

Appendix A – District Maps

Appendix B – Property Maps

Appendix C – Forest Structure Table

Forest Type	Size Class	Acres	Stocking	Trees/Acre	Basal Area/Acre	Cubic Foot Volume /Acre	Board Foot Volume /Acre
Open	NA	992	NA	NA	NA	NA	NA
White Pine	Seeding / Sapling	0	NA	NA	NA	NA	NA
	Pole	662	C	295	136	2663	8054
	Saw Log	992	B	162	183	4392	25607
Hemlock	Seeding / Sapling	0	NA	NA	NA	NA	NA
	Pole	2646	A	283	158	3198	11258
	Saw	3473	A	226	183	3941	18738
Spruce/Fir	Seeding / Sapling	0	NA	NA	NA	NA	NA
	Pole	2481	B	276	121	2526	6532
	Saw	992	B	287	228	6118	27370
	Saw	496	D	120	95	2438	9734
Northern Hardwood	Seeding / Sapling	0	NA	NA	NA	NA	NA
	Pole	2811	A	266	136	2872	9416
	Pole	6615	B	189	98	1967	6272
	Pole	331	C	108	55	1007	3586
	Saw	4630	A	176	143	3258	16374
Oak / Hardwood	Seeding / Sapling	0	NA	NA	NA	NA	NA
	Pole	496	B	212	108	2043	6541
	Saw	662	B	191	160	3932	23755
Total		31256					

Stocking A - Over Stocked B – Adequately Stocked C – Moderately Stocked D – Under Stocked

Forest Age Class Distribution for All Types

Age	0	1 - 15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	86 -95	96 Plus
Acres	1158	0	0	496	331	331	4961	5126	5953	6614	6284

Trees per acre by diameter class (over 5" dbh) over all species within each type

	WP/P/B	WP/S/B	HK/P/A	HK/S/A	SF/P/B	SF/S/B	SF/S/D	NH/P/A	NH/P/B	NH/P/C	NH/S/A	NH/S/B	OM/P/B	OM/S/B
6	118	42	73	40	103	22	8	87	64	53	39	28	62	48
8	73	21	75	44	70	54	20	62	44	23	27	21	68	34
10	40	18	50	36	46	60	30	50	32	5	27	20	32	26
12	31	20	38	33	25	63	23	33	20	3	23	19	22	19
14	19	13	20	30	15	41	17	19	14	10	23	16	12	13
16	10	14	12	17	5	21	8	7	8	10	15	12	10	19
18	4	7	6	11	2	20	7	4	4	5	11	7	5	9
20	1		2	8	2	3	2	1	1		6	3	2	16
22			1	2		1	3		1		2	2		4
24			1	2	1	2		2			1	1		1
26			1	1							1	1		3
28				1							1			
30				1							1			
32														
34							1		1					
36				1		1			1		1			
Total	296	135	279	227	269	288	118	266	190	109	178	130	213	192

Number of Wildlife Trees per Acre by Type

Class	WP/P/B	WP/S/B	HK/P/A	HK/S/A	SF/P/B	SF/S/B	SF/S/D	NH/P/A	NH/P/B	NH/P/C	NH/S/A	NH/S/B	OM/P/B	OM/S/B
6	118	42	73	40	103	22	8	87	64	53	39	28	62	48
8	73	21	75	44	70	54	20	62	44	23	27	21	68	34
10	40	18	50	36	46	60	30	50	32	5	27	20	32	26
12	31	20	38	33	25	63	23	33	20	3	23	19	22	19
14	19	13	20	30	15	41	17	19	14	10	23	16	12	13
16	10	14	12	17	5	21	8	7	8	10	15	12	10	19
18	4	7	6	11	2	20	7	4	4	5	11	7	5	9
20	1		2	8	2	3	2	1	1		6	3	2	16
22			1	2		1	3		1		2	2		4
24			1	2	1	2		2			1	1		1
26			1	1							1	1		3
28				1							1			
30				1							1			
32														
34								1	1					
36				1		1			1		1			
Total	296	135	279	227	269	288	118	266	190	109	178	130	213	192

Woody Debris: Total Trees (Alive and Dead) Over All Types by Status and Diameter Class

Class	All Live Trees	Dead Sound Trees	Dead Partially Decayed Trees	Dead Decayed Trees	Dead Down Sound Trees	Dead Down Partially Decayed Trees	Dead Down Decayed Trees	Total Dead
6	1745434	35554	167847	95912	4134	43822	53744	401012
8	1375842	16537	128159	67800	3307	33900	45475	295178
10	1061647	9095	65320	45475	4134	29766	27285	181075
12	806158	4961	49610	27285	1654	24805	17363	125678
14	585394	2480	42168	16537	3307	14883	10749	90124
16	341480	2480	14056	6615	2480	7442	8268	41341
18	207534		7441	2480	827	4961	3307	19017
20	102527		4134	2480	827	1654	1654	10749
22	45476		3307	827			827	4961
24	24805		1654		827	827		3307
26	19017			827				827
28	7441					1654		3307
30	4134		827					827
32	3307							
34	1654						827	827
36	5788							1654
Total	6337638	71107	484523	266238	21497	163714	169499	1179884

Number of Trees with Special Wildlife Characteristics per Acre by Class within Forest Type

Type	Small Cavity	Larger Cavity	Small Dead Limbs	Large Dead Limbs	Broken Tops	But Rot	Upper Rot	Any Two Proceeding	Any Three Proceeding	Total
WP/P/B	3		3	1	5		4	1		16
WP/S/B	2	3	4	8	1			8	3	27
HK/P/A	5	1	3	2	2		3	4		21
HK/P/A	5	1	3	2	2		3	4		21
HK/S/A	2	1	8	2	4		3	4	1	24
SF/P/B	3	1	10	2				2		18
SF/S/B			2				2	3		6
SF/S/D			2		2		3	2		8
NH/P/A	1	1	4	3	3		1	6	1	21
NH/P/B	3	2	5	2	6	1	3	4	1	26
NH/P/C			10					10		20
NH/S/A	3	3	4	4	6		3	9	2	33
NH/S/B	2	3	2	2	6			8	3	25
OM/P/B	7	3	8	2	2	5		2	3	32
OM/S/B	3		3	9	8	3		1	5	30

Average Forest Growth and Mortality Per Acre per Year by Forest Type

Forest Type	Repeat Growth			Ingrowth			Mortality			Net Growth		
	Basal Area	Cubic Feet (hundreds)	Board Feet (thousands)	Basal Area	Cubic Feet (hundreds)	Board Feet (thousands)	Basal Area	Cubic Feet (hundreds)	Board Feet (thousands)	Basal Area	Cubic Feet (hundreds)	Board Feet (thousands)
WP/P/B	2.190	0.520	0.3292	1.209	0.195	0.0237	1.942	0.384	0.1332	1.457	0.331	0.2196
WP/S/B	2.470	0.665	0.7094	0.729	0.114	0.0091	0.890	0.180	0.0571	2.309	0.599	0.6614
HK/P/A	1.978	0.462	0.2943	0.452	0.060	0.0000	1.797	0.350	0.1084	0.634	0.173	0.1859
HK/S/A	2.244	0.504	0.4674	0.276	0.035	0.0032	1.076	0.218	0.0791	1.443	0.321	0.3915
SF/P/B	1.497	0.419	0.2149	0.765	0.120	0.0112	1.516	0.307	0.1020	0.746	0.231	0.1242
SF/S/B	3.208	1.161	0.9077	0.157	0.036	-0.0010	2.417	0.457	0.0947	0.948	0.740	0.8120
SF/S/D	1.533	0.479	0.3564	0.129	0.015	0.0000	4.497	1.079	0.3597	-2.835	-0.584	-0.0033
NH/P/A	1.937	0.445	0.2820	0.649	0.103	0.0005	1.470	0.315	0.1451	1.115	0.233	0.1374
NH/P/B	1.313	0.272	0.1904	0.604	0.087	0.0010	1.599	0.349	0.1282	0.318	0.011	0.0631
NH/P/C	0.464	0.098	0.0453	0.181	0.014	0.0000	1.923	0.399	0.2000	-1.278	-0.287	-0.1546
NH/S/A	1.692	0.390	0.3854	0.348	0.051	0.0015	1.112	0.226	0.0668	0.928	0.214	0.3201
NH/S/B	1.173	0.243	0.2279	0.362	0.055	0.0012	1.665	0.362	0.0917	-0.129	-0.063	0.1374
OM/P/B	1.882	0.469	0.2287	0.310	0.044	0.0000	0.922	0.120	0.0126	1.269	0.393	0.2161
OM/S/B	2.229	0.587	0.7063	0.187	0.022	0.0000	1.432	0.349	0.1462	0.983	0.261	0.5602
Average	1.721	0.448	0.3564	0.424	0.063	0.0034	1.724	0.356	0.1156	0.244	0.155	0.2441

Standing Inventory and Total Growth per Year

Total Acres All Forest Types	31,251
Current Total Volume Thousands of Board Feet	341,427
Current Total Volume Hundreds of Cubic Feet	881,702
Net Growth per Year (Thousands of Board Feet)	6,877 (2% increase/year)
Net Growth Per Year (Hundreds of Cubic Feet)	4,965 (0.5% increase/year)

Standard Error of the Means (90% sure of being within 10% of the true mean value)

Board Foot Volume	3.67%
Cubic Foot Volume	1.93%

Appendix D – Nearby Protected Lands

DSPR Facility Buffered	Non-DSPR property within 1 mile	Ownership	Total acres of property
Appalachian National Scenic Trail	Appalachian National Scenic Trail	Federal	0.12
	Chalet WMA	Private	536
	Day Mountain WMA	Dept. of Fish & Game	338
	Marchisio Park	Municipal	20
	Pittsfield Watershed	Municipal	9,523
	Western District H.Q.	Dept. of Fish & Game	3
	Total:		
Ashmere Lake State Park	Dalton Fire District WCE	Municipal	1,754
	Hinsdale Flats WMA	Dept. of Fish & Game	698
	Peru WMA	Dept. of Fish & Game	650
	Total:		
Becket State Forest	Conservation Land	Municipal	721
	Total:		
Bryant Mountain State Forest	Bryant Homestead	Land Trust	43
	Mfclt/Bryant	Other	256
	Mfclt/Streeler	Other	80
	Powell Brook WMA	Dept. of Fish & Game	260
	West Mountain	Land Trust	1,389
	Westfield River Access	Dept. of Fish & Game	43
	(Blank)	Non-Profit	20
	Total:		
C.M. Gardner State Park	Knightville Dam & Reservation	Federal	2,390
	Littleville Dam & Rec. Area	Federal	115
	Littleville Lake Flood Control	Federal	1,403
	Total:		
Chester-Blandford State Forest	Arms Acres	Conservation Organization	72
	Blandford/Huntington WCE (Stanton-Cook, Tomkins & Beesaw Lots)	Private	515
	Chicoyne Parcel	Private	217
	Cummings Parcel	Private	160
	John J. Kelly WMA	Dept. of Fish & Game	325
	Russell Water Supply Land	Municipal	2,456
	Springfield Water Supply Land	Municipal	9,404
	Town Wellfields	Municipal	28
	Wright / Mica Mill WCE	Private	1,675
	Total:		

Gilbert A. Bliss State Forest	Chesterfield Gorge Reservation	Land Trust	210
	Chesterfield WCE	Private	306
	Cummington WMA	Dept. of Fish & Game	189
	Dawes Cemetery	Municipal	1
		Private	2
	Hiram H. Fox WMA	Dept. of Fish & Game	1,019
	Indian Hollow	Federal	240
	Knightville Dam & Reservation	Federal	4,779
	Lilly Pond WMA	Dept. of Fish & Game	209
		Private	140
	Westfield River Access	Dept. of Fish & Game	265
	Westfield River Wilderness Area	Comm of MA	1,364
	(Blank)	Private	741
	Total:		
Huntington State Forest	Holyoke Watershed Land	Municipal	112
	Holyoke Watershed Lands	Municipal	2,128
	Huntington WCE (Stanton-Clapp Lot)	Private	90
	Joy Hill	Private	81
	Westfield Watershed	Municipal	836
	White Reservoir Watershed	Municipal	1,166
Total:			4,412
Krug Sugarbush/Dead State Forest	Gilbert A. Bliss State Forest	Private	0.48
	(Blank)	Private	319
	Indian Hollow	Federal	22
	Knightville Dam & Reservation	Federal	4,779
	Tilloston Park	Municipal	5
	Town Beach	Municipal	9
	Town Forest	Municipal	70
Total:			5,204.48
Middlefield State Forest	Cr #1	Private	36
	Cr #2	Private	109
	Fox Den WMA	Dept. of Fish & Game	381
	Hinsdale Flats WMA	Dept. of Fish & Game	1,323
	Mcelwain-Olsen Property	Land Trust	34
	Peru WMA	Dept. of Fish & Game	1,326
	Walnut Hill WMA	Dept. of Fish & Game	752
Total:			3,961
October Mountain State Forest	Appalachian Trail	Federal	93
	Appalachian National Scenic Trail	Federal	666
	Canoe Meadows	Land Trust	248

	Cemetery	Municipal	27
	Conservation Land	Municipal	3
	George L. Darey Housatonic Valley WMA	Dept. of Fish & Game	888
	Golden Hill	Municipal	68
	Goose Pond Reservation	Land Trust	106
	H. W. Davis	Private	604
	H. W. Davis CBKs Lot 3	Private	103
	Kirvin Park	Municipal	250
	October Mtn Wildlife Corridor	Land Trust	54
	Pittsfield Watershed	Municipal	8,903
	Post Farm	Municipal	24
	Tilloston Park	Municipal	11
	Water Department Land	Municipal	652
	Willow Creek	Municipal	9
	(Blank)	Land Trust	66
		Municipal	207
		Private	800
	Total:		13,784
Peru State Forest	Fox Den WMA	Dept. of Fish & Game	2,902
	Miller	Private	342
	Peru WMA	Dept. of Fish & Game	675
	Westfield River Access	Dept. of Fish & Game	46
	(Blank)	Conservation Organization	373
	Total:		4,338
Pittsfield State Forest	(Blank)	Private	215
	Total:		215
Region V Headquarters	George L. Darey Housatonic Valley WMA	Dept. of Fish & Game	450
	Wild Acres Park	Municipal	71
	(Blank)	Land Trust	155
		Private	128
	Total:		803
Wahconah Falls State Park	Bardin	Private	209
	Chalet WMA	Dept. of Fish & Game	856
	Dalton Fire District WCE	Municipal	850
	Pittsfield Watershed	Municipal	680
	(Blank)	Private	414
	Total:		3,009
Worthington State Forest	Fox Den WMA	Dept. of Fish & Game	709
	Glen Cove Wildlife Sanctuary	Municipal	67
	Mfclt/Paul	Other	46
	Total:		822

Appendix E – 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 DSPR’s mission and policy for resource stewardship.

At the time of writing, DSPR’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 Central Berkshire District. It was known from the outset that the DSPR’s 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 based on the archaeological site files of the MHC was performed in preparation of this section and reviewed recorded sites on sixteen U.S.G.S. Topographic maps that cover the Central Berkshire District. Even at this basic level of inquiry, a total of 103 prehistoric archaeological sites are recorded within the Central Berkshire District (Table 1). Interestingly, in some places there are thousands of acres where not a single prehistoric site is recorded (e.g., the two contiguous USGS Quadrangle Maps of Otis, and Blanford are completely void of recorded

prehistoric archaeological sites). At the same time, thirty sites are recorded on the West Pittsfield Quadrangle and twenty-four on the Woronoco Quadrangle. Note: these numbers refer to the entire quadrangles and not necessarily sites that exist within lands that may be under the jurisdiction of DSPR's Bureau of Forestry.

The Central 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 Central 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.

A. Prehistoric Overview & Archaeological Resources

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 Central 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 Central 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 Central 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 Central 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).

B. 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 Mohawk Trail, which roughly corresponds to portions of present Route 2, was a major east-west corridor between the Hudson and Connecticut valleys. From Deerfield, this important trail went over King Arthur's Seat and crossed the uplands to Shelburne Falls and then it proceeded along the north bank of the Deerfield from the North River Ford in Colrain through Charlemont and over the Hoosac Range. Another important east-west trail connected the Connecticut and Housatonic rivers via the Mill River from Northampton through Williamsburg and up into the

Goshen uplands. From there it continued west paralleling the Swift River gorge through Cummington, toward Plainfield Pond and eventually to Pittsfield (MHC 1984). The most southerly of the major east-west trails followed the north bank of the Westfield from the Connecticut River to the Woronoc 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 stand out 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. Railroad construction was to have a profound impact to the landscape of the western region, when in 1876 a major engineering feat was completed; the construction of the Hoosac Tunnel.

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 Central 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 Central 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 Berkshires, with the possible exception of Bryant Mountain SF, Gilbert Bliss, Krug Sugarbush, C.M. Gardener, Pittsfield, Worthington and Rowe SF, for there are no cultural resources inventoried at this time.

Industrial sites:

Among the industrial sites recorded within the Central Berkshire District are the remains of saw-mills and gristmills (Huntington, Wahconah, Chester/Blandford), textile mills and shoe manufacturing shops (Western Gateway Heritage State Park), brick and charcoal kilns (Pittsfield), marble quarrying (Natural Bridge), mica mining (Chesterfield/Blandford), blacksmith (Mohawk Trail).

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 Central Berkshire District include schools (October Mountain), a number of cemeteries (Otis, October Mountain. and Pittsfield). Perhaps the most ubiquitous civic sites are old roads, which, like homesteads, exist within most of the State Forests and Parks of the Berkshires.

e. The 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 over one dozen forests and reservations in Berkshire County, 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 Berkshire region.

Between 1995 and 1999 DCR compiled a comprehensive inventory of the CCC resources remaining in the Forests and Parks of Massachusetts. Prepared by Shary Berg, *The Civilian Conservation Corps: Shaping the Forests and Parks of Massachusetts* provides information on all of the 22 facilities in Region V that benefited from the work of the CCC. Some of the resources in these parks – ranging from bridges and dams to lodges and landscapes - have been noted for their exemplary design and construction, and many areas are eligible for listing on the National Register of Historic Places. Of note are:

- ❖ Boulder Park, Chester-Blandford State Forest – A well preserved collection of CCC resources including a picnic ground and pavilion, a rustic log gazebo, a swimming area and bathhouse as well as paths, stone steps and landscaping.
- ❖ Felton Lake Bridge, October Mountain State Forest – Although the CCC developed shelters, bridges and trails at Felton Lake, remaining CCC resources are limited to a dam and a stone arch bridge. Featured in Albert Good's *Park and Recreation Structures*, the bridge is typical of CCC design.
- ❖ Ski Lodge and Comfort Station, Pittsfield State Forest – The Ski Lodge is a well-preserved example of a multi-use building constructed by the CCC.
- ❖ Berry Pond Circuit Road, Pittsfield State Forest – This intact CCC roadway provides access to the CCC campground at Berry Pond while also creating a scenic route past an azalea field, a pond and dramatic mountaintop vistas.

- ❖ Administration Building, Pittsfield State Forest – This small CCC building was rehabilitated for use as an interpretive center and retains interior chestnut paneling from the 1930s.
- ❖ Steep Bank Brook Area with Dam, Windsor State Forest – There is a good collection of recreation resources including a swimming area, log bathhouse and a steel truss bridge. One of the most dramatic features of the area is a drop log dam with stone-faced piers.
- ❖ Peru State Forest – extensive archaeological remains of CCC Camp S-74 (Company 111) far more numerous and complex than suggested in the Berg report.

The 1999 statewide CCC survey identified the above resources as significant cultural resources of the Commonwealth. As the extant remains of the legacy of the CCC in Massachusetts, these buildings and landscapes should be protected as part of the Cultural Resource Management of the region as a whole.

HISTORIC BUILDINGS, STRUCTURES & LANDSCAPES

The current level of information on historic buildings, structures and landscapes within the Commonwealth's Forests and Parks system is limited. The primary source for information on these types of resources is the Baseline Cultural Resource Inventory (1984) which identifies known sites and potential sites for historic properties. While some sites are listed on the National Register of Historic Places or documented in other ways, many sites included on the baseline inventory have been predicted based on old atlases, town and county maps and other primary sources. The inventory identified almost 2,000 known and predicted sites across the state with a high concentration in the Berkshire County area. At this time, the 1985 Baseline Inventory is outdated and most predicted sites have not been verified in the field. Another major downfall is that the inventory does not include property acquired by DSPR since 1985 that either expands existing facilities or that establishes new parks.

C. National Register of Historic Places Resources

There are thirty communities within the Central Berkshire District. Within these communities, there are about 890 listings on the State Register of Historic Places (Table 2). Listings include single buildings and structures as well as historic districts that may contain multiple resources such as buildings, landscapes and structures. Each listing reflects a valuable part of the Commonwealth's history and can range from a single 18th century milepost and individual farmsteads to mill and factory buildings, worker tenements and public buildings. The listing inventory does not directly correspond to lands for which DSPR provides stewardship; instead, it includes all of those properties within each of the communities that comprise the Central Berkshire District.

The National Register of Historic Places is the nation's list of significant buildings, districts and sites which are worthy of preservation. Serving as the State Historic Preservation Office (SHPO), the Massachusetts Historical Commission administers the National Register program for the state and maintains the State Register of Historic Places. The State Register includes National Register

properties and properties included in local historic districts, local landmarks and properties protected by preservation easements. Some of the DSPR properties in the Berkshire Ecoregions, which are listed on the National Register, are:

- Jacob's Pillow
- Middlefield-Becket Stone Arch R.R. Bridge
- Hancock Shaker Village (part of Pittsfield SF)
- Mohawk Trail
- Freight Yard Historic District (Western Gateway Heritage SP, North Adams)

Other properties of historical significance 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. Some examples of resources that have been determined eligible for listing are:

- CCC resources (individual buildings, thematic resources)

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

A number of specific areas within the five Berkshire Ecoregions have been identified by the Massachusetts *Landscape Inventory* (DEM 1982). This study recognized two principal areas: the Berkshire Hills and the Taconic sections. The Berkshire Hills contains the Deerfield Valley Unit (USGS Colrain, Ashfield, Shelbourne Falls, Greenfield, Williamsburg) and the Cummington Unit (USGS Worthington, Goshen). The Deerfield Valley Unit is described as including "probably the finest hill country scenery in the Berkshires with many small working farms, fine vistas and a pleasing mix of agricultural land and woodland." The Cummington Unit contains the Chesterfield Gorge "one of the most dramatic in the state" and the many hillside farms, historic structures and small villages in Worthington and Cummington.

The Taconic Section is comprised of the Mt. Greylock Unit (USGS Berlin NY, Williamstown, Hancock, Cheshire, Windsor). Combined, these two landscape units contain the most spectacular vistas and picturesque mountaintop and ridge scenery in the Commonwealth.

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 hills towns create a remarkable ensemble of archaeological remains and attest the difficulties that many 18th, 19th and 20th century farmers faced in trying to eek out a living in the rugged Berkshire and Taconic hills. These remains - stone walls 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 Berkshire Ecoregions 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.

TABLE 1

**Prehistoric Archaeological Sites
Per USGS Quadrangle
Bureau of Forestry
Central Berkshire District**

USGS Quad	# Sites
Becket	3
Blandford	0
Chester	2
Easthampton	4
East Lee	1
Goshen	0
Northampton	9
Otis	0
Peru	1
Pittsfield East	10
Pittsfield West	30
Southampton	8
Westhampton	9
Williamsburg	1
Windsor	1
Woronoco	24
Worthington	0
Total Sites	103

TABLE 2

**National & State Register of Historic Places
Per Community
Bureau of Forestry
Central Berkshire District**

<u>Community</u>	<u># Properties</u>
<u>Becket</u>	<u>115</u>
<u>Blanford</u>	<u>1</u>
<u>Chester</u>	<u>226</u>
<u>Chesterfield</u>	<u>0</u>
<u>Dalton</u>	<u>11</u>
<u>Hancock</u>	<u>28</u>
<u>Hinsdale</u>	<u>0</u>
<u>Huntington</u>	<u>149</u>
<u>Lee</u>	<u>106</u>
<u>Middlefield</u>	<u>9</u>
<u>Otis</u>	<u>0</u>
<u>Peru</u>	<u>0</u>
<u>Pittsfield</u>	<u>151</u>
<u>Worthington</u>	<u>94</u>
<u>Total Sites</u>	<u>890</u>

SUMMARY/CONCLUSION

The relatively low archaeological visibility of the Central 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 Central Berkshire District of paramount importance and places an additional burden on the property manager and forester.

Appendix F - Statutory Policy and Guiding Principles

STATUTORY POLICY

CHAPTER 21. DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

ARTICLE OF FORESTS AND PARKS.

Chapter 21:Section 2F

Chapter 21: Section 4F Bureau of forestry

[Text of section effective until July 1, 2003. Repealed by 2003, 26, Sec. 86. See 2003, 26, Sec. 715]

Section 4F. 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.

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

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 G – 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 Environmental Affairs (EOEA):

- Department of Recreation and Conservation (DCR), Division of State Parks and Recreation (DSPR) – 285,000 acres
- Department of Fish and Game (DFG) – 110,000 acres
- Department of Recreation and Conservation (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 EOEA 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 EOEA’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 EOEA 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 EOEAs 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, EOEAs 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; and
- 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; and
- 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; and
- 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; and
- 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.fsc.org and www.sscertified.com.

Information about State of Massachusetts forestlands can be found on the EOEAs website at www.mass.gov/envir/forest/.

SCS Contact Person: Dave Wager, Director of Forest Management Certification

Mailing Address: SCS, 1939 Harrison Street, Suite 400, Oakland, CA 94612

Phone: (510) 236-9099

E-mail: Dwager@scs1.com

Appendix H – 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 than 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 I – Public Comments

1. Reserve Areas:

- 1.1. No cutting should be done in reserve areas
- 1.2. Question the concept that a large-scale reserve is necessary in order to “absorb” a natural disturbance
- 1.3. Managed forests surrounding a medium sized reserve (1,000 acres maximum size) are less susceptible to disturbances that may be severe within the reserve. This managed forest “buffer” is also considered interior forest for the species that require large areas of interior forest.
- 1.4. A 5,000-acre reserve could suffer greatly from a single large disturbance. Two (2) separate 1,000-acre Forest Reserves far apart could be less susceptible to the same disturbance and would be more valuable.
- 1.5. Identified Forest Reserves need public input on the social and economic considerations must be discussed with town official, citizens, and private landowners
- 1.6. Support large-scale Forest Reserves
- 1.7. DSPR and DFW should work together and put private lands in Forest Reserves that are adjoining to make the largest Forest Reserves as possible and not just to meet a percentage needed for each department
- 1.8. Areas that have been identified as containing especially rich biodiversity and proper historical species distribution should be designated as large-scale reserve areas. Other areas that can be improved by active management should be managed as such.
- 1.9. Areas that are currently not logged should be identified and perhaps should not count towards the 20% reserve ceiling
- 1.10. Concerned about what will happen to existing (mapped and unmapped) trails within Forest Reserves
- 1.11. Forest Reserves are a small fraction of the approximately 600,000 acres of public lands. 15,000-acre Forest Reserves are necessary because they can withstand large-scale natural disturbances.
- 1.12. Concerned about the impact of Forest Reserves on “payment of lieu of taxes” and “forest trust fund” payments to towns

- 1.13. Understand need for Forest Reserves, however, most productive lands should be in Forest Reserves while lands with good access should not be in Forest Reserves. Specifically, October Mountain and Middlefield State Forests should not be in large-scale Forest Reserves.
- 1.14. Old growth with buffers should be included in the reserve system
- 1.15. More baseline information needs to be gathered before Forest Reserves are mapped
- 1.16. Identification of Forest Reserves should be biologically driven
- 1.17. Private lands will serve as reserve buffers and be actively managed lands. Concerned about how state lands surrounding Forest Reserves will be actively managed.
- 1.18. Concerned about how private lands, adjacent to Forest Reserves will be encouraged to be actively managed
- 1.19. Support Forest Reserves because: the state has the only capacity and capability, except non-governmental organizations such as The Nature Conservancy, to establish large-scale Forest Reserves; have seen a lot of bad logging in the Berkshires; and there is no lack of disturbance for edge species.
- 1.20. October Mountain and Middlefield State Forests need to be reconsidered as large-scale Forest Reserves due to the opportunity for tranquility-inspiration values
- 1.21. Need unique area to be set aside as large and small-scale Forest Reserves
- 1.22. In some planning areas, it may be necessary to set aside greater than 20% as Forest Reserves due to less opportunity to establish Forest Reserves in other parts of the state

2. Recreation:

- 2.1. The State needs to prioritize safety for hikers, birders, etc. from motorized recreation
- 2.2. Concerned about motorized vehicle damage to infrastructure (trails, riparian areas, forest values, wetlands, etc.)
- 2.3. Want to see some areas for motorized use (but not all) and zoning for non-motorized use as well
- 2.4. Snowmobiles should be regarded as different from other motorized vehicles due to winter vs. summer use and less environmental damage because use is over the snow
- 2.5. Snowmobile users give back more to the forest than it takes due to volunteer efforts
- 2.6. Many forest roads that are not maintained should be maintained for recreational use and fire prevention. Erosion control needs to be a priority on these old roads.

- 2.7. How will motorized recreation be enforced?
- 2.8. How will any use including Forest Reserves be enforced?
- 2.9. How will funding be provided for enforcement?
- 2.10. Require-raise motorized recreation license fees to fund enforcement and environmental education
- 2.11. Need more interpretation resources (displays, talks, nature hikes, etc.)
- 2.12. Consider prohibition of summer motorized vehicle use on state lands
- 2.13. Unauthorized trails should not be automatically grandfathered into the trail system
- 2.14. Funding is inadequate to put Forest Management Plans into practice
- 2.15. State could train volunteers to establish and maintain trails to approved standards
- 2.16. Enforce existing regulations that limit use on specific trails
- 2.17. Education to make people aware of damage by unauthorized trail uses
- 2.18. Consider limiting motorized recreation use to in-state users
- 2.19. Appalachian National Scenic Trail transects many regions and ecosystems. The AT corridor existing protection should be continued and expanded.
- 2.20. Motorized activities should not occur on public lands
- 2.21. On state lands where motorized use is prohibited, the land has improved. Damage to public natural resources is occurring on state lands where motorized used is allowed or unauthorized use is occurring.
- 2.22. Excluding motorized recreation use is counter productive because it will place more pressure on private lands
- 2.23. Need to control motorized use on state lands through zoning and limit trail use to where it is appropriate
- 2.24. The Appalachian National Scenic Trail of 1,000 feet should be maintained as it has been regardless of whether the trail is in a reserve or Active Management Areas
- 2.25. Maintain roads and trails to prevent environmental degradation and eliminate user created trail bypasses when there are wet areas

- 2.26. Educate motorized users who are not part of official clubs because they are not aware that they need permission to use private landowner lands to ride their ATVs
- 2.27. Law enforcement and users need to be educated to understand the state ATV/ORV laws and regulations
- 2.28. Need to address the many official trails that were built by organizations and the public
- 2.29. Will there be new trails planned?
- 2.30. Reduction in existing trails that may be unauthorized may lead to more conflicts between user groups because there will be less trails
- 2.31. There needs to be trails set aside for hiking only especially to remote precipitous areas
- 2.32. Need funding for signage and enforcement for the existing condition and regulations and any new ones
- 2.33. DSPR need staff on the ground to manage-educate-regulate-and police
- 2.34. More out-of-state ATV/ORV use state lands. Need to have outreach educational programs to educate these users.
- 2.35. Implement a tiered fee system for in-state and out-of state users

3. Biodiversity

- 3.1. DSPR/DFW should work with Friends groups to conduct studies of natural resources
- 3.2. Fund raising should occur to support research
- 3.3. State should manage their lands and be supported by the timber sale revenues
- 3.4. Do management to sustain habitats through prescribed burning and harvesting
- 3.5. Determine if silviculture can benefit rare species
- 3.6. State should take a strong stance on controlling/eradicating invasive exotic species
- 3.7. What will plantations be converted to and how will conversions be done?
- 3.8. Have a Forest Management Plan and follow it
- 3.9. Consider increasing the percentage of uneven-aged management to cover a larger component of forestland appropriate with tree species composition

- 3.10. Remember that the best use may not be human management. All land that is not reserve should not necessarily go into active management.
- 3.11. State lands are definitely a place for even-aged management to produce high quantities of quality timber
- 3.12. Snags, woody debris, den trees, etc. should be considered during management
- 3.13. Aesthetics should be balanced with the goals of securing high quality regeneration (which often requires soil disturbance)
- 3.14. Focus aesthetic values along roads and trails
- 3.15. More emphasis on the return to or protection of forests of pre-manipulated state of tree species diversity, including aggressive elimination of invasive exotic species such as Japanese barberry, bittersweet and treatment of stressed species such as White ash, American beech, eastern hemlock
- 3.16. Create “heritage” areas
- 3.17. Make “fire” prescribed burns part of some of the silvicultural prescriptions
- 3.18. Forest Management Plans need to be real and funded
- 3.19. A lot more timber may be harvested from DSPR lands. The receipts-revenues need to be dedicated for implementation of the management plans.
- 3.20. Active Management Areas should be managed as a good example for private landowners demonstrating stewardship for all resources and social benefits that one could receive for forestlands including profit
- 3.21. Managed forests should be demonstration areas with interpretation relating the What, Where, Why, When... for educational purposes
- 3.22. Timber sales need to be above cost (take in more revenue and benefit than the cost of preparation)
- 3.23. Make timber sales that are economically viable
- 3.24. Do not be afraid to use prescribed fire in the Berkshires if done well and appropriately
- 3.25. Would like to walk through some red pine, Norway spruce plantations so do not eradicate all especially if they were planted by the CCC
- 3.26. Need to explain what you are managing the forest for in terms of desired conditions such as increasing species viability

- 3.27. Hunting on public lands is important and the use should be allowed on public lands especially to deal with the increasing deer populations that are cause forest regeneration and successional problems
- 3.28. When balanced age classes aesthetic should be considered
- 3.29. No need to manage all lands within the Active Management Areas because there will be lands that have poor access, steep slopes, wetlands, etc.
- 3.30. Need to keep flexibility in the plan
- 3.31. Clearcut silvicultural methods should not be eliminated from state lands tools. Perhaps, guidance on the size limits should be established.
- 3.32. Need large course woody debris in Active Management Areas. Maybe management can establish additional down woody debris.
- 3.33. Too heavy salvage may be eliminating insect or disease resistant trees
- 3.34. Pesticide use should be used for species such as Japanese barberry where appropriate
- 3.35. Salvage needs to be thoughtful and if used, need to take into consideration site characteristics, regeneration opportunities and difficulties, site potential, etc.
- 3.36. Herbicides should be used according to labels as well as mechanical means to treat unwanted vegetation
- 3.37. In some places within public lands, herbicides can be used. The public needs to be informed by public meetings for educational purposes.
- 3.38. DSPR has buildings that are collapsing. The public becomes discouraged when they see this. The state needs to properly maintain their infrastructure especially culturally or historic sites and create a lot of antipathy.
- 3.39. Boundaries need to be maintained
- 3.40. Old fields should be maintained
- 3.41. Need to have better fire interagency cooperation and develop fire fighting and the use of prescribed fire policies
- 3.42. Make this planning effort an opportunity to make the state lands centers of excellence due to the thoughtful planning and diligent implementation. This should serve as a model or demonstration for others landowners and subsequent planning efforts.

Responses To Public Comments

The Draft Central Berkshire District Forest Management Plan (CBDFMP) was presented to the public on September 29, 2005 at the DCR Western Region, Regional Office in Pittsfield, MA. Thirty-eight (38) individuals attended the meeting, which was designed to present the key findings and results of the proposed forest management plan and solicit comments. Notices were posted in the *Environmental Monitor* and the Department of Conservation and Recreation (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 the Towns of Peru and Middlefield, Mass Audubon, The Nature Conservancy, and The Sierra 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.

A. Forest Management Planning Principles:

1. Suggest that DCR and Division of Fish and Wildlife (DFW) forest management plans be consistent in approach, format, presentation, public participation process, be as similar and transparent as possible including publishing meetings and comment periods in the *Environmental Monitor*.

Disposition of Comment:

Green certification has led to greatly increased coordination between DCR and DFW. This includes sharing staff time, working on standard contracting policies, and working on a coordinated reserve system. There will always be a need for flexibility to craft plans that reflect their different agency’s mandates and missions. We will continue to work closely with DFW to hold coordinated public meetings and more importantly work cooperatively on management when opportunities arise.

2. Supports long-term planning (105 years), rare species habitat, biodiversity, native eco-systems, and forest health approaches to forest management of state forests as proposed in the forest management plan.

Disposition of Comment:

DCR will continue to commit itself to adaptive management at the project, property, and landscape level that is based on sound long-term management planning.

3. Concerned about maintaining a landscape level forest management approach. Suggest including a map of the Central Berkshire District in the final plan that includes all lands, their current protection status, and state forest active and passive management.

Disposition of Comment:

The CBDFMP is developed in consideration of and consistent with the landscape assessment and forest management framework for the Berkshire Ecoregions . The Department will coordinate vegetation management with adjacent landowners and consider the local landscape patterns during development of project level plans (see Silviculture and Vegetation section). See Appendix A and B for maps showing Department properties as well as landscape level maps.

4. Concerned that the Central Berkshire District lacks detailed information about the forest.

Disposition of Comment:

The CBDFMP contains a summary of forest and natural resource data (see Forest Plan). The Department has collected and processed forest data from the Continuous Forest Inventory as well as 2003 aerial photo-interpretation which included ground verifications. The complete set of data may be viewed at the Western or Central Regional Offices.

5. Supports the application of Adaptive Management principles.

Disposition of Comment:

The Department agrees with this comment. As science, information, and public demands change, DCR will continue to respond by improving its planning, management, and stewardship of our public lands. Forests ecosystems are not static and we will always work to apply the best knowledge and information in our adaptive management approach.

B. Forest Reserves Areas:

1. The towns of Peru and Middlefield selectman support active management of the Middlefield and Peru State Forests.

Disposition of Comment:

The Executive Office of Environmental Affairs and DCR are committed to Commonwealth public lands designated as Forest Reserves (Forest Management Plan Section VI, section 2. Forest Reserves). The Middlefield and Peru State Forests consists of approximately 6,437 acres (Middlefield 3,677 and Peru 2,760 acres). Approximately 2,729 acres have been designated as Forest Reserves. It

was determined after careful review and evaluation of the Forest Reserve evaluation criteria, that Forest Reserves in the Middlefield best serves the ecological and social values that are needed to represent the eco-region. The Department understands and values the towns of Peru and Middlefield's desire to have active management within the towns' state forests. The Department will work with the towns to develop and maintain recreational opportunities consistent with the values of the Forest Reserves as well as opportunities for active management in those remaining lands under multiple-use designation.

2. Suggest that October Mountain State Forest should be a large-scale Forest Reserve to complement and enhance the more intensive management and recreation on adjacent green certified land (state forest).

Disposition of Comment:

October Mountain State Forest was considered as a large-scale Forest Reserve. The Department evaluated this forest using the Forest Reserve evaluation criteria as well as a series of on-the-ground Forest Reserve field reviews. While approximately 1,616 acres were identified as small-scale Forest Reserves, October Mountain was not selected as a large-scale Forest Reserve for the following reasons: 1) there are large amounts of state and town developed roads; 2) the existence of utility lines within the forest; 3) the existence of a high number of ORV/ATV trails and use which is inconsistent with the values and uses associated with the Forest Reserve system; and 4) the high amount of non-native forest vegetation such as Norway Spruce and Red Pine plantations. The Department's analysis and evaluation determined that other candidate large-scale reserves within the respective eco-region better met the Forest Reserve evaluation criteria.

3. Supports the designation of approximately 7,953 acres of Forest Reserves including approximately 4,666 acres of large-scale reserves in Middlefield and Gilbert Bliss State Forests; Forest Reserves management guidelines; and Long-Term Ecological Monitoring as proposed in the forest management plan.

Disposition of Comment:

The Department is in agreement with this comment. As discussed in this forest plan, a system of large scale Forest Reserves are needed to protect the long-term range of forest biodiversity. The Middlefield and Gilbert Bliss reserves are proposed as part of this system. As the state wide planning progresses, their value will be evaluated against other state-wide candidates to insure the strongest large scale Forest Reserve system is chosen.

4. Suggest that the installation and management of cellular towers and wind farms and their associated infrastructure should be prohibited in Forest Reserves and green certified state lands that buffer Forest Reserves.

Disposition of Comment:

Within the Forest Reserve system, new communication sites are prohibited and wind towers are prohibited. On lands within the active management zone, new communication sites and wind towers will be reviewed on a site-by-site and project-by-project basis.

5. Suggest that primary forests should be included in Forest Reserves.

Disposition of Comment:

The Department interprets primary forests as forests which have been mapped as “primary and secondary old growth” areas identified by Robert Leverett as well as forests mapped as lands not in agriculture in 1830. Mr. Leverett participated with the Department in the identification and delineation of Forest Reserves in this planning area. The Department also included many 1830 lands not in agriculture in the Forest Reserve system. It should be noted that there are Central Berkshire District system lands that fall within Forest Reserves where the 1830 information is not available. It is estimated that there is a considerable portion of Forest Reserves that are of 1830 lands however they are not mapped and not included in the estimated amount.

6. Concerned about absence of “reference areas” within Forest Reserves where all management would be prohibited under all circumstances.

Disposition of Comment:

The CBDFMP Forest Reserve guidance was prepared in a manner that set forest management direction and allowed for Department discretionary flexibility due to unforeseen, significant, future situations and circumstances within Forest Reserves. Keeping this in mind, the Department fully recognizes and is committed to Forest Reserves serving as reference area for a number of reasons. The public can expect that management will not occur in Forest Reserves unless lands fall under the exception standards and guidelines. It should be noted that the Department will be implementing a Long-Term Ecological Monitoring program in cooperation with the University of Massachusetts and other partners with the intent of having Forest Reserves serve as unmanaged “reference areas”.

C. Active Management Areas:

1. Suggest that where active management is allowed, the amount of uneven-aged management should be increased.

Disposition of Comment:

The Department will continue to monitor uneven age management and the management of state forests and parks. As discussed in the current plan, the

percentage of actively managed land that will be in uneven-aged management at the end of the first cycle will be between 9 and 10%. This will be an increase of approximately 4% over current conditions.

2. Suggest that early successional habitat should not exceed 25% of the state forest planning area.

Disposition of Comment:

The current plan provides for approximately 12% of the state lands to be in the critical early successional habitat types. Approximately 7% of the forest will be in an early successional stage during each 15 year planning period.

3. Supports allocation of approximately 10% of active management areas to be managed in extended rotation systems. Suggests that location and designation of extended rotation be adjacent to Forest Reserves and be documented in the final forest management plan.

Disposition of Comment:

DCR is committed to using extended rotations on approximately 10% of the active forest resource management areas. Extended rotation areas were chosen in support of Forest Reserves, wetlands, riparian areas and recreational trails and road systems.

4. Concerned about primary forest lands, 1830 mapped forest areas that were not cleared for agriculture which were never mapped or missing from the analysis. Suggest that all 1830 primary forest lands be excluded from commercial harvest unless a site specific review shows that certain proposed practices would enhance the ecological function or value of the site.

Disposition of Comment:

The Department understands and values lands mapped as primary forest lands that were mapped in 1830 as forests. The Plan included all available 1830 lands mapping and the Forest Reserves system included many of the 1830 lands into the Forest Reserve system design. Since the Department has adopted an ecosystem forest management approach to all of our forestlands and 1830 lands have been managed throughout time, it has been determined that when a commercial harvest is planned, forest field data at the stand level has been recorded and silvicultural prescription applied. These prescriptions are consistent with forest ecological and silvicultural principles that the Department is meeting with the intent of enhancing the ecological function and value of the site.

5. Suggest that active management be focused primarily on forests 90 years or younger, and that any management in old forests be restricted and highly selective, with the goal of enhancing late successional forest characteristics.

Disposition of Comment:

The Department has developed forest management planning principles and vegetation management objectives. The Department recognizes the importance of late as well as early successional forest habitats. The Central Berkshire District, beginning in 2035, will have over 35% of the forest in an age class of older than 90 years of age. This is over three times the existing amount. The Department has determined that this forest management strategy adequately provides for the multiple goals and objectives and future forest health conditions. The Department has determined that having a diversity of species and age classes over times together with a planned older forest (some with multiple-age classes) provides a forest that may be resilient to natural and human caused changes. Dependence on a forest of one or few age classes may not provide for species diversity and resilience to disturbances.

6. Suggest that species like oak and cherry be selectively harvested due to disproportionately being harvested on private lands.

Disposition of Comment:

The Department will follow standard silvicultural methods for harvesting and regeneration of these species. The Department will continue to keep abreast of the latest research and treatment methods to insure regeneration of these species.

7. Suggest that forest harvesting be carefully planned to ensure that there are adequate resources to prohibit unauthorized ATV and ORV use and develop best management practices to help minimize the use of temporary logging roads by ATV and ORV use.

Disposition of Comment:

Unauthorized ATV and ORV use is a serious threat and concern to well planned forest management. The Bureau of Forestry will continue to work with other agencies within EOE to use a multi pronged approach to address this problem. This will include careful consideration when working on the access system for forest management. The Department is also working cooperatively with others to determine where ATVs and ORVs can be used safely, under what conditions and to define what constitutes an environmentally sound manner of use.

D. Rare Species, Communities, and Landforms:

1. Suggest that the forest plan includes specific plans for Rich Mesic Forests.

Disposition of Comment:

The Department agrees with this comment. This forest plan includes specific information and management goals and strategies for conserving rich mesic forests.

2. Supports vernal pool forest management guidelines.

Disposition of Comment:

The Department agrees with this comment. This forest plan includes specific information and management goals and strategies for conserving vernal pools.

3. Suggest that rare species and natural communities be thoroughly inventoried by qualified individuals and “potential” rare species habitat or rare community types be excluded from timber harvest unless certified by Natural Heritage and Endangered Species Program (NHESP).

Disposition of Comment:

The Department has emphasized and prioritized rare species habitat protection and the protection of rare natural communities during project planning, implementation, and monitoring. The Department has determined that the management objectives, guidelines, and standards in conjunction with adaptive management and monitoring and our commitment to coordinate and cooperate with NHESP adequately provides for rare species and natural communities. It should be noted that NHESP reviews the Departments vegetation projects, coordinates on multiple projects and mutual training pertaining to this subject.

E. Invasive Species:

1. Suggest providing more specificity for invasive species in terms of pre-harvest review, harvesting procedures, and post harvest monitoring and research.

Disposition of Comment:

The Department has provided for pre-harvesting, harvesting and post-harvesting monitoring and treatment. The Department believes that the invasive species approach is integrated and provides for the long term management of native species.

2. Concerned about giving priority to harvesting of stands threatened by insects and diseases resulting in a wholesale effort to remove hemlock trees based on the Hemlock Woolly Adelgid (HWA) threat.

Disposition of Comment:

The Department will address HWA by monitoring stands dominated by hemlock for the presence of HWA. If any infestation is found, stands will be considered on a case-by-case basis for treatment (no treatment, regeneration, thinning or salvage). Each solution will consider risk to human health and safety, forest health and fire risks. The Plan does not call for the wholesale removal of hemlock trees.

F. Wildlife Habitat:

1. Supports the maintenance of most existing fields and other “wildlife openings” in an open condition for wildlife.

Disposition of Comment:

The Department agrees that fields and other wildlife openings are productive habitat for many species. Existing fields will be restored and/or maintained through various means including agricultural permits, activities by Department staff, and forest product sale revenue. The Department will pursue opportunities where they exist for wildlife opening of other types including brush fields, patch cuts and poplar regeneration.

2. Supports creating and rotating patch cuts of various sizes to maintain habitat diversity by qualified individuals.

Disposition of Comment:

The Department agrees with this comment. Patch cuts when properly planned and applied can be critical to creating early successional habitat. Patch cuts will continue to be used as a management tool to fulfill the habitat requirements of the species that rely upon these conditions.

G. Implementation and Funding:

1. Concerned about DCR’s ability to fund the implementation and monitoring of the Forest Management Plan.

Disposition of Comment:

The Department at this time may not have the capacity and capability to implement and monitor the CBDFMP. The Plan was prepared with the intention that it could be implemented and monitored because it is realistic and could be readily implemented. All attempts will be made to fully implement the plan as prepared and meet the stated natural resource desired conditions, objectives, and guidelines.

2. Suggest providing ongoing training in the latest developments in sustainable forestry protection for protecting biodiversity.

Disposition of Comment:

The Department agrees with this comment. Each DCR Forester is required to be licensed in the State of Massachusetts. To maintain this license, each forester must undergo a minimum of twenty hours of continuing education each year. In addition to this, the Bureau of Forestry provides in house training on many topics including rare and endangered species, invasive species and cultural resources.

Appendix J – 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 **Volume, 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.

Rough 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 K – 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 Types of the U.S., U.S.D.A. Forest Service Ag. Handbook No. 445.
9. Burns, 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. 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.
14. Guide to Wildlife Tree Management in New England Northern Hardwoods, USFS GTR-NE-118

15. 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.
16. Helms, John; Ed., 1998, *The Dictionary of Forestry*, Society of American Foresters, Bethesda, MD.
17. Hibbs, David and William Bentley, "A Management Guide for Oak in New England". University of Connecticut, Cooperative Extension Service.
18. Hunter, M. 1990. *Wildlife, Forests and Forestry Principles of Managing Forests for Biological Diversity*. Prentice Hall Career and Technology, Englewood Cliffs, N.J.
19. Kittredge, D. and Parker, M. 1996 *Massachusetts Forestry Best Management Practices Manual* Cooperative Extension - Univ. of Mass. Amherst., MA
20. Lancaster, Kenneth. "Managing Eastern Hemlock, A Preliminary Guide. U.S.D.A. Forest Service, NA-FR-30, 1985.
21. Lancaster, Kenneth, "White Pine Management, A Quick Review" U.S. Dept. of Ag., Forest Service, NA fr-27. 1984.
22. 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
23. Lancaster, Kenneth, et. al., "A Silvicultural Guide for Developing a Sugarbush". USDA Forest Service. Research Paper, NE-286, 1974.
24. 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.
25. 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.
26. Living Waters, Guiding the Protection of Freshwater Biodiversity in Massachusetts. 2003. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.
27. Managing Eastern Hemlock - A Preliminary Guide, USFS NA-FR-30
28. Marquis, D., Ernst, R. and Stout, S. 1990 *Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies (revised)* Gen. Tech. Rep. NE-96 USDA-Forest Service

29. 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.
30. 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.
31. NED/SIPS User's Manual, Version 1.0, USFS GTR-NE-205
32. Number of Residual Trees: A Guide for Selection Cutting, USFS GTR-NE-80
33. 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.
34. Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies (revised), USFS GTR-NE-96
35. Quantitative Silviculture for Hardwood Forests of the Alleghenies, USFS GTR-NE-183
36. Roach, Benjamin and Samuel Gingrich, “Even-Aged Silviculture for Upland Central Hardwoods”. US Dept. Ag., Forest Service, Agriculture Handbook 355, 1968.
37. 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.
38. Silvicultural Guide for Northern Hardwood Forest Types (revised), USFS RP-NE-603
39. Silvicultural Guide for Paper Birch in the Northeast, USFS RP-NE-535
40. Smith, David M., 1986, *The Practice of Silviculture*, Eighth Edition, John Wiley and Sons, Inc., N.Y.
41. *The Practice of Silviculture: Applied Forest Ecology*, ninth edition, 1997.