

Crop Profile for Pasture/Rangeland in Kansas



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General Production Information

Kansas was ranked 8th in all other hay (excluding alfalfa) production in the United States. The state contributed 4.5% to the total U.S. production behind TX, MO, KY, TN, OS, OK, and AR. Total production for all other hay was more than 3.4 million tons, down 90,000 tons from 2001. Acres harvested at more than 2.3 million acres were down 100,000 acres from 2001. Statewide, the yield for all other hay averaged 1.5 compared with 1.6 ton per acre in 2001. Yearly average price was \$65.0 per ton

in 2001, producing a farm value of more than \$249.6 million. Over time, average acreage of rangeland in Kansas is 17.1 million acres. Most of the 2.24 million acres of pasture in Kansas include smooth brome grass, tall fescue, and bermudagrass. There are 3 to 6 million acres of annual forage in Kansas that include cereal grains, crop residue, and summer annuals.

Production Regions

In 2001, the east central region led the state in total all other hay production with 955,000 tons, followed by southeastern (785,000 tons), and northeastern regions (553,000 tons). These regions combined accounted for more than 59.7% of Kansas all other hay production in Kansas. The southwestern region produced the lowest amount with 127,000 tons. Production per acre ranged from 0.6 tons in Elk County, in region 90, to 3.2 tons per acre in Ellis County, in region 50. Lyon county in the region 80 with 119,600 tons and Miami County in the east central region with 118,800 tons led the state in all other hay production. The next highest ranked counties were Butler in southeastern, Shawnee in southeastern, Jefferson in east central, Coffey in southeastern, and Leavenworth in northeastern Kansas with 88,600, 88,300, 78,900, and 78,300 tons, respectively.

Cultural Practices

Most Kansas soils are suitable to many types of forage, however yield level depends on water holding-capacity of a specific soil type. Kansas is divided into nine districts (Figure 1). Soil types vary within a district. In general, northwestern and most of the west is deep, dark gray-brown silt loams, except the southwest counties are silt and sandy loams, and brown loamy fine sands. A moderately deep, dark gray-brown silt loams, and gray clays dominate the central and north central districts of Kansas. Northeastern Kansas has very dark brown silt, clay and silty clay loams soils whereas, the southeastern part has shallow, very dark gray-brown silt, clay, and silty clay loam soils. Average rainfall ranges from about 16 inches in the northwest to over 42 inches in the southeast.

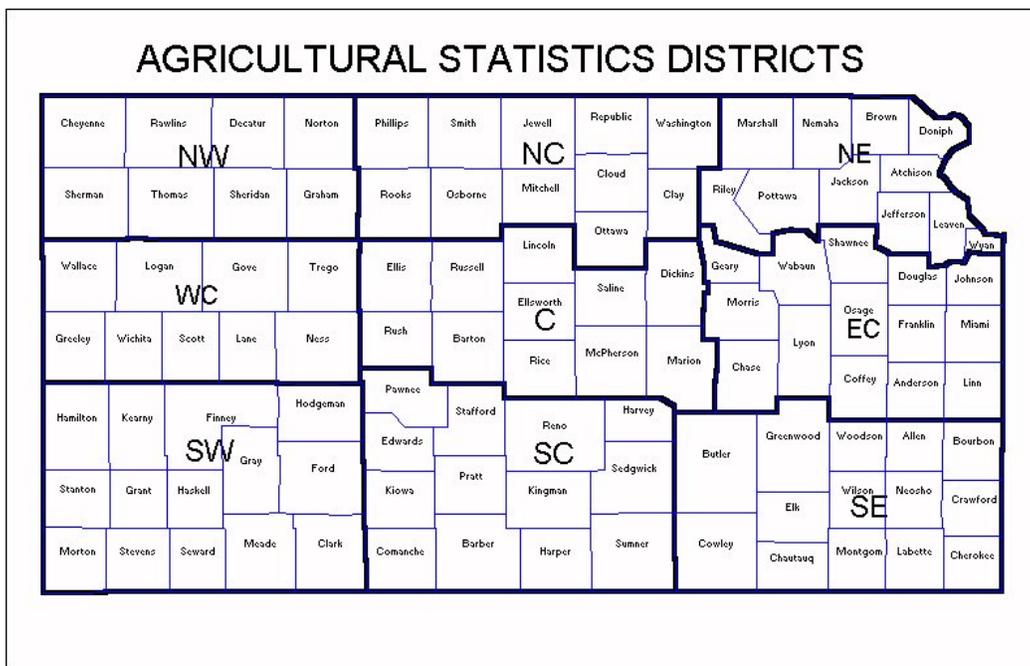


Figure 1. Kansas Districts

Kansas has 17 to 18 million acres of productive rangeland that contributes to the Kansas livestock industry. Kansas pasture/rangeland consists of warm-season grasses (WSG) and cool-season grasses (CSG). The WSG are generally native rangeland with tallgrass rangeland of eastern Kansas to short grass prairie of western Kansas. Smooth bromegrass and tall fescue are CSG planted on croplands in the eastern one-third of the state. They are well adapted to eastern part of the state due to high annual rainfall, while the western regions, with lower rainfall, depend on native grasses and annual forages. In the central and southern regions, incorporation of winter grazing of cereals into the forage programs is common.

Summer Annuals are well adapted to the hot and dry summers. Summer annual grazing programs may either supplement or complement native grasses. Summer annuals grow best when soil temperature is between 70° and 75 °F. Although early spring (late May or early June) is best for seeding, they can be seeded throughout the summer months if moisture is available. Generally, seeds are planted at 1 to 1.5 inches deep except hybrid millet and foxtail (3/4 to 1 inch deep). Seeding rate varies across the state, which depends on plant variety, rainfall, growing conditions, and intended use. Lower seeding rate is used in the dry regions compared with that of the irrigated areas.

1. **Native rangelands** are mixture of native forage species. Warm-and cool-season grass and broadleaf and some annual and perennial plants occur in Kansas. The three native regions in Kansas are the tallgrass prairie, the mixed grass prairie, and the shortgrass Prairie.

Tallgrass prairie:



Located in eastern Kansas, the best known is the area referred to as the Flint Hills. The average annual rainfall is between 30 and 42 inches, and the growing season is between 170 days in the north to more than 200 days in the southern part of the region. Soil types of this region are limestone and shale in the Flint Hills or sandstone, shale, and glacial drift plains. The eastern half is a mixture of grasslands, woodlands, and forest. Cool season tame pastures are commonly used with tallgrass prairie. The dominant grasses and forbs in the tallgrass region are big bluestem, little bluestem, Indiangrass, switchgrass, catclaw sensitivebriar, Illinois bundleflower, and compassplant. Management practices of the tallgrass prairie are prescribed burning, proper stocking, grazing distribution, periodic rest, proper season use, and weed and brush management. The best quality forages are produced from late April to early July. (Image source = <http://www.npwrc.usgs.gov/resource/2000/grlands/grasses.htm>).

Mixed grass prairie:



Bounded on the east by US HWY 77 and on the west by Kansas 23, this type of prairie occupies the center of the state. The average annual rainfall is between 20 and 34 inches, and the growing season varies from 150 days in the northwest to 200 days in the southeastern part of the region. The subsoil of the mixed grass region ranges from shallow to deep soils over calcareous, shale, sandstone or alluvium type. The

top soils are loamy to clay, and some sandy soils. A mixture of tall, mid, and short grass grow in this region. Big bluestem, Indiangrass, switchgrass, and several forbs such as western ragweed and Louisiana sagewort are the dominant grasses and forbs in the mixed grass prairie. Management practices of the mixed grass prairie include proper stocking, grazing distribution, planned periodic rest, proper season of use, and prescribed burning for weed and brush control. The best quality forages are produced from late April to early July. (Image source = http://www.envmedia.com/guides/grasslands/grasslands_screen_grabs/high_res/Buffalo-CU-10.jpg).

Shortgrass prairie:



Located west of Kansas 23, occupying the western quarter of the state. The average annual rainfall is between 16 and 20 inches, and the growing season varies from 150 days in the northwest area to 185 days in the southeast area of the region. The grassland is on deep to moderately deep soils over calcareous subsoils. Blue grama, buffalograss, western wheatgrass, and switchgrass are the dominant grasses, and western ragweed is the common forb. Management practices in the shortgrass prairie include proper stocking, grazing distribution, planned periodic rest, proper season of use, and weed and brush control. The best quality forages are produced from late April to early July. (Image source = <http://www.npwrc.usgs.gov/resource/2000/grlands/grasses.htm>).

2. **Summer annual forages** produce high forage yield in late spring and summer.
 - **Forage sorghum** produces high yields but has limited regrowth ability. It is best used for one-cut silage operations. Forage sorghum is planted at early to mid-June. Seeding rate for forage sorghum planted in wide rows is 4-6 pounds per acre or 10 to 20 pounds per acre if drilled in narrow rows. Seeds are planted at 1.5 inches deep.
 - **Sudangrass** is mostly grown in southeast Kansas. It produces less forage than most of the WSG but regrows rapidly following grazing or haying operations. Sudangrass is planted at the same time as grain sorghum. Seeding rate is 20 to 25 pounds per acre.

- **Hybrid sudangrass** is more productive than sudangrasses when used for greenchop or haying system. Seeding rate for hybrid sudangrass should be at 20 to 25 pounds per acre.
 - **Sorghum-sudangrass hybrid** is the most widely grown in Kansas. It is highly productive forage, but more than 50 percent of the weight of the forage is stem and not leaves. Sorghum-sudangrass hybrids are mostly suitable for greenchop. Seeding rate should be at 20 to 25 pounds per acre.
 - **Hybrid pearl millet** has high forage quality and regrows rapidly. It is mostly suited for haying and grazing operations in southeastern Kansas. Seeds are drilled in narrow rows at 1 to 1.5 inches deep in the last week of May or the first week of June. Hybrid pearl millet seeding rate in southeastern Kansas is between 8 and 10 pounds per acre or 10 and 20 pounds per acre if drilled in narrow rows.
 - **Foxtail millet** is produced in western Kansas. It produces low quality and quantity forages that has poor palatability compared with other WSG, thus it has limited value for forage programs. Foxtail millet is planted at 15-30 pounds per acre.
3. **Bermudagrass** is highly productive WS perennial grasses. It is mostly produced in south central and southeast Kansas. Bermudagrass is mostly used for hay two to three times. It is mostly established by sprigging roots at 15-20 bushels per acre, although one variety can be seeded. Sprigs are planted early in the spring at 2 inches deep.

Other Forages provide a wide selection of forage crops to choose from. Legumes used for pasture include alfalfa, red clover, sweetclover, ladino clover, birdsfoot trefoil, annual lespedeza, arrowleaf clover, berseem clover, hairy vetch, Austrian winter peas, and cowpeas. These crops are successfully established into grass pastures.

Cool season grasses are adapted to eastern and, in favorable soils, in central Kansas. They are either part of the grazing program, by providing forage during the winter months, or they are the only forage program that provides grazing throughout the year. Cool season pastures are an excellent supplement to native range. They are very productive but require high level of management.

Cool season grasses can be planted in early fall, winter, or early spring. Early fall is more desirable for eastern Kansas. Generally, seeding dates for Kansas are between August 25 and October 15. Seeds are drilled at about 0.5 inch deep and optimum growth occurs around 65 to 75 °F.

1. Annuals, such as winter cereals

Winter cereals produce good pasture in late fall and early winter, thus can be valuable complement to summer annuals and native grasses. Small grain cereals such as winter wheat, rye, winter barley, and triticale can be planted in early September and grazed when plants have well established. Besides grazing, small grain cereals can be used as a hay crop, either as an emergency feed or as part of planned

early summer crop program.

Most of the winter wheat grazing occurs during late fall and early winter and again in spring, when other forage sources are low in quality and quantity. Wheat is planted earlier and at higher seeding rate when grown for forage. In eastern Kansas, 90 to 120 pounds per acre is common for early fall grazing. In western Kansas, no more than 50 percent above rates used for grain is recommended. Producers in central Kansas use 75 to 120 pounds per acre for wheat pasture.

Winter barley should not be grazed as short or as late into the fall as wheat. It can provide silage nearly equivalent in feed value to corn silage.

Triticale provides higher forage yield, but lower quality than wheat, it is best suited as pasture. Quick fall and spring growth make rye the most productive of the small grains for pasture.

2. Perennial CSG include smooth brome grass, tall fescue, several species of wheatgrass, reed canarygrass, and Kentucky bluegrass. The two most widely grown in Kansas are:

- **Bromegrass** (*Bromus inermis*), a sod-forming grass, is important in the eastern third of Kansas, and in the irrigated areas of western Kansas. Smooth brome is mostly used for grazing or haying. The grass grows best during March through June and September through November. Bromegrass is well adapted to well-drained soils of eastern Kansas and dryland areas of central and western Kansas. Smooth brome provides excellent hay if harvested at bloom stage. Smooth brome plants can be established in winter or early spring. Seeds are drilled 1/4 to 1/2 inch deep at 10-15 pounds per acre.
- **Tall fescue** (*Festuca arundinacea*) is well adapted to the clay pan soils of the eastern one-thirds of Kansas. Tall fescue forages are complementary to warm-season forages during the spring, fall, and winter. The best quality of forage is from April to June and again in the fall. Plants will grow well with temperatures below 45 °F, but growth stops during summer when temperature reaches 85 °F. Depending on seed viability, seeding rates for tall fescue range between 15 and 25 pounds per acre. Seeds are drilled 1/4 to 3/4 inch deep.
- **Nontraditional forages** plants and weeds such as soybeans, kochia, amaranth, brassicas, crabgrass, and johnsongrass (a noxious weed) can be used as emergency or supplemental forage sources for livestock. Soybean hay can substitute alfalfa or clover hay when cut before pods are 1 inch long. A good silage is produced from a mixture of chopped soybeans with corn or sorghum forage. Kochia in central and western Kansas is used as hay, silage, or for grazing.

On year 2002 survey, we did not collect information on worker activities (such as hand weeding, mowing, and hand-harvesting) involved in range/pasture management.

Pesticide Usage on Range/pasture for Year 2002M

Year 2002 Kansas pesticide usage survey on range/pasture was conducted by Kansas Agricultural Statistics Service and Kansas State University from October to December 2002. Kansas has approximately 18 million acres of productive rangeland state-wide and significantly contributes to the livestock industry. Kansas hosts 33843 individual rangelands (identified by KASS based on year 2001 survey) and 5% of them were sampled state-wide. To assure the samples represent the population, a random sampling protocol has been applied. All questionnaires were mailed directly to the individual ranches. Totally 1550 questionnaires were sent out and 876 of them were collected with valid data from all 9 regions and 103 (out of 105) counties. Following table displays the sample distributions in Kansas in terms of regions and counties.

Sampling Data Distribution

Regions	#county	#survey	% sample
10 (NW)	8	51	5.82%
20 (WC)	9	60	6.85%
30 (SW)	13	64	7.31%
40 (NC)	11	63	7.19%
50 (C)	11	98	11.19%
60 (SC)	13	114	13.01%
70 (NE)	10	109	12.44%
80 (EC)	14	163	18.61%
90 (SE)	14	154	17.58%
sum	103	876	100.00%

East region 70, 80, and 90 were the major contributors to Kansas livestock industry for year 2002. Accordingly, approximately 50% of data were collected from those areas, containing 876 ranches from 103 out of 105 counties (98%). Approximately 78.2% of the pesticides were applied directly by farmers/growers/rancher-self against various pests and 21.8% applied by commercial entities.

Insect Pests

Many insect pests infest summer annual forages in Kansas. Generally, grasshoppers and white grubs, that are found statewide, are capable of causing serious damage to pastures and rangeland. Chinch bugs are often found in eastern and central Kansas, particularly during dry season or if the summer annual

forage is planted into wheat stubble.

The major insect pests concerned in Kansas are:



Grasshopper (*Melanoplus* spp.) may cause damage from May until frost by consuming the foliage. Populations vary from year to year mainly depending on long term weather trends, causing the greatest concern during drought cycles. Economic thresholds for grasshopper densities in pastures or rangeland vary greatly depending on costs of control and expected forage yields or values. (Image source = http://www.insects.org/entophiles/orthoptera/orth_003.html).



White grubs (*Phyllophaga* spp.) may be another greatest insect concern on pastures in central and eastern Kansas especially in the Flint Hills region on brome grass. White grubs are the larvae of beetles and chafers. These insects form an important group of plant feeders, many of which are of considerable economic importance. They are part of the Scarab beetles (*Scarabaeidae*). The most common white grubs are those of the June beetle or Junebug. Refer to following link to learn more about white grubs http://creatures.ifas.ufl.edu/field/white_grub.htm. Late spring or early autumn plowing may help to destroy many larvae, pupae, and adults in the soil and also exposes the insects to predators, such as birds and skunks. For this cultural practice to be effective, plowing must occur before the grubs migrate below the plow depth. It is very difficult to control this pest. Insecticidal control of white grubs could be successful if the chemical can reach the area where the grubs are feeding. Irrigation may be an essential way following insecticide applications for white grub control. (Image source = http://www.ent.iastate.edu/imagegal/coleoptera/scarabaeidae/white_grub_larva.html).



Chinch bugs (*Blissus leucopterus leucopterus*) are

common on bermuda and bluegrass, but seldom cause significant damage. A newly recognized species, the buffalo grass chinch bug may be more of a problem on buffalo grass. Chinch bugs are 1/8 inch long, and have black

bodies with white marks. Adults overwinter in bunch grasses and feed on various grasses in the spring. The red nymphs of chinch bugs suck sap from many species of grasses. Yellow patches of infested plants appear, usually in sunny locations.

Although several insect pests as mentioned above may impact pasture/rangeland in Kansas, there was no report regarding insecticide usage in pasture/rangeland based in the year 2002 survey. However, several cultural approaches may have been applied against insect pests (see table 'Non-Chemical control Approaches').

Weeds

Plants in pasture/rangeland that adversely affect livestock production are considered undesirable weeds that should be eliminated. Range condition is determined with the presence or absence of weeds and forbs.

Weed control methods practiced in May and June include grazing, mowing, April burning, biological control, and herbicide treatments. Grazing is done when weeds are small and palatable to animals. Mowing is effective before annual grasses produce seeds and before broadleaf weed plants reach 8



inches tall. Prescribed burning is done in late spring to control most weeds, brush and undesirable cool season grasses and to increase the percentage of warm-season grasses. The head weevil and rosette weevil can provide biological control of musk thistle. If required, herbicides should be applied after grass plants have become established to reduce annual or perennial broadleaves. (rosette weevil, source = <http://www.nps.gov/plants/alien/fact/canu1.htm>).

Primary weeds in pasture/rangeland of Kansas:



Broom snakeweed (*Gutierrezia sarothrae*) (**yellow top, stinkweed, perennial snakeweed**) is a perennial native weed. Broom snakeweed stands up to ten inches tall. The fan or broom-like shape of the plant makes it easy to recognize in the field. Many tiny yellow flower heads, each containing a few flowers, are clustered on branches at the tips of stems. All the stems rise from a single taproot. Leaves are very narrow. Fruits are achenes equipped with 8 to 10 scales. Flowering season is from July to October. Seeds are the source of reproduction. It is found in every pasture every year, on dry, overgrazed rangeland. Learn more about this weed please refer to link <http://www.lib.ksu.edu/wildflower/broomsnake.html>. (Image source <http://www.lib.ksu.edu/wildflower/broomsnake.html>).



Western ironweed (*Vernonia baldwinii*) is a perennial native forb. Found in dry or heavily grazed pastures, open upland fields, and along roadsides. It occurs throughout Kansas. Western ironweed is one of the most common pasture weeds in Kansas and most commonly on lowland sites. This plant is very bitter and is thus not consumed by cattle. It may increase in overgrazed grasslands. Flower has discoid head about 0.2 inch wide with 17 to 34 florets. The corolla is purple to lavender. Flowering season is from July to September. Rhizomes and seeds are the source of reproduction. Refer to following link to learn more about this weed http://www.missouriplants.com/Pinkalt/Vernonia_baldwinii_page.html. (Image source = <http://www.mobot.org/gardeninghelp/plantfinder/codea/H100.shtml>).



Musk thistle (*Carduus nutans* L.) (**nodding thistle**), a noxious weed, is a biennial forb native to Europe. Musk thistle can grow up to 8 feet tall. Leaves are up to 10 inches long, dark green. Solitary, lightly spiny, and nodding flower heads develop at the stem tips in midsummer and grow to a diameter of 1.5 to 3 inches. Blossoms are deep rose to violet in color. Seeds are 3/16 inch long, shiny, yellowish-brown, and have a hairlike plume. Flowering season is from May to August.

Seeds are the source of reproduction. Found in pastures, rangeland, open woodlands, and fertile lowlands. Two weevils have been introduced as biological control agents for musk thistle: thistle head feeding weevil (*Rhinocyllus conicus* Froelich) and the rosette weevil (*Trichosirocalus horridus* Panzer). Both weevils have been successful in the areas where thistle populations are relatively dense. Refer to following link to learn more about this weed http://www.ppws.vt.edu/scott/weed_id/carnu.htm. (Image source = <http://www.nps.gov/plants/alien/fact/canu1.htm>).



Sericea lespedeza (*Lespedeza cuneata*) (**Chinese bush clover**), a noxious weed, is a perennial legume introduced from China and Japan that becomes a weed in pasture/rangeland in Kansas. *Sericea lespedeza*, the eastern Asian native, was first introduced into Kansas (1930) for forage and erosion control. It has spread rapidly in native rangeland. This was first considered a problem in southeast Kansas in the mid-1980s. It was designated as a noxious weed as of July 1, 2000. More than 300,000 acres in Kansas are infested with *sericea lespedeza*. It is highly competitive with the desirable pasture grasses and has high tannin content, which makes it undesirable to beef cattle. Goats and possibly sheep will eat it. Herbicide treatment, for now, is the only method to control *sericea lespedeza*. Although goat grazing can selectively control *sericea lespedeza*, data for the effectiveness of this method is not available. *Sericea lespedeza* has densely short pubescence on both leaf surfaces. The leaves are small and trifoliate. The pubescence gives the weed a grayish or silvery appearance. Flowers have creamy-white petals. *Sericea lespedeza* is often a weed of pastures, hay fields, roadsides, and abandoned fields. It is found throughout the southeastern United States. Refer to following link to learn more about this weed <http://www.oznet.ksu.edu/sericeawork/>. (Image source = http://www.psu.missouri.edu/fishel/sericea_lespedeza.htm).



Western ragweed (*Ambrosia psilostachya*) (**perennial ragweed**) is a perennial native forb. Western ragweed, an aromatic perennial growing from rhizome-like rootstocks, is a very common weed of roadsides, dry fields and disturbed and waste places. It has once-pinnatifid, coarse-lobed leaves characterized by a greenish, rough pubescence. Male and female flowers develop on the same plant, the male flowers above and nodding, the female flowers below in the leaf axils. Flowering season is from July to October. Rhizomes and seeds are the source of reproduction. Although it is palatable through the first half of the summer, from mid-summer on it becomes undesirable for

cattle. Refer to following link to learn more about this weed http://www.shout.net/~jhilty/plantx/ws_ragweedx.htm. (Image source = <http://www.calflora.net/bloomingplants/westernragweed.html>).

Primary brushes and trees in pasture/rangeland of Kansas:

The brush and tree species include Ash, Buckbrush, Brambles, Cottonwood, Dogwood, Eastern persimmon, Elm, Locust, Oak, Osage orange, Plum brush, Prickly pear, Red cedar, Rose mutiflora, Russian olive, Sagebrush, Skunkbrush, Sumac, Willow, and Yucca.

In 1993, herbicide usage survey on pasture/rangeland was conducted in Kansas, 3.323 million pounds of herbicides were applied to 35% of the pasture/rangeland, mostly to control noxious weeds. 21% of the acres were farmer-applied, only 12% were custom applied. The most frequently used herbicide was 2,4-D. Twenty-one percent of the acres were treated at 0.76 pound per acre per season for a total of 2.892 million pounds. Musk thistle was the most commonly targeted weed. Ground boom was the most common method of application.

In addition to weed control, herbicides were used to control brush/tree on pasture/rangeland. More than 1,030 pounds of herbicides were applied to 10% of the acres to control brushes and/or trees. Again, 2,4-D was the most frequently used herbicide to treat five percent of the acres at 0.78 pound per acre. Osage orange (hedge) was the most common targeted tree. Ground boom was also the common method used for brush/tree control. Besides herbicide treatment, other methods were also used to control weeds and brush/tree on pasture/rangeland in Kansas.

Although many different natural weed/shrub/tree species are competing for resources with pasture/rangeland, only some of them were treated with herbicides. For year 2002, areas treated with various herbicides were approximately 8.6% of total pasture operated areas (native and tamed). Certain areas may be treated for the same or different weeds twice or even three times annually. Therefore weed control is one of the most serious practices for pasture/rangeland management in Kansas. Survey shows seven major herbicides (ingredients), were applied in the control of more than 30 different weeds on pasture/rangeland. Following two tables list the herbicides used and weed/brush/tree controlled.

Herbicides and Targeted Weed/Brush/Tree

Herbicide (Ingredients)	Weeds Targeted

2,4-D	Ash, Bindweed, Brambles (blackberry, etc), Buckbrush, Bull thistle, Bur ragweed, Canada thistle, Dogwood, Goldenrod, Johnsongrass, Locust (honey, black), Musk thistle, Oaks, Osage Orange (hedge), Plum, wild (sand, american), Sagebrush, sand, Sericea lespedeza, Skunkbrush (aromatic sumac), Sumac, smooth, Sunflower, Thistles (pasture, wavyleaf, yellow spine), Western ironweed, Western ragweed, others
Dicamba	Bindweed, Buckbrush, Bull thistle, Canada thistle, Musk thistle, Osage Orange (hedge), Western ragweed, others
Glyphosate	Ash, Bindweed, Bull thistle, Cheatgrass, Johnsongrass, Musk thistle, Russian olive, Sericea lespedeza, Sumac, smooth, Thistles (pasture, wavyleaf, yellow spine), Western ragweed, others
Hexazinone	Yucca
Metsulfuron	Annual broomweed, Bull thistle, Canada thistle, Musk thistle, Sericea lespedeza, Sumac, smooth, Yucca
Picloram	Ash, Bindweed, Buckbrush, Bull thistle, Bur ragweed, Canada thistle, Little barley, Locust (honey, black), Musk thistle, Oaks, Osage Orange (hedge), Plum, wild (sand, american), Sumac, smooth, Thistles (pasture, wavyleaf, yellow spine), Western ragweed, other
Triclopyr	Bindweed, Brambles (blackberry, etc), Buckbrush, Bull thistle, Dogwood, Locust (honey, black), Musk thistle, Osage Orange (hedge), Rose, Multiflora, Sagebrush, sand, Sericea lespedeza, Skunkbrush (aromatic sumac), Sumac, smooth, Thistles (pasture, wavyleaf, yellow spine), Willow, others

Target Weed/Shrub/Tree and Herbicides Applied

Targeted weeds	Herbicides (Trade Name)
Annual broomweed	Escort
Ash	2,4-D Amine, 2,4-D Esters, Glyphomax, Tordon 22K
Bindweed	2,4-D Amine, 2,4-D Esters, Banval 4, Glyphomax, Remedy, Tordon 22K
Brambles (blackberry, etc)	Crossbow, Remedy

Buckbrush	2,4-D Amine, 2,4-D Esters, Banval 4, Crossbow, Other, Remedy, Tordon 22K
Bull thistle	2,4-D Amine, 2,4-D Esters, Banval 4, Escort, Glyphomax, Other, Remedy, Tordon 22K
Bur ragweed	2,4-D Amine, 2,4-D Esters, Tordon 22K
Canada thistle	2,4-D Amine, 2,4-D Esters, Banval 4, Escort, Tordon 22K
Cheatgrass	Glyphomax
Dogwood	2,4-D Esters, Crossbow
Goldenrod	2,4-D Amine
Johnsongrass	2,4-D Amine, Glyphomax
Little barley	Tordon 22K
Locust (honey, black)	2,4-D Amine, 2,4-D Esters, Crossbow, Other, Remedy, Tordon 22K
Musk thistle	2,4-D Amine, 2,4-D Esters, Banval 4, Crossbow, Escort, Glyphomax, Other, Remedy, Tordon 22K
Oaks	2,4-D Amine, 2,4-D Esters, Tordon 22K
Osage Orange (hedge)	2,4-D Amine, 2,4-D Esters, Banval 4, Crossbow, Other, Remedy, Tordon 22K
Plum, wild (sand, american)	2,4-D Amine, 2,4-D Esters, Other, Tordon 22K
Rose, Multiflora	Remedy
Russian olive	Glyphomax
Sagebrush, sand	Crossbow
Sericea lespedeza	2,4-D Amine, 2,4-D Esters, Crossbow, Escort, Glyphomax, Remedy
Skunkbrush (aromatic sumac)	Crossbow
Sumac, smooth	2,4-D Amine, 2,4-D Esters, Escort, Glyphomax, Remedy, Tordon 22K
Sunflower	2,4-D Amine

Thistles (pasture, wavyleaf, yellow spine)	2,4-D Amine, 2,4-D Esters, Crossbow, Glyphomax, Tordon 22K
Western ironweed	2,4-D Amine
Western ragweed	2,4-D Amine, 2,4-D Esters, Banval 4, Glyphomax, Tordon 22K
Willow	Remedy
Yucca	Escort, Velpar L
Other*	2,4-D Amine, 2,4-D Esters, Banval 4, Crossbow, Glyphomax, Tordon 22K

* Unspecified targeted weeds.

Next table displays the herbicide trade names, modes of action, acres treated, percentage of areas treated, and rate. Overall, weed/shrub/tree control is one of the important practices in pasture in Kansas. Based on the following table, the total treated areas and amount for a given herbicides used could be estimated. Kansas has approximately 2.24 million acres of pasture and 6.67% (335,827/2,240,000 pasture) of them was covered with this survey. Thus, the total areas treated with 2,4-D in Kansas was estimated as $2,240,000 * 8.6% * 51% = 982,464.4$ (acres) and the total amount of 2,4-D used was $982,464.4 * 0.65 = 151,148.3$ lb (= 75.6 ton) annually. Furthermore, the total cost using herbicides could be also estimated based upon this survey.

Herbicide Usage Survey on Pasture

Herbicide (Ingredient)	Trade name	Mode of Action ^b	Acres Treated	Percent Treated*	Average rate (lb a.i./a)
2,4-D	2,4-D amin3-var. name, 2,4-D ester-var. name	GR	14549	51	0.65
Dicamba	banval, clarity, Sterling	GR	933	3	0.31
Glyphosate	Roundup, Touchdown, Glyfos, Glyphomax Plus	EPSP	589	2	0.18
Hexazinone	Velpar	PSI	#	#	#

Metsulfuron	Ally, Escort, Cimarron, Cimarron Max	ALSI	1641	6	0.02
Picloram	Tordon 22K	GR	6969	24	0.17
Triclopyr	Remedy, Garlon, Crossbow	GR	3802	13	0.52

* Percent Treated = (acreage treated with a given herbicide / the total acreage treated (28483 acres)) * 100.

Insufficient data reported.

^bALS = ALS (Acetolactate synthase) synthase inhibitor; EPSP = EPSP (5-Enolpyruvyl-3-Shikimate phosphate) synthase inhibitors; PSI = Photosynthesis inhibitors; LI = Lipid inhibitor; CMD = Cell membrane disrupter; SRI = Seedling root inhibitor; PI = Pigment inhibitor (carotenoid); ALSI = Amino acid synthesis (ALS synthase) inhibitor; GR = growth regulator.

Among the herbicides used, 2,4-D is the most frequently used and more than 51% areas were treated at an average rate 0.65 lb/acre, followed by picloram at an average rate of 0.17 lb/acre.

Herbicide application may vary with ingredients and amount in different regions. Following table lists the herbicides and average rates applied in 9 regions in Kansas.

Average Usage* of Herbicides in Different Regions in Kansas

Herbicide (Ingredient)	Region								
	10 (NW)	20 (WC)	30 (SW)	40 (NC)	50 (C)	60 (SC)	70 NE)	80 (EC)	90 SE)
2,4-D	1.05	0.99	0.3	0.5	0.68	0.46	0.62	0.64	0.96
Dicamba	-	0.1	0.48	0.01	1.21	0.12	0.3	-	-
Glyphosate	-	-	-	-	-	0.51	-	0.13	0.7
Hexazinone	-	-	-	-	-	-	-	-	-
Metsulfuron	-	-	-	0.01	-	-	-	0.04	0.02
Picloram	0.23	0.16	-	0.08	0.23	0.07	0.07	0.06	0.25
Triclopyr	-	-	-	-	-	0.04	0.86	0.58	0.3

* lb/acre.

- Insufficient data reported.

Diseases

Fungal endophyte of tall fescue is caused by *Acremonium coenophialum* fungus. This is the only disease that is of concern to Kansas pasture/rangeland. In 1994, about 95% of the Kansas pastures were infected by the endophyte. The organism lives within the fescue plant, and does not affect the growth of the grass, and it is seed transmitted only. The fungus is found in the crown of the fescue plant during winter. The mycelium or strands of the fungus grow slowly during spring into the tillers and eventually into the seed head. The toxin, ergovaline, is either produced by the fungus or by the plant in reaction to the fungus. Animals that consume infected plants react to the toxin. It has been reported that for each 10% increase in endophyte level above 30%, there is a reduction of 0.1 pound in average daily weight gain in beef cattle.

Management:

- Use endophyte-free seed.
- Prevent introduction, by the grazing animal, of fungus-infected seed into the pasture.
- Avoid feeding hay that contains mature infected seed.
- Store or age the seed to reduce live endophyte in the seed.

Although plant diseases may impact pasture/rangeland, there was no report regarding fungicide usage based on year 2002 survey. However, farmers may use some cultural approaches to control plant diseases (see table ‘**Cultural Control Approaches**’).

Pesticide application methods may vary with target pests and crops. The table ‘**Pesticide Application Methods**’ lists the all possible application methods used on pasture/rangeland protection.

Pesticide Application Method

Brush and Weed Control Method	Rate (%)
Broadcast, ground without incorporation	46.68
Broadcast, ground with incorporation	3.36
Broadcast, by air (Aerial application)	19.05
Spot Treatment	30.91
In irrigation	0.00
Banded in or over row	0.00

Non-chemical Control Approaches

Non-chemical (cultural) control is one of the important approaches for pest control in pasture/rangeland protection in Kansas. In this survey, 4 different culture-related questions were raised for various pests regarding the application of cultural approaches in pest control. The table ‘**Cultural Control Approaches**’ lists 4 different cultural approaches used by farmers for controlling pests (weeds, insects, or diseases).

Cultural Control Approaches

Control Approach*	Brush & Weeds (%)	Disease (%)	Insects (%)
Burning	15.18	4.79	6.39
Biological	15.18	2.97	-
Cutting	-	-	4.22
Mowing	21.00	3.08	-
Others**	1.03	0.23	0.34

* Percentage of ranches (out of 876) using the non-chemical practices to control pests (weeds, insects, and diseases). Among those approaches, burning is used against various pests (including weeds, insects, and diseases), while mowing is more likely to be applied against weeds.

** Unspecified application methods

- Insufficient data reported.

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