the early hours of the morning between 0300 and 0500 hours. Temperatures at this time are usually below 15°C and the bees are immobilized in their nesting tunnels. If handled carefully, nesting material can be moved with minimum damage to the bees. However, large bee losses can be anticipated if domiciles are moved at any time during the growing season because bees in northwestern Canada do not consistently return to their nesting tunnels at night. It has been speculated that the long days at higher latitudes encourage the bees to forage late into the day and sudden drops in temperature at this time paralyses the insect on the crop, away from its nesting tunnels. Attempts to recover a large number of bees from one field for transfer to another can be facilitated by the provision of unused nesting material for 1 to 2 weeks after the initial transfer of nesting material has been made to help collect the 'stragglers.'

(viii) Fall and winter management

The adult leafcutting bee population in field shelters gradually decreases by early to mid-August. By then, most of the nesting tunnels have been filled and capped with leaf cuttings. Nesting boxes are then ready to be brought indoors for the winter. The following schedule is recommended for the successful fall and winter management of leafcutting bees.

1. Nesting boxes should be stored at 18 to 20°C for six to eight weeks to allow the larva in each cell to complete its development, i.e., spin a cocoon or reach the diapause stage.
2. After about six weeks, select a few cells at random from each nesting box. Gently scrape the flat end of each cell and examine the exposed tissue. If the tissue is brown then development has been completed

the larvae has spun its cocoon. If this has occurred in a large percentage of cells, then the cells are ready to be removed or stripped from the nesting material.

3. A small percentage of cells, probably containing the earliest laid eggs may not go into diapause. Development will continue and a second generation of bees will be produced in late August. This second generation hatch can be kept to a minimum by bringing nesting boxes indoors when most of the nesting tunnels are filled. Second generation bees will stop developing and will die when the storage temperature is lowered.
4. Strip cells from nesting boards. Ensure that cells are not crushed or damaged with mechanical strippers.
5. Tumble cells thoroughly and remove excess leaf debris. Often, insects like the checkered flower beetle are present in the leaf material and can be removed during tumbling. Ensure that most of the cells are broken up individually. Empty cells are light and a large percentage can be removed during tumbling.
6. Cells should be tumbled outdoors or in a building with adequate ventilation. It is recommended that the operator(s) use face masks as an added protection against dust and mold spores that are released into the air during the process of tumbling cells.
7. Cells should be placed in containers and stored at 5°C. Seal containers adequately to ensure that cells do not absorb moisture. Check cells periodically during storage period.
8. Cells can be sampled for quality after 10 to 12 weeks of storage at

5°C.

9. In the spring, cells are incubated at 30°C and the emergence of leaf cutting bees is timed to coincide with bloom of the alfalfa crop.

An annual routine for managing leafcutting bees

The following is a suggested annual routine for managing leafcutting bees in a majority of the forage legume seed growing areas of northwest Canada. The suggested time frame represents an average value for most areas.

No.	Job to be accomplished	Approximate time schedule
1.	Obtaining leafcutting bee cells	November of previous year to March of the year that cells will be used.
2.	Disinfecting nesting hives and assemblying nesting material	April-May
3.	(See Section 5(8) for methods of disinfection). Selecting suitable fields for pollination	April-June
4.	Mowing pathways to shelters	Mid to late June
5.	Spraying crop for harmful insects	June
6.	Preparing cells for incubation	May - early June

No.	Job to be accomplished	Approximate time schedule
7.	Setting up shelters	June - after crop spraying completed
8.	Incubating cells	June
9.	Take bees out to field	July
10.	Remove incubation trays from field	By last week in July
11.	Remove nesting material from field	Nesting boxes should be brought indoors after 75 percent of the tunnels in each box have been filled All nesting material should be brought indoor by late August - early September
12.	Remove shelters from field	Mid to late September

No.	Job to be accomplished	Approximate time schedule
13.	Store nesting material indoors until cells are ready to be removed from nesting tunnels	August to early October
14.	Removal of cells or stripping from nesting material	October - November
15.	Tumbling cells	November prior to storage
16.	Overwinter storage at 5°C	November - June
17.	Cell quality test	December - March
18.	Repair/disinfection of shelters and hives	October - December
19.	(See Section 5(B) for methods of disinfection).	
	Storage of shelters and hives	After 18 above is complete December - May

5. DISEASES AND PARASITES AND PREDATORS OF THE LEAFCUTTING BEE

A number of investigations have dealt with chalkbrood - perhaps the predominantly studied disease of the bee at this point in time. Chalkbrood can result in heavy bee losses in a relatively short period of time. This disease is prevalent in some of the alfalfa seed producing regions in the western U.S. and, more recently, has been recorded in some provinces inwestern Canada. The cause and symptoms of chalkbrood and measures for controlling or possibly eradicating this disease are detailed below.

(1) Chalkbrood - the disease and causative agent

Chalkbrood is a fungal disease of the larva of the leafcutting bee. The fungus Ascosphaera aggregata has been identified as the causative agent. The chalkbrood disease of honey bee larvae is caused by a different species of fungus which does not cause disease in the leafcutting bee. Other species of Ascophaera are commonly found in leafcutting bee cells, usually growing on pollen stores. These other species do not appear to be pathogenic to the bee.

(2) The spread of chalkbrood

Chalkbrood is spread through the spores of the fungus. These spores can survive and remain infective for many years. They can be introduced into an area with contaminated equipment or nesting material or by infected leafcutting bee cells and leaf material.

(3) The symptoms of a chalkbrood-infected larva

Infected larvae shrink and harden. The interior of the larvae turns chalk-white from the growth of the fungus and the outer surface becomes