

## **Invasive Species**

### **1995**

Prairie Restoration – Among the natural area remnants on WNT, there are several native prairies. Though a spring 1994 burn controlled sweet clover populations, without a spring burn on Coneflower Prairie in 1995, white sweet clover populations occurred in large dense populations on northern, southern, and western boundary. Individual plants were occasional throughout the rest of the prairie. Patterns of sweet clover were similar to those seen in 1994, though not as severe. Prior to seed set, volunteers hand-weeded the prairie.

A population of non-local ecotype switchgrass plants invading from the plantings to the north flowered this season, and were grubbed from the prairie by volunteers. Removal of these plants was accomplished by inserting a narrow spade or trowel into the soil and slicing the roots just under the crown of the plant.

Pest control took a great deal of the Operation Staff's time during the summer and early fall of 1995. Mowing occurred on 2,200 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 so the light would penetrate to the young native plants, and secondly to control thistles. All other mowing was performed as a control to measure to prevent thistle, sweet clover, and mares tail from going to seed.

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.

There were no major weed or insect problems relating to the Farming Program. Very wet spring weather delayed spring planting but otherwise crop production on the Refuge was not very good or slightly higher than in neighboring areas.

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### **2000**

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Volunteers Karen Balmer and Lynn Huebler spent hours in the hot summer sun removing birdsfoot trefoil.

As several years of restoration and reconstruction efforts on the Refuge have begun to bear fruit, the Friends of the Prairie Learning Center sought to become more directly involved in the restoration process. The site selected was a 20 acre parcel along the east end of the Tallgrass Trail. Work on the Friends' Prairie was initiated in 1998 and has since become a premier restoration site.

On the second Saturday of every month, the Friends of the Prairie Learning Center held a stewardship event at the Refuge led by a member of biology staff. Participation ranged from 5 to 50 people who usually worked from 9:00 a.m. to approximately 1:00 p.m. The activities varied based on the time of year and included exotic tree cutting/removal, exotic invasive removal, native seed collection, seed cleaning, seed sowing, gully repair, and orchid labeling. These fun work days give Friends the opportunity to understand the challenges of ecological restoration of the Refuge first hand, and not only assists the restoration process, but provides a foundation for interpretation of the Refuge to the public they address on our behalf.

**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.

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### **2001**

Texas native and Grinnell College master's student Malinda Slagle volunteered her talents and considerable knowledge with the Biological department for two weeks during July. A former U.S. Park Service employee with experience in invasive species, Malinda proved to be a tremendous help in our war on switch grass cultivars and sweet clover in Coneflower Prairie. In addition to her help with these and other activities, Malinda brought a positive attitude and good sense of humor which helped us to keep working at some tedious tasks during the hottest part of the summer.

**Monthly Biology Stewardship Activities** - The Refuge Friends group holds volunteer stewardship activities on the second Saturday of each month and a smaller yet equally dedicated

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group of volunteers turns out on the last Thursday. The Second Saturday stewardship days are focused on the Friends' Prairie area of the Refuge which provides the Friends with an opportunity to develop a sense of ownership and responsibility for a piece of the Refuge. The work days also serve as an educational and recreational connection to the reconstruction process. The Second Saturday stewardship days have proven to be effective tools for harnessing the power of a dedicated work force to accomplish Refuge needs and goals. Though a crew of 6 to 60 people of all ages is possible, a dedicated core of regular attendees helps coordinate activities efficiently with Refuge staff. Their knowledge of Refuge needs and goals allows them to work more independently and accomplish more.

The Thursday evening events were requested by Refuge volunteer Jonathan Yentis as an alternative time for those not able to regularly attend the Saturday events. We also try to have a member of the staff take part to incorporate an educational program related to the work to be performed. Fewer volunteers are able to attend, but a smaller group allows us to interact more personally with them and increase the educational value of the experience. Many of those who attend the Thursday evening programs also attend the Saturday events and they have been able to assume leadership roles for less experienced volunteers.

Some of the efforts for which the volunteers have played a key role include seed collection and processing, invasive species removal, brush clearing, and bluejoint grass potting. These fun and educational events have become a focal point for volunteer activities.

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.

**Invasive Species Conference, Steering Committee and Bus Tour** - On October 6-7, 2000, Biologist Drobney attended a symposium on Invasive Plants and animals in Iowa, hosted by the Iowa Academy of Science. This symposium focused on major plant and animal invasive species issues facing natural resource professionals in Iowa. Pauline subsequently became a member of the Iowa Invasive Species Steering Committee that will form the basis for an Iowa Invasive Species Council. In the past year, the Iowa Invasives Species Steering Committee met several times and developed priorities for the program. Of utmost importance is an education campaign. Another high priority is to develop a statewide database of invasive species in the state. The

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Committee seeks interdisciplinary support and launched a program to educate state legislators, business people, natural resource managers, and those interested in recreation to develop a unified front to combat or prevent spread of highly invasive species.

**Volunteer Program** - Volunteers at the Neal Smith National Wildlife Refuge-Prairie Learning Center are continuing to be a useful tool in restoring the tallgrass prairie and helping with environmental education and special events. Volunteers contributed 16,389 hours to the Refuge this past year. As one of the largest tallgrass prairie reconstruction projects in the United States, our volunteers donated 6,912 hours working on upland restoration, 728 volunteers hours helping with mowing and pest plant control, 6,788 hours providing visitor services and outreach and 1,961 hours with Surveys, Censuses and Investigations.

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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 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

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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**

Rick Hager and the YCC enrollees removed over 150 metal posts from the Old Schoolhouse Unit to diminish hazards during mowing and prescribed fire operations. They cleared more than 100 trees from a three acre prairie remnant, transplanted more than 1,000 prairie plants into the production plots, and weeded invasive plants, mainly sweet clover, thistle and curly dock from primary harvest areas. The crew weeded, cleaned and graded bench areas along the Tallgrass Trail, removed barbed wire, woven wire and metal/wood posts from over one mile of fence line to prepare fall 2003 restoration planting areas. The crew removed hundreds of small trees, mainly cottonwood, locust and willow from road ditches and fields, then treated the stumps to prevent re-growth.

A \$5,000 grant for invasive species control was received, allowing for the purchase of equipment to expedite removal of non-native trees in Thorn Valley Savanna. Matching funds will come from volunteer labor to remove the vegetation.

The southern 20 acres of Thorn Valley Savanna, Site 17, was burned during the spring to suppress a large population of sweet clover that had established itself. The burn was followed by an experimental interseeding using an AirWay Aerator. This technique will be utilized by Iowa Private Lands on private lands. This experience provided them with the opportunity to understand the capability of the machine to minimally disturb dense grass sod in preparation for seeding. Mike Rich, Assistant Iowa Private Lands Coordinator, provided this service. Biology staff calibrated and seeded using a Vicon spreader, operations staff followed up by cultipacking the site.

SCA crewmembers spent a great deal of time, and a lot of sweaty hours, cutting honey and black locust trees in the Thorn Valley Savanna unit. They were able to clear a fairly significant area for future management.

During July, Hager and the YCC crew removed several large trees from an old home site to prepare for fall planting of the area. The crew hand collected spiderwort seed for prairie restoration and cleaned and sterilized over 1,000 conetainers for reuse in the greenhouse next season. The crew assisted EE in removing downed trees and sumac in the Savanna Trail area, they also assisted EE in transplanting over 7,000 plants adjacent to the Overlook Trail. YCC also worked hard in transplanting several hundred plants into the production plots.

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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.

Maintenance Mechanic Boot used the hydra-axe during FY02 and the beginning of FY03 to clear approximately 25 acres of trees during FY03. Van Zee used a tree shredder to cut 450 acres of trees encroaching into the prairie restorations. S. Van Ryswyk and Van Zee removed over 1 mile of fence. This removal of fence gives the area a more undisturbed look and eliminates some safety issues.

As a tallgrass prairie restoration site, our focus is on restoring prairie, not on forest management. However, we are currently trying to restore a 40 acre oak savanna site to its native appearance, this would be our forest management. We have been removing unwanted trees such as black locust, ash, elm, and maple to open up the canopy so light will reach the ground.

Throughout the spring, summer and early fall, crews of volunteers and staff worked to clear trees and brush from the savanna. Small trees were clipped and cut using loppers and bow saws, while larger trees were cut using chainsaws. All of the brush was removed and piled outside of the savanna to be burned at a later date. All of the stumps were treated with Garlon 3A to prevent the sprouting and re-growth of the trees that were removed. The SCA and range tech crews spent a great deal of time removing and treating black locust trees from the area.

The refuge currently maintains a nature trail that winds its way through the oak savanna. This allows visitors to monitor our progress in the restoration process. A burn plan has been established for this unit as well. The burning of the savanna will allow us to knock back some of the undergrowth, stimulate growth of the understory, as well as help to eliminate some of the trees that are not fire tolerant. Our future management plans for this area are to continue to remove invasive species of trees and treat the stumps with chemicals to prevent any regeneration of the tree. Burning of this area will help also help to prevent any regeneration of these trees as well.

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, 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.

## Invasive Species

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.

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.

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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

**Evaluation of methods for Canada thistle-free habitat restoration** - Brd Principal Contact: Diane Larson, Research Wildlife Biologist - Affiliation: Northern Prairie Wildlife Research Center - The National Wildlife Refuge System has an active habitat restoration program and annually seeds thousands of hectares to native plant species. In FY2003 alone, Region 3 restored 26,690 wetland acres and 7,394 upland acres. The noxious weed, Canada thistle (*Cirsium arvense*), plagues these restorations, however. Because its control is mandated by law, it is often necessary to apply herbicide or mow at a time that is detrimental to the success of the restoration as a whole. Disturbance at this early stage of the restoration may, in fact, weaken the native seedlings as much or more than it does Canada thistle, thus thwarting the potential of the native restoration to ultimately suppress Canada thistle and other weedy species. Continued control of Canada thistle may perpetuate the repeated disturbances that favor infestation by a variety of exotic plants, thistle included. The goal of the proposed research is to compare the ability of differing seed mixes and application techniques to suppress Canada thistle establishment in new restorations. We hypothesize that by increasing competition and decreasing the disturbance inherent in seeding, we can produce more weed-resistant restorations.

Potential effects on Canada thistle abundance in restoration of cultivated land is divided into four categories: (1) disturbance, (2) competition, (3) site characteristics and (4) year effects. We will experimentally manipulate disturbance and competition, but must also take into account site characteristics and year effects. Three seeding techniques will constitute differing amounts of disturbance: broadcast seeding during the dormant season is expected to inflict the least disturbance to the seedbed, spring seeding with a seed drill the most, and spring broadcast seeding should be intermediate. We will vary competition through the use of three different seed mixtures. A cool-season grass dominated mix should compete directly with Canada thistle seedlings, which also emerge early in the spring. A warm-season grass dominated mix, while emerging later than Canada thistle, may be more efficient at nutrient uptake and ultimately out-compete thistle through nutrient usurpation. Each of these mixes will have low diversity (eight species). A high diversity mix (at least 35 species) with several species from each functional group may effectively utilize all available niches, thus excluding Canada thistle. Site characteristics we will need to take into account include the existing Canada thistle propagule bank and soil fertility and moisture. Year to year variation, over which we have no control, include seasonal temperature and precipitation, which will influence both the probability of Canada thistle and native seedling establishment, though perhaps not equally.



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The study will be conducted at Neal Smith National Wildlife Refuge, Fergus Falls Wetland Management District, Morris Wetland Management District, Litchfield Wetland Management District and Minnesota Valley National Wildlife Refuge. Total area treated in each field will be approximately four acres. The four acres will be divided into 108 cells, each 12.2 x 12.2 m (40 ft x 40 ft, or 0.0367 acre), which will allow five passes by a typical 2.44 m (8 ft.) seed drill. Sampling (see below) will be restricted to a 2 x 6 m plot in the center of the treated cell to avoid edge effects. To minimize disturbance, cells will be oriented in the field such that each can be reached without crossing another cell; a buffer zone will separate rows of cells to accommodate equipment and site access. Treatments will be assigned to cells at random with 12 replications per treatment in each field.

We will employ three seeding methods and three seed mixes, fully crossed, for a total of nine treatments. The three seeding methods include a dormant season broadcast seed application, a spring broadcast seed application, and a spring seed drilling application. Seed mixes will include two low diversity mixes, one dominated by warm-season grasses, similar to currently used seed mixes, and the other dominated by cool-season grasses. Total species richness in the mix will include only one or two species in each functional group, with the exception of the cool or warm-season grasses, which will have three or four species. The high diversity mix will include at least seven species in each functional group. Functional groups include warm-season grasses, cool-season grasses, warm-season forbs, cool-season forbs, and legumes. To the extent possible, seeds will be collected from sites near the fields to be seeded. Additional seed will be purchased from the nearest available supplier as needed. We will plant 50-60 seeds/m<sup>2</sup> in the drilled application and 60-75 seeds/m<sup>2</sup> for broadcast seedings. Fields will be mowed once in the first year for weed control. We will apply glyphosate and 2,4-D to the spring broadcast field prior to seeding, per normal restoration practice.

Prior to seeding, we will collect soil samples from each cell in each field. Soil will be collected within a 0.5m buffer around each plot using a 2.54 x 10 cm soil corer. We will collect five cores in each of the cells and composite the soil over four-cell blocks (to retain some geographic structure in the data). Soil thus collected will be used to determine average (1) nitrogen availability, (2) soil moisture, and (3) the Canada thistle propagule bank in each field, as well as any gradients across each field. Soil on all fields will be collected within a one-week period.

To assess nitrogen availability in soils we will perform lab incubations on a subset of the soil (approximately 1/5 of soil collected). We first will extract a sub-sample of the collected air-dried soil (referred to as the “initial” sample) with 2 M KCl. A second sub-sample of equal portion will be brought to field capacity (optimal moisture conditions for microbial activity), covered, and allowed to incubate for 28 days at room temperature. Following the 28-day incubation, the sample will be extracted with 2M KCl (the “final” sample). Extracts will then be analyzed for nitrate/nitrite and ammonium, the common available nitrogen compounds in soil using an OI Corporation SF3000 autoanalyzer. Subtracting the initial sample value from the final sample value gives the potential rate of nitrogen mineralization and nitrification, or the potential amount of nitrogen available to plants under ideal conditions, which provides a basis for comparison among the fields. Details of the methods can be found in Robertson (1999).

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Rather than measuring soil moisture directly, which is costly and difficult across large landscapes, we will determine soil texture (percent sand, silt and clay). Soil texture is directly related to water holding capacity and will provide, together with precipitation, an index of relative moisture at each site. We will use the hydrometer method as outlined in Day (1965).

Gross (1990) determined that germination with stratification was the most reliable method to assess viable soil seedbanks. To determine the number of Canada thistle propagules in each field we will first sieve the soil to remove root fragments  $\geq 2$  cm. Root fragments will be mixed with sterilized potting soil and spread over a 2.5 cm layer of vermiculite in greenhouse flats. A paper towel will separate the vermiculite from the soil. Remaining soil will be cold stratified for six weeks, then spread to a depth of 2 cm over a 2.5 cm layer of vermiculite, separated by paper toweling, in greenhouse flats. Flats will be placed in a greenhouse and kept moist, with light regime and temperature consistent with the growing season in the upper Midwest. Root fragments and seedlings will be allowed to grow until no new plants are detected for seven days. At this point, plants or seedlings that can be identified as Canada thistle will be counted and removed. If identification is equivocal, seedlings will be allowed to continue growth until they can be identified; this may entail transplanting seedlings to larger pots. Results will be expressed as average number of Canada thistle root sprouts and seedlings per cubic meter of soil in each field. We will also assess any gradients across each field.

For post-treatment sampling, we will sample the plant community on each plot using a composite of 12-0.5 x 2 m quadrats. The quadrats will allow more complete searches for individual species, while dividing the plot into sufficiently small sections for accurate cover estimation. On each quadrat we will determine aerial cover of each species using Daubenmire cover classes (Daubenmire 1959). We have chosen to use aerial cover because it is directly related to biomass (Elzinga et al. 1998). Coefficients of Conservatism will be assigned to each species, based on published sources. In addition, we will conduct Canada thistle stem counts on a sub-sample of each plot, with the size of the sub-sample depending on the density of Canada thistle stems. Counts will be standardized to stems/m<sup>2</sup>. The plant community will be assessed in May and July of each year. Canada thistle stem counts will be assessed in July.

Expected Products: Results of this project will be incorporated into management recommendations for planting methods and seed mixtures when Canada thistle and other invasive plants threaten prairie restorations. The sampling design and monitoring protocols are fully transferable to other refuges with prairie habitat. The measurement model developed for this project can also guide future monitoring efforts by identifying additional factors that influence invasibility and that may interact with factors we can manipulate to produce varying – and unexpected – results.

We anticipate, in addition to annual and final reports to the refuges and Region 3, at least two peer-reviewed publications and several oral presentations at meetings and workshops as appropriate. The topic of one paper will be the outcome of the restoration trials. The topic of the second paper will be the utility of multivariate hypothesis testing (e.g., structural equation modeling) for the development of monitoring plans. All reports and publications will be available through the Northern Prairie Wildlife Research Center (NPWRC) web site.

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**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 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 serecia was sprayed with herbicide for pasture improvement thus eliminating parent plants, but not dormant seed. Fire likely provided scarification needed for germination.

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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 serecia 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.

The YCC crew built a butterfly garden with 1100 square foot brick walkway, benches, rock wall, boulder and a “puddle” for the butterflies to drink from; cleared approximately three miles of fence; surfaced part of a public use trail with wood chips and built a boardwalk over a wet area; cleared invasive species from prairie plantings and planted seedlings; harvested seed; removed non-native plants from future harvest sites; and cleared brush and trees from prairie remnants, plantings and fence lines. They also aided in the maintenance of the Refuge by litter removal, cleaning offices, washing vehicles and cleaning storage areas and sheds (photos 62 – 66).

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## **2005**

June 2005

Agro-ecosystems: flume installation is nearly complete. Drobney noted that serecia lespedeza (*Lespedeza cuneata*), a highly invasive exotic continues to be present. Researchers have asked

## Invasive Species

that if spraying is necessary, that it includes at least three or all six plots so blocking can be used in statistical analysis. Drobney participated in several conference phone call meetings involving this research.

Thistle suppression: Biology interns, Laurie Fenimore, and David Walsh continue to prepare and mount pressed specimens index cards for field identification purposes. Field treatments were accomplished primarily by Krueger and Boot, though other staff assisted. In preparing for drilling, Boot discovered that the drive mechanism and pulleys had been taken off the old drill, requiring the need to use a Pasture Pleaser for drilling. Spring planting plots were sprayed with glyphosate (Round-up) in preparation for planting. All broadcast delivered seed mixes and most of the drilled treatments were applied. Seeding equipment required frequent calibration. Porcupine grass was hand seeded in very high diversity mixes that were broadcast. .

Hager mowed over 80 patches of Canada thistle totaling approximately 40 acres. Sites were marked by GPS to allow over seeding with prairie species forbs and grass.

YCC started on June 13<sup>th</sup>. Staff coordinator Hager, three enrollees and crew supervisor Nick Allen immediately began removing fence, pulling sweet clover, chipping the Savanna Trail, clipping small trees and cleaning storage buildings. The program runs through August 5<sup>th</sup>.

Biology staff and interns cut sweet clover, stratified seed for id cards, pressed plants and made identification cards for thistle research project, and collected blue-eyed grass from Coneflower Prairie.

Thistle and sweet clover are the issues of the month. Mowing and interseeding with native seed is the treatment. Canada thistle and sweet clover were mowed. Musk thistle and sweet clover and queen anne's lace were pulled by hand.

At the request of ACE Official, Jeff Nelson, Drobney visited several prairie and savanna sites at Lake Red Rock to advise in prairie management issues. Problems included invasive species such as seresia lespedeza (*Lespedeza cuneata*), reed canary grass (*Phalaris arundinacea*), crown vetch (*Coronilla varia*) and others. Treatment was developed as well as a species list for planting in an area where Transline is used. Other issues were also addressed such as seed collection, addition of species diversity and seeding methods. Nelson offered to negotiate for seed collection privileges for relatively rare species on COE land.

July 2005

Volunteers also picked up the pace on planting and weeding the butterfly garden while Robert Swan and his family again removed sweet clover, planted native plants and cleaned conetainers.

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

## Invasive Species

acres. Musk thistle head 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

Drobney did a site visit to plan *Lespedeza cuneata* treatment strategies with Matt Liebman of the Agro-ecosystem research team. The team will provide assistance in field treatment of individual plants. Thistle suppression: Vegetation data collection is complete, and plots are being mowed periodically as needed by refuge operations staff.

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

September 2005

ISU agro-ecosystems group assisted Krueger in treatment of *Lespedeza cuneata* in southwest corner of Basswood burn unit. Thistle suppression: Plots are being mowed periodically as needed by refuge operations staff.

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.

## Invasive Species

On that same note, Researcher Scott Bryant found an individual plant of *Serecia lespedeza* in the parking lot of the Prairie Learning Center. A concerted long-term effort is being planned for control of this species.

November 2005

In lieu of a staff meeting, staff participated in a removal of *Serecia lespedeza* seed heads (*Lespedeza cuneata*) in the Deer Valley burn unit on planting site 30 as a part of a control strategy.

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## 2006

March 2006

Drobney provided input and advice to other biologists in R3 regarding reed canary grass control and participated in a Reed Canary Grass Workshop Committee planning meeting via conference call.

Two biology “Prairie Builder” interns were hired for summer. The first of the interns, Rebecca Mills, will begin in late May and will focus on invasive species monitoring and control. The other intern, Hanni Muerdter, begins in early June and will be a general biology intern.

April 2006

Biology staff began looking for the invasive plant *Lespedeza cuneata* in places it occurred last year, but the plants had not emerged by the end of the month.

Developed a survey for FWS programs in the refuge system in R3, R5, and R6 regarding reed canary grass (*Phalaris arundinacea*) as an invasive species. This survey will be used by the committee (field station employees, BMT, and LMRD) developing a workshop to address the

## Invasive Species

issue. LMRD biologist also participated in a conference call and several other communications to develop the reed canary grass workshop.

Community Service Day: Al Murray worked with Cindy Wilson (Administrator) from Central College to develop a partnership and host a Community Service day for Central College students. On April 19<sup>th</sup> 64 students and faculty members from Central College came to Neal Smith N.W.R to volunteer performing a stewardship project. Murray welcomed the participants and introduced Karen Viste-Sparkman and Jeff Krueger who supervised the group while they removed thistles from a large area of the Deer Valley unit.

May 2006

Biology intern Becca Mills began work May 22. She will be focusing most of her time on invasive species monitoring and control.

Krueger located and identified *Sericea lespedeza* on the Deer Valley unit for control.

June 2006

Hager trained Mills and Muerdter on use of GPS units. They then used these skills to monitor and record *Rubus parvifolius* locations in the Old Game Farm. Mills recorded locations of crown vetch along roadsides using a GPS unit.

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.

Mills and Muerdter participated in hand control measures for invasive species including musk thistle in the Deer Valley unit and Queen Anne's lace around the PLC. They dug up daylilies growing near the Tallgrass Trail and later Muerdter and Viste-Sparkman planted a seed mix in the disturbed area. Mills hand-pulled a small patch of crown vetch along the Tallgrass trail. Mills and Viste-Sparkman hand-pulled scattered white sweet clover plants at Coneflower Prairie. Mills spent much of June researching invasive plants of concern to the Refuge and best practices for their control. She also monitored roadside locations for *Lespedeza cuneata*, but fortunately has not found any yet.



## Invasive Species

July 2006

Drobney participated in the organization and implementation of the Reed Canary Grass Workshop. Reed canary grass workshop was held from July 11-14. Drobney presented results of the tri-regional questionnaire during the workshop. She will also be a reviewer of the reed canary grass proposals presented by USGS. Gilbertson also attended.

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

August 9: with Viste-Sparkman, met with Central College Professor, Anja Butt and her student (NSM Biology Intern) Becca Mills to discuss potential project for a course that would involve GIS and development and implementation of an invasive species monitoring/treatment program involving volunteers.

Drobney sent summary notes for the survey portion of the reed canary grass meeting to BMT for inclusion in emailing to meeting participants.

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.

## Invasive Species

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.

Gilbertson, Drobney, and Viste-Sparkman met with the Central College professor who is working with her GIS class on an invasive plant species monitoring project. This fall the class will use GPS to mark locations of invasive plants in certain units on the refuge, and will present the refuge with GIS shapefiles and written reports of their findings.

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

A group of students from Central College began searching refuge units for invasive plant species. The students will be targeting 6 species that are most visible during the fall, including sericea lespedeza, black locust, honeysuckle, *Rubus parvifolia*, autumn olive, and Canada thistle. They are searching in Highpoint, Deer Valley, Coneflower, Ant Mound, and Savanna Reconstruction Units, and will GPS any invasive plant species they locate.

A special use permit was issued to Anya Butt from Central College in Pella, Iowa and assisting students to collect information on invasive species. Murray worked with Scout Matthew Peterson to initiate his Eagle project along the entry road. Matt and his crew are working on a project to remove fencing and invasive species from an area west of Coneflower prairie.

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

## Invasive Species

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.

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## 2007

January 2007

Drobney, Marc Linderman (co-Principle Investigators) and Silvia Secchi (Sr. Scientist) began developing a proposal for the USDA National Research Initiative on Biology of Weed and Invasive Species in Agroecosystems upon receiving word that the letter of intent was accepted. The title of the project is: Landscape Influence on Invasive Species in the Tallgrass Prairie Region of the United States.

February 2007

Drobney, Marc Linderman and Silvia Secchi finished and submitted a proposal for the USDA National Research Initiative on Biology of Weed and Invasive Species. The title of the project is: Landscape Influence on Invasive Species in the Tallgrass Prairie Region of the United States.

Drobney coordinated a conference call among team members involved in the Canada thistle suppression research to determine staffing needs and strategies, and to agree on management needs for thistle plots this year.

## Invasive Species

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

Drobney, Dykstra, and Gilbertson successfully completed work to hire 3 STEP students to complete the Thistle Suppression Research project at NSM, Morris, Fergus Falls, and Litchfield this season. This turned out to be a complicated and difficult process, with no takers on a previous advertisement for a botanist, change of plans by the volunteer assistant for the project, and the timing of vegetation monitoring planned for the project. To realistically accomplish the project this year and with resources we have, the project start date was moved from mid-July to June 18, to allow a 9 week field work schedule that could be completed before school started in the fall. This allowed hiring of STEPs. The Friends of the Prairie Learning Center LMRD intern is providing botanical skills and will become a STEP hopefully by July 9. Two additional students were located to provide assistance and started as STEPs on June 25.

Bruns, Boot and Krueger have been all over the refuge mowing white and yellow sweet clover as well as thistle in an effort to prevent it from spreading and forming dense patches.

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 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

## Invasive Species

Wahl, DiAllesandro, and Smith finished thistle suppression research plot monitoring on Neal Smith NWR on July 13, and traveled to Litchfield on July 15. Work was completed at Litchfield and the crew moved on to Fergus Falls on July 24. Work is going smoothly.

Sam Simbro completed his internship July 2. Interns Neuhaus and Wickman began the invasive species eradication and also cared for the greenhouse and production plots.

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.

Kim Wahl joined the Neal Smith staff as a Bio Science Aid on July 15. Kim is a STEP student and will be assisting the LMRD with thistle suppression.

On July 16<sup>th</sup> & 17<sup>th</sup> the refuge hosted a large Camporee service project for the Calvinist Cadet Corp. Staff members Krueger, Groom and Murray along with YCCer's worked to buck up felled trees in advance of the event. When the scouts arrived they worked as a group to create brush piles which in the end cleared an area of approximately 4 acres of downed trees along the entry road.

August 2007

Boot and Krueger were busy with mowing sweet clover and fire breaks. Boot worked on equipment repairs and getting bids for new equipment.

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.

A permit was issued to Brian Wilsey to examine effects of spatial relationships of prairie species relative to exotic species suppression.

## Invasive Species

Temporary employees, Andrew J. Diallesandro and Margaret Smith, completed their work on thistle suppression and their employment ended August 18.

### September 2007

Hager spot-sprayed or mowed locations where sericea lespedeza had been found. Most were in small patches that had been treated earlier in the season and were much reduced in size since last year. Volunteer Larry Fudge passed the pesticide applicator's test and received training from Hager in use of GPS and identification of sericea lespedeza. Volunteer David Novak also spent a day with Hager learning to identify the plant, use the GPS, and monitored the Basswood unit. He did not locate any sericea lespedeza plants. Hager and Viste-Sparkman found new sericea plants along the bison road and around the PLC parking lot.

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

Viste-Sparkman attended the Sericea Lespedeza Multi-State Working Group meeting in Clinton, Missouri on September 20-21. The group discussed control methods, current research, and noxious weed status.

### October 2007

Researchers have risen to the occasion of sericea lespedeza (*Lespedeza cuneata*) suppression by volunteering time to thoroughly monitor Cabbage Unit research site during 3 separate events. The National Soil Tilth Laboratory, the Iowa DNR-Geological Survey, Iowa State University professors and students found 40+ individual plants and GPS marked them for later removal by refuge staff. The work involved hours of "high-stepping" through 80 acres of tall prairie vegetation and even physically fit folks had sore muscles. Additional work was performed by the Agro-ecosystem research team from ISU, who searched narrow strips of prairie plantings within experimental crop fields, and along the edges of their experimental areas. No lespedeza was found. The effort to assist in monitoring areas of the refuge demonstrates not only the commitment of researchers to science, but to assisting as volunteers in land management and conservation as well.

## Invasive Species

Drobney coordinated a conference call with Thistle Suppression Research Team to discuss future management needs, especially the coordination of fire management. It was decided that burning would be delayed until the 2008-2009 burn season.

A draft paper summarizing the results of two years of the Thistle Suppression Study is being submitted for publication to Restoration Ecology.

The refuge staff concentrated on identifying and removing remaining sericea lespedeza (*Lespedeza cuneata*) plants to prevent seed development and spread. Seeds began developing in early October and were ripe by the end of the month. Volunteer Larry Fudge assisted Hager and Viste-Sparkman in removing plants that were beginning to develop seed. Viste-Sparkman led volunteers in removal of plants in Coneflower Unit on Ding Darling Day. Hager led a group of 60 high school students on Oct. 27, searching Highpoint for sericea lespedeza plants. Drobney recruited researchers and their students, who spent several hours searching the Cabbage unit on Oct. 27. About 60 plants were found in about half of the unit. Visitor Services staff put together educational packets for hunters in order to educate and encourage reporting of sericea lespedeza plants.

Hager, Gilbertson, and Viste-Sparkman attended an Invasive Species Field Day on October 18. Identification and control of invasive species was discussed. Viste-Sparkman took samples of sericea lespedeza and silver plume grass to share identification tips.

The refuge was host to 125 volunteers who participated in this year's J.N "Ding Darling" prairie rescue day on October 13<sup>th</sup>. Murray, Groom, Hager, Krizman & Viste-Sparkman worked with different groups on projects around the refuge. These included Search and Destroy of Sericea Lespedeza, construction of brush piles, the collection of native prairie plant seed and the cleaning of seed in the seed lab. At the conclusion of activities participants enjoyed bison burgers sold by the Johnston Kiwanis.

Lespedeza information was distributed at hunter parking lots in hopes to get a better idea of where the plant is growing and to raise awareness of this new invasive species.

November 2007

Viste-Sparkman, Hager, and Drobney coordinated an effort by a group of researchers to locate and GPS mark the highly invasive sericea lespedeza (*Lespedeza cuneata*) plants on the Cabbage Patch research area. Drobney requested assistance from the NSM research community and several researchers immediately offered help. Work was performed by approximately 20 people during two sessions and included participants from the National Soil Tilth Lab (NSTL), the IDNR Geological Survey Division, and Iowa State University. Additionally, researchers drew

## Invasive Species

on participants from an ISU class. Mark Tomer of NSTL took the lead to help organize researcher participation and wrote thank yous to all students participating. Hager provided GPS units and guidance for the first surveillance day. More than 40 new observations of sericea were recorded. Drobney and Viste-Sparkman followed up by removing plants from the site later in the month.

Additional efforts by the Agro-ecosystem research group included surveillance of areas in the newly planted research areas under their study. No sericea plants were found, but observation will continue.

Effort to control sericea lespedeza by researchers represents an evolution of simple use of the refuge as a research site by researchers, to their involvement with important stewardship work. This provides opportunity for continued enrichment of the research program as researchers gain a greater understanding of the challenges of refuge land management. Drobney and Viste-Sparkman hope to follow up with a presentation to students at ISU regarding sericea lespedeza control.

Drobney coordinated discussion of on-going needs of the Thistle Suppression project. It was agreed that burning should be attempted in the 2008-2009 burn season. Additional opportunities for funding of the project monitoring were explored, but no new avenues were found. All participating refuges are committed to continuing the project, however. Disappointing news was that the manuscript submitted for publication to the Journal of Restoration Ecology was rejected. Another attempt will be made with the addition of information from this season's monitoring.

In early November researchers and students from Iowa State University returned to continue searching the Cabbage unit for sericea lespedeza, *Lespedeza cuneata*. They used GPS units to mark locations of the plants, and volunteer Larry Fudge, Hager, Drobney, and Viste-Sparkman removed plants with ripe seeds from the unit. By the time all of it was removed in late November it was dropping seed. Hager followed up on possible sericea lespedeza plants in High Point unit and could not locate them, so they were presumably misidentified. Hager and Larry Fudge surveyed part of Bobolink and found and removed a few isolated plants. One hunter called in to report finding a sericea lespedeza plant, with directions to the location in Bobolink unit, but it could not be found. We will survey the area more thoroughly next year.

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## 2008



## Invasive Species

April 2008

Viste-Sparkman led 15 Central College students in a Service Day activity of cutting and removing black locust from the PLC unit near the Tallgrass Trail on 15 April. Hager continued with this activity with a group from DMACC on Earth Day.

May 2008

Two LMRD interns began work on May 20, including Michelle Fuhrer, and Barbara Kagima, who has worked on the refuge doing bison research. LMRD intern work thus far has included getting the LMRD Trimble GPS up and running, and recording the limits of the burn on Thorn Valley Unit, one of the Thistle Suppression research units. Disk plates are being installed in those plots that were missed in initial marking events. A database is being developed for all of the research history for Neal Smith NWR that can be used on the website.

Drobney and members of the Thistle Research group worked on development of SSP funding for 2009-2010 thistle suppression research work.

May 2008

Four Refuge biology interns began working in May: Ryann Cressey, JD Holding, Aliana Reichert-Eberhardt, and Christine Steinwand. They have already accomplished a lot, including transplanting seedlings in the greenhouse, weeding and cleaning debris from the production plots, and tackling invasive species.

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

## Invasive Species

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.

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.

Neal Smith NWR hosted the quarterly Heart of Iowa Cooperative Weed Management Area workshop. Several agencies provided presentations on developing volunteer cadres for invasive species control; using GPS and GIS to track invasive species; developing a statewide invasive species database; and discussion of various tools and equipment for invasive species control.

July 2008

Krueger, Boot and Debruin continued to mow large patches of white sweet clover in attempt to prevent it from going to seed and spreading.

Boot spot sprayed approximately 40 acres of Canada thistle.

The Challenge Cost Share contract for spot spraying sericea lespedeza was open for bids in July, so Hager and Viste-Sparkman showed sites to several contractors interested in bidding. The contract was awarded to Dan Browse of Iowa Restorations. He will meet with staff in August to discuss the plan.

Biology interns and Turnis continued searching for and spot-spraying sericea lespedeza in several units including Bison North and Bison South, and sprayed patches found last year in Cabbage.

## Invasive Species

August 2008

Viste-Sparkman showed contractor Dan Brouse of Iowa Restorations the sites on the refuge where he will be spraying sericea lespedeza. This is a Challenge Cost Share contract.

Refuge biology interns continued to search for and spot-spray sericea lespedeza until they left. The remainder of them finished internships in August.

September 2008

Seed collection kicked into high gear in September as school groups resumed stewardship activities and many species began ripening. By the end of the month most of the counter space in the lab was full of trays of seed. Turnis collected seed from some of the remnants, and Hager led volunteers in seed collection on Second Saturday.

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

Agro-ecosystem researchers continue to collect water soil water, and run-off samples on their research sites. A search was conducted to find any sericea lespedeza plants on the sites. One spot was found with what looked like 1 mature and 4 immature (non-seed producing) plants. The seed producing plant was bagged and removed. The site was marked with a pin flag and with GPS.

## **Invasive Species**

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.

November 2008

Ostermann cut and treated honeysuckle in the Thorne Valley savanna.

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## **2009**

February 2009

Gilbertson and Viste-Sparkman spoke with Working Dogs for Conservation about using dogs to detect sericea lespedeza. They are interested in working with us in 2010 if we can come up with funding for the project.

May 2009

Byron Sleugh, Dow AgroSciences, LLC of West Des Moines, Iowa was issued a Special Use Permit authorizing research on the application of herbicide and grazing treatments for control of sericea.

June 2009

## Invasive Species

Biology interns continued the search for sericea lespedeza (*Lespedeza cuneata*) in the Old Schoolhouse unit.

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.

YCC hand pulled sweet clover around the Overlook Trail.

Murray & YCC crew worked removing invasive species from the area of the overlook trail 24<sup>th</sup>.

Hager, Biology interns and YCC weeded the Prairie City entry plaza prior to Prairie City Days.

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.

Volunteers were very busy here at the refuge in July. Bookstore volunteers contributed nearly 300 hours of time providing information about the refuge to visitors and operating the bookstore. Adopt-a-trail volunteers logged over 100 hours fighting invasive species along the overlook trail.

## **Invasive Species**

Second Saturday stewardship day on the 11<sup>th</sup> found a half dozen volunteers collecting sedges and spiderwort in the Highpoint unit. There were no less than 4 large stewardship groups working with ranger Al Murray pulling sweet clover and Queen Anne's lace along the overlook trail. About eighty youths representing groups from Silos and Smokestacks, Ankeny, Pleasant Hill & Waukee Youth in Parks programs joined in the fight against the weeds!