



45. *Changing Fire*

Description: By the roll of the dice, students use the “Changing River” model to see how fire reacts differently in the three variations of the river.

Objectives: Students learn about changes in the fire regime of the bosque that came about as the river and floodplain were altered, as well as changes with modern management approaches. In particular, students will learn that:

- there is now more fuel in the bosque, due to flood suppression and the introduction of exotic plants;
- there are now fewer fire breaks to stop large fires, since the mosaic of habitats in the floodplain has been lost;
- there are now more sources of ignition in the bosque, due to increased human activity;
- as a consequence of these factors, fires now are more frequent, burn hotter and burn a larger area than prior to the extensive changes to the floodplain; and
- new management strategies focus on removing the danger of catastrophic bosque fires.

Materials: the “Changing River” model, set up first as Rio Bravo, then Rio Manso and lastly Rio Nuevo

dice

“Changing Fire” component cards for Rio Bravo, Rio Manso and Rio Nuevo

Six flame cards for each river

(continued on next page)

45. *Changing Fire*

Grades: 5–12

Time: one hour when building on the already assembled Changing River activity (#13)

Subject: science

Terms: *exotic plants (introduced shrubs), fire break, fire intensity, fire regime, fire triangle, overbank flooding, thicket, understory*





22 yards (20.1 meters) of black yarn cut in the following lengths, at least twelve of each length:

Rio Bravo: 9 inches / 23 cm

Rio Manso: 38 inches / 97 cm

Rio Nuevo: 19 inches / 48 cm

Background: Unlike most upland ecosystems in the arid Southwest, fire probably was not a major factor influencing the bosque prior to European settlement. The bosque and floodplain evolved with flooding as a major source of disturbance, and flooding orchestrated the way different habitats were distributed across the floodplain. Prior to river regulation, the river moved across the floodplain, creating a patchwork of habitats, with marshes and wet meadows interspersed with forest stands of different ages—a patch of newly established seedlings along an attached sandbar, a stand of young trees farther up the bank, a stand of grand, mature trees with little understory a short distance downstream. When the snow melted from the mountains each year, high runoff inundated the forest, washing away some litter and dampening what was left, thereby increasing the rate of wood and leaf decomposition. Little litter, woody debris or understory shrubs remained, creating a park-like appearance.

Prior to the presence of humans in the Rio Grande Valley, the only source of ignition for fires was lightning. At the time of Rio Bravo, fires probably started from lightning strikes in the adjacent upland grasslands and burned down into the floodplain, but they would not have burned far into the floodplain due to moist conditions, a lack of fuel and the natural fire breaks. There simply were not long, dry, stick- and shrub-filled stretches of bosque to burn. Data from fire scars in annual growth rings of trees suggest that prehistoric fires occurred during the dry late-spring period, April through June, before summer thunderstorms arrived.

When the early Puebloans and first Spanish settlers arrived in the valley, they may have burned land to clear for crops, or burned uplands to promote grasses for livestock, and these fires may have burned into the bosque. However, the impact on the floodplain ecosystems still would have been minor, due to the factors described above. The biggest changes began in the early 1900s when the river was channelized and the frequency and extent of flooding decreased. These changes, with a now-stable river channel and lack of seasonal inundation, resulted in an increase in fuel in the forest as the dry conditions inhibited decomposition and fuels were no longer washed away by floods. Also at this time, exotic plants like saltcedar were introduced, and the whole structure of the forest



gradually changed. The patchy bosque stands interspersed with wetlands and meadows changed as wetlands dried up (due to ditches installed to lower the water table), meadows filled in with shrubs and trees and the forest became more continuous within the levees. The frequency of ignitions gradually increased with increasing human activity. In addition to lightning, the bosque now faces multiple sources of ignition: burning of adjacent fields or piles of brush to clear for agriculture, campfires, fireworks, cigarettes, children playing with matches and arson. These accidental (or intentional) fires spread quickly with the piles of dead wood and dry leaves present in the forest and the dense stands of flammable exotic plants such as saltcedar. The lack of fire breaks promotes their spread. The result is that for Rio Manso, fires burn hotter and cover much greater areas, with extensive cottonwood mortality. Since humans are now the main ignition source for bosque fires, fires now occur in every month of the year.

Fortunately, land managers are beginning to make changes to decrease the impact of fires in the bosque. Rio Nuevo results from a new vision of river and floodplain management, and one of the biggest changes is to decrease the standing fuel in the forest. Land managers are now removing much of the downed woody debris within the forest, as well as exotic shrubs and trees like saltcedar, elm and Russian olive and jetty jacks that impeded fire fighters' access. New wetlands are being created, and there is an attempt to restore the mosaic of floodplain habitats that once provided natural fire breaks. Man-made firebreaks are also being added, and in some places flooding is being reintroduced to the forest. All of these changes should help to decrease the impact of fire, by keeping fires more confined and of a lower intensity due to



Dead, charred trees stand along the Rio Grande after the 2003 Montaña fire, although the bankside willows have regrown. Photo by Mark B. Higgins.



reduced fuels. One important change is to decrease the frequency of ignitions, through public education and bosque closures. It is hoped that as more people learn of the vulnerability of the bosque to fires and become aware of the important role of humans as the sources of ignition, public stewardship will eliminate the need to close the bosque during dry periods with great fire threats. This is an important lesson for kids to learn—we really can make a difference!

Procedure:

Introductory discussion:

What do you need for any fire to burn?

Heat, fuel, oxygen—called the fire triangle. All three are needed for a fire.

So, how do we put fires out?

Remove any one of the three parts of the fire triangle:

- Heat: cool fire with water from helicopter, hose, rain.
- Fuel: create fire break by removing vegetation down to mineral soil in zone around fire.
- Oxygen: snuff out and remove oxygen such as tossing dirt on a grass fire, cover flames with a heavy blanket, place a lid on burning food in a pot, use a candle snuffer on a candle flame.

Review with the class the river of the past, the human changes that have occurred and the improved management that is being implemented today. In this activity, you will see the differences in the effects of fire in the three systems: fire played a minor role in the bosque of Rio Bravo, before humans made many changes to the river ecosystem, but has had huge effects in the bosque of Rio Manso, when humans changed the flow of the river and subsequently the surrounding forest with dams, levees and introduced plant species. Finally, the role of fire may again be reduced in Rio Nuevo, with the removal of exotic plants, periodic over-bank flooding and reduced fuel build-up in the floodplain.



To start the activity, choose one item on the bosque model as an ignition point, such as one mature cottonwood tree. Students roll the dice to determine how the feature they selected on the model will be affected by fire. If there is a spread of fire for the number they landed on, they use the flame length for that river model to show the spread of fire. The flame is shortest for Rio Bravo (1.5 inches / 4 cm); longest for Rio Manso (6 inches / 15 cm), medium for Rio Nuevo (3 inches / 8 cm). Using the proper flame length as your radius, pivot the flame around the tree to see what other vegetation will be consumed by fire; any burnable object touched by the flames will burn. Use the appropriate length of yarn to encircle that area and show the extent of the fire. Students should remove plants from the burn area.

Math review of radius and circumferences is appropriate here. The longer pieces of yarn are the circumference of that particular flame-length radius. (See *Extensions*.)

Have teams of students repeat the procedure for other items (e.g., meadow, sapling, etc.). Go around the class to have each group share what their item was and what happened during this fire season—what they did on the model during that round.

When finished with the Rio Bravo, you must replace items removed by fire and set up the model for Rio Manso. You should have the students do the main activity for Rio Nuevo—the restoration projects shown on the cards in Activity #13, Changing River—before looking at the effect of fire on the bosque of Rio Nuevo.

Discussion Questions

Describe the impact of fires in the Rio Manso. (*The narrow ribbon of bosque can be drastically reduced by a few fires.*)

Why are there more fires and more damage in the Rio Manso?

How has fire changed in each bosque?

Why are there different lengths of fire for each time of the river?

What would happen to the burned areas after a fire?

Discuss the effects of fire on each vegetation type (e.g., mature cottonwoods die out, saltcedar spreads, etc.) after each river round.

Discuss fire breaks. What makes a fire break? Did you know that a strong fire in heavy winds can jump the river?



How have the following changed in each part of the activity: amount of fuel, fire breaks, ignition sources?

How can management changes affect fire in the bosque?

How can we reduce fires in the bosque today?

How can your behavior affect fire in the bosque?

Notes:

The fire area delineated may not be a circle, depending on the specific directions on the card. When there is little fire, and “fire does not spread,” the yarn can be dropped in a small pile.

Rio Bravo will not need many pieces of yarn, as there were few fires.

You will have to replace certain pieces on the model for the activity to work. For example, there is only one cottonwood sapling and one grassy meadow on the model for the start of Rio Manso (Changing River Model Pieces: What to Have on the Model When, p. 165), so extra may have to be added. This is a model, and you must make adjustments along the way as needed.

For the purpose of this activity the “flame length” cards illustrate the combination of flame size plus the radiant heat from the fuel—the fire’s intensity. These affect the fire’s spread.

Each round of this activity is during the peak fire season, February through June of any given year.

Upland fires can spread into the bosque through strong winds.

If an area was recently burned, it is a “fire break.” Fire will not burn there again.

There should be one card for every two or three students. You can duplicate the cards to accommodate a larger class. There are six cards for each stage (Rio Bravo, Manso and Nuevo). You can have one student in each group roll the dice and do what is on the card, then pass to the next student to roll the dice and follow directions for that number, and then the third student rolls the dice and follows the directions. Each student can choose a different place on the model to begin, such as a different mature cottonwood, for each roll of the dice.

Assessment:

Oral or brief written assessment using Hansen’s Comprehension Questions (from Freeman & Freeman, “Teaching Reading in a Multilingual Classrooms”):

- 1) What do you remember?
- 2) What else would you like to know?



3) What does it remind you of?

4) What other things have you read that it reminds you of?

Pre-teach the model cards before playing (what do students know before?)

Review before resuming play (what do students remember?)

Review after play (what did students learn?)

Place a frame to isolate parts of the activity while in play. Ask groups to describe what is happening in that section.

Extensions: Pre-teach a math component of radius, diameter and circumference. Give students the radius of flame spread for each time period on the river and have them calculate the circumference of yarn needed.

Rio Bravo radius = 1.5 inches (4 cm); circumference = 9 inches (23 cm)

Rio Manso radius = 6 inches (15 cm); circumference = 38 inches (97 cm)

Rio Nuevo radius = 3 inches (8 cm); circumference = 19 inches (48 cm)

The burned areas on the model can be indicated by mapping: students can draw the growing burned area on graph paper to create an area map. These can become story indicators for setting up the activity if disturbed or keeping track of progress of activity during recess or a weekend, etc.

Use clear plastic bags and a wall chart to insert and sort plants burned in the course of the activity; then graph the numbers to compare each river model.

Simplifying the activity for K-5

Reduce the number of plant pieces by half to reduce visible clutter.

Use repetition and repetitive patterns to support reading in this activity.

Cut out and sort model pieces and label bags.

Place pieces on the model in the proper locations.

Teach the names associated with different model pieces: associate the symbol with living plant on a field trip activity



Use cumulative patterns. For example: How many mature cottonwood trees do we have? How many do we need to play this activity? How many cottonwood saplings were burned?

Create a chart of burned and removed plants (math component).

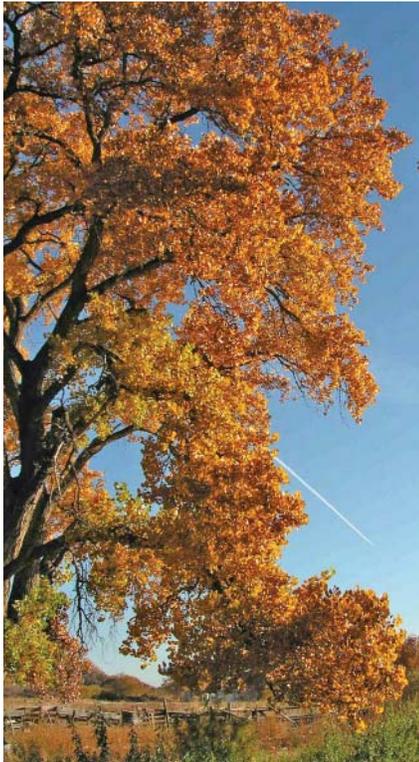
Have students think up alliterations about the activity such as, "How much wood would a woodchuck chuck, if a woodchuck could chuck wood?" Or something using rhythm such as a chant indicated by S-shaped movement using hands mimicking the directional flow of the water (change tenses to indicate time).

"...and the Rio Bravo flowed on and on..."

"...and the Rio Manso flows on and on..."

"...and the Rio Nuevo will flow on and on..."

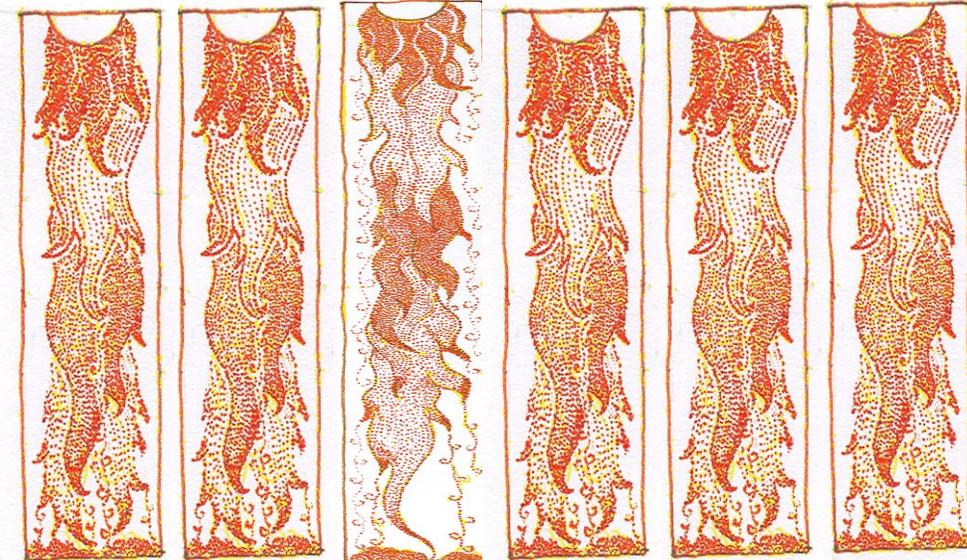
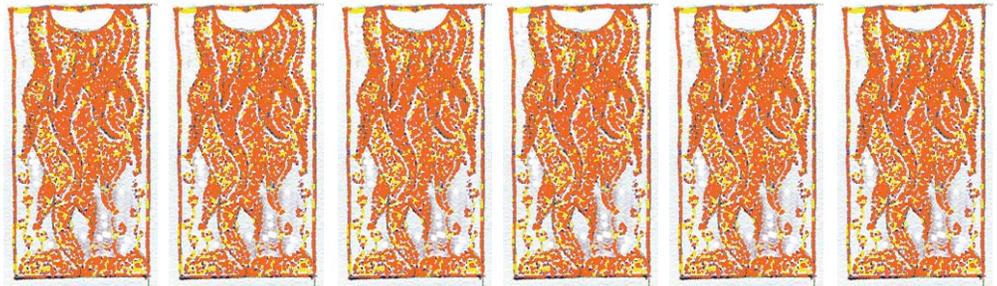
Think of rhymes.



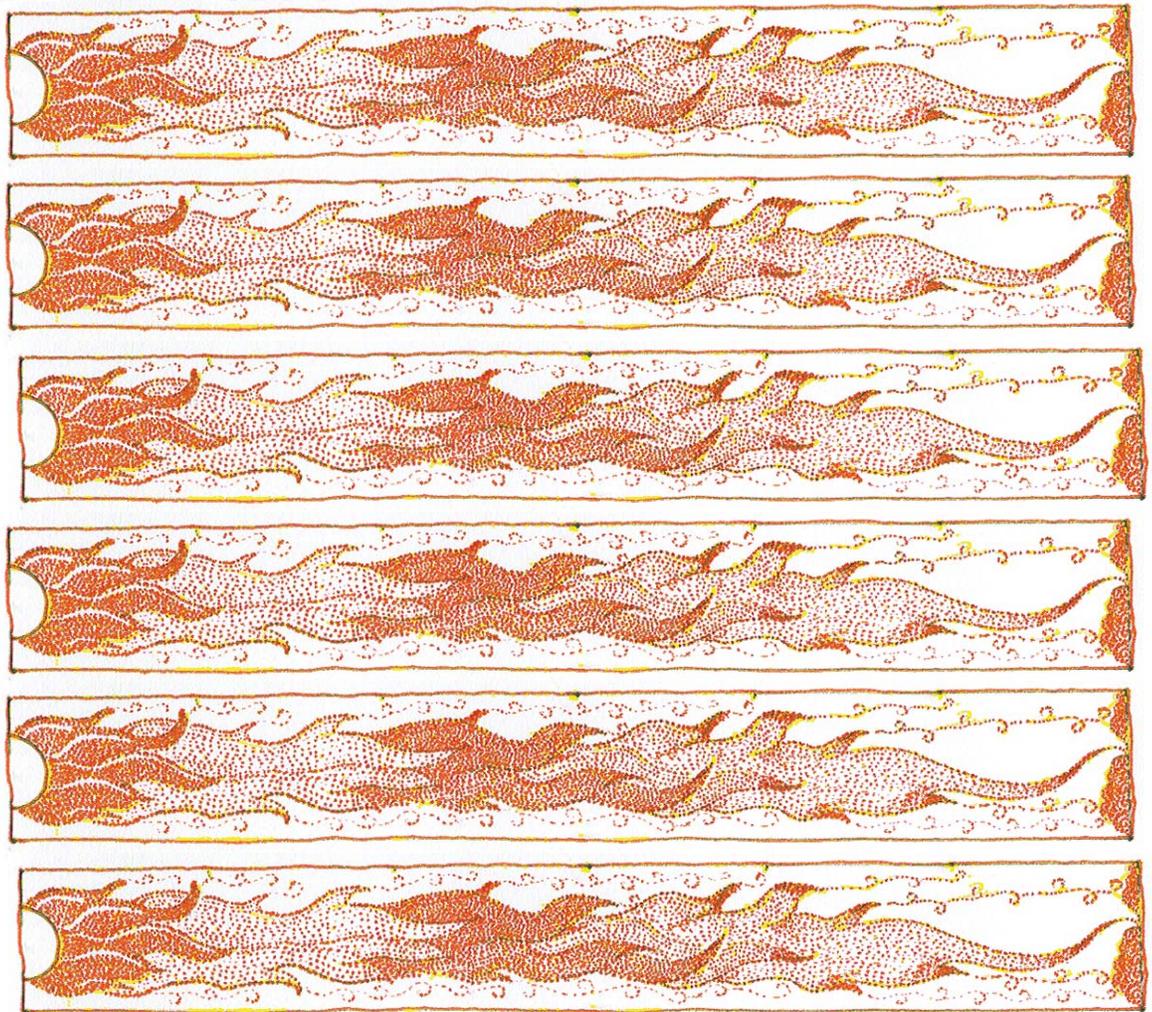
*Fall cottonwood near Algodones.
Photo by Mark B. Higgins.*

Flame Lengths for Rio Grande Fires

→
Rio Bravo



←
Rio Nuevo



→
Rio Manso

Changing Fire Model Directions

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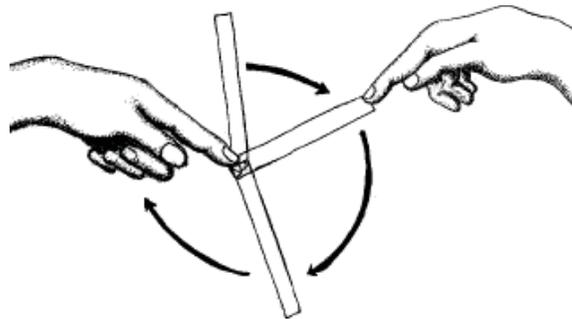


1. Pick one item on the model for this turn. For example, if you have the “Shrub thicket” card, pick one shrub on the model as the focus for this round.
2. Roll the dice and follow the directions for that number on your card.
3. If that number has a “fire spread” use the flame length card for that model of the river:

Rio Bravo = 1.5 inches/4 cm

Rio Manso = 6 inches/15 cm

Rio Nuevo = 3 inches/8 cm



As in this illustration, place the center of the flame on your item, the “shrub thicket” you have identified in #1 above.

- ✓ Pivot the flame around.
- ✓ Then circle that area with black yarn of the proper length:

Rio Bravo = 9 inches/23 cm

Rio Manso = 38 inches/97 cm

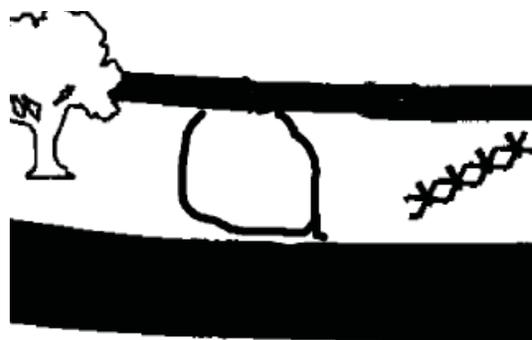
Rio Nuevo = 19 inches/48 cm

4. Remove all plants within the circle.

Leave yarn to show where the fire burned.

Remove the flame card.

5. If the card instructs a small fire, use the yarn dropped onto that plant or few plants, to indicate what burned.





Changing Fire: Rio Bravo

I am a... **Mature Cottonwood Tree**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is no source of ignition, so there is no fire.
2. Lightning strikes the tree. It leaves a scar, but the fire does not spread. The forest is flooded by spring runoff.
3. It is raining. There is no source of ignition, so there is no fire.
4. Fire starts in the grassland/uplands. The fire spreads to the edge of the floodplain where it stops at a clearing. The tree is not burned.
5. There is no source of ignition, so there is no fire.
6. Lightning strikes the tree. It leaves a scar, but the tree continues growing.



Changing Fire: Rio Bravo

I am a... **Cottonwood Sapling**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. It is raining. There is no source of ignition, so there is no fire.
2. Lightning strikes the sapling. The fire spreads to the edge of a clearing and stops.
3. Lightning strikes the sapling. There is little dry fuel. The fire burns only a small area.
4. Forest is flooded by spring runoff. There is no fire.
5. There is no source of ignition, so there is no fire.
6. Lightning strikes the sapling. The bosque is flooded so only a small area burns.



Changing Fire: Rio Bravo

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I am a... **Marsh/Wetland**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is no source of ignition, so there is no fire.
2. Lightning strikes the grassy uplands. Fire spreads to the edge of the marsh where it stops.
3. It is raining. There is no source of ignition, so there is no fire.
4. Lightning strikes a nearby tree. Fire burns to the edge of the marsh and stops.
5. Lightning strikes the edge of the marsh. The marsh is wet so there is no fire.
6. It has been a wet spring. The marsh is unaffected by fire.



Changing Fire: Rio Bravo

I am a... **Grassy Meadow**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning strikes a grassy meadow. The grass is dry and the fire spreads.
2. There is no source of ignition, so there is no fire.
3. Lightning strikes a grassy meadow. The meadow is flooded so there is no fire.
4. There is no source of ignition, so there is no fire.
5. Lightning strikes a grassy meadow. The meadow is flooded so there is no fire.
6. There is no source of ignition, so there is no fire.



Changing Fire: Rio Bravo

I am an...**Upland Shrub**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a light spring rain. There is no source of ignition, so there is no fire.
2. Strong winds dry the shrubs. There is no source of ignition, so there is no fire.
3. Lightning strikes the upland shrub, but it is raining, so there is no fire.
4. Lightning ignites a dry shrub. Strong winds spread fire to nearby grasses.
5. Lightning starts a fire in the shrub. It moves toward the floodplain. Moist soil from recent flooding stops the fire.
6. There is no source of ignition, so there is no fire.



Changing Fire: Rio Bravo

I am a...**Shrub Thicket** (“native riparian shrub” such as willow)

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is no source of ignition, so there is no fire.
2. Lightning strikes a willow thicket at the edge of the river. The willow burns, but flames die out as they reach a wetland.
3. The bosque is moist from flooding. There is no source of ignition, so there is no fire.
4. There is a drought. Lightning strikes a willow thicket and spreads.
5. The bosque floor is moist from flooding. There is no source of ignition, so there is no fire.
6. Lightning strikes a stand of small shrubs and spreads. The fire dies out when it reaches a clearing.



Changing Fire: Rio Manso

I am a...**Mature Cottonwood Tree**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in the tree and it spreads.
2. A campfire left unattended spreads through the dry leaves and ignites the tree. High winds spread the fire quickly.
3. Lightning strikes the tree and starts a fire. The heavy undergrowth and downed branches catch fire. The fire spreads.
4. Carelessly tossed fireworks start a fire in dry leaves and plants under the tree. Strong winds quickly spread the fire.
5. Lightning strikes the tree. It leaves a scar, but the fire does not spread.
6. A tossed cigarette smolders in leaves under a tree. Flames spring up and spread.

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Changing Fire: Rio Manso

I am a...**Cottonwood Sapling**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in the sapling and the fire begins to spread.
2. A campfire left unattended spreads through the dry leaves and ignites a sapling. High winds fan the flames, and the fire spreads.
3. Lightning strikes. A fire starts in the sapling. The heavy undergrowth and downed branches nearby are fuel for a hot fire, which spreads quickly.
4. Carelessly tossed fireworks start a fire under the sapling. Strong winds spread the fire quickly.
5. Lightning strikes the area. It has been raining. There is no fire.
6. A tossed cigarette smolders under the sapling. Flames spring up and spread.



Changing Fire: Rio Manso

I am a...**Marsh/Wetland**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in the dry marsh. The fire spreads.
2. A campfire is left unattended. High winds carry sparks to leaves. Parts of the marsh burn.
3. Lightning strikes a meadow near the marsh. A fire starts. Some of the marsh plants burn.
4. Carelessly tossed fireworks start a fire. Gusty winds spread the fire.
5. Lightning strikes the area. It has been raining so only the edge of the marsh burns.
6. A tossed cigarette starts a fire in the dry marsh. The fire spreads to nearby grasses.



Changing Fire: Rio Manso

I am a...**Grassy Meadow**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. A tossed cigarette ignites grass in the meadow. The fire spreads.
2. Someone builds a campfire. Sparks ignite nearby grass. The fire spreads.
3. Lightning strikes the meadow. Dry grass and leaves burn, and the fire spreads.
4. Lightning strikes dead branches near the meadow. Fire spreads across the meadow and beyond.
5. Kids are playing with fireworks in the bosque. Sparks ignite the dry grass and the fire spreads.
6. Lightning strikes the meadow. A fire starts and spreads through the grass.



Changing Fire: Rio Manso

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I am an...**Upland Shrub**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. A cigarette is tossed from a car. Dry roadside grass and shrubs ignite. Wind spreads the flames toward the bosque.
2. Someone builds a campfire. Wind spreads sparks into a stand of upland shrubs.
3. Lightning strikes an upland shrub. A fire starts and spreads through dry grass.
4. Kids are playing with matches and accidentally start a fire. Flames spread to shrubs.
5. Lightning strikes upland shrubs. The fire spreads through dry grass and into the bosque.
6. Lightning strikes an upland shrub. It is too wet to spread.



Changing Fire: Rio Manso

I am a...**Shrub Thicket** (“introduced shrubs” such as saltcedar)

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. A person smoking in the bosque drops a lit cigarette. Dry leaves begin to burn and ignite dead branches. The fire spreads.
2. Someone builds a campfire. Sparks escape into a saltcedar thicket. The fire spreads.
3. Lightning strikes the shrub thicket. It sparks a fire in dry leaves, and spreads.
4. Lightning strikes the shrub thicket. The fire grows with lots of fuel and spreads.
5. Kids light fireworks in the bosque. Dry weeds catch fire and the fire spreads through the shrub thicket.
6. Lightning strikes the shrub thicket. It starts a fire in dry undergrowth. The fire spreads.



Changing Fire: Rio Nuevo

I am a... **Mature Cottonwood Tree**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in a cottonwood tree. Exotic saltcedar has been removed from this area. Only two cottonwood trees burn and the fire dies out.
2. A campfire left unattended spreads through dry leaves. Downed wood has been removed so the fire remains a ground fire only.
3. Lightning strikes the tree and starts a fire. Undergrowth and downed branches have been removed and the bosque is flooded. Only one cottonwood tree dies.
4. Fireworks are carelessly tossed near the tree. Dry leaves and wood spread the fire.
5. Lightning strikes the tree. The bosque is flooded. The fire does not spread, but it leaves a scar.
6. A carelessly tossed cigarette starts a fire under the tree. The area has not yet been cleared of downed wood. The fire spreads.



Changing Fire: Rio Nuevo

I am a... **Cottonwood Sapling**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in the sapling. Undergrowth and downed branches have been removed. Two cottonwood saplings die but the fire burns out.
2. A campfire left unattended spreads through leaves on the ground. Downed wood has been removed so the fire remains a ground fire.
3. Lightning strikes the sapling. Fire starts. Water covers the floodplain. The fire does not spread.
4. Fireworks are carelessly tossed in dry leaves near the sapling, which starts burning. The bosque is flooded so only one tree burns.
5. Lightning strikes the sapling. The sapling starts burning and a fire spreads.
6. A carelessly tossed cigarette smolders in dry leaves near the sapling. The area has not been cleared of downed wood. The fire spreads.



Changing Fire: Rio Nuevo

I am a...**Marsh/Wetland**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. There is a drought. Lightning starts a fire in the dry marsh. The fire spreads.
2. A campfire is left unattended in a nearby forest. Fire spreads through leaves on the ground. A constructed wetland serves as a fire break; the fire stops.
3. Lightning strikes the marsh. A fire burns a few of the marsh plants but then burns out.
4. Fireworks start a fire in a meadow. Gusty winds spread it to the edge of the marsh, which acts like a fire break and the fire stops.
5. Lightning strikes nearby shrubs. Fire burns to the edge of the newly constructed wetland and stops.
6. A tossed cigarette smolders. The marsh is wet and the fire does not spread.

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Changing Fire: Rio Nuevo

I am a...**Grassy Meadow**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. A cigarette is tossed into a grassy meadow. The dry grass burns. Flames die out at a fire break.
2. Someone leaves a fire unattended. The fire spreads through the grass and into the bosque.
3. Lightning strikes the grassy meadow. A small fire burns, but goes out where ground fuel has been removed.
4. Lightning strikes a grassy meadow and starts a fire. The flames die since the grass is wet from overbank flooding.
5. Kids toss fireworks into the meadow. A fire starts and travels toward the river bank.
6. Lightning strikes a grassy meadow. The grass and soil are wet from a recent overbank flood. There is no fire.



Changing Fire: Rio Nuevo

I am an... **Upland Shrub**

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. A cigarette is tossed from a car. It ignites a shrub and the fire spreads.
2. Lightning strikes an upland shrub. There is little fuel nearby. The fire does not spread.
3. Kids lighting fireworks start a fire that travels toward the bosque. A flood has wet the bosque. The fire dies out.
4. Lightning strikes an upland shrub. A fire starts and spreads.
5. Lightning strikes an upland shrub. A fire starts and moves toward the bosque. Cleared ground stops the fire.
6. Someone builds a fire. Sparks ignite an upland shrub. One shrub burns.



Changing Fire: Rio Nuevo

I am a... **Shrub Thicket** (such as willows)

Roll the dice. Follow directions for the number it lands on. Example: If you roll the number 2, then follow the directions for item 2 in the list below. There is a greater chance for some things to happen, so some options are listed more than once. Use your imagination and the model pieces to demonstrate any changes.

1. Lightning strikes the shrub thicket. The ground is wet from flooding. There is no fire.
2. Someone builds a campfire near some shrubs. Wind carries sparks into the shrubs. This area has not been cleared of saltcedar; fire spreads quickly.
3. Lightning strikes a shrub. It has been raining. The shrub smolders, but no fire starts.
4. Fireworks ignite dead leaves under a shrub. The site has been cleared of downed wood, so there is little fuel for the fire to spread. The fire burns out.
5. Lightning strikes the shrub thicket. The ground is wet from flooding. There is no fire.
6. Someone tosses a cigarette in the shrub thicket. A shrub smolders and bursts into flame. The fire spreads.