Science Roundtable

Rights-of-Way as Habitat Working Group

May 3, 2017

ERC
ENERGY RESOURCES CENTER

UIC

Monarch Conservation Science Partnership integrated monitoring strategy

Wendy Caldwell

Monarch Joint Venture

MCSP Integrated Monitoring Strategy

Rationale, Design and Next Steps

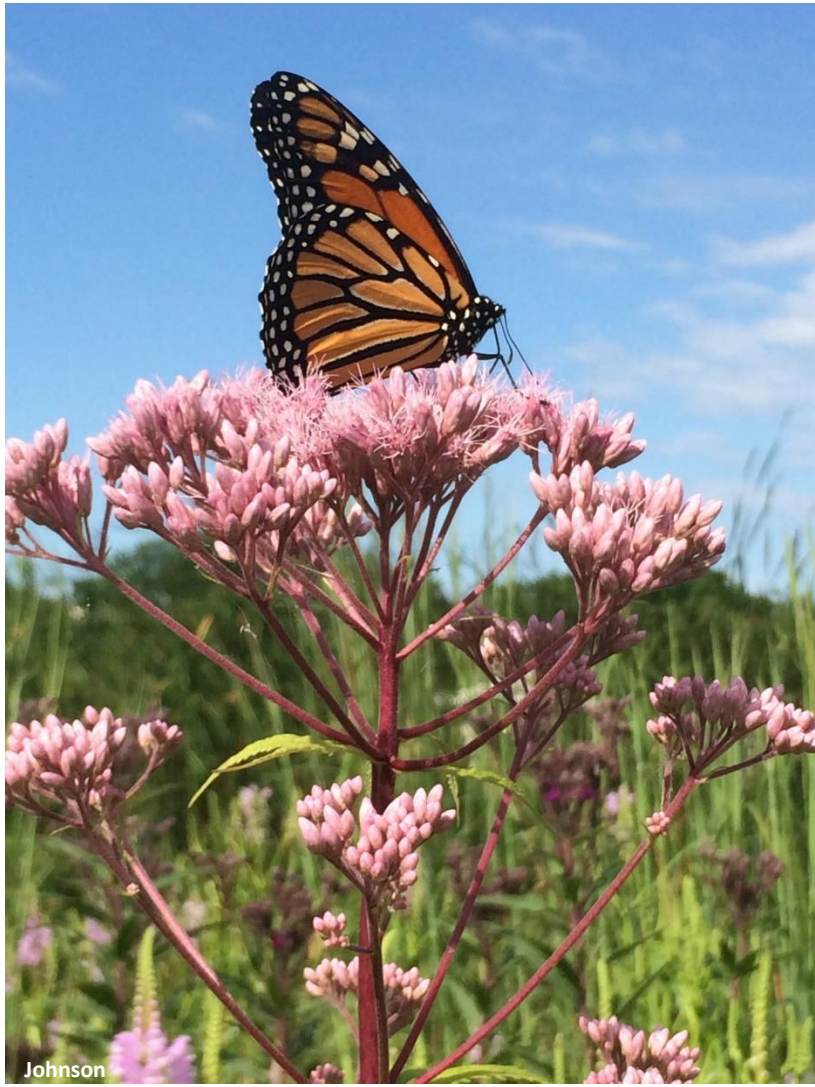
The Monarch Conservation Science Partnership

&

MONARCH JOINT VENTURE

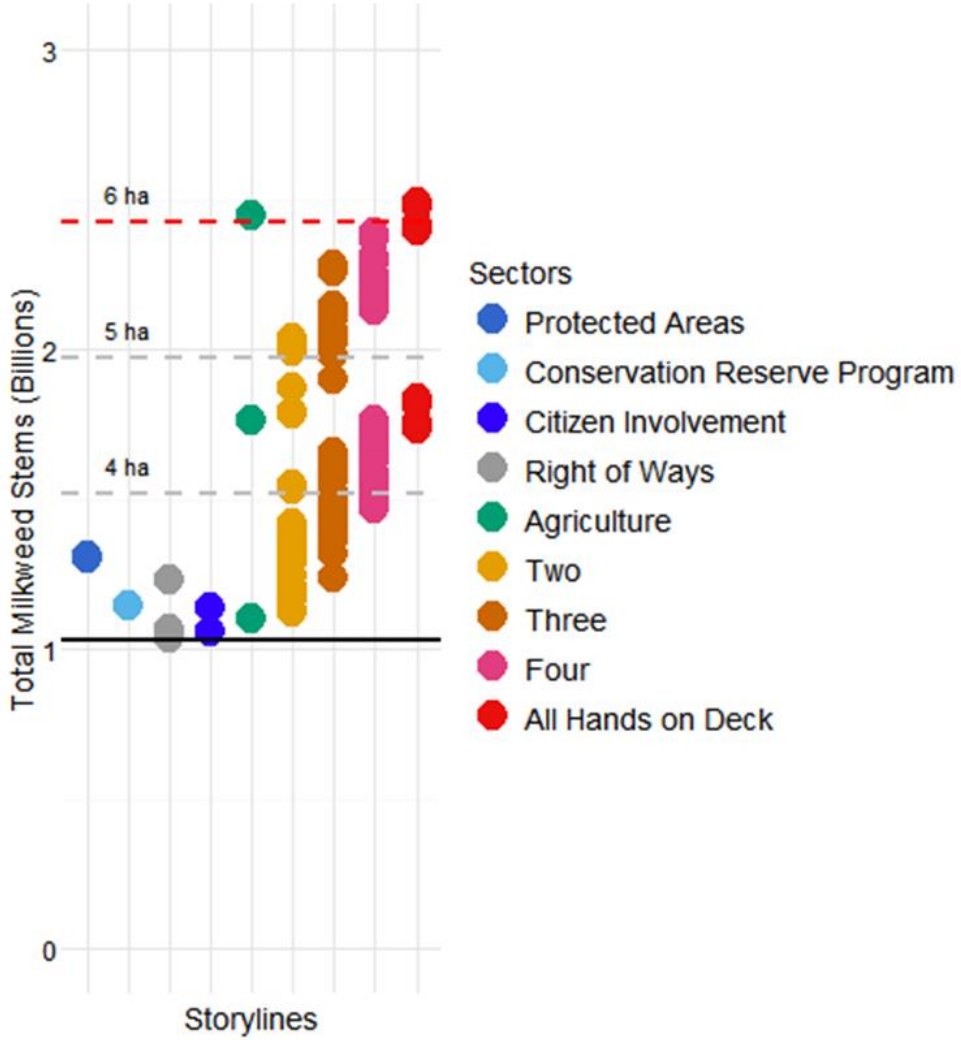
Monitoring Monarch Butterflies and Their Habitat Across North America

Wendy Caldwell, MJV Coordinator

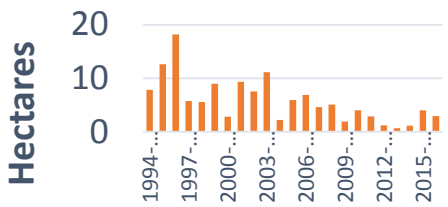


Storylines Analysis

- “All-hands-on-deck”
- Thogmartin et al.



1. Monarch Conservation Target



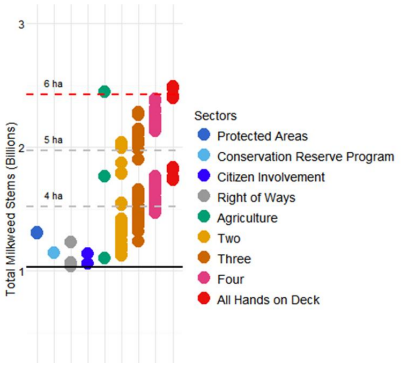
Winter Season

6 hectares of overwintering monarchs

2. Milkweed Conservation Target

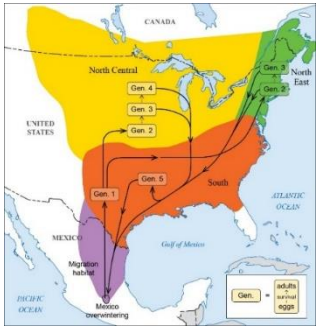
Add ~1.4 billion stems of milkweed

3. Milkweed Storylines Analysis



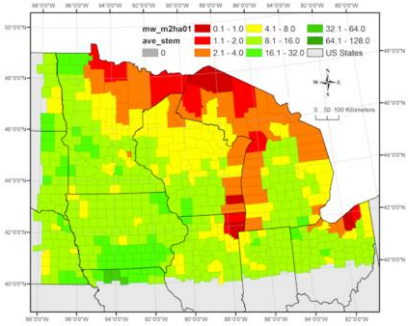
All hands on deck!

4. Demographic Model



All regions on deck!

5. USGS Conservation Tools



Practitioner recommendations

6. Threats Analysis

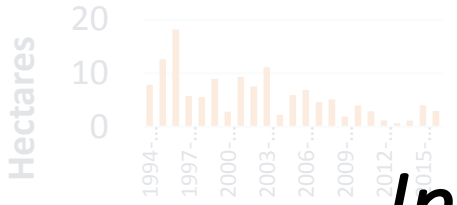
In progress

MCSP Integrated Monitoring Strategy

Fort Collins, 2016

1. Engage **broad audiences** (citizen scientists, federal and state agencies, NGOs)
2. To monitor monarchs and their habitat with **protocols**
3. At **spatially balanced sites**

1. Monarch Conservation Target



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All hands on deck!

Investing in Monitoring =

1. Stronger Model-Driven Recommendations

2. Ability to Evaluate Progress

4. Demographic Model

All regions on deck!

5. USGS Conservation Tools

Practitioner recommendations

6. Threats Analysis

In progress

Pros and cons of existing monitoring programs

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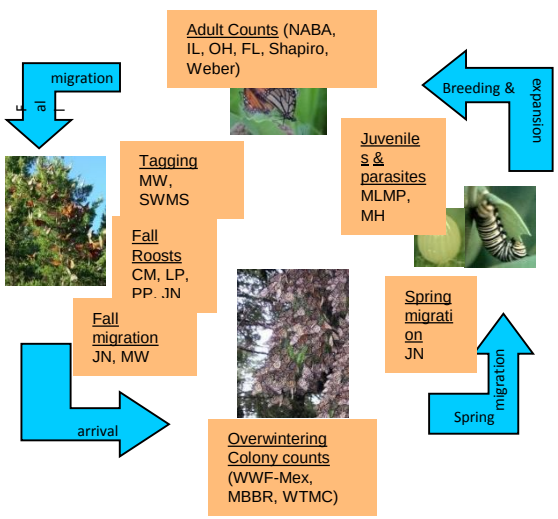

MONITORING PROGRAMS

- NABA: North American Butterfly Association count program
- IL: Illinois monitoring network
- OH: Ohio monitoring network
- Shapiro: No. CA monitoring program
- Weber: MN monitoring site
- MLMP: Monarch Larva Monitoring Project
- MH: Monarch Health
- JN: Journey North
- WWF-Mex: World Wildlife Fund and MBBR in Mexico
- WTMC: Thanksgiving Monarch Counts
- MW: MonarchWatch
- SWMS: Southwest Monarch Study
- CM: Cape May roost monitoring
- LP: Long Point roost monitoring
- PP: Peninsula Point roost monitoring

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- Non-random sampling
- Gaps: temporal, geographic, attribute
- Challenging to combine data

Pros and cons of existing monitoring programs

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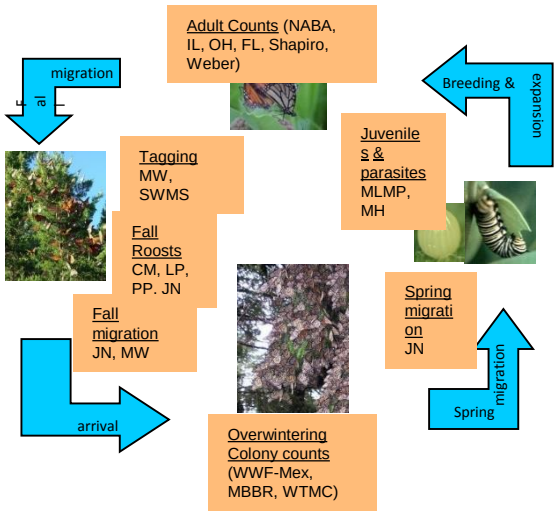

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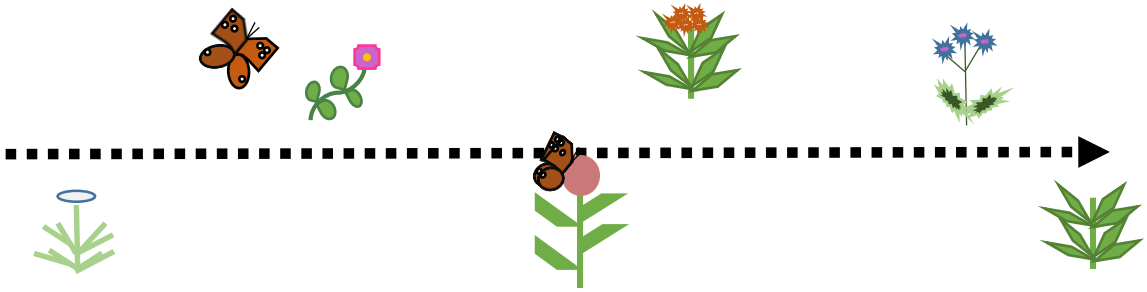
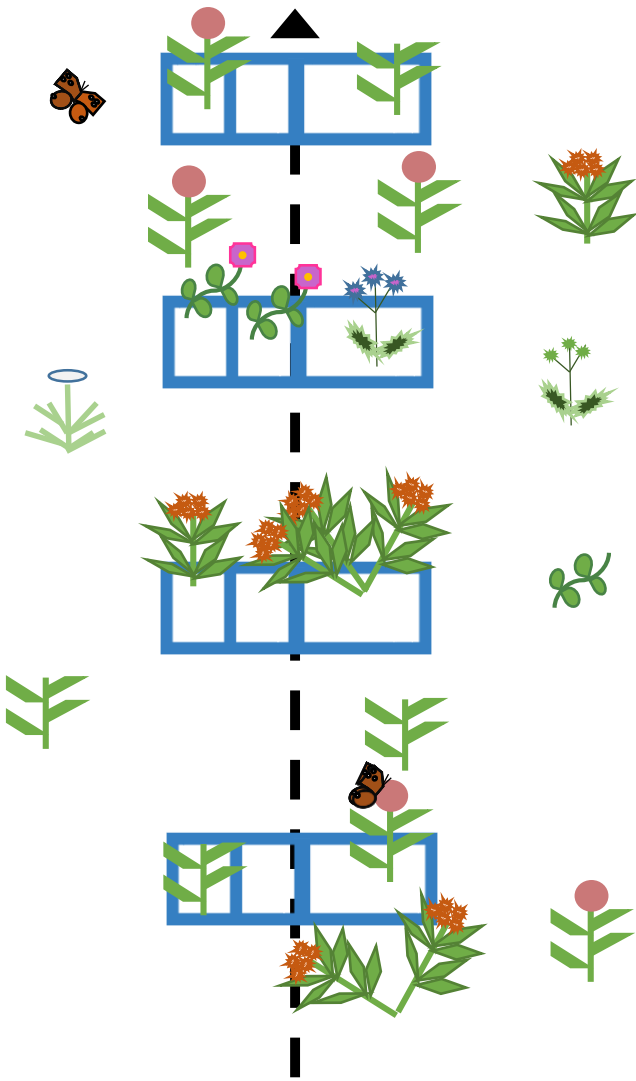
- Non-random sampling
- Gaps: temporal, geographic, attribute
- Challenging to combine data

MCSP Integrated Monitoring Strategy:
Engage broad audiences in spatially balanced data collection

Activities/Protocols

- **1**: Site selection, establishment and description
- **2**: Counting adult butterflies *(modified Pollard Walk)*
- **3**: Counting plants and immature monarchs *(MLMP)*
- **4:** Monarch survival and parasitism *(MLMP, Project Monarch Health, Monarch Watch)*
- **5:** Counting red imported fire ants
- **6:** Data management





Monitoring Strata

Protected grassland

Unprotected grassland

CRP

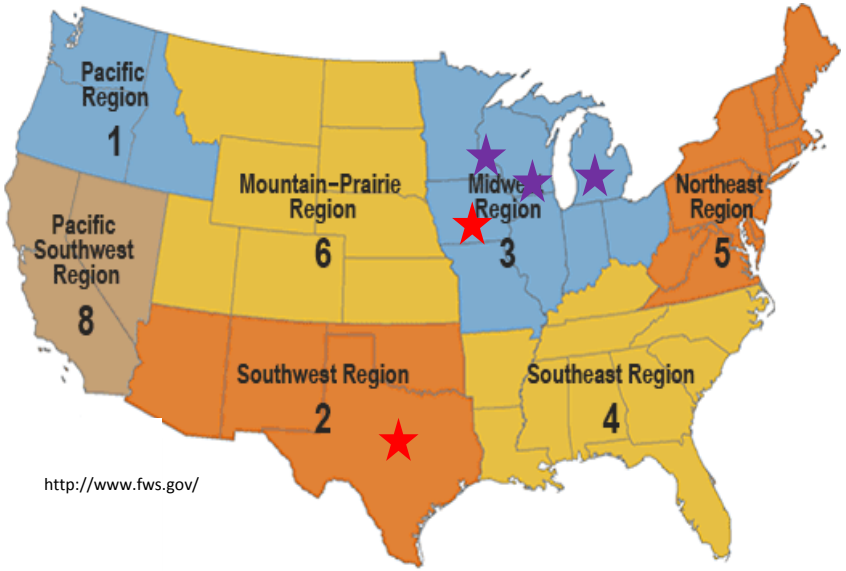
Agricultural lands

ROW habitats

Urban/suburban spaces

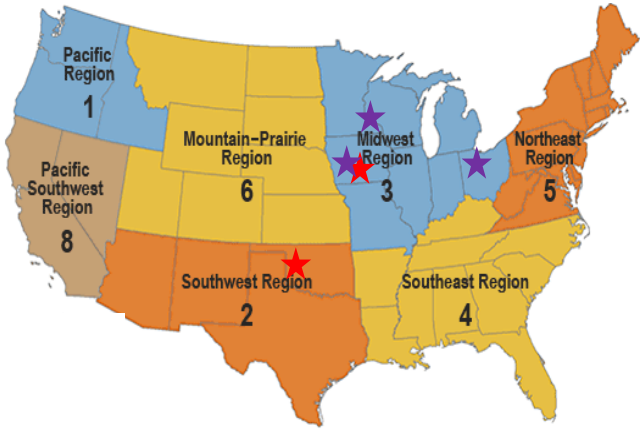
Monitoring Strategy: *2017 Early Implementation*

- **Biotechs on public and private strata**
  - Region 2
  - Region 3
- **Citizen scientists on public strata (NRPC funding)**
  - Citizen science workshops (TBD)

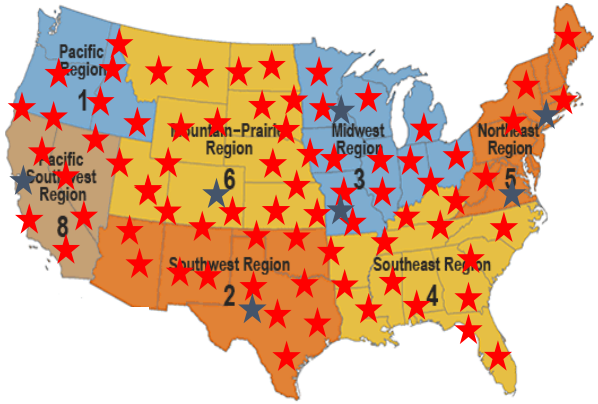


Monitoring Strategy: Next steps

2017



Broad-Scale Implementation



Monitoring Strata

Protected grassland

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National Cooperative Highway Research Program

Evaluating the Suitability of Roadway Corridors for Use by Monarch Butterflies

NCHRP Goals

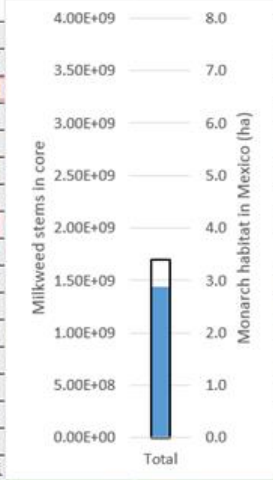
Develop and validate a methodology for transportation practitioners to determine:

- If roadway corridors are suitable for monarch butterfly habitat/production, and
- How to maximize the beneficial aspects and minimize the detrimental impacts

Dianne Kahal-Berman

Product	Deliverables	Outcomes
A. Priority roadside filtration computer model	• Model to identify sites with greatest potential to contribute monarch habitat across geographic scales	Remote identification of priority sites for monarch habitat.
B. Monitoring protocols and data to evaluate roadside habitat quality for monarchs	• Protocols to assess habitat quality • Model parameters, proxies for habitat quality, uncertainty and sensitivity analyses	Practitioners assess habitat quality easily and cheaply, and models are parameterized and validated.
C. Computer model to score habitat potential for monarch production	• Calculator for roadside habitat quality based on landscape context and current attributes	Practitioners evaluate effects of management actions on monarch population.
D. Context sensitive management recommendations and cost estimates	• Structured decision framework prototype detailing regionally appropriate BMPs, costs and benefits, feasibility of creating software-based platform	Practitioners select context-specific management practices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1					marg crop adoption	Corn and Soy	CRP non-wet	CRP- wet	Exurban	Fallow	Marginal Crop	Other Crops	Pasture/Hay	Powerline ROW	Protected Grassland	Rail ROW	Roadside (Freeway/Hwy)	Roadside (Secondary Road)	Roadside (Small Road)	Unsuitable	Urban- High Intensity	Urban- Low Intensity	Urban- Medium Intensity	Urban open core	Wetland
2	state	Acres Changed			**workshop values**	**0.02**	**0.15**	**0.15**	**0.04**	**0.02**	**0.02**	**0.01**	**0.05**	**0.18**	**0.5**	**0.05**	**0.08**	**0.06**	**0.05**	**0**	**0.01**	**0.01**	**0.01**	**0.04**	**0.08**
3	Illinois	856,291			Illinois	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
4	Indiana	504,308			Indiana	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
5	Iowa	1,096,830			Iowa	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
6	Kansas	397,893			Kansas	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
7	Kentucky	203,742			Kentucky	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
8	Maryland	8,444			Maryland	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
9	Michigan	231,478			Michigan	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
10	Minnesota	1,050,625			Minnesota	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
11	Missouri	773,589			Missouri	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
12	Nebraska	464,673			Nebraska	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
13	New York	24,104			New York	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
14	North Dakota	307,806			North Dakota	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
15	Ohio	570,299			Ohio	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
16	Pennsylvania	193,352			Pennsylvania	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
17	South Dakota	480,528			South Dakota	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
18	West Virginia	75,019			West Virginia	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
19	Wisconsin	356261			Wisconsin	0.02	0.15	0.15	0.04	0.02	0.02	0.01	0.05	0.18	0.5	0.05	0.08	0.06	0.05	0	0.01	0.01	0.01	0.04	0.08
20		Current	Amended	Total																					
21	Stems	1,091,301,667	351,468,682	1,442,770,349																					
22	Monarchs (ha)	2.57	0.83	3																					

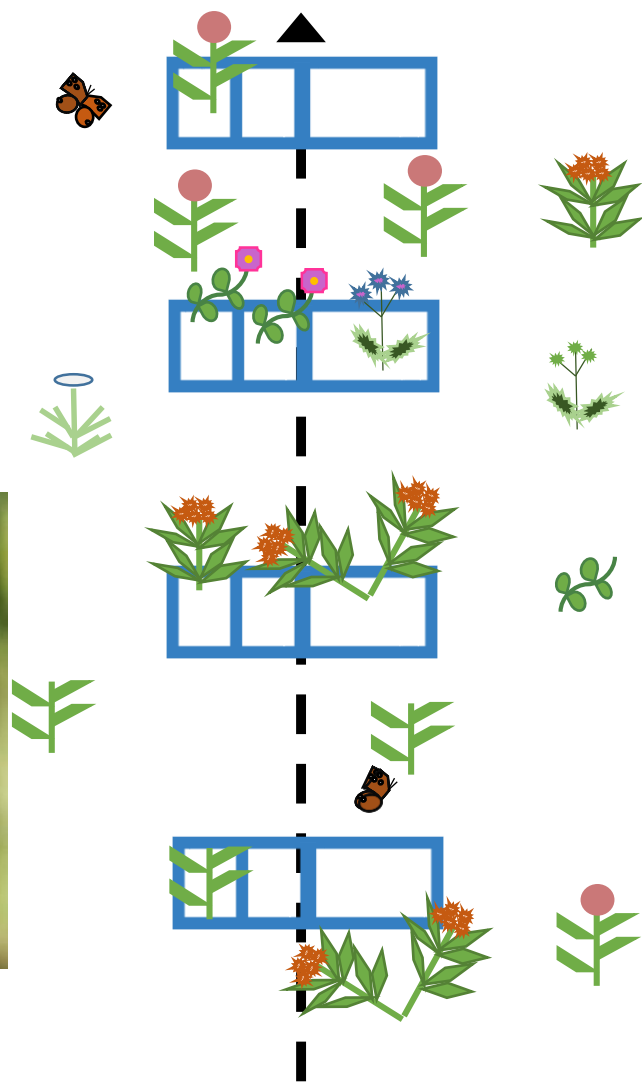


The values above represent the proportion of land in each sector that would adopt the amended stem densities. The top line, "workshop values", are the adoption rates from the structured decision-making workshop and from assumptions made by Thogmartin et al.

Management focus
Management objectives
Management
Current practices &
Mowing
Existing Land cover
High value
Nectar
Milkweed
Low value
Missing something

Product B: Monitoring Protocols

- Integrated Monitoring Strategy (MCSP)
- Basic assessment protocols for practitioners

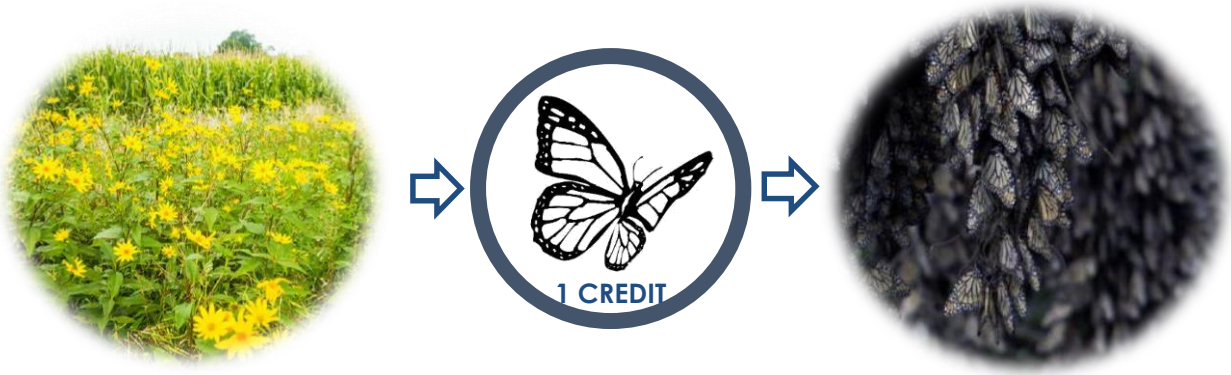


Product C: Computer Scoring Model
HABITAT QUANTIFICATION TOOL (HQT)

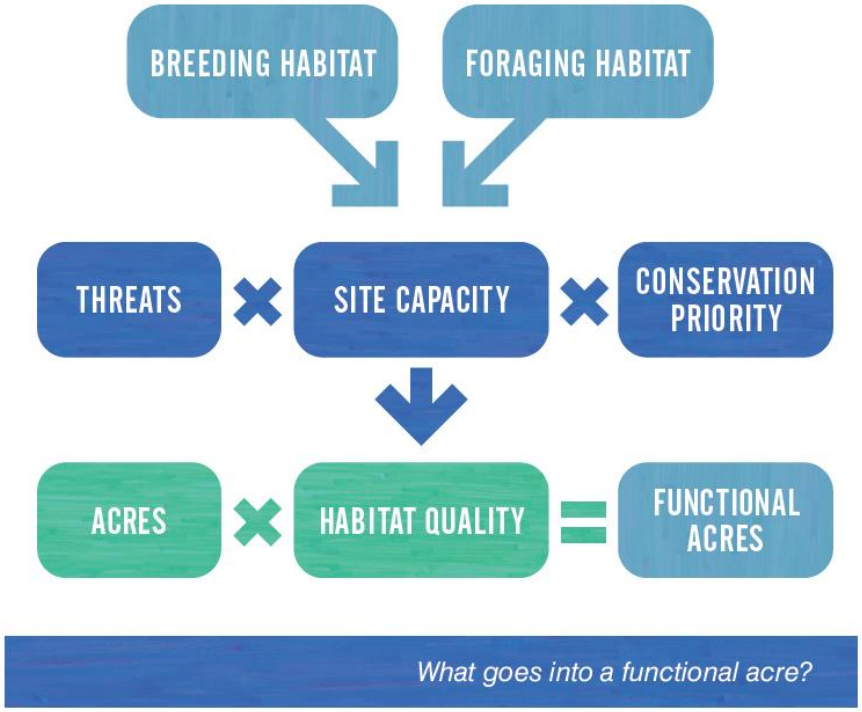
An HQT is a standardized approach to assessing habitat quality for a specific species or community.

PURPOSE OF AN HQT

- Estimate the contribution of a given project towards regional conservation goals.

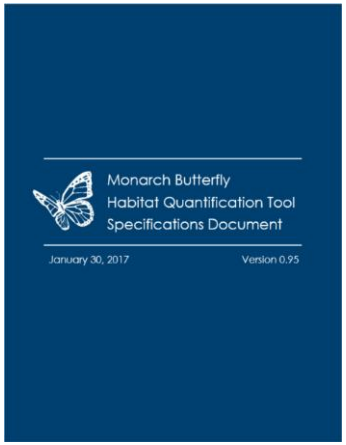


INDICATOR FRAMEWORK

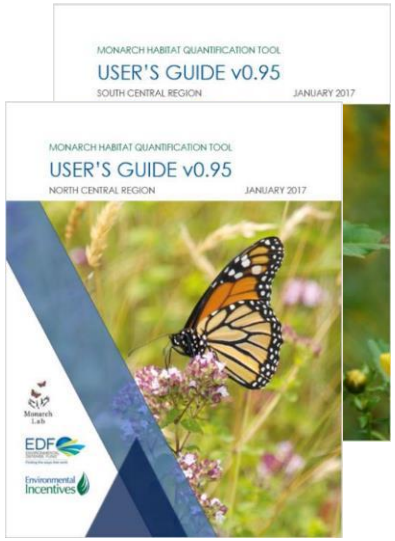


MONARCH HQT COMPONENTS

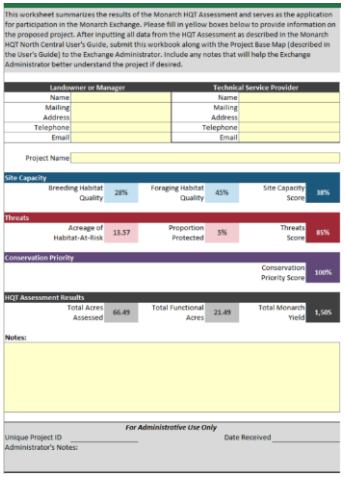
Specifications Document



User's Guides



Calculator



Available at edf.org/monarch

Product D: Context Sensitive Management Recommendations

- Workshops and webinars
- Requires input from practitioners

Questions

Wendy Caldwell
MJV Coordinator
monarchs@monarchjointventure.org

EPRI Pollinator Habitat Field Studies

John Goodrich-Mahoney

Electric Power Research Institute

EPRI's Pollinator Research Program: Protecting and Promoting Pollinators on Electric Utility Lands

John W. Goodrich-Mahoney
Principal Technical Leader

Rights-of-Way as Habitat Science Round Table
May 3, 2017

What is EPRI?

- EPRI is a 501(c3) non-profit charitable organization, which conducts research for the public good
  - EPRI was formed in 1973 and is headquartered in Palo Alto, CA
  - EPRI is funded by the electric utility industry world-wide
    - EPRI also responds to soliciations from DOE and the California Energy Commission
  - EPRI conducts a broad public-private collaborative research program

Protecting and Promoting Pollinators on Electric Utility Lands

- Why is EPRI Involved in Pollinator Research?
  - Global decline in both native and management pollinator populations
  - Internal and external stakeholders asking electric utilities about pollinators on their lands
  - To bring good science and a coordinated response to a critical environmental issue
  - To address electric utility sustainability goals
  - To fulfill EPRI's charge to conduct research for the public good

Protecting and Promoting Pollinators on Electric Utility Lands

- When Did EPRI Start a Formal Pollinator Research Program?
  - Initial discussions with members in 2015 concerning a research program, with the research program starting in 2016
    - Research prior to 2016: 7 technical reports and 1 journal paper

- What Is the Content of the Current Research Program?
  - Member survey
  - Two literature reviews
    - Pollinators: Distribution and transmission rights-of-way
    - Herbicides and Pollinators (just started)
    - Multi-year field research projects (3 to 4 years)
      - Observational and manipulative studies
    - Field study protocols to support studies at distant locations
  - Pollinator Initiative
    - Metrics for measuring pollinator wellbeing on electric utility lands

Protecting and Promoting Pollinators on Electric Utility Lands: Integrated Vegetation Management (IVM)

- EPRI brings over 20 years of IVM research to support its pollinator research program
- Blends ecosystem values with cost-effective vegetation management
- Active management seeks to develop and enhance persistent low-growing vegetation that inhibits the growth of tall trees
- EPRI's research focused developing information to assist utilities in implementing IVM on their transmission systems
  - IVM standards (10 principles and 42 criteria)
  - EPRI IVM assessments
  - ROW Stewardship Council Accreditation
  - IVM training manual
  - Manipulative studies, as part of the pollinator research program

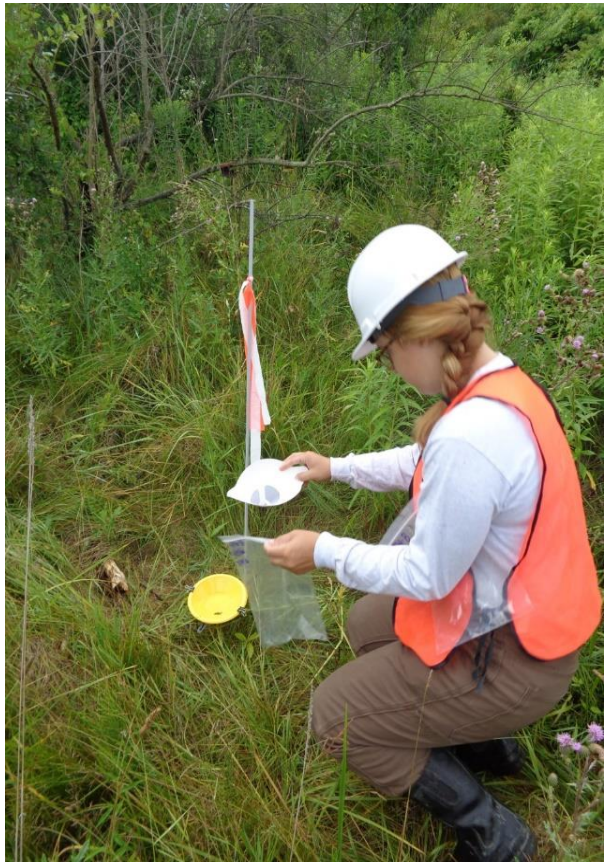
Discussing Integrated Vegetation Management for Transmission Line Corridors

Multi-Year Field Studies
Observational and Manipulative Studies

State University of New York
College of Environmental Science and Forestry
Syracuse, NY

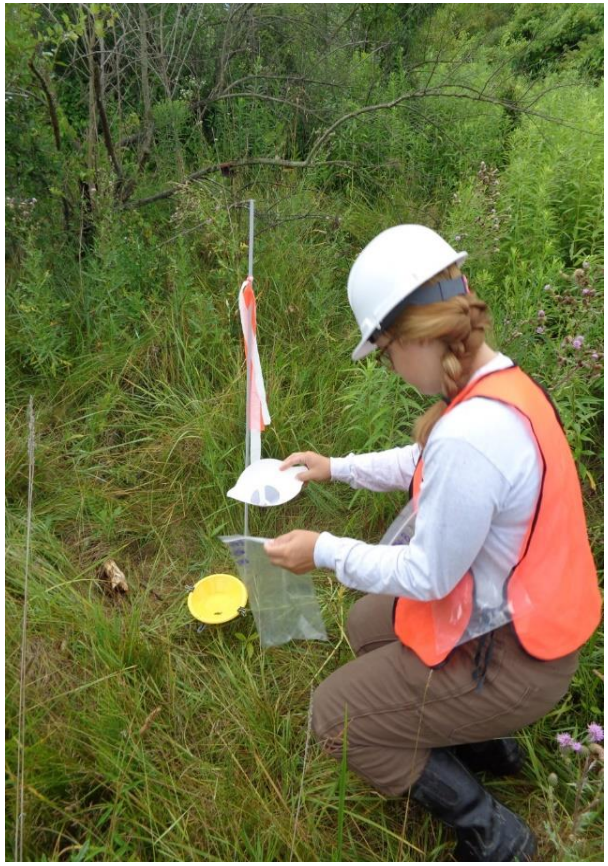
Protecting and Promoting Pollinators on Electric Utility Lands: Field Studies

- Multi-year field research projects to address two basic questions
  - What is the baseline diversity of pollinators on transmission line corridors?
  - What can be done to manage for pollinator habitat in a cost effective manner?



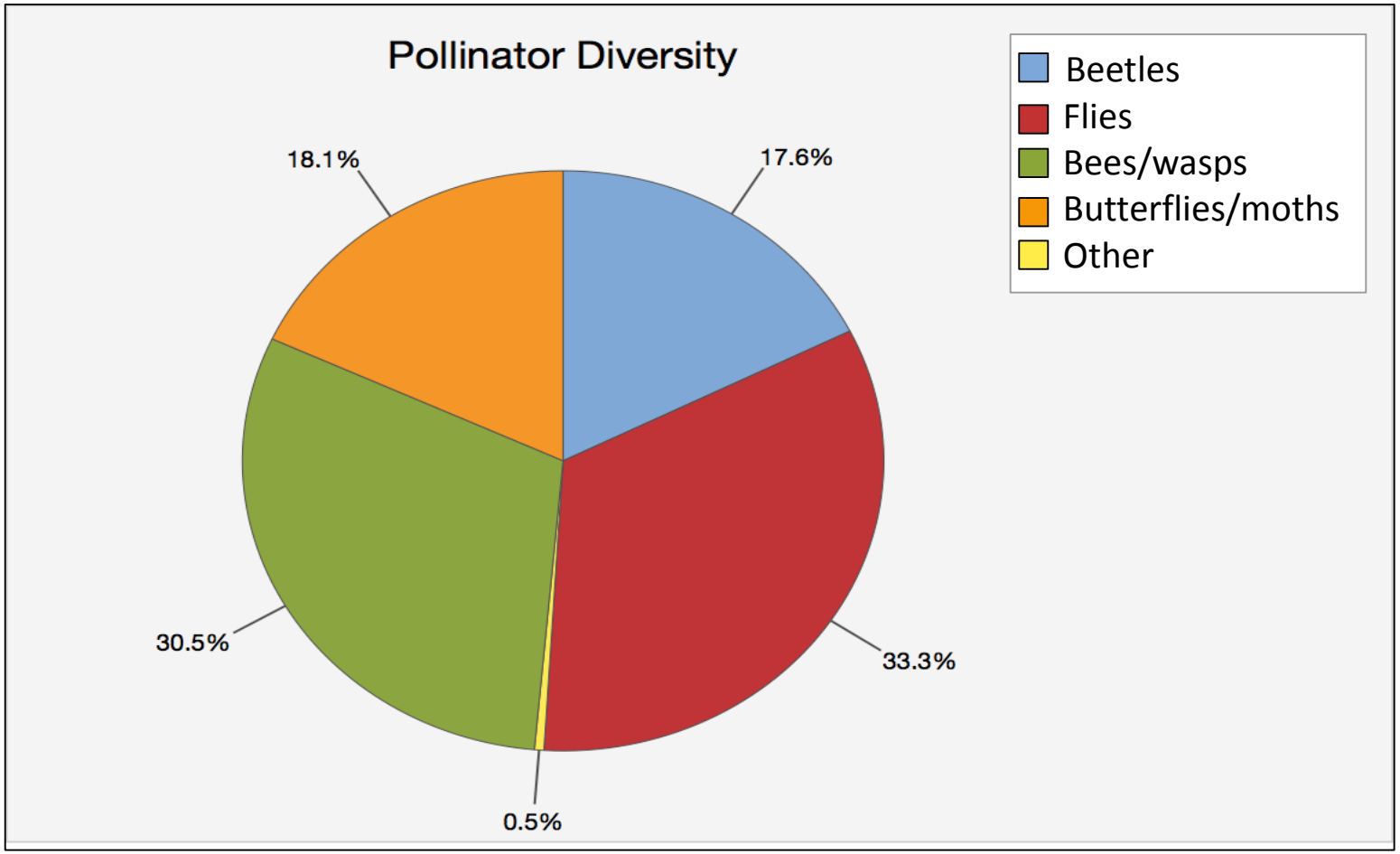
Protecting and Promoting Pollinators on Electric Utility Lands: Field Studies (continued)

- Manipulative studies to begin in 2018
- Seeking additional field sites
- Developing a field study protocol to support these studies



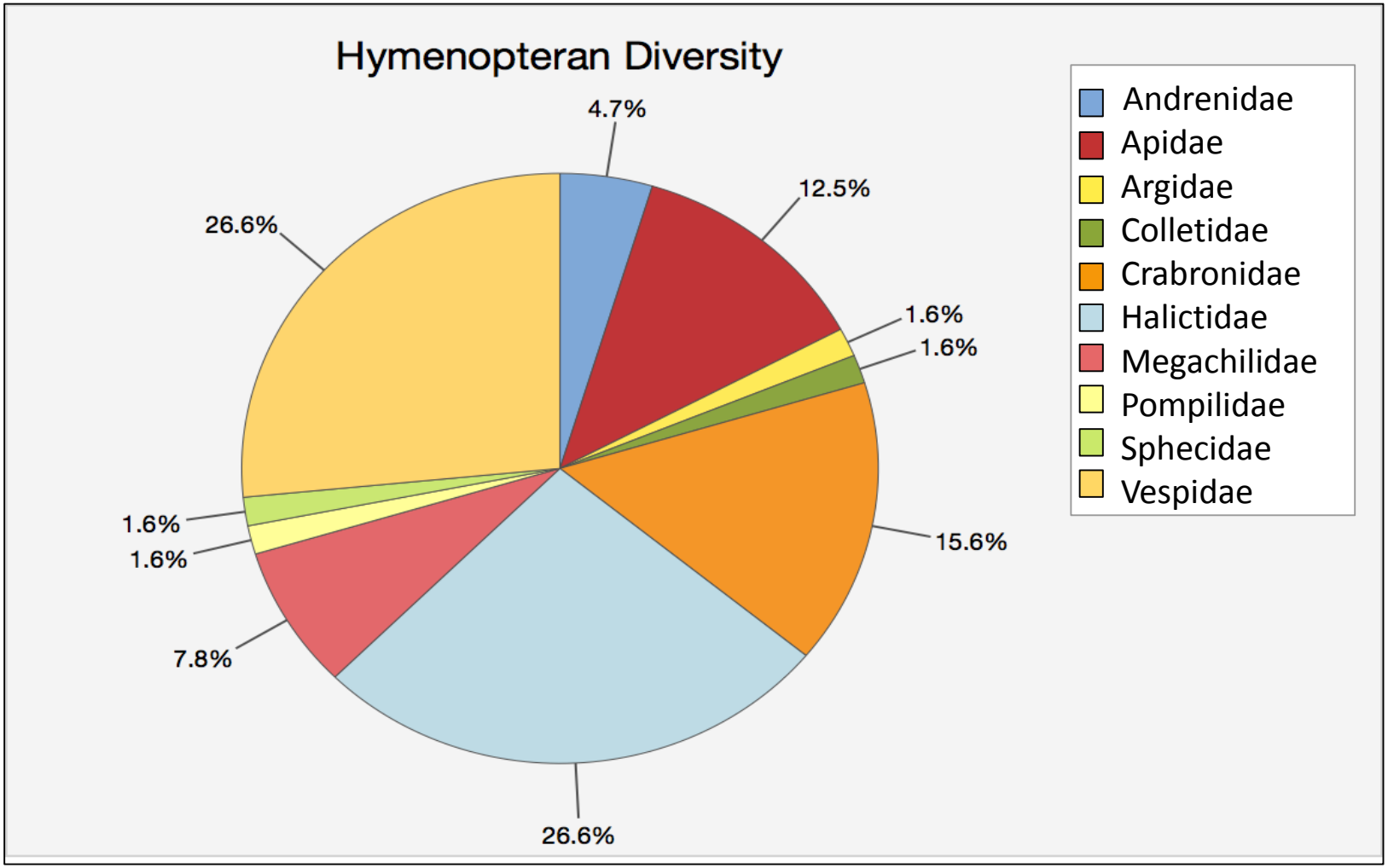
Protecting and Promoting Pollinators on Electric Utility Lands: Initial Results - Observation Study 2016

- Pollinator assemblage patterns on transmission rights-of-way in the New York and the Ohio managed for the long-term with mechanical or chemical treatment schemes
  - Methods are producing discernible spatial and temporal patterns in flowering plants and pollinators
  - First study to document importance of flies and beetles as pollinators on transmission rights-of-way
  - Investigators collected over 3,200 specimens representing 201 species and 42 families



E. McPhail

Pollinators from five orders were present on two study sites in the NE and Mid-west



E. McPhail

The next largest group was bees/wasps (Hymenoptera).

Questions/Comments

Together…Shaping the Future of Electricity

Integrated Vegetation Management (IVM) on utility corridors

Gabe Karns

The Ohio State University

Integrated Vegetation Mgt (IVM) on Pipeline Corridors

Gabriel Karns

ROWs Working Group :: Science Roundtable

THE OHIO STATE UNIVERSITY
SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE

WILDLIFE RESTORATION
Federal Aid Project
funded by your purchase of hunting equipment

TWEL

Overview

- Rights-of-way (ROWs)
- Pipeline ROWs in Eastern OH
- Challenges & **Opportunities**
- Research Objectives

Overhead vs. Underground Utilities

Overhead vs. Underground Utilities

- Shorter return interval
- Woody veg ~~OK~~
- Germination rate/speed
- Forb/herbaceous potential
- Typically narrower
- Access critical
- Sight lines required

ROWs Research

- Relative paucity of pipeline research

Basic Footprint

Forest birds & fragmentation

Noise pollution

ES birds

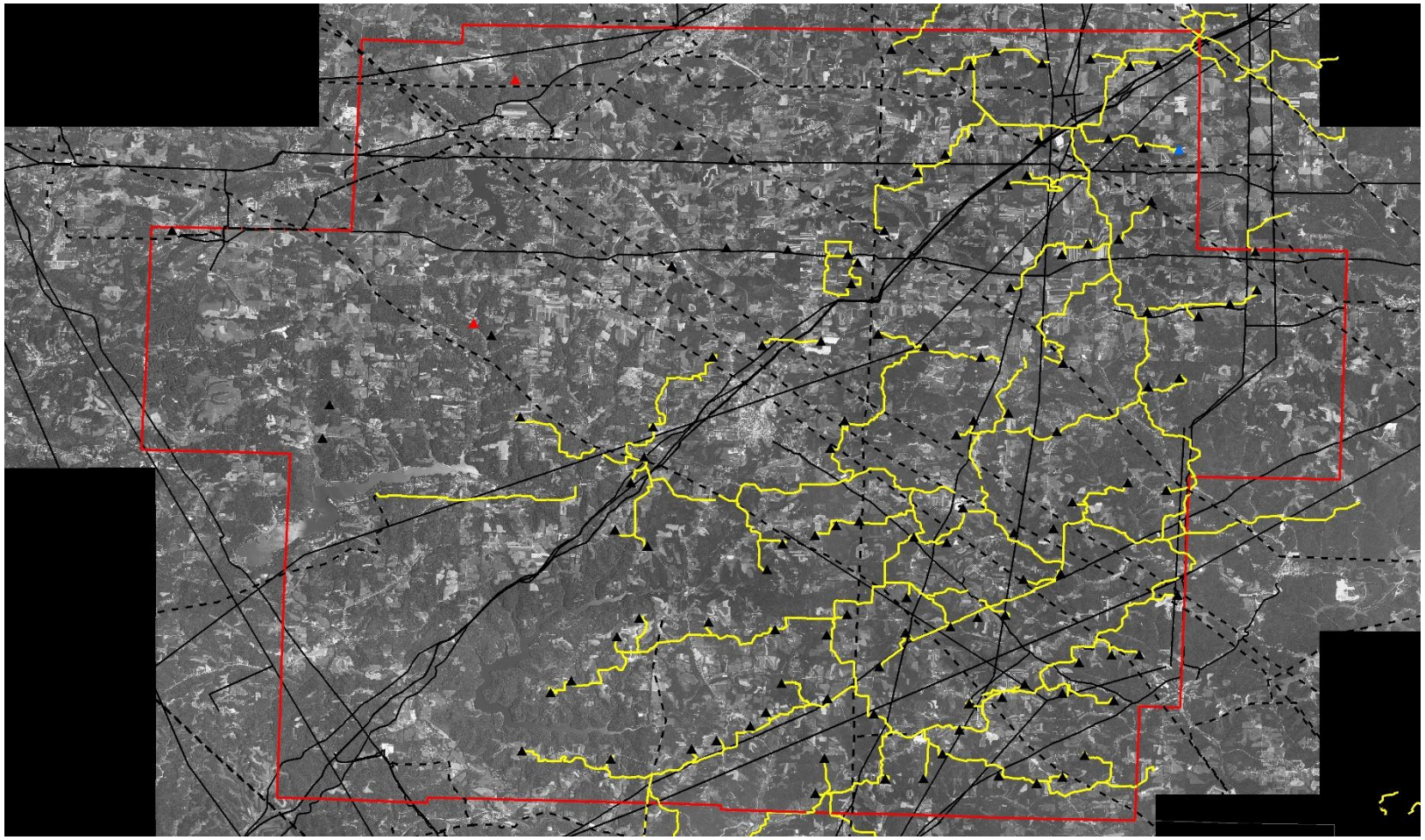
Small mammals

Herps

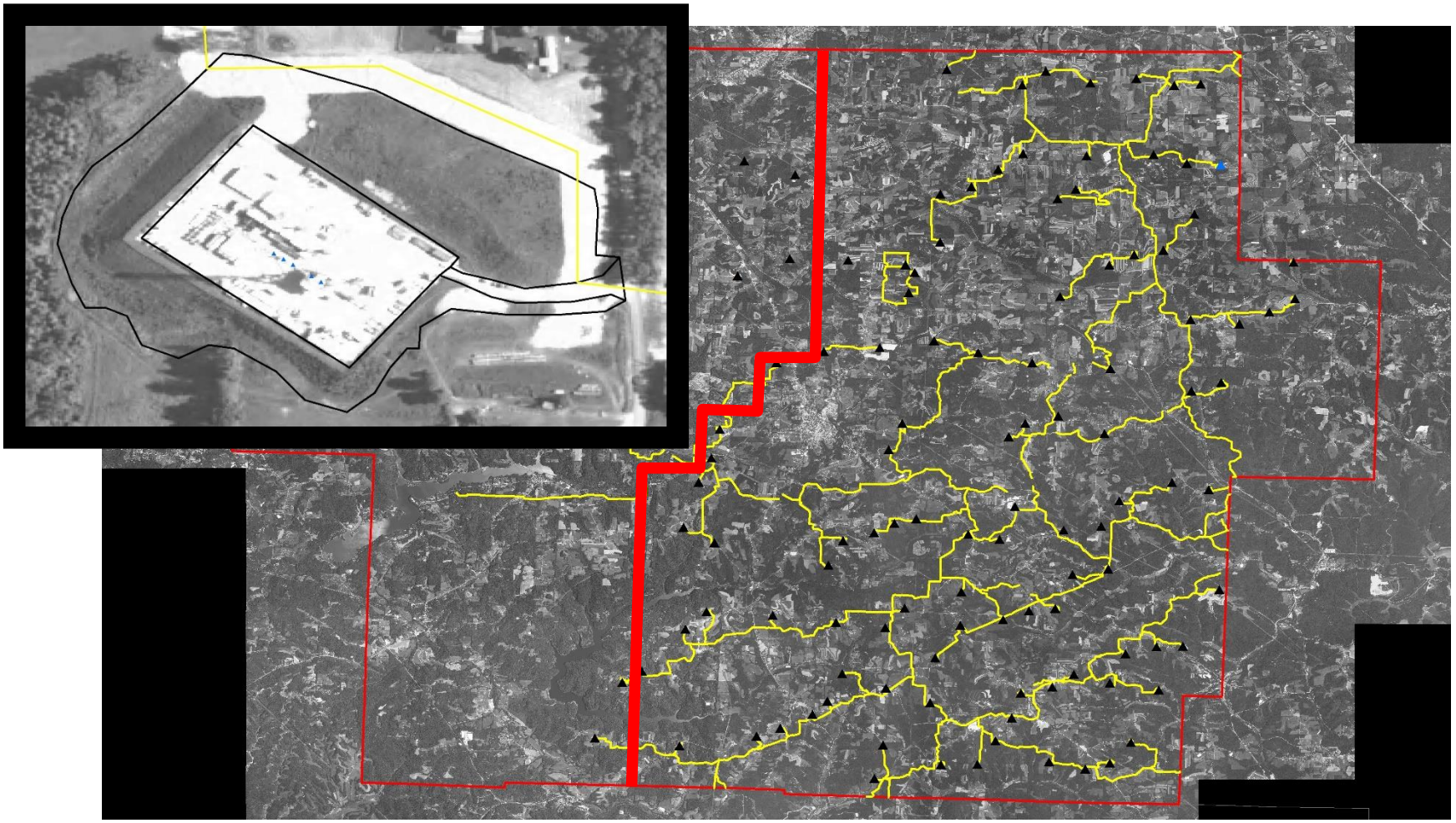
Toxicity & pollutants

Invertebrates

Energy Infrastructure in Eastern OH



Energy Infrastructure in Eastern OH



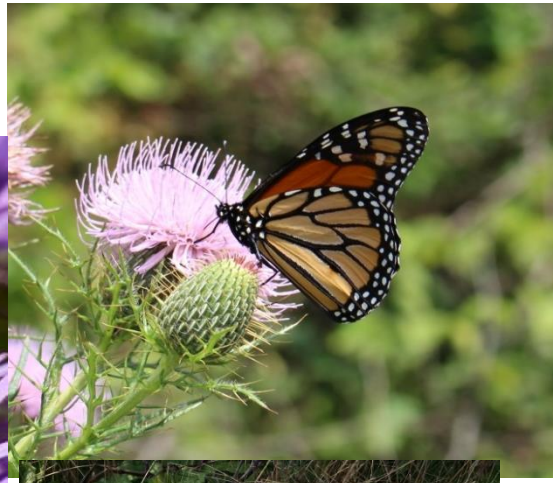
Energy Infrastructure in E. Carroll Cty

- 200 miles of pipeline ROWs
- 23.7 acres of ROW per well pad
- 2.3% direct footprint

1 in every 7 acres influenced!!!

ROWs Research






ROWs Research

PAGE 1 of 2

Pipeline ROWs & Wildlife Habitat Research Project – Job Sheet

- Division of Wildlife & IVM Partners
io State University

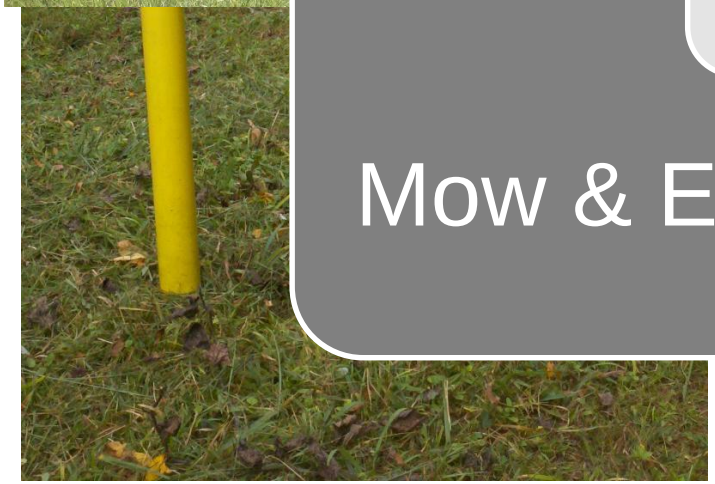
Address:

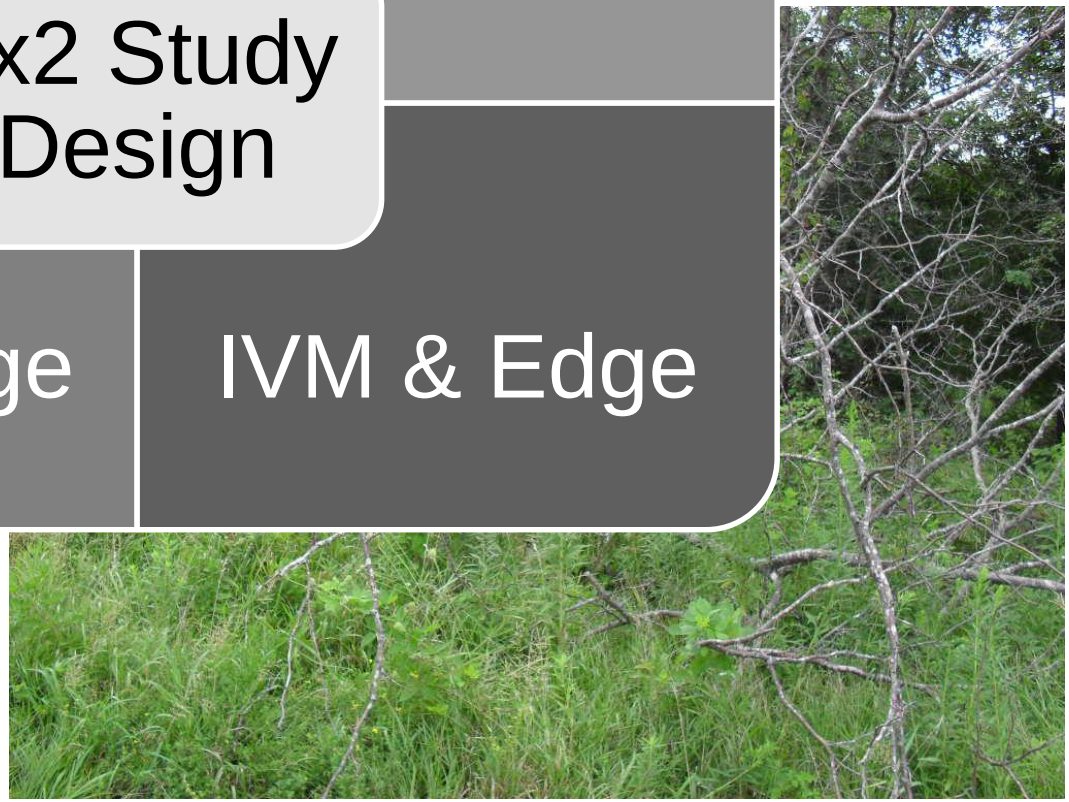
g shale gas pipeline rights-

rasses/forage mixes and
ged this way (e.g., deer,

2x2 Study Design

Mow	IVM
Mow & Edge	IVM & Edge





THE OHIO STATE UNIVERSITY
SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

ROWs Research—Butterflies

ROWs Research—Butterflies 2016

- Butterfly species = 32
- Total butterflies observed = 1,142
- Herbaceous flowering species = 88
- Total flowering blooms counted = 10,385

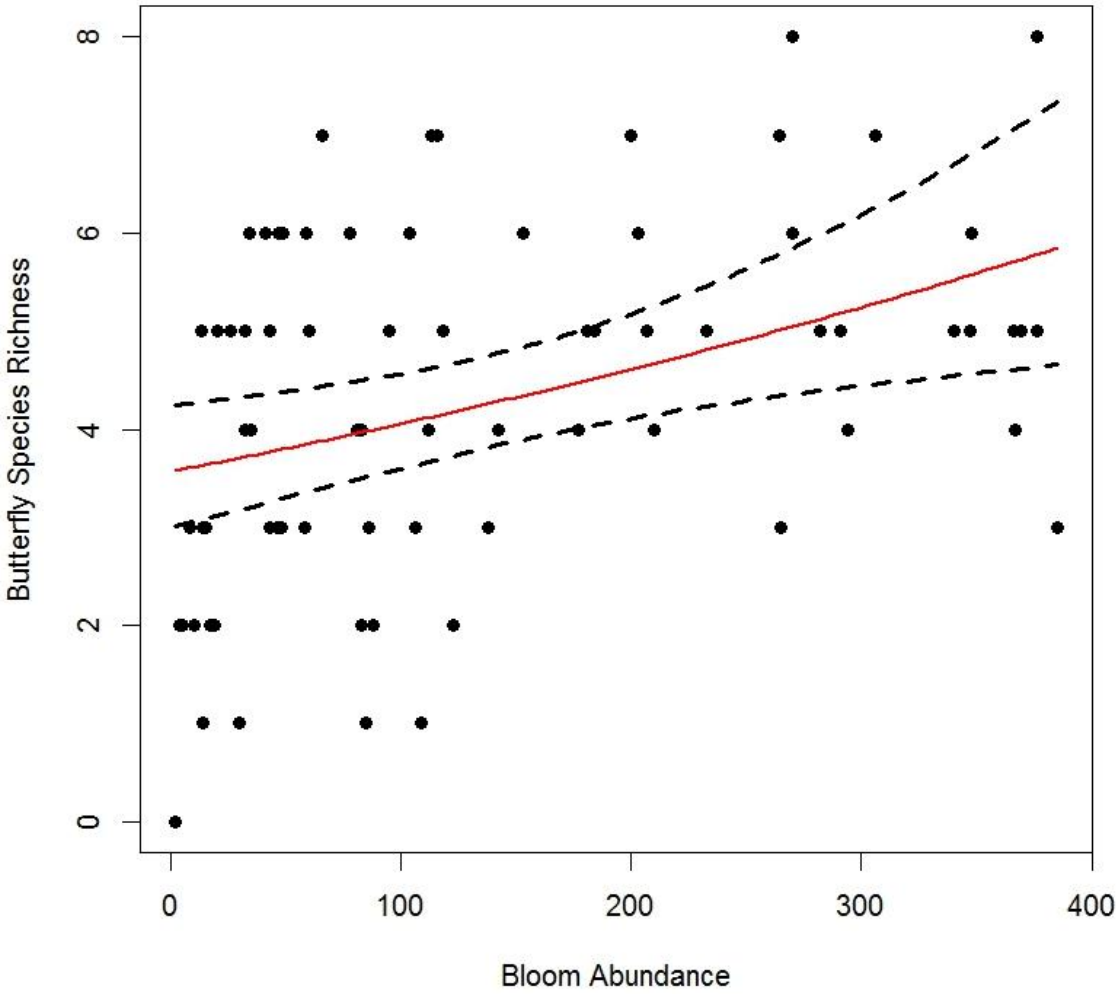
ROWs Research—Butterflies

- What factors influence butterfly abundance and diversity?
- Can managers encourage those factors to further butterfly conservation?
- If so, how?

ROWs Research—Butterflies

- What factors influence butterfly abundance and diversity?
  - Wider ROWs w/ ↑ nectar resources from ↑ diversity of blooming plant species ~ ↑ butterfly abundance & diversity
  - Butterfly abundance & diversity ↑ from May-August
  - Bloom diversity (*not abundance*) ↑ from May-August

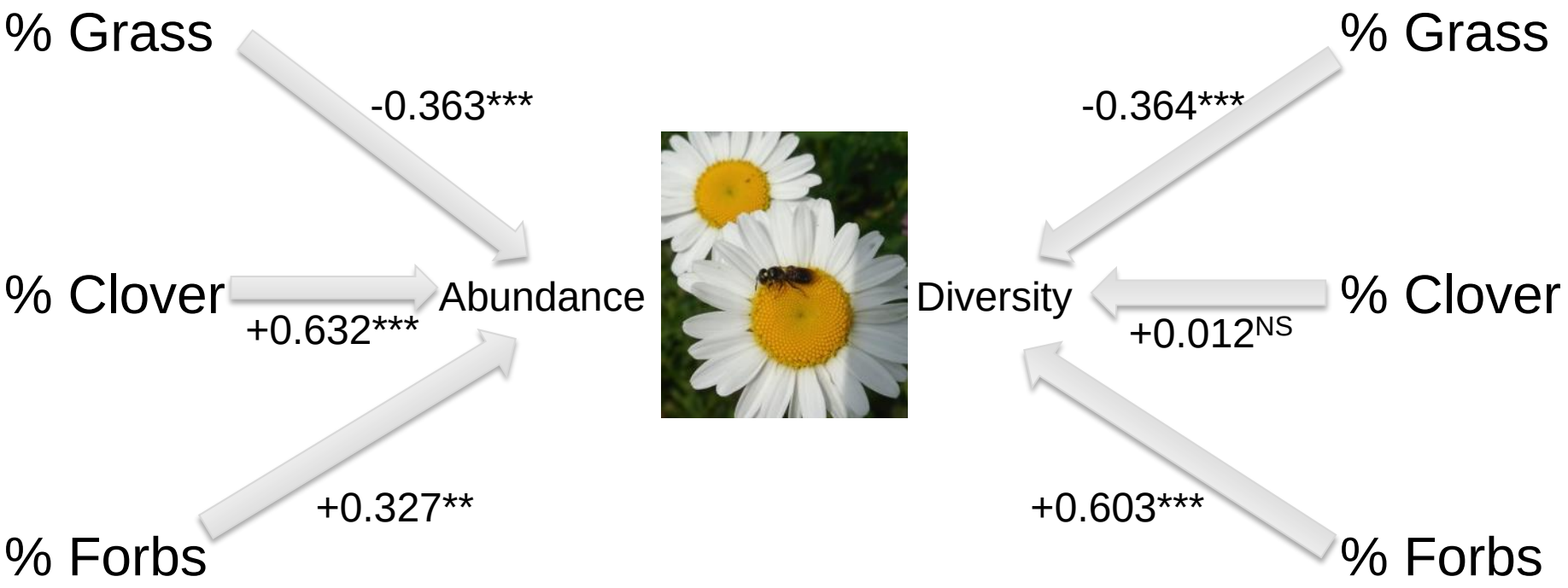
ROWs Research—Butterflies



ROWs Research—Butterflies

ROWs Research—Butterflies

ROWs Research—Butterflies



Bees----------Birds----------Herps

Seed mix design / Perceptions of roadside IVM

Kristine Nemec

University of Northern Iowa Tallgrass Prairie Center

TxDOT native seed collection study

Dennis Markwardt

Texas DOT

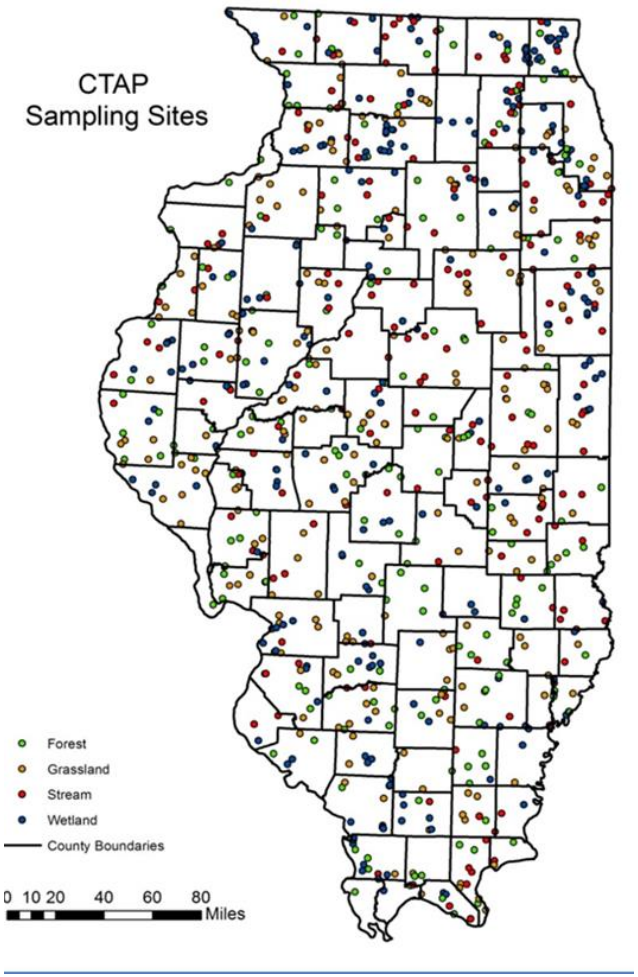
Milkweed occurrence on multiple landscapes

David Zaya & Bill Handel

Illinois Natural History Survey

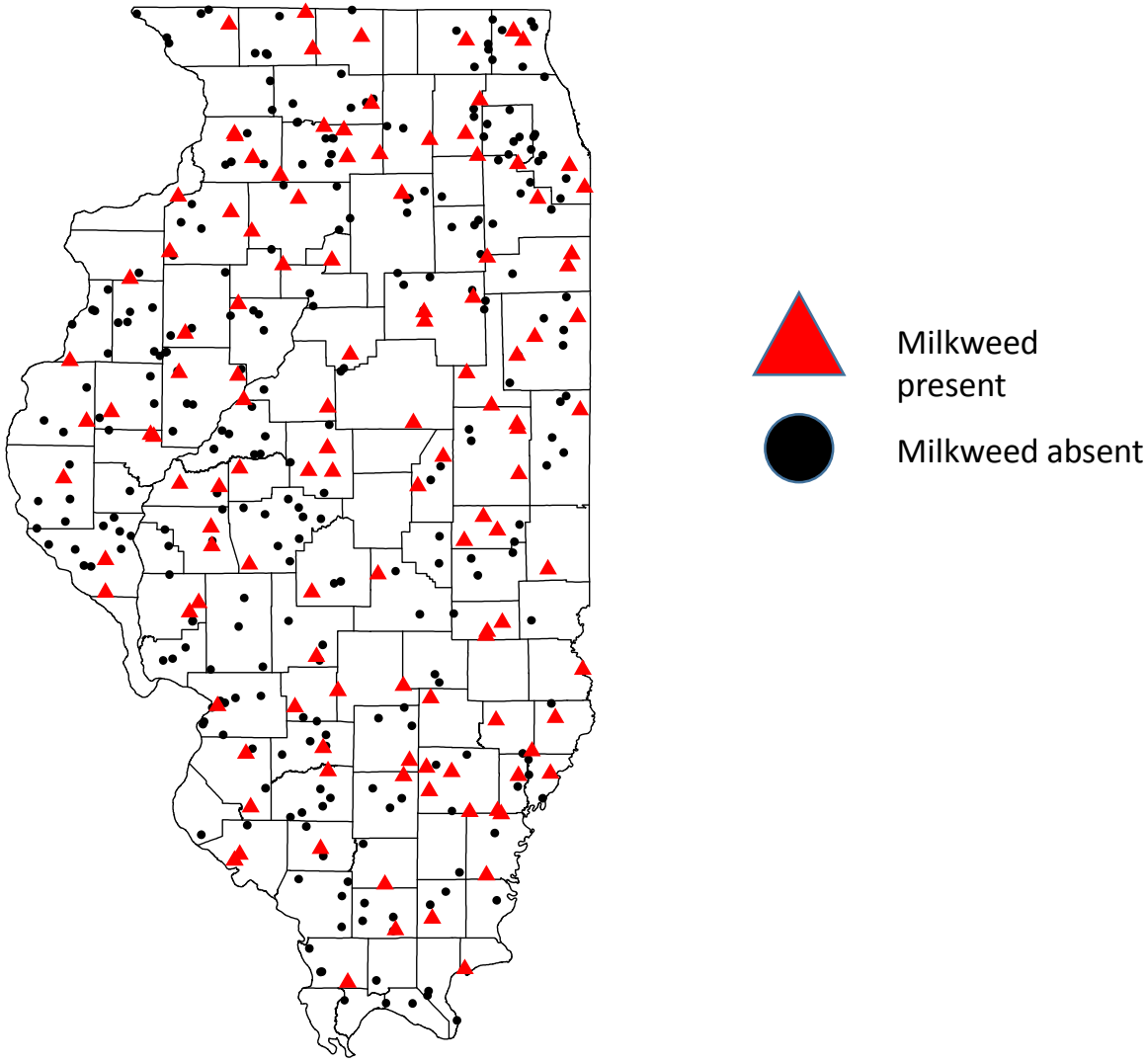
Long-term Trends in Midwestern Milkweeds and their Relevance for Monarchs

David N. Zaya
William Handel
Illinois Natural History Survey



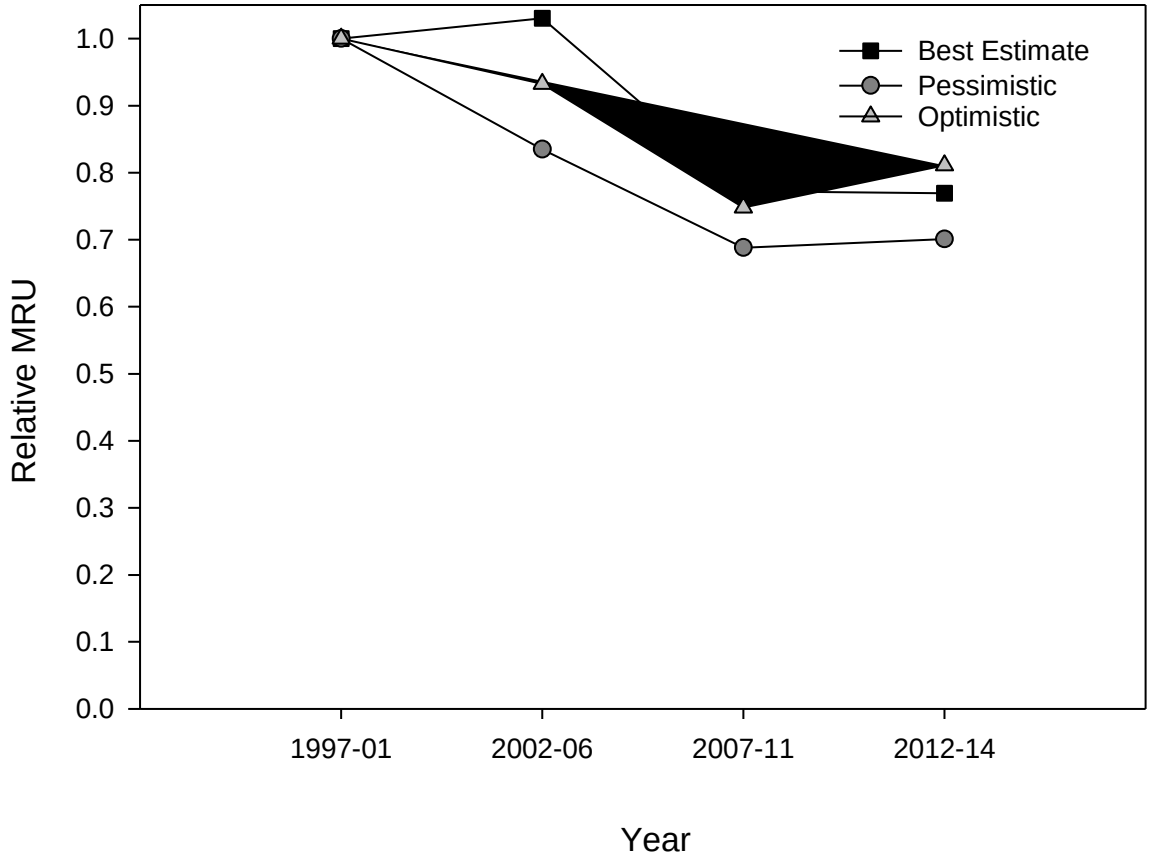
Critical Trends Assessment Program (CTAP)

- 1997-present
- Forest-> Wetland-> Grassland
- Random site selection
- Permanent plots revisited 5-years
- Consistent sampling methodology
- >80% sites private


Milkweed present
Milkweed absent

Monarch Resource Units

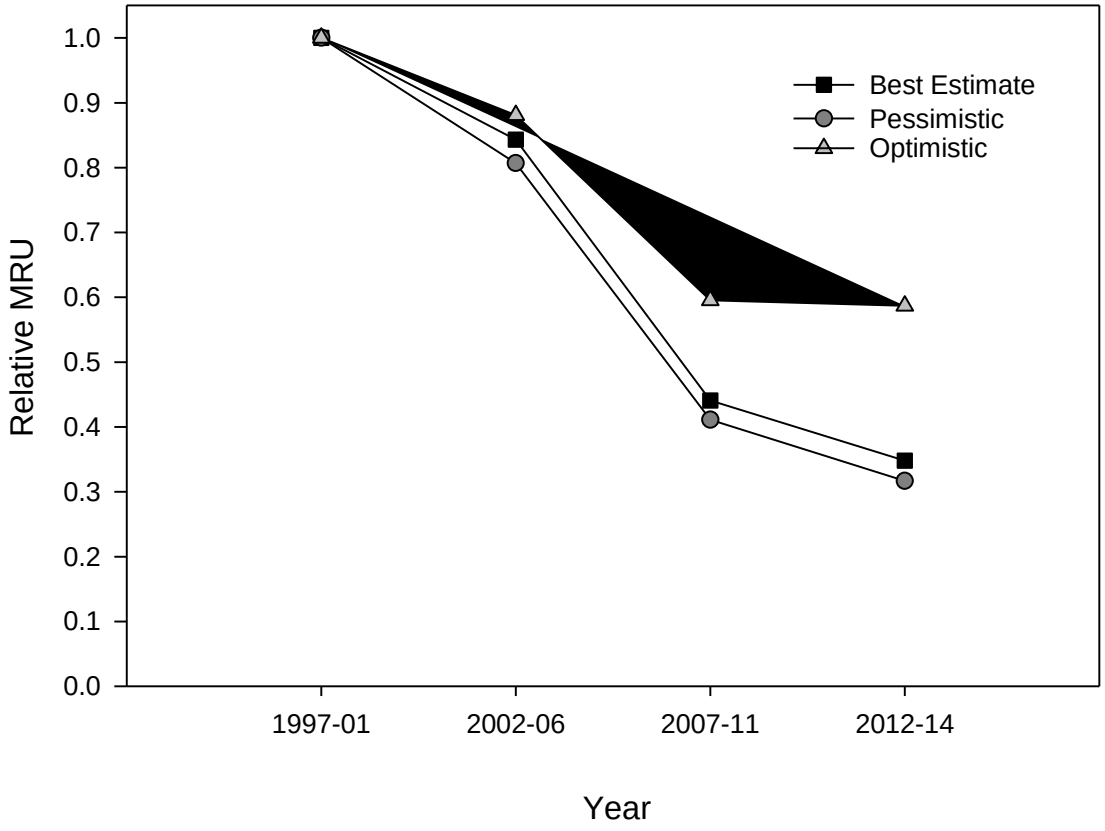
Natural Areas



Zaya et al. In Review

Monarch Resource Units

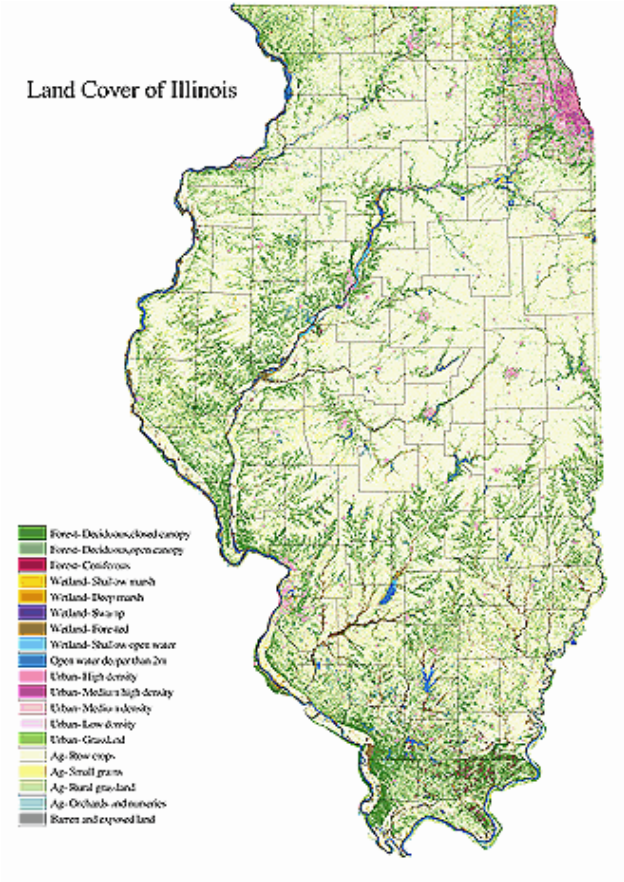
Crop Fields + Natural Areas



Zaya et al. In Review

Gaps in Knowledge

- Heterogeneous distribution of habitat
- Right-of-way influence may change across landscape



Gaps in Knowledge

- Variation through time
  - Intra- and Inter-annual
  - Cycles in plants, butterflies
  - Management
  - e.g. drought years

Gaps in Knowledge

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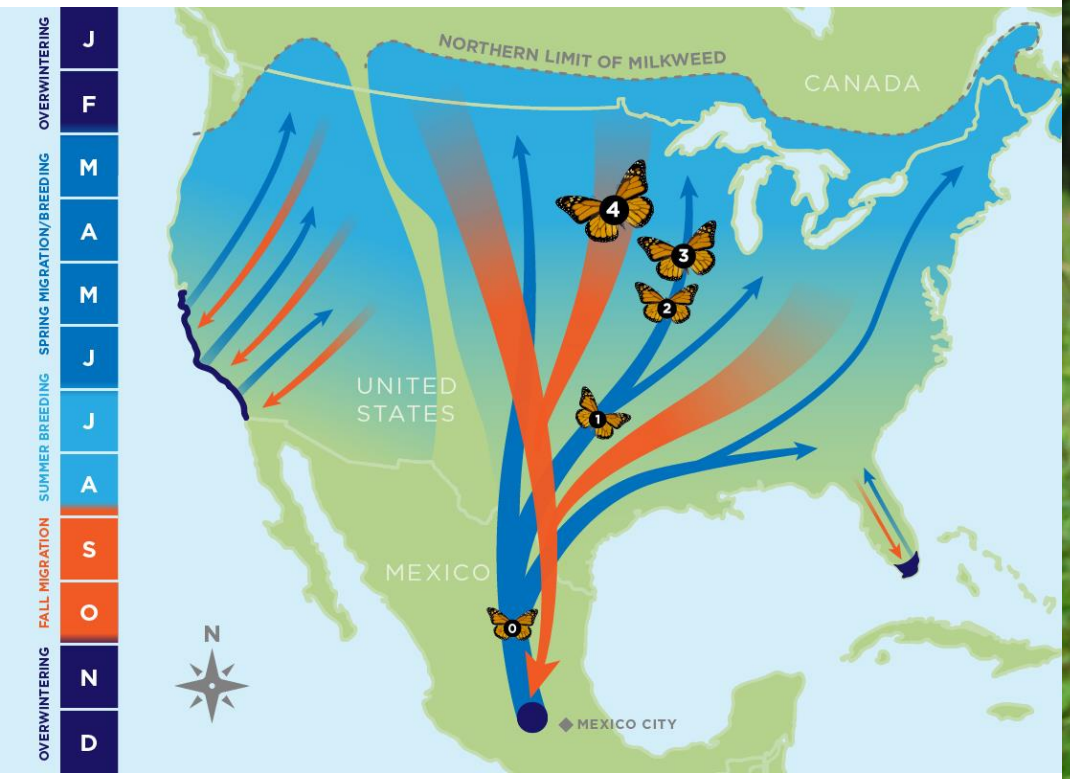
OVERWINTERING
SPRING MIGRATION/BREEDING
SUMMER BREEDING
FALL MIGRATION
OVERWINTERING
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CANADA
UNITED STATES
MEXICO
MEXICO CITY
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NiSource soil microbiology study

Stan Vera-Art

Grow With Trees

Economic value of biodiversity

Amy Ando
University of Illinois

SCIENTIFIC METHOD

The scientific method seeks to explain the events of nature in a reproducible way.

- Make an Observation.
- Form a Question.
- Form a Hypothesis. Conduct an Experiment. ...
- Analyze the Data and Draw a Conclusion.

... A hypothesis is an **educated** guess about how things work. You conduct a fair test by making sure that you **change only one factor** at a time while keeping all other conditions the same.

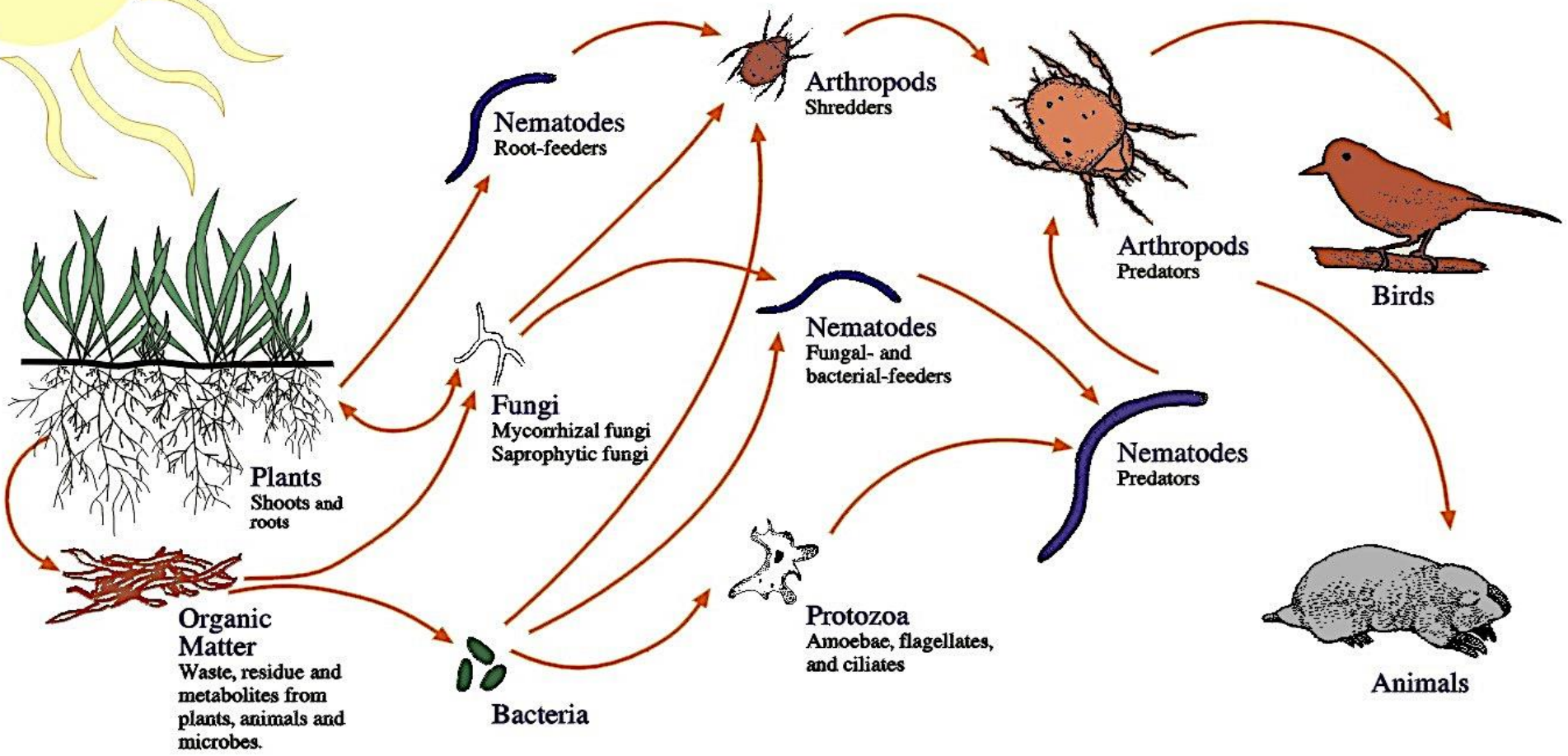
SOIL

A single teaspoon (1 gram) of rich soil can hold up to:

- One billion bacteria
- Several yards of fungal filaments
- Several thousand protozoa
- Scores of nematodes

An **educated** guess … making sure that you **change only one factor** at a time …

SOIL FOODWEB



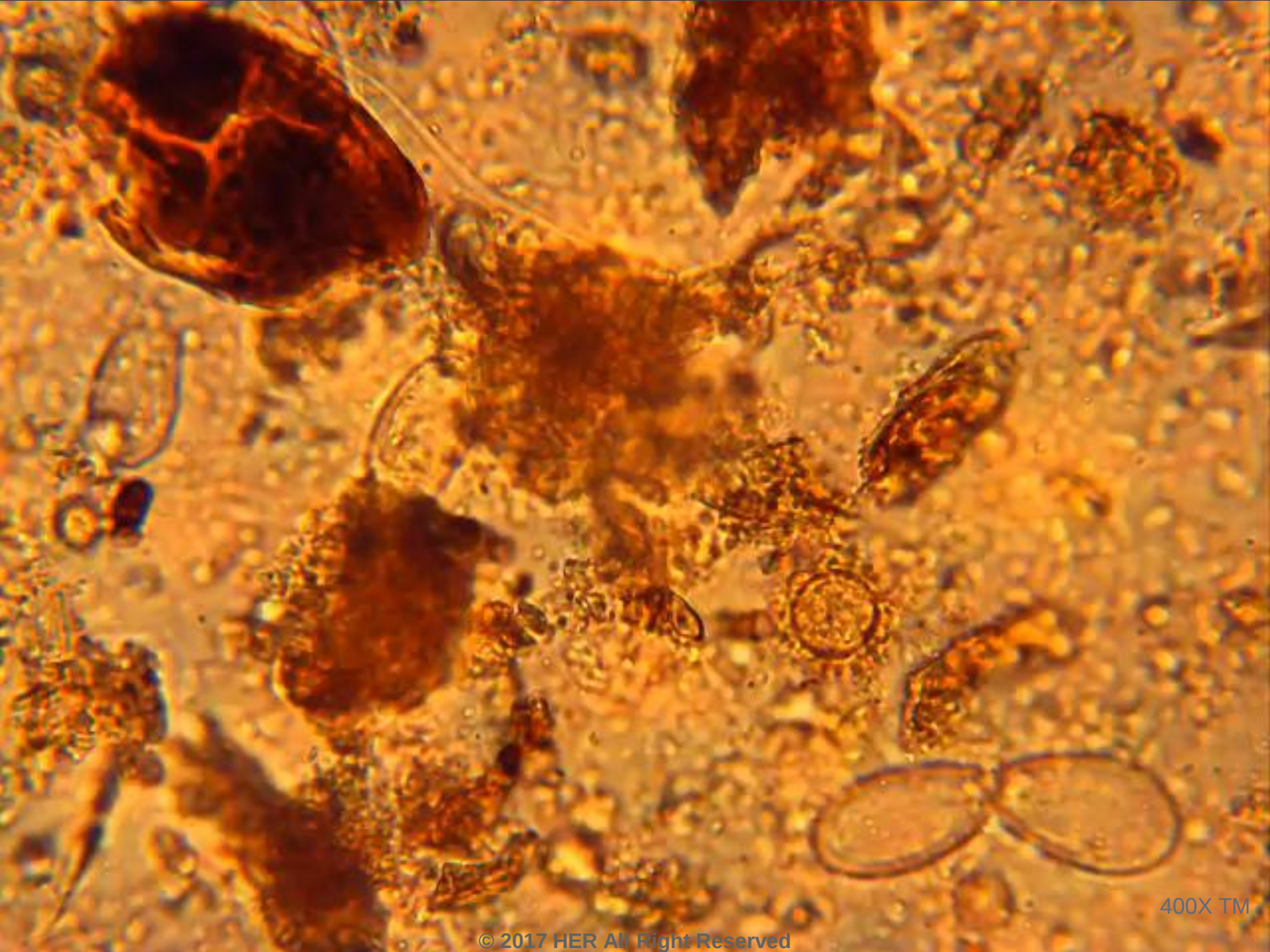
1ST TROPHIC LEVEL
Photosynthesis

2ND TROPHIC LEVEL
Decomposers, Mutualists, Pathogens, Parasites, Root-feeders

3RD TROPHIC LEVEL
Shredders, Predators, Grazers

4TH TROPHIC LEVEL
Higher-level predators

5TH AND HIGHER TROPHIC LEVEL
Higher-level predators



- **Soaking seeds** overnight with mychorrizae

- **Per 1/2 acre Recipe**

Test ROW Swath 1800 Gallon Tank	1800 Gallons Per 1/2 ACRE TANK	Total Materials Per 5 Acres Entire ROW
Complete Fertilizer (Per Bag / 50#)	9	90
HuMagic (Per Bag / 40#)	6	60
Mychorrizae (Per Pound)	5	50
Wood Fiber Mulch (Per Bag / 50#)	9	90
Seed Mix (Per Pound)	30	300

- **Cleaning** tank with baking soda
- **Filling** with pond water for hydro-slurry
- **Adding** all ingredients according to recipe


FINN

Week 1

Week 2

Week 3

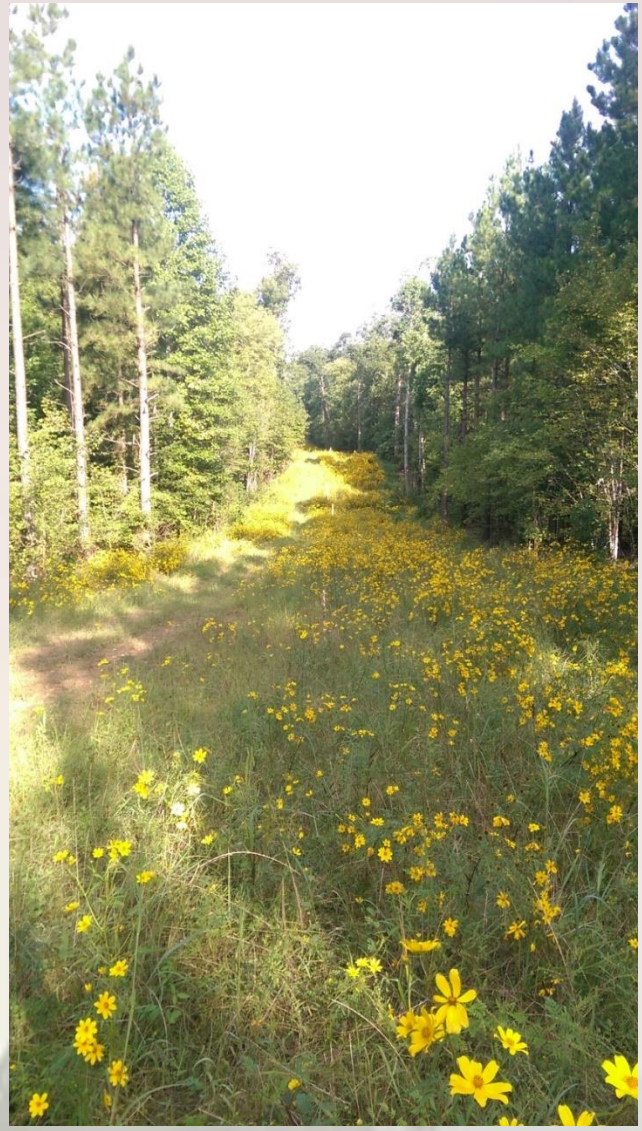
Week 4

Week 5

Week 6

Week 7

Week 8



5 months later

Economic Value of Biodiversity and Grasslands

Amy W. Ando
Dept. of Agricultural and Consumer Economics
University of Illinois Urbana-Champaign

ILLINOIS

Types of research

- Optimal conservation site choice planning:
  - Get the most benefits from your budget
  - Pick a portfolio of lands robust to climate change
- Non-market valuation: what are we willing to pay (WTP) for environmental goods?
  - Reduced flooding
  - Aquatic habitat quality
  - Biodiversity
  - Grasslands

What are people WTP for grasslands?

- Method:
  - Choice experiment survey (hypothetical)
  - Responses from ~300 Illinois households
- Results:
  - People WTP $75-$100/yr for a 100-acre grassland
  - Value increased by proximity, familiarity, wildflowers, biodiversity, large bird populations, endangered species, less burning

(Dissanayake and Ando 2014)

What is value of extra carbon storage from biodiverse grasslands?

- Method:
  - Data from experiments shows how much carbon stored in grasslands as function of # species
  - Use “Social Cost of Carbon” to find the value of reduced damages if you increase # species
- Results:
  - Going from 1 → 2 species stores 9.1 metric tons more carbon, worth $805/hectare
  - Value of additional species declines with diversity

More work to be done

- Valuing more services than just carbon storage. For example:
  - Butterfly “production”
  - Increased bird populations in an area, good for birdwatching and hunting
- What is “non-use value” of having restored grasslands if you can’t walk in them?

Breeding bird habitat on railroad corridors

Christopher Whelan

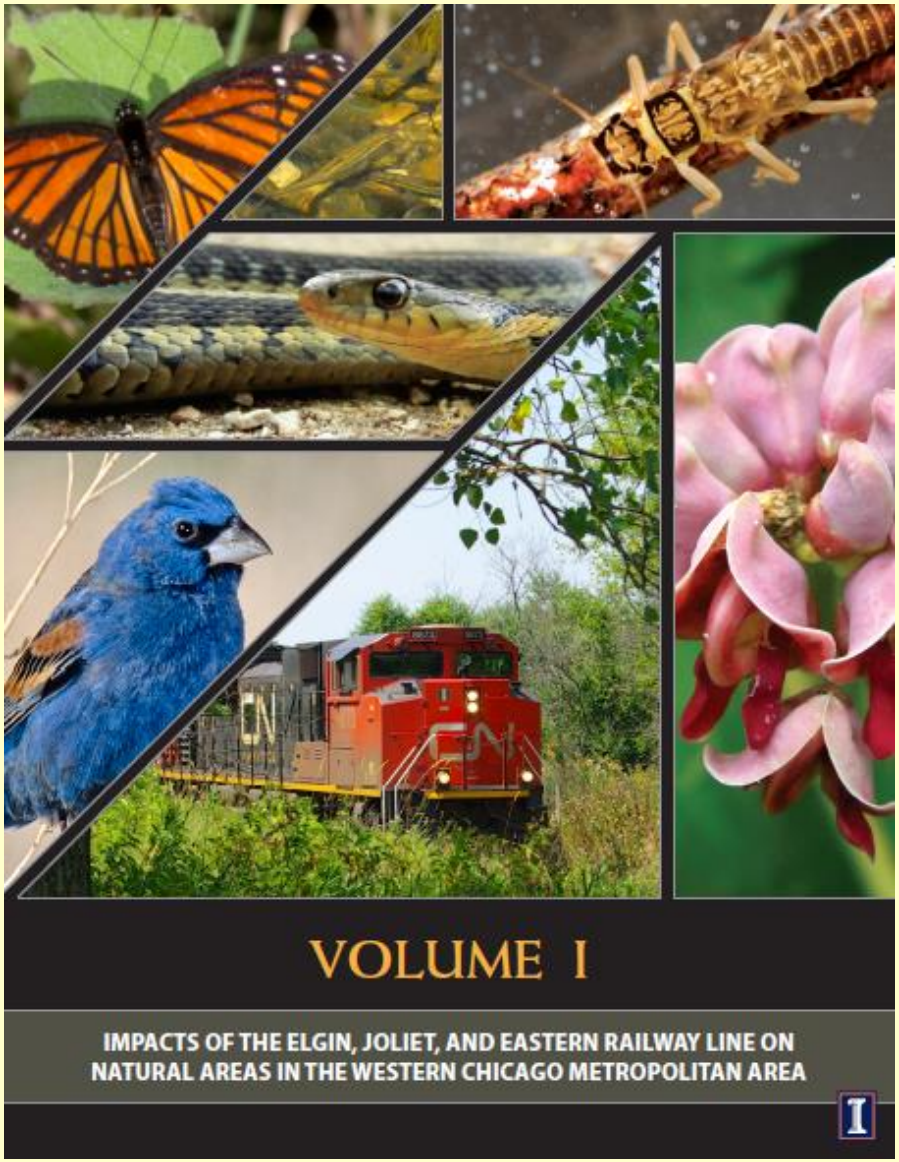
University of Illinois-Chicago

Living along the right side of the tracks:

Railroad rights-of-way as wildlife habitat

Chris Whelan
Department of Biological Sciences
University of Illinois at Chicago

Transportation is key to our society



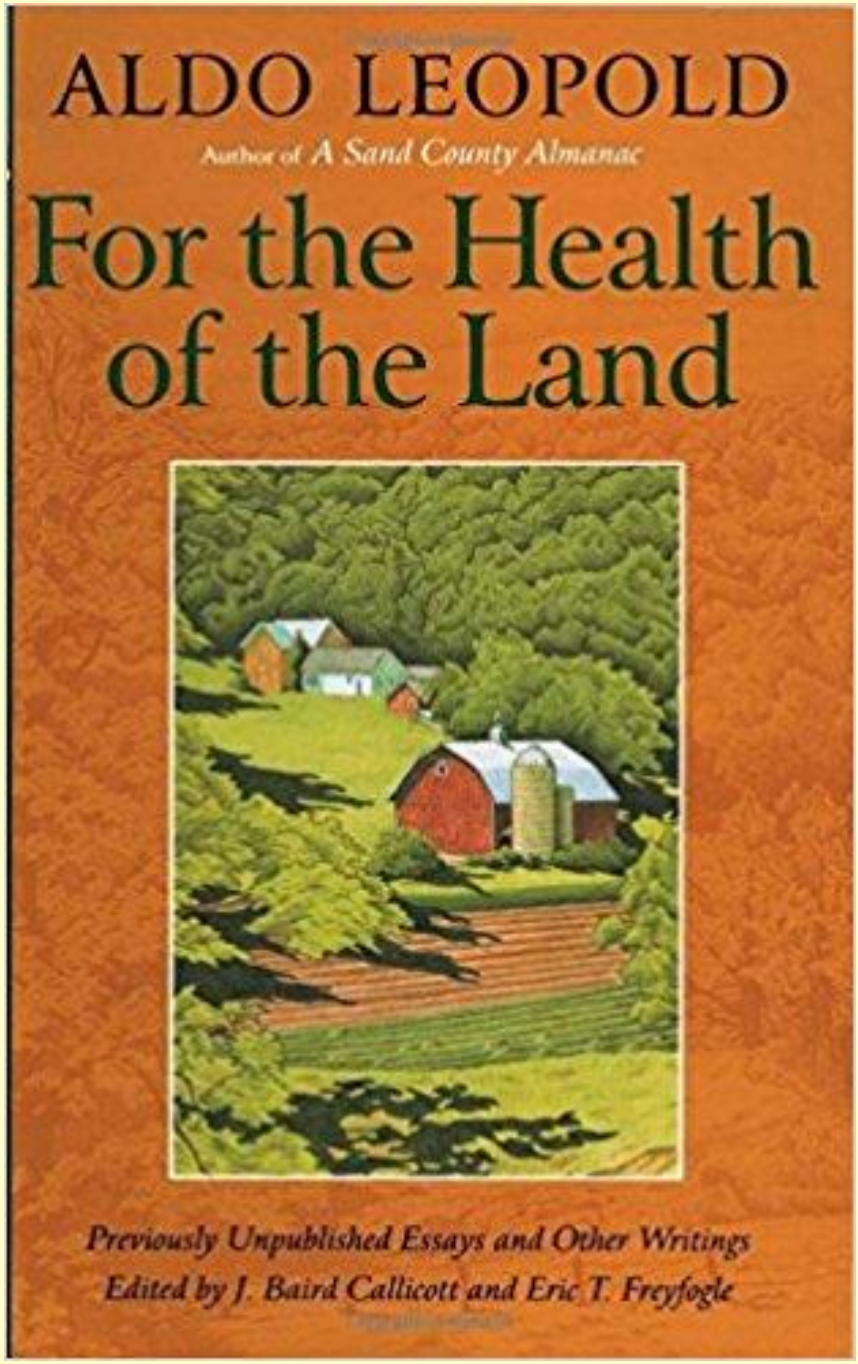
Transportation, in all its forms, has ecological impacts.

Well studied impacts are those associated with the over 4 million miles of highways in the United States.

Less known are potential impacts of 233,000 miles of railroad tracks in the U.S.

Win-Win Ecology

How the earth's species can survive in the midst of human enterprise



Leopold wrote about the need to push for conservation on private lands. Mike's notion of Reconciliation Ecology seems to me to be somewhat a modern restatement of that position.

Win-Win Ecology

- Potential impacts of rail corridors on wildlife – specifically breeding bird communities
- Managing transportation rights-of-way and adjacent lands to enhance habitat for native bird species

Assessing ecology of nesting birds along the Elgin Joliet & Eastern (EJ&E) Rail Corridor

Christopher J Whelan, Illinois Natural History Survey

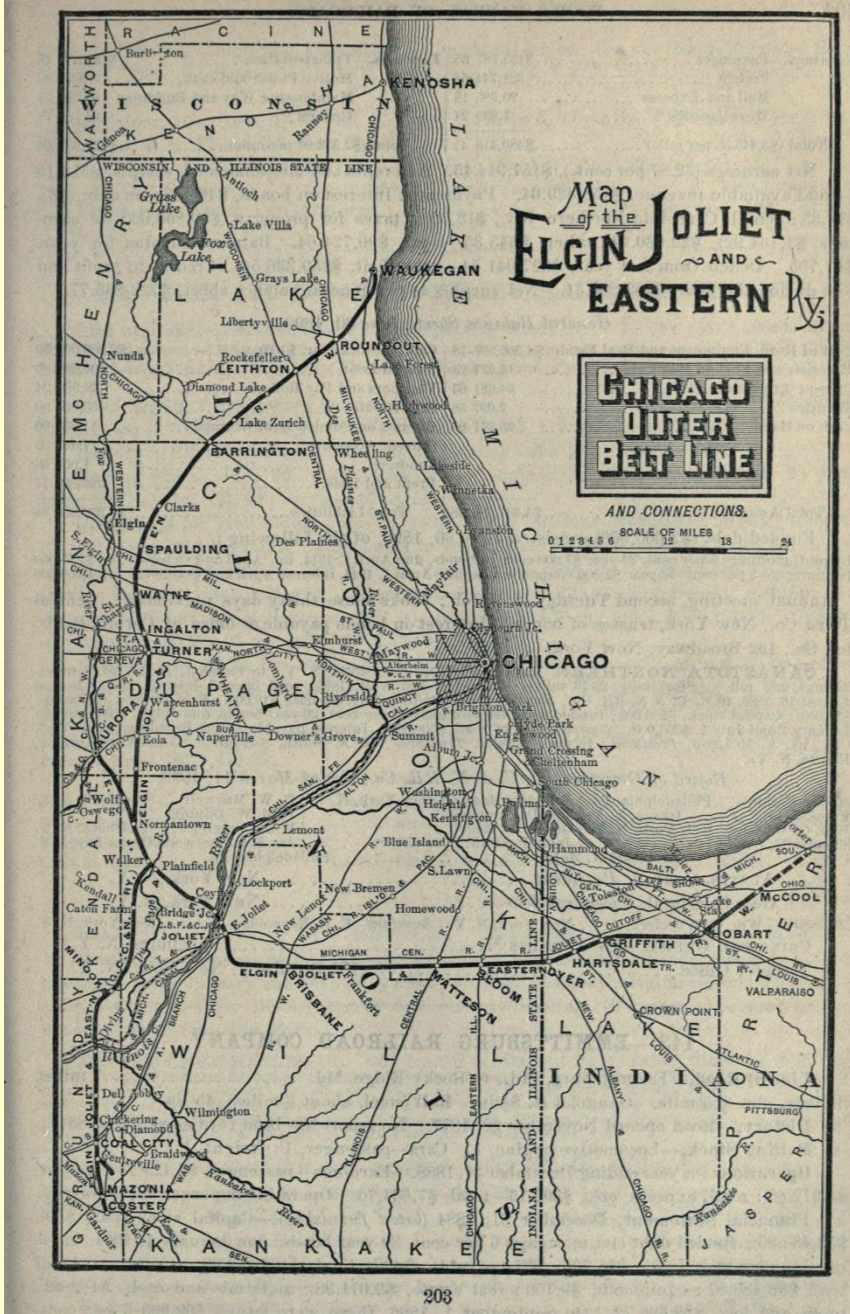
Mason Fidino, Lincoln Park Zoo

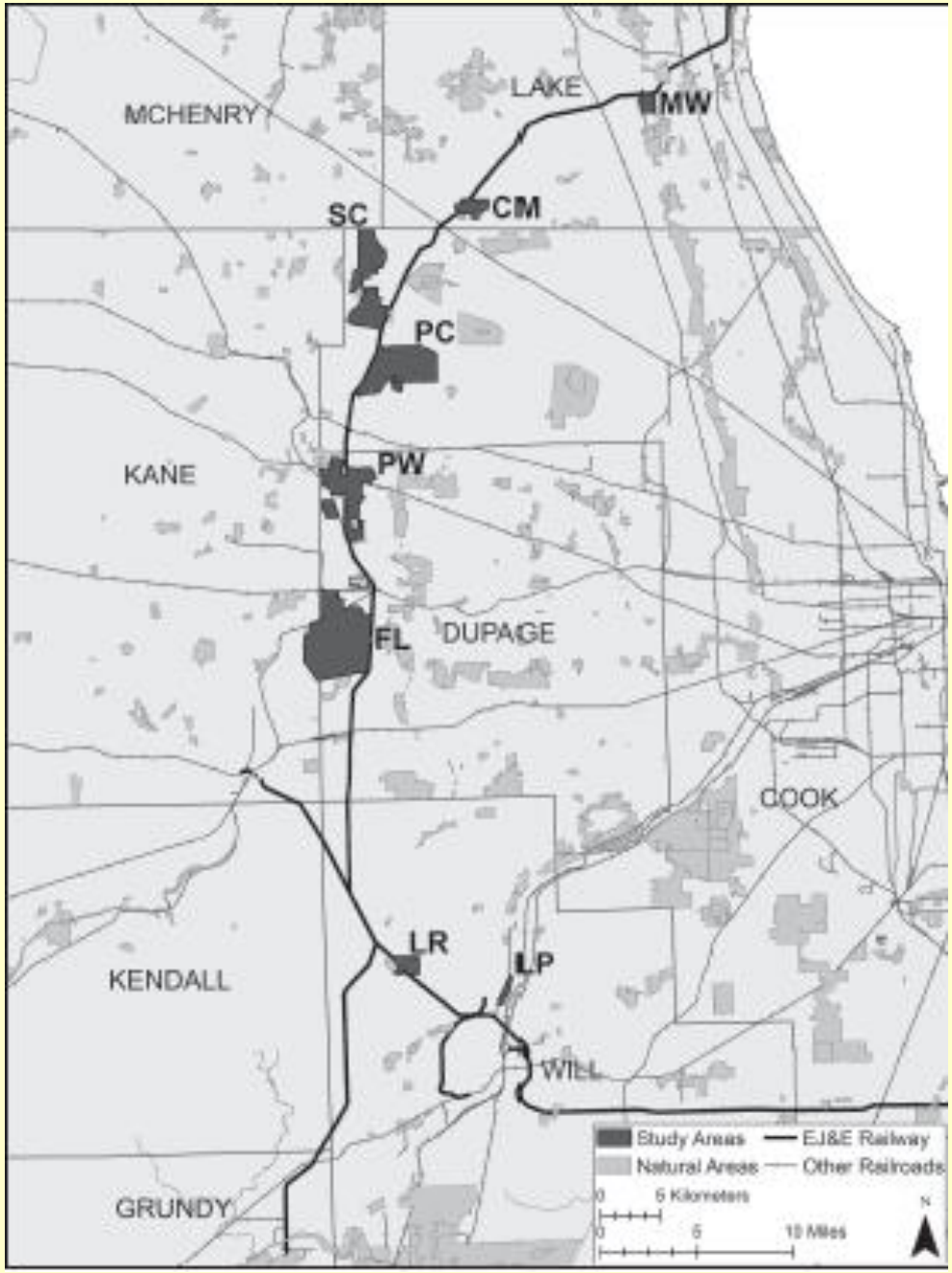
Manette E Sandor, University of Connecticut

Dylan Maddox, Field Museum Associate

Allison K Barner, University of California-Berkeley

Hahn Bui, Real World




MCHENRY
LAKE
MW
SC
CM
PC
KANE
PW
FL
DUPAGE
COOK
LR
LP
KENDALL
WILL
GRUNDY
Study Areas
Natural Areas
EJ&E Railway
Other Railroads
0 5 Kilometers
0 5 10 Miles
N

Rail corridors are buffered from surrounding lands by the adjacent right-of-way (ROW). Vegetation growing in and adjacent to the EJ&E ROW varies:

Grassland

Forest or woodland

Shrubs

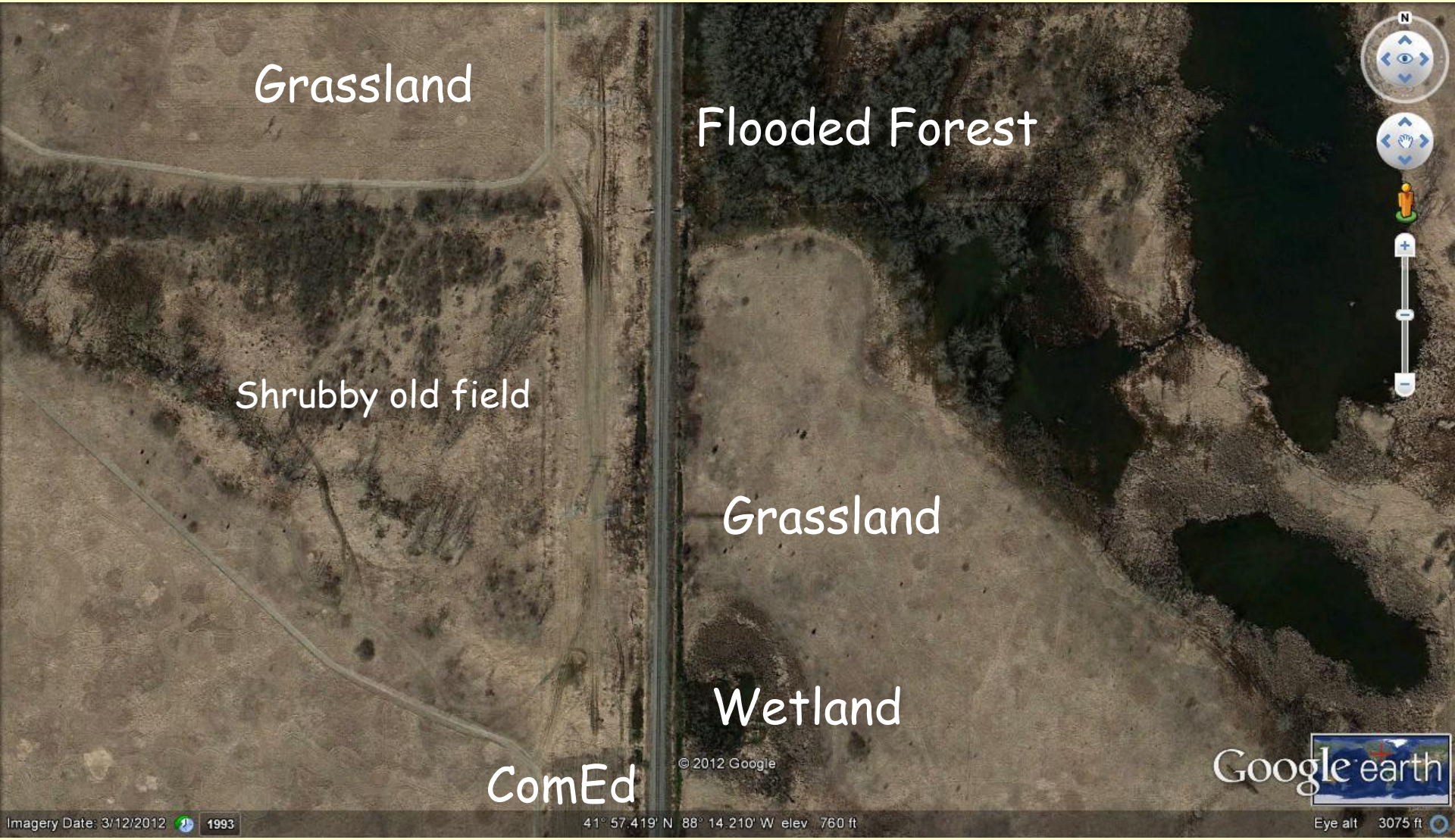
Marsh (cattails) or open water

In 2012, an indigo bunting placed its nest in vegetation indicated by the arrow.

Vegetation growing along the right-of-way potentially provides nesting habitat for various bird species. Our overall project assessed:

- bird species richness
- relative abundances
- nesting ecology
- potential nest predator species
- some behavioral responses to trains

EJ&E rail corridor at Pratt's Wayne Wayne Woods has various habitats adjacent to both its eastern and western rights-of-way



Projects and Sites

Bird species richness
Relative bird abundance
→ All 9 sites

Natural nests
→ Cuba Marsh
Spring Creek
Poplar Creek
Pratt's Wayne Woods

Potential Nest Predators:
- Dummy nests
- Camera traps

→ Cuba Marsh
Spring Creek
Poplar Creek

Key wetland species
→ Cuba Marsh
Spring Creek
Pratt's Wayne Woods

Behavior of nesting herons and egrets
→ Lake Renwick

Behavior of nesting songbirds
→ Cuba Marsh,
Spring Creek
Poplar Creek
Pratts Wayne

Bird Community Results

- Differences in species richness among sites

- Within sites, no difference in species richness close and far from tracks

- Species composition varied among sites

- Species composition varied a small amount close and far from tracks

- Variation was small from year to year

Nesting Ecology

- Population persistence depends upon stable or positive population growth rates, a function of nesting success.
- Trains might affect nesting success or failure.

Negative – passing trains could cause parents to leave nest unattended

Positive – nest predators may avoid habitat along the tracks

Natural Nests

- All natural nests found were recorded
- Over 4 years, over 400 nests of about 30 species were monitored
- Nest location varied in distance from EJ&E corridor
- Mayfield estimates of nest success

Summary

Given conditions on EJ&E from 2009-2012:

- bird communities similar close to and far from tracks
- some nest predators may be more active near tracks
- yet nest success of "track" nests equal to or greater than "away" nests
- nesting birds appear acclimated to trains on tracks

Win-Win Ecology

- Can we enhance RR ROW habitat for birds?
- Huijser and Clevenger (2006): roads and their ROW perceived as disturbance and threat
- In developed landscapes: ROW are often the only remaining natural or "semi-natural habitat"
- Braband (1986): Iowa ROW along rail corridors in largely agricultural landscape perfect example

Right-of-Way Vegetation Management

- choose species that meet needs of RR and adjacent land owner
- native grass, forb, shrub or tree species
- floral species that provide nectar for nectarivores

Rail lines near grain elevator in rural Iowa

Rail line in rural Nebraska

Railroad prairies

Railroad prairie along the right-of-way of the Burlington Northern Railroad, Iowa

Claridon Railroad Prairie, Ohio. This prairie is a mile long and 50 feet white.

Win-win ecology: rail rights-of-way as wildlife habitat

- consider birds as surrogates for all wildlife
- bird communities along the EJ&E RR corridor are similar to those away in similar habitat
- RR corridors may provide useful habitat for many bird and other wildlife species

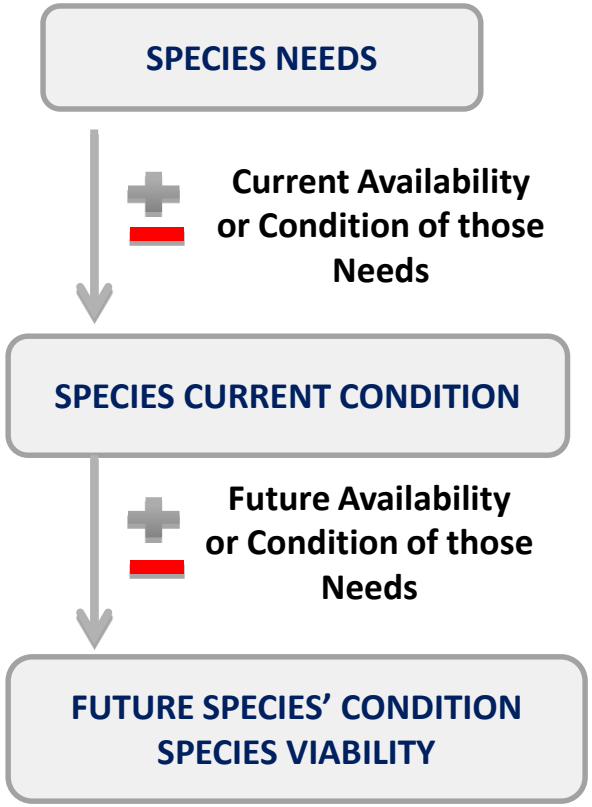
Questions?

USFWS Monarch Species Status Assessment

Kristen Voorhies

U.S. Fish & Wildlife Service

Species Status Assessment (SSA) Framework



- The purpose of the SSA Framework is to describe the *viability* of species in a way that supports our ESA decisions.
- Viability for a species is the ability to sustain populations in the wild over time.

Presented by Kristen J. Voorhies, USFWS Chicago Ecological Services Office

Representation

Resiliency

Redundancy

DATA SOURCES

MODEL INPUTS

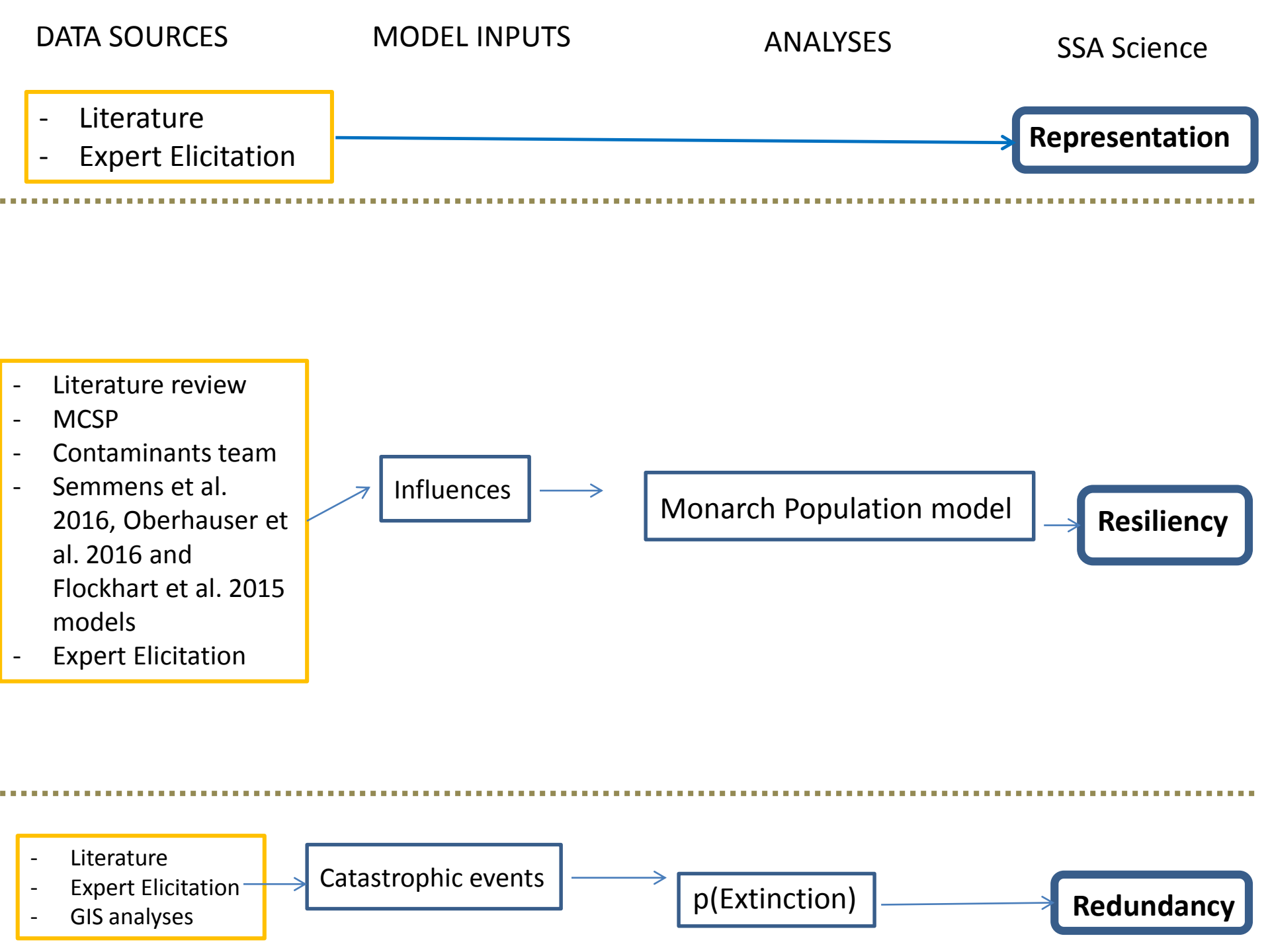
ANALYSES

SSA Science

Representation

Resiliency

Redundancy


DATA SOURCES
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ANALYSES
SSA Science
- Literature
- Expert Elicitation
Representation
- Literature review
- MCSP
- Contaminants team
- Semmens et al. 2016, Oberhauser et al. 2016 and Flockhart et al. 2015 models
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Influences
Monarch Population model
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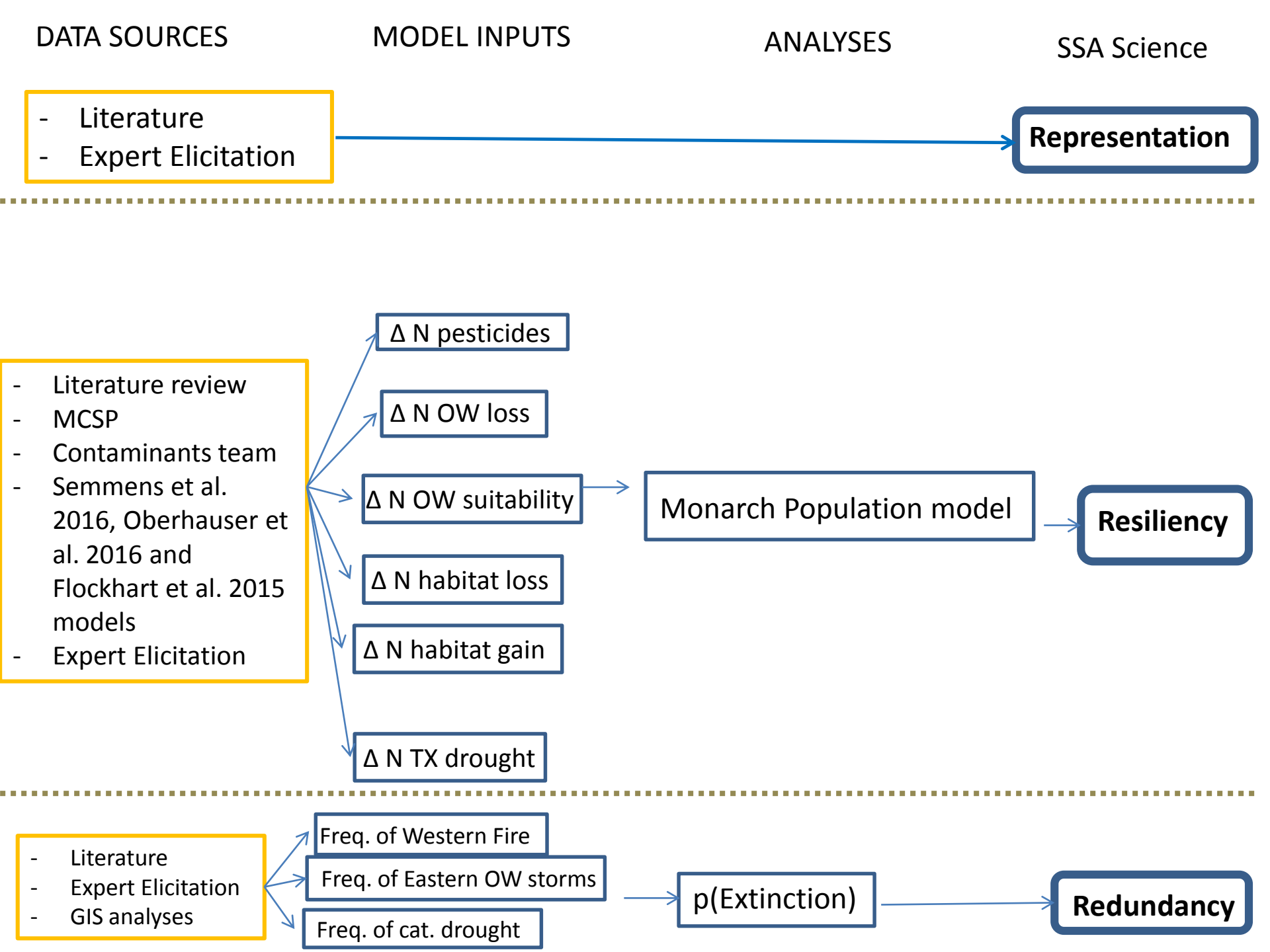
- GIS analyses
Catastrophic events
p(Extinction)
Redundancy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Δ N OW loss
Δ N OW suitability
Δ N habitat loss
Δ N habitat gain
Δ N TX drought
Monarch Population model
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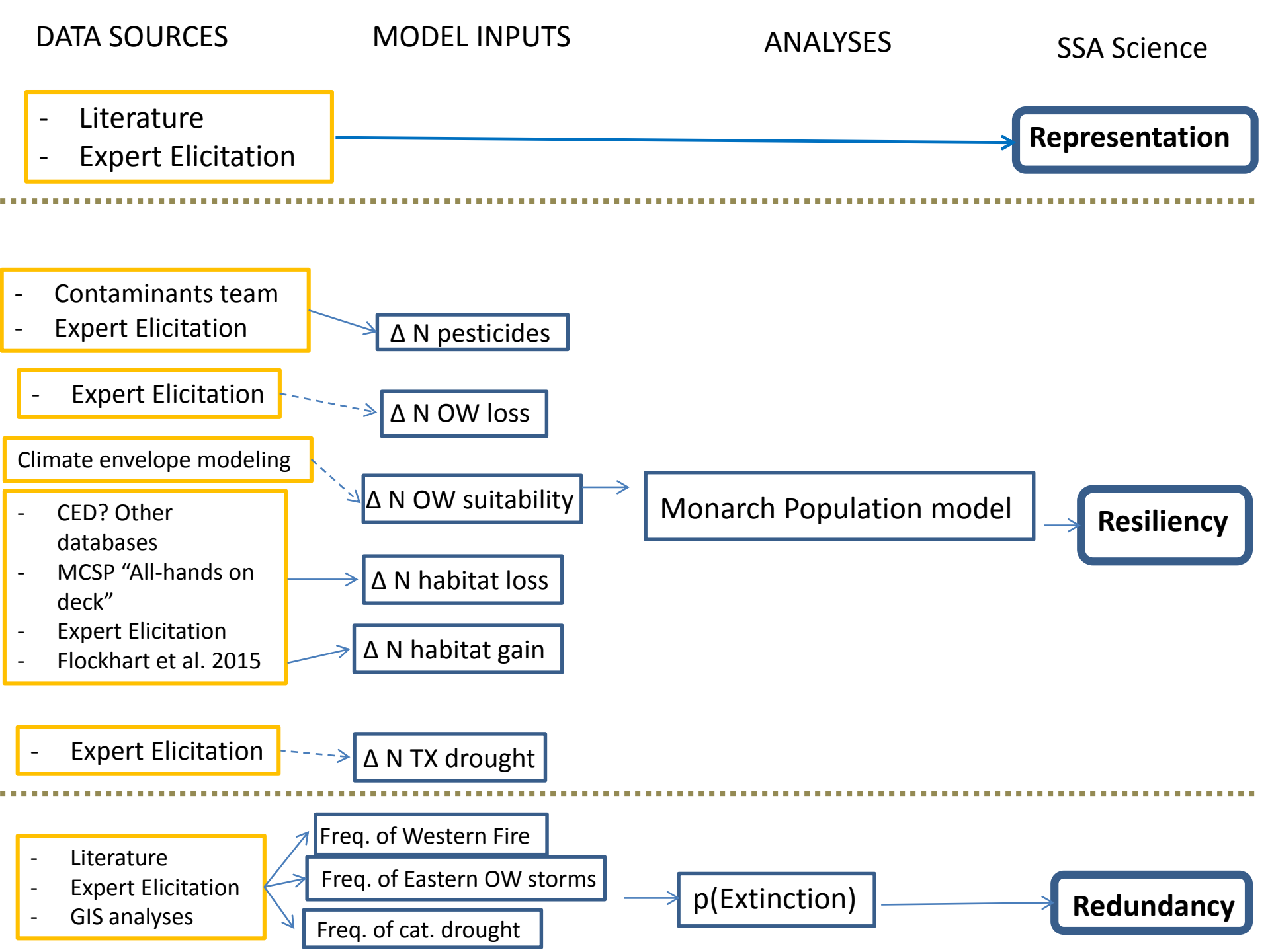
Freq. of Western Fire
Freq. of Eastern OW storms
Freq. of cat. drought
p(Extinction)
Redundancy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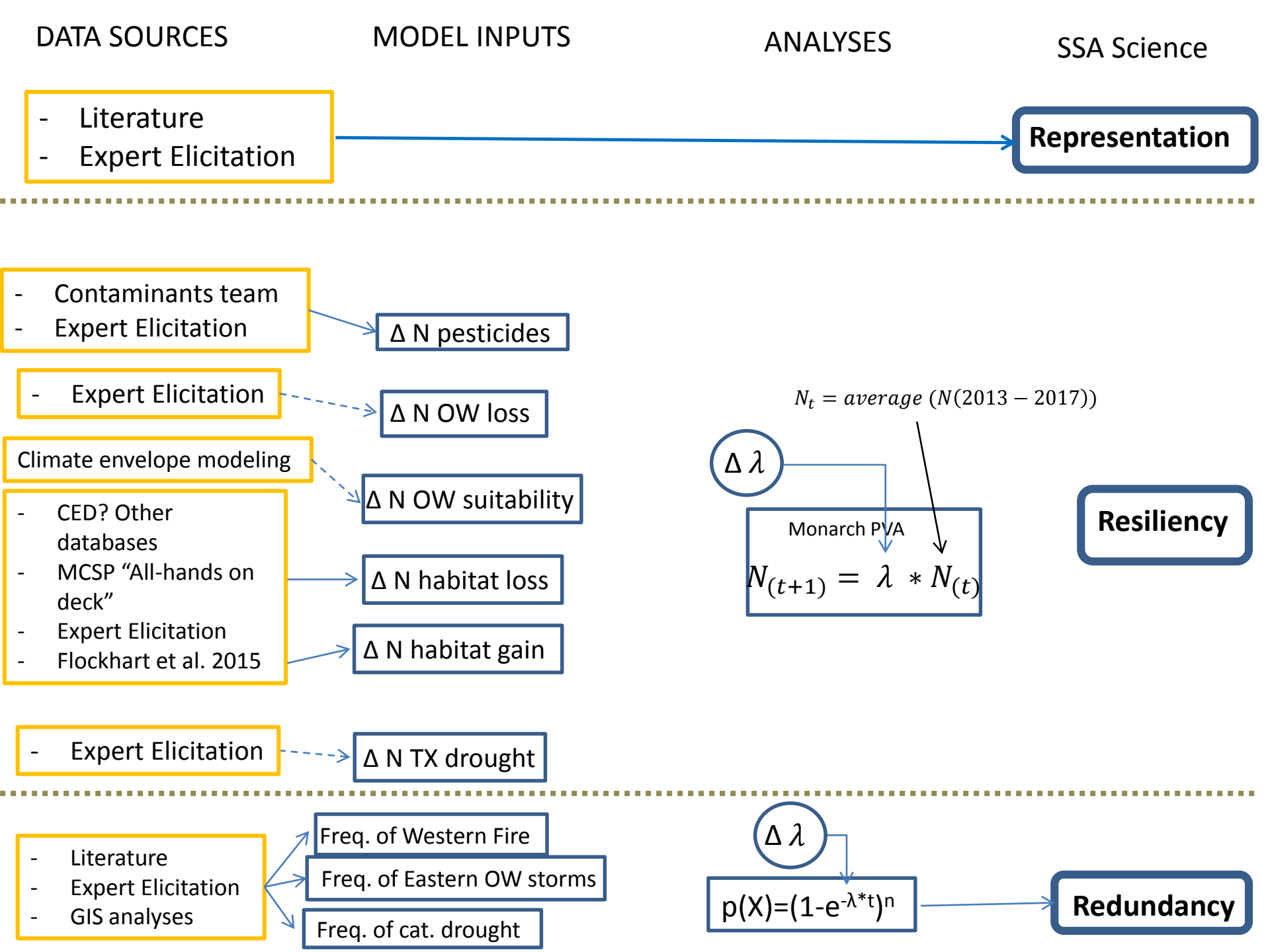
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Δ λ
Monarch PVA
$N_{(t+1)} = \lambda * N_{(t)}$
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- Literature
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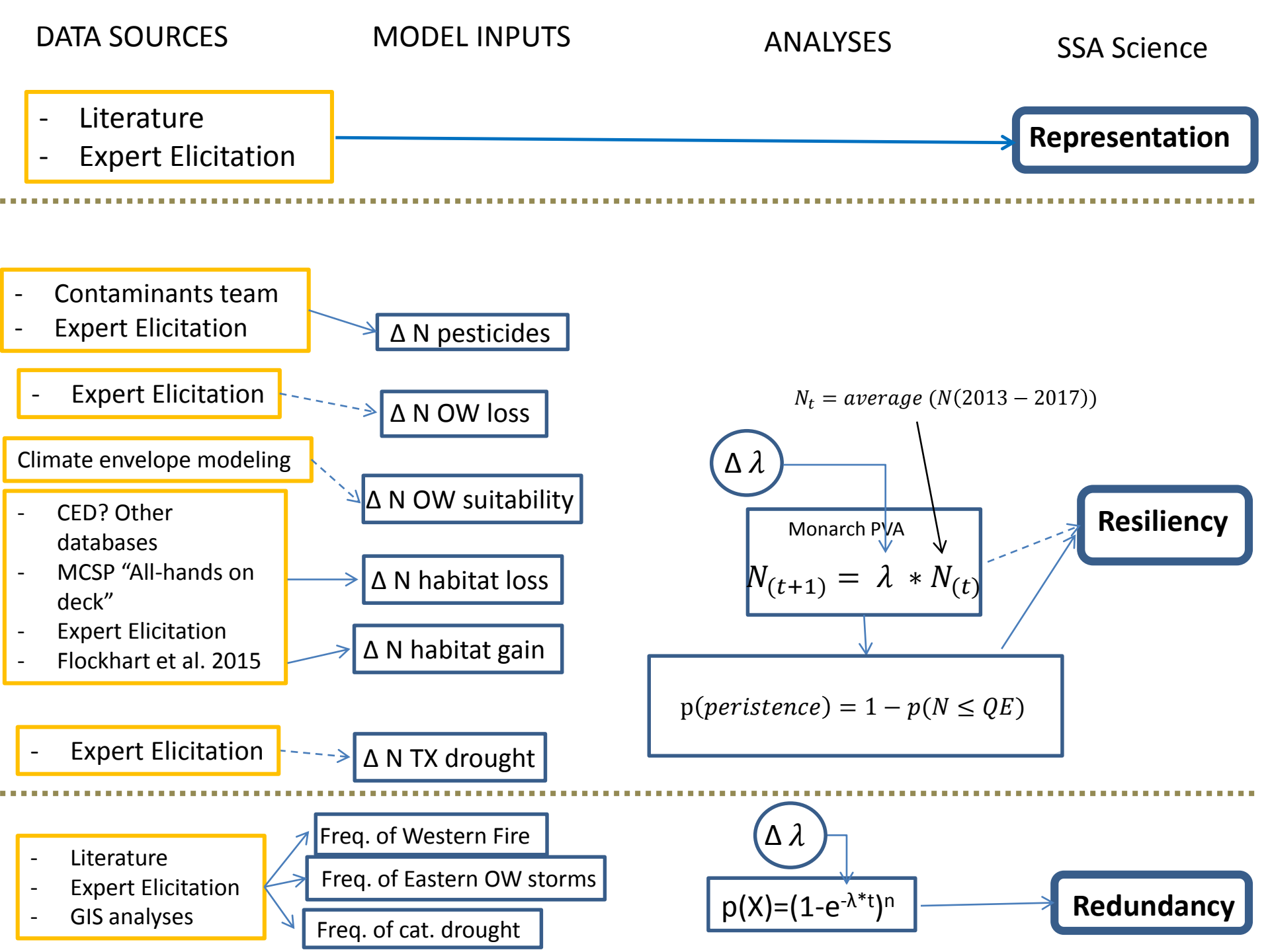
Redundancy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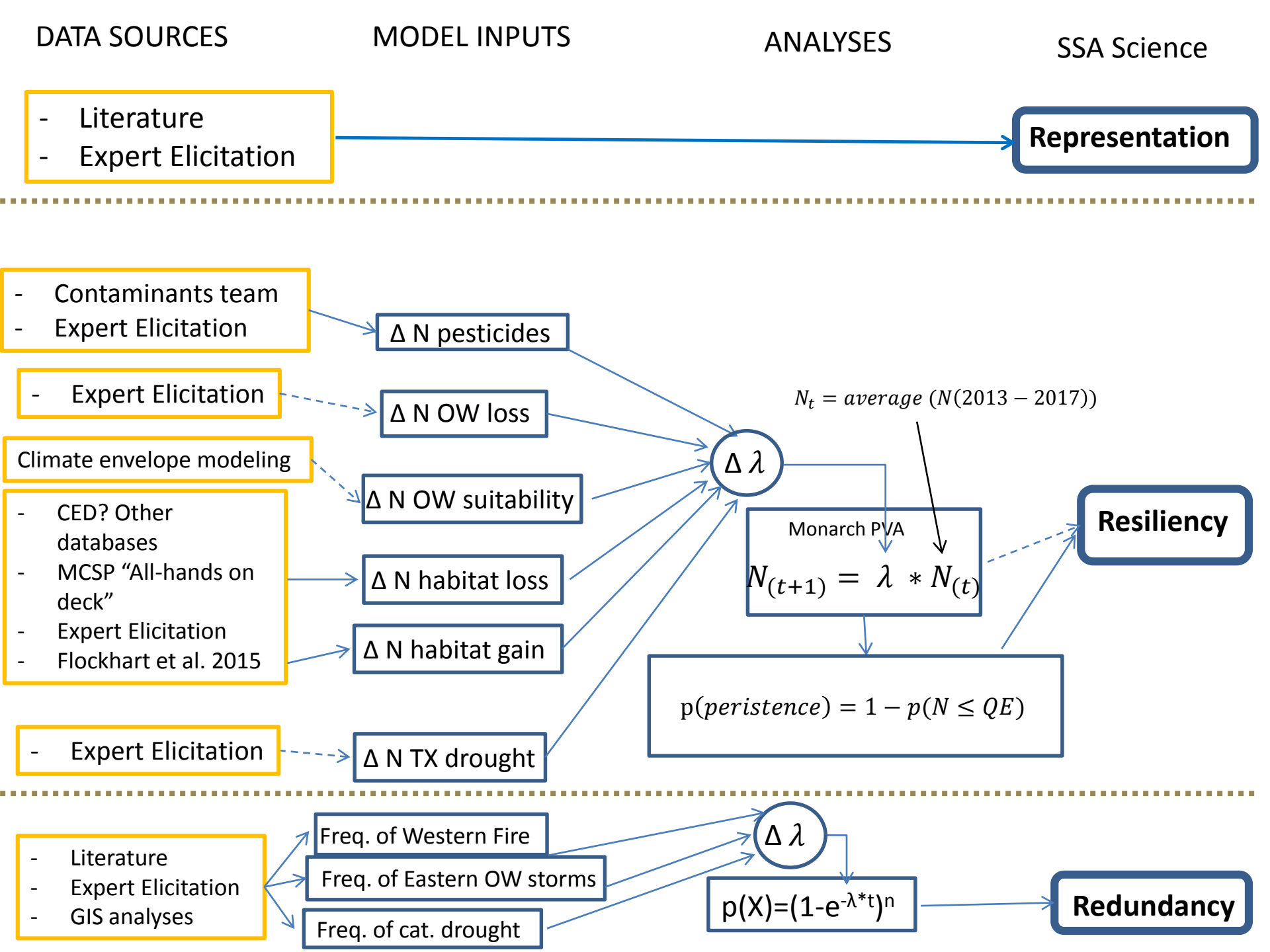
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Monarch PVA
$N_{(t+1)} = \lambda * N_{(t)}$
p(peristence) = 1 − p(N ≤ QE)
Resiliency
- Literature
- Expert Elicitation
- GIS analyses
Freq. of Western Fire
Freq. of Eastern OW storms
Freq. of cat. drought
Δ λ
$p(X)=(1-e^{-\lambda*t})^n$
Redundancy