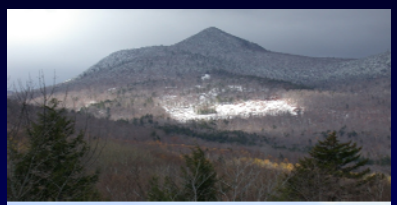
What's New in Northern Hardwoods Silviculture -- The Wildlife Habitat Elements



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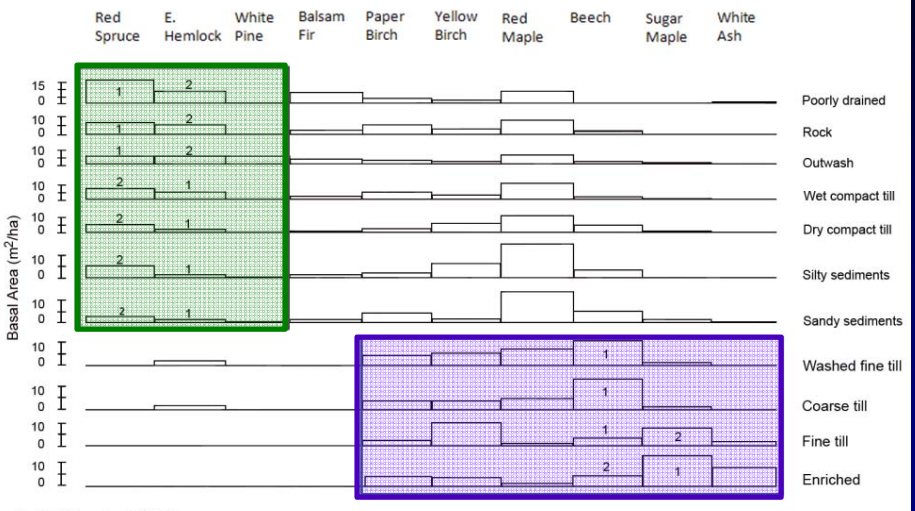
Durham and Bartlett, NH

Soil-Site Relationships



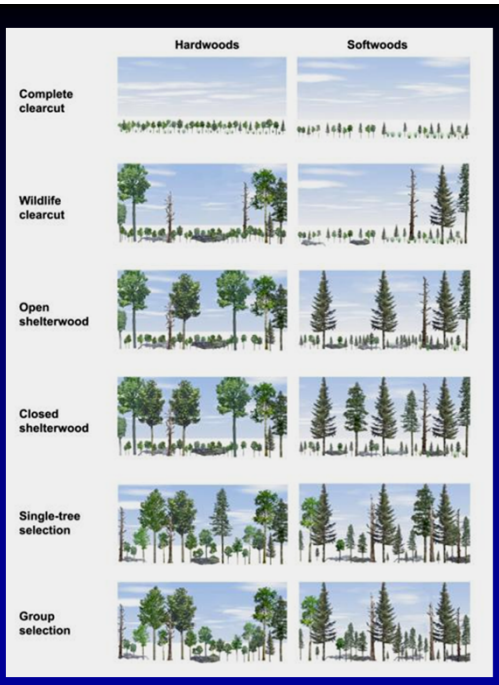
Modified from: Leak (1982)
1 = most abundant in climax stands; 2 = second most abundant in climax stands

Predator-Prey Relationships

Managers create habitat conditions over time across landscapes that influence predator-prey relationships

Based upon past/present land use – how do we proceed?

- Land-use history – regionally
- 60+ years of breeding bird survey results regionally show sharp declines in early successional bird species
- Mature forest bird species more stable than not
- Is natural disturbance silviculture the answer . . .



Silvicultural Options

- Size of opening influences composition
- Frequency of cut matters – cuts create important ephemeral habitats
- Spatial and temporal patterns influence the reoccupation of these ephemeral habitats

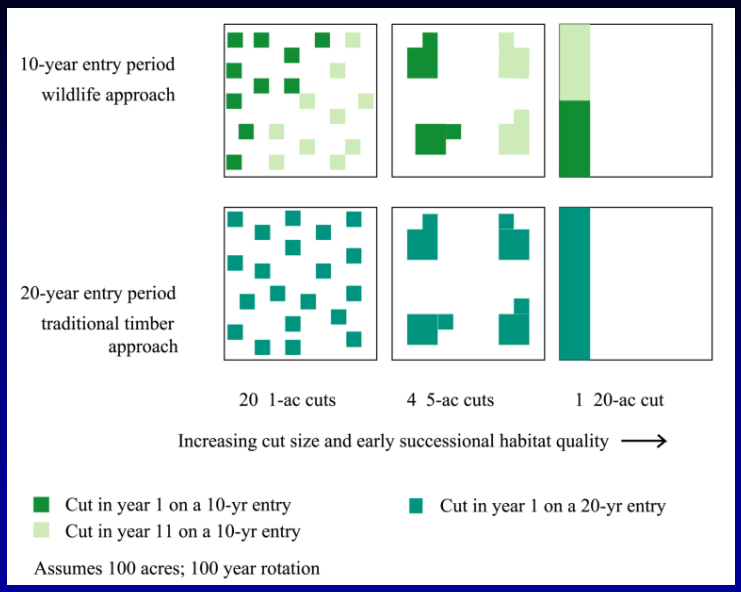
From: DeGraaf et al. 2006

Frequency of Cutting Cycle Matters - Ephemeral Habitats

Species	First appear	Common	Decline
E. bluebird	1	1	2
N. flicker	1	1	7-10
Willow flycatcher	1	4	7-10
Winter wren	1		2
Swainson's thrush	2	4	15*
Chestnut-sided warbler	2	4	10
Mourning warbler	2	5	7-10
Common yellowthroat	2	6	10
American goldfinch	2	6	7-10
Cedar waxwing	2	4	7-10
Veery	3	6	*
Black-and-white warbler	3	4	15*
Rose-breasted grosbeak	3	15	*
Canada warbler	5	15	*
Ruffed grouse	10	15	*
Wood thrush	10	15	*
Ovenbird	10	15	*
Black-throated blue warbler	15	*	*
Black-throated green warbler	15	*	*

From: DeGraaf et al. (1992)

Early Successional Habitat Strategies



From: DeGraaf and Yamasaki 2003

So What's New?

- We're treating stands with an eye to their patchiness – rather than tree-by-tree
- We're recognizing the importance of how regeneration is laid out on-the-ground
- We're paying closer attention to habitat features in managed stands that maintain/enhance wildlife habitat diversity

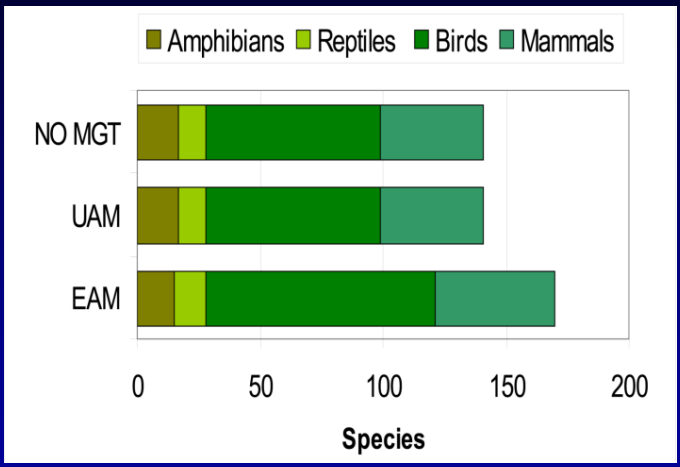
Uneven-aged Management Concerns

Extensive landscapes managed using single-tree selection only tends to limit horizontal diversity, distribution of browse and early and mid-successional foraging substrates used by herbivores and insectivores alike

No Vegetation Management Approaches

- No vertebrate old growth-obligates documented in NE to date
- Surveys indicate some bryophyte, mite, and ground-dwelling beetle species may find such stands of interest

Potential Habitats Available With Broad Management Strategies



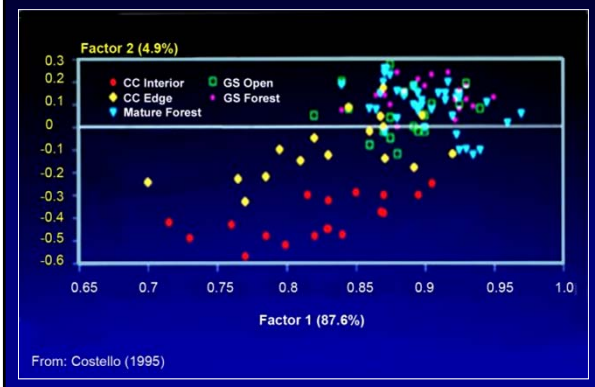
From: DeGraaf et al. 2006

A New Look at Uneven-aged Silvicultural Methods and Responses in New England Beech-Birch-Maple Stands

- Surveys conducted from 1992-1998
- 6 study blocks (1992-1996)
- 1 study block (1994-1998)

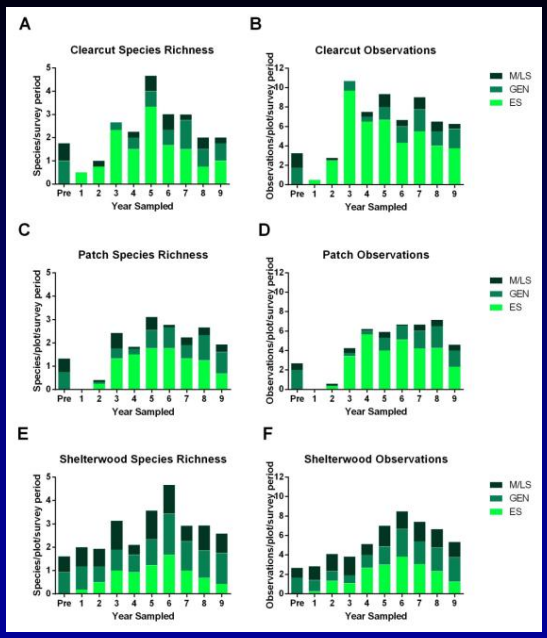
Habitat group	Clearcuts (42)	Group/patch selection (42)	Uncut/mature forest (42)	Total
Opening size	~ 20 acres	0.3-2 acres		
Early successional sp. (ES)	17	9	3	17
ES observations	2119	452	14	2585
Generalist species (GEN)	20	19	16	20
GEN observations	749	1082	1324	3155
Mid-/later successional species (M/LS)	13	15	15	16
M/LS observations	410	1372	1098	2880
Total species	50	43	34	53
Total observations	3278	2906	2436	8620

Ordination of Avian Similarity for 114 Survey Points, WMNF



From: Costello (1995)

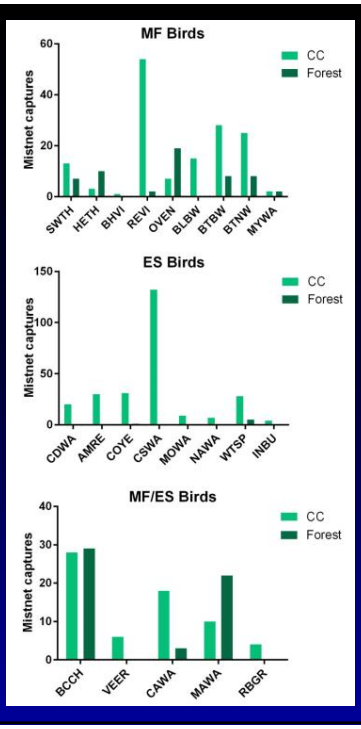
- Early successional bird community in new hardwood clearcuts is very different from the mature hardwood bird community
- Bird community in group selection cuts are mixtures of mature hardwoods and some but not all early successional communities



BEF Case Study -- Bird Use of Clearcuts, Patches, and Shelterwood

- ES species not present in pre-harvest stands
- Species richness was similar (ES, Gen, M/LS)
- Higher proportions of ES species and observations in CC and patches than shelterwood

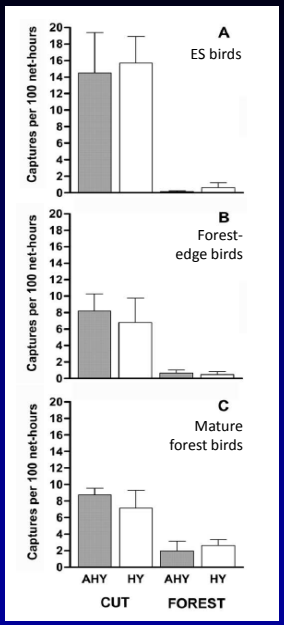
From: Yamasaki et al. (2014)



ESH as Post-Fledging Habitat

- Capture rates of mature forest nesting birds (BLBW, BTBW, BTNW, REVI, SWTH) in ESH > in mature forest during post-fledging period
- ES birds were rarely mist-netted in mature forest habitat
- Generalists use ES habitats also as post-fledging habitat
- Both HY and AHY birds use these openings

From: C. Chandler et al. 2012; Stoleson 2013



Post-breeding Habitat and Bird Condition in PA

- HY as well as AHY birds use clearcut stands
- Mature forest and forest-edge nesting birds use clearcut stands as well as early-successional nesting birds
- Planning/managing bird habitats include nesting as well as post-breeding and pre-migration habitats

From: Stoleson (2013)

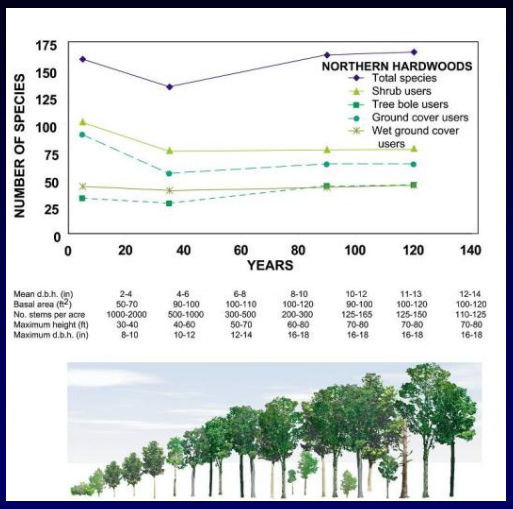
So What's New?

- We're treating stands with an eye to their patchiness – rather than tree-by-tree
- We're recognizing the importance of how regeneration is laid out on-the-ground
- We're paying closer attention to habitat features in managed stands that maintain/enhance wildlife habitat diversity

Bartlett EF – vertebrate richness

Taxa	No. of species
Amphibians	12
Reptiles	6
Birds	108
Mammals	49
Totals	165

BEF Vegetative Structure



- Cover-type -- a good habitat descriptor for some species, not for others -- better with stand structure info
- For species with size-class affinities, interpreting relationships needs stand structure assessment
- Forest bird habitat management needs the finer details of stand structure that neither cover-type nor size-class can provide

From: DeGraaf et al. 1998; Leak et al. 1987; DeGraaf et al. 2001, 2005, 2006

Structure Related Within-Stand Features

Soft mast and herbaceous layer

Regenerating shrub layer

Midstory layer

Upland openings

Vernal pools

Tree Related Within-Stand Features

From: DeGraaf et al. 2006

Retention Areas on Larger Cuts

Provides:

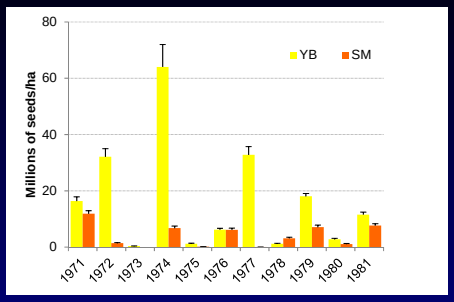
- resistant beech mast opportunities
- larger diameter tree diversity within cut stand over time
- secure groups of cavity trees (OSHA)

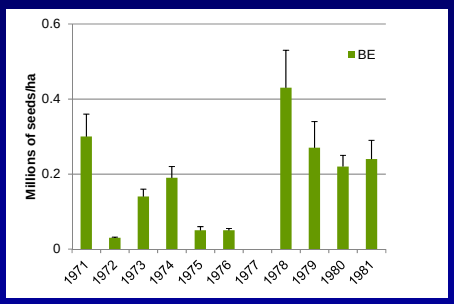
Within-stand Features Enhanced with Integrated Prescriptions

	No mgt	Uneven-aged mgt		Even-aged mgt		
		Single-tree	Group/ patch	Thinning	Shelterwood	Clearcut
Canopy closure	Tree-sized gaps	Closed	Partial	Closed - partial	Partial	Open
Exposed perches			X		X	X
Inclusions	X	X	X	X	X	X
Large cavity trees	Abundant	X	X	X	X	X
Hard mast	X	X	NI	X	X	NI
Soft mast			X		X	X
Midstory	X	X	NI	X	NI	NI
Shrub layer			X		X	X
Herb layer			X		X	X
CWD	Abundant	Minimal	X	X	X	X

Selected Examples:

- Seed fall considerations
- Regional small mammal dynamics
- CWD characteristics
- Terrestrial salamanders
- Forest raptor considerations
- Browse considerations

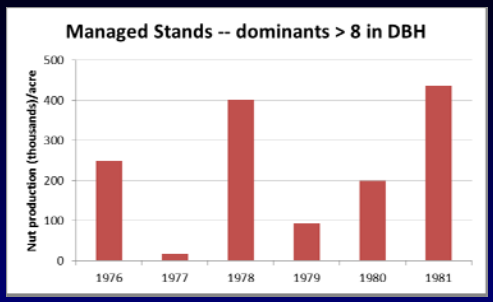


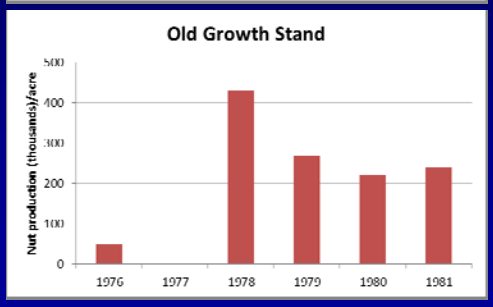


Seed Fall in Old Growth Northern Hardwoods

- SM, YB, and BE account for 98% of seed fall
- On average 1/3 of the crop was available for regeneration
- Seed production is highly variable
- Wildlife consumption estimated at 2-16%; BE consumption at 8%

From: Graber and Leak 1992



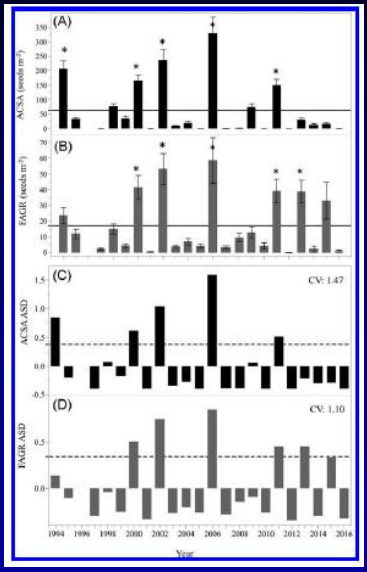


Beech Seed Fall in Managed Stands

- Production increases with age/size and percent of BE basal area
- Seed production is highly variable
- Filled seed averaged 74 to 88%
- Avian consumption ranged from 0 to 11%
- Rodents consumed 0 to 9%
- Heavy seed production occurs about 1 in 3 years

From: Graber and Leak 1992; Leak and Graber 1993

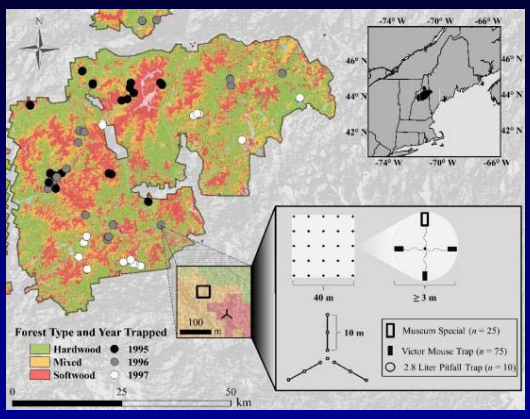
SM/BE Seed Fall -- 1996-2016, HBEF



- Also highly variable – associated with the prior 2 summer temp differences and a prior season nut crop
- SM mast events – 4 times in 20 yrs
- BE mast events – 5 times in 20 yr

From: Cleavitt and Fahey 2017

WMNF/BEF Small Mammals – looking for SYBO



- In the process, describe the small mammal communities across the WM region
- n = 108 sites across WMNF
- focused on 2 ELTs (6E and 115A)
- 9 sites/ELT; snap sets and pitfall set at each site
- 18 sites sampled per year
- 50+ WMNF employees involved in this project

From: Stephens et al. doi: 10.1111/ecog.02233

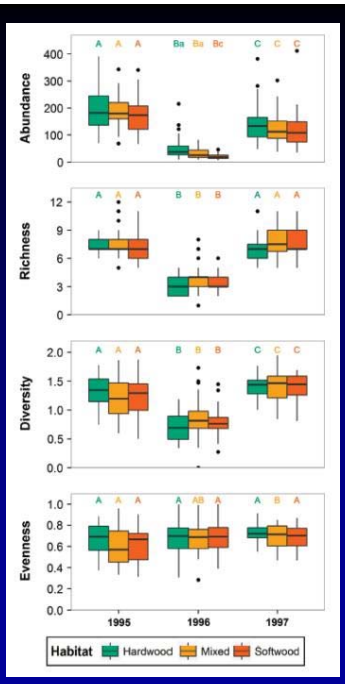
WMNF/BEF Small Mammals – looking for SYBO

Species	Year 1995	1996	1997	Total
Sorex cinereus	1731	372	872	2975
Napaeozapus insignis	234	781	698	1713
Myodes gapperi	1192	60	240	1492
Blarina brevicauda	302	14	631	947
Peromyscus maniculatus	529	31	149	709
Peromyscus leucopus	287	15	185	487
Sorex fumeus	77	23	44	144
Sorex hoyi	37	10	39	86
Microtus pennsylvanicus	20	2	22	44
Sorex dispar	25	3	11	39
Zapus hudsonius	18	10	7	35
Synaptomys cooperi	19	1	6	26
Tamias striatus	10	5	8	23
Sorex palustris	9	5	6	20
Microtus chrotorrhinus	3	2	13	18
Glaucomys sabrinus	4	2		6
Glaucomys volans	3	2	1	6
Tamiasciurus hudsonicus	4			4
Condylura cristata		1	2	3
Microtus pinetorum		1		1
Parascalops breweri			1	1
Synaptomys borealis		1		1
Total	4504	1341	2935	8780

- 22 species of small mammals in the White Mountains region
- 6 species represent 90-96 percent of the catch
- Raw captures without differential corrections

From: Stephens et al. doi: 10.1111/ecog.02233

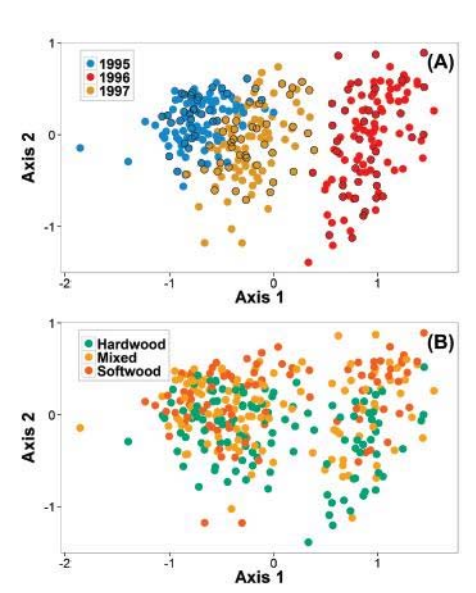
WMNF/BEF Small Mammals – looking for SYBO



- Across the WM region, small mammal community metrics in hardwoods, mixedwood, and softwood habitats were similar
- Yearly captures account for a majority of the variability

From: Stephens et al. doi: 10.1111/ecog.02233

WMNF/BEF Small Mammals – looking for SYBO



- Model tested against BEF long-term data for the same years and show concordance
- Trap year accounted for 50% of the variation
- Small mammal community composition is highly variable and not well described by overstory composition

From: Stephens et al. doi: 10.1111/ecog.02233

CWD – Structural Habitat Elements

Large cavity and den trees
Large hollow logs
Cull, slash, and brush piles

Species That Benefit from CWD Presence

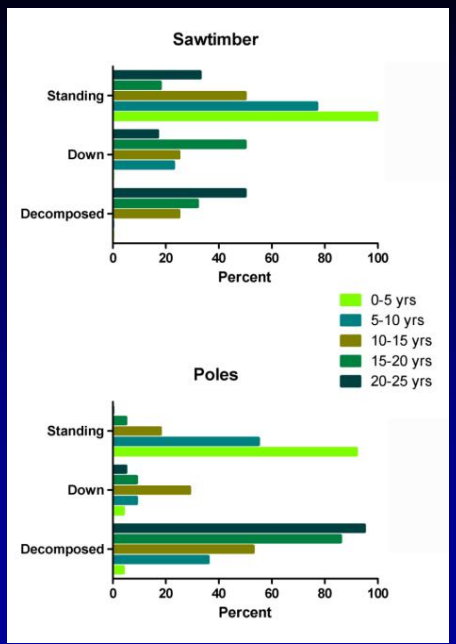






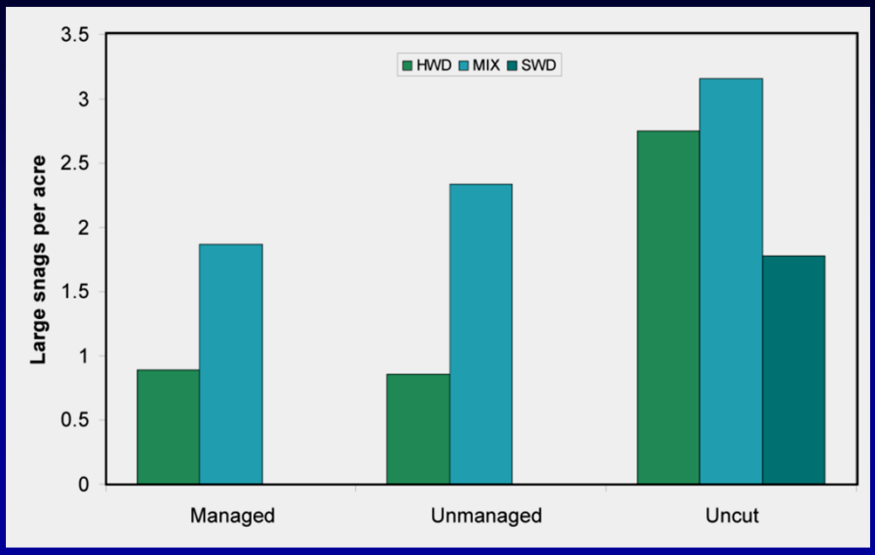


BEF Snag Longevity – Dense Hardwoods

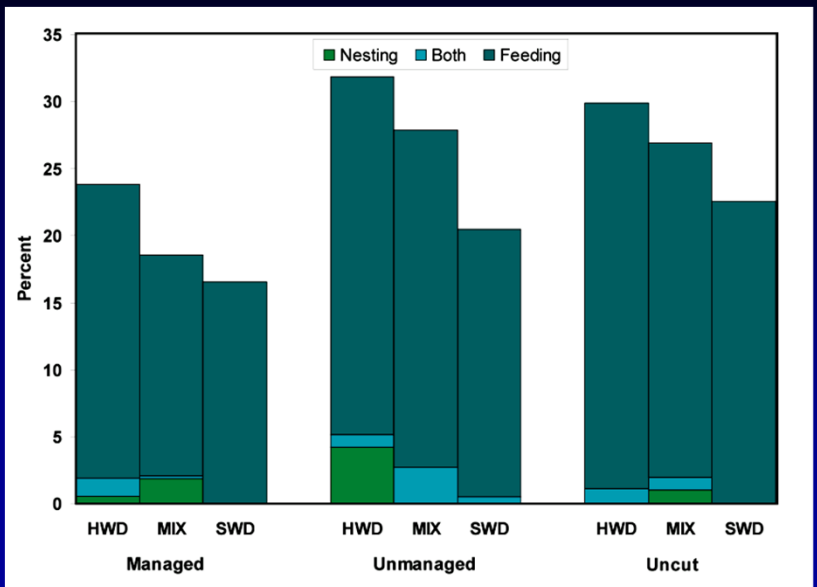



From: Yamasaki and Leak (2006)

BEF – Large Snags (> 16 in dbh)

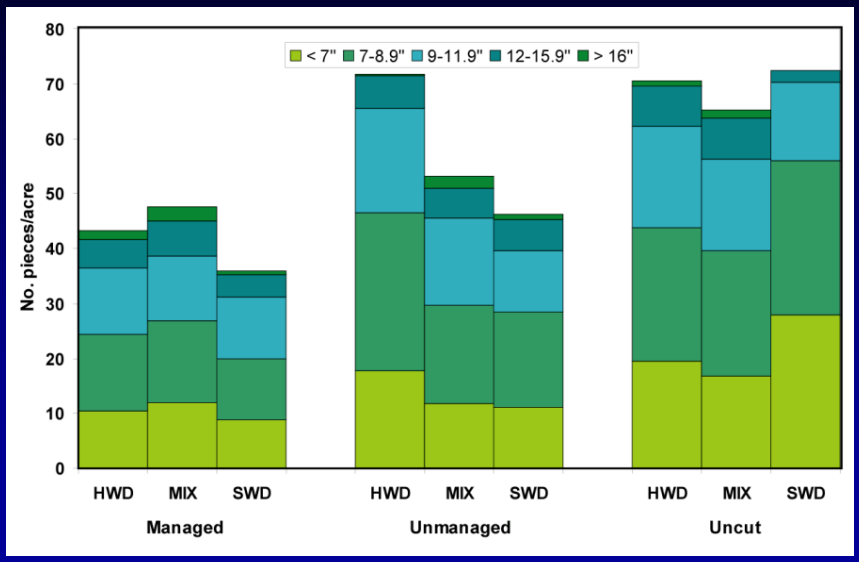


BEF – Evidence of Woodpecker Use



BEF CWD Piece Size Distribution

midpoint diameter (in)

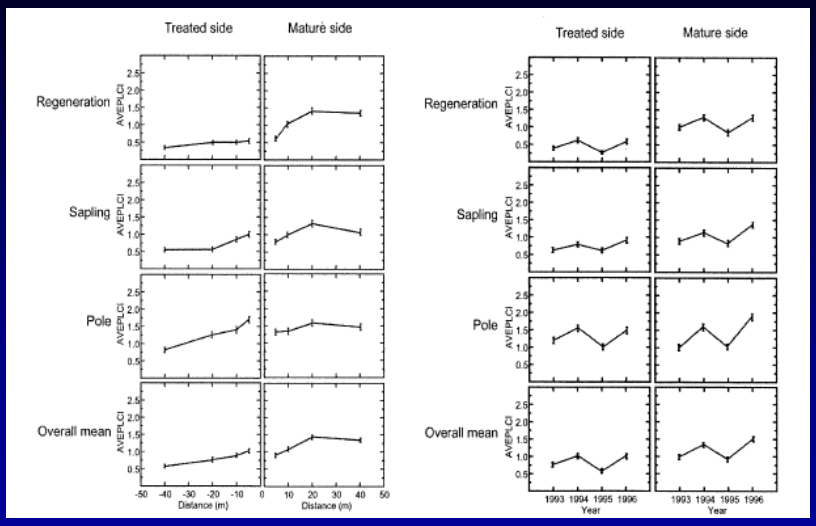


Terrestrial Salamanders

- Cover boards placed across an edge gradient 40 m to either side
- Checked every 2 wks after a rain event
- Structure and cover described
- Number of RBS counted

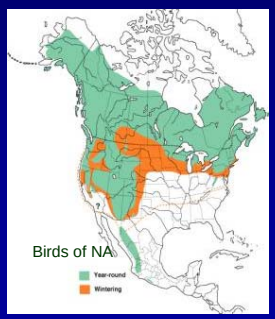
From: DeGraaf and Yamasaki (2002)

Terrestrial Salamanders

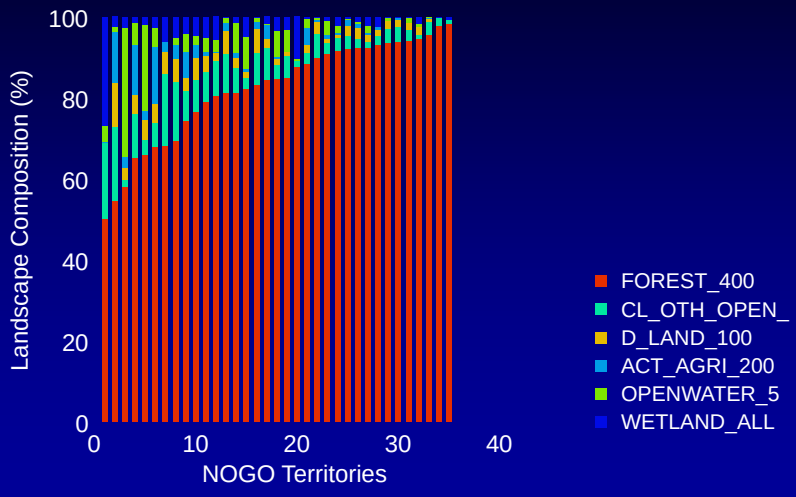


From: DeGraaf and Yamasaki (2002)

Northern Goshawk (*Accipiter gentilis*)



Forest Landscape Compositions



Goshawks Maintain 1 to 8 Nests Within a Territory

Goshawk Nest Territories

- Occur in forest-dominated landscapes
- Often a component of managed stands
- Occur on lands with history of agricultural activity or prior cutting

Nest Site Characteristics

Often near upland openings, woods roads and trails

Most often at the bottom of lower slope positions at elevations less than 1500 ft

Nest Site Characteristics

Goshawks in this region use white pine stands

or mixed stands of spruce/fir and hardwoods

Nest Site Characteristics

- More sawtimber-sized trees and higher softwood basal areas in nest sites compared to random sites

Nest Tree Characteristics

White Pine

Mean DBH = 19.5 in

Hardwoods

Mean DBH = 14.8 in

BEF Patches

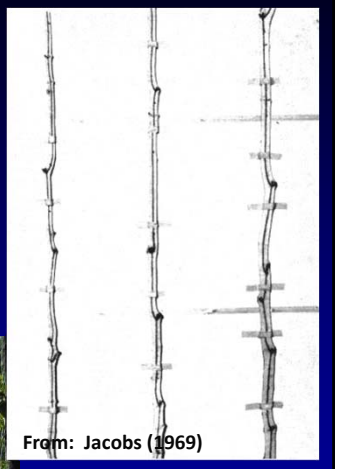
2013

2001

BEF Patches



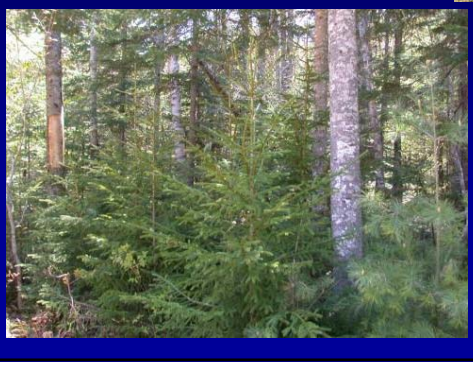

Advanced Regeneration Can Recover from Severe Browsing



From: Jacobs (1969)


From: Trimble (1968)

Browse Pressure Effects

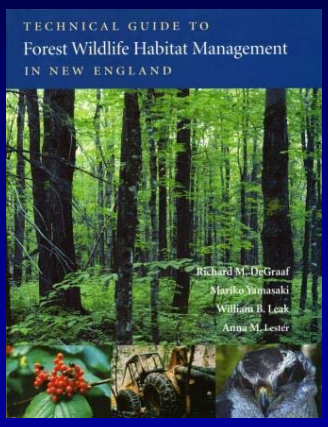
- Heavy browsing on BF can favor RS
- Can increase softwood composition on the right site
- Can be severe in localized areas – moose wintering areas



Physical Obstacles to Limit Browse Impacts?

- Resist lopping all tops
- Consider leaving more tops on-site
- Consider regenerating larger stands
- On small openings -- consider strategic brush fencing

What Has BEF Taught Us About the Practice of Silviculture in the Northeast



- Variety is important -- there is no 'one-size fits all' solution
- Landownership size can influence size of openings
- Working forest landscapes can produce many quality products (wood, habitat, recreational opportunities, visually appealing landscapes) over time with good planning and implementation
- It's important to keep an open mind