Appendix C – Examples of SBK Continous Forest Inventory (CFI) Data

Total Volume Summary over all Types - Thousands of Board Feet
Forest So. Berkshire 2000 41306.8 Acres. Based on 250. Samples

Species or Species Group	Grade 1	Grade 2	Grade 3	Grade 4	Gro Stk	Rgh Cull	Rot Cull	Total	%
White pine	1095.076	10816.813	18863.379	41496.867				72272.117	16.07
Hemlock				71538.313				71538.313	15.91
Spruce/Fir				12189.438				12189.438	2.71
Pitch pine				35.061				35.061	0.01
Red pine				1262.237				1262.237	0.28
Other Softwood				197.053				197.053	0.04
Sugar maple	4823.256	5981.072	10269.471	5538.818				26612.617	5.92
Red maple	5711.706	6652.808	18937.324	14633.076				45934.910	10.22
N.Red oak	44531.051	36320.070	33652.895	9182.930				123686.945	27.51
Black oak		1004.317	265.700	321.860				1591.877	0.35
White oaks	169.988	1143.765	1474.626	432.461				3220.839	0.72
Yellow birch	712.372	2529.151	3468.554	2091.210				8801.287	1.96
Black birch	688.407	2246.981	3038.003	1294.874				7268.266	1.62
White birch	225.273	659.004	3107.483	1655.864				5647.625	1.26
Beech	473.211	319.700	4541.712	10018.498				15353.120	3.41
White ash	11994.316	7624.538	8297.035	1899.705				29815.594	6.63
Poplar/aspen	805.284	708.950	1107.559	353.525				2975.318	0.66
Black cherry	2889.159	4990.621	6677.610	5572.139				20129.529	4.48
Other hardwoods		512.674	295.874	328.925				1137.474	0.25
Totals	74119.102	81510.477	113997.234	180042.844	0.000	0.000	0.000	449669.531	
Percent	16.5	18.1	25.4	40.0	0.0	0.0	0.0		

Total Volume Summary over all Types - Hundreds of Cubic Feet
Forest So. Berkshire 2000 41306.8 Acres. Based on 250. Samples

Species or	Grade 1	Grade 2	Grade 3	Grade 4	Gro Stk	Rgh Cull	Rot Cull	Total	%

Species Group									
White pine	1459.84	13368.27	26168.49	58031.33	6580.57	1429.85	2551.98	109590.34	9.87
Hemlock				126263.16	35287.01	1307.36	15593.53	178451.13	16.07
Spruce/Fir				23485.21	9840.74	9.63	168.61	33504.21	3.02
Pitch pine				65.93	337.24	140.79		543.95	0.05
Red pine				1757.02			66.57	1823.59	0.16
Other Softwood				481.44	375.16	19.77		876.37	0.08
Sugar maple	7649.01	10985.89	19763.89	11145.63	20933.31	434.92	5945.43	76858.07	6.92
Red maple	9390.48	12074.25	36825.77	29510.47	47255.03	2908.31	22308.73	160273.06	14.43
N.Red oak	63728.20	57036.95	57719.48	16610.47	36217.02	5304.19	8266.30	244882.61	22.05
Black oak		1397.51	523.83	594.06	626.22	105.85		3247.46	0.29
White oaks	313.00	1835.36	2715.56	936.95	3197.98	1989.14	207.35	11195.34	1.01
Yellow birch	1577.74	5022.99	7177.05	4406.32	11315.27	999.33	5276.92	35775.62	3.22
Black birch	1393.96	4250.03	6592.50	2906.98	13375.79	240.70	1747.35	30507.32	2.75
White birch	370.93	1337.31	6985.59	4056.07	12280.11	483.25	3010.84	28524.09	2.57
Beech	703.23	554.31	7749.35	19201.18	14630.00	2609.81	12422.99	57870.86	5.21
White ash	16881.48	12184.74	14506.79	3793.82	11705.85	50.37	5422.66	64545.71	5.81
Poplar/aspen	1140.95	1119.15	2152.97	842.62	1007.78		594.49	6857.96	0.62
Black cherry	4495.47	9652.73	13585.65	10805.99	9738.38	1757.91	6187.72	56223.86	5.06
Other hardwoods		988.87	699.97	755.23	3027.81	596.07	3116.64	9184.57	0.83
Totals	109104.29	131808.36	203166.89	315649.91	237731.25	20387.24	92888.11	1110736.25	
Percent	9.8	11.9	18.3	28.4	21.4	1.8	8.4		

Coarse Woody Debris - Total Oven-dry Tons Over All Types by Status Class and Diameter Class

Forest So. Berkshire 2000 41306.8 Acres. Based on 250. Samples. All Species

	Live Trees		Standing Dead Trees 3-5			Down Dead Trees 6-8		Total Dead
	Status 1 & 2	Status 3	Status 4	Status 5	Status 6	Status 7	Status 8	Status 3 thru 8
		Dead	Dead partially	Dead	Dead down	Dead,down partially	Dead down	
Diam Class	Number Tons	live Number Tons	Sound Number Tons	decayed Number Tons	decayed Number Tons	Sound Number Tons	decayed Number Tons	decayed Number Tons
4	461.	13.	13.	362.	68.	775.	2080.	3311.
6	80911.	2338.	4918.	4934.	132.	3503.	6602.	22428.
8	159363.	3014.	7175.	8852.	206.	4820.	9119.	33186.
10	247848.	3263.	9056.	8437.	482.	6311.	8219.	35768.
12	309915.	2780.	7189.	8445.	1060.	5156.	8621.	33252.
14	346001.	1815.	7423.	5148.	1323.	3677.	17248.	36634.
16	299934.	1098.	4896.	4278.	2893.	3432.	8218.	24816.
18	259445.	2016.	5081.	4314.	550.	3187.	4191.	19338.
20	167408.	1093.	3647.	3279.	1620.	603.	1904.	12148.
22	125029.		1269.	1836.		942.	3793.	7840.
24	63564.	1009.	2373.	981.			212.	4575.
26	50652.	1521.	4681.				263.	6465.
28	36372.		494.	1817.			605.	2916.
30	29134.					1582.		1582.
32	10188.		4016.					4016.
34	9616.							
36	20845.							
Totals	2216686.	19960.	62230.	52685.	8334.	33989.	71076.	248275.

Coarse Woody Debris - Total Hundreds of Cubic Feet over All Types by Status Class and Diameter Class

Forst So. Berkshire 2000 41306.8 Acres. Based on 250. Samples. ALL Species

	Live Trees	Standing Dead Trees 3-5			Down Dead Trees 6-8			Total Dead
	Status 1 & 2	Status 3	Status 4	Status 5	Status 6	Status 7	Status 8	Status 3
	live	Dead Sound	Dead partially decayed	Dead decayed	Dead down Sound	Dead,down partially decayed	Dead down partially decayed	Dead thru 8
Diam Class	Number CCF	Number CCF	Number CCF	Number CCF	Number CCF	Number CCF	Number CCF	Number CCF
4	218.77	6.55	6.49	189.69	35.92	438.32	1137.40	1814.37
6	41949.28	1305.43	2716.02	2756.69	65.36	1940.34	3639.14	12422.98
8	84198.49	1801.05	4304.50	5114.88	135.08	2823.89	5316.96	19496.36
10	128135.88	1849.72	5252.70	5059.69	273.49	3571.96	4956.98	20964.54
12	159324.00	1671.72	4300.40	5110.51	559.37	3019.17	4954.01	19615.17
14	172031.03	1053.96	4548.60	3011.17	679.00	2238.23	8917.45	20448.40
16	148435.38	544.31	3307.55	2811.48	1493.17	1898.94	4226.64	14282.10
18	126836.13	1066.92	3202.54	2771.35	313.57	1933.24	2336.52	11624.14
20	82031.93	567.79	2615.42	2205.27	1049.27	460.66	1099.63	7998.05
22	60757.27		1015.22	1222.44		696.68	2237.89	5172.23
24	30418.57	738.74	1731.76	686.36			178.89	3335.75
26	24777.79	854.21	2860.47				233.84	3948.52
28	17610.88		439.95	1011.97			522.07	1974.00
30	14244.52					1158.29		1158.29
32	5237.51		2682.06					2682.06
34	4917.42							
36	9611.14							
Totals	1110736.25	11460.40	38983.68	31951.51	4604.23	20179.71	39757.42	146936.97

Coarse Woody Debris - Total Trees Over All Types by Status Class and Diameter Class

Forest So. Berkshire 2000 41306.8 Acres. Based on 250. Samples. All Species

Live Trees	Standing Dead Trees 3-5			Down Dead Trees 6-8			Total Dead
Status 1 & 2	Status 3	Status 4	Status 5	Status 6	Status 7	Status 8	Status 3 thru 8
live	Dead Sound	Dead partially decayed	Dead decayed	down Sound	Dead,down partially decayed	Dead down decayed	
Diam Class	Number Trees	Number Trees	Number Trees	Number Trees	Number Trees	Number Trees	Number Trees	Number Trees
4	18175.	826.	826.	18175.	2478.	33045.	103267.	158618.
6	1905903.	56177.	121443.	133008.	4131.	74352.	190836.	579947.
8	1534140.	34698.	80962.	114833.	2478.	53699.	131355.	418025.
10	1244164.	19001.	53699.	65265.	3305.	36350.	70221.	247841.
12	964103.	10740.	28915.	39655.	3305.	19827.	42959.	145400.
14	711304.	4957.	20654.	17349.	2478.	10740.	43785.	99962.
16	456028.	1652.	12392.	12392.	4131.	6609.	15696.	52873.
18	298235.	2478.	8261.	8261.	826.	4957.	8261.	33045.
20	152009.	826.	6609.	5783.	1652.	826.	4131.	19827.
22	90049.		2478.	2478.		1652.	7435.	14044.
24	38002.	826.	2478.	826.			826.	4957.
26	25610.	826.	3305.				826.	4957.
28	14870.		826.	826.			1652.	3305.
30	10740.					826.		826.
32	3305.		1652.					1652.
34	2478.							
36	4957.							
Totals	7474073.	133008.	344501.	418851.	24784.	242884.	621251.	1785278.

Management Potential by Type Thousands of Board Feet (MBF)
Forest So. Berkshire 2000 41306.8 Acres. Based on 250. Samples

Type	Potential	Av/Ac	%	Acceptable	Av/Ac	%	Unacceptble	Av/Ac	%	Totals	Av/Ac
WP/P/BCD	0.000 (0.000)	0.00		5496.072 (5.544)	66.86		2724.376 (2.748)	33.14		8220.447 (8.292)	
WP/S/BCD	1309.370 (0.566)	2.43		28751.412 (12.429)	53.28		23897.811 (10.331)	44.29		53958.594 (23.326)	
HK/P/A	3288.181 (1.171)	11.16		16080.643 (5.725)	54.59		10088.257 (3.592)	34.25		29457.082 (10.487)	
HK/P/BC	334.225 (0.337)	13.75		1050.447 (1.060)	43.21		1046.540 (1.056)	43.05		2431.212 (2.452)	
HK/S/AB	7811.528 (1.212)	7.17		65883.117 (10.224)	60.44		35316.348 (5.481)	32.40		109011.000 (16.917)	
SF/S/BC	3431.727 (4.154)	21.53		8707.805 (10.541)	54.63		3800.100 (4.600)	23.84		15939.631 (19.295)	
PO/P/N	0.000 (0.000)	0.00		0.000 (0.000)	0.00		76.351 (0.231)	100.00		76.351 (0.231)	
NH/P/A	766.367 (0.357)	4.17		9756.034 (4.542)	53.10		7849.857 (3.654)	42.73		18372.258 (8.553)	
NH/P/B	289.131 (0.159)	2.70		5523.533 (3.039)	51.50		4913.403 (2.703)	45.81		10726.066 (5.902)	
NH/P/CD	0.000 (0.000)	0.00		91.855 (0.111)	11.05		739.263 (0.895)	88.95		831.118 (1.006)	
NH/S/A	6951.301 (1.618)	10.09		30063.752 (6.998)	43.63		31894.902 (7.424)	46.28		68909.953 (16.041)	
NH/S/B	3305.589 (1.250)	14.91		8789.058 (3.325)	39.64		10078.141 (3.812)	45.45		22172.787 (8.387)	
OM/P/A	1933.518 (0.780)	9.73		11805.258 (4.763)	59.38		6141.439 (2.478)	30.89		19880.215 (8.021)	
OM/P/B	2223.005 (0.585)	11.79		10366.561 (2.728)	54.97		6270.071 (1.650)	33.25		18859.637 (4.963)	
OM/P/CD	0.000 (0.000)	0.00		449.143 (0.544)	35.37		820.567 (0.993)	64.63		1269.710 (1.537)	
OM/S/A	7371.778 (1.940)	12.32		41229.496 (10.849)	68.91		11229.654 (2.955)	18.77		59830.930 (15.744)	
OM/S/BC	2329.964 (1.763)	27.71		2812.994 (2.128)	33.46		3265.039 (2.470)	38.83		8407.997 (6.361)	
OT/NOLEV	0.000 (0.000)	0.00		314.431 (0.119)	23.92		1000.260 (0.378)	76.08		1314.691 (0.497)	
Totals	41345.684 (1.001)	9.19		247171.609 (5.984)	54.97		161152.375 (3.901)	35.84		449669.656 (10.886)	

Total Growth Summary All Types MBF, CCF and Change Over Growth Period
Forest So. Berkshire 2000 All Types Acres 41306.8 Based on 250. Samples

Species or Species Group	Total MBF Now	Total MBF 10yrs*	Change in MBF	Total CCF Now	Total CCF 10yrs	Change in CCF	% MBF	% CCF
White pine	72272.117	102211.570	29939.453	109590.34	143594.16	34003.81	16.1	9.9
Hemlock	71538.313	102539.406	31001.094	178451.13	230433.75	51982.63	15.9	16.1

Spruce/Fir	12189.438	15435.324	3245.886	33504.21	39015.71	5511.50	2.7 3.0
Pitch pine	35.061	69.427	34.367	543.95	622.51	78.56	0.0 0.0
Red pine	1262.237	2317.265	1055.028	1823.59	2852.83	1029.24	0.3 0.2
Other Softwood	197.053	321.749	124.696	876.37	876.37	0.00	0.0 0.1
Sugar maple	26612.617	34277.797	7665.180	76858.07	89132.80	12274.73	5.9 6.9
Red maple	45934.910	64071.578	18136.668	160273.06	197444.53	37171.47	10.2 14.4
N.Red oak	123686.945	156121.750	32434.805	244882.61	288169.19	43286.58	27.5 22.0
Black oak	1591.877	2557.302	965.425	3247.46	3681.09	433.63	0.4 0.3
White oaks	3220.839	5004.563	1783.724	11195.34	13018.10	1822.76	0.7 1.0
Yellow birch	8801.287	13067.499	4266.212	35775.62	42440.72	6665.10	2.0 3.2
Black birch	7268.266	10566.654	3298.389	30507.32	36974.33	6467.01	1.6 2.7
White birch	5647.625	8375.264	2727.639	28524.09	33323.14	4799.05	1.3 2.6
Beech	15353.120	21082.045	5728.925	57870.86	65976.95	8106.09	3.4 5.2
White ash	29815.594	39654.453	9838.859	64545.71	76975.50	12429.79	6.6 5.8
Poplar/aspen	2975.318	3811.758	836.440	6857.96	7476.40	618.44	0.7 0.6
Black cherry	20129.529	26851.951	6722.422	56223.86	65938.58	9714.72	4.5 5.1
Other hardwoods	1137.474	2184.260	1046.786	9184.57	11267.93	2083.36	0.3 0.8
Totals	449669.531	610521.563	160851.984	1110736.25	1349214.63	238478.45	

* or growth period if not 10 years

Growth/acre/year by Types over all Species

PU 3 Number of Plots in PU = 250 Number of Plots used for Growth = 190.

Type	Repeat Growth			Ingrowth			Mortality			Net Growth		
	Basal Area	CCF	MBF	Basal Area	CCF	MBF	Basal Area	CCF	MBF	Basal Area	CCF	MBF
1 WP/P/BCD	1.551	0.376	0.2384	0.369	0.046	0.0000	0.895	0.161	0.0487	1.025	0.260	0.1897

```
  2 WP/S/BCD  2.046   0.567   0.6454   0.378   0.066   0.0173   2.863   0.657   0.4176  -0.439  -
0.024   0.2451
  3 HK/P/A    2.208   0.564   0.2981   0.495   0.067   0.0095   1.178   0.224   0.0670   1.525
0.407   0.2405
  4 HK/P/BC   0.879   0.197   0.0799   1.015   0.126   0.0000   0.497   0.079   0.0090   1.397
0.243   0.0710
  5 HK/S/AB   2.252   0.550   0.4182   0.222   0.032   0.0058   1.646   0.363   0.1639   0.828
0.219   0.2601
  6 SF/S/BC   2.906   0.969   0.6779   0.386   0.062   0.0000   2.046   0.434   0.0569   1.246
0.596   0.6211
  8 NH/P/A    1.916   0.504   0.2972   0.662   0.087   0.0000   1.237   0.231   0.0627   1.341
0.360   0.2345
  9 NH/P/B    1.418   0.318   0.2018   0.523   0.069   0.0000   1.891   0.361   0.1148   0.050
0.026   0.0870
 10 NH/P/CD   0.416   0.077   0.0286   0.581   0.079   0.0000   2.185   0.431   0.1972  -1.188  -
0.276  -0.1686
 11 NH/S/A    2.090   0.517   0.4440   0.300   0.041   0.0000   1.018   0.204   0.0753   1.371
0.354   0.3686
 12 NH/S/B    1.427   0.333   0.2503   0.265   0.039   0.0000   1.814   0.383   0.1678  -0.123  -
0.011   0.0825
 13 OM/P/A    1.814   0.446   0.2703   0.402   0.052   0.0000   1.059   0.178   0.0544   1.157
0.320   0.2159
 14 OM/P/B    1.211   0.288   0.1751   0.398   0.052   0.0000   2.086   0.423   0.1926  -0.477  -
0.082  -0.0174
 15 OM/P/CD   0.704   0.134   0.0531   0.336   0.033   0.0000   0.280   0.043   0.0225   0.760
0.123   0.0305
 16 OM/S/A    1.918   0.528   0.4274   0.231   0.028   0.0000   1.082   0.219   0.0670   1.067
0.337   0.3604
 17 OM/S/BC   1.183   0.294   0.2140   0.256   0.034   0.0000   3.745   0.917   0.4352  -2.306  -
0.589  -0.2212
 18 OT/NOLEV  0.311   0.050   0.0296   0.451   0.063   0.0078   0.443   0.054   0.0000   0.319
0.059   0.0374
================================================================================================
==============
              1.458   0.373   0.2639   0.404   0.054   0.0022   1.443   0.298   0.1196   0.147
0.129   0.1465
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Total Growth/year by Types over all Species

PU 3 Number of Plots in PU = 250 Number of Plots used for Growth = 190.

Type	Repeat Growth		Ingrowth		Mortality		Net Growth	
	CCF	MBF	CCF	MBF	CCF	MBF	CCF	MBF
1 WP/P/BCD	372.704	236.3506	45.435	0.0000	159.926	48.3259	258.213	188.0246
2 WP/S/BCD	1310.739	1492.9728	153.797	39.9729	1520.108	965.9447	-55.572	567.0009
3 HK/P/A	1583.160	837.3448	187.808	26.6263	628.906	188.3257	1142.061	675.6454
4 HK/P/BC	194.884	79.2536	124.534	0.0000	78.126	8.8930	241.292	70.3607
5 HK/S/AB	3542.501	2694.9514	206.030	37.1707	2337.827	1056.2399	1410.704	1675.8822
6 SF/S/BC	800.469	560.0534	50.879	0.0000	358.904	46.9697	492.444	513.0837
7 PO/P/N	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.000	0.0000
8 NH/P/A	1083.393	638.3550	186.886	0.0000	496.771	134.6214	773.508	503.7336
9 NH/P/B	578.353	366.8070	124.505	0.0000	655.544	208.6492	47.315	158.1578
10 NH/P/CD	63.203	23.6655	64.913	0.0000	356.135	162.9411	-228.019	-139.2756
11 NH/S/A	2219.795	1907.2419	174.361	0.0000	874.581	323.6644	1519.575	1583.5775
12 NH/S/B	880.234	661.6756	102.702	0.0000	1011.892	443.6107	-28.956	218.0648
13 OM/P/A	1105.438	669.8381	128.149	0.0000	440.142	134.7390	793.445	535.0992
14 OM/P/B	1094.246	665.5192	199.031	0.0000	1606.625	731.7968	-313.349	-66.2777
15 OM/P/CD	110.385	43.8332	27.156	0.0000	35.567	18.6210	101.974	25.2123
16 OM/S/A	2006.961	1624.2725	107.993	0.0000	834.101	254.5231	1280.852	1369.7494
17 OM/S/BC	387.991	282.8163	45.462	0.0000	1212.181	575.1876	-778.728	-292.3712
18 OT/NOLEV	132.509	78.2350	167.130	20.6733	143.922	0.0000	155.717	98.9083
	17466.965	12863.1855	2096.774	124.4432	12751.261	5303.0532	6812.477	7684.5762

Appendix D – High Conservation Value Forest

Defining HCVFs on DCR & DFW Lands in Massachusetts

A report to
The Bureau of Forestry
Department of Conservation and Recreation
And
The Forestry Project
Division of Fisheries and Wildlife

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Abstract:

Defining and identifying High Conservation Value Forests (HCVF) is a condition of Forest Stewardship Council (FSC) 'Green Certification' of sustainable forestry for Massachusetts' state lands. HCVFs are forest areas that need to be appropriately managed in order to maintain or enhance identified High Conservation Values (HCVs). The definition of HCVs encompasses exceptional or critical ecological attributes, ecosystem services, and social functions. Under certification, areas identified as HCVFs may be harvested, but management activities must maintain or enhance the HCVs present.

The FSC Northeastern Region Standards provide guidance on identifying HCVs, and many HCVs are already identified and mitigated under existing Massachusetts regulations and procedures. In addition, when public land managers in Massachusetts held natural resource expert meetings to establish criteria for identifying Forest Reserves in 2004, many of the criteria chosen represented HCVs. However, FSC has issued an *Interpretation FSC Criterion 9-2* (attached as Appendix D2) that "requires that the forest manager consult with stakeholders on the identification of the High Conservation Values and the management options thereof." This was accomplished by posting the HCVF draft document on the state forestry websites, alerting experts to its existence and need for review, and presenting the document at public meetings on forest planning on January 31 and February 1, 2007.

Rare Species: FSC principles and criteria state that general forest management should conserve biological diversity and its associated values. In addition to this guidance, FSC identifies "significant concentrations" of rare species as an HCV. In Massachusetts, forest cutting plans for areas in known rare species habitats (Priority Habitats) already undergo review by the Natural Heritage and Endangered Species Program (NHESP); therefore identifying all forested sites on state lands within NHESP Priority Habitats as HCVFs would put no additional burden on forestry operations and would meet and exceed the rare species protection intentions of the Green Certification document.

***Rare Ecosystems*:** HCVFs are intended to include forest areas that are in or contain rare, threatened or endangered ecosystems. The FSC Northeast US region report on HCVF standards recommends using natural communities with abundance ranks of S1, S2 or S3 by the state's Natural Heritage Program as the rare ecosystems. In Massachusetts, most S1-S3 community types are disturbance sensitive, and were included in the areas NHESP recommended as being in Forest Reserves. When sufficient numbers of a type occur on state land, it may make sense to keep only the best as reserves, and identify others as HCVs. Those S1-S3 types that were not recommended for Forest Reserves need some conditioned, occasional management, and thus may be appropriate for designation as HCVF since management that maintains or enhances HCVs is allowed. The Northeast working group suggests that S1-S3 natural communities that are around 500 acres would be a target for HCVF, with smaller occurrences being protected through Principle 6.2 (conservation zones and protection areas) and/or 6.4 (representative areas). Very few of the rare types of natural communities in Massachusetts have occurrences that would approach or exceed 500 acres (although some occurrences of pitch pine scrub oak communities do). Despite their small size, designation of S1 and S2, and good quality examples S3 types outside Forest Reserves as HCVF is warranted for conservation of these unique communities. NHESP has not focused on identifying priority natural communities on existing conservation lands, therefore **further inventory on state lands** and reporting of natural communities would

improve NHESP's information about the occurrences of the different types, their condition, and their protection status. Further analysis of protection status of known natural community occurrences would allow identification of the most sensitive for reserve status.

***Landscape Level Ecosystems*:** An additional biodiversity HCV is "large landscape level forests contained within or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance." DCR and DFW have already determined that existing Old Growth will be within Forest Reserves. Massachusetts has three sources of information on such large forests.

An important landscape level ecosystem HCV in Massachusetts would be Interior Forest. Interior Forest is areas of extensive, unfragmented forest land buffered from roads and development that provide important habitat for certain native wildlife species that benefit from unbroken forest patches. Interior Forest patches in Massachusetts have been identified using GIS modeling (MassWildlife unpuplished data). They include many of the common forest types for their respective ecoregions which could cover at least part of the need for representatives of the large forest types. Because Interior Forest provides important habitat for disturbance sensitive and wide ranging species, it should be a designated HCV itself..

Massachusetts has a second source of information to identify important forest areas: areas that were forested in the 1830s (as shown on old maps) and are currently forested may have been continuously forested since pre-settlement times (commonly referred to as "1830s forest," although such designation needs to be shown by on-the-ground evaluation of the soils). These areas typically support greater biodiversity than areas that have been tilled. These forest areas should be identified as HCVFs with special forest management considerations.

The third source of information of good examples of common forest types is the NHESP database which contains 'A' ranked (excellent) examples of the more common types of natural communities. Including those excellent examples that occur on state land as HCVFs would provide recognition and appropriate management to maintain these communities.

High Quality Cold Water Fisheries Resources: DFW is identifying a sub-set of all streams and rivers in Massachusetts that support cold water fish species where the entire fishery is composed of native species. Forests on state lands that buffer and support habitat associated with these unique stream reaches are of high conservation value. Appropriate filter widths on state lands should be designated, when the research by the DFW Fisheries Section is complete and reviewed by DCR.

***Watershed Protection Forest*:** Forest areas that provide basic services of nature in critical situations, such as watershed protection or erosion control are an additional HCV. Watersheds that contribute to drinking water supplies are a particular HCV that are being addressed by DCR's Division of Watershed Protection on the Quabbin, Ware River, and Wachusett watersheds. There are other (primarily municipal) water supply areas on DCR lands, and perhaps on DFW lands, that should be identified as HCVFs, with the management of these areas focused on water supply protection, according to regulation and BMPs.

***Forest Areas Critical for Subsistence of Local Communities*:** These are intended to be key hunting or foraging areas for endemic communities for which there is no alternative food sources, and are unlikely to occur in Massachusetts. FSC comments that they do not occur in the United Kingdom, since it is a highly developed area where most of the population has alternative sources of food. The Northeast working group suggests that is true for the northeast US as well.

***Forest Areas of Special Cultural or Religious Significance*:** DCR and DFW need to identify and interact with any local groups, particularly with any indigenous peoples, that have identified culturally sensitive areas on state lands (Appendix D5 includes some information from the SE Bioreserve report on protecting cultural resources). Areas of potential harvest are already submitted to the Massachusetts Historical Commission (MHC) for review under their regulations and policies concerning historic and archeological sites, for review and comment. In addition, the state archeologist maintains a list of known archeological sites and has modeled areas likely used by Native Americans before European settlement. If those areas are not included as Forest Reserves, they should be included as HCVF until their actual status is determined from studies. Massachusetts forest cutting procedures already cover much for the intent of protecting cultural resources.

Public Review: This HCVF report was made available for public and expert review as part of the Forest Resource Management Planning public involvement process.

Introduction:

Defining and identifying High Conservation Value Forests (HCVF) is a condition of Green Certification for Massachusetts' state lands. Fortunately for land managers, many of the suggested High Conservation Values (HCVs) are already identified and dealt with in existing Massachusetts regulations and procedures. Under Forest Stewardship Council (FSC) certification, areas identified as HCVFs may be harvested, but management activities must maintain or enhance the HCVs present.

Background:

When the Massachusetts state lands were "Green certified" by Scientific Certification Systems (SCS) for the FSC in 2004, a condition of certification was that the agencies develop local definitions of High Conservation Values and apply that to management (Condition 2002.7 for DEM and DFW, 2002.9 for MDC) (SCS, 2004).

Forest Stewardship Council, Northeast (USA) Region Standards - definition of HCVF:

In Principle 9 of the FSC certification standard, forest managers are required to identify HCVs, to manage the forests for HCVs, and to monitor the success of this management. The definition of HCVs encompasses exceptional or critical ecological attributes, ecosystem services, and social functions. High Conservation Value Forests are forests that contain key HCVs. The designation relies solely on the presence of one of more HCVs. While all forests provide environmental and social values, HCVFs encompass exceptional or critical ecological attributes, ecosystem services and social functions. HCVFs are simply the forests where these values are found, or, more precisely, the forest area that needs to be appropriately managed in order to maintain or enhance the identified values (language from Jennings, 2004. ProForest ToolKit: HCVF for Conservation Practitioners. page 1).

<u>Other protections:</u>

FSC principles and criteria include general forest management requirements. The FSC discussions recommend using protected lands, such as Forest Reserves, and zoning to assure protection of the most sensitive forest attributes. Several of these forest attributes are explicitly discussed in Principle 9, the HCVF section.

As noted in the recommendation discussion of this document (p.12), existing Massachusetts' statutes, regulations, and policies protect pre- and post-settlement historic sites, rare species habitat, water supplies, and Old Growth forest.

Principle 6, Environmental Impact, states that forest management should conserve biological diversity and its associated values. The discussion of HCVFs in the Northeast Regional standards refers back to various parts of Principle 6 (6.2, safeguards for rare and endangered species and habitats through zoning and protected areas and /or 6.4, protection of representative samples of existing ecosystems) and suggests that HCVFs need to be designated only where zoning and existing protected areas (Wildlands/Nature Preserves or Forest Reserves in Massachusetts) don't

suffice. Although Forest Reserves may contain HCVs, HCVFs do not need to be designated as protected areas if management does not compromise the HCVs.

Principle 9 Biodiversity Values:

Given the state of knowledge of 'significant concentrations of biodiversity,' there are generally two approaches to conserving it: fine filter and coarse filter.

The *Fine filter* approach relies on identifying rare species (usually state and/or federally listed plants or animals) and protecting them and their habitats. The *Coarse filter* approach uses natural communities, where natural communities are stand-ins for total biodiversity. Natural communities are generally defined as recurring assemblages of plant and animal species, usually found in particular environmental conditions. In this approach, the types of natural communities in a state (or other region) are ranked for abundance throughout the state (S5 types are most abundant, and S1 least, details are given in Appendix D4). The occurrences are then ranked for quality, with the best of the most common types (and all their constituent species) identified for conserving, and as many as possible of the least common (and their constituent species) protected. There is a sliding scale between the best of the abundant types and accepting all that remains of the least common.

Fine Filter - Rare Species: One of the HCVs is "significant concentrations" of rare species. However in Massachusetts, known occurrences of rare species listed in the Massachusetts Endangered Species Act (MESA) have a regulatory impact on forestry – forest cutting plans for areas in known rare species habitats already undergo review. Mitigation for the protection of the rare species is provided: therefore the requirements in Principle 9 of maintaining or enhancing the HCV (rare species in this case) is already being met when the recommendations from review of the forest cutting plan are followed (304 CMR 11.00 11(6) and 321 CMR 10.02 (14)). This means that identifying all areas in NHESP Priority Habitats as HCVFs would put no additional burden on forestry operations and would meet and exceed the rare species protection intentions of the Green Certification document.

Coarse Filter - Natural Communities (part 1)
An additional biodiversity HCV is "large landscape level forests contained within or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance" (FSC, 2004, glossary). This definition is very close to the definitions Natural Heritage Programs use for A (the best, on a scale of A-D) ranked occurrences of each type of natural community. Including A ranked occurrences of the more common types (abundance ranked S5 (demonstrably secure) and S4 (apparently secure) of natural communities from the NHESP database as HCVFs would be a way to meet this part of the broad definition of HCVFs.

In Massachusetts, Old Growth occurrences are A ranked for whatever type of natural community they represent. Most Old Growth studied to date are examples of relatively common types of natural communities, typically Spruce-Fir-Northern Hardwoods Forest, Northern Hardwoods-Hemlock-White Pine Forest or High Elevation Spruce Fir Forest, with an example of Oak-Hemlock-White Pine Forest. DCR and DFW have already determined that Old Growth will be in Forest Reserves, although DFW has not detected any Old Growth forest on its lands. There are a

few non-Old Growth A and B ranked occurrences of common types in the NHESP database, which could be dealt with on an individual basis, by zoning or by calling the A ranked occurrences HCVs. NHESP has records of thirteen occurrences of eight types of common (S5 and S4) upland forest-types on ten DCR properties, with five occurrences of two types of common forested wetlands on five properties. On DFW land there are 28 occurrences of ten types of upland forests on eighteen properties, and one type of forested wetland on one property. As the NE Working Group points out in the notes for the Northeast Regional Standards (p. 32 in Vers. 8.1), there really are not many landscape level (large forests with 25,000 contiguous acres where viable populations of most, if not all, naturally occurring species exist in natural patterns of distribution and abundance) undisturbed forests in the northeast. No such very large unfragmented forests would be expected in Massachusetts, although state forest managers plan to maintain the larger tracts that do occur on public land, with encouragement to private landowners to apply certification standards to large private holdings as well.

As part of the Forest Reserve planning process, interior forest areas (intact forest buffered from roads and developed and open land) on state land were identified on GIS. Interior Forest is considered to be unbroken blocks of unfragmented forest. Natural features such as wetlands and open water are included in this dataset and were not interpreted as fragmenting forest patches. Roads were buffered at different distances depending on the type and the effects on wildlife. The resulting maps of the blocks of interior forest were made available for planning (unpublished DFW Metadata, copy in Appendix D4). Interior forest provides important habitat: for example, songbird nesting success is greater for some species further from forest edge and the disturbances associated with human dominated areas, which have more opportunistic predators such as raccoons, as well as cats and dogs. They also provide habitat to wide ranging species that do not interact well with humans (such as bears and coyotes) or that might be harmed by aspects of development, including by vehicles on highways.

Interior Forest should be a designated as a HCV itself. Interior forests include many of the common forest types for their respective ecoregions which provides good representatives of those forest types.

In addition, a minimum, meaningful, size for interior forest should be established by checking the literature on wildlife habitat needs, particularly that of disturbance sensitive birds. This would allow the most viable areas of interior forest to receive the necessary management attention. It may be that interior forest patches of a few dozen acres do not provide substantial benefit for wildlife, but patches of a few hundred acres may provide substantial benefits for wildlife.

Interior Forest blocks are, by definition, buffered by forest lands that are closer to roads and development. Some of the buffering lands are state (or other) conservation land and so contribute in perpetuity to maintaining the interior forest and its special conditions. In other cases the buffering lands are not designated for conservation, and their long term use as buffers for maintaining the interior forest on the state land is not predictable. Identification of ownerships in the buffers and identification of lands worth protecting for any of the biodiversity values, including as buffers to interior forest, should be undertaken.

Areas larger than the minimum patch size would receive particular focus for identifying ownerships of the buffering lands and for conservation acquisition. The conservation action here should be to identify public lands in the buffers that are not focused on conservation (not under Article 97 of the Massachusetts Constitution), and when possible move them to such protections. Identification of private lands in the buffers would enable discussions of conservation for those lands, including encouragement of sustainable management and forest certification.

Massachusetts has an additional unique data source on forested lands that should be identified as HCVFs. In the 1830s the state mandated that towns make maps showing land use. Most of the forested areas, called '1830s forest' or possible Primary Forest, were untilled woodlots and wooded pastures. These are not Old Growth, they have been harvested and pastured. Although those lands may well have undergone different uses in the time since the maps were made, some areas that were forested in the 1830s won't ever have been tilled. Surveys of the soil structure in the individual sites are necessary to determine whether those sites are actual Primary Forest. Such lands that remain forested have greater biodiversity than areas that have been tilled. 1830s forest areas are shown in a GIS layer (Harvard Forest, 2002) derived from these town wide maps made in the 1830s (not all of the town maps are still available, see the Harvard Forest provisos on their website http://harvardforest.fas.harvard.edu/data/p01/hf014/1830readme.html).

1830s forest areas should be considered for HCVF status because they include areas that have never been tilled which have higher biodiversity than tilled lands. However, it should be noted that 1830s forests were identified from old maps, and even restricted to currently forested areas, those are only two points of data in several hundred years - any given parcel may not have been continuously forested since European settlement. Of the areas that were continuously forested, most were woodlots and thinned repeatedly. They can continue to be managed in ways that maintain undisturbed soils and shaded understory layers and minimize soil compaction, displacement, and erosion. In these older forests, the soil structure with its associated biodiversity is a main attribute to protect: a goal of management should be to avoid the need to mitigate the effects of any harvest when it is done.

Actual current vegetation present can provide indications of undisturbed soil, but examination of the soil structure of each area is necessary to determine actual land use history. Until individual areas are checked, the maps of 1830s/currently forested areas are the best available models of the biodiversity values found in the soils and understories of untilled forests.

Each of the above forest areas supports concentrations of native biodiversity not as widespread in more disturbed parts of the state. Combining these two data sets, areas forested in the 1830s and interior forest, is expected to identify forest lands of particular importance for maintaining native species and ecosystem functioning. Some of the areas that are 1830s forest and interior forest and on state land, are included in Forest Reserves. These 1830s/interior forests areas could be considered HCVs, and part of HCVFs. Keeping in mind that some town maps did not report woodland or forest areas on the 1830s maps, and some town maps have been lost or were not made (Harvard Forest 2002; Hall et al. 2002), there are 58,534 acres of interior, 1830s forest on DCR land, out of 2,583,322 acres (about 2% - acres are "GIS acres", calculated on landuse data in MassGIS). In addition, the planned Forest Reserves already include many of the common forest types for their ecoregions which could cover at least part of the need for representatives of the large types. If the forest types in the Forest Reserves were identified, any types not included

in Forest Reserves that do occur in the 1830s/interior areas might be considered for HCVF status. For towns without 1830s forest, interior forest alone might be used. These interior, older forest areas were also identified in the BioMap report (NHESP 2001), although not to forest type.

Preliminary inventory, at a fairly coarse level, can be done through aerial interpretation of forest cover and use of the existing forest inventory data. Final determination of the forest type requires on the ground surveys. Locations for surveys focused on particular forest types can be modeled from the broader existing information, geology, topography, and site knowledge of the local managers and foresters. DFW has undertaken many of these steps to locate one type of uncommon natural community, Rich Mesic Forest, resulting in many additional acres being identified on state lands. Management of the forest types designated as HCVs should be to encourage the desired conditions, and to minimize disturbance (except focused for regeneration), erosion, and displacement.

Coarse Filter: Natural Communities (part 2)
Principle 9 continues discussing HCVFs to include forest areas that are in or contain rare, threatened or endangered ecosystems. The Northeast region report on HCVF standards recommends using natural communities with abundance ranks of S1, S2 or S3 by the state's Natural Heritage Program as the rare ecosystems. Massachusetts NHESP considers all types of natural communities ranked S1, S2 or S3 to be Priority Natural Communities. In Massachusetts, most S1-S3 community types are disturbance sensitive, and many were included in the areas NHESP recommended as being in Forest Reserves or patch reserves. Some of the community types included in the forest reserves may need occasional conditioned management to maintain them. Maps of locations of the NHESP natural community occurrences could be provided directly to DCR and most are available on MassGIS. It would be straightforward for maps of those locations on DCR land to be made available to the foresters and property managers. Some S1-S3 communities that were excluded from the Forest Reserves may need more conditioned, usually occasional management (for example Atlantic White Cedar Swamps might be strip clear-cut (regeneration harvest)on a very long rotation and Pitch Pine/Scrub Oak communities usually need to be managed to maintain the community attributes and the rare species that depend on the community). HCVF guidelines allow management of the forests with HCVs as long as the HCV is maintained or enhanced. The guidelines encourage using management to maintain successional natural communities. The Northeast working group suggests that S1-S3 natural communities that are around 500 acres would be a target for HCVF, with smaller occurrences being protected through Principle 6.2 (conservation zones and protection areas) and/or 6.4 (representative areas). Very few of the rare types of natural communities in Massachusetts have occurrences that would approach or exceed 500 acres (although some occurrences of pitch pine scrub oak communities do). Despite their small size, designation as HCVs is warranted for protection of all Massachusetts S1 and S2, and the better occurrences of S3 natural community types.

Of the 12 upland forested Natural Community types, out of 29 priority terrestrial natural community types, seven are known from DSPR lands. Of the 17 forested wetland community types, out of 32 palustrine priority types, 9 are known from DSPR lands. For DFW lands, the numbers are: 7 upland types and 20 wetland types. The one type of priority forested natural community that occurs in intertidal estuarine conditions (of 8 priority intertidal types) is not currently documented on state land. It should be noted that in general, state lands have not been

targets of natural community surveys. A few focused surveys on DFW land have resulted in increased numbers of records of priority natural communities. In addition, DFW has targeted some properties for acquisition that had known occurrences of priority natural communities, increasing the known occurrences on DFW land. The complete list of NHESP Priority Natural Community types with explanations of the S ranks is in Appendix D4. Tables 1, 2, and 3 in Appendix D4 have the names, state ranks, and acreages on state lands of forested NHESP Priority Natural Community types.

Other HCVs:

High Quality Cold Water Fisheries Resources: DFW is identifying a sub-set of all streams and rivers in Massachusetts that support cold water fish species where the entire fishery is composed of native species, primarily brook trout. Forests on state lands that buffer and support habitat associated with these unique stream reaches are of high conservation value . Appropriate filter widths on state lands should be designated, when the research by the DFW Fisheries Section is complete and reviewed by DCR.

***Watershed protection*:** Forest areas that provide basic services of nature in critical situations, such as watershed protection or erosion control are an additional HCV. Watersheds that contribute to drinking water supplies are a particular HCV that has been addressed by DCR's Division of Watershed Protection (the watershed portion of the former MDC).
There are other water supply areas on DCR lands that should be identified as HCVFs, with the management of them aimed at protecting the water supplies, according to regulation and BMPs.

Forest Areas critical for subsistence of local communities: these are unlikely to occur in Massachusetts. These are intended to be key hunting or foraging areas for endemic communities for which there is no alternative food sources. FSC comments that they do not occur in the United Kingdom, since it is a highly developed area where most of the population has alternative sources of food. The Northeast working group suggests that is true for the northeast US as well.

Forest areas of special cultural or religious significance*:*
Principle 3, Indigenous People's Rights: Of the concerns for protecting rights of indigenous people, 3.3 appears to have the most relevance to Massachusetts. 3.3 states that "Sites of special cultural, ecological, economic or religious significance to indigenous peoples shall be clearly identified in cooperation with such peoples, and recognized and protected by forest managers." Page 3, FSC Principles, 2004. The NorthEast Working Group noted that "*Certification in general, particularly as addressed under Principles 2 through 5, reinforces the social and economic benefits that accrue to local communities*."

Principle #4: Community relations and worker's rights: part 4.4.d. Significant archeological sites and sites of cultural, historical, or community significance, as identified through consultation with state archeological offices, tribes, universities, and local experts, are designated as special management zones or otherwise protected during harvest operations.
(Appendix D6 has the FSC and NE Standards language on 3.3 and 4.4)

Meetings should be held with any local groups, particularly with any indigenous peoples, that have identified culturally sensitive areas on state lands. This has been done in the area of the SE Bioreserve, and maps of sensitive areas, similar to NHESP Priority Habitat maps were produced.

To protect them, the actual sensitive areas are seldom publicized. It is likely that the communications and contact methods used in the Bioreserve could be used as a model for working statewide, Appendix D5 includes some information from the Bioreserve report on protecting cultural resources.

Appendix D6 includes FSC Principles 3.3 and 4.4 and the comments on them from the Northeast (US) Regional Standards.

Any projects that require funding, licenses, or permits from any state agency must be reviewed by MHC [Massachusetts Historical Commission] in compliance with Massachusetts General Laws Chapter 9, sections 26-27C. This law creates the MHC, the office of the State Archaeologist, and the State Register of Historic Places among other historic preservation programs. It provides for MHC review of state projects, State Archaeologist's Permits, the protection of archaeological sites on public land from unauthorized digging, and the protection of unmarked burials.

Cultural resources are protected from state and federally funded or approved activities under several laws including, but not limited to (modified from Fleming et al. 2005):

- **M.G.L. Ch. 9 s. 26-27c (to 32) as amended (Massachusetts Historical Commission enabling legislation) http://www.mass.gov/legis/laws/mgl/9-26.htm; http://www.mass.gov/legis/laws/mgl/9-27.htm**
- **http://www.sec.state.ma.us/mhc/mhcidx.htm**
- **M.G.L. Ch. 38 s. 6 (Massachusetts Unmarked Burial law) http://www.mass.gov/legis/laws/mgl/38-6.htm**
- **M.G.L. Ch. 30 s 61-62h. Massachusetts Environmental Policy Act (MEPA)**
- **http://www.mass.gov/legis/laws/mgl/30-61.htm and 301 CMR 11.00 http://www.mass.gov/envir/mepa/thirdlevelpages/meparegulations/meparegulations.htm**
- **http://www.mass.gov/envir/mepa/secondlevelpages/aboutmepa.htm**
- **Section 106 of the National Preservation Act of 1966**

To comply with these laws, DCR must consult with the State Historic Preservation Office (SHPO) whenever a state action has the potential to impact historic or archaeological resources. In Massachusetts the SHPO is the Massachusetts Historical Commission (MHC). Cultural Resource Management staff members are available to coordinate the consultation process. In planning projects and activities that are subject to MHC review, schedules must allow for a 30 day review process.

Under these regulations and DCR and DFW policies about consultation with the Massachusetts Historical Commission which is responsible for historic and archeological sites, cultural sites including archeological sites, graveyards, cellar holes, stone walls, are reviewed. In addition, the state archeologist maintains a list of known archeological sites and has provided DCR with maps of areas that meet particular modeling criteria for likely use by Native Americans before European settlement. If those areas are not included as Forest Reserves, they should be included as HCVs until their actual status is determined from studies.

Recommendations for HCVF designations:

In the NE Regional Standard, their Appendix C (and attached in Appendix D3 here) is a guide to the designation of HCVFs. These separate the steps of determining whether various attributes

ought to be designated as HCVs or dealt with through other means. Because Massachusetts has existing regulations protecting rare species and cultural areas that DCR and DFW are already complying with and managing for, it would make practical sense to designate these as HCVs. The same would apply to public water supply areas that are on state land where the management already is for maintaining the water quality, and secondarily for timber harvest as such.

Expert meetings are encouraged to determine HCVs (especially if there are no local standards, which do exist for the Northeastern United States). Natural resource expert meetings were held to establish biodiversity value criteria for making Forest Reserves. Most of the recommendations are basically HCVs –acreage of old growth and acreage of valley bottom land, and concentrations of 1830s forest, viable rare communities, BioMap Ambystomid habitat, riparian and wetland forest, forest interior, and Living Waters CSW (Critical Supporting Watershed). Together with the Northeast standards, HCVs for biodiversity have been well defined for Massachusetts forests. However, FSC has issued an *Interpretation FSC Criterion 9-2* (attached as Appendix D2) that "requires that the forest manager consult with stakeholders on the identification of the High Conservation Values and the management options thereof." Posting this document on the state's forestry web sites for review, calling it to the attention of forestry experts and asking for review, and addressing the HCVF ideas at the various public meetings on the forest management plans where the participants are focused on forests and represent a wide spectrum of interest in forests and forestry should provide important review and feedback on HCVF issues.

Meetings should be held throughout the state to determine areas with cultural or spiritual values to local communities. This information would supplement information from MHC and the state archeologist. Some of those areas have been established as Forest Reserves, some might be managed as HCVFs.

<u>Recommended HCVs and likely effects on forestry operations:</u>

Rare Species:

NHESP Priority Habitats should be designated as HCVs: forest cutting plans for such areas are already being reviewed and responses provided that maintain or enhance the species and their habitats, which meets HCV criteria. These Priority Habitats are in regulation and information exists on maps in the *Natural Heritage Atlas* and as public GIS datalayers.
Effects on state lands management: Using existing regulations and policies would result in no additional constraints on forestry operations.

Rare ecosystems:

All Priority natural communities in NHESP's database should be HCVs under the North East Standards. This includes all occurrences of types ranked S1 and S2, and good quality examples S3 types that are in the NHESP database as tracked Priority Natural Community occurrences. These can be provided to DCR and DFW as a GIS datalayer. NHESP has not focused on existing conservation lands for inventory, therefore **further inventory on state lands** and reporting of natural communities on them would improve NHESP's information about the occurrences of the different types, their condition, and their protection status. For example, DFW Forestry Project

has focused on identifying Rich Mesic Forest that occurs on DFW lands, that has so far resulted in more than doubling the known acreage of Rich Mesic Forest on DFW lands. Those areas will be designated as HCVFs.

Locating and identifying Priority types of forested natural communities is time consuming. Because they are not randomly located in the landscape, it is possible to do some preliminary focusing. Models that incorporate information on habitat conditions provide some possibilities of locations for specific community types, but need to be checked on the ground. Interpreting aerial photographs again tends to provide broader possibilities than most of the specific natural communities occur in (for example, most oak forests types look about the same from aerials, but the specific types generally need to be determined on-site). Existing information, such as CSI plot information should also be reviewed for indications of presence of the uncommon types or to assist in planning site visits.

Effects on state lands management: Consultation before harvesting. For example, expectations would include protections for soil integrity (such as requiring use of forwarders wherever feasible, limiting or excluding skidding of logs, seasonal restrictions on mechanized equipment operation, and careful location of landing areas outside of the HCVF area), procedures to avoid introducing invasives, and possibly restrictions on canopy openings to maintain shade on the forest floor. Since the forest trees are part of the natural community, and affect all the other species present, it might be important to retain particular proportions of tree species. Or, as in the case of early successional communities, opening the canopy might be encouraged. Creation of Conservation Management Practices (CMP's) by NHESP and the DCR and DFW Forestry Programs for different types of forested priority communities would likely be useful (An individual CMP may be applicable to multiple priority communities).

*Landscape level ecosystem*s:

DCR has placed known Old Growth in Forest Reserves. and much of the likely Primary Forest (also called 1830s Forest after the date of maps made throughout the state, as discussed on p. 8 of this document), that occurs on state land was placed in Forest Reserves. Interior Forest (unfragmented forest blocks, also discussed on p. 8 of this document) were also considered in setting up the Forest Reserves. Any remaining large areas that are both Primary Forest and Interior Forest that are not in Forest Reserves should be designated as HCVF. As mentioned earlier, records of 1830s woodlands are missing from some towns, in which case interior forest alone may need to be used until/unless other determinations of undisturbed soil can be made. Exemplary (A – ranked) occurrences of common types of communities from NHESP GIS should be included as HCVFs. There has not been a systematic inventory for these types of occurrences. Large Forest Reserves likely include examples of most the common types of natural communities in an area, but this **needs to be verified by inventory**. Such an inventory can be approached through existing information, such as CFI plots, and landcover maps made from interpretation of aerial photographs . These methods tend to provide guidance on where to look, rather than affirming the presence of particular types of natural communities.

Effects on state lands management: Consultation before harvesting. For example, expectations would include protections for soil integrity (such as requiring use of forwarders where feasible, limiting or excluding skidding of logs, seasonal restrictions on mechanized equipment operation,

and careful location of landing areas outside of the HCVF area), and procedures to avoid introducing invasives. Management foresters should make every effort possible to avoid the need for mitigating the effects of the harvest equipment at the end of a job. The goal is to minimize the impact. With widespread forest types, including interior forests, small openings would be normal, and areas of harvest that otherwise would not fragment the forest would be compatible. Forestry operations might be used to improve degraded examples of primary or widespread forest types. Creation of Conservation Management Plans for groups different types of widespread forested communities would likely be useful.

Ecosystem Services - Critical Watersheds for drinking water supplies:

Drinking water supply areas are known to management foresters and are on maps from DEP, and available from MassGIS. DCR GIS has them mapped.
Effects on forestry operations: Using existing regulations and policies would result in no additional constraints on forestry operations.

High Quality Cold Water Fisheries Resources:

In an analysis of all streams and rivers in Massachusetts, a subset that support cold water fish species where the entire fishery is composed of native species is being identified. Forests associated with these unique stream reaches are of high conservation value, and appropriate widths on state lands should be designated as HCVF when sites are known.
Effects on state lands management: Consultation before harvesting. Appropriate width enhanced buffers on state land, with no or reduced harvest will need to be identified on the ground from maps when the streams have been identified and protocols developed.

Cultural areas:

MHC and State Archeologist have maps, models, and site review. Meetings should be held during the regional or property specific planning with any local groups, particularly with any indigenous peoples, that have identified culturally or spiritually sensitive areas on state lands. Efforts to involve Massachusetts based tribes need to be actively pursued. If there is a state-wide intertribal council, it would provide good initial contacts for identifying appropriate local leaders. DCR planners have experience, for example in the SE Bioreserve, with identifying and contacting individual local groups that have interests in the state lands. Effects on forestry operations: Using existing regulations and policies would likely result in no additional constraints on forestry operations.

Public Review: This draft HCVF report was made available for public review as part of the Forest Resource Management Planning public involvement process. It was posted on the DCR web pages, with a link from the MassWildlife forestry pages, and was made available in written copy upon request to the DCR Bureau of Forestry. Possible expert reviewers were notified of the existence and location of the document, with requests for review. In addition, HCVF ideas and the draft document were introduced at public meetings on ecoregional planning and DCR Management District and DFW Forest Management Zone plans on January 31 and February 1, 2007. Meetings in the forest management planning series were well attended by a wide spectrum

of private and public sector stakeholders who are keenly interested in forests and forestry in Massachusetts, and who provided good input to the planning process.

References, High Conservation Value Forests

Anderson, M.G., Comer, P., Grossman, D., Groves, C., Poiani, K., Reid, M., Schneider, R., Vickery, B., and A. Weakley. 1999. Guidelines for representing ecological communities in ecoregional conservation plans. The Nature Conservancy. 74 pp.
Available from: http://conserveonline.org/docs/2000/11/ecguide.pdf URL checked 6-20-06

Anonymous. 2003. Southeastern Massachusetts Bioreserve Management Plan. Written by staff from TTOR, DFW, DCR and City of Fall River. With GIS mapping support from Epsilon Associates, Inc. August 2003.

Doherty, J.M., H. Herbster, S. Cherau, V.M. Adams. 2001. Working Draft, technical memorandum: Cultural resource planning, southeast Massachusetts Bioreserve. PAL Report No. 1276-1. PAL, Pawtucket, RI in: Cultural Resource Information, Southeastern Massachusetts Bioreserve Project. Draft July 24, 2001. Epsilon Associates, Inc. for the Executive Office of Environmental Affairs.

Forest Stewardship Council. 2004. FSC principles and criteria for forest stewardship. FSC reference code: FSC-STD-01-001 (April 2004). Forest Stewardship Council, AC.
http://www.fsc.org/keepout/en/content_areas/77/71/files/FSC_STD_01_001_FSC_Principles_and_Criteria_for_Forest_Stewardship_2004_04.PDF checked 6-16-06
http://www.fsc.org/en/about/documents/Docs_cent/2,14 interpretation of Principle 9.2, URL checked 6-16-2006

Forest Stewardship Council, U.S. Initiative, Northeast Region Working Group. 2005. Revised final forest stewardship standard for the Northeast region (USA) v. 9.0. URL checked 6-16-06 http://www.fscus.org/images/documents/2006_standards/ne_9.0_NTC.pdf .

Hall, B., G. Motzkin, D. R. Foster, M. Syfert, and J. Burk. 2002. Three hundred years of forest and land-use change in Massachusetts, USA. Journal of Biogeography 129: 1319-1135. URL checked July 2006, available from:
http://harvardforest.fas.harvard.edu/publications/pdfarticles.html

Harvard Forest. 2002. 1830 Map Project. Harvard Forest Archives, Petersham, MA. URL checked July 2006 available from
http://harvardforest.fas.harvard.edu/data/p01/hf014/1830readme.html

High Conservation Value Resource network. 2007. http://hcvnetwork.org/ (url checked 1-26-07)

Jennings, S. 2004.HCVF for conservation practitioners. ProForest, Oxford, UK. In HCVF Final Package from http://www.proforest.net/publications/hiconvf . downloaded 11-2-2005, URL checked 6-16-06

Jennings, S., R. Nussbaum, N. Judd, & T. Evans and others. 2003. High Conservation Value Forest Toolkit. ProForest. Oxford, UK. With WWF and IKEA. From
http://www.proforest.net/publications . downloaded 11-2-2005, checked 6-16-06

Natural Heritage & Endangered Species Program. 2001. BioMap: Guiding Land Conservation for Biodiversity in Massachusetts. Massachusetts Division of Fisheries and Wildlife. Westborough, MA

Seymour, R., D. Capen, J. Furnish, D. Wager. 2004. Certification Evaluation Report for the Natural Forests Managed by The Commonwealth of Massachusetts. A Natural Forest Management Operation Prepared By Scientific Certification Systems, 2000 Powell Street, Suite 1350, Emeryville, CA 94608, USA. Conducted under auspices of the SCS Forest Conservation Program As Accredited by the Forest Stewardship Council. Certification Registration Number SCS-FM/COC-00048N. Available at: http://www.scscertified.com/PDFS/forest_mass.pdf . URL checked 6-20-06

WWF. No date. High conservation value forests. http://www.panda.org/downloads/forests/hcvffinal.pdf . a pamphlet about HCVFs, URL checked 6-20-06.

Appendix D1

From Certification report: Scientific Certification Systems, Final FSC Certification Report EOEA updated 5-4-04, certification registration number SCS-FM/COC-00047N, p. 22 for DEM and DFW and p. 23 for MDC:

Condition DEM/DFW 2002.7: Within 2 years of award of certification, DEM and DFW must designate and delineate HCVF[5] areas and develop a plan for management of these areas.

[5] Guidance on defining High Conservation Value Forests can be found in the document "Identifying High Conservation Values at a national level: a practical guide" available from www.proforest.com .

Condition MDC 2002.9: Within 1 year of award of certification, MDC must determine what percentage of MDC lands falls under HCVF category 4 for watershed values and then prepare an amendment to management plans that formally designates HCVF areas and describes how management of these lands is consistent with maintaining or enhancing HCVF attributes.

Appendix D2. FSC Principle 9

From:
http://www.fsc.org/keepout/en/content_areas/77/71/files/FSC_STD_01_001_FSC_Principles_and_Criteria_for_Forest_Stewardship_2004_04.PDF

FSC-STD-01-001 FSC Principles and Criteria for Forest Stewardship (April 2004)

9 **Principle #9: Maintenance of high conservation value forests**[3]
Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

9.1 Assessment to determine the presence of the attributes consistent with High Conservation Value Forests will be completed, appropriate to scale and intensity of forest management.

9.2 The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.

9.3 The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary.

9.4 Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.

From FSC Appendix A, Glossary

High Conservation Value Forests: High Conservation Value Forests are those that possess one or more of the following attributes:
a) forest areas containing globally, regionally or nationally significant :
concentrations of biodiversity values (e.g., endemism, endangered species, refugia);
and/or large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
b) forest areas that are in or contain rare, threatened or endangered ecosystems
c) forest areas that provide basic services of nature in critical situations (e.g., water-shed protection, erosion control)
d) forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health) and/or critical to local communities' traditional cultural identity
(areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities). 2

Appendix D2 (continued, FSC Principle 9)

From: http://www.fsc.org/en/about/documents/Docs_cent/2,14

FSC Policy and Standards Unit Advice Note

Subject:	**Interpretation of FSC Criterion 9-2**
File name	FSC-ADV-30-901 Interpretation of Criterion 9-2
Advice sought on	What consultation requirements does FSC Criterion 9-2 imply for forest managers and certification bodies?
PSU Advice	1. FSC Criterion 9-2 requires that the forest manager should consult with stakeholders on the identification of the High Conservation Values, and the management options thereof. During evaluation for certification the certification body should consult to confirm whether the manager's consultation was adequate.

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FSC Policy and Standards Unit Advice Note

Subject:	**Interpretation of FSC Criterion 9-2**
File name	FSC-ADV-30-901 Interpretation of Criterion 9-2
File master location	[new server at FSC-IC – location to be specified]
Advice note written by:	M.G.Wenban-Smith
Date:	28-APR-2003
Status	Approved by Head of PSU
References	FSC Principles and Criteria for Forest Stewardship (2000) Board paper BM28-17 FSC Criterion 9-2
Advice sought on	What consultation requirements does FSC Criterion 9-2 imply for forest managers and certification bodies?

PSU Advice

1. FSC Criterion 9-2 requires that the forest manager should consult with stakeholders on the identification of the High Conservation Values, and the management options thereof. During evaluation for certification the certification body should consult to confirm whether the manager's consultation was adequate.

Basis for advice

1. FSC Criterion 9.2 states: *"The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof".*

2. Different FSC members currently interpret this criterion in two rather different ways, relating to their understanding of the expression 'certification process' – either that it puts the obligation on the certification body to carry out consultation, or that it puts the obligation on the forest manager to carry out consultation.

3. At the request of the FSC Board the Policy and Standards Unit sought the advice of the members of the original Principle 9 working group in order to confirm the intention of the Criterion. The consultation clarified that the intention of the Principle 9 working group was i) that the forest manager should consult with stakeholders on the identification of the HCVs, and the management options thereof, and ii) the cb should

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subsequently evaluate whether the consultation was adequate.

4. The FSC Board has agreed that henceforth this shall be considered the correct interpretation of this FSC Criterion.

5. Further background information regarding the consultation is contained in the board paper BM28-17 FSC Criterion 9-2.

Appendix D3. North East United States, Regional Standards, Principle 9

available on line from http://www.fscus.org/images/documents/2006_standards/ne_9.0_NTC.pdf

PRINCIPLE #9: MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS
Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

Note: Appendix C includes an overview to the designation of HCVF under the Northeast Standards.

High Conservation Value Forests are those that possess one or more of the following attributes:

a) **Forest areas containing globally, regionally or nationally significant: concentrations of biodiversity values (e.g., endemism, endangered species, refugia); and/or large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance**

Notes:

Forests with globally, regionally, or nationally significant concentrations of biodiversity

The forests of the northeast contain globally, regionally, or nationally significant concentrations of biodiversity value that are rare and widely dispersed; most have been identified by state Natural Heritage Programs. Examples include the riverbank areas of the St. John's River in Maine, the "Yellow Bog area" within the Nulhegan watershed of northeastern Vermont, and the Southeastern Massachusetts Bioreserve. More common in the northeast are discrete areas of biodiversity value (i. e., they generally contain one rare natural community or an endangered species or two) that are not part of a network of isolated but interconnected habitats that would lead to HCVF status at the landscape scale.

The Northeastern Working Group recommends a stepwise approach to identification of HCVF with significant concentrations of biodiversity. First: identify and protect discrete areas of biodiversity importance as required by Criteria 6.1, 6.2, and 6.4. Second: maintain, enhance, or restore the ecological functions and values of the surrounding stands and landscapes in accordance with Criterion 6.3 and protect other ecological values as required under Criteria 6.5-6.9 and Principle 10. Third: if steps one and two are inadequate to protect the overall biodiversity values of the forest or if the values are considered to be of exceptional significance, then the forest may warrant designation as an HCVF.

Appendix D3. NE Regional Standards, Principle 9 (continued)

Forests with natural patterns of species distribution and abundance

The forests of the northeast have been manipulated by Euro-Americans for the past three hundred years. Much of the region that is now forested was cleared for agriculture, and that which was not has been harvested several times. As a result of this human intervention there are few large landscape-level forests where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance. The best examples are in public and/or private conservation ownership such as the Big Reed Preserve in Maine, parts of the White Mountain National Forest in New Hampshire and Maine, and parts of the Adirondack and Catskill Parks in New York.

There are areas of a few thousand acres in northern Maine where species composition and structure closely approach natural conditions due to light harvest history and a relatively long time (30-50 years) since the last harvest. However, the Maine Forest Biodiversity Project noted that in northern and eastern Maine forest landscape planning units average roughly 25,000 acres in size (C.A. Elliott, ed. 1999. Biodiversity in the Forests of Maine, Guidelines for Land Management. University of Maine Cooperative Extension, Orono, Maine). Thus, there are likely very few areas that meet the definition of a "large landscape-level forest" adopted by regional experts.

b) Forest areas that are in or contain rare, threatened or endangered ecosystems

*Note: Rare, threatened, or endangered (hereafter collectively referred to as "rare") **ecosystems** belong to a subset of natural communities state-ranked as S1, S2, or S3 or G1, G2, or G3 by state Natural Heritage programs. Rare ecosystems may also include outstanding examples of more common (ranked S4 or S5) community types. Rare natural communities that are not extensive in area may be adequately protected under Criterion 6.2 and/or 6.4. Communities or assemblages of communities that are extensive in area are best protected as HCVF.*

- *In the Northeast, rare communities or assemblages of communities dominated by a rare community that approach or exceed 500 acres (200 ha) in area are normally delineated and managed as rare ecosystems under HCVF.*
- *Other factors that may be considered include, but are not limited to,*
    - *Relative rarity of S3-ranked communities (which may range from 21 to 100 examples in a state),*
    - *Distinctiveness in terms of size (a smaller or larger threshold than 500 acres might be appropriate, depending on the size range of the community type), quality (particularly lack of human disturbance), or location within the community's geographic range,*
    - *Vulnerability to degradation, and*
    - *Proximity to protected examples of the same ecosystem type.*
- *Due to their rarity in the Northeast, intact old growth forests (see glossary), which represent an extremely rare stage of what may be a common natural community type, normally qualify as "rare, threatened, or endangered ecosystems" under the HCVF definition.*

Appendix D3. NE Regional Standards, Principle 9 (continued)

c) **Forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control)**

Note: Examples of forest areas that provide basic services of nature in critical situations in the northeast are watersheds that supply water for municipalities (examples may

include Quabbin Reservoir in Massachusetts, the Croton Reservoir in New York and Sebago Lake in Maine). There are few areas within the forest regions of New York and New England that provide basic services of nature in critical situations above and beyond the ecosystem services provided by all forests.

d) **Forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health) and/or critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).**

Note: While important to the social and economic well being of local communities, the northeast contains few, if any, areas where the cultural identity and fundamental subsistence of local communities have been critically linked to a particular forest area. Certification in general, particularly as addressed under Principles 2 through 5, reinforces the social and economic benefits that accrue to local communities.

The region's forests are important to the social identity and economic well being of local communities, especially across the "Northern Forest." This is a region of New England and New York where forest industries and forest-based recreation have long been a dominant economic force (the Northern Forest includes much of northern and eastern Maine, northern New Hampshire, northern Vermont, as well as the Adirondack and Tug Hill regions of New York.) While HCVF designation could be generally applied to much of the Northern Forest region, the region's large size (one of the largest areas of continuous forest in the United States) and complexity of markets for forest products (especially long distance hauling of different species and grades of logs and chips to different communities, states, and into nearby Canada) makes it difficult to associate a particular forest with a specific community's well being. Maintaining socially beneficial, economically healthy, and ecologically viable forests in accordance with FSC Principles will help maintain the strength and vitality of forest-dependent communities across the region.

Appendix D3. NE Regional Standards, Principle 9 (continued)

9.1. Assessment to determine the presence of the attributes consistent with High Conservation Value Forests will be completed, appropriate to scale and intensity of forest management.

9.1.a. Appropriate to scale and intensity of forest management, a comprehensive assessment to determine the presence of attributes consistent with High Conservation Value Forests is conducted.

9.1.b. As part of the assessments and consultations required in Criteria 3.3, 4.4, 6.1, 6.2, and 8.2, the forest owner or manager has identified, mapped, established protection measures, and evaluated the social impacts of management for the appropriate HCVF attributes.

9.2. The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.

Note: FSC understands that Criterion 9.2 is an instruction to FSC-accredited certification bodies and that no indicators are required.

9.3. The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary.

Applicability Note: The applicability of the precautionary principle and the consequent flexibility of forest management vary with the size, configuration, and tenure of the HCVF;

a) *More flexibility is appropriate where HCV forest is less intact, larger in area, has a larger area-to-perimeter ratio, and its tenure is assured over the long term.*

b) *Less flexibility is appropriate where HCV forest is more intact, covers a smaller area, has a smaller area-to-perimeter ratio, and future tenure is uncertain.*

9.3.a. Areas designated as HCVFs are managed over the long term to assure that both the quality of their HCVF attributes and their area are not reduced.

9.3.b. Where the high conservation value crosses ownership boundaries or where the maintenance of the conservation value(s) depends on the proximity of or connectivity with other HCVFs, forest owners or managers coordinate conservation efforts with owners and managers of other HCVFs in their landscape.

9.3.c. The precautionary approach (see Glossary) is adopted when the forest owner or manager has determined that potential management actions are capable of degrading the high conservation values identified.

9.4. Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain and enhance the applicable conservation attributes.

Note: The Working Group considers this Criterion sufficiently explicit and measurable. Indicators are not required.

Appendix D3. NE Regional Standards, Principle 9 (continued)

APPENDIX C

A GUIDE TO THE DESIGNATION OF HCVF WITHIN THE NORTHEAST STANDARD

1) Assessment of HCVF attributes.
   a) Ecological elements: Indicators 6.1a, 6.2, 8.2
   b) Cultural elements: 3.3, 4.4
   c) Synthesis of all elements/HCVF determination. P9, definition of HCVF, 9.1

2) Protection of individual elements that may contribute to HCVF designation:
   a) Rare, threatened, and endangered (R, T, and E) species and natural communities: 6.2.a
      i) For extensive (> 500 ac.) R, T, and E natural communities, presumption is that these should be protected as HCVF under P9, attribute B.
      ii) See also Note under HCVF attribute A.

   b) Old Growth Stands:
      iii) Presumption is that there is protection as representative sample area under 6.4. See applicability note under criterion and 6.4.b.
      iv) If protection as a sample area is not warranted, ecological functions and values are maintained (see 6.4) on these forests.

   c) Old Growth Forests:
      v) Presumption is that these forests are protected as HCVF. See applicability note under 6.3, applicability note under criterion and 6.4, and indicator 6.4.b.
      vi) If HCVF designation is not warranted, old growth forests are protected as a representative sample area under 6.4.

3) HCVF

   a) Attribute A: significant concentrations of individual elements of biodiversity/natural patterns of distribution and abundance.
      i) If protection of individual elements under 6.2 and 6.4 and management of the surrounding forest matrix according to 6.3 will not conserve the landscape value, then HCVF designation is warranted.
      ii) Presumption is that old growth forests are also protected as HCVF.

4) Attribute B: Threatened or endangered ecosystems
      i) Defined as S1-S3 natural communities > 500 ac, consistent with old growth forest threshold
      ii) Presumption is that these sites are protected as HCVF, smaller areas are covered by 6.2.

5) Attribute C: Basic services of nature in critical situations.
      i) Municipal watersheds given as primary examples.

6) Attribute D. Fundamental to local communities
      i) The interconnectedness of many communities and across the landscape makes the direct link between one forest and one community difficult. NEWG emphasizes maintenance of social and economic benefits under Principles 2-5 as key to protecting this attribute.

Appendix D4. NHESP Priority Natural Communities is Massachusetts and their ranks.

1. Terrestrial	Provi-sional Rank	**Palustrine**	
Maritime Juniper Woodland/Shrubland	S1	Calcareous Basin Fen	S1
Maritime Oak - Holly Forest/Woodland	S1	Coastal Interdunal Marsh/Swale	S1
Maritime Pitch Pine On Dunes	S1	Estuarine Intertidal: Sea-Level Fen	S1
Sandplain Grassland	S1	Alluvial Atlantic White Cedar Swamp	S2
Sandplain Heathland	S1	Atlantic White Cedar Bog	S2
Scrub Oak Shrubland	S1	Black Ash Swamp	S2
Serpentine Outcrop Community	S1	Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp	S2
Calcareous Forest Seep Community	S2	Black Gum Swamp	S2
Calcareous Rocky Summit/Rock Outcrop Community	S2	Black Gum-Pin Oak-Swamp White Oak "Perched" Swamp	S2
Dry Riverside Bluff	S2	Calcareous Pondshore/Lakeshore	S2
Hickory - Hop Hornbeam Forest/Woodland	S2	Calcareous Seepage Marsh	S2
High Elevation Spruce - Fir Forest/Woodland	S2	Calcareous Sloping Fen	S2
Maritime Dune Community	S2	Coastal Atlantic White Cedar Swamp	S2
Maritime Erosional Cliff Community	S2	Coastal Plain Pondshore	S2
Maritime Rock Cliff Community	S2	Cobble Bar Forest	S2
Pitch Pine - Scrub Oak Community	S2	High-Terrace Floodplain Forest	S2
Ridgetop Pitch Pine - Scrub Oak Community	S2	Inland Atlantic White Cedar Swamp	S2
Yellow Oak Dry Calcareous Forest	S2	Kettlehole Level Bog	S2
Circumneutral Rocky Summit/Rock Outcrop Community	S2S3	Major-River Floodplain Forest	S2
Calcareous Rock Cliff Community	S3	Northern Atlantic White Cedar Swamp	S2
Calcareous Talus Forest/Woodland	S3	Riverside Seep	S2
Circumneutral Rock Cliff Community	S3	Small-River Floodplain Forest	S2
Circumneutral Talus Forest/Woodland	S3	Spruce-Tamarack Bog	S2
Coastal Forest/Woodland	S3	Transitional Floodplain Forest	S2
Maritime Beach Strand Community	S3	Acidic Graminoid Fen	S3
Maritime Shrubland Community	S3	Acidic Shrub Fen	S3
Rich, Mesic Forest Community	S3	Alluvial Red Maple Swamp	S3

Riverside Rock Outcrop Community	S3	High-Energy Riverbank	S3
Black Oak - Scarlet Oak Forest/Woodland	S3S4	Kettlehole Wet Meadow	S3
		Level Bog	S3
		Riverine Pointbar And Beach	S3
		Spruce-Fir Boreal Swamp	S3

NHESP Priority Natural Community types

Estuarine			
Estuarine Intertidal: Brackish Tidal Marsh	S1	**Estuarine**	
Estuarine Intertidal: Fresh/Brackish Tidal Shrubland	S1	Estuarine Intertidal: Coastal Salt Pond Marsh	S2
Estuarine Intertidal: Fresh/Brackish Tidal Swamp	S1	Estuarine Subtidal: Coastal Salt Pond	S2
Estuarine Intertidal: Freshwater Tidal Marsh	S1	Marine Intertidal: Rocky Shore	S2
Estuarine Intertidal: Fresh/Brackish Flats	S2	Estuarine Intertidal: Salt Marsh	S3
Estuarine Subtidal: Fresh/Brackish Flats	S2	Estuarine Intertidal: Saline /Brackish Flats	S3

NHESP

Natural Community Ranks

Each type of natural community is assigned an “element rank”, based on the species element ranking developed for the Natural Heritage system by The Nature Conservancy and maintained by NatureServe. The state rank (S) reflects the rarity and threat within Massachusetts. Every state assigns its own “S” rank based on the rarity and threat within that state, with regard to regional conditions. Global ranks for communities are not included because each state has its own classication system and the US National Vegetation Classification system uses a different system.

State Ranks

S1 = Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream or especially vulnerable to extirpation in Massachusetts for other reasons.

S2 = Typically 6 - 20 occurrences, few remaining individuals, acres, or miles of stream or very vulnerable to extirpation in Massachusetts for other reasons.

S3 = Typically 21 - 100 occurrences, limited acreage, or miles of stream in Massachusetts.

S4 = Apparently secure in Massachusetts.

S5 = Demonstrably secure in Massachusetts

SU = Status unknown in Massachusetts.

SH = No extant sites known in Massachusetts, but it may still exist.

Table 1. Forested Terrestrial Priority Community occurrences on state land

Terrestrial	State Rank	NHESP Recommended Designation	NHESP acres on DSPR property	Number of DSPR properties	NHESP acres on DFW property	Number of DFW properties
Black Oak - Scarlet Oak Forest/Woodland	S3S4				52	2
Calcareous Forest Seep Community	S2	Patch Reserve				
Calcareous Talus Forest/Woodland	S3	Patch Reserve	34	2	34	1
Circumneutral Talus Forest/Woodland	S3	HCVF	83	3	29	4
Coastal Forest/Woodland	S3		34	3	306	2
Hickory - Hop Hornbeam Forest/Woodland	S2	HCVF	25	3	6	1
High Elevation Spruce - Fir Forest/Woodland	S2	HCVF	268	1		
Maritime Juniper Woodland/Shrubland	S1	Patch Reserve				
Maritime Oak - Holly Forest/Woodland	S1	Patch Reserve	90	3	1	1
Maritime Pitch Pine On Dunes	S1	Patch Reserve				
Rich, Mesic Forest Community	S3	HCVF	120	4	237	6
Yellow Oak Dry Calcareous Forest	S2	Patch Reserve				

Table. Forested Wetland Priority Community occurrences on state land.

Palustrine	State Rank	NHESP Recommended Designation	NHESP acres on DSPR property	Number of DSPR properties	NHESP acres on DFW property	Number of DFW properties
Alluvial Red Maple Swamp	S3	HCVF	35	1	3	1
Atlantic White Cedar Bog	S2	HCVF			44	1
Black Ash Swamp	S2	HCVF	3	1	2	1
Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp	S2	HCVF	3	1	118	3
Black Gum Swamp	S2	HCVF			3	1
Black Gum-Pin Oak-Swamp White Oak "Perched" Swamp	S2	Patch Reserve			408	1
Cobble Bar Forest	S2	Patch Reserve				
High-Terrace Floodplain Forest	S2	Patch Reserve			19	1
Major-River Floodplain Forest	S2	Patch Reserve	22	1	80	5
Small-River Floodplain Forest	S2	Patch Reserve			2	1
Spruce-Fir Boreal Swamp	S3	HCVF	7	1	24	1
Spruce-Tamarack Bog	S2	HCVF	125	1		
Transitional Floodplain Forest	S2	Patch Reserve			26	2
Alluvial Atlantic White Cedar Swamp	S2	HCVF			33	2

Coastal Atlantic White Cedar Swamp	S2	HCVF	494	2	1339	4
Inland Atlantic White Cedar Swamp	S2	HCVF	50	2		
Northern Atlantic White Cedar Swamp	S2	HCVF	84	1		

Table 3. Forested Estuarine NHESP Priority Natural Community Type

Estuarine	**State Rank**	**NHESP Recommended Designation**	**NHESP acres on DSPR property**	**Number of DSPR properties**	**NHESP acres on DFW property**	**Number of DFW properties**
Estuarine Intertidal: Fresh/Brackish Tidal Swamp	S1	Patch Reserve	0	0	0	0

Appendix D5. From Interior Forest Metadata: (unpublished, MA Division of Fisheries & Wildlife)

Massachusetts Division of Fisheries and Wildlife, Forestry Program
June, 2004
Interior Forest Land of Massachusetts Based on Land Use Data

interior_forest describes unbroken blocks of unfragmented forest within forested areas of the Commonwealth of Massachusetts. Other natural features such as wetlands and open water are included in this dataset.</abstract>

There are no legal constraints to accessing these data, however credit to the Massachusetts Division of Fisheries and Wildlife Forestry Program should be given

purpose>The dataset was developed to facilitate the selection of forest reserves in Massachusetts as part of Green Certification by the Forest Stewardship Council on lands owned by Massachusetts state agencies.

supplinf>Fragmenting buffer widths were based partially on done by The Nature Conservancy, Boston Office according to work by: Forman, R.T.T., and R.D. Deblinger. 2000. The Ecological Road-Effect Zone of a Massachusetts (U.S.A.) Suburban Highway. Conservation Biology 14:36-46. Source datasets were obtained from MassGIS, http://www.mass.gov/mgis/massgis.htm

Jeremy Bell GIS Specialist/Habitat Analyst Massachusetts Audubon Society under contract to MassWildlife Forestry Program, 2004 1 Rabbit Hill Road Westborough, MA 01581 http://www.mass.gov/dfwele/dfw/

Users should bear in mind that these data represent land use current as of 1999, and the data could soon become obsolete.

interior_forest was created using the Massachusetts Highway Department Roads data (2003), MassGIS Land Use data (1999), and Boston Transportation Planning Organization's Trains data (2004). Land use classes considered natural features from the Land Use 1999 lu21_code were extracted and converted to a new coverage. Codes 3 (forest), 4(wetland), and 20(open water) were included. Although wetlands and open water are not considered interior forest, in most cases they were considered non-fragmenting natural features in a landscape context and were left in for the initial analysis. Roads were separated into three classes: class 1 roads were buffered at 1000m, classes 2,3,4,7 were buffered at 300 m, and classes 5 and 6 were buffered at 100 m. Trains were buffered at 300 m. All land use categories considered fragmenting (all but 3,4, and 20) were extracted and converted to a new coverage. These features were buffered at 300m. The road, trains, and fragmenting land use buffers were then merged into the non-fragmenting natural features. Once complete, the buffers were extracted and deleted from the coverage, leaving polygons considered to be "interior natural features." Clean and build functions were then run to eliminate sliver polygons and artificial boundaries, such as town lines, that split areas of interior natural areas. Wetland and open water polygons were left in the dataset to keep data analysis flexibility for conservation uses. The coverage was then converted to shapefile format for distribution.

interior_forest was created using the Massachusetts Highway Department Roads data (2003), MassGIS Land Use data (1999), and Boston Transportation Planning Organization's Trains data (2004). Land use classes considered natural features from the Land Use 1999 lu21_code were extracted and converted to a new coverage. Codes 3 (forest), 4(wetland), and 20(open water) were included. Although wetlands and open water are not considered interior forest, in most cases they were considered non-fragmenting natural features in a landscape context and were left in for the initial analysis. Roads were separated into three classes: class 1 roads were buffered at 1000m, classes 2,3,4,7 were buffered at 300 m, and classes 5 and 6 were buffered at 100 m. Trains were buffered at 300 m. All land use categories considered fragmenting (all but 3,4, and 20) were extracted and converted to a new coverage. These features were buffered at 300m. The road, trains, and fragmenting land use buffers were then merged into the non-fragmenting natural features. Once complete, the buffers were extracted and deleted from the coverage, leaving polygons considered to be "interior natural features." Clean and build functions were then run to eliminate sliver polygons and artificial boundaries, such as town lines, that split areas of interior natural areas. Wetland and open

water polygons were left in the dataset to keep data analysis flexibility for conservation uses. The coverage was then converted to shapefile format for distribution.

Appendix D6. Cultural Values

5.2.3 Historical and Archeological Resources

MHC is the State Historic Preservation Office and is responsible for administering State Register properties and other historic and archaeological assets. The MHC is also the office of the State Archaeologist, whose duties are to compile and maintain an inventory of archaeological sites, to issue permits for archaeological investigations on lands in which the Commonwealth has an interest, and, in accordance with Massachusetts General Laws, Chapter 38, Section 6, notify the Commission on Indian Affairs if a possible Native American burial site has been identified.

5.2.3.3 Issues and Recommendations

Management of the resources within the Bioreserve should incorporate the appropriate protection procedures to insure that the cultural resource base is not adversely affected by daily operations and visitor use. The cultural resources including archaeological remains and historic buildings and remnants are finite resources. They represent unique records of past events and behavior that are part of our communal heritage. Typically, prehistoric sites resulted from short-term sporadic occupation. There is seldom much material left, and under the best of circumstances sites are difficult to excavate and interpret properly. They are extremely fragile and easily damaged. Archaeological sites cannot be repaired or fixed, and their loss is analogous to the extinction of a plant or animal species. Once these resources are gone, they are gone forever.

The preservation of cultural resources within the Bioreserve can easily be accomplished through continued cooperation and teamwork. Good planning and early communication about proposed projects will insure smooth project implementation. Beyond the dictates of legal compliance and resource protection, the cultural history of the Bioreserve should be explored, developed and offered to the public.

In general, good management of the cultural resources will include:

- Planning of projects, both capital and normal operations, that takes into account the potential effects on historic and archaeological resources
- Partners should (state agencies must) notify the MHC of any project that has the potential for impacting the historical, architectural, archaeological or cultural qualities of a property. Should partners undertake a project under federal funding or requiring federal oversight and/or permits, Section 106 of the National Historic Preservation Act of 1966 as amended (16 USC 470 et seq.) also requires consultation with the MHC.
- For projects planned at the Bioreserve on state lands, staff should consult with DPR's archaeologist and preservation planners in the Planning, Design and Development of Historic Resources.
- For most projects, the DCR Project Planning, Design and Development staff will require a project description, a site plan and photographs for review. No physical work can occur until one of the following outcomes has been achieved:

- Determination by DCR Project Planning, Design and Development staff that the project constitutes a categorical exemption and is consistent with DEM preservation standards
- Determination of “no effect” or “no adverse effect” from the MHC
- Successful completion of any mitigation outlined in the Memorandum of Agreement (MOA) between DCR and MHC (in cases of determination of “adverse effect”). If Project Planning, Design and Development or the MHC determines that the project will result in an “adverse impact” to cultural and/or archaeological properties, the project proponent will work with OHR and the MHC to avoid, minimize or mitigate the impact. The Office of Project Planning, Design and Development will initiate and manage those activities that will minimize or mitigate adverse impacts to cultural and archaeological resources on the state properties.
- Reporting of discoveries of artifacts or soil anomalies, observing the effects of active recreation to sensitive areas, and monitoring for looting of known archaeological sites (as identified by appropriate staff)
- Prohibition of the use of metal detectors on Commonwealth lands
- Maintenance of confidentiality regarding the specific locations of prehistoric sites (the Freedom of Information Act does not apply)
- Improvements to National Register listed or eligible properties in accordance with the Secretary of the Interior’s Standards for the Treatment of Historic Properties
- Continued recognition of significant historic buildings, objects and landscapes through their nomination to the National Register of Historic Properties

Appendix E – Nearby Protected Lands

DSPR Facility Buffered	Non-DSPR Property Within 1 Mile	Ownership	Total
APPALACHIAN TRAIL CORRIDOR	BUTTERNUT BASIN SKI AREA	Private	27.63
	JUG END FEN NHA	State	16.84
	Mt. Plantain	Land Trust	207.46
	MT. PLANTAIN WCE	Dept. of Fish & Game	963.50
	NPS CONSERVATION EASEMENT	Federal	26.96
	SCHENOB BROOK FEN	Land Trust	256.21
APPALACHIAN TRAIL CORRIDOR Total			1498.60
ARTHUR WHARTON SWANN SF	BROCHU MILLS	Municipal	3.00
	CEMETERY	Municipal	6.22
	GOULD FARM	Non-Profit	93.88
	OPEN SPACE	Municipal	0.51
ARTHUR WHARTON SWANN SF Total			103.62
BASH BISH FALLS STATE PARK	NORTHROP MEMORIAL CAMP	Non-Profit	346.85
	VANDERSMISSEN MEMORIAL PARK	Municipal	34.30
BASH BISH FALLS STATE PARK Total			381.15
BEARTOWN STATE FOREST	AGAWAM LAKE WMA	Dept. of Fish & Game	435.28
	AUSTEN RIGGS CENTER	Non-Profit	13.55
	BECKET WMA	Dept. of Fish & Game	220.11
	BERKSHIRE HILLS REG. SCHOOL DI	Municipal	145.11
	BERKSHIRE THEATRE FESTIVAL	Private	7.79
	BIDDWELL HOUSE	Private	199.91
	BIDWELL PARK	Municipal	7.32
	BROCHU MILLS	Private	3.00
	CEMETERY	Municipal	8.60
	CONGREGATION OF MARIAN FATHERS	Non-Profit	0.59
	COURSER BROOK FARM	Private	65.06
	FISH HATCHERY	Federal	96.79
	GOULD FARM	Non-Profit	564.26
	HARTSVILLE CEMETERY	Municipal	0.52
	HEPHZIBAH HEIGHTS	Non-Profit	64.52
	HIKING CAMP	Non-Profit	132.55
	HOP BROOK WMA	Dept. of Fish & Game	358.79
	LAUREL HILL	Land Trust	217.21
	LONGCOPE PROPERTY	Municipal	35.12
	MADDEN OPEN HEART FOUNDATION	Private	367.38

	MCLENNAN RESERVATION	Land Trust	291.47
	MISSION HOUSE	Land Trust	0.50
	MONUMENT MOUNTAIN RESERVATION	Land Trust	122.73
	OPEN SPACE	Municipal	6.37
	PARADE GROUNDS	Municipal	0.55
	POSSIBLE GOLF COURSE	Municipal	2.98
	RAVINE FALLS FARM	Private	15.38
	RECREATION PARK	Municipal	9.75
	SMITH-ALEXANDER & CLARK FARMS	Private	77.03
	SOUTH LEE PARK	Municipal	0.45
	SUNSET FARM	Private	83.22
	TOWN BEACH	Municipal	14.30
	TYRINGHAM WCE	Dept. of Fish & Game	688.03
BEARTOWN STATE FOREST Total			4256.22
CAMPBELLS FALLS STATE PARK	CAMP SEGOWEA	Non-Profit	61.62
CAMPBELLS FALLS STATE PARK Total			61.62
CLAM LAKE F.C. SITE	NEW MARLBORO / SANDISFIELD WCE (WATERS LOT)	Dept. of Fish & Game	182.02
CLAM LAKE F.C. SITE Total			182.02
COOKSON STATE FOREST	CAMP SEGOWEA	Non-Profit	268.91
	CEMETERY	Municipal	0.87
	HUXLEY CEMETERY	Municipal	0.36
COOKSON STATE FOREST Total			270.14
EAST MOUNTAIN STATE FOREST	ANDREWS PROPERTY	Land Trust	64.42
	BUTTERNUT BASIN SKI AREA	Private	54.61
	CAMP BIGFORD	Private	0.45
	GREAT BARRINGTON FAIRGROUNDS	Non-Profit	73.23
	GROVE STREET PARK	Municipal	2.33
	HOUSATONIC RIVER ACCESS	State	18.68
	JOHN P TRACEY PARK	Municipal	8.78
	MEMORIAL FIELD	Municipal	3.41
	OLYMPIAN MEADOWS	Municipal	25.20
	SEARLES CASTLE	Non-Profit	37.26
	THOMAS TRACT	Non-Profit	40.06
	THREE MILE POND WMA	Dept. of Fish & Game	696.57
EAST MOUNTAIN STATE FOREST Total			1025.01
FOUNTAIN POND PARK	AGAWAM LAKE WMA	Dept. of Fish & Game	85.75
	BERKSHIRE HILLS REG. SCHOOL DI	Municipal	90.44
	MADDEN OPEN HEART FOUNDATION	Private	187.92
	MONUMENT MOUNTAIN	Private	21.21
	MONUMENT MOUNTAIN	Land Trust	470.74

	RESERVATION		
	RISING FIELD	Non-Profit	9.69
FOUNTAIN POND PARK Total			865.75
GRANVILLE STATE FOREST	CR #1	Private	92.79
	FARMINGTON RIVER WATERSHED	CT MDC	1236.15
	TWIN BROOK CAMPING AREA	Non-Profit	40.14
GRANVILLE STATE FOREST Total			1369.07
JUG END STATE RESERVATION & WMA	BLACK ROCK	Land Trust	73.67
	JUG END FEN NHA	Dept. of Fish & Game	62.00
	NORTHROP MEMORIAL CAMP	Non-Profit	6.04
	VANDERSMISSEN MEMORIAL PARK	Private	102.89
JUG END STATE RESERVATION & WMA Total			244.61
MT EVERETT STATE RES	BLACK ROCK	Land Trust	73.67
	DOLOMITE LEDGES NHA	Dept. of Fish & Game	218.49
	Mt. Plantain	Land Trust	207.46
	MT. PLANTAIN WCE	Dept. of Fish & Game	923.21
	ROMANO PROPERTY	Private	29.10
	SCHENOB BROOK ACEC	Land Trust	53.41
	SCHENOB BROOK FEN	Non-Profit	208.92
MT EVERETT STATE RES Total			1714.25
MT WASHINGTON STATE FOREST	Mt. Plantain	Land Trust	40.73
	MT. PLANTAIN WCE	Dept. of Fish & Game	898.01
	NORTHROP MEMORIAL CAMP	Non-Profit	362.52
	ROMANO PROPERTY	Private	19.99
	VANDERSMISSEN MEMORIAL PARK	Private	159.68
MT WASHINGTON STATE FOREST Total			1480.93
OTIS STATE FOREST	CAMP FIRE GIRLS	Non-Profit	138.28
	CEMETERY	Municipal	1.24
	COBBLE MOUNTAIN RESERVOIR	Municipal	217.27
	COUNTY BEACH	State	0.24
	FARMINGTON RIVER WMA	Dept. of Fish & Game	512.33
	OTIS CEMETERY	Municipal	6.75
	OTIS WMA	Dept. of Fish & Game	104.78
	PV GIRL SCOUT CAMP	Non-Profit	183.68
	SPRINGFIELD WATER SUPPLY LAND	Municipal	155.83
OTIS STATE FOREST Total			1320.40
SANDISFIELD STATE FOREST	CEMETERY	Municipal	35.38
	CR #15	Private	109.08
	NEW MARLBORO / SANDISFIELD WCE (HOPPINS LOT)	Dept. of Fish & Game	277.08
	NEW MARLBORO / SANDISFIELD WCE	Dept. of Fish & Game	36.29

	(MANCHESTER LOT)		
	NEW MARLBORO / SANDISFIELD WCE (WATERS LOT)	Dept. of Fish & Game	162.01
	SANDISFIELD SCHOOL	Municipal	5.02
	SMITH-ALEXANDER & CLARK FARMS	Private	59.96
	STEEPLETOP	Private	1307.11
	TIMBER TRAILS CAMP	Non-Profit	393.12
SANDISFIELD STATE FOREST Total			2385.05
SILVER BROOK NORTH F.C. SITE	NEW MARLBORO / SANDISFIELD WCE (HAYFORD LOT)	Dept. of Fish & Game	179.00
	SANDISFIELD SCHOOL	Municipal	5.02
SILVER BROOK NORTH F.C. SITE Total			184.02
TOLLAND STATE FOREST	CAMP FIRE GIRLS	Non-Profit	138.28
	COUNTY BEACH	State	0.24
	FARMINGTON RIVER WATERSHED	CT MDC	838.33
	SPRINGFIELD WATER SUPPLY LAND	Municipal	295.61
	TIMBER TRAILS CAMP	Non-Profit	1027.47
TOLLAND STATE FOREST Total			2299.93
Grand Total			**19642.38**

Appendix F – Rare Species

The following is a list of the 116 rare species that are currently known to occur in the SBK area.

Scientific Name	Common Name	Group	Year Last Seen	State Rank	MESA Status
Bat Hibernaculum		Animal Assemblage	1995	SNR	
Aeshna mutate	Spatterdock Darner	Animal, Invertebrate	2001	S3	SC
Alasmidonta undulate	Triangle Floater	Animal, Invertebrate	2002	S3	SC
Alasmidonta varicose	Brook Floater (Swollen Wedgemussel)	Animal, Invertebrate	2004	S1	E
Catocala herodias gerhardi	Gerhard's Underwing Moth	Animal, Invertebrate	1998	S3	SC
Cicindela duodecimguttata	Twelve-spotted Tiger Beetle	Animal, Invertebrate	1965	S3	SC
Eacles imperialis	Imperial Moth	Animal, Invertebrate	1951	S1	T
Eulimnadia agassizii	Agassiz's Clam Shrimp	Animal, Invertebrate	1993	S1	E
Euphyes dion	Dion Skipper	Animal, Invertebrate	2003	S1S2	T
Gammarus pseudolimnaeus	Northern Spring Amphipod	Animal, Invertebrate	1997	S2	SC
Gomphus borealis	Beaverpond Clubtail	Animal, Invertebrate	2001	S3	Delisted
Gomphus descriptus	Harpoon Clubtail	Animal, Invertebrate	2001	S2	E
Limnadia lenticularis	American Clam Shrimp	Animal, Invertebrate	1993	S1	SC
Neurocordulia yamaskanensis	Stygian Shadowdragon	Animal, Invertebrate	2004	S2	SC
Pomatiopsis lapidaria	Slender Walker	Animal, Invertebrate	2002	S1	E
Satyrium favonius	Oak Hairstreak	Animal, Invertebrate	2003	S2S3	SC
Strophitus undulates	Creeper	Animal, Invertebrate	2002	S3	SC
Stygobromus borealis	Taconic Cave Amphipod	Animal, Invertebrate	1983	S1	E
Stygobromus tenuis tenuis	Piedmont Groundwater Amphipod	Animal, Invertebrate	1991	S1	SC
Stylurus scudderi	Zebra Clubtail	Animal, Invertebrate	2004	S3	E
Stylurus spiniceps	A Clubtail Dragonfly	Animal, Invertebrate	2004	S3	T
Ambystoma jeffersonianum	Jefferson Salamander	Animal, Vertebrate	2004	S3	SC
Ammodramus savannarum	Grasshopper Sparrow	Animal, Vertebrate	1978	S2	T
Botaurus lentiginosus	American Bittern	Animal, Vertebrate	2005	S2	E
Catostomus catostomus	Longnose Sucker	Animal, Vertebrate	2004	S3	SC
Cistothorus platensis	Sedge Wren	Animal, Vertebrate	2005	S1	E
Clemmys guttata	Spotted Turtle	Animal, Vertebrate	2001	S3	Delisted
Crotalus horridus	Timber Rattlesnake	Animal, Vertebrate	2006	S1	E
Falco peregrinus	Peregrine Falcon	Animal, Vertebrate	1947	S1	E
Gallinula chloropus	Common Moorhen	Animal, Vertebrate	2005	S1	SC
Glyptemys insculpta	Wood Turtle	Animal, Vertebrate	2006	S3	SC
Glyptemys muhlenbergii	Bog Turtle	Animal, Vertebrate	1995	S1	E
Gyrinophilus porphyriticus	Spring Salamander	Animal, Vertebrate	2001	S3	Delisted
Haliaeetus leucocephalus	Bald Eagle	Animal, Vertebrate	2006	S1	E
Hemidactylium scutatum	Four-toed Salamander	Animal, Vertebrate	1997	S3	SC
Ixobrychus exilis	Least Bittern	Animal, Vertebrate	1991	S1	E
Lota lota	Burbot	Animal, Vertebrate	1970	S1	SC
Myotis leibii	Eastern Small-footed Bat	Animal, Vertebrate	2005	S1	SC
Myotis sodalist	Indiana Myotis	Animal, Vertebrate	1935	SH	E
Notropis bifrenatus	Bridle Shiner	Animal, Vertebrate	2005	SNR	SC
Podilymbus podiceps	Pied-billed Grebe	Animal, Vertebrate	1987	S1	E
Rallus elegans	King Rail	Animal, Vertebrate	1965	S1	T
Scaphiopus holbrookii	Eastern Spadefoot	Animal, Vertebrate	1996	S2	T

Sorex dispar	Long-tailed Shrew	Animal, Vertebrate	1986	S3	SC
Sorex palustris	Water Shrew	Animal, Vertebrate	1953	S3	SC
Terrapene Carolina	Eastern Box Turtle	Animal, Vertebrate	2005	S3	SC
Tyto alba	Barn Owl	Animal, Vertebrate	1950	S2	SC
Vermivora chrysoptera	Golden-winged Warbler	Animal, Vertebrate	1992	S1	E
Acer nigrum	Black Maple	Vascular Plant	2005	S3	SC
Actaea racemosa	Black Cohosh	Vascular Plant	2005	S1	E
Adlumia fungosa	Climbing Fumitory	Vascular Plant	1998	S3	SC
Agastache scrophulariifolia	Purple Giant Hyssop	Vascular Plant	1920	S1	E
Agrimonia parviflora	Small-flowered Agrimony	Vascular Plant	2003	S1	E
Agrimonia pubescens	Hairy Agrimony	Vascular Plant	1997	S2	T
Amelanchier sanguinea	Roundleaf Shadbush	Vascular Plant	2001	S3	SC
Arabidopsis lyrata	Lyre-leaved Rock-cress	Vascular Plant	1997	S1	E
Arceuthobium pusillum	Dwarf Mistletoe	Vascular Plant	1998	S3	SC
Arisaema dracontium	Green Dragon	Vascular Plant	1997	S2	T
Asplenium montanum	Mountain Spleenwort	Vascular Plant	2004	S1	E
Asplenium ruta-muraria	Wall-rue Spleenwort	Vascular Plant	2005	S2	T
Betula pumila	Swamp Birch	Vascular Plant	2004	S1	E
Blephilia ciliate	Downy Wood-mint	Vascular Plant	2003	S1	E
Blephilia hirsute	Hairy Wood-mint	Vascular Plant	2003	S1	E
Boechera laevigata	Smooth Rock-cress	Vascular Plant	2003	S2	T
Cardamine douglassii	Purple Cress	Vascular Plant	1984	S1	E
Cardamine pratensis var. palustris	Fen Cuckoo Flower	Vascular Plant	2000	S1	T
Carex alopecoidea	Foxtail Sedge	Vascular Plant	2002	S2	T
Carex baileyi	Bailey's Sedge	Vascular Plant		S1	E
Carex bushii	Bush's Sedge	Vascular Plant	2006	S1	E
Carex davisii	Davis's Sedge	Vascular Plant	2002	S1	E
Carex Formosa	Handsome Sedge	Vascular Plant	2002	S1	T
Carex grayi	Gray's Sedge	Vascular Plant	2003	S2	T
Carex hitchcockiana	Hitchcock's Sedge	Vascular Plant	2002	S3	SC
Carex lenticularis	Shore Sedge	Vascular Plant	1985	S2	T
Carex pauciflora	Few-flowered Sedge	Vascular Plant	1913	S1	E
Carex schweinitzii	Schweinitz's Sedge	Vascular Plant	1980	S1	E
Carex sterilis	Dioecious Sedge	Vascular Plant	2003	S2	T
Carex tetanica	Fen Sedge	Vascular Plant	2003	S3	SC
Carex tuckermanii	Tuckerman's Sedge	Vascular Plant	2003	S1	E
Cerastium nutans	Nodding Chickweed	Vascular Plant	1919	S1	E
Chamaelirium luteum	Devil's-bit	Vascular Plant	1994	S1	E
Chenopodium foggii	Fogg's Goosefoot	Vascular Plant	1999	S1	E
Claytonia virginica	Narrow-leaved Spring Beauty	Vascular Plant	2002	S1	E
Clematis occidentalis	Purple Clematis	Vascular Plant	197-	S2	SC
Conioselinum chinense	Hemlock Parsley	Vascular Plant	2004	S3	SC
Corallorhiza odontorhiza	Autumn Coralroot	Vascular Plant	2000	S3	SC
Cryptogramma stelleri	Fragile Rock-brake	Vascular Plant	2001	S1	E
Cynoglossum virginianum var. boreale	Northern Wild Comfrey	Vascular Plant	2004	S1	E
Cyperus houghtonii	Houghton's Flatsedge	Vascular Plant	1989	S1	E
Cypripedium arietinum	Ram's-head Lady's-slipper	Vascular Plant	1908	S1	E
Cypripedium parviflorum var. makasin	Small Yellow Lady's-slipper	Vascular Plant	2003	S1	E
Cypripedium reginae	Showy Lady's-slipper	Vascular Plant	1994	S3	SC
Desmodium cuspidatum	Large-bracted Tick-trefoil	Vascular Plant	1993	S2	T
Eleocharis intermedia	Intermediate Spike-sedge	Vascular Plant	1990	S2	T

Eleocharis quinqueflora	Few-flowered Spike-sedge	Vascular Plant	2002	S1	E
Elymus villosus	Hairy Wild Rye	Vascular Plant	2000	S1	E
Equisetum scirpoides	Dwarf Scouring-rush	Vascular Plant	2002	S3	SC
Eragrostis frankii	Frank's Lovegrass	Vascular Plant	1990	S3	SC
Eriophorum gracile	Slender Cottongrass	Vascular Plant	1991	S2	T
Galium boreale	Northern Bedstraw	Vascular Plant	1989	S1	E
Galium labradoricum	Labrador Bedstraw	Vascular Plant	1999	S2	T
Gentiana andrewsii	Andrews' Bottle Gentian	Vascular Plant	2003	S1	E
Houstonia longifolia var. longifolia	Long-leaved Bluet	Vascular Plant	1993	S1	E
Hydrastis Canadensis	Golden Seal	Vascular Plant	2002	S1	E
Hypericum ascyron	Giant St. John's-wort	Vascular Plant	2002	S1	E
Ilex Montana	Mountain Winterberry	Vascular Plant	2005	S1	E
Juncus filiformis	Thread Rush	Vascular Plant	1994	S1	E
Linum medium var. texanum	Rigid Flax	Vascular Plant	1988	S2	T
Lobelia siphilitica	Great Blue Lobelia	Vascular Plant	2004	S1	E
Malaxis monophyllos var. brachypoda	White Adder's-mouth	Vascular Plant	1984	S1	E
Milium effusum	Woodland Millet	Vascular Plant	1992	S2	T
Minuartia michauxii	Michaux's Sandwort	Vascular Plant	1987	S2	T
Morus rubra	Red Mulberry	Vascular Plant	1988	S1	E
Myriophyllum verticillatum	Comb Water-milfoil	Vascular Plant	2001	S1	E
Nuphar microphylla	Tiny Cow-lily	Vascular Plant	1992	S1	E
Ophioglossum pusillum	Adder's-tongue Fern	Vascular Plant	1915	S2	T
Orontium aquaticum	Golden Club	Vascular Plant	1985	S1	E
Panax quinquefolius	Ginseng	Vascular Plant	1994	S3	SC
Panicum philadelphicum ssp. Gattingeri	Gattinger's Panic-grass	Vascular Plant	1989	S2	SC
Penstemon hirsutus	Hairy Beardtongue	Vascular Plant	2003	S1	E
Petasites frigidus var. palmatus	Sweet Coltsfoot	Vascular Plant	1983	S1	E
Platanthera flava var. herbiola	Pale Green Orchis	Vascular Plant	2002	S2	T
Poa saltuensis spp. Languida	Drooping Speargrass	Vascular Plant	2000	S1	E
Potamogeton confervoides	Algae-like Pondweed	Vascular Plant	2004	S2	T
Potamogeton friesii	Fries' Pondweed	Vascular Plant		S1	E
Potamogeton hillii	Hill's Pondweed	Vascular Plant	2005	S3	SC
Potamogeton vaseyi	A Pondweed	Vascular Plant	2002	S1	E
Pyrola asarifolia ssp. Asarifolia	Pink Pyrola	Vascular Plant	1983	S1	E
Quercus macrocarpa	Mossy-cup Oak	Vascular Plant	1999	S3	SC
Quercus muehlenbergii	Yellow Oak	Vascular Plant	2003	S2	T
Ranunculus micranthus	Tiny-flowered Buttercup	Vascular Plant	1991	S1	E
Ranunculus pensylvanicus	Bristly Buttercup	Vascular Plant	1997	S2	T
Rhododendron maximum	Great Laurel	Vascular Plant	1997	S1S2	T
Rhynchospora capillacea	Capillary Beak-sedge	Vascular Plant	2001	S1	E
Ribes lacustre	Bristly Black Currant	Vascular Plant	19--	S3	SC
Sagittaria cuneata	Wapato	Vascular Plant	2004	S2	T
Sanicula Canadensis	Canadian Sanicle	Vascular Plant	1999	S2	T
Sanicula odorata	Long-styled Sanicle	Vascular Plant	2002	S2	T
Scheuchzeria palustris	Pod-grass	Vascular Plant	1998	S1	E
Solidago simplex ssp. randii var. monticola	Rand's Goldenrod	Vascular Plant	2003	S1	E
Sparganium natans	Small Bur-reed	Vascular Plant	1991	S1	E
Sphenopholis nitida	Shining Wedgegrass	Vascular Plant	1991	S2	T
Spiranthes romanzoffiana	Hooded Ladies'-tresses	Vascular Plant	1990	S1	E
Sporobolus neglectus	Small Dropseed	Vascular Plant	2005	S1	E
Symphyotrichum prenanthoides	Crooked-stem Aster	Vascular Plant	2004	S2	T

Thuja occidentalis	Arborvitae	Vascular Plant	1998	S1	E
Trichomanes intricatum	A Filmy-fern	Vascular Plant	1990	S1	E
Trichostema brachiatum	False Pennyroyal	Vascular Plant	1983	S1	E
Verbena simplex	Narrow-leaved Vervain	Vascular Plant	2003	S1	E
Veronica catenata	Sessile Water-speedwell	Vascular Plant	1997	S1	E
Veronicastrum virginicum	Culver's-root	Vascular Plant	2006	S2	T
Viburnum rafinesquianum	Downy Arrowwood	Vascular Plant	1997	S1	E
Waldsteinia fragarioides	Barren Strawberry	Vascular Plant	2003	S3	SC

MESA Status Codes:

E = Endangered
T = Threatened
SC = Special Concern
Delisted – species no longer protected under MESA, but are usually of conservation interest on state lands.

The following table lists rare species found on DSPR system lands in the SBK District.

Scientific Name	Common Name	Group	Year Last Seen	State Rank	MESA Status
Alasmidonta undulate	Triangle Floater	Animal, Invertebrate	1996	S3	SC
Alasmidonta varicose	Brook Floater (Swollen Wedgemussel)	Animal, Invertebrate	1996	S1	E
Catocala herodias gerhardi	Gerhard's Underwing Moth	Animal, Invertebrate	1998	S3	SC
Cicindela duodecimguttata	Twelve-spotted Tiger Beetle	Animal, Invertebrate	1965	S3	SC
Ambystoma jeffersonianum	Jefferson Salamander	Animal, Vertebrate	1999	S3	SC
Crotalus horridus	Timber Rattlesnake	Animal, Vertebrate	2006	S1	E
Gyrinophilus porphyriticus	Spring Salamander	Animal, Vertebrate	1997	S3	Delisted
Notropis bifrenatus	Bridle Shiner	Animal, Vertebrate	1996	SNR	SC
Sorex dispar	Long-tailed Shrew	Animal, Vertebrate	1951	S3	SC
Sorex palustris	Water Shrew	Animal, Vertebrate	1953	S3	SC
Adlumia fungosa	Climbing Fumitory	Vascular Plant	1919	S3	SC
Agrimonia pubescens	Hairy Agrimony	Vascular Plant	1997	S2	T
Arabidopsis lyrata	Lyre-leaved Rock-cress	Vascular Plant	1991	S1	E
Arceuthobium pusillum	Dwarf Mistletoe	Vascular Plant	1990	S3	SC
Boechera laevigata	Smooth Rock-cress	Vascular Plant	1997	S2	T
Carex baileyi	Bailey's Sedge	Vascular Plant		S1	E
Carex pauciflora	Few-flowered Sedge	Vascular Plant	1913	S1	E
Cerastium nutans	Nodding Chickweed	Vascular Plant	1915	S1	E
Chenopodium foggii	Fogg's Goosefoot	Vascular Plant	1919	S1	E
Clematis occidentalis	Purple Clematis	Vascular Plant	1983	S2	SC
Cypripedium reginae	Showy Lady's-slipper	Vascular Plant	1913	S3	SC
Desmodium cuspidatum	Large-bracted Tick-trefoil	Vascular Plant	1908	S2	T
Ilex Montana	Mountain Winterberry	Vascular Plant	2005	S1	E
Potamogeton confervoides	Algae-like Pondweed	Vascular Plant	2004	S2	T
Ribes lacustre	Bristly Black Currant	Vascular Plant	19??	S3	SC
Solidago simplex ssp. randii var. monticola	Rand's Goldenrod	Vascular Plant	2003	S1	E
Thuja occidentalis	Arborvitae	Vascular Plant	1998	S1	E

MESA Status Codes:

E = Endangered
T = Threatened
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Delisted – species no longer protected under MESA, but are usually of conservation interest on state lands.

Appendix G – Cultural Resource Protection

The Commonwealth of Massachusetts is heir to a rich legacy of cultural resources; its historic buildings, structures, archaeological sites and landscapes are reminders of the important role that the State has played since long before the Pilgrims landed at Plymouth. These resources are milestones in the course of history and teach us about how people lived during prehistoric, pre-and post-Colonial times. They inform us about the industrial and technological changes of the 19th and 20th centuries and even give us a glimpse of life during the Great Depression and two World Wars.

Combined, these diverse historic resources document the human experience in Massachusetts. Scattered across the landscape, this ensemble of buildings, structures and sites tell the story of our common heritage – our Commonwealth – and their protection and preservation has become a vital component of DCR's mission and policy for resource stewardship.

At the time of writing, DCR's Office of Historic Resource's staff has had the opportunity to make only a cursory inspection of the archaeological record of the nineteen Parks and Forests that comprise the Southern Berkshire District. It was known from the outset that the DCR's(former DEM) Site Inventory that was performed in 1985 was in need of updating. It was also known that western Massachusetts is the only part of the State that was not studied as part of the Massachusetts Historical Commission's (MHC) Statewide Survey, which culminated in 1984 with the completion of the Connecticut River Valley. Therefore, it was known from the beginning that the information available for developing cultural resource preservation strategies was incomplete and only preliminary in nature. The following section is offered with these shortcomings in mind.

The western portion of Massachusetts consists of rough, hilly terrain and low river valleys. Although archaeological information on Native American activities in the Berkshires is limited, it is likely that the region was occupied throughout prehistory i.e., from Paleo Indian times 12,000 years ago to early historic times only 450 years ago.

While it is doubtful that Native American populations in the hills of the Berkshires ever approached the numbers of those in the eastern part of the state, particularly in the coastal and estuarine zones, or the nearby Connecticut River Valley, the existing archaeological record must be considered artificially low. This bias has been induced by a number of factors and, as suggested below, actually creates great promise and opportunity for resource preservation and protection. A principal cause of bias, other than the lack of comprehensive research, is the relative lack of amateur collecting activities due to limited development and farming which the region has experienced.

A site inventory was performed in preparation of this section and reviewed recorded sites on U.S.G.S. Topographic maps that cover the Southern Berkshire District. Only two prehistroric archaeological sites are recorded within the Southern Berkshire District, and they both occur within the Appalachian Trail in Great Barrington (19-BK-115, 19-BK-28)..Artifacts were collected in cultivated fields and nothing more is known about them. There are thousands of contiguous acres where not a single prehistoric site is recorded

The Southern Berkshire District includes a diverse landscape that contains some very important ecological differences throughout. However, these differences cannot explain the presence of Native American occupation in one area and the lack of occupation in another. To the contrary, some of the ecological characteristics of the areas where there are no sites are very favorable, even if within limited areas. One must surmise from this that

archaeological sites exist but they simply haven't been found. Over the years, archaeologists have developed a model for identifying locations where sites are likely to occur. By evaluating ***Site Location Criteria***, which takes into account several geographical and ecological characteristics, areas of ***high archaeological sensitivity*** can be identified. By employing this model we can make reasonable predictions about the presence or absence of sites within the Southern Berkshire District and this will become an invaluable tool in the in-house evaluation of impacts to archaeological resources from the implementation of the Bureau's silviculture program.

B. Prehistoric Overview & Archaeological Resources

There are two recorded Native American sites (19BK28 and 19BK115) within the Southern Berkshire District and they are both located in Great Barrington. Nothing except their locations are known. Nothing is known about their age, size, seasons they were used or activities performed.

Existing archaeological data combined with historic records and oral tradition indicates that the Native inhabitants of western Massachusetts, particularly the Berkshires, but also including the middle Connecticut River Valley, had strong ties and cultural affinities to the peoples of the Hudson Valley, more so than to their eastern relatives. It also appears that these ties extend far back into antiquity, and did not just develop in late prehistoric or early historic times.

Presumably the first humans to occupy this region would have been Paleo Indian hunters and gatherers (ca. 12,000 – 9,000 B.P.) While no Paleo sites are known specifically in the Southern Berkshire District, a number have been identified a short distance west on the Hudson River, to the north in Vermont, New Hampshire and Maine, in Connecticut, and several in central, eastern, and southern Massachusetts. Significantly, the Deerfield Economic Development and Industrial Corporation site in Deerfield, which is between 9,000 to 12,000 years old, is located a short distance east of Goshen and northeast of Williamsburg.

From approximately 12,000 years ago to the present, warming climatic trends have resulted in marked landscape changes i.e., forests evolved from tundra-like conditions to Spruce Woodland, to Mixed Spruce and Hardwood Forests, and finally to the Eastern Deciduous Forest of today. These changes included a broad spectrum of commensurate adjustments in associated flora and fauna as well -- with each presenting its own challenges and opportunities to the local human populations. Indeed, the current archaeological record reveals that the topographical and geographical area that comprises the Southern Berkshire District was occupied through the ensuing Early, Middle, and Late Archaic periods (ca. 9,000 – 3,000 B.P.), as well as Early Middle and Late Woodland periods (ca. 3,000 – 500 B.P.)

In order to place the Southern Berkshire District within a broader temporal and spatial context, a model of settlement in the Western Highlands of the Commonwealth has tentatively been formulated based on research in New York (Funk and Ritchie 1973) and Connecticut (Wadleigh 1983). When applied to the Southern Berkshire District, this model predicts that sites located within the highland and upland portions of the region would often be special purpose sites such as quarries, kill sites, and rock shelters. Such sites would tend to be small in area because they were occupied only briefly during the seasonal rounds of small foraging groups or nuclear families. In this model, the Berkshire highlands or uplands are viewed as marginal hinterlands, only used seasonally by peoples who otherwise spent most of the year elsewhere, presumably at lower elevations adjacent to rivers and streams, lakes, ponds and wetlands.

Conversely, the alluvial plains associated with the region's many major rivers such as the Housatonic, Deerfield and Westfield rivers and their tributary streams, would generally be expected to contain larger sites because they would have been occupied by more people for longer periods of time than those of the upland/highland

regime. Similarly, elevated well-drained locations around naturally occurring lakes, ponds, and wetlands may also tend to be larger because they attracted diverse animal and plant species, which in turn were capable of supporting larger and more diverse human populations.

Two important changes that occurred in New England may also have important implications for Native American occupation of the Berkshires in general from at least 8,000 to 2,500 years ago: one of these was natural and the other was cultural. First, approximately 8,000 years ago, scientists believe that the spawning behavior of anadromous fish became reestablished after having been disrupted by the Wisconsin Glacial (Dincauze 1975). From that time on, throughout New England, locations situated adjacent to falls and rapids along the region's major rivers became important for the seasonal harvest of this fishery. Indeed, this fishing activity may have become critical to group survival throughout the rest of prehistory. Therefore, those rivers which retain, or at least before historic damming, had outlets to the sea (Long Island Sound) may be expected to yield higher site densities than those that did not. Secondly, by at least 2,500 years ago, alluvial terraces became particularly attractive to local horticulturalists who had just learned to domesticate corn, beans and squash. Thus, it is predicted that riparian zones in general and particularly those with well developed floodplains, will contain late archaeological sites (i.e., Early, Middle, and Late Woodlands sites ca. 3,000 to 500 years ago).

C. Historic Overview & Archaeological Resources

Town histories written in the 19th century provide reasonably good documentation of Native American activities and sites throughout the Berkshires, although by the time they were written they were already second hand accounts. Perhaps the most obvious remnant of the Early Historic Period is a system of trails, which are believed to be derived from trails create during prehistoric times.

The most southerly of the major east-west trails followed the north bank of the Westfield River from the Connecticut River to the Woronoco ford in Westfield and along Munn Brook to the Berkshire foothills. From here, the trail climbed over Westfield Mountain to Russell Pond, where it looped across the Blandford highlands to Big Pond in Otis and continued west to the Housatonic Valley (MHC 1984).

It isn't easy, or perhaps even not possible, to make broad generalizations about the history of an area as diverse and large as the Berkshires, as almost by definition the diversity precludes generalizations. Nevertheless, in the interest of brevity, certain salient or underlying characteristics do standout that make the Berkshire's history distinct, if not unique, within the state.

Due largely to its rugged topography characterized by high elevations dissected by a maze of steep stream and river valleys; much of the land within the Berkshires was not settled until the mid 18th century. Ecological conditions created a formidable barrier to Colonial settlement, which first focused on the broad river basins of the Connecticut and Hudson rivers. Only after these areas were filled in did settler's attentions turn to the highlands and here too, the bottomlands surrounding the larger rivers tended to be settled first. National and inter-colonial friction also hampered settlement of this frontier region. The disruption of traditional Native American cultural systems brought about by the fur trade and being drawn into colonial wars, resulted in unrest and antagonism between the indigenous people and the aspiring settlers. Further complicating matters was the fact that New York, Connecticut and Massachusetts each held claim to the land between the Hudson and the Connecticut rivers.

Slowly, as population pressures increased even the highlands began to fill-in as "hill towns" increasingly took root in the most advantageous locations. In these early years, the Native American trail system proved vital to the colonial development of the Berkshires because of its dependency on available transportation routes. The

Greenfield, Westfield and Hoosic rivers played an important role in the establishment of early European settlements. This role was enhanced as the Industrial Revolution found its way to the Berkshires and small family owned and operated industrial and commercial businesses were transformed into large highly competitive corporate entities such as the woolen mills in North Adams.

While farming was a primary activity in the early years of historic settlement throughout most of the region, in the highlands this provided a marginal subsistence at best and its occupants often supplemented their livelihood by undertaking a wide range of endeavors. Sawmills and gristmills sprang up along the riverbanks in many communities in the early years of each community's settlement. Railroads had a profound impact to the landscape of the Berkshires.

Besides its impact on industry, the development of rail lines throughout Berkshire County opened up the region for a new industry – tourism. Writers and artists began to flock to the Berkshire hills for summer respite, and the late 1800s saw development of tourist related industries such as grand hotels, sumptuous inns, and summit houses. In the early 19th century, wilderness and the natural beauty of the new United States was a romantic ideal. Outdoor recreation became a popular tourist activity, and the ridges and mountaintops of Berkshire County enjoyed increasing visitation. This was also the era of the "rustic cabin" or lodge which were becoming popular with the wealthy from the northeast's urban centers. This helped New York's Catskills and Adirondack Mountains, and the forests of Maine become the center of the summer's social circuit. In the Berkshires, this era is represented by the former mountain retreat of Alfred C. Douglas (Bash Bish Falls) and the grand Whitney estate (October Mountain).

Thus, as an accident of the development of the Commonwealth's Forest and Parks system, virtually every type of historic archaeological site imaginable has been preserved in one form or another within the Southern Berkshire District. Over the years, as park and forest lands were acquired, the buildings and structures that formerly occupied those lands were often removed, creating a series of historic archaeological sites scattered across the landscape. In some cases these sites are isolated occurrences, such as the remains of a small self-sufficient farmstead. While in other cases, a cluster of sites such as several mills along a stream may represent a former mill village, each individual site of which is related to the other in time and space. In addition, the loss of population and the abandonment of entire "hill towns" have resulted in the creation of a series of related historic archaeological sites that were once churches and meetinghouses, schools, stores, banks, hotels, cemeteries and homesteads.

The existing historic site inventory for the Southern Berkshires District is outlined below:

Domestic sites:

Remains of farmhouses together with their associated barns, chicken coops, ice and milk houses, granaries and fenced in fields and pastures may be informative regarding regional land-use and farming practices. The stone foundations and cellar holes of this class of historic sites are found in virtually every property within the Southern Berkshire District, with the possible exception of Jug End and Campbell's Falls.

Industrial sites:

Among the industrial sites recorded within the Southern Berkshire District are the remains of sawmills at Beartown, Cookson and Otis SF. A lime kiln exists in Egremont on the Appalachian Trail and a cider mill is recorded at Mt. Washington.

Commercial sites:

Less common, or at least less easily identified than industrial sites are those classified as commercial sites. Typically, such sites were small rather obtuse buildings and operations that can not easily be differentiated from many domestic sites. Indeed, these were often small shops or stores (general provisions, tools and hardware, post offices were often within general stores etc.), which were either within a house or were otherwise identical to it in appearance.

Civic sites:

Because of the manner in which the Forest and Park system was created, often with land takings, sometimes abandoned land, but other times viable and operational land, it is not surprising that the remains of many civic sites have survived in the archaeological record. Recorded civic sites in the Southern Berkshire District include schools (Beartown, East Mountain, Granville), a number of cemeteries including one with reputedly 300 interments on the Appalachian Trail (Great Barrington); other cemeteries exist in Beartown, Bash Bish Falls, Otis, Tolland and Sandisfield (reputedly Revolutionary War). Perhaps the most ubiquitous civic site are old roads, which, like homesteads, exist within most of the State Forests and Parks of the Southern Berkshire District.

Civilian Conservation Corps (CCC) sites:

Since many of the early parks were cutover forest or isolated natural features, the citizens of the Commonwealth had limited access to outdoor recreation. It was not until the 1930s that the parks of the Berkshire County region were transformed into premier recreational facilities under the direction of the Civilian Conservation Corps (CCC). From 1933 through 1938, the CCC worked in most of the forests and reservations in Southern Berkshire District, expanding roads, trails, campgrounds, swimming areas and scenic areas in the state forests. Many of these improvements remain the cornerstones of the DCR facilities within the Southern Berkshire District.

CCC camps existed in Sandisfield, Tolland, Granville, Beartown and Otis State Forests. A CCC shelter still survives at East Mountain.

Other Archaeological Sites

The remains of a tavern exists in Sandisfield, and those of a stage coach inn are recorded in Otis SF. An animal pound is also recorded in Otis SF.

HISTORIC BUILDINGS, STRUCTURES & LANDSCAPES

Six historic houses in the Southern Berkshire District are part of DCR's Curatorship Program:

May House, Jug End, Egremont
Trail House, Jug End, Egremont
Guilder Homestead, Jug End, Egremont
Headquarters House, Beartown, Monterey
Hunt House, Mt Washington SF, Mt. Washington
Ann Lee Cottage, Mt. Washington SF, Mt. Washington

All of the CCC related buildings, structures and archaeological remains have been determined eligible for listing on the National Register. In most cases, properties eligible for listing should be managed as though they were listed, providing for a consistently high level of preservation.

The repair, rehabilitation and stabilization of National Register properties should be consistent with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Historic Landscapes

Small town centers and agricultural landscapes are abundant in this region. Most of the region remained rural and featured a dispersed settlement pattern throughout most of historic times. Abandoned hill towns create a remarkable ensemble of archaeological remains and attest to the difficulties that many 18th, 19th and 20th century farmers faced in trying to eek out a living in the rugged Berkshire hills. These remains - stonewalls that partitioned off land for pasture and tillage, the archaeological vestiges of many former farms and mills, together with those still in operation - create significant ***vernacular landscapes*** for the Southern Berkshire District and to the Commonwealth in general. Likewise, the combination of these vernacular landscapes and the varied topography create a collection of significant ***Scenic Landscapes*** that are critical to preserve.

SUMMARY/CONCLUSION

The relatively low archaeological visibility of the Southern Berkshire District has extremely important implications for property managers, foresters and students of archaeology and history alike. Because of limited modern population and development pressures, less open and tilled land and fewer artifact collectors, there is potential that relatively intact archaeological sites remain to be discovered here. Thus, sites with good integrity, -- that is, sites with limited disturbance and which have a high degree of scientific research value -- are likely to exist in the Berkshires. These potential conditions make the preservation of archaeological sites within the Southern Berkshire District of paramount importance and places an additional burden on the property manager and forester.

Appendix H - Statutory Policy and Guiding Principles

PART I. ADMINISTRATION OF THE GOVERNMENT

TITLE XIX. AGRICULTURE AND CONSERVATION

CHAPTER 132A. STATE RECREATION AREAS OUTSIDE OF THE METROPOLITAN PARKS DISTRICT

Chapter 132A: Section 1F. Duties of bureau of forestry

Section 1F. The bureau of forestry shall, under the supervision of the director, with the approval of the commissioner perform such duties as respects forest management practices, reforestation, development of forest or wooded areas under the control of the department, making them in perpetuity income producing and improving such wooded areas. It shall be responsible for such other duties as are now vested in the division of forestry by the general laws or any special laws and shall be responsible for shade tree management, arboricultural service and insect suppression of public nuisances as defined in section eleven of chapter one hundred and thirty-two, subject to the approval of the director and, notwithstanding the provisions of any general or special law to the contrary, the bureau may require all tree spraying or other treatment performed by other departments, agencies or political subdivisions to be carried out under its direction. The bureau may promulgate rules and regulations to carry out its duties and powers. It shall assume the responsibilities of section one A of chapter one hundred and thirty-two and shall be responsible for such other duties as are not otherwise vested in the division of forestry; provided, however, that all personnel of the forest, fire, shade tree and pest control units in their respective collective bargaining units at the time of this consolidation to the bureau of forestry shall remain in their respective collective bargaining units.

MGL 132A Sec 1D enacted 2003 c. 26 Sec 393 effective July 1, 2003

Chapter 132, Section 40, provides a framework within which the Bureau of Forestry operates and defines its mission.

> *It is hereby declared that the **public welfare requires the rehabilitation, maintenance, and protection of forest lands** for the purpose of conserving water, preventing floods and soil erosion, improving the conditions for wildlife and recreation, protecting and improving air and water quality, and providing a continuing and increasing supply of forest products for public consumption, farm use and for the wood-using industries of the commonwealth,*
>
> *Therefore, it is hereby declared to be the policy of the Commonwealth that all lands devoted to **forest growth shall be kept in such condition as shall not jeopardize the public interests**, and that the policy of the Commonwealth shall further be one of **cooperation with the landowners and other agencies** interested in forestry practices for the proper and profitable management of all forest lands in the interest of the owner, the public and the users of forest products.*

GUIDING PRINCIPLES (Sustainable Forest Management)

Ecosystem Management: The principles of Ecosystem Management (EM) guide the Bureau of Forestry in carrying out its mission. In contrast with traditional, production-oriented resource management, ecosystem

management is "…a philosophical concept for dealing with larger spatial scales; longer time frames; and in which management decisions must be socially acceptable, economically feasible and ecologically sustainable". Rather than setting commodity-based targets, EM defines desired conditions and develops strategies that lead to achieving them. Although some have put forth more complex definitions, EM can be considered to have three main elements: biodiversity, a social component and adaptive management.

Conserving Biodiversity: Biodiversity is the variety of life and its processes; and includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur. Biodiversity may be sought on any scale: an entire landscape, an urban neighborhood or an aggregation of microscopic organisms. Generally speaking, the more diverse an ecosystem is, the more stable and resilient it is in the face of disturbance. In EM, three types of diversity are considered. Structural diversity can occur within a small group of trees (stands) where multiple age and/or size classes may be present. The term can also relate to a landscape with an aggregation of even-aged stands or a mixture of forest and other types of open space such as farmland and water. Compositional diversity relates to a mix of organisms, across a variety of scales, from the landscape to the stand level. Functional diversity relates to the genetic diversity within a population and also to the ability of an ecosystem to support processes necessary for its functioning and perpetuation.

Social Component: EM considers humans to be an integral component of the ecosystem, with the ability to meet many of their needs through the thoughtful application of EM principles. EM is collaborative and public participation is a part of the decision-making process. Like all democratic processes, effective EM requires that participants be well-informed and willing to compromise to achieve consensus. When ownerships are complex, some issues can only be brought to resolution by involving all of the stakeholders and creating partnerships through which desired conditions can be achieved.

Adaptive Management: Learning by this process occurs from the results of past actions. It is circular in nature and its components are: plan, act, monitor and evaluate. If the desired results of an action have not been achieved, the actions are modified when the process begins anew. Monitoring and evaluation are accomplished through: resource inventories and their analyses and deliberate and efficient record keeping.

The Role of Working Forests: To achieve its mission of balancing social needs with ecosystem health, the Bureau uses silviculture and other management tools to create a desired condition. Because the removal of trees is an extremely labor-intensive activity, current markets for wood products have a significant impact on the cost-effectiveness of creating desired conditions; some objectives will generate revenue and others will require an investment of revenue.

Action through Programs: The Bureau carries out its mission by managing the state forest and park system and by providing education, technical assistance, technology transfer, resource assessment, monitoring, regulatory oversight and outreach. It organizes and conducts this business through five program areas: Service Forestry (private lands), Management Forestry (state lands), Urban Forestry, Forest Health, and Marketing & Utilization. In the delivery of these programs, it cooperates with federal and other state agencies, municipalities, the business community, non-governmental organizations, academia and individual landowners.

Appendix I – Green Certification Information

On May 11th 2004, the State of Massachusetts (MA) received Forest Stewardship Council (FSC) endorsed forest certification for the State lands managed by the principal agencies of the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA):

• DCR, Division of State Parks and Recreation (DSPR) – 285,000 acres
• Department of Fish and Game (DFG) – 110,000 acres
• DCR, Division of Water Supply Protection (DWSP) – 45,000 acres
• Re-Certification of the Quabbin Reservoir (DCR–DWSP) – 59,000 acres

1. *What is Forest Certification?*

Under the sponsorship of the FSC, Scientific Certification Systems (SCS) promotes responsible forest management by certifying environmentally appropriate, socially beneficial, and economically viable forest management. Consumers purchasing products bearing the FSC and SCS labels can be assured that their wood products come from forests that have been responsibly managed to FSC standards.

2. *Why is this significant?*

FSC Green Certification evolved from the certified organic grown agricultural programs and has expanded to millions of acres of the best-managed forests in the world. The certification being awarded to EOEEA agencies is one of less than a dozen such certifications awarded to states and is the first comprehensive award because it involves all of the managed forestland under environmental agencies in Massachusetts. Other state designations were for only a subset of state lands (for example, only forest department and not fish and wildlife land or only a portion of the state). This award builds on the certification award received in 1998 by the DCR for the Quabbin Reservoir holding – the first FSC Green Certified public forestland award in the U.S.

3. *What were EOEEA's goals in undergoing Green Certification and are they being met?*

a) *Improve forest management practices on state forestlands* – the requirements for management improvements for EOEEA agencies over the first 5 year period of Green Certification are literally a "blueprint" to further improving our forest management program.

b) *Identify opportunities for coordination of forest management among the three state forest management agencies* – in undergoing Green Certification the agencies have already begun significant coordination efforts on areas such as designation of "forest reserves", rare and endangered species and archaeological site policy, forest road inventories, and forest type mapping. The agencies have also begun coordinating management of nearby properties to enhance landscape-scale natural resource and ecosystem management.

c) *Encourage improvements in private forestland practices, by providing examples and building toward market incentives for verified sustainable management practices* – since EOEEA began undergoing Green Certification, a landowner cooperative of more than 25 owners, a large mill's forestland and two saw mills have undergone and received Green Certification. Green Certification at Quabbin has helped in the ability of DCR to sell its forest products at good prices – DCR has averaged $1 million in timber sale revenues over the past few years. DCR also set aside about 20% of the forests at Quabbin in reserves where no commercial forestry occurs.

d) *Improve public understanding and confidence of active forest management practices on state forestlands, by providing an independent, FSC-accredited audit of those practices* – in beginning to implement requirements of Green Certification, EOEEA received positive feedback on initial management plan documents from several environmental organizations and the general public.

e) *Increase timber revenues through increasing sustainable forestry and access to Green Certification markets* - Green Certification has helped put the DWSP on a sustainable forestry program that averages $1M per year. Once management plans and other requirements are in place – DSPR and DFG will also increase the sustainable timber revenues to proportionate levels while setting aside significant areas in forest reserves where commercial forestry will not be permitted.

4. *Who determines the Standard for Certification?*

The Forest Stewardship Council is an international organization that evaluates, accredits, and monitors independent forest product certifiers. Scientific Certification Systems (SCS) is accredited as a certifier by the Forest Stewardship Council and uses an accredited set of standards based on the FSC principals and criteria in its evaluation activities.

5. *What are the steps required in the SCS Certification Evaluation Process?*

A full evaluation of the land under consideration is conducted following the steps below:

a) Assemble evaluation team of natural resource professionals

b) Publicize upcoming evaluation and standards to be used

c) Determine evaluation scope, collect and analyze data

d) Consult with stakeholders

e) Score the operations performance relative to the standard

f) Specify pre-conditions, conditions, and recommendations

g) Write report and have results peer reviewed

6. *What are the Evaluation Criteria used by SCS?*

a) The generic certification criteria of the SCS Forest Conservation Program, accredited by the Forest Stewardship Council (FSC). The criteria are organized into three program elements: **Timber Resource Sustainability**, **Ecosystem Maintenance**, and **Financial, Socio-Economic, and Legal Considerations**. The generic criteria are contained in the SCS Forest Conservation Program Operations Manual, available upon request from SCS.

b) The FSC Principles & Criteria, specifically the Northeast Regional Standard, to which the SCS generic criteria have been harmonized. These criteria are available at www.fscoax.org.

7. *What is Timber Resource Sustainability?*

The timber resource sustainability program element is concerned with the manner in which the timber inventories of an ownership are managed for continuous production over the long run. The evaluation considers the degree to which:

a) Forest stands are maintained or restored to fully stocked, vigorous growing condition, occupied by high-valued tree species

b) Steady, significant progress is made, over time, in "regulating" the age and/or size class distribution of stands (even-aged management) or trees or groups of trees (uneven-aged management)

c) Standing timber inventory is built up to levels associated with optimal stocking

d) Temporal harvest patterns at the ownership level (or the working circle level, for larger ownerships) generally exhibit stability and absence of wide fluctuations

e) Management is oriented towards yielding high-valued timber products

8. ***What is Forest Ecosystem Maintenance?***

This program element is concerned with the extent to which the natural forest ecosystems indigenous to the ownership are adversely impacted during the process of managing, harvesting, and extracting timber products. The evaluation considers:

a) Forest community structure and composition

b) Long-Term ecological productivity

c) Wildlife management actions, strategies, and programs

d) Watercourse management policies and programs

e) Pesticide use – practices and policies

f) Ecosystem reserve policies

9. ***What are the Financial, Socio-Economic, and Legal Considerations?***

This program element is concerned with three non-biophysical issues. First, it addresses the financial viability of the ownership structure and management program. Second, this program element addresses the socio-economic dimension of sustainable forest management – the human dimension of forestland use and the goods and services yielded from the forest. Special emphasis is placed upon sustaining the historical patterns of benefit, particularly to local and regional populations (including employees, contractors, neighbors, and local communities). Lastly, this program element addresses the legal and regulatory context in which forest management operations are conducted. The evaluation considers:

a) Financial stability

b) Community and public involvement

c) Public use management

d) Investment of capital and personnel

e) Employee and contractor relations

f) Compliance with relevant laws, regulations, treaties and conventions

10. ***Where can I obtain additional information?***

More information about FSC and SCS can be obtained at www.fscoax.org and www.scs1.com.

Information about State of Massachusetts forestlands can be found on the EOEEA website at www.state.ma.us/envir/.

SCS Contact Person: Dave Wager, Director of Forest Management Certification
Mailing Address: SCS, 1939 Harrison Street, Suite 400, Oakland, CA 94612
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Appendix J – Natural Resource Protection as a Climate Strategy

Massachusetts is extraordinarily rich in coastal and inland natural resources, and a number of economic sectors – including tourism, farming, fishing, and forestry – rely on their continued health. Climate change threatens these resources directly, and the state can take actions to protect and enhance them against future potential impacts of climate change. Furthermore these resources – particularly forests and farmland – can be key components in an overall strategy to reduce our net statewide carbon emissions and conserve our carbon resource.

GOAL

Scientific research has shown that climate change poses a significant risk to our already stressed natural resources. Climate change can be significantly lessened by reducing greenhouse gas emissions through changes in agricultural and forestry management. Natural resource managers and land conservation advocates need to integrate these latest scientific findings into their planning processes and day-to-day management techniques. The state will nurture awareness of the connection between climate change, greenhouse gas pollution, and our forests, oceans, fisheries, and farms. The state will actively foster new ways to protect these resources while conserving carbon and reducing greenhouse gas emissions.

ACTIONS

HOST WORKSHOPS ON THE POTENTIAL IMPACTS OF CLIMATE CHANGE ON NATURAL RESOURCES AND LAND MANAGEMENT

In March 2004, the state convened an interdisciplinary workshop to disseminate scientific information on the potential impacts of climate change on the natural resources of Massachusetts and the New England region, and the implications for resource management. The workshop drew upon the talents of traditional conservation organizations, land managers, universities and colleges, science centers and museums, oceanographers, natural resource-based industries, recreation industries, other non-governmental organizations and interested citizens. Follow-up workshops will continue to connect sound science with public and private managers and practitioners, to shape feasible, cost-effective solutions.

PROMOTE COASTAL PLANNING PROGRAMS THAT RESPOND TO CLIMATE CHANGE AND HELP PRESERVE WETLANDS

The Massachusetts Coastal Zone Management Office (CZM) will integrate climate change considerations into their policy-making and their planning and management of state-owned coastal areas. They will encourage coastal municipalities to institute adaptation measures to reduce climate impacts, assist state open space preservation programs in the identification of coastal lands in need of protection, and encourage coastal municipalities to consider development strategies that include protection measures such as bulkheads, dikes, and seawalls in critical areas.

PROMOTE A NEW FOREST VISION THAT INTEGRATES CARBON RESOURCE MANAGEMENT WITH OTHER NATURAL RESOURCE GOALS

The state will continue its efforts to maintain existing forests, increase land conservation areas, and give incentives for native (non-invasive) reforestation of previously forested area. The amount of carbon stored or

sequestered by these activities will be measured and monitored over time to ensure that real carbon benefits accrue, and to better understand the long-term benefits of such programs. The state will focus on measures including:

Tree selection that will both increase carbon storage and shepherd adaptation to climate change over time.

Continued support for urban tree planting programs. Additional shade in certain urban areas mitigates the "heat island effect," and an urban tree-planting program can help lower energy demand by diminishing the need for air-conditioning. Reducing the size of the heat island has the additional benefit of reducing the formation of ground-level ozone smog in our cities.

Including carbon resource management as one criterion in the management plan of state forests and other public lands. The state will encourage similar practices on private lands affected by conservation restrictions.

Renewed research on the role of controlled and uncontrolled forest fires in returning carbon to the soil rather than emitting it into the atmosphere.

The state will encourage land and building development practices that preserve existing trees during construction, encourage the planting of native replacement trees, and emphasize reforestation of cleared land in and around developments. The state will meet its obligation to replace trees affected by state projects

PROTECTING OUR FORESTS : A NATURAL DEFENSE AGAINST CLIMATE CHANGE

Massachusetts is the third most densely populated state yet it has the eighth highest percentage of forest cover. Massachusetts has long recognized that the state's extensive forests furnish a broad array of benefits that support our quality of life. The state's forest ecosystems provide habitat for wildlife, a resource base for timber production, a wide range of opportunities for recreation, a natural filter to purify the air and water, and a vital source of aesthetic pleasure. As development rates have outpaced population growth over the past four decades, the state has sought ways to ensure that forest resources are used in a sustainable manner. Today, however, an important ecosystem function waits to be fully integrated into this planning process – the beneficial role forests play in sequestering, storing, and emitting carbon dioxide. Carbon is a key component of soil, the atmosphere, the ocean, plants, and animals, and constantly moves among and between these reservoirs through natural and human-caused processes. This network of flows is called the global carbon cycle. For example, when forests grow, or wood decays, or soils are tilled, carbon is exchanged between land and the atmosphere.

Before the industrial revolution, levels of carbon dioxide and other greenhouse gases in the atmosphere were fairly constant: about the same amount of carbon was released to the atmosphere from the land or ocean as was returned to the land and ocean by other processes. However, human activities, including large-scale fossil fuel use and deforestation, have since perturbed this balance, causing carbon to accumulate in the atmosphere faster that it can be removed. A process that causes a net transfer of carbon to the atmosphere, such as burning coal, is called a carbon source. A process that causes a net removal of carbon from the atmosphere, such as when forests grow, is called a sink. Carbon resource conservation strives to encourage activities that remove or keep more carbon out of the atmosphere and discourage activities that release carbon into the atmosphere.

Massachusetts is studying the role of forests in climate change. Specifically, the state is promoting strategies to conserve and maintain working forests and their safe storage of carbon. Massachusetts will also seek to use forest carbon markets to encourage the retention of higher value-added products in the local timber industry, which currently exports much unfinished product out of state. Other strategies include the use of sustainably harvested biofuels to offset fossil fuel consumption, planting trees in urban areas to reduce the heating and

cooling load of buildings, and the use of wood products instead of more emission intensive materials like concrete, plastics, and steel. The state's goal is to fully incorporate net greenhouse gas emissions impacts when making forest management and land use decisions.

Appendix K – Public Comments

Responses To Public Comments

The Draft Southern Berkshire District Forest Management Plan was presented to the public on February 1, 2007 at the Great Barrington Community Center in Great Barrington, MA. Twelve public participants attended the meeting, which was designed to present the key finding and results of the proposed forest management plan and solicit comments. Notices were posted in the *Environmental Monitor* and the DCR Forestry Program web pages encouraging the public to comment on the draft plan. It should be noted that the general feedback by the public at the September 29th meeting and personal contact by others is one of general agreement with the proposed plan.

The Bureau of Forestry received comments from 71 ATV/ORV supporters concerned about forest reserves, the Massachusetts Forest Landowner Association, The Nature Conservancy, the Sierra Club, Susan Benoit and Alexandra Dawson of Massachusetts Audubon, Environment Massachusetts and the Appalachian Mountain Club. A "content analysis" was conducted to identify areas of support, concerns, and suggestions. Each respondent's specific comments were coded and combined where there was commonality. The results of the "content analysis" were further sorted by Forest Management Plan topics. All comments were assessed for change and incorporation into the plan. The following are the support, suggestions, concerns of the public and their disposition.

The following comments were received during the public comment period (January-February 2007) concerning the ***Draft Southern and Northern Berkshire and Western Connecticut Valley Districts Forest Resource Management Plans***.

A. Forest Reserves:

1. ***Amount of Forest Reserves Issues:*** Public comments were received concerning the amount of forest reserves (large and small-scale) proposed in the draft plans. Public comments ranged from support for the proposed amount; complete opposition to delineating any forest reserves; a call to reduce the amount; and, conversely, support for increasing the amount of forest reserves. It should be noted that this public issue is a continuation of comments received during the Forest Reserve and Berkshire Ecoregional development comment period and it is expected that over time the issue will continue to persist.

   Bureaus Response to Amount of Forest Reserve Issues: Approximately 27% of the State Forest and Park system lands have been delineated as forest reserves for the multiple purposes of providing late successional habitat, interior forests, biological, genetic and ecological diversity, and back-country recreation values. The Bureaus, in cooperation and coordination with internal and external partners, devoted much time and effort identifying the proposed location and amount of forest reserves. The Bureaus assessment of public comments has resulted in the conclusion that the proposed forest reserve system meets the scientific and publicly developed criteria and purpose of forest reserves. It should also be noted that the Bureaus, together with the University of Massachusetts, DCR Division of Water Supply and Protection, and the MA Department of Fish and Wildlife, Division of Fisheries and Wildlife has initiated a Long-term Monitoring system that will address many of the public issues related to forest reserve and actively managed forests.

2. ***Tolland State Forest Reserve Issues:*** A large number of public comments suggested that the Tolland State Forest forest reserve should be removed from the forest reserve design because it is a long-term special and unique place (this issue also relates to the public comment on special places) for ATV-ORV use. The public suggested that ATV-ORV use be allowed in forest reserves. Some public specifically commented that the Tolland State Forest forest reserve was correctly identified and support the delineation of the forest reserve.

   Bureaus Response to Tolland State Forest Reserve Issues: The Bureaus recognize that the Tolland State Forest forest reserve has existing trails that have had long-term ATV-ORV use. These trails are very important to the sector of the public who recreates using ATVs-ORVs. The trails and associated use has become a very special and unique place over time for generations of users. New information related to forest ecology, watershed management, and biodiversity, and the need and desire that forests, including recreation, be managed for long-term sustainability Through GIS analysis, applying the small-scale forest reserve criteria and combining with local knowledge of the forest ecology of the area, a portion of Tolland State Forest was identified as a proposed small scale forest reserve.

   In response to public comment, Bureaus and DCR staff conducted a field review of the Tolland State Forest small-scale forest reserve. As a result of the field review, it was determined that the forest reserve meets the criteria, purpose, and need for forest reserves. The Tolland State Forest forest reserve will remain as a forest reserve. Furthermore, it was determined that ATV-ORV use is not consistent with the criteria, purpose, and need of forest reserves. Therefore, ATV-ORV use and activity will not be included in this forest reserve areas as well as other reserve areas. In summary, the environmental impact observed during this field trip (and where the use is occurring elsewhere) is considerable and beyond the threshold established for forest reserves.

   Field observation concerning the use of the ATV-ORV trail included:

   - The trail is located in close proximity to the Farmington River
   - The trail has considerable damage and is causing erosion and degradation of water quality
   - The trail and use has adverse impacts to ecological functions and biodiversity (important species and habitats)
   - The trail leaves the Farmington River riparian zone and ascends a steep hillside which is approximately 30% in slope or greater
   - Substantial erosion is occurring on this steep trail (a portion has been abandoned and relocated)
   - As the relocated trail erodes, the users are widening the trail (in some cases wider than 20 feet) causing additional erosion and site degradation.

   The Bureaus and DCR understand the importance of ATV-ORV use and activity by the public who enjoy this type of outdoor recreation. Until the Tolland State Forest is evaluated for ATV-ORV use using DCR's (spell out official name of policy) ATV-ORV criteria, the use may continue. As soon as the Tolland State Forest ATV-ORV evaluation has been completed, the ATV-ORV trail will be closed to the use.Pedestrian use may occur, however, some portions of the trail will be relocated away from the river. Depending on the outcome of the evaluation, a new ATV-ORV trail may be established (relocated), consistent with ATV-ORV trail guidelines that are publicly safe, environmentally sound, and maintained over time.

3. ***Expansion of Forest Reserves Issues:*** Public comments were received concerning the expansion of large-scale forest reserves including increasing the size to a minimum 15,000 acres. It was also suggested that forest reserves in general may be expanded through fee acquisition, conservation restrictions and/or private landowner agreements who intend to manage their forest lands as forest reserves.

   Bureaus Response to the Expansion of Forest Reserve Issues: The issue of expanding forest reserves and, in particular, expending large-scale forest reserves to a minimum size of 15,000 acres is partially related to the public issue concerning the amount of forest reserve. The large-scale forest reserve design is consistent with the September, 2006 Secretary of the Executive Office of Energy and Environment Affairs *Large-Scale Forest Reserve Announcement* and the 4 years of forest reserve study and field review in the context of the existing inventory of State Forest and Park system lands. The Bureaus recognize that, over time, additional lands may be added to the State Forest and Park system and fully support the increase of forest reserve areas where the evaluation criteria, purpose, and need of forest reserves are met. The Bureaus also support private landowner's choice to manage their lands as forest reserves consistent with the standards and conditions that pertain to the management of State Forest and Parks forest reserves.

4. ***Management of Forest Reserves Issues:*** Public comments were made that support the management guidelines as written and also to limit the management of forest reserves to ecological restoration and enhancement. A specific comment was made supporting the continued management of open fields within the forest reserve.

   Bureaus Response to the Management of Forest Reserve Issues: The Bureaus do not intend to alter the proposed management standards and guidelines for the forest reserves. It should be noted that all forest reserves are intended to have as little forest management as possible with a few exceptions. These are: ecological restoration and enhancement where non-native and unnatural conditions (such as off-site and non native plantations) are included in the design. Also included are significant emergency situations that threaten the public interests, such as a highly destructive invasive species forest pest or extreme fuels build-up.

   Open fields can and should be maintained primarily through prescribed fire. The prescribed fire prescription should contain the optimum timing of the use of fire to improve habitat and minimize adverse impacts such as disrupt nesting season, wildfire risks, recreation, air quality, etc. Use of mechanized equipment may occur if prescribed fire opportunities are not available.

5. ***Miscellaneous Forest Reserve Issues:*** The public commented that forest reserve references should be cited and that the full suite of criteria used to select small scale forest reserves should be disclosed including the identification of the natural community types or rare species occurrences used in the selection process.

   Bureaus Response to the Miscellaneous Forest Reserve Issues: The Bureaus have added the citing of references concerning the identification and delineation of forest reserves consistent with the Division of Fish and Wildlife. The small-scale forest reserve evaluation criteria, which are consistent with the large-scale forest reserve evaluation, are included in the Forest Resource Management Plans. The forest reserve evaluation criteria analysis is presented on individual State Forest resources maps and in methodologies found in the appendix of the Forest Resource Management Plans. Maps include the general rare species and natural community vegetation types used to identify and delineate forest reserves.

3. **Forest Stewardship Council (FSC) Sustainable Forest Certification Program:**

FSC Certification Program Issues: A public comment was made in support of the FSC sustainable and well-managed forest certification program and the Bureaus efforts to meet the conditions of this "green certification" program.

Bureaus Response to the FSC Certification Program Issues: The Bureau will continue to meet FSC conditions to the highest level possible in consideration of available resources.

B. Forest Resource Management Planning:

1. ***New Definitions Suggestions:*** A public comment was made seeking to clarify and define the purpose of sustainable forest management, commercial forest management, ecological forest management and forest health forest management on state forests, parks, and reservations, including the suggestion that DCR should decouple the management of forests from the parks.

Bureaus Response to the New Definitions Suggestions: Definitions of commercial forest management, ecological forest management, and forest health forest management have been included in the Forest Resource Management Plans.

Sustainable forest management has been defined as management that considers environmental (ecological), social and economic variables. Sustainable forest management is a long-term planning process and philosophy that carefully balances the environmental, social and economic needs with a comprehensive strategy that provides for native forests, biodiversity; high quality water, air, and climate standards; cultural resources; aesthetics, activities, and uses; renewable forest products and by-products; and the economics associated with employment, revenue, taxes, etc. DCR system lands are managed by sustainable forest management principles, which are annually audited by the Forest Stewardship Council: *Northeast Conditions.*

Commercial forest management has been defined as management that is intensive and designed primarily to focus on the long-term optimization of forest products and revenue within the environmental and harvesting laws and regulations of Massachusetts. It should be noted that private tree farms, industrial forest lands, etc. may be examples of lands managed under commercial forest management. DCR system lands are not managed by commercial forest management principles.

Ecological forest management has been defined as management that is based on ecological principles such as working within site condition constraints and managing for native and natural species and communities, natural disturbance patterns, and forest composition, structure, and function. Included in ecological forest management is ecological restoration and maintenance, resulting in a forest where non-native species may occur but will be managed for native species or habitats such as early successional or exemplarily vegetation communities. Although DCR does not manage the forest solely by forest ecological principles, DCR supports the principles of ecosystem management (ecological, social, and economic considerations) which includes many of the principles of ecological forest management.

Forest health forest management has been defined as management that is the result of managing the forest based on species composition, age, structure, growth, vigor, and mortality. Although DCR

does not manage the forest solely by forest health forest management, DCR supports the principles of managing the forest in consideration of forest health considerations.

Legislatively there is no difference in the definitions of State Forests, Parks, and Reservations. Over time, Massachusetts acquired properties and arbitrarily named them either as a State Forest, Park, or Reservation. DCR recognizes that the public perceives that each name (Forest, Park, or Reservation) means that a different purpose, activity, or use occurs. DCR has a long history and knowledge of each property and their associated activities, uses, and issues. We seek public input and comments on their future management. Regardless of the property name, DCR manages according to the larger landscape characteristics, site and environmental factors, appropriate uses and activities, and natural resources needs with a high level of sensitivity. In summary, high use areas (known as intensive use) are managed for public safety, use and activity in the context of environment laws and regulations, and in partial consideration of biodiversity and forest health (as defined by DCR).

The suggestion of decoupling forest and parks is a consideration worthy of exploration but beyond the scope of this analysis. The issue of first defining state forests and parks as separate entities, establishing evaluation criteria to identify potential forest and parks by the "new definition", applying the evaluation criteria, and assessing the analysis will be forwarded to DCR leadership for consideration.

2. ***New Planning Zone Issues:*** A public comment was made to develop a new zone that splits Zone 2. This new zone would emphasize dispersed recreation with no "commercial" timber harvesting (note: reference White Mountain NF and Maine Bureau of Parks and Lands).

   Bureaus Response to the New Zone Issues: The forest reserve system was established primarily to incorporate "unfragmented landscapes", backcountry areas, and larger landscape level forest blocks that serve well as dispersed recreation areas. Further analysis (appendix maps) indicate that the Bureaus identified and proposed forest reserve areas that either meet or partially meet the suggestion of emphasizing dispersed recreation where forest management, unless for the purpose of ecological restoration and maintenance, should not occur. It should also be noted that Massachusetts DCR system lands are proportionally similar to the White Mountain National Forest and Maine Bureau of Parks and Lands; small in parcel size, dispersed within the landscape, and much more developed by roads, housing, other structures, and facilities such as utility lines. The feasibility of delineation DCR system lands (property sizes ranging from 100 acres to 12,000 acres) into multiple zones like National Forest System Lands (property sizes ranging from 700,000 to millions of acres) might be cumbersome, difficult to administer, and pose unnecessary complexities to the public users.

3. ***Forest and Natural Resource Management Unit Planning Issues:*** Public comments were made supporting the development of unit plans and to stop all cutting until the unit plans are completed. Other comments were made in support of the Southern and Northern Berkshire and Western Connecticut Valley Districts Forest Resource Management Plans. These comments included the support for the plan's hierarchical approach emphasizing biodiversity conservation, rare species habitat, maintaining native ecosystems, maintaining forest health, long term planning and adaptive management.

   Bureaus Response to the Forest and Natural Resource Management Unit Plan Issues: DCR supports the development of unit plans that include natural and cultural resources, activities and uses, infrastructure guidance and direction, and operational and monitoring procedures. The Southern and Northern Berkshire and Western Connecticut Valley District Forest Resource Management Plans contain many of the attributes and site specific information that can be

readily used in the development of unit plans (see appendix maps). DCR's Resource Management Planning process will be developing unit plans across the state as staffing allows. The plans will incorporate information from the District Forest Resource Management Plans and then serve as the guiding planning document for the park, forest, reservation, or pathway.

DCR does not agree that all harvesting (cutting) should not occur until unit plans are completed. DCR system lands have been managed over time with minimal written guidance in the form of any management plans. An example is Mount Greylock Reservation which has been under the supervision and management of professional foresters since 1904 when the office of State Forester was established. The Southern and Northern Berkshire and Western Connecticut Valley Districts Forest Resource Management Plans contain a wealth of the most current information, the short and long-term desired condition of the forest (up to 105 years from now), clear guidance for the prioritization and management of the natural resources, information on where forest management activities may take place, resource needs to implement the plan, and monitoring strategies. DCR also complies with all environmental and harvesting laws and regulations and is annually audited by a third party under Forest Stewardship Council Northeast standards and conditions for sustainable and well-managed forests.

4. ***Forest Resource Management Plan Criteria and Limitations Issues:*** Some public comments suggested that the Forest Resource Management Plans have clear criteria and limitations for the type and location of forestry operations (defining where and when management practices will occur) pending completion of property level resource management plans. Other public comments supported the Bureaus' efforts to do good forest management in the context of the Forest Resource Management Plans.

   Bureaus Response to Forest Resource Management Plan Criteria and Limitations Issues: As stated above, the Forest Resource Management Plans have clear criteria and limitations for the type and location of forestry operations. The plans should be carefully examined to understand the management philosophy, direction, emphasis and priorities, and conditions upon which management may occur, as well as maps of each unit visually depicting the forest resource management process, philosophy, and outcome.

5. ***Habitat and Rotation Issues:*** Some public comments suggested that the 105 year rotation is an economic rotation and that extended rotations will not provide for late sucessional habitat. Other public comments supported early successional habitat on state land. Another public comment encouraged maximizing uneven age management located adjacent to forest reserves and described the frequency and intensity of harvesting in extended rotation management including, if possible, mapping uneven age management to show how they complement forest reserve areas.

   Bureaus Response to Habitat and Rotation Issues: The 105 year rotation was selected based on forest health, forest biological, aesthetics, activities and use conditions and considerations. The biological basis for selecting the 105 year rotation is that this is the "normally accepted" culmination point where the mean and average annual incremental (growth) cross and depart. The economic rotation is generally based on two concepts 1) maximizing the financial returns from an "operating" or "commercial" forest and 2) maximizing the rate of return. Clearly, an economic rotation or financial orientation to the management of DCR lands was not a consideration since DCR does not manage their forest land within this framework.

   Two rotation ages (105 and 150 years) for even aged forest management system were selected because of all the biological, cultural, social, and economic values associated with DCR system

lands. It should be noted that where forest management occurs, additional site specific measures such as the retention of wildlife trees, legacy or standard trees and down and coarse woody debris are planned to enhance and simulate natural processes, biological considerations, and social expectations at the expense of revenue (this is the same as revenue) and value.

A 150 year even age forest management rotation system was selected to complement the forest reserve systems, increase forest ecological value and biodiversity, and address public aesthetic concerns near and adjacent to special places, activities, and high use areas. It is DCR's thinking that a 150 year rotation may provide components of late successional habitat as stands develop over time. The intent of the 150 year rotation is to provide late successional habitat which is one of the major goals of the forest reserve system.

The providing of modest amounts of early successional habitat, according to the ecological conditions of the Berkshire Ecoregion Ecological Assessment, is an important part of the District Forest Resource Management Plans strategy to provide for biodiversity and habitat for a large number of species. It should also be noted and recognized that many small games species that are traditionally hunted rely primarily on early successional habitat. In addition, these areas also are especially important to non-game wildlife and plant species.

Where possible, extended rotation and uneven age forest management systems will be identified through preliminary GIS analysis and mapped adjacent to forest reserves as will important aesthetic, activity, and use areas. It should be noted that the GIS data is an approximation and field verification and adjustment over time will be necessary.

The District Forest Resource Management Plans provide further description of the frequency and intensity of harvesting in extended and uneven age rotation forest management.

6. ***Rare Species Issues:*** Some public comments suggested the need to improve resource inventories (including rare species inventory); a question about how biodiversity goals were set given the lack of detailed information about rare species and the need to specifically include spotted turtle habitat on state land an how it should be managed in accordance with the spotted turtle conservation management practices. Other comments complimented and supported the DCR biodiversity strategy including rare species conservation management, the removal of non-native plantations, age class diversity (including late successional stages), and uneven age structural features.

   Bureaus Response to Rare Species Issues: The District Forest Resource Management Plans were developed with the best available scientific information. The Core Forest Resource Planning Team included a scientist from the MA Natural Heritage and Endangered Species Program who served two primary functions: 1) direct input and participation in all aspects of the planning process and 2) coordinated the input and review by NHESP specialists throughout all phases of the preparation of the plans. NHESP and DCR have considerable information on rare species and their habitat as well as an understanding that the data set may never be completed. It should be noted that an extraordinary effort has been made to prioritize and complete formal, publicly reviewed rare species Conservation Management Practices. The spotted turtle, although not presently considered a rare species at this time, Conservation Management Practices has been included as a requirement in the District Forest Management Plans.

   DCR's biodiversity strategy was predicated on establishing: 1.) a goal that all DCR system lands should be managed for native species, 2.) delineation of forest reserves to serve as late successional

habitat, 3.) rare species and vegetative community conservation, and 4.) diversity in species composition and structure.

7. ***Forest Health Issues:*** Some public comments suggested that there should be a complete list of major forest health issues; there was objection that the sole management of hemlock woolly adelgid is removing affected trees; that the population of invasive species along skid trails and soil disturbance associated with forestry should be addressed; and that plan should differentiate between natural mortality and unnatural mortality associated with introduced pests and diseases and air and water pollution.

   Bureaus Response to Forest Health Issues: The revised plans have incorporated the entire list of presently known major forest health issues. The hemlock woolly adelgid section includes a number of measures that address the management of eastern hemlock trees and forests.

   Invasive species, which are recognized as a major threat to native Massachusetts species, are dealt with through a number of measures. The plan included direction on the prevention of introducing invasive species while conducting harvest operation by requiring clean logging equipment. The measure is designed to reduce potential seed dissemination from equipment. It is fully recognized that skid trails and exposed soils present potential opportunities for the establishment of invasive species. Past experience has indicated that rapid regeneration of vegetative native species, in most cases, has resulted in the establishment of predominately native vegetation. Project level monitoring that includes identification and treatment of newly established herbaceous invasive species is included in the plans monitoring strategy.

   Differentiating between natural mortality and unnatural mortality associated with introduced pests and diseases and air and water pollution may occur through a number ways recognizing there will be a number of limitation and uncertainties concerning specific and accurate assessment of the exact causes and relationships of introduced pests and diseases, water pollution and other factors such as natural disasters, vegetative successional processes, climate change, etc. Landscape inventories such as the US Forest Service's Forest Inventory and Analysis, the Bureau's Continuous Forest Inventory, and efforts such as a cooperative University of Massachusetts Long-term Ecological Monitoring Program should provide important information on broad changes and trends in vegetation that could be further analyzed for cause and effect relationships with their change agents. The Bureaus routinely seek and cooperate on scientific studies which will include the emerging issues of changes in vegetation including mortality.

   It should be noted that Massachusetts forests, in general, are becoming mature and in many cases overstocked. It is widely known that this situation increases the basic competitive stresses for sunlight, water, and nutrients (basic components of survival needs) and as environmental stress increase and become limiting factors, forests become more susceptible to damaging agents and catastrophic changes. The Bureau's staff and scientists (primarily the US Forest Service Forest Health Specialist) are dispatched to assess forests where wide-spread mortality has occurred and prepare formal reports on the cause of the mortality, damaging agents, and integrated approaches to managing the affected forest and forest that may be affected in the future.

8. ***Forest Economic Issues:*** Some public comments supported the balanced economic benefits through the production of forest products with other ecological and social benefits, the plans create new sources of funding to deal with infrastructure maintenance and invasive species, and increased harvesting on state land will increase forest trust fund payments to towns. Other public comments suggested that the Forest Resource Management Plans should be economically sustainable.

Bureaus Response Forest Economic to Issues: The plan was carefully and thoughtfully (with all of the public's input considered) developed in a manner that balances the ecological, social, and economic considerations over time (105 years). A plan, which equally considers and is predicated on ecological, social, and economic sustainability (Forest Stewardship Council definition of a well-managed forest), stands the chance of being accepted by the public and implemented over the long-run. The public acceptance and long-term resilience of State Forest, Park, and Reservation system lands is one of the Bureau's primary goals. Constantly changing forest resource management plan strategies, where there are wide imbalances in the ecological, social, and economic factors, have not withstood the challenges of time, failed, and resulted in mismanaged forests.

The plan, will provide a number of ecological, social, and economic benefits because of its design. Some public comments recognized that environmental, administrative, and recreational improvements will occur, such as improved roads and trails, public access with reduced erosion and improved water quality; identification and treatment of known invasive species; closing of unauthorized ATV and ORV trails; picking up of trash and abandoned junk; increased forest trust fund payments to towns; etc.

The plan is not economically sustainable from a stand alone "business" or "commercial" sense nor was there a goal to manage the State Forest, Parks, and Reservation in a manner where the costs and revenues balance. The enabling legislative mandate for our forests includes a multiple resource and use mission, including providing forest products and revenue. Society has placed high values on forests landscape values such as: water quality, rare species, cultural resources, aesthetics, recreational activities, uses, and lands where no forest management occurs (forest reserves). It should be noted that these values were addressed first during the forest resource management process. To be economically sustainable, a higher percentage of forestlands suitable for forest management would need to be allocated in the Active Management Area than currently proposed and the levels of harvesting would need to be increased from the presently planned modest level (that addresses the entire suite of ecological, social, and economic considerations) to one that focuses more on an "industrial' or "commercial" approach.

9. ***Important and Sensitive Natural Resource Issues:*** Some public comments were concerned that increased harvesting may unintentionally harm undocumented but important resources or undermine public support for the Green Certification process. DCR should avoid cutting in areas likely to be of high sensitivity, unless and until a site specific management plan clearly identifies overriding justifications for such work. Comments also questioned whether the aesthetics of "special places" for people who have long used the forest for special recreation may be unacceptably altered.

   Bureaus Response to Important and Sensitive Natural Resource Issues: The plan portion of the rare species and communities and High Conservation Value Forests was developed by the Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP) staff based on the best information available. These plans will be amended or revised when and if new information becomes available and are predicated on "adaptive management" principles. Forest Resource Management Plans during the implementation are required to meet the Forest Cutting Practices Act and associated Massachusetts environmental legislation such as Endangered Species Act, Wetlands Protection Act, etc. The Bureau's Service Forestry and NHESP staff review and approve all proposed harvesting plans, again with the best information available. The Bureau has also began, as necessary by priority and with available funding, to initiate rare species and vegetative community searches to further ensure the identification of important and sensitive natural resources. The Bureau's staff routinely attend professional training on rare species, plant identification,

wetlands delineation, vernal pool management, visual management and conduct frequent field trips to review management forestry staff's work and "lessons" learned.

Over time, there is a possibility that rare species are being disturbed. However, due to the plan's modest forest management strategy and commitment to silvicultural systems, impact to species and alterations of habitat should be slight or even beneficial over the long-run.

A site specific management plan (unless 100% of the area is completely inventoried by resource specialists with 100% accuracy) might be expected to have similar risks as the District Forest Resource Management plans.

The plans identify sensitive resource sites as well as the process of identifying "special places" and call for forest management consistent with their associated values. Avoiding these sites over the long-term avoids and defers present and future public safety, biodiversity, forest health, and aesthetic issues. Often "special places" are associated with holding onto the present "snap-shot" of what the forest looks and feels like today. Forests are biologically-based entities and change, sometimes rapidly and abruptly over time. Forest management is considered and scheduled for the purpose of maintaining forests, partially to provide to the public recreational opportunities that are safe, healthy and biologically diverse. The costs of deferring forest management to the point where widespread forest mortality has occurred is astronomical economically, it can potentially change the aesthetics in a more dramatic manner than forest management, and is ecologically far more intrusive than the modest approach currently planned. The Bureau recognizes that the desired level of public satisfaction for State Lands Forest Management will be achieved through providing for a wide range of values. Forest management that is planned and implemented with the balance of Commonwealth interests through public participation and input and according to the principles of sustainable ecological, social, and economic forest management will in the long run result in the public support and appreciation of how state public lands are managed.

In summary, all expected adverse impacts to important sensitive and natural resources are expected to be short term in means of intensity, impact, and duration.

10. Plan Omissions: The following omissions were reported by the public:

a. The Forest Resource Management Plans do not include maps according to FSC standards and property maps are excellent, should include non DCR protected land.
b. The list of intensive use areas needs to be completed.
c. SBK: On page 51, 24% of the forest is over 90 years of age, however, in the description of current conditions, it is reported that we have 15% over 114 years old, this needs to be reconciled.
d. Confirm page 18 WCV listing that 49.87% of protected OS has unknown ownership.
e. Develop a chart breaking down the management areas, recreation corridors, stream//wetland corridors, extended rotation forests and early succession forests, including a breakdown by town.

Bureaus Response to Plan Omission Issues:

a. Maps meet the FSC standards, as the list of maps included in the Northeast Certification Standards are "recommended" vs. required. The revised final plan included a map with non DCR protected land.
b. The revised final plan included a current completed list of intensive use areas

c. Page 51 has been reviewed and revised to reconcile conflicting and different percentages of forest in the 90 and above and 114 year old age classes.

d. This comment is in error, this percentage refers to all Chapter 61 lands, not "unknown ownership."

e. The revised plan has a new chart breaking down the management areas, recreation corridors, stream/wetland corridors, extended rotation forests and early succession forests, including a breakdown by town.

11. Active Forest Management Issues: Some public comments were concerned that salvage logging, if improperly applied, may excessively remove downed woody debris and future nutrients. They suggest that salvage logging be limited to prevent further damage to the forest on non-threatened forest regeneration. Other public comments supported the DCR Active Forest Management Program emphasizing native biodiversity as the underlying silvicultural and vegetation management goal on all state forest and park lands including restoration of native forest conditions maintaining a diversity of native forest types and age classes, removing nonnative plantations and emphasizing ecosystem function.

Bureaus Response to Active Forest Management Issues: All forest plan standards and guidelines apply to salvage operations, therefore it is highly unlikely that salvage would be improperly applied resulting in excessive removal of downed woody debris and loss of future nutrients. The plan calls for all treatment areas to provide for horizontal and vertical structure as a means of providing coarse woody debris for the purposes of habitat and nutrient recycling. Forest salvage operations are scheduled in consideration of all resources and forest plan goals. In Forest Reserve areas, there are no plans to conduct salvage operations unless they meet the strict exception criteria established in the plan.

The support for the plan's Active Forest Management Program emphasizing native biodiversity as the underlying silvicultural and vegetation management goal on all state forest and park lands including restoration of native forest conditions, maintaining a diversity of native forest types and age classes, removing nonnative plantations, and emphasizing ecosystem function is appreciated. Providing for a diversity of biological conditions (biodiversity) is one of our principle and underlying forest management goals. Implementation, over time, will prove invaluable from an ecological, social and economic standpoint especially if global climate change and catastrophic damage to our forest occurs as expected. Providing for biodiversity and advancing a pro-active forest management philosophy is our insurance and assurance that forests will support a high level of species and habitats over time. The alternative is low biodiversity because of very similar, non-diverse habitats.

12. Global Climate Change Issues: Some public comments were concerned about an over-emphasis on early successional forest management and not providing carbon sequestration benefits. Other comments supported the anticipation of global climate change and the management for biodiversity.

Bureaus Response to Global Climate Change Issues: Global climate change, including effects of carbon sequestration in relationship to forest management, is an important emerging area of concern and consideration. The plan does not rely heavily of the creation of early successional habitat as a strategy to increase the rates of carbon sequestration. The plan focuses the following forest management techniques that can help to sequester carbon: a.) reduce forest densities by thinning to keep trees healthy as a way to minimize forest health problems (dead, decaying trees and wildland fires emit carbon at high rates), b.) encourage the rapid reforestation that is relatively free to grow after natural disasters or forest management regeneration practices, and 3.) utilization of wood

products and energy generated from wood (sustainably and locally grown) in lieu of the production of fossil fuel-intensive products such as steel and concrete, energy from fossil fuels, and all products transported from afar.

D. Public Input Issues: Some public comments suggested that the public input for planning and timber sales should be improved and that the state should engage the public in a process to understand what the residents in MA value in their state forest and park system.

Bureaus Response to Public Input Issues: DCR has had 9 public meetings and 4 open public comment periods associated with the development of the plans. The public has had multiple opportunities to provide their input into the Ecoregional Ecological Assessment; Forest Reserve systems, and Forest Resource Management Planning in the Berkshire area. DCR has developed a number of measures to inform the public of future planned vegetation management projects and has developed a more expansive public notice policy.

E. High Conservation Value Forest Issues: A public comment suggested that DCR forest interior areas > 500 acres be designated as High Conservation Value forest.

Bureaus Response to High Conservation Value Forest Issues: The Bureau has conducted a GIS analysis of interior forest areas > 500 acres both within and outside of the Forest Reserve systems. Interior forests > 500 acres in size and not in the Forest Reserve systems will be designated as High Conservation Value Forests and managed according to extended rotation (150 years) and uneven age (150 year) silvicultural systems.

F. Forest Monitoring Issues: Some public comments supported the development of the long- term ecological monitoring program and suggested that the monitoring report contain progress concerning the implementation of the plan.

Bureaus Response to Forest Monitoring Issues: The Long-term Ecological Monitoring Program is designed to provide agency and public answers concerning forest reserve and active management over long periods of time. This is one of the most important aspects of the plan and is the first priority for funding within the Bureaus. The plan monitoring report includes a summary comparison of what was planned, implemented, and their effectiveness.

Appendix L – Glossary

Acceptable Growing Stock (AGS) - See **Management Potential**.

Aesthetics - forest value, rooted in beauty and visual appreciation, affording inspiration, contributing to the arts, and providing a special quality of life.

Allowable Harvest - the calculation of the amount of forest products that may be harvested, annually or periodically, from a specified area over a stated period, in accordance with the objectives of management.

Aspect - the orientation of a slope with respect to the compass; the direction toward which a slope faces; north facing slopes are generally cooler than south facing slopes.

Basal area - a measurement of the cross-sectional area of a tree trunk, in square feet, at breast height. Basal area (BA) of a forest stand is the sum of the basal areas of the individual trees, and is reported as BA per acre.

Biological diversity - the variety of plants and animals, the communities they form, and the ecological functions they perform at the genetic, stand, landscape, and regional levels.

Biological legacy - an organism, a reproductive portion of an organism, or a biologically derived structure or pattern inherited from a previous ecosystem—Note: biological legacies often include large trees, snags, and down logs left after harvesting to provide refuge and to structurally enrich the new stand.

Biological maturity - the point in the life cycle of a tree at which there is no net biomass accumulation; the stage before decline when annual growth is offset by breakage and decay. See **Financial Maturity**

Biomass - the total weight of all organisms in a particular population, sample, or area; biomass production may be used as an expression of site quality.

BMP - Abbrev. *Best Management Practices.*

Board foot - See V**olume, tree**

Bole - the main trunk of a tree.

Broad-based dip - an erosion control structure similar to and having the same purpose as a waterbar. Structurally, broad-based dips differ in that they are generally longer, less abrupt, often are paved with stone and are more appropriately used on truck roads. See **Waterbar.**

Browse - portions of woody plants including twigs, shoots, and leaves used as food by such animals as deer.

Buffer Strip - a forest area of light cutting where 50% or less of the basal area is removed at any one time (Ch. 132 regs.).

Canopy - the upper level of a forest, consisting of branches and leaves of taller trees. A canopy is complete (or has 100 percent cover) if the ground is completely hidden when viewed from above the trees.

Catastrophic Risk - high health and safety risk factors to people, high damage to human structures, or high destruction of forest conditions.

CCF - Hundreds of cubic feet. See **Volume, tree.**

CFI - Abbrev. *Continuous Forest Inventory;* a sampling method using permanent plots that are visited periodically to inventory large forest properties. Its purpose is to ascertain the condition of the forest as regards health, growth, and other ecosystem dynamics. With this information, long-term forest management policy is formulated to serve the needs of its owners.

Cleaning - See **Intermediate Cuttings.**

Coarse Woody Debris (CWD) - Dead and down woody material that is generally greater than 3" in diameter. See **Biological Legacy**

Cord - See **Volume, tree.**

Compartment - a subdivision of a forest property for administrative convenience and record keeping purposes

Community - a collection of living organisms in a defined area that function together in an organized system through which energy, nutrients, and water cycle.

Conservation - the wise use and management of natural resources.

Coppice Cutting - See **Regeneration Cutting**.

Corridor - a strip of wildlife habitat, unique from the landscape on either side of it, that links one isolated ecosystem "island" (e.g., forest fragment) to another. Corridors allow certain species access to isolated habitat areas, which consequently contributes to the genetic health of the populations involved.

Critical habitat - Uncommon habitat of great value to wildlife such as abandoned fields, orchards, aspen stands, blueberry barrens, cliffs, talus, caves, etc.

Crop tree - a term traditionally reserved to describe a tree of a commercially desirable species, with the potential to grow straight, tall, and vigorously. However, a crop tree can be one selected for non-timber purposes (varying with landowner objectives), such as mast production or den tree potential. See **Management Potential**

Crown class - an evaluation of an individual tree's crown in relation to its position in the canopy and the amount of full sunlight it receives. The four recognized categories are: dominant (D), codominant (C), intermediate (I), and overtopped or suppressed (S).

Cull Tree - a live tree of commercial species that contains less than 50% usable material.

Ro*ugh cull:* a tree whose primary cause of cull is crook, sweep, etc.
Rotten cull: a tree whose primary cause of cull is rot.

Danger tree - A standing tree that presents a hazard to employees due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stems or limbs, and the direction and lean of the tree. OSHA 1910.266, Logging Operations

Daylight - verb; to cut vegetation adjacent to a road or other open area to increase solar insulation to its surface.

DBH - abbrev. *diameter at breast height*; the diameter at breast height of a standing tree measured at 4.5' above the ground.

Den Tree-living hollow trees that are used for shelter by mammals or birds. Syn.; cavity tree.

Diameter-limit cut - a timber harvesting treatment in which all trees over a specified diameter may be cut. See **High Grading**.

Disturbance - a natural or human-induced environmental change that alters one or more of the floral, faunal, and microbial communities within an ecosystem. Timber harvesting is the most common human disturbance. Windstorms and fire are examples of natural disturbance.

Ecology - the study of interactions between living organisms and their environment.

Economic Maturity - See **Financial Maturity**

Ecosystem - a natural unit comprised of living organisms and their interactions with their environment, including the circulation, transformation, and accumulation of energy and matter.

Ecosystem management - Forest management that is applied with emphases on 1.) maintaining biodiversity, 2.) addressing societal or social needs, and 3.) being adaptive. See **Forest Management**.

Ecotype - a genetic subdivision of a species resulting from the selective action of a particular environment and showing adaptation to that environment. Ecotypes may be geographic, climatic, elevational, or soil-related.

Edge - the boundary between open land and woodland or between any two distinct ecological communities. This transition area between environments provides valuable wildlife habitat for some species, but can be problematic for some species, due to increased predation and parasitism. Syn.: ecotone

Endangered species - See **Rare Species**

Even-aged stand - See **Stand Structure**.

Featured Resource - the resource that is the primary focus of management activities.

Financial maturity - the point in the life cycle of a tree or stand when harvesting can be most profitable, i.e., when the rate of value increase of an individual tree or stand falls below a desired alternative rate of return. Syn.: Economic Maturity

Forest land - Land that is at least 10% stocked with trees.

Forest interior dependent species - animal species that depend upon extensive areas of continuous, unbroken forest habitat to live and reproduce, and are susceptible to higher rates of predation and population decline when interior forest habitat is fragmented or disturbed. See **Fragmentation.**

Forest management - the practical application of biological, physical, quantitative, managerial, economic, social and policy principles to the regeneration, management, utilization and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest.

Forest Road - A road owned by and under the jurisdiction of the Department of Conservation and Recreation, Division of Parks and Recreation.

Forest type - aggregations of tree species that commonly occur because of similar ecological requirements. Four major forest types in Massachusetts are northern hardwoods, oak/hickory, white pine and oak/pine. Syn. forest association.

Filter Strip - an area of forest land, adjoining the bank of a water body, where no more than 50% of the basal area is harvested at any one time (Ch. 132 regs.).

Fragmentation, forest - the segmentation of a large tract or contiguous tracts of forest to smaller patches, often isolated from each other by non-forest habitat. Results from the collective impact of residential and commercial development, highway and utility construction, and other piecemeal land use changes.

Ford - a stream crossing using a stable stream bottom as the roadbed.

Fuel management - the act or practice of controlling flammability and resistance to control of wildland fuels through mechanical, chemical, biological or manual means, or by fire in support of land management objectives.

Girdling - a method of killing unwanted trees by cutting through the living tissues around the bole. Can be used instead of cutting to prevent felling damage to nearby trees. Girdled trees can provide cavities and dead wood for wildlife and insects.

GIS - Geographic Information System. A computer-based system for collecting, storing, updating, manipulating, displaying and analyzing geographically referenced data.

GPS - Global Positioning System. A satellite-based navigation system.

Grade - the angle of an inclined surface as expressed in terms of percent slope: vertical rise per 100' of horizontal run.

Grade, tree - A classification system for standing trees that is based on their potential for yielding high value lumber.

Growing Stock - For inventory purposes, all live trees that are between 5.0” dbh to 10.9” dbh and are greater than 50% sound. See **Management Potential**

Growth, net - The average annual net increase in the volume of trees expressed either as a per acre value or total value for a given unit of land. Mathematically it is expressed as follows: {[growth of the existing trees at the beginning of the period]+ [ingrowth the volume of trees that have reached merchantability during the period]} – {(the volume of trees that have died during the period) + (the volume of trees that have become cull during the period.

Habitat - the geographically defined area where environmental conditions (e.g., climate, topography, etc.) meet the life needs (e.g.,. food, shelter, etc.) of an organism, population, or community.

High-grading - a type of timber harvesting in which larger trees of commercially valuable species are removed with little regard for the quality, quantity, or distribution of trees and regeneration left on the site; often results when a diameter limit harvest is imposed. See **Diameter Limit Cutting.**

Herbaceous - A class of vegetation dominated by non-woody plants known as herbs; [graminoids (grass), forbs and ferns].

Incidental taking - the taking of a rare species that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Intermediate Cuttings - Operations conducted in a stand during its development from regeneration stage to maturity. These are carried out to improve the quality of the existing stand, increase its growth and provide for earlier financial returns, without any effort directed at regeneration.

Cleaning: a cutting made in a stand, not past the sapling stage, to free the best trees from undesirable individuals of the same age that overtop them or are likely to do so. See *weeding.*

Thinning: a cutting whose purpose is to control the growth of stands by adjusting stand density.

Salvage Cutting: a harvest whose primary purpose is to remove trees that have been or are in imminent danger of being killed or damaged by injurious agencies.

Weeding: a cutting made in a stand not past the sapling stage that eliminates or suppresses undesirable vegetation regardless of crown position. See *Cleaning.*

Landing - any place where round timber is assembled for further transport, commonly with a change in method. Generally, a cleared area where log trucks are loaded.

Legacy tree - a tree, usually mature or old-growth, that is retained on a site after harvesting or naturally disturbance to provide a biological legacy. . See **Biological Legacy**

Management plan - a document prepared by natural resource professionals to guide and direct the use and management of a forest property. It consists of inventory data and prescribed activities designed to meet ownership objectives.

Management potential - For forest inventory purposes, a classification method in which a tree is rated based on the likelihood that it will develop into a tree that will be structurally sound, vigorous and yield products of high value. The three classes are as follows:

Preferred Crop Tree: the highest class; a tree with a dominant crown and no or minimal sweep or crook and no or few limbs in the butt 16' log.

Acceptable Growing Stock: a tree of codominant or greater crown class with moderate sweep or crook and a moderate number of limbs in the butt 16' log.

Unacceptable Growing Stock: Any tree not meeting the above criteria.

Also, see **Growing stock**

Mast - Seed produced by woody-stemmed, perennial plants, generally referring to soft (fruit) or hard (nut) mast.

Matrix, forest - The most extensive and connected landscape element that plays the dominant role in landscape functioning.

MBF - Abbrev. Thousands of board feet. See **Tree Volume**

Merchantable - of trees, crops or stands, of a size, quality and condition suitable for marketing under given economic conditions even if so situated as not to be immediately accessible for logging. See **Operable.**

Multiple use and value - a conceptual basis for managing a forest area to yield more than one use or value simultaneously. Common uses and values include aesthetics, water, wildlife, recreation, and timber.

Niche - the physical and functional location of an organism within an ecosystem; where a living thing is found and what it does there.

Old growth stand - A stand that has been formally designated as an old growth stand. These areas must meet a preponderance of the following four criteria: 1.) Be of a size that is large enough to be self sustaining. 2.) Show no evidence of significant post-European disturbance. 3.) Should have a component of trees that are greater than 50% of the maximum longevity for that species. 4.) Shall be a makeup that is self-perpetuating.

Old growth attributes - attributes often associated with old growth forests such as large amounts of coarse woody debris, large trees, etc. that are achieved through deliberate actions in a managed forest. See **Biological legacy**

Operable - trees, crops or stands that are both merchantable and accessible for harvesting. See **Merchantable.**

Patch - a small area of a particular ecological community surrounded by distinctly different ecological communities, such as a forest stand surrounded by agricultural lands or a small opening surrounded by forestland.

Poletimber - See **Size Class**.

Population - a group of individuals of one plant or animal taxon (species, subspecies, or variety).

Preservation - a management philosophy or goal which seeks to protect indigenous ecosystem structure, function, and integrity from human impacts. Management activities are generally excluded from "preserved" forests.

Raptor - A bird of prey.

Rare species - A collective term used to describe species listed under the MA Endangered Species Act as *endangered*, *threatened*, or of *special concern*.

Endangered: native species which are in danger of extinction throughout all or part of their range, or which are in danger of extirpation from Massachusetts, as documented by biological research and inventory.

Threatened: native species which are likely to become endangered in the foreseeable future, or which are declining or rare as determined by biological research and inventory.

Special concern: native species which have been documented by biological research or inventory to have suffered a decline that could threaten the species if allowed to continue unchecked, or which occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become threatened within Massachusetts.

Recreation, outdoor - Outdoor recreation is generally considered to be of two types. *Extensive recreation* is that which occurs throughout a large area and is not confined to a specific place or developed facility e.g., hunting, fishing, hiking, horseback riding, snowmobiling, cross-country skiing, etc. Syn, dispersed. *Intensive recreation* includes high density recreational activities that take place at a developed facility e.g., camp and picnic grounds and swimming beaches.

Regeneration - the renewal of a tree crop, whether by natural or artificial means - may be broken down into those treatments that produce stands originating from seed (high forest) or from vegetative regeneration (coppice or sprouts) and create even-aged or uneven-aged stands. Syn. reproduction.

Regeneration Cutting - Any removal of trees intended to assist regeneration already present or to make regeneration possible. The operation creates either an even-aged stand or an uneven-aged stand. See **Even-aged stand** and **Uneven-aged stand**

Clearcutting; (even-aged) removal of the entire stand in one cutting with reproduction obtained artificially or by natural seeding from adjacent stands or from trees cut in the clearing operation.

Seed-tree: (even-aged) removal of the old stand in one cutting, except for a small number of seed trees left singly or in groups.

Shelterwood: (even-aged) removal of the old stand in a series of cuttings, which extend over a relatively short portion of the rotation, by means of which the establishment of essentially even-aged reproduction under the partial shelter of seed trees is encouraged.

Selection: (uneven-aged) removal of trees, throughout all size classes, either as single scattered individuals or in small groups at relatively short intervals, repeated indefinitely, by means of which the continuous establishment of reproduction is encouraged and an uneven-aged stand is maintained.

Coppice: (even-aged or uneven-aged) any type of cutting in which dependence is placed mainly on vegetative reproduction.

Regeneration interference - an impediment to regeneration due to competing vegetation, or soil/site limitations.

Release - removal of overtopping trees to allow understory or overtopped trees to grow in response to increased light.

Reproduction - Syn; Regeneration.

Reserve tree - a tree, pole-sized or larger, retained in either a dispersed or aggregated manner after the regeneration period under the clearcutting, seed tree, shelterwood, group selection or coppice methods. Syn. Standard, legacy tree

Residual stand - trees remaining following any silvicultural operation.

Riparian Area - an area in close proximity to a watercourse, lake, swamp or spring.

Rotation - the planned number of years between the formation or regeneration of a crop or stand and its final harvest at a specified stage of maturity.

Rotation, extended - a rotation longer than necessary to grown timber crops to financial maturity or size and generally used to provide habitat or nontimber values.

Salvage Cutting - See **Intermediate cutting**

Sapling - See **Size Class**

Sawtimber - See **Size Class.**

Seed Tree Cutting - See **Regeneration Cutting**.

Seedling - See **Size Class.**

Seep (Seepage) - Groundwater (as opposed to surface flow) escaping through or emerging from the ground along an extensive line or surface, as contrasted with a spring where water emerges from a localized spot..

Selection cutting - See **Regeneration Cutting**.

Selective cutting - a cutting that removes only a portion of trees in a stand. Note: selective cutting is a loose term that should not be confused with cutting done in accordance with the selection method, is not a recognized silvicultural system and is often synonymous with or associated with High Grading.

Shelterwood Cutting - See **Regeneration Cutting.**

Silviculture - the theory and practice of controlling forest establishment, composition, structure and growth.

Silvicultural prescription - a detailed, quantitative plan, at the stand level of resolution, for conducting a silvicultural operation.

Silvicultural System - a program for the treatment of a stand throughout a rotation. An even-aged system deals with stands in which the trees have no or relatively little difference in age. An uneven-aged system deals with stands in which the trees differ markedly in age.

Site - the combination of biotic, climatic, topographic, and soil conditions of an area; the environment at a location.

Site index – See **Site Quality.**

Site preparation - Hand or mechanized manipulation of a site designed to enhance the success of regeneration.

Site quality - the inherent productive capacity of a specific location (site) in the forest affected by available growth factors (light, heat, water, nutrients, anchorage); often expressed as site index – the height of the average tree in an even-aged stand at a given age. In New England 50 years is generally used as the base age.

Size Class:

Seedling; a young tree, less than sapling size of seed origin.

Sapling: a tree greater than 1" dbh and less than 4.9" dbh.

Poletimber: a tree greater than 4.9" dbh and less than sawtimber size.

Sawtimber: a tree greater than 11.0" dbh having at least 8' of usable length and less than 50% cull.

Slash - tops, branches, slabs, sawdust or debris resulting from logging or land clearing operations.

Slope, steep - An area where the average, sustained slope is greater than 50%. See **Grade.**

Snag - a standing dead tree, greater than 20' tall, which has decayed to the point where most of its limbs have fallen; if less than 20' tall it is referred to as a *stub*. A hard snag is composed primarily of sound wood, generally merchantable and a soft snag is composed primarily of wood in advanced stages of decay and deterioration. See **Biological legacy.**

Special concern, Species of - see **Rare species**

Species - a subordinate classification to a genus; reproductively isolated organisms that have common characteristics, such as eastern white pine or white-tailed deer.

Stand - a community of trees possessing sufficient uniformity as regards composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities, so forming a silvicultural or management entity.

Standard - a tree (or trees), which remain after the harvest in the coppice with standards regeneration method to attain goals other than regeneration. See **Reserve trees.**

Stand Condition - Stand condition is based on species age, size, quality, and stocking of the trees making up the main stand.

Non-stocked: Those stands less than 10% stocked with commercial tree species.

High Risk: Those stands which will not survive the next ten years, or in which, due to decay, insects, disease, mortality or other factors will have a net volume loss in the next ten years.

Sparse: Those stands that are not high risk, but which have less than 40 sq. ft. of basal area/acre.

Low Quality: Stands which are not sparse or high risk, but have less than 40 sq. ft. of basal area/acre in poletimber or sawlog trees that are classified as either acceptable or preferred growing stock..

Mature: An even-aged stand within 5 years of rotation age or beyond rotation age which does not fit into any of the above categories or an uneven-aged stand that exceeds the stocking and size criteria for that type.

Immature: Any stand more than 5 years from rotation age which does not fit into any of the above categories.

In Process of Regeneration: A stand in which work has been done to establish regeneration; site preparation, planting, seeding, shelterwood cutting, etc.

Stand Structure - A description of the distribution and representation of tree age and size classes within a stand.

Even-aged, single-storied: Theoretically, stands in which all trees are one age. In actual practice, these stands are marked by an even canopy of uniform height characterized by intimate competition between trees of approximately the same size. The greatest number of stems are in a diameter class represented by the average of the stand.

The ages of the trees usually do not differ by more than 20 years.

Even-aged, two-storied: Stands composed of two distinct canopy layers, such as, an overstory and understory sapling layer possibly from seed tree and shelterwood operations. This may also be true in older plantations where tolerant hardwoods may become established as management intensity decreases (burning and other means of understory control).

Two relatively even canopy levels can be recognized in the stand. Both canopy levels tend to be uniformly distributed across the stand. The average age of each level differs significantly from the other.

Uneven-aged (sized): Theoretically, these stands contain trees of every age on a continuum from seedlings to mature canopy trees. In practice, uneven-aged stands are characterized by a broken or uneven canopy layer. The largest number of trees is in the smaller diameter classes. As trees increase in diameter, their numbers diminish throughout the stand. Generally, a stand with 3 or more structural layers may be considered as uneven-aged.

Mosaic: At least two distinct size classes are represented and these are not uniformly distributed, but are grouped in small repeating aggregations, or occur as stringers less than 120 feet wide, throughout the stand. Each size class aggregation is too small to be recognized and mapped as an individual stand. The aggregations may or may not be even-aged.

Stewardship - the wise management and use of forest resources to ensure their health and productivity for the future with regard for generations to come.

Stocking - the degree of occupancy of an area by trees. In even-aged stands, stocking levels are expressed as different levels (A, B and C) based upon stocking guides that use tree diameter, basal area and number of trees per acre. The A level represents the density of undisturbed even-aged stands. The B level represents the minimum density for maximum basal area and cubic foot growth. The C level represents both the minimum stocking of acceptable growing stock to make a stand suitable for management for timber products and represents 10 years growth below the B level.

Overstocked: stands above the "A" level of stocking for their forest type, tree density and size class.
Fully stocked: stands between the "A" and "C" levels of stocking for their forest type, tree density and size class.
Understocked: stands below the "C" level of stocking for their forest type, tree density and size class.

In uneven-aged stands, stocking is based on residual basal area, maximum tree size and a ratio known as "Q" which is a mathematical expression of the desired diameter distribution.

Structure, horizontal - the spatial arrangement of plant communities; a complex horizontal structure is characterized by diverse plant communities within a given geographic unit.

Structure, vertical - the arrangement of plants in a given community from the ground (herbaceous and woody shrubs) into the main forest canopy; a complex vertical structure is characterized by lush undergrowth and successive layers of woody vegetation extending into the crowns of dominant and co-dominant trees. (See *crown class.)*

Stumpage value - the commercial value of standing trees.

Succession - the natural series of replacements of one plant community (and the associated fauna) by another over time and in the absence of disturbance.

Sustained yield - historically, a timber management concept in which the volume of wood removed is equal to growth within the total forest. The concept is applicable to nontimber forest values as well.

Thinning - See **Intermediate cuttings.**

Threatened species - See **Rare species**.

Tolerance - a characteristic of trees that describes the relative ability to thrive with respect to the growth factors (light, heat, water nutrients, anchorage). Usually used to describe shade tolerance: the ability of a species to thrive at low light levels.

T.S.I. - timber stand improvement; a loose term comprising all intermediate cuttings made to improve the composition, constitution, condition and increment of a timber stand. The practice may be commercial; yielding net revenues or precommercial or noncommercial; where the cost of accomplishing the work exceeds the value of the products removed.

Unacceptable Growing Stock (UGS) - See **Management Potential**.

Understory - the smaller vegetation (shrubs, seedlings, saplings, small trees) within a forest stand, occupying the vertical area between the overstory and the herbaceous plants of the forest floor.

Uneven-aged stand - See **Stand Structure**

Vernal or autumnal ponds - a class of wetland characterized by small, shallow, temporary pools of fresh water present in spring and fall, which typically do not support fish but are very important breeding grounds for many species of amphibians. Some species are totally dependent upon such ponds; examples are spring peepers and mole salamanders.

Volume, tree - the contents of the merchantable portion of a tree, expressed either as 1.) Board foot volume, where a board foot is equivalent to a piece of wood 12" x 12" x 1" thick, excluding the waste inherent in processing; 2.) Cubic foot volume with no waste attributed to processing: 3.) Cord volume, where 80 cubic feet of solid wood are equivalent to one cord. One cord of wood contains 128 cubic feet of air, bark and wood or 4.) Tons of oven-dry wood.

Water Bar - a shallow depression, 12" to 36" wide, cut across a dirt road or skid trail at approximately a 30 degree angle to its alignment, for the purpose of diverting the overland flow of water from the surface of the road. See **Broad-based dip**.

Wetland - an area meeting the criteria for a wetland under Massachusetts General Laws, Chapter 131, the Wetlands Protection Act.

Wildlife tree - a live or dead tree designated for wildlife habitat or retained to become future wildlife habitat.

Appendix M – References

1. A Management Guide for Oak in New England, Conn. Coop. Extension Publication #83-12

2. A Method of Applying Group Selection in Central Appalachian Hardwoods, USFS RP-NE-696

3. A Silvicultural Guide for Spruce-Fir in the Northeast, USFS GTR-NE-6

4. A Silvicultural Guide for White Pine in the Northeast, USFS GTR-NE-41

5. An Ecological Assessment and Forest Management Framework for the Lower Worcester Plateau Ecoregion in Massachusetts. 2nd Draft. 23 December 2003. Commonwealth of Massachusetts, Executive Office of Environmental Affairs.

6. Berlik, M.M., D.B. Kittredge, D.R. Foster. 2002. The Illusion of Preservation: A Global Environmental Argument for the Local Production of Natural Resources. Harvard Forest Paper No. 26. Harvard Forest, Harvard University, Petersham, MA.

7. BioMap, Guiding Land Conservation for Biodiversity in Massachusetts. 2001. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.

8. Burns, Russell M., Silvicultural Systems for the Major Forest Tvues of the U.S., U.S.D.A. Forest Service Ag. Handbook No. 445.

9. Bums, Russell M., and Barbara Honkala. Silvics of North America., U.S.D.A. Forest Service. Ag. Handbook *654.*

10. DeGraaf, R.M., M. Yamasaki, W.B. Leak, J.W.Lanier. 1992. New England Wildlife: Management of Forested Habitats. USDA Forest Service General Technical Report NE-144. Northeast Forest Experiment Station, Radnor, PA. 271 pp.

11. Distribution of Cut Guides for Thinning in Alleghany Hardwoods: a Review, USFS RN-NE-362

12. Even-aged Silviculture for Upland Central Hardwoods, USFS, Agriculture Handbook 355

13. Foster, D.L., D.H. Knight and J.R. Franklin. 1998a. Landscape patterns and legacies resulting from large, infrequent forest disturbances. Ecosystems (1998)1:497-510.

14. Frank, Robert M. and John Bjorkbom. ‘A Silvicultural Guide for Spruce-Fir in the Northeast.” U.S. Dept.of Ag., Forest Service General Technical Report NE-6, 1973.

15. Guide to Wildlife Tree Management in New England Northern Hardwoods, USFS GTR-NE-118

16. Hall, B., G. Motzkin, D. R. Foster, M. Syfert, and J. Burk. 2002. Three hundred years of forest and land-use change in Massachusetts, USA. Journal of Biogeography 129: 1319-1135.

17. Helms, John; Ed., 1998, *The Dictionary of Forestry*, Society of American Foresters, Bethesda, MD.

18. Hibbs, David and William Bentley, "A Management Guide for Oak in New England". University of Connecticut, Cooperative Extension Service.

19. Hunter, M. 1990. *Wildlife, Forests and ForestryPrinciples of Managing Forests for Biological Diversity*.Prentice Hall Career and Technology, Englewood Cliffs, N.J.

20. Hunter, M.L. Jr. 1996. Fundamentals of conservation biology. Blackwell Science, Cambridge, MA.482pp

21. Kittredge, D. and Parker, M. 1996 *Massachusetts Forestry Best Management Practices Manual* Cooperative Extension - Univ. of Mass. Amherst., MA

22. Lancaster, Kenneth. "Managing Eastern Hemlock, A Preliminary Guide. U.S.D.A. Forest Service, NA-FR-30, 1985.

23. Lancaster, Kenneth, "White Pine Management, A Quick Review" U.S. Dept. of Ag., Forest Service, NA fr-27. 1984.

24. Lancaster, Kenneth and William D. Leak, "A Silvicultural Guide for White Pine in the Northeast, U.S. Forest Service General Technical Report NE-4 1, 1978

25. Lancaster, Kenneth, et. al., "A Silvicultural Guide for Developing a Sugarbush". USDA Forest Service. Research Paper, NE-286, 1974.

26. Leak, William and Staley Filip, "Uneven-Aged Management of Northern Hardwoods in New England. U.S. Dept. of Ag., Forest Service Research Paper NE-332, 1975.

27. Leak, William, Dale Solomon and Stanley Filip, "A Silvicultural Guide for Northern Hardwoods in the Northeast". U.S. Dept. Ag., Forest Service, Research Paper NE-143, 1969.

28. Living Waters, Guiding the Protection of Freshwater Biodiversity in Massachusetts. 2003. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.

29. Managing Eastern Hemlock - A Preliminary Guide, USFS NA-FR-30

30. Marquis, D., Ernst, R. and Stout, S. 1990 *Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghanies (revised)* Gen. Tech. Rep. NE-96 USDA-Forest Service

31. Massachusetts Department of Environmental Management., 1998. *Manual for Continuous Forest Inventory Field Procedures*. Massachusetts Dept. of Env. Mgmt., Div. of Forests and Parks, Bureau of Forestry. Amherst, MA.

32. Mawson, J.C., W.H. Rivers. A Forest Land Classification System for Massachusetts. July 1994. Department of Forestry and Wildlife Management, University of Massachusetts, Amherst MA.

33. NED/SIPS User's Manual, Version 1.0, USFS GTR-NE-205

34. Norton, D. 1999.Forest Reserves. Pp 525-555 in M.L. Hunter, Jr., ed. Maintaining biodiversity in forest ecosystems. Cambridge Univ. Press. New York, NY. 667p

35. Number of Residual Trees: A Guide for Selection Cutting, USFS GTR-NE-80

36. Oregon Forest Resources Institute, Forests, Carbon and Climate Change, 2007

37. Office of Geographic and Environmental Information (Mass GIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs – All map data comes from this source unless otherwise noted.

38. Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies (revised), USFS GTR-NE-96

39. Quantitative Silviculture for Hardwood Forests of the Alleghenies, USFS GTR-NE-183

40. Roach, Benjamin and Samuel Gingrick, “Even-Aged Silviculture for Upland Central Hardwoods”. US Dept. Ag., Forest Service, Agriculture Handbook *355*, 1968.

41. Sampson, T.L., J. P. Barrett, and W.B. Leak, “A Stocking Chart for Northern Red Oak in New England”. New Hampshire Agricultural Experiment Station, University of New Hampshire.

42. Silvicultural Guide for Northern Hardwood Forest Types (revised), USFS RP-NE-603

43. Silvicultural Guide for Paper Birch in the Northeast, USFS RP-NE-535

44. Smith, David M., 1986, The Practice of Silviculture, Eighth Edition, John Wiley and Sons, Inc., N.Y.

45. The Practice of Silviculture: Applied Forest Ecology, ninth edition, 1997.

46. Walters, C.J. and C.S. Holling. 1990. Large-scale management experiments and learning by doing. Ecology, 7(16):2060-2068