# Rio Bravo Information Cards



**Cottonwood Seedlings** —"baby" cottonwoods
(*Populus deltoides ssp. wislizenii)*

Small cottonwood trees which have just started growing. Generally, seedlings are less than 1" (2.5 cm) in diameter at 4.5' (1.35 m) from ground level. Habitat needs:

- bare, wet soil to germinate
- open areas where there is a lot of sunlight
- roots must stay in water as the water table drops throughout the summer
- grows near water, on sand bars, near river's edge

RIO BRAVO

**Cottonwood Sapling**—"teenage" cottonwoods
(*Populus deltoides ssp. wislizenii*)

Small cottonwood trees. Larger than 1 in. (2.5 cm) in diameter and less than 4 in. (10 cm) in diameter at 4.5 ft (1.35 m) above the ground level. Habitat needs:

- roots must reach to water as the water drops throughout the summer
- in former high water area—not far from riverbank
- not along the edge of river

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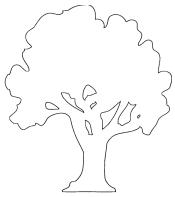
**Big Cottonwood**—"mature" cottonwoods
(*Populus deltoides ssp. wislizenii*)

Mature Rio Grande cottonwood trees can be up to 80 ft (24 m) tall and 4 ft (1.2 m) in diameter. Habitat needs:

- usually not near current river channel (trees survived because the river changed location after the trees were established)
- in the flood plain, not on valley slopes
- roots must reach to permanent water table



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**Cattails** (*Typha* sp.)

These wetland plants represent marshes and are are important areas for wildlife nesting, protection and food. Habitat needs:

- there must be water at the surface for most if not all of the year
- often at an oxbow—an old channel of the river
- occasionally on the edges of sand bars or the inside curve of meanders

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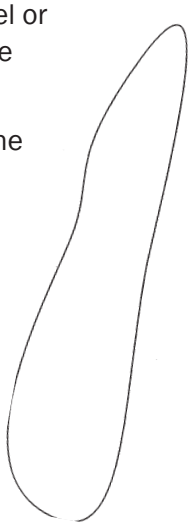
# Rio Bravo Information Cards

**Sand bar**

Sand bars form in areas of the river where the water slows. Sediments, such as sand, drop out of the slowly moving river. Place:

- in the river channel or along the edge of the river
- lengthwise, with the flow of water



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**Upland Shrubs**

Upland shrubs grow in dry places where the water table does not come near the surface. Habitat needs:

- live in higher areas
- depend on rain for moisture
- can live on very little water each year

Examples: fourwing saltbush, fringed sage, broom dalea/false indigo

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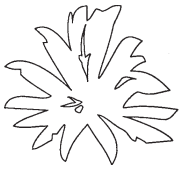
**Native Riparian Shrubs**

Native shrubs have lived here for thousands of years. Habitat needs:

- in the flood plain of the river—the lowland alongside the river
- in the shade under old/mature cottonwoods
- sand bars

Examples: New Mexico privet/New Mexico olive, silverleaf buffaloberry, coyote willow



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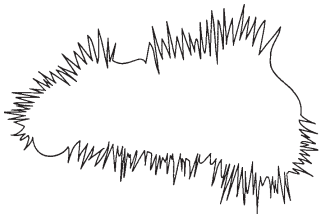
**Grassy Meadow**

Grasses are one of the largest families of plants, providing seeds, leaves, and roots as food for many rodents, insects, and birds; and shelter for birds, insects, and rodents

- Different species grow in many environments from dry uplands to wet marshes, in full sunlight or in forest shade

Examples: saltgrass, blue grama



RIO BRAVO

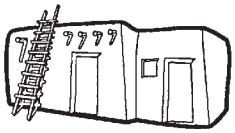
# Rio Manso Information Cards



**Houses**

People moved into the area.

• place houses where you would want to live



RIO MANSO

**Agricultural Fields**

Include gardens, orchards, cropland and pastures.

• place in the flood plain of the river

• you may need to clear land for your crops

• orient long, narrow fields with the short side next to a ditch

RIO MANSO

**Irrigation Ditches and Drains**

Irrigation ditches and drains move water to agricultural fields and back to the river

• place drains outside of and parallel to the levees

• irrigation ditches should run from the river to the fields

• remember that water flows downhill

RIO MANSO

**Levee**

A levee is a raised embankment running parallel to the river. This high berm keeps the river confined in high water, and protects areas beyond from flooding.

• place parallel along the entire length of the river

• place on both sides of the river

• narrow and straighten the river—confine it to a narrow channel

RIO MANSO

# Rio Manso Information Cards

**Exotic Riparian Trees**

Non-native, exotic trees were brought here by people; most species were introduced in the last 100 years.

• place in the flood plain of the river—the lowland alongside the river

• may grow in the shade under big cottonwoods.

• often grow in openings, such as after a fire

Examples: Russian olive, saltcedar or tamarisk, Siberian elm, tree of heaven

RIO MANSO

**Snags**

Snags are standing dead trees. Many have died due to lack of water. Others are trees that were killed by fire. Most bosque fires are started by people, and fires have increased since humans settled in the area.

• place in bosque between river and levee

RIO MANSO

**Dam**

Place (or imagine) a dam at the upper edge of the model

• it will cross from one edge of the flood plain to the other—from upland to upland across the river

• it will totally control the flow of the river—water will be released under specific conditions

• catastrophic flood will now be controlled—the spring runoff will be reduced and the summer flow will be increased as water held behind the dam in high flow will be released in times of lower flow

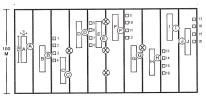
RIO MANSO

# Rio Nuevo Information Card

**Monitoring Plots**

Resource managers need to monitor the results of their actions, and monitor the bosque in general to understand what changes are happening:

- select sites where you want information about what is happening in the bosque
- select some sites that have not been disturbed
- select some sites where restoration projects are installed



RIO NUEVO

About the monitoring icon:

The icon used to represent monitoring plots is a diagram of a study plot from the Bosque Ecosystem Monitoring Program (BEMP) along the Middle Rio Grande. BEMP is only one kind of monitoring study, and other studies may have different designs. BEMP plots are 100 meters by 200 meters and are oriented lengthwise parallel to the river. Each plot contains 10 vegetation plots (the long rectangles), five ground water wells (circle with an 'x'), 10 litterfall tubs (circle with letter), and 20 pitfall traps (small squares). The plots also have two rain gauges and three temperature data loggers but these are not pictured on the icon.

# Rio Nuevo Habitat Restoration Project Cards

## Overbank Flooding

During years with a high winter snowpack there will be lots of water melting and flowing down the watershed in the spring. Much water will be held in reservoirs for irrigation through the summer, but in good years a large flow can be allowed downstream during the normal season for spring runoff. The water managers at the Army Corps of Engineers and Bureau of Reclamation can decide to allow for water amounts to pass through the dams that will spill over the banks of the river and flood some of the floodplain of the Rio Grande. This is called "overbank flooding." (The goal is to have standing water in wooded areas within the levees. This way the communities outside the levees are protected from flooding.) Overbank flooding promotes the growth of mature cottonwoods and other native riparian plants as well as encouraging the natural cycling of nutrients.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ place ten more cottonwood seedlings on the model; seedlings can be added to sand bars or edges of the river or to places that have been cleared of other vegetation
- ✓ place two more native riparian shrubs on the edges of the Rio Grande; plants such as willows will grow well now
- ✓ remove one upland shrub: wetter areas are no longer attracting upland plants
- ✓ if any homes have been placed within the levees, remove these now: floodplains are a silly place to build anyway
- ✓ remove one snag: with overbank flooding fuels are reduced by faster decomposition and less likely to burn with wetter conditions
- ✓ remove one exotic tree as conditions are not as optimum for some of these plants

## Pole Planting of Cottonwoods

The numbers of cottonwoods are decreasing along the Rio Grande, because for decades flooding has been prevented and natural places for cottonwood establishment are not being created. One way to counteract this is to plant cottonwoods. Cottonwoods have an adaptation that land managers can take advantage of: a long, young branch of a cottonwood tree (here called a "pole") can be cut and put in the ground where it will send out roots and grow. We can have tall trees immediately, without needing to grow them in a nursery from seed. This usually takes a lot of labor, a giant drill to drill a hole down to the water table (remember cottonwoods need to have their roots in the water to survive), and very long branches of cottonwood, 15 to 20 feet long (and even then, all but a few feet will be buried). The cottonwood pole is slipped in the newly drilled hole and dirt is packed in. This is a way to give some cottonwoods a good start, but it is expensive, especially if you are looking at miles of river needing more cottonwoods.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ add ten more cottonwood saplings to the model, making sure you put them close to the river where the water table is not too deep
- ✓ add one more mature cottonwood tree to symbolize that this project will mean large trees in the future

# Rio Nuevo Habitat Restoration Project Cards

## Wetland Construction

The numbers of marshes and wetlands have been reduced over the last decades. Managers can create new ponds and wetlands. Some examples are the ponds at the Mesilla Valley Bosque State Park, at the Bosque del Apache National Wildlife Refuge and at the Rio Bosque Wetlands Park in El Paso. A different wetland is a "constructed wetland" that takes wastewater and sends it through a series of small water pools. Each pool is filled with cattails and other plants that clean the water.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ place 50 more cattails on the model in groups representing 10 new constructed wetlands
- ✓ add five cottonwood seedlings (although wetlands are not specifically designed to recruit new cottonwoods, they often provide a good site for cottonwoods to reestablish)
- ✓ add one native riparian shrub: conditions are better for native plants such as willows
- ✓ remove one upland shrub: wetter areas are no longer attracting upland plants
- ✓ remove one exotic tree as conditions are not as good for some of these plants

## Fuel-wood Reduction

In earlier years, the overbank flooding that would occur every few years would saturate the branches and leaves that had fallen on the ground in the bosque. By being wet, they would decompose more quickly than they have in recent decades. Microscopic organisms such as bacteria and fungi break down plant material into nutrients that can be used by other plants; this is called nutrient cycling. Prior to the regulation of the river, the cottonwood forest did not burn as hot as is does today—sometimes it was so wet that fuel wood on the ground decomposed fairly quickly. Since the elimination of overbank flooding after large dams were constructed on the river, fuel wood has built up on the floor of the cottonwood forests and everything is much drier. Fires spread very quickly once they get started and generally burn hotter and longer in the same area. Most fires are caused by careless people, and there are many more people living in the valley today. The fires burn far and wide. One way to reduce the destructiveness of fire in the bosque is to clean the area of downed trees and branches—reducing the fuels that create destructive fires. Teams of volunteers can haul away branches and sticks; a shredder can be used to create mulch that will decompose more quickly than large branches.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ remove five exotic trees: much of the excess trees removed in these projects are non-natives
- ✓ remove one upland shrub; again we can select to remove shrubs like one-seed juniper
- ✓ add one native riparian shrub; while removing exotic and upland plants we are making room for native riparian shrubs
- ✓ add one grassy meadow: fuel breaks create more grasslands

# Rio Nuevo Habitat Restoration Project Cards

## Creation of Secondary Channels

The river used to have many channels as it flowed down the valley. Some would only have water in them during the spring runoff, but this was enough for cottonwoods to get a good start. In some areas, the easiest way for cottonwoods to get established is for us to help out nature a little. In places where the banks are just too high, managers can take in a bulldozer, lower the bank and create a small side channel where water will flow some times of the year. Cottonwoods and native shrubs such as willow can get established here. At the Rio Grande Nature Center State Park in Albuquerque, an old, unused canal has been turned into a secondary channel by digging it deeper and reconnecting it to the river. When the river is high, water will flow into this canal, providing silvery minnows with habitat and refuge during low water periods.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ add 40 cottonwood seedlings; these projects are prime habitat for germinating cottonwoods
- ✓ add one mature cottonwood tree to represent the future forest
- ✓ add 10 cattails to show more wetlands being developed
- ✓ add two sand bars below the project site, created by sediment added by the earth work
- ✓ add two native riparian shrubs: birds like willow flycatchers need thickets of willows to nest; these thickets have been rare for many years, and now more are being created
- ✓ remove one upland shrub because the habitat no longer provides dry conditions these plants need
- ✓ remove one non-native tree

## Removal of Exotic Species

Many agencies and landowners are involved in reducing the number of introduced species such as saltcedar (also known as tamarisk, *Tamarix chinensis*), Russian olive (*Elaeagnus angustifolia*) and Siberian elm (*Ulmus* sp.) in the bosque. These exotic shrubs and trees are increasing, in general, because human-caused changes in the river valley provide favorable conditions for them to grow. Saltcedar has been thriving, especially along the Rio Grande south of Bernalillo County. Saltcedar trees flower and produce seeds throughout the growing season; their reproduction is not restricted to spring/early summer as are native cottonwoods. When bare ground is colonized late in summer by saltcedar, it will not be bare in the spring when cottonwoods are sending out seeds. Both Russian olive and Siberian elm can sprout in shaded areas, under the canopy of the cottonwoods and are becoming very common in the bosque. Entire food chains depend on the cottonwood trees of the bosque. As cottonwoods are crowded out by introduced species such as these, the entire ecosystem is affected and fewer native species thrive.

Large saltcedar removal efforts have been undertaken at the Bosque del Apache National Wildlife Refuge. They have experimented with different procedures to effectively keep the saltcedar from returning. Santa Ana Pueblo north of Albuquerque has also undertaken major projects to restore the bosque to its previous native-species-only state. Mesilla Valley Bosque State Park is a showplace contrasting a restored area to the invaded area. This work can range from volunteers cutting down and removing exotic trees to the large equipment of bulldozing and repeated rootplowing, sometimes using herbicides to reduce their reoccurrence.

What beneficial changes will there be as the result of this project? What habitat components can we replace on the model now?

- ✓ remove 10 exotic trees
- ✓ remove one upland shrub in the flood plain (we can select to remove shrubs like one-seed juniper during these projects)
- ✓ add two grassy meadows: removing exotic species provides space for more grasslands
- ✓ add one mature cottonwood: as exotic species are removed there is room for our native trees

# Rio Nuevo Habitat Restoration Project Cards

## Water Conservation

The amount of water that is used by people along the river has an impact on the health of the bosque and river life. Pumping more water than is replenished through infiltration each year causes the water table to drop; plants that depend on ground water can no longer reach their roots to that depth and die. When the water table is lowered, more river water will soak down in the ground, leaving less flow on the surface—less water for all of the users who need water. Some communities along the Rio in southern New Mexico use river water for their household supplies, but 100% of New Mexico's Rio water below Elephant Butte Dam is designated for agriculture. Though some water will be returned to the river as treated waste water or drainage from farms, much is used, evaporates or infiltrates to ground water. Fast-growing communities, like Las Cruces and Santa Teresa, are demanding more water for residential and commercial use. Some of this comes from the Rio Grande already, but more rights may be purchased from farmers and other users as the demand rises. Water must still be delivered to users in Texas and Mexico, many of whom are turning to ground water sources to meet their needs. We can lessen the need to lower the flow of the Rio Grande by reducing water use at home: plant low-water-use landscaping, install low-flow toilets or turn off the water while brushing your teeth. Farmers have become more water-efficient by metering water deliveries to farms (with help from the Elephant Butte Irrigation District, EBID), laser-leveling farm fields to control runoff and experimenting with alternative methods of irrigation, like sprinkler or drip irrigation.

What changes will there be as a result of this water conservation project? What habitat components can we replace on the model now?

- ✓ add five cottonwood seedlings: with more water in the river, more places can flood and start new trees, and seedlings can be added to sand bars or edges of the river
- ✓ add five cattails: more water in the river means more wetlands

## Monitoring

An important part of managing the bosque is to understand what is happening to the plants, animals, water table, and other ecological functions in the bosque. The process of collecting, compiling, and analyzing information is called "monitoring." Monitoring is an essential tool for land managers to understand if their actions are making any changes (good or bad) in the ecosystem. Many agencies responsible for caring for the river and the bosque collect data on a regular basis. Some schools also help collect important data. In addition to measuring the water table, weather factors, and soil factors, students also collect information about plants and animals.

Why is it important to collect information about the bosque over the long term? How can this information be used to help manage the bosque?

- ✓ add six monitoring plots to the model. Carefully choose places you wish to monitor. You may want some sites that have not been disturbed by recent activities. You might also want some sites where you have done projects.

*Note: The monitoring icon is an image of a Bosque Ecosystem Monitoring Program (BEMP) plot. These sites are scattered throughout the Middle Rio Grande Valley and are generally monitored by students from Grades 2–12.*