



Citadel Project Area

Final Environmental Impact Statement

Appendix B

Silvicultural Findings of Compliance with Laws, Regulations, and Policy

The following findings are made based on the environmental analysis and the silvicultural prescription for the 28,135 acres of National Forest System land in the Citadel project area:

Consistency [16 U.S.C.1604(i)]:

1. Timber harvest would occur on lands suited for timber production or would occur in areas where timber harvest is permitted and is necessary to help achieve other resource management objectives;

Table B-1. Proposed Harvest on Suitable Timber Lands

	Alternative B	Alternative C
Harvest on Suitable Timber Production (Timber Component 5xx or 6xx)	10,609 acres	10,184 acres
Harvest Permitted for Multiple-Use Objectives (Timber Component 8xx)	127 acres	315 acres

Timber harvest is proposed on lands classified as not suited for timber production. Pine removal would occur in hardwood stands where pine has invaded to conserve existing hardwood communities and restore historic hardwood communities (Forest Plan Objective 201). Existing meadows and some historic meadows would be restored through the removal of pine from within those sites (Forest Plan Objective 205). Identified old growth stands may be treated to adjust stocking. These treatments are being performed to serve multiple use objectives (16 USC m c 2) and provide diversity and browse for wildlife and cattle and are not required to meet CMAI.

The following are meadows where pine removal would occur to retain the meadow characteristics:

Table B-2. Stands Proposed for Meadow Enhancement

VEG_LINK	Prj_Acres	AltB	AltC	TIMBER COM	BH_COVER_T
070601 8	6		/me		GRA
070604 67	13		/me		GRA
070702 7	7		/me		GRA
070702 13	5		/me		GRA
070702 15	17		/me		GRA
070801 14	20		/me		GRA
071005 50	3		/me		GRA
071101 1	20		/me		GRA
071101 19	15		/me		GRA

2. Silvicultural treatments are consistent with the Forest Plan. The proposed treatments in both action alternatives comply with the Forest Plan Acceptable Silvicultural Systems (Forest Plan II-25), including the even-aged systems of shelterwood and clearcut, and the uneven-aged system of selection cutting. Even-aged regeneration harvests are appropriate to meet the objectives and requirements of the Forest Plan. Specific desired conditions include a better balance of structural stages, improved age class distribution, and adequate restocking. Apparent proposals within the Botanical Area (Stand 071001 0047) are due to mapping irregularities; the stand is bisected by the botanical area boundary, however no treatment would extend into the botanical area.

Timber Harvest [16 U.S.C. 1604 (g) (3) (E)]:

1. Soil, slope, or other watershed conditions would not be irreversibly damaged; see the soils/hydrology specialist report.
2. There is assurance that the lands can be adequately restocked within five years after final regeneration harvest;

Adequate stocking is 150 conifer seedlings per acre, assuming no intermediate treatments; where intermediate treatments will be done, 300 conifer seedlings per acre are required.

Research and experience indicate the shelterwood method should be the primary regeneration method and is ideally suited and widely applicable in the Black Hills (USDA-FS Research Paper RM-124, 6/74). It is a scientifically sound method of regeneration for ponderosa pine as described in Agriculture Handbook #445 (revised 12/83) pages 80-83.

The areas planned for clearcutting in Alternative B would not be required to meet the minimum stocking requirement, though they would be monitored for response. The clearcut was not recommended for regeneration, but to meet other resource requirements (creation of Structural Stage 1).

3. Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water are protected from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment where harvests are likely to seriously and adversely affect water conditions or fish habitat; see soils/hydrology specialist report.
4. The harvesting system to be used was not selected primarily because it will give the greatest dollar return or the greatest unit output of timber.

Proposed systems for the Citadel project area include Shelterwood, Clearcut, and Uneven-Aged Systems which are acceptable systems under the Forest Plan (II-25). Clearcutting and Uneven-Aged Systems are proposed for minor amounts and move toward specific habitat requirements (Structural Stage 1 and uneven stand structure, respectively). The shelterwood system is proposed on extensive areas in both action alternatives. Research (Shepperd 2002) and past experience has shown the shelterwood method to be the most reliable in managing the Black Hills.

Even-aged Regeneration Harvests [16 U.S.C. 1604 (g) (3) (F)]:

1. Clearcutting is the optimum method to achieve the desired results. Clearcutting was chosen to create Structural Stage 1 in Alternative C. Retaining overstory trees would have maintained a seed source, resulting in a quicker conversion out of SS 1. While these areas are not planned to be maintained as openings in perpetuity, the 5 year restocking guideline would not apply to them. Status as to suitability for timber production would be evaluated during the next entry. The following stands are proposed for clearcutting under Alternative C. Alternative B does not include clearcutting.

Table B-3. Stands Proposed for Clearcut Treatment

VEG_LINK	AltB	AltC	Prj_Acres
070601 26		CC/rx	13
070601 29		CC/rx	9
071001 22	CT60/pct/rx	CC/rx	38
071001 62	CT60/pct/rx	CC/rx	9
071002 3	CT60/pct/rx	CC/rx	22
071002 55		CC/rx	3
071004 6		CC/rx	5
071005 38	CT60/pct/rx	CC/rx	10

VEG_LINK	AltB	AltC	Prj_Acres
071005 39	CT60/pct/rx	CC/rx	10
071005 55	COSR/pct	CC/rx	10
	Total Clearcut Ac		129

2. Clearcuts, coppice cuts, seed tree, and shelterwood regeneration harvests are appropriate to meeting the objectives and requirements of the Forest Plan;

See number 2 above in the consistency statement.

3. An interdisciplinary review was completed and the potential environmental, biological, aesthetic, engineering, and economic impacts were assessed and the cutting methods are consistent with the multiple use of the project area. This analysis and finding are part of the Environmental Analysis and subsequent decision conducted under NFMA and NEPA provisions.

4. Cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain. See treatment maps in the project file. Treatments are proposed to correspond to naturally occurring stand boundaries except where overriding concerns such as private ownership, water influence zones, botanical area boundaries, and archeological resources identify a different boundary line.

5. Even-aged regeneration harvests (clearcuts and seed cuts) made in one operation meet the 40-acre maximum opening size limit requirement. None of the proposed clearcuts exceed 40 acres. The seed cuts do not qualify as an opening as a sufficient number of trees are retained.

6. Harvest would be consistent with the protection of soil, watershed, fish, wildlife, recreation, aesthetic resources, cultural and historic resources, and the regeneration of timber resources.

See specialist reports, located in Citadel project file, for specifics.

Culmination of Mean Annual Increment [16 U.S.C. 1604 (m)]:

Culmination of Mean Annual Increment (CMAI) occurs when the periodic annual increment equals the mean annual increment (MAI). The requirement is that stands of trees harvested have generally reached the culmination of mean annual increment of growth. “Generally reached culmination” is defined as the age at which the stand achieves at least 95 percent of the cubic foot volume at culmination. The CMAI requirement only applies to even-aged management on lands suited for timber production. The CMAI requirement does not apply to thinning, salvage, or sanitation harvests or to harvests designed to achieve non-timber resource objectives (16 U.S.C. 1604(m)).

The analysis was done using the Forest Vegetation Simulator (FVS) and making bare ground runs based on site measured site index. The stands were “grown” unrestricted for over 200 years. The apex of the growth curve is CMAI. The actual rate at CMAI was multiplied by 95% to get the generally accepted value. The age at 95% CMAI was compared to the actual measured age, and if the age met or exceeded the modeled age at CMAI, the stand was determined to have met the requirement. This method of determination was used since the volume that has been either removed through harvesting, precommercial thinning, or lost to mortality over the time since the stands were established is not known and an approximation would have been less accurate than measured growth rates and site indices. Attached (see Figure B-1 below) are the FVS runs showing the growth curves.

Some of the sites are multi-storied or patchy containing components (overstory, understory, inclusions etc.) that are individually either below or above CMAI. When inventoried these components are all combined and an average for the stand is computed. Since the PAI and MAI for the stand is an average of the PAI and MAI of each of its components, the stand average may fall above or below the CMAI of each of its components. Since the regulations speak to even-aged sites, and these sites are not, then CMAI may not apply, however the

management objectives are to manage these sites as evenaged sites so CMAI should be considered. Although it is difficult to calculate CMAI on components of a stand, portions receiving regeneration treatments are similar to other evenaged mature stands in the area that are at CMAI and therefore have reached CMAI. The recommended treatment would regenerate those components or inclusions that show similarities with stands known to be at or beyond CMAI and manage those components below CMAI with intermediate treatments (i.e. precommercial thinning, intermediate thinning). Stands receiving an Overstory Removal treatment should have been evaluated for CMAI in a prior treatment (during the Seed Cut regeneration phase), and the removal of the overstory may be considered a liberation cut to allow the regenerated stand room to grow. However, Overstory Removal stands in either alternative were also evaluated for CMAI conditions. The following stands were considered for CMAI requirements:

Table B-4. Stands Considered for CMAI Requirements

CMAI_Stands						
VEG_LINK	AltB	AltC	Stand Age	Age at 95%CMAI	SITE_INDEX	Note
070601 10	CSC30/pct/rx	CSC30/pct/rx	131	80	73	Meets Requirement
070601 21	COSR/pct	COSR/pct	116	80	66	Meets Requirement
070601 25	CSC30/pct/rx	CSC30/pct/rx	115	80	65	Meets Requirement
070601 27	COSR/pct	COSR/pct	137	85	60	Meets Requirement
070601 28	COSR/pct	COSR/pct	124	85	63	Meets Requirement
070601 45	COSR/pct	COSR/pct	137	80	72	Meets Requirement
070602 46	COSR/pct	COSR/pct	95	85	62	Meets Requirement
070604 25	COSR/pct	COSR/pct	92	75	82	Meets Requirement
070604 29	COSR/pct	COSR/pct	72	85	55	Multiple Use-Structural Stage Needs
070604 64	COSR/pct	COSR/pct	94	80	69	Meets Requirement
070702 11	CT60/pct/rx	CSC30/pct/rx	100	75	79	Meets Requirement
070702 55	CSC30/pct/rx	CSC30/pct/rx	131	80	65	Meets Requirement
070801 1	COSR/pct	COSR/pct	140	80	72	Meets Requirement
070801 17	COSR/pct	COSR/pct	89	75	81	Meets Requirement
070801 30	COSR/pct	COSR/pct	100	75	80	Meets Requirement
070801 32	COSR/pct	COSR/pct		100	54	Liberation Cut, formerly regenerated
070801 34	COSR/pct	COSR/pct	92	75	82	Meets Requirement
070801 47	COSR/pct	COSR/pct	80	75	80	Meets Requirement
070801 58	COSR/pct	COSR/pct	122	80	66	Meets Requirement
070802 2	COSR/pct	COSR/pct	110	75	77	Meets Requirement
070802 11	CSC30/pct/rx	CSC30/pct/rx	128	85	63	Meets Requirement
070802 20	COSR/pct	COSR/pct	94	80	71	Meets Requirement
070802 42	CSC30/pct/rx	CSC30/pct/rx	142	80	73	Meets Requirement
070802 50	COSR/pct	COSR/pct	145	75	76	Meets Requirement
070803 16	CT60/pct/rx	CSC30/pct/rx	100	80	73	Meets Requirement
070803 20	COSR/pct	COSR/pct	96	85	60	Meets Requirement
070803 41	COSR/pct	COSR/pct/rx	74	85	63	Multiple Use-Structural Stage Needs
070803 53	COSR/pct	COSR/pct/rx	151	85	62	Meets Requirement
070804 6	COSR/pct	COSR/pct	119	85	59	Meets Requirement
070804 8	COSR/pct	COSR/pct	116	85	62	Meets Requirement
070804 28	COSR/pct	COSR/pct	107	75	78	Meets Requirement

CMAI_Stand						
VEG_LINK	AltB	AltC	Stand Age	Age at 95%CMAI	SITE_INDEX	Note
070804 31	COSR/pct	COSR/pct	76	80	71	Multiple Use-Structural Stage Needs
070804 40	COSR/pct	COSR/pct	83	80	67	Meets Requirement
070804 43	COSR/pct	COSR/pct	93	80	67	Meets Requirement
070805 3	CSC30/pct/rx	CSC30/pct/rx	132	80	72	Meets Requirement
070805 6	CSC30/pct/rx	CT20/pct/rx	128	85	61	Meets Requirement
070805 7	CSC30/pct/rx	CGS/pct/rx	123	80	69	Meets Requirement
070805 12	COSR/pct	CGS/pct/rx	142	80	65	Meets Requirement
070805 19	CSC30/pct/rx	CSC30/pct/rx	108	80	65	Meets Requirement
070805 30	CSC30/pct/rx	CSC30/pct/rx	149	80	68	Meets Requirement
070806 23	CSC30/pct/rx	CT20/pct/rx	101	85	63	Meets Requirement
070806 31	COSR/pct	COSR/pct/rx	99	80	70	Meets Requirement
070806 42	COSR/pct	CT40/pct/rx	90	80	68	Meets Requirement
070806 59	COSR/pct	CSC30/pct/rx	100	80	68	Meets Requirement
071001 19	CSC30/pct/rx	CSC30/pct/rx	86	80	73	Meets Requirement
071001 26	CSC30/pct/rx	CSC30/pct/rx	144	100	51	Meets Requirement
071001 31	COSR/pct	COSR/pct	77	75	86	Meets Requirement
071001 33	COSR/pct	COSR/pct	79	85	55	Multiple Use-Structural Stage Needs
071001 35	COSR/pct	COSR/pct	91	80	73	Meets Requirement
071001 37	COSR/pct	COSR/pct	103	80	65	Meets Requirement
071001 51	COSR/pct	COSR/pct	80	85	62	Multiple Use-Structural Stage Needs
071001 53	COSR/pct	COSR/pct	80	85	59	Multiple Use-Structural Stage Needs
071002 23	COSR/pct	COSR/pct/rx	119	85	60	Meets Requirement
071002 43	CSC30/pct/rx	CSC30/pct/rx	106	80	66	Meets Requirement
071002 54	COSR/pct	COSR/pct	94	80	70	Meets Requirement
071002 60	COSR/pct	COSR/pct	91	80	68	Meets Requirement
071002 61	COSR/pct	COSR/pct	95	80	68	Meets Requirement
071002 71	COSR/pct	COSR/pct/rx	96	80	66	Meets Requirement
071002 75	COSR/pct	COSR/pct/rx	94	80	73	Meets Requirement
071004 5	COSR/pct	COSR/pct	92	85	64	Meets Requirement
071004 8	COSR/pct	COSR/pct	82	80	73	Meets Requirement
071004 9	COSR/pct	COSR/pct	92	80	69	Meets Requirement
071004 11	COSR/pct	COSR/pct	95	75	84	Meets Requirement
071004 17	COSR/pct	COSR/pct	110	80	74	Meets Requirement
071004 22	COSR/pct	COSR/pct	90	80	71	Meets Requirement
071004 31	COSR/pct	COSR/pct	86	75	76	Meets Requirement
071004 46	COSR/pct	COSR/pct	102	80	70	Meets Requirement
071004 58	CT60/pct/rx	CSC30/pct/rx	102	80	71	Meets Requirement
071005 4	COSR/pct	COSR/pct	71	80	66	Multiple Use-Structural Stage Needs
071005 9	COSR/pct	COSR/pct/rx	130	100	51	Meets Requirement
071005 22	COSR/pct	COSR/pct	196	100	46	Meets Requirement

CMAI_Stand						
VEG_LINK	AltB	AltC	Stand Age	Age at 95%CMAI	SITE_INDEX	Note
071005 24	COSR/pct	COSR/pct	147	80	67	Meets Requirement
071005 25	COSR/pct	COSR/pct	139	85	59	Meets Requirement
071005 31	COSR/pct	COSR/pct/rx	134	80	69	Meets Requirement
071005 32	CSC30/pct/rx	CSC30/pct/rx	89	75	75	Meets Requirement
071005 45	COSR/pct	COSR/pct	145	85	56	Meets Requirement
071005 48	COSR/pct	COSR/pct	125	85	62	Meets Requirement
071005 49	COSR/pct	COSR/pct	122	80	69	Meets Requirement
071005 52	COSR/pct	COSR/pct	127	80	65	Meets Requirement
071005 53	COSR/pct	COSR/pct	88	85	63	Meets Requirement
071005 54	COSR/pct	COSR/pct	108	80	71	Meets Requirement
071005 55	COSR/pct	CC/rx	101	80	69	Meets Requirement
071005 56	COSR/pct	COSR/pct	98	85	56	Meets Requirement
071005 59	COSR/pct	COSR/pct	94	85	60	Meets Requirement
071101 8	COSR/pct	COSR/pct	94	75	76	Meets Requirement
071101 16	COSR/pct	COSR/pct	99	80	74	Meets Requirement
071101 17	CSC30/pct/rx	CSC30/pct/rx	109	75	82	Meets Requirement
071102 32	COSR/pct	COSR/pct	124	85	63	Meets Requirement
071103 4	COSR/pct	CT40/pct/rx	120	80	69	Meets Requirement
071103 13	COSR/pct	COSR/pct	94	85	63	Meets Requirement
071103 23	CSC30/pct/rx	CSC30/pct/rx	137	85	56	Meets Requirement
071103 28	COSR/pct	COSR/pct	102	80	72	Meets Requirement
071103 37	COSR/pct	COSR/pct	101	75	81	Meets Requirement
071103 44	COSR/pct	COSR/pct	115	80	72	Meets Requirement
071103 47	COSR/pct	COSR/pct	96	85	62	Meets Requirement
071104 9	COSR/pct	COSR/pct	165	85	60	Meets Requirement
071104 27	COSR/pct	COSR/pct	99	80	70	Meets Requirement
071104 30	COSR/pct	COSR/pct	101	80	70	Meets Requirement
071104 41	COSR/pct	COSR/pct/rx	111	80	65	Meets Requirement
071105 12	CT40/pct/rx	CSC30/pct/rx	128	105	42	Meets Requirement
071105 34	CSC30/pct/rx	CSC30/pct/rx	112	80	72	Meets Requirement
071105 57	COSR/pct	COSR/pct/rx	107	80	70	Meets Requirement
071105 61	COSR/pct	COSR/pct/rx	92	80	65	Meets Requirement
071105 71	COSR/pct	COSR/pct	97	80	70	Meets Requirement
071105 97	COSR/pct	COSR/pct/rx	157	100	53	Meets Requirement
071106 10	CSC30/pct/rx	CSC30/pct/rx	109	80	70	Meets Requirement
071106 18	COSR/pct	COSR/pct	4	75	80	Liberation Cut, formerly regenerated
071107 1	COSR/pct	COSR/pct	92	75	77	Meets Requirement
071107 5	COSR/pct	COSR/pct	93	75	76	Meets Requirement
071107 8	COSR/pct	COSR/pct	96	75	78	Meets Requirement
071107 13	COSR/pct	COSR/pct	96	80	73	Meets Requirement
071107 15	COSR/pct	COSR/pct	88	80	72	Meets Requirement
071107 22	COSR/pct	COSR/pct/rx	102	80	71	Meets Requirement
071107 29	CSC30/pct/rx		163	80	72	Meets Requirement

CMAI_Stand						
VEG_LINK	AltB	AltC	Stand Age	Age at 95%CMAI	SITE_INDEX	Note
071107 41	COSR/pct	COSR/pct	93	80	71	Meets Requirement
071107 44	COSR/pct	COSR/pct	99	75	82	Meets Requirement

All stands considered (112 stands and 3,311 acres in Alternative B, and 108 stands and 3,067 acres in Alternative C) met either the exception to the requirement (multiple-use objective) or the requirement for CMAI itself.

Findings prepared and recommended by:

/S/ Elizabeth Stiller
(Certified Silviculturist)

Date: 2/21/07

Findings accepted by:

/S/ Rhonda O'Byrne
District Ranger
(Line Officer Title)

Date: 5/9/07

Figure B-1. CMAI Graphs from FVS Modeling

