People and Water: An Information Challenge*

Principal authors: Marilee Long[1], Mark Kumler[2], Sharon Gabel[2,] James L. Wescoat Jr[2], and Greg Luft[1].

with contributions by: Chris Bridges[3], Tom Cech[4], Kevin Dennehy[5], Nancy Driver[5], Dana Green[1], Carmine Iadarola[6], Trina McGuire[7], and Tyler Stevens[8,] Charles (Tommy) Thompson[9].

[1] *Department of Technical Journalism, Colorado State University, Fort Collins, Colorado, 80523*
[2] *Department of Geography, University of Colorado–Boulder, Boulder, Colorado, 80309*
[3] *Colorado Water Conservation Board*
[4] *Central Colorado Water Conservancy District*
[5] *U.S. Geological Survey National Water Quality Assessment Program*
[6] *AquaSan Network, Inc.*
[7] *Denver Water*
[8] *Colorado Water Education Foundation*
[9] *Southeastern Colorado Water Conservancy District*

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PREFACE

In September 1993 the Colorado Water Resources Research Institute (CWRRI) distributed a request for proposals for research projects that would attempt to "integrate knowledge that supports a better understanding of [broad] water management issues" within the state of Colorado (CWRRI, 1993). One of the critical water problems identified by CWRRI's Research Planning Advisory Committee was: "Water information for the public — how can we make it meaningful, interesting, and informative?"

After a preliminary round of preproposals, the four principal authors were encouraged to collaborate on a proposal that would address the general question "How do water users and managers ensure that the public is informed about the many dimensions and roles of water in Colorado?" The authors invited representatives from several public water management organizations to join them in the creation of a Public Water Information Task Force. Representatives from the Colorado Water Conserva-

tion Board, the Central and Southeastern Colorado Water Conservancy Districts, Denver Water, AquaSan Network, Inc., the Colorado Water Education Foundation, and the U.S. Geological Survey served on the task force.

The task force hopes this document will help guide future efforts to inform citizens about and involve them in water issues, as well as guide future academic research in this area.

INTRODUCTION

The purpose of this report is to provide a framework for water communication efforts in Colorado and to suggest areas in need of attention. To that end, the report draws attention to existing, effective practices and to continuing problems and future needs associated with informing and educating Coloradans about water issues.

Some may challenge the necessity of communicating with the public about water. They may argue that water courts and other water agencies do a good job of managing Colorado's water and that the public does not need a greater voice in the process. Most, however, will agree that active public participation is integral to good water management. Increasingly in Colorado, people are determining water policy at the ballot box. Better informed citizens make wise water decisions more likely.

Some may also believe that current water-related public information efforts are adequate. The task force agrees that some communication activities have worked well; however, the task force believes others need improvement. In addition, the communication needs of some audiences are not being addressed.

Water communication efforts are important for several reasons. First, the public is increasingly concerned about water issues. Second, as the state's population grows, new residents may not have a good understanding of Colorado water issues. Third, this increasing population causes a greater demand for water. Fourth, regions of the state have diverse water requirements, and residents may not have a good understanding of the water needs in areas outside of their region. Fifth, the federal government plays a dynamic role in state water

issues and it is critical that people keep up with the changes.

The task force members met approximately once a month between August 1994 and August 1995 to discuss the status of water communication efforts within Colorado. Task force members identified three objectives: 1) to develop a conceptual framework for the understanding of water issues, 2) to review the vehicles or methods for disseminating water information to various segments of the public and evaluate their usefulness, and 3) to identify a set of issues, considerations, and priorities to direct the future development of water information for the public.

During the year, the task force identified two critical underlying issues: 1) what are the different audiences, programs, and tools for communicating water information? and 2) what are the specific water-related information issues and needs? The task force addressed the first issue by developing a graphic "matrix" to illustrate the complexity of conveying water information. The task force addressed the second issue by designing and conducting a detailed survey of water information organizations around the state. Both products are discussed in detail in this report.

To be most effective, the task force believes water communication efforts should be constant, rather than crisis-driven. These ongoing efforts can lay the groundwork for information campaigns during droughts, poor water quality episodes, etc.

THE CHALLENGES ASSOCIATED WITH CONVEYING WATER INFORMATION

The task force identified many challenges to the effective communication of water informa-

tion. This section will review some of these challenges, and, in some cases, suggest solutions.

The primary challenge identified by the task force was getting residents interested in understanding water issues. Historically, water rights were decided in the courts and the general public, broadly construed, had little incentive or opportunity to get involved — today the public's role is increasing dramatically. State amendments have changed the public's role, and it is increasingly important that the public have a better understanding of complex water issues. The task force acknowledges that part of this challenge is gaining the interest of "information gatekeepers," such as newspaper editors and television news producers. One idea for gaining interest in water issues is to emphasize the financial considerations. Another approach is to encourage water utilities to provide information packets to parents of newborns, emphasizing, for example, the amount of water the child would use over his/her lifetime.

While getting current residents interested is a task in itself, educating newcomers is a special challenge. As Colorado's population grows, it is critical that these new residents learn about Colorado water issues. While there is currently no mechanism for getting water information to all new residents, task force members suggest working with established organizations such as Welcome Wagon, chambers of commerce, and realty associations. Water utilities could also send information packets to new customers, whether they just moved to the state or are relocating within the state.

Related to the challenge of getting people interested is the challenge of determining what people want or need to know. Many water issues are so complex that thousands of pages have been written about them. Distilling this glut of information into a reasonably-sized "package" of information for the general public is a formidable challenge. There may be conflicting opinions about which information is important to convey (e.g., among different interest groups) or over how the information should be presented. Even if the experts agree upon what the public *needs* to know about the issues, this may not be the same as what the public *wants* to know. Reconciling the two ideas may be difficult.

Correcting misperceptions is another related challenge. Misperceptions about water are particularly dangerous when it comes to public decision-making concerning water issues. These misperceptions need to be addressed to promote wise water decision-making.

Another challenge is to foster and maintain long-term commitments to water education. While alerting the public in crises helps to alleviate people's short-term concerns, long-term commitments to educating the public *before* the crises occur could help to avert these concerns altogether.

Knowing which communication efforts are effective is a separate challenge. It is rare for an organization to commit the resources to study the effectiveness of communication efforts, yet this is the very information that is needed to determine which messages and media work. Evaluation of water communication efforts is critical.

Adequate funding is the final, pervasive, challenge to water communication efforts. In the complex matrix of water users, programs, and tools (detailed in the next section), every element requires some level of human, physical, and/or financial resources. Institutions that hope to communicate with their audiences must

acknowledge this and devote funds to the process.

.C. THE PUBLIC INFORMATION PROBLEM AS A MATRIX

When the task force discussed the complexity of "the water information communication challenge," it became apparent that the problem has many dimensions. To simplify the discussion of the issues, the task force attempted to classify and stratify the different components. What began as a two-dimensional table of "publics" and "problems" evolved into a three-dimensional matrix of "audiences," "programs" and "tools" (see Figure 1). The matrix should be seen as a simplified schematic representing the great variety of communication situations, not as an exhaustive inventory of all possible situations.

The vertical axis of the matrix covers the objects of the communication efforts. This axis, named "users," includes those involved in the ownership and distribution of water as well as general municipal and commercial water users. The subdivision into three general tiers was based primarily on the perspective of the individual, with the finer subdivision identifying specific examples of audiences within each tier. Of the several ways that might be used to categorize the "users" (including type of water use, level of water involvement, and age of individual), this classification hints at the great range of audiences that might be approached. While not easy to illustrate, there may be considerable overlap among the different tiers. It is possible, for example, that an individual might work for a water utility during the day, teach Colorado water law in the evening, and be an "ordinary" residential water user at home at night.

Figure 1. The matrix of the water communication challenge.

The horizontal axis represents the variety of communication programs that might be used. These are arranged in a loose continuum from the distribution of basic facts or quick information about water use, through innovative programs (a.k.a. "fun and games"), detailed education, and outreach (e.g., extension service), to water-event-based activities, with the latter including flood and drought communications. The leftmost columns might also be seen as programs that seek simply to "inform" audiences, while the rightmost columns represent more advanced programs that strive to "educate." From either perspective, it should be clear that a wide variety of communication programs exist.

The third dimension, indicated by the depth in the matrix, represents the variety of tools or media that might be used to communicate water information. These range from one-on-one and group discussions, through traditional print and electronic mass media, to interactive, on-line bulletin boards, CDs, and information pages on the World Wide Web.

This matrix demonstrates the interplay among three key components of the water information communication challenge--users, communication programs, and communication tools. When designing its survey of water organizations, which is discussed in later sections of this report, the task force used this matrix to develop the questionnaire.

EXAMPLES OF RECENT STUDIES AND PROGRAMS

This section of the report summarizes previous studies and projects dealing with state public information issues, efforts, and methods indicated in the previous matrix. The task force compiled information from its representatives,

civic organizations, public agencies, and a systematic literature search. Numerous programs have been sponsored by civic organizations, public agencies, and academic institutions, a few of which are mentioned below.

Civic organizations have long sought to convey basic information about Colorado water issues and law to a broad public audience (e.g., Colorado League of Women Voters, 1992). Their publications have been useful in public meetings and teaching and have often been made available for a modest price. Other civic groups have sponsored public outreach projects and "town meetings." For example, *Colorado Water: The Next 100 Years*, funded by the Colorado Endowment for the Humanities, compiled information on public concerns in the seven water divisions of the state (Preskorn, 1991). The archives from those public forums provide useful information for assessing changing public concerns.

Although the task force did not examine the many water education initiatives underway around the state, their importance for stimulating interest and disseminating basic information to teachers, students, and parents must be underscored (e.g., water festivals and curricula for teachers). Information services of public agencies — from the local to the federal — are discussed in a later section of the report which presents the survey results. However, special mention should be made of major information efforts by large water management organizations including the U.S. Geological Survey, the Colorado Water Conservation Board, Project WET, and Denver Water.

The U.S. Geological Survey has taken an active role in making information available to the public in a variety of new and innovative ways. The agency realizes that its information should be relevant and accessible. This is being

accomplished by using the Internet, a variety of outreach publications (fact sheets, circulars, videos), participation of Survey personnel in area water festivals, open houses, and education programs at schools. These activities are being accomplished while maintaining the USGS's traditional scientific data and information outlets through professional journals, societies, and meetings. The Survey also maintains the flow of information to individuals and agencies interested in water-related activities by sponsoring local professional technical meetings and holding semi-annual liaison meetings with interested citizens in major water basins across the country. The Survey has made improvements in making its data and information accessible to a wide audience but there are still areas that need further attention. This information in its present form needs to be distributed to the appropriate people, and public awareness of the agency also needs to be enhanced. These are the short-term challenges for the Survey. In the future, a better job will need to be done in all areas mentioned above, and Survey products (data and information) must remain relevant to the entire public.

At the national level, clearinghouses have been established for water information in several fields that have special relevance for Colorado. For example, Colorado has a large number of small community water suppliers in towns in the mountains and eastern plains. Although the total number of people served by small systems is not very large, these systems have special problems obtaining and disseminating useful information. They often rely, for example, on contributions from volunteer, non-specialized, and part-time labor (Tamburini and Habernicht, 1992). To serve these groups, a National Drinking Water Clearinghouse was established in 1991 in Morgantown, West Virginia. It has a toll-free number and

inexpensive publications on management, technologies, regulations, and financing of small systems (*Small Flows*, 1995). Although the task force did not survey small systems, the task force suspects that few of them in Colorado are aware of these valuable resources.

Similarly, Colorado is experiencing renewed interest in local, citizen-based initiatives for watershed management — as are other states around the country. These groups produce small newsletters that do not circulate very widely, and few are aware of comparable experiences in other parts of the state or country. To facilitate information exchange, a clearinghouse titled *Know your Watershed* has been established at Purdue University. In June 1995, this clearinghouse released a diskette with information on more than 600 active watershed initiatives in the United States (Keppe, 1995). Again, the task force suspects that only a small number of Coloradans are aware of this watershed resource and that effective means are needed to increase awareness of national and regional information resources.

The task force conducted a search of scientific research on public information and water management. Three bibliographic databases — *Selected Water Resources Abstracts, Georef,* and *GEOBASE* — were searched for the period from 1990 to 1995. The following key words were used in the search:

- public information,
- public opinion,
- public participation,
- public involvement,
- education,
- conflict resolution.

Special attention was given to research in or about Colorado. In addition, the task force examined the public information publications of

several professional organizations. For municipal and industrial water information, the task force consulted the publications of the American Water Works Association (AWWA) on the role of public information in utility management and public notification and participation requirements of the Safe Drinking Water Act (Jackson and Udevitz, 1993; Miller, 1992; Pontius, 1995; American Water Works Association, 1993). In contrast with citizens' clearinghouse information, the AWWA has a large professional and scientific readership and publications program. Its growing number of publications on public information, including *So the People May Know* (1993), reflects the intense pressures for public involvement in municipal water management in recent years.

Until recently, public information was often regarded as synonymous with "public relations" or "public affairs." There was little coordination between general public information needs and those associated with risk assessment or crisis management. Recent events are generating pressure for increased attention to risks and crises. Flooding of the Des Moines, Iowa, water treatment plant in the 1993 Mississippi River floods; a *Cryptosporidium* outbreak in Milwaukee, Wisconsin; and earthquake damage to vital water supply lines in recent California earthquakes have all underscored the importance of public information dissemination during crises.

Although it is not widely known among water users, the University of Colorado at Boulder's Natural Hazards Library and Natural Hazards Research Applications and Information Center have some of the largest collections of information on public communication in crises and in risk assessment in the United States. The Hazards Center also has a large amount of general research on human behavior in crises, and about the relative efficacy of different public communication approaches and techniques during crises.

These institutional sources of information were consulted in conjunction with search results from the bibliographic databases. Three major themes may be discerned from previous research on public information in water management:

1. Patterns and trends in public information programs;

2. General information-seeking behavior and institutions;

3. Information in relation to risk, crisis, and conflict.

These themes are discussed briefly below.

Patterns and Trends in Public Information Programs

A general trend is recognized from the "quiet service" of water companies several decades ago, to agency-managed "public participation" and "public relations" programs in the 1970s, to more open, interactive, continuous, citizen-based programs in the 1990s (Wegner-Gwidt, 1990). Some report widening social participation as compared with earlier dominance by a small number of private and special interest groups (Stiftel, 1990). New organizational linkages among utilities, state regulators, and consumers are facilitating information flows (e.g., Becker, 1993).

In the aftermath of the 1993 Mississippi River floods, it was discovered that regional scientific databases were inadequate, which led to large-scale development of an electronic information system (described in the Interagency Floodplain Management Review Committee, 1994). However, the new information technologies have a number of problems, including their

(sometimes) proprietary status, the management of model versions, and access of users to model parameters (Harrison, 1995; Johnson, 1990).

Very little public information research deals with Colorado, which suggests that experiences here are not being widely shared or scientifically scrutinized. Comparative studies of public water problems and programs are also rare (see Bleed et al., 1990). The most active region for public information research and experimentation — some of which might be useful for water organizations in Colorado — appears to be the Great Lakes (Fortner, 1991; Harris, 1990; Landre and Knuth, 1993a, b). The Great Lakes studies have emphasized water quality and recreation concerns among the public.

General Information-Seeking Behavior and Institutions

The literature on behavioral and institutional aspects of information examines public attitudes and perceptions, as well as agency structures that facilitate or constrain information flows. A large amount of research has elicited public perceptions about water problems and alternatives, including conservation and wastewater reuse (Flack and Greenberg, 1987; Work, Rothberg, and Miller, 1980). Recent advances have been made in using "contingent valuation" methods to estimate individual and collective willingness to pay for different water alternatives (Cordell and Bergstrom 1993; Whitehead and Blomquist, 1991). Institutional research has focused on problems of coordination, integration, and efficiency in water management. One recent study, for example, examined the use of watershed planning to facilitate inter-agency communication and exchange of information — which has had mixed results (Miller, 1993).

Perhaps the most important findings are those which document major discrepancies between the attitudes and perceptions of water managers and their public constituents. Some researchers have found, for example, that citizens have broader views (e.g., about environmental protection of riparian corridors and wetlands) than water managers expect (Carroll and Hendrix, 1992; House and Sangster, 1990). Beatty (1991) frames these views as a reflection of "public conscience" which has not been fully, clearly, or widely perceived by water managers. Not surprisingly, "citizens" have broader views and concerns than "customers." The importance and power of public cooperation has been documented recently in Utah and California (Peralta and Peralta, 1992; Pyle, 1995). Conversely, Howe and Smith (1993) show that water managers are not as risk-averse as the public often assumes; managers try to develop attitudes toward risk appropriate to their water supply situation and their consumers' preferences.

Information in Relation to Risk, Crisis, and Conflict

With some notable exceptions (e.g., the Two Forks dam proposal), it is difficult to predict public interest in, or conflict over, specific types of information on water issues (Bruvold, 1992; Syme and Nancarrow, 1992). The use that individuals make of water information probably depends on situational variables such as their level of involvement with water issues, their recognition and perception of the issues, and their perceptions of their ability to bring about change (Grunig, 1983, 1989).

The mass media play a role in conveying water information to the public. First, studies indicate that the media are a major source of scientific information for adults (e.g., Miller,

1986; Howard et al., 1987; Nelkin, 1987) and that the public is interested in environmental news stories (e.g., McEnvoy, 1972; Burgoon et al., 1983; Atwater, 1988). However, the media's ability to provide detailed information on water issues is often hampered by time and space constraints. Second, research on the agenda-setting function of the media indicates that by highlighting certain issues, the media influences what the public thinks about (Severin and Tankard, 1992; McCombs, 1994). Consequently, while the mass media may be a good vehicle for placing water issues on the public agenda, the media may not be a very good source of detailed information.

Changes in water user attitudes may require long-term processes of education and experience, and not just new information (Harmon, 1993; Harris et al., 1993; Thompson and Stoutmyer, 1991). Research on the impact of information about groundwater contamination indicates three stages beginning with initial interest and awareness, contact with information about alternatives, and collaborative use of information to effect a transition (Contant, 1990).

The role of cultivating — and maintaining — *trust* in these processes of public communication is a crucial issue (Dent, 1993; Ford, 1990; Jackson and Udevitz, 1993). Credible information has been described as the "backbone" for effective communication (Dent, 1993).

Trust and credibility are especially important in crises. Risk assessment, management, and *communication* represent some of the greatest challenges for U.S. regulatory policies in the 1990s, particularly in the fields of water quality and natural hazards (Aldrich et al. 1993; Santos, 1990; Scherer, 1991). Risk communication has advanced even further in the fields of

hazardous waste management and environmental justice, which may provide useful lessons for water managers (Wiedemann and Femers, 1993). Interestingly, public information and warning programs have greatly reduced the loss of life from flooding in the U.S., but have not been able to stem rising property losses. Information conveyed during the five-year drought in California, by contrast, resulted in conservation measures that greatly reduced water use (Burton, 1992). The reductions continued after the drought to the extent that water rates had to be raised. Public information programs have proven effective during rate increases, provided the public was brought in early and had a free hand in the construction and selection of alternatives (Rothstein and Jones, 1993). Dziegielewski et al. (1993) point out that the role of media is not well understood by water managers during droughts. They also suggest that the media cannot improve on imprecise and ambiguous messages provided by agencies; nor can the media explain complex water management issues.

Credible information is crucial for conflict resolution (Lamb and Taylor, 1990). Reduction of public water resources data collection and environmental monitoring by agencies like the U.S. Geological Survey and Environmental Protection Agency, because of budget cuts, greatly undermines the foundation for daily decision-making at all levels (e.g., Interagency Task Force, 1994). These findings from previous research provide a useful foundation and backdrop for the survey of Colorado water organizations, which is reported in the next section.

WATER TASK FORCE SURVEY

Colorado water organizations are a primary source of water information. Often these organizations spend considerable time and energy trying to inform people about water. While the efforts of individual organizations may be known, the combined efforts of these organizations have not been documented.

In developing a conceptual framework for public understanding of water issues in Colorado, task force members decided to answer three questions: 1) what types of water information do citizens seek? 2) how do citizens pursue this information? and 3) how it is typically communicated? It is assumed that individuals with questions about water resources will first contact water providers. As a result, the task force determined that surveying the principal water providers throughout Colorado would be an effective method of discovering the variety and nature of public information requests about water resources.

Methods

Water management in Colorado is administered by the Water Resources Division of the State Department of Natural Resources. Duties of the division include monitoring and administering water rights and priorities throughout the state and counseling other state agencies with respect to water issues. Administrative duties are further subdivided over seven geographic regions, one for each major watershed in the state. These seven divisions and their headquarters are as follows (see also Figure 2):

Figure 2. Water Divisions of Colorado (adapted from Wescoat, 1984)

Division 1: South Platte River Basin (Greeley)

Division 2: Arkansas River Basin (Pueblo)

Division 3: Rio Grande Basin (Alamosa)

Division 4: Gunnison River Basin (Montrose)

Division 5: Colorado River Mainstem (Glenwood Springs)

Division 6: Yampa, Green and North Platte River Basins (Steamboat Springs)

Division 7: San Juan, Piedra, Las Animas, Los Pinos, La Plata, and Mancos River Basins (Durango)

To achieve a representative sample, survey respondents were chosen from each of these seven water administration divisions. Five respondents were identified for each division. These respondents represented both rural and urban areas (two respondents from each category) and the state's division engineer. Potential respondents were selected after consulting with task force members, checking the Colorado Water Congress Directory, and talking with local agricultural extension agents.

The survey consisted of 30 questions, ranging from the frequency and types of public inquiries to principal challenges in providing water information to the public in the future. Along with the survey, a cover letter describing the task force's goals and the purpose of the research was mailed to potential respondents in mid-May 1995. Respondents were contacted by telephone during June 1995. Survey results were compiled and analyzed by the end of July.

Officials were asked specific questions about how they respond to public requests for "information" on the following topics: 1) policy issues; 2) water rights; 3) water supply or drought; 4) wetlands, rivers, and reservoirs; 5) their organization's programs; 6) groundwater;

7) billings and meter readings; 8) water rates and fees; 9) federal and state water policy; 10) leaks, spills, and disruptions; 11) environmental issues; 12) water quality and pollution; 13) recreation; and 14) odor, taste, and temperature.

To analyze the open-ended questions in the survey, a coding scheme was developed. Two people used the coding scheme to code a random sample of open-ended responses. The Scott's Pi intercoder reliabilities for the open-ended responses ranged from .70 to .90, which is within acceptable limits.

SURVEY RESULTS

Of the 44 leading Colorado water organizations contacted, 43 participated in the survey. While this small, non-random sample precludes the use of inferential statistics, a descriptive analysis of the results is possible.

Description of Respondents

As Table 1 shows, the sample represents three types of organizations and all seven state water divisions. Water organizations in the sample also represent a variety of service area sizes. The number of people served ranged from 1,200 people to the entire state population. See Table 2 for the breakdown by size.

Table 1. Breakdown of respondents by organizational type and division (N = 43).

Organization Type	Number of Organizations
Municipal Water	17
Conservancy Org.	14
Govt./Other	12

Division*	
1, Greeley	9
2, Pueblo	5
3, Alamosa	5
4, Montrose	6
5, Glenwood Springs	5
6, Steamboat Springs	4
7, Durango	6

*Three respondents were not classified by division because they represent state-wide organizations.

Table 2. Size of water organizations in sample (N = 43).

Number of People	Number of Organizations
1 to 12,000	11
12,001 to 69,999	16
70,000 and above	16

Aspects of Organizations' Commitment to Public Information

Most organizations had designated a staff member to handle public information requests. Of the 43 organizations in the survey, 31 had a public information (PI) person. In each division, the majority of organizations had a designated PI person; division 4 was the only division that had a designated person at each organization surveyed. Conservancy organizations were most likely to have designated PI staff.

At organizations without a designated PI staff member, whoever answered the phone tried to answer the PI request, or he/she referred the caller to a specialist in the organization. One organization did not field PI requests because it had a separate service center.

Time spent responding to PI requests varied dramatically. The amount of time per day spent responding to PI requests ranged from 3 minutes to 5 hours. The mean amount was 79 minutes, and the median was 49 minutes. As Table 3 shows, the amount of time respondents devoted to filling PI requests varied by division and organization type.

In general, employees believe that their organizations support employee efforts to compile additional information to fill PI requests. Only one organization did not support these efforts, while six others said it depended on the request.

Table 3. Average amount of time spent per day responding to public information requests by division and type of organization (N = 43).

Division*	Mean (in minutes)	Number of Organizations
1, Greeley	78	9
2, Pueblo	57	5
3, Alamosa	101	5
4, Montrose	78	6
5, Glenwood Springs	85	5
6, Steamboat Springs	68	4
7, Durango	86	6
Organization Type		
Municipality	72	17
Conservancy	49	14
Govt/Other	126	12

*Three respondents were not classified by division because they represent state-wide organizations

However, fewer than half of the organizations surveyed had a PI budget. Only

15 of the 43 organizations reported that they budgeted funds for PI. Conservancy districts were most likely to have PI budgets. The government/other organization group was the least likely group to have a PI budget—only one organization in this group had a PI budget. Among divisions, Montrose (division 4) and Steamboat Springs (division 6) had no organizations with PI budgets.

Respondents from 13 of the 15 organizations with PI budgets knew the size of their PI budgets. The size varied widely from $5,000 to $1,800,000, with a mean of $182,538 and a median of $21,000. These budgets covered a wide variety of activities. Municipalities reported the largest budgets, followed by conservancy districts; the government/other organization group was a distant third.

For organizations with PI budgets, the budgets were considered adequate by respondents. When asked about the adequacy of their PI budgets, respondents overwhelmingly stated that their budgets were adequate. Furthermore, they overwhelmingly responded that their budgets were growing.

Most organizations did not have written public information plans to cover crises. Fewer than half of the organizations (17 of 43) had written public information plans to cover crises; two organizations were developing plans. Results also indicate that government/other organizations are most likely to have crisis plans, while crisis plans in conservancy organizations are rare. (see Table 4).

Table 4. Frequency of public information plans for crises by organization type (N = 43).

	Type of Organization		
Status of Crisis Plan	Gov't/ Other	Munic- ipality	Conserv. Org.
Has Crisis Plan	9	6	2
Does Not Have Plan	3	9	12
Plan in Progress	0	2	0
	12	17	14

The most common crises covered by the plans were water supply interruptions and flooding; these were followed closely by drought. To a slightly lesser degree, crisis plans covered water quality problems.

Characteristics of Information Requests

More than half of all respondents received information requests daily. Twenty-six respondents fielded daily PI requests, while 12 respondents received weekly requests. No patterns were observed across divisions or type of organization.

More than half of respondents (26 of 43) said that PI requests clustered at key times. Of the key times mentioned, the most frequent answers were as follows: after rate increases or mailings (nine responses), during spring runoff (eight responses), and during crises (six responses). Not surprisingly, municipalities most often got PI requests after rate increases or mailings.

Water organizations fielded questions on a variety of areas. Table 5 summarizes this information.

Table 5. Frequency of public information questions (N = 43).

| | Number of Respondents | | | |
| | | Some- | | |
Group	Often	times	Never	N/A*
Policy Issues	18	18	6	1
Water Rights	17	18	7	1
Water Supply or Drought	16	25	1	1
Wetlands, Rivers, Reservoirs	16	19	7	1
Organization's Programs	15	25	2	1
Groundwater	15	16	11	1
Billings & Meter Readings	15	10	12	6
Water Rates & Fees	14	14	12	3
Federal & State Water Policy	13	21	8	1
Leaks, Spills, Disruptions	10	22	9	2
Environmental Issues	9	26	7	1
Water Quality and Pollution	6	33	3	1
Recreation	5	27	10	1
Odor, Taste, Temperature	4	20	18	1

*One organization did not deal directly with information requests.

Table 6. Frequency of PI requests from groups of people (N = 43).

| | Number of Respondents | | | |
| | | Some- | | |
Group	Often	times	Never	N/A*
Customers	32	7	3	1
Developers	23	17	2	1
State/Fed. Officials	16	24	2	1
City Officials	13	26	3	1
Lawyers	12	25	5	1
Students	8	31	3	1
Media Organizations	6	35	1	1
Educators	5	36	1	1
Water Brokers	5	19	18	1
Activists	3	28	11	1

*One organization did not deal directly with information requests.

Water organizations were most likely to get public information queries from customers, followed by developers, which may be indicative of the growth in the state *(see Table 6).* Of the additional types of people that respondents mentioned, those most frequently mentioned were Realtors (mentioned six times), contractors/engineers (mentioned three times), and other water organizations (mentioned three times)

A few differences among organizational types are worthy of note. Conservancy districts and government/other organizations were more likely to be contacted by water brokers than were municipalities. Lawyers appeared to be more likely to contact government/other organizations than municipalities or conservancy organizations. This pattern is also true for state/federal officials.

The most common way for people to contact a water organization was by phone *(see Table 7).* In addition to the other methods listed in Table 7, organizations said they were often contacted by fax (19 mentions), which was followed very distantly by Internet (four mentions).

Water Organization Responses to Public Information Requests

Respondents believed that talking to people was a very effective way to disseminate PI information. Using printed material, such as maps and brochures, was judged less effective (see Table 8).

Table 7. Methods people use to contact water organizations (N = 43)

	Number of Responses			
Method	Often	Some-times	Never	N/A*
Phone	40	2	0	1
Personal Visits	18	24	0	1
Public Meetings	9	30	3	1
Letter	8	31	3	1

*One organization did not deal directly with information requests.

Table 8. Effectiveness of selected methods of responding to PI requests (N = 42*).

	Number of Responses			
Method	Very Effective	Mod. Effect.	Not Effect.	N/A*
Verbal	33	8	0	1
Referrals to Specialists	21	17	2	2
Maps	16	17	6	3
Brochures or Data	12	25	3	2

*One respondent did not answer this question.

Respondents used a variety of methods to respond to PI requests. More than 20 additional methods were mentioned by respondents. Of these, the most often named methods were press releases (11 responses), school programs (nine responses), and meetings (eight responses). Some of the less-often mentioned responses were public service announcements, newsletters, field demonstrations, and speakers' bureaus.

Respondents used many sources to fill PI requests beyond their expertise *(see Table 9).* Of these, public agencies, outside specialists, and internal specialists were used most often.

Table 9. Sources of additional information (N = 43).

	Number of Responses	
Source	Use	Don't Use
Public Agencies	36	7
Specialists Outside Organization	36	7
Specialists at Organization	34	9
Professional Associations	31	12
Technical Journals & Newsletters	31	12
Consultants	31	12
Libraries	23	20
University Professors	20	23
Non-Profit Organizations	16	27

The use of additional sources varied by division. Alamosa (division 3) and Montrose (division 4) were less likely than other divisions to use internal specialists. Montrose was also less likely to use professional associations. Greeley (division 1) was most likely to use university professors, while Steamboat Springs (division 6) and Durango (division 7) were least likely to use them. Greeley, Glenwood Springs, and Durango (divisions 1, 5, and 7, respectively) were more likely than other divisions to use technical journals and newsletters. Greeley was most likely to use libraries, while Steamboat Springs was least likely.

Perceived Knowledge Levels Concerning Water Topics

An important aspect of public information efforts is the knowledge level of the audience. To assess the overall knowledge level that water organization representatives believed the public has, a composite measure of knowledge level was created by calculating the average perceived knowledge level across all knowledge questions. The reliability for this composite score was 0.88, indicating that the score is reliable. Table 10 provides a breakdown of

these composite scores. **Water organizations generally believed the public has an adequate level of knowledge related to water issues.** *Interestingly,* division 2 organizations felt that the public had a relatively high level of knowledge, an observation which warrants further exploration. Please note that this data represents water organizations' *perceptions* of public knowledge, not actual knowledge.

Table 10. Perceived knowledge levels of public 1 = well-informed, 2 = adequately informed, 3 = poorly informed. (N = 42*).

Overall Mean = 2.18
Overall Median = 2.32

By Division	Mean
Division 1	2.46
Division 2	1.56
Division 3	2.04
Division 4	2.48
Division 5	2.23
Division 6	2.14
Division 7	2.06
Other**	2.52

By Organizational Type	Mean
Municipality	2.19
Conservancy	2.15
Govt/Other	2.22

* One respondent did not answer this question.
** Three respondents represented state-wide organizations.

***W**ater organizations believed that the public was least informed about water rights, federal and state water policy, policy issues, and groundwater* (see Table 11). The public appeared to be best informed about water consumption topics (e.g., rates and fees) and recreation.

Table 11. Perceived knowledge levels of public by water topic (N = 43).

Water Topic	Well	Adeq.	Poorly	N/A
Recreation*	8	29	2	3
Billing & Meter Readings	4	23	4	12
Water Rates & Fees	3	24	6	10
Water Supply or Drought	5	22	15	1
Leaks, Spills, Disruptions	4	18	15	6
Odor, Taste, Temperature	3	18	15	7
Environmental Issues*	4	21	16	1
Organization's Programs*	5	18	18	1
Wetlands, Rivers, & Reserv's*	3	16	22	1
Water Quality & Pollution*	3	13	24	2
Groundwater*	5	9	27	1
Policy Issues*	0	13	28	1
Fed./State Water Policy*	0	11	30	1
Water Rights*	3	7	31	1

*One respondent did not answer these parts of the question.

Future Public Information Concerns

In addition to assessing the state of public information activities, the task force also wanted to find out about future needs and concerns. When asked about the key challenges to providing water information to the public in the future, respondents gave a wide assortment of answers (see Table 12). **Nearly 20 percent of responses had to do with the effective presentation of information.**

The most often cited challenges for municipalities concerned the effective presentation of information (eight responses) and costs associated with water, such as permit and storage costs (four responses). The most often cited challenge for conservancy districts also concerned the effective presentation of information (four responses). For government/other organizations, the most often cited challenge was having adequate money/resources to communicate (three responses).

The responses by division were fairly even dispersed, with the exception of division 1 (Greeley). By far, division 1's most cited challenge was effective presentation of information (seven responses).

Table 12. Most commonly named future public information challenges (N = 43).

Challenge	Number of Responses	Percentage of Responses
Presenting Information Well	12	18.2
Having Adequate Money/Resources	5	7.6
Having Water Quality Information	5	7.6
Having Information on Water Costs	4	6.1
Making Information Relevant	2	3.0
Using Computers to Convey Information	2	3.0
Getting Information to New Residents	2	3.0
Coping with Growth/Water Supply	2	3.0
Don't Know/No Response	1	1.5
Other	31	47.0
	66*	100.0

*Because respondents could provide multiple answers, the total number of responses exceeds the total number of respondents.

When asked about future public information and information services needs of their organizations, respondents again gave an assortment of answers. The most often cited needs were for water supply and water quality information (see Table 13). No patterns were discernible for division or type of organization.

When asked about their future research needs, respondents again gave a variety of responses (see Table 14). Two needs mentioned often relate to public information materials, i.e., the development of public information materials and research on effective methods for conveying public information. Several respondents were satisfied with current efforts and were also already working with universities on specific research questions.

Table 13. Most commonly named information needs of organizations (N = 43).

Information Need	Number of Responses	Percentage of Responses
Water Supply	10	13.2
Water Quality	9	11.8
Information Materials	8	10.5
Water Conservation	7	9.2
Development of Internet Resources	5	6.6
Water Costs	4	5.3
Don't Know/No Response	4	5.3
Water Rights	3	3.9
Rules/Regulations	3	3.9
Access to Databases	2	2.6
Water Pollution	2	2.6
Other	19	25.0
	76*	100.0

*Because respondents could provide multiple answers, the total number of responses exceeds the total number of respondents.

Table 14. Most frequently named research needs of organizations (N = 43).

Research Need	Number	%
Development of PI Materials	9	15.3
Current Research Effort Is Adequate	8	13.6
Don't Know	6	10.2
Research on How To Present Information	5	8.5
Modeling/Statistical Analysis	5	8.5
Already Working with Univ's on Projects	3	5.1
Contaminants	3	5.1
Water Quality	2	3.4
Other	18	30.5
	59*	100.0

*Because respondents could provide multiple answers, the total number of responses exceeds the total number of respondents.

CONCLUSIONS/RECOMMENDATIONS

Survey results indicate that the state's water organizations have made a commitment to communicating water information to a diverse group of constituencies. To that end, the

organizations have developed many methods for communicating water information.

Along with the findings noted in the previous section, survey results indicate that informing people about water-related issues is a complicated process that is both proactive and reactive. Along with initiating press releases, water-bill notices and media announcements, water organizations must react to frequent telephone calls and personal visits from those who need information.

Most organizations are willing to support employee efforts to develop information resources, and they often address the demand for information by designating a staff member to serve as the focal point for public contact and information distribution. The amount of time required for these tasks varies dramatically, with some designated staff members spending only minutes a day while others may dedicate the greater part of the day to fulfilling information requests.

These water communicators largely believe that the public is adequately informed about residential and recreational water use. In general, the population is less informed about issues such as water rights, governmental water policy, and groundwater.

Ironically, while most organizations recognize and support information development and distribution, few have written public information plans to cover crises such as water supply interruption, flooding and drought.

The results of this survey also point out some public information areas that need attention. For example, one of the major concerns of staff members who provide information is in presenting it well. Based on the results of this survey and task force discussions, the task force makes the following recommendations to

further enhance water information activities in the state.

- Create a clearinghouse for water information activities in Colorado. Within the state, many organizations have developed effective approaches to communicating water information. However, these efforts are largely unknown by other organizations. One organization should assume responsibility, and receive support, for helping the state's water organization employees learn what their colleagues in other organizations are doing to communicate water information. Likewise, water organizations should be encouraged to share examples of successful and unsuccessful communication efforts.

- Help water organizations develop crisis plans that include the dissemination of information. Survey results indicate that many organizations do not have written crisis plans that include steps for informing the public and other important groups. Workshops and seminars should be organized to help organizations take a proactive approach to crisis and risk communication.

- Hold communication training workshops to help water organizations learn to communicate with their constituencies more effectively. Depending on demand, these workshops could be based on different audiences (e.g., media representatives, residential users, school children) on different information delivery systems (e.g., computer-based technologies, field demonstrations, water bill inserts) or on different topics (e.g., water quality, water conservation, water supply).

- Support current efforts by water organizations to disseminate information. For organizations with public information budgets

and personnel, these activities should be continued. Other water organizations need to make budgetary commitments to water information activities.

- Increase coordination of public information and education programs. Some Colorado water organizations have already established impressive education programs. These programs need continued support to serve the long-term goals of advancing public knowledge and involvement in Colorado water issues.

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