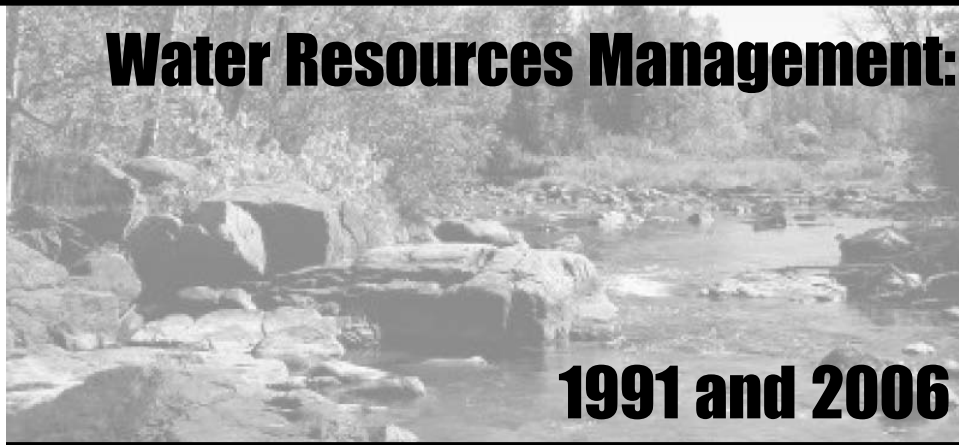


Pennsylvania Local Government and

Water Resources Management:



1991 and 2006

The Center for



Rural Pennsylvania

A Legislative Agency of the Pennsylvania General Assembly

Pennsylvania Local Government and Water Resources Management: 1991 and 2006

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Information contained in this report does not necessarily reflect the views of individual board members or the Center for Rural Pennsylvania.

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Project Summary

This research project was designed to help policymakers, local officials, and others improve local management of the quality and quantity of groundwater and surface water resources by identifying and describing current and future water resource issues in the commonwealth.

Through a 2006 mail survey of municipalities, the research measured water concerns, attitudes toward management responsibility, and municipal officials' aspirations about their future water management efforts.

The research compared the results of the 2006 survey with the results of a similar survey conducted in 1991. The comparison helped to identify trends in water resource issues over the past 15 years.

According to the 2006 research results, a majority of local government officials indicated that the quality of water in their municipality was good to very good, and the quantity of water was adequate. These officials were also aware that land uses pose threats to both groundwater and surface water.

In general, local officials said the quality of water in their municipalities had diminished in 2006 compared to 1991.

Introduction

Every day, Pennsylvania local officials make decisions that affect water resources. Trends in increasing water demands, more frequent droughts, and rising public concern about water availability and quality will likely make sound local decisions about water even more critical to the well being of Pennsylvanians.

This research project was designed to help policymakers, local officials, and others improve local management of the quality and quantity of groundwater and surface water resources. The goals of the research were to identify and describe the current and future water resource issues in the commonwealth. Other goals included the documentation of: current water management activities of local governments; knowledge and use of water management tools; and the educational, training and technical assistance needs of local governments.

Through survey instruments, the project measured water concerns, attitudes toward management responsibility, and municipal officials' aspirations regarding their future water management efforts.

The research provides a comparative analysis of the changes that have occurred relative to local government management of water resources since a 1991 survey from which the current (2006) survey was modeled. The 2006 survey provided information necessary to identify statewide trends over the past 15 years on water resource issues. Furthermore, the 2006 information allowed a region-by-region comparison of results to gain a better understanding of how Pennsylvanians in different areas of the state are managing their water resources, and what issues may be specific to their area.

Methodology

This research compared the findings of a 1991 Center for Rural Pennsylvania-sponsored survey of local government officials to a 2006 survey of the same population. To ensure that the 2006 survey included contemporary issues, key informants were selected from a range of organizations including non-governmental organizations, quasi-governmental entities, academia, and state agencies to provide professional input on the current state, needs, and issues of water resource management and local municipal participation in the process.

The key informant interviews resulted in an expansion of the 1991 survey from 25 to 33 questions. This allowed emerging issues, state planning measures, and other concerns to be assessed. The new questions focused on:

- Land use threats to surface water,
- County-level zoning coverage,
- County-level subdivision and land development ordinance coverage,
- Use of the State Water Plan in decision making,
- Knowledge of the Pennsylvania Water Resources Planning Act (Act 220) and its requirements,
- Contact with organizations that help with and/or focus on improved water management,
- Leadership in providing assistance to municipalities to address local water problems, and
- Attempts locally to identify and explore the use of new technologies for water management.

Twelve of the questions remained exactly the same and another seven were similar, but had slight wording changes. For instance, the 1991 survey routinely sought to survey attitudes relative to groundwater resources. When possible, the 2006 survey was expanded to refer to

groundwater and surface water collectively as “water resources.” Another wording revision was to phrase “intergovernmental” activities (as posed in the 1991 survey) as “multi-municipal” activities.

2006 Survey Administration

The researchers obtained a list of 2,556 Pennsylvania municipalities from the Governor's Center for Local Government Services¹. This list included the name and address of the municipality. The mailings were sent to the attention of the municipal secretary and the cover letter was directed to the “local government official.”

This list was provided to the Penn State Center for Survey Research where the survey was administered. The first mailing of the surveys began on April 4, 2006. Two subsequent mailings were also sent. The final mailing was sent to 1,939 non-responding municipalities.

At the end of the data collection period (July 1, 2006), the response rate for completed returns was 52 percent, very similar to the 1991 survey response rate of 53 percent.

Survey participants were asked to identify the position they held in their municipality. Their responses show that over half of the participants served as staff to their local governments. Just under half of the respondents identified themselves as government officials. Two and a half percent of the survey participants indicated that they were planning commission members.

¹ Data source taken from “Municipal Statistics” at www.newpa.com/default.aspx?id=137.

Results

2006 Survey

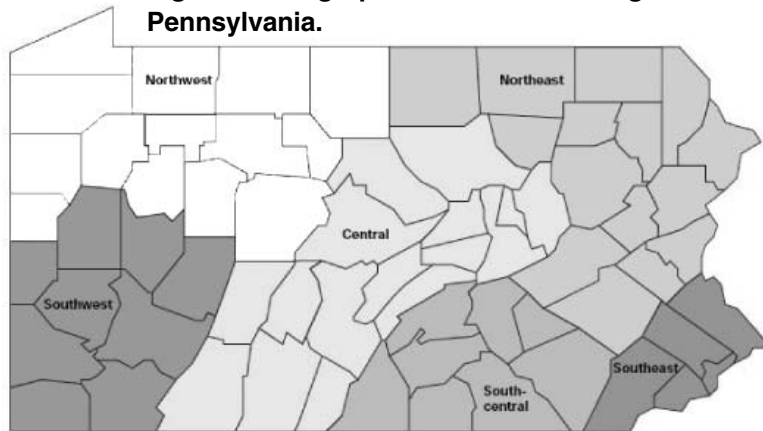
The 2006 survey did not define the terms surface water, groundwater, or water resources. Therefore, the responses received are based on the respondents understanding of these resources. Figure 1 illustrates the boundaries for the regions discussed within this report.

Selected results were evaluated by rural-urban classification, municipal type, and population. The rural-urban, municipal type, and population data were obtained from the Center for Rural Pennsylvania. The Center defines a municipality as rural when the population density within the municipality is less than 274 persons per square mile or the municipality's total population is less than 2,500 unless more than 50 percent of the population lives in an urbanized area, as defined by the U.S. Census Bureau. All other municipalities are considered urban.

Reliance on Groundwater

When respondents were asked how much their municipality relied on groundwater for its water supply, nearly 70 percent said their municipality relied on groundwater as the water supply and 19 percent said their municipality had little or no reliance on groundwater as a water supply. The results suggest that the respondents were generally aware of the degree to which their municipality relied on groundwater as a water supply. Regional differences in responses to this question showed that local officials in the southwest region, and to a lesser extent, the southeast region of the state, perceived a lower reliance on groundwater as a water supply (Figure 2). This perception may be due to these regions having a higher density, urban population that had grown around larger river systems

Figure 1: Geographic boundaries of regions in Pennsylvania.



Source: *An Inventory of Planning in Pennsylvania*. Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension.

and more access to surface water as a source. Generally, the more rural areas of the state acknowledged a heightened awareness of their dependence on groundwater as a water supply.

Water Quality

When respondents were asked for their opinion about the present quality of water in their municipality, 77 percent replied that water quality was either good or very good, 3 percent said their water quality was poor, and nearly 20 percent rated their water quality as “fair.” Statewide, the results suggest that, in general, respondents believe their municipality’s water quality is good; however, the western portion of the state perceived its water quality to be slightly lower than the central and eastern portions of the state.

When comparing urban local officials’ perceptions of water quality with rural officials’ perceptions, the researchers found a statistically significant difference (Figure 3).

The respondents were also asked about the future projection of water quality in their municipality. The 2006 survey asked participants for their opinion of what the water quality would be in the year 2010. Fourteen percent of survey participants said they expected their municipality’s water quality to diminish by 2010, 13 percent said the quality of water would improve in the future, and 65 percent expected the quality of water to remain the same as 2006. The southeast and southwest regions tended to believe that water quality would improve by 2010 (Figure 4), while the northeast and south central

Figure 2: Municipal reliance on groundwater for water supply. (mean response)

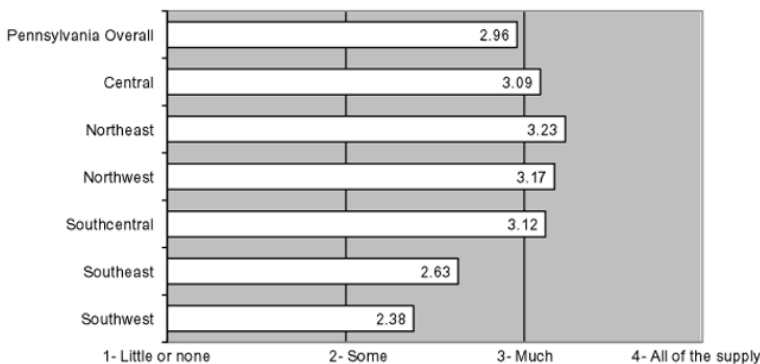


Figure 3: Rural vs. urban officials' perceptions of water quality.

	Rural (N=856)	Urban (N=431)
1. Very good	27 %	40%
2. Good	48%	44%
3. Fair	21%	14%
4. Poor	4%	2%
	100%	100%

regions indicated that water quality would worsen. Tourism and consequent development pressures in the northeast, and the south central's rate of growth and increase of industry are possible reasons for the slight tendency towards the belief that water quality was "getting worse."

Threats to Groundwater Quality

Respondents were asked their opinion about which land uses posed threats to the quality of groundwater in their municipality. Statewide land use activities identified as posing the greatest risk to groundwater quality were: septic tanks, highway de-icing salts, residential lawn chemicals, and agricultural activity (Figure 5 on Page 8). However, regional differences were apparent. For example, the southeast region identified residential lawn chemicals as the greatest threat to groundwater quality, while statewide, these chemicals were rated as the third greatest threat. Similarly, in the south central and central regions, agricultural activity was identified as the greatest threat to groundwater quality. Statewide, it was identified as the fourth greatest threat. Oil and gas drilling emerged in the western portion of the state as a more significant perceived threat to groundwater quality than in other regions of the state. This was expected given the extent of extractions that occur in the northwest and southwest. Statewide, the threat posed by oil and gas drilling was perceived to be one of the lowest threats – whereas in the northwest region, it showed up as one of the top

two threats, second only to septic tanks.

Threats to Surface Water Quality

Survey participants were also asked to consider the degree to which the same land use activities threatened surface water quality in their municipalities (Figure 6 on Page 8). Statewide, highway de-icing salts, agricultural activity, construction site runoff, and residential lawn chemicals were identified as the greatest threat to surface water quality.

Water Quantity

Respondents were also asked questions about the adequacy of water supply in their municipality: less than 4 percent replied that the water supply was not adequate or barely meeting the municipality's water needs. Seventy percent of respondents said their municipality's water supply was either adequate or abundant. However, 27 percent indicated that, while their water

supply was usually adequate, occasional shortages occurred. Regionally, the south central region tended to respond that the water supply was adequate, but that occasional shortages occurred, more so than other regions.

Among urban and rural local officials, urban officials tended to indicate that their water supply was more adequate than rural officials tended to indicate. (Figure 7 on Page 8). The rural – urban comparison on water adequacy was statistically significant.

Respondents were also asked about the future adequacy of the water supply in their respective municipalities. Seventy-eight percent of respondents believed that their water supply would stay about the same or possibly improve by the year 2010. However, 15 percent of survey participants indicated their municipality's water supply would be less adequate by 2010. Seven percent of respondents did not know what the adequacy of water supply would be in the year 2010.

Figure 4: Mean response by region to question: What do you expect of the quality of water in your municipality in 2010? 1=Improve. 2 = Stay about the same. 3= Get worse.

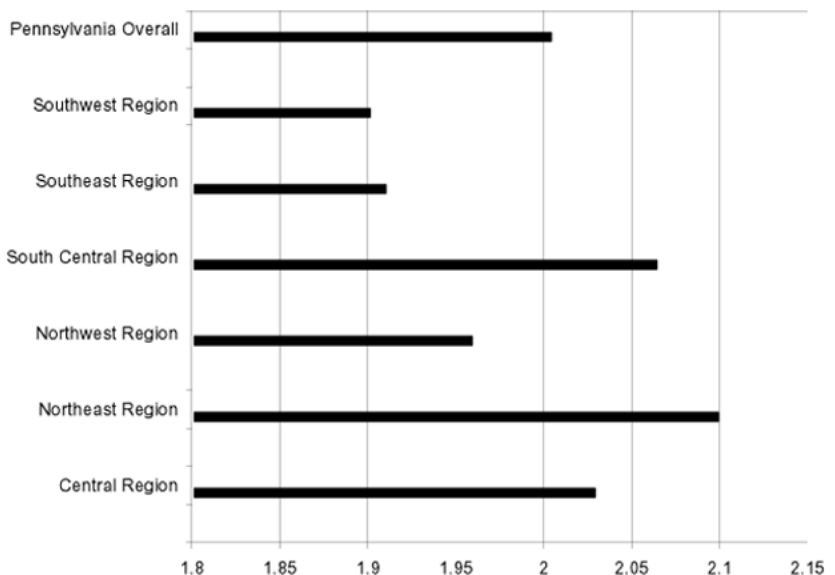


Figure 5: Selected land uses that respondents chose as the leading threat to groundwater quality. (Number of responses is in parenthesis)

Activity	None	Some	A great deal	Don't know
Agricultural activity	37% (474)	47% (596)	12% (155)	4% (56)
Construction site runoff	35% (458)	49% (620)	9% (117)	6% (78)
Highway de-icing salts	25% (320)	60% (772)	8% (99)	7% (87)
Residential lawn chemicals	28% (357)	55% (696)	7% (92)	10% (132)
Septic tanks	26% (331)	53% (683)	15% (193)	6% (71)

Figure 6: Selected land uses that respondents chose as the leading threat to surface water. (Number of responses is in parenthesis)

Activity	None	Some	A great deal	Don't know
Agricultural activity	30% (378)	50% (632)	15% (192)	4% (52)
Construction site runoff	29% (366)	50% (629)	14% (175)	6% (79)
Highway de-icing salts	19% (242)	62% (769)	13% (157)	6% (78)
Residential lawn chemicals	25% (305)	55% (687)	11% (136)	9% (113)
Septic tanks	30% (367)	53% (656)	11% (138)	6% (79)

Threats to Water Quantity

Survey participants were asked to identify the degree to which the following community changes or natural occurrences threatened water quantity in their municipality: drought, rapid population growth, business/industrial expansion, increased water use by existing population, mining impact, increased agricultural use, increased land development, transportation/road building maintenance, flooding, industrial accident, and other. Respondents indicated that drought (93 percent), increased land development (70 percent), increased water use by the existing population (67

percent), rapid population growth (64 percent), and flooding (58 percent) posed the highest threats to the water supply. (Figure 8).

Groundwater as a Community Issue

Survey participants were asked whether groundwater was an issue in their municipalities. This question was designed to measure the degree to which groundwater was considered an issue in the community and the level of existing local government efforts to manage the resource. Fifty-five percent of respondents indicated that groundwater was not an issue in their municipality. The remaining 45

percent responded that groundwater was either becoming an issue, or was already an issue and local government officials were considering what could be done to protect and manage their groundwater, or that local government was already gathering or using management tools and was either actively involved or becoming so in comprehensive groundwater management.

In general, municipalities that reported groundwater as a growing issue had the greatest number of households that relied on groundwater. In municipalities where more than 50 percent of households relied on community water systems, the perception that groundwater was “not an issue” was less frequent. In municipalities where groundwater was currently an issue, increasing groundwater concern and management was correlated with municipalities with greater household reliance on community water systems.

As a follow up to this question, survey participants were asked about the importance of groundwater in comparison to other issues facing their local government. One quarter of respondents indicated that groundwater management was of little importance in comparison with other issues. Nearly two-thirds of respondents indicated that groundwater management was either important or equal to other important issues— but of secondary importance. Thirteen percent of respondents believed groundwater management was of prime importance to their local governments.

Survey participants were also asked to consider their municipality’s resources, such as budget, personnel and time, and to identify their municipality’s highest priority issues. In this open-ended question, and considering where their municipality’s resources were devoted, respondents were asked to identify their local government’s

Figure 7: Rural-urban comparison of perceived adequacy of water supply. (percentage)

	Rural(N=865)	Urban(N=432)
1. Abundant supply	12.83	24.54
2. Adequate supply	51.56	55.09
3. Usually adequate	31.56	18.98
4. Barely adequate	2.43	0.23
5. Not adequate	1.62	1.16
	100.00	100.00

Figure 8: Identified as threats to adequate water quality. (Number of responses is in parenthesis)

Threats	None	Some	A great deal	Don't know
Drought	6% (74)	50% (652)	43% (550)	1% (18)
Flooding	35% (444)	48% (617)	10% (134)	7% (88)
Increased land development	26% (335)	50% (639)	20% (261)	4% (45)
Increased water use by existing population	31% (398)	56% (714)	11% (139)	2% (28)
Rapid population growth	33% (422)	44% (568)	20% (254)	3% (42)

three highest priority issues. Responses were collated into 16 categories so that the results could be compared with a similar question posed in the 1991 survey. Overall, funding mechanisms, such as finances, taxes and grants, were identified as one of the highest priorities (20 percent). The second highest priority identified was roads and roads maintenance (19.5 percent) and third, government management

and general services (9.7 percent) (Figure 9).

Experience with Planning— Water and Land Use

Survey participants were asked whether their municipality was covered by a county zoning ordinance. Almost one-third reported that their municipality was covered by a county zoning ordinance. Nearly two-thirds said their municipality was

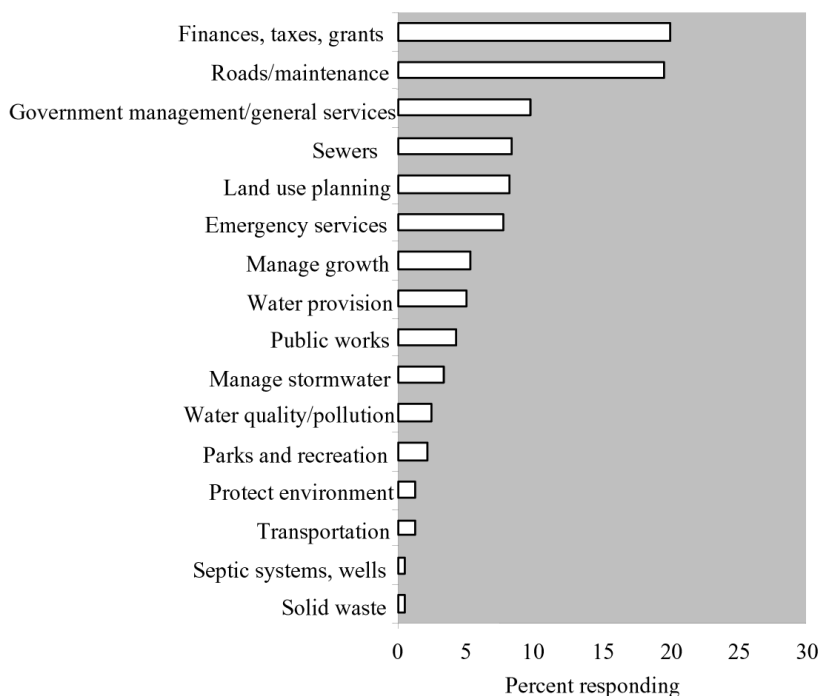
not covered by a county zoning ordinance or that they did not know whether it was covered by a county zoning ordinance. However, based on information provided by the Pennsylvania Department of Community and Economic Development (DCED), only 182 municipalities statewide are covered by their county's zoning ordinance – representing 7 percent of all municipalities.²

A follow-up question asked respondents whether their municipality was covered by a county-level subdivision and land development ordinance. Almost half of respondents indicated that their municipality was covered under a county-level subdivision and land development ordinance and 43 percent responded that their municipality was not. Eight percent were not aware of whether their municipality was covered by a county-level subdivision and land development ordinance. According to DCED records, there are approximately 1,000 municipalities in Pennsylvania that are covered by their county's subdivision and development ordinance, representing about 39 percent of municipalities statewide.

The responses to these local planning questions varied greatly, depending on the region of the state (Figure 10 on Page 10). This result may indicate that municipalities in certain regions were more likely to have their own ordinances for these activities. There was less variance in regional response to the question about whether municipalities were covered by county zoning ordinances – with generally less than 35 percent of respondents indicating such coverage.

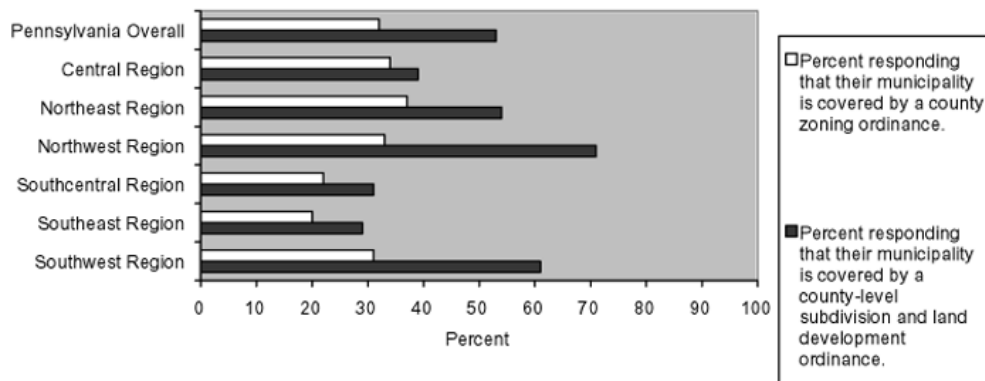
Survey participants were also asked a two-part question on whether their municipalities had certain planning or management tools including:

Figure 9: Considering your municipality's resources – budget, personnel, time, etc. – what are the highest priority issues for your local government? (percent responding)



² 2005 State Land Use Growth Management Report, DCED.

Figure 10: Local planning issues – percentage of municipalities by region covered by county ordinances.



zoning, subdivision regulations, site plan review, maintenance of open space, floodplain management, prohibition of activities likely to pollute, purchase of property or development rights, household hazardous waste collection, and building permits. Respondents who identified a particular tool were then asked to identify the frequency with which the planning and management tool was used.

Building permits was the tool identified with the greatest frequency throughout the state and regionally, followed by floodplain management, and subdivision plans. (Figure 11). The results are also shown by municipality type (Figure 12).

The survey participants were then asked to indicate the frequency in

which water quality or quantity was considered when the identified tools were employed by their municipality (Figure 13).

Throughout Pennsylvania, water quality and quantity appeared to be generally considered in conjunction with the use of the identified tools. An exception to this was a slight tendency in the northwest region to indicate that water quality and quantity were considered less in conjunction with building permits. There was a slight tendency in the northwest and southwest regions to not consider water quality and quantity in conjunction with floodplain management tools.

When asked about any additional water management activities or tools used by their municipality, respon-

dents most frequently identified storm water management, erosion and sedimentation control, and design standards for wells, septic tanks, or underground storage tanks.

Nearly 20 percent of respondents said that the planning and management tools identified previously were developed or applied to a specific groundwater problem or potential problem.

For the 244 respondents who had indicated yes to the previous question, the survey revealed that the tools and activities had been applied to both surface water and groundwater. Twenty-seven percent were applied only for groundwater and 21 percent to surface water alone.

The survey asked whether respondents' municipalities had entered into multi-municipality agreements or participated in any cooperative efforts with other municipalities regarding land use or water planning. The results show that more than 25 percent of respondents said their municipality had engaged in multi-municipality agreements. The remaining 73 percent said their municipality had not engaged in such efforts.

The nature of land use cooperation for the 27 percent of respondents who indicated their municipality had conducted such activities was primarily comprehensive-planning-based at the regional level (several municipalities) or in some cases, on a county level. Other land use cooperative efforts mentioned included regional plans for wellhead protection, transportation, zoning, agricultural security areas and park and open space, to name a few. Water planning that was most often cited included emergency water supply planning, provision of public water supplies,

Figure 11: Percent respondents, by region, indicating their municipality has specific planning or management tools.

	Central Region	Northeast Region	Northwest Region	South-central Region	Southeast Region	Southwest Region	Pennsylvania Overall
Zoning	46.0	59.4	37.6	76.3	88.0	48.5	56.2
Subdivision regulations	58.1	67.6	48.1	80.6	85.2	51.5	62.8
Site plan review	46.0	65.1	35.0	80.6	83.3	51.9	57.5
Maintenance of open space	17.7	27.4	5.9	42.5	66.7	19.7	25.8
Floodplain management	64.1	69.8	48.5	71.0	73.1	60.1	63.4
Prohibition of activities likely to pollute	19.8	34.2	17.7	33.3	51.9	26.6	28.6
Purchase of property or development rights	11.3	14.9	7.6	15.1	47.2	9.4	15.0
Household hazardous waste	9.7	11.7	8.0	22.6	49.1	15.0	16.1
Building permits	81.9	85.4	79.0	85.5	86.1	73.8	81.8

Figure 12: Percent respondents, by municipality type, indicating that their municipality has specific planning or management tools.

Planning or management tools	First class township (N=39)	Second class township (N=789)	Borough (N=466)	City (N=24)
Zoning*****	82	51	61	92
Subdivision regulation*****	82	67	54	75
Site plan review*****	80	59	53	79
Maintenance of open space****	54	25	25	38
Floodplain management****	80	68	55	63
Prohibition of activities likely to pollute *****	54	25	33	42
Purchase of property or development rights*****	26	16	12	38
Household hazardous waste collection*****	41	13	18	38

Chi sq test: ***** = $p < 0.0001$; **** = $p < 0.001$

regionalized sewer treatment, storm water management planning, MS4³ planning, and high quality stream protection.

Survey participants were asked whether organizations that help with and/or focus on improved water management had direct contact with their local government. Fifty-four percent of respondents indicated that there had not been contact with organizations for this purpose. Twenty-eight percent reported that they were aware that these types of organizations had been in direct contact with their local government, while 18 percent of respondents stated that they did not know whether organizations with this interest had been in contact with their local government. The respondents who had identified organizations that work on improved water management cited a wide variety of groups with which they had interacted. Included were: state agencies, like DEP; state-based nongovernmental organizations (NGOs), such as the Pennsylvania Rural Water Association; regional and local authorities, like the Susquehanna River Basin Commission, and smaller, county or multi-municipal-based water authorities; county organizations, such as the planning offices or conservation

³ MS4 – Municipal Separate Storm Sewer Systems

districts; and local environmental, non-profit organizations, such as watershed associations, conservancies and land trusts. Respondents primarily identified the contact with these groups as being for informational purposes. However, a portion of the respondents also mentioned the development of funding opportunities through grants as a reason for the contact.

Municipal Perspectives and Needs Related to Water Resources

Survey participants were asked to determine the degree to which a series of factors, such as the lack of authority, money, political support, community awareness, industrial support, data/information, and technical assistance, limited their municipality's water management efforts. Participants were also asked to consider whether resistance to

land-use planning, the need to cooperate with other units of government, the political status or power of the major polluter, and number (or severity) of contaminants were limitations to water management efforts. Statewide, respondents cited lack of money as the greatest limitation to municipalities' water management efforts. The regional analysis also indicated that a lack of community awareness was a limitation to municipal efforts.

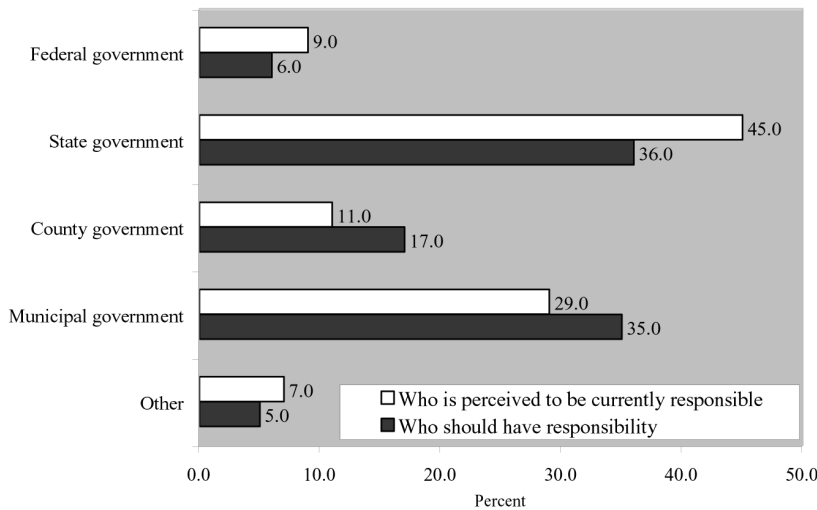
Survey participants were asked in an open-ended question what things they believe need to happen for their municipality to increase its water planning and management activity. The responses were grouped into categories that were identified in the 1991 survey, which included funding, public awareness, learning about pollution, growth, the need for state guidance, loss of water, and local municipal management. Respondents identified funding (28 percent) and public awareness (25 percent) as the greatest needs for increasing water planning and management activities.

When asked about the support received by various groups for their efforts to manage water, the respondents identified community, county, and political leaders, along with state officials and agencies. Regionally, the same groups were identified except in the southeast region, which indicated that citizen environmental

Figure 13: Percentage of respondents specifying how often water quality and/or quantity is considered when employing the planning and management tools listed below.

Planning or management tools	How often is water considered?		
	Never or Rarely	Sometimes	Regular Basis
Zoning	31	30	39
Subdivision regulation	20	28	52
Site plan review	18	27	55
Maintenance of open space	29	38	34
Floodplain management	22	31	47
Prohibition of activities likely to pollute	17	29	53
Purchase of property or development rights	40	33	27
Household hazardous waste collection	40	29	31
Building permits	30	28	37

Figure 14: Who is perceived to have primary responsibility for water management and who should have responsibility? (percent)



groups were also supportive of water management efforts. The level of support from citizen environmental groups noted by the southeast region was not as evident statewide or in other regions.

The top three preferences for the types of assistance needed at the municipal level relative to local water problems were the need for funding, education, and technical assistance. The fourth most frequently identified need was for data on local water. Nearly 70 percent of respondents indicated that funding was the highest need – both statewide and regionally.

When asked to identify who they believed had primary (and current) responsibility for water management, respondents clearly indicated that state (45 percent) and municipal (29 percent) government had the primary responsibility for water management. (Figure 14). About 9 percent of respondents identified the federal government, 11 percent identified county government, and 7 percent stated that others, namely citizens, should bear primary responsibility for water management. However, water authorities and water companies were also identified. Overall, this result seems to suggest a preference for the state to have primary responsibility.

When asked to identify which of

these groups *should* have primary responsibility, about 35 percent of respondents suggested municipalities. State government was identified by about 36 percent of the respondents as the entity that should have primary responsibility for water management, 9 percentage points fewer than the respondents’ indication of the state’s current responsibility for water management. Municipal government was identified by 35 percent of respondents as the entity that should have primary responsibility for water management, up six percentage points from the perception of their current level of responsibility. Federal government’s responsibility decreased and county government’s responsibility increased in this response.

State Water Plan, Pennsylvania Water Resources Planning Act (Act 220), and Outreach

In the 1970s, Pennsylvania developed a State Water Plan for all regions of the commonwealth. The survey asked whether the respondents’ municipalities had used information from the plan for their water planning and management. The respondents who indicated that their municipalities had used the plan comprised less than 3 percent of the total responses. The remainder of the responses were

either “don’t know” or “no” – suggesting that public officials were either unaware of the plan’s use by their municipalities or were aware that their municipalities had not used the plan at all.

The Pennsylvania Water Resources Planning Act (Act 220) was passed in 2002, enabling an update of the State Water Plan. Local officials were asked about their level of awareness of Act 220 and its requirements. The survey results indicated that less than 20 percent of respondents knew a great deal or somewhat about Act 220 and 83 percent knew little or nothing about it.

The researchers compared rural and urban local officials’ ratings of how much they knew about Act 220 and found that rural officials knew less about this law than urban officials. For example, 60 percent of rural officials reported knowing nothing about Act 220 compared to 45 percent of urban officials .

When comparing knowledge of Act 220 by municipal type, it is clear that second class townships indicated the overall lowest level of awareness of Act 220 in comparison with other municipal types.

Sixty-two percent of respondents from second-class townships knew nothing of Act 220, compared with 50 percent of first class townships, 44.5 percent of boroughs, and 37.5 percent of cities. Fewer than 12 percent of local officials from townships of the second class believed they knew either “some” or “a lot” about Act 220 in comparison with 14 percent from first class townships, 26 percent from boroughs, and 33 percent of the responding cities.

Seventy-three percent of survey participants had indicated that their municipality had not developed or sponsored any educational or citizen participation activities on water quality/quantity. The remaining respondents indicated that their municipality had sponsored or

developed educational or citizen participation activities related to water quality and quantity. For all regions, the most common educational tool employed was print materials, such as brochures, and the second most common tool was public meetings, followed by newspaper articles and community education programs. Water conservation programs were generally offered less frequently by municipalities as a part of their water quality and quantity educational activities.

Comparison of 2006 and 1991 Survey Results

Selected 2006 survey questions and 1991 survey questions were compared in as part of the research project. As noted earlier, the response rate for the 2006 survey was about 52 percent. In 1991, the response rate was 53 percent.

Comparisons between the 1991 and 2006 survey results were possible at the state level only for 12 similar questions. Where results are presented for these several questions, the reader is cautioned.

A difference between mean responses between the 1991 survey and 2006 survey at the 0.05 confidence level is noted as being significant. A difference between mean responses at the 0.01 confidence level is noted as being highly significant. Differences noted at these levels of confidence will result in a conclusion that there is a significant difference between survey years. In some cases, statistical significance at a lower level of confidence (0.10) is noted, but no definitive conclusions are made.

Water Quality

Municipalities that relied on groundwater for “all of their supply” decreased slightly (by about 3 percent) from 1991 to 2006. On a statewide level, municipal reliance on groundwater did not change

significantly over the 15-year period.

In terms of water quality, there was a slight decline in the percentage of respondents who believed the present water quality in their municipality was “very good.” There was a slight increase from 1991 to 2006 in the percentage of respondents who thought their water quality was “fair” and those who thought it was “poor.” Overall the results show a decline in municipal officials’ perception of the present quality of their water supply.

Water Quantity

From 1991 to 2006, there was a small decline in the percentage of respondents who believed that the present water supply in their municipality was adequate. On a statewide basis, municipal officials’ views about the adequacy of the water supply remained unchanged over the 15-year period. Moreover, on a statewide basis, municipal officials’ views about the future adequacy of their supply remained relatively unchanged over the 15-year period.

Threats to Groundwater Quality and Quantity

Local officials felt that most land uses were a greater threat to groundwater quality in 2006 than in 1991. The land uses that changed the most in their threat level were: construction site runoff, residential lawn chemicals, agricultural activity, and highway de-icing. Only landfills were ranked as relatively less of a threat to groundwater quality in 2006 compared to 1991. From a statewide perspective, local officials perceived all other land uses – underground storage tanks, municipal sewage, mining, hazardous waste, industrial waste, and septic tanks – to have remained about the same over this period.

Groundwater’s Importance at the Local Level

In 1991, about 22 percent of

respondents reported that groundwater already was an issue in their municipality. In 2006, the percentage of respondents reporting that groundwater was an issue increased to about 27 percent. Based on the analysis, Pennsylvania’s municipal officials definitely perceived that groundwater was increasing in importance as a community issue over the 15-year period.

Experience with Planning – Water and Land Use

In both survey years, respondents were asked a two-part question on whether their municipalities have any of the following planning or management tools: zoning, subdivision regulations, site plan review, maintenance of open space, floodplain management, prohibition of activities likely to pollute, purchase of property or development rights, household hazardous waste collection, and building permits. In both 2006 and 1991, respondents selected building permits, floodplain management, subdivision regulations, site plan review, and zoning as the top five planning and management tools. Looking over all of the tools, municipalities reported a decline in having these tools over time. The exceptions were site plan review and household hazardous waste collection, for which a similar number of municipalities reported having in 1991 and 2006. The tools for which municipalities reported the biggest changes were: floodplain management (-15 percent), prohibition of activities likely to pollute (-13 percent); building permits (-6 percent) and subdivision regulations (-5 percent).

Respondents were also asked how often water quality and/or quantity was considered when employing these tools. There was a decline in responses that water was “never or rarely” considered for almost all tools (exception was building permits)

from 1991 to 2006. There was an increase in the percent of respondents who said water was “sometimes” and “regularly” considered when using all the tools except zoning and building permits. Moreover, for most of the tools, water appeared to be more frequently considered as a factor in decision-making in 2006 than in 1991.

Overall, water quality and/or water quantity factors were more frequently considered in the application of a variety of local government decisions over time, especially in the areas of open space maintenance, purchase of property or development rights, household hazardous waste collection, and building permits.

A question was asked about use of any additional water management activities or tools in the local official’s municipality. In 1991, the most frequently used tools were: design standards for wells, septic systems, and underground storage tanks (52 percent), storm water management (50 percent), erosion and sedimentation controls (44 percent), identifying potential pollution threats (21 percent), and municipal water plans (19 percent). In 2006, the percentage of municipalities with additional water activities or tools increased for all items except monitoring well water and municipal water plans. The most frequently identified activities or tools in 2006 were storm water management (64 percent, up 14 percent from 1991); erosion and sedimentation controls (58 percent, up 14 percent from 1991); design standards for wells, septic systems, and underground storage tanks (55 percent, up 3 percent from 1991); natural resource districts (e.g. wellhead protection, aquifer recharge area, watershed protection area – 22 percent, up 8 percent from 1991); and identifying potential pollution threats (20 percent, down 1 percent since 1991).

Municipal activities or tools for

water quantity management appeared to increase in relatively minor ways over the 15-year time period. For example, water conservation programs only increased from 15 percent to 16 percent of municipalities that reported using them. Another small, but positive sign – both for groundwater quantity and quality – was that comprehensive groundwater management planning was mentioned by 8 percent of municipalities in 2006, compared to 6 percent in 1991. However, the use of municipal water plans declined slightly from 19 percent to 18 percent from 1991 to 2006.

The use of storm water management, erosion and sedimentation control plans, natural resource districts (such as wellhead protection, aquifer recharge area, and watershed protection area) and comprehensive groundwater planning were the only tools that significantly increased over the 15-year period.

In 1991, 13 percent of those surveyed said planning and management tools were developed or applied to a specific water problem. In 2006, 19 percent responded similarly. The researchers concluded that there was an increase in municipalities that applied selected planning and management tools to a specific water problem or potential problem over the 1991 to 2006 period. In 1991, 39 percent of municipalities reported that communication between the municipality’s water provider and those making land use decisions never occurred. In 2006, the situation had improved slightly since those reporting that no such communication had occurred dropped 5 percentage points to 34 percent. Also, those municipalities that reported frequent communication increased slightly, from 14 percent to 17 percent. While relatively minor, the positive change in responses was highly significant. Moreover, it appears that some small but important strides are being made

in terms of frequency of communication between water providers and those making land use decisions at the local level in Pennsylvania.

In 1991, 18 percent of respondents reported that their municipality had entered into multi-municipality agreements or participated in cooperative efforts with other municipalities regarding land use and water planning. In 2006, the percentage of municipalities entering into multi-municipality agreements or participating in any cooperative efforts with other municipalities grew to 27 percent. Thus, the efforts of municipalities to cooperate with each other over land use and water planning increased significantly over the 15-year period.

In 1991, 15 percent of respondents’ municipalities sponsored or developed educational or citizen participation activities on water quality and quantity. The most frequently reported activities were public meetings, news articles, brochures and water conservation programs. In 2006, 27 percent of municipalities reported having sponsored educational or citizen participation activities regarding water quality and quantity. The most frequently reported activities were brochures, public meetings, news articles and water conservation programs. The use of local groundwater surveys, while only used by a small percentage of municipalities, did increase a great deal since 1991 (5 percent versus 8 percent in 2006).

To increase their water planning and management activities, in 1991, respondents said municipalities would need the following: funding (19 percent), public awareness (15 percent), learning of pollution (12 percent), growth (7 percent), and state guidance (7 percent). In 2006, funding and public awareness were number one and two, but the frequency with which they were mentioned increased significantly

(26 percent and 25 percent, respectively). This was followed by greater cooperation among agencies, governments, developers and

organizations (7 percent), better-qualified staff (6 percent), loss of water (6 percent), and state guidance (5 percent). Over the longer view, it

appeared that local officials further appreciated the critical role of funding and public awareness. In addition, over the 15-year period,

Figure 15: Comparison of key findings of the 1991 and 2006 surveys

Key Findings – 1991 Survey	vs.	Key Findings – 2006 Survey
Priority Given to Water		
1991		2006
More than 80 percent of respondents indicated that their communities receive all or part of their supply from groundwater. However, groundwater issues were not a high priority concern to local governments, and few municipalities had management programs in place.		Little change occurred in municipal reliance on groundwater over the 15-year period between surveys. Interest and awareness of groundwater as a community issue, however, has increased significantly since 1991. Groundwater issues have not gained in relative importance compared to other issues local governments face, such as finances and taxes.
Consideration of Water in Land Use Planning		
1991		2006
The majority of municipalities reporting a moderate level of concern for groundwater considered water in their land use deliberations at least “sometimes.” The majority of municipalities recognized the pollution preventative nature of land-use controls, but water was not consistently considered in planning deliberations.		Land use tools were increasingly used with consideration of water quality and quantity. There was a decline in the number of respondents indicating that water was “never” or “rarely” considered when land use tools were used. Surprisingly, an overall decline in the availability of tools available to municipalities is observed in comparison to the 1991 responses.
Multi-Municipal Land Use and Water Planning		
1991		2006
Very little intergovernmental cooperation occurred regarding land use or water planning. Only 18 percent of local officials indicated that their municipality had participated in intergovernmental agreements or efforts regarding land use or water planning.		The percentage of municipalities using multi-municipality agreements or participating in cooperative efforts regarding land use and water planning increased significantly. 27 percent of respondents reported multi-municipal efforts involving land use and water planning, an increase of almost 10 percent from 1991.
Barriers to Water Management		
1991		2006
Funds, community awareness, and information of local groundwater issues were identified by local officials as barriers to water management. However, certain types of communities, such as those with higher incomes, population levels, and a perceived lower water quality, were taking steps to manage groundwater resources.		Funding, and, to a lesser extent, education, were identified by local officials as needs for addressing water resource management. The need for local data decreased.
Opinions About Water Management Responsibility⁴		
1991		2006
More than 40 percent of municipal officials identified the state as having primary authority for groundwater management while almost one-quarter identified local governments.		Little change occurred in the attitudes about who currently has or should have responsibility for water management.

⁴ This question was asked slightly differently in 2006 than in 1991 – “responsibility for water management” versus “responsibility for groundwater management”.

more local officials identified the role of greater cooperation among agencies, governments, developers and organizations, and qualified staff as critical factors affecting water planning and management. Interestingly, learning of pollution and

growth were identified less frequently in 2006 than in 1991. State guidance and loss of water were identified at roughly the same, although slightly less, frequency in 2006 than 1991. The key results from the 1991 and

2006 surveys are summarized side by side in Figure 15 on Page 15. The five categories listed in the table provide a useful framework for representing the breadth of information obtained in both surveys.

Conclusions and Policy Considerations

This section briefly describes the major findings. Following each category of findings, policy implications are identified. Where the survey results allowed, specific recommendations and policy implications are given. In some cases, the finding from the survey helped identify the implication but not necessarily the response to address it.

Conclusions Based on 2006 Results Groundwater Quantity

Municipal leaders in areas with large river systems have a lower perception of reliance on groundwater. While this may generally be accurate given the presence of surface water treatment systems in these areas (e.g. municipalities near the Schuylkill River in southeast Pennsylvania and near the Ohio River and its tributaries in southwest Pennsylvania), it also raises the question of whether officials in these areas understand the interconnections between the availability of surface water (base stream flow) and the integral role of groundwater in sustaining surface water supplies.

Municipal officials in rural areas of the state perceive, to a greater degree than officials in urban areas, that their water supply is dependent upon groundwater. Residents of rural areas likely have a heightened awareness of well-supplied drinking water, and consequently, groundwater as a source of water supply. From the survey, it appears that water supply adequacy is a greater problem in rural areas. However, groundwater was perceived to be less of a community issue in rural areas than urban areas. As far as groundwater quantity specifically, the researchers found that rural officials perceived their water supply – more likely to be groundwater than surface water – to be less adequate than officials in urban areas.

Policy Implication: Water resource education is essential in rural and urban communities alike to ensure that citizens and public officials understand the connections between groundwater and surface water, and how the water quantity and quality of each of these resources is affected by private or public actions. The current school-aged population will increasingly receive this education as the Pennsylvania Department of Education's

Academic Standards for Environment and Ecology has a benchmark for understanding the interconnectedness of groundwater and surface water. The adult population can be better served through increased and ongoing public outreach via radio, newspaper, and television programming as well as community meetings. Improved education is possible through improved partnerships between entities that have water resources outreach as a part of their mission including DEP, conservation districts, U.S. Department of Agriculture (USDA) Resource Conservation and Development Councils (RCDs), Penn State Cooperative Extension, non-governmental organizations, the network of state- and local level watershed organizations and partnerships that extend beyond the state's boundaries, such as the Mid-Atlantic Regional Water Program, a collaborative effort between the U.S. Department of Agriculture and the land grant universities of Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia.

Water Quality

A majority of local officials indicated that the quality of water in their municipality was “good” to “very good.” Officials in the southeast and northeast regions of the state said their water quality was better than other regions. Yet, when asked about their expectations for their municipalities' water quality for the year 2010, officials in these two regions more strongly believed that their municipality's water quality would worsen. This perception may be an indication of the regions' concerns about how population growth will influence the quality of water, particularly the areas of greater Philadelphia and the Poconos (as reflected in the data for the southeast and northeast regions, respectively). The indication for these regions of worsening water quality over the course of the next four years result from municipal officials' expectations of further population increases and accompanying growth-related environmental threats.

Threats to Groundwater

The 2006 survey clearly indicates that local officials were aware that land uses pose threats to groundwater

quality. The survey provides a better understanding of which land uses local officials are most concerned about as threats within their region. On a statewide basis, septic tanks, highway de-icing, agricultural activity, residential lawn chemicals, and construction site run-off were identified by municipal leaders as the land uses that posed the greatest threats. Yet, for the northwest and southwest regions, the greatest threat identified was oil and gas drilling. The elevation of residential lawn chemicals as a threat to groundwater supply on a statewide basis appears to have been influenced by the prevalence with which it was recognized as a threat in regions with large cities – most notably, the southeast region. Given the amount of conversion of ag-lands to residential areas in rural areas, the threat of residential lawn chemicals to groundwater quality is also relevant in these transitioning areas. As a result, it is a possible opportunity for communication and education. However, on a statewide basis, for groundwater pollutants that are likely to be transported to groundwater via storm water, a relatively small proportion of responding municipal officials – 25 percent and 36 percent for highway de-icing and construction site runoff, respectively – believe these activities do not pose any threat to groundwater. Continued efforts by state government agencies and non-governmental organizations, such as the Pennsylvania Rural Water Association (PRWA), League of Women Voters Water Resources Education Network (WREN), and state-based or local watershed organizations to educate local decision makers on groundwater quality issues, especially about residential lawn chemicals in developing areas, and state-wide about highway deicing salts and construction run-off are needed.

Policy Implication: (a) An opportunity exists for government agencies to develop and provide region-specific guidance for water quality protection. This approach could address regional differences in land use activities that pose the greatest threat to groundwater quality, according to the perceptions of local officials identified in the survey. (b) Local officials and rural residents, particularly in regions without major cities, are also in need of educational campaigns about the potential of residential lawn chemicals to impact groundwater quality. This threat is not confined to urban/suburban areas, although educational campaigns have more typically targeted cities. DEP, in collaboration with the Susquehanna River Basin Commission, the Delaware River Basin Commission, other local authorities, and watershed organizations (such as the Chesapeake Bay Foundation) have experience in conducting outreach campaigns on this topic.

Threats to Surface Water

Local officials participating in the survey believed land uses posed a slightly greater threat to surface water than to groundwater. The exception to this was for land uses where septic tanks or underground storage tanks are located. Here the perception was that groundwater was more threatened. The belief that land uses pose a greater threat to surface water suggests there is a need for continued and improved education about the interconnections between groundwater and surface water quantity and quality. This is particularly true in the karst (with limestone rock underlying them) areas of the state, where there is large and continuous movement of water between surface water and groundwater sources. These areas also are more susceptible to groundwater contamination from surface sources.

Water Supply

Local officials strongly believed that, presently, the water supply in their municipality was adequate. Almost 3 percent of respondents stated their municipality's supply was either barely adequate or not adequate. Yet in all regions, municipal officials felt that their water supply would worsen as 2010 approaches. Furthermore, local officials identified drought as the greatest threat (93 percent) to the adequacy of water supply more so than increased land development, increased use of water by the existing population, and rapid population growth.

Local officials, while believing that their present water supply is adequate, are concerned that a natural occurrence, such as drought, poses a greater threat to the availability of water than population and land changes in their communities. With these attitudes, and regardless of what occurrences or activities they perceive as posing the highest threat to the availability of water supply, water conservation education or outreach, as a municipal activity, should have been identified by local officials as a tool of interest. Yet fewer than 17 percent of municipalities identified water conservation programs as a water management activity or tool used by their municipality. Less than 5 percent of municipalities identified water conservation programs as an education or citizen participation activity sponsored by their municipality. Since drought is perceived to be the greatest threat to water supply, it is puzzling that water conservation is not a widely used tool or educational strategy. The answer likely lies in the perception of the current adequate availability of water. Water conservation may be perceived to be a need only when the actual water supply is diminished. Yet water conservation programs work only as citizens are educated about the need and options. Therefore, water conservation must be in place in antici-

pation of diminished water supplies, regardless of the cause of the diminished water supply.

Policy Implication: Routine water conservation education is a viable tool for encouraging local water resource management. This activity may include guidance for local citizens on water use, consumption, conservation techniques, and education of the school-age population. Water conservation education is vital during periods when water supplies are adequate, so that as water supplies change, regardless of whether it is drought, population, or land change driven, residents will already have a clear sense of use and behaviors that are conservation-based. The Water Resources Planning Act (Act 220 of 2002) created a technical assistance center within DEP to promote voluntary water conservation. While there is no mandated water conservation within Act 220, the technical assistance was designed to provide educational programs for households and other water users as well as recognize outstanding water conservation efforts. Furthermore, Act 220 has authorized PENNVEST loans to address water losses within public water systems. Local governments – in partnership with state and local agencies, authorities, and watershed organizations – can be encouraged to seek assistance in developing and conducting water conservation education through these means.

Planning

One-quarter of the responding municipalities had entered into multi-municipality agreements or worked cooperatively with other municipalities regarding land use or water planning. This constitutes a marked improvement over historic regional cooperation relative to water planning. The finding also demonstrates that municipalities are increasingly willing to and capable of improving interactions with their neighboring municipalities on land-use and water planning issues. This finding suggests that municipalities are more aware of their shared geographic boundaries and the need for resource planning.

The resources available to municipalities for formulating water planning activities are a part of the State Water Plan and Act 220. However, less than 4 percent of survey respondents used the State Water Plan in decision-making about water planning and management. And nearly 83 percent of respondents knew little or nothing about Act 220. Both of these state programs should serve as a resource to municipalities, particularly with respect to regional planning for water resources, and yet they are barely used. With one quarter of the municipalities indicating they are undertaking regional land use and water planning activities, a majority of the municipalities remain candidates to support regionalized or at least, watershed-based, planning efforts.

Policy Implication: It may be beneficial for DEP to develop and implement outreach mechanisms for making the State Water Plan and Act 220 more relevant to a larger number of municipalities to encourage and enable watershed-based water quantity planning, and to provide technical assistance as needed. These activities could occur concurrently to the larger watershed initiatives underway with the Act 220 planning process so that municipalities will better understand the importance of and their respective roles in water quantity management from a basin-wide perspective.

Conclusions Based on Time Trend – 1991 and 2006 Survey Results

Water Quality and Quantity

Local officials said the quality of water in their municipalities diminished in 2006 compared to 1991. This perception may be due to:

- (1) an actual, diminished water quality,
- (2) a heightened awareness of their community's level of water quality, or
- (3) a combination of both (1) and (2).

Regardless, this perception is supported by the increase in perception that land uses pose “some” or “a great deal” of threat to the groundwater quality. The exception was that, in 2006, local officials perceived that landfills were less of a threat to groundwater than in 1991. This change may be linked to greater control as well as improvement in the management and regulation of solid waste by other levels of government, including states and counties. In other words, municipal officials may have an overall greater sense that solid waste is more likely to be properly managed now. The types of threats that local officials are now more concerned about are typically sources of pollution that disperse under wet weather conditions, such as agricultural activity, construction site runoff, highway de-icing salts and residential lawn chemicals, all of which depend on the movement of water across roadways, impervious surfaces, and through the subsurface to contaminate groundwater.

In contrast to the local officials' growing level of concern regarding the groundwater quality and the threats land uses pose was the relative lack of change in attitudes towards water quantity. In the 15 years between surveys, droughts occurred and land use patterns changed to accommodate growing or sprawling populations. Yet the level of local official concern about the availability of water in their municipality remained relatively unchanged. One possible explanation for the lack of change could be the overall perception that, as is generally common in the eastern United States, water is abundant and supply and quantity concerns are not as relevant in comparison with western states.

From the findings that local officials' concerns about water quality were increasing over time and that concerns about water quantity were not, the researchers conclude that more attention must be given by state and local agencies and NGOs to educating Pennsylvanians on water quantity issues. These results suggest that municipal leadership is generally becoming more informed over time about water quality issues that confront our communities – but perhaps have not made the same level of progress in understanding the growing issues of water availability. Along with other factors, the expansion of education about water quality issues appears to be having an impact. Existing water quality educational efforts may provide an excellent model for increasing the understanding of water quantity issues and threats as well.

Policy Implication: The integration of water quantity education into water quality education programs could improve Pennsylvanians' understanding of the connections between quality and quantity. This could be accomplished through the variety of interests identified in each of the previous policy implications sections as being vested in environmental education. These organizations include, but are not limited to, DEP, conservation districts, RCDs, Penn State Cooperative Extension, and state- and local-level watershed organizations, such as the Chesapeake Bay Watershed Association, Pennsylvania Organization of Watersheds and Rivers, WREN, and the PRWA. As with all of the recommendations, there is a need to identify financial and other resources to support these educational needs.

Groundwater as a Community Issue

While there has not been a large shift in the relative *importance* of groundwater as a community issue in comparison with other issues facing local government, there are significant gains in the *recognition* that groundwater is an issue for local government and that management tools are necessary. The progress noted in the increased recognition of groundwater as a community issue may reflect the growing presence statewide of watershed education programs.

Communication, Planning, and Education

The results provided several indications of progress in how municipalities are planning and communicating about water resources:

- Communications between water suppliers and municipalities had slightly increased during the 15-year period.
- Cooperative efforts and multi-municipal agreements relative to land use and water planning grew from 18 percent in 1991 to 27 percent in 2006.
- Municipal-sponsored education or citizen participa-

tion programs about water quality and quantity increased by 12 percent from 1991 to 2006.

The growth in municipal-sponsored education or citizen participation programs may be a factor influencing a number of positive changes that were documented from 1991 to 2006. During this time period, many local watershed organizations were created in response to stakeholder interest in water resources. In addition, programs emerged that involved building coalitions between local governments, their local watershed organizations, and others to enhance source-water protection through improved education and outreach. An example is the League of Women Voter's Water Resources Education Network that provides annual seed grants for local projects of this nature. Likewise, the Growing Greener Program created during the Ridge administration and expanded significantly during Governor Rendell's tenure, provided resources for watershed education, management, and restoration projects – many of which partnered local governments with agencies and NGOs. These programs, along with outreach efforts conducted by state and regional agencies, likely all contribute to the enhanced awareness of water as an issue, how land uses influence water resources, and why multi-municipal cooperation and interaction is valuable to water and land use planning.

Policy Implication: Past investment in public education and outreach appeared to have helped to elevate recognition of groundwater resources as a community issue and enhanced understanding of water quality issues and threats. Continuing these state investments and partnerships with local municipalities, regional and state agencies, and township and county officials associations, would be beneficial to improving future water resource management efforts.

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