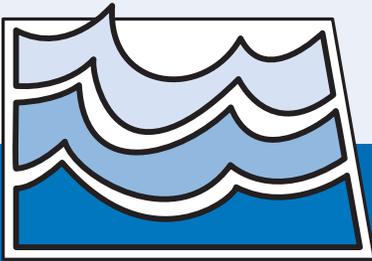


A REFERENCE GUIDE OF NORTH DAKOTA WATERS



ND STATE WATER COMMISSION
900 E BOULEVARD AVE
BISMARCK ND 58505
WWW.SWC.ND.GOV

North Dakota Quick Facts

Water Basics

Water Cycle

Watershed

Surface & Ground Water

Atmospheric Water

Floods & Floodplains

Droughts

ND Water Map

Water Use

Five Drainage Basins

Missouri River Basin

James River Basin

Red River Basin

Devils Lake Basin

Mouse River Basin

Water Equivalence

Stream Flow

Water Management – Know Your Water Managers

Water Words



2014

Dear Friends,

Water is North Dakota's most precious and valuable natural resource. It is important that we use all of the state's water resources wisely, keep it clean, and not take it for granted. On a daily basis our water resources are used for municipal, rural, and regional water supply systems, power production, agriculture, industry and recreation. Most recently, water has played a major role in growing the state's economy through its use in oilfield development.

It has been nearly a decade since the last edition of this publication was printed. In that time, the state has seen significant growth in industrial development and population, especially in the western part of the state. In addition, record flooding events and the continued need to provide quality and reliable water supplies throughout the state, have presented water managers with a unique set of challenges for years to come. And to meet those challenges, education is always a key factor toward progress.

It is my pleasure to present this up to date and redesigned publication that will serve as an excellent reference to you all.

Best regards,

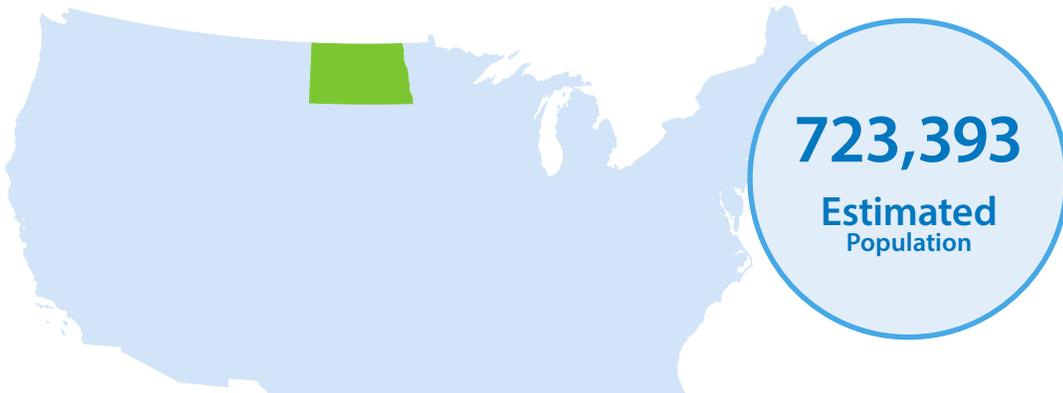
Todd Sando, P.E.

State Engineer and Chief Engineer - Secretary

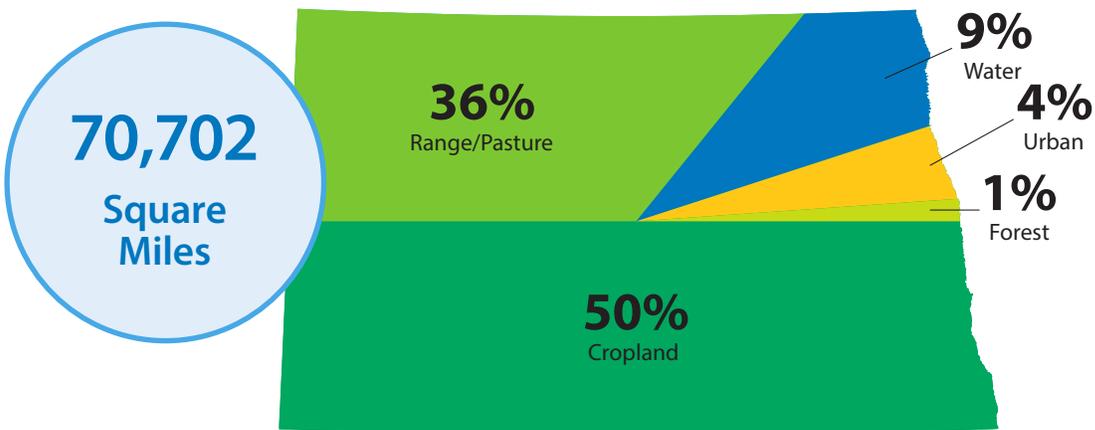
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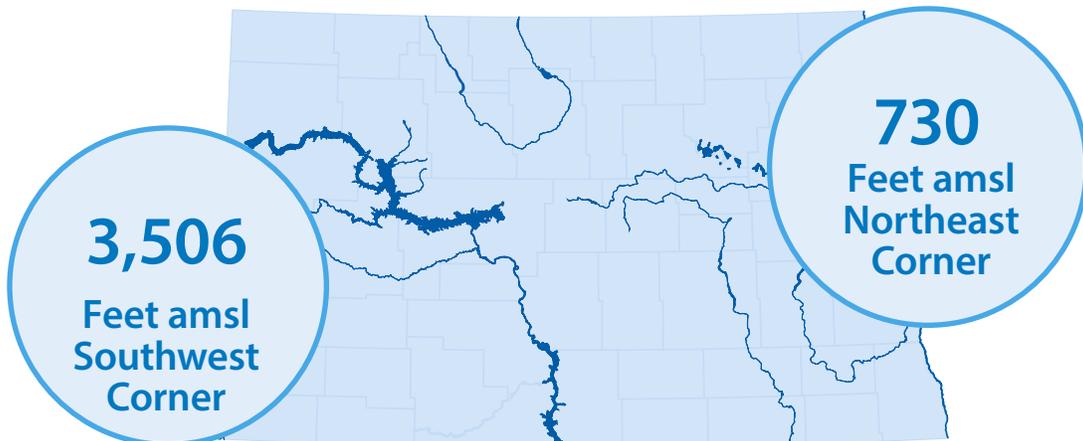
NORTH DAKOTA QUICK FACTS



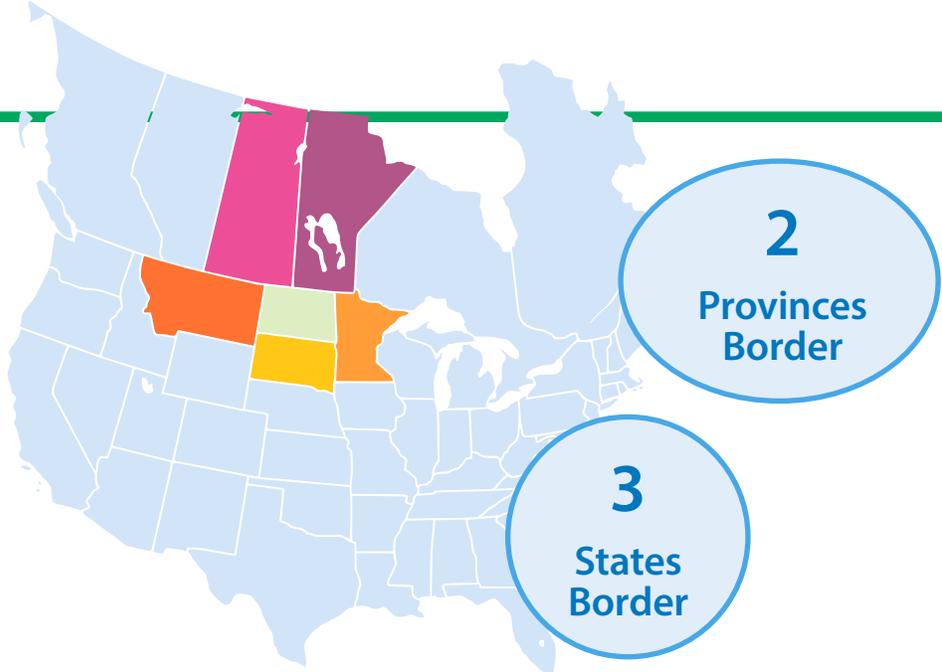
In 2010, the US Census Bureau estimated that North Dakota's population was 672,591, of which 59% was urban and 41% was rural. In 2013, the state population was estimated to be 723,393 – a 7.5% increase in just three years.



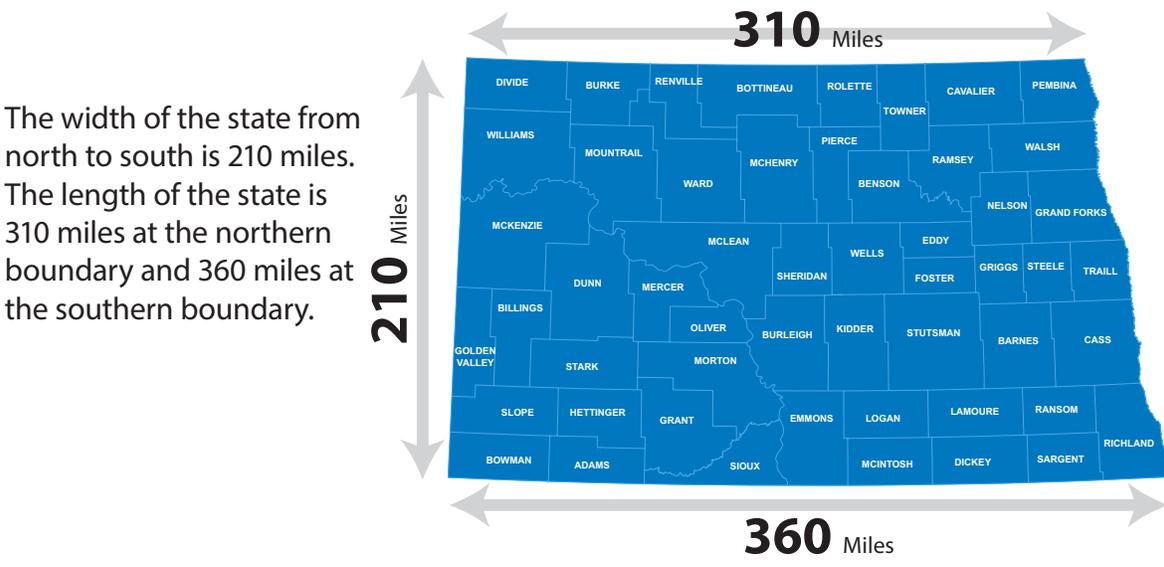
North Dakota covers 70,702 square miles in a rectangular-like area at the center of the North American continent. Nine percent, or 6,363 square miles of the state's surface area is covered by water.



Elevations range from about 730 feet above mean sea level (amsl) in the northeast corner of the state to 3,506 feet amsl in the southwest.



The state is bordered to the north by two Canadian provinces – Manitoba and Saskatchewan; Minnesota to the east, South Dakota to the south, and Montana to the west.

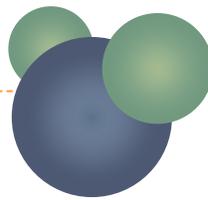


North Dakota's economy is based primarily on agriculture, mining, energy, and the tourism industry. Mining within North Dakota includes the extraction of petroleum, natural gas, non-fuel minerals, and lignite coal.

WATER BASICS

Water Molecule

Water is the most abundant compound on earth, covering nearly **70%** of the land surface.



Also known as **H₂O**
water is made up of two hydrogen atoms covalently bonded to an oxygen atom.

Adhesion Cohesion

Water likes to stick to itself and other things



Water molecules form hydrogen bonds with other water molecules.

Cohesion

These bonds are constantly breaking, and forming new bonds with other water molecules.



Water also likes to stick to other things.

Adhesion

Adhesive bonds are stronger than cohesive bonds.

Some examples of adhesive bonds of water molecules include; dew drops on spider webs, water that collects on the outside of a water glass, and water that is on your body when you get out of the shower.

Different States

The water molecule can be found in three different states or forms.



Liquid
Water

Solid

Ice, Snow, Hail, Sleet



Gas

Water Vapor

Surface Tension

The strong cohesive bonds between water molecules create surface tension.



Surface tension can be seen when you fill a glass with water to the very top and a little more.

One can see the water actually "bubbles" up and over the edges of the glass but does not spill out.

Certain insects use surface tension of water in their ability to walk across water without falling in. If one is careful, paperclips can be floated on the water surface of a full glass of water, demonstrating surface tension.

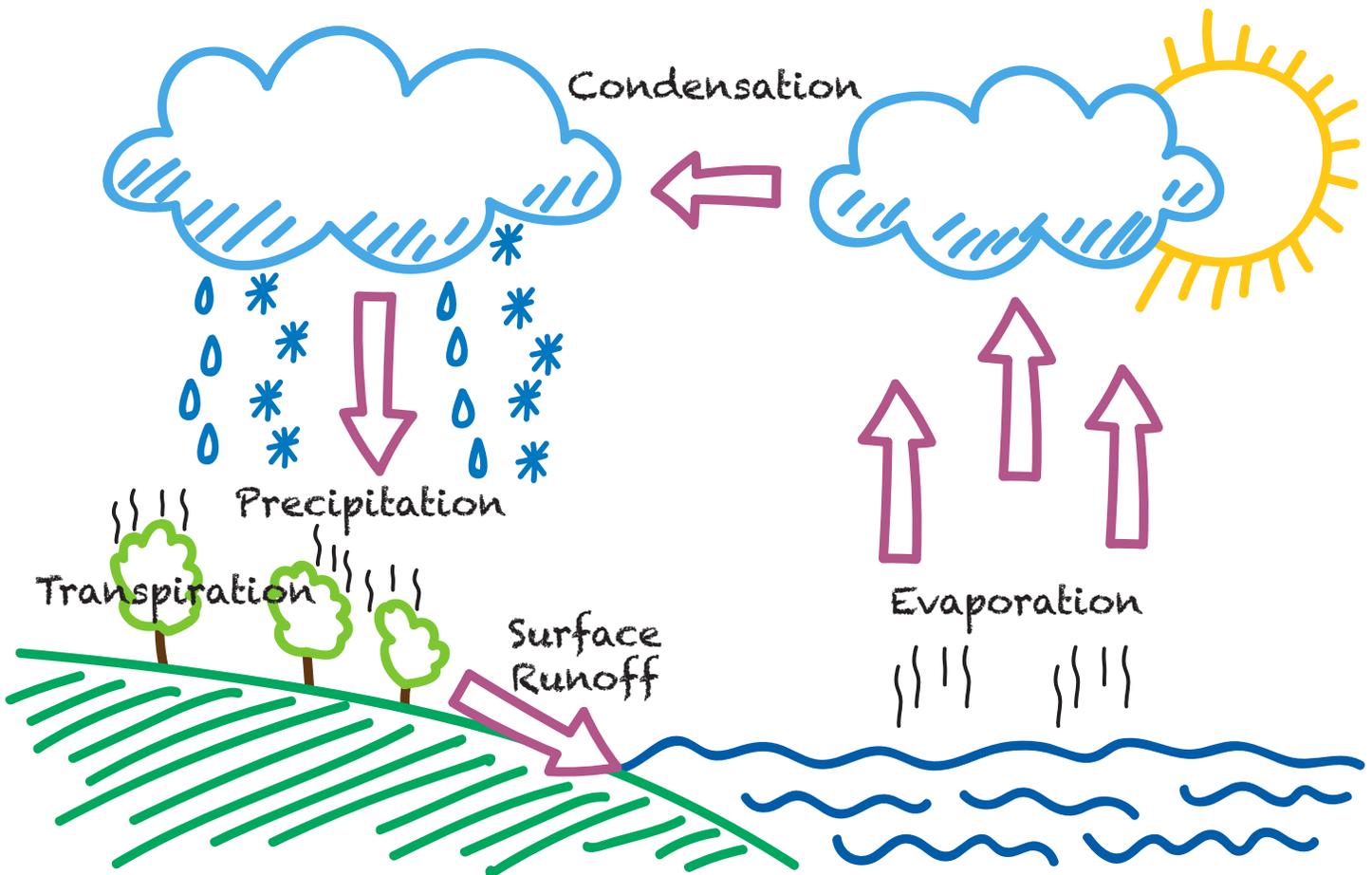


I'm Addy!



I'm Cole!

WATER CYCLE



- The **hydrologic cycle** is the intricate circulation of water around our planet. Rivers and lakes make up a visible part of the water cycle in North Dakota, but there is a tremendous amount of “invisible water” in the form of water vapor flowing through the atmosphere.
- During the summer when warm, moist air from the Gulf of Mexico makes its continental trek northward through the plains, there are roughly 5.5 million acre-feet (MAF) or nearly 2 trillion gallons of water floating above North Dakota

every day! In addition, more than three quarters of the state’s annual precipitation occurs between April and September when moisture from this low-level flow condenses into rain-producing clouds.

- The following (page 5) is a very basic description of the incredibly dynamic water cycle that is continually working around us. It is difficult to comprehend the sheer amount of water in our atmosphere that we are unable to see and what a vital role it plays in sustaining life on this planet.



DID YOU KNOW

1. Water is a resource that cannot be created by man.
2. Really old ground water is called fossil water.
3. Ground water or water stored in the earth’s surface can remain there for thousands of years before moving.
4. Water regulates the earth’s temperature. It also regulates the temperature of the human body.

WATER CYCLE

Evaporation is the movement of water from the earth's surface to the atmosphere. The process turns water from a liquid to a vapor (gas). In North Dakota, the evaporation rate is seasonally and annually variable. It is estimated that the average annual evaporation from shallow lakes and reservoirs ranges from 38 inches in the southwest, to 26 inches in the northeast part of the state. The average amount of water evaporated from North Dakota's Lake Sakakawea per day is 2,472 acre-feet, or nearly 800 million gallons. This is enough water to grow approximately 73,000 bushels of wheat.

Transpiration is the process by which plants give up moisture through their leaves to the atmosphere. Water is released as water vapor into the atmosphere. For example, an acre of corn typically loses 3,000-4,000 gallons of water per day through transpiration. Through evaporation and transpiration, the liquid form of water is changed to a gas called water vapor. It is estimated that 3,100 cubic miles of water, primarily in the form of invisible vapor, are contained in the atmosphere at any one time. If it were to fall all at once, the earth would be covered with about 1 inch of water.

Precipitation occurs when water vapor condenses, forming tiny cloud droplets as moist air rises and cools. With time, the droplets may collide and grow. Precipitation is the process of these droplets falling from the atmosphere to the ground. Most often it starts out at high altitudes as ice crystals. If the resulting precipitation melts before reaching the ground, we receive rain. If not, we get snow. Other forms of precipitation include hail and sleet.

Condensation is the process by which a vapor becomes a liquid. In meteorological usage, this term is applied only to the transformation from vapor to a liquid. Within the water cycle, condensation happens when warm moist air combines with cool air, turning the moisture in the warm air into a liquid.



DID YOU KNOW

Approximately 70% of the earth's surface is covered with water.

- Only 1% of this water we can use
- 97% is saltwater
- 2% is water frozen in glaciers

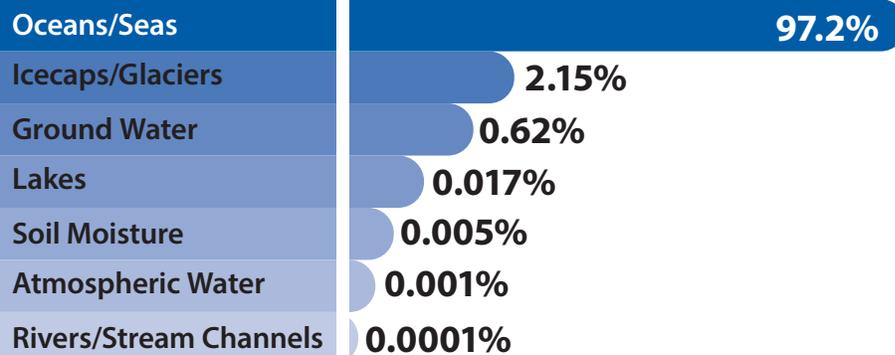
Today, we have approximately the same amount of water as the first day on earth.

Water moves in a never-ending cycle; nature recycles it over and over again.

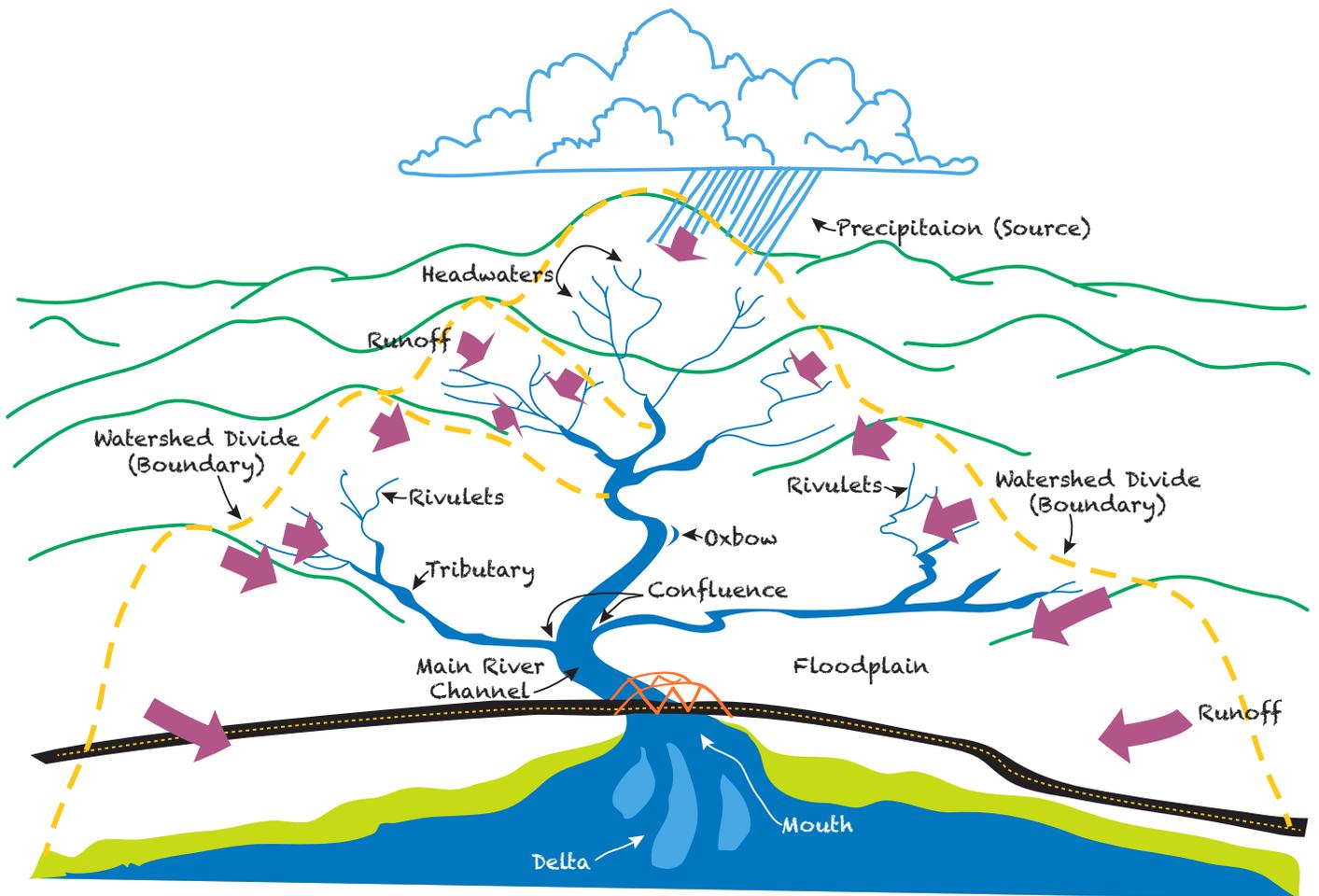
The water you drink may have been a drink for a dinosaur.

You use an average of 168 gallons of water per day.

In the United States, we use approximately 25 trillion gallons of fresh water each year.



WATERSHED



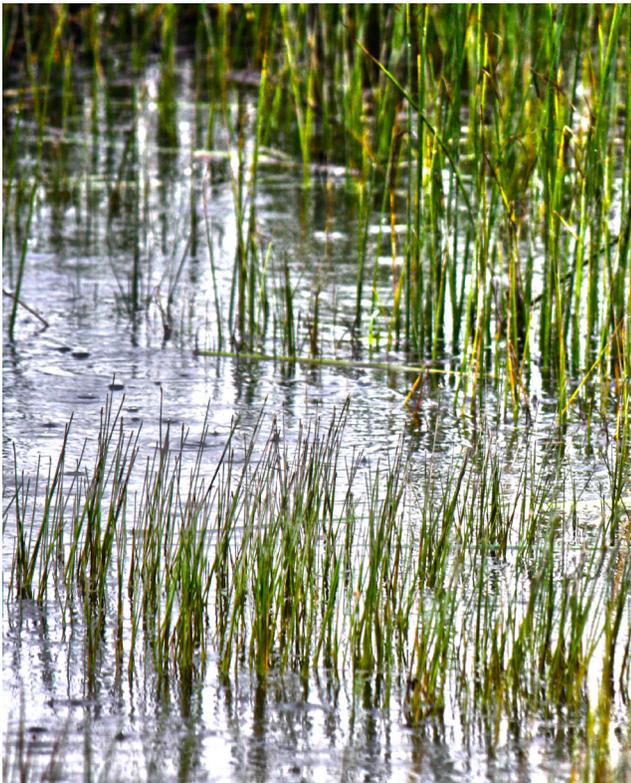
- **Watersheds** are an area of land that is drained by a system of rivers, streams, creeks, and other drainage systems to a common point. That common point may be a larger river, lake, or even an ocean.
- North Dakota is located in two large watershed basins; the Missouri River Basin, and the Hudson Bay Basin. These two basins are separated by a continental divide. The Missouri River basin drains into the Mississippi River, which later flows into the Gulf of Mexico at New Orleans, Louisiana. The Red River Basin flows north towards Canada and into the Hudson Bay.
- Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. In the continental US there are 2,110 watersheds. When you include Hawaii, Alaska, and Puerto Rico, there are 2,267 watersheds.



SURFACE & GROUND WATER

Surface Water

- Surface water is water contained or flowing in streams, rivers, wetlands, lakes, reservoirs, or other bodies of water on the earth's surface.
- Surface water quality in North Dakota is quite variable and influenced by climatic conditions, land use, erosion, and shallow ground water discharged from springs. Increased stream flows associated with snowmelt and precipitation generally cause a decrease in dissolved solids and an increase in suspended sediment. The reverse is common during normal or low flow conditions.
- North Dakota's sometimes significant and dramatic river flow variations and lake-level elevations are caused by climatic conditions, precipitation amounts, evaporation rates, and snow pack conditions.
- Flow in all streams is seasonally variable. Runoff is often the greatest in early spring as a result of snowmelt and rainfall. Many of the smaller seasonal streams experience little or no flow for extended periods during the drier summer months.



Missouri River Surface Water

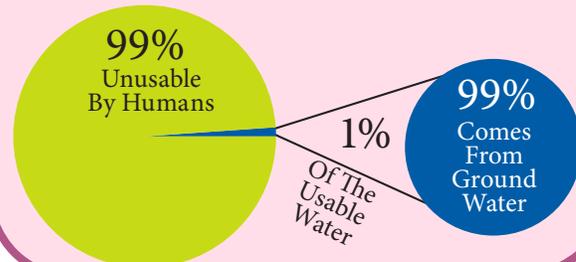
Ground Water

- Ground water lies under the land surface throughout all of North Dakota. Ground water generally occurs in two major types of rock – unconsolidated deposits and bedrock.
- Unconsolidated deposits are loose beds of gravel, sand, silt, or clay of glacial origin. Bedrock consists primarily of shale and sandstone. With the exception of southwestern North Dakota, bedrock underlies the unconsolidated deposits.
- Saturated deposits that are sufficiently permeable to readily transmit water are called aquifers.
- Bedrock aquifers underlie the entire state and tend to be more continuous and widespread than aquifers in the unconsolidated deposits.
- It is estimated that 60 million acre feet of water is stored in the major unconsolidated aquifers in the state. The amount of water available in the bedrock aquifers is unknown.
- Water quality of the state's aquifers varies greatly.
- Of the 125 North Dakota communities with municipal distribution systems relying on ground water for their water supply, none exceed primary water quality standards.
- Primary water quality standards are part of the National Primary Drinking Water Regulations administered by the Environmental Protection Agency (EPA). These primary standards regulate contaminate levels within drinking water based on toxicity and health effects.



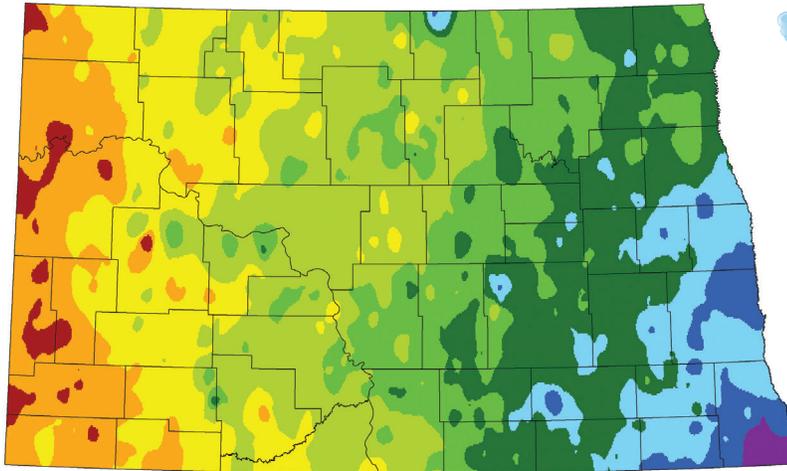
DID YOU KNOW

Of all the water on the earth only 1% is available for our use.

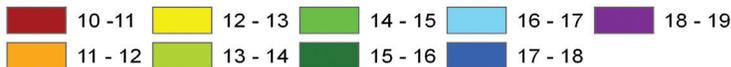


ATMOSPHERIC WATER

30 Year (1983 - 2012) Average Rainfall (April - September)



Precipitation in Inches



DID YOU KNOW

By far the greatest source of atmospheric water over North Dakota is the Gulf of Mexico, not the Pacific Ocean. The contribution of Lake Sakakawea, Lake Oahe, and Devils Lake is relatively minor.

Atmospheric Water

- In wet years, 62 to 90 MAF of water falls on the state as precipitation, while in dry years the amount is reduced to 30 to 60 MAF.
- On a typical summer thunderstorm day, about 7 MAF of water passes over North Dakota in the form of invisible water vapor.
- In the atmosphere, water seldom freezes right at 32° F (0° C), but instead supercools, often to subzero (0° F) temperatures before forming ice crystals.
- Most northern Great Plains precipitation, even from summer thunderstorms, originates as ice within clouds miles above the surface, where typical temperatures range from 0° to -50° F.
- In a typical developing North Dakota summertime cloud, one cubic inch contains more than 10,000 tiny cloud droplets, each only about 0.0005 inches in diameter. It requires about 1 million cloud droplets to compose a raindrop.
- Vast amounts of heat are released when water condenses to form clouds, and again when that water freezes. The scale of this energy release is mind-boggling. An average thunderstorm cell during its 30-minute lifetime liberates more energy than a World War II-era atomic bomb.
- Annual mean precipitation in the state ranges from 14 inches in the far west to 23 inches in the extreme east and southeast.

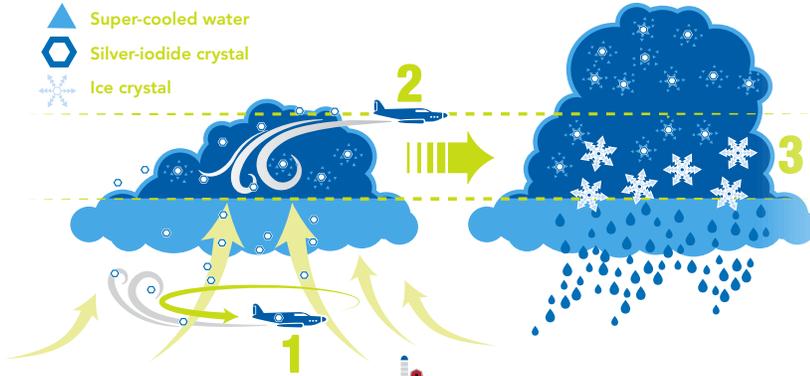
STATEWIDE RAIN RECORDS				
	TIME	PLACE	AMOUNT*	DATE
HIGH	24 hrs.	Gilby	10.05	June 13, 2000
	1 mo.	Mohall	14.01	June 1944
	1 yr.	Milnor	37.98	1944
LOW	1 yr.	Parshall	4.02	1934

* Amount in Inches

STATEWIDE SNOWFALL RECORDS				
	TIME	PLACE	AMOUNT*	DATE
HIGH	24 hrs.	Fullerton	29.7	May 11, 1922
	1 mo.	Minot	35.4	April 1970
	1 yr.	Bismarck	103.1	1996
LOW	1 yr.	Jamestown	9.02	1958

* Amount in Inches

Warm Season - Cloud Seeding

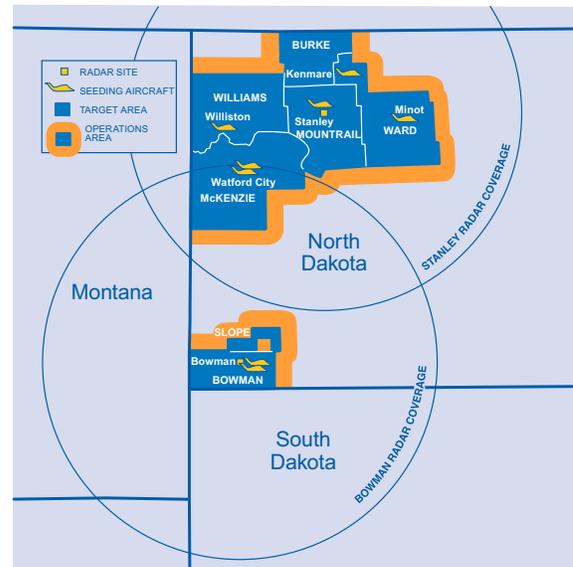


1. Silver iodide, dry ice or other hygroscopic (water attracting) materials are released in the updraft or
2. Placed directly in the cloud
3. Silver iodide/dry ice particles aid in the conversion of supercooled water droplets to ice crystals and eventually snowflakes that melt and become rain

Credit North American Weather Modification Council

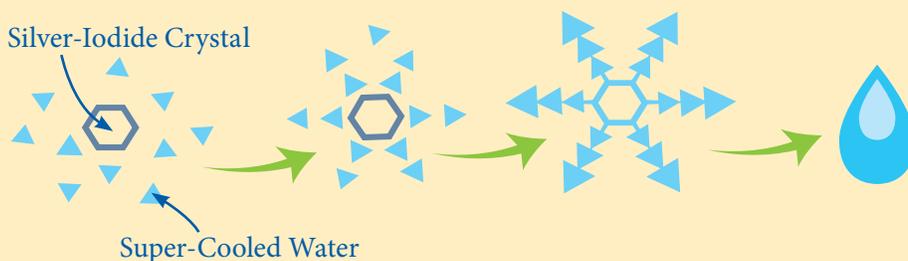
Cloud Modification

- North Dakota has had a cloud modification project in place for over fifty years. Cloud seeding, often called cloud or weather modification, is a scientific process intended to enhance rain and snow, reduce hail damage, and alleviate fog.
- The North Dakota Cloud Modification Project (NDCMP) is one of the longest running hail suppression projects in the world.
- Bowman, Burke, McKenzie, Mountrail, part of Slope, Ward, and Williams counties are currently participating in the NDCMP.
- Independent long-term evaluations of the program have shown that the project has increased summer rainfall 5-10% and has reduced crop-hail damage by 45%. This is an incredible benefit for farmers and ranchers within the areas this project takes place.



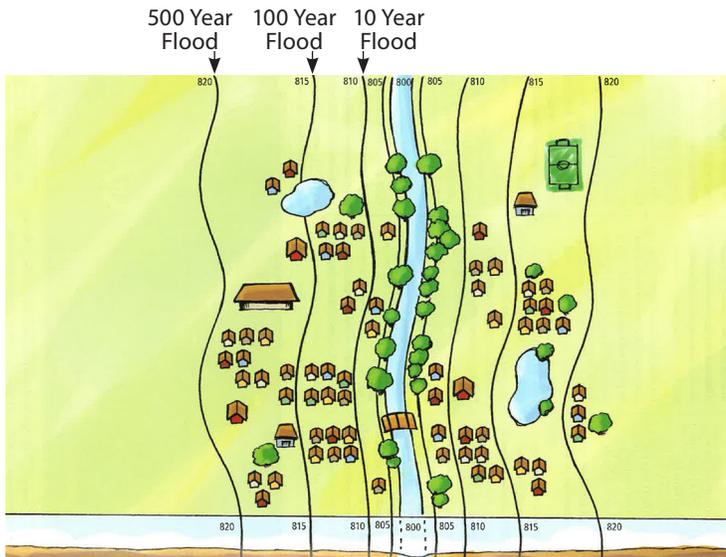
North Dakota Cloud Modification Project (NDCMP) target areas.

Inducing The Formation Of Ice Crystals In A Cumulus Cloud



1. Silver-iodide crystals have a shape similar to ice crystals and provide a "seed" or nucleus for ice formation when placed in a cloud.
2. Droplets of super-cooled water in the cloud attach to the silver iodide and form ice crystals.
3. Ice crystals grow until they acquire enough mass to fall toward earth, melting and becoming raindrops.

FLOODS & FLOODPLAINS



Floodplains are identified as 10 year flood, 100 year flood and 500 year flood. A 10 year flood means there is a 1 in 10 chance of a flood of that magnitude occurring each year.

- A flood is the temporary inundation of normally dry land areas resulting from the overtopping of the natural or artificial confines of a river or other body of water.
- Flooding of agricultural land and urban areas results from heavy runoff of snowmelt and/or heavy rainfall.
- A floodplain is a normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually lowland adjacent to a stream or lake.
- In North Dakota, 2.5 million acres (6% of the state's total area) are located in floodplain areas.
- About 36,000 North Dakota residents, (or 5% of the state's population) live in floodplain areas.

DROUGHTS

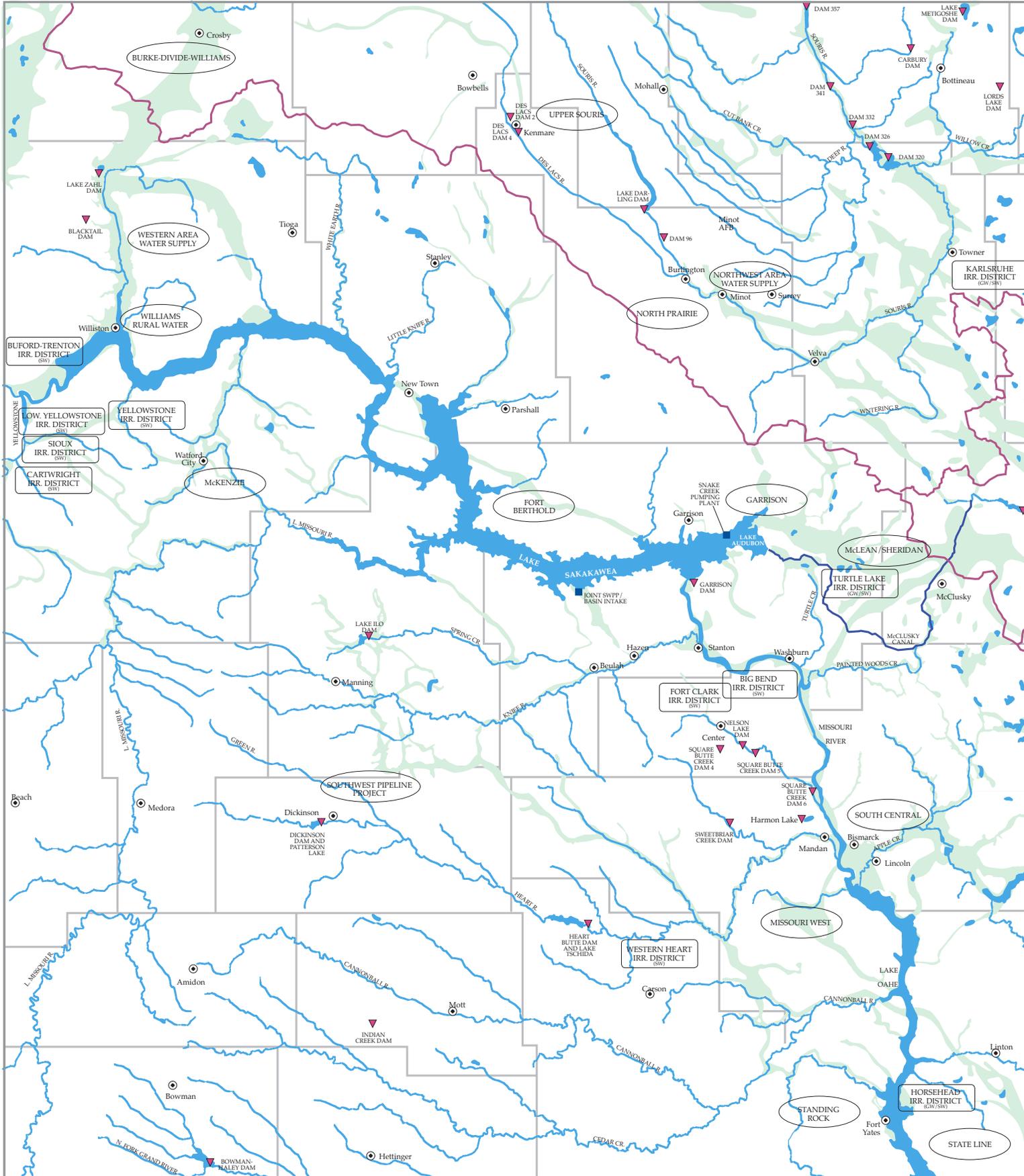
Drought tends to be defined in three different ways:

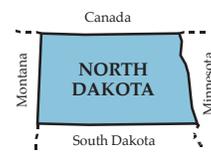
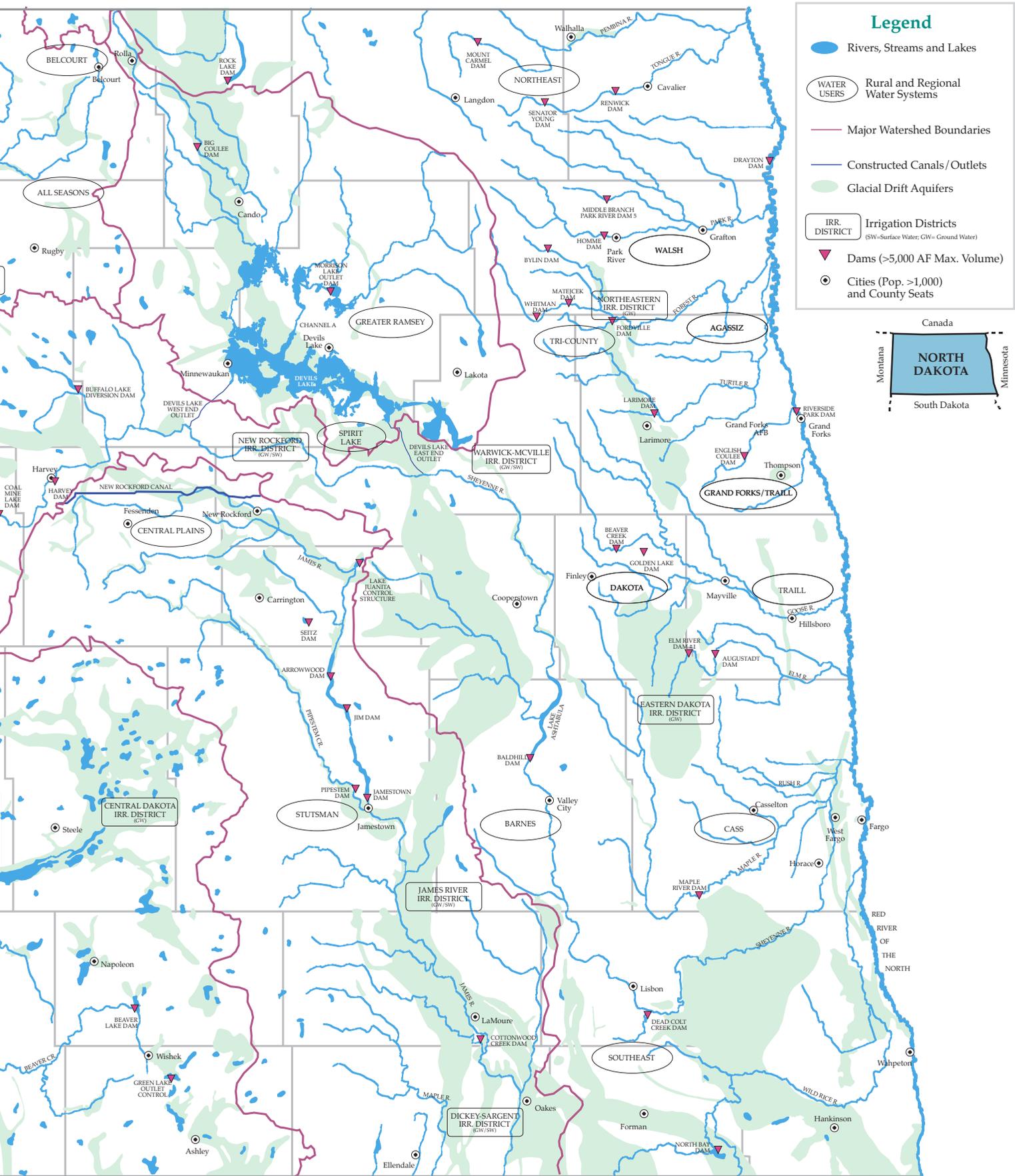
- **Meteorological:** A meteorological drought is when there is a prolonged period of less than average precipitation.
- **Agricultural:** Are droughts that can affect crop production and rangeland. Many times agricultural droughts are influenced by meteorological drought, however, it may also occur due to untimely precipitation.
- **Hydrological:** Hydrological drought happens when water reserves in aquifers, lakes, rivers, and reservoirs fall below average. Many times hydrological droughts take longer to develop.
- Extended drought has a devastating effect on the state's economy and people. Farmers may experience crop failures and ranchers may not have forage or water supplies for their cattle.
- Under extended droughts, municipalities may call for water conservation measures which can directly affect everyone.



Franklin D. Roosevelt visited Devils Lake, North Dakota in August 1934, to view the extensive drought there; 35,000 people were present during his four hour stay.

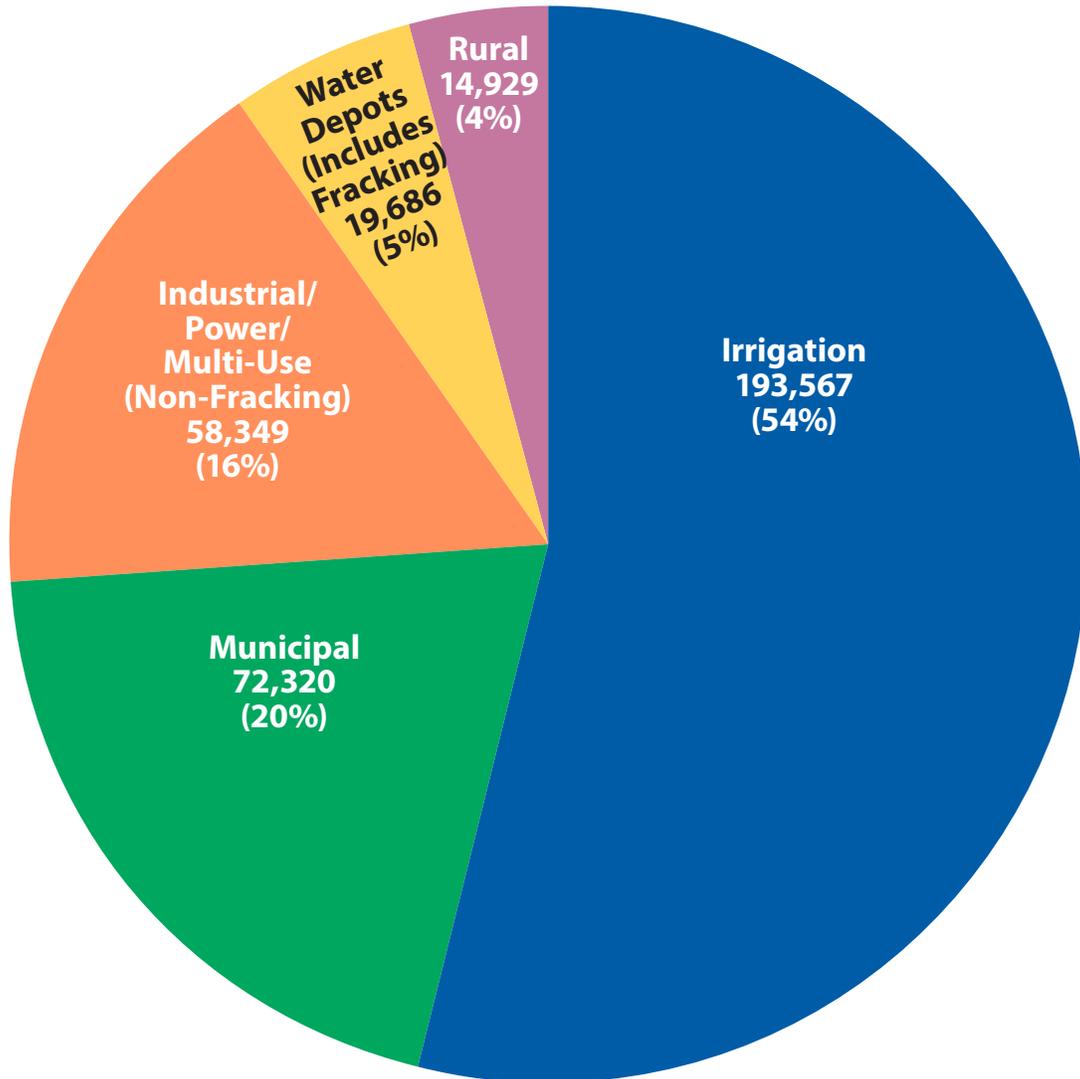
ND WATER MAP





2013 Consumptive Water Use In North Dakota *(In-Acre-Feet)*

Total Consumptive Use = 358,851 Acre-Feet



- Consumptive Water Use** is the difference between the total quantity of water withdrawn from a source for any use, and the quantity of water returned to the source. This includes the release of water into the atmosphere and the consumption of water by man, animals, and plants. Further it includes the incorporation of water into the products of industrial or food processing.
- Non-Consumptive Water Use** is using water in a way that does not reduce the supply, or using diverted water and returning it to the source without reducing supply. Hydroelectric power generation uses a tremendous amount of water in a non-consumptive manner.
- The State of North Dakota keeps close records of water use throughout the state. In general, water uses are divided into four categories: Municipal & Rural Domestic, Irrigation, Power Generation, and Industrial.
- Not all of the state has adequate water quantity or quality to meet municipal, rural domestic, irrigation, and livestock needs.

WATER USE

Municipal Water

- Municipal water is water that is used for both indoor and outdoor household purposes. Common examples of indoor household uses include: drinking, food preparation, bathing, washing clothes, dishes, and flushing toilets. Examples of outdoor municipal uses could include watering lawns and gardens.
- Municipal water may come from a public water supply or self supplied from a well.
- Municipal water accounts for about 20% of all water use in North Dakota.

Rural Water

- For the most part, rural water systems are drawn from water sources, treated, and transported through extensive pipelines to supply water to remote/rural areas. Most of the time, rural water customers will use well water on their property for agricultural purposes, watering lawns, and other uses that are not within the household.
- Rural water use accounts for about 4% of all water used in the state.

Irrigation Water

- Irrigation is the practice of artificially supplying water to crops, and has been going on for thousands of years, since humans have been cultivating plants. It is essential for keeping fruits, vegetables, and grains growing to feed the world's population.
- In North Dakota, irrigation is mostly distributed by availability of water and adequate soil type. It can be used for many types of crops, but corn is the most irrigated crop. Farmers in the state also irrigate alfalfa, barley, dry beans, soybeans, potatoes and sugar beets. Irrigation accounts for approximately 54% of all water used in North Dakota.

Industrial & Power Generation

- Industrial water use makes up approximately 16% of all water use in North Dakota.
- Industrial water use is supplied by sources other than municipal distribution systems.
- Industrial water uses include the following: fabricating, processing, washing, cooling, and transporting a product. Examples of products include food, paper, chemicals, and refined petroleum.
- Agricultural uses of water for chemical application and cattle watering are examples of industrial water uses as well.
- Power generation is a major industry in North Dakota. There are six coal-fired power plants along the Missouri River and one on Lake Nelson. Electricity produced by these power plants supply energy needs to North Dakota and in bordering states.
- The main use of water in power generation is for cooling of equipment. Much of the water is released back into the rivers and lakes the plants are situated along. Water is also emitted as steam into the atmosphere.

Water Depots

- Water Depots are privately and publicly owned facilities that provide water mainly for oilfield purposes. Water at these facilities are available for purchase
- Hydraulic fracturing or fracking is the main use of this water, however there are a variety of other uses including dust suppression on gravel roads.



BURGER BREAKDOWN

It takes 660 gallons of water to create a 1/3 lb. beef patty.

40 gallons = 1 slice of cheese

1 gallon = 2 slices of tomato

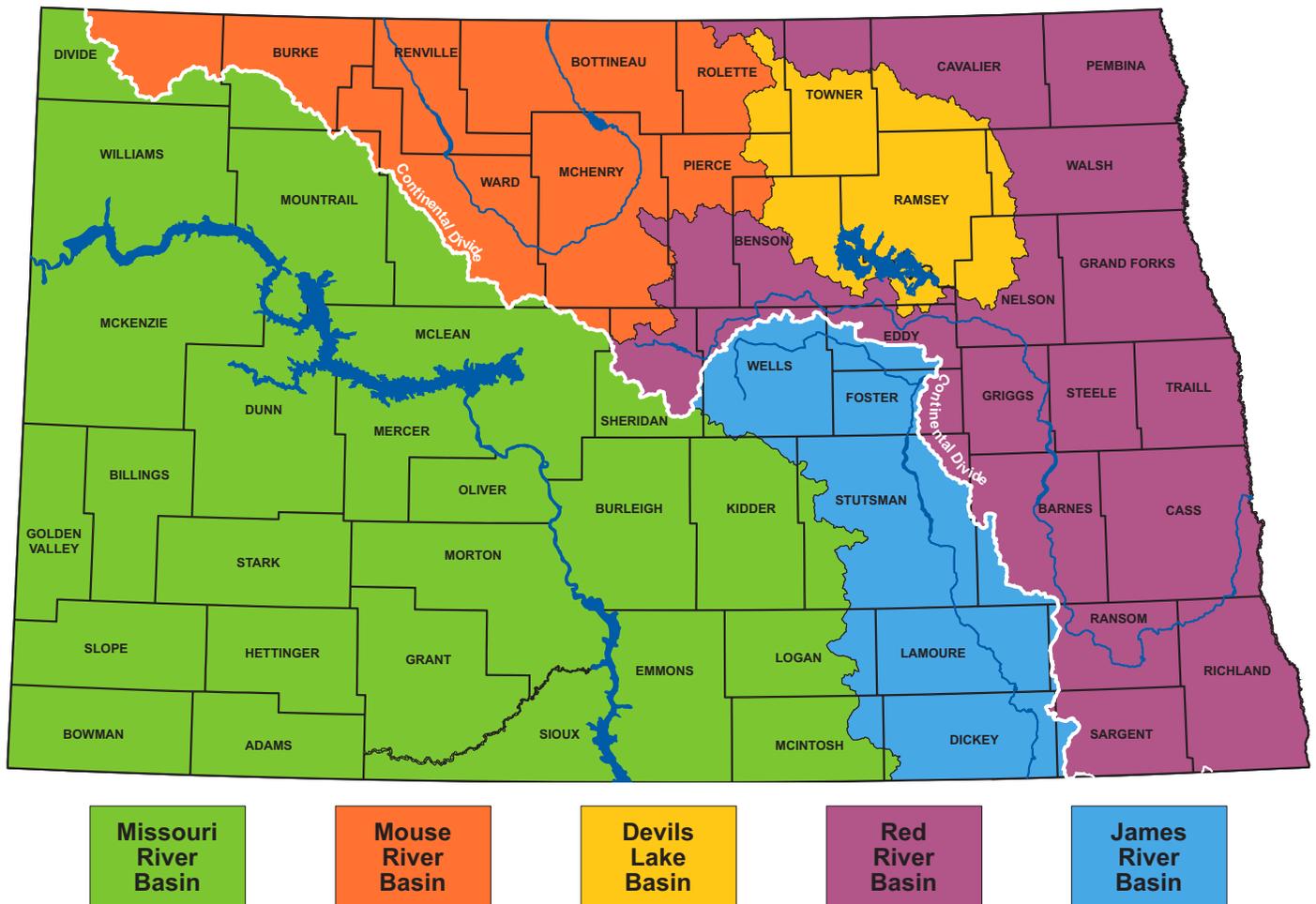
3 cups = 1 leaf of lettuce

22 gallons = bun

+ 108 gallons = 3 slices of bacon

= 831 gallons OR
13,296 glasses of water (8 oz. cup)

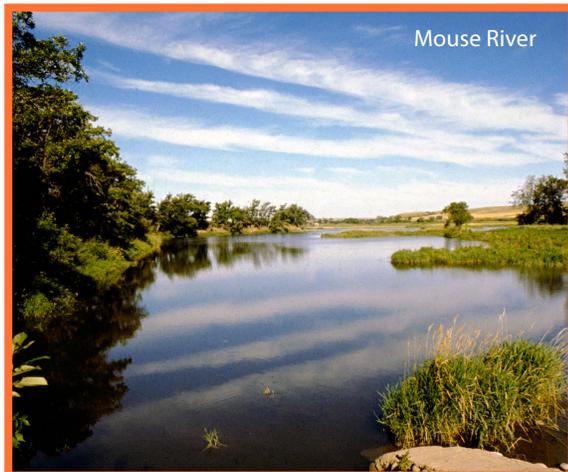
FIVE DRAINAGE BASINS



- North Dakota's major rivers and their tributaries total approximately 5,100 river miles. Major Rivers include the Missouri River, Mouse River, Red River, Sheyenne River, and James River.
- The total combined annual flow of the Red River at Fargo, the Sheyenne River at Valley City, the James River at Jamestown, and the Mouse River at Minot is about 4% of the annual flow of the Missouri River at Bismarck.
- Seven of North Dakota's largest lakes and reservoirs (greater than 10,000 acres each) comprise a total of 863,000 acres. These major lakes and reservoirs include: Lake Sakakawea, Lake Oahe, Lake Audubon, Lake Ashtabula, Devils Lake, and Jamestown Reservoir. Hundreds of smaller lakes are also scattered throughout the state.
- Reservoirs are extremely important to outdoor recreation, providing 87% of the water surface acres available for fishing, boating, and other recreational uses.
- Ninety-seven percent of the total normal reservoir storage in the state is within Lake Sakakawea and Lake Oahe.
- The State of North Dakota is separated into two major drainage basins by a continental divide running from the northwest through the central and southeastern part of the state. The northeastern portion of the state falls generally within the Hudson Bay drainage, while the southwestern part is drained by the Missouri River into the Gulf of Mexico. These two drainages are known as the Missouri River Drainage and The Hudson Bay Drainage.

FIVE DRAINAGE BASINS

- The Missouri River drainage basin in North Dakota includes the major sub-basins of the Missouri River and James Rivers. The area is characterized by a combination of glaciated terrain, with badlands and landforms of eroded, soft sedimentary bedrock in the southwest. The badlands include colorful cliffs, canyons, gorges, ravines, and gullies that have been created by extensive wind and water erosion.
- The Hudson Bay drainage basin includes the Mouse and Red River systems, as well as the Devils Lake Basin.



MISSOURI RIVER BASIN

Incorporated Communities: 105
Drainage Area: 34,544 sq. miles

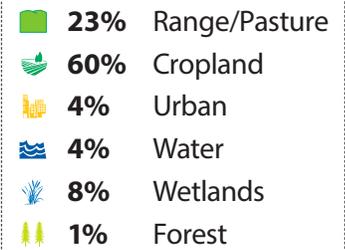
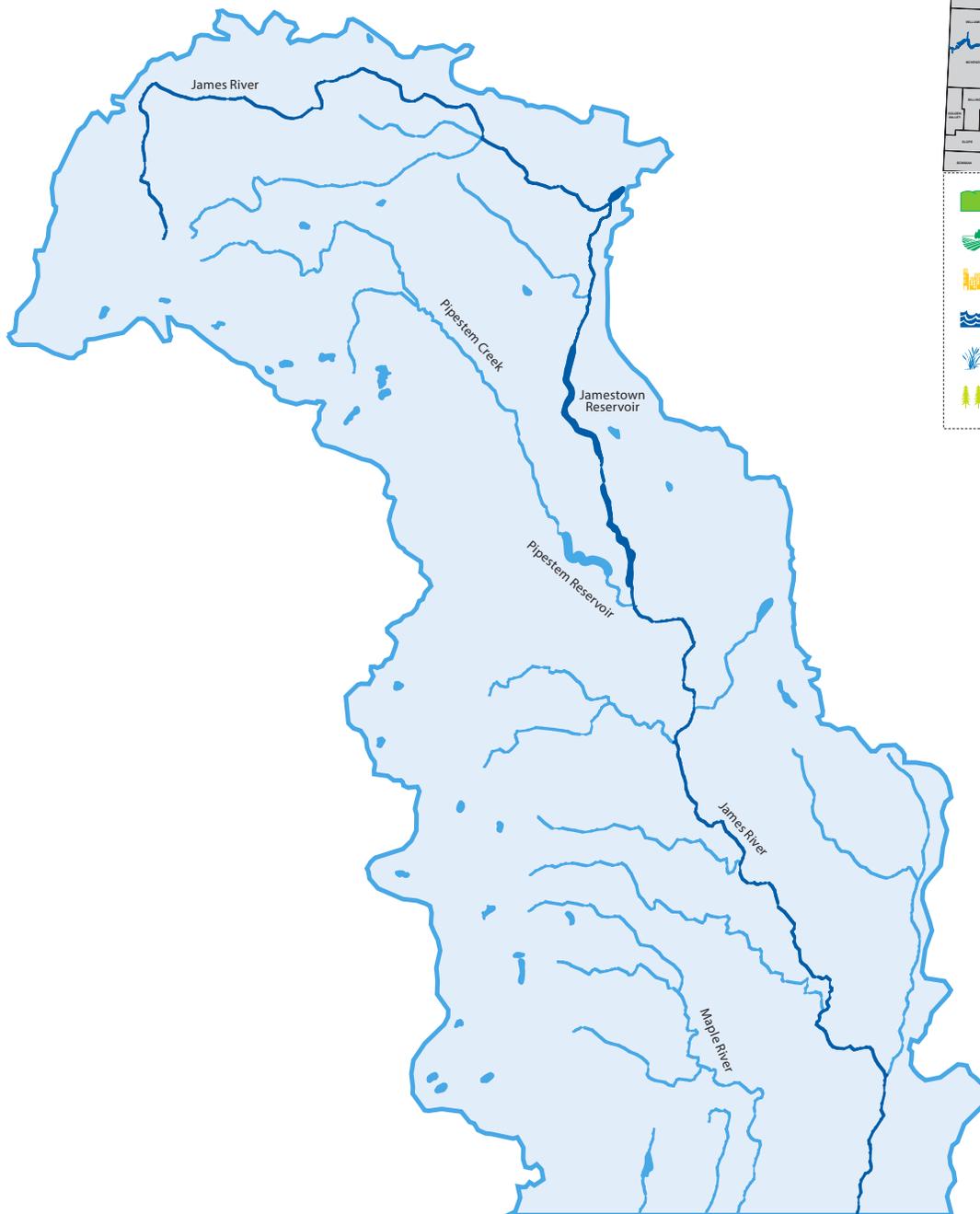


	54%	Range/Pasture
	35%	Cropland
	4%	Urban
	3%	Water
	2%	Wetlands
	2%	Forest

- Historically, the Missouri River has had the best water quality of any river in the state.
- The Missouri River Basin, comprised of seven major sub-basins, is the largest in the state. It drains approximately 48% of the state's total area. Many tributaries on the south and west sides of the Missouri River typically create small but sharply-defined valleys. This area is well drained with very few natural lakes. The topography is characterized by numerous flat-topped, steep sided buttes and hills. The most prominent are located in what is known as the Badlands along the Little Missouri River.
- The area east of the Missouri River is characterized by numerous small lakes and wetlands.
- Annual mean precipitation in the basin ranges from 14 inches in the northwest to 22 inches in the east.
- Lake Sakakawea was formed by the closing of Garrison Dam in 1953. Lake Sakakawea normally covers 365,000 surface acres, can store a maximum of 24.2 million acre feet, and has 1,600 miles of shoreline in six counties. Lake Oahe, formed by closing Oahe Dam in 1959 in South Dakota, covers up to 374,000 acres, 80,000 surface acres in North Dakota, and can store a maximum of 23.1 MAF. The two projects required a total of 550,000 acres of land in North Dakota, including shoreline acres needed for flood conditions.
- Only about 79 miles of the original 350 Missouri River miles in North Dakota remain free flowing outside of reservoir boundaries.
- The Little Missouri River is the only river designated as a State Scenic River by the North Dakota Legislature.

JAMES RIVER BASIN

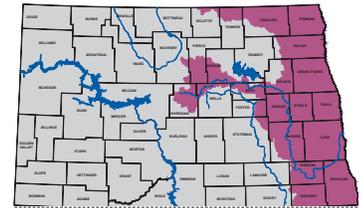
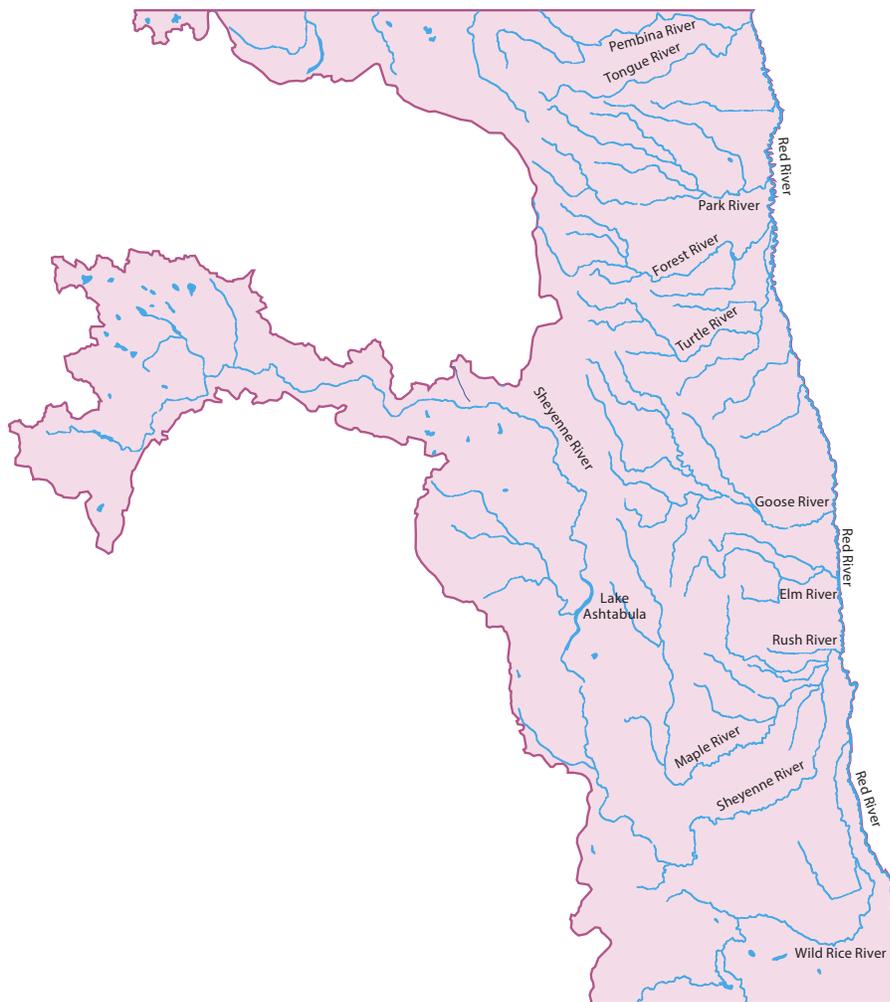
Incorporated Communities: 33
Drainage Area: 6,493 sq. miles



- The James River, a major tributary of the Missouri River, is located in central North Dakota, but does not join the Missouri River until it reaches Yankton, South Dakota.
- One of the principal tributaries of the James River is Pipestem Creek.
- Fifty-six percent of the basin does not contribute to flows in the James River.
- There are abundant wetlands in the basin.
- Annual mean precipitation in the basin is about 21 inches.
- Pipestem Dam and the Jamestown Reservoir were constructed for flood control and flow regulation purposes. Jamestown Reservoir is the largest reservoir in the James River Basin, with a maximum storage capacity of 230,000 acre-feet, covering 13,250 surface acres.

RED RIVER BASIN

Incorporated Communities: 140
Drainage Area: 17,100 sq. miles

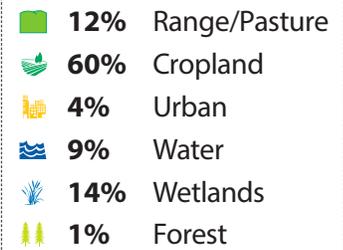


	13%	Range/Pasture
	70%	Cropland
	5%	Urban
	3%	Water
	8%	Wetlands
	2%	Forest

- From its origin at the confluence of the Ottertail and Bois de Sioux Rivers at Wahpeton, North Dakota, and Breckenridge, Minnesota, the Red River winds northerly almost 400 river miles, forming the boundary between North Dakota and Minnesota. From the Canadian border, the Red River flows about 155 river miles north to Lake Winnipeg in Manitoba.
- The valley through which the river flows is actually the bed of glacial Lake Agassiz. The lakebed is very flat and accounts for the meandering course and low gradient of the river.
- The headwaters of most of the eight major tributaries in North Dakota begin in the drift prairie in the western part of the basin where valleys are narrow and steep-sided. As the tributaries enter the lowlands of the lakebed, the river slopes become very flat, with poorly-defined watershed boundaries.
- The annual mean precipitation within the basin ranges from 18 inches in the west to more than 23 inches in the southeast.
- The largest reservoir in the Red River Basin is Lake Ashtabula. This flood control and water supply dam is located on the main channel of the Sheyenne River, and has 200,000 acre-feet of maximum storage.
- The Red River Basin has 70% of its area devoted to cropland – the highest percentage among the five major basins.
- The Sheyenne River, a major tributary of the Red River, is 506 miles long, making it the longest river in North Dakota.

DEVILS LAKE BASIN

Incorporated Communities: 28
Drainage Area: 3,842 sq. miles



- The Devils Lake Basin lies within the Red River Basin.
- The drainage system of the Devils Lake Basin is formed by chains of waterways and connecting lakes, with the majority of the basin's water reaching its ultimate collecting point at Devils Lake.
- Devils Lake does not have a natural outlet, until it reaches an elevation of 1,458 feet above mean sea level (amsl). So as water flows in, the lake has the potential to rise.
- Throughout recorded history, the water level of Devils Lake has fluctuated greatly. The U.S. Geological Survey recorded the elevation of 1,438 feet amsl in 1897, after which the level showed a gradual downward trend to a low of 1,401 feet amsl in 1940.
- Devils Lake has risen a total of 53.4 feet from elevation 1,401 feet amsl in 1940, to a historic high of 1,454.4 feet amsl in 2011, causing major flood-related damages.
- As the lake levels change, so do water quality parameters. Lower water levels are generally associated with decreased water quality, and higher levels are generally associated with improved water quality.
- Until recently, the Devils Lake Basin contributed very little to the Red River drainage. However, in 2005 a West Devils Lake outlet was constructed, and in 2012, an East Devils Lake outlet was completed in response to the emergency. These outlets are controlled and help to relieve the Devils Lake Basin of flooding by draining water into the Sheyenne River.
- Devils Lake is the largest natural lake in North Dakota, at about 185,000 acres as of 2014. At this level, Devils Lakes contains approximately 3,775,000 acre-feet of water.
- Seventy-two percent of the basin is used for agricultural purposes.

MOUSE RIVER BASIN

Incorporated Communities: 52
Drainage Area: 8,734 square miles

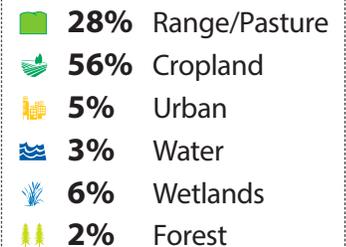


DID YOU KNOW

In 2011 the Mouse River Basin flooded and devastated numerous communities along its path.

The Mouse River saw the highest flows on record, mostly resulting from widespread, unprecedented rainfall throughout the basin.

In Minot, the flood inundated 4,100 homes and in Ward County the flood caused the evacuation of 11,000 people.



- The Mouse River originates in Saskatchewan, Canada and forms a 357 mile “loop” through North Dakota before it re-enters Canada.
- In Canada, the Mouse River is known as the Souris River.
- The Mouse River Basin handles drainage from Saskatchewan, Montana, North Dakota, and Manitoba.
- There are seven major tributaries of the Mouse River in North Dakota. The principal tributary is the Des Lacs River.
- The topography in the basin is varied to include hilly terrain in the southwest, flat glacial Mouse Lake plain in the east, and forested hills of the Turtle Mountains in the northeast.
- Annual mean precipitation ranges from 15 inches in the west to 18 inches in the east.
- The Upper Souris, J. Clark Salyer, and Des Lacs National Wildlife Refuges are formed by small dams located on the Mouse and Des Lacs Rivers. The dams retain 352,788 acre-feet at maximum storage, equivalent to 88% of the total storage in the basin.
- Rafferty, Alameda, and Boundary Dams in Saskatchewan also provide floodwater storage benefits upstream of North Dakota.

WATER EQUIVALANCE TABLE

ONE ACRE-FOOT

=



ONE CUBIC FOOT

=



Quantity		
1 acre-foot	=	325,851 gallons
1 acre-foot	=	43,560 cubic feet
1 million gallons	=	3.07 acre-feet
1 cubic foot	=	7.48 gallons

Flow		
1 million gallons per day (mgd)	=	694.4 gallons per minute
1 million gallons per day (mgd)	=	1.55 cubic feet per second
1 million gallons per day (mgd)	=	1,120 acre-feet per year
1 billion gallons per day (bgd)	=	1.12 million acre-feet per year
1 cubic foot per second	=	1.98 acre-feet per day

Quick Facts
1 inch of rain yields about 27,200 gallons per acre
1 gallon of water weights 8.34 pounds
1 cubic foot of water weighs 62.38 pounds

STREAM FLOW

Mouse River, Minot
 (Water Years 1903-2013)
 Annual Mean: 179
 Max. Peak (6/25/11): 26,900
 Lowest Daily Mean: 0
 Annual Runoff: 129,600

Mouse River, Westhope
 (Water Years 1929-2013)
 Annual Mean: 335
 Max. Peak (7/5/11): 30,400
 Lowest Daily Mean: 0
 Annual Runoff: 242,700

Yellowstone River, Sidney, MT
 (Water Years 1967-2012)*
 Annual Mean: 12,010
 Max. Peak (5/24/11): 124,000
 Lowest Daily Mean: 800
 Annual Runoff: 8,701,000

*Annual Runoff after Bighorn Lake reached operational level.

Missouri River, Culbertson, MT
 (Water Years 1958-2013)*
 Annual Mean: 10,120
 Max. Peak (6/16/11): 104,000
 Lowest Daily Mean: 2,000
 Annual Runoff: 7,330,000

*Annual Runoff after operational level of Fort Peck was reached.

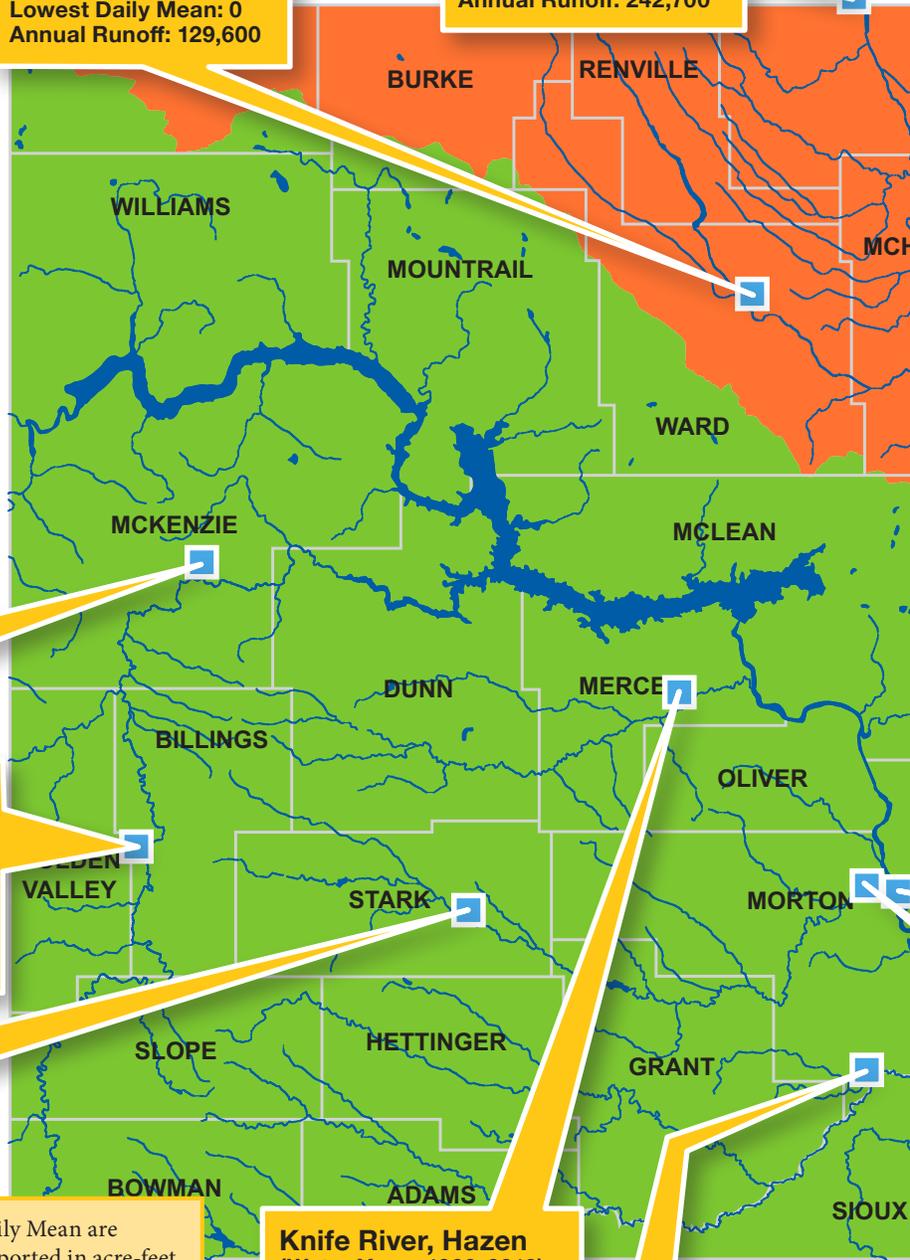
Little Missouri River, Watford City
 (Water Years 1935-2012)
 Annual Mean: 548
 Max. Peak (3/25/47): 110,000
 Lowest Daily Mean: 0
 Annual Runoff: 396,900

Little Missouri River, Medora
 (Water Years 1903-2012)
 Annual Mean: 459
 Max. Peak (3/23/47): 65,000
 Lowest Daily Mean: 0
 Annual Runoff: 332,4000

Heart River, Richardton
 (Water Years 1903-2013)
 Annual Mean: 97.5
 Max. Peak (4/16/50): 23,400
 Lowest Daily Mean: 0
 Annual Runoff: 70,620

Knife River, Hazen
 (Water Years 1929-2013)
 Annual Mean: 168
 Max. Peak (6/24/66): 35,300
 Lowest Daily Mean: 0
 Annual Runoff: 121,600

Cannonball River, Breien
 (Water Years 1934-2012)
 Annual Mean: 248
 Max. Peak (4/19/50): 94,800
 Lowest Daily Mean: 0
 Annual Runoff: 179,400



Stream Flow Definitions

Note: Annual Mean, Max. Peak Flow, and Lowest Daily Mean are reported in cubic feet per second. Annual Runoff is reported in acre-feet. Definitions:

Annual Mean - The arithmetic mean for the individual daily mean discharges for the reported water years.

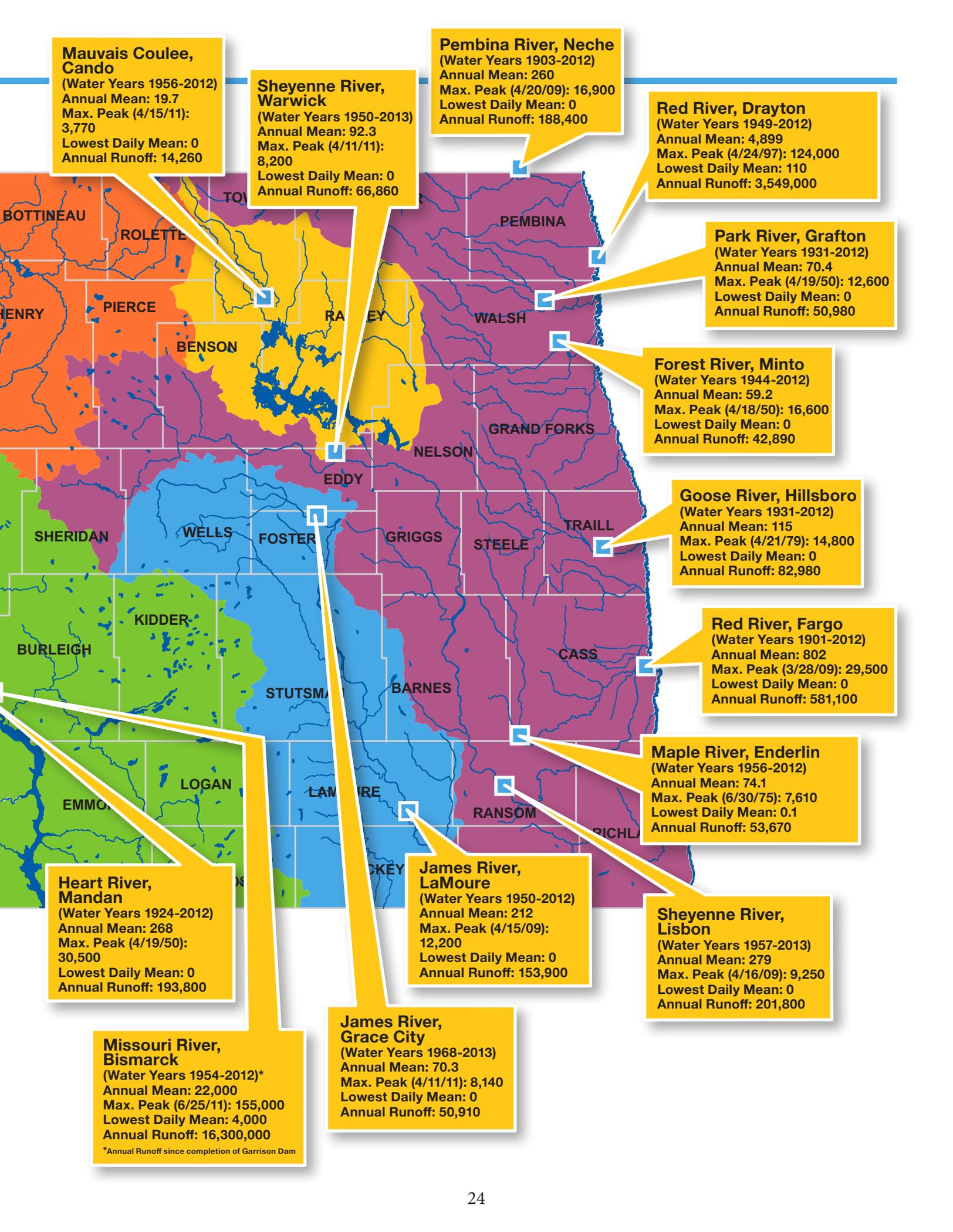
Max. Peak Flow - The maximum instantaneous peak discharge that occurred during the reported water years.

Lowest Daily Mean - The minimum daily mean discharge for the reported water years.

Annual Runoff - The total quantity of water in runoff for a drainage area for the year.

Acre-Feet - The quantity of water required to cover one acre to a depth of one foot.

Cubic Feet Per Second - The rate of discharge representing a volume of one cubic foot passing a given point in one second.



Mauvais Coulee, Cando
 (Water Years 1956-2012)
 Annual Mean: 19.7
 Max. Peak (4/15/11): 3,770
 Lowest Daily Mean: 0
 Annual Runoff: 14,260

Sheyenne River, Warwick
 (Water Years 1950-2013)
 Annual Mean: 92.3
 Max. Peak (4/11/11): 8,200
 Lowest Daily Mean: 0
 Annual Runoff: 66,860

Pembina River, Necho
 (Water Years 1903-2012)
 Annual Mean: 260
 Max. Peak (4/20/09): 16,900
 Lowest Daily Mean: 0
 Annual Runoff: 188,400

Red River, Drayton
 (Water Years 1949-2012)
 Annual Mean: 4,899
 Max. Peak (4/24/97): 124,000
 Lowest Daily Mean: 110
 Annual Runoff: 3,549,000

Park River, Grafton
 (Water Years 1931-2012)
 Annual Mean: 70.4
 Max. Peak (4/19/50): 12,600
 Lowest Daily Mean: 0
 Annual Runoff: 50,980

Forest River, Minto
 (Water Years 1944-2012)
 Annual Mean: 59.2
 Max. Peak (4/18/50): 16,600
 Lowest Daily Mean: 0
 Annual Runoff: 42,890

Goose River, Hillsboro
 (Water Years 1931-2012)
 Annual Mean: 115
 Max. Peak (4/21/79): 14,800
 Lowest Daily Mean: 0
 Annual Runoff: 82,980

Red River, Fargo
 (Water Years 1901-2012)
 Annual Mean: 802
 Max. Peak (3/28/09): 29,500
 Lowest Daily Mean: 0
 Annual Runoff: 581,100

Maple River, Enderlin
 (Water Years 1956-2012)
 Annual Mean: 74.1
 Max. Peak (6/30/75): 7,610
 Lowest Daily Mean: 0.1
 Annual Runoff: 53,670

James River, LaMoure
 (Water Years 1950-2012)
 Annual Mean: 212
 Max. Peak (4/15/09): 12,200
 Lowest Daily Mean: 0
 Annual Runoff: 153,900

Sheyenne River, Lisbon
 (Water Years 1957-2013)
 Annual Mean: 279
 Max. Peak (4/16/09): 9,250
 Lowest Daily Mean: 0
 Annual Runoff: 201,800

Heart River, Mandan
 (Water Years 1924-2012)
 Annual Mean: 268
 Max. Peak (4/19/50): 30,500
 Lowest Daily Mean: 0
 Annual Runoff: 193,800

Missouri River, Bismarck
 (Water Years 1954-2012)*
 Annual Mean: 22,000
 Max. Peak (6/25/11): 155,000
 Lowest Daily Mean: 4,000
 Annual Runoff: 16,300,000
 *Annual Runoff since completion of Garrison Dam

James River, Grace City
 (Water Years 1968-2013)
 Annual Mean: 70.3
 Max. Peak (4/11/11): 8,140
 Lowest Daily Mean: 0
 Annual Runoff: 50,910

KNOW YOUR WATER MANAGERS

Water management today represents a cooperative venture between various public entities. Government agencies, including the following, participate to varying degrees in water resource projects and programs.

FEDERAL

US Army Corps of Engineers

The US Army Corps of Engineers focuses on numerous aspects of water management including reservoir management, natural resource management, recreation, flood prevention, water supply, electric generation, and protection of threatened and endangered species.

Bureau of Land Management

The Bureau of Land Management (BLM) is involved with managing expansive areas for livestock grazing. Water resource management projects and dams were built on BLM lands-expanding their mission to include reservoir management, flood prevention, water-based recreation, erosion control, water quality, and watershed restoration.

Bureau of Reclamation

The Bureau of Reclamation (BOR) owns and operates dams and reservoirs in the western portion of the United States. Most of their facilities produce hydroelectric power. The BOR supplies water for communities, rural areas, irrigation, and water-based recreation.

Environmental Protection Agency

The Environmental Protection Agency (EPA) has a wide range of responsibilities including monitoring water quality, spill/superfund cleanup, drinking water standards, pollution prevention, and public education.

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) plans, prepares, and mitigates natural disasters such as floods. They also administer the National Flood Insurance Program. FEMA operates Flood Mapping Services that work with communities to identify flood hazards and assess flood risk. FEMA also responds to communities after disasters to aid in recovery.

United States Fish & Wildlife Service

The United State Fish and Wildlife Service enforces the protection of threatened and endangered species and the Migratory Bird Act. They manage National Wildlife Refuges and administer wetland/grassland easements for wildlife habitat.

United States Geological Survey

The United States Geological Survey (USGS) is a federal agency that works in biology, geography, geology and hydrology. USGS is the nation's primary civilian mapping agency. USGS also monitors streams and other bodies of water across the country for flow and depth.

National Oceanic & Atmospheric Administration

The National Oceanic & Atmospheric Administration (NOAA) is tasked with monitoring and studying weather and oceanic patterns. Due to the wide range in climates throughout the US, NOAA maintains a presence in every state. This presence is known as the National Weather Service (NWS). The NWS provides flood and river forecasts, weather forecasts, and produces regional weather watches, advisories, and warnings to the public for extreme weather.

Natural Resources Conservation Service

The NRCS works with agricultural producers to coordinate projects and funding for water quality, watersheds, wetlands, sedimentation, pesticides, drainage management, stream restoration, management of animal waste, pests, salinity, irrigation, and nutrients.

STATE

North Dakota State Water Commission

The primary responsibility of the North Dakota State Water Commission (SWC) is to provide effective management of North Dakota's water resources. SWC focuses on providing an adequate supply of good quality water for people, agriculture, industry, and fish and wildlife. In order to improve the quality of life and strengthen the economy of North Dakota, SWC must manage the water resources of the state for the benefit of its people.

Office of the State Engineer

The Office of the State Engineer (OSE) was created in 1905 to regulate and administer matters concerning the allocation of the state's water and related land resources in accordance with Article XI of the North Dakota Constitution, which declares all waters to be property of the state for public use. The OSE is responsible for the enforcement of regulations as they pertain to sovereign lands, the appropriation of water, and dam safety.

Department of Agriculture

The North Dakota Department of Agriculture focuses on enhancing the agriculture industry within the state. However, they also manage the Waterbank Program that provides participating landowners with a financial incentive to preserve wetlands. The agency administers the Pesticide Water Quality Program by working with EPA and various state and federal agencies to mitigate the risk of pesticides to the state's water resources.

KNOW YOUR WATER MANAGERS

STATE (continued)

Department of Health

Water quality is essential to public health, our natural environment, and economic development in North Dakota. The North Dakota Department of Health administers a number of public health related programs including: Ground Water Protection Program, Waste Water Program, Surface Water Protection Program, and Drinking Water Program.

Department of Transportation

The North Dakota Department of Transportation (DOT) builds and maintains roadways throughout the state. DOT designs roadways to minimize impacts to water resources, including storm-water management, wetland mitigation, and environmental permitting.

Division of Emergency Management

The North Dakota Division of Emergency Management responds to adverse weather conditions throughout the state. They play a primary role in public assistance and hazard mitigation by providing flood information, educating the public what to expect before, during, and after a weather event. NDDEM helps coordinate state acquisition of resources, produce hazard mitigation plans, monitor possible ice jams, and provide mapping resources.

NDSU Extension Service

The NDSU Extension Service conducts research and educates the public about common concerns generally directed at agricultural applications. Extension Service includes; crop and livestock research, planting advice, food research, weed control, water quality, irrigation research, and disaster education.

North Dakota Game & Fish Department

The North Dakota Game and Fish Department (Game & Fish) is responsible for maintaining high quality fisheries and hunting opportunities, enforcement of game and fish laws, and public education of Aquatic Nuisance Species issues.

Garrison Diversion Conservancy District

The Garrison Diversion Conservancy District (Garrison Diversion) was originally formed to manage Garrison Diversion; a large-scale project to bring Lake Sakakawea water through a system of canals and small lakes in order to provide water for irrigation in suitable parts of North Dakota. Current focus areas of Garrison Diversion includes the Municipal, Rural and Industrial Program; recreational programs; and maintenance activities.

North Dakota Geological Survey

The North Dakota Geological Survey studies and maintains records and serves as the primary source for geological information for the state. The agency maintains County Ground Water Bulletins and artesian water papers.

North Dakota Industrial Commission - Oil & Gas Division

The North Dakota Industrial Commission is the regulatory and promotion agency for the North Dakota's mineral resource development. The Oil and Gas Division has regulations to track and ensure protection of ground water quality, oversee disposal of saltwater, and track and report produced oil, gas, and water.

North Dakota Parks & Recreation Department

The North Dakota Parks and Recreation Department (NDPRD) focuses mainly on providing outdoor recreation opportunities within each of 13 parks throughout the state. These opportunities include; camping, hiking, fishing, marinas, boating, and swimming. The NDPRD also administers grant programs that promote outdoor recreation opportunities in communities.

LOCAL

County Park Boards

County park boards are responsible for overseeing recreation and park areas in their jurisdictions. They offer facilities for water-based recreation, community playgrounds, picnic areas, and facilities for sporting activities.

County Commissions

The county commission is a governing body responsible for overseeing county activities and working to ensure that citizen concerns are met, federal and state requirements are fulfilled, and county operations run smoothly.

Irrigation Districts

Irrigated land allows for higher crop yields in marginal land, as well as the opportunity to grow crops in non-traditional areas. Irrigation districts have been organized around the state to provide these services. The formation of irrigation districts allows for reduced costs of water intake structures and operations because the costs are spread to a number of different users. Irrigation districts are operated as an elected board.

KNOW YOUR WATER MANAGERS

LOCAL (continued)

Municipalities

Municipalities or a city/town that has corporate status and local government are generally in charge of numerous water management tasks. Many municipalities have their own water treatment and wastewater treatment facilities. They provide a reliable water supply to residents. Municipalities also maintain infrastructure and construct new infrastructure as needed. Other responsibilities of municipalities are surface water and runoff management.

Water Resource Districts

Water Resource Districts (WRD) are generally on the county level of government, with a few exceptions. County water resource districts are made up of an appointed five-member board that serves a 3 year term. Depending upon how many issues they have to work with, they generally meet on a monthly basis. Some districts, for example, where there are a lot of agricultural drainage applications, will meet more than once per month. Most WRDs among other things, have jurisdiction over all dams, water channels, reservoirs and artificial lakes in the county. WRDs regulate surface water to prevent floods by modifying channels or floodplains of any stream or watercourse within the WRD. WRDs can operate and maintain recreational facilities. WRDs also have the authority to plan, modify or repair sanitary and storm sewer systems and treatment plants, and can coordinate proposals to install, construct or modify culverts and bridges. WRDs also have regulatory authority to review permits for dikes, dams and other devices, which retain more than 50 acre-feet of water or 25 acre-feet of water for a medium-hazard or high-hazard dam. WRDs also regulate drainage that drains a pond, slough, lake or sheetwater, or any series thereof, with a watershed of 80 acres or more. They also have the statutory responsibility to close illegal drainage, remove negligent obstructions to drains or watercourses, and removal of illegally constructed dikes, dams and other devices.

Joint Water Resource Districts

Joint water resource districts were authorized in 1975 recognizing that water issues and projects don't necessarily follow political boundaries. Since then, many joint districts have been formed. The Red River Joint Water Resource Board was the first to be established to address flooding problems in the Red River Basin. Joint boards bring individual water resource boards together to cooperate on water development projects and to collectively solve water management problems.

Rural & Regional Water Systems

Rural and regional water systems are entities that are established to provide quality water supplies to rural and larger regional areas of North Dakota. Typically, they maintain and manage the construction of pipelines and facilitate rural water hookups to private landowners. Some operate their own water treatment plants.



DID YOU KNOW

The more we know about water use, the better we can be at using it wisely.

OUTSIDE

- One broken sprinkler head could use up to 225 gallons per 15 minute cycle.

IN THE BATHROOM

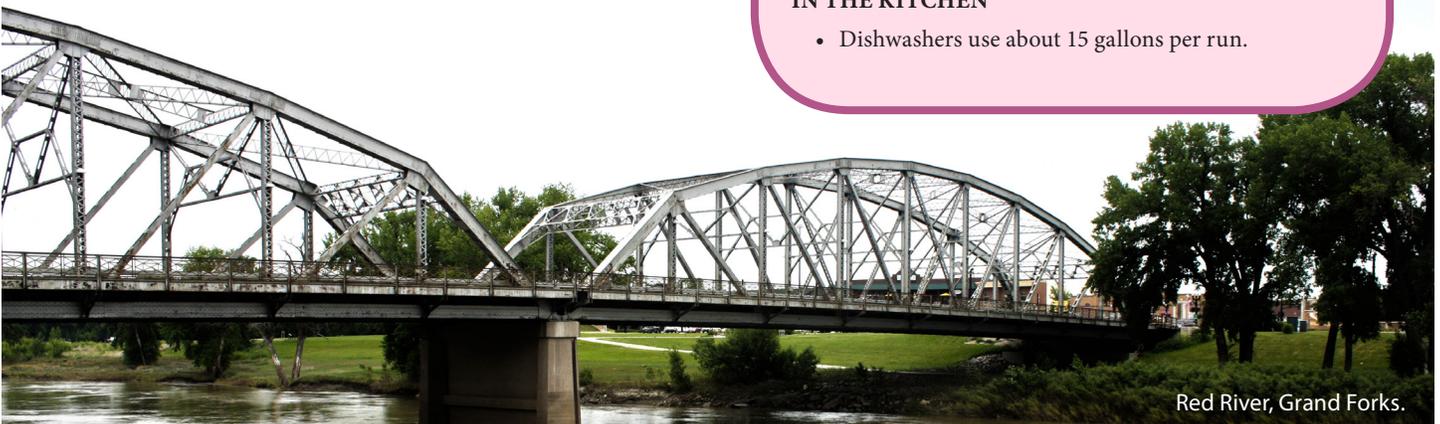
- Two-thirds of the water used in an average home is used in the bathroom.
- A faulty toilet tank flapper can consume 1,500 gallons a day.
- Every flush uses 5 to 7 gallons of water.

IN THE LAUNDRY ROOM

- A washing machine can use 40 or more gallons of water per load.

IN THE KITCHEN

- Dishwashers use about 15 gallons per run.



KNOW YOUR WATER MANAGERS

INTERNATIONAL & INTERSTATE

International Joint Commission

The International Joint Commission (IJC) was created by Canada and the United States because it was recognized that each country is affected by the other's actions in lake and river systems along the border. The two countries cooperate to manage these waters wisely and protect them for the benefit of today's citizens and future generations. Two main responsibilities of the IJC include regulating shared water uses and investigating transboundary issues and recommending solutions.

International Red River Board

A sub-section of the IJC, the International Red River Board (IRR) has its own board separate from the IJC. They are charged with maintaining awareness of basin-wide development activities, providing a forum for communication, recommending appropriate strategies concerning water quality, quantity, and health; and monitoring/reporting on flood preparedness and mitigation activities.

Red River Basin Commission

The mission of the Red River Basin Commission (RRBC) is to develop a Red River Basin natural resources framework plan; to achieve commitment to implement the framework plan; and to work toward a unified voice for the Red River Basin. The group seeks to develop a Red River Basin where residents, organizations, and governments work together to achieve basin-wide commitment to comprehensive integrated watershed stewardship and management. The RRBC includes members from the states of North Dakota, Minnesota, and South Dakota, as well as the Canadian province of Manitoba.

International Souris River Board

The International Souris River Board (ISRB) ensures a more eco-systemic approach to transboundary water issues; compliance for the apportionment of river flows; oversight of flood operations; and assists the Commission in preventing and resolving transboundary disputes. Board membership is made up of water management professionals from Saskatchewan, Manitoba, and North Dakota.

Missouri River Association of States & Tribes

Also known as MoRAST. This organization is an interstate organization formed by a joint resolution of the Governors of Wyoming, Montana, North Dakota, South Dakota and Kansas and the Mni Sose Intertribal Water Rights Coalition. MoRAST was formed to help resolve issues of concern to Missouri River basin states and tribes; to serve as a forum to foster communication and information exchange among the member states, tribes, and various other governmental units; and to facilitate the management of the natural resources of the Missouri River basin.

Western States Water Council

The Western States Water Council (WSWC) is an organization consisting of representatives appointed by the governors of 18 western states. The purpose of the WSWC is: 1) to accomplish effective cooperation among western states in the conservation, development and management of water resources; 2) to maintain vital state prerogatives, while identifying ways to accommodate legitimate federal interests; 3) to provide a forum for the exchange of views, perspectives, and experiences among member states; and 4) to provide analysis of federal and state developments in order to assist member states in evaluating impacts of federal laws and programs and the effectiveness of state laws and policies.



Blue Heron on the Missouri River.

WATER WORDS

A

Accretion – The gradual addition of sediments to stream banks and lakeshores.

Acre-foot - The quantity of water needed to cover one acre to a depth of one foot. One acre-foot equals 43,560 cubic feet or 325,851 gallons. The average U.S. household uses approximately 1 acre-foot of water per year.

Adhesion - The force that holds the molecules of unlike substances together when they are in contact; distinguished from cohesion.

Adsorption – Adhesion of the molecules of a gas, liquid, or dissolved substance to water.

Aerate - To cause air to circulate through water.

Aerobic - Characterizing organisms able to live only in the presence of air or free oxygen, and conditions that exist only in the presence of air or free oxygen.

Aggradation - The build-up of sediments at the headwaters of a lake or reservoir, or at a point where stream flow slows to the point that it will drop part or its entire sediment load.

Algae Bloom - Rapid growth of algae on the surface of lakes, streams, or ponds; stimulated by nutrient enrichment.

Alkali - Any strongly basic substance of hydroxide and carbonate, such as soda, potash, etc., that is soluble in water and increases the pH of a solution. Water or soil with alkali in it with a pH above 7.0 is considered alkaline, and alkalinity is a measure of the amount of alkali in the substance or solution.

Alkaline – The presence of alkalis in water or soil in amounts sufficient to raise the pH value above 7.0.

Alluvium - Sand, clay, and other earth materials gradually deposited along riverbeds and floodplains.

Anaerobic – Characterizing organisms able to live and grow only where there is no air or free oxygen, and conditions that exist only in the absence of air or free oxygen.

Annual Flood - The greatest flow volume of a watercourse in a water year.

Appropriated Water – Water from a stream, reservoir, or other source, reserved for a specific use under state water rights regulations.

Aquatic Nuisance Species (ANS) – ANS are any non-native, aquatic species of plant or animal that have a negative impact on beneficial aquatic species, aquatic habitats, the environment, or the economy.

Aquifer – Water saturated materials (sand, gravel, silt, permeable rock) able to yield significant quantities of water to wells and springs; described as artesian (confined) or water table (unconfined).

Aquifer System - A series of (more or less) interrelated aquifers providing a source of groundwater throughout a large area.

Arid - Describes regions where precipitation is insufficient in quantity for most crops and where agriculture is impractical without irrigation.

Artesian Water – Groundwater under pressure greater than atmospheric pressure. A well tapping an artesian aquifer is an artesian well. The water level in an artesian well rises above the artesian aquifer, to a point at which the artesian pressure equals atmospheric pressure. Artesian (flowing) wells will flow if the artesian pressure exceeds atmospheric pressure at the land surface. When an aquifer is bounded above and below by low permeability materials, it is known as an artesian or confined aquifer.

Assessment (Legal) Drain - An artificial channel or an improved natural waterway designed to remove excess runoff; constructed and maintained by an accredited sponsoring agency under the provisions of Chapter 61 -21 of the North Dakota Century Code.

Atmosphere - The layer of gases surrounding the earth composed primarily of nitrogen, and oxygen.

Average Annual Flow - The average of annual volumes for a watercourse, converted to a rate of flow for a single year; measured in cubic feet per second (cfs).

WATER WORDS

Average Annual Runoff (Yield) - The average of water-year runoff for the total period of record for a watercourse; measured in inches or acre-feet.

B

Bank Stabilization – Implementation of structural features along a stream bank to reduce or prevent bank erosion or sloughing, often done with riprap, which is a facing layer (protective cover) of stones.

Bank Storage - The water absorbed into the banks of a stream channel during high flows, that is released to the stream after the high water recedes.

Base Flood (100-Year Flood) -The flood having a 1% average probability of being equaled or exceeded, in any given year, at a designated location. It may occur in any year or even in successive years if the hydrologic conditions are conducive for flooding. The determination of what constitutes a 1% flood is based upon a statistical analysis of a 30-year period of record (ex. 1981-2010).

Base Flow - 1) Stream flow derived primarily from ground water contributions to the stream. 2) As defined in the State Water Resources Act of 1971, the flows administratively established “to provide for the preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values.”

Basin – An area, within which all surface water drains towards a collective area, bounded by a drainage divide, consisting of a drainage system, often with features such as streams, natural or man-made lakes. (Also called drainage basin or watershed.)

Biota - The plant and animal life of a region.

Brackish Water - Water having a dissolved solids (salts) content between fresh water and seawater.

Brine - Water with high concentrations of salts or minerals.

C

Capillary Action - The ability of a liquid to flow into narrow spaces without the assistance of, and in opposition to external forces like gravity. Examples of this include water moving in porous material like soil, and plant water uptake.

Channel - A general term for any natural or artificial structure that conveys water.

Channelization - The artificial widening, deepening or realignment of a watercourse.

Cirrus - A principal cloud type found at high altitudes and composed of ice crystals collected into delicate wisps or patches.

Cistern - A tank, usually underground, in which rainwater is collected for use.

Climate – The meteorological elements that characterize the average and extreme conditions of the atmosphere over a long period of time, at any one place or region on the earth’s surface.

Closed-Basin - A drainage basin having no natural outlet.

Cloud - A visible mass of minuscule water droplets and/or ice particles in the atmosphere above the earth’s surface.

Cloud Seeding - Any process of injecting a substance into a cloud, for the purpose of influencing the cloud’s subsequent development. Ordinarily, this refers to the injection of a nucleating agent, which creates a nucleus around which precipitation will form.

Cohesion - The force by which the molecules of a substance are held together; distinguished from adhesion.

Coliform Bacteria - A group of organisms usually found in the colons of animals and humans. The presence of coliform bacteria in water is an indicator of possible pollution by fecal material.

WATER WORDS

Colloids - Fine suspended solids that will not settle by gravity.

Condensation - The process by which a vapor becomes a liquid; the opposite of evaporation.

Confluence - The place where streams meet.

Conjunctive Use – Planned management of surface water and groundwater resources as an interrelated system. For example, the practice of storage of surface water in a groundwater system for future use.

Conservation - The continuing protection and management of natural resources in accordance with principles that assure their optimum long-term economic and social benefits.

Conservation Storage – The portion of water stored in a reservoir that can be later released for useful purposes such as municipal water supply, power, or irrigation.

Consumptive Use - The difference between the total quantity of water withdrawn from a source for any use, and the quantity of water returned to the source, such as: the release of water into the atmosphere; the consumption of water by man, animals, and plants; and the incorporation of water into the products of industrial or food processing.

Continental Divide – The drainage divide separating the rivers that flow toward opposite sides of a continent.

Contributing Area - That portion of a watershed that contributes to measured runoff under normal conditions.

Creek - A small watercourse that serves as the natural drainage course for a drainage basin. The term is relative according to size. Creeks in a humid region would often be called rivers if they occurred in an arid area.

Crest - 1) The top of a dam, dike or spillway. 2) The highest elevation reached by floodwaters flowing in a channel.

Cubic Feet Per Second (cfs) – A unit of measurement expressing the rate of discharge, typically referring to stream flow. One cfs is equal to the discharge in a stream of a cross section one foot wide and one foot deep, flowing with an average velocity of one foot per second; equals 448.8 gallons per minute, and approximately 1.98 acre-feet per 24-hour period.

Cumulonimbus (Thundercloud, Thunderhead) - The ultimate stage of development of cumulus clouds. Cumulonimbus clouds are very dense and very tall, commonly five to ten miles in diameter, and sometimes reaching heights of 12 miles or more. The upper portion is at least partly composed of ice crystals, and it often takes the form of an anvil or vast plume. The base of the cloud is invariably dark and is often accompanied by low, ragged clouds.

Cumulus - A principal cloud type characterized by vertical development. They generally have flat bases, a “cotton-like” appearance, and may occur in hives or in clusters.

Current - The portion of a watercourse that is moving with a velocity much greater than the average of the rest of the water.

D

Dam - A structure of earth, rock, concrete, or other materials designed to retain water, creating a pond, lake or reservoir

Dam Failure - Catastrophic type of failure characterized by a rapid and uncontrolled release of impounded water.

Degradation – The general lowering of the streambed of a watercourse by erosive processes, such as scouring by flowing water.

Dendritic - A drainage pattern in which tributaries branch irregularly in all directions from and at almost any angle to a larger stream. From an aerial view, it resembles the branching pattern of trees.

Depletion - Loss of water from surface water reservoirs or ground water aquifers at a rate greater than that of recharge.

WATER WORDS

Detention – The storage of water for a limited period of time (hours or days).

Detention Dam - An artificial barrier commonly used for temporarily impounding water.

Dew Point - The temperature at which a gas or vapor condenses to form a liquid. The point at which dew begins to form.

Dew - The droplets of water condensed from air onto a surface when the temperature falls.

Dike (Levee) - An embankment to confine or control the movement of water.

Discharge - Outflow of water. The use of this term is not restricted as to course or location, and it can be used to describe the flow of water from a pipe or from a drainage basin.

Dissolved Oxygen (DO) – The amount of oxygen freely available in water and necessary for aquatic life, and the oxidation of organic materials.

Distillation - The process of first heating a mixture to separate the more volatile from the less volatile parts, and then cooling and condensing the resulting vapor so as to produce a more nearly pure or refined substance.

Distilled Water - Water that has been treated by boiling and condensing to remove solids, inorganics, and some organic chemicals.

Diversion - The transfer of water from a stream, lake, aquifer, or other source of water, by a canal, pipe, well, or channel to another watercourse, or to the land, as in the case of an irrigation system.

Diversion Dam - An artificial barrier designed to enable the transfer of water from a stream into a canal, pipe, or other conveyance mechanism.

Domestic Consumption (Use) - The quantity of water used for household purposes such as washing, food preparation, and bathing.

Drainage Divide - A point on the land surface that divides one drainage area from another.

Drainage Main - A natural or artificial ditch or conduit for moving water off the land.

Drought - An extended period of time during which an area receives below average water, in terms of direct precipitation or runoff.

E

Easement – A legal instrument enabling the giving, selling, or taking of certain land or water rights without transfer of title, such as for the passage of utility lines.

Eminent Domain (Condemnation) - An action by the government to seize private property with due monetary compensation, but without the owner's consent. The property is taken either for government use or by delegation to third parties who will devote it to public or civic use.

Encroachment - Any physical object placed in the floodplain that hinders the passage of water, or otherwise affects flood flows, such as fill, excavation, storage of equipment and materials, or buildings.

Environmental Assessment (EA) – A federal process to determine the potential impacts of a project. If it is found that significant impacts will result, an Environmental Impact Statement is often required in order for the project to continue.

Environmental Impact Statement (EIS) - A required evaluation of the effects of actions or programs on the natural environment. The National Environmental Policy Act of 1969 requires, in some circumstances, that a federal EIS be prepared.

Ephemeral Stream - A stream that carries only surface runoff, and thus flows only during and following precipitation in the immediate area.

Erosion - The wearing down or washing away of the soil and land surface by the action of water, wind, or ice.

WATER WORDS

Eutrophic - Designation of a lake rich in nutrients. The process by which a water body becomes eutrophic is called eutrophication.

Evaporation - The process by which a liquid changes to vapor.

Evapotranspiration - The loss of water from a land area through evaporation from soil, and through plant transpiration.

F

Field Capacity - The maximum amount of water held in a prescribed volume of soil against the pull of gravity.

Fish Passage - A structure to facilitate fish migration upstream, on or around artificial barriers (dams) in a watercourse.

Flood - The inundation of normally dry land areas, resulting from the overtopping of the natural or artificial confines of a river or other body of water.

Flood Protection - The prevention or reduction of flood damages by structural or nonstructural measures.

Flood Control Storage - Storage of water in reservoirs, or by other means in order to reduce flood damage.

Flood Damage - The economic impacts caused by floods including damage by inundation, erosion, or sediment deposition. Damages also include emergency costs and business or financial losses. Evaluation may be based on the cost of replacing or repairing or rehabilitating; or the comparative change in market or sales value; or on the change in income or production caused by flooding.

Flood Frequency - An expression or measure of how often a hydrologic event of a given size or magnitude should, on average, be equaled or exceeded.

Flood Peak (Peak Stage, Peak Discharge) - The highest magnitude of the stage or discharge attained by a given flood.

Flood Storage - The volume or space in a reservoir between the controlled retention water level (spillway crest) and the maximum water level. Flood storage cannot be retained in the reservoir, but will flow over the spillway until the controlled retention water level is reached.

Floodplain - Any normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually lowland adjacent to a stream or lake.

Floodplain Management - The process of moving people and structures away from the water, by using the regulation of land and development to make them less susceptible to damage from this natural hazard.

Floodway - [Natural] The channel of a river or stream and those parts of the adjacent floodplain adjoining the channel that is required to carry and discharge the base flood.

Floodway - [Artificial] A structure, usually a channel that diverts some or all of the flows of a watercourse around an area in order to protect it from flooding.

Flood Insurance - The specific insurance coverage against property loss from flooding. In the U.S., the National Flood Insurance Program (NFIP) was created to enable property owners in participating communities to purchase insurance protection from the government against losses from flooding.

Flood Probability - The statistical probability that a flood of a given size will be equaled or exceeded in a given period of time.

Flood Stage - The stage at which overflow of a stream or body of water begins.

Flow - The rate of water discharged from a source; expressed in volume over time.

Flow Augmentation - The addition of water to a watercourse, especially in order to meet in-stream flow needs.

WATER WORDS

Freeboard - The vertical distance between a designated maximum water level and the top of a structure.

Free Flowing - Without artificial restrictions, such as a dam, diversion channel, etc.

G

Gaging Station - A particular site on a stream, canal, lake, or reservoir, where hydrologic data is collected.

Gallon - A unit of volume. A U.S. gallon contains 231 cubic inches, 0.133 cubic feet, or 3.785 liters. One U.S. gallon of water weighs 8.34 pounds.

Gallons Per Minute - A unit of measurement for expressing rate of discharge, typically used in measuring municipal or well capacity.

Glacial Drift - All earth material transported and deposited by ice and/or water flowing from a glacier.

Glacial Outwash - Layered material, chiefly sand and gravel deposited by melt water streams that were in front of the margin of a glacier.

Glacial Till - All material deposited directly by a glacier with little or no layering or reworking by melt water.

Glacier - A huge mass of ice, formed on land by the compaction and recrystallization of snow that moves very slowly downslope or outward due to its own weight.

Gradient - Degree of incline; the steepness of a slope.

Groundwater Recharge - The inflow of water into an aquifer.

H

Hail - Precipitation that forms into balls or lumps of ice over 0.2 inches in diameter. Alternating freezing and melting of moisture as turbulent air currents within a cloud carry it up and down, to form hail.

Hail Suppression - The process of cloud seeding to reduce hail size and/or amount from a thunderstorm. Clouds are seeded with efficient, artificial ice nuclei (silver iodide or dry ice) to increase the number of ice crystals in a cloud and boosting the competition for cloud water among those crystals. As a result, more, smaller hailstones are created that may partially or completely melt before reaching the ground.

Hardness - The ability of water to consume excessive amounts of soap, prior to forming a lather, and to produce scale in hot water heaters, boilers, or other units in which the temperature is greatly increased.

Hard Water - Water with hardness greater than 75 mg/l of CaCO₃, is usually considered hard.

Headwaters - The source and upper reaches of a stream; also the upper reaches of a reservoir.

Heat of Vaporization - The amount of heat needed to turn one gram of a liquid into a vapor, without a rise in temperature of the liquid.

Hydraulics - The study of liquids, particularly water, under all conditions of rest and motion.

Hydraulic Fracturing (Fracking) - The use of pressurized fluid (often a mixture of water, particles such as sand or clay, and chemical additives) to increase fractures in rock, in order to release petroleum or natural gas.

Hydroelectricity - Electric energy produced by water powered turbine generators.

Hydrograph - A graph showing the changes in discharge of a stream or river, or the changes in water levels of a well with the passage of time.

Hydrologic Cycle - The constant circulation of water from the sea, through the atmosphere, to the land, and back to the sea by overland, groundwater, and atmospheric routes.

Hydrologic Unit - A geographical area representing part or all of a surface drainage basin, or a distinct hydrologic feature.

WATER WORDS

Hydrology - The science of waters of the earth; water's properties, circulation, principles, and distribution.

I

Ice Jam - When water builds up behind a blockage of ice, such as when an upstream water body thaws before the downstream ice thaws, building up in shallow or narrow areas of the watercourse. Ice jams can exacerbate flooding effects, by rapidly raising water levels, and also by releasing the stored water very quickly.

Impervious [Hydrology] - Incapable of being penetrated by water.

In-stream Flows [Fish & Wildlife] - The minimum amount of water required in a stream to maintain the existing aquatic resources and associated wildlife and riparian habitat.

In-Stream Use - The use of water within the stream channel, such as fish and other aquatic life, recreation, navigation, and hydroelectric power production.

Infiltration - The movement of water into soil or porous rock. Infiltration occurs as water flows through the larger pores of rock or between soil particles under the influence of gravity, or as a gradual wetting of small particles by capillary action.

Influent Stream - A watercourse that contributes water to the zone of saturation, and to bank storage.

Interbasin Transfer - The diversion of water from one drainage basin to one or more other drainage basins.

Intermittent Stream (Coulee) - A watercourse that flows only at certain times of the year because losses from seepage or evaporation are greater than the available stream flow.

Intrabasin Transfer - The diversion of water within a drainage basin.

Irrigable Land - Land possessing favorable soil, topographic, drainage, climatic conditions, and an adequate water supply capable of economically supporting irrigation.

Irrigation - The controlled application of water to cropland, hay land, or pasture to supplement that supplied through nature.

J

Jetty - A structure extending into a sea, lake, or river to influence the current or tide, in order to protect harbors, shores, and banks.

Joint Water Board (Joint Water Resource District) - A collective organization of North Dakota water board representatives from a specific basin. These organizations often cross county lines, and thus draw membership from multiple counties.

K

Kilowatt (KW) - A unit of electrical power equal to 1,000 watts or 1.341 horsepower.

L

Lake - Any inland body of standing water, usually freshwater, larger than a pool or pond; a body of water filling a depression in the earth's surface.

Leaching - The removal of soluble organic and inorganic substances from the topsoil downward by the action of percolating water.

Lentic - Characterizing aquatic communities found in standing water.

LiDAR (Light Detection & Ranging) - A remote sensing technology that can measure the distance to, or other properties of a target by illuminating the target with light, often using pulses from a laser. This technology is often used in generating highly accurate topographical data.

Limnology - The branch of hydrology pertaining to the study of fresh water, especially ponds and lakes.

WATER WORDS

Liter - The basic unit of measurement for volume in the metric system; equal to 0.26 gallons.

Lotic Environment – Characterizing aquatic communities found in running water.

Lowhead Dam (Weir) - A dam across a watercourse that causes water to pool behind the structure, but all water flows over the top of the dam structure.

Low-level Drawdown - A discharge feature of a dam allowing water to be removed from the bottom of a reservoir.

M

Maximum Storage - The total volume in a reservoir, including flood surcharge, at the top of the dam.

Mean Sea Level (MSL) - The level of the surface of the sea between mean high and mean low tide; used as a reference point for measuring elevations. Often given as “Above Mean Sea Level” to distinguish it from areas below sea level.

Mitigation - An action designed to lessen or reduce adverse impacts; frequently used in the context of environmental assessment.

Model - A simulation, by descriptive, statistical, or other means, of a process or thing, that is difficult or impossible to observe directly. Often used as a method of making real-world predictions about probable outcomes based upon changes in model inputs.

Moraine – Glacial till that has accumulated and been deposited by a glacier.

Mouth (Watercourse) - The point of discharge of a watercourse, a lake, or the sea.

Multiple-Purpose Reservoir - A reservoir planned and constructed to provide water for more than one purpose.

Municipal-Industrial Water - Water supplied for municipal and industrial uses.

N

Natural Flow - The flow of a watercourse, as it would be if unaltered by upstream diversion, storage, import, export, or change in upstream consumptive use caused by development.

Navigable Waters - Any waters that were in fact navigable at time of statehood. Navigability in this case, refers to water bodies that were used, or were susceptible to being used, in their ordinary condition, as highways for commerce over which trade and travel were or may have been conducted in the customary modes of trade on water. (NDAC 89-10-01-03)

Nimbus – A rain producing cloud.

Non-Consumptive Use – Using non-diverted water in a way that does not reduce the supply, or using diverted water and returning it to the source without reducing the supply.

Non-Contributing Area - An area within a drainage basin having no direct connection with the basin’s principal drainage system.

Non-Point Source Pollution - Pollution discharged over a wide land area, not from one specific location.

Nutrients - Elements or compounds essential to life, including carbon, oxygen, nitrogen, phosphorus, and many others.

O

Observation Well - A well used to monitor changes in the water levels of an aquifer, and to obtain samples for water quality analyses.

Ordinary High Watermark (OHWM) - The line below which the action of the water is frequent enough to either prevent the growth of vegetation, or to restrict its growth to predominantly wetland species. (NDAC 89-10-01-03)

WATER WORDS

Ordinary Low Watermark (OLWM) - The low level reached by waters of a lake under ordinary conditions, unaffected by periods of extreme and continuous drought.

Organic Matter - Plant and animal residues, or substances made by living organisms.

P

Parts Per Million (ppm) - Number of parts of a chemical found in one million parts of a solid, liquid, or gaseous mixture. Equivalent to milligrams per liter (mg/L).

Peak Flow - The maximum discharge that occurs during a flood. It is coincident with the peak of a flood hydrograph.

Percolation - The movement of water downward through the subsurface to the zone of saturation.

Perennial Stream - A watercourse that flows from source to mouth throughout the year.

Permeability - A measure of the ability of a material (such as rocks, gravel, sand) to transmit fluids.

pH - An expression of both acidity and alkalinity on a scale of 0-14, with 7 representing neutrality; numbers less than 7 indicate increasing acidity, and numbers greater than 7 indicate increasing alkalinity.

Physical Landscape - Natural land forms and associated natural phenomena of a region.

Phytoplankton - Usually microscopic aquatic plants (sometimes consisting of only one cell).

Plankton - The microscopic animal and plant life found floating or drifting in bodies of water.

Plug - Cement, grout, or other material used to fill and seal a hole drilled for a water well.

Pluvial - Pertaining to precipitation.

Point Source Pollution - Pollutants discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels, and containers of various types.

Porosity - The ratio (usually expressed as a percentage) of the volume of openings in a rock to the total volume of the rock.

Potable - Water fit for human consumption.

Precipitate - To cause a slightly soluble substance to become insoluble, through heat, chemicals, and separate out from a solution.

Precipitation - Water falling, in a liquid or solid state from the atmosphere, to a land or water surface.

Q

R

Rain - Water falling to earth in drops that have been condensed from moisture in the atmosphere.

Reach - Any arbitrarily defined length of a stream.

Reclaimed Water - Wastewater that has been treated sufficient for beneficial use.

Relative Humidity - The ratio (percentage), of the quantity of water vapor in the air, compared to the quantity of water vapor the air could hold at that temperature.

Reservoir - A pond, lake, or basin (natural or artificial) that stores, regulates, or controls water.

Retention - The storage of water for extended periods of time (weeks or months), for alternate uses or flood storage.

Riparian Areas - Land areas directly influenced by a body of water. Usually have visible vegetation or physical characteristics showing water's influence. Watercourse and lake borders, and marshes are typical riparian areas.

WATER WORDS

River - A natural stream of water of substantial volume.

River Basin - A term used to designate the area drained by a river and its tributaries.

Runoff - The amount of precipitation appearing in watercourses and lakes, defined as the depth to which a drainage area would be covered if all of the runoff for a given period of time were uniformly distributed over it.

Rural-Domestic Water - Household use and livestock watering associated with ranch and farm operations, and uses by the rural nonfarm population.

S

Saline Water - Water containing any of the salts of the alkali metals or magnesium in concentrations greater than 1,000 parts per million.

Salinity - The concentration of dissolved salts in water.

Sandbar - A landform within or extending into a body of water, typically composed of sand, silt or small pebbles.

Sediment - Fragmented organic or inorganic material, derived from the weathering of soil, alluvial, and rock materials; removed by erosion and transported by water, wind, ice, and gravity.

Sedimentation - The deposition of sediment from a state of suspension in the water or air.

Seepage - The internal movement of water that may take place through the dam, the foundation or the abutments.

Silt - Sedimentary particles smaller than sand particles, but larger than clay particles.

Sleet - A form of precipitation consisting of a mix of ice, rain, and snow.

Sludge - Any heavy, slimy deposit, sediment, or mass, that occurs as the precipitate in a sewage tank or the sediment in a steam boiler.

Snow Density - The ratio of the volume of melt water (derived from a sample of snow) to the initial volume of the snow sample.

Snow - Precipitation in the form of crystalline water ice.

Snowpack - The winter accumulation of snow.

Soil Erosion - The process by which soil is removed from one place by forces such as wind, water, waves, or glaciers and eventually deposited at some new place.

Sovereign Lands - Those areas, including the beds and islands, lying within the ordinary high watermark of navigable lakes and streams. (NDCC 61-33-01)

Spillway - A type of structure that conveys water released from a reservoir. The principal spillway conveys water through or over a dam and maintains the normal pool level of a reservoir. The emergency spillway (auxiliary spillway) conveys water through or over a dam only during flooding conditions.

Spring Seep - A place where water discharges from the ground, often forming a pool.

Storativity - A measurement of the volume of water that can transfer, into or out of, an aquifer, by surface area, under a unit change in aquifer water level.

Stratus - A low altitude cloud typically resembling a horizontal layer of fog.

Stream Load - All the material transported by a stream either as visible sediment (bed load, suspended load) or in solution (dissolved load).

Stream - Any water body moving under gravity flow through clearly defined natural channels to progressively lower levels.

WATER WORDS

Stream Bank Erosion – The wearing away of watercourse banks by flowing water.

Stream Flow - The discharge that occurs in a natural channel. Although the term “discharge” can be applied to the flow of a canal, the word “stream flow” uniquely describes the discharge in a surface stream. The term “stream flow” is more general than the term “runoff,” as stream flow may be applied to discharge whether or not it is affected by diversion or regulation.

Sub-Basin - Subdivision of a major river basin, drained by tributaries or groups of tributaries, including associated closed basins.

Super Cooled Water – Water that has been cooled below its freezing point without causing solidification.

Surface Water - Water contained or flowing in streams, rivers, wetlands, lakes, reservoirs, or other bodies of water on the earth’s surface.

Suspended Solids (SS) – Defined in waste management, these are small particles of solid pollutants that resist separation by conventional methods. SS (along with BOD) is a measurement of water quality, and an indicator of treatment plant efficiency.

T

Thalweg - The line of maximum depth in a stream.

Tile Drainage – An agricultural practice that uses tile drain (often corrugated and perforated plastic tubing buried under the soil surface) to remove excess water from cropland through gravity flow or pumping.

Topographic Maps - Maps with lines showing equal elevation of a region’s relief; also showing natural and man-made surface features, including hills, valleys, rivers, and lakes; and man-made features such as canals, bridges, roads, cities, etc.

Topography - The general configuration of the land surface, including relief and position of natural and man-made features.

Total Dissolved Solids (TDS) - The quantity of dissolved materials in the water.

Total Storage (Reservoir) – The volume of storage below the maximum designed water surface level, including dead storage.

Total Suspended Solids - Solids found in wastewater or in a stream that can be removed by filtration. The origin of suspended matter may be manmade wastes or natural sources such as silt.

Transpiration - The process by which water absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface, principally from the leaves.

Tributary - A watercourse that contributes water to another watercourse.

Turbidity - Cloudiness caused by the presence of suspended solids in water; an indicator of water quality.

U

Unconfined Aquifer – An aquifer in which the upper boundary is the top of the zone of saturation.

Unconsolidated Deposits - Sediment not cemented together. May consist of sand, silt, or clay.

V

Void - The portion of a volume of soil or rock not occupied by solid phase materials. Voids may be filled with liquid or gas.

W

Wastewater - Water that carries wastes from homes, businesses, and industries; a mixture of water and dissolved or suspended solids.

Wastewater Treatment - Any of the mechanical or chemical processes used to modify the quality of wastewater in order to make it more compatible or acceptable to man and the environment.

WATER WORDS

Water - An odorless, tasteless, colorless liquid formed by a combination of hydrogen and oxygen (H₂O); forms streams, lakes, and seas, and is a major constituent of all living matter. It freezes at 0 C (32 F) and boils at 100 C (212 F) at sea level.

Water Board (Water Resource District) – In North Dakota, a political entity with membership appointed by county commission, with authority to levy taxes, manage water, and build water projects within their county. (See Joint Water Boards)

Water Conservation - The care, preservation, or protection of water resources.

Water Contamination – Impairment of water quality to a degree that reduces the usability of the water for ordinary purposes, or that creates a hazard to public health through poisoning or spread of disease.

Water Equivalent - The depth or amount of water that would result from the complete melting of a sample of deposited snow.

Water Pollution - Industrial and institutional wastes, and other harmful or objectionable material in sufficient quantities to result in a measurable degradation of the water quality.

Water Quality - A term used to describe the chemical, physical, and biological characteristics of water, with respect to its suitability for a particular use.

Water Right - A legal right to use a specified amount of water for beneficial purposes.

Watershed - Area of land that contributes surface runoff to a given point in a drainage system.

Water Yield - The surface runoff from a drainage basin; precipitation minus the evapotranspiration. Usually measured in cubic feet per second or acre-foot per square mile. For ground water, the volume of water pumped from a well in a given period of time in gallons per minute (gpm).

Weather - The composite condition of the near earth atmosphere, which includes temperature, barometric pressure, wind, humidity, clouds, and precipitation. Weather variations over a long period create the climate.

Weather Modification – The intentional or inadvertent alteration of clouds and precipitation.

Well - A pit, hole, or shaft sunk into the earth to tap an underground source of water.

Wetlands - Lands where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the surrounding environment. Other common names for wetlands are sloughs, ponds, and marshes.

Withdrawal - The act of removing water from surface or groundwater sources in order to use it.

Z

Zone of Saturation – Subsurface zone in which all the pores of the material are filled with ground water under pressure greater than atmosphere



DID YOU KNOW

The longest river in the world is the Nile River at about 4,132 miles (6,650 km) in length.

The longest river in the USA is the Missouri River at about 2,340 miles (3,770 km) in length.



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