

Public Perceptions of Water Quality in Iowa: A Statewide Survey

Prepared for

Iowa Department of Natural Resources

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Executive Summary

In 2015 the Center for Social and Behavioral Research at the University of Northern Iowa conducted a survey on perceptions, knowledge, behavior, and attitudes toward water quality in the state of Iowa. This was funded as part of the Nonpoint Source Management Plan (2012) objective to develop and implement a statewide campaign to inform residents about water quality issues in Iowa, motivate citizen involvement, and change both individual behaviors and community practices. This report summarizes the key findings from the project on topics related to general views on the environment, understanding of water quality and causes of water pollution, participation in recreational activities involving water, environmental behaviors (both positive and negative) that could impact water quality, awareness of strategies for improving water quality, and responsibility for improving and willingness to invest in water quality improvement.

Views on Water Quality: When asked about their general views on the environment and water quality, concern for these two issues was on par with other topics of national concern, such as jobs and economic growth. The majority of Iowans (80%) are satisfied with the quality of the water in the area they live, but one-in-five is dissatisfied with the quality of water in their area. Three-in-five Iowans rated their home drinking water as good or excellent and two-in-five rated it as fair or poor. In comparison, nearly three in ten (29%) Iowans perceived the quality of lakes, rivers, and creeks in the last ten years as “getting worse,” just under half (49%) said the quality was about the same, and approximately two-in-five Iowans (22%) found the quality of waterways to be “getting better” over the last ten years. When asked to consider how the quality of local lakes, rivers, and creeks will change in the next ten years, 40% of Iowans thought it would stay the same, 27% thought it would improve, and nearly one-third (32%) thought that the quality would decline.

In terms of understanding water quality, slightly less than one-third (31%) of Iowans said their level of knowledge regarding water quality was “low” or “very low,” a plurality (45%) reported it was neither low nor high, and nearly a quarter (24%) said it was high or very high. The majority of respondents (63%) correctly reported that water from storm sewers goes directly to lakes, rivers, and creeks.

Threats to Water Quality: A majority of Iowans (85%) identified the following as moderate or severe threats to water quality in Iowa: runoff from cropland, livestock waste, cities and towns; dumping oil or household chemicals down the drain; and industrial or factory waste. Fifteen percent of respondents said these sources were not much of a threat to water quality in the state. When presented with a list of possible pollutants, approximately eight out of ten Iowans thought or knew nitrates (81%) and phosphates (78%) from fertilizer, as well as pesticides (82%)

to be pollutants affecting lakes, rivers, and creeks in their area. About one-in-five lowans were not sure, knew they were not, or thought they were not a possible pollutant.

Attitudes about Water Quality Issues: An overwhelming majority of lowans (85%) agreed (i.e., agreed or strongly agreed) that clean water was needed for economic growth in Iowa. Fifteen percent disagreed (i.e., disagreed or strongly disagreed) or neither disagreed nor agreed with this statement. When asked how likely they would be willing to change a single behavior to improve water quality as part of a local effort, a majority of lowans (70%) said they probably or definitely would change their behavior. Twenty percent said they might or might not adopt or change a single behavior, and ten percent said they probably or definitely would not change a behavior. A majority (58%) of lowans agreed with a statement saying they knew what steps to take in order to prevent contamination of Iowa's lakes, rivers, and creeks. Nearly a quarter (24%) of lowans said they neither agreed nor disagreed with this statement and about one-in-five (18%) of respondents said they disagreed with this statement.

Water-Related Activities & Practices: The majority (85%) of lowans reported having visited a lake, river or creek in Iowa during the last two years for recreation purposes such as swimming, boating, and fishing. Half (50%) of respondents have swum in Iowa during the last two years and 70% have been boating. Of those who had been to a body of water in the state, one-third said that a beach had been closed at the time due to a problem with the water.

lowans differed in their positive and negative environmental practices with sixty percent using some type of fertilizer – conventional, organic, or a combination of both—and four-in-ten saying they did not use anything on their lawn. The majority of lowans reported that they disposed of pet waste (80%) and hazardous materials (53%) in a manner that protected water quality, and four out of five (80%) reported using car washes rather than washing their vehicle on their driveway or yard.

Information & Engagement: Just over half (56%) of lowans said they had seen, heard, or read something about water quality issues in their area or community. In most cases this was a local or state news story (58%) or from a brochure, flyer, or some other kind of written information (41%). If a respondent wanted to learn more about water quality, most respondents used internet searches (43%), state and federal agencies (23%), conservation groups (14%), or news outlets (12%) as information sources. In terms of volunteering, about one-quarter (23%) of lowans were involved in some kind of activity such as volunteering in a clean-up day, monitoring water quality, or joining a water protection group. The majority of respondents (77%) were not involved in such activities. Most lowans preferred to be contacted through the mail (40%), email (18%), or social media (12%) if they were to be invited to participate in a local effort to improve water quality.

In general Iowans considered government, private entities, and individuals all responsible for improving water quality in the state. Approximately six-in-ten respondents said individual citizens and residents of the state, state government, or local governments were “somewhat” responsible for water quality in Iowa, and about one-third of Iowans said these groups were “completely” responsible for working to improve water quality. On average, Iowans would be willing to pay an additional \$38.50 in taxes or fees to protect water quality in the state.

Subgroup Findings: The results of subgroup analysis revealed that gender, age, income, and residence were important factors to consider when examining public perceptions and attitudes toward water quality. Self-reported knowledge was also important for perceptions of water quality. For general attitudes toward water quality, measured as either “high” or “low” agreement with statements related to water quality protection and program enhancement, women, those earning \$50,000 or less per year, Iowans not residing in rural areas, or those who liked to fish were all more likely to have “high” agreement and those who were young (18-34 years old) were more likely to have “low” agreement compared to Iowans in other categories.

In terms of overall perceptions of water quality, young residents (18-34 years old), rural residents, or those who identified as having “low” or “neither low nor high” levels of knowledge were more likely to have said that poor quality drinking water was not a problem or a small problem. However, Iowans earning \$50,000 or less per year were more likely to view problems with drinking water as a moderate or very big problem. As for perceptions of waterways, women or older residents (55+ years old) were more likely than men or younger residents to have said that water quality in Iowa’s lakes, rivers, and creeks was a moderate or very big problem. Young Iowans (18-34 years old), rural residents, or those who self-reported “low” or “neither low nor high” levels of knowledge were more likely to have said that poor quality of waterways was not a problem or a small problem than older Iowans, urban dwellers or those with higher levels of self-reported knowledge. Sense of place was a significant predictor of general water quality attitudes and revealed that among Iowans who own or live near water, those with a “low” sense of place attachment were also more likely to have low agreement on general water quality attitudes.

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Introduction

Iowa's Nonpoint Source Management Plan (2012) serves as the organizing framework for the Department of Natural Resources' vision, goals, and objectives to develop action steps that reduce nonpoint source pollution and improve water quality during the next five to ten years. One of the primary objectives of the plan is to develop and implement a statewide campaign to inform people about water quality issues in Iowa, motivate citizen involvement, and change behaviors in households and communities (Objective 2.5). To this end, the Center for Social and Behavioral Research (CSBR) at the University of Northern Iowa (UNI) conducted a statewide survey of Iowans to obtain baseline measures of public understanding and willingness to participate in improving water quality. Public perceptions, values and activities are fundamentally tied to the state's ability to reduce nonpoint source pollution. Understanding public awareness, environmental behaviors and activities is integral to planning and implementing successful approaches to improving water quality.

This report summarizes the key findings from the project which included a mixed-methods design incorporating a qualitative component (focus groups) and a quantitative component (statewide survey). The focus groups were conducted primarily to inform the survey development and the summary focus group report can be found in Appendix A. The 2015 Statewide Survey of Public Perceptions of Water Quality in Iowa included topics on general views on the environment, understanding of water quality and causes of water pollution, participation in recreational activities involving water, environmental behaviors (both positive and negative) that could impact water quality, awareness of strategies for improving water quality, and responsibility for improving and willingness to invest in water quality improvement. Additionally, subgroup and multivariate analyses were conducted to evaluate the degree to which other factors, such as demographic characteristics, place of residence, and sense of place, might impact public perceptions and attitudes. We believe that findings from this report will provide a baseline of information to assess the impact of future informational campaigns and will serve as a foundation for bridging differences across viewpoints and priorities with the goal of building common ground that can motivate and inform local and regional environmental planning that is cooperative and successful in its efforts to improve water quality in the state of Iowa.

Background and Methodology

To measure public perceptions of water quality and nonpoint source pollution in Iowa, the UNI Center for Social and Behavioral Research conducted a statewide survey of adults. The survey was sponsored by the Iowa Department of Natural Resources with funds from the United States Environmental Protection Agency (Section 319). The questionnaire was developed in consultation with Iowa DNR staff.

Questionnaire topics included:

1. General views on the environment;
2. Understanding of water quality and causes of water pollution;
3. Participation in recreational activities;
4. Positive and negative environmental behaviors that could impact water quality;
5. Awareness of strategies for improving water quality;
6. Responsibility for improving water quality and willingness to pay or invest in water quality improvement; and
7. Demographic and geographic factors that could impact perceptions, knowledge, and attitudes.

The complete survey instrument can be found in Appendix B.

Population and Sampling Design

The survey used a dual-frame random digit dial (DF-RDD) sample design that included both landline and cell phones. All phone numbers were obtained from Marketing Systems Group (MSG). A modified Kish protocol was used for within-household selection for landline calls. Respondents were Iowans who were at least 18 years of age or older at the time of the interview. Interviews were completed from February 17, 2015 through June 18, 2015, and averaged 34 minutes in length. Interviews were conducted in both English and Spanish.

A total of 2,080 interviews were completed. This included 384 (18%) landline and 1,696 (82%) cell phone interviews.

Response rates were calculated using the American Association for Public Opinion Research (AAPOR RR3) calculation. The overall response rate was 31%. The response rate for the RDD landline and the cell phone samples were 28% and 31%, respectively. The overall cooperation rate (AAPOR CR3) was 71%. The cooperation rate for interviews completed via cell phone (75%) was higher than for landline (57%).

Weighting and Precision of Estimates

For analyses, the data were weighted to mirror the adult Iowa population on key characteristics including age, gender, race/ethnicity, education, household income, place of residence and telephone status.¹ The post-stratification weights were computed with SAS (see www.sas.com). These weighted data help adjust for any areas of over- or underrepresentation in the sample and are used to generalize to the statewide population of adult Iowans, thus we refer to respondents as “Iowans” throughout the report. Descriptive statistics, including frequencies and distributions were calculated for the total sample and for population subgroups including gender, age group, income, education, place of residence, and geographic features (e.g., watershed) for select questions in the interview. Margin of sampling error (MOE) taking into account the design effect is $\pm 1.2\%$ for the overall sample and as high as $\pm 8.5\%$ for the analyses using the smallest subgroups (Watershed subgroup: Northeast). IBM SPSS Statistics 22 was used for initial data management, descriptive analyses and multivariate analysis, and SUDAAN v 10.0 was used to determine population estimates of responses. Analyses conducted in SUDAAN have been adjusted for the design effect² due to differential probabilities of selection, clustering and weighting.

To account for the large number of comparisons being analyzed, the significance level was set at $p\text{-value} \leq 0.01$ (or 1%) for the subgroup analyses and at $p\text{-value} \leq 0.05$ (5%) for the multivariate analyses. Unless otherwise noted, the term “percent” refers to the “weighted percent” of survey respondents.

¹ See Appendix C. Weighting Methodology Report.

² The Design Effect (**DEFF**) is a measure of estimated ratio between variances between cluster versus simple random sampling design in a weighted data analysis.

Survey Results

Demographic characteristics of the survey sample can be found in Table 1. The unweighted distribution of respondents was 55% male compared to 45% female. By age group, 47% of respondents were 55 years or older, 32% were 35-54 years old, and 21% were 18-34 years old, respectively. The mean age of respondents was 51 years (range: 18-93 years). In terms of ethnicity, respondents were 96% non-Hispanic and 4% Hispanic. Consistent with the state demographics, the majority of respondents were white (95%), 2% were African-American and 4% were other races. As for education, 36% of respondents reported four or more years of college, 34% at least some college, and 30% had a high school diploma or less. By place of residence, approximately 30% reported living in a rural area compared to 71% living in a town of 5,000 residents or more.

Percentages in figures were rounded to the nearest whole number, therefore percentage totals will range from 99% to 101%. Unless otherwise noted, proportions reported in all charts and figures and all survey items described in the report are from cued responses (i.e., closed-ended questions).

Table 1. Demographic characteristics of respondents

	Sample size (n)	Unweighted %	Estimated % after weighting
Total Sample	2,080	--	--
Gender			
Men	1,137	55%	57%
Women	943	45%	43%
Age Group			
18-34	441	21%	30%
35-54	655	32%	34%
55 and older	984	47%	37%
Ethnicity			
Hispanic	84	4%	8%
Non-Hispanic	1982	96%	92%
Race			
White	1948	95%	91%
Black or African American	32	2%	3%
Asian	14	1%	1%
Native Hawaiian or other Pacific Islander	3	<1%	<1%
American Indian or Alaska Native	15	1%	1%
Some other race	40	2%	4%
Education			
High school graduate/GED or less	619	30%	42%
Some college (1-3 yrs) / Associates degree	708	34%	33%
4-year undergraduate or graduate degree	753	36%	24%
Employment			
Employed for wages	1,101	53%	55%
Self-employed	257	12%	10%
Out of work / Unable to work	145	7%	8%
Student	69	3%	5%
Homemaker	49	2%	4%
Retired	456	22%	18%
Annual Gross Household Income			
Less than \$50,000	835	40%	38%
\$50,000 to less than \$100,000	774	37%	35%
\$100,000 or More	471	23%	27%
Place of residence			
Rural (Farm, rural setting, or outside city limits)	614	30%	20%
Non-Rural (>5,000 population)	1,466	71%	80%

Sums less than 2,080 due to respondents who answered 'Don't know' or 'Refused'.

Section 1. General views on the environment and water quality.

Iowans were asked to report their level of concern about a variety of issues facing the country today (Figure 1). Topics ranged from jobs and economic growth to terrorism with two specific environmental issues included in the list (the environment and water quality). Iowans' reported levels of concern for the environment and water quality were in line with those of many other issues of national importance. Approximately one-third of Iowans said that they were "extremely concerned" about the environment (35%) and water quality (32%), comparable to immigration (33%) and jobs and economic growth (36%). Iowans were most concerned about health care and terrorism or national security, with 45% and 43% indicating extreme concern, respectively.

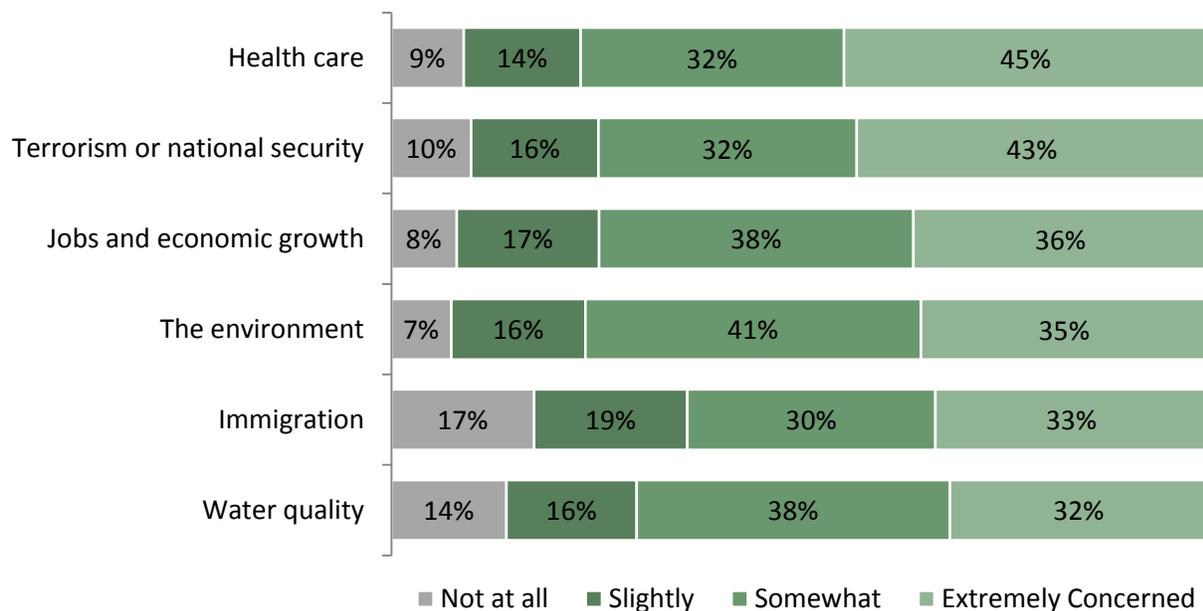


Figure 1. Ratings of concern for issues facing the country today

When asked about problems in Iowa specifically (Figure 2), more than half of Iowans (53%) said that poor quality of water in lakes, rivers, and creeks was either a moderate or very big problem compared to less than one-third (31%) of Iowans who deemed poor quality drinking water as a moderate or very big problem. Just over four in ten Iowans indicated that poor quality drinking water and lack of places for outdoor recreation were *not* problems at all, at 43% and 47% respectively. In contrast, about one in five (19%) Iowans thought that poor water quality of lakes, rivers, and creeks was *not a problem* at all. Of all the problems presented, the deteriorating condition of roads and bridges was viewed as the most significant problem with

about a third of lowans (34%) indicating that this was “a very big problem” and another 38% indicating it was a moderate problem.

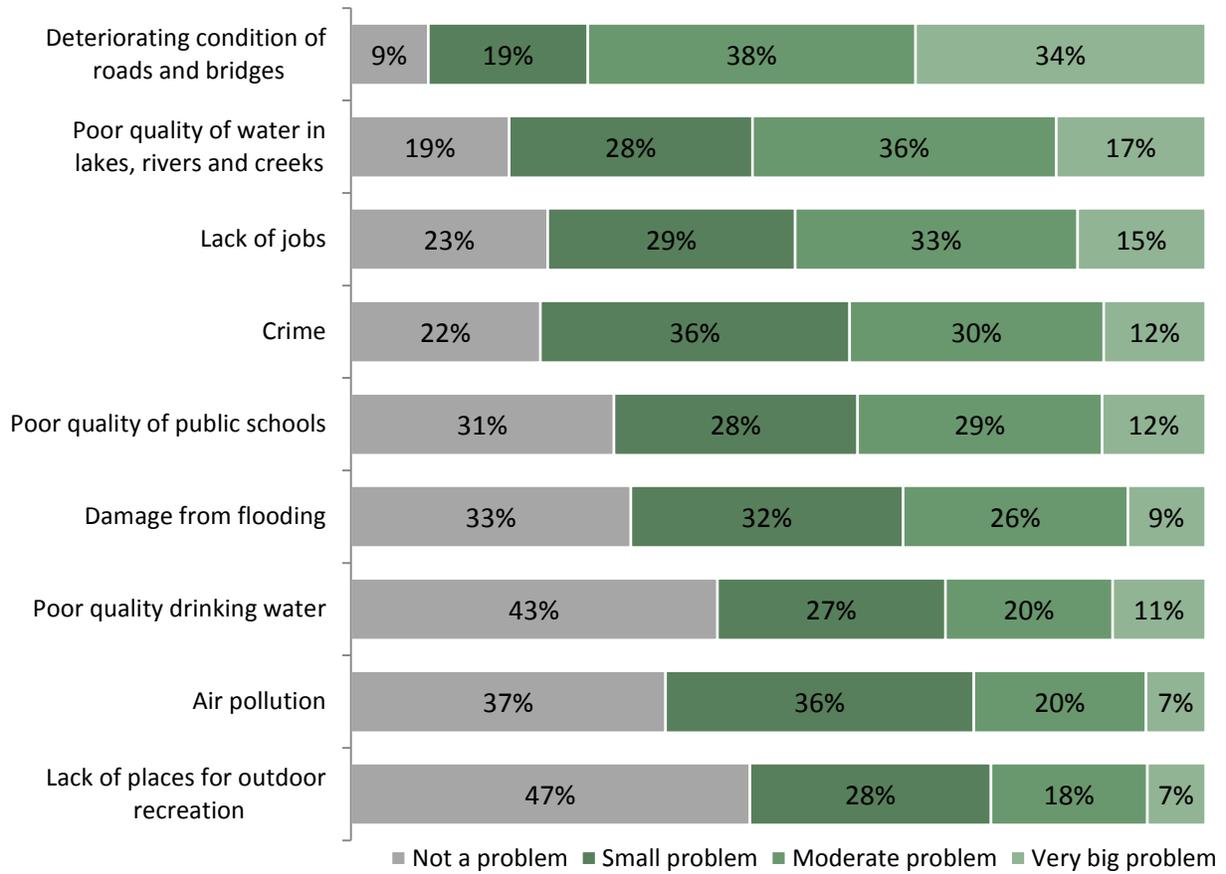


Figure 2. Severity of issues facing Iowa

When asked to think about what things will be like ten years from now in Iowa, residents expressed a mix of expectations. The majority of lowans (57%) believe that Iowa’s lakes, rivers, and creeks will be more polluted in the future than they are today and that health care will be less affordable (69%) (Figure 3). In contrast, lowans thought the economy would be stronger (71%) and that public education would improve (55%).

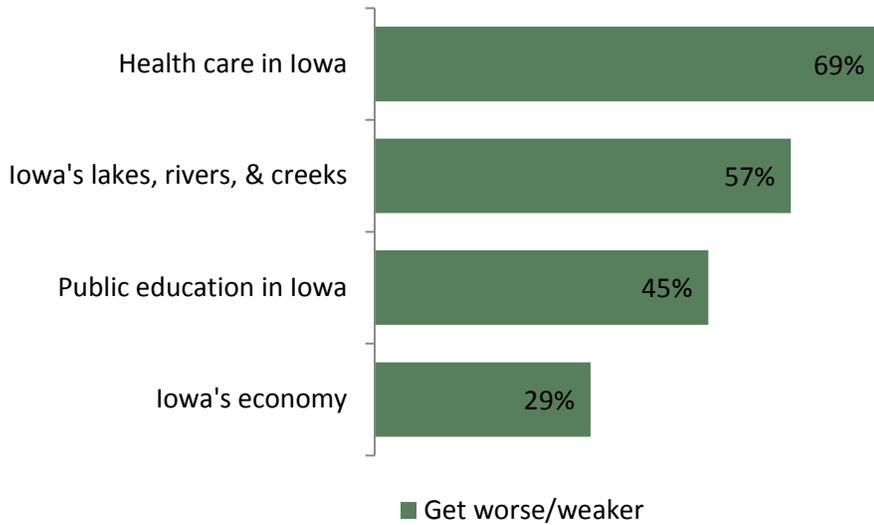


Figure 3. Perceptions about the “state of the state” in 10 years

Satisfaction with the quality of water in Iowa

Satisfaction with water quality was asked in a variety of ways beginning with general questions about water quality and then shifting to more detailed questions about drinking water and waterways such as lakes, rivers, and creeks. Iowans were somewhat divided in terms of their overall assessment of water quality in the state. Slightly more than one-half (55%) of Iowans rated Iowa’s overall water quality as good or excellent while 45% rated it as fair or poor (Figure 4).

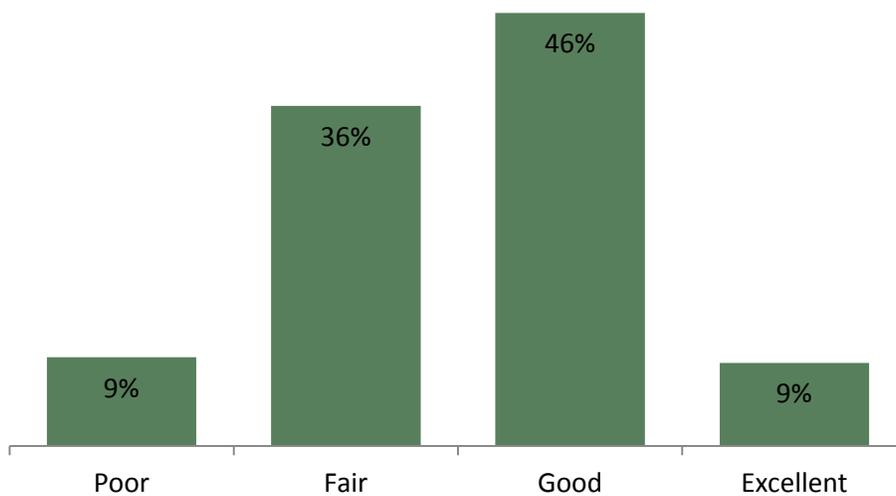


Figure 4. Perceptions of water quality in Iowa

Eighty percent of lowans indicated they were satisfied with the quality of water in the city or area where they live (Figure 5). Those who were dissatisfied were asked in an uncued question to identify which aspects of water quality they found unsatisfactory (Figure 6).

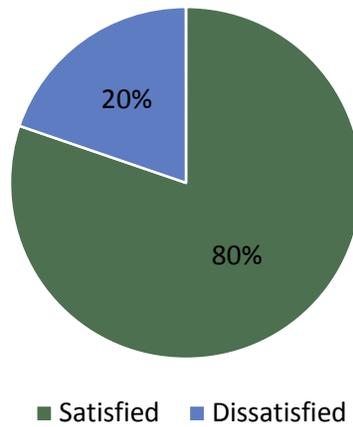


Figure 5. Satisfaction with the quality of water in the city or area where respondent lives

A plurality noted bad taste (43%) and/or worries over contamination (34%) as the source of their concern. Other mentions included hard water (15%), “smell” of chlorine (13%) or sulfur (8%), and discolored or murky water (11%).

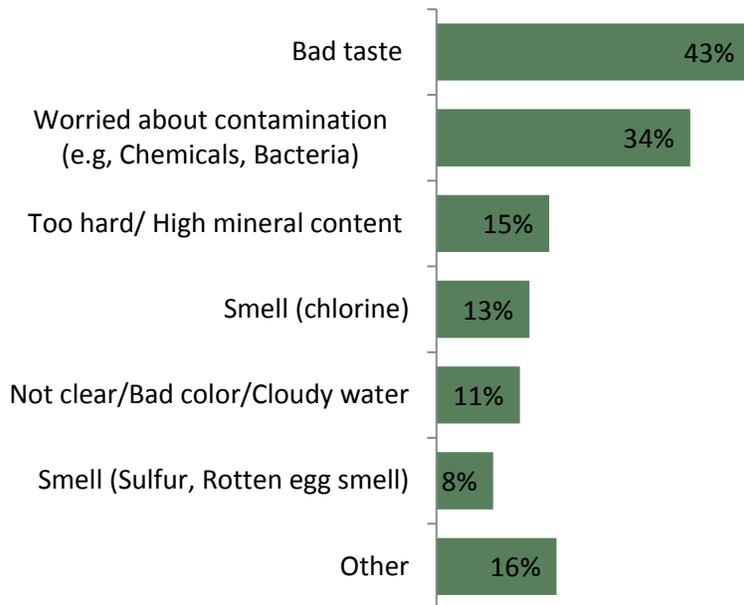


Figure 6. Aspects of water contributing to dissatisfaction with water quality
*Only asked of those who indicated dissatisfaction with water quality where they live.

When asked to rate the quality of their home drinking water, as it comes from the faucet with no filtering of any kind, 59% of lowans rated their home drinking water as good or excellent, while 41% of lowans rated it as fair or poor (Figure 7).

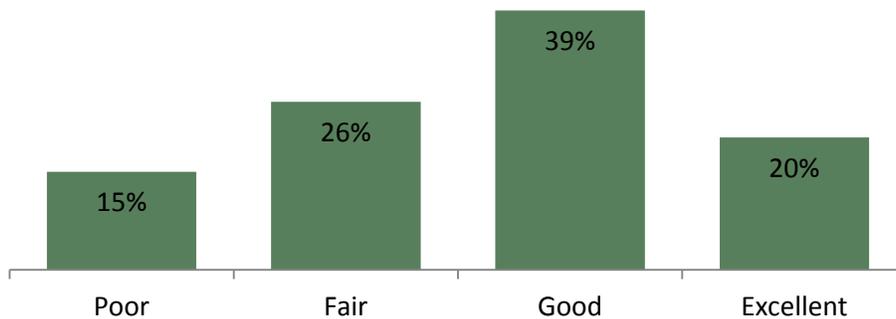


Figure 7. Perceptions of the quality of unfiltered home drinking water from the faucet

Despite positive ratings of the quality of home drinking water, just over two-thirds of lowans (68%) expressed concern about the safety of their tap water by indicating they were somewhat, moderately, or extremely concerned (Figure 8).

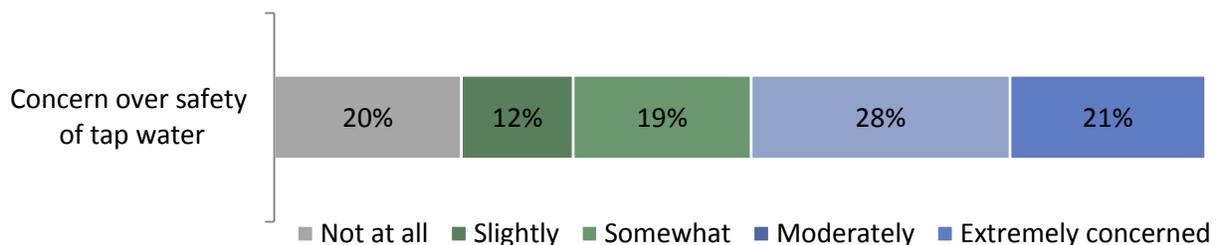


Figure 8. Concern over safety of tap water

When asked to compare the quality of drinking water to ten years ago, nearly two-thirds of lowans (68%) said that it is about the same, whereas 21% thought it was getting better (Figure 9). Eleven percent thought it was worse than a decade ago.



Figure 9. Perceived change in overall quality of drinking water over the last ten years

In regard to water quality in Iowa’s waterways³ (i.e., lakes, rivers, and creeks), respondents were asked to rate the quality of water both in their area and statewide. As shown in Figure 10, similar response patterns emerged for perceptions of waterways both in proximity to the respondent and statewide. Forty-five percent of Iowans rated the water quality in Iowa waterways as good or excellent and 46% rated bodies of water close to their home as good or excellent.

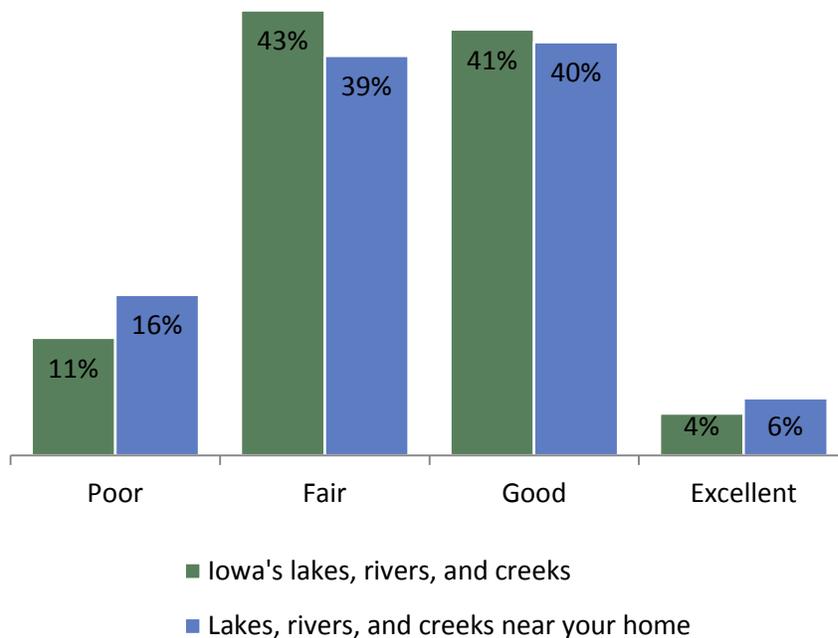


Figure 10. Perceptions of the quality of lakes, rivers and creeks in Iowa and near their home

³ Waterways, as defined in this report, refer specifically to Iowa’s lakes, rivers, and creeks.

When asked to reflect on changes in water quality in Iowa’s waterways over the last ten years, just under one-half of respondents (49%) reported no change in the quality (Figure 11); however, nearly thirty percent (29%) of Iowans thought that the overall quality of lakes, rivers, and creeks was getting worse.

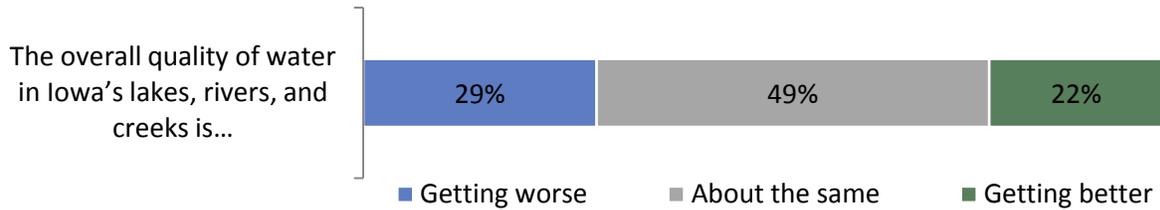


Figure 11. Perceived change in quality of Iowa’s lakes, rivers, and creeks over the last ten years

When asked to consider how the quality of lakes, rivers and creeks in their area will change in the next ten years, two-thirds of Iowans (68%) stated the quality will remain the same or improve, while nearly one-third (32%) thought it would decline (Figure 12).

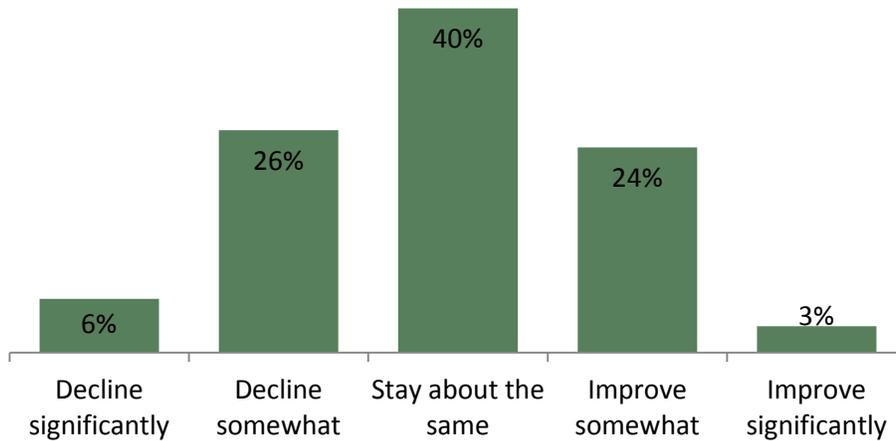


Figure 12. Predicted change in quality of Iowa waterways near respondent during next 10 years

Section 2. Understanding of water quality and causes of water pollution.

Understanding of water quality and causes of water pollution

Iowans were asked to identify their level of knowledge with regard to water quality issues facing their community. Forty-five percent of Iowans said their knowledge level was neither low nor high, while 31% indicated a low or very low level of knowledge and 24% indicated high or very high (Figure 13).

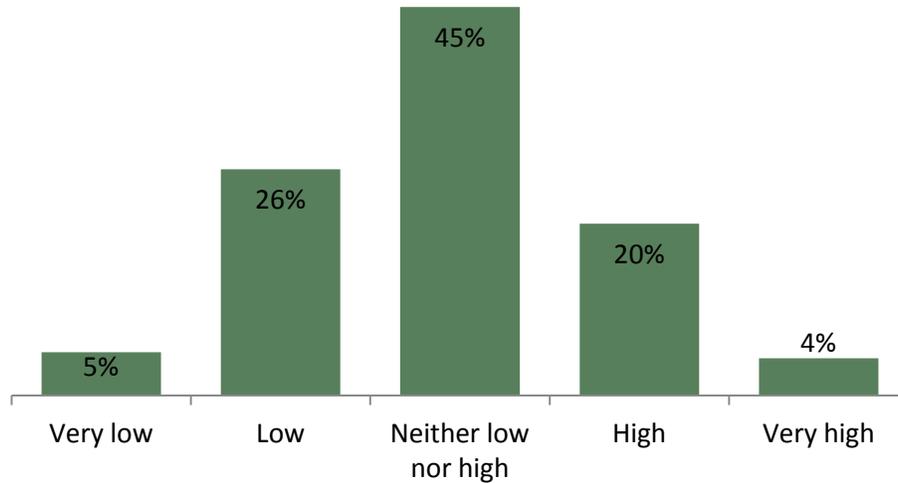


Figure 13. Self-reported level of knowledge regarding water quality issues

About two-thirds (63%) of Iowans accurately identified that water from storm sewers goes directly to lakes, river, and creeks; approximately one-quarter (27%) mistakenly said it went to wastewater treatment plants and one-tenth (10%) said the water soaked into the ground (Figure 14).

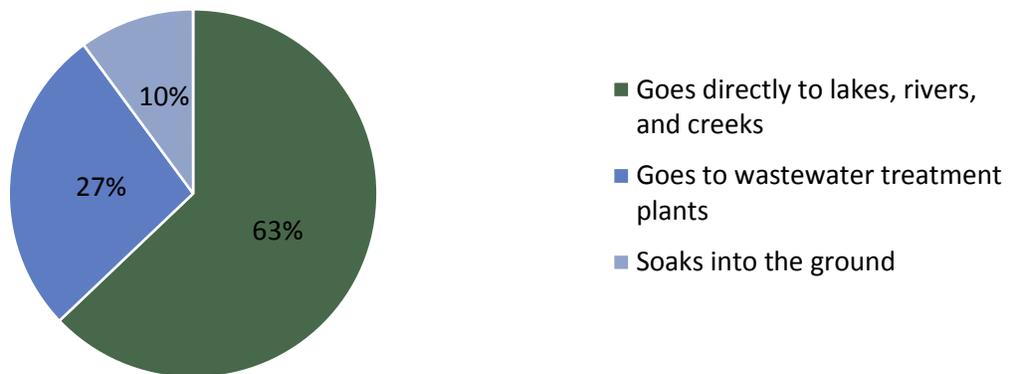


Figure 14. Perceived destination of storm sewer discharge

When asked to list (without prompting) potential sources of water pollution or contamination, excluding industrial waste or wastewater treatment plants, the top five uncued sources mentioned were agricultural runoff (41%), agricultural chemicals (33%), illegal dumping, trash or litter (25%), runoff from livestock waste (20%), and urban runoff (16%). Over 85% of respondents identified runoff from cropland, runoff from livestock waste, runoff from cities and towns, dumping oil or household chemicals down the drain, and industrial or factory waste as moderate or serious threats to water quality in Iowa (Figure 15).

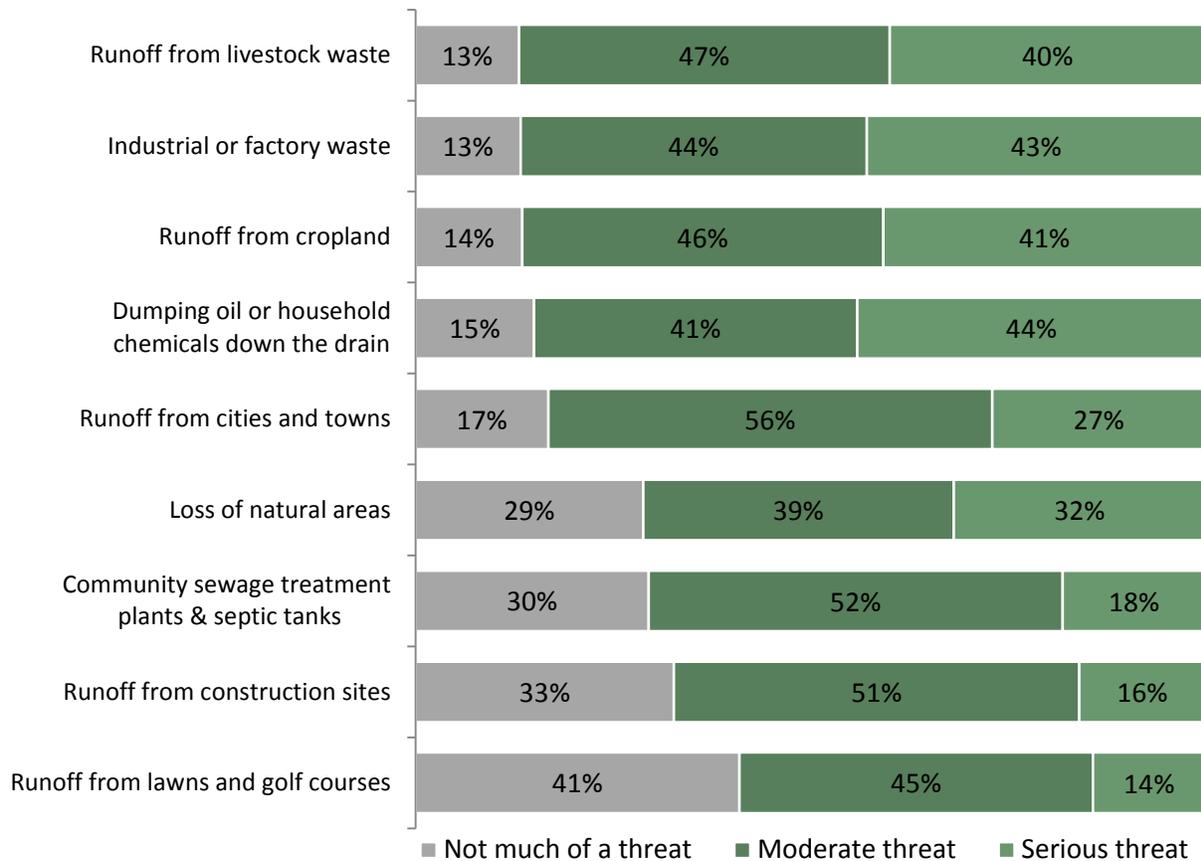


Figure 15. Severity of threat posed to Iowa's water by pollution sources

When asked to identify the sources of pollution that pose the biggest threat to the quality of water *in their area* specifically, the most common uncued responses were related to runoff from agricultural areas (51%), trash and litter (15%), waste from factories (15%), and runoff from livestock waste (14%). Respondents were then asked whether they knew or thought pollutants from a list of possible contaminants in Iowa were affecting lakes, rivers, and creeks by responding they “know it is not,” “think it is not,” “think that it is,” or “know it is” a pollutant

in their area. Eight out of ten lowans thought or knew nitrates (81%) and phosphates (78%) from fertilizer, as well as pesticides (82%) to be pollutants affecting lakes, rivers, and creeks *in their area* (Figure 16). The majority of lowans (56%) indicated that waste from pets, such as dogs, was not affecting waterways near them, while lowans were most uncertain about whether minerals such as iron, manganese, calcium (27% “not sure”) and heavy metals such as lead, arsenic, or mercury (21% “not sure”) were affecting waterways near them.

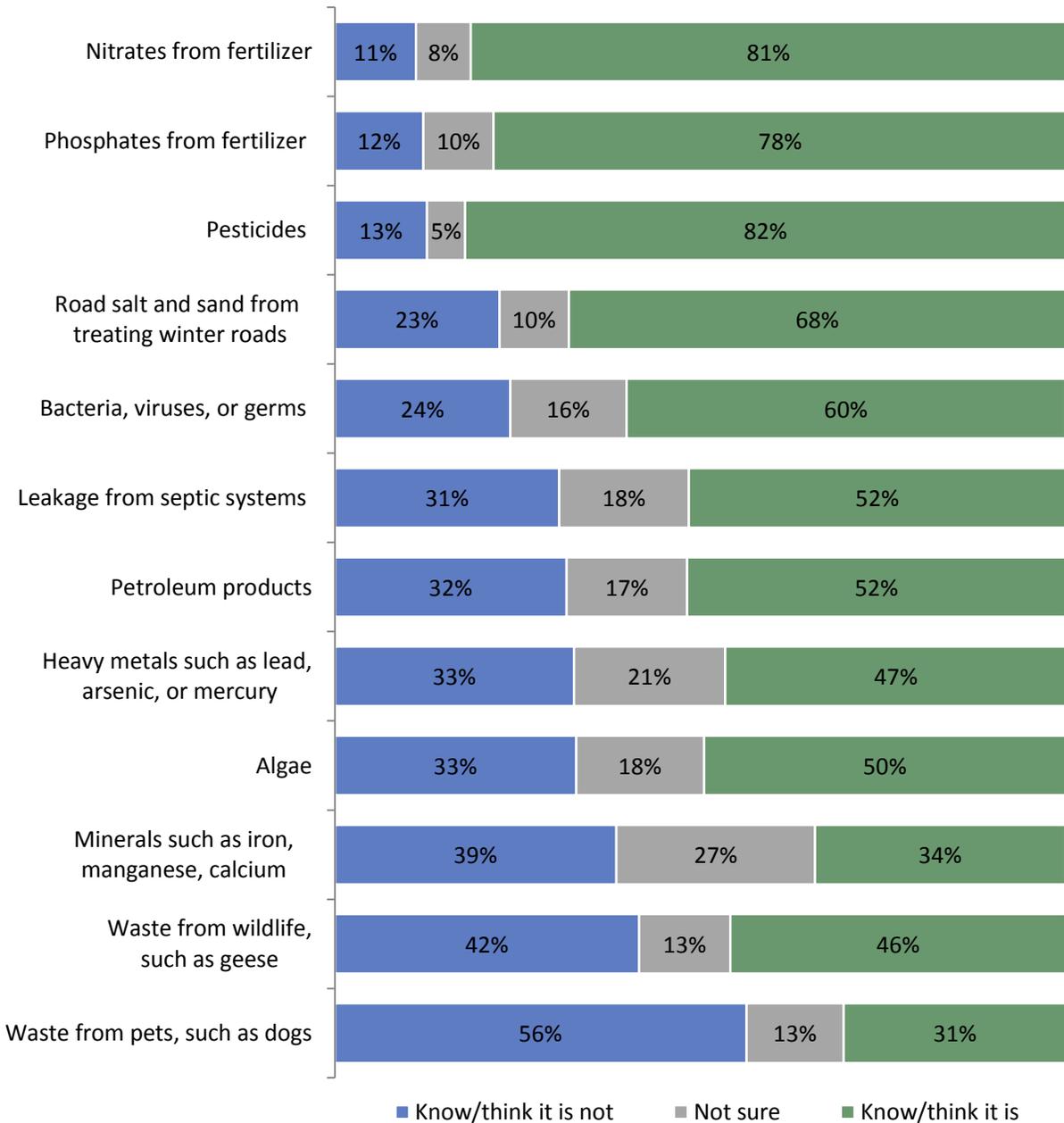


Figure 16. lowans’ perceptions of possible pollutants affecting waterways in their area

Attitudes toward water quality

To further explore attitudes toward water quality, respondents were asked the degree to which they disagreed or agreed with a list of fifteen statements regarding a variety of issues related to water quality. Response options ranged from strongly disagree to strongly agree on a five-point scale. These statements were analyzed via factor analysis to determine whether they were related to one another and might be grouped into underlying categories or factors. The 15 statements grouped into three factors and are presented in those groupings below.⁴

The first set of attitudes can be interpreted as the degree to which potential threats to water quality, such as runoff from livestock operations and paved areas, chemicals in drinking water, and lack of attention to water protection were perceived as problems (Figure 17). Nearly two-thirds (64%) of lowans agreed or strongly agreed that water runoff from livestock operations was a problem, and sixty percent felt similarly about runoff from agricultural production. Sixty-one percent of lowans agreed or strongly agreed with a need to increase regulations for landowners to protect soil and water.

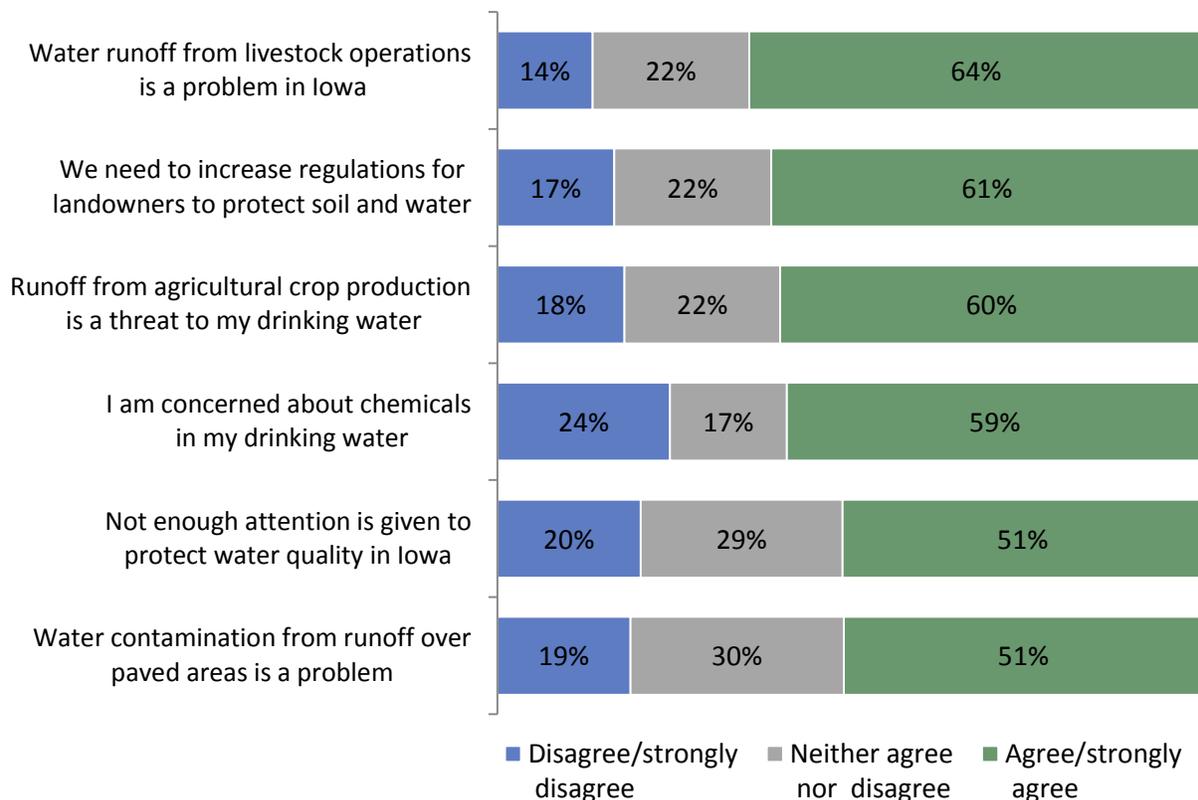


Figure 17. Attitudes toward potential threats to water quality

⁴ Additional information on the scale construction can be found in Appendix E.

The second set of attitudes combined statements reflecting actions that could be taken to improve water quality (Figure 18). An estimated 85% of lowans agreed (agreed or strongly agreed) that clean water is needed for economic growth in Iowa and three-quarters agreed that there is a need to improve lakes, rivers, and creeks for tourism or recreation in the state (75%). Nearly three-quarters (74%) agreed or strongly agreed that incentives for farmers to protect soil and water should be increased. Though most lowans were also willing to change some daily behaviors to improve water quality their area (80% agree or strongly agree), a smaller proportion (58%) knew what steps to take in order to prevent contamination of Iowa’s waterways.

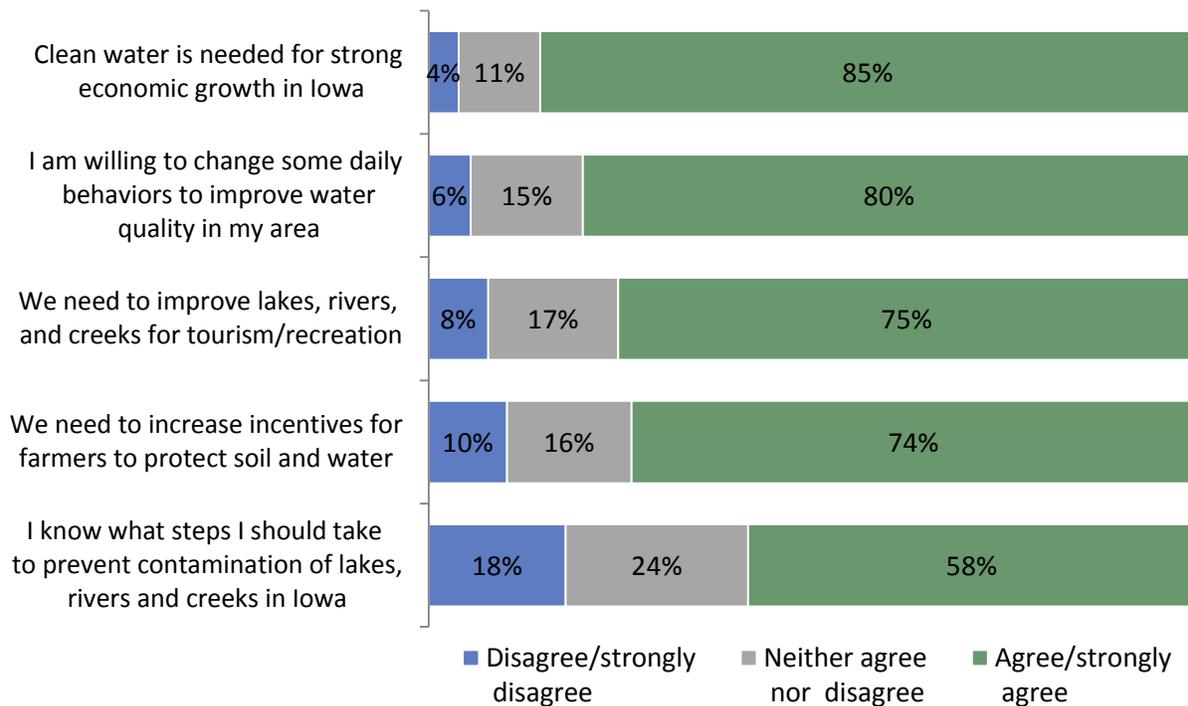


Figure 18. Attitudes toward actionable steps to improve water quality

The third set of attitudes related to agreement on issues pertaining to possible regulations and/or legislation regarding water pollution. Six in ten lowans (60%) disagreed (defined as disagreed or strongly disagreed) with the statement “water pollution laws are too tough in Iowa,” and just under half of the respondents (48%) disagreed that efforts to keep water clean should be voluntary rather than mandated by the government. There was less consistency among respondents for this set of attitudes with more than one-third (35%) neither agreeing or disagreeing with the statement “farmers take undue blame for environmental problems” and

29% neither agreeing or disagreeing with the statement “tough water protection laws hurt economic development.”

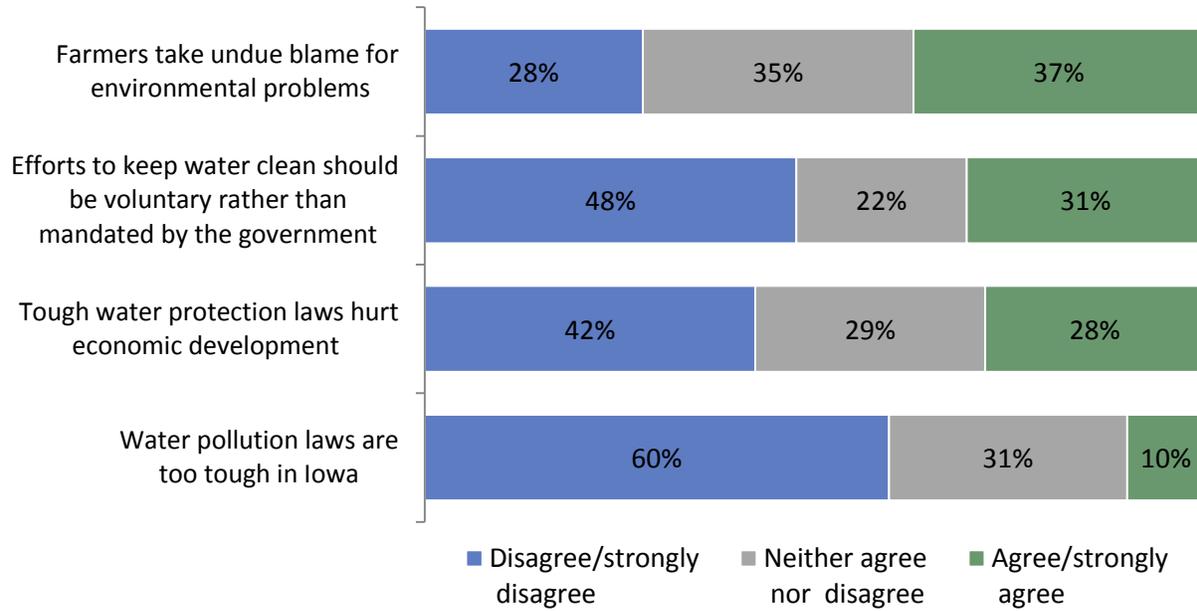


Figure 19. Attitudes toward policy-related statements about water quality

Section 3. Participation in recreational activities involving water

Participation in water-related recreational activities

The majority of lowans (85%) visited a lake, river, or creek in Iowa during the last two years for recreational purposes (Figure 20). Moreover, of those who visited an Iowa waterway in the last two years, 70% said they visited from two to six different waterways.

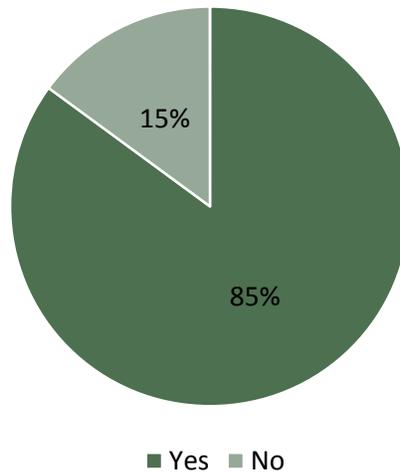


Figure 20. Visitation to a lake, river, or creek in Iowa during the last two years for recreation

Fishing (52%), boating/sailing (35%), and swimming (34%) were the three most common activities cited by lowans who had visited an Iowa lake, river, or creek in the past two years. Among those who had utilized an Iowa waterway for recreation, 51% indicated they had swum and 61% indicated they had boated. In addition, of those who visited a lake, river, or creek in Iowa in the past two years, one-third (34%) indicated that a beach had been closed when they visited because of a problem with the water (Figure 21).

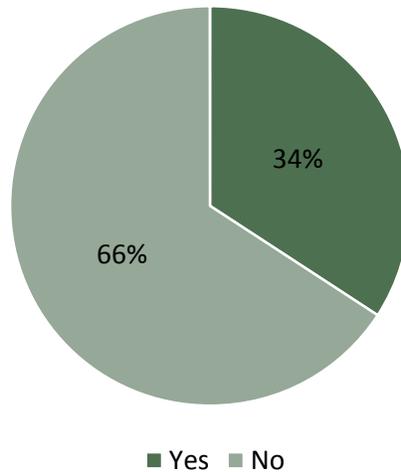


Figure 21. Experience with an Iowa beach closing due to water conditions during a visit

Among those who reported not swimming in a lake during the previous two years, approximately half (50%) said in response to an uncued question that they do not swim or are not interested in swimming. Furthermore, 29% mentioned unclear water or closed beaches as the primary reason for not swimming. Iowans who had not boated in the last two years cited lack of equipment or excessive cost (50%) as the primary reason. Nearly one-third (32%) of non-boaters said they had no interest in boating as the primary reason for not boating in response to an uncued question.

Fishing in Iowa

Among those who had gone to a waterway for recreational purposes in the last two years, 53% had fished in an Iowa lake, river, creek, or farm pond. When asked where they fished (Figure 22), lakes (53%) and rivers (41%) were more common than farm ponds (27%) or creeks (21%).

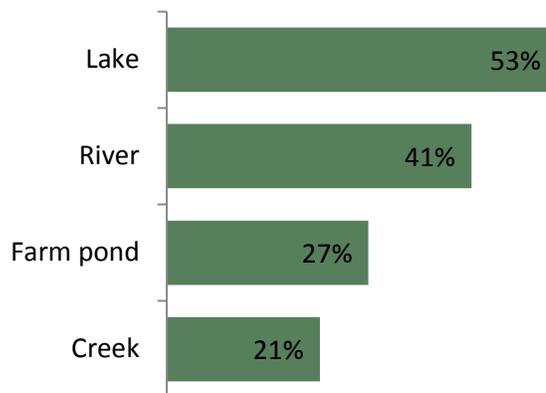


Figure 22. Types of waterways fished during the past two years

Although fishing is a popular recreational activity, five percent of lowans indicated they do not consume fish at all and more than half (56%) of lowans indicated they have not consumed fish caught in an Iowa lake, river, creek, or farm pond during the past two years.

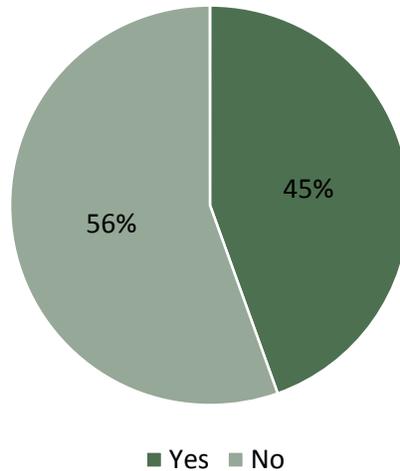


Figure 23. Consumed fish from an Iowa lake, river, creek, or farm pond in the last two years.

Finally, respondents were asked to indicate if they thought it would be safe to eat fish caught in an Iowa lake, river, creek, or farm pond, respectively (Figure 24). For all sources, approximately half of the respondents said they would consider the fish safe to eat if the fish was caught in a farm pond (52%), creek (53%), and a slightly higher majority (56%) thought fish from a river was safe to eat, and more than two-thirds thought it would be safe if it was caught in a lake (69%).

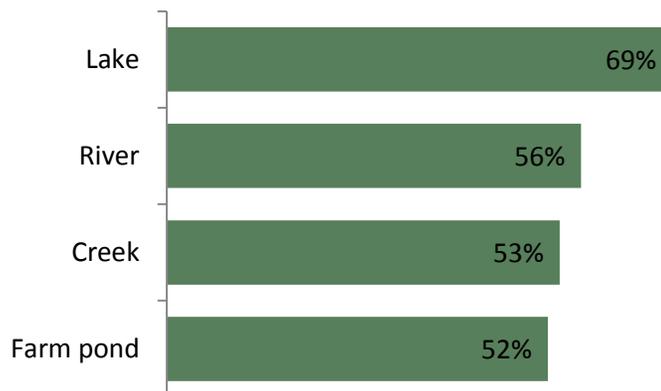


Figure 24. Respondents who believe it is safe to eat fish caught in various Iowa waterways

Section 4. Positive and negative environmental behaviors that could impact water quality.

Lawn and garden An estimated 78% of lowans reported having a lawn or garden to maintain. Among those, approximately one-third said they use some type of conventional (i.e., non-organic) fertilizer, either administering the fertilizer themselves (24%) or hiring a lawn care company to apply the product on their property (12%) (Figure 25). Fourteen percent said they use a type of non-chemical application, such as compost or organic fertilizer. Nearly one-tenth (9%) of respondents said they use both organic and conventional fertilizer, which may be either a combination of compost and chemical products or organic and chemical fertilizers. The largest proportion (40%) of lowans said they use no fertilizer on their lawns.

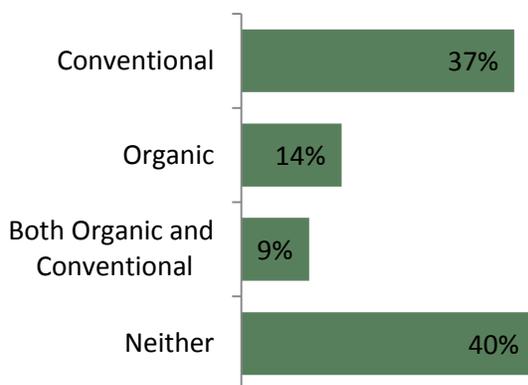


Figure 25. Types of fertilizer applied to Iowa lawns

For lowans who do fertilize their lawns, two-thirds (66%) reported that they do so one to two times per year, and nearly three-quarters (73%) report that their fertilizer use has stayed the same during the last two years. Thirteen percent of those who maintain a yard or garden reported that they have conducted a soil test to check for nutrients on their property.

Pet waste lowans are split almost evenly between dog owners (48%) and non-dog owners (52%), and among dog owners, the majority (61%) claim to pick up their dog's pet waste in all locations, at all times, and one-fifth (20%) state they do not pick up after their dog in their lawn or any other location where they walk their dog.

Washing vehicles Among lowans who have a vehicle, the majority report that they use commercial car washes to clean their primary vehicle, whether it be an automatic car wash (52%) or a self-serve car wash (28%). Thirteen percent said that they wash it at home, either on the driveway (10%) or on the lawn (3%).

Hazardous materials About half of lowans (53%) report that they took hazardous materials such as leftover paints, cleaners, and other toxic chemicals to a collection site in the past year.

In general, a majority of lowans in the statewide survey report positive behaviors toward water quality in regard to discarding pet waste, washing vehicles, and disposing hazardous materials (Figure 26).

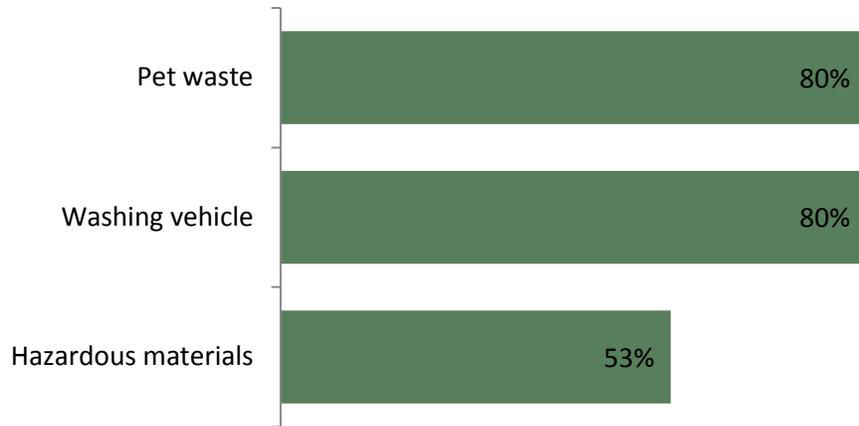


Figure 26. Positive behaviors related to pet waste (e.g., picking up pet waste), washing vehicles (e.g., using a commercial car wash), and hazardous materials (e.g., taking leftover paints, cleaners, or other toxic chemicals to hazardous waste drop-off location)

Section 5. Awareness of strategies for improving water quality.

Information sources and participation in efforts to improve water quality

When asked about sources of information related to water quality issues in their area or community, a majority of Iowans (57%) said that they recalled seeing, hearing, or reading something about the topic in the past year (Figure 27). Among those who recalled some type of information they saw, heard, or read, the majority (58%) said it was from a news story in the local or state media, and 41% reported receiving a brochure, flyer, letter, or some other kind of written information.

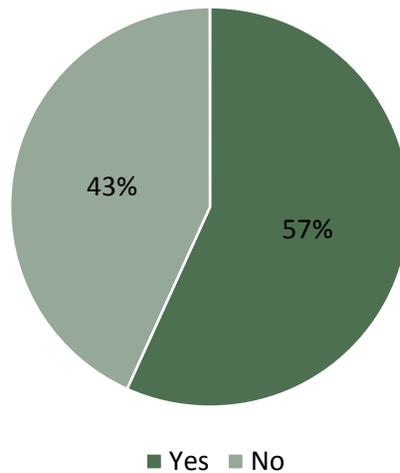


Figure 27. Respondents who recalled seeing, hearing, or reading information about water quality in their area

In an open-ended question with no cuing, Iowans were asked where they would go to find information about water quality and conservation. Internet searches (43%) were the most frequently mentioned means of obtaining information about water quality and conservation, followed by state and federal agencies (23%), such as the Iowa Department of Natural Resources (DNR) and Iowa Department of Agriculture and Land Stewardship (IDALS) (Figure 28).

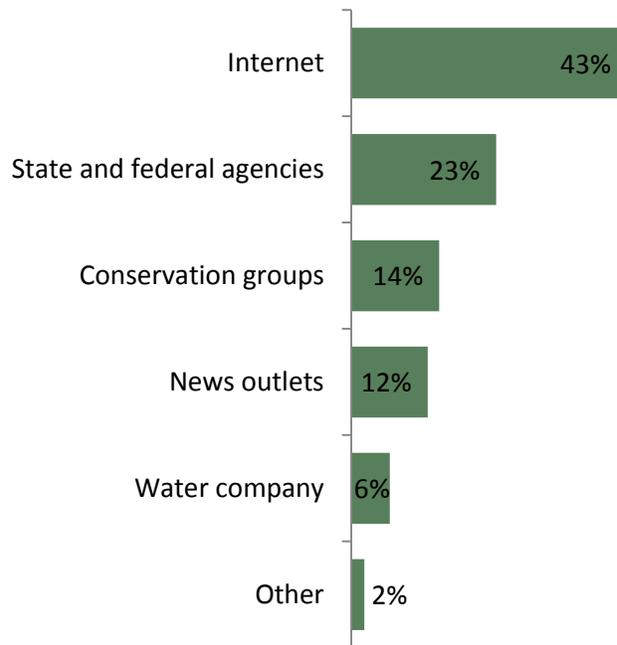


Figure 28. Information sources used for retrieving information about water quality and conservation

When asked if they had participated in efforts to improve water quality in the past two years, nearly one-quarter of lowans (23%) reported that they were involved in at least one kind of activity, such as volunteering to monitor water quality or joining a water protection group. Respondents were most likely to indicate that they have volunteered in a lake, river, or creek clean-up day (16%).

If someone were to extend an invitation to participate in a local effort to improve water quality, lowans report that they would most prefer receiving this information through the mail (40%), via email (18%), or through social media outlets such as Facebook, Twitter or Instagram (12%).

Section 6. Responsibility for improving water quality and willingness to pay or invest in water quality improvement.

Iowans were asked how responsible different groups, (i.e., federal, state, and local governments, businesses, or individuals) should be for working to improve water quality in their area or community. The majority of Iowans attributed responsibility for working to improve water quality, either somewhat or completely, to state and local governments, farmers, businesses, and residents (Figure 29). The percent of Iowans who somewhat or completely agreed ranged from a high of 97% for citizens or residents of the state to a low of 86% for the federal government. Citizens and residents of the state, state government, and local government were identified most often as groups that are completely responsible for water quality in the state.

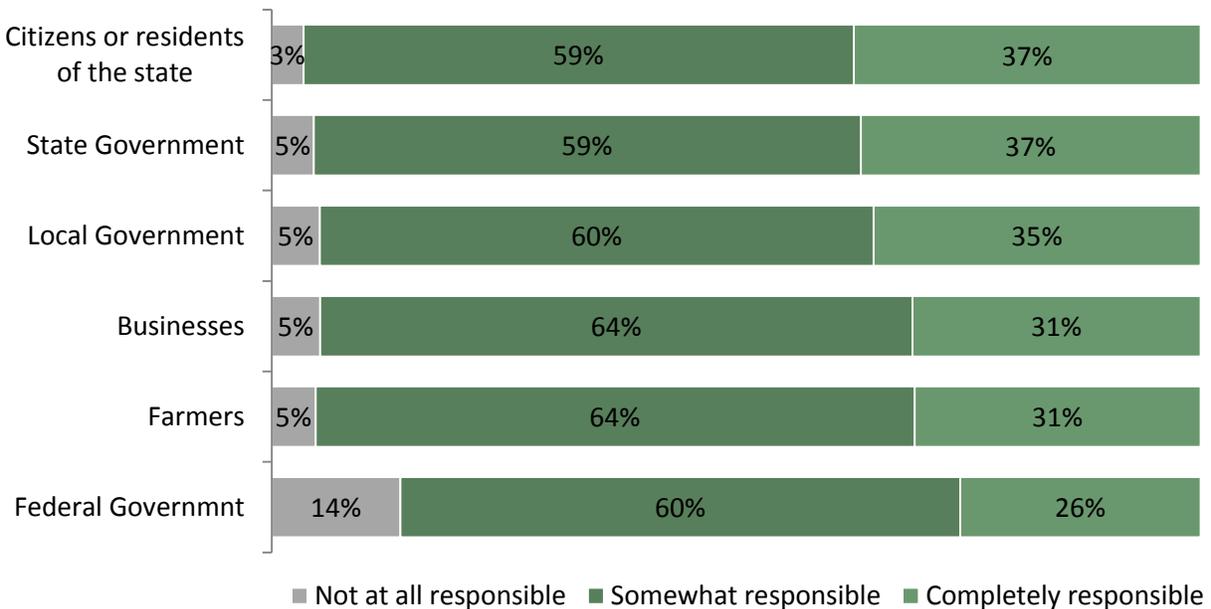


Figure 29. Attribution of responsibility for working to improve water quality

Iowans were asked to rate the same groups on a five-point scale from “very poorly” to “very well” regarding how well they are fulfilling their responsibility for protecting water quality in their areas and communities. The largest proportion of Iowans said local government was fulfilling their responsibilities well or very well (Figure 30). One-half (49%) of Iowans in the statewide survey indicated the local government was fulfilling their responsibility either well or very well as compared to the state (43%) and federal government (31%). As for individuals, over one-third of Iowans (36%) considered residents to be fulfilling their responsibility well or very

well, a smaller proportion than that of farmers’ meeting their responsibilities to water quality (42%). The federal government received the highest proportion of “very poorly” or “poorly” responses (29%) and local government received the lowest (19%). Individual responsibility – whether it was farmers (25%) or state residents (28%) – fell between these two as did businesses (21%).

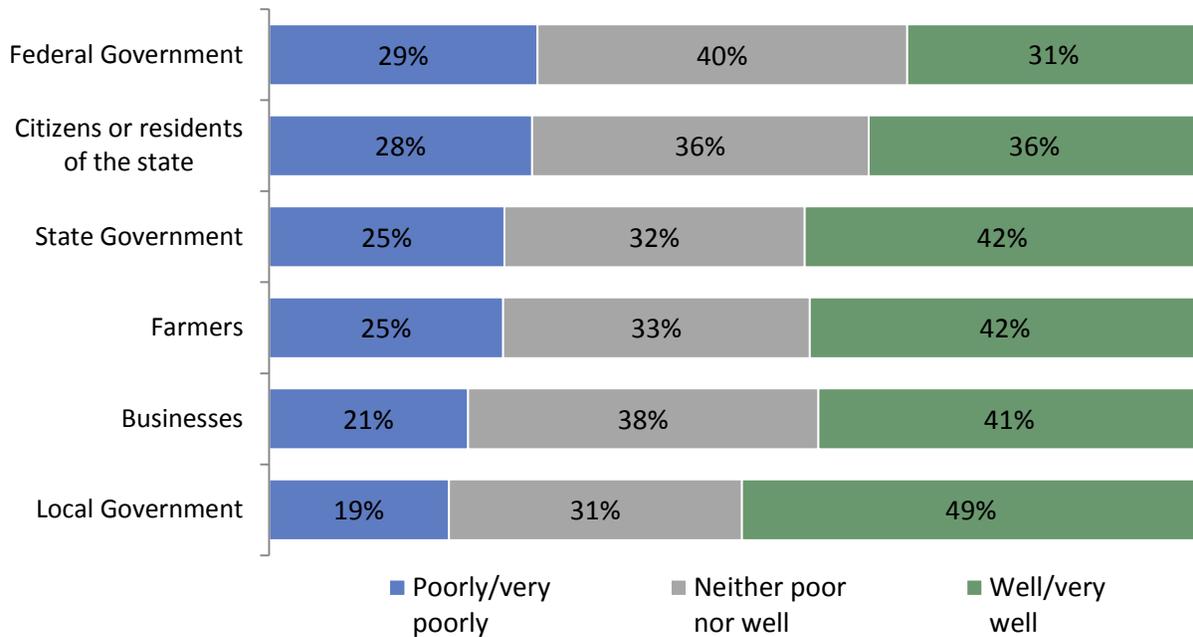


Figure 30. Evaluation of how well various groups are fulfilling their responsibility to protect water quality

Respondents in the statewide survey were asked about financing improvements in water quality. Currently government environmental programs are financed through taxes, water bills, and other means; however, more money would be needed if water quality in Iowa is to be protected. The funds would go towards additional and expanded programs to control pollution, monitor water quality, protect fish habitat, and educate residents on how to reduce water contamination and pollution. Asked if they would be willing to pay additional taxes or fees each year for programs to protect water quality, the average amount Iowans report that they would be willing to pay each year was \$38.50.

Respondents were also asked how likely they would be to adopt or change one behavior to improve water quality in their community as part of a local effort; responses ranged from “definitely would not” to “definitely would.” More than two-thirds of Iowans said they probably

would (44%) or definitely would (26%) change or adopt one behavior in an effort to improve water quality in their area (Figure 31).

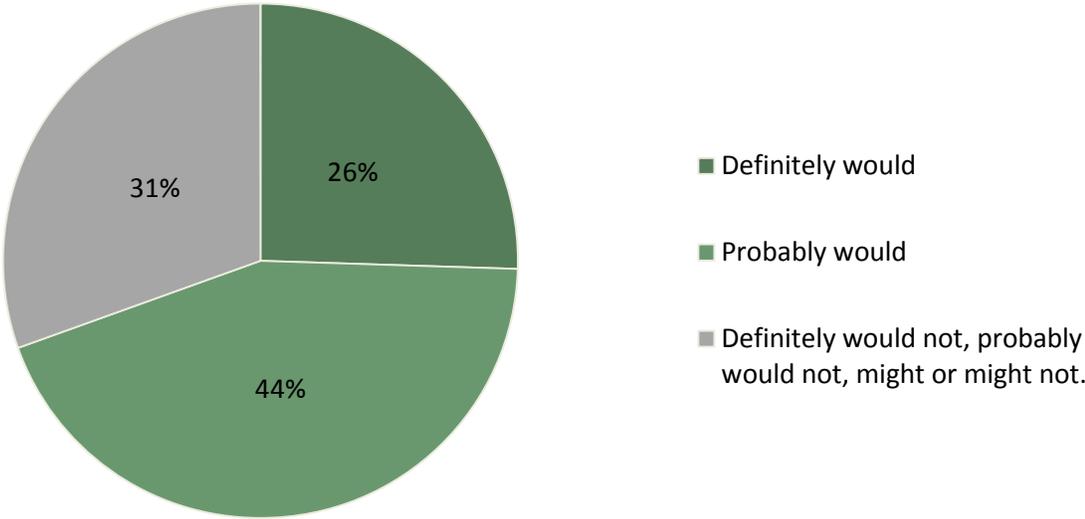


Figure 31. Respondents' reported willingness to adopt or change one behavior to improve water quality in their community

Section 7. Factors that could impact perceptions, knowledge and attitudes

Subgroup analyses by demographic and geographic factors

The preceding sections in the report used descriptive statistics to detail the estimated proportion of responses to individual questions in the statewide survey. In this section, subgroup analyses are reported to examine which factors may be associated with public perceptions, values, behaviors, and activities related to water quality in the state. For example, people's perceptions of water quality may differ depending on their age or whether they live near a lake. Such information can be of value when planning and communicating information to various places and groups of Iowans. Subgroup analysis divides respondents in a survey into groups based on demographic (e.g., age, income, education) or other characteristics (e.g., knowledge or behaviors), and differences in averages or proportions are analyzed to identify any significant variations across subgroups.

Survey questions directly related to satisfaction with water quality, knowledge, information seeking behaviors, responsibility for improving water quality, and willingness to invest in water quality improvement were chosen for subgroup analysis and selected based on their potential relevance to any future statewide campaign to inform Iowans about water quality issues. Table 2 reports demographic (e.g., gender, age, income, and education) and geographic (e.g., rural or non-rural, watershed, quadrant) factors associated with the selected survey questions.

On March 10, 2015 the Board of Water Works Trustees of the City of Des Moines voted to proceed with a lawsuit under the Clean Water Act. Because of the attention the lawsuit received in local and state media outlets, it was important to determine whether and to what extent this external event might have shaped respondents' perceptions on water quality given that it occurred during data collection (February 17, 2015 through June 18, 2015). Thus, Table 2 also includes the results of subgroup analysis on residents in the Des Moines Metropolitan Statistical Area (MSA) compared to the rest of the state.

Statistically significant differences in perceptions of water quality were found by age, income, education, whether a respondent resided within or outside the Des Moines Metropolitan Statistical Area (MSA), and the geographic quadrant of Iowa (NW, SW, NE, SE) in which they live. Younger Iowans (18-34 years old) reported water quality was "not a problem" at a higher proportion than older Iowans both in terms of drinking water and waterways (lakes, rivers, and creeks) in Iowa. Low income residents or those with a high school degree or less were more likely than those with higher education or incomes to have said water quality was a "very big problem." Iowans living in the Des Moines MSA were more likely than those living in other areas to say that the quality of drinking water was a problem. A higher proportion of residents

of northeast Iowa said that the quality of drinking water was “not a problem” compared to those in the southwest part of the state.

Table 2. Demographic and geographic factors that may impact perceptions, knowledge, and attitudes of water quality in Iowa

Demographic & Geographic	Poor water quality is a problem	Self-reported knowledge of water quality issues	Use of state or federal agencies for information on water quality	Attribution of responsibility for improving water quality	Willingness to pay for programs to improve water quality in Iowa.
Gender	NSD	*	*	NSD	*
Age	*	*	*	*	NSD
Income	*	*	*	NSD	*
Education	*	*	*	*	*
Rural - Non-rural	NSD	NSD	NSD	*	NSD
Watershed	NSD	NSD	NSD	NSD	NSD
Des Moines MSA	*	NSD	NSD	NSD	NSD
Quadrants	*	NSD	NSD	NSD	NSD

*Significant at p<.01 using Pearson’s chi-square tests.

NSD = No Significant Difference

In terms of self-reported knowledge about water quality, higher proportions of women, those in the lowest income category (<\$50,000), and lowans with a high school diploma indicated a “low” level of knowledge compared to men, those making more than \$100,000 per year, or lowans with a bachelor’s degree or more. A higher proportion of older lowans reported a “high” level of knowledge than did those between 18-34 years old.

Related to seeking information about water quality, higher proportions of men, lowans between the ages of 35 and 54 years old, and those possessing a bachelor’s degree or higher reported using state and federal agencies more than did women, those who were below 34 years old, and those lowans with a high school diploma or less, respectively. lowans in the lowest income category (<\$50,000) were less likely to use agencies as an information source than were those in the middle or those in the highest income categories.

When asked who should be held responsible for water quality, higher proportions of older lowans (55+ years old) and higher proportions of rural residents agreed that businesses should be held “completely” responsible than did those who were 34 years old or younger and those

who lived in non-rural areas. Iowans with a bachelor's degree or higher agreed that both businesses and local government should be held "somewhat" responsible higher proportions than did those with a high school diploma or less.

Willingness to pay for improvements is one way in which Iowans may signal interest and a commitment to water quality in Iowa. When asked if they would be willing to pay taxes or fees to finance these improvements, a higher proportion of women reported that they were willing to pay between \$10 and \$49 than were men. While there was a significant difference in the amount willing to pay by income, this was likely a factor of ability to contribute higher or lower amounts based on income level. Education level was also significantly associated with willingness to pay. Consistent with likely lower incomes, those with a high school diploma or less were more likely to endorse being willing to pay \$10 or less than were those with a bachelor's degree or higher. Higher proportions of Iowans with a bachelor's degree or higher said they would be willing to pay \$150-\$200 than did those with a high school diploma or less.

Multivariate analyses of demographic and geographic factors

The effect of demographic, geographic and other factors rarely occurs in isolation and multivariate analysis allows for multiple factors influencing the perceptions and attitudes of respondents to be examined at the same time. Specifically, multivariate analysis allows the examination of a unique effect of a factor of interest while controlling for other factors, thus offering a fuller explanation of the underlying forces driving differences in opinion on a given variable.

Multivariate models were constructed to focus on factors influencing: 1) general attitudes toward water quality in Iowa, and 2) overall perceptions of water quality in the respondent's area both in terms of drinking water and local lakes, rivers, and creeks. Both general attitudes and water quality were coded as dichotomous variables for this analysis. That is, respondents were grouped in one of two categories depending on their response. Logistic regression, a statistical analysis technique used to determine probabilistic relationships between variables, was used to estimate the probability that a respondent was in one of those two categories based on the values of the factors. Odds ratios were computed and are a measure of association between a demographic or geographic factor and a perception, attitude, or behavior. The odds ratio is a number that represents the odds that an outcome will occur given a particular attribute of the factor. For example, in this analysis, if the odds ratio is 1.89 for women on general water attitudes, this means that women are almost twice (1.89 times) as likely as men to have positive attitudes toward protecting water quality. Odds ratios above one indicate higher likelihood and odds ratios below one indicate lower likelihood. Confidence

intervals (95%) are also reported for each odds ratio.⁵ A 95% confidence interval means that if the same population of adult Iowans was sampled on multiple occasions and interval estimates were made each time, the resulting intervals would include the true population value approximately 95% of the time.

For the general water attitudes model, fifteen statements about attitudes toward water quality were combined into an overall score that was then recoded into a binary variable, i.e., “high” or “low”. A “high” score indicates agreement with a majority of statements related to protecting water quality and supporting enhanced measures to improve quality, while a “low” score indicates a response of “neither agree nor disagree” or disagreement with the statements.⁶ A “baseline” model of general attitudes included gender, age, income, and education as demographic predictors as well as an indicator for living in a rural area or elsewhere.⁷ The results from the baseline model revealed that gender, age, and living in a rural area were all statistically significant predictors, and a second model was constructed to examine whether knowledge (i.e., self-reported knowledge of water quality issues), engagement in water recreational activities (i.e., swimming, boating, or fishing in Iowa’s waterways), and proximity to waterfront property (i.e., owning or living on property within walking distance or viewing distance of an Iowan lake or river) influenced general water quality attitudes.

The overall model was statistically significant at $p < 0.05$. Gender, age, rural residence, and fishing were statistically significant predictors of general water quality attitudes. The proportion between lowest and highest income categories was statistically significant as well. Iowans in the lowest (<\$50,000) income category were more likely to be in “high” agreement about protecting water quality than were those in the highest income group (>\$100,000). Women, residents in cities and towns, and those who have been fishing in the last two years were more likely to be in “high” agreement than were men, rural residents, and non-fishers. Being an Iowan in the youngest age category (18-34 years old) predicted “low” agreement compared to those in the middle age category (35-54 years old).

⁵ When making inferences from a sample to the population, a confidence interval gives an estimated range of values which is likely to include the unknown population parameter of interest. A population parameter is a fixed value for a variable, such as the mean or variance, in the population. The confidence interval contains this parameter plus or minus a margin of sampling error, that is, the amount the value is expected to vary if different samples were drawn from the population.

⁶ The results of a factor analysis identifying the latent constructs can be found in Appendix E.

⁷ Results of the baseline model are available in Appendix D.

Specifically, related to overall attitudes toward water quality:

- The odds ratio for those earning \$50,000 or less was 1.34 [CI: 1.00, 1.79].
- The odds ratio for women was 1.89 [CI: 1.45, 2.22].
- The odds ratio for 18-34 year olds was 0.64 [CI: 0.48, 0.84].
- The odds ratio for non-rural residents was 1.85 [CI: 1.49, 2.30].
- The odds ratio for fishing was 1.35 [CI: 1.08, 1.68]

These results suggest that Iowans who were within the lowest income category, were women, lived in non-rural areas, or who had been fishing in Iowa during the last two years were significantly more likely to report “high” general water attitudes than were those with other characteristics. Younger respondents were significantly more likely to have “low” general water attitudes than were those with other characteristics. Self-reported knowledge, education, swimming, boating, and living near waterfront property were not significant factors in predicting general water quality attitudes.

The same multivariate analytic approach was used to estimate the effect of various factors on overall perceptions of water quality. Perceptions of poor quality drinking water and water in rivers, lakes, and creeks were examined in separate models with responses for each being collapsed into dichotomous variables that combine “a very big problem” with “a moderate problem” and “a small problem” with “not a problem”. Baseline models with demographic characteristics and rural residence were estimated⁸ and findings revealed that age, income, and rural residence were statistically significant predictors of poor quality of drinking water. Similarly, age, income, and rural residence were statistically significant for perceptions of poor water quality in lakes, rivers, and creeks, as was gender. A second set of models built on the baseline models by adding self-reported knowledge, engagement in water recreational activities, and proximity to waterfront property.

The model for poor quality drinking water was statistically significant at $p < .05$. Age, income, rural residence, and self-reported knowledge were statistically significant predictors. Those who were young (18-34 years old), those who lived in rural areas, and those who self-identified their level of knowledge regarding water quality as either “low” or “neither low nor high” were more likely than other groups to consider poor quality of drinking water as either not a problem or a small problem. Iowans earning \$50,000 or less a year were more likely than other groups to perceive drinking water quality as a very big or moderate problem.

⁸ Results of the baseline model available in Appendix D.

Analyses looking at predictors of poor quality drinking water found that:

- The odds ratio for 18-34 years old was 0.54 [CI: 0.41, 0.72]
- The odds ratio for rural residents was 0.66 [CI: 0.53, 0.82]
- The odds ratio for “low” knowledge was 0.69 [CI: 0.53, 0.91] and for “neither low nor high” was 0.76 [CI: 0.60, 0.95].
- The odds ratio for the lowest income category was 1.5 [CI: 1.13, 1.98].

These results suggest that lowans who were in the youngest age category (18-34 years old), lived in rural areas, or those had low or moderate levels of self-reported knowledge were significantly more likely to report problems with drinking water quality as either not a problem or a small problem compared to those with other characteristics. lowans in the lowest income category were significantly more likely than others to view problems with drinking water quality as either a moderate or very big problem. Gender, education, recreational activities (i.e., boating, swimming, fishing), and proximity to waterfront property were not significant factors in shaping lowans’ perceptions of overall drinking water quality when controlling for other factors.

The model for poor quality rivers, lakes, and creeks was also significant ($p < .05$). Gender, age, rural residence, and self-reported knowledge were statistically significant predictors. Women and those in the oldest age category (55+ years old) were more likely to consider the quality of water in Iowa’s waterways as a moderate or very big problem than men or those in the middle age groups. Those who were 18-34 years old, lived in rural areas, or who self-identified their level of knowledge regarding water quality as either “low” or “neither low nor high” were more likely than others to have indicated poor quality of drinking water as either not a problem or a small problem.

- The odds ratio for 18-34 year olds was 0.70 [CI: 0.55, 0.91] and for 55+ years old was 1.31 [CI: 1.06, 1.63].
- The odds ratio for women was 1.42 [CI: 1.17, 1.71].
- The odds ratio for rural residents was 0.66 [CI: 0.54, 0.81].
- The odds ratio for “low” self-reported knowledge was 0.61 [CI: 0.47, 0.80] and for “neither low nor high” was 0.73 [CI: 0.57, 0.92].

These results suggest that women or those in the oldest age category (55+ years old) were significantly more likely than those with other characteristics to say problems with water quality in area lakes, rivers, and creeks were either a moderate or a very big. lowans in the youngest age category (18-34 years old), residents in rural areas, or those with low or moderate levels of self-reported knowledge about water quality were significantly more likely to have said

that water quality was not a problem or was a small problem. Income, education, proximity to waterfront property, and recreational activities were not statistically significant.

Proximity to water and sense of place

Over the past two decades, social scientists have examined the importance of “sense of place” and its relationship to attitudes and behaviors (Stedman, 2002; Vaske & Kobrin, 2001; Payton, Fulton & Anderson, 2005; Smith, Davenport, Anderson & Leahy, 2011). Specifically, the role of “place meaning” has emerged as an important construct in understanding environmental perspectives (e.g., Cheng, Kruger & Daniels, 2003). In the statewide survey, approximately one-quarter (24%) of respondents said they live or have property very near a lake or river in Iowa; this was defined as land that is within walking distance to the shoreline or where water can be seen from the property. In this section we examine whether proximity to water, conceptualized as a sense of place and measured with a battery of indicators, influences attitudes and perceptions towards water quality in Iowa among those who live and/or own property near a waterway. The sense of place (SOP) scale was constructed from twelve items that asked the degree to which a respondent agreed or disagreed to items related to place identity, emotional attachment, and dependence on the land.⁹ This scale was used as a predictor variable in the models with demographic characteristics, rural residence, self-reported knowledge, and water recreational activities.

The sense of place model for general water quality attitudes was significant at $p < .05$. Gender and sense of place were statistically significant predictors of general water quality attitudes. Men and those categorized as having a “low” sense of place attachment were more likely to be in the “low” agreement category for water attitudes.

- The odds ratio for men was 0.47 [CI: 0.28, 0.77].
- The odds ratio for “low” sense of place was 0.56 [CI: 0.35, 0.88].

Age, income, education, rural residence, self-reported knowledge, and recreational behaviors were not significant predictors in this model.

The sense of place model for quality of drinking water was significant at $p < .05$. Age and income were statistically significant. Among Iowans who either lived near or owned waterfront property and those between 18-34 years old were less likely than others to agree that poor quality drinking water was a problem. Respondents earning \$50,000 or less per year were more likely than other groups to agree that water quality was a problem. Specifically, the findings were:

⁹ The results of a factor analysis identifying the latent constructs can be found in Appendix E.

- The odds ratio for 18-34 years old was 0.45 [CI: 0.25, 0.80].
- The odds ratio for \$50,000 or less was 2.56 [CI: 1.44, 4.53].

Gender, education, rural residence, self-reported knowledge, recreational activities, and sense of place attachment were not statistically significant predictors in this model.

The third and final sense of place model looked at quality of lakes, rivers, and creeks and was statistically significant at $p < .05$. Gender, age, and low-level of self-reported knowledge were statistically significant predictors of perceptions of quality of waterways. Men were more likely than others to be in the “low” problem category as were lowans under the age of 55 and those with “low” levels of self-reported knowledge. The detailed findings were:

- The odds ratio for men was 0.60 [CI: 0.40, 0.91].
- The odds ratio for 18-34 years old was 0.54 [CI: 0.32, 0.91] and for 35-54 years old was 0.60 [CI: 0.39, 0.94].
- The odds ratio for “low” self-reported knowledge was 0.55 [CI: 0.31, 0.97].

No other factors were significant at $p < .05$.

Conclusions

Iowa's Nonpoint Source Management Plan (2012) serves as a framework for the DNR's goals, objectives, and potential strategies to improve water quality in the state. Goal 2 in this framework seeks to improve technical assistance, outreach and education that will lead to assessment, planning, and implementation of the steps in the plan. The statewide survey was designed to provide a baseline for this future work and to inform the development of a campaign to educate Iowans about water quality issues with the long-term goal of increasing involvement and changing behaviors to improve water quality in the state.

When asked general views about the environment and water quality, concern for these two issues was on par with other topics of national concern, such as jobs and economic growth. The majority of Iowans (80%) are satisfied with the quality of drinking water in the area they live, but one-in-five are dissatisfied with quality of water in their area. Three-in-five Iowans rated their home drinking water as good or excellent and two-in-five rated it as fair or poor. Nearly thirty percent (29%) of Iowans perceived a decrease in quality of lakes, rivers, and creeks in the last ten years, just under half (49%) viewed the quality about the same, and about two-in-five Iowans (22%) considered the quality of waterways as getting better over the last ten years. When asked to consider how the quality of waters will change in the next ten years, the majority (68%) of Iowans thought it would stay the same or improve, while nearly one-third (32%) thought it would decline.

In terms of understanding water quality, slightly less than one-third (31%) of Iowans said their level of knowledge regarding water quality was "low" or "very low," a plurality (45%) reported it was neither low nor high, and nearly a quarter (24%) said it was high or very high. The majority of respondents (63%) accurately reported that water from storm sewers goes directly to lakes, rivers, and creeks.

Furthermore, a majority of Iowans (85%) identified the following as moderate or severe threats to water quality in Iowa: runoff from cropland, livestock waste, cities and towns; dumping oil or household chemicals down the drain; and industrial or factory waste. Fifteen percent of respondents said these were not the biggest threats to water quality in their area. Eight out of ten Iowans identified nitrates, phosphates from fertilizers, and pesticides as pollutants affecting lakes, rivers, and creeks in their area. Twenty percent of respondents either knew/thought or were not sure nitrates, phosphates from fertilizers, or pesticides were possible pollutants affecting waterways in their area.

An overwhelming majority of Iowans (85%) agreed (agreed or strongly agreed) that clean water was needed for economic growth in Iowa. Fifteen percent disagreed (i.e., disagreed or strongly disagreed) or neither agreed nor disagreed with this statement. When asked how likely they would be willing to change a single behavior to improve water quality in their community, a majority of Iowans (70%) said they probably or definitely would change their behavior. A smaller proportion (58%) agreed with a statement saying they knew what steps to take in order to prevent contamination of Iowa's lakes, rivers, and creeks, and nearly a quarter (24%) of Iowans said they neither agreed nor disagreed with this statement.

The majority (85%) of Iowans reported having visited a lake, river or creek in Iowa during the last two years for recreation purposes such as swimming, boating, and fishing. Half (50%) of Iowans have swum in an Iowa waterway during the last two years and 70% have been boating. Of those who had been to an Iowa waterway, one-third said that a beach had been closed at the time due to a problem with the water.

Iowans differed in their positive and negative environmental practices with sixty percent using some type of fertilizer – conventional, organic, or a combination of both—and four-in-ten saying they did not use anything on their lawn. The majority of Iowans reported that they disposed of pet waste (80%) and hazardous materials (53%) in a manner that protected water quality, and four out of five (80%) reported using car washes rather than washing their vehicle on their driveway or yard.

Just over half (56%) of Iowans said they had seen, heard, or read something about water quality issues in their area or community. In most cases this was a local or state news story (58%) or from a brochure, flyer, or some other kind of written information (41%). If a respondent wanted to learn more about water quality, most respondents used internet searches (43%), state and federal agencies (23%), conservation groups (14%), or news outlets as information sources. In terms of volunteering, about one-quarter (23%) of Iowans were involved in some kind of activity such as volunteering in a clean-up day, monitoring water quality, or joining a water protection group. The majority of respondents (77%) were not involved in such activities. Most Iowans preferred to be contacted through the mail (40%), email (18%), or social media (12%) if they were to be invited to participate in a local effort to improve water quality.

In general Iowans considered government, private entities, and individuals all responsible for improving water quality in the state. Individual citizens and residents of the state, state government, and local government were most often labeled as “completely” responsible for water quality in Iowa. On average, Iowans would be willing to pay an additional \$38.50 in taxes or fees to protect water quality in the state.

The results of subgroup analysis revealed that gender, age, income, and residence were important factors to consider when examining public perceptions and attitudes toward water quality. Self-reported knowledge was also important for perceptions of water quality. For general attitudes toward water quality, measured as either “high” or “low” agreement with statements related to water quality protection and program enhancement, women, those earning \$50,000 or less per year, lowans not residing in rural areas, or those who liked to fish were all more likely to have “high” agreement and those who were young (18-34 years old) were more likely to have “low” agreement compared to lowans in other categories.

In terms of overall perceptions of water quality, young residents (18-34 years old), rural residents, or those who identified as having “low” or “neither low nor high” levels of knowledge were more likely to have said that poor quality drinking water was not a problem or a small problem. However, lowans earning \$50,000 or less per year were more likely to view problems with drinking water as a moderate or very big problem. As for perceptions of waterways, women or older residents (55+ years old) were more likely than men or younger residents to have said that water quality in Iowa’s lakes, rivers, and creeks was a moderate or very big problem. Young lowans (18-34 years old), rural residents, or those who self-reported “low” or “neither low nor high” levels of knowledge were more likely to have said that poor quality of waterways was not a problem or a small problem than were older lowans, urban dwellers or those with higher levels of self-reported knowledge. Sense of place was a significant predictor of general water quality attitudes and revealed that among lowans who own or live near water, those with a “low” sense of place attachment were also more likely to have low agreement on general water quality attitudes.

We believe the findings from this report will assist in the designing and implementation of any statewide campaigns to inform lowans about water quality issues. These findings provide a baseline against which the effectiveness of a campaign can be assessed through a future survey measuring public understanding of these topics. In the near term the results from the statewide survey serve as an important instrument in improving outreach and education on water quality issues in Iowa.

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Appendix A – Focus Group Findings

Background & Methods

Study Design A qualitative study utilizing focus groups with adult Iowans was conducted to provide foundational information for a broader study of public perceptions of nonpoint source water pollution in Iowa. The themes and key issues that emerge from focus groups can provide substantive information that is valuable to the development of a quantitative questionnaire used in a survey. Collaborating with DNR staff, CSBR staff conducted four, 90-minute focus groups which took place in four locations around the state (two rural and two urban). The groups took place in Pocahontas, Cedar Rapids, Des Moines, and Washington, Iowa providing both geographic and rural/urban diversity.

Recruitment Focus group participants were recruited through convenience sampling that was coordinated by CSBR. Participants were recruited through the CSBR Research Registry which includes adults throughout the state and by random-digit-dialing of areas targeted. A balance of age and gender was sought in recruiting. All participants were given a \$45 Visa gift card as compensation for their time and travel.

Materials A semi-structured interview guide was developed to elicit information about perceptions of water quality issues. The moderator guide contained approximately thirty questions and probes were also included for each question to explore topics thoroughly and to facilitate meaningful conversation (See focus group appendices: Participant questionnaire, Focus group moderator guide).

Data Collection Signed informed consent and assent was obtained from participants before conducting the focus groups. Groups were moderated by Mary Losch and Erin Heiden and both researchers were in attendance at every group. The group discussions were audio-recorded. Key themes were identified from audio recordings. Study protocol and informed consent process was approved by the Institutional Review Board at the University of Northern Iowa.

Analysis Inductive thematic analysis was used to identify major themes in the data that emerged from the content of the focus groups. Both of the moderators reviewed the focus group content to familiarize themselves with the information and identify key themes that emerged. Themes were then compared within and between the four focus group discussions to yield the key themes outlined in this report.

Participant statements often reflected multiple themes. Illustrative quotations which repeatedly emerged across or within focus groups were extracted separately for further review. The most important themes were consolidated for inclusion in the report provided here. Other important nuances and details are not included here because of the limitation of time. We

would encourage a thorough review of the transcripts to get a deeper understanding of the group content and valuable insights contained therein.

Participant Profile Participants were asked to provide demographic and background information about themselves. Questions included gender, race, ethnicity, education, and place of residence (Table 3).

Table 3. Demographic information from focus group participants

	<i>n</i>	%
County		
Pocahontas	7	24.1
Linn	8	27.6
Polk	9	31.0
Washington	5	17.2
Gender		
Female	12	41.4
Male	17	58.6
Age (Range, mean)		
	(27-86), <i>M</i> = 57.48	
18-34	5	17.2
35-55	9	31.0
55+	15	51.7
Ethnicity		
Hispanic/Latino	0	0
Non-Hispanic/Latino	29	100
Race		
White	27	93.1
Black/African American	2	6.9
Educational level		
High school graduate or less	5	17.2
Some college, but did not finish	7	24.1
Two year college degree (AA/AS)	4	13.8
Four year college degree (BA/BS)	7	24.1
Graduate/professional degree	6	20.7
Community type		
Farm or in an open rural area	4	13.8
Small town (less than 5,000)	9	31.0
Large town (5,000 to less than 25,000)	3	10.3
City (25,000 to less than 50,000)	1	3.4
City (50,000+)	12	41.4
Occupational status		
Retired/semi-retired	12	42.9
Employed full-time	7	25.0
Employed part-time	2	7.1
Self-employed , other	3	10.7
Self-employed, agriculture	3	10.7
Homemaker	1	3.6

Summary of Key Findings

- Local geography plays a role in perceptions regarding water/water quality issues. Rural locations had more farmers who expressed different knowledge and views. Urban locations included more participants with knowledge about development and industrial impact on water quality.
- For both rural and urban counties, agriculture is the main focus of participants' views about the main cause of poor water quality.
- Participants in every focus group were very aware of current events surrounding Des Moines Waterworks legal action against Sac, Calhoun and Buena Vista Counties.
- Although there was variation, many focus group participants had relatively high interest and some had notable subject matter knowledge regarding water quality issues.
- Pocahontas participants especially focused on aesthetics of the local water such as clarity, taste and, smell.
- Top-of-mind associations to the word "water" tended to focus on drinking water as opposed to waterways for fishing and swimming.
- When thinking of their "interactions" with water, most think of cleaning, bathing and laundry. Few participants thought of recreation.
- Participants have associations to water quality and water pollution with some distinctions between the two. Water pollution tends to connote more manmade contaminants for some participants.
- Beyond agricultural practices, few participants had suggestions about how people negatively impact water quality.
- Participants had limited awareness of local creeks versus rivers and the awareness tended to map into occupation (e.g., farming) or history of local flooding.
- Connectedness of waterways was a concept that many participants seemed to understand at a macro level, but they did not have good mental maps of how waterways were connected in their area.
- Only a few participants could define the term "watershed" although most reported that they had heard the term. Only one or two thought about themselves as living in a specific watershed in Iowa.
- Most participants viewed responsibility for good water quality as a shared responsibility.
- All participants held a personal value surrounding the importance of water.
- Education, tax credits, and subsidies were offered as ways to motivate people to act.
- Views about voluntary versus regulated approaches to water quality measures were mixed although more participants expressed the view that solely voluntary approaches would not suffice to address the problems.
- Awareness of the DNR was broad and included a perception of the organization as a tester of water quality and enforcer of regulations. Virtually none of the participants were familiar with the acronym IDALS. Although not "top of mind," EPA was widely recognized when prompted and elicited some negative associations and responses from a few of participants who were engaged in farming. Participants were most likely to identify DNR or local/county commissions as being the state agency responsible for water quality in their area.

Themes and Responses

Section 1. General perceptions about water

Theme #1: With few exceptions, associations to the term “water” focused on drinking water and the need for water to sustain life. There was some variation in the tone and content of associations across groups. Initial thoughts about water centered on the quality of water for drinking, such as purity and taste. Even when water was thought of in a broader sense, it was in a context of how characteristics of Iowa’s water, such as a high nitrate content or pollution from agricultural practices, ultimately affect the water supply used for drinking. Pocahontas was especially focused on drinking water and the aesthetics of the water in their community residential water. Concerns about nitrates and awareness of the recent litigation regarding farm runoff was also evident in all groups and especially so in Des Moines.

“I don’t drink the water here.”

“Terrible water.”

“They sent out a report say, five years ago, and it stated that anybody with any immune deficiency problems or anything like that, with bad health or anything should not drink the water, even the city water. We can’t drink the water and we have two, three filtration systems in our house.”

“I used the tap water and it burned up four coffee pots and one was a hundred and something dollar coffee pot and I went -- my kids won’t drink it and my son drinks anything and he won’t drink no tap water.”

“I’ve heard advice that you can’t -- you shouldn’t catch and eat fish east of the Mississippi. So that comes to the pollution in the water and the mercury in the fish comes to mind.”

“When I think about water I think obviously, need it to, to live. You can’t function without it. And comes to mind too, I live in a small town and I do think the water quality varies greatly whether you have well water or you live in a small community or you live in a large community.”

“Nitrates.”

“I was just going to say life-giving, I think of gardens and my backyard.”

“I think about how necessary it is; thinking back to the flood and being without water for several days and the fact that we take it for granted.”

“I think of pollution and runoff in the rivers and streets.”

“Bottle.”

Theme #2: Interactions with water tended to be based in the home – bathing, laundry, cooking. Agriculture and a few recreational uses like swimming, fishing, and boating were suggested by several participants. When participants thought about the ways they interact with water, they focused on how water is directly used for showering/bathing and laundry, and indirectly for recreation when swimming or boating. Participants with an agricultural background or occupation that requires attention to water (e.g. construction & development) were also aware of how they interact with water for agricultural chemical application, livestock, and construction planning for run-off. Numerous participants listed cooking, washing (bodies, clothing, cars) as ways we interact with water (beyond drinking). Examples of nearby lakes and fishing and swimming were mentioned by a few but were secondary and tended to occur more after probes/prompts.

“Tons of ways, shower, use it in cooking. Use it bathing. Use it to power wash the deck. Numerous.”

“I was going to say we do a lot of washing of food and of clothing and of bedding and things like that which uses a lot of water I think.”

“We do lots of laundry at my house; five kids and we do cloth diapers, so I feel like -- my kids use it for fun. We also, obviously, drink it and so it’s just a part of our everyday life.”

“Recreation and sporting, canoeing, boating, fishing, although I don’t fish as much as I used to when I was a kid because I’m concerned about everything that’s in the rivers and streams.”

Theme #3: Concerns about water in Iowa are significant and center primarily on agricultural runoff. When participants were asked about concerns about water in their lives and what they associate with water in Iowa, the role of water in agriculture, and its central place in Iowa’s economy, was described in all focus groups. Participants noted the recent litigation targeting agricultural runoff and increase in nitrate levels. Overall, participants raised concerns about levels of agricultural chemicals in the water although some noted that they were happy with their local water. There were dissenting views especially among some of the farmers. Also noteworthy were a few participants who expressed “no concerns,” but also indicated that they had several levels of filtration on their residential water supplies.

“Well, the difference that, you know, people in Cedar Rapids have city water. Those of us that live in the county probably are on a private well and so there’s a variety of ways that we obtain water or where our water comes from. And even the difference just from Marion to Cedar Rapids, from one town to another even if they have city water the variety of the aquifers and so on that the water comes from.”

“Chemical contamination, herbicides, pesticides.”

"Iowa's rivers rank about 47th in pollution that are really bad."

"There's some current events going on with the Des Moines Waterworks suing what's it, the BV, Sac, and Calhoun County."

"We have wonderful water in Des Moines, and when you go other places, you really see the difference."

"I think about the farmers. I've never lived on a farm, but I think about the people who depend upon the water for their livelihood, and then when you have a drought or you have a flood, how it can completely turn the economy around and really disable them from being, from their existence almost."

"I don't know I think we're pretty fortunate. We've got good water, adequate water in this part of the state. And for the most part, it's good, you know...."

"Well, what's in the paper now is there's a lot of pollution of the water because of runoff from farms. And I'm a former farmer so I cringe at that because we were always very careful about that."

"My town is having a lot of difficulties with our main water line. They recently found contaminations with their sewer water coming into the drinking water and what am I feeding my child?"

"No, I live in the country and I have a well and that's, no. I have it softened so that I can do my wash and stuff. But it's -- and I have a drinking water system. So no, I have no concerns whatsoever."

"Well, I had my water tested because I live right inside of Polk County and on a well. My nitrates were 7.8, and I know in the United States, anything below 10 mg per liter is fine, but when I got on the internet, in Europe, they average about 5. So, I'm now drinking bottled water all the time."

"One of the concerns, I watch, when we have these developments in [THESE CITIES AND THE] development here, is we put all these parking areas in, and some of them with the ordinances and so forth now, as I understand it, try to provide some wastewater or water collection facilities, that some of the older ones particularly don't have them. We have a lot of water that runs off that would otherwise be soaking in the ground. We wouldn't have water going down into some of the streams."

"As a developer downtown, if you put a parking lot in the city of Des Moines of more than 20 spaces, you have to build a retention pond which downtown, where space is valuable and limited just as farmland is, instead of putting in a 20 car parking lot, you can only put in a 15, and the other 5 spots have to be used to retain the water. That's a regulation that we have to live by. I don't know a single developer, who if that regulation was not there, would put that in voluntarily. And so I laugh when our governor and legislatures say, "If we just voluntarily tell these farmers to do that, they will." Some of them will, but I don't think that -- we're tightly regulated here, and they aren't, so I kind of look and try and think, okay, what are we doing?"

"Because we're an agricultural state, we have gotten away with a lot more than other states because they haven't enforced a lot of the regulations for our farms and stuff, and I'm not going to blame the farmers. I

think if you get raised to farm a certain way, you just keep doing it. My grandpa was a farmer, but like you said, it's not going to be voluntary because cost, I mean, different things that are going to affect them."

"We have a filter for the months of June and July to get the -- I read about Atrazine. It's one of the weed killers and so we're not going to cook with normal tap water, we're going to filter it even if it's pasta. So we're real careful with the quality of what water we're using to cook with and especially during the summer months."

"Yeah, we've got to mention the news I looked at the news a little bit today and I didn't think about it but I've got this newborn little girl at home and apparently the nitrate levels are real dangerous for the very young and the very old I guess. If I read it right. But the City of Des Moines is suing the counties around apparently because of the nitrate levels from the farm runoff. But I just read that today. That's the ongoing concern is what's going down the Mississippi and out into the Gulf and stuff."

Following specific probe for concerns about water quality in Iowa:

"To me, no, not today. I mean when I go get a drink of water I don't worry about it. I don't think, you know, think about it to be honest with you. If I send for the kids and we go swimming at the reservoir, I don't think twice about it, you know, I just. So no, it's not something I worry about and I don't."

"It's a big concern to me."

[FOLLOWING PREVIOUS COMMENT] *"Yeah, me too. It's almost a black eye for Iowa, a big black eye."*

"I think Iowa could be one bad event from a real public relations nightmare just like Dayton, Ohio last year couldn't drink their water for a week because of this algae bloom out in the lake, and with more and more of this, I think people on the coast probably think Iowa's a clean, natural state of clean farms, but the reality is it could become known as a very polluted state. I looked at it from a tourism, a public relations standpoint. We're just shooting ourselves in the foot by having these filthy streams and not doing much about I guess is the perception anyway."

Features of the state affecting water quality more or less than other places:

"Farming."

"Maybe the hog confinements."

"I think the farming methods -- we have a lot of -- and that can be good or bad. I think most people in this area are concerned about and they're careful. But supposedly, people in other areas of Iowa aren't that careful I don't know."

"I don't think a lot of people realize that there are three million humans in Iowa, and there are least what, 19 or 20 million hogs, as well as other livestock. It's like double the size of New York City of the hogs the size of people and bigger. They're putting out so much waste, and they're up throughout especially Northern Iowa. The sewage systems and kind of touch and go. Some do a good job and some don't. It's like having a big chunk of 20 million extra million people in this state, seriously."

"I think the farmers have to look at it because farmers did start to use fertilizers, and fertilizers gave additional yields. And so put on a little more and first thing is we're over fertilizing. We have excess fertilizer. It wasn't being used. I think unfortunately that's been realized, and there are methods that farmers use now that they're more specific in where they put this much here or this much here to match what's needed, but this back here has to be cleaned up, so we've got accumulation that's going to take a while even with the best in practices to get over."

"When you think of how much fertilizer people use in everything, in the city as well, in the golf courses."

"In the golf courses especially. I'm very much acquainted. I'm a big golfer myself, but they do. They use a lot of things. I bet I can remember how they used to have night crawlers on the greens. You don't see night crawlers anymore."

"Well, a lot of farms, you know, like had said earlier is run off or carelessness on the farmer's part or, you know."

"We push it down into the Gulf and we said that, but you're going somewhere different from beyond agriculture."

"Yeah, we gathered the water on our roofs and then we direct them to our downspouts and then direct them to the street and quickly without filtering them direct them back to the river. So you don't have that natural filtration as it moves it way to the river, except floods and everything is going to the river but –"

"I often think too having moved from being in town to being out of town where I have a septic tank and I have a disposal in my sink, but I don't do what I used to do when I lived in town. In town, people, all their scraps and everything, you know they put it down the disposal and of course, where is all that going? That's got to go through our water treatment plant. Where I know that I certainly have changed my ways living with a septic tank, you know it either goes in the garbage or we have a –"

"But, I think sometimes just we as a population are not very careful about what we are throwing down there. The city certainly has tried every pharmacy in town will collect any of your old medicine bottles, you know, drugs and they have certain days for controlled drugs. But even if you have say expired aspirin or Tylenol you can take it to the pharmacy and they have a...bin that they throw it in, yeah. And then they'll dispose of it and I always hope I tease a couple of my former students that are pharmacists that I hope you're disposing of that not by just watering it, flushing it down, that it's burned or something."

Theme #4: Water quality is a concept that is familiar to and has meaning for participants.

Water pollution is synonymous for some but not for others. Many participants held slightly more positive associations with water quality and somewhat more negative associations with water pollution.

In response to “water quality”:

“Pure water.”

“Drinkable.”

“I just want it to be safe and not hurt me.”

“Misinformation. I mean I’m not saying there is a problem don’t get me wrong. But if you look at the actual facts and the histories in the last 50 years, sometimes that get left out and the news tries to make a big story. There’s always room for improvement it’s just I guess that’s what I think of when I hear “water quality.” It’s a little scary.”

“Chemical runoff.”

“I think of taking shower and smelling of swimming pool coming out of your nozzle because they have had to add so much chlorine. The last couple winters, there are just the times where they’ve had to add a whole bunch of chemicals to offset the nitrates and...”

“I think about that I live in a small community. I know before I perceived like, the water report and there’s things that are out of the normal range and it’s usually just said well, we’re working on that or whatever. It always come to mind, did it ever go back to the other, you know, and they only have to disclose so much to you. So I just think being in a little farming community, you never know really what’s in your water.”

“Yeah, although I’d say that it’s water quality we’re much -- we know much more about it now. And so, you know, I think farmers are putting, you know, instead of just dumping a lot of fertilizers on I think the technology is there that they can really measure what they really need for their crops and going over, going beyond I think. So I think we’re better at it compared to what we used to be. And again, water you can’t, you know, just, you know, distilled water isn’t good for you because it doesn’t have anything in it other than steam. So you need to have some, the right healthy water. And so which does have certain kinds of things, you know. And I don’t mind the right amount of fluoride is fine with me too because it does do some things and that, you know...”

“The safeness of the water.”

“When I think of quality, I think of a lot of time I associate that with clean. And with anything clean, clean paint, clean carpet, clean cars you think of something of quality of being without contaminants, without things added, without, you want it to be in its purest form and I would associate that with water. I would

believe the highest quality of water would be that without things added and that without, all pure water as in going back to being a distilled water and that's what I would use quality. And as the opposite, I would view pollution as anything being added to the water that's not water."

In response to "water pollution":

"The chlordane that they used and how that leached from the Daniel's Park area over to that lake, the Cedar Lake. And then you go by water puddles that have, you know, you can see oil rings in them or something and you think that's all got to go down the drain and it's headed down to the river."

"And there was a few companies here that would wait for a heavy rain and then dump 5,000 of gallons of acid to the river because we had two or three, four inches and they could get by with it."

"I would just find as some unnatural contamination. There's obviously algae blooms and oil that's natural. Naturally, occurred things are going to be in the water effect the quality as far as our concern. But the pollution to me is the contamination that's unnatural and then has adverse effects on life."

"Like, somebody's dumping chemicals in the water, garbage in the water..."

"In this area you don't have pollution doesn't affect us, but what it does is our county is one of the ones being sued; we pollute the water and Des Moines suffers from it I mean so I mean you're not, you're not saying it's not our problem, it doesn't affect us as much. But it carried on down and the other thing is it overall it destroys the basic resource."

"Water pollution is just poor quality of water."

"Fish kills. I think there's stuff in Gazette last year about a bunch of -- there's a bunch of -- some factory contaminants. A bunch of fish kills and stuff. I forget which creeks they were."

"Accidental spill."

"I know one time we went down to, not Darling, the lake further on south but we couldn't swim because of water pollution. And come to find out talking to some locals there had been a dry spring and that the geese, there were thousands of geese down [THERE] that's where it came from, you know. But nobody thinks of that, they all think of who dumped what in the water."

"Well, something that's got heavy metals in it or something like that I guess or some chemicals."

"The first thing I thought of was dead, floating fish."

Theme #5: Clean water definitions vary but focus mostly on purity and clarity and appeared to be influenced by some negative experiences with dirty or polluted water. Water that is clear and does not cause health problems was associated with clean water. Clean water was associated with high quality water free of contaminants. Some participants made distinctions and some did not. Again, the focus was primarily on drinking water although recreation was mentioned occasionally. While negative experiences with polluted water were not mentioned by most participants, those who did mention them tended to have specific and vivid recollections.

In response to “clean water”:

“It’s not brown.”

“I don’t even know how the hell we would test our home water. I don’t have a clue...”

“Free of nitrates.”

“I think of clean water, pure water, water that’s why down in the ground in those aquifers that’s been there for hundreds of years. It’s been cleansed where the stuff we pull out in rivers. It’s just stuff that’s right there then when Waterworks pulls that stuff in, it’s water that people upstream have drank and processed and kicked backed out and come from their water work facilities and their sewage treatment plans. That stuff in those aquifers, it takes hundreds of years to get down into that and so when we dig down into that we’re tapping into it, we don’t have that available to us.”

“I can see through.”

“And my home phone number is just a digit away from City Hall, so I don’t know how many phone calls I’ve gotten, you’re killing all my damn house plants, from people, old ladies calling complaining about the water it’s killing all their house plants. It’s making this sick, making that sick, so I’ve had to tell them, I’m sorry you’re not speaking to City Hall but...”

Comparing “clean water” with “water quality”:

“I think clean water - I think clean water. When I think of water quality, I think of clean water or polluted water. I think of it as more of the science of water.”

“I think the distinction that we were talking about earlier, pollution, or water pollution, it’s the same thing. It describes the water quality, but we want clean water. We don’t want polluted water.”

"Water quality is a matter of degree. I mean you can have water that's drinkable that doesn't kill you immediately and you can drink it. But you can have water also that tastes bad that eventually probably makes you sick or is, I mean, you can take Love Canal or some such place."

Characteristics of poor water quality:

It's brown. Our water was brown this summer. Yucky.

If you make ice and you've got floaters in your water.

"It stinks. The ice stinks."

"Taste is the big thing. If the water is free and clear of all like, distilled I'd say to me at least in my opinion it tastes much better"

"Well, if I'm going down, say somewhere, and I'm going to go boating or I want to go swimming and I can't see the bottom of the pond or the lake or whatever, I don't think I'm going to go in that water. You know I want to be able where I'm stepping and because at least that -- if it's clear, I mean, I know you're stirred up with the sand and all that kind of thing. But if it's fairly clear looking water well, you know, again you kind of associate that the quality must be okay. It's not something I want to drink no matter, but --."

Negative Experiences with dirty or polluted water:

"The only thing I could say is that time we went to the lake and the E.coli -- I think it was E.coli was too there, high. That's the only time of -- and they weren't letting you swim then."

"Turning on the faucet and going to fill up your water, dog's water bowl, and it's just coming out brown. I've had that happen."

"I have a long, two long filters this long, in my basement; filters the water. And every month I have to change those big round filters and they will be the darkest brown, rust that in pure rust every month."

"First thing that comes to mind is Delhi Belly."

"My daughter was hospitalized when she was young. My ex-husband used to take her out boating on the Cedar, which I would never boat on the Cedar, but she didn't know any better when she was three or four. They get water in their mouth and hospitalized not once but twice with giardia. Well, where do you get giardia in, I mean, that's like what they catch in a third world country and hospitalized twice at St. Luke's from it, so --"

Theme #6: It was difficult for participants to articulate how people negatively affect the quality of water. Although a range of points were raised over the course of the discussion by one or two participants (e.g., pharmaceutical disposal, engine chemicals from boats, soaps and detergents), beyond agriculture, few suggestions were provided when participants were specifically asked for ways people negatively impact water quality.

"Washing dishes."

"Factories."

"Farms too close to rivers or streams or this and lets the soil runoff in there."

"Throwing out the garbage."

"Pollution."

Theme #7: Solutions to water quality challenges in Iowa tended to focus on education, managing farm practices, and helping to subsidize good farm practices. Participants appeared to find it difficult to come up with solutions to water quality challenges in Iowa. Broad suggestions for education, monitoring or supporting good behavior through financial incentives were offered.

"I think just patience. I think we're gaining every year, but it's not a solution that is going to happen overnight. I think just patience. It is not something that I don't think you could regulate from D.C. I think just patience and education."

"You know education would be a big one. And I think, just from my personal experience at home, as the younger generation maybe starts to take over, their adapting these new technologies and new stuff and that just takes patience to continue to improve...:"

"Well, yeah, we're a hundred percent no-till. I mean that's something that my brother and I have started and kind of changed from the way my father used to do it. All our manure gets incorporated into the ground. We stay away from tile inlets and we're doing stuff like that all the time. We're trying the cover crops thing I'm not sure, where that's going exactly; if grain prices don't come around it's not going anywhere."

"Well, we've put rye out and I guess the last couple years we've puts some rye out. I think it's an excellent thing, it's just you have to have money to do it. It takes a lot of money to do it, so --. There's that where like I said the manure incorporating. We're -- we've cut our nitrogen rates back with the cost of it and we're learning how to map everything and control it on the fly, you know. And we're not, nobody wants to put any extra out there, it just costs a fortune. So we're trying -- we're raising more on less every year. So I guess, you know, years ago manure used to be thought as of waste, now I can tell you every -- I can give you an

analysis just like commercial fertilizer what it is and how much I've got out there. So it's a tremendous asset but you just have to manage it well. There's other things I could go on forever..."

"I think there are probably smarter ways to do the things that we're doing, whether it's raising hogs or planting crops. I know that the faculty at Iowa State are working on that, and companies are working on that, but things cost money...And, so, there's doing things the right way and doing them maybe the smart way and doing them in a way that we've always done them. As all of try to tend to do things that we have always done them that are maybe a little bit easier and a little bit cheaper to do. I think going back to Participant 1's a feature of Iowa that causes this is probably is the political landscape that we live in. You don't want to have regulations because regulation people think are stifling, but sometimes, we need them to stop us from doing what we do that is detrimental to ourselves and other people."

"Sure, I mean, we can all do things on an individual basis in our households. I mean, for me, I look at also just not taking for granted the resource, so rain buckets, not wasting our water for our garden, using rainwater. I try to teach my kids not to waste because we do. We take it for granted, oh, you just turn the faucet on, stuff like that. In terms of the pollution, be careful what you're putting on your lawn."

"They have these rain barrels now that you can get."

"When I was a kid, my dad would teach us when we change the oil in the cars, you would just take it out to the side and just pour the oil in the spot by the weeds, the burn barrel where we'd dump. It was like, "Oh, maybe that wasn't the best idea, dad."

"You know and the same thing with manure management. By the same notion there was a time when, you know, there was a lot of guys, a lot of farmers out there that some is good, more is better. Well, not they've got us in some degree into a situation where we are at. I think that can -- there's also to some degree can be pointed back at residential properties. You know, when I go out and spray I know that usually this square foot of ground gets this much chemical put on it because I'm going out there and with a relatively accurate piece of equipment to see to it gets applied properly. And then the guy watering or spraying his lawn he's out there kind of sprinkling it and I can remember one time when I lived in town, a neighbor was telling me about something, he was spraying on his lawn. I says, well, what is it? Well, it's Weed-B-Gon. And there's a lot more to it than 'It's Weed-B-Gon.'"

"Don't you think a program of education through farm organizations and similar, I mean, where people, I mean farmers I think are doing a great deal to help this situation because most farmers are sharing your philosophy or at least a lot of them do. Before, as you just said, more was better, but I think programs of education in the school and then programs of education and through farm organizations are so on are ways that you make people aware of this kind of thing and that they are doing something. Because at least they won't be doing it out of ignorance if they're doing it. And I think this is one way -- because I think farmers have done a lot to help the state in this kind of thinking."

"You know, like I said I think it has to be from kind of monetary incentive. I think there should be more inspections and tougher fines on any type of manufacturer or say the hog facilities that end up with these runoffs. You know, how often are they really inspected or -- and you hear about the things and it's devastating when that stuff happens when it kills all the fish and who knows what it does as it's going "

Section 2. Knowledge about waterways

Theme #1: Overall, participants had a good concept of waterways and the interconnectedness of waterways but had less detailed knowledge of those creeks near them.

Farmers and those affected by flooding had a good working knowledge of the waterways nearby. Others struggled to name creeks and streams nearby. Some could name the creek but when asked to draw waterways in their area, few could do so.

"Crooked Creek..."

"There is a small creek but I don't know what it is."

"The town calls it Cemetery Creek because it's right on the other side of the cemetery."

"I live next to Beaver Creek, so water comes into our yard and it flows down into Beaver Creek which then comes into the Des Moines River. "

"Well, yeah, we're sending it all from Iowa we're sending it all down to Mississippi and then down to the Gulf and that's where –"

"I don't know where my creek connects. I haven't really explored it too much"

"That's the ongoing concern is what's going down the Mississippi and out into the Gulf and stuff. "

"In this area you don't have pollution doesn't affect us, but what it does is our county is one of the ones being sued; we pollute the water and Des Moines suffers from it I mean so I mean you're not, you're not saying it's not our problem, it doesn't affect us as much. But it carried on down and the other thing is it overall it destroys the basic resource."

Theme #2: Few participants could identify a watershed when shown a graphic and few could define a watershed but most indicated that they had heard the term. When shown a graphic of a watershed, with few exceptions only farmers identified it as a watershed. When asked for a term that describes an area where all the water drains to a common location, again, only farmers tended to use the term "watershed." Descriptions included lake, swamp, drainage district, and basin.

"Yes, water treatment plant that's nothing like the watershed. I guess I don't know what the hell watershed is."

"Well, I mean the Mississippi has a watershed, which is huge; basically the central part of the country. And then it breaks down to the English to the Iowa watershed there. It's just the flow, the direction of flow, of the water that comes off the land."

"I've heard it, but I didn't know what it meant."

"A whole natural recylation process at the water from the rain and everything else. It flows underground. It flows state by state down all the way through that's how the watersheds."

"When I think of watershed I think of the area of ground that a particular drainage ditch, district river the area that, that river drains."

"Yeah, yeah, I'm using the Mississippi River as one example. There's the Des Moines River watershed covers I think it's about a third of the state, which pokes up, there's a line that draws up through Pocahontas County that goes in there. But I think of the area of ground of a particular ditch or county tile in some cases, the area that particular body or instillation drains. Different drains of water."

"Kind of, it makes me think, you know, I guess I don't know."

"Drainage."

"Conservation."

Section 3. Attitudes about public policies regarding water quality in Iowa

Theme #1: We are all responsible for water quality in Iowa. There was near consensus within and across groups that there is shared responsibility for ensuring good water quality in the state. Although agencies such as the DNR were known and mentioned when probed, the initial responses focused on shared responsibility with agencies or soil conservation districts playing specific roles.

"Everyone yeah, absolutely."

"Well, everybody should do their part..."

"Each individual."

"We all have a responsibility."

"Consumers to water plant to elected officials."

"Myself. Everyone, I mean, everyone's responsible from the 10 year old kid to the mega corporations to the -- I mean everyone and everybody has to be and I think they are I think in the last since I've been young. I mean it's changing. It's just we've got to be patient."

"The state and federal government and Army Corps of Engineers things like that."

"I kind of feel like DNR but then I think that doesn't really fall into their..."

"The Iowa DNR or whatever. For Iowa, yeah, they would be -- have over -- all oversight and education I would think for Iowa itself."

"Department of Agriculture is..."

"Different counties have their own water commissions; I believe...Each county has representatives to ensure that their water quality is good."

"...you've got soil conservation districts. You've got the drainage districts. All of those are responsible for some parts in there, but as far as the quality, I don't know the quality part..."

[EPA] *"They are a federal agency and they no right interfering with state business is my opinion on that."*

Theme #2: Financial responsibility is a shared responsibility and should be balanced across industry and consumers and taxpayers. In addition to shared financial responsibility through tax incentives, taxes, fees, etc., some participants also pointed to the complexity of the shared responsibility.

"Through taxes."

"Water bill."

[FINANCIAL RESPONSIBILITY LIES] *"with the legislature."*

"Our money and DNR for inspectors."

"It always comes down to consumer. You know it's always going to be whether through taxes or whether it's individually or whatever. It's always going to be down to the person who, you know, wants to be a citizen of the country. Otherwise, it's going to be high debt that's going to create high interest and all that. So, you know, it's -- or inflation I guess high debt would cause high inflation. "

"In Europe, all the manufacturers have to have their own sewage disposal. In this country, the taxpayer pays for it. "

"And it might as well be, you know, individuals paying for it because if you pass it off to corporate America and you start taxing them. Saying well, you'll pollute more than the individual so you'll pay for it but then they'll just find other ways well, that's the reason why we don't pay living wages, that's the reason we, you know, we're paying people underneath the table because we're having to pay all these taxes. And so it might as well just be the individual that pays for it because we're going to end up taking it on the chin one way or another is my opinion. "

"Yeah, something. But I think in terms with the quality of our land, you know, majority comes from our taxes. In our city limits in what we pay for our water bill sometimes it's grants like, to clean up the lakes and things. Sometimes there's fundraisers depending on what is getting cleaned like, pools. People are trying to get fundraisers for pools it all varies on what you're trying to maintain and look clean. "

"Yeah, tax breaks if they're doing a good job making sure that their, the runoff and everything else isn't -- that everything's in good quality they should be, getting credit for it too. "

"I mean, it would be wonderful if the government could streamline things, but you have many different departments. So, it would be nice if there could be a specific department that was over that whether it be alone or similar interests, but at this point, it may not be reality that there's -- it could be spread too thin. If it has to go to the DNR and this commission and this commission, then no one may be able to do anything. So to ask where it goes, it may not be a good solution where it goes right now. They might need to consolidate."

Theme #3: There were strong views but no common voice regarding water quality policy water protection policy. Views were split among those suggesting that state legislative or local groups should be responsible for policy. A few suggested voluntary/no strict policies and others pointed to agencies at the state and federal level as playing an important role. In other cases, the ambivalence about regulation and restrictions was clear in the comments expressed. This was especially true for some of the farmers in the group. These issues elicited some of the most detailed and pointed responses.

"That's one of the legislatures'... That's one of their responsibilities is to develop policy. Actually, it probably needs to be -- all of these issues that feed into water quality, all of these different departments and commissions probably, in a really good world would be reviewed and combined, and the money would go where it was needed instead of being distributed for people to do little dibby dabs of things here and there. But I don't know how soon that's going to happen. I may not be around to see it."

"I think they need to stop blanket policy. They need to, if you're doing something wrong, nail them. Nail them to the wall. But I am sick and tired of having to prove myself innocent before I can do anything and I'm tired of it. And if that's why when you say the word DNR and EPA, I just cringe to no end. But I mean, you have to have an enforcer and there has to be rules and regulations....I think that there needs to be standards, voluntary standards, and if you're not, you know if you're doing something, out there, that doesn't apply common sense and you're breaking those laws then you need the enforcement. I don't think we need -- I don't need somebody coming out there and right now, I have to file a paper telling the DNR what I'm going to do with my manure every year that's not the way this country is supposed to be and I've never done anything wrong. And, you know, I try and do my best to utilize it. So I guess, that's where I would say it goes back to overreach as far as I'm concerned on that....And you can't control Mother Nature. I mean, you can't control it. They'll like the DNR or Des Moines Water Works they've had to turn their denitrification system on twice in eight years and both of them were after huge rain events that nobody can control. And, you know, it -- that land out there and some of that contamination comes from runoff and erosion but that's stuff worth, you know, 10 to 14 thousand dollars an acre I don't want any off that running off down the creek anymore. And that never used to be that way. And that's why I say it's a time issue we just need to -- it's getting solved is not going to happen overnight, but I think 10 years down the road it's going to be a lot better than it is today. So I guess everybody wants instant gratification that just doesn't work anymore in practicality."

"We see what the EPA is trying to do now with this controlling water. I mean if it goes through what they're wanting to do, I mean every pond, creek, waterway, mud roads are going to be controlled by the federal government. And that isn't their -- I don't think the real intention, but if it goes through like they want they will be controlling your pond and your waterway and this. I think some common sense needs to be out there and not as Participant 3 said, blank policy. ...I think our attitude has changed so much. I know when I started farming years and years ago; I mean we plowed up and down hills. We farmed, as close to the creek as we could get and we'd didn't care if we sprayed every chemical we could think of that. And now,

it's not only I mean, it's basically common sense. We were wasting so much then, but it was better than going out and doing it by hand is what basically we were doing before running a corn plow through 40 times. But it just, a little bit enforcement but I think it's nice that we have kind of a voluntary system. I mean, you don't see that many people abusing things like you used to, I mean, it's just common sense. Things cost so much to produce on a farm or in manufacturing that nobody I think is intentionally wasting anything, so."

"Taxes kind of go into -- the one program that has a lot of money, more than money than they know how to dole out is the farm subsidies. There has been talk about farmers getting the subsidies for certain things. Can there be strings attached? That's a whole new regulatory thing, but rather than just, here's your subsidy or what have you, might be tied to, are you following the proper practices? Are you doing these things? Because that's where the billions of dollars are. It's a matter of do we have the political will to enforce that. You know if I'm a farmer...I don't want somebody telling me what to do..."

"Okay. What I'm saying is, I mean, if you take farming as an essential. I mean it's probably the most important single industry in the world because farming lets the rest of us, gives the rest of us something so we can live. And consequently, if a farmer, in carrying out his obligations and so on, to produce food has to have a water filtration system or has to have some kind of a drainage ditch or so on, it seems to me that he should be, to some degree at least, reimbursed through that either by tax rebate, by some kind of a subsidy, by some kind of a sharing or cooperative effort where he pays so much the government pays so much and so on. But it seems to me, that the public as he is operating to the benefit of the public and is taking money out of his pocket to do it. I think he is entitled to something or adhering to public policy."

"After I got out of the military, I spent five years living in Europe, as an American, but living in Germany. You can't even wash your own car in your own driveway because you're fined if they come out and catch you washing your car and that water from your car is going into the system, the sewer system; running out your driveway and going into the sewer system you're fined because that oil and everything from your car when you wash your car. Here, we just do it without thinking about it and the soap bubbles everything just go everywhere all the stuff in your yard. Over there, you can't do it. Their water quality is a lot better than ours is. We're not regulated here."

"Anything in the public interest, where what you do affects somebody else and yourself is, should be subject to some form of regulation because water knows no boundaries. Water doesn't say, somebody said in the recent campaign, farmers should be able to do anything he wants on his land because it's his land. But unfortunately, when that water goes down stream and pollutes the Des Moines water system it is not his water and it's not his land, it's everybody's. I think anything that affects the public interest and particularly water because nothing is more overflowing in a sense than water. You have to have some sort of regulations to protect the interest of the public."

"I think too much regulation causes people to react the other way just that fine amount so that way you don't have acting out or purposely doing something because I was told not to."

Theme #4: Information about water quality issues and policy come from a variety of sources with no central, common location. Standard media such as newspapers, magazines, radio internet and television are commonly reported. Less frequently, utility bills, and city water reports were mentioned. Overall, participants viewed the information as easy to understand. No one in the groups had ever heard of the Land Legacy Amendment.

Theme #5: Key barriers to doing more to protect the water were identified as lack of awareness or not enough education and apathy or laziness. Primary “motivators” for better practices that positively affect water were education/awareness and money. Greater awareness, more education and money were viewed as the most important motivators for people to do more to protect water quality.

[NEED MORE] *“Education and money.”*

“I was going to say there’s a lot of just ignorance, and I don’t mean that in a demeaning way.

“...I just live in a part of town that personal responsibility isn’t high on anyone’s list. I mean, you don’t take care of yourself, why are you going to take care of your water? I mean, it’s true. How am I supposed to motivate my neighbors? We can do all we can, but... they probably have to lose something to motivate them.”

“Unfortunately, it’s many times has to come to a crisis before we react to something.”

“And it doesn’t cost me a darn thing to do it so it’s no problem for me to do it. There’s certain things that I’ve done that yeah cost me a little bit of money to do it. I don’t worry about it too much. There’s certain other things that might cost quite bit of money to do it and I’m not near as likely to go out and employee that practice, you know, because of the -- it gets back to the dollar bill.”

“I think our lives have changed. I think there’s a lot more fertilizer. I think there’s a lot more -- the factory farms have just blossomed here. I think, I don’t know that it was a lot. I do. I do believe it was better. I think our whole culture, the way we grow food has changed, and it used to not be horrible not to have a great lawn.”

“You see a lot of planning and zoning that, you know, they’re really making some very nice features of plants and trees and all that kind of thing that if you build a new building or a new house you’re required to do certain things to do that. So, you know, a lot of the water quality stuff can be done very nicely if people kind of understand what it’s doing on one thing but it’s also adding to the quality of the building or the lot or something like that.”

“Having some kind of incentives for people to do, you know, modify their land or whatever so that their drainage is better or, you know, it’s kind of scary to think sometimes you hear about other parts of the

country where there's water shortages and what's going to happen, you know, how will that impact us? That's going to have a big impact when we're told we can only have the water on for so many hours a day or ..."

Limitations

As is true for all qualitative methods, results from these focus groups are based on the expressed views of the particular sample of participants and are unique to their experiences and opinions. The results reflected common themes raised by the participants, which also reflected their particular perspectives. Although there were attempts to include some diversity and groups were held in both rural and urban locations, the use of focus groups using convenience samples precludes representation from all possible relevant groups. It is more difficult to recruit participants from the 18-34 age range. In addition, the use of more than one moderator with differing emphases and use of probes within the guide which yields somewhat different experiences across groups. Time of year may also have impacted responses given that more recreational activities occur in warmer months and this may have impacted the salience (or lack thereof) of water issues related to recreation. Lastly, given the constraints on the timeline in this particular project, no full content analysis was performed

Appendix B – Survey Instrument and Item Frequencies

DNR Water Quality Questionnaire

Note: All n-counts reflect unweighted sample size. Unless otherwise specified, percentages (%) reflect the weighted percent of survey respondents.

Environmental literacy and general views on the environment and water quality

1. The first question is about issues facing the country today. For each of the following issues, please tell me if you are not at all, slightly, somewhat, or extremely concerned. Would you say not at all, slightly, somewhat, or extremely concerned? [RANDOMIZED]

	Unweighted n	Not at all concerned (%)	Slightly concerned (%)	Somewhat concerned (%)	Extremely concerned (%)
Jobs and economic growth	2,063	8.0	17.5	38.5	36.1
Immigration*	2,050	17.5	18.8	30.4	33.4
Health Care	2,065	8.9	14.3	32.3	44.6
Terrorism or National Security	2,069	9.8	15.6	31.6	43.0
The Environment	2,072	7.3	16.4	41.1	35.1
Water Quality	2,068	14.1	16.0	38.4	31.6

* Interviewers were given the option to skip this question to avoid misperceptions of Spanish-speaking participants about the purpose of the survey.

2. Now I would like for you to think about what things will be like IN IOWA in 2025, that is, 10 years from now. Do you think...[RANDOMIZED]

- a. Public education will improve or public education will get worse?

	Unweighted n	(%)
Public education will improve.	1,040	54.5
Public education will get worse.	914	45.5

- b. Health care will be more affordable or health care will be less affordable?

	Unweighted n	(%)
Health care will be more affordable.	568	31.1
Health care will be less affordable.	1,398	68.9

c. Iowa's economy will be stronger than today or Iowa's economy will be weaker than today?

	Unweighted n	(%)
Iowa's economy will be stronger than today.	1,295	70.6
Iowa's economy will be weaker than today.	597	29.4

d. Iowa's lakes, rivers & creeks will be cleaner than they are today or Iowa's lakes, rivers & creeks will be more polluted than they are today?

	Unweighted n	(%)
Iowa's lakes, rivers, and creeks will be cleaner than they are today.	893	43.3
Iowa's lakes, rivers, and creeks will be more polluted than they are today.	1,053	56.7

3. I am going to read a list of issues that are viewed by some as problems IN IOWA. As I read each one, please tell me if you think it is not a problem at all, a small problem, a moderate problem or a very big problem in YOUR AREA. Would you say _____ is not a problem, a small problem, a moderate problem, or a very big problem in your area? [RANDOMIZED]

	Unweighted n	Not a problem at all (%)	Small problem (%)	Moderate problem (%)	Very big problem (%)
Crime	2,068	22.2	36.2	29.7	11.9
Poor quality drinking water	2,062	42.9	26.7	19.5	10.9
Poor quality of water in lakes, rivers, and creeks	2,043	18.5	28.4	35.6	17.5
Poor quality of public schools	2,027	30.8	28.5	28.6	12.1
Lack of jobs	2,046	23.0	28.9	33.0	15.0
Air pollution	2,070	36.8	36.1	20.2	7.0
Lack of places for outdoor recreation	2,068	46.7	28.2	18.3	6.8
Deteriorating condition of roads and bridges	2,070	9.1	18.6	38.3	33.9
Damage from flooding	2,061	32.8	31.8	26.3	9.1

4. What sources of pollution do you think are the biggest threats to the quality of water in YOUR AREA?

	Unweighted n	(%)
Runoff from agricultural areas / cropland	1,151	50.7
Runoff from livestock waste / hog confinements, CAFOs (e.g., chicken, turkey)	336	13.7
Waste dumped by factories	277	14.6
Trash, litter, residential dumping	256	15.1
Runoff from urban areas	110	5.3
Sediment from agricultural erosion	105	3.8
Runoff from lawns and golf courses	101	4.2
Community sewage treatment plants and septic tanks	67	3.0
Runoff from roads and parking lots	46	2.1
Runoff from construction sites and building development	38	1.7
Sediment from construction sites and building development	11	0.5
Other	216	10.3
Don't know/Not sure	224	13

5. In the city or area where you live, are you satisfied or dissatisfied with the quality of the water?

	Unweighted n	(%)
Satisfied	1,631	80.2
Dissatisfied	429	19.8

6. What aspects of the water would you say are unsatisfactory?

	Unweighted	
	n	(%)
Bad taste	180	42.6
Worried about contamination/Chemicals/Bacteria	149	34.4
Too hard/ High mineral content	66	15.3
Smell, chlorine	58	12.6
Not clear/ Bad color/Cloudy water	50	11.3
Smell, odor/ Sulphur/ Rotten egg smell	41	7.7
Particulate matter floating in it/ Floaties/ Specs	20	4.0
Algae	9	1.0
Too soft/etches glasses/film or milky color on glassware	5	1.0
High iron/rust/-discolors clothing, appliances	31	5.5
Unsafe/ Can't filter/ Don't trust	7	2
Dead fish/ No fish	6	0.8
Too expensive	6	1
Trash/Waste	2	0
Other	53	14.1
Don't know/Not sure	8	1
Refused	1	0

7. Overall, would you say water quality in Iowa is poor, fair, good or excellent?

	Unweighted n	(%)
Poor	190	9.4
Fair	735	36.0
Good	920	45.9
Excellent	184	8.8

[HALF ASKED QUESTION 8A HERE AND HALF ASKED QUESTION QB NEAR THE END TO ASSESS ORDER EFFECT. Results were compiled.]

8A/8B. As part of a local effort, how likely do you think you would be to adopt or change one behavior to improve water quality in your community?

	Unweighted n	(%)
Definitely would not	27	1.6
Probably would not	173	8.5
Might or might not	397	20.4
Probably would	909	44.0
Definitely would	535	25.5

9. Overall, how would you rate the quality of Iowa's lakes, rivers, & creeks? Would you say they are...

Unweighted n	Poor (%)	Fair (%)	Good (%)	Excellent (%)
2,046	11.4	43.2	41.3	4.1

10. Overall, how would you rate the quality of lakes, rivers, & creeks near your home? Would you say they are...

Unweighted n	Poor (%)	Fair (%)	Good (%)	Excellent (%)
2,052	15.6	38.7	40.1	5.6

11. In the next 10 years, do you think the quality of lakes, rivers, and creeks in YOUR AREA will...

	Unweighted n	(%)
Decline significantly	133	6.3
Decline somewhat	506	26.1
Stay about the same	816	40.4
Improve somewhat	541	24.1
Improve significantly	48	3.1

12. Most towns and cities in Iowa have storm sewers that help prevent flooding by draining rainwater from streets and parking lots. Where do you think water entering storm sewers goes? Does it primarily go...

	Unweighted n	(%)
To wastewater treatment plants	502	27.0
Directly to lakes, rivers, and creeks	1,212	62.9
Soak into the ground	200	10.1

13. How would you rate the quality of your home drinking water as it comes from the faucet with no filtering of any kind? Would you say it is...

	Unweighted n	(%)
Poor	304	14.9
Fair	504	25.5
Good	808	39.4
Excellent	443	20.1

14. For each of the following, please tell me whether you think it is getting worse, is about the same or is getting better than it was 10 years ago. The first is...

[RANDOMIZE]

	Unweighted n	Getting worse (%)	About the same (%)	Getting better (%)
The overall quality of drinking water in YOUR AREA is...	1,994	11.2	68.0	20.7
The overall quality of water in Iowa's lakes, rivers, and creeks is...	1,991	29.2	49.1	21.8

15. Thinking about water quality issues facing YOUR AREA, would you say that your level of knowledge is very low, low, neither low nor high, high or very high?

	Unweighted n	(%)
Very low	85	5.0
Low	486	26.1
Neither low nor high	924	44.8
High	474	19.8
Very high	96	4.3

Understanding of water quality and causes of water pollution

16. Not including industrial waste or wastewater treatment plants, what sources of water pollution or contamination can you think of?

	Unweighted n	(%)
Agricultural runoff (nitrogen and phosphorus fertilizer, sediment)	921	40.6
Agricultural chemicals/Herbicides/Insecticides	735	32.6
Illegal dumping, trash or litter	465	24.5
Runoff from livestock waste or manure/ Confined animal feeding operations (CAFO)	465	19.8
Urban runoff (storm water)/ Auto oil and fuel leakage runoff from town and cities	340	15.7
Chemicals used on residential lawncare/Nitrogen and phosphorus fertilizer	238	10.4
City sewers/Leakage from septic systems	120	5.3
Erosion from crop fields	85	3.5
Manure application to agricultural fields	85	3.5
Products used in cleaning homes and businesses/ Household hazardous wastes	66	3.0
Chemicals used on golf courses	48	1.8
Construction erosion	30	1.4
Pet waste	28	1.3
Creek/Stream bank erosion	25	1.3
Other	198	8.3
Don't know/Not sure	274	16

17. I am going to read a list of statements. For each one, please answer on a scale of 1 to 5, where 1 means strongly disagree, 2 means disagree, 3 means neither disagree nor agree, 4 means agree or 5 means strongly agree.

	Unweighted n	Strongly Disagree (%)	Disagree (%)	Neither disagree nor agree (%)	Agree (%)	Strongly Agree (%)
Water pollution laws are too tough in Iowa.	1,958	24.4	35.1	30.6	7.3	2.6
Not enough attention is given to protect water quality in Iowa.	2,020	4.2	16.1	28.6	33.2	17.8
Clean water is needed for strong economic growth in Iowa.	2,069	1.1	2.8	10.7	39.2	46.2
Tough water protection laws hurt economic development.	2,008	14.3	28.1	29.5	19.2	9.0
Water contamination from runoff over paved areas is a problem.	2,004	4.6	14.3	30.3	34.9	16.0
I am concerned about chemicals in my drinking water.	2,073	9.5	15.0	16.6	26.7	32.3
Water runoff from livestock operations is a problem in Iowa.	2,012	3.5	10.1	22.2	36.7	27.6
Runoff from agricultural crop production is a threat to my drinking water.	2,045	5.5	12.6	22.0	34.3	25.6
Farmers take undue blame for environmental problems.	2,032	7.9	20.1	34.7	24.8	12.5
I know what steps I should take to prevent contamination of lakes, rivers, and creeks in Iowa.	2,038	4.4	13.5	23.8	37.6	20.7
Efforts to keep water clean should be voluntary rather than mandated by the government.	2,043	22.5	25.2	21.8	18.5	12.0
I am willing to change some daily behaviors to improve water quality in my area.	2,060	2.0	3.5	14.6	46.4	33.5
We need to increase incentives for farmers to protect soil and water.	2,054	2.6	7.6	16.2	39.7	33.8
We need to improve lakes, rivers, and creeks for tourism/recreation.	2,068	2.0	5.8	16.9	41.4	33.9
We need to increase regulations for landowners to protect soil and water.	2,047	4.9	11.7	22.3	38.2	23.0

18. Now I am going to ask you about your level of concern. Overall, would you say you are not at all, slightly, somewhat, moderately, or extremely concerned about the safety of your tap water?

	Unweighted n	(%)
Not at all	400	20.1
Slightly	236	12.0
Somewhat	382	19.1
Moderately	603	27.8
Extremely concerned	453	21.0

19. I am going to read a list of possible pollutants. For each one, please tell me whether you KNOW it is not a pollutant affecting lakes, rivers, and creeks IN YOUR AREA, you THINK it is not, you THINK it IS or you KNOW it is a pollutant affecting lakes, rivers, and creeks IN YOUR AREA. If you're not sure, just let me know.

[RANDOMIZE]

	Unweighted n	You KNOW it is NOT (%)	You THINK it is NOT (%)	Not Sure (%)	You THINK it is (%)	You KNOW it IS (%)
Bacteria, viruses, or germs	2,075	3.6	20.4	15.9	34.5	25.5
Nitrates from fertilizer	2,078	1.6	9.5	7.5	42.0	39.4
Phosphates from fertilizer	2,077	2.3	9.8	9.6	44.5	33.9
Heavy metals such as lead, arsenic, or mercury	2,078	5.2	27.5	20.7	24.3	22.4
Minerals such as iron, manganese, calcium	2,073	6.4	32.1	27.2	22.9	11.3
Pesticides	2,080	1.9	10.7	5.2	42.6	39.6
Road salt and sand from treating winter roads	2,080	4.3	18.2	9.5	40.8	27.2
Petroleum products	2,080	4.6	27.1	16.5	28.8	23.0
Algae	2,078	5.5	27.5	17.5	28.7	20.8
Leakage from septic systems	2,079	5.0	25.7	17.7	31.8	19.8
Waste from wildlife, such as geese	2,079	9.3	32.3	12.5	28.7	17.2
Waste from pets, such as dogs	2,080	12.6	43.7	13.3	19.3	11.2

20. Now, thinking about water quality IN IOWA, in your opinion, how serious a threat are the following to water quality IN IOWA? For each please tell me if you think it is not much of a threat, a moderate threat, or a serious threat to water quality IN IOWA. [RANDOMIZE]

	Unweighted n	Not much of a threat (%)	A moderate threat (%)	A serious threat in Iowa (%)
a. Loss of natural areas (Any area of land/nature/open area that hasn't been developed or farmed)	2,010	28.8	39.3	31.9
b. Industrial or factory waste	2,020	13.3	43.8	42.9
c. Dumping oil or household chemicals down the drain	2,023	15.0	40.9	44.1
d. Runoff from construction sites	1,991	32.7	51.3	16.0
e. Community sewage treatment plants & septic tanks	1,992	29.5	52.4	18.1
f. Runoff from lawns and golf courses	2,031	41.0	44.7	14.3
g. Runoff from cities and towns	2,035	16.8	56.2	27.0
h. Runoff from cropland	2,051	13.5	45.7	40.8
i. Runoff from livestock waste	2,046	13.1	46.9	40.0

Participation in recreational activities and/or employment involving water

For the next questions, you may answer yes or no

21. Is there a lake, river, or creek within a 30-minute drive of where you live?

	Unweighted n	(%)
Yes	2,043	97.6
No	34	2.4

22. In the past two years, have you visited a lake, river, or creek NEAR YOU for recreation purposes?

	Unweighted n	(%)
Yes	1,650	82.3
No	391	17.7

23. In the past two years, have you visited ANY Iowa lake, river, or creek for recreational purposes?

	Unweighted n	(%)
Yes	119	31.0
No	310	69.0

24. What is the primary reason you have not visited an Iowa lake, river or creek for recreational purposes?

	Unweighted n	(%)
No interest/don't fish/don't swim/don't boat	151	47.0
Too busy to get away	54	16.7
Unable (disability)	31	11.8
Water too dirty/unclean/beaches closed	16	6.0
Too old/age	15	5.1
Don't have equipment/Cost too much	9	4.4
Don't travel	9	2.9
On vacation/Live out of state	8	4.0
Too far away	2	0.8
Lake too busy/crowded	1	0.5
Other	7	1.4

25. In what activities did you typically take part when you visited these lakes, rivers or creeks during the past two years? [SELECT ALL THAT APPLY]

	Unweighted n	(%)
Fishing	932	52.1
Boating/Sailing	655	35.2
Swimming/Visiting a beach/Wading in the water	563	33.8
Walking/Biking/Running/Exercise	219	11.5
Canoeing/Kayaking	187	9.8
Camping	176	10.0
Picnicking	168	9.3
Hiking/Backpacking	162	8.9
Birdwatching/Enjoying nature	123	7.4
Hunting/Shooting activities/Range	54	2.2
Water skiing/Wakeboarding/Personal water craft (Jet Ski, Wave Runner)	50	2.6
Play outdoor/Yard games: Frisbee golf, catch, horseshoes, darts, volleyball, etc.	34	2.1
Stand-up Paddle Boarding (SUP)/Tubing	23	1.3
Skiing (Downhill or Cross Country)/Snowshoeing/Snowmobiling	19	1.0
Play at Playground	9	0.7
Collecting (mushrooms, arrowheads, stones)	7	0
ATV or 4-wheeling	5	0.3
Sightseeing	6	0
Picking up litter	4	0
Horseback riding	2	0
SCUBA diving/Snorkeling	2	0.1
Socializing	1	0
Other	69	3.5
Don't know/Not sure	4	0
Refused	1	0

26. In the past two years, have you been swimming in ANY Iowa lake, river, or creek?

	Unweighted n	(%)
Yes	839	50.7
No	930	49.3

27. What is the primary reason you have not been swimming in an Iowa lake, river or creek?

	Unweighted n	(%)
No interest/don't swim	478	50.4
Water too dirty/unclean/beaches closed	248	28.6
Unable (disability)	60	5.7
Too busy to get away	50	5.9
Too old/age	26	2.8
Afraid to go in the water (fish/animals/can't see bottom)	12	1.6
Swim in pool/owns pool	10	1.7
Too far away	10	0.9
Too cold	5	0.5
Safety issues	3	0.2
Don't have equipment/Cost too much	2	0.2
Don't travel	2	0.2
Leeches	2	0.2
Vacation elsewhere besides Iowa	2	0.2
Can't swim	1	0.1
Lake too busy/crowded	1	0.3
Other	13	0.9

28. Have you ever visited an Iowa beach area that had been closed at the time you visited because of a problem with the water?

	Unweighted n	(%)
Yes	641	34.2
No	1,122	65.8

29. In the past two years, have you been boating on ANY Iowa lake, river, or creek?

	Unweighted n	(%)
Yes	1,083	60.9
No	686	39.1

30. What is the primary reason you have not been boating on an Iowa lake, river or creek for recreational purposes?

	Unweighted n	(%)
Don't have equipment (boat)/Cost too much	332	49.5
No interest/don't boat	223	32.2
Too busy to get away	53	7.6
Unable (disability)	26	3.4
Water too dirty/unclean/beaches closed	12	1.8
Too far away	3	0.6
Don't travel	1	0.2
Lake too busy/crowded	1	0.1
Other	29	4.7

31. Thinking of all your visits to lakes, rivers or creeks in Iowa, approximately how many Iowa lakes, rivers, or creeks have you visited in the past two years for recreation purposes of any kind?

	Unweighted n	(%)
1	240	13.2
2 to 3	682	40.8
4 to 6	523	28.7
7 to 10	174	9.3
10+	150	8.1

32. In the past two years, have you fished in an Iowa...

	Unweighted n	(%)
a. Lake?		
Yes	920	53.0
No	847	47.0
b. River?		
Yes	706	41.4
No	1,063	58.6
c. Creek?		
Yes	374	20.8
No	1,392	79.2
d. Farm Pond?		
Yes	505	27.4
No	1,263	72.6

33 In the past two years, have you eaten fish caught in an Iowa...

	<u>Unweighted n</u>	<u>(%)</u>
a. Lake?		
Yes	785	38.1
No	1,130	56.7
Don't Eat Fish	121	5.2
b. River?		
Yes	608	28.9
No	1,312	65.9
Don't Eat Fish	121	5.2
c. Creek?		
Yes	221	10.0
No	1,706	84.8
Don't Eat Fish	121	5.2
d. Farm Pond?		
Yes	418	20.0
No	1,516	74.8
Don't Eat Fish	121	5.2

34. If fish caught in an Iowa _____ were offered to you, do you think it would be safe to eat?

	Unweighted n	(%)
a. Lake?		
Yes	838	68.7
No	259	22.9
Depends on Where Caught	115	8.3
b. River?		
Yes	787	56.3
No	488	36.0
Depends on Where Caught	123	7.7
c. Creek?		
Yes	924	53.4
No	646	38.4
Depends on Where Caught	151	8.1
d. Farm Pond?		
Yes	818	51.8
No	578	39.1
Depends on Where Caught	163	9.1

Positive and negative environmental behaviors that could impact water quality

35. Does your home have a lawn or garden that you or someone in your household maintains or cares for?

	Unweighted n	(%)
Yes	1,654	78.1
No	423	21.9

36. Which statement best describes how you fertilize your lawn, the yard or garden that you care for?
Would you say...

	Unweighted n	(%)
Neither you nor anyone else uses fertilizer on your lawn.	642	40.0
You use chemical fertilizer at least occasionally.	385	24.0
You hire a lawn care company to fertilize your lawn.	212	13.2
You use compost but no chemical fertilizer.	211	12.4
You use compost AND chemical fertilizer.	159	8.8
I use purchased organic fertilizer.	21	1.2
I use some combination of chemical and organic fertilizer.	4	0.4
I hire a lawn company, company uses non-phosphate/organic fertilizer.	3	0.0

37. How many times per year do you fertilize your lawn or garden?

	Unweighted n	(%)
More than 4 times	42	4.8
3-4 times	180	20.7
1-2 times	664	65.6
Less than once per year	78	7.4
Use on specific plants, not lawn	16	1.5

38. In the past two years, would you say your use of lawn or garden fertilizer has decreased, stayed about the same, or increased?

	Unweighted n	(%)
Decreased	230	22.1
Stayed the same	697	72.5
Increased	57	5.4

39. Have you ever conducted a soil test on your lawn or garden to measure nutrients?

	Unweighted n	(%)
Yes	241	13.1
No	1,400	86.9

40. Do you have a dog?

	Unweighted n	(%)
Yes	960	47.7
No	1,120	52.3

41. Do you pick up any of the waste your dog leaves in your lawn or any other location where you walk your dog?

	Unweighted n	(%)
a. Yes, if waste is not in my lawn	77	7.6
b. Yes, in my lawn	109	11.8
c. Yes, all locations	533	60.6
d. No	237	20.0

42. QUESTION DROPPED AFTER PILOT

43. The next question asks about washing your primary vehicle. Generally, where do you wash your primary vehicle?

	Unweighted n	(%)
Commercial car wash (automatic or attendant hand wash)	1,066	52.3
Coin-operated self-serve hand wash (do it yourself)	570	27.7
At home in the driveway or on the street	217	10.2
Don't wash it/have a vehicle, but do not wash	87	3.8
At home on the lawn, grass or gravel surface	71	2.8
At work	12	0.5
Other	40	2.0
Doesn't apply/No vehicle	24	1.2

Responsibility for improving water quality and willingness to pay (WTP) or invest in water quality improvement

44. For each of the groups I list, please indicate whether they should be not at all responsible, somewhat responsible, or completely responsible for working to improve water quality in YOUR AREA. The first is...

	Unweighted n	Not at all (%)	Unweighted n	Somewhat (%)	Unweighted n	Completely (%)
Federal Government	287	13.8	1,249	60.3	482	25.9
State Government	91	4.5	1,232	58.9	713	36.6
Local Government	100	5.2	1,258	59.6	684	35.2
Farmers	75	4.7	1,301	64.5	668	30.8
Businesses	106	5.2	1,290	63.8	636	31.0
Citizens or residents of the state	54	3.4	1217	59.2	772	37.4

44a1-f1. How well are _____ fulfilling their responsibility for protecting water quality in your area/community?

	Unweighted n	Very poorly (%)	Poorly (%)	Neither poor nor well (%)	Well (%)	Very well (%)
Federal Government	1,598	7.6	21.2	39.7	27.4	4.1
State Government	1,803	5.6	19.6	32.2	35.9	6.6
Local Government	1,811	3.9	15.5	31.5	39.6	9.6
Farmers	1,807	3.7	21.4	33.0	33.6	8.3
Businesses	1,719	4.6	16.7	37.6	35.8	5.2
Citizens or residents of the state	1,898	4.3	23.9	36.1	31.9	3.8

45a. Now I would like to ask you about financing improvements in water quality. We already pay for government environmental programs through taxes, water bills, and other means. However, more money will be needed if water quality in Iowa is to be protected. This money would pay for additional and expanded programs to control pollution, monitor water quality, protect fish habitat, and educate people about ways to reduce water contamination and pollution. The goal would be to make sure water quality in Iowa is safe enough for fishing, swimming, and drinking once treated. Would you and your household be willing to pay \$10 in additional taxes or fees each year for these programs, if you knew the money would be used to make sure water quality in Iowa is clean and safe?

		Unweighted n	(%)
Would you and your household be willing to pay \$10	Yes	1,687	83.6
	No	343	16.4
Would you be willing to pay \$25	Yes	1,217	72.8
	No	439	27.2
Would you be willing to pay \$50	Yes	761	63.5
	No	437	36.5
Would you be willing to pay \$75	Yes	555	72.1
	No	201	27.9
Would you be willing to pay \$100	Yes	480	86.4
	No	74	13.6
Would you be willing to pay \$125	Yes	273	59.7
	No	202	40.3
Would you be willing to pay \$150	Yes	252	93.8
	No	21	6.2
Would you be willing to pay \$175	Yes	226	87.6
	No	26	12.4
Would you be willing to pay \$200	Yes	216	96.1
	No	10	3.9

46. What is the most you would be willing to pay each year between _____ and _____?
[Not Reported]

Factors (e.g., demographic, sense of place, information sources) that could impact the knowledge and attitudes assessed

47. In the past year, do you recall seeing, hearing, or reading information about water quality issues in YOUR AREA?

	Unweighted n	(%)
Yes	1,249	56.8
No	810	43.2

48. In what form was the information you received?

	Unweighted n	(%)
News story in local media	723	58.1
Brochure/flyer/letter/other written info	529	41.0
Info on website/Internet	128	9.6
Conversation with friends/family/co-workers	69	4.2
Info on social media (FB, Twitter, etc.)	30	2.1
Other	61	4.3
Don't know/Not sure	12	1
Refused	0	0

49. Do you recall the source of the information, that is, who or what organization provided the information?

	Unweighted n	(%)
Media/broadcast news	260	20.9
Local water company or utility/waterworks/city government	255	21.8
DNR	172	13.4
Environmental group/organization	95	6.0
Farm or agricultural organization	54	3.5
Local conservation board	41	2.5
Watershed organization	25	1.5
ISU Extension	23	1.2
National group	14	1.0
Other	61	5.0
Do not recall source	409	33.4
Don't know/Not sure	21	1
Refused	2	0

50. When you are interested in getting information about water quality and conservation, where would you go to find that information?

	Unweighted	
	n	(%)
Internet searches	879	43.0
State agencies (DNR, IDALS)	476	20.7
City/Council/Local government (Chamber of Commerce/Co. Supervisors)	235	12.5
County extension service (ISU Extension/Ag. Specialists)	141	5.7
Local newspapers	129	6.1
Water company/Water bill/Inserts/Newsletter	120	6.0
County Conservation Boards/Conservation Directors	84	3.3
Local TV or radio broadcasts	62	3.4
Federal agencies (EPA, USGS, USDA)	41	1.9
Library	50	2
State/regional newspapers (Gazette, Register)	50	2.0
Natural Resources Conservation Service (NRCS)	44	1.6
Local nonprofit organizations (e.g., the local watershed organization)	40	1.6
Environmentally-focused orgs (e.g., Nature Conservancy, Sierra Club, etc.)	37	1.4
Neighbors and friends	25	1.1
Farm Bureau	11	0.4
National Newspaper (NYT, Washington Post)	8	0.4
Farm agencies/groups	5	0
Legislators/congressman	5	0
Universities	5	0
Scientists/Researchers	4	0.4
Social media outlets (FB, Twitter, Instagram, etc.)	2	0.1
Local seed/chemical/fertilizer dealers	0	0
Other	117	5.3
Don't know/Not sure	149	8
Not interested in water quality/Never seek info	36	1.7
Refused	2	0

51. There are many sources of information for improving water quality. How trustworthy do you think each of the following sources would be in providing information about improving water quality? Would you say not at all, not too, mostly or very trustworthy?

	Unweighted n	Not at All trustworthy (%)	Not too trustworthy (%)	Mostly trustworthy (%)	Very trustworthy (%)
Your water company	1,957	6.2	10.8	58.8	24.2
Your local government	2,023	9.2	17.7	59.1	14.0
State government agencies	2,015	8.1	19.4	58.6	13.9
Federal government agencies	2,019	15.0	21.3	51.7	12.0
Radio programs	1,843	16.7	33.7	43.5	6.1
Internet websites	1,706	19.8	36.1	40.1	3.9
Your doctor or other health care provider	1,991	12.3	17.7	47.4	22.5
Environmental groups or organizations	1,973	10.6	19.6	50.7	19.2
Scientists/Researchers	1,965	3.7	7.2	51.2	37.9
Farm/Commodity Groups	1,941	17.3	32.0	44.0	6.7
Local Farmers	1,982	15.6	31.6	45.4	7.4
Local conservation board or local watershed board	1,997	2.3	5.6	54.3	37.8

52. Do you currently live on or have property very near a lake or river in Iowa? That is, somewhere close enough that you could easily walk to the water or can see water from your property.

	Unweighted n	(%)
Yes	519	24.2
No	1,561	75.8

53. Please indicate the extent to which each of the following statements describes your feelings about having property on or near the lake or river. Please tell me if you strongly disagree, disagree, neither disagree nor agree, agree or strongly agree, with each of the following statements. Would you say ...[RANDOMIZE]

	Unweighted n	Strongly Disagree (%)	Disagree (%)	Neither disagree nor agree (%)	Agree (%)	Strongly Agree (%)
Everything about my lake/river property is a reflection of me.	509	5.2	36.0	26.4	24.0	8.4
My lake/river property says very little about who I am.	506	10.5	34.8	17.1	31.0	6.6
I feel that I can really be myself at my lake/river property.	509	3.5	10.9	14.2	54.1	17.3
My lake/river property reflects the type of person I am.	510	4.2	27.3	24.2	35.1	9.3
I feel relaxed when I'm at my lake/river property	514	0.8	8.1	7.6	62.2	21.4
I feel happiest when I'm at my lake/river property.	513	3.5	14.7	25.6	38.6	17.6
My lake/river property is my favorite place to be.	513	2.2	25.0	20.8	37.0	15.0
I really miss my lake/river property when I'm away from it for too long.	509	4.9	26.3	22.3	32.8	13.8
My lake/river property is the best place for doing the things that I enjoy most.	509	2.8	21.5	21.2	38.8	15.8
For doing the things that I enjoy most, no other place can compare to my lake/river property	513	4.6	29.7	24.2	29.2	12.2
My lake/river property is not a good place to do the things I most like to do	515	14.2	50.1	16..5	15.7	3.5
As far as I am concerned, there are better places to be than at my lake/river property.	510	11.1	33.8	20.6	25.8	8.7

54. For the next set of questions, you may answer yes or no. In the past year, have you...
[RANDOMIZE]

		Unweighted	
		n	(%)
		<hr/>	
a.	Contributed time or money to an environmental or wildlife conservation group?		
	Yes	814	34.7
	No	1,257	65.3
b.	Started buying a product because you think it protects the environment?		
	Yes	1,040	47.3
	No	1,014	52.7
c.	Contacted a government agency to get information about the environment?		
	Yes	274	10.8
	No	1,803	89.2
d.	Watched a television special on the environment?		
	Yes	1,214	57.8
	No	844	42.2
e.	Voted for or against a political candidate because of his or her position on the environment?		
	Yes	646	28.7
	No	1,401	71.3
f.	Taken leftover paints, cleaners or other toxic chemicals to a hazardous waste drop-off?		
	Yes	1,158	53.3
	No	906	46.7

55. Have you participated in any of the following activities in the past TWO years?
[RANDOMIZE]

		Unweighted n	(%)
a. Volunteer water quality monitoring	Yes	104	4.3
	No	1,975	95.7
b. Lake, river, creek or watershed protection groups	Yes	175	7.0
	No	1,902	93.0
c. County, municipal, township, or tribal commission meetings?	Yes	234	9.3
	No	1,845	90.7
d. Participated in a lake, river, or creek clean-up day	Yes	365	16.0
	No	1,713	84.0

57a. If someone were going to invite you to participate in a local effort to improve water quality, how would you MOST prefer getting that information? Would it be through a...

	Unweighted n	(%)
Mail (USPS)/Letter	813	40.3
Email contact	357	17.5
Social media information like Facebook, Twitter, or Instagram	216	11.8
Community event	203	8.7
Town meeting	163	8.0
Phone call	162	7.5
Personal visit at your home	84	4.5
Newspaper	14	0.2
News/Media	5	0.1
TV/Radio	4	0.2
Friend/family/acquaintance	2	0.0
Internet	1	0.0
Text	0	0.0
Other	42	1.7

57b. What would be your NEXT preferred method?

	Unweighted n	(%)
Email contact	424	21.9
Mail (USPS)/Letter	390	18.8
Phone call	298	17.0
Social media information like Facebook, Twitter, or Instagram	299	15.3
Town meeting	201	9.7
Community event	190	9.9
Personal visit at your home	95	4.5
Newspaper	21	0.9
Radio	14	0.8
Media	8	0.2
Internet	4	0.1
Text	4	0.2
Friend/family/acquaintance	3	0.1
Other	69	2.9

DEMOGRAPHICS

D1. Now I have just a few background questions and we'll be finished. And you are...

	Unweighted n	(%)
Male	1,137	56.8
Female	943	43.2

D2. What is your current age?

	Unweighted n	(%)
18 to 24	164	12.1
25 to 34	277	17.4
35 to 44	293	16.5
45 to 54	362	17.4
55 to 64	476	18.4
65 to 95	508	18.3

D3. What is the highest level of education you have completed?

	Unweighted n	(%)
Less than high school graduate	68	8.5
Grade 12 or GED (high school graduate)	551	33.9
One or more years of college but no degree	370	17.0
Associate's or other 2-year degree	336	16.3
College graduate with a 4-year degree such as a BA or BS	501	16.6
Graduate degree completed (MA, MS, MFA, MBA, MD, PhD, EdD, etc.)	252	7.7

Education (3 categories)	Unweighted n	%
High school graduate or less	619	42.4%
Associate's degree or some college	708	33.4%
College graduate with 4 year degree or higher	753	24.2%

D4. Which of the following best describes where you live? Do you live...

	Unweighted n	(%)
On a farm	241	7.8
In a rural setting, not on a farm	244	8.7
In a rural subdivision outside of city limits	121	3.7
In a small town of less than 5,000 people	482	21.4
In a larger town of 5,000 to less than 25,000 people	348	19.1
In a city of 25,000 to less than 150,000 people	418	32.7
In a larger city of 150,000 or more people	187	6.6

Urban/Rural (3 categories)	Unweighted	
	n	%
Rural	614	19.9%
Town <25,000 people	847	40.7%
City >25,000 people	619	39.4%

D5. Are you currently...

	Unweighted n	(%)
Employed for wages	1,101	54.9
Self-employed	257	10.4
Out of work for more than 1 year	21	1.3
Out of work for less than 1 year	43	2.5
A Homemaker	49	3.7
A Student	69	5.4
Retired	456	17.7
Unable to work	81	4.2

D6. What is your annual gross household income from all sources before taxes? Is it...

	Unweighted n	(%)
Less than \$15,000	149	7.7
\$15,000 to less than \$24,999	170	7.1
\$25,000 to less than \$34,999	223	8.7
\$35,000 to less than \$49,999	293	14.0
\$50,000 to less than \$74,999	459	22.0
\$75,000 to less than \$99,999	315	13.3
\$100,000 to less than \$149,999	293	17.8
\$150,000 or more	178	9.4

D7. Can you tell me if your annual gross household income is less than, equal to, or greater than \$50,000?

**Asked only if respondent refused to answer D6.*

	Unweighted n	(%)
Less than \$50,000	52	41.4
Equal to \$50,000	15	17.6
Greater than \$50,000	66	41.0

D8. Are you of Hispanic, Latino, or Spanish origin?

	Unweighted n	(%)
Yes	84	8.0
No	1,982	92.0

9. Which one or more of the following would you say is your race?

	Unweighted n	(%)
White	1953	90.0
Black or African American	37	3.0
Asian	19	1
Native Hawaiian or Other Pacific Islander	4	0.0
American Indian, Alaska Native	27	2.0
Other	44	4.0
Don't know/Not sure	2	2.0
Refused	26	1.0

D10. Which one of these groups would you say BEST represents your race?

**Asked only if respondent identified more than one race in D9.*

	Unweighted n	(%)
White	20	61.1
Black or African American	1	6.5
Native Hawaiian or Other Pacific Islander	4	6.2
American Indian, Alaska Native	1	17.1
Other	1	9.0

Appendix C – Weighting Methodology Report



WEIGHTING METHODOLOGY REPORT

IOWA WATER QUALITY—

DUAL FRAME STUDY

Prepared by Trent D. Buskirk, July 7, 2015

Design Overview:

A survey of adults 18 and over was drawn for the entire state of Iowa. In order to maximize coverage of adults in the state a dual frame design was used that included both cellular and landline telephone numbers within the state of Iowa. In total, 3,453,200 landline and 4,253,000 cellular telephone numbers served as the basis of the respective sampling frames. A total of 13,334 landline numbers were randomly selected from the landline frame and a total of 23,333 cellular numbers were randomly selected from the cell phone frame. The survey secured a total of 2,080 interviews with adults (1,696 of which were obtained from the cell phone frame while the remaining 384 were obtained from the landline frame).

Weighting:

Virtually, all survey data are weighted before they can be used to produce reliable estimates of population parameters. While reflecting the selection probabilities of sampled units, weighting also attempts to compensate for practical limitations of a sample survey, such as differential nonresponse and undercoverage. The weighting process for this survey entailed two major steps. The first step consisted of computation of the *design weights* to reflect selection probabilities of households. In the second step, design weights were calibrated so that the resulting final weights would aggregate to reported totals for the target population with respect to specific geodemographic characteristics.

The computation of the design weights consisted of two steps: computation of the base weight and adjustment for multiplicity/selection of an adult within the household. The base weight was computed separately for each frame for landline and cell phone only adults. For those adults who were dual users, a base weight that reflected possibilities of being included in the sample from either of the two frames was computed as described in Buskirk and Best (2012)

(www.amstat.org/sections/srms/proceedings/y2012/files/304351_72969.pdf). The multiplicity adjustment for within household selection of one adult was capped at 3 for those households that had more than 3 adults based on an examination of the underlying distribution of household sizes for those respondents reached in the landline frame. No within-household selection was undertaken for numbers dialed from the cell phone frame so the respective weighting computations for the cell frame did not include any such multiplicity adjustment.

For the calibration step, weights were adjusted using an iterative proportional fitting method called raking, whereby design weights were simultaneously adjusted along several dimensions using the *WgtAdjust* procedure of SUDAAN (www.rti.org/sudaan). This calibration procedure ensures that all weighted frequency counts along any of the raking dimensions match their corresponding population totals obtained from external sources (<http://www2.sas.com/proceedings/sugi29/207-29.pdf>). In order for the calibration to be successful, each sampled unit must not have missing values on the variables used as part of the raking procedure. To this end, we imputed missing values on the specific variables using a weighted sequential hot deck procedure in SUDAAN. This process ensures that the overall weighted distributions of the imputed data match those of the original data. The missing values were imputed based on classes determined by combinations of phone status (e.g. landline only, cell only or

dual user) and gender in part due to the potential for these variables to be related to the outcomes of interest as well as to the item-level missingness. These two variables were also chosen based on their overall level of completeness with no missing cases for gender and phone status having relatively few missing values. A final weight adjustment step was undertaken to trim extreme weights to an upper bound of 4,000 and a lower bound of 200 (which represent the 97.5th and 2.5th percentiles of the weight distribution, respectively) The trimmed weights were recalibrated so that no final weight exceeded six times the interquartile range of the final weights (Battaglia et al., 2009).

The base sampling weights were specifically calibrated to external control totals for 6 main dimensions: the interaction of age-group by sex (see Table 1 below) and race/ethnicity (Table 2), education (Table 3), income (Table 4), place of residence (Table 5) and cell phone only status (Table 6). The population totals used for calibrating the sampling weights were obtained from the March 2014 Current Population Survey (CPS). However, CPS does not report on farm units. To obtain estimates of the Iowa population residing in various places of residence we made use of data from 2009-2013 5-Year American Community Survey (ACS) Public Use Microdata Samples (PUMS). According to the ACS a farm unit is defined as having 10 or more acres of land and generating \$1,000 or more in annual agricultural sales. After identifying the 18+ population living on farm units, 5-Year ACS Public Use Microdata Sample (PUMS) data was used to derive population counts falling within the categories specified by the *place of residence* question (see Table 5 below). Areas with 5,000 or less people were grouped into the Farm or Non-Farm Rural Area category. These relative distribution of adults 18+ residing in each of these place of residence categories derived from the ACS PUMS data were then applied to the population estimate from CPS to obtain the final population counts that are displayed in the right side of Table 5. The Cell Phone Only population totals were obtained by applying MSG IA State-Level CPO estimates to the total population estimates derived from the CPS.

Table 1. Respondent and population counts by Gender and Age for the 1st raking dimension

Age	Males				Females			
	Respondents		Population		Respondents		Population	
18-24	91	8.0%	157,734	13.6%	73	7.7%	126,245	10.6%
25-34	159	14.0%	194,475	16.8%	118	12.5%	214,140	18.0%
35-44	155	13.6%	201,563	17.4%	138	14.6%	185,917	15.6%
45-54	197	17.3%	203,266	17.6%	165	17.5%	204,633	17.2%
55-64	269	23.7%	221,086	19.1%	207	22.0%	211,852	17.8%
65+	266	23.4%	179,605	15.5%	242	25.7%	249,782	20.9%
Total	1,137	100.0%	1,157,729	100.0%	943	100.0%	1,192,569	100.0%

Table 2. Respondent and population counts by Race/Ethnicity for the 2nd raking dimension

Race	Respondents		Population	
Non-Hispanic White	1,928	92.7%	2,046,540	87.1%
Non-Hispanic Other	67	3.2%	116,341	5.0%
Hispanic	85	4.1%	187,417	8.0%
Total	2,080	100.0%	2,350,298	100.0%

Table 3. Respondent and population counts by Education for the 3rd raking dimension

Education	Respondents		Population	
Less than high school	67	3.2%	199,960	8.5%
High school or GED	552	26.5%	797,004	33.9%
Some college / Associates	707	34.0%	784,458	33.4%
College graduate	501	24.1%	387,814	16.5%
Post graduate	253	12.2%	181,062	7.7%
Total	2,080	100.0%	2,350,298	100.0%

Table 4. Respondent and population counts by Income for the 4th raking dimension

Household Income	Respondents		Population	
Under \$15,000	146	7.0%	180,249	7.7%
\$15,000 up to \$25,000	175	8.4%	167,937	7.1%
\$25,000 up to \$35,000	213	10.2%	203,781	8.7%
\$35,000 up to \$50,000	291	14.0%	329,410	14.0%
\$50,000 up to \$75,000	468	22.5%	517,724	22.0%
\$75,000 up to \$100,000	321	15.4%	313,483	13.3%
\$100,000 up to \$150,000	291	14.0%	417,874	17.8%
\$150,000 or more	175	8.4%	219,840	9.4%
Total	2,080	100.0%	2,350,298	100.0%

Table 5. Respondent and population counts by Place of Residence for the 5th raking dimension

Place of Residence	Respondents		Population	
Farm or Non-Farm Rural Area	617	29.7%	468,355	19.9%
Small Town (<5,000)	495	23.8%	514,388	21.9%
Large Town (5,000 - 25,000)	355	17.1%	441,293	18.8%
Small City (25,000 - 150,000)	424	20.4%	771,204	32.8%
Large City (>150,000)	189	9.1%	155,058	6.6%
Total	2,080	100.0%	2,350,298	100.0%

Table 6. Respondent and population counts by Telephone Status for the 6th raking dimension

Telephone Status	Respondents		Population	
Not Cell-Phone Only	1,142	54.9%	1,542,971	65.7%
Cell-Phone Only	938	45.1%	807,327	34.4%
Total	2,080	100.0%	2,350,298	100.0%

Variance Estimation for Weighted Data:

Survey estimates can only be interpreted properly in light of their associated sampling errors. Since weighting often increases variances of estimates, use of standard variance calculation formulae with weighted data can result in misleading statistical inferences. With weighted data, two general approaches for variance estimation can be distinguished. One method is *Taylor Series Linearization* and the second is *Replication*. There are several statistical software packages that can be used to produce design-proper estimates of variances, including SAS, SUDAAN, SPSS, and Stata.

An Approximation Method for Variance Estimation can be used to avoid the need for special software packages. Researchers who do not have access to such tools for design-proper estimation of standard errors can approximate the resulting variance inflation due to weighting and incorporate that in subsequent calculations of confidence intervals and tests of significance. With w_i representing the final weight of the i^{th} respondent, the inflation due to weighting, which is commonly referred to as *Unequal Weighting Effect (UWE)*, can be approximated by:

$$\delta = 1 + \frac{\sum_{i=1}^n \frac{(w_i - \bar{w})^2}{n-1}}{\bar{w}^2}$$

For calculation of a confidence interval for an estimated percentage, \hat{p} , one can obtain the conventional variance of the given percentage and multiply it by the approximated design effect, δ , and use the resulting quantity as adjusted variance. As such, the adjusted standard deviation for the percentage in question would be given by:

$$S(\hat{p}) \approx \sqrt{\frac{\hat{p}(1-\hat{p})}{n-1} \left(\frac{N-n}{N}\right) \times \delta}$$

Subsequently, the $(100-\alpha)$ percent confidence interval for P would be given by:

$$\hat{p} - z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n-1} \left(\frac{N-n}{N}\right) \times \delta} \leq P \leq \hat{p} + z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n-1} \left(\frac{N-n}{N}\right) \times \delta}$$

Summary Information for the Weighted Data:

An overall histogram illustrating the design weights computed from the first step as well as the final, calibrated weights from the second are shown in Figures 1 and 2, respectively. Based on the UWE equation in the previous sample, the value computed for this study based on the final weights is: 1.844. The UWE for the first stage weight (without calibration to population totals) is 1.192. The increase in the UWE is expected as the calibration process potentially decreases coverage/nonresponse bias at the expense of increases in the variability of the sampling weights. However, in this case the increase is rather small. The UWE of 1.844 can be used in the computation of confidence intervals for estimates derived using the final sampling weights as described in the previous section.

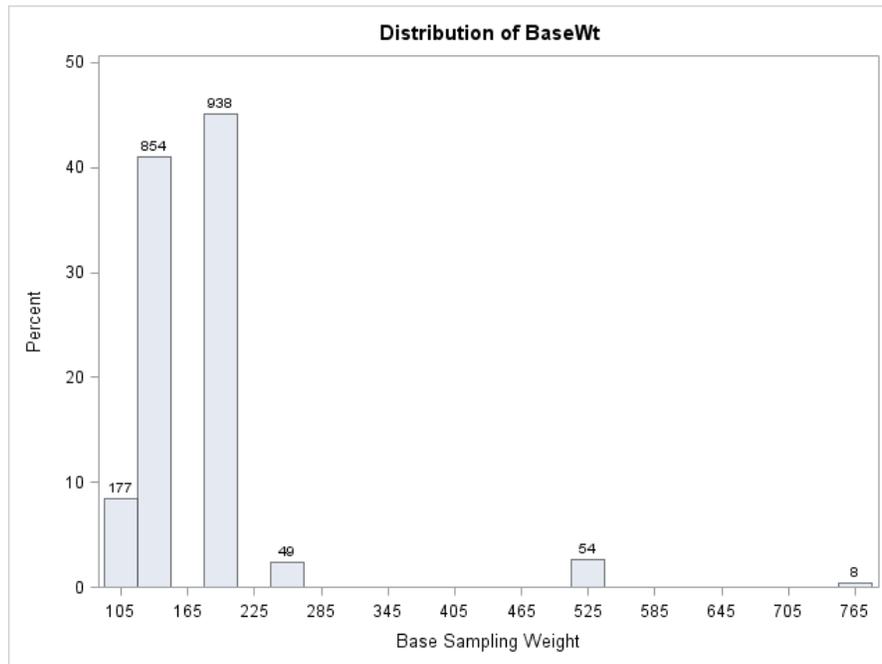


Figure 1. Distribution of the Base Design Weights computed from Step 1 of the overall weight computation (including base weight-probability of selection as well as multiplicity for within household selection of one adult)

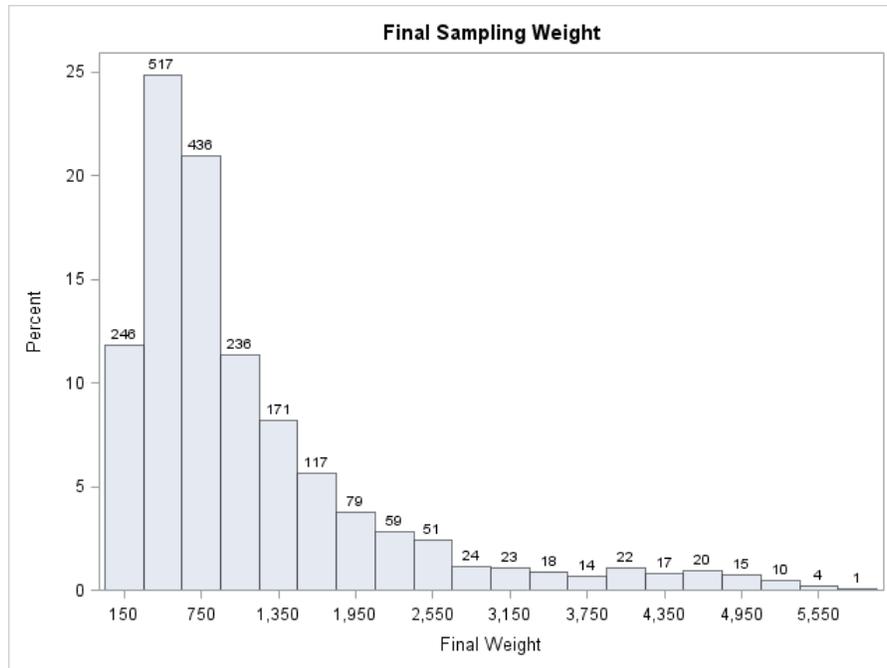


Figure 2. Distribution of the final calibrated sampling weights. These weights should be used in all analyses

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Appendix D – Logistic Regression Results

Response variable: Composite score of attitudes toward water quality scale, categorized as low (<3.334) and high (>3.335).

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		0.455	0.152	8.916	1	0.003	1.577	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	0.451	0.103	19.131	1	0.000	1.571	1.283	1.923
Age Group of Respondent	18-34 years old	-0.432	0.141	9.429	1	0.002	0.649	0.493	0.855
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	-0.272	0.119	5.261	1	0.022	0.761	0.603	0.961
Annual Gross Income of Respondents Household	Less than \$50K	0.208	0.142	2.126	1	0.145	1.231	0.931	1.627
	\$50K to less than \$100K	0.176	0.134	1.738	1	0.187	1.193	0.918	1.550
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	-0.155	0.133	1.369	1	0.242	0.856	0.660	1.111
	Some College	-0.025	0.126	0.041	1	0.840	0.975	0.762	1.247
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	0.526	0.107	24.371	1	0.000	1.692	1.373	2.085

¹Indicates reference category for logistic regression.

Model: Chi-square = 61.744, df = 8, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Response variable: Composite score of attitudes toward water quality scale, categorized as low (<3.334) and high (>3.335).

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		0.128	0.202	0.400	1	0.527	1.136	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	0.585	0.109	29.104	1	0.000	1.796	1.452	2.221
Age Group of Respondent	18-34 years old	-0.455	0.144	10.024	1	0.002	0.635	0.479	0.841
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	-0.226	0.124	3.314	1	0.069	0.798	0.626	1.017
Annual Gross Income of Respondents Household	Less than \$50K	0.293	0.148	3.930	1	0.047	1.340	1.003	1.790
	\$50K to less than \$100K	0.212	0.136	2.432	1	0.119	1.237	0.947	1.615
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	-0.149	0.136	1.203	1	0.273	0.862	0.661	1.124
	Some College	-0.060	0.128	0.224	1	0.636	0.941	0.733	1.209
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	0.616	0.110	31.047	1	0.000	1.851	1.490	2.298
Self-reported knowledge of water quality issues	Low	-0.271	0.146	3.424	1	0.064	0.763	0.573	1.016
	Neither low nor high	-0.040	0.126	0.100	1	0.752	0.961	0.751	1.229
	High ¹	--	--	--	--	--	--	--	--
Own property near water	No ¹	--	--	--	--	--	--	--	--
	Yes	0.208	0.121	2.940	1	0.086	1.231	0.971	1.562
Fishing	No ¹	--	--	--	--	--	--	--	--
	Yes	0.297	0.113	6.838	1	0.009	1.345	1.077	1.680
Swimming	No ¹	--	--	--	--	--	--	--	--
	Yes	0.113	0.122	0.867	1	0.352	1.120	0.882	1.421
Boating	No ¹	--	--	--	--	--	--	--	--
	Yes	0.010	0.119	0.006	1	0.936	1.010	0.800	1.275

¹Indicates reference category for logistic regression.

Model: Chi-square = 85.137, df = 14, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Response variable: Poor quality drinking water with two response options “not a problem/a small problem” and “moderate/very big problem”.

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		-1.041	0.147	50.457	1	0.000	0.353	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	-0.005	0.097	0.003	1	0.959	0.995	0.823	1.203
Age Group of Respondent	18-34 years old	-0.688	0.133	26.742	1	0.000	0.503	0.387	0.652
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	-0.070	0.108	0.418	1	0.518	0.932	0.754	1.153
Annual Gross Income of Respondents Household	Less than \$50K	0.373	0.139	7.180	1	0.007	1.452	1.105	1.908
	\$50K to less than \$100K	0.018	0.133	0.018	1	0.894	1.018	0.784	1.322
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	0.115	0.128	0.805	1	0.370	1.122	0.873	1.441
	Some College	0.083	0.120	0.478	1	0.489	1.087	0.858	1.376
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	0.344	0.108	10.115	1	0.001	1.411	1.141	1.745

¹Indicates reference category for logistic regression.

Model: Chi-square = 55.138, df = 8, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Response variable: Poor quality drinking water with two response options “not a problem/a small problem” and “moderate/very big problem”.

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		-0.672	0.181	13.803	1	0.000	0.511	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	0.111	0.101	1.190	1	0.275	1.117	0.916	1.363
Age Group of Respondent	18-34 years old	-0.612	0.146	17.610	1	0.000	0.542	0.408	0.722
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	0.050	0.113	0.193	1	0.660	1.051	0.842	1.312
Annual Gross Income of Respondents Household	Less than \$50K	0.403	0.143	7.899	1	0.005	1.496	1.130	1.982
	\$50K to less than \$100K	0.042	0.135	0.098	1	0.754	1.043	0.801	1.359
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	0.134	0.130	1.063	1	0.302	1.144	0.886	1.476
	Some College	0.079	0.122	0.417	1	0.518	1.082	0.852	1.373
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	-0.418	0.111	14.139	1	0.000	0.658	0.529	0.819
Self-reported knowledge of water quality issues	Low	-0.371	0.139	7.097	1	0.008	0.690	0.525	0.907
	Neither low nor high	-0.279	0.118	5.621	1	0.018	0.756	0.600	0.953
	High ¹	--	--	--	--	--	--	--	--
Own property near water	No ¹	--	--	--	--	--	--	--	--
	Yes	0.129	0.114	1.290	1	0.256	1.138	0.911	1.421
Fishing	No ¹	--	--	--	--	--	--	--	--
	Yes	0.147	0.108	1.839	1	0.175	1.158	0.937	1.432
Swimming	No ¹	--	--	--	--	--	--	--	--
	Yes	-0.063	0.115	0.298	1	0.585	0.939	0.750	1.176
Boating	No ¹	--	--	--	--	--	--	--	--
	Yes	-0.005	0.113	0.002	1	0.967	0.995	0.798	1.242

¹Indicates reference category for logistic regression.

Model: Chi-square = 69.614, df = 14, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Response variable: Poor quality water in lakes, rivers, & creeks with two response options “not a problem/a small problem” and “moderate/very big problem”.

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		0.220	0.135	2.664	1	0.103	1.246	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	0.246	0.092	7.149	1	0.007	1.279	1.068	1.531
Age Group of Respondent	18-34 years old	-0.676	0.119	32.450	1	0.000	0.509	0.403	0.642
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	-0.306	0.105	8.548	1	0.003	0.736	0.600	0.904
Annual Gross Income of Respondents Household	Less than \$50K	0.113	0.131	0.743	1	0.389	1.120	0.866	1.447
	\$50K to less than \$100K	-0.244	0.123	3.945	1	0.047	0.784	0.616	0.997
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	-0.206	0.121	2.911	1	0.088	0.814	0.642	1.031
	Some College	-0.118	0.113	1.090	1	0.296	0.889	0.712	1.109
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	0.343	0.100	11.897	1	0.001	1.410	1.160	1.713

¹Indicates reference category for logistic regression.

Model: Chi-square = 67.765, df = 8, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Response variable: Poor quality water in lakes, rivers, & creeks with two response options “not a problem/a small problem” and “moderate/very big problem”.

Independent Variables and Effects		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
Intercept		0.426	0.172	6.159	1	0.013	1.531	--	--
Gender of Respondent	Male ¹	--	--	--	--	--	--	--	--
	Female	0.347	0.096	12.930	1	0.000	1.415	1.171	1.709
Age Group of Respondent	18-34 years old	-0.348	0.130	7.169	1	0.007	0.706	0.548	0.911
	35-54 years old ¹	--	--	--	--	--	--	--	--
	55+ years old	0.273	0.109	6.196	1	0.013	1.313	1.060	1.628
Annual Gross Income of Respondents Household	Less than \$50K	0.160	0.135	1.395	1	0.238	1.173	0.900	1.529
	\$50K to less than \$100K	-0.207	0.124	2.770	1	0.096	0.813	0.637	1.037
	\$100K or more ¹	--	--	--	--	--	--	--	--
Final Classification of Education	High School or less	-0.154	0.123	1.557	1	0.212	0.858	0.674	1.092
	Some College	-0.102	0.115	0.795	1	0.373	0.903	0.721	1.130
	BA or More ¹	--	--	--	--	--	--	--	--
Rural residence	Rural ¹	--	--	--	--	--	--	--	--
	Non-rural	-0.415	0.102	16.451	1	0.000	0.660	0.540	0.807
Self-reported knowledge of water quality issues	Low	-0.487	0.133	13.406	1	0.000	0.614	0.473	0.797
	Neither low nor high	-0.310	0.114	7.399	1	0.007	0.733	0.586	0.917
	High ¹	--	--	--	--	--	--	--	--
Own property near water	No ¹	--	--	--	--	--	--	--	--
	Yes	0.087	0.108	0.652	1	0.420	1.091	0.883	1.349
Fishing	No ¹	--	--	--	--	--	--	--	--
	Yes	-0.017	0.102	0.026	1	0.872	0.984	0.805	1.202
Swimming	No ¹	--	--	--	--	--	--	--	--
	Yes	-0.019	0.109	0.030	1	0.864	0.982	0.793	1.214
Boating	No ¹	--	--	--	--	--	--	--	--
	Yes	0.063	0.107	0.342	1	0.559	1.065	0.863	1.314

¹Indicates reference category for logistic regression.

Model: Chi-square = 85.137, df = 14, p<0.001.

State wide survey of public perceptions of water quality in Iowa, 2015, CSBR, Iowa adults (18+)

Appendix E – Factor Analysis – Attitudes toward water quality scale.

		Pattern Matrix ^a		
Q17. For each one, please answer on a scale of 1 to 5, where 1 means strongly disagree and 5 means strongly agree.		Component		
		1	2	3
Component 1 Cronbach's Alpha = 0.789	Runoff from agricultural crop production is a threat to my drinking water.	0.881	-0.084	-0.073
	I am concerned about chemicals in my drinking water.	0.787	0.020	-0.198
	Water runoff from livestock operations is a problem in Iowa.	0.723	0.062	-0.016
	Not enough attention is given to protect water quality in Iowa.	0.579	0.116	0.110
	We need to increase regulations for landowners to protect soil and water.	0.557	0.116	0.194
	Water contamination from runoff over paved areas is a problem.	0.434	0.241	-0.145
Component 2 Cronbach's Alpha = 0.606	Clean water is needed for strong economic growth in Iowa.	0.069	0.677	0.066
	We need to increase incentives for farmers to protect soil and water.	0.100	0.575	-0.050
	I am willing to change some daily behaviors to improve water quality in my area.	0.171	0.548	0.144
	I know what steps I should take to prevent contamination of lakes, rivers and creeks in Iowa.	-0.090	0.524	-0.115
	We need to improve lakes, rivers, and creeks for tourism/recreation.	0.185	0.514	0.138
Component 3 Cronbach's Alpha = 0.606	Tough water protection laws hurt economic development. ¹	-0.270	0.081	0.806
	Water pollution laws are too tough in Iowa. ¹	-0.084	0.139	0.745
	Efforts to keep water clean should be voluntary rather than mandated by the government. ¹	0.086	-0.091	0.641
	Farmers take undue blame for environmental problems. ¹	0.354	-0.452	0.467

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

¹Item reverse coded for scale reliability.