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## Managing the Alfalfa Leaf-cutting Bee for Higher Alfalfa Seed Yields (Revised)

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## MANAGING

THE ALFALFA LEAF-CUTTING BEE  
FOR HIGHER ALFALFA SEED YIELDS

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The alfalfa leaf-cutting bee (*Megachile rotundata*) has become an important ally of our alfalfa seed growers since its introduction into our area in the mid 1950's. In Idaho, Oregon, Washington and Alberta, this bee now appears to be the most important alfalfa pollinator, and hundreds of growers are managing it successfully. In California intensive efforts by growers are beginning to pay off, especially in the Sacramento Valley. Development has been slow in Utah, but interest has increased over the last five years.

This bee, which is charcoal gray and only a little larger than a house fly, trips and cross-pollinates alfalfa very efficiently. Except for alfalfa, clovers and a few mints, it visits few plants for pollen or nectar. It does not cut leaves of shrubs and trees as other leaf-cutting bees do, but it does cut flower petals on occasion. The adults fly from late June to September and populations build up best when weather is warm and plenty of alfalfa bloom is present.

One female alfalfa leaf-cutting bee per five square yards appears to be adequate for good pollination of alfalfa seed fields. This means about 1,000 bees per acre should be present during most of the bloom period. A total population of 2,000 should insure at least 1,000 actually foraging on the field. Based on this figure, 100,000 nesting females should be enough to pollinate a 50-acre alfalfa seed field if the breeding shelters are well spaced throughout the field. Six shelters spaced around the margin of the field and at 600-foot intervals within the field ordinarily should provide a good distribution of bees. Although alfalfa leaf-cutting

bees usually fly only a few hundred feet from their nests into the field, there is evidence that they forage farther (up to 200 yards) from very large, populous shelters (50,000 or more bees per shelter).

**Obtaining Bees:** These bees are now present in most agricultural areas of Utah. An examination of old nail holes in out-buildings and insect burrows in dead trees and posts will likely disclose their presence. Where such examination shows many bees to be present, prepared straws or 4 x 4's drilled with holes of the right diameter can be made available to encourage maximum bee reproduction. These ready-made nesting holes should be put out before the end of June. For a more rapid build-up of populations to a useful level, it is advisable to purchase bees from growers who have them for sale. Names of such growers can probably be obtained from the County Agricultural Agents of Canyon, Marsing and Owyhee Counties, Idaho; Malheur County, Oregon; and East Millard County, Utah.

**Care:** Alfalfa leaf-cutting bees prefer to nest in smooth-walled tubular holes about 3/16 inch in diameter. Light should enter the holes only at the entrance. Early work showed that 4 x 4 timbers drilled with 3/16-inch holes about 3½ inches deep are readily accepted as nesting places. A high speed drill is best to insure smooth-walled nesting holes.

Holes in wood can also be prepared by grooving boards and stacking them together. Planer blades can be modified to cut a series of 3/16-inch grooves in boards which can be strapped together tightly. The principal advantages of this type of unit are the clean holes resulting from grooving the boards with the grain of the wood and the ease with which they can be taken apart to clean out scavengers and pollen-blocked holes. Both drilled and grooved units can be obtained commercially. Contact the county agents mentioned previously for the names of suppliers.

Soda straws may be used as nests. These should have an inside diameter of 5/32, 6/32 or 7/32 inch. The 6/32-inch straw is the best size, but is not generally available. The straws

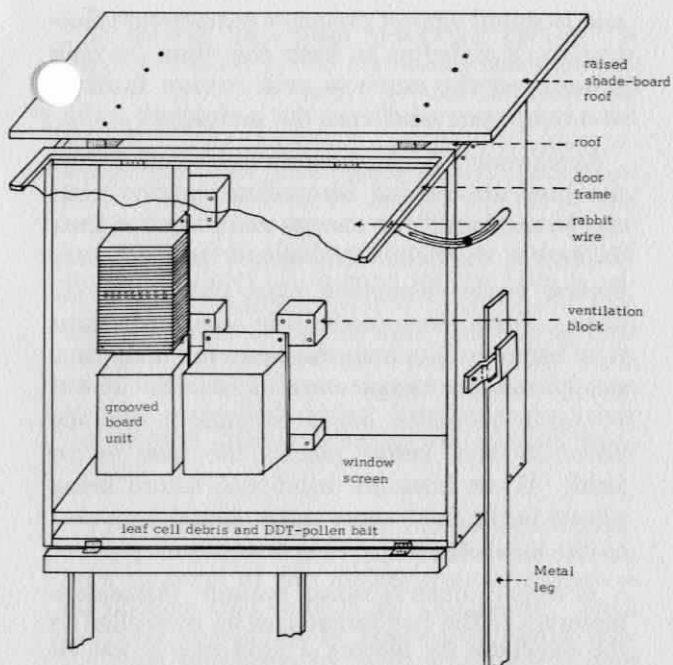
should be packed tightly into strong containers such as coffee cans or large juice cans. When straws are sawed to shorter lengths, always have the smooth unsawed ends as the entrances. It is well to set the straws in rubber cement at the bottom (back) of the container so they will not fall out or be readily pulled out by birds.

Corrugated cardboard with large flutes called bottle wrap can be rolled into any size roll. A 6-inch roll allows for at least 600 nests. Another type, called build-up corrugated paper, can be cut and glued into any size blocks by the paper company. A large flute size, about 3/16-inch, is best in either case, and the flutes cut to be 4 to 6 inches long. Cardboard should be securely glued on the back of each roll or block. Corrugated cardboard is not as attractive to the bees as soda straws or holes in wood and is usually accepted only when the population is exceptionally high.

These bees are gregarious and like to nest near the hole from which they emerge. They also show a tendency to choose the same kind of nesting material and holes of the same diameter as those from which they emerged. For this reason the grower often finds it difficult to change from one type of nest material to another.

**Shelters:** Shelters should be built to meet your conditions and facilities. A good shelter should:

1. Protect the nesting materials against high-angle rays of the sun when the weather is hot.
2. Have an easterly exposure.
3. Afford some shelter from wind and rain.
4. Provide good ventilation.
5. Be large enough to be conspicuous for the bees and have plenty of nesting holes.
6. Be placed 2½ feet or more above ground.
7. Be built so that covers may be added for protection against birds or pesticides.



A box or cupboard supported on legs and well protected by a good shade board roof is satisfactory. At the back screened slots should be provided for ventilation. The open side of the cupboard should be so built that it can be covered with rabbit wire to keep out birds or covered with cloth to confine the bees for a short time following insecticide applications. It is well to line the inside with fiber board for insulation. Painting the outside white or covering it with aluminum foil helps to reflect the light, further protecting the eggs and young larvae from excessive heat.

**Overwintering:** By October the nesting materials can be moved to an unheated room or cellar for overwintering. In such places they should be protected from mice. To prevent a build-up of scavenger beetles during storage

and to guard against excessive temperature fluctuation, it is better to keep the nests (or cells taken from the nests) in cold storage facilities at a temperature between 30° and 40° F.

**Incubation:** Approximately one month before the bees are needed for pollination, the nests can be removed from storage and placed in their shelters in the field. Emergence time will vary several weeks depending upon climatic conditions. For a more predictable emergence date, it is better to incubate the nests (or cells) at a nearly constant temperature of from 85° to 90° F. until the males begin to emerge (usually about 15 days) before placing the nests in the field. When bees are incubated before being placed in the field, some water should be added to the incubator to provide humidity.

A serious chalcid wasp parasite (*Monodontomerus*) of the bee larvae can be controlled in the incubator by placing a light over a pan of water. The wasps emerge before the bees, fly to the light, and drown in the water. Whenever individual cells are incubated, chalcid control should be used to avoid re-infestation before the bees emerge.

To prevent bees from re-nesting in boxes with loose cells or in old nesting materials, the nests or cells should be placed in a tight box with a long screen cone attached to one side. When individual cells are placed in a shelter, the bees should be ready to emerge or else desiccation of the pupae may occur. If the bees are needed to pollinate first crop alfalfa, the shelters should be oriented to the south until shade temperatures reach about 90° F. After this time they should be oriented to the east or northeast.

**Moving Bees in the Field:** If the bees are moved after they begin nesting, they will return to their original location. However, if nothing but alfalfa remains, most of the bees will return to the recently moved shelter. This is particularly the case if the shelter is large and affords a conspicuous landmark. Several seed growers have successfully used large shelters mounted on trailers which can be moved to areas needing additional pollination. It is important in this case that there be nothing in the vicinity of the old location to which the bees can orient.



**Protecting Bees from Scavenger Beetles:** A species of grain beetle (*Tribolium madens*) and several species of carpet beetles (*Trogoderma*) infest leaf-cutter nests. These can be baited from the nests and killed with DDT-treated pollen pellets taken from pollen traps on honey bee hives. The pellets can be placed under the nesting materials where the bees cannot contact them or in shallow grooves or corrugated cardboard flutes too narrow for the bees to enter. This method of control is successful during incubation or nesting and also during cold storage if the temperature is above 40° F. Studies in Alberta indicate that carpet beetles can also be controlled during incubation by using the method described earlier for chalcid wasp control.

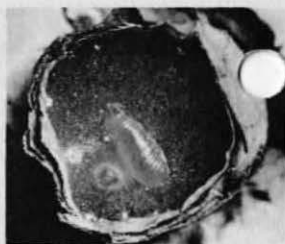
**Protection of Bees from Insecticides:** Leaf-cutting bees are more susceptible than honey bees to some of the long-residue hydrocarbon insecticides such as DDT and toxaphene. Such materials should not be applied to alfalfa after the early bud stage on fields where these bees are used. Dylox used at one pound or less of actual toxicant per acre can be applied to the bloom in the evening or early morning with little danger to adult bees. A demeton (Systox)-Dylox control program is relatively safe during bloom when applied at the proper time of day, and it usually takes care of both aphids and lygus bugs. Phosdrin can be used with relative safety if it is applied between the time the bees leave the field and 10 p.m. Later applications can result in extensive poisoning under some atmospheric conditions. Most of the other materials used for alfalfa insect control are quite hazardous to leaf-cutting bees and should not be used when these bees are important pollinators in the area.



# Life History Stages Of The Alfalfa Leaf-Cutting Bee



1. Egg on provisions



2. First instar larva



3. Second instar larva



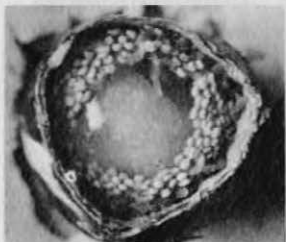
4. Third instar larva



5. Young fourth instar



6. Older fourth instar



7. Fourth instar defecating,  
starting to spin silk



8. Cocoon "nipple"  
surrounded by fecal pellets



9. Dark-eyed pupa