

## Chemical Use

### 1992

Most, if not all, of the Pest Control activities which took place at WNT during 1992 were agricultural related. Various farm oriented chemical were used by the co-op farmers to control weeds and grasses on the croplands. There were also approximately 110 acres of ground treated for undesirable vegetation by contractors for the restoration project. On this ground, ROUND-UP was used to burn down the existing growth in preparation for the planting of native species.

Cropland chemical usage was restricted to those listed on the approved list. Due to the steep topography of the Refuge, no-till farming is used extensively. This makes chemical control of pests critical. No-till is a fine technique for reducing soil erosion problems but it is antitheses to refuge system goals of reducing application of chemical agents. Another approach would be, if the land is so steep that no-till agronomic techniques are needed, should it be farmed?

Because of the heavy no-till use and the lack of any significant wet areas, we requested and received approval to use LORSBAN 15G on the corn-on-corn rotation to prevent damage by corn rootworm. This type of rotation is used because of the steepness of the terrain. It is the intent of WNT to withdraw this type of ground from production as soon as practical to alleviate these situations and to reduce the soil erosion potential.

We also received approval to use ACCENT herbicide on the no-till ground within WNT. It appears to be the best herbicide to control grasses in corn in a no-till situation. The alternate is to use atrazine which is a problem when preceding grass planting.

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### 1994

Prior to planting, herbicide (Roundup and 2-4D) was applied to most plantings.

Because WNT is using only local ecotype seed, a non-local ecotype switchgrass is being eradicated. A 25 acre switchgrass planting immediately north of Coneflower Prairie was burned in early May, and sprayed with Roundup at a rate of 2 quarts per acre, and with 2-4D ester at a rate of .5 quarts/acre when switchgrass was approximately 8 inches tall. Oats were seeded to provide temporary cover.

Switchgrass populations were reduced significantly in this are due to herbicide treatment except in areas missed by sprayers along the fence line. As a result, a band of switchgrass persisted that is approximately 40 feet wide on that field edge.

## Chemical Use

A few vigorous clumps of switchgrass (in Coneflower Prairie), apparent escapes from the non-local ecotype switchgrass field adjacent to the north (of Coneflower Prairie), were treated with glyphosate.

Spraying – 94 – As part of Integrated Pest Management (IPM), the Refuge required Cooperators to use crop scouting. The crop scouting firm determined that a significant cutworm problem existed in corn fields on the Refuge and recommended spraying. A request was made and granted to use specific insecticides not on the Regional Approved List.

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## 1995

Planting site preparation included herbicide treatment using Roundup and 2.4D in most cases. Oats and Canada wild rye were used as nurse crops. First year plantings and many second year plantings were routinely mowed once or twice during the growing season to reduce weed competition for light and water to limit weed seed production.

In some three-year-old plantings mowing was used to limit success of particular weed problems on the site. Site 17, for example, supported heavy populations of sweet clover. This biennial exotic species can be a severe problem in prairie plantings. This site was mowed twice at peak blooming and prior to seed set to reduce reproductive success of the sweet clover. Interestingly, a good stand of prairie dominated by little bluestem matured and was harvested despite repeated mowing.

Woodland communities on WNT consist of oak savannas diminished due to fire suppression, grazing, and timber harvest. An interpretive trail designed to preserve oaks and avoid important herbaceous understory vegetation was cleared during winter of 1994-1995 in the Thorn Valley site. Several Groups of school children, college students, and volunteers hand cleared small areas of this site. Woody stems were removed and burned, and stumps were treated with Garlon4 by WNT staff. During the summer, the cleared areas boasted an abundance of typical savanna species despite its sparse condition prior to clearing. Though this vegetation was damaged in construction, we expect much of the savanna will respond in a similar way as widespread clearing continues. The process of clearing is slow because of resource commitments to other needs, e.g. prairie harvest, planting.

Transplantation of savanna species to this site also occurred in 1995. In early spring, volunteers alerted Biologist Drobney of the presence of a good quality savanna remnant facing destruction due to Highway 23 improvement in Wapello County, Iowa. A segment of the roadside was preserved due to the presence of the state endangered species, false hellebore. A combined effort of volunteers and WNT staff resulted in 15 pick-up loads of plants (a rare species of spiderwort, showy orchis, Culver's root, blue-eyed grass, dwarf larkspur, creamy gentian, wild bean, Michigan lily, starry companion, and several other species) from a 3-mile portion of roadside being transplanted in early spring and summer. Iowa DOT permission was obtained first.

## Chemical Use

Herbicides also played a role in pest control. Approximately 400 acres were sprayed with Round-up and 2,4-D, both as a pre-plant burn down and as a control measure for a thistle and other undesirable weed species. Late fall spraying of brome grass, Reed canary grass, and switchgrass was completed in an attempt to eradicate these problem areas. These areas will be surveyed in the spring, 1996 to document the effectiveness of this method. If this produces good results, planting of local-ecotype native species will be done, if not, another year of control measures will be taken.

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### 1996/7

Pest control continues to take a major portion of the Operations Staff's time during the summer and early fall months. Mowing to control weeds, thistle, and undesired brush took place on approximately 2,000 acres. This continues to be a part of the management strategy for new plantings.

Chemical control was done on 585 acres by Refuge staff. This treatment was done to control brush resprout, using Garlon 4 and burn down prior to planting of native species, using 2-4D and Roundup.

In 1995 we reported the use of Roundup in a late fall application to control Reed Canary, Brome, and Switch grasses. It appears that a properly timed late fall application does indeed have controlling effects on these species. More work will be done to document this control method.

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### 1998

Pest control took a great deal of Operation Staff's time during the summer and fall of 1998. Mowing occurred on 2,500 acres to assist in controlling undesired weeds, thistle, and invading brush. These acres were, for the most part, planted to native species or edges of remnant tracts, and former CRP acres. On the land planted to native species, we mowed to accomplish two things – to control undesirable weed species to the light would penetrate to the young native plants, and secondly to control thistles. All other mowing was performed as a control measure to prevent thistle, sweet clover, and mares tail from going to seed. Herbicides also played a role in pest control. Approximately 690 acres were sprayed with Round-up and 2,4-D or Transline, all used as either a pre-plant burn down and as a control measure for thistle and other undesirable weed species. Also, Garlon 4 was used on stumps to prevent woody re-growth (18 gallons at approximately 2.5 acres).

## Chemical Use

There were no major weed or insect problems relating to the farming program. Very wet spring weather delayed planting but otherwise crop production on the Refuge was as good as or slightly higher than on neighboring areas.

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### 2000

**Spring Planting** - During 2000, approximately 64 acres were planted in the spring. Limiting planting to a few acres allowed us to focus more effort on exotic species control and to re-evaluate prairie reconstruction success on previously planted acres in order to adaptively manage. Seeding rates (viable seed) were approximately 12 lbs/acre on mesic sites, 9.5 lbs/acre on wet-mesic and savanna areas and 7.5 lbs/acre on reed canary grass areas.

Plantings were in brome fields for conversion to prairie. In the past, plantings were concentrated on crop land, because although smooth brome (*Bromis inermis*) and other species present in old pastures and Conservation Reserve Program areas are exotic, they were at least perennial vegetation on a farmed landscape. At this point, several brome-dominated areas are surrounded by prairie plantings and as such, are sources of invasion of brome by seed and via rhizomatous expansion into plantings. These brome areas were strategically targeted for reconstruction, and included areas that are in the most visible and most heavily planted core of the Refuge.

Strategy for preparation and planting included herbicide treatment in spring and then planting into existing sod using a drill. Planting into sod reduces the degree of weed seed release from the seed bank that occurs when the soil has been cultivated.

Brome recovered in portions of the planting areas despite herbicide treatment. Though it is most desirable to completely kill cool season exotics prior to planting, stressing brome prior to planting does provide a window of opportunity for establishment of prairie seedlings. These plantings were frequently mowed this summer to continue to limit competition for light and other resources necessary for seedling survival.

**Summer Internships** -The summer interns participated in a diverse array of tasks and experiences that would give them a well rounded perspective on tallgrass prairie and savanna reconstruction and habitat management. Each intern also had a more specific project that enabled them to focus on one aspect of ecological issues at the Refuge. Both interns participated in the following experiences:

Exotic invasive plant treatments: pulling yellow and white sweet clover (*Melilotus oficionalis*, and *M. alba*), clipping and spraying reed canary grass (*Phalaris arundinacea*), clipping of Canada thistle (*Cirsium arvense*)

Non-commercial pesticide applicator certification

## Chemical Use

Canada thistle is a problem throughout the Refuge and is treated using TransLine. Strategies to eliminate this problem species are being explored by the Refuge biologist. Reed canary grass is a problem in dry creek bottoms and will be treated with well timed mowing and spraying sequences using RoundUp.

Biology staff spent a significant amount of time managing invasive plant species during the summer of 2000. Two interns and the STEP BioTech were trained and certified as non-commercial pesticide applicators in June and spot-treated reed canary grass (*Phalaris arundinacea*) around the Savanna Trail. To prevent seeding, reed canary grass heads were clipped by hand in several areas where patches were of relatively small size.

Another invasive addressed by biology staff was yellow and white sweet clover, (*Melilotus officinalis*, *M. alba*). This species was pulled or clipped by hand in several areas of the Refuge where population numbers had increased in recent years but were still manageable without machinery.

One summer internship focused on Canada thistle (*Cirsium arvense*) populations. Thistle patches were located, measured and recorded with GPS equipment. Of special interest was a 265 acre area known as the Flaherty site. This data was then compiled and mapped on GIS software. Patches located in this survey were spot mowed as a management treatment. Another less intensive effort was asserted by other biology staff to locate and record the Canada thistle patches on a large portion of the rest of the Refuge. With this information, we will be able to closely monitor changes in Canada thistle populations and refine management strategies to control this invasive species.

Unusually cool wet springs for the past several years have allowed these exotics to proliferate and will require intensive Refuge attention in seasons to come.

Purple loosestrife, (*Lythrum salicaria*), an extremely invasive exotic species in wetlands, was observed by Drobney in summer, 2000, near the south boundary. Five plants were observed on the south side of County Road F-70 that forms the south boundary of the Refuge. Drobney contacted the Jasper County Engineers' department and obtained permission to eradicate the plants. Unfortunately, two of the plants were mowed prior to eradication.

On the Friends' Stewardship Saturday following discovery of the purple loosestrife, volunteers did a windshield survey of much of the area surrounding the Refuge in attempts to locate additional plants. No plants were found, though volunteers enjoyed taking a closer look and appreciating the large number of lavender and purple plants in bloom at that time. Reconnaissance will continue in future years. Currently, no purple loosestrife plants have been observed on the Refuge.

Garlic mustard (*Alliaria petiolata*) has been observed in Jasper County along the South Skunk River in summer, 2000 by Scott Bryant and Pauline Drobney. This extremely invasive species of woodlands has not been previously recorded in Jasper County.

## Chemical Use

Though it has not been observed on the Refuge, finding it in Jasper County within 12 miles of the Refuge is a concern, as it often travels along waterways.

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### 2001

Friends' Biological Interns - The Biology Department had the good fortune of having two dedicated and hard working interns, sponsored by the Friends. Ron VanNimwegen, a student at Iowa State University and Joe Heffron, a student at Drake University, were an integral part of biological operations over the summer and participated in all department activities, including invasive species control (both earned non-commercial pesticide applicator certification); hand seed collecting: needle grass (*Stipa* sp.) and blue-eyed grass (*Sisyrinchium campestre*); seed cleaning; butterfly survey transect layout; and bluejoint grass (*Calamagrostis canadensis*) potting.

Canada thistle is a problem throughout the Refuge and is treated using TransLine and early mowing. Strategies to eliminate this problem species are being explored by the Refuge Biologist. Reed canary grass is a problem in dry creek bottoms and will be treated with well timed mowing and spraying sequences using Round-Up. Approximately 300 acres of invasive plants were controlled during FY 2001.

The Biology Department had an active and productive year in controlling unwanted and invasive plant species. Control measures took many forms and were species specific. Yellow sweet clover (*Melilotus officinalis*) and white sweet clover (*M. alba*), were targeted by manual removal and to very good effect. Several full days of pulling eliminated a large percentage of the potential seed crop. Reed canary (*Phalaris arundinacea*) patches in the Friends' Prairie and on the Interpretive Trail through the Thorn Valley Savanna were chemically treated with Round-up, as were crown vetch (*Coronilla varia*) and an exotic species of *Rubus* in the Game Farm remnant. We used both manual removal and herbicide on a switchgrass (*Panicum virgatum*) cultivar invasion in the Coneflower Prairie remnant.

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### 2002

Canada thistle is a problem throughout the Refuge and is treated using TransLine and early mowing. Strategies to eliminate this problem species are being explored by the Refuge biologist. Reed canary grass is a problem in dry creek bottoms and is treated with well timed mowing and spraying sequences using RoundUp. Other target species included sweet clover, musk thistle and black locust, yellow and white sweet clover, crown vetch and *Rubus parvifolius* (no common name available).

Charland and teams including interns and volunteers have worked valiantly to eliminate black locust on two sites on the Refuge, one near Thorn Valley Savanna, the second on

## Chemical Use

the south side of Planting Site 23. Garlon and RoundUp were used and both resulted in varying degrees of success.

*Rubus parvifolius* is a member of the raspberry family, is relatively new and does not show up in most botanical keys. In Iowa, it was distributed by the DNR State Forest Nursery in Ames in the 1960's for conservation purposes. On NSM, it thrives in partial shade as a decumbent vine with pink flowers. Charland and interns have focused on killing a population that has become alarmingly extensive in one savanna. Much progress in controlling this species has been made using RoundUp, though vigilance is necessary to totally eliminate this difficult-to-manage species.

Pesticide records are maintained on the Refuge to document the amount and type of chemical used within each planting site or other management area. Sixty-one gallons of chemical were used this year including RoundUp, Rodeo, 2,4-D, Garlon 3A and Transline. A volunteer, Elmer Blythe, entered the years of data onto a database. Bio Tech Charland also created a database that was later adopted as the master with the information that Blythe created merged into it.

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## 2003

S. Van Ryswyk, Van Zee and Boot mowed and sprayed Canada and musk thistle on 120 acres and mowed and spot sprayed 20 miles of roadside and fire breaks. They removed approximately one mile of fence. Boot also filled two abandoned wells on the refuge.

A "patch mix" was used by staff to inter-seed in areas of soil disturbance. Black locust trees were cut within the Thorn Valley Savanna and the south side of the High Point units and stumps were treated with Garlon 3A to prevent the trees re-growth. The Prairie Learning Center parking lot medians were tilled and reseeded in areas that had been sprayed earlier to remove non-local ecotype switchgrass.

The Sedge Meadow Reconstruction site was sprayed where possible with Rodeo by operations staff with a six-wheeler and sprayer. SCA, Range Techs, and Krueger mowed, used weed eaters and sprayed areas by hand to adequately expose stumps so motorized sprayers could treat the entire area.

SCA, Range Techs and Krueger continued to fight the battle against the reed canary grass within the sedge meadow. Crews used weed eaters and brush mowers to knock down the grass, while others treated the newly cut grass with Rodeo herbicide.

Canada thistle is a problem throughout the refuge and is treated using TransLine and early mowing. Reed canary grass is a problem in dry creek bottoms and is treated with well timed mowing and spraying sequences using RoundUp. Other target species included sweet clover, musk thistle and black locust, yellow and white sweet clover,

## Chemical Use

crown vetch and *Rubus parvifolius* (no common name available). Boot and Van Zee treated approximately 120 acres of problem areas during FY2003.

Pesticide records are maintained on the refuge to document the amount and type of chemical used within each planting site or other management area. Sixty-one gallons of chemical were used this year including Round-Up, Rodeo, 2,4-D, Garlon 3A and Transline. A volunteer, Elmer Blythe, entered several years of data onto a database.

Controlling invasive, unwanted and exotic plant species on the refuge seems to be an ongoing project as well as definite job security. We spent the year trying to control various species such as Canada thistle, willow, reed canary grass, switchgrass, black locust, rubus and the dreaded *Sericea lespedeza*. We utilized a variety of management techniques such as mowing, cutting, clipping, burning and treating with chemical application to aid in controlling these species.

The refuge staff identified a non-native species of *Rubus* that has been a problem for a couple of years now. This year we took a different approach and hit it hard with chemical applications. First it was treated with Round-up in the spring of the year, the Round-up knocked the *Rubus* back a little from the first treatment but it still hung in there and continued to slowly spread. In early summer when the *Rubus* was still recovering from the first treatment, we hit it with a second treatment of Round-up. Approximately a week later we treated it with Garlon 3A. After about a week, it was dead, the leaves were dried, brown and crisp and the stems were dried and wilted. This treatment seemed to have, at least from our perspective, a positive effect on the *Rubus*; however, we will continue to monitor it next year to see if it recovers.

Non-native switchgrass has also been a challenge for us. This year we utilized a variety of techniques to help control and try to prevent its spread. In late spring, with the help of interns, we used brush cutters on weed eaters to mow down all of the switchgrass we could identify around the Prairie Learning Center and adjoining parking areas. With the aid of the SCA crew, we then returned and treated the clumps with Plateau herbicide using backpack and hand sprayers for application. We also used this method of treatment on our Coneflower Unit where switchgrass is not as prevalent yet still unwanted. Later in the summer when the switchgrass was flowering and forming seed heads, we located these plants around the Learning Center and the Coneflower Unit and clipped off the heads and disposed of them in the garbage. Plants were then treated with Plateau. Switchgrass continued to form seed heads throughout the summer, so we were constantly finding new plants in areas we had already treated. We will be treating switchgrass again next year, we are certain of that, we hope though that we were able to knock it back and help to prevent its spread.

We currently have reed canary grass growing in various places throughout the refuge. One of the places we focused our attention on heavily this year was our sedge meadow reconstruction area. The SCA crew, along with refuge staff, began by cutting the reed canary grass with mowers and brush cutters to first knock it down for easier access and treatment. We then returned to the area and used backpack sprayers to apply Rodeo



## Chemical Use

herbicide due to the moistness of the area. Later in the summer, we treated the area a second time with the use of a Polaris Ranger with a thirty gallon tank and wand sprayer. The cutting and chemical treatments seemed to have knocked the grass down and slowed its advance for the time being. A burn plan has been written for the spring of 2004, this would additionally aid in the control of the grass by burning off new shoots and further stressing established plants.

This year for the first time, *Sericea lespedeza* was identified on the refuge. This plant was formerly used for pastures and along roadsides, however, in Iowa it is classified as a noxious invader. It spreads rapidly and consumes areas if left untreated and chokes out local native vegetation. It is fire tolerant and is not killed by chemical application, simply prevented from flowering. Once we positively identified the plant in the three small patches on the refuge, we applied Round-up on each site prior to flowering. The plants appeared to be stressed by the chemical and did not achieve flowering or seed production; however, the plants did not appear to have been eliminated.

The control of Canada thistle was performed by mowing and moderate chemical treatment. Isolated patches of thistle were identified throughout the refuge; these patches were then mowed, along with a radius around them to prevent the spread. Areas that were disturbed by machinery where thistles had come up were treated with chemicals.

In our more wooded areas we have experienced problems with the invasion of black locust and willows. In our Oak Savanna restoration area we spent a great deal of time this year removing and treating black locust trees and saplings. Trees were cut using chainsaws, bow saws and loppers by refuge staff as well as a number of school groups and volunteers. Remaining stumps were then treated with Garlon 3A to prevent their regeneration. Because black locust sprouts from the stump and the roots, this poses a challenge to completely eradicating it, however, once the stumps are treated with Garlon we are improving our odds in controlling its spread.

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## 2004

In August, Operations inter-seeded approximately 200 acres to try and increase diversity along road sides, ditches, and chemically treated areas of brome grass.

In February, a contractor cut trees in Thorn Valley Savanna to further savanna restoration. Staff followed behind chemically treating stumps to prevent regrowth. Excellent progress was made and a wide area was successfully cleared freeing up oaks to sunlight and promoting regeneration of young oaks as well as savanna ground cover. Volunteers worked steadily to remove the trees and brush from the savanna and form brush piles to be burned in winter. Some of the wood was made available to the public through a special collection permit.

## Chemical Use

Maintenance Mechanic Boot used the hydra-axe during FY04 on approximately 25 acres of trees. Van Zee used a tree shredder to cut four to five acres of trees encroaching into the prairie restorations (photo 30).

**Serecia Lespedeza** - The biggest invasive species scare faced during the period was the discovery of *serecia lespedeza*. *Lespedeza* was discovered in October of 2003 in a unit being machine harvested. Hager brought an unknown plant to Drobney who recognized it as *serecia lespedeza*. This highly invasive species readily clones, is fire tolerant, and can exclude other plants due to deep and extensive root systems. Within 24 hours of identification, the area had been extensively surveyed and plants treated with Garlon 3A. Plants were approximately two to five feet in basal diameter, and were in flower though no fruits were found. Follow-up survey of the area revealed no additional plants.

Despite the good news, there is more bad news. In December 2003, an old brome (*Bromis inermis*) field was planted with prairie seed after a late fall burn. In late summer of 2004, numerous plants were detected on the western edge of this unit within an area approximately 200 feet from field entrance. Because *serecia lespedeza* had been found elsewhere on the Refuge, we were especially sensitive to the possibility that we may have inadvertently harvested seed contaminated with *serecia lespedeza*, and replanted it in this site. This seemed unlikely as no one had reported a population of this species which is bright green and apparent in contrast to dried prairie vegetation during harvest season. Presence of a population large enough to supply the amount of seed needed for a population the size of that observed on Basswood would have been apparent to harvesters. Our two concerns were to eliminate the discovered population and to detect others, if present, on other portions of the Refuge.

In fall 2004, the field with *serecia lespedeza* was treated with Transline a few days after the first observation of the species. This chemical is selective for legumes and composites and its use would preserve prairie species in other families. Evidence of effectiveness came slowly, and it was not until late in the season that the leaves began to turn yellow. Though this is typically the season that native warm season prairie species begin to turn brown, normally *serecia lespedeza* is bright green during this time. As such, it is likely that chemical treatment was effective, at least to some degree. We will continue vigilance in the 2005 growing season.

A large offensive of staff and volunteers was launched to canvas the Refuge to locate and map other populations of *lespedeza*. We focused initially on areas that had been planted from fall 2003 to spring 2004 using the same seed mix as that used on Basswood in case it was inadvertently planted. *Serecia lespedeza* would have been obvious in the mowed, late season plantings, but no *serecia* was found. Additional checks were done by staff and volunteers on other plantings including the area where *serecia lespedeza* had been observed in past years, again with no additional observations of this invasive species.

Literature indicates that *serecia lespedeza* was planted in the 1940's for erosion control on steep dry areas, though it proved to be a poor solution to that problem. Seed needs to be scarified to germinate. The brome field where it was discovered had had no treatment

## Chemical Use

except mowing since the Refuge started. It is unlikely that plants were present in this area, as they would have provided a notable contrast to the brome in height, color, and texture and would have been observed. It is possible that a past planting of sercia was sprayed with herbicide for pasture improvement thus eliminating parent plants, but not dormant seed. Fire likely provided scarification needed for germination.

Canada thistle is a problem throughout the Refuge and is treated using TransLine or RoundUp and early mowing. Reed canary grass is a problem in dry creek bottoms and is treated with well timed mowing and spraying sequences using Rodeo or RoundUp. The wet weather really caused problems in controlling some of these species. This year was a continuous struggle to keep up with the mowing and spraying requirements. Other target species included sweet clover, musk thistle and black locust, yellow and white sweet clover, crown vetch and *Rubus parvifolius* (no common name available). Rich, Hager, Bruns, Boot and Van Zee treated approximately 200 acres of problem areas during FY2004.

Pesticide records are maintained on the Refuge to document the amount and type of chemical used within each planting site or other management area. Thirty-two gallons of chemicals were used this year including RoundUp, Rodeo, 2,4-D, Garlon 3A and 4, and Transline.

One focus was on location and treatment of highly invasive, exotic plant species. Among species of special concern on the Refuge are sercia lespedeza (*Lespedeza cuneata*), *Rubus parviflorus*, and black locust (*Robinia pseudoacacia*). Though there are many exotic species on the Refuge, these are especially insidious and will result in a need for significant additional management resources for control in the future if left unchecked.

**Black Locust** - There are five known sites of black locust on the Refuge, with two sites complicated by adjacent, cloning populations on private property. Staff and volunteers have been especially concentrating efforts on areas with relatively fewer trees in order to gain control on at least three of the five populations. This species spreads aggressively by root and can overtake an area in only a few years if left uncontrolled. Efforts seem to be paying off, with fewer trees appearing in treated areas than in past years.

This year, many hours were spent cutting and chemically treating black locust saplings around the Prairie Learning Center and on Thorn Valley Oak Savanna. After cutting, stumps were treated with Garlon 3A to prevent regeneration of the trees.

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## 2005

Biology staff contributions to upland restoration included: preparation of all bulk harvests for seed analysis, sending seed to ISU seed lab for seed analysis, herbicide treatment of black locust populations on the west side of Thorn Valley Savanna, and in the PLC area,

## Chemical Use

seed harvest in production plots and other areas, coordination of refuge seed collection/cleaning activities, performing seed cleaning and with volunteer Erma Selser, developing this year's seed inventory, assisted Public Use staff and Below in guiding seed collection activities of college groups and volunteers, shut down the production greenhouse and seed production plots for winter; winterized irrigation system, drained water lines in the greenhouse to prevent freezing, and prepared plants in containers for overwintering, prepared equipment, supplies, and forms for biological work to be done during bison round-up.

Tree stumps were treated with Garlon 3 this month.

### March 2005

A tremendous amount of work went into removal of several hundred trees in the old game farm area. Rich, Boot, Hager, Krueger, Severson, Braun and Hollerich all worked on cutting trees and brush for a future Boy Scout project. Approximately 5 acres of trees were removed in one day. The project will be the removal and piling of the trees. This is to take place in July. Allen reported later in the day to provide chemical treatment to all downed trees.

Boot continued tree treatment on the newly planted Burkenholtz unit. This unit has really changed in the last two years due to Hager's, Severson's and Boot's considerable work done in this area.

### April 2005

Through a conference call with other participants of the Thistle Suppression Research project, the group coordinated work schedules for soil sampling, herbicide treatment, planting, and subsequent monitoring. At this point, phenology was approximately 3 weeks ahead of usual due to approximately 2 weeks of unseasonably warm weather, but later in the month, with two weeks of below normal temperatures, this had changed. Drobney reported that seed had been received for highly diverse mix on April 7. Seed for High and Low diversity mixes have been finished and are ready for planting. Soil samples were taken in selected plots by USGS Junior Researcher, Jen Larson in mid-April.

### July 2005

Cultivar switchgrass was manually removed in Coneflower Prairie remnant. Black locust was cut and treated in west side of Thorn Valley Savanna. Boot sprayed lespedeza cuneata on 15 acres. Musk thistle heads were removed and plants grubbed out in 10 acres around the refuge. Canada thistle was mowed and areas interseeded on approximately 100 acres.

### August 2005

## Chemical Use

Black locust near Thorn Valley Savanna was cut and treated with Garlon.

Boot sprayed 15 acres of *Lespedeza cuneata*.

September 2005

ISU agro-ecosystems group assisted Krueger in treatment of *Lespedeza cuneata* in southwest corner of Basswood burn unit.

Krueger worked to control sericia lespedeza (*Lespedeza cuneata*) on the southwest corner of Basswood Unit. ISU researchers, Welsh, and Braun assisted in the hand treatment of plants with Garlon-4. Post-treatment evaluation revealed that areas of the plants treated were shriveled and brown. Some plants were apparently missed and will have to be treated later.

October 2005

While combining seed, Boot found a new patch of sericia lespedeza (*Lespedeza cuneata*) in Deer Valley. Krueger verified identity of the species and marked it using GPS technology. Unfortunately, some plants of this highly invasive species were clipped and included in the combined harvest. Krueger treated the patch with Garlon 4. Additional treatment will be needed in future years. Staff are making plans for control of this patch, and will destroy the harvest from that area. On that same note, Researcher Scott Bryant found an individual plant of sericia lespedeza in the parking lot of the Prairie Learning Center. A concerted long-term effort is being planned for control of this species.

Costello cleaned and weeded over-wintered plants in the production greenhouse. Krueger and Costello moved forward with work on the production plots, edging, repairing water lines and removing weeds. Earth day activities assisted with restoration projects including planting in the butterfly garden, removing fencing, removing and treating woody vegetation, and removing garbage from the refuge.

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## 2006

May 2006

A large colony of the highly invasive *Rubus parvifolius* was found at the Savanna Reconstruction Unit in an area where it was not previously known. On a second visit to the area it was discovered that the original infestation which had been treated previously was still thriving. Krueger and Mills returned to treat the area with herbicide.

Hager and Allen treated ~ 10 acres small trees and stumps with Garlon 4 in North Middle and NE Entry Units. Boot continued working on moving trees and brush that had been

## Chemical Use

cut at the North Unit. Stump grinding and tree chipping continued. Hager and Allen mowed several acres of sumac in Coneflower and Thorn Valley Units.

### June 2006

Boot, Bruns, Krueger, Hager, and Allen mowed and sprayed herbicide to control several invasive plants including white and yellow sweet clover, crown vetch, musk thistle, Canada thistle, *Rubus parvifolius* and *sericea lespedeza* for a total of about 100 acres mowed and 100 acres sprayed.

### July 2006

It was a particularly good year for certain invasive species on the Refuge. Krueger spot-sprayed patches of invasive plants with herbicide this month. The particularly nasty *Sericea lespedeza* was treated in the Ant Mound unit and along the entry road, and *Rubus parvifolius* was treated at the Savanna Reconstruction site. Muerdter and Mills monitored part of the entry road for *Sericea lespedeza* and did not locate any. Muerdter and Mills pulled and mowed white sweet clover at Coneflower Prairie. Viste-Sparkman, Mills, and a group of students from DMACC pulled white sweet clover in the Butterfly Hill Unit. Mills continued to spend most of her time researching invasive species biology and control methods. Boot, Hager and Bruns continued invasive weed control by mowing and spraying herbicide. Most of the problems were musk and Canada thistle, *lespedeza cuneata*, and sweet clover.

### August 2006

Hager sprayed a test of Krennite on sumac trees at Coneflower Prairie. The sumac were burned in the fall and mowed in the spring. Hopefully, the final treatment of pesticide will provide the control desired. No single treatment has been successful to date. A test spray of Plateau was attempted to control Queen Ann's Lace on the shoulder of the entry road and along trails. Hager also sprayed the recently constructed pull offs for the auto tour route, the cattle guard crossings, the maintenance yard and the wetland berms with glyphosate.

Krueger put in considerable effort locating and spraying populations of *sericea lespedeza* in several units. He continued to monitor and re-treat these sites throughout the month. In addition, he treated *Rubus parvifolius* and other invasive plant species.

### September 2006

Krueger, Hager, and Viste-Sparkman continued to find more new locations for *sericea lespedeza* (*Lespedeza cuneata*). Coneflower, Ant Mound, Basswood, Deer Valley, North and South Bison Units, Cabbage, Highpoint and the Henslow Hill roadside are all known to have infestations. Krueger and Hager spot-sprayed some patches, while others will be mowed to prevent seed set. Locations of all known populations are being recorded with GPS. We plan on treating it aggressively earlier in the season next year now that we have

## Chemical Use

the locations known. This plant has increased 10 fold in the last year. Our first encounter was in 2004 with one known population.

October 2006

Hager located, GPS'd, and mowed or treated several areas containing *Lespedeza cuneata*. He also researched several chemical treatment options for testing next year. A huge effort will be needed next year to control the spread of this invasive species. Viste-Sparkman contacted Tim Menard at Flint Hills NWR and discussed control techniques for *Lespedeza cuneata*. They have had some success in controlling it and Tim was optimistic that with persistence we could win the battle. Hager, Krueger and Murray attended pesticide training to maintain their state issued pesticide applicator licenses.

November 2006

Viste-Sparkman led the Field Biology class from DMACC's Newton campus in removing a patch of black locust from the Thorn Valley unit. Murray and Hager followed up with stump treatment.

Murray and Eicke are cutting trees and brush and herbicide stump treating at Buzzard Head.

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## 2007

May 2007

'Tis the season of mowing. Operations staff has begun to mow new plantings, areas of resprouting trees, as well as Canada thistle and sweet clover sites. Staff started looking for *Lespedeza cuneata*, GPS'ing its location so it can be tracked, and treating plants. Also, several hundred tree stumps were treated with Garlon to prevent them from re-sprouting. Krueger used the excavator to remove trees from Walnut Creek during an Eagle Scout project so the trees could be bucked up and piled for burning.

June 2007

Range Tech. Molly Caldwell, Nick Allen and the YCC crew spent several days working along the entrance road cutting down small trees and chemically treating them in an effort to prevent them from spreading.

Biology interns Simbro, Neuhaus, and Wickman spot-sprayed *Lespedeza cuneata* in Ant Mound, Deer Valley, and Coneflower units. They used GPS units to visit locations that were marked last year. Follow-up visits found more new plants emerging, although plants that were sprayed earlier this year were killed. They are using a 2% solution of Garlon 4 with crop oil. Additional new locations are also being treated and locations

## Chemical Use

recorded using GPS. The problem is big, but not insurmountable, and we are making progress this year thanks to the hard work of the Biology crew.

July 2007

Interns Neuhaus and Wickman continued invasive species control, including musk thistle removal and searching for and spraying sericea lespedeza. The lespedeza sites were GPS'd so we know where each is and how large the infestation is.

August 2007

Interns Ryan Neuhaus and Scott Wickman continued control of invasive sericea lespedeza. Ryan finished his internship August 10, and Scott finished his August 17. This year's biology interns made great progress in controlling sericea on the refuge. They visited sites repeatedly, locating areas with GPS and spot-spraying any plants that were found. More plants remain, so treatment will need to continue.

September 2007

Krueger mowed black locust patches on the Highpoint unit, areas will be sprayed with Krenite once the trees begin to resprout.

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## 2008

May 2008

Volunteer Larry Fudge sprayed black locust and willow stumps in the PLC unit that had been cut earlier during Earth Day. The Refuge biology interns began treatment of two small patches and one large patch of black locust in the Thorn Valley unit. They are making great progress.

June 2008

Viste-Sparkman completed the Scope of Work for the sericea lespedeza contract. It was sent to the Regional contracting office.

Interns spent most of the month working on invasive species control, cutting and treating black locust at the Thorn Valley savanna, and searching for and spot-spraying sericea lespedeza. The five interns, as well as Turnis and new volunteer Ron Eckoff, have been able to cover a lot of ground by gridding the area. They completed Deer Valley, Thorn Valley, and most of Northeast Entry during June. They are finding low levels of sericea lespedeza and treat it as they go.



## **Chemical Use**

Because of the areas of new lespedeza infestations we are finding, we are speculating that the seed had probably been lying dormant in the soil and were activated by the prairie plantings. Polk County Conservation area at Chichaqua Bottoms is having the same issue and has decided to plow up the 200 acre planting, plant it to crops for a few years and then replant prairie.

September 2008

Biological staff coordinated and inspected results of the work of Iowa Restorations, which began spraying the sericea lespedeza contract areas. All the units were sprayed by the end of the month, but some surviving sericea will need further treatment.

Hager made arrangements to purchase and pick up a boomless tank sprayer that can be used on an ATV or mule. This will be useful in spraying smaller infestations that are too large for backpack sprayers.

October 2008

The contractor on the sericea lespedeza spot-spraying completed treatment of plants in the contract areas. Plants that were treated late and those that were missed were still alive and produced seed this year. Sericea lespedeza seed from some of the plants that were treated late, that were mowed and developed seed late, and untreated plants were collected and taken to the ISU seed lab for tetrazolium (tz) testing. The results were that late developing seed (pods still green) and plants showing signs of chemical burn had 81% viability. Those that were untreated had 66% viability.

Boot spot sprayed 160 acres of crown vetch, Canada thistle, and sweetclover.

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## **2009**

January 2009

Hager completed the FY2008 PUPs report and prepared all 2009 PUPs (Pesticide Use Proposals) for the refuge. Gilbertson approved station PUPs and forwarded the others to the RO for approval.

May 2009

Hager organized the pesticide room and worked on mounting the new sprayer on the Kubota to get it up and running.

June 2009

## Chemical Use

Hager sprayed Canada thistle in Bobolink and Cabbage units using the new boomless sprayer on the Kubota. These units have high plant diversity and this sprayer makes it able to spray a smaller area, impacting fewer desirable plants.

Boot sprayed Canada thistle with the Patriot on several larger patches, and Boot and Debruin mowed hundreds of acres of sweet clover.

July 2009

Hager used the new spray rig to treat sericea lespedeza in Antmound. Volunteer Larry Fudge assisted and will take over while Hager is on the duck banding detail.

Biology interns Rice, Taylor, and Zearing searched for and treated sericea lespedeza in several units. YCC crew assisted them on some days.

Boot, Debruin, and Kane mowed and/or sprayed sweet clover and Canada thistle on several hundred acres.

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