Ecosystem Management & Conservation of Biological Diversity

Goals for this evening:

1. Provide information on ecosystem management and biodiversity on the GMNF

2. Gather public comments on these topics for the revised Forest Plan

Agenda

- Announcements
- Overview of Plan Revision
- Ecosystem Management and Conservation of Biological Diversity
- Questions

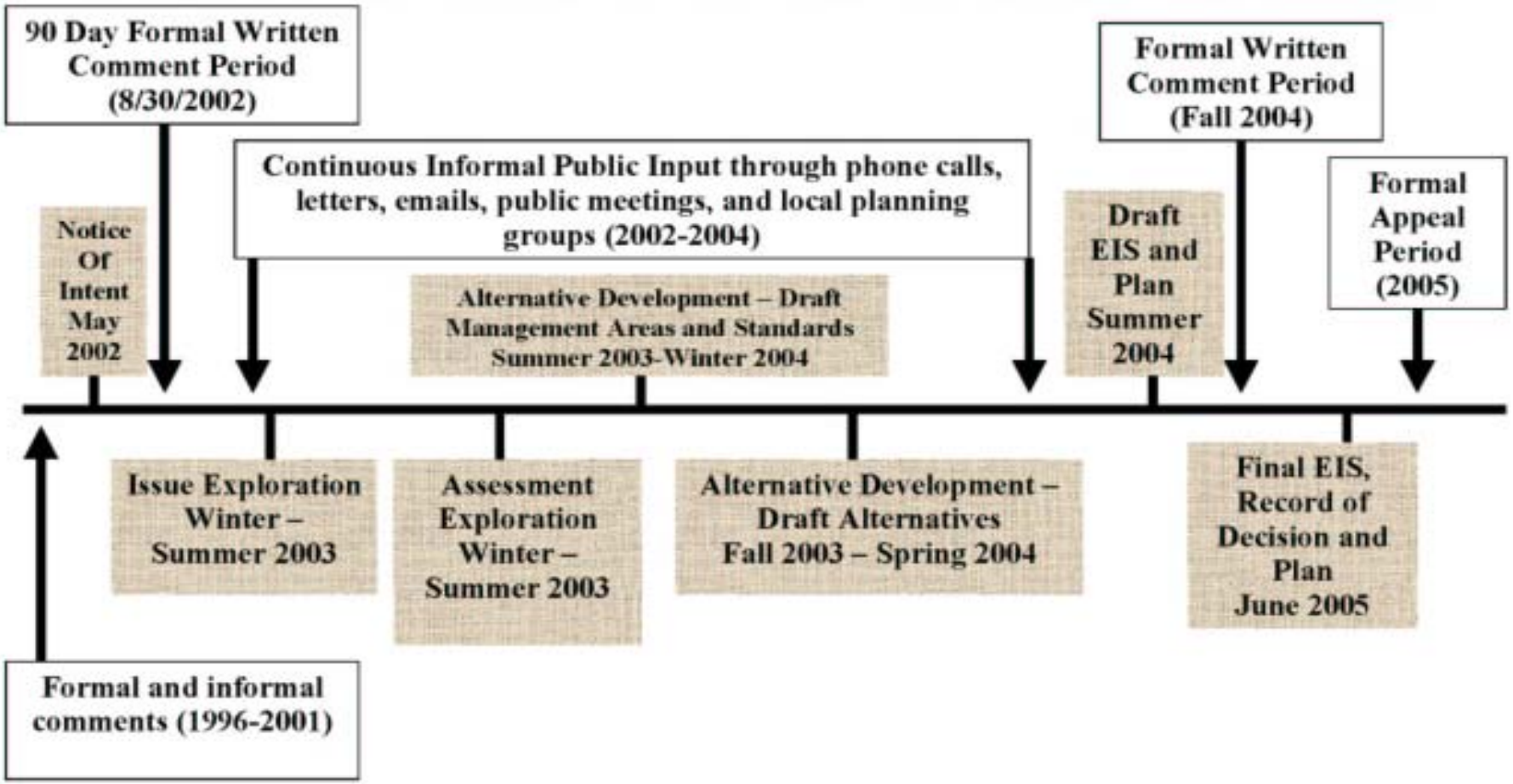
Announcements

- Missed previous meetings?
- Public input meetings – No Decisions
- Website: www.fs.fed.us/r9/gmfl/nepa_planning/plan_revision.htm

Forest Plan Revision

- Why are we revising the plan?
- How can you get involved?
- Where are we in the process?

Public Involvement Timeline
GMNF Forest Plan Revision



Issue Exploration Spring-Summer 2003

- Role of the GMNF
- Desired Future
- Goals and Objectives
- Land Acquisition Priorities
- New Land Management
- Developed Recreation
- Road Management
- Trail Management
- Ecosystems
- Biodiversity
- Wilderness
- Timber Management
- Vegetation Management

Ecosystem Management and Conservation of Biological Diversity

Green Mountain National Forest

What is an Ecosystem?

- An ecosystem is a community of living organisms (e.g. plants, animals, humans), their physical environment, and the processes, functions, and interactions that combined lead to their recognition as an interdependent unit

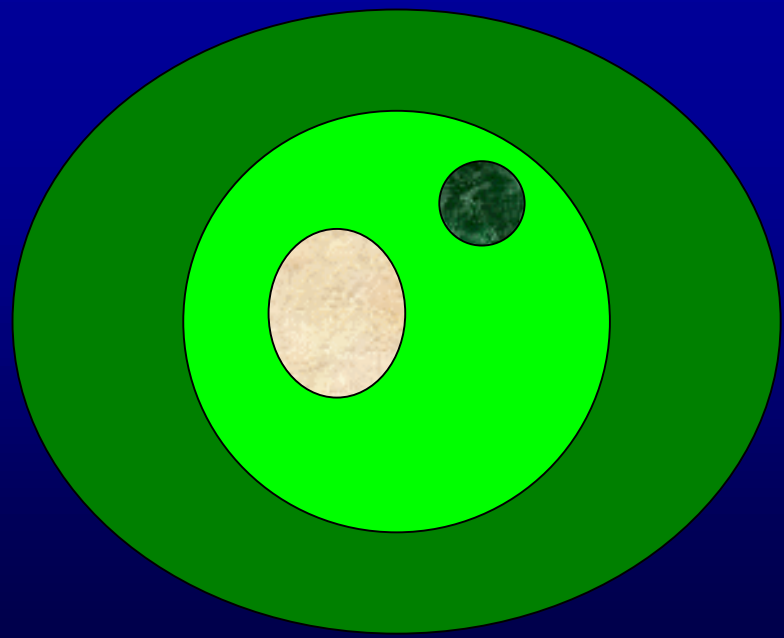
Ecosystems are...

SPATIAL

Ecosystems range in size

Ecosystems are hierarchical

Ecosystems are interdependent



Ecosystems are...

- INFLUENCED BY FORCES
- Disturbances
- Competition & predation
- Changes in forces

Wind disturbance near Bourn Pond

Ecosystems are…

- TEMPORAL
- Ecosystems are dynamic
- Ecosystems are influenced by their history
- Over hundreds of years, ecosystems can grow larger, shrink, or disappear – through natural or human causes

“Ecosystems are not only more complex than we think, they are more complex than we can think. This should lead us to be cautious, and a little bit humble.”
– Jack Ward Thomas

What is Ecosystem Management?

"An approach to the management of natural resources that strives to maintain or restore the sustainability of ecosystems and to provide present and future generations a continuous flow of multiple benefits in a manner that is harmonious with ecosystem sustainability." - David Unger, Ass. Deputy Chief of the US Forest Service, 1996

What is Ecosystem Management?

- Ecosystem management represents a shift in focus from “outputs” to “process, pattern, and function”
- Ecosystem management makes use of tools developed over decades of management and applies them to this new focus.

5 Principles of Ecosystem Management

1. Socially defined goals and management objectives
2. Integrated, holistic science
3. Broad scales – time and space
4. Collaborative decision building
5. Adaptable institutions

- *from Moote et al 1994; Iverson 1993.*

Ecosystem Management on the GMNF

- Watershed assessments
- Work with State on ecological land classification and natural communities
- Work with UVM on spatial analysis
- Public involvement and use of science in plan revision
- Building a stronger monitoring program

Relationship with National Forest Management Act (NFMA)

- National Forests are ecosystems
- Important aspects of national heritage preserved
- Coordinated planning with other land management agencies
- Integration of planning activities
- Public involvement
- Responsiveness to changing conditions

Ecosystem Management, NFMA, and Biological Diversity

- NFMA and associated regulations within the agency also require management to:
  - "...maintain at least viable populations of [existing native and desired non-native plants, fish, and wildlife] species."
  - "...provide for diversity of plant and animal communities based on the suitability and capability of the specific land area..."

What is Conservation Biology?

- First formulated in the late 1960's to 1980's as the application of science to conservation problems
- Addresses the dynamics and problems of species, communities, and ecosystems that are disturbed
- Publication of "Conservation Biology" by Michael Soulé in 1980
- Formation of professional organization "Society for Conservation Biology", and peer-reviewed journal "Conservation Biology" in 1987

What is Conservation Biology?

- Crisis or mission-oriented science
- Combination of pure and applied science
- Focuses on how to maintain, protect, and restore the diversity of life on Earth, or biodiversity.

What is Biodiversity?

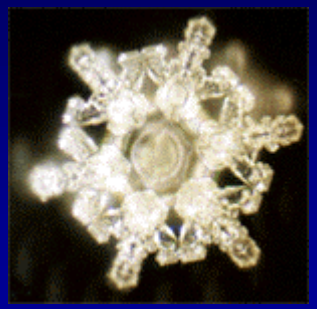
The Variety of Life and its Processes

The variety of living organisms & their genetic differences;

The communities and ecosystems in which they occur;

The ecological and evolutionary processes that keep them functioning, yet ever changing and adapting.

What is Biodiversity?



Genes
Species

Populations
Communities

Ecosystems
Landscapes

What is Biodiversity?

Species

Communities

Landscapes

The Most Useful and Relevant Levels

Is There a Biodiversity Crisis?

- In the U.S. there are 1,262 plants and animals federally listed as T or E
- Scientists indicate current rate of extinction is 100-1,000 times faster than natural rate
- Acceleration throughout human history
- This loss will affect people – food, medicine, industrial products, eco-services

Why is Biodiversity Important?

- Utilitarian value – benefits to people
  - Food crops
  - Building materials
  - Decomposing organisms
- Inherent value – value due to existence

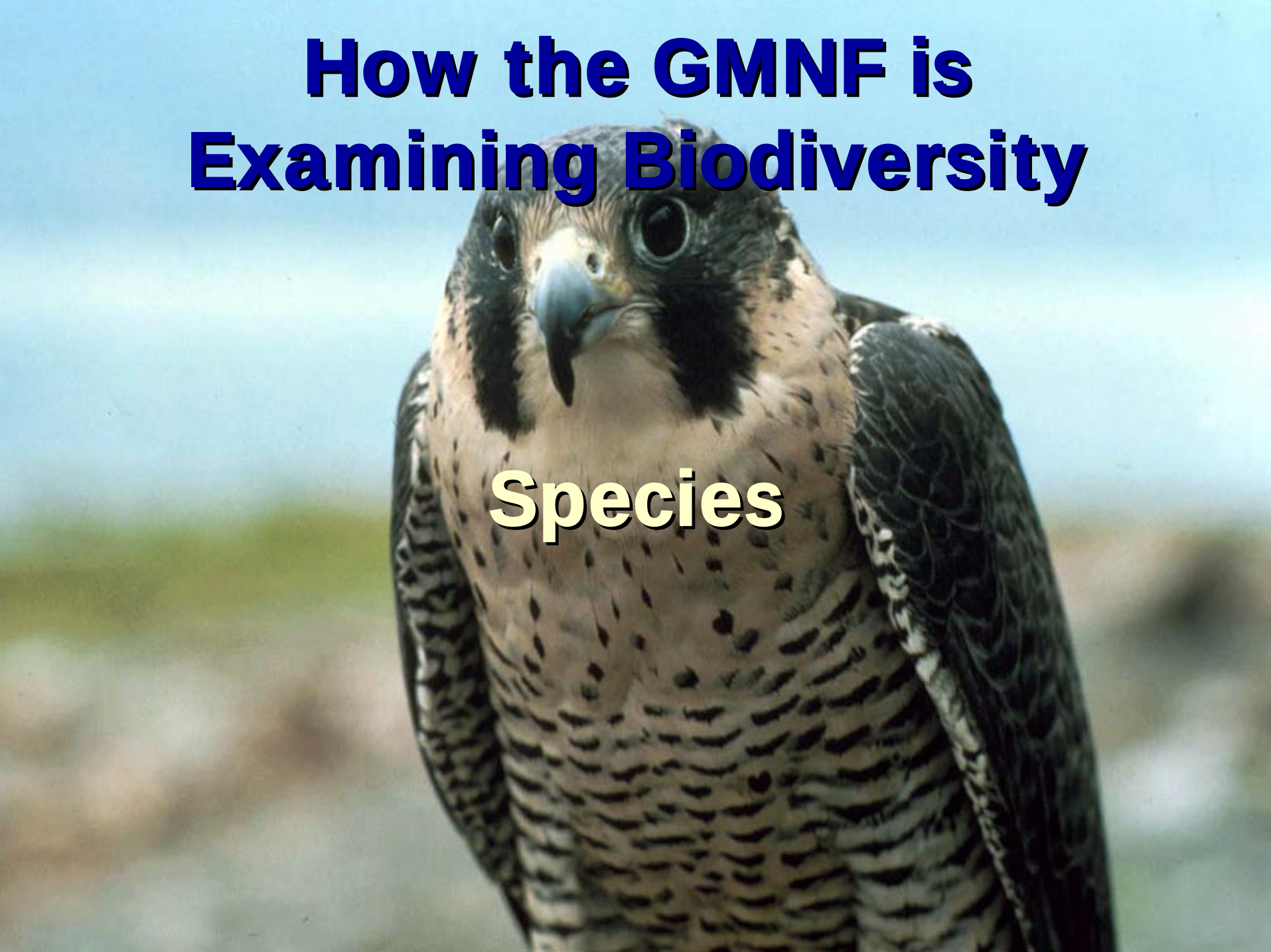
What are the Main Threats to Biodiversity?

- Habitat loss and fragmentation
- Habitat degradation
- Introduced species
- Overharvesting of species

Key Elements of Biodiversity Conservation

- Viable populations
- Representation in conservation design
  - Species
  - Natural communities
  - Landscapes

How the GMNF is Examining Biodiversity



Species

How the GMNF is Examining Biodiversity

- Focus is on conservation of rare species that are at risk of being lost from the Forest
- Process called Species Viability Evaluation
- Identify at species-at-risk
- Evaluate effects of alternatives on them
- Once an alternative is selected, species that continue to be at risk are protected

What is a Species Viability Evaluation (SVE)?

- A qualitative process
- Assembles existing information
- Uses expert judgments
  - likely future status of species populations
  - ecological conditions that support them.

Why are we doing a Species Viability Evaluation?

- National Forest Management Act viability requirements
- Legal decisions - identify ecological conditions needed to maintain species viability over time

What is “Viability”?

A viable population is “one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area.”

“…habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.”

-NFMA 1982 regulations

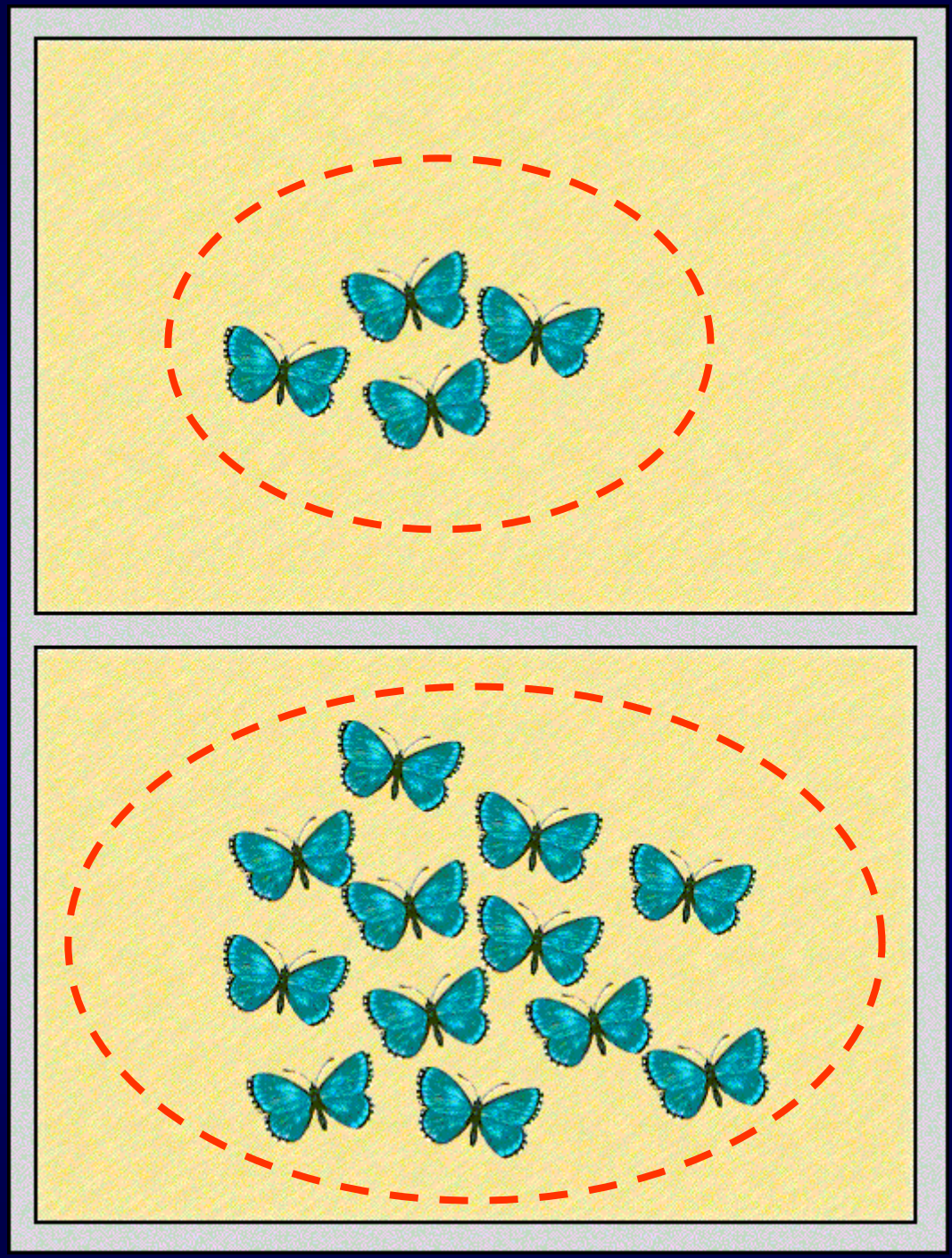
What is Viability?

Size: Populations large and healthy enough to endure long-term

Condition: With most components intact, not significantly degraded

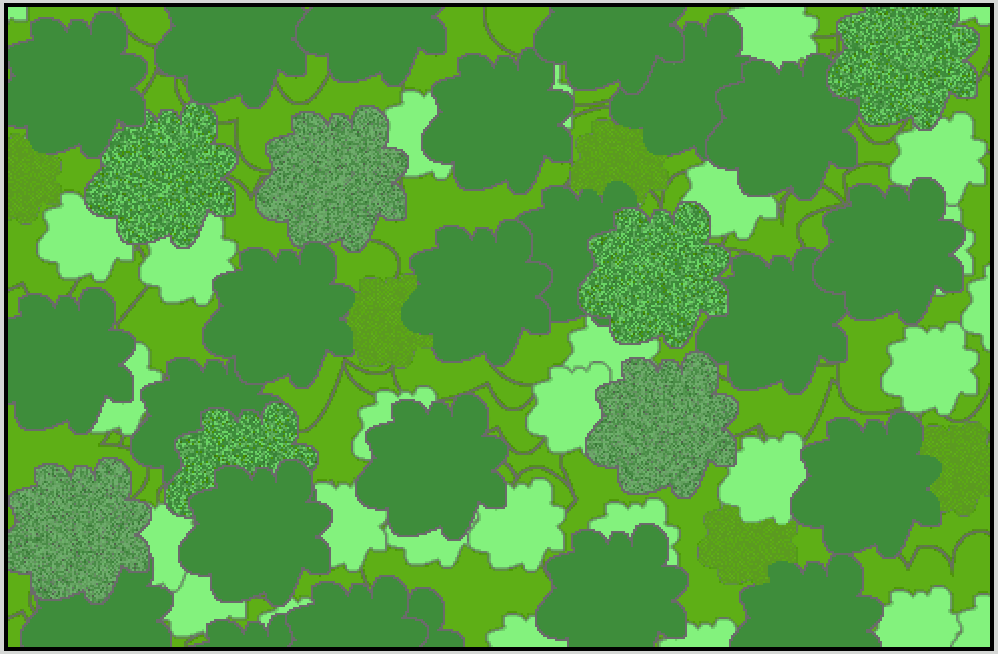
Landscape Context: In a setting which supports an organism's life history and ecosystem functions

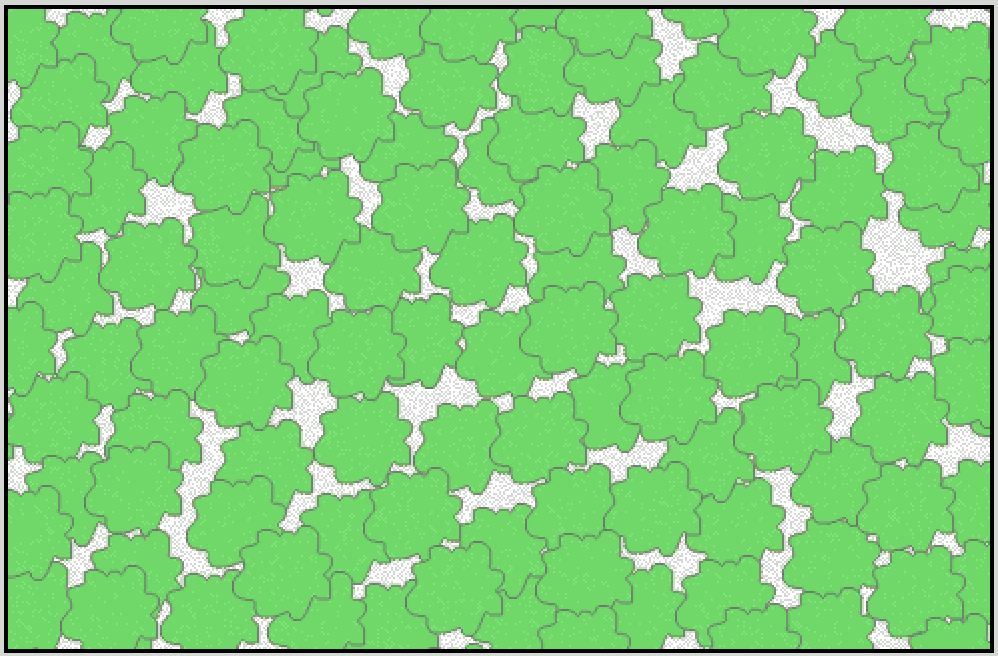
For example...



Viability:

Size

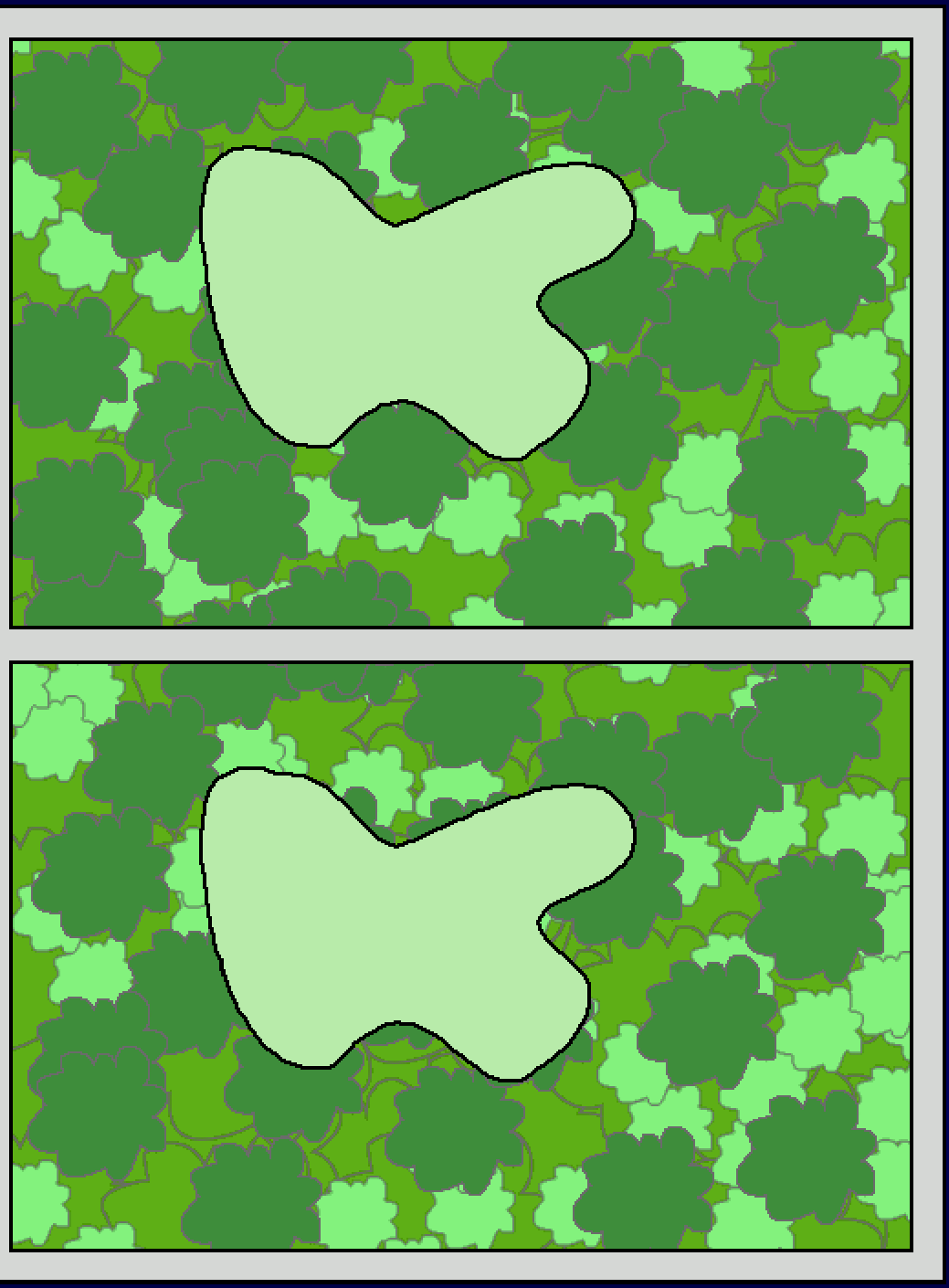




Viability:

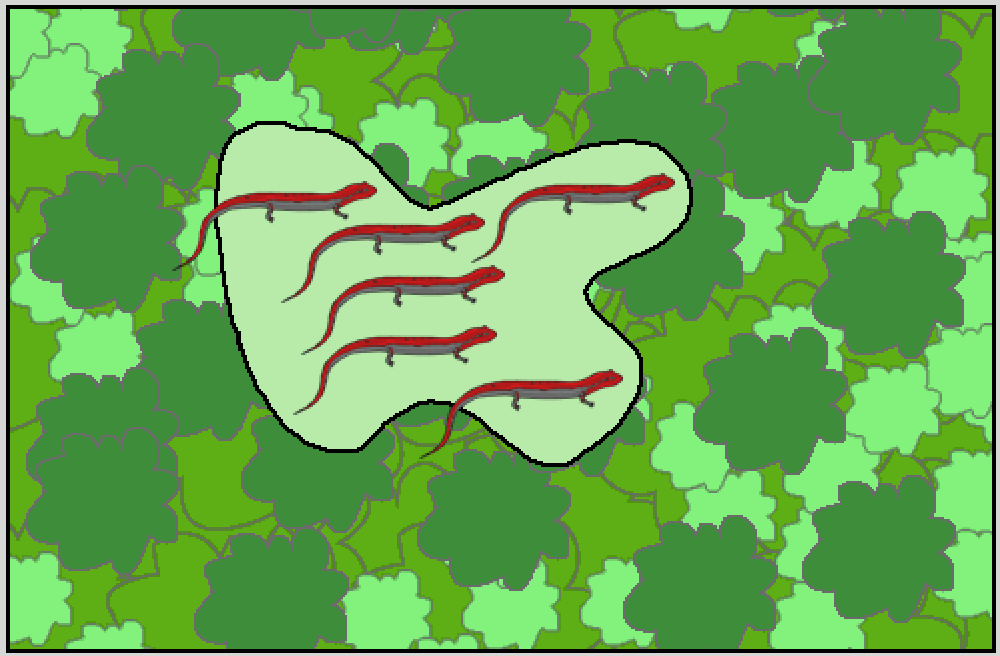
Condition

- Age Structure
- Habitat Structure
- No Exotics
- “Good” Habitat



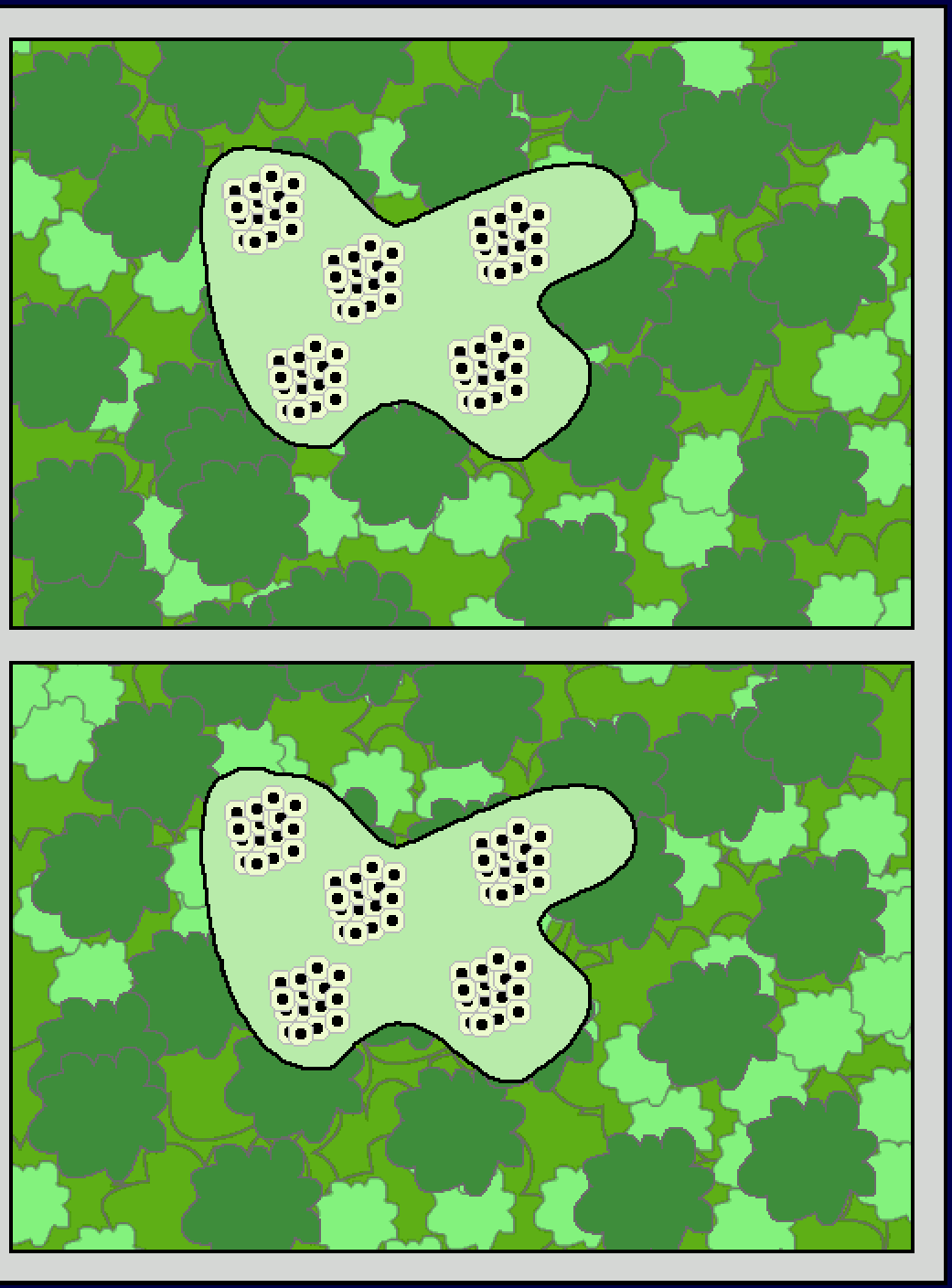
Viability:

Landscape Context



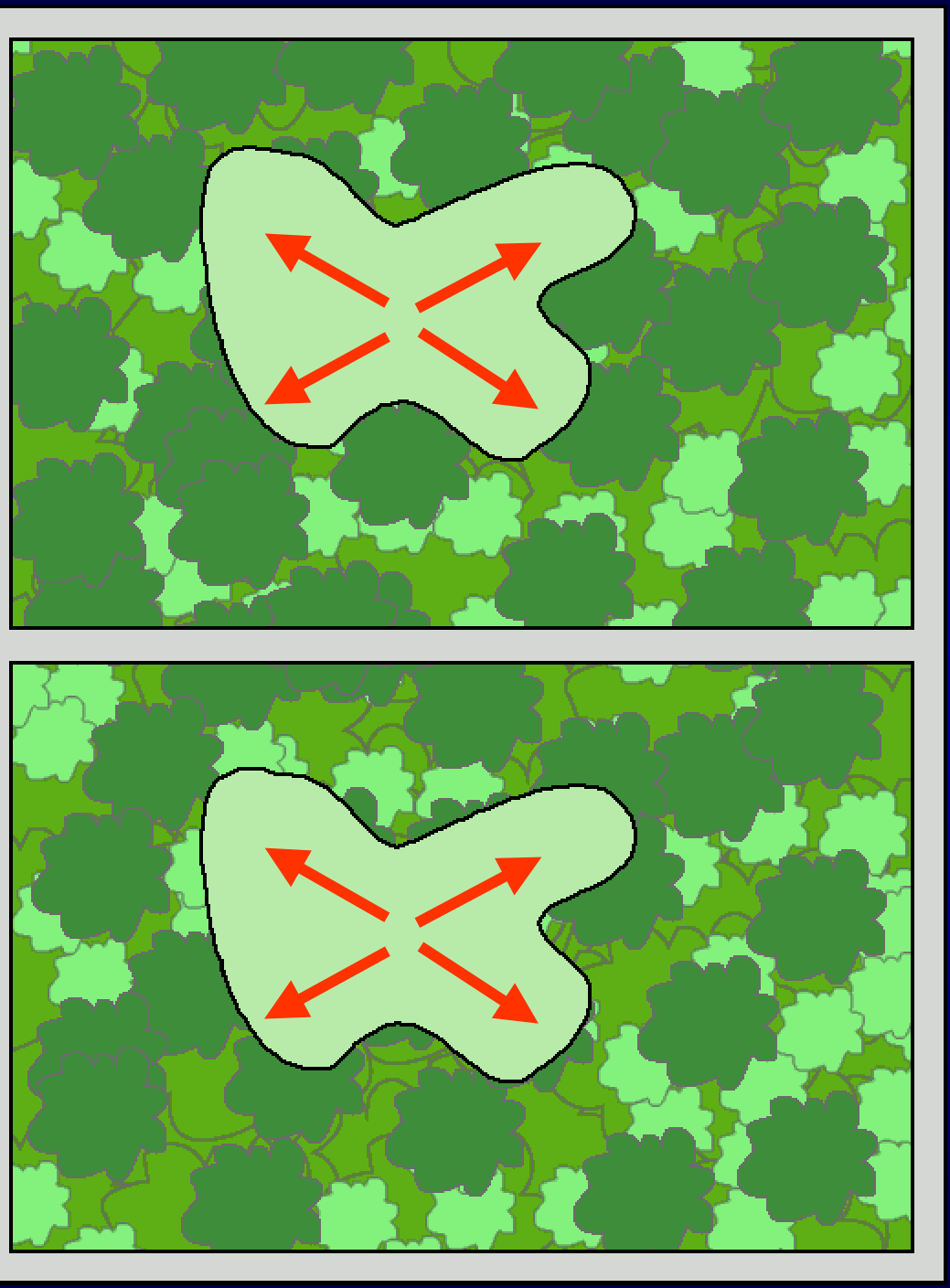
Viability:

Landscape Context



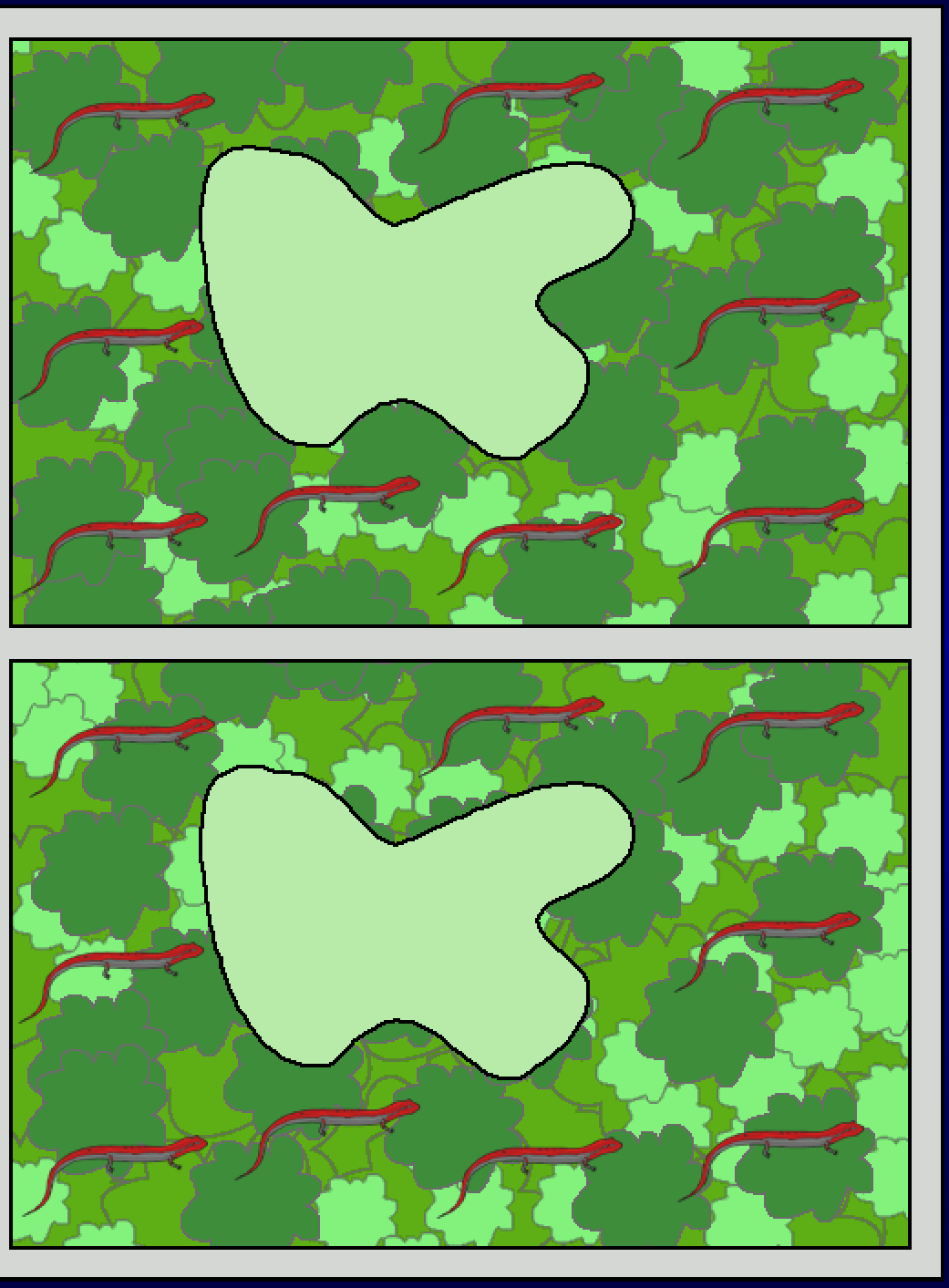
Viability:

Landscape Context



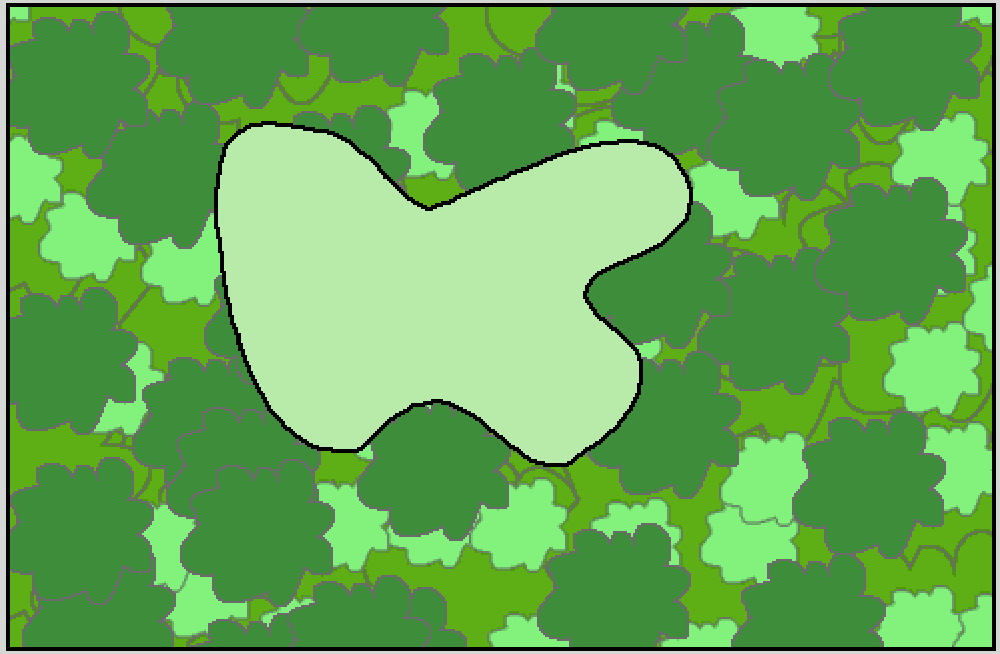
Viability:

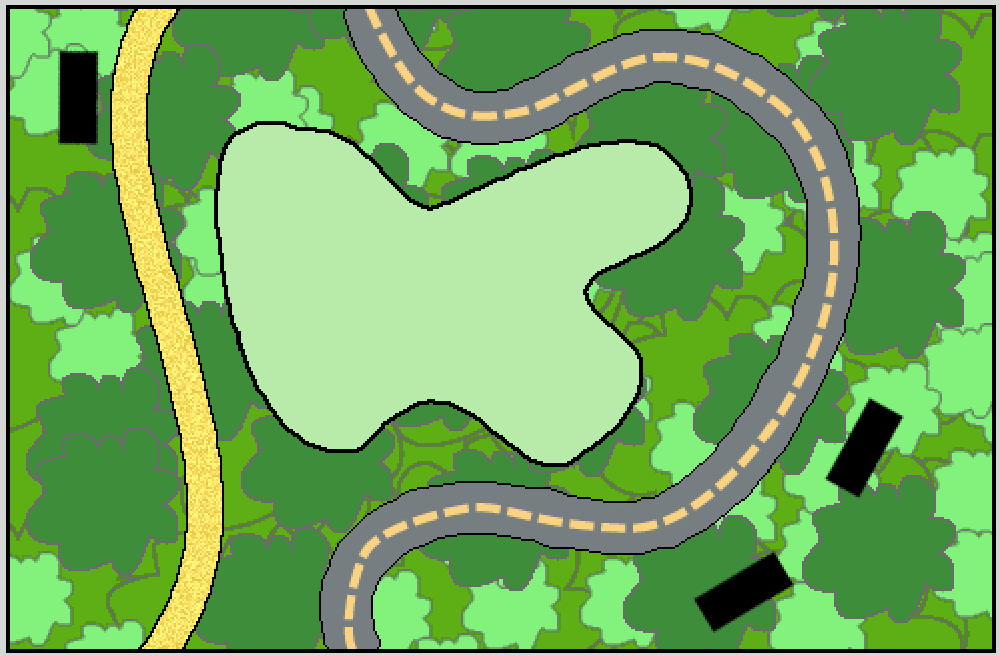
Landscape Context



Viability:

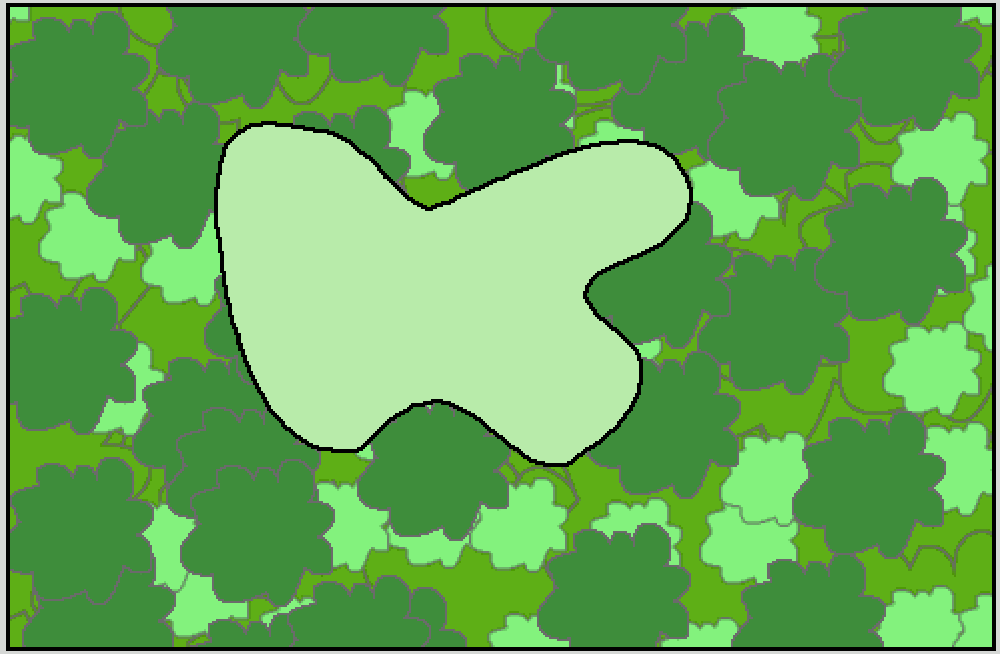
Landscape Context

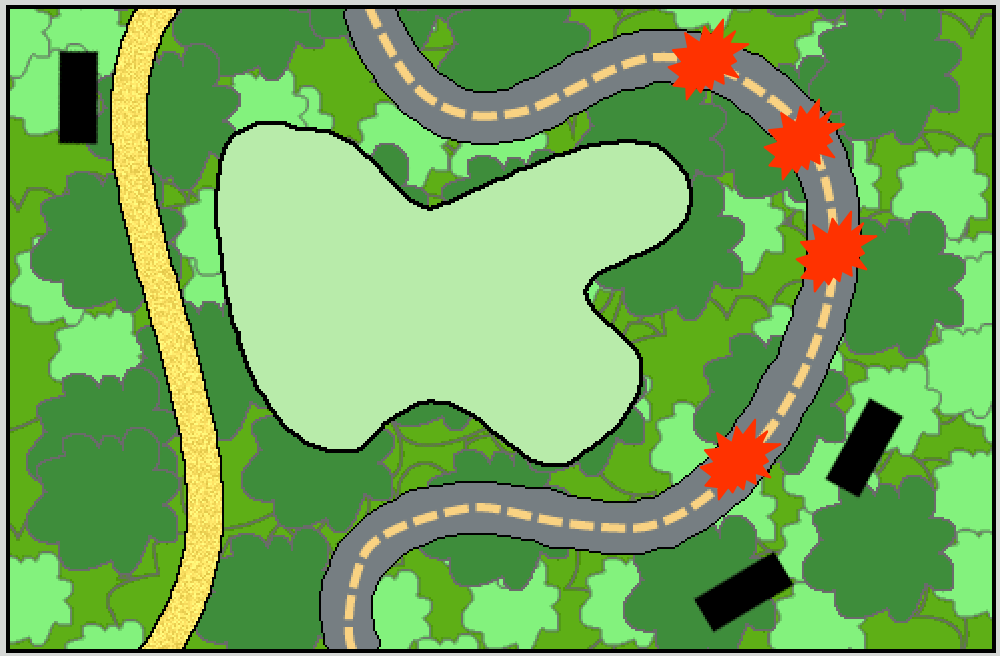




Viability:

Landscape Context





Viability:

Landscape Context

What species do we need to evaluate throughout Revision?

- Federally Endangered, Threatened and Proposed species
- Regional Forester's Sensitive Species (RFSS)
- Species likely to occur on the GMNF for which viability in the next 10-20 years is a concern

Species with a viability concern

Species for which a viability concern exists may include:

- State endangered, threatened, and special concern species
- Species that are State ranked as rare
- Those at risk of being extirpated from the Green Mountain National Forest
- Only those known or likely to occur on the Forest

Literature Reviews

- Literature reviews were prepared for 384 plants & 94 animals that were known or possible on the GMNF
- Based on information in the reviews the list was further reduced to 261 plants & 65 animals

Expert Panels

- Experts are recognized by peers
- Gather unpublished local & expert knowledge
- Provide professional judgment
- Validate and supplement information
- Not to provide management recommendations

Panel Potential Outcomes

- Outcome A - populations are essentially as healthy as ever
- Outcome B - habitat and/or populations reduced some but still doing well; minimally viable for amphibians
- Outcome C - habitat and/or populations reduced quite a bit, minimally viable
- Outcome D and E - major reductions that mean the species is not viable

Evaluation Criteria

- A - Regional Forester Sensitive Species
  - Known on the GMNF
  - Outcomes B to E

Showy ladyslipper

Peregrine falcon

Evaluation Criteria

- B - Other Species of Viability Concern
  - Known or likely on the GMNF
  - Outcomes at or trending to D or worse

Pitch pine

Gray petaltail

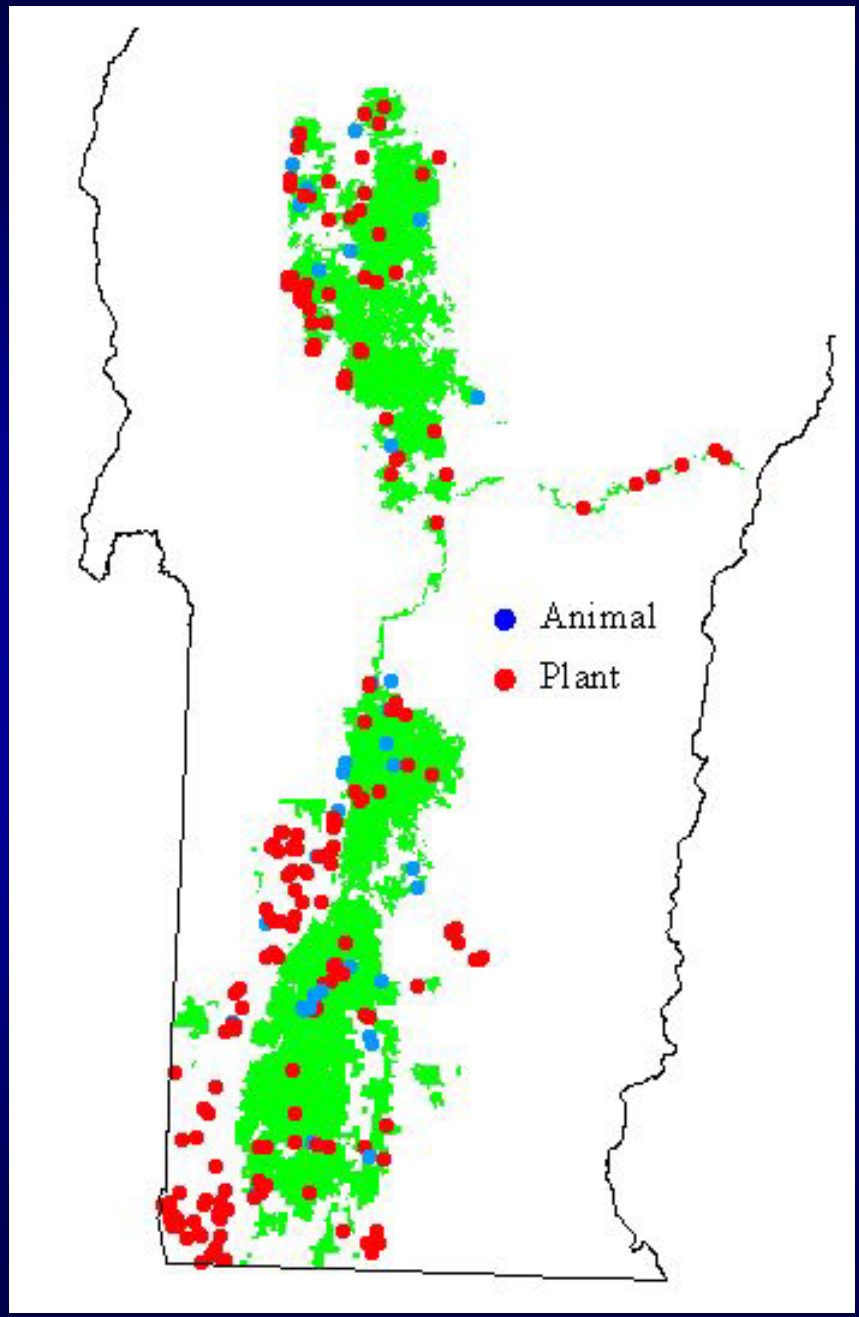
Evaluation Criteria

- C - Species of Potential Viability Concern
  - Known or likely on the GMNF
  - Outcomes at or trending toward C, or uncertain
  - Likely to be affected by management
  - Has traits, habitats, or response to management unlike other species of viability concern

SVE Species – Group C

Rough-leaved goldenrod

Blue-spotted salamander



GMNF Rare Species

Animals

Plants

How will this information be used?

- Forest Plan Revision:
  - management direction
  - standards and guidelines for species enhancement and protection
  - landscape-level habitat objectives
- In project development and analysis, to determine when enhancement or protection are needed, and how to achieve that goal.

How the GMNF is Examining Biodiversity –

Management Indicator Species

Management Indicator Species

- Based on the premise that certain species can represent other species in terms of:
  - Response to management
  - Population trends

Management Indicator Species

- Summary Requirements – NFMA 1982
  - MIS indicate effects of management through changes in species populations
  - Can include virtually any vertebrate, invertebrate, plant
  - Must be used to analyze effects of alternatives
  - Must be monitored and related to habitat

Categories of MIS

- Endangered and threatened plant and animal species (state and Federal)
- Special habitat needs influenced by management
- Hunted, fished, trapped
- Non-game special interest
- Population changes indicate effects of management on other species

NFMA does not:

- Have criteria for adequate set of MIS
- Require the choice of particular species
- Directly link MIS to viability requirement

MIS on the GMNF

- Selection based on major vegetative community types and special habitat features/conditions
- The GMNF selected 14 MIS species, including 9 birds, 4 mammals, and 1 fish
- Habitats represented by these species include:
  - Young and mature hardwoods
  - Young and mature softwoods (hi and low elevations)
  - Young and mature aspen/birch
  - Mature oak
  - Upland openings
  - Unique habitats – marsh, stream, cliff, beaver flowage

MIS Trends on the GMNF

- Increasing trends for species representing:
  - High elevation, mature softwood (black-poll warbler)
  - Aspen and birch (beaver, yellow-bellied sapsucker)
  - Streams (brook trout)
  - Cliffs (peregrine falcon)
- Stable to slight decline for species representing:
  - Low elevation mature softwood (white-tailed deer)
- Possibly stable trend for species representing:
  - Mature hardwoods (barred owl)
  - Regenerating softwoods (snowshoe hare)
  - Upland openings (American woodcock)

MIS Issues

- Poor funding of monitoring program
- Monitoring methods need improvement
- Some MIS were ineffective indicators (swallow, bittern, sapsucker)
- Trends can sometimes take decades to detect
- Success of vertebrates ≠ success of other elements of biodiversity

MIS – Next Steps

- Determine what adjustments in MIS program would better satisfy NFMA
- Work with research on improvements to monitoring mechanics
- Integrate use of other ecological indicators – e.g. # cavity trees, vernal pools - to get at health of habitats and natural communities


How the GMNF is Examining Biodiversity
Natural communities

What is a Community?

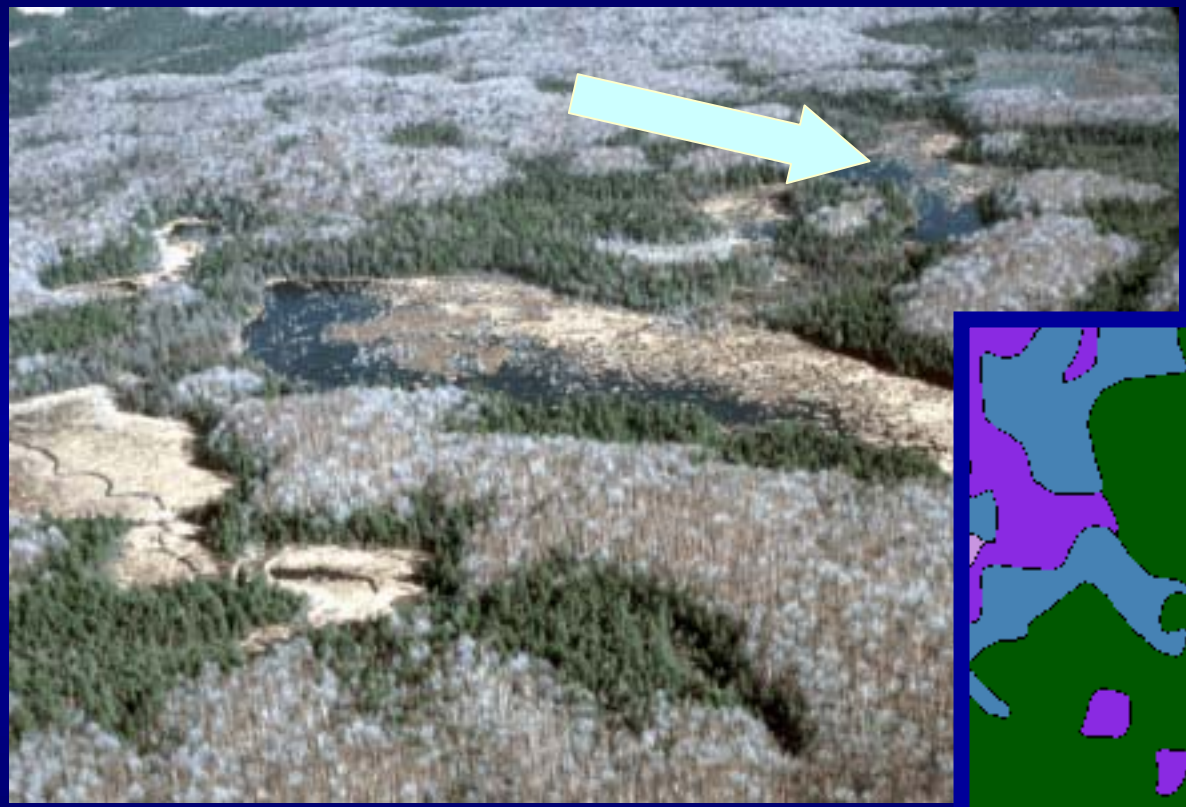
A Natural Community is an interacting assemblage of organisms, their physical environment, and the natural processes that affect them.

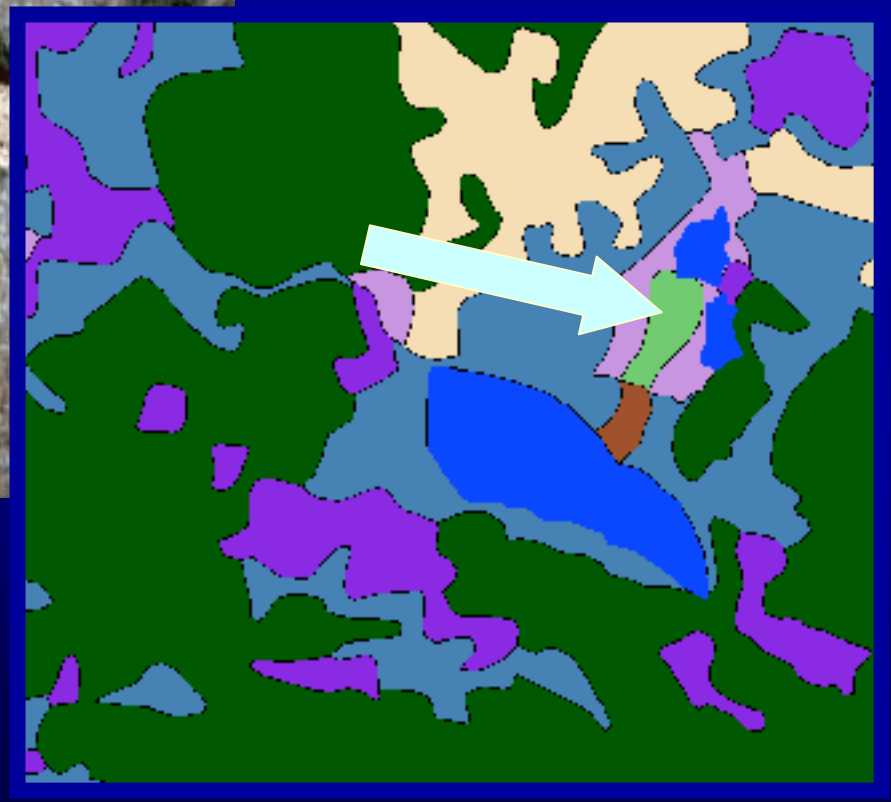
They occur repeatedly across the landscape.

They are named by plant community

There are 80 Community Types in Vermont, ~61 of these occur on the GMNF.

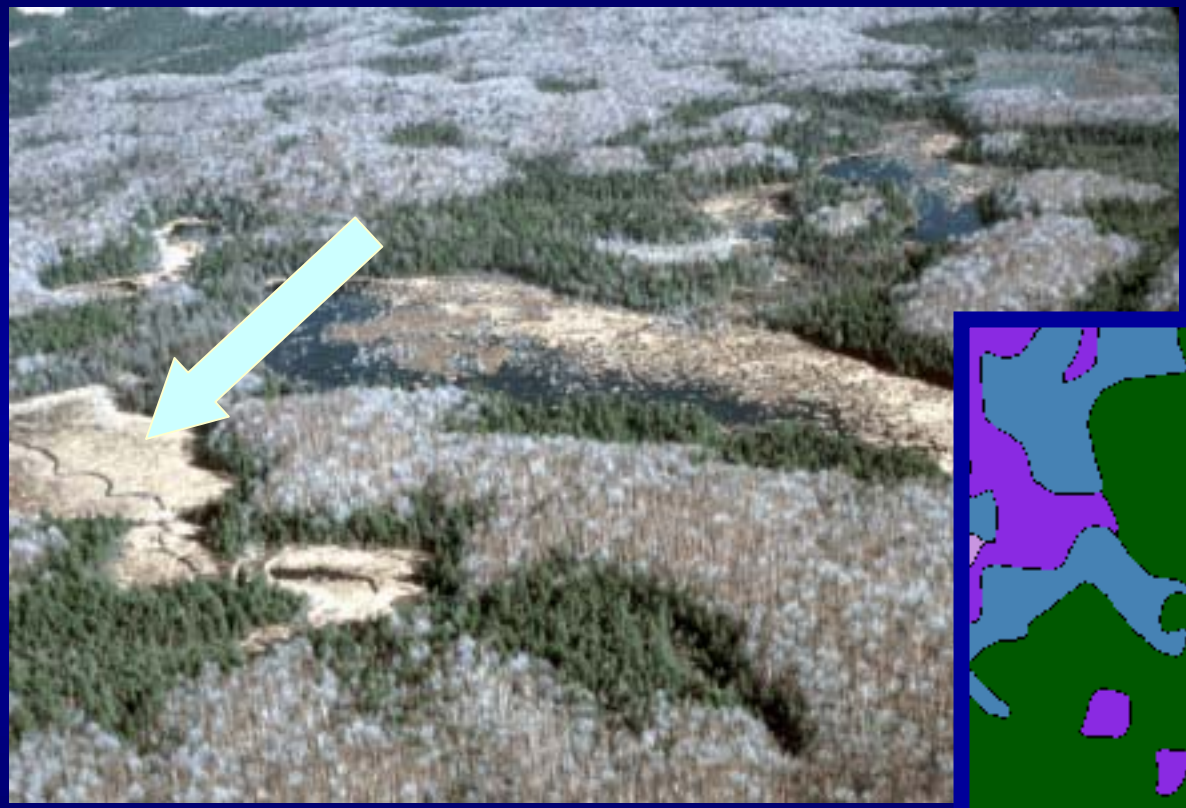
What is a Community?

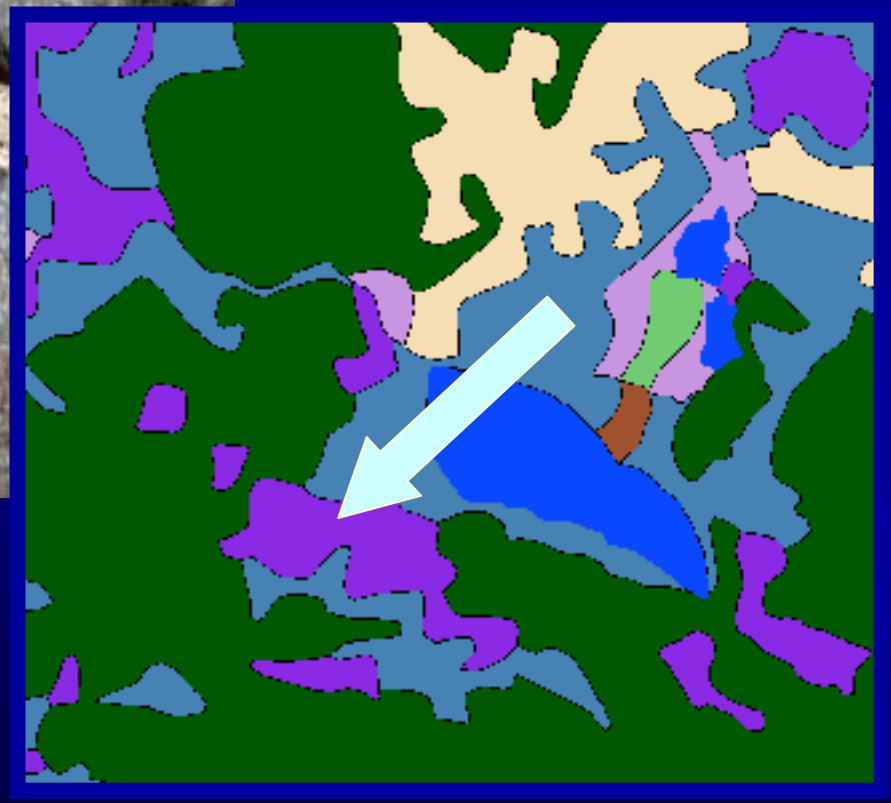




Sedge Meadow: Small Patch <20 Acres

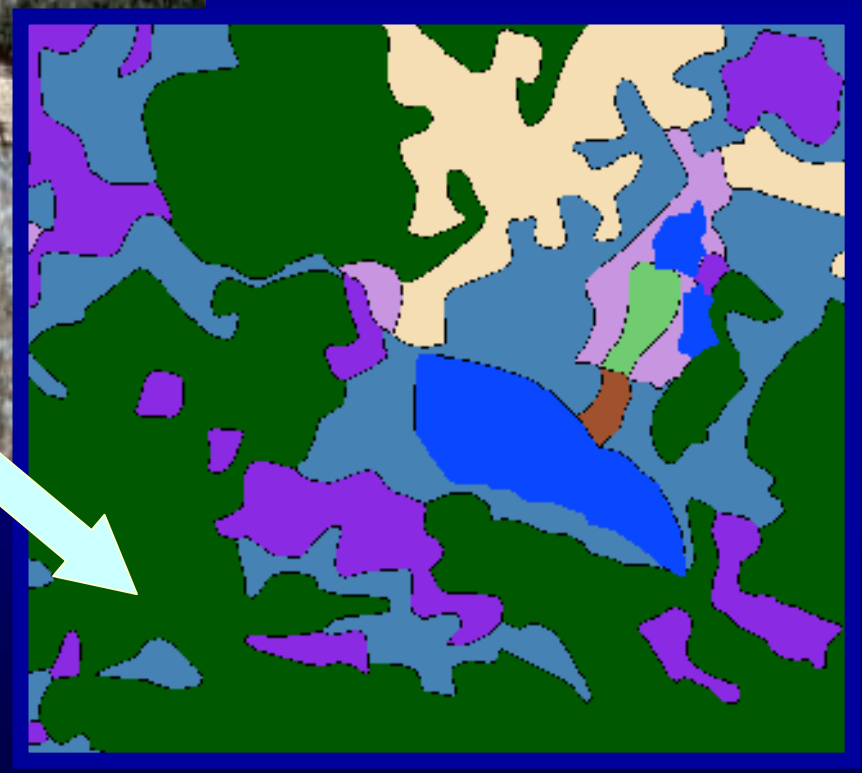
What is a Community?





Emergent Wetland:
Large Patch <100 Acres

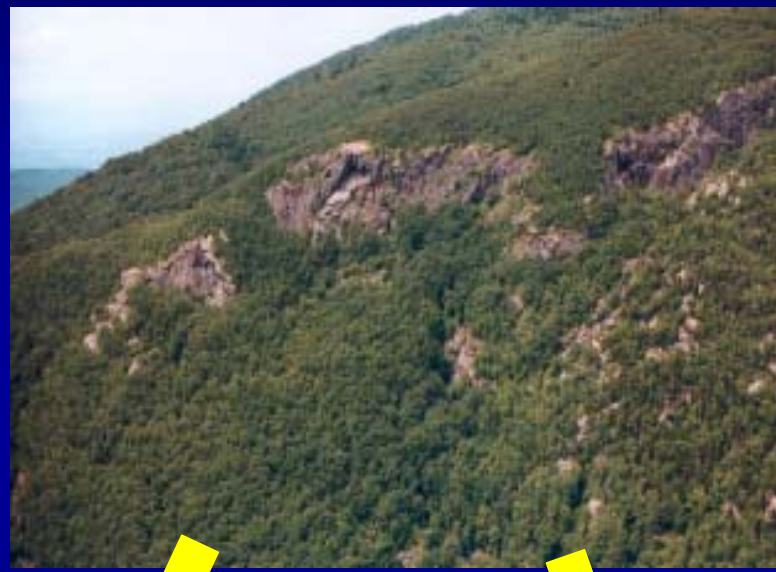
What is a Community?



Northern Hardwood Forest:
Matrix 25,000+ Acres

Natural Communities

Surrogates for species



Why is Protecting Natural Communities Important?

- Natural communities comprise living and non-living components that interact
- Traditional conservation focused on protection of single species
- Current practices focus on protection of ecosystems or groups of ecosystems (landscapes)
- This increases the chance that ecosystem processes and uninventoried species are protected

How the GMNF is Examining Biodiversity

- Natural communities serve as both coarse and fine filters
  - Small patch natural communities are caught in the fine filter
  - Matrix and large patch natural communities catch a number of more common organisms

How the GMNF is Examining Biodiversity

- The GMNF has identified approx. 85 rare, unique, or outstanding natural communities on the GMNF
- NFMA does not specify conservation goals for natural communities or ecosystems
- Preliminary goal is to at least conserve all rare natural communities and the best examples of the more common ones

Aquatic Communities

- An Aquatics Expert Working Group has classified aquatic ecosystems based on:
  - aquatic plant diversity
  - small insect diversity
  - running water fish assemblages
- This group identified the best examples of each type in the State
- Preliminary goal is to conserve those examples that occur on the GMNF

Exemplary Aquatic Communities


How the GMNF is Examining Biodiversity
Landscapes

What is a Landscape?

"...a heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout." – Forman & Godron 1986

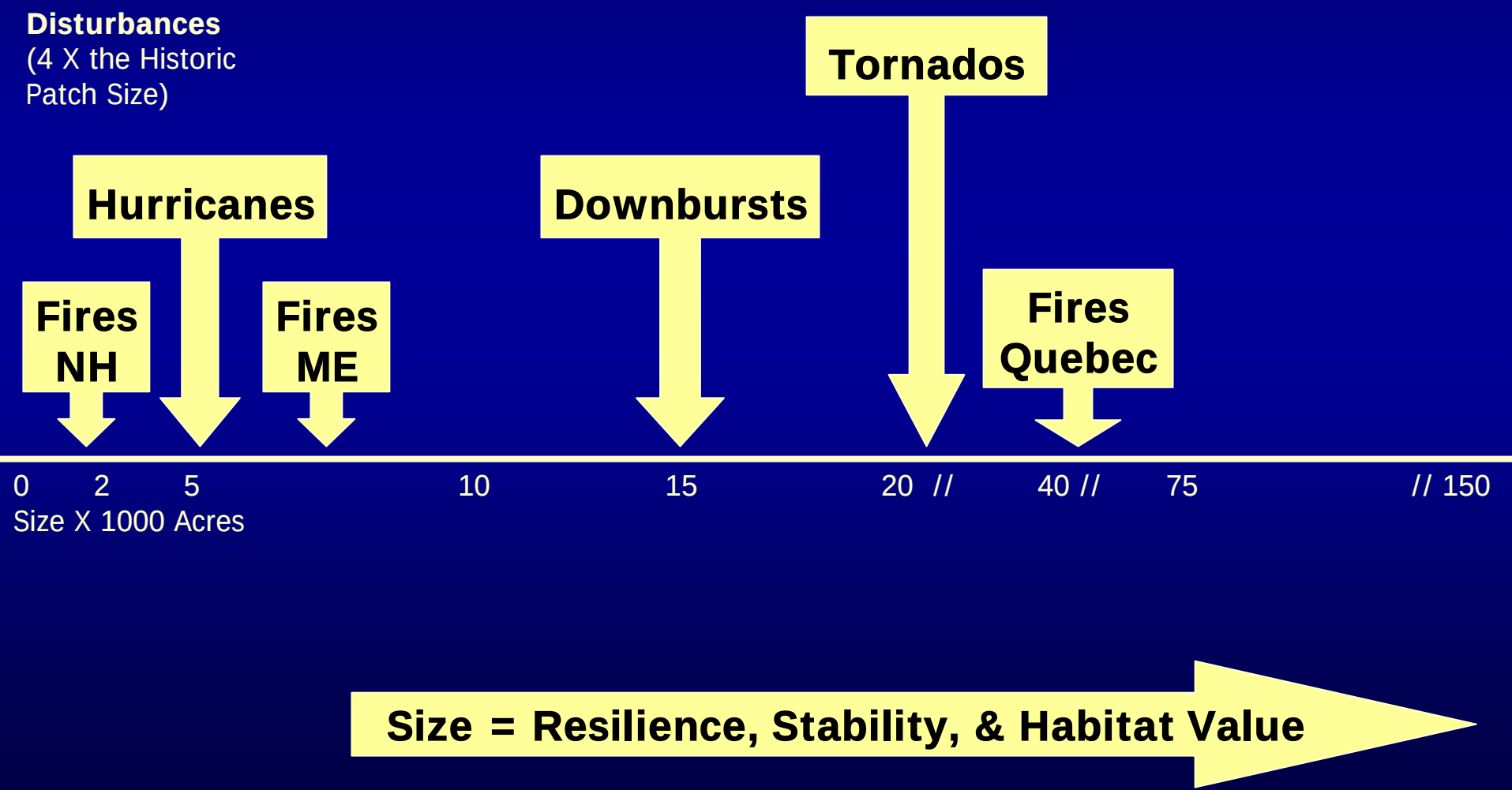
What is a Landscape?

- Landscapes are ecosystems that occur at a scale of 1000’s of acres
- Includes smaller ecosystems that interact
- The interacting ecosystems exhibit a pattern
- The pattern of small, large, and matrix ecosystems repeats
- Corridors connect similar patches through a dissimilar matrix or patch group

Why is Protecting Landscapes Important?

- Increases the chance that large ecosystem processes are protected

Scaling Factors for Disturbance in Northern Hardwood Forests

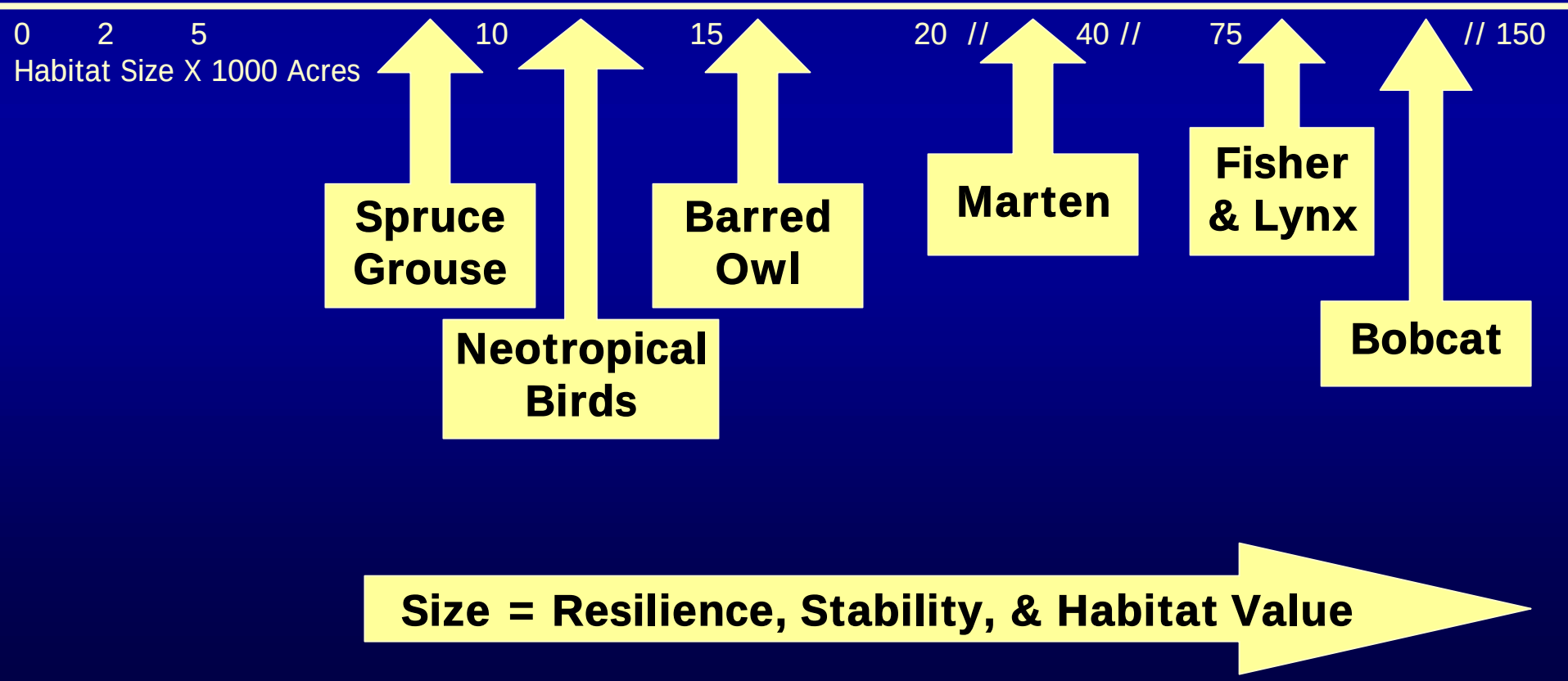


Why is Protecting Landscapes Important?

- Increases the chance that large ecosystem processes are protected
- Coarse filter – catch organisms that range widely and depend on a heterogeneous landscape for life history

Scaling Factors for Animals of Northern Hardwood Forests

Species (25 X the Mean Female Home Range)

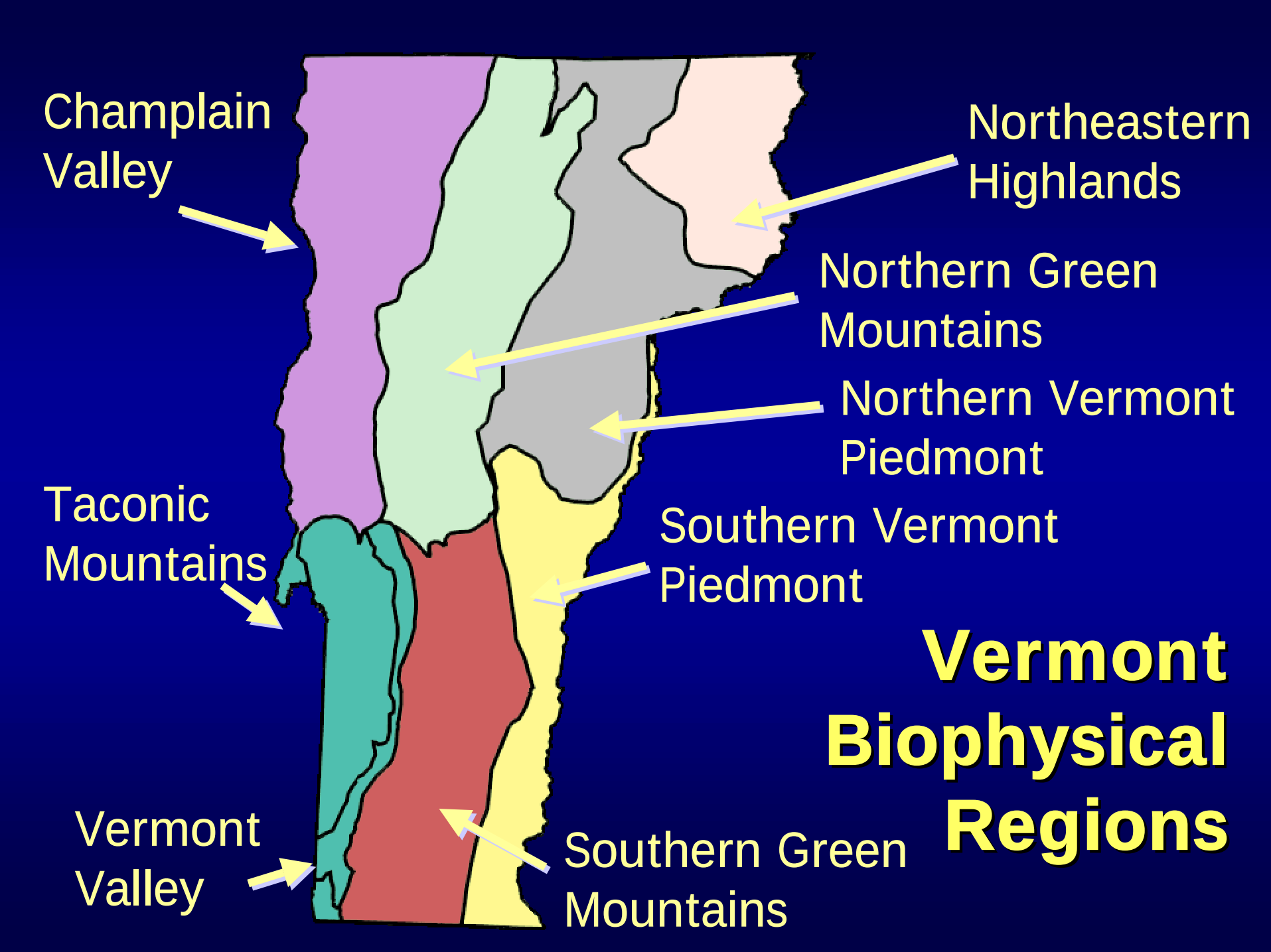


Why is Protecting Landscapes Important?

- Increases the chance that large ecosystem processes are protected
- Coarse filter – catches organisms that range widely and depend on a heterogeneous landscape for life history
- A diverse representation of physical environments will likely maintain a majority of species diversity

How the GMNF is Examining Biodiversity

- Mapping landscapes and landscape components
- Approaches to conserving landscapes


Champlain Valley
Northeastern Highlands
Northern Green Mountains
Northern Vermont Piedmont
Taconic Mountains
Southern Vermont Piedmont
Vermont Valley
Southern Green Mountains
Vermont Biophysical Regions

Landtype Associations

Valley bottoms

Low hills & mountains

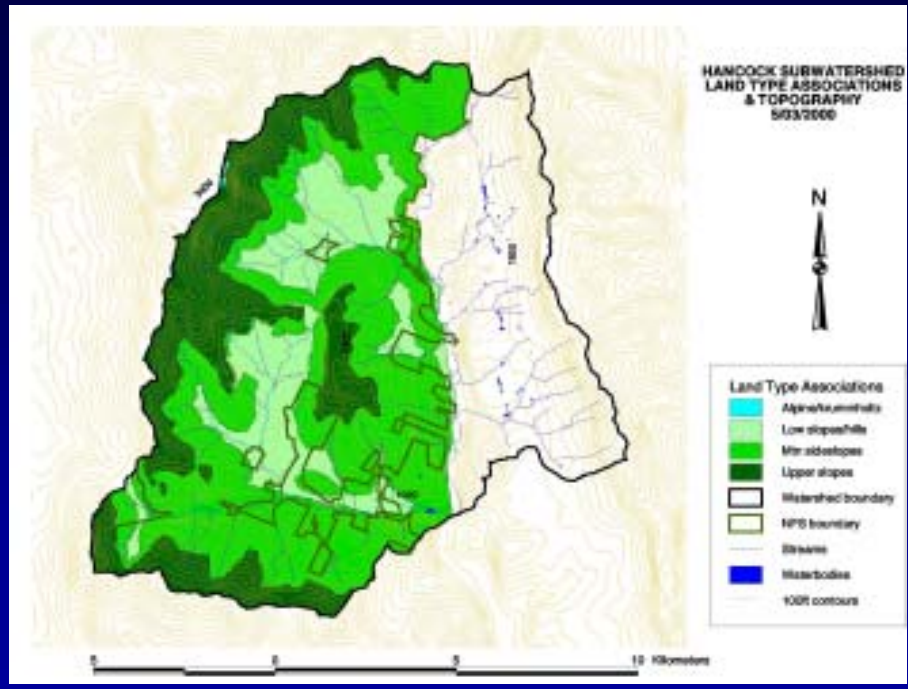
Escarpment

Precambrian plateau

Mountain sideslopes

Upper mountain slopes

Mountain tops/alpine



Ecological Landtypes

Wet soils

Rocky steep soils

Soils with hard pan

Soils with loose till

Outwash

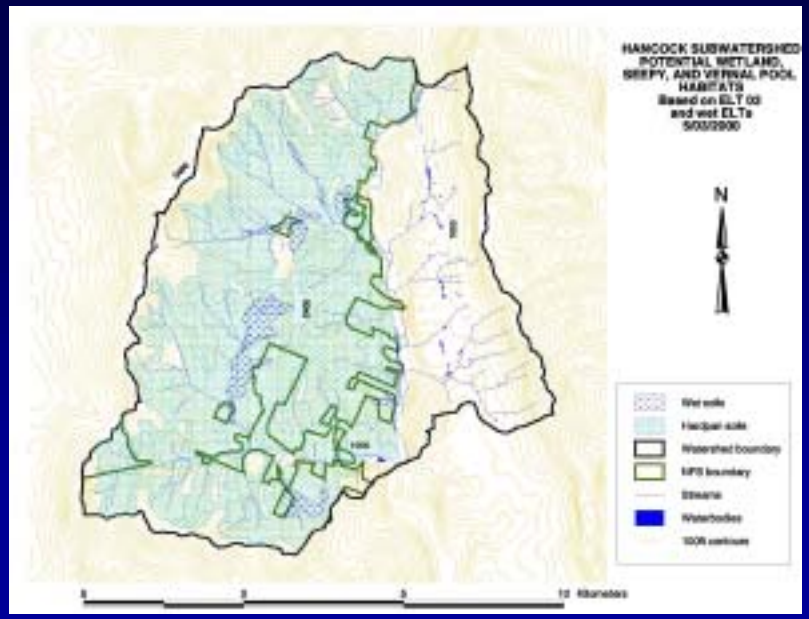
Fine sediments

Alluvium

High elev. thin soils

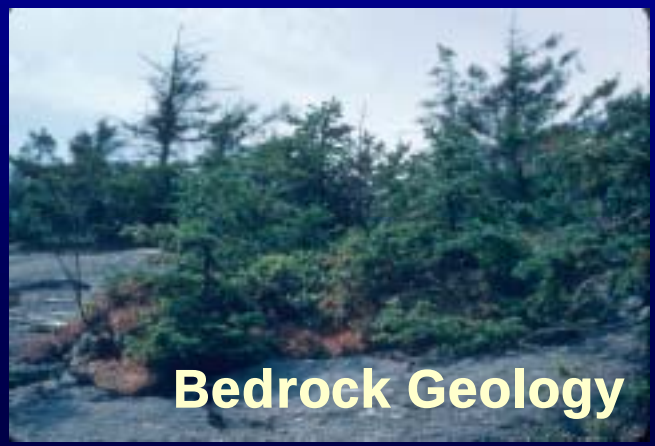
Alpine/cryoplanation

Breaklands



Enduring Features

Physical diversity as a surrogate for community diversity



Landforms

Surficial geology

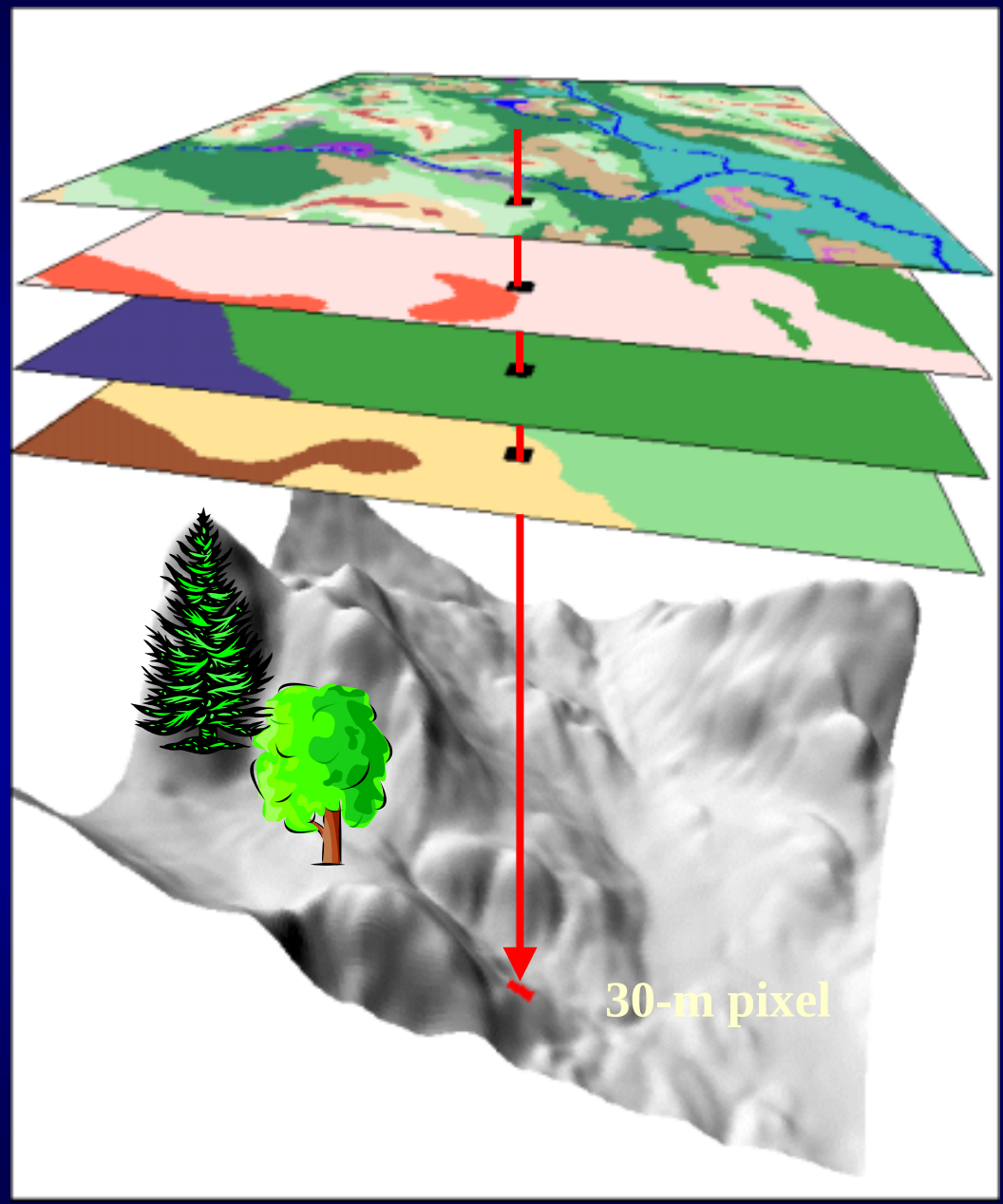
Bedrock geology

Elevation

Landscape Diversity Units

Land cover data

Ecological Land Units (ELUs)



Ecological Land Unit Groups

Integrated physical diversity

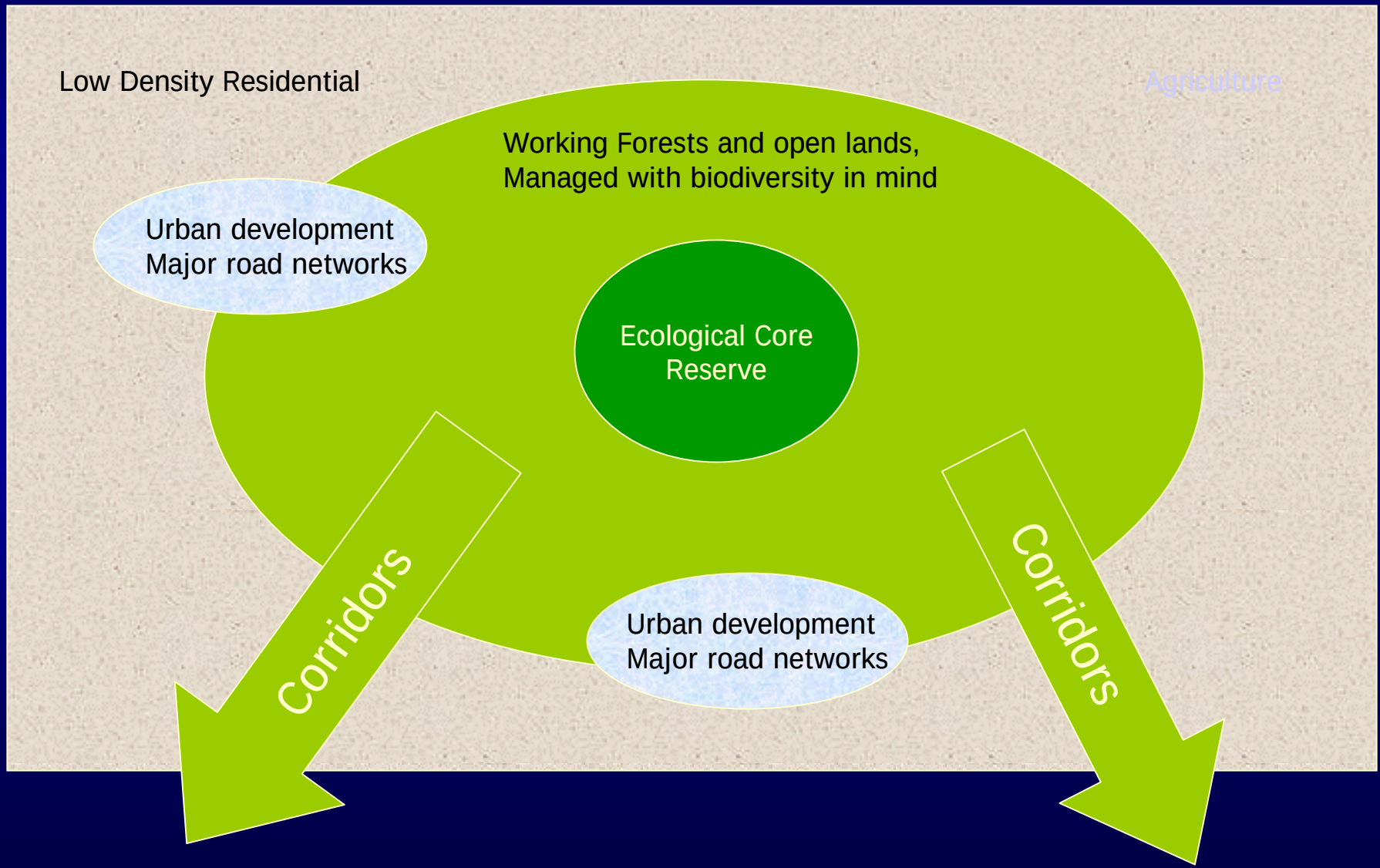
Grouped by related natural communities

Labeled for most common natural community expected there

Approaches to Conserving Landscapes

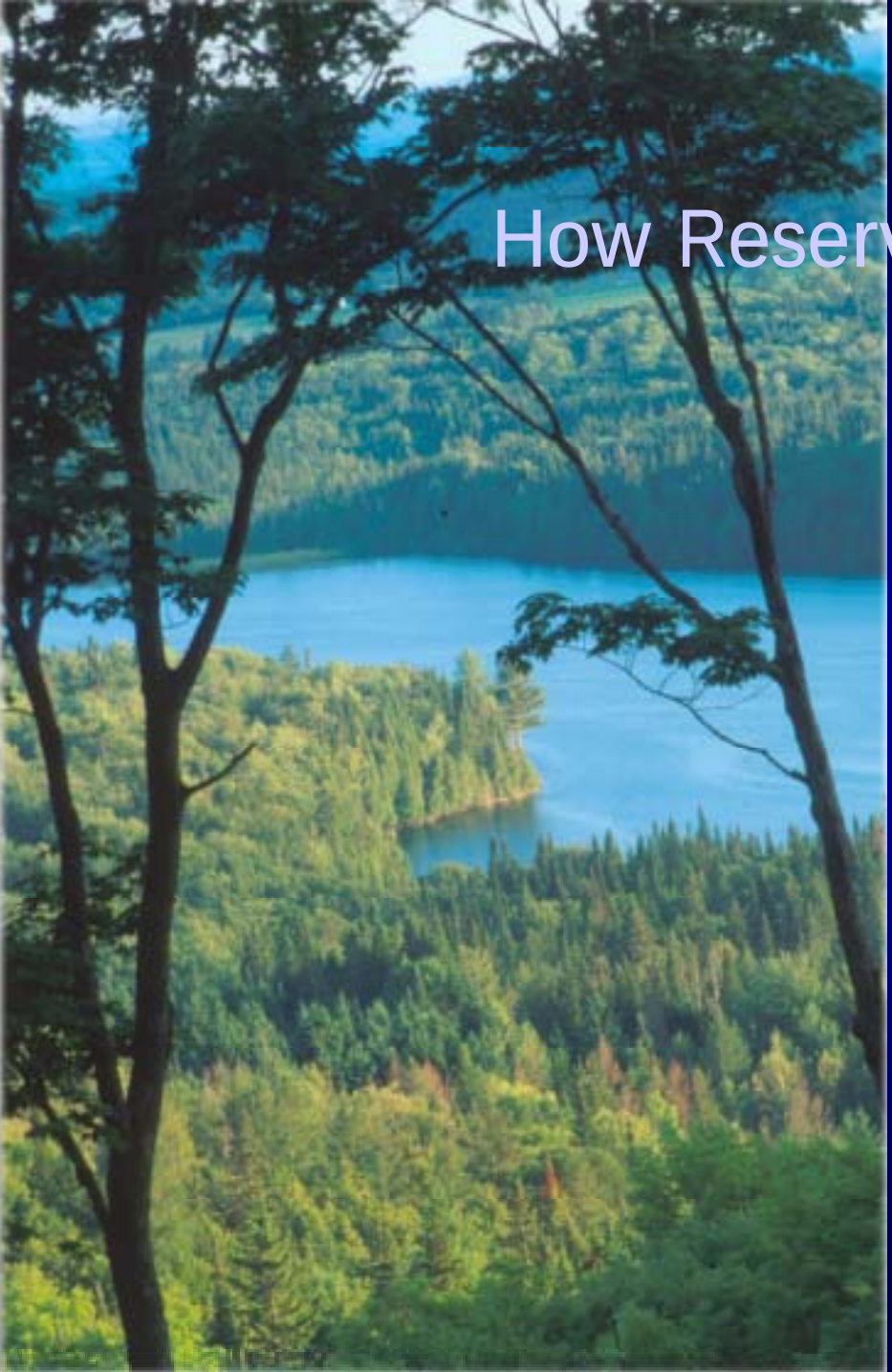
- Zoning Approach (reserves, buffers, matrix)
  - Reserves – conserve natural processes
  - Buffers – manage resources sustainably
  - Matrix – intensive management
- Alternative Forest Management
  - Management in the buffers
  - Conserves biodiversity
  - Reserves for species that can’t tolerate management

Biodiversity Conservation Zones



How Working Lands Contribute

- Diversity of Natural Communities
- Habitat for many common species with specialized needs
- Habitat for some rare species
- Connections between reserves
- Recreation and nature study



How Reserves Contribute

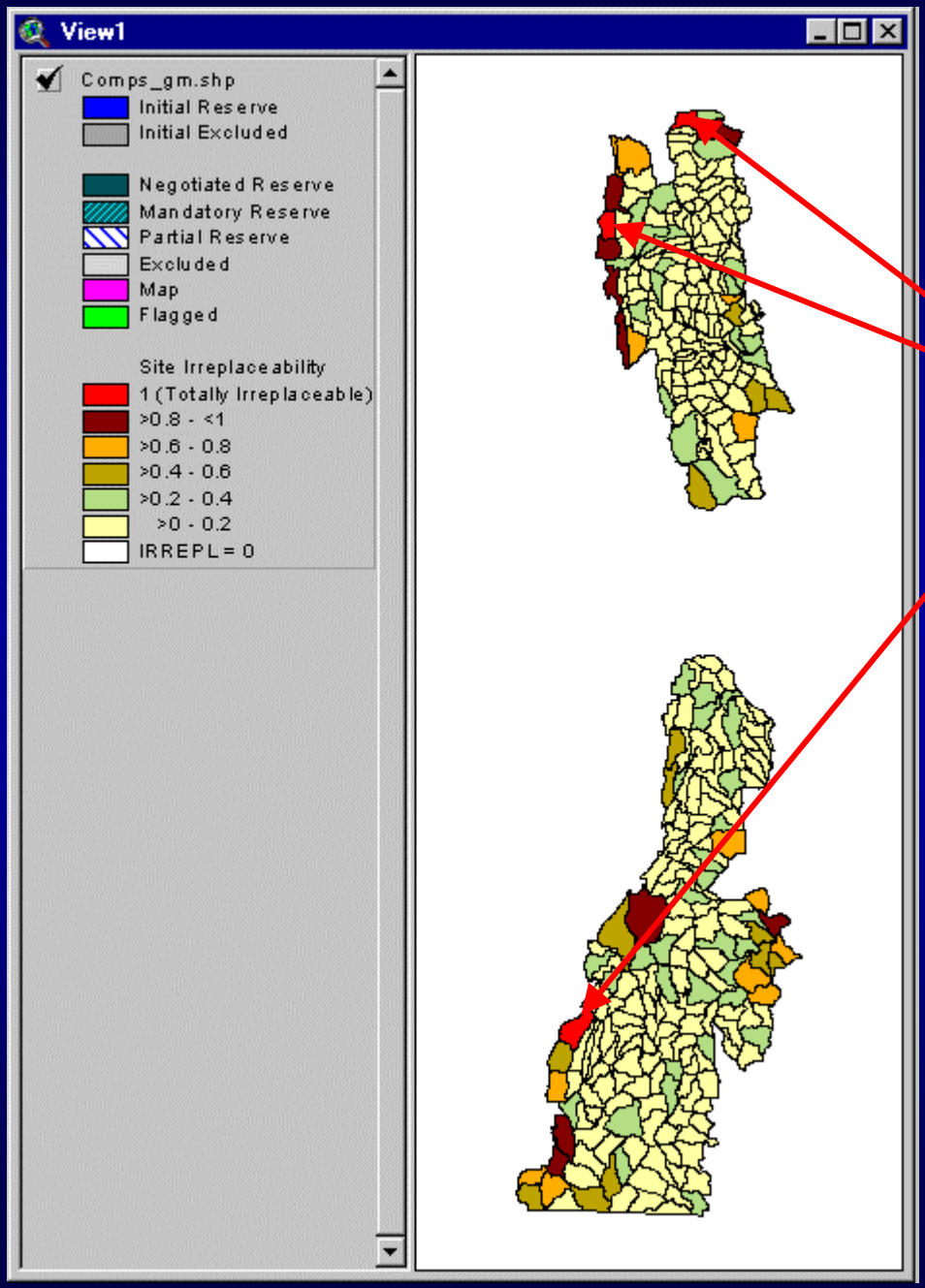
- Ecological baselines
- Habitat for species that rely on natural systems
- Ecosystems with complex structure and characteristic species
- Evolutionary and ecological processes are functional

C-Plan

- Computer program that applies biodiversity values to units of land
  - Sites –units of land
  - Features – elements of biodiversity
  - Targets – conservation goals for features
- Irreplaceability index – the degree to which a site is unique in terms of features measured

C-Plan

- Designed for conflict resolution
  - Sites with irreplaceable features are identified up front and reserved
  - Sites with features that are less irreplaceable can be traded among interests to achieve conservation goals
  - Can lead to a conservation design that most stakeholders agree to



C-Plan Run

Irreplaceable compartments – based on ELTs

Alternative Forest Management

- Applies to general forestry lands (e.g. stewardship lands, buffer, working forest)
- May apply to some reserves depending on desired conditions
- Objectives include conservation of biological diversity

Shifting Mosaic

- Cooperative project between Manomet Maine, Plum Creek Timber, and J.D. Irving Timber (www.manometmaine.com/shiftmosaic.html)
- Two primary goals:
  - Economic goal – landowner economic goals; wood flow sustainable
  - Ecological goal - self-sustaining populations of all plant and animal species indefinitely.
- Approach – shift animal and plant habitats through space and time by design

Variable Retention

- Four key ways to maintain biodiversity:
  - provide constant supply of structural features that are *known* to be important to biodiversity (e.g. large trees, snags, and woody debris)
  - provide refuge for sensitive species that will colonize the surrounding managed forest matrix as it develops suitable conditions
  - establish habitat patches as stepping stones for dispersing individuals, seeds, and spores
  - Increase the structural diversity of managed stands.

How the GMNF is Examining Biodiversity - summary

- Review all of the available approaches to conservation of biodiversity
- Rely on available scientific data
- Rely on expert knowledge
- Use GIS tools for analysis
- Clearly document methods
- Make planning tools available

Questions

1. What does conservation or protection mean to you? What sorts of management activities or uses are consistent or inconsistent with these terms?
2. What plant or animal species, or groups of species, would you like to see protected or enhanced?
3. What natural communities, ecological conditions, or landscape features would you like to see conserved, maintained or enhanced?