

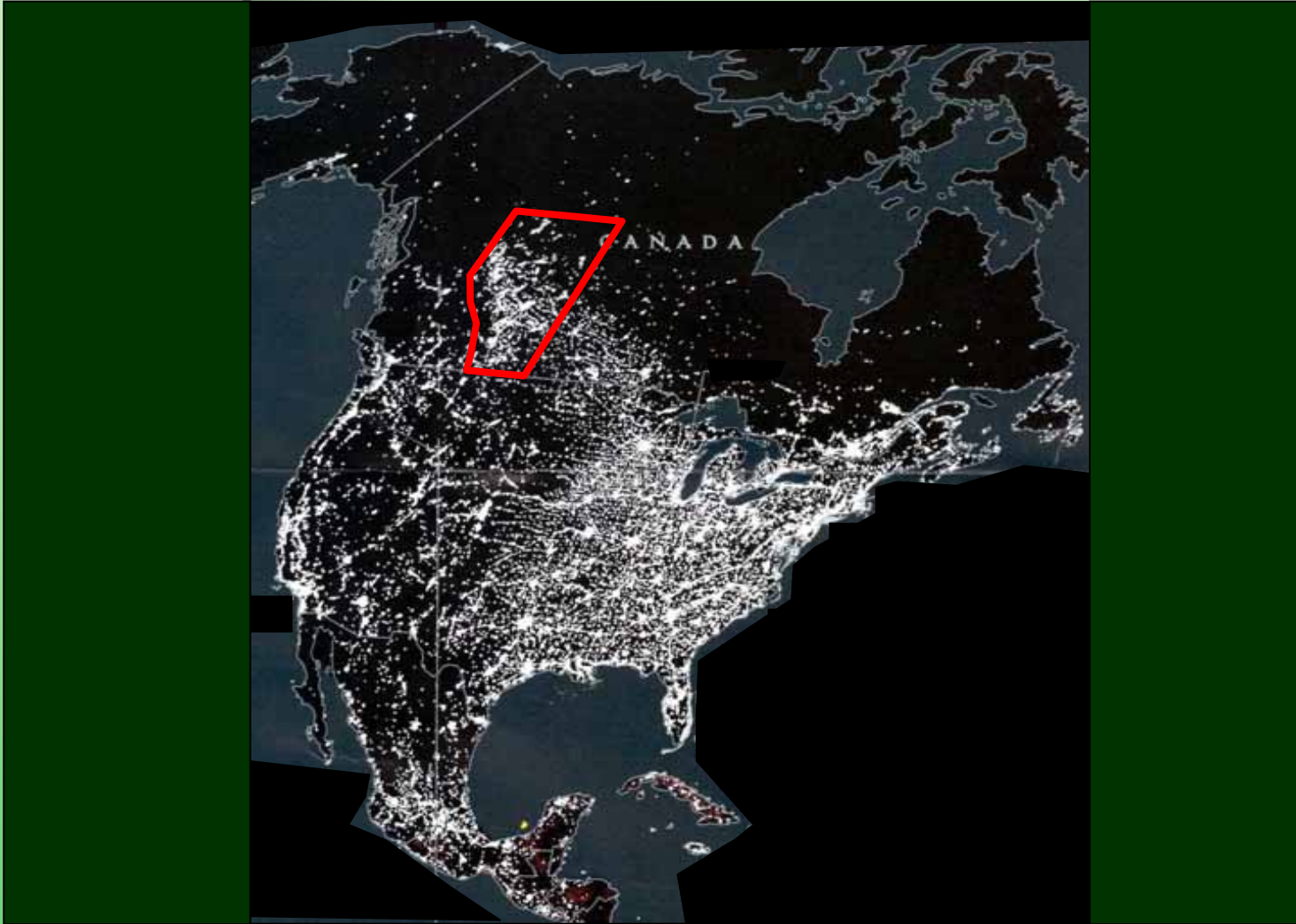
Measuring Ecosystem Health Regional & Local

Jim Schieck

March 30, 2010



Alberta Is A Busy Place



The Challenge

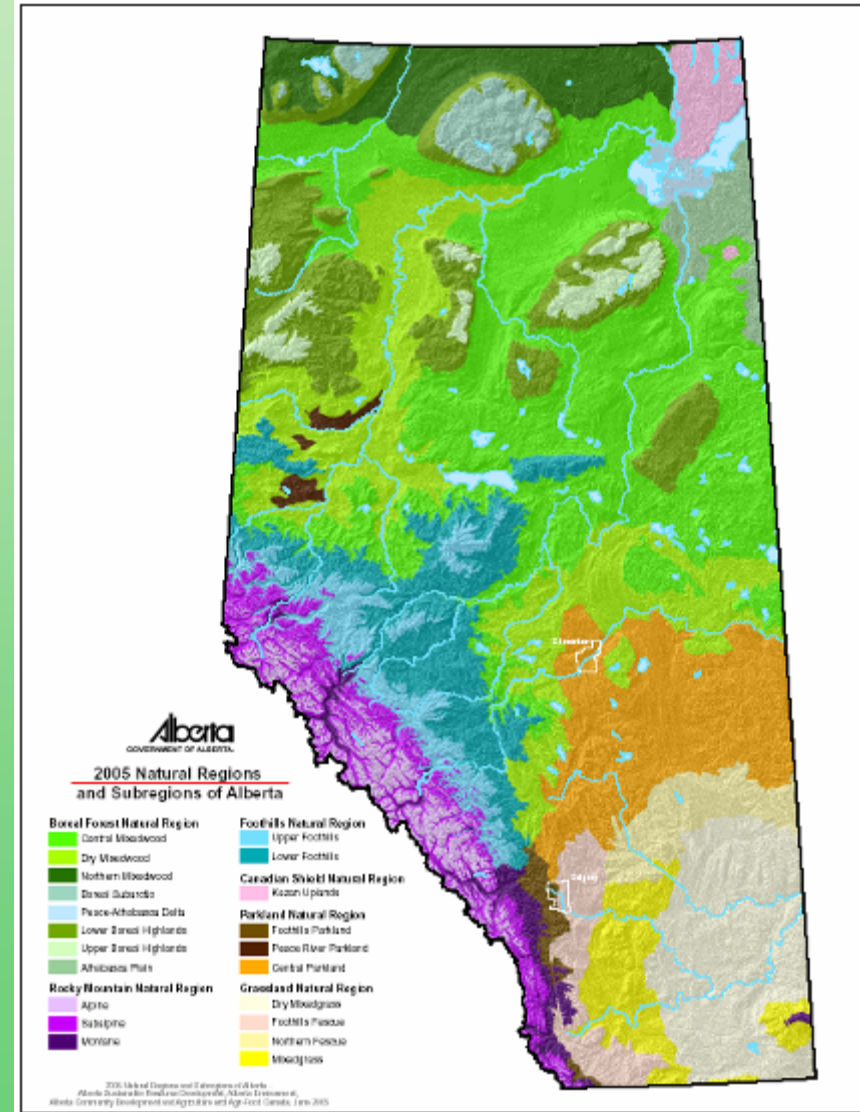
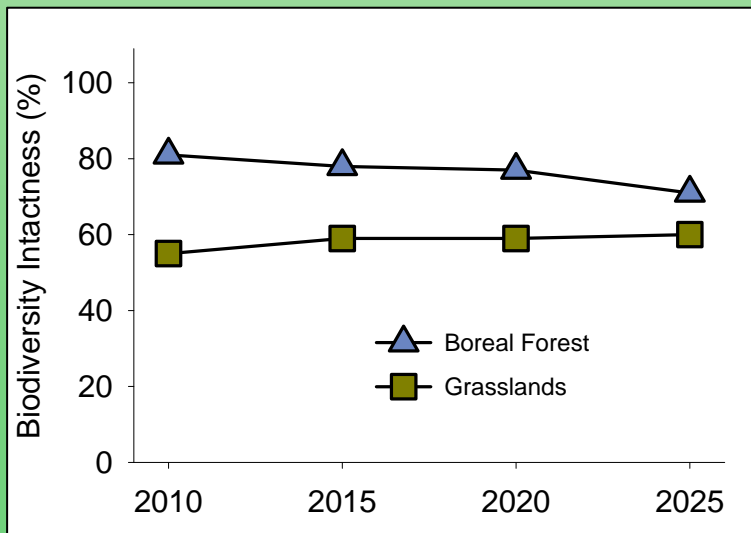


- Ecosystems are
 - complex
 - not well represented by single species or single habitats
- Small research datasets cannot be “rolled-up” to describe health of ecosystems

There are no short-cuts

To evaluate Ecosystem Health we need effective well thought-out monitoring

Goal: Develop a system to monitor changes in biodiversity and ecosystem integrity at provincial and regional scales



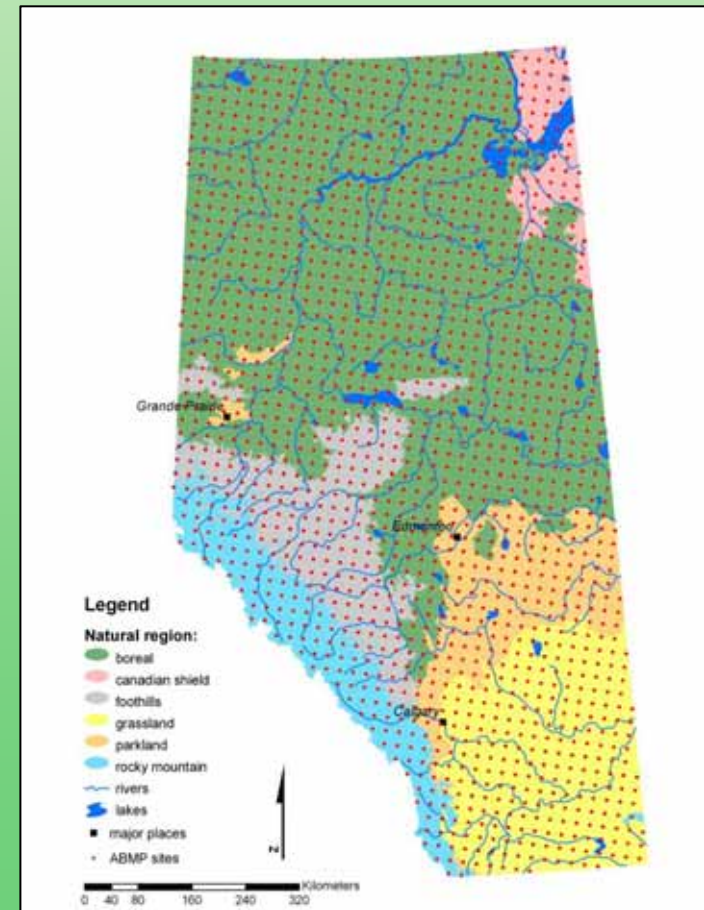
Regional-level Ecosystem Health



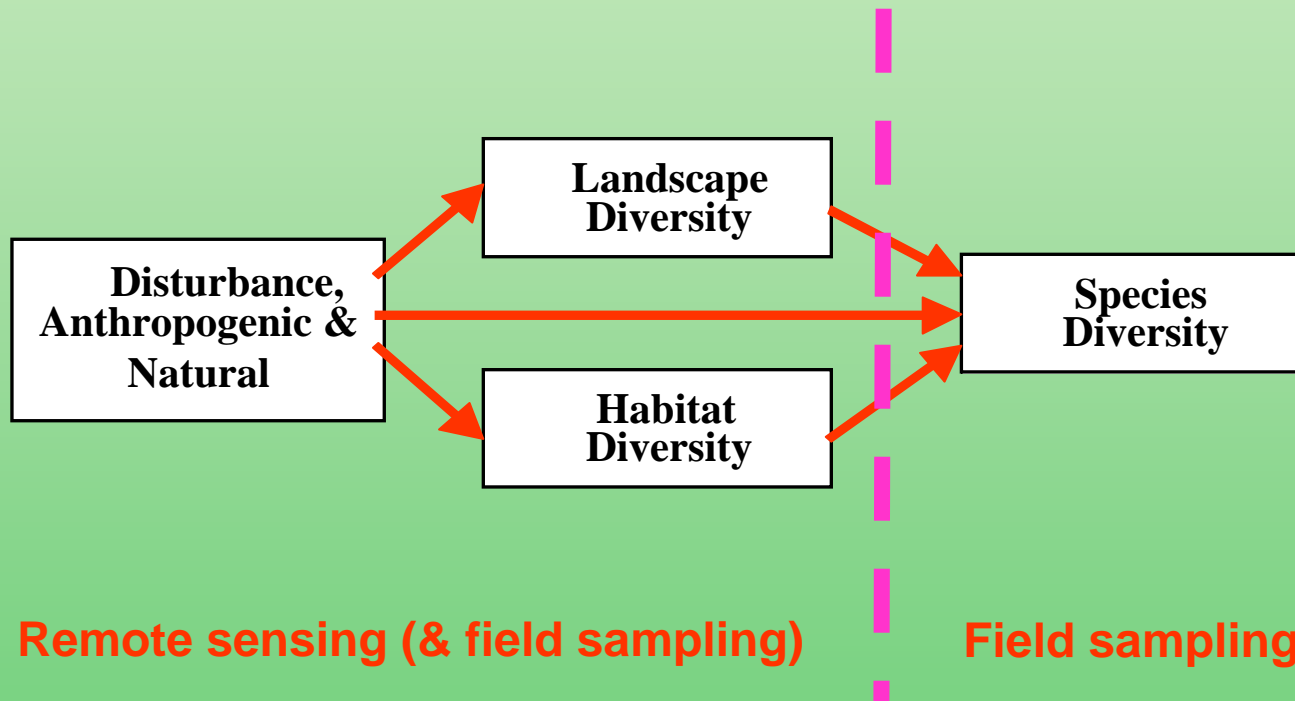
More than 40 commitments by the Alberta Government
All of the commitments are at the Regional Level (sustainable management)

ABMI Designed to Track Health (Intactness) at the Regional Scale (average from all sites within a region)

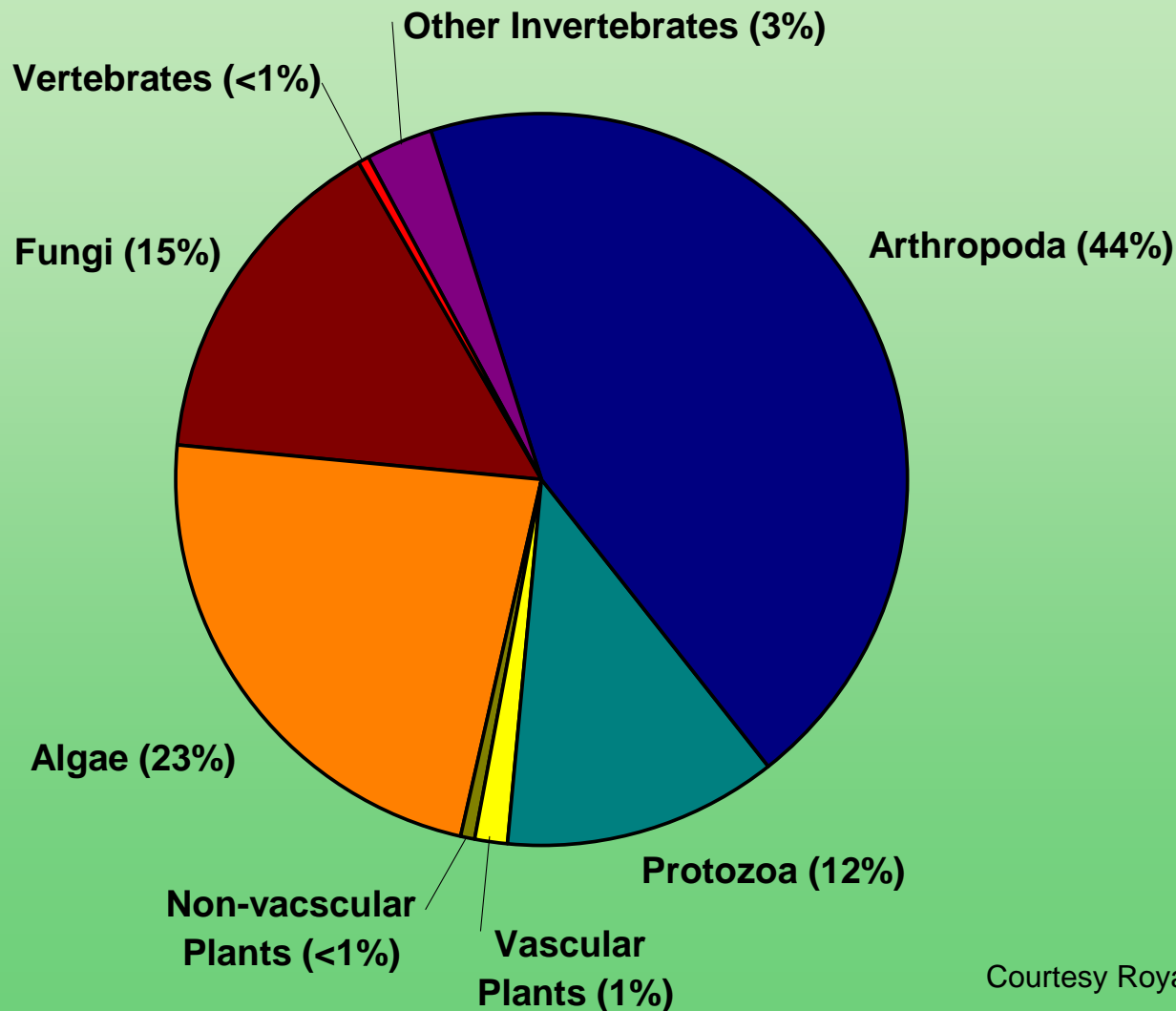
- Grid with a 20 km spacing (1656 sites)
- Return interval of 5 years
- Designed to detect change in regions of approximately 2 million ha



What To Measure



Alberta's Biodiversity --- 80,000 Species



ABMI Solution



Emphasis on “species assemblages”

- with >1000 species surveyed expect that some will respond to each type of ecological change

Vascular Plants

Mosses

Lichens

Birds

Mammals

Fish

Springtails

Mites

Aquatic Invertebrates



Assemblages chosen based on statistical properties, and importance to society

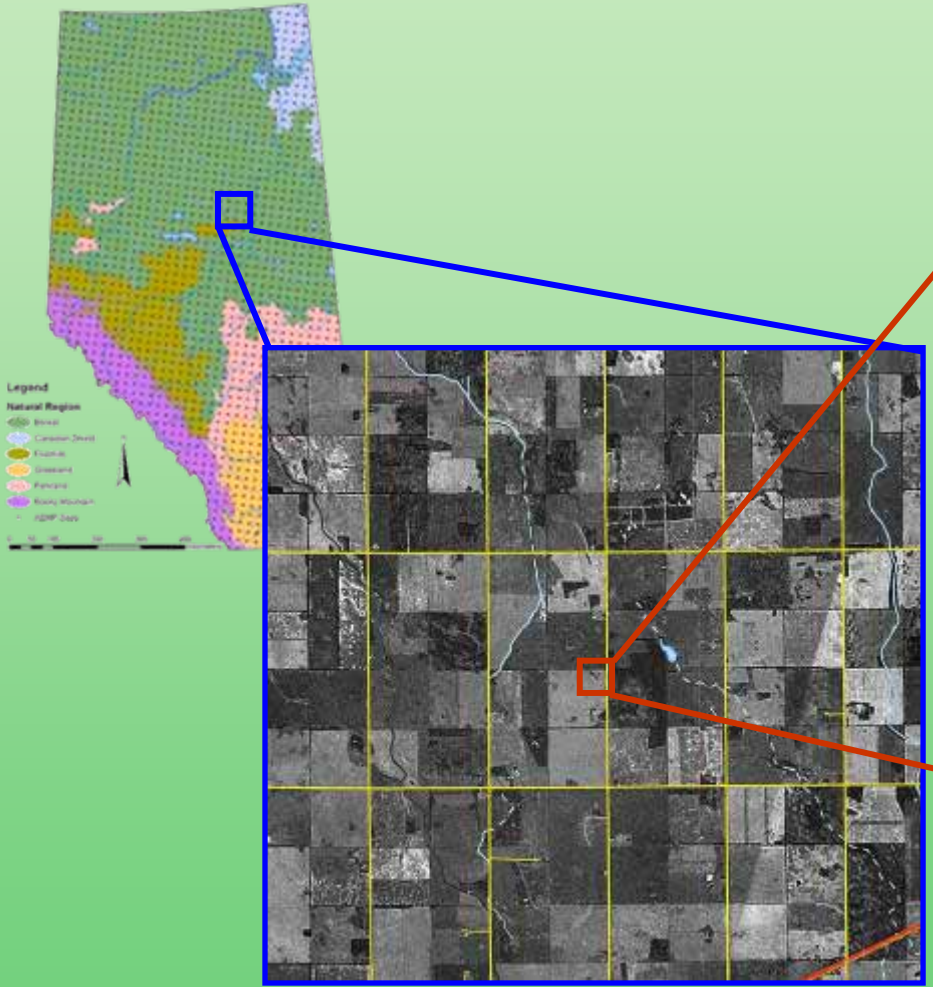
ABMI Solution (cont)



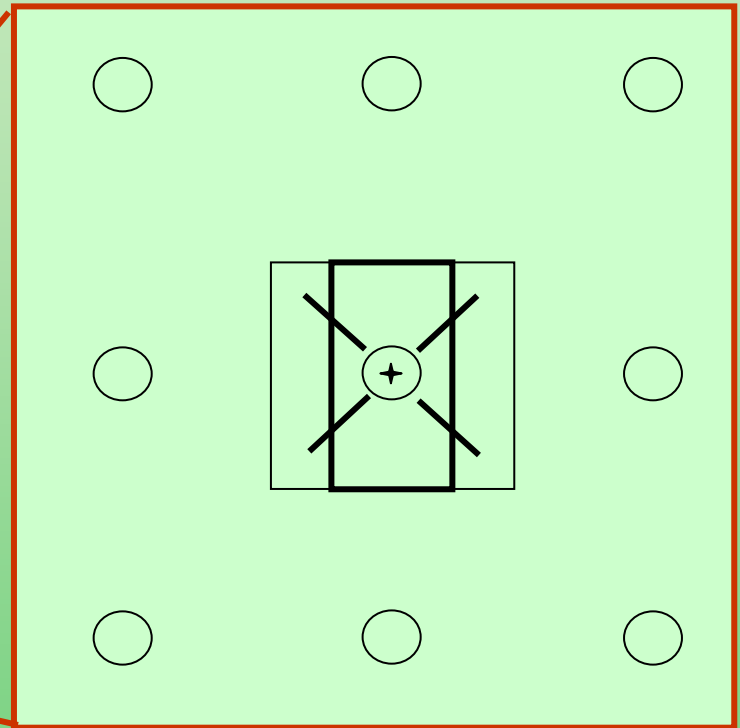
- **Terrestrial habitat conditions**
 - *Soil & vegetation structure*
- **Aquatic habitat conditions**
 - *Water chemistry & wetland structure*
- **Landscape conditions**
 - *vegetation composition & pattern*



Layout of ABMI



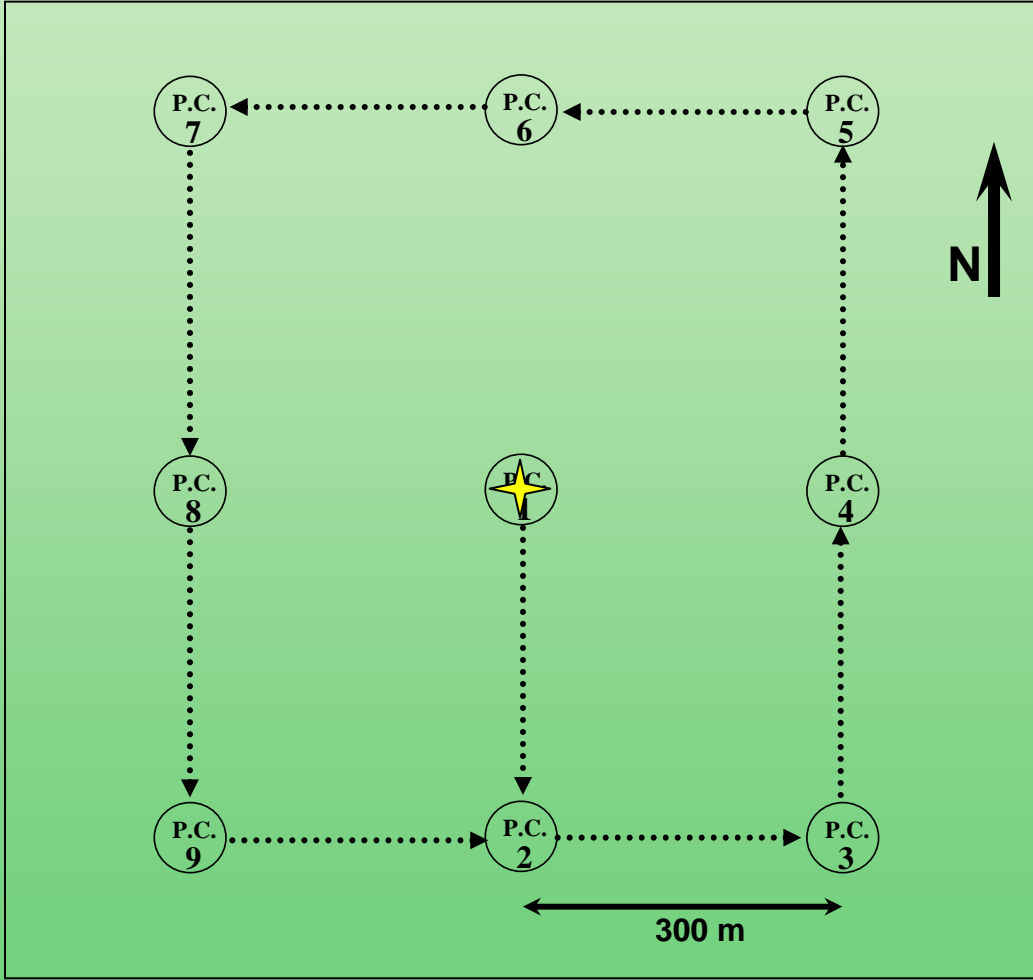
- Legend
- Natural Region
 - Wetland
 - Coastal Shrub
 - Woodland
 - Grassland
 - Farmland
 - Wetland
 - Wetland
 - Wetland



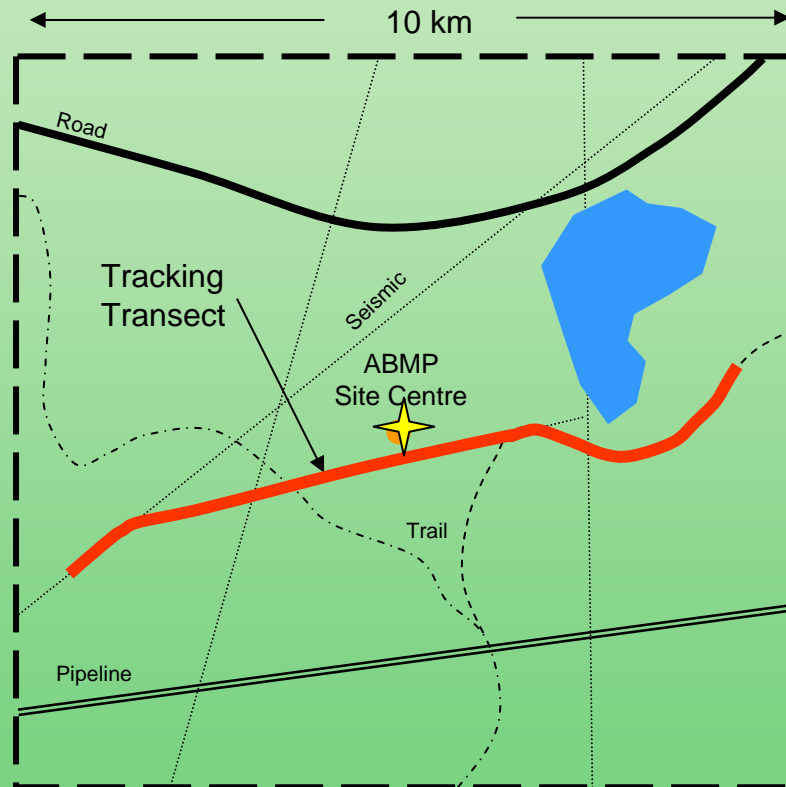
Remote Sensing

**Field Sampling
Species and Habitats**

Birds (point counts)

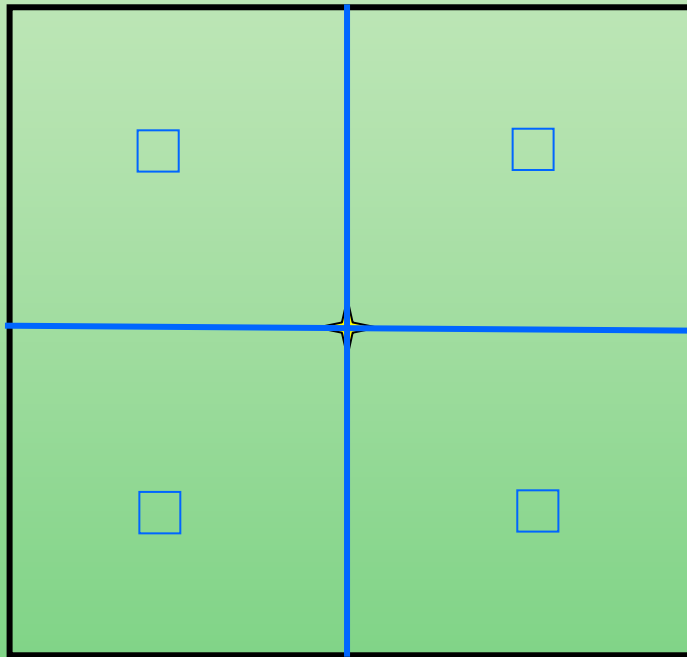


Mammals (snow tracking)



Ground Biota

100 m



Mosses
Lichens

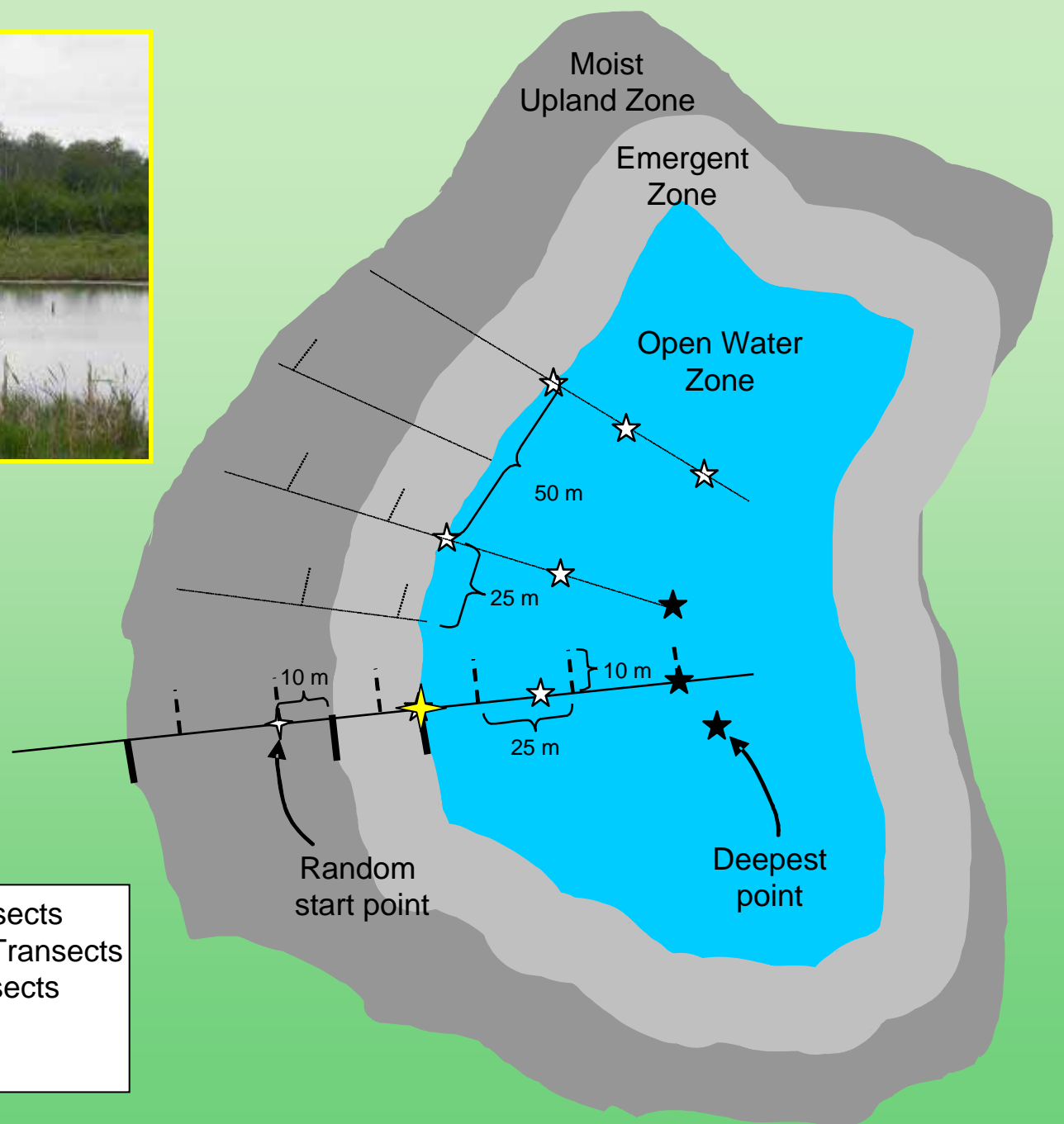
Vascular Plants






Springtails & Mites





Wetland Sampling



-  Fixed Vegetation Transects
-  Transition Vegetation Transects
-  Extra Vegetation Transects
-  Invertebrate Sweeps
-  Water Characteristics

Converting Data to Ecosystem Health



Landscapes



Habitats



Species



Desirable Traits

Must

- Simple messaging
- Intuitive to decision makers
- Non-judgmental language
- Inform management

ABMI Solution

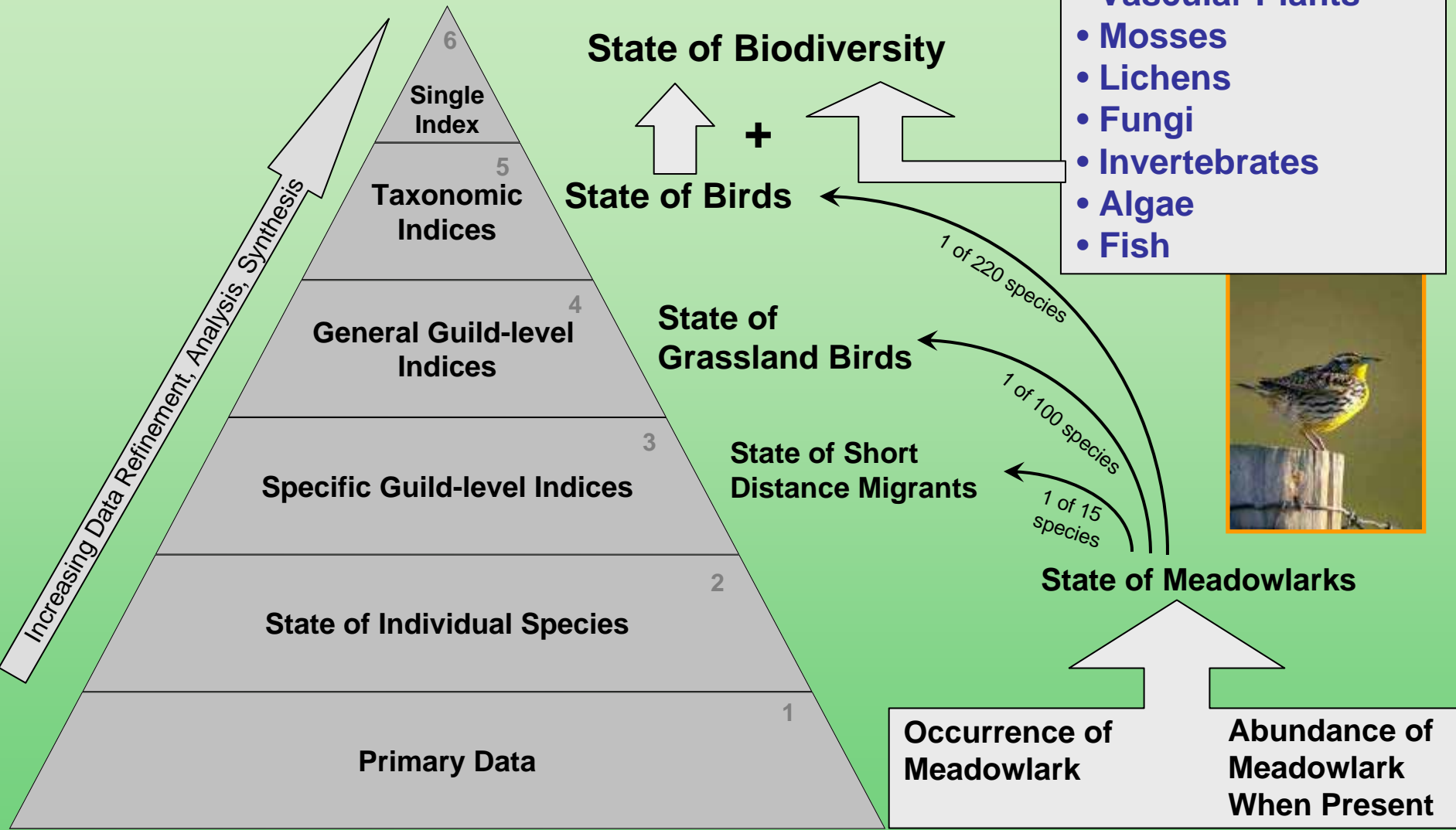
- 1. Information Pyramids**
- 2. Time Zero Benchmark**



Photo by: S. E. Nielsen

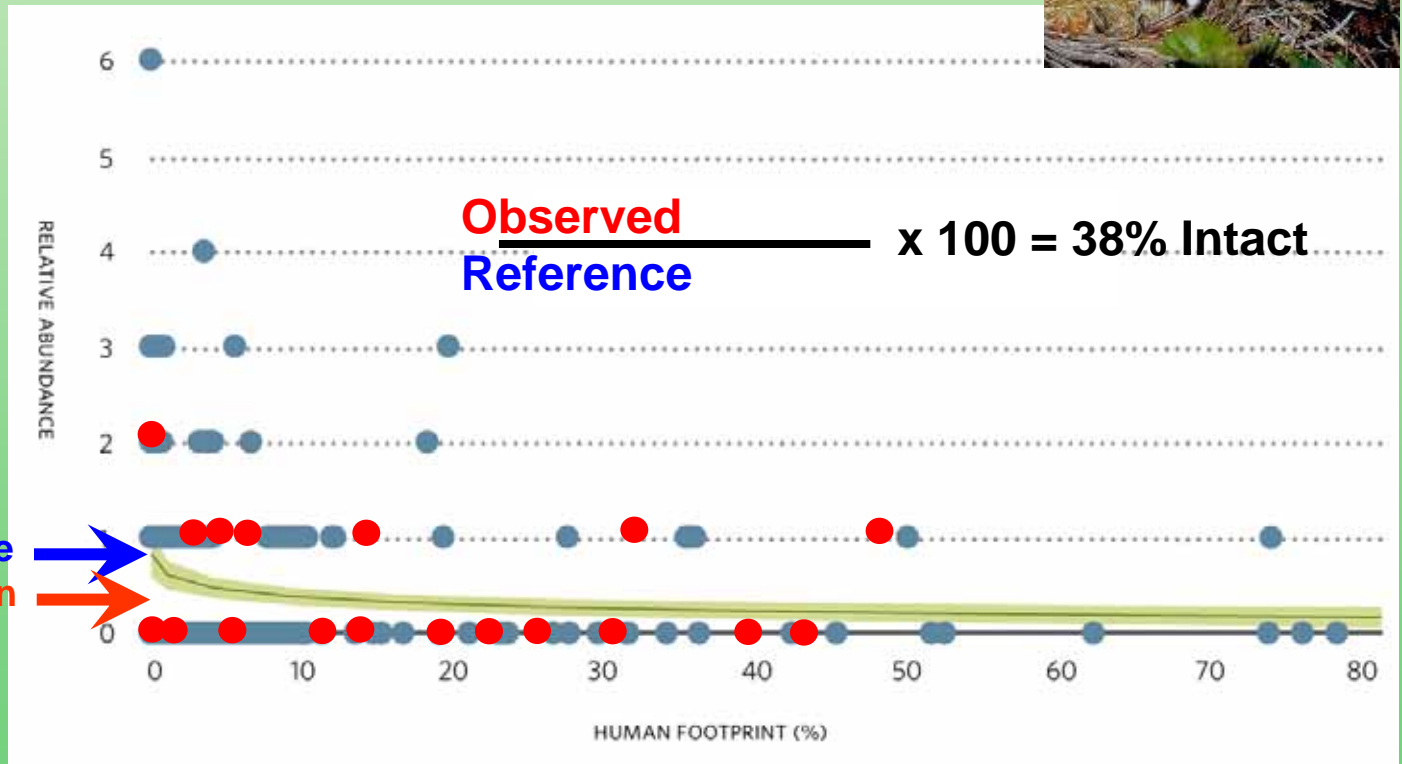
Example Using Meadowlark

- 8 other Groups**
- Mammals
 - Vascular Plants
 - Mosses
 - Lichens
 - Fungi
 - Invertebrates
 - Algae
 - Fish



ABMI - Degree of Intactness

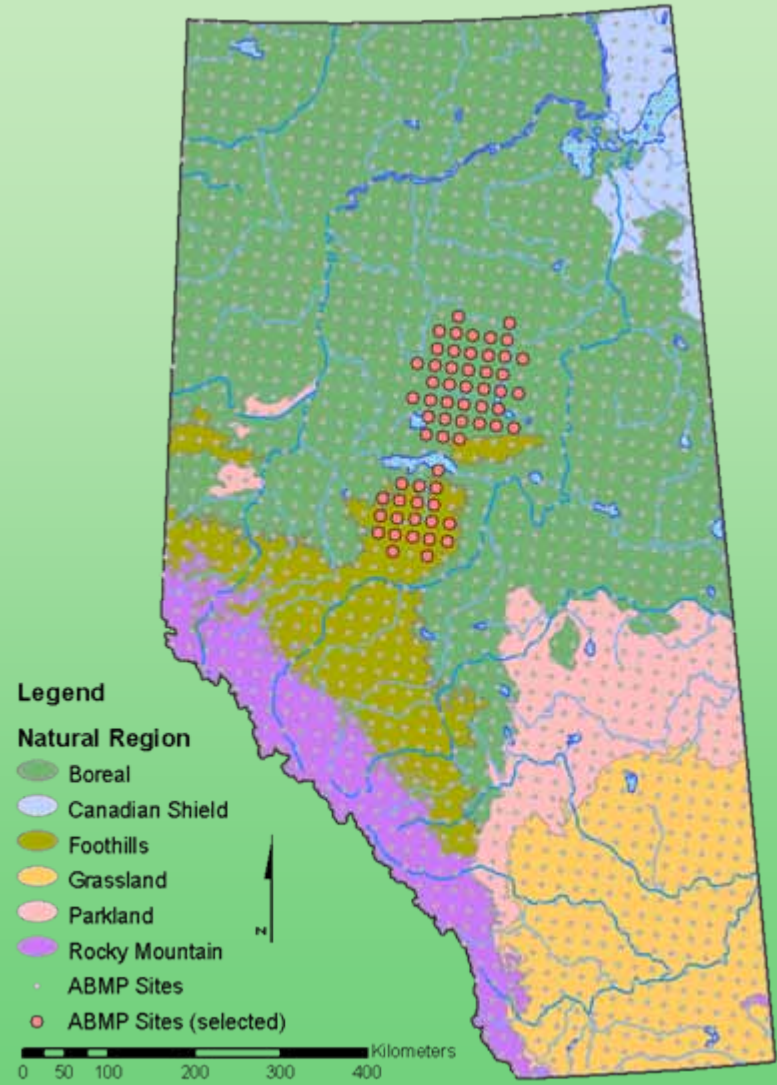
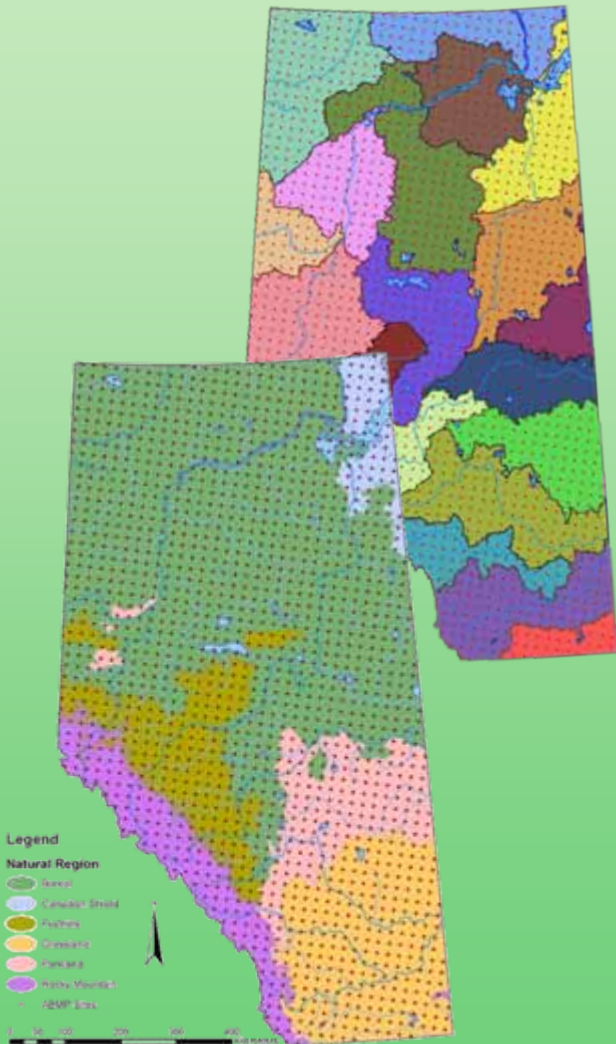
Palm Warbler



Expected at Reference
Observed in Region

Predefined Regions

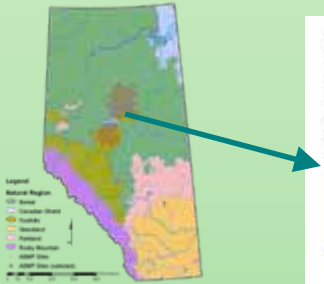
User-defined Regions



Overview Status: Species



Not available yet, but where the ABMI is heading



Current Status (selected area)

Data collection sites: 70
 Size: 2,800,000 Hectares

Species Intactness in Selected Area		92%
Species	Intactness Selected Area	Intactness Province
Mammals	94%	94%
Birds	91%	91%
Fish	86%	86%
Invertebrates	83%	83%
Vascular Plants	88%	88%
Mosses	91%	91%
Lichen	82%	82%
Algae	94%	94%
Fungus	90%	90%

You can also explore species by:

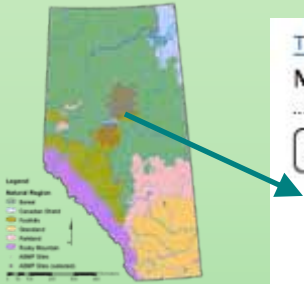
- [Species Search](#)
- [Guilds & Indicator Groups](#)

Habitat Intactness in Selected Area		90%
Habitat Type	Intactness Selected Area	Intactness Province
Field Elements		
Live Trees	91%	91%
Snags	86%	86%
Downed Woody Material	83%	83%
Shrubs / Saplings	88%	88%
Low Vegetation Cover	91%	91%
Litter	82%	82%
Structural Diversity	94%	94%
Ecosystems		
Forest Habitat	90%	90%
Shrubland Habitat	94%	94%
Grassland Habitat	91%	91%
Alpine Habitat	86%	86%
Peatland / Wetland Habitat	83%	83%
Aquatic Habitat	86%	86%

A Specific Species



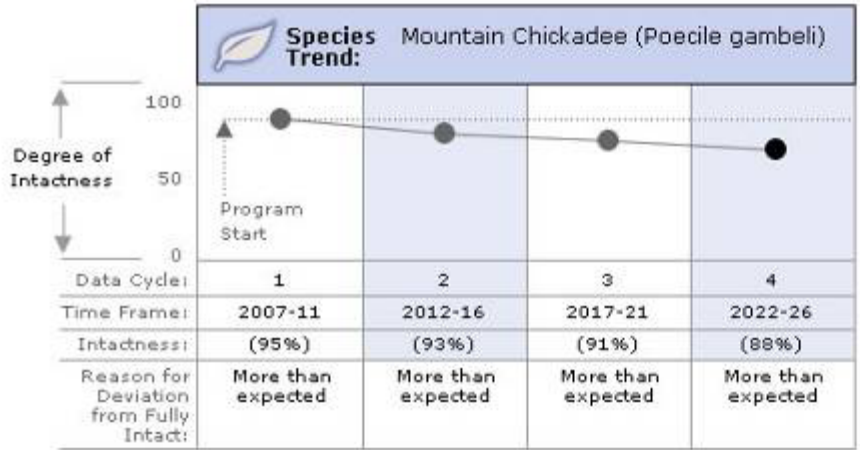
Not available yet, but where the ABMI is heading



Taxonomy: [Animals](#) > [Orders of Birds](#) > [Families of Passeriformes](#) > [Genus/Species of Paridae](#) >

Mountain Chickadee (*Poecile gambeli*)

- Species Trend**
- Occurance & Abundance
- Distribution Maps
- Habitat Relationships
- Species Account

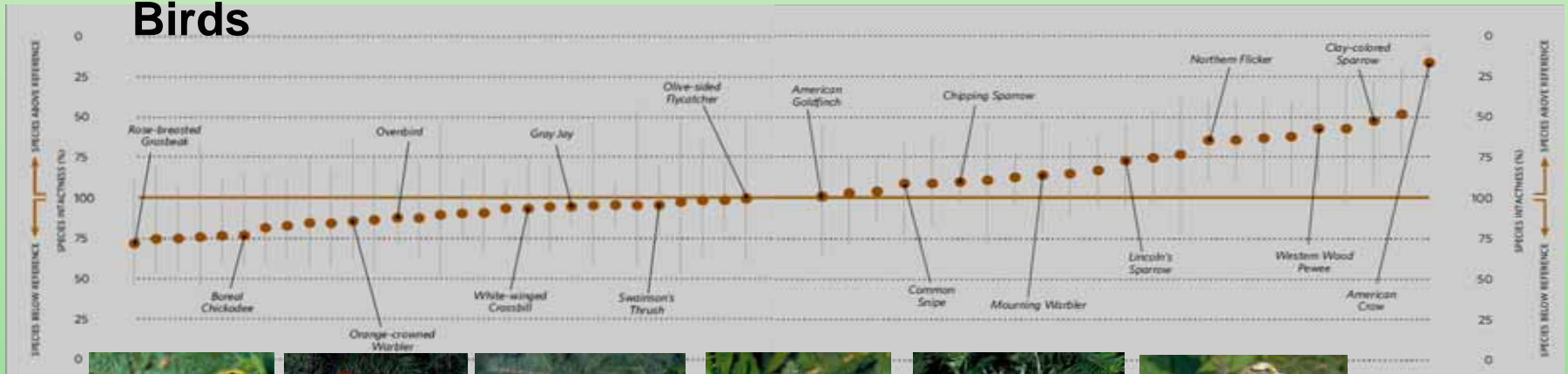


[Download Chart as a graphic](#)

Regional-level Intactness - Species



Birds



Also for Plants

Plus Habitats

etc.

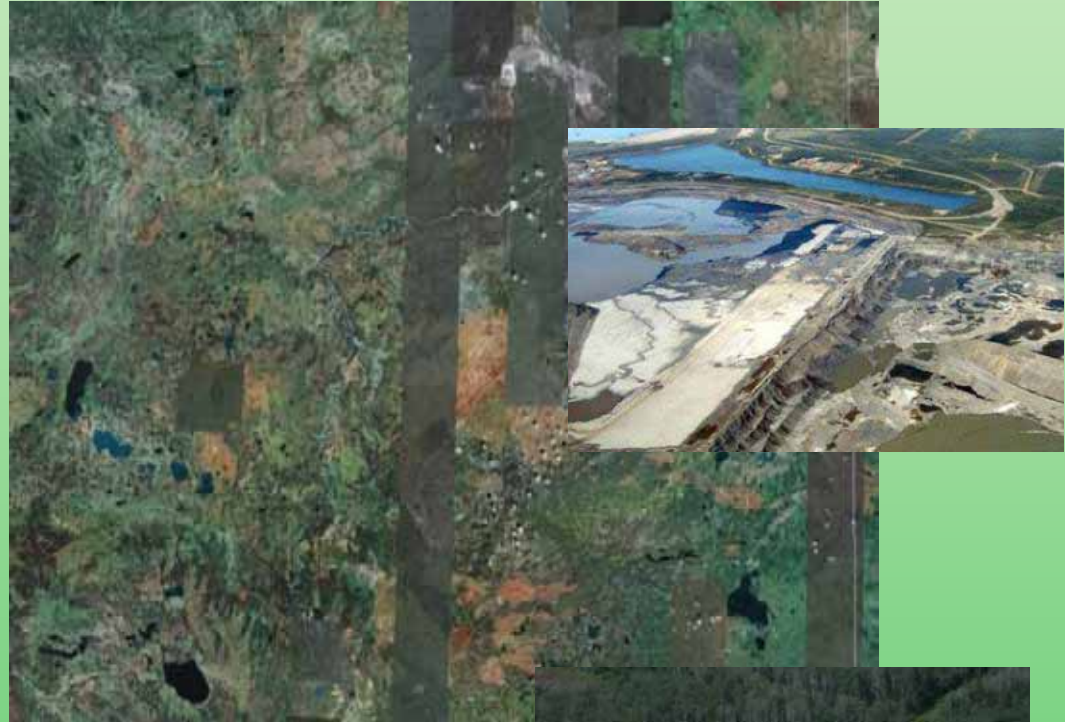
etc.

Regional-level Intactness - Biodiversity



**Average Regional Health
in
NE Alberta**

**94-97%
Depending on
Group Assessed**



**Need both the regional-level
and site-level assessment**



Measuring Site Condition (History)

Integrated Measure of Ecological or Biodiversity Condition

→ used extensively for EIA's

Index of Biotic Integrity (IBI; Karr 1981)

→ evaluates biota at a test site in relation to biota at “pristine” sites

→ if biota are similar to “pristine” then site is healthy

→ combines info on abundance of indicator taxa

→ uses an additive model ($\# \text{ shredders} + \# \text{ predators} - \# \text{ grazers}$)

→ models developed by analyses and expert opinion

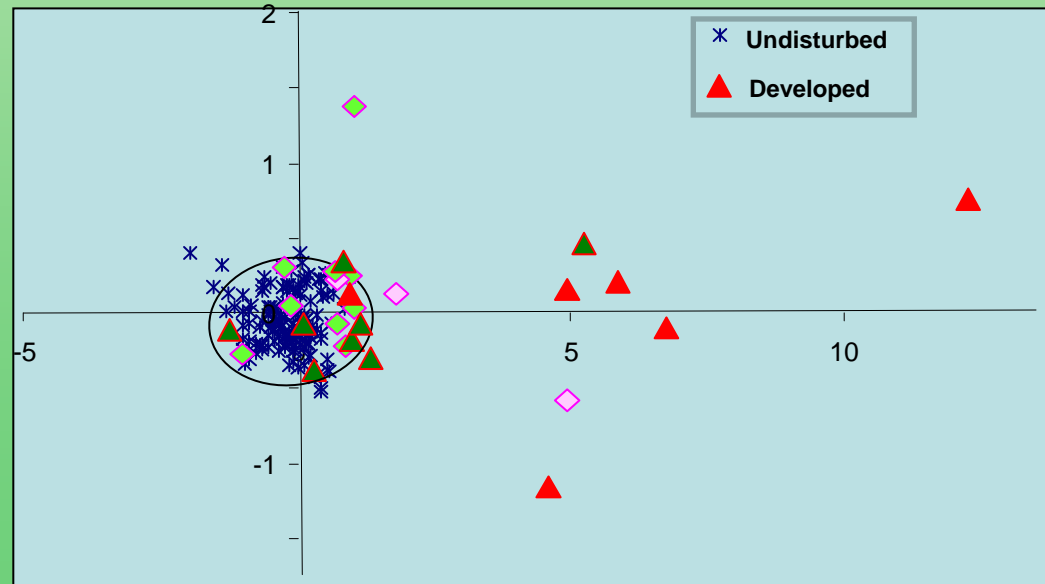
→ extended to plants, birds & mammals



Measuring Site Condition (more history)

Reference Condition Approach (RCA; Bailey et al. ~1995)

- developed for aquatic inverts, but applicable to all taxa
- more objective comparison between test and “pristine” sites
- uses all species in the analyses
- identifies natural variation when determining “pristine” conditions
- relationships calculated using ordinations



Measuring Site Condition (new ABMI method)

Degree of Intactness of Species Communities (ABMI)

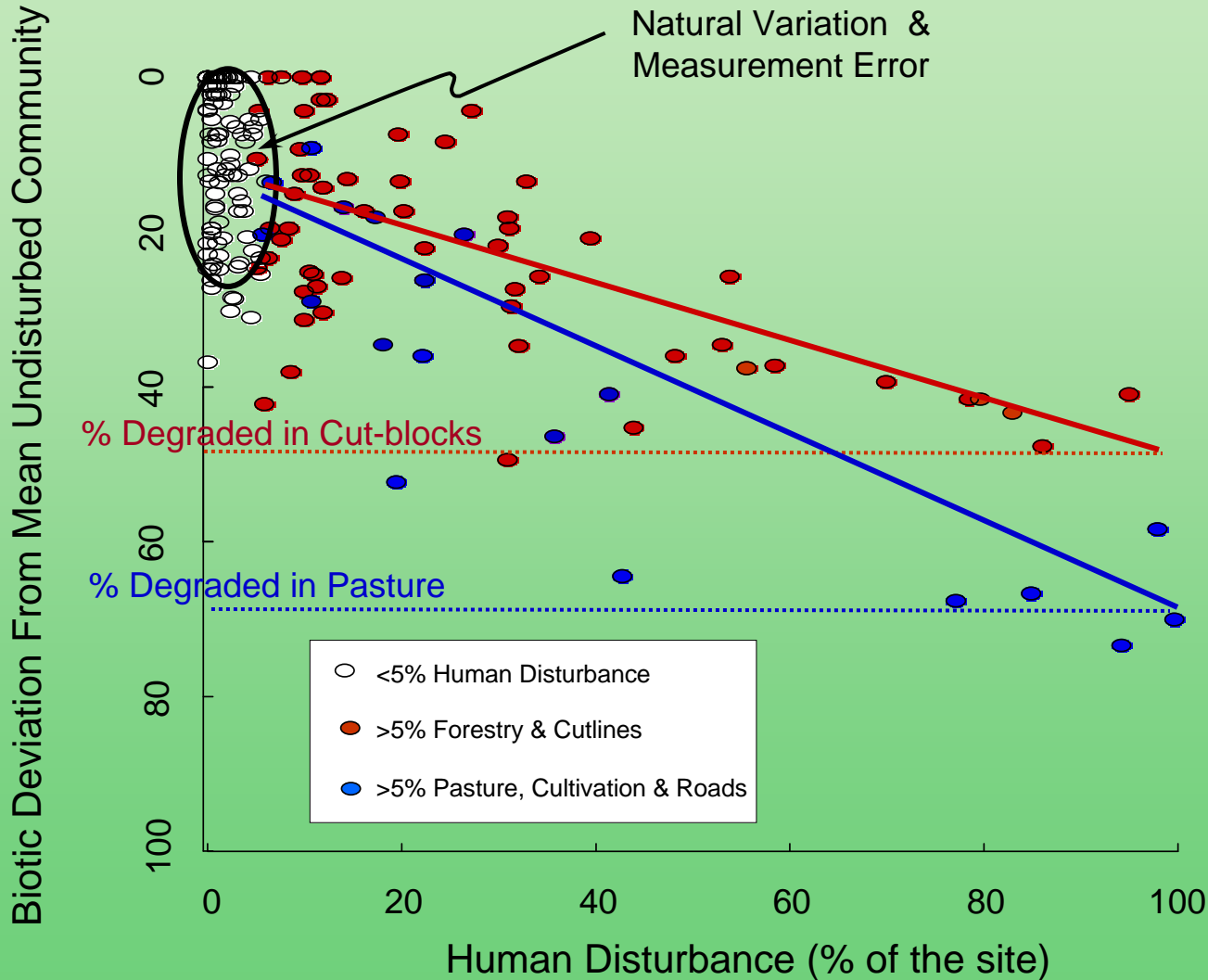
- based on maximum likelihood methods
- deviance from reference determined for each species at the “test” site and then averaged across species
- deviance converted to a measure from 0 (similar to the mean of undisturbed) to 100 (totally altered)

- still under development
- appears to identify signal better than ordination



Assessing Site Condition – Boreal Birds & Plants

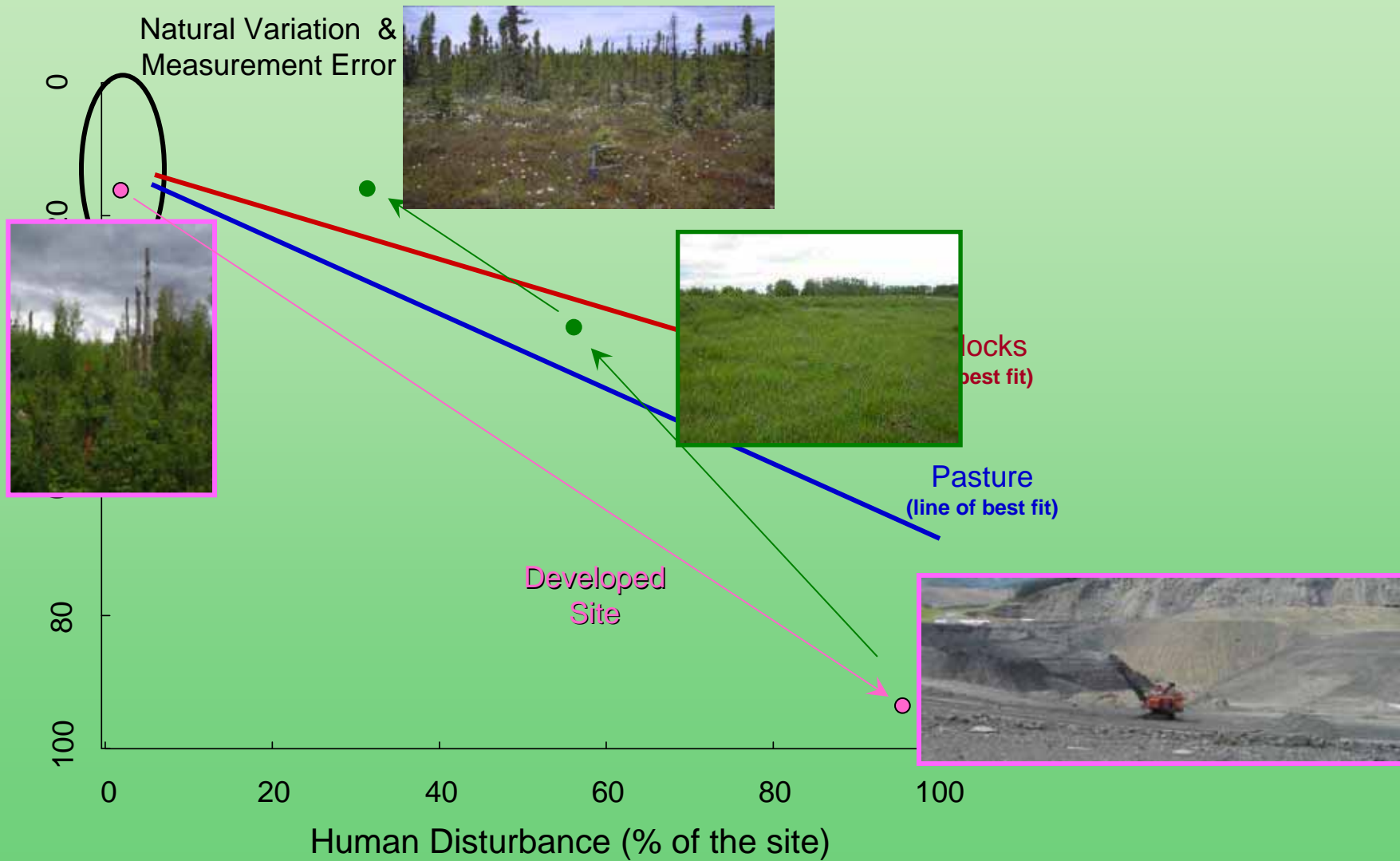
still under development



Assessing Ecological Recovery

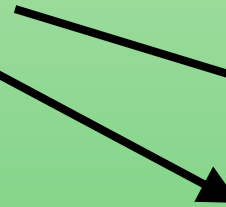
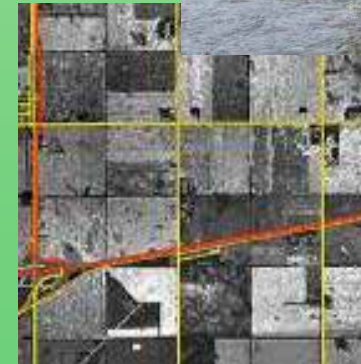
still under development

Biotic Deviation From Mean Undisturbed Community



Cumulative Effects → The Monster

Site-level Reclamation and Offsets Overlook Cumulative Effects



Summary



1. ABMI can be used to support management and both the regional and local scale
2. At the regional scale, average intactness of species is assessed for each species observed abundance (average throughout the region) is compared to expected abundance at zero human disturbance
3. At the site scale, condition of the biotic community is assessed observed community at a site is compared to the average community found at undisturbed sites

Questions

ABMP Web Site
www.abmi.ab.ca



