Cover Picture: Two snow surveyors from the Soil Conservation Service traveling to a snow course. Measurements of the mountain snowpack during the winter and spring months provide water users in cities and on irrigated lands with information on the amount of streamflow to be expected during the summer months. Snow surveys in Utah were initiated more than 30 years ago by Governor George D. Clyde on the Logan River watershed. Governor Clyde was a member of the Utah Station staff at the time. Measurements of snowpack and forecasts of streamflow are now made for all principal streams throughout the state. Reports on water supply outlook are available from offices of the Soil Conservation Service, county agricultural agents, the State Engineer, and water commissioners. Surveys are made at monthly or more frequent intervals from January 1 to June 1. Gregory L. Pearson, snow survey supervisor, Soil Conservation Service.

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New Publications

Bul. 444. Control of ground cherry, by D. C. Tingey. Department of Agronomy,  
15 p.

This publication discusses the use of various combination treatments in the control of this perennial weed. These treatments include cropping, cultivation, and the use of chemicals.

Spec. rept. 16. Today's research, tomorrow's progress, a report commemorating the  
Experiment Station's seventy-fifth anniversary. 28 p.

This report recounts the story of some of the research efforts of the Station over the period of its history.

A copy of either of these publications will be sent free on request to the Agricultural Experiment Station, Utah State University, Logan, Utah.
ALKALOIDS AND MEDICINES FROM PLANTS

FRANK R. STERMITZ

A soldier on the battlefield, in pain from a bullet wound in the leg ... a psychopathic killer in a mental institution, glaring with hatred at anyone who approach ... a missionary, lying alone in a jungle hut, burning and delirious with fever ... a young child, wasting away with a cancerous blood disease. ... What have these indi-
viduals in common aside from their obvious knowledge of pain? Each can have hope of relief because of certain medicines which have been obtained from plants. In the above cases these medicines are, respectively, morphine, reserpine, quinine, and vincalocouoblastine.

Morphine, although first isolated in a pure state in 1806, was known in crude form many hundreds of years before that date. At the opposite extreme, vincalocouoblastine was unknown before 1960 and its development as a medicine is a result of modern chemical research. The only source of each compound is a common garden variety plant.

Although there are a variety of substances with interesting physiological activity which have been obtained from plants, most of these belong to a single class of compounds called alkaloids. As the name might suggest, alkaloids bear a certain chemical relation to some more familiar compounds, such as those found in the “alkali” water or soil common in the West or those in the commercial preparation, “Alka-Seltzer.” These compounds are known as “bases” and they react chemically to neutralize acids. The bases present in alkali soil or in Alka-Seltzer are relatively simple chemical compounds belonging to the class of “inorganic” compounds. However, alkaloids are extremely complex “organic” compounds. Each molecule of an alkaloid may be made of 40 to 100 atoms rather than the 3 to 9 atoms which compose a molecular unit of an inorganic base.

Physiological action of alkaloids

Although alkaloids will react with acids, the important medicinal or physiological action of these compounds does not specifically depend upon this property. Activity usually is dependent on the entire complex, multi-atomic molecule rather than on the one site which gives it its properties as a base. It is often found that the presence or absence of any one of the many atoms or even a slight shifting of position of atoms in the structure will mean the difference between a useful medicine and a compound of no therapeutic value. In many cases the chemist does not know which part or parts of the molecule are the important ones for medicinal activity. One of the present goals of research in this area is to pinpoint more definitely the relation between chemical structure and physiological activity.

New medicine from plants

How does the modern chemist proceed in the search for new medicines from plants? One of the ways which has been quite useful is simply to isolate as many alkaloids from as many plants as possible and then test them for activity. This is called a broad screening program and is deemed successful if 2 or 3 compounds out of 10,000 tested prove useful. Simple chemical color tests can be used to establish the presence of alkaloids in the plant and they can be extracted rather easily in a crude form. However, the subsequent purification and determination of the exact constitution of the alkaloid is a more difficult and time consuming process. The number of chemists available to undertake these investigations is too small for the relatively large number of plants still to be studied.

A more scientific way to seek medicines would involve investigating only those plants likely to contain useful alkaloids. How can this be known in advance? Graduate students in the Department of Chemistry at Utah State University are now engaged in two areas of research directed towards solving this problem.

The first area or method consists of choosing plants which are botanically closely related to those known to contain useful alkaloids. Since morphine and several other pain-killing drugs occur in one variety of poppy, Papaver somniferum, it has proved useful to seek other such drugs in related varieties of poppies. Two wild varieties currently under

(Continued on page 23)
Chemical Weed Control In Small Fruits

J. Lamar Anderson

Weed control is one of the most important and often the most expensive practices in the production of good yields of high quality small fruits. Weeds compete with these crops for space, nutrients, water, and light and may reduce yields considerably. Hand weeding of strawberries may cost several hundred dollars per acre per year. By using proper herbicides and other management practices, this cost may be reduced considerably.

Many new herbicides have been developed within the past decade that greatly aid the fruit grower in his weed control program. Chemicals, however, will not eliminate the need for good cultural practices. Cultivation is often the most efficient method of removing weeds between rows. Herbicide applications should be planned to supplement cultivation practices. You cannot cultivate within the strawberry or raspberry row, however, and hand hoeing is expensive and often injures the plants. For the control of weeds within the row, herbicides are particularly valuable to the small fruit grower.

Weed control research has been conducted at Utah State University for the past seven years in a number of small fruit plantings. From this research, using many chemicals, formulations, and concentrations, recommendations for Utah small fruit plantings are made in table 1.

In general, weeds are killed most easily when conditions favor germination and rapid growth. Unusual environmental conditions such as heavy rain at or immediately after herbicide application may cause erratic weed control. Young weeds are killed more easily than mature, well-established weeds. Some herbicides, such as Dacthal, kill germinating seeds only and have no effect on established weeds, while others, such as Dowpon (dalapon), are more effective when absorbed through the leaves and should be

(Continued on page 24)
Research shows

**SPRING GRAZING CRITICAL TO DESERT RANGES**

Desert ranges of the Intermountain Region are mostly grazed by sheep and cattle from October to April or May. However, some are used yearlong by cattle. The dates that these ranges are grazed are important because desert plants have only one season in which they can grow. Growth begins generally in late March and continues until the dry season in June. The vegetation is dormant during the rest of the year, except following unusually heavy summer rains.

Plants, as all other forms of life, must have food to survive. They are the only organisms that make their own food and all animal life is dependent in turn upon the plants. Fortunately, the plant makes more food than it requires and the remainder can be used by animals. But we need to be careful that only the surplus is harvested. The basic requirement, needed for nutrition of the plant itself, must be left.

Food, mostly sugars, is made in the leaves. The more leaf surface, the more food that will be made. The food is then stored, part in the leaves but part in the stems and roots, too. Grazing range plants closely removes too much of the food factory — the leaves. This is generally thought to be less serious in the fall and winter when the year's manufacturing is completed. The same reasoning suggests that spring and early summer grazing, when the factory is in full force, is more serious.

Research started

The Station recently has conducted basic studies on typical salt-desert ranges in western Utah to try to measure the role of season...
of grazing and its influence on range plant health. Remember that these deserts are dry and often the soils are forbiddingly salty. The life of a plant is not an easy one, even when undisturbed. It is important, then, to limit grazing to a season and intensity that will not harm the plants beyond tolerable limits.

A two-phase study was conducted to determine the physiological response of important forage plants to different seasons and intensities of grazing. The first phase was carried on from 1955 to 1957, and the second from 1958 to 1961. In each phase, seven species of range plants were subjected to three successive years of treatment.

During the first phase, the plants were harvested at three intensities during each of four seasons. They were harvested by hand in a manner simulating forage removal by grazing animals. The three intensities were 25, 50, and 75 percent of herbage removal. The four seasons were fall (November 1), early winter (January 1), late winter (March 1), and spring. The plants were clipped in the spring when they had made about 20 percent of their annual growth, usually about May 1. The seven species were all long-lived perennial forage plants including big sagebrush (Artemisia tridentata), black sagebrush (Artemisia nova), shadscale (Atriplex confertifolia), Nuttall saltbush (Atriplex nuttallii), winterfat or white sage (Europia lanata), squirreltail grass (Sitanion hystrix), and Indian ricegrass (Oryzopsis hymenoides).

The work was repeated at two different locations about 90 miles apart and ten plants of each species were harvested for each treatment at each location.

The second phase of the study included the same species but a third location was added. The clipping treatments were made somewhat more severe — 30, 60, and 90 percent of the foliage was removed. The seasons also were changed slightly, the new ones being winter, early spring, and late spring. Early spring was defined as about the time new growth first appeared (usually April 1), and late spring as about the time 20 percent of the new growth had been produced (usually May 1).

The effect of these treatments on the range plants was determined in the late summer each year. Careful records were made of the death of any of these plants. Decreases in size of the remaining plants were

(Continued on page 25)

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**Table 1. Losses in numbers and size of desert range plants as a result of harvesting for three consecutive years at various seasons and intensities (Phase 1)**

<table>
<thead>
<tr>
<th>Grazing season</th>
<th>Percent of forage removed</th>
<th>Percent of the plants that died</th>
<th>Percent reduction in size of remaining live plants</th>
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</thead>
<tbody>
<tr>
<td>Fall (November 1)</td>
<td>25</td>
<td>5.1</td>
<td>10.8</td>
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<tr>
<td>50</td>
<td>6.4</td>
<td>11.9</td>
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<tr>
<td>75</td>
<td>11.5</td>
<td>23.2</td>
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<tr>
<td>Average</td>
<td>7.7</td>
<td>15.3</td>
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<tr>
<td>Early winter (January 1)</td>
<td>25</td>
<td>2.8</td>
<td>9.8</td>
</tr>
<tr>
<td>50</td>
<td>5.7</td>
<td>11.6</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>11.4</td>
<td>22.8</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>6.4</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>Late winter (March 1)</td>
<td>25</td>
<td>2.6</td>
<td>11.5</td>
</tr>
<tr>
<td>50</td>
<td>5.0</td>
<td>10.4</td>
<td></td>
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<tr>
<td>75</td>
<td>12.5</td>
<td>20.7</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>6.7</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Spring (May 1)</td>
<td>25</td>
<td>4.0</td>
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<tr>
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<td>75</td>
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<td>Average of all seasons</td>
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<td>50</td>
<td>7.7</td>
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</tr>
<tr>
<td>75</td>
<td>14.5</td>
<td>25.2</td>
<td></td>
</tr>
</tbody>
</table>

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FOR MARCH 1964
This third article on the weather is written by the same authors as the first two: LOIS M. COX, technical writer; E. A. RICHARDSON, climatologist of the U. S. Weather Bureau in Salt Lake City; and GAYLEN L. ASHCROFT, assistant professor of meteorology in the Department of Agronomy.
Despite circumstantial evidence to the contrary, weather forecasts are not derived by gazing into a crystal ball or flipping a coin. Each of these maligned and misunderstood pieces of prose results from hours of calculation, computation, and observation. Men, balloons, TIROS satellites, and miscellaneous electronic equipment all function in producing the weather forecast.

Then why do so many forecasts appear to be incorrect, or at least inexact? The problem, odd as this may seem, is as much in the user of the forecast as in the forecast itself.

The science evolves

Admittedly, this wasn’t always the case. Early meteorologists were simply individuals who kept “weather diaries.” The first continuous weather records in what is now the United States were kept in 1644-45 by Reverend John C. Holm in Delaware. Such men rarely ventured forecasts; and if they had, their potential accuracy would have been doubtful.

Government-sponsored weather observations were made for the first time during the war of 1814 when Dr. James Tilton, the surgeon-general of the Army, ordered hospital surgeons to keep climatological records. In 1849 Professor Joseph Henry of the Smithsonian Institution established an extensive network of weather observation posts. He also supplied weather instruments to telegraph companies whose employees made local observations and sent them to the Institution. By 1860 Dr. Henry had 500 stations making regular weather reports. This system was disrupted by the Civil War.

The first weather observations known to be recorded in Utah were made on the day the Mormon pioneers entered the Great Salt Lake Valley. Wilford Woodruff made the following entry in his diary, “July 24, 1847. There was a thundershower toward evening and it rained over nearly the whole valley. It also rained a little in the forepart of the night. We felt thankful for this as it was generally conceived opinion that it did not rain in the valley during the summer season.”

In 1870 Congress passed a bill authorizing the Secretary of War to make weather observations at military stations. Utah’s first weather station was established by the U.S. Army Signal Corps in 1870 at Corinne. On March 18, 1874, the first official observation was transmitted from Salt Lake City, “Two feet of snow on the level.”

Government weather operations were transferred to the Department of Agriculture in 1891. They remained there until the requirements of a rapidly expanding aviation industry made a transfer inevitable. The Weather Bureau therefore became part of the Department of Commerce in 1940. At that time, meteorology was well on its way to being the highly instrumented science it is today.

Today’s techniques

Modern meteorology relies heavily on recent communication technology. Some of the communication is between electronic or radio instru-

(Continued on page 26)
Library Progress in Utah

CARMEN FREDRICKSON

with comments by JOSEPH A. GEDDES

As the result of a study made by the Utah Station on the public libraries of Utah and published in 1956 (Libraries as social institutions. Utah Agr. Exp. Sta. Bul. 393) and the efforts of numerous groups and women's organizations, the Utah State Legislature in 1957 passed a new library law. This act appropriated money for the establishment of a state library under the direction of a state library commission and lodged authority in the Commission to develop a state system of libraries.

The question arises as to the influence of the state librarian and the commission as well as public pressure in improving the inadequate public library situation in the state during the first 5 years of operation. The reports of the state librarian have been supplemented with direct data furnished by the librarians as the basis for this evaluation of the present situation.

CARMEN FREDRICKSON is associate professor of sociology. DR. J. A. GEDDES is former head of the department, now retired.

Size of libraries

In 1962, thirty-four of Utah's fifty-three libraries had under 15,000 volumes. The actual range was from 1,200 to 14,700 volumes. These libraries lacked trained librarians, book and magazine facilities, newer means of communication, and served a limited public during the time they were open.

Only 14 libraries had book collections between 15,000 and 50,000 volumes and five had collections of more than 50,000 volumes, the Salt Lake City and Salt Lake County libraries, Provo, Ogden, and Davis County.

Training of librarians

Of the 34 small libraries, 23 had only part-time librarians. Of the 38 librarians employed, three had B.S. degrees, one in four was a high school graduate. Few of them were taking educational courses to improve their training. This was also true of librarians in the medium sized libraries. Positions in the smaller libraries held little financial incentive for additional training.

Librarians in the larger libraries were much better trained; many of them had masters and bachelors degrees in library science and some others had degrees in other disciplines. Some of them were continuing their training through college classes.

However the state library commission because of lack of authorization, has refrained from establishing minimum training standards for public librarians or a salary schedule for individuals with special library training and experience. These policies are decided by the local boards and are usually not set forth in writing.

Book accessions

Purchase of books and periodicals is indeed limited in the smaller and medium sized libraries. The small libraries averaged 381 books a year between 1958 and 1962; the medium
Upper, the State Library, located at 603 East South Temple, is the distributing center of library resources which supplement those of 53 reporting libraries, more than a dozen branches, and 13 bookmobiles. Russell Davis, the director, operates under a state commission of eleven. Middle, Salt Lake City's new public library building, now under construction. In addition to the central library, there are six branches and two bookmobiles. Lower, the new Utah State University library is the focal point of campus intellectual activities.

sized libraries 1,062 books. Loss of population in some of the rural counties along with dearth of plans to offset its effects probably accounts for lack of library growth in these areas.

In the five large libraries book purchases between 1958 and 1962 averaged 14,100 yearly compared to 11,974 for the 1953-57 period.

Buildings and equipment

Among the small libraries improvements in the physical plant consisted mainly in renovations. In the medium sized group five new libraries were built in a 5 year period in addition to the allocation of a wing in a new city county building for library use. Air conditioning was installed in two libraries.

The building program of the Salt Lake County system continued with the construction of the East Mill Creek Branch in 1959 and the Rose Park Branch now under construction. Salt Lake City's new central library building is also under construction. Ogden City and Weber County are planning a new $1.6 million dollar building for city and county use.

Bookmobile service

One of the most outstanding contributions of the state library has been the establishment of bookmobile service in some of the rural counties. The service began in 1959 and now operates in twelve counties, serving a population of 97,911 in 1962 not including communities with public libraries. Circulation has in-
creased from about 103,560 in 1959 to more than 508,000 in 1962. In addition San Juan County owns and operates its own bookmobile — as does Salt Lake City with two bookmobiles and Salt Lake County Library with 4.

Each of the six state bookmobiles is supplied with 10,000 volumes. The titles are changed continually as a result of requests and to keep the collection timely.

The bookmobile runs year-round taking books to isolated people as well as to heavily populated areas. The steady increase of book circulation as a result of bookmobile service creates a new cultural outlet for these people. This service can be made at low cost per volume circulated. Once established, a bookmobile invites use of the newer forms of library service, so that it becomes an instrument for spreading widely not only books and periodicals, but other forms of mass media as well. There is, however, large room for further development in the presently unreached rural communities of 15 counties. One of these counties has no library, four have only one library each.

Special services
Children's story hours were the commonest type of special service offered by libraries of the state but were found infrequently in most small and medium sized libraries. No lecture series nor exhibits were listed in their reports. Story hours were sponsored by the large libraries as were book reviews, dramas, lectures, exhibits, and illustrated talks.

While Utah is developing a library consciousness, there is much to be done to bring our libraries up to acceptable standards. The state library law was revised in 1963 to empower the state library commission to develop standards for public libraries and rules and regulations for the certification of public librarians. When this is done it will be the basis for upgrading the profession. Bills now in Congress, if passed, should make funds available for the further improvement of library services in the state.

We have too many small libraries with inadequate services, too few trained librarians, generally inadequate salaries, poor book collections. Our task is to make these small institutions more efficient by regional or central supply or planning agencies that would handle such tasks as purchasing and processing books and other materials for the small library as well as to operate bookmobiles and mass media service. The state library has already demonstrated the value of bookmobiles. This service needs further extension on a regional or county basis.

Comments by Joseph A. Geddes

**Comment 1. On new library buildings.** The findings during the 5 year period 1958-1962 indicate vigorous building activity among university libraries; among large public libraries (over 50,000 volumes), a medium sized public libraries, but almost no building activity among the small public libraries. While 13 of the counties where many of these small libraries are located have lost population between 1950-1960, it may be pointed out that loss of population and library decline do not necessarily go together. There is an alternative. The Ogden City-Weber County plans to build a 1.6 million dollar building for joint use are promising. Thus far the State Library Commission, although it is best situated to envision library needs for the future, has not yet assisted local bodies in planning of buildings.

**Comment 2. Emphasis on bookmobiles.** Most observers feel the state librarian has done a good job in expanding the use of bookmobiles in the state. The bookmobile is valuable not only in getting good books and periodicals to the people who want them but it makes easy and inexpensive mass media service. Salt Lake County Library's experimental work in this area is of great value to the rest of the state.

**Comment 3. The need of standards.**

Efforts were made in 1957 to include a section placing optional responsibility on the Library Commission to develop standards. It failed to pass the legislature but in 1963, through the efforts of the Commission and the State Librarian, such a section was incorporated in the law. Thus, although little progress towards developing a professional class of librarians was made between 1958-1962 the people may confidently look forward to substantial beginnings during the next five years.

**Comment 4. Excess of small libraries.** Population pressure on the land is usually blamed for Utah's excessive proportion of agencies too small for efficient operation - small farms, small counties, small villages, small libraries, that promote small conceptual thinking and planning. In stead of a harbinger of decline, these small units have potential advantages because they are near the people, providing inter-county cooperation can be achieved in developing regional supply agencies to: (1) strengthen the small agencies, and (2) provide the newer developments such as bookmobiles and mass media services which the small agencies cannot provide by themselves. These regional supply agencies can do this more cheaply and better than they can be operated out of Salt Lake City as is now being done.

To observe an instrumentality grow that has the capacity to compete successfully with propagandists and commercial advertising for peoples' time is truly a privilege. But for the library to be able to do this, the people must insist that the regional library's mass media department be strongly developed to such an extent that without abandonment the old weekly story hour for children should grow into a daily evening library hour in which great artists in speech, in literature, in art, in drama, in religion, in book reviewing bring the choicer fruits of civilization within their reach.
Fig. 1. Utah BLM District 7: Subunits, location of state lands in 1960, and location of state lands after suggested blocking procedure

N. KEITH ROBERTS
E. BOYD WENNERGREN

If the State Land Board (Board) were to block or bring together into larger tracts the grazing lands under its control, a positive management program could be developed; contract provisions could provide incentive for private capital to be used in improving the ranges; and both the Board and the lessee could benefit economically from such action. The law provides ways for the Bureau of Land Management (BLM) and Utah to exchange lands.

The State Land Board administers about 3 million acres of land granted at the time Utah became a state. For the most part these lands are scattered throughout the 25 million acres administered for the federal government by the BLM. The revenues from state lands are set aside by law for the support of the common schools and other public institutions. The Board has a custodial responsibility to administer these lands in such a way that maximum revenues will accrue to the support of the school system.

In their present scattered condition, management of these lands beyond the level undertaken on surrounding public land is virtually impossible. The costs of fencing and policing the scattered tracts would be prohibitive. Management of any kind including the setting of fee levels must be closely geared to BLM practices. Though BLM and Board personnel have cooperated well over the years to solve their mutual problems, the Board goal to maximize returns from its small and scattered holdings has suffered because of the federal agency's goal to meet only administrative and improvement costs. Blocking would provide the Board with an opportunity for independent management of the grant lands.

Undoubtedly it would not be advisable to block some state lands in each county for grazing because the land already has or is expected to have a higher use than grazing. Only appraisal of individual land parcels in questionable areas can determine the desirability of blocking. Also, in some areas some good and some poor land is found. The state should be prepared to take the poor as well as the good in a blocking procedure. However, the quality of the resource in the proposed block should average higher than the state holdings before blocking.

A method has been developed for implementing a blocking policy. Suppose the state were interested in blocking its lands in the better grazing areas of the state. It should trade land in the poorer areas for public land in the better grazing areas. The law requires that an appraisal be made of the quality of the lands being traded and that exchange be made on this basis.

DRS. N. KEITH ROBERTS and E. BOYD WENNERGREN are members of the Department of Agricultural Economics. This is the last in a series of articles relating to state lands and their disposition. The articles have been based on a study made for the State Land Board.
Table 1. Utah BLM District 7: trading ratios, blocked, and unblocked acreages, 1960

<table>
<thead>
<tr>
<th></th>
<th>Total state acres</th>
<th>Total BLM acres</th>
<th>Suggested acres per AUM</th>
<th>Buckhorn equivalent ratio Col. 3</th>
<th>Salt Wash equivalent ratio Col. 3</th>
<th>State acres Buckhorn equivalent Col. 1</th>
<th>State acres Salt Wash equivalent Col. 1</th>
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<tbody>
<tr>
<td><strong>Under the Ledges</strong></td>
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<tr>
<td>Roost*</td>
<td>131,487</td>
<td>1,088,365</td>
<td>25.1</td>
<td>2.041</td>
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<td>Flat Top</td>
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<td>228,284</td>
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<td>1.524</td>
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<td>294,940</td>
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<td>20,617</td>
<td>179,704</td>
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</tr>
<tr>
<td><strong>Miller Creek</strong></td>
<td>7,479</td>
<td>321,273</td>
<td>14.5</td>
<td>1.179</td>
<td>1.169</td>
<td>1.169</td>
<td>30,584</td>
</tr>
<tr>
<td><strong>Sinbad</strong></td>
<td>35,753</td>
<td>73,951</td>
<td>13.8</td>
<td>1.122</td>
<td>1.113</td>
<td>1.113</td>
<td>9,636</td>
</tr>
<tr>
<td><strong>Huntington Creek</strong></td>
<td>10,725</td>
<td>254,967</td>
<td>13.3</td>
<td>1.081</td>
<td>1.073</td>
<td>1.073</td>
<td>26,270</td>
</tr>
<tr>
<td><strong>Cove and Coal Creek</strong></td>
<td>28,188</td>
<td>102,051</td>
<td>12.4</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>23,942</td>
</tr>
<tr>
<td><strong>Salt Wash</strong></td>
<td>23,942</td>
<td>80,174</td>
<td>12.3</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>23,942</td>
</tr>
<tr>
<td><strong>Buckhorn</strong></td>
<td>8,433</td>
<td>3,190,453</td>
<td>18.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total unblocked</strong></td>
<td>373,159</td>
<td>3,190,453</td>
<td>18.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total blocked</strong></td>
<td>250,951</td>
<td>3,314,661</td>
<td>12.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Under the Ledges, Roost, and Flat Top were not separated by BLM appraisal.

A blocking procedure

Using range quality as the basis for exchange, areas of any size or type can be traded.

The carrying capacity for wise long-run management for eleven BLM districts in the state has been determined and these data will serve as an example of how state lands may be blocked. To illustrate the procedure, BLM District 7 (fig. 1) is used. District 7 includes most of Carbon and Emery Counties and parts of Wasatch, Duchesne, Wayne, and Garfield Counties.

Suggested carrying capacities, trading ratios, and state land traded for BLM land are shown in table 1. Column 1 contains total Board controlled acres in each BLM subunit in District 7 for 1960. Column 2 tells how many acres of BLM land were in each subunit in 1960. Column 2 tells how many acres of BLM land were in each subunit in 1960. Column 3 has the BLM average suggested carrying capacity for each subunit as estimated in 1960. Column 4 tells how many acres in each subunit would have to be given up to acquire an acre in the
Buckhorn Unit of District 7, which has the highest suggested capacity. Column 5 tells how many acres in each remaining subunit would have to be given up for an acre in Salt Wash Unit. Column 6 converts state acres in the subunits (Column 1) to equivalent acres in Buckhorn subunit. For instance, the state would trade 131,487 acres of state land in Under the Ledges, Roost, and Flat Top for 64,423 acres of BLM land in Buckhorn. State acres in the poorer subunits would be traded for BLM acres in Buckhorn until all BLM acres (Column 2) are acquired by the state. Column 7 converts state acres in the remaining subunits (column 1) to the equivalent acres in Salt Wash until there are no more state acres outside the block to trade. All of the BLM land (192,951 acres) in Salt Wash would not be required to complete the trade. The BLM would still control 30,607 acres in Salt Wash. The land would be scattered throughout the BLM portion of Salt Wash. To finalize the blocking, state land in Salt Wash would be traded acre for acre for BLM land in the subunit.

The status of state lands in District 7 before and after blocking is shown in figure 1. Before the exchange in District 7, the Board controlled 375,159 acres. After the exchange, 250,951 acres. The BLM acreage would increase 124,208 acres. After similar trades in each BLM district, the Board would control about 925,000 acres less land than before trading (table 2) but it would be more valuable grazing land in larger units.

If the state land were blocked within each BLM district, the state would control eleven blocks of land. Again, this might not include all the state land in each district because some may be expected to shift to higher uses than grazing and, therefore, if blocked, returns would be sacrificed.

The process could be applied to blocking in counties or in any other area unit for which the necessary data are available.

The impact of blocking

Blocking surface rights in and of itself would not increase returns to the Board. The average grazing fee in 1960 was about 4.7 cents per acre. If the fee schedule were not changed from the 1960 rates for the blocked subunits in the above example, blocking state lands as suggested would result in lower returns to the Board. Fees would have to average 5.4 cents per acre on the blocked area to equal returns to the Board for 1960.

The advantages to blocking would be that the state could strengthen the tenure position of the lessee through the lease contract as well as have better management control over the land. If ranchers know that they are going to operate on a state range big enough to supply a season's feed requirements and long enough to recover the investment they make in range improvements, they are more inclined to make the necessary improvements. A contract with the Land Board that would lag any increase in fees as a result of increased productivity on the range would provide the incentive for ranchers. Thus, both ranchers and the Board could reap a proportionate share of the rewards from improved management practices. Under the present scattered conditions, neither can afford to manage the state parcels separately from the surrounding federal lands.

The previous argument provides the rationale for blocking the grazing rights associated with Utah's grant lands. It does not follow, however, that the same arguments can be used with respect to blocking subsurface rights associated with the grant lands. Returns to the Board from subsurface resource development which includes minerals, gas, and oil leases and royalties have grown in importance during the last few years (fig. 2). It may be that the Board's interest in subsurface resources can best be protected by leaving the subsurface rights scattered throughout the state. This case can be argued because of the uncertainty attached to the location of producing deposits and because of the relatively large payoff associated with the successful gamble on the occasional discovery of economically feasible developments. An ideal program for the state would be to block surface rights and leave subsurface rights scattered except where known mineral characteristics exist. The Board would then be in a position to manage its grazing lands as it saw fit but it would also have rights to mineral potentials throughout the state. To divorce surface and subsurface rights in trading may require some changes in the law.

Table 2. Acres of land controlled by Utah State Land Board before and after trading for most productive grazing land in each BLM grazing district, 1960 data

<table>
<thead>
<tr>
<th>District</th>
<th>Acreage before blocking</th>
<th>Acreage after blocking</th>
</tr>
</thead>
<tbody>
<tr>
<td>State land</td>
<td>BLM land</td>
<td>State land</td>
</tr>
<tr>
<td>1</td>
<td>227,773</td>
<td>1,139,252</td>
</tr>
<tr>
<td>2</td>
<td>217,073</td>
<td>2,556,173</td>
</tr>
<tr>
<td>3</td>
<td>283,196</td>
<td>2,622,127</td>
</tr>
<tr>
<td>4</td>
<td>203,061</td>
<td>1,659,988</td>
</tr>
<tr>
<td>5</td>
<td>274,049</td>
<td>2,131,128</td>
</tr>
<tr>
<td>6</td>
<td>231,410</td>
<td>2,458,947</td>
</tr>
<tr>
<td>7</td>
<td>375,159</td>
<td>3,190,453</td>
</tr>
<tr>
<td>8</td>
<td>216,999</td>
<td>1,860,324</td>
</tr>
<tr>
<td>10</td>
<td>191,460</td>
<td>2,196,629</td>
</tr>
<tr>
<td>11</td>
<td>252,823</td>
<td>2,599,629</td>
</tr>
</tbody>
</table>

State total | 2,696,461 | 24,913,115 | 1,772,413 | 25,837,163
Diseases of the joints of men and animals are as old as medical history itself. Arthritis describes an inflammatory process of a joint, and if many joints of the same animal are inflamed at the same time, the disease is called polyarthritis. Arthritic diseases of domestic animals not only have economic importance, they also cause severe suffering of the affected animals, because they are seldom fatal but rather debilitating. In some instances of arthritic diseases of men and animals, the cause is not yet known.

Recently, as a new cause of arthritis, a virus was isolated from joints of lambs suffering clinically from stiffness and lameness. This report presents some results obtained during the past two years of studies on polyarthritis of lambs also known to livestockmen as stiff lamb disease.

Description of the disease

The disease was observed mainly among lambs on ranges but it was also seen in lambs in feedlots and farm flocks. The lambs had varying degrees of stiffness and lameness. They usually had elevated temperatures or fever as high as 107.2 F. The affected lambs had loss of appetite, were depressed, reluctant to move, and had lost body weight. Many of them would be lying down in the shade, and would not resist being caught. These lambs were gaunt and lingered behind the rest of the band. Some of the lambs

(Continued on page 27)
Fig. 4. Lateral aspect of stifle joint. Fibrin adhering to inside lining of thickened joint capsule (C); intra-articular fibrin (F); peri-articular edema and hemorrhage (E+H); intra-articular ligament (L).

Fig. 5. Fibrinous mass connecting tendon to tendon sheath. Specimen is from experimentally produced polyarthritis.

Fig. 6. Section of synovial membrane from a polyarthritic lamb depicting slight changes. Synovial layers (A) still intact. Inflammatory cells (B) invading vessel wall (C) and perivascular tissue, x480.

Fig. 7. Advanced lesion in synovial tissue of a polyarthritic lamb illustrating pseud stratified appearance of synovial layers (A) and infiltration with inflammatory cells (B), hyperemia and hemorrhage (D) underlying synovial layers, x480.

Fig. 8. Giemsa-stained smear of joint fluid. Synovial cell (S) containing clusters of virus and infected monocyte (M), x1250.

FOR MARCH 1964
In 1963, Utah families decorated their homes with approximately one-half of one percent of the total number of Christmas trees used in the United States. Of the 200,000 Christmas trees on the Utah retail market, 98 to 99 percent were successfully marketed. The high sales percentage and low surplus made 1963 a successful retail sales year, especially when comparing it with the seemingly disastrous record of 1962. In 1963, many retailers had sold all but a few utility and dull grade trees a week before Christmas. Although complete information was not collected for 1962, limited information indicated the Utah market was grossly oversupplied.

During the 1960 and 1961 Christmas seasons, retail and consumption studies were conducted throughout Utah. (Results of these two studies appear in the March issues of the 1961 and 1962 “Utah Farm and Home Science.”) Information collected during the 1962 season dealt primarily with the sur-
plus following the retail period. In 1963, a study was conducted similar to those in 1960 and 1961 which showed definite changes in the retailing and consumption of Christmas trees in Utah.

**Quality and number of trees available**

Pinyon pine, the most common tree on the market in 1960 and 1961, was displaced in 1963 by Douglas-fir (table 1). The quantity of a species on the retail market seems to have little to do with its popularity among consumers. Rather, this is determined by the wholesale sources available to the retailer. Normally, there is an adequate number of wholesale trees available, but the species vary from year to year.

Not only did pinyon pine decrease in number, but there was an obvious decrease in quality. These two facts would indicate that marketable pinyon pine, popular in Utah and other areas of the United States (it comprised 1 percent or nearly 450,000 of the total trees consumed in the United States in 1962) is becoming scarce. Another indication of this assumption is that more two-needle pinyon pine appeared on the market this past season compared to greater numbers of the higher-quality single-needle pinyon pine in previous years.

Although Douglas-fir was the most abundant tree on the market, it decreased in numbers when compared with 1960 and 1961. The decrease in percent of both pinyon pine and Douglas-fir was not only offset by increases in other species, but also by the addition of new species to the retail market.

The quality of spruce and subalpine fir was consistent with 1960 and 1961; however, there was a marked improvement in the quality of Douglas-fir, ponderosa pine, and lodgepole pine. The improved quality of Douglas-fir was one of the factors helping to make 1963 a successful retail season. The 1960 study indicated that more than 75 percent of the unsold trees were low-quality imported Douglas-fir.

Even though quality of some trees improved, the success of the 1963 season can be primarily attributed to supply. The supply came closer to meeting the demand than during any of the past years when information was compiled. Surpluses of 20 to 35 percent in 1962 discouraged many retailers from entering the 1963 market. The 1963 survey showed that those retailers selling trees in 1962 reduced their supply by 23.5 percent in 1963. This reduction, along with a reduction in retail lots, brought supply so close to demand that only 1 to 2 percent waste was recorded.

The retail Christmas tree business exhibits rather unique and extreme changes from year to year. Demand on one hand tends to rise slightly each year in relation to population (Continued on page 29)

**Table 1. Species of Christmas trees in Utah retail yards, 1960, 1961, and 1963**

<table>
<thead>
<tr>
<th>Species</th>
<th>1960</th>
<th>1961</th>
<th>1963</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon pine</td>
<td>43.7</td>
<td>38.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>35.4</td>
<td>35.0</td>
<td>30.7</td>
</tr>
<tr>
<td>Subalpine fir</td>
<td>4.4</td>
<td>10.7</td>
<td>19.9</td>
</tr>
<tr>
<td>Spruce</td>
<td>5.4</td>
<td>9.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>2.0</td>
<td>2.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>1.8</td>
<td>2.7</td>
<td>1.9</td>
</tr>
<tr>
<td>White fir</td>
<td>7.2</td>
<td>2.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Grand fir</td>
<td></td>
<td></td>
<td>0.7</td>
</tr>
<tr>
<td>Scotch pine</td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Others</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
Left, the author sampling the soil around sugar beet plants for evidence of soil-inhabiting pests. Center, population counts of symphylan and callembola are difficult to obtain. The photograph shows soil in 10 inch pie pans that has been removed from the root zone of seven randomized sugar beets. Water has been added to the soil and thoroughly stirred to force the symphylans, callembola, or root aphids to the surface for counting. Right, garden symphylans to the left and the smaller springtails to the right, about 10 times natural size.

PELLETED SEED CONTAINING INSECTICIDES

HOWARD E. DORST

The addition of insecticides to pelleted seed provides an economical method for the control of certain pests. The use of such seed in experimental plots of sugar beets reduced infestations of the sugar beet root maggot, the garden symphylan, and the beet leafhopper in 1962. In 1963 the hop-flea beetle, a leafminer, and the beet leafhopper were controlled by the use of pelleted seed containing insecticides.

In the past, insecticides and fungicides have been added to the exterior of seed as dry material or slurries for insect and fungus control. Dry materials fail to adhere to the seed when handled and their value is often lost. Slurries tend to decrease germination.

Monogerm sugar beet seed, which has almost entirely replaced the multigerm seed, was developed by plant breeders to produce single plants for mechanical thinning. Since the mechanical thinner requires precision planting, frequently irregularly shaped seeds must be made more uniform in size and shape so they can be metered out accurately in conventional planters as well as in precision-type planters.

Experiments conducted in cooperation with the Amalgamated Sugar Company involved testing seeds that had been pelleted by a commercial company so as to include an insecticide. Phorate and Di-Syston, O,O-diethyl S-[2-(ethylthio) ethyl] phosphorodithioate, two systemic insecticides formulated in carbon powder, were each incorporated in some of the pelleted material. In other material V-C 13, O-2,4-dichlorophenyl O,O-diethyl phosphorothioate, also a systemic insecticide, were added as wettable powders to the pellet, as was aldrin, a hydrocarbon insecticide. Experimental use of a special inert material to provide a layer of insulation between the seed and the systemic insecticide resulted in markedly less toxicity and damage to the germinating seed than when this protective layer was omitted.

Insecticides in pelleted seed increase yields

The increased yields of sugar beets obtained when seed pelleted with each of the four insecticides was used to control the sugar beet.
CONTROLS INSECTS IN SUGAR BEETS

root maggot and garden symphyllan are clearly shown in table 1. Where untreated seed was used, 20 percent of the plants were killed by the root maggot. All materials used in the pelleted seed reduced sugar beet root maggot damage and increased yield. V-C 13 at 4 ounces per acre reduced the stand of beets; but in spite of this initial reduction in stand, yield was increased by 9 tons per acre. Counts revealed that all materials reduced populations of the garden symphyllan and that phorate and V-C 13 gave the best control of this pest. Although Di-Syston and aldrin were effective in controlling the root maggot, they were less effective in controlling the symphyllans.

In three experimental fields where root maggot populations were light, the yields of sugar beets increased 3.9 to 5.8 tons per acre in plots planted to pelleted seed containing 2 ounces of phorate per acre. In two of these fields, the yields increased 4.3 to 5 tons per acre in plots planted to pelleted seed containing 4 ounces of V-C 13 per acre. In all three of these fields an accurate determination of which pests were controlled could not be made.

Symphyllans are often mistaken for springtails (Collembola), which to the naked eye appear similar when found in the soil. Symphyllans, however, do not jump like springtails and are smaller, as shown in fig. 3.

In 1963, hop-flea beetle damage to small beets was reduced 84 percent with pelleted seed treated with 2 ounces of phorate per acre. Leafminer damage to sugar beets was reduced 40 percent with some insecticide treated seed. One other insecticide in pelleted seed gave 68 percent control of root aphid or collembola. Yields were increased 2.4 tons per acre with the phorate at the 2.0 ounce rate. Beet leafhoppers feeding on sugar beets were reduced about 50 percent with a 420 pounds net sugar increase per acre.

These experiments demonstrated that the systemic insecticides tested in pelleted beet seed effectively controlled certain insects. However, at some of the higher rates, these materials are toxic to the beet plant. Entomologists are now searching for a systemic insecticide that will effectively control the garden symphyllan, leafminers, the hop-flea beetle, the sugar beet root maggot, and the beet leafhopper with a minimum of toxic effects.

Table 1. Sugar beet root maggot and symphyllan control on sugar beets in field plots with insecticide incorporated in pelleted seed, Lewiston, Utah, 1962

<table>
<thead>
<tr>
<th>Insecticide and dosage in ounces per acre in pelleted seed</th>
<th>Thinned stand per 100 feet of row</th>
<th>Beets killed by maggot per 100 feet</th>
<th>Symphyllan count per 7 beet samples</th>
<th>Yield in tons per acre of beets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phorate, 2.0</td>
<td>69</td>
<td>1.2</td>
<td>1.5</td>
<td>21</td>
</tr>
<tr>
<td>V-C 13, 4.0</td>
<td>39</td>
<td>1.7</td>
<td>1.0</td>
<td>31</td>
</tr>
<tr>
<td>Aldrin, 0.8</td>
<td>75</td>
<td>0.7</td>
<td>3.7</td>
<td>26</td>
</tr>
<tr>
<td>Di-Syston, 0.9</td>
<td>65</td>
<td>1.0</td>
<td>4.7</td>
<td>25</td>
</tr>
<tr>
<td>Check (unpelleted seed)</td>
<td>60</td>
<td>19.7</td>
<td>6.5</td>
<td>22</td>
</tr>
</tbody>
</table>
WEED CONTROL
in Utah conifer tree plantings

WILLIAM G. POULSEN

Weed control on tree plantings in Utah has always been an expensive project, costing 15 to 20 percent of the first year's investment. Many trees are planted on areas where there has been no weed control in recent years, and these areas create problems which make some tree plantings uneconomical.

In other states Simazine has proved successful in weed control tests. Threns of the New Haven Connecticut Station (Bul. 638, 1960) states that Simazine is an outstanding preemergence herbicide for controlling weeds without injury to a wide range of nursery species. Because of this success elsewhere five experimental areas on loam to clay loam soils in northern Utah were established during 1962 and 1963 to determine rates of Simazine 80W required to achieve satisfactory weed control without damage to tree seedlings.

The spray solution was applied with a small hand sprayer, using six gallons of water per 1,000 square feet of area.

The tree species involved were blue spruce (Picea pungens), eastern red cedar (Juniperus virginiana), ponderosa pine (Pinus ponderosa), and Douglas fir (Pseudotsuga menziesii). The weeds present in the five areas were redroot (Amaranthus retroflexus), mallow (Sphaeralcea sp.), wild rye (Elymus cinereus), Russian thistle (Salsola kali var. tenuifolia), morning glory (Convolvulus arvensis), prickly lettuce (Lactuca serriola), groundcherry (Physalis subglabrata), junegrass (Bromus tectorum), crested wheatgrass (Agropyron cristatum), bromegrass (Bromus inermis), chickweed (Stellaria sp.), dandelion (Taraxacum officinale), and milkweed (Asclepias speciosa).

Areas 1, 2, 4, and 5 were sprayed in November 1962, and area 3 in May 1963. This was the second growing season for the trees in areas 1, 4, and 5; the fifth growing season for areas 2 and 3.

Rates for weed control

Some chlorosis appeared in ponderosa pine when rates of 1.25 to

<table>
<thead>
<tr>
<th>Area</th>
<th>Species</th>
<th>Method of irrigation</th>
<th>Rate of application</th>
<th>Average weeds per square foot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ounces per 1000</td>
<td>number</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>square feet</td>
<td></td>
</tr>
</tbody>
</table>


Area 1 showing the results of Simazine 80 W applied at the rate of 1.75 ounces per 1,000 square feet, with uncontrolled plot on the right side.

In area 2 all the weeds were controlled around the young conifer tree.
1.75 ounces per 1,000 square feet were used in the fall application. However, no chlorosis was present with the 2.0 ounce rate when applied in the spring.

At rates higher than 1.25 ounces per 1,000 square feet, little additional weed control was achieved; rates as low as 0.50 were adequate for the annuals. Groundcherry was not controlled even at the 1.75 ounce rate.

The chemical company recommends rates of 1.0 ounce per 1,000 square feet for sandy, sandy loam, and other light soils low in organic matter, and 1.25 ounces for heavy clay and loam soils high in organic matter. The amount of chemical required to achieve adequate weed control depends upon the soil type, season of application, type of irrigation used, and the species of weeds present.

Season for treatments

Treatments can be made at almost any season of the year; however, fall is usually recommended where winter annuals create a problem. Early spring or summer application after clean cultivation provides good control but irrigation or rain is necessary to move the chemical into the root zone because Simazine acts through the roots of germinating weed seeds.

The residual effect of the chemical will depend mainly on the amount used and the quantity of moisture received. Simazine when applied at the rate of 0.75 ounces per 1,000 square feet will lose most of its weed controlling capability by the end of two months under moist soil conditions. When applied at the rate of 1.0 to 1.75 ounces per 1,000 square feet it provides good weed control into the fall.

In areas where chlorosis was present in ponderosa pine, a slight reduction in growth rate occurred. Ponderosa pine appears to be more sensitive to the chemical than the other three species used in the study and it should be applied at the lower rates or in the spring. In these tests, by late fall most of the ponderosa pines had changed back to their normal green color.

Early spring applications are usually safer than fall applications because of shallower chemical penetration. Once the area is sprayed the soil should not be disturbed or the effectiveness of the chemical will be reduced. If spraying equipment is not available, Simazine is available in granular form. Where there is a question on the rate of chemical to use, a low rate (0.50 to 1.00 ounces) is safer until experience is gained in its use.

In weed control tests in conifer tree plantings in Utah using Simazine from 77 to 100 percent of the weeds were killed. The chemical is unique in that it is economical, needs to be applied only once a year, can be applied at almost any season, and can be sprayed directly over the young trees without damage. Weed control costs can be reduced 50 to 75 percent and injuries to trees from weeding can be eliminated.

ALKALOIDS

(Continued from page 4)

investigation at Logan are familiar sights in certain areas of Utah. One, *Roemeria refracta*, has a red flower and can be seen blooming profusely as an unwanted weed in farms bordering Cache-Box Elder County line west of Logan. A second, *Argemone munita*, is a white poppy having prickly leaves and is found in some of the more arid regions of the state or along excavated road banks. A third poppy variety, *Romneya coulteri*, has been obtained from California and is particularly rich in alkaloids. So far nine different alkaloids have been isolated from this one plant and there are probably additional ones present in trace amounts.

A second method of attack concentrates on those plants which are known to be toxic. This information is usually gained from farm and ranch reports of livestock deaths due to plant ingestion. The line between a useful medicine and a poisonous substance is often a difficult one to draw and may simply depend on the amount of material taken. On the other hand, if the reason for toxicity is known, the chemist can often modify the poison chemically and transform it into a useful drug. Several of the range poisons common to Utah are being investigated. A particularly interesting plant, *Oxytropis sericea* or white loco weed, has been found to contain three alkaloids. This plant causes large livestock losses to ranchers in the Intermountain West. Some Russian chemists have recently demonstrated that a related species, *Oxytropis muricata*, contains an alkaloid which was previously known as a synthetic compound and which is used in treating certain mental depressed states in humans. This effect against depression in humans may be quite closely related to the over-agitated, "loco" actions of livestock which have eaten excessive amounts of these plants. In addition to perhaps unveiling new medicines, chemical study of these poisonous plants may lead to the establishment of effective control of the poisoning.

How does the plant make alkaloids

Several intriguing problems unrelated to the search for medicines also arise in the study of alkaloids. One of these involves trying to determine what types of reactions the plant uses to make the alkaloids in the first place. This study is termed "biosynthesis" and is perhaps best investigated by using radioactive tracer compounds which can be followed as they are converted in the plant into alkaloids. A second problem arises from the fact that although the number of known alkaloids is now in the thousands, not a single plant function has been found for these complicated materials. Since no known functions have been demonstrated, investigators often assume the alkaloids to
be merely waste products of regular plant metabolism. However, it is known that a number of alkaloids are rapidly metabolized in the

**WEED CONTROL IN SMALL FRUITS**

(Continued from page 3)

applied to the actively growing weed.

Dacthal may be sprayed on recently planted strawberry rows or incorporated two inches into the soil with a rotovator or by cross discing the soil before transplanting. Soil incorporation before planting has resulted in better weed control than spraying after the berries are planted. Once weeds have emerged Dacthal has no herbicidal effect upon them. A soil incorporated application of Dacthal at a rate of 12 pounds per acre resulted in near perfect weed control in strawberries throughout the 1963 growing season at the Farmington Field Station.

Sesone has no herbicidal activity when applied directly to the foliage, but when leached into the soil it is oxidized or changed to 2,4-D by soil microorganisms. The 2,4-D is then absorbed through plant roots and effectively controls young broad-leaved weeds. Sesone usually controls weeds for a 3 to 5 week period following application during the summer months. More than one application for control of late germinating weeds likely will be necessary. Precede each treatment with cultivation or hoeing. A light rain or irrigation is needed to leach the herbicide into the soil.

The amine salt of 2,4-D can be used to control broad-leaved weeds in established strawberry plantings. If 2,4-D is applied during blossoming, fruit development, or in the fall during bud formation, deformed fruit, leaves, and runners are likely to develop. Grapes are easily damaged by 2,4-D; therefore, do not use 2,4-D in any formulation in or near grape plantings.

Read carefully the information on the label concerning application rates and crops on which the chemicals may be used before applying herbicides. Never apply an herbicide to a crop for which it has not been recommended. Clearance is given for each crop on the label attached to the container. It is important to apply the correct amount of herbicide uniformly over the desired control area. Herbicide application rates are given in pounds of active ingredient per acre. Dacthal, for example, is formulated as a 75 percent wettable (W) powder. To follow a recommendation of 12 pounds to the acre, one would apply 16 pounds of the commercial formulation. A practical means of calibration for application to a small fruit planting is given in table 2.

Equip your knapsack or boom sprayer with 800T-jet nozzles and 50 mesh screens when using wet-

**Table 1. 1964 weed control recommendation for small fruit crops**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Chemical and rate per acre</th>
<th>Weeds controlled</th>
<th>Time and method of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strawberries</td>
<td>Dacthal, 8-12 pounds</td>
<td>Germinating grasses and broad-leaved weeds</td>
<td>Incorporate into soil before new planting.</td>
</tr>
<tr>
<td></td>
<td>Sesone, 4-6 pounds</td>
<td>Germinating broad-leaved weeds</td>
<td>Apply to soil before weed emergence, within 1 week after transplanting, requires soil moisture.</td>
</tr>
<tr>
<td></td>
<td>2,4-D amine, ½ pound</td>
<td>Broad-leaved weeds, puncture vine</td>
<td>When early germinating weeds first appear, before berries blossom.</td>
</tr>
<tr>
<td>Rasberries</td>
<td>Simazine, 4 pounds</td>
<td>Germinating broad-leaved weeds and annual grasses</td>
<td>Late fall or early spring before weed emergence.</td>
</tr>
<tr>
<td>Blackberries</td>
<td>Karmex diuron, 3.2 pounds</td>
<td>Germinating broad-leaved weeds and annual grasses</td>
<td>Late fall or early spring before weed emergence.</td>
</tr>
<tr>
<td></td>
<td>CIPC, 8 pounds</td>
<td>Germinating grasses and some broad-leaved weeds</td>
<td>Early spring while canes are still dormant.</td>
</tr>
<tr>
<td>Grapes</td>
<td>Simazine, 4 pounds</td>
<td>Germinating broad-leaved weeds and annual grasses</td>
<td>Late fall or early spring before weed emergence.</td>
</tr>
<tr>
<td></td>
<td>Karmex diuron, 3.2 pounds</td>
<td>Germinating broad-leaved weeds and annual grasses</td>
<td>Late fall or early spring before weed emergence.</td>
</tr>
<tr>
<td></td>
<td>Dowpon (Dalapon), 8.5 pounds</td>
<td>Spot treatment of Johnson’s grass, crabgrass and bermudagrass</td>
<td>When grasses are 4 to 8 inches tall. Repeat once if necessary.</td>
</tr>
</tbody>
</table>

**Table 2. Guide for application of herbicides in small fruits**

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Formulation</th>
<th>Amount (active ingredient) per 50 gallons of water†</th>
<th>Amount of specified formulated per 2 gallons of water†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dacthal</td>
<td>75 W</td>
<td>2.5 pounds</td>
<td>6.0 level tablespoons</td>
</tr>
<tr>
<td>Sesone</td>
<td>90 %</td>
<td>1-1.5 pounds</td>
<td>3.0 level tablespoons</td>
</tr>
<tr>
<td>2,4-D amine</td>
<td>80 W</td>
<td>.125 pounds</td>
<td>3.5 level tablespoons</td>
</tr>
<tr>
<td>Simazine</td>
<td>80 W</td>
<td>1.0 pound</td>
<td>3.0 level tablespoons</td>
</tr>
<tr>
<td>Karmex</td>
<td>Diuron 80 W</td>
<td>.8 pound</td>
<td>3.0 level tablespoons</td>
</tr>
<tr>
<td>CIPC</td>
<td></td>
<td>2.0 pounds</td>
<td>6.0 level tablespoons</td>
</tr>
<tr>
<td>Dowpon</td>
<td>Dalapon 85 %</td>
<td>2.0 pounds</td>
<td></td>
</tr>
</tbody>
</table>

*Apply at a rate of 1.5 gallons of spray material per 300 square feet of area to be treated, for example, 100 feet of row 3 feet wide.
†Basis of 200 gallons per acre.
table powders. Wettable powders such as Simazine or Karmex do not go into solution, and if a 100 mesh screen or a nozzle with an orifice smaller than a 8004 is used in spraying these herbicides, the nozzle or screen is likely to become clogged with particles of spray materials.

Use a sprayer equipped with mechanical agitation if you are spraying wettable powders. By-pass agitation will not keep Simazine and especially Karmex in suspension. When using a knapsack or small 3 gallon sprayer, shake the sprayer frequently to keep the herbicide in suspension.

**SPRING GRAZING OF DESERT RANGES**

(Continued from page 7)

also noted. The results of these records are shown in tables 1 and 2.

**Effect of season of harvesting**

In the first phase of the study, spring harvesting was much more detrimental than that of the other three seasons. It caused about 89 percent more death loss of plants and resulted in 54 percent more reduction in size of the remaining plants than did the other seasons (table 1). Fall, early winter, and late winter harvestings did not differ much in their effects.

Because spring grazing was so much more harmful in this first phase, greater emphasis was placed on spring harvesting in the second phase. In the second study, harvesting twice, once during the winter and again in late spring, was the most detrimental. Harvesting only in late spring was second most harmful. There was little difference between winter and early spring harvesting. Late spring grazing appeared to be considerably more detrimental than early spring.

Harvesting during winter and again during late spring for three successive years killed an average of 29 percent of the plants and reduced the size of living plants about 33 percent (table 2). Of plants harvested only in late spring 18 percent were dead, and living plants suffered a 22 percent reduction in size. In contrast, early spring harvesting killed only 9 percent of the plants and reduced living plant size only 17 percent.

**Effect of intensity of harvesting**

Without exception, the more of the herbage that was removed, the more plants died and the smaller were the remaining plants. However, it can be seen from table 1 that differences in 25 and 50 percent herbage removal generally were small compared to differences between 50 and 75 percent removal. In the spring, however, even the 50 percent removal was impressively more harmful than was the 25 percent.

In the second phase, when harvesting was more intense, results were a little different (table 2). Except for plants harvested only in the winter, 60 percent herbage removal caused significantly more death loss and size reduction than 30 percent herbage removal, and 90 percent was significantly more detrimental than 60 percent.

Results of these studies are important to stockmen who use desert ranges. They show beyond question that stock need to leave the desert range as soon as growth of the shrubs is underway. This gives renewed emphasis to the need of Utah ranchers to develop crested wheatgrass pastures for early spring grazing.

Any grazing which removes over 25 to 30 percent of the desert plant

<table>
<thead>
<tr>
<th>Grazing season</th>
<th>Percent of forage removed</th>
<th>Percent of plants that died</th>
<th>Percent reduction in size of remaining live plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall (January 1)</td>
<td>30</td>
<td>2.4</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>5.4</td>
<td>9.4</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>20.1</td>
<td>26.5</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>9.3</td>
<td>14.5</td>
</tr>
<tr>
<td>Winter and late spring (Jan. 1 and May 1)</td>
<td>30</td>
<td>6.7</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>20.1</td>
<td>34.1</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>60.1</td>
<td>46.0</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>29.0</td>
<td>32.7</td>
</tr>
<tr>
<td>Early spring (April)</td>
<td>30</td>
<td>2.5</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>5.8</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>18.9</td>
<td>34.5</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>9.0</td>
<td>17.3</td>
</tr>
<tr>
<td>Late spring (May 1)</td>
<td>30</td>
<td>4.0</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>12.6</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>37.9</td>
<td>42.5</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>18.2</td>
<td>22.3</td>
</tr>
<tr>
<td>Average of all seasons</td>
<td>30</td>
<td>3.9</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>11.0</td>
<td>25.1</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>34.2</td>
<td>34.6</td>
</tr>
</tbody>
</table>
herbage after about April 1 must be regarded as dangerous. This is especially serious when forage is removed during the winter and again in the spring. The amount should never exceed 30 percent in either season. The situation might occur when sheep graze winter range until late spring or when cattle graze desert ranges year round.

Stockmen should be aware that season of grazing affects grazing capacity. The number of animals we can safely put on ranges varies with how the range is used. Desert ranges are adapted to winter grazing. Our salt-shrub ranges are among the best in the world for use at this time of the year. But they are not adapted to spring use. If emergency situations make it necessary to graze them in the spring, then we cannot expect the range to carry the full number of animals. Data from this experiment suggest that the correct stocking on a range grazed in winter only is about twice that of the same range if grazed in the spring.

THE FORECAST
(Continued from page 9)

ments, some is between such instruments and meteorologists, and some is between volunteer observers and meteorologists. All of these factors are links in the chain that terminates for you in the weather forecast.

At the present time, weather forecasts are based on data supplied by ground observation stations and on instrumented readings taken in the upper atmosphere. The readings are obtained by sending up a balloon carrying an instrument called a radiosonde. As the balloon ascends, the radiosonde continuously radios back to earth the various temperatures, humidity, and pressure conditions that it encounters. Wind direction and velocity are obtained at different altitudes by tracking the balloon either optically or electronically.

Information from the balloon-launching stations (some on the ocean), plus that from the official ground observation stations is sent to the Weather Bureau headquarters in Washington, D. C. Most of these data are entered directly from teletype lines into the Bureau's computer.

The computer analyzes the data and then actually draws weather maps. Some of these maps illustrate ground level conditions while others give wind direction and velocity at various altitudes. The computer-drawn maps plus hand-drawn maps are sent by facsimile machine to using agencies such as the Salt Lake City Weather Bureau. One map is delivered each 10 to 15 minutes around the clock.

The area forecaster prepares the weather forecast for his area based on these maps, current local information, and his knowledge of regional topography, storm patterns, and pertinent peculiarities.

In Utah, local information is gleaned from several sources. Balloons with radiosonde equipment are sent up twice daily at Salt Lake City. Two additional balloons are launched daily at different times just for wind determinations. Eight ground observation stations scattered through the state also submit data for use in forecasting. The observation station at Price is one of the few automated stations now operating in the United States.

Forecasts prepared in the Salt Lake forecast office cover Utah, eastern Nevada, and southern Idaho. These forecasts are released to the mass information media (radio, newspapers, television) for dissemination to the public.

Even so-called local forecasts, however, cannot adequately account for all the diverse factors that influence local weather. For example, the "local" forecast for Salt Lake City and vicinity is supposed to apply to the area within a 20-mile radius of the city boundaries. Even a superficial glance at a map shows that this is an impossible ideal.

No single forecast can accurately describe the weather in the valley
bottom and in the mountains. This is particularly true in the winter when the valley may be smothering under a layer of fog, while mountain slopes well within the 20-mile radius are soaking up sunshine.

Reader responsibility

Such discrepancies mean that the usefulness of the forecast must depend on the reader's "savvy."

Forecasts look deceptively easy to interpret. They are apparently as direct and to the point as writing can be, The language is simple. The words are commonplace. But these very points constitute the bases for misinterpretation by the reader.

In composing forecasts, the meteorologist must choose which of many pertinent probabilities to report. Then too, the limited number of words that he can use often have connotations that do not match his technical meanings. In addition, each forecast reaches an audience that is more widely spread geographically than its potential accuracy warrants.

All in all, communication between the meteorologists and their audience has been less than satisfactory — on both sides.

So what can you, the user of the forecast, do about this? How can you help make weather forecasts serve you better?

First, you can learn the meteorologist's meanings for the words he uses in his forecasts. A list of some of the most commonly encountered terms appears here with their special definitions.

Second, you can recognize that every forecast can state only a few of the relevant items. Allowances must be made for the omitted data.

Third, you can become knowledgeable about local topographical features and other conditions in your area that may affect weather patterns. Past and future articles in this series should help you fulfill steps 2 and 3.

And fourth, you can learn to be sure what kind of forecast you are reading, and to realize its specific purpose. The various forecasts and warnings are defined.

Using the forecast

To show how the four self-help steps can make weather forecasts more useful at your local level, let us consider a typical winter 36-hour forecast for Salt Lake City and vicinity.

"Continued fog and smoke today and tonight except fair and mild in surrounding mountains. Increasing cloudiness tomorrow with snow by mid-afternoon. Warmer tonight.

High this afternoon 30 to 35. Low tonight 15 to 20. High tomorrow 35 to 40."

As you read or heard the forecast, you would automatically allow for the chance that the storm might veer off course or change speed for some reason. If it stayed on schedule, however, you'd look for the fog to thin out on the higher bench levels as the storm front approached.

At those elevations, clouds would move in aloft during the late afternoon or evening of the forecast. During the "today" of the forecast, this would probably involve only thin cirrus clouds. As the storm system continued to advance, however, you'd expect the clouds to thicken and to have obscured the sky completely by the next morning.

Even though it wasn't stated in the forecast, you'd realize that the area's general pattern of storm systems would generate considerable wind at the higher elevations.

The smoke and fog would start to dissipate in the valley as the snow began to fall. The temperature in the valley bottom would then reach the relatively warm levels predicted for the "tomorrow" of the forecast. In this way, by understanding (1) the language, (2) the relevance of specific location in or around the city, and (3) that innumerable factors might delay or modify the storm enroute, you help maximize the forecast's usefulness. Whether a forecast turns out to be fact or fable, thus depends largely on the user's interpretation.

The next installment in this series of articles will describe some of the seasonal variations that occur in Utah's climate. It will give particular attention to precipitation patterns.

POLYARTHRITIS OF LAMBS
(Continued from page 17)

In 1962 the morbidity ranged from 2 to 18.5 percent in the flocks observed, but the mortality rate was low. In 1963 two bands were observed with a morbidity rate of 35 percent in one, and 66 percent in the second. These lambs contracted the disease within a 4 day period. The affected lambs were 3 to 8 months old and ranged in weight from 55 to 105 pounds. In 1963, however, many smaller lambs also were observed to have the disease. In a given flock, the larger lambs appear to be affected more often than the smaller ones. The disease was observed from July through October.

Normally, no enlargement of the joints could be noticed, however, in long standing, advanced cases, slight enlargement of the stifle, hock, elbow, and knee joints could be detected. The pathologic changes were found to be associated with the joints and adjoining muscles, tendons, and tendon sheaths. The larger, freely movable, weight-bearing joints such as the hip, stifle, tarsal, atlanto-occipital, shoulder, elbow, and carpal were the joints most frequently and severely involved. Most joints of affected lambs contained an excess of greyish-yellow, viscous, turbid synovial fluid. Differently sized and shaped, greyish-yellow flakes and plaques of fibrin were present in some joints.

The capsules of involved joints had varying degrees of thickening. Mild,
but specific lesions were also found in livers, kidneys, lungs, hearts, and brains of lambs afflicted with polyarthritis.

**Distribution of the disease**

Polyarthritis of lambs has a wide distribution in Utah and, based on our own observations and reports from sheepmen in Idaho, Wyoming, and Nevada. Other scientists had described highly similar and most probably identical conditions in California, Oregon, Washington, Montana, Colorado, and Wisconsin where this disease was first described in 1960. The lambs studied by workers in Wisconsin had the disease about 4 weeks after they had arrived from the Western States.

**Cause of the disease, a virus**

In 1962 and in 1963 a virus was isolated from various joint fluid samples of each affected lamb tested. The virus was also recovered from the blood, cerebrospinal fluid, different internal organs, and body secretions. No other microorganisms of etiologic significance were found in affected joints.

The virus was isolated and propagated in developing chicken embryos. Its cultural, pathogenic, and staining properties, and morphologic features as well as serologic tests, were used to identify the agent isolated from affected joints. These studies characterized the infectious agent found as belonging to the psittacosis group of viruses which comprises a large number of serologically related but pathogenically differing viruses. These viruses not only cause diseases in parakeets, birds, many laboratory and domestic animal species but also cause several distinct diseases of man.

A disease highly similar or identical to the one occurring on ranges was produced experimentally in 5 to 6 month old lambs by inoculation of chicken embryo-propagated virus, which was originally isolated from joint tissue of naturally affected range lambs. The lambs were inoculated by various routes. Irrespective of the route of inoculation, all exposed lambs developed stiffness and lameness. The joints had typical lesions at necropsy 3 days after inoculation. The lesions were, however, more severe 7 and 21 days after exposure. Some lambs were inoculated directly into one or two joints. It was found that virus filtered out of the infected joint cavity, entered the bloodstream, and invaded other joints. These experiments unequivocally proved that the virus demonstrated in synovial tissues and fluids of naturally affected lambs must be the cause of this newly discovered joint disease.

**Importance of correct diagnosis**

There are several other diseases of sheep which cause stiffness and lameness. Streptococci, staphylococci, corynebacteria, erysipelas, and hemophilus species of pathogenic microorganisms have been known to affect joint tissues. These bacterial infections usually invade the joints of younger lambs, after entering the body through the umbilical cord soon after birth or through wounds made at the time of docking and castration. Effective methods to prevent these infections have been worked out in the past and are well publicized. Lambs suffering from bluetongue may be stiff and have intermittent lameness. All these diseases can be easily distinguished from the newly recognized condition by any experienced diagnostician.

Another condition resulting in stiffness of lambs is white muscle disease. This disease process affects the muscles, which assume a whitish color and a cooked appearance as a result of selenium and vitamin E deficiency. White muscle disease is most common in lambs from 1 to 8 weeks of age. Affected lambs do not have fever, unless there are secondary complications. It is well known that an adequate supply of selenium and vitamin E prevents white muscle disease. This disease is, in its pathologic changes and etiology, fundamentally different from the newly recognized polyarthritis of lambs.

Mineral deficiency, leading to poor growth performance, can result in adverse bone changes. It received special attention here at Utah State University and led to recommendations for supplying balanced mineral mixes containing proper ratios of calcium and phosphorus to prevent deficiencies. It was found, in this study, that most lambs suffering from viral polyarthritis had free access to recommended mineral mixes. This fact allows the conclusion that a mineral deficiency is not a primary factor in the pathogenesis of viral polyarthritis.

Each of the specific causes and factors that result in lameness and stiffness of lambs requires specific consideration and treatment or preventative measures. The correct diagnosis of the specific causative agent or factors is therefore imperative. This is the only and best approach to reduce or prevent losses caused by the widespread diseases affecting muscles, bones, and joints of sheep, or any other animal species.

**Treatment and prevention**

The response to medication of animals having viral polyarthritis varies with individual cases and circumstances. If administered in the very early stage of the disease, penicillin therapy appeared to be beneficial under field conditions. Longer standing, more advanced cases did not respond satisfactorily to treatment with penicillin. Penicillin with a long lasting action should be used. It is also known that the group of agents to which the virus causing polyarthritis belongs is most susceptible to chlortetracycline, an antibiotic. When lambs were put to rest in hospital pens and cared for properly so that they did not have to move appreciably to obtain food and water, they appeared to improve without antibiotic therapy. For any arthritic disease good thera-
py is rest and limited movement.

Not enough is known at present about transmission of the causative viral agent, the immune response it elicits, and the pathogenesis of the disease to justify the recommendation of specific preventative measures. All these aspects of the disease require considerable basic research in the future.

What can we learn from this disease?

An important and philosophic question arises: "Is viral polyarthritis a new disease or an old one that had not been recognized earlier?" There is no easy answer to this inquiry. Though some sheepmen claim to have seen this disease in the past, it certainly did not come to any scientist's attention. This can be explained by a possible low incidence of the disease. A considerable change in the previously existing host-parasite equilibrium must have occurred in recent years, leading to the high incidence and severity of the disease, that necessitated the investigative effort of the writers. These findings also can suggest the occurrence or emergence of new diseases as known ones are being eliminated.

Detailed studies of various aspects of viral polyarthritis may well yield useful answers to many questions concerning other arthritic diseases. Our results also encourage a search for similar causes of joint ailments of other animal species.

CHRISTMAS TREES
(Continued from page 19)

increase with no apparent extreme fluctuations caused by price changes. Supply, on the other hand, increases and decreases greatly from year to year. These changes in supply can be attributed primarily to an increase in the number of retailers following a successful year, providing weather conditions are not severe in the higher elevations. Weather conditions occasionally govern wholesale availability of trees.

Successful sales one year tend to encourage new retailers to enter the market in an effort to capture what seems to be easy income. Although there are few businesses in which an operator faces the risk and uncertainty that he does in the Christmas tree business, the physical ease of entering the market, the low capital expenditure required, and the compatibility with established businesses, result in increased retailers. This increase results in an excess supply of trees and, therefore, poor sales success. Thus, many retailers are discouraged from entering the market the following year and consequently, a more successful sales surplus record is recorded. In Utah in the past, the even years have been poor and the odd successful.

Source of trees

The percentage of Utah grown trees on the Utah retail market dropped significantly in 1963 (table 2). Montana, although supplying a lesser percentage than in the past, continued to supply the largest number of trees. Canadian trees appeared on the market for the first time during the study years.

Additional information compiled in the 1963 study compared both the percent of each species and source of these trees in four Utah counties. Cache, Weber, Salt Lake, and Iron Counties were singled out for comparative examination. Cache, Weber, and Salt Lake were relatively similar in both categories. The difference between these counties and Iron County, however, was great. This can be attributed to the greater population and easier accessibility to out-of-state sources of wholesale supply in the three northern counties.

The information collected in Iron County showed an interesting and somewhat paradoxical condition. Pinyon pine is harvested for Utah and out-of-state markets in greater quantity than any other Utah species. It is harvested primarily in southern Utah with Iron County as the focal point. Yet, due to its popularity in other areas, it is shipped out. Still, Iron County used a far greater percentage of Utah trees than Cache, Weber, and Salt Lake Counties.

The Iron County retail market comprised more than 93 percent Utah grown trees. The high use of white fir, especially when compared with use in the other counties accounts for this fact. Found in Utah,
only in the southern portions of the state, white fir comprised 53 percent of the retail market in the area. Although like pinyon pine in that it grows and is harvested primarily in southern Utah, it is more attractive to the local consumers because it is found in the high mountain areas and not in their "back yard" as is pinyon pine.

**Prices slightly higher**

Price in 1963 showed little change over the 1960 study results (table 3). The slight rise in both wholesale and retail prices was due in large part to increased procurement and sales costs. Improved quality may have also contributed somewhat to the increase. Although it was not evident in the usual wholesale price range, the scarcity of high quality pinyon pine caused rather extreme increases in wholesale and retail prices in limited cases. One retailer reported paying $5 wholesale per tree for large high quality pinyon pine.

**Size of sales outlet**

There were few changes in the type of retail establishments. The size of these establishments did change somewhat in that there was a more uniform distribution of all sizes.

**Untreated trees most popular**

Untreated Christmas trees as in past years continued to dominate the market. The painted trees are not as popular as they were two or three years ago. The flocked tree has tended to replace the painted tree. It has not, however, gained the popularity that the painted tree had several years ago. This is most likely due to the high cost of flocked trees which ran $2.50 to $3.25 and higher per foot in 1963.

**Use of artificial trees increasing**

Although 1963 was a successful Christmas tree retailing season, there was one apparent fact that created concern. A small sample of homes in Cache Valley and Salt Lake Valley indicated a substantial increase in the use of artificial Christmas trees. Ten days before Christmas, 155 homes in Cache Valley and 541 in Salt Lake Valley, where a tree could be seen in the home, were observed; 14.8 percent and 20.3 percent, respectively, of the homes counted had artificial trees. In 1960, study revealed that only about 3 percent of 373 families sampled had artificial trees.

This increase in artificial trees would seem to indicate that they are making considerable inroads on the natural tree market. However, a family will often display an artificial tree where it may be seen by the outsider and still have a natural tree located in some other room, such as a recreation room, for family use. There is still, however, enough evidence to indicate that the artificial tree has substantially increased in popularity in recent years.

**Future of the market**

Since the Christmas tree retail market fluctuates greatly from year to year and place to place, it is difficult to project what the future will hold. If, however, it follows the trend of the past four years, 1964 will see increased surpluses and a much less successful year than 1961 and 1963 because of increased inventories and additional individuals in the retail market.

The results of an extensive experiment on the interrelations of nutritional stress on growth and production of range sheep indicate that a 5 percent protein level for pregnant ewes in the last 100 days of gestation is critical and an increase of 7 percent is no more than barely adequate.—John E. Butcher.

**Alfalfa's tolerance to repeated floodings**

Careful management of irrigation water to avoid prolonged flooding of alfalfa roots often increases hay production and also conserves water.

Investigations in Nevada show that repeated floodings lasting longer than three days each reduce hay yields and damage plant roots. This knowledge should enable stockmen to produce more hay from fields where the water table lies within a few feet of the ground surface. Where it is not practical to lower the water table with underground or surface drainage, productivity of these alfalfa fields usually can be maintained by avoiding over-irrigation. Alfalfa thrives where the distance to the water table is as little as two feet, provided its roots are well aerated and have sufficient oxygen.

More than seven tons of alfalfa hay, in three cuttings, were harvested where roots were flooded for intervals of one to three days throughout the growing season. Yields were sharply reduced, however, by repeated floodings lasting four days or more. Where floodings lasted seven days, annual hay production was reduced to two tons per acre, nearly all from the first cutting.

Alfalfa stands were noticeably thinner and the foliage was lighter green where floodings lasted four days or longer. Root growth deteriorated progressively, indicating that aeration essential for growth and development was lacking. Poor aeration encourages development of some plant diseases.

The time that alfalfa can tolerate waterlogged soil without damage depends upon the stage of plant and root development, salt content of the soil and water, and temperature. Alfalfa is most easily harmed by prolonged flooding when temperatures are high.

**FARM AND HOME SCIENCE**
Research in dryland agriculture aimed specifically to the problems and needs of northern Utah has been made possible by the donation of a 40-acre farm in Box Elder County. It will be named the Blue Creek Experiment Farm.

Eighty-two local farmers, businesses, and the county provided the $7,000 purchase price to obtain the land that was formerly on the Henry Schumann farm.

Earl Fuhriman, heading the Farm Research Fund Committee, presented a deed for the land to Trustee R. J. Potter and President Daryl Chase at a luncheon on campus in Logan, February 21, 1964.

Director Wynne Thorne of the Agricultural Experiment Station named a nine-man advisory committee of farmers to meet with research staff members at least once a year to review past research and plans for future research and make specific suggestions to meet the producers' problems. The committee includes Hugh Manning, chairman, farming at Blind Springs; Ed Deakin, Sage Valley; Earl Fuhriman, Pocatello Valley; Howard Glenn, Hansel Valley; D. B. Green and Vean Postma, Promontory; Seth Hammond, Upper Blue Creek; Henry Schumann, Upper Blue Creek; and Deloras Stokes, Little Pocatello Valley.

Director Thorne explained that when the farmers donated this research farm to the University they culminated 20 years of expressed interest in having such a research facility in their area.

President Chase commended the type of cooperation that made it possible to obtain the farm for research. "It exhibits real interest in your business and mutual confidence in your school," he said.

Associate Experiment Station Director Kenneth W. Hill explained that research on the farm would be focused on determining better ways of conserving moisture, developing crop varieties, and tillage practices most suitable to the area.

Rex F. Nielson and Wade G. Dewey of the Agronomy Department worked with the farmers in selecting the site. They and other University staff members will conduct research deemed most pertinent to northern Utah's dryland agriculture.

Deed to the Blue Creek Experiment Farm for dry-land agricultural research is presented to President Daryl Chase by Earl Fuhriman, representing Box Elder dry farmers. Looking on are Director Wynne Thorne, Trustee R. J. Potter, and Henry Schumann, former owner.
Pesticide Residues . . .
A continuing study at USU

Utah Agricultural Experiment Station has conducted research since 1948 on the residual behavior of many modern insecticides and the toxicity hazards to man and animal resulting from insecticide residues on foods. Some of the earliest data which established the movement of DDT and related insecticides through the food chain, after their application to a field crop, was developed by Utah researchers and was used by the U.S. Food and Drug Administration in establishing tolerances for the various insecticides on foods. As an example of such research, alfalfa was dusted with DDT at several treatment levels, the harvested hay was fed to dairy cows, and butter was made from the cows' milk and fed to laboratory rats. Some of the findings showed that dusting alfalfa with 1 pound DDT per acre resulted in a residue level of 10-19 parts per million in hay; from 1.3 to 1.7 ppm in milk, and 43 ppm in butterfat when the hay was fed to dairy cows; and about 70 ppm in the fat of rats after feeding the butter in their diet for 16 weeks. In other experiments, insecticide transmission to meat and eggs was also studied.

Effects of insecticide residues on animal health have been studied in conjunction with work in evaluating the tendency of the animal to accumulate insecticides in its tissues. One example of such work was a long term study in which various levels of dieldrin were fed to ewe sheep daily for 40 months. During that time, the health of the animals was apparently normal and they reproduced normally each year. The accumulation of dieldrin in the tissues of the ewes and its transmission to their lamb were measured at intervals throughout the experimental period. Many of the lambs born to ewes receiving 25 ppm dieldrin died soon after birth; the minimum diet level for such a toxic effect was indicated to lie between 5 and 25 ppm dieldrin when continuously present in the diet. The interpretation of such research has aided in evaluating hazards to man arising from potential insecticide residues in the food supply and has been useful in establishing federal and state safety controls on insecticide usage.

Current research at the Utah Agricultural Experiment Station is concerned with increasing our understanding of the processes of tissue accumulation of insecticides and their excretion in milk. Possible methods for rapid removal of tissue insecticide stores are also being studied.

Modern insecticides have an important place in the production of plant and animal products for food. They are so toxic, however, that appropriate precautions are necessary to protect food consumers, precautions based on research such as that carried out in Utah. Continuation of such research is needed to increase our knowledge of the behavior of these chemicals and thereby help to promote the public safety and increase the usefulness of pesticides in agriculture—Joseph C. Street.