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Here's Way to Increase Seed Crop

■ The fortunate alfalfa seed grower who has a large alkali bee nesting site near his field can usually count on high yields. Alkali bees pollinate alfalfa much more efficiently than do honey bees. But they are much less abundant on most alfalfa fields in Utah.

These valuable bees are about two-thirds as large as honey bees and have iridescent coppery-green stripes across their abdomens. Their densely populated breeding areas occur on moist, salty ground. They construct nest burrows in the soil from 6 to 10 inches deep, each female building and provisioning her own nest without help from her neighbors. A successful nest contains from 15 to 20 brood cells in each of which is placed a ball of honey-moistened pollen and a single egg. As soon as the egg is laid, the mother bee seals the cell and has no further contact with her offspring. Most of the nests are constructed and provisioned in July and early August. The larva matures by late August and becomes a pupa during the following May or June. The adult emerges from late June to mid-July and lives for about a month.

The characteristics of an ideal nesting site:

1. Soil composed of fine sandy loam (a high percentage of clay is undesirable).
2. Well-drained surface (the best sites are usually on hummocks or gentle slopes).
3. A constant underground supply of moisture extending upward to the surface (thoroughly saturated soil is too wet).
4. A bare or only sparsely vegetated surface.
5. Salty crust, if present, not thick or hard.
6. No fluffy, dry layer under the crust.

A GOOD NESTING site may contain more than 1,000,000 nests and remain populous for many years. More commonly, however, after a few years the population suffers a drastic decline or disappears altogether. The principal causes of such a decline are:

1. Bloom-stage applications with highly toxic insecticides.
2. Plowing.
3. Digging by skunks in search of alkali bee larvae.
4. Flooding.
5. Drying of the soil by: (a) Drainage ditches; (b) lining of irrigation canals; (c) withholding irrigation water from areas ordinarily receiving it.
6. Encroachment by dense growth of saltgrass, kochia, or other salt-tolerant vegetation.
7. Development of a thick or hard crust.
8. Excessive trampling by livestock.
9. Increased population of parasites.
10. Heavy rains during the nesting season.

These causes, except for untimely rains, are largely under the grower's control. Many farming practices which are ordinarily desirable, if done without regard for alkali bees, can sharply reduce seed yields by damaging nesting sites of alkali bees. Growers should remember that land occupied by an alkali bee site is worth many times the same acreage devoted to crop production.

Seed growers should find all the nesting sites within several miles of their fields and take whatever steps are needed to protect them from harm. Usually nesting sites can be protected most effectively on a community basis, since the value of the bees extends beyond property lines, as does the influence of many farming practices, such as spraying and drainage. Most of the measures involve simple control over farming practices and need no discussion here. Weeds can be eliminated by mowing or by spraying with herbicides. Skunks are readily controlled by baiting or trapping. Seed growers can organize and offer a bounty for skunks on an area-wide basis.

Controlling alkali bee parasites is a more difficult problem. Fortunately for Utah, the bee fly, probably the most important of several parasites, is a serious problem only in Salt Lake, Box Elder and Cache counties. Preliminary tests indicate that 10 quarts per acre of a 5 per cent methoxychlor emulsion applied on the nesting sites in early morning hours, about two weeks after the bees first appear, will destroy many of the bee flies without seriously reducing the number of alkali bees.

THE FIRST STEP toward increasing alkali bee numbers is to study the conditions that create the existing nesting site. By reproducing these conditions on soils of the same basic type, the sites can be expanded and new ones created.

A hard-pan layer a foot or more under the surface is important to promote enough lateral underground movement of water to maintain moist conditions near the surface over large areas. More investigation is needed to develop economical ways of forming such a layer where it does not already exist. In some soils simple compaction by heavy machinery may be enough. In others a layer of clay packed two or three feet below the surface may do a good job. With a suitable soil, a hard-pan layer, and a water supply, the next step is to construct a series of blind parallel ditches to grade and run water through on a schedule that will keep the whole area moist, especially during June, July and August.

In naturally saline soils, subirrigation will usually increase surface salinity to the desired level. If salt does not appear at the surface, granulated rock salt should be mixed into the top 2 inches at the rate of about 9 pounds per square yard to help draw moisture to the surface.

It is also possible to build permanent nesting sites by making excavations three feet deep, lining them with 0.008-inch polyethylene or 0.007-inch vinyl film and then backfilling with a 1-inch bed of soil, a 6-inch layer of gravel, and 2½ feet of fine sandy loam (in most cases the native soil). Water can be applied through pieces of tile or pipe extending from the soil surface to the gravel layer. One watering in June usually lasts all season. Salt should be added as described above. A shallow bed

attracts nesting bees as well as a deep one, but more frequent watering is required. The size of such beds depends on the amount of alfalfa to be pollinated and the resources of the growers concerned. A cooperating group of seed growers in northeastern Oregon is now building about 50 large alkali bee sites of this nature.

NEWLY CREATED areas can be colonized by installing undisturbed blocks of soil taken in the fall or spring from existing sites. Steel cylinders about 12 by 12 inches and slit open on one side are driven into an established breeding site and pried loose with a plug of soil enclosed. At the new site the cylinder is opened slightly to release the plug into a prepared excavation. From 25 to 50 plugs should be used to establish a new colony.

When existing sites are protected and plenty of forage is available, the bees usually increase and move into new areas of suitable ground within a mile or so of their old sites.

Simultaneous programs of protecting existing sites and creating new areas favorable for nesting have paid off well in Wyoming, Idaho, Oregon and Washington. The same practices should be profitable in Utah.

Seed growers should attempt to bring their alfalfa into bloom when alkali bees are most active, normally from mid-July through early August. In most areas this can best be done with a delayed first crop or an early second crop.—G. E. BOHART and G. F. Knowlton, Utah State University.