



# A History of the Agricultural Research Center—Hays

## THE FIRST 100 YEARS



Bulletin 663  
Kansas State University  
Agricultural Experiment Station  
and Cooperative Extension Service

# **A HISTORY OF THE AGRICULTURAL RESEARCH CENTER—HAYS**

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## **THE FIRST 100 YEARS<sup>1</sup>**

*William M. Phillips<sup>2</sup>*

### **SUMMARY**

This history discusses the development and accomplishment of the Agricultural Research Center—Hays (formerly the Fort Hays Branch Experiment Station) over its first 100 years from 1901 to 2001. It focuses on two major areas: administration/physical facilities and research programs and also includes shorter sections on the forest nursery, the state park, support personnel, and community involvement. Appendices present reprints of resolutions and acts relating to the founding and organization of the Station, a list of administrative and research staff, a roster of former and current employees, and an extensive list of publications by staff members.

### **ACKNOWLEDGMENTS**

In 1996, Dr. Patrick Coyne, Head, Western Kansas Agricultural Research Centers, began urging me to write this history. By early 1998, my resolve not to do so weakened and I agreed to proceed. Since then Pat Coyne, his faculty, and several of his staff at the Agricultural Research Center-Hays (ARCH) have actively supported my efforts. Special thanks are due Pam Ball, Office Manager at ARCH, for compiling and typing the extensive publications list and employee roster and preparing the revised manuscript. Joe Becker, ARCH Grounds Manager, aided in finding suitable illustrations and researching background information on the German prisoners of war. I also thank Eileen Schofield, Senior Editor, Department of Communications, for editing the final manuscript and revising and expanding the publications list, and Fred Anderson, graphic designer, Department of Communications, for formatting and cover design. I obtained information from many printed sources and from recollections of many people. The most important printed sources were Kansas Agricultural Experiment Station [Bulletin 453, A History of the Fort Hays \(Kansas\) Branch Experiment Station 1901-1962](#), by Leland E. Call and Louis C. Aicher<sup>3</sup>, published in May 1963 (available at <http://www.oznet.ksu.edu>) and annual reports written by the Superintendents. With only a few exceptions as noted, I have not cited specific sources of information, nor does this publication duplicate all of the detailed discussions in Bulletin 453. Errors in fact and interpretation are the sole responsibility of the author, whose association with the Station has spanned more than half a century. Without the support and help from my wife, Doris Phillips, this task could not have been completed. She did nearly all the typing of preliminary drafts and provided valuable counsel.

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1 Contribution no. 01-100-B from the Kansas Agricultural Experiment Station

2 Emeritus Professor, Agricultural Experiment Station, Kansas State University

3 Available at: <http://www.oznet.ksu.edu>

## **COVER PHOTOS**

*Clockwise, starting at upper left photograph:*

1. Entrance sign welcoming visitors to the Research Center.
2. Recent aerial panorama of the Agricultural Research Center–Hays (photograph taken in 2000).
3. Recent shot of the main office, which was constructed in 1931.
4. An illustration of present day research. Georeferencing for precision agriculture research using a Trimble Ag132 backpack global positioning system (GPS) unit and a hand-held computer.
5. Current photograph of the superintendent's home, which was completed in 1927.

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## INTRODUCTION

This publication is meant to provide more than a mere recitation of facts. Rather my aim is to give insight into some of the successes, failures, triumphs, and tribulations that marked the past 100 years at the Agricultural Research Center-Hays. The reader must judge my success or lack thereof. The title reflects the name change that occurred in 1994. Prior to that date, the accepted name was The Fort Hays Branch Experiment Station. Throughout this publication, most references are to the Experiment Station or simply to the Station.

The Military Reservation near Hays, Kansas, was established in October 1865. Known as Camp Fletcher, it was located about 14 miles southeast of the present city of Hays. Camp Fletcher was renamed Fort Hays in November 1866 and relocated in June 1867 to its position adjacent to the city. After the railroad construction was complete and the threat of hostile Indian attack subsided, the Fort became surplus to the needs of the United States Army. Near the end of the 19<sup>th</sup> century, the Reservation was turned over to the U.S. Department of the Interior for disposition. In 1895, with remarkable foresight, Mr. Jno Schlyer, a State Representative from Ellis County Kansas, petitioned the Legislature to pass a resolution to be sent to the United States Senate. This resolution requested that the entire Reservation be donated to the State of Kansas for (1) a western branch of the Kansas Agricultural College, (2) the western branch of the Kansas State Normal School, and (3) a public park. Subsequent resolutions, legislative acts, and actions by the State Board of Regents established the branch experiment station and provided the first appropriation of State funds. In 1901, \$3,000 was authorized for the fiscal year ending on June 30, 1902, and the same amount was made available for the following fiscal year. Although developments of the college and park are important, this publication will not discuss

them except as they relate to the Experiment Station. Several of the enabling resolutions and acts, together with some discussion, are included in Appendix A.

Mr. Schlyer probably did not foresee the impact on agriculture that the Station would have over the next 100 years. His purpose in 1895 was to provide research and demonstrations to help farmers in the immediate area who were struggling to eke out a living on land and under climatic conditions considered at that time to be barely suitable for crop production. Certainly, the Station has provided help for area farmers. But its influence also has spread across the state, the nation, and even the world.

The Station history includes many facets, all of which are intertwined but yet separate. So the remainder of this publication is divided into two main sections: (1) Administration and Physical Facilities and (2) Research Overview. In addition, brief discussions of the state park and the state forest nursery are included. Development of the physical facilities is a fascinating story. Administrative leadership certainly played an important role in all facets. Individual scientists doing the research always have been the keys to developing improved agricultural practices. Many of these individuals have served 20 to 40 or more years as dedicated scientists, thus providing continuity for the many complex studies that result in more efficient agricultural production.

**Page 40** contains a list of administrative and research staff. Some of the research projects have been ongoing since early in the century. Other work began later, and some studies were conducted for a time and then terminated. All research projects evolved as knowledge was gained and as needs of modern agriculture changed. But research findings are of value only after they have been made available to farmers and the

scientific community. Thus research is not complete until results have been presented or published in state or federal reports, and scientific journals. Station scientists have made countless public presentations, most of which cannot be documented fully. A bibliography of more formalized publications is presented in Appendix B. This brief history will summarize only some of the many important findings that have been attained over the years. Readers interested in detailed research results should refer to the publications.

Success most often is credited to administrators and research scientists, whereas the role of support personnel, such as research technicians and assistants, farm laborers, equipment operators, and office employees often is overlooked. A roster of present and past employees is presented in Appendix C. During the past 100 years, many of these employees have served even longer than the long-term scientists. Without their dedication, many of the research discoveries would have been delayed.



*Panorama of the Station, c.1926.*

# ADMINISTRATION AND PHYSICAL FACILITIES

## EARLY YEARS, 1901-1921

Establishment of the Station was greeted with skepticism and even resentment. Skepticism arose because few people believed that the area would ever support profitable agriculture, and the idea of using a scientific approach to solving agricultural problems was foreign to most people. Resentment stemmed largely from settlers who occupied part of the land after the Fort became inactive and before it was given to the State. The Board of Regents recognized this circumstance and in 1901 passed a resolution that attempted to alleviate the problem (see Appendix A). The resolution provided the mechanism for solving the dilemma but certainly did not satisfy those occupying the land. The matter finally was settled when the Board of Regents executed leases that permitted the claimants to remain on the land from three to five years, after which all future claim was relinquished.

Fortunately, College of Agriculture officials ignored the skepticism. Other agricultural leaders also saw potential for developing a valuable resource. In 1901 and 1902 several editorials appeared in popular agricultural publications. Here are two examples.

From THE INDUSTRIALIST, January 1901:  
"F.D. Colburn, Vice-president of the college regents, is very enthusiastic over the possibilities of having, on a large and decisive scale, an experiment station in the western half of the state, right at the navel of the continent as it were, and thinks a failure to make it in time the foremost example of its kind in existence an inexcusable and short-sighted folly. The body of land is ample, its quality entirely typical of both the high prairie and the creek 'bottom' and its situation every way superb."

From KANSAS FARMER, May 1902 an editorial entitled: "A Big Experimental Farm":  
"The Kansas State Agricultural College has just come into full possession of, and beginning work on, a part of the abandoned Fort Hays Military Reservation. The body of the land contains 4,000 acres, practically all

of which is tillable land and representative of the vast area through western Kansas, Nebraska, Oklahoma and Colorado. . . . This location being typical of the Great Western Plains is expected to make a great experiment station. A thousand acres or so will be reserved for pasture and breaking at future times. A large area of alfalfa will be planted and other areas devoted to trials of various forage plants that may be adapted to the west. Fifty acres of land is being prepared for planting forest trees next spring and undoubtedly a whole quarter section will later be developed to this. . . . The branch station will bear the same relationship to the agricultural college as any of its various departments. It is not expected that any money of the national appropriation for the Experiment Station can be used here, as it is already inadequate to the needs at Manhattan. The Fort Hays Branch will rely on its own resources and the generosity of the state. The appropriation for the years 1902 and 1903 is but \$3,000 per annum, which is hardly sufficient to make even a semblance of beginning."

In December 1901, the Board of Regents adopted a resolution that dealt with management of the Station (see Appendix A) and appointed a Regent member, Mr. Fairchild, to take charge. The resolution also provided that "a practical farmer be employed, who shall be known as foreman of the farm....". The Board of Regents selected the Station Superintendents until 1906. Mr. J.G. Haney was appointed on March 29, 1902. He assumed his duties as soon as the title to the Reservation was reported clear by the Kansas Attorney General. His appointment generally was regarded as a positive step. He was a Kansan with a degree from Kansas State College and had worked for several years in New Mexico in field and livestock research. Unfortunately, he remained at Hays for only about two and one-half years. Available records indicate that, although demonstration plantings of several field and garden crops were made as early as 1902, little actual research was carried out during that time. This should not be surprising, because the emphasis had to be on development of physical facilities, i.e. buildings, roads, and fences. In 1903 (fiscal year 1904), the State

Legislature appropriated \$27,000 for support of the Station. Much of this was used for beginning construction of the physical plant. During Haney's tenure, several buildings were moved from the military compound to the Station campus. One of these was used as the Superintendent's residence and later as residence for a member of the research staff. Other buildings were used as general farm structures. Some buildings at the Fort were dismantled, and the lumber was used to construct additional farm buildings and a 14-room house for workmen.

Along with the building program, 1902 saw the beginnings of the Station as a demonstration farm. This was in line with directives from the Board of Regents. Minutes of a 1902 Board meeting stated in part "The (Station) management is accordingly instructed to pick up outside men and teams to whatever extent is necessary to keep the farm work in line with the best farm management". This was not accomplished easily. Lack of draft animals and labor precluded farming on the scale required by the large acreage involved. More importantly, farming methods suitable for the area were not well understood. Methods used in areas of higher rainfall resulted in soil erosion by the strong winds. Later, research and the advent of power equipment resulted in the type of farm the Regents envisioned in 1902. That demonstration aspect of the Station continued to be important even as the extensive research program developed.

Although the large fields may not have been managed as desired, small areas were used for demonstration plantings. In 1902, the following crops were planted: five varieties of macaroni wheat (probably durum), three varieties of sorghum in rows, thickly sown sorghum and sorghum and kafir mixtures, barley, soybeans, cowpeas, alfalfa, bromegrass, melons, peanuts, and garbanzos. A grass garden with 31 varieties and species was laid out, and several tree and shrub species were planted. In addition, a garden area was planted to potatoes, Jerusalem artichokes, corn, cowpeas, soybeans,

sorghum, and rape. Little information concerning results and observations of these plantings has been located, but it seems remarkable that so many different species were planted so early in the Station's history.

Haney established a forest nursery in 1903. This must be regarded as a most significant accomplishment, which involved planting 1,000 deciduous forest trees, 4,000 cedar and pine trees, 300 fruit trees, and 500 vines. As will be seen, this was the first of many nursery plantings made during the next 50 years. These early nurseries provided trees for establishing shelterbelts, orchards, plantings in the State Park, and some landscaping of the Station campus. The fruit trees included several varieties of apple, plum, and peach. Some of them began bearing fruit about 1910, but the hot summer temperatures, high winds, low rainfall, and finally cold temperatures took a heavy toll. As the original trees died, they were replaced with cherry trees.

Haney resigned effective December 31, 1904. Mr. O.H. Elling was appointed Acting Superintendent in April 1905. Elling had served as farm foreman under Haney and, therefore, was well acquainted with the operation. But he apparently had little technical training and held the position only until March 1907. Demonstration plantings were continued, and in 1905, 8,000 additional trees were planted in the forest nursery. The trees planted earlier had grown well, and in 1905, about 2,500 of them were transplanted to the State Park. In 1906, one of the oldest buildings on the Station, a large horse barn, was struck by lightning and burned. A new barn was built in 1907, and later it served as the seed house.

Although much of the activity on the Station during these early years was devoted to demonstration-type work, as early as 1905, the U. S. Department of Agriculture (USDA) became aware that the location had promise for significant research studies. Some modest federal financial support for cereal crops research was received in 1905, and the Division of Dry-

land Agriculture, USDA, established a research project at the Station in 1906. Further, the USDA began supporting forage crops research in 1913. Thus, most of the active crops research was financed at least partially by USDA. The state, for its part, provided some labor, the land, and other physical facilities. Cooperation with the Department of Agriculture will be detailed further as the individual research projects are discussed more fully in some of the following sections.

In a few years, it became apparent that an administrator with greater authority and executive power was needed to replace the Regent manager. In 1906, the President of the College, together with the Board of Regents, appointed Dr. C.W. Burkett as Director of the Kansas Agricultural Experiment Station. His responsibility included planning and supervising Station operations wherever they were conducted throughout the State. Thus Burkett had direct administrative supervision over activities at the Hays Station and was responsible for appointing Superintendents. He appointed Mr. C.K. McClelland as Superintendent effective May 1907. McClelland had been employed by the Office of Farm Management, USDA, and had been associated with Dr. Burkett in Eastern United States. As with the appointment of the first Superintendent, Haney, McClelland appeared to have had the necessary qualifications to provide excellent leadership. Apparently he did not find conditions at Hays to his liking and resigned on December 31, 1909, less than three years after assuming his duties. Little information is available concerning Station activities during his tenure. Some additional buildings were constructed, demonstration plantings continued, and cooperative research with USDA was well underway.

During the several months following McClelland's departure, Mr. George K. Helder, Assistant Superintendent, was in charge of the Station. On June 1, 1910, Professor A.M. TenEyck, Head of the Department of Agronomy, Kansas Agriculture College was transferred to the Hays Experiment Station.

Dr. H.J. Waters, President of the College, felt that the Station was an important part of the College and that it could be strengthened by this appointment. Unfortunately TenEyck and the Dean of Agriculture and Director of the Experiment Station, Edwin H. Webster, did not work well together. TenEyck resigned effective December 31, 1912, but seems to have abrogated his duties several months prior to that date. Assistant Superintendent Helder again was called upon to oversee the work, and he was appointed Superintendent on July 1, 1913. Helder was one of the few employees that provided some continuity during the early development of the Station. He was employed first in March 1904, and, in his words, "in almost every capacity for which there seemed no special employee to do the particular work needed".

In his 1912 annual report, Superintendent Helder wrote that the Board of Regents had desired annual reports; but he believed that this one, written in early 1913 and covering the work primarily of 1912 but also some previous results, was the first complete report. He pointed out that the summer of 1912 completed the first decade of the Fort Hays Branch Experiment Station. By then more than 2,000 acres were under cultivation, after a very modest beginning in 1902 when only a few acres were producing crops. Helder wrote that from one pony purchased in 1902, work stock had increased to more than 60 horses and mules in 1912. In that year fire again destroyed a barn and killed 21 horses.

Improvements to the physical plant were ongoing during the first 10 years, but there seemed to be an upsurge in 1912. Some new barns and other buildings along with fences and roads were constructed in that year, and several administrators over the years had a penchant for rearranging buildings on the campus. Helder also moved several buildings. This was the first reported shuffling, but no doubt the attractive campus enjoyed today had its beginning early in the century. In 1910, the Board of Regents had directed that the State

Normal School furnish electric power to the Station. This was soon changed, and power was purchased from the City of Hays. By 1912 electric lines were extended to all of the buildings on the main campus. With less dependence on kerosene lamps and lanterns, the fire danger was lessened. Also the telephone system was reported to be "almost complete" in 1912. One must wonder as to its extent. This author recalls the phone system in 1948 and for a few years after when (except for phones in residences) there was one phone in the office hallway and probably one in the Superintendent's office. For many years, the Station telephone number was simply 123, given orally to an operator, who then rang the office. Long distance calls were rare, but even as late as 1970, some restrictions on toll calls were in place.

In 1912 the livestock project was still largely unorganized, although efforts had been made to purchase a herd of beef cows. The stated purpose of the beef herd was to study and compare the four popular beef breeds. Thus 25 heifers along with a purebred bull of each breed, Hereford, Angus, Shorthorn, and Galloway, were purchased. During the early years, the research seemed to have little guidance or direction. In addition to the beef cattle work, the dairy project was formalized in 1911. Silos and other facilities were constructed specifically for the dairy.

Livestock research became more structured after 1912. The first of many Roundup publications was prepared in 1913 as a mimeographed circular, and in 1914 a more formalized publication was printed. The cover of the publication indicated that on Friday, May 1, 1914, "Stockmen and cattle breeders of Kansas, Colorado, and the Panhandle (presumably Oklahoma) will be entertained". The circular did not contain specific research results, but just listed the activities of the day. The full-day event included some observations of the livestock and physical facilities; a noon lunch (again the first of many); introductions; and talks by the Station Superintendent, the Director of the Kansas Experiment Stations, and

livestock specialists. Alex Philip, a well-known local rancher, presided. The circular stated that the main purpose of the meeting was to present results from studies of maintenance rations fed to breeding cows; heifer breeding; and the comparative values of corn, kafir, and sorghum silage in beef heifer rations. Comparative values of several protein supplements also were discussed. With only minor exceptions, a similar format has been used for the Roundup programs over most of the next 75 or more years.

Helder continued to write detailed reports throughout his tenure. During that time, some of the financial record-keeping systems were initiated. Before then, organized control of financial matters seemed to be lacking. His reports also described various other improvements, including purchase of machinery, additional building construction, and expansion of several phases of the research and demonstration work. Also during that time, the Board of Regents instructed the Superintendent to assume some responsibility for overseeing the Normal School lands that were leased to individual farmers. Although some of the tenants were excellent farmers, others were not following satisfactory methods. The school officials were criticized for allowing the land to be misused, and the Regents hoped that the change in management would alleviate the criticism. It is not clear how long the Station Superintendent continued to oversee those operations. Later the Normal School (Fort Hays State University) assumed full control. In the mid-1930's, the Station leased part of the college land. The first lease involved about 460 acres. The Station later operated an additional 320 acres for a few years, but soon reverted to the original acreage.

Helder served as Superintendent until March 15, 1916, and was succeeded by Mr. Charles R. Weeks. The latter was probably the first Superintendent to effectively articulate what he felt should be the basic goal of the Experiment Station, i.e., to conduct research. When he took over the job, he stated very succinctly that some reorganization of the entire

operation was needed. Although sale of products from the commercial farm had supplied funds to cover many of the expenses, he felt that a more consistent source of income from State appropriations was necessary. He also proposed that the work of the Station be divided into three distinct parts: (1) the scientific research projects, (2) public service and demonstration work, and (3) the commercial farm. He was very outspoken in his support of the Station as a research institution. He wrote: "This Station is primarily an Experiment Station. This fact must not be lost sight of, and it is the duty of those interested in this institution and the farmers in the district that it serves, to lose no opportunity to give this information to the Legislature and others interested. If this is not an Experiment Station, why should the State handle it at all?" He pointed out that much of the scientific work was being done cooperatively with USDA and the Kansas Agricultural Experiment Station and implied that the research would suffer without USDA funds.

Weeks also noted that many of the research projects had been underway for about 12 years and were just beginning to return data

that could be relied upon in this area of uncertain weather. This progress was emphasized by the fact that even in those early years, Station personnel already had begun preparing publications for distribution to farmers, and increasing numbers of visitors came directly to the Station seeking information. The public service and demonstration part of the work was conducted in various ways, including demonstrations on nearby farms. Under Weeks' supervision, the commercial farm was an important part of the overall operation. It was being run as any well-managed farm should be for profitable returns.

Many of the Station improvements were possible only because money generated by the sale of products remained in the fee account for use at the Hays location. Then, as now, the farm produced livestock feed and pure crop seed. The livestock were used to generate research results and then marketed. Thus, much of the feed crop production was marketed through livestock. Seed sales not only generated money for operations, but, more importantly, provided pure seed of improved crop varieties to farmers. But as Weeks continued to point out, depending on these sales to provide



*These teachers came in 1917 to study sorghum varieties.*

for most of the operating expense was dangerous because of the great variation from year to year.

Following Weeks' resignation on May 1, 1920, Prof. Harry L. Kent was appointed Superintendent of the Station. Kent had been working in an administrative position in the College of Agriculture in Manhattan before his transfer to Hays. There is no question that he was an able administrator, but he did not seem to work well with college officials in Manhattan. As a result, he stayed only until the middle of September 1921. Following his resignation, he went to New Mexico as President of New Mexico State University and served for many years in that capacity. He apparently was a talented individual who simply became dissatisfied with working conditions in Kansas.

Detailed reports of the developments at the Station from 1918 to 1922 seem to be largely lacking. This lack no doubt relates to the rapid turnover of personnel in administrative positions. During the first 20 years of the Experiment Station's existence, seven different men had served as Superintendent, including Elling, who was Acting Superintendent for about two years. Therefore the apparent lack of continuity in the overall operation is not surprising. Each individual had his own ideas about the importance of the various activities and, as a result, many programs did not progress as might have been desired. However, some important advances did occur.

The demonstration plantings of many food and feed crops, road and building construction on the Station campus, establishment of the forest nursery, and subsequent planting of forest trees in the State Park played important roles in the Station's development. The early vegetation trials seem to have been conducted primarily by the Station Superintendent and laborers under his direction. The forest nursery began as early as the spring of 1903 when various species of trees and shrubbery were planted. In 1907, a shelterbelt was established south of the Station headquarters.

Early photographs show almost no trees, so the campus plan and landscaping of today had their beginnings in these early years. In 1910, a State Forester was appointed, and the nursery began producing large numbers of seedling trees for distribution. Changes in leadership of the nursery somewhat paralleled the changes in superintendents during the first 20 years. Some 11 or 12 different individuals acted as project leaders in the forest and nursery work. This turnover of personnel continued albeit at a lesser rate until 1951 when the State Forest Nursery was closed. Since that time forestry activity has been limited, although some experimental tree plantings have been made in recent years.

The sale of pure seed to farmers began early in the century. This service aspect grew in importance and continues to be highly significant. The wheat varieties Kharkov and, later, Kanred, were improved selections from Turkey and were the first of many varieties developed in Kansas and sold by the Station. Pink Kafir was an important high-yielding grain sorghum. It was grown along with other grain and forage varieties, and seed was sold. These varieties predated the development of the dwarf sorghums now widely grown for grain. In total, many thousands of bushels of wheat, kafir, forage sorghum, oats, barley, corn, and alfalfa were provided to farmers throughout Kansas and surrounding states.

Some of the buildings constructed during those early years are still in existence today, although many of them deteriorated and were torn down and replaced. The L-shaped frame buildings, known for many years as the mule barns, were built in 1911 to serve as shelters for the work animals and later were used to house trucks, tractors, and other farm equipment that replaced them. Modern buildings now have replaced these wood frame structures. Some residences built early in the century have been demolished, but a few are still in existence and are being used. The overall appearance of the Station changed dramatically during the first 20 years, as buildings were con-

structed and then sometimes moved to different locations. When the Station started, of course, little or no machinery was on hand. This had to be purchased, and work stock obtained. But for a few years, part of the work was done under contract with local farmers who had extra time and work stock that the Station could hire.

Most importantly, the Station began to be recognized as an important research institution. Crops-related research projects, partly fi-

nanced by the USDA, were well underway. Some of the USDA scientists did provide continuity that had been lacking in these projects. The beef cattle herd was established, and feeding and management research assumed increasing importance. A commercial dairy was started, but only limited research work was conducted. A sizable swine project was underway, and at least for a short time, some sheep were involved. The swine and sheep provided minimal research information, but their management could be observed by visiting farmers.



*School boys and their teacher from Webster, Kansas, visited the Station in 1920.*

## **THE AICHER YEARS, 1921-1952**

No one at that time could have recognized the importance of Mr. Louis C. Aicher's appointment as Superintendent in 1921. As we look back over the early years, it is apparent that each of the several Superintendents played a part in the early development of the Station, but the tenure of each was short. However this trend changed with Mr. Aicher's appointment; he would serve as Superintendent for 31 years. The reader will note that all references to him are as "Mr. Aicher". This is in no way accidental. Few or none of his professional or non-professional staff would have presumed to address him as "Louie". Yes, he was in many ways autocratic, and his decisions were authoritative; he was not universally liked, but was widely respected. He believed he had the best Experiment Station in the world. Probably more than any other individual, he prepared the Station for the second 50 years. This writer had great admiration for him. As a young, inexperienced

staff member, I fondly recall late night conversations with him in his office after the day's work was done.

Soon after his arrival, it was apparent that Mr. Aicher would make major operational changes. One of the first was to combine many of the small fields into large contiguous blocks of land that were adapted to using larger machinery. He began buying power equipment and at the same time began reducing the number of horses and mules on the Station. During the mid-1920's, he reported that he believed, with the power equipment, the Station could be operated with some 60 horses and mules. At that time, it was not uncommon to have 65 to 70 draft animals in the field on any given day, with some held in reserve. We now know that this number decreased rapidly with the advent of additional machinery. Mr. Aicher did state that some draft animals always would be needed. So, even he, with his mechanical insight, did not foresee the complete change to



*In 1925 only a small, inadequate greenhouse was available.*

tractor power. Mr. Arthur F. Swanson, Cereal Crops Project Leader, was the last to change. He continued using horses for power until the late 1940's. He felt (perhaps correctly) that tractors caused too much soil compaction.

Mr. Aicher also quickly and significantly changed the livestock program. Prior to his arrival, the beef cattle work was confined primarily to some small feeding trials and comparisons of four and then two beef cattle breeds. He felt that maintaining separate cow herds of two breeds, Hereford and Galloway, was inefficient and difficult to manage. He soon disposed of the Galloways and began developing what turned out to be one of the very finest nonregistered Hereford cow herds to be found anywhere. Purebred bulls always were used, and only the best heifers were retained as replacements. Bulletin 453 gives a detailed description of the selection and breeding that resulted in this excellent beef cattle herd. Although he worked cooperatively with animal scientists at Kansas State College for some of the complex nutrition studies, he oversaw all of the livestock work and assumed sole responsibility for managing the cow herd. Not until 1946 when the pasture management research

project was initiated did he relinquish any control of the livestock research.

Comparatively few changes were made in the crops research programs during the early part of Mr. Aicher's time as Superintendent. Cereal crops, forage crops, and dryland agriculture projects were lead by USDA scientists. Some of these project leaders had been on the staff for several years prior to Mr. Aicher's coming to the Station, and some remained active for many years after. In 1929 the USDA initiated soil conservation studies at the Station. Although the USDA soil conservation employees remained for only a few years, Mr. Aicher continued the research well into the 1940's.

Field bindweed, the difficult-to-control, deep-rooted, perennial weed, had been a problem on many of the fields since the beginning years of the Station. It probably was introduced as a contaminant in seed wheat prior to 1900. Some control was accomplished with repeated tillage. Early research involved heavy applications (as much as 20 tons per acre) of common salt. The salt eliminated the weed, but unfortunately affected soil productivity and physical properties for 50 or more years. A new herbi-



*Three 6-mule teams blank listing prior to seeding sorghum in 1926.*

cide, sodium chlorate, became available in the 1920's. The crops research scientists did some of the pioneering work to determine its effectiveness, and it quickly replaced sodium chloride as the herbicide of choice for treating small areas of bindweed. A new project was started in 1935 when the USDA began financing bindweed control research. Although some of the Station fields had bindweed, the infestations were not uniform, so heavily infested adjacent land owned by Fort Hays State College was leased for the new project. Thus began one of the premier bindweed studies. In a few years, the bindweed project branched out into other phases of weed control.

Mr. Aicher soon relocated the first of many buildings that he would move. The dairy had been losing money for many years and was providing little or no experimental data. So in 1922, only about a year after arriving, he moved the dairy herd operation and the dairy barn from the site about a mile south of headquarters to the headquarters area. There the dairy could be supervised more closely. That barn is still in place in the livestock area. After the dairy herd was dispersed, the building served several functions including the first au-

ditorium and later a nutrition laboratory. He soon built a brick structure to house the swine operation. This piggery was large enough to take care of 35-40 sows and, although the work with swine did not involve much research, the swine project remained on the Station until about 1950.

The list of buildings constructed and changes made in the physical plant between 1922 and 1927 is indeed impressive. In 1925, the first significant greenhouse was erected to replace an old small greenhouse. Some beef cattle barns were moved from the south end. Mr. Aicher recorded moving the old sheep shed and rebuilding the old buggy shed, but neither of these buildings was identified further. He remodeled the old stone barn located at that time near the present auditorium. The barn later was moved to make room for the present-day auditorium. He completed the two-story wooden machine shed that now houses the maintenance shop on the lower level. Originally, the machine shop occupied that area. The roof on the old sheet-metal machine shed, the present metal building that sits east of the office building, was replaced. The dryland agriculture field buildings were erected to accom-



*Baling hay directly from the field in 1926. This may be the first pick-up baler ever used.*

moderate that research project. The boarding house, known without affection by the employees living there as the “Hotel”, required extensive repair as did several residences. The main water tower had been built in 1920, but it leaked badly and was repaired in 1927. New scales were purchased and put in place. All of this building and repair work was culminated with construction of the new residence for the Superintendent that was completed in June 1927. This solid brick, three-story building replaced a frame house reported to be rat infested from basement to attic. The new house (once described by Mr. Aicher as the “new cottage”) cost \$12,000, which was paid from the Station fee account. This was the first of the impressive brick buildings constructed between 1926 and 1951.

The first two tractors owned by the Station were purchased primarily to provide belt power, but they also began replacing some of the animal power used for field work. Mr. Aicher purchased the first combine, a 20-foot cutter bar Holt. He designed many shop-built machines used to alleviate some of the hard work involved in farming operations. A power post-hole digger, possibly the first such ma-

chine, was constructed. Compared to the machines we see today, it was large and cumbersome, yet it would drill a posthole in about 30 seconds as compared to the many minutes of hard labor if done by hand. He also designed and built a pick-up hay baler, again crude by today’s standards but nevertheless a great innovation. He pointed out that its capabilities had little or no limitation if only he could find men who could tie the wires as fast as the baler could bale. This early machine was the forerunner of the automatic tying balers now in use. He also developed a number of machines for various tillage practices, particularly tools adapted to cultivating dryland fields.

Seed sales to area farmers were significant almost from the Station’s beginning. Mr. Aicher quickly realized that this was one of the most important functions of the Station, and he established quality controls necessary to produce and sell only high quality seed. For example, he began isolating the sorghum seed fields from one another to prevent cross-pollination. Seed sales showed remarkable growth. By 1925, sorghum seed had been distributed from the Station into all but eight Kansas counties. In 1930, more than 700,000 pounds



*The first time wheat was drilled on the Station using a tractor rather than horse power c.1925.*

were sold. However sales varied from year to year depending on crop yields, which, in turn, depended on weather conditions. In addition to the mainstays of wheat and sorghum, Hays Golden Corn was one of the important crops of the area, and the Station produced seed for sale to local farmers. Prior to introduction of combine-height grain sorghums, the most important grain varieties were Pink Kafir and Dawn Kafir, and 1930 was the first year that the forage sorghum variety Atlas seed sales exceeded sales of Early Sumac. For several years, Kanred was the only wheat variety sold for seed, but in 1937, Tenmarq surpassed Kanred.

Work with trees and shrubs that began very early in the Station's history continued after Mr. Aicher arrived. However, he recognized some definite shortcomings and made significant changes. Prior to 1927, some 13 or 14 different individuals served as nurserymen. In that year, Mr. E.W. Johnson, a graduate in horticulture and forestry from Colorado Agricultural College, was hired to operate the nursery.

He remained for several years and was assigned not only to work within the forest nursery but also to care for the orchards, the State Park, and various tree plantings around the Station. He also assumed responsibility for care and landscaping of the general campus area. Mr. Aicher hoped that research work with trees would lead to improved nursery plantings in the west central part of the state.

Mr. Aicher continued and, in fact, expanded the scope and number of field days that were held on the Station. The annual Cattlemen's Roundup was an outstanding public relations activity and was well attended. According to Mr. Aicher, attendance at Roundup from 1921 to 1927 varied considerably but generally averaged between 1,000 and 1,500. The crops field days attracted fewer numbers, and attendance varied with the season and whether or not farmers were busy with their own activities. The judging contest for young people was started in 1921 and expanded from its beginnings as a livestock judging contest to



*Digging basement for new office building, 1930.*

include the home economics and grain judging contests. By 1927, 21 high school and 12 4-H club livestock teams, 21 grain judging teams, and 11 home economics teams competed. These numbers increased greatly over the years. This spring event was an important part of the educational arm of the Station, and, although modified, has continued until the present time.

In today's world of telephone communications and electronic transmission of data and information it's difficult to believe that in fiscal year 1925-26, more than 4,000 letters were received and answered by the Station offices. These numbers were typical for many years prior to more widespread use of telephones and, later, electronic equipment. Many of these inquiries related either to the availability of seed or information concerning improved agricultural practices. Even in these early times, the Experiment Station was recognized as a source of reliable information. This perception is evidenced further by the number of scientific and nonscientific visitors from within the state, as well as from other states and several foreign countries.

In 1927, Mr. Aicher summarized the business operations of the Station since 1903. He discussed annual appropriations, other funds (e.g., the fee account) available for use on the Station, the costs for salaries and labor, and various other expenses. During the first 20 or so years, the annual appropriations varied greatly, ranging from the first allotment of \$3,000 to just over \$27,000. Beginning in 1922, the appropriations seemed to stabilize at about \$25,000 per year. The collection of

fees, that is money available from the sale of products from the Station, varied during those first 25 years from just over \$600 in 1903 to more than \$50,000 in some of the later years. Then as now, fee collections depended largely on the amount and price of seed sold and on prices received for livestock and other commodities. In most years prior to 1919, appropriations exceeded expenses for salary and labor. Several positions were financed largely by the USDA. No reliable record was found of the size of the labor force during those early years. But beginning in 1919, the salary and labor expenditures exceeded the appropriations nearly every year. This points out that many of the improvements seen on the Station resulted from judicious use of funds generated from sources other than state appropriations. These funds not only paid for many of the buildings that are presently on the Station, but also paid for new machinery, machinery replacement and covered general ongoing expenses. The wisdom of allowing the Station to accumulate money in the fee account as opposed to turning it over to the state general fund and relying on adequate appropriations could be debated. Annual appropriations sufficient to operate the Station might have alleviated some of the



*Crops laboratory building, 1934. This was the only brick building on the Station financed by State-appropriated funds.*

variation in year-to-year income. However, it is doubtful that the appropriations would ever have fully compensated the Station for all the fee money. Thus, many of the improvements financed by the fee account probably would not have been possible.

During the late 1920's and early 1930's, Mr. Aicher continued to make changes and improvements to the physical plant. The south-end unit was converted from the dairy operation to winter-feeding of beef cattle and a location for the cow herd. Construction of the new brick office building was started in 1930 and completed in 1931. The State Legislature authorized construction of the crops and soils laboratory in 1931. The act included a \$10,500 appropriation to pay part of the cost. Lack of additional funds delayed completion until 1936. Even though not completely financed, it stands today as one of the few buildings constructed with appropriated funds. Dire need existed for a new seed house and a new grain elevator. The seed house was constructed in 1941, but a new grain elevator was many years in the future. Mr. Aicher closed the boarding house in 1930, and the building was torn down a few years later. The extent of other needed improvements can be illustrated

by noting that some 2,000 loads of sand were used to improve the main roads, and a railcar load of posts was required to build and repair fences on the Station.

In 1928, serious flooding washed out several bridges and left many fields muddy and difficult to work with horses or wheeled tractors. Mr. Aicher believed that track-laying tractors would be more useful in the muddy fields and bought the first Caterpillar tractor for use on the Station. From then until his retirement in 1952 much of the field work was done with these tractors. Although he purchased several steel-wheeled and rubber-tired wheel tractors, he greatly favored the "Cats".

The first indications of the effect of the great depression and later the drought of the 1930's were evident in 1931 when the Station's income was less than half that of some previous years. That meant few improvements could be made during the year even though 1931 crop yields were excellent, and Mr. Aicher wrote in 1932 that wheat and sorghum "produced enormously". Reported yields in 1932 included one field of Wheatland milo that yielded 71.5 bushels per acre and wheat averaged more than 39 bushels per acre. These



*Seedhouse completed in 1942. Construction began in 1940, but lack of funds delayed completion.*

yields were indeed remarkable for that time. Throughout much of the extended drought, many farmers experienced total crop failures, but crop yields on the Experiment Station remained at acceptable levels, thus reflecting the importance of good management. Only in 1937 was a complete wheat failure recorded. However, low commodity prices severely limited the Station's income.

The great drought began in 1933 and continued for nearly a decade. Throughout much of that time, Mr. Aicher remained remarkably optimistic about the outlook for agriculture and the future of the Station. It was not until 1939 that he seemed to lose some of his enthusiasm and optimism. But in spite of low yields and low commodity prices, he made a number of improvements. Nearly all of the farming was done with tractor power rather than horse power, and rubber-tired tractors replaced some of the steel-wheel models. He believed that one of his greatest achievements was the development of the basin lister or damming lister. This was prior to the introduction of subsurface tillage and residue-conservation machines, and the primary tillage tools were moldboard and one-way disc plows. Largely through Mr. Aicher's efforts, listers began re-

placing moldboard plows. The listed ridges helped prevent soil wind erosion, but the furrows were subject to water erosion. Some machinery manufacturers tried to devise attachments to create dams within the lister furrows, but most of those early machines were not satisfactory. Mr. Aicher along with his shop man, A.N. Canady, developed a heavy duty damming attachment that could be farm-built and used on listers to create a series of small dams to retain moisture. This machine was never used widely except for emergency tillage to stop soil blowing, but it probably was unsurpassed in its ability to reduce wind erosion and conserve water. Although he did not universally condemn the one-way disc plow, Mr. Aicher pointed out repeatedly that improper use of this type of equipment contributed to the damage done by wind erosion throughout western Kansas and adjoining states. This tool's limited use on the Station no doubt was a factor in reducing soil loss.

During the early 1930's, hope still existed that the area could be used for some fruit production, and a thousand cherry trees of several varieties were planted in 1930 along with 10 varieties of plums. These trees began producing in a couple of years and remained in



*This 4-row basin lister created dams to retard erosion.*

*Basins following a high intensity 2.5-inch rain. No significant erosion occurred.*

production for a time, but it was soon apparent that the extreme climatic conditions particularly in the 1930's were not conducive to fruit production. The cherry orchard was destroyed by the 1940 Armistice Day freeze. This weather event will be further discussed later.

Dust storms and high temperatures were characteristic of several years during the 1930's. From February to May of 1935, dust storms came into the area repeatedly, often as little as one to three days apart. At times, visibility was less than six feet. However, because of conservation-type tillage being practiced, little damage was done to the Experiment Station's cultivated fields. In 1934, the temperature exceeded 100° F. on 53 days and that record was broken in 1936 by 54 days with temperatures above 100 degrees. The heat and drought continued for several years, and in July 1939, the average maximum temperature was more than 101° F.

As the drought continued and intensified, livestock feed became scarce. The first attempts to maintain the livestock herds during the drought involved shipping the dairy cattle to locations further east in Kansas. This was not a satisfactory solution, and the dairy herd

was disbursed in the mid-1930's. The beef cattle herds were kept at Hays whenever possible, but in some years lack of feed required that part of the herd be transported to better pastures. As will be seen, selling part of the beef cattle herd was necessary in two or more years to generate money to pay for the day-to-day operation of the Station. In 1937, Mr. Aicher did find money to erect the new steel water tower and make major improvements in all of the water systems on the Station. In the mid-1930's, the Station granted the City of Hays permission to construct the municipal sewage disposal plant on its land. The agreement included a proviso that the Station could, if it so desired, connect its sewer system to the new plant. Further, the city agreed that the Station would not be charged a fee for sewage disposal. Lack of funds delayed the connection until 1938.

Lack of funds also limited other construction and new machinery and equipment purchases during the Depression. In 1939, a new field machine, described as a "Hoeme" duckfoot, became available on loan from the manufacturer. Although duckfoot-type machines had been in use for several years, this model was built strongly enough to do effective

subsurface tillage. It was the forerunner of some of the later subsurface tillage machines that are in use today. The duckfoot shovels were not more than 12 to 16 inches wide, whereas blades on the newer machines are several feet wide. A bank of six pit silos was constructed and put into use in the mid 1930's. Much of the labor for construction was furnished through the depres-



*Subsurface tillage using large V-blades to retain residue on the soil surface. These implements became the tools of choice to reduce erosion.*

sion-born Works Progress Administration. These silos remained in place for many years. Because of extreme difficulty in removing feed from them, they never seemed entirely practical and were abandoned in the 1950's.

Mr. Aicher had compassion for the local people, many of whom were suffering because of the Great Depression. The lack of jobs, low wages for those fortunate enough to find work, and low commodity prices caused many hardships. He allowed some who were unemployed to cut and saw into firewood dead and dying trees along Big Creek. By agreement, the Experiment Station would take half of the wood in payment and the workers could take the other half. The Station then sold its share at \$2.00 per load to local people. In one of our late evening conversations, Mr. Aicher shared with me an event that few others were privileged to know. Surely his acquaintances and even the Station employees, many of whom regarded him as a curmudgeon, would have been amazed had they known that once, when the payroll checks had not arrived just prior to a holiday (as I recall, Christmas), Mr. Aicher borrowed money on a personal note. He then used that money to give each employee an advance to be repaid when the checks were received. The only record was a canceled note in one of the drawers of his desk.

The close of the decade of the 1930's generally is considered the end of the great drought and the Great Depression. Although rainfall in 1940 was somewhat higher than it had been in the drought years, the distribution was such that all of the crops grown on the Experiment Station that year partially failed. Rainfall increased in the fall of 1940, and crop production in the ensuing years improved. However, in the fall of 1940, cash flow was so limited that the beef cattle winter-feeding trials had to be eliminated. A letter written to Mr. Aicher by L.E. Call, Director of the Agricultural Experiment Station, stated that in order to meet general expenses and payroll budgets and prevent illegal deficit spending, it would be necessary to eliminate the livestock feeding

work, eliminate the labor scheduled for that research, and reduce the stenographic help in the office. Even these measures did not ensure financial security. In the fall of 1940, as had been the case in 1939, part of the beef cattle herd had to be sold to generate operating money. Mr. Aicher pointed out that allowing carryover of appropriated funds from previous years' surpluses could prevent some of these hardships.

Because no winter feeding trials were conducted in 1940-1941, the Roundup program that had been ongoing for many years was in jeopardy. Nevertheless the 28th Cattlemen's Roundup was held in 1941. Because there were no current results to report, the Roundup publication summarized the livestock work that had taken place prior to 1940-41. Thus, this traditional annual event was continued. In 1940, warm temperatures prevailed well into the fall so much of the vegetation, including most trees, had not gone into dormancy when the temperature dropped very rapidly on November 11. For the next two nights, the minimum temperature reached 0° F or below. This infamous Armistice Day freeze resulted in extensive damage to vegetation. It killed some two million tree seedlings growing in the forest nursery. Trunks of larger trees were split by the expansion of frozen sap. Siberian elm (commonly called Chinese elm) and fruit trees suffered the greatest damage. The cherry orchard planted in the early 1930's had been producing very well. However, in the spring of 1941, it was evident that nearly all the cherry and plum trees had been killed by the freeze. The dead and damaged trees were pulled, and the orchard was never replanted.

Commodity prices and general climatic conditions improved in 1941, so that funds were sufficient to operate the Station and finance additional construction. The long-awaited new seed house was started prior to the beginning of World War II and completed in 1942. That was the last major construction until 1948. Of course, the war caused significant changes in the operation of the Station.

Although the research staff remained intact, finding field and stenographic help developed into a significant problem. Many supplies became scarce. The Department of the Army became interested in buffalograss seed production and, more importantly, in treatments necessary to improve its germination. The Army needed seed to establish sod runways on satellite airports throughout the Great Plains. A treatment to improve the very low germination of newly harvested buffalograss seed had been developed at the Station. This process consisted of soaking the seed in a potassium nitrate solution, refrigerating the seed for some six weeks, and then drying it. The treatment increased germination from about 8 percent to 60 percent or more. Because of their interest and need for seed, Army officials agreed to provide two commercial refrigerators with 10,000 pound capacity for keeping the soaked seed at 40° F. Mr. Aicher and his shop personnel designed and built the drying equipment. Following the war, these refrigerators were given to the Station and commercial treatment of buffalograss continued for many years.

**Prisoners of War:** During World War II, camps were established in Kansas and Nebraska to confine German prisoners of war. If certain stringent regulations and codes of the Geneva Convention were met some of these men could be used to help alleviate the war-caused shortage of farm labor. Army officials from the camp in Nebraska inspected the facili-

ties and approved the Station as a suitable site for the prisoners and the guard detail. The first contingent of 100 prisoners arrived from the camp near Concordia, Kansas in September 1943. In 1944 and 1945 they came from the camp in Nebraska. As many as 150 were housed in the barns near the beef cattle feeding facilities. Probably not more than 30 to 35 worked on the Station, the others on surrounding farms. As could be expected, very specific rules were established concerning the use of prisoners and conduct of both prisoners and those for whom they worked. The Station and surrounding farmers paid the Department of the Army \$3.25 per day per man used. Those on the Station performed a variety of tasks, including some construction work, general farm labor, and even some technical work in the laboratories. Aicher reported that the prisoners provided valuable service during a time of labor shortage. Because of the presence of the prisoners, the annual Roundup and judging contest could not be held in the spring of 1945. That was the only cancellation of the events since their beginnings in 1913 and 1921 respectively. Shortly after the war in Germany ended, the prisoners were returned to their home country. The last contingent left the Station in November 1945. Some of them, and later their families, maintained contact with people in the Hays area.

Late in the 1940's, all of the horses and mules used as work stock were sold. By that



*German prisoners of war in front of their mess hall, the Station auditorium.*

time, little or no market existed for work animals and in Mr. Aicher's words, "12 of these were large black Percheron horses weighing about a ton each. They made beautiful teams and it was like pulling teeth to see these horses leave the place, particularly for the purpose they were going. They were sold at \$45 per head to a manufacturer of dog meat."

With the improved financial conditions in 1948, construction of the building described as the utility building began. To free the construction site for the new building, the barn that served as a seed house prior to 1931 had to be moved. It was moved to the livestock feeding area and now serves as a hay barn. The new structure was designed to house the buffalograss seed-treating facility in the basement. The upper floor was used for seed storage, primarily buffalograss. When scheduled meetings necessitated an auditorium, the seed was moved to temporary locations. Buffalograss treatment was terminated in the 1960's and the utility building was remodeled and converted to the auditorium. Shortly after the original utility building was completed, a

steel grain elevator was constructed nearby. Mr. Aicher had indicated in his early days at the Station that a new seed elevator was needed badly, but work did not start until nearly 30 years later. I remember one unexpected event during construction. I was standing outside what is now the maintenance shop watching the activities. It was suddenly apparent that the bulldozer pushing fill dirt toward the new elevator pits was not stopping. The result was that the D-6 Caterpillar tractor nosed over and fell into the pit. The operator was not injured, but many of us waited for the Aicher temper to be manifested. However, he took it all very calmly and simply proceeded to hire a large crane to extract the tractor.

Mr. Aicher started the last of the permanent brick buildings, the shop building, in the fall of 1951. To make room for the new shop, the building used for tractor repair had to be moved. That building was converted to a small garage and oil room. Plans for the new shop included combining the machine and tractor shops and putting coworkers in charge of each section. However, irresolvable conflicts



*Harvesting sorghum for silage in 1950, using the Aicher-designed self-propelled field cutter.*

between the machinist and mechanic doomed that plan. John Burkhart, the mechanic at the time, assumed both responsibilities and served for many years. Although near retirement, Mr. Aicher continued to reshuffle buildings. His last change was to move the grain elevator located near the office building since the very early years to the beef cattle research area. There it served as the feed elevator for that research project until the new feed mill was constructed in the late 1970's.

The vagaries of the climate continued to be manifest in 1951 when more than 43 inches of precipitation fell, compared with the average of just over 23 inches per year. Serious flooding occurred not only on the Experiment Station but in the adjacent city of Hays and the surrounding area. The city suffered great economic loss and even some loss of life. The flood prompted the city to build a dike and to change the creek channel that ran through the Station. The dike increased the danger of flooding on the Station but, more importantly, helped prevent future losses of life and property in the city.

In addition to the floods, several significant events occurred during this last year of Mr. Aicher's time as Superintendent. The sub-surface tillage tool known as the "Noble Blade" was first used widely in that year. The original blade supplied by the Noble Manufacturing Company in Canada was straight rather than the large V-blades now commonly used in crop-residue management throughout the Great Plains. We believe the Station was the first place in Kansas to use this equipment extensively. Fiscal year 1951 also marked the closing of the State Forest Nursery that had been producing seedling trees and nursery stock for most of the 50-year history of the Station. The Kansas Nurserymen's Association felt the Station was in direct competition with its commercial business and requested that the nursery be closed. Mr. Aicher regarded the loss as a blow to farmstead and shelterbelt tree plantings. From 1916 through 1952, nearly

nine million trees had been distributed from the Experiment Station.

As his tenure of 31 years came to a close, if Mr. Aicher had listed his most important contributions, probably the improvements in the physical plant ranked highest. He was responsible for building all of the brick buildings on the Station. In addition, many other buildings were moved, improved, or remodeled. Certainly high on his list would have been some of the machines and attachments perfected in the Station shop, including the power post-hole digger that was developed in 1927, the pick-up hay baler, several machines involved in harvesting buffalograss sod and seed, and the equipment to treat buffalograss seed. The basin lister and other lister attachments significantly reduced wind erosion during the 1930's "dust bowl".

Perhaps the most lasting machinery innovation began in 1947. Binding, loading, and then unloading green bundles of forage sorghum into the forage chopper at the silo were among the most labor-intensive jobs on the farm in that era. In 1945, the Station first attempted to harvest silage with a field cutter. A single-row machine was purchased, but it proved to be unsatisfactory. It was sold, and a two row-cutter was built in the Station shop. That machine soon prompted Mr. Aicher and the shop man to begin constructing a self-propelled unit. As might be expected, there were many false starts and alterations in the unit before it performed satisfactorily. Sometimes less than a truckload of silage was chopped before the machine was returned to the shop for alterations. It was the forerunner of the field cutters now used whenever silage is harvested.

Even with his emphasis on physical plant and equipment improvement, Mr. Aicher did not lose sight of the major role of the Station, i.e., research. Some of the previous superintendents had pointed out the importance of doing research work. But much of the activity during the early years involved testing and demonstrations to show the adaptability of

crops and crop varieties and to study management practices best suited to the area. These studies were, and still are, essential, but as answers were obtained, the scope of research could be expanded. This expansion began during Mr. Aicher's tenure and continues today. As new crop varieties were developed, pure seed distribution became increasingly important. During 1951, for the first time, more than one million pounds of seed were distributed from the Station.

Although much of the crops research was under the direction of USDA scientists, the extensive grain storage investigations done from 1936 through 1940 were in cooperation with the Department of Agricultural Engineering, Kansas State College. The Station Superintendent in cooperation with the Animal Husbandry Department at the college directed beef cattle research. The grazing investigations and pasture management project was started in 1946, and a full-time staff member was employed to do that research. State support for crops research increased during the late 1940's. This included paying part of the salary of some of the federal scientists and hiring research assistants and associates. As will be seen, this trend toward state support continued until the last federally funded project was terminated in 1973. Not until about 1950 were significant grants from outside sources available to help finance some of the research work.

Things did not always go smoothly. The dryland agriculture project field laboratory building was destroyed by fire in 1930. In 1931, a lawsuit was filed by an Oklahoma company that was distributing a variety of grain sorghum. The suit, brought against L.C. Aicher; R.I. Throckmorton, Chief Agronomist, Kansas Agricultural College; J.W. Farmer, County Agent in Greenwood County; and R.S. Trumbull, County Agent in Ford County, al-

leged that Aicher and his associates conspired to damage the sale of the seed of this new variety that had been developed by a farmer in Oklahoma. The defendants were accused of asserting that the sorghum was highly susceptible to disease and did not yield as well as other sorghums. Had it been brought to trial, this suit, most certainly would have established precedents concerning the rights of scientists to report findings of experimental work, even though such results might be unfavorable to some interests. The last reference that could be found concerning this suit indicated that it was still pending, but the president of the company bringing the suit had absconded with some \$15,000 and could not be found. A news article said, "This may lead to the dismissal of the suit." In 1932, the arrest of a man for stealing gasoline from the Station was reported, and another reference was made in 1933 to a theft of gasoline and tools, noting that "the thief was taken to jail." In 1939, Mr. F.L. Timmons, bindweed project leader, reportedly used a material in one of the Station pastures that was supposed to kill prickly pear cactus. The label indicated that the chemical was not palatable, and livestock would not eat the treated vegetation. However, cattle did eat some, and five of them died. Examination of the label indicated the herbicide had an arsenic base. Then there was the case of the "cowboy" driving cattle with a pickup truck. One of the registered Hereford bulls was moving too slowly, a nudge with the truck resulted in a broken leg. Those years were not without more serious tragedy. In April of 1925, a strong wind broke off power poles and pulled down the attached power lines. The following day, some students from the Teachers College (now Fort Hays State University) were hiking over the Station. A young man started to climb over a fence and was electrocuted because the downed wires were in contact with the fence.

## **THE DUITSMAN QUARTER CENTURY, 1952-1976**

When Mr. Aicher retired on June 30, 1952, Mr. W.W. (Bill) Duitsman had been at the Station for about two years as Assistant Superintendent. This gave him the opportunity to observe the operation and prepare himself to take over as Superintendent. Although the two men had great respect for each other, their personalities and style of management were grossly different. As has been pointed out, Mr. Aicher maintained a certain formality in his office. Bill Duitsman, on the other hand, was more informal in his approach to management. That is not to say that he was not in charge, for he certainly was. While nearly everyone addressed his predecessor as Mr. Aicher, few people addressed Duitsman as Mr. Duitsman.

Duitsman came to the Station with a Cooperative Extension background. He had been a successful county agent in northeast Kansas, and his extension credentials remained evident during his time as Superintendent. He was unsurpassed in ability to maintain good relationships with the general farming and agribusiness communities. Duitsman's public relations interests and abilities were illustrated when, a few years after his arrival, he began a daily radio program on KAYS, the local Hays radio station. He continued these talks five or six times a week for more than 20 years. Some years later, in 1969, he added a weekly program on KSAL Salina radio. In his last radio program over KSAL on July 16, 1976, he summarized some of his activities for the previous 25 years. He indicated he had given more than 350 broadcasts from Salina, and that the total of all radio, TV, and other personal appearances during his tenure equaled about 4,500 presentations. . It was not uncommon for him to be the featured speaker at two or even more county farm meetings in a week.

His previous experiences undoubtedly influenced his first perceptions of important research. Questions often asked by Duitsman

soon after his arrival included: "Is the research related to immediate farm needs? Are the methods being used something farmers could use?" He favored research that had an immediate impact, rather than studies that yielded information that might (or might not) be valuable in the future. However, in a few years this outlook changed, and he became much more open to new research ideas. Although immediate practical applications of research remained uppermost in his thinking, he voiced little opposition toward including some fundamental research.

The Station research staff began to take on a different character during the latter years of Mr. Aicher's tenure. Some young, but well trained, scientists were added to the faculty. Duitsman continued to add to and change the research personnel. Within a few years, nearly all of the research projects were lead by individuals who had recently received graduate degrees. All had at least Masters of Science degrees and several had earned or would soon pursue doctoral degrees. At that time, such advanced training was unusual at locations away from the main campus. That "young staff at Hays" was not always recognized, in a favorable light by personnel at the Central Station at Kansas State University in Manhattan. No doubt some of their feelings were caused by Duitsman's extreme pride in the Station and in his research staff. He was never hesitant to point out the research accomplishments at Hays. In some cases there was animosity, but perhaps also envy, by some individuals in Manhattan. Sometimes Duitsman seemed to add fuel to the fire by urging his staff not to discuss their ongoing research too freely with others in the University until such time as the results could be presented publicly. Thus, they often could be well ahead of others within the system. No one could deny that under Duitsman, unprecedented research findings were reported to the farm community through public appearances by the staff and through Experiment Station publications. Reports to the scientific community also increased as indicated by ar-

ticles in scientific journals and presentations at professional meetings. Duitsman insisted that Kansas farmers be the first to know, but he did not discourage publication of research results in refereed journals. Along with these research developments, the Station also received unique support from some Kansas State University administrators. Other individuals might be cited, but Dr. Floyd Smith stands out. During his time as Director of the Experiment Stations he was extremely supportive of the work at Hays and he often recognized some of the outstanding and ongoing work at the Station.

Hosting local farmers, agricultural scientists, and even visitors from outside the country began soon after the Station was established. But during the 1950's and 1960's a significant increase occurred in the number of visiting foreign agriculturalists from developed and developing countries. The Station's reputation had spread internationally, and individuals and agencies responsible for arranging itineraries often included the Station. Duitsman's public relations activities certainly contributed to this recognition, but scientific publications by the various project leaders were even more important.

Financing remained uncertain throughout this period. Money appropriated by the State Legislature continued to be approximately equal to the costs of salaries and wages. All other operating expenses had to be generated from other sources. Nearly one-half of the operating budget came from the fee account, which depended upon production and the prices received for livestock and grain commodities. The Station did not produce hybrid sorghum seed for sale to the public, so seed wheat represented the major income from crop sales. Most of the other crops and the native grass pastures were utilized for the beef cattle project, and income was generated through sale of cattle. Changes in beef cattle research led to changes in marketing strategies. Earlier, fat cattle were finished to coincide with the spring Roundup, so that they could be marketed im-

mediately after the field day. Thus a large sum of money was available in the spring of each year. But funds often were scarce prior to that April date. As the livestock program evolved, finished cattle were marketed several times throughout the year.

The importance of the fee account cannot be overstated, but during the Duitsman era, funding from various outside sources increased. The Kansas Wheat and Sorghum commissions began supporting some of the crops and livestock research, including major funding to support a new plant pathologist position. Several commercial organizations began awarding grants to partially support the research. These commercial grants were particularly important in the livestock and weed control projects. Although the situation was sometimes feast or famine, the overall finances of the Experiment Station were nevertheless envied of most of the other research agencies in the Kansas State University system.

When Duitsman became Superintendent, many of the permanent buildings that still exist on the Station were in place. All of the brick structures were built during Mr. Aicher's time as Superintendent. Thus, even though Duitsman was responsible for several building improvements, the campus appeared much the same when he left in 1976 as it did in 1952. One of his high-priority building projects was to cover the seating area of the livestock arena. The annual Roundup and Judging Contest, held in late April, had long been exposed to the weather. Duitsman considered these two events among the most important functions of the year. It was not uncommon to have 1,000 or more attendees at each event. Early photographs show merely a crude fence surrounded by those attending. Later, portable bleacher seats were erected each year. Duitsman designed and built the permanent arena and bleacher seats. Finally in the late 1960's, the bleachers were enclosed with sheet metal. Although the arena served those two functions well, it had little other utility.

A new building to provide work space for the crops and soils research projects was constructed immediately adjacent to the crops laboratory. This added sorely needed space for storing and processing material harvested from research plots. Other building improvements included construction of a shed for the research project machinery. This was done entirely with Station labor and with funds generated by the Station. Duitsman also was responsible for constructing several small upright silos and made major improvements in the large trench silos. The pit silos, which were difficult to fill and difficult to empty, were abandoned. Several greenhouse sections were added. These greatly enhanced the ongoing projects in plant breeding, entomology, plant pathology, and weed control, and made possible some expansion into more basic research. Less apparent than new building construction, but nonetheless important, were interior changes in several buildings, including the auditorium, cattle research lab and the drying room in the crops laboratory.

In addition to changes around headquarters, several others took place between 1952 and 1976. Construction of the Highway 40 bypass along the north side of the Station divided some fields and made it more difficult to access the irrigation pump that provided water from Big Creek for the forest nursery and crops research plots near the greenhouses. This pump later was abandoned after flooding damaged the electric motor. A water well dug in the nursery area replaced the Big Creek source. The City of Hays and the Station experienced a devastating flood in 1951. Construction of a protective dike and channel improvement resulted in increased flood damage to the Station in 1957, but, more importantly, it prevented damage and loss of life in the city. As part of its flood-control efforts, the city instigated considerable alteration of the Big Creek channel, including eliminating several bends as it wandered across the Station. The new ditch served as the main creek channel. For several years, efforts were made to control woody veg-

etation along this new channel, but natural forces won out, and the area became tree-lined. Also about that time, U.S. Highway 183 as it exists today was built. The resulting fill needed for road construction permanently destroyed perhaps as much as one-half mile of the original Big Creek channel.

The new highway had an additional impact in that it resulted in the first ever land purchase by the Station. To digress: When the original military tract of land was assigned as an agricultural research location, an 80-acre area was set aside and became known as the "Schlyer Farm". This privately owned tract was farmed by the owners for many years. It also served as a site for a nightclub (respectable) aptly named "Gala Garden". The author has been unable to discover why this land was not included as part of the Station. In any event, when the new highway right-of-way was established, about 20 acres of the Schlyer property were isolated on the west side of the new road. Rather than allow some potentially undesirable commercial enterprise to locate adjacent to the Station, Duitsman succeeded in finding funds to purchase the land.

The 1935 agreement regarding sewage disposal was abrogated by the City of Hays in the 1960's, when a new disposal facility was built at a different site. That 1935 pact allowed the city to construct a plant on Station property. In return, the city agreed to allow the Station to use the plant at no charge. This met the needs very well until that plant no longer was sufficient for the city's growing requirements. When the new facility was built, the existing installation was abandoned. Only after long negotiations did Duitsman agree to install a sewage lift station to pump waste into the city lines and to pay a fee for the service. To an outsider this might seem unimportant, but fear of failure of that sewage pump was never far from the Superintendent's mind.

Duitsman's public relation activities and his desire to show the Experiment Station in a favorable light seemed to know no bounds.

He conceived the idea of hosting various groups for outdoor steak cookouts. These started with small numbers, although they seemed large at the time. Later, the 50 or 60 steaks first prepared appeared insignificant when compared with the more than 450 steaks on the grill at the same time when the Station hosted a regional meeting of the Kansas Livestock Association. He also began having an appreciation dinner in association with the annual Roundup. A group of 50 or so individuals including various officials from Kansas State University, local farm and civic leaders, and local and State political figures were invited to Duitsman's house where again steaks were cooked on an outdoor grill. This practice has continued, although modified, until the present time. Its sole purpose was, and is, to acknowledge support of agricultural leaders, local businesses, political figures, and academicians.

In the early 1970's, but well before he knew he might accept a different job, Duitsman conceived the idea of having some physical memorial to commemorate the 75th anniversary of the Experiment Station to be

observed in 1977. He proceeded to raise funds from private sources sufficient to import a large (22 tons) block of limestone and to hire a local sculptor, Pete Felten, to carve the stone bull now located just north of the Station office. This sculpture was dedicated as part of the Roundup program in April 1977, approximately one year after Duitsman left the Station. He returned for the dedication and was a part of the program that included several political figures, as well as officials from Kansas State University.

So how can I best describe this complex individual? I had the privilege to serve on the research staff of the Station during the entire 25 years of Bill Duitsman's time as Superintendent. During those years he changed in some ways and in other ways remained very much the same. Certainly, he was pleasant in social settings. He was a tireless worker for Kansas agriculture. He had contacts within the state legislature, which enabled him to get favorable action on certain bills. He was a dedicated worker in his church and the community. He served on many local and statewide committees. He was aware of concerns and events that were important to his various staff members, yet some would call him dogmatic in his administration of the Station. Once he announced a decision, changing his outlook was difficult. But those on the research staff knew that each of them would have his complete support when dealing with officials within the Agricultural Experiment Station and with the general public. If he felt the Station was being slighted in any way, those involved were sure to be subjected to his resolve (let's admit it, his anger). Certainly, he regarded the Station as "his" and often gave the impression that probably no one could operate the facility as efficiently as he. He took unending pride in the appearance of the Station, particularly the tree-lined main entrance and drive to the office. Duitsman was awarded a large number of honors during his time as Superintendent. Many statewide agricultural groups such as the Kansas Association of Conservation Districts, the



*75th-anniversary limestone bull.*

Kansas Livestock Association, and Future Farmers of America formally recognized his contributions.

In the early 1970's, Duitsman, always an ardent Republican, seriously considered going into politics and running for a seat in the U.S. Congress as Representative from the western Kansas congressional district. After much soul searching, he decided that he would not pursue that avenue, but in 1976, the opportunity was presented to him to become Secretary of the Kansas State Board of Agriculture. He was quoted as follows in a news story on June 4, 1976: "I feel relieved that a decision has been made. There is one heck of a challenge. I

made the decision because of the tremendous support by agricultural people and the legislators throughout Kansas." He was granted a leave of absence from his duties at the Experiment Station with the understanding that he could return to his position on the Station should he so desire. This arrangement impinged on the selection process for his successor, because a permanent replacement could not be named. Upon his departure on July 1, 1976, Mr. William (Bill) M. Phillips, Research Agronomist in charge of the Weed Control Project on the Station reluctantly left his research and assumed the duties as Acting Superintendent.



*Part of a Fall Field Day crowd. Duitsman expanded this event so that as many as 20 vehicles were used to transport those attending.*

## **APPROACHING THE SECOND 100 YEARS, 1976-2001**

Phillips accepted the position of Acting Superintendent with the understanding that Bill Duitsman could return as Superintendent anytime during the following year. However, near the end of that year, Duitsman's leave of absence was extended for another year, even though it seemed unlikely that he would return to Hays. So Phillips served as Acting Superintendent for two years. Dr. Floyd Smith was the Director of the Kansas Agricultural Experiment Station when Phillips was named Acting Superintendent and was responsible for making the appointment permanent in 1978. His support of Phillips and the entire Experiment Station operation was key to its continued success. In 1980, the responsibilities of the Director were transferred to the Dean of Agriculture, and an Associate Director was appointed to deal directly with the research programs. Associate Director Dr. Jim Osbun and Phillips established an excellent working relationship. Following Osbun, Dr. Kurt Feltner also provided invaluable guidance and support. Note that during the Phillips tenure, the job title was changed officially from Superintendent to Head at all of the Kansas Branch Experiment Stations. This was done to more clearly recognize the five outlying units as Departments within the College of Agriculture, Kansas State University, and was a step toward identifying the locations as research centers rather than merely testing and demonstration sites.

Never during the two years that Phillips was Acting Superintendent did Duitsman take part in the Station's operation or in any way suggest that he did not agree with administrative changes. But the temporary nature of Phillips' appointment made his decision making somewhat difficult. He was reluctant to propose changes that might be reversed if Duitsman returned. Although he had served under Duitsman, he did not adopt all of Duitsman's management styles. Certainly he was not an effective radio personality nor did he have Duitsman's statewide recognition by

various agricultural leaders and members of the legislature. However, Phillips did strive to continue and, in fact, improve the relationships between the local community and the Experiment Station. He served on a number of city committees and was a Director and later President of the Hays Chamber of Commerce.

Because he had been on the research staff of the Experiment Station since 1948 as leader of the Weed Investigations Project, Phillips was well acquainted with the Station and familiar with Duitsman's operating procedures and management philosophies. Although his primary responsibility was weed control research, he maintained an active interest in all the research projects and in management of the general farm fields. His focus on the overall operation was fueled at least partially by the need to provide weed control information for various aspects of the Station operation. This familiarity served him well as he undertook his management duties.

Phillips' approach to leadership of the research staff, although perhaps similar to Duitsman's, varied in some important ways. Duitsman expected to be kept fully informed about the details of virtually all experimental work and, in some cases, might have been accused of trying to micromanage some of the activities. On the other hand, Phillips operated under the philosophy that staff scientists were competent and needed only general directions as to the type of research expected. Then the individual researcher should plan the research and make most of the decisions for carrying it out. He did insist that research conducted have relevance to Kansas agriculture but also gave the scientists the opportunity to pursue some more fundamental problems. This philosophy contributed to the ongoing shift toward more science and less demonstration in the Station's program. As will be noted later, this shift accelerated during the last years of the century. Phillips believed that his primary function as Head was to provide the best possible working conditions, including good physical facilities, new and improved equipment, and adequate fi-

nances. Meeting these goals was not always possible because of budget restraints, but he did upgrade machinery and obtained funds to purchase laboratory apparatus.

That “young” staff of the Duitsman era was beginning to age, but Phillips had the opportunity to hire some new people who sustained and expanded the vigorous research programs. As had been true for at least the previous 25 or 30 years, few professional staff or support personnel resigned. Competence certainly depends on more than mere longevity, but this continuity was extremely important in maintaining the outstanding research programs. The untimely death from cancer of Dr. Ron Livers in November 1979 was a tragic loss. He was one of the outstanding wheat breeders in the country and had developed several important winter wheat varieties.

The Station began adopting computer technology in the 1970's. Even prior to that John Brethour, Research Animal Scientist, started training himself to use this new tool. Simply because of distances involved, computers on the main campus at Manhattan were not readily available to the outlying locations, but Ft. Hays State University allowed Brethour access to the IBM computer on that campus during hours when it was not in use, i.e., late at night and on weekends. In the mid-1970's, following Brethour's advice, Phillips agreed to purchase a Wang computer. This instrument was one of the first to use disc storage and have a screen display and allowed a move away from reliance on mainframe computers. Approval to purchase required special permission from University and State purchasing authorities. The Wang was highly advanced for that time and certainly established the Station as the off-campus leader in computer technology. That leadership is still evident today. When the first computer arrived at the Station most of the staff could claim little appreciation of its capabilities nor did they understand its use. However, John Brethour quickly began writing programs (no software was available) to facili-

tate his beef cattle research work. Largely through his efforts in those early years, other staff members gradually became more comfortable with computer use.

Field days continued to be important parts of the Experiment Station's public relations activities. Roundup in the spring, the Wheat Field Day in June, and the Fall Field Day in late August or early September drew significant numbers of people to the Station. The 4-H and Vocational Agriculture Livestock, Home Economics, and Crop Judging contests held the day after Roundup brought as many as 2,000 young people and their leaders to the Station. Sometimes it seemed that all other activities were on hold throughout most of April during preparations for those events. Phillips, as Duitsman before him, along with other employees worked tirelessly so that everything was in readiness when the day arrived. Attendees could be sure the events would start on time. An exception occurred on a foggy morning in late April when part of the crowd for Roundup was late arriving. Phillips delayed starting the activity for some 15 or 20 minutes while waiting for latecomers. This might have been good for those who were delayed by the fog, but one of the earlier arrivals took him sorely to task. The comment was “I knew it was foggy. I started early and got here on time. We expect you to start these events on time.”

Evolution of the grading, scoring, and ranking procedures for the Judging Contests is worthy of note. From the beginning of the contests in the 1920's until the mid-1950's, everything was done by hand. With 1500 or so contestants representing nearly 500 teams and each individual judged eight or nine classes, a total of some 12,000 cards had to be graded. Then scores were posted, totaled by individual and team, and finally ranked. This work often was not finished until 11:00 P.M. or later. And by then errors crept in. Bill Ross, Sorghum Breeder, designed a simplified posting and ranking system, but not until John Brethour wrote computer programs was the procedure

automated. The new feed mill was the most significant construction during Phillips tenure. This facility replaced one of the oldest buildings at the Station. That old grain elevator originally was located near the office building and, in fact, served as the office for several years. Mr. Aicher had the elevator moved to the beef cattle feeding area in about 1948. The new feed mill provided storage and mixing capabilities that greatly enhanced the efficiency of the cattle-feeding research programs. Although preliminary plans for the mill were initiated during Bill Duitsman's time on the Station, funds were not available until 1978. Construction was completed in 1979, and the old elevator was razed. Other construction included the machine shed built in 1984 to house some of the large pieces of farm equipment that previously had been exposed to the weather. Improvements were made in the interior of several buildings, including the basement of the auditorium. Four of the wooden frame houses built about 1912 were repaired and remodeled.

Phillips had plans to replace much of the water distribution system. These plans were thwarted when it was discovered that the water tower, which was erected in the 1930's

and had received minimal maintenance, required extensive and expensive repair. Additional money was not available for new water lines, even though the need for repair became evident when an undetected leak (directly into the sewer system) depleted the water in the tower and demand exceeded the capacity of the water well. After the leak was found and repaired, Phillips concluded that a back-up water well would be a prudent investment. Numerous test drillings confirmed the suspected lack of significant underground water in the immediate area. A new well was drilled, and a pump installed near the existing well. No doubt, both wells drew water from the same strata, but the installation did provide a second pump. At about the same time, the Kansas Board of Health ordered chlorination of the water and weekly sampling to determine possible contamination. There was no evidence of illnesses related to the water, but by State law, the number of people using water from the system dictated that it be tested and treated.

Although perhaps not important to the main purpose of the Station, activities around and relating to the area known as Custer Island generated much interest during the late 1970's and early 1980's. This area, established very

early in the Station's history as a family picnic area, was located in a bend of Big Creek. Despite the name we know that General Custer's campground was located a short distance downstream. It was a delightful area for family outings, and several improvements were made over the years. A dam across the creek created a pond. Shelter houses and rest rooms were constructed, and a cable-suspension foot-bridge crossed the creek.



*Custer Island picnic area, 1952.*

Experiment Station personnel maintained the area, and many Hays residents used it. Unfortunately, as has been the case in many public areas, vandalism began to be a problem. As early as 1958, Duitsman reported that several of the boards comprising the approach to the swinging bridge had been torn loose and apparently used as firewood. Similar destruction occurred repeatedly during the ensuing years. The shelter houses and other buildings were destroyed as was the entire swinging bridge. The area changed from an area for family outings to one favored for weekend boisterous parties and motorcycle rallies. In the 1970's, even as this destruction was taking place, some Hays business men conceived the idea of expanding Custer Island into a major park. In addition to the existing area, they proposed taking approximately 100 acres of Experiment Station land. The ambitious plan included overnight camping sites to accommodate travelers, softball diamonds, a prairie dog village, and expanded picnic areas. This plan was presented to the community with little or no consultation with the Experiment Station administration. Nor was the Board of Regents informed of the intention to take over land that it controlled. The plan received little public support.

Finally in 1980, Phillips decided the area must be closed to the public. Vandalism, the cost of maintaining the area, concerns for safety of individuals using the area, and lack of suitable fencing to separate the Custer Island area from the adjoining Station pastures contributed to his decision. To enforce his resolve, Station workers constructed approximately one-half mile of five-wire barbed wire fence to isolate the area. By the following morning, each of the five strands of wire had been cut between each post along the entire length of the fence. The wires were simply replaced and, although some additional vandalism did occur, Custer Island remained closed. The closure probably would not have been so successful had it not been for support of many residents and the local press who realized the area no longer served its original function.

Other activities and events also had little impact on the overall mission of the Station. Some of them were serious, some comical, some merely interesting. In May 1977, two thefts occurred. The first involved tools stolen from the Station shop. Later that month, one of the Station vehicles was stolen. It later was recovered undamaged, but the tools were not recovered, nor were suspects apprehended. Other "mysterious disappearances" and some vandalism occurred, but, except for Custer Island, little damage to property.

One of the most unusual events occurred on one Roundup morning, when Phillips looked toward the office and discovered that the American flag was flying upside down on the flagpole near the office. This distress signal was the result of an honest mistake by the custodian responsible for raising the flag. Needless to say, the error was quickly corrected. But along with trials and tribulations there were times of particular enjoyment. These can be illustrated by citing the day that Ralph Dreiling, the classified employee in charge of the cattle feeding operations, was recognized as one of the finalists as Classified Employee of the Year of the entire Kansas State University system. Ralph was only one of many dedicated Classified Employees who have worked on the Station. Others will be mentioned later in this publication.

Phillips announced his retirement in May of 1984 and left the Station on January 15, 1985. This was one month short of 37 years after he arrived in February of 1948 to begin his work in weed control research. A nationwide search for his replacement was initiated, and a number of candidates were interviewed. For a few months following Phillips departure and prior to his replacement's arrival, Bill Stegmeier, a research staff member, was Acting Head.

The following was added to the manuscript by John Brethour:

*“It seems a little unfair for the author to assess his own administration of the station and he has been too modest in his accomplishments; so, as one of the faculty who served under him, perhaps my detached insight is appropriate. Bill was the only head who was elevated to the position from inside the organization. That provided him considerable insight about the needs of the faculty and a familiarity with the staff and their various talents. He was well known in the Hays, western Kansas agricultural, and Kansas State University communities. He once told me that he considered his role, as head, was simply to provide that which was necessary for the scientists to do their work and then get out of their way. He invoked principles of total quality management – empowerment, managing while walking about, team spirit – a decade before that management style become popular. His was the most stress-free of all the administrations at the station. He absorbed virtually all the regulatory paper-work chores as well as all budgetary responsibility. In a period when every state agency began to expect reporting of one sort or another, I think Bill had the ability to distinguish between the substantive and the merely procedural and respond accordingly. He was an excellent financial officer; was able to respond to all reasonable requests, kept the equipment current, and left the station in excellent condition.”*

Dr. Patrick (Pat) I. Coyne’s appointment in early 1985 guaranteed that the historically strong leadership of the Station would continue. His educational background and agricultural research experiences brought assurance that he would appreciate the ongoing research programs. As with each previous change in administration, Pat brought his own style and approach to management. He quickly expanded the computer capabilities in his office and pro-

vided incentives to ensure that each staff member had access to computer hardware. Desktop computers in each office soon replaced the central unit previously shared by the staff. So from the beginnings in the 1970’s and augmented by Pat Coyne’s foresight, the Station has continued to be a leader in adopting new computer technologies. By the close of the 20th century, exciting new research programs, such as precision agriculture, were underway. Precision agriculture involves an approach to production in which inputs such as seed, fertilizer, irrigation water, and pesticides are prescribed and applied on a site-specific basis. Further, crop yields are monitored site by site rather than on a whole field. This precision depends on availability of such things as accurate global positioning systems and high capacity computers. But regardless of such technological advances, the role played by individual scientists is not diminished but rather enhanced by new and sophisticated tools.

When Coyne took over the administration of the Station it had nine research staff members. At least three of these had been on the faculty for 30 or more years, and the average length of service of the nine was a little over 21 years. As has been pointed out, longevity does not necessarily equal competence and high productivity, but it does give a degree of continuity, which is impossible when frequent changes occur. Agricultural research under field conditions is necessarily long term, if climatic and other variables are considered fully. Unfortunately shortly after Coyne’s arrival the longtime sorghum breeder, Harold Hackerott, passed away and soon after that, John Launchbaugh, a longtime range management specialist, retired. Coyne replaced both of these individuals with highly competent scientists and, although some turnover has occurred since his arrival, six of the nine positions still continue to be filled by individuals who were on the staff at the time of his arrival in 1985. The untimely death of Bill Stegmeier in 1998 left a void in the research staff.

The research effort of the permanent staff has been enhanced by increased use of research assistants and research associates. Many of these positions have been made possible by financial grants from various agribusiness corporations and from the Kansas Wheat and Sorghum commissions. Although the total budget for the Station has increased over the years, the proportion appropriated by the State Legislature has remained quite constant at about 50 percent. Sale of products provides about 40 percent, and the remaining 10 percent comes from grants, gifts, and various other sources.

In 1986, the Station headquarters area had approximately 30 buildings and the land resources consisted of approximately 3,700 acres. This included 465 acres leased from Ft. Hays State University. Of this total, approximately 1800 acres were cropland and about 1600 acres range and grassland. Buildings, roads, waterways, and a small amount of wasteland occupy about 275 acres. Recently 2,400 acres of rangeland were purchased and added to the area available for conducting beef cattle research. Although this land is located approximately 26 miles from Station headquarters, it provides unprecedented opportunities to expand research with the beef cattle cow herd. Dean of Agriculture Dr. Marc Johnson and others responsible for the acquisition are to be congratulated.

During the past 15 years, several buildings have been erected and others have had major alterations and improvements. Some of the oldest buildings on the Station described for many years as simply the "mule barns" were torn down and replaced with modern sheet-metal structures that provided additional storage for equipment and included some additional laboratory space. A new building provided safe storage for farm chemicals. Another new facility provided a controlled environment for storing valuable plant breeding seed stocks. Major construction and remodeling were required to make the auditorium comply with the Americans with Disabilities Act. Several of the wooden frame houses that had been in use

since the early 1900's were abandoned and torn down, or moved from the Station.

As always, some events and activities not related directly to the research mission required administrative action. Some of these actions were not necessarily popular with all in the local community. For example, closing the Custer Island picnic area did not completely eliminate the use and sometimes the abuse of the area along the Big Creek corridor. Coyne attempted to deny public access to the area. After weathering strong opposition to that action, he arrived at an admirable solution. With the help of some local residents, the Big Creek Natural Area was established in 1997. The goal was to preserve this natural area as an outdoor laboratory and classroom for future generations and to make it available to high school and university students. Equally important, by limiting public access, interference with research in the area is not jeopardized.

Two highly significant events occurred in 1994. Action by the Kansas State Legislature changed the official name of the outlying Experiment Stations associated with Kansas State University from Branch Station to Agricultural Research Center. Thus, the Fort Hays Branch Experiment Station became the Agricultural Research Center-Hays (ARCH). Locally, this name change served to more clearly differentiate between the Research Center and Fort Hays State University. Because both had carried the designation Ft. Hays, many individuals believed the Station was part of the University. Although cooperation has long existed between the two, they are separate.

A second far-reaching change also occurred in 1994 when Dean of Agriculture Marc Johnson, combined the administration of the Western Kansas Agricultural Research Centers under one administrative head. The business office of these combined units is located at ARCH, but each of the centers is otherwise self-contained with separate operating budgets. Coyne became Head of the combined unit that included installations at Hays, Garden City,

Tribune, and Colby. The combination consolidated administrative functions of the four locations and, thus, reduced costs, promoted program integration, and lessened research duplication. The additional responsibilities required that Coyne spend some time at each of the other locations, which reduced the time that he was involved actively in the management of ARCH. But with competent staff at all locations, no disruption of research at ARCH was apparent.

Prior to Coyne's arrival, the purpose of the Station had not been fully articulated, probably since the 1901 Resolutions. Certainly, its reasons for existence generally were understood, but Coyne was the first to detail in print the missions of the Station, its general focus, and some of the goals and objectives. Pat wrote: "The mission of the Station is to serve the people of Kansas by developing new knowledge and technology needed to stabilize and sustain long-term profitable production of food and fiber in a manner consistent with conservation of natural resources, protection of the environment, and assurance of food safety. Emphasis is on production efficiency through optimization of inputs in order to increase profit margins for producers in the long term."

The mission statement included three very general, broad based goals: (1) To develop efficient management systems in all phases of beef cattle production and to use Kansas grown forages and feed grains complemented with forages from native range lands. (2) To develop genetically superior varieties and germplasm lines of principal and alternate crops for western Kansas that incorporate resistance to dis-

ease, insect and environmental stresses; provide acceptable yields, and enhance end-product quality. (3) To develop sustainable, profitable, crop production and tillage systems that conserve the natural resources; maximize water-use efficiency; and minimize losses in yield and product quality caused by weed, insect, and disease pests. The primary geographical region of focus has long been recognized as west central Kansas, but many of the research results are applicable to all parts of Kansas and to areas beyond.

The Research Center at Hays seems uniquely situated to pursue these goals. The staff is made up of scientists of several different disciplines that together provide the needed broad-based approach to solving problems. During Coyne's tenure as Head an unprecedented number of publications and presentations have distributed research results to the farm and scientific communities. The ARCH scientists at the end of these 100 years certainly have tools that were not available to those who were responsible for research that began a century ago. These present-day scientists have computers, communications, and other technologies that the original staff members could not have anticipated. The Center is unique in many ways, but represents a true Agricultural Research Center that is part of the Kansas State University system, yet functions as a department located away from the main campus. Scientists seeking a location to conduct meaningful agricultural research could not find a more suitable atmosphere. And so the Agricultural Research Center-Hays will continue to provide leadership that will ensure productive agriculture in Kansas and beyond.

## ADMINISTRATIVE AND RESEARCH STAFF

Exact dates of arrival and departure are not readily available for all scientists, and records do not include first names for some early staff members. The lists do not include names of all individuals that might have been involved in the various projects. For example, nonprofessionals sometimes served on an interim basis after departure of a staff scientist and before arrival of a replacement. The names given here include those who had professional recognition or academic rank in the Kansas State University system.

### Superintendents (Title changed to Department Head about 1981)

	<u>Beginning Date</u>	<u>Ending Date</u>
J.G. Haney	March 29, 1902	December 31, 1904
O.H. Elling (Acting)	March 20, 1905	March 27, 1907
C.K. McClelland	May 16, 1907	December 31, 1909
A.M. TenEyck	June 1, 1910	December 31, 1912
George K. Helder	January 1, 1913	May 31, 1916
Charles R. Weeks	April 1, 1916	May 7, 1920
Harry L. Kent	May 8, 1920	August 31, 1921
Louis C. Aicher	September 21, 1921	June 30, 1952
Wilbert W. Duitsman*	July 1, 1952	June 30, 1976
William M. Phillips	July 1, 1976	January 17, 1985
Patrick I. Coyne	April 15, 1985	To date

\*Assistant. Superintendent March 1, 1950 to June 30, 1952



*J.G. Haney*



*O.H. Elling*



*A.M. TenEyck*



*G.K. Helder*



*C.R. Weeks*



*H.L. Kent*



*L.C. Aicher*



*W.W. Duitsman*



*W.M. Phillips*



*P.I. Coyne*

**Assistants to the Superintendent, Administrative Assistants**

George K. Helder	March 1, 1904	December 31, 1912
E. J. Montague	August 1, 1913	April 15, 1918
Elliott C. Gibbons	June 1, 1918	October 31, 1919
A.H. Kerns	November 1, 1919	September 15, 1924
Robert R. Stehwein	September 16, 1924	December 31, 1924
Walter R. Weaver	February 1, 1925	June 30, 1928
Libbie Reeves Taylor	July 1, 1928	December 31, 1933
Lawrence Reed	January 1, 1934	April 11, 1949
William M. Baxter	March 27, 1949	December 31, 1987
Ronald D. Pickard	June 27, 1994	January 23, 1998
Spencer J. Casey	April 6, 1998	To date

**Alternative Crops**

William D. Stegmeier	February 15, 1971	May 16, 1998
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**Beef Cattle and Other Livestock**

J.A. Wilham	April 13, 1908	August 31, 1911
A.M. Patterson	April 15, 1914	September 15, 1914
A.L. Burkholder	July 16, 1917	August 31, 1918
H.G. Chittenden	September 3, 1918	January 31, 1922
Louis C. Aicher	September 21, 1921	June 30, 1952
Frank B. Kessler*	March 6, 1946	March 11, 1957
John R. Brethour	June 8, 1957	September 30, 1966
Reappointment	September 1, 1968	To date
Donald G. Ely	August 1, 1966	August 31, 1968

*\*Shared appointment with Range Management*

**Cereal Crops**

A.D. Colliver	April 1, 1905	December 31, 1908
C.C. Cunningham	January 21, 1909	July 31, 1911
B.E. Rothgeb	April 1, 1910	March 1, 1912
F.A. Kiene	March 1, 1912	April 30, 1919
Arthur F. Swanson	June 1, 1919	October 3, 1951
Lowell Penny	April 1, 1947	June 1, 1949
Alfred J. Casady	June 1, 1949	June 30, 1951
Wayne L. Fowler	July 1, 1952	July 31, 1953

**Sorghum Research**

William M. Ross	September 1, 1951	August 31, 1969
Harold L. Hackerott*	September 1969	September 7, 1985
Kenneth D. Kofoid	May 18, 1986	To date

*\*Transferred from Forage Crops*

**Wheat Research**

John D. Miller	August 17, 1953	August 28, 1957
James A. Wilson	September 16, 1957	October 1, 1961
Ronald W. Livers	February 1, 1962	November 5, 1979
T. Joe Martin*	January 18, 1980	To date

*\*Transferred from Plant Pathology*

**Entomology**

Woodrow W. Franklin	May 15, 1948	November 10, 1953
Tom L. Harvey	March 15, 1954	To date

**Forage Crops**

R.E. Getty	April 1, 1913	March 31, 1929
David A. Savage	April 1, 1929	January 23, 1937
Leon E. Wenger	March 1, 1937	August 6, 1943
Robert E. Wagner	October 30, 1943	March 1, 1945
Freidrich E. Meenen	March 5, 1945	June 16, 1951
Alfred J. Casady*	July 1, 1951	August 28, 1954
Harold Hackerott**	November 1, 1954	September 1969

*\*Transferred from Cereal Crops*

*\*\*Transferred to Sorghum Research*

**Plant Pathology**

Roscoe Bellingham	March 3, 1952	June 1, 1957
T. Joe Martin*	September 1, 1974	January 17, 1980
Curt Bender	September 26, 1980	October 17, 1981
Dallas L. Seifers	April 1, 1982	To date

*\*Transferred to Wheat Research*

**Range Management**

Frank B. Kessler	See Beef Cattle	
John L. Launchbaugh	October 1, 1955	September 17, 1985
Kenneth C. Olson	May 18, 1986	September 23, 1992
Eric S. Vanzant	June 18, 1993	May 22, 1998
Keith R. Harmony	June 13, 1999	To date

**Soil Investigations**

L.E. Hazen	1907	1908
A.L. Hallsted	1909	1945
Andrew B. Erhart	1946	1948
Paul L Brown	1949	1956
Ralph Luebs	1956	1959
Carlyle A. Thompson	January 1, 1964	To Date

**Weed Control**

F. Leonard Timmons	July 1, 1935	June 12, 1948
William M. Phillips	February 15, 1948	June 30, 1976
Phillip W. Stahlman	November 18, 1976	To Date

## RESEARCH OVERVIEW

No attempt will be made to give detailed or even summary results of the many research projects that have been carried out during the past 100 years. Rather I will endeavor to highlight some general research areas and describe detailed results in only a few cases. More details about research can be found in the special publication *An Annotated Chronology of Research Highlights*, Agricultural Research Center—Hays. In addition, careful study of the publications listed in Appendix C will reveal some interesting developments. During the early part of the Station history, major emphasis was on demonstrations and production research that could be used immediately by the general farming community. Although that aim is still important and the need is still being met through publications of the Experiment Station or Extension Service and popular outlets, the number of articles published in scientific journals has increased greatly. For example: Prior to 1950, approximately 25 articles had been subjected to peer review and printed in scientific publications. One staff scientist, Mr. Arthur F. Swanson, authored more than half of those. In only about 12 years following 1950, the number more than doubled. That trend has continued and intensified in the ensuing years. The need to provide published information that will enable Kansas farmers to increase their total production and production efficiencies cannot be over emphasized. But the significance of the large number of contributions to the worldwide scientific literature must not be overlooked.

The role of the U.S. Department of Agriculture (USDA) in research at Hays should be recognized. As has been pointed out, much of the early crops research was

funded at least partially by the USDA. Research agronomists in cereal crops, forage crops, soil management, weed control, and soil conservation were federal employees. The Soil Conservation Service, USDA, supported studies of soil erosion and water runoff for only a few years. The department began reducing support for forage research in the 1940's and terminated that federal project about 1950. Next, in 1959 the Division of Dryland Agriculture, USDA, terminated most of the funding for the project started in 1906. In 1969, the Agricultural Research Service (ARS), USDA ended funding for cereal crops work, which also had begun early in the century. Finally, in 1973, ARS closed the last federally funded project, weed control. In every instance, the research was continued with support from state funds, but many people felt that USDA officials were short sighted. Because significant state financial support had augmented federal funds, it is doubtful that USDA could have achieved so many meaningful results elsewhere at so small a cost.

Many of the researchers who have worked at the Station are mentioned in the following sections. A complete list is included **on page 40**.



*Crowd assembled for the second annual Roundup, April 1, 1915.*

## **BEEF CATTLE**

Although several classes of livestock appeared on the Station immediately after its establishment, beef cattle soon emerged as the most important as far as research and demonstrations were concerned. The herd management and feeding work started in the second year of the Station's operation and has continued without interruption to the present. The first beef herd consisted of 144 head of common cattle, mostly breeding stock. These cattle were sold in 1907, and an experiment was started to compare four beef breeds: Short-horn, Angus, Hereford, and Galloway. The plan was to maintain these breeds as separate entities, produce calves, and compare the performance of the different breeds. Unfortunately, the experiment was never designed adequately, and little or no usable information was forthcoming. In the following years, the Hereford herd was increased, but little cow herd research was accomplished. Soon after his arrival in 1921, Louis C. Aicher began a systematic dispersal of all the cows except Herefords. He initiated careful selection and breeding policies and developed one of the superior nonregistered Hereford herds in the country. Bulletin 453 describes his program in detail, including the pedigrees of the outstanding sires he used. Little research was conducted with the cow

herd, but it did serve as an excellent demonstration of what could be accomplished with good breeding and selection. Calves produced by the cow herd were used in feeding trials, but only after replacement heifers for the cow herd were selected.

Results of the beef cattle work have been reported to the agricultural community through an ongoing series of publications that began with a mimeographed circular in 1913. The first recorded reference to Roundup appears in the 1914 Circular entitled "Roundup on The Fort Hays Reservation." Since that field day on May 1, 1914, Roundup has been a fixture at the Experiment Station. It has been held each year except 1945 when German prisoners of war were housed in the livestock research area. Roundup reports have been published in all but two years, making it one of the longest series published by any public research agency. For many years, the Roundup reports consisted almost entirely of data recorded from the various experiments with little or no interpretation. There seemed to be a reluctance to summarize the data and to formulate any type of recommendation. Rather, the philosophy seemed to be, "Only the facts are given. Draw your own conclusions." This same philosophy was evident in publications from other research projects. Changes needed to overcome



*"Entertainment" at the second annual roundup, April 1, 1915.*

this reluctance to interpret results were slow to emerge, but surely usable recommendations should be part of publications written to provide information to farmers.

From about 1920 to 1944, Dr. C.W. McCampbell, animal scientist located in Manhattan, was the principal investigator for beef cattle; although Mr. Aicher and his herdsmen supervised the actual day-to-day activities. Mr. Frank Kessler arrived in 1946 and became involved in the beef cattle feeding work as well as some of the range management studies, but he had little input into cow herd management. He remained until 1957, when Mr. John R. Brethour came to the Station. Except for a two year period in the 1960's, he has directed the beef cattle research since that time. He was the first on-site individual to have full responsibility for the project. Brethour expanded the cow herd research to include performance testing, creep feeding, breed evaluations, management strategies, and reproductive physiology. The recent purchase of additional rangeland has allowed for expansion from about 120 to 350 cows. However, this number represents less



*John R. Brethour*

than one-fourth of the more than 1,500 head of cattle on the Station. Beef cattle nutrition work always has focused on crops grown in the area. Sorghum has been especially important, and the Station certainly has been a leader in research with this crop. From beginnings early in the century, the studies involved both grain and forage sorghums. The forage research has



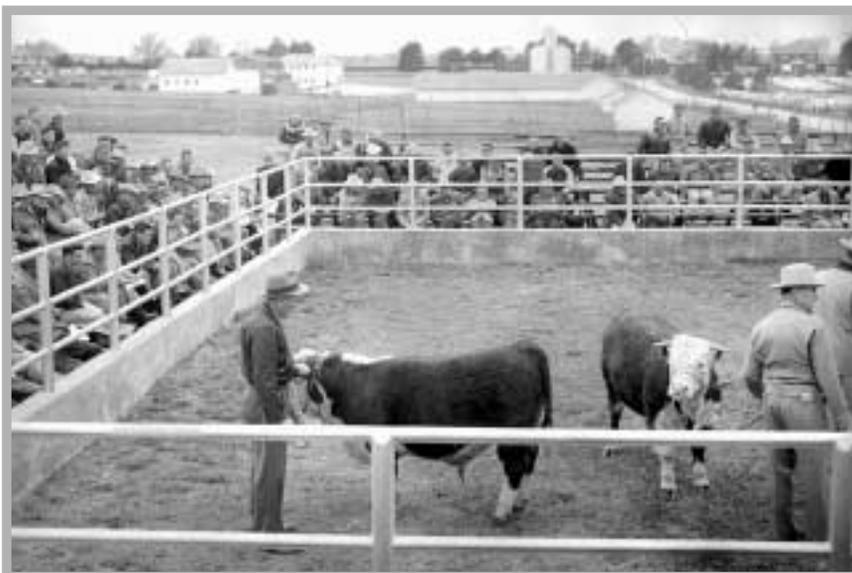
*Cars and Crowd at Roundup, c.1926.*



*Facilities used for Judging Contest, 1932.*

shown important relationships between dry matter content and resulting silage quality, demonstrated variation among sorghum varieties, and established that silage additives then available did not improve quality sufficiently to provide an economic response. The Station was

among the first to evaluate ensiling high moisture sorghum grain. When fall weather is cool and moist, harvesting dry sorghum grain is often difficult, but ensiling at the proper high moisture content can salvage the grain. Many other silage and dry roughage experiments have been carried out and results presented in the Roundup reports.



*Cattle in the improved arena, 1966, but still no shelter from inclement weather.*

Research with feed grains directed by Brethour proved that with proper preparation, the feeding value of sorghum grain is approximately 93 percent that of corn. This is considerably higher than the previously recognized conversion factor. John also did pioneering research using wheat in cattle fat-

tening rations. Some preliminary work had been conducted, but had been based on the assumption that wheat could constitute only a relatively small percentage of the total grain in a feeding ration, because higher amounts surely would cause digestive problems. His work showed that, with correct management, feeding wheat as 100 percent of the grain in finishing rations was possible. He also studied different wheat types and varieties and conclusively proved that the commonly grown hard red winter wheat varieties were fully equal to the so-called feed varieties. Probably the most important result of the wheat-feeding experiments was to inform producers that wheat could be used successfully in cattle rations. Estimates indicate that over a half billion bushels of wheat have been fed to cattle in the U.S. since Brethour's work proved it could be used safely. In addition to the conventional feeding studies, many experiments involved feed additives and performance-enhancing implants.

Brethour's extensive use of computers as an aid to conducting and interpreting research results deserves special mention. In the early years of computer science, no software was available to provide the types of analysis that we now have come to expect. Brethour, through self education, wrote programs that

met the needs of his research work. He developed an interactive least-cost feed ration program that enabled cattle feeders to input various feed ingredients along with their cost and determine which was the most economical to use in their feedlot. As future beef producers look back on Brethour's many accomplishments, perhaps the greatest will be his work to establish ultrasound technology as a production tool. He was one of the first to recognize the potential of ultrasound readings as an aid in predicting carcass composition prior to slaughter. Without trying to explain the technology in detail, suffice to say that by interfacing the ultrasound system with computers, feedlot managers can scan large numbers of cattle in a comparatively short time and accurately predict the optimum time when they should be marketed. Later, Brethour worked with ultrasound scanning on very young cattle. Results indicate that scanning at weaning time can predict carcass quality when the animal is slaughtered many months later. This ultrasound-computer technology has been assigned to Kansas State University Research Foundation and patents have been granted. The Station is now acclaimed as the world leader in developing ultrasound technology as a beef-cattle production tool.



*Enclosed arena with permanent seats for about 800. These facilities were designed by Duitsman.*

## **CEREAL CROPS**

Investigations with Cereal crops began with demonstration plantings in 1902. The Station Superintendent conducted, or at least directed, the work. Even at that early date, records indicate that the USDA supplied some funds and furnished some seed stocks. The earliest record of a staff member other than the Superintendent being in charge of the cereal investigations was Mr. A. D. Colliver in 1905. That individual was paid partially from USDA funds, but from then until 1912, the state supplied some money for the project leader's salary as well as furnishing physical facilities and labor. A more formalized arrangement with the USDA began in 1912, and a full time USDA scientist, Mr. F. A. Kiene, was put in charge and remained until 1919. Mr. Arthur F. Swanson, who led the project until he retired in 1951, replaced him.

From 1902 through 1920, most of the cereal investigations involved variety testing along with observations and research concerning rate and date of seeding. Winter wheat received the greatest attention; but other crops, including spring wheat, grain sorghum, oats, barley, and corn were tested. Forage sorghum investigations were carried out by the forage crops project until 1936. After that date and until 1953, all of the sorghum and wheat work fell under one project leader. The early wheat work was done almost entirely with Turkey and Kharkov and selections from those two varieties. Kanred, the first important variety developed at Kansas State College, was grown widely throughout the

state. The Station actively participated in its development and was responsible for distributing many thousands of bushels of seed. Later, the varieties Tenmarq and Comanche were developed at the College; they also became important in Kansas and the surrounding areas. Swanson started the active wheat breeding program at the Station. Kiowa was the first variety developed and distributed to farmers. Bison, a close relative of Kiowa, was released in 1955 and soon became the most popular variety of the state. In 1961, Bison was grown on 27 percent of the Kansas wheat acreage and was regarded highly for its milling and baking qualities.

In 1947, a state financed position was added to assist the USDA scientist. Several young researchers filled that position prior to the arrival of Dr. William M. Ross in 1951. He came to Hays expecting to gain valuable training by working under Swanson. However, Swanson soon departed for an international assignment in Peru and retired after his return. Ross found himself in charge, accepted the USDA appointment, and quickly established a reputation as a highly competent plant breeder. In 1953 the wheat and sorghum breeding pro-



*Combine mounted on Caterpillar tractor for harvesting experimental grain plots. This machine, designed by Aicher, was no doubt the first self-propelled plot combine.*

grams were separated. The USDA employee, Ross, was put in charge of sorghum breeding, and the state assumed responsibility for the wheat breeding work, led by Dr. John D. Miller. The federal sorghum project at Hays was terminated in 1969, but not before Ross was recognized as a premier sorghum geneticist. Since 1969 both wheat and sorghum research has been funded from state funds supplemented by various grants.

During the late 1950's, the concept of hybrid wheat was studied intensively, but conventional plant breeding that led to new wheat varieties was not particularly productive. That changed in 1962, when Dr. Ronald W. Livers assumed leadership of the wheat-improvement project and began actively developing lines and varieties. During his tenure, five important varieties were developed and released from the Station: Eagle, Sage, Kirwin, Larned, and Cheney. For many years Eagle's milling and baking performance set the standard for desirable quality. Larned, released in 1976, is still grown on limited acres in the state. Following Livers's death in 1979, Dr. T. Joe Martin, who was working on the Station as a Plant Pathologist, transferred to the wheat breeding position.

Martin carried on the work that Livers had in place and expanded it into a truly outstanding program. The first variety released following his appointment as wheat breeder was Arkan. It became one of the leading varieties in Kansas in spite of some controversy regarding its grade classification. But perhaps this controversy led to some needed changes in wheat-grading procedures. Arkan was followed by Dodge, Norkan, and Ike. In 1990 an experimental hard white wheat, KS84HW196, was released to the American White Wheat Producers Association. This variety initiated production of hard white wheat in western Kansas. In 1999, a high-yielding, hard white wheat, Trego, was distributed to the seed producers as a general public release. The wheat-breeding program at Hays began the conversion to the development of hard white wheat in 1987, and by 1999, was devoting about 90% of its resources to the hard whites. The release of Trego and other high-yielding, high-quality white varieties may significantly change Kansas wheat production and provide greater opportunities in international trade.

As important as new ready-to-plant varieties may be to agriculture, perhaps even

more important are germplasm lines that can be used by plant breeders throughout the world to develop improved varieties of wheat. In addition to varieties released for farm production, the wheat program has developed and released some 18 or more germplasm lines that were made available to all public and private breeding programs. These included some of the original genetic resources used in the early hybrid-wheat program and newly developed lines with improved co-



*Seeding wheat breeding plots with a 2-row tractor mounted planter. As late as the 1950's this was done entirely with manpower.*

leoptile length coupled with short stature, and resistance to Hessian fly, wheat streak mosaic virus, wheat curl mite, green bug, and Russian wheat aphid. Developing varieties and germplasm releases with insect and disease resistance requires cooperative efforts among the wheat breeder, entomologists, and plant pathologists. These contributions will be discussed further in the sections on entomology and plant pathology research.

However, as far as farmers are concerned, new varieties provide the most tangible evidence of a successful wheat-breeding program. Certainly, germplasm releases should not overshadow new variety development. The importance of varieties released from the Station can be illustrated by noting that since Kiowa was released in 1950, new varieties developed at the Station have been planted on more than 120 million acres. This is equivalent to total wheat plantings for approximately 10 years in Kansas. Assessing the monetary value of research is often difficult; however, in the case of new wheat varieties, some observations are possible. A new variety is developed and released with the aim of providing some improvement over the existing varieties that it is likely to replace. This may be increased disease and insect resistance, increased drought tolerance, better quality, and other factors. But finally, the success of a variety is measured by its yield and acceptance by growers. Assume that a new variety will yield only one additional bushel per acre (many surpass that) than existing varieties. Then, if over the years, improved varieties have been planted on as many as 120 million acres, increased production over time has been 120 million bushels, or more than one million bushels for each year the Station has been

in existence. Similar extrapolations can be used to evaluate other research.

As pointed out, sorghum was included in the demonstration plantings as early as 1902. Most sorghum varieties were tall forage types with comparatively low grain yields. The first important grain variety, Pink Kafir, was selected about 1912 and was an important part of the grain sorghum production for many years. Swanson believed that sorghum improvement was fully as important as the wheat work, and he began selecting and breeding to improve the existing varieties. Wheatland, the first combine-type sorghum to be grown widely, was brought to the Station in 1929 and released in 1931. Westland, a variety developed at the Garden City Experiment Station, and Midland, developed by Swanson, replaced Wheatland. These were the leading varieties until sorghum hybrids became available in the 1950's. Midland seed sales played an important role in the Station finances during the 1940's. In 1945, approximately 250,000 pounds of seed were distributed. Other grain sorghum varieties developed by Swanson included Early Kalo, Club Kafir, and Cody. He also began extensive work to improve forage varieties. The available varieties, such as Red



*A modern self-propelled plot combine.*

Amber and Black Amber, were late maturing, often lodged badly, and produced little grain. Early Sumac was developed at the Station prior to Swanson's arrival and largely replaced those older forage varieties. Early Sumac remained important but was supplemented by varieties developed at the Station. Swanson's active sorghum-improvement project led to the release of several forage varieties including Norkan and Ellis. Both had excellent feed qualities, and Norkan had high grain yields, but neither competed well with varieties that had higher forage yields. As with grain sorghum, hybrids soon replaced most of the forage varieties.

Discovery of male-sterile plants (a trait necessary to produce hybrids in crops that may self-pollinate) enabled sorghum breeders to produce hybrids for commercial use. Pure-line variety development essentially ceased. The Kansas Agricultural Experiment Station released some grain sorghum hybrids. However, it soon became apparent the most important function for the Station would be to develop breeding lines that could be used by public and private breeding programs. In 1969, the USDA terminated the sorghum-breeding project at Hays. Ross was transferred to Lincoln, Nebraska, and Mr. Harold Hackerott, who was al-

ready on the Station staff, became the sorghum breeder. Research by the sorghum geneticist, working cooperatively with entomologists and plant pathologists, certainly has served a most important role in sorghum improvement. In 1969, a new greenbug biotype that attacked sorghum throughout its production areas was identified. Through intensive efforts Hackerott, and Tom Harvey, Entomologist, found resistance and developed the first germplasm lines needed to combat this new sorghum pest. Since that time, several additional releases have provided resistance to new greenbug biotypes. Lines resistant to several diseases also were developed. Much of the genetic background of many of the commercially grown hybrid sorghums can be traced to breeding lines released from the Station.

Following Hackerott's death in 1986, Dr. Kenneth D. Kofoid was hired to head the sorghum-breeding project. He had been a wheat geneticist at North Dakota State University prior to coming to Hays, but he was well aware of work being done at the Station. Kofoid was Bill Ross's first graduate research assistant after Ross moved to Lincoln, Nebraska. As such, Kofoid had heard much about working at the Hays Station, especially about

the weather. While in the field on hot, blustery days, Ross quite often would stand and look around and say, "Ah, just like western Kansas!" Kofoid has continued the close working relationship between the breeding project and both the entomology and pathology projects. When a new biotype of greenbug was identified in 1990, he and Harvey were able to release a resistant germplasm within months. The cooperative effort with the pathology project has shown that sorghum also can be infected with wheat streak



*Joe Martin, Wheat Breeder, discussing wheat variety performance plots at a Spring Field Day.*

mosaic virus. Although this is not good news to sorghum producers, having this knowledge allows the breeding program to develop germplasm that tolerates the disease. In all, this team has released 27 germplasm lines with insect and disease resistance to the commercial seed industry for their use in developing hybrids.



*Kenneth Kofoed*

In addition to the work with wheat and sorghum, considerable selection and development work with corn was done early in the century. Climatic conditions in the Hays area were not conducive to extensive corn production using the open-pollinated varieties then available. An exception was a selection that proved to be quite well adapted to conditions in west central Kansas. This variety, later named Hays Golden, was grown widely in Kansas until the advent of corn hybrids and higher-yielding grain sorghums. Hays Golden was used as a parent variety in several commercial corn hybrids. In recent years, corn has again increased in popularity and is being grown on nonirrigated land. Some of the newer hybrids are better adapted to the area, and no doubt corn will continue to be important, at least until prolonged drought occurs.

Other cereals, including spring wheat, winter and spring barleys, and oats were tested and observed in demonstration plantings, but only limited variety-improvement work was done. Briefly, the studies showed that none of those crops could compete successfully with winter wheat and sorghum for grain production in the west central Great Plains. Some spring wheat varieties and germplasms continue to provide genetic material that can be incorporated into the winter wheat- breeding program.

## **FORAGE CROPS**

Experimental work with forage crops began with the establishment of the Station. The most extensive work during those early times was with forage sorghum. After his arrival in 1919, Swanson of the cereal project, did some breeding and selection, but much of the genetic improvement took place after the forage sorghum program was transferred to Cereal Crops in 1936. In addition to observing varieties, the early work included methods of culture and utilization of the crop. Sudan grass received considerable attention; particularly important were cultural practices involving rate and date of seeding and determination of optimum growth stage for harvesting hay. Some efforts were made to improve alfalfa, bromegrass, and big bluestem. Early observational plantings included a large number of different crops, some of which (e.g., soybeans) could not be classified as forages.

Prior to 1913, the Station Superintendent oversaw most of the forage work. In that year a cooperative agreement was initiated with the Bureau of Plant Industry, USDA. The department paid the salary of a scientific worker stationed at Hays, and the Station provided the physical facilities and most of the labor. This was similar to the arrangement with other USDA scientists located at Hays. This cooperative venture continued until 1937, when the state assumed responsibility for one-half of the scientific worker's salary. All federal support for the project was terminated in 1950. Mr. R.E. Getty, the first USDA scientist, arrived in 1913 and directed the work until 1929. He tested a large number of forage and miscellaneous crops to determine their adaptability to conditions in west central Kansas. His tests included several legumes in addition to soybeans, and he observed some root crops, e.g. sugar beets. Although Mr. Getty used the best varieties then available, he soon determined that few, if any, of these alternative crops could compete successfully with wheat and sorghum under the climatic conditions at Hays. Farmers had considerable interest in foxtail millets. They could

be grown successfully, but tests showed that they could not compete with forage sorghum in either yield or forage quality.

During the drought of 1932-1936, survival of native grasses was studied carefully under the direction of Mr. David A. Savage. In anticipation of a need to reseed after the drought, studies were initiated to determine optimum seeding date, seedbed preparation, and seeding methods. As will be seen, these studies were expanded in later years. The breeding program, or perhaps more accurately a selection program, for improving buffalograss began in 1936. A selection that was superior in seed production and height of seed stems was located and increased vegetatively in 1942. This female plant selection then was pollinated with numerous selected male plants. This improved selection was released as a buffalograss variety named Hays 1-I, and several thousand pounds of seed were harvested and distributed. Concurrent with this buffalograss variety improvement work was the research needed to develop a system for improving the germination of newly harvested buffalograss seed. This process is discussed in some detail in the section on the L.C. Aicher administration. Most of the grass research work in the forage project was terminated with the arrival of Dr. John Launchbaugh in 1955 as leader of the Range Management project. As noted in the Range Management section, he did outstanding work in range reseeding and other aspects of grass management.

It was apparent as early as 1902 that alfalfa could be grown successfully on the bottomland fields along Big Creek. Problems associated with establishment and seed production were studied. Later, lines and varieties, including the bacterial wilt-resistant variety Buffalo, were evaluated. An active alfalfa breeding project was initiated in 1954 when the spotted alfalfa aphid first appeared. The plant breeder, Harold Hackerott, and the entomologist, Tom Harvey, worked together to find resistance to this insect pest, and, certainly in nearly record time, developed and released the

resistant variety Cody. A similar program a few years later resulted in the release of Kanza, the first alfalfa variety resistant to the pea aphid. This cooperation between scientists from different disciplines illustrates the value of having close association and cooperation among the resident staff members.

Hackerott transferred to the sorghum breeding position in 1969, and only limited work was accomplished on cultivated forages other than sorghum after that. As noted above, the Range Management scientist did most of the grass research. A new project was started in 1971 to investigate some possible alternative crops for use in west central Kansas.

## **ALTERNATIVE CROPS**

Hard red winter wheat became the crop of choice soon after it was introduced into the area late in the 19th century. However, farmers then and continuing to the present have sought possible alternative crops that would equal or exceed returns from wheat. The first of these crops that became important, of course, was sorghum; but during the early years of the 20th century, considerable acreage of corn also was planted. Since the Station's origin, many other possible alternative crops have been planted and observed by crop scientists. As noted previously, most of these crops were discarded quickly as unsatisfactory for the climatic conditions or simply did not have potential for economic returns that could compete with those of wheat and sorghum. This was true even with corn, especially following development of combine-type grain sorghums. More recently, with improved corn hybrids and soybean varieties, these two crops have extended their area of adaptability further west in Kansas than previously thought possible.

Research to find alternative crops intensified with the arrival of Mr. William D. Stegmeier in 1971. He had worked previously at the Garden City Branch Experiment Station, where his studies with wheat, sorghum, corn, and several possible alternative minor crops

such as castor beans, soybeans, pinto beans, safflower, winter barley, and popcorn provided an excellent background for his studies at Hays. When he came to the Station, most of the oil-type sunflower production was in Texas and in the northern states. Stegmeier believed that the crop had potential in Kansas and began an intensive breeding program to improve yields and increase disease and insect resistance in sunflower varieties. His work contributed to acceptance of the crop by Kansas farmers. Acreage was limited for several years, partly because seed-processing plants were not available within the state. With the addition of such plants, sunflower is now an established crop in the state.

Stegmeier's most notable work was his breeding program with pearl millet. This crop, which is entirely different from the previously tested foxtail and proso millets, is a staple food and feed crop in many countries of Asia and Africa, but it had never been grown in Kansas. He believed that it had potential as a new crop for Kansas farmers and that it might compete successfully with grain sorghum. When he



*William Stegmeier*

started his work, the typical pearl millet variety was a tall late-maturing type adapted to tropical climates. Stegmeier knew that, if the crop was to be successful as an alternative to sorghum, it must be converted to a short-stature, early-maturing, high-yielding grain type. His breeding work soon attracted attention beyond the borders of Kansas. Beginning in 1978, the project at Hays was linked to international crop improvement programs including the International Crops Institute for Semi-Arid Tropics (ICRISAT) headquartered in Hyderabad, India, and the U. S. Department of State Aid to International Development program entitled International Sorghum and Millet Cooperative Research (INTSORMIL). That cooperation resulted in exchange of several thousand varieties, germplasm lines, and elite inbred selections of pearl millet.

Developing hybrids of crops such as sorghum and pearl millet, requires parental lines that are male sterile (that is, plants that will not self pollinate), thus assuring fertilization from a separate male line. Stegmeier's breeding program at Hays developed two male sterile lines from a West Africa source. These lines have been highly successful as parental stock and were recommended by the Indian National Program for general use as seed parents. The new inbred lines imparted early maturity, larger seed size, and higher grain yields than had been available previously. Early maturity is particularly important in areas of India and Africa, where short season crops are desirable because of the need to produce two or even three crops during a given year. Reliable reports from India indicate that by 1997, at least half of all of the pearl millet hybrids marketed by India's private growers were produced using these female parents. This means that more than five million acres of pearl millet grown in India in a given year are hybrids derived from Stegmeier's program. Perhaps even more importantly, these inbred lines are used widely in breeding programs in India and elsewhere. This will lead, in turn, to further improvement in this significant feed and food crop. Because of his work with the international sector, Stegmeier was recog-

nized as part of a team that received a distinguished scientific achievement award sponsored by ICRISAT. Pearl millet is not yet grown widely in Kansas and perhaps never will be, even though extensive yield trials showed that the new hybrids can compete successfully with grain sorghum. Feeding trials with beef cattle indicated that the grain and forage could be used in place of sorghum grain and forage. But the impact of the research program at Hays has been felt worldwide and is particularly meaningful in areas that are often short of food to feed their population.

In addition to the research with pearl millet and sunflower, Stegmeier did a limited amount of work with canola, amaranth, and other possible alternative crops. Of these, probably only canola may find a niche in Kansas agriculture and then only after continued breeding and varietal improvement has taken place. Stegmeier's untimely death from cancer in 1998 brought closure to one of the important crop-improvement programs in the world.

## **ENTOMOLOGY**

Alfalfa flowers must be "tripped" to produce seed. The need to determine the roles of insects and various mechanical devices in alfalfa flower tripping intensified in 1948. Some cooperative work with Agricultural Engineering to study mechanical tripping was underway. The first full-time entomologist arrived at the Station in 1948 to determine the role of both beneficial and harmful insects. This established a unique arrangement between the Station and the Department of Entomology, Kansas State University, in that the entomologist at Hays was a member of the Department staff at Manhattan. This arrangement has continued to the present time and is the only case where a full-time scientist located at Hays is not a Station faculty member.

Dr. Woodrow W. Franklin, who had been working on alfalfa insects in Manhattan, filled the position. He immediately began research to determine the role of wild bees as



*Reducing grasshopper infestation with a "hopper dozer." Modern insecticides and insect-resistant crops have reduced losses due to insects.*

well as colonies of domestic honeybees in the pollination of the crop. He had sufficient colonies to warrant harvesting and processing honey. Additionally, Franklin did extensive survey work throughout west central Kansas to determine levels of insect infestation and species of insects that were affecting alfalfa. He accepted an overseas assignment in 1953 and Mr. Tom L. Harvey replaced him in 1954. Alfalfa pollination research was largely abandoned. Harvey has remained at the Station since that date and epitomizes the definition of a long-term commitment to a research program. A few years after his arrival, he took sabbatical leave to pursue and obtain a Ph.D. from Oklahoma State University.

Although his independent research in several areas has been important, perhaps Harvey's greatest contribution has been to work closely with other staff members to develop insect-resistant crop germplasm lines and varieties. He also worked closely with livestock researchers to develop unique and effective insect control methods, particularly for beef cattle. His impressive list of publications documents his contributions, but one needs special mention. He originated the idea for, and pub-

lished the first technical paper on, insecticide-impregnated ear tags for fly control on cattle. This system soon became an industry standard. Good researchers are never short of ideas, but some ideas work, whereas others do not. This is illustrated by the studies with hornfly control on cattle, Harvey and John Brethour, Animal Scientist, were trying to develop a bolus (a large pill) containing a larvicide that eventually would be excreted in the manure and contain sufficient insecticide to kill hornfly larvae. They had trouble getting a bolus large enough to contain the necessary amount of larvicide and decided to try using a 6-ounce frozen juice can as a mold. They then tried to administer the bolus down the animal's throat using a caulking gun. Although this bolus was too large for practical application, it proved to be a forerunner of the sustained-release boluses now used to treat cattle. The livestock insect research is documented in 24 articles published in refereed journals from 1959 to 1988 (see appendix C). This work was discontinued in 1989 when an increased effort was needed to study insects and mites in relation to the transmission of virus diseases of wheat and sorghum. That research involves close cooperation with Dallas Seifers, plant pathologist, and one



*Dead sorghum plants killed by aphids vs. resistant lines developed through plant breeding and selection.*



*Tom Harvey*

notable result was the identification of the wheat curl mite as the vector of the High Plains virus of wheat and corn.

Several insect-resistant varieties and lines of several crops are mentioned in other research sections. Teamwork between plant breeders and the entomologist resulted in the development and release of such varieties as Cody and Kanza alfalfa. They identified a greenbug-resistant sorghum and developed and released several germplasm lines used in commercial and public breeding programs to produce greenbug-resistant sorghum hybrids. Likewise, they identified, developed, and released wheat lines resistant to the wheat curl mite, the vector for the destructive wheat streak mosaic. More recently, a Russian wheat aphid-resistant wheat variety, Stanton, was released. Prior to doing the extensive research necessary to develop these varieties and lines, it often was necessary to learn to rear the insect in question and then to effectively infest plants being used in the study. Harvey has a unique ability to adapt systems necessary to accomplish these tasks.

## **PLANT PATHOLOGY**

In 1952 a severe outbreak of western wheat streak mosaic virus devastated thousands of acres of the Kansas crop. Thus began many years of research to find resistance to the disease and incorporate that resistance into varieties and lines. In 1952, the USDA funded a position at Hays to study this largely unknown disease. The program was fairly short-lived and produced little or no usable information. From then until 1974, the disease resistance work was done by the wheat breeder, Dr. Ron Livers, in cooperation with pathologists at the central Station in Manhattan. In 1974, the Kansas Wheat Commission provided funds to substantially finance a new pathologist position at the Station. Dr. T. Joe Martin began working closely with Livers in the wheat breeding program. Following Livers' illness and death in 1979, Martin assumed the wheat breeding responsibilities, and Dr. Kurt Bender was em-



*Dallas Seifers*

ployed. Unfortunately, responsibilities required that he return to the family farm in Iowa, so his stay at the Station was quite brief. Dr. Dallas L. Seifers assumed the position of plant pathologist in early 1982 and has remained in that position.

The plant pathologist works closely with plant breeders to develop disease-resistant varieties and lines. The original thrust of the pathology work was to find resistance to wheat streak mosaic virus. In that effort and to further expand the plant pathology work, Seifers delved into more basic studies. That work is made possible in part by continuing support from the Kansas Wheat Commission and the Kansas Crop Improvement Association. The research now includes other viruses that cause losses in wheat, sorghum, and other crops. Several of these infect sorghum, including maize dwarf mosaic virus, sugar cane mosaic virus, Johnsongrass mosaic virus, and sorghum mosaic virus. Additionally, vigilance is required to identify new viruses that may affect crops. Technological advances have permitted expansion into even more basic research areas, including work with transgenic (gene transfer) wheats. In recent years cooperative projects

have begun with scientists in several states, Canada, Israel, and France. Pioneering work at Hays enables the project to supply scientists throughout the United States and other countries with virus isolates and procedures for use in viral research work.

## **RANGE MANAGEMENT**

When the Station was established, only a small part of the land allocation was under cultivation. Additional sod was broken during the early years, but about half of the original acreage remained in native grasses. Little management research was done on these pastures prior to 1946, and grass improvement work was carried out on the Forage Crops project. In 1946, a new position was added, and Mr. Frank B. Kessler was hired. He served a dual capacity in that he began pasture management studies and also was involved in some of the research on beef cattle feeding. At about the same time, Mr. Friedrich E. Meenen was named project leader of the Forage Crops project, and both he and Kessler were involved in range management and grass improvement. Meenen continued ongoing work to select and develop new strains of buffalograss, but with his departure in 1951, most of the forage improvement research emphasized cultivated crops rather than native grasses.

A study started in 1946 compared heavy, moderate, and light intensities of summer grazing on native shortgrass range. These three pastures were maintained under the same grazing regimes for many years, but additional research was superimposed to determine the role of supplemental feeding on grass. In 1948, buffalograss, western wheatgrass, and intermediate wheatgrass were planted separately on three previously cultivated lowland fields. Grazing comparisons on these three grasses were made from 1949 to 1960. Not unexpectedly, the tall-growing cool-season wheatgrasses produced more forage than buffalograss on this lowland site.

Pasture and range research expanded rapidly beginning in 1955 with the arrival of Dr. John L. Launchbaugh. During the next 30 years, he conducted studies on range reseeding, winter grazing on native shortgrass range, use of protein supplements with summer grazing, fertilization of native pastures, and weed control in both native and reseeded pastures. The range reseeding research was no doubt the most extensive ever undertaken. Launchbaugh pioneered work with complementary forages used in conjunction with grazing native rangeland. Briefly, that involved using cropland adjacent to pastures to produce forage that cattle could graze directly from the field. The system significantly improved cattle performance. Launchbaugh initiated yet another line of research with his studies of intensive-early stocking on shortgrass ranges. This work on the shortgrass areas was done essentially concurrently with research at the central Station in Manhattan on the tallgrass prairies in the Flint Hills area. Launchbaugh's publications relating to reseeding research, grazing intensity, and other work in range management in Experiment Station Circulars and Bulletins and in technical journals brought recognition from the ranching and scientific communities. Today, many of his recommendations form the back-



*Keith Harmony*

ground of sound range management practices on native shortgrass pastures.

Following Launchbaugh's retirement in 1985, Dr. Kenneth C. Olson was employed to carry on the range research. He was followed in 1993 by Dr. Eric Vanzant. Both of them continued and refined the intensive-early stocking research that had been started by Launchbaugh. They found that shortgrass rangeland does not respond to intensive stocking as positively as Flint Hills range, and unless carefully managed, the system will have some undesirable effects on the forage productivity and the plant composition. In addition to studies relating directly to rangeland, research was initiated with several introduced warm-season grasses and protein supplementation. Since about 1990, the range project has involved livestock management as well as grassland management. Dr. Keith R. Harmoney replaced Vanzant in June of 1999.

## **SOIL MANAGEMENT**

Observations, demonstrations, and a small amount of research relating to soils began as early as 1902. As was the case with most of the research at that time, the Station Superintendent was in charge of the work. But very early in the century, the Division of Dry Land Agriculture, USDA, established a number of experimental stations throughout the Great Plains to study crop adaptation and the effects of different cultural methods, cropping systems, and fertilizer practices on crop production. The project at Hays was started in 1906, and the first scientist, Mr. L.E. Hazen, arrived in 1907. He stayed only until 1908, when Mr. A.L. Halsted replaced him and served as the project leader until 1945 (36 years). The investigations included many different methods of seedbed preparation; continuous cropping compared to alternate crop-fallow rotations for winter wheat, barley, corn, kafir, milo, oats, and spring wheat; and other crop culture studies. Halsted soon recognized that winter wheat and sorghum would be most important to the

area, so over time, most other crops were dropped or became less important in the research. Management studies included uses of commercial fertilizers, barnyard manure, and green manure crops and the effect of burning stubble following grain harvest. Tillage tools used during the early years included the moldboard plow, chisel, subsoilers, and several types of listers. Later, disc-type implements were added, and in the 1940's, the duckfoot and subsurface machines became more important. Over the years, more than 50 cropping systems were studied. Many of these were interwoven with various tillage systems and fertilizer practices. During the 100 years of soils research, hundreds of thousands of soil moisture samples have been taken to determine the effect of treatment on water storage in the soil. For many years, this was one of the labor-intensive tasks on the Station. Driving steel sampling tubes eight or more feet into hard clay or clay-loam soils is laborious. Pulling them out was harder, even though done one foot at a time. Power equipment became available only after about 1950.

The sheer physical size of the project was daunting. This work was done on 1/10th acre plots, each of which measured 2 x 8 rods (33 x 128 feet). When roadways necessary for turning equipment were added, the several hundred plots obviously required a large area of land. As is always the case when conducting soils experiments, having uniform conditions throughout the experimental area was difficult; and the large area required for these tillage studies made for a troubling problem. Some scientists might be critical of the results of these early studies because of this lack of soil uniformity and, at times, lack of replication. However, without a doubt, important results were obtained. The century of investigational work indicates that successful dryland farming in the area is possible, but the farmer must be willing to follow a flexible system when choosing cultural and other management practices.

The cultural studies that started as early as 1907 dominated the soils research well into the 1950's. But beginning about 1950, the general character of the research began to change. Following Mr. Halstead's departure, Mr. Andrew B. Erhart was project leader from 1946 to 1948. Then Mr. Paul L. Brown assumed leadership and, although he did not neglect the ongoing long-term studies, he began some additional work including some more fundamental research. These studies included nitrogen and organic carbon changes in some of the cultivated western Kansas soils. As part of his research in pursuit of his Ph.D. degree, Brown also studied evapotranspiration and water-use efficiency of grain sorghum grown under different cultural practices. Shortly after his departure in 1956,



*Carlyle Thompson with a deep tillage tool used to improve water intake into the soil.*

the federal government stopped supporting the lead scientist on the project, and for several years, the ongoing tillage work was maintained, but little new research was undertaken.

The state assumed total financial responsibility for the soils project and, beginning in 1964, Mr. Carlyle Thompson became the



*Applying fertilizer to plots that previously had paper and yard wastes incorporated into the soil.*

leader. He also continued many of the ongoing long-term tillage and cultural experiments but began expanding the work to include extensive off-station soil fertility research. During his time as project leader, Carlyle has conducted studies on more than 200 farms in Ellis and surrounding counties. By working away from the main Station, he was able to study the effects of fertilizer on several different soil types with different management practices. Reporting detailed results of all these experiments is not possible here, but several summary statements can be made. Not surprisingly, crop yields increased with increasing depth of moist soil. Also, the judicious use of fertilizer increased water use efficiency. Thompson's work established optimum rates for nitrogen and potassium fertilizers. He studied many different carriers for these fertilizer products as well as distribution and placement systems. More recently, the soils research has included adding waste paper products and yard wastes to agricultural land. Such wastes usually are consigned to landfills.

The wheat-sorghum-fallow crop rotation has been used in west central Kansas for at least 50 years, both under conventional tillage and the newer reduced-tillage systems. Soil management studies have shown that this crop rotation has fewer economic risks and greater yield consistency than wheat-fallow, sorghum-fallow, continuous wheat, or continuous sorghum. This rotation has been adapted widely in the wheat-fallow areas in the western one-third of Kansas. The early work with reduced tillage for crop production was done on the weed research project, but Thompson expanded the research with detailed fertilizer studies and methods of seeding into untilled soil.

## **WEED CONTROL**

Controlling unwanted vegetation is a major problem wherever crops are produced. Often these weeds are introduced as contaminants in crop seeds brought in from other areas. Field bindweed is a fitting example. This deep-rooted perennial weed was introduced into Kansas from Europe, almost certainly in seed of Turkey wheat and perhaps in garden seeds. The weed appeared in many parts of central Kansas at about the time the Station was established. Bindweed competed vigorously with wheat and other crops and caused substantial yield losses. Kansas legislators became aware of the problem, and passed a bill in 1907 to appropriate \$1,000 to be expended under the direction of the Board of Regents for experiments to eliminate bindweed. This money was placed with the Department of Agronomy at the College in Manhattan, but because the problem was most acute in central Kansas, the work was undertaken at Hays. However, the weed was not extensive on the Station, so land heavily infested with bindweed was rented from private owners.

The first experiments consisted of 16 treatments with smother crops and cultivation



*Planting sorghum in undisturbed wheat stubble, thus the soil had been protected from erosion since the previous year's wheat harvest.*

systems. The agronomy professor in charge of the work reported that ordinary methods of tillage during a single season seemed to result in more favorable conditions for bindweed growth. However, winter plowing and the proper use of smother crops such as sorghum and kafir showed some promise to destroy or at least weaken bindweed. He found it could also be destroyed by poisoning the soil with a large quantity of salt or brine, but nothing would grow on the treated soil for several years. The state appropriations were not continued, and the work was discontinued. From then until 1936, various ways to control or eradicate bindweed were tested sporadically, but, except for some sodium chlorate and salt applications, little research was conducted. The conclusions reached in 1908 concerning the use of salt to kill the weed and its effect on soil was certainly prophetic. Applications made in 1919 were still influencing crop production at least into the 1960's.

In 1935 the USDA started a series of bindweed-control studies at research locations throughout the Great Plains. One of those was at Hays, and Mr. F. Leonard Timmons was appointed as project leader. As with other USDA scientists at Hays, USDA paid his salary, and the Station paid most operating costs of the

project. This financial arrangement continued until 1951 when the State assumed responsibility for part of the scientist's salary. Then in 1973 all of the federal support was withdrawn, and the State funded the weed control research.

When Timmons arrived, sodium chlorate was the only significant herbicide (other than salt) available. This material did not render the soil sterile for nearly as long as salt, but it did limit crop production for several years and so was adapted for use only on comparatively small areas of the weed. Timmons began cultural control experiments using intensive cultivation and competitive cropping systems. He initiated detailed studies of the root system and its food reserves as affected by frequency and depth of cultivation. Although these root reserve studies did not relate directly to controlling the weed, they led to more complete understanding of the results following various cultivation treatments. He developed practical and effective cultural systems with specific recommendations regarding tillage frequency, competitive crops, and crop rotations. Timmons also initiated studies on the duration of viability of bindweed seed in the soil. His work, along with some that was carried on after his departure, indicated that the seed may

remain viable in the soil for more than 50 years.

Although field bindweed control was Timmons' primary concern, he expanded weed control work into other areas. The greatest change came in 1945 when the new herbicide 2,4-D became available.

Timmons was one of the first civilians to be allowed to test this herbicide, which had been developed for possible military use during World War II (but was not used). It was the first highly selective, growth-regulating



*Sorghum growing in the previous year's wheat stubble. The Station began using this system in the 1960's.*

herbicide and marked the beginning of expanding interest in weed control research. Timmons initiated a large number of experiments with 2,4-D for control of bindweed and common weeds in wheat and other Kansas crops. His and subsequent work showed that 2,4-D would not completely eliminate bindweed under most conditions. But it did provide a high degree of control, particularly when combined with some intensive cultivation and competitive cropping systems. Timmons left Hays in 1948 and was succeeded by Mr. William M. Phillips.

Shortly after Phillips became project leader, several objectives were articulated more specifically. Field bindweed research remained important, and Phillips' publications on its control became authoritative in the farming and scientific communities. But as many new herbicides were developed, the research became more wide ranging. Under his direction, the first of many preemergence-type herbicides were evaluated for controlling weeds in sorghum. Expanded use of 2,4-D in wheat led to questions concerning possible carryover of the chemical into the grain. In the mid 1960s Phillips collaborated with scientists in the USDA and other federal and state agencies to conduct comprehensive studies on the effect and fate of 2,4-D applied to wheat. This research showed that 2,4-D applied to the growing crop did not change the milling and baking quality of wheat. These studies contributed to knowledge necessary to establish safe and effective directions for use. Phillips continued searching for ways to control field bindweed and did extensive research on soil persistence and movement of several herbicides. He and Range Management project leader John Launchbaugh studied the root system of the widespread annual weed kochia. Their publication stands as a definitive treatise on the depth and lateral spread of kochia roots.

Phillips did pioneering work to develop a reduced-tillage system for use in wheat-sorghum-fallow rotations. His recommendations enabled producers to combine herbicides with minimum tillage for weed control during fallow

after wheat and prior to planting sorghum. His publications in the popular press and professional journals led to acceptance by farmers and recognition by weed control scientists in other states and nations. The system is used widely in many wheat-sorghum (or corn) producing areas. The original recommendations have been altered based on additional research, but the concept remains unchanged. This system decreases the number of field operations and often substantially increases sorghum yields. After its introduction, the herbicide glyphosate (Roundup) quickly became important in reduced-tillage work and other weed-control situations. Phillips was one of the first to observe and study the effects of water quality, spray volumes, and herbicide mixtures on the efficacy of glyphosate.

Prior to the advent of computers, calculating amounts of herbicides and other agricultural chemicals to be applied on small experimental plots to give specific rates per acre was time-consuming and subject to frequent errors. In 1962, Phillips designed a logarithmic-based, slide-rule calculator that quickly



*Phillip Stahlman*

and accurately determined the amounts needed of both liquid and dry formulations of any percent active ingredient. Following his publication, one of the major agricultural chemical companies refined the original design and furnished the device to many scientists in several disciplines.

Subsequent to Phillips appointment as Acting Station Superintendent in 1976, Mr. Phillip W. Stahlman was hired to continue the weed control research. Along with his many other studies, he continued the work started by Phillips to further determine the effect of several factors on activity of glyphosate. Stahlman conducted extensive studies for control of grassy weeds in wheat, including determining infestation levels that justify applying herbicides for downy brome control. He has been instrumental in developing information on use, rate, timing, and herbicide carryover necessary for labeling a number of new herbicides for weed control in wheat. While continuing his research program, Stahlman furthered his education and obtained a Ph.D. from the University of Wyoming. He has greatly increased the financial support of the project by receiving grants from several sources. Through publica-

tions and public appearances, he has become a recognized authority on weed control in the fallow, winter wheat, and grain sorghum producing areas and has national and international recognition.

One unique area of research investigated the use of indigenous soil bacteria for selective control of winter annual grass weeds in winter wheat. Several hundred bacterial isolates were screened for growth-suppressive effects, and nearly 200 were found that inhibited root growth of winter annual brome species and/or jointed goatgrass without affecting winter wheat growth. Some isolates provided up to 70% early-season suppression of downy brome in field experiments. A U.S. patent was granted for three isolates. But, unfortunately, the purified isolates became less effective each time they were cultured. Either they mutated and lost the ability to produce growth-suppressive toxins, or had no need to produce the toxin when they were taken out of the wild. What initially appeared so promising ended in failure, and the project was terminated. However, the potential of using rhizobacteria as biological control agents was demonstrated, and federal scientists are continuing work in this area.

## **OTHER RESEARCH AND OBSERVATIONS**

Although some of the work discussed here certainly qualifies as research, other activities were primarily demonstrations to help area farmers in their quest toward profitable agriculture. These brief descriptions summarize only some of the important information generated outside the major research projects.

**GRAIN STORAGE:** Combine harvesters came into widespread use in the 1920's and introduced an entirely new grain-handling system. Farmers always had bound wheat when the grain was too moist for safe storage. The ripening process was completed in shocks or stacks. The combine changed that, but no definitive information was available concerning the safe moisture content of stored wheat. During the latter part of the 1920's and the 1930's, high moisture content probably damaged 10 to 25 percent of the total Kansas wheat crop.

Work was started at the Station in 1929 under the direction of Prof. F.C. Fenton, Department of Agricultural Engineering, and Dr. C.O. Swanson, Department of Milling Industry, Kansas State College. They stored wheat in several types of bins with several ventilation systems. Further research was undertaken in 1936 in cooperation with the Bureau of Agricultural Chemistry and Engineering, USDA. Their conclusions can be summarized in a few general statements. Wheat could be stored safely for several years in bins, if moisture content is 13 percent or less. But for wheat with moisture contents in the range of 13 to 14.5 percent, some ventilation appeared to be necessary. Some bin construction types provided sufficient natural ventilation. In other cases, the ventilation could be provided by power fans. Finally, wheat with moisture above 14.5 percent, and perhaps as high as 18 percent, could be stored in ventilated bins, if the distances air traveled were very short and the blowers had high capacity.



*Mr. Aicher recognized the value of combine harvesters as early as 1927, but farmers often harvested high moisture grain.*

**IRRIGATION:** Research with nonirrigated agricultural production always has been the main thrust of the Station's work; however, some irrigation investigations were conducted as early as 1903. Like much of the early crops work, this was in cooperation with the USDA. It quickly became apparent that neither underground water sources nor stream flow in the Hays area were sufficient for large-scale agricultural irrigation, so actual irrigation research work was very limited. However supplemental irrigation has proved important in providing water to save valuable plant-breeding material and to produce thousands of tree seedlings grown and distributed from the State Forest Nursery.

**SOIL CONSERVATION:** This work was started in the 1930's and continued into the early 1940's. It was done in cooperation with the Soil Conservation Service (SCS), Bureau of Chemistry and Soils, USDA. For a few years the SCS provided research scientists, but Superintendent Louis C. Aicher oversaw the work in later years. The studies were designed to determine: (1) loss of soil and water from contoured farm fields and pastures, (2) effects of contouring on the production and succession of native grasses under grazing conditions, (3) methods of establishing native grasses, and (4) the best grasses to use on terrace outlets and flood-water courses. A rather elaborate system of plots and water collection flumes was constructed to measure the water, soil, and nutrient losses from the various plots each time rain resulted in runoff.

**HORSES AND MULES:** The Station depended chiefly on horses and mules as power for the field work well into the 1920's. The first work animals were purchased in 1903. A few years later, someone in administration suggested that the Station engage in a breeding program that would supply the necessary work stock. Several mares were purchased, and a stallion and a jack obtained. This effort proved to be only moderately successful, but perhaps demonstrated that, although some replacement stock could be produced, most individual farm-

ers could not successfully raise all of the needed horses and mules.

**DAIRY CATTLE:** The first cow owned by the Station was purchased to supply milk to the Station personnel. Then in 1911, the state legislature appropriated \$3,000 to start a dairy project. The intention was to establish the dairy farm as a separate and distinct unit from the rest of the Experiment Station and to operate it in a practical businesslike manner in order to demonstrate the desirability of more dairying for western Kansas. Apparently the dairy herd was never meant to be involved in meaningful research. The dairy was maintained until 1934, when severe drought resulted in poor pasture conditions and limited feed supply, thus forcing the Station to reduce its livestock population. The dairy herd was leased to some state agencies in eastern Kansas. At the termination of the lease agreements, the agencies purchased the animals. The dairy never was reinitiated, so the Station has not maintained a dairy herd since 1935.

**SWINE:** The first hogs were purchased in 1904. Three breeds were obtained, and feeding experiments were started in 1905. Much of the interest was centered on utilizing hogs to salvage feed that passed through cattle undigested. Other trials compared rations built around crops commonly grown in the area. A few years later, the swine herd was reduced to only one breed, Duroc Jersey. This herd was improved through purchases, breeding, and selection, and by 1928, only purebred Duroc Jersey hogs were on hand. This herd represented some of the best breeding in the state, and many gilts and young boars were sold to farmers throughout western Kansas and eastern Colorado. But few reports of research findings were published. In 1929, 42 sows farrowed and produced 373 pigs of which 299 were saved. Later, intestinal parasites began causing trouble, and some work was carried out to determine how they might be controlled. High temperatures and the extreme drought in the 1930's resulted in death losses, and the Duroc Jersey herd was dispersed. Without apparent

explanation (were they believed to be more heat tolerant?) a herd of Poland China hogs was started, but it never achieved large numbers. Between 1940 and 1950, the only use made of swine was to utilize waste grain. Because the project was not contributing to the experimental findings of the Station, a decision was made to discontinue swine production in 1950. Swine again made a brief appearance on the Station later in the 1950's in an effort to utilize the feedlot waste, but little or no research was accomplished, and the herd again was dispersed.

**SHEEP:** The first and only sheep owned by the Station were purchased in 1912, and by 1915, the flock consisted of 90 ewes bred for spring lambing. The sheep work had two stated objectives: (1) to determine the possibility of exterminating bindweed with sheep and (2) to demonstrate to local farmers that sheep production could be profitable in west central Kansas. The sheep grazed on bindweed-infested areas until they had eaten the weed down to very short stubble. However, it failed to supply sufficient forage to sustain the animals, and the grazing did not exterminate bindweed. Losses from wild dogs and other factors made it advisable to discontinue the sheep project in 1922. No sheep have been kept on the Station since that time.

## FOREST NURSERY

Nursery plantings were made as early as 1903 and included about 1,000 deciduous trees; 4,000 cedar and pine trees; 300 fruit trees, and some 500 vines. In 1905, more nursery plantings were made and approximately 2,500 trees were transplanted from the nursery to the State Park. This was the first of many plantings made by the Station in the park. In 1907, extensive plantings were started to demonstrate the value of windbreaks, particularly those that might protect orchards. Drought and later a hailstorm destroyed many of those trees. A more formalized program started in 1910, when a State Forester was appointed. He established a nursery to produce forest and shade trees, ornamental trees and shrubs, and vines that might grow in the area. In 1912, the Board of Regents directed that the nursery stock be grown at the Station and made available to Kansas residents at cost. Propagation and distribution of nursery stock continued for several years with little or no emphasis on research. This changed in 1927, when Mr. E.W. Johnson, a graduate in Horticulture and Forestry from Colorado Agricultural College, was appointed State Forester. Mr. E.P. Eshbaugh, Mr. J.C. Crupper, Jr., and Mr. J.G. Harrison followed him. All were competent nurserymen

and in addition to producing nursery stock for sale, they did some research with new trees and shrubs that might be adapted to western Kansas conditions. Distribution of forest tree seedlings in cooperation with the U.S. Forest Service as authorized by the Clarke-McNary Act was started in 1928. About 10,000 seedlings were distributed in the first year. That number reached as high as 868,000 in 1948. In the 10 years prior to the program being discontinued in 1952, more than 5,000,000 trees were distributed.

In addition to the forest nursery work, the project leader in forest investigations was responsible for orchards and vineyards on the Station. Several different fruit species were planted, but it became apparent that most were not adapted to the climate. As the various species died or were damaged severely, they were replaced with cherry trees. Cherries proved to be quite productive, but nearly the entire orchard was destroyed in the 1940 Armistice Day freeze and was not replanted. Some work also was done with vine crops and, in the early years of the Station, extensive demonstration plantings of garden crops were made. These included, but were not limited to, potatoes, cabbage, tomatoes, beans, and corn.

After cessation of nursery sales in 1952, only a few trees were produced on the Station. These provided stock to landscape the campus and replace trees that died. In 1964, the Station and the Cooperative Extension Service, Kansas State University, agreed that an Assistant State Forester should have an office at Hays. Mr. Fred Atchison arrived on July 1, 1964 and remained until May 31, 1978. He was replaced by Mr. Jim Strine.



*Tree seedling beds in the State Forest Nursery. Several million trees were distributed from about 1910 through 1952.*

Although not on the Station staff, these men provided valuable services to urban and rural interests.

The Siberian elm (commonly called Chinese elm) tree planted on the Station in 1913 was one of two obtained from China and was the first Siberian elm to be planted in Kansas. This specimen grew rapidly, and the variety gained great popularity. Thousands of seedlings were propagated from this original tree and were distributed throughout the state. Popularity of the species continued until 1931 when a

severe blizzard hit western Kansas. Thousands of Siberian elms were injured severely or killed. The next severe damage occurred with the Armistice Day freeze in 1940. Nearly all elms over 16 inches in diameter were killed, and most smaller trees were damaged severely. The old tree that had been planted in 1913 was killed except for one small branch on one side. It was removed the next fall. This puts to rest the rumor that this tree has survived all of the vicissitudes of western Kansas weather and remains alive today. Such is not the case.

## STATE PARK

Much of the development of the State Park is intertwined with that of the Station. The legislative act establishing the Station included using part of the land as a public park. The responsibility for development and maintenance of the park fell to the Station (presumably as so directed by the Board of Regents). The first reported action was in 1905, when 43 acres were set aside for park purposes. In that year, the Station graded drives, erected fences and gates, and set out trees that had been growing in the forest nursery. Tree species included redbud, bur oak, black walnut, honey locust, coffee bean, white elm, hackberry, persimmon, green ash, Russian mulberry, Russian olive, red elm, poplar, cottonwood, and soft maple. A grove of Siberian elm was planted west of the original park. Thus today, except for trees immediately adjacent to the creek, most of the trees in Frontier Park can be attributed to the foresight of the early Station administrators. Some of the trees that originally lined the creek, especially those growing west of what is now Main Street, were destroyed as part of the "channel improvement" that took place following the 1951 flood.

In the early 1920's, the Station leased 40 acres of grassland to the City of Hays for the establishment of a golf course. Additional land subsequently was provided so the course could be expanded. Later some of the city recreation areas were established on land east of

the wooded park area provided by the Station. These sites were maintained by the city. The Station also granted permission for the city to build the municipal sewage disposal plant on Station-owned land. When that facility was abandoned, the area served as headquarters for the Hays City Park Department. Continuing the previous arrangement, the city paid no fee for using the land.

In 1931, the Kansas Legislature passed House Bill 626 (see Appendix A), which created the "Kansas Frontier Historical Park on the Fort Hays Military Reservation". The new park included the original 43-acre park, the site of the old Fort Hays buildings, and some 120 acres of adjacent Station land. (See Appendix A for a legal description.) Most of this was pasture land that had definite value as part of the experimental work of the Station. The 1931, act also established a Park Board which then took over care and maintenance of the park. But the Station still was involved. In 1933, some 200 men of the Civil Conservation Corps (CCC) began work to improve the park. The Station's Forest Nurseryman was appointed Technical Supervisor of these CCC workers as well as all U.S. Forest Service CCC Camps in Kansas. Additional changes in park management were made in later years when the State Historical Society assumed many of the management responsibilities.

## WEATHER RECORDS

Precipitation was recorded at the military reservation beginning in 1868. It is not clear who recorded data after the reservation was abandoned and before the Station was established. However, archived data at the Station show yearly precipitation for the past 133 years (1868 through 2000). Beginning in 1901, observations were taken by Station personnel. When the U.S. Department of Agriculture Dryland Agriculture project was established in 1907, more detailed weather observations became an integral part of that project. Starting in 1910 and, with a lapse of only a few years, continuing until that project closed in 1959, the USDA scientist in charge was responsible for collecting and recording weather data. Thus, precipitation, temperature, wind velocity, and evaporation records have been maintained at the Hays research center since 1907.

Since 1868 yearly precipitation has averaged 22.7 inches. About 77 percent of this total normally falls during the growing season, April through September. Greatest monthly amounts usually occur in May, June, and July. Winter months, November, December, January, and February each average less than one inch of precipitation. Since records have been logged, annual precipitation amounts have ranged from 43.34 inches in 1951 to 9.21 inches in 1956. Average annual snowfall over 107 years has been 19.6 inches. The highest snowfall amounts are received in February and March, averaging 4.8 and 4.3 inches, respectively. Many weather factors other than precipitation are significant, but moisture or lack thereof is the most important factor in dryland crop production.

Average annual mean temperature for 104 years, 1897 through 2000, is 53.9° F, with a mean maximum of 67.2° F and a mean minimum of 40.5° F. Average January mean temperature is below freezing, and July average is about 80° F. As with precipitation, there are

large variations from year to year. Except for five years (1908, 1915, 1958, 1972, and 1992), daily maximum temperatures of 100° F or higher were recorded during each summer. Zero or subzero temperatures were recorded in all but three years (1941, 1987, and 1992). Extreme temperatures recorded were 117° F July 13, 1934, and -25° F December 22 and 23, 1989. Average date of the last killing frost in the spring is April 27 and the first killing frost in the fall, October 14, but the frost-free period has varied from 114 to 203 days.

George Griffith was the first to record weather data at the Station. He was the observer from 1901 through February 1903. Mrs. J.G. Haney, wife of Superintendent Haney, was the recorder from March 1903 through April 1904, and George Holden followed from May 1904 through March 1910. A.L. Hallsted, USDA Soil Scientist, came to the Station in 1909 and began keeping more detailed weather data in April 1910. He apparently relinquished this duty to Elliot Gibbons during part of 1918 and 1919, and to A.H. Kern from November 1919 until September 1924. Hallsted again took over, and, with frequent help from Mamie and Maude Hallsted, continued until his retirement in May 1946. Andrew Erhart was the official observer from June 1946 through May 1948, when Paul Brown replaced him as soils project leader. Brown continued until 1956 when he was transferred by the USDA to Montana. Bill Baxter, Assistant to the Superintendent, maintained the weather records from October 1956 until February 1986. Joe Becker, Grounds Manager, is currently the observer and is responsible for all official equipment as well as KSU automated instruments. Official weather observations have been recorded on a daily basis. However the time of day has varied. Since 1946, temperature, precipitation and other data for the previous 24 hours were recorded at 8 AM. Some of the soil scientists determined temperature and relative humidity several times during the day.

Today, the research center is an official observation point for the National Weather Service and National Oceanic and Atmospheric Administration. Weather stats are reported by local radio and television stations and printed

in area newspapers. A variety of weather data can also be located on the center's website (<http://www.oznet.ksu.edu/wkarc/>) along with links to other related information.

## SUPPORT PERSONNEL

Station Superintendents, Department Heads, and research scientists receive recognition from the public, from their professional colleagues, and from the scientific community throughout the world. Research contributions are the only reason for having a research facility. But it seems entirely fitting to pay tribute to the many workers who labor behind the scenes and enable the research staff to accomplish many of the things that lead to their recognition. Throughout most of the past 100 years, the Station staff has included an Assistant to the Superintendent or Administrative Assistant. Some of these individuals had academic rank; others were selected from available clerical workers. As can be seen in the listing on **page 40**, seven employees held the position between 1904 and 1934 but only four since then. Little is known about the duties of the first seven. But we do know that George Helder, the Assistant to the Superintendent from 1904 to 1913, was appointed Superintendent in 1913. This is the only recorded promotion from the Assistant position. Lawrence Reed, appointed in 1934, was the first to hold the position for an extended time. Following Reed's resignation in 1949, William Baxter became the assistant. Baxter's academic background was in accounting. He was chiefly responsible for maintaining financial records and served admirably throughout most of Bill Duitsman's and Bill Phillips' tenures as Superintendent. He developed a particular interest in weather records. Because of the public's fascination with weather and his accumulation of weather facts, Baxter often was recognized locally as the face of the Experiment Station.

A second important group, collectively called classified employees, includes secretarial

support, accountants, maintenance personnel, farm laborers, research technicians, and all of the other individuals that make a successful operation possible. Although one is on dangerous ground to mention certain individuals and not others, efforts have been made to compile a complete roster of all who have ever been employed at the research center. Names were retrieved from the archived records available and are listed in Appendix C. Employees with 20 or more years of service are mentioned here, but nevertheless they represent only a sample of the many dedicated workers who have served at the Station. All employees should be assured that their talents are appreciated and essential to the success of the Research Center. First, a few general observations. Anyone who has not been in the position of Station Superintendent or Head cannot know the satisfaction of waking after an overnight snowstorm and hearing the sound of the snowplow already clearing roads, so cattle can be fed and other necessary functions carried out. I was never sure how the operator negotiated the snowdrifts to get from his home to the Station, but he was always there. Likewise, if weather interrupted electric power, the auxiliary generator in the greenhouse would soon start and provide enough current to prevent freeze damage to the valuable and often irreplaceable plant material. (But where were you when the black cattle got out in the middle of a dark night and had to be found and penned?)

If individuals are to be named it seems only fitting to begin with E.N. Canady who started his service in 1925. Canady was a shop man and blacksmith par excellence. Without his abilities in the shop, it is doubtful that Mr. Aicher could have successfully designed and

constructed the many mechanical devices that were built during his 31 years as Superintendent. Canady remained active until 1949. Another “old-timer” who must be mentioned is F.H. “Fritz” Brueggeman. He came to the Experiment Station in the late 1920’s as a young unmarried farm laborer. He lived for a time in the old hotel and was responsible for caring for many of the work animals on the Station. He was promoted to Farm Foreman in the early 1940’s. However, he soon realized that he was not suited for this position and left to work elsewhere. He returned to Station employment in 1949 and served as field help on the Weed Control Project until 1965. Howard ImMasche followed Brueggeman as Farm Foreman and served with competence and good humor until 1972. Surely few, if any, others have done the job so well. John Burkhardt started his time at the Station in 1942, when he was hired as the tractor and engine mechanic. Those duties were combined with the general shop functions in 1952, and he remained in that position until 1967. Along with Bill Duitsman and several of the project leaders, he designed and built numerous machines adapted for use on the research projects. During this time Harold Boor, first employed as a farm laborer in 1955, came into the shop as an aide, and following Burkhardt’s departure, maintained the shop un-

til 1993. He also was responsible for helping design and build specialized equipment needed on the research projects. The last of the century’s longtime shop personnel, Ron Wagner, was hired as a farm laborer in 1976. He began helping Harold Boor in the shop and assumed the duties following Boor’s retirement. Trimming trees, hedges, and other ornamentals was Seraphin Walters’ responsibility for more than 35 years.

Many outstanding classified employees were involved directly with the research scientists in conducting field and laboratory experiments. Certainly there has never been a more dedicated and competent technician than Ralph Dreiling, who served the Livestock Research Project for 40 plus years. And we cannot ignore the consummate cowboy, Glenn Spicer, who was in charge of the beef cattle cow herd for some 20 years. Jim Leiker began in 1949 and for nearly a half century was a virtual fixture in the greenhouses. Most of his career was as a technician on the Entomology project. He seemed to be always on hand, be it workday, weekend, or holiday.

And so, where to stop. The list of employees hired between 1951 and 1980 and who worked for 20 or more years includes Joe Becker, Robert Cline, John Dome, Dennis

Ernst, Robert Fields, Harvey Jansonius, Tom Lang, Marvin Leiker, Jerold Penka, John Rhine, and perhaps others I have missed. Because I used an arbitrary cut-off date of 1980, many hired since then and still giving dedicated service are not identified by name. As pointed out in previous sections, longevity in itself does not assure productivity, but the task is more difficult without continuity. The Station is surely unique in having an outstanding group of employees to support the research staff.



*Ralph Dreiling at the feed mill control console.*

## **SOCIAL ACTIVITIES AND COMMUNITY INVOLVEMENT**

Certainly some scientists interviewed for staff positions declined to accept the job because they felt they would be isolated professionally at an outlying location. In nearly all cases, if they accepted a position and came to the Station, they soon discovered the excellent research climate. Likewise, their spouses may have felt they would be socially and intellectually isolated. In 1935, Mrs. Edith Aicher, wife of Superintendent L.C. Aicher, organized the Station Wives Club. She hoped to provide a rather formal study club atmosphere where staff wives would find interest outside the home. The emphasis changed with passing years, and the meetings became more simple social gatherings. Interest waned as more wives accepted employment in the community and their time with their families had high priority. By the mid-1970's, the club had few activities.

At a time when most farm wives had little involvement in the active management of the livestock operations, Mr. Aicher initiated a

“Women’s Program” held at the same time as Roundup. These yearly programs involved entertainment and demonstrations such as bread making, meat selection, and meat cutting. The change was gradual, but by the late 1970's, more women were attending the beef cattle program than the women’s activities. and the separate program was discontinued.

Although no formal record exists of community activities and involvement by the Station staff, there is no doubt that nearly all were, and still are, active members of the Hays community. Staff personnel and their families found time to be Boy Scout, Girl Scout, and 4-H Club members and leaders. Little League baseball and other sports activities found ready support. Several staff members were active in their churches and civic clubs such as Rotary, Lions, and Optimists. Good relationships between the Station and the local community were fostered through Chamber of Commerce memberships and Board of Education activities,

## **CONCLUSIONS**

As I neared the end of this writing process an acquaintance posed this question: “What is the most significant contribution of the Station during the past 100 years?” Of course, there is no one answer to that question. I could discuss with him crop variety improvements; crop germplasm lines that would, in turn, lead to more improved varieties and hybrids; beef cattle research that resulted in vastly enhanced production efficiency both in the feedlot and on native grass; studies in soil

management, weed control, and many other research endeavors that will improve the lot of Kansas farmers, add to scientific agricultural literature, and through applications of this new knowledge help feed a hungry world. But those statements still do not adequately respond to his question. Perhaps we should merely say that the Agricultural Research Center-Hays has provided research leadership in the past and will continue to do so in the future.

## APPENDIX A. LEGISLATIVE AUTHORIZATION AND RESOLUTIONS

In 1889, the Secretary of the Interior directed the suspension of action on the Fort Hays Military Reservation to await the action of Congress in regard to it. In February 1895, Representative Jno. Schlyer of Ellis County introduced a resolution in the House of Representatives of the Kansas Legislature, which was adopted. The Senate concurred on February 8, 1895. The Resolution stated:

WHEREAS, The experience of the settlers upon the plains of western Kansas, covering a period of more than twenty years, has demonstrated conclusively that agriculture cannot be pursued with profit under existing natural conditions, and that artificial means and methods must be substituted therefore; and  
WHEREAS, The tests and experiments required to determine the fitness of new methods applicable to these higher altitudes and limited rainfall cannot be made at the Agricultural College of the state; and  
WHEREAS, The Fort Hays military reservation, at an altitude of 2000 feet above sea-level, contains a valuable body of native timber that should be preserved to posterity, and the land of said reservation is admirably adapted for such experiments in agriculture as are required in the premises; and  
WHEREAS, The buildings upon said military reservation, formerly used as residences for officers and their families, barracks for troops, storehouses, etc., are large and commodious, but cannot be moved without destruction of their value, but in their position are of great value, and could be used, with little additional repairs, for the purposes of a branch of the State Normal School; and  
WHEREAS, The location of a branch of the State Normal School at this place would be central and convenient for the whole of the north half of the state; and  
WHEREAS, The said military reservation has long since been abandoned by the United States government as a military post; now, therefore, be it  
Resolved, by the house of representatives of the state of Kansas, the senate concurring therein, That our senators and representatives in Congress are hereby requested to secure the passage of an act of Congress donating the said Fort Hays military reservation to the state of Kansas for the following public purposes: (1) For a western branch of the Kansas Agricultural College; (2) for a western branch of the Kansas State Normal Institute; (3) for a public park.  
Resolved, further, That the secretary of state is hereby instructed to transmit a copy of these resolutions to the president of the United States senate, the speaker of the house of representatives, and to each senator and representative in Congress from the state of Kansas.

On Saturday, February 23, 1895, a copy of said concurrent resolution was laid before the Senate of the United States by the Vice President. It was referred to the Committee on Public Lands and accepted by Senate Bill 2799 introduced by Senator Martin; it reads as follows:

Be it enacted, etc.: That the abandoned Fort Hays military reservation and all the improvements thereon, situated in the state of Kansas, be and the same is hereby granted to said state, upon the conditions that said state shall establish and maintain perpetually thereon, first, a western branch of the Kansas Agricultural College; second, a western branch of the Kansas State Normal Institute, and that in connection therewith the said reservation shall be used and maintained as a public park; provided, that said state shall, within five years from and after the passage of this act, accept this grant and shall by proper legislative action establish on said reservation western branches of the Kansas Agricultural College and the Kansas State Normal Institute; and whenever the lands shall cease to be used by said state for the purposes herein mentioned the same shall revert to the United States.

This bill passed the Senate on February 26 and the House on March 2, 1895. Congress adjourned on March 4 and the bill failed to receive the President's signature. Even though Senate Bill 2799 was not signed, the district land officers were advised by a telegram dated March 22, 1895 that lands were withdrawn from settlement to give opportunity for further legislation.

A bill similar to No. 2799 was introduced in the 54th Congress and reported favorably to the House of Representatives by Mr. Charles Curtis from the Committee on Public Lands. This bill did not become a law, although it again was reported favorably by the second session of the 54th Congress. A similar bill was introduced in the 55th Congress and passed the Senate but did not come up in the House. It was introduced again in the 56th Congress, in the Senate by Sena-

tor Harris and in the House by Congressman Reeder, and became a law on March 28, 1900. As finally passed, it reads as follows:

A BILL granting to the state of Kansas the abandoned Fort Hays military reservation in said state, for the purpose of establishing an experimental station of the Kansas Agricultural college and a western branch of the Kansas State Normal School thereon, and a public park. Be it enacted, That the abandoned Fort Hays reservation, and all improvements thereon, situated in the state of Kansas, be and the same is hereby granted to said state upon the conditions that said state shall establish and maintain perpetually thereon, (1) an experimental station of the Kansas Agricultural College, and (2) a western branch of the Kansas State Normal School, and that, in connection therewith, the said reservation shall be used and maintained as a public park; provided, that said state shall, within five years from and after passage of this act, accept this grant, and shall, by proper legislative action, establish on said reservation an experiment station of the Kansas Agricultural College, and a western branch of the Kansas State Normal School; and when ever the lands shall cease to be used by said state for the purposes herein mentioned, the same shall revert to the United States; provided further, that the provisions of this act shall not apply to any tract or tracts within the limits of said reservation to which valid claims have attached by settlement or otherwise under any public-land laws of the United States.

Acting under this law, the 1901 session of the Kansas Legislature passed the following joint resolution:

SECTION 1. That the state of Kansas hereby accepts from the United States the abandoned Fort Hays military reservation, as provided in an act of Congress relating thereto, approved March 27, 1900.

SECTION 2. That the provisions of the act of Congress, 'An act granting to the state of Kansas the abandoned Fort Hays military reservation, in said state, for the purpose of establishing an experimental station of the Kansas Agricultural College and a western branch of the Kansas State Normal School thereon and a public park,' approved March 27, 1900, are hereby accepted by the state of Kansas.

SECTION 3. That upon the approval of this act by the governor, he is requested to transmit a certified copy of the same to the secretary of the interior of the United States.

Approved February 7, 1901.

Copy transmitted to Secretary of Interior February 7, 1901.

The Legislature of 1901 passed an act in respect to the division of the reservation, making appropriations for the branch station and the branch normal school. This act reads as follows:

Be it enacted by the Legislature of the State of Kansas:

SECTION 1. The board of regents of the State Agricultural College and of the State Normal School, respectively, are hereby authorized to locate and establish an experimental station of the State Agricultural College and a branch or auxiliary of the State Normal School on the Fort Hays military reservation.

SECTION 2. The following described tracts of land lying within the limits of the reservation aforesaid, to wit: Section 36, township 13 south, range 19 west; section 31, township 13 south, range 18 west; section 1, township 14 south, range 19 west; sections 6 and 8, the east half of section 7, the north half of section 17, and the northeast quarter of section 18, all in township 14 south, range 18 west, are hereby placed under the direction of the regents of the State Normal School. It shall be their duty to lease or rent the said lands to the best advantage, and all moneys derived from rents for such lands shall be collected by the regents aforesaid, who shall deposit the same with the treasurer of the board, to be expended by the said board of regents for the equipment and maintenance of said auxiliary of the State Normal School.

SECTION 3. All the remaining lands of the reservation aforesaid are hereby placed under the direction of the board of regents of the State Agricultural College, except the north half of section 5, township 14 south, range 18 west, which with the buildings thereon, shall be used jointly as may be determined by the boards of regents of the institutions aforesaid.

SECTION 4. The said board of regents of the State Normal School shall employ a principal and such assistant teachers and janitors as the needs of the school may demand; shall prescribe the course of study, not extending over more than two years, conditions of admission, and such other regulations as may be required for its successful conduct; provided, that such course of study shall embrace only such branches as may prepare pupils for the advanced academic and professional work provided at the State Normal School at Emporia.

SECTION 5. All persons meeting the requirements for admission prescribed by the board of regents shall be admitted to said school; and on declaring their intention to fit themselves to teach in the schools of Kansas shall be exempt from all fees, save a small matriculation fee, which the board of regents may require. Students not intending to teach may be charged a reasonable fee, at the discretion of the board.

SECTION 6. Any person of good moral character over sixteen years of age, having been in actual attendance at least twenty weeks at the above-named school, and having completed the course of study prescribed by the said board of regents, shall be awarded a certificate which shall be a legal certificate to teach in any of the public schools of the state except high schools, and good for one year. Said certificate shall also admit the holder to the third year's work at the State Normal School at Emporia without examination.

SECTION 7. The president of the State Normal School shall be president of said auxiliary normal school, with such duties and responsibilities as the board of regents may determine.

SECTION 8. The sum of \$7,000 is hereby appropriated for the fiscal year ending June 30, 1902, and the sum of \$5,000 for the fiscal year ending June 30, 1903, is hereby appropriated, for the current expenses and improvements of said auxiliary normal school, the said amounts to be expended under the direction of the board of regents of the State Normal School.

SECTION 9. The board of regents of the State Agricultural College is hereby authorized to locate and establish on the reservation aforesaid an experimental station of the Agricultural College, and shall adopt such measures as may be necessary to place the same in successful operation and to preserve the land upon which the native timber is now growing as a public park.

SECTION 10. To carry out the provisions of section 9 of this act, the sum of \$3,000 is hereby appropriated for the fiscal year ending June 30, 1902, and \$3,000 for the fiscal year ending June 30, 1903.

SECTION 11. All sums of money payable out of the appropriations specified in section 8 of this act shall be upon vouchers approved by the board of regents of the State Normal School; and all sums payable out of the appropriations specified in Section 10 shall be upon vouchers approved by the board of regents of the State Agricultural College.

SECTION 12. The auditor of state is hereby authorized to draw his warrants on the treasurer of state for the several sums and purposes specified in this act upon verified vouchers approved by the board of regents of the State Normal School or the State Agricultural College; provided, that no portion of the money appropriated in this act shall be expended by the board of regents until the attorney general of the state of Kansas shall first notify the governor and the board of regents that the title to the land in said reservation is unimpaired, and the land is available under the terms of the act of Congress ceding said reservation to the state.

SECTION 13. This act shall take effect and be in force from and after its publication in the official state paper.

Approved February 26, 1901

Published in official state paper. March 1, 1901.

After the Army no longer occupied the reservation, but before the land was given to Kansas, some of the land was filed upon and occupied by settlers. When the state accepted the reservation, these claims constituted a flaw in the title, although deeds to the land had not been granted.

Taking cognizance of this situation, the regents passed the following resolution on April 4, 1901:

Moved by Regent Stewart to adopt the following resolution: Whereas the Legislature at its recent session passed an act accepting from the United States the tract of land known as the Fort Hays Military Reservation and whereas the grant of said land to the state of Kansas provides that it should be utilized by the State Normal School and the Agricultural College and whereas the act of acceptance provides that no money shall be expended on said land until the attorney general shall find that the state can have a good title to all of said land and whereas it has come to be knowledge of this board that a considerable portion of said land is held and claimed by private parties and that the citizens of Hays in connection with the attorney general are now endeavoring to secure the relinquishment of the present claimants on said land, therefore be it resolved that a committee of four be appointed from the board with direction to call upon the attorney general and if after consultation with him it shall be deemed best shall meet with the regents of the State Normal School at Hays next week and act in concert with them and assist the citizens there in securing the release of the claims on said reservation lands, but under no circumstances shall any arrangements be made whereby funds of this college or the state of Kansas shall be used for securing said releases or for making any improvements on said land until such time as the title of all such

land shall be vested in the state. Moved by Regent Satterthwaite that the committee consist of Regents McDowell, Coburn, Stewart and Fairchild. Amendment carried. Resolution as amended carried.

The matter finally was settled by the Board of Regents executing leases to the claimants to permit them to remain on the land from three to five years in consideration of which all future claim was relinquished.

Plans for the management of the Branch Station were set forth in the following resolution adopted by the Board of Regents on December 13, 1901:

Resolved, That the president of the board of regents shall appoint a regent, who shall, under the direction of the board, have special charge of all matters pertaining to the Fort Hays reservation in behalf of the Agricultural College, the Experiment Station Council to direct all experiments, subject to the approval of the board.

Resolved, That the crop experiments and such other experiments as can be provided for, be begun in the year 1902 on as liberal a scale as circumstances and the funds at our command permit; and that all seeding, cultivation, harvesting, storing, sale and purchase of commodities, or of livestock and its feeding, pertaining to experimental work, and all records in reference thereto, be under the immediate supervision and direction of a competent man, who shall be stationed at Hays so much of the time as may be necessary for best doing the work contemplated.

Resolved, That such repairs be made upon the buildings on the Fort Hays reservation as shall make them available for use, and that a practical farmer be employed, who shall be known as foreman of the farm, and who shall see that all contracts pertaining thereto are fulfilled and all property belonging to the Experiment Station be properly cared for, and shall perform such other duties as shall be assigned to him.

Resolved, That the regent appointed to have charge of the interests of the Experiment Station at Hays shall be paid his per diem and actual and necessary expenses incurred in the performance of such duties, but shall not be allowed mileage.

In 1931, legislation was enacted officially creating the state park and defining its boundaries. The Legislature of 1931 passed House Bill No. 626, which reads in part:

An act relating to and creating the Kansas Frontier Historical Park on the Fort Hays Military Reservation, to be designated and set aside by the State Board of Regents and making appropriation for the preservation and upkeep of same. Be it enacted by the Legislature of the State of Kansas.

SECTION 1. The State Board of Regents shall designate and set aside for park purposes that portion of the Fort Hays Military Reservation which was the site of the buildings of old Fort Hays, together with the remaining buildings of said fort and such other portions of said reservations as the Board may deem to be of particular historical interest of which, in the judgment of said Board, may be favorably situated and well adapted for park purposes, . . . and said Board shall within six months from the effective date of this resolution designate the boundaries of such portions of said reservation so set aside for park purposes.

SECTION 2. The portion of said reservation so set aside and designated by the Board of Regents for park purposes, together with a strip of ground along Big Creek in Sec. 4, T14, R18, which has been set aside for park purposes, shall be known as Kansas Frontier Historical Park in the Fort Hays Military Reservation, and said park shall at all times be subject to the general supervision and control of the State Board of Regents, but the active custody and management thereof shall be vested in a Board of Managers, consisting of the chairman of the State Board of Regents, the secretary of the State Historical Society, the President of Kansas State Agricultural College, the President of the Fort Hays Teachers College at Hays, Kansas, and a fifth member appointed by the governor. Said Board of Managers may, subject to revision by the State Board of Regents, make all proper and needful rules and regulations for the use, preservation, improvement, control and maintenance of said park and ground and buildings thereon, and may permit such use of the grounds or any portion thereof, as is not inconsistent with this act or with the purpose for which said grounds have been set aside.

The act also carried an appropriation of \$500 for the fiscal year ending June 30, 1932. Over 120 acres were taken for the Frontier Historical Park in addition to the 43 acres previously designated for park purposes. A legal description of the park as established at this time is given in the 1931 Annual Report of the Hays Station. The Park Board was established at that time, and care of the park was transferred from the Station to the new Board.

## APPENDIX B. PUBLICATIONS

As pointed out in the Introduction, agricultural research is not complete until the results are communicated to the farming and/or scientific communities. The large number of citations included here indicates considerable success in making results available. Efforts were made to list all of the significant publications, but some may have been omitted inadvertently, and some citations are incomplete. Some of the earliest publications apparently were prepared in-house and do not appear in the publication lists.

Different types of publications serve different but equally important audiences. Scientific journals and books usually include detailed data often collected over several years. Before publishing, most are subjected to review by peer scientists, who also are the major readers. The Kansas Agricultural Experiment Station (KAES), other state agencies (including Cooperative Extension Service), and the U.S. Department of Agriculture (USDA) publish Technical Bulletins, Bulletins, Circulars, Reports of Progress, and others. Over the years, the categories of KAES publications have changed. New ones have been added, others have been eliminated, and the criteria for contents have been modified. Thus, similar reports of research in one area may have been published in two or three categories. The titles of some annual publications also have changed. Most of these emphasize information that is useful to the production agricultural community. Experiment Station scientists also prepare papers for oral presentations at scientific and professional meetings and conferences. These papers often are published in the proceedings of the conferences, but sometimes only abstracts are published in the journal of the sponsoring organization. These are designated (Abst.). In addition, many brief reports and articles are written for publication by the popular press. Most of these are printed in publications not easily referenced so are not included here.

Publications in the following lists are arranged chronologically and then alphabetically by author within each year.

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## APPENDIX C. ROSTER OF CURRENT AND FORMER EMPLOYEES

Abbott, Phil	Atteberry, Dean	Befort, August	Binder, Adolph
Abd El-Hamid, Mosad	Augustine, Dennis	Befort, Bill	Binder, Alois
Abell, David	Augustine, Michael	Befort, Celestine	Binder, Charles
Abeln, Leonard	Aule, Thomas	Befort, Clarence	Binder, Donald
Abernathy, Louis	Axelson, George	Befort, Conrad	Binder, Isidore
Ackerman, Jeffrey	Aye, F.S.	Befort, Craig	Binder, Julius
Acton, H.S.	Baird, J.O.	Befort, Edmund	Binder, Paul
Aeilts, Carl	Baird, R.F.	Befort, Ignatius	Binder, Robert J.
Aeilts, Theodore	Baker, David	Befort, John	Binder, Robert R.
Aicher, George	Baker, E.J.	Befort, Ralph	Binkley, Royal
Aicher, Louis C. Jr.	Baker, Ernest	Befort, Robert	Binsfeld, N.
Aikin, S.M.	Baker, Herbert	Befort, Tony	Bird, Cecil
Akers, Greg	Baker, Sindi	Beilman, John	Bird, Eugene
Albertson, Maurice	Baker, W.A.	Beilman, P.	Bird, Forrest
Albrecht, Gerhard	Baldwin, Julie	Bell, Beulah	Bird, Ronald
Alcon, F.L.	Ball, Pamela	Bell, C.W.	Bishop, Mark
Alexander, A.A.	Banahan, John	Bell, I.	Bissing, Charles
Alexander, E.	Bansfeld, N.	Bell, Leland	Bissing, Clem
Alexander, O.	Barber, G.W.	Bell, M.J.	Bissing, Justus
Allen, F.M.	Barber, Roy	Bell, Victor	Bissing, Lawrence
Allen, Ronald	Barber, Vernon	Bellaire, Harold	Bissing, Pete
Allender, Clarence	Barlow, Richard	Bellingham, Roscoe	Bissing, Raymond
Almond, Ernest	Barnard, A.M.	Bellis, Nancy	Bissing, Richard
Almquist, Carl	Barnes, Carl	Belman, W.G.	Bissing, Robert
Alpers, Warren	Barnes, Charles	Bender, Curtlin	Blackman, William
Alspaugh, Jesse	Barnes, John	Bender, J.W.	Blakesley, A.D.
Anderson, C.O.	Barta, Jonathan	Bender, William	Blakesley, Lee
Anderson, E.R.	Barta, Terry	Bennett, Bill	Blandefield, Paul
Anderson, Edward	Bartlett, Lonnie	Bennett, Clifford	Blanding, Terry
Anderson, Hubert	Bartman, Jerome	Bensfeld, Nick	Blank, Larry
Anderson, M.	Bascom, J.L.	Berens, Arthur	Blatt, Charles
Anderson, Virgil	Basgall, Gerald	Berens, Herman	Blender, Ed
Andrews, J.L.	Batchelder, F.P.	Berens, Jacob	Blender, Francis
Appel, Jon	Batman, Erin	Berens, Otto	Blick, Tillie
Applegate, Arthur	Battin, George	Berens, Robert	Block, Alford
Applegate, F.	Bauer, Merle	Berg, James	Blocksome, Carolyn
Applehans, Allen	Bauer, Steven	Bergman, C.W.	Bobbitt, W.J.
Arensman, Ben	Baughman, Eva	Berland, Raymond	Bode, I.T.
Arkenberg, B.J.	Baughman, C.D.	Berlin, Guy	Bodmer, Caleb
Armbruster, Betty	Baughman, Mrs. E.	Berry, Jerry	Boller, Clyde
Armstrong, Clarence	Baumer, C.	Bessant, Clyde	Bollig, Frank
Armstrong, Ralph	Baumer, Kenneth	Best, David	Bollig, Marion
Arnhold, Fred	Baumer, Ralph	Betz, Aaron	Bond, Betty
Arnhold, Gary	Baus, Raymond	Bice, Claude	Boor, Harold
Arnhold, LeRoy	Baxter, A.E.	Bice, Clayton	Boos, Al
Arnold, H.	Baxter, Bill	Bice, Clyde	Boos, Francis
Arnold, L.N.	Baxter, Bird	Biehler, Wayne	Boos, Henry
Arnold, Sidney	Baxter, William	Bieker, Alois	Boos, Joe
Artman, Peter	Beach, Charles	Bieker, Aloysius	Boos, John
Arvilo, Ermilo	Bean, William	Bieker, Bernard	Boos, Leo
Asburn, Pat	Beatty, Joseph	Bieker, Eldon	Boos, Peter
Aschwege, Wayne	Bechard, Mary Beth	Bieker, Francis	Boot, L.
Ash, B.F.	Becker, Eldon	Bieker, Fred	Booth, Robin
Ashbaugh, W.L.	Becker, Jacob	Bieker, Nick	Bortic, M.
Asher, Lloyd	Becker, Joseph	Bieker, Robert	Boxler, Harold
Ashmore, John	Becker, R.B.	Bieker, Tony	Boxler, Jerold
Ashmore, Marcia	Beckum, Bruce	Biery, Jennifer	Boxler, Martin
Ashmore, Silas	Beem, M.G.	Biggs, Thomas	Boxler, Mike
Atchison, Fred	Beeman, J.S.	Billinger, Mike	Boyd, E.M.
Atchison, Fred Jr.	Beeth, Howard	Billinger, Peter	Boyle, Alan
Atkins, John	Befort, Adam	Billinger, W.J.	Bozarth, George
Atkinson, Irvin	Befort, Alois	Bills, Frank	Brack, Leon

Bradshaw, John	Burbach, Douglas	Case, Wilfred	Conway, John Jr.
Brady, Joseph	Burch, John	Casebeer, Ernest	Cook, Kenneth
Brandt, James	Burgardt, Clifford	Casey, Spencer	Coons, J.W.
Braun, Dan	Burgardt, James	Cashman, Marjorie	Cooper, Raymond
Braun, David	Burghardt, Etzel	Casper, James	Cooper, Roy
Braun, Jared	Burkhart, Beverly	Cathcart, Lester	Copeland, Paul
Brenemen, Richard	Burkhart, John Jr.	Chapman, George	Copp, O.D.
Brengle, H.I.	Burkhart, Joyce	Charvat, Van	Cordill, Nicole
Brenn, David	Burkhart, M.	Chenowith, Harry	Costner, John
Brenner, David	Burkhead, L.C.	Chinn, Tim	Coulter, Earl
Brenner, Lance	Burkholder, A.L.	Chittenden, H.G.	Countrysman, D.
Brethour, John	Burkholder, Arthur	Chittenden, Thomas	Cowan, John
Briney, Jerry	Burnett, Don	Choitz, Janna	Cox, George
Brockman, J.	Burnett, R.I.	Chrisler, Delmer	Coyle, F.S.
Brook, Tec	Burns, Henry	Christiansen, W.N.	Coyne, Patrick
Brooking, O.C.	Burns, Joseph	Clark, Bert	Cragg, F.C.
Brooks, Gail	Burns, Thomas	Clark, Clarence	Craig, J.M.
Brooks, Jess	Burris, Irvin	Clark, Delbert	Craigmile, H.S.
Brooks, Tina	Burris, Less	Clark, E.F.	Craine, Rosalie
Brower, George	Burton, Roy	Clark, Henry	Cramer, George
Brown, Allen	Burtscher, A.W.	Clark, Joseph	Crannell, Max
Brown, E.M.	Bush, Lex	Clark, Maude	Cravens, George
Brown, John	Butcher, Antone	Clark, Paul	Crawford, Donna
Brown, Leo	Butler, John	Clark, Richard	Crawford, Keith
Brown, Leroy	Butler, Wesley	Clark, Russell	Crawford, Linda
Brown, Mark	Butts, W.D.	Clark, Silas	Crawford, Lorie
Brown, Mary	Bye, F.S.	Clark, Stanley	Creamer, Duane
Brown, Ora	Byerley, Thomas	Clark, W.H.	Creighton, Alex
Brown, Paul	Byers, Hugh	Clause, Earl	Creighton, Don
Brown, Peter	Byers, Joseph	Clay, Byron	Creighton, Keith
Brown, Ray	Byers, R.H.	Clay, Harry	Crissman, H.E.
Brown, Robert	Byron, George	Clay, Henry	Critchett, A.
Brueggeman, F.H.	Caceres, Jacobo	Clay, Mrs. T.	Crocker, Benjamin
Brull, Pia	Caldwell, Fred	Clay, Ray	Crocker, Carl
Brull, T.W.	Caldwell, R.E.	Clements, M.C.	Crocker, G.
Brumitt, A.	Calir, Harold	Cline, Jason	Cron, A.B.
Brumitt, E.J.	Callahan, J.P.	Cline, Rex	Crosby, Steven
Brumitt, Jacob	Callahan, Ronald	Cline, Robert	Crosly, F.L.
Brumitt, John	Callahan, William	Cloud, Noah	Crow, J.
Brumitt, Willard	Calvert, F.W.	Cobb, Darrel	Crowl, Clarence
Brummer, Todd	Calvert, Will	Cobb, Don	Culley, Kevin
Brungardt, Allen	Campbell, Jack	Cobb, Gareth	Cummings, A.G.
Brungardt, Anselm	Campbell, Lloyd	Coble, F.S.	Cunningham, C.B.
Brungardt, Anton	Campbell, Martin	Coe, H.K.	Cunningham, C.C.
Brungardt, B.P.	Campbell, O.P.	Coffey, A.	Cunningham, F.L.
Brungardt, Carrie	Campmire, Melvin	Cole, Anthony	Currie, Randall
Brungardt, Dominic	Canaday, E.N.	Cole, E.C.	Curry, James
Brungardt, James	Canaday, Henry	Cole, Lawrence	Curry, Leon
Brungardt, John	Canaday, Roy	Collins, H.S.	Curtis, John
Brungardt, Kenneth	Cane, J.B.	Collins, Lewis	Curtis, LeRoy
Brungardt, Paul	Cane, Reece	Collins, Melissa	Curtis, Phillip
Bruns, Roland	Carder, Jeremy	Colliver, A.D.	Curtis, William
Bryan, Dorothy	Carlile, T.J.	Colson, Peggy	Cushman, Frank
Bryant, V.C.	Carlisle, Clair	Compton, Swan	Custer, Ray
Buchanan, Kay	Carman, Debra	Conaway, Thomas	Cutler, Carrie
Buchheister, Ione	Carmichael, Gordon	Conger, Duane	Dallna, Leo
Buchheister, Jack	Carnahan, J.R.	Conklin, B.J.	Dana, A.
Buckles, J.R.	Carnahan, Roy	Conklin, George	Danielson, Albert
Bugg, William	Carpenter, Denis	Connelly, Bill	Darland, Raymond
Bullock, George	Carroll, Charles	Connelly, W.E.	Datson, Will
Bullock, Linn	Carson, Karl	Conner, A.	Daugherty, Delwin
Bullock, Milon	Carter, N.D.	Conner, Ann	Daugherty, John
Bullock, Roy	Casady, Alfred	Conner, Donald	Davenport, C.A.
Bunch, Richard	Casady, Robert	Connor, Wesley	David, Leonard
Bunker, Eddie	Case, Alice	Conrad, Herbert	Davidson, A.P.

Davidson, Vester	Doerfler, Alex	Eddleman, Gerald	Felton, Peter
Davis, Ed	Doerfler, C.J.	Ediger, Orlin	Fench, Jack
Davis, J.C.	Doerfler, James	Edwards, Charles	Fenoughty, Frank
Davis, John	Doerfler, Joe	Edwards, Dick	Ferguson, Bennett
Davis, Lavern	Doerfler, Marvin	Edwards, E.	Fernandez, John
Davis, Mervin	Dome, John Jr.	Ehrlick, Dave	Ficken, Clinton
Dawson, J.H.	Domey, Charles	Eickbush, Andrew	Ficken, Dale
Dazey, A.C.	Domey, John	Eickbush, Victor	Fields, Robert
Dazey, Ray	Domey, William	Eickhoff, Nathan	Finch, Douglas
Deane, Robert	Donaldson, L.	Eilert, John	Fink, Ralph
DeBoer, Guy	Dorney, John	Eining, Danny	Finkbiner, J.B.
Dechant, A.	Dorney, Wilfred	Einsel, Rodney	Fischer, Ed
Dechant, Alvin	Dorney, William	Ekey, Fauntleroy	Fischer, Jesse
Dechant, E.	Dorsch, Thomas	Ekey, Sammuell	Fisher, J.P.
Dechant, Hayes	Doty, J.O.	Elam, Dan	Fisher, Peter
Dechant, Herbert	Dougherty, Elmer	Elder, Harold	Fisher, Ralph
Dechant, John	Downing, Robert	Ellenbecker, Frederick	Fisher, Thomas
Dechant, Nicholas	Downs, Arthur	Ellenz, Jana	Fitting, Hans
Dechant, Peter	Downs, Walter	Elling, O.H.	Fitzgerald, Pat
Dechant, Tony	Doyle, Joe	Ellis, Frederick	Fitzpatrick, H.J.
Dechant, Walter	Drake, Arlyn	Ely, Donald	Flanagan, O.K.
Dechant, Wayne	Drake, Herbert	Ely, W.B.	Flanders, A.A.
Deeds, William	Drake, R.R.	Embry, Dick	Flanders, J.E.
DeForest, Elbert	Drees, Mildred	Emery, D.J.	Flax, L.W.
DeForest, Kenneth	Drees, Thomas	Emery, Russell	Fleming, Roy
Deines, Chad	Dreher, M.A.	Emery, W.E.	Floersch, Mathias
Deisher, Douglas	Dreher, Melvin	Emrich, Frank	Flora, Lowell
Dellett, Fred	Dreher, Philip	Engel, Bruce	Floyd, John
Dempsey, Michael	Dreher, Victor	Engel, Charles	Folkers, Lois
Denia, Elgin	Dreiling, Ben	Engel, Eric	Foltz, C.V.
Denning, Gene	Dreiling, Chris	Engle, Alex	Foos, Matthew
Denning, Gilbert	Dreiling, David	Englesby, E.T.	Ford, Mary
Denning, Melvin	Dreiling, Fred	Enlow, Charles	Foreman, George
Denning, Nick	Dreiling, Gilbert	Ensign, Ernest	Foresman, C.E.
Denning, Robert	Dreiling, Joe	Ensign, Lester	Fortune, Jerry
Denning, Roger	Dreiling, Larry	Epstein, Estelle	Foss, Dewey
DeWees, Bergen	Dreiling, Leslie	Erhart, Andrew	Foster, Bill
Deyoe, Carrol	Dreiling, Louis	Erickson, C.T.	Foster, N.T.
Dible, Diana	Dreiling, M.P.	Erickson, Rex	Foster, Vernon
Dick, Alex	Dreiling, Neil	Ernst, Dennis	Fowler, Wayne
Dick, S.W.	Dreiling, Ralph	Erwin, Joseph	Fox, Charles
Dickerson, Charles	Dreiling, Rudolph	Eshbaugh, D.E.	Frahm, Richard
Diehl, T.M.	Dreiling, William	Eshbaugh, F.P.	France, D.C.
Dies, Barry	Driskell, S.R.	Esterdahl, Albert	Frank, Edward
DiLiberto, V.	Drugan, G.J.	Eubank, Paul	Frank, J.S.
Dilley, Steven	Dubbs, Owen	Everhart, Marion	Franke, Richard
Dinges, Alex	Dubin, Bob	Everhart, O.	Franklin, D.E.
Dinges, Alfred	Duerksen, D.E.	Evers, Carlos	Franklin, Woodrow
Dinges, Charles	Duesing, Phillip	Fabrick, Paul	Frantz, Emma
Dinges, Edward	Duitsman, Wilbert	Fahey, Pat	Freeman, C.
Dinkel, Aegidius	Dunavan, Clayton	Fair, Fred	Freeman, G.C.
Dinkel, Brent	Dunn, George	Fairchild, F.P.	Freeman, Roy
Dinkel, Frank	Durboraw, Glen	Farber, Alan	Freeman, Russell
Dinkel, Gerard	Durfee, Dale	Farber, Ford	Freeman, W.M.
Dinkel, Henry	Dusin, Karl	Farlow, J.A.	Frees, John
Dinkel, Joseph	Dutton, J.A.	Feezor, George	Frey, Jon
Dinkel, Markus	Dye, Dennis	Feiden, Jack	Fritts, Bernal
Dinkel, Steve	Dyer, Lou	Feitz, Joe	Fritts, Gale
Dister, Douglas	Earley, Donald	Fellers, Harvey	Fross, Fred
Dixon, W.C.	Easley, Claude	Felten, Pete Jr.	Fuchs, K.S.
Dodd, O.M.	Easley, S.C.	Feltes, Arthur	Fuhrman, Stephanie
Dodge, C.H.	Eberhart, Ira	Feltes, Ed	Fukahara, Harry
Dodge, O.D.	Eberle, Marvin	Feltis, Harold	Fuller, Leo
Dodge, Walter	Eberly, Will	Feltis, Jim	Furbeck, Fred
Dodrill, Ellsworth	Eccleston, Sheldon	Feltis, N.J.	Furbeck, G.E.

Fyfe, Fred	Glick, J.M.	Gross, Kenneth	Harmoney, Keith
Gabel, Edmund	Glick, J.W.	Gross, Leo	Harper, A.E.
Gabel, Gilbert	Glick, N.A.	Gross, Martin	Harper, Arvin
Gabel, Harold	Gnad, John	Gross, Paul	Harper, Betty
Gabel, Joe	Goble, Harold	Gross, R.	Harper, Ernest
Gabel, Leo	Goble, M.	Gross, Theodore	Harper, Everett
Gabel, Vernon	Goetz, Adam	Gross, Vernon	Harper, John
Gable, Donald Jr.	Goetz, Alvin	Grossardt, B.R.	Harries, George
Gallagher, Pete	Goetz, Ernest	Grote, Hilbert	Harris, Charles
Galliart, Henry	Goetz, Eugene	Groves, Clyde	Harris, David
Galloway, Walter	Goetz, Herbert	Growe, Kenneth	Harris, Frank
Garey, Meryl	Goetz, J.P.	Growe, Marilyn	Harris, George
Garnett, Thomas	Goetz, Vernon	Gruner, Cecil	Harris, Jack
Garrett, Lloyd	Goetz, Wesley	Guardstaff, W.H.	Harris, John
Garton, Gail	Goff, Carl	Guernsey, W.H.	Harris, L.G.
Garvert, Terry	Goff, Lew	Gullett, E.J.	Harris, Pamela
Gaschler, Dennis	Goldforb, Jacob	Haas, Francis	Harris, Richard
Gaschler, Thomas	Goller, George	Haas, Robert	Harrison, Jackie
Gates, Ryerson	Good, Larry	Hackerott, Glenn	Harrison, Jewell
Gatschet, Denise	Goodrich, Charles	Hackerott, Harold	Harrison, Joe
Gatschet, John	Goodrich, D.T.	Hackett, William	Harrison, Rich
Gatschet, Mark	Goodrick, Garland	Haddock, Donald	Harshbarger, Elwood
Gatschet, Ramona	Gordon, J.	Hadley, Ralph	Harshbarger, G.E.
Gauss, Henry	Gosney, Abe	Haefner, Pete	Hart, Ernest
Gauss, Michael	Gosser, Lou	Hager, Kim	Hartley, J.
Gearhart, O.D.	Gosser, Roy	Haggard, Jared	Harvey, Tom
Geier, Patrick	Gosser, Wallace	Haile, Gorden	Hase, Cecil
Geist, Albert	Gottschalk, Adolph	Hale, Charles	Hashimoto, Y.
Geist, August	Gottschalk, Clinton	Hale, Effie	Hauser, Alois
Geist, Brenda	Gottschalk, Curtis	Hale, J.T.	Haverman, Alfred
Geist, James	Gottschalk, Mark	Hale, O.P.	Hawk, E.S.
Geist, Thomas	Gottschalk, Neil	Hale, Selman	Hawkes, E.W.
George, William	Gottschalk, Richard	Haley, Paula	Hawkins, H.
Germann, James	Grabbe, Adolph	Hall, Barbara	Hawks, Charles
Gerstner, Elaine	Grabbe, Clarence	Hall, Charles	Hayes, Charles
Gerstner, LeRoy	Grabbe, Edward	Hall, Joseph	Haynes, Charles
Gerstner, Norman	Grabbe, Paul	Hall, Richard	Hayter, B.
Getty, R.E.	Grabbe, Ron	Hallsted, A.L.	Haywood, Clarence
Getz, Alec	Graber, John	Hallsted, Mamie	Haywood, Mary
Getz, John	Graft, P.L.	Hallsted, Maude	Hazen, L.E.
Gibbons, Elliott	Graft, Thomas	Halperin, Morris	Hazlett, Donald
Gibbons, George	Graham, Cody	Hamel, Richard	Hazlett, Steven
Giebler, Alois	Graham, H.	Hamilton, Mrs. S.E.	Hazlett, V.C.
Giebler, Felix	Green, Connie	Hamilton, Neal	Heaton, Richard
Giebler, Mathew	Greene, R.	Hamilton, S.E.	Heger, John
Giebler, Patrick	Gregory, Max	Hammer, W.E.	Heinze, Charles
Giebler, Robert	Griffing, Ward	Hammerschmidt, Elden	Helder, George
Giebler, Tony	Griffing, Willis	Hammerschmidt, Otto	Helm, Robert
Gilger, James	Griffith, George	Hammerschmidt, Richard	Hemphill, Marjorie
Gill, Harold	Griffith, Howard	Hancock, Paul	Hemphill, Summer
Gill, Shirley	Griffith, Walter	Hancock, Pierce	Henderson, William
Gilleece, C.H.	Grisham, A.	Haney, J.G.	Henry, G.S.
Gilleece, J.S.	Groff, Homer	Hankins, C.R.	Hepp, Conrad
Gilmore, Jack	Groff, Joe	Hanley, F.M.	Hepp, John
Gilstrap, W.H.	Groff, Walter	Hann, Joe	Herl, Justin
Glascock, Tami	Gross, Agnes	Hansen, Alois	Herman, Bob
Glassman, Anton	Gross, C.F.	Hansen, Keith	Herman, Clarence
Glassman, Edgar	Gross, Gail	Hanson, Kathy	Herman, Edmond
Glassman, Florian	Gross, George	Hardin, J.J.	Herman, Herbert
Glassman, Ludwig	Gross, Harold	Hargett, Eric	Herman, Louis
Glassman, Ralph	Gross, Harry	Hargett, Jennifer	Herman, Mike
Gleim, Henry	Gross, Henry	Harkness, J.G.	Heronema, William
Gleim, John	Gross, Jacob	Harman, Steven	Herrman, Gregory
Gleissner, Frederick	Gross, James	Harmon, S.A.	Herrman, J. Eugene
Glick, Cyrus	Gross, John	Harmon, William	Herrman, LeRoy

Herrman, Melba	Hubbard, C.A. Jr.	Johnson, E.W.	Kinderknecht, Nick
Herrman, Raymond	Huddleston, Howard	Johnson, Elbert	Kinderknecht, Norman Jr.
Herron, Robert	Hughes, Anita	Johnson, Emil	Kinderknecht, Pamela
Hertel, Phil	Hughes, E.C.	Johnson, Ernest	Kinderknecht, T.
Hertlein, Harvey	Huitt, Bill	Johnson, G.W.	King, A.A.
Hertlein, John	Huitt, George	Johnson, George	King, Bert
Hertling, Charles	Hulstine, Leland	Johnson, John	King, C.L.
Hervey, H.H.	Hunt, G.W.	Johnson, Norman	King, Elvin
Hess, George	Hunt, Wayne	Johnson, Oscar	King, E.R.
Hetler, H.	Hunter, R. Duane	Johnson, Peter	King, Leland
Heyka, Michael	Hunter, R.A.	Johnson, Sandra	King, Max
Hickert, Kevin	Hunzeker, Carl	Johnson, Wayne	King, W.A.
Hickman, Harold	Hurd, Joseph	Johnston, Charles	Kingsley, H.M.
Hild, Joseph	Hurley, T.D.	Johnston, Milford	Kircher, Tonya
Hildebrand, William	Huser, Bryan	Johnston, Walter	Kirk, Kent
Hildwein, H.L.	Huslig, James	Jones, Cliff	Kirk, Larry
Hill, George	Huslig, Marcus	Jones, Elgie	Kirkbride, Eddie
Hill, H.	Huston, John	Jones, Herbert	Kirkman, M.G.
Hill, Kevin	Huston, Paul	Jordan, John	Kiser, L.
Hill, Lyman	Hutchison, Herbert Jr.	Joy, Rolla	Kiser, Will
Hilton, Ralph	Hutchison, Patsy	Juenemann, David	Kisner, Steve Jr.
Hinde, R.R.	Hwit, Albert	Junk, Raymond	Kitchen, Robert
Hinojos, April	Iloff, Steve	Kane, Edna	Klaus, Anton
Hoagland, Lee	Imel, Charles	Karlin, Al	Klaus, Benedict
Hodgson, E.H.	ImMasche, Donald	Karlin, Leroy	Klaus, Cletus
Hodson, Will	ImMasche, Dorothy	Karlin, Marvin	Klaus, Edgar
Hoffman, Allison	ImMasche, Howard	Karlin, Norbert	Klaus, Joe
Hoffman, Gerald	Immenschuch, A.E.	Karlin, Peter	Klaus, Peter
Hoffman, J.P.	Indiek, Joni	Karlin, Ronald	Klaus, Roy
Hoffman, Jack	Ingram, Frank	Karnes, Ray	Klaus, Victor
Hoffman, John	Irvin, James	Karper, R.E.	Klaus, Walter
Hoffman, Melvin	Irwin, Devern	Karr, David	Klaus, Wilfred
Hoffman, Mike	Ivil, M.C.	Kats, Sean	Klaus, William
Hoffman, Ralph	Ivory, Ed	Kays, Fred	Klotz, Robert
Hoffman, Robert	Jaccard, C.R.	Kays, Paul	Knoll, Alex
Hoffman, William	Jaccard, J.C.	Kear, Paul	Knoll, Devon
Hogan, Lee	Jackson, C.F.	Keberlein, Alvin	Knoll, Omer
Hogsett, Stanley	Jackson, H.	Keck, Jimmie	Knoll, Robert
Hohn, Marcus	Jackson, Norman	Keefer, William	Knott, Guy
Holden, George	Jackson, Wells	Keenan, Bob	Kobler, Dean
Holland, F.D.	Jacobini, Horace	Keenan, James	Koerner, Aloysius
Hollenbeck, G.	Jacobs, Joe	Keller, Frank	Koerner, August
Holm, Florian	Jacobs, Norman	Keller, Sharon	Koerner, Herbert
Holste, Keith	Jacobs, Ralph	Keller, Willis	Koerner, Hilary
Holyak, John	Jacobs, Rita	Kellerman, Mark	Koerner, Leroy
Honer, Thomas	Jacobs, Robert	Kellogg, Doyle	Koerner, Marcell
Hood, Stephen	Jacobson, Luther	Kelsey, E.B.	Kofoid, Eric
Hood, Wayne	Jaeger, Donagene	Kennedy, Walter	Kofoid, Kenneth
Hooker, George	Jaeger, H. Rolland	Kent, Clarence	Kohl, H.A.
Hoop, Ray	Jaeger, John	Kent, G. Raymond	Kohl, Hugo
Hoover, Cleta	Jansonius, Harvey	Kent, G.C.	Kohler, Peter
Hoover, John	Jansonius, Troy	Kent, Harry	Kolarik, Stephen
Hoover, Roy	Jantzen, Ed	Kenter, Maurice	Korbe, Allen
Hopkins, Terry	Jarrett, H.J.	Kern, Beth	Korbe, Andrew
Hopp, Terry	Jenkins, Thomas	Kerns, A.H.	Korbe, Felix Jr.
Hopper, J.	Jensen, Christian	Kerr, Gregory	Korbe, J.D.
Horchem, Ronald	Jensen, David	Kesling, Jesse	Korbe, Killian
Horner, Jackie	Jepsen, Raymond	Kessler, Frank	Korbe, Walter
Hosley, Roy	Jerrett, J.A.	Khaleeq, Babrak	Kraft, Amanda
House, Clarence	Jewell, A.N.	Khlopeck, Phil	Kraft, Bill
Houser, Theodore	Jewell, Elwood	Kiene, F.A.	Kraft, Tammy
Howard, Jason	Jewell, Frank	Kilman, Robert	Kramer, James
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Howe, John	Johnson, David	Kincaid, Jeffrey	Kraus, Weston
Hoy, Coronda	Johnson, E.L.	Kinderknecht, Julie	Krause, Paul

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Krauss, Herman	Leiker, Alvin J.	Lovedilsch, Clarence	Maxwell, Robert
Krenzlin, Myron	Leiker, Anthony	Lowe, Alvin	Maxwell, Walter Jr.
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Lande, H.H.	Leiker, John	Madden, Eddie	McClelland, R.C.
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Leach, William	Lindsey, Arlo	Marshall, Max	McKinney, Thea
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Leeper, Harold	Linnenberger, Andy	Maska, J.R.	McNinnery, Fred
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Leikam, Lucille	Livers, Geraldine	Massey, Kady	McVey, James
Leikam, William	Livers, Ronald	Masters, Richard	McVicker, John
Leiker, Aegidius	Livingston, Michael	Mastin, Mary Lou	McVicker, Robert
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Medina, Juan  
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Mellick, Ronald  
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Meyer, P.K.  
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Middlehoff, C.J.  
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Mikelson, F.W.  
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Millard, Floyd  
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Miller, Alphonse  
Miller, Donna  
Miller, Ed  
Miller, George  
Miller, Hal  
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Miller, Jake  
Miller, Joe  
Miller, John  
Miller, Lee  
Miller, Marcell  
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Milliken, F.B.  
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Mills, H.E.  
Mills, Vern  
Mindrup, E.F.  
Mitchell, W.C.  
Mizell, Harold  
Moberly, John

Moberly, Joseph  
Mock, Allen  
Mock, Clarence  
Mock, Eddie  
Mock, Joseph  
Moe, Joseph  
Moeder, Englebert  
Moffett, Joseph Jr.  
Monahan, George  
Montague, E.J.  
Montgomery, Jerome  
Moore, A.B.  
Moore, Byrd  
Moore, E.W.  
Moore, Edmund II  
Moore, G.C.  
Moore, Hale  
Moore, Joyce  
Moore, Lily  
Moore, Michelle  
Moore, Stanley  
Moore, Virgil  
Moorhous, John Jr.  
Moorman, Claude  
Morgan, Clem Jr.  
Morgan, Clinton  
Morphew, Lorin  
Morris, George  
Morris, William  
Morrisey, Billy  
Morrison, George  
Mort, Ned  
Mortensen, A.E.  
Morton, L.E.  
Morton, Thomas  
Moshy, Rolland  
Mosier, Ben  
Mosier, David  
Mosler, William  
Moss, Lynn  
Motz, Frank  
Mowry, Jan  
Mudd, Patrick  
Mueller, Charles  
Mueller, William  
Mullen, Charles  
Mullen, E.H.  
Mumm, Joe  
Mundee, Junior  
Mundee, Keith  
Munsch, Troy  
Munsell, Darrell  
Munson, F.L.  
Munson, Roy  
Murphy, Don  
Murphy, F.  
Murray, Paul  
Murray, R.S.  
Morrow, F.L.  
Myer, Willard  
Myers, Bill  
Myers, Charles  
Myers, Joan  
Myers, Johnnie  
Mygatt, J.F.

Nash, Leslie  
Neal, Reva  
Neale, A.S.  
Nebel, Warren  
Needles, Foster  
Needles, Keith  
Neeley, Lawrence  
Neelly, Rock  
Negus, Willis Jr.  
Neilsen, John  
Nelson, Albert  
Nelson, H.E.  
Nelson, Joanne  
Nelson, John  
Nelson, Virgil  
Nemecheck, Alvin  
Newcomer, Arthur  
Newland, John  
Nicholas, Henry  
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Nichols, J.L.  
Nicholson, Eric  
Nicholson, Robert  
Nickelson, Marilee  
Nickles, W.C.  
Nickoloff, K.P.  
Nielsen, H.T.  
Nimmons, John  
Nixon, William  
Noland, David  
Noonan, Mike  
Nordyke, Clinton  
Norman, E.  
Norris, Fred  
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North, Tricia  
Northam, Donna  
Northam, Francis  
Northrup, A.A.  
Nulton, Charles  
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Nulton, Rodger  
Nulton, Tommy  
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Nuzum, Paul  
Nyteray, Andrew  
O'Brien, M.  
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O'Laughlin, J.  
O'Leary, John  
Oakley, James  
Oakley, William  
Ochs, Glenna  
Ochs, John  
Ochs, Sidney  
Okenberry, Gifford  
Oldham, T.  
Olinger, M.  
Olsen, Lee  
Olson, Dale  
Olson, Kenneth  
Orth, Arthur  
Orth, Clemens

Orth, Donald  
Orth, Frank Jr.  
Orth, John Jr.  
Oshant, Fred Jr.  
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Otezza, M.J.  
Otott, Roger  
Otte, Gary  
Ottooson, F.H.  
Owens, W.N.  
Owensby, James  
Page, John  
Page, Maynard  
Page, Monte  
Painter, LaVerne  
Palmer, Paul  
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Parker, Merle  
Parker, Robert  
Parks, Ralph  
Pate, J.E.  
Patterson, A.M.  
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Patton, Donald  
Patton, Roger  
Paul, W.H.  
Payne, James  
Payne, John  
Pearce, H.E.  
Pearce, R.L.  
Pearson, Lyle  
Pearson, M.C.  
Pearson, Sylvester  
Pederson, John  
Pederson, Lester  
Pelham, J.L.  
Pelzel, Leo  
Penka, Jerold  
Penny, Lowell  
Penny, Skeet  
Perkins, Dale  
Perkins, F.R.  
Perkins, Frank  
Perry, E.G.  
Peter, Donald  
Peters, Adolph  
Peters, Fred  
Peters, P.  
Peterson, Kermit  
Peterson, P.  
Pfannenstiel, Alfred  
Pfannenstiel, Aloys  
Pfannenstiel, Bob  
Pfannenstiel, Boniface  
Pfannenstiel, Casper  
Pfannenstiel, Clarence  
Pfannenstiel, Earl  
Pfannenstiel, Edmund  
Pfannenstiel, Edward  
Pfannenstiel, Edwin  
Pfannenstiel, Frank  
Pfannenstiel, Gerald  
Pfannenstiel, Gilbert  
Pfannenstiel, Harvey

Pfannenstiel, I.P.	Poland, Lester	Riedel, Eddie	Roth, Linus
Pfannenstiel, Ignatius	Polley, Joseph	Riedel, Elmer	Roth, Louis
Pfannenstiel, Ignatius A.	Popp, Daryl	Riedel, Julius	Roth, Vic
Pfannenstiel, Irwin	Popp, Glenn	Riedel, Matt	Rothenberger, Paul
Pfannenstiel, Jake	Porter, Anna	Riedel, Richard	Rothenberger, Vern
Pfannenstiel, Joe	Porter, C.E.	Riegel, David	Rothgeb, B.E.
Pfannenstiel, John	Porter, C.W.	Riegel, Donald	Rothgeb, Harold
Pfannenstiel, Joseph	Porter, Walter	Riegel, Kenneth	Rousseau, Angela
Pfannenstiel, Justin	Potter, Leslie	Ring, Charles	Royce, Clare
Pfannenstiel, L.	Pottorff, Michael	Ritter, E.E.	Royse, David
Pfannenstiel, Marvin	Pratt, F.B.	Robben, Raymond	Rubottom, Darrel
Pfannenstiel, Melvin	Pratt, Normand	Robbins, Melvin	Ruda, Robert
Pfannenstiel, Mike	Pratt, S.V.	Robinson, Alex	Ruder, Albert
Pfannenstiel, Nick F.	Pratt, V.L.	Robinson, Jamie	Ruder, Alfred
Pfannenstiel, Nick N.	Preston, Joe	Robinson, John	Ruder, B.M.
Pfannenstiel, Richard	Preston, V.Y.	Robinson, Stephen	Ruder, Brian
Pfannenstiel, Roy	Price, J.W.	Robison, Wayne	Ruder, Charles
Pfannenstiel, Severin	Price, Mary	Rogers, A.E.	Ruder, Duane
Pfannenstiel, Theodore A.	Prindiville, George	Rogers, Earl	Ruder, Eugene
Pfannenstiel, Theodore L.	Pritchard, Kevin	Rogers, Pat	Ruder, Fidelis
Pfannenstiel, Travis	Prizer, R.M.	Rohleder, Edward	Ruder, Gene
Pfannenstiel, Vernon	Prockish, Daniel	Rohleder, Luke	Ruder, Ig
Pfannenstiel, Walter	Prose, Dale	Rohleder, Richard	Ruder, James
Pfeifer, A.	Pruitt, A.H.	Rohleder, V.J.	Ruder, Marvin
Pfeifer, Allen	Pugh, A.B.	Rohleder, Valerius	Ruder, Nick
Pfeifer, Alvin	Puruker, O.R.	Rohr, Adolph	Ruder, Richard
Pfeifer, Anthony	Purvis, Roy	Rohr, Al	Ruder, Theabold
Pfeifer, Anthony Jr.	Quinn, Jerry	Rohr, Alex	Ruder, Vernon
Pfeifer, Dennis	Quint, Alois	Rohr, Alfred	Rumpel, Philip
Pfeifer, Herbert	Quint, John	Rohr, Alois	Rumsey, Jack
Pfeifer, John	Quint, Wayne	Rohr, Alvin	Rune, Jake
Pfeifer, Josephine	Radford, Marcie	Rohr, Anthony	Rupp, Alex
Pfeifer, Leonard	Rajewski, John	Rohr, Clarence	Rupp, Basil
Pfeifer, Norman	Ramba, W.A.	Rohr, Conrad	Rupp, Ben
Pfeifer, Ralph	Ramey, Ceis	Rohr, Daniel	Rupp, Darrel
Pfeifer, Randall	Ramey, W.T.	Rohr, Eddie	Rupp, Hank
Pfeifer, Richard	Randa, Elmer	Rohr, Edna	Rupp, Joe
Pfeifer, Tony	Randolph, Lawrence	Rohr, Frank	Rupp, Leo
Pfeifer, Tony Jr.	Rao, Aluri	Rohr, Gilbert	Rupp, Paul
Pflughoft, Ronald	Rathbun, Bruce	Rohr, Jerry	Rupp, Ralph
Pfortmiller, Richard	Ray, William	Rohr, John	Rupp, Richard
Phelps, A.	Reed, Bert	Rohr, Joseph	Rush, John
Philip, Mary Allyn	Reed, C.S.	Rohr, Julius	Rusk, Walter
Philip, W.D. III	Reed, Clyde	Rohr, L.B.	Russell, Dean
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Phillips, Alex	Reed, M.H.	Rohr, Lawrence	Russell, Stanley
Phillips, Doris	Reed, Mac	Rohr, Matt	Rutheford, O.L.
Phillips, William	Reed, Ralph	Rohr, Melvin	Ruthrauff, R.
Phillis, E.G.	Reed, Thomas	Rohr, P.J.	Ryan, Wendell
Pickard, Ronald	Reidel, John	Rohr, Philip	Ryberg, Rena
Picken, C.A.	Reimer, Greg	Rohr, Ruth	Sack, Eugene
Pickering, David	Revilla, Luis	Rohr, Theabold	Sack, Leo
Pierce, E.S.	Reyner, Guy	Rohr, Tony	Sack, Tony
Pierce, E.W.	Reynolds, Clarence	Rohr, Wilfred	Sack, Vera
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Pike, Kenneth	Rhine, John	Romme, Dale	Salisbury, Ray
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Pivonka, G.H.	Richardson, Joyce	Rose, Selby	Samuelson, Earli
Pixley, H.K.	Richter, W.A.	Rose, W.S.	Sander, Alice
Planas, Joseph	Riddle, Jimmy	Ross, Joyce	Sander, Alvin
Plumb, Paul	Rider, Eugene	Ross, William	Sander, Anton
Plumb, Robert	Ridgeway, S.C.	Rostocil, Walter	Sander, J.A.
Podlena, Robert	Riedel, Arthur	Roth, Cecil	Sander, Melvin

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Schmeidler, Phil  
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Schmeidler, William  
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Schreiner, Daniel  
Schreiner, Peter  
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Schuetz, Edmund  
Schuhs, Forrest  
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Schull, C.W.  
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Schumacher, Isidor  
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Schumacher, Katherine  
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Schumacher, Wendelin  
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Scott, Ira Jr.  
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Searcy, Billy  
Sears, A.  
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Seiling, W.T.J.  
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Seitz, Thomas  
Sell, M.  
Sellers, Ray  
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Shade, Clide  
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Shade, S.E.  
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Shaver, Richard

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Showman, C.E.  
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Williams, Lewis			

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April 2001

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