

November 2, 1979

TO: Nels I. Johnson, Regional Wildlife Biologist  
 FROM: Jerry Weinrich, Endangered Species/Wild Turkey Biologist  
 SUBJECT: Current and Projected Estimates of Kirtland's Warbler Nesting Habitat

Analysis of the stand data compiled by Mike Mang for the 78,000 acres of state owned land to be designated as Critical Habitat for the Kirtland's Warbler reveals that there will indeed be a significant decrease in acreage of habitable-aged jack pine available in the next 10 years. The following tabulations are for stands of 40 acres or more only since smaller stands are very rarely occupied by warblers (really, stands less than 80 acres are seldom used). "Occupiable-aged" is assumed to be from 10 to 20 years old for plantings and for regeneration following commercial harvest, and from 8 to 20 years old for wildfire areas. Although the total acreages are the most impressive, I have included acreages and locations for all such stands for future reference.

<u>County</u>	<u>Location</u>	<u>Apparently Occupiable 1979</u>	<u>Occupiable-Aged In 1984</u>	<u>Occupiable-Aged In 1989</u>
Clare	T20N,R5W, Secs 2 & 3	0	0	Possibly 100+
	T20N,R5W,S 8	40	40	0
	T20N,R5W,S 8	40	40	0
	Sub-total	80	80	100
Crawford	T28N,R1W, Secs 7 & 8	0	0	120
	T28N,R1W, Sec 10 & 15	41	41	41
	T28N,R1W,S 27	50	50	50
	T28N,R1W,S 5	170	0	0
	T28N,R1W,S 5	274	0	0
	T28N,R1W,S 6	31	0	0
	T28N,R1W,S 6	0	299	299
	T27N,R1W,S24	156	156	0
	T27N,R1W,S21&28	0	178	178
	T27N,R1W,S21	00	172	172
	T25N,R3W,S12	72	0	0
	T25N,R3W,S12	28	0	0
	T25N,R3W,S2	194	0	0
	T25N,R2W,S6 & 7	190	0	0
	T26N,R3W,S2	91	91	0
	T25N,R4W,S7&18	412	412	0
T27N,R4W,S18&19	216	0	0	
T27N,R4W,S30	354	354	0	
Sub-total		2279	1784	891

<u>County</u>	<u>Location</u>	<u>Apparently Occupiable 1979</u>	<u>Occupiable-Aged In 1984</u>	<u>Occupiable-Aged In 1989</u>
Kankaska	T25N, R5W, Secs. 13, 22, 23, 24, 25, 26½, 27	1679	1679	0
	T25N, R5W, S13	0	0	186
	T27N, R5W, S12	267	0	0
	T27N, R5W, S13	41	0	0
	T25N, R6W, S2 & 3	363 (mostly red pine)	363	363
	T25N, R6W, S17	0	68	68
	T25N, R6W, S20&21	0	179	179
	T25N, R6W, S15&21	0	111	111
	Sub-total	2350	2400	907
	Montmorency	T32N, R3E, S16	40	40
T32N, R2E, S21&22		162	162	162
T32N, R2E, S27		45	45	0
Sub-Total	247	247	162	
Presque Isle	T33N, R3E, S30	116	116	0
Ogemaw	T24N, R1E, S9	55	0	0
	T24N, R1E, S4	117	117	0
	T24N, R1E, S4	0	94	94
	T24N, R1E, S4	30	30	0
	T24N, R1E, S4	46	40	40
	T24N, R1E, S1	93	93	0
	T24N, R1E, S11	22	22	0
	T24N, R1E, S2&3	220	220	0
	T24N, R2E, S4	0	0	53
	T24N, R2E, S7 & T24N, R1E, S12	99	99	0
	T24N, R1E, S9	0	160	160
	T24N, R1E, S9	40	0	0
	T24N, R1E, S18	0	120	120
	T24N, R1E, S7	65	0	0
	T24N, R1E, S7	0	65	65
	T24N, R1E, S8	69	0	0
	T24N, R1E, S8	160	160	0
	T24N, R1E, S8	0	80	80
	T24N, R1E, S8	80	0	0
	T24N, R1E, S15	110	0	0
	T24N, R1E, S10	166	0	0
	T24N, R1E, S10	78	0	0
	T24N, R1E, S10	64	64	0
	T24N, R1E, S23	15	0	0
	T24N, R1E, S13	30	30	0
	T24N, R1E, S23	62	0	0
	T24N, R1E, S13 & T24N, R2E, S18	287	287	0
	T24N, R1E, S17	0	160	160
	T24N, R1E, S21	0	0	30

<u>County</u>	<u>Location</u>	<u>Apparently Occupiable 1979</u>	<u>Occupiable-Aged In 1984</u>	<u>Occupiable-Aged In 1989</u>	
Ogemaw - Cont'd.	T24N,R1E,S22	160	0	0	
	T24N,R1E,S22	0	100	100	
	T24N,R1E,S21	41	0	0	
	T24N,R1E,S21	0	0	100	
	T24N,R2E,S17	66	0	0	
	T24N,R1E,S24 &				
	T24N,R2E,S19	54	54	0	
	T24N,R2E,S19	220	220	0	
	T24N,R2E,S19	227	227	0	
	T24N,R1E,S29	43	0	0	
	T24N,R1E,S20	63	0	0	
	T24N,R1E,S27	0	0	100	
	T24N,R1E,S35	45	45	45	
	T24N,R1E,S26 & 35	0	0	150	
	T24N,R2E,S30	54	54	0	
	T24N,R2E,S29 & 30	241	241	0	
	T24N,R2E,S32	129	129	0	
	T24N,R2E,S32	144	144	0	
	T24N,R1E,S31 &				
	T23N,R1E,S6	299	299	0	
	T23N,R1E,S5	80	80	0	
	T23N,R1E,S18	112	112	0	
	T23N,R1E,S5	154	0	0	
	T23N,R1E,S16	80	0	0	
	T23N,R1E,S16	0	80	80	
	T23N,R1E,S9	0	210	210	
	T23N,R1E,S4	243	0	0	
	T23N,R1E,S9	0	80	80	
	T23N,R1E,S20	0	80	80	
	T23N,R1E,S28	0	0	120+	
	T23N,R1E,S30	58	0	0	
	Sub-Total		4421	3996	1867
	Oscoda	T28N,R1E,S30	0	100	100
T28N,R1E,S20		95	0	0	
T27N,R2E,S7 & 18		244	244	0	
T27N,R1E,S12		43	43	0	
T27N,R1E,S13		211	211	0	
T27N,R1E,S13		22	0	0	
T27N,R1E,S13		196	196	0	
T27N,R1E,S14		29	29	0	
T27N,R1E,S32 & 33		186	186	0	
Sub-Total		1026	1009	100	
Otsego	T29N,R1W,S21	0	46	46	
	T29N,R1W,S21	0	59	59	
	T29N,R1W,S28	0	40	40	
	T29N,R1W,S29	0	188	188	
	T29N,R1W,S32	0	46	46	
Sub-Total		0	379	379	

County	Location	Apparently Occupiable 1979	Occupiable-Aged In 1984	Occupiable-Aged In 1989
Roscommon	T23N, R1W, S11	35	0	0
	T23N, R1W, S2 & 11	103	103	0
	T23N, R1W, S2	34	34	0
	T23N, R1W, S12	52	52	0
	T23N, R1W, S1	254	254	0
	T23N, R1W, S1	20	20	0
	T23N, R1W, S1	0	0	212
Sub-Total		498	463	212
Grand Total		11,017	10,474	4,618

The major conclusion to be drawn from the preceding is that potential habitat on these state-owned lands will decrease by nearly 60 per cent in the next ten years. Since it takes nearly ten years to create habitat of the age required for nesting by planting, this decrease will occur in spite of any increased effort we might accomplish in the immediate future, but such an increased effort is most necessary if the decline in available habitat is to be reversed - and, the sooner the better.

The impending shortage of nesting habitat is undoubtedly even more severe than the preceding tabulation suggests. Of the total of 11,017 acres of "apparently - occupiable habitat in 1979, only the following (about 7000 A) was actually used by warblers in 1979 (acreage of whole stands is listed even though only a part of the stand was occupied - again, maximum estimates):

County	Location	Acreage of Stand	Acreage Usable in 1984
Crawford	T28N, R1W, S5	444	0
	T27N, R1W, S24	156	156
	T25N, R2W, S6 & 7 &		
	T25N, R3W, S12	220	0
	T26N, R3W, S2	91	91
Sub-Total		911	247
Kankaska-Crawford	T25N, R5W, S13, 22, 23, 24, 25, 26 & 27 and T25N, R4W, S7 & 8 (Fletcher Burn)	2091	2091
	Sub-Total	2091	2091
Ogemaw	T24N, R1E, S2, 3, 10	298	220
	T24N, R1E, S8	229	160
	T24N, R1E, S22	80	0
	T24N, R1E, S23	77	0
	T24N, R2E, S18, 19, 20, 29, 30, 32 (Damon Burn) &		
	T24N, R1E, S13, 24	1386	1386
Sub-Total		2070	1766

County	Location	Acreage of Stand	Acreage Usable in 1984
Oscoda	T27N, R1E, S12, 13, 14 & T27N, R2E, S7 & 18 (Muskrat Lake Burn)	701	701
	T27N, R1E, S32, 33	<u>186</u>	<u>186</u>
Sub-Total		887	887
Roscommon-Ogemaw	T23N, R1W, S1, 2, 11, 12 & T24N, R1E, S31 & T23N, R1E, S5, 6 (St. Helen Burn)	842	842
Sub-Total		<u>842</u>	<u>842</u>
Grand Total		6,801	5,833

So, even though there exists about 11,000 acres of "occupiable-aged" jack pine type, only somewhat less than 7000 acres (62%) of this was occupied in 1979. It might be suggested that this was due primarily to a low population of warblers available to occupy this habitat but I think rather it reflects more the quality of that habitat. I think the fact that 71.4% (91 of 126) of the warblers found on this 11,000+ acres were located in four large wildfire areas (St. Helen, Damon, Muskrat Lake and Fletcher) constituting only 45.6% of the 11,000+ total suggests that these areas are being selected for occupation. Note, too, that many of the stands that are "apparently-occupiable" are of rather small acreage, some have unusual ground covers, many are quite lightly stocked, and many do not possess the uniformity in height normally preferred by warblers.

Note, too, that all of the currently - occupied habitat will be over 20 years of age in 10 years. The following is a list of parcels which will reach occupiable age within the next 10 years:

County	Location	Acres Occupiable In 1984	Acres Occupiable In 1989
Clare	T20N, R5W, S2, 3	0	*100
Crawford	T28N, R1W, S6	299	299
	T27N, R1W, S21, 28	178	178
	T27N, R1W, S21	172	172
Kalkaska	T25N, R6W, S17	68	68
	T25N, R6W, S20, 21	179	179
	T25N, R6W, S15, 21	111	111
	T25N, R5W, S13	0	*186
Ogemaw	T24N, R1E, S4	94	94
	T24N, R2E, S4	0	*53
	T24N, R1E, S9	160	160
	T24N, R1E, S18	120	120
	T24N, R1E, S7	65	65
	T24N, R1E, S8	80	80
	T24N, R1E, S17	160	160
	T24N, R1E, S21	0	*130
	T24N, R1E, S22	100	100
	T24N, R1E, S27	0	*100
	T24N, R1E, S26, 35	0	*150
	T23N, R1E, S16	80	80

Nels I. Johnson

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<u>County</u>	<u>Location</u>	<u>Acres Occupiable In 1984</u>	<u>Acres Occupiable In 1989</u>
Ogeraw Cont'd.	T23N,R1E,S9	210	210
	T23N,R1E,S19	80	80
	T23N,R1E,S20	80	80
	T23N,R1E,S28	0	*120
Oscoda	T28N,R1E,S30	100	100
Otsego	T29N,R1W,S21	46	46
	T29N,R1W,S21	59	59
	T29N,R1W,S28	40	40
	T29N,R1W,S29	188	188
	T29N,R1W,S32	46	46
Roscommon	T23N,R1W,S1	0	*212
Total		<u>2,715</u>	<u>3,766</u>

Of the 3766 acres of new habitat that will be available in 1989, only those with asterisks (1051 acres) have been regenerated within the last three years.

These tabulations point to a severe decline in the amount of available habitat and for the warbler to survive, this decline must be reversed as soon as possible. The need for an increased, large-scale, cooperative planting effort for the next two - three years is apparent. At the same time, a similar large-scale effort is required to improve the feasibility of regenerating jack pine naturally by seed tree burning and/or seeding.

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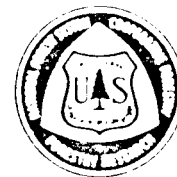
Mio Ranger District

REPLY TO: 2630 Wildlife Habitat

December 3, 1979

SUBJECT: Current and Projected Estimates of Kirtland's  
Warbler Nesting Habitat

TO: Horace LaBumbard  
Timber-Wildlife Staff Officer



An analysis has been made of the 53,000 acres of National Forest land to be designated as Critical Habitat for the Kirtland's Warbler. Stand data were examined to determine how much occupiable Kirtland's Warbler Habitat exists at the present time, how much will exist five years from now (1984), and ten years from now (1989).

In making this analysis, the following criteria were utilized:

- (1) Stands 40 acres or larger were considered (actually the Kirtland's rarely occupies a stand less than 80 acres in size).
- (2) "Occupiable-aged" is assumed to be from 10 to 20 years old for planting and for regeneration following commercial harvest, and 8 to 20 years for wildfire areas.
- (3) Only those stands that have been regenerated to date (1979) were included in the analysis.
- (4) Only lands to be designated as Critical Habitat were evaluated, with the exception of a few small stands (approximately 150 acres) that were occupied by 2 singing males in areas excluded from proposed Critical Habitat.

The following list identifies occupiable tracts, the regeneration technique utilized, and the time period when they should be suitable for occupancy. Refer to the draft Kirtland's Warbler Habitat Management Plan for information on the relative location of the Areas, Units, and Blocks.

COUNTY	KIRTLANDS MARBLER HANT AREA	UNIT	BLOCK	REGENERATION TECH 'E	APPARENTLY OCCUPIABLE NOW (1979)	OCCUPIABLE AGED IN 1984	OCCUPIABLE AC IN
Wood	McKinley	Byron Lake	V	Wildfire (1976)	-0-	128	128
	Pine River	Unit IV	I	Natural Regen.- Seed Tree (1978)	-0-	-0-	193
		Unit V	I	Natural Regen.- Seed Tree (1977)	-0-	-0-	245
				Sub-total	-0-	128	566
Wood	Eldorado	Rock Cemetery Hunter's Lake	V I	Planted J.P. (1978-79) Planted J.P. (1978)	-0- -0-	-0- -0-	121 147
	Pere Cheney	Chase Bridge	IV	Planted R.P. (1961)	45*	-0-	-0-
				Sub-total	45	-0-	268
Wood	Pine River	Unit X	V	Natural Regen.- Seed Tree (1978)	-0-	-0-	130
	Tawas	Buck Creek	III	Natural Regen.- Roller Chopped (1971)	172	172	172
			IV	Planted R.P. and Natural J.P. (1967)	179	179	-0-
			V	Natural Regen. (1972)	192	192	192
		Monument Road	V	Planted J.P. (1976)	-0-	-0-	56
		Silver Creek	I	Planted J.P.	-0-	-0-	67
			III	Natural Regen.- Roller Chopped and Fill-in Planted (1978)	-0-	-0-	78
					-0-	-0-	162



COUNTY	KIRTLANDS WARBLER HABITAT AREA	UNIT	BLOCK	REGISTRATION TECI	REGENERATION E	APPARENTLY OCCUPIABLE NOW (1979)	OCCUPIABLE AGED IN 1984	OCCUPIABLE ( ) IN 1989
0	Tawas	Silver Creek	IV	Planted J.P. (1977)		-0-	-0-	66
			V	Planted J.P. (1979)		-0-	-0-	266
		Outside' Critical Habitat		Planted R.P. and Natural J.P. (1967)		75*	75	-0-
		Vaughn Creek	I	Natural Regen.- Seed Tree (1979)		-0-	-0-	131
			I	Natural Regen- Roller Chopped (1968)		92	92	-0-
			III	Planted R.P. and Natural J.P. (1967)		143	143	-0-
			IV	Natural Regen.- Roller Chopped (1969)		142	142	142
			V	Natural Regen.- Seed Tree (1979)		-0-	-0-	194
					Sub-total	995	995	1,656
ada	Big Creek	Briggs Road	I	Planted J.P. (1976)		-0-	213	213
		Outside Critical Habitat (Sec.30)		Natural J.P. (Powerline TSI Area)		80*	80	-0-
	Mack Lake	Crane Lake	N $\frac{1}{2}$ of Sec.5 IV	Natural J.P. with Several Stands of Planted R.P.		250	250	-0-
		Mack Lake	III (Sec.12)	Planted R.P.(1957)		170*	-0-	-0-
			VIII (Sec.2)	Natural Regen.-Seed Tree (1966)		239*	239	-0-
			IX (Sec.3)	Planted J.P. and R.P. (1968)		499*	499	-0-
			X (Sec.4)	Natural Regen.-Roller Chopped-Fill-in Plant 1979		-0-	-0-	420

COUNTY	KIR'S WARBLER HABITAT AREA	UNIT	BLOCK	REGISTRATION TECHNIQUE	APPARENTLY OCCUPIABLE NOW (1979)	OCCUPIABLE AGED IN 1984	OCCUPIABLE IN 1984
Podia	Mckinley	Blockhouse	--	Roller Chopped-Planted R.P. (1972)	-0-	355	355
			--	Roller Chopped-Planted R.P. (1974)	-0-	127	127
			--	Roller Chopped-Planted R.P. (1976)	-0-	46	46
			--	Natural Regen.-Roller Chopped (1970)	673*	673	673
		Comins Flat	V	Planted J.P. (1978)	-0-	174	174
		Game and Forest	I	Natural Regen.-Roller Chopped (1969)	113	113	113
			II	Natural Regen.-Recent Overstory Removal (1975)	109*	109	109
			III	Natural Regen.-Recent Overstory Removal (1975)	75*	75	75
			III	Planted J.P. (1975)	-0-	99	99
			IV	Roller Chopped Planted R.P. (1974)	-0-	79	79
			V	Roller Chopped Planted J.P. (1975)	-0-	180	180
		Reed Road	I	Roller Chopped Planted R.P. (1968)	242	242	-0-
			II	Roller Chopped Planted R.P. (1972)	200*	200	200
			II	Roller Chopped Planted R.P. (1968)	103	103	-0-

CITY	KIRTLANDS WARBLER UNIT	BLOCK	REGISTRATION	APPARENTLY OCCUPIABLE NOW (1979)	OCCUPIABLE AGED IN 1984	OCCUPIABLE IN 1989
		III	Roller Chopped Planted R.P. (1969)	-0-	171	171
		III	Roller Chopped Planted R.P. (1968)	56	56	-0-
		IV	Roller Chopped Planted R.P. (1973)	-0-	161	161
	McKinley	V	Roller Chopped Planted R.P. (1974)	-0-	153	153
		V	Natural Regen. - J.P.	88	88	88
			Sub-total	2,897	4,265	3,436
			Grand-total	3,937	5,388	5,926

\*Habitat that has been occupied by Warbler's in the past 10 years.

## ANALYSIS

The Kirtland's Warbler Recovery Plan and Habitat Management Plan prescribes management of the jack pine type on a 45 to 50 year rotation. The goal of a sustained, even flow of habitat for the future has been identified. Ideally, we should have 20% of our Warbler Habitat in each 10 year age class. On National Forest land, we should eventually have 10,600 acres in each 10 year age class.

Assuming the occupiable age of Warbler Habitat represents the 10-20 year age class, we presently have 3,937 acres of occupiable habitat (37% of our goal). By 1984, we will have reached 51% of our goal and by 1989, 56% of our goal.

The data above does not include a substantial acreage of habitat that has been recently, or soon will be, harvested. As this habitat becomes regenerated, I am confident that we will continue to improve on the age class regulation goals.

The attached letter (written by Jerry Weinrich, dated November 2, 1979) provides an analysis of Warbler Habitat conditions on state lands. As shown in the data, there will be a drastic reduction in suitable habitat during the next 10 years (dropping from 11,017 acres to 4,618 acres). Unsuccessful planting and natural regeneration of jack pine was identified as a serious problem area. The need for a large scale cooperative planting effort was also emphasized.

Jerry stressed quality of habitat as a crucial factor for occupancy by the Kirtland's. There appears to be a preference exhibited by the bird for habitat created by wildfire. Over 70% of the nesting Warblers (on State land) are situated on only 45% of the occupiable habitat available. This 45% is habitat that was created as a result of wildfire.

The Warbler's very selective nature can also be observed on National Forest lands. Of the 3,937 acres identified as occupiable, only about 29% (1,150 acres) of this habitat is presently utilized. This averages out to one pair for every 37 acres of occupied habitat. Considering all of the occupiable habitat available on National Forest lands, this average would decrease to one pair for every 127 acres.

Excluding the Pere Cheney Warbler Unit (part of a proposed land exchange with the State), there were 31 nesting pairs on National Forest lands in 1979. Presently there is no occupiable Warbler habitat, that can be attributed to wildfire, on National Forest lands. Our birds are mostly nesting in areas that are a result of a planned seed tree burn (1966) or planting (1968) after burning (Sections 2 and 3 - Mack Lake Unit). Both of these areas had excellent survival of regeneration. Preliminary findings indicate that the denser portions of the occupied habitat in Section 2 (our best habitat at the present time) have an average density in the neighborhood of 2,900 stems/acre. Upon completion of John Probst's research, we should have better knowledge concerning optimal stem density in Warbler Habitat. It would appear, however, that our present prescribed planting format of 1,200 trees/acre (excluding openings) may be on the low side of the Warbler's level of acceptance.

One factor that is presently boosting the amount of occupiable habitat now (and during the next 10 years) is the 2,800 acre McKinley clearcut. I have listed most of it as occupiable now (1979) and almost all of it by 1984. The additional acreage associated with this habitat could be misleading. The area was cut in the early to middle 1960's. Most of it was then roller chopped for natural regeneration. The resulting regeneration was sparse and a substantial amount of the acreage was then planted to red pine in the early 1970's. Presently there are dense pockets of natural jack pine regeneration (a result of roller chopping) that appear to be ideal for Warblers. Most of it, however, still appears to be too sparse for Warbler occupancy. There was, however, a moment of encouragement in 1976, when six pairs occupied denser portions of the McKinley area. Unfortunately, there has been little to no use since then. Personally, I feel that the denser natural regeneration areas have a good chance for sustained occupancy but have serious doubts concerning the use of the relatively sparse planted areas by Warblers. Time will tell. In conclusion, the data on occupiable habitat, now, and during the next 10 years, may be inflated by as much as 1,500-2,000 acres by including questionable portions of the McKinley clearcut.

#### APPARENT TRENDS

The previous data indicate some serious trends including;

- (1) Most of the present "prime habitat", that has a wildfire origin, will have grown out of the suitable size range for Warbler occupancy by 1989.
- (2) Warblers appear to be very discriminant in use of habitat from a non-wildfire origin.
- (3) A statewide drop in occupiable habitat from 14,954 acres (1979) to 10,544 acres is predicted by 1984.
- (4) Both the State D.N.R. and Forest Service appear to be having problems in recent years, developing consistent techniques for assuring high quality habitat through natural and artificial regeneration of jack pine.
- (5) Without quality control during the early stages of habitat development, a substantial portion of out habitat managed for Warblers may be unsuitable for occupancy.

#### PROBLEM AREAS

In light of the above trends, the following problem areas need to be addressed;

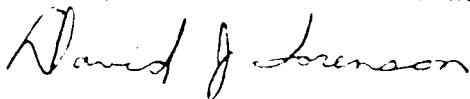
- I. Prescribed burning - The timely completion of prescribed burning continues to be a problem and in some cases has held up our planting efforts. Most of our problems seem to stem from a shortage of suitable burning weather and

inadequate quantities of fuels left within prescribed burning areas. All three Districts have indicated they will continue to place a high priority designation on prescribed burning.

- II. Artificial Regeneration - In general, during the past three years we have experienced only fair (at best) survival in our jack pine plantations. Some plantations have been almost a complete failure. Very few of our recent plantations meet the 75-80% survival requirements established for suitable Kirtland's Warbler habitat. We need to keep close tabs on these plantations and prescribe fill-in planting (if necessary) before there is a significant difference in size between the original planted stock and the fill-in stock. Concerning those plantations that appear to be complete failures, we need to get back and replant them as soon as possible. I believe these planting activities should take priority over any new planting that is being planned in non-Warbler habitat.
- III. Natural Regeneration - I have only guarded optimism (at best) in regard to our recent efforts to attain natural regeneration of jack pine. Although it may be too early to predict, the three seed tree burns on the Harrisville District (burned in 1977 and 1978) show very little sign of regeneration to date. We should watch these areas closely, and if it appears there is little chance of achieving the desired stocking levels, these stands should be planted.

Obviously, with planting costs over \$100.00/acre, future Warbler habitat management will lean heavily toward natural regeneration of jack pine. Presently several of the Districts are attempting some limited experimentation on their own. It seems that we should get together and attempt some sort of combined systematic approach to the problem. The State D.N.R. is also experimenting and perhaps we can learn something from our combined successes and failures.

My own personal observations indicate that most wildfire areas get more than adequate regeneration. This is probably due to an abundance of seed and a desirable micro-climate, created by the standing snags, for survival of the young seedlings. With artificial regeneration costs so high, we can afford to leave additional volume as a seed source (we presently prescribe 20-25 trees/acre). I guess the question is; "How much volume do we need to leave in order to be assured of adequate regeneration?" Perhaps this is an avenue we should investigate further.



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