FIRE ECOLOGY AND RESTORATION IN THE SOUTH LLANO WATERSHED

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The Texas Parks and Wildlife Department and the South Llano Watershed Alliance convened a workshop of 25 experts from government agencies, universities, NGOs and private consultants at Texas Tech-Junction to discuss impacts and recommendations on the Oasis Fire that swept through portions of the South Llano watershed in April. Most of the group felt it was a unique situation in terms of the interaction of 1) extreme drought prior to the fire, 2) intense fire and 3) extreme post-fire drought. Those in the group that deal with severe fire on a regular basis and have extensive experience with wildfire felt that it is most likely that the land will eventually recover on its own. Most in the group believe that the natural source of seed in the soil may be compromised in the hottest burn areas under the canopy of juniper and that re-seeding may be helpful in these locations. Many landowners will desire to aid in the recovery of their land. Some of the recommendations from the workshop include:

- Closely monitor the spread and increase in invasive plant species post-fire, particularly around areas disturbed via fire suppression activities or post-fire soil disturbance. This is where a native seeding with early successional species may provide some benefit. To learn more about invasive plant species in Texas, go to: http://www.texasinvasives.org/i101/ecoalert_detail.php?ecoregion_id=7 .
- Focus rehabilitation on areas that may pose a risk to personal safety/property or very specific resource concerns.
- Do not overreact and be sure to only implement "do no harm" management practices (e.g., limit soil disturbance, grazing, excessive browsing post fire).
- Avoiding land clearing using heavy equipment to prevent further soil erosion and potential for invasive species to spread. If standing dead trees need to be removed, consider hand treatment. Also consider the benefit to wildlife by leaving standing dead trees.
- Before implementing any management practice, consider contacting a local natural resource professional to asses the impacts of certain actions to native wildlife.
- Consider deferred grazing to avoid the erosion from hoof action on bare soil and to allow vegetation the best chance of establishing cover. Once the land begins to recover continue to defer from grazing until a good cover has established and two seed crops have been made.
- Consider placing cages or temporary protective fences around re-sprouting trees and shrubs to limit browsing by deer and feral goats.
- Check dams (trincheras) in small, dry arroyos may be useful to reduce erosion in some cases and when properly constructed. A good example can be found at: http://www.treesearch.fs.fed.us/pubs/22751

- Slash spreading can provide soil cover to moderate- and high-burn severity areas. Dead brush and tree slash on the ground will also help protect newly establishing grasses, shrubs and trees.
- Log erosion barriers in timbered areas with moderate- and high-burn severity can trap sediments where hill slope erosion rates are of concern.
- Fiber rolls can reduce erosion by shortening the slope length to slow overland flow velocity, trap sediment and provide a seedbed for vegetative recovery.
- Mulch in the form of straw, hay or wood chips will help protect the soil, reduce erosion and conserve moisture. Be certain that hay mulch does not contain undesirable seed such as K. R. bluestem or any of the exotic old world bluestem grasses.

Steve Nelle, NRCS, San Angelo provided a good summary of the impacts.

Impacts to Grass Cover

Most grasses thrive after fire in wet years; most grasses are damaged after fire in a dry year. Several studies indicate a three year recovery period if the fire occurred in a dry year.

1. Most species of short grass are harmed by fire during a dry year.
2. Following a spring wildfire, when soil was dry, recovery of short grasses took three growing seasons; recovery was 35%, 62% and 97% following the 1st, 2nd and 3rd growing seasons.
3. The rhizomatous form of sideoats grama is almost always reduced 40% to 50% by fire during dry years and may require three years for full recovery.
4. Fire will cause little bluestem to decrease as much as 58% during dry years or increase as much as 81% during wet years.
5. Following wildfire in a dry year, the cover and yield of the following grasses were reduced: big bluestem, little bluestem, hairy grama, sideoats grama, buffalograss, blue grama.

Impacts to Soil

After severe fire, ground cover is eliminated and the soil is exposed. Not only are existing plants consumed, but the cover of decomposing litter and organic debris is destroyed. Living plants and plant residue are what normally protects the soil from wind and water erosion and extremes in temperature. Without this cover, the soil is vulnerable to erosion. In one study conducted in the Edwards Plateau, soil erosion after severe fire was documented to be 7 – 10 tons per acre over a 2.5 year period. Other extreme fires in other locations have resulted in soil loss rates exceeding 100 tons per acre. The severity of erosion is related to slope, rainfall intensity and the length of time soil remains exposed.

In addition to the risk of irreversible erosion, the physical and biological attributes of the soil are impacted by severe fire. Soil exposed to the sun remains hotter and drier with increased rates of evaporation. Runoff rates are increased as the capacity of the soil to absorb rainfall is diminished. Soil microorganisms, which have a great influence on soil nutrients, are diminished after fire and, according to one study, require three to five years to recover.

Impacts to Livestock Grazing

The premise of successful and sustainable livestock ranching is the grazing of surplus grass. The consensus of scientific information indicates that grass cover does not generally recover until the end of the third year after severe fires burned under dry conditions. This often means a loss of grazing for three years. The length of time for the grass to recover and for grazing to resume will depend a great deal on rainfall in the months and years following the fire. Livestock producers would be prudent to suspend grazing until a desirable density of grasses returns and the covering of litter is re-established and the grasses have made two good seed crops. The economic loss of grazing and the substantial cost to rebuild fences is extreme in many cases.

Impacts to Wildlife Habitat

Most species of wildlife escape direct mortality by fire. Some species that are more vulnerable to death by severe fire include slow moving animals and some animals that may not be able to jump fences. The more significant wildlife impacts are the indirect effects of extreme fire on the habitat. Loss of cover and loss of food supplies will usually cause animals to relocate to other nearby areas. As cover and food supplies return, wildlife will return. In the meantime, ranchers who lease hunting rights may be impacted for several years or longer.

The Big Picture

Fire is a valuable land management tool when used in a prescribed setting and can dramatically increase the health of a landscape. The ecosystem of the Edwards Plateau evolved with fire. However, in fires of this magnitude there are both positive and negative impacts as well as some opportunities that would otherwise not be available.

On the Positive Side:

1. Greatly reduced pricklypear cover (although many plants are alive and re-spouting).
2. Excellent control of tasajillo (although tasajiillo is very important to turkey).
3. Greatly reduced cover of cedar, including a high degree of kill on blueberry cedar and a probable high degree of kill on smaller redberry cedar.
4. With the decrease in cedar cover there is an opportunity for increased future grass, forb and browse production
5. Improved browse availability (after initial regrowth).
6. Enhanced use of low value browse such as persimmon, whitebrush, lotebush, algerita.
7. Enhanced nutritional value of all browse.
8. Removal of dead slash.
9. Reductions in raccoons, skunks, porcupines and rattlesnakes (this may not be viewed as positive to everyone).
10. The land will recover.

On the Negative Side:

1. Ground is bare; soil is vulnerable to erosion. Coupled with the severe drought this puts topsoil at a greater risk than during a prescribed burn which would have been conducted during conditions optimal for minimal detriment and maximum benefit to the ecosystem.
2. Rainfall infiltration is reduced; runoff is increased; rainfall effectiveness is reduced.

3. Possible (probable) death of some grasses – extent unknown.
4. Loss of grazing.
5. Loss of fences, solar panels, above ground water lines, deer blinds, etc.
6. Loss of woody cover for deer and other wildlife.
7. Loss of nest cover for birds; fawning cover for deer.
8. Loss of mesquite beans, acorns, prickly pear apples as important wildlife foods.
9. Reduced deer populations and hunting potential (depending on location).
10. Turkey roost impacts.
11. Increased vulnerability to predation.
12. Reductions in current and future marketing of hunting.
13. Possible toxic plant problems if grazing.
14. Extreme economic impacts.

Opportunities:

1. Re-configure fences to better accommodate grazing management.
2. Individual plant herbicide control of redberry cedar resprouts within the first 12 to 18 months (use "Brush Sculpting" principles to retain needed cover).
3. Monitor grass recovery on a regular basis and keep track of corresponding rainfall.
4. Chronicle range recovery for the benefit of future generations.
5. Photo points – take repeat photos at fixed locations to document recovery and changes.
6. Install cages to monitor growth and utilization of grasses, perennial forbs and shrubs.
7. Mini plot irrigation – water small plots with 1 inch at 1, 2 and 4 week intervals to provide indication of response. (need to fence off or erect cages on these plots).
8. Enhanced opportunities for predator and hog control.
9. Monitor deer population with informal spotlight runs, helicopter or trail camera.
10. Depending on speed and degree of initial grass recovery, ranchers may consider chaining and aerial seeding some areas with low erosion risk to hasten establishment of desirable grasses.

The Burned Area Emergency Response (BAER) program of the U.S. Forest Service (http://www.fs.fed.us/eng/pubs/pdf/BAERCAT/lo_res/lo_res.shtml) provides detail on some of the recommendations, including:

Slash spreading provides soil cover to moderate- and high-burn severity areas. The treatment is designed to reduce hill slope erosion by increasing ground cover with available onsite materials. Slash spreading involves felling, lopping, and scattering trees and brush to provide soil cover. Slash spreading reduces erosion by providing soil cover. This is best used in areas of high erosion potential thus hand treatment is encouraged and the use of heavy equipment would be contraindicative to the goal of minimizing erosion. This treatment is intended for use in one or more of the following locations:

• Areas of high- and moderate-burn severity.
• Areas burned but with available slash material onsite.
• Soils with high erosion-hazard ratings.

Log erosion barriers (LEBs) are used in timbered areas with moderate- and high-burn severity where hill slope erosion rates are increased significantly from the fire. LEBs are logs placed in a shallow trench on the contour. LEBs trap sediment if laid in a bricklayer pattern on the hill slope. The potential volume of sediment stored is dependent on slope, size, and length of the felled trees, and proper implementation. LEBs with soil end berms trap more sediment. Use this treatment in one or more of these locations:

- Hill slopes with high- and moderate-burn severity.
- Slopes between 25 and 60 percent.
- Areas where water repellent soils are present.
- Soils with high erosion-hazard ratings.
- Watersheds with high values at risk.

Fiber rolls are used in high-burn severity areas where soil erosion and water quality deterioration are at risk. Fiber rolls are used where LEBs are not practical. They are for intensive treatment of high values at risk including heritage sites. Fiber rolls, commonly called wattles, are prefabricated rolls manufactured from rice straw and wrapped in ultraviolet degradable plastic or jute netting. Fiber rolls are approximately 9 inches in diameter and up to 25 feet long. A 25-foot-long fiber roll weighs 35 pounds. Fiber rolls are designed for low-surface flows not to exceed 1 cubic foot per second. They are not for stream channels or gullies. Fiber rolls reduce erosion by shortening the slope length to slow overland flow velocity. Fiber rolls trap sediment and provide a seedbed for vegetative recovery. If water repellant soils are present, the installation of the fiber rolls may break through the water repellant layer and can improve infiltration. Use fiber rolls in one or more of these locations:

- Areas of high- and moderate-burn severity.
- Slopes with less than 40 percent of the original ground cover remaining.
- Slopes between 20 and 40 percent.
- Soils not less than 8 inches deep.
- Slopes with less than 25-percent surface rock