

Formative Assessment - 5.3.4

General Format:

This formative assessment exemplar contains the following components:

1. Teacher Facing Information: This provides teachers with the full cluster as well as additional information including the question types, alignment to three dimensions, and answer key. Additionally, an example of a proficient student answer and a proficiency scale for all three dimensions are included to support the evaluation of the last item of the assessment. [pages 2-9]
2. Students Facing Assessment: This is what the student may see. It is in a form that can be printed or uploaded to a learning platform. (Exception: Questions including simulations will need technology to utilize during assessment.) [pages 10-17]
3. Optional student home data collection extension. [pages 18-20]

Accommodation Considerations:

Teachers should consider possible common ways to provide accommodations for students with disabilities, English language learners, students with diverse needs or students from different cultural backgrounds. For example, these accommodations may include: Providing academic language supports, presenting sentence stems, or reading aloud to students. All students should be allowed access to a dictionary.

References:

Moulding, B., Huff, K., & Van der Veen, W. (2021). *Engaging Students in Science Investigation Using GRC*. Ogden, UT: ELM Tree Publishing.

Utah State Board of Education: Science

<https://www.schools.utah.gov/curr/science?mid=1128&tid=1>

Science Core Guide: Grade 5

<https://docs.google.com/document/d/1BSspv7m27kFuTWHWU2nX4rauld55gUu4wv5NwOFp2As/edit#>

Formative Assessment Exemplar 5.3.4

<https://docs.google.com/document/d/1EjDAWInx5SLbYwRAR5oDcbKXRdYYMFdf9p-RdBbQnNM/edit>

Teacher Facing Information

Standard: 5.3.4

Assessment Format: Printable or Online Format (Does not require students to have online access)


Phenomenon	
<p>Stimulus</p> <p>Conserving Water</p> <p>A student has been learning how the Goshute are working to protect their water. In her own neighborhood she sees lawn signs that say “slow the flow—save H₂O” and wonders what difference one person’s efforts will make in water conservation efforts.</p>	<p>Proficient Student Explanation of Phenomenon:</p> <p>Conserving water indoors and outdoors helps protect Earth’s resources and environments, but also requires additional energy and funding. Even with these constraints, stretching our water supply is extremely important. One person can make a difference. Conservation is necessary to ensure we have water now and in the future.</p>
 <p>https://slowtheflow.org/</p>	
Cluster Task Statement	
<p>(Represents the ultimate way the phenomenon will be explained or the design problem will be addressed)</p> <p>In the questions that follow, you will identify criteria and constraints, analyze available data on proposed solutions, and determine if one family’s efforts are worth the energy it takes to conserve water.</p>	
Supporting Information	

Table 1: Student's family average indoor water usage

Water Use Task	Times used in one day	Gallons used per time	Gallons used per day
Flush toilet	12	6	72
Run faucet for 1 minute (waiting for water to get hot or cold)	5	4	20
Fill a bathtub (about 5 inches of water)	1	40	40
Shower (5 minutes)	8 (One time recorded for every 5 minutes)	35	280
Run dishwasher	1	15	15
Wash a load of dishes by hand (in a basin or plugged sink without water running)	0	4	0
Wash a load of dishes by hand (with water running)	1	30	30
Wash 1 large load of clothing	1	45	45
Wash 1 small load of clothing	0	30	0
Brush teeth with water running	4	2	8
Brush teeth with water off	4	1	4
Wash hands	16	1	16
Drink water	8	0.25	2
TOTAL			532

(Table adapted from [4-H Water Conservation with the Water Lion](#))

Table 2: Student's family average outdoor water usage

Water Use Task	Times used in one week	Gallons used per time	Gallons used per week
Wash a car, animal, or other object (water off while soaping)	1	40	40
Wash a car, animal, or other object (water on while soaping)	0	180	
Water landscaping before 10 am or after 6 pm (20 minutes)	12 (four hours)	140	1680
Water landscaping between 10 am to 6 pm (20 minutes)	3 (one hour)	185	555
TOTAL			

(Table adapted from [4-H Water Conservation with the Water Lion](#))

Website Reading 3: Conserve Water in Utah

Water is the essence of life. It provides us with joy, health, food, economic opportunities, adventures, breathtaking landscapes, power generation, laughter and memories, and because it makes up two-thirds of our bodies, it makes it so you can be here, visiting our website (and on the earth)!

Our population is projected to double by 2065, so stretching our water supply is critical. Traditionally, two-thirds of Utah's growth has been from "natural increase" from the population having children. This percentage is declining with more people moving in. People have discovered Utah is a great play to live, work and play. Unfortunately, they don't bring water with them. Conservation is key to ensuring we have water now and for future generations.

Water is the most limited natural resource with 97% of it saltwater and only 3% freshwater. Of this 3%, 2.5% of it is unavailable because it is frozen as snow and ice, locked up in the atmosphere and soil, polluted, or lies too far under the earth's surface to be extracted at a reasonable cost. That means only 0.5% of all the earth's fresh water is easily accessible as surface water in rivers, streams and lakes. We encourage you to be a steward of Utah's water by using it wisely and sharing information with others.

Cluster Questions

Gather:

Cluster Question # 1

Question Type: Highlighting Text

Addresses:

 x DCI (content from standard)

 x SEP (Analyzing and interpreting data)

 x CCC (cause and effect, structure and function of engineering devices[appliances])

Answer:

Benefits:

-The nutrients in reusing cooking water can help plants grow better.

-Use less water by filling sink
-Save three gallons by turning off water while brushing teeth

-Save 1,875 gallons by shortening shower one minute each day for a year

-Newer appliances use half the amount of water

Obstacle:

-Old models use more water and would have to be replaced

Question 1:

In Website Reading 1, find (underline or write down) a detail that explains how indoor water can be conserved. Find (put a box around or write down) a second detail that explains how water conservation efforts might be an obstacle.

Website Reading 1: Tips for Indoor Water Usage

Reuse Cooking Water

Consider watering your plants with the water left over from cooked pasta and vegetables. Seriously. The extra nutrients can help plants grow better.

Fill It First

You'll use far less water by filling your sink to rinse vegetables, pans, and dishes than by just letting the water run.

Load It Full

The more dishes you get into the dishwasher per load, the more efficient your water use. Newer dishwashers use about half the water of older models, too. A new energy efficient dishwasher [costs approximately \$800-\$1500.]

Fix All Drips

On average, [leaks make up about 14% of all indoor water use.] If you live in a home built before 1975, your pipes are probably made of cast iron. Although cast iron pipes can last 50-100 years, [deterioration of cast iron pipes is normal after just 25 years.] If your faucet is not dripping, you'll save about three gallons of water by turning it off while brushing your teeth.

Shorten Your Shower

Showering just one minute less every day will save up to 1,875 gallons of water each year. In addition, replacing old showerheads can cut your water use in half.

<p>-New appliances are expensive -Deterioration of pipes causing leaks is common -Laundry uses over 20% of all the water in your home -It requires extra time and energy to ask questions</p>	<p>Wash Full Loads [Laundry uses over 20% of all the water in your home.] Use discretion when washing. Newer front loading machines also <u>use about half the water</u> and detergent of conventional models. A new [energy efficient washing machine costs \$750-\$2000.] When getting ready to do laundry, [always ask, “Does this really need washing?”] <u>If clothes aren’t dirty, don’t wash them.</u></p> <p>Upgrade Your Toilets <u>Newer models use just 1.28 gallons per flush.</u> Models made [prior to 1992 use between 3.5 and 7 gallons per flush.]</p>
<p>Gather: Cluster Question # <u>2</u> Question Type: Highlighting Text Addresses: <input checked="" type="checkbox"/> DCI <input checked="" type="checkbox"/> SEP (Analyzing and interpreting data) <input checked="" type="checkbox"/> CCC (Cause and effect, Structure and function of engineering devices [sprinklers])</p> <p>Answer:</p> <p>Benefits: Simple ideas Beautiful Even once makes a difference Pay lower water bill Saving water can be fun</p> <p>Obstacle: Requires paying extra attention Has to be adjusted Initial costs for landscaping are expensive</p>	<p>Question 2: In website 2, find (underline) a detail that explains how outdoor water can be conserved. Find (put a box around) a second detail that explains how water conservation efforts might be an obstacle to a family.</p> <p>Website Reading 2: Tips for Outdoor Water Usage</p> <p>Tree: Water Wider Root tips need water; the base of the tree doesn’t. Water around the drip line, located directly under the circumference of the tree. [You’ll need to pay extra attention to set up sprinklers this way.]</p> <p>Rain Gutter: Aim to Conserve Direct downspouts and other runoff towards shrubs and trees. This <u>only has to be done once</u> and will use water better.</p> <p>Landscape: Conserving Water is <u>Beautiful</u> Less grass and more shrubs, wildflowers, and rocks <u>adds curb appeal and saves water (and money paying for water.)</u> Try xeriscaping to save even more water. The [average cost to add native plants to a xeriscaping project is between \$2,000 and \$5,000.] Hiring a landscaper for various projects, you can [expect to pay around \$50 to \$100 per hour.]</p> <p>Watering Can: Perfect for Pots Use a watering can to water potted plants or small areas. Watering these small spaces with a hose wastes water.</p> <p>Water-Wise Plants Learn more about water-wise plants for Utah landscapes. <u>Free classes and design plans can be accessed online.</u> These classes can be an hour or longer depending on your needs.</p> <p>Sprinklers: No Wet Cement [Adjust sprinklers] so they don’t spray sidewalks and driveways.</p> <p>Kids: <u>Conservation Fun</u> Let them run through the sprinklers in an area where your lawn needs it the most.</p>

Gather:
 Cluster Question # 3
 Question Type: Table Match
 Addresses:
 x DCI
 x SEP (Analyzing and interpreting data)
 CCC
 Answer:

Reasons to conserve water	Reasons it is hard to conserve water
Limited natural resource	Longer wait for clean clothes or dishes
One minute can make a difference	Requires breaking habits
Population is projected to double	High cost of installing new equipment

Table 3 - Indoor Water Usage Conservation

Question 3:
 Using Table 1, Website Reading 1, and Website Reading 3 sort the following items into their correct category as to whether they are an advantage or disadvantage to indoor water conservation.

High cost of installing new equipment
 Requires breaking habits
 Population is projected to double
 One minute can make a difference
 Limited natural resource
 Longer wait for clean clothes or dishes

Table 3 - Indoor Water Usage Conservation

Reasons to conserve water	Reasons it is hard to conserve water

Gather:
 Cluster Question # 4
 Question Type: Table Match
 Addresses:
 x DCI
 x SEP (Analyzing and interpreting data)
 CCC
 Answer:

Question 4:
 Using Table 2, Website Reading 2, and Website Reading 3, sort the following items into their correct category as to whether they are an advantage or disadvantage to outdoor water conservation.

Limited natural resource
 Yard is already landscaped with grass
 High initial cost to add native plants and xeriscaping
 Stretching water supply is critical
 Water evaporates when used during the day
 Conservation opportunities are fun
 Adds beauty
 Requires extra effort

Reasons to conserve water	Reasons it is hard to conserve water
Limited natural resource	Yard is already landscaped with grass
Stretching water supply is critical	High initial cost to add native plants and xeriscaping
Conservation opportunities are fun	Water evaporates when used during the day
Adds beauty	Requires extra effort

Table 4 - Outdoor Water Usage

Table 4 - Outdoor Water Usage

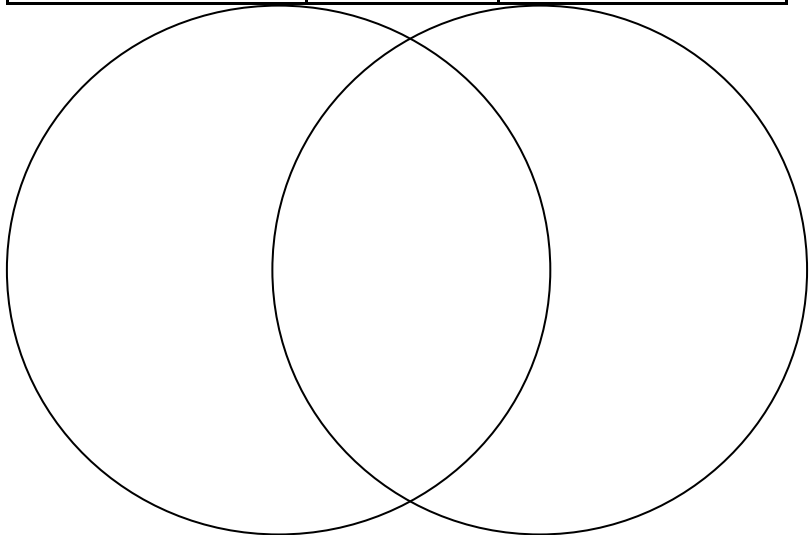
Reasons to conserve water	Reasons it is hard to conserve water

Reason:
 Cluster Question # 5
 Question Type: Modeling
 Addresses:
 x DCI
 x SEP (Constructing an explanation)
 CCC (scale and proportion- inside versus outside)
 Answer:
 Possible answers could include pros and cons from questions 1-4.

Question 5:
 Complete the Venn Diagram in Figure 3 to show the similarities and differences of conserving water indoors and conserving water outdoors. Be sure that you include at least 1 pro and 1 con in each section.

Figure 3 - Comparing and contrasting water conservation

Indoor Water Conservation	Both	Outdoor Water Conservation
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Communicate:
 Cluster Question # 6
 Question Type: Long Answer
 Addresses:
 x DCI
 x SEP (Obtaining, evaluating, and communicating information)
 CCC (Cause and effect, Structure and Function)
 Answer:
 Conserving water indoors and outdoors helps protect Earth’s resources and environments, but also requires additional energy and funding. Even with these constraints, stretching our water supply is extremely important. One person can make a difference. Conservation is necessary to ensure we have water now and in the future.

Question 6:
 Based on what you have learned and the information provided, what do you feel are the most effective ways to start conserving water? Is it worth the effort required to conserve water? Does one person’s efforts make a difference? Write a paragraph supporting your claim with evidence from the resources provided.

Proficiency Scale

Proficient Student Explanation:

Conserving water indoors and outdoors helps protect Earth’s resources and environments, but also requires additional energy and funding. Even with these constraints, stretching our water supply is extremely important. One person can make a difference. Conservation is necessary to ensure we have water now and in the future.

Level 1 - Emerging	Level 2 - Partially Proficient	Level 3 - Proficient	Level 4 - Extending
SEP: Does not meet the minimum standard to receive a 2.	SEP: Generate and/or compare multiple solutions to a problem.	SEP: Apply scientific ideas to solve design problems. Generate and compare multiple solutions to a problem based on how well they meet the	SEP: Extends beyond proficient in any way.

		criteria and constraints of the design solution.	
<p>CCC: Does not meet the minimum standard to receive a 2.</p>	<p>CCC: Relates the shape and stability of structures of natural and designed objects to their function(s).</p>	<p>CCC: Observes different materials have different substructures. Identifies substructures have shapes and parts that serve functions.</p>	<p>CCC: Extends beyond proficient in any way.</p>
<p>DCI: Does not meet the minimum standard to receive a 2.</p>	<p>DCI: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.</p>	<p>DCI: Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.</p>	<p>DCI: Extends beyond proficient in any way.</p>

(Student Facing Format on following pages)








Name: _____ Date: _____







Stimulus

Conserving Water

A student has been learning how the Goshute are working to protect their water. In her own neighborhood she sees lawn signs that say “slow the flow–save H₂O” and wonders what difference one person’s efforts will make in water conservation efforts.

Table 1: Student’s family average indoor water usage

Water Use Task	Times used in one day	Gallons used per time	Gallons used per day
Flush toilet 	12	6	72
Run faucet for 1 minute (waiting for water to get hot or cold) 	5	4	20
Fill a bathtub (about 5 inches of water) 	1	40	40
Shower (5 minutes) 	8 (One time recorded for every 5 minutes)	35	280
Run dishwasher 	1	15	15
Wash a load of dishes by hand (in a basin or plugged sink without water running) 	0	4	0
Wash a load of dishes by hand (with water running) 	1	30	30



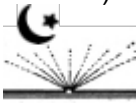
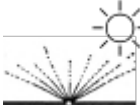
Water Use Task	Times used in one day	Gallons used per time	Gallons used per day
Wash a load of dishes by hand (with water running) 	1	30	30
Wash 1 small load of clothing 	0	30	0
Brush teeth with water running 	4	2	8
Brush teeth with water off 	4	1	4
Wash hands 	16	1	16
Drink water (It is recommended each person drinks eight 8-ounce glasses of water a day, which equals half a gallon.) 	8	0.25	2
TOTAL			532

(Table adapted from [4-H Water Conservation with the Water Lion](#))

Circle the two tasks which use the most water.

Color the two tasks yellow which use the least water (not including 0).

Table 2: Student's family average outdoor water usage

Water Use Task	Times used in one week	Gallons used per time	Gallons used per week
Wash a car, animal, or other object (water off while soaping) 	1	40	40
Wash a car, animal, or other object (water on while soaping) 	0	180	0
Water landscaping before 10 am or after 6 pm (20 minutes) 	12 (four hours)	140	1680
Water landscaping between 10 am to 6 pm (20 minutes) 	3 (one hour)	185	555
TOTAL			2,275

(Table adapted from [4-H Water Conservation with the Water Lion](#))

If desired, students can take home blank copies of indoor and outdoor water usage charts and use their own data in this activity.



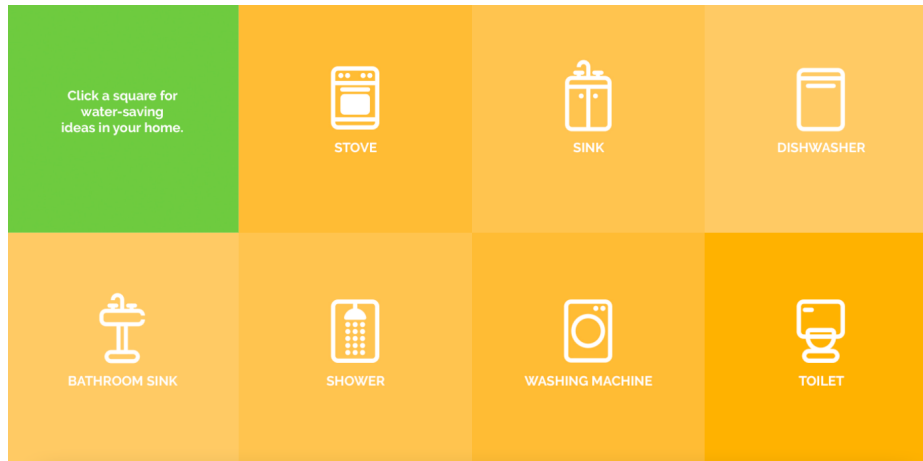
<https://slowtheflow.org/>

Your Task

In the questions that follow, you will identify criteria and constraints, analyze available data on proposed solutions, and determine if one family's efforts are worth the energy it takes to conserve water.

Question 1

Have students go to <https://slowtheflow.org/indoor-tips/> or print the reading materials from below for students to write on. There are a few additional details in the reading materials below that have been added to the information from the website.



Find (underline or write down) a detail that explains how indoor water can be conserved. Find (put a box around or write down) a second detail that explains how water conservation efforts might be an obstacle.

Website Reading 1: Tips for Indoor Water Usage

Reuse Cooking Water

Consider watering your plants with the water left over from cooked pasta and vegetables. Seriously. The extra nutrients can help plants grow better.

Fill It First

You'll use far less water by filling your sink to rinse vegetables, pans, and dishes than by just letting the water run.

Load It Full

The more dishes you get into the dishwasher per load, the more efficient your water use. Newer dishwashers use about half the water of older models, too. A new energy efficient dishwasher costs approximately \$800-\$1500.

Fix All Drips

On average, leaks make up about 14% of all indoor water use. If you live in a home built before 1975, your pipes are probably made of cast iron. Although cast iron pipes can last 50-100 years, deterioration of cast iron pipes is normal after just 25 years. If your faucet is not dripping, you'll save about three gallons of water by turning it off while brushing your teeth.

Shorten Your Shower

Showering just one minute less every day will save up to 1,875 gallons of water each year. In addition, replacing old showerheads can cut your water use in half.

Wash Full Loads

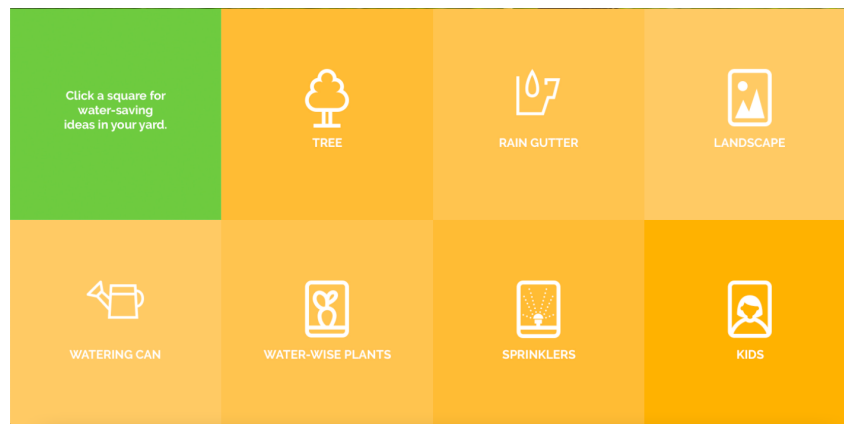
Laundry uses over 20% of all the water in your home. Use discretion when washing. Newer front loading machines also use about half the water and detergent of conventional models. A new energy efficient washing machine costs \$750-\$2000. When getting ready to do laundry, always ask, "Does this really need washing?" If clothes aren't dirty, don't wash them.

Upgrade Your Toilets

Newer models use just 1.28 gallons per flush. Models made prior to 1992 use between 3.5 and 7 gallons per flush.

Question 2

Have students go to <https://slowtheflow.org/outdoor-tips/> or print the reading materials from below for students to write on. There are a few additional details in the reading materials below that have been added to the information from the website.



Find (underline) a detail that explains how outdoor water can be conserved. Find (put a box around) a second detail that explains how water conservation efforts might be an obstacle to a family.

Website Reading 2: Tips for Outdoor Water Usage

Tree: Water Wider

Root tips need water; the base of the tree doesn't. Water around the drip line, located directly under the circumference of the tree. You'll need to pay extra attention to set up sprinklers this way.

Rain Gutter: Aim to Conserve

Direct downspouts and other runoff towards shrubs and trees. This only has to be done once and will use water better.

Landscape: Conserving Water is Beautiful

Less grass and more shrubs, wildflowers, and rocks adds curb appeal and saves water (and money paying for water.) Try xeriscaping to save even more water. The average cost to add native plants to a xeriscaping

project is between \$2,000 and \$5,000. Hiring a landscaper for various projects, you can expect to pay around \$50 to \$100 per hour.

Watering Can: Perfect for Pots

Use a watering can to water potted plants or small areas. Watering these small spaces with a hose wastes water.

Water-Wise Plants

Learn more about water-wise plants for Utah landscapes. Free classes and design plans can be accessed online. These classes can be an hour or longer depending on your needs.

Sprinklers: No Wet Cement

Adjust sprinklers so they don't spray sidewalks and driveways.

Kids: Conservation Fun

Let them run through the sprinklers in an area where your lawn needs it the most.

Website Reading 3: Conserve Water in Utah

Have students go to Website Reading 3 at <https://conservewater.utah.gov/> or print the reading materials from below for students to write on.

Water is the essence of life. It provides us with joy, health, food, economic opportunities, adventures, breathtaking landscapes, power generation, laughter and memories, and because it makes up two-thirds of our bodies, it makes it so you can be here, visiting our website (and on the earth)!

Our population is projected to double by 2065, so stretching our water supply is critical. Traditionally, two-thirds of Utah's growth has been from "natural increase" from the population having children. This percentage is declining with more people moving in. People have discovered Utah is a great place to live, work and play. Unfortunately, they don't bring water with them. Conservation is key to ensuring we have water now and for future generations.

Water is the most limited natural resource with 97% of it saltwater and only 3% freshwater. Of this 3%, 2.5% of it is unavailable because it is frozen as snow and ice, locked up in the atmosphere and soil, polluted, or lies too far under the earth's surface to be extracted at a reasonable cost. That means only 0.5% of all the earth's fresh water is easily accessible as surface water in rivers, streams and lakes. We encourage you to be a steward of Utah's water by using it wisely and sharing information with others.

Question 3

Using Table 1, Website Reading 1, and Website Reading 3 sort the following items into their correct category in Table 3 as to whether they are an advantage or disadvantage to indoor water conservation.

- High cost of installing new equipment
- Requires breaking habits
- Population is projected to double
- One minute can make a difference
- Limited natural resource
- Longer wait for clean clothes or dishes

Table 3 - Indoor Water Usage Conservation

Reasons to conserve water	Reasons it is hard to conserve water

Question 4

Using Table 2, Website Reading 2, and Website Reading 3, sort the following items into their correct category in Table 4 as to whether they are an advantage or disadvantage to outdoor water conservation.

- Limited natural resource
- Yard is already landscaped with grass
- High initial cost to add native plants and xeriscaping
- Stretching water supply is critical
- Water evaporates when used during the day
- Conservation opportunities are fun
- Adds beauty
- Requires extra effort

Table 4 - Outdoor Water Usage

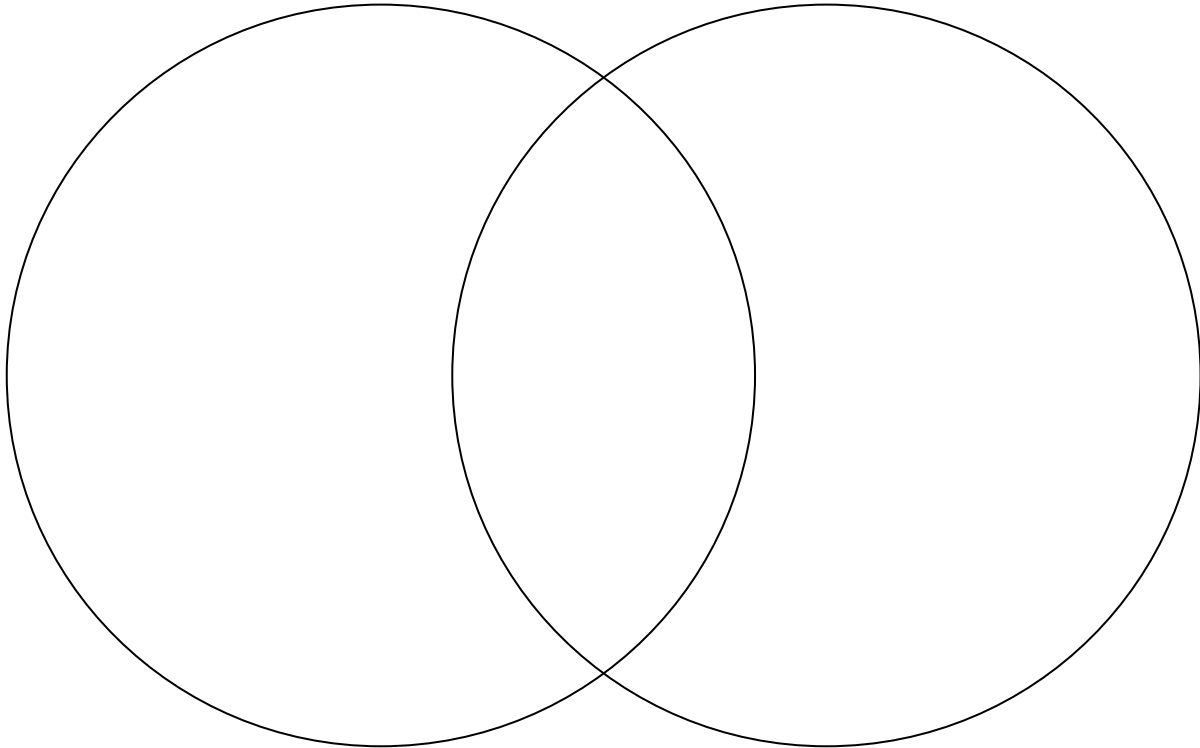
Reasons to conserve water	Reasons it is hard to conserve water

Question 5

Complete the Venn Diagram in Figure 1 to show the similarities and differences of conserving water indoors and conserving water outdoors. Be sure that you include at least 1 pro and 1 con in each section.

Figure 1 - Comparing and contrasting water conservation

Indoor Water Conservation	Both	Outdoor Water Conservation
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Question 6

Based on what you have learned and the information provided, what do you feel are the most effective ways to start conserving water? Is it worth the effort required to conserve water? Does one person's efforts make a difference? Write a paragraph supporting your claim with evidence from the resources provided.

Optional Student Water Conservation Data Collection Tables

Adapted from <https://ecosystems.psu.edu/outreach/youth/sftrc/lesson-plan-pdfs/4hwaterlion.pdf>

Follow these steps:

1. Each time you use water in a way listed on the chart, make a tally mark next to the activity in column B.
2. At the end of the day, count the tally marks for “flush toilet.”
3. Multiply the number of tally marks in column B by the number given in column C. This answer tells you the number of gallons per day you used to flush the toilet. Write this answer in column D.
4. Repeat steps 2 and 3 for the other activities in column A of the chart.
5. Add up all the numbers in column E to get the total number of gallons of water you used on your first tally day.
6. Repeat these steps on days 2 and 3 of your water use tally.

Name: _____ Date: _____

Table 1: Student's family average indoor water usage

Water Use Task	Times Used In One Day	Gallons used per time	Gallons used per day
Flush toilet		6	
Run faucet for 1 minute (waiting for water to get hot or cold)		4	
Fill a bathtub (about 5 inches of water)		40	
Shower (5 minutes)	(One time recorded for every 5 minutes)	35	
Run dishwasher		15	
Wash a load of dishes by hand (in a basin or plugged sink without water running)		4	
Wash a load of dishes by hand (with water running) 30		30	
Wash 1 large load of clothing		45	
Wash 1 small load of clothing		30	
Brush teeth with water running		2	
Brush teeth with water off		1	
Wash hands		1	
Drink water		0.25	
Other			
TOTAL			

(Table adapted from [4-H Water Conservation with the Water Lion](#))

Name: _____ Date: _____

Table 2: Student's family average outdoor water usage

Water Use Task	Times used in one week	Gallons used per time	Gallons used per week
Wash a car, animal, or other object (water off while soaping)		40	
Wash a car, animal, or other object (water on while soaping)		180	
Water landscaping before 10 am or after 6 pm (20 minutes)		140	
Water landscaping between 10 am to 6 pm (20 minutes)		185	
Other			
TOTAL			

(Table adapted from [4-H Water Conservation with the Water Lion](#))