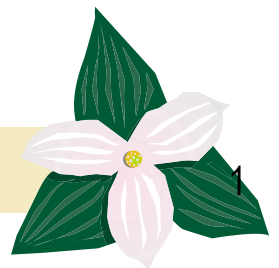


Biodiversity Indicators for Woodlot Owners

Caring for Your Land Series of Workshops

September 2005



Outline

◆ Introduction

Landowner's Role

- ◆ Monitoring with Indicators
- ◆ The Indicators
- ◆ How to Monitor
- ◆ How to Record
- ◆ Assessment and Strategies
- ◆ How to Report

Introduction to Biodiversity



- ◆ Are you protecting biodiversity in your woodland?
- ◆ How do you know?
- ◆ Wouldn't it be nice to have a tool which would show if you are doing the right things to protect biodiversity in your woodland?



Definition of biodiversity

The variety of life and all its processes

Why is biodiversity important?

- ◆ The basis for a functioning planet and the existence of living things
- ◆ Direct utilitarian and economic values to humans
- ◆ Recreational and educational values
- ◆ Intrinsic value
- ◆ Loss of biodiversity involves extinction and/or extirpation of organisms



Levels of biodiversity

- ◆ Genetic diversity
- ◆ Species richness
- ◆ Community / ecosystem diversity
- ◆ Landscape diversity



Sources of biodiversity

- ◆ Population size
- ◆ Metapopulations
- ◆ Species Interactions
- ◆ Succession
- ◆ Source and Sink Dynamics
- ◆ Community Structure
- ◆ Introduction of Non-Native Species



Biodiversity concepts



- ◆ Fragmentation
- ◆ Edges
- ◆ Size
- ◆ Habitat heterogeneity
- ◆ Context
- ◆ Connections

2002/12/15

Managing to conserve biodiversity

Landowner's Role

1. Management Planning
2. Management Activities and Implementation
3. Monitoring
4. Using indicators



1. Management Planning

- ◆ Description of the overall property and how it fits into the local landscape
- ◆ Statement of strategies and objectives
- ◆ Inventory of the woodland and its biodiversity
- ◆ Assessment of the status of the biodiversity with recommendations
- ◆ Plan of activities with a budget



2. Management Activities and Implementation

- ◆ Carry out the activities proposed in the plan using the appropriate guidelines



3. Monitoring

- ◆ Regular process of checking various parameters
- ◆ Join a monitoring program
- ◆ Report rare species, oddities, and environmental changes



4. Using indicators

- ◆ **Species Indicators:** focus on a few chosen species which can represent the remainder
- ◆ **Habitat Indicators:** measurements or estimates of the number or amount of features or habitat units present



Biodiversity indicators for woodland owners & the observer network

- ◆ A monitoring program for woodland owners with 2 main goals



Monitoring with Indicators

1. A tool to help woodland owners know if they are doing the right things to protect and enhance biodiversity.
2. A system for monitoring biodiversity in woodlands across a region.



Features

- ◆ Species which are reliable indicators of certain conditions
- ◆ Species which are widespread
- ◆ Species which are easy to detect and recognize
- ◆ Habitat indicators which are direct measurements or estimates
- ◆ Recording and reporting systems which are effective and easy to use
- ◆ A manual to instruct and guide participants



The Indicators

The Indicators

Chosen from research documents and
with advice from professionals

The Indicators

CRITERION	HABITAT INDICATORS	SPECIES INDICATORS	
		positive	negative
Old Growth	10 ha or 10% of stand	X	
Downed Woody Debris	5 large fallen logs / ha	X	
Forest Interior	at least 4 ha	X	
Woodlot Size / Connections	at least 40 contiguous ha	X	
Closed Canopy	minimum 70% closure	X	
Special Wildlife Habitats	1 supercanopy tree / 4 ha 10 conifers / ha 7 cavity trees / ha 5 snags / ha 8 mast trees / ha		
Good Undergrowth		X	
Rare / Uncommon Species		X	
Water Quality		X	
Invasive Species			X

The Indicators

BIODIVERSITY SPECIES INDICATORS

Criterion	Species Indicators
old growth	any large trees (>120 yrs old or > 50 cm dbh)
old growth	Redback Salamander
	Yellow-spotted Salamander
downed woody debris	any salamanders
forest interior	Barred Owl
	Veery
	Hermit Thrush
old growth, downed woody debris, & forest interior	Pileated Woodpecker
woodlot size / connections	Leopard Frog
	Fisher
closed canopy	Least Flycatcher
	Red-eyed Vireo
	Wood Thrush
	Yellow-bellied Sapsucker
	Scarlet Tanager
	Snowshoe Hare
	Northern Flying Squirrel
forest interior & closed canopy	Hairy Woodpecker
	White-breasted Nuthatch
	Brown Creeper
	Winter Wren
	Black-throated Green Warbler
	Ovenbird
forest interior, woodlot size, & closed canopy	Red-shouldered Hawk

The Indicators

BIODIVERSITY SPECIES INDICATORS

Criterion	Species Indicators
good undergrowth (spring ephemerals)	Foamflower
	Solomon's-seal
	Blue Cohosh
	White Trillium
	Bloodroot
	Dutchman's-breeches
	Wild Leek
	Wild Lily-of-the-valley
rare / uncommon species (various species)	Bitternut Hickory
	Butternut
	Walnut
	Oak
water quality in temporary pools	Chorus Frog
water quality in permanent pools	Bull Frog
invasive species (various species)	European Buckthorn
	Glossy Buckthorn
	Siberian Elm
	Manitoba Maple
	Norway Maple
	White Poplar
	Garlic Mustard

Criterion: Old Growth

Species Indicators:

any large trees (but especially White Pine) over 120 years,
or over 50 cm dbh



Criterion: Old Growth



Redback Salamander

Species Indicators:

Redback Salamander,
Yellow-spotted Salamander



Yellow-spotted
Salamander

The Indicators

Criterion: Downed Woody Debris

Eastern Newt



Species Indicators:

Any salamander

Blue-spotted
Salamander



The Indicators

Criterion: Forest interior



**Barred
Owl**



Species Indicators:

Barred Owl, Hermit Thrush, Veery



**Hermit
Thrush**



Veery



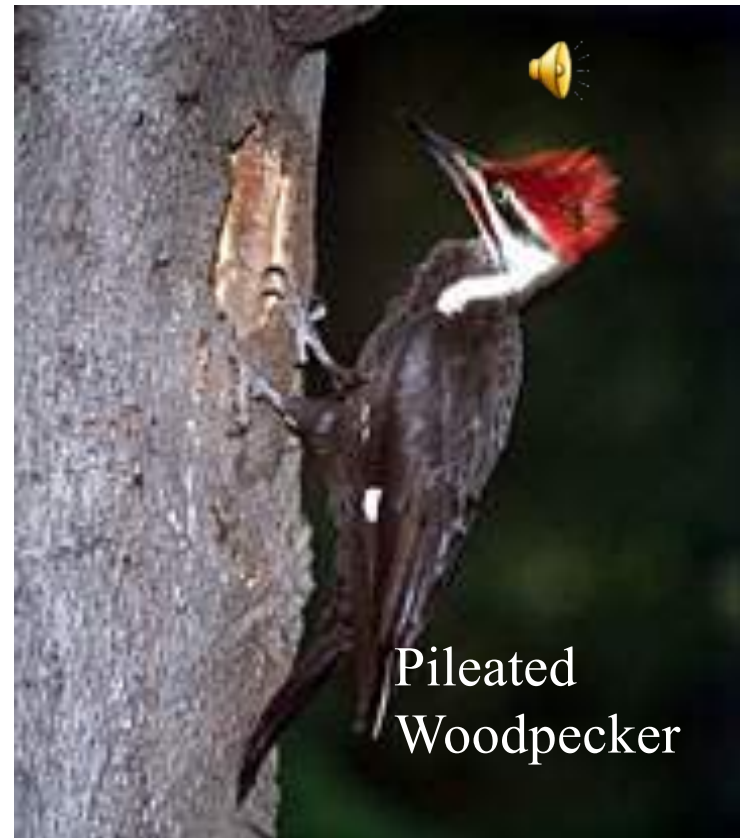
The Indicators

Criterion: Old Growth, Downed Woody Debris, & Forest Interior



Species Indicator:

Pileated Woodpecker



Pileated
Woodpecker

The Indicators

Criterion: Woodlot Size / Connections

Species Indicators: Leopard Frog, Fisher



Criterion: Closed Canopy

Species Indicators:

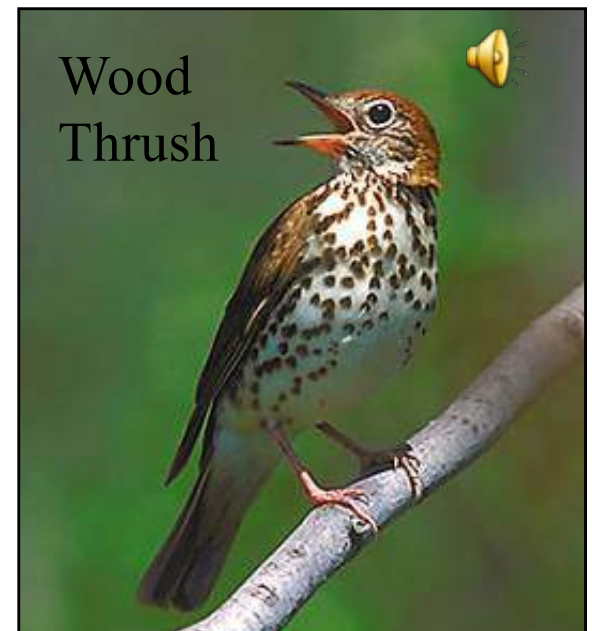
Least Flycatcher, Red-eyed Vireo,
Wood Thrush, Scarlet Tanager,
Yellow-bellied Sapsucker,
Snowshoe Hare,
Northern Flying Squirrel



Least
Flycatcher



Red-eyed
Vireo



Wood
Thrush

Criterion: Closed Canopy



Yellow-
bellied
Sapsucker



Scarlet Tanager

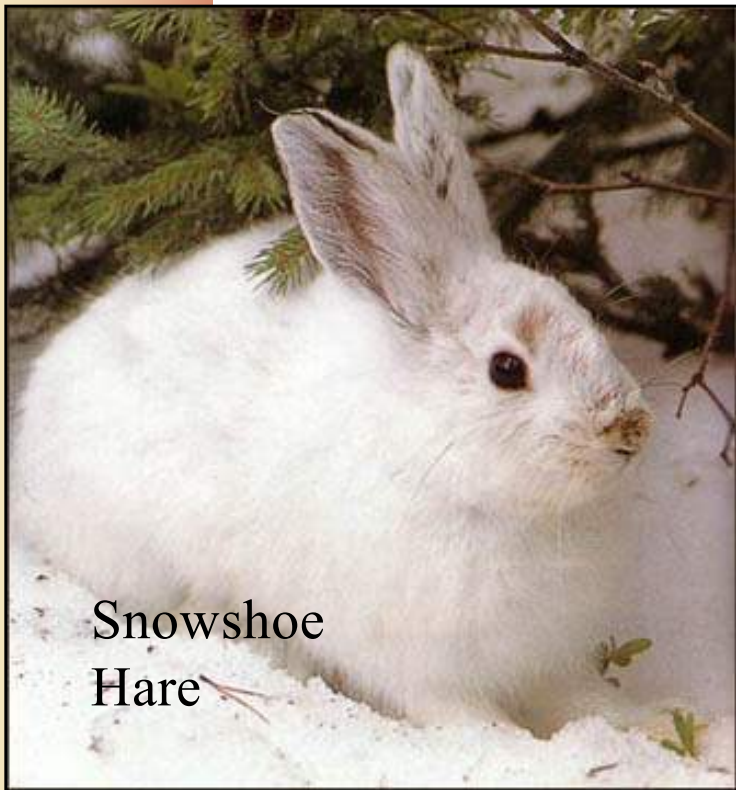
Species

Indicators:

Least Flycatcher,
Red-eyed Vireo,
Wood Thrush,
Scarlet Tanager,
Yellow-bellied
Sapsucker,
Snowshoe Hare,
Northern Flying
Squirrel

Criterion: Closed Canopy

Species Indicators: Least Flycatcher, Red-eyed Vireo, Wood Thrush, Scarlet Tanager, Yellow-bellied Sapsucker, Snowshoe Hare, Northern Flying Squirrel



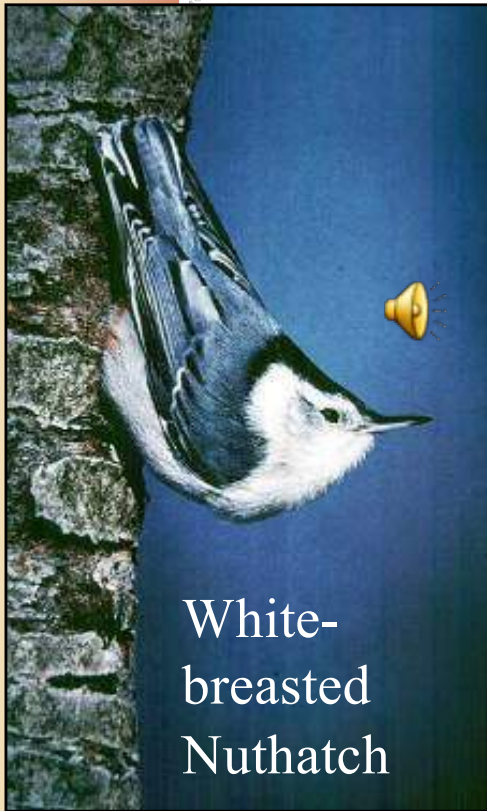
Snowshoe
Hare

Northern
Flying
Squirrel



The Indicators

Criterion: Forest Interior & Closed Canopy



White-
breasted
Nuthatch



Hairy
Woodpecker

Species

Indicators: Hairy Woodpecker, White-breasted Nuthatch, Brown Creeper, Winter Wren, Ovenbird, Black-throated Green Woodpecker

Criterion: Forest Interior & Closed Canopy

Species Indicators: Hairy Woodpecker, White-breasted Nuthatch, Brown Creeper, Winter Wren, Ovenbird, Black-throated Green Woodpecker

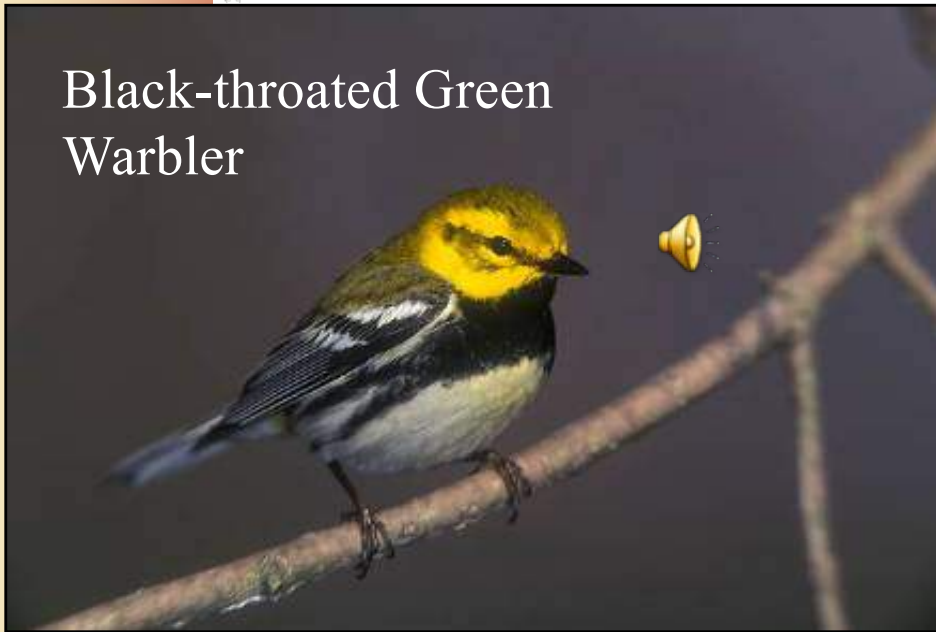


The Indicators

Criterion: Forest Interior & Closed Canopy

Species Indicators: Hairy Woodpecker, White-breasted Nuthatch, Brown Creeper, Winter Wren, Ovenbird, Black-throated Green Woodpecker

Black-throated Green
Warbler



Ovenbird



The Indicators

Criterion: Woodlot Size & Closed Canopy

Red-shouldered Hawk



Species Indicators:

Red-shouldered Hawk



Criterion: Good Underbrush

Species Indicators: Spring ephemerals, Foamflower, Solomon's Seal, Blue Cohosh, White Trillium, Bloodroot, Dutchmans Breeches, Wild Leek, Wild Lily-of-the-valley



Solomon's-seal



Foamflower

The Indicators

Criterion: Good Underbrush

Species Indicators: Spring ephemerals, Foamflower, Solomon's Seal, Blue Cohosh, White Trillium, Bloodroot, Dutchmans Breeches, Wild Leek, Wild Lily-of-the-valley



Blue Cohosh



White Trillium

The Indicators

Criterion: Good Underbrush

Species Indicators: Spring ephemerals, Foamflower, Solomon's Seal, Blue Cohosh, White Trillium, Bloodroot, Dutchmans Breeches, Wild Leek, Wild Lily-of-the-valley



Bloodroot



Dutchman's-breeches

Criterion: Good Underbrush

Species Indicators: Spring ephemerals, Foamflower, Solomon's Seal, Blue Cohosh, White Trillium, Bloodroot, Dutchmans Breeches, Wild Leek, Wild Lily-of-the-valley



Wild Leek



Wild Lily-of-the-valley

Criterion: Rare / Uncommon Species

Species Indicators:

Various species, significant regionally or provincially



The Indicators

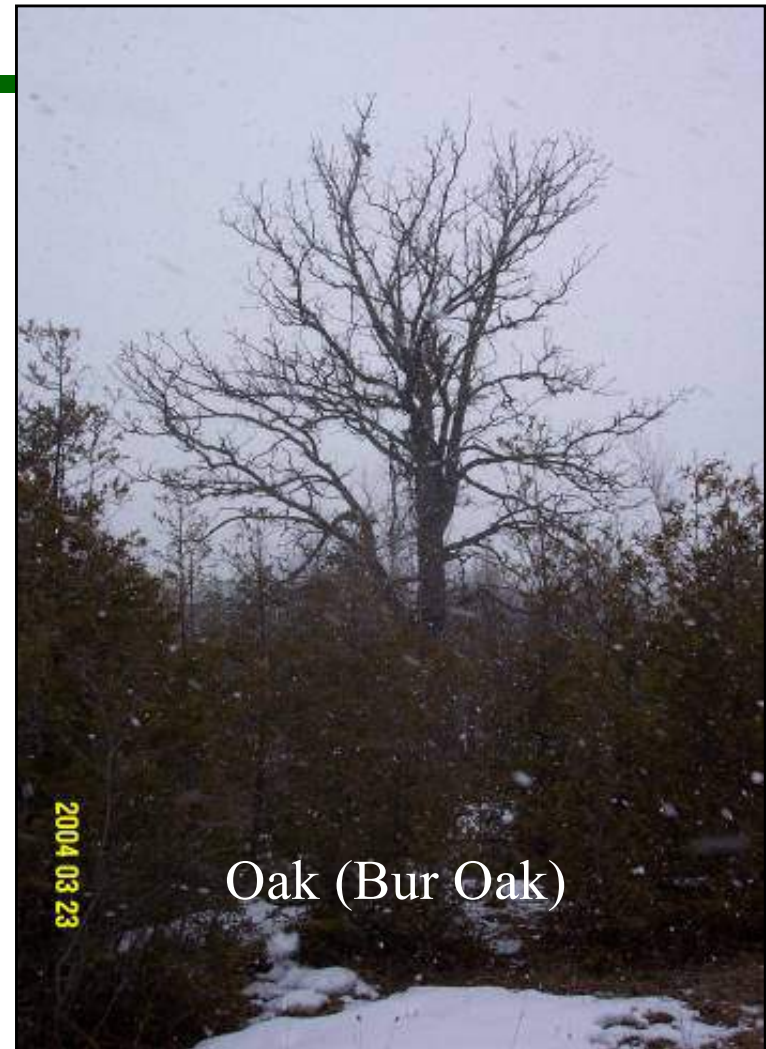
Criterion: Rare / Uncommon Species

Species Indicators:

Various species, significant regionally or provincially



Walnut



Oak (Bur Oak)

The Indicators

Criterion: Water Quality in Temporary Pools



Chorus Frog

Species Indicators:

Chorus Frog

The Indicators

Criterion: Water Quality in Permanent Pools



Bull Frog

Species Indicators:

Bull Frog

Criterion: Invasive Species

Species Indicators:

Various species



Glossy Buckthorn



Siberian Elm

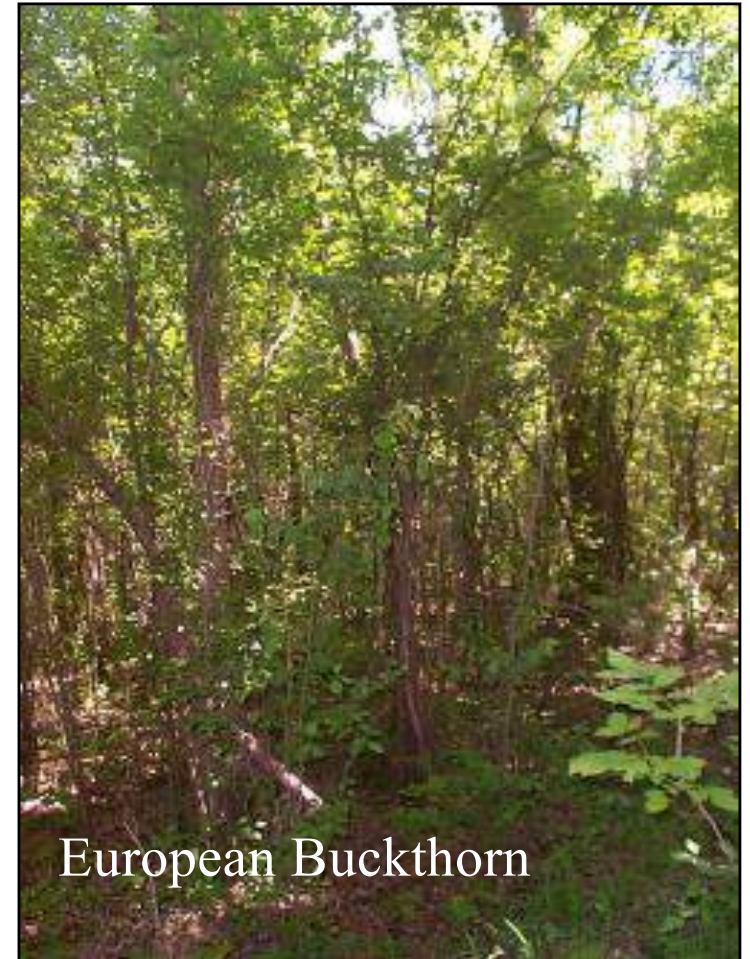
Criterion: Invasive Species

Species Indicators:

Various species



European
Buckthorn



European Buckthorn

Criterion: Invasive Species

Species Indicators: Various species



Manitoba Maple

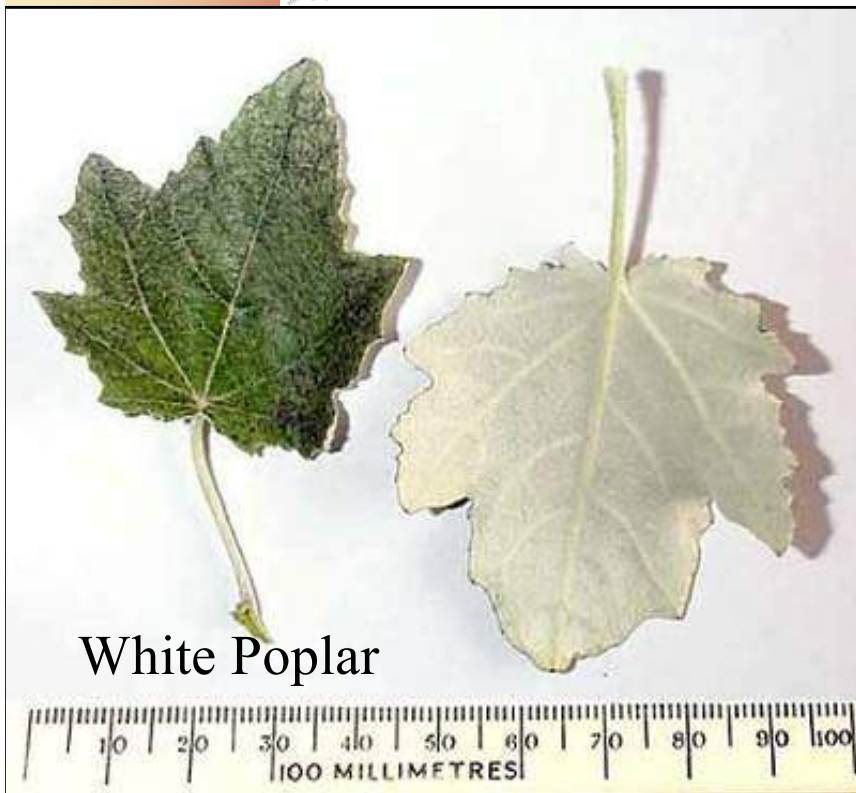


Norway
Maple

The Indicators

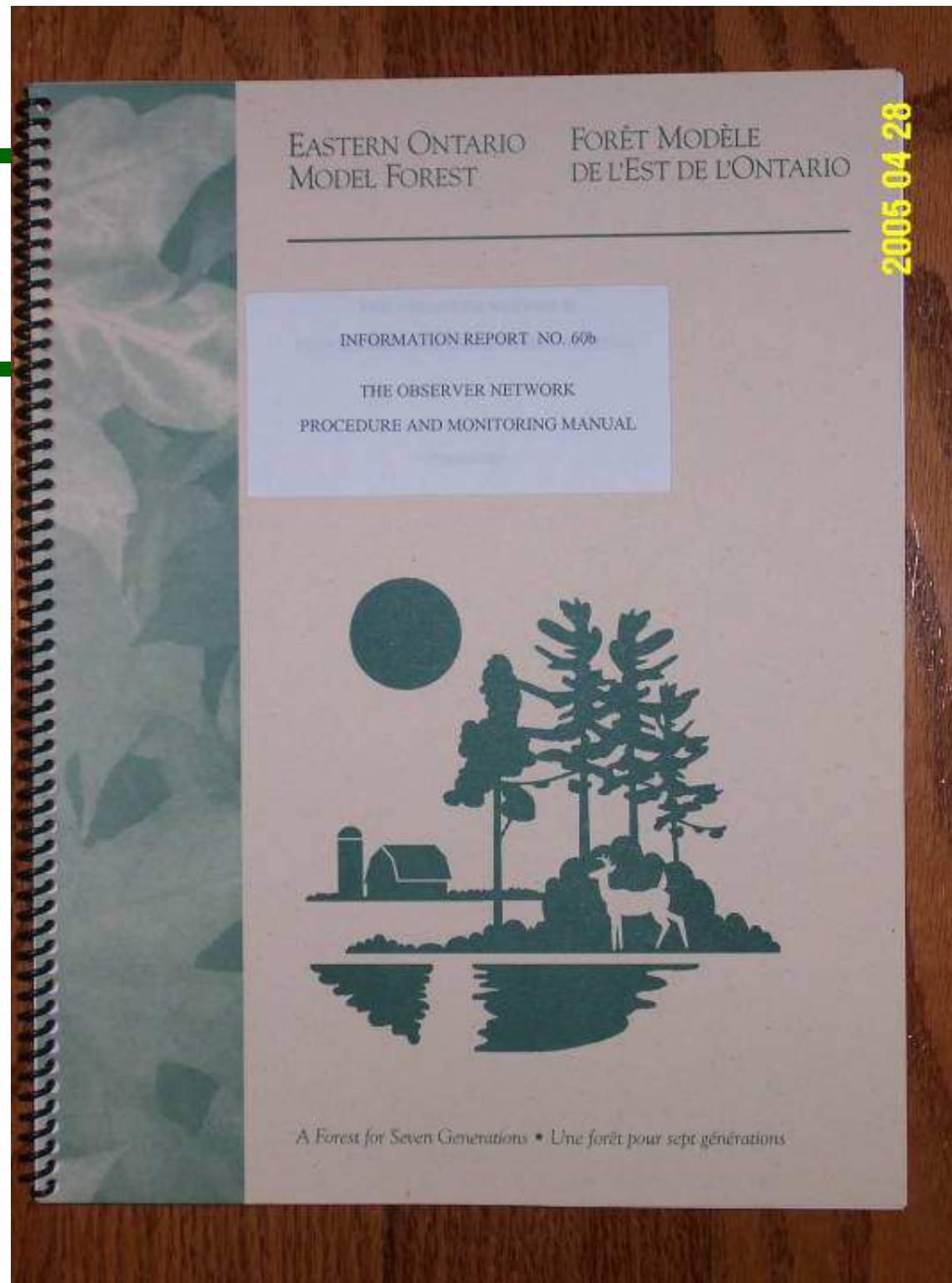
Criterion: Invasive Species

Species Indicators: Various species



How to monitor

The Monitoring Manual



How to monitor



- ◆ How to prepare a biodiversity monitoring plan
- ◆ How to measure tree DBH, height, age, basal area and woodlot area

How to monitor

How to monitor habitat indicators

2002/07/03

How to monitor



1. Old Growth

- ◆ Estimate area with large old trees.

2. Forest Interior Size

- ◆ Measure area from aerial photo.

3. Size or Connections

- ◆ Measure area of contiguous woodland.

How to monitor



4. Downed Woody Debris

- ◆ Estimate number of fallen logs per hectare.

5. Closed Canopy

- ◆ Estimate the percentage of sky covered by canopy.

6. Super canopy Trees, Conifers (in non-conifer compartments), Snags, Mast Trees, Cavity Trees

- ◆ Estimate number per hectare.

A photograph of a winter forest. The ground is covered in a layer of snow, with some dry grass and fallen branches visible. Several bare trees stand in the background, and a large pile of sticks and branches is in the foreground. The text "How to monitor" is overlaid in the top left corner.

How to monitor

How to monitor species
indicators

How to monitor

1. Amphibians

- ◆ Chorus Frog

- ◆ Leopard Frog

Establish monitoring station near potential wetland; listen for calls for 3 minutes on a spring evening.

- ◆ Bull Frog

Similar station & protocol near permanent water.

- ◆ Salamanders

At 3 stations place boards; check during the year.



How to monitor

2. Reptiles

◆ Snakes

Look for hibernacula;
check in spring & fall.

3. Mammals

◆ Flying Squirrels

Look for den trees & observe.

◆ Fisher

◆ Snowshoe Hare

Watch for tracks in winter.



How to monitor

4. Birds

◆ Songbirds

At 3 stations, listen for 5 minutes, between 05:00 and 10:00.

Do this once or twice between May 24 and July 10.

◆ Pileated Woodpecker

Watch for large rectangular holes in trees.

◆ Barred Owl

Listen late at night.

◆ Stick Nests

Note location & observe activity.



5. Plants

- ◆ Trees
- ◆ Wildflowers
- ◆ Lichens and Mosses
- ◆ Invasive Plants

Do inventories.



2004 03 21

Recording

- ◆ The Biodiversity Monitoring Record documents all of the indicator species which are present, or which could be present on the property.



How to record

BIODIVERSITY SPECIES INDICATORS

Criterion	Species Indicators	Species observed	Location	Date
old growth	any large trees			
old growth	Redback Salamander			
	Yellow-spotted Salamander			
downed woody debris	any salamanders			
forest interior	Barred Owl			
	Veery			
	Hermit Thrush			
old growth, downed woody debris, & forest interior	Pileated Woodpecker			
woodlot size / connections	Leopard Frog			
	Fisher			
closed canopy	Least Flycatcher			
	Red-eyed Vireo			
	Wood Thrush			
	Yellow-bellied Sapsucker			
	Scarlet Tanager			
	Snowshoe Hare			
	Northern Flying Squirrel			
forest interior & closed canopy	Hairy Woodpecker			
	White-breasted Nuthatch			
	Brown Creeper			
	Winter Wren			
	Black-throated Green Warbler			
	Ovenbird			
forest interior, woodlot size, & closed canopy	Red-shouldered Hawk			

How to record

BIODIVERSITY SPECIES INDICATORS

Criterion	Species Indicators	Species observed	Location	Date
good undergrowth (spring ephemerals)	Foamflower			
	Solomon's-seal			
	Blue Cohosh			
	White Trillium			
	Bloodroot			
	Dutchman's-breeches			
	Wild Leek			
	Wild Lily-of-the-valley			
rare / uncommon species (various species)	Bitternut Hickory			
	Butternut			
	Walnut			
	Oak			
water quality in temporary pools	Chorus Frog			
water quality in permanent pools	Bull Frog			
invasive species (various species)	European Buckthorn			
	Glossy Buckthorn			
	Siberian Elm			
	Manitoba Maple			
	Norway Maple			
	White Poplar			
	Garlic Mustard			

Habitat assessment & preparation of biodiversity management strategies



- ◆ Assess current conditions based on indicator status.
- ◆ Prepare management strategies for inclusion in management plan.

Assessment & Strategies

BIODIVERSITY MONITORING RECORD (example)

Criterion	Indicator	Species observed	Location	Date
old growth	large trees (>120 yrs old or > 50 cm dbh)	Maple	W1	2000
adequate downed woody debris	any salamanders	1 Eastern Newt 1 Blue-spotted	W1 W3	2000 2001
old growth, downed woody debris, forest interior	Pileated Woodpecker	1 pair	W1	2002
forest interior	Barred Owl Veery Hermit Thrush	1 several 1	nearby W1, W2 W3	2000 2000 2003
size or connections	Leopard Frog Fisher	many tracks	all W1, W3	2000 2002

Assessment & Strategies

BIODIVERSITY MONITORING RECORD (example)

Criterion	Indicator	Number	Location	Date
forest interior & closed canopy	Hairy Woodpecker	1 pair	W3	2000
	White-breasted Nuthatch	1 pair	various	2000
	Brown Creeper	1	W3	1999
	Winter Wren			
	Black-throated Green Warbler	1	W3	2000
	Ovenbird	several	W1, P1	2000
forest interior, size, & closed canopy	Red-shouldered Hawk			
closed canopy	Yellow-bellied Sapsucker	1	W1	2000
	Least Flycatcher	1	W3	1998
	Wood Thrush	few	W1, P1	2000
	Red-eyed Vireo	few	W1, P1	2000
	Snowshoe Hare	many	all	2000
	Northern Flying Squirrel	present	W1	1980

Assessment & Strategies

Criterion	Indicator	Number	Location	Date
canopy species / closed canopy	Scarlet Tanager	1	C1	1998
protection from disturbance	stick nest snake hibernaculum Red-shouldered Hawk	present	W1	2000
good undergrowth spring ephemerals	Foamflower Solomon's-seal Blue Cohosh White Trillium Bloodroot Dutchman's-breeches Wild Leek Wild Lily-of-the-valley	few few few few	P1 W1, P1 W3 W1	2000 2000 2000 2000

Assessment & Strategies

HABITAT ASSESSMENT (example)

habitat indicator	2001	year of change
woodlot size (contiguous forest) (minimum 40 ha)	okay (34 ha owned, more adjacent)	
forest interior size (minimum 4 ha)	okay (4 ha)	
old growth = age 120, or trees > 50 cm dbh (minimum 10 ha or 30% of stand)	inadequate present only in W1	
down woody debris (5 large logs/ha)	inadequate	
canopy closure (minimum 70%)	adequate where canopy present	
supercanopy trees (1 per 4 ha)	okay	
conifers (10/ha)	okay	
cavity trees (7/ha)	inadequate	
snags (5/ha)	okay	
mast trees (8/ha)	inadequate	

Biodiversity Management Strategies

(examples)

1. Allow natural growth and regeneration to create more closed canopy, more interior forest, more trees suitable for cavities, more mast trees, more down woody debris, and, over the longterm, more old growth. This will create more habitat for bird indicators.
2. When cutting, do not open the canopy below 70% and do not remove down woody debris for firewood. This should create more habitat for salamanders. Continue to protect uncommon trees.
3. Continue plantation management to promote hardwood growth. This should allow more mast trees to grow and provide more habitat for spring ephemerals.

Assessment & Strategies

- ◆ The landowner carries out the activities of the plan and completes the monitoring record every year.



Assessment & Strategies

- ◆ As biodiversity goals are met, the number of positive indicator species present should increase, and the number of negative indicators decrease.



Reporting

- ◆ Landowners submit data to a central location, such as Community Nature Watch
- ◆ Information used to monitor biodiversity in woodlands across a region
- ◆ Data compiled in State of the Forest reports
- ◆ Corrective or instructional programs developed, if necessary



Summary

- ◆ Introduction to Biodiversity
- ◆ Landowner's Role
- ◆ Monitoring with Indicators
- ◆ The Indicators
- ◆ How to Monitor
- ◆ How to Record
- ◆ Assessment and Strategies
- ◆ How to Report

Credits

- ◆ EASTERN ONTARIO MODEL FOREST,
 - ◆ Kemptville (Cathy Nielsen)
- ◆ CANADIAN BIODIVERSITY INSTITUTE,
 - ◆ Ottawa (Heather Hamilton)
- ◆ LEEDS COUNTY STEWARDSHIP COUNCIL
 - ◆ Brockville (Gary Nielsen)
- ◆ GRENVILLE LAND STEWARDSHIP COUNCIL
 - ◆ Brockville (Jack Henry)
- ◆ AUTHOR: Stewart Hamill, wildlife biologist
 Merrickville, ON

Accompanying documents

- ◆ **Biodiversity Indicators for Woodland Owners**
EOMF Information Report # 60a
by Stew Hamill
- ◆ **The Observer Network**
Procedures and Monitoring Manual
EOMF Information Report # 60b
by Stew Hamill