

Nina Nichols¹, Sanjit Kundu¹, Heather Larson¹, Will Bailey¹ and Tracy Bouvette²

¹Resolution Research & Marketing, Inc.

²Bouvette Consulting

Abstract

Water supply limitations affect nearly all the water users in the water-short west since the available water is called upon to support so many diverse uses in its journey from source to sea. The Drought & Water Supply Assessment allowed participants to identify water supply limitations that affect their individual operations and uses, including those that are both structural and non-structural such as:

- Availability and presence of water and water rights
- Suitability and usability of structures
- Regulatory and policy impacts
- Public expectations
- Other competing factors

The results of the analyses indicate which types of limitations exist and their severity, and which limitations have the greatest impacts on current water supply.

Introduction

Water supply limitations affect nearly all the water users in the water-short western states as the available water is called upon to support so many diverse uses in its journey from source to sea. To characterize local and regional limitations, an evaluation of Colorado’s current water supply was performed as a component of the Drought & Water Supply Assessment, in which participants identified both structural and non-structural water supply limitations that influence their individual operations and uses.

To determine the limitations most affecting Colorado water users, respondents were first asked whether various factors were a limitation to their current water supply. Those who responded in the affirmative were then asked to rate that limitation on a scale of 1 to 5, where 5 represented severely limiting and 1 represented slightly limiting. Using the combination of these questions, the assessment not only was able to demonstrate which factors were seen as limitations, but how severely each limitation affects current water supply. The combination of being ranked by a majority of respondents as a limitation and of being ranked as a severe (4 – 5) limitation indicates issues of widely recognized importance for meeting water supply needs.

Contents:

Introduction

Summary of Responses

- Availability of Storage
- Availability of In-Basin Water Rights
- Reliability of In-Basin Water Rights
- Development Pressure on Agricultural Water Rights
- Other Limitations

Discussion

Table 11-1: Limitations

Availability of in-basin water rights
Availability of storage
Availability of transbasin water rights
Availability of augmentation water
Availability of groundwater
Clean Water Act overall
CWCB instream flows
Diversion structures
Endangered Species Act
Federal land management
Federal special use permitting, by-pass flows or reserved water rights
Need for new or upgraded raw water treatment infrastructure
Federal environmental permitting requirements
Pressure of development on agricultural land water rights
Reliability of production wells
Reliability of existing in-basin water rights
Reliability of existing transbasin water rights
Restrictions on use of existing storage
Section 404 permits
Water quality (surface/groundwater)
US Fish and Wildlife Service flow recommendations
Water transmission system/conveyance facilities (e.g., ditches, pipes, etc.)
Water distribution system losses
Public expectation for instream water use (environmental, recreational, aesthetic)

Table 11-1 presents the complete listing of all limitations included within the survey instrument. Note that all participants were given the opportunity to identify other limitations that may impact their current water supply. A discussion of the “other” responses is included below.

Summary of Responses

Considering the wide range of Colorado water users, it is understandable that the limits of one organization or entity may not be a concern for another. There were, however, common water supply limitations mentioned by a majority of water users—specifically the availability of storage and the availability and reliability of in-basin water rights as indicated in Figure 11-1. These limitations had the most consistently high rating, both as a water supply limitation and a limitation ranked as severe, and should thus be considered among the most significant in the state.

Figure 11-1: Water Supply Limitations Identified by Respondents

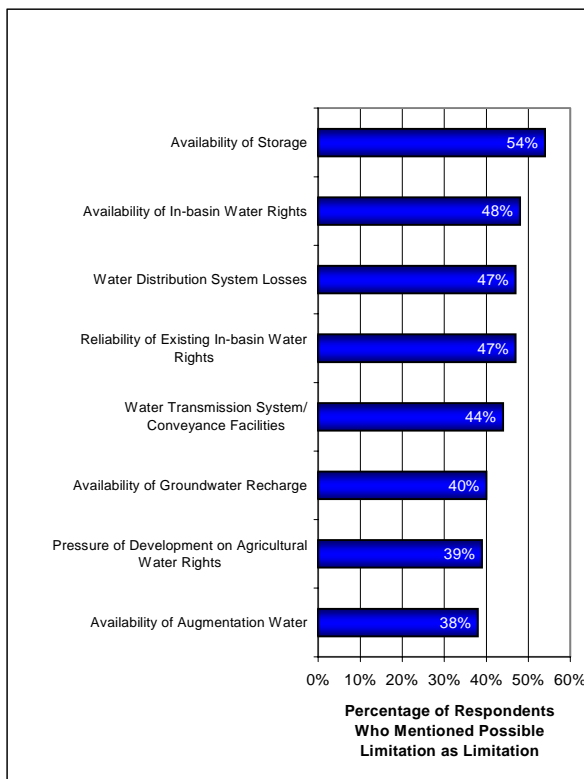
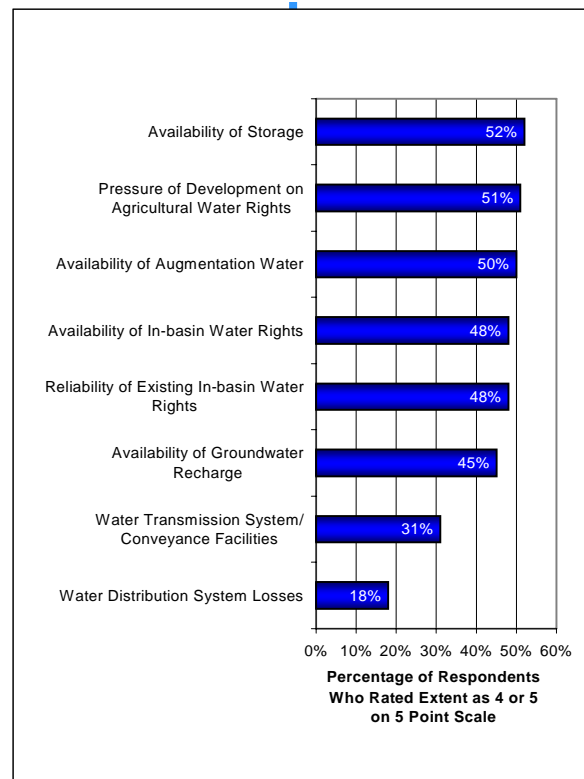


Figure 11-2: Water Supply Limitations Rated as Severe by Respondents



When asked to rate the severity of each identified limitation, water users again opined with a consistent message independent of geography and segment. As indicated in Figure 11-2, the availability of storage and the availability of augmentation water were consistently rated high in the severity of these limitations (by those

water users that identified these issues as limitations). The pressure of development on agricultural water rights, which relates to municipal entities pursuing the use of agricultural water (e.g., Aurora and Rocky Ford) was also reported as a severe limitation.

Availability of Storage

One limitation that stands above the rest in affecting organizations regardless of segment (with the exception of power) or river basin is the issue of available water storage (see Table 11-2). Fifty-four percent of respondents indicated that storage deficiencies limit their water supply (Figure 11-1), with a majority of those respondents, 52%, rating the severity of the limitation as a 4 or 5 (Figure 11-2). This response was largely consistent across water divisions (ranging from 48% to 59%). Divisions 1 and 5 had the highest number of respondents declaring the limitation. In addition, Division 1 viewed the severity of the limitation as the most severe with 42% of respondents indicating the highest possible score of 5. This can perhaps be attributed to the large number of groundwater appropriators that are in need of augmentation water to operate, and the fact that Division 1, which must comply with the South Platte compact at the state line, is the largest municipal, industrial and agricultural water user in the State and is therefore perpetually facing the challenge of water scarcity.

With regard to segmentation of water users, it is clear from the survey responses that the larger municipal entities (i.e. those with a population greater than 5,000) feel the most affected by the lack of available water storage, followed closely by the large agricultural users (i.e. those that irrigate over 3,200 acres). In conclusion, the lack of available storage is clearly a statewide concern as displayed in Figure 11-1.

Availability of In-Basin Water Rights

Figures 11-1 and 11-2 also illustrate the other most often-cited water supply limitations identified by the survey participants and their respective severity. The availability of in-basin water rights was widely ranked as an extreme limitation, with almost half of all of respondents indicating its limiting effect on their current water supply and 48% of those rating its severity as a 4 or 5. The responses were fairly comparable across all divisions (ranging from 40-54%) with Divisions 3 and 7 viewing the extent of the limitation as the most severe (see Table 11-3). This is likely due, in part, to the severity of the most recent drought in those areas and the overall lack of available water in those divisions. Although Division 3 had the lowest percentage of participants in the assessment who indicated that the availability of in-basin water

Table 11-2: Response by Segment and Division for Availability of Storage

Segment	Limitation	Severe*
Municipal	56	49
Agricultural	55	55
Power	0	0
WCD	60	67
Industry	19	67
Federal	36	20
State	44	25
Other	61	50
Division	Limitation	Severe*
Division 1	56	57
Division 2	49	52
Division 3	55	56
Division 4	57	40
Division 5	59	32
Division 6	52	49
Division 7	48	57

* percent of respondents who cited this as a limitation and of those % that gave it a 4 or 5 rating on a 5 point scale. WCD = Water Conservancy District

Table 11-3: Response by Segment and Division for Availability of In-Basin Water Rights

Segment	Limitation	Severe*
Municipal	40	55
Agricultural	58	47
Power	20	0
WCD	32	38
Industry	44	43
Federal	50	0
State	56	20
Other	61	64
Division	Limitation	Severe*
Division 1	48	52
Division 2	52	48
Division 3	40	59
Division 4	54	45
Division 5	49	35
Division 6	43	33
Division 7	53	60

* percent of respondents who cited this as a limitation and of those % that gave it a 4 or 5 rating on a 5 point scale. WCD = Water Conservancy District

rights was a limitation, almost 60% of those concerned with this issue rated its severity as a 4 or 5, or very limiting. Division 6 rated the extent of the limitation and severity of the limitation lower than other divisions, which is consistent with the fact that Division 6 has not had to administer water at any time in the past.

Among segments, the small collection of entities in the “other”¹ category indicated the availability of in-basin water rights as a limitation. Following other users by percentage of respondents, agricultural users had the most respondents that mentioned this as a limitation, especially among the larger users. Municipal users rated the severity somewhat higher overall.

Reliability of In-Basin Water Rights

Along with availability, the reliability of existing in-basin water rights ranked similarly high on the list of limitations. Forty-seven percent described it as a limitation and of those, 48% rated the extent of the limitation a 4-5. Again, Divisions 3 and 7 rated the extent of the limitation highest with more than three in five respondents rating the reliability of existing in-basin water rights extremely limiting (see Table 11-4). However, when looking at all divisions collectively, Division 3 respondents rated the reliability of in-basin water rights a 5 (extremely limiting) by a 2:1 ratio over the average divisional response.

Among segments, other users had the highest mention of the limitation, with the industry segment rating its severity as the highest: an astounding 84% of those described it as very or extremely limiting (a 4 or 5).

Development Pressure on Agricultural Water Rights

Nearly 40% of all respondents designated pressure of development on agricultural land water rights as a limitation and more than half of them saw it as a significant concern. This is especially a concern in the agricultural entities where more than half stated it is a limitation and 61% rated it a 4 or 5. Among the divisions, Division 7 stands out from the other divisions with 50% naming pressure of development on agricultural land water rights a limitation and 60% rating it as severely limiting (see Table 11-5).

¹ Other entities: 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.

Table 11-4: Response by Segment and Division for Reliability of In-Basin Water Rights

Segment	Limitation	Severe*
Municipal	40	42
Agricultural	53	53
Power	60	66
WCD	60	47
Industry	38	84
Federal	21	66
State	56	60
Other	73	32
Division	Limitation	Severe*
Division 1	46	49
Division 2	47	51
Division 3	55	65
Division 4	37	50
Division 5	43	46
Division 6	46	40
Division 7	48	63

* percent of respondents who cited this as a limitation and of those % that gave it a 4 or 5 rating on a 5 point scale. WCD = Water Conservancy District

Table 11-5: Response by Segment and Division for Pressure of Development on Agricultural Water Rights

Segment	Limitation	Severe*
Municipal	26	35
Agricultural	51	61
Power	0	0
WCD	44	54
Industry	38	66
Federal	29	25
State	22	50
Other	77	47
Division	Limitation	Severe*
Division 1	41	51
Division 2	39	58
Division 3	40	41
Division 4	43	57
Division 5	31	44
Division 6	28	50
Division 7	50	60

* percent of respondents who cited this as a limitation and of those % that gave it a 4 or 5 rating on a 5 point scale. WCD = Water Conservancy District

Other Limitations

As Figure 11-1 indicates, other factors that are noteworthy with respect to identified current water supply limitations reported by the water users include the availability of groundwater recharge, the availability of augmentation water, and water transmission conveyance facilities.

For groundwater recharge, 40% named it a limitation with 45% rating it severe. Divisions 4, 5, and 7 showed considerably lower numbers as most entities in those regions do not have access to significant groundwater supplies. Agricultural entities had high mention of this limitation as well as the highest severity rating among segments, presumably due to the reliance of agriculture on groundwater in numerous locations throughout the state.

Thirty-eight percent of users cited the availability of augmentation water as a limitation and half of those rated it as severe. Approximately half of Division 2 cited this as a limitation and 55% rated it a 4 or 5. It was found to be a severe limitation for large agricultural entities, 44% of which reported it as a limitation and 50% of those respondents ranked it a 4 or 5.

Although nearly half (47%) of all respondents rated water distribution system losses as a limitation (ranked number three on the list of all these limitations to current water supply in Figure 11-1), though only 18% of this same overall population rated it as severely limiting as shown in Figure 11-2.

The remaining limitations were identified by a similar percentage of respondents, roughly 30%. However, significant statistical differences appeared between two Divisions, Divisions 1 and 6, in regard to the identification of limitations to current water supply. For certain limitations (i.e. availability of trans-basin water rights, reliability of existing trans-basin water rights, federal permitting requirements) Division 1 consistently had among the highest percentage of respondents who felt constrained, while Division 6 was always at the low end of that reported limitation concern. System issues, including the need for new or upgraded raw water treatment infrastructure and water transmission systems and/or conveyance facilities are more often a limitation of concern in Division 1 and less of a concern in Division 6 in comparison to the other water divisions.

It is worth noting the unique responses received for two issues: the availability of trans-basin water rights and the Endangered Species Act. Although just over one-third of survey participants indicated that either of these issues is a limitation, those that did indicated that the

limitation was severe, which was particularly true for the larger municipal and agricultural entities. The agricultural participants rated the severity of the Endangered Species Act appreciably higher than any other segment.

Table 11-6 presents a listing of the most severe limitations, those ranked as 4 or 5, identified by each segment surveyed.

Table 11-6: Most Severe Limitation as Identified by Segment

Segment	Most Severe Limitation
Municipal	Availability of Storage
Agricultural	Availability of Storage
Power	Availability of In-Basin Water Rights/ESA
Water Conservancy District	Availability of Storage
Industry	Availability of In-Basin Water Rights
Federal	ESA
State	Availability of Storage
Other	Availability of In-Basin Water Rights/Availability of Ground Water

ESA – Endangered Species Act

Finally, less than one out of three respondents mentioned the following limitations: the need for new or upgraded raw water treatment infrastructure (rated extremely low by agricultural entities, but significantly higher for municipal organizations); reliability of production wells; federal land management; CWCB instream flows; and diversion structures. Eighty-three survey participants, 15% of those surveyed, identified other limitations when provided the opportunity during the survey. The most often quoted limitation in the other category was lack of water (20%). Funding limitations were identified by 17% of those that selected to comment on this category.

Discussion

The availability of storage is the single most widespread and severe limitation to current water supply indicated by Colorado water users agreed upon consistently by all divisions and all segments. Division 1 viewed the severity as the most dire, but all other divisions agreed to a considerable extent.

Water availability issues are the next most widespread and severe for Colorado’s water users based on the survey results. Depending on the location and use, the availability of groundwater, recharge water, in-basin water rights (surface water), and augmentation water are identified as important and severe.

Infrastructure issues were identified as limitations, including transmission and distribution; however, the severity of these limitations was identified as significantly lower than water availability for the current water supply.

Of particular note is the issue of development pressures on agricultural water rights. This issue reflects the changing demand on agricultural water rights created as these rights are permanently transferred to other users – chiefly municipal. The agricultural community views these pressures as widespread and significant.

Finally, survey respondents did not express widespread concern that environmental, policy, or certain types of infrastructure issues were limitations to the current water supply. However, for those entities (e.g., agricultural entities) that did identify any of these issues as a constraint (e.g., the Endangered Species Act), the constraint was ranked as severe.