

Appendix A, Treatment Unit Description for Alternative's 2 and 3 Alternative 2

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
01	239	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
02	46	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	50PP/50DF/aspen	300	100-150	80-120	60-80	40-60%	25-40%	GB
03	14	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
04	8	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
05	11	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
06	15	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
07	4	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
08	169	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF/trace LP	200-300	10-50	80-120	10-20	40-60%	0-25%	GB
09	49	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
09a	89	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-60	120	20-50	40-60%	0-25%	GB
10	186	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	GB
11	170	Regeneration Harvest	2-aged seedtree	DF/PP NRG +	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
			w/res, burn	plant PP									
11a	18	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	GB
12	71	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/trace AS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
12a	120	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/Trace AS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
13	23	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/Trace AS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
13a	10	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/Trace AS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
14	42	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	65PP/35DF/Trace AS/LP	300	100-150	60-180	60-80	40-60%	25-40%	GB
15	20	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/35DF/10 LP/trace AS	300	100-150	60-180	60-80	40-60%	25-40%	GB
16	33	Intermediate Harvest	Improvement Cut, Underburn	N/A	MIX	10PP/45LP/45 DF/trace AS	300	100-150	60-180	60-80	40-60%	25-40%	GB
17	33	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/35DF/10 LP/trace AS	300	100-150	60-180	60-80	40-60%	25-40%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
17a	70	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/35DF/10 LP/trace AS	300	100-150	60-180	60-80	40-60%	25-40%	GB
17b	31	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/35DF/10 LP/trace AS	300	100-150	60-180	60-80	40-60%	25-40%	GB
18	50	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	65DF/25PP/10 LP	400	100-150	100-140	60-80	40-60%	25-40%	GB
18a	4	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	65DF/25PP/10 LP	400	100-150	100-140	60-80	40-60%	25-40%	GB
23	78	Intermediate Harvest	Improvement Cut, Underburn	N/A	MIX	45PP/45DF/5L P/5AS	150	75-100	60-140	60-80	40-60%	25-40%	GB
24	52	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	AS	50AS/10PP/15 LP/15DF	150	100	80-160	60-140	25-40%	25-40%	N/A
25	22	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/40DF/5A S	150	75-100	80-120	60-80	40-60%	25-40%	GB
26	152	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	MIX	25LP/25DF/15 AS/trace ES/PP	200-300	150-250	60-140	60-120	40-60%	25-60%	N/A
27	22	Regeneration Harvest	2-aged seedtree w/res, burn	LP/DF/PP NRG	LP	50LP/30PP/20 DF/trace AS	250	20-50	100-140	5-20	40-60%	0-25%	GB
28	48	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	70DF/20LP/10 PP	250	100-150	140-160	60-80	40-60%	25-40%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
29	77	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	70DF/20LP/10 PP	250	100-150	140-160	60-80	40-60%	25-40%	GB
30	14	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF/ trace AS	250-350	20-50	100-140	5-20	40-60%	0-25%	Cable
30a	29	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF/ Trace AS	250-350	20-50	100-140	5-20	40-60%	0-25%	Cable
33	27	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	50DF/25PP/25 LP/trace AS	300	100-150	120	60-80	40-60%	25-40%	GB
34	42	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	50DF/25PP/25 LP/trace AS	300	100-150	120	60-80	40-60%	25-40%	GB
35	40	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	50DF/25PP/25 LP/trace AS	300	100-150	120	60-80	40-60%	25-40%	GB
38	35	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	70PP/15DF/15 LP	200	75-100	100-120	50-80	25-40%	25-40%	GB
39	56	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland	Trace	0	Trace	0	0%	0%	N/A
40	32	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/PP	Trace	0	Trace	0	0%	0%	N/A
41	20	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	AS	50AS/10PP/15 LP/15DF	150	100	80-160	60-140	25-40%	25-40%	N/A
42	79	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	50PP/50DF	200-300	100-150	80-140	60-80	40-60%	25-40%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
45	10	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
45a	56	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
45b	18	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
46	14	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
46a	32	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
46b	16	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
47	125	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
50	39	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	DF	99DF/1AS	300-400	250-350	140	120	60%+	40-60%	N/A
51	63	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	DF	99DF/1AS	300-400	250-350	140	120	60%+	40-60%	N/A
52	35	Regeneration Harvest	2-aged seedtree w/res, burn	Plant PP, low stocking	PP	99PP/10DF/ Trace AS	250	20-50	120-140	5-20	40-60%	0-25%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
52a	54	Regeneration Harvest	2-aged seedtree w/res, burn	Plant PP, low stocking	PP	99PP/1DF/Trace AS	250	20-50	120-140	5-20	40-60%	0-25%	GB
53	24	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	99PP/1DF/Trace AS	250	100-150	120-140	80-120	40-60%	25-40%	N/A
54	13	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	99PP/1DF/Trace AS	250	100-150	120-140	80-120	40-60%	25-40%	N/A
57	75	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	90PP/10DF	75-250	50-150	100	80-100	40-60%	25-40%	N/A
58	59	Regeneration Harvest	2-aged seedtree w/res, burn	DF NRG + plant PP	PP	70PP/30DF/Trace AS	150-250	20-50	100	5-20	40-60%	0-25%	GB
59	48	Regeneration Harvest	2-aged seedtree w/res, burn	DF NRG + plant PP	PP	70PP/30DF/trace AS	150-250	20-50	100	5-20	40-60%	0-25%	GB
59a	65	Regeneration Harvest	2-aged seedtree w/res, burn	DF NRG + plant PP	PP	70PP/30DF/Trace AS	150-250	20-50	100	5-20	40-60%	0-25%	GB
60	65	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
61	36	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
62	102	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
63	102	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
63a	19	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
63b	7	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
64	146	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
65	12	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB
66	69	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/PP	Trace	0	Trace	0	0%	0%	N/A
67	12	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/AS	Trace	0	Trace	0	0%	0%	N/A
68	71	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100-200	60-180	50-120	40-60%	40-60%	N/A
69	17	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100-200	60-180	50-120	40-60%	40-60%	N/A
70	130	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100-200	60-180	50-120	40-60%	40-60%	N/A
71	56	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	65PP/25DF/10 LP/aspens	250	100-200	120	50-100	40-60%	40-60%	N/A

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est. TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
72	259	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	50PP/50DF	200-300	100-150	80-140	60-80	40-60%	25-40%	N/A

Treatment Unit Description - Alternative 3

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
01	239	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
02	46	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	50PP/50DF/aspens	300	100-150	80-120	60-80	40-60%	25-40%	NA
03	14	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
04	8	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
05	11	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
06	15	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
07	4	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
08	169	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	80PP/20DF/traceLP	200-300	10-50	80-120	10-20	40-60	0-25%	NA

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
09	49	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	GB
09a	89	Prescribed Fire	Slashing, Broadcast Burn	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspens	250	20-60	120	20-50	40-60%	0-25%	NA
10	186	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	NA
11	170	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	NA
11a	18	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF	200-300	10-50	80-120	10-20	40-60%	0-25%	GB
12	71	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/traceAS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
13	23	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	60DF/40PP/traceAS/LP	300	100-150	80-120	60-80	40-60%	25-40%	GB
13a	10	Prescribed Fire	Slashing, Broadcast Burn	N/A	DF	60DF/40PP/traceAS/LP	300	100-150	80-120	60-80	40-60%	25-40%	NA
14	42	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	65PP/35DF/traceAS/LP	300	100-150	60-180	60-80	40-60%	25-40%	GB
16	33	Intermediate Harvest	Improvement Cut, Underburn	N/A	MIX	10PP/45LP/45 DF/traceAS	300	100-150	60-180	60-80	40-60%	25-40%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
17	33	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/35DF/10 LP/traceAS	300	100-150	60-180	60-80	40-60%	25-40%	GB
17a	70	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	55PP/35DF/10 LP/traceAS	300	100-150	60-180	60-80	40-60%	25-40%	NA
18	50	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	65DF/25PP/10 LP	400	100-150	100-140	60-80	40-60%	25-40%	GB
18a	4	Prescribed Fire	Slashing, Broadcast Burn	N/A	DF	65DF/25PP/10 LP	401	100-150	100-140	60-81	40-60%	25-40%	NA
23	78	Intermediate Harvest	Improvement Cut, Underburn	N/A	MIX	45PP/45DF/5LP/5AS	150	75-100	60-140	60-80	40-60%	25-40%	GB
24	52	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	AS	50AS/10PP/15 LP/15DF	150	100	80-160	60-140	25-40%	25-40%	N/A
25	22	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	55PP/40DF/5AS	150	75-100	80-120	60-80	40-60%	25-40%	GB
26	152	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	MIX	25LP/25DF/15 AS/trace ES/PP	200-300	150-250	60-140	60-120	40-60%	25-60%	N/A
27	22	Regeneration Harvest	2-aged seedtree w/res, burn	LP/DF/PP NRG	LP	50LP/30PP/20 DF/trace AS	250	20-50	100-140	5-20	40-60%	0-25%	GB
28	48	Prescribed Fire	Slashing, Broadcast Burn	N/A	DF	70DF/20LP/10 PP	250	100-150	140-160	60-80	40-60%	25-40%	NA

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
29	77	Prescribed Fire	Slashing, Broadcast Burn	N/A	DF	70DF/20LP/10 PP	250	100-150	140-160	60-80	40-60%	25-40%	NA
30	14	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	80PP/20DF/trace AS	250-350	20-50	100-140	5-20	40-60%	0-25%	Cable
30a	29	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	80PP/20DF/trace AS	250-350	20-50	100-140	5-20	40-60%	0-25%	NA
35	40	Intermediate Harvest	Improvement Cut, Underburn	N/A	DF	50DF/25PP/25 LP/trace AS	300	100-150	120	60-80	40-60%	25-40%	GB
38	35	Intermediate Harvest	Improvement Cut, Underburn	N/A	PP	70PP/15DF/15 LP	200	75-100	100-120	50-80	25-40%	25-40%	GB
39	56	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland	Trace	0	Trace	0	0%	0%	N/A
40	32	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/PP	Trace	0	Trace	0	0%	0%	N/A
41	20	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	AS	50AS/10PP/15 LP/15DF	150	100	80-160	60-140	25-40%	25-40%	N/A
42	79	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	50PP/50DF	200-300	100-150	80-140	60-80	40-60%	25-40%	NA
45	10	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
45a	56	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	90PP/10DF/Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	NA

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
45b	18	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	NA
46	14	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
46a	32	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	NA
46b	16	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	NA
47	125	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	90PP/10DF/ Trace AS	200-300	20-50	40-120	5-20	40-60%	0-25%	GB
50	39	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	DF	99DF/1AS	300-400	250-350	140	120	60%+	40-60%	N/A
51	63	Prescribed Fire	Slashing, jackpot burn (aspen)	N/A	DF	99DF/1AS	300-400	250-350	140	120	60%+	40-60%	N/A
52	35	Regeneration Harvest	2-aged seedtree w/res, burn	Plant PP, low stocking	PP	99PP/1DF/ Trace AS	250	20-50	120-140	5-20	40-60%	0-25%	GB
52a	54	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	99PP/1DF/ Trace AS	250	20-50	120-140	5-20	40-60%	0-25%	NA
53	24	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	99PP/1DF/ Trace AS	250	100-150	120-140	80-120	40-60%	25-40%	N/A

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
54	13	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	99PP/1DF/ Trace AS	250	100-150	120-140	80-120	40-60%	25-40%	N/A
57	75	Prescribed Fire	Slashing, Broadcast Burn	Plant PP, low stocking	PP	90PP/10DF	75-250	50-150	100	80-100	40-60%	25-40%	N/A
58	59	Prescribed Fire	Slashing, Broadcast Burn	DF NRG + plant PP	PP	70PP/30DF/ Trace AS	150-250	20-50	100	5-20	40-60%	0-25%	NA
59	48	Regeneration Harvest	2-aged seedtree w/res, burn	DF NRG + plant PP	PP	70PP/30DF/ Trace AS	150-250	20-50	100	5-20	40-60%	0-25%	GB
59a	65	Prescribed Fire	Slashing, Broadcast Burn	DF NRG + plant PP	PP	70PP/30DF/ Trace AS	150-250	20-50	100	5-20	40-60%	0-25%	NA
60	65	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	NA
61	36	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	NA
62	102	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	99PP/1DF	100-300	20-50	80-120	5-20	40-60%	0-25%	NA
63	102	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	NA
63b	7	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF /trace AS	100-300	20-50	80-120	5-20	40-60%	0-25%	GB

Unit	Acres	Treatment Type	Treatment Prescription Target Conditions	Regen	Forest Type	Current Conditions Species Composition in 2008	Est TPA	Target Ave TPA	Est BA	Target BA	Est CC %	Target Ave CC %	Logging System
64	146	Prescribed Fire	Slashing, Broadcast Burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80- 120	5-20	40- 60%	0-25%	NA
65	12	Regeneration Harvest	2-aged seedtree w/res, burn	DF/PP NRG + plant PP	PP	70PP/30DF/ Trace AS	100-300	20-50	80- 120	5-20	40- 60%	0-25%	GB
66	69	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/PP	Trace	0	Trace	0	0%	0%	N/A
67	12	Prescribed Fire	Slashing, Burn (grassland)	N/A	NF	Grassland/AS	Trace	0	Trace	0	0%	0%	N/A
68	71	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100- 200	60- 180	50-120	40- 60%	40-60%	N/A
69	17	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100- 200	60- 180	50-120	40- 60%	40-60%	N/A
70	130	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	60PP/40DF/ Trace AS	200-300	100- 200	60- 180	50-120	40- 60%	40-60%	N/A
71	56	Prescribed Fire	Slashing, Broadcast Burn	N/A	PP	65PP/25DF/10 LP/aspen	250	100- 200	120	50-100	40- 60%	40-60%	N/A
10	49	Regeneration Harvest	Shelterwood w/ Reserves	DF NRG + plant PP	PP	65PP/25DF/10 LP/aspen	250	20-61	121	20-51	40- 60%	0-25%	GB

Appendix B, Cumulative Effects

The area to be analyzed in a cumulative effects analysis is usually not limited to the project area, and it varies with the resource or species being analyzed. Each resource will have different “boundaries” for its effects analysis. Quantified, detailed information regarding effects, leading to specific reasoned conclusions can be found in the cumulative effects section of each specialist report located in the project record. Sensitive Plants are analyzed forest-wide for cumulative effects and are included in a stand alone document. The following catalog of past, present, and reasonably foreseeable activities briefly addresses cumulative effects that are common to the resources listed.

Table B-1 Cumulative Effects by Resource

Past Harvest, Fuels Activities, and Wildfire by Decade - Acres			
Activity/Project Name	Decade/Year	Drainage	Scope of Activity
1960-1969			
Forest Service Timber Harvest	1960-1969	See GIS Map	Warm Springs Cumulative Effects Analysis Area
			By HUCs 307 (McClellan Creek) Regeneration harvest: 61 acres Intermediate harvest: <u>84 acres</u> Total: 145 acres
Fire	1960-1969	See GIS Map	Warm Springs Cumulative Effects Analysis Area
			By HUCs 307 (McClellan Creek) Fuels Activities: <u>48 acres</u> Total: 48 acres
<p>Air Quality: No Effect Fisheries: Continued potential for negative effect from any existing roads on the landscape Habitats of Special Concern: These treatments created more open conditions, lessened the hazards to high severity fire, and to some extent increased resiliency of treated stands to insects. Minimal effect due to the limited number of acres treated. Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report Lands: Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources Noxious Weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations Range: The effects of these disturbances are reflected in the existing condition of the current range resources Recreation/Scenery: Timber harvest activities did affect recreation opportunities in some areas, primarily road access. While some roads</p>			

were closed following harvest activities other roads were left open for public use. The removal of timber facilitated additional off-route travel and recreation use, both motorized and non-motorized.

Soils: No effects. These fuel and timber harvest activities do not coincide with proposed vegetation treatment units.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations

Transportation: The effects of these disturbances/activities are reflected in the existing condition of the current transportation system.

Wildlife: Vegetation management/fuel activities that occurred in the 1960s are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area. Possible cumulative effects include permanent road construction associated with vegetation management and road use in the subsequent decades. However, the contribution of the Proposed Project to this ongoing effect to wildlife that may be impacted by open roads is expected to be minimal.

1970-1979

Forest Service Timber Harvest	1970-1979	See GIS Map	Warm Springs Cumulative Effects Analysis Area	By HUCs
			Regeneration harvest: Total: <u>35 acres</u> 35 acres	307 (McClellan Creek) Regeneration harvest: <u>35 acres</u> Total: 35 acres
Fire	1970-1979	See GIS Map	Warm Springs Cumulative Effects Analysis Area	By HUCs
			Fuels Activities: Total: <u>91 acres</u> 91 acres	307 (McClellan Creek) Fuels Activities <u>91 acres</u> Total: 91 acres

Air Quality: No Effect

Fisheries: Continued potential for negative effect from any existing roads on the landscape

Habitats of Special Concern: These treatments created more open conditions, lessened the hazards to high severity fire, and to some extent increased resiliency of treated stands to insects. Minimal effect due to the limited number of acres treated.

Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources

Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report

Lands: No effect

Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources

Noxious Weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations

Range: The effects of these disturbances are reflected in the existing condition of the current range resources

Recreation/Scenery: Timber harvest activities did affect recreation opportunities in some areas, primarily road access. While some roads were closed following harvest activities other roads were left open for public use.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations

Soils: The effects of these disturbances are reflected in the existing condition of the soils resource. Past timber harvest activities do not coincide with proposed vegetation treatment

Transportation: The effects of these disturbances/activities are reflected in the existing condition of the current transportation system.

Wildlife: Vegetation management that occurred in the 1970s is reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area. Possible cumulative effects include permanent road construction associated with vegetation management and road use in the subsequent decades. However, the contribution of the Proposed Project to this ongoing effect to wildlife that may be

impacted by open roads is expected to be minimal.				
1980-1989				
Forest Service Timber Harvest	1980-1989	See GIS Map	Warm Springs Cumulative Effects Analysis Area Regeneration harvest: <u>41 acres</u> Total: 41 acres	By HUCs 307 (McClellan Creek) Regeneration harvest: <u>41 acres</u> Total: 41 acres
Fire	1980-1989	See GIS Map	Warm Springs Cumulative Effects Analysis Area Fuels Activities: <u>1,751 acres</u> Total: 1,751 acres	By HUCs 307 (McClellan Creek) Fuels Activities: <u>1,751 acres</u> Total: 1,751 acres
<p>Air Quality: No Effect</p> <p>Fisheries: Continued potential for negative effect from any existing roads on the landscape. Some riparian harvest reduced potential for recruitment of woody debris to streams in limited locations. Emphasis on implementation of BMPS and SMZ rules greatly reduced risk for negative effects to fish habitat.</p> <p>Habitats of Special Concern: Increased activity during the 1980s than prior. These treatments created more open conditions, lessened the hazards to high severity fire, and to some extent increased resiliency of treated stands to insects. Minimal effect due to the limited number of acres treated.</p> <p>Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources</p> <p>Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report</p> <p>Lands: No effect</p> <p>Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources</p> <p>Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations</p> <p>Range: The effects of these disturbances are reflected in the existing condition of the current range resources</p> <p>Recreation/Scenery: Timber harvest activities did affect recreation opportunities in some areas, primarily road access. While some roads were closed following harvest activities other roads were left open for public use.</p> <p>Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations</p> <p>Soils: No effects. These fuel activities do not coincide with proposed vegetation treatment units.</p> <p>Transportation: The effects of these disturbances/activities are reflected in the existing condition of the current transportation system.</p> <p>Weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations</p> <p>Wildlife: Vegetation management/fuel activities that occurred in the 1980's are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area. Possible cumulative effects include permanent road construction associated with vegetation management and road use in the subsequent decades. However, the contribution of the Proposed Project to this ongoing effect to wildlife that may be impacted by open roads is expected to be minimal.</p>				
Wildfire Warm Springs, 49,612 acres	1988	See GIS Map	Warm Springs Cumulative Effects Analysis Area Warm Springs: <u>23,367 acres</u> Total: 23,367 acres	By HUCs 303 (Warm Springs Creek) Warm Springs: 1,247 acres

total				307 (McClellan Creek) Warm Springs: <u>17,106 acres</u> Total: 18,353 acres
<p>Air Quality: No Effect Fisheries: Effects to fish and fish and fish habitat from all past activities addressed as a function of current sediment levels in streams as discussed in the fishery report. Habitats of Special Concern: This fire covered most of one third order drainage (0904), there are no mature or old stands to designate for old growth. The fire also reduced old growth designation opportunities in the other third order drainages, to a lesser degree. None of the Alternatives would lower the amount of available old growth, and the Action Alternatives will take a step toward altering fire behavior in old growth and provide resilient stands to become old growth in the future Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources. Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations Range: The effects of these disturbances are reflected in the existing condition of the current range resources Recreation/Scenery: Timber harvest activities did affect recreation opportunities in some areas, primarily road access. While some roads were closed following harvest activities other roads were left open for public use. The removal of timber facilitated additional off-route travel and recreation use, both motorized and non-motorized. Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Soils: No effects. The Warm Springs Fire did not coincide with the proposed treatment units. Transportation: No significant impacts to the road system. Wildlife: This fire burned approximately 49,600 acres across ownerships, 369 acres in the project area. Conditions vary depending on fire intensity, but for the most part are widespread areas of jackstraw fuels with thick lodgepole pine regeneration. The effects of the Warm Springs fire are reflected in the environmental baseline through R1-VMAP and the FIA/intensified grid data. Many of the burned acres are providing elk hiding cover and screening for other species, mainly small mammals.</p>				
1990-1999				
Forest Service Timber Harvest	1990-1999	See GIS Map	Warm Springs Cumulative Effects Analysis Area Regeneration harvest: 326 acres Intermediate harvest: <u>75 acres</u> Total: 404 acres	By HUCs 307 (McClellan Creek) Regeneration harvest: 326 acres Intermediate harvest: <u>75 acres</u> Total: 404 acres
Fire	1990-1999	See GIS Map	Warm Springs Cumulative Effects Analysis Area Fuels Activities: <u>1,976 acres</u> Total: 1,976 acres	By HUCs 303 (Warm Springs Creek) Fuels Activities 19 acres 307 (McClellan Creek)

				Fuels Activities: 1,711 acres 308 (Middle Prickly Pear Creek) Fuels Activities: <u>245 acres</u> Total: 1,975 acres
<p>Air Quality: No Effect Fisheries: Emphasis on implementation of BMPS, INFISH and SMZ rules greatly reduced negative effects to fish habitat. Any residual negative effect is associated with condition of existing roads on the landscape. Some short term negative effects due to road upgrades and improvement as well as sediment delivery associated with use of the roads. With road improvement, implementation of INFISH and SMZ rules the overall effect to fisheries is minor Habitats of Special Concern: These treatments created more open conditions, lessened the hazards to high severity fire, and to some extent increased resiliency of treated stands to insects. Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources. Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations. Range: The effects of these disturbances are reflected in the existing condition of the current range resources Recreation/Scenery: Timber harvest activities did affect recreation opportunities in some areas, primarily road access. While some roads were closed following harvest activities other roads were left open for public use. Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Soils: The effects of these disturbances are reflected in the existing condition of the soil resource. Past timber harvest activities do not coincide with proposed vegetation treatment units. Transportation: The effects of these disturbances/activities are reflected in the existing condition of the current transportation system. Wildlife: Regeneration harvest from this era is generally sapling-sized stands today, whereas intermediate harvests are more open mature forests. In the 1990s, fuel treatment activities were somewhat extensive. Vegetation management/fuel activities that occurred in the 1990's are reflected in the environmental baseline through R1-VMAP and FIA/Intensified Grid Data that reflect the current vegetation condition in the Project area. Possible cumulative effects include permanent road construction associated with vegetation management and road use in the subsequent decades. However, the contribution of the Proposed Project to this ongoing effect to wildlife that may be impacted by open roads is expected to be minimal.</p>				
2000-2010				
Forest Service Timber Harvest	2000-2010	See GIS Map	Warm Springs Cumulative Effects Analysis Area Intermediate harvest: <u>2 acres</u> Total: 2 acres	By HUCs 307 (McClellan Creek) Intermediate harvest: 1 acre 308 (Middle Prickly Pear Creek) Intermediate harvest: <u>1 acre</u> Total: 2 acres
Fire	2000-2010	See GIS Map	Warm Springs Cumulative Effects Analysis Area	By HUCs

			Fuels Activities: <u>34 acres</u> Total: 34 acres	307 (McClellan Creek) Fuels Activities: 2 acres 308 (Middle Prickly Pear Creek) Fuels Activities: <u>32 acres</u> Total: 34 acres
<p>Air Quality: These activities could impact air quality however, it would be short-term. Fisheries: No effect Habitats of Special Concern: This was a small treatment around Strawberry Lookout, in an administrative site area. There is no measurable cumulative impact Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: No effect long-term effect due to the small scale of activities Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources. Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations. Range: No effect Recreation/Scenery: No impacts to recreation/scenery due to the small scale of activities. Sensitive Plants: Recent ground disturbing activities associated with these activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. Soils: No effects. These timber harvest activities do not coincide with proposed vegetation treatment units. Transportation: No significant impacts to the transportation system. Wildlife: This was a small treatment around Strawberry Lookout, in an administrative site area in the Sheep Creek herd unit. Vegetation management/fuel activities that occurred during or before 2005 are reflected in the environmental baseline through R1-VMAP and FIA data. Vegetation management/fuel activities that occurred post 2005 are not reflected in the baseline. Those harvest and fuel activities that occurred since 2005 generally resulted in changes to elk hiding cover, and other wildlife habitats that comprise unmanaged forests. The Proposed Action does not appreciably add to those effects. Some elk hiding cover will be removed as well as snag habitat. Ample snags are present as a result of mountain pine beetle outbreaks, among other disturbance agents.</p>				
Wildfire Boulder Hill, 2,480 acres total	2000	See GIS Map	Warm Springs Cumulative Effects Analysis Area Boulder Hill: <u>537 acres</u> Total 537 acres	By HUCs Total: 0 acres
<p>Air Quality: No Effect Fisheries: Effects to fish and fish and fish habitat from all past activities addressed as a function of current sediment levels in streams as discussed in the fishery report. Habitats of Special Concern: This fire would have provided an additional snag resource Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: Effects from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the hydrology report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources.</p>				

Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations.

Range: No effect

Recreation/Scenery: No effect

Soils: No effects. The Boulder Hill Fire did not coincide with the proposed treatment units.

Transportation: No significant impacts to the transportation system.

Wildlife: This wildfire resulted in variable conditions, accounted for in the existing condition. It added to a mosaic of structures and age classes, and lowered fuels, on the landscape to a relatively small degree. It is located in the Prickly Pear herd unit. Since there are no treatments proposed in hiding cover in the Prickly Pear herd unit, there are no cumulative effects relative to hiding cover. The Warm Springs habitat enhancement project will result in some stands resembling early seral conditions. This will result in a loss of habitat for species that utilize mature forests and it may create movement barriers for species that need mature forests for travel. From that aspect, the Project will add incrementally to the Boulder Hill fire.

General Overview Of The Effects From Vegetation Treatment Activities 1960- Present Intermediate Harvest, Regeneration Harvest, And Fuels Activities

Fire/Fuels: Effects to fire/fuels depend on the specific treatment type and time since treatment was implemented. Vegetation treatments can reduce the potential for a surface fire to transition to a crown fire, reduce fire intensity and scorching, and diminish the ability for a crown fire to spread. These treatments can also break up tracts of contiguous timber on the landscape which increases the variety of age and structural classes which impacts how a fire burns across the landscape. Vegetation treatments that increase canopy base height and reduce canopy bulk density and surface fuels can effectively modify fire behavior. Treatments are effective for about ten years as related to potential fire behavior. Beneficial results created from vegetation treatments may only last temporarily depending on the site, as conifer regeneration under an existing overstory may increase the potential for a crown fire. The existing condition reflects the effects of these activities.

Intermediate harvests reduce stand density providing an open stand structure that can decrease the ability for crown fire to effectively spread. These treatments can also remove ladder fuels that reduce the potential for crown fire initiation. Regeneration harvests remove all or most of the overstory which eliminates the potential for crown fire. Treatment of surface fuels with prescribed fire following harvests lowers potential fire intensity and flame lengths should a wildfire occur. Fuels activities may include mechanical thinning (usually hand thinning with chainsaws) and/or prescribed fire. These actions reduce stand density, surface fuels, and ladder fuels. Application of prescribed fire reintroduces fire as an important process in ecosystems that have adapted with periodic fire.

Vegetation: The stands that have been regeneration harvested consist of pole, sapling, or seedling stands depending on the year of harvest. Areas of intermediate harvest are mature stands in a more open condition. Past harvest has added to a mosaic of forest ages and structures. Past harvest would have reduced the snag resource in some areas, and promoted live trees for snag recruitment in others. In general hazard trees would have been removed with most treatments. Wood products would also have been garnered. Recent policy has precluded harvest in old growth, but it is possible that some past harvests removed old growth. Fuels activities include prescribed burning, which would have created snags in some areas. These activities in general have resulted in more open forests and fewer small trees in areas. Prescribed fire often targeted promotion of aspen or other ecosystems components of concern (grasslands, shrublands) as well as fuel reduction. Forest conditions resulting from harvest and fuels activities are taken into account in the existing condition.

Foreseeable Future Activities for the Helena National Forest		
Activity/Project Name	Estimated Date Implementation	Scope of Activity
Helena National Forest Hazardous Tree Removal	2010	This project will reduce the public safety hazard by removing hazard trees and hazardous fuels along approximately 488 miles of currently open roads and trails (9,359 acres), and the six campgrounds and 12 administrative sites
<p>Air Quality: These activities could impact air quality however, it would be short-term.</p> <p>Fire/Fuels: Hazardous tree removal will reduce fuel loads in selected areas.</p> <p>Fisheries: Some negative effects in some locations associated with sediment delivery from roads and use of roads. Some improvements over existing conditions in some locations due to road improvements</p> <p>Habitats of special Concern: This activity may promote aspen and ponderosa pine in small narrow units, would contribute to more open conditions, and less fuels.</p> <p>Heritage: No known effects to cultural resources</p> <p>Hydrology: Proposed activities are predicted to reduce net sediment delivery to streams from HNF management activities (e.g. roads, timber harvest). This is based on the assumption that chronic sediment delivery from HNF system roads would be reduced wherever treatment or hauling is planned at sediment-delivery points due to rigorous use of road BMPs.</p> <p>Lands: This activity would positively affect the lands resource by reducing the hazard to private landowners or permittees who use NFS roads to access their property or permitted area of use.</p> <p>Noxious weeds: These activities could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially.</p> <p>Minerals: No effects to mineral resources.</p> <p>Range: Positive effect to the range resource</p> <p>Recreation: The removal of hazard trees from developed recreation and administrative sites would meet FS policy direction and reduce risks to visitors. Removal of hazard trees along Forest roads would also minimize future road maintenance costs. Hazard tree removal adjacent to roads may increase travel violations and facilitate development of new dispersed campsites.</p> <p>Scenery: Due to the condition (dead and dying) of trees proposed for removal, results will be similar, with or without implementation of the proposed project. The effects of proposed treatments will vary in duration and intensity depending upon site-specific conditions. It is anticipated that the short term effects of cut stumps and slash will diminish over time. Long term, accelerated regeneration of the under-story will result, creating species diversity and increased variety in color and texture to the landscapes.</p> <p>Soils: No effects to the Warm Springs project area.</p> <p>Transportation: No impacts from the Hazardous Tree Removal project to the road system located within the Warm Springs project area.</p> <p>Vegetation: The action may have the effect of removing hazardous trees on a strip on either side of open roads. Combined with past treatments, the Action Alternatives increase resilience at a greater scale. This occurs to the greatest extent with Alternatives 2 and to a lesser extent with Alternative 3.</p> <p>Wildlife: The Warm Springs Project would add incrementally to the Forest-wide Hazard Tree Removal Project since the Warm Springs Project would remove xx acres of hiding cover in the Sheep Creek herd unit.</p>		

On-going Activities for the Warm Springs Project Cumulative Effects Analysis Area		
Activity/Project Name	Date of Implementation	Scope of Activity
Clancy Unionville	Ongoing	This project focuses on restoration of grasslands and open savannah areas with hand treatments and prescribed fire, as well as regeneration harvests in MPB-killed lodgepole stands and intermediate harvests in stands with a Douglas-fir component.
<p>Air Quality: No Effect</p> <p>Fire/Fuels: This project includes harvest (same as general effects for harvest activities) and hazardous fuels activities, namely slashing conifer encroachment in grasslands, removing ladder fuels (conifer regeneration), and prescribed fire. These changes will reduce the potential for a surface fire to transition to a crown fire.</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p> <p>Habitats of special Concern: This project focuses on restoration of grassland and open savannah areas with hand treatments and prescribed fire, as well as regeneration harvests in MPB-killed lodgepole stands and intermediate harvests in stands with a Douglas-fir component. No cumulative impact, other than increasing the resiliency of stands that may become old growth someday.</p> <p>Heritage: No known effects to cultural sites on FS property</p> <p>Hydrology: Potential for short-term impacts to water quality from unit treatments and road decommissioning, and long-term improvement in water quality/Hydrology conditions due to road decommissioning.</p> <p>Lands: No effect</p> <p>Minerals: No effects to mine sites on FS property</p> <p>Noxious weeds: These activities could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially.</p> <p>Range: No effect to the range resource within the Warm Springs project area.</p> <p>Recreation: This activity impacted wheeled motorized travel in the project area. It reduced opportunities for wheeled motorized travel</p> <p>Soils: No effects. These activities do not coincide with proposed vegetation treatment units.</p> <p>Vegetation: Same as general effects of past harvest and fuels treatments.</p> <p>Transportation: Harvest activities may create temporary roads to access the timber and haul the timber off site. Additional traffic to the transportation system may increase the amount of maintenance required.</p> <p>Wildlife: The Warm Springs project will remove goshawk foraging habitat and elk habitat. Therefore the Project will add incrementally to wildlife impacts associated with the Clancy Unionville project; however, the herd units associated with the Project do not overlap with the Clancy Unionville project area. The Project will also add to the impacts to animal movement. Clancy Unionville implementation will impact the habitat of goshawk habitat. Elk security would expand (due to road closures) however some hiding cover will be removed. The local goshawk population would not decline as a result of timber harvest and will remain in accordance with applicable management guidelines. This Project may also impact animal movement.</p>		
Timber Harvest on Private Lands	On-going	Unspecified acres; primarily tractor logging
<p>Air Quality: These activities could impact air quality however, it would be short-term.</p> <p>Fire/Fuels: Same as general effects of harvest activities (intermediate and regeneration harvest).</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p>		

<p>Habitats of Special Concern: Harvest is ongoing on private ground primarily in response to the MPB. Intermediate harvest areas are or would add to the mosaic of more open mature stands on the landscape</p> <p>Heritage: No effects to cultural sites on FS property</p> <p>Hydrology: Long-term sediment delivery associated with road building and some private-land harvest practices; potential for long-term increase in peak flow and annual water yield.</p> <p>Lands: No effect</p> <p>Minerals: No effects to mine sites on FS property</p> <p>Noxious weeds: These activities could spread the existing weed populations as well as introduce new populations</p> <p>Recreation: The greatest potential for recreation effects is the impact upon game animals. Due to harvest activities, wildlife may be displaced from private land to National Forest land</p> <p>Range: No effect</p> <p>Soils: No effects. These timber harvest activities do not coincide with proposed vegetation treatment units.</p> <p>Transportation: No long-term effect to FS roads</p> <p>Vegetation: Same as general effects of past harvest and fuels treatments.</p> <p>Wildlife: Harvest is ongoing on private ground primarily in response to the MPB. Intermediate harvest areas are or would add to the mosaic of more open mature stands on the landscape. Regeneration harvest areas are or would be seedling-sized stands, adding to the mosaic of early seral forest on the landscape. The Warm Springs project would add incrementally to impacts associated with private land timber harvest especially relative to hiding cover and snag removal as well as impacting animal movement.</p>		
Grazing Activities on Private lands	On-going	Grazing of cattle, sheep and horses on private lands
<p>Air Quality: No Effect</p> <p>Fire/Fuels: Same as general effects of livestock grazing.</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p> <p>Heritage: No effects to cultural sites on FS property</p> <p>Habitats of Special Concern: No measurable effect to habitats of special concern on FS lands</p> <p>Hydrology: Impacts to riparian/wetland conditions and water quality based on trampling/grazing adjacent to streams.</p> <p>Lands: Private lands are within the scope of the lands resource. It is not expected that private land grazing would have direct impacts to the lands resource.</p> <p>Minerals: No effects to mine sites on FS property</p> <p>Noxious weeds: These activities could spread the existing weed populations as well as introduce new populations</p> <p>Range: May result in riparian vegetation, stream bank and upland impacts.</p> <p>Recreation: No effect</p> <p>Soils: No effects. These grazing activities on private land do not coincide with proposed vegetation treatment units</p> <p>Transportation: No impact to the transportation system on NFS lands</p> <p>Vegetation: Same as general effects of grazing.</p> <p>Wildlife: The Warm Springs Project will add incrementally to impacts to grasslands for the short term as a result of prescribed fire. This in turn will result in short term impacts to elk and other species that utilize grasslands.</p>		
Agricultural Use	On-going	Agricultural farming on private lands
<p>Air Quality: No Effect</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in</p>		

<p>streams as discussed in the fishery report</p> <p>Habitats of Special Concern: No measurable effect to habitats of special concern</p> <p>Heritage: No effects to cultural sites on FS property</p> <p>Hydrology: Impacts to water quality and riparian/wetland conditions from land use practices near stream channels and withdrawal of surface and groundwater for irrigation.</p> <p>Lands: No effect</p> <p>Minerals: No effects to mine sites on FS property</p> <p>Noxious weeds: These activities could spread the existing weed populations as well as introduce new populations</p> <p>Recreation: No effect.</p> <p>Range: No effect</p> <p>Soils: No effects. These land use activities do not coincide with proposed vegetation treatment units</p> <p>Transportation: No significant impact from farming to existing roads.</p> <p>Vegetation: No measurable effect to forested vegetation.</p> <p>Wildlife: No measurable effect to wildlife</p>		
Noxious Weed Treatment	On-going	Herbicide treatment is primarily along roads and in patches that are accessible to mechanized equipment, and backpack/horsepack equipment; bio-control treatment (insects), and grazing control.
<p>Air Quality: No Effect</p> <p>Fire/Fuels: Same as general effects of noxious weed treatment.</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p> <p>Habitats of Special Concern: Noxious weed spraying generally promotes sagebrush/ bitterbrush/grasslands by reducing non-native plant infestations.</p> <p>Heritage: No known effects to cultural sites on FS property</p> <p>Hydrology: Potential short-term impacts to water quality if stream set-backs are not adhered to or if spills occur.</p> <p>Lands: Herbicide treatment is a benefit to the lands resource by reducing weeds on public and private land. Herbicide applications are implemented under Forest standards</p> <p>Minerals: No effects to mine sites on FS property</p> <p>Noxious weeds: Beneficial effect in reducing/suppressing weed populations.</p> <p>Range: Potential for increased forage on suitable rangelands. Reduced spread of weeds on treated areas.</p> <p>Recreation: This activity may temporarily impact recreation opportunities and use in the project area.</p> <p>Soils: The effects of these disturbances are reflected in the existing condition of the soil resource</p> <p>Transportation: No impacts from noxious weed treatment.</p> <p>Vegetation: Same as general effects of weed spraying.</p> <p>Wildlife: No measurable effect to wildlife</p>		
Haslip Private Road	On-going	A private road special use permit issued to James and Delores Haslip that authorizes the use and maintenance of approximately 1.25 miles of private road on NFS lands.
<p>Air Quality: No Effect</p> <p>Fire/Fuels: No effect</p>		

<p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p> <p>Habitats of Special Concern: No measurable effect to habitats of special concern</p> <p>Heritage: No effect</p> <p>Hydrology: Minor cumulative effects anticipated related to light road use and consequent inability to decommission otherwise closed road.</p> <p>Lands: The road permit was issued following Forest Plan standards and does not adversely affect the lands resource.</p> <p>Minerals: No effect</p> <p>Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially.</p> <p>Range: No effect</p> <p>Recreation: No effect</p> <p>Soils: No effects.</p> <p>Transportation: No impacts to NFS road system.</p> <p>Vegetation: No measurable effect to forested vegetation.</p> <p>Wildlife: The Warm Springs Project will result in displacement to some wildlife species that are sensitive to human activities and/or avoid roads. Temporary road construction of 13.7 miles is proposed under Alternative 2. The Project will add incrementally to the disturbance associated with this ongoing activity including creating additional barriers to animal movement.</p>		
<p>Schonberg/O'Leary Private Road FLPMA Easement, Buried Utilities, and Snow Removal</p>	<p>On-going</p>	<p>Private road easement issued to Schoneberg/O'Leary that authorizes the installation of buried utilities across approximately 1.5 miles of road on NFS lands. 750ft of existing road will be relocated and the private road easement will authorize road that crosses 1.02 miles of NFS lands. Snow removal on .75 miles of forest road #226 will be authorized.</p>
<p>Air Quality: No Effect Fire/Fuels: No effect</p> <p>Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report</p> <p>Heritage: No effects</p> <p>Habitats of Special Concern: No measurable effect to habitats of special concern</p> <p>Hydrology: Minor cumulative effects anticipated related to light road use.</p> <p>Lands: The buried utility was issued following Forest Plan standards and does not adversely affect the lands resource.</p> <p>Minerals: No effect</p> <p>Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially.</p> <p>Range: No effect</p> <p>Recreation: No effect</p> <p>Soils: No effects.</p> <p>Transportation: No impacts to NFS road system.</p> <p>Vegetation: No measurable effect to forested vegetation.</p> <p>Wildlife: The Warm Springs Project will result in displacement to some wildlife species that are sensitive to human activities and/or avoid roads. Temporary road construction of 13.7 miles is proposed under Alternative 2. The Project will add incrementally to the disturbance associated with this ongoing activity including creating additional barriers to animal movement.</p>		

North Elkhorns Livestock Grazing	On-going	Livestock grazing is occurring on multiple allotments in the N. Elkhorn livestock grazing analysis area and will continue in the future.
<p>Air Quality: No Effect Fire/Fuels: Same as general effects of livestock grazing Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of Special concern: There are potential impacts to sagebrush, bitterbrush and grasslands from grazing. Action Alternatives would promote sagebrush/grasslands in proposed treatments Heritage: No known effects to cultural sites Hydrology: Impacts to riparian/wetland conditions and water quality based on trampling/grazing adjacent to streams. Lands: No effect Minerals: No effect Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially. Range: The effects of this grazing are reflected in the existing condition of the current range resources. Recreation: No effect Soils: The effects of these disturbances are reflected in the existing condition of the soil resource. Transportation: No significant impact from grazing on existing roads. Vegetation: Same as general effects of grazing. Wildlife: The Warm Springs Project will add incrementally to impacts to grasslands for the short term as a result of prescribed fire. This in turn will result in short term impacts to elk and other species that utilize grasslands.</p>		
Grazing Permit Renewals	On-going	McClellan Creek, Maupin, and Brown's Gulch Allotments
<p>Air Quality: No Effect Fire/Fuels: Same as general effects of livestock grazing Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Heritage: No known effects to cultural sites Habitats of Special Concern: Lands: No effect Minerals: No effect Range: The effects of this grazing are reflected in the existing condition of the current range resources. Hydrology: Impacts to riparian/wetland conditions and water quality based on trampling/grazing adjacent to streams. Fire/Fuels: Same as general effects of livestock grazing Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially Range: The effects of this grazing for are detailed in environmental consequences section of range resources Recreation: No effect Soils: The effects of these disturbances are reflected in the existing condition of the soil resource. Transportation: No significant impact from grazing on existing roads. Vegetation: Same as general effects of grazing.</p>		

<p>Wildlife: The Warm Springs Project will add incrementally to impacts to grasslands for the short term as a result of prescribed fire. This in turn will result in short term impacts to elk and other species that utilize grasslands.</p>		
<p>Elkhorn Mountain Ranch Grazing Permit</p>	<p>On-going</p>	<p>A grazing permit is issued to Elkhorn Mountain Ranch for the grazing of domestic livestock on the McClellan C&H allotment of the Helena Ranger District. This permit will be in effect for 10 years.</p>
<p>Air Quality: No Effect. Fire/Fuels: Same as general effects of livestock grazing Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of Special concern: There are potential impacts to sagebrush, bitterbrush and grasslands from grazing. Action Alternatives would promote sagebrush/grasslands in proposed treatments Heritage: No known effects to cultural sites Hydrology: Impacts to riparian/wetland conditions and water quality based on trampling/grazing adjacent to streams. Lands: No effect Minerals: No effects to mineral resources Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially Recreation: No effect Range: The effects of this grazing for are detailed in environmental consequences section of range resources Soils: The effects of these disturbances are reflected in the existing condition of the soil resource. Transportation: No significant impact from grazing on existing roads. Vegetation: Same as general effects of grazing. Wildlife: The Warm Springs Project will add incrementally to impacts to grasslands for the short term as a result of prescribed fire. This in turn will result in short term impacts to elk and other species that utilize grasslands.</p>		
<p>1 Special Use Permit for Agriculture Residence</p>	<p>On-going</p>	<p>use code: 223</p>
<p>Air Quality: No Effect Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of Special Concern: No measurable effect to habitats of special concern. Heritage: No known effects to cultural resources Hydrology: No cumulative effects anticipated. Lands: Special use permit was issued per Forest Plan guidance. No effects to the lands resource. Minerals: No effects to mineral resources Noxious weeds: Minor effect Recreation: No effect Soils: The effects of these disturbances are reflected in the existing condition of the soil resource. Transportation: No significant impact from farming on existing roads. Vegetation: No effect</p>		

Wildlife: No measurable effect to wildlife		
Elkhorn Mountain 50 Mile Endurance Run	On-going	The Helena Ultra Runners League used existing trails and travel routes on the Helena National Forest to host the annual "Elkhorn Mountain 50 Mile Endurance Run".
<p>Air Quality: No Effect Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of Special Concern: No measurable effect to habitats of special concern. Heritage: No effects to cultural sites on FS property Hydrology: No cumulative effects anticipated. Lands: No effect Minerals: No effects to mine sites on FS property Noxious Weeds: No effect. Range: No effect Recreation: No effect Soils: No effect Transportation: No significant impact from runners on existing roads and trails Vegetation: Wildlife: No measurable effect to wildlife</p>		
Marks Ranch Private Road FLMPA Easement and Buried Utilities	On-going	An easement and permit is issued to Marks Ranch that authorizes the installation, use, and maintenance of approximately 3000 ft of road on NFS lands. .17 miles of new road would be constructed and .2 miles of abandoned road would be obliterated.
<p>Air Quality: No Effect Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of Special Concern: No measurable effect to habitats of special concern. Heritage: No effects Hydrology: Minor cumulative effects anticipated related to light road use and consequent inability to decommission otherwise closed road. Lands: The easement and road permit were issued following Forest Plan standards and does not adversely affect the lands resource. Minerals: No effects Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially Recreation: No effect. Range: No effect Transportation: No impacts to NFS road system. Vegetation: No measurable effect to forested vegetation. Wildlife: The Warm Springs Project will result in displacement to some wildlife species that are sensitive to human activities and/or avoid roads. Temporary road construction of 13.7 miles is proposed under Alternative 2. The Project will add incrementally to the disturbance associated with this ongoing activity including creating additional barriers to animal movement.</p>		

Prickly Pear Creek Private Access and Utilities	On-going	Authorized use of existing forest roads and Prickly Pear Creek Drainage for access to private lands within the HNF. This would also include the installation of buried electrical lines across 130 ft of NFS lands.
<p>Air Quality: No effect Fire/Fuels: Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of special Concern: No measurable effect to habitats of special concern Heritage: No effects Hydrology: Minor cumulative effects anticipated related to light road use and consequent inability to decommission otherwise closed road. Lands: The buried utility was issued following Forest Plan standards and does not adversely affect the lands resource. Minerals: No effects Noxious weeds: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially. Range: No effect Recreation: No effect Soils: No effect Transportation: A slight increased use of existing roads could lead to minimal maintenance increase. This is accounted for in the road use permit. Vegetation: No measurable effect to forested vegetation. Wildlife: The Warm Springs Project will result in displacement to some wildlife species that are sensitive to human activities and/or avoid roads. Temporary road construction of 13.7 miles is proposed under Alternative 2. The Project will add incrementally to the disturbance associated with this ongoing activity including creating additional barriers to animal movement.</p>		

Past Activities for the Warm Springs Project Cumulative Effects Analysis Area		
McClellan Creek Trail Reconstruction	June-1998	Construction and reconstruction of the southern sections of McClellan Creek Trail #302 took place. Work included installation of water bars, construction of switch backs, and rehabilitation of tread.
<p>Air Quality: No effect Fire/Fuels: No effect Habitats of special Concern: No measurable effect to habitats of special concern Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations.</p>		

<p>Range: No effect. Recreation: The project improved access to National Forest lands and recreation opportunities. Soils: No effect Transportation: The effects of these disturbances are reflected in the existing condition Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Montgomery Park Trail Reconstruction</p>	<p>January-1997</p>	<p>Construction and reconstruction on Montgomery Park Trail #301. About 4595 ft of trail was relocated and constructed, 395 ft of turnpiking was constructed, and about 20 water bars were installed.</p>
<p>Air Quality: No effect Fire/Fuels: No effect Habitats of special Concern: No measurable effect to habitats of special concern Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations. Range: No effect. Recreation: The project improved access to National Forest lands and recreation opportunities Soils: No effects. Trail reconstruction activities do not coincide with proposed vegetation treatments. Transportation: The effects of these disturbances are reflected in the existing condition Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Montgomery Park Trail Reconstruction</p>	<p>July-1995</p>	<p>Construction/reconstruction of Montgomery Park Trail #301 on 15,180 ft of trail and 4 new trail segments totaling 3,385ft were constructed.</p>
<p>Air Quality: No effect Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Habitats of special Concern: No measurable effect to habitats of special concern Heritage: The effects of these disturbances are reflected in the existing condition of the cultural resources Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations.</p>		

<p>Range: No effect Recreation: The project improved access to National Forest lands and recreation opportunities Soils: No effects. Trail reconstruction activities do not coincide with proposed vegetation treatments. Transportation: The effects of these disturbances are reflected in the existing condition Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Elkhorn Search and Rescue Snowmobile Event</p>	<p>November-1992</p>	<p>The Elkhorn Search and Rescue Unit was issued a special use permit to hold a snowmobile fundraising event that was held on NFS lands administered by the Helena Ranger District. This event was authorized for the next five years with this permit.</p>
<p>Air Quality: No long-term effect Fire/Fuels: No effect Habitats of special Concern: No measurable effect to habitats of special concern Heritage: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Lands: No effect Minerals: The effects of these disturbances are reflected in the existing condition of the mineral resources Noxious weeds: Minor effect. Range: No effect Recreation: This activity approved recreation use as authorized by permit Soils: No effect Transportation: No long term effect Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Barrett Productions Commercial Video Filming</p>	<p>November-2002</p>	<p>Barrett Productions was issued a temporary special use permit that authorized short-term filming of big game hunting on HNF lands in the Elkhorn Wildlife Management Unit.</p>
<p>Air Quality: No effect Fire/Fuels: No effect Habitats of special Concern: No measurable effect to habitats of special concern Heritage: No effect Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Lands: No effect Minerals: No effects</p>		

<p>Noxious weeds: The effects of these disturbances are reflected in the existing condition of the current weed infestations. Range: No effect Recreation: No effect Soils: No effect Transportation: No long term impact from this activity on existing roads and trails. Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Black White & Color, Inc. Commercial Still Photography</p>	<p>May-2002</p>	<p>Black White & Color Inc. was issued a special use permit that authorized short term commercial still photography along a particular segment of the Prickly Pear Creek Road in the Elkhorn Mountains.</p>
<p>Air Quality: No effect Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Heritage: No effect Habitats of special Concern: No measurable effect to habitats of special concern Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Lands: No effect Minerals: No effects Noxious weeds: Minor effect. Range: No effect Recreation: No effect Soils: No effect Transportation: No long term impact from photography crew on existing roads and trails. Vegetation: No measurable effect to forested vegetation. Wildlife: No measurable effect to wildlife</p>		
<p>Spring Hill Land Exchange</p>	<p>March-2007</p>	<p>1.44 acres of federal land described as the Federal Lands in the EA, to the Montana History Foundation, was exchanged for approximately 116.841 acres of land owned by Prickly Pear Land Trust Inc. in a three party exchange.</p>
<p>Air Quality: No effect. Fire/Fuels: No effect Fisheries: Effects to fish and fish and fish habitat from all past and ongoing activities addressed as a function of current sediment levels in streams as discussed in the fishery report Heritage: No effect Habitats of special Concern: No measurable effect to habitats of special concern Hydrology: Effects to water quality and riparian/wetland conditions from all past activities is addressed in general terms in the Hydrology Specialist Report Lands: Land exchanges are executed under Forest Plan standards and do not have negative or positive effects to the lands resource.</p>		

Minerals: No effects
Noxious weeds: No effect.
Range: No effect
Recreation: This project may have displaced existing recreation use off private land while creating new opportunities on the National Forest.
Soils: No effect
Transportation: Increased road mileage could lead to a very slight increase in maintenance costs.
Vegetation: No measurable effect to forested vegetation. The condition of acquired lands is taken into account in the existing condition for these areas.
Wildlife: No measurable effect to wildlife. The condition of acquired lands is taken into account in the existing condition for these areas.

Table B-2 Forest-wide Sensitive Plants Cumulative Effects

Foreseeable Future Activities for the Townsend District -		
Activity/Name	Estimated Implementation	Scope of Activity
Teague Ranches Ditch Bill Easements CE		Issuance of easements for water storage and conveyances systems that qualify under authority of the Ditch Bill (P.L 99-545). Pickfoot and Atlanta Creeks.
Sensitive Plants: It is unlikely that there are cumulative impacts with this activity. These developments are in place and would not likely adversely impact any sensitive plant populations. Sensitive plants have not been found in these areas in past surveys.		
Grassy Mountain Vegetation Project	2011	Approximately 3,832 acres for intermediate harvest, hand-thinning, and prescribed fire east of Grassy Mountain in the southern Big Belts. A portion of the project area has been identified as Wildland-Urban Interface (WUI) by the Meagher County Community Wildfire Protection Plan.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Grassy/Deep Creek Cattle and Horse AMP Revision	2011	Revise AMP written in 1968 and 1969.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

Cabin Gulch Vegetation Project	2010-2011	The proposed project includes regeneration harvest, intermediate harvest, hand-thinning,, and prescribed fire on approximately 3,315 acres in the project area. The project is designed to restore fire-adapted ecosystems, reduce the potential for stand-replacing fire, and improve water quality in the project area.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

Foreseeable Future Activities for the Helena District		
Activity/Name	Estimated Implementation	Scope of Activity
Holiday Private Access	2011	Special use application requesting access to private land. An exchange of reciprocal easements is possible.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site, although sensitive plants are know from other areas in the Telegraph drainage.		
Skelton Private Access	11/2010	Special use application requesting private access to two separate tracts of private land. An exchange of reciprocal easements will be required, thus allowing the public access to adjacent NFS lands.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Telegraph Creek Road Conveyance	12/2010	Conveyance of ROW easement to Powell County of isolated segments of Forest Development Road #495.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Sensitive plants have been found on sections of road #495, but not in Section 29.		
Elliston Vegetation Project	On Hold	This project area is located in the wildland-urban interface directly south of the community of Elliston and will utilize a variety of silvicultural tools including mechanical harvest, hand-thinning with chainsaws, and prescribed fire on approximately 763 acres.
Sensitive Plants: No cumulative impact		
Telegraph Vegetation Project	2011	The proposed project includes regeneration harvest, intermediate harvest, and prescribed fire on approximately 6,300 acres in the project area. In response to mountain pine beetle outbreaks, objectives include recovering economic value of dead and dying trees, promoting desirable regeneration, and maintaining diverse wildlife habitats. A portion of the project area is classified as Wildland-Urban Interface.

Sensitive Plants: There are known populations of <i>Juncus hallii</i> in this project area. Those populations have been identified and will be protected from ground disturbing activities and herbicide application. Cumulative effects would be likely be minimal with the proposed design criteria and mitigation for this project.		
Austin Grazing Reauthorization	2011	Grazing continued on the Austin Allotment. The Austin Cattle and Horse Allotment located west of Helena in the area known as Blue Cloud.
Sensitive Plants: Minor effect		
Empire Grazing Reauthorization	2011	Grazing continued on the Empire Allotment. The Empire Cattle and Horse Allotment is located north west of Helena in the Bald Butte and Lost Horse Creek area.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
MacDonald Pass Grazing Reauthorization	2011	Grazing continued on the MacDonald Pass Allotment. The MacDonald Pass Cattle and Horse Allotment is located west of Helena along the Continental Divide at MacDonald Pass.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Divide Travel Plan EIS	2011	Travel management analysis covering summer and winter motorized use. The Divide Travel Planning Area includes approximately 155,500 acres of National Forest System lands. The area encompasses Black Mountain and extends to the Tenmile Drainage and Little Blackfoot and Bison Mountain Areas.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
MacDonald Pass Ski Trail Hazard Tree Removal	On Hold	Remove dead and/or dying trees along each side of the ski trails in specific locations for a distance of one and one-half tree lengths (90 to 120 ft) totaling 180 acres.
Sensitive Plants: It is unlikely that there would be cumulative effects with this project. The area was surveyed in 2010 and no sensitive plants were found. Numerous wetlands were found, which is the highest potential habitat for sensitive plants. Those areas would be protected from ground disturbance and provide protection for any sensitive plants that may occur.		

Foreseeable Future Activities for the Lincoln District -		
Estimated Implementation	Estimated Implementation	Estimated Implementation
Blackfoot - North Divide Winter Travel Planning	2011	Travel management plan that will provide for a variety of motorized and non-motorized winter recreation opportunities. Lincoln Ranger District. - (except Scapegoat Wilderness) & approx. 30,000 acres NW of Helena RD.
Sensitive Plants: The activities addressed occur on known roads and trails that are existing on the Lincoln RD, on frozen or snow covered ground generally. Any known plant populations would be protected from disturbance from winter activities.		

Blackfoot Travel Plan (non-winter)	2011	Travel Management analysis for non-winter motorized use. Lincoln Ranger District. Excluding the Scapegoat Wilderness
Sensitive Plants: Cumulative effects would likely be minimal. The activities addressed occur on known roads and trails that are existing on the Lincoln RD. Any effects from road decommissioning to known plant populations would be mitigated to avoid any possibility of a species being listed.		
Helena National Forest Plan Amendment - Management Area Designation	2011	Assign management area designation for land purchased in 2006 from the Nature Conservancy.
Sensitive Plants: There is no cumulative impact from this activity.		
Lincoln Rip Rap	2011	Utilize local areas on Lincoln Ranger district Forest Service lands to provide economically viable amounts of quality riprap for fisheries river restoration.
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in these areas.		
Lincoln Compound Sanitation Salvage	12/2010	Removal of dead and dying trees on 160 acres both north and south of Highway 200.
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in this area.		
Stonewall Vegetation Project	2012	This project is located in Lewis and Clark Counties northwest of Lincoln and includes approximately 8,600 acres. Objectives include improving resiliency to insects and fires, modifying fire behavior, recovering economic value of timber, and enhancing aspen, western larch, and ponderosa pine habitat. A portion of the project area is classified as Wildland-Urban Interface.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

On-going Activities for the Townsend District

Activity/Project Name	Date of Implementation	Scope of Activity
Benton Gulch Placer Exploration/John Zawada	6/2010	Sampling of placer materials. East side of the Big Belt Mtns. in Benton Gulch.
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in these areas.		
Bigler Lode Mine Sampling	7/2010	Underground mining would drift 50-60 feet and produce 150 tons of waste rock that would be used to fill exploration pit in the area. Gypsy Lake, east side of the Belt Mtns.
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in these areas.		
Cement gulch sample drilling	6/2010	Exploration of mineral deposit in the Cement Gulch area . Drilling of 15 holes to a depth of 500 ft. Some small diameter trees would be removed. Top of Cement Gulch in the Big Belts on the Townsend Ranger District.
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in these areas.		
SCB#1	6/2010	Mining on a placer claim. Townsend Ranger District. Meagher County. T10N;

		R03E; section 06.Benton Gulch in the Big Belts
Sensitive Plants: There is no cumulative impact from this activity. There are no known sensitive plant populations in these areas.		
South Belts Road Closure Prescriptions CE	9/2010	Determine the method of road closures in compliance with the S. Belts Travel Plan. Townsend Ranger District. Broadwater County. Southern Belt Mountains
Sensitive Plants: There is no cumulative impact from this activity. There are known sensitive plant populations near the disturbance, but no known plant populations in the specific area of disturbance.		
South Belts Travel Implementation	On-going	South Belts Travel Plan Implementation
Sensitive Plants: Minor effect		
Ray Creek Grazing allotment	On-going	Reauthorization of grazing using an adaptive management strategy.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Past Timber Harvest on Private Lands	On-going	Unspecified acres; primarily tractor logging
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations.		
Grazing Activities on Private lands	On-going	Grazing of cattle, sheep and horses..
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Agricultural Use	On-going	Agricultural farming, primarily irrigated hay and wheat operations, on private lands within all watersheds
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Deep Creek Picnic Area	On-going	Reopened in 2005 Day use only. 5/15 – 10/15.
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Deep Creek Hazard Fuels	2004-present	Hand thinning (chainsaws) and burning on 720 acres north of Highway 12.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Frank Flynn Memorial Cabin	On-going	Recreation special use permit. Over-night use April – November.
Sensitive Plants: Minor effect		
Grassy Mountain Lodge	On-going	Outfitter and guide special use permit for non-consumptive use, horseback and camping trips (6/1 – 9/1).
Sensitive Plants: Minor effect		
Montana High Country Cattle Drive	On-going	Recreation special use permit for cattle drive in Dry Creek, Ridge Road area. June – August. Three drives per season.
Sensitive Plants: Minor effect		
Livestock Grazing Permits	On-going	S. Belts area includes 10 allotments; 1 sheep and all others cattle.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Lundborg Cabin		Cabin conveyed to FS but not yet in rental program.
Sensitive Plants: Minor effect		
Mining Activity	On-going	permitted mining activity in the S. Belts in recent years, limited to hand work.

Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Noxious Weed Treatment	On-going	Herbicide treatment, backpack/horsepack equipment; some biocontrol treatment (insects), grazing control (sheep), and mechanical.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Rams Horn Outfitting	On-going	Outfitter and guide special use permit for big game and spring bear seasons; overnight camp in Birch Creek basin with access from Edith Lake trailhead.
Sensitive Plants: Minor effect		
Rillway Rental Cabin	On-going	Cabin is on FS rental system. Year-round overnight use.
Sensitive Plants: Minor effect		
Road Maintenance	Annual	Grading and spot-gravelling performed on approx. 25 miles of roads in the S. Belts annually.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Skidway Campground	On-going annual use and maintenance	Developed recreation site, overnight use. Season of use 5/15 – 11/15.
Sensitive Plants: Minor effect		
Sun Mountain Logging Road Permit	2005 – 2007	Permits log haul on approx. ¼ mile of FS road; approx. 21 mbf of timber from private land.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
South Belts Winter Travel Plan	Implementation on-going	Includes travel decision for the period 12/2-5/15 for roads and areas in the South Belts Travel area (Mt. Boulder Baldy south to Dry Creek, 130,000 acres).
Sensitive Plants: Minor effect		
Private Land Watershed Restoration Plan	On-going	Plan developed jointly with FS; most recommended projects are on private land, addressing private land practices.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Private Land Development	On-going	Development for housing in several areas, including W. Flanks of Belts, along Deep Creek, at Grassy Mountain Subdivision.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
6 Special Use Permits for Outfitter and Guide	On-going	Use code: 153
8 Special Use Permits for Livestock Area	On-going	Use code: 215
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

5 Special Use Permits for Powerline	On-going	Vigilante Electric Coop. Inc., Northwestern Corporation, and Western Tele-communications. (use code: 643)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for DOT Easement	On-going	Department of Transportation (use code: 741)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
5 Special Use Permits for Federal Land Policy & Mgmt Act Permit	On-going	use code: 753
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
2 Special Use Permits for Microwave-Industrial	On-going	Northwestern Corporation and Gallatin County 911 communications (use code: 804)
Sensitive Plants: Minor impact		
1 Special Use Permit for Private Mobile Radio Service	On-going	Vigilante Electric Coop. Inc. (use code: 806)
Sensitive Plants: Minor effect		
1 Special Use Permit for Irrigation Water Trans Pipeline<12”D	On-going	Timothy L. Page (use code: 913)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Water Trans Pipeline<12”D	On-going	Teague Ranches Inc. (use code: 915)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Dam, Reservoir	On-going	Teague Ranches Inc. (use code: 922)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
South Belts Travel Implementation	On-going	Gates, sign installation, and road closures.
Sensitive Plants: Minor effect if no ground disturbance occurs		
Trail Maintenance	On-going	
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Wagner/Atlanta Veg. Treatments	On-going	Slashing of encroachment and burning.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

Crow Creek Veg.Treatments	On-going	Slashing of encroachment and burning.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Raptor View Research Study	On-going	Grassy mountain
Sensitive Plants: No impact		
Private special use permit (James Chrichton)	On-going	private land access (use code 753)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

On-going Activities for the Helena District		
Activity/Project Name	Date of Implementation	Scope of Activity
Radar Placer	2010-ongoing	Sample 20 holes 6x20x8 deep with a backhoe over a 3 year period; test for gold with a metal detector and refill. Ophir Creek area below Cayuse Springs on the Helena National Forest.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past and in 2010. Sensitive plants have not been found on these sites.		
Timber Harvest – Private Lands	On-going	Unspecified acres; primarily tractor logging
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Grazing Activities on Private lands	On-going	Grazing of cattle, sheep and horses.
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Agricultural Use	On-going	Agricultural farming, on private lands within all watersheds
Sensitive Plants: These activities could spread the existing weed populations as well as introduce new populations		
Clancy Grazing AMP	2010-Ongoing	Proposed reauthorization of grazing using an adaptive management strategy.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Clancy Unionville	Ongoing	Implement Travel planning component and proceed with vegetation management components including timber harvests and fuels treatments
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Park Lake Hazard Tree Removal	On-going	Removal of dead and dying lodgepole pine trees on approximately 30 acres in Park Lake campground and day use area.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Noxious Weed Treatment	On-going	Herbicide treatment along roads and in patches that are accessible to mechanized equipment, backpack/horsepack equipment; some biocontrol treatment (insects), grazing control (sheep), and mechanical.

Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Road Maintenance	Annual	Grading and spot-gravelling performed on approx. 25 miles of roads in the S. Belts annually.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Pike Aspen Improvement and Restoration Project	On-going	Apprx. 4 acres of aspen will be fenced to promote aspen regeneration. Fence height is between 6 and 7 feet in order to exclude domestic and native ungulates. Small diameter conifers will be removed, lopped, and scattered.
Sensitive Plants: Minor effect.		
Elkhorn Mountain 50 Mile Endurance Run	On-going	Use existing trails and travel routes on the Helena National Forest to host the annual "Elkhorn Mountain 50 Mile Endurance Run".
Sensitive Plants: No effect		
Tri Arab Horse Club Judged Trail Ride	On-going	The Tri Arabian Horse Club of Helena two day Tri-Arab Horse Club judged trail ride.
Sensitive Plants: Minor effect		
"Dirt Divas Mountain Bike Clinic"	On-going	A Special Use Permit issued to the Great Divide Cyclery to hold a one day mountain bike clinic for up to 100 participants and spectators. on existing trails and old wheel tracks, on city and forest lands in the Helena South Hills.
Sensitive Plants: Minor effect		
York 38 Special Mountain Bike Adventure Ride	On-going	Special Use Permit issued to the York Volunteer Fire Department to hold a one day mountain bike ride for up to 200 participants and spectators for 5 years.
Sensitive Plants: Minor effect.		
Gerleman Privately Owned Residence	On-going August	A special use permit was reauthorized for occupancy of NFS land by a privately owned residence on NFS lands in Orofino Gulch.
Sensitive Plants: Minor effect		
American Bar Hazardous Fuel Reduction	On-going	Hazardous fuel reduction in the American Bar and Cochran Gulch. The project consists of chain saw thinning around large trees (200 acres), hand piling brush in areas of heavy fuel accumulation to be burned individually (125 acres), and utilizing low impact prescribed fire techniques to achieve the desired results (60+ acres).
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
"Don't Fence Me In" 10K Run - 4K Walk	On-going (annual)	Prickly Pear Land Trust will be authorized to use the existing trails and travel routes on the HNF to hold the "Don't Fence Me In 10K run and 4K walk".
Sensitive Plants: No effect		
Zucconi Private Road and Utilities	On-going	Construction of approximately 290 ft of private road on NFS land. In addition, utilities may be buried across the same lands within the road right-of-way.

Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Wilson Private Road and Utilities	On-going 07/2002	Authorized use of approximately 1200 ft of private road on NFS lands. Utilities may be buried within the same right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Joehler Private Road and Utilities	On-going 06/2002	Authorized construction/reconstruction of approximately 25 ft of private road on NFS lands. Utilities buried across approximately 75 ft. on NFS land.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Strachan Satellite Dish	On-going 03/2002	Special use permit that authorizes construction, use, and maintenance of the privately owned improvement. The lead in wire crosses roughly 300 ft of NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Andersen private Road and Utilities	On-going	Private Road Special Use Permit authorizes the reconstruction, use, and maintenance of right-of-way. Approx. 200 ft of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Kerner Private Road	On-going	Private Road Special Use Permit that authorizes the reconstruction, use, and maintenance of this right-of-way. Approximately 3000 ft of private road on NFS lands. Public motorized use will be prohibited on this right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Skinner Private Road	On-going	Private Road Special Use Permit that authorizes the reconstruction, use, and maintenance of this right-of-way. Approximately 1800 ft of private road on NFS lands. Public motorized use will be prohibited on this right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Senecal Private Road	On-going	Private Road Special Use Permit that authorizes the use, and maintenance of this right-of-way. Approximately 520 ft of private road on NFS lands. Public motorized use will be prohibited on this right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Baum Ranch Private Road	On-going	Private Road Special Use Permit that authorizes the reconstruction, use, and maintenance of this right-of-way. Approximately 2300 ft of private road on NFS lands. Public motorized use will be prohibited on this right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Nelles Private Road Use	On-going	Special Use Permit that authorizes motorized wheeled use, and maintenance

		of this right-of-way from April 1- Nov. 30. Approximately 3 and ½ miles of NFS road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Dangerfield Private Road	On-going	Private Road Special Use Permit that authorizes the reconstruction, use, and maintenance of this right-of-way. Approximately 1550 ft of private road on NFS lands. Public motorized use will be prohibited on this right-of-way.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Lewis & Clark County Sheriff's Office Radio Repeater	On-going	The Lewis & Clark Sheriffs Office will be issued a short-term special use permit that allows them to operate a repeater. The installation of this repeater will improve Lewis & Clark County communications along the east shore of Canyon Ferry Reservoir and in the York area.
Sensitive Plants: Minor effect		
McMahon Private Road	On-going	Private road easement that authorizes the use and maintenance of this right-of-way located in the Moose Creek Drainage. Approximately 2940 ft of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Qwest Buried Telephone - Unionville #2 Line-	On-going	Special use permit to install a buried telephone line across approximately 4670 ft of NFS lands. Following installation the permit will be terminated and the new line will be added to the permittee's master special use permit
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Haslip Private Road	On-going	A private road special use permit that authorizes the use and maintenance of approximately 1.25 miles of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Hunter Private Road and Snow Removal	On-going	A private road special use permit that authorizes the reconstruction, use, and maintenance of approximately 940 ft of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Goodspeed Private Road	On-going	A private road special use permit that authorizes the reconstruction, use, and maintenance of approximately 265 ft of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Montana Power Company Hauser Dam Substation	On-going	A special use permit issued to the Montana Power Company that authorizes a power substation on NFS lands in the Hauser Dam area.

Sensitive Plants: Minor effect		
Montana Power Company Buried Power Line/ Airport-Armory Extension	On-going	Special use permit that authorizes the installation, use, and maintenance of a 7.2 kV buried power line on NFS lands in the vicinity of Montana Army National Guard Facility located within the boundary of the Helena Regional Airport.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Bell Private Road	On-going	A private road special use permit that authorizes the reconstruction, use, and maintenance of approximately 660 ft of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Montana Power Company Buried Power Line	On-going	Special use permit that authorizes the installation, use, and maintenance of a 12.5kV buried power line on NFS lands within an existing road in Lost Horse Creek Drainage.
Sensitive Plants: Minor effect		
Larson and Bennett Special Use Private Roads	On-going	Authorization to reconstruct, use, and maintain 345 ft of private road across NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Touch America, Inc. Fiber Optic Installation	On-going	Authorization to install, use, and maintain six underground 2 inch fiber optic ducts, once duct installed with a fiber optic cable, on lands administered by the Helena Ranger District.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
O&F Landowner's Association Special Use Private Road	On-going	A private road special use permit that authorizes the reconstruction, use, and maintenance of approximately 1 mile of private road on NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Montana Power company's Rainbow 100kv Aerial Power Lines	On-going	Montana Power Company has been authorized to repair and rehabilitate aerial power lines across 9 miles of NFS lands.
Sensitive Plants: Minor effect		
Schonberg/O'Leary Private Road FLPMA Easement, Buried Utilities, and Snow Removal	On-going	A private road easement that authorizes the installation of buried utilities across approximately 1.5 miles of road on NFS lands. 750ft of existing road will be relocated and the private road easement will authorize road that crosses 1.02 miles of NFS lands. Snow removal on .75 miles of forest road #226 will be authorized.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Marks Ranch Private Road FLMPA	On-going	An easement and permit that authorizes the installation, use, and maintenance

Easement and Buried Utilities		of approximately 3000 ft of road on NFS lands. .17 miles of new road will be constructed and .2 miles of abandoned road will be obliterated.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Beaver-Soup Livestock Grazing	On-going	Livestock grazing is occurring on multiple allotments in the Beaver-Soup livestock grazing analysis area and will continue in the future.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
North Elkhorns Livestock Grazing	On-going	Livestock grazing on multiple allotments in the N. Elkhorn livestock grazing analysis area and will continue in the future.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Squaw Gulch Road Construction, Use and Maintenance	On-going	A special use permit that authorizes the construction use, and maintenance of approximately 2000 ft of private road on NFS lands and improvement of 1 mile of existing road in this gulch.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Helena Lions Sunshine Camp Special Use Permit	On-going	Permit renewal for Sunshine Camp. Special use permit valid since 1943.
Sensitive Plants: Minor effect		
Prickly Pear Creek Private Access and Utilities	On-going	Authorized use of existing forest roads and Prickly Pear Creek Drainage for access to private lands within the HNF. Includes the installation of buried electrical lines across 130 ft of NFS lands.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Grazing Permit Renewals	On-going	The renewal of grazing permits for the Hat Creek and Ophir-Hope C&H allotments, Ten-Mile Priest Pass C&H allotment.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
BR Cattle Company Permit Issuance	On-going	Grazing of domestic livestock on the Spring Gulch C&H allotment
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Elkhorn Mountain Ranch Grazing Permit	On-going	Grazing of domestic livestock on the McClellan C&H allotment.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
John Vincent Permit Issuance	On-going	Grazing of domestic livestock on the McQuithy-Bear Trap C&H allotment

Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Marks Ranch Permit Issuance	On-going	Grazing of domestic livestock on the Clancy C&H allotment
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
ZHZ LLP/Forest Service exchange of Road Easements and New Road Construction	On-going 12/2008	Easement exchange: Authority to construct, operate, and maintain a road to a year-round residence, in exchange for administrative and public access across existing roads.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
1 Special Use Permit For A Club	On-going	Travis Creek Community Association (use code: 112)
Sensitive Plants: Minor effect		
1 Special Use Permit For An Organization Camp	On-going	Helena Lions Club (use code: 113)
Sensitive Plants: Minor effect		
9 Special Use Permits For Isolated Cabins	On-going	use code: 121
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
11 Special Use Permits For Recreation Residence	On-going	use code: 123
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit For Campground And Picnic Ground	On-going	Grand Lodge A.F. and A.M. of Montana (use code: 141)
Sensitive Plants: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially		
1 Special Use Permit For A Target Range	On-going	Prickly Pear Sportsman's Association (use code: 146)
Sensitive Plants: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially		
1 Special Use Permit For A Recreation Event	On-going	York Fire Service Area (use code: 149)
Sensitive Plants: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMPs populations should not expand substantially		
1 Special Use Permit For Outfitter And Guide	On-going	Gates of the Mountains Inc. (use code: 153)
Sensitive Plants: Minor effect		

2 Special Use Permits for Cultivation	On-going	use code: 211
Sensitive Plants: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMPs populations should not expand substantially		
11 Special Use Permits for Livestock Area	On-going	use code: 215
Sensitive Plants: This activity could spread the existing weed populations as well as introduce new populations, but with implementation of BMP's populations should not expand substantially		
1 Special Use Permit for Fence	On-going	State of MT; Dept. of Transportation (use code: 222)
Sensitive Plants: Minor effect		
1 Special Use Permit for Agriculture Residence	On-going	Robert L. Marks (use code: 223)
Sensitive Plants: Minor effect		
1 Special Use Permit for Monument	On-going	Grand Lodge A.F. and A.M. of Montana (use code: 332)
Sensitive Plants: Minor effect		
1 Special Use Permit for Liquid Waste Disposal Area	On-going	Stewart & Jeanette Ditchey
Sensitive Plants: Minor effect		
4 Special Use Permits for Residence, Privately-Owned Building	On-going	use code: 342
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Other Improvement	On-going	use code: 373
Sensitive Plants: Minor effect		
1 Special Use Permit for Weather Station	On-going	MT Dept. of Natural Resources (use code 423)
Sensitive Plants: Minor effect		
1 Special Use Permit for Military Training Area	On-going	Montana National Guard (use code: 431)
Sensitive Plants: Minor effect		
2 Special Use Permits for Warehouse and Storage Yard	On-going	Montana Highway Commission and Montana History Foundation Inc. (use code: 521)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for	On-going	use code: 593

Log Landing		
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Yarding Corridor	On-going	use code: 594
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Oil and Gas Pipeline	On-going	Yellowstone Pipeline Co. (use code: 631)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for REA Financed Powerline	On-going	Vigilante Electric Coop. Inc. (use code: 641)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
3 Special Use Permits for Powerline	On-going	American Bar Landowner's Association, use code: 643
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Other Utility Improvement	On-going	Montana Power Company (use code: 644)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Airport or Airway Beacon	On-going	Montana Aeronautics Division (use code: 714)
Sensitive Plants: Minor effect		
2 Special Use Permits for DOT Easement	On-going	Both were issued to the Department of Transportation. (use code: 741)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Forest Road and Trail Act Easement	On-going	Jefferson County (use code: 751)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
7 Special Use Permits for Federal Land Policy & Mgmt Act Easement	On-going	use code: 752
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
54 Special Use Permits for Federal	On-going	use code: 753

Land Policy & Mgmt Act		
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Amateur Radio	On-going	State of Montana, Disaster and Emergency Services Division (use code: 801)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Personal/Private Receive Only	On-going	Jim Strachan (use code: 802)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
2 Special Use Permits for Microwave-Industrial	On-going	Northwestern Corporation, The Burlington Northern & Santa Fe Railway Company (use code: 804)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
5 Special Use Permits for Private Mobile Radio Service	On-going	Federal Aviation Admin., Lewis & Clark County Sheriff's Office, Rocky Mountain Contractors, Inc., State of MT; Dept of Transportation (use code: 806)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Cellular	On-going	Montana 5-Mineral Limited Part (use code: 810)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Commercial Mobile Radio Service	On-going	Century Leasing Company (use code: 815)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Television Broadcast	On-going	Beartooth Communications Company (use code: 817)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
2 Special Use Permits for Facility Manger	On-going	Century Leasing Company and MacPass Radio LLC. (use code: 818)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
7 Special Use Permits for Telephone and Telegraph Line	On-going	use code: 821

Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Irrigation Water Ditch	On-going	Montana Fish & Game Department (use code: 911)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Irrigation Water Trans Pipeline < 12" D	On-going	State of MT; Department of Transportation (use code: 913)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Water Trans Pipeline < 12" D	On-going	City of Helena (use code: 914)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
2 Special Use Permits for Water Trans Pipeline <12"D	On-going	use code: 915
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Dam/Reservoir	On-going	City of Helena (use code: 922)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Water Diversion, Weir	On-going	use code: 923
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Well, Spring, or Windmill	On-going	use code: 931
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
North Belts Travel Implementation	On-going	North Belts Travel Plan Implementation
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
South Belts Travel Implementation	On-going	South Belts Travel Plan Implementation
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Trail Maintenance	On-going	

Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.

On-going Activities for the Lincoln District		
Activity/Project Name	Date of Implementation	Scope of Activity
Marsh/Tarhead Allotment	2010-On-going	Allotment management plan revision – maintain the current management and incorporate the adaptive management concept.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Timber Harvest Private Lands	On-going	Unspecified acres; primarily tractor logging
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Grazing Activities on Private lands	On-going	Grazing of cattle, sheep and horses.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Agricultural Use	On-going	Agricultural farming, primarily irrigated hay and wheat operations, on private lands within all watersheds
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Noxious Weed Treatment	On-going	Herbicide treatment i along roads and in patches that are accessible to mechanized equipment, backpack/horsepack equipment; some biocontrol treatment (insects), grazing control (sheep)
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Alice Creek & Poorman prescribed burns	On-going	Davis Unit scheduled to be burned FY 2010. Ethel Units 23/24 scheduled to be burned FY 2010
Watershed: Potential for short-term sediment delivery to streams from erosion of recently burned areas, although no-ignition buffers should minimize this potential.		
Road Maintenance	Annual	Grading and spot-gravelling performed on approx. 25 miles of roads in the S. Belts annually.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted		
Hennesy Placer Sampling	On-going 09/2008	Hand digging with pick and shovel and removal of fines for sampling. Total volume per year would be around five cubic yards.
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Special Use Permit for	On-going	use code: 129

Isolated Cabin		
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
5 Special Use Permits for Recreation Events	On-going	use code: 149
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
7 Special Use Permits for Outfitter and Guide	On-going	Use code: 153
Sensitive Plants: Minor effect		
3 Special Use Permits for Livestock Area	On-going	Use code: 215
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Cemetery	On-going	Use code: 321
Sensitive Plants: Minor effect		
2 Special Use Permits for Research Studies	On-going	Use code: 422
Sensitive Plants: No effect		
2 Special Use Permits for Weather Stations	On-going	U.S. Weather Bureau. (Use code: 423)
Sensitive Plants: Minor effect		
1 Special Use Permit for REA Powerline	On-going	Missoula Electric Coop. inc (Use code: 641)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
3 Special Use Permits for DOT Easements	On-going	Department of Transportation. (Use code: 741)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
8 Special Use Permits for Federal Land Policy & Mgmt Acts	On-going	Use code: 753
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Microwave-Industrial	On-going	Burlington Northern Inc. (Use code: 804)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

1 Special Use Permit for REA Financed Telephone Line	On-going	Lincoln Telephone Co. Inc. (Use code: 822)
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
1 Special Use Permit for Stream Gauging Station	On-going	MT Dept. of Natural Resources (Use code: 941)
Sensitive Plants: Minor effect		
Trail Maintenance	On-going	
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Road use permits	On-going	Gary Jensen & LP
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Lincoln Airport	On-going	20 year permit..
Sensitive Plants: This activity could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		

Past Activities for the Townsend (D-1) District 1987- September 2010

Activity/Project Name	Date of Implementation	Scope of Activity
Elkhorn Improvements	6/2010	Eagle Riparian Fence & Water Development and Indian Creek Pasture Division Fence. Construct approximately 3miles of fence, a cattleguard on Rd. 405 and develop a spring to provide offsite water to livestock. Elkhorn Mountains.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on these sites.		
Eureka Creek Riparian Restoration	6/2010	Utilize dead and dying conifers to minimize livestock access to stream banks by placing them along the banks along approx. 1 mile of the stream reach. Also install an off-site tank to provide water to livestock. Elkhorn Mountains.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on these sites.		
2010 HMO Closures -- Townsend Ranger District	06/2010	Installation of access controls or the permanent closure of mine openings on the Townsend Ranger District to ensure public safety. Confederate Gulch, Montana and Greenhorn Gulch, Sheps and Ribedeau, Giant Hill area.
Sensitive Plants: Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on these sites.		
GGM&B Camas Creek placer gold sampling	2009	The operator proposes to sample for placer gold in a tailings area at the head of Camas Creek in the Big Belt Mtns.

Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Benton Gulch Placer Sampling	2009	Removal of the top soil of the sample area and removal of gold bearing gravel to a trammel. It is washed and returned to the sample area, and the top soil would be replaced and seeded.
Sensitive Plants: These activities could impact sensitive plant populations. Known populations would be protected from disturbance, but some habitat or individuals could be impacted.		
Sulphur Bar Creek Tributaries Riparian Fencing	January-08	Riparian fencing was put up for unnamed tributaries of Sulphur Bar Creek.
Sensitive Plants: Minor effect		
Carl Creek and Cedar Bar Creek Riparian Fencing	January-08	.Riparian fencing for Carl and Cedar Bar Creek
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
North Fork Livestock Grazing Management Decision	September-07	Grazing of domestic livestock on the Deep Creek allotment
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Camas Creek Allotment and Water Development	September-06	Development of a water source (seep) located east of Stovecamp trailhead. Installation of collection and feeder pipe, installation of stock tank and overflow pipe. Seep area was fenced.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Whitehorse Allotment Water Development	September-06	Development of a water source in Kimber Gulch, work included: fish friendly head box placement, installation 200-500 ft of supply pipe, stock tank, and 500 ft. of fence built to keep animals out of the creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana High Country Cattle Drive	June-06	A special use permit for the Montana High Country Cattle Drive.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Whites Gulch Fish Barrier Maintenance	May-06	Replacement of Whites Gulch fish barrier with a more permanent structure.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
LaMonte Schnur Outfitting	Outfitter and guide special use permit for fishing/sightseeing (7/1 – 9/1) and spring/fall bear hunting (4/15 – 6/1). Edith Lake trailhead access.	
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Baldy Allotment Management Plan	February-06	Cattle grazing on the 640 acre Baldy allotment continued.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Sun Mountain Lumber Commercial Log Hauling	September-05	A road use permit issued to Sun Mountain Lumber Co. to haul 21,400 MBF across an existing road on NFS lands. In order to minimize erosion of the road surface Sun Mountain Logging Co.: 1) installed an embedded “squashed” culvert at the existing stream crossing 2) installed approximately 13 rolling dips as

		drainage control on portions of road draining into the tributary and 3) maintained these features throughout the permitted hauling period.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
E.A. Johnson, 2005 Mineral Plan of Operations	July-05	Five trenches were excavated in the Cement Gulch area. Each trench was about 2 feet wide, 5 feet deep, and 100 feet long to allow for a geologic evaluation and geo-chemical testing.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Douglas Lynch, 2005 Mineral Plan of Operations	June-05	3 phased-gold exploration in the Hour Gulch. Phase 1) Three trenches being 4 feet wide by 6 feet deep and 20 feet long were made. Phase 2) One trench 2-3 feet wide by 6-8 feet deep to bedrock and 20 feet long. Phase 3) Four trenches 2-3 feet wide by 6 feet deep and 10-20 feet long.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels:		
Stephen Links, 2005 Mineral Plan of Operations	June-05	4 inch suction dredge to conduct gold prospecting in Cement Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Dry Range Land Exchange	June-05	1,931.65 acres of Federal Land was conveyed in the Dry Range area in exchange for 1,280 acres of nonfederal lands in the Klondike Pass area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Cayuse Non-motorized Trail Maintenance	June-05	Maintenance and reconstruction of the Cayuse Trail # 235 between Avalanche Creek Trailhead and Nary Time Trail #234. Maintenance of 22000 feet of trail tread, reconstruction of switchbacks, and installation of 20 waterbars occurred.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
North Belts Travel Plan [Townsend & Helena RDs]	May-05	N. Belts travel plan decision.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Crow Creek Non-motorized Trail Reconstruction	March-05	No document
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Joint Venture Mining Claim, 2005 Mineral Plan of Operations	February-05	Plan of operations for small scale placer gold mine. Mine was 75 ft by 60 ft wide and 8-15ft deep.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Rehabilitation of Road 425-M1 Crossing of Magpie Creek at Collins Gulch	September-04	Rehabilitation of Forest road 425-M1, included removal of 4 culverts, removal of road fill from the Magpie Creek floodplain, and rehabilitation of the site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Construction of Water Developments and Relocating an Existing Fence [Baldy Allot]	September-04	Development of stock water site on Ray Creek and relocation of approximately 1 mile of pasture fence.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Power Gulch Bighorn Sheep Prescribed Burn	July-04	Wildlife improvement project in Power Gulch, this included removal of about 80% of the trees and burning in the 70 acre unit.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Westslope Cutthroat Trout Habitat Enhancements, Eureka & Staubach Creeks	June-04	Fish habitat enhancement project on Staubach and Eureka Creeks. Work included placing logs and other debris into the stream channel for pool formation.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Outfitter Guide 5 Year Priority Use Permit [Grassy Mt Lodge]	June-04	Outfitter Guide priority use permits were issued to Grassy Mountain Lodge and Jeff and Mary Hoeffner.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Construction of Water Developments	May-04	Development of stock water sites in Pole Creek, White Horse, and South Crow allotments, water developments were created feeding off five springs on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Poe Park Non-Motorized Trail Reconstruction	April-04	Reconstruction of Poe Park Trail #110. Work included trail reconstruction of approximately 1 mile, creation of 3-4 switchbacks, building a 60 ft puncheon, trail obliteration of approximately 600 ft.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Indian Creek Park Restoration	April-04	Wildlife habitat enhancement project, work included mechanically removing encroaching Douglas-fir on approximately 120 acres of grassland parks.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elk Creek Placer Gold Exploration	January-04	Gold exploration permit for 5 mining claims along Elk Creek. Work consisted of approximately 18 test holes, 3ft wide by 20 ft long by 16 ft deep or to bedrock.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Outfitter Guide Permit Renewals	September-03	Renewal of outfitter guide permit.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Temporary Re-opening of Reclaimed Road in Johnny's Gulch Area	July-03	Road was reopened to allow for BLM access to project area for timber removal and burning.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Pole Creek Stock Trail Cutout Project	July-03	About ½ mile of historically used stock trail in the Pole Creek area was cleared.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana High Country Cattle Drive Special Use Permit	June-03	A special use permit was issued for the Montana High Country Cattle Drive.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Review - Crow Creek Vegetation Treatment and Allotment	June-03	This document discusses the changing conditions after the EA was signed in May of 1994.

Management Plan Revisions		
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Skidway and Blacktail Cross-Country Ski Trails	May-03	The construction of two cross country ski trails in the Grassy Mtn. roadless area which consist of about 2.8 miles of trail construction.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Insecticide Application to Improve Cone Production	April-03	Systemic insecticide was utilized to promote the development of Douglas-fir cone crop.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Strategies to Reduce Additional Douglas fir Mortality in Fire Recovery Areas	April-03	Pheromone and tree trap control was used to try to minimize Douglas-fir beetle outbreak in the vicinities of the Cave Gulch and Modlow-Toston fires.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Barrett Productions Commercial Video Filming	November-02	Temporary special use permit that authorized short-term filming of big game hunting on HNF lands in the Elkhorn Wildlife Management Unit.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Staubach Creek Riparian Protection Project	August-02	Riparian protection project, the work included selective cutting of aspen, pine, and fir to block cattle trails and the construction of approximately ½ mile of fence.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Cave Gulch Fire Restoration Projects	August-02	Post fire restoration that included trail reconstruction, tree transplanting, and fencing vulnerable stands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
American Land Conservancy Special Use Road Improvement and Access	August-02	Road improvements for access to Hawkeye placer mining claim along Crowe Creek. Work included the improvement of road, removal of old mining equipment and materials, and rehabilitation of the area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Monte Schnur, Outfitter/Guide, 2002 Operation	July-02	Outfitter guide permit for Monte Schnur that provided for hunting and scenic trips not to exceed one year.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
E.W. Watson & Sons Outfitting, Inc, 2002 Operation	July-02	Temporary use permit for E.W. Watson & Sons Outfitting. Activities included trail riding, fishing, photography, and camping.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ramshorn Outfitter/Guide Permit Reissuance	July-02	Reissuance of outfitter guider permit to Ramshorn Outfitters, designated camp is in T8N, R4E, sec 15.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Battle Creek Outfitters, 2002 Operation	July-02	Temporary use permit for Battle Creek Outfitter/ Larry Richtmeyer. Activities that included photography, site seeing, and big game hunting.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Crichton Special Use Road	June-02	Permit for road access across NFS lands in order to access private land.

Improvement and Access		
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Extension and Construction of Kmon Pipeline and Water Development	June-02	Extension and construction of water systems on the Wagner/Atlanta implementation area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Grassy Mountain Lodge	May-02	Issuance of Outfitter Guide priority use permits to Grassy Mountain Lodge, not to exceed one year.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Bighorn Sheep and Elk Winter Range Burning Projects	May-02	Slashing and burning occurred on approximately 1040 acres in the Elkhorn Mountains to improve big game winter range.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Tree Planting in the Cave Gulch and Maudlow Toston Fire Areas	April-02	The burned plantations of the Cave Gulch and Maudlow-Toston wildfires of 2000 were replanted along with the ponderosa pine stand in Little Hellgate Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Pheromone Control Measures for Douglas Fir Beetles	March-02	Pheromones to control the Douglas-fir beetle were put up through Deep Creek Canyon, Deep Creek Picnic Area, and Skidway Campground.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elk Creek Placer Gold Exploration	March-02	Placer gold exploration in the Elk Creek area consisting of 15 test holes about 3ft wide by 20 ft long by 16 ft deep.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Boulder Lakes Trail #142 Reconstruction Project	March-02	Relocation/construction activities on Boulder Lakes Trail #142. Approximately 2800 ft of trail was constructed/relocated, 2 switchbacks with erosion control measures, and 3 short sections of wooden crossings replaced.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
South Elkhorns Range and Vegetation Project	October-01	Livestock grazing was revised and the use of prescribed fire and thinning took place to improve vegetative conditions.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Fire Restoration Projects Townsend Ranger District	June-01	Effort to recover the resources and facilities lost in the Maudlow-Toston and Cave Gulch Fires. Wildlife Habitat Restoration and Grazing Management.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Confederate Gulch Placer Gold Exploration, James M. Collins	June-01	Placer gold exploration permit for the Confederate Gulch area, opened ¼ mile of closed road to access the mining area and then proceeded to dig 4-5 sample sites approximately 15-20 ft long by 6 ft wide by 20 ft deep.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Army National Guard, Aircraft Recovery Training Operation	June-01	Special use permit for 2-day aircraft recovery training for the Army National Guard.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Watershed Restoration and Livestock Grazing for the Magpie Confederate Analysis Area	January-00	Watershed recovery measures in Magpie, Hellgate, Little Hellgate, Avalanche, Whites Gulch, and Confederate Gulch watersheds on HNF and BLM lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Slim Sam Aspen Project, Elkhorn Mountains	July-99	A variety of methods were used to treat 23 small aspen clones, totaling about 25 acres along Slim Sam Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Precommercial Tree Thinning on the Townsend Ranger District	March-99	Twenty nine acres were pre-commercially thinned of overstocked lodgepole pine and Douglas-fir trees in the North Fork of Deep Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Beaver Creek Trail Reconstruction	February-99	Construction/reconstruction on Beaver Creek Trail #115. Work consisted of construction/reconstruction of 6 miles of trail and construction of two bridges.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
South Belts Winter Travel and Recreation Plan	January-99	South Belts Winter Travel Plan decision document.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Reclamation of Phase 1 Hazardous Mine Openings in the Elkhorn Mountains	September-98	Hazards to forest users, livestock, and wildlife were eliminated by closing unsafe mine openings in the eastern Elkhorn Mountains.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
North Elkhorns Livestock Grazing Analysis and Vegetation Treatments-REVERSED	March-98	Treatments included reducing head numbers, prescribed fire, closing some areas, and installing some new fences.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hazardous Mine Openings in the Elkhorn Mountains	September-97	Hazards to forest users, livestock, and wildlife were eliminated by closing unsafe mine openings in the eastern Elkhorn Mountains.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elkhorn Travel Plan Implementation Project	September-97	Implementation of Elkhorns Travel Plan, closing, decommissioning, and rehabilitating roads in the area took place.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Confederate Gulch Project, Placer Gold Exploration Plan of Operations	August-97	Three test pits (10ft long by 6ft wide, and up to 8ft deep) north of Confederate Creek on the Diamond City Queen mining claims. After test pits, the area was rehabilitated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Burns Mountain #1 Shaft Reopening	August-97	Continued gold exploration on the Burns Mountain claim. Action reopened existing mine shaft and under ground workings.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
GC Mining Claims Exploration	July-97	Plan of operations for Cominco American Inc. that conducted exploration drilling

Drilling Plan of Operations		activities in the Cooney Gulch area. 1-3 core holes were drilled adjacent to Magpie Creek along road #425.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Miller Mountain Project Exploration Drilling Plan of Operations	July-97	Plan of operations to continue gold exploration activities in the Miller Mountain area. 10 exploration holes were drilled and approximately 1400 ft. of temporary road was constructed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Indian Creek Tailings Removal - Action Memorandum	June-97	document explains the commencement of the removal of the Indian Creek tailings.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Wagner/Atlanta Allotment Management Plans	December-96	Eight allotment management plans were revised through livestock management prescriptions and utilization standards in uplands and riparian areas.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Valid Mining Claim - Plan of Operations for Placer Gold Exploration	October-96	Plan of operations to conduct placer gold exploration along Thompson Creek. 15 tests pits approximately 12ft. long by 4ft. wide by 6ft. deep were dug.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elkhorn Forest Plan Amendment	September-96	Amendment document for the Elkhorn Wildlife Management Unit Forest Plan.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Bighorn Sheep Habitat Enhancement Project, Crow Creek, Elkhorn Mountains	September-96	The Helena National Forest burned approximately 790 acres of lower Crow Creek to enhance bighorn sheep winter range.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Crow Water Development Construction and Reconstruction	August-96	Decisions to revise the North Crow C&H and South Crow C&H allotment plans and to put in new water developments to improve livestock distribution and aid in meeting riparian and upland utilization standards.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Whites Gulch Road Reclamation	August-96	Nine culverts in the Whites Gulch road were removed, the road fill material was redistributed to a location away from the stream, where natural flow of stream is constricted material was removed and replaced, a section of the road was ripped, waterbarred, and seeded, and a section close to Whites Pass was recontoured.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Exploration Drilling Miller Mountain Project Area	July-96	Continued gold exploration activities in the Miller Mountain area. Twelve exploration holes were drilled and 3700ft of road was built.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Redtail and Old Gold Claims Plan of Operations	July-96	Plan of operations to conduct placer gold exploration in Shannon Gulch and Avalanche Creek areas. Two shafts about 5ft square and 30ft deep were dug.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Bigler, Bourbon Mill, Travis, and Burns Mountain #1 & #2; Mineral Plan of Operations	June-96	Plan of operations to conduct exploration activities in Bigler Mine area. Twenty five small, shallow exploration holes were drilled.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Yellowboy #1 and #2 Placer Claims; Mineral Plan of Operations	June-96	Plan of operations to conduct placer gold exploration in Thomas Creek area. An area 50ft wide by 400ft long by 5ft deep was placer mined.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Luck Boy #1 Mineral Plan of Operations for Placer Exploration	June-96	Plan of operations to conduct placer gold exploration in the Cement Gulch area. An area 30ft long by 10ft wide by 6-8ft deep was placer mined.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hidden Hollow Ranch Outfitter/Guide Permit Reissuance	April-96	A special use permit was issued to Hidden Hollow Ranch to conduct commercial outfitting.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elk Creek Mineral Plan of Operations for Placer Exploration Mary Sue Claim	October-95	Plan of operations to conduct placer gold exploration in the Elk Creek area. Three trenches about 8ft long by 3ft wide by 16ft deep were dug. The trenches were recontoured and seeded the same day they were dug.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Coony Gulch Mineral Plan of Operations for Placer Exploration	September-95	Plan of operations to conduct placer gold exploration in the Coony Gulch area. Five trenches about 15ft long by 4ft wide by 15ft deep were dug.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elkhorn Travel Management Plan, Correction Notice	September-95	Elkhorn Mountain Travel Management Plan correction notice document.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hello Lucky Mining Claim; Hard Rock Gold Exploration,	July-95	Plan of operations to dig an exploratory adit on the Hello Lucky mining claim. The adit was approximately 5ft wide by 6ft tall and extend into the hill 10-15ft.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Underground Mining Plan OD Operations for the Bigler Mine	June-95	Plan of operations to continue a small scale underground mining operation at the Bigler mining site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Vosburg Mine Site – Action Memorandum	May-95	Action memorandum to document and explain the decision to remove the Vosburg mine site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Miller Mountain Project Area; Exploration Drilling	September-94	Road construction and exploration drilling on Miller Mountain project. Approximately 1000ft of road was constructed and 6 exploration holes drilled.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Spruce Creek Trail Proposal	August-94	Construction of approximately 2.5 miles of non-motorized trail.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Whites Gulch Stream Stabilization	June-94	Reclamation of a section of Whites Creek occurred to restore hydrologic stability

and Fisheries Enhancement Project		that enhanced existing Westslope Cutthroat Trout habitat and abundance.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Placer Testing Plan of Operations, Benton Gulch Project	May-94	Plan of operations to conduct placer testing in Hour Gulch. Two test trenches 10ft wide by 50ft long were dug. The disturbed area was reclaimed, contoured and revegetated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Greyson Creek Project	April-94	One drill site on the Greyson Creek Project was withdrawn.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Greyson Creek Project, Exploration Drilling	August-93	Plan of operations to conduct exploration drilling in the vicinity of Greyson Creek. Operations included excavating drill pads, mud pits and water tank pads to nine sites that conducted core drilling for hardrock materials.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Vermont Creek Project, Testing Plan of Operations	July-93	Plan of operations to conduct placer testing in the vicinity of Vermont Creek. Seven trenches approximately 4ft wide by 80ft long by 8-10ft deep were excavated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Wildlife: No cumulative effects anticipated		
Smith River Land Exchange	June-93	This exchange involves 3584.40 acres of Forest Service lands in the Dry Range area for 1651.87 acres of private land that mainly runs along the Smith River.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Smith River Land Exchange Environmental Assessment	May-93	This exchange involved 3584.40 acres of Forest Service lands in the Dry Range area for 1651.87 acres of private land that mainly runs along the Smith River.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Thomas & Judy Williams; Grazing Permit Issuance	February-93	A grazing permit was issued to Thomas and Judy Williams for the grazing of domestic livestock on the North Crow C&H allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Crazy Creek Trail Relocation	February-93	Construction of 2800ft of new trail in the Elkhorn Mountains.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Duck Creek to Stove Camp Trail Construction	February-93	2.8 miles of new trail was constructed between Duck Creek Pass and Stove Camp area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Donald W. Shearer; Grazing Permit Reissuance	November-92	Grazing permit was reissued for the grazing of domestic livestock on the Dry Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
David and Alice Rieder; Grazing Permit Transfer	November-92	A grazing permit was issued for the grazing of domestic livestock on the Ray Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Pegasus Gold Corporation, Vermont Gulch	September-92	Plan of operations and reclamation that involved the excavation of 10 exploration trenches and drilling in Vermont Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elk Creek placer testing project	August-92	Plan of operations and reclamation to conduct placer testing in Elk and Slough Creeks.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
R & L Ranch; Grazing Permit Issuance	July-92	A grazing permit for the grazing of domestic livestock on the Six Mile allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Gravelly LD Ranch; Grazing Permit Reissuance	July-92	A grazing permit for the grazing of domestic livestock on the Magpie and White's Gulch allotments.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Diamond H Livestock; Grazing Permit Issuance	July-92	A grazing permit was issued for the grazing of domestic livestock on the Deep Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Judy Placer Mining, Rocker Creek	June-92	Plan of operations that included reclamation to conduct placer mining in Rocker Creek. Operations included excavating into a stream terrace adjacent to Rocker Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ken and Marie Romo; Grazing Permit Transfer	June-92	A grazing permit for the grazing of domestic livestock on the North Crow allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Castle Mountain Ranch, Inc.; Grazing Permit Issuance	June-92	A grazing permit for the grazing of domestic livestock on the Grassy Mountain allotment
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Keith and Robin Kirschier; Grazing Permit Transfer	June-92	Grazing of domestic livestock on the North Crow allotment
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Placer Mining Plan of Operations, for the Diamond City Project,	June-92	Placer mining in Confederate Gulch in the Diamond City area. Activities included excavating into an existing bench with a backhoe, washing the excavated material in a trailer mounted trommel and catching the finds in a settling pond.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Pegasus Gold Miller Mtn. Project	June-92	Pegasus Gold Co. planned to drill 98 holes, construct approximately 50 drill pads, and construct 9000ft of new access road, followed by reclamation.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ray and Mark Ogle; Grazing Permit Issuance	April-92	A grazing permit was issued for the grazing of domestic livestock on the Mule Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Elaine Clark; Grazing Permit Issuance	April-92	A grazing permit was issued for the grazing of domestic livestock on the Pole Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Decision Notice Supplement to the Miller Mountain Project	November-91	In addition to the original Miller Mountain Project, Pegasus constructed 22 drill pads, 3300 ft of new road, and drilling 22 holes.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Louisiana-Pacific Corporation, Special Use Access Road	October-91	Louisiana-Pacific Corporation constructed 650 of temporary road to access a section of private land.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Supplement to the Miller Mountain Environmental Assessment [Curator Gold, April 1989]	October-91	In addition to the original Miller Mountain Project, Pegasus constructed 22 drill pads, 3300 ft of new road, and drilling 22 holes.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
East Elkhorns Kimber Gulch, Travel Management	October-91	The East Elkhorns & Kimber Gulch Travel Management Plan document.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Independence Mining Corp., Exploration Drilling	August-91	Exploration drilling in the Bar Gulch area. Activities included reverse circulation drilling of six holes and construction of mud sumps for each drill site. Reclamation construction included construction of water bars on exploration road and Bar Gulch road, and replacing the kelly humps.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Noranda Exploration, Incorp., Exploration Drilling	August-91	Plan of operations to conduct exploratory drilling in the Cement Gulch area. Activities included construction of 3 drill pads, 3 mud pits, and 700ft of new access road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ray & Mark Ogle; Grazing Permit Issuance	July-91	A grazing permit was issued for the grazing of domestic livestock on the Mule Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Clark Ranch; Grazing Permit Reissuance	July-91	A grazing permit was reissued for the grazing of domestic livestock on the Deep Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
William P. Loney; Grazing Permit Reissuance	July-91	A grazing permit was reissued for the grazing of domestic livestock on the Mule Creek allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Plymale Brothers, Grazing Permit Reissuance	July-91	A grazing permit was reissued for the grazing of domestic livestock on the Whites Gulch allotment.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Therapy Mining Claim; Placer Mining Plan of Operations	May-91	Placer mining operations on the Therapy mining claim in Benton Gulch. Activities included scraping and loading old placer gravel piles and then running the

		gravels through a trammel. A berm was created to contain and settle the washed fine material.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
East Elkhorns/Kimber Gulch Closure	August-90	A permanent yearlong road and area closure in East Elkhorns/Kimber Gulch area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Whites Gulch Road Safety Project	June-90	Reconstruction of the Whites Gulch road #587. The existing road was reconstructed by constructing a ditch, adding surfacing, installing 1900 ft of guard rail, and signing the steep grade.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Bear Claim, Vermont Gulch; Placer Mining Plan of Operations	May-90	Plan of operations and reclamation for placer mining activity in the Vermont Gulch area. Operations included excavating for a settling pond, a sump pond and the placer material mining area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Mervyn Reykdal, Confederate and Greenhorn Gulches; Placer Mining	May-90	Operations included excavation of a pond for pumping water to his placer mining operation on patented mining claims at the mouth of Greenhorn Gulch in Confederate Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Pegasus Gold Corporation's Diamond Hill Project	April-90	Pegasus's plan of operation and reclamation included exploratory drilling, road reconstruction, and new road construction and reclamation.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Revegetation of Administrative Site Horse Pasture	January-90	Twenty one acres on the Administrative site horse pasture was treated to improve vegetative site cover for forage and aesthetic needs.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Clinton Schnee, North Fork of Atlanta Creek	August-89	Plan of operations that involved excavation of 12 test holes on an unpatented mining claim in the North Ford of Atlanta Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Road and Area Closure, Jimmys Gulch	August-89	A permanent area and road closure in Jimmy's Gulch area of Confederate Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Nopper and Owens, Thomas Gulch	August-89	Plan of operations for excavating 12 test holes on their unpatented mining claim in Thomas Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Pathfinder Mines Corporation, Silverwave Claim	June-89	Plan of operation for mineral exploration activities. The activities included the drilling of five holes using a reverse circulation drill.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
FMC Gold Company, Stay Hot and Royal Monarch	April-89	FMC Gold Co. was drilled at 2 locations on existing roads within the Elkhorn Wildlife Management Unit.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
HNF Noxious Weed Control	October-87	A program that integrates biological, preventative, manual, mechanical, and herbicides will be implemented. This will emphasize cooperative programs with the counties.
Sensitive Plants: T The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels:		
Boulder Creek Trail w/Maps	June-86	Provided public access to the existing Boulder Creek Trail, upper Boulder Creek, Boulder Lakes, and the Spruce Creek area. This extended seasonal access into Boulder Lakes by utilizing the Boulder Creek Trail.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
HNF Noxious Weed Control	May-85	Annually treat at least 300 acres. The noxious weeds inventory indicates where these are located. All weed treatments performed by ground rigs with booms, hand held sprayers or a combination of any of these methods.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Past Activities for the Helena (D-2) District 1987- 2010

Activity/Project Name	Date of Implementation	Scope of Activity
2010 HMO Closures Helena Ranger District	8/2010	Installation of access controls or the permanent closure of mine openings on the Helena Ranger District to ensure public safety. Frohner Basin, Grizzly Gulch, Oro Fino Gulch, Wakina Sky Gulch, Moose Gulch areas.
Sensitive Plants: Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on these sites.		
Kingsberry Road Relocation	9/2010	Reroute about 2,000 feet of existing road from pvt. property, to NFS lands immediately to the south west. The road would provide access from the Jimtown Road to the Oregon Gulch/Hedges Mountain area.
Sensitive Plants: Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Haug Special Use Private Road Permit Renewal	8/2010	Renewal of an existing Road Use Permit that allows the permittee to access their private land
Sensitive Plants: Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Spring Gulch Riparian Area Protection & Restoration Project	07/2010	Construct approx. 1.5 miles of fence along the banks of approx. 0.6 miles of stream on Spring Gulch. The fence will be a combo of three-strand barbed wire & jack rail fence. Materials for the jack rail fence will be from beetle killed lodgepole pine. Spring Gulch, in the Dog Creek Headwaters.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Little Blackfoot River	09/2010	Conveyance of ROW easement to Powell County of isolated segments of Forest

Road Conveyance		Development Road #227. This conveyance will consolidate jurisdiction of the affected existing road.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
CDNST Construction	2009	Construction of 7 miles of new CDNST in the head of Bison Creek.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Prickly Pear Land Trust (PPLT)	5/2010	Non-motorized recreation event. Approx. 550 participants & 50 spectators. Located just south of Helena on the Forest System Trails in the Rodney Ridge/Davis Gulch Area.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Skelton Access	2009	Special use application requesting private access to two separate tracts of private land. An exchange of reciprocal easements will be required, thus allowing the public access to adjacent NFS land.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Mathew Daw Special Use, Road Permit	2009	Special use application requesting private land access on Forest road # 4-127B1 year long.
Sensitive Plants: It is unlikely that there would be cumulative effects with this activity. Field crews have collected data in this area in the past. Sensitive plants have not been found on this site.		
Blizzard Basin Water Developments	June-2008	One water development was replaced and one new developed. These water developments collect water in a conventional headbox and pipe water to a tank at each of two locations.
Sensitive Plants: Minor effect		
Spring Hill Land Exchange	March-2007	1.44 acres of federal land described as the Federal Lands was exchanged for approximately 116.841 acres of land owned by Prickly Pear Land Trust Inc. (PPLT) in a three party exchange.
Sensitive Plants: No effect		
Elkhorn Mountain 50 Mile Endurance Run	July-2006	The Helena Ultra Runners League used existing trails and travel routes on the Helena National Forest to host the annual "Elkhorn Mountain 50 Mile Endurance Run".
Sensitive Plants: Minor effect		
York 38 Special Mountain Bike Adventure Ride	June-2006	A Special Use Permit was issued to the York Volunteer Fire Department to organize and hold a one day mountain bike ride for up to 200 participants and spectators for the next 5 years.
Sensitive Plants: Minor effect		
North Pasture Division Fence	March-2006	This fence allowed better cattle distribution by utilizing an area in the east part of the pasture that did not get much use. As a result it helped keep cattle off the Frog Pond

		areas as well as off Elliston Creek and shortened the season of use for two parts of the pasture.
Sensitive Plants: Minor effects		
Great Divide Cycling Team Race	July-2005	A special use permit was issued to the Great Divide Cycling Team to organize and host and one day mountain bike ride for up to 50 participants and spectators.
Sensitive Plants: Minor effects		
Dry Range Land Exchange	June-2005	1,931.65 acres of federal land described as Dry Range tract in the Dry Range area was exchanged for 1,280 acres of non-federal land described as the Grassy Mountain tract in the Klondike Pass area.
Sensitive Plants: Minor effects		
Park Lake Dam Repairs	March-2005	Dam Repairs
Sensitive Plants: Minor effects		
York Townsite Project	January-2005	37.78 acres of federal land, comprised of 15 separate national forest system tracts were sold to the Lewis & Clark County Commissioners, who in turn sold separate lots to current, adjacent landowners or permittees.
Sensitive Plants: Minor effects		
Cellar Gulch Temporary and Commercial Road Use	January-2005	1500 ft of temporary road was constructed across NFS lands in the Cellar Gulch Drainage. The temporary road provided short-term access to adjacent DNRC lands for timber harvest by DNRC
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
U.S. Army/ Montana National Guard Sweeney Creek Land Navigation Course	September-2004	A Special Use Permit was issued authorizing occupancy of NFS lands by the Montana Army National Guard in the Sweeney Creek area.
Sensitive Plants: Minor effects		
Gerleman Privately Owned Residence	August-2004	A special use permit was reauthorized for occupancy of NFS land by a privately owned residence on NFS lands in Orofino Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Great Divide Cycling Team Race	August-2004	A special use permit was issued to the Great Divide Cycling Team to organize and host a one day mountain bike ride for up to 50 participants and spectators.
Sensitive Plants: Minor effects		
North Western Corporation Rimini Extension	July-2004	Special use permit that authorized the installation, use, and maintenance of seventy five feet of power line. Power poles to support this line were installed on private lands on each side of the affected NF tract.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
MacDonald Pass Electronics Site Renovations	June-2004	This facility houses local, state, and federal government communications users on the site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
North Western Corporation Moose Creek Utility Extension/ City of	February-2004	Northwestern Corporation was issued a special use permit that authorized the installation, use, and maintenance, of 30ft of power line and the installation of an

Helena Moose Creek Head Gate Modification		additional power pole.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
"Don't Fence Me In" 10K Run - 4K Walk	April-2003	Prickly Pear Land Trust was authorized to use the existing trails and travel routes on the HNF to hold the "Don't Fence Me In 10K run and 4K walk".
Sensitive Plants: Minor effects		
Jericho Mountain Continental Divide Trail Reroute	April-2003	Construction activities on a segment of the Continental Divide National Scenic Trail #337 occurred. The primary purpose of this project was to relocate the CDNST to the top of the Continental Divide.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
South Hills Trail Construction/Reroute	April-2003	Construction and reconstruction activities t on several trail segments in the South Hills as part of an interagency cooperative project with the city of Helena.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Barrett Productions Commercial Video Filming	November-2002	Barrett Productions was issued a temporary special use permit authorizing short-term filming of big game hunting on HNF lands in the Elkhorn Wildlife Management Unit.
Sensitive Plants: Minor effect		
Eakin Encroachment	August-2002	Continued use of a small tract on NFS lands currently occupied by an encroaching privately owned garage. A special use permit for occupancy of .04 acres was issued
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Society for Creative Anachronism Historic Recreation Group Event	August-2002	A one time special use permit was issued for the Society for Creative Anachronism Historic Recreation Group event.
Sensitive Plants: Minor effect		
Capital Trail Vehicle Association & Montana Trail Vehicle Riders Association Annual Campout	July-2002	A one time use special use permit was issued for the Capitol Trail Vehicle Association/Montana Trail Vehicle Riders Association annual campout
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Black White & Color, Inc. Commercial Still Photography	May-2002	Black White & Color Inc. was issued a special use permit that authorized short term commercial still photography along a particular segment of the Prickly Pear Creek Road in the Elkhorn Mountains.
Sensitive Plants: Minor effect		
State of Montana FW&P's Site Investigation Park Lake	August-2001	Private road special use permit that authorized the construction, use, and maintenance of 200 feet of temporary road, 500 feet of existing road, and excavation of 100 feet of temporary exploratory trenching on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Rock Creek Buffalo, Inc. Private Road	June-2001	A private road special use permit was issued that authorized the reconstruction, use, and maintenance of approximately 2400 feet of private road on NFS lands. Public motorized use of this right-of-way was prohibited.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

D&G Lumber Private Commercial Road Use	September-2000	A private road special use permit was issued that authorized the reconstruction, use, maintenance, and obliteration of approximately 740 ft of temporary road on NFS lands. A road use permit was granted for road #495 and #1856.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Porcupine Creek Trail Reconstruction	February-2000	Construction/reconstruction on Porcupine Creek trail # 263. Work included check dams, water bars, drains, and bridge construction. Restored 20 meters of trail and constructed 277 meters of new trail.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Continental Divide Trail Reconstruction Phase I	April-1999	Construction/reconstruction on the Continental Divide Trail # 337. The work occurred on the Helena Ranger District portion of the Continental Divide Trail.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Department of Corrections Aspen Youth Alternatives	December-1998	A temporary special use permit for institutional outfitting in the Little Blackfoot Area. Yurts were constructed at Monarch Creek Trailhead and Blackfoot Meadows Trailhead.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Robert Miles Mining Plan of Operation	July-1998	Exploration of the Bugler unpatented mining claim located in Charity Gulch. Work consisted of 2 exploration trenches 70 ft long, 3 ft wide, and 7 feet deep. Reclamation was completed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
McClellan Creek Trail Reconstruction	June-1998	Construction and reconstruction of the southern sections of McClellan Creek Trail #302 took place. Work included installation of water bars, construction of switch backs, and rehabilitation of tread.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Monarch Creek Trail Reconstruction	June-1998	Construction/reconstruction on the Monarch Creek Trail #362. Activities included water bars, reconstruction of switchbacks, installation of drains, installation of stock bridges, and construction of a turnpike. Also approximately 727 meters of abandoned trail was obliterated and 560 meters of existing trail was regrubbed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Muskrat Creek Trail #72 Trail Reconstruction Project	June-1998	The reconstruction and relocation of unsuitable portions of the Muskrat Creek Trail #72 took place.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Westmark International Placer Plan of Operations	June-1998	Approved plan of operation for a placer mining operation and exploration of Westmark Internationals unpatented mining claims. Estimated disturbances was 96 acres.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Frontier Town Monument, Sign, and Power Line Special Use Permit Re-issuance	February-1998	A special use permit was reissued to the owner of Frontier Town for the private monument, sign and power line that occupy .22 acres of NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Special Use Permit Elliston Volunteer Fire Dept. Fund Raiser	January-1998	. The permit authorized an annual charity snowmobile ride each of the next five years. The activities occurred primarily on existing groomed snowmobile trails.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Department of Corrections Aspen Youth Alternatives	December-1997	A temporary special use permit was issued to Montana Dept. of Correction for institutional outfitting in the Elkhorn Area. Yurts were constructed at South Pole Creek and Wilson Creek.
Sensitive Plants: Minor effects		
Austin Snowmobile Parking	November-1997	Construction of snowmobile parking area, approximately ½ acre was cleared.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Treasure Mountain Snowmobile Trail Relocation	November-1997	Snowmobile trail relocation in the Treasure Mountain area. New trail construction occurred and also a winter parking area was established.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Minnehaha Creek Private Commercial Road Use	October-1997	A private commercial road use permit was issued to Dave Haug to transport timber products across 2.9 miles of NFS lands off private land and 500 ft of skid trail was created on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Waterline Trail Construction & Designation	August-1997	A segment of the waterline utility corridor was designated as a "systems" trail. Approximately 600 ft of new trail was constructed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
York Community Hall/Fire Hall Permit Renewal and Facility Modifications	February-1997	Reissuance of permit to York Community Fire, permit for continued use of land and construction of addition to building.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montgomery Park Trail Reconstruction	January-1997	Construction and reconstruction on Montgomery Park Trail #301. About 4595 ft of trail was relocated and constructed, 395 ft of turnpiking was constructed, and about 20 water bars were installed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
BR Cattle Company Special Use Permit; Hope Creek	June-1996	A special use permit was issued for grazing on 200 acres of NFS lands.
Sensitive Plants: T The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Christison Special Use Outfitting Permit	June-1996	Special use permit was issued for commercial horse back rides that followed existing roads and trails.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Maras Private Road Special Use Permit	June-1996	A private road special use permit that authorized the reconstruction, use, and maintenance of 60 ft of private road on NFS lands in the Ophir Creek Drainage.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montgomery Park Trail Reconstruction	June-1996	Construction and reconstruction on Montgomery Park Trail #301. About 4595 ft of trail was relocated and constructed, 395 ft of turnpiking was constructed, and about

		20 water bars were installed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Mount Helena Ridge Trail Reconstruction	May-1996	Construction/reconstruction on the Helena Mountain Ridge Trail #373.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hope Creek Temporary Road Construction and Commercial Use	October-1995	Construction of approximately 185 ft across NFS lands, also authorized commercial use of existing Forest Service roads #571, #708, #1855. (Occurred over 3 seasons)
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Additional Communications Use; Hogback Mountain Electronics Site Capital Communications	September-1995	Use of National Forest Land for installing, operating and maintaining a mobile radio commercial communications system.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Additional Communications Use; Hogback Mountain Electronics Site KFBB Corporation	September-1995	Use of National Forest Land for installing, operating and maintaining an industrial microwave system.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Bureau of Mines and Geology Seismic Monitoring Station	July-1995	Installation, use, and maintenance on a seismic monitoring station on lands administered by the Helena Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montgomery Park Trail Reconstruction	July-1995	Construction/reconstruction of Montgomery Park Trail #301 on 15,180 ft of trail and 4 new trail segments totaling 3,385ft were constructed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Colvin Special Use Private Road	June-1995	A special use permit was issued to reconstruct, use, and maintain 245ft of private road on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
TRI Fiber Optic Installations	May-1995	Installation, use, and maintenance of two fiber optic communication lines on lands administered by Helena Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Red Mountain/ Park Commercial Road Use	March-1995	Private commercial use of both Forest Development roads and non-system roads in the Red Mountain/ Park Lake area for the purpose of transporting timber products form private property located within the HNF.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Bullion Parks/ Telegraph Creek Private Commercial Road Use	December-1994	Private commercial use of NFS lands and roads in the Jericho Mountain area for the purpose of transporting products off private property located within the HNF. Construction and use of approximately 1200 foot of temp skid trail and decking area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Red Elk Placer Bud Morris, Claimant/ Operator Mining Plan of	November-1994	Further exploration occurred on Mr. Bud Morris's unpatented mining claims located in the Dead Wood Gulch.

Operations		
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Additional Communications Use; Hogback Mountain Electronics Site	October-1994	Installing, operating, and maintaining an internal mobile radio system on Hogback Mountain Electronics site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Amateur Radio Authorization; MacDonald Pass Electronics Site	October-1994	Installing, operating, and maintaining an amateur radio system on MacDonald Pass Electronics site.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Cellular Telephone Authorization; MacDonald Pass Electronics Site	October-1994	Installing, operating, and maintaining a commercial cellular telephone facility.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Snowshoe Creek Private Commercial Road Use	July-1994	Commercial road use to use .7 mile of forest developmental road #708 to transport timber off of private land.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Stowe Commercial Road Use	May-1994	Commercial use of approximately 4.5 miles of existing forest road in the Little Blackfoot/Treasure Mountain area of the HNF. Installation of a temporary bridge at the Little Blackfoot crossing occurred.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Chessman-Lava Mountain Trail Reconstruction	April-1994	Maintenance and reconstruction of approximately 8 miles of existing roads and trails in the Chessman Reservoir-Lava Mountain Area occurred.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ogilvie-Cellar Gulch Temporary Road Construction and Commercial Use	February-1994	Construction of approximately 2084 feet of temporary road across NFS lands in order to access Montana State Lands occurred. Commercial use of forest road #4039 to allow for transportation of timber off of said lands was authorized.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Chamounix Project Placer Dome U.S. Inc. Mining Plan of Operations	June-1993	Exploratory drilling occurred on unpatented mining claims located near Mullan Pass in the Austin Creek Drainage on NFS lands administered by the Helena Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Irish Hill Project Phelps Dodge Mining Company Mining Plan of Operation	June-1993	Exploratory drilling was conducted on their unpatented mining claims located on the ridge separating Trout Creek and Spotted Dog Creek Drainages on NFS lands administered by the Helena Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ophir Group Project American Copper & Nickel Company, Inc. Mining Plan of Operations	May-1993	Exploratory drilling occurred on unpatented mining claims located in Ophir Gulch on NFS lands administered by the Helena Ranger District.
Sensitive Plants: T The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Salisbury Private Road FLPMA Easement	January-1993	AFLPMA easement was issued to construct, use, and maintain a private road across NFS lands in order to provide permanent access to their private property and home.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elkhorn Search and Rescue Snowmobile Event	November-1992	The Elkhorn Search and Rescue Unit was issued a special use permit to hold a snowmobile fundraising event that was held on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Trout Creek Canyon Road Reconstruction	November-1992	Reconstruction of the road through Trout Creek Canyon on the Helena Ranger District. The existing 3 mile trail was improved and or relocated. In addition a segment of the trail was designed and constructed to accommodate disabled persons.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Dog Creek Road Improvement	September-1992	Trees and other vegetation were cleared from a distance of about 10 ft on either side of .8 miles of the Dog Creek Road. The clearing was necessary in order to improve drainage and to allow adequate maintenance of the road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations s		
Mining Plan Of Operation For HRM 2 Lode Claim Tabor Resources Corporation	July-1992	Construction of approximately 500 feet of temporary road, two drill pads 20 ft by 35 ft, and drilling of two core holes took place. The newly constructed road and drill pads were put back to contour and were reseeded to grasses in the fall.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Squaw Gulch Road Commercial Use Permit	July-1992	A road use permit was issued that authorized him to use an existing Forest Service developmental road to move approximately 80 MBF of saw-log material across NFS lands from private property within the Squaw Gulch Drainage.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Dosier Special-Use Private Road	June-1992	A special use permit was issued for the construction, use, and maintenance of approximately 185 ft of private road across NFS lands in order to provide access to adjacent private lands. Buried power and utility lines also occupy this right-of-way.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Mining Plans Of Operation For Clemmer Gulch and O'Keefe Mountain Projects	June-1992	Temporary disturbance of approximately 2 acres of NFS lands to access 12 drill sites. Three of the twelve drill sites involved the removal of 50-60 trees that were considered noncommercial timber. Access roads and drill sites returned to previous contour and were re-vegetated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hoovestal Private Road FLPMA Easement	May-1992	Private road easement across NFS lands was granted to1 to construct, use, and maintain a private road across NFS lands to access private property.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Army National Guard Special-Use Permit	April-1992	A special use permit was issued to conduct a small training exercise on NFS lands. The land navigation exercises were held in the Greenhorn Mountain area.
Sensitive Plants: Minor effect		

Cozzie Special-Use Private Road	January-1992	A special use permit was issued that authorized the reconstruction, use, and maintenance of approximately 265 feet of existing road across NFS lands in order to provide access to adjacent private lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
FLPMA Forest Road Easement Lane Associations	October-1991	A forest road easement was issued to for approximately 1.3 miles on Jim Ball spur road #4143-A1 on the Helena National Forest. The right-of-way is 6839 ft long by 10 ft wide and contains 1.57 acres.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Meadow Creek Project FMC Gold Company Mining Plan of Operations	October-1991	FMC Gold Co. conducted exploratory drilling on their unpatented mining claims located in the Meadow Creek vicinity on private and NFS land administered by the Helena Ranger District. Eleven of the twelve drill sites are located on NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Ophir Group Project American Copper & Nickel Company, Inc. Mining Plan of Operations	October-1991	The American Copper & Nickel Company Inc. conducted exploratory drilling on their unpatented mining claims located near Ophir Gulch on NFS lands administered by the Helena Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Minnehaha Trail Project	September-1991	A trail between Moose Creek Work Center and road 527 was constructed including the construction of a bridge 30' long 14' wide across Minnehaha Creek, installation of a culvert near the work center, power poles on the railroad bed were relocated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Trout Creek; Temporary Road Construction, Salvage of Standing Dead lodgepole pine, Commercial Hauling	September-1991	A special use permit was issued to Louisiana Pacific to construct approximately 980 feet of temporary road across NFS lands. Removal of approximately 40000 board feet of standing dead lodgepole on NFS lands adjacent to this temporary road was also authorized to this permit holder.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
John T. and Merrylee McCrea small Tracts Case	July-1991	The Forest Service sold 2.8 acres that contained three tracts of mineral fractions virtually surrounded by patented mining claims in order to improve management and adjust property boundaries.
Sensitive Plants: Minor effect		
Ten-Mile Creek Gravel Source Drilling	July-1991	Construction of approximately 580 ft of primitive road across NFS lands that provided short-term access to a potential gravel source. This road was used by a track-mounted drill rig to access the site, where it drilled up to five core sample test holes. On completion the road was obliterated, and re-vegetated where practical.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Elbert and Leslie Bressie Permit Issuance	June-1991	A grazing permit was issued for the grazing of domestic livestock on the Spotted Dog/Trout Creek allotment of the Helena Ranger District. Ten yr. permit t
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Herb Eskildsen Permit Reissuance	June-1991	A grazing permit was reissued for the grazing of domestic livestock on the Cellar/North Fork allotment of the Helena Ranger District. 10 year permit.

Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
U.S. West Buried Phone Line	June-1991	A special use permit was issued to U.S. West Communications Inc. for the installation of a buried phone line across NFS lands within right-of-way of road #137.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels:		
Hoovestal Private Road	February-1991	A special use permit was issued for the construction of a private road across NFS lands that provided access to his private property.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hat Creek Cattle and Horse Allotment	November-1990	An updated allotment management plan for the Hat Creek C&H allotment that involved the incorporation of two sections of land from the adjacent Spotted Dog-Trout Creek allotment and the implementation of a three pasture deferred rotation system. Approximately .5 miles of barbed wire fence was constructed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fuels/fire: Same as general effects of livestock grazing		
MacDonald Pass Cattle & Horse Allotment	November-1990	An updated allotment management plan occurred on the MacDonald Pass C&H allotment. This involved the implementation of two two-pasture deferred rotation systems.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fuels/fire: Same as general effects of livestock grazing		
The Universal Power Resources, Inc. Plan of Operation for the TK Lodes	July-1990	The proposed activities included, exploratory drilling, trenching, bulk sampling, and reclamation.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Chryso Exploration's Wilson Creek Gold Project Final EIS	June-1990	The development of 5 exploration test holes, 5 exploration trenches, and a small placer mine operation and settling pond took place in the Wilson Creek Drainage.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Forage Improvement Practices on the Clancy C&H Allotment	March-1990	Prescribed fire was used on approximately 380 acres of open parks and sage rush stands. The sagebrush was reduced to approximately 40% of its current cover on the site. .
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels: Fire is an important process in grasslands and shrublands. Many of the plants are adapted to fire and require periodic fire as part of their lifecycle. Sagebrush is easily killed by fire; burning in these areas serves to create different age classes as sagebrush recolonizes the burned areas		
Clancy Cattle and Horse Allotment Revision of the Allotment Management Plan	July-1988	The implementation of a new grazing system required: 1) Moving the location of two cattle guards along existing roads. 2) Installation of three new cattle guards along existing roads. 3) Installation of 7 miles of wire fence. 4) Reconstruction of 2 miles of allotment boundary fence. 5) Removal of 1 mile of existing fence.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Chessman Reservoir Complex- Repair and Management	February-1988	Hauling of rip-rap material from existing rock pit sites and hauling construction equipment and materials from off the forest to the reservoir site using existing roads.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Rimini Abandoned Mine Reclamation Project Drilling of Water Quality Monitoring Well	February-1988	The drilling of a well for sampling ground water quality occurred near Ten-Mile Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Chessman Minerals Pit Site	August-1987	A minerals pit site was developed for immediate and future use to improve forest roads for administrative, commodity, and public use activities.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Priest Pass Resurfacing Project	February-1987	The Priest Pass road was resurfaced with crushed aggregate surfacing on 5.5 miles of 14ft wide road to reduce erosion damage and improve access for timber management and public use activities. The installation of additional culverts, other drainage structures, and erosion control seeding, was implemented to further reduce sedimentation.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Louisiana-Pacific Private Commercial Road Use	1987	A private road special use permit that authorized the reconstruction, use, maintenance and obliteration of approximately 200 ft of temporary road on NFS lands and use of 1 mile of existing forest developmental road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Past Activities for the Lincoln (D-4) District		
Activity/Project Name	Date of Implementation	Scope of Activity
East Nevada Livestock Grazing Management	2007	Livestock grazing continued within the East Nevada allotment area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels: Same as general effects of livestock grazing		
West Nevada Livestock Grazing Management	2007	Livestock grazing continued within the West Nevada allotment area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations Fire/Fuels: Same as general effects of livestock grazing		
Flesher Pass Trailhead Reconstruction	March-2004	A portion of the Flesher Pass Trailhead was reconstructed and relocated. Work included installation of restroom facilities, picnic tables, and a safer parking area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
User Developed Trail Rehabilitation/Closure	October-2002	A user developed ATV trail on the east side of Flesher pass was closed and rehabilitated.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Raptor Fall Banding	August-2002	A temporary special use permit was issued to conduct fall banding of raptors as they migrate through the Rogers Pass area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Mineral Creek Trail Reroute	June-2002	Approximately 2.5 miles of the Mineral Creek trail was rerouted to its original tread

		and the old trail was rehabbed / obliterated.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Ringeye/Camp Creek Trail Reroutes	June-2002	The Ringeye/Camp Creek Trail was rerouted to meet proper safety standards. Old trails were rehabbed / obliterated.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Outfitter Guide Temporary Special Use Permits	June-2002	Three temporary special use permits were issued to conduct outfitting and guiding activities in the Alice Creek area.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Shrub Planting	May-2002	Shrub planting occurred in Alice Creek, Liverpool Creek, and Washington Gulch.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Forest road Special Use Permit - Ferguson	April-2002	Authorization to use a Forest Service road located in Lewis & Clark county to access their private property.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Special Use Permit for Lone Point Road Use	March-2002	A special user permit was issued for use of approximately 1.6 miles of Lone Point road in order to access their private property.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Transplant Mountain Goats into the Scapegoat Wilderness	February-2002	A helicopter was utilized to transplant mountain goats into the Scapegoat Wilderness.
Sensitive Plants: Minor effect		
DNRC/Rogers Pass Road Use Permit	August-2001	A Special use permit was issued for log hauling along .4 miles of existing Forest Service Road 1807 and 150ft of temporary road was constructed.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Fiber Optic Telecommunication Line Installation, Lincoln Telephone Company, Inc.	August-2001	A special use permit was issued to Lincoln Telephone Co. to include an additional 1.8 miles of an underground fiber optic telecommunication cable.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Lincoln Telephone Company - Additional Fiber Cable	August-2001	A special use permit was issued to Lincoln Telephone Co. to include an additional 1.8 miles of an underground fiber optic telecommunication cable.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Road Use Permit including 1 culvert installation in Madison Gulch (Senecal)	August-2001	A road use permit was issued to use Forest Service road # 329, 4128, and 1829. He also installed one culvert in Madison Gulch.
Sensitive Plants: The effects of these disturbances are reflected		in the existing condition of the current sensitive plant populations
Rogers Pass Raptor Study Permit	August-2001	A permit was issued for the use of NFS lands to study Golden Eagles. ¼ of an acre was used on the N. side of Rogers Pass.
Sensitive Plants: No effect		
State of Montana Timber Hauling Forest Service roads #1807 & 1807	August-2001	Commercial log hauling of State of Montana timber on State land occurred on Forest Service roads #1807 and 1807-A1. Approximately .4 miles of #1807 was

A1- Roger Pass Microwave Roads		used and 150 ft of 1807-A1 was built used and reclaimed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Timber hauling on Copper Rd #330 (Al Ray, Paid Year Long)	August-2001	Al Ray hauled private timber on approximately 2.6 miles of Forest Service Copper Creek road #330.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Authorization of FS road for commercial log hauling from private land	July-2001	2.5 miles of road Forest Service Road #1163 & 1163B was used to haul logs from private land up Nevada Ogden Road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Fool Hen Snow Plowing (Heng)	May-2001	Approximately 4 miles of road was snowplowed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Authorization of FS road for commercial log hauling from private land	April-2001	Approximately 1,200,000 BF was hauled on 4.5 miles of Forest road from private land up Copper Creek and Landers Fork.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Private Timber Hauling, Forest Service Road #1815 - Meadow Creek	April-2001	Commercial log hauling of private timber from private land on Forest Service Road #1815 the Meadow Creek Road took place. Approximately 500-700' of road was used and an estimated 100-150 MBF of sawlogs were hauled.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Construction of an Outhouse on Stonewall Mountain	May-1999	Construction of an outhouse on Stonewall Mountain to service the needs of Stonewall Lookout during the fire season took place.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Montana Department of Corrections Aspen Youth Alternatives	December-1998	A temporary special use permit was issued to Montana Department of Corrections for institutional outfitting in the Little Blackfoot area. They conducted a juvenile treatment program managed by Aspen Youth Alternatives.
Sensitive Plants: Minor effects		
Love Project - Lincoln Montana, Core Drilling, Big Blackfoot Mining, Inc.	February-1998	Big Blackfoot Mining Inc. drilled 8 core drilling sites near the junction of Lone Point Road and Hwy 200.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Outfitter and Guide Special Use Permit, Harold Gilchrist, Landers Fork Outfitters	August-1997	A special use permit was issued to Harold Gilchrist with Landers Fork Outfitters that authorized outfitting and guiding operations in the Bob Marshall Wilderness Complex.
Sensitive Plants: Minor effect		
Outfitter and Guide Special Use Permit, Les Nader, Red Mountain Wilderness Outfitters Inc.	August-1997	A special use permit that authorized outfitting and guiding operations in the Bob Marshall Wilderness Complex.
Sensitive Plants: Minor effect		

Outfitter and Guide Special Use Permit, Mary Faith Hoeffner, K-Lazy 3 Outfitters Inc.	August-1997	A special use permit was issued that authorized outfitting and guiding operations in the Bob Marshall Wilderness Complex.
Sensitive Plants: Minor effect		
Outfitter and Guide Special Use Permit, Ron Mills, Ron Mills Outfitting	August-1997	A special use permit was issued that authorized outfitting and guiding operations in the Bob Marshall Wilderness Complex.
Sensitive Plants: Minor effect		
Outfitter and Guide Special Use Permit, William Plante, Scapegoat Wilderness Outfitters	August-1997	A special use permit was issued that authorized outfitting and guiding operations in the Bob Marshall Wilderness Complex.
Sensitive Plants: Minor effect		
Fiber Optic Telecommunication Line Installation, Blackfoot Telephone Cooperative Inc., Lincoln Telephone Company, Inc.	July-1997	Blackfoot Telephone Cooperative Inc. and Lincoln Telephone Co. installed a fiber optic telecommunication line. Segments of the line were on 11 miles of NFS lands.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Willow Creek Allotment Management Plan	May-1997	Proposal to combine Poorman Creek and Willow Creek into the Willow Creek Allotment to make Forest Service administration easier.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Snowbank Lake Diversion Drop-Log Structure Fisheries Pool and Spawning Habitat Improvement	July-1996	Five drop-log structures were installed to improve fisheries pool habitat and spawning habitat quality in Snowbank Lake diversion.
Sensitive Plants: Minor effect		
Moose Creek Drop-Log Structure Fisheries Pool Habitat Improvement	August-1995	Installation of five drop-log structures to improve fisheries pool habitat in Moose Creek Drainage occurred.
Sensitive Plants: Minor effect		
Telephone Gulch/Bear Creek Road Obliteration	August-1995	Forest road 4080 was rehabilitated. Approximately 3.5 miles of road was reclaimed, stabilized, and reseeded.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Permit to haul private timber on FS roads (Al Ray)	July-1995	A permit was issued to Al Ray to haul private timber on Forest Service roads #330, 1882, 1847, 1847A.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Dry Creek Trail Bridge Reconstruction	June-1995	Dry Creek Trail #483 bridge was reconstructed.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Sourdough Trail #427 Reconstruction	June-1995	Sourdough trail #427 in the Scapegoat Wilderness was reconstructed. 300ft of trail was relocated to avoid wet boggy area that it then crossed. Other work included

		installing waterbars, brushing, clearing and maintaining existing waterbars.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Star (WO34) Exploration Project, FMC Gold Company	July-1993	Plan of operations for FMC Gold Company to drill 9 shallow reverse circulation drill holes in McCarthy Gulch.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Seven-up Pete Exploration Phelps Dodge Mining Company Seven-up Pete Venture	August-1992	A plan of operations for Phelps Dodge Mining Co. to drill 15 shallow reverse circulation drill holes in Seven-Up Pete area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Washington Gulch, Mining, L.P., Inc.	July-1992	A plan of operations for Washington Gulch L.P. Inc to placer mine. The also built a process plan in Washington Gulch area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Prickley Gulch Exploration Project, Homestake Mining Company	June-1992	Plan of operations for Homestake Mining Co. to excavate 3 trenches and construct 500ft of temporary road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
"Race to the Sky" Sled Dog Race	January-1992	A special use permit was given to Montana Sled Dog Inc. to conduct sled dog races over portions of National Forests.
Sensitive Plants: Minor effects		
Bear #26, 27, 31, 49, 54 Claims Mining Project, Phelps Dodge Mining Company	September-1991	Plan of operations for Phelps Dodge Mining Company to drill six reverse circulation exploration holes and construct approximately 3000ft of temporary road in the Ethel Gulch area.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
OMO 1-12 Claims Mining Project	August-1991	Plan of operations for Leonard Orr to conduct 5 exploration air angle drill holes in Alice Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Sunshine Lode Claims Mining Project	July-1991	Plan of operations for Bruce Cox to do surface trenching near Ogden Mountain. The approximate time of disturbance was one hour.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Three Friends Placer Mining Project	July-1991	Plan of operations to placer mine up Lincoln Gulch. The approximate area of disturbance was 2 acres.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Gould-Helmville Trail #467 and Continental National Divide Scenic Trail #440 Trail Closures	October-1990	A decision was made to close the Gould-Helmville Trail #467 to motorized vehicles over 48in. wide, also a segment of the Continental Divide Scenic Trail #440.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Exploration Drilling on the Indigo Project	August-1990	Plan of operations that included the drilling of nine drill sites and construction of 2500 ft. of new road.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Prescribed Burning for Wildlife Habitat Improvement and Fuels Reduction	March-1990	Prescribed burning was used to enhance or maintain wildlife habitat or reduce fuel loading on approximately 450 acres on the Lincoln Ranger District.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Hogum Creek Transportation Analysis	November-1988	A high access control alternative was chosen for the Hogum Creek Transportation Analysis, it involved the closure of several roads.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Upgrading the Indian Meadows Wilderness Portal	November-1988	This project included the reconstruction of road #1882, rehabilitating the administrative site, and upgrading the public facilities at the wilderness portal.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Klondike Ore #1 Placer Mine Plan of Operations and Reclamation	July-1988	Placer mine operations and reclamation were approved for Klondike Ore #1.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Helena National Forest Noxious Weed Control Program EIS	October-1987	A program that integrates biological, preventative, manual, mechanical, and herbicides was implemented for the treatment of noxious weeds on the HNF.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Sunshine Mining Company, Hope #1, #2, #4, #12, #11, & #10 Claims, Core Drilling, Water Well Drilling	June-1987	Sunshine Mining Company added 10 drill sites and additional road construction to their original plan of operations.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Amending Recreation Management Direction for the Bob Marshall, Great Bear, and Scapegoat Wilderness	April-1987	Decision to amend the Flathead, Helena, Lewis & Clark, and Lolo National Forest plans to incorporate recreation management direction for the Bob Marshall, Great Bear, and Scapegoat Wildernesses.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Western Energy Company, Bison Claim Group, Core Drilling Operation	December-1986	The plan of operations was to conduct core drilling between Seven Up Pete Creek and Hogum Creek.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
Right -of-way from the Sieben Ranch Company	September-1986	A section of existing road which provides access to NFS lands crosses a section of private Sieben Ranch land.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		
System Trail Relocation at Big Horn Lake	June-1986	Relocation and construction of approximately 1 mile of trail # 442 accessing Big Horn Lake took place.
Sensitive Plants: The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations		

Appendix C- Wildlife Analysis

The table, below, provides the rationale for the level of analysis applied to each wildlife parameter. Some of the parameters have been described in detail in the *Warm Springs Wildlife Specialist Report* (USDA 2010).

Table C-1 Wildlife Analysis Approach Table

Wildlife Parameter	Analysis Approach
Wildlife Habitats	
General	The project area comprises several types of wildlife habitats from dry forests to sagebrush/grasslands. The <i>Warm Springs Wildlife Specialist Report</i> (USDA 2010) will address effects to the wildlife habitats in the project area relative to current and desired conditions including habitat loss associated with the vegetation management. Habitats analyzed include dry and cool moist forests, riparian, aspen, shrublands, grasslands, juniper, and snags and CWD.
Snags and CWD	Snags and down logs are currently available across the project area. It is anticipated that future dead wood levels will increase due to the current level of insect and disease on the landscape. The <i>Warm Springs Wildlife Specialist Report</i> will address this topic.
Dispersal, Migration, and Travel Corridors	While there is no empirical evidence to support the concept of corridors, many conceptual models have been built to project connectivity across landscapes. The <i>Warm Springs Wildlife Specialist Report</i> will address this topic.
Fragmentation	The Warm Springs Project area is characterized by forested stands interrupted by sagebrush or grasslands. Aspen stands occur throughout the project area. The extent of impacts associated with vegetation management depends on the species, its size, home range, and dispersal habits, as well as the juxtaposition of habitat. Species with small home ranges and limited mobility generally are more susceptible to the barriers and subsequent fragmentation associated with vegetation management. The <i>Warm Springs Wildlife Specialist Report</i> will address fragmentation.
Edge Effects	Vegetation management produces edge effects. Edge effects may extend up to 200 meters into a forest and may substantially affect biological communities and ecological processes. Edge zones tend to be drier and less shady than interior forests and tend to favor shade-intolerant plants. Edge-adapted species (i.e. many terrestrial 'game' species) benefit from increases in edge whereas species dependent on true interior habitat may be unable to maintain their populations in landscapes where edge is abundant. The <i>Warm Springs Wildlife Specialist Report</i> will address edge effects.
Noxious Weeds	Noxious weeds impact wildlife by reducing habitat availability where noxious weeds successfully out compete native vegetation. The <i>Warm Springs Noxious Weeds Specialist Report</i> will analyze the effects of the various Alternatives on noxious weeds.
Unique Features	Several wildlife species use unique features such as cliffs, caves, and talus slopes. These features are not analyzed as a separate topic in the <i>Warm Springs Wildlife Specialist Report</i> ; rather, they are analyzed under the respective species that uses the unique feature where applicable.
Big Game	
Elk	The <i>Forest Plan</i> identifies the components of elk habitat that need to be addressed in this analysis. The elk analysis is further described in the <i>Warm Springs Wildlife Specialist Report</i> .
Mule Deer	There are a number of populations of mule deer within the Elkhorn WMU. For the purposes of mule deer analyses, elk

Table C-1 Wildlife Analysis Approach Table

Wildlife Parameter	Analysis Approach
	will serve as the surrogate analysis species for mule deer. Effects described for elk are assumed to be similar for mule deer.
Moose	The Shiras moose, a northern Rocky Mountain subspecies, is native to Montana. Moose may be found throughout the Elkhorn WMU. Because of their solitary nature coupled with a lack of moist early-seral or riparian habitats, moose densities are low. Although moose do use nearly all types of mountainous habitats, moose densities seem to be roughly correlated with the extent of swampy, boggy, riparian types found in a general area. There may be effects of vegetation management on moose. However, the effects are assumed to be reflected in the analysis of Riparian Habitats.
Bighorn Sheep	Bighorn sheep are currently not within the project area. This species will not be analyzed further for this project.
Mountain Goat	Mountain goats are not native east of the continental divide in Montana and were introduced in the Big Belt Mountains at the Gates of the Mountains in 1951. They are not expected to occur in the project area due to lack of habitat. Therefore there will be no further discussion.
Other Hunting and Trapping	See the discussion pertaining to forest carnivores, specifically wolverine, fisher, and marten.
Threatened, Endangered, and Proposed Species	
Wolf	Wolves occurring east of I-15, are currently considered a nonessential experimental population. Effects to wolves are discussed further in the <i>Warm Springs Wildlife Specialist Report</i> .
Grizzly	The Elkhorns are not located within any Bear Management Unit, nor does the area fall under the management situation in the Recovery Plan. The Project Area is well outside current occupied grizzly bear range which is located to the west and north of the Project Area along the Continental Divide and on the Lincoln Ranger District. Furthermore, the U.S. Fish and Wildlife Species List dated 2/4/10 indicates the grizzly bears are not present in the project area.
Canada Lynx	Lynx are not considered present in the project area. The project area is not covered under NMLRD. There is no habitat in the project area. This species will not be analyzed further for this project.
Sensitive Species	
Bald Eagle	The project area does not occur within the Upper Missouri Recovery Zone, which is the closest Recovery Zone to the project area. Bald eagles have not been sighted in the project area nor does the project area provide bald eagle nesting or roosting habitat. Therefore, there will be no additional analyses.
Wolverine	If wolverines frequent the project area, they probably use it in route to other high elevation areas within the Elkhorns that provide natal denning habitat or winter ranges that provide winter-killed elk as a source of carrion. According to the Montana Natural Heritage Program, Natural Heritage Tracker, wolverines have been observed in or near the project area (See http://mtnhp.org/Tracker/NHTMap.aspx?elcode=AMAJF01020 , select <i>Tracker</i> , for more information). Primary effects associated with the vegetation management include potential disturbance and effects to ungulates, a wolverine prey base. The wolverine is analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Fisher	The project area is predominately xeric habitat with few mesic zones associated with fisher. There is abundant cover and downed wood and snags desirable to fisher, but riparian zones are extremely limited. The fisher will be analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .

Table C-1 Wildlife Analysis Approach Table

Wildlife Parameter	Analysis Approach
Black-backed Woodpecker	Following the 1988 Warm Springs Fire, which burned within the project area, black-backed woodpeckers were observed foraging in burned trees until 1995. After depletion of their food source, black-backed woodpeckers moved out of the project area and have not been observed since. Given the lack of recent fire activity in and around the project area, the presence of black-backed woodpecker is unlikely and has not been documented recently in the project area. Black-backed woodpeckers are analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Peregrine Falcon	Peregrine falcons do occur in the project area. Therefore, there will be no additional analyses.
Flammulated Owl	Flammulated owls use open park like conifer Forests, especially ponderosa pine. They require adequate insect forage base and a larger snag component. This species will be addressed in the <i>Warm Springs Wildlife Specialist Report</i> .
Boreal Toad	Vegetation management activities that potentially disturb shallow, wet areas may impact toads. A qualitative discussion based on habitat potential and level of effect by Alternative will be included in the <i>Warm Springs Wildlife Specialist Report</i> .
Townsend's Big-eared Bat	These bats inhabit various habitats with caves, tunnels, or trees with loose bark. There is potential habitat in the project area in terms of large trees with loose bark and an abundance of insects. However, there have not been any sightings. This species will be analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Northern Leopard Frog	Northern Leopard frogs have not been identified in the project area. They are not expected to be present due to lack of suitable habitat. Northern Leopard frogs will not be analyzed further.
Plains Spadefoot Toad	Plain's Spadefoot toads have not been identified in the project area. Spadefoot toads will not be analyzed further.
Harlequin Duck	Harlequin ducks are not expected to occur in the project area therefore there is no further analysis.
Northern Bog Lemming	The Northern bog lemming is not present in the project area therefore no further analysis will be conducted.
Management Indicator Species	
Northern Goshawk	Goshawks occur in a variety of elevational habitats. They are most commonly associated with forested habitats with structurally mature characteristics. The goshawk is analyzed further in the <i>Warm Springs Wildlife Specialist Report</i> .
Pileated Woodpecker	The pileated woodpecker is identified as an old growth dependent MIS species in the <i>Forest Plan</i> . Pileated woodpecker habitat will be further analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Hairy Woodpecker	The hairy woodpecker is identified as a snag-dependent MIS in the <i>Forest Plan</i> . Hairy woodpeckers are present in the project area and are further analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Marten	The marten is an indicator used to monitor the quality of large continuous blocks of mature cover. Martens use mature to old growth spruce/fir stands for denning, with stumps and downed logs being critical components. The marten will be analyzed in the <i>Warm Springs Wildlife Specialist Report</i> .
Hunted Species Group	See above for elk, mule deer, and bighorn sheep under Big Game.

Table C-2 Summary of Effect to TES and MIS Species

Species	Status in the Warm Springs Project Area
Grizzly Bear (threatened)	Grizzly bears are not considered present in the project area.
Canada Lynx (threatened)	Lynx are not considered present in the project area. The project area is not covered under NMLRD.
Gray Wolf (experimental)	Wolves may be transients in the project area based on the current rate of expansion although there have been no verified sightings. No packs currently inhabit the project area. Habitat suitability is good for ungulates, and prey (elk, deer) populations are high. Suitable habitat (abundant prey) is widely available.
Bald Eagle (sensitive)	The project area does not occur within the Upper Missouri Recovery Zone, which is the closest Recovery Zone to the project area. Bald eagles have not been sighted in the project area nor does the project area provide bald eagle nesting or roosting habitat. Therefore, there will be no additional analyses.
Wolverine (sensitive)	Wolverines are uncommon but may occasionally move through the project area. Foraging habitat is available throughout all landscapes; natal denning habitat is concentrated in rocky basins at high elevations outside the project area.
Fisher (sensitive)	Fishers have not been reported in the project area, or in the Elkhorns. There is no summer fisher habitat in the project area. Primary habitat is available outside the project area, and marginal habitat is widely available. Individual fishers could wander into the area although the habitats in the project area are marginal.
Northern Bog Lemming (sensitive)	Suitable habitats (high elevation sphagnum bogs) are not present in the project area.
Townsend's Big-Eared Bat (sensitive)	No big-eared bats have been identified in the Warm Springs area, according to the Montana Natural Heritage Database, and their status here is unknown. Key habitat components are scattered and uncommon. The nearest known breeding colony is 17 miles to the northeast of the project area (Hendricks and Maxell 2005).
Peregrine Falcon (sensitive)	Peregrine falcons are not present in the project area and there is no suitable habitat within the project area. Peregrine falcons are unlikely to occur in the project area due to lack of suitable nest habitat.
Flammulated Owl (sensitive)	Flammulated owls may be present in a few low/mid-elevation stands of open grown ponderosa pine, aspen, or Douglas-fir within the project area. Nesting flammulated owls are likely uncommon in the project area due to fire suppression that has decimated ponderosa pine habitat via MPB infestations and the encroachment of Douglas-fir. Flammulated owls have been detected in the vicinity of Strawberry Butte.
Black-Backed Woodpecker (sensitive)	Black-backed woodpeckers have not been observed in the project area even though woodpecker cavity searches have been conducted for several years including 2010. Potential habitat does exist due to recent insect infestations; however, black-backed woodpeckers are more closely associated with burned areas than insect infestations on the HNF.
Harlequin Duck (sensitive)	Harlequin ducks are not known to be present in the project area. Suitable habitat (broad, swift mountain streams with robust shoreline vegetation & minimal human presence) is not present in the project area.
Northern Leopard Frog (sensitive)	Leopard frogs have not been identified in the project area. They are not expected to be present due to lack of suitable habitat. These frogs are extinct in the western half of the state and no permanent ponds occur in the project area.

Table C-2 Summary of Effect to TES and MIS Species

Plain's Spadefoot Toad (sensitive)	Plain's Spadefoot toads have not been identified in the project area, though they have been identified at a single location along the Missouri River on the HNF. They are not expected to be present due to lack of suitable habitat.
Boreal Toad (sensitive)	Boreal toad habitat may be present in the project area, as limited nursery habitat is present in the project area within riparian zones. The Montana Natural Heritage program records one occurrence of boreal toads in the Mill Creek drainage in the vicinity of the project area in 2007.

The following table summarizes the effects of the three alternatives¹ on TES species. Only those species expected to occur in the project area are analyzed in the *Warm Springs Project Wildlife Specialist Report* (USDA 2010).

Table C-3 Effects Determinations for TES Species in the Warm Springs Project Area

Species	Alternative 1	Alternative 2	Alternative 3
Grizzly Bear (threatened)	No Effect	No Effect	No Effect
Canada Lynx (threatened)	No Effect	No Effect	No Effect
Gray Wolf (sensitive)	No Effect	No Effect	No Effect
Wolverine (sensitive)	No Impact	No Impact	No Impact
Fisher (sensitive)	No Impact	No Impact	No Impact
Bald Eagle (sensitive)	No Impact	No Impact	No Impact
Northern Bog Lemming (sensitive)	No Impact	No Impact	No Impact
Townsend's Big-Eared Bat (sensitive)	No Impact	No Impact	No Impact
Peregrine Falcon (sensitive)	No Impact	No Impact	No Impact
Flammulated Owl (sensitive)	No Impact	May impact individuals but is not likely to lead to federal listing	May impact individuals but is not likely to lead to federal listing
Black-Backed Woodpecker (sensitive)	No Impact	May impact individuals but is not likely to lead to federal listing	May impact individuals but is not likely to lead to federal listing
Harlequin Duck (sensitive)	No Impact	No Impact	No Impact
Northern Leopard Frog (sensitive)	No Impact	No Impact	No Impact
Plain's Spadefoot Toad (sensitive)	No Impact	No Impact	No Impact
Boreal Toad (sensitive)	No Impact	May impact individuals but is not likely to lead to federal listing	May impact individuals but is not likely to lead to federal listing

¹ Direction from Forest Service Region 1 (1995) is to use the determination "no effect" for threatened, endangered, and proposed species and to apply a determination of "no impact" to sensitive species (presumably to emphasize the distinction between sensitive species and listed species).

The following table summarizes the effects of the three alternatives on MIS species. Only those species expected to occur in the project area are analyzed in the *Warm Springs Wildlife Specialist Report* (USDA 2010).

Table C-4 Effects Determinations for MIS² Species-in the Warm Springs Project Area

Species	Alternative 1	Alternative 2	Alternative 3
Elk ³ (hunted species)	No impact	Impacts to hiding cover (less than those associated with Alternative 3); however, habitat remains abundant and well-distributed across the Forest.	Impacts to hiding cover; however, habitat remains abundant and well-distributed across the Forest.
Northern Goshawk (old growth dependent)	No impact	Impacts to goshawk habitat associated with proposed treatments. Habitat remains abundant and well-distributed across the Forest.	Impacts to goshawk habitat associated with proposed treatments (less than those associated with Alternatives 2). Habitat remains abundant and well-distributed across the Forest.
Pileated Woodpecker (old growth dependent)	No impact	Impacts to pileated woodpecker habitat associated with proposed treatments. Habitat remains abundant and well-distributed across the Forest.	Impacts to pileated woodpecker habitat associated with proposed treatments (less than those associated with Alternatives 2). Habitat remains abundant and well-distributed across the Forest.
Hairy Woodpecker (snag dependent)	No impact	Impacts to hairy woodpecker habitat associated with proposed treatments. Habitat remains abundant and well-distributed across the Forest.	Impacts to hairy woodpecker habitat associated with proposed treatments (less than those associated with Alternatives 2). Habitat remains abundant and well-distributed across the Forest.
Marten (mature forest dependent)	No impact	Impacts to marten habitat associated with proposed treatments. Habitat remains abundant and well-distributed across the Forest.	Impacts to marten habitat associated with proposed treatments (less than those associated with Alternatives 2). Habitat remains abundant and well-distributed across the Forest.

² The T&E species group determinations are located in the table Effects Determinations for TES Species-in the Warm Springs Project Area and address grizzly bears, gray wolves, bald eagles (now sensitive) and peregrine falcons (now sensitive).

³ Bighorn sheep and mule deer are also included in the 'hunted species group'. Bighorn sheep are not present in the project area and elk analyses are assumed to be a surrogate for mule deer.

Glossary

10-year return-interval precipitation year: A rainfall event with a 10-year recurrence interval.

Recurrence intervals, whether for precipitation or flood events, place a statistical value on the events. Over a long period of record, a 10-year design storm would be expected to occur on average once every 10 years (but could occur more or less frequently). The exceedance probability of an event with a specific recurrence interval is equal to 100 divided by the recurrence interval. For example, the probability of a 10-year design storm occurring in any given year is 100/10, or 10%.

20-foot winds: Wind speed and direction at 20 feet above the height of the top of the vegetation.

25-year design storm event: A rainfall event with a 25-year recurrence interval. Recurrence intervals, whether for precipitation or flood events, place a statistical value on the events. Over a long period of record, a 25-year design storm would be expected to occur on average once every 25 years (but could occur more or less frequently). The exceedance probability of an event with a specific recurrence interval is equal to 100 divided by the recurrence interval. For example, the probability of a 25-year design storm occurring in any given year is 100/25, or 4%.

100-year design storm event: See definition of 25-year design storm event. A 100-year design storm event is a rainfall event with a 1% probability of occurrence in any given year.

100-Hour fuel: Fuels that range from 1–3 inches and take about 100 hours to lose or gain two-thirds of the equilibrium moisture content of their environment.

1,000-Hour fuel: Fuels from 3–8 inches and take about 1,000 hours to lose or gain two-thirds of the equilibrium moisture content of their environment.

2009\$: Reflects what a US dollar was worth in 2009 without being adjusted for inflation for the current year.

Active crown fire: A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other.

Active ratio: The ratio of the crown fire rate of spread to the critical crown fire rate of spread. The fire may be an active crown fire if the active ratio value is greater than or equal to one.

Activity area: A land area affected by a management activity to which soil quality standards are applied. Activity areas must be feasible to monitor and include harvest units within timber sale areas, prescribed burn areas, grazing areas or pastures within range allotments, riparian areas, recreation areas, and alpine areas. All temporary roads, skid trails, and landings are considered part of an activity area.

Adit: A nearly horizontal passage from the surface into a mine.

Affected environment: The natural, physical, and human-related environment that is sensitive to changes due to proposed actions.

Age classes: Tree ages grouped by meaningful classes.

Air quality: Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88 206: Jan. 1978.

Allelopathic properties: The ability of a plant species to produce chemicals that inhibit the growth of other plants.

Alternative: A mix of management prescriptions applied to specific land areas to achieve a set of goals and objectives. Each alternative represents a different way of achieving a set of similar management objectives.

Analysis area: In contrast with implementation/project area, which is comprised of and defined by the general area in which activities are proposed under the various alternatives, the analysis area varies by resources and issues. It is defined by the area and resources that could potentially be affected or influenced by proposed activities.

Andesites: Fine-grained, generally dark colored, igneous volcanic rock with more silica than basalt, commonly with visible crystals of plagioclase feldspar that generally occur in lava flows, but also as dikes.

Animal unit (AU): The amount of forage needed by an animal unit, one mature 1,000 pound cow and her suckling calf, grazing for one month. The quantity of forage needed is based on the cow's metabolic weight.

Animal unit months (AUM): The amount of forage needed by an AU grazing for one month. The quantity of forage needed is based on the cow's metabolic weight.

Anthropogenic emissions: Emissions produced because of human activity, including emissions from agricultural activity and domestic livestock.

Anthropogenic: Effects, processes, or materials that are derived from human activities.

Arrastra: A mill, consisting of one or more large stones dragged around on a circular bed, used to grind ore.

Aspect: The cardinal direction (north, south, east, west) towards which a slope faces.

Basal area per acre (BA/ac): A measure of density. The cross-sectional surface area of trees at breast height (4.5 feet) measured in square feet. BA/ac represents trees taller than breast height.

BEHAVE: A software application that predicts wildland fire behavior for fire management purposes. It is designed for use by fire and land managers who are familiar with fuels, weather, topography, wildfire situations, and the associated terminology.

Best management practices (BMPs): A set of practices which, when applied during implementation of a project, ensures that water-related beneficial uses are protected and that state water quality standards are met.

Biogeographic corridors: Corridors on the continental scale that function in evolution and distribution.

Biophysical settings: Land delineations based on the physical setting of an area (aspect and elevation) and the potential vegetation community that can occupy a specific environmental setting.

Board foot: A unit of measure of wood one inch thick, and one foot on each side. Equals $\frac{1}{12}$ cubic foot of wood.

Broadcast burn: Controlled burn where fire is intentionally ignited and allowed to proceed over a designated area within well-defined boundaries to reduce fuels, and to prepare sites for planting and/or ecosystem restoration

Bulk density: See **soil bulk density** and **canopy bulk density**.

Calculated risk of failure: Likelihood that a recurrence interval flood (e.g., five-year, 10-year, 25-year, etc.) would probably be equaled or exceeded at least once during the specified design life of a culvert crossing

Canopy: The collective crowns or upper branches in a stand of trees.

Canopy base height: For modeling in Behave Plus, canopy base height refers to understory ladder fuels and the main canopy layer for a stand of trees.

Canopy bulk density: Mass of available canopy fuel per unit canopy volume of a stand.

Canopy closure: The progressive reduction of space between tree crowns as they spread laterally; a measure of the percent of potential open space occupied by the collective tree crowns in a stand.

Canopy cover: Spacing between plants in the dominant vegetation type. A measure of the coverage of tree crowns in a stand, as a percentage of the land area.

Canopy coverage: The degree to which tree crowns block sunlight or obscure the sky.

Caudices: The thickened persistent stem bases of some herbaceous perennial plants.

Cavity: The hollow, excavated in snags by birds, used for roosting and reproduction by many birds and mammals.

Central tendency: Measures indicating the middle or center of a distribution.

Chains/h: Chains per hour (1 chain = 66 feet)

Channel morphology: The physical form and structure of a stream channel as a product of a complex set of variables operating within a watershed. Any changes imposed on these variables can result in changes to the natural structure of the stream.

Chert: An extremely dense type of quartz, including jasper and flint, having a dull, opaque luster and made up of microscopic crystals.

Classified road: A road constructed or maintained for long-term highway vehicle use. Classified roads may be public, private, or forest development.

Climatic constraints: Limitations due to prevailing weather.

Climax successional theory: A theory that states vegetation communities are constantly changing, moving toward an "endpoint," which has been called a "climax" (Pfister et al. 1977).

Climax vegetation: A biological community of plants that, through the process of ecological succession, has reached a steady state due to the species' suitability to average conditions in the area.

Closed canopy: A canopy created by trees or shrubs (or both) that is dense enough to exclude most of the direct sunlight from the forest floor.

Closed road: A National Forest road or segment that is restricted from certain types of use during certain seasons of the year. The prohibited use and the time period of closure must be specified. The closure is legal when the Forest Supervisor has issued an order and posted it in accordance with 36 *CFR* 261.

Coarse woody debris (CWD)(fire and fuels, soils, forested vegetation): Organic materials on the soil surface; such as plant stems, branches, and logs; with a greater than three-inch diameter, or 1000-hour time-lag fuels.

Coarse woody debris (wildlife): Woody material of at least seven-inch diameter from whatever source that is dead and lying on the forest floor. The term describes terrestrial species habitat.

Collector roads: Roads serving smaller land areas than Forest arterial roads, usually connected to a Forest arterial or public highway and collecting traffic from Forest local roads and/or terminal facilities. The location and standard are influenced by both long-term multi-resource service needs and travel efficiency. May be operated for either constant or intermittent service depending on land use and resource management objectives for the area.

Columnar: Descriptor of column shape in plants.

Compaction: A physical change in soil properties from compression, vibration, or shearing that increases soil bulk density and decreases porosity, air exchange, root penetration, infiltration and permeability.

Conditional crown fire: A fire that enters a stand as a crown fire from a crown fire in an adjacent stand.

Conifer: Any of a group of needle and cone-bearing evergreen trees.

Connectivity: The abundance and spatial patterning of habitat and the ability of members of a population to move from patch to patch of similar habitat.

Corner monument: A corner is a legal location that is a corner of a major division of land. Corner monuments mark the corner with an iron post or stone, marked by stamping the distinguishing initial letter or letters, corner numbers, and survey numbers on the cap of a brass-capped monument.

Corridor: A narrow strip, stepping stones, or a series of stepping stones of hospitable territory traversing inhospitable territory and providing access from one area to another. Corridors fall into five general categories:

- Biogeographic—on the continental scale: function is evolutionary and distributional
- Season Migration—on the continental to local scale; function is behavioral and physiological for ecological survival
- Dispersal and Emigration—scale varies by species; function is use of unoccupied habitat, maintenance of current habitat, and optimal species fitness
- Travel—scale is within a home range; function is daily life requirements

- Invasive—all scales

Cover: Vegetation used by wildlife for seeking protection from predators, breeding and rearing young (hiding cover), or ameliorating conditions of weather (thermal cover).

Critical crown rate of spread: Critical rate of spread necessary to maintain active crown fire.

Critical reach: Section of stream that fish biologists carefully select to measure and monitor existing fine sediment levels as a function of past and ongoing actions and to gauge trends in response to changes in land management.

Critical surface flame length: Surface fire flame length (the distance between the flame tip and the midpoint of the flame depth at the base of the flame) associated with the critical surface intensity needed to transition to a crown fire.

Critical surface intensity: Fire intensity sufficient to transition to a crown fire.

Crown fire: A fire that spreads in the canopy of trees or shrubs at a rate independent from surface fire.

Crown rate of spread (ROS): Forward spread rate of the crown fire; indicates a sustained run over several hours that includes spotting (fires jumping ahead of the fireline).

Cubic foot: The volume of a cube with sides of one foot (0.3048 m) in length.

Cultural resources: The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs etc.) having scientific, prehistoric, or social values. More commonly referred to as Heritage Resources.

Cumulative effect: The impact on the environment that results from the incremental impact of an action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period.

Cyclic corridor: Corridors or traverses for species migration available only during certain periods.

Debitage: Sharp-edged waste material left over during the creation of stone tools.

Decadent: Deteriorating; when used in reference to stand condition there are inferences of the loss of trees from the overstory and of the presence of disease, or indications of loss of vigor in dominant trees so that the mean annual increment is negative.

Decumbent: Horizontal branches on plants.

Deferred rotation grazing system: A grazing system that provides for a systematic rotation of grazing among pastures. The time of the rest period generally changes in succeeding years.

Denning Site: A place of shelter for an animal; also, where an animal gives birth and raises young.

Detrimental soil condition: The condition where established soil quality standards are not met and the result is a significant change in soil quality.

Detrimental soil disturbance: These disturbances includes the effects of compaction, displacement, rutting, severely burned soils, surface erosion, loss of surface organic matter, and soil mass

movement. At least 85% of an activity area must have soil that is in satisfactory condition.

Detrimental conditions include:

Diameter at breast height (DBH): Tree diameters at 4.5 feet (breast height), often weighted by basal area to reflect the mature trees in a stand. *Quadratic mean diameter* (QMD), or the average diameter of the average tree, is also used in some datasets.

Dispersal: The movement of organisms away from the place of birth or from centers of population density.

Displacement: Detrimental displacement is the removal of 1 or more inches (depth) of any surface soil horizon, usually the A horizon, from a continuous area greater than 100 square feet.

Diversity: The relative distribution and abundance of different plant and animal communities and species within an area.

Divide Landscape: The aspect of the land that is characteristic to the Continental Divide area in the project.

Dominant: Plant species or species groups which, by means of their numbers, coverage, or size, influence or control the existence of associated species.

Duff: An organic surface soil layer, below the litter layer, in which the original form of plant and animal matter cannot be identified with the unaided eye.

Early seral: The first vegetative response to a disturbance such as fire, insects, disease, or logging that has removed or killed the overstory.

Economic diversity: The degree to which an economy's mix of industries, sectors, and skill and employment levels differ from a larger reference economy.

Economic specialization: Concentration of a few particular tasks producing only a few particular items or economic activities.

Ecosystem: An interacting natural system including all the component organisms together with the abiotic environment (non-living chemical and physical factors in the defined system).

Ecotones: the zone on either side of the edge of an area that is influenced by the transition between contrasting vegetation types.

Edge: An interface where forested and open-country habitats meet.

Edge effect: Fragmentation that results in an increased proportion of the remaining forest being located in close proximity to the forest edge.

Effects (impacts): Environmental consequences (the scientific and analytical basis for comparison of alternatives) resulting from a proposed action. Effects may be either direct, which are caused by the action and occur at the same time and place, or indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative.

Elk analysis area: An area within the National Forest boundary used by a herd of elk throughout the year. This includes summer and winter range and all areas in between. This also includes any private land that occurs within the National Forest boundary (i.e., inholdings).

Elk herd unit: The total area used by a herd of elk in the course of one years' movement from summer to winter range. This includes areas outside the National Forest boundary.

Elk hiding cover: A stand of coniferous trees having a crown closure of >40%.

Elk security: Large areas (>250 acres) more than ½ mile from open roads that provide a place of refuge for elk during hunting season. A measure of elk vulnerability to hunting.

Elk summer range: Range, usually at higher elevations, used by elk during the summer; a summer range is usually much more extensive than a winter range.

Elk thermal cover: Vegetation used by elk to mitigate the adverse effects of weather. A forest stand that is at least 40 feet in height with tree canopy cover of at least 70% provides thermal cover. These stand conditions are achieved in closed sampling-pole stands and by all older stands unless the canopy cover is reduced below 70%. Deciduous stands may serve as thermal cover in summer but not in winter.

Elk winter range: Winter range is identified generally as those areas under 6,000 feet in elevation. It is usually at lower elevation and used by elk during the winter months; usually better defined and smaller than summer ranges.

Elkhorn Cooperative Wildlife Management Area: An area of approximately 300,000 acres in the Elkhorn Mountains that was established in 1992 and managed cooperatively through a partnership of government agencies.

Elkhorn Wildlife Management Unit: A management area designated in the HNF *Forest Plan* as the result of the *Final Elkhorn Wilderness Study Report* of 1982. It is approximately 160,000 acres and includes the Elkhorn Mountains.

Emigration: The behavior of individuals or populations of animals leaving an area to settle elsewhere.

Endangered species: A species that is in danger of extinction as designated by the Endangered Species Act of 1973, throughout all or a significant portion of its range.

Endemic: Native to or confined to a certain region.

Entrainment: The pickup and movement of sediment as bed load or in suspension by current flow.

Environment: The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental Impact Statement: A detailed statement prepared by the responsible official in which a major Federal action which significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and effects analyzed.

Epidemic: The populations of plants, animals, and diseases that build-up, often rapidly, to highly abnormal and generally injurious levels.

Erosion: Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is much more rapid than normal, natural, or geologic erosion, primarily as a result of the influence of activities of people, animals, or natural catastrophes.

Estivating: Being in a dormant or torpid state during the summer months.

Ethnographic: Related to the branch of anthropology that describes specific human cultures.

Federal Register: A daily publication that reports Presidential and Federal Agency documents.

Fine woody debris: Dead wood less than three inches in diameter or 1–, 10–, and 100–hour time lag fuels.

Fines: Particles less than one-quarter-inch (six mm) diameter in size.

Fire frequency: Number of fires per unit time in a specified area.

Fire severity: The degree to which a site has been altered or disrupted by fire: severity is affected by fire intensity and how long the fire remains at the site.

Fire type: Surface (S), torching (T, (passive crown fire)), or crowning (C, (active crown fire)).

Fire-dependent ecosystems: Ecosystems in which fire is essential and the species have evolved adaptations to respond positively to fire and to facilitate fire's spread.

Fireline intensity: A quantitative measure that describes the rate of heat release per unit time per unit length of the linear fire front.

Flame length: Within the flaming front, the length of the flame (measured by the distance between the flame tip and the midpoint of the flame depth at the base of the flame) of a spreading surface fire; a function of fire intensity that influences the effect on vegetation.

FlamMap: A landscape fire behavior model.

Foliar moisture: Moisture content of overstory foliage; one of the attributes used to determine transition from surface to crown fire; 100% refers to mature foliage with new growth complete.

Forage: Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Forb: Herbaceous flowering plants that are not graminoids (grasses, sedges and rushes).

Forest Service sensitive species: Those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by:

- a. Substantial current or predicted downward trends in population numbers or density.
- b. Substantial current or predicted downward trends in habitat capability that would reduce a species' existing distribution (*FSM 2670.5*).

Forest type: Association of tree species that have similar ecological requirements.

Fragmentation: A change in landscape structure that leads to smaller patch sizes, less interior habitat, and greater distances between patches, which in turn can lead to subpopulation isolation.

Fry: A free swimming life stage of juvenile salmonid fish following absorption of the yolk sac and prior to the development of parr marks (markings that provide camouflage from predators).

Fuel model: A cohesive set of parameters that define the necessary inputs to the fire spread model.

Fuels management: Manipulation or reduction of fuels to meet Forest protection and management objectives while preserving and enhancing environmental quality.

Fuels: Combustible materials present in the forest that potentially contribute a significant fire hazard.

Fugitive dust: Dust particles that are introduced into the air through certain activities such as soil cultivation, or vehicles operating on open fields or dirt roadways.

Graminoids: A grouping of plants consisting of grasses, sedges, and rushes.

Ground cover: Ground cover consists of vegetation, fine organic matter, coarse woody material, and rock fragments larger than three-quarter-inch in diameter in contact with the soil surface.

Ground fire/surface fire: Fire that burns in the organic material below the litter layer, mostly by smoldering combustion. Fires in duff, peat, dead moss and lichens, and punky (dry rot) wood are typically ground fires.

Ground truth: Refers to information that is collected on location.

Habitat component: A simple part, or a relatively complex entity regarded as a part, or an area or type of environment in which an organism or biological population normally occurs.

Habitat effectiveness: The degree to which a patch of habitat is able to support an animal or group of animals. Habitat effectiveness in an otherwise good patch of habitat can be reduced by high levels of human disturbance, long distances to other habitat patches, or any other factors in the surrounding landscape that detract from the patch's ability to function as habitat.

Habitat type: An aggregation of units of land capable of producing similar plant communities at climax.

Habitat: The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Head months (HM): One month's use and occupancy of the range by one animal. For grazing fee purposes, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or 5 sheep or goats.

Herd unit: The total area used by a herd in the course of one year's movement from summer to winter range.

Hibernaculum: The place where a hibernating animal shelters for the winter.

Hiding cover: Cover that animals require for protection from predators and the breeding and rearing of young. Cover is usually vegetation, but can be structural such as boulders or other topographical features.

Historic: Having importance in or influence on history.

Hydrologically connected road: Any road segment that, during a "design" runoff event, has a continuous surface flow path between any part of the road prism and a natural stream channel.

Hydrologic Function: Soil hydrologic function is the ability of the soil to absorb, store, and transmit water, both vertically and horizontally. Changes in soil bulk density, soil structure, and ground cover can alter the hydrologic function of the soil.

Immigration: The behavior of individuals or populations of animals moving into an area to settle there.

Indirect effects: Secondary effects that occur in locations other than the initial action location, or occur significantly later in time.

INFRA: Integrated data management tool to manage and report accurate information and associated financial data on the inventory of constructed features

Interfingered: Describes sedimentary rocks that change laterally from one type to another in a zone where the two types form interpenetrating wedges.

Intermediate harvest: Treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Intermediate treatments can result in uneven-aged, two-aged, or even-aged stands depending on existing conditions and objectives

Internal migration: Where residence changes from one residential unit to another in the same county.

International migration: Where residence changes from one residential unit to another outside of the original country.

Invasive corridors: A corridor which didn't exist prior to human disturbance or manipulation which allowed certain species to move to areas previously not within their original range.

Ips beetle: Bark beetles, also called "engraver beetles," that develop under the bark and tunnel through trees, damaging and killing pine and spruce trees.

Jackpot burn: The ignition of concentrated fuels on the forest floor, whether they are natural fuels or fuels resulting from a silvicultural cutting treatment.

Jackstraw: Live and dead trees and shrubs that have either fallen or are supported by other vegetation in a disorganized fashion that results in a deep, complex fuel profile.

Ladder fuels: Fuels that provide vertical continuity between surface and canopy fuels; an example would be conifer seedlings and saplings.

Land exchange: A land exchange is a discretionary and voluntary real estate transaction between the Federal government and a non-Federal party and may be initiated by either party. A non-Federal party may be a person, State, or local governmental entity. The non-Federal party to a land exchange must be the owner of the non-Federal land or be in a position to acquire and convey it prior to initiating the land exchange process.

Landscape: The aspect of the land that is characteristic of a particular region or area.

Landtype: A unit of land with similar designated soil, vegetation, geology, topography, climate and drainage. The basis for mapping units in the land systems inventory.

Late seral: A vegetation condition that can last for many decades with no or moderate disturbance such as insects, fire, or management that doesn't remove the entire overstory.

Life form: The morphology of an organism that distinguishes it from others.

Lithic scatter: A distribution of cultural items that consists primarily of lithic (i.e., stone) material. The scatter may include formed tools such as points or knives, or it may contain only chipping debris from tool-making activities.

Litter: An organic surface soil layer usually composed of identifiable leaves, branches, other vegetative material, and animal remains.

Live fuel moisture: Herbaceous and live woody fuels; 100% refers to mature foliage with new growth complete.

Local roads: Roads connecting terminal facilities with collector or arterial roads, or public highways. The location and standard are usually controlled by a specific resource activity rather than travel efficiency. Forest local roads may be developed and operated for either long- or short-term service.

Low severity burn: Fire used as a tool to achieve stand objectives with low severity effect and the intent to reduce ladder fuels and reduce overstory tree density to a minor extent.

Low to moderate intensity fires: A fire with a flame length less than 4 feet and fire line intensity less than 100 BTU per foot per second. These fires can generally be attacked at the head or flanks by people using hand tools. Fire severity would include scorched trees with mixed green and scorched needles. Surface litter, mosses, and herbs would be charred or consumed with soil organic layer intact but charred to a few millimeters depth. These fires do not kill many mature trees.

Management area: Geographic areas, not necessarily contiguous, which have common management direction, consistent with the *Forest Plan* allocations.

Management direction: A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management indicator species: A species whose habitat requirements most reflect those of the species community in the habitat of concern. These species are usually used to indicate habitat quality and to predict future conditions.

Mapped weed acres: Mapped acres containing at least 1% noxious weed cover.

Mean fire interval: Mean of all fire intervals in a given area for a specified period.

Microsite: A pocket within an environment with unique features, conditions, or characteristics.

Mid seral: A vegetation condition that occurs from several years to several decades after the early seral stage, depending on the biophysical setting.

Midflame windspeed: The wind speed at mid-flame height above the fuelbed; also referred to as eye-level winds.

Mitigation: Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Mixed severity burn: When fire is used as a tool to achieve stand objectives with mixed severity fire effect and the intent to reduce ladder fuels and overstory tree density. Overall mature tree mortality is generally 30–50%, occurring in patches. Patches generally do not exceed 5–10 acres in large units (>50 acres) or 20% of the unit size in units <50 acres.

Mixing heights: The height to which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly homogenous air mass.

Monitoring and Evaluation: The evaluation, on a sample basis, of *Forest Plan* management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Montane forest: The highland area located below the subalpine zone. Montane regions generally have cooler temperatures and often have higher rainfall than the adjacent lowland regions, and are frequently home to distinct communities of plants and animals

Mop-up: Post-fire clean up and extinguishing of isolated pockets of smoldering fire

National Historic Preservation Act: Legislation intended to preserve historical and archeological sites in the United States of America.

National Registry of Historic Places: A formal list established by the National Historic Preservation Act of 1966 of cultural resources worth of preservation. The list is maintained by the National Park Service and lists archeological, historic, and architectural properties.

NEPA: National Environmental Policy Act of 1969

NEXUS: Software designed to model crown fire potential (Scott 1999). NEXUS links surface and crown fire models to calculate crown fire hazard within a single stand using fuel models, fuel moisture, canopy fuels, wind and topography as inputs.

No action alternative: The no action alternative is required by regulations implemented in the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The no action alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the no action alternative is defined as one where no action or activity would take place.

Non-labor income: Consists of dividends, interest and rent (collectively often referred to as money earned from investments) and Transfer Payments (payments from governments to individuals, age-related, including Medicare, disability insurance payments, and retirements).

Non-recreation special use: A non-recreation, special-use authorization that provides permission, without conveying an interest in land, to occupy and use National Forest System lands or facilities for specific non-recreation purposes such as permitted roads, utilities, and livestock areas, and which is both revocable and terminable.

Non-system road: Another name for an unclassified road.

Noxious weed: Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment” (7 USC 104 § 7702, 2000).

Off-highway vehicle (OHV): A self-propelled vehicle used for recreation or cross-country travel on public lands, trails, easements lakes, rivers or streams. The term includes but is not limited to motorcycles, ATVs, dune buggies, amphibious vehicles, air cushion vehicles, and any other means of land transportation deriving motive power from any source other than muscle or wind.

Old growth habitat: Old growth is a distinct successional stage in the development of a timber stand that has special significance for wildlife, generally characterized by: (1) large diameter trees (often exceeding 19-inch DBH) with a relatively dense, often multilayer canopy, (2) the presence of large, standing dead or dying trees, (3) down and dead trees, (4) stand decadence associated with the presence of various fungi and heartrots, (5) and an average age often in excess of 200 years.

Open canopy: The canopy created by trees and/or shrubs that is open enough to permit a percentage of sunlight to hit the forest floor. This percentage varies by biophysical setting.

Open road density: Generally used relative to a standard set in the *Forest Plan* that is applied to most Management Areas important to big game. Also used to address overall effects of open roads on wildlife.

Overstory: The portion of trees in a forest that forms the uppermost layer of foliage.

Parturition: The process of giving birth.

Passive crown fire: A fire in the crowns of the trees in which trees or groups of trees torch, ignited by the passing front of the fire. The torching trees reinforce the spread rate, but these fires are not different, basically, from surface fires.

Patch: A unit of measure for determining effects to wildlife connectivity. A patch is an area that is >½ mile from an open road regardless of size of area.

Peatlands: Areas with peat soils. The thickness of the peat layer varies per location.

Per Capita Personal Income Total Personal Income divided by population

Permittee: The person or entity to whom a recreation or non-recreation special-use authorization is issued.

Personal income: Income received by persons of all sources.

Polygon: An area fully encompassed by a series of connected lines. Because lines have direction, the system can determine the area that falls within the lines.

Post-fledging areas: A variety of forest types and canopy covers defended by the adult goshawk pair during the nesting season and used by fledglings to refine hunting and flying skills until they disperse in fall.

Postkill: Vegetation present once mountain pine beetle infestation has run its course.

Potential natural vegetation: See potential vegetation community.

Potential vegetation community: The potential of a land area to support a specific type of natural vegetation. This term is used interchangeably with potential natural vegetation (PNV).

Prehistoric: The period before recorded history.

Prekill: Vegetation present prior to mountain pine beetle infestation.

Prescribed burning: The intentional application of fire to wildland fuels in either their natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e., silviculture, wildlife management, reduction of fuel hazard, etc.).

Primary range: The range that livestock prefer to use or will use first under minimum management. Primary range is readily accessible to livestock, has available water, and will be grazed until depleted before cattle make substantial use of secondary range.

Project area: As used in this document, essentially synonymous with implementation area, which is comprised of and defined by the general area in which activities are proposed under the various alternatives. Contrast with analysis area.

Project record: An assemblage of documents that contains all the information developed or used during an environmental analysis. This information may be summarized in an Environmental Assessment or an Environmental Impact Statement.

Proper functioning condition (PFC): The ability of a stream, river, wetland, or lake, and its riparian area, to withstand normal peak flood events without experiencing accelerated soil loss, channel or bank movement, or filter runoff and store and safely release water.

Proprietor: An owner or co-owner of a business.

Proprietors' share of total employment: The share owners' of businesses hold of total employment.

Proprietors' share of total income: The share owners' of businesses hold of total income.

Public Land Survey System (PLSS): The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, [Bureau of Land Management](#) (BLM). The PLSS is used to divide public domain lands, which are lands owned by the Federal government for the benefit of the citizens of the United States. The PLSS typically divides land into 6-mile-square townships, which is the level of information included in the National Atlas. Townships are subdivided into 36 1-mile sections. Sections can be further subdivided into quarter sections, quarter-quarter sections, or irregular government lots. Normally, a permanent monument, or marker, is placed at each section corner. Monuments are also placed at quarter-section corners and at other important points, such as the corners of government lots. Today permanent monuments are usually inscribed tablets set on iron rods or in concrete. The original PLSS surveys were often marked by wooden stakes or posts, marked trees, pits, or piles of rock, or other less-permanent markers.

Quadratic mean diameter: The measure of average tree diameter conventionally used in forestry, as opposed to the arithmetic mean diameter.

Quartz monzonite: An intrusive igneous rock that has an approximately equal proportion of orthoclase and plagioclase feldspars.

Real terms: Any price of value that have been adjusted for changes in the purchasing power of money.

Record of Decision: A concise public document disclosing the decision made following preparation of an EIS and the rationale used by the deciding officer to reach that decision.

Recreation opportunity spectrum (ROS): A method of mapping and describing outdoor recreation opportunities and activities by natural resource setting.

Reference condition: An estimate of the central tendency of the range of succession class composition, fire frequency, and fire severity for a biophysical unit within a landscape project area. The condition that would be present if fire was occurring in a typical frequency on the landscape.

Reforestation: The natural or artificial restocking of an area with forest trees. It may include tree planting and seeding measures to obtain natural regeneration.

Refugia: Large, continuous areas encompassing the full array of seasonal habitats that are relatively secure from human development.

Regeneration: The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop (seedlings, saplings) itself.

Regeneration harvest: Treatment designed to create a new age class (single-aged or two or more age classes). The existing stand is replaced. For the Warm Springs Project, the existing stands that would be replaced are already dead from MPB infestation.

Residence time: The total length of time that the flaming front of the fire occupies one point.

Resiliency: The ability to recover quickly to conditions and relationships existing prior to a disturbance, e.g. wildfire (Hollings, 1973).

Restoration: Treatments that restore vital soil functions to their inherent range of variability. It is recognized that treatments may need to occur over a period of years and may need to be maintained. Restoration treatments could include, but are not limited to, tillage, ripping, seeding, mulching, recontouring if temporary roads, and water barring.

Rhizomes: Horizontal, usually underground, stems that often send out roots and shoots from their nodes.

Rhyolites: A volcanic rock chemically equivalent to granite, usually light colored, very fine-grained or glassy-looking. May have tiny visible crystals of quartz and/or feldspar dispersed in a glassy white, green, or pink groundmass.

Right-of-way: In its strict meaning, it is the right of passage over another person's ground; and in its legal and generally accepted meaning, in reference to a roadway, it is a mere easement in the lands of others, obtained by lawful condemnation for public use or by purchase. It is unusual to use the term to apply to an absolute ownership of land to be used for a roadway or other type of use.

Road: A wide range of definitions have been used, however, for this document the definition from the Forest Transportation Planning Rule: designated motorized travelways over 50 inches wide, unless designated as a trail.

Road Decommissioning: Decommissioning refers to full obliteration of the road—ripping the roadbed, restoring the road prism to natural contour, removing culverts, replacing topsoil, placement of woody debris to provide stability, and native seeding.

Road Maintenance: Includes any expenditure in the repair or upkeep of a road necessary to perpetuate the road and provide for its safe use. Road maintenance is not intended to substantially improve conditions above those originally constructed; however, there may be a need for adding to or modifying the original conditions without increasing service provided. A road may need to be operated and maintained at a higher level during periods of commercial use than is required at other times. Typical examples of these activities include installing additional minor culverts and traffic control devices, implementing traffic management strategies, placing small quantities of spot surfacing, and revegetating cut and fill slopes.

Road Reconstruction: Road reconstruction consists of preparing the roadway surface to meet BMP standards in accordance with soil and water conservation practices hand book (FSH 2509.22) to be suitable for logging trucks and equipment. Road reconstruction activities can include: surface shaping and grading (blading), minor earthwork (cut and fill), ditch reshaping, adding gravel, replacing or installing culverts, and installation of surface cross drains.

Rutting: Deformation of the soil under saturated conditions resulting in detrimental changes to soil structure and reduced porosity. In detrimental rutting, wheel ruts are at least 2 inches deep in wet soils.

Savannah: More or less open woodland having an undergrowth mainly of grasses.

Scarification: Physical disturbance of surface soil horizons, usually to improve germination and early survival of natural seed-based regeneration. This disturbance is not excessive enough to be considered detrimental soil disturbance.

Scenery management system (SMS): A system for establishing standards of measurement for assessing proposed and existing impacts to the scenic quality. Adopted by the Forest Service in 1994.

Scoping. The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action, i.e., the range of actions, alternatives, and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.

Scorch height: Height above the ground that the temperature in the convection column reaches the lethal temperature to kill live crown foliage.

Seasonal migration: The seasonal movement of complete populations of animals to a more favorable environment. It is usually a response to lower temperatures resulting in a reduced food supply, and is often triggered by a change in day length.

Secondary range: The remainder of the suitable range. It will be used only lightly by domestic livestock when primary range is properly grazed. Due to steeper slopes (>30%), inaccessibility, lack of available water and/or other factors, cattle do not prefer to graze these range areas.

Sediment yield: The amount of material eroded from the land surface by runoff and delivered to a stream system.

Sediment: Any material carried in suspension by water, which will ultimately settle to the bottom. Sediment has two main sources: from the channel area itself and from disturbed sites.

Seedlings and Saplings: Non-commercial-size young trees, generally occurring in plantations.

Sensitive species: Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Seral stage: A transitory or developmental stage of a biotic community in an ecological succession (does not include climax successional stage or pioneer stage).

Serotinous: Remaining closed on the tree with seed dissemination delayed or occurring gradually.

Severely burned soil: Physical and biological changes to soil resulting from high-intensity burns of long duration are detrimental. This standard is used when evaluating prescribed fire. Guidelines for assessing burn intensity are contained in the Burned-Area Emergency Rehabilitation Handbook (FSH 2509.13).

Shrub: A plant with persistent woody stems and relatively low growth form; usually producing several basal shoots as opposed to a single bole.

Site identification strategy (SIS): A forest-specific document prepared to fulfill programmatic cultural resource responsibilities and bridge the goals of NHPA Section 106 and 110. The objective of the SIS is to guide the decision-making process regarding level of fieldwork and documentation for various types of undertakings.

Size class (Fire): Coded attribute representing the fire size.

- A 0–0.25 acres
- B 0.25–9.9 acres
- C 10–99.9 acres
- D 100–299.9 acres
- E 300–999.9 acres
- F 1000–4999.9 acres
- G 5000+ acres

Size class (Silviculture): Meaningful group of tree sizes usually expressed as diameter at breast height (DBH).

Slash Burning: The treatment or burning of slash to reduce fire or insect hazards.

Slash: The residue left on the ground after felling and other silvicultural operations and/or accumulating there because of storm, fire, girdling, or poisoning of trees.

Slope: The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent.

Snag: A standing dead or dying tree that provides food and shelter for wildlife.

Soil bulk density: The mass of dry soil per unit volume, corrected for weight and volume of coarse fragments >2 millimeters in diameter. Often expressed as grams per cubic centimeter.

Soil hydrologic function: The process of soil absorbing, storing, and releasing precipitation—either rain or snow melt.

Soil Productivity The inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses.

Soil mass movement: The detachment and downslope movement of soil or the surface mantle in the form of debris slides/avalanches or deep-seated rotational failures or slumps

Soil Quality The capacity of a specific soil to function within its surroundings, support plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.

Species: A unit of classification of plants and animals consisting of the largest and most inclusive array of sexually reproducing and cross-fertilizing individuals which share a common gene pool.

Spotting: Embers that are transported ahead of the zone of direct ignition of the main fire that start new fires.

Stand density index (SDI): A relative measure of stand density similar to basal area, but based on number of trees at a given "index" diameter. It is a useful measure of the onset of tree competition, growth, and insect damage potential.

Stand replacement fires: Fires that kill or top-kill aboveground parts of the dominant vegetation, changing aboveground structure substantially. The majority of the aboveground, dominant vegetation is either consumed or dies because of the fire.

Stand: A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from adjacent communities.

Standard: A particular action, level of performance, or threshold specified by the *Forest Plan* for resource protection or accomplishment of management objectives. Unlike "guidelines" which are optional, standards specified in the *Forest Plan* are mandatory.

Subnivean zones: Areas under the snow.

Succession: The gradual process of community change and replacement leading toward a climax community.

Successional stage: A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax.

Surface erosion: Rills, gullies, pedestals, and soil deposition are all indicators of detrimental surface erosion. Minimum amounts of ground cover necessary to keep soil loss to within tolerable limits (generally less than 1 to 2 tons per acres per year) should be established locally depending on site characteristics.

Surface fire: A fire that burns close to the ground surface and includes dead branches, leaves, and low vegetation.

System road: Another name for classified road.

Telemetry: Automatic transmission and measurement of data from remote sources by wire or radio or other means.

Thermal cover: Vegetation cover that animals require to stay warm or cool.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tillering: To put forth new shoots from the root or around the bottom of the original stalk.

Torching: A fire that burns a single tree or group of trees, also known as passive crown fire.

Total personal income: Income received by persons of all sources

Transition ratio: The ratio of the surface fireline intensity to the critical surface fireline intensity. A transition ratio that is ≥ 1 indicates surface fireline intensity sufficient to transition to crown fire.

Transitory range: Land which produces forage or has inherent forage producing capabilities and can become available on a temporary basis as a result of partial or complete removal of the vegetation through fire, logging, or other events.

Travel corridor: Local routes established by individual animals or groups of animals to move within home ranges between foraging habitat, cover, and breeding sites.

Turbidity: Having sediment or foreign particles stirred up or suspended.

Twenty-foot winds: Wind speed and direction at 20 feet above the height of the top of the vegetation

Unclassified road: A road that is not constructed, maintained, or intended for long-term highway vehicle use, such as roads built for temporary access and other remnants of short-term-use roads associated with fire suppression; timber harvest; and oil, gas, or mineral activities; as well as travel-ways resulting from off-road vehicle use.

Underburn: Prescribed fire method where burning is conducted in the understory of the forest, below the dominant trees.

Understory: Generally herbaceous or shrubby vegetation that makes up the layer of forest under the tree canopy layer.

Vegetation class: Types of vegetation that would be expected to exist in the reference condition.

Vegetation type: The mixture of vegetation covering a forest site.

Vertical structure: A number of size (height) classes in a stand.

Visual quality objective (VQO): Standards for scenery resources set in the *Forest Plan* that provide guidelines for altering the landscape.

Visual resource management system: A system that provides standards of measurement (VQOs) for assessing proposed and existing impacts to the scenic quality. Used by the Forest Service until 1994.

Visual resource: The composite of landforms, water features, vegetative patterns and cultural features that create the visual environment.

Weed treatment acres: Acres of weed infestation identified in the Weeds GIS database at the HNF.

Wildfire: Any fire not designated and managed as a prescribed fire with an approved prescription.

Wildland urban interface: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel.

Wind adjustment factor: Adjusts the 20-foot wind speed to mid-flame wind speed depending on the sheltering of fuels from the wind.

- 0.1—fully sheltered, dense stands
- 0.2—fully sheltered, open stands
- 0.3—partially sheltered
- 0.4—unsheltered

Wolverine natal denning: Wolverine natal den habitat in the northern Rockies is strongly tied to high elevation and glaciated landscapes. Although cirques are used as natal denning habitat and may be preferred in most years, a given female that uses a cirque basin one year will use other glaciated landforms in other years. Variable snow conditions may make other glaciated landforms, such as cirque headwalls, or avalanche chutes, more attractive as natal den sites in some years. Glaciated landscapes probably encompass most if not all natal den habitat in Region One (Hillis and Kennedy 2003).

Literature

Clean Air Act. Act of 2004.

Agee, James K., Berni Bahro, Mark A. Finney, Philip N. Omi, David B. Sapsis, Carl N. Skinner, Jan W. van Wagtendonk, and C. Phillip Weatherspoon. 2000. The use of shaded fuelbreaks in landscape fire management. *Forest Ecology and Management* 127, 55–66.

Agee, James K. and Carl N. Skinner. 2005. Basic principles of forest fuel reduction treatments. *Forest Ecology and Management* 211, 83–96.

Agee, James. K. 1993. *Fire ecology of Pacific Northwest Forests*. Island Press.

Amaranthus, M. P., J. M. Trappe, and R. J. Molina. 1989. Long-term forest productivity and the living soil. In *Maintaining the long-term productivity of Pacific Northwest forest ecosystems*. ed. Perry, D. A., R. Meurisse, B. Thomas, R. Miller, J. Boyle, J. Means, C. R. Perry, and R. F. Powers, Chap. 3, 36–52. Portland, OR: Timber Press.

Amman, Gene D., Gene D. Lessard, Lynn A. Rasmussen, and Curtis G. O'Neil. 1988a. *Lodgepole pine vigor, regeneration, and infestation by mountain pine beetle following partial cutting on the Shoshone National Forest, Wyoming*. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Research Paper INT-396. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. December 1988.

Amman, Gene D., Mark D. McGregor, and Jr Dolph. 1989. Mountain Pine Beetle. *Forest Insect and Disease Leaflet 2*

Amman, Gene D., Mark D. McGregor, Richard F. Schmitz, and Robert D. Oakes. 1988b. Susceptibility of lodgepole pine to infestation by mountain pine beetles following partial cutting of stands. *Canadian Journal of Forest Research* 18, 688-95.

Amman, GeneD. and J. A. Logan. 1998. Silvicultural control of Mountain Pine Beetle: Prescriptions and the influence of microclimate. *American Entomologist* (Fall): 166-177.

Anderson, Hal E. 1982. *Aids to determining fuel models for estimating fire behavior*. General Technical Report INT-122. Ogden: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. April.

Armour, Charles D., Stephen C. Bunting, and Leon F Neuenschwander. 1984. Fire intensity effects on the understory in ponderosa pine forests. *Journal of Range Management* 37, no. 1 44–9.

Arno, S. F., E. D. Reinhardt, and J. H. Scott. 1993. *Forest structure and landscape patterns in the subalpine lodgepole pine type: A procedure for quantifying past and present conditions*. U.S. Department of Agriculture, Forest Service. General Technical Report INT-294. Ogden, Utah: Intermountain Forest and Range Experiment Station.

Arno, Stephen F. 1980. Forest Fire History in the Northern Rockies. *Journa of Forestry* 78, (1980): 460-465.

———. 2000a. Fire regimes in western forest ecosystems. In *Wildland fire in ecosystems: Effects of fire on flora*. General Technical Report RMRS-GTR-42-Volume 2. ed. Brown, James K. and Jane Kapler Smith, Chap. 5, 97–120. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

- . 2000b. *Wildland fire in ecosystems: Effects of fire on flora*. U.S. Department of Agriculture, Forest Service. General Technical Report RMRS-GTR-42-Volume 2.
- Arno, Stephen F. and Steven Allison-Bunnell. 2002. *Flames in our forest: Disaster or renewal?* Washington D.C.: Island Press.
- Arno, Stephen F., Carl E. Fiedler, and Matthew K. Arno. 2008. Giant pines and grassy glades: The historic ponderosa ecosystem, disappearing icon of the American West. *Forest History Today* (Spring): 12–19.
- Arno, Stephen F. and George E. Gruell. 1983. Fire history at the forest-grassland ecotone in southwestern Montana. *Journal of Range Management* 36, no. 3 (May): 332–36.
- Arno, Stephen F., David J. Parsons, and Robert E. Keane. USDA Forest Service. 2000. *Mixed-Severity Fire Regimes in the Northern Rocky Mountains: Consequences of Fire Exclusion and Options for the Future*. US Forest Service Proceedings RMRS-P-15-Vol.5. 2000.
- Arno, Stephen F. and T. D. Peterson. 1983. *Variation in estimates of fire intervals: A closer look at fire history on the Bitterroot National Forest*. Research Paper INT-RP-301. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Arno, Stephen F., Joe. H Scott, and Michael G Hartwell. 1995. *Age class structure of old growth ponderosa pine/douglas fir stands and its relationship to fire history*. U.S Department of Agriculture, Forest Service, Intermountain Research Station. Research Paper INT-RP-481. Ogden, Utah.
- Asher, Jerry and Carol Spurrier. 1998. *The spread of invasive weeds in western wildlands: A state of biological emergency*. U.S. Department of the Interior, Bureau of Land Management. The Governor's Idaho Weed Summit. Boise, Idaho: May 19.
- Avian Science Center. 2007. Northern Region Landbird Monitoring Program Field Methods. Birds in Old Growth. 2007.
- Axelson, Gustave. 2009. *The alpha accipiter*. Minnesota Department of Natural Resources. http://www.dnr.state.mn.us/volunteer/marapr09/alpha_accipiter.html. (accessed December 15, 2009).
- Baker, W. L. and D. Ehle. 2001. Uncertainty in surface-fire history: the case of ponderosa pine forests in the western United States. *Canadian Journal of Forest Research* 31, (2001): 1-23 p.
- Banci, V. 1994. "Wolverine" in *The scientific basis of conserving forest carnivores, American marten, fisher, lynx, and wolverine in the Western United States*. USDA, US Forest Service. Gen-Tech Report RM-254. Fort Collins, CO: 1994.
- Barrett, Stephen W. 2005. *Role of fire in the Elkhorn Mountains: Fire history and fire regime condition class*. Final Report. Townsend, MT: Townsend Ranger District, Helena National Forest, Forest Service, U.S. Department of Agriculture. April.
- Bartos, Dale L. and Gene D. Amman. 1989. *Microclimate: an alternative to tree vigor as a basis for mountain pine beetle infestations*. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Research Paper INT-400. Odgen, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. March 1989.

- Bate, Lisa J. 2003. Annual Progress Report: Birds and Burns Network. Helena National Forest. December 2003.
- . 2004. Annual Progress Report: Birds and Burns Network. Helena National Forest. August 2004.
- . 2005. Progress Report: Birds and Burns Network. Helena National Forest. Helena National Forest. June 2005.
- . 2007. 2006 Annual Progress Report: Birds and Burns Network. Helena National Forest. February 2007.
- Baty, G. R. 1995. Resource partitioning and browse use by sympatric elk, mule deer, and white-tailed deer on a winter range in western Montana. Thesis. University of Montana.
- BEA. (U.S. Bureau of Economic Analysis). 2009a. *Local Area Personal Income, Table CA30*. www.bea.gov. (accessed .
- . 2009b. *Table CA1-3 : Local Area Population*. www.bea.gov. (accessed .
- . 2009c. *Table CA25N: Total Full-Time and Part-Time Employment by NAICS Industry*. www.bea.gov. (accessed .
- Beck K.G. 2001. How do weeds affect us all. Grazing Land Forum VIII, "An Explosion in Slow Motion: Noxious Weeds and Invasive Alien Plants on Grazing Lands", Bozeman, MT, <http://library.ndsu.edu/repository/bitstream/handle/10365/4099/11BECK94.PDF?sequence=1> (accessed 02/03/10).
- Beck, Barb Springer. 1989. *Historical overview of the Helena and Deerlodge National Forests*. U.S. Department of Agriculture, Forest Service, Northern Region, Deerlodge National Forest. Montana.
- Bollenbacher, Barry, Renate Bush, Beth Hahn, and Renee Lundberg. 2008. Region One Vegetation Classification, Mapping, Inventory and Analysis Report: Estimates of snag densities for eastside forests in the Northern Region. U.S. Department of Agriculture, Forest Service. Report 08-07 v.2.0. Missoula, MT. December 2008.
- Brewer, Lorraine T., Renate Bush, Jodie E. Canfield, and Alan R. Dohmen. 2007. *Northern goshawk Northern Region overview: Key findings and project considerations*. U.S. Department of Agriculture, Forest Service, Northern Goshawk Working Group.
- Bricker, Mary. 2009. Field Surveys. Helena, MT. 2009.
- Brooks, Kenneth N., Peter F. Ffolliott, Hans M. Gregersen, and Leonard F. DeBano. 1991. *Hydrology and the management of watersheds*. Ames, Iowa: Iowa State University Press.
- Brown, C. J. D. 1971. *Fishes of Montana*. Bozeman, Montana: Montana State University.
- Brown, James K. and Norbert V. DeByle. 1987. Fire damage, mortality and suckering in aspen. *Canadian Journal of Forest Research* 17, 1100–9.
- Brown, James K., Elizabeth D. Reinhardt, and Kylie A. Kramer. 2003. *Coarse woody debris: Managing benefits and fire hazard in the recovering forest*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-105.

- Brown, James K. and Jane Kapler Smith. USDA Forest Service. 2000. *Wildland fire in ecosystems: Effects of fire on flora*. General Technical Report RMRS-GTR-42-volume 2. Odgen, Utah: USDA Forest Service, Rocky Mountain Research Station. December 2000.
- Brown, Richard T., James K. Agee, and Jerry A. Franklin. 2004. Forest restoration and fire: Principles in the context of place. *Conservation Biology* 18, no. 4 (903–12):
- Bulaon, Beverly and Nancy Sturdevant. 2006. *Determining stand susceptibility to western spruce budworm and potential damaging effects*. Numbered Report 06-07. Missoula, Montana: U.S. Department of Agriculture, Forest Service. May.
- Bull, E. L., C. G. Parks, and T. R. Torgersen. USDA Forest Service Pacific Northwest Research Station. 1997. *Trees and logs important to wildlife in the interior Columbia River basin*. General Technical Report PNW-GTR-391. Portland, OR: USFS. 1997.
- Bull, Evelyn L. 1987. Ecology of the pileated woodpecker in northeastern Oregon. *Journal of Wildlife Management* 51, no. 2 472-81.
- Bull, Evelyn L. and Anthony L. Wright. 1990. Nesting habitat of flammulated owls in Oregon. *Journal of Raptor Research* 24, no. 3 52-55.
- Bunting, Stephen C. 1989. Effects of prescribed fire on rangeland shrubs in the intermountain region. Prescribed fire in the intermountain region: Symposium proceedings., ed. Baumgartner, David M., David W. Breuer, and Benjamin A. Zamora, 103-106. Spokane, WA; Pullman, WA, March 3, 1986.
- Burcham, Milo, W. Daniel Edge, and C. Les Marcum. 1999. Elk use of private land refuges. *Wildlife Society Bulletin* 27, no. 3 833–9.
- Buskirk, S. W., S. C. Forrest, M. G. Raphael, and H. J. Harlow. 1989. Winter resting site ecology of marten in the central Rocky Mountain. *Journal of Wildlife Management* 53, no. 1 (January 1989): 191-6.
- Callery, Dave. U.S. Department of Agriculture, Forest Service. 2010. Memorandum: Warm Springs project. Memorandum. January 2010.
- Carlson, Clinton E. and N. William Wulff. 1989. *Silvicultural strategies to reduce stand and forest susceptibility to the western spruce budworm*. U.S. Department of Agriculture, Forest Service. Agriculture Handbook No. 676.
- Cassirer, E. F., D. J. Freddy, and E. D. Ables. 1992. Elk response to disturbance by cross-country skiers in Yellowstone National Park. *Wildlife Society Bulletin* 20, 375–81.
- Caton, E. L. 1996. Effects of fire and salvage logging on the cavity-nesting bird community in northwestern Montana. Dissertation. University of Montana, Missoula, MT.
- Chamberlin, T. W., R. D. Harr, and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. 181–205. American Fisheries Society Special Publication 19.
- Chapin, T. G., D. J. Harrison, and D. M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. *Journal of Wildlife Management* 61, no. 3 (July 1997): 707-17.

- Christensen, Alan G., L. Jack Lyon, and James W. Unsworth. 1993. *Elk management in the Northern Region: Considerations in forest plan updates or revisions*. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. General Technical Report INT-303. Ogden, Utah.
- Cilimburg, Amy, Kristina Smucker, and Dick Hutto. 2006. Black-backed woodpeckers and the bird community in beetle outbreak areas. University of Montana, Division of Biological Sciences, Avian Science Center. Final Report. Missoula, MT. 2006.
- Cleasby, Thomas E., Joanna N. Thamke, and David A. Nimick. 2001. Arsenic and metal loads and source areas in the Middle Fork Warm Springs watershed, Jefferson County, Montana. U.S. Geological Survey. Water Resources Investigation Report 03-4153. June 2001.
- Clough, Lorraine T. 2000. Nesting habitat selection and productivity of northern goshawks in West-Central Montana. M.S. thesis. University of Montana, Missoula, MT.
- Coffin, K. W. 1994. Population characteristics and winter habitat selection by Pine marten in Southwest Montana. Master of Science Thesis. Montana State University. 1994.
- Cole, Walter E. and Gene D. Amman. 1980. Mountain pine beetle dynamics in lodgepole pine forest; Part I: Course of an infestation. Intermountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. General Technical Report INT-89. November.
- Cole, Walter E., Donn B. Cahill, and Gene D. Lessard. 1983. *Harvesting strategies for management of mountain pine beetle infestations in lodgepole pine: Preliminary evaluation, East Long Creek demonstration area, Shoshone National Forest, Wyoming*. Research Notes INT-333. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Cole, Walter E. and Mark D. McGregor. 1983. *Estimating the rate and amount of tree loss from Mountain pine beetle infestations*. Research Paper INT-318. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. September.
- Cooperrider, Allen Y. 2002. Elk and Ecosystem Management. In *North American elk ecology and management*. ed. Toweill, Dale E., Jack Ward Thomas, and Daniel P. Metz, Chap. 11, 515–31. Smithsonian Institution Press.
- Copeland, Jeffrey P. 1996. Biology of the wolverine in central Idaho. Masters Thesis. University of Idaho, Moscow, Idaho.
- Copeland, Jeffrey P. and Howard Hudak. 1995. The wolverine (*Gulo gulo*) in Idaho: Habitat Conservation Assessment (HCA) and Conservation Strategy (CS). Idaho Department of Fish and Game, Idaho Department of Parks and Recreation, U.S. Department of the Interior, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Department of Agriculture, Forest Service. February 1995.
- Cornell Lab of Ornithology. 2010. *Birds of North America*. <http://bna.birds.cornell.edu/bna>. (accessed February 25, 2010).
- Craighead, Frank L. 2002. *Wildlife-related road impacts in the Yellowstone to Yukon region*. Yellowstone to Yukon Conservation Initiative.
- Czaplewski, Raymond L. 2004. Application of forest inventory and analysis (FIA) data to estimate the amount of old growth forest and snag density in the Northern Region of the National Forest system. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

- D'Antonio, Carla D., Nelroy E. Jackson, Carol C. Horvitz, and Rob Hedberg. 2004. Invasive plants in wildland ecosystems: Merging the study of invasion processes with management needs. *Frontiers in Ecology and the Environment* 2, no. 10 (December 2004): 513-521.
- Daddow, Richard L. and Gordon E. Washington. 1983. *Growth-limiting soil bulk densities as influenced by soil texture*. WSDG report WSDG-TN-00005. Watershed Systems Development Group, USDA Forest Service.
- Dalsoglio, Julie. U.S. Environmental Protection Agency. Re: EPA's EIS Guidance & Scoping Comments for the Warm Springs Habitat Enhancement Project EIS. Ms. Liz VanGenderen. November 3, 2009.
- Daly, C., G. H. Taylor, W. P. Gibson, T. W. Parzybok, G. L. Johnson, and P. A. Pasteris. 2000. High-quality spatial climate data sets for the United States and beyond. *American Society of Agricultural Engineers* 43, no. 6 1957–62.
- Davis, Carl M. 1998. *Helena National Forest annual heritage resource compliance report: 1997 field season*. U.S. Department of Agriculture, Forest Service, Northern Region. Helena, Montana: Helena National Forest.
- Davis, Jerry W. 1983. Snags are for wildlife. *Snag Habitat Management*
- Davis, Leslie B. and Sally T. Greiser. 1992. Indian Creek Paleoindians: Early occupation of the Elkhorn Mountains' southeast flank, west-central Montana. In *Ice Age hunters of the Rockies*. ed. Stanford, Dennis J. and Jane S. Day, Chap. 7, 225–228. Denver, Colorado: Denver Museum of Natural History, University Press of Colorado.
- Davis, Marsha and Chris Holbeck. 2001. Nuts and bolts of BAER soil and watershed assessments. 11th Conference on Research and Resource Management in Parks and Public Lands, ed. Harmon, David, The George Wright Society.
- DeBano, Leonard F., Daniel G. Neary, and Peter F. Ffolliot. 1998. *Fire's Effects on Ecosystems*. 1 vols., John Wiley & Sons.
- DeSimone, R., T. Carlsen, B. Sterlin, and M. Thompson. 1986. *Elkhorn Mountains wildlife monitoring program*. Montana Department of Fish, Wildlife, and Parks. Helena, Montana.
- DiTomaso, Joseph M. 2000. Invasive weeds in rangelands: Species, impacts, and management. *Weed Science* 48, 255–65.
- Dixon, Gary E. 2002. *Essential FVS: A user's guide to the forest vegetation simulator (Revised January 2010)*. U.S. Department of Agriculture, Forest Service, Forest Management Service Center. Internal Report. Fort Collins, CO.
- Dixon, R. D. and V. A. Saab. 2000. Black-backed woodpeckers. In *The birds of North America*. ed. Poole, A. and F. Gill, Cornell, New York: Cornell Laboratory of Ornithology and the Academy of Natural Science.
- Dobkin, David S. 1994. *Neotropical migrant landbirds in the Northern Rockies and Great Plains: A handbook for conservation and management*. U.S. Department of Agriculture, Forest Service, Northern Region.
- Dodson, Erich K. and Carl E. Fiedler. 2006. Impacts of restoration treatments on alien plant invasion in *Pinus ponderosa* forest, Montana, USA. *Journal of Applied Ecology* 43, 887–97.

- Dodson, Erich K., David W. Peterson, and Richy J. Harrod. 2008. Understory vegetation response to thinning and burning restoration treatments in dry conifer forests of the eastern Cascades, USA. *Forest Ecology and Management* 255, (January 2008): 3131-40.
- Dudley, Jonathan G. 2005. Home range size and foraging habitat of black-backed woodpeckers. M.S. Thesis. Boise State University, Boise, Idaho.
- Duncan, Sally. 1999. Dead and dying trees: Essential for life in the forest. *Science Findings* no. 20 (November):
- Elliot, William J. 2004. WEPP internet interfaces for forest erosion prediction. *Journal of the American Water Resources Association* 40, no. 2 299–309.
- Elliot, William J., David E. Hall, and Dayna L. Scheele. 2000. *WEPP interface for disturbed forest and range runoff, erosion and sediment delivery*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station and San Dimas Technology and Development Center. February.
- EPA. 2009. Air quality index report. December. <http://www.airnow.gov/index.cfm?action=aqibasics.aqi>. (accessed December 21, 9 A.D.).
- ERG. 2006. *Elkhorns vegetation Study: Phase II*. June.
- Faaborg, John, Margaret Brittingham, Therese Donovan, and John Blake. 1993. *Habitat fragmentation in the temperate zone: A perspective for managers*.
- Finney, Mark A. 2001. Design of Regular Landscape Fuel Treatment Patterns for Modifying Fire Growth and Behavior. *Forest Science* 47, no. 2 (2001): 219-228.
- Finney, Mark A. and Jack D. Cohen. 2003. *Expectation and evaluation of fuel management objectives*. RMRS-P-29. USDA Forest Service.
- Finney, Mark A., Charles W. McHugh, and Isacc C. Grenfell. 2005. Stand- and landscape-level effects of prescribed burning on two Arizona wildfires. *Canadian Journal of Forest Research* 35, 1714–22.
- Finney, Mark A., Rob C. Seli, Charles W. McHugh, Alan A. Ager, Berni Bahro, and James K. Agee. 2006. Simulation of Long-Term Landscape-Level Fuel Treatment Effects on Large Wildfires. Paper presented at Fuels Management-How to Measure Success: Conference Proceedings, 125-147. Portland, OR, RMRS-P-41. 2006).
- Fischer, William C. and Bruce D. Clayton. 1983. *Fire ecology of Montana forest habitat types east of the Continental Divide*. General Technical Report INT-141. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. May.
- Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society Special Publication 19.
- Furniss, Malcolm M., R. Ladd Livingston, and Mark D. McGregor. 1981. Development of a stand susceptibility classification for douglas-fir beetle. In *Hazard-rating systems in forest pest management: symposium proceedings, 1980 July 31-August 1, Athens, GA*. ed. Hedden, R. L., S. J. Barras, and J. E. Coster, 115-127. Washington, D.C.: USDA, Forest Service.

- Gehman, Steve. 2006. Wildlife surveys in the MacDonald Pass area: Conducted during Winter 2005-2006. Wild Things Unlimited. Summary of Efforts and Findings. April 2006.
- Gehman, Steve and Andrew Jakes. 2007. Winter wildlife tracking surveys in the MacDonald Pass area: January-March 2007. Wild Things Unlimited. April 2007.
- Gehman, Steve, Andrew Jakes, and Betsy Robinson. 2008. Winter wildlife tracking surveys in the MacDonald Pass area Year Three: December 2007-March 2008. Wild Things Unlimited. October 2008.
- Gehman, Steve, Jamie Walton, and Betsy Robinson. 2001. Rare carnivore surveys on the Helena National Forest.
- . 2002. Rare carnivore surveys on the Helena National Forest. Wild Things Unlimited. Bozeman, MT. 2002.
- Gehman, Steven, Jamie Walton, and Betsy Robinson. 2003. Rare carnivore surveys on the Helena National Forest: Winter 2002-2003. Wild Things Unlimited. Bozeman, MT. September 2003.
- Gibson, Ken. 2003. *Bark beetle conditions Northern Region*. Missoula, Montana: U.S. Department of Agriculture, Forest Service, Forest Health Protection.
- . Forest Health Protection and State Forestry Organizations. 2004. Mountain Pine Beetle Management. 4.1. March 2004.
- . 2009. Bark beetle conditions northern regions. U.S. Department of Agriculture, Forest Service, Northern Region. Missoula, MT. 2009.
- Gibson, Ken, Sandy Kegley, and Barbara Bentz. 2009. *Mountain pine beetle, forest insect and disease leaflet 2*. Portland, Oregon: USDA Forest Service, Pacific Northern Region.
- Goggans, R. 1986. Habitat use by flammulated owls in northeastern Oregon. Masters of Science. Oregon State University, Corvallis, Oregon.
- Goggans, R., R. D. Dixon, and C. Seminara. 1987. Habitat use by Three-toed and Black-backed Woodpeckers, Descutes National Forest, Oregon. Nongame Report 87-3-02. 1987.
- Graham, Russell T., Alan E. Harvey, Threasa B. Jain, and Jonalea R. Tonn. 1999. *The effects of thinning and similar stand treatments on fire behavior in western forests*. USDA Forest Service, USDI Bureau of Land Management. General Technical Report PNW-GTR-463. September.
- Graham, Russell T., Alan E. Harvey, Martin F. Jurgensen, Theresa B. Jain, Jonalea R. Tonn, and Deborah S. Page-Dumroese. 1994. *Managing coarse woody debris in forests of the Rocky Mountains*. Research Paper INT-RP-477. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Graham, Russell T., Sarah McCafferrey, and Theresa B. Jain. USDA. 2004. *Science basis for changing forest structures to modify wildfire behavior and severity*. US Department of Agriculture, Forest Service, Rocky Mountain Research Station. RMRS-GTR-120. Fort Collins, CO.
- Gravelle, J. A. and T. E. Link. 2007. Influence of timber harvesting on headwater peak stream temperatures in a Northern Idaho watershed. *Forest Science* 53, no. 2 (December 2006): 189-205.

- Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. *Old-growth forest types of the Northern Region*. U.S. Department of Agriculture, Forest Service. R-1 SES 4/92. Errata 2005.
- Greenwald, D. Noah, D. Coleman Crocker-Bedford, Len Broberg, Kieran F. Suckling, and Timothy Tibbitts. 2005. A review of northern goshawk habitat selection in the home range and implications for forest management in the Western United States. *Wildlife Society Bulletin* 33, 122-128.
- Grenon, Jill and Mark Story. 2009. *U.S. Forest Service Region I Lake Chemistry, NADP, and IMPROVE air quality data analysis*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. RMRS-GTR-230WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. September 2009.
- Griffith. Bureau of Forestry. 1904. *Elkhorns Forest Reserve Report*.
- Grove, A. J., C. L. Wambolt, and C. L. Frisina. 2005. Douglas-fir's effect on mountain big sagebrush wildlife habitats. *Wildlife Society Bulletin* 33, no. 1 74–80.
- Gruell, George E. 1983. *Fire and vegetative trends in the northern Rockies: Interpretations from 1871-1982 photographs*. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. General Technical Report INT-158. Ogden, Utah: December.
- Gruell, George E. and James K. Brown. USDA Forest Service. 1986. *Prescribed Fire Opportunities in Grasslands Invaded by Douglas-fir: State-of-the-Art Guidelines*. General Technical Report INT-198. Ogden, UT: USDA Forest Service, Intermountain Research Station. July 1986.
- Gruell, George E., Wyman C. Schmidt, Stephen F. Arno, and William J. Reich. 1982. *Seventy years of vegetative change in a managed ponderosa pine forest in western Montana: Implications for resource management*. General Technical Report INT 130. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. August.
- Gruver, Jeffery C. and Douglas A. Keinath. 2006. *Townsend's big-eared bat (Corynorhinus townsendii): A technical conservation assessment*. USDA Forest Service, Rocky Mountain Region, Species Conservation Project.
<http://www.fs.fed.us/r2/projects/scp/assessments/townsendbig-earedbat.pdf>. (accessed .
- Habeck, James R. and Robert W. Mutch. 1973. Fire-Dependent Forests in the Northern Rocky Mountains. *Quaternary Research* 3, (April 1973): 408-24.
- Habeck, Jim R. 1988. Old-growth forests in the northern Rocky Mountains. *Natural Areas Journal* 8, 202–11.
- Hann, W., M. Beighley, P. Teensma, T. Sexton, and M. Hilbruner. 2004. A cohesive strategy for protecting people and sustaining natural resources: Predicting outcomes for program options. Fire, Fuel Treatments, and Ecological Restoration Conference, Fort Collins, CO, April 16, 2002.
- Hann, W. J. and D. L. Bunnell. 2001. Fire and land management planning and implementation across multiple scales. *International Journal of Wildland Fire* 10, 389—403.
- Hann, W. J., A Shlisky, D. Havlina, K. Schon, S. Barrett, T. DeMeo, K. Pohl, et al. 2008. *Interagency fire regime condition class guidebook. Last update January 2008*. U.S. Department of Agriculture, Forest Service, U.S. Department of the Interior, The Nature Conservancy, System for Environmental Management. Version 1.3.0. www.frcc.gov. (accessed .

- Hann, W. J. and D. J. Strohm. Omi, Philip N. and Linda A. Joyce, eds. 2003. Fire regime condition class and associated data for fire and fuels planning: methods and applications. Paper presented at Fire, fuel treatments, and ecological restoration: Conference proceedings, 337-443. Fort Collins, CO, April 16, 2002. RMRS-P-29. U.S. Forest Service, Rocky Mountain Research Station.
- Hann, Wendel, Doug Havalina, Ayn Shlisky, Bev Schwab, Mark Kaib, and Nate Benson. 2003. *Interagency and The Nature Conservancy fire regime condition class*. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management. <http://www.frcc.gov>. (accessed .
- Harper, Archie. 2009. [Personal communication]. Fisheries Biologist. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, Montana.
- . 2009. Warm Springs Project Helena National Forest fisheries NFMA background report. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena Montana. October.
- . 2010. Memorandum: Warm Springs project. Memorandum. January 2010.
- Harvey, Alan E., Michael Geist, Gerald I. McDonald, Martin F. Jurgensen, Patrick H. Cochran, Darlene Zabowski, and Robert T. Meurisse. 1994. *Biotic and abiotic processes in eastside ecosystems: The effects of management on soil properties, processes, and productivity*. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. General Technical Report PNW-GTR-323. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. February 1994.
- Hatler, D. F. 1989. A wolverine management strategy for British Columbia. B.C. Ministry of Environment, Wildlife Branch. Wildlife Bulletin No. B-60. Victoria, B.C. May 1989.
- Hatton, John H. Bureau of Forestry. 1904. *The Proposed Big Belt Forest Reserve Montana*. September, October 1904.
- Hayward, Gregory D. and Jon Verner. 1994. *Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment*. U.S. Department of Agriculture, Forest Service. General Technical Report RM-253. September.
- Headwaters Economics. 2009a. A SocioEconomic Profile: Meagher, MT. EPS. 12/14/2009. www.headwaters.org. (accessed .
- . 2009b. A SocioEconomic Profile: Powell, MT. EPS. 12/14/2009. www.headwaters.org. (accessed .
- . 2009c. A Summary SocioEconomic Profile: Broadwater, MT. EPS. 12/14/2009. www.headwaters.org. (accessed .
- . 2009d. A Summary SocioEconomic Profile: Jefferson, MT. EPA. 12/14/09. www.headwaters.org. (accessed .
- . 2009e. A Summary SocioEconomic Profile: Lewis and Clark, MT. EPS. 12/14/2009. www.headwaters.org. (accessed .
- Heinemeyer, Kimberly S. and Jeffery L. Jones. 1994. *Fisher biology and management in the Western United States: A literatur review and adaptive management strategy*. U.S. Department of Agriculture, Forest Service, Northern Region and the Interagency Forest Carnivore Working Group.

- Hendricks, Paul and Paul Maxell. 2005. *Bat surveys on USFS Northern Region lands in Montana: 2005*. U.S. Department of Agriculture, Forest Service. Montana Natural Heritage Program.
- Hessburg, Paul F. and James K. Agee. 2003. An environmental narrative of Inland Northwest United States forests, 1800-2000. *Forest Ecology and Management* 178, (2003): 23-59.
- Hessburg, Paul F., James K. Agee, and Jerry F. Franklin. 2005. Dry forest and wildland fires of the inland Northwest USA: Contrasting the landscape ecology of the pre-settlement and modern eras. *Forest Ecology and Management* 211, 117–39.
- Hessburg, Paul F., Russel G. Mitchell, and Gregory M. Filip. 1994. *Historical and current roles of insects and pathogens in eastern Oregon and Washington forested landscapes*. General Technical Report PNW-GTR-327. USDA Forest Service. April.
- Hicks, B. J., J. D. Hall, P. A. Bisson, and J. R. Sedell. 1991. Responses of salmonids to habitat changes. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. 484–5. American Fisheries Society Special Publication 19.
- Hillis, J. M., D. Pengeroth, and R. Leach. 2003. Potential changes in large diameter snag densities, snag recruitment opportunities, and impacts on snag-dependent species in Region One. Unpublished report. 2003.
- Hillis, Mike and B. Kennedy. 2003. *Wolverine natal den assessment*. National Fire Plan Cohesive Strategy Team. Missoula, Montana: U.S. Department of Agriculture, Forest Service, Region 1.
- Hillis, Mike, J. E. Thompson, L. J. Canfield, L. J. Lyon, C. L. Marcum, P. M. Dolan, and D. R. McCleery. 1991. Defining elk security: the Hillis paradigm. In *Proceedings of Elk Vulnerability Symposium*. ed. Christensen, A. G., L. J. Lyon, and T. N. Lonner, Bozeman, MT: Montana State University.
- Hitchcox, Susan M. 1996. Abundance and nesting success of cavity-nesting birds in unlogged and salvage-logged burned forest in northwestern Montana. M.S. thesis. University of Montana, Missoula, MT.
- Hornocker, Maurine G. and Howard S. Hash. 1981. Ecology of the wolverine in northwestern Montana. *Canadian Journal of Zoology* 59, (September 1980): 1286-1301.
- Hoyt, Jeff S. and Susan J. Hannon. 2002. Habitat associations of Black-backed and Three-toed Woodpeckers in the boreal forest of Alberta. *Canadian Journal of Forestry Research* 32, (October 2002): 1881-1888.
- Hulme, Philip E. 2006. Beyond control: Wider implications for the management of biological invasions. *Journal of Applied Ecology* 43, (2006): 835-847.
- Hummel, S. and Agee J.K. 2003. Western spruce budworm defoliation effects on forest structure and potential fire behavior. *Northwest Science* 77, 159–69.
- Hunter, Malcolm. L. 1996. *Wildlife, forests, and forestry: principles of managing forest for biological diversity*. Upper Saddle River, New Jersey: Prentice-Hall Inc.
- Hutto, Richard L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. *Conservation Biology* 9, 1041–58.
- Hutto, Richard L. and Jock S. Young. 2002. Regional landbird monitoring: Perspectives from the Northern Rocky Mountains. *Wildlife Society Bulletin* 30, no. 3 738–50.

- Ihle, Beth. 2009. *Warm Springs vegetation treatment project NFMA existing condition for minerals and geology resources*. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, Montana.
- Jacobs, James S. and Roger L. Sheley. 2003. Prescribed fire effects on dalmation toadflax. *Journal of Range Management* 56, no. 2 193–7.
- Jenkins, Michael J., Elizabeth Hebertson, Wesley Page, and C. Arik Jorgensen. 2008. Bark beetles, fuels, fires and implications for forest management in the Intermountain West. *Forest Ecology and Management* 254, 16-34.
- Johnson, E. A., K. Miyaniishi, and J. M. H. Weir. 1995. Old-growth, disturbance, and ecosystem management. *Canadian Journal of Botany* 73, 918–26.
- Johnson, Kathleen A. 2000. *Artemisia tridentata* subsp. *vaseyana*. In *Fire effects information system [Online]*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed February 2, 2010).
- Johnson, Sherri L. 2004. Factors influencing stream temperatures in small streams: substrate effects and a shading experiment. *Canadian Journal of Fisheries Aquatic Science* 61, (2004): 913-23.
- Jones, Bobette E., Tom H. Rickman, Alfred Vazquez, Yukako Sado, and Kenneth W. Tate. 2005. Removal of encroaching conifers to regenerate degraded aspen stands in the Sierra Nevada. *Restoration Ecology* 13, no. 2 (June): 373–79.
- Jones, J. L. 1991. Habitat use of fisher in north-central Idaho. Thesis. University of Idaho, Moscow. 1991.
- Joy, S. M. 2002. Northern Goshawk habitat on the Kaibab National Forest Arizona: Factors affecting nest locations and territory quality. Dissertation. University of Colorado. 2002.
- Kaufman, M. G., E. D. Odelson D. A. Walker, and M. J. Klug. 2000. Microbial community ecology and insect nutrition. *American Entomologist* 46, 173–84.
- Kegley, Sandra J., R. Ladd Livingston, and Kenneth E. Gibson. 1997. *Pine engraver, ips pini (say), in the western United States*. Forest Insect and Disease Leaflet 122. Portland, Oregon: USDA Forest Service, Pacific Northwest Region.
- Kelsall, J. P. 1981. Status report on the wolverine, *Gulo gulo*, in Canada in 1981. Committee on the Status of Endangered Wildlife in Canada. 1981.
- Kendley, Jack. 2002. Post wildfire monitoring report, North Hills fire of 1984. Forest Service. Internal FS document. 2002.
- Kennedy, Patricia L. 2003. *Northern goshawk (Accipiter gentilis atricapillus): A technical conservation assessment*. USDA Forest Service, Rocky Mountain Region. <http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf>. (accessed .
- Kirk, T. A. and W. J. Zielinski. 2009. Developing and testing a landscape habitat suitability model for the American marten (*Martes americana*) in the Cascades mountains of California. *Landscape Ecology* 24, no. 6 759–73.
- Knight, George C. 1989. *Overview: Ecological and cultural prehistory of the Helena and Deerlodge National Forests Montana*. U.S. Department of Agriculture, Forest Service, Helena and Deerlodge National Forests.

- Knowles, Noah, Michael D. Dettinger, and Daniel R. Cayan. 2006. Trends in snowfall versus rainfall for the western United States. *Journal of Climate* 19, no. 18 4545–59.
- Koch, Eilers. 1907. *Report on the Proposed Bridger Forest Reserve Montana*. Bureau of Forestry. Bureau of Forestry.
- Kolb, Peter F. 2002. *Forestland Grazing: Understory Forage Management*.
- Kolb, Thomas E., Kristina M. Holmberg, Michael R. Wagner, and Joseph E. Stone. 1998. Regulation of ponderosa pine foliar physiology and insect resistance mechanism by basal area treatments. *Tree Physiology* 18, 375–81.
- Korol, J. J., M. A. Hemstrom, W. J. Hann, and R. A. Gravenmier. USDA Forest Service. 2002. *Snags and down wood in the Interior Columbia Basin Ecosystem Management Project*. General Technical Report PSW-GTR-181. USFS. 2002.
- Kotliar, N. B., S. J. Hejl, R. L. Hutto, V. A. Saab, C. P. Melcher, and M. McFadzen. 2002. Effects of fire and post-fire salvage logging on avian communities in conifer-dominated forests of the western United States. In *Effects of habitat fragmentation on birds in western landscapes: contrasts with paradigms from the eastern United States*. ed. George, T. L. and D. S. Dobkin, Chap. Studies in Avian Biology No. 25, 49–64. Camarillo, California: Cooper Ornithological Society.
- Kunkel, Kyran E., Toni K. Ruth, Daniel H. Pletcher, and Maurice G. Hornocker. 1999. Winter prey selection by wolves and cougars in and near Glacier National Park, Montana. *Journal of Wildlife Management* 63, no. 3 901–10.
- Lafren, John M., Dennis C. Flanagan, and Bernard A. Engel. 2004. Soil erosion and sediment yield prediction accuracy using WEPP. *Journal of the American Water Resources Association* 40, no. 2 (289–97):
- Larsen, Isaac J. and Lee H. MacDonald. 2007. Predicting postfire sediment yields at the hillslope scale: Testing RUSLE and Disturbed WEPP. *Water Resources Research* 43, no. 11
- Latta, Greg and Claire A. Montgomery. 2004. Minimizing the cost of stand level management for older forest structure in western Oregon. *Western Journal of Applied Forestry* 19, no. 4 221–31.
- Lee, D. C., J. Sedell, B. Rieman, R. Thurow, and J. William. 1997. Broadcast assessment of aquatic species and habitats. In *An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basin*. ed. Quigley, Thomas M. and Sylvia J. Arbelbide, Chap. Vol. 3, Ch. 4, PNW-GTR-405. Portland, Oregon: U.S. Department of Agriculture, Forest Service.
- Lehmkuhl, John F., Maureen Kennedy, E. David Ford, Peter H. Singleton, William L. Gaines, and Rick L. Lind. 2007. Seeing the forest for the fuel: Integrating ecological values and fuels management. *Forest Ecology and Management* 246, no. 1 73–80.
- Lemke, P. L. 1994. Northern goshawk (*Accipiter gentiles*) habitat study, Beaverhead National Forest, Montana. U.S. Department of Agriculture, Forest Service, Wisdom and Wise River Ranger Districts.
- Lesica, Peter. 1996. Using fire history models to estimate proportions of old growth forest in northwest Montana, USA. *Biological Conservation* 77, 33–9.

- _____. 1999. Effects of fire on the demography of the endangered, geophytic herb *Silene spaldingii* (Caryophyllaceae). *American Journal of Botany* 86, no. 7 (1999): 996-1002.
- Lesica, Peter and Brian Martin. 2003. Effects of prescribed fire and season of burn on recruitment of the invasive exotic plant, *Potentilla recta*, in a semiarid grassland. *Restoration Ecology* 11, no. 4 516–23.
- Lindh, Briana C. and Patricia S. Muir. 2004. Understory vegetation in young Douglas-fir forests: Does thinning help restore old-growth composition? *Forest Ecology and Management* 192, 285–96.
- Linkhart, B. D. 2001. Life history characteristics and habitat quality of flammulated owls (*Otus flammeolus*) in Colorado. Dissertation. University of Colorado, Boulder, Colorado.
- Linkhart, Brian D. and Richard T. Reynolds. 1997. Territories of flammulated owls (*Otus flammeolus*): Is occupancy a measure of habitat quality? In *Biology and conservation of owls in the northern hemisphere, second international symposium*. ed. Duncan, J. R., D. H. Johnson, and T. H. Nicholls, 250–54.
- Livingston, Ladd. 2004. *Pine engraver management*. U.S. Department of Agriculture, Forest Service, Forest Health Protection. May.
- Lloyd, Jim. 1985. Habitat Capability Model COWFISH. Beaverhead National Forest, Custer National Forest, Gallatin National Forest. February 1985.
- Lodge, David M. and Kristin Shrader-Frechette. 2003. Nonindigenous species: Ecological explanation, environmental ethics, and public policy. *Conservation Biology* 17, no. 1 (February): 31–7.
- Long, James N. and John D Shaw. 2005. A Density Management Diagram for Even-aged Ponderosa Pine Stands. *Western Journal of Applied Forestry* 20, no. 4 (2005): 205-15.
- Long, Ryan A., Janet L. Rachlow, and John G. Kie. 2008. Effects of season and scale on response of elk and mule deer habitat manipulation. *Journal of Wildlife Management* 72, no. 5 1133–42.
- Lonner, T. N. and J. D. Cada. 1982. Some effects of forest management on elk hunting opportunity. In *The western states elk workshop*. ed. Britt, T. L. and D. P. Theobald, 119–28. Flagstaff, Arizona: Arizona Fish and Game Department.
- Lonner, Terry N. 1991. Elk vulnerability and the biomodulator. Elk Vulnerability Symposium, Bozeman, Montana, April 10, 1991. Montana State University.
- Lonsdale, W. M. 1999. Global patterns of plant invasions and the concept of invasibility. *Ecology* 80, no. 5 1522–36.
- Losensky, B. John. 1993. Historical vegetation in region one by climatic section.
- Louda, Svata M., D. Kendall, J. Connor, and D. Simberloff. 1997. Ecological effects of an insect introduced for the biological control of weeds. *Science* 277, (August 1997): 1088-1090.
- Lynch, Heather J., Roy A. Renkin, Robert L. Crabtree, and Paul R. Moorcroft. 2006. The influence of previous Mountain pine beetle (*Dendroctonus ponderosae*) activity on the 1988 Yellowstone fires. *Ecosystems* 9, 1318-27.

- Lyon, L. Jack. 1983. Road density models describing habitat effectiveness for elk. *Journal of Forestry* 81, no. 9 (September 1983): 592-595.
- Lyon, L. Jack, T. N. Lonner, and J. P. Weigand. 1985. *Coordinating elk and timber management*. Montana Department of Fish, Wildlife and Parks. Final Report of the Montana Coop. Elk-logging Study, 1970-1985. Bozeman, MT.
- MacDonald, L. H., A. W. Smart, and R. C. Wissmar. 1991. *Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska*. CSS/EPA 910/9-91-001. Seattle, Washington.
- MacDonald, Lee H. and John D. Stednick. 2003. Forests and Water: A State-of-the-Art Review for Colorado. Colorado State University. CWRR1 Competition Report No. 196. Fort Collins, CO. 2003.
- MacDonald, Neil W., Peter J. Bosscher, Christopher A. Mieczkowski, Emily M. Sauter, and Brenda J. Tinsley. 2001. Pre- and post-germination burning reduces establishment of spotted knapweed seedlings (Michigan). *Ecological Restoration* 19, no. 4 260–1.
- Mack, Richard N., Daniel Simberloff, W. Mark Lonsdale, Harry Evans, Michael Clout, and Fakhri A. Bazzaz. 2000. Biotic invasion: Causes, epidemiology, global consequences, and control. *Ecological Applications* 10, no. 3 689–710.
- Marshall, David B. 1988. Draft report: Status of the wolverine in Oregon. Oregon Department of Fish and Wildlife. Portland, OR. October 1988.
- Marti, C. 1997. Flammulated owls (*Otus flammeolus*) breeding in deciduous forests. In *Biology and conservation of owls in the Northern Hemisphere*. ed. Duncan, J. R., D. H. Johnson, and T. H. Nicholls, Chap. General Technical Report NC-190, 262–6. St. Paul, MN: U.S. Department of Agriculture, Forest Service.
- Martin, Robert E. Kauffman J. Boone and Joan D. Landsberg. 1989. *Use of Prescribed Fire to Reduce Wildfire*. General Technical Report PSW-109. 1989.
- Maser, C., S. P. Cline, K. Cromack, J. M. Trappe, and E. Hansen. 1988. What we know about large trees that fall to the forest floor. In *Form the Forest to the Sea*. ed. Maser, C., R. F. Tarrant, J. M. Trappe, and J. F. Franklin, Chap. 2, 25–44.
- Maxell, Bryce A. 2000. *Management of Montana's amphibians: A review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history, and the status and conservation of individual species*. Order Number 43-0343-0-0224. Report to USFS Region 1. Missoula, Mt: University of Montana, Wildlife Biology Program.
- McCallum, D. Archibald. 1994. Review of technical knowledge: Flammulated owls. In *Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment*. ed. Hayward, Gregory D. and Jon Verner, 14-27.
- McClelland, B. Riley. 1977. Relationships between hole-nesting birds, forest snags, and decay in western larch—douglas-fir forests of the northern Rocky Mountains. Ph.D. dissertation. University of Montana, Missoula, MT.
- McGlone, Christopher M., Judith D. Springer, and Daniel C. Laughlin. 2009. Can pine forest restoration promote a diverse and abundant understory and simultaneously resist nonnative invasion? *Forest Ecology and Management* 259, (September 2009): 2638-2646.

- McGrath, Michael T., Stephen DeStefano, Robert A. Riggs, Larry L. Irwin, and Gary J. Roloff. 2003. Spatially explicit influences on northern goshawk nesting habit in the Interior Pacific Northwest. *Wildlife Monographs* 154, 1–63.
- McGregor, Mark D., Gene D. Amman, Richard F. Schmitz, and Robert D. Oakes. 1987. Partial cutting lodgepole pine stands to reduce losses to the mountain pine beetle. *Canadian Journal of Forest Research* 17, (May 1987): 1234-39.
- McIver, James D. and Lynn Starr. tech. eds. 2000. *Environmental effects of postfire logging: literature review and annotated bibliography*. General Technical Report PNW-GTR-486. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- McKenzie, Don, David L. Peterson, and Jeremy Littell. 2007. Stress complexes. In *Forest fires and air pollution issues*. ed. Bytnerowicz, Andrzej, Michael Arbaugh, Chris Andersen, and Al Riebau, N.p.: Elsevier Ltd.
- Meehan, W. R. and T. C. Bjornn. 1991. Salmonid distribution and life histories: Brook trout. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. 78–9. American Fisheries Society Special Publication 19.
- Meffe, Gary K. and C. Ronald Carroll. 1994. Habitat fragmentation. In *Principles of conservation biology*. Chap. 9, 237-63.
- Metesh, J., J. Lonn, R Marvin, P Hargrave, and J. Madison. 1997. *Abandoned and inactive mines Helena National Forest Volume 1 Upper Missouri River Drainage*. Montana Bureau of Mines and Geology. Publication 352.
- MFWP. 1992. *Statewide elk plan for Montana*. Helena, MT: Montana Fish, Wildlife, and Parks.
- MIG, Inc. 1999. IMPLAN Professional 2.0. Stillwater, Minnesota: implan.com (accessed .
- Millar, Constance I., Nathan L. Stephenson, and Scott L. Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. *Ecological Applications* 17, no. 8 2145–51.
- Mitchel, Russel G. and Haiganoush K. Preisler. 1998. Fall rate of lodgepole pine killed by the mountain pine beetle in central Oregon. *Western Journal of American Forestry* 13, no. 1 (1998):
- Montana DEQ Clean Water Act Information Center. 2009. Montana DEQ Clean Water Act Information Center. <http://cwaic.mt.gov/>. (accessed 2009).
- Montana Steering Committee: Intermountain West Joint Venture. 2005. Coordinated implementation plan for bird conservation in western Montana. 2005.
- Montgomery, Claire A., Greg S. Latta, and Darius M. Adams. 2006. The cost of achieving old-growth forest structure. *Land economics* 82, no. 2 240–256.
- Morgan, Penny, G. H. Aplet, J. B. Haufler, H. C. Humphries, M. M. Moore, and W. D. Wilson. 1994. Historic range of variability: A useful tool for evaluating ecosystem change. In *Assessing forest ecosystem health in the inland west*. ed. Sampson, R. N. and D. A. Adams, 87–111. Binghamton, New York: Haworth Press.
- Morrison, Duncan and Ken Mallett. 1996. Silvicultural management of armillaria root disease in western Canadian forests. *Canadian Journal of Plant Pathology* 18, 194–99.

- MTDEQ. 2004. *Mitchell Creek: Historic context*. <http://www.deq.state.mt.us/abandonedmines/linkdocs/techdocs/84tech.asp>. (accessed December 15, 2009).
- . 2010. Montana Department of Environmental Quality Website. <http://www.deq.state.mt.us>. (accessed .
- MTFWP. 2005. *Montana's comprehensive fish and wildlife conservation strategy*. Helena, Montana: Montana Fish, Wildlife & Parks.
- . 2008. *Montana Fish, Wildlife, and Parks Website*. Montana Department of Fish, Wildlife, and Parks Website. <http://fwp.mt.gov/hunting/planahunt>. (accessed March 4, 2010).
- . Fish Wildlife and Parks. 2009a. *Animal field guide: Gray wolf*. http://fwp.mt.gov/fieldguide/detail_amaja01030.aspx. (accessed December 11, 2009a).
- . Fish Wildlife and Parks. 2009b. *Animal field guide: Townsend's big-eared bat*. http://fieldguide.mt.gov/detail_AMACC08010.aspx. (accessed December 11, 2009b).
- . Fish Wildlife and Parks. 2009c. *Animal field guide: Western toad*. http://fwp.mt.gov/fieldguide/detail_AAABB01030.aspx. (accessed December 7, 2009c).
- MTFWP, USDA, and USDI. 1993. *Elkhorn landscape analysis final document*. S 333.9516 U8ela.
- MTFWP, USDI, and USDA. Bureau of Land Management, Butte Field Office; Forest Service, Beaverhead-Deerlodge National Forest, Helena National Forest. 2000. Memorandum of Understanding (MOU) Elkhorns Cooperative Management Area. April 2000.
- MTNHP. 2004. *Montana Natural Heritage Program Database*. <http://www.mtnhp.org>. (accessed .
- . 2010a. Animal species of concern. <http://mtnhp.org/speciesofconcern/?AorP=a>. (accessed February 10, 2010a).
- . 2010b. *Database*. <http://mtnhp.org>. (accessed .
- Mueggler, W. F. and W. L. Stewart. 1980. *Grassland and shrubland habitat types of western Montana*. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. General Technical Report INT-66.
- Mutch, Robert W., Stephen F. Arno, James K. Brown, Clinton E. Carlson, Roger D. Ottmar, and Janice L. Peterson. USDA Forest Service. 1993. *Forest Health in the Blue Mountains: A Management Strategy for Fire-Adapted Ecosystems*. General Technical Report PNW-GTR-310. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. February 1993.
- Negron, Jose F., John A. Anhold, and A. Steve Munson. 2001. Within-stand spatial distribution of tree mortality caused by the douglas-fir beetle. *Community and Ecosystem Ecology* 30, no. 2 215-224.
- Negron, Jose F. and John B. Popp. 2004. Probability of ponderosa pine infestation by mountain pine beetle in the Colorado Front Range. *Forest Ecology and Management* 191, 17-27.
- Negron, Jose F., Willis C. Schaupp Jr., Kenneth E. Gibson, John Anhold, Dawn Hansen, Ralph Thier, and Phil Mocettini. 1999. Estimating extent of mortality associated with the Douglas-fir beetle in the central and northern Rockies. *Western Journal of Applied Forestry* 14, no. 3 121-7.

- Nelson, Lee. MTFWP. Montana Fish, Wildlife and Parks Biologist. 2010.
- Nock, Erin Elizabeth. 2008. A simple GIS approach to predicting rare plant habitat: North Central Rocky Mountains, United States Forest Service, Region One. Thesis. The University of Montana, Missoula, MT. Spring 2008.
- Noss, Reed F., Howard B. Quigley, Maurine G. Hornocker, Troy Merrill, and Paul C. Paquet. 1996. Conservation Biology and Carnivore Conservation in the Rocky Mountains. *Conservation Biology* 10, no. 4 (August 1996): 949-63.
- Nudds, T. D. 1977. Quantifying the vegetative structure of wildlife cover. *Wildlife Society Bulletin* 5, 113-7.
- Olsen, Lois. 2009. [Personal communication]. Ecologist. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, Montana. December 10.
- Olsen, Lois J. 2009a. *Warm Springs sensitive plants NFMA report*. U.S. Department of Agriculture, Forest Service, Helena National Forest.
- . 2009b. *Warm Springs vegetation project, Helena National Forest, Noxious weeds detailed NFMA background report*. U.S. Department of Agriculture, Forest Service, Helena National Forest.
- Olsen, W. K., J. M. Schmid, and S. A. Mata. 1996. Stand characteristics associated with mountain pine beetle infestations in ponderosa pine. *Forest Science* 42, no. 3 310-27.
- Omi, Philip N. and Erik J. Martinson. 2002. *Effect of fuels treatment on wildfire severity*. Western Forest Fire Research Center; Colorado State University. Final Report. March 2002.
- Omi, Philip N., Erik J. Martinson, and Geneva W. Chong. 2007. *Effectiveness of pre-fire fuel treatments*. Final Report JFSP Project 03-2-1-07. December.
- Ortega, Yvette K. and Dean E. Pearson. Effects of a common broadleaf herbicide treatment on grassland community dominants vary with initial levels of exotic plant invasion. Missoula, MT. In review.
- Paige, Christine and Sharon A. Ritter. 1999. *Managing sagebrush habitats for bird communities*. Partners in Flight, Western Working Group.
- Parrett, Charles and D. R. Johnson. USDI; USGS. 2004. *Methods for Estimating Flood Frequency in Montana Based on Data through Water Year 1998*. BIA; BLM; CSKT; Mt DNRC; Mt DOT; USDA Forest Service. Water-Resources Investigations Report 03-4308. Helena, MT: USGS. February 2004.
- Pauchard, Anibal, Paul B. Alaback, and Eric G. Edlund. 2003. Plant invasion in protected areas at multiple scales: *Linaria vulgaris* (scrophulariaceae) in the West Yellowstone area. *Western North American Naturalist* 63, no. 4 416-28.
- Paysen, Timothy E., R. James Ansley, James K. Brown, Gerald J. Gottfried, Sally M. Haase, Michael G. Harrington, Marcia G. Narog, Stephen S. Sackett, and Ruth C. Wilson. 2000. Fire in western shrubland, woodland, and grassland ecosystems. In *Wildland fire in ecosystems: Effects of fire on flora: General Technical Report RMRS-GTR-42*. Chap. 6, 121-41. Fort Collins, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

- Pearson, Dean E. and Robert J. Fletcher Jr. 2008. Mitigating exotic impacts: Restoring deer mouse populations elevated by an exotic food subsidy. *Ecological Applications* 18, no. 2 (September 2008): 321-334.
- Perry, D. A., J Huang, and A. Oetter D. R. Youngblood. 2004. Forest structure and fire susceptibility in volcanic landscapes of the eastern High Cascades, Oregon. *Conservation Biology* 18, no. 4 (August): 913–26.
- Peterson, David L., Morris C. Johnson, James K. Agee, Theresa B. Jain, Donald McKenzie, and Elizabeth D. Reinhardt. 2003. *Fuels Planning: Managing Forest Structure to Reduce Fire Hazard*. 2003.
- . USDA Forest Service. 2005. *Forest Structure and Fire Hazard in Dry Forests of the Western United States*. General Technical Report PNW-GTR-628. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station. February 2005.
- Pfister, Robert D., Bernard L. Kovalchik, Stephen F. Arno, and Richard C. Presby. 1977. *Forest habitat types of Montana*. General Technical Report. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Pierson, Jennifer Christy. 2009. Genetic population structure and dispersal of two North American woodpeckers in ephemeral habitats. Dissertation. University of Montana. December 2009.
- Platts, William S., Walter F. Megahan, and G. Wayne Minshall. 1983. *Methods for evaluating stream, riparian, and biotic conditions*. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. General Technical Report INT-138. Ogden, Utah.
- Pollet, Jolie and Philip N. Omni. 2002. Effect of thinning and prescribed burning on crown severity in ponderosa pine forests. *International Journal of Wildland Fire* 11, (2002): 1-10.
- Poole, Jackie and Bonnie Heidel. Montana Natural Heritage Program. 1993. Sensitive Plant Surveys in the Big Belt and Elkhorn Mountains. USDA Forest Service. Helena, MT. January 1993.
- Potyondy, John P. 1981. *Technical guide for erosion prevention and control on timber sale areas*. Region 4 Soil and Water Management.
- Powell, Hugh. 2000. The influence of prey density of post-fire habitat use on the black-backed woodpecker. M.S. Thesis. University of Montana, Missoula, Montana.
- Prichard, Don, John Anderson, Cindy Correll, Jim Fogg, Karl Gebhart, Russ Krapf, Steve Leonard, Brenda Mitchell, and Janice Staats. 1998. *Riparian area management: A user guide to assessing proper functioning condition and the supporting science for lotic areas*. Technical Report BLM/RS/ST-98/001+1737. Denver, CO: U.S. Department of the Interior, Bureau of Land Management, National Applied Resource Sciences Center.
- Raymond, Crystal L. and David L. Peterson. 2005. Fuel treatments alter the effects of wildfire in a mixed-evergreen forest, Oregon, USA. *Canadian Journal of Forest Research* 35, 2981–95.
- Reed, Rebecca A., Julia Johnson-Barnard, and William L. Baker. 1996. Contributions of roads to forest fragmentation in the Rocky Mountains. *Conservation Biology* 10, no. 4 (August): 1098-106.
- Reel, S., L. Schassberger, and Bill Ruediger. 1989. *Caring for our natural communities: Region 1 threatened, endangered, and sensitive species program*. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region.

- Reese, Kerry P. and John T. Ratti. 1988. Edge effect: A concept under scrutiny. In *Transactions of the 53rd North American Wildlife and Natural Resource Conference*. Chap. 4, 127-36.
- Reeves, G. H., L. E. Benda, K. M. Burnett, P. A. Bisson, and J. R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonoids in the Pacific Northwest. *American Fisheries Society Symposium* 17, (1995): 334-349.
- Reeves, G. H., J. D. Hall, T. C. Roelofs, T. L. Hickman, and C. O. Baker. 1991. Rehabilitating and modifying stream habitats. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society Special Publication 19.
- Reich, Robin M., Suzanne M. Joy, and Richard T. Reynolds. 2004. Predicting the location of northern goshawk nests: modeling the spatial dependency between nest locations and forest structure. *Ecological Modelling* 176, (2004): 109-33.
- Reichel, James D. 1996. *Preliminary amphibian and reptile survey of the Helena National Forest: 1995*. Montana Natural Heritage Program. Helena, Montana.
- Reineke, L. H. 1933. Perfecting a stand-density index for even-aged stands. *Journal of Agricultural Research* 46, no. 7 (April 1933): 627-638.
- Reinhardt, Elizabeth and Nicholas L. Crookston. 2003. *The fire and fuels extension to the Forest Vegetation Simulator*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-116. Ogden, UT.
- Reynolds, Richard T., Russell T. Graham, and Douglas A. Boyce Jr. 2008. Northern goshawk habitat: an intersection of science, management, and conservation. *Journal of Wildlife Management* 72, no. 4 1047-55.
- Reynolds, Richard T., Russell T. Graham, M. Hildergard Reiser, Richard L. Bassett, Patricia L. Kennedy, Douglas A. Boyce, Greg Goodwin, Randall Smith, and E. Leon Fisher. 1992. *Management recommendations for the northern goshawk in the southwestern United States*. U.S. Department of Agriculture, Forest Service. General Technical Report RM-217. Albuquerque, New Mexico.
- Reynolds, Richard T., J. David Wiens, Suzanne M. Joy, and Susan R. Salafsky. 2005. Sampling considerations for demographic and habitat studies of northern goshawks. *Journal of Raptor Research* 39, no. 3 274-85.
- Rhodes, Jonathan J. and William L. Baker. 2008. Fire probability, fuel treatment effectiveness and ecological tradeoffs in Western U.S. Public Forests. *The Open Forest Science Journal* 1, (2008): 1-7.
- Rice, Peter M., Guy R. McPherson, and Lisa J. Rew. 2008. Chapter 8: Fire and nonnative invasive plants in the Interior West Bioregion. U.S. Department of Agriculture, Forest Service. General Technical Report RMRS-GTR-42-vol. 6. 2008.
- Rice, Peter M., J. Christopher Toney, Donald J. Bedunah, and Clinton E. Carlson. 1997. Elk winter forage enhancement by herbicide control of spotted knapweed. *Wildlife Society Bulletin* 25, no. 3 (Autumn 1997): 627-633.
- Rippy, Raini C., Jane E. Stewart, Paul J. Zambino, Ned B. Klopfenstein, Joanne M. Tirocke, Mee-Sook Kim, and Walter G. Thies. 2005. *Root diseases in coniferous forests of the Inland West: Potential*

- implications of fuel treatments*. General Technical Report RMRS-GTR-141. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Ritter, S., F. Samson, J. Carotti, and J. Hillis. 2000. R1 snag protocol. U.S. Department of Agriculture, Forest Service, Region One. Missoula, MT.
- Ritter, Sharon A. and Christine Paige. 2000. *Keeping birds in the sagebrush sea*.
- Roath, Leonard and William Krueger. 1982. Cattle Grazing and Behavior on a Forested Range. *Journal of Range Management* 35, no. 3 (May 1982): 332-8.
- Robichaud, Peter R., Joseph W. Wagenbrenner, Robert E. Brown, and Kevin M. Spigel. 2009. Three years of hillslope sediment yields following the Valley Complex fires, Western Montana. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Research Paper RMRS-RP-77. Fort Collins, CO. September 2009.
- Roby, R. N., W. C. Ackerman, F. B. Fulkerson, and F. A. Crowley. 1960. *Mines and mineral deposits (except fuels), Jefferson County, Montana*. Montana Bureau of Mines and Geology. Bulletin 16.
- Rose, Cathy L., Bruce G. Marcot, T. Kim Mellen, Janet L. Ohmann, Karen L. Waddell, Deborah L. Lindley, and Barry Schreiber. 2001. Decaying wood in Pacific Northwest forests: Concepts and tools for habitat management. In *Wood legacies*. 580-612.
- Rosenberg, Daniel K., Barry R. Noon, and E. Charles Meslow. 1997. Biological corridors: Form, function, and efficacy. *BioScience* 47, no. 10 (November 1997): 677-87.
- Ruggiero, Leonard F., Keith B. Aubry, Steven W. Buskirk, L. Jack Lyon, and William J. Zielinski. 1994. *The scientific basis for conserving forest carnivores American marten, fisher, lynx, and wolverine in the western United States*. General Technical Report RM-254. Fort Collins, CO: U.S. Department of Agriculture, Forest Service.
- Rumble, Mike A. and John E. Gobeille. 1995. Wildlife associations in Rocky Mountain juniper in the northern Great Plains, South Dakota. In *Desired future conditions for pinon-juniper ecosystems*. ed. Shaw, D. W., E. F. Aldon, and C. LoSapio, 80-90. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- Ryan, K. C. 2000. Global change and wildland fire. In *Wildland fire in ecosystems: Effects of fire on flora*. ed. Brown, J. K. and J. Kapler Smith, Chap. General Technical Report. RMRS-GTR-42-vol.2, 175-183. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Ryan, Kevin C. and Gene D. Amman. 1994. *Interactions between fire-injured trees and insects in the greater Yellowstone area*. Plants and their environments: Proceedings of the first biennial scientific conference on the greater Yellowstone ecosystem. Yellowstone National Park, Wyoming: September 16-17, 1991.
- Sala, Anna, Gregory D. Peters, Lorna R. McIntyre, and Michael G. Harrington. 2005. Physiological responses of ponderosa pine in western Montana to thinning, prescribed fire and burning season. *Tree Physiology* 25, 339-48.
- Samson, Fred. 1997. *1996 Terrestrial Protocols*. U.S. Department of Agriculture, Forest Service, Northern Region. U.S. Department of Agriculture, Forest Service, Northern Region. March 1997.

- Samson, Fred B. 2006a. *A conservation assessment of the northern goshawk, black-backed woodpeckers, flammulated owl, and pileated woodpecker in the Northern Region*. U.S. Department of Agriculture, Forest Service.
- . 2006b. *Habitat estimates for maintaining viable populations of the northern goshawk, black-backed woodpecker, flammulated owl, pileated woodpecker, american marten, and fisher*. U.S. Department of Agriculture, Forest Service.
- Samson, Fred B., Fritz L. Knopf, and Wayne R. Ostlie. 2004. Great Plains ecosystems: Past, present, and future. *Wildlife Society Bulletin* 32, no. 1 6–15.
- Saveland, James M., Stephen R. Bakken, and Leon F Neuenschwander. 1990. *Predicting mortality and scorch height from prescribed burning for ponderosa pine in northern Idaho*. Moscow, Idaho: University of Idaho, Wildlife and Range Experiment Station.
- Schmid, J. M. 1987. Insects of ponderosa pine: Impact and control. Ponderosa pine, the species and its management, Spokane, Washington, September 29, 1987.
- Schmid, J. M. and S. A. Mata. 1992. *Stand density and mountain pine beetle caused tree mortality in ponderosa pine stands*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-515. March 1992.
- Schmidt, Kirsten M., James P. Menakis, Colin C. Hardy, Wnedel J. Hann, and David L. Bunnell. 2002. *Development of Coarse-Scale spatial Data for Wildland Fire and Fuel Management*. General Technical Report RMRS-87. April 2002.
- Schmitz, Richard F. and Kenneth E. Gibson. 1996. Douglas-fir beetle. U.S. Department of Agriculture, Forest Service. Forest Insect & Disease Leaflet 5. 1996.
- Schwecke, Deitrich A. and Wendell Hann. USDA. 1984. *Fire behavior and vegetation response to spring and fall burning on the Helena National Forest*.
- Scott, J. H. and E. Reinhardt. 2001a. Estimating canopy fuels in conifer forests. *Fire Management Today* 62, 45–50.
- Scott, Joe. 1998. Reduce fire hazards in ponderosa pine by thinning. *Fire Management Notes* 58, no. 1 20–5.
- Scott, Joe H. and Elizabeth D. Reinhardt. 2001b. *Assessing crown fire potential by linking models of surface and crown fire behavior*. Research Paper RMRS-RS-29. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. September 2001.
- Scott, Joe. H. and R. E. Burgan. 2005. Standard fire behavior fuel models: A comprehensive set for use with Rothermel's surface fire spread model.
- Shea, Katriona, Dave Kelly, Andrew W. Sheppard, and Tim L. Woodburn. 2005. Context-dependent biological control of an invasive thistle. *Ecology* 86, no. 12 (May 2005): 3174-3181.
- Shepperd, Wayne D. 1986. *Silviculture of aspen forests in the Rocky Mountains and the Southwest*. RM-TT-7. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- . 1990. *Initial growth, development, and clonal dynamics of regenerated aspen in the Rocky Mountains*. Research Paper RM-312. U.S. Department of Agriculture, Forest Service.

- . 1996. *Response of aspen root suckers to regeneration methods and post-harvest protection*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-RP-324. Fort Collins, Colorado.
- . 2001. Manipulations to regenerate aspen ecosystems 2001. In *Sustaining aspen in western landscapes: Symposium proceedings*. 13—15. Grand Junction, CO: USDA Forest Service, Rocky Mountain Research Station.
- Shepperd, Wayne D., Paul C. Rogers, David Burton, and Dale L. Bartos. 2006. *Ecology, biodiversity, management, and restoration of aspen in the Sierra Nevada*. General Technical Report RMRS-GTR-178. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Shlisky, Ann and Wendel Hann. 2003. Rapid scientific assessment of mid-scale fire regime conditions in the Western U.S. Proceedings of the 3rd International Wildland Fire Conference. Sydney, Australia. October 2003. October 3, 2003).
- Shore, T. L. and L. Safranyik. 1992. *Susceptibility and risk rating systems for the mountain pine beetle in lodgepole pine stands*. Forestry Canada, Pacific and Yukon Region, Pacific Forestry Centre. Information Report BC-X-336. N.p.: Minister of Supply and Services Canada.
- Sieg, Carolyn Hull. 1988. *The value of Rocky Mountain juniper (Juniperus scopulorum) woodlands in South Dakota as small mammal habitat*. General Technical Report 166.
- . 1991. Geographic affinity of bird species associated with Rocky Mountain juniper woodlands and adjacent grasslands in southwestern South Dakota. *Prairie Naturalist* 23, no. 1 25–33.
- Simonin, Kevin A. 2000. *Euphorbia esula*. In *Fire effects information system*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.
- Sirucek, Dean. 2001. *Soil survey of Helena National Forest area, Montana*. Washington, DC: U.S. Department of Agriculture, Montana Agriculture Experiment Station.
- Skinner, Carl N., Martin W. Ritchie, Todd Hamilton, and Julie Symons. 2005. Effects of thinning and prescribed fire on wildlife severity. 25th Forest Vegetation Management Conference, 80-91. Redding, California, January 20, 2004.
- Skovlin, Jon M., Peter Zager, and Bruce K. Johnson. 2002. Elk habitat selection and evaluation. In *North American elk ecology and management*. ed. Toweill, Dale E., Jack Ward Thomas, and Daniel P. Metz, Chap. 12, 531-55. Smithsonian Institution Press.
- Slough, B. G. 1989. Movements and habitat use by transplanted marten in the Yukon Territory. *Journal of Wildlife Management* 53, no. 4 (October 1989): 991-7.
- Smith, David M., Bruce C. Larson, Matthew J. Kelty, and Mark S. Ashton. 1997a. *The Practice of Silviculture: Applied Forest Ecology*. 9th ed. Hoboken, NJ: John Wiley and Sons, Inc.
- . 1997b. *The Practice of silviculture: Applied forest ecology*. 9th ed. Hoboken, NJ: John Wiley and Sons, Inc.

- Smith, P. W. and S. F. Arno. 1999. *Eighty-eight years of change in a managed ponderosa pine forest*. General Technical Report RMRS-GTR-23. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. March.
- Smith, R. H. 2000. *Xylem monoterpenes of pines: distribution, variation, genetics, function*. U.S. Department of Agriculture, Forest Service. General Technical Report PSW-177.
- Smith, Ricarrd G., Bruce D. Maxwell, Menalled Fabin D., and Lisa J. Rew. 2006. Lessons from agriculture may improve the management of invasive plants in wildland systems. *Frontiers in Ecology and the Environment* 4, no. 8 (October 2006): 428-434.
- Sousa, P. J. 1987. *Habitat suitability index models: Hairy woodpecker*. U.S. Fish and Wildlife Service. Biological Report 82(10.146).
- Spencer, W. D. 1987. Seasonal rest-site preferences of pine martens in the northern Sierra Nevada. *Journal of Wildlife Management* 51, no. 3 (July 1987): 616-621.
- Squires, John R. and R. T. Reynolds. 1997. Northern goshawk (*Accipiter Gentilis*). In *The Birds of North America*. ed. Poole, A. and F. Gills, Philadelphia, Pennsylvania and Washington, D.C.: The Academy of Natural Sciences and The American Ornithologists' Union.
- Squires, John R. and Leonard F. Ruggiero. 1996. Nest-site preference of northern goshawks in southcentral Wyoming. *The Journal of Wildlife Management* 60, no. 1 170–7.
- Stam, B. R., J. C. Malechek, D. L. Bartos, J. E. Brown, and E. B. Godfrey. 2008. Effect of conifer encroachment into aspen stands on understory biomass. *Rangeland Ecology and Management* 61, 93–7.
- Stowell, Rick, Al Espinosa, Ted C. Bjornn, William S. Platts, Dave C. Burns, and John S. Irving. 1983. *Guide for predicting salmonid response to sediment yields in Idaho batholith watersheds*. U.S. Department of Agriculture, Forest Service.
- Stratton, R. D. 2004. Assessing the effectiveness of landscape fuel treatments on fire growth and behavior. *Journal of Forestry* 102, no. 7 (October/November): 32–40.
- Sturdevant, Nancy. 2008. Information regarding mountain pine beetle and the proposed thinning project, tenmile creek drainage, Helena National Forest.
- _____. 2010. [Personal communication]. Entomologist. U.S. Department of Agriculture, Forest Service, Northern Region. 3//2010.
- Swanson, F. J., J. A. Jones, D. O. Wallin, and J. H. Cissel. 1994. Natural Variability-Implications for Ecosystem Management. 1994.
- Swanston, D. N. 1991. Natural Processes. In *Influences of forest and rangeland management on salmonid fishes and their habitats*. 139–42. American Fisheries Society Special Publication 19.
- Tappeiner II, John C., Douglas A. Maguire, and Timothy B. Harrington. 2007. Measures of stand density and structure. In *Silviculture and ecology of Western U.S. Forests*. Chap. 6, 161-86. Corvallis, OR: Oregon State University Press.

- Temple, S. A. and B. A. Wilcox. 2000. Introduction: Predicting effects of habitat patchiness and fragmentation. In *Wildlife 2000: Modeling habitat relationships of terrestrial vertebrates*. ed. Verner, J., M. L. Morrison, and C. J. Ralph, 261–2. The University of Wisconsin Press.
- Thomas, Jack Ward. 1979. *Wildlife habitats in managed forests the Blue Mountains of Oregon and Washington*. U.S. Department of Agriculture, Forest Service. Agriculture Handbook No. 553. Washington, D.C.: Wildlife Management Institute, U.S. Department of Interior, Bureau of Land Management. September.
- Thomas, Jack Ward, C. Maser, and J. E. Rodierk. 1979. *Wildlife habitats in managed rangelands—The Great Basin of southeastern Oregon: Riparian zones*. U. S. Department of Agriculture, Forest Service. General Technical Report PNW-80.
- Thompson, Ian D. 1994. Marten populations in uncut and logged boreal forests in Ontario. *The Journal of Wildlife Management* 58, no. 2 272–80.
- Thompson, Ian D. and Patrick. W. Colgan. 1994. Marten activity in uncut and logged boreal forests in Ontario. *Journal of Wildlife Management* 58, no. 2 (April 1994): 280-8.
- Thysell, David R. and Andrew B. Carey. 2001. Manipulation of density of *Pseudotsuga menziesii* canopies: Preliminary effects on understory vegetation. *Canadian Journal of Forest Research* 31, 1513–25.
- Tinker, Daniel B., Catherine A. C. Resor, Gary P. Beauvais, Kurt F. Kipfmüller, Charles I. Fernandes, and William L. Baker. 1998. Watershed analysis of forest fragmentation by clearcuts and roads in a Wyoming forest. *Landscape Ecology* 13, no. 3 (June): 149-65.
- Tirmenstein, D. 2000. *Festuca altaica*, *F. campestris*, *F. hallii*. In *Fire effects information system*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed December 15, 2009).
- Tomson, Scott. 1998. American marten (*Martes americana*) ecology and summer/fall habitat selection in North Idaho. Masters of Science. University of Montana.
- Tri-County Fire Working Group. 2005. *Regional Community Wildfire Protection Plan*. Helena, Montana: 2005.
- Tucker, P. 1988. *Annotated gray wolf bibliography*. U.S. Department of the Interior, Fish and Wildlife Service.
- Turner, D. 1998. Helena National Forest heritage inventory form: Warm Springs Delta. U.S. Department of Agriculture, Forest Service. Helena, Montana. August.
- . 1999. Helena National Forest heritage inventory form: Road 226-D1 road rip and seed. U.S. Department of Agriculture, Forest Service. Helena, Montana. August.
- Unger, L. S. and D. W. Langor. 2009. Natural Resources Canada: Insects and diseases of Canada's forests-Mountain pine beetle [Website]. <http://imfc/cfl.scf.rncan.gc.ca/insecte-insect-eng.asp?gelD=2816>. (accessed December, 2009).
- US Bureau of Census. 1970. *Intercensal Estimates of the Total Resident Population of the States: 1970 to 1980*. www.census.gov/popest/archives/1980s/st7080ts.txt. (accessed January 3, 2010).

- . 2008a. *Table 1: Annual Estimate of the Population for the United States, Regions, States and Puerto Rico: April 1, 2000 to July 1, 2008 (NST-EST2007-01)*. www.census.gov. (accessed .
- . 2008b. *Table CO-EST2008-POPCHG2000_2008-30*.
- US EPA. 2004. *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for Lake Helena Watershed Planning Area: Volume 1-Watershed Characterization and Water Quality Status Review*. Tetra Tech, Inc.; Land & Water Consulting, Inc. December 2004.
- . 2006. *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area: Volume II-Final Report*. Tetra Tech, Inc.; PBS&J. August 2006.
- USACE. 1987. *Corps of Engineers Wetlands Delineation Manual*. U.S. Geological Service. Technical Report Y-87-1. January 1987.
- USDA. Forest Service, Northern Region. N.d. *Visual character types and variety class description*. R1 80-11. U.S. Department of Agriculture, Forest Service.
- USDA. 1922. *Map of Range Survey: Helena National Forest-Elkhorn Division*. Helena National Forest. 1922.
- . 1974. *The visual management system*. In *National Forest landscape management*. Chap. 1, Agriculture Handbook Number 462. U. S. Department of Agriculture, Forest Service.
- . Forest Service. 1976. *National forest management Act*. Washington, DC.
- . Forest Service. 1980. *An approach to water resources evaluation of non-point silvicultural sources*. Precedural Handbook EPA-600. Washington, DC: U.S. Department of Agriculture, Forest Service.
- . Forest Service. 1982a. *Elkhorn wilderness study*. Helena, Montana: U.S. Department of Agriculture, Forest Service, Helena National Forest.
- . Forest Service. 1982b. *National Forest Management Act: Planning Regulations*. Washington, DC.
- . Forest Service. 1982c. *ROS user's guide*. U.S. Department of Agriculture, Forest Service.
- . Forest Service. 1985a. *Integrating management strategies for the mountain pine beetle with multiple-resource management of lodgepole pine forests*. General Technical Report INT-174. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. April.
- . 1985b. *Natural falling of beetle-killed ponderosa pine*.
- . Forest Service. 1986a. *Forest plan*. Helena National Forest. Helena, Montana.
- . Forest Service. 1986b. *Forest plan: Record of Decision*. Helena National Forest. Helena, Montana.
- . Forest Service. 1986c. *Helena National Forest plan*. Helena National Forest. Helena, Montana.

- _____ . The National Forest Management Act of 1976. Act of 1986d.
- _____. Forest Service. 1988a. FSH 2509.22-Soil and Water Conservation Practices Handbook: Chapter 10-Soil and Water Conservation Practices Documentation. R-1/R-4 Amendment No. 1. May 1988.
- _____. Forest Service. 1988b. General water quality best management practices. PNW-GTR-222. Portland, OR. November.
- _____. Forest Service. 1988c. *Soil and water conservation practices handbook*. Forest Service Handbook FSH 2509.22.
- _____. Helena National Forest. 1993. Cowfish Data Sheet. Helena, MT. June 1993.
- _____. Forest Service. 1994. FSH 7709.56b - Transportation Structures Handbook. WO Amendment 7709.56b-94-1. July 1994. <http://www.fs.fed.us/im/directives/fsh/7709.56b>. (accessed .
- _____. Forest Service. 1995a. *Landscape aesthetics: A handbook for scenery management*. Agricultural Handbook Number 701. U.S. Department of Agriculture, Forest Service. December.
- _____. Forest Service. 1995b. *North Elkhorns Implementation Area*. Final Document. January 1995.
- _____. Forest Service. 1997. *Connectivity protocol*. U.S. Department of Agriculture, Forest Service, Region 1.
- _____. Forest Service. 1998a. FSH 7709.56 - Road Preconstruction Handbook. WO 5/87 Amendment 1. November 1998. <http://www.fs.fed.us/im/directives/fsh/7709.56>. (accessed .
- _____. Forest Service. 1998b. *Northern Region overview: Detailed report*. U.S. Department of Agriculture, Forest Service, Northern Region.
- _____. 1998c. R1 Draft model set all species. 1998.
- _____. Forest Service. 1998d. *The water/road interaction technology series*. Technology and Development Program. San Dimas, California: <http://stream.fs.fed.us/water-road/>. (accessed December 20, 2009d).
- _____. Forest Service. 1999a. *Forest Service Manual, FSM 2500 -- Watershed and air management*. R-1 Supplement No. 2500-99-1. November 12.
- _____. Forest Service. 1999b. *Roads Analysis: Informing decisions about managing the National Forest transportation system*. FS-643. Washington, DC: U.S. Department of Agriculture, Forest Service.
- _____. Snag Protocol Team. 2000. *Northern Region Snag Management Protocol*. USDA. 2000.
- _____. Forest Service. 2001a. *Noxious weed management*. Forest Service Manual 2080.
- _____. Forest Service. 2001b. Vegetative successional pathways in the Maudlow/Toston fire area. U.S. Department of Agriculture, Forest Service, Helena National Forest.
- _____. USDA. 2002a. *Draft White Paper on Managing for Viable Populations 2000*. Draft. USDA. 2002.

- . 2002b. *FHP training manual: Forest insect and disease identification and management*. Forest Service.
- . Forest Service. 2003a. "*Maudlow Toston Salvage Sale Unit Log*" documenting an Oct. 29, 2003 field review of BMP and mitigation implementation and effectiveness in a winter tractor logging unit, completed by Soil Scientists Sue Farley and Vince Archer.
- . Forest Service. 2003b. "*Maudlow Toston Salvage Sale, Photos from BMP Effectiveness Monitoring*" documenting an Oct. 16, 2003 field review of BMP and mitigation implementation and effectiveness in skyline units (both summer and winter logging) and tractor units that were winter logged, completed by Soil Scientists Sue Farley and Vince Archer.
- . Forest Service. 2004a. *Helena National Forest roads analysis report 2002–2004*. Helena, Montana: U.S. Department of Agriculture, Forest Service.
- . Forest Service. 2004b. National fire plan. Healthy Forests and Rangelands. <http://www.forestsandrangelands.gov/overview/index.shtml>. (accessed December 23, 2009b).
- . Forest Service. 2005a. "*South Helena Hazardous Fuels Reduction Project, Photos From Interdisciplinary Team Field Review On April 1, 2005*". Photos and captions compiled by Sue Farley, Soil Scientist.
- . 2005b. Interior west forest inventory & analysis: Forest survey field procedures, Version 2.01. March.
- . Forest Service. 2005c. *Montana forest insect and disease conditions and program highlights-2004*. Report 05-1.
- . Forest Service. 2006a. *Final environmental impact statement: Helena National Forest weed treatment project*. Helena National Forest. Helena, Montana.
- . Forest Service. 2006b. *Montana forest insect and disease conditions and program highlights-2005*. Report 06-1.
- . Forest Service. 2006c. Region One vegetation classification, mapping, inventory and analysis report: Estimates of old growth for the Northern Region and National Forest. Numbered Report 06-03 v1.2.
- . 2007a. *Final environmental impact statement: Northern Rockies lynx management direction*. U.S. Department of Agriculture, Forest Service. March.
- . Forest Service. 2007b. *Forest insect and disease conditions in the United States 2006*. U.S. Department of Agriculture, Forest Service.
- . Forest Service. 2007c. *Montana forest insect and disease conditions and program highlights-2006*. Report 07-1.
- . 2008a. Common Stand Exam Field Guide for Region 1. March 2008.
- . Forest Service. 2008b. Criteria for wildlife models. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, Montana.

- . Forest Service. 2008c. Deriving estimates with the R1 summary database. U.S. Department of Agriculture, Forest Service.
- . Forest Service. 2008d. Fire behavior modeling methods for the Cabin Gulch Vegetation Project. Helena National Forest. Helena, Montana.
- . 2008e. *Forest Service handbook*. U.S. Department of Agriculture, Forest Service. 1909.15-2008-1 National Environmental Policy Act Handbook. Washington, D.C..
- . 2008f. Goshawk field inventory methods Helena National Forest. 2008. 2008.
- . Forest Service. 2008g. *Insect activity on the Helena National Forest: Assessment and recommendations*. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, MT: September 2008.
- . Forest Service. 2008h. *Integrated restoration and protection strategy of the Northern Region*. <http://www.fs.fed.us/r1/projects/int-restoration/index.shtml>. (accessed December 8, 2009h).
- . Forest Service Helena National Forest. 2008i. Maupin Allotment Inspections 2004-2008. Inspection Report. Helena, MT. 2008.
- . Forest Service Helena Ranger District. 2008j. Maupin permitted use. Helena, MT. 2008.
- . 2008k. Region 1 Grid Intensification using CSE Protocols Field Procedures. Version 1.2. February 2008.
- . 2008l. Whitetail hazardous fuels project: Rangeland management specialist report. U.S. Department of Agriculture, Forest Service, Custer National Forest, Ashland Ranger District. Dawson, Megan. Ashland, Montana. March.
- . Forest Service. 2009a. PFC Warm Springs. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena, Montana.
- . Forest Service, Region 1. 2009b. *R1-VMap Accuracy Assessment Procedures for Region 1*. Numbered Report 09-11. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. December 2009.
- . Forest Service. 2009c. RoadInfra: File geodatabase feature class. Helena National Forest. Helena, Montana.
- . Forest Service, Region 1. 2009d. *The Region 1 Existing Vegetation Map Products (VMap) Release 9.1.1*. Numbered Report 09-03. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. May 2009.
- . 2009e. Warm Springs Project Helena National Forest hydrology NFMA background report. U.S. Department of Agriculture, Forest Service, Helena National Forest. Helena Montana. September.
- . Natural Resource Conservation Service. 2010a. Plants database. <http://plants.usda.gov/>. (accessed .
- . Forest Service. 2010b. Telegraph Project Draft Environmental Impact Statement. U.S. Department of Agriculture, Forest Service, Helena National Forest. Missoula, Montana.

- . Forest Service, Helena National Forest. 2010c. Warm Springs habitat enhancement project: Cultural resources specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010d. Warm Springs habitat enhancement project: Economics specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service. 2010e. Warm Springs habitat enhancement project: Fire, fuels, air quality specialist report. U.S. Department of Agriculture, Forest Service, Helena National Forest. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010f. Warm Springs habitat enhancement project: Fisheries specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010g. Warm Springs habitat enhancement project: Habitats of special concern specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010h. Warm Springs habitat enhancement project: Hydrology specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010i. Warm Springs habitat enhancement project: Lands specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010j. Warm Springs habitat enhancement project: Minerals specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010k. Warm Springs habitat enhancement project: Noxious weeds specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010l. Warm Springs habitat enhancement project: Rangeland management specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010m. Warm Springs habitat enhancement project: Recreation and Scenery specialist report. Missoula, MT. Prepared by Ecosystem Research Group.
- . Forest Service, Helena National Forest. 2010n. Warm Springs habitat enhancement project: Sensitive plants specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010o. Warm Springs habitat enhancement project: Silviculture specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010p. Warm Springs habitat enhancement project: Soils specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010q. Warm Springs habitat enhancement project: Transportation specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- . Forest Service, Helena National Forest. 2010r. Warm Springs habitat enhancement project: Wildlife biological evaluation. Prepared by Ecosystem Research Group. Missoula, Montana.

- . Forest Service, Helena National Forest. 2010s. Warm Springs habitat enhancement project: Wildlife specialist report. Prepared by Ecosystem Research Group. Missoula, Montana.
- USDA and USDI. 1993a. *Elkhorn landscape analysis final document*. U.S. Fish, Wildlife and Parks, Forest Service, Bureau of Land Management. S 333.9516 U8ela.
- . 1993b. *Elkhorn landscape analysis final document*. U.S. Fish, Wildlife and Parks, Forest Service, Bureau of Land Management. S 333.9516 U8ela.
- . Forest Service; Bureau of Land Management. 1997. *Upper Columbia River Basin Draft Environmental Impact Statement*. Interior Columbia Basin Ecosystem Management Project. May 1997. <http://www.iicbemp.gov/pdfs/deis/ucrb/ueis.html>. (accessed .
- . Forest Service, Bureau of Land Management. 2000. Maudlow fire narrative. Northern California Geographic Area Coordinating Center.
- . 2001. A collaborative approach for reducing wildland fire risks to communities and the environment: 10-year comprehensive strategy. August 2001.
- . U.S. Department of Agriculture, Bureau of Land Management. 2008. Biological assessment of road related actions on Western Montana's federal lands that are likely to adversely affect bull trout. Submitted to the U.S. Fish and Wildlife Service, Montana Field Office. Helena, MT. April 2008.
- USDI. Bureau of Land Management. N.d. *Historical index for Township 8 North, Range 2 West; Township 8 North, Range 3 West; and Township 9 North, Range 2 West*. Microfiche on file, Butte Field Office. Butte, Montana.
- . U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT.
- . Fish and Wildlife Service. 1998. *Endangered and threatened wildlife and plants; Notice of 12-month finding on a petition to list the northern goshawk in the contiguous United States west of the 100th Meridian*. Federal Register: Volume 6, Number 124. Washington, DC.
- . 2000. *Final environmental impact statement for the Pinedale anticline natural gas field exploration and development project: Sublette County, Wyoming*. EIS-00-018. Washington DC: U.S. Government Printing Office. May.
- . Fish and Wildlife Service. 2008. *Endangered and Threatened wildlife and plants; 12-month finding on a petition to list the North American wolverine as endangered or threatened*. 50 CFR Part 17 [FWS-R6-2008-0029; 1111 FY07 MO-B2].
- USDI, Nez Perce Tribe, National Park Service, and USDA. 2003. *Rocky Mountain wolf recovery 2002 annual report*. Helena, Montana: U.S. Fish and Wildlife Service.
- USDI and USDA. 1995. *Elkhorn Mountains travel management plan: Decision notice and finding of no significant impact*. U.S. Department of the Interior, Bureau of Land Management, U.S. Department of Agriculture, Forest Service. Helena, Montana.
- USDI, Fish and Wildlife Service. 1987. *Northern Rocky Mountain gray wolf recovery plan*. Denver, CO.
- USEPA. 2010. Air Quality System. Raw Data Report. Helena, MT. February 2010. February 12, 10 A.D.).

- Walker, Richard and Lance Craighead. 1997. Analyzing Wildlife Movement Corridors In Montana Using GIS. Paper presented at ESRI User Conference, 1-23. San Diego, CA, July 8, 1997. ESRI Paper. Bozeman, Montana.
- Waller, John S. and Christopher Servheen. 1998. *Documenting grizzly bear highway crossing patterns using GPS technology*.
- Wargo, P. M. and T. C. Harrington. 1991. Host stress and susceptibility. In *Armillaria root disease*. ed. Shaw, C. G. and G. A. Kile, 88–101. Agriculture Handbook 691: U.S. Department of Agriculture, Forest Service.
- Wargo, Phillip M. and Charles G. Shaw III. 1985. Armillaria root rot: the puzzle is being solved. *Plant Disease* 69, 826–32.
- Waters, T. F. 1995. Sediments in streams: sources, biological effects, and control. *American Fisheries Society Monograph #7*, (1995):
- Werner, J. Kirwin, Bryce A. Maxell, Paul Hendricks, and Dennis L. Flath. 2004. *Amphibians and reptiles of Montana*. Missoula, Montana: Mountain Press Publishing Company.
- Westerling, A. L., H. G. Hidalgo, D. R. Cayan, and T. W. Swetnam. 2006. Warming and earlier spring increase Western U.S. forest wildfire activity. *Science* 313, no. 5789 (August 18): 940–3.
- Williams, David W. and Andrew M. Liebhold. 2002. Climate change and the outbreak ranges of two North American bark beetles. *Agricultural and Forest Ecology* 4, 87-99.
- Winfield, Jay. USFS Helena Ranger District. 1998a. Browns Gulch C & H Allotment Management Plan. Helena, MT. March 1998.
- . USDA Forest Service. 1998b. Maupin Creek C & H Allotment Management Plan. Allotment Management Plan. 1998.
- Winthers, E., D. Fallon, J. Haglund, T. DeMeo, D. Tart, M. Ferwerda, G. Robertson, et al. 2004. Terrestrial ecological unit inventory technical guide. U.S. Department of Agriculture, Forest Service, Washington Office, Ecosystem Management Coordination Staff. 2004.
- Woodbridge, Brian. 2009. [Personal communication]. Wildlife Biologist. U.S. Fish and Wildlife Services. Yreka, California. April 15.
- Woodbridge, Brian and Christina D. Hargis. 2006. *Northern goshawk inventory and monitoring technical guide*. USDA Forest Service. GTR WO-71. Washington, DC.
- Wright, V. 2000. The Aldo Leopold Wilderness Research Institute: A national wilderness research program in support of wilderness management. *Wilderness science in a time of change*, ed. McCool, Stephen F., David N. Cole, William T. Borrie, and Jennifer O'Loughlin, 260–8. Missoula, Montana, May 23, 1999. RMRS-P-15-Vol. 3. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Wright, Vita, Sallie J. Hejl, and Richard L. Hutto. 1997. Conservation implications of a multi-scale study of flammulated owl (*Otus flammeolus*) habitat use in the Northern Rocky Mountains, USA. In *Biology and conservation of owls of the Northern Hemisphere: Second international symposium: General Technical Report NC-190*. ed. Duncan, James R., David H. Johnson, and Thomas H. Nicholls, Chap. General Technical Report NC-190, 506–16. USDA Forest Service.

- Young, James A., Raymond A. Evans, Richard E. Eckert, and Burgess L. Kay. 1987. Cheatgrass. *Rangelands* 9, no. 6 (December): 266–70.
- Zielinski, W. J., R. L. Truex, G. A. Schmidt, and F. V. Schlexer. 2004. Resting habitat selection by fisher in California. *The Journal of Wildlife Management* 68, no. 3 (July): 475–92.
- Ziesak, Roger. 2008. Montana Forestry Best Management Practices Monitoring: 2008 Forestry BMP Audit Report. Department of Natural Resources and Conservation, Forestry Division. Missoula, MT.
- Ziska, Lewis H. 2006. Climate Change Impacts on Weeds. Climate Change and Agriculture: Promoting Practical and Profitable Responses, Beltsville, MD, February 21, 6 A.D.
- Zlatnik, Elena. 1999a. *Pseudoroegneria spicata*. In *Fire effects information system*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed December 15, 2009a).
- . 1999b. *Purshia tridentata*. In *Fire Effects Information System, [Online]*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed February 2, 2010b).
- Zouhar, Kris. 2003a. *Potentilla recta*. In *Fire effects information system, (Online)*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed March 22, 2009a).
- Zouhar, Kristin L. 2000. *Festuca idahoensis*. In *Fire effects information system*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed December 15, 2009).
- . 2001a. *Centaurea maculosa*. In *Fire effects information system, (Online)*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed March 22, 2009a).
- . 2001b. *Cirsium arvense*. In *Fire effects information system, (Online)*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed March 22, 2009b).
- . 2003b. *Linaria* spp. In *Fire effects information system (Online)*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis/>. (accessed March 22, 2009b).

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