



Irrigation Organizations

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Irrigation organizations totaled 2,677 in 2019

In 2019, there were 2,677 organizations directly involved in the management of local water supplies – both groundwater and surface water – for irrigation on farms and ranches.

The two primary functions of organizations are irrigation water delivery and groundwater management. This consisted of 2,543 organizations involved with delivering water directly to farms while 735 organizations were involved with regulating or otherwise influencing groundwater used by farmers for irrigation.

Nationally, organizations delivering off-farm water served, on average, 95 farms covering 7,020 irrigated acres. Organizations involved with groundwater management serviced, on average, 108 farms covering 30,177 irrigated acres and 416 irrigation wells.

Water delivery organizations received 70,088,848 acre-feet of water in 2019. The organizations delivered and/or released 67,315,436 acre-feet of water in 2019. Producers received the majority, with 41,449,038 acre-feet going to farms and ranches.

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Irrigation Organizations by Function – Region and United States: 2019

Geographic area ¹	Number	Primary functions ²	
		Irrigation water delivery	Groundwater management
Eastern Rockies	898	883	175
High Plains	177	96	85
Northwestern	424	413	71
Pacific	245	234	158
Southeastern	13	8	12
Southwestern	920	909	234
United States	2,677	2,543	735
Geographic area ¹	Secondary functions ²		
	Municipal or residential water	Electricity generation	Recreation or wildlife management
Eastern Rockies	101	18	61
High Plains	31	4	25
Northwestern	58	25	15
Pacific	46	17	15
Southeastern	1	-	3
Southwestern	127	23	49
United States	364	87	168
Geographic area ¹	Secondary functions ²		
	Agricultural drainage management	Flood retention - main river channel	Other
Eastern Rockies	90	26	67
High Plains	16	13	20
Northwestern	38	18	50
Pacific	35	24	60
Southeastern	8	1	5
Southwestern	104	42	73
United States	291	124	275

- Represents zero.

¹ See appendix for more information on region definitions.

² Organizations can have more than one primary and secondary function.

Water Delivery Organizations by Type – Region and United States: 2019

Geographic area	Organizations			Unincorporated mutuals		
	Number ¹	Average farms serviced	Average acres irrigated	Number ¹	Average farms serviced	Average acres irrigated
Eastern Rockies	883	79	5,000	99	(D)	777
High Plains	96	103	11,544	-	-	-
Northwestern	413	124	11,420	31	(D)	1,587
Pacific	234	188	20,095	-	-	-
Southeastern	8	36	6,694	-	-	-
Southwestern	909	73	3,141	215	23	440
United States	2,543	95	7,020	345	20	640
Geographic area	Incorporated mutuals			Irrigation districts		
	Number ¹	Average farms serviced	Average acres irrigated	Number ¹	Average farms serviced	Average acres irrigated
Eastern Rockies	554	30	2,682	178	195	12,242
High Plains	8	(D)	(D)	83	111	11,952
Northwestern	179	80	8,388	178	(D)	15,076
Pacific	18	(D)	(D)	177	233	24,104
Southeastern	1	(D)	(D)	7	(D)	(D)
Southwestern	395	69	2,159	240	114	(D)
United States	1,155	51	3,422	863	168	13,315
Geographic area	U.S. Bureau of Indian Affairs organizations			Other		
	Number ¹	Average farms serviced	Average acres irrigated	Number ¹	Average farms serviced	Average acres irrigated
Eastern Rockies	15	(D)	22,265	37	(D)	9,161
High Plains	2	(D)	(D)	3	(D)	(D)
Northwestern	2	(D)	(D)	23	122	(D)
Pacific	6	(D)	(D)	33	(D)	7,774
Southeastern	-	-	-	-	-	-
Southwestern	14	342	36,207	45	42	(D)
United States	39	357	30,552	141	121	7,060

- Represents zero.

(D) Withheld to avoid disclosing data for individual operations.

¹ Represents the total number of organizations in business, which may include organizations that delivered no water in 2019.

Groundwater Organizations – Region and United States: 2019

Geographic area	Number	Average farms serviced ¹	Average acres irrigated with local groundwater	Average number of active wells	Average number of capped or deactivated wells	Number of organizations involved with groundwater recharge
Eastern Rockies	175	31	5,805	52	7	22
High Plains	85	514	166,069	2,118	417	6
Northwestern	71	46	16,813	113	4	14
Pacific	158	174	22,133	483	7	57
Southeastern	12	510	(D)	1,728	30	1
Southwestern	234	9	(D)	49	(Z)	4
United States	735	108	30,177	416	52	104

(D) Withheld to avoid disclosing data for individual operations.

(Z) Less than half of the unit shown.

¹ Average excludes organizations that only reported accounts.

Water Supply for Delivery Organizations by Source – Region and United States: 2019

Geographic area	Total water entering delivery system	Irrigation organization or project sources			Municipal or industrial
		Federal	State	Private or local	
	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)
Eastern Rockies	16,881,053	4,911,393	2,642,091	1,340,677	79,463
High Plains	4,968,403	1,592,028	26,519	38,017	(D)
Northwestern	18,675,939	9,949,023	2,184,193	1,800,420	(D)
Pacific	18,595,651	9,228,163	1,328,403	3,147,025	255,108
Southeastern	297,040	-	164,406	-	-
Southwestern	10,670,762	2,919,268	392,463	679,243	148,247
United States	70,088,848	28,599,875	6,738,075	7,005,382	521,888
Geographic area	Other supplier	Direct diversion sources			
		Streams, lakes, and ponds	Other reservoirs	Drainage water	Pumped groundwater
	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)
Eastern Rockies	465,698	7,038,559	397,533	(D)	(D)
High Plains	-	(D)	(D)	(D)	-
Northwestern	(D)	3,006,011	(D)	(D)	(D)
Pacific	817,009	3,541,727	(D)	(D)	257,888
Southeastern	(D)	(D)	-	(D)	-
Southwestern	246,650	5,014,886	589,736	89,814	590,455
United States	1,598,759	21,864,893	2,300,913	296,432	1,162,631

- Represents zero.

(D) Withheld to avoid disclosing data for individual operations.

Quantity of Water Delivered and Released by Delivery Organizations – Region and United States: 2019

Geographic area	Total	Deliveries to water users			
		Farms and ranches	Residential or domestic users	Other irrigation organizations	Industrial, parks, and other clients
	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)
Eastern Rockies	15,687,967	8,719,418	487,353	1,011,184	803,671
High Plains	4,786,903	1,195,063	(D)	(D)	(D)
Northwestern	18,103,677	10,805,873	848,972	347,059	57,007
Pacific	18,270,367	13,180,091	553,425	58,628	501,516
Southeastern	297,072	260,781	-	(D)	(D)
Southwestern	10,169,450	7,287,812	(D)	(D)	156,626
United States	67,315,436	41,449,038	2,275,508	1,498,380	1,524,947
Geographic area	Other releases and uses				Conveyance losses
	Released for downstream use	Environmental requirements	Diverted for groundwater recharge	Other releases	
	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)	(Acre-feet)
Eastern Rockies	795,633	353,994	82,525	849,198	2,584,991
High Plains	(D)	-	(D)	2,821,328	(D)
Northwestern	1,395,208	146,597	115,910	750,274	3,636,777
Pacific	109,452	318,493	975,460	121,690	2,451,612
Southeastern	(D)	-	-	(D)	(D)
Southwestern	742,872	137,795	(D)	(D)	1,390,290
United States	3,107,160	956,879	1,184,972	4,596,633	10,721,919

- Represents zero.

(D) Withheld to avoid disclosing data for individual operations.

Irrigation Organizations Definitions

The following terms and definitions provide detailed descriptions for specific words and phrases used in this publication and within publication tables.

Agricultural drainage management: Organization maintains and controls infrastructure such as drains and canals that drain excess water from agricultural land.

Average acres irrigated: The number of irrigated acres of farmland identified and reported by organizations. An average is used since farms can be associated with multiple organizations. When reported under water delivery, it represents the number of irrigated acres supplied water on average by an organization in 2019. When reported under groundwater management, it represents the number of acres irrigated by farmers using wells in 2019 that were subject to groundwater management (see Groundwater management) by an organization.

Average farms serviced: The number of irrigated farms identified and reported by organizations. An average is used since farms can be associated with multiple organizations. When reported under water delivery, it represents the number of farms supplied water on average by an organization in 2019. When reported under groundwater management, it represents the number of farms using irrigation wells in 2019 that were subject to groundwater management (see Groundwater management) by an organization.

Conveyance facilities: Any form of infrastructure designed to help move water from one location to another. System components include diversion ponds, conveyance canals and/or pipes, pumping stations, water-flow regulating structures, flow measuring devices, and turnouts.

Conveyance losses: Water that leaves the conveyance facilities of the organization before reaching the intended client or destination due to water conveyance. Causes of water loss include water percolating into the ground through unlined canals and leaks, non-crop (phreatophyte) consumption, and surface evaporation. Does not include water lost due to floods or overflow. While some forms of conveyance losses can recharge groundwater aquifers, they only count as conveyance losses and not as managed groundwater recharge.

Diverted for groundwater recharge: Act of recharging groundwater intentionally using recharge basins, injection wells, off-season flooding of fields, and/or other methods where the water is planned to return to the aquifer. Water lost during conveyance is not counted as managed groundwater recharge.

Eastern Rockies: Region that includes the states of Colorado, Montana, and Wyoming.

Electricity generation: An organization that creates and generally provides electricity in addition to water. Power generation is usually hydroelectric but can include other forms of generation.

Environmental requirements: Water released for environmental purposes, such as for maintaining water levels of rivers, lakes, and wetlands for habitats and recreational purposes.

Flood retention – main river channel: Organization maintains and controls infrastructure located in-river, such as dams, that allows control over the downstream flow of the river. Infrastructure generally used to reduce downstream flows during high flow events.

Geographic area: Includes only 24 U.S. states where a majority of irrigation occurs. The six regions consist of states based on location, similarities in institutions and hydrologic conditions, grouping for data presentation, and accounting for organizations that operated in multiple states. The six areas are Eastern Rockies, High Plains, Northwestern, Pacific, Southeastern, and Southwestern.

Groundwater management: Roles and/or functions an organization has, generally with legal authority, including but not limited to: monitoring and reporting groundwater conditions, collecting groundwater pumping data, charging fees for

pumping groundwater or for groundwater pumping rights, permitting development of new wells, managing groundwater recharge, and managing groundwater quality.

High Plains: Region that includes the states of Kansas, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas.

Incorporated mutual: A legal entity owned by shareholders who use a water conveyance system. This is a legally constituted corporation owned by the users and generally supplying water at a cost.

Irrigation district: A public corporation or special-purpose governmental unit, which can make use of taxing powers with statutory authority to assess taxes and/or fees for water delivery.

Irrigation organization: An organization that is involved with delivering water directly to irrigated farms and/or manages groundwater used by farmers for irrigation.

Municipal or residential water: An organization involved with residential or city water. Activities include delivering drinkable sources of water (sometimes referred to as potable or culinary), sewer management, and water treatment.

Northwestern: Region that includes the states of Idaho, Oregon, and Washington.

Number of organizations involved with groundwater recharge: Groundwater organizations intentionally diverting water for groundwater recharge (see Diverted for groundwater recharge).

Other releases: Water released for any other reason, including but not limited to: unused excess water returned to source, overflow due to flooding, and breaches where infrastructure failed to hold water.

Pacific: Region that includes the states of California and Nevada.

Recreation or wildlife management: Organizations that have facilities located within a park or open space and therefore are assigned a regulatory role. Reservoirs within parks often double as tourist attractions with activities such as fishing and canoeing.

Released for down-stream use: Water released from conveyance facilities intended for diversion downstream and used later by another agency or individual not directly connected to the irrigation organization's facilities. Water released down-stream without users identified was recorded in 'Other releases'.

Residential or domestic users: Water delivered to non-farm homes. Water can be either potable or not.

Southeastern: Region that includes the states of Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina.

Southwestern: Region that includes the states of Arizona, New Mexico, and Utah.

Unincorporated mutual: An informal partnership among ditch users. This is typically a partnership or informal group of two or more farmers who operate irrigation supply works for their own needs. Many operate with no official formal organization.

U.S. Bureau of Indian Affairs organizations: Irrigation projects and systems operated by the U.S. Bureau of Indian Affairs (USBIA), which primarily serve farms on American Indian reservations.

Water delivery: Water sent via conveyance facilities (see Conveyance facilities) directly to a client. Water is considered directly delivered if the client withdraws the water from the conveyance infrastructure (canals) or if the water ends up in, on, or adjacent to the client's operation outside of the conveyance infrastructure intentionally. Water that leaves the conveyance infrastructure and enters into another irrigation organization's infrastructure, which in turn will be delivered to a farm, does not count as if it was delivered directly to a farm.

Survey and Statistical Methodology

Scope and Purpose: This work was conducted by the USDA’s National Agricultural Statistics Service (NASS) and Economic Research Service (ERS), in collaboration with the Office of the Chief Economist (OCE). It provides a greater understanding of local irrigation organizations, their operations, and their impact on drought resilience. Increasing demands on the Nation’s limited water resources has heightened the need for information on local management decisions and infrastructure systems that can help guide agricultural drought responses. Limited data on how water-supply entities respond to water scarcity hinders local water management decisions. NASS and ERS developed a national survey to provide the first updated dataset of local water-supply management entities since the Census Bureau conducted the 1978 Census of Irrigation Organizations. Over the last several decades, many aspects of local water management institutions have changed, including the number and size of irrigation organizations, the pricing structures used for cost recovery, the increasing demand for new types of water quantity data, and the expanding emphasis on groundwater management. This report provides a nationally representative assessment of irrigation water-delivery entities and groundwater management districts serving the U.S. agricultural irrigated sector.

This dataset includes information on organization structure, irrigation coverage, and water use by source. While the survey complements the Irrigation and Water Management Survey, both surveys finished during different calendar years on different populations. The purpose of this section is to describe the survey methodology utilized to produce the final estimates in this publication.

Survey Timeline: Data collection began in February 2020 and concluded in June 2020 with analysis and review completed by publication on December 17, 2020.

Sampling: The target population consists of organizations that deliver water to farms and ranches or manage (or otherwise directly influence) on-farm groundwater usage. While irrigation occurs in every state, this report focuses on the 24 states where irrigation organizations are most common. The population of interest for this survey includes ditch companies, irrigation districts, groundwater management districts, and other organizations in the surveyed states. Omitted from the population are organizations that deliver water only to households or other non-farm and non-ranch customers as well as ‘pass through’ organizations that deliver water to irrigation organizations but do not directly deliver water to farms and ranches. The Bureau of Indian Affairs irrigation projects and systems are included in the population.

All 5,246 in-scope operations in the 24 surveyed states were included in the sample.

Response Rate: The proportion of the sample that completed the survey, excluding those organizations that did not have the item of interest or were out of business at the time of data collection. The response rate for the survey is 44 percent. This calculation follows Guideline 3.2.2 of the Office of Management and Budget’s (OMB) Standards and Guidelines for Statistical Surveys (September 2006).

Stratification: The sample contains two types of organizations: groundwater management and non-groundwater management organizations. Groundwater organizations were assigned to one group while non-groundwater organizations were distributed into three groups based on their size. All highly impactful organizations from both types of organizations were assigned to a unique group.

Descriptions of the strata distributions are as follows:

- A. Organizations that directly influence groundwater
- B. Large-scale organizations that do not directly influence groundwater
- C. Medium-scale organizations that do not directly influence groundwater
- D. Small-scale organizations that do not directly influence groundwater
- E. Highly impactful organizations

Data Collection: The paper questionnaire version was the primary questionnaire while the web and telephone-interviewing instruments were built modeling the paper instrument. NASS and ERS developed the questionnaire, with input from various project stakeholders. NASS evaluated the questionnaire's content and format through a specifications process, where requests for changes were evaluated and either approved or disapproved during questionnaire development.

All federal data collections required approval by the OMB. NASS was required to document the public need for the data, show the design applied sound statistical practice, ensure the data did not already exist elsewhere, and guarantee that the public was not excessively burdened. The questionnaire displayed a statement of purpose about the usefulness of the collected data as well as an active OMB number that provided NASS the authority to conduct the survey. The questionnaire included a statement covering the response burden with an estimate of the amount of time required to complete the form as well as a confidentiality statement ensuring protection of the respondent's information.

Respondents received the questionnaire, along with a cover letter and instructions for web reporting by mail in mid-February 2020. Data collection utilized mail, web, and telephone interview modes for the survey. Respondents who did not return their survey by the end of March 2020 were sent a follow-up mailing, which consisted of another questionnaire. Respondents who did not return their survey received an autodial message encouraging them to report online. As a final effort, a pressure-sealed postcard was sent in June 2020 to serve as a reminder to respondents to complete their survey, with an emphasis on online response to improve response rates. Data collection concluded in June 2020.

RFO and HQ staff made additional efforts to account for all highly impactful records. In the event a highly impactful organization did not respond, staff conducted extensive research to estimate the record. All highly impactful records were accounted for and therefore not eligible for non-response weighting adjustments.

Survey Edit: During data collection, staff members reviewed and edited items for consistency and reasonableness alongside an automated system. The edit, following the survey's classifications and rules, assessed each record's status as either "In business", "Out of business", "No item of interest", or as a "Non-respondent". Relationships between data items within records on the survey were checked and verified. Statisticians reviewed records that did not pass the automated edit logic. During review, questionable items were either verified or updated if found to be incorrect.

Total Survey Error: There are two main types of estimation error that affect all estimates obtained from almost any survey.

The first type of error, referred to as non-observation error, occurs in any estimate generated from a survey in which nonresponse occurs or where data are not potentially obtainable from every unit in the target population. Statistical weighting (see Weighting Methodology below) is used to reduce the effects of this type of error.

The second type of error, referred to as non-sampling errors, includes all other errors that can arise from many different sources. These sources may include respondent error, enumerator error, or incorrect data keying, editing, or imputing for missing data. Non-sampling error due to mail list incompleteness and duplication, as well as misclassification of records on the mail list, is referred to as coverage error.

Weighting Methodology: Not every contacted irrigation organization provided the requested data. Non-respondents were accounted for by increasing the survey weights of the respondents inversely to the proportion of non-respondents within the same strata. Record-level list frame control data of irrigation organizations were used to define weighting cells where organizations of similar delivery type (i.e. surface vs. ground water) and size were grouped. The counts of survey respondents and non-respondents were used to compute the adjustment factor for each cell. The methodology assumed nonresponse was random within the weighting cell. For example, if a weighting cell has 100 organizations of which 80 responded and 20 did not, every respondent would have its original weight of 1 increased to 1.25 (100/80) to represent the organizations not responding.

Reliability: The accuracy of data products may be evaluated through sampling and non-sampling error. The measurement of error due to sampling is evaluated by the coefficient of variation (CV) for each estimated item. Non-

sampling error is evaluated by response rates and the percent of the estimate from respondents. The coefficient of variation is a measure of the relative amount of error associated with a sample estimate. Specifically, it is the standard error of a point estimate divided by that estimate, generally multiplied times 100 for reporting as a percentage. This relative measure allows the comparison of reliability for a range of estimates. For example, the standard error is often larger for large population estimates than for small population estimates, but the large population estimates may have a smaller CV, indicating a more reliable estimate. CVs for estimates are available from NASS Quick Stats.

Every estimate in this report has a corresponding CV published with it. NASS has identified the following index to use when evaluating the coefficient of variation.

Low Reliability Estimate. Coefficient of variation (CV) 30 percent or higher.

Caution should be used when using this estimate in any form. Please consult NASS for more information or guidance.

Medium Reliability Estimate. Coefficient of variation (CV) between 15 percent and 29.9 percent

High Reliability Estimate. Coefficient of variation (CV) less than 15 percent.

Estimation Procedures: State data were summarized and aggregated by regions for consistency and reasonableness. Data were reviewed utilizing interactive analysis tools, which displayed data for all reports by questionnaire items. The tools provided a variety of plots, tables, and special tabulations that allowed analysts to compare an individual record to other similar records within the same regions and states. The tools allowed staff to locate unusual data relationships and outliers during the review process and allowed staff to verify all relationships were compliant during the estimation phase.

Information Contacts

Listed below are the commodity statisticians in the Environmental, Economics and Demographics Branch of the National Agricultural Statistics Service to contact for additional information. Email inquiries may be sent to nass@usda.gov.

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