

Nina Nichols¹, Sanjit Kundu¹, Heather Larson¹ and Tracy Bouvette²

¹Resolution Research & Marketing, Inc.

²Bouvette Consulting

Abstract

This chapter presents the methodologies used to administer the Drought & Water Supply Assessment instrument from mid-January to late-April 2003. The methodologies included the combined use of mailings, telephone calls and internet based surveys to reach participants in all major river basins across all identified water use types. As participation increased from January through April, analyses were performed in real time to evaluate the geographic distribution and water use segmentation of the retained data. Finally, participation was evaluated not only on the number and distribution of participants, but also on total water use represented in the assessment versus total water use in the State, using figures provided by the assessment participants.

Conducting the Survey

The survey was administered from mid-January to late-April 2003 using a wide variety of methodologies, the most common being telephone calls with support from mailings, faxes, and the Internet in order to ensure the highest possible participation. The first communications to the selected participants were letters sent at the beginning of January announcing the Assessment and the CWCB's intent to gather reliable water information to improve drought conditions in Colorado. Next, postcard reminders were mailed to each targeted participant explaining the purpose of the study and the procedure that would follow to facilitate participation. The mailing included an 800 number that respondents could call between 9am and 9pm Mountain Time to schedule an interview or ask questions, as well as providing preliminary questions so that the participant could gather necessary information ahead of time to expedite the interview. Such preface information included approximate average yearly water use and storage volume. The postcards for each water division were mailed at different times, beginning in mid-January, and calls began in each division approximately one week after mailing. Figure 10-1 presents the relative timing of the mailings with the administration of the survey.

Each potential participant was contacted upwards of ten times for an initial call to explain the study and to schedule an appointment time convenient for the participant to complete the survey. Interviews were scheduled from 7am - 9pm Mountain Time for the duration of approximately one hour each, depending on the participant's responses. Participants also had the option to fax in water use and storage numbers in order to expedite the scheduled telephone interview. Calls continued through the end of April.

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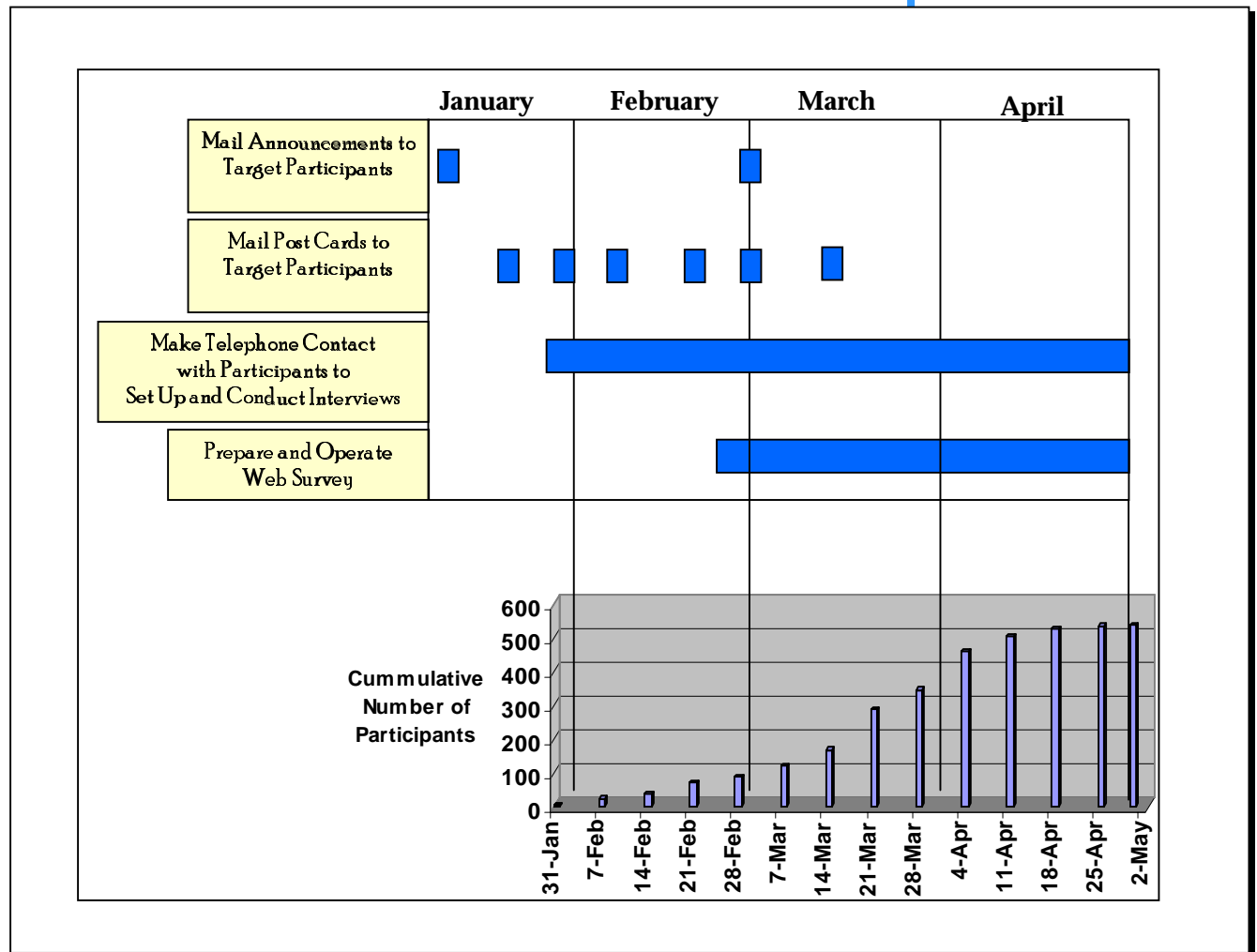
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Discussion

In order to gain participation from those difficult to reach by telephone, a link was posted to the survey on the CWCB website in February. Researchers were able to offer this alternative to participants who found it difficult to schedule an hour of time on the phone, thus increasing participation significantly. At the end of the surveying period, key organizations who had not responded by telephone or via the Internet were re-contacted and encouraged to complete the Assessment.

Figure 10-1: Timing of Survey Mailings and Administration



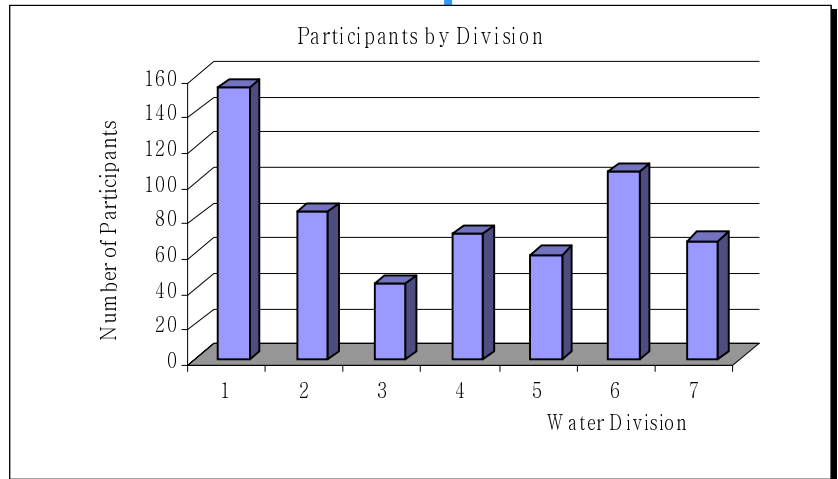
Respondent Summary

Throughout the data-gathering period, participation was closely monitored by segment and division to assure that representation was adequate for final classification. Analyses and reports were sent weekly to the CWCB. By the end of April, it was determined that an appropriate number of entities had been surveyed from each division

and segment to produce statistically valid results. The final evaluation was conducted by the aforementioned segmentation as well as by water use.

The initial database of participants included a list of 1094 potential respondents for contact. Wrong numbers and disconnects were diligently pursued to ensure every opportunity of contacting each entity. After determining that some of the participants could not be contacted due to inadequate information, the number of useable numbers proved to be 825 – 75% of the original database. Of these 825 potential respondents, interviews were conducted with 537 – a completion rate of 65%. Please see Figure 10-2 at right for a summary of participants by water division. Please see Figures 1 through 8 attached to the end of this chapter for maps of the distribution of respondents across the state and in all seven major water divisions, respectively.

Figure 10-2: Participants by Division



Sampling Error and Statistical Significance

All sample surveys are subject to what is known as sampling error – the extent to which the results of the sample survey may differ from what would be obtained if the entire population of interest was interviewed. The size of the sampling error is almost entirely due to the number of people interviewed for the survey and the variance of responses.

For the assessment, sample sizes were chosen to achieve high levels of statistical significance—95% confidence level with a maximum margin of error of four points—for the gathered data in its entirety. The findings can be regarded with considerable confidence since the sample size allows 95% certainty that the figures reported are within four percentage points (plus or minus) of what they would be if all Colorado water users had been interviewed. Expressing it another way, if the study were repeated 20 times, the results would come out within four percentage points (plus or minus) of the figures reported here in 19 of those 20 studies. In short, one can treat these findings as quite reliable. Additional studies would show the same patterns of data reported herein. A lesser degree of statistical confidence applies separately to the regional populations (each individual water division) in this study, though the sample sizes within each division are large enough to provide stable patterns. The municipal and

agricultural sectors had the largest response bases among segments, providing high levels of statistical reliability. Among other sectors, the majority of each target population was interviewed, allowing comparative analysis by segment. Table 10-1 summarizes the survey participants by water division and segment.

The sampling strategy allowed insight from the largest water providers in the state, responsible for over 80% of total water use in the state, as described later in this chapter. Additionally, the strategy provided a vehicle to capture the opinions of a significant number of smaller organizations and providers.

Table 10-1: Summary of Survey Participants

Segment	Water Division							Total
	Division 1	Division 2	Division 3	Division 4	Division 5	Division 6	Division 7	
Power	0	2	0	0	0	3	0	5
Federal	2	1	4	5	6	7	5	14
State	3	4	3	3	4	6	4	9
Municipal	97	50	16	18	25	16	19	241
Agriculture	43	15	15	35	14	60	30	204
WCD*	2	1	5	3	4	6	6	25
Industry	2	4	0	4	2	5	0	16
Other**	5	6	0	2	5	3	3	23
Total	154	83	43	70	60	106	67	537

*WCD is Water Conservancy or Conservation District.

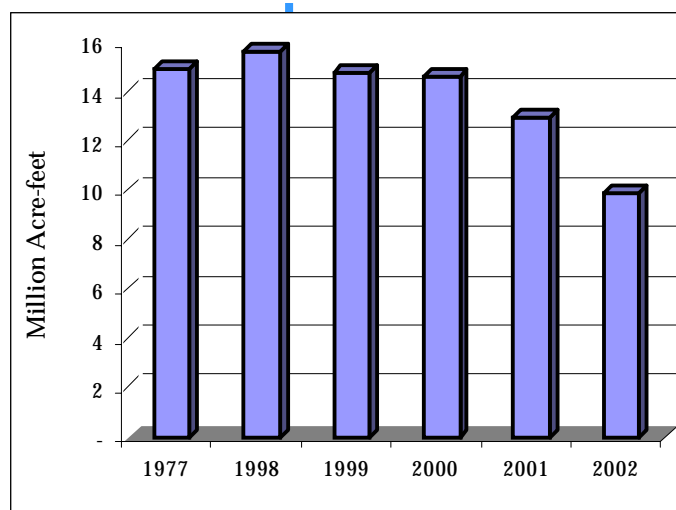
**Other: a collection of twenty-three entities, ranging from tribes, to home owners associations (HOA's), etc., not fitting into any of the other described entities of Federal, State, Agriculture, Municipal, Power, Industry, or Water Conservation Districts.

Please note that when adding responses across segment and division, the total exceeds the survey response total of 537. This is because some respondents are located across more than one division, thus they are counted in all appropriate divisions. A list of participants is provided in Appendix B.

Water Use Reported by Respondents

The water use of these participants was monitored to identify the percentage of Colorado's total reported diversions and/or deliveries (as reported by the State Engineer's Office) represented by the assessment respondents. Figure 10-3 presents the reported water use by all the respondents that answered the question (and including delivery totals for the Bureau of Reclamation estimated from their reservoir discharge figures at 2 million acre-feet annually). On average, the total water use for the assessment participants (measured as delivered or diverted water, not as consumed water) was found on any given year to range from 84 to 93%

Figure 10-3: Water Use Reported by Respondents



of the total state-wide delivery reported by the State Engineer's Office. Therefore, the survey was determined to have captured the opinion of at least 80% of Colorado's water users.

Characterization of Respondents by Population and Irrigated Acreage

The characteristics of the participants were also developed in terms of population served and irrigated acreage. Figures 10-4 and 10-5 show the total number of respondents who reported water deliveries to serve populations of different sizes and for irrigation of varying acreage, respectively

These figures illustrate some interesting issues regarding water deliveries, among them:

- The largest number of participants responded that they deliver quantities of water at the lowest end of the scale presented in the survey. Over 25% of participants provide water to populations of less than 200; over 30% of participants deliver water for irrigation on less than 160 acres. Of the over 140 participants who reported delivering water to less than 200 people, almost 110 were from the agricultural sector, as should be expected. Similarly, of the over 170 participants who irrigate less than 160 acres, over 130 were from the municipal sector. Therefore, about 30 entities that provide municipal water to less than 200 people, and 40 agricultural entities that irrigate less than 100 acres were interviewed, rounding out the distribution of water user types. These small water users represent an important demographic of water use since they represent a large segment of water users in the state. (As a means of comparison, there are only 30 municipalities with populations over 10,000 in the state.)

Figure 10-4: Number of Respondents versus Population Served

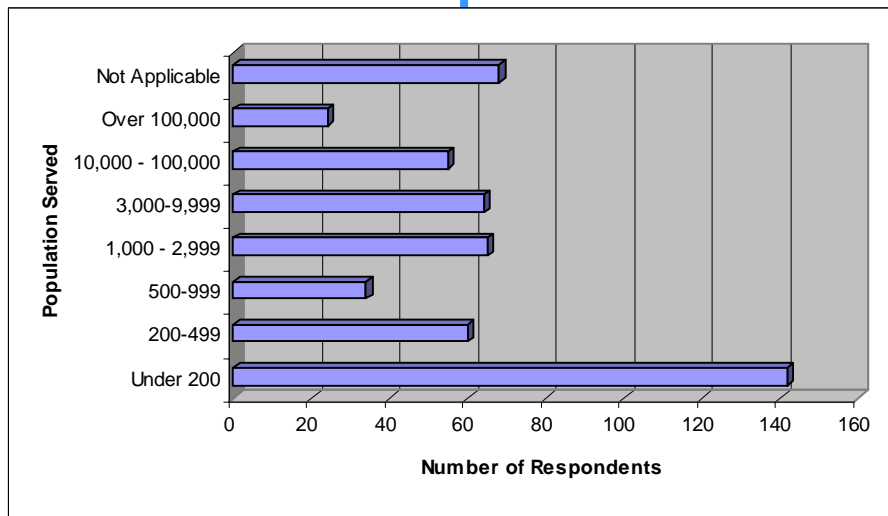
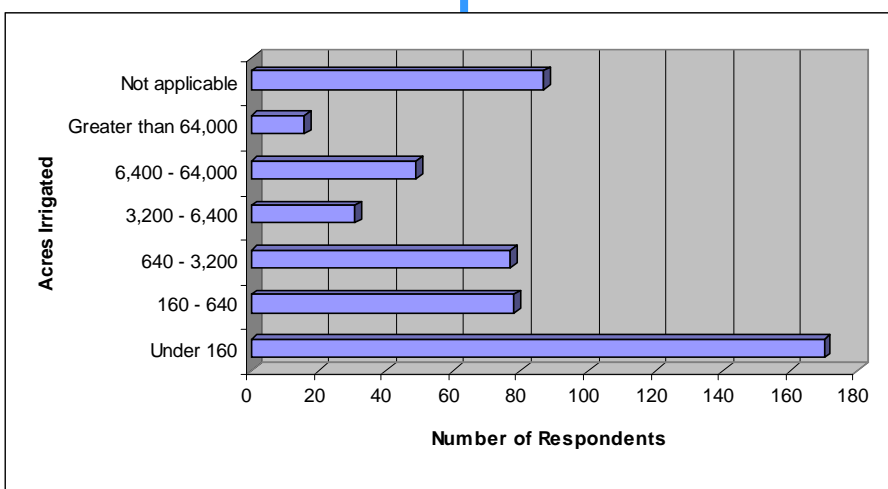


Figure 10-5: Number of Respondents versus Acres Irrigated



- A common response for both population and acres irrigated was “Not Applicable.” This is largely explained by responses from the municipal and agricultural sectors, with municipalities not delivering irrigation water and agricultural entities not providing domestic water supply for population centers. Industrial and water conservancy districts also had high levels of responses listed as “Not Applicable” as would be expected.
- The distribution of respondents with respect to both population served and irrigated acreage indicates that that survey was successful in the engagement of a wide range of water delivery amounts, within the two key segments of municipal and agricultural water use. In addition, the survey was successful in obtaining opinion information from a fairly even distribution of water use deliveries based on the number of respondents indicated for each of the categories.

Discussion

The administration of the assessment successfully engaged Colorado water users within selected water use segments and geographies (i.e. water divisions) to determine current opinion on:

- Limitations of water supply – current and future
- Drought impacts
- Drought, water supply, and water conservation planning
- Drought mitigation methods
- Cooperative agreements
- State role in drought planning and mitigation efforts.

The survey accessed 537 water users representing eight water use segments in all seven of the major river basins. These water users, which ranged from small to large, represented over 80% of the state’s water diversions and/or deliveries in any given year.