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Summarize the work performed during the project period covered by this report:

During this project period demonstrations that featured wildlife habitat management and soil conservation practices were successfully integrated with ongoing agricultural objectives at the MU Bradford Research and Extension Center (BREC). Demonstrations were developed and designed to provide landowners with information on practices that can be adopted to improve the capability of their farm to provide habitat for a variety of wildlife, including bobwhite quail and grassland birds, as well as implement management practices that enhance soil conservation, without reducing farm profitability. The process identified in MU Extension Publication MP 902, "*Missouri bobwhite quail habitat appraisal guide"*, was used to determine habitat components that were in shortest supply and in need of management. Among those that needed to be addressed were a lack of shrubby cover and quality brood-rearing cover. Management decisions and practices implemented were based on recommendations provided in MU Extension Guide G9432, "*Habitat management practices for bobwhite quail*" and the Missouri Department of Conservation publication "*On the edge*". These practices included the use of field borders around crop fields, edge feathering, control of invasive species, use of alternative forages for conservation benefits, management of diversion channels, shrub plantings and

use of bobwhite quail cover bundle, and native warm-season grass management.

Field Borders Around Crop Fields

Research has shown that wildlife respond to habitat management practices that provide food and cover. Field borders were established and managed around selected crop fields for these purposes using recommendations provided in MU Guide G9421, *"Field borders for agronomic, economic and wildlife benefits".* Field borders should be at least 30 feet in width to be most beneficial for wildlife. Several management options for establishing a field border exist, including planting a 30 or 60 ft border in a mix of grasses and forbs (CP33 mix) or using a root plow to severe tree roots reducing the competition for water near the field border (photo 1).

At BREC, soybean and corn were planted on either side of a field border that had been either been divided into the following treatments:

- Root plowed 36 inches near the wooded edge

-Planted to a 30 or 60 ft CP33 mix planted

-Field edge left unmanaged

Cultural practices were conventional for both corn and soybeans for planting date, pest management, and fertility. Single rows of corn were harvested beginning at the edge of the field border for the control and root plow treatments and beginning at the edge of the 30 and 60 ft. CP33 mixes. Soybeans were planted in 15 inch rows and were harvested as single rows. The single row harvest allowed us to determine how far competition for light, water, and nutrients extended from the field border. These yield differences were compared at 30 and 60 ft. from the field border.

Edge Feathering:

Many wildlife species need dense "shrubby" cover on a daily basis. This type of habitat is often absent around crop fields in Missouri. In addition, the edge or transition between woodland habitat and crop fields is typically nonexistent on many farms in Missouri. Edge feathering practices can create a transition zone between a crop field and a woodland, an existing tree line or overgrown hedgerow creating a transition zone of shrubs, vines, and herbaceous vegetation between cropland or grassland and wooded area. To be effective, edge feathering should be conducted next to early-successional vegetation, such as a field border composed early-successional vegetation, a food plot or cropland. The "*Edge Feathering*" job sheet (JS-Biol-18) published by USDA NRCS, Missouri Department of Conservation and MU Extension, provides additional recommendations that were used as the basis for implementing this practice at BREC.

During the winter of 2006/2007, a 1500' wooded draw that provided a riparian corridor next to a meandering stream was selected as one of the sites for implementing this demonstration. The wooded draw was divided into three sections:

1. Undesirable trees cut and stumps treated with a herbicide
2. Undesirable trees cut and not treated
   -Some trees were hinged cut
3. Undesirable trees not cut

Approximately 80% of all trees were cut, leaving only those trees that near the stream in place, to prevent soil erosion and maintain stream bank stability or for economic purposes (photos 2 and 3). The previous spring (May 2006), a field border 30-

120 ft. wide along the South edge was created adjacent to the tree line by planting the standard CP33 mix containing a ratio of 1:1 forbs to grass species.

The CP33 mix has changed from the standard 30:1 ratio of grass:forb to one that is 1:1 grass:forb in order to increase the amount of native forbs and legumes which provide a source of insects and seed for wildlife. Both the standard CP33 mix and the new CP33 mix is composed of native warm season grasses such as little bluestem and side oats gramma. For a comparison, native cool season grasses were substituted in the new CP33 mix which was compared to both CP33 mixes using warm season grasses. The additional area on the north side of the edge feathering was divided into four sections and planted to:

1. Virginia Wildrye + 10 species forb mix
2. Canada Wildrye + 10 species forb mix
3. River Oats + 10 species forb mix
4. Standard CP33 mix
5. New CP33 mix

After forb and grass establishment, a variety of native shrubs (elderberry, silky dogwood, false indigo, and button bush) were planted in two rows, at a 6 ft. spacing approximately 15 ft. from the edge on both sides of the edge feathering. Soybeans and corn were planted and yields determined within 50 ft. of the field border and yields were determined on a per row basis.

Invasive Specie Control:

Several species of plants that were introduced for forage or for preventing soil erosion are now considered to be invasive in pastures and waterways because of their

growth habit. These include cool season grasses such as tall fescue. Tall fescue is an important crop for livestock grazing and for controlling soil erosion, however it does not provide quality habitat for wildlife.

In addition, much attention has been given to the use of Sericea Lespedeza and Reed Canarygrass, two invasive species that have caused problems in the agricultural landscape. Research has shown that controlling these species is not a one step process, but requires both a prescribed fire and the use of herbicide treatments over a multiyear period.

A large area that had been planted to Indiangrass at BREC and infested with Sericea Lespedeza was subdivided into four smaller units and managed using a variety of techniques, including prescribed fire and herbicide applications. Treatments include:

1. Spring burn followed by Remedy (Triclopyr) herbicide application of 1.5 pts/acre in June;
2. Remedy application in June;
3. Spring burn followed by Remedy herbicide application in June using 1.5 pts/acre and then Ally (Metsulfuron) application in September 0.5 oz/acre;
4. Ally application in September using 0.5 oz/acre;
5. Spring burn followed by Ally application in September using 0.5 oz/acre.

A similar study was conducted at the Baskett Wildlife Research and Education Area (located near Ashland, Missouri) on a field that was composed of a pure stand of Sericea Lespedeza. At each location the percent control of the Sericea Lespedeza and percent species composition of treatment was recorded.

A 1000 ft. grass waterway that consisted of a monoculture of Reed Canary grass was divided into equal units and one of six different management practices was applied:

1. Spring burn followed by Roundup after green up in April;
2. Roundup applied in April at early green up;
3. Spring burn followed by Roundup after green up in June;
4. Roundup applied in June;
5. Fall burn followed by Roundup after green up;
6. Fall mowed followed by Roundup.

Percent control of Reed Canary grass after each treatment was recorded. Treatments for both species were repeated for three consecutive years.

Alternative Forages:

Tall fescue is the predominant pasture forage in Missouri and many states throughout the Midwest and Southeast. Although tall fescue provides excellent soil erosion control and is a high yielding grass for grazing and hay, its dense and aggressive growth characteristics discourages plant diversity, thus, can be a detriment for many wildlife species. Practices have been designed that reduce the dominance of tall fescue in pastures and forage crops. However, there has not been a wide selection of grasses or combinations of grasses and legumes that can be easily established which exhibit the forage quality and yield desired by livestock producers. There are several recommendations for alternative mixtures that can be used as a replacement for tall fescue. The following alternative grass and forbs mixes were compared:

1. Tall Fescue*

2. Tall Fescue+ Forbs (Showy Tick Trefoil, Illinois Bundle flower, Oxeye Sunflower, Grayheaded Coneflower, and Stiff Golden Rod)

3. Tall Fescue+Switchgrass+Big Bluestem

4. Virginia Wildrye (VWR)+Forbs

5. VWR+ Big Bluestem

6. VWR+Big Bluestem+Forbs

7. VWR+River Oats+Forbs

8. Switchgrass+Forbs

9. Eastern Gammagrass+Forbs

10. Forbs

* all plots were planted at the same rate of a total of 50 seeds/ft2

Forages were planted by overseeding during the winter of 2007 at BREC and the MU Hundley-Whaley Center (located in Northwest Missouri) and during the winter of 2008 at the MU Wurdack Farm (located in the Missouri Ozarks). Forage yield was determined at BREC in 2008 and 2009 and observations for field days at Hundley-Whaley and Wurdack.

As with most forages, it took a complete year for these treatments to become fully established. At BREC, a summer and fall harvest was conducted during 2008. Based on these results, each plot was split where 60 lb N/acre was applied to half and 0 N/acre applied to the other during the next year (2009).

Diversion Channel:

A 1200 ft. diversion channel was constructed at BREC during November of 2005 near the site that was used for the "Edge Feathering" demonstration. In Missouri and throughout the Midwest and Southeast, tall fescue is the predominate grass used for waterways and diversion channels. Tall fescue is very effective in controlling soil erosion, however as discussed earlier, it provides little wildlife benefit. During April 2006, the diversion channel was subdivided into equal portions and planted to the following treatments:

Treatment 1-Tall Fescue-17 lbs/acre*

Treatment 2-Switchgrass (Cave in rock) 10.1 lbs/acre + Virginia Wildrye (Cuivre) 11.6 lbs/acre

Treatment 3-Switchgrass (low growing) 10.1 lbs/acre + Virginia Wildrye 11.6 lbs/acre

Treatment 4-Big Bluestem (short) 18 lbs/acre + Virginia Wildrye 11.6 lbs/acre

Treatment 5-Tall Dropseed 1.5 lbs/acre + Sideoats Gramma 6.1 lbs/acre + Fox Sedge 0.9 lb/acre

Treatment 6-Big Bluestem (short) 6 lbs/acre + Sideoats Gramma 4.6 lbs/cre + Little Bluestem 3.3 lbs/acre + Fox Sedge 0.7 lbs/acre

Treatment 7- Tall Dropseed 1.7 lbs/acre + Virginia Wildrye 11.6 lbs/acre + Fox Sedge 1.0 lb/acre

Treatment 8-Virginia Wildrye-46.5 lb/acre

*all treatments lbs/acre of pure live seed

A comparison for establishment and competiveness was made between a typical tall growing forage type of switchgrass (Cave-in Rock) to a shorter native switchgrass.

Visual establishment and growth differences were noted throughout the period of this project.

Quail Covey Headquarters Utilizing Quail Cover Bundles:

Bobwhite quail utilize shrubby, escape cover on a daily basis, however this habitat is often the most limiting on many Missouri farms. This habitat is often referred to as "covey headquarters" and it can be created by using a variety of management techniques that include edge feathering, hinge-cutting trees, or by planting native shrubs. We used publication JS-Bio-19, "*Quail Covey Headquarters*", published by USDA NRCS, MDC and MU Extension, as the basis for implementing this management practice.

However, survival of native shrubs is often erratic when establishing these species with bare root seedlings. A comparison between using RPM (Root Production Method, from Forrest Keeling, Elsberry Missouri) and Bare Root Seedlings that are used for Missouri Quail Cover Bundles was initiated in 2007. The following shrubs were planted as a bare root in spring 2007 and as a RPM (Root Production Method) in fall 2007: False Indigo, Wild Plum, Aromatic Sumac, and Roughleaf Dogwood. These shrubs are commonly used by landowners wanting to provide habitat for wildlife, however, questions include whether or not it is better and more economical to use bare root seedlings or use more expensive potted plants.

Bobwhites use this type of patchy "escape" cover on a daily basis. They use shrubby cover to avoid hot summer sun and to seek protection from predators and harsh weather. Without this habitat component, few quail will be present on the farm.

Using MU Extension Publication MP902, "*Missouri Bobwhite quail habitat appraisal guide"*, it was determined that this type of cover was most limiting at the BREC. To establish this cover type, quail covey headquarters were established at strategic locations using the cover bundles. Covey headquarters were located near other habitats that provided early-successional vegetation such as fence rows, crop fields and field borders. These habitats provided nesting and brood-rearing cover as well as food (photo 4). Covey headquarters were planted a distance of at least 660 feet apart and consisted of five species. These included wild plum, rough leaf dogwood, aromatic sumac, false indigo, and blackberry. A mix of forbs and warm season grasses were planted around selected each bundle (photo 5).

Native Warm Season Grass Management:

The lack of brood-rearing cover was also identified as an important limiting factor at the BREC. This cover type is important for the survival of bobwhite quail chicks and many grassland bird species. Dense sod or vegetation is detrimental to wildlife feeding and movement and can be improved by using a variety of management practices such as prescribed burning and light disking. Both of these practices can be used to enhance grassland habitat by reducing residue and creating bare ground conditions which allows for the germination of desirable seed-producing forbs and legumes. Another positive result is that insect populations are often increased because of the improved plant diversity that results.

Prescribed burning and disking was used to improve plant diversity in existing stands of native warm-season grasses (NWSG) as well as used as a management tool to promote a diversity of early-successional plant vegetation (photo 6). Grasses were

burned either in the spring or fall and half of each burned area was then disked (photo 7). Using a light tandem disk often required two or more trips to adequately reduce the NWSG stand.

Describe significant results, accomplishments, and lessons learned. Compare actual accomplishments to the project goals in your proposal:

Field Border:

Competition from the field border on corn and soybean growth was evident throughout the growing season (photo 8) with corn and soybean grain yield severely reduced next to the field border (Figures 1 and 2). Surprisingly, the root plow treatment had little effect with either corn or soybean yield although there was somewhat of a noticeable difference in growth (photos 9 and 10). This difference in grain production compared to vegetative growth response may indicate that reproductive growth (grain yield) is much more sensitive to competition than vegetative growth. In both control and root plow treatments, corn yields did not reach average until nearly 30 ft. from the edge whereas soybeans fully recovered at a distance of 15 ft. from the edge. As a comparison corn and soybean yield was near normal next to the 30 and 60 ft. CP33 mixes, although there was a slight decrease near the first few rows of the CP33 mixes from wildlife damage.

Although 2008 and 2009 were very wet years there were still large decreases in yield next to the trees, indicating that water is not as limiting as we may have thought. Light and nutrients still had an impact on limiting yield (Figures 1 and 2).

The lack of a response from the root plow treatment could be explained by the fact that trees in the field border consisted of mature oaks and other hardwoods that are

deep rooted. Root plowing at a 36 inch depth would have little benefit. If the field border had been dominated by shrubs and trees with a shallow, spreading root growth pattern, then root plowing may have been more effective. The field border used in this demonstration ran North and South, which would shade the adjacent crop either in the morning or afternoon. The reduction in light quality in the morning or afternoon could be the major factor in reducing grain yield.

Competition from trees was also evident in the CP33 mixes with a growth difference within the first 15 ft. of the edge (photo 11). Apparently, the warm season grasses and forbs are also being stunted from the competition of light and water from the trees. This observation could mean that the type of forbs and grasses planted near the edge may need to be more shade and drought tolerant than those 15 ft. beyond the edge.

Edge Feathering:

Establishment of the new CP33 mix (30-120 ft.) along the South side of the edge feathering was successful and resulted in an immediate flush of forbs during the first year (photo 12). In succeeding years the amount of little bluestem and side oats gamma increased and within two years of planting, the mix provided excellent wildlife habitat for nesting birds and small mammals (photo 13). By year three there was some encroachment of tall fescue (photo 14) which required treatment with a non selective post emergent grass herbicide (Poast or Select) applied during the fall when the warm season grasses were dormant. In those areas where there is a substantial non native cool season grass seed bank, periodic spraying will be necessary.

The CP33 mixes and edge feathering provided a source of habitat during winter ice and snow storms (photo 15). The various heights of shrubs and forbs provided a ready source of food and shelter throughout the winter and early spring.

Corn yield was actually less near the CP33 mix and increased with distance out from the edge (Figure 3). Corn grain yield reduction near the interface of the CP33 mix was greater as the border widened which was associated with more noticeable wildlife damage. The wider area provided species such as raccoons and white-tailed deer more available habitat and additional opportunity to cause damage out into the crop field. Soybean yield was not as adversely affected by wildlife damage and was most noticeable in the 60 ft. CP33 treatment (Figure 4). Soybeans can compensate from damage caused by deer during their vegetative stage due to their relatively long period of reproductive development. Width of the field border is an important consideration for landowners. In this case the field border was straightened and a 30-120 ft. wide area was created. This reduced the number of point rows and made farming the adjacent area much easier. Landowners may want to consider all options before determining final width including potential wildlife use, grain yield, and ease of management.

Comparison of native cool season grasses indicated that Virginia Wild rye (cv Cuivre) established more optimally as compared to Canada Wild rye and River Oats (photo 16). Only the mix of VWR and forbs compared favorably with the standard and new CP33 mixes containing little bluestem and side oats gramma. Utilizing the cool season grass VWR with standard CP33 mixes along field borders gives further options to enhance diversity for wildlife habitat.

Three years after the native shrubs were established, only about one half were still alive and beginning to reach a size where they were becoming functional for wildlife use (photo 17). Utilizing bare root seedlings is an economic way of establishing several species of shrubs. However, side by side comparisons showed that quicker growth could be accomplished by utilizing trees produced by the RPM method (Forrest-Keeling Elsberry Missouri), but cost per plant and area to be planted is a consideration.

Removing a large percentage of the medium-sized trees resulted in a large amount of regeneration and shrubby growth that created a diverse woodland habitat for wildlife. This resulted whether or not stumps were left untreated, treated, or hinged (photo 18). Tree hinging was the fastest method of thinning and resulted in a living brush pile with a complex and dense habitat structure which will continue to provide excellent habitat for wildlife for several years. Soon after trees were cut and not treated, many began to resprout, creating a desirable habitat (photo 19). Trees that were cut and stumps treated stayed fairly open with an understory developing from briers and other herbaceous vegetation at the ground level.

Brush piles were created out of downed trees which, if stacked properly, will immediately increase the amount of escape cover available on a farm. A covey of quail was flushed in the early afternoon after a brush pile had been established earlier that morning.

Hinging trees (cutting through the tree but leaving a small amount of wood intact) was the most effective treatment in increasing habitat cover when considering time and cost. Hinged trees either died, sprouted new growth from the stump, or they simply continued to grow, creating a 30-50 ft. linear area of shrubby habitat (photo 20). Hinging

multiple trees within a small area and layering them on each other is also an effective method to create this type of cover. Each of the techniques described was effective in addressing the need for additional escape cover, an important habitat component for bobwhite quail.

Alternative Forages:

In 2008, VWR was the prominent cool season grass in the alternative forages followed by the warm season grasses, switchgrass and big bluestem (photo 21). Forbs established a little slower than the VWR but many were evident in the understory of the grass. At Hundley-Wayley, VWR plots stand out among the rest (photo 22). In fact, they are higher in quality than those at BREC, possibly a result of a slightly cooler climate and deeper soils. Establishment at Wurdack did not provide satisfactory results, possibly due to spring flooding.

During 2008 at BREC, plots harvested were split and either harvested in the summer or early fall to examine growth of cool and warm season grasses. Regrowth from the summer harvest was also measured.

The summer harvest had an average yield of 2.3 tons/acre (Figure 5). Greatest yield was generally found with those treatments that contained tall fescue (2.6 tons/acre). However, switchgrass mixed with forbs also yielded 2.6 tons/acre. Mixes with the native cool season grass Virginia Wildrye did not yield as much tall fescue mixes, averaging 2.0 tons/acre. It is not surprising that switchgrass yield was better than other native warm season grasses since it is known for its ease of establishment. Although dry matter yield was higher with tall fescue forage quality, TDN was less with those mixtures of VWR

(Figure 6). This is important since tall fescue is often cited as not having adequate TDN and higher quality would help make VWR a viable alternative.

Fall regrowth of all combinations averaged 1.1 tons/acre. Once again, the top yielding combinations had tall fescue included in the mix. Forage quality of these forage combinations was greater than in the summer and averaged 55.2 TDN (Figure 7).

Fall dry matter yield averaged 2.5 tons /acre over each of the treatments. Yield trends were similar during the summer harvest, with those treatments having tall fescue also possessing the greatest forage yield (Figure 8). However, forage quality was also greater with tall fescue compared to those of the forage mixes containing VWR. These results may indicate that VWR does not grow off well in the late summer and fall.

In 2009 the plots were split in two, with either 0 or 60 lbs N/acre applied. The reason no nitrogen had been applied in previous studies was to give the forbs a chance to establish and to see if the native legumes (Desmodium and Illinois Bundleflower) could produce sufficient nitrogen.

Surprisingly, treating with 60 lb N/acre increased forage yield by 0.5 tons/acre in 2009 when averaged over all treatments. Unlike the previous year, forage yields in those treatments containing VWR were greater than those containing tall fescue, regardless of N treatment (Figure 9) (photos 23 and 24). This may indicate that VWR may take an extra year to establish for full production. Those treatments with the native warm season grasses (i.e., Switchgrass, Big Bluestem, and Eastern Gammagrass) also had much higher forage yields in 2009, indicating a lag in establishment. Surprisingly, there was little difference in TDN or Crude Protein with application of 60 lb N/acre (Figure 10). However, when forbs were grown alone, crude protein was highest, probably from the

higher number of legumes present such as showy tick trefoil (Desmodium). Illinois bundleflower did not establish very well compared to the other forbs and legumes.

Tall fescue and switchgrass are quick to establish and have excellent quality during the second year after establishment. However, Virginia Wild rye and other Native Warm Season Grasses will produce equal or greater yield and quality of tall fescue by the third year. Forage yield and quality will continue to be monitored over the next few years to determine if any production and species shifts occur.

Invasive Species:

Sericea Lespedeza:

Where the stand of Sericea was in a mix of warm season grasses, treatment with either Ally and Remedy herbicides in late spring or fall accompanied by a spring burn were effective in reducing the Sericea and increasing Indiangrass density (Figure 10) (photos 25 and 26). However, herbicide treatment without a prescribed fire did not reduce the density of Sericea. Better control results with a combination of prescribed burning and herbicide application. This may be due to the fact spring burning encourages new Sericea growth which then is very susceptible to a herbicide treatment. Young growth in perennial cool season grasses such as tall fescue is very susceptible to glyph sate treatment.

A drawback to using a broad spectrum herbicide to control Sericea Lespedeza that wildlife friendly forbs and legumes are also suppressed (although common goldenrod did not seem to be affected. Before investing in forb and legume seed, growers will need to take this into consideration. Similar results were obtained at the Basket Wildlife Research and Education Area, where the initial pure stands of Sericea were thinned after

three years of using combinations of prescribed fire and herbicide treatments (Figure 11). Indiangrass and Big Bluestem became established as the Sericea was suppressed. An alternative management practice may be to overseed and managing the area for native warm season grasses. Spring burns of the NWSG would promote the grass growth and may lead to a reduced Sericea stand; however total eradication may not be possible without some herbicide treatment.

Reed Canary Grass:

The most effective treatments for controlling Reed Canary grass were a spring burn followed by glyphosate in April or June (Figure 12). However, by the following spring there was some grass regrowth, which indicated that total elimination of reed canary grass will take several years of burning and glyphosate application (photos 27 and 28).

As with Sericea, weakening the stand with a glyphosate treatment and burning to allow competition maybe one of the best control measures. In this situation Rice Rip Grass became established in those areas where Reed Canary Grass was suppressed. It would be interesting to see if seeding of a native warm season grass that is associated with similar wet areas such as Eastern Gamma Grass after two years of burning and herbicide treatment would help choke out the remaining Reed Canary Grass.

Native Warm Season Grass Management:

Fall and winter burns followed by disking were very effective in reducing the warm season grass density and opening up the canopy for the emergence of forbs and annual weeds including common ragweed, giant foxtail, and partridge pea. Repeated fall

burns and disking for three years continued to open up the canopy and reach a level of desired composition of grasses and forbs for wildlife (photos 29 and 30). Afterward a maintenance burn/disk will be needed every other year. A species shift of the NWSG was also noted with Big Bluestem taking over as the Indian grass was controlled. There was some Sericea lespedeza beginning to establish in areas that had been multiple disked and was sprayed immediately.

Spring burning/disking was not as effective as fall treatments in reducing NWSG stands and allowing forb growth (photo 31). In fact, without disking, spring burns increased NSWG density. These burns and disking operations were conducted on ground that was not susceptible to erosion. Reducing NWSG density would best be accomplished through frequent fall burns.

Diversion Channel:

Liming and fertilizing greatly increased the growth and enhanced the establishment of all of the grasses established in the diversion channel. Although not used for crop production, adequate soil pH and fertility is necessary for successful grass establishment and something that landowners will want to correct before planting.

After three years, mixtures of VWR and warm season grasses had established sufficiently so that soil erosion was reduced and benefits for wildlife were observed (photo 32). These mixtures were equal or superior to tall fescue in ground cover establishment (photo 33). Virginia Wild rye was clearly the best choice as an alternative for replacing tall fescue due to quick and robust growth. Often VWR is found near wooded areas and it known more as an edge grass. It is important to consider a VWR variety such as Cuivre since it has been selected to thrive in open conditions. For a

diverse habitat and growth during the spring and fall, a mixture of VWR and either switchgrass or big bluestem is recommended (photo 34).

Establishment of Covey Headquarters Using Quail Cover Bundles:

Establishment of quail covey headquarters using shrubs that are bare root seedlings is slow and takes up to three years (or longer) before adequate habitat can be developed. However, once developed, they can provide adequate shrubby cover that is required for bobwhite quail. Covey headquarters can be enhanced by planting native grasses, forbs and legumes to enhance wildlife benefits during the establishment time.

The RPM (Root Production Method, Forrest Keeling, Elsberry, MO) plants had greater survival and became more functional for wildlife in a shorter time than did the bare root seedlings. There is an increase in cost not only with the purchasing RPM seedlings but also in the time needed for planting. RPM seedlings are an excellent choice, particularly if only a small area is to be planted and time is not a factor. However, when properly planted, bare root seedlings will survive and thrive with little extra care.

Field Days:

Field demonstrations were highlighted each year at Native Plant and Bobwhite Quail Management Field Days. These educational programs were well attended, attracting over 150 landowners and natural resource professionals each year from Missouri as well as from many states in the Midwest and South. (photos).

Other clinics and workshops utilized the demonstrations during their educational programming. These included the Crop Injury and Diagnostic Clinic, which is a hands-on demonstration for agricultural professionals for crop production and trouble shooting. In addition, workshops conducted by the Missouri Department of Conservation, USDA-NRCS, and MU Extension used the demonstrations as part of their educational programming and training.

Tours were given each year at BREC that highlighted the demonstrations. These included the National Crop Insurance Service adjusters, FFA Field Day, and Missouri Soybean Association. Each year several presentations were given to local community leaders that highlighted the conservation and wildlife management activities that were being conducted at BREC.

Professional presentations on "integrating soil and wildlife habitat management with agronomic objectives through the use of demonstrations" were given at the Triennial Fish and Wildlife Extension Specialists Conference in 2006, the American Society of Agronomy (ASA) in 2007, at the Missouri Natural Resource Conference (MNRC) in 2008 and 2009, and at the National Soil and Water Conservation Society Conference (SWCS) in 2009. Numerous mass media activities, including print and video press releases, were also conducted as an educational tool. A final summary of these activities and on using the educational model that has been created will be given at the MNRC and at the ASA in California in 2010.

Ending Summary:

This grant has provided a funding source that enabled wildlife and agronomic objectives to be enhanced on the MU BREC. As a result, an educational model using demonstrations was successfully developed which provided research based information

on integrating wildlife and soil conservation management practices with the agronomic objectives of the farm. This model can be replicated as an educational method on other Agriculture Experiment Stations, to provide an expanded clientele interested in agriculture and wildlife with research-based information on implementing a variety of management techniques and practices designed to improve the economic aspects of the farm while also enhancing wildlife habitat and soil conservation.

Several thousand natural resource professionals, landowners, and youth have been able to observe and see how these practices were designed and implemented as well as how they were effective in accomplishing the goals that were identified. This grant has allowed the BREC to critique and develop the entire farm for wildlife management objectives within an agricultural landscape that utilized modern farming practices.

Management activity has enhanced the plant diversity and improved the habitat on the farm, as indicated by information gained from MP902, "Bobwhite quail habitat appraisal guide". Habitat limiting factors were identified (lack of shrubby escape and brood-rearing cover) and management was conducted to improve the carrying capacity of the farm to support a greater diversity of wildlife and a greater population of bobwhite quail. One measure that has resulted is the increase in the fall population of bobwhite quail on the farm (as measured by the number of coveys on the area). During 2004, prior to practices being implemented, surveys indicated that only one covey resided on the farm. During the fall 2008 and 2009, annual fall covey counts were conducted by student volunteers, MDC wildlife biologists and MU Extension staff. The results of these call counts indicate that up to 24 coveys (range from 16-24) now are on the farm. Assuming an average covey size of 12, this equates to a population of 0.44 birds per acre. This is

proximate to the population goals established with MDC Quail Focus Areas that have been developed (0.5 birds per acre). We were able to accomplish these wildlife goals while managing an agricultural cropping system without negatively impacting the financial objectives of the farm. These accomplishments will result in BREC not only being an educational role model for other University of Missouri Farms and Centers but a potential model for all Missouri farms.

In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:

1. **A listing of EQIP-eligible producers involved in the project, identified by name and social security or taxpayer identification number.**

Attached is a list of participants at the Quail Management/Native Plant Field Day.

2. **The dollar amount of any direct or indirect payment made to each individual producer or entity for structural, vegetative, or management practices. Both semiannual and cumulative payment amounts must be submitted.**

NA

3. **A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative, or management practice through this grant is in compliance with the adjusted gross income (AGI) and highly-erodible lands and wetlands conservation (HEL/WC) compliance provisions of the Farm Bill.**