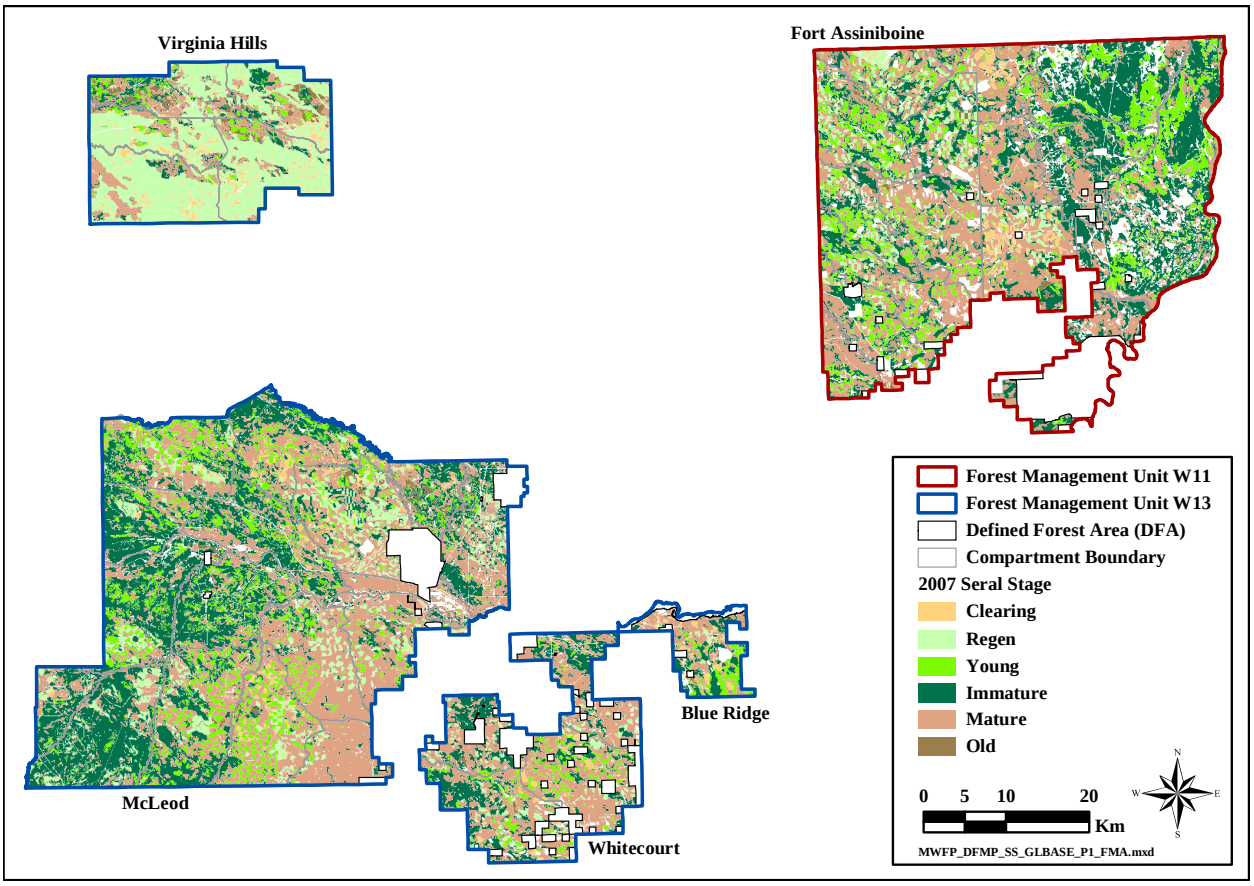

Figure 32. Forested landbase seral stage distribution on DFA.

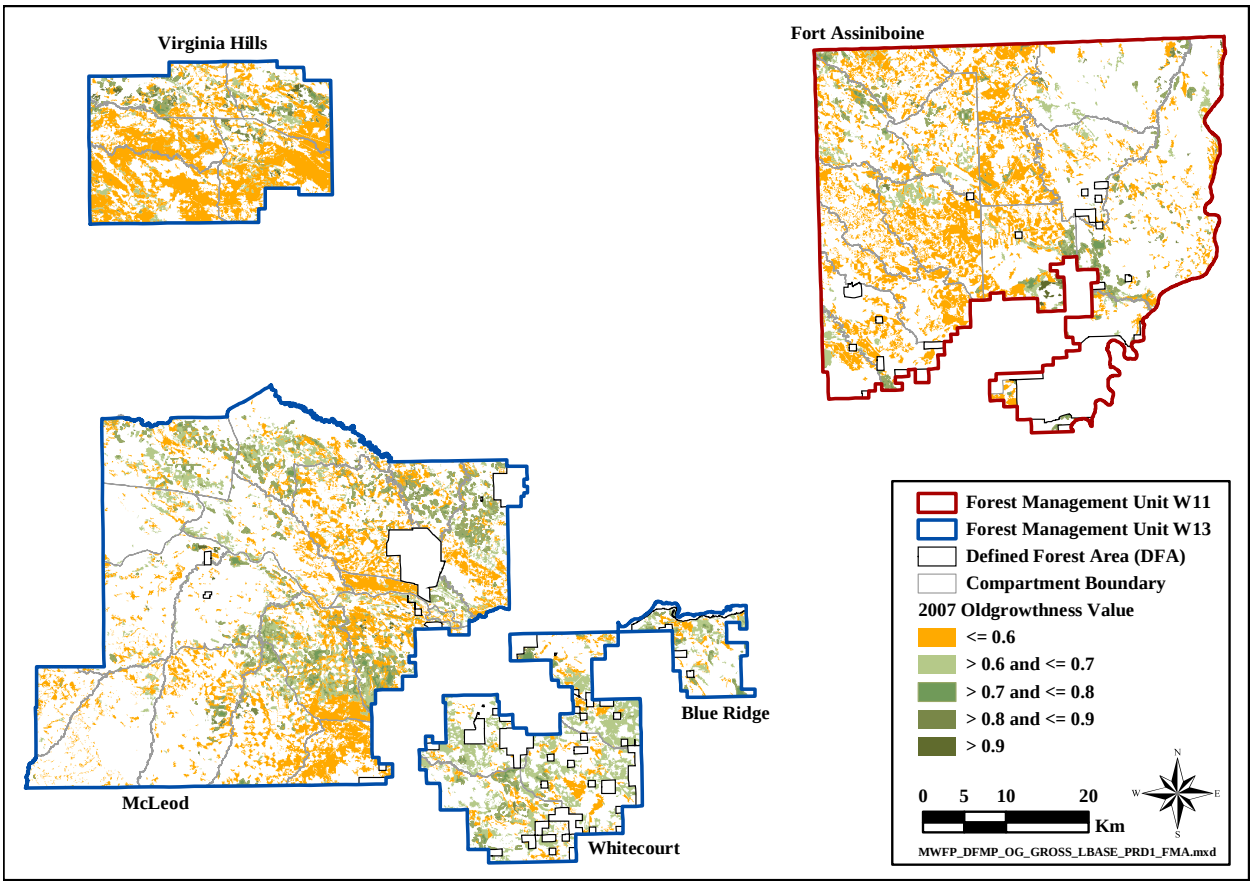

Figure 33. Forested landbase oldgrowthness distribution on DFA.

Table 28, Table 29 and Table 30 summarize the managed landbase area within each seral stage by BCG and species stratum, for W11, W13, and W11 and W13 combined, respectively. Figure 34 illustrates the managed landbase seral stage distribution for W11, W13, and W11 and W13 combined, respectively. Figure 35 illustrates the spatial distribution of the species strata for the DFA, while Figure 36 illustrates the spatial distribution and degree of oldgrowthness for the managed landbase.

Table 28. W11 managed landbase seral stage summary.

Species	Clearing		Regen		Young		Immature		Mature		Old		Oldgrowthness	
Strata	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)
Deciduous Broad Cover Group (D)														
AW	822	1%	2,291	3%	1,731	2%	21,103	24%	26,828	31%	410	0%	11,087	13%
BW	-	0%	7	0%	-	0%	109	0%	12	0%	4	0%	10	0%
Total	822	1%	2,297	3%	1,731	2%	21,212	24%	26,840	31%	414	0%	11,098	13%
Deciduous / Coniferous Broad Cover Group (DC)														
AP	31	0%	212	0%	85	0%	343	0%	821	1%	14	0%	369	0%
AS	151	0%	580	1%	241	0%	201	0%	3,702	4%	-	0%	1,604	2%
Total	182	0%	791	1%	325	0%	544	1%	4,523	5%	14	0%	1,973	2%
Coniferous / Deciduous Broad Cover Group (CD)														
PA	9	0%	345	0%	185	0%	210	0%	807	1%	-	0%	71	0%
SA	481	1%	1,187	1%	-	0%	217	0%	3,177	4%	5	0%	1,237	1%
Total	489	1%	1,532	2%	185	0%	427	0%	3,984	5%	5	0%	1,308	1%
Coniferous Broad Cover Group (C)														
PL	167	0%	973	1%	2,100	2%	2,624	3%	5,668	6%	57	0%	1,185	1%
SW	629	1%	1,397	2%	267	0%	508	1%	6,663	8%	-	0%	635	1%
Total	796	1%	2,370	3%	2,366	3%	3,131	4%	12,331	14%	57	0%	1,820	2%
Grand Total	2,289	3%	6,991	8%	4,607	5%	25,314	29%	47,677	55%	489	1%	16,200	19%

Table 29. W13 managed landbase seral stage summary.

Species	Clearing		Regen		Young		Immature		Mature		Old		Oldgrowthness	
Strata	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)
Deciduous Broad Cover Group (D)														
AW	1,276	1%	4,069	2%	2,545	1%	21,122	10%	28,082	14%	693	0%	13,838	7%
BW	5	0%	53	0%	84	0%	919	0%	40	0%	3	0%	18	0%
Total	1,281	1%	4,122	2%	2,629	1%	22,041	11%	28,122	14%	696	0%	13,856	7%
Deciduous / Coniferous Broad Cover Group (DC)														
AP	149	0%	1,018	0%	80	0%	1,857	1%	2,833	1%	50	0%	1,317	1%
AS	560	0%	692	0%	846	0%	3,841	2%	13,047	6%	110	0%	6,579	3%
Total	709	0%	1,711	1%	926	0%	5,697	3%	15,880	8%	160	0%	7,896	4%
Coniferous / Deciduous Broad Cover Group (CD)														
PA	242	0%	3,516	2%	1,148	1%	2,517	1%	2,793	1%	55	0%	2,233	1%
SA	398	0%	2,090	1%	4,671	2%	1,798	1%	8,524	4%	247	0%	4,791	2%
Total	641	0%	5,605	3%	5,819	3%	4,316	2%	11,317	5%	303	0%	7,023	3%
Coniferous Broad Cover Group (C)														
PL	383	0%	22,677	11%	5,017	2%	28,025	14%	8,486	4%	2,131	1%	10,186	5%
SB	256	0%	396	0%	3,314	2%	1,957	1%	4,185	2%	697	0%	2,767	1%
SW	1,306	1%	3,980	2%	685	0%	2,109	1%	8,796	4%	42	0%	2,326	1%
Total	1,945	1%	27,052	13%	9,016	4%	32,091	16%	21,467	10%	2,869	1%	15,280	7%
Grand Total	4,576	2%	38,490	19%	18,390	9%	64,145	31%	76,785	37%	4,028	2%	44,055	21%

Table 30. W11 and W13 managed landbase seral stage summary.

Species	Clearing		Regen		Young		Immature		Mature		Old		Oldgrowthness	
Strata	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)
Deciduous Broad Cover Group (D)														
AW	2,098	1%	6,360	2%	4,276	1%	42,225	14%	54,910	19%	1,103	0%	24,925	8%
BW	5	0%	59	0%	84	0%	1,028	0%	52	0%	7	0%	29	0%
Total	2,103	1%	6,419	2%	4,360	1%	43,253	15%	54,962	19%	1,110	0%	24,954	8%
Deciduous / Coniferous Broad Cover Group (DC)														
AP	180	0%	1,230	0%	165	0%	2,200	1%	3,653	1%	64	0%	1,687	1%
AS	711	0%	1,272	0%	1,087	0%	4,042	1%	16,749	6%	110	0%	8,182	3%
Total	892	0%	2,502	1%	1,251	0%	6,242	2%	20,403	7%	174	0%	9,869	3%
Coniferous / Deciduous Broad Cover Group (CD)														
PA	251	0%	3,861	1%	1,333	0%	2,727	1%	3,599	1%	55	0%	2,304	1%
SA	879	0%	3,277	1%	4,671	2%	2,016	1%	11,701	4%	252	0%	6,028	2%
Total	1,130	0%	7,138	2%	6,004	2%	4,742	2%	15,301	5%	307	0%	8,332	3%
Coniferous Broad Cover Group (C)														
PL	551	0%	23,650	8%	7,116	2%	30,649	10%	14,154	5%	2,187	1%	11,372	4%
SB	256	0%	396	0%	3,314	1%	1,957	1%	4,185	1%	697	0%	2,767	1%
SW	1,934	1%	5,377	2%	951	0%	2,616	1%	15,459	5%	42	0%	2,961	1%
Total	2,741	1%	29,423	10%	11,382	4%	35,222	12%	33,797	12%	2,926	1%	17,100	6%
Grand Total	6,866	2%	45,481	15%	22,997	8%	89,459	30%	124,463	42%	4,517	2%	60,255	21%

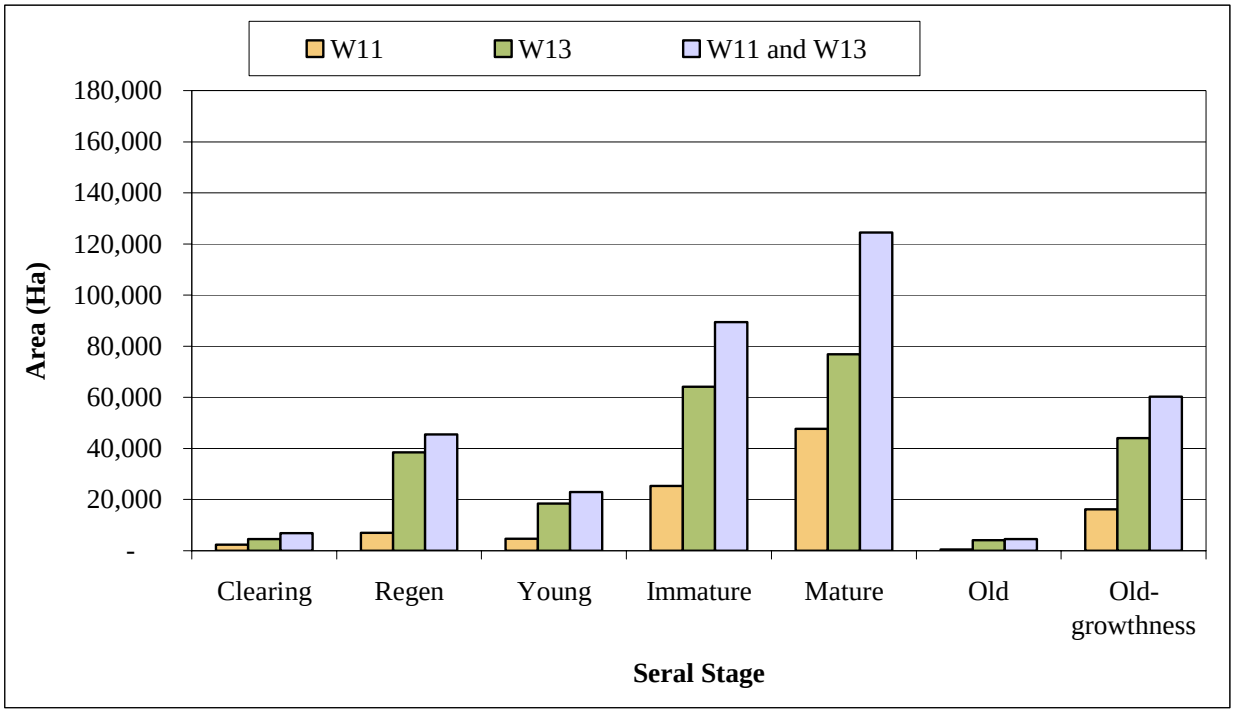

Figure 34. Managed landbase seral stage distribution by FMU and combined FMUs.

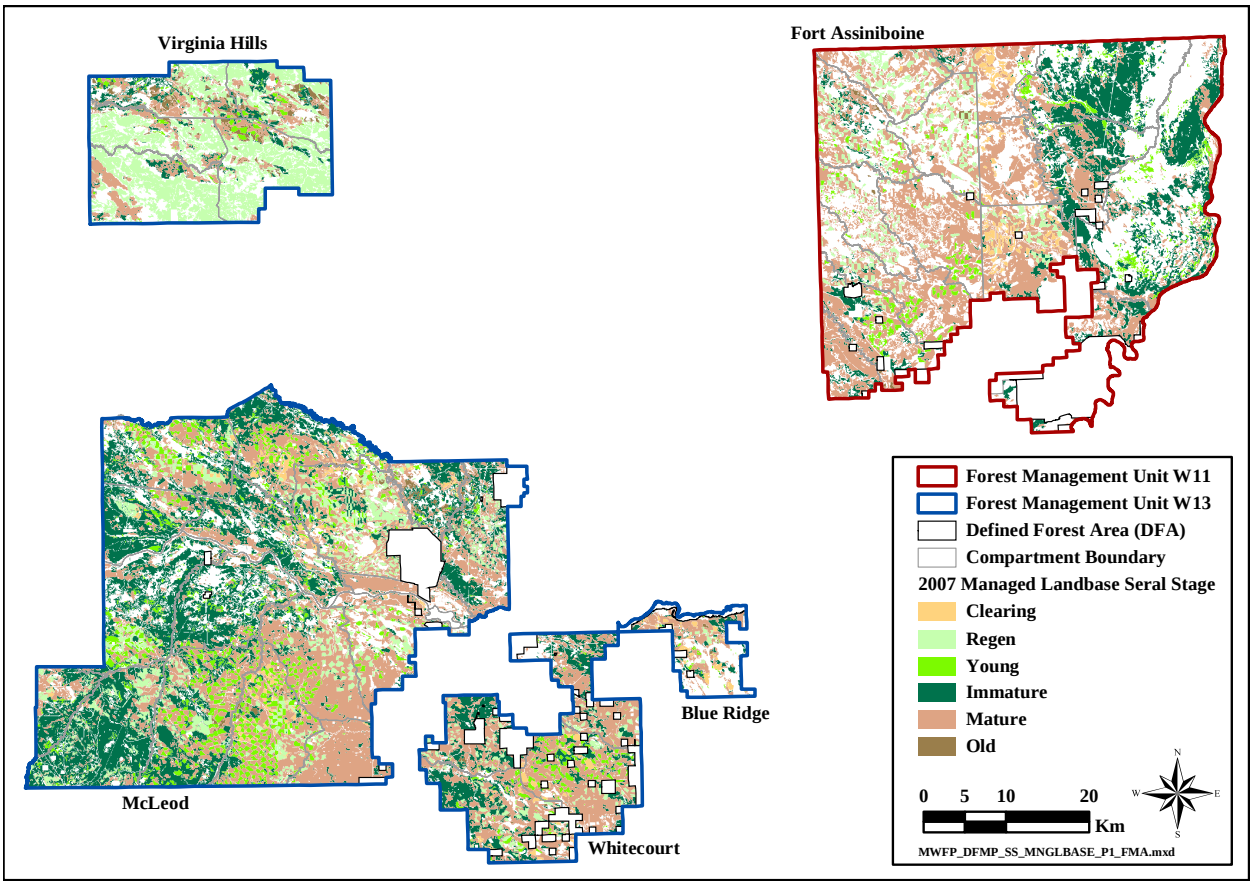

Figure 35. Managed Landbase seral stage distribution on DFA.

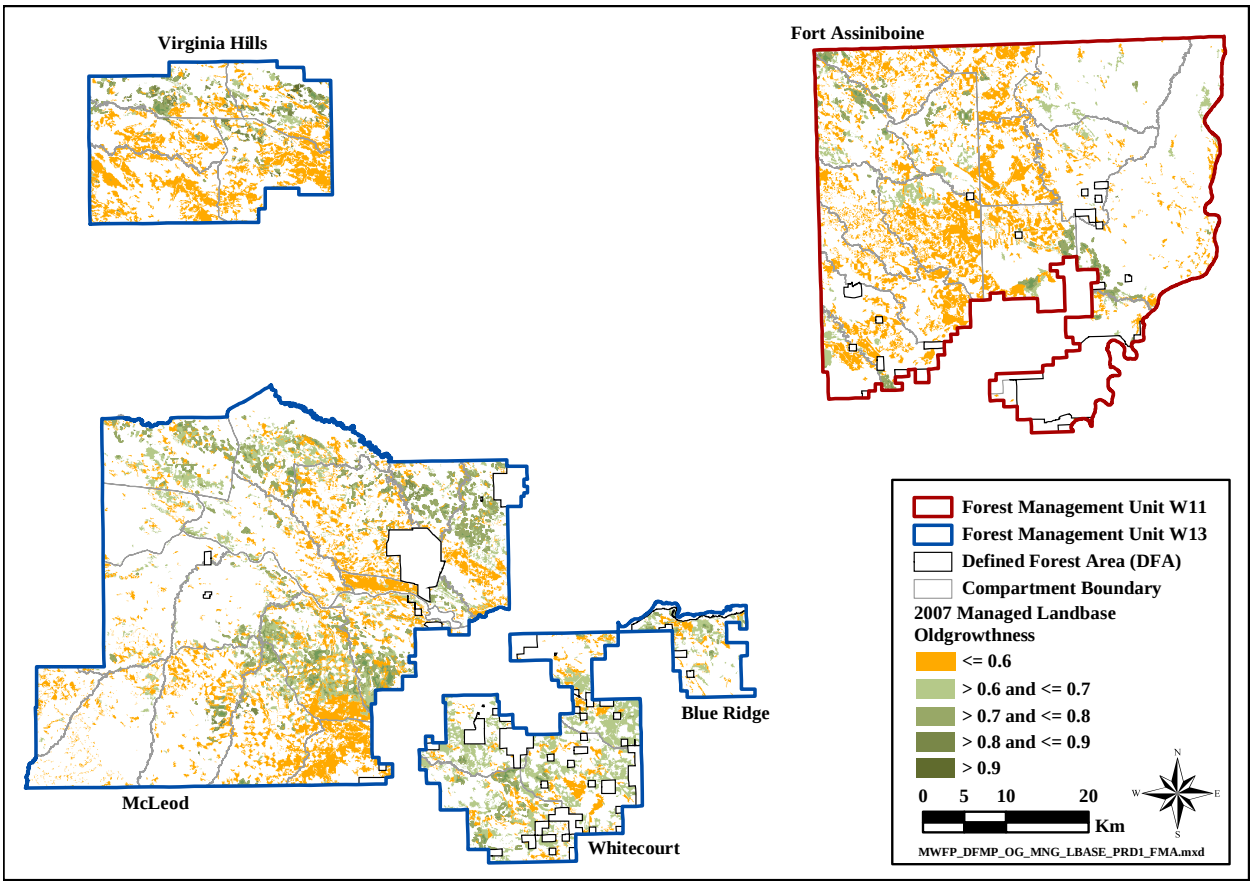

Figure 36. Managed landbase oldgrowthness distribution on DFA.

4.4 Forest Patches

Forest patches are areas of land on a forest trajectory that fall into the clearing and regeneration (regen) seral stages (see Table 24 for description of seral stages). Patches are defined as forest openings that are the result of natural (e.g. fire, insect) and non-natural (e.g. harvesting) events. Openings such as well sites and pipelines do not fall into the category of patches, since these areas are not on a forest trajectory.

Patch-size classes were derived from an analysis of the *Regional Fire History Assessment*, completed as part of the 1997-2016 DFMP, and are consistent with the opening sizes resulting from natural disturbances, primarily fire events. Table 31 provides a summary of the opening-patch size distribution on the Forested Landbase for W11, W13, and W11 and W13 combined. Figure 37 and Figure 38 illustrate the spatial distribution, by patch size class, of the forest patches on the Forested Landbase for W11 and W13, respectively. Note that the majority of the opening-patch area in W13 falls into the 1000 + ha class, which is a result of the Virginia Hills fire of 1998.

Table 31. W11 and W13 forested landbases opening-patch size class distribution.

	0 - 4 ha		4 - 100 ha		100 - 1000 ha		1000 + ha		Total	
FMU	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
W11	59	1%	8,104	84%	1,537	16%	-	0%	9,699	16%
W13	297	1%	16,552	32%	5,760	11%	29,713	57%	52,323	84%
Total	356	1%	24,656	40%	7,297	12%	29,713	48%	62,023	100%

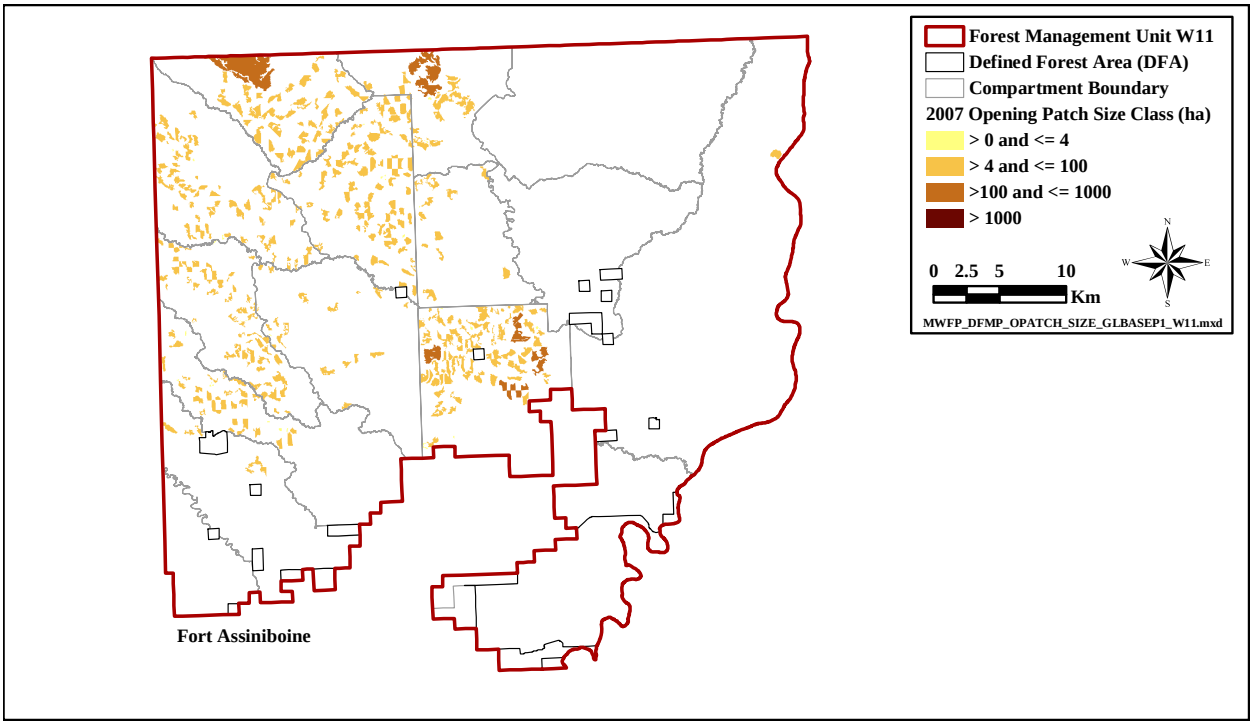

Figure 37. Forested landbase forest patch distribution for W11.

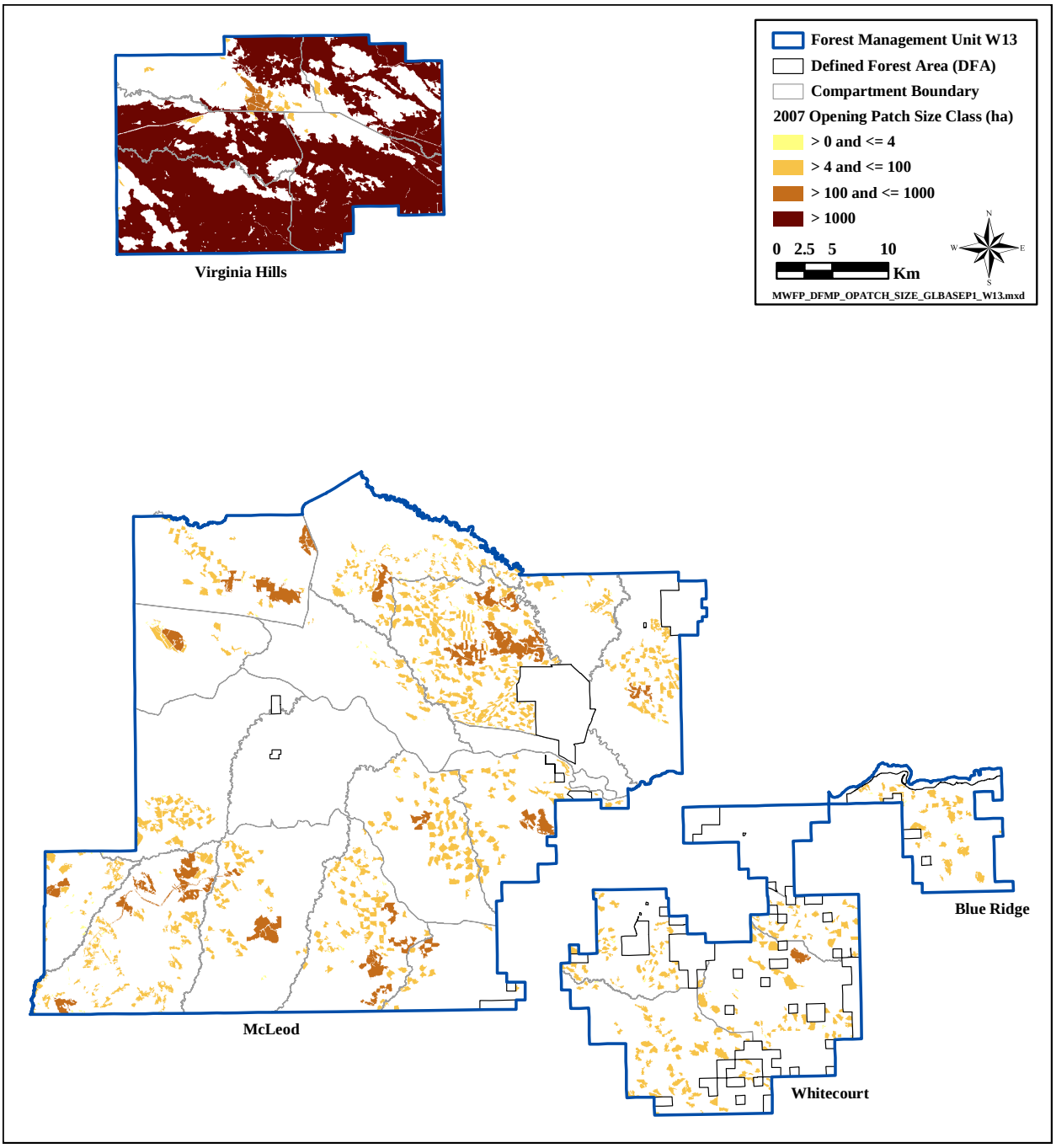

Figure 38. Forested landbase forest patch distribution for W13.

4.5 Spatial and Temporal Variability of Cover Types and Seral Stages

The forecasted spatial and temporal variability of cover types and seral stages in the DFA is covered in *Chapter 5 – Forecasting and the Preferred Forest Management Scenario*.

5. Forest Landscape Disturbance and Succession

5.1 Inherent Disturbance Regime

Fire has been one of the primary agents of natural disturbance in each of the natural subregions within the DFA (Rowe and Scotter 1973). Pre-European fire cycles in this region have varied spatially and temporally since the last ice age, with a fire-return interval ranging from a few decades to a few centuries (Viereck 1983; Cayford and McRae 1983). Some stands may burn more often, while others may not burn at all (Van Wagner 1978).

The current fire regime is characterized by two types of fires: frequent, small, low-to-moderate intensity fires that can be readily contained by initial attack resources and infrequent, large, high-intensity crown fires that have escaped initial attack and are difficult to suppress.

Fire disturbance is covered in detail under Section 6.2.

5.2 Insects and Diseases

5.2.1 Insects

Mountain pine beetle (Dendroctonus ponderosae)

A mountain pine beetle (MPB) infestation, which has spread into the DFA from pine-dominated regions to the west, poses significant threat to pine trees in and around the DFA. As a result of a detailed risk assessment for the area, Millar Western is proposing in its Preferred Forest Management Scenario (PFMS) to increase its overall harvest level to remove susceptible pine

trees (refer to *Chapter 5 – Forecasting and the Preferred Forest Management Scenario*, for details.).

Large aspen tortrix (Choristoneura conflictana [Walker])

During 2005, large aspen tortrix infested an area approximately 16,000 ha in size, in and around, the Whitecourt and McLeod subunits of the DFA. The infestation was considered light, affecting less than 35% of trees. This infestation followed a similar outbreak in 2004, when an area approximately 11,000 ha in size was defoliated. Although a risk to the aspen trees within the DFA, large aspen tortrix infestations historically have lasted about three years, then collapsed. Collapses are often followed by forest tent-caterpillar outbreaks (Alberta 2005).

Forest tent caterpillar (Malacosoma disstria [Hubner])

While no forest tent-caterpillar infestation exists on in the DFA, there is a moderate risk that one could follow the collapse of the current large aspen tortrix infestation (Alberta 2005). During the 1980s, forest tent-caterpillar caused significant defoliation in Millar Western operating areas.

***Aspen two-leaf tier (Enargia decolour* [Walker])**

During 2005, some aspen two-leaf tier defoliation was observed within the large aspen tortrix infestation (see above). The risk of significant damage resulting from this insect is low (Alberta 2005).

Other Insects

While Millar Western is not aware of any other insect infestations in its DFA, spruce budworm (*Choristoneura fumiferana* [Clemens]) and jack pine budworm (*Choristoneura pinus* [Freeman]) infestations are not uncommon in the region, creating a potential risk to white spruce and, to a lesser extent, balsam fir and jack pine (Volney et al 1999).

Regarding impacts of insects on young stands, a synopsis of reports from the Forest Insect and Disease Survey (FIDS) of the Canadian Forest Service (CFS), which has been operating in this region since 1937, suggests that young stands may be significantly influenced by three main insects: white pine terminal weevil (*Pissodes strobe* [Peck]), which feeds principally on white spruce; the lodgepole pine terminal weevil (*Pissodes terminalis* [Hopkins]), which feeds on terminals of lodgepole and jack pines; and the Warren root collar weevil (*Hylobius warreni* [Wood]), which is particularly damaging to young conifers in the region (Cerezke and Volney 1995).

5.2.2 Diseases

Root and Trunk Rots

Millar Western is not aware of any significant disease outbreaks in the DFA, but various root and trunk rots are known to exist throughout. The most common root rots in conifers include Armillaria spp. and *Inonotus tomentosus*. Surveys of young stands reveal that the Armillaria root

rot is one of the most important diseases in regenerated stands between five- and twenty-five years of age, as it can cause significant mortality in plantations (Mallett 1992). Trunk rots include *Phellinus pini* and *Haematostereum sanguinolentum*. Aspen trunk rots include *Phellinus tremulae* and *Peniophora polygonia*.

Lodgepole pine dwarf mistletoe

In addition to root and trunk rots, lodgepole pine dwarf mistletoe, a parasite, exists on lodgepole and jack pine trees throughout the DFA.

Other Diseases

Western gall rust is a prevalent disease affecting young stands of pines growing in intensively Managed stands (Hiratsuka 1987).

5.3 Invasive Exotic Species

At present, no invasive exotic insect species are known to reside in the DFA. To date, the gypsy moth (*Lymantria dispar (L.)*) has not been found in the DFA or anywhere else in the Green Zone of Alberta; however, it represents a serious threat to the forest resource. Although the gypsy moth prefers oak, birch, willow and trembling aspen, it can feed on the leaves of hundreds of species of plants, including conifers. The gypsy moth is of significant concern, for several reasons: the DFA region lacks a sufficient number of parasite and predator species to control the gypsy moth; the insect has a high reproduction rate; it has a high consumption rate (of leaf tissue); and it will feed on any tree species during severe infestations (SRD Forest Health Website: http://www.srd.gov.ab.ca/forests/health/a_gypsymoth.html).

5.4 Forest Succession Trajectories

Forest succession trajectories are described in *Chapter 5 – Forecasting and the Preferred Forest Management Scenario*.

5.5 Timber Harvesting

Various industrial timber harvesting intensities and techniques have been practised on the DFA for nearly a century. In earlier years, the largest trees were selectively harvested, a technique that gave way to clearcutting in the 1960's and combinations of clearcutting and alternative, ecologically sensitive harvesting methods in the 1990's.

Table 32 summarizes, by decade, the area harvested within each subunit of the DFA from 1960 to the end of the 2005 timber year (May 1 to April 30). The most significant increase in harvest area – 262% (36,538 ha compared to 13,943 ha) – occurred from the 1980s to the 1990s. During