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Wildlife Benefits of Switchgrass Production in Kentucky

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Introduction

Switchgrass (*Panicum virgatum*) is a warm-season perennial grass native to much of the United States including Kentucky (USDA). Switchgrass can be grown on marginal soils and regularly produces high biomass yields (4 to 8 tons of dry matter per acre) in Kentucky. Switchgrass varieties are broadly classified into two ecotypes: lowland and upland. Lowland varieties, such as 'Alamo,' typically produce higher yields, while upland varieties, such as 'Cave-in-Rock' and 'Kanlow,' generally have higher forage quality.

Warm-season grasses with high biomass yields including switchgrass have recently been considered for use as bioenergy crops. However many of these grasses are expensive and time-consuming to establish and have few other uses. Switchgrass has been identified as a uniquely viable option because it can be grown for forage in addition to biomass production. Producers can establish the crop and manage yearly for forage production until contracts for biomass are secured, helping to offset the cost of establishment and reducing the risk of establishing a biomass crop that may have no value at the time of harvest.

Switchgrass has long been present in tall-grass prairies—habitats that were occasionally disturbed by drought, fire, and grazing by wildlife. While managed stands of switchgrass in monoculture are not ecologically equivalent to biodiverse tall-grass prairies, they can have similar characteristics. Switchgrass is a bunch-type grass; this growth pattern produces an open understory with areas of bare soil for animals to move under the canopy of the grass. Because of its height (up to 6 ft), switchgrass can also provide cover for larger animals such as deer and turkey and landing space for tall-grass prairie birds.

Management of switchgrass stands can also have an impact on wildlife habitats. Stands managed for forage production are often harvested in the summer, when birds and small mammals are utilizing the habitat the most. This may disrupt nesting and make switchgrass less desirable for wildlife. Fortunately, stands managed for bioenergy applications are harvested in late fall, when wildlife activity is dramatically reduced. Research indicates that in areas with switchgrass for biomass production, harvesting some fields and leaving other standing will further support bird populations. However in areas where idle tall-grass prairies are found, total harvest of switchgrass stands for biomass increases the diversity of grassland birds in the area.

Measuring Impacts on Wildlife

The biodiversity of wildlife populations can be assessed in a variety of ways. Quantitative measurements include species richness (number of species observed in an ecological community) and relative abundance or evenness (abundance of each species within a community). Species richness and abundance are used together to evaluate the overall species diversity of a given ecological community. Generally, a community with many species and many individuals of each species is considered the most diverse and healthy. Other studies focus on the use of indicator species, whose presence is considered an indicator (either positive or negative) of overall environmental health within the area. All of these parameters are measured using observations of animals themselves or evidence of their presence, such as tracks, songs, nests, or droppings.

In 2013, 2014, and 2015, trained bird watchers conducted bird counts by visual or song identification in and adjacent to five mature switchgrass stands (4-6 years old) in northern Kentucky (Table 1). Bird species richness ranged from 11 to 32, and abundance ranged from 45 to 243 over the three years of observations. Avian counts revealed a total of 52 species over five locations. Frequently observed species are listed in Table 2.

Wildlife cameras provide a useful tool to measure wildlife traffic at a specific location. A study conducted in 2013 and 2014 observed wildlife at six switchgrass fields in Kentucky over the growing

Table 1. Observations of bird species present at switchgrass stands in Northern Kentucky during a four-hour period during the summer

Year	Number of	Field A	Field B	Field C	Field D	Field E
2013	Species	15	20	16	11	12
	Individuals	82	112	79	45	85
2014	Species	19	32	24	18	20
	Individuals	112	142	75	90	243
2015	Species	10	15	18	15	17
	Individuals	67	47	44	49	89

Table 2. Frequently observed avian species in switchgrass stands over five locations in Northern Kentucky

American crow	Eastern phoebe	Northern flicker
American goldfinch	Eastern towhee	Northern mockingbird
American robin	European starling	Prairie warbler
Barn swallow	Field sparrow	Purple martin
Blue grosbeak	Great-crested flycatcher	Red-winged blackbird
Brow thrasher	House wren	Savannah sparrow
Chipping sparrow	Indigo bunting	Song sparrow
Common yellowthroat	Killdeer	Turkey vulture
Downy woodpecker	Mourning dove	White-breasted nuthatch
Eastern bluebird	Northern bob white	Willow flycatcher
Eastern kingbird	Northern cardinal	Yellow-billed cuckoo
Eastern meadowlark		

season (April through October). Deer and turkey were the most commonly observed animals in all locations. Other wildlife included fox, rabbit, opossum, coyote, groundhog, squirrels, and raccoons. Species observed are listed in Table 3.

Switchgrass Compared to other Agricultural Crops

An extensive study in 2009 compared the small mammal populations (mice and voles) found in switchgrass, corn fields, and cool-season grass hay fields at four locations in Kentucky (Figure 1). This research showed a greater abundance of small mammals in switchgrass fields than cool-season hay fields in the summer and fall, and more than cornfields in the fall (Figure 2). The differences between switchgrass and corn were even more dramatic in corn fields where tillage was used than in no-till corn fields. Small mammals are often considered indicator species and indicate a healthy habitat.

Table 3. Wildlife observations at six switchgrass fields in northern Kentucky in April through July 2013 and 2014

	April		May		June		July	
Field	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**
A	5 deer 5 rabbit 3 coyotes	4 deer 6 fox 1 rabbit 1 opossum	23 deer 1 coyote	14 deer 4 turkey 6 fox 2 rabbit 3 coyote	27 deer 1 fox	25 deer 2 turkey	36 deer	26 deer 1 turkey 1 coyote 6 rabbit 10 fox 1 groundhog 2 squirrel 1 raccoon 1 opossum
B	13 deer 8 fox 3 coyote	1 deer	13 deer 1 coyote	3 deer	10 deer	1 deer	1 deer	17 deer 4 turkey 1 coyote
C	5 deer		11 deer	15 deer 2 turkey	17 deer	13 deer	9 deer 1 turkey	5 deer
D	15 deer 3 coyote	4 deer 1 turkey	23 deer 1 coyote	44 deer 4 turkey	28 deer	45 deer 1 turkey	3 deer	38 deer
E	3 deer 4 turkey 3 rabbit 1 opossum		3 deer		2 deer	18 deer	4 deer	4 deer
F		3 deer 1 turkey		8 deer		8 deer		7 deer

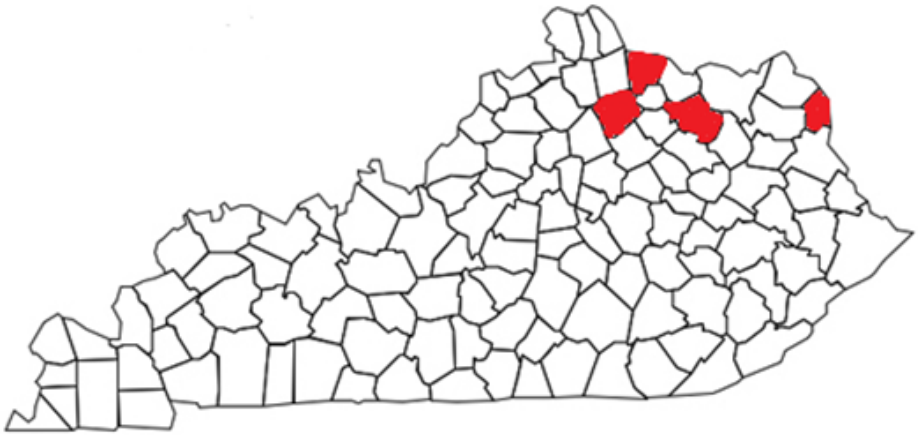

Figure 1. Established switchgrass stands in Harrison, Bracken, Fleming, and Boyd counties were surveyed for utilization by wildlife.

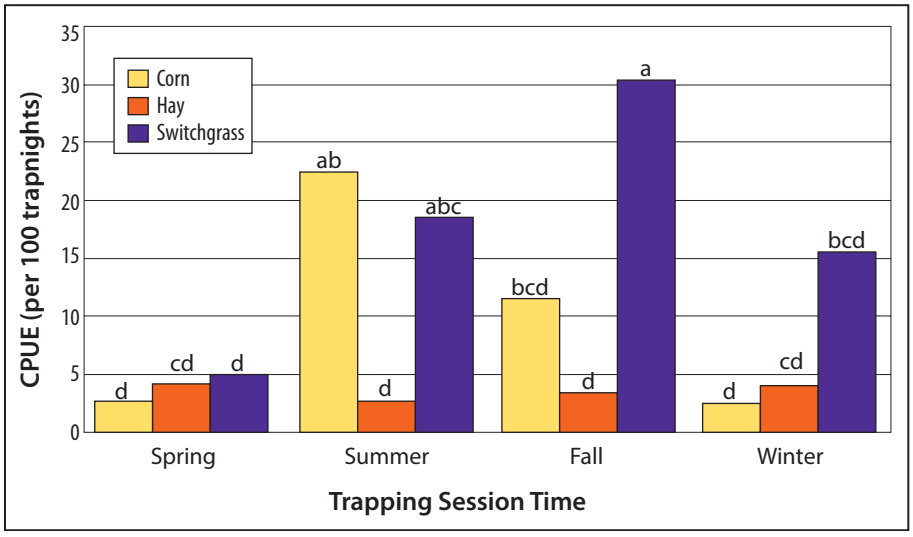

Figure 2. Relative abundance of small mammals (capture per unit effort) comparison for corn, hay, and switchgrass. Least square means with the same letter are not significantly different (P≤0.05).

Conclusion

These studies demonstrate that switchgrass establishment can have wildlife benefits in Kentucky. However it must also be profitable and beneficial to farmers in order to be economically viable. Switchgrass can qualify for Conservation Reserve Program (CRP) cost-share money, allowing producers to establish and maintain stands at a reduced cost. Switchgrass can be grazed or harvested for hay or biomass production. An interactive decision aid, Profitability of Switchgrass for Biomass Compared to Hay, was developed by Greg Halich and S. Ray Smith to compare the costs and profits of switchgrass hay compared to cool-season perennial hay pastures such as tall fescue. This decision aid can be found online at http://www.uky.edu/Ag/Forage/budget-switchgrassvhay.xls. In addition, switchgrass has an extensive root system that sequesters carbon dioxide, improving organic matter and providing an ecological service that may become valuable to farmers in the future for carbon credits.

Switchgrass is a versatile grass that can be utilized for forage or biomass production. Establishing and maintaining switchgrass is also beneficial to many types of wildlife by providing suitable habitat and cover. For more information about establishing and managing switchgrass in Kentucky, see Switchgrass for Biomass Production in Kentucky (AGR-201) at http://www2.ca.uky.edu/agcomm/pubs/agr/agr201/agr201.pdf.

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