



## *Water Issues in Texas:*

*A Survey of Public Perceptions  
and Attitudes about Water*



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# Water Issues in Texas: A Survey of Public Perceptions and Attitudes about Water

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# Water Issues in Texas: A Survey of Public Perceptions and Attitudes about Water

## EXECUTIVE SUMMARY

The Texas AgriLife Extension Service facilitated a random sample survey of Texas residents to evaluate their awareness of, attitudes about and willingness to act on water issues. The results of this survey will be useful to citizens, local governments, state agencies and policy makers in planning for the future.

### *Beliefs about Water Quality*

- Survey respondents consider clean drinking water (94 percent), clean groundwater (76 percent), and clean rivers and lakes (70 percent) very important.
- Respondents have greater confidence in the quality of their groundwater (32 percent believe it is good or excellent, or good and improving) than they do in the quality of their surface waters (23 percent believe surface waters are good or excellent, or good and improving); even fewer (11 percent) believe marine water quality is good, excellent, or good and improving.

### *Conditions Perceived to Affect Local Water Quality*

- Industry (45 percent), stormwater runoff (31 percent) and new suburban development (28 percent) are viewed as most responsible for pollution problems in rivers and lakes.
- About one-third of respondents suspect pesticides and fertilizers affect water quality in their area.

### *Protecting Local Waters*

- Few respondents (2 to 9 percent) believe that governmental entities or individual citizens are fulfilling their responsibilities for protecting water resources very well, although most reported not knowing for certain (23 to 43 percent).

### *Water Quantity*

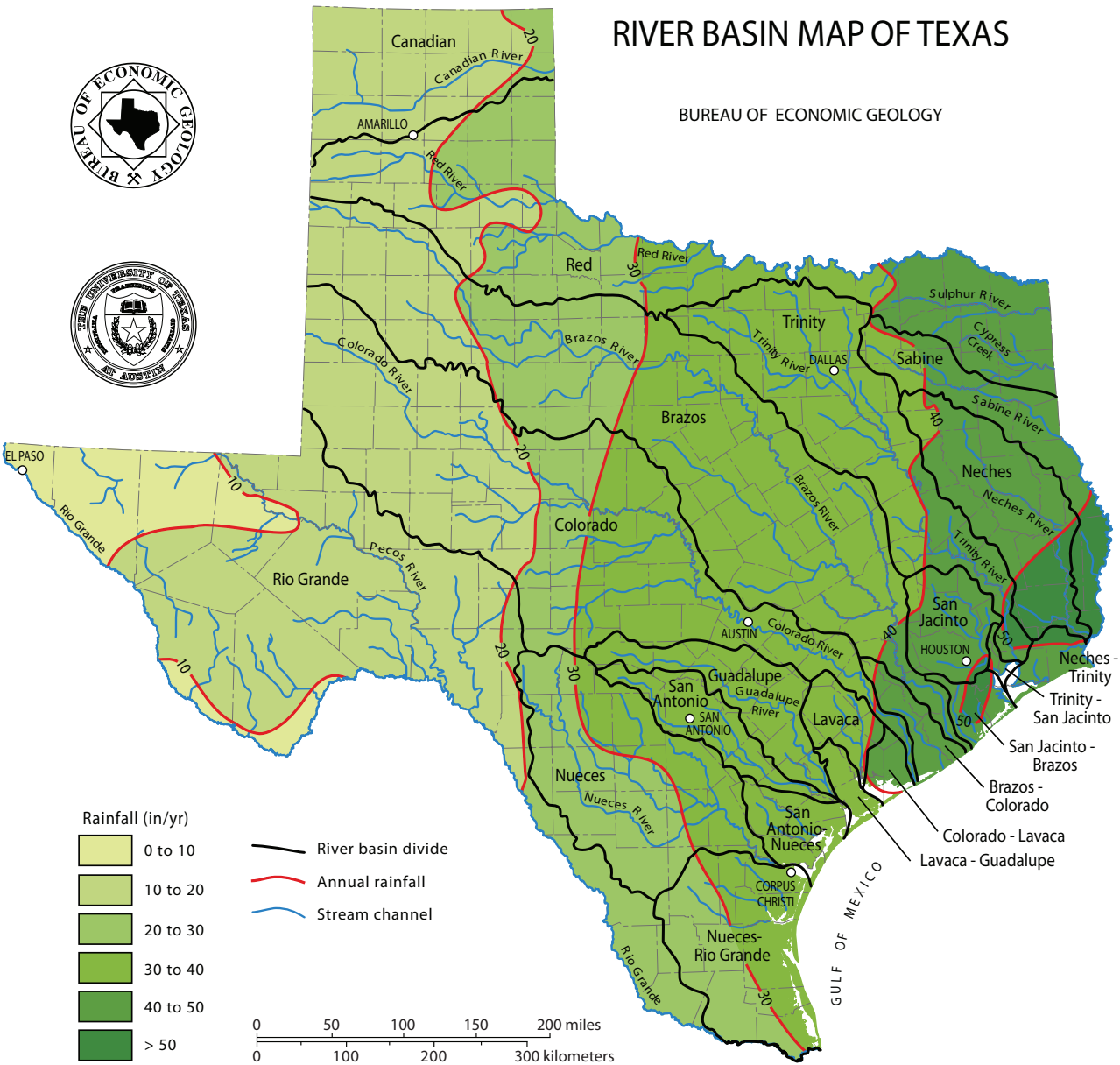
- About half of respondents (and 62 percent of those involved with farming/ranching) believe that water quantity is an issue in their areas, and only 20 percent believe there will probably be an adequate water supply to meet demands in 10 years.

### *Learning about Water Issues*

- Respondents are most likely to receive water quality information from newspapers (42 percent), environmental agencies (40 percent) and television (38 percent). Farmers and ranchers (40 percent) are especially likely to obtain water quality information from the Texas AgriLife Extension Service.
- Most respondents would like to learn more about protecting public drinking water supplies (50 percent), water management in home and garden landscapes (34 percent), and fish and wildlife water needs (28 percent). Residents of farms and those living outside of city limits and not farming also are greatly interested in private wells (56 and 32 percent) and septic system management (44 and 32 percent).
- Respondents are most likely to obtain water resource information by viewing television (45 percent); reading fact sheets, bulletins or brochures (45 percent); or visiting websites (44 percent).

# RIVER BASIN MAP OF TEXAS

BUREAU OF ECONOMIC GEOLOGY



River basins	Texas length (miles)	Texas area (sq mi)	Number of major reservoirs*	Conservation storage (acre ft)*	Storage (acre ft/sq mi)
Brazos	840	42,800	19	3,322,880	75
Canadian	200	12,700	2	560,900	44
Colorado	600	39,893	11	3,803,900	95
Guadalupe	250	6,070	2	420,000	70
Lavaca	74	2,309	1	157,900	68
Neches	416	10,011	4	3,455,500	345
Nueces	315	16,950	2	931,640	60
Red	680	30,823	7	4,593,460	149
Rio Grande	1,250	48,259	3	3,772,000	78
Sabine	360	7,426	2	6,041,300	814
San Jacinto	70	5,600	2	570,400	102
Trinity	550	17,696	14	6,969,710	388

\*Data from Texas Water Development Board.

MAP 1. River basin map of Texas.

## INTRODUCTION

The goal of the Southern Region Water Resource Project, funded by the USDA National Institute for Food and Agriculture (NIFA), is to build institutional partnerships and to help citizens, landowners, agencies and community leaders better address water resource concerns. As part of that regional project, Texas citizens were surveyed about their perceptions and attitudes related to water resources.

Educators, technicians, scientists and policy makers must understand the viewpoints of citizens if they wish to engage them in discussions and decisions about water. It is these attitudes, in combination with social connections and social pressures, that motivate citizen action to protect land and water resources.

The survey was mailed to 1,275 randomly selected Texas residents in fall 2008; 419 surveys were returned (32.9 percent). The survey was developed and conducted in collaboration with Robert Mahler, Professor of Soil and Environmental Sciences at the University of Idaho, as part of a USDA national project. Findings were analyzed and prepared by the Texas AgriLife Extension Service and the University of Idaho (see Appendix A for details on survey methodology).

## DEMOGRAPHICS

Texas is home to more than 24 million people. The largest metropolitan area is Dallas-Fort Worth (population 6,300,006) located along the Trinity River. Other large metro areas are Houston (5,728,143) on Galveston Bay, San Antonio (2,031,445) on the San Antonio River, and the capital Austin (1,652,602) on the Colorado River. The median age in Texas, according to 2008 census estimates, is 34.4 years (Table 1). More than half the population is Caucasian. The minority population is growing, with 36.5 percent Hispanic and 11.9 percent Black/African American. Per capita income in 2007 was \$37,083.

The Texas landscape drains into a variety of bays before reaching the Gulf of Mexico. The state's rivers, underground aquifers, wetlands and lakes are a critical natural resource base that provides public and private water supplies, as well as recreation and natural beauty. The state's average annual rainfall varies widely from 8.8 inches in El Paso to 57.2 inches in Beaumont.

**Table 1. Texas demographic profile.**

Population (U.S. Census Bureau estimate 2008)	24,326,974
Median age	34.4 years
Race/ethnicity (U.S. Census Bureau estimate 2008)	
Percent White	82.4
Percent Black/African American	11.9
Percent American Indian	<1
Percent Asian	3.5
Percent Native Hawaiian/Pacific Islander	<1
Percent Hispanic/Latino*	36.5
Per capita income 2007	\$37,083
Percent land in farms/ranches	78
Pastureland percent of total farmland	66.9
Cropland percent of total farmland	25.8
Woodland, pond, house lot percent of total farmland	5.4
Agricultural sector output 2008 (crop, livestock and forestry) (\$1,000)	\$22,080,250

\*Hispanic origin is considered an ethnicity, not a race. Hispanics may be of any race.

Texas' soils, topography and climate are well suited to agricultural production. Texas is a top agricultural producer of cattle, cotton, poultry, greenhouse and nursery products, and dairy products. The agricultural land base contains more than 130 million acres of farmland (with a reported 247,500 farms in 2007), which represents 78 percent of the land in Texas. About 87 million acres are in pastureland. The market value of agricultural products exceeds \$22 billion.

In addition to agriculture, the most significant contributors to the Texas economy are mining (oil and gas), construction, manufacturing, finance and insurance.

## FINDINGS

### Respondent Characteristics

Nineteen percent of survey respondents were age 49 or younger. Three age groups responded about equally: 19.5 percent were 40 to 49, 18.9 percent were 50 to 59, and 21.9 percent were 60 to 69. About 24 percent of the respondents were 70 or older (Fig. 1). Only 10.4 percent of respondents were 30 to 39 years old and 5.2 percent were younger than 30. It should be noted that survey respondents are older on average than the population of Texas and so responses are more likely to reflect attitudes of older citizens rather than younger ones.



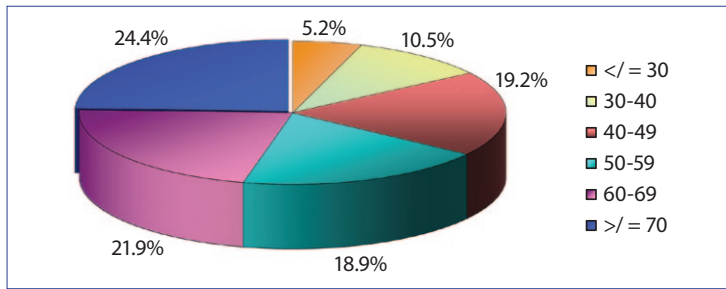


Figure 1. Age.

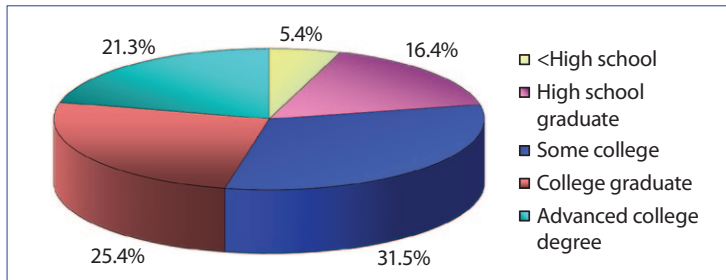


Figure 2. Education.

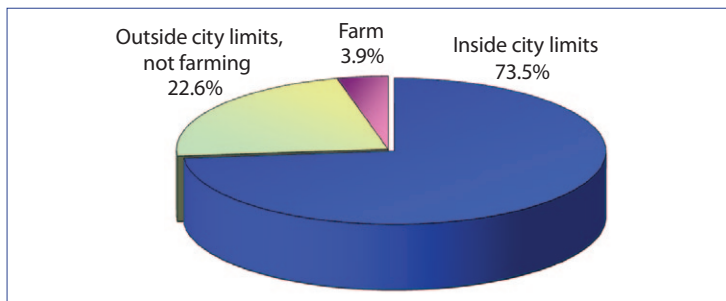


Figure 3. Where do you live?

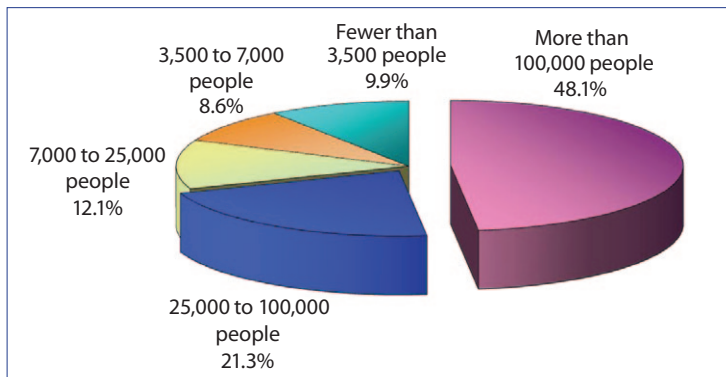


Figure 4. Community size.

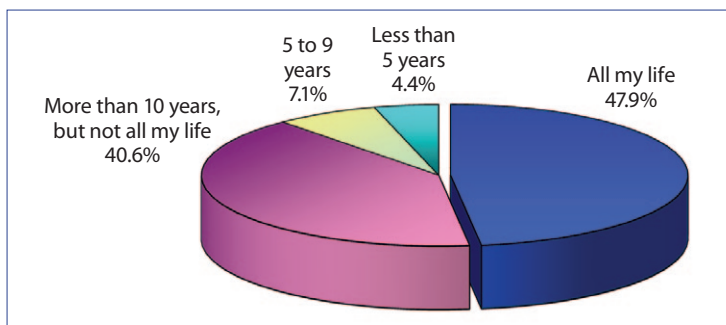


Figure 5. How long have you lived in your state?

More than 63 percent of the respondents are male. Almost 36 percent are female.

Respondents are well educated. Ninety-five percent completed high school and about 78 percent continued with post-secondary education (Fig. 2).

About 74 percent of respondents live inside a town or city limits (Fig. 3), while 26.5 percent live outside of city limits. Four percent of respondents are engaged in farming/ranching, while 22.6 percent of respondents live outside of city limits and are not engaged in farming/ranching. Forty-eight percent of those living inside city limits reside in communities with more than 100,000 people (Fig. 4), and another 21.3 percent live in communities of 25,000 to 100,000 people. More than 30 percent live in small communities with fewer than 25,000 people, and about 10 percent live in communities with fewer than 3,500 people.

A large group (48 percent) of respondents have lived in Texas all their lives (Fig. 5). Another large group (41 percent) have lived in Texas more than 10 years but not all their lives. About 4 percent moved to this state in the last 5 years. Long-term residency suggests many of the respondents have deep knowledge of their communities and regions.

## Perceptions of Water Issues

### Importance of Water Issues

Respondents were given a list of water issues and asked to rate each according to its importance. Figure 6 shows that all of them believe clean drinking water is very important (93.5 percent) or important (6.5 percent). More than 75 percent of respondents indicated that clean groundwater is very important and 21.7 percent think it is important. Most respondents rate clean rivers, lakes, beaches, marine water, bays and estuaries as very important (70.0 percent to 62.5 percent). About equal percentages of respondents consider water for agriculture, aquatic habitat and shellfishing very important (55.1 percent to 53.5 percent). More than 89

percent of respondents consider water for municipal water systems very important (46.1 percent) or important (43.1 percent). While about 48.7 percent of the respondents think water for commerce, industry and power are important, they are less likely to give those categories the highest value of very important (34.9 percent). Water for recreation is considered important by 43.9 percent of respondents; however, less than a

third considered water for recreation very important. Similarly, less than a third of respondents considered issues associated with hypoxia and inter/intra state transfers or sales of water rights as very important.

As illustrated in Figure 6, drinking water is highly valued by all respondents. More than 68 percent receive their water from a public rural water district or

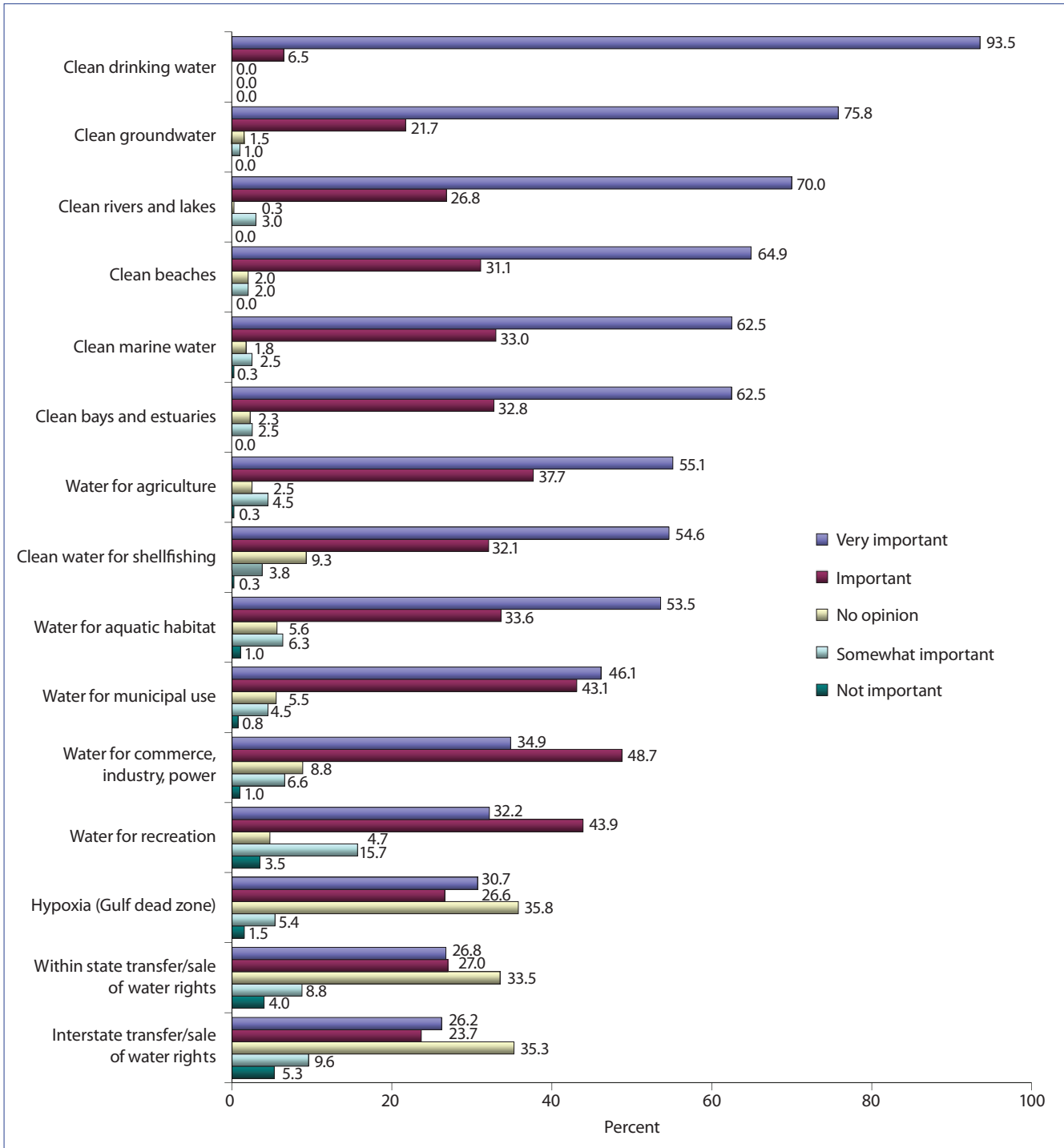


Figure 6. Importance of water issues.

public municipal water supply (Fig. 7). About 8 percent depend on private well systems. Surprisingly, more than 23 percent report using bottled water as their primary source of drinking water. The proportion of those drinking bottled water was about the same regardless of where they lived (23.4 percent within city limits, 23.9 percent outside of city limits and not farming, and 18.8 percent of those farming). Twenty-one percent of respondents who live outside city boundaries (Fig. 8) obtain their drinking water from private

wells, while 55.8 percent receive their drinking water from public municipal or public rural water district systems.

More than 80 percent of all respondents believe their home drinking water is safe to drink (Fig. 9). Fifty-six percent are satisfied with their drinking water, but 24 percent are not satisfied. This may be the same 23 percent who primarily drink bottled water. Figure 9 indicates that about 52 percent report often using bottled water for drinking. About half of the respondents have water filter or water treatment systems.

### Beliefs about Water Quality

A watershed is a region or area of land that drains into a body of water such as a stream, lake, wetland or river. Many respondents reported knowing what a watershed is (Fig. 10). Those living outside of city limits and involved in farming/ranching are most likely to know what a watershed is (93.3 percent); fewer of those living inside city boundaries report knowing what a watershed is (63.7 percent). Only half of those age 39 and younger reported knowing what a watershed is, compared to 71 percent of those 40 to 69 years old.

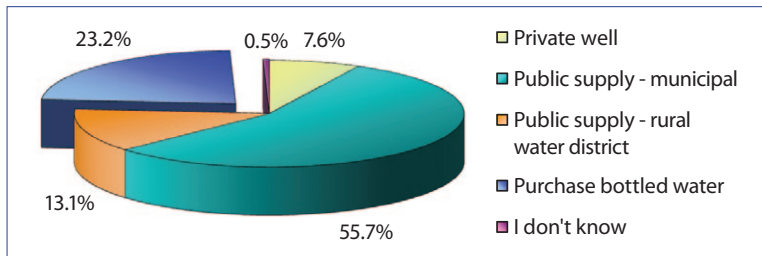


Figure 7. Where do you primarily get your drinking water?

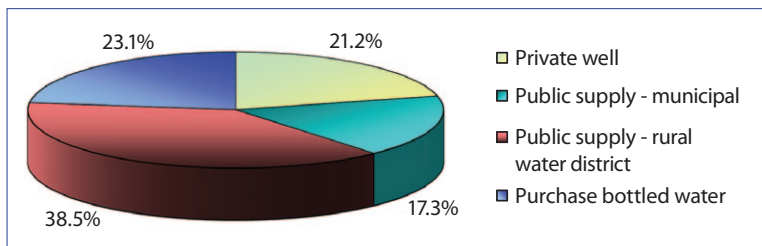


Figure 8. Where do you primarily get your drinking water: respondents living outside cities.

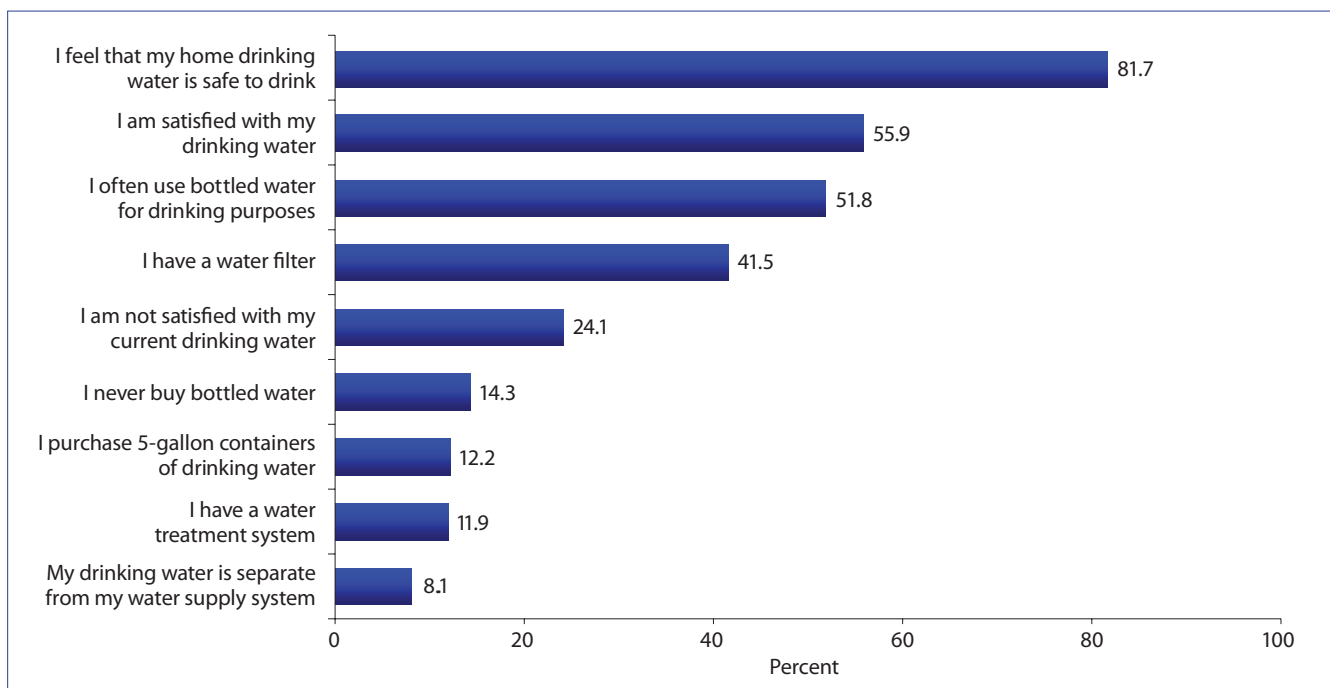
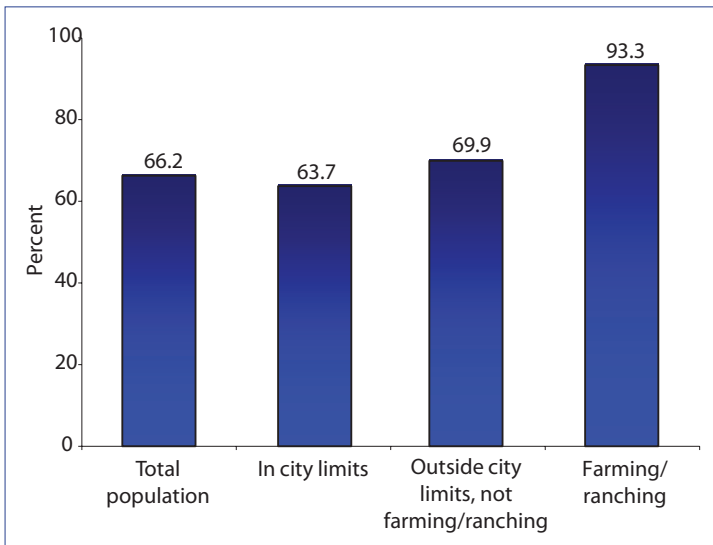


Figure 9. Home water systems. (Check all that apply.)



Perceptions of ground and surface water quality vary by where a respondent lives (Figs. 11 and 12). About 31 percent of those who farm and 27.5 percent of those outside city limits and not farming believe that the quality of groundwater in their area is good or excellent (Fig.11). In contrast, only 17.2 percent of respondents living inside city limits believe the quality of groundwater in their area to be good or excellent. A high proportion of those living inside cities (35.4 percent) and outside of city limits and not farming (26.4 percent) admit they do not know what their groundwater quality is. Only about 6 percent of farming/ranching respondents report not knowing.

Figure 10. Do you know what a watershed is?

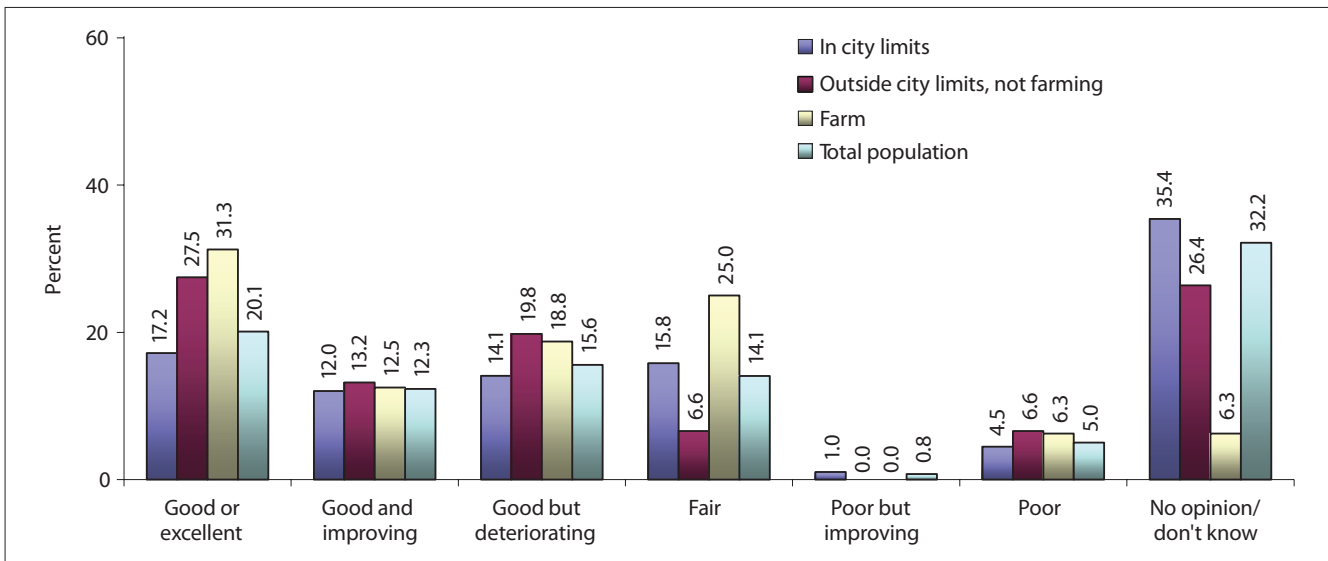


Figure 11. What is the quality of groundwater where you live?

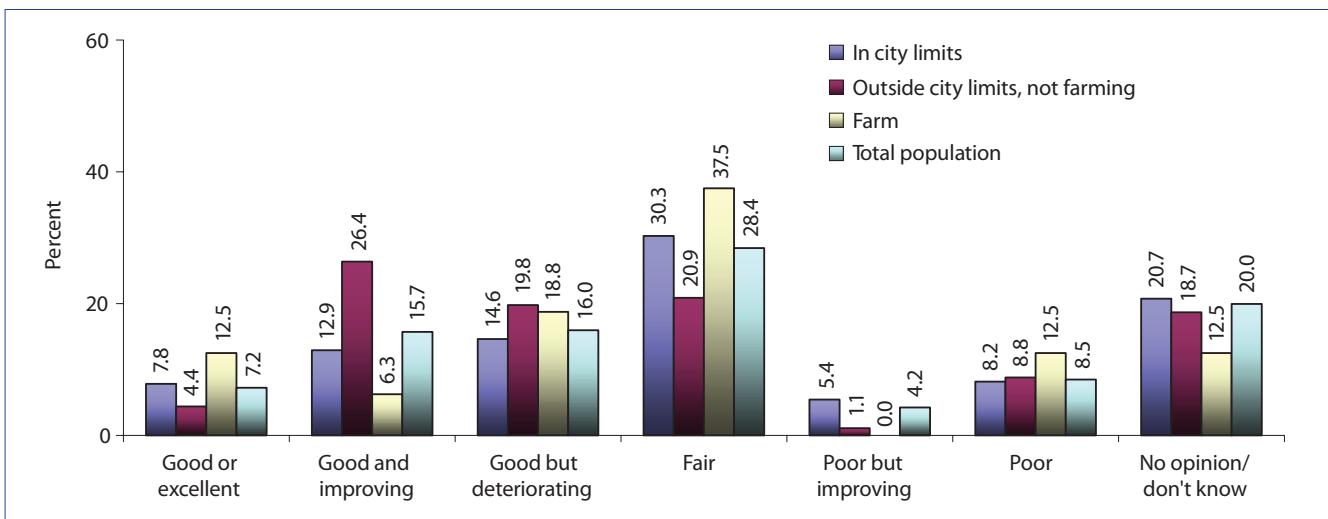


Figure 12. What is the quality of surface water in your area?

Compared to groundwater quality knowledge, more respondents are able to offer an assessment of surface water quality where they live (Fig. 12). All groups are less likely to rate their surface waters as good or excellent (7.2 percent compared to 20.1 percent for groundwater). Furthermore, all groups are more likely to rate their surface waters as only fair (28.4 percent compared to 14.1 percent for groundwater). Those respondents involved in farming/ranching give surface water quality in their area even lower marks, with more than a third believing it to be fair and 18.8 percent reporting that it is good but deteriorating. Only 4.4 percent of those living outside city limits and not involved in farming/ranching think their surface waters are good or excellent; however, 26.4 percent of that group believe surface waters in their area are good and improving. Eight to 12.5 percent of all groups believe their surface waters are poor.

Even fewer individuals surveyed believe that the quality of ocean waters off the coast of the southern states is good or excellent (Fig. 13): all groups gave similar responses ranging from 0 percent of farmers to 2.2 percent of those living outside city limits but not farming/ranching. About a third of those surveyed indicated that they didn't know or had no opinion regarding ocean water quality. Most respondents considered ocean water quality good but deteriorating (19.7 percent) or fair (14.4 percent), and 5 percent said they consider ocean water quality poor.

### Conditions Perceived to Affect Local Water Quality

Respondents consider pesticides a known problem (6.3 percent) or suspected problem (37.3 percent) affecting water quality in Texas (Fig. 14). Fertilizers/nitrates and fertilizers/phosphates also are suspected (33.8 percent and 31.2 percent) or known (6.5 percent for both) to be a problem. Other conditions believed by about a third of respondents to be a problem are petroleum products (3.5 percent known problem, 29.0 percent suspected) and algae (6.4 percent known problem, 27.0 percent suspected problem). Minerals (8.4 percent known problem, 22.8 percent suspected) and heavy metals (5.6 percent known problem, 22.5 percent suspected) are also conditions thought to contribute to water quality problems where respondents live. Possibly the most noteworthy result of this survey question is that about 40 to 50 percent of all respondents say they do not know whether any of these conditions are affecting their water quality.

Respondents were asked to identify the top three causes of existing pollution in Texas rivers and lakes (Fig. 15). All respondents agree that industry and new suburban developments are major sources of pollutants. Stormwater runoff was considered a major source of pollution by those living within city limits and those living outside city limits and not farming (both about 31 percent), but a lesser problem by those living on farms and ranches (18.8 percent). Interestingly, pollution associated with the production of crops was considered significant by about 22 to 26 percent of respondents not

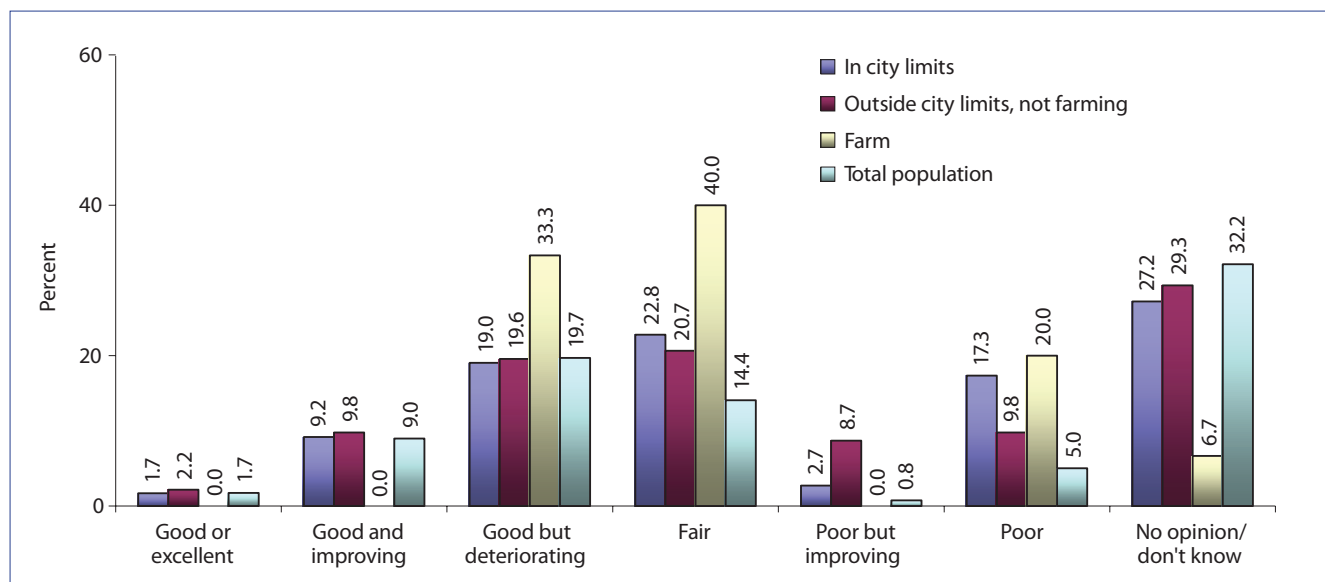


Figure 13. What is the quality of ocean waters off the coast of the southern states?



involved in farming or ranching, while 52.4 percent of those farming believe crop production may be one of the major contributors of pollutants.

A smaller proportion of total respondents (16 to 24 percent) consider erosion from roads and construction, landfills, oil wells and mining, livestock production, runoff from home landscapes, septic systems

and wastewater treatment plants to be significant contributors to water pollution. Farmers (37.5 percent) are more likely to think that wastewater treatment plants are responsible for existing pollution than other residents. More citizens living outside city limits and not farming (25.8 percent) and within city limits (15.2 percent) believe that septic systems are sources of pollution compared to farmers (12.5 percent).

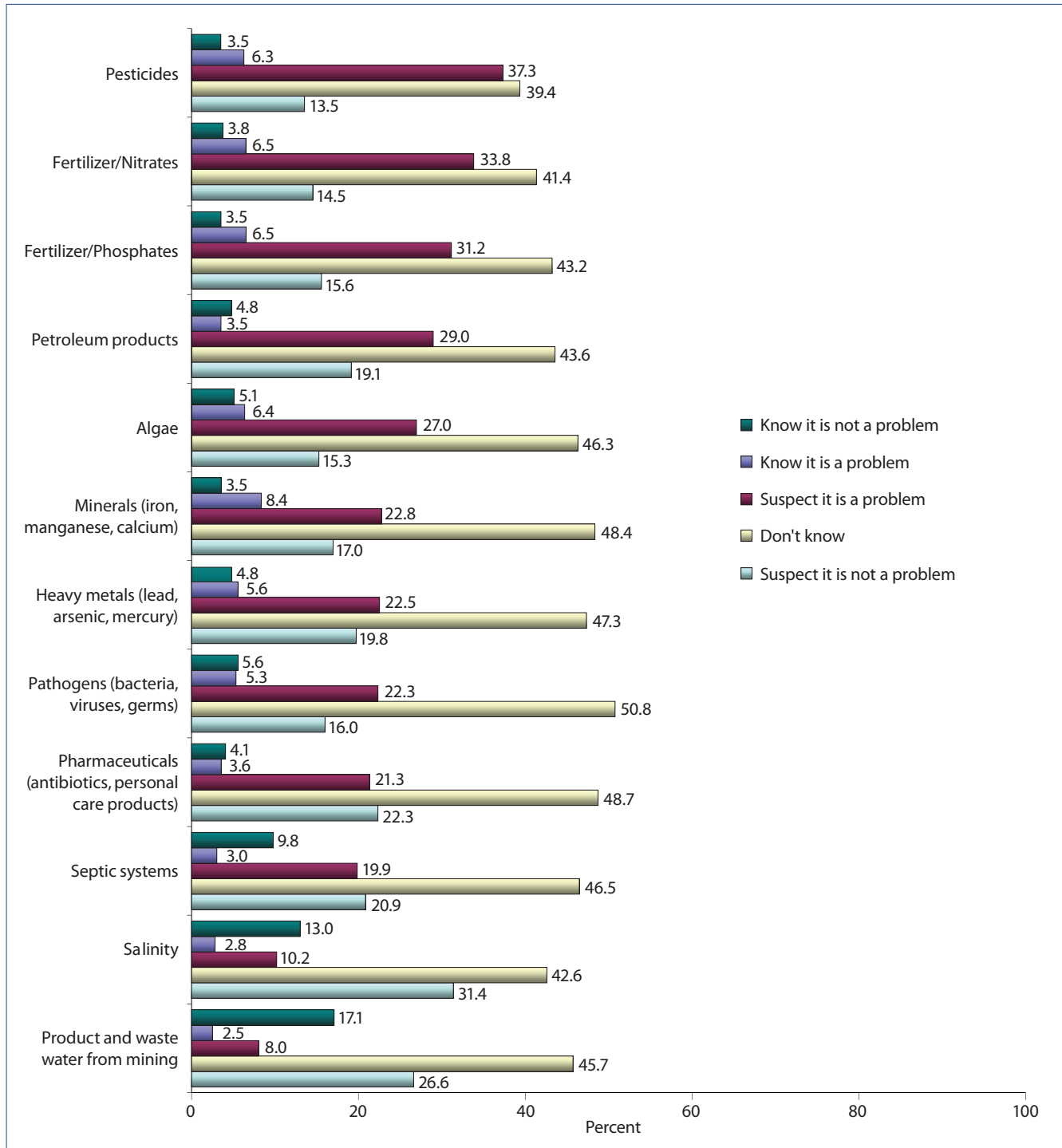


Figure 14. Do any of the following conditions affect water quality in your area?

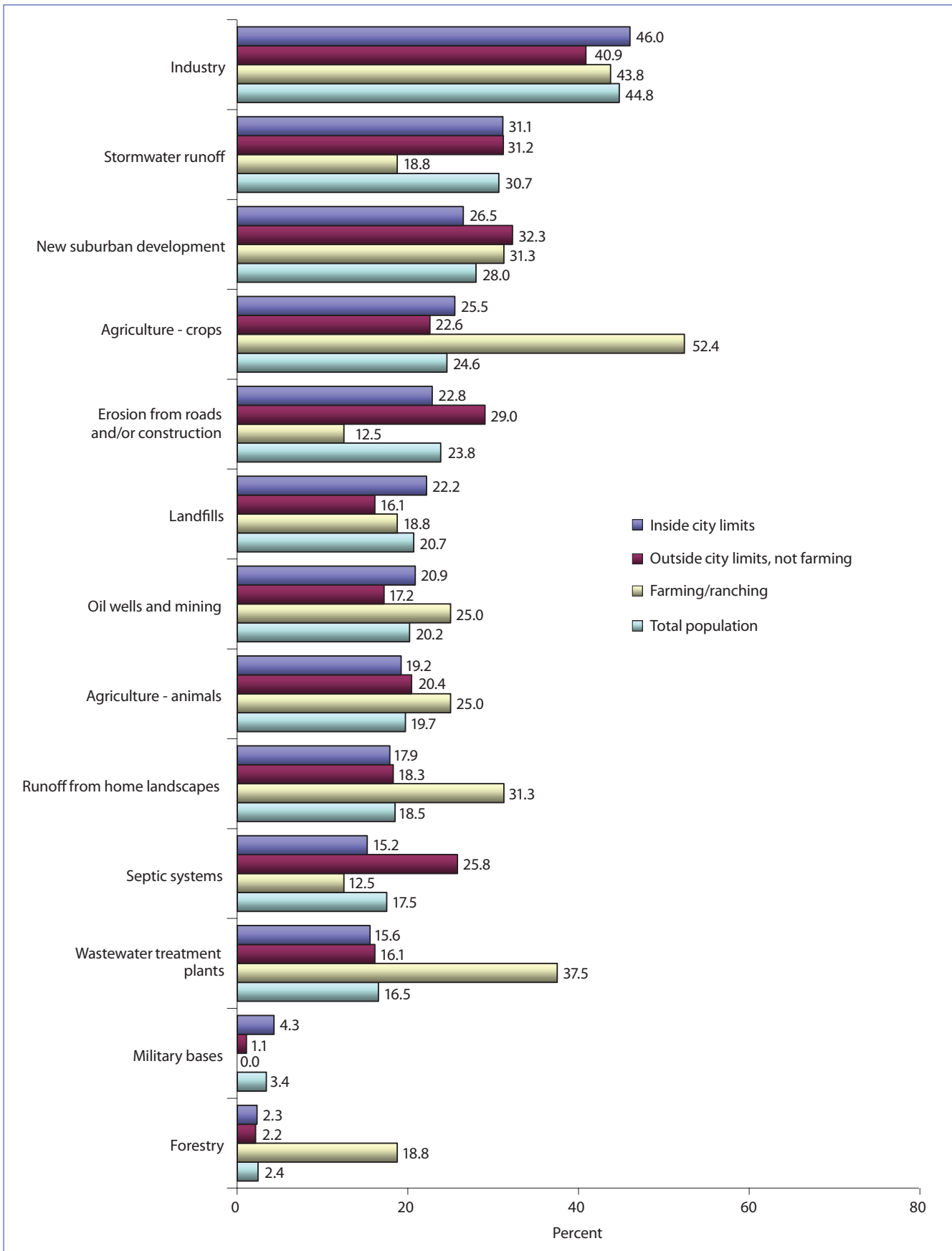


Figure 15. Which are most responsible for existing pollution problems in rivers and lakes in your state? (Check up to three answers.)

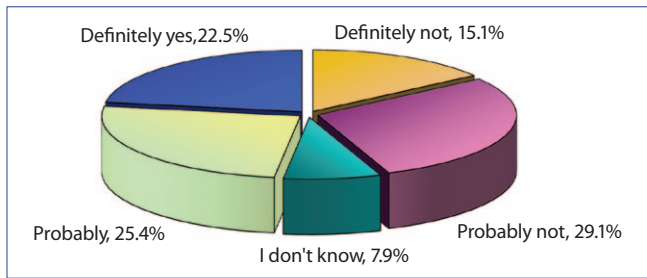


Figure 16. Is water quantity a problem where you live?

## Water Quantity

Water shortages and restrictions are increasingly issues across the U.S. Some areas in Texas have abundant water resources, while others are arid. In recent years, drought and population growth have affected the quantity of water available for industry, agriculture, recreation and human consumption. Surprisingly, more than 44 percent of all respondents believe water quantity issues are definitely not (15.1 percent) or probably not (29.1 percent) a problem where they live (Fig. 16). A slightly larger number (47.9 percent) responded that water quantity is definitely (22.5 percent) or probably (25.4 percent) a concern. About 8 percent reported not knowing or not having an opinion.

Closer examination of the responses (Fig. 17) shows that 61.2 percent of those living outside city limits and not farming believe water quantity is not or probably

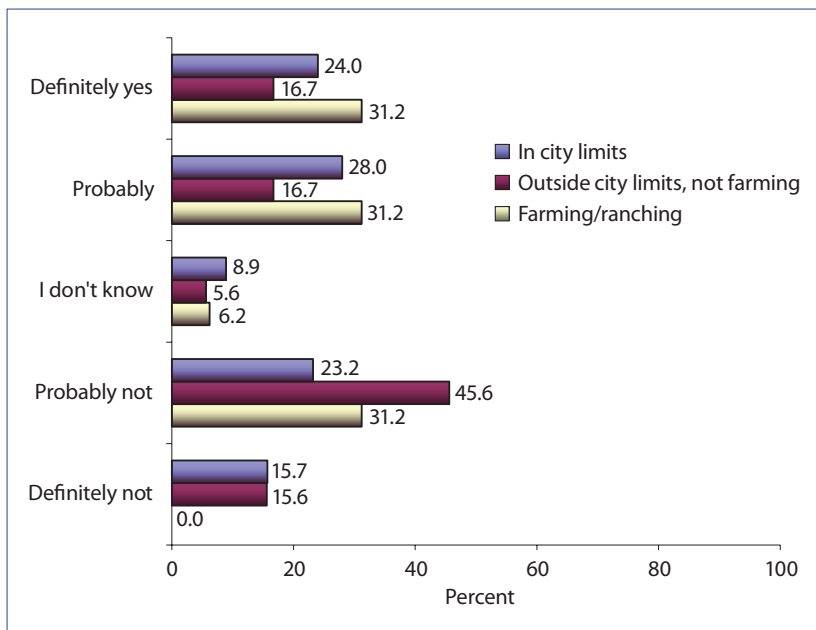


Figure 17. Perception of water quantity as a problem based on respondents' locations.

is not a concern in their area, compared to 31.2 percent of those farming and 38.9 percent of those living within city limits.

Several additional questions related to water quantity were included in the survey; however, the data are not charted here. First, Texans were asked to evaluate the likelihood of their area suffering from a prolonged drought. About 52 percent (range of 50.0 to 52.9 percent for all three home location categories) of respondents believe that the chances of a prolonged drought in their area are increasing. Considerably fewer (range of 0.0 to 2.7 percent for all location categories) think the chances are decreasing. Other respondents (range of 35.2 to 43.8 percent) predict the likelihood of prolonged drought will stay the same.

Similar responses were given when survey participants were asked whether they thought the amount of rainfall in their area will change as a result of global warming (data not charted here). Most respondents believe that global warming will result in a significant (30.3 percent) or slight (13.2 percent) decrease in the amount of rainfall in their area. About 26 percent anticipate no change in the amount of rainfall in their area.

Respondents also were asked to evaluate the likelihood of their area having adequate water to meet its needs 10 years from now. Twenty percent of respondents (18.4 to 24.7 percent for the three location categories) think there is a high chance of their area having adequate water resources, while about 41.3 percent (39.9 to 56.2 percent for the three location categories) think there is only a medium chance and 30.3 percent (ranging from 25 percent for farmers/ranchers to 32.1 percent of city dwellers) think there is a low chance that their area will have adequate water.

## Protecting Local Waters

Participants have varying opinions about how well federal, state and local governments and individual citizens are fulfilling their responsibilities to protect water resources

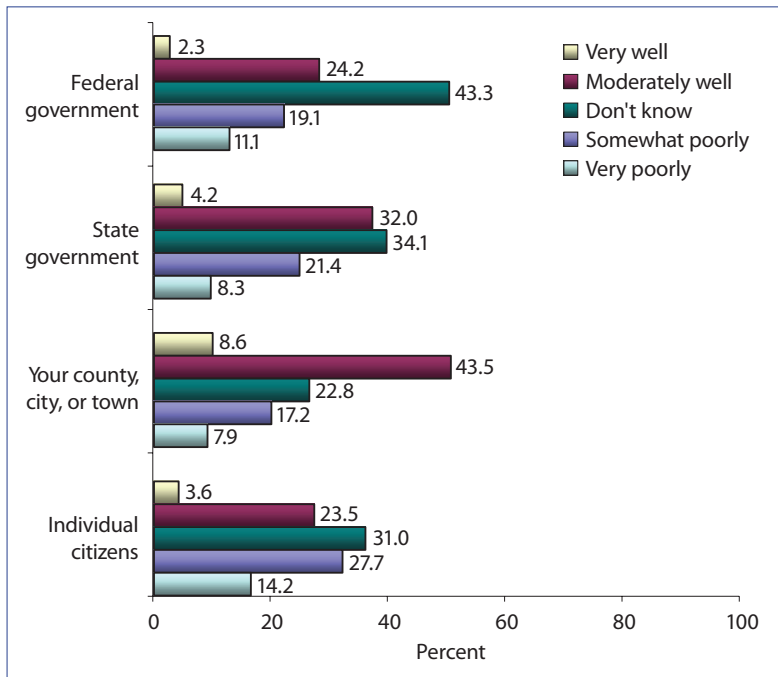


Figure 18. How well is each group fulfilling its responsibility for protecting water resources in your community?

(Fig. 18). Respondents seem to be most confident that the organizations with which they are most familiar—their state (32.0 percent) and local governments (43.5 percent)—are fulfilling their responsibilities moderately well. Fewer respondents believe the federal government (24.2 percent) and individual citizens (23.5 percent) are fulfilling their responsibilities moderately well. A very small number believe that any of the groups (range of 2.3 percent to 8.6 percent) is fulfilling its responsibilities very well. Many respondents (22.8 percent to 43.3 percent) say they do not know whether the groups are fulfilling their responsibilities.

Survey participants were asked how important certain actions are in protecting water resources (Fig. 19). All actions are considered very important by at least 32 percent of respondents. Those actions considered very important or important by the most respondents included improving water quality monitoring to detect pollution (92.8 percent), improving wastewater treatment (87.6 percent), residential water conservation (91.3 percent), and educating municipal officials (90.9 percent).

## Personal Natural Resource Ethics and Actions

Respondents' viewpoints on the environment and use of natural resources vary from protectionist stances to the belief in full development and use of the natural resource base. When asked to locate their viewpoint on a spectrum ranging from total natural resource use to total environmental protection, 13.7 percent felt they tended more toward natural resource use, 75.8 percent described themselves as tending more toward environmental protection, and 10.6 percent preferred equal balance (data not charted).

Beliefs and attitudes about environmental issues are influenced by one's sources of information and the ethics and actions of others. About 51 percent of respondents

said news coverage caused them to change their minds on environmental issues (Fig. 20). However, social connections and personal experiences are important to a large number of respondents: 35.1 percent changed because of conversations with other people and 29.4 percent changed their minds because of first-hand observations and experiences. Financial considerations (15.3 percent) and classes (13.8 percent) are also causes of change. About 11 percent reported having changed their minds because of public meetings and volunteer activities. About 6 percent changed their minds on environmental issues because of an elected official's speech.

Texas respondents have undertaken a variety of efforts to preserve water quality or conserve water (Fig. 21). All groups reported making changes in how often they water their yards. About 81 percent of those living on farms/ranches have changed their yard irrigation practices, while 75.2 percent of city dwellers and 60.2 percent of those living outside city limits and not farming have made modifications. Many respondents also have adopted new technologies to protect or conserve water resources, including more than 56 percent of farmers, 39.8 percent of those living outside city limits and not farming, and 36.4 percent of city dwellers. More than 37 percent of farmers changed their use of pesticides, fertilizers or other chemicals to protect water qual-

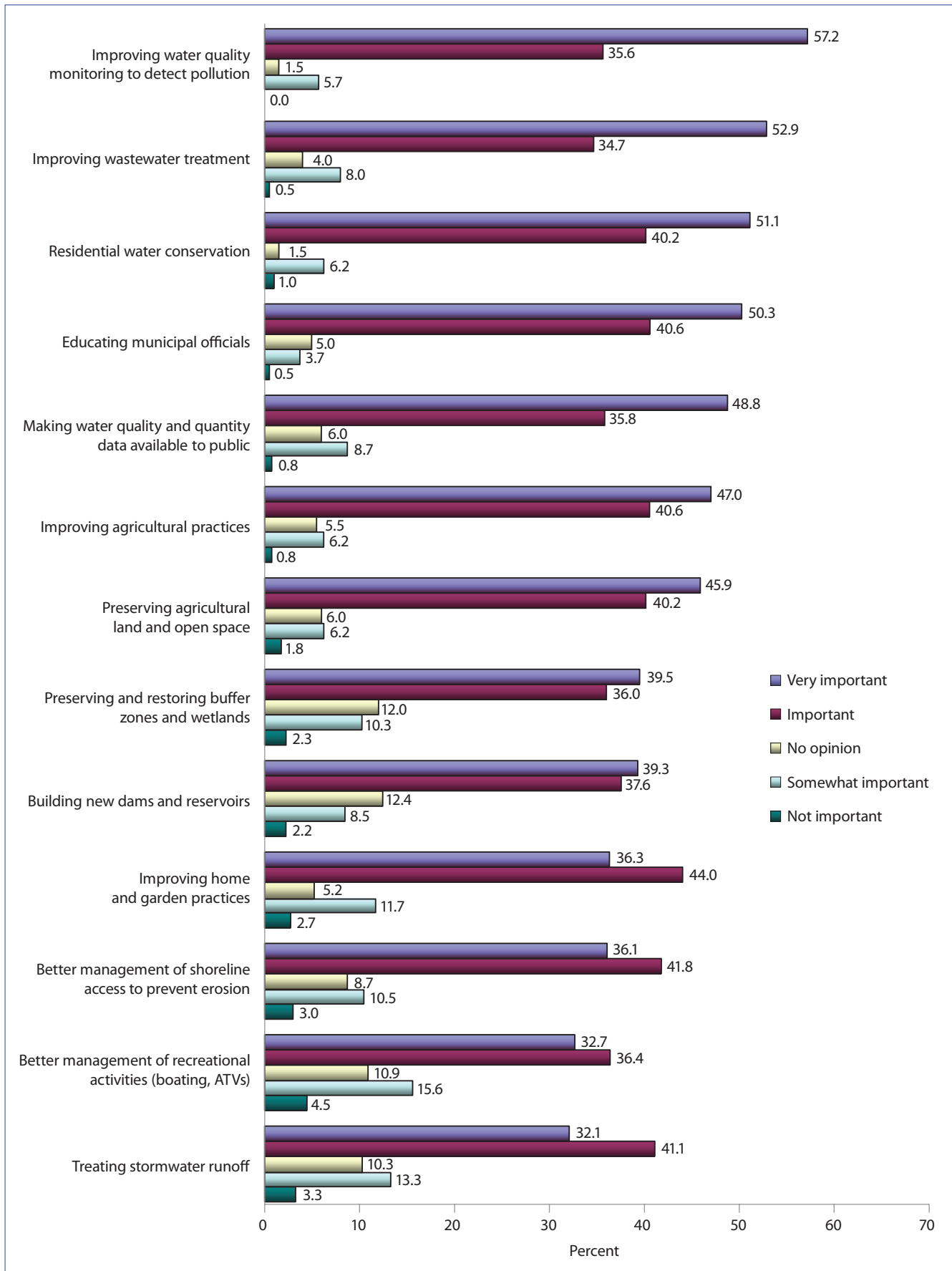


Figure 19. How important are these actions in protecting water resources?



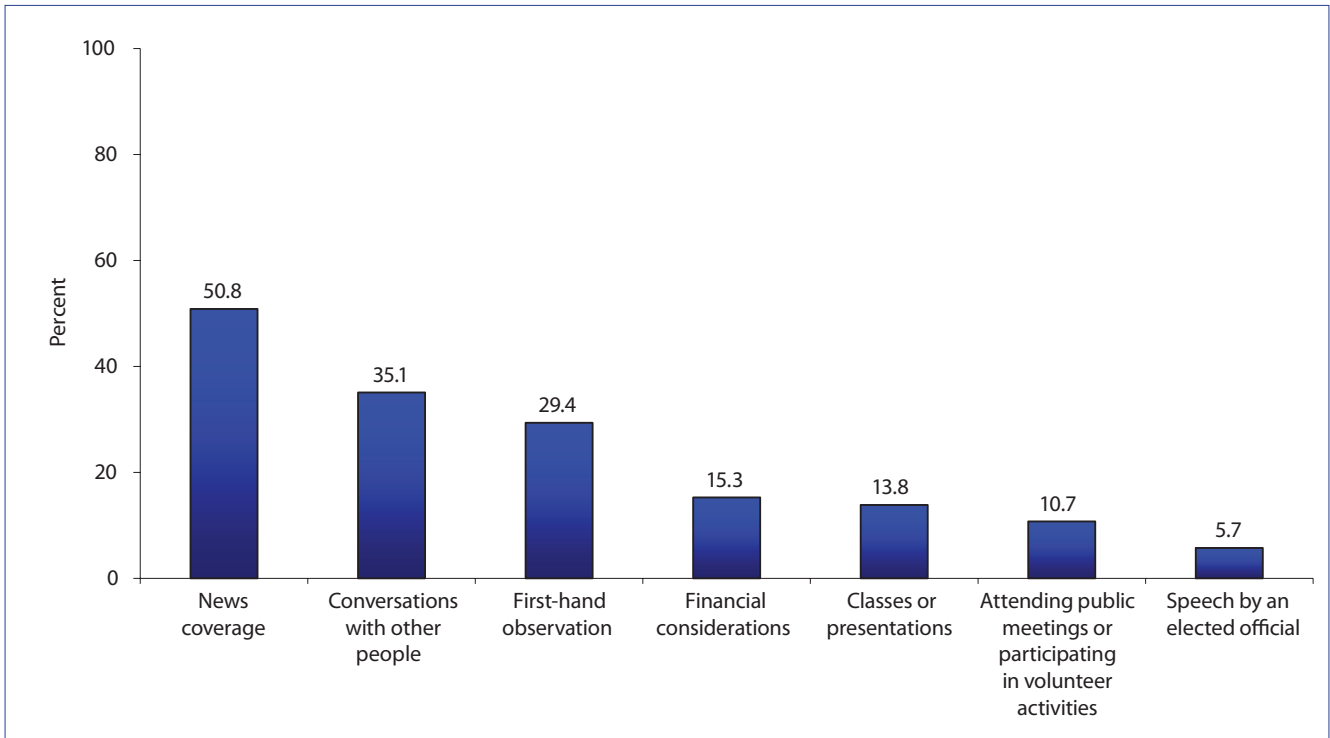


Figure 20. What resulted in changes-of-mind on environmental issues? (Check all that apply.)

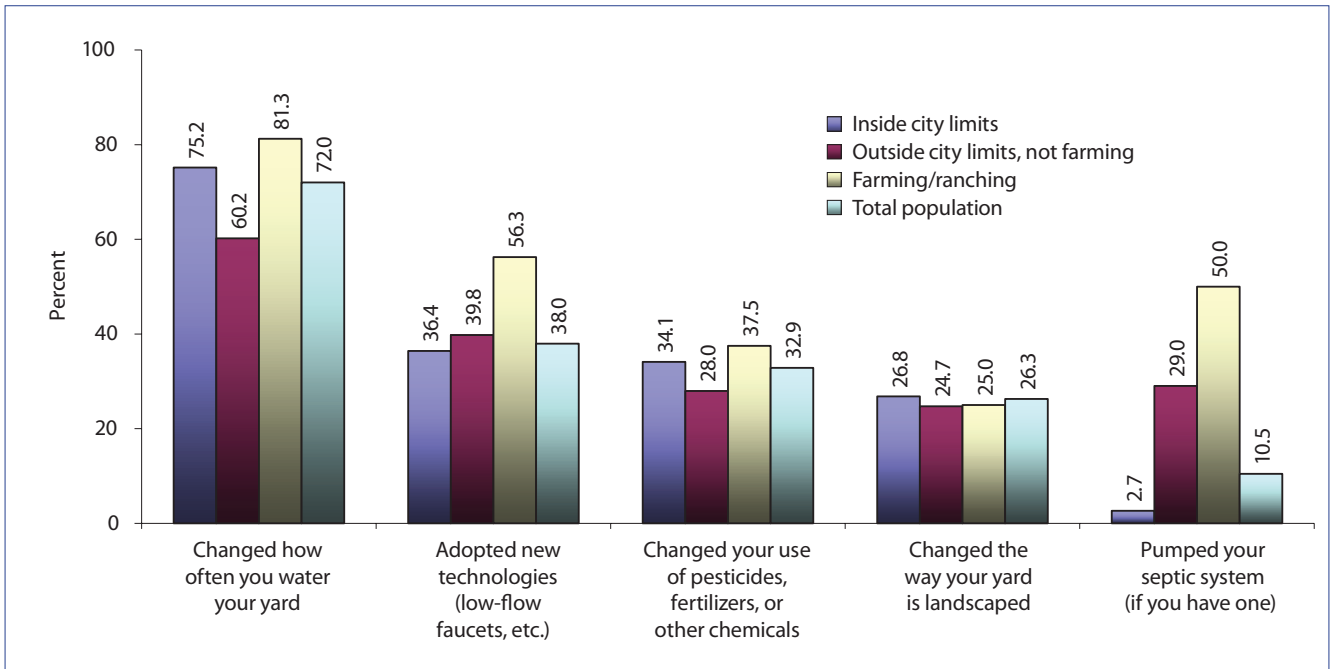


Figure 21. Efforts to conserve water or preserve water quality?

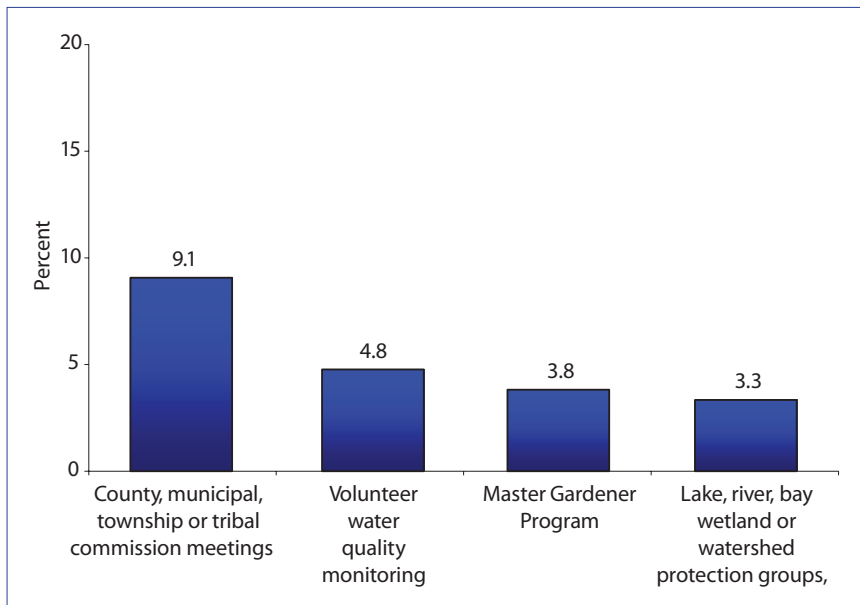


Figure 22. Have you participated in the following activities? (Check all that apply.)

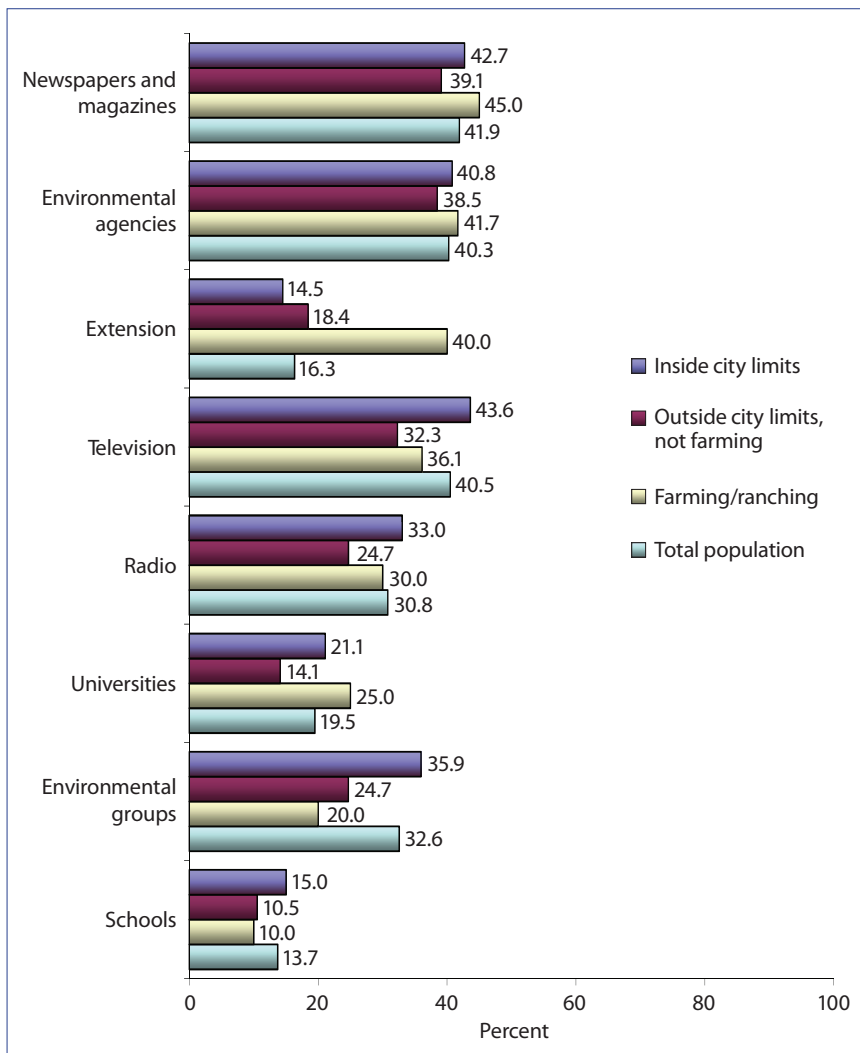


Figure 23. From which sources have you received water quality information? (Check all that apply.)

ity. However, many of those living inside cities (34.1 percent) or outside cities and not farming (28.0 percent) also changed their pesticide, fertilizer or other chemical use. Between 24.7 percent and 26.8 percent of all respondents changed the way their yards are landscaped. Half of farmers/ranchers, but only 29 percent of those living outside cities and not farming, reported having pumped their septic systems.

Participation in local government processes and resource management groups is limited (Fig. 22). Only 9 percent have participated in county, municipal or township meetings. About 5 percent are involved in volunteer water quality monitoring; 3.8 percent are Master Gardeners; and 3.3 percent are part of lake, river, bay, wetland or watershed protection groups.

### Learning About Water Issues

Texas respondents obtain information about water quality in many ways (Fig. 23). Averaged across all respondent groups, newspapers and magazines (41.9 percent), environmental agencies (40.3 percent) and television (40.5 percent) are primary sources of information. For those living inside the city limits, television (43.6 percent) and newspapers and magazines (42.7 percent) are the most important sources. Farmers and ranchers also rely heavily on newspapers and magazines (45 percent), but are particularly likely to have received water quality information through the Texas AgriLife Extension Service (40.0 percent). Farm respondents also report using university services (25.0 percent). Environmental groups (32.6 percent) and radio (30.8 percent) are

other significant sources of water quality information for all groups.

While 43.5 percent of respondents say they would visit a website for information on water quality, there are differences among age groups (Fig. 24). Those least likely to use a website are over the age of 70. Highest use is reported by those aged 30 to 39 (69.0 percent), followed by those aged 40 to 49 (57.1 percent).

About 50 percent of all respondents say they would like to learn more about protecting public drinking water supplies (Fig. 25). Thirty-four percent of all respondents are interested in learning more about water management in home and garden landscaping. Twenty-eight percent would like to learn more about fish and wildlife water needs, and 26.3 percent are interested in community actions concerning water issues. Differences among urban residents and those living outside city limits, regardless of involvement in farming or ranching, are most evident in the management of private wells and septic systems. As charted separately in Figure 26, those living on farms and outside cities have a much higher

interest in private wells (56.3 and 32.3 percent) and septic system management (43.8 and 32.3 percent) than those living inside cities (9.9 percent and 8.6 percent, respectively). Like those living in cities, farmers' next greatest area of interest is learning more about protecting public drinking water supplies (37.5 percent), as well as fish and wildlife water needs (37.5 percent). Farm/ranch residents and those living outside city limits and not farming also are interested in watershed management (37.5 percent, 22.6 percent), water management in home and garden landscaping (31.3 percent, 30.1 percent), and nutrient and pesticide management (31.3 percent, 17.2 percent). About a third of farmers/ranchers also are interested in learning more about landscape buffers and watershed restoration.

Finally, respondents reported on the ways they would like information to be presented so they can take advantage of it (Fig. 27). The most popular among all groups are watching TV coverage (44.5 percent); reading fact sheets, bulletins or brochures (44.5 percent); and using the Web (44.0 percent). However, respondents who are farming or ranching are slightly more likely

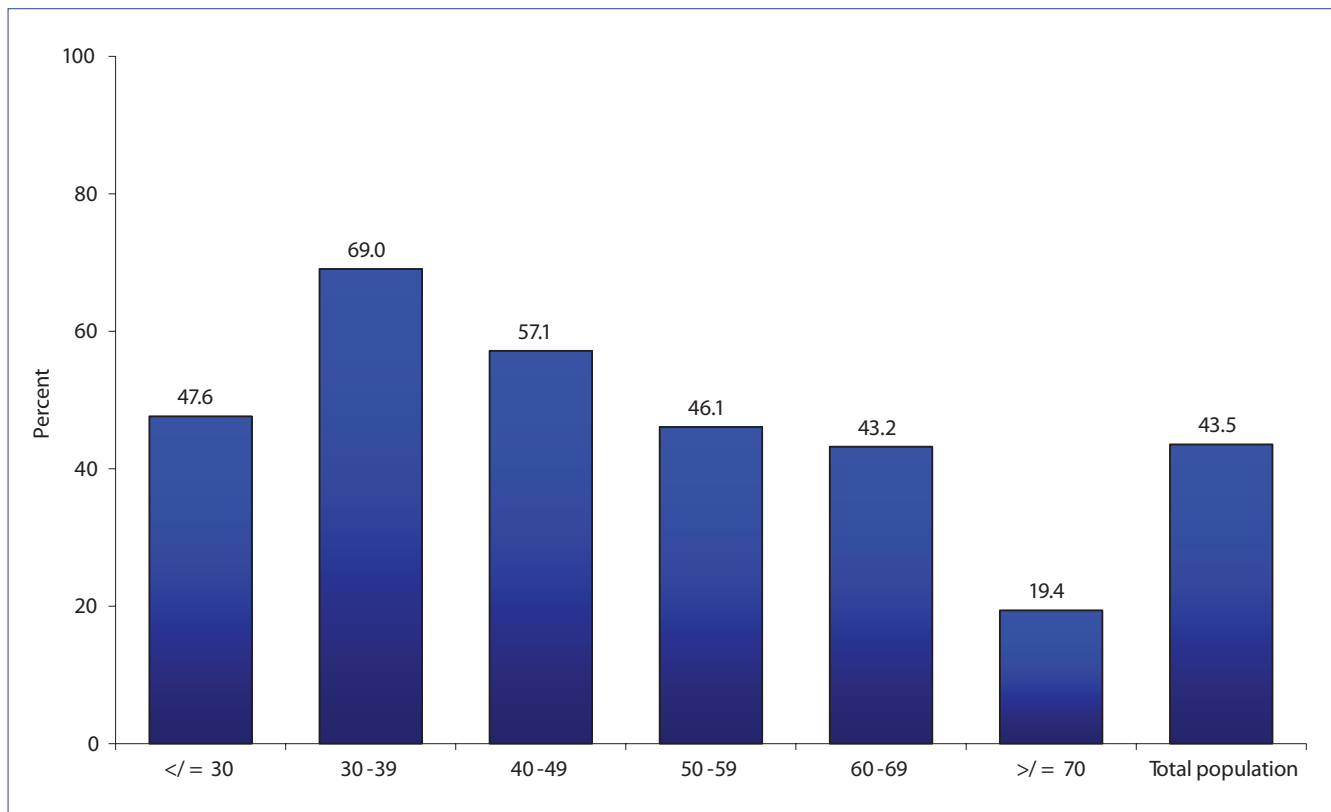


Figure 24. Would you visit a website for information about water quality issues? (by age)

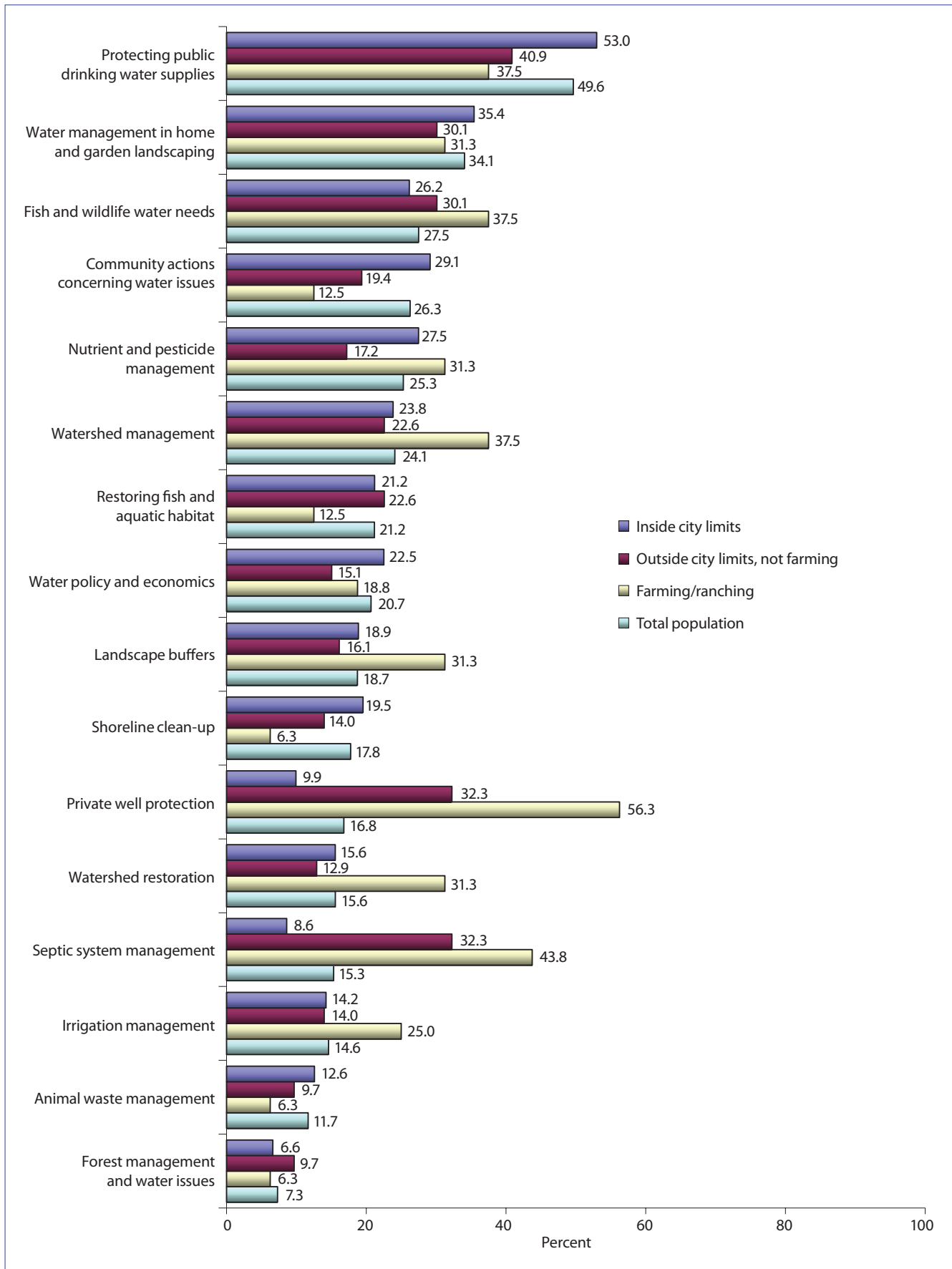


Figure 25. Would you like to learn more about any of the following? (ordered by total population preferences)

to read fact sheets, bulletins or brochures than they are to watch TV coverage, and they are less likely to visit a website than people who reside within city limits or live outside cities and are not involved with farming. About 32 percent of the total population would like to receive information through newspaper articles. Seventeen percent would watch a video of information and 12.4 percent would ask for an assessment of water-related

practices for their home, farm or workplace. Smaller numbers would look at a demonstration or display (10.5 percent), attend a short course or workshop (also 10.5 percent), attend a fair or festival (9.7 percent), participate in a one-time volunteer activity (8.0 percent), take a certification course (7.5 percent), or be trained for a regular volunteer position (4.9 percent).

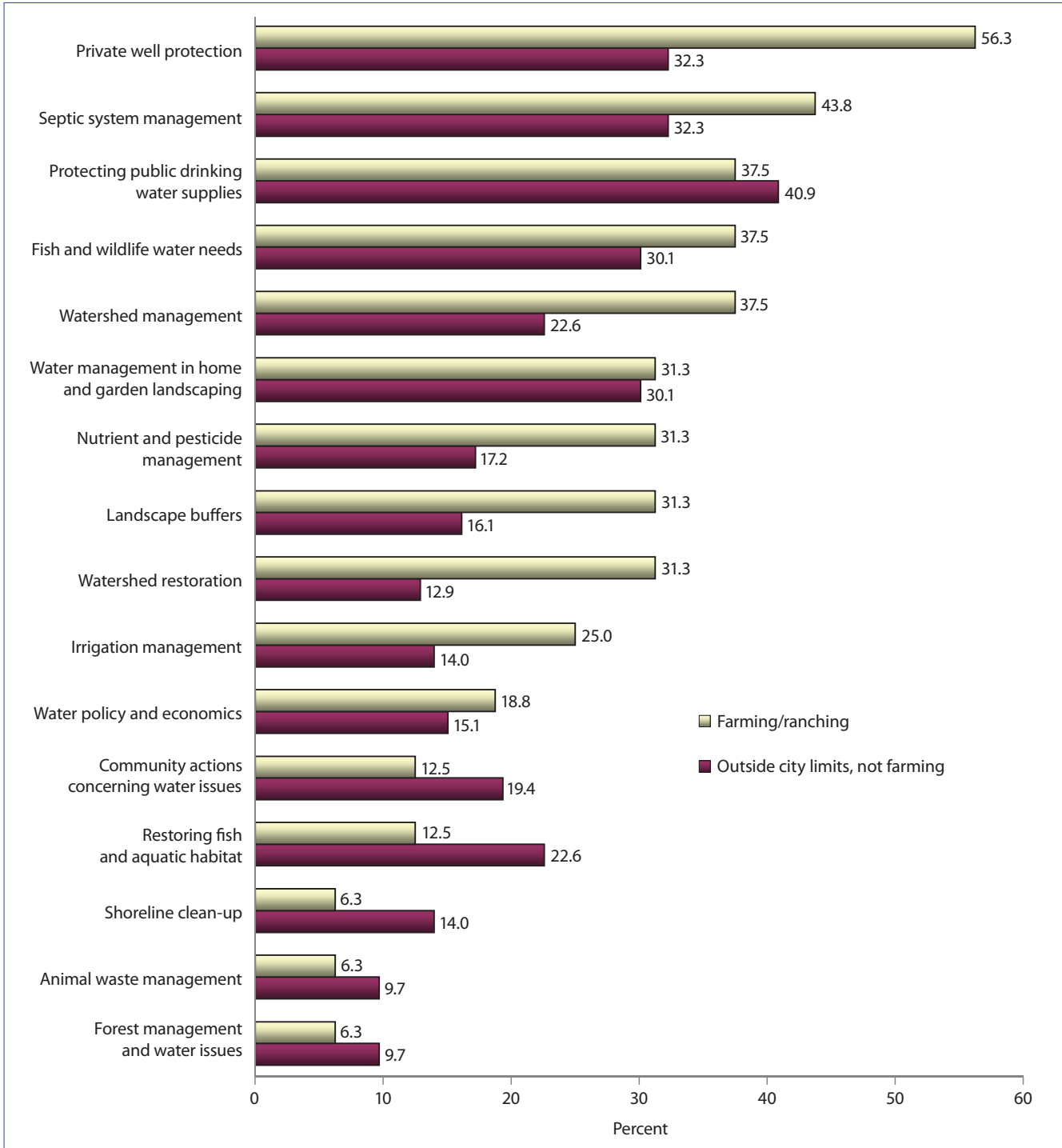


Figure 26. Would you like to learn more about any of the following? (farming/ranching and outside city limits, not farming)



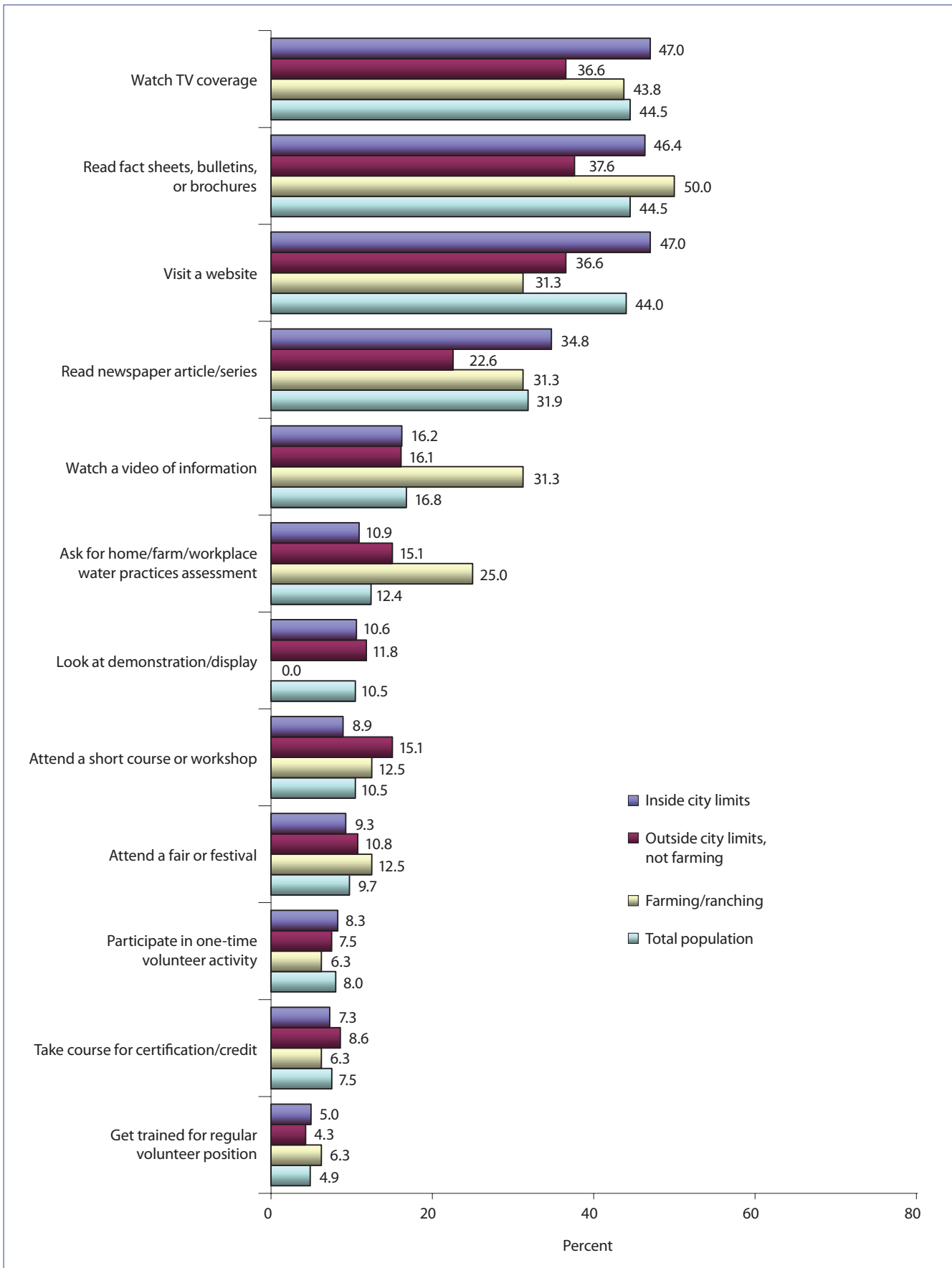


Figure 27. Learning opportunities likely to be taken advantage of by respondents.

## CONCLUSION

Many survey respondents have given a great deal of thought to water resource issues. Clean drinking water, surface and groundwater, and clean beaches, estuaries, bays, beaches and marine waters are very important to them and they want to learn more about these issues.

More than 80 percent of all respondents believe their home drinking water is safe, yet more than 23 percent purchase bottled water as their primary source of drinking water. Many have concerns about the quality of surface, ground and marine waters. About a third of respondents suspect pesticides and fertilizers affect water quality in their areas. With one exception, all groups felt that industry, stormwater runoff and new suburban development were likely responsible for existing pollution problems in rivers and lakes. Fewer farmers reported stormwater runoff as probably responsible. One-half to one-third of all respondents would like to learn more about protecting public drinking water supplies and home and garden landscaping. Farmers and those living outside cities and not farming have even greater interest in private well and septic system management. Most respondents would like to receive water resource information through TV coverage; fact sheets, bulletins or brochures; or visiting websites.

Few respondents from all of the location groups believe that government or individual citizens are fulfilling their responsibilities for protecting water

resources very well, although the largest group of respondents reported not knowing. Many respondents believe that water is a natural resource that should be used; however, more described themselves as tending toward water resource protection. When asked about the importance of water issues, the majority felt that clean drinking water, groundwater, rivers and lakes, beaches, marine water, bays and estuaries were very important. Water for agriculture, shellfishing, aquatic habitat and municipal uses also was considered very important by a large number of respondents.

Half of the respondents believe there is a water quantity problem in their area, while 42 percent believe water quantity issues are definitely not or probably not a problem where they live. About 52 percent believe the chances of a prolonged drought in their area are increasing. Forty-two percent believe there is a medium chance that their area will have adequate water resources in 10 years.

It is not enough to ask Texas residents what they think about water issues. The next step is to use these findings to inform our technical and educational intervention strategies. Knowing how citizens learn about water issues and the priorities they give to them can help community leaders, government officials, the Texas AgriLife Extension Service, and state agency personnel better target their programs. We encourage community leaders to talk about these results and think about what major water issues their communities face.



# APPENDICES

## APPENDIX A: Survey Methodology

### Survey Methodology

A 59-item survey was designed based on water quality questions developed for a national survey by water quality coordinators under the leadership of Robert Mahler, Professor of Soil and Environmental Sciences at the University of Idaho, and modified through discussions with the Southern Region Water Resource Project Principal Investigators (see Appendix C for survey items). This national random sample survey, stratified by state, was conducted in the 13-state southern region beginning in the spring of 2008 under USDA 406 Water Quality grant #2004-51330-02245, Coordination of Water Quality Programs in the Pacific Northwest. Random sample survey numbers were based on July 1, 2005, U.S. Census estimates (rounded to nearest 10,000) of the current population of the southern states.

Each state was allocated 200 surveys for a base population of 500,000 people. An additional 25 surveys were added per additional 250,000. A random sample of names was drawn for each state. After accounting for 10 percent bad addresses, 1,275 surveys were sent to randomly selected individuals in Texas.

The Dillman four-stage mail survey methodology was used. The first mailing sent in the summer of 2008, followed by a reminder card. Approximately 20 days later a letter with a second survey was sent to those who had not yet responded. About 20 days later a second reminder post card was mailed to non-responders. The initial mailing and third mailing included a cover letter, the survey, and a postage-paid return envelope. Survey addresses were purchased from Survey Sampling International, Fairfield, CT. Human assurance approval was obtained from the University of Idaho as the USDA-CSREES-406 grant awardee.

The final response rate for Texas was 33 percent. Data were analyzed at the University of Idaho and Texas A&M University.

## APPENDIX B: Letter of Invitation



Jane Doe  
55 Maple Drive  
Dallas, TX 54857

August 10, 2008

Dear Jane,

Texas A & M University is concerned with water issues and how these issues affect our businesses and daily lives. Your views and the views of other citizens about a wide range of water issues as provided in the enclosed survey are crucial to guide the University's research and educational efforts in Texas.

Your response to this survey is very important. You are one of 1,275 residents of Texas who are being asked for their views on water issues. Your responses will represent the 20,850,000 residents of the state. Would you please complete this questionnaire and return it in the business reply envelope supplied with this mailing? The questionnaire should only take about 12 minutes to complete. You may note that the business reply envelope is addressed to the University of Idaho as they are collaborating with land grant universities in Texas as part of a nation-wide effort. All results of this survey will be available to the general public.

Your response will be completely confidential. This questionnaire has an identification number in ink in the top right hand corner for mailing purposes only. This is so that we may check your name off the mailing list when your completed survey is returned. Your name will never be placed on the questionnaire itself.

My name is Robert Mahler and I am the Water Quality Coordinator at the University of Idaho. I have been conducting water resource surveys in the western United States for the past five years. To ensure this survey's integrity I am working with the Water Quality contacts at Texas A & M University (Dr. Mark McFarland and Dr. Christopher Boleman) to develop the survey and process your input. If you have any questions, we would be happy to answer them. Our email addresses are [bmahler@uidaho.edu](mailto:bmahler@uidaho.edu), [ml-mcfarland@tamu.edu](mailto:ml-mcfarland@tamu.edu), and [ct-boleman@tamu.edu](mailto:ct-boleman@tamu.edu). Please return the survey in the business reply envelope. Thank you for your assistance.

Sincerely,

Dr. Robert L. Mahler  
Professor  
University of Idaho  
Water Quality Coordinator

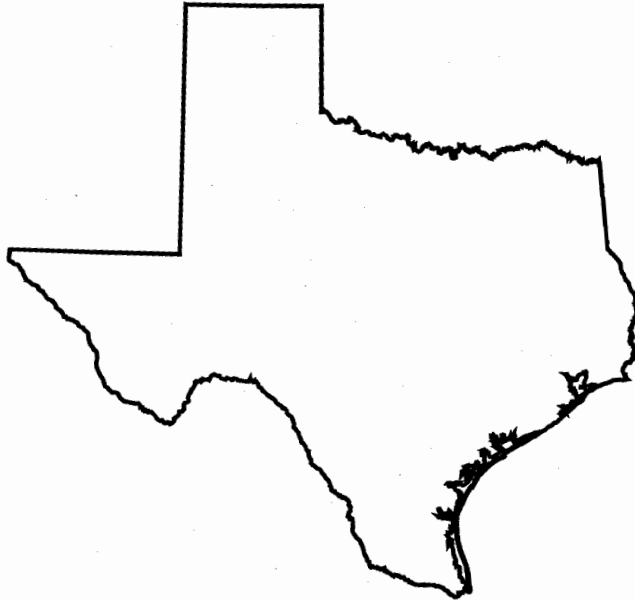
Dr. Mark L. McFarland  
Water Quality Coordinator  
Texas A & M University

Dr. Christopher T. Boleman  
Extension Specialist  
Texas A & M University

Enclosures

## APPENDIX C: Survey Questionnaire

### *WATER ISSUES IN TEXAS*



**A survey of public attitudes in Texas**

**Sponsored by:  
Southern Region  
Texas A&M University  
Prairie View A&M University  
University of Idaho**

**August 2008**



## WATER ISSUES IN TEXAS

<b>HOW DO YOU FEEL ABOUT THE ENVIRONMENT?</b>
-----------------------------------------------

How important are each of the following water issues to you? (Circle **one** answer per question)

Issue	Not important	Somewhat important	No opinion	Important	Very important
1. Clean rivers and lakes	N	S	O	I	V
2. Clean marine water	N	S	O	I	V
3. Clean bays and estuaries	N	S	O	I	V
4. Clean water for shellfishing	N	S	O	I	V
5. Clean beaches	N	S	O	I	V
6. Clean drinking water	N	S	O	I	V
7. Clean groundwater	N	S	O	I	V
8. Water for commerce/ industry/power generation	N	S	O	I	V
9. Water for household landscapes	N	S	O	I	V
10. Water for agriculture	N	S	O	I	V
11. Water for aquatic habitat	N	S	O	I	V
12. Water for recreation	N	S	O	I	V
13. Water for municipal use	N	S	O	I	V
14. Interstate transfer/sale of water rights	N	S	O	I	V
15. Within state transfer/sale of water rights	N	S	O	I	V
16. Hypoxia (Gulf dead zone)	N	S	O	I	V

How important are the following actions in protecting our water resources? (Circle **one** answer per question)

Issue	Not important	Somewhat important	No opinion	Important	Very important
17. Treating stormwater runoff	N	S	O	I	V
18. Improving wastewater treatment	N	S	O	I	V
19. Residential water conservation	N	S	O	I	V
20. Building new water storage structures (dams, reservoirs)	N	S	O	I	V
21. Improving home and garden practices	N	S	O	I	V
22. Preserving & restoring buffer zones & wetlands	N	S	O	I	V
23. Improving agricultural practices	N	S	O	I	V
24. Preserving agricultural land & open space	N	S	O	I	V
25. Better management of recreational activities (boating, fishing, ATVs)	N	S	O	I	V
26. Better management of shoreline access to prevent erosion	N	S	O	I	V
27. Improving water quality monitoring to detect pollution	N	S	O	I	V
28. Making water quality and quantity data available to public	N	S	O	I	V
29. Educating municipal officials	N	S	O	I	V

## DRINKING WATER ISSUES

30. Where do you primarily get your drinking water? (Circle **one** answer)
- a. Private supply (private well, river, pond, lake)
  - b. Public supply – municipal
  - c. Public supply – rural water district
  - d. Purchase bottled water
  - e. I don't know
31. Please **check all** of the boxes that apply to your home drinking water system.
- I have a water treatment system (softener, etc.)
  - I have a water filter
  - I purchase 5 gallon containers of drinking water
  - I often use bottled water for drinking purposes
  - I never buy bottled water
  - I am satisfied with my drinking water (piped in house)
  - I am not satisfied with my current drinking water (piped in house)
  - My drinking water is separate from my water supply system
32. Do you feel that your home tap drinking water is safe to drink?
- a. Yes
  - b. No
33. Do you have your home drinking water tested?
- a. Yes
  - b. No

## PROTECTING AND PRESERVING WATER RESOURCES

34. In your opinion, what is the quality of groundwater (sources of well water) in your area?
- a. Good or excellent
  - b. Good, and improving
  - c. Good, but deteriorating
  - d. Fair
  - e. Poor, but improving
  - f. Poor
  - g. No opinion / don't know
35. In your opinion, what is the quality of surface waters (rivers, streams, lakes, channels, and wetlands) where you live?
- a. Good or excellent
  - b. Good, and improving
  - c. Good, but deteriorating
  - d. Fair
  - e. Poor, but improving
  - f. Poor
  - g. No opinion / don't know

36. Do you regard water **quantity** (having enough water) as a problem in the area where you live? (Circle **one** answer)
- a. Definitely not
  - b. Probably not
  - c. I don't know
  - d. Probably
  - e. Definitely yes

37. Do you know of or suspect that any of the following pollutants affect either surface or groundwater quality in your area?

Pollutant	Know it is NOT a problem	Suspect it is NOT a problem	Don't know	Suspect it IS a problem	Know it IS a problem
a. Pathogens (bacteria, viruses, germs)	1	2	3	4	5
b. Fertilizer/Nitrates	1	2	3	4	5
c. Fertilizer/Phosphates	1	2	3	4	5
d. Heavy metals (lead, arsenic, mercury)	1	2	3	4	5
e. Minerals (iron, manganese, calcium)	1	2	3	4	5
f. Pesticides	1	2	3	4	5
g. Salinity (water too salty)	1	2	3	4	5
h. Pharmaceuticals (antibiotics, personal care products)	1	2	3	4	5
i. Petroleum products	1	2	3	4	5
j. Algae	1	2	3	4	5
k. Product and waste water from mining	1	2	3	4	5
l. Septic systems	1	2	3	4	5

38. In your opinion, what is the quality of ocean waters off the coast of the Southern states?
- a. Good or excellent
  - b. Good, and improving
  - c. Good, but deteriorating
  - d. Fair
  - e. Poor, but improving
  - f. Poor
  - g. No opinion / don't know

39. In your opinion, which of the following are most responsible for the existing pollution problems in rivers and lakes in your state? (Check up to 3 answers)
- Forestry (wood harvesting)
  - Agriculture – crops
  - Agriculture – animals
  - Erosion from roads and/or construction, repair
  - Industry
  - Military bases
  - Septic systems
  - Runoff from home landscapes
  - Stormwater runoff
  - Landfills
  - Wastewater treatment plants
  - New suburban development
  - Oil wells and mining

40. Do you know what a watershed is? (Check **one** box)
- Yes
  - No

41. How well do you feel each one of these groups is fulfilling their responsibility for protecting water resources in your community? (Circle **one** answer per group)

Group	Very well	Moderately well	Don't know	Somewhat poorly	Very poorly
a. Federal government	1	2	3	4	5
b. State government	1	2	3	4	5
c. Your county, city, or town	1	2	3	4	5
d. Individual citizens	1	2	3	4	5

42. The likelihood of your area suffering from a prolonged drought is:
- a. Increasing
  - b. Decreasing
  - c. Staying the same
  - d. No opinion
43. The likelihood of your area having enough water resources to meet all of its needs 10 years from now is:
- a. High (likely enough water)
  - b. Medium
  - c. Low (likely not enough water)
  - d. No opinion

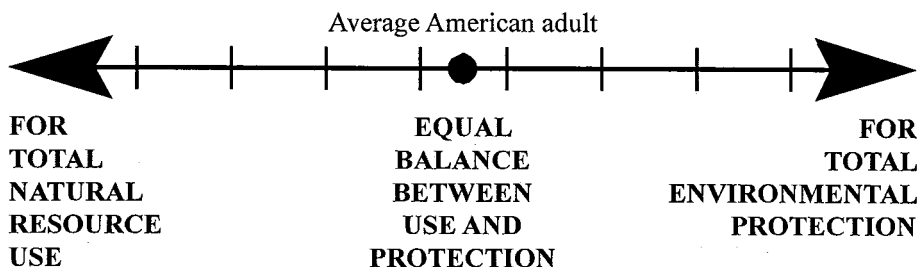
44. Have you or someone in your household done any of the following as part of an individual or community effort to conserve water or preserve water quality? (Check **all** that apply)

- Changed the way your yard is landscaped
- Changed how often you water your yard
- Changed your use of pesticides, fertilizers, or other chemicals
- Pumped your septic system (if you have one)
- Adopted new technologies (low flow faucets, etc.)

45. Have you received water resources information from the following sources? (Check **one** box per source)

	Yes	No
a. Cable television	<input type="checkbox"/>	<input type="checkbox"/>
b. Network television	<input type="checkbox"/>	<input type="checkbox"/>
c. Public television	<input type="checkbox"/>	<input type="checkbox"/>
d. Local newspapers	<input type="checkbox"/>	<input type="checkbox"/>
e. Major newspapers	<input type="checkbox"/>	<input type="checkbox"/>
f. Extension	<input type="checkbox"/>	<input type="checkbox"/>
g. Universities	<input type="checkbox"/>	<input type="checkbox"/>
h. Schools	<input type="checkbox"/>	<input type="checkbox"/>
i. Environmental agencies	<input type="checkbox"/>	<input type="checkbox"/>
j. Environmental groups	<input type="checkbox"/>	<input type="checkbox"/>
k. Magazines	<input type="checkbox"/>	<input type="checkbox"/>
l. Radio	<input type="checkbox"/>	<input type="checkbox"/>
m. Friends and family	<input type="checkbox"/>	<input type="checkbox"/>

46. Please place an X on the line below to indicate how you see yourself on environmental issues:



47. Have you participated in any of the following activities? (Circle **all** that apply)

- a. Master Gardener program
- b. Volunteer water quality monitoring
- c. Lake, river, bay, wetland, or watershed protection groups
- d. County, municipal, township or tribal commission meetings



48. Would you like to learn more about any of the following water quality issue areas? (Check **all** that interest you)

- Watershed management
- Watershed restoration
- Forest management and water issues
- Irrigation management
- Animal waste management
- Nutrient and pesticide management
- Private well protection
- Septic system management
- Protecting public drinking water supplies
- Water policy and economics
- Community actions concerning water issues
- Fish and wildlife water needs
- Home and garden landscaping
- Restoring fish and aquatic habitat
- Landscape buffers
- Shoreline clean-up

49. If you had the following kinds of learning opportunities to learn more about water issues, which would you be most likely to take advantage of? (Check up to **3** items)

- Read printed fact sheets, bulletins, or brochures
- Visit a web site
- Attend a short course or workshop
- Look at a demonstration or display
- Read a newspaper article or series
- Watch TV coverage
- Watch a video of information
- Take part in a onetime volunteer activity (for example, water monitoring, streamside restoration, or education)
- Take a course for certification or credit
- Get trained for a regular volunteer position (for example, as a watershed steward or a water quality monitor)
- Learn how to conduct a home, farm, or workplace water practices assessment
- Attend a fair or festival

50. Have you ever changed your mind about an environmental issue as a result of: (Check **all** that apply)

- News coverage (TV, newspapers, Internet, etc.)
- Conversations with other people
- Attending public meetings or participating in volunteer activities
- Classes or presentations
- Speech by an elected official
- Firsthand observation (field trips, etc.)
- Financial considerations

51. Do you think that the amount of rainfall in your area will change as a result of global warming?
- Yes, a significant increase in rainfall
  - Yes, a slight increase in rainfall
  - No, no change in rainfall
  - Yes, a slight decrease in rainfall
  - Yes, a significant decrease in rainfall
  - I don't know

**PLEASE ANSWER THE FOLLOWING AS THEY PERTAIN TO YOU**

52. Where do you live?
- Inside city limits
  - Outside city limits, not engaged in farming
  - Outside city limits, currently engaged in farming
53. The population of the city/town in which you live is:
- More than 100,000 people
  - 25,000 to 100,000 people
  - 7,000 to 25,000 people
  - 3,500 to 7,000 people
  - Less than 3,500 people
54. What is your zip code?  
ZIP CODE \_\_\_\_\_
55. How long have you lived in Texas?
- All my life
  - More than 10 years, but not all my life
  - 5 to 9 years
  - Less than 5 years
56. What is your gender?
- Male
  - Female
57. What is your age?  
\_\_\_\_\_ years old
58. What is the highest level of education you have completed?
- Less than high school or some high school
  - High school graduate
  - Some college or vocational training
  - College graduate
  - Advanced college or other professional degree

59. Where do you normally get your news? (Check **all** that apply)

- Local newspapers
- Major newspapers
- Radio
- Internet
- Local television
- National television
- Cable television
- Public television
- Magazines or newsletters

**THANK YOU FOR YOUR HELP**



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