

Northern Superior Uplands: A comparison of Range of Natural Variation and current conditions.

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for the Minnesota Forest Resource Council

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Interim status of this data

This data is a re-issue of the data presented in 2001, with the following changes: age classes are presented in 10 year intervals, rather than Vegetation Growth Stages, Frelich's type 1 "Sugar maple" is replaced with type 9 "Northern Hardwood".

This data does not include the new FIA data, nor some updates recently received for some county lands. There are still some classification issues with the Lowland Conifer and Rich Swamp types. This re-release is being made to allow people to use a more compact and somewhat updated source — when the new FIA data is released a new version of this report with the most up to date information available will be prepared. It would be very inefficient to completely regenerate the data set prior to the release of the new FIA data.

Ecosystem type classification and the common inventory

The current condition is compared to the Range of Natural Variation (RNV) condition by assigning each stand polygon in the DNR's common inventory data set to the spatially corresponding ecosystem type mapped by White (2000, figure 1). The percent of stands in each ten year age class is then plotted against the RNV from Frelich (2000). The common inventory combines DNR, County and Federal lands. To that we have added FIA data to account for private lands, and stand age information for the BWCAW. The area of the inventory area ("Mapped acres") within each ecosystem type is shown

in table 1.

In this version of the analysis Frelich's ecosystem type 1, Sugar Maple, has been replaced with type 9, Northern Hardwood, which better reflects the integration of this type with the rest of the landscape. As in previous versions, Frelich's ecosystem type 8, Jack pine Aspen Oak, is not included, as it exists almost exclusively on the Kabetogama Peninsula, and is difficult to characterize.

Frelich number	Percent mapped	Mapped acres	Name	System acres
2	88	668886	Mesic white pine-red pine	756966
3	91	642828	Dry-mesic white pine-red pine	706731
4	61	683204	Lowland Conifer	1128056
5	45	71990	Rich swamp	161232
6	81	875113	Mesic birch-aspen-spruce-fir	1075332
7	98	1047592	Jack pine-black spruce	1069905
9	84	244575	Northern hardwoods	290670
			Open water	173305
			Unforested wetland	516521
			Developed land	18409

Table 1: *Between 45 and 98 percent of the area classified for each ecosystem type is included in the inventory data used.*

The composition in each ten year age range is broken down in the tables that follow the succession diagram and current vs. RNV plot for each type.

Older growth stages may contain more stands

When dealing with RNV analysis, many people ask how older Vegetation Growth Stages (VGS) can cover a greater proportion of the landscape than younger VGSs. This is a good question if you're used to dealing with tree age distribution plots. With the growth form specific stages defined by Lee Frelich (the box and arrow diagrams starting on page 5) the main answer is that the VGSs represent different lengths of time, and it's reasonable for a VGS that represents stands 20–100 years after disturbance to contain more stands than a VGS that represents stands 1–20 years years after disturbance, even though all the stands in the older VGS came from the younger VGS.

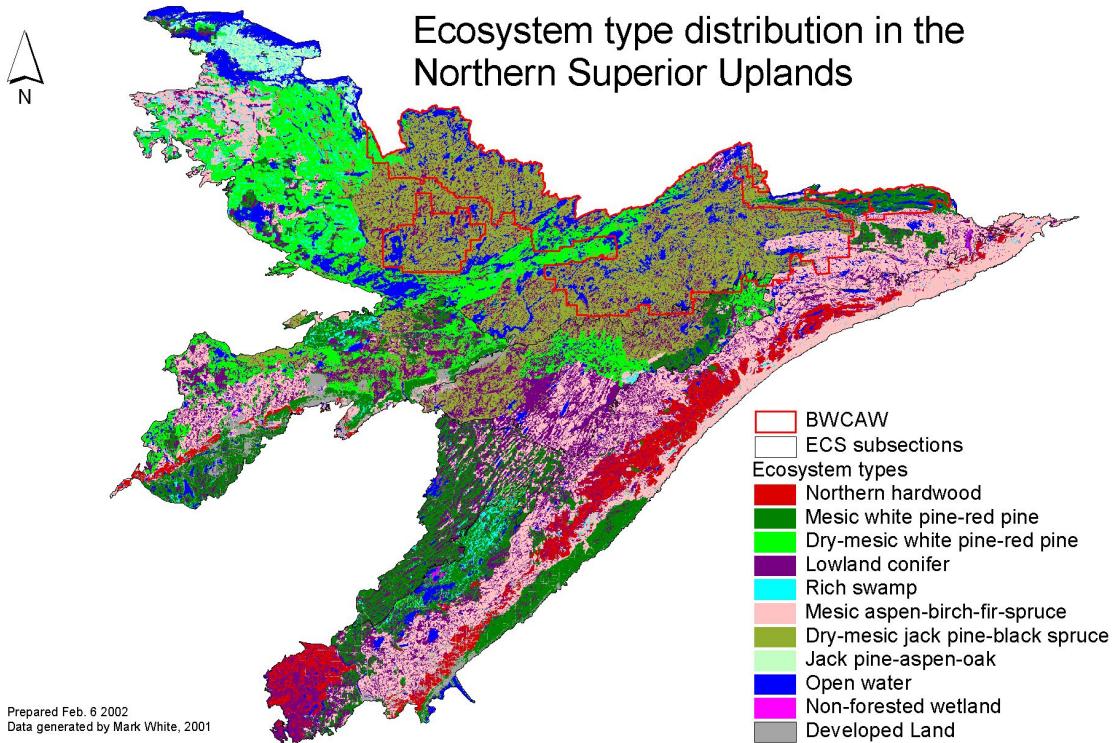


Figure 1: Ecosystem types delineated by Frelich (2000) for the Northern Superior Uplands section.

But in the bar-graphs included here, the distribution of stands is broken down into equal (10 year) intervals, and yet there are *still* later stages which contain more stands than earlier stages. This can arise from situations like that shown in figure 2. If movement from VGS 1 to VGS 2 is reasonably rapid (heavy arrow), perhaps due to succession, but movement from VGS 2 to VGS 3 (light arrow) is less rapid, perhaps because ground fire slows succession, and movement from VGS 3 back to VGS 1 is also less rapid, perhaps because of infrequent disturbance, then there is an accumulation of stands in VGS 2. *Remember that a stand can persist much longer than a tree.*

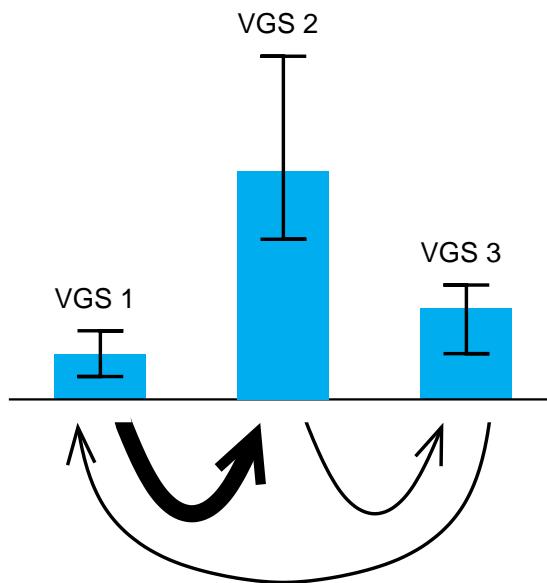


Figure 2: *Older growth stages may contain more stands: here the heavy arrow represents a rapid transfer and the lighter arrows less rapid transfers. The result of such a system would be an accumulation of stands in VGS 2.*

Nature of data

It is important to realize that this data is provisional. Improved data sets and more detailed analyses regularly become available. Exact numbers are subject to change. On the other hand, we believe that this data is a good representation of the current situation overall, and in particular the relationship between the current condition and the RNV is unlikely to be significantly revised. Therefore this information can be used when considering management directions with respect to the RNV.

Questions about that data presented here can be addressed to:

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References

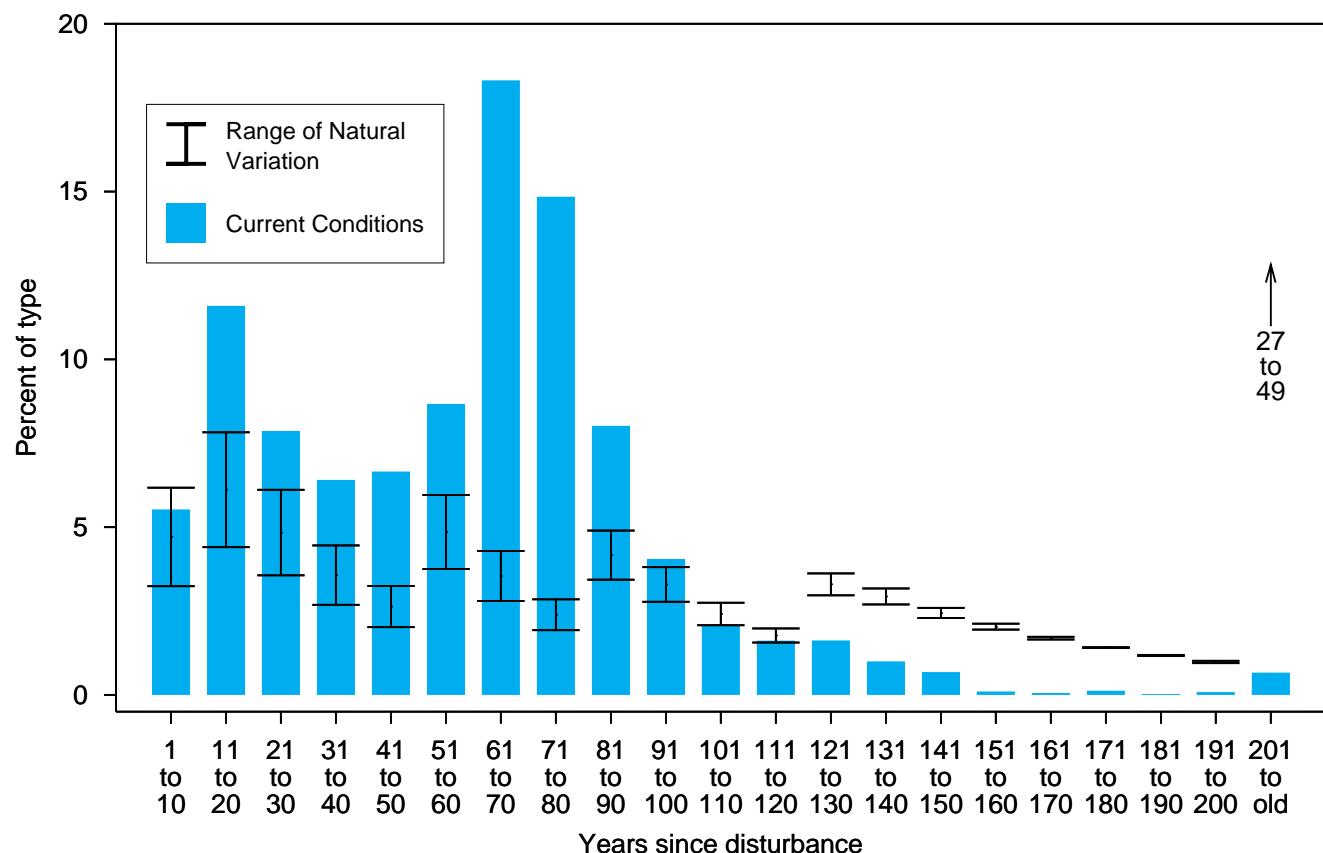
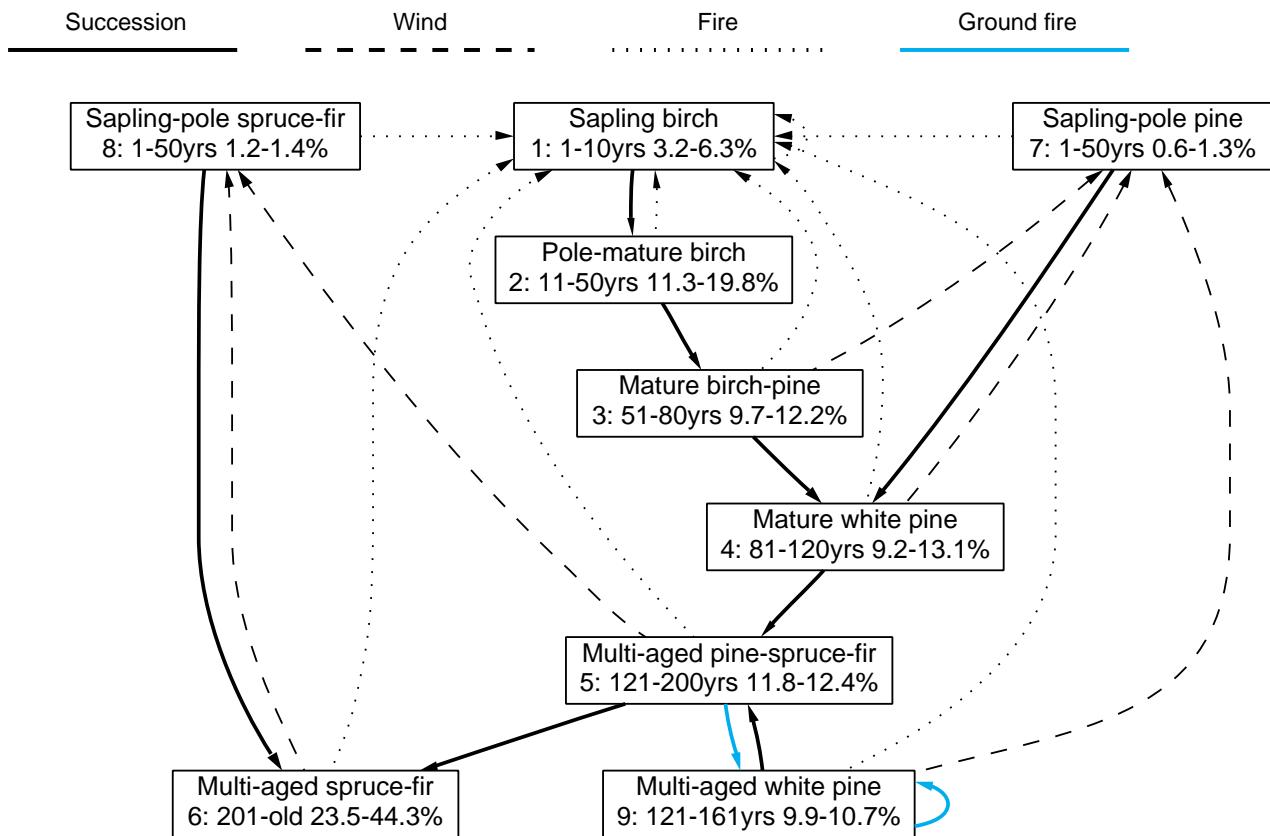
DNR Common Inventory Data Prepared by Chad Skally and others. See
<http://www.iic.state.mn.us/>

Frelich, L. 2000. Natural Range of Variability estimates for forest vegetation growth stages of Minnesota's Northern Superior Uplands.

White, M. 2000. Minnesota Northern Superior Uplands Natural Vegetation Map.

Frellich type 2: Dry red pine-white pine

Disturbance interval (years) - Wind: 1000-2000 Fire: 150-300 Ground Fire: 40

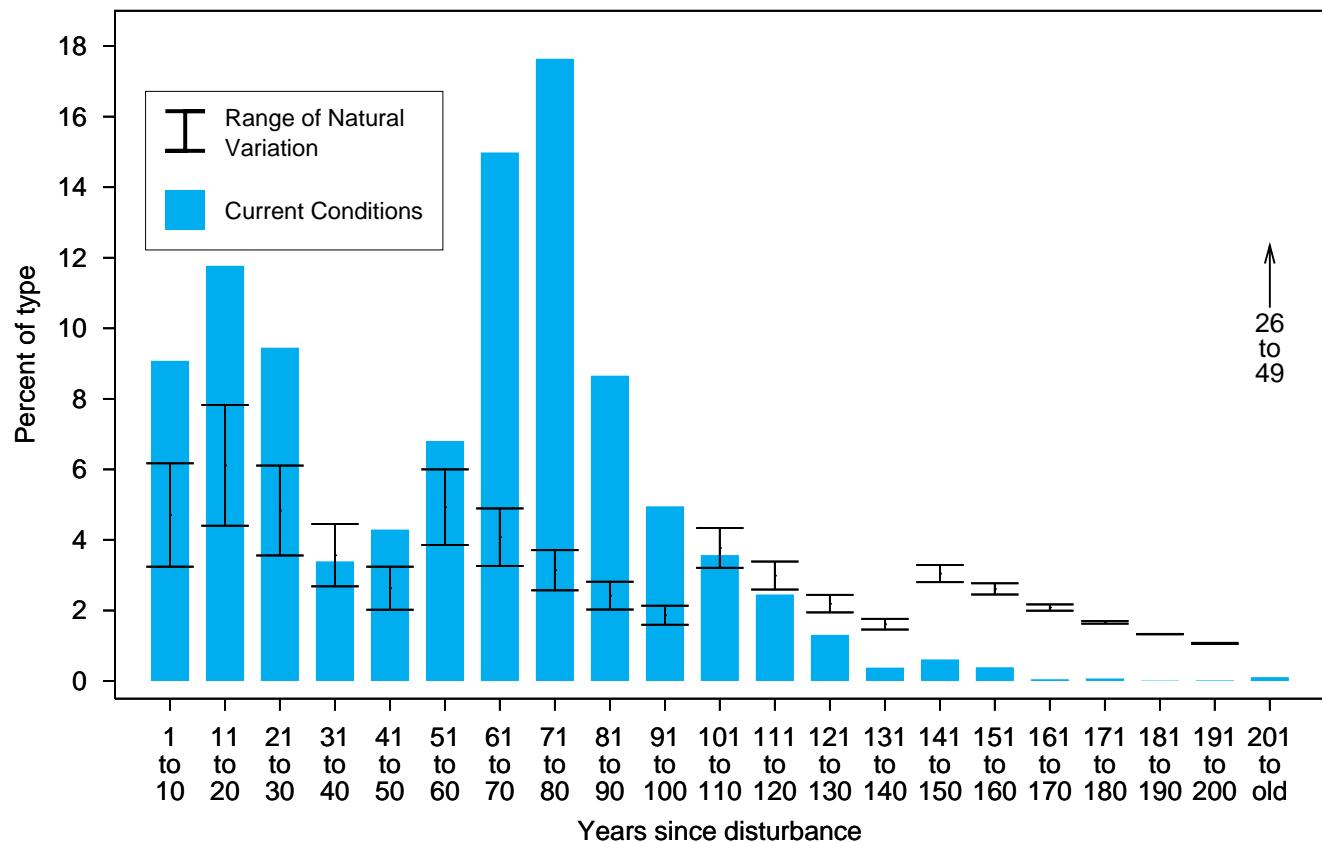
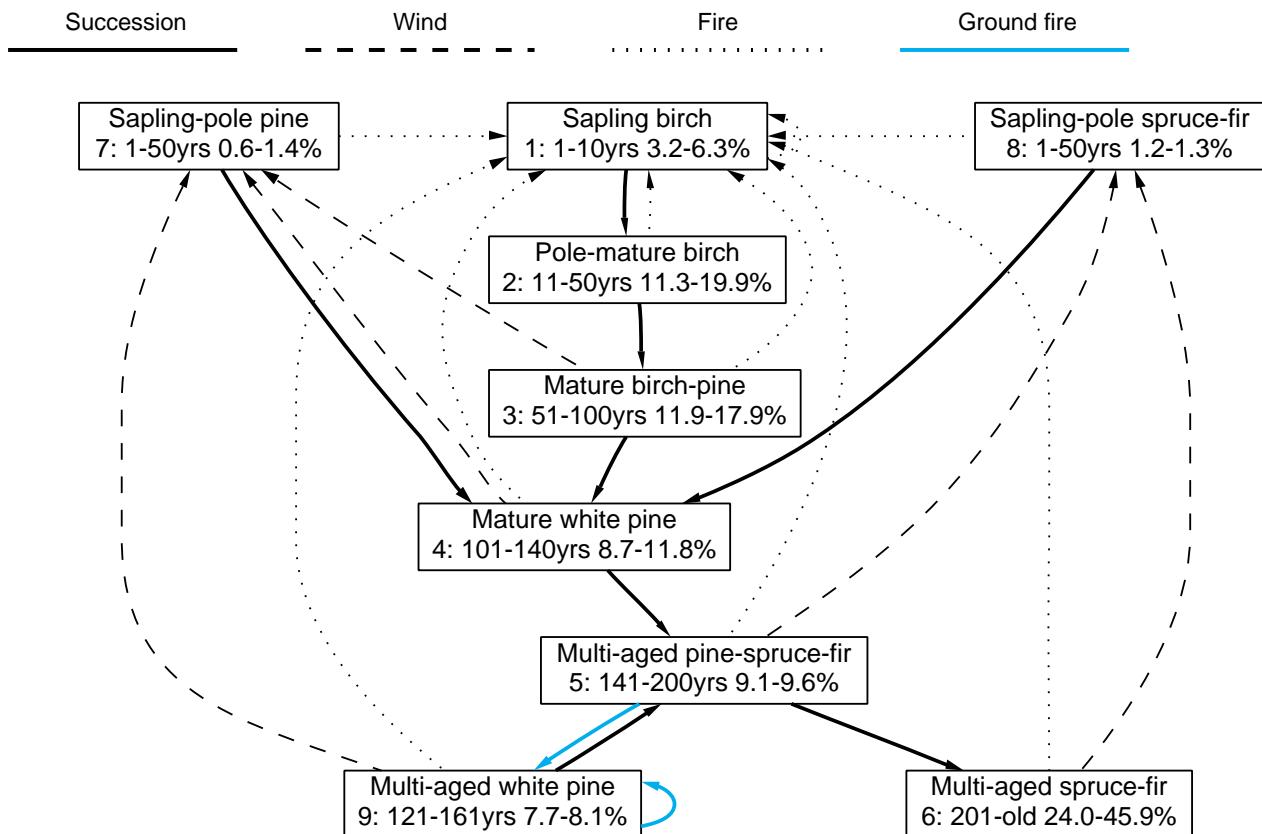


2: Mesic white and red pine
Percent cover breakdown
See also area breakdown

2: Mesic white and red pine Area breakdown

Frelich type 3: Mesic red pine-white pine

Disturbance interval (years) - Wind: 1000-2000 Fire: 150-300 Ground Fire: 40



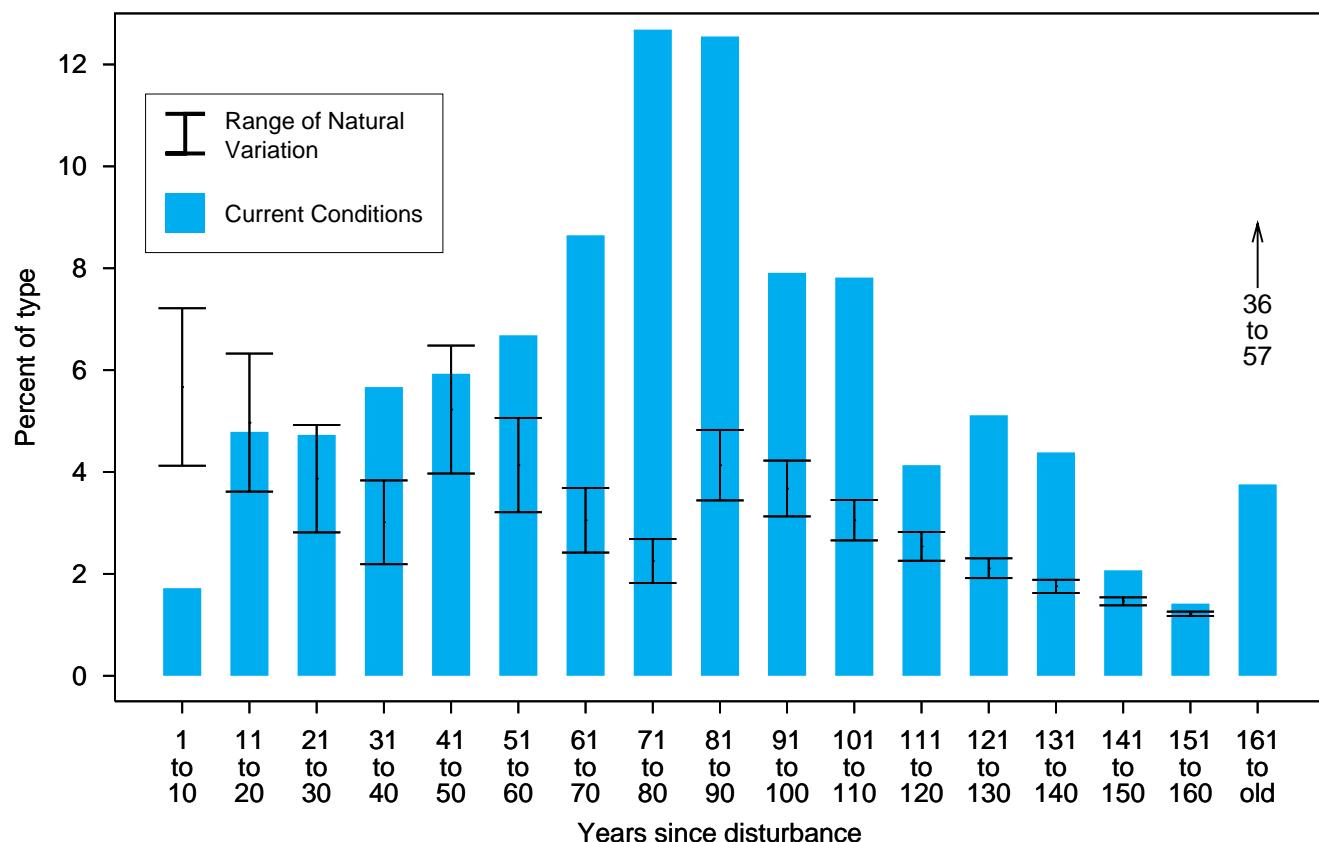
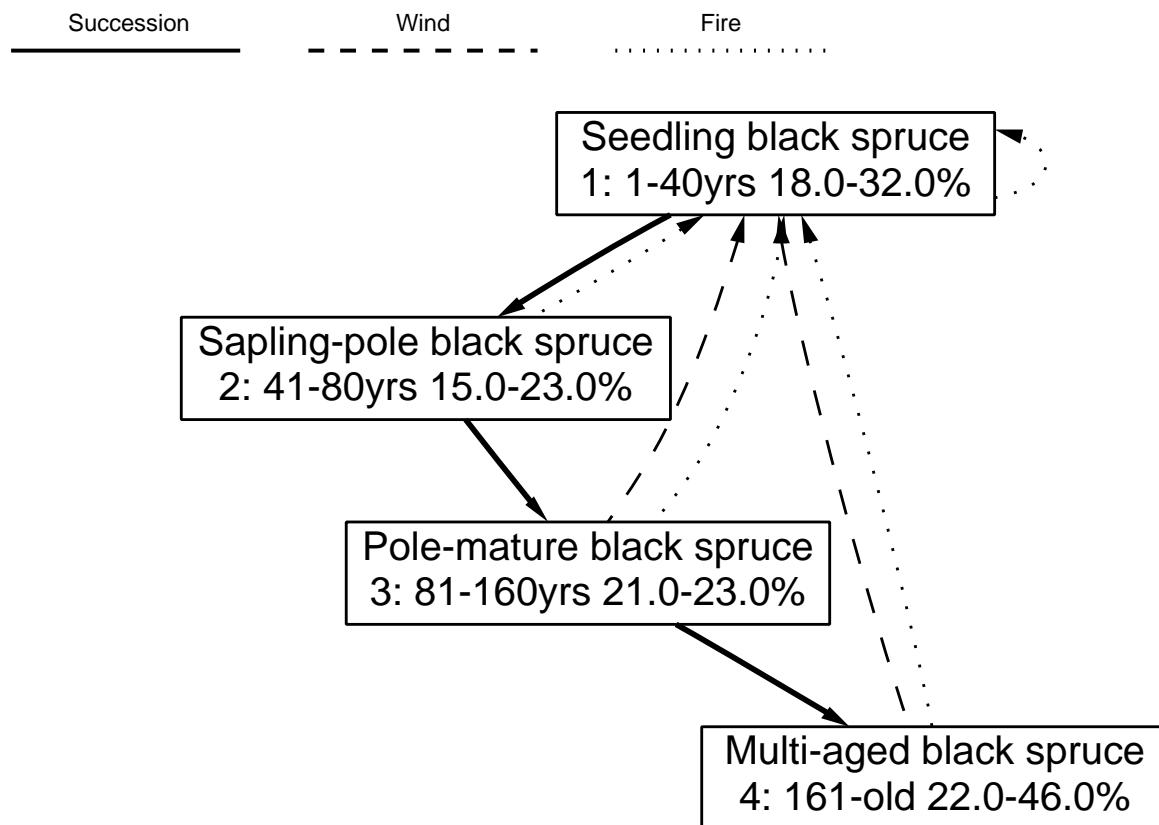
3: Dry-mesic white and red pine Percent cover breakdown See also area breakdown

	Age (years) from to	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	old
Current acres (thousands)	58	76	61	22	28	44	96	113	56	32	23	16	8	2	4	3	0	0	0	0	1	
Current % of type	9.1	11.8	9.4	3.4	4.3	6.8	15	17.6	8.7	5	3.6	2.5	1.3	0.4	0.6	0.4	0.1	0.1	0	0	0.1	
RNV minimum % of type	3.2	4.4	3.6	2.7	2	3.9	3.3	2.6	2	1.6	3.2	2.6	1.9	1.5	2.8	2.5	2	1.6	1.3	1.1	27	
RNV maximum % of type	6.2	7.8	6.1	4.5	3.2	6	4.9	3.7	2.8	2.1	4.3	3.4	2.4	1.8	3.3	2.8	2.2	1.7	1.3	1	49.4	
Breakdown of age class by current cover type percent of age class ($\geq 10\%$ in bold)																						
Balsam poplar																						
Aspen	32	56	46	19	18	23	23	16	13	7	2	1	1									
Aspen-spruce-fir	10	9	15	16	42	33	41	26	30	31	24	5	6									
Aspen-birch-spruce-fir	26																				34	
Aspen-birch	2																					
Paper birch	2																					
Paper birch-spruce-fir																						
Oak																						
Jack pine	11	7	2	2	2	2	2	6	3	4	12	11	3	12							47	
Jack pine-hardwood	1	1	10	6	1	1	2	2	2	2	3	1	1	2							17	
Spruce-fir			1	2	1	2	2	2	1	4	3	1	1	3							1	
Spruce-fir-hardwood	2																				8	
Balsam fir	3	2	10	9	4	2	3	1				1	1	4	2						5	
Balsam fir-hardwood																					1	
Red pine	5	8	2	1		2	1	1	1	1	2	1	1	2	1	2	5	5	5	2	9	
Red pine-spruce-fir	1	1	2	6	16	4	3	3	2	5	7	12	11	5	6	1	2	5	10	3	1	
Red pine-hardwood	1																				1	
White pine	3	1																			1	
White pine-spruce-fir	1	4	1	3	4				1	5	3	8	14	11	5	1	2	5	2	3	9	
White pine-hardwood	1																				1	
White spruce	1																				1	
Northern hardwood	1	1	8	4		2	1	5	1													
Lowland black spruce	2	3	6	1	18	2	3	13	6	4	4	6	6	2	2	2	2	2	3	2	4	
Upland black spruce	1	1	1	1			1	1	1	1	2	1	1	1	1	1	1	1	2	3	5	
Tamarack																						
Black ash	1	2	6	4		2	3	3	2	2	2	14	1	7	4	42	4	3	7	7	7	
Black ash-conifer																						
White cedar	2											3	7	3	12	9	20	82	8	15	8	
Mixed swamp conifers												1	1	1	1	1	2	1	1	1	44	

3: Dry-mesic white and red pine Area breakdown

Frelich type 4: Lowland conifer

Disturbance interval (years) - Wind: 1000-2000 Fire: 150-300 Ground Fire: N/A



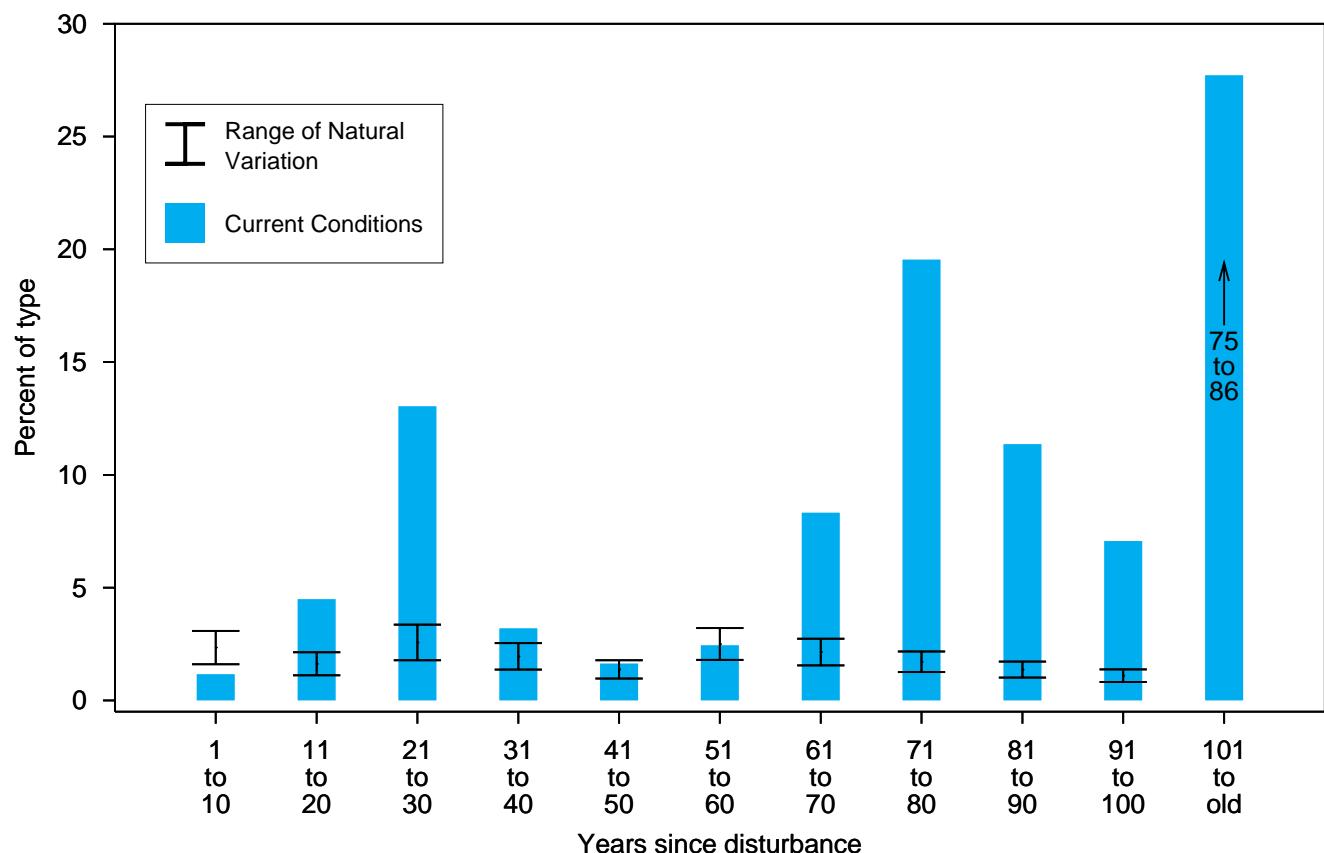
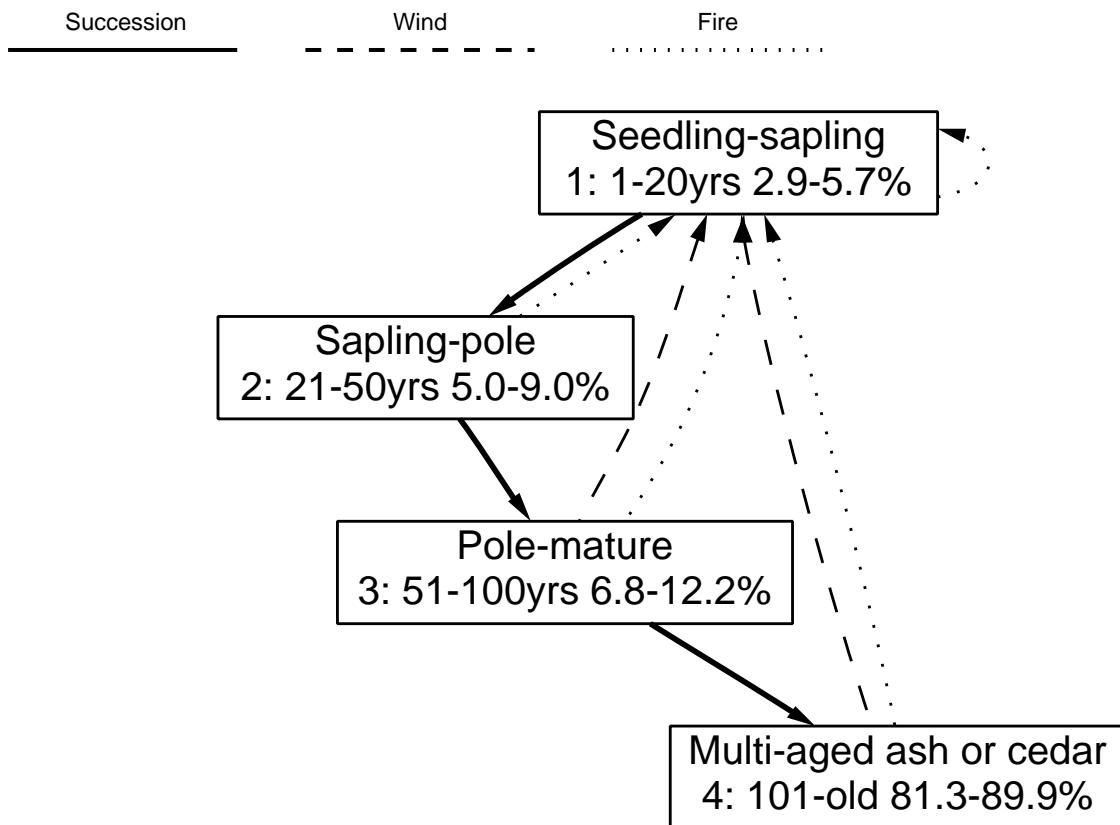
4: Lowland Conifer Percent cover breakdown

See also area breakdown

4: Lowland Conifer Area breakdown

Frelich type 5: Rich swamp

Disturbance interval (years) - Wind: 1000-2000 Fire: 500-1000 Ground Fire: N/A



5: Rich Swamp

Percent cover breakdown

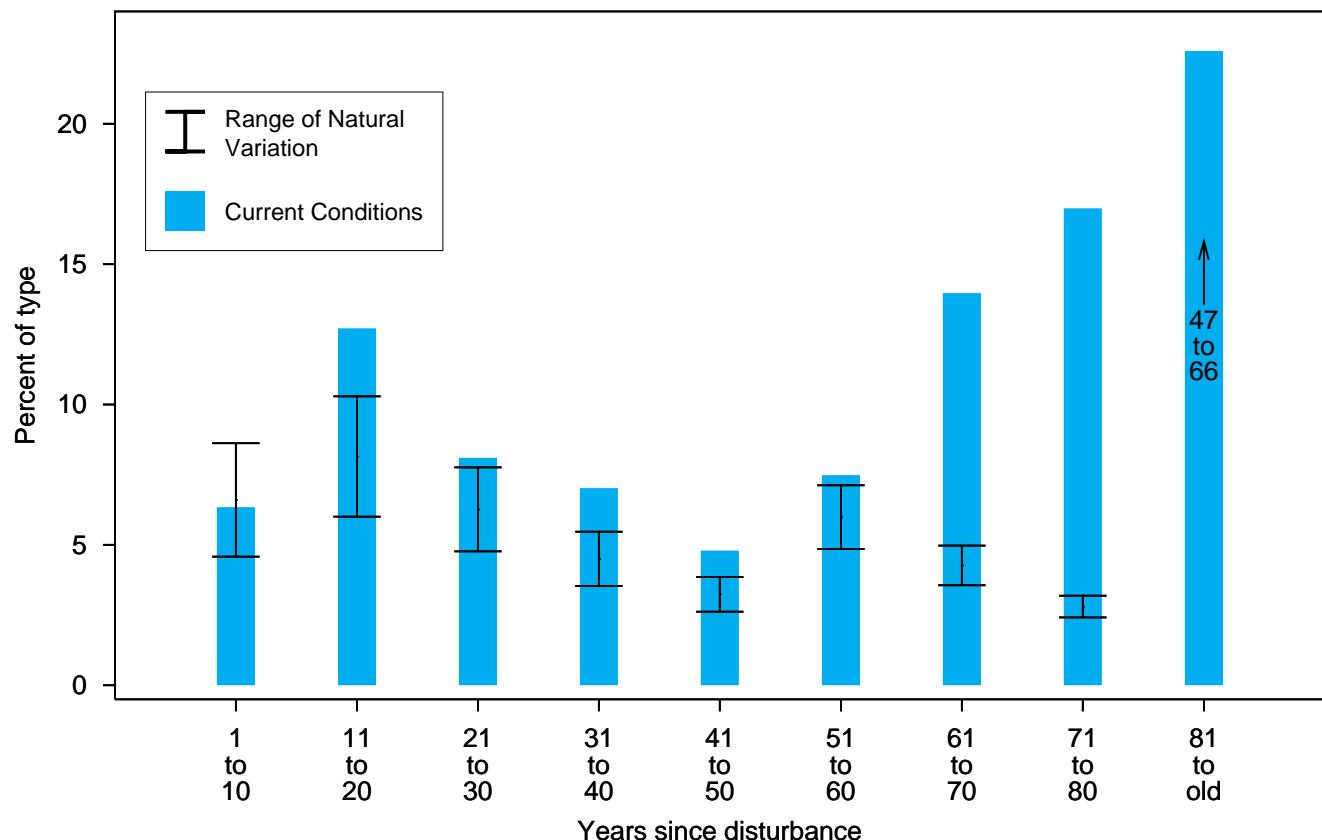
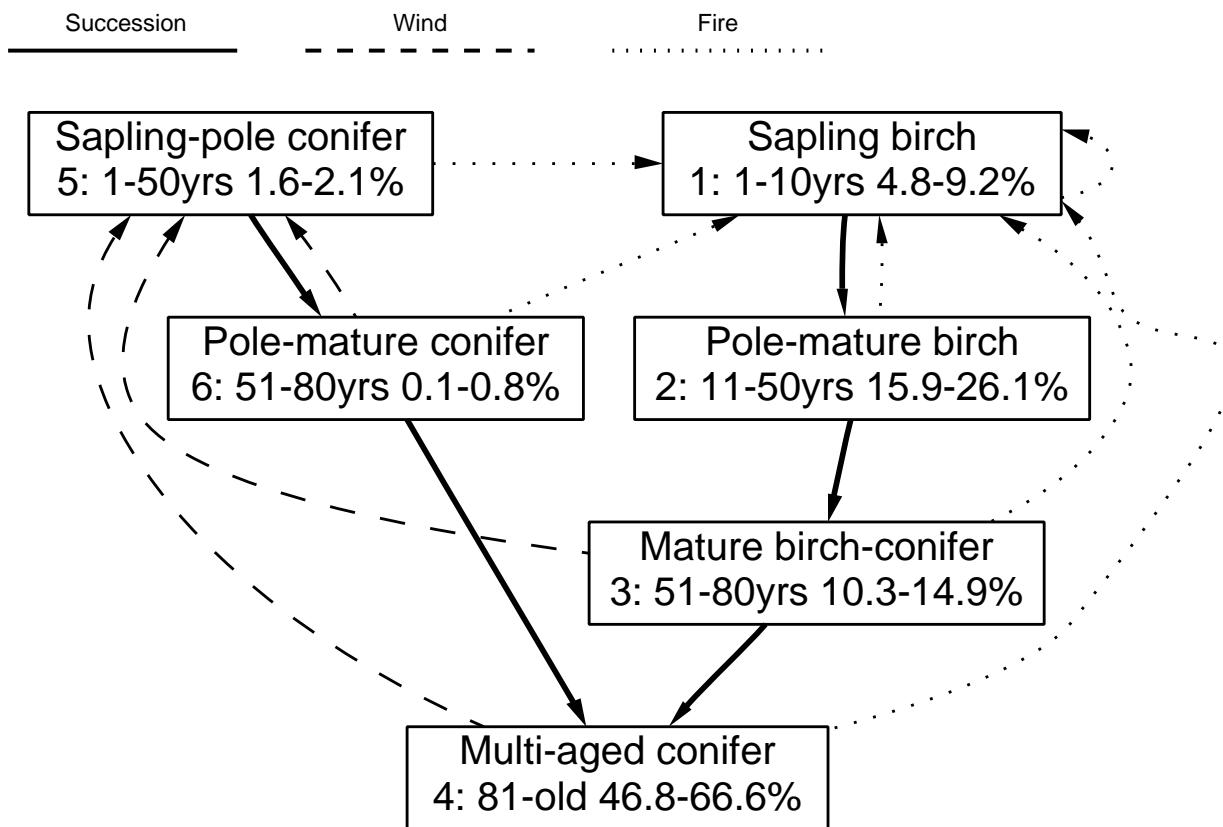
See also area breakdown

5: Rich Swamp Area breakdown

	Age (years) from to	1	11	21	31	41	51	61	71	81	91	101	
Current acres (thousands)	10	20	30	40	50	60	70	80	90	100	old	20	
Current % of type	1.2	4.5	13	3.2	1	2	6	14	8	5	20		
RNV minimum % of type	1.6	1.1	1.8	1.4	1	1.8	1.6	1.3	1	0.8	75.3		
RNV maximum % of type	3.1	2.1	3.4	2.5	1.8	3.2	2.7	2.2	1.7	1.4	86.5		
Breakdown of age class by current cover type area (thousands of acres) ($\geq 10k \text{ in bold}$)													
Balsam poplar													
Aspen	0.2	0.4	4.1	0.1	0.1	0.1	0.1	0.2	0.1				
Aspen-spruce-fir													
Aspen-birch													
Paper birch													
Paper birch-spruce-fir													
Jack pine													
Jack pine-hardwood													
Spruce-fir													
Balsam fir													
Balsam fir-hardwood													
Red pine													
White spruce													
White spruce-hardwood													
Northern hardwood													
Lowland black spruce	0.3	0.3	0.4	0.6	0.5	0.9	1.6	4.3	3.9	0.1	0.2		
Upland black spruce													
Tamarack	0.1	0.1	0.2	0.2	0.1	0.1	0.7	0.3	0.3	0.1	0.3		
Black ash	0.1				0.1	0.2	0.7	0.7	0.5	0.5	1.5		
Black ash-conifer													
White cedar						0.1	0.2	0.3	0.3	0.2	1		
Mixed swamp conifers							0.1	0.6	1.5	1.2	9.3		
								0.7	0.7	0.7			

Frelich type 6: Mesic birch-aspen-spruce-fir

Disturbance interval (years) - Wind: 1000-2000 Fire: 100-200 Ground Fire: N/A



6: Mesic birch-aspen-spruce-fir
Percent cover breakdown
See also area breakdown

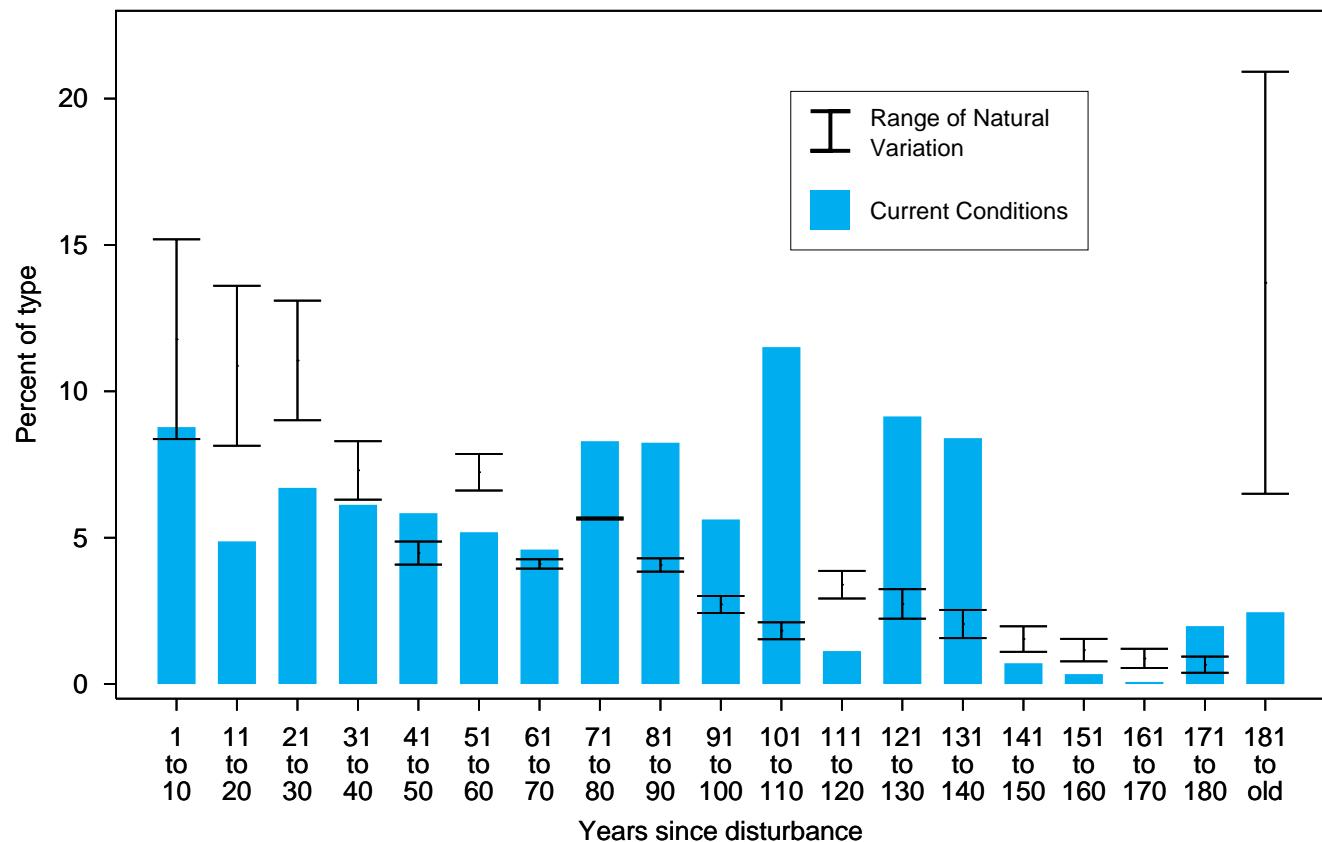
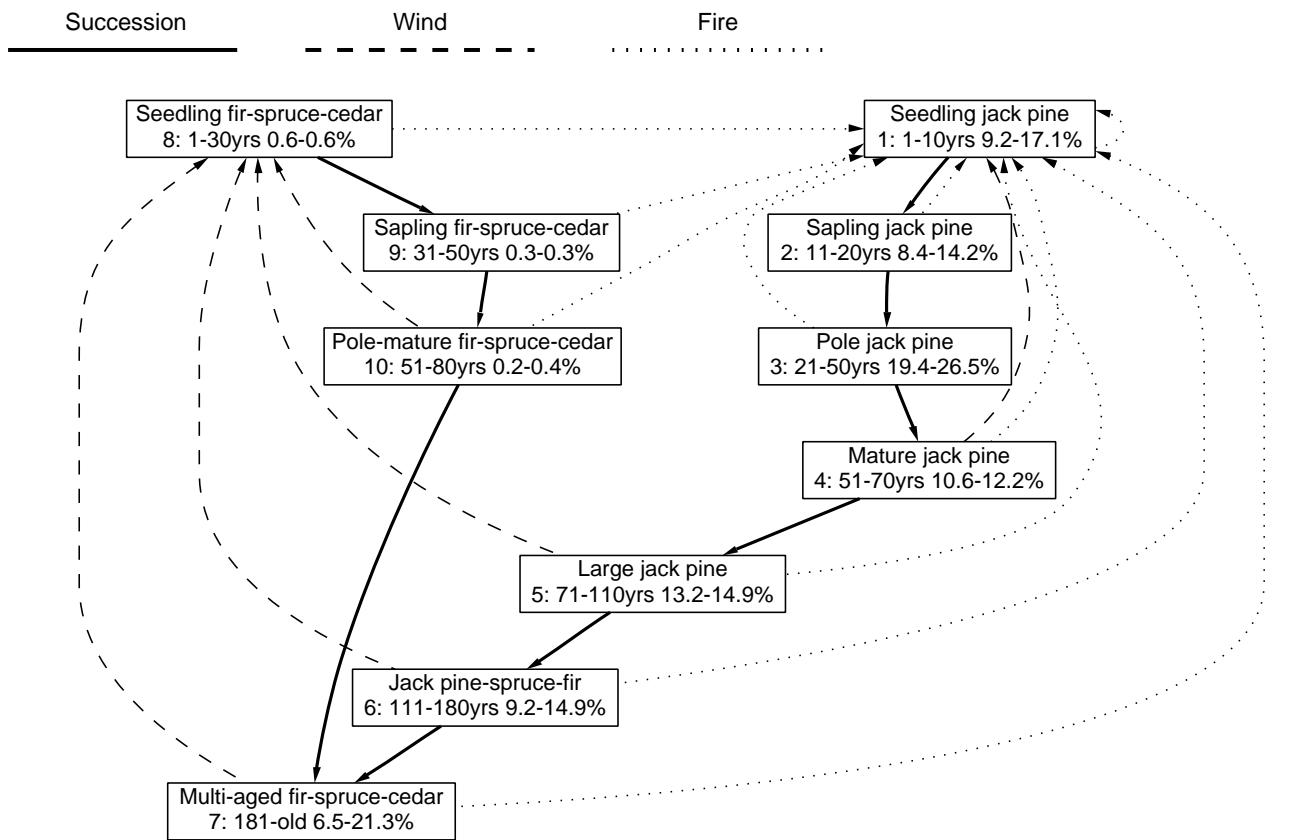
Age (years) from to		Breakdown of age class by current cover type						percent of age class ($\geq 10\%$ in bold)		
Current acres (thousands)		Balsam poplar						1		
Current % of type		Aspen						1		
RNV minimum % of type		Aspen-spruce-fir						1		
RNV maximum % of type		Aspen-birch						1		
		Paper birch						1		
		Paper birch-spruce-fir						1		
		Jack pine						1		
		Jack pine-hardwood						1		
		Spruce-fir						1		
		Spruce-fir-hardwood						1		
		Balsam fir						1		
		Balsam fir-hardwood						1		
		Red pine						1		
		Red pine-hardwood						1		
		White pine						1		
		White pine-spruce-fir						1		
		White pine-hardwood						1		
		White spruce						1		
		White spruce-hardwood						1		
		Northern hardwood						1		
		Lowland black spruce						1		
		Upland black spruce						1		
		Tamarack						1		
		Black ash						1		
		White cedar						1		
		Mixed swamp conifers						1		
		Cut over						1		

6: Mesic birch-aspen-spruce-fir Area breakdown

	Age (years) from to	1	11	21	31	41	51	61	71	81
Current acres (thousands)	10	20	30	40	50	60	70	80	old	
Current % of type	6.3	12.7	8.1	7	4.8	7.5	14	17	22.6	
RNV minimum % of type	4.6	6	4.8	3.5	2.6	4.9	3.6	2.4	47.1	
RNV maximum % of type	8.6	10.3	7.8	5.5	3.9	7.1	5	3.2	66.8	
Breakdown of age class by current cover type area (thousands of acres) ($\geq 10k$ in bold)										
Balsam poplar	0.6	1.4	3.5	5.4	0.3	3.4	1	1.4		
Aspen	28.1	56.8	31.8	16.4	16.5	22.3	21.1	17.4	17.9	
Aspen-spruce-fir	8	2.1	5.2	8.3	11.2	11.6	24.6	30	25.1	
Aspen-birch-spruce-fir	0.8	0.7	0.8	0.2	0.1	1.8	6	5.4		
Aspen-birch	0.2	0.1	1.2				0.2	0.6	1.3	
Paper birch	1.5	5	3.1	1.2	1.8	5.9	13.5	20	17.3	
Paper birch-spruce-fir	0.5	0.1	0.7		2.9	3.4	12	18.7	17.7	
Jack pine	2.5	2.9	0.6	0.4	0.5	0.5	0.8	5.3	5	
Jack pine-hardwood	0.5	0.7	1.8	0.2	0.2	0.2	0.9	0.7	1	
Spruce-fir	1.3	0.7	1	1.1	1.5	4	8.6	14.7	11.8	
Spruce-fir-hardwood	0.8	0.8	0.1	0.1			0.3	4.1	3.1	
Balsam fir	1.8	6.4	0.4	1.5	1.1	2.3	10.6	5.1	5.6	
Balsam fir-hardwood					5.6		4.5	2.5		
Red pine	1.8	7.6	1	0.2	0.1	0.1	0.6	0.2	2.7	
Red pine-spruce-fir	0.1	2.1	1.9	4.2	1.5	0.3	2.4	0.2	0.5	
Red pine-hardwood	0.7	0.1					0.1	0.1	0.9	
White pine	0.8					0.1	0.1	2.2		
White pine-spruce-fir										
White pine-hardwood	0.2					0.1	0.3	3.3		
White spruce	1.1	15.5	3.1	0.4	0.2	0.4	1.1	0.5	0.7	
White spruce-hardwood	0.5	1.5	7.1	8	1.8	0.5	1.1	0.7	2.4	
Northern hardwood	1.9	3.3	3.1	1.1	1	7.6	2.7	6.5	15.8	
Lowland black spruce	0.3	3.2	0.7	0.5	0.4	4.3	3.3	2.6	6.4	
Upland black spruce	0.3	0.6	0.6	0.4	0.7	2	2.7	4.1		
Tamarack	0.1	0.1	1.1			1	0.1	0.2		
Black ash		4.7	2.3		0.2	4.3	6.7	14.3		
Black ash-conifer								0.1		
White cedar										
Mixed swamp conifers	0.1	0.1	0.1	0.1	0.3	0.2	0.4	0.8	25.8	
Cut over	0.4	0.8	0.1			0.7	0.5	5.4		
Upland grass	0.1		0.1							
Lowland grass	0.1						0.3	0.1		
Upland brush	0.1						0.1	0.2		
Lowland brush	0.2	0.1						0.1		

Frellich type 7: Jack pine-black spruce

Disturbance interval (years) - Wind: 1000-2000 Fire: 50-100 Ground Fire: N/A



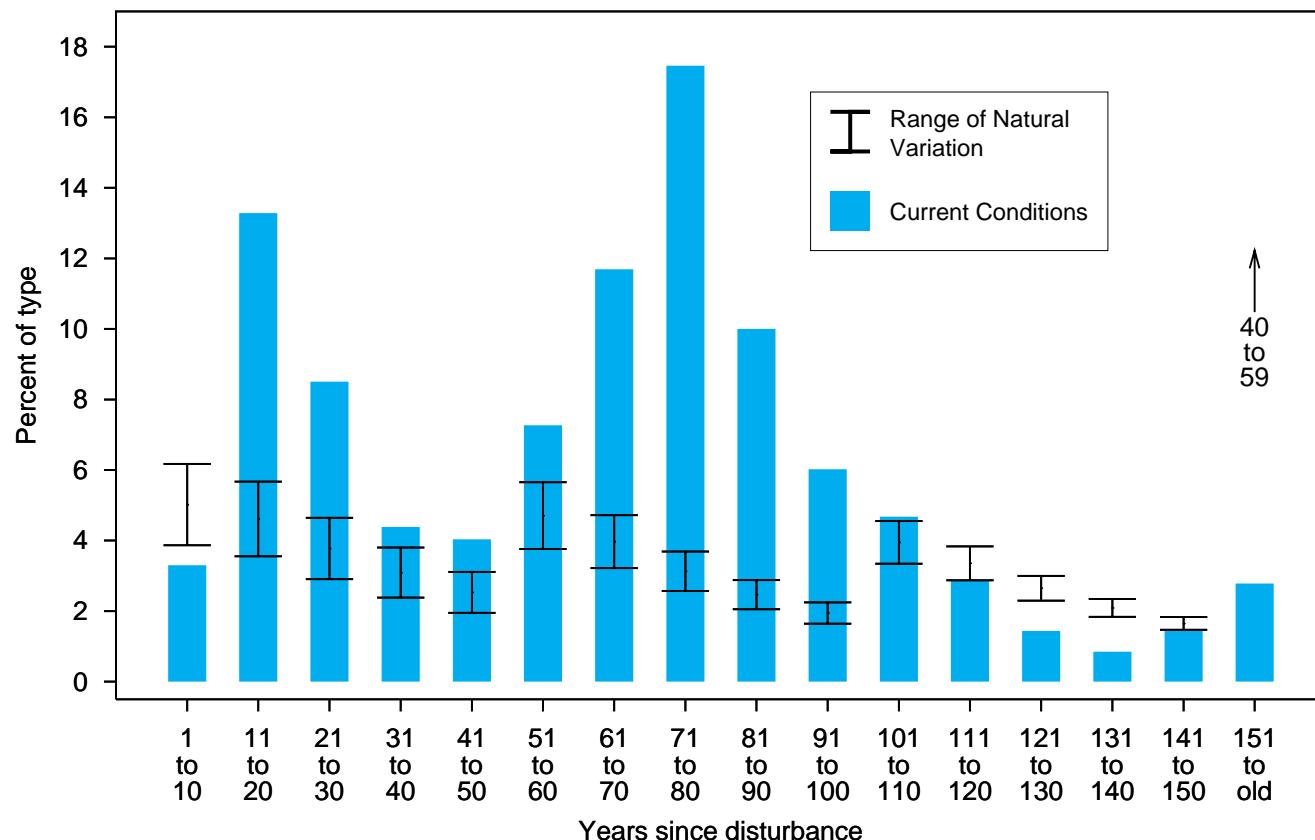
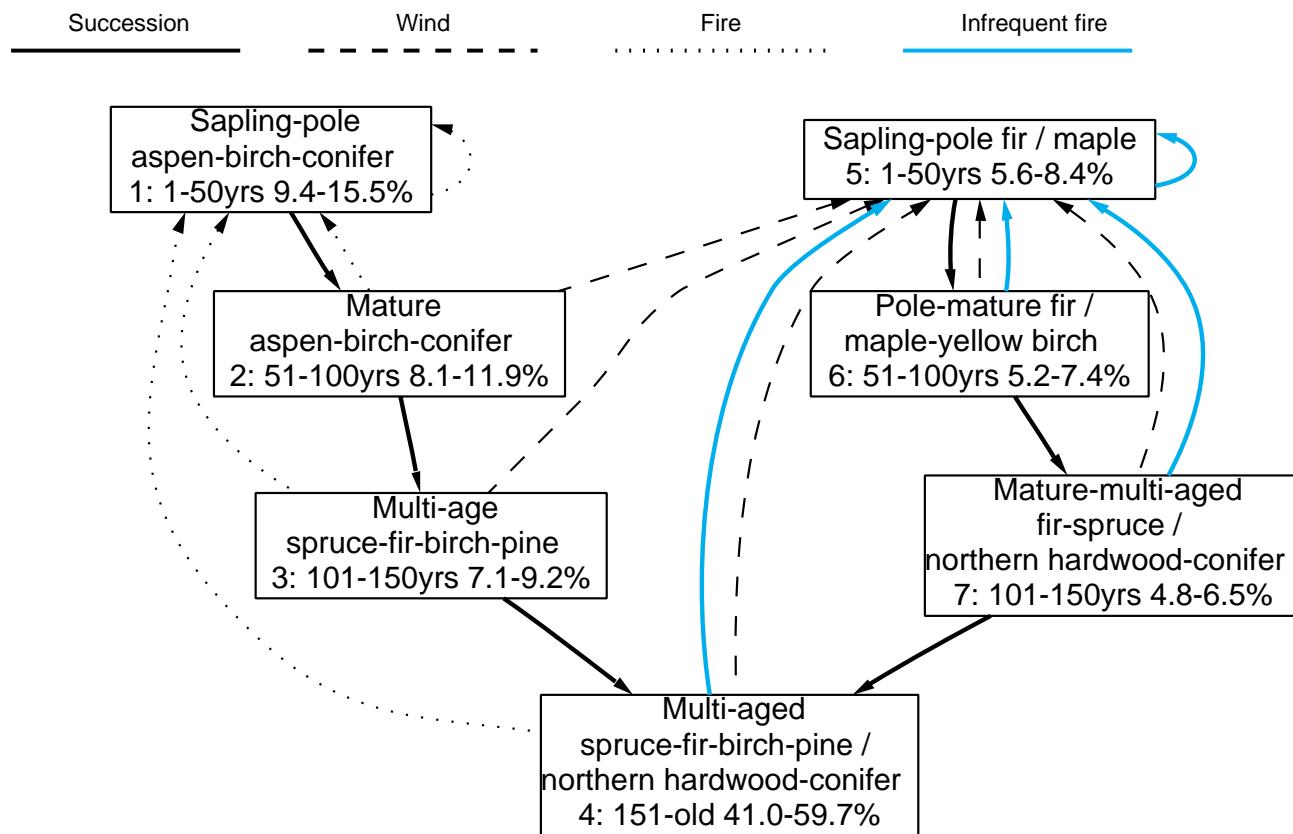
7: Jack pine-black spruce Percent cover breakdown

See also area breakdown

7: Jack pine-black spruce Area breakdown

Frellich type 9: Sugar Maple-Northern Hardwood

Disturbance interval (years) - Wind: 1000-2000 Fire: 200-400 Infrequent Fire: 600-1000



9: Northern Hardwood (MW) Percent cover breakdown See also area breakdown

9: Northern Hardwood (MW) Area breakdown

Age (years) from to	Breakdown of age class by current cover type area (thousands of acres) ($\geq 10\text{K}$ in bold)												151 old																							
	Current acres (thousands)	Current % of type	RNV minimum % of type	RNV maximum % of type	Balsam poplar	Aspen	Aspen-spruce-fir	Paper birch	Paper birch-spruce-fir	Oak	Jack pine	Jack pine-hardwood	Spruce-fir	Balsam fir	Balsam fir-hardwood	Red pine	Red pine-hardwood	White spruce	White spruce-hardwood	Northern hardwood	Lowland black spruce	Upland black spruce	Tamarack	Black ash	White cedar	Mixed swamp conifers	Cut over									
10	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	140	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10					
8	32	21	11	10	18	29	43	24	15	11	7	4	2	4	7	11	7	4	2	4	141	131	121	111	101	91	81	71	61	51	41	31	21	11	8	1
3.3	13.3	8.5	4.4	4	7.3	11.7	17.5	10	6	4.7	2.9	1.4	0.9	1.4	2.8	7	4	2	4	1.4	151	141	131	121	111	91	81	71	61	51	41	31	21	11	8	1
3.9	3.6	2.9	2.4	1.9	3.8	3.2	2.6	2.1	1.6	3.3	2.9	2.3	1.8	1.5	41	1.5	2.3	1.8	1.5	1.4	151	141	131	121	111	91	81	71	61	51	41	31	21	11	8	1
6.2	5.7	4.6	3.8	3.1	5.7	4.7	3.7	2.9	2.3	4.6	3.8	3	2.3	1.8	59.7	2.3	1.8	2.3	1.8	1.5	151	141	131	121	111	91	81	71	61	51	41	31	21	11	8	1