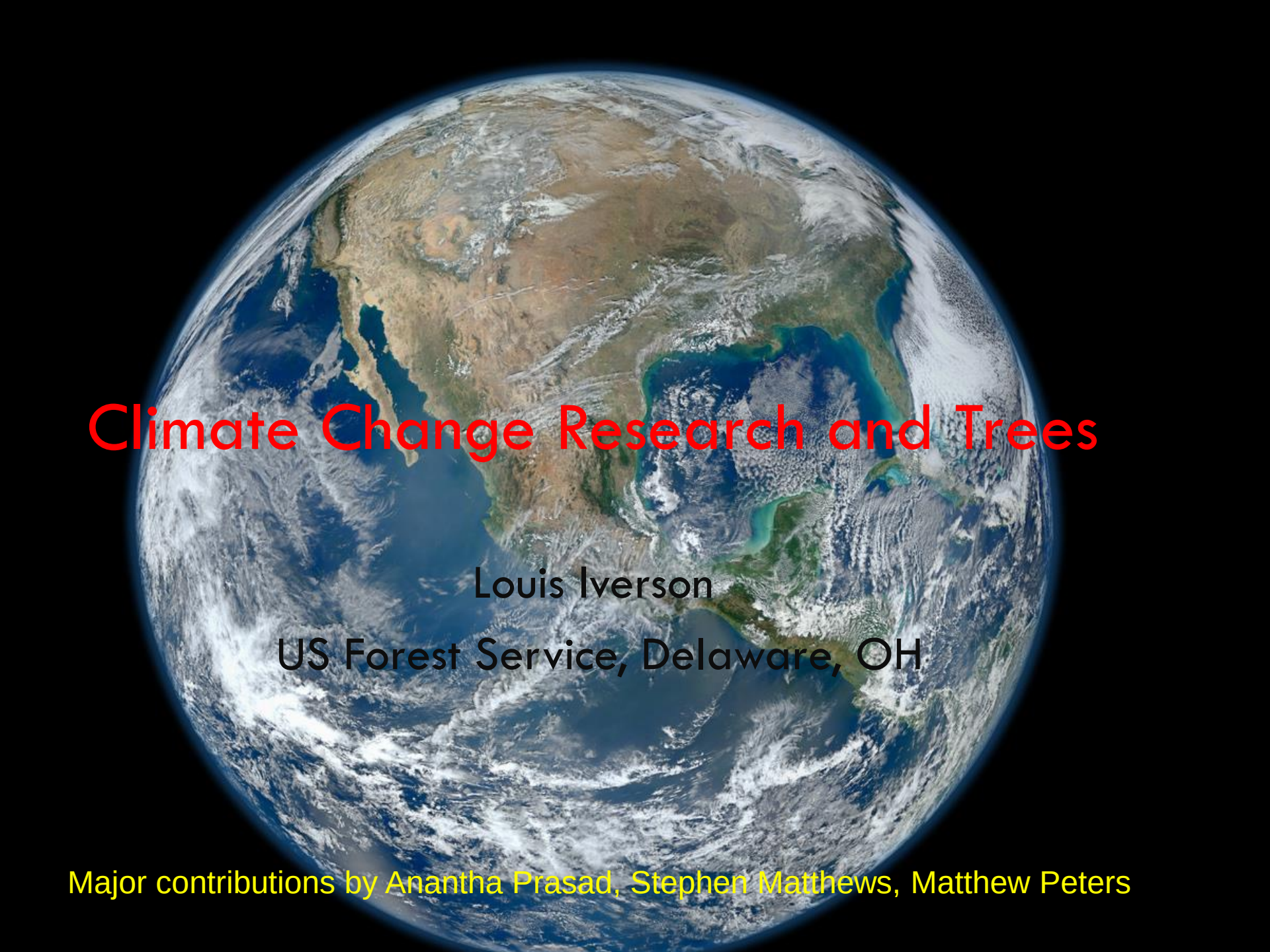


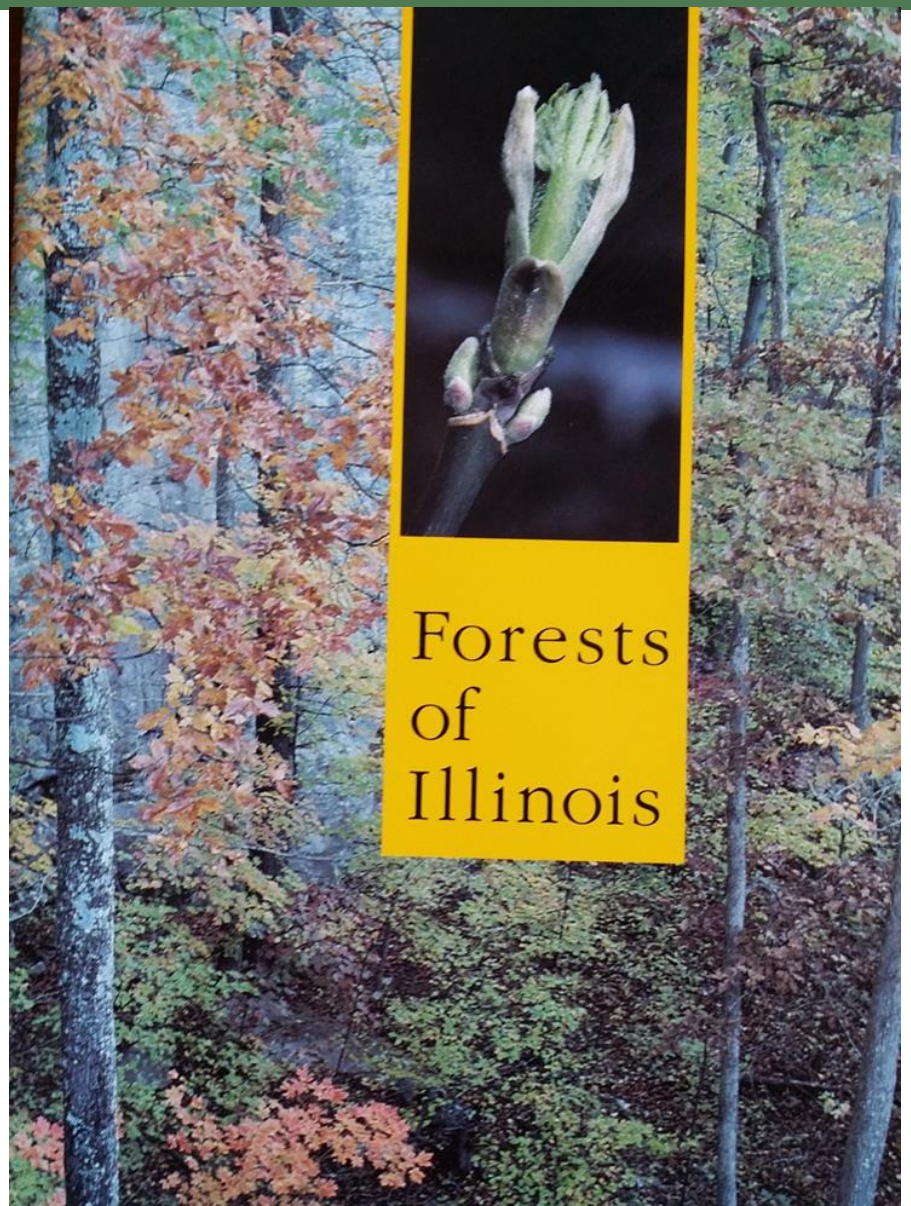
Climate Change Research and Trees

Louis Iverson

US Forest Service, Delaware, OH

Major contributions by Anantha Prasad, Stephen Matthews, Matthew Peters

Forest Resources of Illinois



Iverson, L. R. Forest resources of Illinois: what do we have and what are they doing for us? Symposium Proceedings: Our Living Heritage. Champaign, IL: Illinois Natural History Survey Bulletin 34; 1991. 361-374.

Forest Resources of Illinois: What Do We Have and What Are They Doing for Us?

Louis R. Iverson, Illinois Natural History Survey

Forest Resource Trends in Illinois

Louis R. Iverson[1]

U.S.D.A. Forest Service
Northeastern Forest Experiment Station
359 Main Road
Delaware, OH 43015

INTRODUCTION

Even though forests occupy only 12% of the land area of Illinois, they play a valuable role in the health of the state's environment and that of its citizens. Many of these benefits have been reviewed in *Forest Resources of Illinois: An Atlas and Analysis of Spatial and Temporal Trends* (Iverson *et al.* 1989),

century, estimated at 1.13% per year (Iverson 1991), rivals and even surpasses that of any tropical deforestation occurring today.

However, forest area has recently been increasing in Illinois. The lowest estimate of forest area in the state was made by Telford (1926), who estimated forest area to be only 3.02 million acres (1.22 m ha)

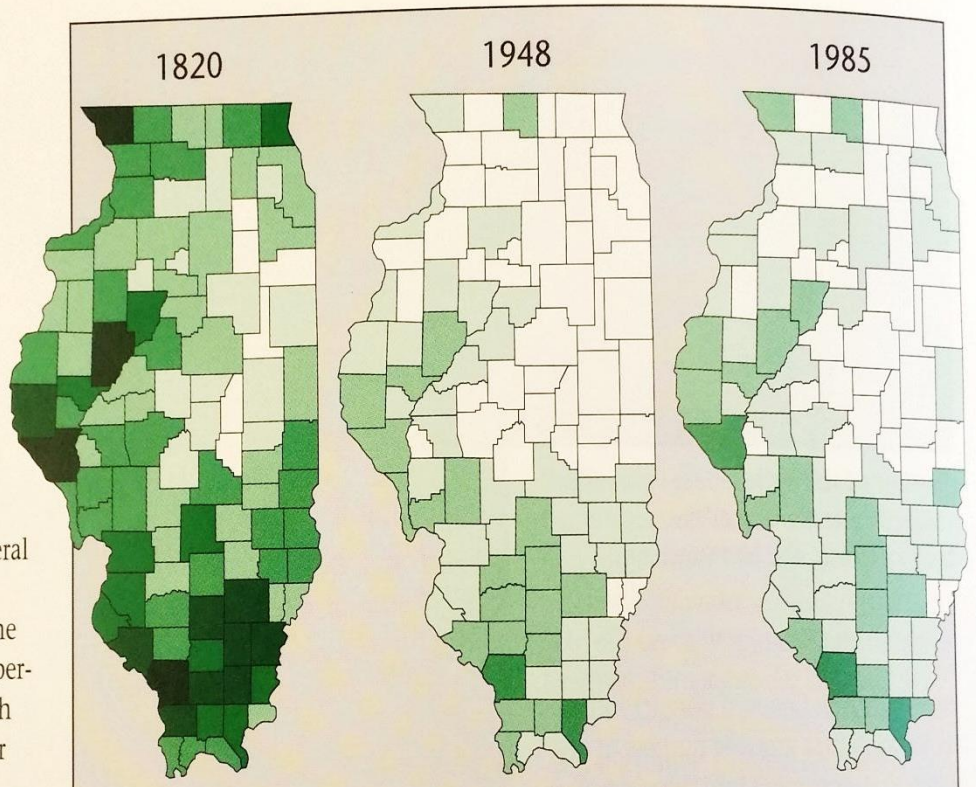
Trends in Illinois Forests

A History of Illinois Forests

Louis R. Iverson

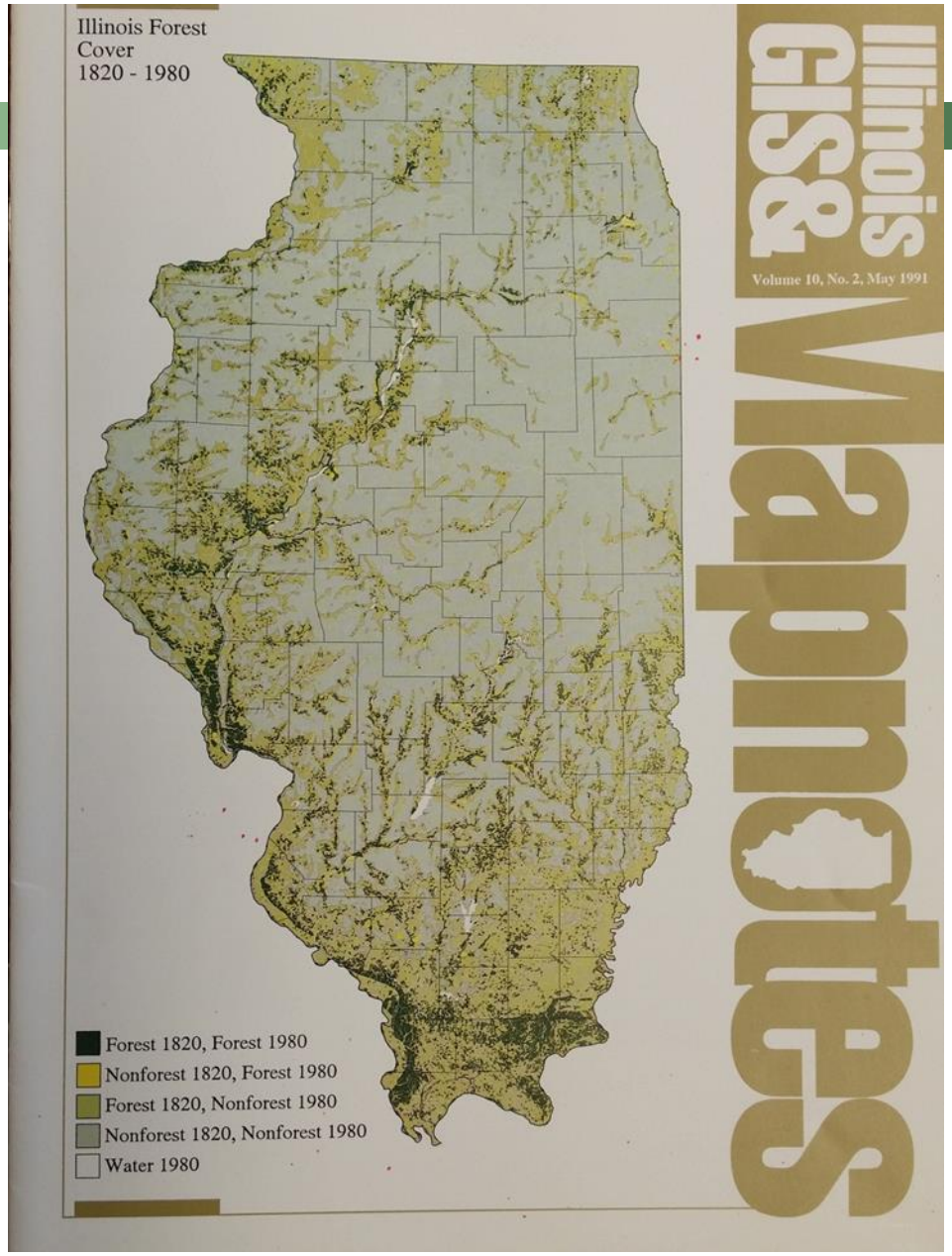
Illinois forests have undergone radical change since the first European settlers came in the early 1800s. According to records of the U.S. General Land Office, which began mapping Illinois' forest, prairie, and water in the early 1800s, Illinois was formerly 38 percent forested (13.8 million acres), with 61 percent prairie and 1 percent water (see maps).

Except for the seven most southerly counties, which were almost entirely forested, and the Grand Prairie region of east-central Illinois, which was only about 16 percent forested, prairie and forest were fairly equally divided across the state. Ecological factors such as moisture



Illinois forested acres by county, 1820 to 1985

- 0 – 30,000
- 30,000 – 60,000
- 60,000 – 120,000
- 120,000 – 180,000
- 180,000 – 240,000
- 240,000 – 300,000
- over 300,000


Illinois Forest Cover
1820 - 1980
Forest 1820, Forest 1980
Nonforest 1820, Forest 1980
Forest 1820, Nonforest 1980
Nonforest 1820, Nonforest 1980
Water 1980
Illinois GIS & Mapnotes
Volume 10, No. 2, May 1991


Forest Cover in Illinois 1820–1980

Landscape Ecology vol. 2 no. 1 pp 45-61 (1988)
SPB Academic Publishing, The Hague

Land-use changes in Illinois, USA: The influence of landscape attributes on current and historic land use

Louis R. Iverson
Illinois Natural History Survey, Champaign, Illinois 61820 USA

Keywords: Illinois, geographic information system, landscape ecology, soil, land use, presettlement vegetation, land-use change, fractal dimension

Adv. Space Res. Vol. 7, No. 11, pp. (11)183–(11)194, 1987
Printed in Great Britain

0273–1177/87 $0.00+.50

ANALYZING LONG-TERM CHANGES IN VEGETATION WITH GEOGRAPHIC INFORMATION SYSTEM AND REMOTELY SENSED DATA

Louis R. Iverson* and Paul G. Risser**

**Illinois Natural History Survey, 607 E. Peabody Drive, Champaign, IL 61820, U.S.A.*
***University of New Mexico, Scholes Hall 108, Albuquerque, NM 87131, U.S.A.*

Illinois Plant Information Network

- Data on 3209 vascular plants

Transactions of the Illinois State Academy of Science
(1997), Volume 90, 1 and 2, pp. 41-64

received 2/23/96
accepted 7/15/96

A Summary of the Illinois Flora Based on the Illinois Plant Information Network

Louis R. Iverson and Anantha Prasad
Northeastern Forest Experiment Station,
USDA Forest Service, 359 Main Road,
Delaware, OH 43015

David M. Ketzner
Illinois Natural History Survey
Center for Wildlife Ecology
607 E. Peabody Drive
Champaign, IL 61820

Keywords: vascular plants, distribution, taxonomy, Illinois, biodiversity

http://www.nrs.fs.fed.us/data/il/ilpin/

Urban Forest Relation to Household Density and Income

Urban Ecosystems, 4: 105–124, 2000

Urban forest cover of the Chicago region and its relation to household density and income

LOUIS R. IVERSON liverson/ne_de@fs.fed.us
USDA Forest Service, 359 Main Road, Delaware, OH 43015

ELIZABETH A. COOK
Center of Excellence for GIS and Wildlife Management, USDA-NRCS at Lincoln University, 306 Founders Hall Jefferson City, MO 65102

Abstract. Urban forests and herbaceous open space play a vital role in the environmental and aesthetic "health" of cities, yet they are rarely identified in land-use inventories of urban areas. To provide information on urban forests and other vegetative land cover in Illinois cities, Landsat Thematic Mapper (TM) data from June 27, 1988, were classified for the Chicago metropolitan region (9,717 km^2). Ten land-cover classes were identified, including

CHICAGO CLIMATE ACTION PLAN

CLIMATE CHANGE AND CHICAGO

PROJECTIONS AND POTENTIAL IMPACTS

EXECUTIVE SUMMARY 09-18-2008

Journal of Great Lakes Research 36 (2010) 74–85

Contents lists available at ScienceDirect

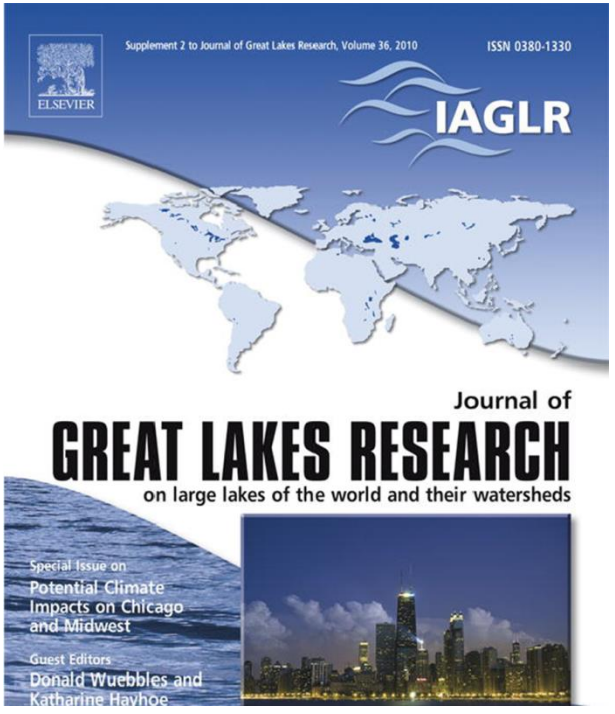
Journal of Great Lakes Research

journal homepage: www.elsevier.com/locate/jglr

Climate change impacts on terrestrial ecosystems in metropolitan Chicago and its surrounding, multi-state region

Jessica J. Hellmann [a,*], Knute J. Nadelhoffer [b], Louis R. Iverson [c], Lewis H. Ziska [d], Stephen N. Matthews [c], Philip Myers [b], Anantha M. Prasad [c], Matthew P. Peters [c]

[a] Department of Biological Sciences, University of Notre Dame, Notre Dame, IN 46556, USA
[b] Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, MI 48109, USA
[c] Northern Research Station, USDA Forest Service, Delaware, OH 43015, USA
[d] US Department of Agriculture, Beltsville, MD 20705, USA

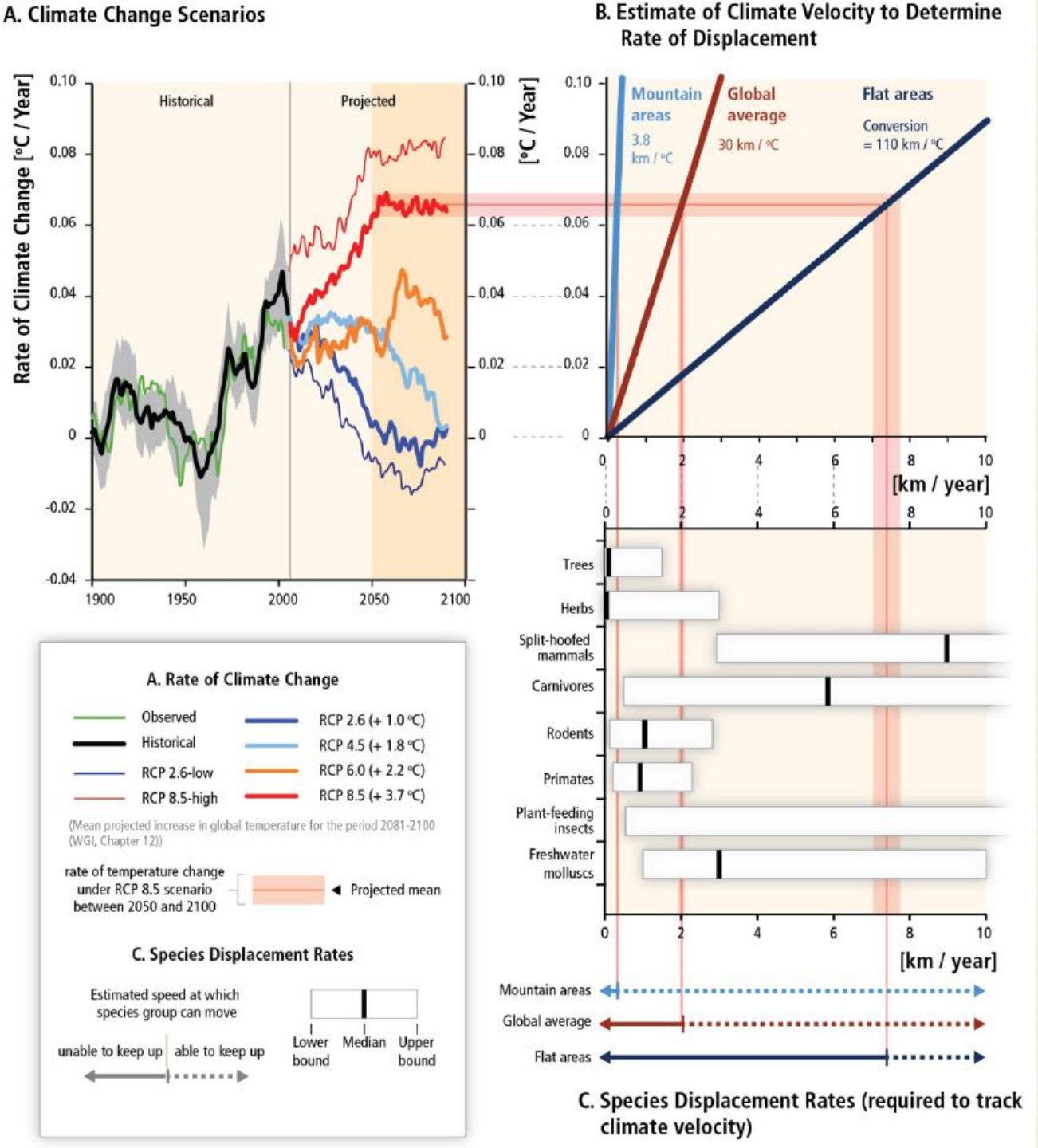


Climate has always been changing

~ 13,000 years ago

Today

http://www.esd.ornl.gov/projects/qen/nercNORTHAMERICA.html



IPCC Impacts Report

March 31, 2014

U.S. Global Change Research Program
National Climate Assessment
http://assessment.globalchange.gov

Preparing the Nation for Change

Introduction to the National Climate Assesement

globalchange.gov
U.S. Global Change Research Program

Thirteen Agencies, One Vision: Empower the Nation with Global Change Science

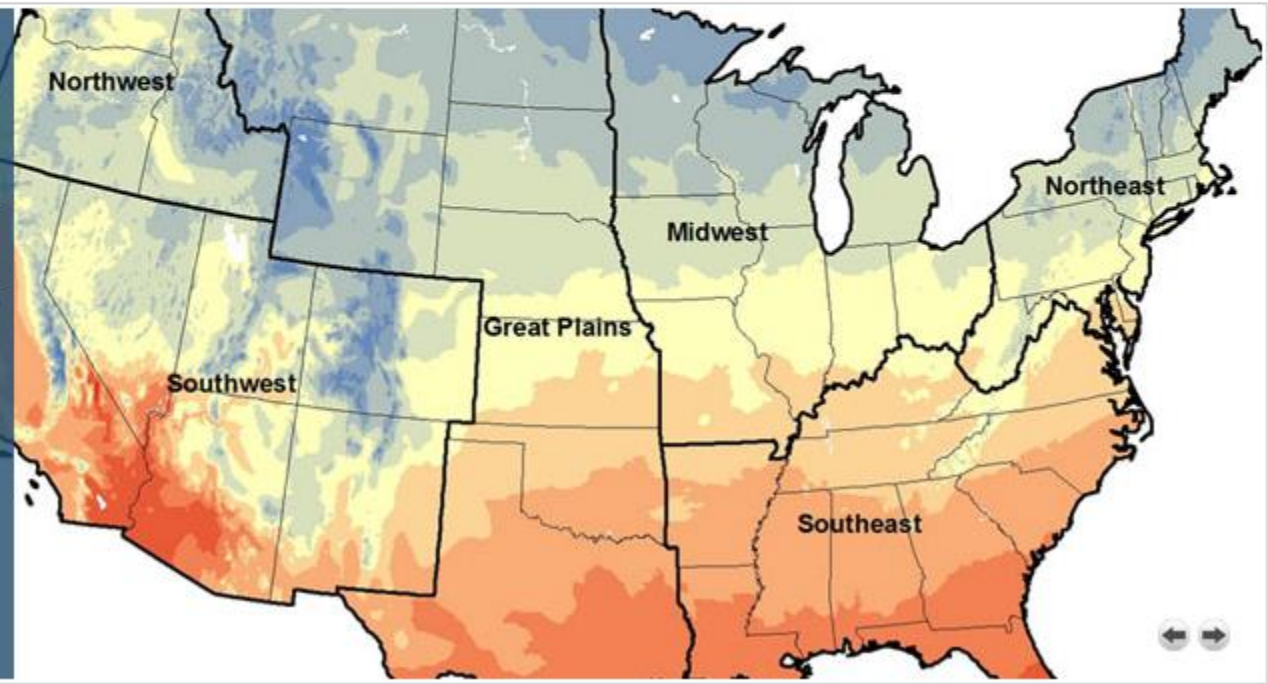
Home | About | What We Do | News | Resources | Contact Us | search...

How Will Climate Change Impact Your Region?

Scenarios for Climate Assessment & Adaptation

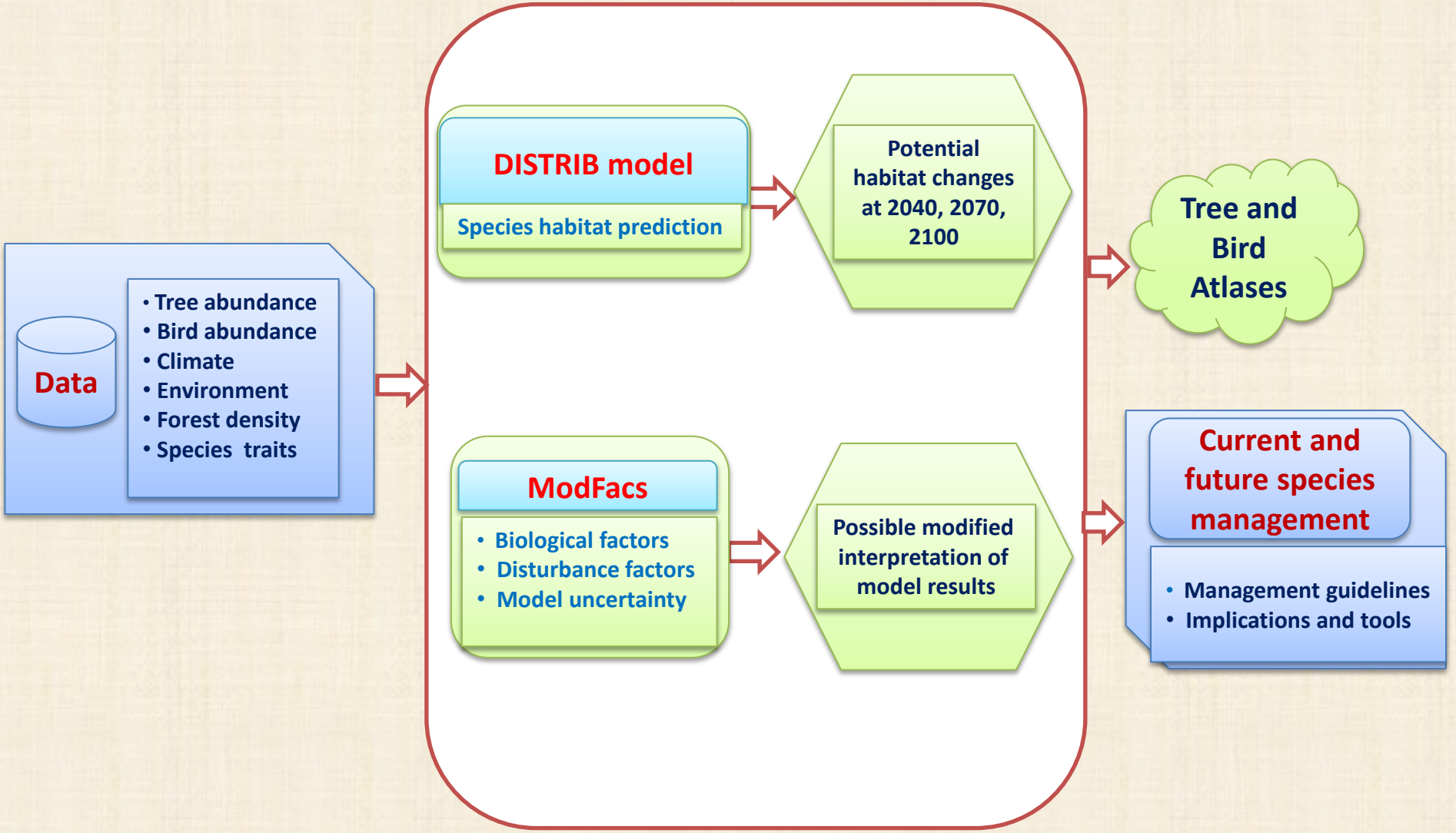
New reports explore how a shifting climate may impact eight U.S. regions.

More...



Mandated by Congress every four years -
to include methods to document climate-related risks and opportunities

Our Modeling Scheme



Iverson et al. 2011 Ecosystems

red maple (*Acer rubrum*)

Model Reliability: High

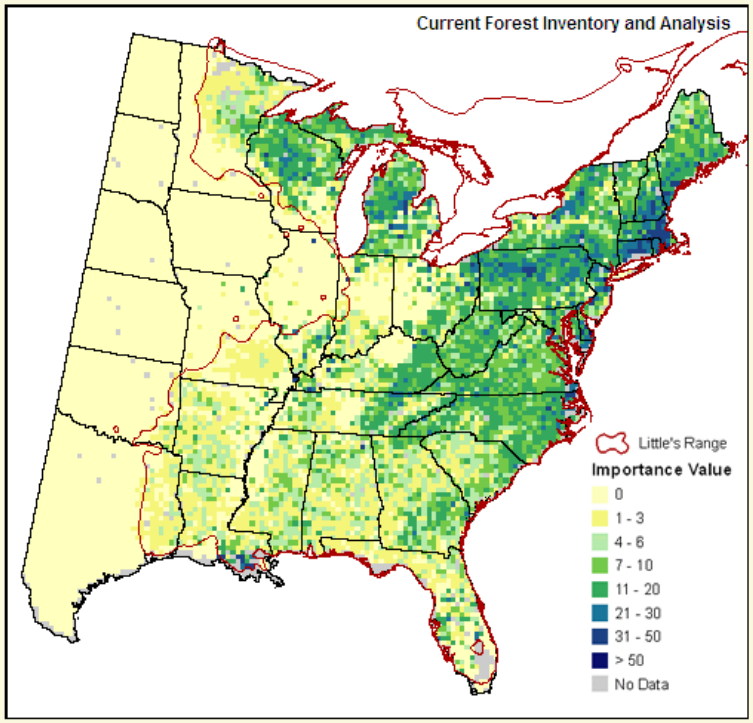
Current Distribution | Climate Scenarios | Predictor Maps

Current Distribution Maps for red maple

Help »

Current Forest Inventory and Anal

Compare Two Species



View All Climate Scenarios in Google Earth (259 KB)

About red maple

Climate Change Adaptability

What traits will impact red maple's abililty to adapt to climate change, and in what way?:

Positive Traits

Seedling establishment

Environment habitat specificity

Edaphic specificity Shade tolerance

Dispersal

Negative Traits

None

More on these traits and MODFACT

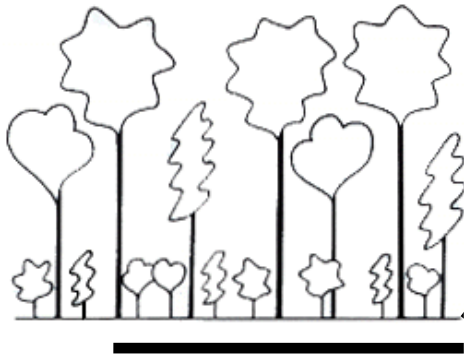
Range and Niche Maps

Search for Trees & Birds:

Enter a common or scientific name

List of Trees | List of Birds

But many other factors (biological and disturbance) come in to play to determine more likely outcomes



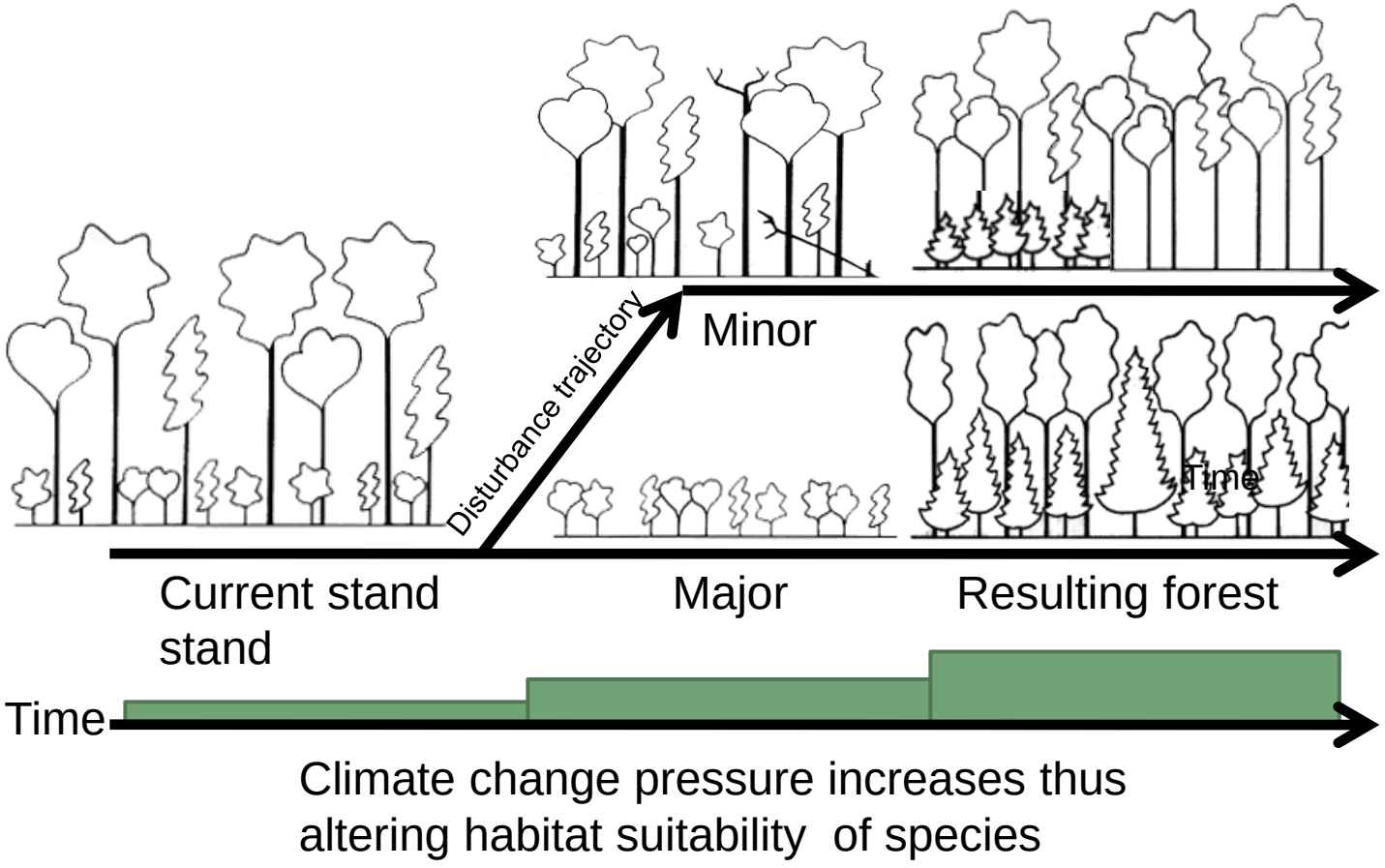
Current stand
stand

Future stand ?

Time

Climate change pressure increases thus altering habitat suitability of species

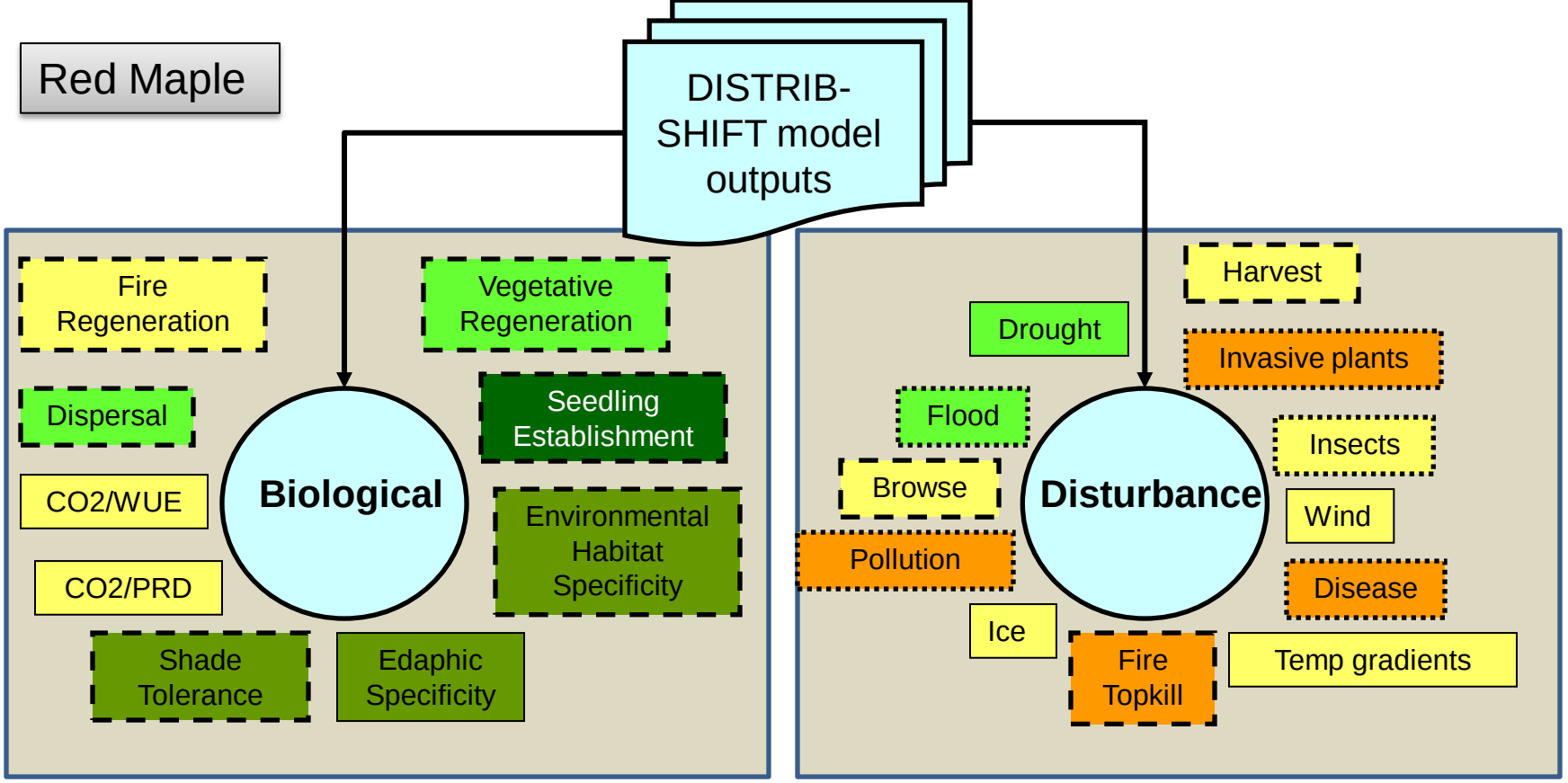
But many other factors (biological and disturbance) come in to play to determine more likely outcomes



Modifying factors

- We rate biological (n=9) and disturbance (n=12) characteristics for positive or negative impacts
- Goal was to evaluate more realistic outcomes at regional and local levels

Red Maple



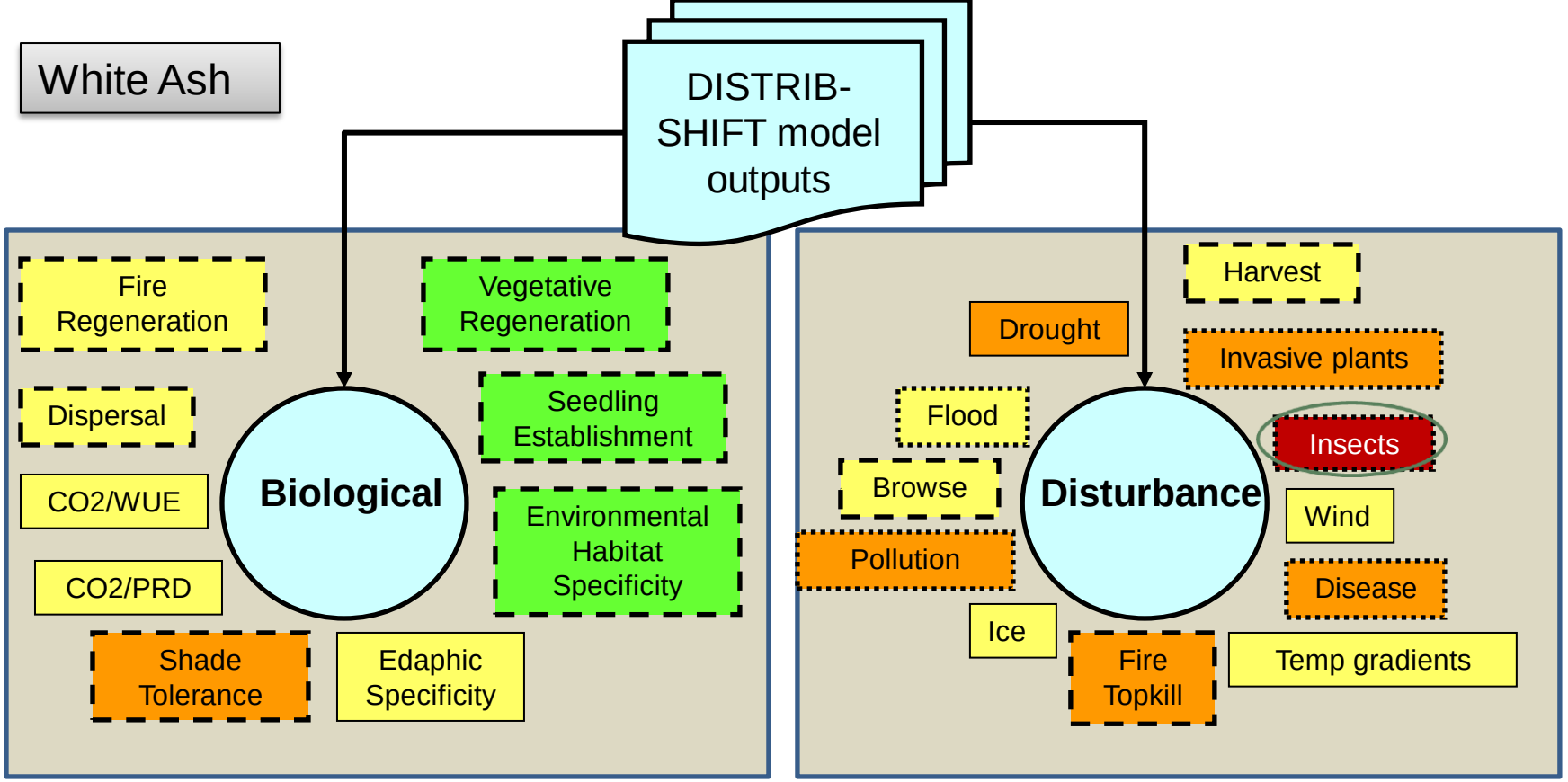
Characteristic Score =
Literature score X Uncertainty X Future relevance

V Hi Pos	High pos	Low pos	Minimal	Low neg	High neg	V Lo neg

Manager influence

Cannot Influence	Regional Influence	Local Influence

Northern Research Station
USDA Forest Service



Characteristic Score =
Literature score X Uncertainty X Future relevance

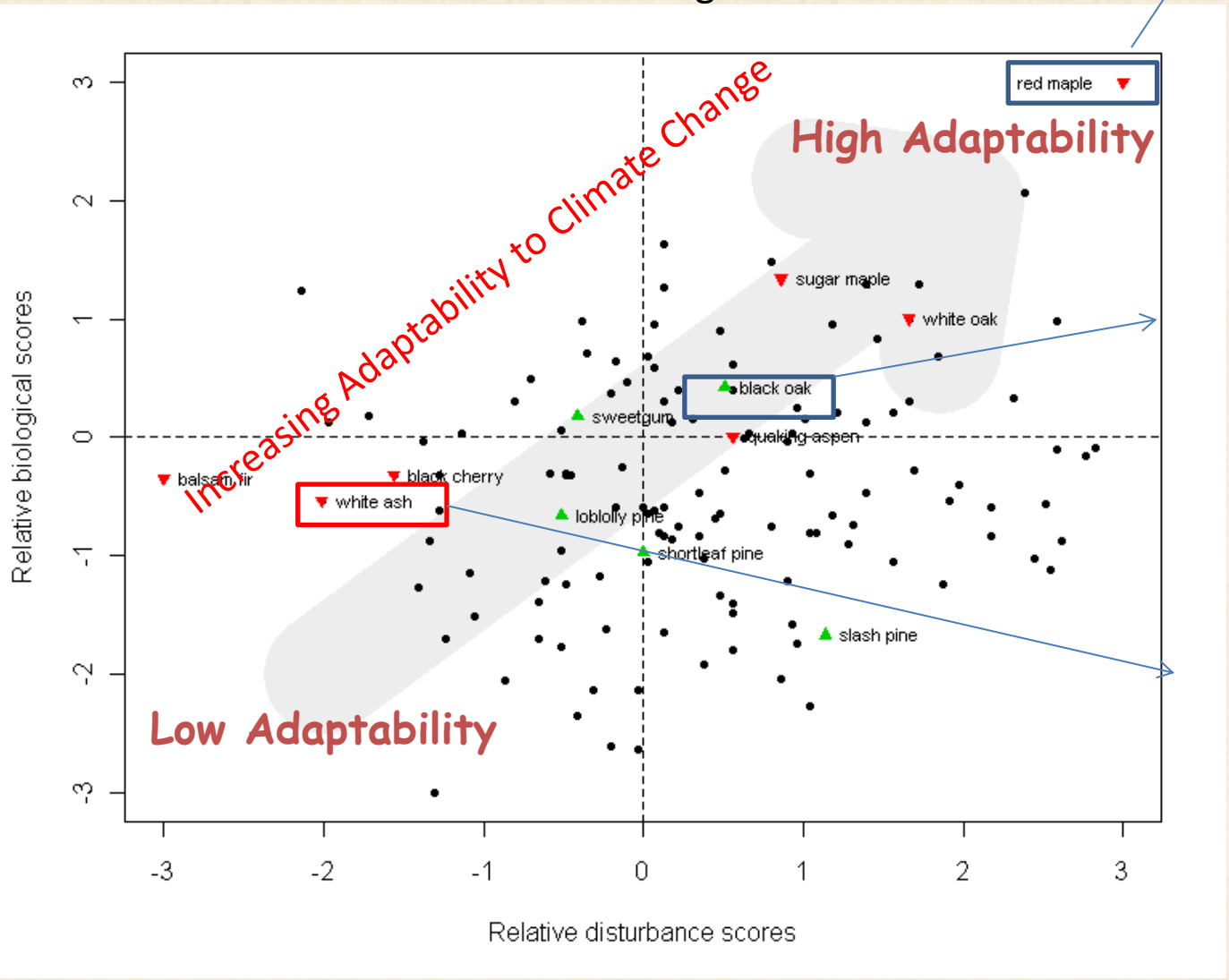
V Hi Pos	High pos	Low pos	Minimal	Low neg	High neg	V Lo neg

Manager influence

Cannot Influence	Regional Influence	Local Influence

Modification Factors

12 Disturbance Factors and 9 Biological Factors considered



Red Maple:

- Projected habitat declines across East US
- Characteristics suggest high adaptability

Black Oak:

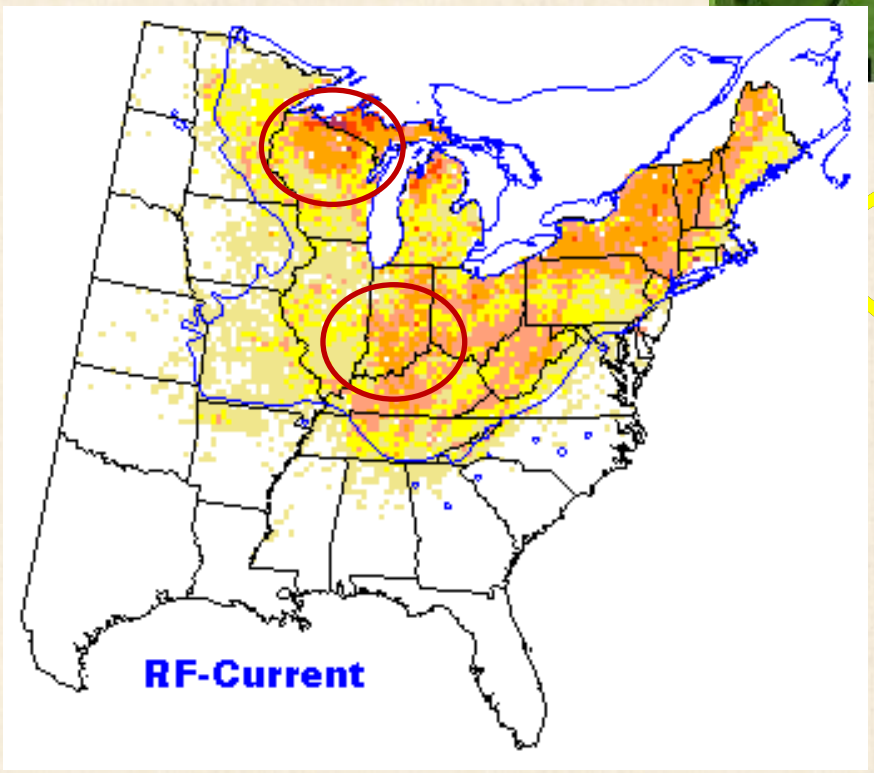
- Projected habitat increases
- Positive ModFac profile suggests it may be able to persist in harsh areas

White Ash:

- Projected habitat declines
- Negative ModFac
- Metrics suggest it will likely face severe limits in eastern US

Matthews et al. 2011, For. Ecol. Manag.; Iverson et al. 2011 Ecosystems

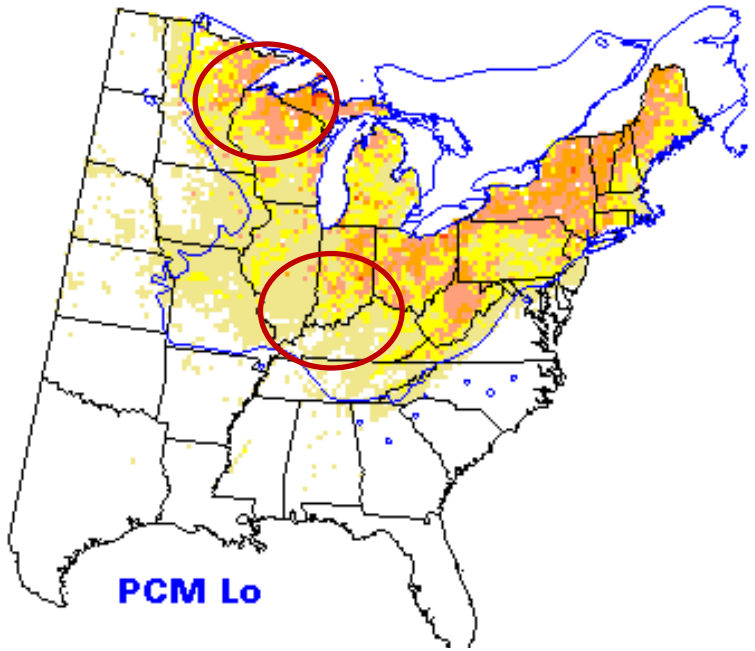
Sugar Maple Habitat Changes by 2100

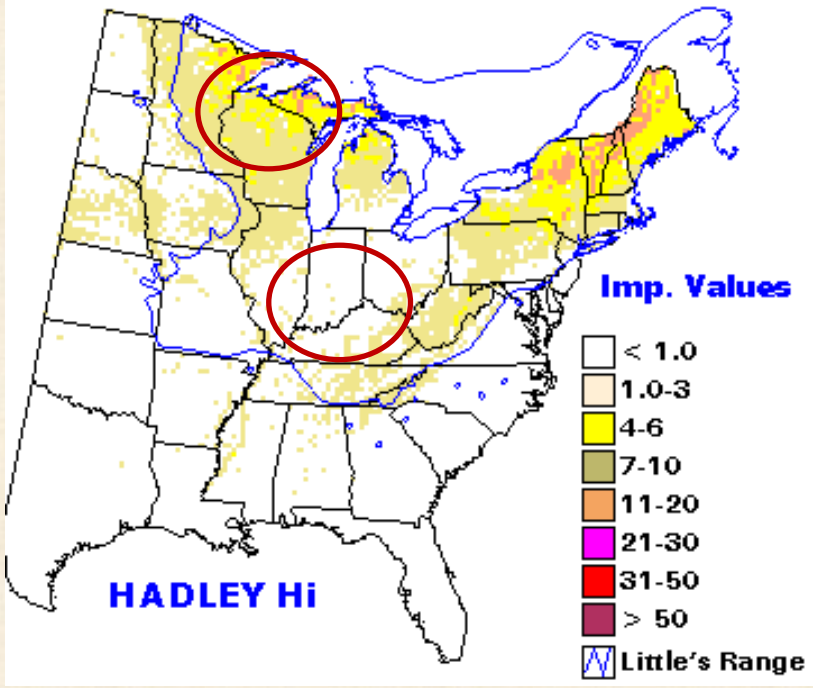


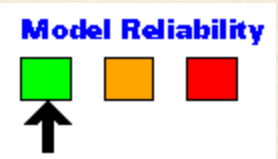
Low

?

High

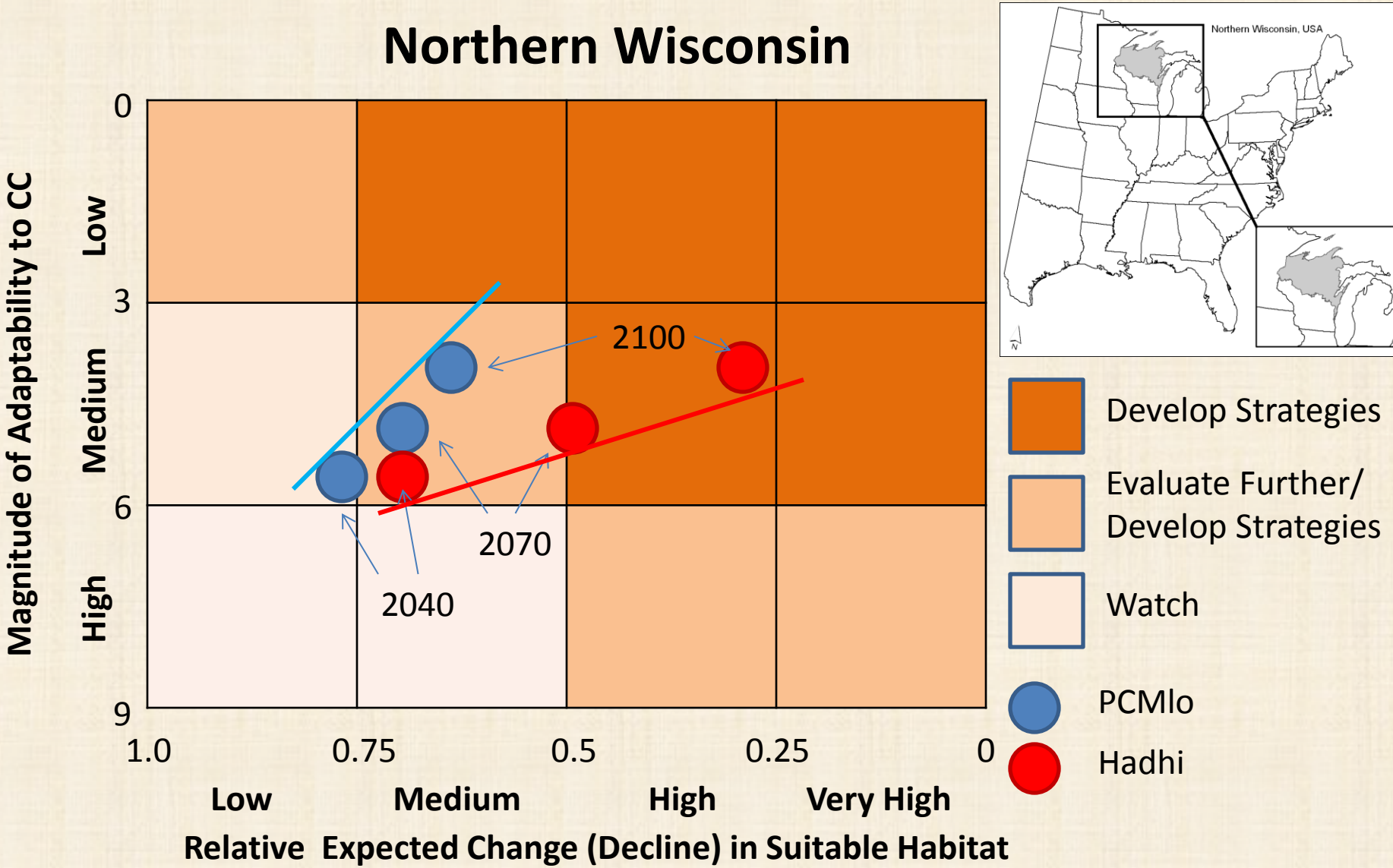






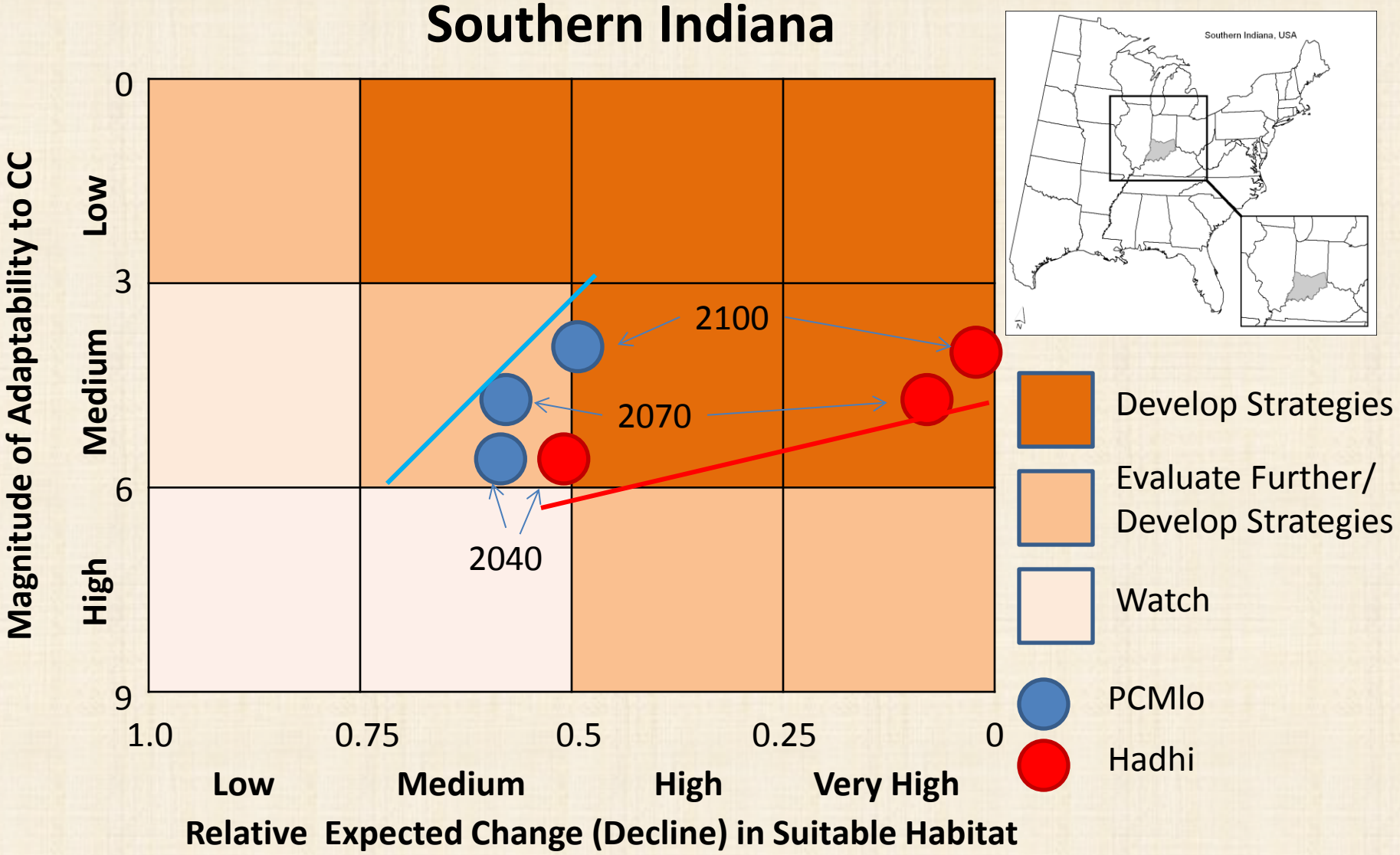
Iverson et al. 2008, Forest Ecology and Management

Risk of Habitat Decline in Sugar Maple



Iverson et al., Climatic Change, 2012

Risk of Habitat Decline in Sugar Maple



Conclusions

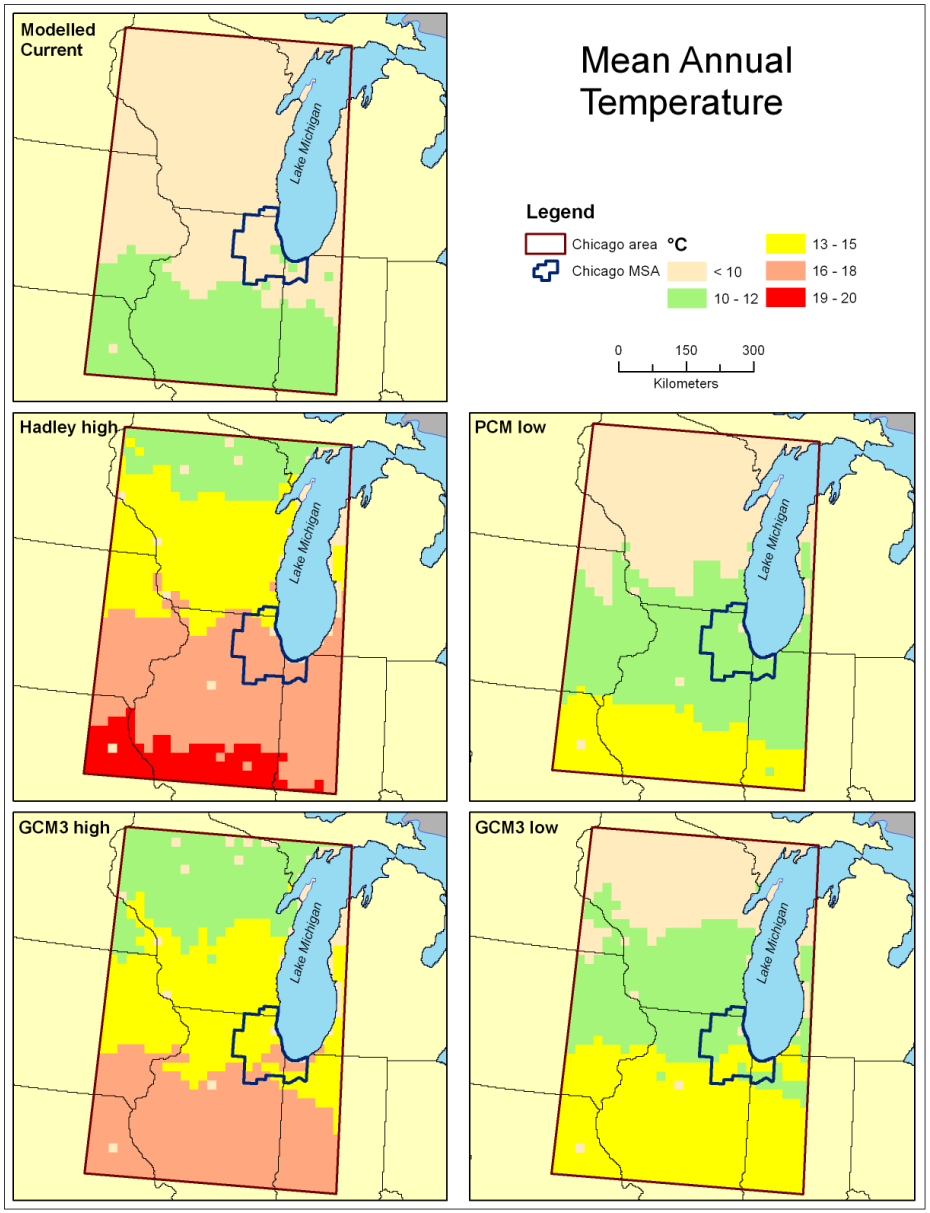
- We have a problem, and an opportunity.
- We use a combination of habitat modeling and species traits analysis to assess species success into the future.
- The risk matrix approach allows for prioritization of strategies on species management, e.g.
  - Can we build resistance for at-risk ‘loser’ species
    - encouraging refugia
    - silvicultural manipulations
  - Can we assist migration of ‘gainer’ species
    - corridors .
    - managed relocation?
- The time to act, each in our own ways, is now.
- Urban settings are the best places to act for many reasons.

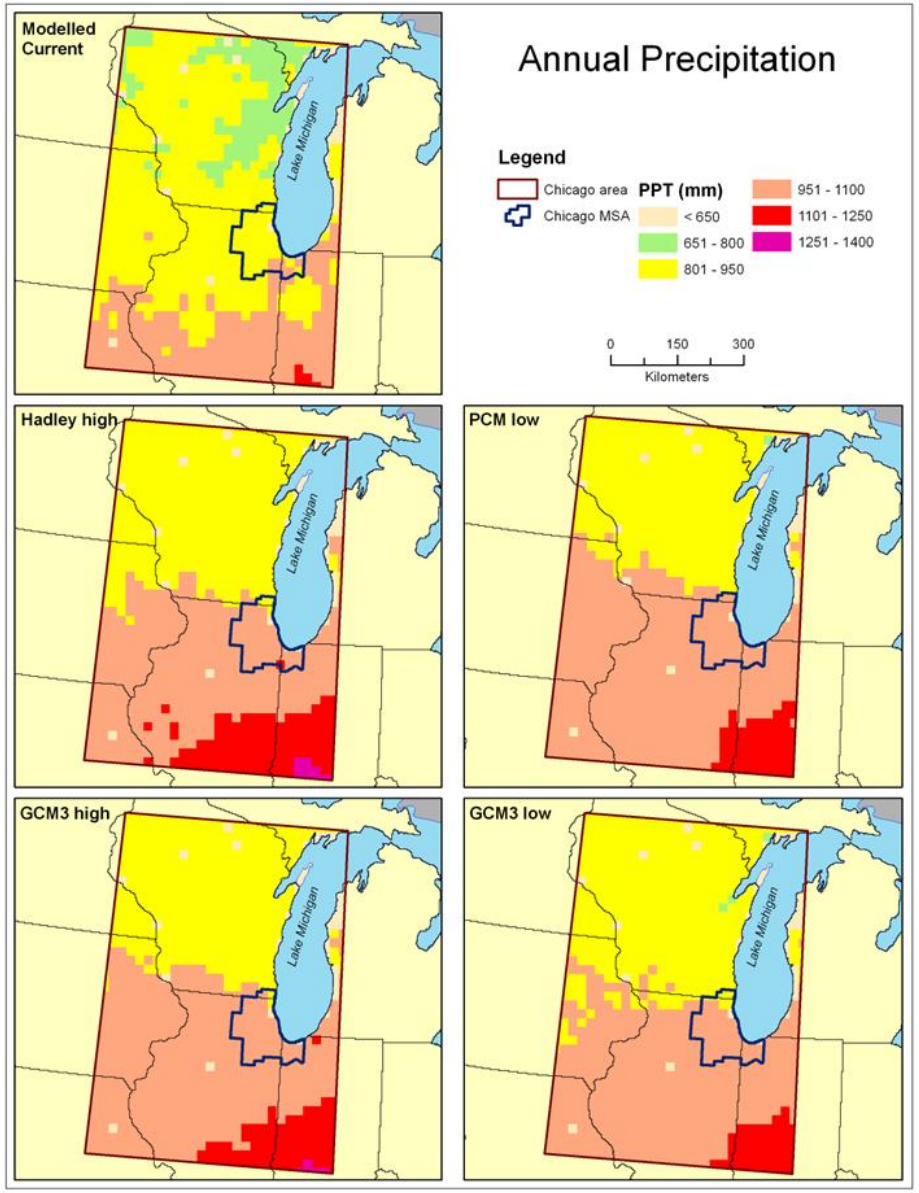
Thank you!

- USFS Northern Research Station
  - A. Prasad, M. Peters, S. Matthews
  - FIA folks: R. McCullough, all the field crews
  - Web folks: J. Lootens-White, D. Deitzman
- Northern Global Change Research
  - R. Birdsey, J. Hom, David Hollinger
- National Climate Assessment
  - G. Yohe, T. Patel-Weynand, J. Vose, D. Peterson, S. Pryor , D. Scavia
- Northern Institute of Applied Climate Science
  - C. Swanston, M. Janowiak, S. Handler, L. Brandt, P. Butler, K. Schmitt

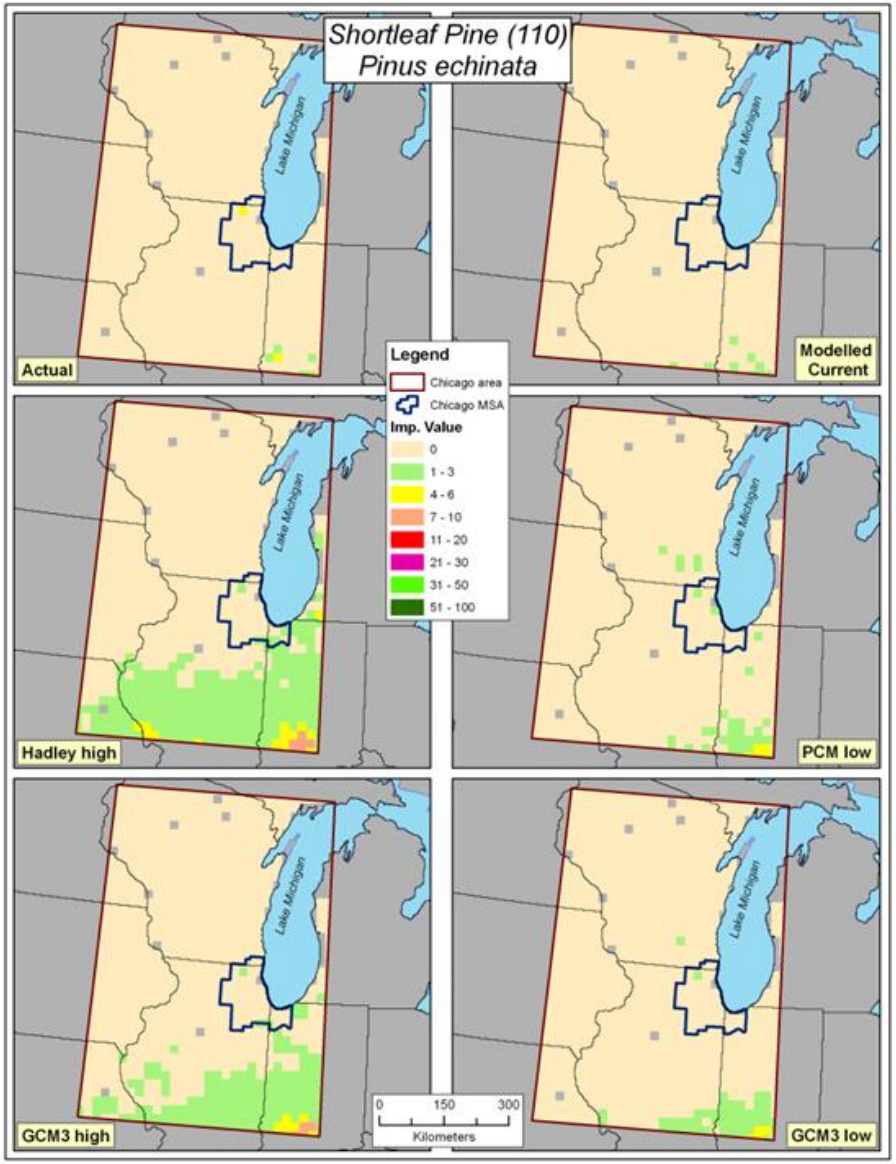
Louis Iverson, Anantha Prasad, Stephen Matthews, Matthew Peters
liverson@fs.fed.us 740-368-0097
All publications available at http://www.treesearch.fs.fed.us/ or Google Scholar or Web of Science or ResearchGate: 'louis iverson'
Atlas web site http://www.nrs.fs.fed.us/atlas

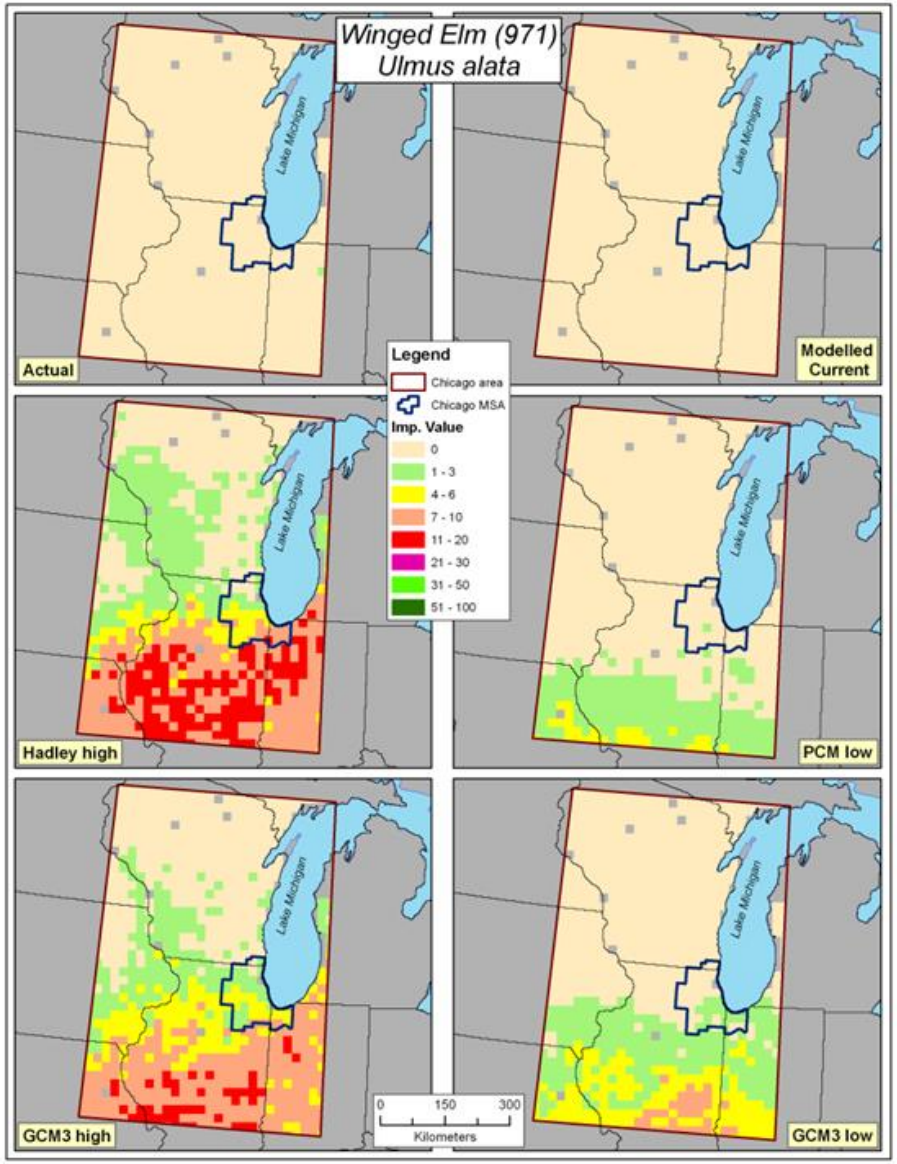
Annual Temperature and Precipitation





Shortleaf Pine and Winged Elm Gain





Sugar Maple and Balsam Fir Lose