

## LREC Restoration Management History 2004-2009

### Prairies

Management history:

#### Burns

We began alternating burning the South and North prairie in 2006. We are now also burning the Pasture Prairie in alternate years. Burning in alternating years helps increase refuge habitat available for insects and birds, although Colleen has literature that birds may even need up to 2-3 years between prairie burns. Wait and see what her research turns up. It may make sense to space out burns even more for wildlife's sake, but then we run the risk of prairies that are too woody to get a burn through. Some grass is required for a good burn to carry. Woody species and even forbs are too wet to carry fire under the conditions that we burn. Burns seem to decrease shrubs and trees dramatically in the prairie when used in combination with cutting and painting trees and shrubs but they increase *Humulus japonicus*, which likes disturbance. We conducted burns in North Prairie and Pasture Prairie 2/17/05. Burned South Prairie and Pasture Prairie 12/21/05. Burned North and Pasture Prairie 3/9/07. Burned the North Woods, Pasture and South Prairie 11/30/07. Burned the North Prairie on 1/2/09. See more details about burns in burn plans in the Burns folder.

#### Mowing

We have mowed areas to increase seed germination and to prevent weeds from taking over new prairie plantings. Mowing does seem to help seeds get established, but we often run the risk of increase of some invasives at the same time. Always watch mowed areas for *Humulus japonicus*, which likes disturbance. In 2004 we mowed the N corner of the North prairie and the North corner of the South Prairie. Mowing the N corner of the N prairie seemed to decrease blackberry populations but mowing the N corner of the S prairie seems to have only increased cup plant populations and made the area grow thicker. Checking out the plant monitoring data for the N corner of the S prairie over time might be wise to see how things have changed there. In 2005 we mowed the Between prairie (planted between the Pasture prairie and the strip of prairie by the 9711 driveway) and the area of the North prairie where *Apios americana* grows. The *A. americana* mowing did not particularly control *A. americana* but it did seem to reduce its dominance and allow a number of our seeds to really establish. In 2007, we saw larger populations of *Oenothera biennis*, *Castilleja coccinea*, and *Rudbeckia hirta*. In 2009 we are seeing large populations of *Monarda fistulosa*. In 2008 and 2009 we mowed the extension of the Pasture prairie between the Pasture Prairie and the driveway.

#### Invasive plant species management

In all years we cut and painted trees and shrubs in prairies following burns. This has been somewhat unsuccessful. Most of the small trees and shrubs are killed by the fire. The *Morus spp.* that we cut and paint seem to be unaffected by the fire or by cutting and painting, but both do seem to arrest their growth and dominance, if not actually killing the plants. Cutting and painting in the fall prior to a burn might be considered to increase kill of *Morus* in particular. Other tree species do not seem to continually resprout from the same base, so cutting and painting them following a burn seems to be effective.

Apparently, cutting and painting following a burn does nothing to curb new growth of blackberry (*Rubus occidentalis*), witnessed by our revisiting recently treated patches this spring 09. Probably the best way to control *R. occidentalis* is to mow areas dominated by it in years that it is not burned. If necessary, it can also be cut and painted, but keep in mind that it's native and even grows naturally to an extent in prairies, although in a prairie our size, it could dominate it easily over time and let little else grow, so a balance is needed. Top priority should be given to controlling non-natives. In 2004 we spent a lot of time controlling *Solidago altissima* by cutting and painting it with Round-up. We even had an intern study it in small plots. She treated these areas when it was in the vegetative stage, in mid-summer. If you come across waist high rebar in the prairie, it is probably from this study and should be removed. We revisited her study plots and found that the *S. altissima* reinvaded quickly following control in these small areas. *S. altissima* is an aggressive native and is the most dominant plant in our prairies. It grows by rhizomes and spreads by seed. One way to arrest some of its spread supposedly is to mow it while it is flowering. In 2004 and 2005 we cut and painted *Rumex crispus* and *H. japonicus* throughout the prairies. Generally, the South Prairie seemed to have the worst infestations, as, in looking back, that is where we spent the most time killing. In April 2006, we sprayed hops and dock in the Pasture and South Prairie. The *R. crispus* spraying seemed to have been very helpful, the *H. japonicus* spraying, not as much. In 2006- 2008, we pulled Japanese hops in the prairies but concentrated less on curly dock. Consequently, in 2009, populations of *R. crispus* seem to have increased and we have spent much time, particularly in the North Prairie controlling it. Spraying in the spring of '10 for *R. crispus* would probably help a great deal in the time controlling it requires. In 2004-2008, we treated crown vetch in the South prairie near R26 and near the chaff prairie/brush pile area. We did not locate any in 2009. In 2005-2006 we treated Bermuda grass (*Cynodon dactylon*) and crown vetch (*Securigera varia*) in the between prairie. In 2006-2007 we treated *C. dactylon* and other grasses in the Pasture Prairie Extension area prior to discing and seeding. In 2006 we found and treated sericea lespedeza (*Lespedeza cuneata*) near R22 in the South Prairie with Garlon 3a and in 2007 we treated it with Escort and in 2009 we found it again and treated in July by cutting and painting with Garlon 3a. Research shows that Roundup is ineffective.

### Seeding/planting

We spread seed in the Between prairie in 2005 following the burn, which followed two sprayings of the Bermuda grass. We planted plants in the Between prairie in 2005 and 2006 in plots marked with rebar. We have since taken out the rebar for ease of management. The Between prairie has had lots of issues due to remaining *C. dactylon* and lots of invading *S. altissima*. We have continued doing some mowing in the area to decrease *S. altissima* and have sprayed *C. dactylon* several times. We spread seed in the area of the North Prairie dominated by *Apios americana* in 2005 following the burn and in several other areas of the North Prairie. This has been pretty successful in decreasing dominance of *A. americana*. I would suggest continued addition of seed to the area, particularly of grass species to improve burns and hemi-parasitic species such as *Castilleja coccinea*, *Pedicularis lanceolata* and *P. canadensis*. Hemi-parasitic species tend to bring the height down of the plants they parasitize.

We also sowed seed in the Pasture Prairie in 2005. We sowed more seed in the Pasture Prairie and South Prairie in 2006 following a burn. The sedges we sowed in the Pasture Prairie seem to be taking off according to our 2009 census. We had very few in the area in the prior census. We sowed seed in the Pasture Prairie Extension area in Fall 2007 following control of Bermuda grass throughout Fall, Winter of 2006. This area seems to be establishing pretty well, except for the rampant growth of *Trifolium pratense*. We may be able to control *T. pratense* by mowing. We mowed the area twice in 2009 and may need to continue mowing through summer '09.

### Monitoring

We monitored the South Prairie in 2004, Pasture Prairie in 2005, North Prairie in 2006, South Prairie in 2007, and Pasture Prairie in 2009. I have compared our data to other small remnant prairies in an online paper on our website. Basically, we are doing well on a large scale. We have lots of native plant species and their numbers compare well with native prairies. However, at a small scale when you look plot by plot we have fewer plant species per plot than a native prairie. So, while we might have 216 different kinds of plants in the prairie somewhere, on average, we've only got 8 plants per plot compared to 16 at an average native prairie. So, we probably need to try to reduce the dominance of some species (tall goldenrod in particular) and spread around some of the more conservative, rare species with seed to some of the tall goldenrod dominated areas. I have not compared data within our site to evaluate change over time. This is something that would be valuable for an intern project in the future, if there is interest. They could follow a similar analysis to intern Abby Carroll from 2009.

### Woodland

#### Burns

Getting a burn through the woods is difficult. The burn must take place in late fall or early winter so that the leaf litter is not permanently wet. Once there is snow or substantial rain in the fall or winter, the leaf litter in the floodplain will not dry out. Following leaf fall, leaves must be blown or raked away from around trees and shrubs to be protected and off of trails that are being used as firebreaks. In October, once the stinging nettle, *Laportea canadensis*, has started falling over, pieces of wood from 2"-6" in diameter that are within 50' of the edge need to be hauled into the interior or they need to be cut and hauled to the brush pile or out of the burn unit. This work comes at the same time as one of the best times to control *Euonymus* and collect many prairie seeds. Try to use as many dry days to spray or collect seed and work on clearing on wet days.

We have been successful in burning the woods one time in my tenure here, the North Woods on 11/30/07. That burn was slow and low intensity but it has done a lot for the North Woods. We only burned from the far North trail entrance to the overlook South of the Tree Trail by the South Prairie and only on the non-creek side of the trail. Some *Euonymus* was killed in the Tree Trail area by putting straw bales from the Kemper Center on top prior to the burn. You can also pick up bagged leaves from people's yards. Also, more new native species have germinated following the fire.

Particularly *Agastache nepetoides*, *Blephelia hirsuta*, *Chasmanthium latifolium*, *Bromus pubescens*, and *Arnoglossum muhlenbergii* seem to have benefited.

#### Invasive species control

The woods are dominated by invasive species, so we have worked hard to try to reduce their numbers, but it is an ongoing battle.

*Euonymus hederaceus* (formerly *E. fortunei*)

Each winter, we cut and paint *Euonymus* vines growing up trees. In winter 04, we started on the West side of the creek at the North end. Each winter, we have made some progress. Last winter we had made it down to near the mulch pile. I have seen some *Euonymus* vines regrowing up the trees that we cleared several years ago, so revisiting some of those before proceeding South of the mulch pile might be a good idea. It is really really important to work on killing as many of these vertical vines as possible to reduce new growth of *Euonymus* in uninvaded areas. There are also many trees in the small woods near the Glass House that are covered in vines, and many on the East side of the creek. If interns or volunteers are ever bored, send them out to cut vines!

We have been spraying the North Woods *Euonymus* every September or October '05-08 with 2-5% Accord with Cidekick. In '07, we made it to the South side of the Tree Trail, but in some years, we made it only to the North sitting circle ('08) or the south end of the North woods ('05, '06). In '09, it would be a good idea to start from the South side of the Tree Trail and work North to better cover the Southern portion of the area. In summer '06, John Lee, an intern, sprayed some areas on the East side of the creek from the horse trail (under an '05 intern's honeysuckle removal project). In '07, we also sprayed the *Euonymus* in the Glass House woods and the woods at the North end on the East side (NE woods) with Accord. Respraying those areas might also be helpful. Anywhere >100 ft of the stream should be sprayed with 2% Crossbow or Garlon 3a as those herbicides are more effective than glyphosate on *Euonymus* although they do migrate through the soil so should not be used close to the stream.

We have been removing bush honeysuckle on a small scale in various areas. In general, my advice is: remove by cutting and painting with fresh full strength glyphosate in winter or summer. Then follow-up the next two years. We have had the least resprouts from those removal dates. However, fall is also an option, if you are willing to make piles of brush and leave it in place. We did not do this in the past because we felt the piles were hampering our restoration progress, but it is a lot of trouble to haul the honeysuckle out. Way more than removing it in the first place. And the board has told us that we are not allowed to buy a chipper because they are too dangerous. Chipping it and blowing the chips throughout the area does work well and we have had Meredith chip some piles of honeysuckle for us. But that requires him to be able to get his truck in there and if you're cutting expenses, that is a consideration. In the past, we also have hauled honeysuckle to the brush pile and Ladue hauled it off. The problem with that (besides the intensive labor required) is that Ladue will chip it up and use the chips in their municipal mulch, which may not kill honeysuckle seeds that would be present in fall (as an aside, in winter '07/'08 I tried putting some berries in our mulch pile in some screen bags at various depths for a few months and then hauled them out and put them in some soil in the greenhouse to see if they would germinate. They didn't, but I don't know that our berries were very good that year as the control that I left sitting on the

ground also didn't germinate.). So, if you do removal in fall, do not put the brush in the brush pile. I feel that spring is not a good time to do honeysuckle removal because it seems like we get the most resprouts from that time. Particularly March. April and May might be ok.

We have made a continuing project of controlling honeysuckle along the creek banks and replacing ASAP with tree seedling whips and riparian plant plugs. We gradually have removed a small amount more each year, starting at the North end on the West side of the creek. We have removed most of the honeysuckle along the North woods banks. Continuing that project South might be a good idea. In summer '05 we removed honeysuckle on the East side of the creek across from the horse trail. We have not rechecked this area recently. In spring '06 and fall '07 we removed honeysuckle between the Pasture Prairie and Litzsinger Road and in front of 9701 Litzsinger Road. We did up to the fencing in '06 then the rest in '07 when Litzsinger Road bridge was closed. Much of this is resprouting and needs follow-up treatment. We did follow-up in '07 when we treated the area closest to the road, but it needs further treatment. In summer '06 we removed some honeysuckle along the back property line with Tom Corry in the woods. I have not noticed any resprouting there. In '07 we removed honeysuckle on the east side of the creek. In general, you can remove honeysuckle pretty rapidly, particularly with a chainsaw or a large crew of volunteers with lopers and hand saws. It's the brush removal that is most difficult. Continue monitoring bush honeysuckle removal area on east side of creek, in woods by glass house, along Litzsinger Road, and along the creek in the North Woods for resprouts.

Garlic mustard (*Alliaria petiolata*) has been a continuing problem here. I understand garlic mustard has been here since at least '92 (it was listed in Ochs' species list). We usually try to spray garlic mustard as we spray *Euonymus* areas in fall and lesser celandine areas in winter/spring. You can spray it up until it flowers, but I've not had any luck after that point. We then have pulled garlic mustard in April and May when it starts flowering. I feel that our garlic mustard populations have decreased, peaking in about 2005. Make sure to be systematic with garlic mustard pulling. Go through the entire woods, combing every area, both sides of the creek (if possible) but particularly the West side and by the Litzsinger Rd bridge. Because garlic mustard is somewhat sparse, this is a somewhat discouraging/difficult volunteer or student activity. But it is so important, because where one garlic mustard is, it produces more seeds than where there are many. We have combed the woods every spring I've been here looking for garlic mustard.

Lesser celandine (*Ranunculus ficaria*) has exploded during my time here. In '03 and '04 it was misidentified as marsh marigold (*Caltha palustris*). It is present only during late winter-spring then fades but crowds out native plants. I noticed it in '05 and sprayed it in the North Woods and South Woods using 2-4% Rodeo. Since that time it has increased exponentially, growing anywhere the *Euonymus* has died in the woods, particularly sunny spots. It has a thick glossy leaf, so 5% glyphosate is probably appropriate to try to get it to absorb better. Also, it seems most effective to spray while flowering or even after flowering. Just don't wait too late because it dies back completely in May.

Planting and seed sowing

We spread seed in the North woods in 2005, 2006, and 2007. This seed seems to have flourished, particularly following the 07 burn. We also spread seed on the East side in 2008. This seed seems to be flourishing, particularly the Virginia wild rye. We spread seed in the Glass House woods in 2009. I have not noticed much germination from that yet. In 2008 we spread seed in the area damaged by the removal of the sycamore by the deck and in the open low ponding area adjacent to it. We have not yet seen much germination from this seed. We spread seed along the trail closed near the cabin in 2009. Some of this seed seems to be germinating. Care needs to be taken to make sure this trail remains closed so people don't walk on the germinating seeds. We spread seed along the closed tree trail in winter 2006. The tree trail seed does not seem to have been too successful, this area receives a lot of flooding pressure. More seed for the future should be collected at SNR in the low parts of the woods by the Meramec and near Brush Creek. Seed should be added to the South Woods in winter '10.

We have done a fair amount of planting in the woods, particularly in areas where *Euonymus* has been pulled by students, primarily near the cabin area. Unfortunately, student *Euonymus* removal is often not very successful. The students pull *Euonymus* and they do not remove all of the roots and so it comes back. We have usually gone back and repulled after students are done but it is tough to get complete coverage even then. Possibly digging with a cultivator or shovel to make sure roots are gone is a good idea, although this disturbs the soil and could promote germination of some weeds such as giant ragweed. Maybe after the initial pulling session, several layers of newspaper and mulch could be put on top before planting to ensure *Euonymus* death.

### Monitoring

Monitoring of the West woodland will be carried out using the protocols outline in Slagle et al 2006. Monitoring in the East woodland has not been attempted at this time. We will need to create a grid system on that side of the creek. Perhaps in winter 2010 with the help of volunteers, this could be accomplished and baseline data prior to any planned largescale removal project.

### **Creek bed and banks**

#### Flooding

Whenever it happens...it happens. It's a natural ecosystem process so we can try to work with it as best we can. Manage effects by planting to minimize erosion and adding seed to new soil deposits. We have had a series of major floods in the time that I have been here, the worst being 9/14/08 from Hurricane Ike where we lost one of our buildings and our boardwalk.

#### Burns

Not really possible in this zone. We tried using a propane flame torch borrowed from SNR to do some directed burning of some areas. Not really so successful, and it was hard to haul around.

#### Invasive plants

The first year I was here '04, we were not able to finish removing Japanese hops along the length. In '05, there was so much we also were not able to finish. In '06 and '07, we removed hops along the whole length of the stream. In '08 coverage may have been more spotty and the job was less thorough and systematic. Pulling seems to be the most effective removal method although it is so continual. A combination of spraying and pulling has also been successful. Spraying once usually is not enough as the germination time of hops seems to be variable and often times you can't hit all of the leaves. We have only recently started finding Johnson grass but have consistently found a few clumps every year. Remove ASAP! We also found sweet clover in the stream bed which can be a major invasive problem. We pulled them and removed them as soon as we saw them too.

#### Planting and seeding

We have tried some planting and seeding along the creek. It is usually one of our most intensive planting areas. We remove honeysuckle and then plant. Many of these plants have been successful particularly Virginia wild rye, button bush, indigo bush, swamp milkweed, blue lobelia, red lobelia, creek oats, and nine bark. However, it is a very tough area to plant in and we have lost, in some areas, up to 90% of the plants planted there. Seeding has been more successful than expected, with good germination of Virginia wild rye and Eastern gamma grass in some seeded areas. One thing we tried to keep in mind was that herbaceous plants, particularly grasses, have deep, fibrous root systems that may be more effective at holding soil than tree roots.

#### Monitoring

Visual stream survey done yearly and plant survey in combination with the woodland survey.