21. *Bosque Survey*

Description: Students develop a true/false survey of their knowledge of the bosque, then administer the survey to others and analyze the response data.

Objectives: Students will:

- review what they have learned about the bosque;
- learn what others know about the bosque;
- educate participants in the survey and their community about the bosque; and
- learn about surveying techniques by conducting a simple survey, collecting data, organizing and displaying data and analyzing survey results.

Materials:

- Copies of the Bosque Survey tabulation sheet
- Pencils
- Calculator

Phenomenon: People who live near the bosque often don't know much about it.

Lesson Question:

- *What do other people know about the bosque?*

21. Bosque Survey

Grades: 5–8

Time: two class periods plus administration of survey

Subjects: science, math

Terms: *Variable depending on the direction the questions take*

New Mexico STEM Ready! / Next Generation Science Standards

NGSS DCIs

Variable depending on the direction the questions take and focus if it is a summary activity

NGSS CCCs

Variable depending on the direction the questions take

NGSS SEPs

Asking Questions; Analyzing & Interpreting Data; Using Mathematics & Computational Thinking; Obtaining, Evaluating & Communicating Information*

Mathematics: Statistics & Probability

6.SP Develop understanding of statistical variability; Summarize & describe distributions

7.SP Use random sampling to draw inferences about a population; Draw informal comparative inferences about two populations.

(* indicates extension activity)

Background:

This activity can serve as an assessment following the River of Change unit (Chapter 4) or it can be developed to follow up any of the individual activities. Once your students have completed the River of Change activities, they should be bursting with new knowledge that they are ready to share. The survey format included here allows students to use their knowledge to develop questions about the bosque that they will ask of family, friends, neighbors, etc. In an optional extension, students follow up on the most often missed questions by presenting information about the bosque to their community.

This is a good opportunity to tie in mathematics and cover some Statistics and Probability Standards.

Procedure:

- After completing the River of Change unit, ask students what they have learned about the bosque (and river). *What was the most interesting thing you learned? The most unusual or unexpected thing? Has your opinion about the bosque changed with your new knowledge?* Then ask what they would like other people to know about the bosque. *What is the most important information you want to share?* Revisit your KWL charts. *What interesting questions arose during your studies?*

- Students develop a list of questions to survey what people know about the bosque. As a class, choose ten statements that will test peoples' knowledge. See ***Tips for Developing Statements*** for helpful suggestions. Give students time to propose True/False statements and discuss as a class which will be the most interesting to include.

  Another option is for students to write bosque information on slips of paper (un-signed) and put them in a hat. The teacher selects some to turn into true/false survey statements. This is a way to model creating survey statements. **(Asking Questions)**

- A sample survey is included. If time is short and you want to focus on the mathematical exercise, you may use the included survey instead of having students develop their own questions.

Tips for Developing Statements for Survey Questions

- Use KWL charts created while doing River of Change and other activities to determine what students learned and what else they want to know.
- Remember that the point of these statements is not to stump people or make a very difficult survey but rather to encourage the sharing of knowledge about the bosque.
- Use True/False statements. These are the easiest to tabulate.
- Include ten questions in your survey to simplify statistical analyses.

- Practice interviewing in class either in pairs or demonstrating with the teacher in front of the class with one or two students. The students practice how to tell respondents the correct information in appropriate ways. The practice respondent should get a few things wrong on purpose. Students should be encouraged to talk with the respondent about what they learned in their study of the bosque, not just repeat the statement to the respondent and tell them they got it right or wrong.
- Review percentages and averaging with your class. *If someone has eight of ten correct--what percent is correct?* Have the students calculate percentages for each practice survey.
- Review the draft survey to determine whether questions should be revised. Make any changes needed. For example, a question might be too technical for a general audience or phrased in a confusing way.
- Have students predict how they think the respondents will do. *What questions will they get right? Which will be hard for the respondents?* Have them write their thoughts down. They can even discuss percentages here--*what percent of people are likely to get this answer correct?* They can base these predictions on what they as a group knew before their unit on the bosque, so not just on wild guesses. After the survey, compare their predictions with the actual results.
- Prepare for conducting the survey. Go over the instructions on the survey. Discuss how many people will be questioned by each student. Your goal is to survey 100 people. (A class of 20 will survey five people each.) Students might take questions home to ask family, friends and neighbors, or your class might survey other classes at school. Official surveyors will start by stating the purpose of the survey, how the data will be shared, and that answers will be confidential.
- After each survey, students should go over the correct answers with those they have surveyed and tell them the percentage answered correctly. In teaching about the bosque in this way, students solidify their own knowledge.

- Students will return with all of their surveys completed, correct answers recorded, and percentage correct answers calculated.
- Now students combine their results with the rest of the class. Go through each question and record the total number of correct answers of all the people surveyed. If you surveyed 100 people, this number represents the percentage of correct answers for each question.
    - count the total correct (out of ten questions) for each person and average the sums across 100 people = average score for the whole survey.
    - for each question, count the total correct across the 100 people and that is your percentage correct for that question. Do that for each of the 10 questions.
    - how did these answers compare to their expectations regarding correct responses before conducting the survey
- Students display the data in some way, using a graph, chart, etc. Data can be organized in dot plots, histograms or box plots. Give measures of center and describe the overall patterns and any striking deviation from that pattern.
- Find the mean and median and discuss by looking at the organization of the data which was the best to help them answer their question. **(6.SP; Analyzing & Interpreting Data; Using Mathematics & Computational Thinking)**
- Students answer the analysis questions.

  Analysis Questions:
    - *Which questions were answered correctly by most participants?*
    - *Which question(s) were answered incorrectly by the most participants?*
    - Make a general statement about the level of knowledge and understanding of the bosque among the people surveyed.
    - Discuss the validity of their sample. Use this sample to draw inferences about a population. *Do you think these results will be true for the general public? Why or why not?* Have students average the number of correct responses across their five respondents and compare to the average of the full group (100 people). *Does their sample fit with the results of the overall average? Does the overall average give a result that makes sense based on the individual results?* **(7.SP)**

Assessment:

Writing questions about the bosque and weighing the most interesting or important ideas to share in a survey will show their learning of bosque concepts as they conclude a unit about the bosque. Surveying others and calculating the results will further their skills of using statistics. Finally they must evaluate the results through answering the Analysis Questions. **(Analyzing & Interpreting Data)**

Extensions:

- Write a news article about your findings.
- Take the questions that were most often answered incorrectly and design something to teach that information. This could be done using posters, videos, leaflets, etc.—an "ad campaign." Present this to family, friends, neighbors or other classes. Consider different ways to share the information, such as a presentation to the PTA or to other classes, a table at a community event, postings on social media, etc. **(Obtaining, Evaluating & Communicating Information)**
- Follow this exercise with Activity #38 "River Stories" to collect oral histories about the Rio Grande.

Mathematics Standards:
Statistics & Probability

6.SP *Develop understanding of statistical variability; Summarize & describe distributions*

7.SP *Use random sampling to draw inferences about a population; Draw informal comparative inferences about two populations.*

Say's Phoebe at Valle de Oro National Wildlife Refuge
Photograph by Laurel Ladwig

Bosque Survey

1	2	3	4	5 (5 people surveyed)	Is this statement True or False?
					1.
					2.
					3.
					4.
					5.
					6.
					7.
					8.
					9.
					10.
					Number of correct answers
					Percentage correct (multiply by 10)

Student's name _____

Instructions

- Read the statements to five participants and record their True (T) or False (F) answers in Columns 1 through 5.
- Have correct answers on the next page. Go over the correct answers with each participant after they have answered the survey questions. Use your own words and knowledge of the bosque.
- Sum the total correct (out of ten statements) for each person and tell them their score.
- Back in class, average the number correct across 100 people = average score for the whole survey.
- For each statement, count the total correct across 100 people and that is your average for that statement. Do that for each of the 10 questions.

Bosque Survey

1	2	3	4	5	Is this statement True or False? (5 people surveyed)
					1. A Rio Grande cottonwood lives about 300 years.
					2. Cottonwood seeds can germinate anywhere so most survive to start new trees.
					3. Saltcedar and elm trees have always been a part of the Rio Grande bosque.
					4. Rio Grande cottonwood trees get all the moisture they need from rain.
					5. We don't have to be concerned about the bosque. It will always be the way it is now.
					6. The cottonwood has been the most important tree in the bosque for thousands of years.
					7. The bosque and river provide important habitat for animals that are threatened or endangered or at risk of becoming so.
					8. Historically, annual floods provided wet ground that cottonwood seeds needed to grow and develop.
					9. Cottonwood trees have either female or male flowers but not both on the same tree.
					10. Land managers are able to create conditions artificially that allow cottonwoods and other native plants to germinate and grow.
					Number of correct answers
					Percentage correct (multiply by 10)

Student's name _____

Instructions

- Read the statements to five participants and record their True (T) or False (F) answers in Columns 1 through 5.
- Have correct answers on the next page. Go over the correct answers with each participant after they have answered the survey questions. Use your own words and knowledge of the bosque.
- Sum the total correct (out of ten statements) for each person and tell them their score.
- Back in class, average the number correct across 100 people = average score for the whole survey.
- For each statement, count the total correct across 100 people and that is your average for that statement. Do that for each of the 10 questions.

Answers to Bosque Survey

1. False: Cottonwood trees are like people—not many grow to be more than 100 years old. Cottonwoods are not long-lived trees.
2. False: Cottonwood seeds need sunlight, a clear space and soil that stays wet until the seedling roots reach the water table. Very few seeds germinate. Even fewer find the conditions needed to develop into trees.
3. False: Saltcedar and elm trees came to the bosque in the 1930s. Russian olive was also introduced about the same time.
4. False: Large trees like cottonwoods need much more than the 10 inches (25 cm) of rain that make our area a desert. We often get even less than that. Cottonwoods tap the water table/groundwater for their needs.
5. False: The bosque has always been changing following natural cycles. But today's changes are not cyclical. Instead, they represent a progression from one type of habitat to another. Without responsible management, the bosque may not survive as a cottonwood forest.
6. True: The Rio Grande cottonwood has been evolving with the river for more than a million years. Cottonwood leaves that look like our modern cottonwood trees are preserved as fossils near the Albuquerque airport in ash from the Jemez volcano eruption 1.2 million years ago.
7. True: Threatened, endangered or rare species that use the bosque, river or floodplain include the Northern Leopard Frog, Bald Eagle, Yellow-billed Cuckoo, Southwestern Willow Flycatcher, Rio Grande Silvery Minnow, and New Mexico Jumping Mouse. These species are also classified as Species of Greatest Conservation Need (SGCN) by the New Mexico Department of Game and Fish.
8. True: Annual floods kept the soil wet long enough for this to happen. Because the river is now controlled by levees and dams, it no longer floods unless managers allow it.
9. True: Cottonwoods with male flowers release pollen in the spring. It floats in the air to the trees with female flowers that later produce the cottony seeds.
10. True: Some strategies that land managers use include creating artificial floods, clearing sandbars, constructing channels that allow water to move into the forest, and planting cottonwood poles.

There are many ways people can help restore the forest.