



# **Incorporation of Research Results into Forest Management**

***“Research to Empower the Manager”***

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**J.D. Irving, Limited**

**January, 2010**





# Outline

- Introduction
  - A brief history of JDI FRAC
  - What were the objectives in 1998?
  - What platforms was the R&D under
- How JDI puts knowledge to use
- J.D. Irving, Limited Use of SFMN Research Results in Management
- What's in the future?





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# Why the need for Research

- We need to grow more wood
- We change forests both at the stand and landscape scales
- There are significant knowledge gaps on potential impacts of forest management on different taxa and key ecosystem processes
- We are interested at doing the right thing
- We want our decisions to be based on science





# Brief History of the JDI Forest Research Advisory Committee

- Founded in 1998 as a product of FSC Certification audits
- Made up of renowned experts in ecological fields
- Originally lead by Gordon Baskerville
- First two years were to establish the foundation
- First projects in 2000-01
- Set aside some benchmark reserves for research





# Research to empower the forest manager

- Formed in 1998, JDI FRAC mandate was to identify or advocate research to help company managers solve problems in their forests
- Focused on research to address knowledge gaps w.r.t. non-timber biodiversity values & natural disturbance:
  - 1) establish objective measures for each target non-timber value
  - 2) determine functional cause-effect basis for mgmt. of availability of conditions needed for each non-timber value
- FRAC develops and recommends research projects:
  1. assess state of a forest quantitatively with respect to non-timber values, especially biodiversity
  2. role of natural disturbances as the historical cause of temporal/spatial patterns of stand types & stages of development
  3. Issue with intensive forest management
- must empower, not supplant, managers as decision makers
- active partnership of researchers & forest managers
- regular 2-way communication & 2-way education





# The membership...

- **Dr. Dave MacLean, forest ecology (Chairman)**
- **Dr. Marc André Villard, bird ecology**
- **Dan Beaudette, habitat & biology**
- **Dr. Robert Wagner, forest productivity**
- **Dr. Jeremy Wilson, landscape ecology**
- **Dr. John Hagan, wildlife & landscape ecology**
- **Dr. Andy Whitman, wildlife & landscape ecology**
- **Company staff**
- **Other Researchers specific to individual projects**





# What Platforms was R&D done under?

- JDI Cash & In-Kind
- Sustainable Forest Management Network (SFMN)
- NSERC IPS scholarships
- Other Partnerships (i.e. FMF)





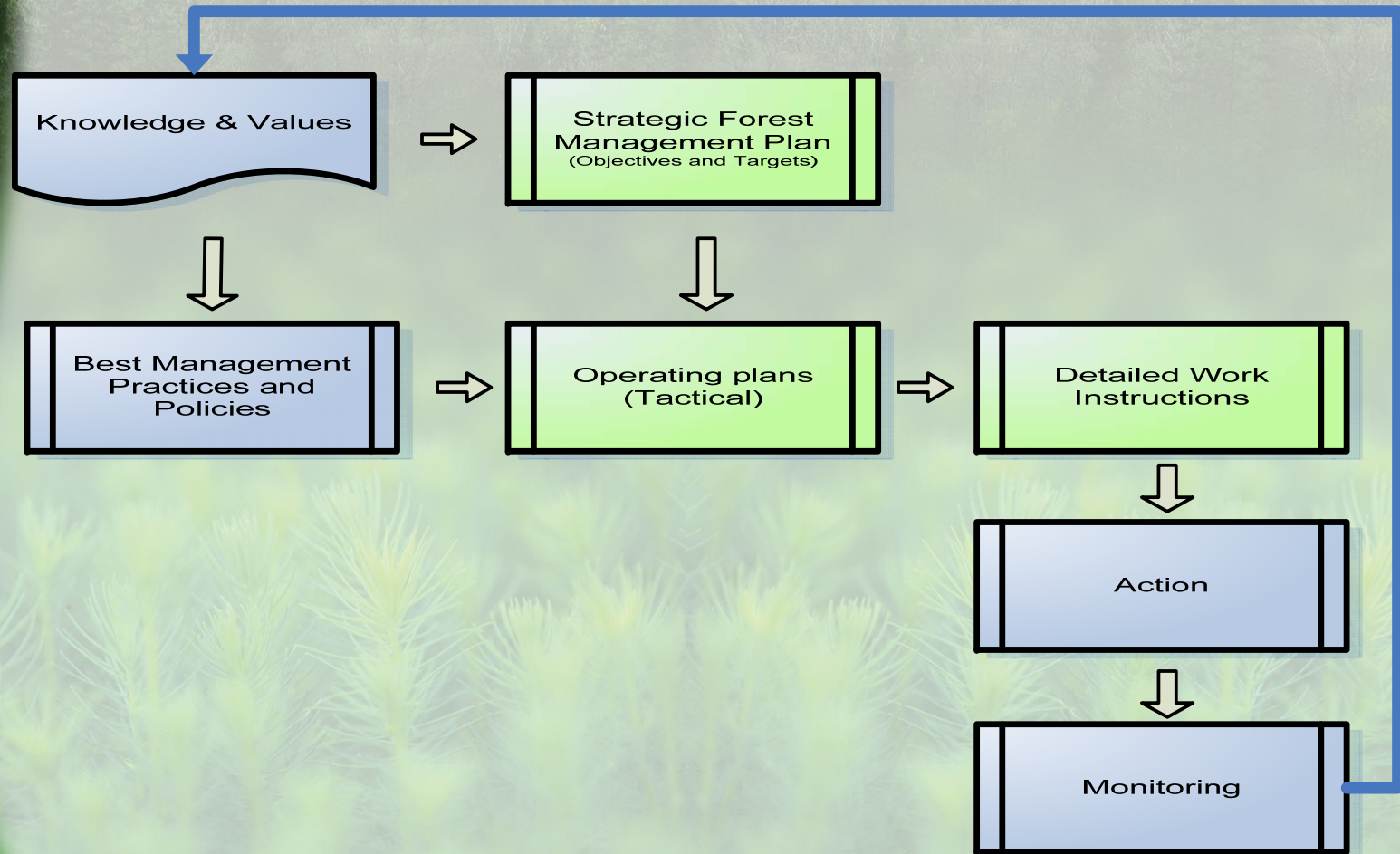
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# Our Forest Management Process







# How we use new Knowledge

**Knowledge gained from cooperative research is used to :**

- **trigger analyses to quantify our baseline situation and/or prepare forecasts of future forest conditions to compare to proposed targets.**
- **initiate a review of how we inventory certain habitat features and stratify our forest inventory.**
- **formulate new management strategies, objectives, targets and measures.**
- **formulate Best Management Practices for implementation in the field**
- **come up with new research questions.**
- **include an issue as a new significant environmental impact in our EMS**



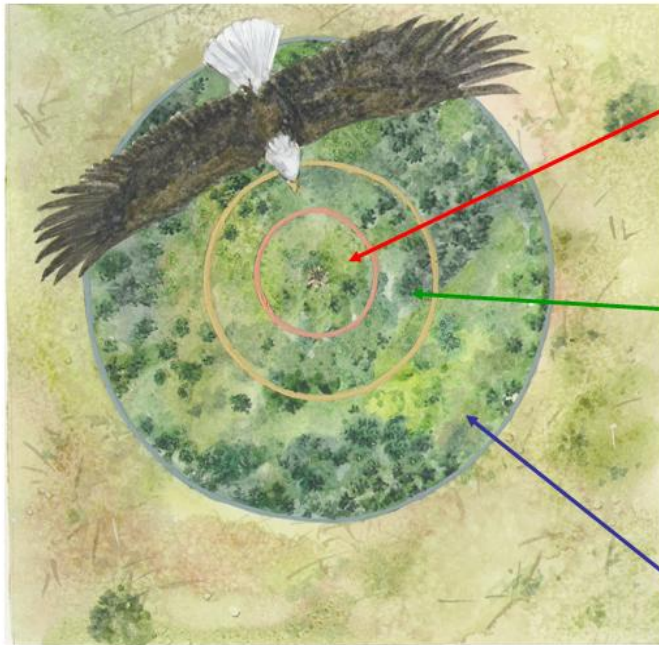


# Designing company programs

## UNIQUE AREAS PROJECT



## Rare Plant Habitat Pre- Screening Program



**"A" – "No  
Harvest Zone"**

**"B" – "Nesting  
Season No Activity  
Zone" – March 1st  
to August 15<sup>th</sup>.**

**"C" – "No Road  
Zone"**



Forest Species of Concern







### Cedar Swamps & Seeps (Calcareous)

**IMPORTANCE:** Cedar Swamps are cool, low-lying forests that are usually adjacent to a stream or a meandering set of streams. The presence of cedar generally indicates high soil richness. The shaded, moist and rich site conditions make these sites good habitat for many orchids and other R/E plants.

Cedar seeps are pockets of cedar within the coniferous forest that are saturated by a cold ground-water source. The shrub layer is generally sparse, with the ground layer consisting mainly of sphagnum moss. The moist environment, calcium-laden groundwater and low light conditions make cedar seeps favorable to many R/E plants.

**Associated Natural Communities:** Northern White Cedar Swamp, Cedar-Spruce Seepage-Forest.

#### Enduring Features

Flat, poorly-drained, rich bedrock.  
Seeps: Gently sloped, open water source, poorly drains, rich bedrock.

#### Dominant Canopy

Eastern white cedar 80-90%, balsam poplar (20%)  
Mature / over-mature age class

#### Other Associates

Tamarack, black spruce, balsam fir, black ash

#### Canopy Closure

50-90%

#### Prominent Shrub Species

Wild raisin, speckled alder, dogwoods

#### Prominent herbaceous species (bloom dates in brackets)

Kidney-leaved violet (*V. renifolia*) May to July, yellow lady slipper (*C. parviflorum*) early to mid June, sweet scented bedstraw July - August, naked miterwort June - July, twayblade June - August, dwarf rattlesnake plantain July - August, cinnamon fern, sweet coltsfoot (*Petasites frigidus* var. *patens*)



1 Broad lipped twayblade



2 Naked Miterwort



Sweet Coltsfoot



Dwarf Rattlesnake Plantain

## Example:

### Special Habitat Types :

- Calcareous TH
- Floodplain Hardwoods
- Calcareous eC Swamps & seeps
- Older Growth wP Stands
- Forested base of cliffs and talus slopes
- Non-calcareous TH
- bS Swamps

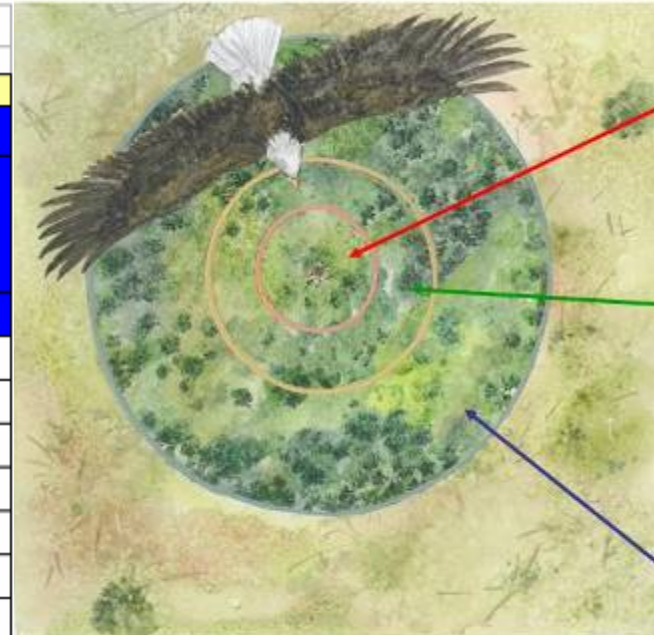




# Example: Stick Nest BMP's

## RAPTOR & HERON NEST BUFFERING STANDARDS

Species	Nest Type	Buffer Type					
		"A"		"B"		"C"	
		No Harvest Zone (m)		Nesting Season No-Activity Zone from March 1st to August 15th		No-Roads Zone (m)	
		50	100	≥ 100	≥ 200	≥ 100	≥ 400
Bald Eagle	Stick		✓		✓		✓
Peregrine Falcon	Cliff		✓		✓		✓
Cooper's Hawk	Stick		✓		✓	✓	
Red Shouldered Hawk	Stick		✓		✓	✓	
Long-eared Owl	Stick		✓		✓	✓	
Boreal Owl	Cavity		✓		✓	✓	
Hawk Owl	Stick		✓		✓	✓	
Heron (All Species)	Stick		✓		✓		✓
Sharp-shinned Hawk	Stick	✓		✓		✓	
Northern Goshawk	Stick	✓		✓		✓	
Red-Tailed Hawk	Stick	✓		✓		✓	
Broad-winged Hawk	Stick	✓		✓		✓	
Barred Owl	Cavity	✓		✓		✓	
Northern Saw-whet Owl	Cavity	✓		✓		✓	
Osprey	Stick	✓		✓		✓	
American Kestrel	Cavity	✓		✓		✓	
Merlin	Stick	✓		✓		✓	
Great Horned Owl	Stick	✓		✓		✓	



"A" – "No Harvest Zone"

"B" – "Nesting Season No Activity Zone" – March 1st to August 15th.

"C" – "No Road Zone"







# Example: Training Guides

Range Maps

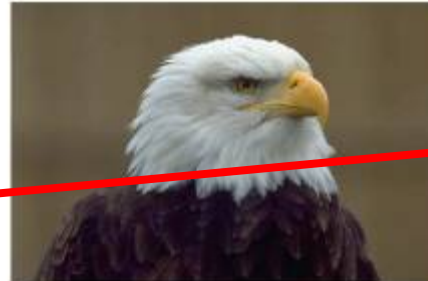
Known  
Locations  
(Unique Areas)

Description

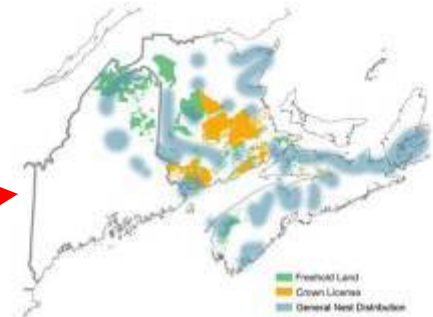
Habitat

Recommended  
Practices

## Bald Eagle (*Haliaeetus leucocephalus*)



### Distribution:



### Known Locations (Unique Areas Sites):

CMS – 50004, 60005, 60006, 60008, 60014, 60055, 60056, 60057, 60058  
DD – 40007, 40067, 40069  
Sx – 70097  
NS – 80001, 80004, 90046, 90026  
Me – 20023, 20024, 20025, 20026, 20009, 20080, 20075, 20077, 20085, 20086, 20087, 20088, 20089, 20090

**NB Status:** **Endangered** (regionally)

**NB S Rank:** S2N

**NS Status:** None

**NS S Rank:** S3N

**Me Status:** **Threatened**

**Me S Rank:** S4N

**Fed Gov't Status:** **Threatened**, US Endangered Species Act

**G Rank:** G4

### Recommended Practices:

The first 2 or 3 months of nesting are most sensitive to disturbance. Chronic disturbance may cause them to abandon eggs

Aggressive displays or regular sightings of this bird in an area may indicate a nearby nest location. This should be confirmed prior to operations in the block. If a nest is located within 400m of operations, the following recommendations should be applied.

Provide a protective (uncut) wildlife management zone of 100m (330ft) around nest. All harvest methods are acceptable outside this 100m zone **during the non-nesting period (Aug 16<sup>th</sup> – Feb 27)**.

Consider retaining an alternative nest tree on site. Avoid new road construction within 400m (1312ft) of nest site, if not already established.

See Operating Near Raptor Nests diagram, page 9.

### Description:

A very large raptor with a body length of 71-96cm (28-38in) and a wingspan of 204cm (80in). The adult has an evenly dark brown body with white head and tail. Yellow eyes, legs, and bill. Immature is variably dark with white scattered throughout body, grey bill, dark brown eyes. Takes 4-5 years to reach adult plumage. An immature Bald Eagle is sometimes confused with a mature Golden Eagle. Although females are slightly larger than males, there are no differences in feather colour and pattern. Diet: prefers fish but also eats large birds, small mammals and carrion. **Nesting season: March 1<sup>st</sup> – August 15<sup>th</sup>** Although northeastern population is predominantly migratory, some individuals will over winter in our area, especially along coast, or near stable food source (ie near livestock farms, meat processing areas etc.)

### Habitat:

Large nests ( 2.4-3m [8-10ft] wide and 0.9-1.2m[3-4ft] deep), are constructed of sticks and are re-used for many years. Most often chooses the largest and tallest tree (usually pines) in a stand alongside lakes, rivershores or seacoasts. Will defend an area 1-2km<sup>2</sup> (0.4-0.8mi<sup>2</sup>) from other eagles.





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# Adaptive Management because of FRAC

- Direct changes in on-the-ground practices and setting of management plan objectives
- Clearer understanding at the forest and stand scales of forest dynamics over time from a broader range of values than primary forest products
- A long-term legacy of study sites including the working forest, reserve areas and natural-disturbance inspired adaptive management reserve areas





# A fresh look at habitat structures

- The numbers of large live trees (>30cm) has increased from 10 to 60 for tolerant and old hardwood stand types as well as old mixedwood
- FRAC research has also been used in revising the New Brunswick Crown land standards.
- Assessment of dead stems and coarse woody debris has been included in Forest Development Surveys in the district to quantify these characteristics.







# New Habitat Definitions

Habitat	Crown Closure	Basal Area (m <sup>2</sup> /ha)				Live Stems	Dead Stems (Stems/Ha)			Cavities	CWD (m <sup>3</sup> /ha)
		All Species	TH	HW	SW	>= 30cm	>= 10cm	>= 30cm	>= 45cm		>= 8cm
Old Tolerant Hardwood	40%	18	14			60	20		0.5		
Old Hardwood Habitat	40%	18		14		60	20	15	0.5		
Old Mixedwood Habitat	40%	18		6	6	60					20
Old Spruce-Fir Habitat	40%	18			14	10	20	10			30
Old Forest Habitat	40%	18				20		3			30





# New instructions to operators

Based on studies woodpeckers:

- In TH partial cuts, leave 5-8 large beech trees per hectare
- In plantation thinnings, leave poplars as future snags





# New strategic analytical tools

- Combinations of harvesting and protection impacts in the event of an insect outbreak
- Assessment of management strategies from both the forest carbon and forest products standpoints allow carbon to be an integrated forest value.





# New understandings

- regeneration response of tolerant hardwoods to various stand management options
- response of bryophytes, vascular plants and small mammals to pre-commercial thinning of natural regeneration
- the complexity of forest management as well as emphasizes the long-term commitment to forest stewardship.





# Graduate Students

- regular presentation and review of individual projects by FRAC members and JDI managers
- communicating results to JDI employees across the company as well as to the general public.

1. Jeff Higdon. 2004
- 2\*. David Etheridge. 2005
3. Brendan Hemens. incomplete.
- 4\*. Mike Montigny. 2005
5. Adam Dick. 2010.
6. Jean-Sébastien Guénette. 2003
7. Jérôme Lemaître. 2004
8. Anne-Sophie Bertrand. 2006
- 9\*. Eric Neilson. 2007
- 10\*. Chris Hennigar. 2009
- 11\*. Jonathan Leggo 2010.
12. Greg Slaney. 2008
13. Chang, Wei-Yew. 2010.
- 14\*. Luke Amos-Binks. 2010
- 15\*. Amanda Colford. 2010
16. Bruno Chicoine. 2009
17. Amy Witkowski. 2010
18. Keri La France. 2010
19. Julie Henderson. 2010
- 20\*. Pascale Forget. 2008
21. Matt Smith. 2010.
22. Aurore Pérot. 2008
- 23\*. Samuel Haché. 2009
- 24\*. Jean-Francois Poulin. 2008
25. Chris Ward. 2009
26. Jean-Francois Carle. 2010



# Our Forests' Role in Reducing Greenhouse Gases

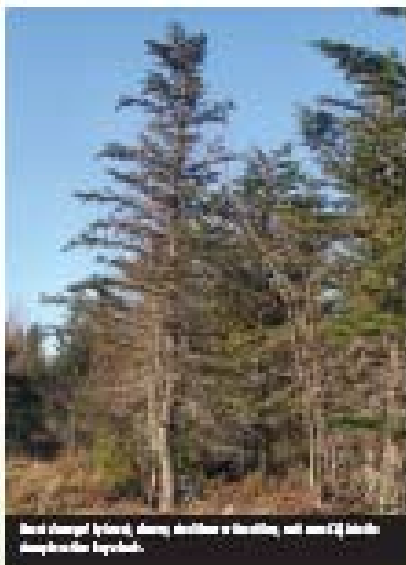
Carbon is cycling around the world above trees using carbon dioxide (CO<sub>2</sub>) concentrations in our atmosphere (approximately 320 times 1962). An important component of this balance is the harvesting of our forests. Plants use CO<sub>2</sub> and produce the oxygen we breathe. When plants die and decompose, they release CO<sub>2</sub> back to the atmosphere. The United States' harvest of its forests at the time of the study (1982) has been making self-sustaining at the U.S. being limited under the direction of its. Devoliation is understood the role our CO<sub>2</sub>CO<sub>2</sub> history that forest decline (Figure 1) is verified that forest plants are absorbing CO<sub>2</sub>. The ability of plants and forests to absorb CO<sub>2</sub> is observed as several levels.

## At the plant level....

Trees and plants use CO<sub>2</sub> along with light energy from the sun and water and nutrients from the soil to produce sugars. Oxygen is released into the atmosphere in this process. The carbon returned from CO<sub>2</sub> ends up in cellulose and lignin, which are the largest components of wood. As a result of carbon being stored and stored in wood, forests play an important role offsetting the amounts of CO<sub>2</sub> in the atmosphere.

## At the forest stand level....

As trees in the forest grow, dead trees, leaves, and branches fall to the ground. Over time, this dead material enters the soil and decomposes, releasing carbon back into the atmosphere. In general, as trees in standing forest have young to mature, the dead is a net absorber of CO<sub>2</sub>, and growth dies and trees begin to die. This is



Forest stand showing a mix of mature and young trees. Mature trees are shown in the foreground, and young trees are shown in the background.

part of a complex process with many components called the carbon cycle. The amount of CO<sub>2</sub> absorbed by a forest stand depends on the development stage of the forest in it. If a forest has had a major disturbance, such as insect or disease mortality, forest fire, or wind throw, it will release more CO<sub>2</sub> by decomposition than is removed by the remaining trees. These stands will be a source of CO<sub>2</sub>. As stands regenerate, growth processes and they begin to absorb more CO<sub>2</sub> than they release. At this stage, these stands are called carbon sinks and the means that they are reducing atmospheric CO<sub>2</sub>.

## At the landscape level....

Taking current forest conditions and expected forest development into account, forest management plans are prepared at the landscape scale to address sustainability for a wide range of values.

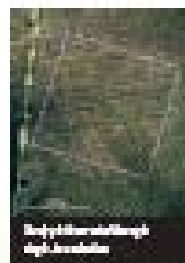


Wood products are made from harvested trees and are a valuable resource.



# Understanding Ecological Effects of Harvesting Using Birds as Indicators

Partial harvest treatments in hardwood stands open the possibility of combining wood production and the conservation of sensitive forest species. The key is in the intensity of the harvest and in the interval between harvest cycles. Sensitive species, like the black-throated blue warbler, favor the dense regeneration following canopy opening by partial harvesting, whereas others like the ovenbird require a more shaded, forest recovering with a thick layer of dead leaves. Still others, like the brown creeper, are linked to densities of large trees where they search the bark for spiders, moths, and other insect larvae.



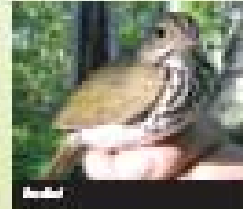
Forest stand showing a dense canopy, which is typical of a partial harvest treatment.

As birds track, it also asks: Will we be able to meet the response of two of these species (black-throated blue warbler) to disturbance relative they can adapt to current harvest practices, or whether these species practices could be modified to meet their requirements as well as those of plant and animal with similar ecological needs. The main goal of the study was to test the hypothesis that as trees are removed, birds will increase their territories which, in turn, will reduce their overall density. The study compared treated and untreated hardwood stands.

## Research

### Ovenbird

During the first three years of the study, 260 bird territories were monitored. Each year, about two thirds of the males that were marked with white bands came back (80% in 2004; 81% in 2005). Typically, ovenbirds will select the same territory as the year before (important for a bird that feeds the winter 2004 for south of Florida). It was observed that in the case of treated stands, ovenbirds would defend larger territories than in the case of unharvested control sites. Some other



Ovenbird

harvesting, food was less abundant than in forest treatment and birds increased their territories accordingly.

The study later that explains reproductive success was egg production by ovens, such as the number and size of eggs. It was also found to be greater in the first year following harvest. The next year will help determine how regeneration and growth in the treated stand will influence ovenbird population densities.



Person holding a bird, likely an ovenbird.

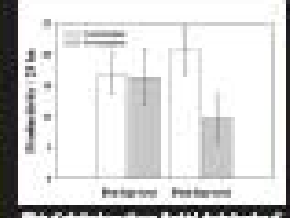
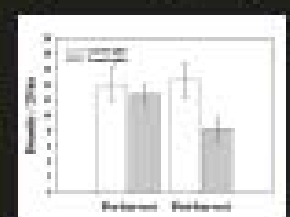
### Brown Creeper

The brown creeper is an increasingly declining bird, but its nesting ground nesting habitats are unique. It feeds on the trunk and branches of trees in forest interiors. This bird builds its nest under the partial bark of dead and dying trees. The creeper is known to prefer stands with a high proportion of large trees. The study focused on determining the density of birds in treated and



Brown Creeper

untreated stands while understanding the impact that large trees have. It better understood its requirements, we also compared the density of large trees between sites with more and other where creeper was absent.

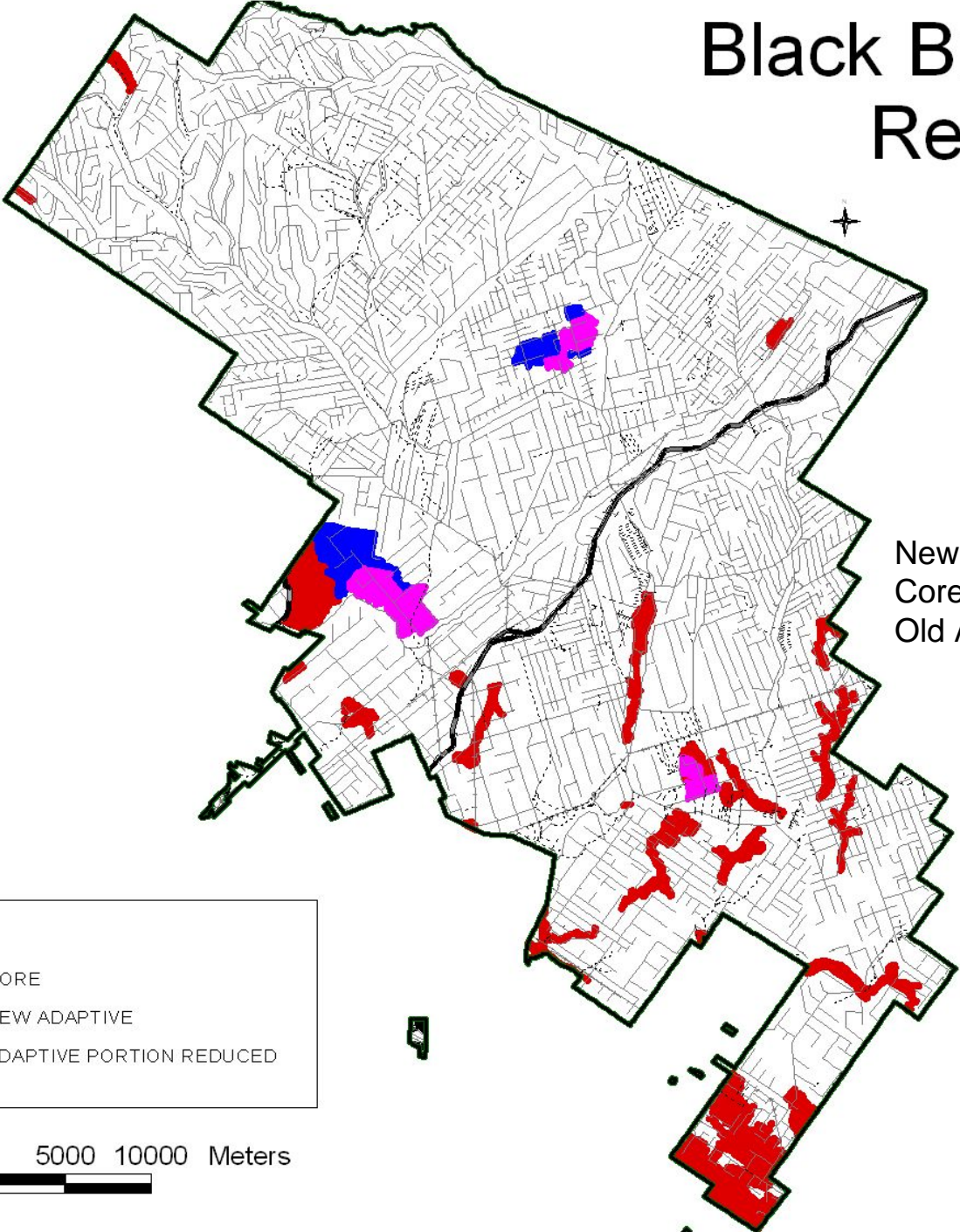


Two graphs comparing bird densities in treated and untreated stands. The top graph shows ovenbird density and the bottom graph shows brown creeper density.





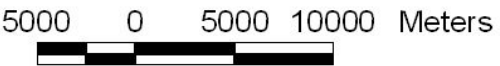
# Black Brook District Reserves



New Adaptive Reserves = 1387ha  
Core Reserves = 6720 ha  
Old Adaptive Reserves = 2781 ha

Reserves

- CORE
- NEW ADAPTIVE
- ADAPTIVE PORTION REDUCED







# Key Success Factors

- Research projects were developed from the outset by a structured group of company forest managers and researchers
- FRAC pursued several research ideas related to managing for biodiversity and using natural disturbance information as input into stand- and forest-level management decisions.
- There has been company 'buy-in' regarding the value of the research from the outset
- On-going redirection and mutual learning on the part of both managers and researchers
- Regular and continuing communication is a key component of effective applied research projects.





# So, has all this research empowered the manager?

YES! Because JDI staff has:

- Gained considerable knowledge in ecosystem processes and functions
- Learned to apply the findings to our management
- Developed relationships and networks with researchers
- Made it part of our daily business language





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# New Directions

Recognition that, over time, some planted stands will be required to serve as old softwood habitat has resulted in the new research project related to varying levels structural diversity and coarse woody debris at the commercial thinning stage of planted stand development. Vascular plants, bryophytes, beetles, song birds and small mammals will be monitored across replicated study sites.





Thank you!