



**On Pollinators & Their
Conservation:
History, International Context
and Canada's Role**

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Pollination & Pollinator Shortages



- **Since the dawn of agriculture**
 - Figs
 - Dates
- **Recent examples**
 - Red clover in New Zealand
 - Oil palm in Malaysia
 - Alfalfa in western Canada

Pollination & Pollinator Shortages



- **Pesticides**
- **Habitat Destruction**
- **Habitat Loss**
- **Habitat Fragmentation**
- **Diseases & Parasites**

Pollination & Pollinator Shortages: Canadian Stories - Alfalfa

- **Alfalfa in the Canadian West**
- **F.W.L. Sladen (1918) advocated *Megachile* spp. for pollination**
- **To the 1940s, system seemed effective (Salt 1940)**
- **High productivity of alfalfa seed leads to expansion of fields**
- **By 1950s, problems!**

Pollination & Pollinator Shortages: Canadian Stories - Alfalfa

- Huge alfalfa fields, no *Megachile* nesting habitat, except around edges
- Yields drop: 1000 to 15 kg/ha of seed (Stephen 1955)
- Solution

Pollination & Pollinator Shortages: Canadian Stories - Alfalfa

- **Alfalfa leafcutting
bee husbandry**
- **G Hobbs,
Lethbridge, AB
(perfected by mid
1960s)**



Pollination & Pollinator Shortages: Canadian Stories – Apple

- **Apple in the Canadian East**
- **Native bees (many species) were effective (Macoun 1923, 1924)**
- **Insecticides became problematic, studies by W.H. Brittain and team (1928-1932) in Annapolis Valley, NS**
- **Solution**

Pollination & Pollinator Shortages: Canadian Stories – Apple

- **Honeybee husbandry**
- **Hive-mounted pollen dispensers**
- **Changes in pesticide application policies and legislation (Bees Acts across Canada, Ontario 1887)**
- **Bee breeding**

Pollination & Pollinator Shortages: Canadian Stories – Honeybees

- **Beekeeping in Canada**
- **First records: Quebec, 1820s; Ontario, 1830s**
- **Industrial growth for honey and other hive products**
- **1891 = 145,000 colonies for 3.4 million lbs of honey in Ontario**

Pollination & Pollinator Shortages: Canadian Stories – Honeybees

- **Problems**
 - Pesticides
 - Diseases
 - Parasites
- **Solutions**



Pollination & Pollinator Shortages: Canadian Stories – Honeybees

- **Pesticides**
 - legislation, product labeling, use reduction
- **Diseases**
 - sanitation (Foul Brood Act 1889, 1906)
 - bee breeding for resistance
- **Parasites**
 - tracheal mite resistance (1980 on)
 - Varroa mite resistance (1990s)

Pollination & Pollinator Shortages: Canadian Stories – Greenhouse Tomatoes

- **Still air**
- **Hand pollination**
 - Labour costs \$\$\$
 - Reliability
 - Timing
- **Solution**



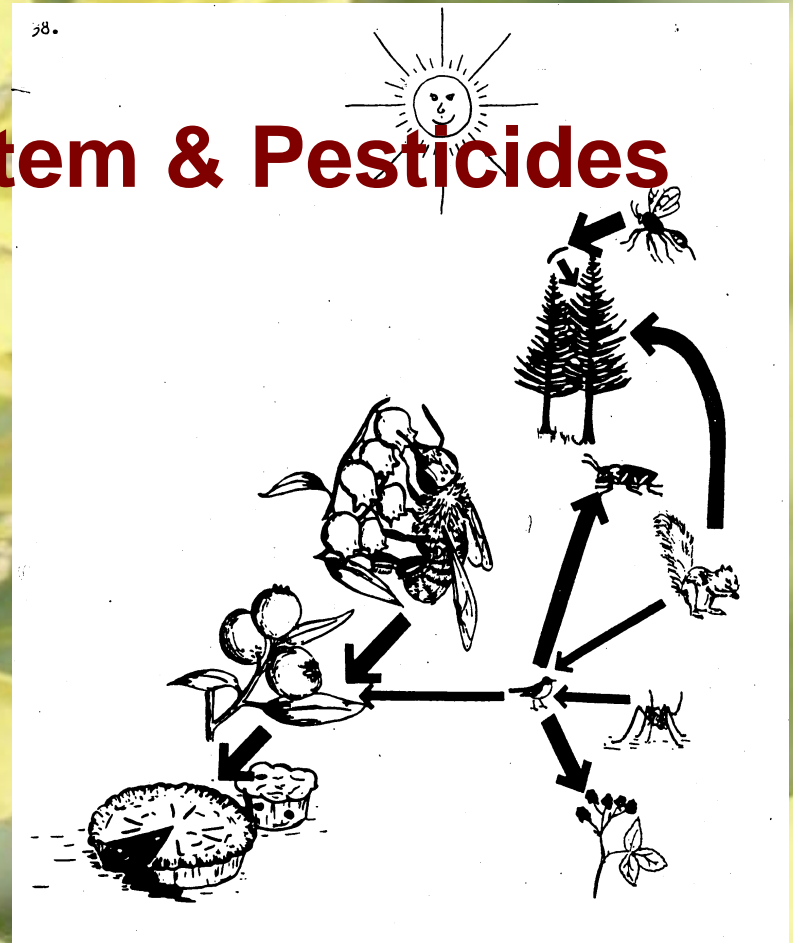
Pollination & Pollinator Shortages: Canadian Stories – Greenhouse Tomatoes

- **Bumblebee culture**
- **Plowright and Jay 1966**
Kevan *et al* 1991
Dogterom 1998
Morandin *et al* 2001-02
Winston team 2003-04



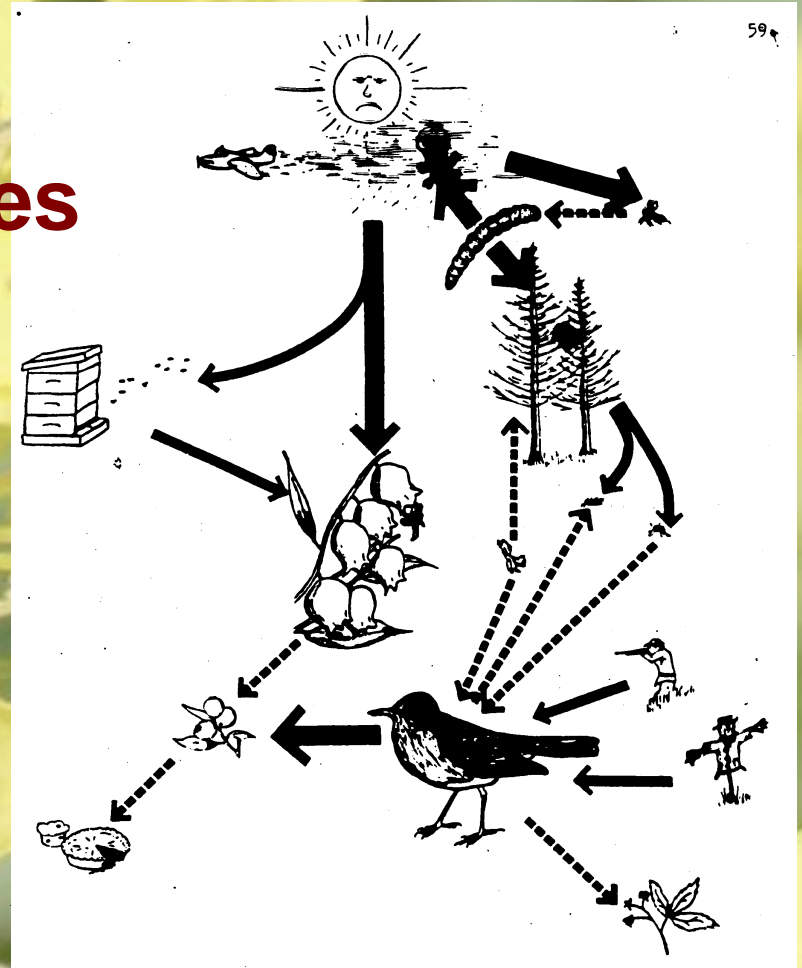
Pollination & Pollinator Shortages: Canadian Stories – Blueberries & the Forest

- **Problem: pesticides**
- **Blueberry Pie Ecosystem & Pesticides**
– Before Fenitrothion



Pollination & Pollinator Shortages: Canadian Stories – Blueberries & the Forest

- **Blueberry Pie
Ecosystem & Pesticides**
– During Fenitrothion
- **This example: New
Brunswick**
- **Other similar examples:
Quebec, Ontario**



Pollination & Pollinator Shortages: Canadian Stories – Blueberries & the Forest

- **Solutions**

- Litigation
- Restraining orders
- More science

- Other pesticides
- Other pollinators
- Other plants
- Other places

**Disrupted ecosystem
function**

**Reduced pollinator
diversity and abundance**

Reduced fruit / seed set

Pollination & Pollinator Shortages: Canadian Stories – The Forest

- **Solution**

- Tighter control on forest pesticide use
- More emphasis on biocontrol
- Recognition of pollinators in forest ecosystem function

New Brunswick blueberry story was the start of a major trend in pollinator conservation worldwide

Initiatives on Pollination & Pollinator Shortages: Canada at the Forefront

- **NRCCanada (1981) Pesticide Pollinator Interactions**
- **AgCanada (1989) National Workshop, Winnipeg**
- **ESC (1997) Pollinators & Mother Earth**
- **Canadian participation in International & US meetings (1992, 1995-1999, 1998-2006)**
- **Review of Canadian Legislation (Thomas)**
- **US NRC (2007) *Status of Pollinators in North America***