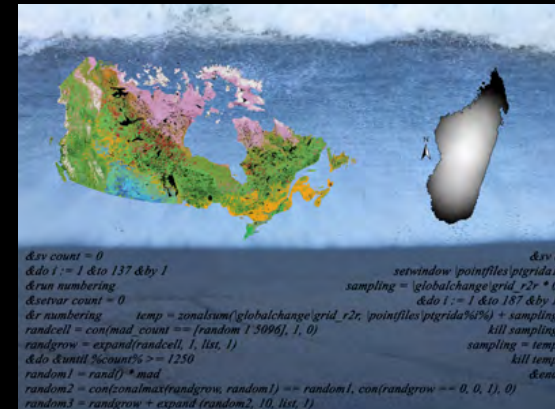


CANPOLIN VII Prediction

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Canadian Facility
for Ecoinformatics
Research



<http://www.macroecology.ca>

Key ingredients for WG 7 - Prediction

1. Observations of pollinator species
2. Environmental observation and geomatics data
3. Development of models predicting where pollinators should be given spatial and temporal environmental difference.
4. Tests of model effectiveness

Why? To determine where pollinators have been, how they responded to the last half century of climate change, and where they're going next.

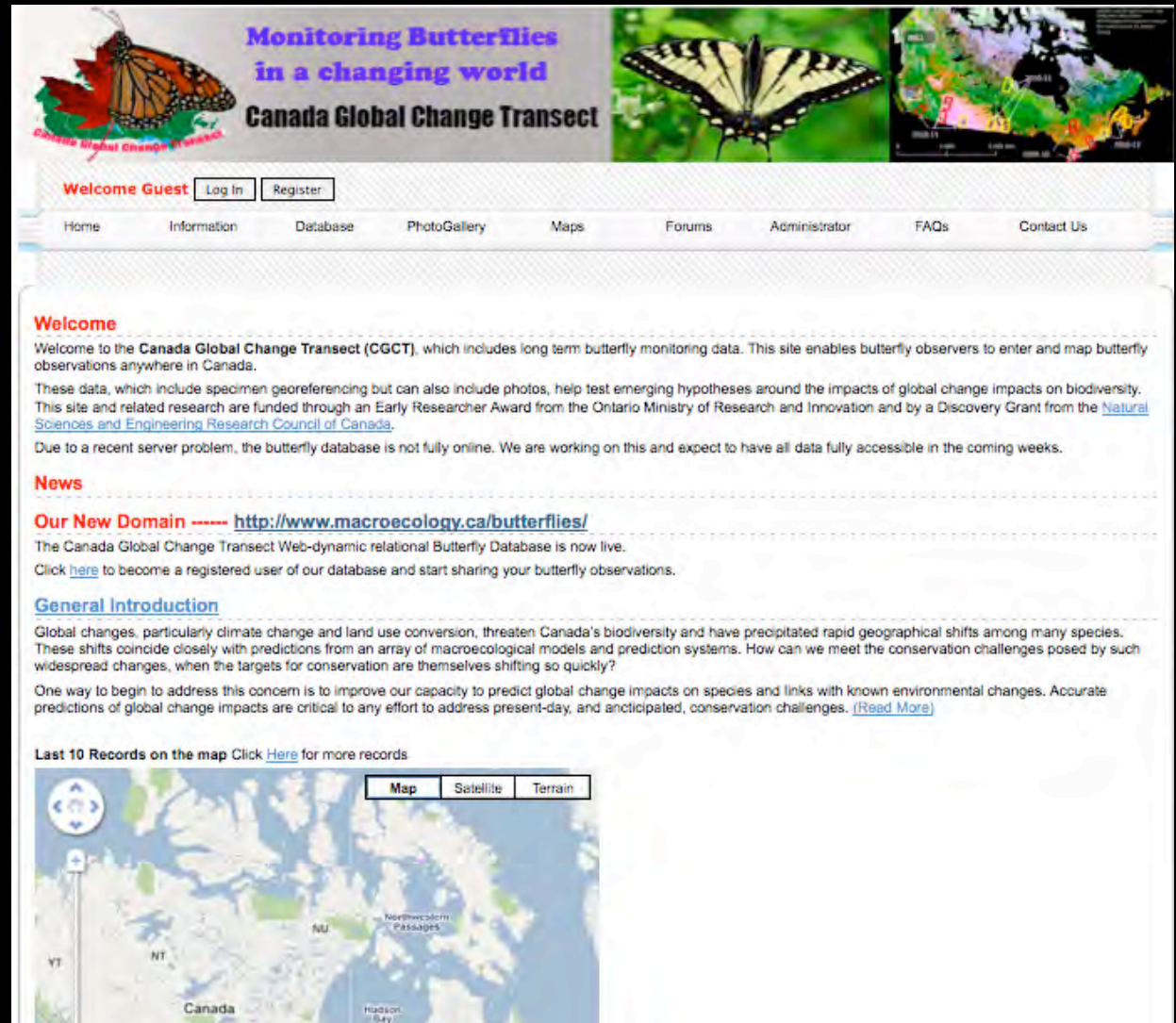
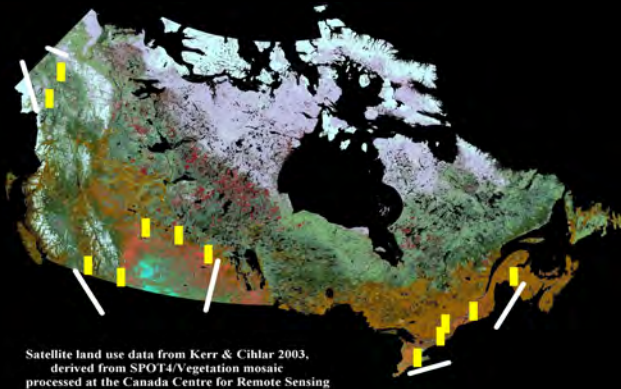
1. Pollinator observations

Large collections of pollinator observations are indispensable. These are increasingly available.

1. CANPOLIN databasing efforts (especially Laurence, Jeff, and Cory at WG1)
2. Existing and in-development online data access (GBIF, Canada Global Change Transect)
3. Partnerships with collection curators and observers (e.g. *Bombus* data)

1. Pollinator observations

<http://www.macroecology.ca/butterflies/>



Monitoring Butterflies in a changing world
Canada Global Change Transect

Welcome Guest

Home Information Database PhotoGallery Maps Forums Administrator FAQs Contact Us

Welcome

Welcome to the **Canada Global Change Transect (CGCT)**, which includes long term butterfly monitoring data. This site enables butterfly observers to enter and map butterfly observations anywhere in Canada.

These data, which include specimen georeferencing but can also include photos, help test emerging hypotheses around the impacts of global change impacts on biodiversity. This site and related research are funded through an Early Researcher Award from the Ontario Ministry of Research and Innovation and by a Discovery Grant from the [Natural Sciences and Engineering Research Council of Canada](#).

Due to a recent server problem, the butterfly database is not fully online. We are working on this and expect to have all data fully accessible in the coming weeks.

News

Our New Domain ----- <http://www.macroecology.ca/butterflies/>

The Canada Global Change Transect Web-dynamic relational Butterfly Database is now live.


Click [here](#) to become a registered user of our database and start sharing your butterfly observations.

General Introduction

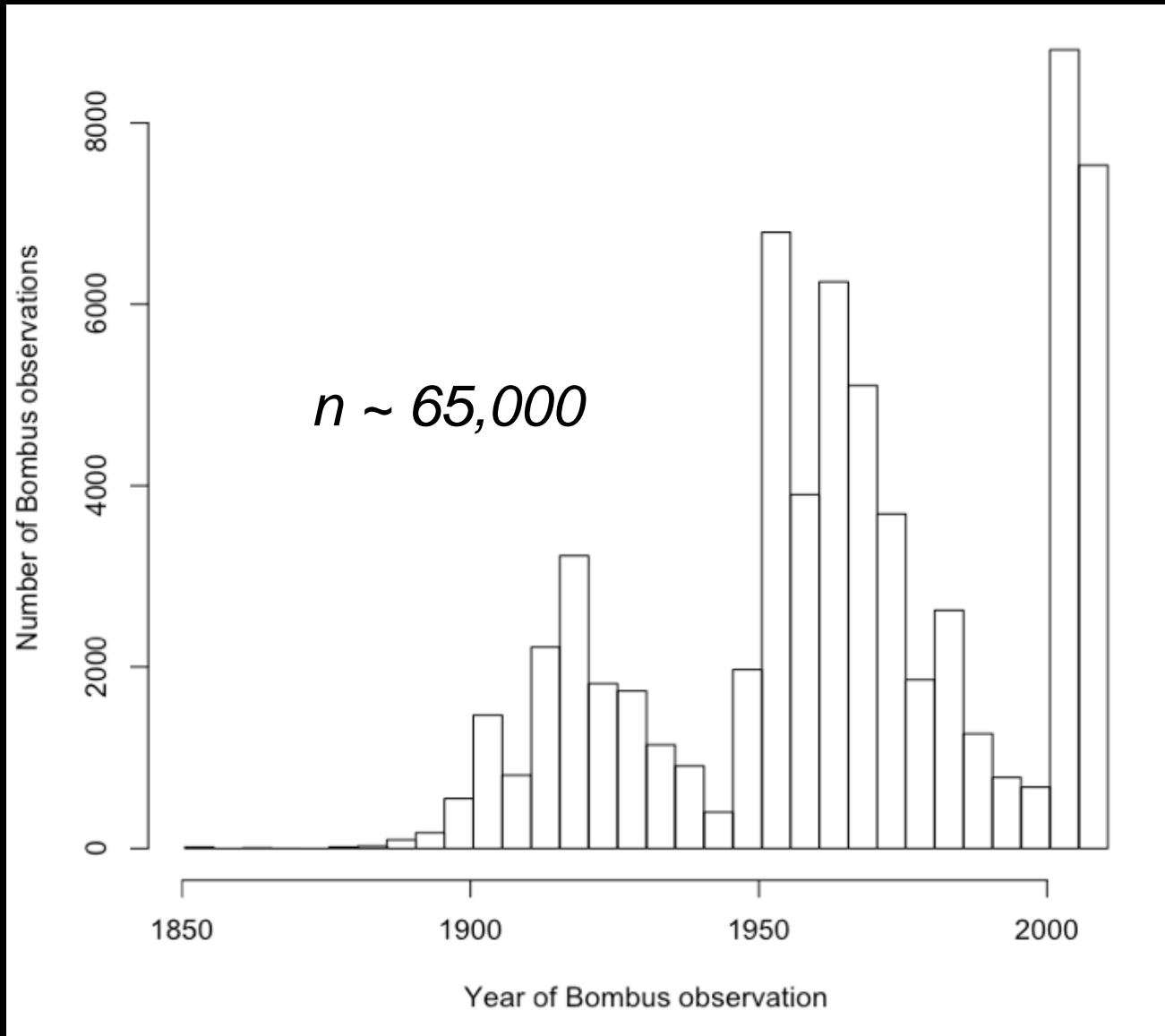
Global changes, particularly climate change and land use conversion, threaten Canada's biodiversity and have precipitated rapid geographical shifts among many species. These shifts coincide closely with predictions from an array of macroecological models and prediction systems. How can we meet the conservation challenges posed by such widespread changes, when the targets for conservation are themselves shifting so quickly?

One way to begin to address this concern is to improve our capacity to predict global change impacts on species and links with known environmental changes. Accurate predictions of global change impacts are critical to any effort to address present-day, and anticipated, conservation challenges. ([Read More](#))

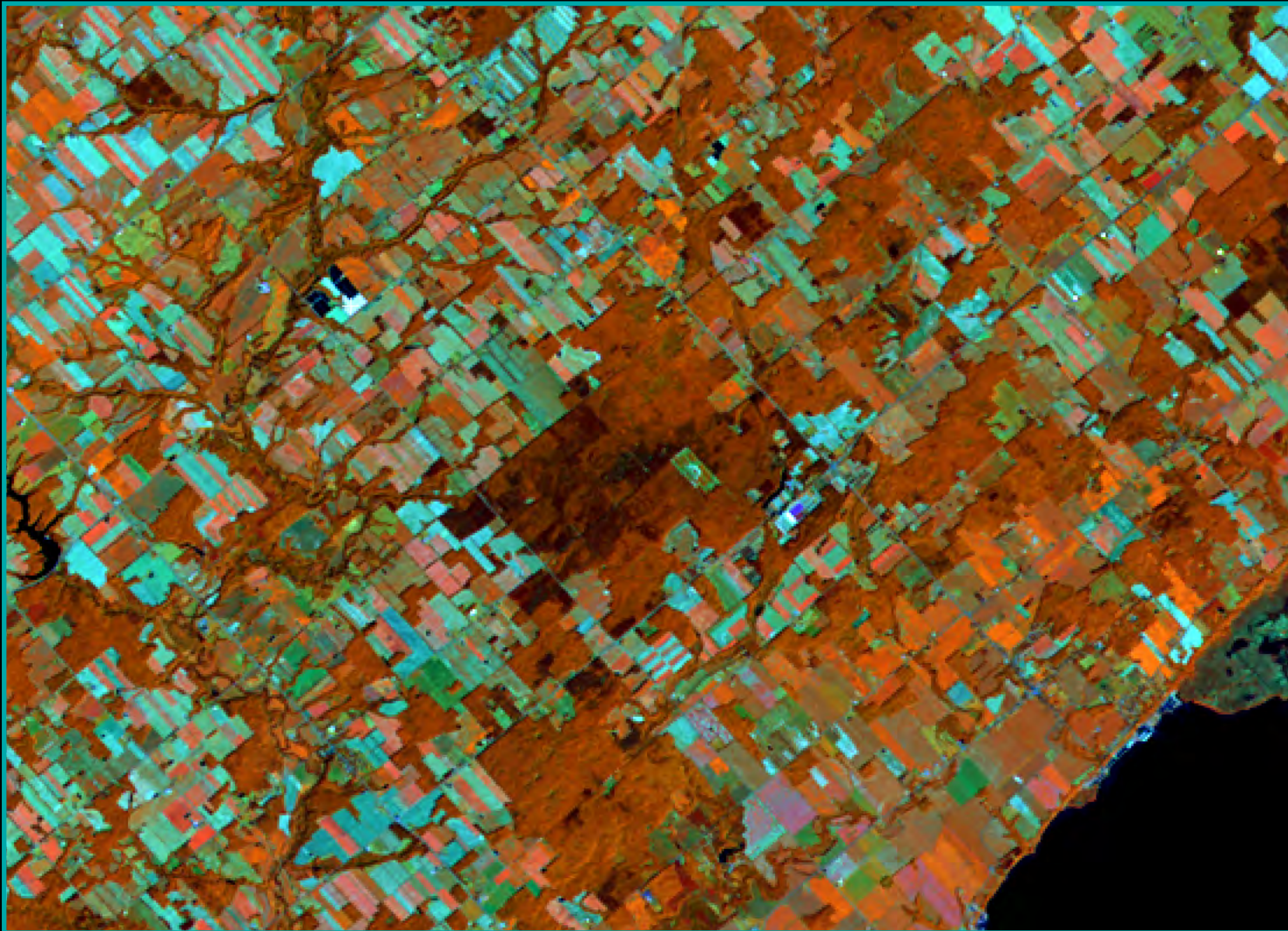
Last 10 Records on the map Click [Here](#) for more records



1. Pollinator observations



2. Environmental observations



Landsat imagery for the most intact remaining area in Carolinian Canada.

2. Environmental observations

Detection of land cover changes: forests to clearcut.

1990

2005



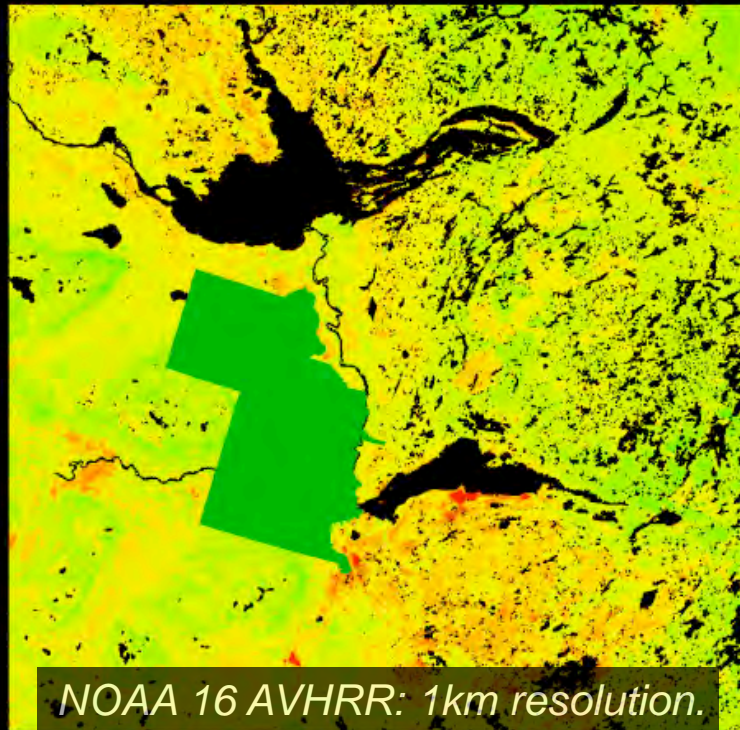
Landsat 5 Thematic Mapper. 30m resolution.

0 1 2 4 6 8 Km

Data courtesy of Rob Fraser, Ian Olthof, Darren Pouliot, Canada Centre for Remote Sensing

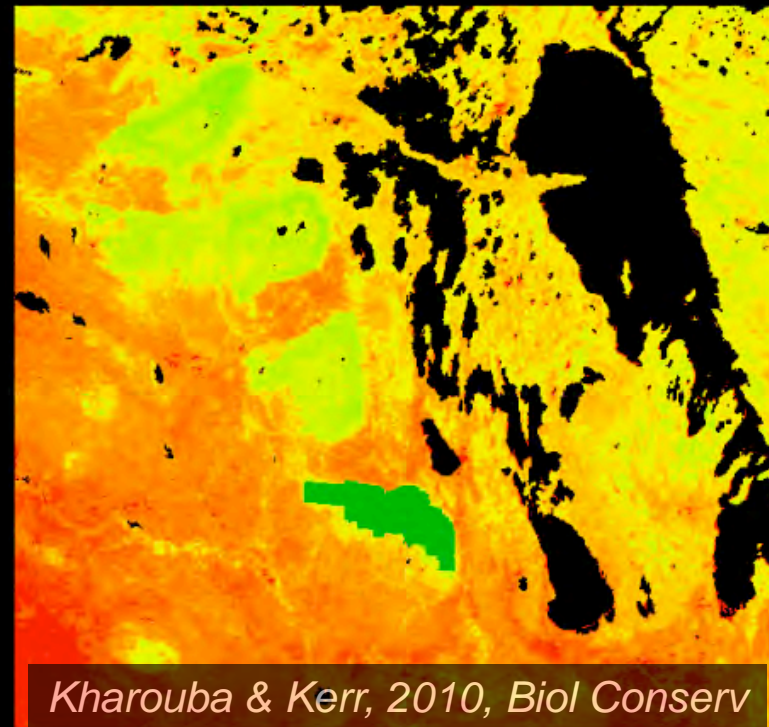
2. Environmental observations

Some measurements of deviations from "natural" are possible.



0 50 100 Kilometres

Wood Buffalo National Park



0 50 100 Kilometres

Riding Mountain National Park



2. Environmental observations

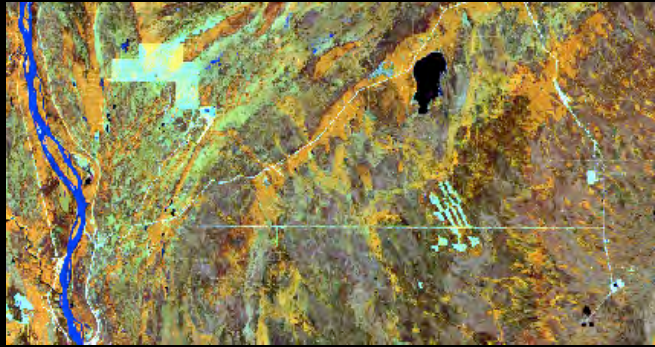
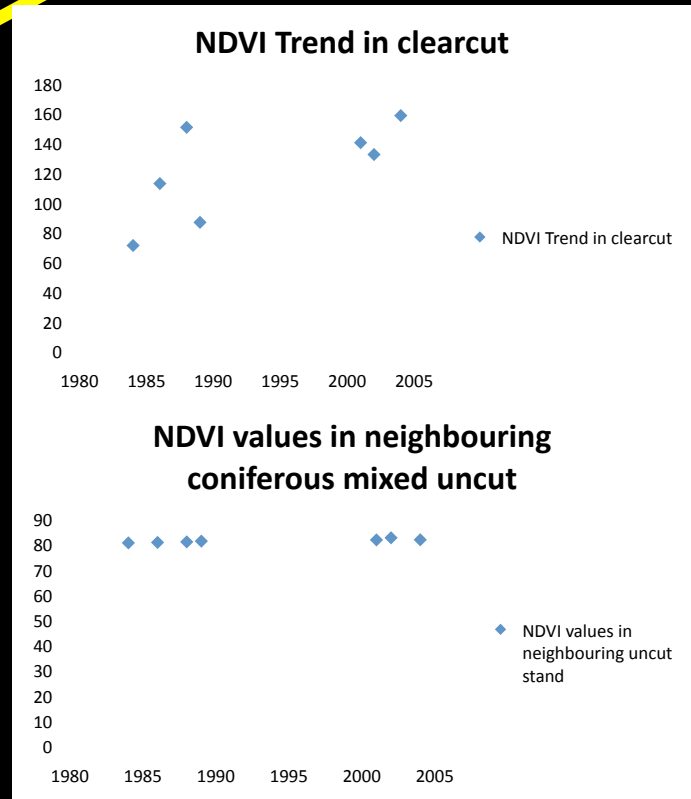
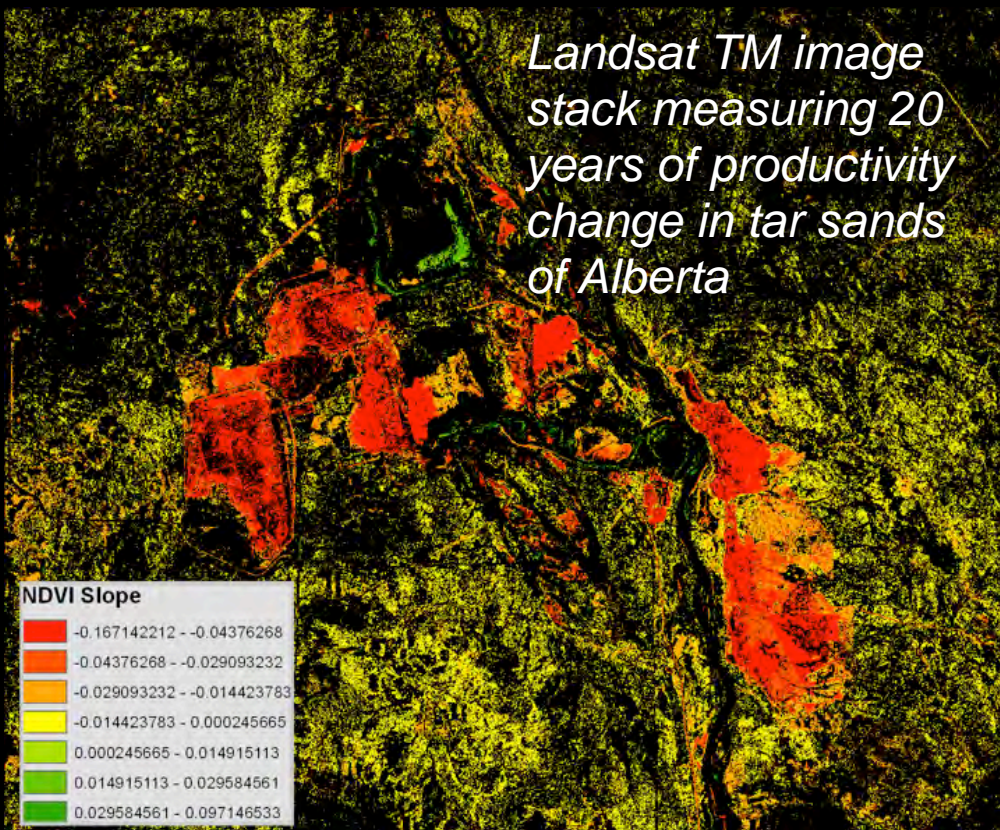


Image stack: each scene radiometrically normalized to TOA reflectance

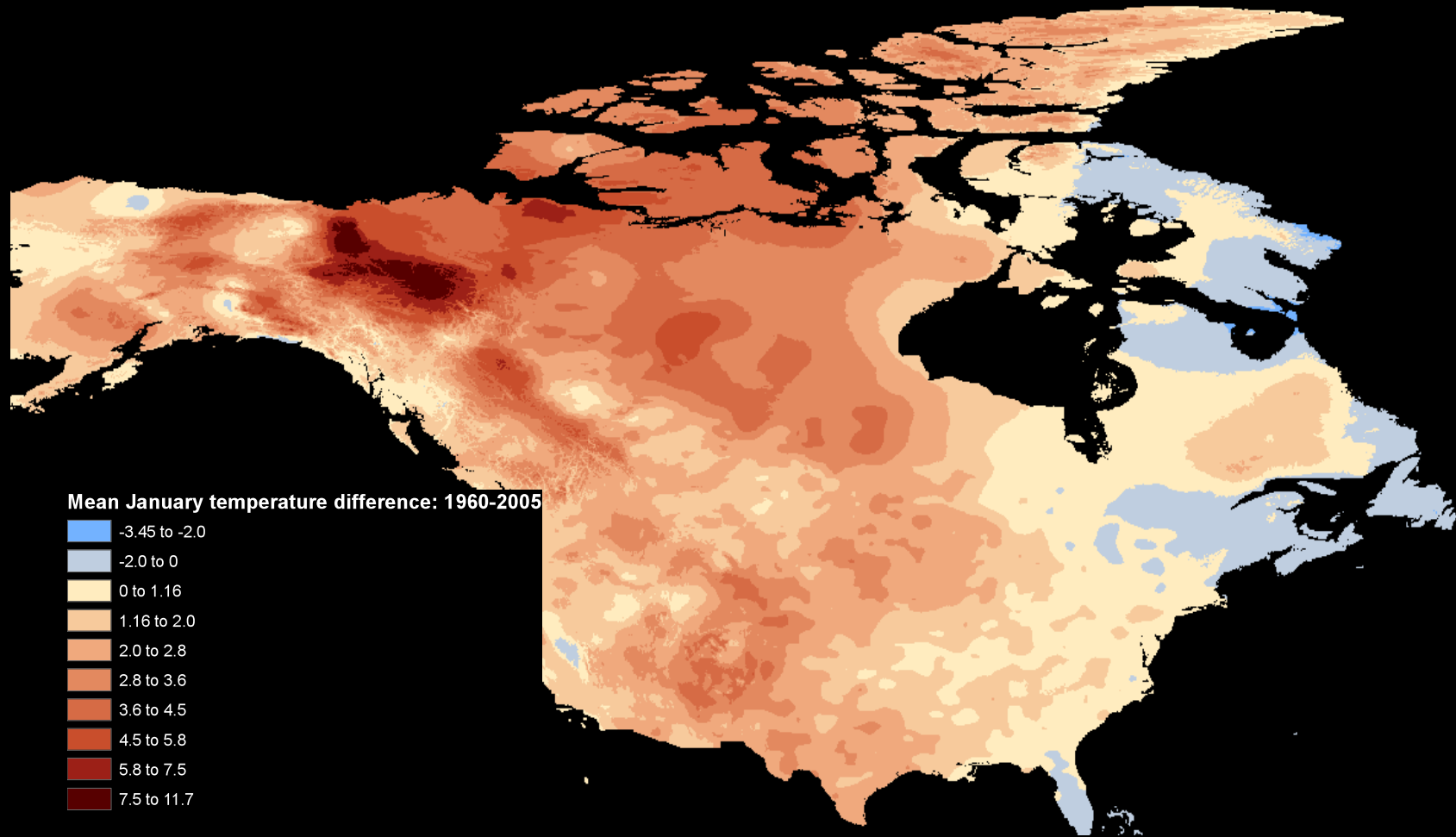
Cloud/haze masking.

TheilSen regression:

Landsat TM image stack measuring 20 years of productivity change in tar sands of Alberta



2. Environmental observations

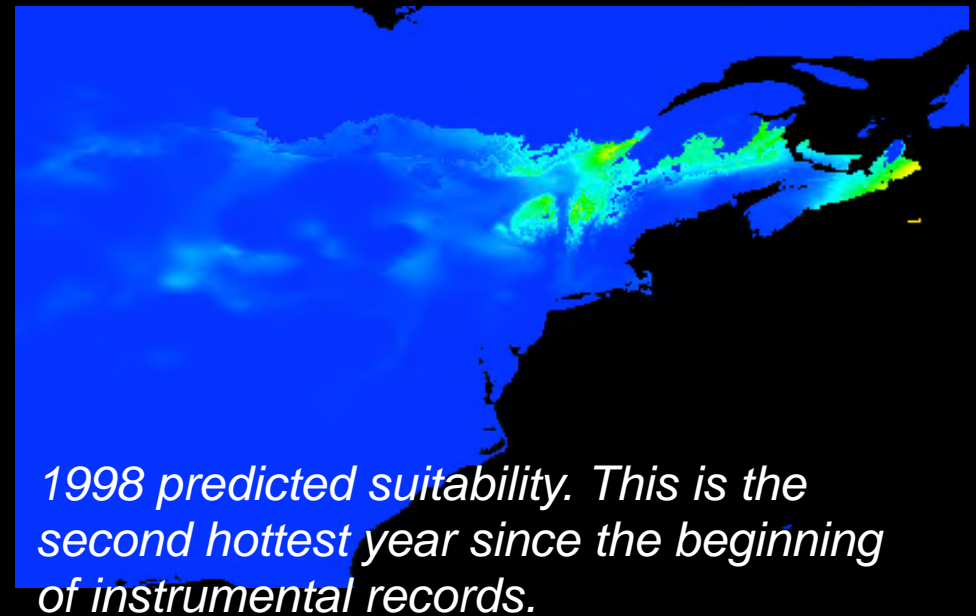
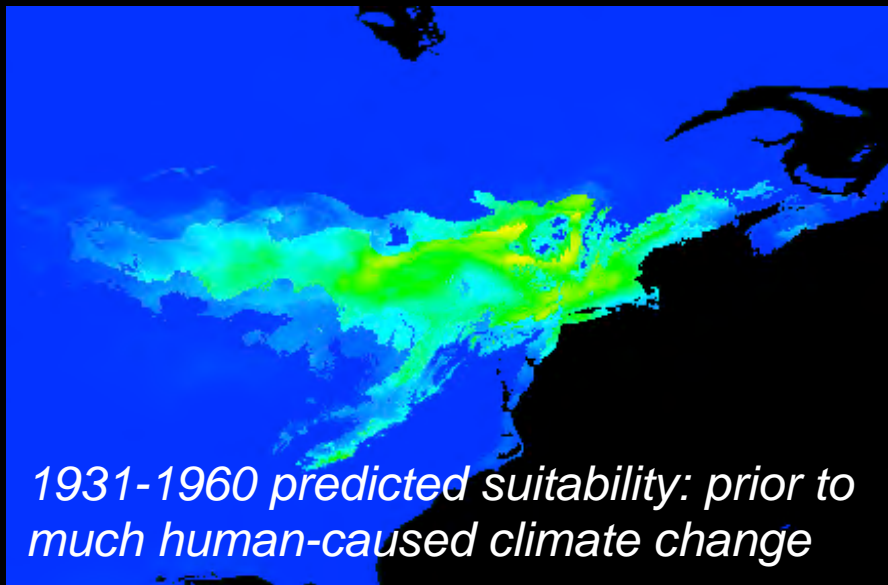


Climate data: *Difference in January temperature between 1961-1965 and 2000-2005. Warming nearly everywhere, dramatically in some areas.*

3. Models

- Maximum Entropy
- Accuracy
- Hindcasting/Forecasting

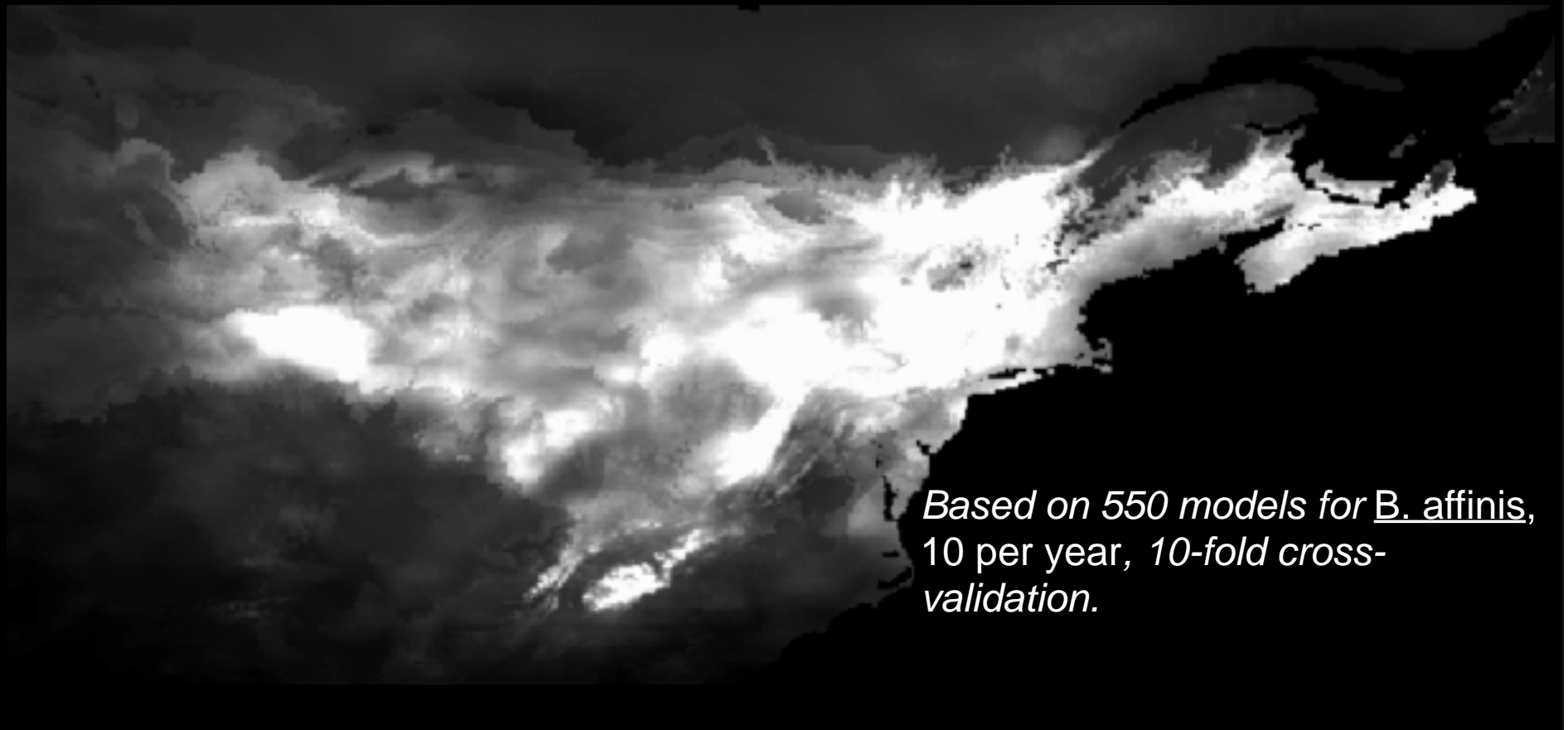
Bombus affinis: a species in precipitous decline.



3. Models

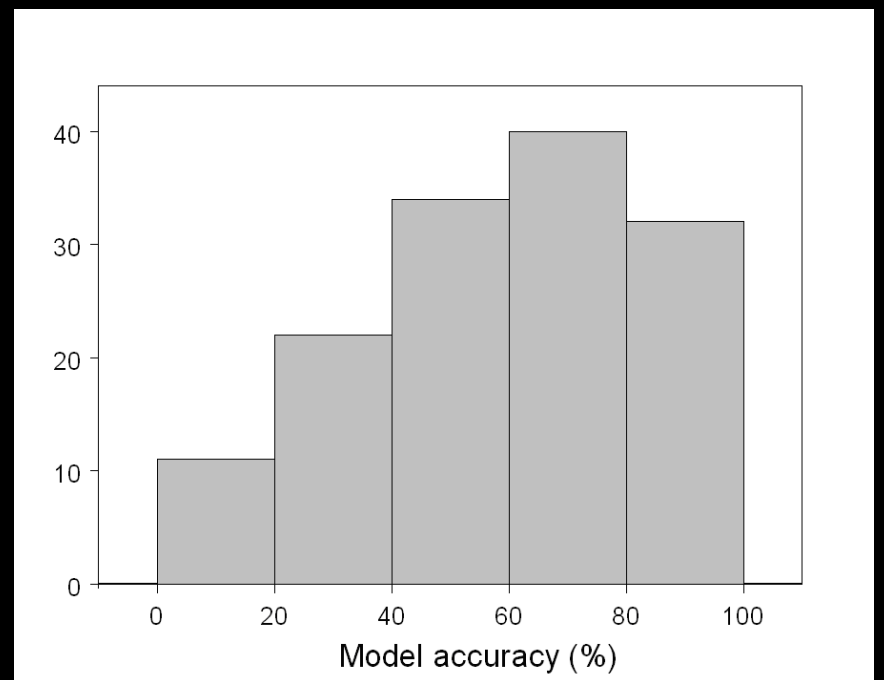
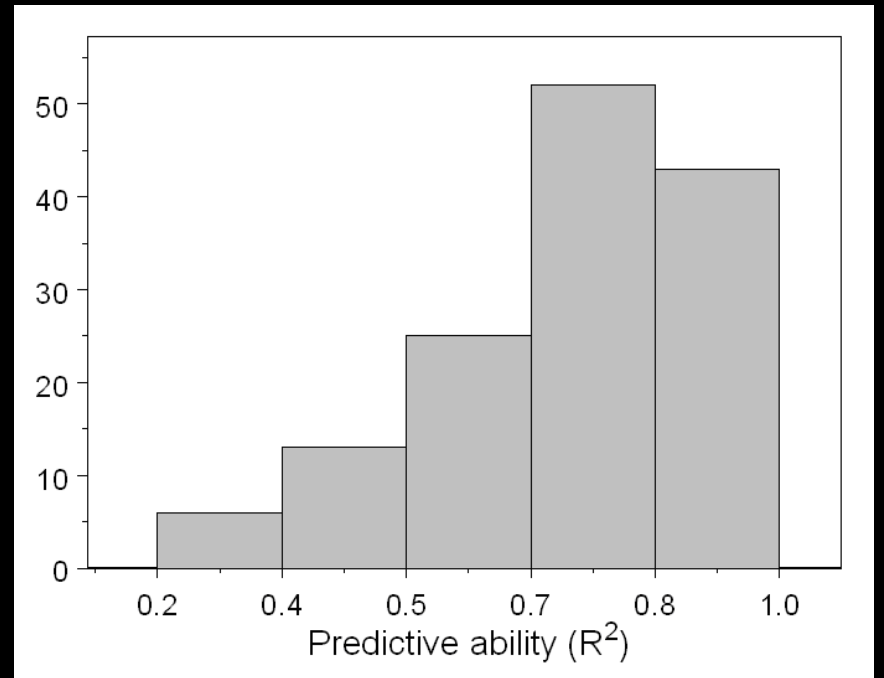
Models for B. affinis suggest rapid, climate-driven fluctuations in habitat suitability from 1960 to 2006.

Map of variance in predicted suitability.



*Based on 550 models for B. affinis,
10 per year, 10-fold cross-
validation.*

- Predictive ability of projections are good through the 20th century.
 - Models of some species become unreliable through time.
 - We can predict geographical responses to climate & land use change.
- Models for some species were very accurate and could allow prediction of climate change impacts on species' range.
- Predictions for single species have variable accuracy.



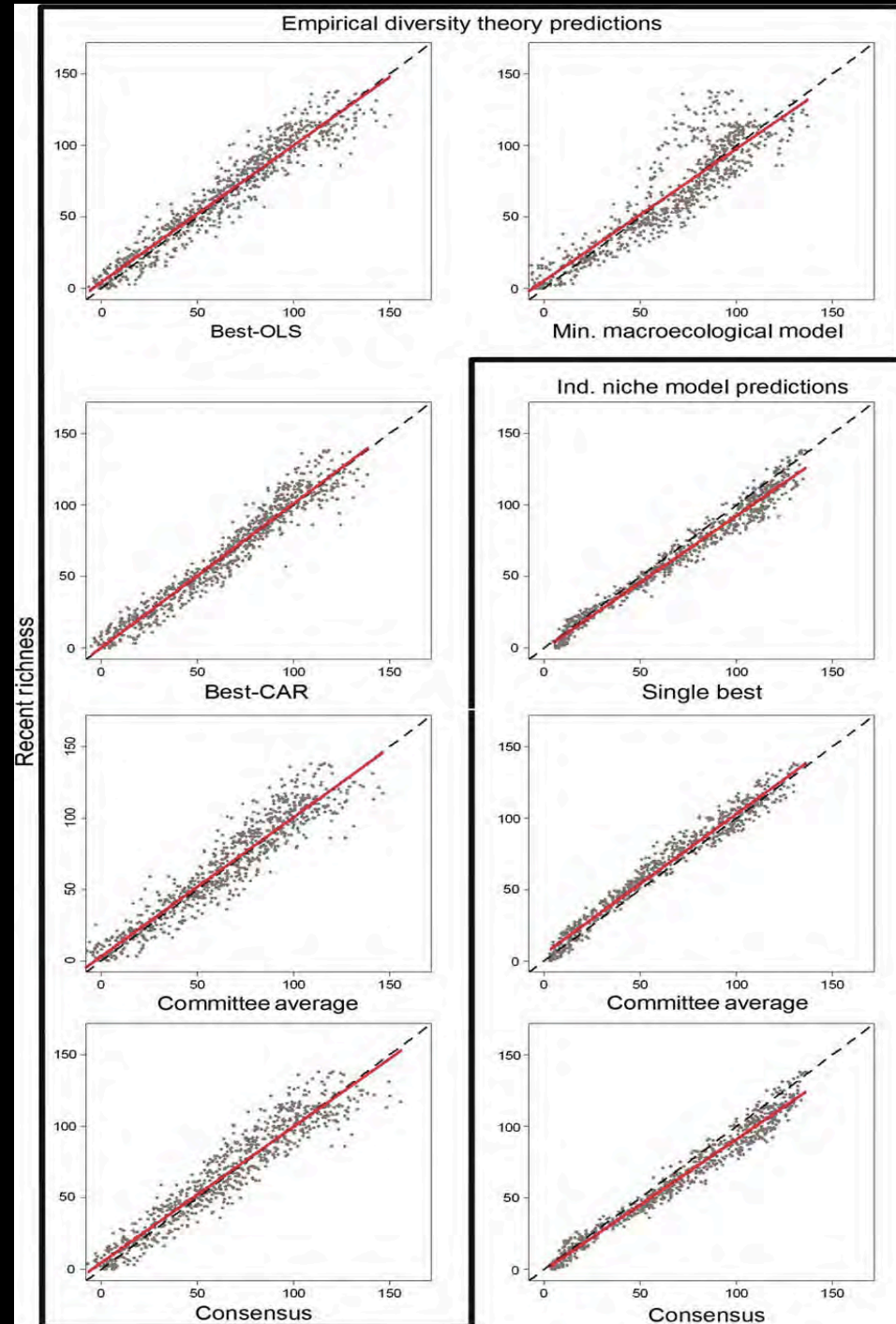
Kharouba et al. 2009. *Ecology*.

4. Tests

Have species predicted to have shifted actually gone where models said they would?

Tests based on Canadian butterflies are ongoing but promising.

Algar et al. 2009. Ecography.
Kharouba et al. 2009. Ecology.



2011: Goals

- Complete pilot on B. affinis.
- Tests of basic predictions of pathogen, land use intensity, and climate hypotheses for Bombus.
- Ramping up geomatics data processing, focusing on hotspots of pollinator diversity and CANPOLIN field sites (interactive with WG5).

Acknowledgements

- CANPOLIN & NSERC, Canada Centre for Remote Sensing, Canadian Forest Service
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