## STONE ENVIRONMENTAL



#### Native Bees: Ecology, Distribution, and Declines

Leif Richardson Stone Environmental, Inc., Montpelier, VT leif@stone-env.com / @leifr7

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#### **Native bees**

- 1. Patterns of diversity and distribution in North America
- 2. Declines and conservation
- 3. Sensitive bee species and transportation infrastructure



#### **Native bees**

•20,000 species of bees (> 4,000 in North America)
•Crop pollinators, whether honey bees used or not
•Some: declines in diversity, abundance, range size



#### **Pollination is critical to agriculture**

88% of flowering plants are animal pollinated75% of crop plants benefit from pollinationPollination = 10% of total value of agriculture



#### Are bees in trouble?

- •Widespread reports of decline—and persistence
- •Trends hard to detect



**Parallel Declines in Pollinators and Insect-Pollinated Plants in** Britain and the Netherlands

J. C. Biesmeijer,<sup>1\*</sup> S. P. M. Roberts,<sup>2</sup> M. Reemer,<sup>3</sup> R. Ohlemüller,<sup>4</sup> M. Edwards,<sup>5</sup> T. Peeters,<sup>3</sup> A. P. Schaffers,<sup>7</sup> S. G. Potts,<sup>2</sup> R. Kleukers,<sup>3</sup> C. D. Thomas,<sup>4</sup> J. Settele,<sup>8</sup> W. E. Kumin<sup>4</sup>

Bees and Colory Collapse - NYTimes.com

Ehe New Hork Eimes http://nyti.ms/1yjqLQb

THE OPINION PAGES | OP-ED CONTRIBUTOR | NYT NOW

**Our Bees, Ourselves** Bees and Colony Collapse

By MARK WINSTON JULY 14, 2014

VANCOUVER, British Columbia - AROUND the world, honey are dving in huge numbers: About one-third of hives collapse pattern going back a decade. For bees and the plants they polli well as for beekeepers, farmers, honey lovers and everyone else appreciates this marvelous social insect - this is a catastrophe

#### Cell Global pollinator declines: trends. impacts and drivers Simon G. Potts<sup>1</sup>, Jacobus C. Biesmeijer<sup>2</sup>, Clair

Review



**Bee Die-Off Soars, Putting Crops at Risk** By MICHAEL WINES

A mysterious malady seems to have expanded drastically in the past year, wiping out as many as half of the beehives needed to pollinate much of America's produce.

#### Patterns of widespread decline in North American bumble bees

Sydney A. Cameron<sup>a,1</sup>, Jeffrey D. Lozier<sup>a</sup>, James P. Strange<sup>b</sup>, Jonathan B. Koch<sup>b,c</sup>, Nils Cordes<sup>a,2</sup>, Leellen F. Solter<sup>d</sup>, and Terry L. Griswold<sup>b</sup>

\*Department of Entomology and Institute for Genomic Biology, University of Illinois, Urbana, IL 61801; \*United States Department of Agriculture-Agricultural Research Service Pollinating Insects Research Unit, Utah State University, Logan, UT 8432; \*Department of Biology, Utah State University, Logan, UT 84321; and "Illinois Natural History Survey, Institute of Natural Resource Sustainability, University of Illinois, Champaign, IL 61801;

Edited\* by Gene E. Robinson, University of Illinois, Urbana, IL, and approved November 24, 2010 (received for review October 3, 2010)

hele bees (Bombus) are vitally important pollinators of wild study in the United States identified lower genetic diversity

Sam Droege, USFWS



#### **Bumble bee declines in Vermont**

#### •Changes in bumble bee species abundance, distribution



Relative abundance

#### **Transportation infrastructure**

•Road density correlated with bee species occurrence



Richardson et al. in review

#### Effect of landscape on bee occurrence



% of land cover

Richardson et al. in review

## Why are bees declining?

- •Habitat loss
- •Disease
- •Pesticides
- •Climate change

# Agriculture







## Monitoring for a rare bumble bee in transportation

•Rusty-patched bumble bee (*Bombus affinis*)

•Distribution: eastern North America, with many historical (gray) and few recent (green) observations



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#### **Rusty-patched bumble bee**

# Listed by USFWS as endangered in 2017 Management focus: "High Potential Zones" (yellow/red)



USFWS

#### **Rusty-Patched Bumble Bee: still found in MA?**



Tetra Tech; MDOT; Stone Environmental



#### **Rusty-Patched Bumble Bee: still found in MA?**



#### Results

- Rusty-patched bumble bee extirpated (?) from Massachusetts
- Declines of other species



Stone Environmental unpublished; photo: L. Richardson





#### Thank you

For more information / www.stone-env.com Contact / leif@stone-env.com