respondents reported a lack of public investment in water system infrastructure. Many systems rely on pipes and treatment facilities that are decades old. Water systems face increasing costs of infrastructure upgrades and water treatment. The expenses are putting rural water systems, as well as small municipal systems, in the difficult position of deciding how best to continue providing clean water to customers without substantial rate increases.



Many respondents mentioned concerns about the water treatment industry's retiring workforce. They noted that the industry has water operators with years of knowledge and experience, but many are on the cusp of retirement. Systems are now concerned that not enough young people are entering the field of water operation to fill upcoming vacancies. They also note that young people are not moving to rural areas where there are or will be open positions.

Population Change

As noted previously, Iowa's rural population is shrinking. The result of a smaller population for rural water systems and small municipal systems is a reduced base of ratepayers to pay for system updates and upgrades. With fewer people across which to spread the cost, it becomes more costly per customer to make system improvements and upgrades necessary to treat to water quality standards.

Coupled with the need for infrastructure upgrades, depopulation makes it challenging for rural water systems and small communities to provide safe drinking water at an affordable rate. Rural water systems face the added challenge of reduced population density, making each new connection to the system and maintenance of pipes more costly for customers and providing a lower return on investment to the system.

However, shrinking rural populations have created opportunities for some rural water systems. As small municipalities have to make tough decisions about how to continue to provide safe drinking water, there are expansion opportunities for rural water systems. The economies of scale often make rural water a better option than continuing to operate a small municipal system with a shrinking pool

of ratepayers. Rural water systems can sell water wholesale to communities that wish to keep operating their own system but cannot afford separate water treatment costs. Another option for the municipal system is to become a franchise of the rural water system. This helps reduce operating costs and spreads infrastructure expenses over a larger base of ratepayers.

As one survey respondent said:

“Many small communities across rural Iowa are facing challenges meeting regulatory limits and hiring/retaining certified operators to run them. Those communities also have a retiring workforce. Many of those same communities are facing a water system improvement project that would cause their residents to face significant financial hardship. Rural water is a simple and viable option for them. These high-density/high-usage customers also benefit rural water associations because they generate a relatively larger amount of revenue while requiring less infrastructure investment.” *(edited for clarity)*

Safe Drinking Water Access

The results of the rural water survey shed light on Iowans’ ability to access safe drinking water across the state. Rural water is part of a larger picture of other public water systems and private wells that Iowans rely on for drinking water.

Many rural water systems purchase water from other municipal or rural water systems. As urban populations increase and rural populations decrease, demand on larger public water systems has increased. Rural water systems located near urban areas often purchase water from municipal systems to meet demand. For instance, Des Moines Water Works sells water to two rural water systems adjacent to its service area.

Approximately 7% of Iowans still rely on private wells as their primary source of drinking water in rural Iowa (DNR, 2020). Many households still connect to rural water systems each year. The top reasons cited by rural water systems for households to connect to rural water are summarized in Table 4.

Table 4: Top reasons cited for connecting to rural water.

Q: What reasons are cited for connecting to rural water (from households previously on a private well)?	
Reason	Number of responses
Poor private well water quality/low confidence in water quality	12

New construction	9
New ownership	8
Decreased water rate	2
Other: Existing well issues that are more costly remedy than connecting to rural water.	

Rural water systems were also asked why they believe private well users in their service area are not connecting to rural water. The top reason was that the private well user doesn't believe they have a reason to – they are happy with their private well water (Table 5).

Table 5: Top reasons cited for not connecting to rural water.

Q: Why are private well users in your service area not connecting to rural water?	
Reason	Number of responses
No reason to - happy with their private well water	10
Area already almost entirely saturated - very few private well owners	7
Unaware of risks to private well water quality	6
High cost of connecting to rural water is prohibitive	4
Unaware of benefits of rural water	3
Other reasons: Avoidance of monthly bill, unaware of opportunity to connect to rural water, "I've always drank well water and I'm healthy" mindset.	

Notably, nine rural water systems believe more private well owners would choose to connect to rural water systems if financial assistance was available.

The survey indicated that rural water system managers believe the general public as a whole is slightly better informed about drinking water quality than private well owners (Table 6). This is significant because private wells are subject to less regulation and oversight than public water systems. With less awareness of the risks of poor water quality, private well owners may be at greater risk of exposing themselves to poor water quality than the general population.

Table 6: Average ratings of private well users' and lowans' awareness of private well risks/drinking water quality on a scale of 1 to 5 (1 - not at all informed, 3 - somewhat informed, 5 - very well informed).

Question	Average
Do you think that lowans relying on private wells are aware of the risks, such as nitrates, bacteria, etc.?	2.89
In general, do you think lowans are well-informed about the quality of their drinking water?	3.00

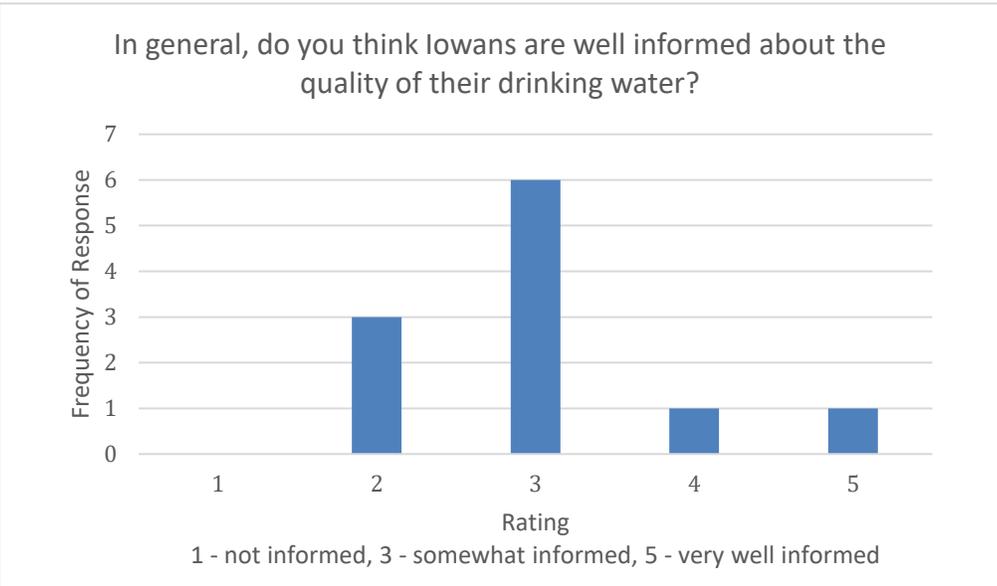
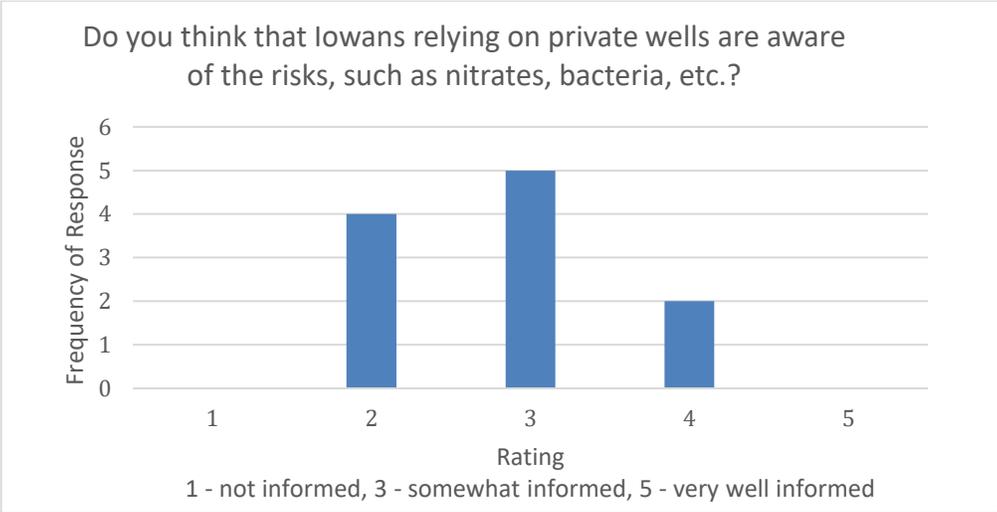


Figure 4 – Response frequency to questions on water quality awareness.

Opportunities and Threats

Survey respondents were asked to complete a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the rural water industry. The results of the SWOT analysis and other components of the survey indicate a few areas of opportunity for rural water systems to increase access to safe drinking water in Iowa, as well as a few areas where policy change could help (Figure 6).

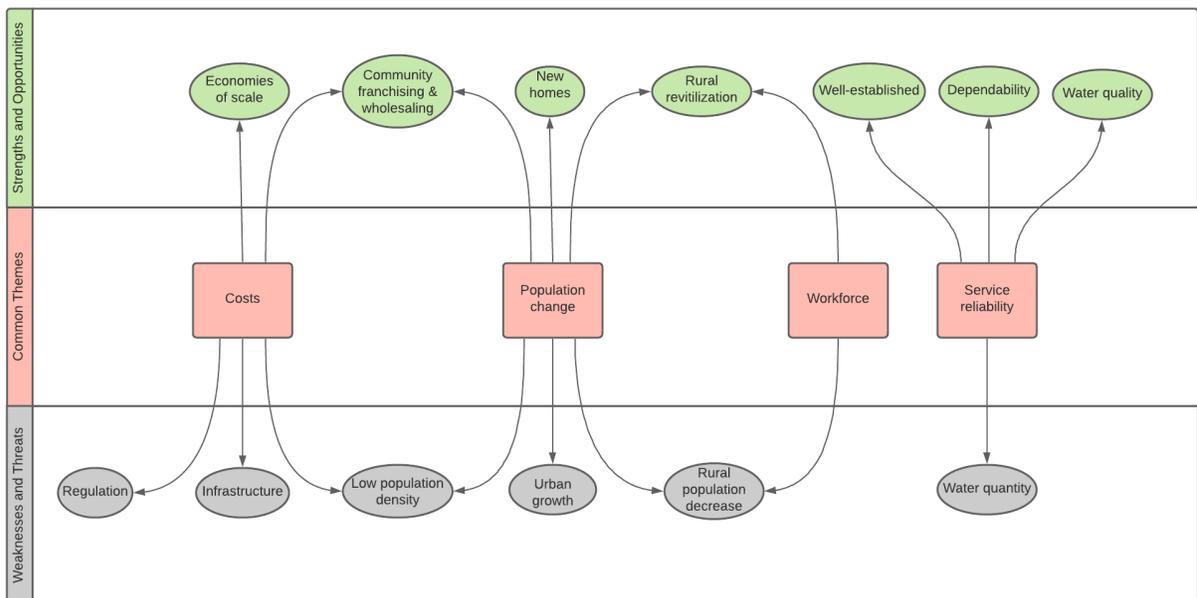


Figure 5 – Conceptual diagram of SWOT analysis results.

One area of opportunity is the conversation around rural revitalization and investment. This conversation has developed in recent years as policymakers and rural Iowans seek ways to preserve rural life and revitalize rural economies.

State leadership has prioritized rural revitalization and is discussing ways to improve rural quality of life (Tomaka, 2020). Much of the discussion has been about expanding broadband, increasing housing access, and improving mental health services. Rural water systems believe that investment in water and wastewater treatment infrastructure would improve drinking water quality and access, reduce costs for ratepayers, and increase reliability. This would increase the attractiveness of living in rural Iowa.

Exurban areas in the state continue to grow and provide expansion opportunities for rural water systems, which helps keep costs down. These areas are outside municipal service areas so rural water systems can work with developers to connect new neighborhoods cost-effectively.

However, exurban expansion has created challenges for rural water systems as municipalities move to annex territory within rural water service areas. Rural water systems cite disputes about water service territories and their systems' abilities to gain new customers and continue providing affordable drinking water. One survey respondent said, "Generally, many of the growth areas across [our system's] service territory about municipalities, and disputes can arise over water service territory rights. If [the system] were to relinquish or lose service rights to the areas that are experiencing growth while also facing a declining customer base within the rural areas of the system, then maintaining adequate cash flows without rates inflating significantly would become challenging." (edited for clarity)

As rural areas and municipalities lose population, opportunity for rural water systems exists in community franchising. Many systems have begun providing service to municipalities that can no longer afford to operate independent water systems. Community franchising creates an economy of scale that has benefitted both municipalities and rural water systems. Some systems may look to consolidation or regionalization in the future as well to remain viable.

Rural water systems also see opportunity for young people entering the field of water operation. With many operators near retirement, jobs are becoming available. The loss of industry knowledge is a threat identified by many rural water systems, but creating stable jobs and drawing more young people into the industry and rural areas is an opportunity for growth. However, the systems need to be able to provide competitive compensation and benefits to attract and retain high-quality staff.

Recommendations

Rural Iowans would benefit from a comprehensive regional or state-level approach to drinking water treatment, access, and planning. Regional and/or state-level planning could address issues that affect all public water systems, such as projected climate change impacts on water quantity, population change and territory annexation, aging infrastructure, and expansion of water-intensive livestock operations. Such an approach would help identify issues, develop coordinated response and strategy, and pool resources in an underinvested industry. Establishing and funding the coordination of a drinking water advisory and planning group would require legislation. The group should be led by the Iowa Department of Natural Resources and include representation from various agencies and

stakeholders such as the Iowa Department of Agriculture and Land Stewardship, the Iowa Economic Development Authority, the Iowa Department of Public Health, water system operators, local government officials, industry groups, and academic experts in fields such as climate, hydrology, and environmental engineering.

Small and rural water systems that lack capacity and experience working with federal programs would benefit from a clearinghouse of information and funding sources for water systems seeking upgrades and technical assistance. There are several state and federal sources of financial and technical support, and the logistics of upgrading, consolidating, or establishing a new rural water utility can be very complicated (White, Oamek, & Martinek, 2005). A clearinghouse of this kind would require interagency cooperation between EPA and USDA, both of which administer programs for water infrastructure and technical assistance. With state-level support from DNR, more water systems could apply for these programs and access additional funding.

EPA should also resume regular surveying of community water systems and develop a survey of private well users. Lack of information on these utilities and users makes it difficult to identify emerging issues and effective solutions. A baseline of information is necessary to identify public health risks and how the agency and partners can most effectively increase access to safe drinking water.

Conclusion

Rural Iowans receive drinking water through small municipal public water systems, rural water systems, or private wells. As rural Iowa faces depopulation and water pollution that threatens public health, rural water systems have grown to increase access to safe drinking water. However, more information and coordination is necessary to ensure all rural Iowans have access to safe drinking water now and in the future. A collaborative, science-based approach to addressing issues facing rural water and small municipal systems will help effectively plan for the future and increase safe drinking water access. With investment and a proactive approach to addressing challenges, rural water system services can help grow and sustain rural Iowa.

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Authors

Alicia Vasto - Water Policy and Advocacy Specialist, Iowa Environmental Council

Dr. Silvia Secchi - Associate Professor, Department of Geographical and Sustainability Sciences, University of Iowa

About

This report was published in February 2021. We extend a special thanks to everyone that participated in the study, provided expertise and background information, and reviewed the report.



Appendix A

Rural Water System Survey

Welcome: Project Description and Purpose

The Iowa Environmental Council (IEC) is collaborating with Dr. Silvia Secchi at the University of Iowa on research of rural water systems in Iowa.

The purpose of the research is to identify trends and opportunities for rural water systems, and challenges private well owners may face in accessing safe drinking water. The ultimate goal of this project, in concert with IEC's education and policy work, is to increase access to safe drinking water for all Iowans, especially those that are currently on vulnerable private wells. The subsequent report will be made publicly available.

This survey is a portion of our research. Your participation is completely voluntary. You may withdraw at any time or skip any question. The survey will take approximately 20 minutes.

By participating, you allow your responses to be included in IEC's report. Survey results will be compiled and anonymized.

- Your system will be listed as a survey respondent in order to explain the survey scope and methods.
- Your system will not be linked to specific answers in the report narrative.
- Your personal information is completely confidential.

Please contact Alicia Vasto at vasto@iaenvironment.org if you have any questions about the project or how survey data will be used.

Your insight is incredibly valuable; thank you for participating.

Rural Water System Survey

Background Information

1. Contact Information

Name	<input type="text"/>
Rural Water System	<input type="text"/>
Address	<input type="text"/>
Address 2	<input type="text"/>
City/Town	<input type="text"/>
State/Province	<input type="text"/>
ZIP/Postal Code	<input type="text"/>
Email Address	<input type="text"/>
Phone Number	<input type="text"/>

2. Year founded/established

3. Approximate number of full-time staff

0 30+

4. What percentage of your system's water demand is purchased vs. treated by the system? (Numbers must add up to 100)

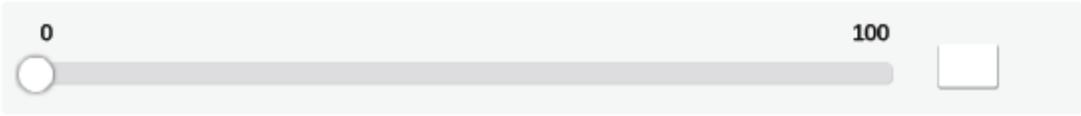
% Purchased	<input type="text"/>
% Treated	<input type="text"/>

5. What percentage of your system's water demand is purchased by the following: (Numbers must add up to 100)

% Individual rural customers	<input type="text"/>
% Community franchise	<input type="text"/>
% Community wholesale	<input type="text"/>

6. What percentage of rural households in your service area are on rural water?

0 100



Rural Water System Survey

Water Quality

7. What are your system's main water quality concerns?

8. Have the system's water quality concerns changed in the last 20 years? If the system is less than 20 years old, have water quality concerns changed since established?

Yes

No

If yes, please explain:

9. Does your system have a source water protection plan?

Yes

No

Don't know

Rural Water System Survey

Water Quantity

10. Is the source water protection plan being implemented?

- Yes
 No
 Don't know

Comments:

11. Is water quantity a concern for your system?

1 - Not a concern

2 - Somewhat a concern

3 - Very much a concern

12. How has overall water demand changed over time? Check all that apply:

- Increase due to system expansion
 Increase in saturation of service area
 Increase in community franchises or wholesale
 Increase in population within service area
 Increase due to increase in per customer usage rate
 Not changed
 Decrease due to decrease in customer usage rate
 Increase or decrease for some other reason

Please explain your response:

13. If your system uses a groundwater source, how does your system track water availability and/or demand on aquifers?

Rural Water System Survey

Private Wells

For the next section, please answer the questions based on your professional opinions and experience.

14. Approximately how many households previously on a private well connected to rural water within the last 5 years?

0 100+

15. What reasons are cited for connecting to rural water? Check all that apply:

- | | |
|--|---|
| <input type="checkbox"/> New construction | <input type="checkbox"/> Decreased cost of connecting |
| <input type="checkbox"/> Poor private well water quality/low confidence in water quality | <input type="checkbox"/> New ownership |
| <input type="checkbox"/> Decreased water rate | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Not applicable | |
| <input type="checkbox"/> Other (please specify) | |

16. Why are private well users in your service area not connecting to rural water? Check all that apply:

- | | |
|--|---|
| <input type="checkbox"/> Area already almost entirely saturated - very few private well owners | <input type="checkbox"/> Unaware of benefits of rural water |
| <input type="checkbox"/> High cost of connecting to rural water is prohibitive | <input type="checkbox"/> Unaware of risks to private well water quality |
| <input type="checkbox"/> No reason to - happy with their private well water | <input type="checkbox"/> Unaware of opportunity to connect to rural water |
| <input type="checkbox"/> Not applicable | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Other (please specify) | |

17. If there was financial assistance for private well owners to connect to rural water, would you expect more households to make the switch?

- Yes
 No
 Don't know

Please provide additional comments. If you answered yes, please let us know the approximate cost or range of cost to connect to rural water:

18. Do you think that lowans relying on private wells are aware of the risks, such as nitrates, bacteria, etc.?

1 - not at all informed

3 - somewhat informed

5 - very well informed

19. In general, do you think lowans are well informed about the quality of their drinking water?

1 - not at all informed

3 - somewhat informed

5 - very well informed

20. Please share any additional comments or thoughts about private well users connecting to rural water.

Rural Water System Survey

Future of Rural Water

Please answer the following questions based on your professional opinions and experience.

21. What is your system's outlook on expansion?

22. What do you see for the future of rural water in Iowa? In the next 20 years, what do you think the strengths, weaknesses, etc. are for the whole sector? Please complete a simple SWOT analysis.

Strengths

Weaknesses

Opportunities

Threats

Rural Water System Survey

Additional Comments

23. Please share any additional comments or thoughts you have regarding rural water, private wells, and/or safe drinking water in Iowa.