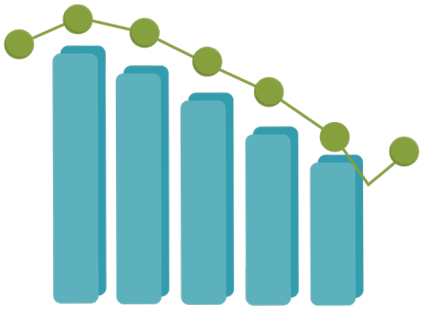
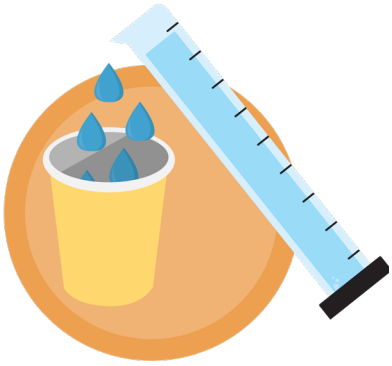
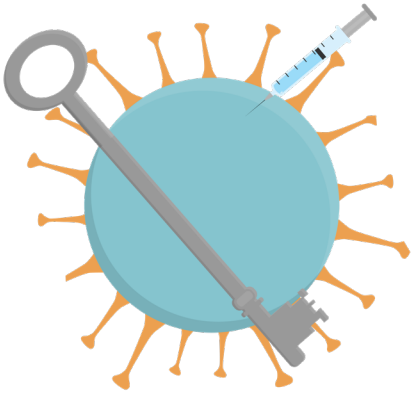
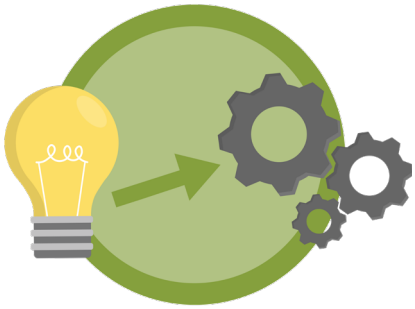
Water Conservation

DATA JAM









A Lesson Module for 6th-12th Grade Students

WATER CONSERVATION DATA JAM

A Lesson Module for 6th–12th Grade Students

Welcome to the Water Conservation Data Jam, developed by the nonprofit Asombro Institute for Science Education with funding from the Environmental Protection Agency's Environmental Education Grant Program.

The project aims to increase 6th-12th-grade students' environmental literacy and ability to communicate science and turn knowledge into action that benefits New Mexico's environment. The unit is centered on the following phenomenon: **data provide evidence for the importance of water conservation in New Mexico, and we can share that information creatively and provide possible solutions.**

Students analyze local water use data and communicate a trend in the data to nonscientists through creative projects such as poems, physical models, and games. They then propose an action based on the data trend they identified to encourage water conservation in the community. Students' Water Conservation Data Jam projects will highlight the need for water conservation and actions that they and others can take to become stewards of our water resources.

We designed the unit as a flexible menu with four **Main Course** core components:

- A short introduction video to give students an overview of the project
- A 45-minute lesson where students work together to develop an example data jam
- A 45-minute lesson introducing students to data trends and graphs
- A 45-minute lesson on turning data trends into creative projects and action plans

You can also add optional activities to the Main Course components to create a module that works best for your students. These optional components include:

- **Appetizers** – four activities that help students gain background information on water issues in New Mexico and the need for water conservation. You can do one or all of these activities before the Main Course lessons, depending on your students' needs and the amount of time you have available for the unit.
- **Desserts** – two recommended activities to extend the project by having students present their projects, provide peer feedback, and implement their action plans.

The unit is also designed so you can implement it regardless of whether or not your students have technology access. For each main course component, you'll find the "CODAP Version," built for educators whose students all have access to the internet and computers or tablets. The "PDF Version" of each lesson is designed for students without devices; this version includes handouts that you will copy for your students.

This binder includes teacher guides, student worksheets, and other materials to get you started. All resources are also available on the Water Conservation Data Jam teacher resources webpage:

https://asombro.org/wcdjteacher

Thank you for taking your students on a journey of discovery to learn more about New Mexico water issues, gain data literacy, practice science communication, and turn knowledge into action to protect our state's resources. We look forward to working with you!

Asombro Institute
FOR SCIENCE EDUCATION

(575) 524-3334 (www.asombro.org)

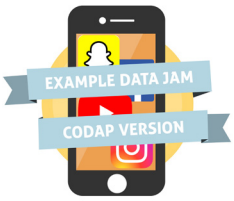
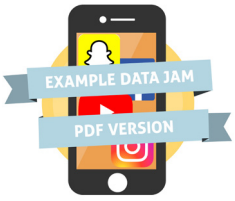
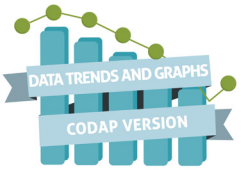
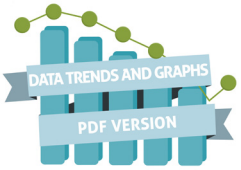
WATER CONSERVATION DATA JAM

A Lesson Module for 6th–12th Grade Students

MENU AND TABLE OF CONTENTS

GETTING STARTED

ACTIVITY MENU

Main Courses ***Core components of the Water Conservation Data Jam***		 A-01  B-01	 C-01  D-01	 E-01
Appetizers ***Optional activities to help students learn more about New Mexico water issues; choose one to four***	 F-01	 G-01	 H-01	 I-01
Desserts ***Optional activities for students to extend their learning; choose one or two***	 J-01	 K-01	CLICK THE ACTIVITY ICONS TO NAVIGATE TO EACH SECTION	

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NEXT GENERATION SCIENCE STANDARDS

The Water Conservation Data Jam is aligned with all three dimensions of the Next Generation Science Standards.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems (MS, HS) Developing and Using Models (MS, HS) Analyzing and Interpreting Data (MS, HS) Using Mathematics and Computational Thinking (MS) Constructing Explanations and Designing Solutions (MS, HS) Engaging in Argument from Evidence (MS, HS)	ESS3.A Natural Resources (MS, HS) ESS3.C Human Impacts on Earth Systems (MS, HS) ETS1.A Defining and Delimiting Engineering Problems (HS)	Patterns (MS, HS) Stability and Change (MS, HS)

AGRICULTURE, FOOD, AND NATURAL RESOURCES (AFNR) CAREER CLUSTER CONTENT STANDARD

CS.04.02 Assess and explain the natural resource-related trends, technologies, and policies that impact AFNR systems.

COMMON CORE STATE STANDARDS

Mathematics

6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems.

6.SP.5 Summarize numerical data sets in relation to their context.

8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.

High School (Statistics and Probability) - S.ID.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

English Language Arts

6.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

6.RI.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

6.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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8.L2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

6.L3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

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9-10.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

11-12.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

6.WHST.1 Write arguments to support claims with clear reasons and relevant evidence.

6.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to the task, purpose, and audience.

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A SAMPLE SCHEDULE

There are many ways you can schedule the Water Conservation Data Jam in your classroom. Here is a sample schedule that requires two lessons per week over three weeks. It includes all four required Main Course components as well as all six optional Appetizer and Dessert components. Note that students will need time after the Creative Projects and Action Plans lesson to complete their projects.

	Day 1	Day 2
Week 1	**Main Course: Introduction Video** Appetizer: **How Much Water Do You Use?** Appetizer: **Water Allocation** Appetizer: **Breakout Box**	**Main Course: Example Data Jam** Appetizer: **CODAP Escape Room (homework)**
Week 2	**Main Course: Data Trends and Graphs**	**Main Course: Creative Projects and Action Plans**
Week 3	Dessert: **Turning a Plan into Action**	Dessert: **Presentations and Peer Review**

BACKGROUND

Water is an essential resource, and its scarcity is often apparent in arid southwestern states like New Mexico. The National Integrated Drought Information System (https://www.drought.gov/states/new-mexico) uses data to create weekly maps showing the percentage of New Mexico in various categories of water scarcity, ranging from "abnormally dry" to "exceptional drought." Since 2000, vast areas of New Mexico have routinely been abnormally dry, meaning that the soil moisture across the state is low and the danger of possible wildfire is serious (NIDIS 2021). The most prolonged duration of drought recorded since 2000 lasted 329 weeks, from May 2001 through August 2007. The most intense drought occurred in January 2021, when more than half of the state was in the highest category of drought.

At the same time that New Mexico faces prolonged and persistent droughts, the human population is steadily increasing by approximately 2% annually (US Census 2019). Population increases without massive water conservation efforts cause increased water demand; this is shown in water consumption data, such as the data presented in the New Mexico Water Use by Categories Report (Magnuson et al. 2015). Thus, water demand is increasing, yet water is becoming scarcer.

Water scarcity affects many sectors. Some of the most notable effects are on wildlife and agriculture. Drought can cause changes in wildlife behavior, which has cascading effects in ecosystems. When drought leads to a lack of surface water for livestock and crops, farmers often must drill even further to reach underground water sources to supplement their production, increasing costs. In 2008, scientists estimated that disruption of water supplies causes $300 million annually in economic losses in New Mexico, mainly to the agricultural industry (Hurd and Coonrod 2008).

Water scarcity is a top concern for local and regional governments in New Mexico. For example, in the Doña Ana County All-Hazard Mitigation Plan, drought was chosen as one of the most critical local hazards due to the county's vulnerability to losses in agriculture, municipal and industrial water supply, recreation/tourism, and wildlife. Within the plan, most jurisdictions listed one primary strategy to combat drought risk: conduct a public education campaign to raise awareness of drought conditions and provide recommendations for conserving water.

The Water Conservation Data Jam aligns perfectly with this strategy. Empowering students to learn about water issues in New Mexico, interpret and communicate water use data, and then propose water conservation actions will help our leaders of tomorrow ensure a livable future in our enchanting state.

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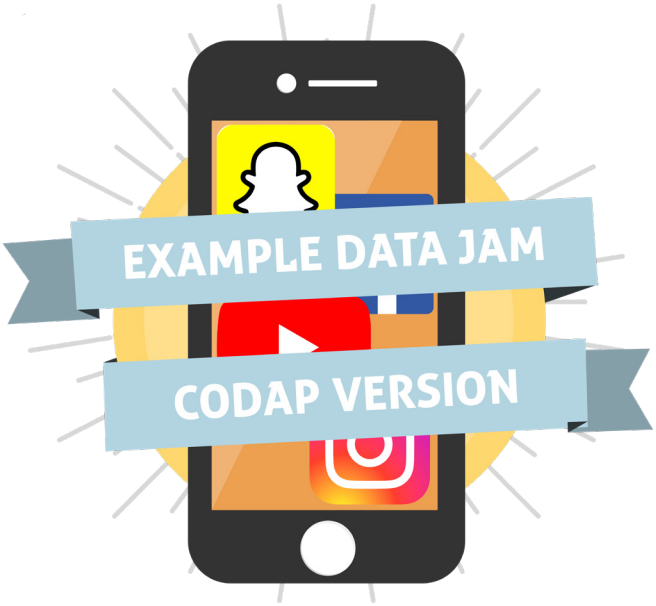
Water Conservation



Data Jam

DESCRIPTION

As an introduction to the Water Conservation Data Jam, students participate in an interactive data jam with their classmates using a dataset on social media. Once they have been introduced to all the project components, they learn how to start exploring the water dataset they will use for their own projects.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Understand the components of a data jam
- Practice finding a data trend and developing a creative project using a sample dataset
- Apply their understanding to the water use dataset

TIME
45 MINUTES

MATERIALS

- Optional: Making Your Own Dataset
- Internet-connected device [1 per student or 1 per class with a projector]
- Introduction to the Water Conservation Data Jam video
- PowerPoint presentation
- Class Poem Document [fillable PDF]
- Social Media Dataset
- Water Use Dataset
- Social Media Sample Project
- Rubric

PREPARATION

1. Optional: prepare your own Water Use Dataset for a county near you instead of using the datasets available from Asombro. Follow the instructions in Making Your Own Dataset.
2. Set up a computer with internet access and a projector (if applicable) and prepare to show the PowerPoint.
3. Prepare to use the Class Poem Document and PowerPoint to guide students through creating a class poem together as an example data jam project. You can choose to either add the sentences students will write to the Class Poem Document during class or collect students' sentences, add them to the document later, and show it to the class during the next lesson.
4. Have students watch the three-minute Introduction to the Water Conservation Data Jam video. You can either assign this as homework before the lesson or watch the video together in class. The transcript is available here.
5. If needed, set up an assignment in your online learning platform (Canvas, Google Classroom, etc.). Here is some suggested text for the online assignment:
   If you did not watch the Introduction to the Water Conservation Data Jam video, you can find it here: https://www.youtube.com watch?v=Ax3lRXAbN0g. Before the next class, go to the Water Use Dataset webpage. On this webpage, click the button for your county. Then:
   1. Read the Background and Procedures boxes for the dataset.
   2. Watch the short video about the dataset.
   3. Choose a water-use category that you are interested in investigating.
   4. Look at the other resources available on this website.

PROCEDURES

Introduction

1. **Slide 1**: New Mexico is a dry state, and it is essential to find ways to conserve our limited water resources. You will think about this as you complete your Water Conservation Data Jam project. You will learn how to interpret a set of data, find a creative way to represent a data trend, and develop an action plan to address water conservation issues. Today, we will learn about the different parts of a data jam by doing an example data jam together before you start on your own projects.
2. **Slide 2**: data are important, and they can tell us what is going on in the world. You have probably seen something like this graph of COVID-19 cases in New Mexico.
3. **Slide 3**: data can also be fun and tell you about individuals. This graph shows my desire for ice cream throughout the day, and we can see a pattern. My desire for ice cream is low in the morning, and it increases throughout the day. Educators can change the title and y-axis of this graph to make it about something more applicable to themselves.
4. **Slide 4**: now it is your turn to create a graph that shows a data trend about you. This graph has the time of day on the x-axis, and the y-axis is unlabeled. You will pick the label for the y-axis of this graph that best describes you. The graph shows that your choice for the y-axis label needs to be something that increases steadily throughout the day.
    a. Your choices are: A. My desire for Takis; B. Loudness of my voice; C. Strangeness of filters I use for a selfie; or D. My fear of being attacked by zombies. Educators may edit these options to fit their class or allow students to make up their own label. Ask students to share their choices, and make a note of which choice was the most popular.
    b. Explain that [A, B, C, or D] was the most popular answer, which means that, for example: "In this class, students' desire for Takis increases steadily throughout the day." This one-sentence explanation of a pattern in data is called a **data trend**.
    c. We used fabricated data for this example, but in the Water Conservation Data Jam, you will use actual data collected by scientists.

Overview of Introduction Video Content

1. **Slide 5**: the Water Conservation Data Jam has two goals. One goal is finding a creative way to represent a data trend so that a non-scientist can understand it. You will do this by writing a short report with seven sections and making a creative project.
2. **Slide 6**: this is an example from a dataset that you will not use about kangaroo rat populations.
    a. This student was given a dataset from a study on kangaroo rat populations from 1995 – 2007. Data were collected during the Small Mammal Exclusion Study at the Jornada Basin LTER (Long-Term Ecological Research) site near Las Cruces, NM.
    b. The student examined the dataset and noticed a data trend or pattern in the data. They wrote the data trend in a complete sentence: "While the kangaroo rat population size was relatively constant over time, it was much higher in 1998 and 2000."
    c. Then, the student came up with a creative way to show that data trend: piñatas shaped like kangaroo rats. The circumference of each piñata is scaled to the number of kangaroo rats caught by scientists. The scale is one centimeter of circumference represents one kangaroo rat. You can see the data trend by looking at the piñatas. The piñatas are bigger in 1998 and 2000 and smaller in the other years.
3. **Slide 7**: after identifying a data trend and representing it creatively, the second goal is to propose an action plan to address the water conservation issue you identified in your data trend.
4. **Slide 8:** your action plan will present a solution to the water conservation issue you identified in your data trend. This is a student sample of an action plan from a previous class. They identified a data trend about water use by livestock and presented an action plan to store water for animals.

Example Data Jam with a Social Media Dataset: Finding a Data Trend

1. **Slide 9**: to complete the Water Conservation Data Jam, you will:
    a. Identify a data trend from a water dataset.
    b. Make a creative project.
    c. Design an action plan.
    d. Complete your written report. Today, we are going to do an example data jam project together as a class to learn about all the parts that you will include in your own data jam project.
2. **Slide 10**: the first thing we do in a data jam is look for **data trends**. A data trend is a story told by the dataset, a pattern in the data, or a relationship between two or more variables. It should be one to two sentences. At the beginning of class, we identified a data trend using the graphs of made-up data. (Remind students of the data trend from your class.) The student project shown earlier included the data trend: "While the kangaroo rat population size was relatively constant over time, it was much higher in 1998 and 2000."
3. **Slide 11**: we will start our example data jam by looking at a sample dataset and finding a data trend. We will use the Common Online Data Analysis Platform (CODAP) tool to explore the datasets.
4. Switch from the PowerPoint to

the social media dataset on the Asombro website (asombro.org/social).

5. For your Water Conservation Data Jam project, you will use a dataset about water. Today, we will do an example data jam using a dataset about social media. This dataset is set up the same way as the dataset you will be using for your own project, so everything we do today will help you with your own project.
6. Explain each section of the dataset webpage.
   a. At the top of the dataset page is the **background section** (Figure 1), which provides general information about the topic. For example, this background section explains that social media has been around less than 30 years but is used by hundreds of millions of people globally and is important to the economy.
   b. The **procedures section** (Figure 2) explains how the data were collected. Remember that you do not collect your own data for the Water Conservation Data Jam. Instead, you are using an existing dataset. It is still important to understand who collected the data and how they were collected. These data come from a research group that did a survey in 2018 asking people which social media platforms they used.
   c. Scroll down to see the **data**.
   d. We are using a tool called CODAP, the Common Online Data Analysis Platform, created by the Concord Consortium. This tool helps us explore and graph the data to find a data trend.
      i. Note that data are shown to us in a table and a graph. What kind of graph do you see? [Answer: scatterplot]
      ii. When we are looking for a data trend, the first thing we do is figure out which variables are included in the dataset. Variables are things that are measured – or things we have data on. They can be found in the title and column headings of tables and the titles, axis labels, and legends of graphs. What variables do you see in this dataset? [Answer: age group, social media platforms (YouTube, Facebook, Instagram, Snapchat), percentage of people who use each platform, technology owned (smartphone, laptop or desktop computer), and percentage of people that use each technology.]
7. Guide students to identify data trends.
   a. There are a lot of data on this webpage, so to find a data trend, you should start by focusing on one or two variables by taking other variables off the graph. To remove a variable, click on the variable on the y-axis, then "Remove Y: variable." For example, click "Snapchat" on the y-axis, then "Remove Y: Snapchat" (Figure 3).
   b. Take **YouTube, Facebook, and Snapchat off the graph**. With just Instagram on the graph, what data trend do you see?

EXAMPLE DATASET – SOCIAL MEDIA

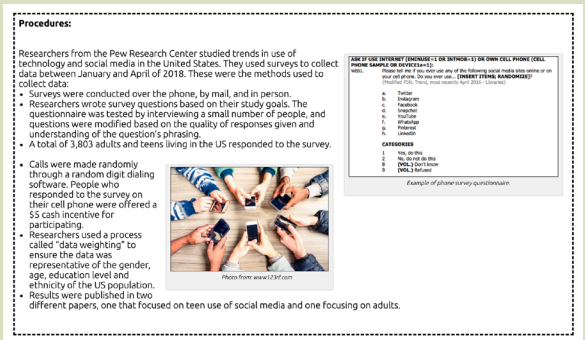
Do NOT use this dataset for your final Data Jam project.

Background:

Social media platforms are web-based tools that create a community for sharing content and messages online. The first social media sites were created in the late 1990's and early 2000's. These early sites have been replaced by other sites and applications that are used by millions of people around the world. Social media now accounts for more than 24 billion dollars in global revenue.

Social media has become a major part of modern society used by hundreds of millions of people around the world. It serves as an important marketing tool for businesses and allows users to stay up to date with current events. On average, in 2019 people spent more than two hours per day on social media.

Figure 1. Background section of dataset



Procedures:

Researchers from the Pew Research Center studied trends in use of technology and social media in the United States. They used surveys to collect data between January and April of 2018. These were the methods used to collect data:

- Surveys were conducted over the phone, by mail, and in person.
- Researchers wrote survey questions based on their study goals. The questionnaire was tested by interviewing a small number of people, and questions were modified based on the quality of responses given and understanding of the question's phrasing.
- A total of 3,803 adults and teens living in the US responded to the survey.
- Calls were made randomly through a random digit dialing software. People who responded to the survey on their cell phone were offered a $5 cash incentive for participating.
- Researchers used a process called "data weighting" to ensure the data was representative of the gender, age, education level and ethnicity of the US population.
- Results were published in two different papers, one that focused on teen use of social media and one focusing on adults.

Figure 2. Procedures section of dataset

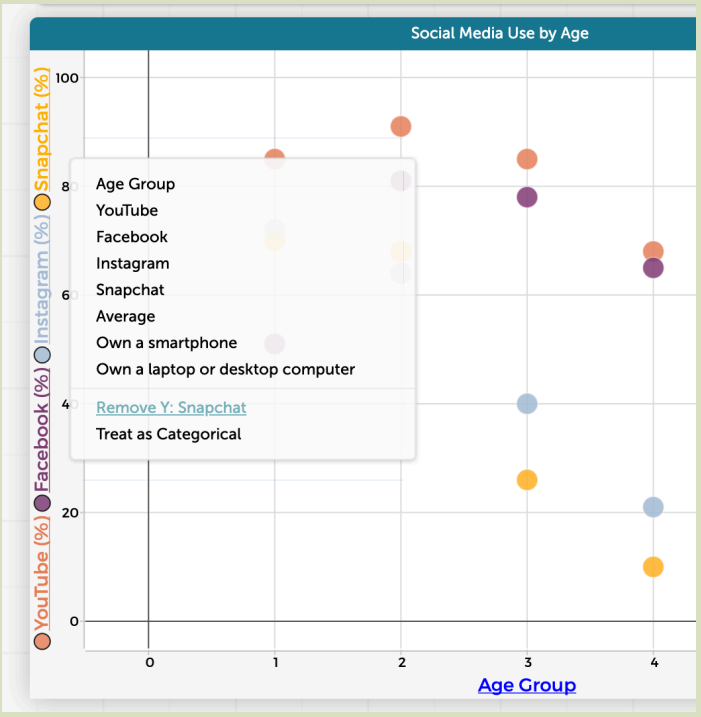


Figure 3. Removing a variable

[Answer: The percentage of people who use Instagram decreases with age.] This is a good example of a data trend.

c. We just looked at two variables (age group and percentage of people who use Instagram). You might want to compare more variables.
d. To add another variable to the graph, drag it to the y-axis. You will see a plus sign at the top and "add attribute: [variable]" (Figure 4). **Add YouTube to the graph**. If you compare YouTube and Instagram, you see that "more people use YouTube than Instagram in every age group." That is another good data trend.
e. **Remove YouTube, then add Snapchat back to the graph**. The data trend here is, "the percentage of people using Snapchat and Instagram decreases with age."
f. A good data trend needs to include the main variable in the dataset. In this example dataset, we need to include the percentage of people who use social media. Additional variables are given (e.g., percentage of people who own a smartphone), and we can use them to explain our data trend.

8. Switch from the dataset website back to the PowerPoint.
9. **Slide 12**: in the next lesson, we will learn more tips and tricks for using CODAP. You will use this tool to look for data trends in a different dataset for your own projects.
10. **Slide 13**: there are five qualities of a good data trend. A data trend will:
    a. Show a pattern, not just one data point.
    b. Have more than one variable.
    c. Only use data found on the dataset. In a data jam, you will not collect your own data or find data from other sources.
    d. Be specific.
    e. Include the main variable. In the social media example, the main variable was the percentage of people who use social media.
11. **Slide 14**: keeping the criteria on the previous slide in mind, which of these data trends is a good data trend for our example data jam project? Option 1 is "Teenagers who use Facebook don't have any friends." Option 2 is "85% of teenagers use YouTube." Option 3 is "The percentage of people who use Snapchat and Instagram decreases with age." Have students vote by holding up one, two, or three fingers. If teaching remotely, you can use a poll or chat.
    a. Option 3 is the best data trend because it meets all of the criteria of a good data trend.
    b. Option 1 does not work because our dataset did not include any information about how many friends people have.
    c. Option 2 does not work because it is a data POINT, not a data TREND. This statement can be graphically represented using only one number from the data table, and a data trend needs to include multiple data points.
12. **Slide 15**: this data trend shows a pattern in the data.
    a. It has more than one variable (percentage of people who use Instagram, percentage of people who use Snapchat, and age group).
    b. It only uses data from the dataset we were given.
    c. It is specific and explains the variables we used. "Younger people use Instagram and Snapchat less" is an example of a data trend that is not specific enough.
    d. It includes the main variable in the dataset: the percentage of people who use social media.
    e. Once you have identified a data trend and written it in a single sentence, you will need a graph that shows that data trend; we will use this one we made in CODAP.

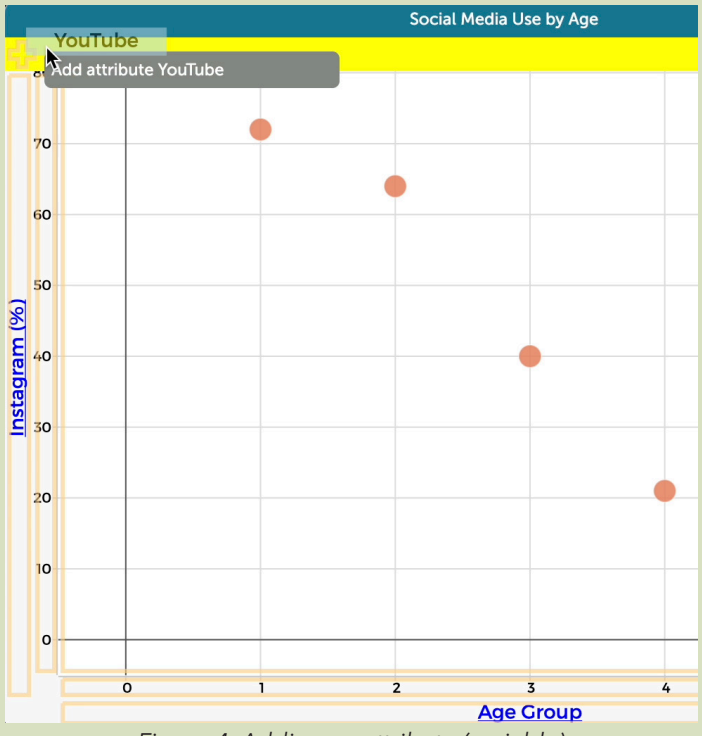


Figure 4. Adding an attribute (variable)

Example Data Jam with a Social Media Dataset: Possible Explanation and Creative Representation

1. **Slide 16**: you will also come up with a possible explanation that explains your data trend. Do not include this explanation in your data trend – it has its own section. In this section, you should try to explain why the data trend you identified is true. Think about what the pattern could mean. This is where you can look for additional information outside the dataset.
2. **Slide 17**: once you have identified a data trend, you will develop a creative way to show that trend. A creative project represents your data trend in a new and unusual way, like the student who made piñatas to show kangaroo rat population data. You should look at a creative project and see the data trend; we can see from the large piñatas which years had higher kangaroo rat populations. You can use symbols, objects, actions, or words to represent the data. Videos, pictures, words (like a poem or song), models, and food are just a few examples of ways you can represent a data trend.
3. **Slide 18**: these projects are examples made to represent the data trend: "the percentage of people who use Snapchat and Instagram decreases with age." The slide shows a picture of a model made with beads, an infographic with social media logos, and a screenshot from a video of a student bouncing a basketball to represent the data.
4. **Slide 19**: another example of a creative project is a poem. As a class, we are going to make a poem that shows our example data trend.
    a. Our data trend only talks about Snapchat and Instagram, so we do not need to include other social media platforms.
    b. We want the number of words in each sentence of the poem to represent the percentage of people in each age group that use that social media.
        i. We could make each word represent 1% of people, but that would mean, for example, we would need a 72-word sentence to represent Instagram use by 13-17-year-olds.
        ii. Instead, we decided to make one word represent 3% of people in the age group who use the social media platform. To figure out the number of words in each sentence, each number from the data table was divided by 3 (and rounded to the nearest whole number).
    c. Each student will write one sentence of the poem. The first two sentences are filled out already as examples. For example, the first sentence represents the percentage of 13-17-year-olds who use Snapchat and has 23 words: "#Snapchatslaps! It's lit and not for Boomers, the filters update and keep it fresh, which piques my interest and makes it the best!"
    d. The second sentence represents the percentage of 13-17-year-olds who use Instagram and has 24 words: "Lots of teens use social media, Instagram is pretty popular, I don't know why people like it, I have never used it even once."
        i. This example shows that even if you do not use the social media platform you are assigned to write about, you can still write a sentence about it.
    e. Each student is assigned one age group and social media platform combination based on the first letter of your first name. These assignments are listed on the slide. For example, if your name starts with A, you will write a sentence with 23 words about how 18-29-year-olds use Snapchat.
    f. Tell students to write their sentences with the correct number of words and label the app name and corresponding age group. Compile student responses into one poem using the Class Poem Document, and share it during the next lesson.

Wrap-Up

1. **Slide 20**: today, we did an example data jam using a dataset about social media. In the next class, you will be using the same steps and tools we used today to start your own data jam project to explore water use data. Here are the steps:
    a. Choose one or more water use categories. You can find the dataset at asombro.org/WCDJData.
    b. Use CODAP to find a data trend.
    c. Make a creative project that shows that data trend.
    d. Make an action plan based on that trend.
    e. Compile a report in a slide presentation that includes title, data trends, graph, possible explanation, creative project, action plan, and brief reflection.
2. **Slide 21**: finding a data trend is the first step in Water Conservation Data Jam, and it is crucial in moving forward with the project. Your creative project and action plan both need to be based on your data trend.
3. **Slide 22**: in the next lesson, we will learn more about finding a data trend. Explain the homework assignment to students.
    a. Before the next class, students should explore the water dataset at http://asombro.org/WCDJData/. If time allows, show the dataset webpage to students.
    b. Students should read the background and procedures section, watch the dataset video, choose a water-use category they are interested in investigating, and look at the other resources available on the website.
    c. Note that there are many other buttons on the page (Figure 5);

these are resources to help students.

i. Introduction Video: this is the video provided to students as an assignment or viewed as a class before this lesson. This video can be viewed by students at any time as a reminder of the project. The transcript for this video is available here.
ii. About the CODAP Dataset Video: this video helps students navigate the Water Conservation Data Jam dataset using CODAP. The button toward the bottom of the page, above the data, links to this same video. The transcript for this video is available here.
iii. Social Media Sample Project: this shows a completed report using the example social media dataset used in this lesson.
iv. Rubric: this is the grading rubric for the Water Conservation Data Jam. This rubric is available for students to view at any time so that they are aware of each component of the final report and the point value for each component.
v. Creative Project How To Video: this video is a review of the lesson, Creative Projects and Action Plans. It will help students make a creative project based on their data trend. The transcript for this video is available here.

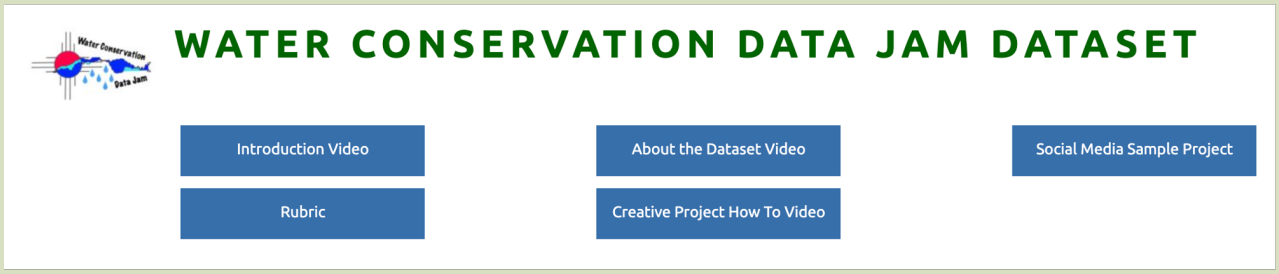


Figure 5. Buttons on the dataset webpage link to additional resources that may help students with their projects.

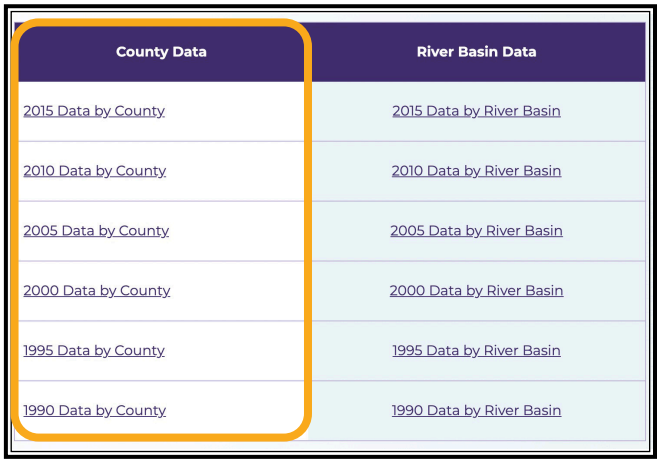
MAKING YOUR OWN DATASET VIDEO

1. Watch this video to learn how to make your own Water Conservation Data Jam dataset.
2. If needed, refer back to the following instructions for reminders of each step.

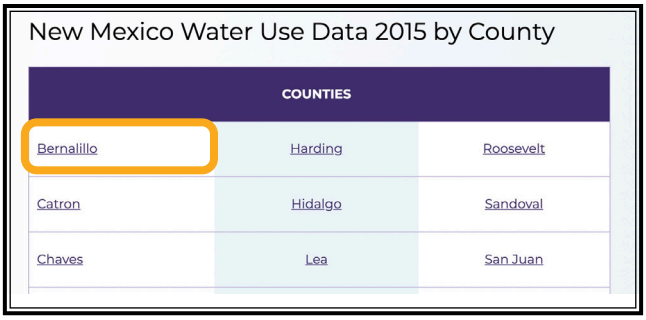
FINDING YOUR LOCAL WATER USE DATA - NEW MEXICO

Water Use by Categories Data from New Mexico Office of the State Engineer Water Use Technical Reports and Data

1. Download the spreadsheet template here.
2. Go to this website: https://www.ose.state.nm.us/WUC/wuc_waterUseData.php.
3. Scroll down to find "County Data," and click on the desired year. Click on your county.



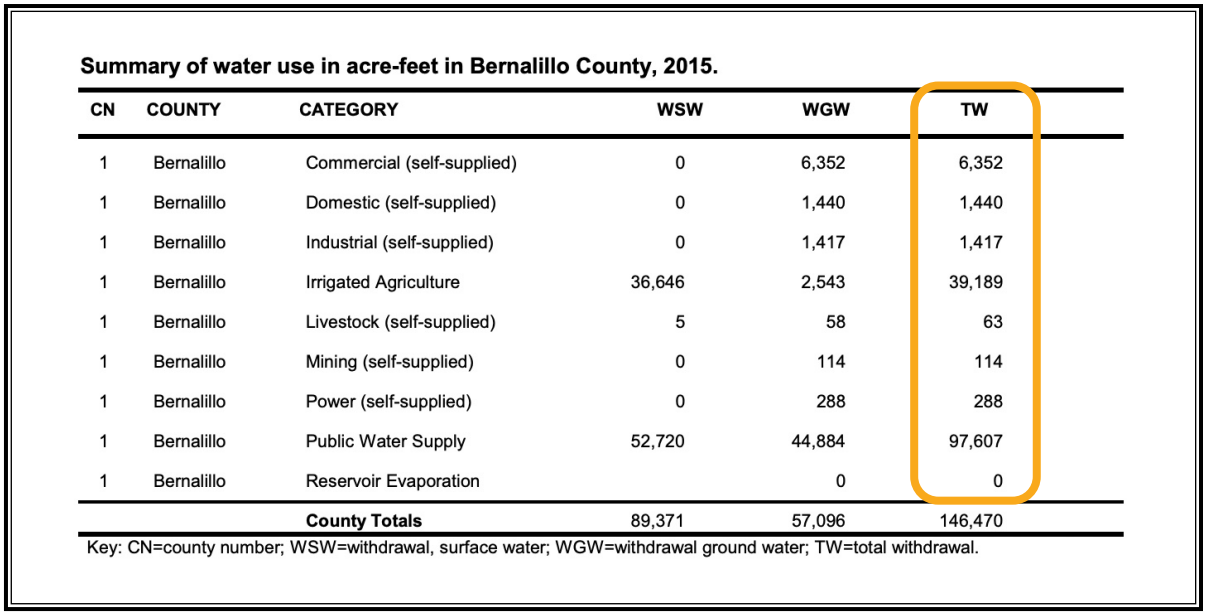
County Data	River Basin Data
2015 Data by County	2015 Data by River Basin
2010 Data by County	2010 Data by River Basin
2005 Data by County	2005 Data by River Basin
2000 Data by County	2000 Data by River Basin
1995 Data by County	1995 Data by River Basin
1990 Data by County	1990 Data by River Basin



New Mexico Water Use Data 2015 by County

COUNTIES		
Bernalillo	Harding	Roosevelt
Catron	Hidalgo	Sandoval
Chaves	Lea	San Juan

4. The example below is the data table from Bernalillo County 2015. Find the Total Withdrawals column (TW).



Summary of water use in acre-feet in Bernalillo County, 2015.

CN	COUNTY	CATEGORY	WSW	WGW	TW
1	Bernalillo	Commercial (self-supplied)	0	6,352	6,352
1	Bernalillo	Domestic (self-supplied)	0	1,440	1,440
1	Bernalillo	Industrial (self-supplied)	0	1,417	1,417
1	Bernalillo	Irrigated Agriculture	36,646	2,543	39,189
1	Bernalillo	Livestock (self-supplied)	5	58	63
1	Bernalillo	Mining (self-supplied)	0	114	114
1	Bernalillo	Power (self-supplied)	0	288	288
1	Bernalillo	Public Water Supply	52,720	44,884	97,607
1	Bernalillo	Reservoir Evaporation		0	0
		County Totals	89,371	57,096	146,470

Key: CN=county number; WSW=withdrawal, surface water; WGW=withdrawal ground water; TW=total withdrawal.

5. Copy and paste the values for each water category into the spreadsheet template. Copy the following values directly: Irrigated Agriculture (Agricultural Use), Livestock (Livestock Use), Commercial (Commercial Use), and Power (Power Use). Combine the value for Domestic and Public Water Supply to get the value for Residential Use. Combine Industrial and Power to get the value for Industrial and Power Use.

Summary of water use in acre-feet in Bernalillo County, 2015.

CN	COUNTY	CATEGORY	WSW	WGW	TW
1	Bernalillo	Commercial (self-supplied)	0	6,352	6,352
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1	Bernalillo	Livestock (self-supplied)	5	58	63
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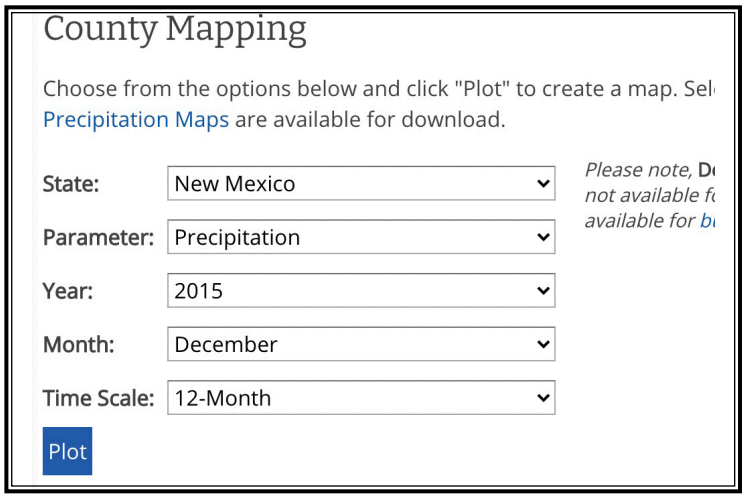
Key: CN=county number; WSW=withdrawal, surface water; WGW=withdrawal ground water; TW=total withdrawal.

FINDING YOUR LOCAL PRECIPITATION DATA

Precipitation Data (NOAA, interactive tool updated daily)

1. Go to this website: https://www.ncdc.noaa.gov/cag/county/mapping

2. Change the settings to the following:
   a. State: New Mexico
   b. Parameter: Precipitation
   c. Year: 1995, 2000, 2005, 2010, 2015
   d. Month: December
   e. Time Scale: 12-Month



3. Click "Plot" to access your data. Find your county and the precipitation value column in inches. Copy and paste the values from each year into the Precipitation column on your spreadsheet.

Download Table Data: XML | Download All Months/Years: XML

COUNTY	VALUE	RANK 126 YEARS	ANOMALY	1901-2000 MEAN
Bernalillo County, NM	16.74"	121	4.73"	12.01"
Catron County, NM	19.35"	108	3.49"	15.86"
Chaves County, NM	19.61"	113	5.73"	13.88"
Cibola County, NM	16.58"	111	3.49"	13.09"
Colfax County, NM	22.81"	124	5.87"	16.94"
Curry County, NM	28.40"	124	11.48"	16.92"
De Baca County, NM	23.21"	123	9.07"	14.14"
Dona Ana County, NM	12.82"	113	3.16"	9.66"

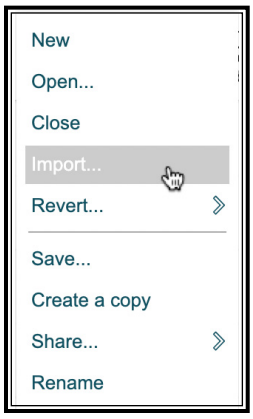
ADDING YOUR DATA TO CODAP

1. Save your data spreadsheet as a comma delimited (.csv) file.

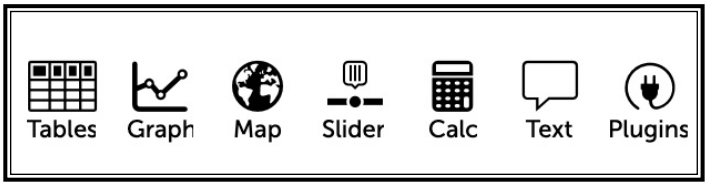
2. Go to this website: https://codap.concord.org/

3. Click "Launch CODAP" in the upper right corner, and then click "Create New Document."

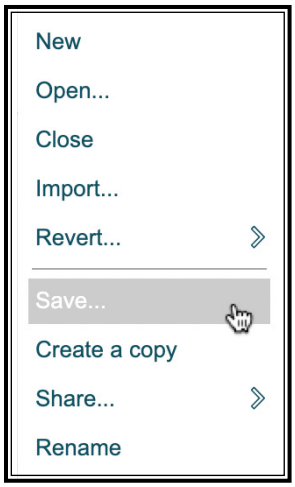
4. Use the menu in the top left corner and click "Import," then select your .csv file. Your data table will appear, and you can format it as needed.

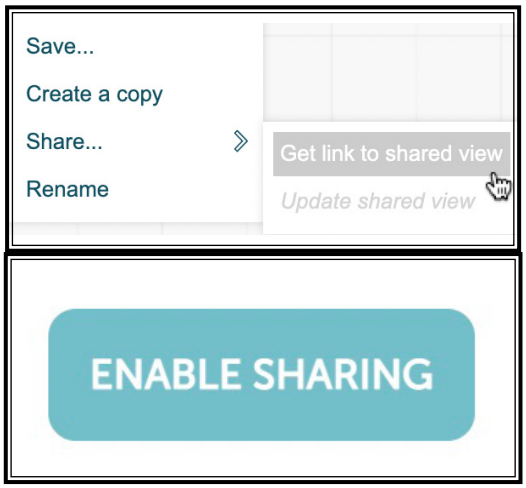


5. As needed, add additional tables, graphs, maps, sliders, a calculator, or text using the menu bar at the top. If you are uncertain about what to add or whether to add additional features, watch the video.



6. Save your file to Google Drive (recommended) or a local file. To share your CODAP page, click "Share," "Get link to shared view," and "Enable Sharing." A link will be generated that you can share, or use the embed code to embed into a website.





MAKING YOUR OWN DATASET VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

This video will show you how to download local water use data, prepare the data using Excel, and create your own data set page in CODAP.

To prepare an Excel spreadsheet for your data, your first column should be years: every five years from 1995 to 2015. Then you should have the water use categories: residential, agricultural, livestock, commercial, industrial and mining, and power. You'll also need precipitation in inches and human population.

To download data on water use in your county, go to the New Mexico Office of the State Engineer Water Use Technical Reports and Data website. You can find the link in the description below. Scroll down and you'll see data by county for different years. Start by clicking on 2015 data by county. Select your county from the list. We'll show you Doña Ana County as an example.

You're looking for total withdrawals or "TW" for each water use category. Copy these values directly into your spreadsheet: agricultural, livestock, commercial, and power. To calculate residential water use, you'll add domestic plus the public water supply.
Industrial and mining will also be added together. You'll follow the same steps for 2010, 2005, 2000, and 1995. Some of the older reports may look a little different, so make sure you're always using the total withdrawals or "TW" column.

Once you've added the water use data from all five years to your spreadsheet, you'll find annual precipitation data from your county. You can find this using NOAA's climate at a glance tool using the link in the video description.

You'll also add human population data from your county, which can be found from the U.S. Census Bureau.

Make sure your columns are labeled appropriately with units!

To import your data into the Common Online Data Analysis Platform, or CODAP, you'll need to save your spreadsheet as a comma-delimited or dot-CSV file. Click "Save As," and under file format select comma-delimited. Then you can import the file directly into CODAP.

Go to codap.concord.org and click "Try CODAP." Click "Create New Document" and to import your data, select "Import" and select your CSV file or drag it and drop it. You'll see your data table appear, and now you can edit it. Drag out your columns wide enough so you can see them. Click to change the title of your data table to "Water Use by Categories and Other Variables."

Create a text box by clicking "Text." We added a description of what an acre-foot is.

Make a blank graph that students can manipulate. To find a data trend, click "Graph." Drag your empty graph to where you want it and resize it. Drag year to the x-axis and leave the y-axis blank so students can drag different variables to it. Change the title of the graph to "Water Use."

To save your data set, click "Save," and you have the option to save it to a Google Drive, which we recommend, or a local file. Now you're ready to share your CODAP page so students can access it. Click "Share." Get a link to shared view and enable sharing. It'll give you three options to share your page. You can share it via a link, or if you have a website for your class, you can embed it into a webpage using the embed code.

For any questions, the help button in the top right corner has many resources available to you, or you can contact us at Asombro for help.

Good luck creating your own data sets!

[background music]

INTRODUCTION TO THE WATER CONSERVATION DATA JAM VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

Hi! I'm Ms. Em. from the team at the Asombro Institute for Science Education. I'm here to introduce you to a fun project called the Water Conservation Data Jam, which is funded in part by a grant from the Environmental Protection Agency. You'll complete this assignment in your class, either online or in person.

What is a data jam? It's a creative project that explains a data trend to an audience that's not familiar with that topic.

Here's an example from a different project that used a data set on kangaroo rats near Las Cruces. These students noted that some years there were a lot of kangaroo rats, while other years there were very few. They made piñatas to represent the kangaroo rat population size each year of the study. The circumference of the piñata is scaled to the number of kangaroo rats the scientists caught that year.

For the Water Conservation Data Jam, you'll be making a creative representation to teach people about water issues in New Mexico using a data set provided to you by your teacher. You won't be collecting your own data like a science fair project. You'll look carefully at this data set and identify a data trend, then you'll make a creative representation of this water data trend and propose a possible solution to conserve water in New Mexico. All of this will be compiled into a single report that you'll turn into your teacher.

There will be seven pieces to your final report: a title, data trend, graph, possible explanation, creative project, a solution in the form of an action plan, and a brief reflection. Some portions will be just a sentence long and others will require a paragraph.

Your teacher will set the due date and give you instructions for each part of the project. You'll have the tools available to help you on these pieces including: videos on your assignment and help from your teacher.

In your first class, we'll introduce you more to the Water Conservation Data Jam project. Then we will work through an entire example data jam as a class, where we'll analyze an example data set and then create a song or a poem as a creative project.

Welcome to the Water Conservation Data Jam! We can't wait to get started!

[background music]

DATA JAM EXAMPLE CREATIVE PROJECT
CLASS POEM DOCUMENT

Data Trend: The percentage of people who use Snapchat and Instagram decreases with age.	Key: 1 word= 3% of people in that age group who use the social media app

SOCIAL MEDIA PLATFORM	AGE GROUP	# OF WORDS IN SENTENCE	SENTENCE
SNAPCHAT	**13-17**	**23**	#Snapchatslaps! It's hip and not for Boomers. The filters update and keep it fresh which piques my interest and makes it the best!
INSTAGRAM	**13-17**	**24**	Lots of teens use social media, Instagram is pretty popular, I don't know why people like it, I have never used it even once.
SNAPCHAT (A-C)	**18-29**	**23**	
INSTAGRAM (D-G)	**18-29**	**21**	
SNAPCHAT (H-K)	**30-49**	**9**	
INSTAGRAM (L-O)	**30-49**	**13**	
SNAPCHAT (P-R)	**50-64**	**3**	
INSTAGRAM (S)	**50-64**	**7**	
SNAPCHAT (T-Z)	**65+**	**1**	
INSTAGRAM (T-Z)	**65+**	**3**	

Oh, Snap! Social Media Use by Different Age Groups

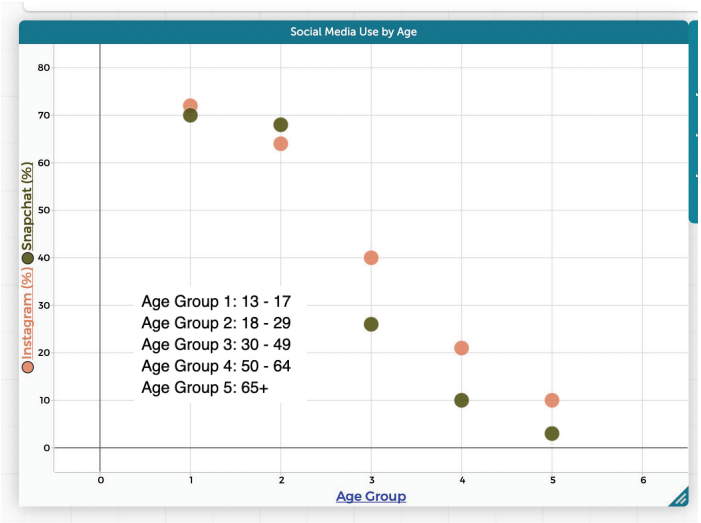
Sample Data Project

Data Trend

The percentage of people who use Snapchat and Instagram decreases with age.

Graph

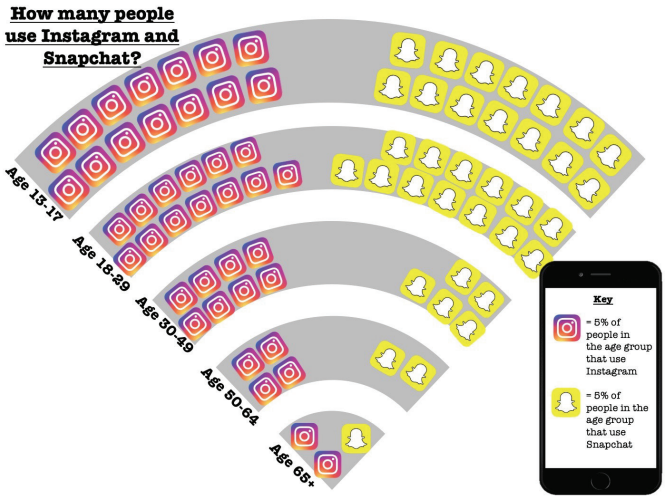
Snapchat and Instagram Use by Age



Possible Explanation

Instagram and Snapchat are both apps designed to be used on smart phones rather than on computers. The percentage of people who own a smart phone also decreases with age, so it makes sense that these apps are more popular with groups that are more likely to have a smart phone.

Creative Project



Action Plan

The data trend I identified is that the percentage of people who use Snapchat and Instagram decreases with age. This trend presents a financial problem for local businesses who rely on marketing via social media to increase awareness about their services. Because older people are less likely to use Snapchat and Instagram, they are also less likely to interact with businesses that use those platforms. My action plan will target people in the 30 to 49-year-old age group and aim to increase their use of Snapchat and Instagram to help local businesses.

To increase Snapchat and Instagram use by people in the 30 to 49-year-old age group, I will team up with local businesses and suggest that they provide exclusive coupons or discounts via social media. I will help businesses run advertisements about these social media discounts in places where older people will see them, such as newspapers, television, or at the local businesses. People will receive coupons through social media, which will make them more likely to download apps like Snapchat and Instagram. This action plan will help local businesses reach more customers, and it will increase the percentage of people in older age groups who use Snapchat and Instagram.

Brief Reflection

When I first heard about the Water Conservation Data Jam project, I thought it sounded crazy. I have never done anything like this before. I collected my own data for a science fair project once, but I did not have to come up with a creative way to present that data.

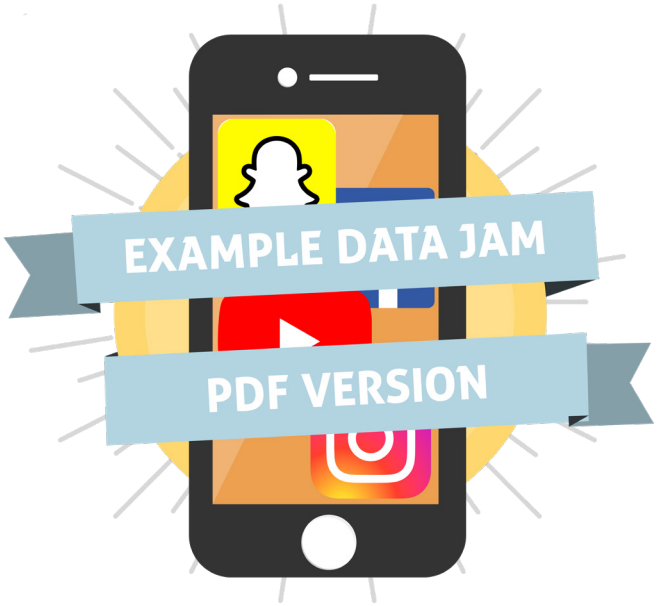
Now that I have done a Data Jam project, I realize how much fun it is. It was difficult to figure out what the data trend was. However, once we had that, we had fun figuring out a creative way to present the data and solving water problems. We also had to do a lot of work to figure out the scale for our creative project. I learned how fun it is to think about new ways to present scientific data. One question I now have is what jobs are available that would allow me to use these skills.

Name: _____ Date: _____ Period: _____

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
1. The title of the project is descriptive.	**5**	**4**	**3**	**2**	**1**	**0**
2. The data trend is one or two sentences that describes a clear pattern in the data. It is specific and includes more than one variable.	**15**	**13**	**12**	**8**	**5**	**0**
3. The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.	**10**	**8**	**7**	**5**	**3**	**0**
4. The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts.	**10**	**8**	**7**	**5**	**3**	**0**
5. The project does not contain grammar/spelling errors that distract from the content.	**10**	**8**	**7**	**5**	**3**	**0**
6. The creative representation of the data trend (e.g., video, infographic, poem) is creative, easily understandable, and appealing to nonscientist audiences.	**10**	**8**	**7**	**5**	**3**	**0**
7. The creative representation accurately portrays the data trend.	**10**	**8**	**7**	**5**	**3**	**0**
8. The creative representation references specific data to demonstrate accurate portrayal of the trend (e.g., physical model contains a legend; reference is made to particular data in a poem).	**10**	**8**	**7**	**5**	**3**	**0**
9. The action plan proposes a good solution that would help solve the water issue identified in the data trend. The audience for the proposed solution and the way in which this audience would be reached is identified.	**15**	**13**	**12**	**8**	**5**	**0**
10. Report contains a brief reflection section; please do not rate the quality; please give an "outstanding" rating if this section is included or a "no evidence" rating if it is not included.	**5**					**0**
Comments:						

Water Conservation



Data Jam

DESCRIPTION

As an introduction to the Water Conservation Data Jam, students participate in an interactive data jam with their classmates using a dataset on social media. Once they have been introduced to all the project components, they learn how to start exploring the water dataset they will use for their own projects.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Understand the components of a data jam
- Practice finding a data trend and developing a creative project using a sample dataset
- Apply their understanding to the water use dataset

TIME

45 MINUTES

MATERIALS

- Computer and projector (if needed) to show PowerPoint [1 per class]
- Introduction to the Water Conservation Data Jam video
- PowerPoint presentation
- Class Poem Document [fillable PDF]
- Social Media Use Dataset [1 per student or 1 class set]
- Water Use Dataset [1 per student; choose a county]
  Bernalillo, Chaves, Cibola, Doña Ana, Lea, Luna, Rio Arriba, Sandoval, San Juan, Santa Fe, Valencia
- Rubric [1 per student]

PREPARATION

1. Optional: prepare your own Water Use Dataset for a county near you instead of using the datasets available from Asombro.
2. Set up a computer and projector and prepare to show the PowerPoint.
3. Prepare to use the Class Poem Document and PowerPoint to guide students through creating a class poem together as an example data jam project. You can choose to either add the sentences students will write to the Class Poem Document during class or collect students' sentences, add them to the document later, and show it to the class during the next lesson.
4. Have students watch the three-minute Introduction to the Water Conservation Data Jam video. You can either assign this as homework before the lesson or watch the video together in class, the transcript is available here.
5. Print a class set of the Social Media Dataset. These can be collected and reused if you have multiple classes.
6. If needed, set up an assignment in your online learning platform (Canvas, Google Classroom, etc.). Here is some suggested text for the online assignment:
   If you did not watch the Introduction to the Water Conservation Data Jam video, you can find it here: https://www.youtube.com/watch?v=Ax3lRXAbN0g
   Before the next class:
   1. Read the Background and Procedures sections of the Water-Use Dataset.
   2. Choose a water-use category that you are interested in investigating.

PROCEDURES

Introduction

1. **Slide 1**: New Mexico is a dry state, and it is essential to find ways to conserve our limited water resources. You will think about this as you complete your Water Conservation Data Jam project. You will learn how to interpret a set of data, find a creative way to represent a data trend, and develop an action plan to address water conservation issues. Today, we will learn about the different parts of a data jam by doing an example data jam together before you start on your own projects.
2. **Slide 2**: data are important, and they can tell us what is going on in the world. You have probably seen something like this graph of COVID-19 cases in New Mexico.
3. **Slide 3**: data can also be fun and tell you about individuals. This graph shows my desire for ice cream throughout the day, and we can see a pattern. My desire for ice cream is low in the morning, and it increases throughout the day. Educators can change the title and y-axis of this graph to make it about something more applicable to themselves.
4. **Slide 4**: now it is your turn to create a graph that shows a data trend about you. This graph has the time of day on the x-axis, and the y-axis is unlabeled. You will pick the label for the y-axis of this graph that best describes you. The graph shows that your choice for the y-axis label needs to be something that increases steadily throughout the day.
   a. Your choices are: A. My desire for Takis; B. Loudness of my voice; C. Strangeness of filters I use for a selfie; or D. My fear of being attacked by zombies. Educators may edit these options to fit their class or allow students to make up their own label. Ask students to share their choices, and make a note of which choice was the most popular.
   b. Explain that [A, B, C, or D] was the most popular answer, which means that, for example: "In this class, students' desire for Takis increases steadily throughout the day." This one-sentence explanation of a pattern in data is called a **data trend**.
   c. We used fabricated data for this example, but in the Water Conservation Data Jam, you will use actual data collected by scientists.

Overview of Introduction Video Content

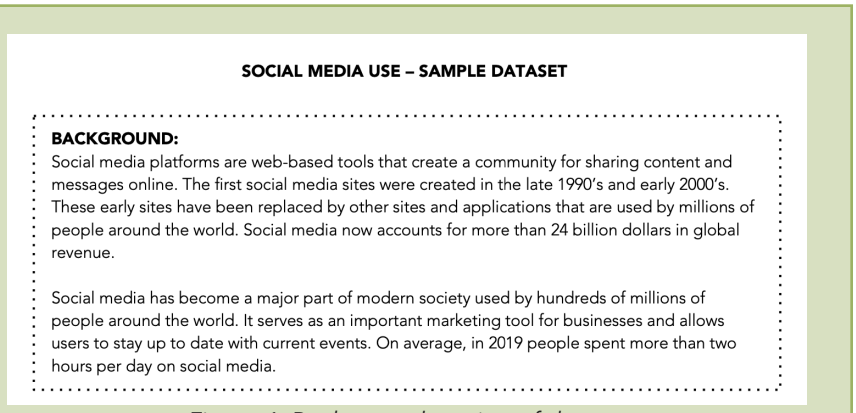
1. **Slide 5**: the Water Conservation Data Jam has two goals. One goal is finding a creative way to represent a data trend so that a non-scientist can understand it. You will do this by writing a short report with seven sections and making a creative project.
2. **Slide 6**: this is an example from a dataset that you will not use about kangaroo rat populations.
   a. This student was given a dataset from a study on kangaroo rat populations from 1995 – 2007. Data were collected during the Small Mammal Exclusion Study at the Jornada Basin LTER (Long-Term Ecological Research) site near Las Cruces, NM.
   b. The student examined the dataset and noticed a data trend or pattern in the data. They wrote the data trend in a complete sentence: "While the kangaroo rat population size was relatively constant over time, it was much higher in 1998 and 2000."
   c. Then, the student came up with a creative way to show that data trend: piñatas shaped like kangaroo rats. The circumference of each piñata is scaled to the number of kangaroo rats caught by scientists; one centimeter of circumference represents one kangaroo rat. You can see the data trend by looking at the piñatas. The piñatas are bigger in 1998 and 2000 and smaller in the other years.
3. **Slide 7**: after identifying a data trend and representing it creatively, the second goal is to propose an action plan to address the water conservation issue you identified in your data trend.
4. **Slide 8**: your action plan will present a solution to the water conservation issue you identified in your data trend. This is a student sample of an action plan from a previous class. They identified a data trend about water use by livestock and presented an action plan to store water for animals.

Example Data Jam with a Social Media Dataset: Finding a Data Trend

1. **Slide 9**: to complete the Water Conservation Data Jam, you will:
   a. Identify a data trend from a water dataset.
   b. Make a creative project.
   c. Design an action plan.
   d. Complete your written report.

   Today, we are going to do an example data jam project together as a class to learn about all the parts that you will include in your own data jam project.
2. **Slide 10**: the first thing we do in a data jam is look for **data trends**. A data trend is a story told by the dataset, a pattern in the data, or a relationship between two or more variables. It should be one to two sentences. At the beginning of class, we identified a data trend using the graphs of made-up data. (Remind students of the data trend from your class.) The student project shown earlier included the data trend: "While the kangaroo rat population size was relatively constant over time, it was much higher in 1998 and 2000."
3. **Slide 11**: hand out copies of the Social Media Dataset. For your project, you will use a dataset about water. Today, we will do an example data jam using a dataset about social media. This dataset is set up the same way as the dataset you will be using for your own project, so everything we do today will help you with your own project.

4. Explain each section of the dataset.
   a. At the top of the dataset page is the **background section** (Figure 1), which provides general information about the topic. For example, this background section explains that social media has been around less than 30 years but is used by hundreds of millions of people globally and is important to the economy.
   b. The **procedures section** (Figure 2) explains how the data were collected. Remember that you do not collect your own data for the Water Conservation Data Jam. Instead, you are using an existing dataset. It is still important to understand who collected the data and how they were collected. These data come from a research group that did a survey in 2018 asking people which social media platforms they used.
5. **Slide 12**: note that data are shown in a table and a graph.
   a. What kind of graph do you see? [Answer: scatterplot]
   b. When we are looking for a data trend, the first thing we need to do is figure out which variables are included in the dataset. Variables are things that are measured – or things we have data on. They can be found in the title and column headings of tables and the titles, axis labels, and legends of graphs.
   c. What variables do you see in this dataset? [Answer: age group, social media platforms (YouTube, Facebook, Instagram, Snapchat), percentage of people who use each platform, technology owned (smartphone, laptop or desktop computer), and percentage of people that use each technology]
6. **Slide 13**: there are a lot of data in this dataset, so to find a data trend, you should focus on one or two variables by sketching your own graph. With just Instagram on the graph, what data trend do you see? [Answer: The percentage of people who use Instagram decreases with age.] This is a good example of a data trend.
7. **Slide 14**: now that we have found one data trend, let us see if we find any others by adding a third variable to the graph. If you compare YouTube and Instagram, you see that "more people use YouTube than Instagram in every age group". That is another good data trend.
8. **Slide 15**: let us try a different set of variables by making a different graph by adding Snapchat and Instagram to the graph by age. The data trend here is that the percentage of people using Snapchat and Instagram decreases with age. Any one of these three we found already would be good data trends.
9. **Slide 16**: a good data trend needs to include the main variable in the dataset. In this example dataset, we need to include the percentage of people who use social media. Additional variables are given (e.g., the percentage of people who own a smartphone), and we can use them to explain our data trend.
10. **Slide 17**: in the next lesson you will use similar strategies that we used with this social media dataset to look for data trends in a water-use dataset for your own projects.
11. **Slide 18**: there are five qualities of a good data trend. A data trend will:

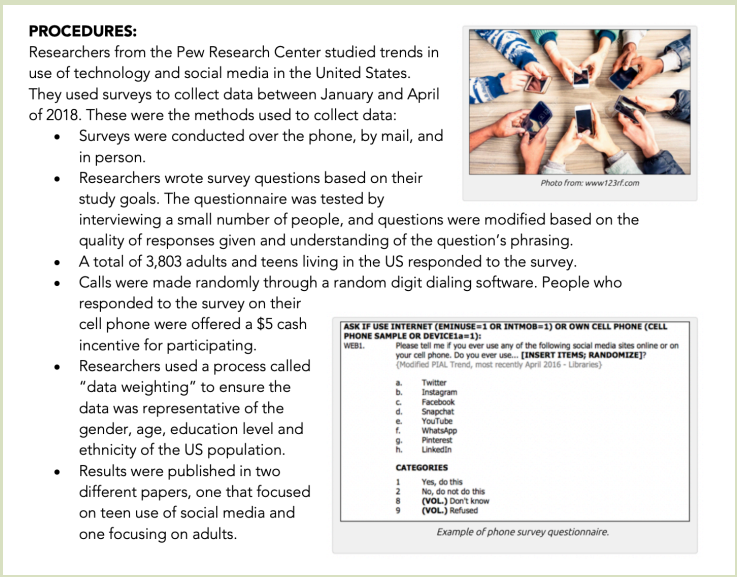


SOCIAL MEDIA USE – SAMPLE DATASET

BACKGROUND:
Social media platforms are web-based tools that create a community for sharing content and messages online. The first social media sites were created in the late 1990's and early 2000's. These early sites have been replaced by other sites and applications that are used by millions of people around the world. Social media now accounts for more than 24 billion dollars in global revenue.

Social media has become a major part of modern society used by hundreds of millions of people around the world. It serves as an important marketing tool for businesses and allows users to stay up to date with current events. On average, in 2019 people spent more than two hours per day on social media.

Figure 1. Background section of dataset



PROCEDURES:
Researchers from the Pew Research Center studied trends in use of technology and social media in the United States. They used surveys to collect data between January and April of 2018. These were the methods used to collect data:

- Surveys were conducted over the phone, by mail, and in person.
- Researchers wrote survey questions based on their study goals. The questionnaire was tested by interviewing a small number of people, and questions were modified based on the quality of responses given and understanding of the question's phrasing.
- A total of 3,803 adults and teens living in the US responded to the survey.
- Calls were made randomly through a random digit dialing software. People who responded to the survey on their cell phone were offered a $5 cash incentive for participating.
- Researchers used a process called "data weighting" to ensure the data was representative of the gender, age, education level and ethnicity of the US population.
- Results were published in two different papers, one that focused on teen use of social media and one focusing on adults.

Photo from: www123rf.com

ASK IF USE INTERNET (EMINUSE=1 OR INTMOB=1) OR OWN CELL PHONE (CELL PHONE SAMPLE OR DEVICE1a=1):
WEB1. Please tell me if you ever use any of the following social media sites online or on your cell phone. Do you ever use... **[INSERT ITEMS; RANDOMIZE]**?
(Modified PIAL Trend, most recently April 2016 - Libraries)

a. Twitter
b. Instagram
c. Facebook
d. Snapchat
e. YouTube
f. WhatsApp
g. Pinterest
h. LinkedIn

CATEGORIES
1 Yes, do this
2 No, do not do this
8 **(VOL.)** Don't know
9 **(VOL.)** Refused

Example of phone survey questionnaire.

Figure 2. Procedures section of dataset

a. Show a pattern, not just one data point.
b. Have more than one variable.
c. Only data found on the dataset. In a data jam, you should not collect your own data or find data from other sources.
d. Be specific.
e. Include the main variable. In the social media example, the main variable was the percentage of people who use social media.

12. **Slide 19**: keeping the criteria on the previous slide in mind, which of these data trends is a good data trend for our example data jam project? Option 1 is "Teenagers who use Facebook don't have any friends." Option 2 is "85% of teenagers use YouTube." Option 3 is "The percentage of people who use Snapchat and Instagram decreases with age." Have students vote by holding up one, two, or three fingers. If teaching remotely, you can use a poll or chat.
    a. Option 3 is the best data trend because it meets all of the criteria of a good data trend.
    b. Option 1 does not work because our dataset did not include any information about how many friends people have.
    c. Option 2 does not work because it is a data POINT, not a data TREND. This statement can be graphically represented using only one number from the data table, and a data trend needs to include multiple data points.
13. **Slide 20**: this data trend shows a pattern in the data.
    a. It has more than one variable (percentage of people who use Instagram, percentage of people who use Snapchat, and age group).
    b. It only uses data from the dataset we were given.
    c. It is specific and explains the variables we used. "Younger people use Instagram and Snapchat less" is an example of a data trend that is not specific enough.
    d. It includes the main variable in the dataset: the percentage of people who use social media.
    e. Once you have identified a data trend and written it in a single sentence, you will need a graph that shows that data trend.

Example Data Jam with a Social Media Dataset: Possible Explanation and Creative Representation

1. **Slide 21**: you will also come up with a possible explanation that explains your data trend. Do not include this explanation in your data trend – it has its own section. In this section, you should try to explain why the data trend you identified is true. Think about what the pattern could mean. This is where you can look for additional information outside the dataset.
2. **Slide 22**: once you have identified a data trend, you will develop a creative way to show that trend. A creative project represents your data trend in a new and unusual way, like the student who made piñatas to show kangaroo rat population data. You should look at a creative project and see the data trend; we can see from the large piñatas which years had higher kangaroo rat populations. You can use symbols, objects, actions, or words to represent the data. Videos, pictures, words (like a poem or song), models, and food are just a few examples of ways you can represent a data trend.
3. **Slide 23**: these projects are examples made to represent the data trend: "the percentage of people who use Snapchat and Instagram decreases with age." The slide shows a picture of a model made with beads, an infographic with social media logos, and a screenshot from a video of a student bouncing a basketball to represent the data.
4. **Slide 24**: another example of a creative project is a poem. As a class, we are going to make a poem that shows our example data trend.
    a. Our data trend only talks about Snapchat and Instagram, so we do not need to include other social media platforms.
    b. We want the number of words in each sentence of the poem to represent the percentage of people in each age group that use that social media.
        i. We could make each word represent 1% of people, but that would mean, for example, we would need a 72-word sentence to represent Instagram use by 13-17-year-olds.
        ii. Instead, we decided to make one word represent 3% of people in the age group who use the social media platform. To figure out the number of words in each sentence, each number from the data table was divided by 3 (and rounded to the nearest whole number).
    c. Each student will write one sentence of the poem. The first two sentences are filled out already as examples. For example, the first sentence represents the percentage of 13-17-year-olds who use Snapchat and has 23 words: "#Snapchatslaps! It's lit and not for Boomers, the filters update and keep it fresh, which piques my interest and makes it the best!"
    d. The second sentence represents the percentage of 13-17-year-olds who use Instagram and has 24 words: "Lots of teens use social media, Instagram is pretty popular, I don't know why people like it, I have never used it even once."
        i. This example shows that even if you do not use the social media platform you are assigned to write about, you can still write a sentence about it.
    e. Each student is assigned one age group and social media platform combination based on the first letter of your first name.

These assignments are listed on the slide. For example, if your first name starts with A, you will write a sentence with 23 words about how 18-29-year-olds use Snapchat.

f. Tell students to write their sentences with the correct number of words and label the app name and corresponding age group. Compile student responses into one poem using the Class Poem Document, and share it during the next lesson.

Wrap-Up

1. **Slide 25**: today, we did an example data jam using a dataset about social media. In the next class, you will be using the same steps and tools we used today to start your own data jam project to explore water use data. Here are the steps:
   a. Choose one or more water-use categories on the dataset that you will be given.
   b. Graph some of the data to find a data trend.
   c. Make a creative project that shows that data trend.
   d. Make an action plan based on that trend.
   e. Compile a report in a slide presentation that includes title, data trends, graph, possible explanation, creative project, action plan, and brief reflection.
2. **Slide 26**: finding a data trend is the first step in Water Conservation Data Jam, and it is crucial in moving forward with the project. Your creative project and action plan both need to be based on your data trend.
3. **Slide 27**: in our next lesson, we will learn more about finding a data trend. Pass out copies of the Water Use Dataset and the rubric, and explain the homework assignment to students. Before the next class, students should read the background and procedures section and choose a water-use category they are interested in investigating. Discuss the grading rubric for the Water Conservation Data Jam. Let students know that they should review the rubric so that they are aware of each component of the final report and the point value for each component.

INTRODUCTION TO THE WATER CONSERVATION DATA JAM VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

Hi! I'm Ms. Em. from the team at the Asombro Institute for Science Education. I'm here to introduce you to a fun project called the Water Conservation Data Jam, which is funded in part by a grant from the Environmental Protection Agency. You'll complete this assignment in your class, either online or in person.

What is a data jam? It's a creative project that explains a data trend to an audience that's not familiar with that topic.

Here's an example from a different project that used a data set on kangaroo rats near Las Cruces. These students noted that some years there were a lot of kangaroo rats, while other years there were very few. They made piñatas to represent the kangaroo rat population size each year of the study. The circumference of the piñata is scaled to the number of kangaroo rats the scientists caught that year.

For the Water Conservation Data Jam, you'll be making a creative representation to teach people about water issues in New Mexico using a data set provided to you by your teacher. You won't be collecting your own data like a science fair project. You'll look carefully at this data set and identify a data trend, then you'll make a creative representation of this water data trend and propose a possible solution to conserve water in New Mexico. All of this will be compiled into a single report that you'll turn into your teacher.

There will be seven pieces to your final report: a title, data trend, graph, possible explanation, creative project, a solution in the form of an action plan, and a brief reflection. Some portions will be just a sentence long and others will require a paragraph.

Your teacher will set the due date and give you instructions for each part of the project. You'll have the tools available to help you on these pieces including: videos on your assignment and help from your teacher.

In your first class, we'll introduce you more to the Water Conservation Data Jam project. Then we will work through an entire example data jam as a class, where we'll analyze an example data set and then create a song or a poem as a creative project.

Welcome to the Water Conservation Data Jam! We can't wait to get started!

[background music]

DATA JAM EXAMPLE CREATIVE PROJECT
CLASS POEM DOCUMENT

Data Trend: The percentage of people who use Snapchat and Instagram decreases with age.	Key: 1 word= 3% of people in that age group who use the social media app

SOCIAL MEDIA PLATFORM	AGE GROUP	# OF WORDS IN SENTENCE	SENTENCE
SNAPCHAT	**13-17**	**23**	#Snapchatslaps! It's hip and not for Boomers. The filters update and keep it fresh which piques my interest and makes it the best!
INSTAGRAM	**13-17**	**24**	Lots of teens use social media, Instagram is pretty popular, I don't know why people like it, I have never used it even once.
SNAPCHAT (A-C)	**18-29**	**23**	
INSTAGRAM (D-G)	**18-29**	**21**	
SNAPCHAT (H-K)	**30-49**	**9**	
INSTAGRAM (L-O)	**30-49**	**13**	
SNAPCHAT (P-R)	**50-64**	**3**	
INSTAGRAM (S)	**50-64**	**7**	
SNAPCHAT (T-Z)	**65+**	**1**	
INSTAGRAM (T-Z)	**65+**	**3**	

SOCIAL MEDIA USE – SAMPLE DATASET

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PROCEDURES:

Photo from: www123rf.com

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{Modified PIAL Trend, most recently April 2016 - Libraries}

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b. Instagram
c. Facebook
d. Snapchat
e. YouTube
f. WhatsApp
g. Pinterest
h. LinkedIn

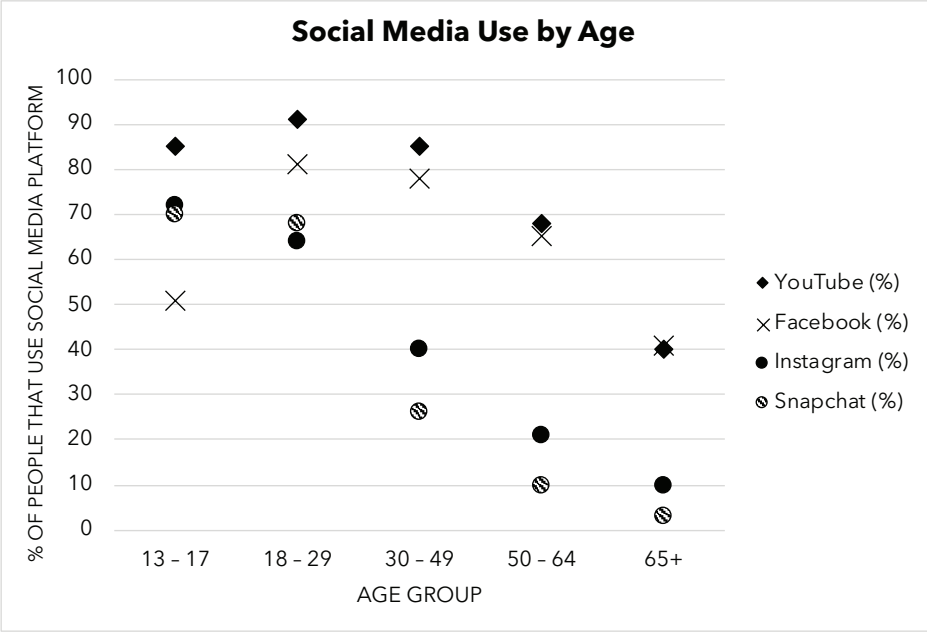
CATEGORIES

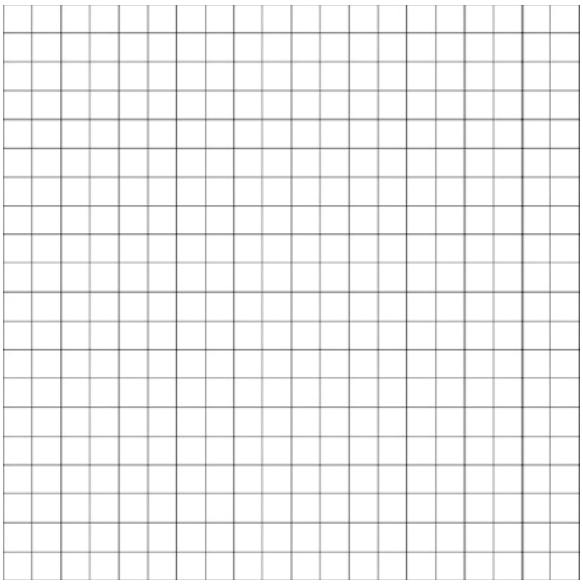
1 Yes, do this
2 No, do not do this
8 **(VOL.)** Don't know
9 **(VOL.)** Refused

Example of phone survey questionnaire.

TABLE 1. SOCIAL MEDIA DATA

Age Group	YouTube (%)	Facebook (%)	Instagram (%)	Snapchat (%)	Average (%)	Own a smartphone (%)	Own a laptop or desktop computer (%)
13 – 17	85	51	72	70	70	95	88
18 – 29	91	81	64	68	76	94	83
30 – 49	85	78	40	26	57	89	73
50 – 64	68	65	21	10	41	73	74
65+	40	41	10	3	24	46	60





WATER CONSERVATION DATA JAM DATASET – BERNALILLO COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Bernalillo County Water Authority is a major public water supplier in Bernalillo County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Bernalillo County.

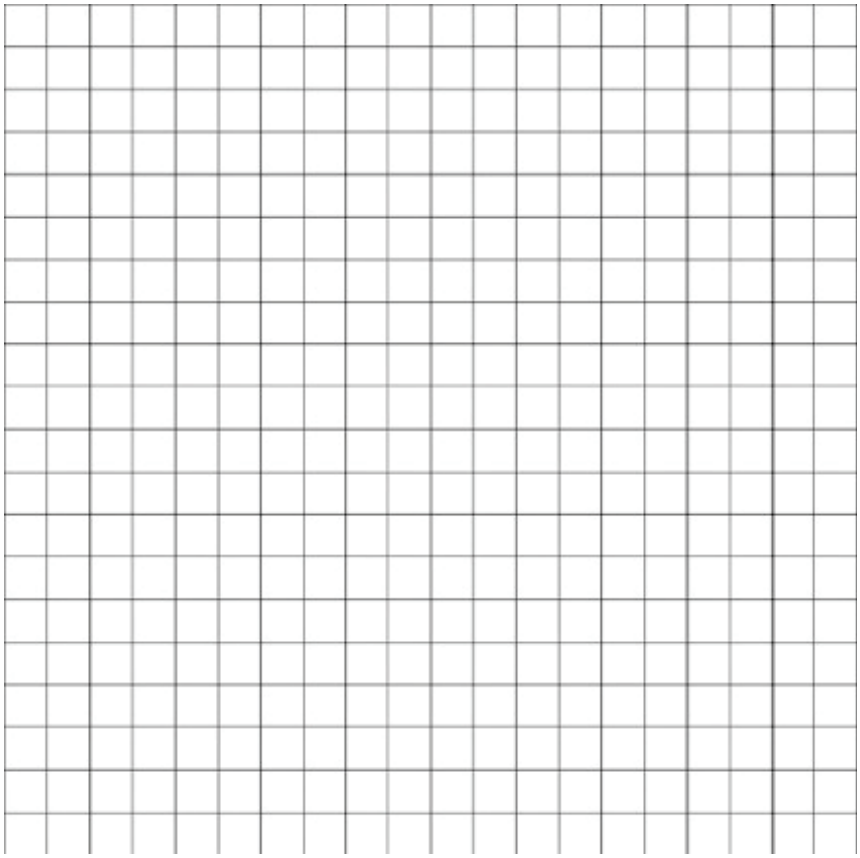
- HUMAN POPULATION: Data were collected by the US Census Bureau for Bernalillo County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	137,630	69,114	809	3,723	1,131	253	8.2	522,195
2000	123,949	65,236	824	5,503	841	840	12.1	557,432
2005	120,694	43,920	378	6,555	2,047	363	13.1	609,526
2010	113,139	45,913	257	9,032	1,161	466	11.7	663,948
2015	99,047	39,189	63	6,352	1,531	288	16.7	676,248

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – CHAVES COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Roswell Municipal Water System is a major public water supplier in Chaves County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Chaves County.

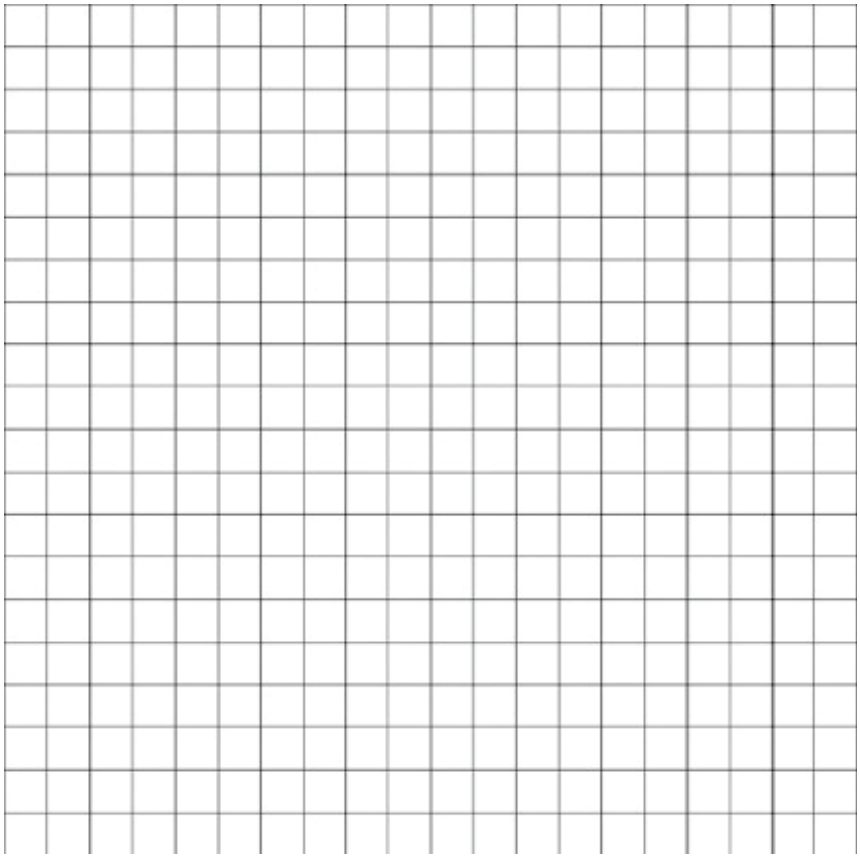
- HUMAN POPULATION: Data were collected by the US Census Bureau for Chaves County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	19,743	293,738	7,688	2,488	722	0	9.9	61,539
2000	19,245	337,467	10,433	1,596	714	0	11.4	61,263
2005	17,374	237,225	11,156	2,426	751	0	12.8	61,491
2010	17,679	241,598	8,342	2,789	288	0	15.1	65,727
2015	16,067	211,104	7,265	3,828	293	0	19.6	65,825

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – CIBOLA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Grants Domestic Water System is a major public water supplier in Cibola County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Cibola County.

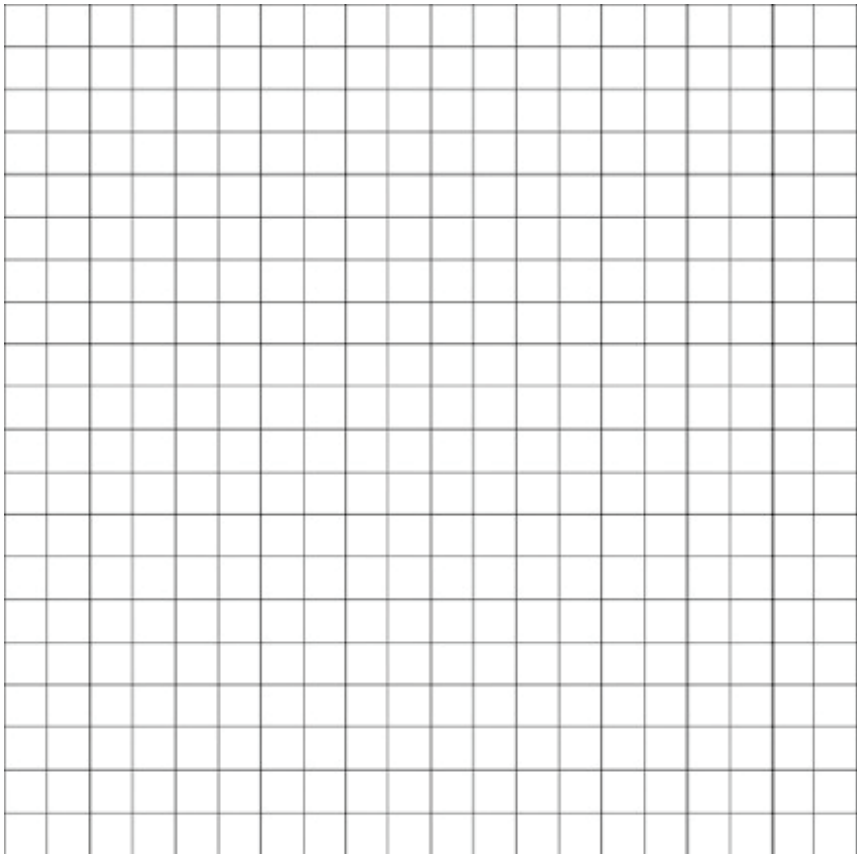
- HUMAN POPULATION: Data were collected by the US Census Bureau for Cibola County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	3809	5415	250	31	377	0	9.7	25155
2000	4178	4849	277	60	6	0	11.6	25675
2005	4653	5693	217	69	1172	0	12.0	27270
2010	4010	5446	206	45	2770	0	13.7	27320
2015	3748	2514	129	113	874	0	16.6	27044

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – DOÑA ANA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Las Cruces Municipal Water System is a major public water supplier in Doña Ana County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Doña Ana County.

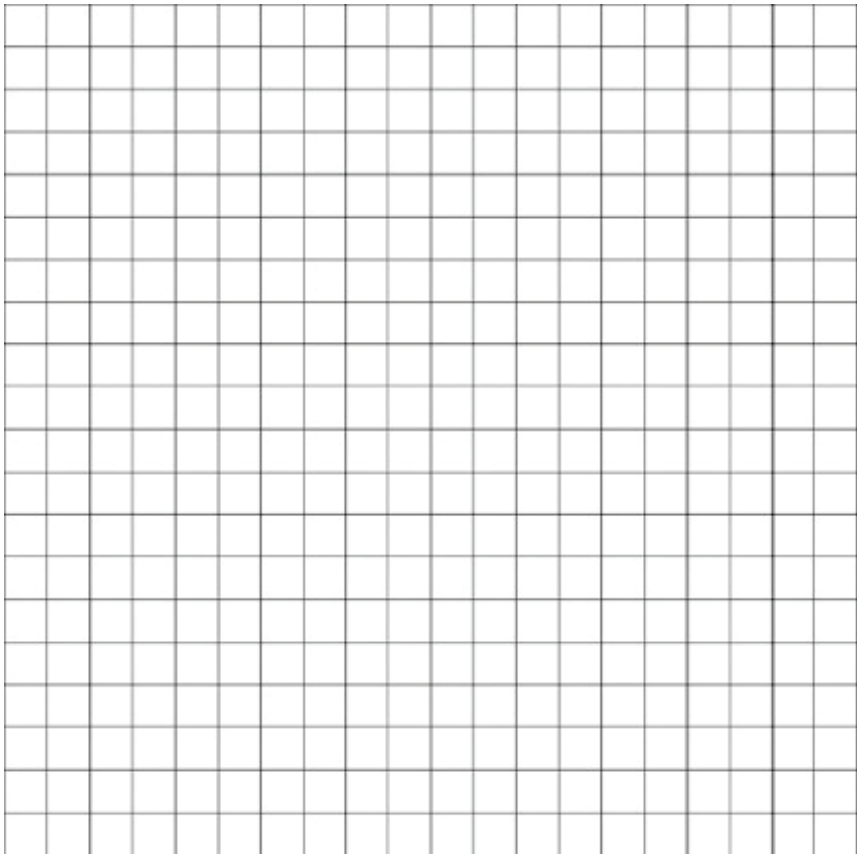
- HUMAN POPULATION: Data were collected by the US Census Bureau for Doña Ana County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	36,750	446,612	2,774	4,599	133	2,440	7.6	158,059
2000	39,144	510,916	4,590	4,750	100	2,775	10.2	174,880
2005	40,803	469,830	6,981	11,266	119	2,152	10.4	189,199
2010	42,087	393,480	4,393	7,875	194	1,966	9.8	209,233
2015	37,605	333,449	3,117	6,261	46	2,023	12.8	216,577

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – LEA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Hobbs Municipal Water Supply is a major public water supplier in Lea County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Lea County.

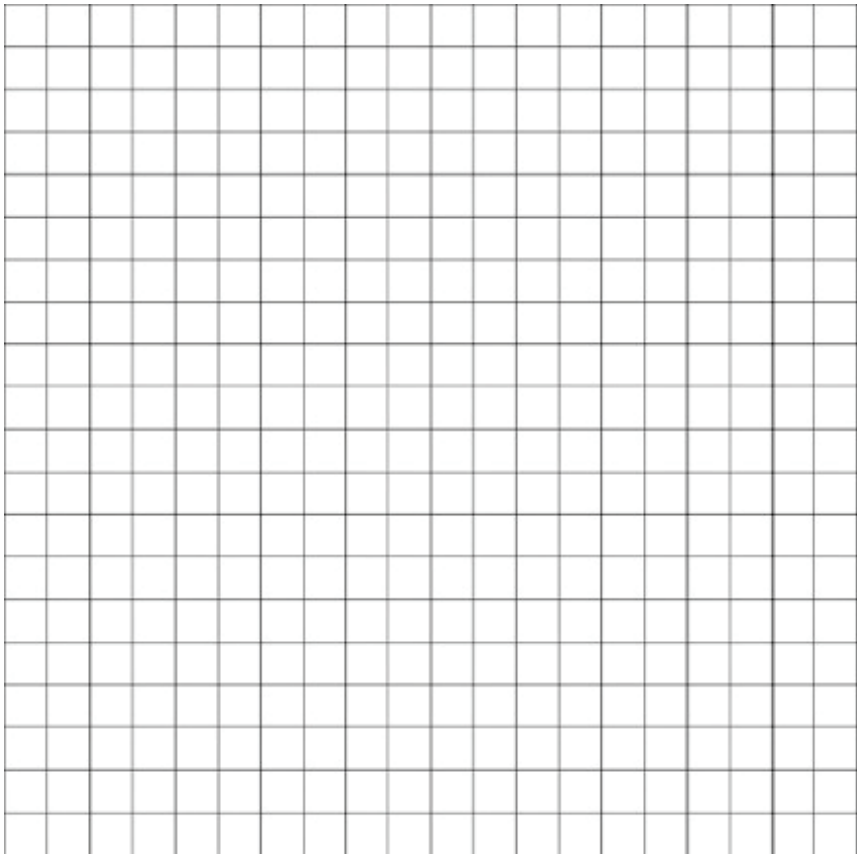
- HUMAN POPULATION: Data were collected by the US Census Bureau for Lea County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	17457	131163	1497	1346	20472	4445	13.6	56356
2000	16029	129792	2798	1653	31304	5093	12.6	55183
2005	14779	135371	3737	3264	24453	4415	15.9	56400
2010	14693	172297	2186	1866	2276	3781	15.6	64599
2015	12917	117366	2702	1541	3383	4472	23.4	71476

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – LUNA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Deming Municipal Water System is a major public water supplier in Luna County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Luna County.

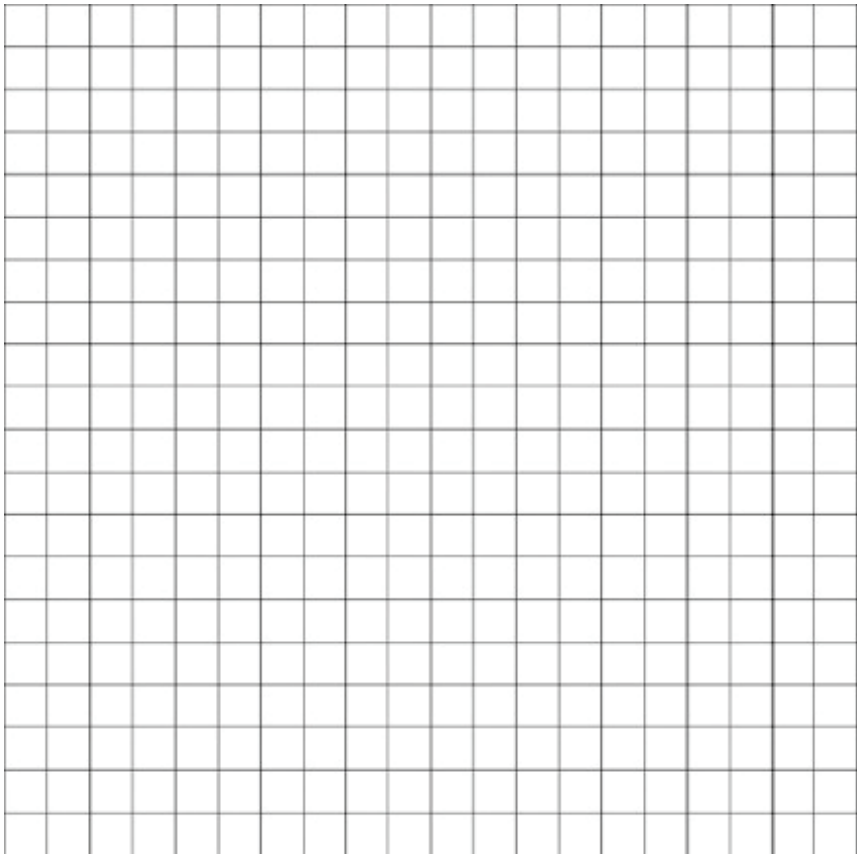
- HUMAN POPULATION: Data were collected by the US Census Bureau for Luna County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	5,020	141,335	447	192	318	0	7.7	22,381
2000	5,105	114,183	424	186	96	0	11.0	24,959
2005	5,238	135,216	889	309	101	0	8.5	26,248
2010	4,923	115,765	570	314	179	1,219	9.3	25,082
2015	4,276	84,091	886	302	143	1,091	12.7	24,367

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – RIO ARRIBA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Espanola Water System is a major public water supplier in Rio Arriba County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Rio Arriba County.

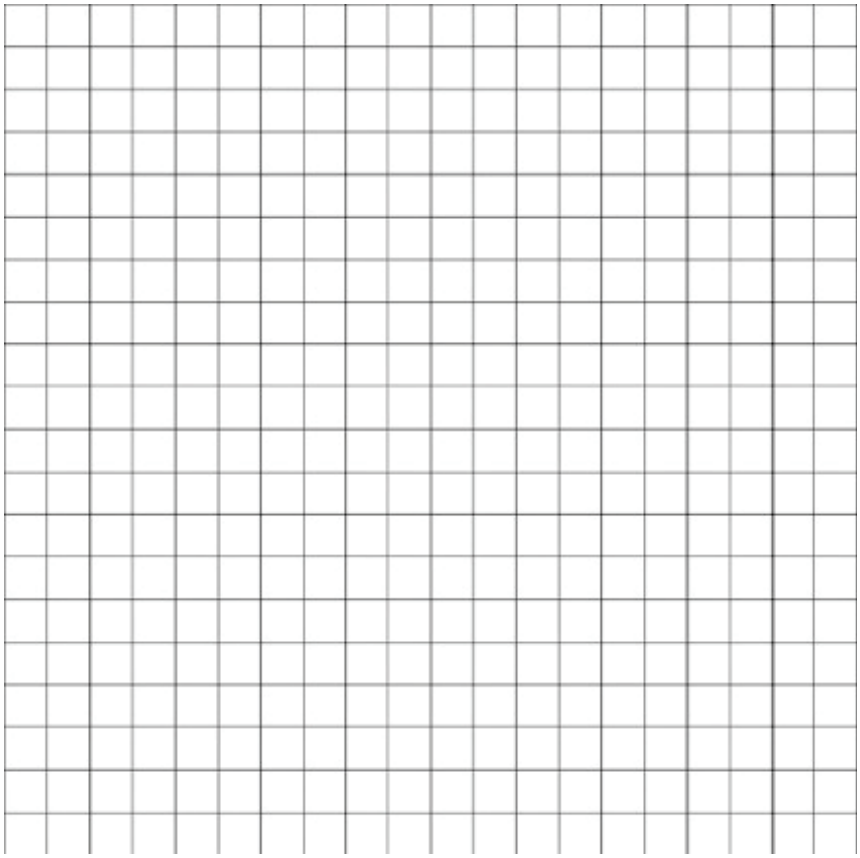
- HUMAN POPULATION: Data were collected by the US Census Bureau for Rio Arriba County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	4033	89910	193	257	675	0	16.5	36809
2000	4391	111853	345	496	234	0	14.2	41223
2005	4236	112716	342	1046	234	0	18.3	40760
2010	3999	113666	393	1566	546	0	17.3	40289
2015	3284	97401	348	3965	158	0	21.3	39370

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – SANDOVAL COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, Rio Rancho Sewer and Wastewater Services is a major public water supplier in Sandoval County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Sandoval County.

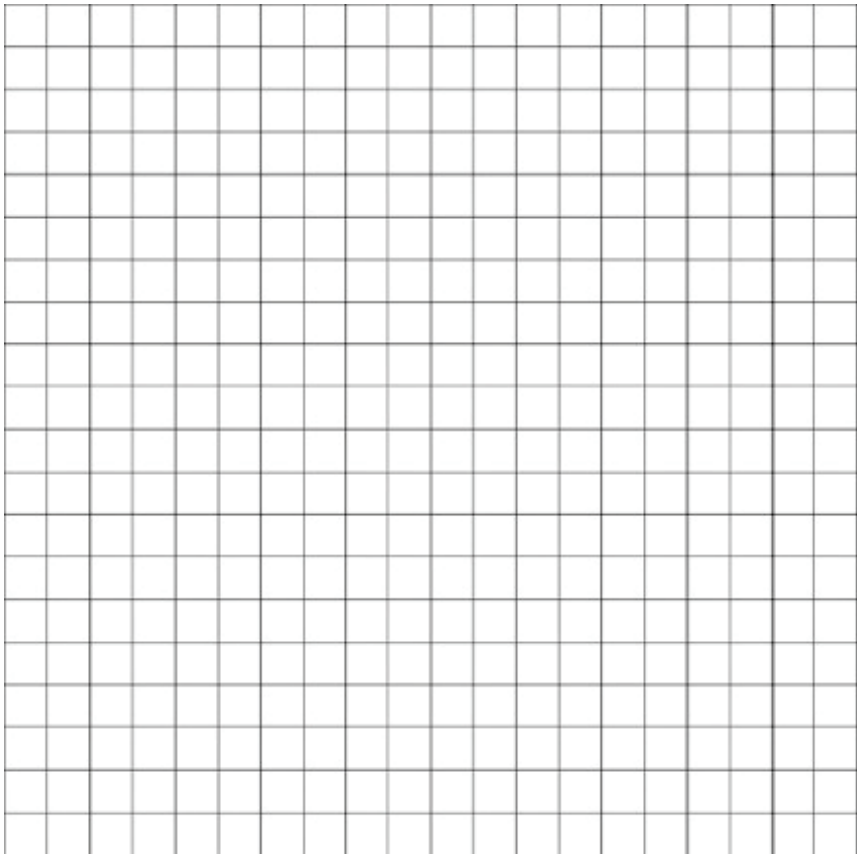
- HUMAN POPULATION: Data were collected by the US Census Bureau for Sandoval County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	17856	55428	368	656	1342	0	11.6	79794
2000	15209	62337	259	2089	4050	0	12.4	91210
2005	16615	54382	129	2642	4568	0	13.2	106190
2010	18658	48946	141	2865	3341	0	14.2	132430
2015	15790	36463	78	2766	3022	0	18.1	138521

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – SAN JUAN COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the City of Farmington Water System is a major public water supplier in San Juan County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across San Juan County.

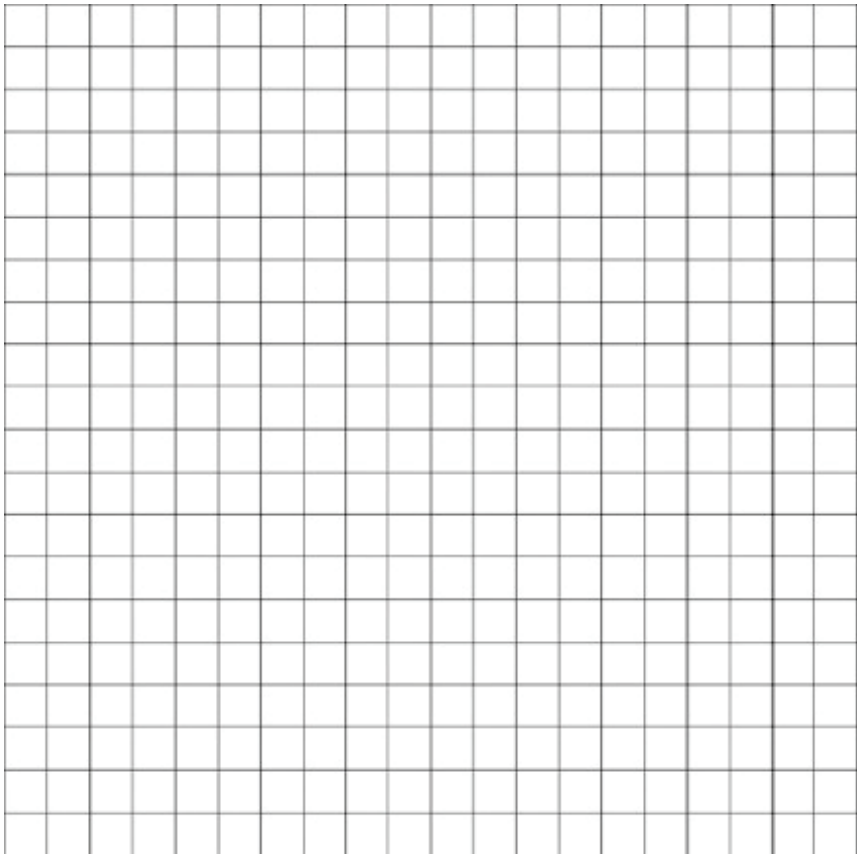
- HUMAN POPULATION: Data were collected by the US Census Bureau for San Juan County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	19,394	313,051	439	210	576	51,908	8.6	99,931
2000	20,675	221,100	527	215	1,961	50,450	9.4	114,029
2005	24,964	294,268	320	278	2,441	51,633	10.5	122,578
2010	49,144	313,323	317	1,134	1,788	47,434	11.0	130,202
2015	22,401	283,395	156	480	71	39,677	13.8	128,246

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – SANTA FE COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the City of Santa Fe Water is a major public water supplier in Santa Fe County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Santa Fe County.

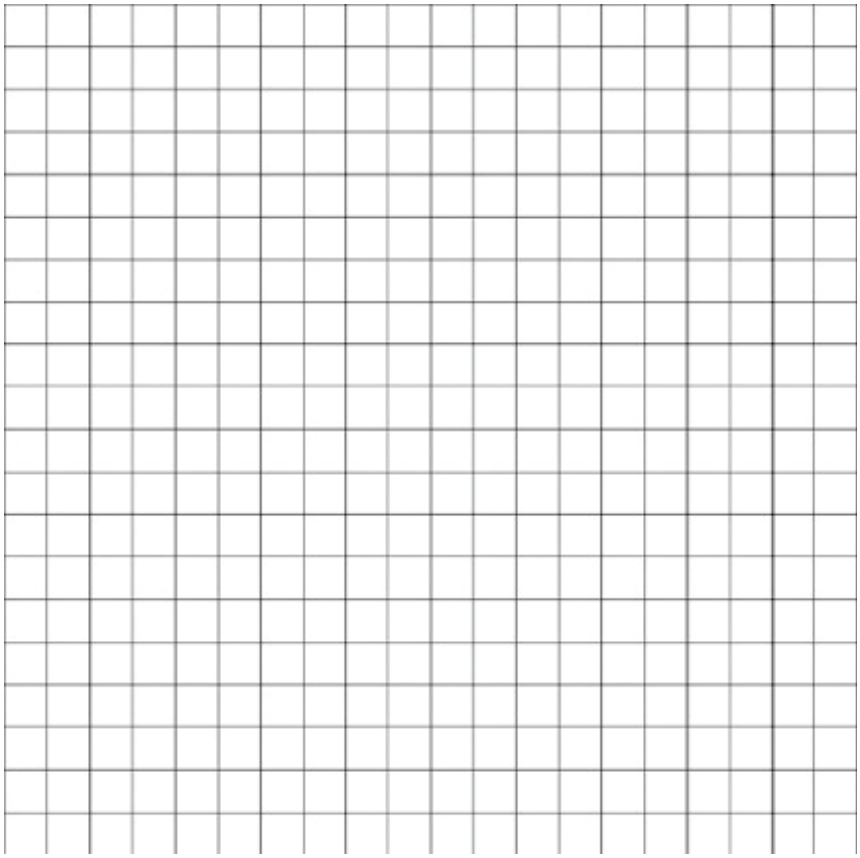
- HUMAN POPULATION: Data were collected by the US Census Bureau for Santa Fe County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	17,746	32,404	334	491	70	2	11.5	116,746
2000	18,356	33,364	299	559	41	0	15.0	129,843
2005	15,839	36,446	131	1,277	44	0	15.4	140,468
2010	15,883	38,511	114	1,692	47	0	15.6	144,528
2015	14,270	21,151	78	1,138	17	0	19.8	148,098

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons



WATER CONSERVATION DATA JAM DATASET – VALENCIA COUNTY WATER USE

BACKGROUND:

The Water Use and Conservation Bureau of the New Mexico Office of the State Engineer publishes the New Mexico Water Use by Categories Report every five years (https://www.ose.state.nm.us/WUC/wuc_waterUseData.php). The purpose of the report is to make water use data available to the public. Data from the report are used by community planners, legislators, scientists, and individuals. This dataset includes data from the New Mexico Water Use by Categories Reports from the last 20 years (1995-2015).

WATER USE VARIABLES:

- RESIDENTIAL WATER USE: This includes all water supplied by community water systems that have common collection, treatment, and distribution facilities to provide water to multiple locations. For example, the Los Lunas Water System is a major public water supplier in Valencia County. Most public water suppliers report the meter records of water use to the NM Office of the State Engineer. It also includes domestic, self-supplied water, which would include single family houses with their own well. The domestic, self-supplied water withdrawals are calculated by multiplying water use per person per day (currently estimated at 80-100 gallons, depending on the county) by the number of people served by self-supplied water.
    - While we call this "residential use," this public water supply category would also capture water supplied by public water suppliers to golf courses, parks, and athletic fields.

- AGRICULTURAL USE: This category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. This value is estimated using a multi-step process that includes:
    - Calculating the total acreage of irrigated acreage by crop and by irrigation system (drip, flood, or sprinkler) using a Geographic Information System (GIS) to integrate map layers showing the entire state. Information from agencies like the USDA Farm Service Agency and county extension agents was used to validate the values determined using maps and aerial images.
    - Obtaining temperature and precipitation data from the state.
    - Determining the irrigation season for each crop.
    - Using the information from above to calculate the "weighted consumptive irrigation requirement" for each crop.

- LIVESTOCK USE: This category includes water used to raise livestock, maintain livestock facilities, and provide for on-farm processing of poultry and dairy products. These values are estimated using two pieces of information:
    - The number of livestock by species per county – These values come primarily from the New Mexico Department of Agriculture.

    - Water withdrawals – Metered water withdrawals are used when available. When the water use is not metered, these values are estimated using water requirements per animal per day for each livestock species (e.g., 65 gallons per dairy cow per day and 3 gallons per hog per day)

- COMMERCIAL USE: This category includes use by self-supplied businesses (e.g. motels, restaurants), schools, hospitals, and self-supplied golf courses. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- INDUSTRIAL AND MINING USE: Industrial water use includes businesses that process raw materials or manufacture goods. The industrial category also includes water used for construction of highways and buildings. Mining use includes water used for oil and gas production, quarrying, and milling. The values are calculated by combining metered withdrawals and estimating non-metered withdrawals based on earlier records.

- POWER USE: This category includes all self-supplied power generating facilities, including coal-mining operations associated with a power generating facility. The values are calculated by combining metered withdrawals and contacting non-metered facilities.

OTHER VARIABLES INCLUDED IN THE DATASET

- PRECIPITATION: Data were collected by the NOAA National Centers for Environmental Information from a network of rain gauges located at a variety of land-based stations across the county. This dataset includes total precipitation from across Valencia County.

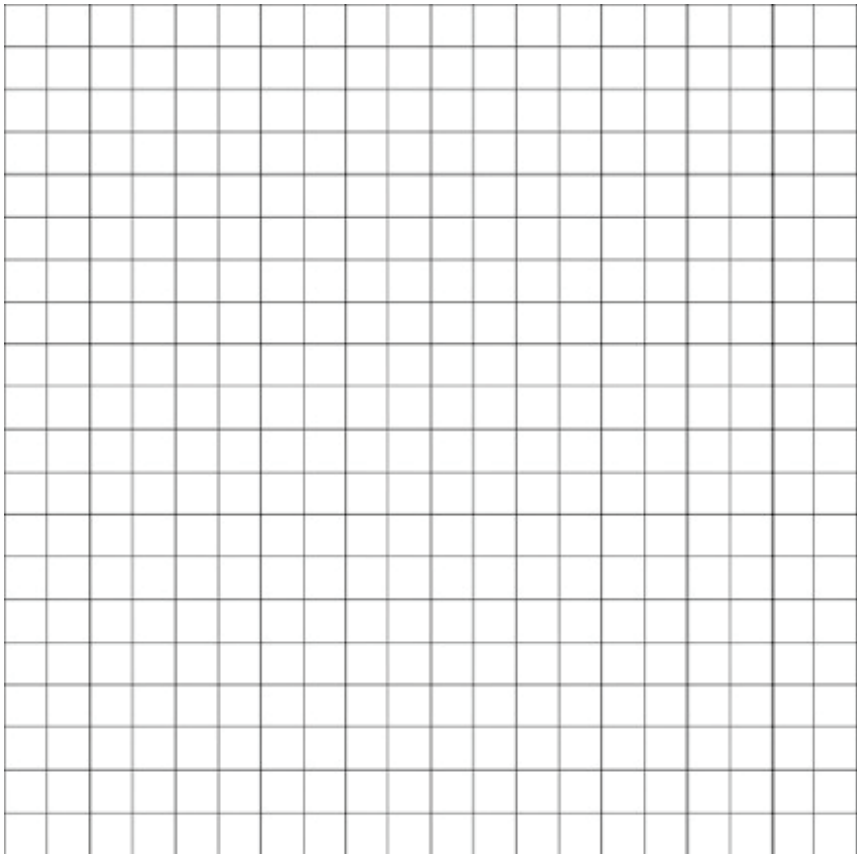
- HUMAN POPULATION: Data were collected by the US Census Bureau for Valencia County. A complete population census is conducted every 10 years, and populations are estimated in between.

TABLE 1. WATER USE BY CATEGORIES AND OTHER VARIABLES

Year	Residential Use (AF)	Agricultural Use (AF)	Livestock Use (AF)	Commercial Use (AF)	Industrial and Mining Use (AF)	Power Use (AF)	Precipitation (in.)	Human Population (# of people)
1995	8220	191376	722	1075	43	0	6.5	56906
2000	9324	168986	917	810	49	0	11.0	66393
2005	9550	186216	911	1592	66	0	11.0	68890
2010	10240	171622	888	221	510	6	9.3	76797
2015	8813	142510	714	540	564	4	14.4	75661

Acre-feet (AF): A unit of volume of water equal to the volume of a sheet of water one acre in size (a bit larger than the size of a football field) and one foot deep.

1 AF = 325,851 gallons

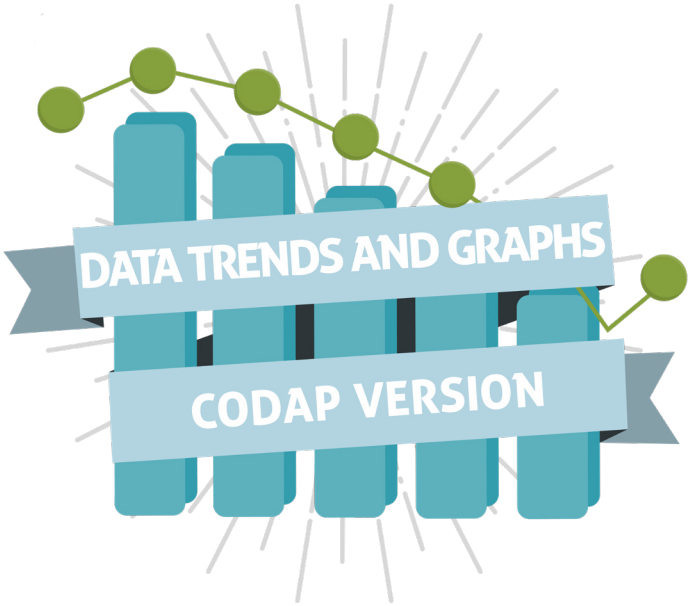


Name: _____ Date: _____ Period: _____

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
1. The title of the project is descriptive.	**5**	**4**	**3**	**2**	**1**	**0**
2. The data trend is one or two sentences that describes a clear pattern in the data. It is specific and includes more than one variable.	**15**	**13**	**12**	**8**	**5**	**0**
3. The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.	**10**	**8**	**7**	**5**	**3**	**0**
4. The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts.	**10**	**8**	**7**	**5**	**3**	**0**
5. The project does not contain grammar/spelling errors that distract from the content.	**10**	**8**	**7**	**5**	**3**	**0**
6. The creative representation of the data trend (e.g., video, infographic, poem) is creative, easily understandable, and appealing to nonscientist audiences.	**10**	**8**	**7**	**5**	**3**	**0**
7. The creative representation accurately portrays the data trend.	**10**	**8**	**7**	**5**	**3**	**0**
8. The creative representation references specific data to demonstrate accurate portrayal of the trend (e.g., physical model contains a legend; reference is made to particular data in a poem).	**10**	**8**	**7**	**5**	**3**	**0**
9. The action plan proposes a good solution that would help solve the water issue identified in the data trend. The audience for the proposed solution and the way in which this audience would be reached is identified.	**15**	**13**	**12**	**8**	**5**	**0**
10. Report contains a brief reflection section; please do not rate the quality; please give an "outstanding" rating if this section is included or a "no evidence" rating if it is not included.	**5**					**0**
Comments:						

Water Conservation



Data Jam

DESCRIPTION

Students will learn how to use the CODAP tool to find a data trend and create a graph for their Water Conservation Data Jam project. They will also receive instructions on the possible explanation section of the report and begin working on their projects.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Practice graphing using the CODAP tool
- Learn how to identify a data trend

TIME
45 MINUTES

MATERIALS

- Internet-connected device [1 per student or 1 per class with a projector]
- PowerPoint presentation
- Student Report document
- Water Use Dataset (asombro.org/WCDJData)
- About the CODAP Dataset Video, transcript is available here

PREPARATION

1. Set up a computer with internet access and projector (if applicable) and prepare to show the PowerPoint.
2. Download and distribute the Student Report document for students to work on throughout the lesson.
3. If needed, set up an assignment using your remote learning platform (Canvas, Google Classroom, etc.).
   a. Post links to the Introduction to the Water Conservation Data Jam video [https://www.youtube.com/watch?v=Ax3lRXAbN0g] and the Water Use Dataset webpage [http://www.asombro.org/WCDJData].
   b. Here is the suggested text for the online assignment:
      i. Remember a good data trend will:
         1. Show a pattern, not just one data point.
         2. Have more than one variable.
         3. Use only data from the dataset.
         4. Be specific.
         5. Include the main variable of the dataset.
      ii. To turn in your Water Conservation Data Jam Report, you must:
         1. Have a one- or two-sentence Data Trend.
         2. Have a graph that shows the evidence for your data trend. This can be a photo of the graph generated using CODAP, a graph created with another program, or a hand-drawn graph.
         3. Write a Possible Explanation in paragraph form explaining why you think your trend occurred.

PROCEDURES

Introduction to Data Trend and Graph

1. **Slide 1**: today, we will begin working on the Water Conservation Data Jam by exploring a dataset on water use and finding a data trend using graphs.

2. **Slide 2**: last time, we discussed that the goal of a data jam is to explain a data trend to an audience that is unfamiliar with the topic. In our example data jam, we created a poem to illustrate the data trend that the percentage of people who use Instagram and Snapchat decreases with age. Here is the class poem we created last time.
3. **Slide 3**: you will start exploring the water use dataset for your projects. At the end of the project, you will turn in a Student Report PowerPoint/Google Slide presentation that includes the five report sections, a creative project, and an action plan. I will grade your project using this rubric, which you can find in your assignment and on the dataset website. You will see references to this rubric throughout this lesson.
4. **Slide 4**: we will get started on a few sections of your Student Report. You will have time to get a start on each of these sections, but you likely will not finish these during class time. Today's goals are to:
   a. Make a claim by finding a data trend.
   b. Provide the evidence for your data trend by making a graph.
   c. Provide a possible explanation for your data trend.
5. **Slide 5**: after our last lesson, you should have examined the dataset and chosen one or more water uses that you would like to use for your project. If you have not chosen a water use, you can select one now. You also may have watched the "CODAP/ Data Trends" video; if so, that will help you today. If you have not watched that video, we will discuss CODAP and data trends, and you can watch it later as a reminder.
6. **Slide 6**: for the assignment you will begin today, download the Student Report PowerPoint or Google Slides from your online assignment/our class website, and add to the data trend, graph, and possible explanation in the report.
7. **Slide 7**: a data trend is a pattern in the data, the story the data tells us, or a relationship between two or more variables. Last time, we identified this data trend in our example: "The percentage of people who use Snapchat and Instagram decreases with age." The graph provides evidence for our data trend.
8. **Slide 8**: there are five criteria for a good data trend, and we can see all of them in the data trend from our example data jam. [Click to make each criterion appear.]
   a. Your data trend should be a pattern, not just one data point. You should be comparing two variables or looking at a change over time.
   b. Your trend should have more than one variable. This data trend includes the percentage of people who use social media and age. Your data trend does not need to include all the information on the dataset. For example, we chose only two social media platforms – Snapchat and Instagram.
   c. You should only be using data from this dataset. You will not search online or in books for additional data for your data trend. We only used the data on the percentage of people who use each type of social media and their age group.
   d. The data trend should be specific. For example, "younger people use social media more" is not specific enough because we do not know the type of social media you are talking about or the age of "younger people."
   e. The data trend should include the main variable in the dataset. The percentage of people who use social media is the main variable in this dataset, and it is included in the data trend.

   The rubric explains the grading criteria for the data trend section of your report. This section is worth 15 of the 100 points, and the data trend should be one or two sentences that describe a clear pattern in the data. It should be specific and include more than one variable.
9. **Slide 9**: switch to the dataset website asombro.org/wcdjdata and demonstrate how to use CODAP to find a data trend. Teachers may find it helpful to watch this video before class to learn how to use CODAP.
10. Looking for data trends using CODAP.
    a. In the example data jam, we reviewed the variables and changed variables on the graphs to look for a data trend. We will do these same steps with the water use dataset.
    b. On this Water Conservation Data Jam website, we will use the dataset from ____ county (choose the county you would like the class to use).
    c. Notice that this dataset has a background section and a section that gives details about each of the variables in the data table. Be sure to read these sections.
    d. The default graph on the webpage has years on the x-axis and no variable on the y-axis. The CODAP tool allows you to change variables on your graph to look for patterns. To add variables to the graph, click on the variable name in the table and drag it to the axis. For example, to see how water used for power changes over time, **click on Power Use and drag it to the y-axis**

(Figure 1). The axis turns yellow. The graph now shows water used for power, in acre-feet, from 1995 to 2015 in five-year intervals.
   i. Look at the graph.
   ii. Do you see a trend or pattern in the data?

e. Now, perhaps I want to know if precipitation has any effect on the pattern I just saw. Since the measurement of precipitation is in inches and the numbers are much smaller than the water use for power values, I can add this to a second y-axis on the right side of the graph. **Drag Precipitation from the table to the secondary y-axis on the right side of the graph** (Figure 2).

f. Does precipitation follow the same trend over time as water use for power (i.e., can precipitation patterns help explain the water use trend)? How would you write this data trend as a complete sentence?

g. If you think you have made a mistake in CODAP or the graph does not look how you expect it to, you can just **refresh/reload your web browser**, and it will confirm that you want to reload the page. The page will reset to the original state, with years on the x-axis and nothing on the y-axis.

h. "Year" is the default variable on the x-axis, but you can change this by dragging another variable from the table to the x-axis, just like we did with the y-axis earlier.

i. For example, if you are interested in seeing if the human population affects residential water use, **drag Human Population from the table to the x-axis, and drag Residential Use to the y-axis**.

i. Some other helpful tips for working in CODAP:
   i. You can change the variables on each axis of a scatterplot by clicking on the axis label.
   ii. Hover over a data point to see the data for that point (Figure 3).
   iii. You can add multiple variables to one axis of the graph by dragging them to the yellow plus sign in the top left corner of the graph. The plus sign will not appear until you drag the variable onto the graph.

j. Creating the graph for your Student Report:
   i. Once you find the data

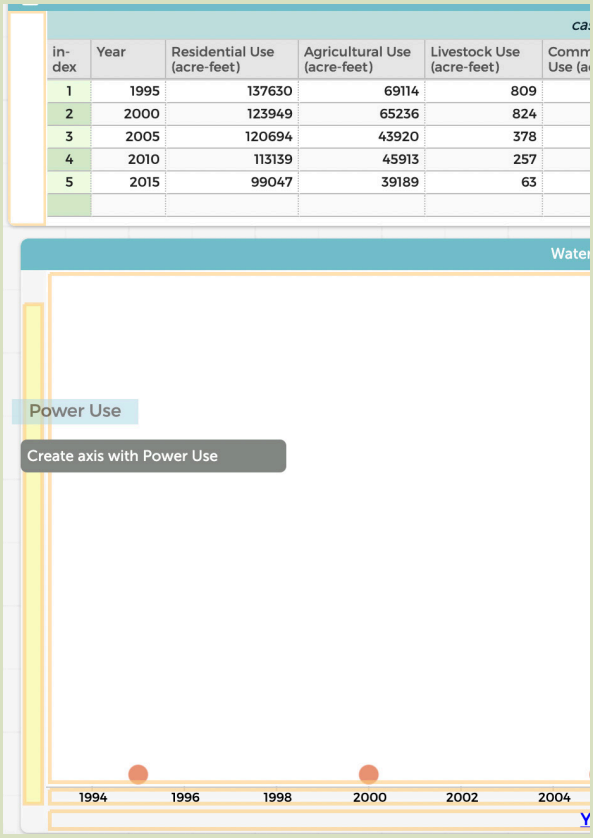


Figure 1. Adding the variable Power Use to the y-axis. Drag the variable name "Power Use (acre-feet)" to the y-axis to plot water used for power over time.

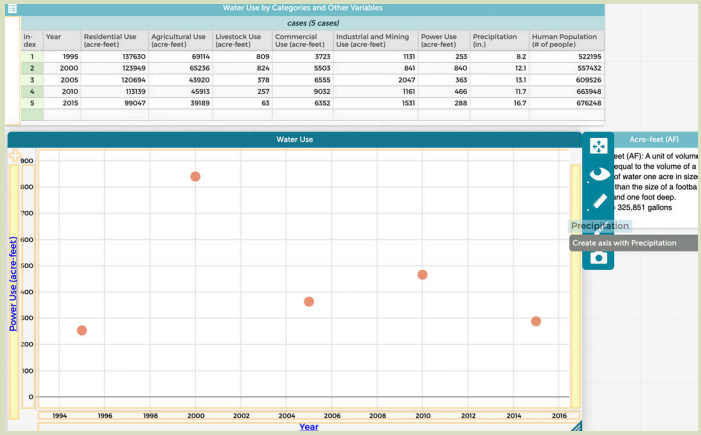


Figure 2. Adding Precipitation (in.) to the secondary (right) y-axis. Drag the variable name "Precipitation (in.)" to the y-axis on the right side of the graph to plot precipitation with its own y-axis scale.

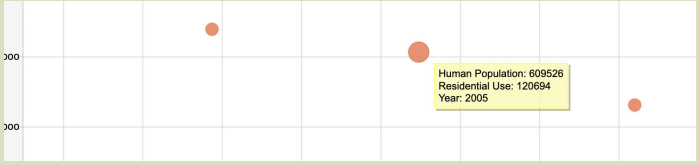


Figure 3. Hover over a point to see the data.

trend you want to use for your project, the next step is to properly label your graph and take a picture of it for your Student Report.

ii. CODAP will automatically label the y-axis and x-axis. Make sure these accurately reflect the variables in your data trend.

iii. The title of the graph will automatically be labeled "Water Use." To change the title, double-click on the title and type your graph title.

iv. There are two options for capturing your graph to add it to your report:
   1. Take a **screenshot**.
   2. Use the **camera icon** on the right side of the graph (Figure 4). Click on the camera icon, scroll to Export Image, then download the image. CODAP will place the graph's title at the bottom of your graph when you export the image.

v. The dataset video (on YouTube) will give you additional tips for working with scatterplots, finding a data trend, and creating a graph. The dataset video is available by clicking on the pink box on the dataset page (Figure 5).

k. Refresh the webpage and remind students that they will be working from this dataset page during work time at the end of class. Switch back to the PowerPoint slides.

11. **Slide 10**: your graph (a) helps you write your data trend, (b) is a visual representation of the pattern in the data, (c) shows a relationship between two or more variables, and (d) includes a title and axis labels. The rubric explains the grading criteria for the graph, which is worth 10 points: The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.

Possible Explanation & Accessing the Student Report

1. **Slide 11**: your Student Report will include a **possible explanation** for the data trend.
   a. The possible explanation should provide a reason for your data trend. It can be your best guess based on other information on the dataset or something you already know. What could the pattern mean? How could that pattern occur? Your possible explanation just needs to be a reasonable (possible) explanation; it may or may not be the true explanation.
   b. In your Student Report, you will write one to two paragraphs to provide a possible explanation for your data trend.
      i. Encourage students to look at the background information on the dataset for each water-use category in their data trend.
   c. This section of the project is worth 10 points. The rubric states, "The possible

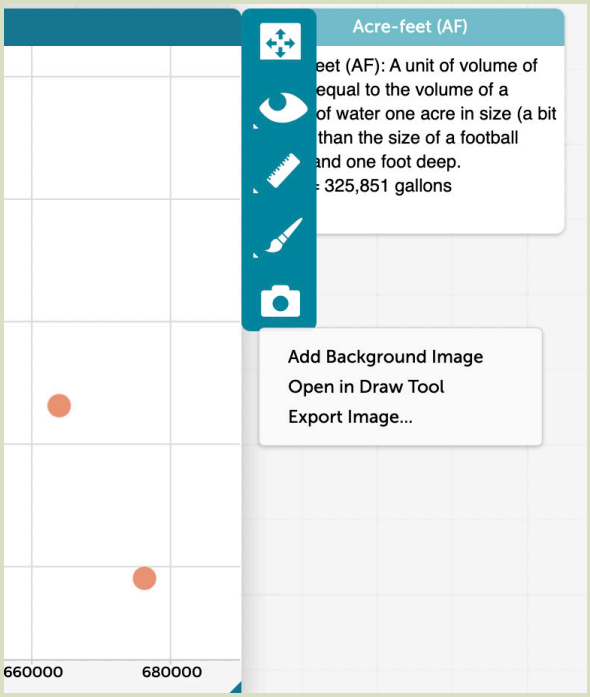


Figure 4. Use the camera icon to take a picture of the graph and export it to Google Drive or a local file.

Figure 5. Watch the dataset video for additional tips on working with the water use dataset.

explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts."

2. **Slide 12**: here is the possible explanation from our example data jam project. It helps explain the data trend "The percentage of people who use Snapchat and Instagram decreases with age." We used background information on the dataset and the data showing that cell phone use also decreases with age.
3. Show students where they can find and download the Student Report PowerPoint or Google Slides that they will be working on today.

Work Time

1. **Slide 13**: depending on the amount of class time left, give students 15 minutes or more to begin their projects. Give students the URL for the dataset page and remind them which county's data they will be using: http://asombro.org/wcdjdata/
   a. You will have 15 minutes to work independently on your project. Here are the suggested steps:
      i. Watch the dataset video linked on the page as the big pink square.
      ii. Explore the dataset by graphing the data to find a data trend.
      iii. Once you have a data trend you like, type it as a one- to a two-sentence statement in your Student Report.
      iv. Add axis labels and a title to a graph showing your data trend.
      v. Take a screenshot of your graph and add it to your Student Report.
   b. You will probably not have time to complete all of this work. Use this time to get started, and please ask questions.
   c. Your 15 minutes begins now. [Click to start the timer.]

Workshop Data Trends

1. **Slide 14**: have students share their data trends if there is time. Discuss a few trends and point out good qualities and places for improvement.
   a. Remember, a good data trend will:
      i. Show a pattern, not just one data point.
      ii. Have more than one variable.
      iii. Use only data from the dataset.
      iv. Be specific.
      v. Include the main variable of water use.
2. **Slide 15**: here are some examples of good data trends from Doña Ana County. These examples will give you an idea of how to write your own data trend. Read as many as you can in the time available.
   a. Residential use of water increased steadily until 2010 before decreasing.
   b. Commercial water use hit a peak in 2005 before starting to decline, but it has still not declined to 1995 and 2000 levels.
   c. Residential use of water does NOT increase in years with higher precipitation. In fact, residential water use generally decreased with higher annual precipitation.
   d. Neither water for agriculture use nor residential use increase in a simple correlation with the human population.

Wrap-Up

1. **Slide 16**: today, we worked on the data trend, graph, and possible explanation.
   a. Your assignment is to complete these three sections before our next meeting for this project.
      i. The social media example Student Report is on the website if you need to reference it as a reminder of what to include in these three sections.
   b. You have many resources available: videos on how to use CODAP and how to select a data trend, the dataset video, an example project, and the rubric.
   c. The next steps of the Water Conservation Data Jam will be (a) making a creative representation that shows the data trend you chose today, (b) developing an action with a possible solution, and (c) sharing your project with others.

WATER CONSERVATION DATA JAM GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
1. The title of the project is descriptive.	5	4	3	2	1	0

Fun Title for Your Project

Your Name

Instructions:
Throughout this slide presentation, replace the text with your work as you complete each component.
Before submission, remove the rubric information from each slide and customize the slides by using a design, transitions, and animations if desired.

WATER CONSERVATION DATA JAM GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
2. The data trend is one or two sentences that describes a clear pattern in the data. It is specific and includes more than one variable.	15	13	12	8	5	0

Data Trend

- Explore the dataset using the tools on this page: https://www.asombro.org/WCDJData
- A good data trend should:
  - Show a pattern, not just one data point
  - Contain more than 1 variable
  - Only include data found on the dataset provided
  - Be specific
  - Be about the main variable (water use)
- This will be your data trend for the entire project. Briefly state the trend **HERE** in one or two sentences.

Graph

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
3. The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.	10	8	7	5	3	0

- Make a graph showing the data trend that you wrote on slide 2.
  - This graph should come from data on the webpage: https://www.asombro.org/WCDJData
- Place a downloaded picture or screenshot of that graph **HERE**.

Possible Explanation

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
4. The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts.	10	8	7	5	3	0

- Draft 1 – 2 paragraphs giving a possible explanation for your data trend **HERE**.

Creative Project

- The creative project is a fun and interesting way to show your data trend. This can be an infographic, model, poem, song, etc.
- For many types of projects, you will need a key that explains the scale, the symbols, and what the symbols represent.
- Take a picture of your creative representation, provide a link to a video of your presentation, or write your written creative representation **HERE**.
  - Don't use blurry or pixelated images.
  - Don't use tiny images.
  - DO take pictures from multiple angles.
  - DO consider placing your creative representation in a video where you explain the representation.

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
6. The creative representation of the data trend (e.g., video, infographic, poem) is creative, easily understandable, and appealing to nonscientist audiences.	10	8	7	5	3	0
7. The creative representation accurately portrays the data trend.	10	8	7	5	3	0
8. The creative representation references specific data to demonstrate accurate portrayal of the trend (e.g., physical model contains a legend; reference is made to particular data in a poem).	10	8	7	5	3	0

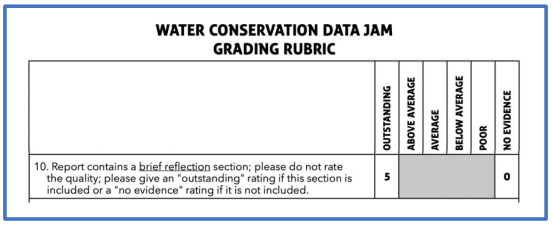
Action Plan

- Make a plan for solving the water issue identified in your data trend.
- Answer the following questions **HERE**.
  - What is your data trend?
  - What is your proposed solution to help solve the issue you identified in your trend?
  - What audience will you try to reach with your proposed solution and how you will try to reach them?

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
9. The action plan proposes a good solution that would help solve the water issue identified in the data trend. The audience for the proposed solution and the way in which this audience would be reached is identified.	15	13	12	8	5	0

Brief Reflection



WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
10. Report contains a brief reflection section; please do not rate the quality; please give an "outstanding" rating if this section is included or a "no evidence" rating if it is not included.	5					0

- Write your thoughts about the Water Conservation Data Jam.
  - Answer questions such as:
    - Which part was the most fun?
    - What challenges did you have?
    - What did you learn?
    - What is one thing you could have done to make this project even better?
    - What was one thing that you think was amazing about your project?
- **You automatically get five points for writing your thoughts about the project on this slide and zero points for forgetting. Don't forget this slide!**

ABOUT THE CODAP DATASET VIDEO TRANSCRIPT

[background music]

The data you'll use for the Water Conservation Data Jam is part of the New Mexico Water Use by Categories Report that's published every five years. The purpose of this report is to make water use data available to the public and is typically used by community planners, legislators, scientists, and individuals. The data has been simplified for the Water Conservation Data Jam. You can read more about the various uses in this report that will be part of this data jam here.

Data are given to you in a data table and a graph that you can manipulate. This is data from Doña Ana County. Your numbers might look a little different.

We'll talk about the data table first. This data set includes data from 1995 through 2015, that's published in the New Mexico Water Use by Categories Report. You are given data on six major categories of water users: residential, agricultural, livestock, commercial, industrial and mining, and power.

The water used data is presented in acre-feet. An acre-foot is a unit of measurement for water equal one acre in size, or a bit larger than the size of a football field, and one foot deep. One acre-foot equals 325,851 gallons. You will look for a trend in one or more of these water use categories.

The data set also includes precipitation and human population in the same years. These variables may be used to explain a water use trend, but should not be used as a trend themselves. These can be graphed on the graph along the x-axis or as a secondary y-axis on the right side of the graph.

Precipitation and human population can help you explain the data trend you find.

Water use is the main variable in this data set, so you should include one of the water use categories in your data trend. Here's a hint: it should probably be graphed on the y-axis.

You can choose more than one water use category by dragging it to the plus sign on the graph.

Remember that you can change the variables that are on each graph to show the different data you're interested in. When you're looking for a data trend you can try hiding different variables that you're not interested in. Try dragging different variables from the data table onto the graph. Look for patterns in the data or relationships between two variables. Try looking at more than one type of water use. How does water use change over time? Does water use change with human population when it's added to the right side of the graph?
Once you have a graph, you can start to interpret the data. You can ask yourself, "What are the data showing me? How do each of the variables change? What are the patterns in the data?"

You can hover your mouse over a data point to see exactly what the data point is representing. You can click on the data point to highlight it.

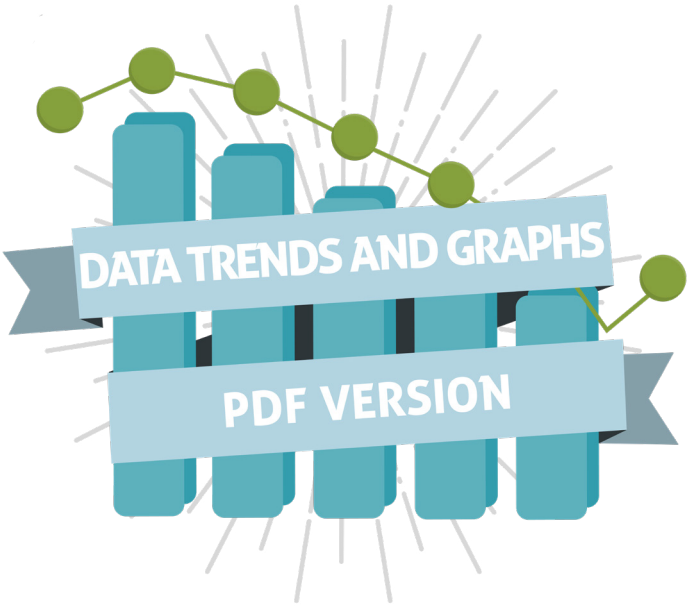
Remember, if something goes wrong with your graph and you'd like to start over you can always refresh the page!

As a reminder, a good data trend should: show a pattern not just one data point; it should include more than one variable; only data found in this data set; it should be specific; and something about the main variable of water use. Keeping this in mind will help you writing an explanation for your data trend.

Once you find a data trend, write it as a complete sentence in your report. Your report should also include a graph that clearly shows your data trend. Give your graph a descriptive title by double clicking on the one that's already there. And check to make sure your axes have the correct labels. You can use the paint brush button to change the colors and appearance of your graph. Then use the camera button to save a picture of your graph. Choose export image. It will give you the option to save it to a google drive or your downloads folder. Or you can take a screenshot of your graph then add your graph to your report.

[background music]

Water Conservation



Data Jam

DESCRIPTION

Students will learn how to find a data trend and create a graph for their Water Conservation Data Jam project. They will also receive instructions on the possible explanation section of the report and begin working on their projects.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Practice graphing using the data pages
- Learn how to identify a data trend

TIME

45 MINUTES

MATERIALS

- Internet-connected device [1 per student or 1 per class with a projector]
- PowerPoint presentation
- Student Report (choose one):
  - o Student Report document as a slideshow
  - o Student Report Rough Draft Workbook [1 per student]
- About the PDF Dataset Video, transcript is available here
- Water Use Dataset [1 per student; choose a county]
  Bernalillo, Chaves, Cibola, Doña Ana, Lea, Luna, Rio Arriba, Sandoval, San Juan, Santa Fe, Valencia
- Rubric [1 per student]
- Social Media Sample Project
- Optional: additional graphing paper for student use

PREPARATION

1. Set up a computer and projector (if applicable) to show the PowerPoint.
2. Download and distribute the Student Report document as a slideshow or workbook for students to work on throughout the lesson.
3. Have a copy of the Social Media Example Project available for students to refer to if needed.
4. Have students watch the six-minute video: About the PDF Dataset. You can either assign this as homework or watch the video together in class. Transcript is available here.
5. If needed, set up an assignment for homework that tells students their Student Reports must:
   a. Have a one- or a two-sentence Data Trend.
   b. Have a Graph that shows evidence for the data trend. This can be a photo of the graph created on the computer or a hand-drawn graph.
   c. Include a Possible Explanation in paragraph form explaining a possible reason for the data trend.

PROCEDURES

Introduction to Data Trend and Graph

1. **Slide 1**: today, we will begin working on the Water Conservation Data Jam by exploring a dataset on water use and finding a data trend using graphs.
2. **Slide 2**: last time, we discussed that the goal of a data jam is to explain a data trend to an audience that is unfamiliar with the topic. In our example data jam, we created a poem to illustrate the data trend that the percentage of people who use Instagram and Snapchat

decreases with age. Here is the class poem we created last time. Show the Social Media Sample Project, which was completed using the Social Media Use dataset.

3. **Slide 3**: you will start exploring the water use dataset for your projects. At the end of the project, you will turn in a Student Report PowerPoint/Google Slide presentation that includes the five report sections, a creative project, and an action plan. Give students a copy of the rubric if they don't yet have one. I will grade your project using the rubric. You will see references to this rubric throughout this lesson.
4. **Slide 4**: we will get started on a few sections of your Student Report. You will have time to start these sections, but you likely will not finish during class time. Today's goals are to:
   a. Make a claim by finding a data trend.
   b. Provide the evidence for your data trend by making a graph.
   c. Provide a possible explanation for your data trend.
5. **Slide 5**: after our last lesson, you should have examined the dataset and chosen one or more water uses that you would like to use for your project. If you have not chosen a water use, you can select one now. You may also have watched the Data Trends video; if so, that will help you today. If you have not watched that video, we will discuss the data and data trends, and you can watch it later as a reminder.
6. **Slide 6/7**: [choose to use either slide six or slide seven depending on how you will have students complete their report.] For the assignment you will begin today, you have the Student Report (PowerPoint, Google Slides, or workbook) to begin to complete. We will be focusing on adding information for the data trend, graph, and possible explanation into this report.
7. **Slide 8**: a data trend is a pattern in the data, the story the data tells us, or a relationship between two or more variables. Last time, we identified this data trend in our example data jam: "The percentage of people who use Snapchat and Instagram decreases with age." The graph provides evidence for our data trend.
8. **Slide 9**: there are five criteria for a good data trend, and we can see all of them in the data trend from our example data jam. [Click to make each criterion appear.]
   a. Your data trend should be a pattern, not just one data point. You should be comparing two variables or looking at a change over time.
   b. Your trend should have more than one variable. This data trend includes the percentage of people who use social media and age. Your data trend does not need to include all the information on the dataset. For example, we chose only two social media platforms – Snapchat and Instagram.
   c. You should only be using data from this dataset. You will not search online or in books for additional data for your data trend. We only used the data on the percentage of people who use each type of social media and their age group.
   d. The data trend should be specific. For example, "younger people use social media more" is not specific enough because we do not know what type of social media you are talking about or the age of "younger people."
   e. The data trend should include the main variable in the dataset. The percentage of people who use social media is the main variable in this dataset, and it is included in the data trend.
   f. The rubric explains the grading criteria for the data trend section of your report. This section is worth 15 of the 100 points, and the data trend should be one or two sentences that describe a clear pattern in the data. It should be specific and include more than one variable.
9. **Slide 10**: looking for data trends.
   a. In the example data jam, we reviewed the variables and then explored the data to look for a data trend. We will do these same steps with the water use dataset.
   b. We will be using the dataset from Doña Ana County. Your data may be different from the data in this example.
   c. Notice that this dataset has a background section and a section that gives details about each of the variables in the data table. Be sure to read these sections.
10. **Slide 11**: start by graphing two variables. We suggest you use "Year" as one of your variables and put it on the x-axis (the horizontal axis). Then, add one of the water use categories to the y-axis (the vertical axis).
11. **Slide 12**: for example, this graph shows how water for Power Use changes over time from 1995 to 2015 in Doña Ana County.
    a. Do you see a trend or pattern in the data?
    b. If not, try graphing another water use variable or investigate the effect of a third variable.
12. **Slide 13**: you can add additional information like Precipitation or Human Population by adding a second y-axis on the right side of the graph, using a scale appropriate for this other variable.
13. **Slide 14**: this graph shows both water for power use and precipitation plotted on the same graph, with years on the x-axis.
    a. Do you see a trend or pattern in these data? Does water use for power follow the same pattern as changes in precipitation from 1995 to 2015?
14. **Slide 15**: if you would prefer not to use Year as a variable, you can put Precipitation or Human Population on the x-axis. Suppose you wanted to explore

the relationship between Human Population and Residential Water Use. In that case, you could plot Human Population on the x-axis (horizontal axis) and Residential Water Use on the y-axis. Each point would represent the data for these variables in a given year.

15. **Slide 16**: this graph compares Human Population and Residential Water Use
    a. Do you see a trend or pattern in this data? Does residential water use increase steadily as the human population increases?
16. **Slide 17**: once you have found your data trend, you need to create a graph for your Student Report. You can create your graph by drawing it or using a computer program. Either way, your graph (a) helps you write your data trend, (b) is a visual representation of the pattern in the data, (c) shows a relationship between two or more variables, and (d) includes a title and axis labels. The rubric explains the grading criteria for the graph, which is worth 10 points: The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.

Possible Explanation

1. **Slide 18**: your Student Report will include a **possible explanation** for the data trend.
    a. The possible explanation should provide a reason for your data trend. It can be your best guess based on other information on the dataset or something you already know. What could the pattern mean? How could that pattern occur? Your possible explanation just needs to be a reasonable (possible) explanation; it may or may not be the true explanation.
    b. In your Student Report, you will write one to two paragraphs to provide a possible explanation for your data trend.
        i. Encourage students to look at the background information on the dataset for each water-use category in their data trend.
    c. This section of the project is worth 10 points. The rubric states, "The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts."
2. **Slide 19**: for example, here is the possible explanation from our example data jam project. It helps explain the data trend "The percentage of people who use Snapchat and Instagram decreases with age." We used background information on the dataset and the data showing that cell phone use also decreases with age.
3. Show students where they can find and download the Student Report PowerPoint or Google Slides that they will be working on today or make sure they each have a copy of the Report Rough Draft Workbook.

Work Time

1. **Slide 20**: depending on the amount of class time left, give students 15 minutes or more to begin their projects.
    a. You will have 15 minutes to work independently on your project. Here are the suggested steps:
        i. Explore the dataset by graphing the data to find a data trend.
        ii. Once you have a data trend you like, write it as a one- to a two-sentence statement in your Student Report.
        iii. Create your graph. Make sure it includes axis labels and a title. It should only include data relevant to your data trend.
        iv. Add your graph to your report.
    b. You will probably not have time to complete all of this work. Use this time to get started, and please ask questions.
    c. Your 15 minutes begins now. [Click to start the timer.]

Workshop Data Trends

1. **Slide 21**: have students share their data trends if there is time. Discuss a few trends and point out good qualities and places for improvement.
    a. Remember, a good data trend will:
        i. Show a pattern, not just one data point.
        ii. Have more than one variable.
        iii. Use only data from the dataset.
        iv. Be specific.
        v. Include the main variable of water use.
2. **Slide 22**: here are some examples of good data trends from Doña Ana County. These examples will give you an idea of how to write your own data trend. Read as many as you can in the time available.
    a. Residential use of water increased steadily until 2010 before decreasing.
    b. Commercial water use hit a peak in 2005 before starting to decline, but it has still not declined to 1995 and 2000 levels.
    c. Residential use of water does NOT increase in years with higher precipitation. In fact, residential water use generally decreased with higher annual precipitation.
    d. Neither water for agriculture use nor residential use increase in a simple correlation with the human population.

Wrap-Up

1. **Slide 23**: today, we worked on the data trend, graph, and possible explanation.
    a. Your assignment is to complete these three sections before our next meeting for this project.
    b. The next steps of the Water Conservation Data Jam will be (a) making a creative representation that shows the data trend you chose today, (b) developing an action with a possible solution, and (c) sharing your project with others.

WATER CONSERVATION DATA JAM GRADING RUBRIC	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
1. The title of the project is descriptive.	5	4	3	2	1	0

Fun Title for Your Project

Your Name

Instructions:
Throughout this slide presentation, replace the text with your work as you complete each component.
Before submission, remove the rubric information from each slide and customize the slides by using a design, transitions, and animations if desired.

Data Trend

WATER CONSERVATION DATA JAM GRADING RUBRIC	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
2. The data trend is one or two sentences that describes a clear pattern in the data. It is specific and includes more than one variable.	15	13	12	8	5	0

- Explore the dataset by making a graph or multiple graphs from your dataset handout.
- A good data trend should:
  - Show a pattern, not just one data point
  - Contain more than 1 variable
  - Only include data found on the dataset provided
  - Be specific
  - Be about the main variable (water use)
- This will be your data trend for the entire project. Briefly state the trend **HERE** in one or two sentences.

Graph

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
3. The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.	10	8	7	5	3	0

- Make a graph showing the data trend that you wrote on slide 2.
  - This graph should come from data on the dataset handout you received.
  - You will not be getting data from research or your own project.
- Place a downloaded picture or screenshot of that graph **HERE**.

Possible Explanation

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
4. The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts.	10	8	7	5	3	0

- Draft 1 – 2 paragraphs giving a possible explanation for your data trend **HERE**.

Creative Project

- The creative project is a fun and interesting way to show your data trend. This can be an infographic, model, poem, song, etc.
- For many types of projects, you will need a key that explains the scale, the symbols, and what the symbols represent.
- Take a picture of your creative representation, provide a link to a video of your presentation, or write your written creative representation **HERE**.
  - Don't use blurry or pixelated images.
  - Don't use tiny images.
  - DO take pictures from multiple angles.
  - DO consider placing your creative representation in a video where you explain the representation.

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
6. The creative representation of the data trend (e.g., video, infographic, poem) is creative, easily understandable, and appealing to nonscientist audiences.	10	8	7	5	3	0
7. The creative representation accurately portrays the data trend.	10	8	7	5	3	0
8. The creative representation references specific data to demonstrate accurate portrayal of the trend (e.g., physical model contains a legend; reference is made to particular data in a poem).	10	8	7	5	3	0

Action Plan

- Make a plan for solving the water issue identified in your data trend.
- Answer the following questions **HERE**.
  - What is your data trend?
  - What is your proposed solution to help solve the issue you identified in your trend?
  - What audience will you try to reach with your proposed solution and how you will try to reach them?

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
9. The action plan proposes a good solution that would help solve the water issue identified in the data trend. The audience for the proposed solution and the way in which this audience would be reached is identified.	15	13	12	8	5	0

Brief Reflection

WATER CONSERVATION DATA JAM
GRADING RUBRIC

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	NO EVIDENCE
10. Report contains a brief reflection section; please do not rate the quality; please give an "outstanding" rating if this section is included or a "no evidence" rating if it is not included.	5					0

- Write your thoughts about the Water Conservation Data Jam.
  - Answer questions such as:
    - Which part was the most fun?
    - What challenges did you have?
    - What did you learn?
    - What is one thing you could have done to make this project even better?
    - What was one thing that you think was amazing about your project?
- **You automatically get five points for writing your thoughts about the project on this slide and zero points for forgetting. Don't forget this slide!**

WATER CONSERVATION DATA JAM REPORT ROUGH DRAFT WORKBOOK

YOUR NAME:

FUN, DESCRIPTIVE TITLE FOR YOUR PROJECT:

DATA TREND

From the grading rubric – 15 points: The data trend is one or two sentences that describes a clear pattern in the data. It is specific and includes more than one variable.

1. Explore the dataset on your handout and identify a data trend you want to use for your project.
2. A good data trend should:
   a. Show a pattern, not just one data point
   b. Contain more than one variable
   c. Only include data found on the dataset provided
   d. Be specific
   e. Be about the main variable (water use)
3. This will be your data trend for the entire project. Briefly state the trend **HERE** in one or two sentences.

_____

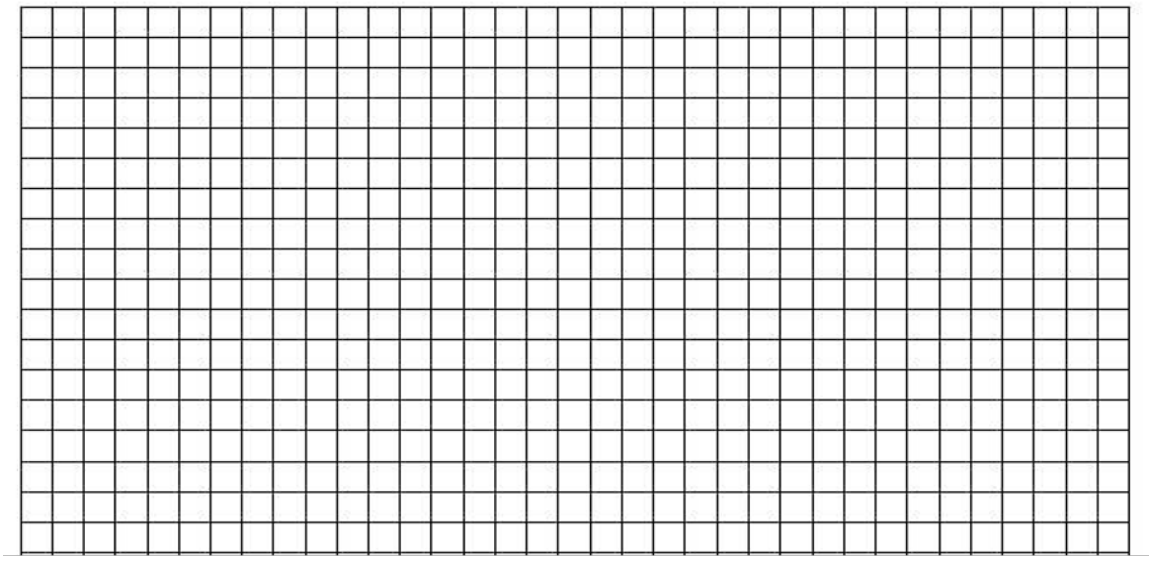
_____

_____

GRAPH

From the grading rubric – 10 points: The graph of data trend is a clear representation of the data trend. It includes a title, axis labels, and a legend (if necessary). Computer-generated or hand-drawn graphs are acceptable.

Make a graph that shows your data trend. Be sure to include a title, axis labels, and a legend, if necessary. The graph should contain only the data from the dataset that are part of your data trend.



POSSIBLE EXPLANATION

Draft one to two paragraphs giving a possible explanation for your data trend.

From the grading rubric – 10 points:
The possible explanation section contains a reasonable explanation for the data trend. The explanation is consistent with scientific concepts.

CREATIVE PROJECT

1. The creative project is a fun and interesting way to show your data trend. It can be an infographic, model, poem, song, etc. Use the space below to brainstorm and plan your creative project.
2. For most projects, you will need a key that explains the scale and the symbols. You can work on that key **HERE**.

From the grading rubric – 30 points:
The creative representation of the data trend (e.g., video, infographic, poem) is creative, easily understandable, and appealing to nonscientist audiences. The creative representation accurately portrays the data trend. The creative representation references specific data to demonstrate accurate portrayal of the trend.

ACTION PLAN

1. Make a plan for solving the water issue identified in your data trend.
2. Answer the following questions.
   a. What is your data trend?
   b. What is your proposed solution to help solve the issue you identified in your trend?
   c. What audience will you try to reach?

From the grading rubric – 15 points:
The action plan proposes a good solution that would help solve the water issue identified in the data trend. The audience for the proposed solution and the way in which this audience would be reached is identified.

BRIEF REFLECTION

1. Write your thoughts about the Water Conservation Data Jam.
2. Answer questions such as: Which part was the most fun? What challenges did you have? What did you learn? You automatically get five points for writing your thoughts about the project and zero points for forgetting. **Don't forget this part!**

ABOUT THE PDF DATASET VIDEO TRANSCRIPT

[background music]

You are given a data set on water use in your county. In this video we'll show you an example data set from Doña Ana County. Yours might look a little different.

The background section of the data page tells us why this topic is important. It also tells us that the data you'll use for the Water Conservation Data Jam is part of the New Mexico Water Use by Categories Report that's published every five years. The purpose of this report is to make water use data available to the public and is typically used by community planners, legislators, scientists, and individuals. These data have been simplified for the Water Conservation Data Jam.

The water use variables section tells us more about the variables included in this data set and the procedures that were used to collect them.

Data are given to you in a data table. You also have an area where you can graph the data below. We'll talk about the data table first.

To get started, you'll need to understand the variables you have. You can find variables in the column headings of the table. The first column includes data from every five years between 1995 and 2015. In the next columns you're given data on six major water use categories. These include residential; homes and public water supply; agricultural or crops; livestock or animals; commercial or business; industrial and mining; and power.

The water use data are presented in acre-feet. An acre-foot is a unit of measurement for water equal to the volume of a sheet of water one acre in size, or a bit larger than the size of a football field, and one foot deep. One acre-foot equals 325,851 gallons.

Water use is the main variable in this data set, so you should include at least one of the water use categories in your data trend. The data set also includes precipitation in inches and human population in these same years. These variables may be used to explain a water use trend but should not be used as a trend by themselves. Precipitation and human population can help you to explain the data trend you find.

Once you understand the variables in the data set you can start to look for a data trend by sketching some graphs in the space shown here.

Start by comparing two variables. For example, you could look at how one water use category changes over time. To graph change over time, make sure that years is on your x-axis. Then you can choose one of the water use categories and graph it along the y-axis. Look for patterns in the data, or relationships between the variables.

To compare how multiple water use categories change over time, you can add another water use category to the y-axis. Make sure to use a different color or symbol and include a legend. You can add another variable, like human population or precipitation to the graph. Does water use change with human population or precipitation?

Instead of change over time, you can also compare two different water use categories. Put water use "Variable A" on the x-axis and water use "Variable B" on the y-axis.

Once you have a graph, you can start to interpret the data. You can ask yourself, "What are the data showing me? How did each of the variables change? What are the patterns in the data?" If you're not able to find a data trend with the variables you've chosen, you can always sketch a new graph with different variables.

As a reminder, a good data trend should: show a pattern not just one data point; it should have more than one variable; use only data from this data set; and be specific. It should also include the main variable, which is water use.

Once you've found a pattern in the data, write it down as a one or two-sentence statement. Then add your graph to your report.

[background music]

Oh, Snap! Social Media Use by Different Age Groups

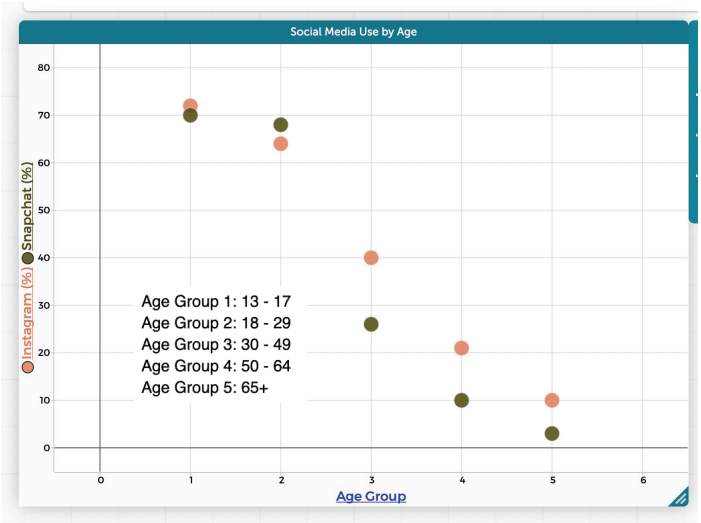
Sample Data Project

Data Trend

The percentage of people who use Snapchat and Instagram decreases with age.

Graph

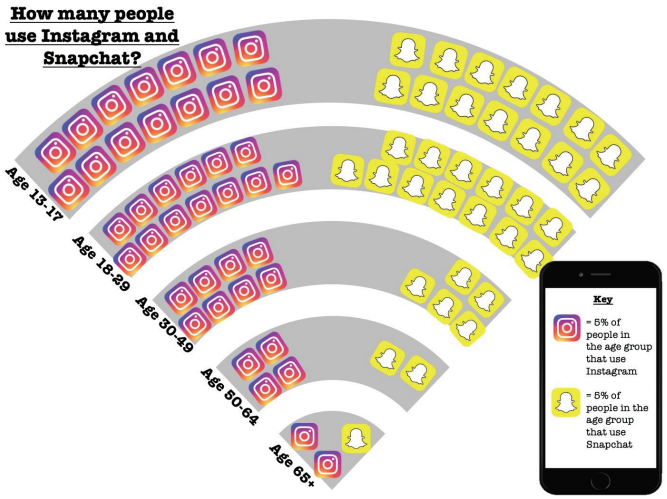
Snapchat and Instagram Use by Age



Possible Explanation

Instagram and Snapchat are both apps designed to be used on smart phones rather than on computers. The percentage of people who own a smart phone also decreases with age, so it makes sense that these apps are more popular with groups that are more likely to have a smart phone.

Creative Project



Action Plan

The data trend I identified is that the percentage of people who use Snapchat and Instagram decreases with age. This trend presents a financial problem for local businesses who rely on marketing via social media to increase awareness about their services. Because older people are less likely to use Snapchat and Instagram, they are also less likely to interact with businesses that use those platforms. My action plan will target people in the 30 to 49-year-old age group and aim to increase their use of Snapchat and Instagram to help local businesses.

To increase Snapchat and Instagram use by people in the 30 to 49-year-old age group, I will team up with local businesses and suggest that they provide exclusive coupons or discounts via social media. I will help businesses run advertisements about these social media discounts in places where older people will see them, such as newspapers, television, or at the local businesses. People will receive coupons through social media, which will make them more likely to download apps like Snapchat and Instagram. This action plan will help local businesses reach more customers, and it will increase the percentage of people in older age groups who use Snapchat and Instagram.

Brief Reflection

When I first heard about the Water Conservation Data Jam project, I thought it sounded crazy. I have never done anything like this before. I collected my own data for a science fair project once, but I did not have to come up with a creative way to present that data.

Now that I have done a Data Jam project, I realize how much fun it is. It was difficult to figure out what the data trend was. However, once we had that, we had fun figuring out a creative way to present the data and solving water problems. We also had to do a lot of work to figure out the scale for our creative project. I learned how fun it is to think about new ways to present scientific data. One question I now have is what jobs are available that would allow me to use these skills.

Water Conservation

Data Jam

DESCRIPTION

Students will use the data trend they found in the previous lesson to start work on a creative project and action plan. The creative project (e.g., poem, physical model, game) represents the data trend in a fun and interesting way. The action plan proposes a solution to address a water conservation issue related to the data trend. At the end of the lesson, students receive instructions on completing their reports.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Be introduced to creative representations of data trends and how to make a scale/ key to represent the data accurately
- Discuss action plans to help solve the water issue they identified
- Continue filling out the Student Report for the creative project and action plan
- Discuss homework to complete the Water Conservation Data Jam by the due date

TIME
45 MINUTES

MATERIALS

- Internet-connected device [1 per student or 1 per class with a projector]
- PowerPoint presentation
- For CODAP Version:
  - Student Report document
  - Water Use Dataset (asombro.org/wcdjdata)
  - Creative Project How-To Video, transcript is available here
- For PDF Version:
  - Student Report document as a slideshow or
  - Student Report Rough Draft Workbook [1 per student]
  - Water Use Dataset [1 per student; choose a county]

PREPARATION

1. Set up a computer and projector (if applicable) and prepare to show the PowerPoint.
2. If needed, set up an assignment for homework in your virtual learning platform. Provide the Student Report document (either as a slideshow or workbook) and a link to the Water Use Dataset webpage. Here is some suggested text for the assignment.
   a. Remember, a good creative project:
      i. Should represent the data trend you identified, not all of the data.
      ii. Should not be a re-creation of your graph.
   b. To turn in your Water Conservation Data Jam Report, you must:
      i. Make your creative project with a key to explain any symbols and scale you used to represent the data.
      ii. Submit the report along with any necessary video or photos. If you are submitting a picture of your creative project, I suggest taking several pictures from multiple angles.
      iii. Write your action plan to propose a solution to address the water issue related to your data trend.

PROCEDURES

Introducing the Creative Project

1. **Slide 1**: we will be discussing creative projects and action plans today. This is an example of a creative project based on the sample social media dataset. We will discuss how we made this creative project to give you some ideas on making your creative project.
2. **Slide 2**: in the last lesson, or as homework, you found a data trend.
   a. Remember the goal of a data jam – to explain a data trend to an audience unfamiliar with the topic through a report and creative

project. Then create an action plan to solve a water use issue related to your data trend.
   b. Today, we will be using the data trend you identified to make a creative project. For many students, the creative project is the most fun part of the data jam.
   c. Then we will finish by discussing the action plan and final sections of your report.
3. **Slide 3**: using the social media dataset, we found this trend: "The percentage of people who use Instagram and Snapchat decreases with age." To show this data trend creatively, we made a poem where each word represented three percent of people who use each social media platform. This was one example of a creative project.
4. **Slide 4**: play to your interests and strengths; this kangaroo rat example explains the pattern in a fun and interesting way in the form of piñatas. You can make videos, take pictures, write words, make models, cook food, or do ANYTHING!
5. **Slide 5**: an excellent creative project should represent the data trend in a new and unusual way. It should represent the data trend you selected, not all of the data. It should not just be a re-creation of your graph.
6. **Slide 6**: here is one example of a new and unusual way to represent the data using beads.
   a. The key in this example tells us that each bead represents one percent of people who use Snapchat and Instagram.
   b. Each age group is represented by its own labeled string.
   c. Notice that the longest strands are for the 13–17-year-old age group. You can easily see there is a difference between the age groups by looking at this model.
7. **Slide 7**: here is another example from a student-made video.
   a. In the video, the student bounced a basketball, and each bounce of the basketball represented one percent of people who use social media.
   b. This still from that video is showing Snapchat use for 13 – 17-year-olds. For this segment of the video, he will bounce the ball 70 times. Notice that there is a key included, so you know what he is representing.
8. **Slide 8**: this is an infographic, where each bar of the Wi-Fi symbol represents an age group, and each logo represents five percent of people in that age group who use social media. We are going to talk more about the steps used to create this infographic.

How to Make a Key and Choose a Scale

1. **Slide 9**: using a scale means you can use different numbers or sizes of symbols to represent your data. Scaling helps you represent the data accurately in your creative project.
   a. The data table tells us that 72% of the 13–17-year-old age group use Instagram. We could represent this number with 72 Instagram logos. The key shows that one logo represents 1% of people in that age group.
   b. However, 72 Instagram logos do not fit in the space we have on the Wi-Fi infographic. This is why a scale can be helpful.
2. **Slide 10**: we will look at the 30 to 49-year-old age group and try to find a scale that works for our project.
   a. To use a scale where one logo equals 1% of people, we would have to include 40 Instagram logos and 26 Snapchat logos. When we do this, we can easily see that this age group uses Instagram more than Snapchat. However, this scale does not work because we do not have enough room for all these logos.
   b. [Click to show.] We can scale the data by making each logo represent 5% of the people in that age group. To create this scale, we divide all of the percentages from the data table by 5. If we divide 40 by 5, we get 8, which means we need 8 Instagram logos to represent the 40% of people in this age group who use Instagram. Notice that we include a key indicating that each logo now represents 5% of people in that age group.
   c. [Click to show.] To accurately show the data, we must divide all the numbers in the data table by the same number. For example, dividing 26 by five and rounding tells us that we need five Snapchat logos.
   d. Even with our scaled data, we can still see that this age group uses Instagram more than Snapchat, and we can use fewer logos to represent the same data.
3. **Slide 11**: since we chose a scale of one logo representing 5% of people, we now divide every other number in the data table by five.
   a. Notice that the key shows that each logo represents five percent of people in that age group who use the social media platform.
   b. Notice that the logos all now fit onto the Wi-Fi symbol we are using for our creative project.
4. **Slide 12**: you can also use the size of something to show your scale.
   a. In this example, different-sized logos are used to represent the data.
   b. This key shows that 1 cm of logo height represents 10% of people in that age group. To get the heights, we would divide each number in the data table by 10. Note that we do not have to round the answers this time because we can accurately measure 2.6 cm.
   c. Remember, we would need to divide every number in this data table by 10.
5. **Slide 13**: here are some tips for creating a scale:
   a. Decide on an idea: For example, imagine I will make

a model house for which the height of the model from the tip of the roof point to the bottom of the house represents the number of acre-feet of residential water use (height of model house = number of acre-feet).
   b. Start with a reasonable guess for the scale (one acre-foot = one inch)
   c. Do the math for the largest and smallest numbers you need to represent to show your data trend (42,087 acre-feet = 42,087 inches and 36,750 acre-feet = 36,750 inches)
   d. Does this make sense for your project? If not, edit the scale. Since 42,087 inches is approximately two-thirds of a mile, this is clearly not a good scale for my project. How can I adjust the scale so I am making a model that is several inches tall instead?
   e. [Click to show the division problem to the screen.] The number of acre-feet divided by 10,000 will equal a reasonable size for my model.
   f. [Click to show the full set of numbers.] When doing math like this, remember to apply it to all the numbers in your dataset for your data trend. Also, remember that it is okay to round your numbers.
6. **Slide 14**: once you have decided on a scale, you must create a key that explains your scale. A key should include all the symbols used and give a specific number for what each symbol represents.
7. **Slide 15**: creative projects can also be written items, such as poems, stories, and comics. These do not need to have a scale if they refer to the specific data in the written piece directly like in this sample. This is an example of a song that explains the data. Unlike the sample poem we created, this one mentions the data directly in writing, so a key is not needed.

Work Time and the Action Plan

1. **Slide 16**: depending on the amount of class time remaining, give students 10 minutes or more to brainstorm their creative projects and develop an appropriate scale and key.
2. **Slide 17**: you also need to make an action plan, a proposed solution to the water-use issue you identified in your data trend and showed in your creative project.
   a. This is a sample action plan that corresponds with the sample dataset on social media use. Read or summarize the action plan for students. Note that it includes three main components:
      i. <u>The data trend</u>: Instagram and Snapchat use decreases with age.
      ii. <u>The audience</u>: 30 to 49-year-olds. Businesses that use these social media platforms for advertising are less likely to interact with people in this age group because they are less active on social media.
      iii. <u>The plan</u>: Put advertisements in places where 30 to 49-year-olds will see them, like on tv or in the newspaper. These ads will encourage people to follow businesses on Instagram and Snapchat for special deals.
   b. Note that there is an optional "dessert" assignment called <u>Turning a Plan into Action</u>. If you have more time and would like students to take action on their plans, use this assignment.

Wrap-Up – Next Steps to Complete Your "Report" Presentation

1. **Slide 18**: there are two final parts of your Water Conservation Data Jam Report. The first one is a title, and I recommend you think of a descriptive and fun title after you create your creative project and action plan. [Click to have titles appear.]
   a. Which do you think would be the best title for the sample project we have done together?
      i. Water Conservation Data Jam Project
      ii. Oh, Snap! Social Media Use by Different Age Groups
      iii. Use of Social Media by Different Age Groups
   b. Have students vote for their favorite.
   c. [Click to highlight Option 2.] I like Option 2 best because it is witty and descriptive. Option 3 is acceptable. Option 1 is not descriptive.
2. **Slide 19**: the final part of your report is a brief reflection. In this section, you reflect on your experience with the Water Conservation Data Jam. You will not be scored on <u>what</u> you write in this section. Include a brief reflection, and you will receive five points.
3. **Slide 20**: here are some quick tips about finishing your projects:
   a. Make your work neat; proofread and edit your work.
   b. Include a scale and key.
   c. Take lots of photos or videos from different angles of any physical models you build.
   d. Remember that your action plan should help solve the problem you identified in your data trend.
   e. The requirements for the report can be found on your rubric and report document. Make sure you have included every section!
4. **Slide 21**: we have now discussed all the components of your Water Conservation Data Jam project. You will submit a report (including title, data trend, graph, possible explanation, and brief reflection), a creative project, and an action plan.

CREATIVE PROJECT HOW-TO VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

You've already finished several parts of your Data Jam project, and you're ready to begin on one of the last pieces: the Creative Project. But how do you get started making a creative project? This video will show you five steps to make a successful Data Jam Creative Project.

Your creative project needs to represent your data trend. You should have already identified and written your data trend in a previous assignment. In the mini data jam, we did this together. We found the data trend: "The percentage of people who use Snapchat and Instagram decreases with age." A creative project representing this data trend will use the numbers from these two columns of the data table. Then you need to brainstorm how you can represent your data trend in a creative way!

Remember, your project shouldn't just recreate your graph, but you need to include specific data. Someone should be able to look at your project and recreate the data table from your data set.

If you're having trouble thinking of an idea, start by making a list of your hobbies. For example, if you like to play basketball, you could make a video dribbling a basketball to represent your data. In this example, one bounce of the basketball represents one percent of 13 to 17-year-olds who use Snapchat. So he will bounce the basketball 70 times. Each section of the video represents one age group and one social media platform. So the next part will represent the percent of 18 to 29-year-olds that use Snapchat.

If you like to do crafts, you can make a model. Each yellow bead represents one percent of people who use Snapchat, and each pink bead represents one percent of people who use Instagram.

If you like to sing, you could write a song or a rap. If you like to write, you could write a short story or a poem like the example you did as a class. If you like to do things on the computer or draw, you can make an infographic. These are just some examples. Please feel free to surprise your teacher with your creative representation!

Once you've settled on an idea, you need to think about the scale you'll use to represent numbers from the data set. Most projects need a scale. Here's an infographic that uses the Snapchat and Instagram logos. Each bar of the wi-fi symbol represents one age group. Our first idea was that one logo would equal one percent of the people who use that app. But when we looked at the data table, we realized we would have to draw 72 Instagram logos just for the 13 to 17-year-olds group, so we tried dividing all the numbers by five. Now we only have to draw 14 Instagram logos for the 13 to 17-year-olds group, and our key shows that one logo represents five percent.

If your data set has small numbers, you can use multiplication to find the right scale. As long as you divide or multiply all the numbers in the data set by the same number, your scale will be correct. You can also use size to show the scale of something. Instead of drawing 14 Instagram logos to represent the 13 to 17-year-olds, I could draw one Instagram logo that is 14 centimeters tall.

Remember the example you made in class? Each word here represents three percent. We determined the number of words that needed to be in each sentence by dividing the numbers from the data table by three.

Your project might include symbols, pictures, or objects to represent the data. Make sure to include a key to explain your scale to your audience. Each one of these creative project examples has a key. You can check the key by doing the math. In this example, we can count the number of logos, multiply by five, and get the number in the data table. Some project ideas might not need a scale, like some poems, songs, or stories. However, you still need to include specific data in these types of projects, like this example.

If you're not sure if your project idea needs to include a scale, ask for help. Finally, once you've added your key to your project, you need to turn in your project. If submitting it online, take a video or many photos from different angles. Remember, it needs to be very clear and self-explanatory.

Have fun creating your project!
[background music]

Water Conservation

Data Jam

DESCRIPTION

Students keep track of how much water they use over the course of one day and discuss the results as a class.

GRADE LEVEL

6-12

OBJECTIVES

Students will:

- Assess their personal water use by completing a log
- Compare activities that used the most and least amounts of water

TIME

10 MINUTES TO EXPLAIN ASSIGNMENT IN ONE CLASS PERIOD

10 - 30 MINUTES IN A SUBSEQUENT CLASS PERIOD TO DISCUSS RESULTS

MATERIALS

- How Much Water Do You Use? handout [1 per student]

PREPARATION

1. If needed, set up an assignment in your virtual learning platform (Canvas, Google Classroom, etc.)
    a. Provide student access to the How Much Water Do You Use? handout.
    b. Suggested text for online assignment:
    How Much Water Do You Use? Before we begin the Water Conservation Data Jam, we will find how much water we use by completing a log of our water use over the course of one day. Follow the directions on the handout to track how much water you use.

PROCEDURES

Day 1

1. Hand out the How Much Water Do You Use? handout to each student, or provide students with instructions to access an online assignment.
2. Explain that they will be keeping track of how much water they use over the course of one day. Starting tomorrow, they will follow the instructions on the handout to track every time they use water.

Day 2

1. Lead a discussion about the results. Which activities used the most water? Which activities used the least water? Was there anything you found surprising? How can you reduce your water use? Why is it important to conserve water?

Name: _____ Date: _____ Period: _____

Water Conservation Data Jam

Water is an essential resource, and we use it every day. We all drink water and take showers or baths, but some of the ways you use water may not be as obvious. In this activity, you will track how much water you use throughout the day, starting first thing in the morning. At the end of the day, you will calculate how many gallons of water you used.

Some common activities that use water and the amount of water used are listed below. Make a tally mark in the Tally Mark column each time you do an activity that uses water.

*NOTE: If someone in your home cooked, washed dishes, or did laundry, and you ate food or wore clothes, you should count those gallons listed for cooking a meal, washing dishes, and washing clothes as a part of your water use for the day.

ACTIVITY	TALLY MARK	NUMBER OF GALLONS USED	TOTAL WATER USED (NUMBER OF TALLY MARKS MULTIPLIED BY NUMBER OF GALLONS USED)
Bath		**35**	
Shower (10 minutes)		**50**	
Brushing Teeth with the Tap On		**5**	
Brushing Teeth with the Tap Off		**0.5**	
Washing Your Hands		**5**	
Flushing the Toilet		**3**	
Cooking a Meal		**3**	
Washing Dishes by Hand		**30**	
Washing Dishes in Dishwasher		**15**	
Drinking Water		**0.5**	
Washing Clothes in Machine		**35**	
Watering Indoor Plants		**3**	
Watering a 100 Square Foot Lawn		**62**	
Watering One Tree		**11**	

How many gallons of water did you use in one day? Add all the values from the Total Water Used column, and write the total in the box below.

TOTAL USED IN ONE DAY: _____ gallons of water

Water Conservation

Data Jam

DESCRIPTION

Students compete in a water allocation relay to (1) learn about tradeoffs in allocating scarce resources and (2) receive an introduction to the water-use variables in the dataset they will use for the rest of the project. Students learn about water-use data for six user groups in Doña Ana County, New Mexico: residential, agricultural, livestock, commercial, power, and industrial/mining.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Understand that allocating water to six user groups requires difficult decisions because there is not always enough water to meet all needs, especially during times of drought

TIME
45 MINUTES

LESSON OPTIONS:

There are two options for delivering this lesson. Option 1 is a hands-on activity that requires the materials listed below. Option 2 is a five-minute video, which is best for educators with limited time or resources.

OPTION 1: HANDS-ON WATER ALLOCATION RELAY

MATERIALS

- Computer and projector for educator
- Powerpoint presentation
- Two 1,000 mL graduated cylinders
- Empty Water Bottles [1 of each size]
  - 1 Gallon
  - 1 Liter
  - 16 oz.
  - 8 oz.
- Twenty 5-oz. clear plastic cups
- Two overflow containers, shallow plastic 9-cup containers (Figures 1 and 2)
- Paper towels
- Timer
- If a sink is not available, an empty 5-gallon container in which to dump water from the relay is needed
- An alternative to the in-class relay is to have students watch the Water Allocation Video. The video transcript is available here.

PREPARATION

1. Set up a projector and computer to display the slide presentation.
2. Set up the Water Allocation Relay supplies (Figures 1 and 2). Before the relay, label the cups, graduated cylinder, water bottles, and overflow container.
   a. The Year of Plenty setup (Figure 1) includes:
      i. 1 gal container of water labeled **groundwater**
      ii. 1 L container of water labeled **surface water**
      iii. 100 mL graduated cylinder labeled **Doña Ana County Population**
      iv. 8-cup plastic container labeled **WCDJ Water Allocation Relay Year of Plenty**
      v. Ten 5 oz. cups labeled as follows:
         1. 1 cup labeled **human needs**
         2. 1 cup labeled **industry needs**

3. 5 cups labeled **agriculture needs**
4. 3 cups labeled **agriculture needs – surface water**

b. The Year of Drought setup (Figure 2) includes:
   i. 16 oz. container of water labeled **groundwater**
   ii. 8 oz. container of water labeled **surface water**
   iii. 100 mL graduated cylinder labeled **Doña Ana County Population**
   iv. 8-cup plastic container labeled **WCDJ Water Allocation Relay Year of Drought**
   v. 10 5 oz. cups labeled as follows:
      1. 1 cup labeled **human needs**
      2. 1 cup labeled **industry needs**
      3. 5 cups labeled **agriculture needs**
      4. 3 cups labeled **agriculture needs – surface water**

3. Plan to divide the class into two teams:
   a. Year of Plenty group
   b. Year of Drought group

PROCEDURES

1. **Slide 1**: today, we will learn how we use and allocate water through a water resource relay. You will be looking at water use data in this relay, and you will use similar data throughout the rest of the Water Conservation Data Jam.
2. **Slide 2**: we will examine the major water users of Doña Ana County because these are also the major water users throughout New Mexico. In our water allocation relay, we will use different-sized water bottles to represent water found on the surface and water from underground, called groundwater. These sources will need to meet the needs of Doña Ana County. Surface water is a body of water that is above ground, such as lakes, rivers, and arroyos. The water from the ground is from aquifers. Most water for residential use in New Mexico comes from groundwater.
3. **Slide 3**: the unit for the water data is acre-feet. One acre-foot is the amount of water that would cover one acre (approximately the size of a football field from goal post to goal post) at one foot of depth. It is equivalent to 325,851 gallons. [This is an animated slide that auto-plays and repeats.]
   a. The total withdrawal from both surface and groundwater in Doña Ana County each year is 382,501 acre-feet, which is more than 124 billion gallons.
4. **Slide 4**: we will represent the water withdrawal for six common water users in Doña Ana County: residential, agricultural, livestock, commercial, industrial & mining, and power. The total amount of water in each sector will be represented by 10 cups.
   a. To simplify the distribution for the Water Allocation Relay, each cup will represent a range from 2-18% or 8,330 to 68,850 acre-feet of the total withdrawal.
5. **Slide 5**: approximately 10% of the total water use is for residential users (37,605 acre-feet). The cup representing this will be called **human needs**. In Doña Ana County, all the water for residential use comes from groundwater. This use category includes community water systems, which are metered, and domestic private wells, which are estimated. This is the water that comes to your house for you to drink, bathe, wash clothes, do dishes, and perform other household chores.
6. **Slide 6**: irrigated agricultural use and livestock use are combined in this relay for a total of eight cups. These combined categories make up 88% (336,566 acre-feet) of total water use in Doña Ana County. To meet these needs, farmers use a combination of surface water and groundwater. Groundwater withdrawal for agriculture will be represented by five cups. Surface water

Figure 1. Year of Plenty setup, including 10 small cups, one 1000-mL graduated cylinder, a one-gallon bottle filled with water, a 1-L bottle filled with water, and an overflow container

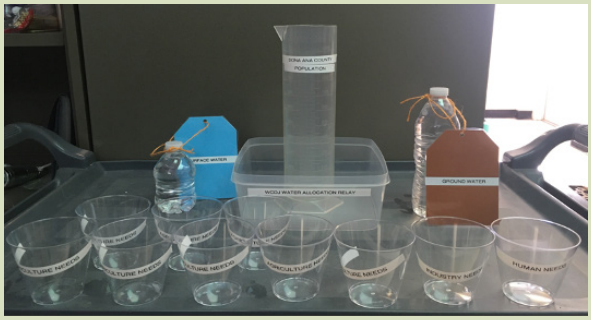


Figure 2. Year of Drought setup, including 10 small cups, one 1000-mL graduated cylinder, a 16-oz. bottle filled with water, a 8-oz. bottle filled with water, and an overflow container

withdrawal for agriculture will be represented by three cups. This is the water used to irrigate all crops, farm use, ranch use, and wildlife. Soil types and water requirements for each crop type are used to estimate water use. Meters are used when farms are irrigated with surface water. Farmers are only allowed a certain allotment of surface water per acre.

7. **Slide 7**: the last cup will combine water use for industry, commercial, mining, and power; these are combined in our relay because they do not use a large percentage of the total water use. These uses combined make up about 2% (8,330 acre-feet) of total water use. All of this water comes from groundwater.
8. **Slide 8**: separate students into two groups: one group for the year of plenty and one group for the year of drought.
   a. The goal for each group is to use the ground and surface water resources they have to meet the needs of the population.
      i. All the cups must be filled with water, then emptied into the Doña Ana County Population graduated cylinder. The winning team is the one with the most water in their graduated cylinder at the end.
      ii. Cups labeled "surface water" must be filled from the surface water container. All other cups will be filled from the groundwater container.
      iii. Students will line up in front of their station, Year of Plenty or Year of Drought.
      iv. The first student in line will fill one cup with water from either the groundwater or surface water container, then move to the back of the line. If water is running low, students may need to make choices about which cup should be filled first.
      v. The next students will do the same until all the cups have been filled.
      vi. Once all the cups have been filled, the next student in line will pour one cup into the Doña Ana County Population graduated cylinder, then move to the back of the line.
      vii. The next students will do the same until all the cups have been emptied.
      viii. Once all of the cups have been emptied into the Population graduated cylinder, the process is repeated until water or time runs out.
   b. The amount of water each group has depends on whether it is a year of plenty or a year of drought. However, the demand of the population as a whole is constant, represented by the graduated cylinder. Each group is trying to meet the population's needs by filling up the graduated cylinder.
   c. Each team will do their best to fill the cups in order to meet the needs of Doña Ana County then pour their filled cups into the graduated cylinder for the population.
   d. Team members can keep pouring water into the cups and then from the cups into the graduated cylinders until they run out of water or time, whichever comes first. People want their water needs met instantly, so we will only have three minutes to get water to the population.
   e. ***Set timer for three minutes –*** Students in the relay will follow the instructions to pour water from the containers to the cups to the cylinders during this time until they run out of water or time is up.
   f. Water for the year of plenty will overflow the population container to indicate that there was plenty of water to meet the needs of the population. Water for the year of drought will be limited, and students will have to make decisions about where to allocate their water.
2. **Slide 9**: what is the main lesson from this demonstration?
   a. Refer to the year of plenty and then to the year of drought and ask the class the following:
      i. Was there enough water to support the citizens of Doña Ana County? Were you able to fill up the Population graduated cylinder?
      ii. Was there any waste (spills)? Did it matter?

OPTION 2: WATER ALLOCATION VIDEO

PREPARATION

1. Set up a computer and projector or student computers, and ensure the ability to watch and project the YouTube video.
2. Alternatively, you can set up an assignment using your virtual learning platform (Canvas, Google Classroom, etc.).
   a. Students will need access to the Water Allocation Video.
   b. Suggested text for online assignment: Learn about how water is used in New Mexico by watching this video: https://youtu.be/28RfGMvr_QM

PROCEDURES

1. Have students watch the Water Allocation Video (4:38 minutes). This can be done in class using a projector or student computers. Alternatively, the video can be assigned as an online assignment or as homework. The video discusses the six major water use categories (residential, agricultural, livestock, commercial, industrial & mining, and power), introduces the unit acre-feet, and demonstrates that water is a scarce resource in New Mexico.

WATER ALLOCATION VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

To help prepare you for the Water Conservation Data Jam, we're going to learn about water use by six major water users in Doña Ana County, New Mexico. We'll be looking at the major water users of Doña Ana County because these are common major water users throughout New Mexico.

To learn about these water users, we'll watch a water allocation race. In this race, we'll see data of water use from Doña Ana County's residential, agricultural, livestock, commercial, industrial and mining, and power sectors.

Before we watch the water allocation race, let's talk about how it's set up. As you can see there are various containers in this race. Each container represents something related to water use. The goal of the race is to fill up the beaker for the population of Doña Ana County. If the beaker is full, that means everyone has enough water.

To meet these needs, we get our water from lakes and rivers, and the majority of our water comes from underground.

As you can see in a "Year of Plenty," there's more water available than in a "Year of Drought."

This race will use data on the totals of water use in the year 2015 and is measured in acre-feet. An acre-foot is equivalent to one foot of water covering a football field from goal post to goal post. One acre-foot equals 325,851 gallons of water in volume. Doña Ana County uses 382,501 acre-feet each year. That's more than 124 billion gallons!

Ten cups will represent the total amount of water needed for Doña Ana County and the different ways people use water. Human needs are considered residential use and is represented by one cup. This is the water we use in our homes for washing, cooking, and everything else. Irrigated agricultural use by farmers growing food, and use by livestock like cows and chickens are combined for this race. Agriculture and livestock is the largest water user in Doña Ana County and will be represented by eight cups. Water use for industry, commercial, mining, and power will also be combined since they use the least amount of water and will be represented by one cup. This is water used in restaurants and schools, constructing buildings and highways, and power plants that generate electricity.

The amount of water we have depends on whether it is a "Year of Plenty" or a "Year of Drought." However, the need for water doesn't go down during a drought year. Each participant for the "Year of Plenty" and the "Year of Drought" will do their best to fill the cups in order to fill the needs of Doña Ana County, then pour their filled cups into the beaker for the population.

People want their water needs met instantly, so they will only have two minutes to get water to the population.

Ready? Set? Water!

The participant on the left is operating in a "Year of Plenty," and the participant on the right is operating in a "Year of Drought." They have their ten cups for the different water needs and their beaker for the total population needs. They are filling up the cups to try and fill the beaker and can continue to pour water until they are out of water or out of time, whichever comes first.

As we can see, water for the "Year of Plenty" is overflowing and shows that there was plenty of water to meet the needs of the population.

On the other hand, water for the "Year of Drought" wasn't enough to fill the population container. Decisions had to be made on where to place, or how to allocate, the water.

You saw in the race that water is used in many different ways, and there's not always enough to fulfill all of our needs.

In the Water Conservation Data Jam, you'll continue to explore the data used in the race.

Have fun jamming!
[background music]

Water Conservation

Data Jam

DESCRIPTION

Students work together to solve and open a breakout box, which represents a water issue affecting a community. Students play the roles of various stakeholders with specific water needs and complete an activity to open a lock on the breakout box. The information learned by each stakeholder group is then reported to the whole class during a newscast-style session.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Understand the importance of community collaboration in tackling water issues and implementing conservation strategies

TIME
30 MINUTES

MATERIALS

- Copies of Stakeholder Breakout Box handouts [1 set for every 6 students]
- Copies of H_2O News handout [1 per student]
- PowerPoint presentation
- Computer and projector for educator
- Stakeholder Scenario Pages, printed double sided, marked with invisible ink pen (as explained in Preparation section), laminated for durability if desired [1 class set]
- Set of Pecan Farmer Scenario Cards, printed double sided (long-edge left), cut on lines, marked with invisible ink pen (as explained in Preparation section), laminated for durability if desired [1 class set]
- Set of Reporter handouts, cut in half, laminated if possible [if laminated: 1 set to reuse with every class; if not laminated: 1 set for each class]
  - If Reporter handouts are laminated, one set of 7 thin wet-erase markers are also needed
- News Anchor handout, copied double sided, laminated if possible [if laminated: 1 to reuse with every class; if not laminated: 1 for each class]
- 12" toolbox with top tray (Figure 1), such as the one found at this link
- Lock-out hasp (Figure 2), such as the one found at this link
- Black 4-digit, set-your-own combination lock (Figure 2), such as the one found at this link
- Blue 4-digit, set-your-own combination lock (Figure 2), such as the one found at this link
- Pink 4-digit, set-your-own combination lock (Figure 2), such as the one found at this link
- 3-digit, set-your-own combination lock (Figure 2), such as the one found at this link
- 4-letter word, set-your-own combination lock (Figure 2), such as the one found at this link
- Directional set-your-own combination lock (Figure 2), such as the one found at this link
- Two black lights (Figure 3), such as the one found at this link
- Invisible ink, black-light pen (Figure 3), such as the one found at this link
- Prizes for entire class [1 set per class]
  - These can include stickers for water bottles (Figure 4), collapsible water bottles, water bottle holders, wrapped snacks, or any other small prize.



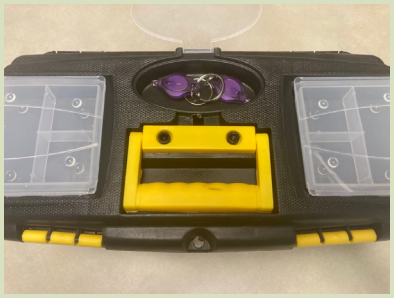


Figure 1. 12" toolbox with top tray to be used as the breakout box

Figure 2. Lock hasp and locks

Figure 3. Invisible ink pen and lights

Figure 4. Example breakout box prizes

PREPARATION

1. Set up a computer and projector and display the PowerPoint presentation.
2. Use the instructions included with the locks to set them up with the following combinations.
   - o Black 4-digit combination lock: 2 6 4 2
   - o Blue 4-digit combination lock: 3 0 2 2
   - o Pink 4-digit combination lock: 2 5 9 1
   - o 3-digit combination lock: 2 2 4
   - o Word lock: B E E S
   - o Directional lock: ⇦ ⇦ ⇧ ⇧
3. Cut the Pecan Farmer Scenario Cards on the lines. Draw the arrows indicated below on the back of each of the listed cards with the invisible ink, black-light pen, and then laminate for durability if desired.
   - o Growers should know the soil type = ⇦
   - o The first watering of the year is very important = ⇦
   - o The age of the pecan tree affects its water needs = ⇧
   - o High summer temperatures equal a high water demand for pecans = ⇧
4. On side two of the Landscape Designer Stakeholder Scenario Page (Figure 5), use the invisible ink, black-light pen to write the following letters in invisible ink in the Water Use column of the Tree and Shrub Guide table for the indicated species. See the answer key for clarification if needed.
   a. *Prosopis velutina*, velvet mesquite, in the Water Use column, below the word "low," write "E" (which is the student's answer for #2).

TREE AND SHRUB GUIDE

SCIENTIFIC NAME	COMMON NAME	COLOR	PLANT TYPE	WATER REQUIREMENTS	VISITED BY OR HOSTS POLLINATORS
Rosa ausmus	*rose bush*	purple, red, white, yellow, or pink flowers	shrub	high K	butterflies
Populus deltoides	*eastern cottonwood*	green leaves	tree	high E	bees and flies
Prosopis velutina	*velvet mesquite*	greenish-yellow leaves	tree	low E	bees, flies, and butterflies
Salix babylonica	*weeping willow*	leaves are green and whitish on underside	tree	high Y	bees and butterflies
Buddleja buddleja	*butterfly bush*	green, purple, white, orange, or pink flowers	shrub	medium T	bees, hummingbirds, and flies
Chilopsis linearis	*desert willow*	whitish tinged with purple flowers	tree	low B	bees, butterflies, and hummingbirds
Leucophyllum frutescens	*Texas barometer bush*	purple flowers	shrub	low E	bees and hummingbirds
Yucca torreyi	*Torrey's yucca*	white to cream flowers	yucca	low R	yucca moths
Cylindropuntia imbricata	*tree cholla*	magenta flowers	cactus	low A	cactus bees
Purshia mexicana	*Mexican cliffrose*	yellowish-white flowers	shrub	low S	bees and flies

Figure 5. Back side of Landscape Designer Stakeholder Scenario Page - all letters should be in INVISIBLE INK

b. *Chilopsis linearis*, desert willow, in the Water Use column, below the word "low," write "B" (which is the student's answer for #1).
c. *Leucophyllum frutescens*, Texas barometer bush, in the Water Use column, below the word "low," write "E" (which is the student's answer for #3).
d. *Purshia mexicana*, Mexican cliffrose, in the Water Use column, below the word "low," write "S" (which is the student's answer for #4).
e. For all of the other species, write the letters T, R, and A in the Water Use column, below the word "low" and "medium". Then write the letters K, E, and Y in the Water Use column, below the word "high."

5. Laminate the Stakeholder Scenario Pages for durability if desired.
6. Cut the Reporter handouts in half. Laminate for reuse if possible.
7. Assemble the breakout box.
   a. The locking loop on the toolbox may need to be expanded to fit the hasp. This can be done with a 5/16-inch drill bit.
   b. Place the prizes inside the breakout box.
   c. Hook the hasp through both parts of the locking loop on the front of the toolbox.
   d. Add the locks to the lockout hasp (Figure 6). The locks can be placed on the hasp in any order.

Figure 6. Locks on the hasp

8. Place the breakout box in a visible location to generate student interest.
   a. Make sure the breakout box is easily accessible because one student from each group will be attempting to open one of the locks.
   b. During the activity, plan to station an instructor near the breakout box to assist with the locks.
9. Plan to assign students to one of the following stakeholder groups. It is best if there are at least two people in each of the six stakeholder groups. Consider the difficulty level listed below when assigning students to groups.
   a. Landscape Designer – easy
   b. Pecan Farmer – easy
   c. Wildlife Biologist – medium
   d. Community Member – medium
   e. NM Environment Department – difficult
   f. Homeowner - difficult
   g. News Reporter, one student per stakeholder group – easy
      i. Each stakeholder group will need one student to act as the news reporter for their group. The news reporter must be capable of working with their stakeholder group and also completing the corresponding reporter handout simultaneously. Each reporter will deliver the information collected on the reporter handout during the H_2O News newscast session of the class period.
   h. News Anchor, one student per class – easy
      i. The news anchor (one student per class) will also be part of one of the stakeholder groups. The news anchor must visit each of the other stakeholder groups and record the name of the student acting as reporter in each of the groups. The news anchor will coordinate and lead the delivery of the information collected on the Reporter handouts during the H_2O News newscast session the end of the class period. The stakeholder group that has the news anchor will have two students participating in the newscast: the news anchor and a reporter.
10. Organize the Stakeholder Breakout Box handouts and Stakeholder Scenario Pages.
    a. Sort the Stakeholder Breakout Box handouts by stakeholder group and be prepared to pass them out to each of the six groups during class. The number of copies needed per group will vary, depending on how many students will be assigned to each of the six stakeholder groups.
    b. Place the corresponding Stakeholder Scenario Page with each of the stacks of Stakeholder Breakout Box handouts.
11. Plan to pass out a H_2O News handout to each student just before the H_2O News newscast session near the end of class.

PROCEDURES

Breakout Box Introduction

1. Play the slideshow in PowerPoint, and select "use timings" in the slideshow settings.
2. **Slide 1**: we will be unlocking a breakout box with prizes for everyone inside. This breakout box requires that you work together and think critically to solve water conservation issues. Your success with opening the box will depend a great deal on collaboration, critical thinking, and communication. Similarly, your success with the Water Conservation Data Jam project is dependent on collaboration, creativity, critical thinking, and communication.
3. **Slide 2**: everyone in your stakeholder group will work together to solve your assigned tasks. You can divide the work, work together, or volunteer for different tasks. Work quickly and

be aware of time because time is limited.

4. **Slide 3**: there are six stakeholder groups, one for each lock on the breakout box.
5. Divide students into six stakeholder groups. Pass out the sorted Stakeholder Breakout Box handouts and Stakeholder Scenario Pages to the corresponding groups.
6. **Slide 4**: one member of each group will also be a reporter who will collect the information from her/his stakeholder group and report it during the Daily H_2O News newscast at the end of class. Additionally, there will be one news anchor to coordinate and lead the delivery of the information collected during the H_2O News newscast. Reporters and the news anchor should be prepared for public speaking and must be able complete their group work in addition to an extra, simple handout.
7. Assign or ask for volunteers to play the role of six reporters and one news anchor.
   a. One reporter is needed from each stakeholder group.
   b. All news reporters and the anchor will work with a stakeholder group to collect the information on their handout to report on the news.
   c. Plan to also appoint one student as news anchor within one of the stakeholder groups. This stakeholder group will have two students take part in the newscast session at the end.
8. Pass out the Reporter handouts to the reporters in each group, being sure to give them the handout that corresponds to their stakeholder group, and pass out the News Anchor handout to the news anchor.
9. **Slide 5**: each group has a different Stakeholder Breakout Box handout. Everyone in your group, including the reporter and anchor, if applicable, should have the same handout. Your group also has one Stakeholder Scenario Page. It contains all of the clues you will need to solve the questions on your Stakeholder Breakout Box handout and figure out the combination for your team's lock. The reporter in your group will use the Reporter handout to record the information needed for delivering their report during the newscast session at the end of the class.
10. **Slide 6**: make sure to work together to answer the questions on your handouts so you can open your lock for the breakout box. You will determine the combination for your team's lock by answering the questions. Have your answer checked before attempting to open the lock for your team. Ask for help if you need it.

Solving the Breakout Box

1. ***Slide 7***: you have will 20 minutes to complete the breakout box challenge and open the box. Once you believe that you are ready to try to open your lock, try it on the lock. If it does not work, check your worksheet and try again. Ask for help if you need it.
   a. Your 20 minutes will begin when the raindrops appear. [Click to make raindrops appear on the screen.] Each raindrop will disappear after four minutes. When all of the raindrops disappear, time will be up.
2. While students are completing their Stakeholder Breakout Box handouts:
   a. Visit all groups regularly to check for understanding and clarify instructions as needed.
   b. Ensure that the reporter in each group is completing the Reporter handout.
   c. Ensure that the news anchor is visiting the other groups to record the names of each of the reporters on the News Anchor handout.
3. Check each stakeholder group's answers using the Stakeholder Breakout Box handouts answer key if student groups are unable to open their lock on a second attempt.
4. Allow one student from each group to attempt to open their lock.
5. End the activity after 20 minutes.
6. Once the last lock is off, do not allow the students to open the breakout box. Leave the hasp attached to the box.

H_2O News

1. Once the locks are off, the news anchor and news reporters will present their reports.
2. Pass out the H_2O News handout to each student.
3. Direct the news anchor and reporters to come to the front of the classroom to conduct the newscast session. The news anchor will lead the session from their handout.
4. **Slides 8-14**: the news anchor and reporter from each group will now come up to the front of the class. Bring your News Anchor and Reporter handouts. As they deliver the newscast, everyone in class will fill out the H_2O News handout with the information from the reports. The news anchor will now begin.
   a. **Slide 9**: after the anchor delivers the introduction, the reporter from the New Mexico Environment Department will present their report. [For Slides 9-14, click to make the answers appear one at a time as the reporter reveals them.]
   b. **Slide 10**: the reporter from the pecan farmer group will present their report.
   c. **Slide 11**: the reporter from the homeowner group will present their report.
   d. **Slide 12**: the reporter from the landscape designer group will present their report.
   e. **Slide 13**: the reporter from the community member group will present their report.
   f. **Slide 14**: the reporter from the wildlife biologist group will present their report.
5. **Slide 15**: now that we have heard the news report, the news anchor

will open the breakout box to reveal and pass out the prizes inside the box.

a. This collaboration was a type of cooperative learning.
b. This activity illustrated that as your groups worked together to learn or solve a problem, the whole class worked toward a bigger solution.
c. The small groups were essential to this process because they showed us how smaller groups are necessary to solve the bigger issue of water conservation.

Name: _____ Date: _____ Period: _____

NEW MEXICO ENVIRONMENT DEPARTMENT - DISTRICT 3 MANAGER

Use the Stakeholder Scenario Page to answer the questions below. Rounding ***must be done*** on all final answers.

1. How much of the lot (in ft^2) is covered by impermeable surfaces? Add the area of the house, sidewalk, garage, and shop.

2. Fill out the table to calculate how much of the annual precipitation that falls on the lot becomes surface runoff. The amount of surface runoff depends on the surface type. The harder the surface, the more runoff is generated. All of the water that falls on impermeable surfaces becomes runoff, but only part of the water that falls on permeable surfaces becomes runoff.

SURFACE TYPE	AREA COVERED BY SURFACE TYPE (FT^2)	x	AMOUNT OF RAIN (FT)	x	AMOUNT THAT BECOMES RUNOFF *(the percent in numerical form)*	= TOTAL RUNOFF IN (FT^3) *(round to whole numbers)*
Impermeable surfaces (pavement, buildings, sidewalks, parking lots) 100% runoff	*(answer to question 1)*	x	0.83 ft	x	1	=
Permeable surfaces (lawns, gravel) 60% runoff	*(total lot area minus the area covered by impermeable surfaces)*	x	0.83 ft	x	0.60	=

3. How much total runoff does the lot generate? (Add the rounded total runoff amounts in ft^3.)

4. As the Manager for the New Mexico Environmental Department, you will develop a public service announcement to educate homeowners on how to reduce runoff from their lots. **Rain gardens** are arrangements of landscape plants designed to absorb water so none of it becomes runoff. If 50% of the permeable surface on the lot were to be replaced by a rain garden, how much total runoff would be generated by the lot?

_____ ft^3 x 0.50 = _____ ft^3 + _____ ft^3 = _____ ft^3 total runoff
Total permeable runoff from #2 | *Round up to a whole number* | *Total impermeable runoff from #2*

5. Runoff affects water quality and often pollutes water that animals, plants, and people depend on. Less runoff means better habitats for wildlife and cleaner water for people.

   a. How many cubic feet (ft^3) of water did not become polluted runoff water because of using a rain garden? (Subtract the rain garden runoff amount from the total runoff of the lot.)

   1 ft^3 = 7.48 gallons

   _____ ft^3 were not polluted

   b. Convert the answer in ft^3 from 5a to gallons.

   _____ gallons were not polluted (rounded to the nearest whole number)

TO OPEN YOUR PINK 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the *first two digits* from your answer to question 1 and the *last two digits* from question 5b.

_____ _____ _____ _____

Name: _____ Date: _____ Period: _____

COMMUNITY MEMBER

After reading your water meter, the utility company sends you a bill. Read the Stakeholder Scenario Page about water bills, and use the information to answer the questions.

1. What is the reading on the Hersey Manufacturing Co. dial? _____

2. Look at the columns under *Meter Readings* on the **Sample Water Bill**. These figures show water use in hundreds of cubic feet (Ccf). What was the most recent reading recorded by the meter technician? _____

3. The *Service Date* indicates the service period covered by this bill. The last date is the day the meter was read. When was the meter read last on the **Sample Water Bill**?

   _____

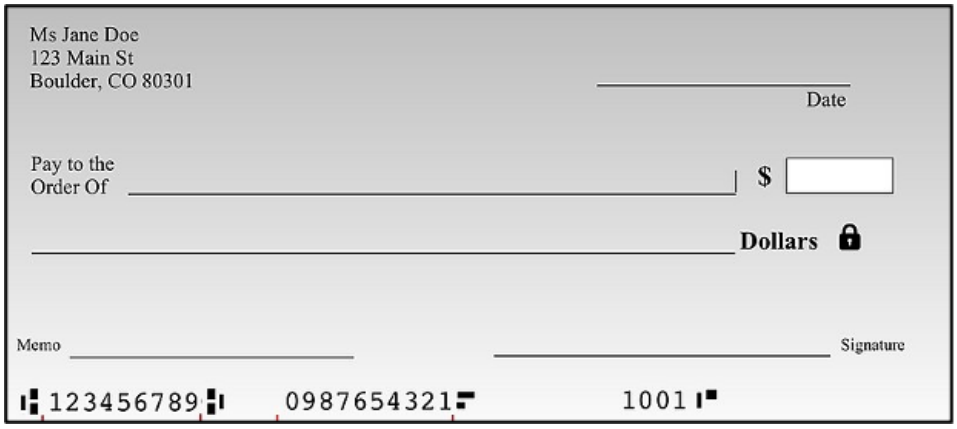
4. The *Units* column indicates hundreds of cubic feet (Ccf) of water used. How many units in Ccf of water were used in this service period on the Sample Water Bill from the bill date: Oct. 17, 2002? _____

167 Ccf = 16,700 cubic feet 1 cubic foot = 7.48 gallons

   How many gallons of water is this? _____

5. According to the **Las Cruces Water Bill**, in which month did this customer use the most water? _____

6. Once you have received your **Las Cruces Water Bill**, you must pay it. Using the Sample Check as a guide, fill out the check using the *Total Charges for Water Service* from the Las Cruces Water Bill.



TO OPEN YOUR BLUE 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the four digits of the amount of the check you wrote in question 6.

_____ _____ _____ _____

Name: _____ Date: _____ Period: _____

HOMEOWNER

1. Using the *Water-Conserving Method Answer Bank* on the Stakeholder Scenario Page, fill in the blank spaces in the table below. Read the choices in the answer bank very carefully to determine how many gallons of water are used for each of the activities when using water-conserving methods.

ACTIVITY	CONVENTIONAL METHOD (WATER USE IN GALLONS)	WATER-CONSERVING METHOD (WATER USE IN GALLONS)	AVERAGE USE
Brushing teeth	2 gallons (water running while brushing teeth)	_____ gallons	2x daily
Flushing the toilet	3.5 gallons (each flush)	1.3 gallons	5x daily
Showering	50 gallons (conventional showerhead, 10 minutes)	12.5 gallons	10 minutes daily
Washing dishes by hand	30 gallons (tap water running while washing/rinsing)	_____ gallons	1x daily
Laundry (washing machine)	35 gallons/load (highest water level, partial load)	25 gallons	2x weekly

2. By using only **water-conserving methods**, how many gallons of water per week does one person use? **Fill in the blanks below.**

ACTIVITY	WATER-CONSERVING METHOD (WATER USE IN GALLONS)		AVERAGE USE	TIME PERIOD		GALLONS/WEEK
Brushing teeth	_____ gallons	x	2 times/day	7 days/week	=	_____ gal/week
Flushing the toilet	1.3 gallons	x	5 times/day	7 days/week	=	_____ gal/week
Showering	12.5 gallons	x	1 time/day	7 days/week	=	_____ gal/week
Washing dishes by hand	_____ gallons	x	1 time/day	7 days/week	=	_____ gal/week
Laundry (washing machine)	25 gallons	x	2 times/week	1 week	=	_____ gal/week
				Total	=	_____ gal/week

3. How much water could one person save in one week by using water conserving methods instead of conventional methods, which use 780.5 gallons per week? (conventional minus conserving) _____

4. Another one of your responsibilities as a homeowner is checking for leaks. A constantly running toilet can waste 200 gallons a day. How many gallons will be wasted in 1 week? _____

5. How many 8 oz. glasses of water could you fill with the amount of water saved in 1 week by fixing a toilet leak?

1 gallon = 128 oz.

_____ gallons x 128 oz. per gallon ÷ 8 oz. per glass = _____

TO OPEN YOUR 3-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the first three digits of the answer to question 5.

_____ _____ _____

Name: _____ Date: _____ Period: _____

PECAN FARMER

You are a farmer in the Mesilla Valley of New Mexico who owns a pecan orchard. You are concerned about the best way to water pecans.

Read the Pecan Farmer Scenario cards and fill in the blanks below. After the blanks are filled, read the article below. Find the four cards that are listed in the content of the article. Put these four cards to the side, and keep them in the order they are listed in the article.

1. Good soil moisture in August will _____
2. Know _____
3. Drip irrigation can reduce _____
4. First watering is _____
5. Tree age affects _____
6. Pecan trees start producing nuts or seeds at _____ years
7. High temp = _____
8. One acre-foot will cover approximately the size of _____

TO OPEN YOUR DIRECTIONAL LOCK AND HELP YOUR COMMUNITY:
use the four cards in order from the article below. Keep them in order, and flip them over. The back of the cards will give you the directions for your directional lock in order. Request the black light from your instructor, and use it to discover your combination.

_____ _____ _____ _____

(EXCERPT FROM:)

WATER MANAGEMENT IN PECAN ORCHARDS

Herrera, E. A.; Sammis, T. (2001). *Water Management in Pecan Orchards*. NMSU Cooperative Extension Services. Guide H-652, p.1.

Watering pecan trees should entail more than just applying water to orchards every 14 to 21 days. Often growers ask what is the appropriate number of days between irrigations. But they should be more concerned with the best way to water the orchard.

First, growers should know the soil type and soil profile in each orchard block. Soil type and profile are very important in determining the soil's water-holding capacity. Clay soils hold more water and can be watered less often than sandy soils.

Second, apply a large amount at the first watering of the year. After that, the goal should be to replenish the water that has been used by the trees and lost to evaporation.

Third, tree age plays an important role in water needs. Trees in established or mature orchards demand more water than do young, growing trees.

Fourth, water demand at the beginning of the season is much less than in June and July, when temperatures are high, foliage is fully developed and pecan nuts are growing. Nuts are full of liquid for about six to seven weeks, beginning in about mid-July in Las Cruces, New Mexico.

Name: _____ Date: _____ Period: _____

WILDLIFE BIOLOGIST

You are a wildlife biologist working with the New Mexico Department of Game and Fish in the Chihuahuan Desert ecoregion. The Chihuahuan Desert ecoregion is separated into 31 different habitats. You manage two of them:

- Chihuahuan Desert Scrub (US National Vegetation Classification System Code M086)
- Warm-Desert Arroyo Riparian Scrub (US National Vegetation Classification System Code M092)

USE TABLE 1 ON THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 1 AND 2:

1. How many species in the Chihuahuan Desert Ecoregion are listed as immediate priority species?

   _____

2. Which taxon (animal group) has the most species listed as immediate priority? _____

USE TABLE 2 ON THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 3 AND 4:

3. How many Category I bird species are found in the Chihuahuan Desert Scrub habitat (code M086)?

   _____

4. How many Category I bird species are found in the Warm-Desert Arroyo Riparian Scrub habitat (code M092)?

   _____

   List their common names: _____

USE PAGE ONE OF THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 5 AND 6:

5. The grey vireo is most likely to be found in which of the habitats that you manage?

   _____

6. How might the habitat of the gray vireo be affected by drought?

   _____

TO OPEN YOUR BLACK 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use your answers to question 1 (two digits), question 3, and question 4.

_____ _____ _____ _____

Name: _____ Date: _____ Period: _____

LANDSCAPE DESIGNER

You are a landscape designer. Use the Tree and Shrub Guide on the Stakeholder Scenario Page to choose **low water use plants** that meet each of your client's requirements, and write down the common names of the best plants for your client in the empty spaces below.

1 _____ is a tree that attracts many pollinators.

3 _____ has purple flowers.

2 _____ is a small tree.

4 _____ attracts pollinators including flies.

CLIENT REQUIREMENTS

1. To line their driveway, they would like trees with flowers that attract many pollinators such as butterflies and hummingbirds.
2. They would like small trees in both the northeast and northwest corners of their lot, to provide privacy from neighbors.
3. They would like to look out their bedroom window and see a shrub with purple flowers that doesn't attract flies.
4. When they sit on their back patio, they would like to see yellowish-white flowers that attracts pollinators including flies.

TO OPEN YOUR WORD LOCK AND HELP YOUR COMMUNITY:

Once you have identified the plants you will use in your landscape design, request the black light from your instructor. Shine the light on the water requirements column of the Tree and Shrub Guide for the four plants you selected (in numerical order) to reveal the letters. Make sure you look at the plants in the order that they are listed by the numbers in the landscape design diagram. Write your word below:

_____ _____ _____ _____

ANSWER KEY

NEW MEXICO ENVIRONMENT DEPARTMENT - DISTRICT 3 MANAGER

Use the Stakeholder Scenario Page to answer the questions below. Rounding ***must be done*** on all final answers.

1. How much of the lot (in ft^2) is covered by impermeable surfaces? Add the area of the house, sidewalk, garage, and shop.

   2,580 ft^2

2. Fill out the table to calculate how much of the annual precipitation that falls on the lot becomes surface runoff. The amount of surface runoff depends on the surface type. The harder the surface, the more runoff is generated. All of the water that falls on impermeable surfaces becomes runoff, but only part of the water that falls on permeable surfaces becomes runoff.

SURFACE TYPE	AREA COVERED BY SURFACE TYPE (FT^2)	x	AMOUNT OF RAIN (FT)	x	AMOUNT THAT BECOMES RUNOFF *(the percent in numerical form)*	= TOTAL RUNOFF IN (FT^3) *(round to whole numbers)*
Impermeable surfaces (pavement, buildings, sidewalks, parking lots) 100% runoff	*2,580 ft^2* *(answer to question 1)*	x	0.83 ft	x	1	= *2,141 ft^3*
Permeable surfaces (lawns, gravel) 60% runoff	*5,420 ft^2* *(total lot area minus the area covered by impermeable surfaces)*	x	0.83 ft	x	0.60	= *2,699 ft^3*

3. How much total runoff does the lot generate? (Add the rounded total runoff amounts in ft^3.)

   4,840 ft^3

4. As the Manager for the New Mexico Environmental Department, you will develop a public service announcement to educate homeowners on how to reduce runoff from their lots. **Rain gardens** are arrangements of landscape plants designed to absorb water so none of it becomes runoff. If 50% of the permeable surface on the lot were to be replaced by a rain garden, how much total runoff would be generated by the lot?

   2,699 (ft^3) *Total permeable runoff from #2* x 0.50 = *1,350* (ft^3) *Round up to a whole number* + *2,141* (ft^3) *Total impermeable runoff from #2* = *3,491* ft^3 total runoff

5. Runoff affects water quality and often pollutes water that animals, plants, and people depend on. Less runoff means better habitats for wildlife and cleaner water for people.

   a. How many cubic feet (ft^3) of water did not become polluted runoff water because of using a rain garden? (Subtract the rain garden runoff amount from the total runoff of the lot.)

   4,840 − 3,491
   = 1,349 ft^3 were not polluted

   1 ft^3 = 7.48 gallons

   b. Convert the answer in ft^3 from 5a to gallons.

   1,349 x 7.48
   = 10,091 gallons were not polluted (rounded to the nearest whole number)

TO OPEN YOUR PINK 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the *first two digits* from your answer to question 1 and the *last two digits* from question 5b.

2 *5* *9* *1*

ANSWER KEY

COMMUNITY MEMBER

After reading your water meter, the utility company sends you a bill. Read the Stakeholder Scenario Page about water bills, and use the information to answer the questions.

1. What is the reading on the Hersey Manufacturing Co. dial? *984*

2. Look at the columns under *Meter Readings* on the **Sample Water Bill**. These figures show water use in hundreds of cubic feet (Ccf). What was the most recent reading recorded by the meter technician? *21,634 Ccf*

3. The *Service Date* indicates the service period covered by this bill. The last date is the day the meter was read.

   When was the meter read last on the **Sample Water Bill**?
   10/14/02

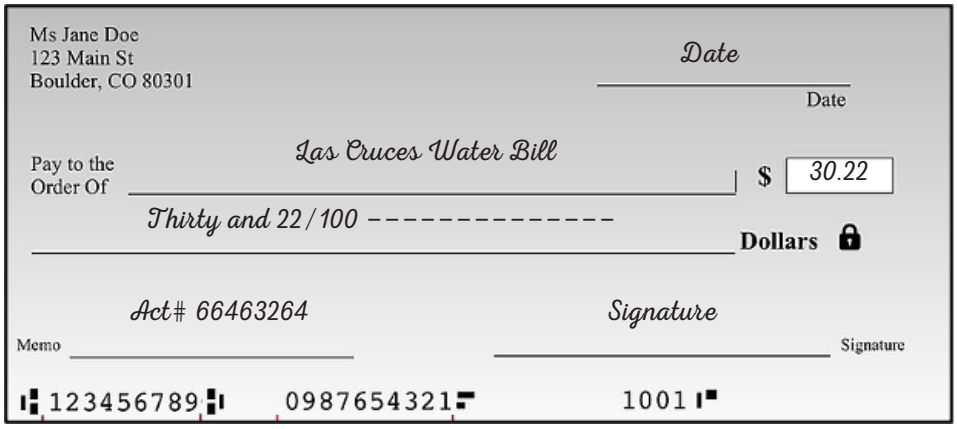
4. The *Units* column indicates hundreds of cubic feet (Ccf) of water used. How many units in Ccf of water were used in this service period on the Sample Water Bill from the bill date: Oct. 17, 2002? *167 Ccf of water*

167 Ccf = 16,700 cubic feet 1 cubic foot = 7.48 gallons

   How many gallons of water is this? *124,916 gallons*

5. According to the **Las Cruces Water Bill**, in which month did this customer use the most water? *July*

6. Once you have received your **Las Cruces Water Bill**, you must pay it. Using the Sample Check as a guide, fill out the check using the *Total Charges for Water Service* from the Las Cruces Water Bill.



TO OPEN YOUR BLUE 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the four digits of the amount of the check you wrote in question 6.

3 *0* *2* *2*

ANSWER KEY

HOMEOWNER

1. Using the *Water-Conserving Method Answer Bank* on the Stakeholder Scenario Page, fill in the blank spaces in the table below. Read the choices in the answer bank very carefully to determine how many gallons of water are used for each of the activities when using water-conserving methods.

ACTIVITY	CONVENTIONAL METHOD (WATER USE IN GALLONS)	WATER-CONSERVING METHOD (WATER USE IN GALLONS)	AVERAGE USE
Brushing teeth	2 gallons (water running while brushing teeth)	*0.25* gallons	2x daily
Flushing the toilet	3.5 gallons (each flush)	1.3 gallons	5x daily
Showering	50 gallons (conventional showerhead, 10 minutes)	12.5 gallons	10 minutes daily
Washing dishes by hand	30 gallons (tap water running while washing/rinsing)	*5* gallons	1x daily
Laundry (washing machine)	35 gallons/load (highest water level, partial load)	25 gallons	2x weekly

2. By using only **water-conserving methods**, how many gallons of water per week does one person use? **Fill in the blanks below.**

ACTIVITY	WATER-CONSERVING METHOD (WATER USE IN GALLONS)		AVERAGE USE	TIME PERIOD		GALLONS/WEEK
Brushing teeth	*0.25* gallons	x	2 times/day	7 days/week	=	*3.5* gal/week
Flushing the toilet	1.3 gallons	x	5 times/day	7 days/week	=	*45.5* gal/week
Showering	12.5 gallons	x	1 time/day	7 days/week	=	*87.5* gal/week
Washing dishes by hand	*5* gallons	x	1 time/day	7 days/week	=	*35* gal/week
Laundry (washing machine)	25 gallons	x	2 times/week	1 week	=	*50* gal/week
				Total	=	*221.5* gal/week

3. How much water could one person save in one week by using water conserving methods instead of conventional methods, which use 780.5 gallons per week? (conventional minus conserving) *559 gallons*

780.5 gallons/week – 221.5 gallons/week = 559 gallons per week saved

4. Another one of your responsibilities as a homeowner is checking for leaks. A constantly running toilet can waste 200 gallons a day. How many gallons will be wasted in 1 week? *1,400 gallons*

7 days/week x 200 gallons/day = 1,400 gallons per week wasted

5. How many 8 oz. glasses of water could you fill with the amount of water saved in 1 week by fixing a toilet leak?

1 gallon = 128 oz.

1,400 gallons x 128 oz. per gallon ÷ 8 oz. per glass = *22,400 glasses of water*

TO OPEN YOUR 3-DIGIT LOCK AND HELP YOUR COMMUNITY:
use the first three digits of the answer to question 5.

2 *2* *4*

ANSWER KEY

PECAN FARMER

You are a farmer in the Mesilla Valley of New Mexico who owns a pecan orchard. You are concerned about the best way to water pecans.

Read the Pecan Farmer Scenario cards and fill in the blanks below. After the blanks are filled, read the article below. Find the four cards that are listed in the content of the article. Put these four cards to the side, and keep them in the order they are listed in the article.

1. Good soil moisture in August will *help nuts reach optimum size*
2. Know *their soil type*
3. Drip irrigation can reduce *evaporative losses and labor*
4. First watering is *very important*
5. Tree age affects *how much water it needs*
6. Pecan trees start producing nuts or seeds at *seven* years
7. High temp = *high water demand*
8. One acre-foot will cover approximately the size of *a football field (in water 1 ft. deep)*

Ensure that the Directional Arrows are on the backs of the cards as listed below. Four cards put to the side, in order:

a. Know their soil type
Direction: ←

b. First watering is very important
Direction: ←

c. Tree age affects how much water it needs
Direction: ↑

d. High temp = high water demand
Direction: ↑

TO OPEN YOUR DIRECTIONAL LOCK AND HELP YOUR COMMUNITY:
use the four cards in order from the article below. Keep them in order, and flip them over. The back of the cards will give you the directions for your directional lock in order. Request the black light from your instructor, and use it to discover your combination.

← ← ↑ ↑

(EXCERPT FROM:)

WATER MANAGEMENT IN PECAN ORCHARDS

Herrera, E. A.; Sammis, T. (2001). *Water Management in Pecan Orchards*. NMSU Cooperative Extension Services. Guide H-652, p.1.

Watering pecan trees should entail more than just applying water to orchards every 14 to 21 days. Often growers ask what is the appropriate number of days between irrigations. But they should be more concerned with the best way to water the orchard.

First, growers should know the soil type and soil profile in each orchard block. Soil type and profile are very important in determining the soil's water-holding capacity. Clay soils hold more water and can be watered less often than sandy soils.

Second, apply a large amount at the first watering of the year. After that, the goal should be to replenish the water that has been used by the trees and lost to evaporation.

Third, tree age plays an important role in water needs. Trees in established or mature orchards demand more water than do young, growing trees.

Fourth, water demand at the beginning of the season is much less than in June and July, when temperatures are high, foliage is fully developed and pecan nuts are growing. Nuts are full of liquid for about six to seven weeks, beginning in about mid-July in Las Cruces, New Mexico.

ANSWER KEY

WILDLIFE BIOLOGIST

You are a wildlife biologist working with the New Mexico Department of Game and Fish in the Chihuahuan Desert ecoregion. The Chihuahuan Desert ecoregion is separated into 31 different habitats. You manage two of them:

- Chihuahuan Desert Scrub (US National Vegetation Classification System Code M086)
- Warm-Desert Arroyo Riparian Scrub (US National Vegetation Classification System Code M092)

USE TABLE 1 ON THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 1 AND 2:

1. How many species in the Chihuahuan Desert Ecoregion are listed as immediate priority species?

   26 species

2. Which taxon (animal group) has the most species listed as immediate priority? *Birds*

USE TABLE 2 ON THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 3 AND 4:

3. How many Category I bird species are found in the Chihuahuan Desert Scrub habitat (code M086)?

   4 bird species

4. How many Category I bird species are found in the Warm-Desert Arroyo Riparian Scrub habitat (code M092)?

   2 bird species

   List their common names: *Bendire' s thrasher and gray vireo*

USE PAGE ONE OF THE STAKEHOLDER SCENARIO PAGE TO ANSWER QUESTIONS 5 AND 6:

5. The grey vireo is most likely to be found in which of the habitats that you manage?

   Warm–Desert Arroyo Riparian Scrub

6. How might the habitat of the gray vireo be affected by drought?

   answers may vary but should include something about loss of habitat

TO OPEN YOUR BLACK 4-DIGIT LOCK AND HELP YOUR COMMUNITY:
use your answers to question 1 (two digits), question 3, and question 4.

2 *6* *4* *2*

ANSWER KEY

LANDSCAPE DESIGNER

You are a landscape designer. Use the Tree and Shrub Guide on the Stakeholder Scenario Page to choose **low water use plants** that meet each of your client's requirements, and write down the common names of the best plants for your client in the empty spaces below.

1 _Desert Willow_ is a tree that attracts many pollinators.

3 _Texas Barometer Bush_ has purple flowers.

2 _Velvet Mesquite_ is a small tree.

4 _Mexican Cliffrose_ attracts pollinators including flies.

CLIENT REQUIREMENTS

1. To line their driveway, they would like trees with flowers that attract many pollinators such as butterflies and hummingbirds.
2. They would like small trees in both the northeast and northwest corners of their lot, to provide privacy from neighbors.
3. They would like to look out their bedroom window and see a shrub with purple flowers that doesn't attract flies.
4. When they sit on their back patio, they would like to see yellowish-white flowers that attracts pollinators including flies.

As preparation for this, ensure that the letters are written on the page with the black-light (following the key and instructions for letters under the water requirements for the remaining plants).

TO OPEN YOUR WORD LOCK AND HELP YOUR COMMUNITY:

Once you have identified the plants you will use in your landscape design, request the black light from your instructor. Shine the light on the water requirements column of the Tree and Shrub Guide for the four plants you selected (in numerical order) to reveal the letters. Make sure you look at the plants in the order that they are listed by the numbers in the landscape design diagram. Write your word below:

_B_ _E_ _E_ _S_

Name: _____ Date: _____ Period: _____

H_2O NEWS

STAY TUNED TO H_2O NEWS FOR THESE IMPORTANT ANSWERS...

NEW MEXICO ENVIRONMENT DEPARTMENT

Buildings, rooftops, sidewalks, and parking lots are large areas that are impermeable and shed water quickly. This water is called runoff. One of the best ways to ensure clean water is to control the runoff surface where water first comes into contact with the land.

FOR YOUR INFORMATION

Our example average home site of 8,000 ft^2 and has 2,580 ft^2 of hard surface. All of the water that falls here becomes runoff. The remaining 5,420 ft^2 is permeable, and 60% of water from these surfaces is runoff. We get 0.83 ft of rain each year.

1. How many cubic feet of runoff are created from an average home site?

   _____ ft^3

2. What would be the total runoff if the lawn were converted to a rain garden?

   _____ ft^3

3. If we converted the saved runoff to gallons (multiply by 7.48), how many gallons would that equal? (round to the nearest whole number)

   _____ (Answer to #1) - _____ (Answer to #2) = _____ (Water saved) x _____ (gallons/ft^3) = _____ gallons

PECAN FARMER

Farmers use science and technology to produce the most food using the fewest resources possible. Many farmers are using water conserving irrigation methods. Pecan farmers take several factors into account when making decisions about irrigating their crops.

4. The four major things that pecan producers should be concerned about when deciding the best way to water their pecan crop are:

   a. Know _____

   b. First watering is _____

   c. Tree age affects _____

   d. High temp = _____

HOMEOWNER

On average, every member of a household uses about 164 gallons of water per day. One way to do our part to conserve this natural resource is to check for leaks and avoid wasting water.

5. A constantly running toilet can waste 200 gallons of water per day. How many gallons will be wasted in 1 week?

   _____

6. There are 128 ounces in a gallon. How many 8 oz. glasses of water could you fill with the amount of water saved in 1 week if you fixed this leak? _____

LANDSCAPE DESIGNER

One way to use water sensibly is to use less of our drinking water for lawns and gardens. Xeriscaping is an alternative to traditional landscaping that favors drought-tolerant plants. These can be just as beautiful as high-water-use plants, and they also attract native species of birds and other pollinators.

7. Two low-water-use plants that will attract hummingbirds are: (circle two)

DESERT WILLOW **WEEPING WILLOW** **VELVET MESQUITE** **TEXAS BAROMETER BUSH**

COMMUNITY MEMBER

Use the bill below to answer the following questions.

Account Number: 0216257-03098 Service from 7/11/02 to 10/14/02
Bill Date: Oct. 17, 2002

METER READINGS		CONSUMPTION INFORMATION			
Current	Previous	Units (Ccf)	Gallons	Days	Gallons/Day
21,634	21,467	167	124,916	96	1,301
	LAST YEAR	174	130,152	90	1,446

Cost per Ccf = $1.04 Please Pay This Amount $173.68

FOR YOUR INFORMATION
Every water company will produce a bill for the water used by the customer, whether you own or rent. The water bill will show use in units of hundreds of cubic feet or Ccf.

8. How much water, in units of Ccf, was used this period? _____

9. How many gallons of water is this? _____

WILDLIFE BIOLOGIST

Wildlife biologists regularly monitor wildlife species and habitats to identify priority species and to assess the impact of conservation methods.

TABLE 1
Adapted from Table 21 of the State Wildlife Action Plan for New Mexico; Number of Species of Greatest Conservation Need in the Chihuahuan Desert ecoregion.

	CATEGORY (REASON SPECIES IS LISTED AS SPECIES OF GREATEST CONSERVATION NEED)				
TAXON	IMMEDIATE PRIORITY	LIMITED HABITAT	SUSCEPTIBLE	DATA NEEDED	FEDERALLY LISTED
Amphibians	0	3	1	2	1
Birds	13	5	25	8	5
Crustaceans	0	0	0	13	2
Fish	7	2	3	0	8
Mammals	4	1	2	1	5
Molluscs	1	5	1	3	5
Birds	1	1	5	3	0

10. How many species in the Chihuahuan Desert Ecoregion are listed as Immediate Priority species? _____

11. Which bird species is threatened by water scarcity, which can result in loss of habitat? (circle one)

GAMBEL'S QUAIL **BENDIRE'S THRASHER** **ROAD RUNNER** **COOPER'S HAWK** **GRAY VIREO**

ANSWER KEY

H_2O NEWS

STAY TUNED TO H_2O NEWS FOR THESE IMPORTANT ANSWERS...

NEW MEXICO ENVIRONMENT DEPARTMENT

Buildings, rooftops, sidewalks, and parking lots are large areas that are impermeable and shed water quickly. This water is called runoff. One of the best ways to ensure clean water is to control the runoff surface where water first comes into contact with the land.

FOR YOUR INFORMATION

Our example average home site of 8,000 ft^2 and has 2,580 ft^2 of hard surface. All of the water that falls here becomes runoff. The remaining 5,420 ft^2 is permeable, and 60% of water from these surfaces is runoff. We get 0.83 ft of rain each year.

1. How many cubic feet of runoff are created from an average home site?

   4,840 ft^3

2. What would be the total runoff if the lawn were converted to a rain garden?

   3,491 ft^3

3. If we converted the saved runoff to gallons (multiply by 7.48), how many gallons would that equal? (round to the nearest whole number)

   4,840 (Answer to #1) - *3,491* (Answer to #2) = *1,349* (Water saved) x *7.48* (gallons/ft^3) = *10,091* gallons

PECAN FARMER

Farmers use science and technology to produce the most food using the fewest resources possible. Many farmers are using water conserving irrigation methods. Pecan farmers take several factors into account when making decisions about irrigating their crops.

4. The four major things that pecan producers should be concerned about when deciding the best way to water their pecan crop are:

   a. Know *the soil type*

   b. First watering is *very important*

   c. Tree age affects *its water needs*

   d. High temp = *high water demand*

HOMEOWNER

On average, every member of a household uses about 164 gallons of water per day. One way to do our part to conserve this natural resource is to check for leaks and avoid wasting water.

5. A constantly running toilet can waste 200 gallons of water per day. How many gallons will be wasted in 1 week?

   1,400 gallons

6. There are 128 ounces in a gallon. How many 8 oz. glasses of water could you fill with the amount of water saved in 1 week if you fixed this leak? *22,400 8 oz. glasses of water*

ANSWER KEY

LANDSCAPE DESIGNER

One way to use water sensibly is to use less of our drinking water for lawns and gardens. Xeriscaping is an alternative to traditional landscaping that favors drought-tolerant plants. These can be just as beautiful as high-water-use plants, and they also attract native species of birds and other pollinators.

7. Two low-water-use plants that will attract hummingbirds are: (circle two)

DESERT WILLOW **WEEPING WILLOW** **VELVET MESQUITE** **TEXAS BAROMETER BUSH**

COMMUNITY MEMBER

Use the bill below to answer the following questions.

Account Number: 0216257-03098 Service from 7/11/02 to 10/14/02
Bill Date: Oct. 17, 2002

METER READINGS		CONSUMPTION INFORMATION			
Current	Previous	Units (Ccf)	Gallons	Days	Gallons/Day
21,634	21,467	167	124,916	96	1,301
	LAST YEAR	174	130,152	90	1,446

Cost per Ccf = $1.04 Please Pay This Amount $173.68

FOR YOUR INFORMATION
Every water company will produce a bill for the water used by the customer, whether you own or rent. The water bill will show use in units of hundreds of cubic feet or Ccf.

8. How much water, in units of Ccf, was used this period? *167 Ccf*

9. How many gallons of water is this? *124,196 gallons*

WILDLIFE BIOLOGIST

Wildlife biologists regularly monitor wildlife species and habitats to identify priority species and to assess the impact of conservation methods.

TABLE 1
Adapted from Table 21 of the State Wildlife Action Plan for New Mexico; Number of Species of Greatest Conservation Need in the Chihuahuan Desert ecoregion.

	CATEGORY (REASON SPECIES IS LISTED AS SPECIES OF GREATEST CONSERVATION NEED)				
TAXON	IMMEDIATE PRIORITY	LIMITED HABITAT	SUSCEPTIBLE	DATA NEEDED	FEDERALLY LISTED
Amphibians	0	3	1	2	1
Birds	13	5	25	8	5
Crustaceans	0	0	0	13	2
Fish	7	2	3	0	8
Mammals	4	1	2	1	5
Molluscs	1	5	1	3	5
Birds	1	1	5	3	0

10. How many species in the Chihuahuan Desert Ecoregion are listed as Immediate Priority species? *26*

11. Which bird species is threatened by water scarcity, which can result in loss of habitat? (circle one)

GAMBEL'S QUAIL **BENDIRE'S THRASHER** **ROAD RUNNER** **COOPER'S HAWK** **GRAY VIREO**

STAKEHOLDER SCENARIO PAGE

NEW MEXICO ENVIRONMENT DEPARTMENT - DISTRICT 3 MANAGER

The New Mexico Environment Department is responsible for many aspects of environmental health, including ensuring that the water supply remains clean.

Soil is permeable, and when rain falls onto land, it soaks into the ground like water into a sponge. In urban areas, there are more impermeable surfaces that do not allow liquid to pass through. Rooftops, sidewalks, and parking lots are large areas that are impermeable and shed water quickly. This water is called runoff.

When water runs over impermeable surfaces, it can become contaminated with pollutants, which will then flow directly into our water supply. One of the best ways to ensure clean water is to control the runoff surface where the water first comes into contact with land.

Your job as District 3 Manager for the Environment Department is to analyze the runoff generated by impermeable surfaces on a typical home lot in Las Cruces, New Mexico. Las Cruces receives an average of approximately 10 inches of precipitation annually, which is equal to 0.83 feet.

Figure 1. Map of typical home lot in Las Cruces.
Photo: Las Cruces Claz.org

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STAKEHOLDER SCENARIO PAGE

COMMUNITY MEMBER

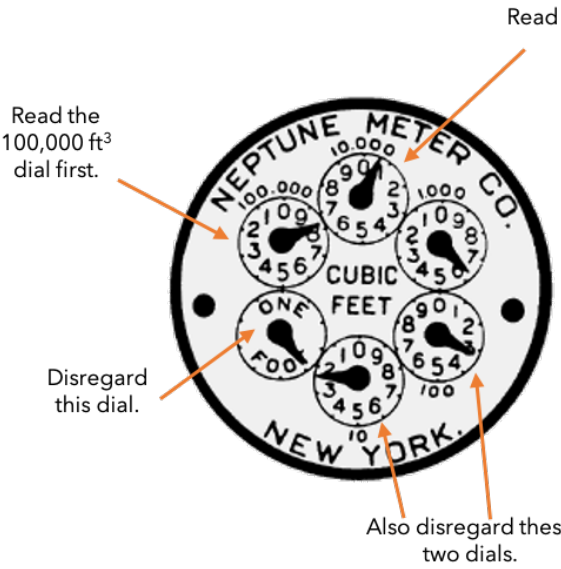
If you get water from your city's utility department, a meter technician comes to your home every month to read your water meter. Water meters are mechanical or electric. They are used to measure the flow of water for a residence in cubic feet or gallons. There are two common types of meters that are used.

Straight reading meters are read in the same way a speedometer is used in a car. Just read and record the number shown.

Read as 1,937 ft^3, or 1,937 Ccf, for this meter.

Picture from https://www.savingwaterpartnership.org/water-meter

Circular reading meters have six or seven dials. To read one, start with the dial that is measuring in the greatest volume (100,000 ft^3), then read the dials in descending order. The one-foot dial is a test dial that indicates leaks in a water system. <u>If the hand on any dial is between two numbers, record the lower number.</u> A water company will charge in units of 100 cubic feet (1Ccf), so meter readers either record the "100," "10," and "one foot" dials as "0" or just disregard them altogether.



Pictures from East Bay Municipal Utility

EXAMPLE:

In the circular reading meter above, start with 100,000 ft^3 and disregard the three dials indicated.

It reads: 8, 0, and 6.

The number of units for this reading is registered as **806**.

SAMPLE WATER BILL

Account Number: 0216257-03098
Bill Date: Oct. 17, 2002

Service from 7/11/02 to 10/14/02

METER READINGS		CONSUMPTION INFORMATION			
Current	Previous	Units (Ccf)	Gallons	Days	Gallons/Day
21,634	21,467	167	124,916	96	1,301
	LAST YEAR	174	130,152	90	1,446

Cost per Ccf = $1.04

Please Pay This Amount $173.68

SAMPLE CHECK

Ms Jane Doe
123 Main St
Boulder, CO 80301

Month Day, Year
Date

Pay to the Order Of Water Company $ 173.68

One-Hundred Seventy-Three and 68/100 ---------- Dollars

Memo Act # 0216257-03098

Jane Doe Signature

123456789 0987654321 1001

LAS CRUCES WATER BILL

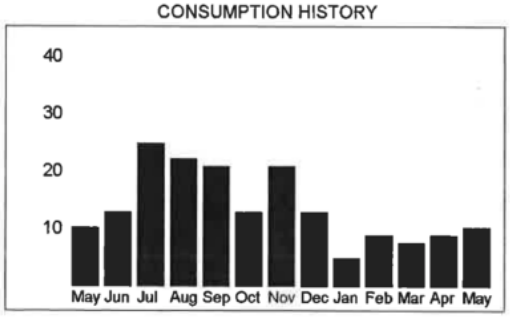
Water Service Current Charges

Billing Period Read Date
May 8

Rate Class
3000
WATER

Meter Number	Current Reading	Previous Reading	1000 Gallons Used
66463264	17	8	9

CONSUMPTION HISTORY



Access Fee		12.09
First	3000 gallons x $0.0000/1000 gallons	0.00
Next	6000 gallons x $2.5300/1000 gallons	15.18
Landscape/Irrigation Water Access Fee		0.00
Water Rights	9000 gallons x $0.1100/1000 gallons	0.99
Devel. Rate Ride	9000 gallons x $0.0000/1000 gallons	0.00
Litigation Rider	9000 gallons x $0.0000/1000 gallons	0.00
Water Franchise Fee		0.55
Governmental Gross Receipts Tax		1.41
Total Charges for Water Service		$30.22

STAKEHOLDER SCENARIO PAGE

HOMEOWNER

As a local homeowner, you are concerned with reducing water use in your household. You have done research and are compiling a list of potential actions you could take in your own home to reduce water consumption.

WATER-CONSERVING METHOD ANSWER BANK

25 gallons (lowest water level, full load)

0.25 gallons (use a glass of water to rinse teeth)

5 gallons (fill the sink for wash and rinse)

12.5 gallons (water-saving showerhead, 5 minutes)

1.3 gallons (use high-efficiency toilet)

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STAKEHOLDER SCENARIO PAGE

WILDLIFE BIOLOGIST

You are a wildlife biologist with the New Mexico Department of Game and Fish, and you use the most recent (2016) State Wildlife Action Plan for New Mexico to make decisions. One of your jobs is to monitor Species of Greatest Conservation Need (SGCN) in the Chihuahuan Desert ecoregion of the state. SGCN are species that are in danger of becoming endangered or threatened.

Your region covers 26,989 square miles and includes most of the southern third of New Mexico (Figure 1). The annual precipitation averages 10.4 inches and most of it falls in the summer.

Habitats for many SGCN and other wildlife species are dependent on available surface water. Drought, changing climate, and increased human populations often mean that maintaining enough water for wildlife species can be a challenge.

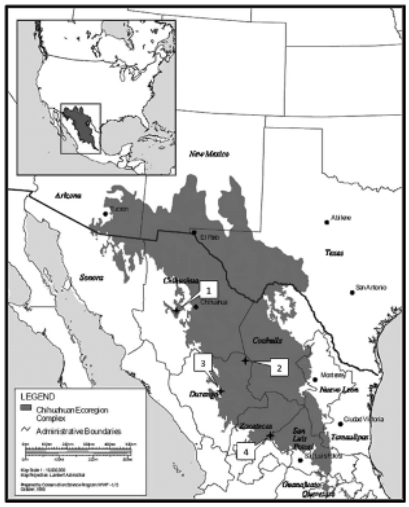

Figure 1. Map of the Chihuahuan Desert Ecoregion (Source: NPS.gov)

(SYNOPSIS FROM:)

ABUNDANCE AND HABITAT PREFERENCES OF GRAY VIREOS

Schlossberg, S.; Bollinger, E.K. (2006). *Abundance and habitat of gray vireos (vireo vicinior) on the Colorado plateau*. The American Ornithologists' Union. Vol. 123(1), p.33-44.

Gray vireos are a threatened species in New Mexico. Gray vireos live in open spaces with many piñon and juniper trees. Their territories are often near rocky slopes, arroyos, and steep hillsides. The main threat to the gray vireo is loss of its piñon-juniper habitats in New Mexico's desert regions.

Table 1. The number of Species of Greatest Conservation Need in the Chihuahuan Desert Ecoregion

TABLE 1
Adapted from Table 21 of the State Wildlife Action Plan for New Mexico; Number of Species of Greatest Conservation Need in the Chihuahuan Desert ecoregion.

	CATEGORY (REASON SPECIES IS LISTED AS SPECIES OF GREATEST CONSERVATION NEED)				
TAXON	**IMMEDIATE PRIORITY**	**LIMITED HABITAT**	**SUSCEPTIBLE**	**DATA NEEDED**	**FEDERALLY LISTED**
Amphibians	0	3	1	2	1
Birds	13	5	25	8	5
Crustaceans	0	0	0	13	2
Fish	7	2	3	0	8
Mammals	4	1	2	1	5
Molluscs	1	5	1	3	5
Birds	1	1	5	3	0

Table 2. 13 bird species categorized as Immediate Priority (Category I) in the Chihuahuan Desert ecoregion

TABLE 2 Adapted from Table 23 of the State Wildlife Action Plan: SGCN in the Chihuahuan Desert ecoregion				
COMMON NAME	**SCIENTIFIC NAME**	**TAXON**	**CATEGORY**	**HABITAT CODE**
Bendire's Thrasher	*Toxostoma bendirei*	Birds	I	M026, M027, M028, M051, M076, M082, M086, M087, M092, M093, M169, M170, M171, M887
Sprague's Pipit	*Anthus spragueii*	Birds	I	M051, M053, M087, M171
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	M010, M011, M026, M027, M034, M036, M049, M887
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	I	M051, M052, M053, M086, M087, M170, M171
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	I	M010, M011, M022, M027, M026, M028, M034, M049, M053, M169, M171, M887, M888
Flammulated Owl	*Psiloscops flammeolus*	Birds	I	M010, M011, M020, M022, M026, M027, M034, M036, M049, M051, M075, M168, M169, M171, M887
McCown's Longspur	*Rhynchophanes mccownii*	Birds	I	M053, M087, M171
Grace's Warbler	*Setophaga graciae*	Birds	I	M011, M022, M026, M027, M034, M036, M049, M171, M887
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	I	M010, M011, M020, M022, M026, M027, M034, M036, M049, M075, M076, M086, M091, M171, M887
Black-chinned Sparrow	*Spizella atrogularis*	Birds	I	M010, M026, M027, M091
Gray Vireo	*Vireo vicinior*	Birds	I	M010, M011, M022, M026, M027, M028, M034, M036, M049, M051, M082, M086, M087, M091, M092, M093, M169, M171, M887
Red-faced Warbler	*Cardellina rubrifrons*	Birds	I	M010, M011, M022, M034, M036, M887
Painted Redstart	*Myioborus pictus*	Birds	I	M010, M011, M022, M034, M036

You are a wildlife biologist working with the New Mexico Department of Game and Fish in the Chihuahuan Desert ecoregion. The Chihuahuan Desert ecoregion is separated into 31 different habitats. You manage two of them:

- **Chihuahuan Desert Scrub** (US National Vegetation Classification System Code **M086**)
  - This habitat is found mostly at elevations of approximately 3,000 – 6,500 feet. Desert-adapted shrubs like creosote bush and tarbush dominate it. Drought is relatively common in this habitat.

- **Warm-Desert Arroyo Riparian Scrub** (US National Vegetation Classification System Code **M092**)
  - This habitat is found along the edges of arroyos and other temporary waterways in the Chihuahuan Desert ecoregion. It is dominated by desert willow, Apache plume, and little-leaf sumac. Flash flooding occurs in this habitat, although there is very little moisture for most of the year.

STAKEHOLDER SCENARIO PAGE

LANDSCAPE DESIGNER

A landscape designer designs gardens and other outdoor spaces by planning the location of plants and structures within these environments. Landscape designers are responsible for ensuring that outdoor spaces are made to the specifications of their customers. Many landscape designers in the southwestern United States specialize in xeriscaping. Xeriscaping is a landscaping technique used in arid climates that uses plants that require very little water. Your company specializes in xeriscaping and is called "Xero the Hero Landscape Design."

Your company has been hired to landscape a home for a family in Las Cruces, NM. The lot has existing landscaping gravel and borders of perennial flowers (plants that live for multiple years) that can be integrated into the new design. The customers have made several requests for the new design. Because of the dry climate in southern New Mexico, they want you to use xeriscaping methods and therefore all plants you select must be low water use.

TREE AND SHRUB GUIDE

SCIENTIFIC NAME	COMMON NAME	COLOR	PLANT TYPE	WATER REQUIREMENTS	VISITED BY OR HOSTS POLLINATORS
Rosa ausmus	*rose bush*	purple, red, white, yellow, or pink flowers	shrub	high	butterflies
Populus deltoides	*eastern cottonwood*	green leaves	tree	high	bees and flies
Prosopis velutina	*velvet mesquite*	greenish-yellow leaves	tree	low	bees, flies, and butterflies
Salix babylonica	*weeping willow*	leaves are green and whitish on underside	tree	high	bees and butterflies
Buddleja buddleja	*butterfly bush*	green, purple, white, orange, or pink flowers	shrub	medium	bees, hummingbirds, and flies
Chilopsis linearis	*desert willow*	whitish tinged with purple flowers	tree	low	bees, butterflies, and hummingbirds
Leucophyllum frutescens	*Texas barometer bush*	purple flowers	shrub	low	bees and hummingbirds
Yucca torreyi	*Torrey's yucca*	white to cream flowers	yucca	low	yucca moths
Cylindropuntia imbricata	*tree cholla*	magenta flowers	cactus	low	cactus bees
Purshia mexicana	*Mexican cliffrose*	yellowish-white flowers	shrub	low	bees and flies

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ANSWER KEY

STAKEHOLDER SCENARIO PAGE

LANDSCAPE DESIGNER

A landscape designer designs gardens and other outdoor spaces by planning the location of plants and structures within these environments. Landscape designers are responsible for ensuring that outdoor spaces are made to the specifications of their customers. Many landscape designers in the southwestern United States specialize in xeriscaping. Xeriscaping is a landscaping technique used in arid climates that uses plants that require very little water. Your company specializes in xeriscaping and is called "Xero the Hero Landscape Design."

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TREE AND SHRUB GUIDE

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Buddleja buddleja	*butterfly bush*	green, purple, white, orange, or pink flowers	shrub	medium T	bees, hummingbirds, and flies
Chilopsis linearis	*desert willow*	whitish tinged with purple flowers	tree	low B	bees, butterflies, and hummingbirds
Leucophyllum frutescens	*Texas barometer bush*	purple flowers	shrub	low E	bees and hummingbirds
Yucca torreyi	*Torrey's yucca*	white to cream flowers	yucca	low R	yucca moths
Cylindropuntia imbricata	*tree cholla*	magenta flowers	cactus	low A	cactus bees
Purshia mexicana	*Mexican cliffrose*	yellowish-white flowers	shrub	low S	bees and flies

Photo: Ag In the Classroom

The age of the pecan tree affects its water needs.

Photo: Ag In the Classroom

It takes 7 years for pecan trees to start producing nuts or seeds.

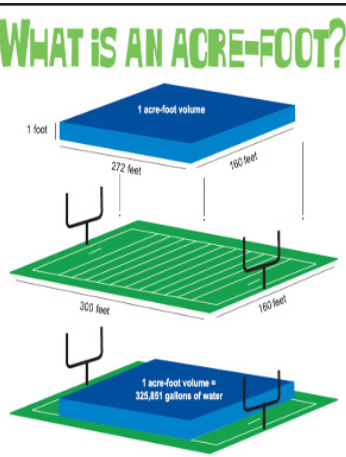


Photo: Texas Agriculture Education

One acre-foot of water will cover an acre, approximately the size of a football field, one foot deep.

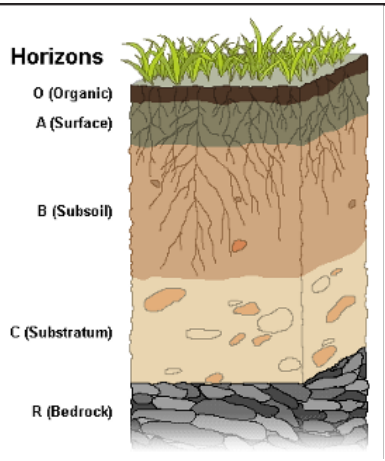


Photo: Wikipedia

Growers should know the soil type of their orchard.

Photo: Mesillablog.com

The first watering of the year is very important.

Photo: KRWG - Las Cruces, NM

Good soil moisture during August will help the nuts reach optimum size and diminish loss.

Photo: Newacespecan.com

High summer temperatures equal a high water-demand for pecans.

Photo: Ewingirrigation.com

Drip irrigation can make irrigation simpler, reduce evaporative losses, and reduce labor.

PECAN FARMER

PECAN FARMER

PECAN FARMER

PECAN FARMER

PECAN FARMER

PECAN FARMER

PECAN FARMER

PECAN FARMER

REPORTER #1: NM ENVIRONMENT DEPARTMENT

(Main Anchor will say, "(Your name) can you tell us more about water issues from an environmental perspective?")

I am the District 3 manager for the New Mexico Environment Department. In urban areas where there are more hard surface areas like buildings, sidewalks, and parking lots, rainwater runs off quickly. One of the best ways to make sure we have clean water is to control surfaces that can create runoff when it rains. An average size house with a sidewalk and a shed covers about 8,000 square feet. The amount of runoff from this surface would be _____ cubic feet. If we converted the lawn and gravel to a rain garden, runoff would be reduced to _____ cubic feet. A rain garden is a depressed area in the landscape that collects water from roof downspouts. That's approximately _____ gallons of water that we could avoid polluting.

REPORTER #2: PECAN FARMER

(Main Anchor will say, "We will now turn to (your name) who is in the field at a local pecan orchard.")

I am a pecan farmer. I know that watering pecan trees involves more than just a watering schedule. Pecan producers, like me, have four things to be concerned about when managing the best way to water pecans. First, growers should know _____. Second, the first watering of the year is _____ to replenish the trees and to be able to manage them from there. Third, the age of the tree affects _____. And fourth, summer's high temperatures result in_____. It takes seven years for pecan trees to start producing pecans, so water management in pecan orchards is important.

REPORTER #3: HOMEOWNER

(Main Anchor will say, "Let's go to (your name) in Las Cruces, who knows first-hand the effects water conservation can have.")

I am a homeowner here in town. I can't believe it! I just can't believe it! My toilet was constantly running for 1 week. Can you believe I wasted _____ gallons of water? That's _____ 8-ounce glasses of water. On average, one person uses 164 gallons of water a day. I learned that I could save _____ gallons a week just by switching over to simple water-conserving methods for everyday activities in my household. I'm glad I fixed my toilet. I want to do my part to conserve water.

REPORTER #4: LANDSCAPE DESIGNER

(Main Anchor will say, "Let's go live to (your name) for more water conserving tips.")

It's a beautiful day here in sunny New Mexico! As a landscape designer, I believe it's never too early to start thinking about those low-water-use plants. You don't have to sacrifice beauty for low water use. This gorgeous _____ _____ is a tree that attracts hummingbirds, which are important pollinators. The _____ _____ has purple flowers and also attracts hummingbirds. Remember, you can have a colorful yard with low water use plants.

REPORTER #5: COMMUNITY MEMBER

(Main Anchor will say, " ... we go live to an apartment building (your name) is going to tell us about our water bills.")

I live in an apartment here in town. Every water utility company produces a bill. Here is what you need to know about understanding it. Your water bill shows water use in hundreds of cubic feet. A utility worker reads this information on two different types of meters: a straight reading meter or a circular reading meter. I can see from my bill that the meter technician recorded that my most recent reading was _____ units. My bill from October said that I used _____ units, which equals _____ gallons. It is important to pay attention to those water bills. They can tell you if you have a leak and when your peak water use is.

REPORTER #6: WILDLIFE BIOLOGIST

(Main Anchor will say, "(Your name), what can you tell us about water conservation for New Mexico wildlife?")

I am a wildlife biologist with New Mexico Department of Game and Fish. My job is to examine the number of Species of Greatest Conservation Need in the Chihuahuan Desert. There are _____ species listed as Immediate Priority in this region. Of those in the Immediate Priority category, _____ bird species are found in the Chihuahuan Desert Scrub habitat. In comparison, there are _____ bird species in the Warm-Desert Arroyo Riparian Scrub habitat. Wildlife-friendly water management policies are important to help these species. If changes aren't made, birds like the _____ will continue to be threatened by water scarcity, which can result in loss of habitat.

H_2O NEWS ANCHOR

Anchor: Hello! This is _____. We begin our story this _____ with news of water
your name *morning/afternoon*

conservation initiatives from around _____. We are learning from breaking news from around the country
your city name

that on average the United States has low to medium water stress, but stakeholders in our city tell a different story.

According to World Resources Institute, the majority of the southwestern United States is in medium to extremely high

water-stress. New Mexico is the only state that is at an extremely high water-stress level. Our index is above 80%, which

means we can meet our water needs but have less than 20% in reserve. _____, can you tell us more
name of reporter #1

about water issues from an environmental perspective?

REPORTER #1: NM ENVIRONMENT DEPARTMENT

(Reporter ends with, "That's approximately 10,091 gallons of water that we could avoid polluting.")

Anchor: Thank you for that important information. This is something we all need to realize, that we need to

protect the soil and control runoff, especially from large areas like rooftops and parking lots. We will now turn to

_____ who is in the field at a local pecan orchard.
name of reporter #2

REPORTER #2: PECAN FARMER

(Reporter ends with, "It takes seven years for pecan trees to start producing, so water management in pecan orchards is

important.")

Anchor: Let's go to _____ in Las Cruces, who knows first-hand the effects water conservation can have.
name of reporter #3

REPORTER #3: HOMEOWNER

(Reporter ends with, "I want to do my part to conserve water.")

Anchor: Thank you for those great water saving tips that we can all use. Speaking of homeowners, let's not forget the

plants we put into our yards. Let's go live to _____for more water conserving tips.
name of reporter #4

REPORTER #4: LANDSCAPER

(Reporter ends with, "Remember you can have a colorful yard with low water use plants.")

Anchor: Thank you for that advice! Not far from our homeowner and designer, we go live to an apartment building where _____ is going to tell us about our water bills.
name of reporter #5

REPORTER #5: COMMUNITY MEMBER

(Reporter ends with, "They can tell you if you have a leak or when your peak water use is.")

Anchor: Thank you, it is always good advice to pay attention to those water bills! The last person we would like to speak with today is a wildlife biologist to learn about how water issues affect our wildlife. _____, what can
name of reporter #6
you tell us about water conservation for New Mexico wildlife?

REPORTER #6: WILDLIFE BIOLOGIST

(Reporter ends with, " … will continue to be threatened by water scarcity, which can result in loss of habitat.")

Anchor: Thank you to all who worked hard to provide this water conservation information.

(PAUSE and count to 10 in your head.)

WAIT A MINUTE!!! Our affiliate stations have just informed me, that due to the collaborative work of some individuals in _____ class who found solutions to many water conservation issues, they will be rewarded
teacher's name
with a water prize to remind them of the importance of water conservation. Thank you! This is _____
your name
signing off of this live update from H2O News.

ANSWER KEY

H_2O NEWS ANCHOR

Anchor: Hello! This is _____anchor ' s name_____. We begin our story this_____morning or afternoon_____ with news of water conservation initiatives from around _____city name_____. We are learning from breaking news from around the country that on average the United States has low to medium water stress, but stakeholders in our city tell a different story. According to World Resources Institute, the majority of the southwestern United States is in medium to extremely high water-stress. New Mexico is the only state that is at an extremely high water-stress level. Our index is above 80%, which means we can meet our water needs but have less than 20% in reserve. _____reporter #1 name_____, can you tell us more about water issues from an environmental perspective?

REPORTER #1: NM ENVIRONMENT DEPARTMENT

I am the District 3 manager for the New Mexico Environment Department. In urban areas where there are more hard surface areas like buildings, sidewalks, and parking lots, rainwater runs off quickly. One of the best ways to make sure we have clean water is to control surfaces that can create runoff when it rains. An average size house with a sidewalk and a shed covers about 8,000 square feet. The amount of runoff from this surface would be _____4,840_____ cubic feet. If we converted the lawn and gravel to a rain garden, runoff would be reduced to _____3,491_____ cubic feet. A rain garden is a depressed area in the landscape that collects water from roof downspouts. That's approximately _____10,091_____ gallons of water that we could avoid polluting.

H_2O NEWS ANCHOR

Anchor: Thank you for that important information. This is something we all need to realize, that we need to protect the soil and control runoff, especially from large areas like rooftops and parking lots. We will now turn to _____reporter #2 name_____ who is in the field at a local pecan orchard.

ANSWER KEY

REPORTER #2: PECAN FARMER

I am a pecan farmer. I know that watering pecan trees involves more than just a watering schedule. Pecan producers, like me, have four things to be concerned about when managing the best way to water pecans. First, growers should know _____*the soil type*_____. Second, the first watering of the year is _____*very important*_____ to replenish the trees and to be able to manage them from there. Third, the age of the tree affects _____*its water needs*_____. And fourth, summer's high temperatures result in_____*a high water demand*_____. It takes seven years for pecan trees to start producing pecans, so water management in pecan orchards is important.

H_2O NEWS ANCHOR

Anchor: Let's go to _____*reporter #3 name*_____ in Las Cruces, who knows first-hand the effects water conservation can have.

REPORTER #3: HOMEOWNER

I am a homeowner here in town. I can't believe it! I just can't believe it! My toilet was constantly running for 1 week. Can you believe I wasted _____*1,400*_____ gallons of water? That's _____*22,400*_____ 8-ounce glasses of water. On average, one person uses 164 gallons of water a day. I learned that I could save _____*559*_____ gallons a week just by switching over to simple water-conserving methods for everyday activities in my household. I'm glad I fixed my toilet. I want to do my part to conserve water.

H_2O NEWS ANCHOR

Anchor: Thank you for those great water saving tips that we can all use. Speaking of homeowners, let's not forget the plants we put into our yards. Let's go live to _____*reporter #4 name*_____for more water conserving tips.

ANSWER KEY

REPORTER #4: LANDSCAPER

It's a beautiful day here in sunny New Mexico! As a landscape designer, I believe it's never too early to start thinking about those low-water-use plants. You don't have to sacrifice beauty for low water use. This gorgeous _desert_ _willow_ is a tree that attracts hummingbirds, which are important pollinators. The _Texas barometer bush_ has purple flowers and also attracts hummingbirds. Remember, you can have a colorful yard with low water use plants.

H_2O NEWS ANCHOR

Anchor: Thank you, it is always good advice to pay attention to those water bills! The last person we would like to speak with today is a wildlife biologist to learn about how water issues affect our wildlife. _reporter #5 name_, what can you tell us about water conservation for New Mexico wildlife?

REPORTER #5: COMMUNITY MEMBER

I live in an apartment here in town. Every water utility company produces a bill. Here is what you need to know about understanding it. Your water bill shows water use in hundreds of cubic feet. A utility worker reads this information on two different types of meters: a straight reading meter or a circular reading meter. I can see from my bill that the meter technician recorded that my most recent reading was _984_ units. My bill from October said that I used _167_ units, which equals _124,916_ gallons. It is important to pay attention to those water bills. They can tell you if you have a leak and when your peak water use is.

H_2O NEWS ANCHOR

Anchor: Thank you, it is always good advice to pay attention to those water bills! The last person we would like to speak with today is a wildlife biologist to learn about how water issues affect our wildlife. _reporter #6 name_, what can you tell us about water conservation for New Mexico wildlife?

ANSWER KEY

REPORTER #6: WILDLIFE BIOLOGIST

I am a wildlife biologist with New Mexico Department of Game and Fish. My job is to examine the number of Species of Greatest Conservation Need in the Chihuahuan Desert. There are _26_ species listed as Immediate Priority in this region. Of those in the Immediate Priority category, _4_ bird species are found in the Chihuahuan Desert Scrub habitat. In comparison, there are _2_ bird species in the Warm-Desert Arroyo Riparian Scrub habitat. Wildlife-friendly water management policies are important to help these species. If changes aren't made, birds like the _gray vireo_ will continue to be threatened by water scarcity, which can result in loss of habitat.

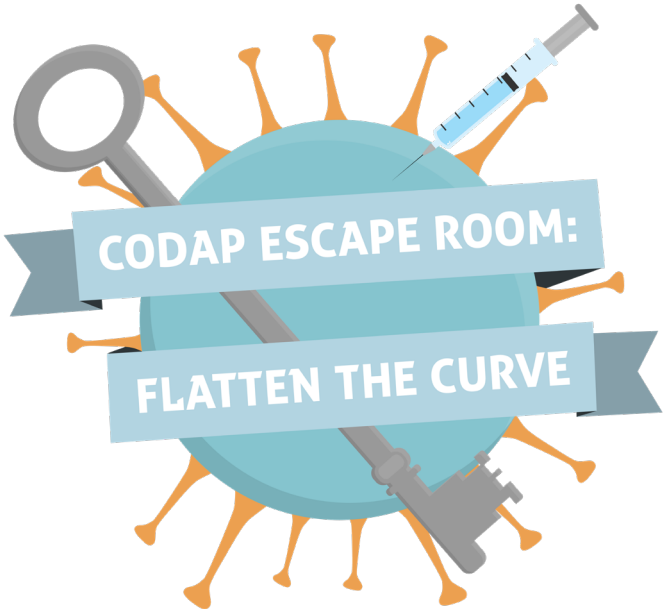
H_2O NEWS ANCHOR

Anchor: Thank you to all who worked hard to provide this water conservation information.

(PAUSE and count to 10 in your head.)

WAIT A MINUTE!!! Our affiliate stations have just informed me, that due to the collaborative work of some individuals in _teacher's name_ class who found solutions to many water conservation issues, they will be rewarded with a water prize to remind them of the importance of water conservation. Thank you! This is _anchor's name_ signing off of this live update from H2O News.

Water Conservation



Data Jam

DESCRIPTION

Students practice reading tables and graphs while using the Common Online Data Analysis Platform (CODAP), the same tool they will use to look for data trends for the Water Conservation Data Jam. In the game, students will take on the role of a scientist in the future using COVID-19 data to make predictions about a new outbreak and find a vaccine. Students will learn how to manipulate data in CODAP while answering questions using COVID-19 data and solving puzzles.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Practice reading tables and graphs
- Learn how to use CODAP

TIME
30 - 45 MINUTES

MATERIALS

- Internet connected device [1 per student]
- CODAP Escape Room link (http://asombro.org/flattenthecurve/)

PREPARATION

1. If needed, set up an assignment in your virtual learning platform (Canvas, Google Classroom, etc.).
   a. Provide student access to the CODAP Escape Room game.
   b. Suggested text for online assignment:
      CODAP Escape Room: We will be using an online data program called CODAP to look at water data in the Water Conservation Data Jam. You will use CODAP in this game to look at data from the COVID-19 pandemic and solve puzzles to create a vaccine. http://asombro.org/flattenthecurve/

PROCEDURES

1. Give students the link to the CODAP Escape Room game.
2. Students should follow the instructions in the game to answer the questions using data, hints, and help videos. If they have trouble moving past a question, advise students to make sure they are following instructions and using the correct capitalization and spaces in their answer.
3. Students will need 30-45 minutes to answer the questions and solve the puzzles in the game.

ANSWER KEY

Task 1: Determine how fast viruses can spread around the world.

- How many new cases were reported in China in January of 2020? *9,724 cases*
- Besides China and the United States, what other country reported cases in January 2020? *Italy*
- How many months did it take for the United States to reach more than 100,000 cases of COVID-19? *2 months*
- Which country in the data table never reported more than 600 cases in a single month and was most successful at preventing the spread of COVID-19? *NEW ZEALAND (in all capital letters)*
- mRNA Code #1 from maze: *ACGCCAUG*

Task 2: Identify places where outbreaks happened in the COVID-19 pandemic.

- What date shows the highest number of cases in New Mexico? *November 24, 2020*
- Which of the three states had the most cases on November 24th, 2020? *Texas*
- Which state's cases increased the most during December of 2020? *CALIFORNIA (in all capital letters)*
- Approximately two weeks after which holiday did Texas, Florida, New York, and Arizona see the most cases? *NEW YEARS EVE (in all capital letters)*
- mRNA Code #2 from cipher: *AGACGUCU*

Task 3: Determine which age group is the most at risk.

- Which age group had the most cases of COVID-19? *18-29*
- Did the 18–29-year-old age group also have the most deaths? *NO (in all capital letters)*
- mRNA Code #3: *CUCAGGAAU*

Create the vaccine.

- How many digits are in the number 20 (the age group had the most cases of COVID-19)? *2*
- How many strands of mRNA did you collect to make this vaccine? *3*
- What number do you multiply 8 by to get 8 as the answer? *1*
- Final mRNA Code: *AGACGUCUCUCAGGAAUACGCCAUG (Code 2, Code 3, Code 1)*
- What brand of vaccine did Dr. Kizzmekia Corbett help with? *MODERNA (in all capital letters)*

Water Conservation

Data Jam

DESCRIPTION

Students expand on their action plan to help address the water issue they identified and depicted in their Water Conservation Data Jam Report.

GRADE LEVEL

6-12

OBJECTIVES

Students will:

- Compose a detailed action plan
- Put their plan into action by creating the product (e.g., prototype, model, graphic, public service announcement, etc.) they have planned
- Evaluate their product based on criteria and constraints described in the action plan

TIME

45 MINUTES

MATERIALS

- Turning a Plan Into Action Student Handout [1 per student]

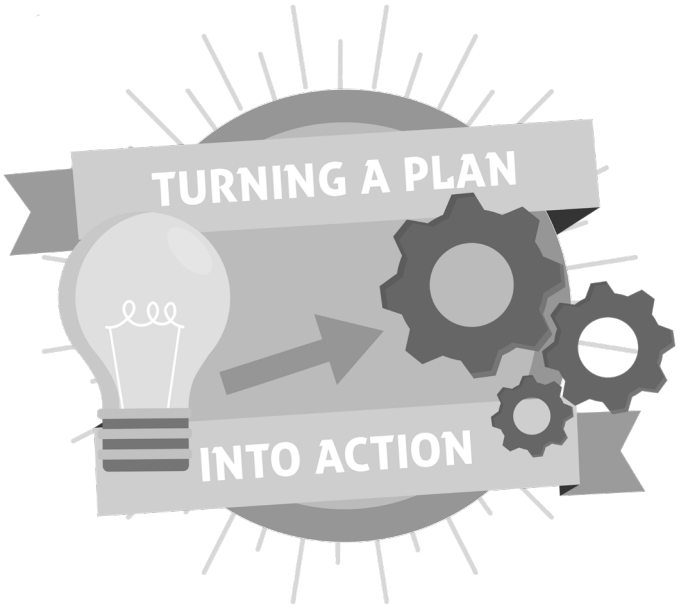
PREPARATION

1. Make the Turning a Plan Into Action Student handout available to students. You can either make copies or give students access to the fillable PDF version.

PROCEDURES

1. In their Water Conservation Data Jam Report, students wrote a brief action plan to address a water issue identified from the dataset. In this lesson, they will take the powerful step of turning this action plan into action by expanding the plan and creating the product they have designed.
2. Students can make a model, prototype, artwork, song, poem, public service announcement, or any other solution they designed. This expansion of their solution should raise awareness, serve as a a call to action, change perceptions about water conservation, or affect change in some way.
3. Make sure students have access to the Turning a Plan Into Action Student handout.
4. Explain that this handout includes eight questions that will help students expand upon their action plan. Students will address:
   a. The problem they are trying to solve. This should be based on the data trend they identified in their Water Conservation Data Jam projects.
   b. The target audience they are trying to reach
   c. Other ways the problem has been solved by others
   d. Constraints or limiting factors to consider for their solution
   e. Measurable criteria that will indicate the success of the action
5. Students will create an action project and write a descriptive caption. Students will attach photos of prototypes or models, if applicable. Then they will test the solution, report on the test, and imagine how the solution could be changed if money and time were removed as constraints.
6. Spend the remainder of class time (and additional class time, if needed and available) working on action projects.
7. Refer to the Example Project for a complete example using rooftop rainwater harvesting as a possible solution to increasing residential water use.

Name: _____ Date: _____ Period: _____



Water Conservation *Data Jam*

1. What problem are you trying to solve?

2. Who is the target audience you need to reach to bring about change?

3. Do some research on how other people may have addressed the problem you identified. Brainstorm solutions and list three potential ideas you could design, build, or create. One of these might be the solution you proposed in your Water Conservation Data Jam project Report.

4. What constraints (or limiting factors) are important to consider when creating your solution (i.e., cost, safety, time, access to materials, etc.)? Fill out the T-chart to analyze the constraints that may affect each of the solutions you listed in question 3. Then, circle the solution you listed in question 3 that you think is the most feasible.

POSSIBLE CONSTRAINT	HOW WOULD THIS AFFECT MY SOLUTION IDEAS?

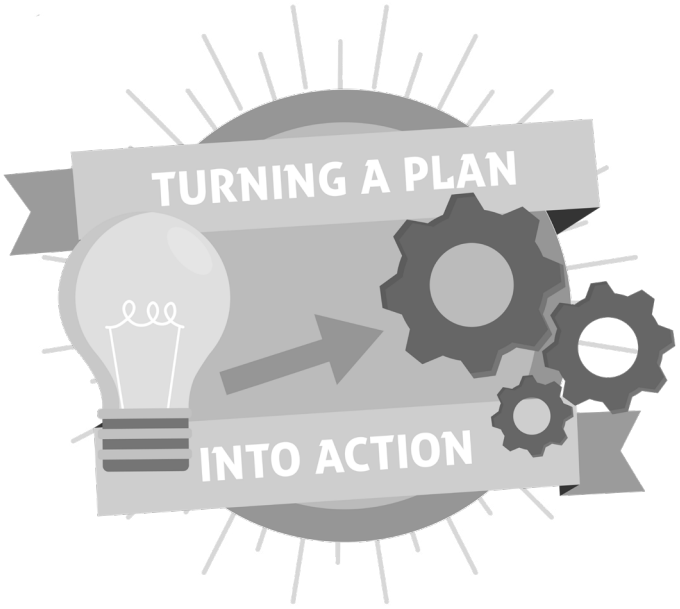
5. How will you know that your solution is successful? List one or two measurable criteria you can use to determine success.

6. Create your solution. For example, you could build a prototype or model, or you could make a graphic or public service announcement. If your solution is a prototype or model, take a photo of your solution, and submit it as a separate attachment. Write a descriptive caption for your project below. For a public service announcement, make sure to include: (1) the main idea of your solution, (2) key points, (3) a memorable title, and (4) a catchphrase.

7. Test your solution and report your results here. Did you meet the criteria for success you listed in question 5? What worked well? What could have gone better?

8. Imagine you received a grant for $1,000 and also had unlimited time. With the constraints of money and time removed, describe changes you would make to your solution.

EXAMPLE PROJECT



Water Conservation

Data Jam

1. What problem are you trying to solve?

Residential water use has been increasing since 2005.

2. Who is the target audience you need to reach to bring about change?

Residential water use includes golf courses, so I will focus on golf course managers and golfers who can encourage the golf course to conserve water.

3. Do some research on how other people may have addressed the problem you identified. Brainstorm solutions and list three potential ideas you could design, build, or create. One of these might be the solution you proposed in your Water Conservation Data Jam project Report.

a. *Some golf courses are planting types of grass that require less water to grow. I could research this and make a flyer for golf course managers.*

b. *Many golf courses have been designed so that the areas surrounding the fairways and greens are left in a natural state with native plants that don' t require much extra watering. I could work with the Native Plant Society to make a video about this solution for golfers.*

c. *Rooftop rainwater harvesting systems could be put on the clubhouse and other buildings around the golf course. Water collected in these systems could be used to water the area of the golf course near the buildings. I could research and make an informational poster about the benefits of rainwater harvesting systems, including how much money could be saved, and show it to golf course employees and golfers.*

EXAMPLE PROJECT

4. What constraints (or limiting factors) are important to consider when creating your solution (i.e., cost, safety, time, access to materials, etc.)? Fill out the T-chart to analyze the constraints that may affect each of the solutions you listed in question 3. Then, circle the solution you listed in question 3 that you think is the most feasible.

POSSIBLE CONSTRAINT	HOW WOULD THIS AFFECT MY SOLUTION IDEAS?
Cost	*If the solution is expensive, golf courses won't do it.*
Time	*I need to show how the solution might save time for the golf course.*
Safety	*The solution needs to be safe for golfers using the course.*

5. How will you know that your solution is successful? List one or two measurable criteria you can use to determine success.

a. *I give my informational poster about rooftop rainwater harvesting systems to a golf course manager and get her/him to consider rooftop rainwater harvesting systems.*

b. *A golf course installs a rooftop rainwater harvesting system and reduces their water use over time.*

6. Create your solution. For example, you could build a prototype or model, or you could make a graphic or public service announcement. If your solution is a prototype or model, take a photo of your solution, and submit it as a separate attachment. Write a descriptive caption for your project below. For a public service announcement, make sure to include: (1) the main idea of your solution, (2) key points, (3) a memorable title, and (4) a catchphrase.

Descriptive captions for projects should be written here, and photos should be submitted separately.

7. Test your solution and report your results here. Did you meet the criteria for success you listed in question 5? What worked well? What could have gone better?

I talked with the manager of a local golf course. She asked me if a rooftop rainwater harvesting system could be installed by their grounds crew or if they would need to hire someone else to install and maintain it. I didn't know the answer to this question, so I did more research and called her to let her know that the systems are simple and can be installed by people with basic construction experience.

This golf course installed a small rain barrel system as a test of the concept near one of the side doors. They added a sign telling golfers what it was. The manager said that a lot of golfers have talked to her about it and seem very interested. She is considering adding a larger system.

8. Imagine you received a grant for $1,000 and also had unlimited time. With the constraints of money and time removed, describe changes you would make to your solution.

I'd hire a graphic designer to make the flyer look amazing. I would also write to rainwater harvesting system companies to see if they would donate their systems or give us a big discount to encourage more golf courses to install the systems.

Water Conservation

Data Jam

DESCRIPTION

Students present their Water Conservation Data Jam projects to the class. During these presentations, students may also complete the optional peer review activity after watching a brief instructional video.

GRADE LEVEL
6-12

OBJECTIVES

Students will:

- Present their reports to the class
- (Optional) Watch an instructional video about completing a peer review activity
- (Optional) Complete a peer review handout

TIME

ONE TO TWO
45 MINUTE PERIODS

MATERIALS

- Peer Review Video, video transcript available here
- Internet-connected device [1 per student or 1 per class with projector]
- Peer Review handout [1 per student, either on computer or hard copy]

PREPARATION

1. Set up a computer and projector or student computers and ensure the ability to watch and project the YouTube videos if necessary.
2. Decide how you would like your students to present their Water Conservation Data Jam Reports to the class. Here are a few options:
   a. PowerPoint or Google Slide presentations.
   b. Digital storytelling through an online platform, such as FlipGrid. Students could record their presentations, and they could be played during class or posted on an online classroom platform.
   c. Students turn their reports into posters that other students view through a gallery walk.
   d. If using the online version of the assignment, here is some suggested text for the online assignment:
      i. Now that you have completed the Water Conservation Data Jam, you will present your project to the class. Take some time to prepare your presentation.
      ii. After the presentations, every student will complete a Peer Review handout. Watch this short video for instructions about completing this handout: https://www.youtube.com/watch?v=qGJV4ylSwCc
      iii. Complete the Peer Review handout.
3. Inform students that they will be presenting their reports to the class, and schedule one or more dates for these presentations.

PROCEDURES

1. If students will complete the optional Peer Review activity:
   a. Ensure all students have access to the Peer Review handout (on a computer or hard copies).
   b. Have students watch the three-minute Peer Review instructional video. This can be done together in class or assigned as a homework assignment before class.
   c. Discuss the Peer Review handout, and make sure that students understand the assignment. They will complete the handout after all presentations are complete, but some students might also want to take notes during presentations.
2. Have each student or group of students present their Water Conservation Data Jam project Reports to the class.

PEER REVIEW VIDEO TRANSCRIPT

Brought to you by the Asombro Institute for Science Education.
[background music]

Congratulations! You've done some fantastic work with your data! You identified your data trend and then used it to make a creative project and an action plan. Great job!

Your teacher will soon have you present all your work to the class. When you complete these presentations, you'll be completing a peer review form.

In the scientific community, peer review is essential to academic writing. It helps to ensure that papers published in scientific journals answer meaningful questions and draw accurate conclusions.

As a student, this review of your peers will help you in giving and receiving feedback, which is a great skill to have.

Your assignment page will have four questions for you to answer in reference to all of the presentations. The first question asks, "What common themes did you see in everyone's data trends?" Did you notice any similarities or patterns between the data trends your classmates found?

The second question is, "How did action plans address those common themes?" For this question, we're asking you to think about your answer to question one. You can ask yourself if the action plan helped solve that water issue.

The third and fourth questions are pretty straightforward and are asking your opinion about your favorite creative project and action plan. To write about your opinion, you can ask yourself, "What was my favorite creative project showing a data trend?" and "What action plan would be a good one to actually have happen?"

When you've completed this peer review, you'll have completed all that you need to do for this activity.

Make sure to turn it in as your teacher instructs.

[background music]

Name: _____ Date: _____ Period: _____

Water Conservation

Data Jam

DIRECTIONS: AFTER ALL PRESENTATIONS HAVE BEEN MADE, ANSWER THE FOLLOWING QUESTIONS.	
What common themes did you see in everyone's data trends?	
How did action plans address those common themes?	
What was your favorite way that someone showed their data trend?	
What action plan do you think you would like to do or see take place?	