



## Change Is All Around Us

### *Land-use Change in the Middle Rio Grande Valley*

**Description:** Students look at land-use changes in the Rio Grande Valley in two ways: by coloring a 1918 land-use map of Corrales and comparing it to a 1992 map; and by graphing the cover type in the Middle Rio Grande Valley from surveys in 1935 and 1989.

**Objectives:** Students will:

- identify past and current land uses in the Middle Rio Grande Valley;
- identify the relationship between cultural (human) land use and natural land cover types within the landscape of the Middle Rio Grande Valley;
- gain experience in reading maps; and
- gain experience in analyzing data and determining historical correlations.

**Materials:** copies of 1918 and 1992 maps for each student or pair of students  
color pencils and graph paper for each student

**Background:** We are completely dependent on our landscape. It supports our existence. We use the land to live, work, play, learn and shop. Our survival depends on the land, but does our use balance the needs of the landscape as well? Is human use sustainable? Taking too much from the land can cause environmental stresses which lead to environmental degradation. An unhealthy environment will affect humans as we depend on the land.

In most areas of the world, land use changes over time, either through natural or man-made processes or a combination of both. By looking at archaeological records, field survey data and

### 36. *Change Is All Around Us*



**Grades:** 6–12

**Time:** two class periods

**Subjects:** science, social studies

**Terms:** *land use, cover type, Middle Rio Grande Conservancy District, agriculture, commercial, residential, riparian, upland, range, urban, hectare, reach*



accounts through oral histories, we have been able to determine historical land use in the Middle Rio Grande Valley. More recent documentation is gained from maps, aerial surveys and written documents. By looking at all the documentation, we are able to look for land-use patterns and identify changes.

The Village of Corrales is located just north of Albuquerque in the Middle Rio Grande Valley. In 1918 the Office of the State Engineer completed a formal survey of the Middle Rio Grande Valley. In 1992 the Middle Rio Grande Conservancy District completed a map showing contemporary land use. This activity uses those maps and survey data to examine how land use has changed over the last century.

**Summary points**—What changes have occurred in the Middle Rio Grande Valley?

We want students to consider how the use of the land changes over time. How might changes in transportation, technology, economy, farming, or social politics affect our use of the land? The trend from the early 1900s to today is of increasing residential and urban areas and decreasing agricultural and riparian areas. Agricultural lands are being converted into residential areas. Both agricultural and riparian areas are being chopped into small pieces surrounded by residential or commercial uses. This is happening fastest near growing cities such as Albuquerque.

The number of acres of forest has not changed appreciably over this time, though surveys record this forest changing from a primarily cottonwood forest to one dominated by introduced saltcedar and Russian olive trees. What has changed in area is the amount of wetlands. In 1918, from Cochiti Dam to San Marcial (the Middle Rio Grande Valley) there were 52,000 acres (21,053 hectares) of wetlands; these include marsh, open water, saltgrass meadow and alkali flats. In 1989, there were 14,780 acres (5,985 hectares) of river, lake, wet meadow, marsh or pond and most of those areas were in designated state or federal refuges. This amounts to a decrease of over 70%.

The Rio Grande bosque is a long, narrow habitat. Reduction in the extent of the bosque through construction of housing, shopping centers and clearing for agriculture has reduced the area that native plants and animals have to live. The interruption of habitat, called fragmentation, also affects the life of the bosque with power lines, bridges and roads cutting through the narrow bosque. Populations of plants and animals are separated; migration and dispersal of species is impaired. When a habitat is broken into small pieces separated by farmland or



residences, some species may not be able to survive, although many species use farmland for habitat and are able to move across it.

Encourage students to look at both the maps and the data and compare cultural/human land use to natural land cover type. There are ways that these are separate, but many ways in which they are intricately connected. Have students think about how human land use is connected to natural land use.

**Notes on maps—Part 1:** These maps were prepared by the Middle Rio Grande Conservancy District (MRGCD) for this guide. The original 1918 map was made by the Office of the State Engineer in a survey of water use in the Middle Rio Grande conducted from November 1917 to September 1918. The maps were hand-drawn on 30 pages called “linens,” a woven linen paper. The 1992 map is from a survey conducted by the federal Bureau of Reclamation and is part of the Land Use Trends Analysis (LUTA) data set from air photos.

Only the area of Corrales that is part of the MRGCD was included in the 1992 survey; the blank areas are outside of the district boundary.

Today, these maps are needed for the same reason as in 1918: to determine irrigated land and water use in the valley. Comparing 1918 maps to recent maps is what is done today by the Office of the State Engineer and the MRGCD, only with computer assistance—but is basically what the students are doing in this activity.

**Notes on data—Part 2:** The 1935 data is from the National Ecology Research Center, U.S. Fish and Wildlife Service; the 1989 data is from the National Wetlands Inventory by the U.S. Fish and Wildlife Service. Both data sets appear in the *Middle Rio Grande Ecosystem: Bosque Biological Management Plan*. One bit of trivia is that the 1935 aerial photo survey was done by Charles A. Lindberg (yes, that Lindberg). If you notice, the 1989 survey has a percentage of “no photo coverage,” while Lindberg’s 1935 survey has complete coverage.

Cochiti Reach .....	Cochiti Dam to Angostura Dam .....	21 mi (34 km)
Albuquerque Reach ....	Angostura Dam to Isleta Diversion Dam ....	38 mi (61 km)
Belen Reach .....	Isleta to Bernardo .....	39 mi (63 km)
Socorro Reach .....	Bernardo to San Marcial.....	62 mi (100 km)
	(just above Elephant Butte Lake)	



## *Oral History*

### *An Interview with Hector Gonzales by Rebecca Tydings*

In the fall of 2002, Hector Gonzales and his eight brothers and sisters are looking for a buyer for their 23 acres in Corrales, NM. This bit of property is all that remains of his family's portion of the Alameda Land Grant. In 1710, Governor Marques de Penuela gave 104,000 acres to Captain Francisco Montez Vigil as a reward for military service. Two years later in 1712, Capitan Vigil sold his land to Juan Gonzales Bas or Vas. (Note: The Spanish B and V are pronounced the same. This part of the name was later dropped.) Juan Gonzales Bas built a home and a small chapel in honor of Our Lady of Conception. By 1744 eight families occupied the Alameda Land Grant centered around the house and chapel of the Gonzales family. This was the beginning of the Hispanic community Alameda. By 1770, Alameda had grown to 66 families containing 388 persons\*. The story of why the Gonzales family is now selling their historical property is the story of how land has been used within the Middle Rio Grande floodplain for the last 400 years. It also addresses the current practice of selling fertile agricultural land along the Rio Grande for real estate development.

Born July 20, 1924, Hector Gonzales grew up in Albuquerque. His father farmed the land and until his late teens Gonzales and his brothers and sisters lived and worked there weekends and summers. Their main crop was alfalfa sold to dairies in Albuquerque. The children helped cut the alfalfa and rake it into rows to dry. Later it would be raked together and piled on a wagon, then carried to the front of the property, near the Corrales Road, where it would be stacked into haystacks. Here the dairymen from Albuquerque would purchase the crop for cattle feed. The Gonzales family also raised chili, corn, squash, apples, apricots and peaches. Much of their crop was canned or dried for their own use. A job Gonzales remembers from his youth was using a horse pulling a scraper to tear down and level what had once been part of the family's old home. It had been built of *terrones*, chunks of vegetative material cut from the bogs along the river and stacked into walls, much like adobe walls are built today. A stiffened cloth tacked to it covered the ceiling. At that time land was more valuable for raising crops than for a home. Hector's brothers eventually became sheet-metal workers and auto mechanics or worked in the construction industry, jobs for which they were paid wages. Hector himself became a plumber and operated the Eveready Plumbing and Heating until 1987 when he gave it to his son and daughter-in-law.

According to Gonzales the eastern boundary of the Alameda Land Grant was partially the hills on the east side of the river, where Edith Blvd. is now. The land grant extended west to the "Ceja de Rio Puerco," the drop-off of the lava escarpment of the Rio Puerco, 16 miles (25.6 km) west from the Rio Grande. The northern boundary was the Arroyo de la Barranca. The southern boundary was the small hills that designated the Land Grant of Louis Garcia de Noriega. Paseo



del Norte represents this southern boundary nowadays. Gonzales stops his story to explain that at that time the village of Alameda was on the west side of the Rio Grande. “Remember now,” he says, “that the river ruled the valley. When it flooded it went anywhere it wanted to.” In 1874 the Rio Grande overflowed its banks and swept into an old channel on the west side of the valley. The river’s course was changed and the village of Alameda was now on the east side of the river. Gonzales explains that the corrals where livestock were kept for the community of Alameda were separated from the village by the river’s new course. “That,” he continues “was the beginning of the area now called Corrales.”

Continuing, Gonzales tells that people supported their families by raising sheep and cattle and growing squash, melons, corn, apples, alfalfa and native grass for the livestock. The *acequia madre* (mother ditch for irrigation) had to be reworked every year because the annual spring floods of the Rio Grande would clog or remove the point of diversion, the point where water was diverted from the river to be distributed to the fields. Hay was cut by hand and raked into rows in the field. Wood from the bosque was used for everything: fences, gates, ladders and vigas for houses. Cottonwood trunks were hollowed out to make water toughs. The local climate was moister then and mushrooms or *hungos* were gathered from trunks of the cottonwood. Mixed with red chili, the dish was a substitute for meat during the Lenten season.

Through time, each descendent of Juan Gonzales passed along his or her portion of the Alameda Land Grant to the children. Each time the parcels became narrower and narrower as the land was divided again and again. The land was divided into strips, measured north to south by *varas*. (A *vara* is equivalent to 32 inches, four inches less than a yard.) The *varas* extended from the Rio Grande on the east to the Ceja of the Rio Puerco on the west. In the late 1700s or the beginning of the following century, Andres Facundo Gonzales was given 1,000-plus additional *varas* of land from his mother, Maria Manuela Baca. Gonzales explains that each time those 4,000 to 5,000 (1.6–2 ha) acres was passed on to descendents, the “sliver would get thinner.” In order, Juan Gonzales Bas gave part of his land to his son Juan Julian Gonzales, who passed some land on to his son Andres Facundo Gonzales. It was then divided again and Antonio Jose Gonzales received a parcel, then gave a portion to his son, Jose Faustin Gonzales. On June 18, 1820, Antonio Jose Gonzales was born. He is the grandfather of Hector Gonzales who in 2002 shares ownership of the land with his two brothers and six sisters. They are selling their 23 acres (9.2 ha). “The sliver can be divided no smaller,” says Hector Gonzales, who has three grandchildren and three great-grandchildren.

The 23 acres are not even contiguous. There are three parcels—8.5 acres, 7.75 acres and 6.75 acres (3.4 ha, 3.1 ha, 2.7 ha)—separated by acequias, Old Church Road and the main canal. In the past some of the property was lost for failure to pay taxes when the Middle Rio Grande Conservancy District was formed.



The Gonzales family had to regain the land by paying the back taxes. Some land was purchased from the family for the riverside drain, the interior drain and for Corrales Road.

Gonzales's family has been leasing the property in recent years to Gus Wagner, who farms and sells produce in Corrales and Albuquerque's north valley. "He does it well," says Gonzales. "He grows sweet corn, green chili and black-eyed peas.

"When will we sell it? That's anybody's guess," continues Gonzales. "We would like to sell to a land trust for which the land will remain as open space and be farmed as it has been. Other options are to sell to developers or an individual. The best parcel is 'view land'."

For 290 years this has been the heritage of the Gonzales family.

\*Simmons, Mark. 1982. Albuquerque: A Narrative History. University of New Mexico Press, Albuquerque. Page 103.

- Procedure:**
1. Introductory discussion: What are some of the ways that we use land? Ask students to think of different land uses in the Middle Rio Grande Valley. Make a list on the board. Then group these into the following categories: agriculture/range, commercial, residential, urban, riparian, river/open water, upland.
  2. Explain to students that this is a two-part activity. First they will color maps; second they will make graphs. Then they will use their knowledge of both to interpret how the changes affect the users of the valley.

### **Part 1: Map Study**

1. Ask the students how maps might be used to understand land-use changes. Introduce the concept of maps as a way of recording information about land use. If appropriate, cover the basic elements of a map, direction, scale, key, and title.
2. Have the students work individually or in pairs. Pass out the copies of the 1918 and 1992 maps of Corrales. Have the students color in the different land-use type areas and color the key to match. The 1992 map is more complex, and it will take good eyes to sort out the categories. Students could color only the riparian areas on both maps as a first comparison, then color



the agricultural areas, and finally the residential areas on the 1992 map—to make clear comparisons in stages.

**1918.** The original 1918 topographic map underlies the land-use symbols and terms. Students can ignore the topographic lines while coloring the categories. Look for the written categories of use in small print to determine the category of areas:

1918 key category	Term used on the map
Agriculture	<i>cultivated Class 1 or 2</i>
Commercial	two small squares saying <i>store</i> and <i>cemetery</i> (We know this is a stretch!)
Open water	trace the <i>Rio Grande</i> down the page
Riparian	<i>sand bars, alkali or timber</i> (the <i>timber</i> has a distinctive pattern like small shrubs) =bosque
Upland <i>sand</i> and <i>sage brush</i>	topographic lines with the words
Residential	(not represented in this 1918 survey)

- You only need to color the area within the dotted boundary of the current Village of Corrales.
- Color the land-use sections with distinctive colors and color the corresponding key box. Some areas, especially agriculture, have several boxes adjacent to each other; color them the same colors.

3. Have the students answer the worksheet questions:

**Teacher key: 1918 map:**

What is the largest land use (that is not upland)? Where is it located? *Riparian, along the river.*

What is the smallest land use? Where is it located? *Commercial, along the agricultural area.*

Why do you think it is the largest land use? or the smallest? *The river flooded regularly, and people did not use the riparian area next to the river where it was apt to flood.*

Is there a pattern to the land use? Are certain uses found in certain areas on the map? *Agriculture is found in the lowlands, riparian is immediately next to the river.*



**1992:** How is the 1992 map different from the 1918 map? *All of the area is divided into small pieces of agriculture, and residences, with much less riparian area. Commercial has grown.*

Has the size of the bosque riparian area changed? (Is it bigger or smaller, has it moved?) *It is much smaller.*

Has the upland area changed? *Many residences in the uplands.*

## Part 2: Data Interpretation

The data are broken into four sections, so it may help to make teams of four or five students to work on this activity. If appropriate, cover the concepts of scale, how to construct a bar graph and how to read a bar graph.

1. Hand out the data sheet Land Use Changes in the Middle Rio Grande Valley and graph paper. If students use a computer program to create the graphs, orient students to that. The data are in hectares. One hectare (pronounced: "hec-tair") equals 2.47 acres.
2. Have the students graph the data with bar graphs. Have the class (or team) decide on an appropriate scale so the graphs can be compared.
3. Compare the graphs. Have the students answer the worksheet questions about the graphs:

What is the largest land use in your stretch of river?

Cochiti Reach. In 1935? *Range.* In 1989? *Range.*

Albuquerque Reach. In 1935? *Agriculture.* In 1989? *Urban.*

Belen Reach. In 1935? *Agriculture.* In 1989? *Agriculture.*

Socorro Reach. In 1935? *Scrub-shrub.* In 1989? *Scrub-shrub.*

What has changed between 1935 and 1989?

Cochiti Reach. *River or man-made channel decreased; forest acres increased; scrub-shrub dropped dramatically; lake, wet meadow, marsh or pond decreased; urban increased; range and agriculture changed little.*

Albuquerque Reach. *River or man-made channel decreased; forest acres increased a bit; scrub-shrub has dropped dramatically; lake, wet meadow, marsh or pond decreased to almost nothing; urban increased sky-high; range and agriculture decreased.*

Belen Reach. *River or man-made channel decreased; forest acres increased; scrub-shrub dropped dramatically; lake, wet meadow, marsh or pond decreased; urban tripled; range dropped dramatically and agriculture increased.*



Socorro Reach. *River or man-made channel decreased by half; forest acres dropped by over half; scrub-shrub increased; lake, wet meadow, marsh or pond decreased; urban increased; range is little changed and agriculture increased.*

Why do you think there were changes?

Predict what your graph would look like 50 years in the future. State each category and how you think it will be different.

Summary interpretation from the maps and the graphs:

How would changes in the valley shown in the graphs and the maps affect these users of the Middle Rio Grande Valley?

*Farmers. There is still agriculture in the valley, but not in the urban areas.*

*Residents, including you and your family. Do you want to live in close proximity to other people or do you want to be in rural areas? Think about driving distances/commuting, gardens, animals, traffic, fresh air, open spaces for walking, local food, etc. The urban areas are growing and crowding out agriculture and natural areas.*

*Wildlife. There is less room for wildlife, fewer wetlands, a narrow forest, all in a long narrow line.*

Summarize the changes in land use over the 20th century.

*The trend from the early 1900s to today is of increasing residential and urban areas and decreasing agricultural and riparian areas. Agricultural lands are being converted into residential areas. Both agricultural and riparian areas are being chopped into small pieces surrounded by residential or commercial uses. This is happening fastest near growing cities such as Albuquerque's metro area. What has changed in area is the amount of wetlands. There has been a decrease of over 70% of the wetland area over the 20th century.*

**Assessment:** Ask the students to write an essay about why they think land use is different now from 1918. What has led to these changes over time? How has our change in land use affected the natural areas of the landscape? How would you predict land use in the Middle Rio Grande Valley landscape to change in the future?

There are two maps of Corrales, but how would other areas in the valley compare to those maps? Would they be the same or different? Is the area you live in similar to Corrales in the way it changed, or has little changed?

**Extensions:** Sum all of the cover type data to make one additional graph showing the land-use changes over the entire Middle Rio Grande Valley on one graph.



How might students' own neighborhood or town change over time? How would their town land-use map compare to the 1918 or 1992 Village of Corrales map? How would it be similar? How would it be different? Have the students research their own town or neighborhood to see how land use has changed. Have them write out an interview questionnaire related to land use (see "River Stories" activity in this guide). Encourage them to talk to relatives, neighbors, and business people to determine what sorts of changes have taken place.

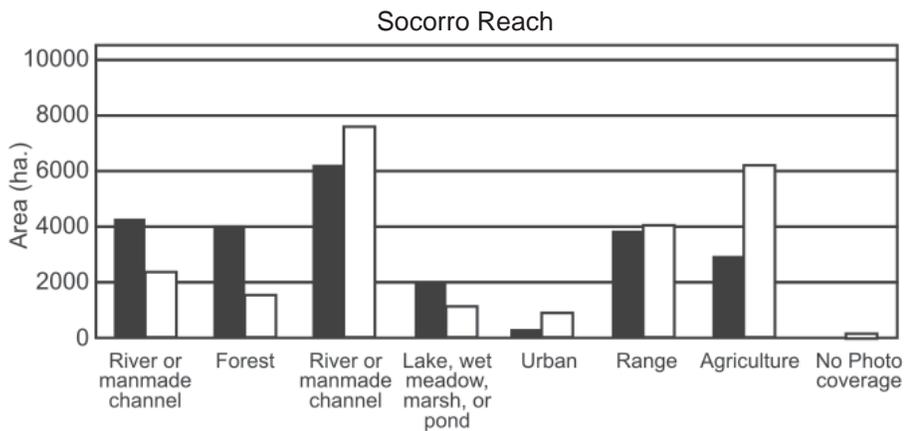
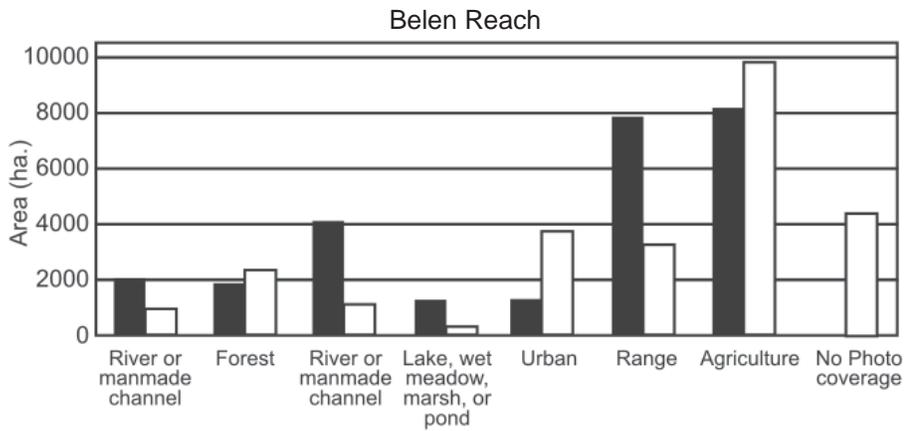
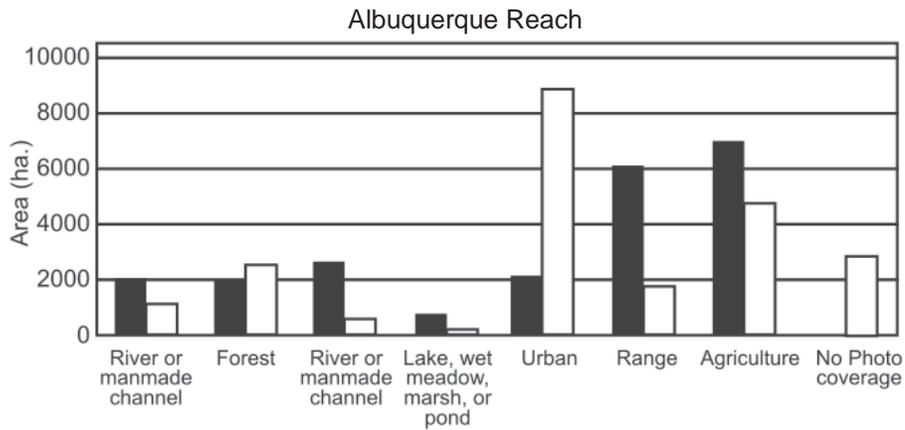
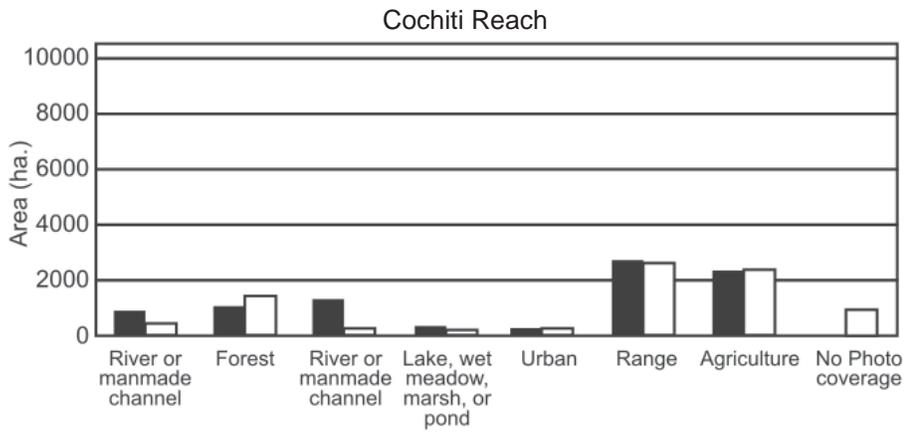
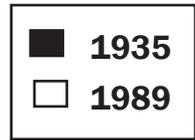
Research how land is passed from generation to generation in different cultures. Hispanic families had property that went from the river for miles into the upland. They would divide their fields so that children would still have an edge on the river and acequia. This has resulted in fields today that are in long, narrow strips. Contrast this to the Pueblo fields that are in large squares. The fields are worked as a group and passed down as a whole field. This difference is clearly seen in the 1992 map, comparing the irrigated land in Corrales to that in Sandia Pueblo across the river.

*References:*

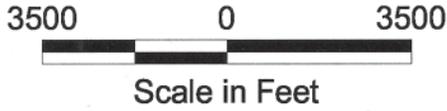
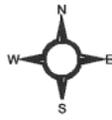
Crawford, C.S., A.C. Cully, R. Leutheuser, M.S. Sifuentes, L.H. White and J.P. Wilber. 1993. Middle Rio Grande Ecosystem: Bosque Biological Management Plan. U.S. Fish and Wildlife Service, District 2, Albuquerque, New Mexico.



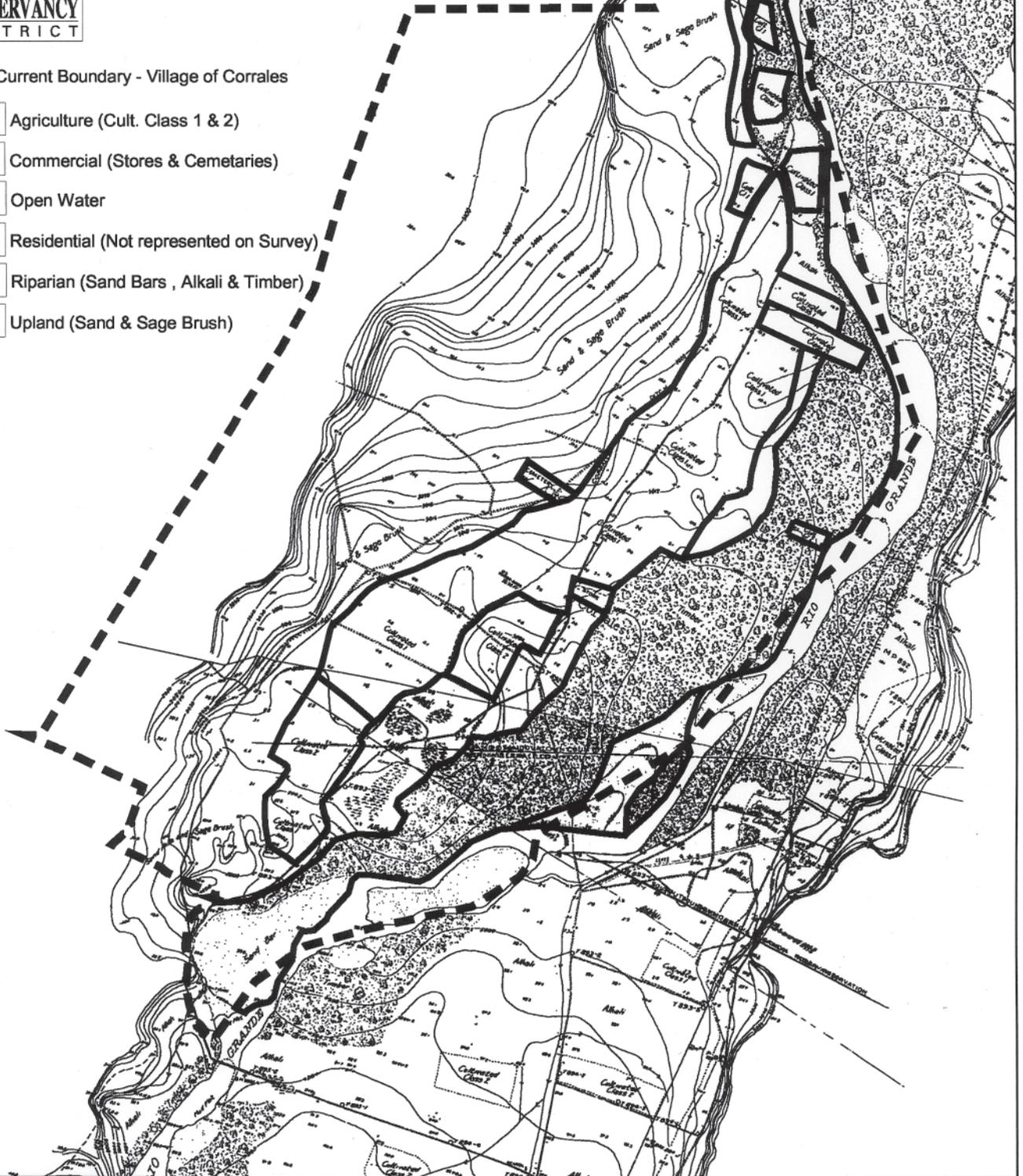
*Teacher Key: Reach Cover Types*



# 1918 Middle Rio Grande Survey Corrales, New Mexico



-  Current Boundary - Village of Corrales
-  Agriculture (Cult. Class 1 & 2)
-  Commercial (Stores & Cemeteries)
-  Open Water
-  Residential (Not represented on Survey)
-  Riparian (Sand Bars, Alkali & Timber)
-  Upland (Sand & Sage Brush)





# Land-use Changes Part 1

1918. The original 1918 topographic map underlies the land-use symbols and terms. You can ignore the topographic lines while coloring the categories. Look for the written categories of use in small print to determine the category of areas:

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Riparian	<i>sand bars, alkali or 'timber</i> (the <i>timber</i> has a distinctive pattern like small shrubs) = <i>bosque</i>
Upland	topographic lines with the words <i>sand</i> and <i>sage brush</i>
Residential	(not represented in this survey)

- You only need to color the area within the dotted boundary of the current Village of Corrales.
- Color the land-use sections with distinctive colors and color the corresponding key box. Some areas, especially agriculture, have several boxes adjacent to each other; color them the same colors.

Questions about the 1918 map:

What is the largest land use (that is not upland)? Where is it located?

What is the smallest land use? Where is it located?

Why do you think it is the largest land use? or the smallest?

Is there a pattern to the land use? Are certain uses found in certain areas on the map?

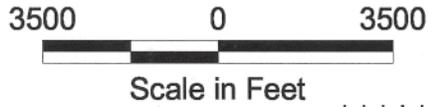
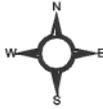
Questions about the 1992 map:

How is the 1992 map different from the 1918 map?

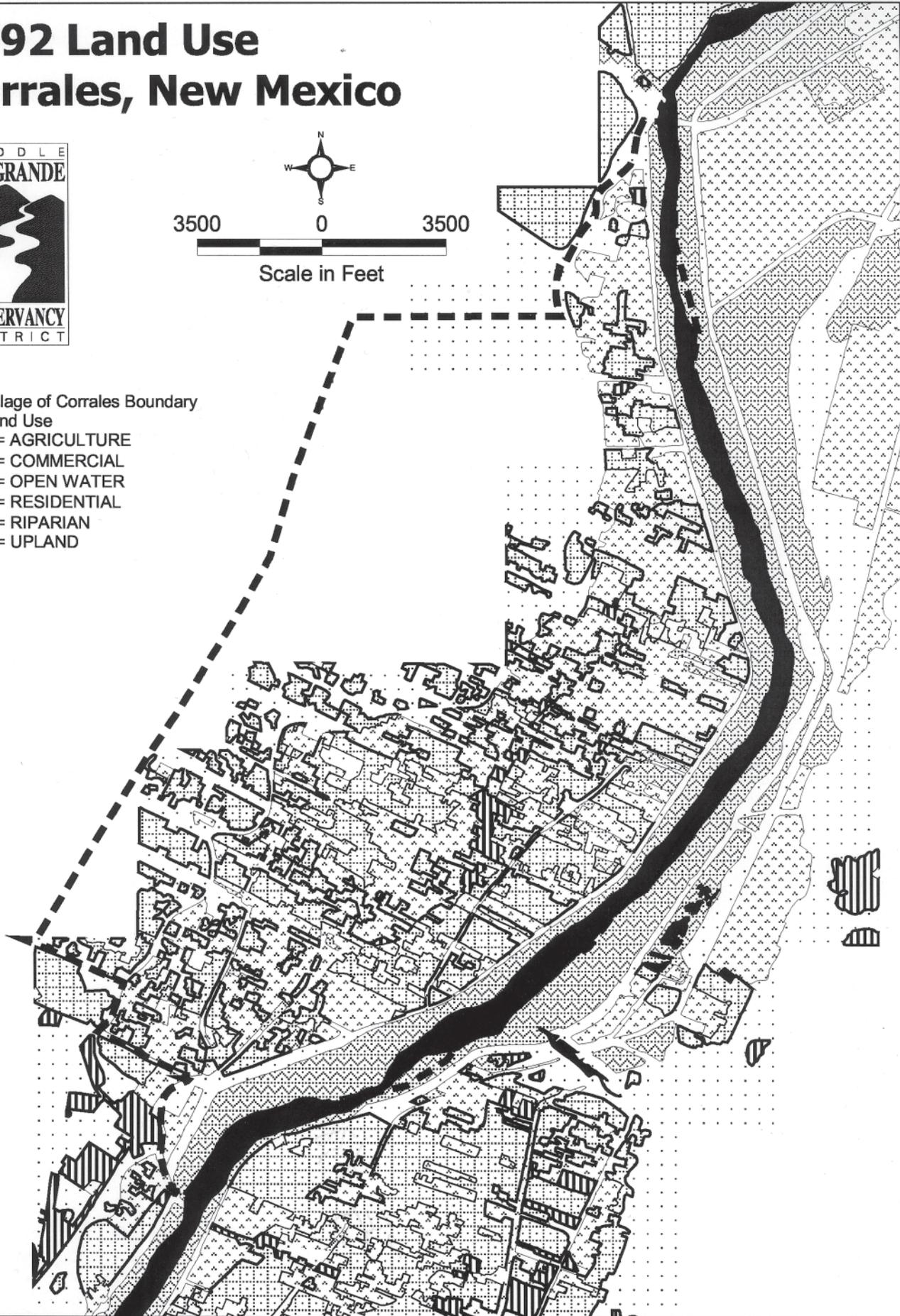
Has the size of the bosque riparian area changed? (Is it bigger or smaller, has it moved?)

Has the upland area changed?

# 1992 Land Use Corrales, New Mexico



-  Village of Corrales Boundary
- 1992 Land Use**
-  1 = AGRICULTURE
-  2 = COMMERCIAL
-  3 = OPEN WATER
-  4 = RESIDENTIAL
-  5 = RIPARIAN
-  6 = UPLAND





## Land-use Changes Part 2

The following charts give the cover type recorded in surveys in 1935 and 1992 of the Middle Rio Grande Valley. The data is divided into different stretches of the valley.

1 hectare = 2.47 acres

Area in Hectares

Cover type	1935	1989
<b>Cochiti Reach</b>		
River or man-made channel	767	417
Forest	888	1,441
Scrub-shrub	1,213	156
Lake, wet meadow, marsh, or pond	257	134
Urban	164	304
Range	2610	2,589
Agriculture	2,285	2,320
No photo coverage	0	824
<b>Albuquerque Reach</b>		
River or man-made channel	2,047	1,100
Forest	1,925	2,472
Scrub-shrub	2,649	600
Lake, wet meadow, marsh or pond	703	117
Urban	2,136	8,803
Range	5,974	1,763
Agriculture	6,974	4,772
No photo coverage	0	2,781
<b>Belen Reach</b>		
River or man-made channel	1,934	930
Forest	1,749	2,376
Scrub-shrub	4,076	1,097
Lake, wet meadow, marsh, or pond	1,161	229
Urban	1,184	3,856
Range	7,870	3,218
Agriculture	8,295	10,071
No photo coverage	0	4,493

Cover type	Area in Hectares	
	1935	1989
Socorro Reach		
River or man-made channel	4,225	1,898
Forest	4,020	1,545
Scrub-shrub	6,107	7,447
Lake, wet meadow, marsh or pond	1,998	1,157
Urban	252	920
Range	3,785	4,015
Agriculture	2,887	6,164
No photo coverage	0	129



### Questions about the graphs:

Which reach is the largest land use in your stretch of river in 1935?

In 1989?

What has changed between 1935 and 1989?

Why do you think there were changes?

Predict what your graph would look like 50 years in the future. State each category and how you think it will be different.

Look at the maps and the graphs: how would changes in the valley shown in the graphs and the maps affect these users of the Middle Rio Grande Valley?

Farmers:

Residents—including you and your family:

Wildlife:

Summarize the changes in land use over the 20th century.