

Literature Cited, Important Notes and Comments to go with
COABC Webinar *What Happens When Honey Bees Disappear*
Prepared by T.G. (Ted) Leischner, Feb 24th, 2010

Important Context

Comment: Bee decline is happening as part of an unprecedented rate of species extinctions worldwide with an all time low in capacity of our planet to provide ecosystem services for life support plus the climate/global change stuff. Pollination is just one of these ecosystem services being impacted by human development essential for life support. However there is much we can do to reverse this situation.

UNEP. 2005. Millennium Ecosystem Assessment Reports.

<http://www.millenniumassessment.org/en/Index.aspx> and the

2009 Intergovernmental Platform on Biodiversity and Ecosystem Services www.ipbes.net

Marris, Gay et al., G. Jones, P. Mwebaze, S. Potts, T. Breeze. Quantifying the value of ecosystem services: A Case Study of Bee Pollination in the UK. The Food and Environment Research Agency, UK (**includes cost of hand pollination in Sichuan Provenance, China**).

<http://www.apimondia.org/2009/pollination/symposia/Evaluating%20the%20role%20of%20pollinating%20honeybees%20in%20UK%20Apple%20Orchards%20-%20MARRIS%20Gay.pdf>

Documentation for Bee Pollinator Decline, Impacts and Recommendations

Buchmann, S. L. and G.P. Nabhan 1996. The Forgotten Pollinators. Island Press. California, USA 292 pages.

National Research Council of the National Academies. 2006. Status of Pollinators in North America. National Academies Press, Washington, D.C. **KEY REFERENCE**

http://books.nap.edu/catalog.php?record_id=11761

Canadian Pollination Initiative (CANPOLIN) website <http://uoguelph.ca/canpolin/index.html>

Kevan, P. New Research Network to Shed Light on Pollinator Decline. Hivelights. Canadian Honey Council. November 2009

<http://www.uoguelph.ca/canpolin/Publications/Hive%20Lights%20Nov%202009%20CANPOLIN>.

North American Pollinators Protection Campaign Website www.nappc.org

Also see the websites of:

Dr. Laurence Packer www.yorku.ca/bugsrus/

Dr. Elizabeth Elle www.sfu.ca/biology/faculty/elle/

Some Cascading Effects of Bee Decline on Plant Populations

Biesmeijer, J. C., Robert S. P. M., Reemer M., Ohlemüller R., Edwards M., Peeters T., Schaffers A.P., Potts S.G., Kleukers R., Thomas C.D., Setele J., Kunin W. E., 2006. Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands. *Science*, 313: 351-354.

Fontaine, C., Dajoz I., Meriguet J., Lore au M., 2006. Functional diversity of plant-pollinator interaction webs enhances the persistence of plant communities. *PLoS Biol.* 4:e1, <http://biology.plosjournals.org/perlserv/?request=getdocument&doi=10.1371%2Fjournal.pbio.0040001>

For more information on global change, bee and plant genetics please contact Dr. Elizabeth Elle, Simon Fraser University.

Naming 500 species of Native Bees

Comment: University of York, ON / CANPOLIN bee collections last season revealed that BC is a bee species hotspot for Canada and the South Okanagan Similkameen, not surprisingly is a global hot spot for bee pollinator species including specialist pollinators of the native flowers living here. Lincoln Best, Grad Student, Univ. York, Toronto, Pers. Communication. Barcoding bees revealed 500 species of bees in BC with almost half of these living in the South Okanagan Similkameen.

See Packer, L., Gibbs, J., Sheffield, C. and P. Kevan. 2008. Barcoding the Bees of the World. In *Anais do VIII o Encontro sobre Abelhas, Ribeirão Preto - SP, Brazil*, p. 276. [\(PDF\)](#)

Rogers, Theresa. 2009. The Beekeeper. *Lab Business Magazine*.

<http://www.labbusinessmag.com/articles/spring09beekeeper/spring09beekeeper.html>

Comment: Dr Laurence Packer was featured in the CBC-TV Documentary, *To Bee or Not to Bee*. See CANPOLIN website for link.

Note: Of the 500 species of native bees in BC, **70% are ground nesters**, 20% are cavity nesters and 10% are bumble bees.

What Do Native Bees look like?

Announcement: In June 2010 Bee Barcoding Dr. Laurence Packer's grad student, Lincoln Best will have a photo Field Guide to the Native Bees of the Okanagan Similkameen ready for distribution

Examples of images from Dr. Packer's lab team:

Bee Trading Card Gallery. <http://resonatingbodies.wordpress.com/art/bumble-domicile/tradingcards/gallery-2/>

David Suzuki Foundation. Excerpt from *A Guide to Toronto's Pollinators*. 35 pages of color photos. http://www.davidsuzuki.org/files/SWAG/Species/Pollinator_Guide_Spg.pdf

Native Pollinator Identification

BugGuide website - Identification, Images, & Information for Insects, Spiders & Their Kin For the United States & Canada <http://bugguide.net/node/view/15740>

Discovery Life Website <http://www.discoverlife.org/mp/20q?search=Apoidea>

Technology to Raise Native Bees Commercially

Important comment: Researchers on bee decline make it clear that the solution to bee decline is not going to be just substituting the honey bees with another species of bee. To retain pollination services from bees we will need an integrated strategy quite a bit more complex than we are used to or want. First we need to remove environmental and nutritional stress on honey bees by providing more forage. We also must begin to raise alternative pollinators e.g. *Osmia* species commercially but these require more management than honey bees. In addition to this we need to also seriously implement native bee pollinator habitat protection and enhancement over entire farms and communities for our 500 species of native bees in BC to thrive. This means we need to learn about native bees.

Orchard Mason Bee Suppliers for Bee and Nest blocks and Books etc

USDA Non-Apis [i.e. native bee] Bee Laboratory, Logan, UT
http://www.ars.usda.gov/Main/site_main.htm?modecode=54-28-05-00

Bosch, J. and W. Kemp. 2001 [How to Manage the Blue Orchard Bee: As an Orchard Pollinator](#), Sustainable Agriculture Network, 98 pages.

BeeDiverse website (Margriet Dogterom PhD, Coquitlam, BC) www.beediverse.com
Dogterom, M. 2002. Pollination with Mason Bees. BeeDiverse Books, Coquitlam, BC
79 pages.

Mason Bee Homes <http://www.masonbeehomes.com/>

Knox Cellars Native Pollinators www.knoxcellars.com

Pollinator Paradise Website (Karen Strickler PhD, UT) <http://www.pollinatorparadise.com/>

Bumble Bee Nest Boxes

Comment: Next to the honey bee as far as long distance generalist pollinator bees are concerned, are our bumble bees. They have huge potential to fill in for honey bees and but they too are declining so need urgent care. They live in abandoned rodent and birds nests, dry base of a tussock of grass or untidy hedge bottom. We need to replace the urge to be tidy with pride in having provided a place for bumble bees to live.

General Information on BB nest boxes <http://www.bumblebee.org/nestboxes.htm>

Coffee Cans for Bumble Bees <http://crawford.tardigrade.net/bugs/BugofMonth36.html>

Cheshire Bumble Bee Box <http://www.cheshire-bka.co.uk/Articles/BumblebeeNests.php>

Tom Clothier Website <http://tomclothier.hort.net/page38.html>

Comment: Invasive or “spill over” diseases of bumble bees are deadly and have caused species extinction e.g. Western Bumble Bee in California. Please pay attention to hygiene in your bumble bee boxes to halt the spread of these diseases. See above websites.

Bee Conservation Technology – What We Need To Do

Xerces Society – Pollinator Conservation program website.

http://www.xerces.org/Pollinator_Insect_Conservation/overview

See <http://www.xerces.org/pollinator-conservation-agriculture/>

Comment: Very user interactive and practical

Xerces Society and The Bee Works. Pollination Conservation Handbook – A Guide to Understanding, Protecting And Providing habitat for Native Pollinator Insects.

<http://www.xerces.org/Pollinator%20Pages.pdf>

Vaugh, M., M. Shepherd, C. Kremen, and S.H. Black. 2007. Farming for Bees – Guidelines for Providing Native Bee Habitat on Farms. Xerces Society for Invertebrate Conservation. Portland, Download from http://www.xerces.org/wp-content/uploads/2008/10/farming_for_bees.pdf

Shepherd, M., M.Vaugh, and S.H. Black. 2008. Pollinator Friendly Parks – How to Enhance Parks, Gardens, and Other Green Spaces for native Pollinator Insects. Xerces Society for Invertebrate Conservation. Portland, OR. Download from <http://www.xerces.org/parks-and-golf-courses/>

Plant Species for Bees

I am currently lining up sources and suppliers etc to provide commercial quantities of seeds and plant for bees. Objective: Adequate area of a high diversity of plant species blooming from spring thru summer to fall along roadsides, hedgerows, fencelines, streamsides, alley ways and vacant lots. We have met the target when like in the “old days” you can see **acres** of these plants in your communities throughout the season. Very important to get our native plants back into our landscapes. We have much work to do.

New research from France clearly shows a direct link between immune competence in honey bee and plant diversity.

Alaux, C., F. Ducloz, D. Crauser and Y Le Conte. 2010. Diet effects on honeybee immunocompetence. Biology Letters, The Royal Society.

<http://rsbl.royalsocietypublishing.org/content/early/2010/01/18/rsbl.2009.0986.abstract>

This paper confirms what most beekeepers know as common knowledge. Since native bees share a common physiology is it probable that this is important for native bees as well.

Basic Annual Mix for Bees

Research seed mixes for bees contain the following common garden flowers and green manure: Lacey Phacelia, Buckwheat, Oil Seed Rape, Black Cumin, Coriander, Pot Marigold,

Bachelors Buttons (*Centuria cyanus*), Wild Mallow, *Malva sylvestris*, Dill, Borage, Legume forages (clovers, sweet clover, alfalfa, vetches, lupines, mint family)

Xerces Map to decide what Bee Plants you need for your region

<http://www.xerces.org/pollinator-resource-center/>

Comment: Note that it covers all of North America!

University of California (Berkeley). Gardening for Bees – Seasonal Recommended Plants

<http://nature.berkeley.edu/urbanbeegardens/list.html>

Comment: This is an excellent list showing which native bee visits what kind of flowers. Pay attention to this in your designs along with seasonality targets.

Phacelia tanacetifolia [Lacey Phacelia]: A brief overview of a potentially useful insectary plant and cover crop as part of a bee forage/green manure mix. Small Farm Success Project. Fact Sheet Number 2. www.smallfarmsuccess.com/Phacelia_farmer_version.pdf

Comment: Phacelia is an important component in commercial seed mixes researched to provide forage for bees over a season. It is a perfect bee plant. Ted is looking for demonstration site cooperators and seed growers

Suppliers of Native Plant Nurseries and Seed Suppliers in BC

<http://www.npsbc.org/Use/use.htm>

Durance, Eva. 2009. Cultivating the Wild – Gardening with Native Plants of British Columbia's Southern Interior and Eastern Washington. Nature Guides BC, Delta.

Workshops Under Construction: Native bees for Farm and Garden Pollination for the 21st Century. Contact Ted for more information.