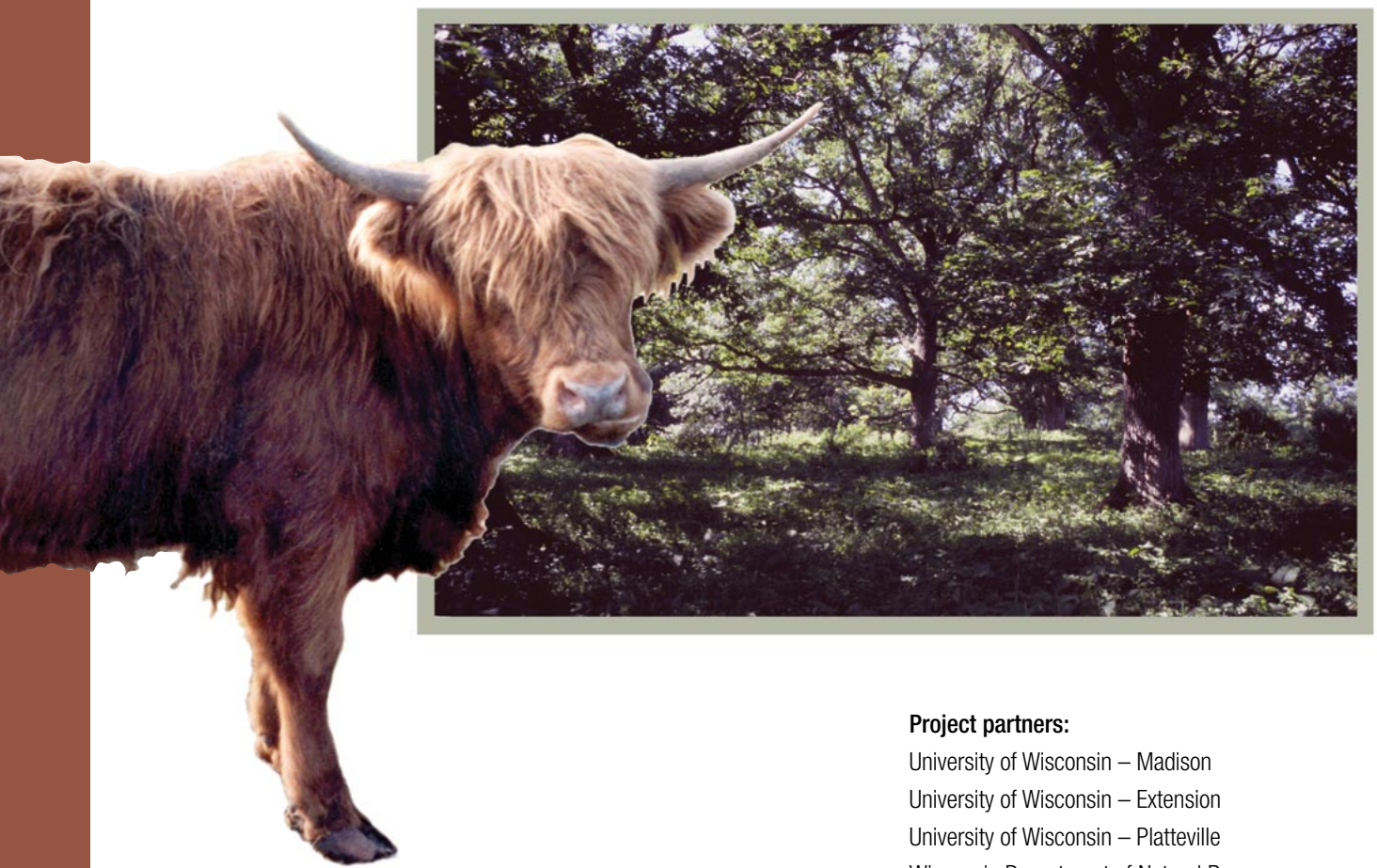
PROJECT SUMMARY

Integrating livestock production and conservation:

Use of cattle in oak savanna restoration

Report compiled by Peggy Compton, Janet Hedtcke and John Harrington with contributing authors as indicated on page 19



Project partners:

University of Wisconsin – Madison
University of Wisconsin – Extension
University of Wisconsin – Platteville
Wisconsin Department of Natural Resources
Rathbun and Niemann farms

Overview and objectives

The historic landscape of southwestern Wisconsin was a mosaic that included a gradient from prairie to forest. Tall grass prairie had few to no trees and depended on frequent fires and grazing to maintain the grass base. The next level was oak savanna, which had scattered trees but also prairie underneath. The oak woodland had more trees, but less than 80% canopy cover. Finally, there was the mixed hardwood forest itself, with little direct sunlight penetration beneath the tree canopy.

In the 1800s, oak savanna covered more than 5,000,000 acres in Wisconsin. Now, savanna is one of Wisconsin's rarest plant communities with only a few thousand acres remaining. Most of the remnants are degraded with invasive plants having replaced the native groundlayer vegetation. It is generally agreed that the major loss of acreage can be attributed to clearing and plowing. Existing acreage has been degraded by overgrazing or complete lack of grazing and cessation of fire. The cessation of either fire or grazing produces an influx of shrubs and trees in the midstory that create sufficient shade to eliminate or severely inhibit the native groundlayer as well as reproduction of the major savanna tree species, (oaks). The Wisconsin Department of Natural Resources has estimated that most of the remaining acres of degraded oak savanna exist on private lands.

Restoring oak savanna structure begins with increasing light penetration to the herbaceous ground layer. Fire and grazing are two mechanisms that may be used for savanna recovery. Fire is not always successful at reducing shrubs and provides limited direct benefit to private landowners and at the same time may introduce liability concerns. Continuous grazing is problematic in that it may cause soil erosion and compaction, decreased fertility and other problems such as reducing desired vegetation to weedier species. A disturbance intermediate in its severity, such as moderate intermittent (rotational) grazing, may result in the greatest diversity of plants and insects. Rotational grazing, however, has not been studied as a potential conservation management tool to restore oak savanna structure in the upper Midwest.

photo: Janet L. Hedtcke

Highland cattle at Creag-Is-Daru Farm.

The overall objective of this study was to determine the effectiveness of rotational grazing and fire on reducing the shrub layer in degraded oak savannas, thereby expanding this ecosystem across the landscape. Documenting the impacts on oak savanna vegetation, livestock performance, insects, soils and small mammal populations were essential components of the project.

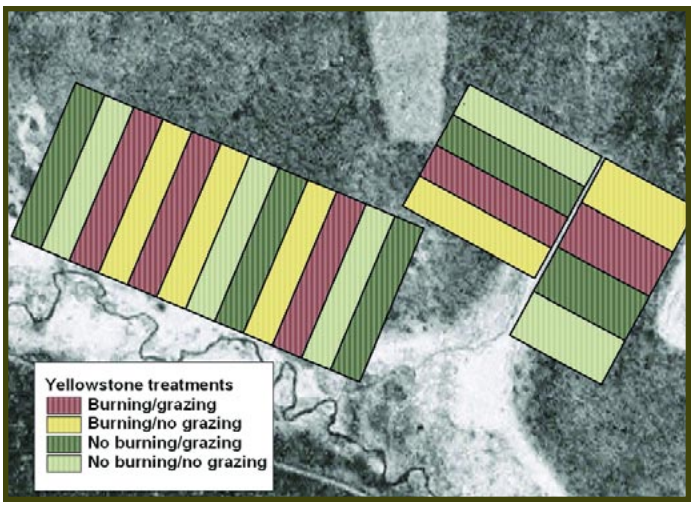
This study took place at three sites in southern Wisconsin: Yellowstone Lake Wildlife Area, owned by the Wisconsin Department of Natural Resources and Prairie Oaks Farm, owned by Ron and Sally Niemann, both in Lafayette County, and Creag-Is-Daru Farm, owned by Peter and Mary Rathbun in Iowa County. Yellowstone Lake Wildlife Area and Prairie Oaks Farm are typical (degraded) oak woodlands, dominated by bur and/or white oak. Soils at these two sites are well-drained, shallow silt loam soils. Creag-Is-Daru Farm is a truer (degraded) oak savanna with well-drained, shallow, sandy soil.

photo: Emily Kathol

Oak tree with prairie grass and flowers beneath.

photo: Martha Rosemeyer

Cattle grazing beneath oak tree.



Oak Savanna Project Research Summaries

Livestock Performance

Overview and objectives

Grazing was used over two seasons to determine its effectiveness in opening the shrub layer in a degraded oak savanna and thus allowing the re-establishment of the prairie forage base. The study was done using a Scottish Highland breed of cattle. They have the advantage of being good browsing animals possessing large horns frequently used to knock over small trees and brush. Their ability to thrive in less than ideal circumstances, outstanding mothering instincts, longevity, and very low calf mortality made this breed an ideal choice for this project.

photo: Josh Posner

View of a plot looking upslope into the woods.

Methods

At Yellowstone Lake Wildlife Area, grazing and fire were compared with untouched check plots. On the two farms, two grazing intensities were compared to check plots (See Table 1). Three-strand high tensile electric fence was installed around each 1-acre plot (paddock) in the spring of 2001 at all three sites. There were 20 paddocks (four treatments repeated five times) at Yellowstone Lake Wildlife Area and 15 paddocks (three treatments repeated five times) at each farm. Each paddock had an open grassy area at the bottom of the slope with increasingly dense understory beneath the tree canopy upslope (See photo to the left).

Grazing began June 1 both years at all three sites. Each grazing cycle was 25 days long. Between replicates, cattle were allowed one day to graze an open pasture area, which helped extend the cycle. At the end of a cycle, grazing was repeated across the plots (See Table 1). At Yellowstone Lake Wildlife Area, steers were grazed all summer. On the two farms, July and/or August cycles of grazing were eliminated due to dry weather both years. Stocking rates were based on a visual evaluation of the existing forage. Cattle behavior, feeding choice, and feeding location were recorded at each site in both years.

Each year animals were weighed at the start and end of the grazing season. Cows and steers were scored in 2002 at the beginning and end of the grazing season using a visual scoring system (body condition score scale of 1-10 with 1 being thinnest and 10 being fattest).

Shrub leaves, (prickly ash [*Xanthoxylem americana*], multiflora rose [*Rosa multiflora*], gray dogwood [*Cornus foemina* spp.], black and red raspberries [*Rubus* spp.], gooseberry [*Ribes* spp.], and wild parsnip [*Pastinaca sativa*]), were collected in late June each year to determine nutritional content. Samples were analyzed for protein and fiber by the UW Soil and Plant Analysis Lab and an in-vitro true digestibility technique (IVTD) was used to measure forage digestibility.

Table 1: Overview of stocking rates, treatments and rotation schedule for each site.

Study Site		Yellowstone Lake Wildlife Area	Creag-Is-Daru Farm	Prairie Oaks Farm
Stocking Rates (including total weight at the start of the grazing season)	2001	18 steers (8,685 lbs. for the first rotation, then reduced by 50%)*	6 cow/calf pairs 3 dry cows (8,840 lbs.)	6 cow/calf pairs (6,717 lbs.)
	2002	12 steers (5,064 lbs.)	2 cow/calf pairs 4 dry cows (5,802 lbs.)	6 cow/calf pairs (7,256 lbs.)
Treatments		Burn (April burn each year) Graze (2 days/paddock/rotation) Burn and Graze (April burn each year plus grazing as above) Control (check plots)	Low intensity (2 days/paddock/rotation) High intensity (3 days/paddock/rotation) Control (check plots)	Low intensity (1 day/paddock/rotation) High intensity (3 days/paddock/rotation) Control (check plots)
Rotation Schedule	2001	June 1 - June 25 June 26 - July 20 July 21 - Aug 14 Aug 18 - Sept 11	June 1 - June 25 July 1 - July 25 Sept 15 - Oct 8	June 1 - June 25 June 26 - July 20 Sept 17 - Oct 10
	2002	June 1 - June 25 June 26 - July 20 July 21 - Aug 17	June 1 - June 25 Aug 26 - Sept 19	June 1 - June 25 Aug 20 - Sept 13

* Cattle numbers were decreased following the first rotation due to evidence that they were overstocked for the amount of forage available in each paddock.

Results

- Generally, lactating cows maintained their body weight (except for calving weight losses) and condition, similar to controls. Dry cows gained an average of 125 lb/head and had an average body condition score of 6.0. Suckling calves gained 165 lb/head, equal to the weight gain of the control animals. At Yellowstone Lake Wildlife Area, due to overstocking and overgrazing

during the first rotation in 2001, steers only gained 55% of the controls (although steers came off the plots in good condition). In 2002, the 12 steers gained as well as the controls (about 100 lb/head) and all maintained or gained a point in body condition (average body condition score of 5.25).

- Wet chemistry analysis indicated that the shrub species (listed on page 4) were of good quality and similar to grass pasture. The 2-year average of crude protein was 15% of dry matter (DM), acid detergent fiber (a measure of digestibility) was 27% of DM, and neutral detergent fiber (a measure of intake) was 35% of DM.
- In-vitro true digestibility confirmed that the leaves of these shrub species were highly digestible – averaging 76% digestible, comparable to high quality alfalfa.
- Observational data revealed that the animals preferred a diversity of plants and readily browsed in the shrub layer. Cows grazed in the shrub areas for 34% of the time and grazed in the open grassy areas only 29% of the time. Prickly ash was the most utilized shrub. Rubbing and trampling comprised a significant amount of time. Cows were more effective at brush clearing than steers.
- It was observed that the first cycle of grazing removed as much as 65% of leaf biomass from shrubs and that twig biomass was reduced by as much as 40% likely due to rubbing, horning, and trampling by the cattle.

After each of the two seasons of managed grazing, cattle were not adversely impacted by grazing in the overgrown oak savanna. Stocking rates of 5,000 to 7,000 pounds of cattle per acre used in a rotational grazing schedule of about 3 days/ month permitted reasonable weight gain while accomplishing shrub removal. However, grazing pressure and/or fire beyond two years and probably some hand removal of the mid-story trees with a chain saw would be necessary to increase light levels sufficiently enough to allow growth of a grassy understory.

Percent of time cattle spent eating various plot components

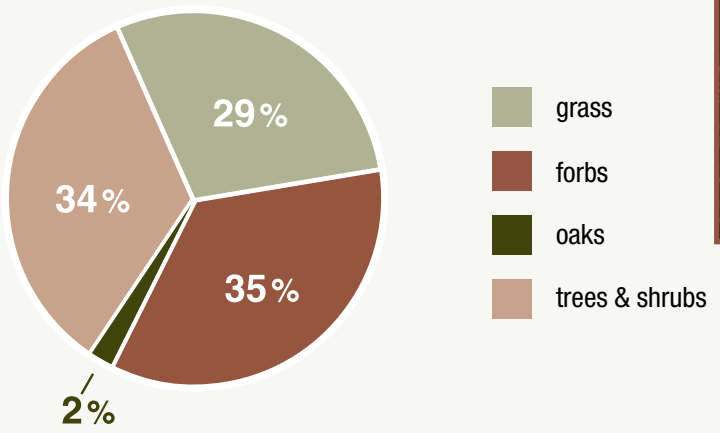


photo: Janet Hedtcke

Cattle browsing in the shrub layer.

Vegetation Restoration

Overview and objectives

The study had several areas of investigation to evaluate the effects of rotational grazing on the vegetation within an overgrown oak savanna/woodland system. Questions included:

- What effects will rotational grazing of cattle have on the shrub (stem density and height) and herbaceous layer (cover) in an overgrown oak savanna?
- How does the response of vegetation to grazing compare to the response of vegetation to fire?
- How effective is grazing, either alone or with fire, at increasing savanna biodiversity over fire alone?

Methods

A stratified random sampling design was used to ensure that quadrats were located from slope base to summit. Paddocks at Yellowstone Lake Wildlife Area were subdivided for sampling purposes into three zones (open prairie pocket, shrub, tree canopied). Trees were sampled for species and diameter prior to treatments. Average and maximum height and stem numbers (density) per diameter class were recorded for all shrubs. Shrubs were sampled prior to any grazing and then during late summer for each year of the project. Herbaceous plants were sampled for species presence and cover in late spring and again in late summer each year to capture the different species present in those seasons. Percentages of bare ground and litter depth were also recorded. All quadrats were permanently established for the length of the study.

Results

Effects of cattle on the shrub (shrub density and height) and herbaceous layer.

Grazing reduced the shrub density and shrub height and opened up the mid-story structure. The impact of grazing through browsing, rubbing and trampling was species specific. Gooseberry, gray dogwood, and multiflora rose were unaffected by the cattle, while *Rubus* spp., prickly-ash, and hazelnut (*Corylus americana*) decreased significantly as a result of grazing. Grazing intensity was an additional factor that influenced the impact of the cattle on the mid-story. The one-day intensity was not long enough to reduce the overall shrub density or height of individual species. The two-day and three-day intensities significantly decreased density and height, although the differences between these two periods were insignificant. After only two years of study, the opening of the mid story has not resulted in changes in the herbaceous layer.

Ability to open structure without causing loss of desired species.

Preliminary results show that grazing was able to open up the mid-story structure without causing a loss of desired species. The native grass cover remained on average the same with grazing, with minimal decreases in native forb cover. The number of species at Yellowstone Lake Wildlife Area increased within all treatment paddocks, suggesting that compared with burning and no treatment,

grazing is not causing a decrease in the total number of species. However, it is too soon to say whether the grazing was detrimental to the desired native species, as changes to the herbaceous vegetation must be monitored for the next few years to observe the long-term impact of grazing.

Response of vegetation to grazing compared with that of fire.

Grazing and fire both decreased the overall stem density and height. Yet, the impact from the addition of burning and grazing on the shrub and sapling mid-story was species specific and was dependent upon where the shrub and saplings were located within the vegetation zones. For the open prairie, shrub thicket, and wooded vegetative areas there was no significant burn-graze interaction. Grazing was unable to reduce gooseberry, while burning significantly reduced gooseberry density. On the other hand, grazing significantly reduced *Rubus* spp., while *Rubus* only slightly decreased with burning in the wooded areas and increased within the more open areas. Some species were not impacted by either burning or grazing within any vegetative zone, such as gray dogwood. Hazelnut density did not decrease with either treatment within the shrub zones, but both burning and grazing reduced densities within the wooded areas.

prairie

prairie control

prairie burn

prairie graze

prairie burn-graze

photos: John Harrington

A view of the four treatments in the prairie pocket zone at Yellowstone Lake Wildlife Area.

In the shrub zone there was almost no fuel to carry the prescribed burn. In these situations, the burn only managed to impact the shrub and saplings along the outer edge of the shrub thicket, with re-sprouting occurring. Cattle were able to penetrate the shrub thickets and decrease shrub density. The prescribed burn was patchy within the wooded zone as well and there was less of an impact on particular species as a result, including prickly-ash, as compared with the open prairie zones. In these instances, grazing again decreased stem density, where fire was unable to.

Effects on biodiversity of grazing (either alone or with fire) versus fire alone.

There was no apparent difference between grazing and prescribed burning on the biodiversity of the herbaceous vegetation. Biodiversity during the two-year period of the study appears to be stable in all treatments and controls. Monitoring over subsequent years will provide more definitive information on whether grazing, alone or with fire, increases or decreases biodiversity.

woodland

woodland control

woodland burn

woodland graze

woodland burn-graze

photos: John Harrington

A view of the four treatments in the tree canopied zone at Yellowstone Lake Wildlife Area.

Small mammals

Overview and objectives

The objective of this component of the project was to obtain baseline data on small mammal populations living on test sites and their comparable control sites and to compare the impacts of grazing and burning on small mammal populations.

Small mammals may be the ideal taxonomic group for studying change at the landscape level. Their presence or absence serves as an indicator of habitat suitability. For many small mammal species, individual animals live for only one breeding season. The environmental changes that alter the habitat suitability for these animals and the factors that prolong stress can cause dramatic changes in species abundance and diversity in just a few years. The native small mammal species associated with unique habitats can be among the first biotic components to be lost as the environmental integrity of a plant community type begins to degrade.

There is a strong association between small mammals and the micro-habitats selected by each species. Small mammal habitat selection is relatively well known; however, from experience and the historical record, many of the prairie preserves in Wisconsin have lost small mammal species diversity. Compounding factors such as habitat fragmentation and isolation, vegetation changes, and inter-species competition have significantly changed the amount, suitability, and accessibility of the micro-habitats these animals require. The species that tend to be associated with tall grass prairie and oak savanna habitats would include prairie voles, prairie deer mice, western harvest mice, and eastern fox squirrels.

> **“The success of some species of plants is dependent upon their seeds falling on the small soil disturbances created by mammals while foraging or at burrow entrances.”**

The ecological influence of small mammals upon the landscape is both subtle and significant. Their most recognized contribution is in serving as a prey base for carnivores, raptors and reptiles. In addition, small mammal populations can play a significant role in the natural regulation of insect numbers. Their burrowing allows air and water to percolate down into the soil and increase soil fertility. Burrows also serve as hibernacula for reptiles and invertebrates. The success of some species of plants is dependent upon their seeds falling on the small soil disturbances created by mammals while foraging or at burrow entrances. Small mammal herbivory and droppings are second only to insects in contributions to nutrient cycling.

Methods

Each treatment area (grazed = entire study area; ungrazed = adjacent to study area) was sampled with twelve trap stations arranged equal-distantly. One small Sherman live trap and one medium Sherman live trap was used at each trap station. Samples were collected in 72 to 288 trapnights (trap night refers to the number of traps multiplied by the number of nights). Captured animals were ear-tagged with numbered tags and released at the point of capture.

In 2001 all paddocks at all study sites were sampled with the exception of paddocks containing cattle at the time of sampling. Two samples were collected at each site, one in early spring preceding the controlled burns and another in August.

In 2002 a representative sample was collected at each of the study sites and control sites. Survey samples comprised identical grids of trap stations equally distributed across one of the designated grazing units at each of study sites. Traps were set July 29 through August 2, 2002. Each study site and control site was sampled with 96 trap nights.

photo: Richard Bautz

Small mammal sampling.

Results

In 2002 there were 147 small mammals captured. (See table, below). The white-footed mouse (*Peromyscus lecopus*) accounted for 141 of the 147 captures. Other species captured included meadow voles, masked shrews, short-tailed shrews and southern flying squirrels. Small mammal species considered prairie and oak savanna dependent or at least strong habitat associates such as prairie voles, prairie deer mice, western harvest mice, and eastern fox squirrels were not captured, although eastern fox squirrels were occasionally seen as road-kills between study sites.

The dominance of the white footed mouse, indicated by the large capture numbers, is to be expected in an overgrown oak savanna since its preferred habitat is a woodland forest (closed canopy) with dense shrubbery. Study plots were too small and captures too limited to directly analyze differences between treatments and controls; however, it is likely an indication that the study areas, after just two years of grazing, were still too overgrown and dense to encourage habitation by typical savanna species.

Table 2: Small mammal survey at the three study sites across both control and grazed treatments.

	Yellowstone Lake Wildlife Area	Creag-Is-Daru Farm	Prairie Oaks Farm
Spring '01 (April/May)	WFM (10)	WFM (4)	WFM (13), STS (1)
Summer '01 (July/August)	WFM (93), STS (3), MS (1), EC (6)	WFM (91), STS (1), MV (2), MJM (1)	WFM (142), STS (1), MS (1), EC (1)
Summer '02 (August)	WFM (42), STS (2), MV (1)	WFM (45), MV (1), STS (1)	WFM (54), MS (1)

WFM = white footed mouse (*Peromyscus* sp.)
STS = short tailed shrew (*Blarina brevicauda*)
MV = meadow vole (*Microtus pennsylvanicus*)
MJM = meadow jumping mouse (*Zapus hudsonius*)
EC = eastern chipmunk (*Tamias striatus*)
MS = masked shrew (*Sorex cinereus*)

Insects

Overview and objectives

This study measures the effects of burning and/or grazing on a specific insect habitat guild. Saproxylic insects are those inhabiting dead pieces of wood and associated habitats. In forested ecosystems, saproxylic taxa comprise the largest proportion of insect diversity. Conservation of insect biodiversity will require more complete understandings of the impacts of management techniques on this group. Where ecosystems have been severely altered, restoration to more authentic conditions may likewise be crucial. The insect component of the oak savanna projects proposed the following hypothesis: Saproxylic insect diversity will be significantly greater on plots with restored vegetation physical structure vs. non-restored plots. Data will also constitute habitat records and express other natural history attributes of poorly understood native insect species.

Methods

During early summer of 2001 pieces of dead wood were placed at randomly situated points along transects on the study plots. Live limbs were removed from mature bur oak trees, (*Quercus macrocarpa*) and cut into 30 cm sections. Two hundred and eighty eight (288) pieces were cut and placed at the points – a quantity sufficient to allow for sampling during three consecutive years. The pieces of wood, functioning as traps, were colonized by saproxylic insects. The insects were later collected from the dead wood by enclosing the pieces of wood in lightproof rearing containers outfitted with a collection vial.

photo: Devin Biggs

Cutting sections of live oak.

Results

A set of 96 logs was picked up and contained in mid-April of 2002. Specimens emerged from this material during the course of the summer and represented insects that colonized the logs during the previous growing season. A total of 2,643 adult insects were collected, sorted and counted. The catch includes eight insect orders, at least 38 families and at least 125 species. Family and species determinations are still being completed.

The most well represented insect orders are Coleoptera (beetles), Hymenoptera (ants and wasps) and Diptera (flies). Smaller numbers of species of Lepidoptera (moths), Orthoptera (a cricket) Thysanoptera (thrips), Psocoptera (bark lice) and Hemiptera (bugs) were also collected.

Taxonomic work is most complete for the beetles, 13 of which have been identified to species. It is difficult in many cases to identify flies even to the species level and most of those specimens will need to be sent to specialists. Data analysis for the first year of sampling will be started when laboratory work is completed.

Most species had only one or two occurrences – an occurrence in this case defined as presence at a piece of wood, regardless of the number of individuals. Twenty-two species had more than five occurrences and eight species had more than 10 occurrences. The most frequently occurring species was a mymarid wasp, which appeared 20 times.

A specific sub-set of saproxylic insects inhabits the fruiting bodies of wood-decaying fungi. Fruiting bodies exhibited damage characteristic of feeding by minute tree-fungus beetles (Coleoptera, Ciidae). Wood-decay fungus sampling during autumn of 2001 demonstrated complete absence of fruiting bodies. By fall 2002, however, fungal colonization was well-advanced. Fungal fruiting bodies were recorded at 127 (66%) of the pieces remaining in the field. The 2003 and 2004 insect sampling is expected to demonstrate correlations between occurrences of ciid beetles and other such insects and fungus species.

Many complex biological interactions occur among the species comprising the saproxylic faunal community. Sciarid and cecidomyiid flies are well represented in these samples. Their larvae developed within the logs feeding on the fungi that colonize wood in its early stages of decomposition. The staphylinid beetles in the samples were primarily involved in feeding on these same fly larvae. The large ichneumonid and braconid wasps were present only at the logs which yielded the large cerambycid beetle (*Xylotrechus colonus*) and were functioning as its parasitoids.

The two additional years of sampling will represent a habitat substrate age progression. Because many saproxylic insects have very specific habitat requirements, it is anticipated that species turnover will be significant between dead wood age classes. It is also anticipated that more symbioses and other biological interactions will be manifested in those samples as ecological succession continues in the dead wood habitat.

Ptilodactyla sp.

photo: Peggy Compton

Oak log used as an insect trap at Yellowstone Lake Wildlife Area.

Soils

Overview and objectives

The purpose of this component of the project was to determine the impact of grazing on soil erosion and soil compaction. The physical properties of soil are important for evaluating its ability to withstand trampling caused by cattle traffic, its vulnerability to erosion, and whether the soil will support a savanna plant community. Soil bulk density, an index of soil compaction, was used as an indirect measure of erosion potential and the soils' ability to contribute to plant understory development.

Methods

Soil cores were extracted from two locations: the perimeter of each sampling quadrat and the inside perimeter of each paddock fence line at each of the three study sites.

During the summer of 2001 baseline soil bulk density samples were taken using a simple hand tube sampler. Five cores per sample location were collected to a depth of six inches. Each core was partitioned into a three-inch top soil sample and three-inch underlying soil sample. Standard methods were used to separately determine volumetric density measurements of the top and underlying part of each core. All treatments at each of the three study sites were compared for the top three inches of soil and the underlying three inches of soil for each year.

> "The data do not show change in compaction; bulk densities remain within the range for uncultivated, non-compacted soils."

Results

Typical bulk densities for uncultivated loamy soils range from about 0.9 to 1.15 g/cc whereas bulk densities for sandy loams and sands are about 1.2 g/cc or more. The bulk densities of the soils in the study areas fall within those ranges.

The baseline sampling in 2001 showed differences in soil bulk density between the study sites. Yellowstone Lake Wildlife Area and Prairie Oaks Farm surface soils have a predominately silt loam texture. The soils at Creag-Is-Daru Farm contain much more sand, which has a higher natural bulk density.

Bulk densities did not display significant or detectable patterns for changes between years within paddocks. The data do not show change in compaction; bulk densities remain within the range for uncultivated, non-compacted soils.

Some visual evidence of erosion was apparent at the study sites, but the cause is unclear. Soil disturbances at the sites seemed to have had minimal impact on the bulk density of the soils. After the first year, bulk density decreased possibly due to freeze/thaw, increased soil microfauna, or simply natural environmental changes. After two seasons of grazing, bulk density increased slightly; however, the values were still well within the realm of uncultivated soils. Both hoof action and considerable researcher foot traffic near the sampling area in the baseline year may have influenced bulk density.

There is no evidence of direct erosion as a result of the grazing pressure applied during the course of this study.

Education and Outreach

Education and outreach were integral components of this project. The educational objectives included raising awareness of the importance of the oak savanna ecosystem and providing information on the possible value of managed (rotational) grazing as a tool in restoring degraded oak savanna. The intended audience for the outreach activities included local and regional landowners and conservation agency personnel statewide. The project supported various educational strategies and programs.

photo: Peggy Compton

Field days

Four project field days were held at Yellowstone Lake Wildlife Area – two during the summer of 2001 and two during the summer of 2002. Each year one field day was held specifically for conservation and natural resource agency professionals. These field days included a detailed look at the research protocols and data being collected, as well as guided tours of the research plots. The 67 natural resource and agency professionals who attended the 2001 and 2002 field days represented the Wisconsin DNR, UW-Extension, UW-Platteville, UW-Madison, the Lancaster Agricultural Research Station, NRCS, Land Conservation Departments, Blue Ox Forestry Consultants, The Blue Mounds Area Project, Sauk County Zoning, the Riverland Conservancy and The Nature Conservancy.

A second field day was held each year specifically for area landowners and farmers and drew 97 participants (2001 and 2002 combined). The topics presented included tax benefits of grazing, resources and tools available for restoration and management of prairie and savanna, how to fence and water for grazing and other practical aspects of the project. Guided tours of the plots were also offered to field day participants.

In 2001, of the field day attendees who returned an evaluation, 94% reported having good or excellent knowledge of the oak savanna ecosystem after attending a field day as compared to 39% prior to the field day; 50% reported an increased interest in grazing cattle in wooded areas following the field day. In 2002, 82% reported having good or excellent knowledge of the oak savanna ecosystem after attending a field day as compared to 32% prior to the field day; 68% reported an increased interest in grazing as a restoration tool following the field day.

Professional presentations

More than 350 people heard about the project during presentations made at the Agriculture Ecosystems Annual Update, the Annual Meeting of the Wisconsin Chapter of Wildlife Society, the Wisconsin Grazing Conference, the Dane County Woodland Owners Conference, the Blue Mounds Area Project winter lecture series, DNR and NRCS agency staff meetings and wildlife, landscape architecture, agronomy and forestry seminars at UW-Madison. Tours of the restoration sites were given to The USAID Latin America Research group and the UW-Extension Basin Educators.

Media reports

The project was featured in a variety of newspaper, television and radio reports. Over a dozen news articles were printed in local and statewide papers including the Yellowstone Watershed Newsletter, *UW College of Agricultural and Life Sciences Quarterly*, *Wisconsin Week, The Monroe Times*, *Wisconsin State Farmer*, *Wisconsin State Journal*, *The Capital Times*, *Janesville Gazette*, *Dubuque Telegraph Herald* and *The Minneapolis Star Tribune*. Following the article in the *Wisconsin State Journal*, project members received 44 calls from landowners wanting additional information about the project. Nearly one-half of the landowner inquiries specifically mentioned that they were interested in restoring oak savanna on their own land and/or interested in using cattle as a restoration tool. Radio coverage included two interviews on Wisconsin Public Radio. The project was the featured story on Madison's WKOW Channel 27 evening news on June 1, 2001.

Educational materials

The project partners developed and printed an educational brochure and a laminated poster display outlining the project's goals and methods. The brochure was mailed to all Wisconsin DNR wildlife biologists and inquiring landowners and was available at meetings, conferences and field days. The poster display was used at three conferences and was displayed at Yellowstone Lake State Park Visitor's Center.

Oak Savanna informational display at Yellowstone Lake State Park Visitor's Center.

Landowner Perspectives

Ron and Sally Niemann, Prairie Oaks Farm

Our 238-acre farm in Lafayette County includes 120 acres of overgrown woods that probably was an open oak savanna area and we needed to do something to make it productive, either as a natural resource or as pasture. The "quick fix" with heavy equipment posed significant erosion problems because of the slopes and, having volunteered at a non-governmental organization clearing brush and trees at a degraded savanna site, it was obvious that without a large volunteer base an individual farm had to come up with a better process.

We know grazing and fire maintained the original savanna, therefore it only made sense to use these as the primary tools to restore the same structure. Fire is easy but one must have fuel, and with the brush shading the ground, the fuel was limited. To remove the brush so that a ground layer can grow, chemicals or grazing can be used as alternatives to the mechanical approach. Grazing made the most sense especially with use-value property tax assessment and the potential of an economic return – a must for farm operators.

Once grazing was selected it was a matter of species selection. Ron had given a presentation at the Midwest Oak Savanna Conference on "The Use of Livestock in Savanna Restoration – An Underutilized Approach" in 1996 in which an analysis was made of the various domestic grazing animals. Using that analysis we chose cattle for the ease of fencing and sale of the progeny. Within the cattle breeds there is great variation in their ability to graze in rough forage and we selected the Scottish Highland cattle for their willingness to browse on the scrub layer. We followed a rotational grazing schedule through the wooded areas and on the open pastures.

Sally and Ron Niemann

It appears that the scrub layer has been significantly impacted and over time will be removed. We have found that after 2-3 years it is possible to get in with a small rotary mower and speed up the process. The cattle remove the smaller trees (up to about 2-3 inches); the larger undesirable species are removed individually with a chainsaw. The Highlands have the greatest impact on the prickly ash, with less impact on the multiflora rose and ribes species.

Our conclusion is that within a reasonable time frame (3-5 years) and a combination of grazing and some mechanical removal the Highlands can successfully open up the dense shrub layer allowing growth of grass. As we are experiencing on our farm, the open oak savanna structure can be restored.

Peter and Mary Rathbun, Creag-Is-Daru Farm

We own a small farm with wooded acreage in Iowa County. We turned to rotational grazing over a decade ago when we became interested in combining grazing with habitat restoration as a goal for the degraded land we had purchased, which included oak savanna habitat. After doing research on various grazing animals, we chose Scottish Highland cattle as our restoration tool.

After meeting some of the project collaborators at a conference in 1998, we became interested in becoming part of a research study that would investigate the use of Scottish Highland cattle in oak savanna restoration. We saw the project as a way to demonstrate more sustainable alternatives to continuous grazing.

We have already seen the benefits in the local farming community of grazing Highland cattle. During the 1980s there was only one herd of Highland cattle in the tri-county area. Today, the number of Highland cattle herds has grown to 15. Seeing neighbors being successful in experimental techniques, building trust with UW-Extension agents and receiving unbiased information all influence landowners.

photo: Colleen Corrigan

Creag-Is-Daru farm.

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PROJECT SUMMARY

Integrating livestock production and conservation:

Use of cattle in oak savanna restoration

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