

*Wild prairie grasses that once covered most of the state have had their role taken over by other, more valuable grasses and legumes.*

## 5. Forage Crops that Feed the Livestock and Save the Soil

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FORAGES, INCLUDING PASTURES, UTILIZE THE LARGEST acreage of any Iowa crop. Iowa folks are more aware of the extent of the corn fields of the state than of the hay and pasture acreage. Iowa's pasture acreage alone, however, equals that of corn—between ten and eleven million acres. This means that about 30 per cent of Iowa's farms is in pasture. The hay acreage is a little less than half this, averaging over the long period of years between three and four million acres.

When Iowa was first settled, most of the prairie—and 85 per cent of the state *was* prairie—was covered with tall grass, almost head high. In some places Indiangrass and big bluestem grew “so tall and dense that herds of cattle were lost to view and could be found at evening only by listening for the tinkling of a cowbell or watching for the waving of the tops of the grass.” One pioneer said, “The white-topped blue wagons of the pioneers moving slowly across the prairies looked like boats at sea, a sea of grass, the surface of which the winds caused to roll in great billows.”

The prairie was a complex of native grasses, legumes, and other flowering plants. Along the sloughs the tall, coarse prairie cordgrass and bluejoint reedgrass were often found in pure stands. On well drained aerated soils big bluestem and Indiangrass held forth. Little bluestem and sideoats grama were found on the steeper hillsides and drouthy sites. Except in spring, when snow was melting, water was scarce and had to be shared by the prairie grasses. Plants with shallow roots, extending only about a foot and a half into the ground, gave way to other grasses with roots that went down four or five feet. Still later other grasses came on with roots that sometimes went as deep as twenty feet. About 65 per cent of the prairie grasses extended their

roots below five feet. The bulk of the prairie was below, not above the surface of the soil. When a farmer mowed the prairie in the fall, getting yields of as much as two to three tons of dry hay per acre, he left a still greater tonnage of living plant material in the surface few inches of soil. As a result of such subterranean growth and decay, native grasses over thousands of years built up our deep, rich, black soils.

Little of the rainfall ran off the soils and the water that did run off was clear, for the soil was protected by litter and leafmold, held in place by the stems and the deep spreading grass roots. Because the prairie cover broke the force of even torrential downpours, mud did not clog the pores of the soil and so keep water from soaking in. So thick and tough were the roots of these grasses that where possible the pioneer did not attempt to break the sod until the grasses had been weakened by grazing and repeated mowing.

For a time the prairies furnished the settler both pasture and hay in unlimited amounts. Later, overgrazing of pastures and need for more nutritious forms of hay led to the replacing of wild prairie grasses with other, more valuable, grasses and legumes. Today, these original grasses can be seen only occasionally along railroad right of ways, in early settlers' cemeteries, and on an occasional small area of native hay land. One of the best examples of the prairie cover of one hundred years ago is to be found in a pioneer burial ground fourteen miles west of Albia on Highway 34. Somewhat similar areas also are to be found in northern and northwestern Iowa where small areas have remained unbroken, the grass being cut at hay.

The dreaded ravages of prairie fires have been described in George A. Ide's *History of Union County*:

In the autumn the annual fires on the prairies were a menace to the first settlers. At the first heavy frost the prairie grass was killed and becoming dry in a short time would readily burn. There was nothing to hinder the ravages of the fierce fires that swept over the prairie, and the approach of a prairie fire fanned by the wind meant danger to life and property. Few indeed were so incautious as to make no preparations against them. The usual method of protecting buildings, stacks, fences, and bridges was to plow a few furrows around the property and set "back fires," burning the grass slowly against the wind, thus placing a burned strip between the pioneer's home and the oncoming flame. . . . Fires were sometimes started by the carelessness of hunters or travelers. These fires were frequent during the entire dry season and the flames could often be seen at night at a great distance reflected in the sky. They left in their blackened path ashes which were taken up and hurled in clouds by the high winds which generally prevailed in connection with them. This often continued for days after great areas had been burned in this and surrounding counties. The smoke and dust at such times were of such density as to partially obscure the sun for days.

As late as 1887 prairie hay was being shipped from Iowa to eastern markets, especially from Kossuth, Palo Alto, and Pocahontas counties. After making a trip through northwestern Iowa in 1887, Professor A. A. Crozier, botanist for Iowa State College, reported:

The area available for cutting is being rapidly diminished, owing to demand for land for cultivation and for pasture, so that the privilege of cutting on the open prairie is no longer free. The price of hay in the field . . . was \$2 to \$2.50 a ton. . . Tame hay usually brings \$1 a ton more . . . In some localities it is the practice to burn the prairies in the fall or early spring.

As pastures were inclosed and grazed heavily throughout the summer, native grasses were weakened and gave way to a newcomer, Kentucky bluegrass, fully as aggressive as some of our most noxious weeds.

#### BLUEGRASS

Bluegrass came to the United States from Europe, where it is native but of little importance. Although it is not known where bluegrass first entered North America, it is believed to have been used as packing material by the early immigrants from Europe. It was reported at Montreal, where the French seeded it with white Dutch clover as early as 1751. Today, bluegrass is by far the most extensively grown pasture grass between the Missouri River and the Atlantic, and as far south as Kentucky and Tennessee. More than 90 per cent of the bluegrass pastures in Iowa developed spontaneously, encouraged unwittingly by early settlers who weakened the prairie grasses by close grazing, frequent mowing, and burning.

Once bluegrass had become established, Iowans were not slow to recognize its advantages. In 1889 a Bluegrass League was formed, with members from eighteen counties and headquarters at Creston, in Union County, for the purpose of advertising the bluegrass region of southwestern Iowa as a place for permanent home building. Stock was generally subscribed to at the rate of \$25 per share, and the League erected a "Bluegrass Palace" on the fair grounds near Creston in the fall of 1889.

The palace was one hundred feet square with four main towers at its corners, the principal tower rising ninety-two feet. The main entrance was through a horseshoe arch built of baled hay, the top of which furnished a speakers' stand. Baled hay was used for gateways and for all projections and towers. The Exposition was formally opened by the governor, accompanied by his official staff in uniform. In 1890 the palace was enlarged. Two wings increased the length to 265 feet and the width to 130 feet. The main tower of the building

was 120 feet, with 90-foot towers on the wings and a 100-foot tower over the main entrance.

Since the beginning of the century, Iowa has had between ten and eleven million acres of open and wooded pasture each year, most of it bluegrass. The acreage of permanent pasture is particularly large in southeastern Iowa where it accounts for as much as 50 per cent of some townships. Land left in pasture usually is that too rough or gullied to be cropped. Some Canada bluegrass is to be found on the less fertile side hills, with Kentucky bluegrass on the bottoms, and on the flat, less eroded tops. A good deal of redtop is also found, usually mixed with bluegrass. Northeastern Iowa, where much of the land is rather steeply rolling, also has a large acreage of permanent pasture. Comparatively little Canada bluegrass or redtop is found here, however. In eastern and east central Iowa the acreage of pasture is large but most pastures are rotated, planted to red clover, alsike, and timothy. Unless generous quantities of lime are used, the soil is too acid for alfalfa or sweetclover. In the Western Livestock Area, sweetclover seeded in small grain has been generally used in the late summer and fall as pasture for cattle brought in from western ranges. Bromegrass and alfalfa are now coming to be used here extensively for pasture as well as for hay.

Early settlers discovered that bluegrass was a "cool-weather grass," growing early in the spring and then turning dormant in midsummer—one of its greatest weaknesses as a pasture plant. In more recent years the heat and drouth of 1934 in southwestern Iowa and of 1936 in western and southern Iowa was so severe as to entirely destroy a large portion of the bluegrass on permanent pastures, particularly that which had been closely grazed. Although bluegrass always becomes dormant and unproductive when temperatures are high, this is the only known record of actual killing of bluegrass by excessive heat.

With the destruction of bluegrass, keen interest developed in bromegrass and large acreages of it are now being seeded for pasture in all parts of the state. The advent of such high yielding plants as bromegrass, the clovers, and alfalfa, together with the soil treatments needed for them to flourish, has prompted a few farmers to say goodbye to bluegrass.

From the very beginning the native grasses, and later the aggressive bluegrass, which is a heavy seed producer and forms a heavy dense sod, provided pasture without any effort on the farmer's part. Because of this, pastures were neglected, both as to maintenance and grazing management. As a result they deteriorated greatly, and peren-

nial weeds crowded in to take up much of the plant food and moisture that might have gone into grass.

Iowa farmers are generally regarded as among the world's best in the production of corn, soybeans, and small grain crops, but Iowa land had been under the plow for three-quarters of a century before any particular attention was given to methods of increasing returns from permanent pasture lands.

Reports from studies at Iowa State College showed that continuous close grazing resulted in a weak, thin sod, because root reserves could not develop, and weedy plants came in to compete with the grass. It was shown that greater seasonal returns could be obtained when grazing was not permitted in the spring until the grass had made a cover growth of several inches. Forage-minded farmers here and there accepted a pasture renovation program and doubled the returns from permanent pasture by liming, phosphating, and introducing a mixture of clovers.

#### ROTATION PASTURE SEEDINGS

Greater acre returns were obtained by farmers from pasture sufficiently level to be plowed, by including it in the regular rotations, leaving land in pasture for only a few years at any one time. A mixture of timothy and red clover or timothy, alsike, and red clover, probably has been used much more extensively for rotation pasture seedings than any other. Beginning about 1910 an increasing number of farmers seeded sweetclover in small grain, which was pastured in the late summer and fall of the seeding year and again in the second year of growth, giving unusually large acre returns. The loss of animals from bloat on sweetclover pasture became so serious in some parts of the state, however, that the use of this legume for pasture, except in mixture with other clovers and grasses, has been considerably reduced.

Although the native grasses could not maintain themselves as pasture with close, continuous grazing, this was not the case when they were allowed to make their full growth and were harvested for hay late in the season. Native grass stands maintained themselves for many years when harvested as hay. In general the acreage of the native grasses went out rather rapidly, because under Iowa conditions the improved grasses and clovers were more palatable and nutritious. Also, it was practically impossible to re-establish stands of these native grasses once the land had been plowed. By 1910 the acreage of wild grass harvested as hay was down to 845,000 and by 1940 it had almost disappeared.

Agricultural reports from southeastern and central Iowa counties as early as 1860 indicate that more and more timothy and red clover was being seeded at that time for hay, with excellent results. Settlers coming into southeastern Iowa from Ohio and states farther east were familiar with timothy and red clover, and the soil and climate of Iowa were found to be especially well suited to this combination. A mixture of red clover and timothy has continued to be the most generally grown hay crop in southern, central, and eastern Iowa. Red clover and timothy also are used extensively for hay in central and north central Iowa, although farther west in the state this combination gives way to alfalfa or to alfalfa and brome grass. In comparatively recent years the straight seeding of alfalfa has given way to combinations with grasses.

The census of 1910 reported four million acres of hay in Iowa, a little less than one-fourth of which was in wild grass. The total alfalfa acreage at that time was twenty-nine thousand, with practically all of this in the extreme western counties. By 1941 Iowa had slightly over one million acres of alfalfa, with by far the largest acreage still found in the western Iowa counties. Excellent fields of alfalfa are found in all parts of the state, however.

Timothy, brome grass, reed canary grass, and Canada blue grass, in addition to the Kentucky blue grass, have survived the testing years and continue to be grown in significant acreages in Iowa.

#### TIMOTHY

Timothy is the hay grass which has been grown more extensively in Iowa than any other through all the years of the state's history. Brought in by the first settlers, it was found to be unusually well suited to Iowa's soil and climate. A large acreage in southeastern Iowa, and a somewhat smaller acreage in the northeastern part of the state, is harvested annually for seed. Iowa has continued to lead all other states in the production of timothy seed. The general procedure in harvest has been to cut with a grain binder when the heads were fully mature and the seeds were beginning to shatter, complete the curing in the shock, and thresh with an ordinary grain separator. More recently, the combine has come into extensive use, though the quality of the seed obtained in this manner of harvest is considerably inferior to that cured in the shock.

#### BROMEGRASS

Professor R. P. Speer, director of the Iowa Station, stated as early as 1890 that smooth brome grass was the most promising grass for Iowa

ever grown at the Station. It was not used much in Iowa, however, until after the drouths of 1934 and 1936 in western Iowa, where bluegrass was so generally killed.

Bromegrass has been found one of the best grasses for use in combination with alfalfa on the more rolling lands of Iowa. Its spreading root system qualifies it for soil conservation, where it has found use in waterways, terrace outlets, and sod flumes.

One of the factors that discouraged the use of bromegrass following the drouth years was the fact that some of the seed generally available was of strains or types not best suited to Iowa conditions. Recent tests have shown that the so-called "southern strains" grown in Nebraska, Kansas, and Iowa are better adapted to the soils and climate of Iowa than the northern type. Farmers using the recognized southern strains of Fischer, Lincoln, and Achenbach obtain stands easily with good production the first hay or pasture year. Bromegrass and such high-producing legumes as alfalfa or red clover make an unbeatable combination as a forage crop for hay and pasture purposes.

#### REED CANARYGRASS

Reed canarygrass, unlike other cultivated grasses grown in the state, is native to Iowa. It originally was found in poorly drained areas, where water may stand for months at a time. It forms a very heavy, deep sod, and from a thin stand will, in a short time, cover the ground completely. Mucky, bottomless quagmires, in which animals became bogged down, when seeded to reed canarygrass have grown such dense sod that animals can pasture freely or the growth be mown for hay.

Strange as it may seem, this grass also has been found to be one of the most drouth-resistant and productive grasses on upland soil. In the hot, dry seasons of 1934 and 1936 it was the one grass that maintained its green, succulent appearance on uplands when other grasses became dry and brown.

In recent years considerable attention has been directed to this grass because of its apparent value in erosion and gully control. It is particularly adapted for use on overflow and poorly drained soils along stream bottoms, and in peat and muck areas. With one of the strongest and heaviest root systems of all the common grasses it is ideal for waterways, sod flumes, and along the waterline of farm ponds. It is believed that up to a million acres of Iowa land are suited to the growing of reed canarygrass. Considerable selection work done by the Iowa Station since 1920 resulted in an improved strain recently released as Ioreed canarygrass.

## REDTOP

Redtop, like timothy, came into Iowa with migrating farmers from states farther east. It is mentioned repeatedly in the earliest records on Iowa agriculture. Its growth is mostly as a volunteer catch in permanent pastures, usually in mixture with Kentucky bluegrass. It thrives on distinctly acid uplands and is especially well suited to poorly drained bottoms. It is not regarded highly as hay or pasture since the feeding value is relatively low and the plant readily becomes unpalatable as it matures.

## CANADA BLUEGRASS

Canada bluegrass is another of the grasses found volunteering freely on a rather large part of the permanent pasture areas in southern Iowa. As lands become thin and unproductive, Kentucky bluegrass is replaced by Canada bluegrass. Pure stands of Canada bluegrass are likely to be found on steeply rolling pastures of the thinner side hill slopes, with Kentucky bluegrass in pure stands or in mixture with redtop on the more level ridge tops and on the more fertile bottomland areas.

Canada bluegrass is regarded as much less desirable than the Kentucky bluegrass since it produces few basal leaves, and such leaves as are borne on the stem are relatively small. When once grazed off, there is very little recovery during the balance of the season. This grass is easily distinguished from Kentucky bluegrass by its flat stems and bluegreen color.

Legumes, like the grasses, differ in their values under different soil conditions and for different uses.

## RED CLOVER

Red clover was the first legume to be grown extensively in Iowa. It was first planted extensively in southeastern Iowa where, as land was cropped through a period of years, the need for a legume in the rotation became apparent. Red clover bacteria apparently were naturally present in the soil. Good stands usually were obtained from the very first. As cropping continued the soils became increasingly acid in reaction, but since red clover has a rather high tolerance to acid soil, it made satisfactory growth under soil conditions which would have made alfalfa or sweetclover growth impossible. The acreage of red clover has continued to be largest in the southeast third of the state where it is ideally suited to rotations there and to a wide variety of soils. In this area many seedings of straight red clover are made,



often the second cutting being harvested for seed, but more generally for hay.

If the plants are cut when in full bloom, a vigorous second crop comes on. Iowa is one of the most important red clover seed-producing states, though we do not usually produce as much seed as we use. Seed yields have not been large as a general rule. It is necessary for insects to visit the red clover flower in order to bring about cross-pollination. Flowers of this plant are generally self-sterile. The bumblebee is ideally suited to the fertilization of the red clover flower, but with the increased proportion of land under the plow, bumblebee nesting places have been generally destroyed. Honeybees have been observed working red clover extensively in certain seasons, but are likely to neglect the red clover when pollen can be obtained more easily from flowers of other species.

An acreage greater than that of straight red clover is seeded with timothy, to which alsike is sometimes added. This combination is used extensively in eastern and northeastern Iowa where straight seedings of red clover are not common. Comparatively little alsike is seeded alone in Iowa as it does not give the second cutting usually had from red clover.

#### ALFALFA

Alfalfa first made its appearance in Iowa on a significant acreage in the southwestern counties in the late nineties, coming in from Nebraska and Kansas. This crop gave large yields and grew thriftily on the Missouri River bottoms, as well as on the deep, loess upland soils of this area. Small trial plantings by individual farmers throughout the state, however, were not generally successful, owing to the fact that many of the soils were acid and the proper bacteria not present. Little or nothing was known of the acidity of Iowa soils at that time. It was assumed that because alfalfa was successful in western and southwestern Iowa and that good results were obtained from plantings by the College at Ames without liming and without inoculation, that the same condition might be expected to prevail in other parts of the state.

In 1910 some thirty-five farmers in different parts of Iowa made experimental plantings of alfalfa in co-operation with the Experiment Station. Part of each of these plantings was limed, another inoculated, and still another both limed and inoculated. The results reported by the Experiment Station in 1913 showed that for success with this crop in most parts of Iowa it would be necessary to apply finely ground limestone to correct the soil acidity, and to inoculate, since the bacteria

necessary to enable alfalfa to take the nitrogen from the air were not generally present.

With this information available the acreage planted to alfalfa increased rapidly throughout the state. The heaviest plantings continued to be made on the deep, porous loessial soils of western and southwestern Iowa where liming was not necessary, but successful fields of alfalfa were soon found in every Iowa county. In 1910, total alfalfa acreage was slightly under 25,000. This increased steadily and rather rapidly, with a peak of 1,134,000 acres in 1942.

After the Grimm variety came to be recognized generally as a particularly winter-hardy variety, the more progressive farmers insisted upon getting certified seed of this, and no other. Early in the twenties, however, a wilt, a disease previously unknown, made its appearance. Prior to that time seedings of alfalfa often continued productive through as many as six to ten years. Stands thinned and became unproductive by the end of the third year—sometimes sooner. Grimm, which had been generally accepted because of its winter-hardiness, became undesirable because of marked susceptibility to wilt. Two varieties introduced from abroad, however, proved wilt-resistant, and alfalfa acreage has increased steadily. One of these new strains, brought in from India and first tested extensively in northern Montana and later by the Iowa Experiment Station, was Ladak. It was found to be somewhat wilt-resistant and winter-hardy, as also was the Cossack variety. More recently two new varieties markedly superior in wilt resistance, Ranger and Buffalo, have been developed by the United States Department of Agriculture in co-operation with the different state experiment stations.

#### SWEETCLOVER

Sweetclover, a legume but not a true clover, was long regarded as a troublesome weed. As early as 1900, however, an occasional Iowa farmer was using it for pasture and for soil improvement purposes. One of the outstanding pioneers was Frank Coverdale, a farmer near Maquoketa, who not only used the clover extensively, but with a crusading spirit went out to sell it to the world. He wrote extensively for agricultural journals and addressed farm groups at every opportunity. By 1910 it was not uncommon to see fields seeded to sweetclover, and by 1920 it was seeded very generally on the nonacid soils of western and northwestern Iowa.

The sweetclover has a very hard, dense seed coat so that the seed at maturity cannot absorb moisture and germinate promptly. Many

seedings failed to make stands until the "Ames Scarifier," invented by H. D. Hughes, was released by the Station in 1913. It was adopted immediately by many seed growers and most seedsmen. It is credited with making the use of sweetclover as a field crop possible. Seeds put through this equipment are scratched and the seed coat softened so that after scarification excellent stands are obtained from seed which otherwise would fail entirely. The scarification of sweetclover seed has come to be recognized as essential.

Educational and research agencies came generally to advocate the seeding of this legume, because of its value in soil improvement as well as in mixtures for pasture. Its use became general throughout the Corn Belt and over an even larger area wherever soils were sufficiently sweet to permit its production.

Because sweetclover was generally seeded in small grain and plowed down late the same fall or early the following spring as a means of adding nitrogen and organic matter to the soil, it has never been possible to get data on the acreage planted. The only count on sweetclover acreage is on that held over for the second year to be harvested for seed, as hay, or used for pasture. Such acreage was but a very small percentage of that seeded. It has been estimated roughly that perhaps two million acres were seeded annually.

Biennial white sweetclover at first was grown more extensively than the biennial yellow. Greater persistency of the yellow and the fact that it produced seed much more generously led gradually to the more general acceptance of the yellow flowered species. Most seedings in recent years have consisted of a mixture of the biennial yellow and biennial white kinds. A superior new yellow, known as Madrid, is now becoming available.

In 1919 seed of an annual, white flowered sweetclover was given wide distribution by the Iowa Experiment Station. This clover has come into extensive use in certain sections of the country, under the name of Hubam clover. It is grown most extensively on the heavier soils in the Cash Grain Area in northwest central Iowa, where it is particularly desirable to plow in the fall. Hubam is also grown in the cotton area of southern Texas and the sugar beet area of Colorado.

#### SOYBEANS

Soybeans for many years were considered a forage in Iowa. At least 60 per cent of the crop was cut and used for hay. War needs for increased supplies of oil and high protein concentrates increased soybeans from a few thousand to over two million acres annually.

Almost all is harvested for the mature beans, the crop going to soybean processing plants for oil extraction.

The first extensive planting of soybeans in the state was in southeastern Iowa, where the common procedure was to drill the beans with a small grain drill, cut them with a mower, and handle as any other hay crop. Although soybeans respond to liming and fertility they can be grown with great success on distinctly acid soils where alfalfa and sweetclover cannot be grown, and where most other legumes make a rather unsatisfactory growth.

A little later a considerable acreage developed in northeast central Iowa, where the crop was used with great satisfaction as a high protein hay and also as a concentrate in the feeding of dairy cattle.

As the demand for an increased acreage of soybeans developed in World War II, the big expansion came on the level soils of central and northwest central Iowa, where soil erosion is least likely to occur. On the more rolling soils, serious erosion sometimes was associated with the soybean crop.

Korean lespedeza was first introduced into the Corn Belt by the United States Department of Agriculture. Extensive seedings were made in southern Iowa. This legume is an annual which must reseed, carrying over from year to year by volunteer seeding. Even in southern Iowa the season is hardly long enough to insure seed maturity although in Missouri the lespedeza acreage is now estimated at about fifteen million. Earlier-maturing strains have been developed by the Iowa Experiment Station, however, and as these become generally available it is anticipated that lespedeza will come to play a very important part in pasture improvement on the less fertile, acid soils of southern Iowa.