PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Lower North Fork Big River	MRC_T75-04	18.5	19.2	17.4	0.0	0.0	19.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	19.0
	MRC_T75-23	13.2	13.2	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	0.0	0.0
	JDSF_3203	18.5	18.5	18.5	0.0	0.0	0.0	0.0	0.0	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_3204	18.3	18.5	17.8	0.0	0.0	0.0	0.0	0.0	18.5	18.5	0.0	17.8	18.3	0.0	18.4	18.5
	JDSF_3205	17.9	17.9	17.9	0.0	0.0	0.0	0.0	0.0	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_3206	17.8	18.1	17.4	0.0	0.0	0.0	0.0	0.0	18.0	18.1	0.0	17.4	17.8	0.0	0.0	0.0
SOUTH FORK BIG RIVER																	
Dark Gulch	FSP_552	15.5	15.7	15.3	0.0	0.0	0.0	0.0	0.0	15.5	15.3	15.7	0.0	0.0	0.0	0.0	0.0
South Daugherty Creek	MCWA_154	17.8	18.1	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.0	17.4	18.0	0.0
	MRC_T79-04	18.7	19.3	18.2	0.0	0.0	0.0	18.7	19.3	0.0	18.4	0.0	18.2	19.0	18.4	18.5	19.1
	MRC_T79-05	18.3	18.7	17.8	0.0	0.0	0.0	0.0	0.0	0.0	18.7	0.0	0.0	0.0	0.0	17.8	18.3
	MRC_T79-09	17.8	18.8	16.5	0.0	0.0	0.0	0.0	0.0	0.0	18.2	0.0	0.0	0.0	16.5	17.7	18.8
	MRC_T79-13	17.1	17.4	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	17.4
Mettick Creek	MCWA_155	18.1	18.3	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3	0.0	18.0	0.0	0.0
	MRC_T79-01	20.1	20.6	19.5	0.0	0.0	0.0	0.0	0.0	20.6	20.5	0.0	20.0	20.4	19.5	19.7	20.3
	MRC_T79-02	18.5	18.7	18.2	0.0	0.0	0.0	0.0	0.0	18.7	18.4	0.0	18.7	0.0	0.0	18.2	18.5
	MRC_T79-08	15.4	16.6	14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	0.0	14.5	16.6
	MRC_T79-10	18.2	18.3	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	18.3

PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	MRC_T79-11	19.4	19.7	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.1	19.7
	MRC_T79-12	19.2	19.9	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	19.9
	MRC_T79-20	14.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0
	MRC_T79-21	13.8	13.8	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0
	MRC_T79-22	12.9	12.9	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	0.0	0.0
LOWER BIG RIVER																	
Laguna Creek	CTM_BIG12	16.1	16.1	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0
	CTM_BIG14	16.1	16.1	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0
Berry Gulch	CTM_BIG10	14.9	15.6	14.4	0.0	0.0	0.0	14.6	15.6	15.0	0.0	14.9	15.0	14.8	14.4	0.0	15.0
	CTM_BIG8	15.5	16.2	14.6	0.0	0.0	0.0	15.2	16.2	15.8	0.0	15.6	15.6	15.5	14.6	15.4	15.5
	CTM_BIG9	14.7	15.6	13.9	0.0	0.0	0.0	0.0	15.6	0.0	0.0	15.0	14.9	14.4	13.9	0.0	14.7
	JDSF_3301	14.1	14.6	13.6	0.0	0.0	0.0	0.0	0.0	13.6	14.6	0.0	14.3	14.0	0.0	0.0	0.0
	JDSF_3302	15.2	15.8	15.0	0.0	0.0	0.0	0.0	0.0	15.3	15.8	0.0	15.0	15.0	0.0	15.2	15.1
	JDSF_3311	14.9	15.0	14.8	0.0	0.0	0.0	0.0	0.0	14.9	0.0	14.8	15.0	0.0	0.0	0.0	0.0
	JDSF_3321	13.9	14.1	13.8	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	0.0	0.0	14.1	0.0	0.0
	JDSF_X08	14.0	14.9	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	13.4	14.9	14.2	0.0
	JDSF_X10	14.2	14.2	14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	0.0	0.0
Mouth of Big River	CTM_BIG11	19.3	20.8	15.6	0.0	0.0	0.0	0.0	0.0	15.6	0.0	20.8	20.4	20.2	0.0	0.0	0.0
	CTM_BIG15	20.4	20.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	20.4
	JDSF_3331	14.8	15.9	14.0	0.0	0.0	0.0	0.0	0.0	14.0	15.9	14.4	14.9	14.8	0.0	0.0	0.0
	JDSF_X05	14.2	14.5	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	13.8	14.5
Two Log Creek	CTM_BIG3	16.3	17.1	15.5	0.0	0.0	0.0	15.5	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	CTM_BIG1	20.5	20.9	19.9	0.0	0.0	0.0	20.8	20.9	20.7	0.0	20.6	20.3	20.7	19.9	20.1	20.5
	CTM_BIG13	20.6	20.9	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.9	20.7	0.0	20.2	20.6	20.6
	CTM_BIG4	15.7	17.1	14.2	0.0	0.0	0.0	15.5	17.1	0.0	0.0	16.4	15.3	15.6	14.2	15.3	16.0
	CTM_BIG5	14.3	14.9	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	14.9
	MRC_T76-01	19.8	20.6	19.3	0.0	0.0	19.7	19.3	0.0	0.0	0.0	0.0	19.4	0.0	0.0	0.0	20.6
	MRC_T76-02	15.4	15.8	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	14.8	15.3	15.5
	MRC_T76-20	13.4	13.4	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0
NOYO HEADWATERS																	
Hayworth Creek	MRC_T70-03	18.2	19.8	16.8	19.1	19.8	18.9	18.3	18.1	18.2	0.0	0.0	16.8	17.8	17.2	17.1	18.6
	MRC_T70-05	17.3	17.9	16.7	0.0	0.0	0.0	17.5	17.6	17.9	0.0	0.0	16.8	17.2	17.2	16.7	17.8
	MRC_T70-06	17.9	18.9	17.1	0.0	0.0	0.0	0.0	0.0	18.9	18.2	0.0	17.1	17.5	17.4	17.9	18.4
	MRC_T70-23	13.5	13.5	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	0.0	0.0
	MRC_T70-24	13.8	13.8	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0
	MRC_T70-25	13.5	13.5	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	0.0	0.0
McMullen Creek	CTM_NOY10	16.2	16.3	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3	16.1	16.1	0.0	0.0	0.0
	MRC_T70-13	16.7	17.5	16.2	0.0	0.0	0.0	0.0	0.0	17.5	16.6	0.0	16.5	0.0	16.2	16.2	17.0
	MRC_T70-14	17.2	17.2	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	0.0	0.0	0.0
Middle Fork N. Fork Noyo	MRC_T70-07	17.3	18.4	16.3	17.9	18.0	17.3	18.4	0.0	17.4	0.0	0.0	16.5	16.8	16.3	0.0	0.0
	MRC_T70-08	15.9	17.1	13.9	0.0	0.0	0.0	15.6	16.3	16.7	0.0	0.0	13.9	15.9	15.9	15.6	17.1
	MRC_T70-10	15.8	16.8	15.2	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	15.7	16.0	15.2	15.2	16.8
North Fork Noyo	MRC_T70-01	17.8	18.5	17.1	0.0	18.5	17.8	17.1	17.7	18.0	0.0	0.0	17.3	17.3	17.5	18.1	18.4

PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	MRC_T70-02	15.2	16.1	13.2	0.0	0.0	0.0	15.0	15.7	15.6	0.0	0.0	13.2	15.3	15.3	15.2	16.1
	MRC_T70-20	19.7	19.7	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.7	0.0	0.0
	MRC_T70-21	14.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0
	MRC_T70-22	13.3	13.3	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0
Olds Creek	MRC_T70-11	17.7	18.8	15.6	0.0	18.3	17.9	17.1	17.9	18.1	15.6	0.0	17.9	17.6	17.9	17.7	18.8
	MRC_T70-15	17.4	17.4	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4
Redwood Creek	MRC_T70-12	17.0	18.1	15.8	0.0	0.0	0.0	16.4	17.4	17.7	0.0	0.0	16.6	17.3	15.8	16.7	18.1
MIDDLE NOYO																	
Duffy Gulch	CTM_NOY11	18.4	19.0	17.9	0.0	0.0	0.0	0.0	0.0	0.0	17.9	18.5	18.3	18.5	18.2	18.8	19.0
	CTM_NOY2	14.9	15.4	14.6	0.0	0.0	0.0	0.0	0.0	0.0	15.4	15.1	14.9	14.6	14.6	0.0	14.8
Little North Fork	CTM_NOY12	17.9	18.1	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.8	18.1
	CTM_NOY13	18.5	18.7	18.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.7	18.5	18.6	18.1	18.6	18.6
	CTM_NOY14	18.6	18.6	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	18.5	18.6	18.4	0.0	18.6
	CTM_NOY4	18.1	18.3	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3	18.2	17.8	18.1	18.1
	CTM_NOY5	14.3	15.6	13.7	0.0	0.0	0.0	13.7	15.1	14.1	15.6	14.1	14.3	13.8	13.9	14.1	14.6
SOUTH FORK NOYO RIVER																	
Brandon Gulch	JDSF_2508	15.6	15.6	15.6	0.0	0.0	0.0	0.0	0.0	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_2571	14.9	15.2	14.7	0.0	0.0	0.0	0.0	0.0	14.9	15.2	14.9	14.7	0.0	0.0	0.0	0.0
	JDSF_2572	15.4	15.7	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3	15.4	15.2	15.3	15.2	15.7
	JDSF_2573	16.0	16.7	15.6	0.0	0.0	0.0	0.0	0.0	16.1	16.7	15.6	15.9	15.6	0.0	0.0	0.0
	JDSF_X06	14.6	15.1	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	14.5	14.3	14.4	15.1
	JDSF_X07	15.6	16.0	15.3	0.0	0.0	0.0	0.0	0.0	15.3	16.0	0.0	0.0	0.0	0.0	0.0	0.0

PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	JDSF_X12	14.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	14.0	0.0
	JDSF_X13	13.8	14.5	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	13.5	14.5
Kass Creek	CTM_NOY6	15.8	15.9	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9	15.7	15.8	0.0	0.0
	CTM_NOY7	14.0	16.3	13.2	0.0	0.0	0.0	13.2	14.5	0.0	16.3	13.8	13.6	13.5	13.6	13.6	14.1
	JDSF_2509	15.9	15.9	15.9	0.0	0.0	0.0	0.0	0.0	15.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parlin Creek	JDSF_2501	15.8	17.3	14.6	0.0	0.0	0.0	0.0	0.0	16.2	17.3	16.2	15.9	15.8	0.0	0.0	0.0
	JDSF_2502	16.9	17.4	16.7	0.0	0.0	0.0	0.0	0.0	16.9	0.0	17.0	17.4	16.8	16.8	16.7	16.9
	JDSF_2503	15.4	16.4	14.7	0.0	0.0	0.0	0.0	0.0	15.2	16.4	0.0	15.7	14.7	15.1	0.0	0.0
	JDSF_2504	16.3	16.8	15.9	0.0	0.0	0.0	0.0	0.0	15.9	16.8	16.0	16.4	16.5	0.0	0.0	0.0
	JDSF_2506	16.3	17.3	16.0	0.0	0.0	0.0	0.0	0.0	16.0	17.3	16.1	16.5	16.3	16.1	16.1	16.3
	JDSF_2531	14.6	15.0	14.3	0.0	0.0	0.0	0.0	0.0	14.7	14.5	14.5	15.0	14.7	14.4	14.3	14.9
	JDSF_2532	15.4	16.0	15.1	0.0	0.0	0.0	0.0	0.0	15.1	15.6	15.2	15.5	15.1	15.1	15.7	16.0
	JDSF_2533	15.5	15.5	15.5	0.0	0.0	0.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_2534	16.5	17.1	16.1	0.0	0.0	0.0	0.0	0.0	16.3	17.1	16.1	0.0	0.0	0.0	0.0	0.0
	JDSF_2551	14.6	15.4	14.0	0.0	0.0	0.0	0.0	0.0	14.0	15.4	14.2	0.0	15.0	0.0	14.2	14.7
	JDSF_2561	13.9	15.1	13.0	0.0	0.0	0.0	0.0	0.0	13.0	15.1	14.0	14.2	13.7	13.6	0.0	0.0
	JDSF_X09	14.7	15.5	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7	15.5	14.0	0.0	0.0
	JDSF_X11	15.7	16.1	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	15.8	15.5	15.5	15.8
LOWER NOYO RIVER																	
Lower Noyo River	CTM_NOY9	17.4	18.1	16.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.1	17.6	16.6	17.4	17.2	17.8

PLANNING WATERSHEDS	Site	Avg	Max	Min	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
COASTAL																	
Caspar Creek	JDSF_3401	14.6	15.5	14.1	0.0	0.0	0.0	0.0	0.0	14.1	15.5	14.5	0.0	14.3	0.0	0.0	0.0
	JDSF_3402	15.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_3411	14.6	15.8	13.9	0.0	0.0	0.0	0.0	0.0	13.9	15.8	14.2	0.0	0.0	0.0	0.0	0.0
	FSP_5801	14.2	14.2	14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	0.0	0.0	0.0	0.0	0.0
Hare Creek	JDSF_2402	14.2	14.3	14.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	14.2	14.3	14.1	0.0	0.0	0.0
	JDSF_2403	14.8	15.7	13.9	0.0	0.0	0.0	0.0	0.0	13.9	15.7	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_2404	13.8	13.8	13.8	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_2405	14.3	15.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	13.8	14.1	0.0	0.0	0.0
	JDSF_2411	13.7	14.4	13.1	0.0	0.0	0.0	0.0	0.0	13.1	14.4	13.4	13.6	13.8	0.0	0.0	0.0
	JDSF_2412	14.7	15.8	14.3	0.0	0.0	0.0	0.0	0.0	14.6	15.8	14.5	0.0	14.5	14.5	14.3	15.0
	JDSF_X01	14.5	14.9	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	14.9
	JDSF_X03	14.9	15.1	14.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9	14.7	15.1	14.8	0.0
	JDSF_X04	14.3	14.6	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	14.0	14.6
Mitchell Creek	JDSF_3490	13.4	14.1	12.6	0.0	0.0	0.0	0.0	0.0	12.6	14.1	0.0	13.5	13.7	13.2	0.0	0.0
	JDSF_X02	13.7	14.2	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	14.2
Russian Gulch	MRC_T72	13.6	14.0	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8	14.0
	JDSF_3501	13.1	13.1	13.1	0.0	0.0	0.0	0.0	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	JDSF_3502	13.2	14.1	12.6	0.0	0.0	0.0	0.0	0.0	12.6	14.1	13.0	13.1	0.0	0.0	0.0	0.0

Attachment B

DRAFT North Coast Watershed Assessment Big River Report[1]

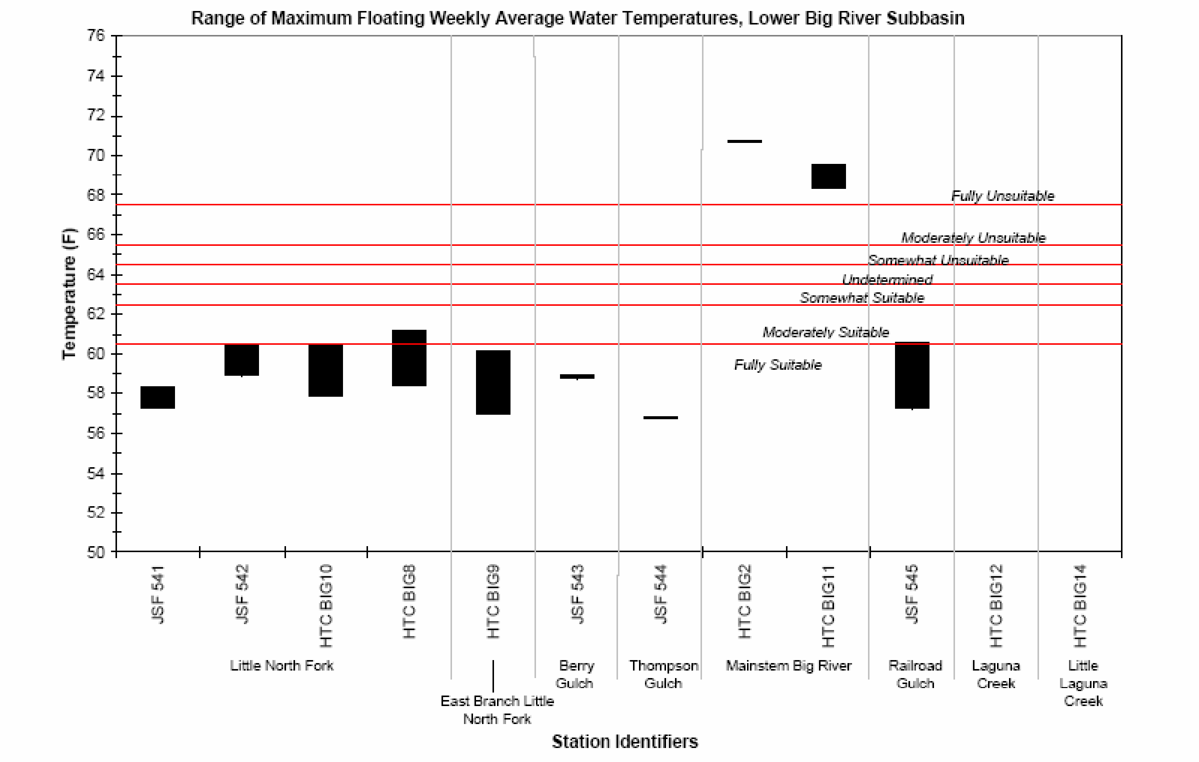
Lower Big River

Water Temperature

1. Continuous water temperature data logging devices were deployed by HTC and JSF at a total of twelve (12) locations in the lower Big River sub-watershed. In general, water temperature was monitored in one or more locations in the lower Big River watershed during the years 1993 to 2001.
2. With the exception of the temperature monitoring sites on the mainstem of the Big River (HTC BIG2, HTC BIG11), water temperatures in the Lower Big River subbasin were fully or moderately suitable. The mainstem Big River sites were fully unsuitable in all years monitored with high diurnal fluctuations (7.9-9.9˚F) and high maximum temperatures (75-76˚F).
3. Most of the Little North Fork and tributary monitoring sites exhibited low diurnal fluctuations suggesting good shading, and/or good flow conditions and/or a tempering marine influence.
4. It is probable that the Little North Fork has a cooling effect on the mainstem Big River. However, the magnitude of that effect is unknown as it is dependant on the temperature differentials and flows.

[1] North Coast Regional Quality Control Board. 2004 (preliminary draft). Big River Water Quality Assessment. Report compiled for the North Coast Watershed Assessment Program. North Coast Regional Quality Control Board, Santa Rosa. Draft utilized with permission of R. Klamt, Chief of Timber Harvest Division, North Coast Regional Water Quality Control Board.

FIGURE 4: RANGE OF MWATS, LOWER BIG RIVER SUBBASIN



Middle Big River

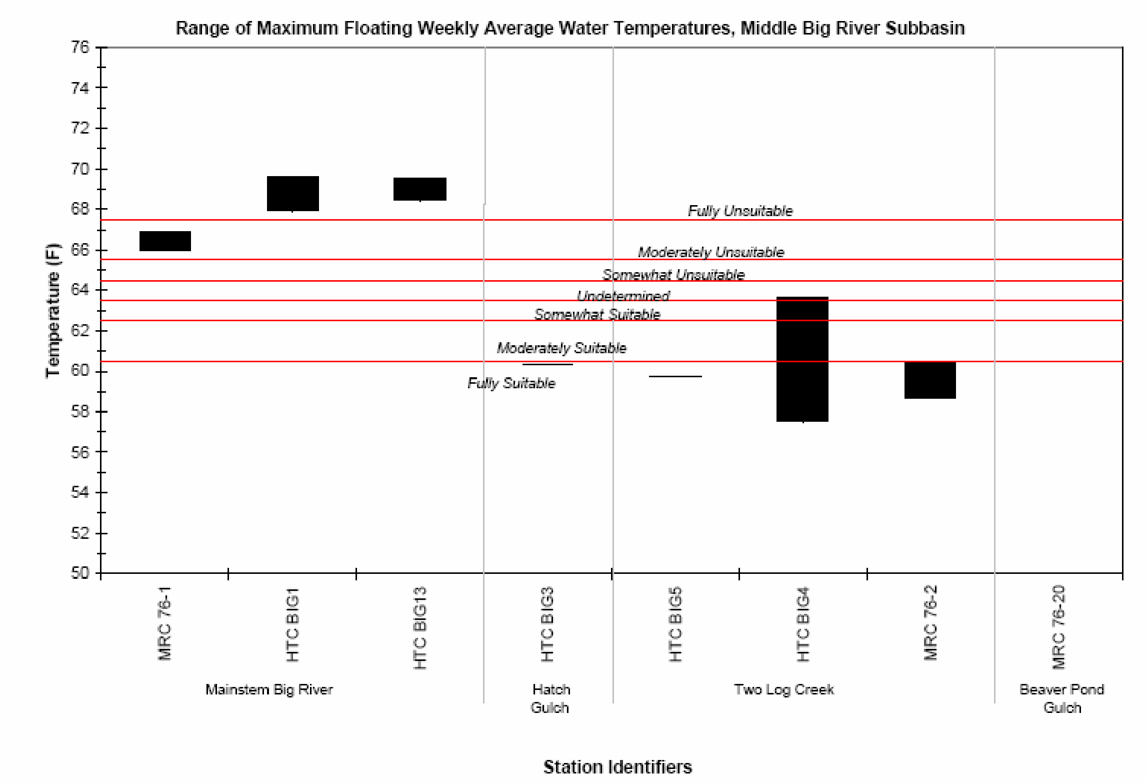
Water Temperature

1. Continuous water temperature data logging devices were deployed by HTC and MRC at a total of nine (9) locations in the middle Big River sub-watershed. With the exception of 1997, water temperature was monitored in one or more locations in the middle Big River sub-watershed during the years 1993 to 2001.
2. Data collected at the two lower Two Log Creek Sites (HTC BIG4 and MRC 76-2), indicated water temperatures between fully suitable with a minimum observed MWAT of 58˚ F and undetermined with a maximum observed MWAT of 64˚ F. Large diurnal temperature fluctuations (6.7-12.0°F) were recorded at both lower Two Log Creek sites, which may indicate poor canopy and/or low flows.
3. The only tributary to Two Log Creek that was monitored was Beaver Pond Gulch (MRC 76-20), which was monitored for one year. Based on this data, the water temperatures at this site was fully suitable with a maximum MWAT of 56°F, but based on the thermograph, it may be more representative of a thermally stratified pool or a site with a significant groundwater component.
4. A site on Hatch Gulch (HTC BIG3), a tributary to the mainstem Big River between the North Fork and Two Log Creek (but below HTC BIG1), was monitored for one year. Monitoring at this site recorded water temperatures that

were fully suitable with a maximum observed MWAT of 60ºF. The diurnal fluctuations at this site were minimal. It is likely that Hatch Gulch provides some cooling effect to the mainstem Big River.

5. All of the water temperature monitoring sites on the mainstem Big River (MRC 76-1, HTC BIG1, and HTC BIG13) had MWATs that varied from moderately to fully unsuitable (67-70˚ F) with maximum daily temperatures (73-77˚ F) in excess of the lethal limit for salmonids. High diurnal fluctuations were also recorded (7.5-12.8˚ F), suggesting poor canopy and/or low flows.
6. It is probable that Two Log Creek has a cooling effect on the mainstem Big River. However, the magnitude of that effect is unknown as it is dependant on the temperature differentials and flows.
7. In lower Two Log Creek, both MRC and HTC have temperature monitoring sites in nearly the same location. It may be more effective if one company monitored the site and shared the information with the other.

FIGURE 8: RANGE OF MWATS, MIDDLE BIG RIVER SUBBASIN

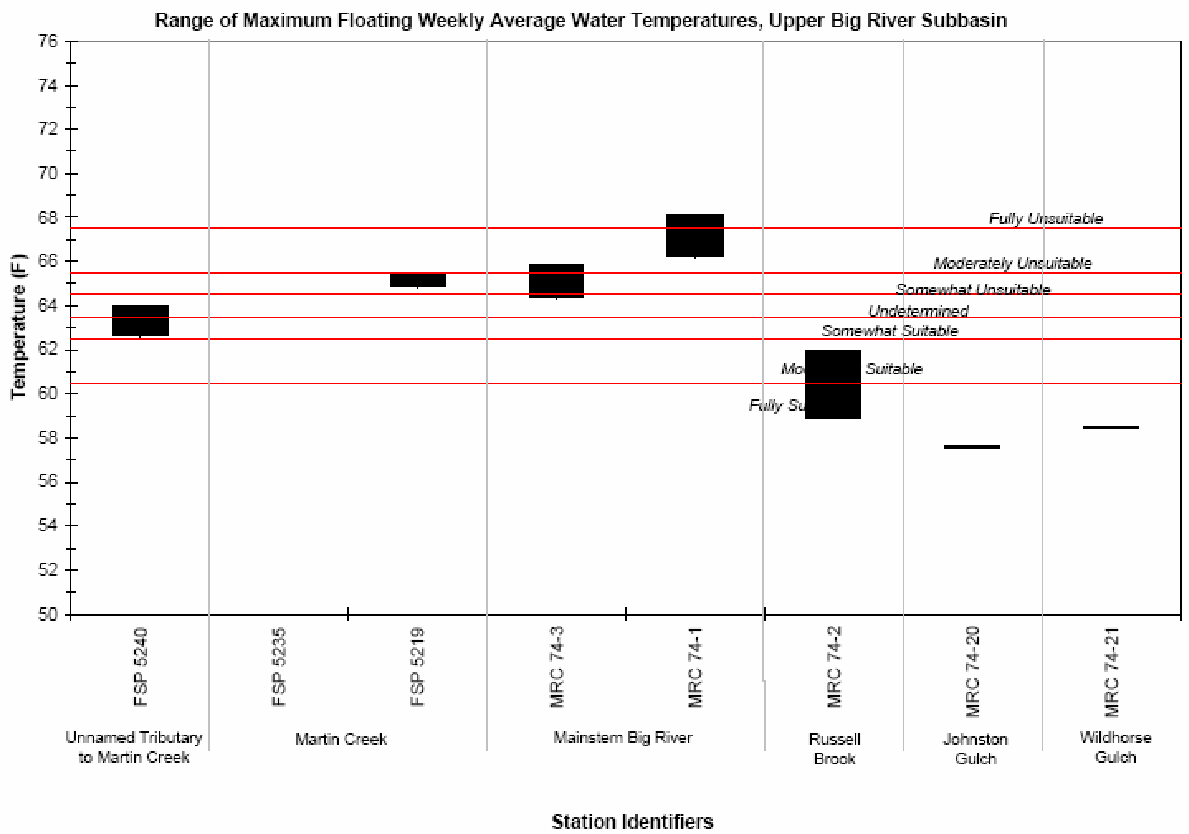


Upper Big River

Water Temperature

1. Continuous water temperature data logging devices were deployed by MRC and JSF at a total of eight (8) locations in the upper Big River sub-watershed. With the exception of 1996, water temperature was monitored in one or more locations in the upper Big River sub-watershed during the years 1990 to 2001.
2. Based on limited data from two sites in the Martin Creek watershed, the water temperatures were somewhat suitable to somewhat unsuitable with a maximum MWAT of 65˚F.
3. There are two monitoring sites on the mainstem Big River, both of which were recorded for four years. Both sites had MWATs that were undetermined to fully unsuitable with a maximum MWAT of 68˚ F. In addition, the site between Russell Brook and the South Fork Big River (MRC 74-1) had a maximum daily temperature of 75˚ F and large diurnal fluctuations of between 10.8-12.9˚ F. Several tributaries to the mainstem Big River were monitored for one to four years.
4. Russell Brook (MRC 74-2) had a maximum MWAT of 62˚ F and moderate diurnal fluctuations of between 6.7-8.4˚ F. This suggests moderate to poor cover and/or low flows and probably contributes cooler water to the mainstem Big River. The other two sites at Johnston Gulch (MRC 74-20) and Wildhorse Gulch (MRC 74-21) have MWATs that are fully suitable (58˚ F), with low diurnal fluctuations. It is likely that the temperature probes at these sites are heavily influenced by subsurface flows (groundwater).

FIGURE 12: RANGE OF MWATS, UPPER BIG RIVER SUBBASIN



North Fork Big River

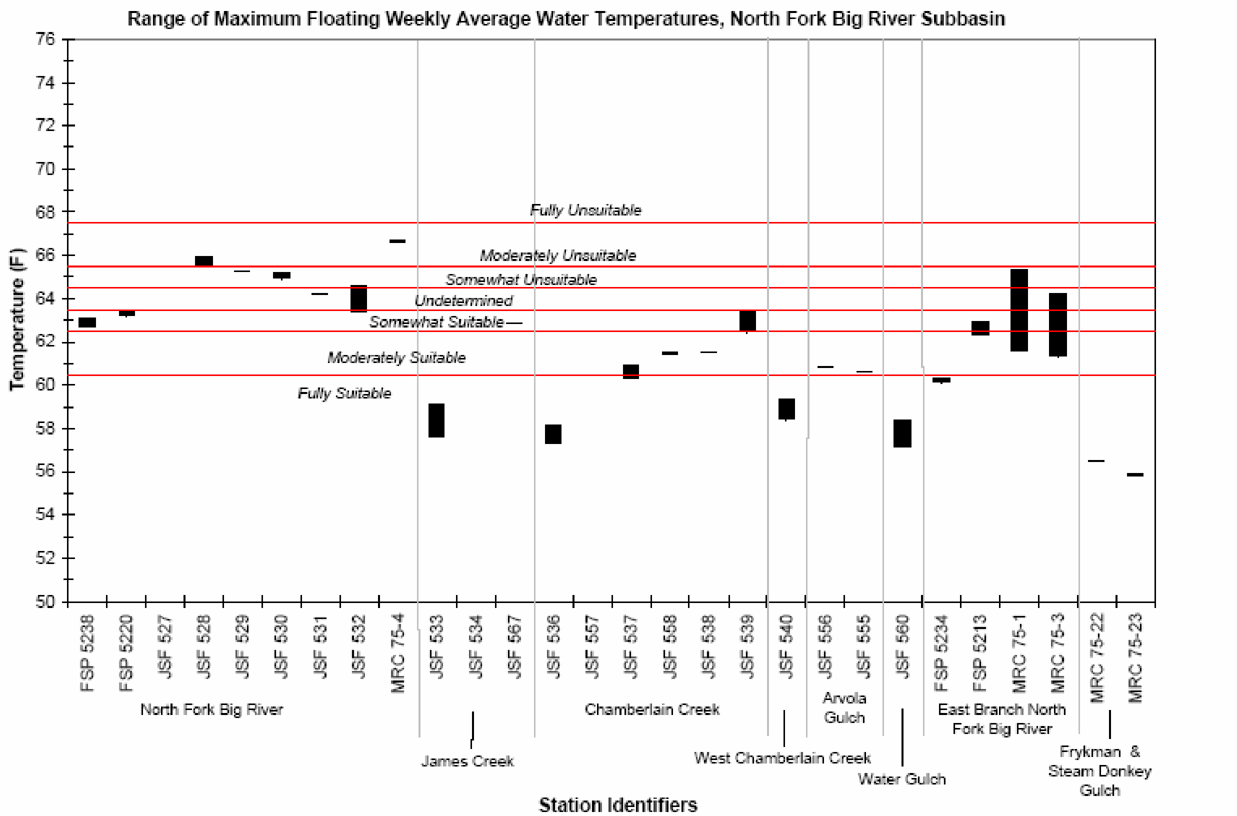
Water Temperature

1. The North Fork Big appears to heat relatively quickly upstream of, and at, the boundary of the JSF. The observed MWATs go from 63˚ F in the headwater area to 66˚F at the JSF boundary. This is likely due to poor canopy, low flows, and possibly different temperature probe placement protocols between FSP and JSF.
2. Once in JSF, water temperatures begin a steady decline. Based on temperature monitors in the North Fork on either side of the James Creek confluence and monitors in James Creek, it appears as though James Creek has a slight cooling effect on the North Fork. Recorded MWATs in the North Fork around James Creek were 65-66˚ F.
3. James Creek appears to be fully suitable at the headwaters and progressively becomes warmer until the confluence with the North Fork. The one year of monitoring near the confluence of the North Fork indicated an MWAT of 63˚F.
4. Based on temperature monitors in the North Fork on either side of the Chamberlain Creek confluence and monitors in Chamberlain Creek, it appears as though James

Creek has a cooling effect on the North Fork. Recorded MWATs in the North Fork around Chamberlain Creek were 64-65˚F.

5. Chamberlain Creek appears to be fully suitable at the headwaters and progressively becomes warmer until the confluence with the North Fork. Monitoring near the confluence of the North Fork indicated MWATs of 62-63˚F.
6. Other monitoring was conducted on several tributaries to Chamberlain Creek, including West Chamberlain Creek, Arvola Gulch, and Water Gulch. Each of these tributaries were fully to moderately suitable in the years monitored with MWATs of 57-61˚F. The thermograph from the Water Gulch site suggests that that the monitoring location may have a significant groundwater component and/or possibly a thermally stratified pool, especially in August and September. To the extent that Water Gulch and West Chamberlain Creek contribute flow to Chamberlain Creek, it is likely that they contribute some amount of cooling to Chamberlain Creek.
7. The final site in lower Chamberlain Creek (JSF 539) appears to have substantially higher water temperatures than JSF 538. Based on a 1994 Landsat vegetation map (KRIS Big River), it may be that the elevated temperatures seen at this site are due to a large clearing in this portion of Chamberlain Creek.
8. Water temperatures downstream of Chamberlain Creek and upstream of the East Branch North Fork appear to remain relatively constant, if the data from JSF 532 can be extrapolated. In any case, the MWAT at this site, it does not appear to be substantially different from JSF 531 (the site upstream of it). The MWAT in this area, with three years of monitoring, is approximately 64˚F.
9. The East Branch of the North Fork has some indication of headwaters with an MWAT of approximately 60˚ F, but with increasing water temperatures between the headwater monitoring site (FSP 5234) and the next site (FSP 5213), which had recorded MWATs of approximately 62-63˚ F in the two years of monitoring. Water temperatures appear to remain relatively constant to the mouth of the East Branch North Fork, with MWATs between 61-65˚ F.
10. Frykman and Steam Donkey Gulch, two small tributaries of the East Branch North Fork were monitored. However, while the water temperatures in both tributaries were fully suitable in the years monitored, it appears as though these temperature probes were placed in a deep stratified pool or are dominated by groundwater influences. In any case, it is unlikely that they contribute significantly to the mainstem of the East Branch North Fork.
11. Water temperatures in the North Fork below the confluence with the East Branch North Fork appears to increase significantly from what was recorded in JSF 532 (upstream of the East Branch North Fork). The maximum MWAT increases between JSF 532 and MRC 75-4 approximately 65 to 67˚F. While it does not appear the confluence of the East Branch North Fork would significantly affect water temperatures, it may be due to local conditions upstream of MRC 75-4 such as poor canopy, or just could be an artifact of the fact that MRC 75-4 was only monitored during one year, which did not coincide with the years monitored at JSF 532.

FIGURE 16: RANGE OF MWATS, NORTH FORK BIG RIVER SUBBASIN



South Fork Big River

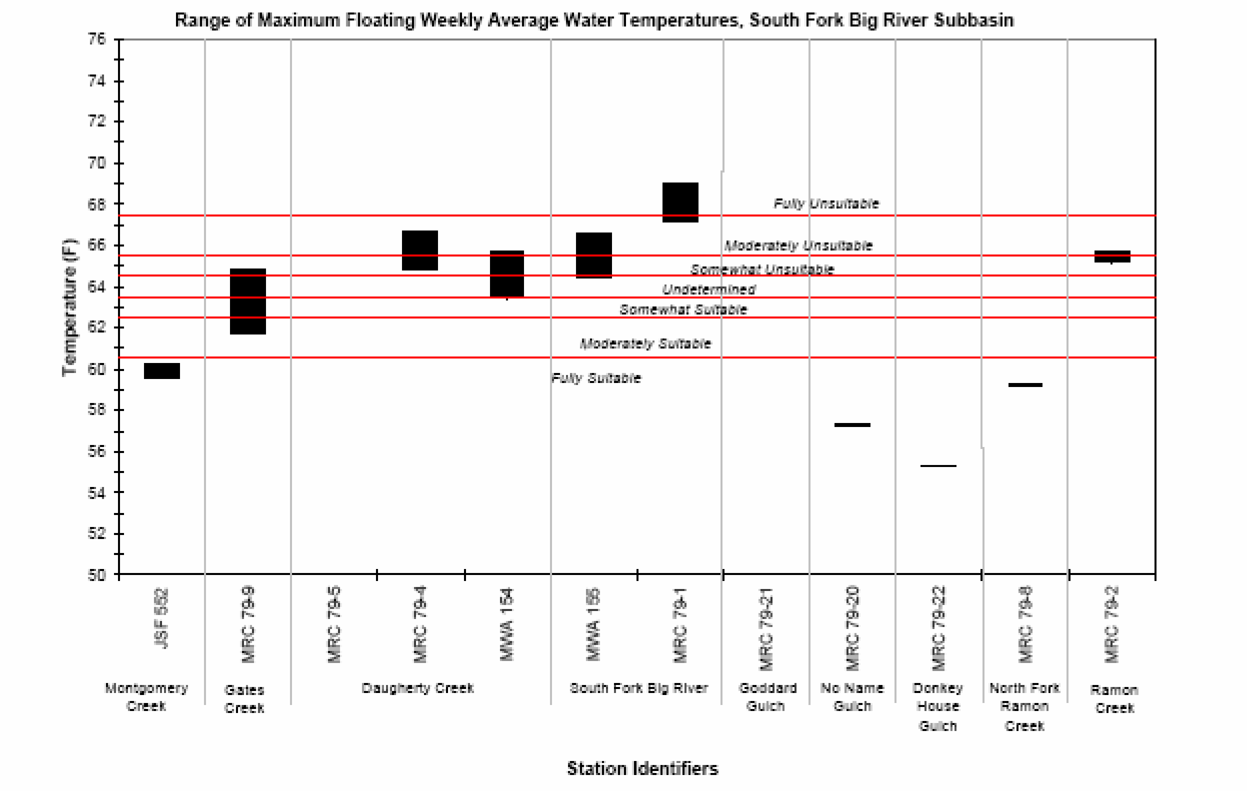
Water Temperature

1. Although upper Daugherty Creek (MRC 79-5) has only one year of data, it appears as though upper and lower Daugherty Creek (MRC 79-4) were similar in temperature with MWATs between 65-67˚ F. The other downstream site (MWA 154) appears to be generally lower than MRC 79-4, but that is to be expected as MWA places its monitoring devices in areas of thermal refugia.
2. During two years of monitoring on Gates Creek, a tributary to Daugherty Creek, MWATs of between 62-65˚ F were recorded. Based on this, it would appear that Gates Creek provides some cooling effect to Daugherty Creek.
3. Montgomery Creek (JSF 552) was within the fully suitable range at approximately 60˚F during all three years monitored. The maximum diurnal fluctuations varied between 4-5˚ F. This site is in an undisturbed location in the Montgomery Woods Reserve and is probably a good example of what can be achieved with adequate canopy in the warmer interior portion of the Big River watershed. It should be noted

that much of the interior watershed is naturally grasslands, and could not reasonably be expected to achieve these water temperatures.

4. As would be expected, the mainstem of the South Fork Big River appears to get progressively warmer as it moves towards the bottom of the watershed. However, by the time it reaches the bottom of the watershed (MRC 79-1), MWATs are generally in the fully unsuitable range as high as 69˚ F with maximum daily temperatures as high as 74˚F.
5. During the one year of monitoring water temperatures in the North Fork Ramon Creek (MRC 79-8), it appeared that it was much cooler than Ramon Creek itself (MRC 79-2), which was monitored for three years. The North Fork Ramon Creek site had a fully suitable MWAT of 59˚ F, whereas Ramon Creek downstream of the North Fork confluence had MWATs from 65-66˚F. However, it is not clear if Ramon Creek is much warmer from the headwaters and the North Fork provides only minimal cooling, or if the combined flow of the North Fork and Ramon Creek become warmer in the segment of stream below the confluence.
6. Donkey House Gulch (MRC 79-22) is a tributary to Ramon Creek, but in the one year of monitoring, it exhibited fully suitable water temperatures with an MWAT of 55˚F. Nevertheless, diurnal fluctuations in this stream appeared to indicate that the monitoring site is either in a thermally stratified pool or is dominated by groundwater. Therefore, it is expected that this would be associated with low flows and probably have little cooling effect on Ramon Creek.
7. Goddard Gulch (MRC 79-21) and No Name Gulch (MRC 79-20), both tributaries to the mainstem South Fork Big River, were each monitored for one year and had fully suitable MWATs of 57˚F. In Lower No Name Gulch, it appears though the stream was flowing until early August, at which time it may have become isolated and dominated by groundwater. This is evident by diurnal temperature fluctuations that gradually become essentially flat. Diurnal fluctuations in Goddard Gulch appeared to indicate that this monitoring site is either in a thermally stratified pool or is dominated by groundwater. Therefore, it is expected Goddard Gulch, and to a lesser degree Lower No Name Gulch would be have low flows making it unlikely that either site would have a significant cooling effect on the mainstem South Fork Big River.
8. Relatively large diurnal fluctuations in virtually all of the monitored sites indicate that throughout the South Fork subbasin there is poor canopy and/or low flows. The only exceptions to this are the monitoring sites at Montgomery Woods Reserve (JSF 552), and the sites located in gulches that are apparently dominated by groundwater. These sites were Goddard Gulch, Donkey House Gulch, and No Name Gulch.

FIGURE 20: RANGE OF MWATS, SOUTH FORK BIG RIVER SUBBASIN



Overall Summary

Water Temperature

With the exception of the Big River Estuary, continuous water temperature data loggers were available in every subbasin. Water temperatures in the mainstem Big River were high in virtually every location tested, and the daily maximum temperatures sometimes exceeded the lethal threshold for salmonids.

Tributaries in the Lower Big River subbasin had fully suitable to moderately suitable water temperatures. It is likely that this is due, in large part, to the cooling marine influence in this subbasin. Although not supported by any data, it is probable that higher precipitation in this subbasin also assists in the rapid re-growth of the forest and understory vegetation that offers stream shading. Overall, the water temperature in the Lower Big River tributaries appears to be in the best condition of any subbasin in the Big River watershed. Also, it is likely that the Little North Fork has some cooling effect as it enters the mainstem Big River.

Tributaries in the Middle Big River subbasin had fully suitable to undetermined water temperatures. While the data in this subbasin is relatively spare, it is likely that the marine influence in this subbasin and rapid re-growth of vegetation also helps keeps water temperatures relatively low. The tributaries that were monitored in this subbasin appear to be in good condition with respect to water temperature for salmonids. Also, it is likely that the Two Log Creek has some cooling effect as it enters the mainstem Big River.

Tributaries in the Upper Big River subbasin had fully suitable to somewhat unsuitable water temperatures. However, except for the site on Russell Brook and two other sites that appear to be dominated by groundwater, the tributaries that were monitored in this subbasin appear to be in poor condition with respect to water temperature for salmonids. It also appears as that the upper mainstem Big River is one of the origins of the warm water seen downstream. Water leaves this subbasin with an MWAT of roughly 66-68˚ F.

Tributaries in the North Fork subbasin, including the North Fork itself, had fully suitable to moderately unsuitable water temperatures. Generally, the tributaries that were monitored in this subbasin appear to be in good condition with respect to water temperature for salmonids. The notable exceptions to this are Lower Chamberlain Creek, most of the East Branch of the North Fork, and the mainstem of the North Fork. The mainstem North Fork is unusual in that it exhibits a rapid increase in water temperature upstream of the JSF boundary, and then slowly declines until it leaves JSF, and again shows a rapid increase near the confluence with the mainstem Big River. The obvious hypothesis is that it may be due to naturally poor canopy or to commercial timber harvesting on either end of the North Fork. In any case, this should be investigated further. It also appears as that the North Fork is one of the origins of the warm water seen downstream in the mainstem Big River. Water leaves this subbasin with an MWAT of roughly 67˚ F.

Tributaries in the South Fork subbasin, including the South Fork Big River, had fully suitable to fully unsuitable water temperatures. Except for the tributaries that appear to be dominated by groundwater and the one site in the Montgomery Reserve, the sites in this subbasin were poor with respect to water temperature. In fact, the lower mainstem South Fork had the highest daily water temperature (74˚ F) of any stream other than the mainstem Big River. Conversely, the site in the Montgomery Reserve is a good example of what can be achieved with adequate canopy in the warmer interior portion of the Big River watershed. Water leaves the South Fork subbasin with an MWAT of roughly 67-69˚F.

AN ABSTRACT OF THE THESIS OF

Kelly Maren Kibler for the degree of Master of Science in Forest Engineering presented on June 28, 2007.
Title: The Influence of Contemporary Forest Harvesting on Summer Stream Temperatures in Headwater Streams of Hinkle Creek, Oregon.

Abstract approved:

Arne E. Skaugset

Stream temperature is a water quality parameter that directly influences the quality of aquatic habitat, particularly for cold-water species such as Pacific salmonids. Forest harvesting adjacent to a stream can increase the amount of solar radiation the stream receives, which can elevate stream temperatures and impair aquatic habitat. Oregon Forest Practice Rules mandate that forest operators leave Riparian Management Areas (RMAs) adjacent to streams in order to minimize the water quality impacts from forest harvesting. However, RMAs that contain overstory merchantable conifers are not required for small non-fish-bearing streams in Oregon, thus there is potential for increases in stream temperature to occur in headwater streams after harvesting. There is concern that increases in stream temperatures and changes to onsite processes in non-fish-bearing, headwater streams may propagate downstream and impair habitat in fish-bearing streams. The objectives of the following work are to assess the effects of contemporary forest management practices on stream temperatures of small non-fish-bearing headwater streams and to develop new knowledge regarding the physical processes that control reach-level stream temperature patterns.

Summer stream temperatures were measured for five years in six headwater streams in the Hinkle Creek basin in southern Oregon. After four years, four of the streams were harvested and vegetated RMAs were not left between the streams and harvest units. The watersheds of the two remaining

streams were not disturbed. Post-harvest stream temperatures were monitored for one year in all six streams. Each harvested stream was paired with one unharvested stream and regression relationships for maximum, minimum and mean daily stream temperatures were developed. Changes to temperatures of harvested streams were detected by comparing the mean pre-harvest regression relationship to the mean post-harvest relationship. Change detection analyses that considered the mean response among all four harvested streams indicated that maximum daily stream temperatures did not increase after harvesting, but that minimum and mean daily temperatures decreased significantly after harvesting. Additionally, diel stream temperature fluctuations were significantly greater one year after harvesting.

Pre- and post-harvest surveys of canopy closure in the harvested and unharvested streams were completed in order to compare levels of stream shading before and after harvest. The post-harvest survey quantified canopy closure from remaining overstory vegetation as well as from logging slash that partially covered the harvested streams. The surveys indicated that mean overstory canopy closure in the harvested streams decreased by 84% as a result of the harvest, but as the logging slash provided considerable cover, total canopy closure decreased by only 20%. It is possible that the logging slash effectively attenuated solar radiation and prevented extreme temperature increases in the harvested streams. However, it is likely that streamflow increased after harvesting and that the increased streamflow also prevented increases to maximum temperatures and contributed to lower minimum and mean stream temperatures.

The Influence of Contemporary Forest Harvesting on Summer Stream Temperatures in Headwater Streams of Hinkle Creek, Oregon

by
Kelly Maren Kibler

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented June 28, 2007
Commencement June 2008

Master of Science thesis of Kelly Maren Kibler presented on June 28, 2007.

APPROVED:

Major Professor, representing Forest Engineering

Head of the Department of Forest Engineering

Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Kelly Maren Kibler, Author

ACKNOWLEDGEMENTS

There are no words that adequately express my gratitude to all of the people who have contributed to the following work. To begin with, I would like to thank all of the people who have spent their summers living less than luxuriously in southern Oregon helping to collect data for this project. Three years of data were collected for this project before I even joined the Hinkle team and I am severely in debt to those who came before me and to those who put up with me when I finally did show up. Thank you Amy Simmons, Nicolas Zegre, Matt Meadows, Tim Otis, Jennifer Fleuret, Dennis Feeney, Tim Royer, Kelly Hoefer, Alison Collette and Kent Smith. Once the data had been collected, I had no idea what to do with it and so next I must thank Manuela Huso and Lisa Ganio for leading me down the path towards defensible statistics and enduring my statistical ignorance with minimal cringing. Thank you to my committee members for your dedication and direction. Most of all, I would like to thank my advisor, Arne Skaugset for his inspiration and leadership. Every time you read something in the following pages that makes you think, “Hey, that’s neat!”, thank Arne because it was probably his idea. The entire Hinkle Creek study would not have been possible if not for the vision and cooperation of the people at Roseburg Forest Products and I applaud them for taking a risk for the sake of advancing our knowledge of watershed management.

Finally, I would like to thank my family, Dad, Mom, Dane, Jess, Carole and Gary, who always found ways to love, support and encourage me, even from 3,000 miles away. Special thanks to Mom and Dad for inspiring me to always challenge myself. At this time, I have to extend the greatest gratitude to my best friend and the love of my life, Benjamin Washabaugh Kibler. Thank you Ben for taking the gamble and rollin’ out West with me and for your endless support and unconditional love. As a gift to you, I would like to dedicate my work to Grandma Betty, a true renaissance woman.

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The influence of contemporary forest harvesting on summer stream temperatures in headwater streams of Hinkle Creek, Oregon

Chapter I: Introduction

Justification

Commercial forestry is a principal industry in Oregon and throughout the Pacific Northwest. Currently, Oregon has 28 million acres of land designated as forestland and 85,600 Oregonians are employed in the forestry industry (Oregon Forest Resources Institute 2006). The income generated and jobs supplied by the forestry industry are crucial to the economy of the state of Oregon. However, the forestlands of the Pacific Northwest support multiple uses in addition to timber, including recreation, high quality water resources, and habitat for terrestrial and aquatic wildlife. Intensive forestry operations may degrade the suitability of these lands to provide some beneficial uses. In an effort to minimize the environmental impact of commercial forestry on the landscape, the State of Oregon enacted the nation’s first Forest Practices Act in 1971 to regulate forestland management. Since the Oregon Forest Practice Rules have been in effect, considerable resources have been directed to exploring procedures that lessen the impact of forest operations on Oregon’s waterways while maintaining economically sustainable harvest practices.

In recent years, populations of native anadromous salmonids have been listed as federally Threatened or Endangered according to the national Endangered Species Act. Declines in populations of anadromous salmonids are correlated with habitat degradation associated with intensive forest management and stream temperature changes that occur in response to management of surrounding watersheds may adversely impact aquatic habitat for anadromous salmonids. However, the mechanisms and processes that influence reach-level stream temperature patterns are not completely understood and there is a need for data on the stream temperature effects of contemporary forest harvesting on privately owned, intensively managed forestland. The objectives of the following work are to

1. observe and quantify how stream temperatures in small, non-fish-bearing headwater streams respond to contemporary intensive harvesting practices, and
2. explain reach-level stream temperature responses through investigation of pre- and post-harvest canopy closure.

Literature review

Physical controls to stream temperature

Observed stream temperatures are the result of interactions between external sources of available energy and water and the in-stream mechanisms that respond to and distribute the inputs of energy and water from external sources (Poole and Berman 2001). Within Poole and Berman's categorization, external stream temperature drivers are defined as processes or conditions that control the relative amounts of energy and water that enter or leave a stream reach. Available incoming solar radiation and water from upstream, tributaries, or subsurface sources are examples of external stream temperature drivers. Conversely, characteristics inherent to the stream's physical structure and the near-stream environment exert an internal control on the stream temperature response to external inputs of heat and water. Stream shading, channel morphology, and substrate condition are examples of internal temperature controls.

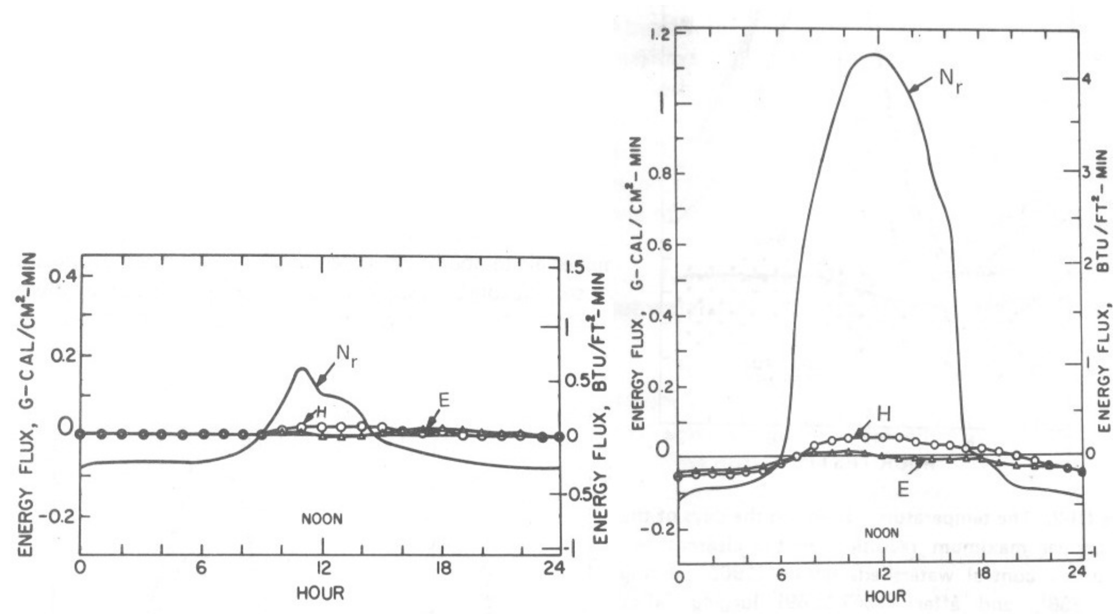
The sources of heat energy exchange between a stream and the surrounding physical environment can be summarized by the following model:

$$\Delta H = N \pm E \pm C \pm S \pm A$$

in which ΔH is the net heat energy gained or lost from the stream, N is heat exchanged by net radiation, E is heat exchange from evaporation or condensation, C is heat conducted between the stream water and substrate, S is heat convected between the stream water and air, and A is advection of incoming water from tributaries or subsurface sources (Moore et al. 2005, Johnson and Jones 2000). The net radiation term in the energy balance encompasses both inputs of shortwave (solar) and longwave (thermal) radiation less emissions of longwave radiation. The input of shortwave radiation is the only heat exchange process within the stream energy balance that is unidirectional; shortwave radiation is delivered to the stream in the form of solar energy but there is no mechanism for emission of shortwave radiation (Boyd and Kaspar 2003).

The primary external driver controlling stream temperature is the amount of solar radiation to which a stream is exposed (Brown 1969, Beschta et al. 1987, Johnson and Jones 2000, Johnson 2004). Brown's 1969 study demonstrated that temperature change in stream reaches that receive little to no advective input from groundwater sources can be predicted using an above ground energy balance approach. Within the energy balance, the incoming solar radiation term dominates the convective and evaporative components of the model, and thus has the greatest impact on the amount of energy available to the stream. Streams that are shaded, such as those that flow through intact forests and are covered by the canopy, receive less solar radiation than streams that are unshaded However radiation has the largest magnitude of any term in the energy balance model, even in a fully shaded stream (Figure 1.1).

The relative effect of available solar energy on stream temperature depends on the extent that solar radiation reaches the water surface. Material that shades the stream controls the amount of solar energy that reaches the stream surface by attenuating and reflecting solar radiation. Shade may be provided by over- or understory riparian vegetation in any stage of life or senescence. Topographic features or stream morphology and orientation may also affect a stream's exposure to solar radiation.



a b

Figure 1.1 Daily patterns of net radiation (N_r), evaporation (E) and convection (H) for a shaded (a) and unshaded (b) stream (Brown 1969).

The absolute amount of solar radiation that reaches a stream is only part of the mechanism by which stream temperatures are raised. The surface area and discharge of a stream are two additional factors that determine the extent to which the temperature of a stream will fluctuate in response to available solar radiation (Brown 1983). As the volume of water to be heated increases, the effect of a fixed amount of solar radiation becomes diluted and a smaller change in temperature is observed. Therefore, as stream discharge increases, the increase in stream temperature associated with a given amount of solar energy decreases. Conversely, as stream surface area increases, the amount of solar radiation that the stream can absorb also increases, which results in high net absorption per unit volume by a stream with a high surface area to volume ratio.

Some researchers have stated that convective heat exchange is a dominant process by which streams heat or cool (Larson and Larson 2001, Smith and Lavis 1975). However, because air temperature and solar radiation are highly correlated, it is often mistakenly concluded that air temperature controls stream heating when, in fact, it is radiative exchange driven by incoming solar radiation that causes stream temperature to increase (Johnson 2003). Energy balance analyses show that the magnitude of the incoming solar radiation term is considerably greater than the convective heat exchange term in the stream heat balance (Figure 1.1), (Brown 1969, Johnson and Jones 2000, Sinokrot and Stefan 1993).

Substrate type affects the way a stream absorbs solar energy. Johnson [2004] observed significant differences in maximum and minimum daily stream temperatures as well as daily stream temperature fluctuations when a bedrock reach was compared to an adjacent alluvial reach. Bedrock substrates of small, shallow streams can absorb radiant solar energy, thus becoming energy sources or sinks depending upon time of day. This process of absorption and storage can dampen the diel temperature signal by storing or releasing energy, resulting in lower maximum and higher minimum temperatures (Brown 1969). However, Johnson [2004] found that a bedrock reach had wider diel fluctuations than an alluvial reach, which suggests that the amount of solar energy absorbed by the bedrock during the day and released at night was not sufficient to dampen the diel fluctuation, as predicted by Brown [1969]. Furthermore, a dampening effect was observed after the stream flowed through the alluvial reach. The increased residence time of water within the alluvial reach may have allowed for conduction of heat between the surface water and the alluvial substrates, thereby cooling warmer water during the day and warming the cooler surface water at night.

Variable hydraulic residence times of individual streams may be instrumental in producing divergent temperature responses across streams that exhibit similar surface area to volume ratios and shade levels, and that are exposed to comparable levels of solar radiation. The degree that surface stream water interacts with the subsurface hyporheic zone can dramatically influence hydraulic residence times (Boulton et al. 1998, Morrice et al. 1997, Haggerty et al. 2002) and thus, temperature patterns within the surface water column (White et al. 1987). Streams characterized by high surface-hyporheic connection and long subsurface flowpaths may effectively thermoregulate through natural heat-exchange processes as warm surface water mixes with cooler subsurface water and remains in contact with subsurface alluvium (White et al.1987). Morrice et al. [1997] illustrated that hydraulic residence time increases with increasing hydraulic connection between surface flowpaths and the subsurface alluvial aquifer. Using both point-specific tracer analysis and reach-scale modeling, Morrice et al. [1997] demonstrated that surface-hyporheic interaction is controlled by hydrogeologic attributes of the channel substrate and the alluvial aquifer. Hydraulic conductivity of the substratum, the magnitude and orientation of hydraulic gradients, stream gradient and geomorphology and stream stage are physical variables that influence rates and volumes of surface-hyporheic exchange (Morrice et al. 1997, Haggerty et al. 2002). In streams examined by Morrice et al. [1997], substrates characterized by high hydraulic conductivities facilitated surface-hyporheic exchange, resulting in greater hydraulic residence times through a reach.

Though many studies and models agree that stream reach temperatures increase in response to land use activities that enhance a stream's exposure to solar radiation, there have been disparate conclusions to questions of downstream heat propagation and associated cumulative watershed impacts. With regard to an above-ground energy budget, the relatively diminutive magnitude of terms that could dispel heat (convection, conduction and evaporation) as compared to the incoming solar term is substantial. Solar radiation absorbed by a stream will result in an increase in stream temperature but the increase will not be easily dissipated by convection, conduction, and evaporation and therefore, theoretically, the stream will cool more slowly than it is heated (Brown 1983). There is ambiguity within current literature regarding what happens to stream temperature downstream of a reach that was warmed by inputs of solar radiation. Beschta and Taylor's [1988] thirty-year study of stream temperature and logging activity in the Salmon Creek watershed documents a significant relationship between stream temperature at the mouth of the watershed and cumulative harvesting effects which indicates that reach-level stream temperature increases are detectable downstream. Oregon Department of Forestry monitoring reports of the Brush Creek watershed indicate that stream temperatures heated as the stream flowed through a clearcut reach but then cooled so that there was no net heating observed at the watershed mouth (Robison et al. 1995, Dent 1997). A Washington study that focused on downstream effects of elevated temperatures in small streams concluded that temperature increases in small streams were mitigated within 150 meters of a confluence with a larger stream, however results varied from site to site (Caldwell et al. 1991). Finally, Johnson [2004] demonstrated that maximum temperatures in an exposed stream reach were cooler after the stream flowed through a 200-meter shaded section than before the stream entered the shaded section. The results of these studies signify that in some situations stream temperature downstream of a disturbance is able to recover somewhat more rapidly than is predicted by an above-ground energy balance but that the temperature response downstream of a heated reach is variable.

The primary process of energy dissipation within a stream is generally through evaporative heat flux, followed by emission of longwave radiation (Boyd and Kaspar 2003). While rates of longwave radiation emission are influenced only by water temperature, evaporative flux is controlled by conditions in the near-stream environment. Vapor pressure gradients at the air-water interface drive evaporation rates and so climatic conditions such as humidity and windspeed significantly affect rates of evaporative flux (Benner 1999, Boyd and Kaspar 2003, Dingman 2002). Gauger and Skaugset observed rates of evaporative heat flux on the order of 400 W/m^2 in a stream in the western Cascades of Oregon, and observed that wind enhanced rates of evaporative heat flux (Gauger and Skaugset, unpublished data). While most heat dissipation through evaporative heat flux occurs during the day when humidity gradients between the stream and air and wind speeds are greatest, net longwave emission away from the stream occurs at night when stream temperatures become warmer than air and sky temperatures.

Physical effects of stream temperature

Maximum annual stream temperatures lag nominally one to two months behind the time of annual maximum solar insolation (Beschta et al. 1987), however, the timing of maximum annual temperature may change when riparian vegetation is removed. Johnson and Jones [2000] report that streams with disturbed riparian canopies reached summer peak temperatures close to the time of maximum solar insolation despite the fact that stream discharge was still high at that time while nearby streams with undisturbed riparian canopies reached peak temperatures later in the summer. This observation reinforces the dominance of solar radiation in determining stream temperature.

Aquatic organisms utilize dissolved oxygen (DO) for respiration for at least a portion of their life cycle; thus DO concentration is a water quality parameter of high significance to aquatic ecosystem health and is regulated under the federal Clean Water Act. The solubility of oxygen decreases in water as temperature increases; thus DO concentrations decrease as water temperature increases. This relationship creates a direct link between water temperature and quality of aquatic habitat. DO is consumed as organic matter within the stream is oxidized by chemical and biological processes during decomposition (Berry 1975, Ice and Brown 1978). Decomposition of organic matter that is dissolved or suspended in the water column or associated with the stream benthos contributes to a stream's biological oxygen demand (BOD). Rates of leaching, decomposition and associated BOD increase as water temperature increases (Berry 1975). The addition of organic matter to headwater streams in the form of logging slash contributes significantly to the BOD of the system, dramatically reduces surface and intergravel DO concentrations and may cause fish stress and mortality (Moring and Lantz 1975, Berry 1975).

Streams depleted of DO reaerate as oxygen from the atmosphere diffuses into the water (Ice and Brown 1978). Reaeration through oxygen diffusion occurs at the water surface and is enhanced by turbulence of the water. Turbulence at the water-air interface entrains air into the water column and brings oxygen-depleted water to the surface where it can reaerate (Ice and Brown 1978). The rate of intergravel reaeration is low in comparison to surface reaeration because the rate of water flux through benthic sediments is much lower than stream velocities (Brown 1983, Berry 1975). Salmonids begin their life cycle in redds as eggs and alevins that inhabit interstitial spaces within streambed gravels and low intergravel DO levels can reduce their survival (Ringler and Hall 1975).

Ecological effects of stream temperature

Water temperature criteria for streams in the Pacific Northwest were developed to protect aquatic habitat for native, cold-water species, particularly salmonids (Sullivan et al. 2000). Anadromous salmonids spawn and rear in freshwater streams and resident salmonids fulfill their entire life cycles within freshwater streams (Everest 1987). Therefore, the thermal environment of a stream constitutes a vital metric of habitat quality that may determine the ability of a stream to support salmonid populations. A shift in thermal patterns of a stream may affect fish populations that are adapted to existing local conditions, either through direct physiological pathways or by indirectly modifying environmental conditions.

Stream temperatures that are sub-optimal can cause outright salmonid mortality or may impose nonlethal effects that influence salmonid growth, behavior (migration and reproduction) and pathogen resistance (Sullivan et al. 2000). The net effect of both lethal and nonlethal impacts to salmonid populations depends on a combination of the severity and duration of exposure to sub-optimal temperatures. Mortality occurs when either the threshold magnitude or duration of extreme temperature exposure is exceeded. Acute temperature effects include those that cause death after an exposure time of less than 96 hours. Water temperatures over 25˚C generally exceed maximum lethal temperature limits of salmonids (Brett 1952), although fish that have acclimated to warm temperatures may persist above this threshold for short periods of time (Brett 1956).

Chronic exposure to sublethal stream temperatures causes stress to salmonids that is manifested through multiple physiological and behavioral pathways and decreases the probability of salmonid survival (Elliot 1981, Sullivan 2000). Physiological responses to a range of elevated but sublethal temperatures indicate that while rates of some physiological functions such as metabolic rate and heart rate increase continuously with increasing temperature, other physiological functions such as growth rate and appetite increase with temperature to a specific threshold, beyond which function declines (Brett 1971). The development of a salmonid at the beginning of its life cycle from egg to alevin, to fry and smolt occurs entirely within freshwater streams and the rate of development at each life stage is largely controlled by stream temperature. Stream temperature controls embryonic growth rates, hatching time of embryos, time spent in the gravel of redds as alevin, and emergence times and growth rates of fry (Marr 1966, Brett 1969, Weatherley and Gill 1995). Growth rates of individual fry are determined by a balance of energy expended by metabolism, activity and excretion to energy obtained through food consumption. After basic survival demands are met, energy that remains is applied to growth and reproduction (Brett 1969, Sullivan et al. 2000). Brett [1969] related the variables of temperature and food consumption to growth rates of salmonid fry and determined that the optimum growth rate for all levels of food availability occurs at temperatures between 5-17˚C. Maximum growth rates occurred at 15˚C when excessive food was available, however temperatures for optimum growth decreased with decreasing food availability and no growth occurred at temperatures above 23˚C. Growth rates of fry influence survival and success in later life stages of development and may determine the amount of time a fry of an anadromous salmonid will spend in the stream before smolting and seaward migration occur (Quinn and Peterson 1996, Weatherley and Gill 1995).

Water temperature directly influences salmonid behavior. Salmonids may survive periods of exposure to sub-optimal temperatures by employing behavioral thermoregulation and physiological energy-saving mechanisms (Elliot 1981). Evidence of bioenergetic regulation of salmon fry in thermally stratified lakes demonstrates that although many physiological processes are maximized at 15˚C in the laboratory, under field conditions during times of low food availability, salmonids naturally prefer cooler ambient temperatures where maintenance metabolism is reduced (Brett 1971). Thermal heterogeneity within a stream occurs when cooler subsurface water enters the stream by subsurface seepage or hyporheic exchange, creating localized areas of cooler habitat relative to the ambient stream temperature. There is evidence that salmonids preferentially seek out thermal refugia during times of temperature stress. Increasing frequency of pockets of cooler water is positively correlated with increased salmonid abundance (Ebersole et al. 2003). Stream temperature also affects salmonid behavior during migrations and thermal barriers to spawning adults may influence spawning locations and migration timing (Lantz 1971).

An indirect effect of elevated stream temperature and increased radiation is higher productivity of the stream ecosystem and a corresponding increase in the availability of food, which has the potential to affect salmonid populations. While the direct relationships between stream temperature and salmonid health have been reasonably well observed and quantified through laboratory experiments, defining comparable magnitudes of influence through indirect pathways is a more challenging task due to the complexity of ecosystem-wide relationships and challenges of performing ecological research *in-situ* (Lee and Samuel 1976). In the Pacific Northwest, fish communities are the highest trophic echelon of instream biota, thus fish are indirectly influenced by changes in the productivity of lower trophic levels, which include input of allochthonous organic matter, instream primary production and aquatic invertebrates (Beschta et al. 1987). Water temperature directly affects chemical and biological processes that occur within the aquatic ecosystem, thus stream temperature is a ubiquitous control to the productivity of the stream ecosystem. Stream temperature influences rates of periphyton growth, organic matter decay and nutrient cycling by controlling rates of chemical transformations within the water column, (Berry 1975, Phinney and McIntire 1965). Increases in stream temperature and light availability that can result from forest harvesting may lead to shifts in biomass production, species composition and dominance of algal communities within the stream (Armitage 1980), which indirectly influences the trophic balance of the stream. Studies that compared in-stream productivity in harvested and unharvested streams often reported higher productivity in disturbed areas due to increases in light and temperature (Murphy and Hall 1981).

Indirect linkages between water temperature and salmonid health exist outside of the influence on food availability. The susceptibility of salmonids to disease and parasites increases in warmer temperatures, presumably due to the high metabolic rates and physiological stress associated with high temperatures (Ordal and Pacha 1963, Cairns et al. 2005). Stream temperature indirectly affects the quality of salmonid habitat by controlling the solubility of oxygen in stream water. Salmonid mortality caused by low DO concentrations occurs at concentrations less than 2mg/L, however nonlethal impacts to salmonids are observed at DO concentrations as high as 6mg/L (Hermann et al. 1962). Decreased growth rate, food consumption and food conversion (weight gain) were observed in juvenile coho salmon when DO concentrations decreased from 8.3 mg/L to 6 mg/L while mortality was observed at 2.3mg/L (Hermann et al. 1962).

Aquatic insects fill a vital niche in lotic ecosystems by processing organic material, thus providing a trophic link between primary production and higher tropic levels. The preponderance of evidence in scientific literature suggests that the instream thermal regime exerts a strong influence over the aquatic insect community. Although laboratory studies that tested the lethal limits of aquatic invertebrates showed that elevated or lowered water temperatures induced mortality when lethal limits of a given species are surpassed (Quinn et al. 1994), sublethal temperature effects may also influence the life history patterns and overall long-term survivability of macroinvertebrate populations. Water temperature affects the community structure of aquatic invertebrates (Gledhill 1960, Hawkins and Hogue 1997) and species extirpation was observed at temperatures above or below threshold temperatures (Sweeney 1978, Quinn et al. 1994, Nordlie and Arthur 1981, Sweeney and Schnack 1977). Peak macroinvertebrate densities and biomass occurred earlier in streams heated above ambient temperatures (Arthur 1982, Hogg and Williams 1996, Rogers 1980) and emergence of adult insects were observed earlier in streams heated as little as 2.5 to 3˚C above ambient temperatures (Nordlie and Arthur 1981, Hogg and Williams 1996, Rempel and Carter 1987). Stream temperature also influences rates of growth and affects reproductive success of aquatic insects. Temperature directly controls the metabolic rate of a given organism (Gillooly et al. 2001), and thus regulates the developmental rate of that organism (Rempel and Carter 1987) and directly affects mature body size (Hogg and Williams 1996, Sweeney and Vannote 1978, Sweeney and Schnack 1977). A compelling hypothesis that relates macroinvertebrate growth to the thermal environment states that each species has an optimal temperature regime that allows each individual to reach a maximum adult size and fecundity and that subjecting a species to a regime that is suboptimal (either warmer or cooler than optimal), results in reduced adult size and fecundity (Sweeney and Vannote 1978, Vannote and Sweeney 1980). This hypothesis is supported by data that demonstrate reduced adult body size for aquatic insects raised at temperatures above (Hogg and Williams 1996, Rempel and Carter 1987) and below (Sweeney and Schnack 1977, Sweeney and Vannote 1978, Sweeney 1978) the ambient thermal regimes as compared to populations raised within ambient temperatures and by studies correlating adult body size to fecundity (Rogers 1983, Sweeney and Vannote 1978, Hogg and Williams 1996).

Stream temperature and forestland management

The relationships between streamflow, solar radiation, shade and stream temperature are prominent in the Pacific Northwest, where intensively managed forest land and streams that support an economically, culturally and ecologically valuable salmon fishery coexist. Incoming solar radiation peaks during the summer months of May, June, July and August. Paradoxically, climate patterns in the Pacific Northwest result in low probabilities of rainfall and high probabilities of clear skies during the summer months, with the result that peak annual solar energy is available during the times of lowest annual stream discharge (Beschta et al. 1987). Small, headwater streams in the Pacific Northwest are vulnerable to increases in temperature during summer low flow months when incident solar radiation is high, particularly when riparian vegetation is removed from streams that were historically shaded by intact forest canopies.

Change to the thermal regimes of forest streams can be an undesirable effect of vegetation removal within the watershed. The historic Alsea Watershed Study demonstrated that the removal of streamside vegetation during forest harvesting caused increases in stream temperatures (Brown and Krygier 1970). Average monthly maximum stream temperatures increased 8˚C the summer after the forest adjacent to a small stream in Oregon's Coast Range was clearcut. In the same stream, diel stream temperature range doubled after clearcutting. The importance of shade was further demonstrated in Levno and Rothacher's [1967] work in the HJ Andrews Experimental Forest in western Oregon. Maximum weekly stream temperatures in a 96-hectare watershed that was clearcut harvested did not diverge significantly from pre-logging temperature patterns until 55% of the vegetation was removed from the watershed. In the same study, no significant changes to stream temperature patterns were observed one year after 25% of 101-hectare watershed was patch cut. Downed wood and understory vegetation remained near the stream in the patch-cut watershed the first year following harvesting, however this material was removed during a winter debris flow that scoured the channel to bedrock, exposing 1,300 feet of the channel to direct solar radiation. Stream temperatures were significantly higher following the debris flow than either before logging or one year after logging, which indicates that the downed vegetation provided shade to the stream and precluded stream temperature increases one year after logging. Brown and Krygier [1967] quantified a 9˚C increase in stream temperatures as water flowed through the 1,300-foot reach that had been was scoured.

The role of senescing organic material as a temporary agent of shade was defined in a study of headwater streams in western Washington (Jackson et al. 2001). Post-harvest stream temperatures in headwater streams were not significantly different than pre-harvest temperatures one year after the streams were clearcut without a vegetated buffer. Jackson et al. [2001] attributed the insignificant temperature response to the meter-thick layer of organic material (logging slash) that covered the clearcut streams and effectively excluded solar radiation after harvesting.

Increases to stream temperatures caused by forest harvest adjacent to streams can be mitigated by Best Management Practices (BMPs), such as retention of riparian vegetation on either side of a stream (Bescheta et al. 1987, Brown and Krygier 1970, Brazier and Brown 1973, Macdonald et al. 2003, Swift and Messer 1971). Gomi et al. [2006] reported increases in maximum daily stream temperature of 2-9˚C in unbuffered headwater streams while maximum daily temperatures in streams with 10- and 30-meter buffers did not increase significantly. Similarly, the temperature increases observed in the HJ Andrews and Alsea paired watershed studies occurred in streams where riparian vegetation was clearcut or removed by debris flows whereas the streams with intact riparian buffers did not warm significantly (Levno and Rothacher 1967, Brown and Krygier 1970).

The characteristics that optimize effectiveness of riparian buffers have been thoroughly studied are known. Brazier and Brown [1973] reported that the volume of commercial timber left in the riparian buffer did not correlate with the amount of energy deflected by the buffer but that the width of the buffer (up to 40 feet) and canopy density of the buffer was directly proportional to temperature protection. In an investigation of riparian temperature gradients and edge effects, Brosofske et al. [1997] concluded that a minimum buffer width of 45 meters was necessary to preserve an unaltered riparian microclimate. In addition to length, width and basal density considerations, the effectiveness of a buffer is directly related to its long-term stability. Macdonald et al. [2003] reported that windthrow often occurs in riparian buffers and the loss of canopy in years following harvesting inhibited stream temperature recovery.

To minimize the environmental effects of forest harvesting on streams, buffer rules were included in Oregon's Forest Practices Act (OFP). Current OFP regulations require forest operators to leave a buffer of riparian vegetation or a Riparian Management Area (RMA) adjacent to streams that support either populations of fish or a domestic use, or large and medium sized streams that do not support fish or a domestic water use. The width of the required RMA ranges from 6 to 30 meters from the stream, depending upon beneficial use (domestic, fish, or neither) and size classification (small, medium, large) of the stream. Within the RMA, forest operators are required to retain:

1. a Standard Target square footage of basal area per 300 meters of stream (basal area retention depends on stream use, stream size, and silvicultural system),
2. all understory vegetation within three meters of the high water level,
3. all overstory trees within six meters of the high water level,
4. all overstory trees that lean over the stream channel, and
5. a portion of live, mature conifer trees in the RMA (number of trees retained depends upon stream use and size) (Oregon Administrative Rule 629-635).

Rules regarding RMAs in other timber-harvesting states of the Pacific Northwest are similar to the buffer rules mandated in Oregon's Forest Practice

Rules. Like Oregon, California, Washington and Idaho designate varying RMA widths and canopy densities depending upon stream size and beneficial use (Adams 2007). Minimum RMA widths are greater for streams in Washington, Idaho and California than for streams in Oregon. Additionally, Washington designates a 15-meter core zone within the larger RMA for fish-bearing streams in which no harvesting may occur. Portions of non-fish-bearing streams in Washington, California, and Idaho that drain to fish-bearing streams are protected by required RMAs of merchantable timber. In Washington, the first 90-150 meters of perennial, non-fish-bearing stream above a confluence with a fish-bearing stream is protected by a no-harvest RMA while Idaho designates RMAs on the first 150-300 meters of non-fish-bearing stream above a confluence. California mandates that RMAs of overstory trees be retained on any stream that demonstrates aquatic life (Adams 2007). In Oregon, RMAs of overstory conifers are not required adjacent to small, non-fish-bearing streams that are not domestic water sources. OFP Rules may require that all understory vegetation and non-merchantable timber be retained within three meters of the stream depending on the Geographic Region in Oregon that the stream is located and the size of the watershed that the stream drains. In any case, small, non-fish-bearing streams are not afforded the protection of a vegetated RMA that is designated for larger streams.

There is concern that stream temperature increases that occur in these unbuffered headwater tributaries may propagate downstream to larger, fish-bearing reaches and that the combined impact of several warmed tributaries may degrade aquatic habitat in fish-bearing streams. Since the OFP Rules were first enacted, revisions have been made to update the Rules as the body of knowledge regarding the impacts of forest management has expanded. Recent recommendations by Oregon's Forest Practices Advisory Committee on Salmon and Watersheds (FPAC) include an extension of current buffer rules to include a 15-meter RMA on either side of the first 150 meters of small, non-fish-bearing streams above a confluence with a fish-bearing stream.

Within the 15-meter RMA, forest operators would be required to retain all non-merchantable timber as well as four square feet of basal area per 30 meters of stream. There is a need to determine what, if any, changes to stream temperature are observed in small, non-fish-bearing streams in response to current Forest Practice Rules and if impacts are observed, whether or not they warrant a change in the current legislation.

Chapter II: The influence of contemporary forest harvesting on summer stream temperatures in headwater streams of Hinkle Creek, Oregon

Introduction

Stream temperature is a physical water quality parameter that directly affects all aquatic life by controlling metabolism, growth, oxygen solubility, organic matter decomposition and nutrient cycling within the stream ecosystem (Phinney and McIntire 1965, Marr 1966, Brett 1969, Brett 1971, Berry 1975, Weatherley and Gill 1995). Changes to prevailing thermal regimes stimulate physiological and behavioral response mechanisms in aquatic biota and effects ranging from physiological stress, changes in growth rates, fecundity, trophic structure, competitive interactions and timing of life history events and mortality are observed ecosystem responses to changes in ambient water temperatures (Brett 1952, Brett 1971, Moring and Lantz 1975, Sweeney and Vannote 1978, Beschta et al. 1987, Hogg and Williams 1996). In extreme cases, changes to thermal characteristics may alter the stream environment to the extent that native species are no longer able to inhabit their historic range. Pacific salmonids are particularly vulnerable to increases in stream temperature as they are cold-water fishes with lethal thermal tolerance of approximately 25˚C that inhabit freshwater streams during almost every stage of their life cycle (Brett 1952).

Many interacting mechanisms and processes contribute to observed stream temperature patterns; however according to energy balance analyses, solar radiation exposure is the primary temperature determinant of small, shallow streams (Brown 1969, Johnson and Jones 2000, Johnson 2004). Solar radiation exposure is limited by shade, such as from an intact forest canopy, and extreme increases to reach-level stream temperatures have been observed when forest canopies are removed (Levno and Rothacher 1967, Brown and Krygier 1970, Swift and Messer 1971). Where Riparian Management Areas (RMAs) that include mature timber are used, some percentage of pre-harvest canopy closure is preserved and often significant changes to stream temperature are not observed (Levno and Rothacher 1967, Brown and Krygier 1970, Swift and Messer 1971, Macdonald et al. 2003, Gomi et al. 2006). Recently the role of logging slash as an agent of post-harvest shade has also been investigated. Jackson et al. [2001] attributed a damped post-harvest temperature response of clearcut streams to exclusion of solar radiation due to a thick layer of logging slash that was deposited over the streams.

A key focus of contemporary watershed management is the role of cumulative watershed effects from the summation of many seemingly benign individual activities that produce a significant additive effect (Beschta and Taylor 1988). Small, non-fish-bearing streams in some regions of Oregon do not require that RMAs of overstory conifers be left during forest harvesting and there is concern that reach-level stream temperature increases may propagate into cumulative watershed effects, affecting downstream salmonid habitat. In order to assess the likelihood of a cumulative watershed effect, it is important to understand processes and mechanisms of stream thermal dynamics operating at the reach scale. Considerable research has focused on the effects of forest harvesting on stream temperatures, however, much of the prominent research was done in the era of old growth conversion, using equipment and techniques that were replaced by modern practices and before the current suite of forest practice rules were put into place. An investigation of the effects of timber harvest on stream temperatures on privately owned, intensively managed forest land with young, harvest-regenerated forest stands harvested using contemporary forest practices is necessary to assess reach-level impacts of current practices.

The objectives of this study are to 1) identify and quantify changes that occur to stream temperatures directly downstream of harvested units the first summer after harvesting and 2) explain the stream temperature response by examining differences in solar radiation exposure pre- versus post-harvest. I hypothesize that the harvesting treatment will reduce canopy closure over the harvested streams and that the increased exposure to solar radiation will cause stream temperatures to become warmer after harvest.

Methods

Site description

This research was undertaken as part of the Hinkle Creek Paired Watershed Study in association with the Watersheds Research Cooperative. We examined the headwater streams of Hinkle Creek, a tributary to Calapooya Creek that drains into the Umpqua River. The Hinkle Creek basin is located in the western Cascades of southern Oregon, approximately 25 miles (40 kilometers) northeast of the city of Roseburg in Douglas County.

The Hinkle Creek watershed is comprised of two fourth-order stream basins, the North Fork (basin area 873 hectares) and the South Fork (basin area 1,060 hectares). The streams flow approximately southwest and northwest, respectively, before they reach a confluence at the western boundary of the study area. The elevation of the study area ranges from about 400 meters above mean sea level (msl) at the mouth of the watershed to about 1,250 meters above msl near the eastern boundary of the watershed. Mean annual precipitation ranges from 1,400 mm at the mouth of the watershed to 1,900 mm at the eastern divide.

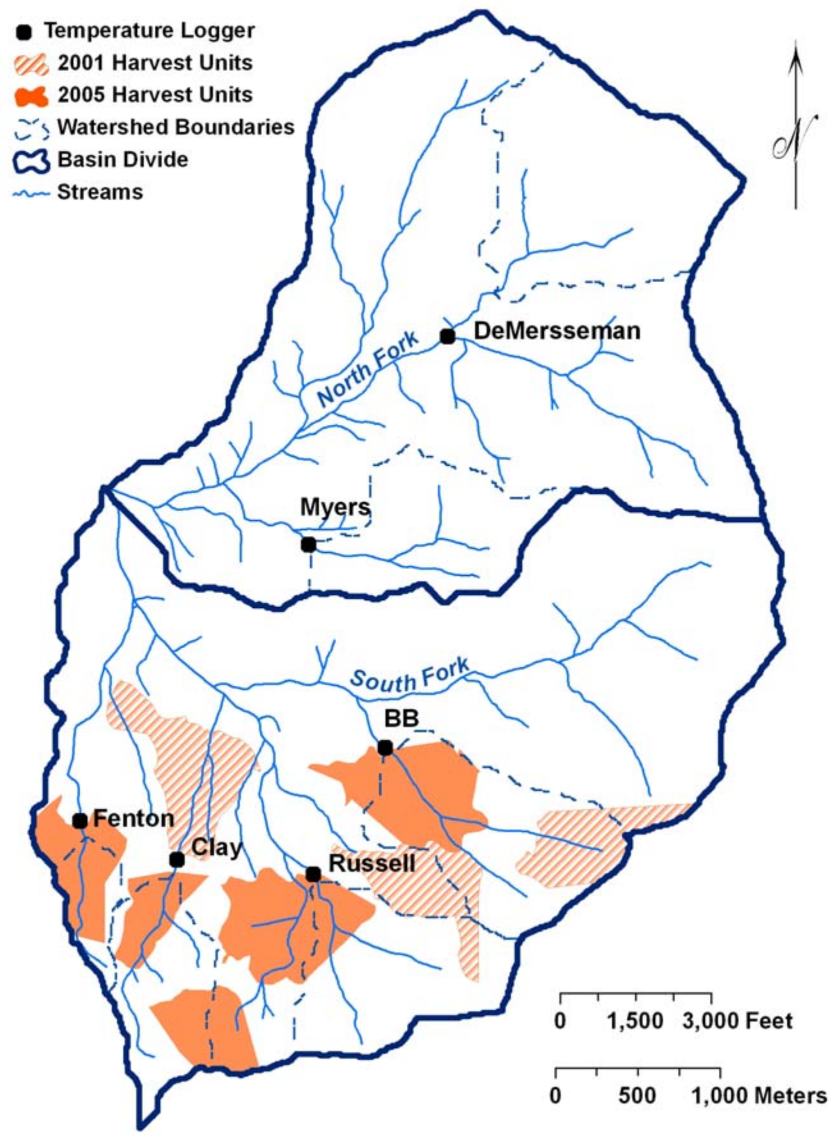


Figure 2.1 Hinkle Creek study area. Black points represent approximate locations of temperature data loggers, flumes, transition points between fish-bearing and non-fish-bearing streams and downstream limits to timber harvesting.

The vegetation in the Hinkle Creek basin is dominated by harvest regenerated stands of 55-year old Douglas fir (*Pseudotsuga menziesii*). Riparian vegetation is comprised of understory species such as huckleberry (*Vaccinium parvifolium*) and sword fern (*Polystichum munitum*), and overstory species such as red alder (*Alnus rubra*). The fish-bearing reaches of Hinkle

Creek contain resident cutthroat trout (*Oncorhynchus clarki*). Roseburg Forest Products (RFP) owns almost the entire watershed and the land is managed primarily for timber production. Before the commencement of the Hinkle Creek study in 2001, approximately 119 hectares of forest in the South Fork basin (11% of the South Fork Basin) was harvested in three clearcut harvest units (Figure 2.1).

Study design

The experimental design of the Hinkle Creek stream temperature study is a Before After Control Intervention (BACI) paired watershed study intended to identify and quantify stream temperature responses to forest harvesting in headwater streams. Six headwater watersheds were selected for study within the Hinkle Creek basin; four harvested (treatment) watersheds in the South Fork basin and two unharvested (control) watersheds in the North Fork basin (Figure 2.1). These headwater watersheds comprise the experimental units of the presented research and will be the focus of the following work. The orientation of the four treatment reaches in the South Fork basin is primarily south-north while the two control reaches in the North Fork basin flow approximately from west to east. Thirty-five hectares of the 2001 harvest units fell within the South Fork headwater watersheds investigated in this study. Four hectares (4%) of the Russell Creek watershed and 31 hectares (28%) of the BB Creek watershed were included in the 2001 harvest units (Figure 2.1). Each of the six headwater streams were instrumented with Montana flumes and stream temperature data loggers at the approximate transition point between a non-fish-bearing and fish-bearing stream designation so that stream reaches upstream of the flumes are designated as small, non-fish-bearing streams.

Harvesting treatment

Between July 2005 and March 2006, vegetation was harvested from the four South Fork watersheds while the watersheds of the North Fork remained unharvested. Harvest units were clearcut according to Oregon's Forest Practice Rules using modern harvesting techniques appropriate for each site. Most harvest units were yarded using a skyline logging system, however a portion of the harvest unit in the Fenton Creek watershed was shovel logged. Felled trees were yarded tree length to the landing where they were processed and removed from the project site via log trucks.

Table 2.1. Harvesting treatment. Areas of harvested and unharvested watersheds are shown in hectares (ha), total stream length within each watershed is given in meters (m), area of watershed harvested is given in hectares and percent of total watershed area, harvested stream length is given in meters and percent of total watershed stream length.

Watershed Name	**Harvested/ Unharvested Watershed**	**Area (ha)**	**Stream Length (m)**	**Area Harvested (ha, percent)**	**Harvested Stream Length (m, percent)**
Fenton Creek	Harvested	20	900	15, 75%	620, 69%
Clay Creek	Harvested	70	2,040	25, 36%	780, 38%
Russell Creek	Harvested	100	1,800	10, 10%	630, 35%
BB Creek	Harvested	110	2,280	35, 32%	1,060, 46%
Harvested Total		**300**	**7,020**	**85, 28%**	**3,090, 44%**
Myers Creek	Unharvested	90	2,100	-----	-----
DeMersseman Creek	Unharvested	160	1,580	-----	-----
Unharvested Total		**250**	**3,680**	**-----**	**-----**

The lower boundaries of the four harvest units coincided with the locations of Montana flumes, the point where the streams transitioned between a non-fish-bearing designation and a fish-bearing designation. Therefore, all stream reaches located within the harvest units were classified as small, non-fish-bearing reaches and according to the Oregon Forest Practice Rules, a Riparian Management Area (RMA) of merchantable timber was not required between the stream and harvest unit. Almost all merchantable timber and most non-merchantable timber and understory riparian vegetation was removed from riparian zones during harvesting. Logging slash, consisting of branches, needles and understory vegetation was left in place and harvested streams were partially covered by logging slash. Site preparation for replanting began in Spring 2006 and included herbicide treatments.

Stream temperature data collection

Summer stream temperatures in the six headwater watersheds were monitored over a four-year period of calibration data collection (2002 through 2005) followed by one year of post-harvest data collection (2006). Average stream temperature was recorded over 10 to 30 minute intervals using Vemco 12 bit Minlog data loggers (±0.2˚C accuracy, used 2002 and 2003), or HOBO Water Temp Pro data loggers (Onset HOBO model H20-001, ±0.2˚C accuracy, used 2004 through 2006). The data loggers were calibrated before deployment to ensure accuracy between locations. HOBO or Vemco data loggers were deployed each year in the late spring or early summer and continuously logged stream temperature data until late fall. Data loggers were located at the downstream edge of the proposed harvest units (Figure 2.1) and were placed in the same specific locations each year. During post-harvest data collection, data loggers were encased in white PVC covers to shade the instruments from direct solar radiation. Holes were drilled in the PVC cases to ensure that water flowed freely over the data loggers. Year-round stream temperatures were recorded within 10 meters of each seasonal data logger at 30 minute intervals (Campbell Scientific CS547A conductivity sensors ±0.1˚C accuracy, used November 2003 through 2006).

Canopy closure data collection

Surveys of canopy closure over the gauged streams were taken during the summer of 2004 and repeated during the summer of 2006. In this study, canopy closure is defined as the proportion of sky that is covered by vegetation that attenuates solar radiation before it reaches the stream (Jennings et al. 1999). The four harvested streams were surveyed at ten-meter intervals from a distance of 300 meters downstream of the downstream limit of the proposed harvest boundaries (flumes) to at least the upstream limits of the proposed harvest units (Figure 2.2). The unharvested streams were surveyed at ten meter intervals from a distance of 300 meters downstream from the flumes to at least 400 meters upstream of the flumes.

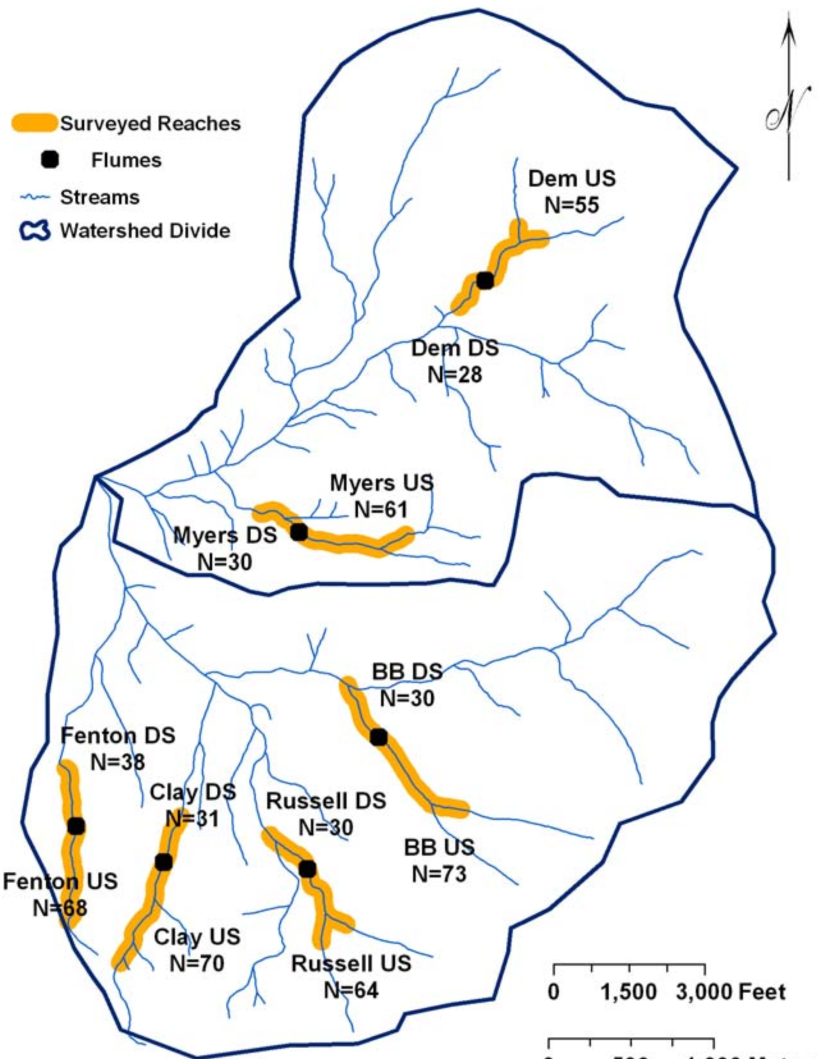


Figure 2.2. The locations of flumes and reaches surveyed for canopy closure in 2004 and 2006. The number of sampling points taken during the 2006 survey is displayed by each reach. The number of sampling points taken during the 2004 survey was equal or greater than the 2006 survey sample size for each reach.

Percent canopy closure was determined by measuring canopy closure upstream, downstream, perpendicular to the stream on river right and perpendicular to the stream on river left with a spherical densiometer held at waist height. The four canopy closure measurements at each location were averaged to calculate percent canopy closure at each sampling location. The densiometer operator took canopy closure measurements from the center of the stream.

During the summer of 2006, the percent canopy closure survey was repeated to gather post-harvest data on levels of shading in harvested and unharvested reaches. Percent canopy closure was sampled every ten meters along each of the six streams using methods similar to the pre-harvest survey. However, because the spherical densiometer held at waist height did not adequately characterize shade provided by downed vegetation in the streams, a second survey method was employed. Digital photos were taken at each sampling location from a perspective of two to eight inches above the water surface. Photos were taken close to the center of the stream at the exact location of densiometer data collection. A bubble level attached to the camera ensured that the photo captured a sampling area directly above the stream and each photo was taken facing north. The photos were analyzed by classifying proportions of light and dark pixels as canopy openness or closure, respectively in Adobe PhotoShop 7.0 software.

Data analysis

Maximum, minimum and mean daily stream temperatures

Parameter analysis of regression curves was used to detect changes to daily maximum, minimum and mean summer stream temperatures in Hinkle Creek (Meredith and Stehman 1991, Loftis et al. 2001). All statistical analysis was conducted within SAS version 9.1 (SAS Corporation, Cary, NC). Maximum, minimum and mean daily stream temperatures were extracted from the full temperature dataset of 10-30 minute observations and the three temperature metrics were analyzed separately. In order to meet the independence assumption inherent to regression, partial autocorrelation plots were examined for data from each stream, each year to determine the time period over which maximum daily temperatures were autocorrelated. This analysis indicated that the maximum lag time between autocorrelated values of daily maximum temperature was two days, thus a dataset consisting of the daily maximum temperature of every third day was systematically selected from the full dataset, with a randomly selected first day. Identical data selection techniques were used to select an independent set of minimum and mean daily temperatures. A two-day maximum lag time was identified for daily minimum and mean stream temperatures and so the final independent dataset also consisted of minimum and mean temperatures from every third day. Examination of residuals reflected that all assumptions of regression were adequately met by the data. Data from 2002 at Russell Creek were flawed due to direct solar absorption by the data logger and so data from this stream and year were removed from all analyses. Harvesting began in Fenton Creek during the summer of 2005, thus all stream temperature data collected in 2005 in Fenton Creek were not considered in this analysis.

A set of geographic and hydrologic characteristics for each watershed was considered to pair each harvested stream to an unharvested stream. Average basin aspect, average stream orientation, stream length upstream of the temperature sensors and stream discharge were considered in this analysis, resulting in the following stream pairings:

Table 2.2. Harvested-unharvested stream pairings for regression analysis.

Harvested Stream	Unharvested Stream	Pair Name
Fenton Creek	Myers Creek	Fen
Clay Creek	Myers Creek	Clay
Russell Creek	DeMerrseman Creek	Rus
BB Creek	DeMerrseman Creek	BB

After watershed pairing was established, the daily maximum temperatures from each harvested stream were plotted against daily maximum temperatures collected on the same day from the paired, unharvested stream. A Least Squares regression line was fit to data from each year, resulting in five regression lines (four pre-harvest and one post-harvest) for each stream pair, except for the Rus pair which lacked 2002 data from Russell Creek and the Fen pair which lacked 2005 data from Fenton Creek. From each regression line, a slope and intercept (˚C) parameter were extracted (Tables A1-A3). Before regression lines were fit to the paired harvested-unharvested relationships, the unharvested temperature data were adjusted by subtracting the mean value of the annual means of daily maximum temperature (2002-2006). This adjustment repositioned the scale of the x-axis, which allowed the intercept of the regression line to fall in the mid-range of the observed stream temperature values, precluding the need to extrapolate the intercept beyond the range of observed data. Similar regression analyses were performed for minimum and mean daily temperatures.

In order to detect changes between pre-harvest and post-harvest slopes and intercepts of the regression relationships, the following repeated measures model was fit to both the slope and intercept datasets:

$$\hat{\beta}_{\mathrm{ij}} = \mu_0 + \mathrm{S_j} + \mathrm{Y_i I_2} + \mathrm{Y_i I_3} + \mathrm{Y_i I_4} + \mathrm{Y_i I_5} + \varepsilon_{ij}$$

$\hat{\beta}_{\mathrm{ij}}$ = slope / intercept for year i (i = 2002, 2003, 2004, 2005, 2006), stream pair j (j = Fen, Rus, Clay, BB)

μ_0 = overall mean slope / intercept for all stream pairs, all years

$\mathrm{S_j}$ = random effect of stream pair that adds variability to the value of β, j = Fen, Rus, Clay, BB; $\mathrm{S_j} \sim \mathrm{N}(0, \sigma_S^{\,2})$

$\mathrm{Y_i}$ = effect of year i

$\mathrm{I_2}$ = indicator; = 1 if 2002, 0 otherwise

$\mathrm{I_3}$ = indicator; = 1 if 2003, 0 otherwise

$\mathrm{I_4}$ = indicator; = 1 if 2004, 0 otherwise

$\mathrm{I_5}$ = indicator; = 1 if 2005, 0 otherwise

ε_{ij} = random error term that represents variability between years;

$$\varepsilon'_{\mathrm{j}} \sim \mathrm{MN}(0, \Sigma_5) \quad \text{and } \Sigma_5 = \begin{matrix} 1 & \rho & \rho^2 & \rho^3 & \rho^4 \\ \rho & 1 & \rho & \rho^2 & \rho^3 \\ \rho^2 & \rho & 1 & \rho & \rho^2 \\ \rho^3 & \rho^2 & \rho & 1 & \rho \\ \rho^4 & \rho^3 & \rho^2 & \rho & 1 \end{matrix}$$

An autoregressive (AR(1)) correlation structure between time periods is the most appropriate correlation structure for repeated measures through time and therefore was selected for this model. Examination of residuals confirmed that the data adequately met all assumptions inherent to the model. Contrasts between mean slopes and intercepts before and after harvest were used to detect changes to the harvested-unharvested relationships of maximum, minimum and mean daily temperature that occurred between pre-harvest years and the post-harvest year.

Diel temperature fluctuation

Diel temperature fluctuation was calculated by subtracting the daily minimum temperature recorded at each stream from the daily maximum temperature. Diel ranges for every day between June 1 and September 30 were considered in this analysis. As diel range tends to fluctuate in a natural seasonal pattern throughout the summer, the season was divided into discrete periods and analyzed separately (Table 2.3).

Table 2.3. The warm season was divided into the following eight periods that were analyzed individually in the diel stream temperature analysis.

Period	Dates
1	June 1 to June 14
2	June 15 to June 30
3	July 1 to July 14
4	July 15 to July 31
5	August 1 to August 14
6	August 15 to August 31
7	September 1 to September 14
8	September 15 to September 30

Changes to diel range were detected by examining the diel range relationship between harvested and unharvested streams before and after harvesting. The pairing of harvested to unharvested streams employed in the maximum, minimum and mean analysis was also applied to diel analysis (Table 2.2). Missing data were simulated by interpolating within regression relationships between the HOBO temperature data logger at each site and the Campbell Scientific temperature probe located on the adjacent flume. The ratio of harvested to unharvested diel range was calculated for each stream pair and a repeated measures model was fit to the diel range ratio dataset. Examination of residuals indicated unequal variance, thus the natural log of the harvested to unharvested ratio of diel range was used to correct for heteroscadacity within the data. All other assumptions of the model were adequately met by the data. The following repeated measures model was used to detect changes to diel stream temperature fluctuation that occurred after harvesting:

$$\log(\hat{\beta}_{ij}) = \mu_0 + S_j + Y_i I_2 + Y_i I_3 + Y_i I_4 + Y_i I_5 + \varepsilon_{ij}$$

$\log(\hat{\beta}_{ij})$ = logged ratio of harvested over unharvested diel range for year i

(i = 2002, 2003, 2004, 2005, 2006), stream pair j (j = Fen, Rus, Clay, BB)

μ_0 = overall mean ratio for all stream pairs, all years

S_j = random effect of stream pair that adds variability to the value of β,

j = Fen, Rus, Clay, BB; $S_j \sim N(0, \sigma_S^2)$

Y_i = effect of year i

I_2 = indicator; = 1 if 2002, 0 otherwise

I_3 = indicator; = 1 if 2003, 0 otherwise

I_4 = indicator; = 1 if 2004, 0 otherwise

I_5 = indicator; = 1 if 2005, 0 otherwise

ε_{ij} = random error term that represents variability between years;

$$\varepsilon'_j \sim MN(0, \Sigma_5) \quad \text{and } \Sigma_5 = \begin{matrix} 1 & \rho & \rho^2 & \rho^3 & \rho^4 \\ \rho & 1 & \rho & \rho^2 & \rho^3 \\ \rho^2 & \rho & 1 & \rho & \rho^2 \\ \rho^3 & \rho^2 & \rho & 1 & \rho \\ \rho^4 & \rho^3 & \rho^2 & \rho & 1 \end{matrix}$$

An autoregressive (AR(1)) correlation structure between time periods is the most appropriate correlation structure for repeated measures through time and therefore was selected for this model. Contrasts between average diel ratio before and after harvest were used to detect changes to diel temperature range that occurred between pre-harvest years and the post-harvest year.

Greatest annual seven-day moving mean of the maximum daily temperature

Seven-day moving mean of the maximum daily stream temperature (seven-day mean) was calculated for every day of the summer for each stream, each year. The relationship of seven-day mean between harvested and unharvested streams was used to assess changes to seven-day mean that occurred after harvesting. The pairing of harvested to unharvested streams used in prior analyses was used to assess changes to annual maximum seven-day mean (Table 2.2). The maximum annual seven-day mean of each unharvested stream was subtracted from the maximum annual seven-day mean of the corresponding harvested streams. The following repeated measures model was used to assess changes to the differences between annual maximum seven-day means of harvested and unharvested streams after harvesting occurred:

$$\hat{\beta}_{\mathrm{ij}} = \mu_0 + \mathrm{S_j} + \mathrm{Y_i I_2} + \mathrm{Y_i I_3} + \mathrm{Y_i I_4} + \mathrm{Y_i I_5} + \varepsilon_{ij}$$

$\hat{\beta}_{\mathrm{ij}}$ = difference between harvested and unharvested 7 - day annual maximum for year i (i = 2002, 2003, 2004, 2005, 2006), stream pair j (j = Fen, Rus, Clay, BB)

μ_0 = overall mean difference for all stream pairs, all years

$\mathrm{S_j}$ = random effect of stream pair that adds variability to the value of β, j = Fen, Rus, Clay, BB; $\mathrm{S_j} \sim \mathrm{N}(0, \sigma_S{}^2)$

$\mathrm{Y_i}$ = effect of year i

$\mathrm{I_2}$ = indicator; = 1 if 2002, 0 otherwise

$\mathrm{I_3}$ = indicator; = 1 if 2003, 0 otherwise

$\mathrm{I_4}$ = indicator; = 1 if 2004, 0 otherwise

$\mathrm{I_5}$ = indicator; = 1 if 2005, 0 otherwise

ε_{ij} = random error term that represents variability between years;

$$\varepsilon'_{\mathrm{j}} \sim \mathrm{MN}(0, \Sigma_5) \quad \text{and } \Sigma_5 = \begin{matrix} 1 & \rho & \rho^2 & \rho^3 & \rho^4 \\ \rho & 1 & \rho & \rho^2 & \rho^3 \\ \rho^2 & \rho & 1 & \rho & \rho^2 \\ \rho^3 & \rho^2 & \rho & 1 & \rho \\ \rho^4 & \rho^3 & \rho^2 & \rho & 1 \end{matrix}$$

An autoregressive (AR(1)) correlation structure between time periods is the most appropriate correlation structure for repeated measures through time and therefore was selected for this model. Examination of residuals confirmed that the data adequately met all assumptions inherent to the model. Post-harvest differences between harvested and unharvested seven-day means were compared to the mean pre-harvest differences using contrasts.

Cumulative degree days

A qualitative comparison of cumulative degree days was undertaken for each stream for years 2004, 2005 and 2006. Cumulative degree days (˚C) from March 1 to September 30 were calculated using mean daily temperature and were plotted for each harvested stream and one unharvested stream.

Canopy closure

Mean percentages of canopy closure and standard deviations from the mean were calculated for each reach (US = upstream of flumes and DS = downstream of flumes) of harvested and unharvested streams for the 2004 and 2006 canopy closure surveys and for both data collection method used during the 2006 survey. Differences between mean percentages of canopy closure recorded in unharvested reaches (Myers US, Myers DS, DeMerrseman US, DeMerrseman DS, Fenton DS, Russell DS and BB DS) were used to estimate the errors between different field crews using the densiometer method and errors between the densiometer and photo methods. Because the Clay DS reach was harvested in 2001 before the onset of the project, data from this reach do not represent unharvested values and thus were not included in the error analysis.

Results

Maximum, minimum and mean daily stream temperatures

Stream temperatures observed in harvested streams were highly correlated to data observed in unharvested streams during the calibration and post-harvest periods of data collection. Most stream pairs exhibited adjusted R^2 values of over 0.95 for maximum, minimum and mean daily temperatures for all years of data collection (Table 2.4). Slope and intercept parameters for all regression lines are in Tables A1-A3 in Appendix A.

Table 2.4. A list of correlation coefficients between maximum, minimum and mean daily stream temperatures for every third day in harvested and unharvested streams.

Stream Pair	Year	Maximum Daily Stream Temperature Adjusted R^2	Minimum Daily Stream Temperature Adjusted R^2	Mean Daily Stream Temperature Adjusted R^2
Fen	2002	0.96	0.94	0.97
Fen	2003	0.98	0.98	0.99
Fen	2004	0.97	0.99	0.99
Fen	2006*	0.92	0.94	0.96
Clay	2002	0.94	0.99	0.99
Clay	2003	0.94	0.99	0.99
Clay	2004	0.98	0.98	0.97
Clay	2005	0.99	0.99	0.99
Clay	2006*	0.91	0.97	0.97
Rus	2003	0.94	0.95	0.95
Rus	2004	0.95	0.96	0.97
Rus	2005	0.98	0.99	0.99
Rus	2006*	0.98	0.98	0.98
BB	2002	0.89	0.96	0.98
BB	2003	0.97	0.96	0.97
BB	2004	0.96	0.96	0.98
BB	2005	0.97	0.99	0.99
BB	2006*	0.97	0.97	0.98

*post-harvest

Statistically significant changes to the maximum daily stream temperature relationship between harvested and unharvested streams were not detected following harvesting at Hinkle Creek (Tables 2.5a and 2.5b, Figures 2.3a and 2.4a). Additionally, significant changes to intercepts of regressions on minimum and mean daily temperatures were not detected (Tables 2.5d and 2.5f, Figures 2.3b, 2.3c, 2.4b and 2.4c); however, post-harvest slopes of minimum and mean daily temperature regressions were significantly lower than pre-harvested slopes (minimum: $t_{10} = 8.64$, $p < 0.0001$, Table 2.5c, Figures 2.3b and 2.4b; mean: $t_{10} = 6.45$, $p < 0.0001$, Table 2.5e, Figures 2.3c and 2.4c). Slopes of post-harvest regressions of minimum daily temperature decreased by 0.26 relative to pre-harvest slopes (95% CI: 0.20 to 0.33) and slopes of post-harvest regressions on mean daily temperature decreased by 0.20 (95% CI: 0.13 to 0.27). Tables 2.5a-2.5f outline the differences in pre-harvest and post-harvest slopes and intercepts of regressions of maximum, minimum and mean daily temperatures for each individual stream pair as well as overall means.

Table 2.5a: Differences between pre-harvest mean slopes and post-harvest slopes of daily maximum stream temperature regressions for each individual stream pair and overall.

Stream Pair	Pre-Harvest Mean Slope (2002 to 2005)	Post-Harvest Slope (2006)	Change in Slope (Post-Pre)
Fen	0.92	0.64	-0.28
Clay	1.27	1.27	0.00
Rus	1.16	1.17	0.01
BB	0.82	1.11	0.30
Mean Slope	1.04	1.05	0.01

Table 2.5b: Differences between pre-harvest mean intercepts and post-harvest intercepts of daily maximum stream temperature regressions for each individual stream pair and overall.

Stream Pair	Pre-Harvest Mean Intercept (2002 to 2005)	Post-Harvest Intercept (2006)	Change in Intercept (Post-Pre)
Fen	13.68	12.11	-1.57
Clay	14.11	15.22	1.11
Rus	12.06	12.66	0.60
BB	12.89	13.64	0.75
Mean Intercept	13.19	13.41	0.22

Table 2.5c: Differences between pre-harvest mean slopes and post-harvest slopes of daily minimum stream temperature regressions for each individual stream pair and overall.

Stream Pair	Pre-Harvest Mean Slope (2002 to 2005)	Post-Harvest Slope (2006)	Change in Slope (Post-Pre)
Fen	0.91	0.59	-0.32
Clay	1.28	1.08	-0.20
Rus	1.28	0.98	-0.30
BB	1.34	1.05	-0.29
Mean Slope	1.19	0.93	-0.26

Table 2.5d: Differences between pre-harvest mean intercepts and post-harvest intercepts of daily minimum stream temperature regressions for each individual stream pair and overall.

Stream Pair	Pre-Harvest Mean Intercept (2002 to 2005)	Post-Harvest Intercept (2006)	Change in Intercept (Post-Pre)
Fen	12.78	10.93	-1.85
Clay	12.95	12.36	-0.59
Rus	11.31	10.39	-0.38
BB	12.08	12.09	0.01
Mean Intercept	12.28	11.58	-0.70

Table 2.5e: Differences between pre-harvest mean slopes and post-harvest slopes of mean daily stream temperature regressions for each individual stream pair and overall.

Stream Pair	Pre-Harvest Mean Slope (2002 to 2005)	Post-Harvest Slope (2006)	Change in Slope (Post-Pre)
Fen	0.92	0.62	-0.30
Clay	1.28	1.18	-0.10
Rus	1.26	1.06	-0.20
BB	1.32	1.10	-0.22
Mean Slope	1.19	0.99	-0.20

Table 2.5f: Differences between pre-harvest mean intercepts and post-harvest intercepts of mean daily stream temperature regressions for each individual stream pair and overall.

Stream Pair	**Pre-Harvest Mean Intercept (2002 to 2005)**	**Post-Harvest Intercept (2006)**	**Change in Intercept (Post-Pre)**
Fen	13.24	11.53	-1.38
Clay	13.49	13.72	0.24
Rus	11.70	11.66	-0.04
BB	12.48	12.79	0.31
Mean Intercept	12.73	12.42	-0.31

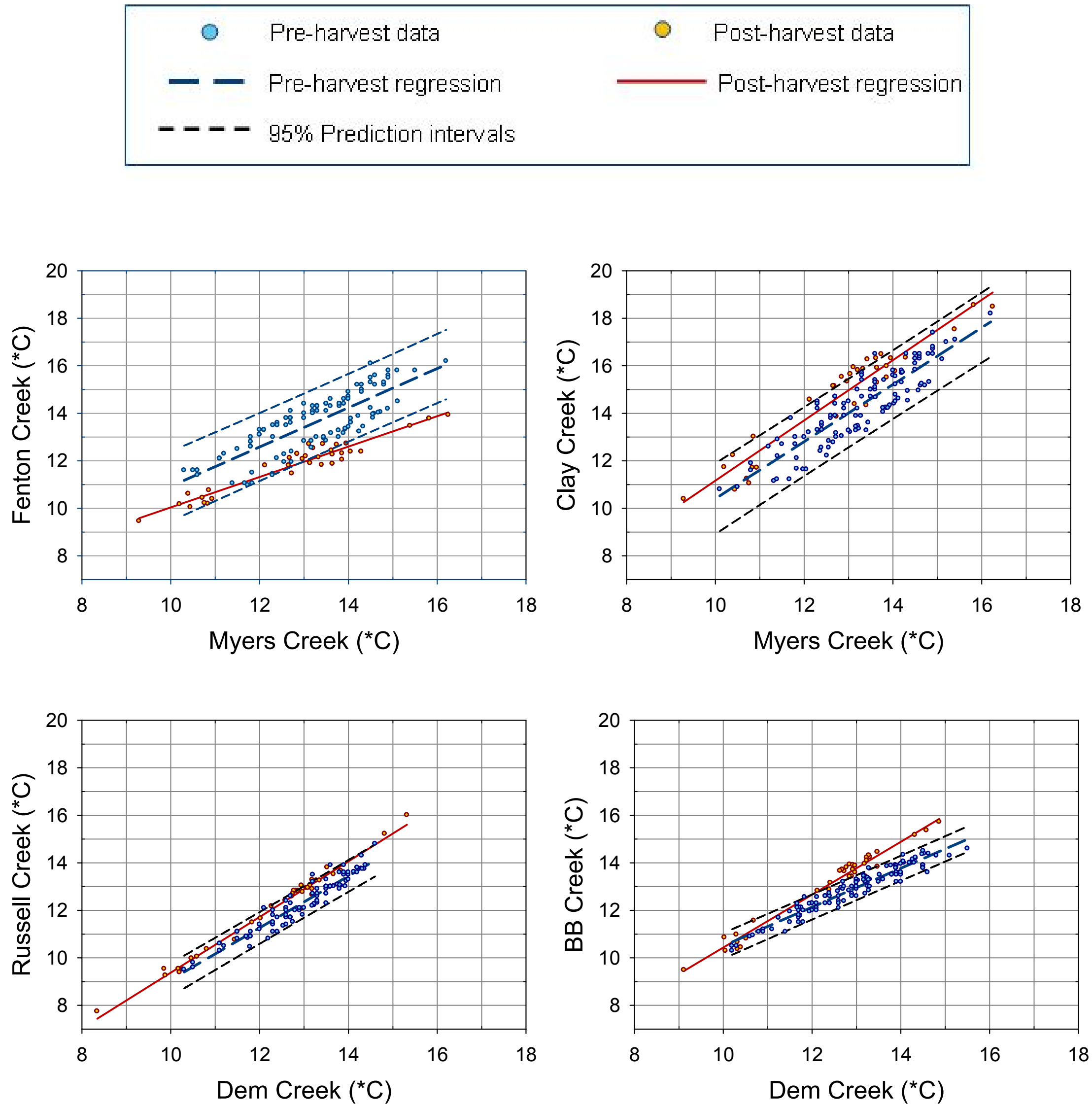


Figure 2.3a. Regressions of maximum daily stream temperatures in harvested streams versus unharvested streams. Each stream pair is shown individually. 95% prediction limits are around pre-harvest data.

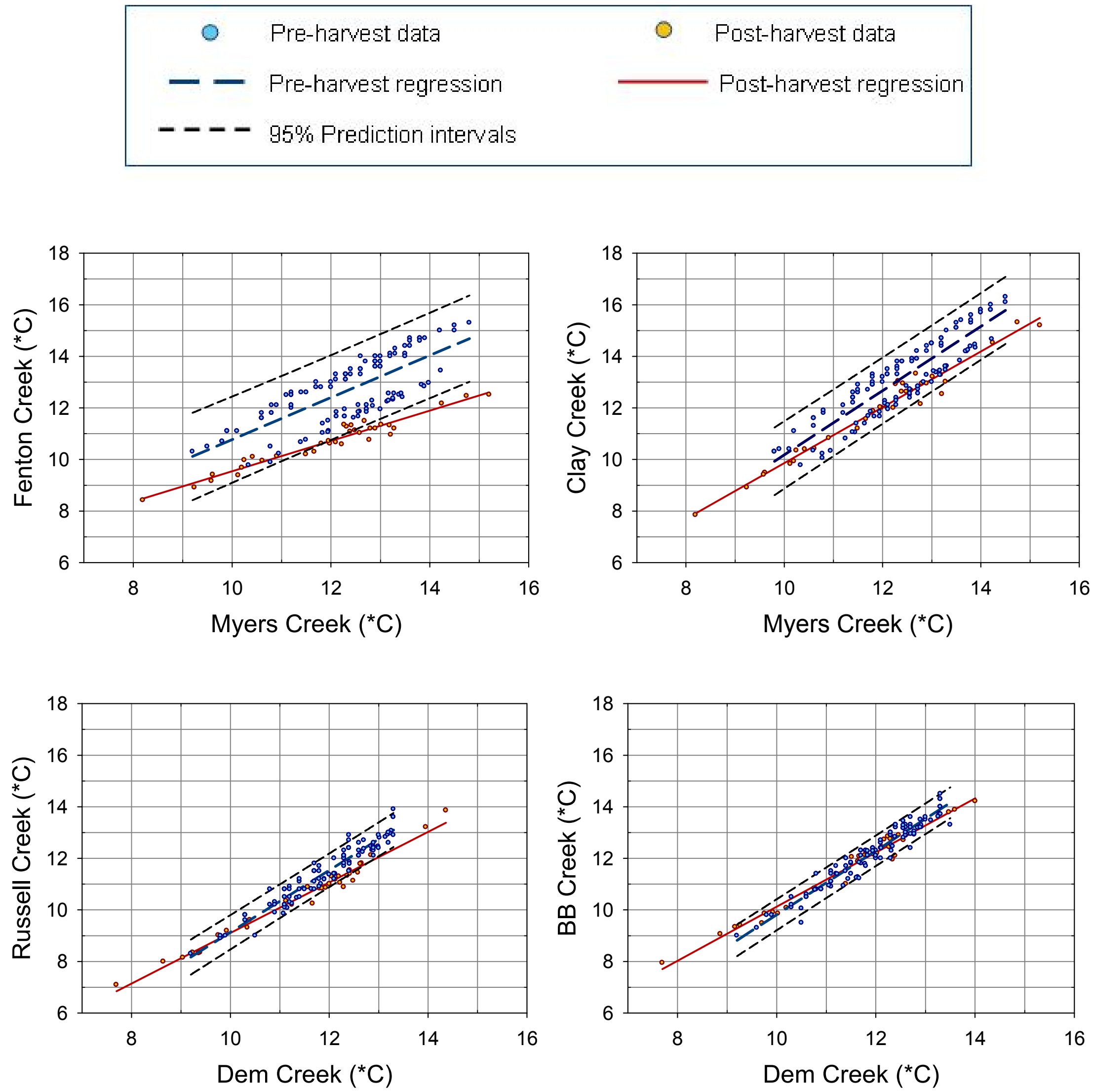


Figure 2.3b. Regressions of minimum daily stream temperatures in harvested streams versus unharvested streams. Each stream pair is shown individually. 95% prediction limits are around pre-harvest data.

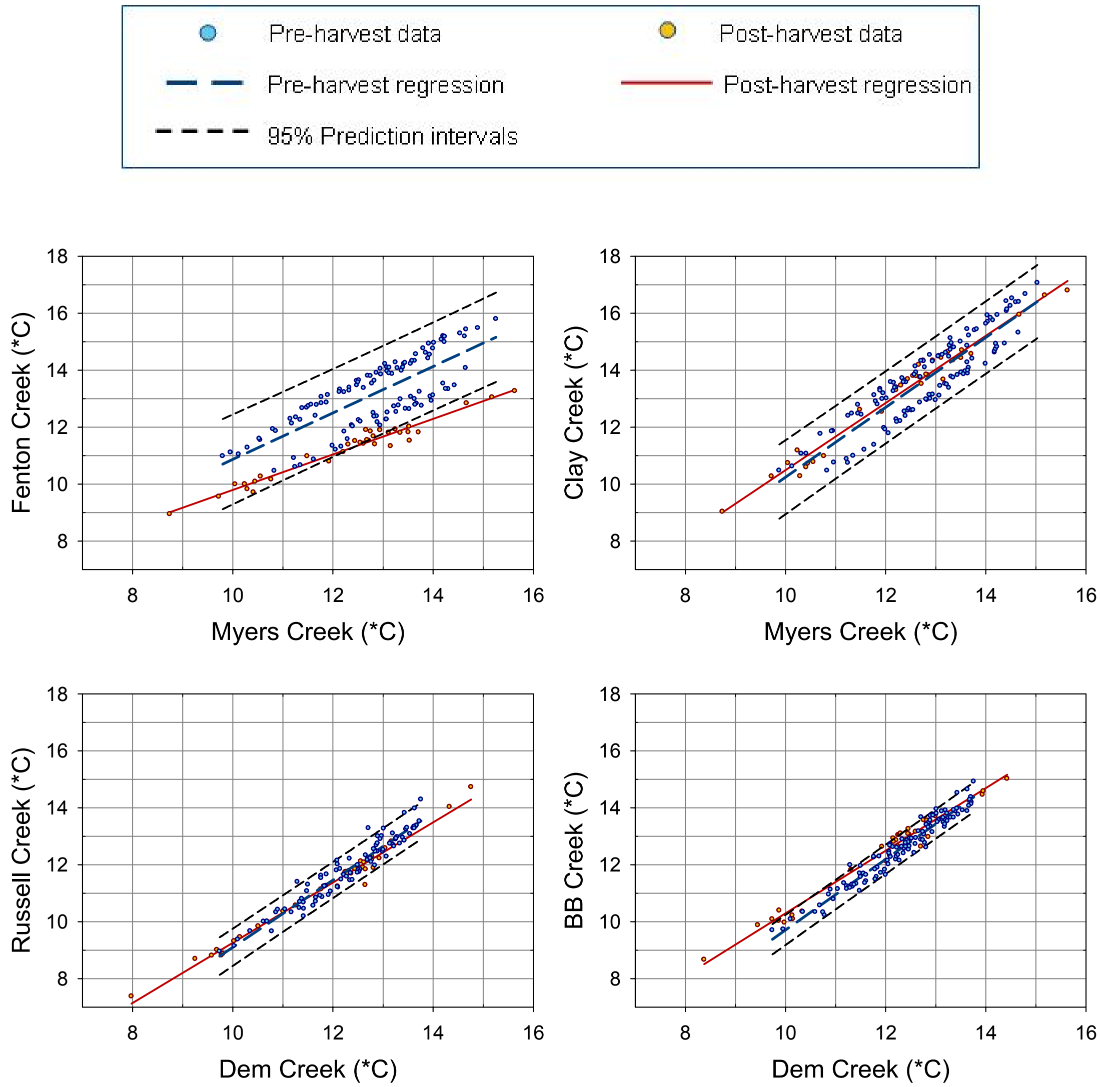


Figure 2.3c. Regressions of mean daily stream temperatures in harvested streams versus unharvested streams. Each stream pair is shown individually. 95% prediction limits are around pre-harvest data.

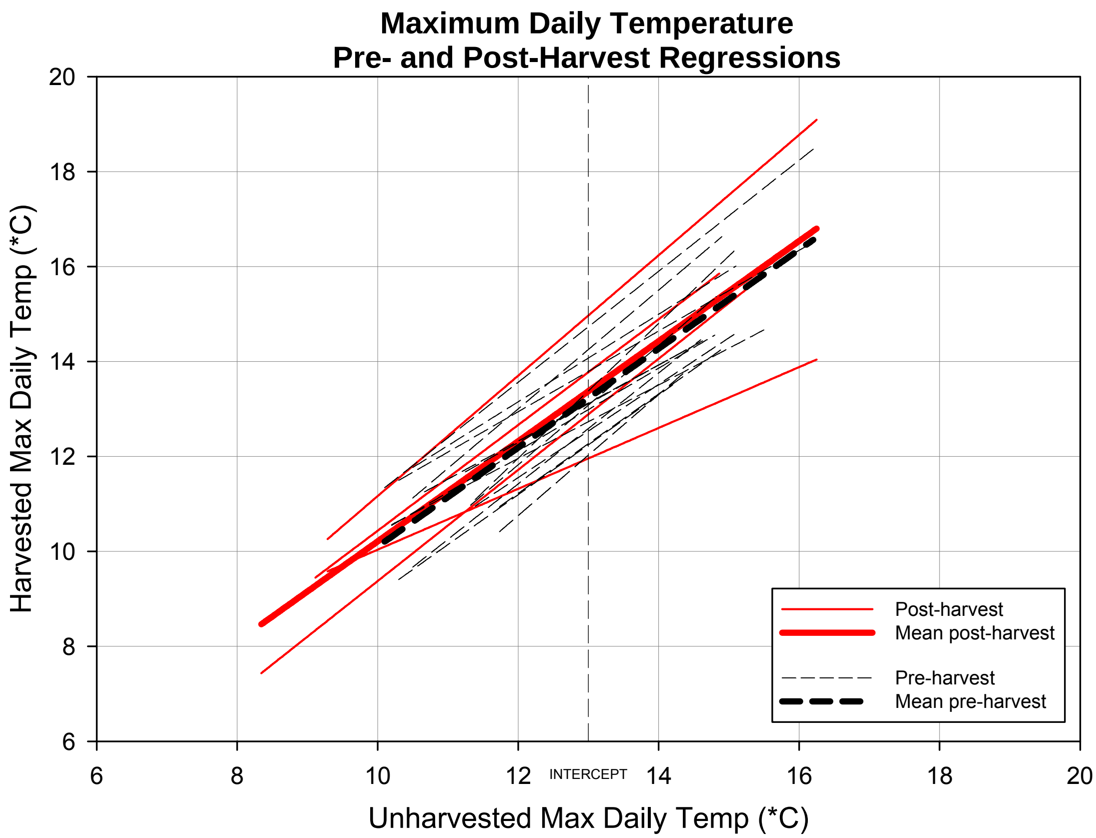


Figure 2.4a. Regressions of maximum daily stream temperatures in harvested streams versus unharvested streams for each stream pair and year illustrate variability of the harvested-unharvested relationship before and after harvest. Mean pre- and post-harvest regressions illustrate comparisons made by the change detection model. Vertical dashed line indicates mean intercept.

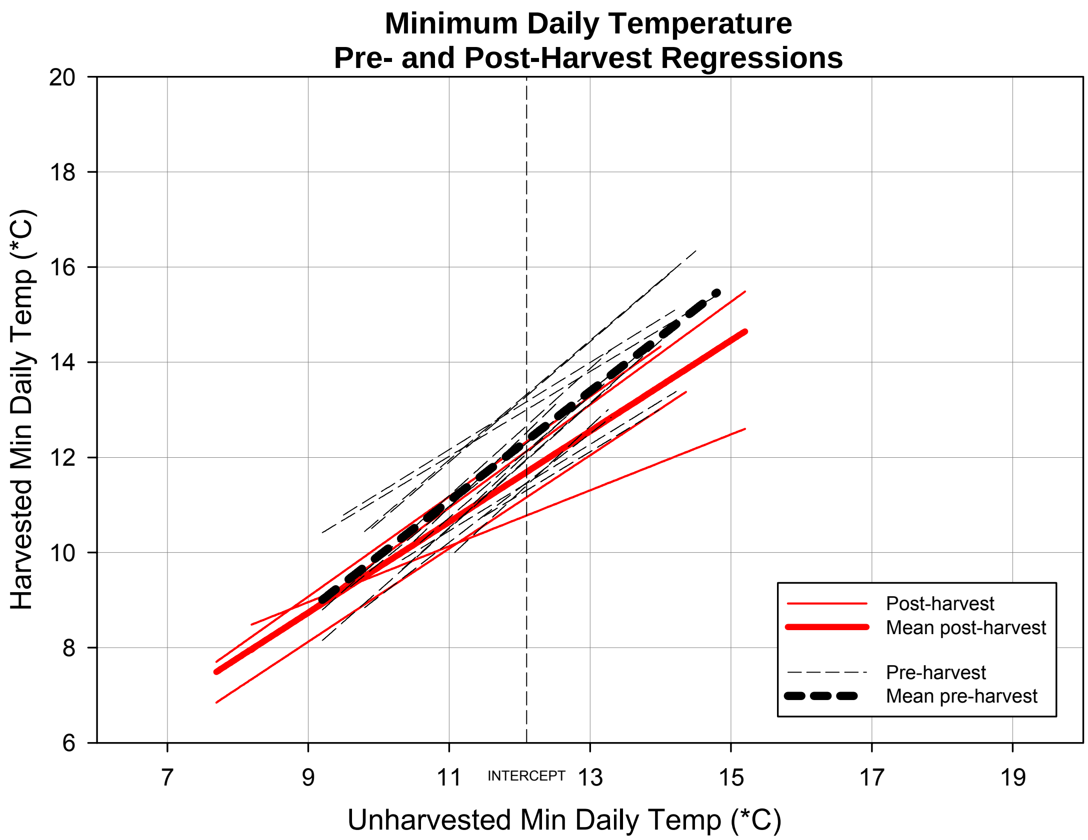


Figure 2.4b. Regressions of minimum daily stream temperatures in harvested streams versus unharvested streams for each stream pair and year illustrate variability of the harvested-unharvested relationship before and after harvest. Mean pre- and post-harvest regressions illustrate comparisons made by the change detection model. Vertical dashed line indicates mean intercept.

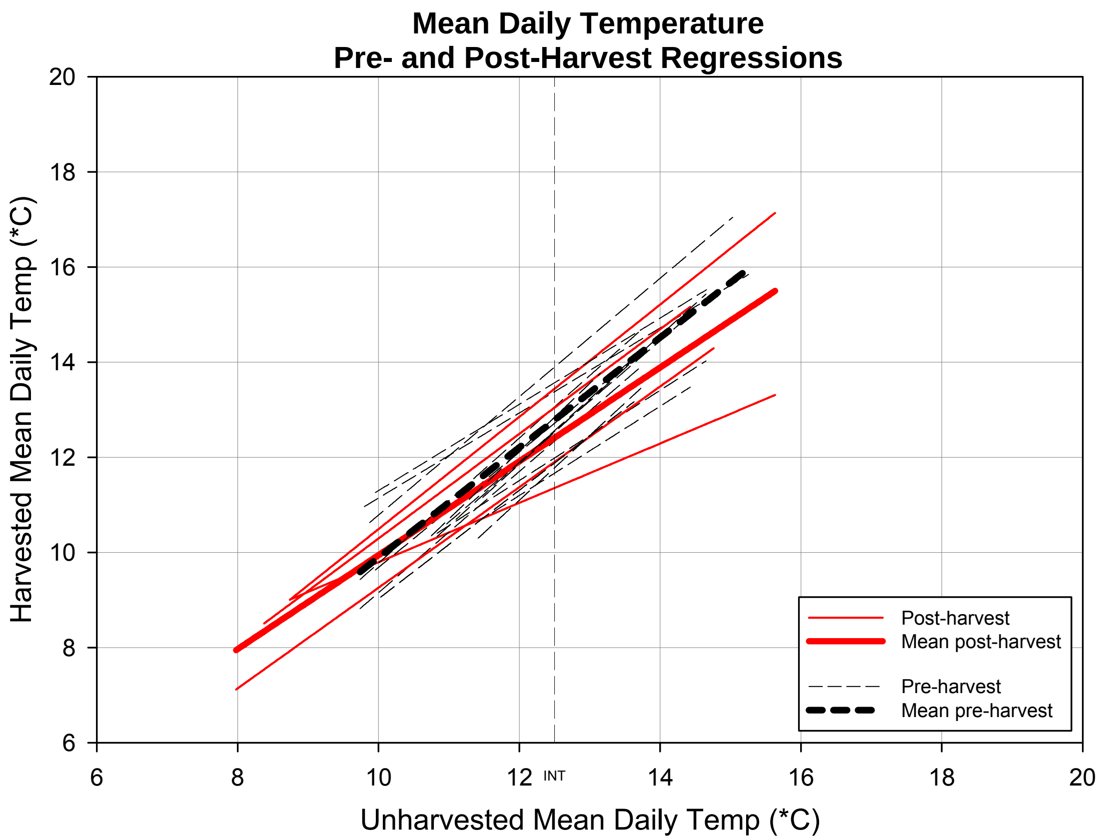


Figure 2.4c. Regressions of daily mean stream temperatures in harvested streams versus unharvested streams for each stream pair and year illustrate variability of the harvested-unharvested relationship before and after harvest. Mean pre- and post-harvest regressions illustrate comparisons made by the change detection model. Vertical dashed line indicates mean intercept.

Diel temperature fluctuation

The post-harvest ratio of harvested to unharvested diel temperature difference was found to be significantly greater than the pre-harvest ratio for every period of the summer except for the period from June 1 to June 14. The following table summarizes the differences between pre-harvest and post-harvest ratios.

Table 2.6. Mean percent change in diel temperature fluctuation after harvesting in four harvested streams. Change is significant in every period except for June 1 to June 14.

Period	Dates	Change	95% CI	DF	t-stat	p-value
1	6/1 to 6/14	49% greater	0 to 123% greater	8	2.27	0.0533
2	6/15 to 6/30	71% greater	25 to 135% greater	8	3.93	0.0043
3	7/1 to 7/14	79% greater	29 to 148% greater	8	4.08	0.0035
4	7/15 to 7/31	118% greater	63 to 193% greater	10	5.92	0.0001
5	8/1 to 8/14	137% greater	88 to 199% greater	10	8.29	<0.0001
6	8/15 to 8/31	97% greater	46 to 166% greater	10	5.05	0.0005
7	9/1 to 9/14	139% greater	96 to 190% greater	10	9.87	<0.0001
8	9/15 to 9/30	71% greater	27 to 128% greater	8	4.21	0.0030

The change between pre-harvest and post-harvest ratios can be interpreted to indicate that the diel range of stream temperatures was significantly greater after harvesting than before.

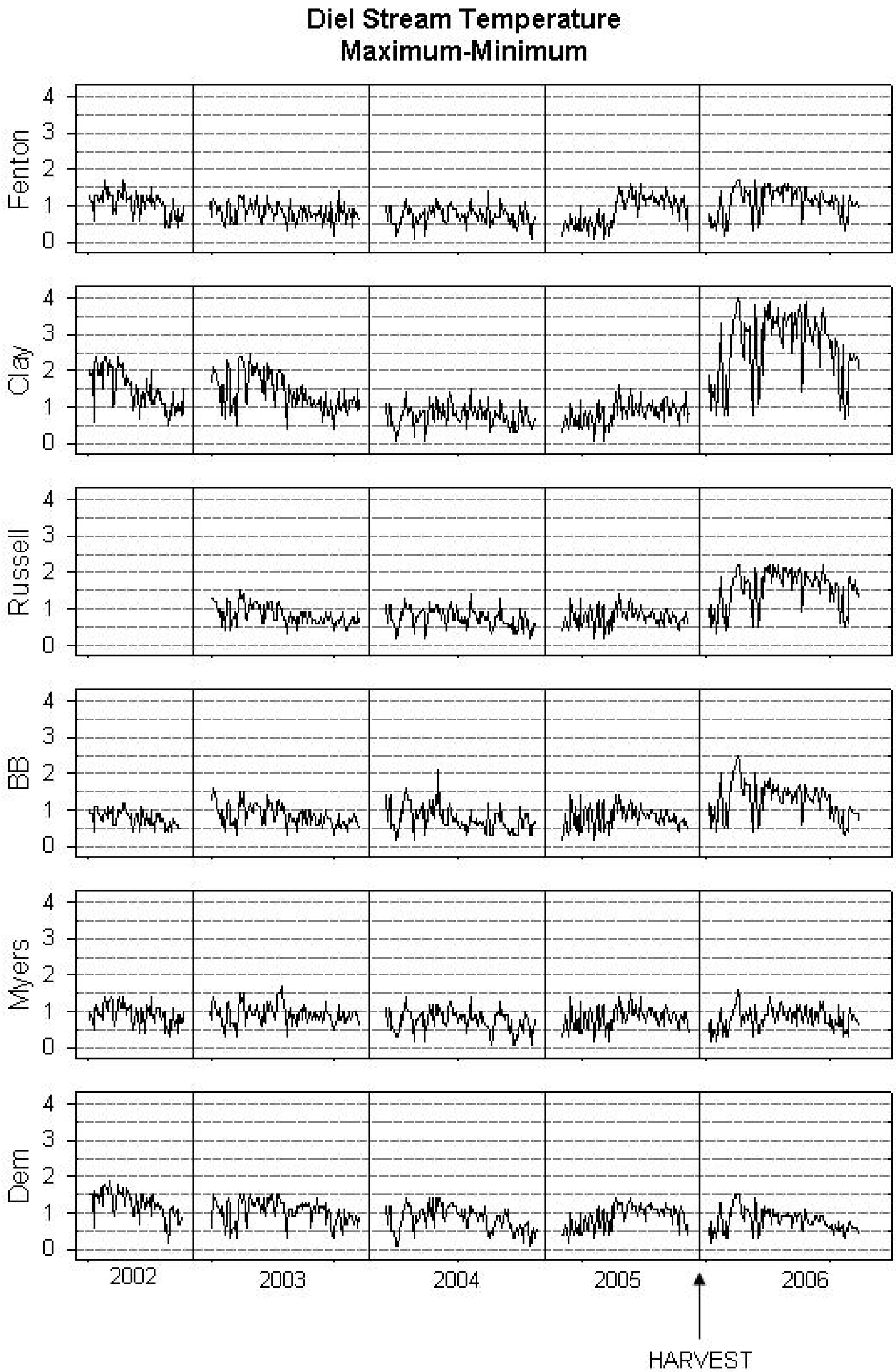


Figure 2.5. Diel fluctuation in stream temperature for every stream pre- and post-harvest. DeMerrseman and Myers are unharvested.

Greatest annual seven-day moving mean of the maximum daily temperature

Statistically significant changes to the magnitude of annual maximum seven-day moving mean of daily maximum temperatures were not detected following harvest at Hinkle Creek. The following table summarizes annual maximum seven-day mean for each stream pair and compares mean pre-treatment maximum seven-day mean to the post-treatment maximum seven-day mean.

Table 2.7. Differences between mean pre-harvest annual maximum seven-day mean stream temperatures and post-harvest annual maximums in each stream. Myers and DeMerrseman are unharvested.

Stream	**Pre-treatment mean (2002-2005) ˚C**	**Post-treatment (2006) ˚C**	**Change (Post-Pre) ˚C**
Fenton	14.9	13.9	-1
Clay	16.3	18.6	2.3
Russell	14.4	15.2	0.8
BB	14.6	15.7	1.1
Myers*	15	16	1
DeMerrseman*	14.2	14.8	0.6

*unharvested

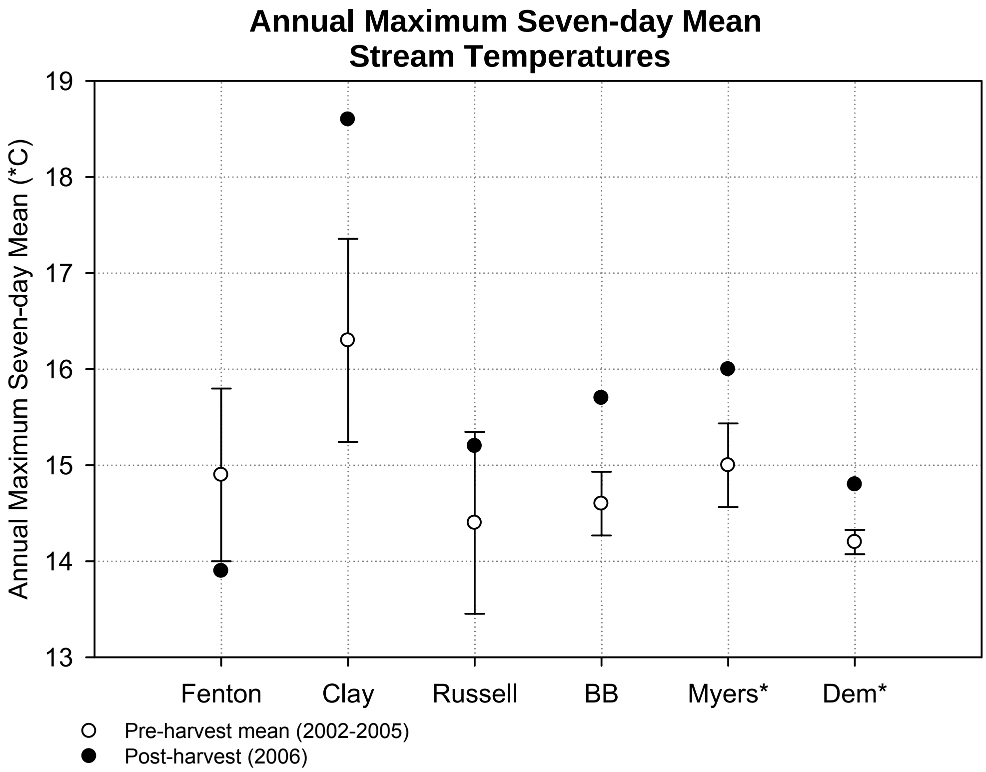


Figure 2.6. Annual maximum seven-day mean stream temperature in all streams, pre- and post-harvest. Error bars display one standard deviation from the mean of four pre-harvest years. *Myers and DeMerrseman are unharvested.

Cumulative degree days

Degree day accumulation for 2006 (post-harvest) is similar to pre-harvest years and patterns of degree day accumulation are similar between harvested and unharvested streams (Figure 2.7).

Canopy closure

A comparison of canopy closure observations taken in unharvested reaches (Figure 2.8) using a densiometer in 2004 and 2006 indicated that the 2004 densiometer crew measured 4% greater canopy closure than the 2006 crew. A similar comparison of canopy closure observations taken in 2004 and 2006 using the densiometer and the photo method revealed that the 2006 densiometer method measured 9% greater canopy closure than the photo method and the 2004 densiometer survey measured 13% greater canopy closure than the photo method. These differences are taken to represent a measure of error between the three surveys. Accounting for error between surveys allows for comparison of canopy closure measurements among the three surveys.

According to the 2004 pre-harvest densiometer survey, all reaches had greater than 95% mean canopy closure prior to harvest, with the exception of Clay DS which was harvested in 2001 before the onset of the Hinkle Creek study (Figure 2.9). The riparian zone surrounding first 100 meters of Clay DS was not harvested to provide trees for wildlife while the remainder of the reach was clearcut harvested.

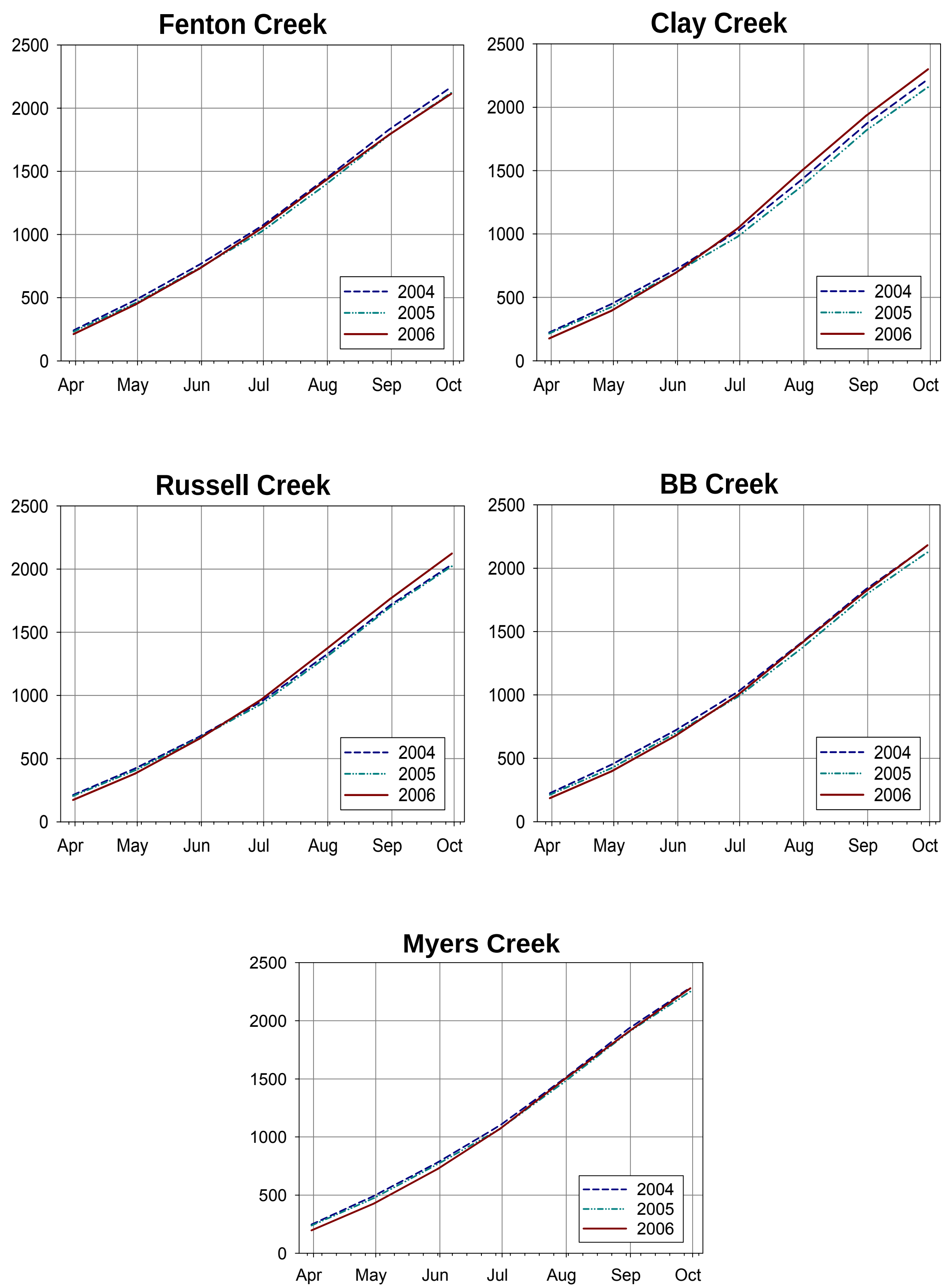


Figure 2.7 Cumulative degree days in four harvested and one unharvested stream for 2004, 2005 and 2006. Degree-day accumulation begins each year on March 1 and ends on September 30.

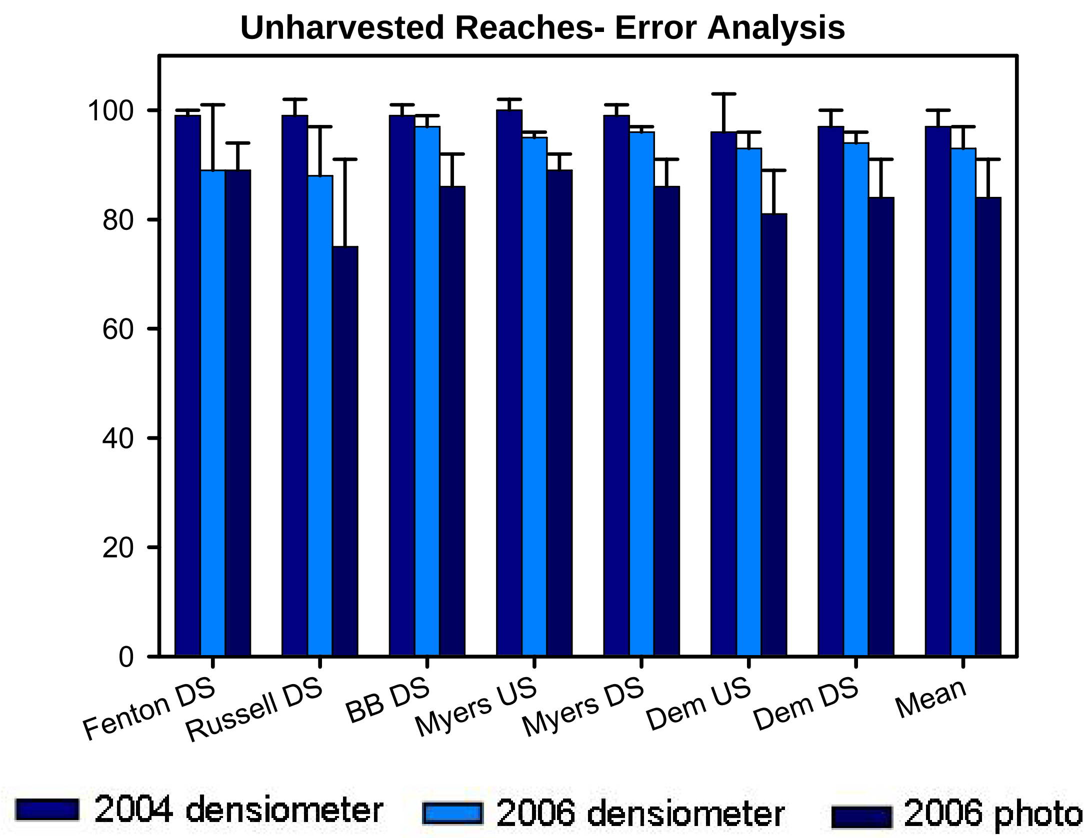


Figure 2.8. Error analysis: Percent canopy closure for all unharvested reaches. Error bars are one standard deviation of the mean. Final group represents mean values across all unharvested reaches.

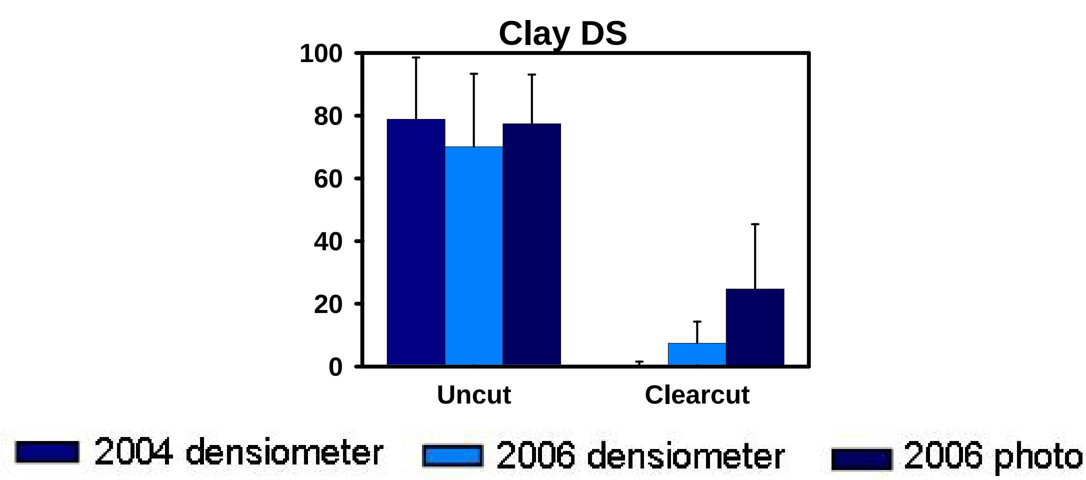


Figure 2.9. Percent canopy closure for uncut and clearcut portions of the Clay DS reach which was harvested in 2001. Error bars are one standard deviation of the mean.

The post-harvest densiometer survey indicates that canopy closure in harvested reaches decreased by 84% on average after harvesting, taking into account error between the 2004 and 2006 crews, whereas there was no change to canopy closure in unharvested reaches (Figure 2.10). However, the 2006 photo survey indicates that canopy closure decreased by 20% when error between the 2006 photo method and 2004 densiometer method is accounted for. Similarly, there was no difference in canopy closure between the densiometer method and the photo method after error between the two methods was accounted for in unharvested reaches.

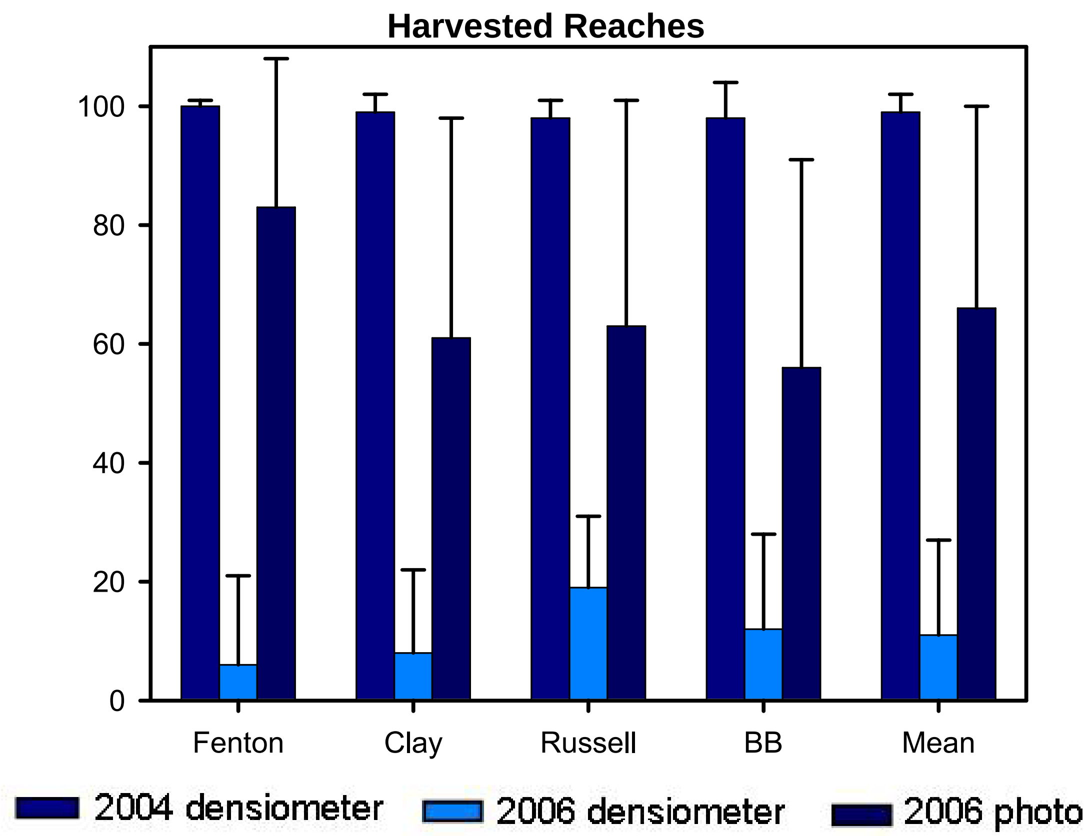


Figure 2.10. Percent canopy closure in harvested reaches. Error bars are one standard deviation of the mean. Final group represents mean values across all harvested reaches.

Table 2.8. Percent canopy closure and standard deviation in each surveyed reach before and after harvest. Fenton US, Clay US, Russell US and BB US were harvested in 2005. Clay DS was harvested in 2001.

Reach	2004 Densiometer	2006 Densiometer	2006 Photo
Fenton US*	100±1	6±15	83±25
Clay US*	99±3	8±14	61±37
Russell US*	98±3	17±19	63±38
BB US*	98±6	12±16	56±35
Myers US	100±2	95±1	89±3
DeMerrseman US	96±7	93±3	81±8
Fenton DS	99±1	89±12	89±15
Clay DS**	23±38	30±34	42±31
Russell DS	99±3	88±9	75±16
BB DS	99±2	97±2	86±6
Myers DS	99±2	96±1	86±5
DeMerrseman DS	97±3	94±2	84±7

* harvested winter 2005; **harvested 2001

Discussion

Analysis

The experimental design of Before After Control Intervention (BACI) studies intended to detect ecological change on the catchment scale, in particular paired watershed studies, is criticized due to costs associated with research on a watershed scale, pseudoreplication of experimental units and the difficulty of drawing causal inference that can be applied outside of the studied area (Hewlett 1973, Hurlbert 1984). However, using data from a paired control watershed as an explanatory variable to predict the response of a specific parameter of interest in a treated watershed can greatly increase the statistical power of change detection models when data observed in the treated and control watersheds are highly correlated (Loftis et al. 2001). The basic structure of a paired watershed investigation includes three distinct phases. During the calibration period, data are collected from paired treatment and control watersheds, which are both undisturbed and assumed to be in a state of equilibrium relative to one another with respect to the parameter of interest. Data recorded during the calibration phase establish the pre-treatment relationship between the treatment and control watersheds and characterize the inherent variability of that relationship. During the second phase, the treatment watershed is disturbed while the control watershed remains undisturbed. The third phase entails a period of post-treatment data collection from both watersheds and analysis focuses on detecting differences between the pre-treatment relationship and the post-treatment relationship. A key assumption made in all paired watershed studies is that the relationship between treated and control areas remains stable over time and that significant changes to the treatment-control relationship occur only due to the perturbation of the treated areas. Subtle fluctuation within the treatment-control relationship that occurs among pre-treatment years of data collection characterize an envelope of natural variability for the relationship and post-treatment changes to the relationship that exceed this envelope constitute significant treatment effects. Within the Hinkle Creek study, the assumption of a stable relationship between stream temperatures in harvested and unharvested streams allows for detection of a harvest effect if the relationship changes significantly following forest harvesting relative to the natural pattern of variability recorded during the calibration years.

Stream temperatures in the harvested and unharvested streams of Hinkle Creek are highly correlated (Table 2.4) thus, including the explanatory variable of stream temperature observed in the unharvested streams as a stable predictor of temperature in the harvested streams greatly enhances the power of the change detection model and reduces the probability that a Type II error will occur during analysis (Loftis et al. 2001). In order to detect changes to daily maximum, minimum and mean stream temperatures in the harvested streams, a pre-harvest relationship between each harvested and unharvested stream was defined by slope and intercept parameters of the harvested-unharvested pair regression line (Tables A1-A3, Appendix A). These regression parameters impart information about how each harvested stream responds to thermal fluxes relative to its unharvested counterpart and differences between the pre-harvest and post-harvest relationships are related through changes to these parameters. There are four possible outcomes of change between the pre-harvest and post-harvest relationships:

1. intercept could change while the slope remains stable,
2. slope could change while the intercept remains stable,
3. slope and intercept could change, or
4. slope and intercept could remain stable.

A change to the intercept parameter alone signifies that the harvested-unharvested relationship remains stable between years, but that every observation in the harvested stream is shifted up or down relative to its position in previous years (Figure 2.11).

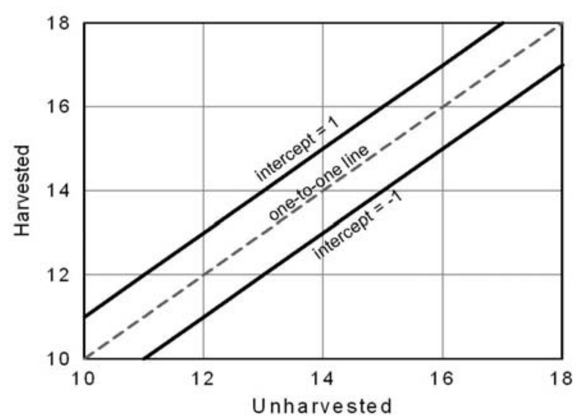


Figure 2.11. Comparison of lines with same slopes but different intercepts.

A slope greater than one indicates that for every one degree temperature increase or decrease in the unharvested stream, temperature in the harvested stream increases or decreases more than one degree (Figure 2.12). Slopes of greater than one signify more extreme temperature fluctuation in the harvested stream as compared to the unharvested stream.

Likewise, a slope of less than one indicates a damped temperature response in the harvested stream as compared to the unharvested stream.

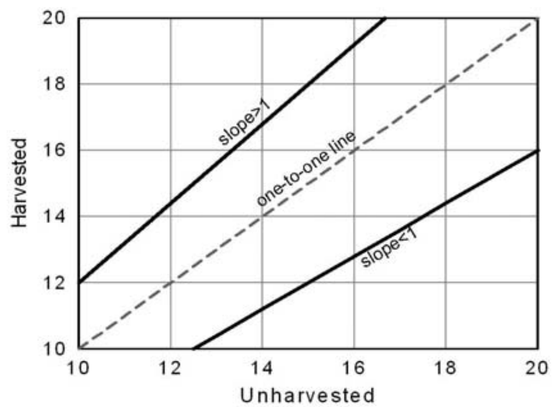


Figure 2.12. Comparison of regression lines with different slopes but same intercept. Slopes are greater than one, equal to one and less than one.

Lines that have different slopes (are not parallel) must eventually cross and if the cross occurs within the range of observed data, the conclusion of whether stream temperatures increased or decreased may vary depending on the range of temperatures in question. An increase in slope does not necessarily indicate that all stream temperatures in the range of observation increased. If the slope of the post-harvest regression increases compared to the pre-harvest slope while the intercept remains stable, this indicates that all temperatures greater than where the pre-harvest and post-harvest lines meet are greater after harvesting than before harvesting. Temperatures that fall below where the pre- and post-harvest lines cross may be cooler in the harvested stream after harvesting. If a difference between pre- and post-harvest slopes occurs in conjunction with a divergence between pre- and post-harvest intercepts, it is possible that the direction of post-harvest stream temperature response may vary even more dramatically depending upon the range of temperatures in question (Figure 2.13).

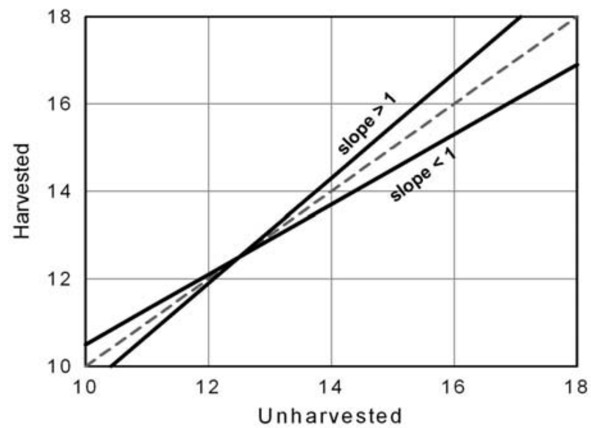


Figure 2.13. Comparison of lines with different slopes and different intercepts. Slopes are greater than one, equal to one and less than one; intercepts are -1, 0 and 1.

For example, if the slope of the post-harvest regression increased relative to the pre-harvest slope and the post-harvest intercept decreased relative to the pre-harvest intercept, it is possible that post-harvest stream temperatures could be greater than pre-harvest temperatures on the warmer end of the observed temperature range and less than pre-harvest temperatures on the cooler end. Therefore, if significant changes to either slope alone or both slope and intercept are confirmed, it is important to specify the range of temperatures over which changes occurred.

A change in slope or intercept between years in a given stream pair signifies that at least one stream is receiving or processing energy differently than in previous years. Because the unharvested watersheds remain undisturbed, it is inferred that any difference between the pre-harvest and post-harvest relationship is due to disturbance of the harvested streams. Additionally, because the pre- and post-harvest harvested-unharvested relationship are created with data from stream pairs that are geographically proximate and subjected to similar climatic conditions, the potentially confounding factor of interannual climatic variability is addressed by investigating changes to the unharvested-harvested relationship.

The significance of a change in slope or intercept after harvest depends on the magnitude of the change relative to the variability among slopes and intercepts observed during pre-harvest years. A change between the pre- and post-harvest parameter of interest must be large relative to the variance of that parameter in order to reject the null hypothesis of no change between pre- and post-harvest conditions. Regression slopes among the four pre-treatment years are stable and variability is low within individual stream pairs (Tables A1-A3 in Appendix A, Figures 2.3a-2.3c). However, variation among mean pre-harvest slopes of the four stream pairs increases variability within the change detection model, which increases the smallest difference in pre- and post-harvest slopes that can be considered statistically significant.

Intercepts vary widely among years within some individual stream pairs. A pattern of shifting intercepts between years was observed in the calibration relationships of Fenton and Clay Creeks (Figures 2.3a-2.3c). Both harvested streams were paired with Myers Creek as the unharvested stream. Data from 2003 and 2004 cluster together as do data from 2002 and 2005 and intercept values from 2003 and 2004 regressions are on the order of 1 to1.5˚C greater than intercepts from 2002 and 2005 regressions, which increases variability within the intercept parameter of these two streams. In contrast, Russell and BB Creeks were paired with DeMerrseman Creek and less interannual variability among intercept parameters exists in Russell and BB regressions than in Fenton and Clay regressions. The difference in variability between stream pair regressions is easily observed when the size of 95% prediction intervals around Fenton and Clay regressions are compared to prediction intervals around Russell and BB regressions (Figures 2.3a-2.3c). The fluctuation of intercept parameters before harvest most likely occurred because of differences in hydrologic variables between years in Fenton and Clay Creeks. This fluctuation in the intercept parameters does not invalidate the calibration relationships, but rather characterizes the variability that can be expected between undisturbed stream pairs.

Maximum, minimum and mean daily stream temperatures

The regression parameters of the post-harvest regressions of maximum daily stream temperatures were not significantly different than pre-harvest regression parameters, which indicates that maximum daily stream temperatures in harvested streams did not increase significantly after forest harvesting. These results are contrary to findings reported in several past BACI studies that examined effects of forest harvesting on temperatures of small streams in the Pacific Northwest. In similar paired watershed investigations, maximum daily stream temperatures often increased after forest canopies were removed (Levno and Rothacher 1967, Brown and Krygier 1970, Gomi et al. 2006, Macdonald et al. 2003). However, Jackson et al. (2001) reported minimal change to stream temperatures in western Washington headwater streams following clearcutting.

Slopes of post-harvest minimum and mean daily stream temperature regressions were significantly less than pre-treatment regression slopes while post-harvest intercepts were not significantly different than pre-treatment intercepts. Over the range of stream temperatures observed, the lower slopes indicate that on most days, minimum and mean daily stream temperatures decreased after harvesting at Hinkle Creek (Figures 2.4c and 2.4c). Changes to minimum stream temperatures are not as widely cited in stream temperature literature as changes to maximum temperatures, likely because the temperature standards of most States are created to address maximum temperatures. However, some research has reported significant decreases to minimum daily temperatures after forest harvesting (Johnson and Jones 2000, Macdonald et al. 2003).

Plots of 95% prediction limits around pre-harvest regression lines function not only to allow visual characterization of the variance of pre-treatment relationships, but also permit identification individual post-harvest departures from predicted values (Figures 2.3a-2.3c). By definition of the 95% prediction interval, one would expect 5% of the post-treatment data to fall outside of the prediction limits, even in lieu of a significant treatment effect.

Examination of regression plots with 95% prediction limits reveals that in 9 out of 12 plots, over 5% of post-treatment data fall outside of 95% prediction limits and that there is a consistent pattern to the departures. Whether the departures fall above the upper 95% prediction limit as in daily maximum temperatures of BB Creek or below the lower 95% prediction limit, as seen in daily maximum temperatures of Fenton Creek (Figure 2.3a), almost every departure from the 95% prediction interval is observed when temperatures in the unharvested stream are greater than 12˚C. The 12˚C threshold is consistent among daily maximum, minimum and mean temperatures. This pattern of departure from the 95% prediction interval indicates that the most significant changes between pre- and post-harvest stream temperatures occurred on days when daily maximum, minimum and mean stream temperatures exceeded 12˚C.

This is an important piece of information to consider when interpreting the slope decreases observed in minimum and mean daily temperature regressions. Lower stream temperatures were observed after harvesting in the harvested streams when the temperature in the unharvested stream was greater than 12˚C. When stream temperatures in the unharvested streams were below the 12˚C, stream temperatures in the harvested streams were similar to pre-harvest temperatures. The pre-harvest and post-harvest slopes were significantly different, and were not parallel and so the lines must cross at some temperature value in the unharvested stream. This temperature in the unharvested stream is a threshold and when minimum or mean daily temperatures are above this threshold value, minimum and mean stream temperatures in the harvested streams were lower after harvest than before harvest. The cross occurred when the minimum daily temperature in the unharvested streams was 9˚C and the mean daily temperature was 10.3˚C. In summary, minimum daily stream temperatures in harvested streams were lower after harvesting when minimum temperatures in the unharvested streams were greater than 9˚C and did not change when minimum temperatures in the unharvested streams were cooler than 9˚C. Likewise, mean daily stream temperatures in harvested streams were lower after harvesting when mean temperatures in the unharvested streams were greater than 10.3˚C and did not change when minimum temperatures in the unharvested streams were cooler than 10.3˚C.

Diel temperature fluctuation

Throughout the summer, diel stream temperature range fluctuates in a pattern of higher diel range during the mid-summer weeks and lower fluctuation at the beginning and end of the warm season (Figure 2.5). As such, it is unreasonable to compare diel stream temperature fluctuations from the beginning or end of the warm season to temperature ranges that occur during the mid-summer weeks. In order to avoid such unrealistic comparisons, the warm season (June 1 to September 30) was partitioned into eight discrete periods that were analyzed separately.

The highly significant differences observed between pre- and post-harvest diel stream temperature fluctuations at Hinkle Creek are similar to results reported for other comparable stream temperature studies (Brown and Krygier 1970, Johnson and Jones 2000). Johnson and Jones [2000] observed that diel range in harvested streams was much greater than in unharvested streams and that diel fluctuation in the harvested streams recovered to magnitudes comparable to unharvested streams after the riparian canopy recovered to pre-harvest levels. Brown and Krygier [1970] reported that diel temperature fluctuations increased dramatically in a clearcut watershed whereas diel fluctuations in an undisturbed and patch-cut watershed did not change appreciably. Most studies that cite differences between pre-harvest and post-harvest diel stream temperature fluctuations often also report significantly greater maximum daily stream temperatures, which were not observed at Hinkle Creek. Rather, the significantly lower minimum daily stream temperatures observed at Hinkle Creek was likely the source of the wider diel fluctuations observed after harvesting.

Diel stream temperature ranges recorded in 2005 in Fenton Creek illustrate the nearly immediate effect of forest harvesting on diel stream temperature fluctuations (Figure 2.5). Fenton Creek was the first harvest unit to be felled and was cut during the summer of 2005. Data from 2005 in Fenton Creek were removed from analysis because data from half of this summer reflect clearcut conditions. On July 14, 2005, diel stream temperature fluctuation nearly doubles as compared to ranges observed the week prior. This date coincides closely with the start of harvesting in Hinkle Creek.

Degree days

Plots of cumulative degree days for harvested streams beginning on March 1 indicate little change in degree day accumulation between pre-harvest years and the post-harvest year (Figure 2.7). Analyses of mean daily temperatures during the warm season (June 1 to September 30) indicate that mean daily stream temperatures decreased in every stream. The decrease in warm season mean daily temperature was not apparent in degree day accumulation starting on March 1 as three of the four harvested streams exceeded pre-harvest degree day accumulation by early July 2006. By October 1 in 2006 Clay Creek had accumulated 78 (3%) more degree days than in 2004 and 140 (6%) more degree days than 2005, Russell Creek had accumulated 86 (4%) more days than 2004 and 100 (5%) more than 2005 and BB Creek had accumulated 4 (0.2%) more days than 2004 and 54 (2.5%) more days than 2005. Cooler mean temperatures were apparent in Fenton Creek which accumulated 53 (2.5%) less degree days in 2006 than in 2004 and 8 (0.4%) days less than 2005. The cumulative degree day plot for Myers Creek (unharvested) demonstrates that 2006 was similar to 2004 and 2005 in terms of degree day accumulation in an undisturbed stream. Johnson and Jones [2000] reported that degree days accumulated more rapidly in an unshaded clearcut stream and a stream scoured by a debris flow than in shaded streams but also reported increases to mean maximum and minimum weekly temperatures in the unshaded streams.

Experimental design and individual stream reach analysis

Pseudoreplication is a common criticism of past paired watershed study designs as many seminal paired watershed studies have based their conclusions on the response of single iterations of applied treatments and employed statistical methods that were designed for replicated studies (Hurlbert 1984). The Hinkle Creek stream temperature study is a paired watershed experiment where the harvesting treatment was applied to multiple experimental units. Within the experimental design of the Hinkle Creek study, the four harvested streams represent four replicates of the harvesting treatment and the average response across the four streams constitutes the overall response. While the replicated experiment is necessary to allow for correct application of hypothesis testing, it is also informative to scrutinize the response of each individual stream. Examination of stream temperature responses and variables that may influence stream temperature at the individual reach level may allow for more comprehensive conclusions to be drawn pertaining to processes that influence stream temperature patterns.

Significant changes to maximum daily stream temperatures were not detected at Hinkle Creek when the mean response of all four harvested streams was considered. An overall response of no change to the unharvested-harvested relationship after harvesting may imply that no change was observed in any of the four individual relationships, which is misleading. When the four streams are considered individually, it is evident that slopes of daily maximum temperature regressions changed significantly in Fenton and BB Creeks after harvest. The post-harvest slope in Fenton Creek was 0.28 (30%) lower than the mean of the pre-harvest slopes and the post-harvest slope in BB Creek was 0.30 (37%) higher than the mean of the pre-harvest slopes (Table 2.5a). There was no appreciable change to post-harvest slopes in Clay and Russell Creeks and as the response vectors from Fenton and BB Creeks were approximately equal in magnitude and opposite in direction, the net change became zero (Figure 2.3a, Table 2.5a).

A similar pattern emerges when the four streams are considered individually in the analysis of annual maximum seven-day mean. Once again, it is helpful to consider the annual maximum temperatures observed in the unharvested streams as a prediction of the annual maximum temperatures that should occur in the harvested streams if there were no change. Annual maximum seven-day mean stream temperatures in the two unharvested streams were 0.5 to 1˚C greater in 2006 than the average of the four pre-harvest years (Table 2.7, Figure 2.6). A similar pattern in the harvested streams should be observed if there were no changes to stream temperatures due to harvesting. The difference between post-harvest and pre-harvest annual seven-day maximums in Russell and BB Creeks was comparable to the difference observed in the unharvested streams, however the annual maximum was 1˚C lower than the average in Fenton Creek and 2.3˚C higher than the average in Clay Creek. Once again, although changes to annual maximum seven-day mean were observed in individual streams, because the streams responded divergently, the overall result is no net change. The pattern of divergent response among the four harvested streams was not observed in minimum and mean daily stream temperature relationships. Slopes of the unharvested-harvested regressions of minimum and mean daily stream temperature decreased after harvesting in all four streams.

Divergent responses among experimental replicates suggest that the effect of treatment was not great enough to stand out beyond the natural variability of the studied experimental units. However, when systems as complex as streams are investigated, one must question whether the temporal and spatial heterogeneity inherent to stream reaches renders the individual stream undesirable as an experimental replicate. The replicated experimental design was developed to detect changes to one isolated variable while all other variables are held constant. The assumed consistency of other factors implies that some level of control must exist over the remaining variables. This level of control is nearly impossible to achieve when working with natural systems, particularly with replicates that are as variable and complex as streams. Heterogeneity in microclimatic factors, surface discharge patterns, stream morphology, and delivery and exchange of water through changing subsurface flowpaths may affect stream temperature patterns from year to year and from stream to stream within a given year. If each variable that could potentially influence stream temperature were controlled, experimental units of replicated concrete troughs would replace actual streams in order to isolate the one variable of interest. However, from a management perspective, such a controlled experiment would not provide the desired information about the effects of forest harvesting on natural streams. Therefore, the inherent variability of streams as replicates must be addressed in any experiment designed to detect stream temperature changes. The use of data from an unharvested stream addresses interannual variability of landscape-scale factors such as climatic variability, but we are still left with many complex processes and interactions within the entity of the individual stream that may be different in the treatment stream and the paired control or between harvested replicates. Investigating changes observed on the level of the individual stream reach rather than on the scale of a replicated experiment can help to identify some of the processes that lead to the observed responses. Additionally, reach-level documentation of variables known to be important to the process of stream heating can be used to explain changes that we observe in each individual stream and perhaps to construct a conceptual framework of the dominant processes that led to the observed stream temperature patterns.

Canopy closure

Based upon results from similar temperature studies in headwater streams in the Pacific Northwest and on the principles of thermal dynamics for a small stream discussed in Brown’s energy balance, the primary *a priori* hypotheses for the Hinkle Creek stream temperature study were that maximum daily stream temperatures would increase significantly, minimum daily temperatures would decrease slightly and mean daily temperatures would increase slightly or remain stable after harvesting. After documenting different results than were hypothesized, it is evident that the suite of processes that control reach scale stream temperatures are not fully understood at this point, or that more specific information is needed to explicate the results. One important piece of information that may partially account for the observed temperature response is the change in solar radiation exposure between pre-harvest and post-harvest years. Absorption of solar radiation is the primary mechanism that causes stream temperatures to increase (Brown 1969, Beschta et al. 1987, Johnson and Jones 2000, Johnson 2004) and as the level of shade over a stream is a significant control to the amount of solar radiation that reaches the stream surface, shade is a crucial determinant of stream temperature patterns (Brown and Krygier 1970, Levno and Rothacher 1967). Although an intact forest canopy is the traditional and most widespread mechanism of stream shading, researchers have demonstrated that any material that attenuates solar radiation before it reaches the stream can prevent increases to stream temperature in similar fashion to a forest canopy (Johnson 2004, Jackson et al. 2001). The anticipated results of the stream temperature study were hypothesized assuming that shade over the streams would decrease considerably after the overstory canopy was removed, leaving the streams exposed to significantly greater amounts of solar radiation. Because solar radiation is the primary driver of stream temperature, it is desirable to compare levels of solar radiation that reached the streams before and after harvesting as it is plausible that the streams did not receive the expected increase in delivery of solar radiation.

Often in forestry and ecological research, rather than taking direct measurements of solar radiation, which is costly and time-consuming, researchers quantify levels of canopy openness to use as a proxy for available solar radiation. Jennings et al. [1999] defines canopy openness as the proportion of sky that is not covered by vegetation and where solar radiation is available to reach the stream without attenuation. Canopy closure is the analog of canopy openness and represents the proportion of sky where shortwave solar radiation is attenuated before it can reach the stream and is related to canopy openness by the following equation:

$$\text{Canopy closure} = 1 - \text{Canopy openness}$$

Canopy closure was measured before and after harvesting with a hand-held spherical densiometer. The spherical densiometer was chosen because it is inexpensive, does not require extensive technical training to employ and measures canopy closure quickly. In total, 688 canopy densiometer measurements characterized twelve stream reaches in the 2004 (pre-harvest) survey and 585 densiometer measurements were taken in the 2006 (post-harvest) survey. This density of canopy closure sampling could not have been feasibly achieved using a more time-consuming method, such as hemispherical photography.

Mean canopy closure within the harvested reaches of Hinkle Creek was over 95% in every reach surveyed with a densiometer before harvesting occurred and harvested reaches had a mean canopy closure of 99%. Therefore the pre-harvest maximum daily temperatures recorded at Hinkle Creek occurred in response to less than 5% of the total available solar radiation. Daily energy balances at Hinkle Creek before harvest most likely looked similar to Brown's energy budget for a forested stream (Figure 1.1a) where evaporation, convective heat exchange and longwave radiation were comparable to incoming solar radiation. According to the survey of post-harvest canopy closure sampled with a densiometer, mean post-harvest canopy closure in the harvested reaches was 11%, meaning that the harvesting treatment reduced overstory canopy closure by 88%. An energy budget for a stream with 11% canopy closure would look more like Brown's energy budget for an unshaded stream (Figure 1.1b) where the magnitude of the incoming solar radiation term is two orders of magnitude larger than the magnitudes of sensible and latent heat flux. If the harvested streams had been exposed to 88% more solar radiation the summer after harvest than in previous years, Brown's energy budget predicts that dramatic increases in stream temperature would be observed. However, the post-harvest stream temperature data clearly indicate that stream temperatures did not increase dramatically following harvest and in fact, stream temperatures decreased in one harvested stream. Clearly, the canopy closure values obtained from the post-harvest densiometer survey underestimated the amount of shade available within the harvested reaches. A possible explanation for the underestimation is that a densiometer is read at waist height, thus cover located below waist height was not accounted for in the densiometer survey. The densiometer survey was an effective method to measure overstory canopy closure but did not provide a true approximation of solar radiation exposure in the harvested streams.

After harvesting, the harvested streams were partially covered by a layer of organic material that was left when the merchantable timber was removed. This layer of logging slash attenuated significant amounts of solar radiation before it could reach the streams. In order to estimate the true increases to solar radiation exposure that occurred as a result of the harvesting treatment, pre-harvest canopy closure and the post-harvest canopy closure that accounts for both overstory vegetation and slash cover must be compared. To quantify canopy closure that included the slash, canopy closure was measured from a perspective of just inches above the stream surface and below the intact slash layer. It was also desirable that a sampling density comparable to the sampling density measured with the densiometer survey was maintained during the slash-closure survey. An additional constraint to the method of measuring slash-closure was that the sampling device had to be small as the space between the stream and the slash layer was often tight. A 35 millimeter digital photo survey was preferred over hemispherical photography because the time constraints associated with hemispherical photography would not allow the desired sampling density and because the hemispherical equipment set-up was too large to fit underneath the slash. Therefore, during the 2006 canopy closure survey, canopy closure was sampled at each survey point with both the densiometer and a digital photo.

Comparing measurements of canopy closure obtained using the two different sampling methods is difficult, however if the error between the two methods can be quantified, the two methods can be compared directly. Seven stream reaches that did not receive a harvesting treatment were surveyed before and after harvesting. These seven reaches had an intact canopy throughout the study period and it is reasonable to assume that change to the true level of canopy closure in these reaches throughout the period of study was negligible. A comparison of canopy closure measurements in these seven reaches taken pre-harvest and post-harvest using the densiometer and photo methods reveals that the differences between canopy closure levels reported in the 2004 and 2006 densiometer surveys and the 2006 densiometer and 2006 photo surveys are consistent between stream reaches (Figure 2.8). On average, the 2004 densiometer survey shows 4% more canopy closure than the 2006 densiometer survey and the 2006 densiometer survey reported 9% more canopy closure than the 2006 photo survey. This brings the total mean error between the 2004 densiometer and 2006 photo survey to 13%. When the 13% error is taken into account, it is possible to compare pre-treatment canopy closure to post-treatment cover from overstory vegetation and logging slash. This comparison allows the reductions in cover due to the harvesting treatment to be quantified.

When the 4% error between the 2004 and 2006 densiometer surveys is considered, the harvesting treatment resulted in an 84% reduction in overstory canopy closure in harvested streams. When cover from logging slash is included in the cover estimates and error between the 2004 densiometer survey and 2006 photo survey is taken into account, canopy closure in harvested streams dropped from a pre-harvest mean of 87% to a post-harvest mean of 67%. A 20% decrease in canopy closure would result in much less dramatic increases to stream temperature than the 84% reduction that was quantified by the densiometer survey.

The 4% error calculated between the 2004 and 2006 densiometer surveys can be attributed to operator error. Two different field crews collected data during the 2004 and 2006 surveys and all error between the two surveys is due to the different operators. The 9% difference between the 2006 densiometer and photo surveys is due to the fact that the two methods sample different areas of the canopy. A spherical densiometer samples approximately an 180˚ view whereas the area of canopy sampled by the 35 millimeter camera lens is smaller. The wider angle of the densiometer accounts for cover that attenuates solar radiation all solar angles throughout the day whereas the photo mainly samples cover that attenuates light during peak solar angles. The different sampling area is probably the main reason for the 13% difference in canopy closure estimated by the two methods.

Past research that examined the effect of forest harvesting on stream temperatures of small streams has often reported that maximum stream temperatures increased dramatically following harvesting (Levno and Rothacher 1967, Levno and Rothacher 1969, Brown and Krygier 1970, Gomi et al. 2006). Most of the sizable increases observed occurred when all logging slash was removed from the stream. Maximum stream temperatures in Watershed 1 of the HJ Andrews Experimental Forest were 2˚C higher than predicted values after logging but were 7.5˚C higher than predicted after logging slash was removed from the stream and burned (Levno and Rothacher 1967, Levno and Rothacher 1969). Likewise, maximum stream temperatures did not increase when Watershed 3 of the HJ Andrews was patch-cut with buffers, however when debris flows scoured the channel and removed the riparian vegetation and downed vegetation in the stream channel, significant increases to maximum stream temperatures were observed (Levno and Rothacher 1967). Stream temperatures observed in a clearcut watershed in the Alsea Watershed Study increased by 8˚C the summer after harvesting, however greater increases were observed during the second summer after harvesting when logging slash was removed from the stream and burned (Brown and Krygier 1970). Logging slash was not removed from four streams that were clearcut without buffers in British Columbia and the maximum temperature increases in these streams varied between 2 and 8˚C (Gomi et al.

2006). Although logging slash was not removed from the streams, Gomi et al. [2006] state that the slash did not cover the streams or provide significant shade. The amount of shade provided by slash was not measured in the British Columbia study and it is possible that the variable maximum temperature response could be partially attributed to variable levels of shading by slash among the four streams. Finally, Jackson et al [2001] observed that maximum stream temperatures did not increase appreciably in streams that were clearcut with no buffers and covered by logging slash. The amalgamation of evidence in these studies indicates that logging slash can provide significant shade to streams and may moderate large increases to maximum stream temperatures. The absence of a significant maximum stream temperature response observed in the headwaters of Hinkle Creek can be attributed, in part, to the extensive cover provided by logging slash.

Further explanation of results

The primary physical mechanisms that dissipate heat from streams are evaporative heat flux and emission of longwave radiation (Boyd and Kaspar 2003). As evaporative flux is controlled by wind speed and vapor pressure gradients at the stream-air interface (Dingman 2002), most energy removed from the stream via evaporative heat flux is removed during the day during peak wind speeds and when the greatest vapor pressure deficit exists (Gauger and Skaugset, unpublished data). Brosofske et al. [1997] reported that forest harvesting disrupted pre-harvest riparian microclimatic gradients and that relative humidity near the stream was lower post-harvest as compared to pre-harvest values. As the vapor pressure of air is directly proportional to relative humidity, a decrease in relative humidity above the stream could lead to increased heat loss from the stream through evaporation and result in cooler minimum temperatures than would be observed under an intact forest canopy. The decreases in near-stream relative humidity observed by Brosofske et al. [1997] were not observed in clearcut conditions but rather represent conditions within buffered stream reaches. Brosofske et al. [1997] observed an exponential decrease in near-stream relative humidity as buffer width decreased thus, relative humidity could potentially be lower in clearcut streams than in the streams investigated in this study.

Brown's daily energy budget for a small stream (Figure 1.1a-1.1b) indicates that net energy fluxes directed away from the stream (negative fluxes) occur during the night (Brown 1983). Emission of longwave radiation is generally the dominant mechanism that removes heat from the stream at night (Brown 1969, Gauger and Skaugset 2004). Macdonald et al. [2003] proposed that stream temperatures were lower than expected following forest harvesting because removal of the riparian canopy allowed net heat losses through longwave back radiation to increase. It is uncertain as to whether the slash layer that covered the streams of Hinkle Creek affected longwave radiation in the same manner as an intact riparian canopy.

Although changes to the riparian microclimate and nighttime longwave radiation emission may partially explain the observed cooler minimum daily stream temperatures, and the minimal response of daily maximum stream temperatures may be partially explained by high levels of slash cover, there is also a hydrologic factor that has likely influenced the post-harvest stream temperature response. There is thorough documentation within the hydrologic literature that stream discharge increases after forest harvesting and that the effect of harvesting on streamflow varies seasonally in western coniferous forests (Harr et al. 1979, Jones and Post 2004, Keppler and Ziemer 1990, Hicks et al. 1991). In the Pacific Northwest, the largest absolute pre- to post-harvest differences in streamflow occur in the winter while greatest changes to relative streamflow occur during dry summer months (Jones and Post 2004). Harr et al. [1979] reported that summer baseflows in southwestern Oregon increased by 196% after a watershed was clearcut. Hicks et al. [1991] reported a 159% increase in late summer streamflow after logging in the HJ Andrews Experimental Forest. A significant increase in summer baseflow increases the volume of water present in the stream channel at any given time and a stream that contains a greater volume of stream water will not warm as much as a stream with a lesser volume of water. The observed increases to streamflow after forest harvesting are attributed primarily to increased inputs from subsurface sources, which have a lower temperature than the minimum daily temperatures observed during the warm season in surface waters of Hinkle Creek. Increases to summer baseflows may partially account for the lack of significant increases to maximum daily temperatures and the significant decreases to mean and minimum daily temperatures in Hinkle Creek. Increases to baseflow volume may also explain the divergent temperature responses observed in maximum daily temperatures. Changes in streamflows were documented to be related significantly to the percentage of total watershed area logged in Caspar Creek (Keppeler and Ziemer 1990). Out of the four stream replicates, the greatest percentage of the watershed was harvested from Fenton Creek (75%) and maximum daily stream temperatures decreased in Fenton Creek after harvesting (Table 2.1, Table 2.5a, Figure 2.3a), perhaps due to increased streamflow. In comparison, only 32% of the BB Creek watershed was harvested and maximum daily temperatures increased in BB Creek after harvesting (Table 2.1, Table 2.5a, Figure 2.3a).

There is an interesting opportunity to further explore the hypothesis that stream temperatures in Fenton Creek decreased after harvesting due to greater inputs of cooler subsurface water. During the summer of 2005, 75% of the Fenton Creek watershed was felled and diel stream temperature fluctuations in Fenton Creek increased immediately after the onset of felling (Figure 2.5). Diel stream temperature fluctuations increased in other streams at this time due to natural seasonal patterns in diel stream temperature, however the increases observed in Fenton Creek were abrupt and of a greater magnitude than increases observed in unharvested streams. The rapid and sizable response indicates that stream temperatures in Fenton Creek responded to felling almost immediately. Because there is often a lag time associated with streamflow increases following vegetation removal, the immediate response in Fenton Creek suggests that increased streamflow was perhaps not the cause of immediate change in diel temperature fluctuations, but that a more instantaneous factor, such as increased solar radiation, was the cause of the abrupt increase in diel fluctuations. If solar radiation were the cause of the instantaneous upsurge in diel stream temperature range, it would be evidenced by increases in maximum daily temperatures. Time-series plots of daily minimum and maximum stream temperatures in Fenton Creek and Myers Creeks (unharvested) during the summer of 2005 indicate that maximum temperatures do increase in Fenton Creek around the time of the abrupt change in diel temperature fluctuation, but that the change is similar in timing and slightly lower in magnitude as compared to changes that occur in Myers Creek at the same time (Figure A7). However, minimum temperatures in Fenton Creek appear to be lower than minimum temperatures in Myers Creek. Therefore it seems that increases in diel fluctuation are greater at Fenton Creek than in the unharvested stream due to lower minimum temperatures rather than warmer maximum temperatures. Changes to summer baseflows in Hinkle Creek were not explored in this study, however a full comparison of pre- and post-harvest summer streamflow should be completed to assess the extent to which stream temperature patterns were influenced by changes to baseflow.

Future considerations for stream temperatures in Hinkle Creek

Although the accumulation of logging slash excluded solar radiation and prevented dramatic stream temperature increases the first summer after harvesting, the thermal buffer provided by the slash is temporary. The slash is comprised of organic material that, in time, will decompose, be consumed or may be moved out of the stream or downstream by high flows. It is inevitable that over time the slash will disappear, leaving the stream increasingly more exposed to solar radiation. The rate of riparian vegetation recovery relative to the rate of slash decomposition will determine the solar radiation loading to the streams over time. In an analysis of cumulative effects of harvesting of stream temperature Beschta and Taylor [1988] assume that the effects of canopy removal on temperatures of small streams are greatest for 5 years after harvesting and that the effects decrease linearly over a period of the following 15 years until pre-harvest canopy closure levels are obtained 20 years after harvest. Similarly, Johnson and Jones [2000] observed that stream temperatures in harvested streams of the HJ Andrews paired watershed study recovered to pre-harvest conditions after full canopy closure was achieved 15 years after harvest. Similar rates of recovery may be observed in watersheds that are permitted to naturally regenerate after harvesting, however, the continued management of intensively managed watersheds may result in a trajectory of growth different from that cited by previous research. If the slash decomposes at a rate faster than the riparian vegetation grows, it is likely that the stream will be exposed to direct solar radiation and that stream temperatures will increase.

The clearcut portion of the Clay DS reach affords a convenient on-site glimpse into what canopy closure levels in the harvested reaches may resemble in five years. The Clay DS reach was harvested by Roseburg Forest Products in 2001 using similar equipment and techniques to what were used in the harvesting treatment of the Hinkle Creek study. This reach of Clay Creek is also designated as small and non-fish-bearing, thus according to the Oregon Forest Practice Rules, a RMA of merchantable timber was not left when the Clay DS reach was harvested. The 2006 photo canopy closure survey of the 2001 harvested Clay DS reach reveals that mean canopy closure from both overstory vegetation and remaining downed vegetation five years after harvest was 25%. Similar site preparation and herbicide treatments were used in the 2001 Clay DS harvest and the 2005 harvest. Therefore, it is reasonable to assume that the levels of canopy closure from overstory vegetation and slash observed in the Clay DS reach in 2006 will be similar to the levels of closure expected in the 2005 harvested streams in five years. Current plans for the future of the Hinkle Creek study include continued monitoring of stream temperatures in the 2005 harvested reaches and it is possible that this prediction can be tested in the future.

Another variable that may influence stream temperature patterns in the future is the recovery of summer baseflows to pre-harvest levels. Streamflow data from watersheds in western Oregon and California that were harvested and regenerated indicate that summer low flows increase for the first ten years following harvest, most likely as a result of reduced evapotranspiration, but as the forest matures, summer streamflow decreases relative to pre-harvest levels (Keppeler and Ziemer 1990, Hicks et al. 1991, Jones and Post 2004). The methods of site preparation following logging varied among sites that contributed streamflow data and range from broadcast burning and natural regeneration to replanting and herbicide application. Site preparation methods that restrict vegetation growth, such as herbicide treatment, are likely to hinder baseflow recovery whereas methods such as broadcast burning and natural regeneration can be expected to expedite baseflow recovery by promoting vegetation growth. The harvest units of Hinkle Creek were not burned and site preparation included multiple herbicide applications, so it is probable that baseflow will recover slowly at Hinkle Creek. The future stream temperatures in harvested reaches of Hinkle Creek will depend on the relative rates of streamflow recovery, riparian vegetation regrowth and slash decomposition.

In addition to the fact that the logging slash is only a temporary mechanism to exclude solar radiation, there are ecological problems that may arise from the input of such large quantities of organic matter into the stream system. As the slash decomposes, the biological oxygen demand (BOD) within the stream will increase and dissolved oxygen (DO) concentrations will be depleted (Berry 1975, Moring and Lantz 1975). The streams investigated at Hinkle Creek are high-gradient and the water likely reaerates quickly following DO depletion (Ice and Brown 1978); however, DO concentrations in lower gradient streams may be negatively affected. Accumulated slash disrupted riffle sequences in a clearcut stream in the Alsea Watershed study which decreased reaeration rates and exacerbated low DO concentrations (Lantz 1971). Additionally, large inputs of logging slash can alter channel morphology and particle size distribution (Jackson et al. 2001) which can potentially affect habitat quality for aquatic biota. Streambed gravels that are clogged with fine particles are not suitable habitat for salmonid spawning and so a reduction in particle sizes brought about by slash accumulation in streams may impair salmonid habitat. The Oregon Forest Practice Rules address logging slash accumulation in order to minimize impacts to water quality and prevent mass debris movement. Operators are instructed to fell away from streams, use logging practices that reduce slash movement on steep slopes and are required to remove slash that may enter streams that support fish or domestic water use within 24 hours. The Rules regarding logging slash are less specific for streams that do not support fish or domestic water use where operators are simply instructed to minimize slash accumulation but are not required to physically remove slash from the stream (ORS 629-630-0600).

Hindsight

If I were to redo this study, I would ensure that the temperature probes were deployed each year early in the growing season. In years 2004, 2005 and 2006 stream temperatures were recorded with Campbell Scientific data loggers that remained in the stream year-round and were located within feet of the HOBO data loggers that supplied primary data. Data from the Campbell Scientific loggers were used to fill in data gaps in the early part of the seasons 2004, 2005 and 2006. I also would have encased the probes in white PVC solar shields every year rather than only the post-harvest year. Data from one location in 2002 was not used because direct absorption of solar radiation corrupted the data. I also would have requested that the harvesting treatment begin after September 30 so that data from all streams taken during the summer of 2005 could be used. Finally, I would have sampled the harvested streams for DO concentration pre- and post-harvest to see if there was an appreciable difference in DO concentrations due to the large input of organic matter. Although pre- and post-harvest comparisons of DO concentration were not undertaken in this study, concurrent investigations into aquatic invertebrate and amphibian populations should document any degradation of aquatic habitat that occurs as a result of harvesting. A thorough investigation into changes to summer baseflows must also be undertaken in order to present a complete picture of the conditions under which these stream temperature results occurred.

Chapter III: Conclusions

Conclusions

Summer stream temperatures were monitored for five years in six headwater streams of the Hinkle Creek basin in southern Oregon. Between the fourth and fifth summer, a harvesting treatment was applied to four of the streams while the other two streams remained undisturbed. Harvest units were logged according to current Oregon Forest Practice Rules and modern harvesting technology was employed. Because the four harvested streams were designated as small and non-fish-bearing, a vegetated riparian buffer was not left between the streams and the harvest units. The harvesting treatment was intended to represent conditions present in intensively managed, privately owned forest land. As the Hinkle Creek basin is situated on forest land owned and intensively managed by Roseburg Forest Products, Inc. and the harvesting was carried out by Roseburg, the harvesting treatment accurately depicts typical harvesting conditions in small, non-fish-bearing streams in Oregon. The objectives of the Hinkle Creek stream temperature study were to identify and quantify changes to stream temperature patterns that occurred after the harvesting treatment was applied and to explain post-harvest stream temperature patterns with reach-level canopy closure data.

Changes to maximum, minimum and mean daily stream temperatures, diel temperature fluctuation and annual maximum seven-day mean temperatures were analyzed using repeated measures models that compared the mean pre-harvest relationship between temperatures observed in the harvested streams and temperatures observed in the unharvested streams to the post-harvest relationship. No significant changes to daily maximum stream temperatures were discerned when the overall response across the four harvested streams was considered, however after harvesting daily minimum and mean stream temperatures were significantly lower after harvesting, particularly on days when the minimum or mean temperature was above 12˚C. Diel stream temperature fluctuations increased significantly after harvesting, often to more than double the mean diel fluctuations that were observed before harvesting occurred. As there was no significant change to maximum daily temperatures, the increased diel range occurred because minimum daily temperatures decreased. There was no appreciable difference between annual maximum seven-day mean temperatures pre- and post-harvest. These results differ from *a priori* hypotheses that stream temperatures would become significantly warmer after harvesting.

Although change detection model results indicated no significant changes to maximum temperatures across the four streams, examination of individual reach responses illustrate that significant changes to maximum temperatures did occur in two of the streams, but because the streams responded divergently, no net changes were detected across the four streams. A closer examination of reach-level variables that could potentially affect stream temperature may partially explain the divergent and unexpected temperature responses. It is generally assumed that significant reductions in stream shading occur when the forest canopy is removed. However, a thick layer of organic logging slash partially covered the small streams one year after harvesting occurred and limited exposure of the streams to solar radiation. When cover due to logging slash was accounted for, only a mean 20% reduction in canopy closure occurred as a result of the harvesting treatment. This reduction is much lower than is generally assumed for streams that are clearcut without a vegetated riparian buffer. It is also likely that summer baseflows increased significantly following the harvest and that the greater volume of cooler water influenced stream heating. The combination of high levels of shade from the logging slash and high stream volumes during the post-harvest year may have prevented dramatic increases in maximum temperatures and caused minimum and mean temperatures to decrease.

The true impact of the harvesting treatment on summer stream temperatures in Hinkle Creek has likely yet to be observed. Over the next several years the protective layer of logging slash covering the harvested streams will decompose and as these watersheds are intensively managed with post-harvest herbicide treatments, it is probable that the streams will be exposed to high levels of solar radiation before the riparian canopy recovers. The balance between recovering riparian shade and volume of stream water will be crucial determinants of stream temperature patterns as these watersheds recover.

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Appendix A

Table A1. Regression line parameters for maximum daily stream temperatures in all stream pairs.

Stream pair	Year	Slope	Intercept
Fen	2002	0.98	12.8
Fen	2003	0.85	14.0
Fen	2004	0.92	14.3
Fen	2006	0.64	12.1
Clay	2002	1.42	13.7
Clay	2003	1.17	15.0
Clay	2004	1.25	14.5
Clay	2005	1.26	13.3
Clay	2006	1.27	15.2
Rus	2003	1.17	12.4
Rus	2004	1.05	12.0
Rus	2005	1.27	11.8
Rus	2006	1.17	12.7
BB	2002	0.80	13.0
BB	2003	0.77	12.6
BB	2004	0.87	12.9
BB	2005	0.82	13.0
BB	2006	1.11	13.6

Table A2. Regression line parameters for minimum daily stream temperatures in all stream pairs.

Stream pair	Year	Slope	Intercept
Fen	2002	0.91	11.7
Fen	2003	0.89	13.2
Fen	2004	0.92	13.4
Fen	2006	0.59	10.9
Clay	2002	1.31	12.2
Clay	2003	1.26	13.6
Clay	2004	1.27	13.6
Clay	2005	1.28	12.4
Clay	2006	1.08	12.4
Rus	2003	1.31	11.6
Rus	2004	1.14	11.2
Rus	2005	1.38	11.1
Rus	2006	0.98	10.9
BB	2002	1.43	12.2
BB	2003	1.33	12.4
BB	2004	1.21	12.0
BB	2005	1.40	11.8
BB	2006	1.05	12.1

Table A3. Regression line parameters for daily mean stream temperatures in all stream pairs.

Stream pair	Year	Slope	Intercept
Fen	2002	0.95	12.3
Fen	2003	0.89	13.6
Fen	2004	0.91	13.8
Fen	2006	0.62	11.5
Clay	2002	1.33	12.9
Clay	2003	1.24	14.2
Clay	2004	1.25	14.0
Clay	2005	1.27	12.8
Clay	2006	1.18	13.7
Rus	2003	1.27	12.0
Rus	2004	1.14	11.6
Rus	2005	1.36	11.5
Rus	2006	1.06	11.7
BB	2002	1.42	12.5
BB	2003	1.31	12.8
BB	2004	1.21	12.4
BB	2005	1.34	12.2
BB	2006	1.10	12.8

Figures A1-A6. The percent canopy closure before harvest (2004) and after harvest (2006) measured using a spherical densitometer and a digital camera (2006). The x-axis is the location of the sampling points along the stream's longitudinal profile. The zero position marks the downstream boundary of the harvest unit. The mean and standard deviations of percent canopy closure after harvest in harvested reaches are shown for data collected using a spherical densitometer and a digital camera.

Figure A1- Fenton Creek

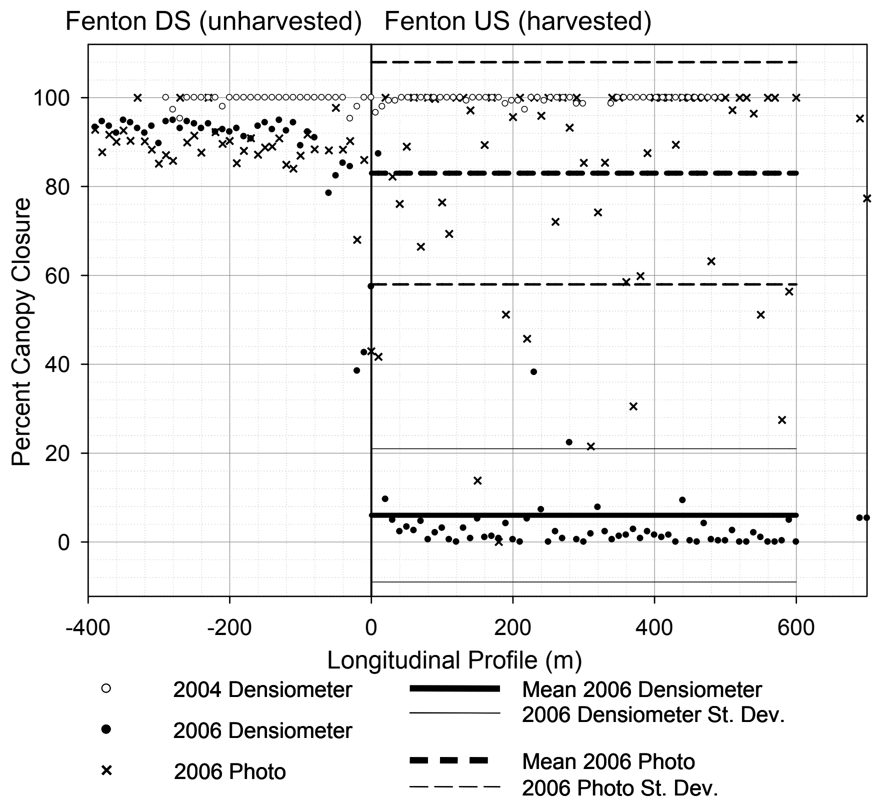


Figure A2- Clay Creek

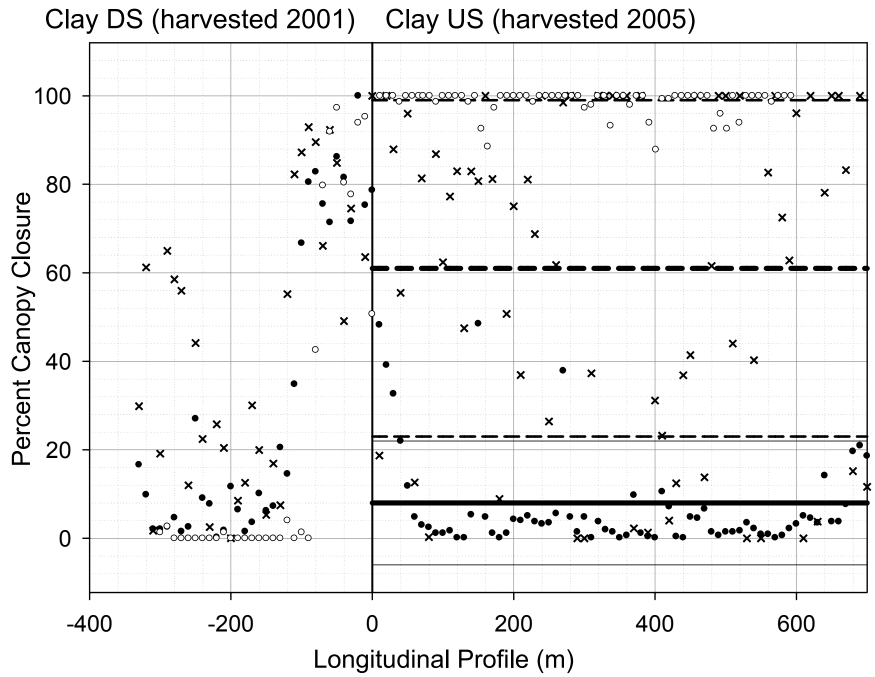


Figure A3- Russell Creek

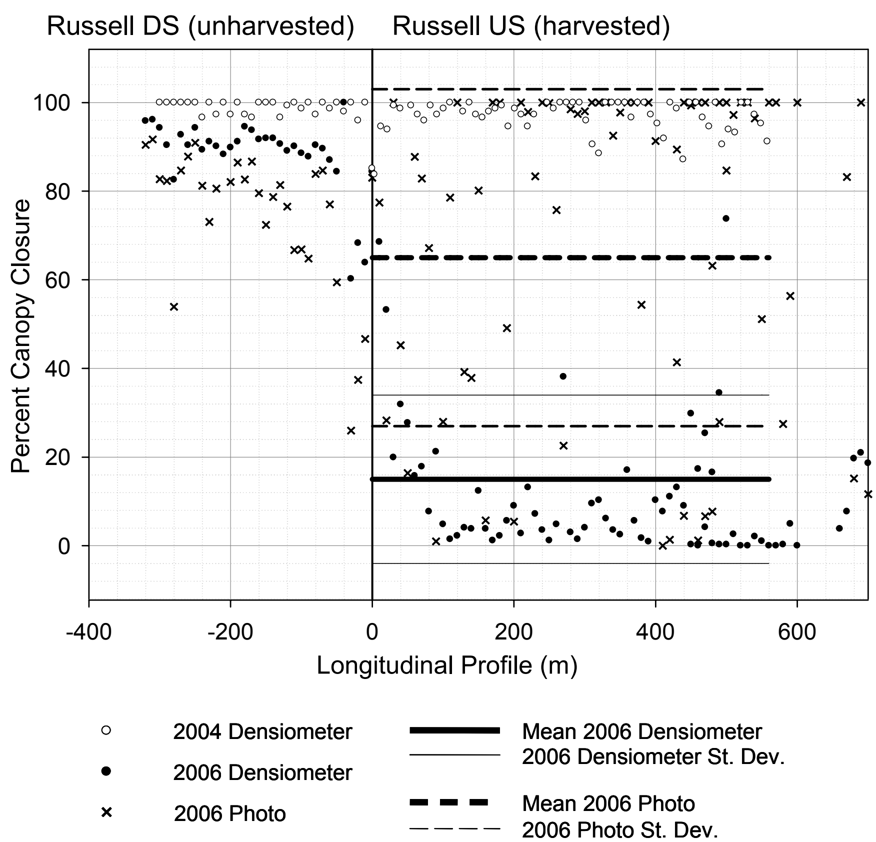


Figure A4- BB Creek

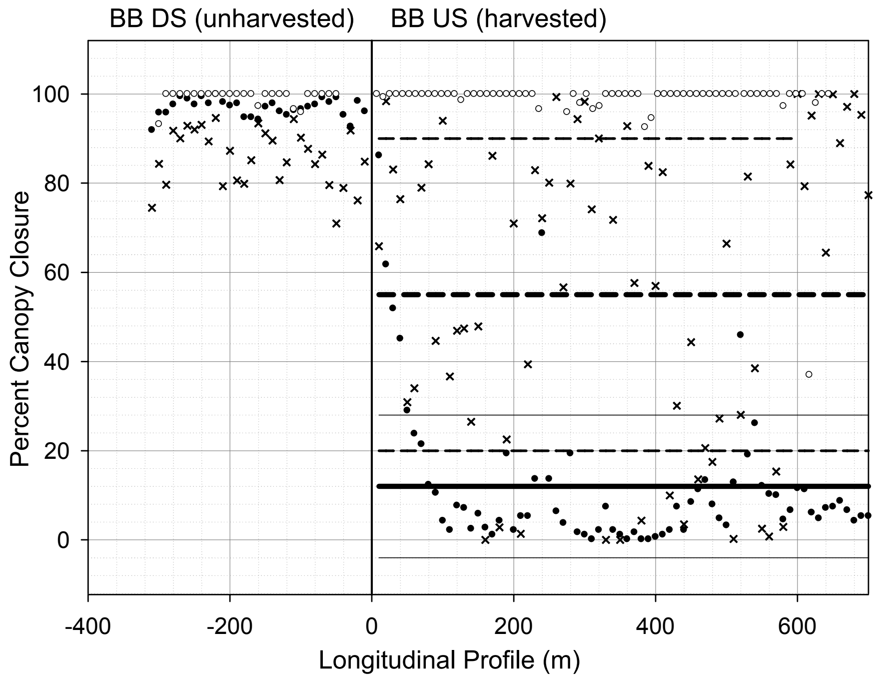


Figure A5- Myers Creek

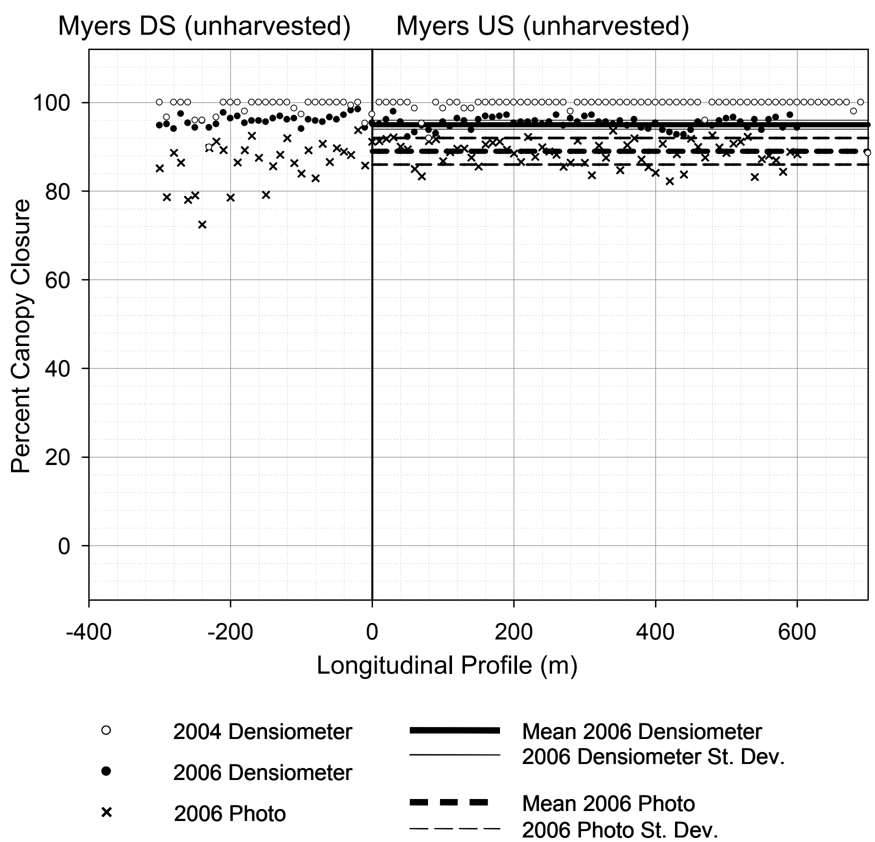


Figure A6- DeMerrseman Creek

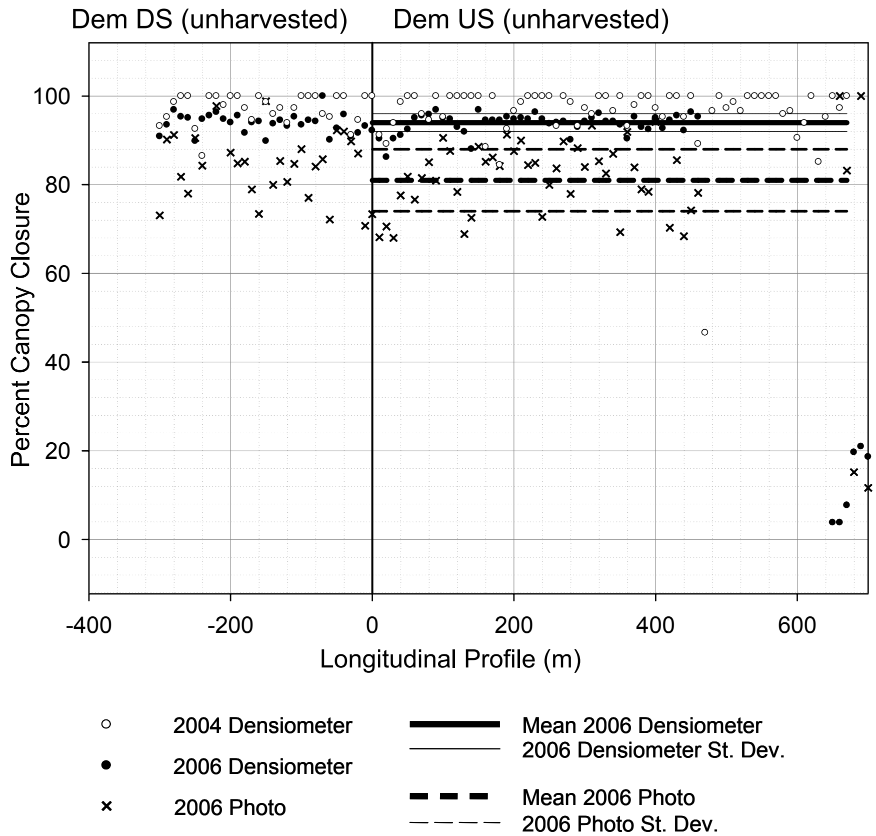
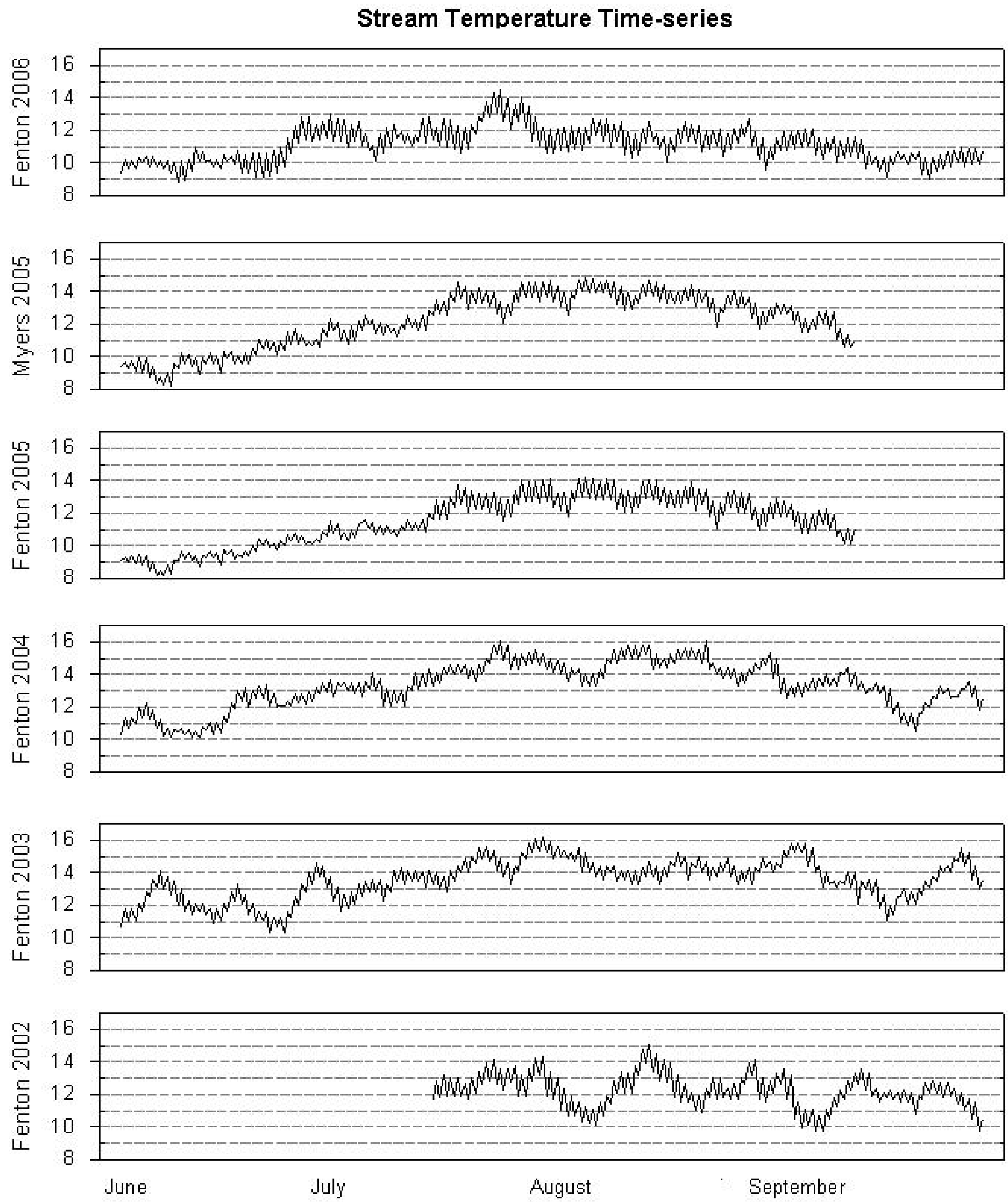


Figure A7. Daily minimum and maximum stream temperatures plotted in time series for Fenton Creek 2002-2006 and Myers Creek (unharvested) 2005.



Summer 1996

The Effects of Buffer Strip Width on Air Temperature and Relative Humidity in a Stream Riparian Zone

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Introduction

Streamside buffer strips have been used for years as a management tool in protecting riparian environments from the adverse effects of timber harvesting. Still, questions about what constitutes adequate buffer widths persists. State and Federal agencies have developed different policies regarding timber harvest practices in riparian zones. These differences concern the width of buffer strips along streams and the activity allowed within these zones.

To determine an optimum buffer width, one that protects the integrity of the riparian ecosystem while allowing profitable timber harvest, researchers have examined riparian processes as a function of distance from stream channels. These studies include the role of root strength on slope stability (Burroughs and Thomas 1977; Sidle et al. 1985; Wu 1986), delivery of large wood to streams (McDade et al. 1990; Vansickle and Gregory 1990; Andrus and Lorenzen 1992), shade (Reifsnyder and Lull 1965; Steinblums 1977; Beschta et al. 1987; Takentat 1988; Chen 1991), water quality (Broderson 1973; Darling et al. 1982; Lynch et al. 1985; Castelle et al. 1992), and wildlife, including benthic invertebrates (Erman et al. 1977; Roderick and Milner 1991).

Few, if any, studies have examined the effects of buffer width on air temperature and relative humidity in riparian zones. This relationship is important because a buffer strip of insufficient width may allow an increase in direct and reflected solar radiation into a stream environment, increasing the air temperature and lowering the relative humidity on warm days. These effects are most pronounced during the afternoon hours of the summer months when the highest concentration of solar radiation is present (Chen 1991).

Methods

From June 7 to August 31, 1994, air temperature and relative humidity in a stream riparian zone were measured at two sites in the Mad River Ranger District, Six Rivers National Forest, California. Both sites were on southwest-facing slopes that had recently been clearcut (1993 for Site 1, and 1992 for Site 2), leaving buffer strips of varying widths between the clearcuts and the streams. The study period, aspect, and slope were chosen to represent conditions where the greatest incident solar radiation and highest air temperatures occur within the study area. Measurements were collected over each stream at six collection sites, where the buffer widths were 150 meters, 90 meters, 60 meters, 30 meters, 15 meters, and 0 meters (clearcut). Measurements were taken once a week during the afternoon when the sun was at a right angle to the buffer strips. This occurred during the hours of 1100-1300 for Site 1 and 1000-1200 for Site 2.

Results

Air temperature above the streams increased exponentially with decreasing buffer width (Figure 1). There was a 6.5°C increase in mean air temperature along the riparian zone between the 150 meter and 0 meter buffer width collection sites. A power function best modeled this relationship with the equation y = 27.739 * x^(-0.055033) R2 = 0.98117, where y is air temperature (°C), and x is buffer width in meters. Mean air temperature rose sharply, 1.6°C/10 meters, in the riparian zone where the buffer width was 0 to 30 meters wide. Where the buffer strip was 30 to 150 meters wide, the rise in mean air temperature was more gradual at 0.2°C/10 meters.

Relative humidity was inversely proportional to air temperature (Figure 2). There was a 19% decrease in mean relative humidity along the riparian zone between the 150 meter and 0 meter buffer width collection sites. This relationship was modeled with the equation y = 34.172 * x^(0.086176) R2 = 0.92435 where y is relative humidity (%), and x is buffer width in meters. At the 0 to 30 meter collection sites, mean relative humidity along the riparian zone dropped sharply at 3.8%/10 meters. Between the 30 and 150 meter buffer width collection sites the drop in mean relative humidity was more gradual at 0.6%/10 meters.

Discussion

Earlier research supports the findings that buffer width affects air temperature and relative humidity. In a study examining microclimate gradients from the edge of a clearcut to 240 meters into an upland forest, *Chen (1991)* found that during the afternoon on a west-facing slope, air temperature decreased exponentially from the edge into the forest at an overall mean rate of 0.4°C/10 meters. The greatest rate of change was found within the first 30 meters where air temperature decreased at a mean rate of 1.0°C/10 meters before decreasing to a rate of 0.4°C/10 meters from 30 to 180 meters into the forest. In the same study, Chen (1991) found that relative humidity increased at a mean rate of 3.7%/10 meters between the edge and 30 meters, and 2.0%/10 meters between 30 to 180 meters before leveling off.

Changes in air temperature and relative humidity were found up to the 150 meter buffer width collection site, which was the control for the study. This indicates that buffer widths greater than 150 meters may affect riparian microclimate. *Chen (1991)* recorded changes in air temperature, relative humidity, and wind velocity up to 240 meters into an upland forest from the edge of a clearcut, while solar radiation, soil temperature, and soil moisture were influenced up to 90 meters.

Changes in microclimate conditions can alter the ecosystem of the riparian environment. Buffer widths that allow increased direct and indirect solar radiation into the riparian zone will increase air temperature and decrease relative humidity in that area. If these measurements move beyond the tolerance levels of terrestrial riparian flora and fauna, these species may perish or be forced to find other suitable habitat to complete their life cycle. *Rudolph and Dickson (1990)* reported amphibian and reptile populations were significantly lower in aquatic habitats with narrow buffer widths (<30 meters) than those with wider buffer strips due to greater shading (i.e., less solar radiation and lower air temperatures) and open understory vegetation. Evapotranspiration rates increase with increasing air temperature and may contribute to a lowering of the groundwater table and soil moisture content. This may prematurely dry up intermittent streams, depriving flora and fauna of an important water source during the dry season. Increased solar radiation and air temperature may also raise the water temperature in a stream to sublethal or lethal levels for resident aquatic life. For example, Northwest fall chinook salmon require stream temperatures between 10.6°C to 19.4°C to migrate upstream, and prefer stream temperatures of 5.6°C to 13.9°C for spawning *(Bjornn and Reiser 1991)*. Water temperatures have been shown to exceed this tolerance level of salmonids along stream reaches where vegetative shading has been reduced *(Brown et al. 1970; Beschta et al. 1987)*.

Land managers who wish to avoid significantly altering the microclimate of a riparian zone may want to leave buffer strips over 30 meters wide in regions similar to the study area. Buffer strips wider than 30 meters will still affect the microclimate of a riparian zone, but at a lower rate of change. The effect of small changes in microclimate (e.g., 1°C or 2°C increase of air temperature) on riparian species has not been extensively studied. Further studies are needed to determine the effects of incremental changes in microclimate on the riparian ecosystem.

Buffer Width Considerations in Forest Management

Establishing a buffer width necessary to maintain a functioning riparian ecosystem is dependent on many factors including local climatic conditions, topography, geology, and vegetation. Arbitrarily set buffer widths will not address the specific conditions and processes of each site. However, using available research, general guidelines for minimum widths can be determined. Much of the data on buffer strips, including this study, indicates that a minimum buffer width of 30 meters (~100 feet) is necessary to avoid significantly impacting riparian environments *(Erman et al. 1977; Steinblums 1977; Rudolph and Dickson 1990; Chen 1991; Spackman and Hughes 1994)*. For many processes such as sediment flow and delivery of large woody debris, this minimum width may be increased to 60 to 80 meters or one site potential tree

(Broderson 1973; Beschta et al. 1993; Thomas et al. 1993). Under the Northwest Forest Plan for federal forestlands in the range of the northern spotted owl, the "interim" buffer widths listed for fish-bearing streams (300 feet or the average height of two site-potential trees) and permanently flowing streams (150 feet or the average height of one site-potential tree) exceeds the minimum buffer width recommended by most studies and provides a high degree of protection pending more detailed analysis and site-scale design.

Watershed analysis can be used to identify critical hillslope, riparian, and channel processes affecting riparian and aquatic functions on a ecosystem or watershed level *(Thomas et al. 1993).* Site specific considerations of these processes can be used in determining buffer widths for each project *(Thomas et al. 1993).* The use of site specific analysis and minimum buffer width guidelines based on research, should allow for riparian zones to be managed for a variety of objectives while maintaining viable riparian ecosystems.-
The Effects of Buffer Strip Width on Air Temperature and Relative Humidity in a Stream Riparian Zone.

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TOP

PREDICTING STREAM TEMPERATURE AFTER RIPARIAN VEGETATION REMOVAL [1]

Bruce J. McGurk[2]

Abstract: Removal of stream channel shading during timber harvest operations may raise the stream temperature and adversely affect desirable aquatic populations. Field work in California at one clearcut and one mature fir site demonstrated diurnal water temperature cycles and provided data to evaluate two stream temperature prediction techniques. Larger diurnal temperature fluctuations were observed in the water flowing through the clearcut than in the undisturbed area above the clearcut site. The mature fir forest also had a large diurnal water temperature variation. A 5.6°C temperature rise was observed through a 380-m clearcut that exposed the stream channel, and Brown's equation predicted a change of 6.1°C. A regression model underpredicted the maximum observed temperature by just under 2°C at the clearcut site. A technique that includes the effect of shade recovery after timber harvest is suggested for use during long-range harvest planning.

Forest management can affect water quality and aquatic life, and riparian areas are both sensitive and easily disturbed. Streamside forest canopy removal allows direct sunlight to reach first- and second-order streams that were extensively shaded before timber harvest. Direct sunlight can increase stream temperature, which effects fish and aquatic insect species composition and growth (Feller 1981). Temperature also affects water quality parameters such as dissolved oxygen and the waste assimilation capacity of a stream.

The effects of logging on stream temperature have been the subject of considerable research and numerous reviews (Brett 1956, Brown 1969, Patton 1973, Anderson and others 1976). Direct solar insolation was found to account for at least 90 percent of a stream's temperature change after clearcutting (Brown 1970). Salmon (*Oncorynchus* sp.), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*) prosper in streams that are between 10° and 18°C, and if water temperatures exceed 24°C they may die, depending on acclimation temperatures, pH, and dissolved oxygen (Patton 1973). The replacement of these high-value, cold-water fish species by warm-water fish has been associated with timber harvest.

Early research determined that an important shading and sediment filtering role was played by the vegetation along channels, and this area was termed a buffer strip (Patton 1973). Management agencies have incorporated this concept by establishing special management areas along active stream channels that include the riparian zone and some amount of the adjoining hillslope. Limited

harvesting may be allowed in these streamside management zones (SMZ), which may vary in width depending on hillslope angle. Although equipment entry into the SMZ is discouraged, the restrictions do not prevent the removal of shade-providing vegetation from riparian zones. In addition, the Pacific Southwest Region (California) of the Forest Service, U.S. Department of Agriculture, has established Best Management Practices (BMP), which state that no adverse temperature impacts should occur to streams during harvests. The actual effectiveness of SMZ restrictions and other BMPs is not known due to the lack of detailed or long-term monitoring.

Early efforts to predict stream temperature changes focused on predicting the maximum temperatures associated with peak summer conditions and low flows (Brown 1969). These early models were based on temperature changes caused by full exposure of the stream reach to the sun at the peak sun angle. By combining the site's latitude with field measurements such as stream temperature, channel width, depth, flow velocity, and an estimate of shading with estimates of potential cover reduction, likely temperature increases can be quantified. The estimated change in temperature, when added to the pre-harvest water temperature, provide an indication as to whether post-harvest temperatures might exceed the lethal limit for the resident fish.

Other modeling approaches include empirical models that are calibrated for one geographic region, or detailed simulation models that require extensive data pertaining to the reaches to be modeled (Schloss 1985, USDA Forest Serv. 1984). The Schloss model is typical of a regression model and was developed in western Oregon to predict maximum summer temperature based on elevation, distance above the main channel, stream order, and shading. The USDA model was developed by the Forest Service to simulate stream temperature

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1 Presented at the California Riparian Systems Conference; September 22-24, 1988; Davis, California.

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response to multiple alternative harvest areas in a basin. It is a physical, energy budget-based algorithm, and has a time step that can range from 15-minute to hourly or daily intervals. Both direct and indirect (diffuse) shading is incorporated, as is stream aspect, topographic shading, groundwater influx and temperature, and flow into and out of the reach. The stream network is represented by sequentially estimating the outflow water temperature in each reach and using that information as the inflow temperature in the next downstream reach. A significant advantage to this model is its ability to handle partial shade, but obtaining the copious input data requires considerable field work.

This paper reports on field work at two streams in California that evaluates Brown's stream temperature change prediction technique and an empirical equation developed in Oregon (Brown 1970, Schloss 1985). Both partial and complete riparian vegetation removal are analyzed. A modification of Beschta and Taylor's (1988) phased vegetation recovery system is proposed as part of a multireach accounting system for basins with multiple cutting areas.

Temperature Prediction

Model Selection

Model selection should be based on the size of the area of concern and on the intended use of the water temperature prediction. Because the typical forestry use is to assess the effect of timber harvest, grazing, recreation, or road construction on large land areas, the complex and data-hungry physical simulation models are inappropriate. Empirical (regression) models may be appropriate if one has been developed for the local area of interest. In most cases, however, a relatively simple model based on the physical processes relating stream surface exposure to sunlight is most appropriate.

Exposed Surface Models

Exposed surface models combine a few crucial types of field data with tabular data dependent on site location (Brown 1969). This type of model uses only physical constants and field measurements, so it is not an empirical, "calibrated" model. Changes in water temperature T(°C) increase directly in relation to new stream surface area A (m^2) that is exposed and insolation N (cal/cm^2-min), and inversely with streamflow Q (m^3/s):

$$\Delta T = \frac{AN}{Q} * .000167 \qquad (1)$$

The coefficient contains the constants for the conversion of the flow, area, and insolation units to temperature.

Because this model predicts a change in temperature, pre-project temperatures should be measured wherever harvests are planned. Streams should be visited during California's low flow and peak heat times of July, August, and September. A simple pocket thermometer could yield representative data for several small basins with a moderate amount of effort, using measurements taken between noon and 1500 hours. Peak temperatures occur due to the interaction of declining streamflow and insolation, in spite of the decline of insolation after June 21.

The parameter A reflects the new channel area that will be exposed due to forest harvest, but topography, channel aspect, and harvest design also have a role in determining A, so subjective judgments may be needed. If 35 percent of the cover in a 100 m zone along the southside of a channel is to be removed, it may be reasonable to equate this to complete removal from about 30 m of channel.

Table 1 – Average values of net solar radiation absorbed by water surfaces in middle latitudes for a range of exposure times (cal/cm^2-min) (after List 1951, Brown 1974).

Water Travel	Latitude (degrees)		
Time (hours)	35	40	45
2	1.30	1.28	1.22
4	1.25	1.22	1.17
6	1.19	1.14	1.11
8	1.09	1.06	1.00

Solar loading N is dependent on season, latitude, and the length of time that the water is in an exposed area. California's National Forests range from 34° to 42° latitude, so N values for the appropriate latitudes have been estimated (table 1). N values could be reduced by about 1 percent for each week after July 1 to account for the seasonal decrease in insolation, but such minor adjustments are probably not warranted due to the inherent errors in area and discharge estimates. The travel times for the 160 m to 400 m openings typical of National Forest System operations and stream gradients are between 1 and 2 hours, so the N values for 2 hour travel times in table 1 should be used for most small streams.

The final requirement for equation 1 is discharge volume, and small mountain streams are difficult to gauge accurately due to shallow depths, turbulence, and side-pool areas. If a small current meter is available, measurement of cross-sectional areas and water velocities can provide reasonably accurate results. Alternately, dye or floating objects such as oranges can be used but accuracy will suffer. If objects such as sticks are used, the velocity should be multiplied by 0.8 to correct for the vertical velocity profile of the stream. Cross-sections should be selected to minimize stagnant water pools near the stream's edge or discharge can be overestimated by 50 to 100 percent.

Empirical Prediction

Empirical equations can be developed by regressing stream temperature on basin, cover, and stream characteristics (Schloss 1985):

$$T = 11.9 - 0.0013E + 0.206L + 0.676R + 1.814(S/50 + 1) \quad (2)$$

where:
T = maximum summer stream temperature (°C)
E = midbasin elevation (m)
L = distance from junction of next higher-order stream (km)
R = stream order
S = shade percentage (percent)
Standard deviation = ±1.7°C.

Equation 2 was calibrated for forested basins in western Oregon that were below 610 m elevation. Unlike equation 1, this technique predicts maximum temperature rather than temperature change. The stream order and channel distance factors are measured on US Geological Survey 7.5° quadrangle maps. The channel length is the distance from the area of interest to that stream's juncture with the "main" channel. The shade code is the percentage of channel that has less than "complete" shade within 1600 m upstream from the point of interest.

Site Descriptions and Field Methods

McGill Creek

A clearcut site was identified 3 km north of Iron Canyon Reservoir along McGill Creek at an elevation of 915 m (figure 1). Iron Canyon Reservoir is in the Shasta National Forest and is 61 km northeast of Redding, California. McGill Creek is a south-draining second-order stream, with a slope of 3.5 percent, that passes through an 8-ha clearcut. The timber operator removed nearly all of the timber on both sides of the stream, and the slash disposal burn got out of control and destroyed most of the remaining near-stream vegetation. These actions produced a 380-m section of stream that had almost no shading.

Field instrumentation consisted of water temperature, air temperature insolation, humidity, and wind instruments. Ten water temperature probes were placed in the unshaded channel, one probe was 70 m upstream of the cut, and probes were placed 35 m and 90 m downstream of the clearcut area. Except for a hygrothermograph and rainfall collector, all readings were collected electronically at 15-minute intervals. The site was monitored for 48 hours between August 31 and September 2, 1983. Approximately 1.3 cm of rain fell during the afternoon and evening of August 31, but September 1 and 2 were warm with clear skies. Peak air temperatures were 29°C on September 1 and 32°C on September 2. The average discharge during the study interval was 18 l/s (0.6 ft^3/s).

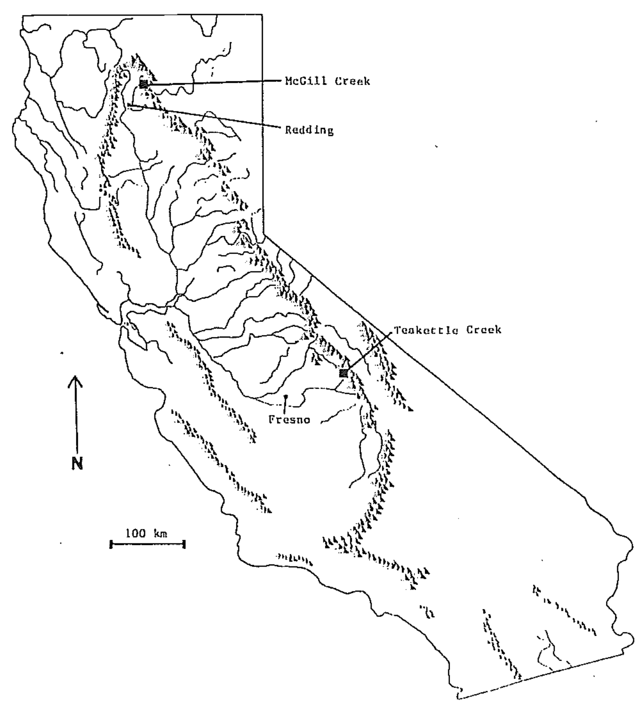

Figure 1—California map pinpointing McGill Creek clearcut site and Teakettle Creek mature fir site where field tests took place

Table 2 – Average water temperatures and meteorological data for McGill Creek near Redding, and for Teakettle Creek near Fresno, California.

Date	Time	Entry Water Temp. (°C)	Exit Water Temp. (°C)	Temp Diff (°C)	Air Temp. (°C)	Insolation (°C)	Windspeed (cal/cm²-min)
McGill Creek							
8/31	15-18	12.0	12.0	0.0	12.8	0.04	0.6
	18-24	11.8	10.7	-1.1	10.3	.0	.3
9/01	0-6	11.6	11.2	-0.4	9.4	-.01	.1
	6-9	11.5	11.6	0.1	10.0	.06	.1
	9-12	11.7	13.9	2.2	15.9	.65	.5
	12-15	12.2	16.7	4.5	20.6	.82	.7
	15-18	12.1	15.6	3.5	16.9	.21	.7
	18-24	11.6	12.2	0.6	7.0	-.05	.4
9/02	0-6	11.0	10.9	-0.1	5.2	.0	.6
	6-9	10.8	10.8	0.0	8.2	.02	.6
	9-12	11.3	14.1	2.8	22.9	.82	.6
	12-15	12.3	17.4	5.1	27.0	.89	.8
Teakettle Creek							
8/26	15-18	11.1	10.6	-0.5	13.8	0.01	0.5
	18-24	9.0	8.9	-0.1	6.8	.0	.8
8/27	0-6	7.5	7.4	-0.1	5.1	.0	.8
	6-9	7.1	7.0	-0.1	9.3	.02	.8
	9-12	9.5	9.2	-0.3	24.4	.69	.4
	12-15	12.0	11.3	-0.7	22.3	.38	.5
	15-18	11.3	10.8	-0.5	14.6	.0	.4
	18-24	9.2	9.0	-0.2	7.4	.0	.0
8/28	0-6	7.8	7.6	-0.2	5.8	.0	.0
	6-9	7.5	7.4	-0.1	9.1	.01	.0
	9-12	9.7	9.4	-0.3	23.4	.70	.5
	12-15	12.0	11.3	-0.7	21.2	.32	.3

Teakettle Creek

The Teakettle site is on the Sierra National Forest at an elevation of 2100 m. It is in the Teakettle Experimental Forest, on the southeast flank of Patterson Mountain and 66 km east of Fresno, California. Teakettle Creek is a southeast-facing, second-order drainage with a slope of 8 percent that passes through senescent red fir. Although some clearings exist due to the presence of 10 m by 40 m wet meadows, the combination of extensive shrub growth and the 50- to 80-m fir trees exclude most direct exposure from sunlight. A shading survey produced an estimate of 80 percent canopy cover.

The field instrumentation at Teakettle was similar to that used at McGill Creek. Approximately 380 m of stream channel was monitored with 11 water temperature probes, and the other instruments were sited along the stream channel. Peak air temperatures were 27°C on August 27 and 25°C on August 28, 1983. The average discharge during the study was 39 l/s (1.3 ft^3/s).

Measurement Accuracy

All thermistor probes were calibrated by measuring their resistances in three baths of known temperature that spanned the expected measurement interval. The agitated water baths were measured using a precision thermometer accurate to ±0.1°C. A separate polynomial equation was developed for each probe.

Replicate stream temperatures were measured by placing two probes within 2 cm of each other at a single random spot at both McGill and Teakettle Creeks. The mean difference around the replicates and the confidence limits around the difference between any two probes were as follows:

	Mean difference (°C)	95 Pct. Confidence interval (°C)
McGill	0.16	±0.3
Teakettle	0.20	±0.4

Based on these confidence intervals, observed water temperature values that differ by less than 0.8°C must be considered to be the same.

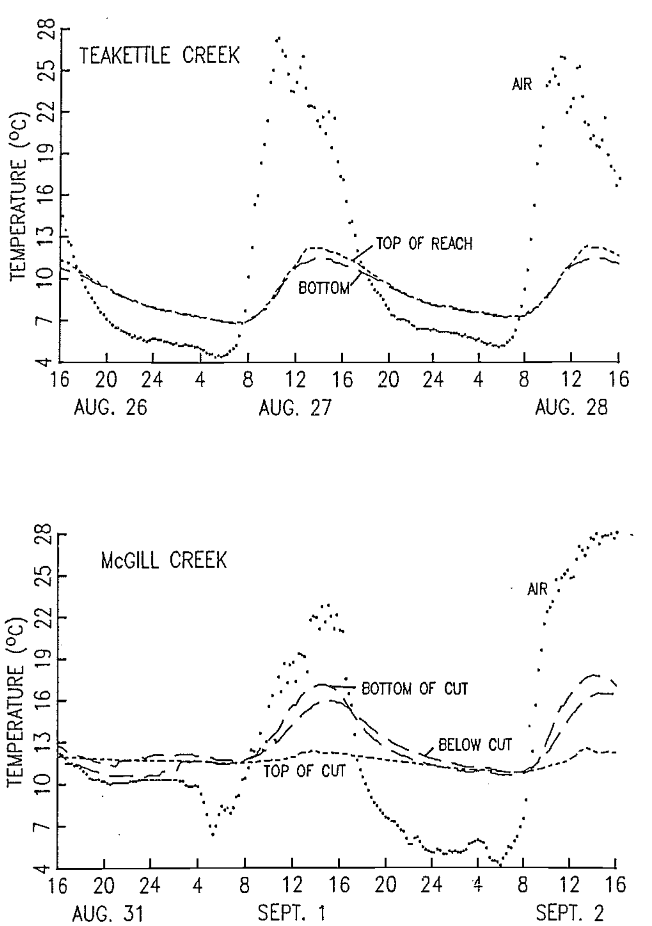

Figure 2–Recorded diurnal water temperature at the two field test sites, August 31 – September 2, 1983.

Results and Discussion

The diurnal water temperature at the two sites share a similar pattern, but there are important differences (figure 2). The air temperatures at both sites peaked at between 24°C and 28°C. The McGill Creek water temperature was 17°C on September 1 and 18°C on September 2, but Teakettle water temperatures peaked at 12°C on both August 27 and 28.

Although both sites produced a sine-shaped temperature pattern, the amplitude varied at the two sites. At McGill Creek, one can hypothesize that the diurnal variation of temperature would be very small in the natural system. Sensors 65 m above and at the upper margin of the clearcut show very small diurnal variations (figure 2). This small variation is due at least in part to the dense shade provided by the willow and alder that choked the channel upstream of the clearcut area. The mature fir forest at Teakettle Creek provided the channel with only 80 percent cover, and the overstory was much higher than at McGill. Teakettle Creek's water temperature is lower than the "natural" case at McGill, a situation that may be due in part to the 1100 m elevation difference. The higher variability at Teakettle may be due to the upstream springs that supply the stream. At McGill, side seeps were common along the channel, and their presence would add to the diurnal variation due the shallow, marshy flow that was exposed to the sun.

Average insolation, windspeed, and air and water temperatures illustrate some of the differences between the sites (table 2). The difference between the 3-hour average water temperature entering and leaving the clearcut was about 5°C at McGill, but the stream actually lost heat in the measured reach at Teakettle. The open site had both larger daytime energy inputs and larger nighttime energy losses due to the lack of a canopy. The total allwave flux was 790 cal/cm^2 at McGill and 383 cal/cm^2 at Teakettle. Windspeeds at the two sites were roughly equivalent, but little wind movement would have been possible in the natural channel areas above the clearcut at McGill due to the dense vegetation close to the water surface. The canopy at Teakettle, however, is much higher, allowing typical diurnal wind patterns.

Exposed Surface Water Temperature Prediction

The McGill Creek site was well suited to Brown's (1970) model for predicting temperature. Channel area was calculated using an average width estimated by measurements at six locations along the channel. In addition to the 1.9-m width along the 380 m of channel, there were also eight small pools that had been constructed for gradient control and to allow sediment to settle. The pools added 111 m^2 to the 483 m^2 of channel surface area, so the estimate of the total exposed area was 594 m^2. McGill Creek is at 41° latitude and the water travel time was about 1 hour (velocity = 0.1 m/s, so the N factor (equation 1, table 1 for 2 hours) equals 1.27. The average discharge, as measured by both current meter and dye velocity/cross-section measurements was 0.019 m^3/s. The calculated temperature change was 6.6°C, and the observed water temperature increase through the cut area was 5.0°C on September 1 and 5.4°C on September 2.

Both the calculated and observed temperatures are estimates that include measurement errors. For equation 1, the area term may have about a 25 percent error, the insolation error may be 20 percent, and the discharge error may be 50 percent. The combined effect of these errors suggests that the predicted value of 6.6 °C is the "best guess" in a range of predicted temperature increase that extends from 3°C to 20°C. Some decrease in the error band may be obtainable with extreme diligence during data collection. The errors associated with the probe measurements are discussed above.

Part of the difference between the predicted and observed values could be due to the decreased solar strength in early September as compared to the peak strength associated with the June 21 summer solstice. Peak insolation at the Central Sierra Snow Laboratory, near Soda Springs, California, declined by 8 percent during that interval. Assuming that the same pattern is followed at McGill Creek, the decreased solar input accounts for 0.5°C, dropping the predicted change for the actual measurement period to 6.1°C. The remaining difference could be due to the shrubby vegetation along the channel, ground water inflow, or errors in the stream area or discharge measurements.

Equation 1 is sensitive to errors in discharge estimation, especially on small streams with low total flows. If the 0.019 m^3/s value is varied by ±10 percent, the initial predicted temperature change (6.1°C) changes to 5.6°C or 6.8°C. Typical current meters are accurate to approximately ±5 percent (USDI Bur. Reclam. 1975), and errors as large as 50 percent are likely in small channels due to lateral turbulence and shallow depths.

The largest 3-hour average insolation values in table 2 for McGill Creek are 35 percent less than a solar loading value of 1.26 estimated for a site at 41° latitude from table 1. The instantaneous net allwave values measured at McGill Creek peaked at 1.1 cal/cm^2-min. If the tabular value is reduced by the 8 percent seasonal factor, the value becomes 1.16 cal/cm^2-min, a value that is only 0.06 cal/cm^2-min different than the observed value.

The Teakettle Creek site is not as well suited for the application of Brown's technique as was McGill Creek. Although no new channel area had been exposed due to harvesting, the 80 percent canopy cover implies that 20 percent of the stream is exposed to insolation. The channel survey yielded an average width estimate of 3.3 m and a length of 380 m, so there is 1254 m^2 of surface area and 251 m^2 of the total is exposed. The insolation value for a 2-hour travel time at 37° latitude, corrected by the 8 percent seasonal factor, is 1.19 cal/cm^2-min. The observed discharge was 0.037 m^3/s, so the predicted temperature increase was 1.4°C. The field results show a top-to-bottom temperature decrease of almost 1°C on both days. Due to the measurement and prediction error factors mentioned above, there is no difference between estimated and observed values, but the divergence is interesting. The decreasing water temperature is counterintuitive in that no large open areas above the measurement site were present from which the stream was recovering. Further, the water temperature at the top of the reach was already rather low for the peak summer heat period.

The diurnal variations at the two sites were markedly different. The Teakettle site had diurnal variations of 4°C, but the undisturbed portion of the McGill site had diurnal variations of 1.2°C. This difference may be due to the lack of low shrub cover at Teakettle versus very dense willow and alder at McGill Creek. The water temperature at Teakettle declined markedly during the night, and this pattern was not seen at McGill in spite of similar air temperatures.

Empirical Temperature Prediction

McGill Creek's elevation is 915 m (E), it is a second order stream (R), and the site is 2.4 km (L) from Iron Canyon Reservoir. The 380 m of clearcut area produces an S value of 24 percent because the remainder of the channel was shaded. It is likely that there would be less overall effect if the clearcut area was split into two portions at either end of the 1600 m effective distance, but this method lumps all partial or unshaded areas into a single ratio. Equation 2 predicts a summer maximum temperature of 15.3 °C. Compared with observed maxima of 17°C and 18°C, the predicted values are surprisingly close.

As a second test at McGill Creek, a prediction can be made for the undisturbed area above the clearcut. The shading factor becomes zero and the channel length changes to 2.5 km. The predicted maximum water temperature is 14.4°C , and the observed maximum was less than 12°C.

Teakettle Creek is at 2100 m elevation, is a first-order stream, and the site is 3 km from the Kings River. Using a shade factor of 20 percent, the predicted summer maximum was 13°C with a standard deviation of 1.7°C. The observed maximum water temperature was 12.3°C, not significantly different than the predicted value. Because Teakettle is further from Oregon and higher than McGill, plus has no real clearcut areas, the correspondence between the observed and predicted temperatures is surprising.

Although these three cases are not an adequate evaluation of Schloss' equation, they do show both the promise and the danger associated with an empirical approach. An equation that was calibrated for a geographic area could be very useful and reasonably accurate. Indiscriminant use, however, could conceal problem situations that deserve closer attention.

Heat Loss

Elevated water temperature may decrease once the heat input disappears. At McGill Creek, a sensor was located 130 m below the clearing. After the Creek flowed under the dense canopy cover for this distance, the peak temperature listed above and shown in figure 2 decreased by 1 or 1.5°C. Heat was lost to the streambed or to the air, but it is not known if this rate of heat loss continued or if the water returned to its original temperature at some downstream point. Many streams lose heat and return to their elevation-, flow-, and groundwater-influenced base temperature within 1.6 km of their exit from a disturbed area (Schloss 1985).

Multiple Harvest Areas

Although one harvest may have only a small effect on stream temperature, multiple harvests within a few years might produce a "cumulative effect" on downstream temperature. For an Oregon watershed following clearcut harvesting, little shade recovery occurred within 5 years after stream banks were cut, but a linear and total recovery occurred during the subsequent 15 years (Beschta and Taylor 1988).

Although some stream temperature models have multicut, multiyear capability, the data requirements preclude their use on basins with miles of channels and numerous subbasins (USDA For. Serv. 1984). A tabular recovery analysis for basins could aid the harvest planning by explicitly incorporating shade recovery information (table 3). The table incorporates a 20-year vegetation growth cycle, and the procedure uses an index that varies from 1 (full effect) to 0 (no effect) to represent the loss of shading due to harvest if any canopy cover is removed from the riparian zone. After 20 years, the index returns to zero as stream shading recovers. In table 3, harvest E occurred near 1960, A occurred near 1965, and B and D occurred near 1970. The column labeled "Total" is the sum of the horizontal coefficients, but the value that should be considered to be a cumulative effect threshold is unknown. If the average riparian timber removal is 50 percent along the associated 300 m of channel and five harvests occurred within a 5-year period, a value of five in the "Total" column might represent 750 m of clearcut stream channel.

The incorporation of this technique during the harvest plan could provide a feedback system such that predicted increases in estimated stream temperatures would increasingly restrict the removal of shading vegetation. A monitoring plan that proceeded concurrently with the harvest would provide valuable information on temperature effects.

Table 3 – Shade recovery calendar for aiding the scheduling of timber harvests within a basin (after Beschta and Taylor 1988).

Harvest Year[1]	Harvest Event									
	A	B	C	D	E	F	G	H	I	Total
1960	1	-	-	-	1	-	-	-	-	2.0
65	1	1	-	1	.6	-	-	-	-	3.6
70	.6	1	-	1	.3	-	-	-	-	2.9
75	.3	.6	-	.6	0	1	-	-	-	2.5
80	0	.3	-	.3	-	1	1	-	-	2.6
85	-	0	1	0	-	.6	1	1	-	3.6
90	-	-	1	-	-	.3	.6	1	1	3.9
95	-	-	.6	-	-	0	.3	.6	1	2.5
2000	-	-	.3	-	-	-	0	.3	.6	1.2
05	-	-	0	-	-	-	-	0	.3	0.3
10	-	-	-	-	-	-	-	-	0	-

[1] Assign harvests to nearest 5-year date.

Conclusions

The exposed surface area model (Brown 1970) for predicting stream temperature may be a good choice for land managers because it requires a minimum of field data that are relatively simple to obtain. If a sufficient data base exists within a region or can be collected over time, an empirical model will simplify maximum temperature prediction associated with shade removal.

Field data from both a clearcut and a mature fir site were used. A predicted temperature change of 6.1°C compared well with an observed change of 5.4°C at a 380 m clearcut site. The prediction equation is sensitive to streamflow, a factor that is known to be difficult to measure with less than at least ±5 percent error. The 80 percent-shaded Teakettle site yielded a predicted increase of 1.4°C compared to an observed decrease of almost 1°C.

Results from the empirical model were 2°C lower than the observed water temperatures in the clearcut portion of McGill Creek and 2°C higher than the undisturbed area (Schloss 1985). The regression model's prediction nearly matched the fir site's water temperature of 12°C. If data were collected for several areas of California and used to calibrate a model with similar structure, greater consistency might be achieved. This type of model has the advantage of requiring no additional field data once the coefficients are estimated.

A shade recovery accounting system was proposed for use during the National Forest System harvest planning process. The system assumes channel cover is regained in 20 years and offers the planner a way to avoid overscheduling harvests in a basin and producing an adverse cumulative temperature effect.

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RIPARIAN MICROCLIMATE AND STREAM TEMPERATURE RESPONSE TO FOREST HARVESTING: A REVIEW[1]

R. Dan Moore, D. L. Spittlehouse, and Anthony Story[2]

ABSTRACT: Forest harvesting can increase solar radiation in the riparian zone as well as wind speed and exposure to air advected from clearings, typically causing increases in summertime air, soil, and stream temperatures and decreases in relative humidity. Stream temperature increases following forest harvesting are primarily controlled by changes in insolation but also depend on stream hydrology and channel morphology. Stream temperatures recovered to pre-harvest levels within 10 years in many studies but took longer in others. Leaving riparian buffers can decrease the magnitude of stream temperature increases and changes to riparian microclimate, but substantial warming has been observed for streams within both unthinned and partial retention buffers. A range of studies has demonstrated that streams may or may not cool after flowing from clearings into shaded environments, and further research is required in relation to the factors controlling downstream cooling. Further research is also required on riparian microclimate and its responses to harvesting, the influences of surface/subsurface water exchange on stream and bed temperature regimes, biological implications of temperature changes in headwater streams (both on site and downstream), and methods for quantifying shade and its influence on radiation inputs to streams and riparian zones.
(KEY TERMS: stream temperature; forestry; headwater; riparian; microclimate; water quality; watershed management; Pacific Northwest.)

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INTRODUCTION

Riparian microclimate and stream temperature are critical factors in relation to habitat conditions in and near streams and are governed by the interactions of energy and water exchanges within the riparian zone. Riparian microclimate sets the boundary conditions for many of the energy exchanges that influence stream temperature, while stream temperature sets one of the boundary conditions for riparian microclimate. The two topics are therefore closely linked and are covered together in this paper, which focuses on research relevant to two concerns: (1) forest harvesting may change riparian microclimate and have an impact on aquatic and terrestrial habitat; and (2) forest harvesting, particularly with removal of riparian vegetation, may result in stream heating or other changes in water temperature that could have deleterious effects on aquatic organisms.

Despite decades of research on stream temperature response to forest harvesting, there are still vigorous debates in the Pacific Northwest about the thermal impacts of forestry and how to manage them (e.g., Larson and Larson, 1996; Beschta, 1997; Ice *et al.*, 2004; Johnson, 2004). The conventional approach to minimizing the effects of forest harvesting on streams and their riparian zones is to retain a forested buffer strip along the stream. Most jurisdictions in the Pacific Northwest require buffer strips to be left along larger (usually fish bearing) streams (Young, 2000). However, less protection is afforded to smaller, non-fish-bearing streams. For example, in British Columbia, buffer strips are not required along non-fish bearing streams unless they are a designated community water supply, and buffer strips are not mandatory along the fish bearing streams whose

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bankfull width is less than 1.5 m. Thus, small streams are potentially subject to significant changes in riparian microclimate and particularly to increased solar radiation, which is the major factor driving summertime stream warming.

Beschta *et al.,* (1987) presented an excellent review of the physical and biological aspects of stream temperature in a forestry context, but more recent research has expanded the geographic scope of knowledge within the Pacific Northwest (PNW) region, shed new light on governing processes, or made advances in relation to tools for monitoring and prediction. In the interests of completeness, this paper will revisit much of the material reviewed by Beschta *et al.* (1987) in addition to reviewing more recent studies but will focus on physical aspects. It is assumed that the reader has a basic grounding in microclimatological principles and terminology. Readers lacking this background are referred to Oke (1987) for an excellent introductory treatment.

Given that the primary concern is with riparian management around small streams, the review focuses as much as possible on studies in catchments less than 100 ha in area or streams less than 2 to 3 m wide. It also focuses on studies in the Pacific Northwest region, broadly defined to include northern California, Oregon, Washington, British Columbia, and southeastern Alaska. However, studies from outside the PNW region were considered if they provided useful insights that were not available from local studies. Similarly, studies that did not focus specifically on small forest streams were included if the results were relevant to small stream thermal regimes.

RIPARIAN MICROCLIMATE

Characteristics of Forest Microclimates

Microclimate below forest canopies has been studied extensively for decades, though usually without explicit attention to riparian zones (FAO, 1962; Reifsnyder and Lull, 1965; Jarvis *et al.,* 1976; Rauner, 1976; Geiger *et al.,* 1995; McCaughey *et al.,* 1997; Chen *et al.,* 1999). Compared to open environments, the canopy reduces solar radiation, precipitation, and wind speed near ground level and increases longwave radiation received at the surface. These changes in turn influence the thermal and moisture environments under forest canopies.

Solar radiation transmission through forest canopies depends on the heights of the crown and the density and arrangement of foliage elements (Vézina and Petch, 1964; Reifsnyder and Lull, 1965; Federer, 1971; Black *et al.,* 1991). Reductions in solar radiation under forest cover range from more than 90 percent with dense canopies (Young and Mitchell, 1994; Chen *et al.,* 1995; Brosofske *et al.,* 1997; Davies-Colley *et al.,* 2000) to less than 75 percent in open stands (Örlander and Langvall, 1993; Spittlehouse *et al.,* 2004). The forest canopy changes the spectral distribution of light because plant foliage differentially absorbs and reflects the various wavelengths (Federer and Tanner, 1966; Vézina and Boulter, 1966; Atzet and Waring, 1970; Yang *et al.,* 1993). There is a greater reduction in the ultraviolet and photosynthetically active radiation ranges compared to longer solar radiation wavelengths. Longwave radiation to the forest floor increases as the canopy density increases because the forest canopy is usually warmer than the sky being blocked and has a higher emissivity (Reifsnyder and Lull, 1965). Although this increase somewhat offsets the reduction in solar radiation below the forest canopy, daytime net radiation below forest canopies is usually substantially lower than that in the open.

The amount of precipitation intercepted by the canopy and lost by evaporation depends upon tree species and the amount of canopy cover and typically varies from 10 to 30 percent of annual precipitation (Calder, 1990; McCaughey *et al.,* 1997; Pomeroy and Goodison, 1997; Spittlehouse, 1998). The fraction of precipitation intercepted decreases as storm magnitude and intensity increase. Time since the previous storm and weather conditions during the current storm are also important.

Wind speed under forest canopies is usually 10 to 20 percent of that in large openings (Raynor, 1971; Chen *et al.,* 1995; Davies-Colley *et al.,* 2000). Wind speed within forest openings depends on their size, and openings of less than about 0.1 ha will have low wind speeds, similar to those in the forest (Spittlehouse *et al.,* 2004).

Forest canopies tend to reduce the diurnal air temperature range compared to large open areas. Maximum differences (open area minus area under forest canopy) in daytime air temperature at the 1.5 to 2 m height varied from 3°C (Brosofske *et al.,* 1997; Davies-Colley *et al.,* 2000; Spittlehouse *et al.,* 2004) to 6°C or more (Young and Mitchell, 1994; Chen *et al.,* 1995; Cadenasso *et al.,* 1997). At night, air temperatures in forest areas are typically about 1°C higher than in the open (Chen *et al.,* 1995; Spittlehouse *et al.,* 2004), though Brosofske *et al.* (1997) found temperatures about 1°C lower above a stream. Surface and near-surface soil temperatures show the largest differences between forest and open sites, being up to 10 to 15°C lower under forest canopies during the daytime and

1 to 2°C higher at night (Chen *et al.,* 1995; Brosofske *et al.,* 1997; Spittlehouse *et al.,* 2004).

The vapor pressure of the air is mainly a function of the surrounding air mass and will be similar in the open and the forest. Consequently, the relative humidity and vapor pressure deficit will depend on the air temperature. The lower daytime forest air temperature means that relative humidity is typically 5 to 25 percent higher in the forest (Chen *et al.,* 1995; Brosofske *et al.,* 1997; Davies-Colley *et al.,* 2000; Spittlehouse *et al.,* 2004).

Riparian zones typically have elevated water tables and higher soil moisture than adjacent upland areas. Partly due to these hydrologic conditions, riparian forest cover and understory vegetation often differ from those of uplands, which would influence penetration of solar radiation and interception loss of precipitation. Surrounding slopes may also block direct and diffuse solar radiation. In small headwater streams, the riparian zone may be narrow to nonexistent due to topographic constraints imposed by steep side slopes (Richardson *et al.,* 2005). In addition to the effects of distinctive forest cover and higher soil moisture, riparian microclimate may be influenced by the stream channel, which can provide a local source of water vapor and act as a heat sink during the day, producing locally cooler and moister conditions near the stream (Brosofske *et al.,* 1997; Danehy and Kirpes, 2000). Riparian vegetation may also serve as a source of water vapor via transpiration (Danehy and Kirpes, 2000). Danehy and Kirpes (2000) found that enhanced relative humidity was restricted to a narrow zone within 10 m of the stream edge at 12 forested sites in eastern Oregon and Washington, most likely due to the constraining effects of steep local topography. Another topographic influence that is particularly important in mountain regions is the development of drainage winds that flow down valleys and gullies (Oke, 1987), advecting cool air into lower reaches.

Edge Effects and the Microclimate of Riparian Buffers

The magnitude of harvesting related changes in riparian microclimate will depend on the width of riparian buffers and how far edge effects extend into the buffer. Studies by Chen *et al.* (1993a,b, 1995) in an old-growth Douglas fir forest in Washington state (tree heights 50 to 65 m) are commonly cited in relation to edge effects and required buffer widths. Their results are consistent with those of Ledwith (1996), Brosofske *et al.* (1997), and Hagan and Whitman (2000), as well as with a range of other studies including Raynor (1971) (10.5 m tall red and white pine, closed canopy, New York state), Öerlander and Langvall (1993) (22 to 25 m tall Norway spruce and Scots pine stands of varying density, Sweden), Young and Mitchell (1994) (mixed podocarp-broadleaf forest in New Zealand), Cadenasso *et al.* (1997) (60+-year-old oak, birch, beech, and maple forest in New York state), Davies-Colley *et al.* (2000) (mature, 20 m tall native broadleaved rainforest in New Zealand), and Spittlehouse *et al.* (2004) (25 to 30 m tall Engelmann spruce-subalpine fir forest with a 40 percent canopy cover in British Columbia). All of these studies show that much of the change in microclimate takes place within about one tree height (15 to 60 m) of the edge. Solar radiation, wind speed, and soil temperature adjust to interior forest conditions more rapidly than do air temperature and relative humidity. Nighttime edge temperatures are similar to interior forest conditions. Daytime relative humidity decreases from interior to edge in response to the increased air temperature.

Edge orientation can be important, particularly for a south-facing edge (in the northern hemisphere), where solar radiation can penetrate some distance into the forest for much of the day. Dignan and Bren (2003) found that light penetration diminished rapidly within 10 to 30 m of the buffer edge for a riparian mountain ash forest in Australia, but that light penetration at 10 m was significantly greater for buffers that faced the equator than for other orientations. Wind blowing directly into the edge penetrates farther into the forest than from other directions (Raynor, 1971; Davies-Colley *et al.,* 2000).

Few studies appear to have examined microclimatic conditions within riparian buffers. In a study in northern California, above stream air temperatures measured in the early afternoon decreased with increasing buffer width, at decreases of about 1.6°C per 10 m for buffer widths up to 30 m and 0.2°C per 10 m for buffer widths from 30 m to 150 m (Ledwith, 1996). Above stream temperatures in the 150 m wide buffer treatments were about 6°C lower than at the no-buffer sites. In the same study, relative humidity was 10 to 15 percent higher than at a clear-cut site for 30 m wide buffers and increased another 5 to 10 percent as buffer widths increased to 150 m. At a study conducted at a first-order stream in Maine (Hagan and Whitman, 2000) where a 23 m wide buffer had been left on each side, air temperature 10 m from the stream in the buffer exhibited local differences from the reference sites of up to about 2°C. Differences up to about 4°C were observed within about 10 m from the buffer edge.

Only one study, covering 15 small streams in western Washington, appears to have examined changes in riparian microclimate using both pre-harvest and post-harvest data (Brosofske *et al.,* 1997). Prior to harvest, gradients from the stream into upland areas existed for all variables except solar radiation and wind speed. After harvest, conditions at the edges of riparian buffers tended to approximate those in the interior of the clear-cut. Solar radiation increased substantially within the buffers relative to pre-harvest conditions. Soil surface temperatures were higher after harvest. For buffers less than about 45 m wide (about one tree height), the pre-harvest gradient from riparian zone to upland was interrupted, which could influence habitat conditions for riparian fauna.

THERMAL PROCESSES AND HEADWATER STREAM TEMPERATURE

An understanding of thermal processes is required as a basis for understanding stream temperature dynamics, in particular for interpreting and generalizing from experimental studies of forestry influences. As a parcel of water flows through a stream reach, its temperature will change as a function of energy and water exchanges across the water surface and the streambed and banks (Figure 1) as described by the following equation (modified from Polehn and Kinsel, 2000).

$$\frac{dT_w}{dx} = \frac{\Sigma Q}{\rho C_p v D} + \frac{F_{gw}}{F}\left(T_{gw} - T_w\right) + \frac{F_{hyp}}{F}\left(T_{hyp} - T_w\right) \quad (1)$$

where dT_w/dx is the rate of change in the temperature (°C) of the water parcel with distance, x(m), as it flows downstream; ΣQ is the net heat exchange by radiation, turbulent exchange, and conduction across the water surface and bed (W/m^2); F is the streamflow (m^3/s); F_{gw} is the ground water inflow rate (m^3/s/m); F_{hyp} is the hyporheic exchange rate (m^3/s/m); T_{gw} and T_{hyp} are the ground water and hyporheic water temperatures, respectively (°C); ρ is the water density (kg/m^3); C_p is the specific heat of water (J/kg/°C); v is the local mean velocity (m/s); and D is the local mean depth (m). Equation (1) assumes steady state flow and ignores longitudinal dispersion. It also ignores the heat input of precipitation, which is typically much less than 1 percent of the total energy input to a stream (Webb and Zhang, 1997; Evans *et al.,* 1998). Similarly, frictional heating is neglected because it can be shown to be important relative to other energy exchanges only for steep streams with relatively high flows, under low radiation conditions. This section provides an overview of the dominant processes represented in Equation (1), followed by a discussion of spatial and temporal dynamics of stream temperature regimes.

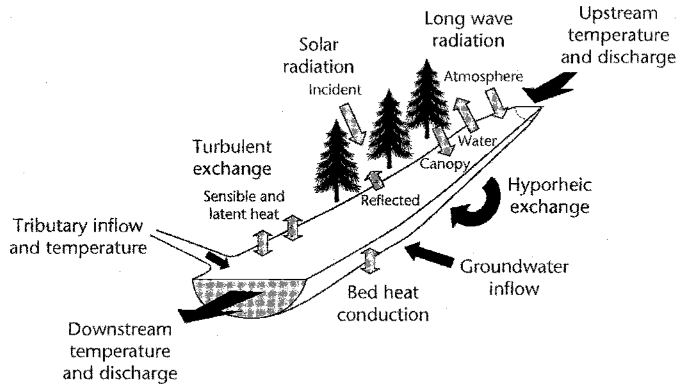

Figure 1. Factors Controlling Stream Temperature. Energy fluxes associated with water exchanges are shown as black arrows.

Radiative Exchanges

Radiation inputs to a stream surface include incoming solar radiation (direct and diffuse) and longwave radiation emitted by the atmosphere, forest canopy, and topography. Canopy cover along the sun's path will reduce the direct component of solar radiation, some of which will be scattered and transmitted through the canopy as diffuse radiation. Transmission of diffuse solar radiation will depend on both the spatial pattern of diffuse radiance from the sky dome and its interactions with the spatial arrangement of canopy elements. The details of solar radiation transmission through canopies are complex. It is often represented by simplified models based on extinction coefficients (e.g., Black *et al.,* 1991; Sridhar *et al.,* 2004) or the spatial distribution of canopy gaps (e.g., Dignan and Bren, 2003). Channel morphology can also influence incident solar radiation at a stream surface. Narrow, incised channels can be effectively shaded by streambanks (Pluhowski, 1972; Webb and Zhang, 1997). Wide channels tend to be less shaded because they have a canopy gap overhead, which will be particularly important for streams oriented north-south.

For solar elevation angles greater than 30 degrees, less than 10 percent of incoming solar radiation will be reflected from the water surface (Oke, 1987). Most incoming solar radiation thus enters the water column, where absorption can occur within the water column and at the bed (Evans *et al.,* 1998). The net effect is that roughly 90 to 95 percent of incident solar radiation is absorbed in the water column or at the bed and thus potentially available for stream heating, except at low solar elevation angles (Evans *et al.,* 1998; Johnson, 2004).

Incoming longwave radiation will be a weighted sum of the emitted radiation from the atmosphere, surrounding terrain, and the canopy, with the weights being their respective view factors (Rutherford *et al.,* 1997). The water surface, canopy, and terrain have high emissivities (typically ≥ 0.95) (Oke, 1987), while the atmospheric emissivity is normally lower, except under overcast conditions. Outgoing longwave radiation includes that emitted by the water surface plus a small fraction (typically 3 to 8 percent) of the incoming longwave radiation that is reflected (Oke, 1987).

Peak daytime net radiation over a stream within a clear-cut can be more than five times greater than that under a forest canopy during summer (Brown, 1969), primarily due to the increase in incident solar radiation. Longwave radiation losses at night may be reduced slightly under forest canopy (Brown, 1969). It has been suggested that longwave radiation losses during autumn and winter may increase following removal (harvest) of forest canopy, leading to more rapid seasonal cooling (e.g., Macdonald *et al.,* 2003b), but this does not appear to have been investigated.

Sensible and Latent Heat Exchanges

Transfers of sensible and latent heat occur by conduction or diffusion and turbulent exchange in the overlying air. Sensible heat exchange depends on the temperature difference between the water surface and overlying air and on the wind speed. Where the stream is warmer than the air, heat transfer away from the stream would be promoted by the unstable temperature stratification, which enhances turbulence. Where the stream is cooler, heat transfer from the air to the stream would be dampened by the stable air temperature stratification (Oke, 1987). Evaporation and associated energy loss occur where the vapor pressure at the water surface (equal to the "saturation" value for the water temperature) exceeds the vapor pressure in the overlying air (a function of the air temperature and relative humidity); condensation and associated energy gain occur where the vapor pressure of the air exceeds the vapor pressure at the water surface. Latent heat exchange also depends on atmospheric stability over the stream.

Most field and modeling studies have used empirical "wind functions" to compute sensible and latent heat fluxes over small streams (e.g., Brown, 1969; Rutherford *et al.,* 1997; Webb and Zhang, 1997; Evans *et al.,* 1998; Johnson, 2004; Moore *et al.,* 2005). There can be great uncertainty in fluxes computed from wind functions, particularly because mean wind speeds under canopies may be less than the stall speed of typical anemometers (Story *et al.,* 2003).

Under intact forest cover, lack of ventilation appears to limit the absolute magnitude of sensible and latent heat exchanges over small streams (Brown, 1969; Webb and Zhang, 1997; Story *et al.,* 2003). Even at open sites such as clear-cuts, sensible and latent heat fluxes over small streams may be limited by bank sheltering, particularly for narrow, incised channels (Gulliver and Stefan, 1986). Brown (1969) and Moore *et al.* (2005) estimated the sensible and latent heat exchanges to be an order of magnitude lower than net radiation on sunny days in recent clear-cuts at coastal sites. Johnson (2004) computed higher values for latent heat flux at a stream in a recovering clear-cut in the Oregon Cascades, though it was still an order of magnitude lower than incident solar radiation.

Bed Heat Exchanges and Thermal Regime of the Streambed

Radiative energy absorbed at the streambed may be transferred to the water column by conduction and turbulent exchange and into the bed sediments directly by conduction and indirectly by advection (in locations where water infiltrates the bed). Given that turbulent exchange is more effective at transferring heat than conduction and that the flowing portions of streams are fully turbulent, much of the energy absorbed at the bed is transferred into the water column, and the temperature at the surface of the bed will generally be close to the temperature of the water column (Sinokrot and Stefan, 1993), except perhaps in pools with upwelling ground water or hyporheic exchange flow.

Bed heat conduction depends on the temperature gradients within the bed and its thermal conductivity and will normally act as a cooling influence on summer days and a warming influence at night, thus tending to reduce diurnal temperature range (Brown, 1985; Moore *et al.,* 2005). For streams within clear-cuts on sunny days, it has been estimated to be approximately 10 percent of net radiation in a step-pool stream (Moore *et al.,* 2005) and up to 25 percent in a bedrock channel (Brown, 1969). Bed heat conduction should depend on stream-subsurface interactions: stream reaches with upwelling ground water tend to have stronger daytime bed temperature gradients than those without and thus should have higher heat loss by conduction (Silliman and Booth, 1993; Story *et al.,* 2003).

Temperatures within the streambed are significant in their own right, since they may influence conditions for post-spawning egg development and fry emergence, as well as conditions for benthic invertebrates. Ringler and Hall (1975) observed summer bed temperature gradients in three catchments in the Oregon Coast Range. Gradients in an unlogged catchment were negligible. Differences of 2°C between the bed surface and 50 cm depth were observed in the streambed of a catchment subject to 25 percent patchcut with riparian buffers, while bed temperatures in artificial redds in a fully clear-cut catchment reached 21˚C with diurnal variations of up to 7˚C at 25 cm depth and vertical changes of about 8˚C over 50 cm. Bed temperatures varied greatly among locations within the clear-cut, likely due to variations in surface water exchange across the bed (Ringler and Hall, 1975). Consistent with this inference, Moore *et al.* (2005) found that bed temperatures in a step pool unit within a clear-cut followed stream temperature more closely in areas of downwelling flow into the bed than in areas of upwelling flow. Given the documented influence of subsurface hydrology on bed temperatures in a range of stream sizes and types and the potential interactions between stream temperature and stream subsurface exchanges (e.g., Shepherd *et al.,* 1986; White *et al.,* 1987; Silliman and Booth, 1993; Constantz, 1998; Curry *et al.,* 2002; Malcolm *et al.,* 2002; Alexander and Caissie, 2003; Moore *et al.,* 2005), the degree to which post-logging bed temperatures reflect changes in surface temperature likely depends on the local hydrologic environment.

Ground Water Inflow

Ground water is typically cooler than stream water in summer during daytime and warmer during winter and thus acts to moderate seasonal and diurnal stream temperature variations (Webb and Zhang, 1999; Bogan *et al.,* 2003). Forest harvesting can increase soil moisture and ground water levels due to decreased interception losses and transpiration (Hetherington, 1987; Adams *et al.,* 1991). Increases in ground water levels following forest harvesting could act to promote cooling or at least ameliorate warming. Alternatively, several authors have speculated that warming of shallow ground water in clear-cuts could result in heat advection to a stream, exacerbating the effects of increased solar radiation or decreasing the effectiveness of riparian buffers (e.g., Hewlett and Fortson, 1982; Hartman and Scrivener, 1990; Brosofske *et al.,* 1997; Bourque and Pomeroy, 2001), and this process has been incorporated into a catchment scale model of hydrology and water quality (St.-Hilaire *et al.,* 2000). Although there is ongoing research on the thermal response of ground water to forest harvesting (Alexander *et al.,* 2003), no published research appears to have examined ground water discharge and temperature both before and after harvest as a direct test of the ground water warming hypothesis.

Hyporheic Exchange

Hyporheic exchange is a two-way transfer of water between a stream and the saturated sediments in the bed and riparian zone. It often occurs where a stream meanders or where there are marked changes in stream gradient. For example, stream water typically flows into the bed at the top of a riffle and re-emerges at the bottom of the riffle (Harvey and Bencala, 1993). If the temperature of hyporheic water discharging into a stream differs from stream temperature, then hyporheic exchange can influence stream temperature dynamics (Equation 1). Several studies have shown that hyporheic exchange creates local thermal heterogeneity in larger streams (e.g., Bilby, 1984; Malard *et al.,* 2002), and recent studies suggest that it can be important in relation to both local and reach scale temperature patterns in headwater streams (Johnson, 2004; Moore *et al.,* 2005). However, there are significant methodological challenges associated with quantifying rates of hyporheic exchange and its influence on stream temperature (Kasahara and Wondzell, 2003; Story *et al.,* 2003; Moore *et al.,* 2005).

Tributary Inflow

Effects of tributary inflow depend on the temperature difference between inflow and stream temperatures and on the relative contribution to discharge, according to a simple mixing equation.

$$T_m = f_i T_i + (1 - f_i) T_s = T_s + f_i (T_i - T_s) \quad (2)$$

where T_i is the inflow temperature (˚C); T_s is temperature at the upstream end of the reach (˚C); T_m is the temperature of the stream inflow mixture (˚C); and f_i is the ratio of inflow rate to streamflow at the downstream end of the reach. Equation (2) assumes complete mixing and may not be valid in the immediate vicinity and some distance downstream of the tributary mouth, where lateral mixing of the tributary flow with the main stream may be incomplete.

Longitudinal Dispersion and Effects of Pools

Longitudinal dispersion results from the variation in velocity through the cross-section of a stream. It would act to "smooth" temperature waves as they propagate downstream, potentially causing a progressive decrease in the diurnal temperature maximum as clearing heated water flows downstream through forested reaches. It is often assumed to be negligible in modeling studies of both small and large streams (e.g., Sinokrot and Stefan, 1993; Rutherford *et al.,* 1997; Polehn and Kinsel, 2000), but no published studies appear to have evaluated its influence in small streams.

The presence of pools can also potentially influence stream temperatures. Being locally deeper zones, pools would tend to change temperature more slowly than the shallower, flowing portions of the stream. However, Brown (1972) observed that there was incomplete mixing in many pools in pool riffle streams in Oregon such that the effective width and depth of flowing water through pools were much smaller than the pool dimensions. Thermal influences of pools do not appear to have been examined in smaller, steeper step pool streams.

Equilibrium Temperature and Adjustment to Changes in Thermal Environment

For a given set of boundary conditions (e.g., solar radiation, air temperature, humidity, wind speed), there will be an "equilibrium" water temperature that will produce a net energy exchange of zero and thus no further change in temperature as water flows downstream (i.e., $dT_w/dx = 0$; Edinger *et al.,* 1968). For stream water being warmed as it flows through a clear-cut, the equilibrium temperature represents the maximum possible temperature the parcel could achieve within the reach at a given time, assuming that boundary conditions remain constant in time and space. However, equilibrium temperature may not be achieved because the boundary conditions may change in time or space before the water parcel can adjust fully to the thermal environment. The concept applies most simply to streams or time scales for which the energy exchanges across the air/water interface dominate the energy budget (Edinger *et al.,* 1968). Stream temperatures influenced by substantial ground water inputs will be consistently less than equilibrium temperature computed from atmospheric conditions during summer and higher in winter (Bogan *et al.,* 2003). Equilibrium temperatures for unshaded reaches are higher than those under shade during summer afternoons (Bartholow, 2000; Bogan *et al.,* 2003).

The rate at which a parcel of water adjusts to a change in the thermal environment depends on stream depth because for deeper streams, heat would be added to or drawn from a greater volume of water. Shallow streams should thus adjust relatively quickly to a change in thermal environment. In addition, flow velocity influences the length of time the parcel of water is exposed to energy exchanges across the water surface and the bed and thus the extent to which the parcel can adjust fully to its thermal environment within a given reach (Figure 2). Given that the depth and velocity of a stream tend to increase with discharge, the sensitivity of stream temperature to a given set of energy inputs should increase as discharge decreases (Brown, 1985; Beschta *et al.,* 1987; Moore *et al.,* 2005).

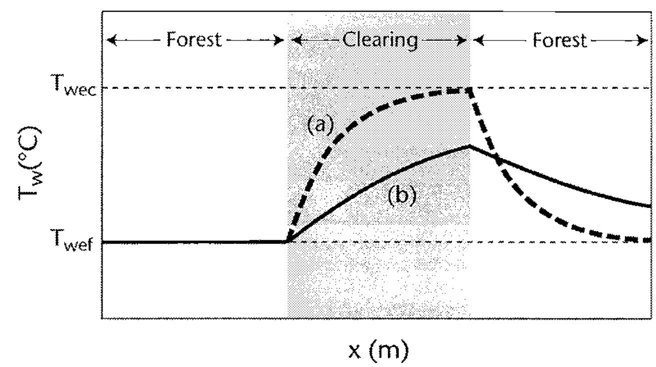

Figure 2. Schematic Temperature Patterns Along a Stream Flowing From Intact Forest, Through a Clear-Cut, and Back Under Intact Forest for (a) Shallow, Low Velocity, and (b) Deep, High Velocity Conditions (T_{wef} = equilibrium temperature in forest; T_{wec} = equilibrium temperature in clearing).

Thermal Trends and Heterogeneity Within Stream Networks

Small forest streams tend to be colder and exhibit less diurnal variability than larger downstream reaches, up to about fourth or fifth order (Vannote and Sweeney, 1980; Holtby and Newcombe, 1982; Macdonald *et al.,* 2003a). Small streams will be more heavily shaded by riparian vegetation and near stream terrain, will have a higher ratio of ground water inflow in a reach to the total downstream flow, and are located at higher elevations and thus experience a generally cooler thermal environment. However, local deviations from a dominant downstream warming trend may occur as a result of ground water inflow, hyporheic exchange, or thermal contrasts between isolated pools and the flowing portion of a stream. In addition, lakes, ponds, and wetlands can produce elevated water temperatures at their outlets, resulting in downstream cooling below them over distances of hundreds of meters, even through cut blocks (Mellina *et al.,* 2002).

Thermal heterogeneity at a range of spatial scales has been well documented in intermediate and large streams (i.e., third order and larger; Bilby, 1984; Arscott *et al.,* 2001; Malard *et al.,* 2001; Ebersole *et al.,* 2003), where it is an important aspect of stream habitat (Neilsen *et al.,* 1994; Ebersole *et al.,* 2003). Thermal heterogeneity in small streams has apparently received less attention, though Story *et al.* (2003) and Moore *et al.* (2005) observed substantial temperature variations in small streams for reaches within a clear-cut and downstream of forest clearings, both along the reach and within channel units.

Stratification of pools can be an ecologically important source of thermal heterogeneity, although its occurrence is variable. Brown (1972) found that only one pool in an intermediate-sized stream with a pool-riffle morphology exhibited significant vertical stratification, with a temperature decrease of 6.5°C over 1.2 m depth. Nielsen *et al.* (1994) observed more prevalent thermal stratification in pools in three larger rivers in northern California and noted their significance as thermal refugia for steelhead. No published studies appear to have examined stratification of pools in smaller, steeper streams.

STREAM TEMPERATURE RESPONSE TO FOREST MANAGEMENT

The effects of forest management on stream temperature have been estimated using a variety of study designs. The most rigorous approach is the BACI (before-after/control-impact) design, which involves monitoring both before and after treatment and includes untreated control sites (e.g., Harris, 1977). A variation is to use a regression of stream temperature on weather data in place of a calibration with a control catchment (e.g., Holtby and Newcombe, 1982; Curry *et al.,* 2002). Some studies used synoptic surveys of streams that had been subjected to a range of treatments (e.g., Rashin and Graber, 1992; Mellina *et al.,* 2002), while others monitored downstream temperature changes in clear-cuts (Brownlee *et al.,* 1988). This review focuses primarily on studies employing a BACI design, which are summarized in Table 1.

Influences of Forest Harvesting Without Riparian Buffers

Almost all study streams in rain-dominated catchments experienced post-harvest increases in summer temperatures, with increases in summer maximum temperatures ranging up to 13°C (Table 1). The strong response at Needle Branch may reflect the harsh treatment: clear-cutting to the streambank, slash burning, and removal of wood from the stream. The difference in response between Needle Branch and H.J. Andrews (HJA) Watershed 1, which was subjected to similar treatment, may reflect the differences in aspects (i.e., south for Needle Branch versus northwest for HJA Watershed 1), but other factors also could have influenced the responses. At HJA Watershed 3, where streamside harvesting influenced only part of the stream length, a debris torrent removed riparian vegetation and scoured the channel to bedrock, ultimately leading to similar temperature increases as observed in HJA Watershed 1. At HJA Watersheds 1 and 3, the timing of summer maximum temperatures shifted from August for predisturbance conditions into late June and early July after disturbance, probably because inputs of solar radiation came to dominate other factors such as seasonal variations in discharge (Johnson and Jones, 2000).

In contrast to the results summarized in Table 1, Jackson *et al.* (2001) found that daily maximum temperature for four of seven study streams within clear-cuts in the Washington Coast Range either did not change significantly or decreased following harvesting, likely due to the large volumes of slash that covered the streams and provided shade. However, the post-harvest summer was substantially cooler than the pre-harvest summer, possibly confounding the results.

Effects on summer minimum daily temperatures do not appear to be as marked as those on maximum temperatures, with both small increases and decreases (on the order of 1 to 2°C) having been reported (e.g., Feller, 1981; Johnson and Jones, 2000). Summer daily temperature ranges after logging have increased up to about 7 to 8°C, compared to pre-logging ranges of about 1 to 3°C (Feller, 1981; Johnson and Jones, 2000). Carnation Creek and one of its tributaries experienced smaller increases in diurnal temperature range than found in other studies, but the reason is not obvious from available information (Holtby and Newcombe, 1982).

Fewer studies have examined stream temperature response to forest harvesting in snowmelt-dominated regimes, and no published studies employed a BACI design to estimate effects of no-buffer harvesting in these environments. Brownlee *et al.* (1988) measured downstream increases in summertime mean daily temperature of 1 to 3°C in three small streams flowing through clear-cuts in the central interior of British Columbia (BC), with increases in daily maximum temperatures of 4.5 to 9°C on the warmest days. Assuming that downstream temperature changes in these reaches were modest under pre-logging conditions, these upstream/downstream comparisons

TABLE 1. Summary of Experiments Documenting Stream Temperature Changes after Forest Harvesting.

Study Location	Latitude (°N)	Treatment Catchment	Harvesting Type[1]	Riparian Buffer	Aspect	Temperature Variable	Observed Value After Treatment (°C)	Change Due to Treatment (observed-predicted) (°C)	Recovery to Pre-Treatment Conditions	Reference
RAIN DOMINATED										
Oregon Coast Range (Alsea Watershed)	45	Needle Branch Creek (71 ha)	CC (100%)	no buffer	S	Mean of monthly max. T (Apr.-Oct.)	17.5	5.5	~70% recovery in 7 years	Harris, 1977
						Maximum summer T	26	11.6	~70% recovery in 7 years	
Oregon Coast Range (Alsea Watershed)	45	Deer Creek (304 ha)	PC (25%)	30 m	S	Mean of monthly max. T (Apr.-Oct.)	14.5	2.0	No obvious recovery over 7 years	Harris, 1977
British Columbia, Southern Coast Mountains	49	A[2] (59 ha)	CC (20%)	no buffer	SSW	Maximum difference between observed and predicted for daily max. T		5.0	No obvious recovery in 4 years	Moore *et al.*, 2005
British Columbia, Southern Coast Mountains	49	A[2] (23.1 ha)	CC (61%)	no buffer	S	Maximum recorded T	21.8	3.9[3]	Apparently full recovery after 6-7 years	Feller, 1981
British Columbia, Southern Coast Mountains	49	B (68 ha)	CC (19%) followed by slash burn	no buffer	S	Maximum recorded T	20.3	1.8[3]	No apparent recovery after 7 years	Feller, 1981
Oregon Cascades (H.J. Andrews)	45	WS1 (96 ha)	CC (100%)	no buffer	WNW	Maximum summer T	23.9	~7[4]	Apparently full recovery in 15 years	Johnson and Jones, 2000
						Summer mean weekly max. T	not given	5.4 to 6.4 (first 4 years after logging)[4]		
						Summer mean weekly min. T	not given	1.8 to 2.0 (higher)[4]		
Oregon Cascades (H.J. Andrews)	45	WS3 (101 ha)	PC (25%)	Riparian vegetation removed by debris flow after logging	NW	Maximum summer T	23.9	~7[4]	Apparently full recovery in 15 years	Johnson and Jones, 2000

TABLE 1. Summary of Experiments Documenting Stream Temperature Changes after Forest Harvesting (cont'd.).

Study Location	Latitude (°N)	Treatment Catchment	Harvesting Type[1]	Riparian Buffer	Aspect	Temperature Variable	Observed Value After Treatment (°C)	Change Due to Treatment (observed-predicted) (°C)	Recovery to Pre-Treatment Conditions	Reference
				RAIN DOMINATED (cont'd.)						
Oregon Cascades (H.J. Andrews) (cont'd.)						Summer mean weekly max. T	not given	3.5 to 5.2 (first 3 years after disturbance)[4]		
						Summer mean weekly min. T	not given	-0.1 to 1.0 (first 3 years after disturbance)[4]		
Oregon Cascades (Bull Run)	45	FC1 (59 ha)	PC (25%) and burned	"sparse strips" left on south banks	W	Maximum summer T	15	3.0	Effect on max. T decreased to < 1°C within 6 years	Harr and Fredriksen, 1988
Oregon Cascades (Bull Run)	45	FC3 (71 ha)	PC (25%)	"sparse strips" left on south banks	SW	Maximum summer T	16	2.5	Effect on max. T decreased to < 1°C within 6 years	Harr and Fredriksen, 1988
Vancouver Island, British Columbia (Carnation Creek)	49	J tributary (24 ha)	CC (100%)	no buffer		Summer (JJA) diel T range	2.3	1.6[5] (after logging)	Only one post-treatment year	Holtby and Newcombe, 1982
							3.2	2.5[5] (after logging and burning)	Only one post-treatment year	
Vancouver Island, British Columbia (Carnation Creek)	49	H tributary (12 ha)	CC (100%)	no buffer		Summer (JJA) diel T range	1.8	1.4[5]	Only one post-treatment year	Holtby and Newcombe, 1982
				INTERIOR						
Central Interior of BC (Stuart-Takla FFIP)	55	B5 (42.5 ha)	CC (38%)	10-30 m, all trees > 30 cm dbh harvested	NW	Weekly T_{mean} (max. change)	not given	2.5	No apparent recovery over 5 years	Macdonald *et al.*, 2003b
Central Interior of BC (Stuart-Takla FFIP)	55	B5 (150 ha)	CC (40%)	10-30 m, all trees > 15-20 cm dbh harvested	NW	Weekly T_{mean} (max. change)	not given	3.0	No apparent recovery over 5 years	Macdonald *et al.*, 2003b

TABLE 1. Summary of Experiments Documenting Stream Temperature Changes after Forest Harvesting (cont'd.).

Study Location	Latitude (°N)	Treatment Catchment	Harvesting Type[1]	Riparian Buffer	Aspect	Temperature Variable	Observed Value After Treatment (°C)	Change Due to Treatment (observed-predicted) (°C)	Recovery to Pre-Treatment Conditions	Reference
INTERIOR (cont'd.)										
Central Interior of BC (Stuart-Takla FFIP)	55	B2 (18 ha)	CC (89%)	20 m high retention buffer on lower 60% of stream length within cut block	W	Weekly T_{mean} (max. change)	not given	3.8	No apparent recovery over 5 years	Macdonald *et al.*, 2003
Central Interior of BC (Stuart-Takla FFIP)	55	B1 (313 ha)	CC (6%)	30 m high retention	W	Weekly T_{mean} (max. change)	not given	0.5	No apparent recovery over 5 years	Macdonald *et al.*, 2003b
Central Interior of BC (Stuart-Takla FFIP)	55	G5 (25 ha)	CC (90%)	20 m low retention	NE	Weekly T_{mean} (max. change)	not given	At least 5.4 (missing data)	No apparent recovery over 5 years	Macdonald *et al.*, 2003b
Central Interior of BC (Stuart-Takla FFIP)	55	118-48 (410 ha)	CC (13%)	30 m, all commercial trees harvested	SW	Mean T_{max} in Aug.		0.3	No apparent recovery over 3 years	Mellina *et al.*, 2002
						Mean T_{min} in Aug.		-0.2	No apparent recovery over 3 years	
						T_{max} in Aug.	20.1	2.2	Insufficient info.	
Central Interior of BC (Stuart-Takla FFIP)	55	118-16 (310 ha)	CC (9%)	30 m, all commercial trees harvested	SE	Mean T_{max} in Aug.		0.3	No apparent recovery over 3 years	Mellina *et al.*, 2002
						Mean T_{min} in Aug.		-1.1	No apparent recovery over 3 years	
						T_{max} in Aug.	20.1	5.1	Insufficient info.	

[1]CC = clear-cut, PC = patch cut and number in brackets is % of catchment area treated.
[2]Different creeks with same name.
[3]Computed as difference in maximum observed temperatures between treatment and control streams after logging, compared to difference before logging.
[4]Computed by authors as difference between treatment and control streams due to lack of pre-logging regression.
[5]Computed as difference pre-logging and post-logging for the treatment stream due to lack of calibration with control.

provide an estimate of the effect of clear-cut logging. Winkler *et al.* (2003) inferred similar effect sizes by comparing summer water temperatures for small, high-elevation streams in the southern interior of BC, one in a clear-cut and one in undisturbed forest.

Winter temperatures have received less attention. Feller (1981) found short lived, modest increases in winter temperatures following logging and decreases following logging and slash burning, though there was no clear explanation for these divergent patterns. Post-harvest temperature differences between clear-cut Needle Branch and Flynn Creek (the control) were positive during winter, though smaller than summer differences (Brown and Krygier, 1970). In rain dominated catchments, smaller effects would be expected in winter than in summer, based on the lower energy inputs and higher discharges. In small snowmelt fed catchments, particularly at high elevation or northern sites, ice formation and snow cover within the channel should reduce temperatures to near 0˚C regardless of canopy cover (e.g., Mellina *et al.,* 2002; Macdonald *et al.,* 2003b), except possibly in ground water discharge areas.

Influences of Harvesting With Riparian Buffers

Studies in rain dominated catchments suggest that buffers may reduce but not entirely protect against increases in summer stream temperature. In the Oregon Coast Range, the mean of the summer monthly maximum temperatures increased by only 2˚C at buffered Deer Creek, compared to the 5.5˚C increase observed at unbuffered Needle Branch (Harris, 1977; Table 1). However, this comparison is confounded by the fact that the Deer Creek watershed was 25 percent patch-cut, with only a portion of the stream network adjacent to cut blocks, compared to the 100 percent cutting at Needle Branch. Post-logging increases in maximum summer stream temperature of up to 3˚C were observed at the two Fox Creek streams in the Oregon Cascades, where sparse or partial-retention buffers were left (Harr and Fredriksen, 1988). In the Washington Coast Range, post-harvest changes in daily maximum temperature ranged from -0.5˚C to 2.6˚C for three streams with unthinned buffers (15 to 21 m wide), while streams with buffers of nonmerchantable species warmed by 2.8 to 4.9˚C (Jackson *et al.,* 2001).

Two studies in snowmelt dominated subboreal catchments examined stream temperature response to harvesting with partial retention buffers, both conducted as part of the Stuart-Takla Fish-Forestry Interaction Project in the central interior of BC (Mellina *et al.,* 2002; Macdonald *et al.,* 2003b). Macdonald *et al.* (2003b) reported maximum changes in mean weekly temperatures that ranged from less than 1˚C to more than 5˚C for a set of streams subject to a range of forestry treatments (Table 1). Greater warming was observed for the low retention buffers and a patch retention treatment than for the high retention buffers. The protective effect of the buffers was compromised by significant blowdown, which reduced riparian canopy density from about 35 percent to 10 percent at one high retention buffer and from about 15 percent to less than 5 percent at one low retention buffer. Mellina *et al.* (2002) documented temperature responses to clear-cut logging with riparian buffers for two lake headed streams. Both streams cooled in the downstream direction both before and after logging. Mean August temperatures at the downstream ends of the cut blocks were slightly warmer (less than 1˚C) after logging, although the maximum daily temperature in August increased by more than 5˚C at one stream. The dominant downstream cooling observed both before and after harvest was attributed to the combination of warm source temperatures associated with the lakes and the strong cooling effect of ground water inflow through the clear-cut, as well as the residual shade provided by the partially logged riparian buffer.

Thermal Recovery Through Time

Post-harvest summer stream temperatures should decrease through time as riparian vegetation and shade levels recover. Summers (unpublished, cited in Beschta *et al.,* 1987) found that shade levels at sites that had been clear-cut and burned recovered more rapidly in wetter forest types and at lower elevations. Shade recovery to old-growth levels occurred within about 10 years in the Coast Range western hemlock zone and about 20 years in the Cascade Mountain western hemlock zone. Shade recovery was only 50 percent complete after about 20 years in the higher-elevation Pacific silver fir zone in the Cascades. Shade recovery depends not only on vegetation growth but also stream width: narrow streams should recover more rapidly.

In experimental studies, temperature recovery occurred within 5 to 10 years or was at least under way for several rain dominated streams (Brown and Krygier, 1970; Harris, 1977; Feller, 1981; Harr and Fredriksen, 1988). However, recovery took longer in other cases or was not detectable in the post-harvest period in some cases. Johnson and Jones (2000) found that summer stream temperatures recovered after about 15 years for streams that had their channels and riparian zones disturbed by debris flows in the Oregon Cascades, while Feller (1981) found no evidence of recovery seven years after harvest for a catchment subject to logging and slash burning. In the subboreal environment of B.C., Mellina *et al.* (2002) found no evidence of recovery within the first three years, while Macdonald *et al.* (2003b) found no evidence for recovery of summer temperatures within the first five years following harvesting with partial-retention buffers. Because the streams studied by Macdonald *et al.* (2003b) were well shaded by shrubby vegetation both before and after harvest (E. MacIsaac, Fisheries and Oceans Canada, November 29, 2004, personal communication), it appears that shading by low vegetation may not be as effective at maintaining low stream temperatures as that from trees. In addition, blowdown within the buffers may have contributed to the apparent lack of recovery reported by Macdonald *et al.* (2003b).

Comparison With Studies Outside the Pacific Northwest

Studies of the effects of forestry on stream temperature have been conducted at locations outside the PNW, including Great Britain (Stott and Marks, 2000), eastern and southern United States (e.g., Swift and Messer, 1971; Hewlett and Fortson, 1982; Rishel *et al.,* 1982; Lynch *et al.,* 1984), Quebec (Prevost *et al.,* 1999), and New Zealand (Rowe and Taylor, 1994). Consistent with results from the PNW, these studies have found that streams subject to canopy removal become warmer in the summer and exhibit greater diurnal fluctuations. However, differences in environmental conditions (climate, hydrology, vegetation), forestry treatments, and reported temperature metrics limit the comparability of quantitative results.

Effects of Forest Roads

Forest roads and their rights-of-way would have a similar influence to cut blocks in terms of enhanced solar radiation inputs. Brown *et al.* (1971) observed downstream warming of up to 7°C in a 46 m reach of Deep Cut Creek in Oregon, which was completely cleared of vegetation during road construction. In the central interior of B.C., streams warmed over 2°C across a 50 m right-of-way, 1.4°C across a 30 m right-of-way, and about 0.4°C across a 20 m right-of-way (Herunter *et al.,* 2003). Another possible effect of forest roads is the interception of ground water and its conveyance to a stream via ditches, where it is exposed to solar radiation, effectively replacing the cooling effect of ground water inflow with inflow of warm ditch water. This process has been observed in the central interior of B.C. (D. Maloney, B.C. Ministry of Forests, Northern Interior Region, October 3, 2000, personal communication) and may be most important in low relief terrain, where high water tables could maintain ditch flow during periods of warm weather.

Downstream and Cumulative Effects

The potential for cumulative effects associated with warming of headwater streams is a significant management concern. Beschta and Taylor (1988) demonstrated that forest harvesting between 1955 and 1984 in the 325 km^2 Salmon Creek watershed produced substantial increases in summer water temperature at the mouth of the watershed. Given that current forest practices in the Pacific Northwest require or recommend buffers around all but the smallest streams and require more careful treatment of unstable terrain, cumulative effects resulting from current practices may be of lower magnitude than those found by Beschta and Taylor (1988). At smaller scales, downstream transmission of clearing heated water would increase the spatial extent of thermal impacts and possibly reduce the habitat value of localized cool water areas that form where headwater streams flow into larger, warmer streams, which tend to be cooler and have higher dissolved oxygen concentrations than other types of cool water areas (Bilby, 1984).

Some authors have argued that downstream cooling is unlikely to occur except in association with cooler ground water or tributary inflow (e.g., Beschta *et al.,* 1987), while others have contended that streams can recover their natural thermal regimes within relatively short distances downstream of forest openings (e.g., Zwieniecki and Newton, 1999). Streams can cool in the downstream direction by dissipation of heat out of the water column or via dilution by cool inflows. Dissipation to the atmosphere (and thus out of the stream-riparian system) can occur via sensible and latent heat exchange and longwave radiation from the water surface. Heat loss via evaporation (latent heat) can be a particularly effective dissipation mechanism at higher water temperatures for larger streams (Benner and Beschta, 2000; Mohseni *et al.,* 2002). However, the effectiveness of evaporation may be reduced in small forest streams by negative feedback caused by accumulation of water vapor above the stream due to poor ventilation. Dissipation of heat from the water column into the bed can occur via conduction and hyporheic exchange (assuming the bed and hyporheic zone are cooler than stream water), but reciprocally, these mechanisms would add that heat to the bed and hyporheic zone (Poole *et al.,* 2001). Therefore, cooling of the water column may occur at the expense of warming the streambed and riparian zone, which can influence rates of growth and development of benthic invertebrates and influence salmonid incubation (Vannote and Sweeney, 1980; Crisp, 1990; Malcolm *et al.,* 2002).

Reported downstream temperature changes below forest clearings are highly variable, with some streams cooling but others continuing to warm (e.g., McGurk, 1989; Caldwell *et al.,* 1991; Zwieniecki and Newton, 1999; Story *et al.,* 2003). The maximum cooling reported in the literature was almost 7˚C over a distance of about 120 m (Greene, 1950). The magnitude of downstream cooling may be positively related in some cases to the maximum upstream temperature. Keith *et al.* (1998) found that greater cooling occurred on sunny days, when maximum stream temperatures were greater than 20˚C, than on cloudy days, when maximum stream temperatures were only approximately 13˚C. Storey and Cowley (1997) observed downstream cooling of 1 to 2˚C for two streams in New Zealand where upstream temperatures were 20˚C or greater. In a third stream, which had a narrow margin of forest in the riparian zone upstream of the study reach, upstream temperatures were lower, approximately 17˚C, and no downstream cooling was observed. However, a high upstream temperature does not ensure that downstream cooling will occur, as illustrated by Brown *et al.* (1971), who observed no significant cooling despite an upstream temperature of 29˚C. These studies all employed only post-treatment data, so that even where cooling was observed, there is no basis to assess whether the stream temperature had recovered to pre-logging levels.

Of the studies reviewed, only three attempted to quantify the processes governing downstream temperature changes under shade (Brown *et al.,* 1971; Story *et al.,* 2003; Johnson, 2004). For one clear July day, Brown *et al.* (1971) found that the latent and conductive heat fluxes were the only cooling (negative) terms because ground water inflow was negligible, and these were offset by the warming influences of net radiation and sensible heat, even though the forest canopy substantially reduced inputs of solar radiation. This estimated net input of heat is consistent with the observed lack of significant downstream cooling. Story *et al.* (2003) found that radiative and turbulent energy exchanges at heavily shaded sites on two streams represented a net input of heat during most afternoons and therefore could not explain the observed cooling of up to more than 4˚C over distances of less than 150 m. Instead, downstream decreases in daily maximum temperatures were caused by energy exchanges between the streams and their subsurface environments via ground water inflow, hyporheic exchange, and heat conduction. In contrast, Johnson (2004) demonstrated that downstream cooling could occur in an artificially shaded stream with no ground water inflow or hyporheic exchange. Clearly, more research is required to clarify the mechanisms responsible for downstream cooling and how they respond to local conditions.

Three factors may mitigate against cumulative effects of stream warming. First, although cooling by dilution of streamwater with colder inflow water cannot reduce downstream temperatures to pre-harvest levels, dilution may be great enough, especially at larger spatial scales, to render the changes ecologically insignificant, as long as the total discharge of clearing-heated streams is not a substantial fraction of the total discharge (Equation 2). Second, the effects of energy inputs will not be linearly additive throughout a stream network. This is a consequence of the relation between energy exchange (particularly energy losses via evaporation and longwave radiation) and stream temperature: increased temperatures in one reach due to reduction of riparian shade may reduce the propensity for the stream to warm in downstream reaches, even in the absence of dilution by ground water or tributary inflow. Finally, where streams flow into lakes, ponds, or wetlands, the resetting of stream temperatures may minimize the possibility for cumulative effects below the lentic environment (Ward and Stanford, 1983).

An important aspect of cumulative effects is the indirect impacts of forest harvesting. For example, removing riparian vegetation not only reduces shade but can result in a stream becoming wider and shallower due to bank erosion, which can produce a greater temperature response to the additional heat inputs. Aggradation caused by logging related mass movements and subsequent sediment loading can similarly cause stream widening and promote warming (Beschta and Taylor, 1988). In addition, debris flows that remove vegetation and scour channel beds to bedrock can lead to marked warming in headwater tributaries (Johnson and Jones, 2000).

MONITORING AND PREDICTING STREAM TEMPERATURE AND ITS CAUSAL FACTORS

Successful management of forestry operations for maintenance of stream temperature regimes requires accurate, cost effective tools for monitoring stream temperature and its causal factors and for predicting the effects of different harvesting options.

Monitoring Stream Temperature

Most recent studies have employed submersible temperature loggers to monitor temperature. These are relatively inexpensive and sufficiently accurate (typically within 0.2°C) for forestry related applications. They also provide sufficient temporal resolution to allow calculation of temperature metrics at a range of time scales, such as maximum daily temperature and accumulated seasonal degree days. Multiple loggers should be used within and downstream of clearings to avoid sampling problems resulting from small scale spatial variability (Story *et al.,* 2003; Moore *et al.,* 2005).

Forward looking infrared radiometry from helicopters has been used for investigating stream temperature patterns in medium to large streams (Torgerson *et al.,* 1999, 2001). However, its application to headwater streams is limited by the sensor resolution relative to typical channel widths for small streams and the fact that low vegetation overhanging the channel may obscure the water surface. However, the technology may be invaluable in identifying cool water areas at tributary mouths and their significance as thermal refugia.

Measuring Shade

Given the importance of solar radiation in causing stream warming following forest harvesting, reliable and practical methods for measuring shade are required for use as indicators of the effectiveness of riparian buffers in protecting against stream temperature changes and for use in predictive models of stream temperature. Many models use canopy and terrain angles, either field measured with a clinometer or estimated from the geometry of the riparian canopy and stream, to determine whether direct solar radiation is blocked. Where blockage by vegetation occurs, the direct radiation reaching the stream is reduced according to estimates of the transmissivity or shade density of the riparian canopy (e.g., Beschta and Weatherred, 1984; Rutherford *et al.,* 1997; Sridhar *et al.,* 2004).

Ocular estimates of canopy cover using instruments such as a spherical densiometer are often used as indices or as model input (e.g., Sullivan *et al.,* 1990; Mellina *et al.,* 2002). Although ocular instruments are generally inexpensive and easy to use in the field, they are prone to operator error due to subjective interpretation. In addition, measurements such as spherical density may not provide a good index of solar radiation blockage except in a uniform canopy. Brazier and Brown (1973) developed an instrument for measuring angular canopy density (ACD), which is the canopy density in the portion of the sky through which the sun passes during the time of maximum potential stream heating, typically July or August, depending on location and hydrologic regime. Teti (2001) described an alternative, robust instrument for measuring ACD based on a convex mirror. Another instrument, the Solar Pathfinder™, focuses on the portion of the canopy responsible for blocking direct solar radiation throughout the day.

Hemispherical photography offers an alternative that is less prone to operator error than ocular methods and allows computation of a range of parameters that are strongly related to solar radiation exposure (Ringold *et al.,* 2003), but it requires off-site analysis. Digital cameras that can be used with fish-eye lenses are steadily decreasing in price, and functional software packages are available both commercially and by free distribution (Frazer *et al.,* 1999).

Shade can also be characterized by comparing radiation or light levels measured above the stream to those at an open site. For example, Webb and Zhang (1997) used a hand-held photographic light meter, following Bartholow (1989), while Davies-Colley and Payne (1998) used a leaf area index canopy analyzer.

Although studies have compared canopy density parameters estimated by different methods (e.g., Englund *et al.,* 2000; Ringold *et al.,* 2003), few studies appear to have assessed which approach provides the best measure of shade for stream temperature assessment. Brazier and Brown (1973) estimated the amount of "heat blockage" caused by the canopy cover in riparian buffers by comparing observed water temperatures to temperatures estimated for a situation of no canopy shade. The good relation between estimated heat blockage and measured ACD confirmed the relevance of ACD as an indicator of buffer effectiveness for temperature control. Rutherford *et al.* (1997) found substantial sampling variability in their shade estimates for a small stream in New Zealand. Using the average field measured shade value in the physically based model STREAMLINE resulted in overestimates of stream temperature. Moore *et al.* (2005) used the spatial distribution of canopy gaps derived from hemispherical canopy photographs, in conjunction with measurements of total and direct solar radiation at an open site, to model the temporal variation of solar irradiance at a stream surface for a clear sky day. Their inability to close a reach scale energy budget may have resulted from sampling bias associated with the canopy photographs but could also have arisen from errors in estimates of the other energy exchanges. Further work is needed to verify predicted solar radiation based on shade measurements, ideally using solar radiation measurements to avoid confounding factors involved in stream heat budgets.

These efforts will be particularly important for application in complex shade environments such as partial-retention riparian buffers or variable retention harvesting units.

In addition to the quantitative measurement of shade, there are questions about shade "quality" in terms of minimizing energy inputs to a stream. For example, Hewlett and Fortson (1982) presented evidence that shade from low, brushy vegetation was less effective than taller trees at moderating water temperatures for a stream in the Georgia Piedmont. Similarly, Macdonald *et al.* (2003b) observed significant temperature increases in central BC despite cover by low vegetation. If these effects are real, it may be that overhanging low vegetation transmits more solar radiation than a coniferous canopy that obstructs the same fraction of sky view, or that it promotes net energy inputs to a stream by influencing longwave radiation and sensible and/or latent heat.

Predicting the Influences of Forest Harvesting on Stream Temperature

Empirical models for predicting stream temperature response to forest harvesting in the PNW include Mitchell's (1999) regression model for predicting the mean monthly stream temperature following complete removal of the riparian canopy, a "temperature screen" for predicting stream temperature as a function of elevation and percent stream shade in Washington (Sullivan *et al.,* 1990) and a multiple regression model that predicts downstream temperature changes as a function of upstream temperature and canopy cover in the central interior of B.C. (Mellina *et al.,* 2002). Although empirical models have the virtues of simplicity and low requirements for input data, they usually involve significant uncertainties, especially when applied to situations different from those represented in the calibration data (e.g., different locations, weather conditions).

Physically based models incorporating energy balance concepts have been developed for application to individual stream reaches, including the seminal model introduced by Brown (1969, 1985), TEMP-84 (Beschta and Weatherred, 1984), TEMPEST (Adams and Sullivan, 1989), Heat Source (Boyd, 1996), and STREAMLINE (Rutherford *et al.,* 1997). Models to simulate stream temperatures at the stream network or catchment scale include SNTEMP (Mattax and Quigley, 1989; Bartholow, 1991, 2000) and a model based on the HSPF (Hydrological Simulation Program – FORTRAN) model developed by the U.S. Environmental Protection Agency and the U.S. Geological Survey (Chen *et al.,* 1998a,b). Other models have been developed, but the ones mentioned are broadly representative of the range of complexity.

Sullivan *et al.* (1990) tested the ability of four reach scale models (Brown's model, TEMP-86, TEMPEST, and SSTEMP) and three catchment scale models (QUAL2E, SNTEMP, and MODEL-Y) to predict forestry related temperature increases in Washington. The catchment scale models required more input data than would be available for operational applications and did not provide accurate temperature predictions. TEMP-86 provided accurate predictions for mean, minimum, and maximum temperatures but required upstream temperatures as input to achieve the high level of performance. TEMPEST was less sensitive to specification of input temperatures, making it more suitable as an operational tool (Sullivan *et al.,* 1990).

Sridhar *et al.* (2004) addressed the problem of unknown upstream temperatures by using a reach length of 1,800 m above the prediction point. For this reach length, the effect of the upstream boundary condition on modeled downstream temperatures became negligible for low flow conditions. However, this approach would not necessarily be appropriate for the headmost streams in the channel network, where the reach of interest may extend only a few hundred meters or less downstream from the channel head. In such cases, an estimate of ground water temperature may be appropriate as an upstream boundary condition.

As mentioned previously, Rutherford *et al.* (1997) found that their model predictions were biased when the mean field measured values for shade were used as input. Although they were able to match the daily maximum and minimum temperatures by increasing the shade values to the maximum observed values, the timing of the diurnal temperature wave was incorrect, suggesting that some process was not properly represented. They hypothesized that flow through gravels (i.e., hyporheic exchange) could have been one of the causes. The significance of hyporheic exchange on reach scale temperature patterns should be investigated further.

DISCUSSION AND CONCLUSIONS

Summary of Forest Harvesting Effects on Microclimate and Stream Temperature

Forest harvesting can increase solar radiation in the riparian zone as well as wind speed and exposure to air advected from clearings, typically causing increases in summertime air, soil, and stream temperatures and decreases in relative humidity. Riparian buffers can help minimize these changes. Edge effects penetrating into a buffer generally decline rapidly within about one tree height into the forest under most circumstances. Solar radiation, soil temperature, and wind speed appear to adjust to forest conditions more rapidly than air temperature and relative humidity.

Clear-cut harvesting can produce significant daytime increases in stream temperature during summer, driven primarily by the increased solar radiation associated with decreased canopy cover but also influenced by channel morphology and stream hydrology. Winter temperature changes have not been as well documented but appear to be smaller in magnitude and sometimes opposite in direction in rain-dominated catchments. Although retention of riparian vegetation can help protect against temperature changes, substantial warming has been observed in streams with both unthinned and partial retention buffers. Road rights-of-way can also produce significant warming. Changes to bed temperature regimes have not been well studied but can be similar to changes in surface water in areas with downwelling flow.

Although the experimental results are qualitatively consistent, it is difficult to make quantitative comparisons of experimental results because the studies have expressed temperature changes using incommensurable temperature metrics. For the studies where similar metrics were available (e.g., maximum summer temperature), treatment effects exhibited substantial variability, even where the treatments appeared to be comparable (e.g., HJA Watershed 1 and Needle Branch). Thus, on their own, experimental results cannot easily be extrapolated to other situations. Application of heat budget models may help to diagnose the reasons for variations in response in experimental studies and provide a tool for confident extrapolation to new situations.

Increased stream temperatures associated with forest harvesting appear to decline to pre-logging levels within five to ten years in many cases, though thermal recovery can take longer in others. There is mixed evidence for the efficacy of low, shrubby vegetation in promoting recovery.

Temperature increases in headwater streams are unlikely to produce substantial changes in the temperatures of larger streams into which they flow, unless the total inflow of clear-cut heated tributaries constitutes a significant proportion of the total flow in the receiving stream. Clearing heated streams may or may not cool when they flow into shaded areas. Where downstream cooling does not occur rapidly, the spatial extent of thermal impacts is effectively extended to lower reaches, which may be fish bearing. In addition, warming of headwater streams could reduce the local cooling effect where they flow into larger streams, thus diminishing the value of those cool water areas as thermal refugia.

Biological Consequences and Implications for Forest Practices

It is difficult to estimate the biological consequences of harvesting related changes in riparian microclimate and stream temperature based on the existing results. In terms of terrestrial ecology in riparian zones, there is incomplete knowledge regarding the numbers of species that are unique to small streams and their riparian zones, as well as their population dynamics, sensitivity to microclimatic changes, and ability to recolonize disturbed habitat (Richardson *et al.,* 2005). The ecological effects of stream temperature changes in small, nonfish bearing streams are also unclear. While it is generally acknowledged that changes in thermal regime can influence macroinvertebrates (Vannote and Sweeney, 1980; Ward and Stanford, 1992), the metrics typically presented for stream temperature changes (e.g., maximum summer temperature) may not be the most biologically significant for streams that remain at sublethal temperatures. Given the emerging appreciation for the role of small streams in providing organic matter to downstream fish bearing reaches (e.g., Wipfli and Gregovich, 2002), a better understanding is required of how changes in the physical conditions in small streams and their interactions with chemical and biological processes influence their downstream exports.

Based on the available studies, a one-tree-height buffer on each side of a stream should be reasonably effective in reducing harvesting impacts on both riparian microclimate and stream temperature. Narrower buffers would provide at least partial protection, but their effectiveness may be compromised by wind throw, and they could still incur costs by complicating access and yarding operations. Alternative approaches to protecting riparian values may be possible that avoid at least some of the problems associated with buffers. For example, in B.C., many companies retain green tree patches within a cut block to provide future wildlife habitat. If these were positioned where they could shade the stream, they could provide at least some of the function of a riparian buffer but perhaps with lower wind throw risk and with less impact on ease of access and yarding.

Issues for Future Research

Riparian microclimates appear to have been relatively little studied, both in general and specifically in relation to the effects of different forest practices. Further research needs to address these knowledge gaps.

Shade is the dominant control on forestry related stream warming, and although algorithms exist for estimating it based on riparian vegetation height and channel geometry, there is a need to refine methods for measuring it in the field and for modeling it. Ground-based hemispherical photographs offer great potential for developing both static indices of shade as well as a tool for modeling the temporal variation of solar transmission as a function of the spatial distribution of canopy gaps. Further research should focus on the application of hemispherical photography, including an assessment of sampling variability and bias. In addition, the effects of low deciduous vegetation on the heat budget of small streams should be examined to help understand and predict trajectories of thermal recovery in time.

Further research should address the thermal implications of surface/subsurface hydrologic interactions. Studies should focus on both the local scale and reach scale effects of heat exchange associated with hyporheic flow paths, particularly those associated with step pool features, which are common in steep headwater streams. Bed temperature patterns in small streams and their relation to stream temperature should be researched, especially in relation to the effects on benthic invertebrates and other nonfish species. The hypothesis that warming of shallow ground water in clear-cuts can contribute to stream warming should be addressed, ideally by a combination of experimental and process/modeling studies.

The physical basis for temperature changes downstream of clearings needs to be clarified. In particular, it may be useful to determine whether diagnostic site factors exist that can predict reaches where cooling will occur. Such information could assist in the identification of "thermal recovery reaches" to limit the downstream propagation of stream warming. It could also help to identify areas within a cut block where shade from a retention patch would have the greatest influence.

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A Comparison of Techniques for Measuring Canopy in Watercourse and Lake Protection Zones

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Abstract

We investigated seven methods for estimating overstory crown canopy. Subjective ocular estimates were compared with the more objective sampling tools; vertical sighting tubes and spherical densiometers. Intensive and controlled measurements allowed us to compare accuracy. We also present the time required to complete the different methods. Ocular estimates based on a walk-through of the riparian area proved sufficient for most pre-harvest evaluations. These estimates were always underestimates, which is conservative from a public trust resource perspective. Estimates that are more accurate require the use of a vertical sighting tube. We recommend the use of the vertical sighting tube to sample canopy along transects rather than plots, as the former are more efficient.

Introduction

California forest practice regulations establish minimum overstory canopy retention levels in Watercourse and Lake Protection Zones (WPLZs). Additionally, guidelines for protecting the habitat value for federally listed threatened and endangered fish species incorporate canopy retention standards as a surrogate for shade (Anon. 1997). Overstory canopy, in the context of the California Forest Practice Rules, has usually been evaluated via ocular estimation. When more objective estimates were desired, practitioners have primarily used spherical densiometers (Lemmon 1956), a curved mirror with an etched grid and bubble level. Recent literature criticizes the spherical densiometer as a tool for measuring overstory canopy cover (Bunnell and

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Vales 1989, Ganey and Block 1994, Cook et. al. 1995). Densiometers measure cover above a conical shaped projection, and thus include both vertical and angular projections of the canopy. Formal evaluation of ocular estimation does not exist in the literature except for comparisons made to spherical densiometer estimates (Vora 1988). Due to the regulatory and resource issues surrounding canopy measurements, Berbach et. al. (1999) noted the need for clear, defensible, and efficient procedures for measuring overstory canopy cover.

The purposes of this study were to 1) identify an inexpensive method for evaluating overstory canopy cover that would be suitable for pre-harvest inspections (PHIs) and 2) identify a more accurate method that could be used on PHIs, for enforcement purposes, or for monitoring. Methods intended to satisfy the first purpose were ocular estimates. Techniques intended to satisfy the second purpose were instrument methods. We anticipated that the instrument methods would be more accurate for a given stand and assumed that a bias would be evident for the spherical densiometer. We were unaware of how the techniques would compare in their precision and relative effort. We hypothesized that the ocular and sighting tube methods would be unbiased.

We examined methods to determine their adequacy for classifying the sampled sites into categories. Harvest plan WLPZ mitigation implicitly includes a range of acceptable post-harvest overstory cover. The ability to correctly classify stands using typical categories was of interest. We also conducted a time study. Methods that provided adequate accuracy were evaluated to select the methods that required the least amount of time.

Methods

We conducted the study on the Jackson Demonstration State Forest, a 50,000-acre coastal forest between Fort Bragg and Willits in Mendocino County. All sample locations were within the Parlin Creek watershed. The stands consisted of redwood and Douglas-fir with minor amounts of other whitewoods and hardwood species. The weather for the study period consisted of calm days with a mix of clear skies and overcast conditions resulting from coastal marine layer fog.

Study sites were set up the week of September 21, 1998 when we identified and laid out the study sites. Next, we intensively measured canopy on the study sites to reliably determine the “true” value of their overstory canopies; see below for details. Test personnel estimated canopy on the study sites the following week in the sequence described below. We designed the procedures so that one person in the field could conduct them.

Study Sites

Sample locations were WLPZs of a width defined by the California Forest

Practice Rules (14 CCR 916.5) and of length 250 feet. We chose the length based on the Rule's requirement that at least 200 lineal feet of WLPZ must be measured to determine conformance with canopy retention standards (14 CCR 916.4(b)(2)). The side of a study site proximal to the watercourse was the transition line as defined the Forest Practice Rules, while the side distant to the watercourse was the distance required by the slope categories of the Rules.

A range of actual overstory cover and slopes were necessary to conduct the tests. Slope categories that we used (Table 1) allowed an analysis of the effect of slope on efficiency. Using the variables of slope and percent cover, we identified four categories. The 40% break-off point for slope approximates the point of substantial changes in efficiency for people or machinery. The 50% category threshold for cover was selected due to its reference by the Rules. Given these four categories, we identified four stands to ensure a balanced experimental design. We located one additional stand for training purposes.

Table 1. Criteria used in selecting study sites.

Variable	Categories
Slope	<40%, ≥40%
Percent Cover	<50%, ≥50%

Each study site required approximately one full day to find, flag, and measure intensively. We used the criteria of Table 1 to subjectively select the study sites. While replication of each of these categories was desirable, we were restricted by resources to two replications for each of the factors in Table 1.

<u>Sampling for Actual Cover</u>

Once we identified a study site and flagged it's boundaries, we sampled it intensively to establish its actual value. Design consideration regarding the ocular estimates required that we have plots of known cover. The circular plots were 1/50 acre in size (diameter of 33.3 feet) within which were five transects (Figure 1). The center transect was 32 feet in length oriented in a north-south direction. Parallel transects 7 feet and 14 feet in both directions from the center transect were 30 and 18 feet long, respectively. Points at one-foot intervals were marked on the transect rope so that a sighting tube reading was taken at every foot. This provided a total of 128 points for a plot. The transect ropes were kept horizontal and stretched tight above or through brush, slash, and trees. This method forced a systematic measurement of vertical overstory that was not influenced by vegetation, slash, or topography.

The number of plots per study site depended on the variability of the study site. The target was a confidence interval bound less than 5% of the mean with 95% confidence. We wanted the plot layout to be random but to also allow for the optimum location of plots so that the maximum number of plots could be

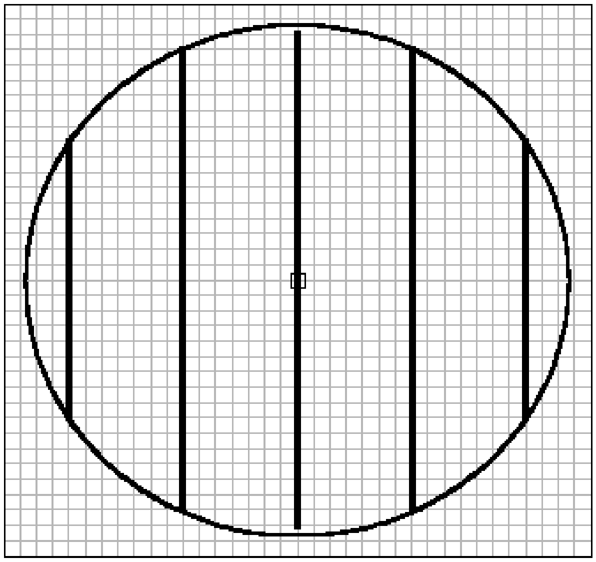

Figure 1. Layout of transects on 1/50-acre plots for intensively measuring the study sites for determining actual cover. Each cell on the grid is one square foot. A measurement was taken at each cell along the transect.

installed, if needed. Thus, the plot selection was without replacement and was pseudo-random because their locations were restricted to occur as follows. We divided the 250 foot length into seven sections of 35.7 feet each. For a 50 foot wide WLPZ, only one plot was possible per section. For the 75 foot and 100 foot wide WLPZs, two plots could be located per section. The 150 foot WLPZ could have four plots per section (Figure 2). The result was a grid of 7x4 squares into which the circular plots were centered. We installed a minimum of one plot per section, for a minimum of seven plots per study site.

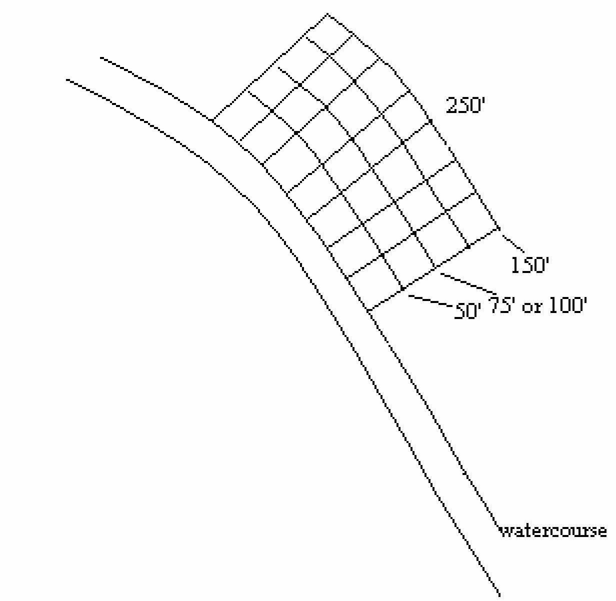

Figure 2. Layout of plots on a WLPZ for intensively measuring a study site. The 1/50-acre circular plots fit within each square. For a 50' width WLPZ there were 7 possible plots, 14 possible plots for 75' or 100' width WLPZ, and 28 plots possible for a 150' width WLPZ.

We selected a random integer in the range of one to one, two, or four depending on WLPZ width. This random number determined the location of the plot in the section. The process was repeated if additional plots were needed. Points already selected were not available again. Plot centers were monumented with a wooden stake labeled with the plot number.

The vertical sighting tube we used was the GRS Densitometer™, an instrument consisting of two pieces of PVC pipe joined into a “T” shape enclosing a mirror, two bubble levels, and two windows. The orientation of the two levels assures a true vertical view (Figure 3). On the window closest to the eye is an etched circle and on the window pointing up is an etched dot. After centering both levels, the canopy was measured by viewing through the small dot when it was centered within the larger circle. A hit was recorded when the dot intercepted vegetation.

The dripline of a tree was the deciding factor in evaluating if a sample was a hit or a miss. Rather than simply recording a hit or miss of a piece of vegetation, a view through the crown of a tree represented a hit. This made the measurement consistent with other canopy estimation techniques such as aerial photo interpretation or crown models predicted from tree attributes. Aerial photo interpretation does not generally account for intra-crown openings. In addition, crown models consider the entire crown cross-sectional area as a solid (Biging and Wensel 1990, Uzoh and Ritchie 1996). The regulatory definition of overstory (14 CCR 895.1) is given as “…that portion of the trees, in a forest of more than one story, forming the upper canopy layers.” This definition does not lend itself to a strict quantitative evaluation. We defined overstory using the general silvicultural definition of dominant or codominant trees, as defined by the microsite (Smith 1962).

The test crews began their inventories after we intensively sampled the study sites. Their data provided the means to evaluate the different combinations of sampling design and instruments. Each crew consisted of one person or “estimator.” Four of the five estimators were California Registered Professional Foresters with extensive field experience, but with variable experience in overstory crown estimation. Table 2 provides a summary of the methods described below.

Table 2. Summary of methods.

Identifier	Instrument	Layout	Comments
1	Ocular	Unstructured walk-through	Before training
2	Ocular	1/50 Acre plots	Same plot centers as “actual” plots; before training
3	Ocular	Unstructured walk-through	After training
4	Ocular	1/50 Acre plots	Same plot centers as “actual” plots; after training
5	Concave spherical densiometer	Plots	Variable sample size, same plot centers as #6
6	Vertical sighting tube	Plots	Variable sample size, same plot centers as #5
7	Vertical sighting tube	Grid of points	Variable sample size

Ocular Estimation Methods

Ocular estimation consisted of two experience levels: a "without training" and a "with training". The canopies were estimated "without training" first because we wished to re-use the same study sites. Within a study site, canopy was estimated by ocular techniques in two portions: 1) the entire site based on a walk-through and 2) at each plot center, from which we calculated an average. Estimators did not take part in study site establishment so they had no prior knowledge of the study sites. Their walk-throughs were not structured; rather they roamed about the study site, as they deemed appropriate. The plot-based method used the same plot centers as were established for estimating actual.

Ocular estimation with training followed the same approach as that without training, except that estimators were trained. At one study site with a range of conditions, we facilitated calibration of estimators’ by telling them the "true" values at each plot, as well as for the total of the study site after they had estimated the canopy.

Instrument Sampling

We evaluated canopy measures using two instruments, the vertical sighting tube and the concave spherical densiometer. Both were used jointly on one sampling scheme, while only the vertical sighting tube was used on another.

Figure 3. The concave spherical densiometer with tape for Strickler's modification is on the left and the vertical sighting tube is on the right.

Sighting Tube Systematic - Plotless

The "sighting tube systematic – plotless" method used a grid of sample points based on a random start. Sample size (the number of points per grid) was determined using the ocular estimate of percent cover following the guidelines of Table 3. This table assumes a 5% acceptable error and is not a function of the size of the area sampled. The binary data that results from using the vertical sighting tube follows a binomial distribution; the source for Table 3.

Table 3. Sample size necessary to meet 5% error at 95% confidence.

Estimated % Cover:	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Estimated Sample Size:	0	36	64	84	96	100	96	84	64	36	0

The plot sheet included a table that specified the distances between points given the sample size and WLPZ width. The initial point was randomly located by starting at a WLPZ corner. A random number table provided the distances to the initial starting point based on a distance parallel and then a distance perpendicular to the watercourse. The offsets were restricted to a range between zero and the distance between points.

Sighting Tube - Plots

Each 1/50-acre circular plot consisted of nine points (Figure 4). The points were laid-out in a 3x3 grid with the center point on the plot center. A spacing of 9'10" was used between points so that each point represented an equal area. The grids were oriented approximately perpendicular to the watercourse. The number of plots sampled was a function of the size of the study site and the variability between plots. Tables 4-7 were used to determine the sample size as a function of the WLPZ width and estimated coefficient of variation (CV).

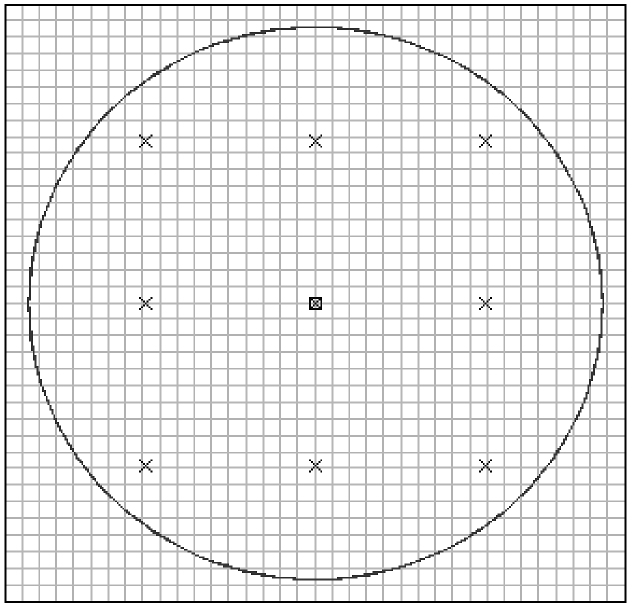

Figure 4. Plot layout of nine sample points for vertical sighting tube measure. Plot is 1/50 acre and distance between sample points is 9'10".

We laid out the plots in the same manner as for the actual (intensive) measurements described above. Plot locations were monumented with a stake, so that we could collect spherical densiometer measurements from the same plot centers.

Table 4. Sample size necessary to meet 5% error for a 50' WLPZ 250' long.

Estimated % CV:	5	10	15	20	25	30	35	40	45	50
Estimated Sample Size:	3	8	10	12	13	13	13	14	14	14

Table 5. Sample size necessary to meet 5% error for a 75' WLPZ 250' long.

Estimated % CV:	5	10	15	20	25	30	35	40	45	50
Estimated Sample Size:	3	9	13	16	18	19	19	20	20	20

Table 6. Sample size necessary to meet 5% error for a 100' WLPZ 250' long.

Estimated % CV:	5	10	15	20	25	30	35	40	45	50
Estimated Sample Size:	4	10	16	20	22	24	25	26	26	27

Table 7. Sample size necessary to meet 5% error for a 150' WLPZ 250' long.

Estimated % CV:	5	10	15	20	25	30	35	40	45	50
Estimated Sample Size:	4	12	20	26	30	33	35	37	38	39

Spherical Densiometer

We tested concave spherical densiometers at the same plot centers used for the sighting tube-plots. Using Strickler's (1959) modification eliminated overlap in view when sampling the four cardinal directions from the plot center. This method required that we sample 17 points in four directions for a total of 68 points per plot. Dividing the number of hits by 68 derived a single value of canopy for each plot. Overstory was not differentiated from understory with this instrument, as the curved mirror reflection does not allow such discrimination.

Experimental Design

Sampling order of the methods was important. The untrained ocular methods necessarily preceded all other methods. The trained ocular methods preceded the instrumented methods in order to assess the specific training provided and not confound the results with experience gained from the instrument methods. Finally, we randomized the order of the remaining methods to avoid any unwanted effects in the cover or time measurements. This entailed three trips to each study site after the "actual" canopy had been measured.

Results

Summaries of the actual attributes of the five study sites are presented in Table 8. We used study site 3 as the training site and therefore did not include it in the report of results. Site 3 had been harvested recently. It provided a diverse training site because within it were a lower slope strip with relatively high canopy cover and an upper slope strip with relatively low cover. Within each strip, the canopy cover was uniform. The two sites with the steepest slopes, sites 1 and 4, also had the most slash. The coefficient of variation (CV) for the canopy cover indicated that the most variation was in the sites with the lowest cover. Plots often fell either within a clump of trees or in the open, thus producing a high variation between plots.

Table 8. Study site statistics from "actual" sampling.

Study Site	Width (ft)	Slope (%)	No. of Plots	Average Cover (%)	CV(%)	Average Basal Area (sq ft/acre)	Notes
1	100	50	9	64	13	124	Slash
2	75	5	7	97	4	357	
3	75	22	11	62	23	238	Training
4	75	45	10	24	68	48	Slash
5	75	5	9	24	72	84	

The combination of instruments and sampling schemes are compared using the difference between the actual percent cover for a study site and the estimated percent cover. A zero value means the actual and estimated values agree completely, a negative value indicates an overestimation, and a positive value shows an underestimation. Within a training regime, the ocular methods with plots were better than the walk-throughs (Figure 5), but only on the study sites that were relatively flat and free of slash.

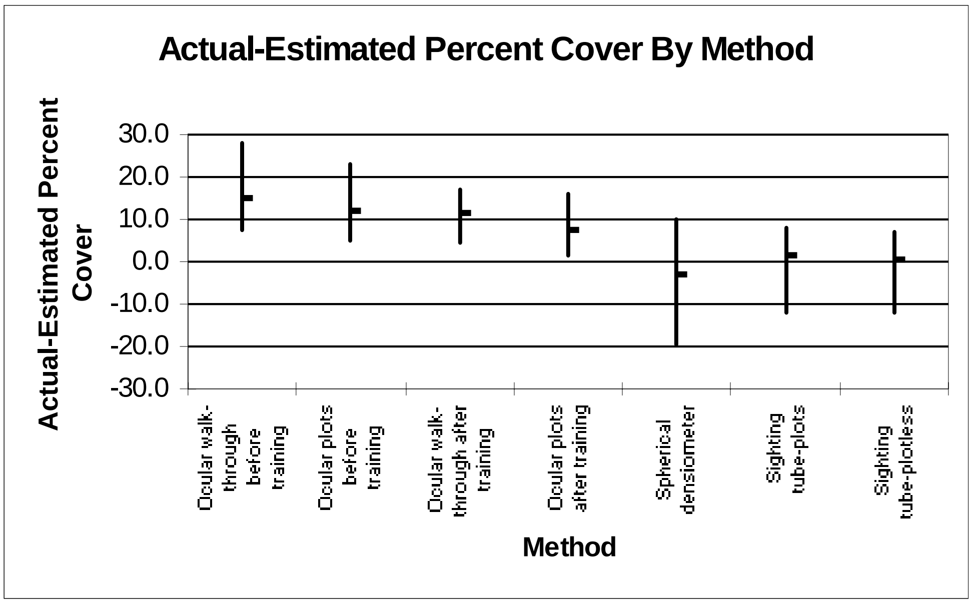

Figure 5. Actual minus estimated percent cover by method. Lines represent high and low figures and tick marks are the average.

Training produced an improvement of 3.3% and 4.4% for the ocular walk-throughs and ocular plots, respectively. Estimators always underestimated the overstory canopy present when using ocular judgement.

The range of estimates was largest for the spherical densiometer (Figure 5). The largest deviation occurred in study site 5 which was relatively open, but surrounded by mature stands. The more severe overestimation of the spherical densiometer is probably due to the angle of view of the instrument incorporating the surrounding dense canopy. Similarly, the largest positive deviation of the instruments occurred with the spherical densiometer on study site 2. This stand was very dense, but there was an opening just outside the WLPZ. Due to the densiometer's measurement angle, these openings were measured. A plot by plot comparison of the sighting tube and spherical densiometer estimates shows how the spherical densiometer frequently overestimates cover (Figure 6).

A categorical approach to presenting the results is to consider the practical applications regarding California forest practice regulations and other regulatory constraints. Three classes were examined with a cutoff of 50% to correspond to the Forest Practice Rules (14 CCR 916.5(e)(G-I)) and a commonly applied cutoff of 75% to address concerns for the endangered coho salmon. Classifying relatively sparse or dense stands does not appear to be an issue with any of the methods (Table 9). The 50-75% range does appear to be affected by method, with the “sighting tube-plotless” method (7) being the most accurate. However, because the actual canopy values (Table 8) were all more than 20% away from the category bounds in the sparse and dense stands, we cannot say from this analysis if the same finding would be true as the actual values approach the bounds.

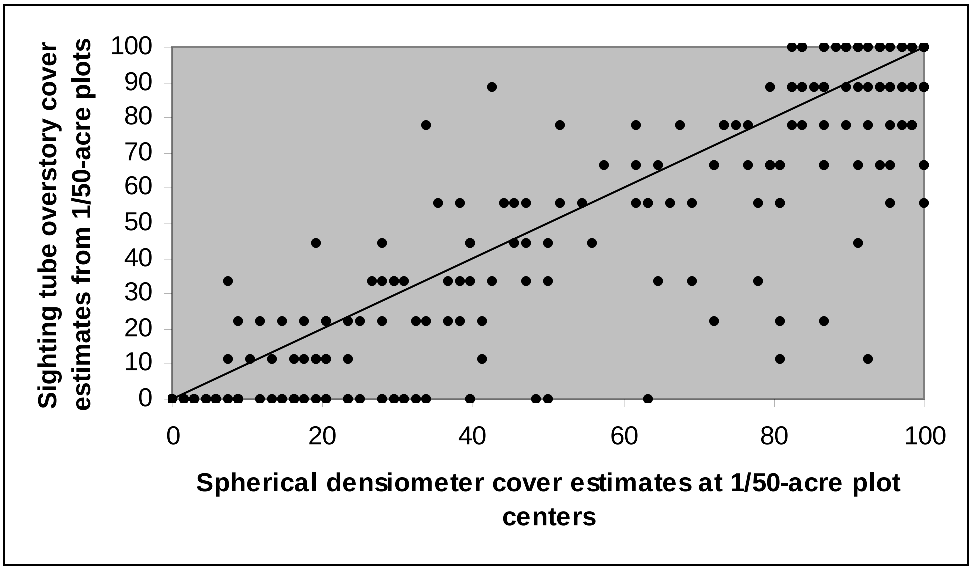

Figure 6. Sighting tube-plot overstory estimates versus concave spherical densiometer estimates of cover.

Table 9. The percentage of estimates that are correctly classified when the actual value is within the given range.

Method	***<50% Canopy***	***50-75% Canopy***	***>75% Canopy***
1-Ocular, walk-through before training	100.0%	0.0%	100.0%
2-Ocular, plots before training	100.0%	0.0%	100.0%
3-Ocular, walk-through after training	100.0%	20.0%	100.0%
4-Ocular, plots after training	100.0%	60.0%	100.0%
5-Spherical densiometer	100.0%	40.0%	100.0%
6-Vertical sighting tube, plots	100.0%	40.0%	100.0%
7-Vertical sighting tube, plotless	100.0%	80.0%	100.0%

Because the ocular estimation without training performed the least satisfactorily in the 50-75% category, we examined the nature of the misclassifications. The actual values were compared with the estimated classifications for methods 1 and 2 only (Table 10). A perfect classification would show numbers only on the diagonal. Untrained ocular estimation appears to result in categorizing the 50-75% class into the less than 50% category. This is also suggested in Figure 5, which also suggests the same to be true for methods 3 and 4. A scatter diagram of cover values for the actual values for the 1/50-acre plots versus post-training ocular estimation illustrates the misclassification in the mid-range of values (Figure 7).

Table 10. Error matrix for methods 1 and 2, untrained ocular estimation.

	Actual			
Estimated	*<50%*	*50-75%*	*>75%*	***Total***
<50%	20	10	0	30
50-75%	0	0	0	0
>75%	0	0	10	10
Total	20	10	10	40

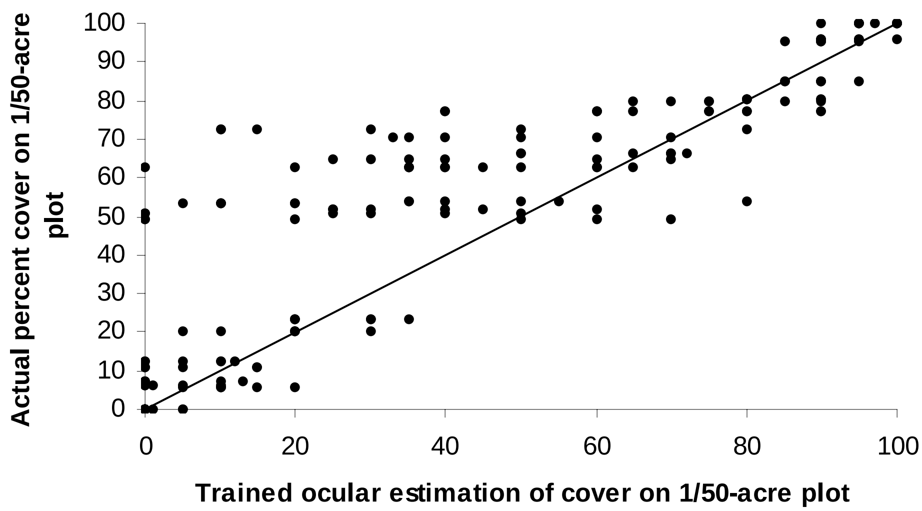

Figure 7. Actual versus trained ocular estimates of overstory cover on 1/50-acre circular plots over all study sites.

We present the times required to obtain the accuracy described above for two classes of measurement difficulty, based on slope and the amount of slash (Table 11). Study sites 2 and 5 provided relatively easy mobility (easy) and sites 1 and 4 were considered more difficult (hard). The walk-through required the least amount of effort of all of the methods. Considering only methods that use instruments (5-7), the “sighting tube-plotless” method using grid points was found to be the most efficient.

Table 11. Time required to a conduct survey for a study site and time per plot or point.

Method	**Difficulty**	***Average Time(min.)***	***Avg. Points/Plots***	***Time per Point/Plot(min.)***
1-Ocular, walk-through	Easy	6.50	na	na
	Hard	12.33	na	na
2-Ocular, plots	Easy	10.17	10.20	1.00
	Hard	20.58	11.40	1.81
3-Ocular, walk-through	Easy	6.00	na	na
	Hard	8.00	na	na
4-Ocular, plots	Easy	9.33	10.20	0.92
	Hard	15.67	11.40	1.37
5-Spherical densiometer	Easy	29.00	10.20	2.84
	Hard	42.08	13.10	3.21
6-Sighting tube, plots	Easy	29.83	10.20	2.92
	Hard	46.33	13.10	3.54
7-Sighting tube, plotless	Easy	21.75	53.50	0.41
	Hard	33.67	58.80	0.57

Discussion

The objectives of this project were to identify: 1) a method of measuring overstory canopy appropriate for PHIs, and 2) a more accurate method for enforcement or monitoring. The California Forest Practice Rules define overstory (14 CCR 895) as "…that portion of the trees, in a forest of more than one story, forming the upper canopy layers." Further, the rules list a variety of functions and processes that are to be protected by WLPZs, including water temperature, streambed and flow modifications by large woody debris, filtration of organic and inorganic material, vertical vegetation diversity, microclimate, snags, and surface cover. If water temperature, and hence shade, were the only factor of interest then a measure of angular shade canopy and relationship to the path of the sun would be of direct interest. A Solar Pathfinder® would be the most appropriate tool to answer that question. Because of the angle of sunlight, the sampling universe would be shifted northward for measuring shade canopy relative to one directly beneath the trees for measuring a vertical projection of canopy. The Forest Practice Rules imply that vertical overstory canopy closure is the parameter of interest.

Ocular estimation appears to be a biased method, although training and experience may reduce the magnitude of the bias. Our field crew consisted of experienced forestry personnel, and training only improved their estimates by less than five percent. The direction of the bias in our field crew of five was always an underestimation. If universally true, this underestimation would protect against harvesting below the standard. If this holds true for a larger population of persons applying the method, this makes the ocular estimation method appropriate for PHIs. The ocular plot method did not provide a substantial improvement in estimation over the walk-through method. The ocular plot method was also more time consuming and therefore we do not recommend it for our stated purposes. Ocular plots would be useful if a measure of variance were needed or as the auxiliary variable in a double sampling scheme.

The use of the vertical sighting tube on a systematic grid is the preferred method for more accurate estimation. This method is also the most efficient for any terrain. Analyses of the spherical densiometer as a tool for measuring vertical overstory canopy cover reveals that the sample collected does not enable an inference to the population and is biased (Bunnell and Vales 1990, Ganey and Block 1994, Cook et al. 1995, Robards 1998). This study is consistent with those conclusions. Other researchers (Nuttle 1997, Jennings et.al. 1999) have correctly pointed out that this instrument is by design not intended to measure canopy cover, but rather canopy density.

Having a clear definition of overstory is critical. Should the overstory be considered in the context of the entire WLPZ area being sampled or based on the particular position of the subject tree relative to its immediate neighbors? Based on the benefits larger trees provide within riparian areas, it seems plausible that the most conservative definition would be the former.

This study was not designed to determine whether experience with estimating canopy using instruments will improve an estimator's ability to ocularly estimate overstory canopy, although that is not an unreasonable hypothesis that could be explored further. Practitioners can improve their confidence in their estimates by always estimating ocularly before sampling with instruments until their ocular estimates are consistently within a desired difference of the instrument technique. Then, only infrequent calibration would be necessary.

Acknowledgements

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NCRWQCB Orders and NTMPs

September 22, 2009
Clay Brandow

NCRWQCB Adopted Orders

In our June 2, 2009 appeal to the SWRCB of the NCRWQCB decision to adopt a new timber waiver, which includes NTMPs in a Categorical Waiver, we state:

> *"(Water) Board staff has not presented evidence to the Board or to CAL FIRE to demonstrate that operations conducted in conformance with approved NTMPs pose a threat to water quality. In the absence of such findings specific to an approved NTMP, it was the Legislature's intent that operations could occur without further discretionary review by CAL FIRE (page 7)."*

And in our cover letter we state:

> *"CAL FIRE is requesting that the State Water Resources Control Board act affirmatively on this appeal to accomplish the followin*g: (1) Rescind Waiver adopted on June 4, 2009 for Categorical Waiver E and extend the previous waiver for an additional five years, <u>unless it is demonstrated that these approved NTMPs have resulted or could potentially result in Basin Plan violations (emphasis added).</u>"

Hence, knowing whether or not any approved NTMPs have resulted in North Coast Basin Plan violations is very important to our appeal. Typically Basin Plan violations show up in five types of Orders adopted by the Water Board. These are:

1) Administrative Civil Liability Complaints,
2) Administrative Civil Liability Orders,
3) Cease and Desist Orders,
4) Clean Up and Abatement Orders, and
5) Notices of Violation

As a means of detecting whether any approved NTMPs have resulted in North Coast Basin Plan violations, I examined North Coast Water Board adopted orders to determine if any of them involved approved NTMPs.

The NCRWQCB web site lists orders adopted by the Water Board going back to 1998. There are 1,122 adopted orders listed of all types, including general orders. My assumption is that this is a complete list of orders adopted by the North Coast Water Board over the last decade.

Of the 1,122 adopted orders listed, there are 405 adopted orders that fit into the five types of orders listed above. Each adopted order title listed is hyperlinked to a copy of the order, which can be read on-line or printed out.

It was not possible to read all 405 orders in the time available. However by reading the descriptive titles, it was possible to eliminate 315 as almost certainly not related to timber harvest operations, including both THPs and NTMPs. Of the remaining 90 orders, I opened them on-line and read portions of them to determine the type of activity involved. Of the 90 adopted orders reviewed, 18 relate to timber harvesting. Of these 18, one was an illegal timber harvest and conversion operating without a permit, and 17 relate to approved THPs. Of these 17, there are three pairs of adopted orders, where each essentially involves the same THP. Also, three of the 17 relate to a large timber company (PALCO, which no longer exists) and their multiple THPs concentrated in several impacted watersheds. **Significantly, none of these adopted orders involve an approved NTMP** (see Tables 1 and 2 below).

Number of Adopted Orders listed on NCRWQCB website of all types	Number of Adopted Orders potentially involving violations of the Basin Plan relating to all activities	Number of Adopted Orders potentially involving violations of the Basin Plan relating to timber harvest	Number of Adopted Orders potentially involving violations of the Basin Plan relating to approved NTMPs
1,122	**405**	**18**	**0**

Table 1. NCRWQCB Adopted Orders 1998-present*.

2009*	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
0	**1**	**3**	**0**	**0**	**1**	**4**	**6**	**0**	**2**	**1**	**0**

*as of 9/17/2009

Table 2. Number of Adopted Orders potentially involving violations of the Basin Plan relating to timber harvest Adopted Orders 1998-present*.

NCRWQCB Tentative Orders

There are four tentative orders listed on the NCRWCB website. None of them involve timber harvesting or NTMPs.

Conclusion

Based on an analysis of the North Coast Regional Water Quality Control Board's adopted orders and tentative orders, a reasonable person would conclude that the North Coast Water Board has an active inspection and enforcement program and that the program has not identified any NTMPs that have resulted in Basin Plan violations during the last decade. The adopted orders that were available for analysis span the period from 1998 to September 17, 2009. The first NTMP approved in the North Coast region was filed with CAL FIRE in 1991.

North Coast NTMP/NTO Water Quality related Notices of Violations

September 23, 2009
Clay Brandow

CAL FIRE records were checked for Notices of Violations (NOVs) of water quality related Forest Practice Rules (FPRs) in the North Coast Region relating to timber harvesting on NTMP/NTOs for the period 1998 to September 22, 2009. This period corresponded to the period of NCRWQCB's Adopted Orders data set that I analyzed. These NOVs are shown in two attached tables.

Table A shows the NOVs for the period from June 23, 2004 to September 22, 2009, or the period starting with the adoption of the previous NCRWQCB Timber Waiver to roughly the date of the adoption of the NCRWQCB Timber Waiver now under appeal. During this period CAL FIRE issued a total of seven (7) NOVs to NTMP/NTOs in the North Coast Region for violations of the WQ-related FPRs.

Table B shows the NOVs for the period from 1998 to June 23, 2004. During this period CAL FIRE issued a total of twelve (12) NOVs to NTMP/NTOs in the North Coast Region for violations of the WQ-related FPRs.

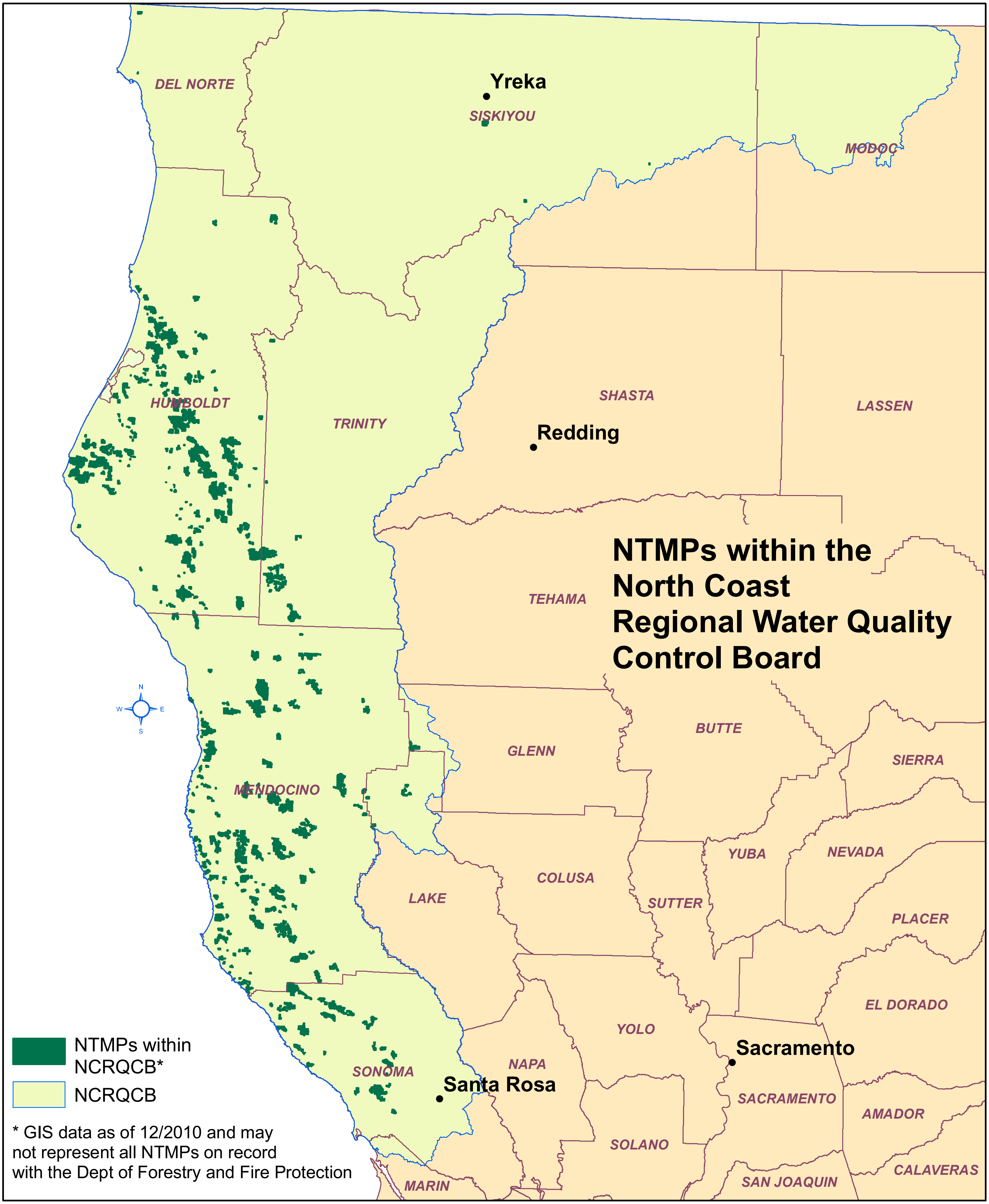
*Note: Some NTMP/NTOs list more than one CalWater planning watershed.

Table A. NTMPs/NTOs -- WQ-related FPR Violations on the North Coast from 6-23-04 to 9-22-09						
NTMP	CalWater IDs*	NTO	CODE SECTION	CODE SECTION DESCRIPTION	INSPECTION DATE	Number of Violations
1-03NTMP-029	1110.000504	1-03NTMP-029-1	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	10/20/04	1
1-04NTMP-015	1111.610201	1-04NTMP-015-1	CCR916.5eB	RPF Designate WLPZ Prior to Ops	7/6/05	1
1-04NTMP-015	1113.130204	1-04NTMP-015-1	CCR916.9f	Min 150' Class I WLPZ	7/6/05	1
"	1113.130204	1-04NTMP-015-1	CCR916.9f	Min 150' Class I WLPZ	1/23/06	1
1-06NTMP-009	1113.830003	1-06NTMP-009-1	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	6/12/08	1
1-99NTMP-014	1109.100103	1-99NTMP-014-13	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	8/2/05	1
2-98NTMP-003	1105.500203	2-98NTMP-003-7	CCR936.4d	Heavy Equip. Not Used in Felling / Site Prep w/in WLPZ Unless in THP	1/31/06	1
					Total Violations	7

Table B. NTMPs/NTOs -- WQ-related FPR Violations on the North Coast from 1998 to 6-23-04						
NTMP	CalWater IDs*	NTO	CODE SECTION	CODE SECTION DESCRIPTION	INSPECTION DATE	Number of Violations
1-00NTMP-014	1111.320505 1111.320702	1-00NTMP-014-1	CCR916.4d	Heavy Equip. Not Used in Felling / Site Prep w/in WLPZ Unless in THP	11/28/00	1
1-01NTMP-027	1110.000104	1-01NTMP-027-1	CCR916.9n1C	Stabilization of Soils October 16 to April 30	10/30/01	1
1-03NTMP-007	1113.200105 1113.200202	1-03NTMP-007-1	CCR916.9i	Retention of Conifers for LWD Recruitment in Class I WLPZ	3/14/05	1
1-95NTMP-014	1110.000604 1113.200202 1111.110203 1111.410602	1-95NTMP-014-4	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	5/5/99	1
1-96NTMP-038	1113.640001	1-96NTMP-038-2	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	12/16/99	1
1-97NTMP-019	1109.100105 1109.100106	1-97NTMP-019-2	CCR916.3b	Slash / Debris Must be Immediately Removed from Watercourses	11/5/99	1
1-97NTMP-023	1113.200102 1113.200106	1-97NTMP-023-4	CCR916.3c	LTO Shall Not Construct/Reconstruct Rds/Tractor Rds/Landings in Watercourse/WLPZ	7/16/01	1
1-97NTMP-028	1111.130202 1111.410501 1111.410502	1-97NTMP-028-1	CCR916.4b2	Timber Ops Shall Conform to Marking, Flagging of WLPZ	5/8/98	1
1-98NTMP-038	1111.310102 1111.310201	1-98NTMP-038-1	CCR916.4d	Heavy Equip. Not Used in Felling / Site Prep w/in WLPZ Unless in THP	6/14/00	1
1-99NTMP-014	1109.100104	1-99NTMP-014-2	CCR916.3b	Slash / Debris Must be Immediately Removed from Watercourses	12/17/01	1
1-99NTMP-014	1110.000501 1110.000503	1-99NTMP-014-8	CCR916.4d	Heavy Equip. Not Used in Felling / Site Prep w/in WLPZ Unless in THP	12/4/02	1
1-99NTMP-025	1113.610001 1113.610002	1-99NTMP-025-2	CCR916.5eB	RPF Designate WLPZ Prior to Ops	4/23/01	1
					Total Violations	12

Conclusion

Based on an analysis of the NOVs issued by CAL FIRE, a reasonable person would conclude that the CAL FIRE has an active inspection and enforcement program, and that violations of WQ-related FPRs on NTMP/NTOs within the North Coast Region are few in number and that compliance was very high, particularly during the period when the previous Timber Waiver adopted by the NCRWQCB in June 23, 2004 was in effect.



FPGIS Forest Practice
California Dept of Forestry and Fire Protection

The State of California and the Department of Forestry and Fire Protection make no representations or warranties regarding the accuracy of data or maps. Neither the State nor the Department shall be liable under any circumstances for any direct, special, incidental, or consequential damages with respect to any claim by any user or third party on account of or arising from the use of data or maps.

GIS Attribute Data for NTMPs within the North Coast Regional Water Quality Control Board

The data represented below is attribute information associated with individual polygons within the California Dept of Forestry and Fire Protection's Forest Practice GIS. This data may not represent all NTMPs on record with the department, but does represent those entered into the GIS at the time of this data request.

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Del Norte	1-04NTMP-020	Selection		Tractor or Skidder	Approved	Thomas & Sharyn Loughry	33.32457688400
Del Norte	1-97NTMP-015	Selection		Tractor/Cable option	Approved	Karen Kahn	291.00582345500
Glenn	2-96NTMP-002	Unevenaged Management		Tractor/Cable option	Approved	Jean Logan, Valerie Saifur, Carol Enos	171.97410658800
Glenn	2-96NTMP-002	Unevenaged Management		Tractor/Cable option	Approved	Jean Logan, Valerie Saifur, Carol Enos	1026.23905016000
Humboldt	1-00NTMP-004	Selection		Tractor or Skidder	Approved	Paine Family Properties	105.89045695600
Humboldt	1-00NTMP-005	Selection		Tractor or Skidder	Approved	Walsh Timber Co	80.32605988080
Humboldt	1-00NTMP-005	Commercial Thin		Tractor or Skidder	Approved	Walsh Timber Co	0.19047313867
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	0.80160197103
Humboldt	1-00NTMP-005	Commercial Thin		Tractor or Skidder	Approved	Walsh Timber Co	4.95971544585
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	0.80439984308
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	3.23239825558
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	4.71285548553
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	7.23881900571
Humboldt	1-00NTMP-005	Commercial Thin		Tractor or Skidder	Approved	Walsh Timber Co	2.84062307161
Humboldt	1-00NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	Walsh Timber Co	6.40135509154
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	29.65082514560
Humboldt	1-00NTMP-007	Selection		Tractor or Skidder	Approved	City Garbage Co of Eureka	119.82515921100
Humboldt	1-00NTMP-007	Selection		Cable System	Approved	City Garbage Co of Eureka	21.13729161940
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	26.93607574680
Humboldt	1-00NTMP-007	Selection		Tractor or Skidder	Approved	City Garbage Co of Eureka	11.42702012910
Humboldt	1-00NTMP-007	Selection		Cable System	Approved	City Garbage Co of Eureka	39.73648079560
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	6.66470442835
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	4.01219750561
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	16.00854809420
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	3.04757685171
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	3.75672564814
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	2.32363509327
Humboldt	1-00NTMP-007	Selection		Tractor/Cable option	Approved	City Garbage Co of Eureka	5.35598273857
Humboldt	1-00NTMP-008	Sanitation Salvage	Group Selection	Tractor or Skidder	Approved	Ribar Timberlands	80.70160363120
Humboldt	1-00NTMP-008	Selection	Group Selection	Tractor or Skidder	Approved	Ribar Timberlands	1137.85299889000

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	25.22248993860
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	15.96267453080
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	6.81063409833
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	13.60196228770
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	11.76938942270
Humboldt	1-00NTMP-008	Sanitation Salvage		Tractor or Skidder	Approved	Ribar Timberlands	13.44658204810
Humboldt	1-00NTMP-009	Selection		Tractor or Skidder	Approved	Steven R. Childs	30.70463682980
Humboldt	1-00NTMP-009	Transition		Tractor or Skidder	Approved	Steven R. Childs	2.41996687597
Humboldt	1-00NTMP-010	Selection		Tractor/Cable option	Approved	R.H. Emmerson & Son	565.41407925500
Humboldt	1-00NTMP-011	Selection		Tractor or Skidder	Approved	Steven Jacobs	20.02304874570
Humboldt	1-00NTMP-013	Transition		Tractor or Skidder	Approved	Toroni, Gay/Gerald	201.49637496200
Humboldt	1-00NTMP-013	Selection		Tractor or Skidder	Approved	Toroni, Gay/Gerald	46.80820182440
Humboldt	1-00NTMP-013	Selection		Tractor or Skidder	Approved	Toroni, Gay/Gerald	21.72993402310
Humboldt	1-00NTMP-013	Transition		Cable System	Approved	Toroni, Gay/Gerald	11.81095852330
Humboldt	1-00NTMP-013	Selection		Cable System	Approved	Toroni, Gay/Gerald	1.54700115867
Humboldt	1-00NTMP-013	Transition		Cable System	Approved	Toroni, Gay/Gerald	1.35936206206
Humboldt	1-00NTMP-013	Selection		Cable System	Approved	Toroni, Gay/Gerald	2.69169249977
Humboldt	1-00NTMP-013	No Harvest Area			Approved	Toroni, Gay/Gerald	3.61247514003
Humboldt	1-00NTMP-013	No Harvest Area			Approved	Toroni, Gay/Gerald	4.86566160713
Humboldt	1-00NTMP-013	Selection		Tractor or Skidder	Approved	Toroni, Gay/Gerald	2.68188336703
Humboldt	1-00NTMP-013	No Harvest Area			Approved	Toroni, Gay/Gerald	82.91890798220
Humboldt	1-00NTMP-013	Rehabilitation - Understocked		Cable System	Approved	Toroni, Gay/Gerald	30.70660993790
Humboldt	1-00NTMP-013	Transition		Tractor or Skidder	Approved	Toroni, Gay/Gerald	0.98732385109
Humboldt	1-00NTMP-013	Transition		Cable System	Approved	Toroni, Gay/Gerald	4.58005473924
Humboldt	1-00NTMP-014	Selection		Tractor or Skidder	Approved	Walter & Patricia Johansen	74.96219037980
Humboldt	1-00NTMP-014	Selection		Cable System	Approved	Walter & Patricia Johansen	6.49388885289
Humboldt	1-00NTMP-016	Selection		Balloon or Helicopter	Approved	Allen & Cheryl Nylander	108.32689786800
Humboldt	1-00NTMP-016	Transition		Balloon or Helicopter	Approved	Allen & Cheryl Nylander	11.28871953340
Humboldt	1-00NTMP-016	Transition		Tractor or Skidder	Approved	Allen & Cheryl Nylander	181.23327316700
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	9.02010642990
Humboldt	1-00NTMP-016	Selection		Tractor/Helicopter option	Approved	Allen & Cheryl Nylander	45.35495128180
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	7.97909429269
Humboldt	1-00NTMP-016	Transition		Tractor/Helicopter option	Approved	Allen & Cheryl Nylander	40.57349446870
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	10.95306429750
Humboldt	1-00NTMP-016	Selection		Tractor/Helicopter option	Approved	Allen & Cheryl Nylander	7.69929914291
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	14.85065366800
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	4.85449047041
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	57.46532327490
Humboldt	1-00NTMP-016	Selection		Tractor/Cable option	Approved	Allen & Cheryl Nylander	89.45340944740
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	56.62591072480
Humboldt	1-00NTMP-016	Rehabilitation - Understocked		Tractor/Cable option	Approved	Allen & Cheryl Nylander	45.27540688490
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	1.44098796984
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	2.16542557849
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	14.54221956520
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	18.50155896260

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	1.92594930820
Humboldt	1-00NTMP-016	Selection		Tractor/Cable option	Approved	Allen & Cheryl Nylander	48.20959447850
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	99.37310812510
Humboldt	1-00NTMP-016	Selection		Tractor/Cable option	Approved	Allen & Cheryl Nylander	4.52941419647
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	0.98715956189
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	19.31254660160
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	5.51445191033
Humboldt	1-00NTMP-016	Selection		Tractor/Cable option	Approved	Allen & Cheryl Nylander	14.83520795240
Humboldt	1-00NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Allen & Cheryl Nylander	42.03027448120
Humboldt	1-00NTMP-016	Selection		Tractor/Cable option	Approved	Allen & Cheryl Nylander	87.35112699450
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	36.38480282180
Humboldt	1-00NTMP-016	Rehabilitation - Understocked		Tractor/Cable option	Approved	Allen & Cheryl Nylander	21.29462979760
Humboldt	1-00NTMP-016	No Harvest Area			Approved	Allen & Cheryl Nylander	16.55604297510
Humboldt	1-00NTMP-016	Selection		Tractor or Skidder	Approved	Allen & Cheryl Nylander	15.65426744590
Humboldt	1-00NTMP-017	Transition		Balloon or Helicopter	Approved	Jerry Carlson	5.52230409962
Humboldt	1-00NTMP-017	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Jerry Carlson	8.69168584273
Humboldt	1-00NTMP-017	Rehabilitation - Understocked		Cable System	Approved	Jerry Carlson	12.87700385760
Humboldt	1-00NTMP-017	Transition		Cable System	Approved	Jerry Carlson	103.71038601000
Humboldt	1-00NTMP-017	Rehabilitation - Understocked		Cable System	Approved	Jerry Carlson	1.81937545331
Humboldt	1-00NTMP-017	Selection		Cable System	Approved	Jerry Carlson	5.63246708583
Humboldt	1-00NTMP-017	Rehabilitation - Understocked		Cable System	Approved	Jerry Carlson	3.14580581298
Humboldt	1-00NTMP-024	Selection		Tractor or Skidder	Approved	Betty Hill	74.63922739300
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	29.59026585830
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	53.21153883230
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	5.28156336123
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	13.70869689080
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	6.48109161019
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	3.27109896356
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	7.34688356299
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	13.16143508370
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	99.70109015420
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	6.12611238324
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	46.29739551950
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	101.44712963400
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	9.85850506627
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	5.27365241834
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	10.98492494840
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	49.38963878060
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	15.48277157520
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	5.87713402942
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor or Skidder	Approved	Wagner Family Ltd	249.48909578900
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Tractor/Cable option	Approved	Wagner Family Ltd	26.53409236170
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	52.11692854170
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Balloon or Helicopter	Approved	Wagner Family Ltd	14.90792326970
Humboldt	1-00NTMP-026	Rehabilitation - Understocked	Selection	Cable System	Approved	Wagner Family Ltd	4.30982843613

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-00NTMP-034	Group Selection		Tractor/Cable option	Approved	A, L, & B Odelberg	148.63633693000
Humboldt	1-00NTMP-035	Group Selection		Tractor or Skidder	Approved	Michael King	55.40509891960
Humboldt	1-00NTMP-036	Unevenaged Management			Approved	Hunt Family Ranch	2166.67621509000
Humboldt	1-00NTMP-037	Transition		Tractor or Skidder	Approved	F & P Landenberger	39.53078614820
Humboldt	1-00NTMP-038	Selection		Tractor or Skidder	Approved	Terry & Linda Wold	25.66187318160
Humboldt	1-00NTMP-042	Selection		Tractor or Skidder	Approved	Blair, Lermo, Hatch	79.68553229940
Humboldt	1-00NTMP-044	Selection		Tractor or Skidder	Approved	Patrick Bartlett	8.60619536719
Humboldt	1-00NTMP-048	Unevenaged Management			Approved	Wagner Land Co	2454.08906230000
Humboldt	1-00NTMP-048	Unevenaged Management			Approved	Wagner Land Co	125.58417699900
Humboldt	1-00NTMP-049	Selection		Tractor or Skidder	Approved	Scott & William Dunn	3020.38570674000
Humboldt	1-00NTMP-052	Selection	Group Selection	Tractor/Cable option	Approved	Dwight Crum	40.37325116190
Humboldt	1-00NTMP-052	Selection	Group Selection	Tractor/Cable option	Approved	Jim Hercher	54.44373526950
Humboldt	1-00NTMP-052	Selection	Group Selection	Tractor/Cable option	Approved	J Frincke/J Marks	48.37039993710
Humboldt	1-00NTMP-054	Unevenaged Management			Approved	Hill & Mendes	509.67774362700
Humboldt	1-00NTMP-055	Unevenaged Management			Approved	Lyle Walker	28.35842032510
Humboldt	1-00NTMP-056	Unevenaged Management			Approved	Robert & James Kirk Trust	200.38886102800
Humboldt	1-00NTMP-056	Unevenaged Management			Approved	Robert & James Kirk Trust, Charles Kirk	51.97483576190
Humboldt	1-00NTMP-056	Unevenaged Management			Approved	Robert & James Kirk Trust, Charles Kirk	247.50028569500
Humboldt	1-00NTMP-059	Selection		Tractor/Cable option	Approved	Lawrence Ford Family	1158.93140524000
Humboldt	1-00NTMP-060	Selection		Tractor or Skidder	Approved	Robert & Sherie England	154.19649264000
Humboldt	1-00NTMP-064	Selection		Tractor or Skidder	Approved	Skaggs Family Trust	24.76810580360
Humboldt	1-00NTMP-067	Selection		Tractor or Skidder	Approved	James & Virginia Kennard	29.90806591750
Humboldt	1-00NTMP-068	Selection		Tractor or Skidder	Approved	Peter Pulis	38.27443609100
Humboldt	1-01NTMP-001	Selection		Tractor or Skidder	Approved	R. & P. Johnsgard	41.31019500960
Humboldt	1-01NTMP-004	Selection	Group Selection	Tractor or Skidder	Approved	John Braun	209.75981536100
Humboldt	1-01NTMP-006	Commercial Thin		Tractor or Skidder	Approved	Donald & Connie Campbell	49.34805301090
Humboldt	1-01NTMP-011	Selection		Tractor/Helicopter option	Approved	Maple Creek Ranch	1260.37213913000
Humboldt	1-01NTMP-012	Group Selection		Tractor or Skidder	Approved	Eureka City Schools	13.07391205590
Humboldt	1-01NTMP-014	Commercial Thin		Tractor or Skidder	Approved	J, J, L & C West	15.67678508430
Humboldt	1-01NTMP-014	Commercial Thin		Tractor or Skidder	Approved	J, J, L & C West	78.57937003430
Humboldt	1-01NTMP-025	Selection		Tractor or Skidder	Approved	Timothy & Barbara Lawlor	12.81719436900
Humboldt	1-01NTMP-025	Selection		Tractor or Skidder	Approved	Timothy & Barbara Lawlor	0.49031669331
Humboldt	1-01NTMP-025	Selection		Tractor or Skidder	Approved	Timothy & Barbara Lawlor	4.27969328861
Humboldt	1-01NTMP-027	Selection	Group Selection	Tractor or Skidder	Approved	Jens Sund	20.21618197000
Humboldt	1-01NTMP-034	Selection		Tractor or Skidder	Approved	Doryce & Gerald Carrico	11.39315616280
Humboldt	1-01NTMP-034	Selection	Group Selection	Tractor or Skidder	Approved	Doryce & Gerald Carrico	16.16082551590
Humboldt	1-01NTMP-034	Transition		Tractor or Skidder	Approved	Doryce & Gerald Carrico	16.83498111460
Humboldt	1-01NTMP-034	Rehabilitation - Understocked		Tractor or Skidder	Approved	Doryce & Gerald Carrico	79.30283682910
Humboldt	1-01NTMP-034	Rehabilitation - Understocked		Tractor or Skidder	Approved	Doryce & Gerald Carrico	24.70670096290
Humboldt	1-01NTMP-034	Selection	Group Selection	Tractor or Skidder	Approved	Doryce & Gerald Carrico	11.57846209670
Humboldt	1-01NTMP-035	Selection		Tractor or Skidder	Approved	Earl & Mary Biehn	115.41500691900
Humboldt	1-01NTMP-035	No Harvest Area			Approved	Earl & Mary Biehn	11.86399427690
Humboldt	1-01NTMP-035	Selection		Tractor or Skidder	Approved	Earl & Mary Biehn	3.74070870406
Humboldt	1-01NTMP-035	No Harvest Area			Approved	Earl & Mary Biehn	15.76077767200
Humboldt	1-01NTMP-035	No Harvest Area			Approved	Earl & Mary Biehn	8.50814809316

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-01NTMP-035	Selection		Tractor or Skidder	Approved	Earl & Mary Biehn	1.06439641573
Humboldt	1-01NTMP-036	Selection		Tractor or Skidder	Approved	P James & A Profant	7.88647633949
Humboldt	1-01NTMP-036	Selection		Tractor or Skidder	Approved	P James & A Profant	61.79986595400
Humboldt	1-01NTMP-036	Selection		Cable System	Approved	P James & A Profant	6.55963250894
Humboldt	1-01NTMP-038	Selection		Tractor or Skidder	Approved	Ross & Kaleen Fisher	41.17570461940
Humboldt	1-01NTMP-043	Selection		Tractor or Skidder	Approved	D Wendt, L Hindley	14.76348199780
Humboldt	1-01NTMP-043	Selection		Tractor or Skidder	Approved	D Wendt, L Hindley	14.68230686840
Humboldt	1-01NTMP-046	Selection		Tractor or Skidder	Approved	Donald & Carol Moore	53.49165831660
Humboldt	1-01NTMP-047	Unevenaged Management			Approved	Gary & Karen Sack	82.35642784280
Humboldt	1-01NTMP-047	Unevenaged Management			Approved	Gary & Karen Sack	12.01609089020
Humboldt	1-01NTMP-049	Transition		Tractor or Skidder	Approved	George Brightman	2499.61848048000
Humboldt	1-01NTMP-049	Transition		Tractor or Skidder	Approved	George Brightman	0.08433771261
Humboldt	1-01NTMP-050	Selection		Tractor or Skidder	Approved	Survivors Trust U-D-T	79.92290440490
Humboldt	1-01NTMP-051	Commercial Thin		Tractor or Skidder	Approved	Jesse Sanders Trustees	29.09546172140
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	56.20887852340
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	81.03736079990
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	1.68391100752
Humboldt	1-01NTMP-051	Rehabilitation - Understocked		Tractor or Skidder	Approved	Jesse Sanders Trustees	12.69975864050
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	7.22353519409
Humboldt	1-01NTMP-051	Rehabilitation - Understocked		Tractor or Skidder	Approved	Jesse Sanders Trustees	0.43891705536
Humboldt	1-01NTMP-051	Rehabilitation - Understocked		Tractor or Skidder	Approved	Jesse Sanders Trustees	1.28921654106
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	3.01711716791
Humboldt	1-01NTMP-051	Rehabilitation - Understocked		Tractor or Skidder	Approved	Jesse Sanders Trustees	2.41644961649
Humboldt	1-01NTMP-051	Group Selection		Tractor or Skidder	Approved	Jesse Sanders Trustees	1.34316553146
Humboldt	1-01NTMP-051	Rehabilitation - Understocked		Tractor or Skidder	Approved	Jesse Sanders Trustees	2.19386899572
Humboldt	1-01NTMP-054	Commercial Thin		Tractor or Skidder	Approved	Trinidad LLC	433.33677190400
Humboldt	1-02NTMP-002	Selection		Tractor/Cable option	Approved	L & K DeVries	136.58654724800
Humboldt	1-02NTMP-002	Rehabilitation - Understocked		Tractor/Cable option	Approved	L & K DeVries	52.68561209910
Humboldt	1-02NTMP-002	Rehabilitation - Understocked		Cable System	Approved	L & K DeVries	1.94314432185
Humboldt	1-02NTMP-002	Selection		Cable System	Approved	L & K DeVries	1.05787644144
Humboldt	1-02NTMP-003	Group Selection		Tractor/Cable option	Approved	Gerould Smith Trust	224.96037253300
Humboldt	1-02NTMP-005	Selection		Tractor or Skidder	Approved	John & Claudia Lima	9.67199683547
Humboldt	1-02NTMP-006	Selection		Tractor/Cable option	Approved	M Brundy, et al	89.51480710470
Humboldt	1-02NTMP-006	No Harvest Area			Approved	M Brundy, et al	82.11733131610
Humboldt	1-02NTMP-006	Selection		Tractor/Cable option	Approved	M Brundy, et al	2.72713339235
Humboldt	1-02NTMP-006	Selection	Group Selection	Tractor or Skidder	Approved	Marcene Barry	39.31089319880
Humboldt	1-02NTMP-006	No Harvest Area			Approved	Marcene Barry	153.79206815500
Humboldt	1-02NTMP-006	Selection	Group Selection	Cable System	Approved	Marcene Barry	19.85817899720
Humboldt	1-02NTMP-006	Selection	Group Selection	Tractor or Skidder	Approved	Marcene Barry	1.19712759779
Humboldt	1-02NTMP-008	Group Selection		Tractor or Skidder	Approved	Robert Lake	20.61845397460
Humboldt	1-02NTMP-009	Selection		Tractor/Cable option	Approved	Barbara Stewart Lindsay & Janice Tosten	2102.25144803000
Humboldt	1-02NTMP-009	Selection		Tractor/Cable option	Approved	Lindsay & Tosten	3104.99193131000
Humboldt	1-02NTMP-012	Group Selection		Tractor or Skidder	Approved	Edward & Penny Ross	36.92383985660
Humboldt	1-02NTMP-013	Commercial Thin		Tractor/Cable option	Approved	D McAdams, B Luckens	121.45842222500
Humboldt	1-02NTMP-013	Commercial Thin		Tractor/Cable option	Approved	Fickle Hill Land LP	42.88387594230

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-02NTMP-014	Selection		Tractor or Skidder	Approved	William Thompson	108.28571649100
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	51.80342125470
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	108.17089334100
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	9.50535451395
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	41.50013488290
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	56.89606597740
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	12.44177930480
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Cable System	Approved	Gordon L. Tosten	65.43288910460
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	22.86640744490
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	61.38109353160
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	37.83171172010
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	0.75661498789
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	2.74656349498
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	180.29680236500
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	272.14680865600
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	3.12355500050
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.04684534003
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	3.23621758149
Humboldt	1-02NTMP-016	Group Selection		Cable System	Approved	Gordon L. Tosten	1.42655473720
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	1.63660689240
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	13.09350004640
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	3.73405905161
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	5.17066872008
Humboldt	1-02NTMP-016	Rehabilitation - Understocked		Tractor or Skidder	Approved	Gordon L. Tosten	73.38549452290
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.79514776390
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	262.98967234900
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.32263734986
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	6.92998762576
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.15473122027
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.47544528774
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	3.80529146503
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	20.65770142200
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	248.16844095900
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.12132409625
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.43665289569
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	3.99469923510
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	858.35310129700
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	2.09209175106
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	3.13536935119
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	4.37566467406
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	59.85496671280
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	2.17002077272
Humboldt	1-02NTMP-016	Transition		Cable System	Approved	Gordon L. Tosten	25.73309068450
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	9.70031804183
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	2.83427605923

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon S. Tosten	19.90240916600
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	2.95020413087
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.24431777074
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.45198391112
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.56433956822
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	79.33739720630
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.32086025433
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.83476653639
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	30.74574278410
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.51922353972
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	8.98453816565
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.69651689687
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.43202613768
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	51.45021578800
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	12.81428879960
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.20360543639
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	18.51916293530
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	1.47246137575
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.10858966800
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.41359603710
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.33914605845
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.44084671840
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	0.06444876384
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	1.21562002256
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.07222927955
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	5.30897548987
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	11.93973712070
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.74803191690
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.09672637967
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.16879800622
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	0.10491290262
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.49476931958
Humboldt	1-02NTMP-016	Transition		Tractor or Skidder	Approved	Gordon L. Tosten	83.26163369700
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	1.88418263330
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.44052502406
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	12.52252998340
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	0.14763270732
Humboldt	1-02NTMP-016	Group Selection		Balloon or Helicopter	Approved	Gordon L. Tosten	49.90348966330
Humboldt	1-02NTMP-016	Group Selection		Cable System	Approved	Gordon L. Tosten	16.16067211000
Humboldt	1-02NTMP-016	No Harvest Area			Approved	Gordon L. Tosten	3.60663297643
Humboldt	1-02NTMP-016	Group Selection		Cable System	Approved	Gordon L. Tosten	39.89243687730
Humboldt	1-02NTMP-016	Group Selection		Cable System	Approved	Gordon L. Tosten	19.60520552420
Humboldt	1-02NTMP-016	Group Selection		Cable System	Approved	Gordon L. Tosten	19.15619854170
Humboldt	1-02NTMP-016	Group Selection		Tractor or Skidder	Approved	Gordon L. Tosten	14.00128271760
Humboldt	1-02NTMP-017	Selection		Tractor or Skidder	Approved	R & M Dickerson	14.80795511770

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-02NTMP-019	Commercial Thin		Tractor or Skidder	Approved	Gerald & Mada McDonald	23.10481590320
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	597.32402528600
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	21.52361622320
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	13.53171272640
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	32.23755177850
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	92.43478796680
Humboldt	1-02NTMP-024	Selection		Tractor or Skidder	Approved	Eleanor May	2.18260832452
Humboldt	1-02NTMP-027	Selection		Tractor or Skidder	Approved	Leland Rock	17.29257638780
Humboldt	1-02NTMP-027	Selection		Tractor or Skidder	Approved	Leland Rock	300.12591029900
Humboldt	1-02NTMP-027	Selection		Tractor or Skidder	Approved	Leland Rock	315.41790292800
Humboldt	1-02NTMP-027	Selection		Tractor or Skidder	Approved	Leland Rock	71.50509254160
Humboldt	1-02NTMP-029	Selection		Tractor or Skidder	Approved	David Grandy	120.41582850400
Humboldt	1-02NTMP-030	Selection		Tractor or Skidder	Approved	Lee Ulansey	192.15968179100
Humboldt	1-02NTMP-031	Selection		Tractor or Skidder	Approved	Steven Little	14.41484684780
Humboldt	1-02NTMP-034	Selection		Tractor or Skidder	Approved	Charlie & Lynn Lawrence	100.72192576500
Humboldt	1-02NTMP-039	Selection		Tractor or Skidder	Approved	Kirby & Nancy Bay	159.18429635800
Humboldt	1-02NTMP-042	Selection		Tractor or Skidder	Approved	Jake and Delores Polm	16.09371844740
Humboldt	1-02NTMP-043	Selection	Group Selection	Tractor/Cable option	Approved	Marion Van Cleave	218.19035328700
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	10.13784372760
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	8.39570138064
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	3.63683616399
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	8.76311848497
Humboldt	1-02NTMP-043	Selection	Group Selection	Tractor/Cable option	Approved	Marion Van Cleave	28.54845507750
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	8.91239471219
Humboldt	1-02NTMP-043	Selection	Group Selection	Cable System	Approved	Marion Van Cleave	18.06475181230
Humboldt	1-02NTMP-043	Selection	Group Selection	Tractor/Cable option	Approved	Marion Van Cleave	218.19035328700
Humboldt	1-03NTMP-004	Selection		Tractor or Skidder	Approved	Robert & Berta Guthridge	172.02486104100
Humboldt	1-03NTMP-010	Selection		Tractor/Helicopter option	Approved	Lindsay & Tosten	157.47014589400
Humboldt	1-03NTMP-013	Selection		Tractor or Skidder	Approved	Slack & Winzler Properties	289.17528501100
Humboldt	1-03NTMP-013	Selection		Tractor or Skidder	Approved	Slack & Winzler Properties	313.44077672300
Humboldt	1-03NTMP-014	Selection		Tractor or Skidder	Approved	Dan Carter	24.12406264560
Humboldt	1-03NTMP-014	Selection		Tractor or Skidder	Approved	Dan Carter	12.26404511800
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	380.59809230600
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	118.01390900400
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	11.55934695580
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	733.80646197800
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	12.96942039700
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	8.85888403122
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	846.98364116500
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	6.30770664653
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	19.17261748020
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	15.68740518230
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	26.32534038480
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	44.36654001040
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	7.48576197483

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	18.21773641660
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	7.36128211911
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	15.66999602830
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	0.50573161614
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	1.64533277484
Humboldt	1-03NTMP-018	Group Selection		Tractor or Skidder	Approved	Hunt Ranch	32.41636809600
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	2.59331160530
Humboldt	1-03NTMP-018	Group Selection		Tractor/Cable option	Approved	Hunt Ranch	14.18017353370
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	21.27216725020
Humboldt	1-03NTMP-018	Group Selection		Cable System	Approved	Hunt Ranch	4.52905206786
Humboldt	1-03NTMP-022	Selection		Tractor or Skidder	Approved	Skaggs Family Trust	196.19037053400
Humboldt	1-03NTMP-022	Selection		Tractor or Skidder	Approved	Skaggs Family Trust	8.35381108224
Humboldt	1-03NTMP-022	Selection		Tractor or Skidder	Approved	Skaggs Family Trust	73.01074892880
Humboldt	1-03NTMP-022	Selection		Cable System	Approved	Skaggs Family Trust	6.36301600604
Humboldt	1-03NTMP-022	Selection		Tractor or Skidder	Approved	Skaggs Family Trust	16.94388673390
Humboldt	1-03NTMP-025	Selection		Tractor or Skidder	Approved	A. Lucchesi & C. Cook	18.75543682290
Humboldt	1-03NTMP-027	Selection		Tractor or Skidder	Approved	Curtis & Ruth Reese	85.77495349920
Humboldt	1-03NTMP-029	Selection		Tractor or Skidder	Approved	Denise Hisel, Mataya Joy	8.75499020254
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	0.64003362620
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	5.40973972728
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	4.54072671800
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	4.83756875012
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	206.11730016500
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	7.62322058369
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	2.31911922275
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	2.12525141553
Humboldt	1-03NTMP-032	Selection		Tractor/Cable option	Approved	Frank Fulton	1.63150283238
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	3.11610290745
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	0.29986096269
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor/Cable option	Approved	Frank Fulton	7.41121990400
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	0.39695048221
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Cable System	Approved	Frank Fulton	22.17453712540
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor/Cable option	Approved	Frank Fulton	0.83082889388
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	0.61777259263
Humboldt	1-03NTMP-032	Transition		Tractor or Skidder	Approved	Frank Fulton	17.13302618570
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	1.00934448354
Humboldt	1-03NTMP-032	Commercial Thin		Cable System	Approved	Frank Fulton	4.30681953302
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Cable System	Approved	Frank Fulton	16.36934741380
Humboldt	1-03NTMP-032	No Harvest Area			Approved	Frank Fulton	1.33438460099
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor/Cable option	Approved	Frank Fulton	22.32354897140
Humboldt	1-03NTMP-032	Commercial Thin		Cable System	Approved	Frank Fulton	5.39896531501
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	0.30373126775
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	1.80614020498
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	8.97583217162
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	3.53470123199

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	94.73447042790
Humboldt	1-03NTMP-032	Transition		Tractor or Skidder	Approved	Frank Fulton	10.79148062830
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.56808151596
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.87847762613
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	0.35341642964
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.61934126777
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.54360647837
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.34117660096
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	2.42970251661
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	0.42035424724
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	0.18277467282
Humboldt	1-03NTMP-032	Selection		Cable System	Approved	Frank Fulton	2.92756485000
Humboldt	1-03NTMP-032	No Harvest Area			Approved	Frank Fulton	2.73863130238
Humboldt	1-03NTMP-032	Transition		Cable System	Approved	Frank Fulton	5.69549178190
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	1.13593304906
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	8.74249588198
Humboldt	1-03NTMP-032	Selection		Cable System	Approved	Frank Fulton	0.06928116244
Humboldt	1-03NTMP-032	Selection		Tractor/Cable option	Approved	Frank Fulton	1.68629754915
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	20.82048964140
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor/Cable option	Approved	Frank Fulton	0.28037691586
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	2.23228936886
Humboldt	1-03NTMP-032	Commercial Thin		Cable System	Approved	Frank Fulton	0.78909484553
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	0.59662819807
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	5.31622104974
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	0.78638771369
Humboldt	1-03NTMP-032	Commercial Thin		Cable System	Approved	Frank Fulton	0.65438394728
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	4.36418243640
Humboldt	1-03NTMP-032	Transition		Tractor or Skidder	Approved	Frank Fulton	19.52416416790
Humboldt	1-03NTMP-032	Transition		Tractor or Skidder	Approved	Frank Fulton	2.08415350200
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	1.11982787373
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor/Cable option	Approved	Frank Fulton	14.16559616240
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	2.74536928682
Humboldt	1-03NTMP-032	Selection		Tractor/Cable option	Approved	Frank Fulton	1.51743218543
Humboldt	1-03NTMP-032	Commercial Thin		Tractor/Cable option	Approved	Frank Fulton	1.60916561104
Humboldt	1-03NTMP-032	Transition		Tractor/Cable option	Approved	Frank Fulton	1.24285961155
Humboldt	1-03NTMP-032	Selection		Cable System	Approved	Frank Fulton	4.15266747495
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	1.29192657009
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	5.63171270528
Humboldt	1-03NTMP-032	Selection		Tractor/Cable option	Approved	Frank Fulton	4.42615579983
Humboldt	1-03NTMP-032	Commercial Thin		Tractor or Skidder	Approved	Frank Fulton	2.79057165868
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	13.74385800800
Humboldt	1-03NTMP-032	Transition		Tractor or Skidder	Approved	Frank Fulton	12.45088002840
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	2.69585707171
Humboldt	1-03NTMP-032	Selection		Tractor or Skidder	Approved	Frank Fulton	2.01747866611
Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	2.02987292894

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Humboldt	1-03NTMP-032	Rehabilitation - Understocked		Tractor or Skidder	Approved	Frank Fulton	1.51741617984
Humboldt	1-03NTMP-033	Commercial Thin	Sanitation Salvage	Tractor/Cable option	Approved	Paul & Cheryl Gruden	280.28308877200
Humboldt	1-03NTMP-033	Selection		Tractor/Cable option	Approved	Paul & Cheryl Gruden	30.13387877530
Humboldt	1-03NTMP-033	Selection		Tractor/Cable option	Approved	Paul & Cheryl Gruden	14.52083074300
Humboldt	1-04NTMP-012	Unevenaged Management		Tractor or Skidder	Approved	Doug Shears, Ulla Nielsen	52.41960648460
Humboldt	1-04NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Doug Shears, Ulla Nielsen	7.89153371418
Humboldt	1-04NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Doug Shears, Ulla Nielsen	1.62452707017
Humboldt	1-04NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Doug Shears, Ulla Nielsen	25.20174893010
Humboldt	1-04NTMP-018	Group Selection		Tractor or Skidder	Approved	Vern Renner, Steve Renner	21.95460859580
Humboldt	1-05NTMP-003	Selection		Tractor or Skidder	Approved	Leonard & Myrna Rousseau	40.55379933200
Humboldt	1-05NTMP-014	Group Selection		Tractor or Skidder	Approved	Craig & Carol Wooster	49.65401613830
Humboldt	1-05NTMP-015	Selection		Tractor or Skidder	Pending	Douglas Way	51.15538081810
Humboldt	1-05NTMP-015	Group Selection		Tractor or Skidder	Pending	Douglas Way	3.11748094484
Humboldt	1-05NTMP-015	Group Selection		Tractor or Skidder	Pending	Douglas Way	3.11544447520
Humboldt	1-05NTMP-020	Group Selection		Tractor or Skidder	Approved	Henry Tsarnas	202.01940801000
Humboldt	1-05NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	Henry Tsarnas	5.44109134609
Humboldt	1-05NTMP-020	Group Selection		Tractor or Skidder	Approved	Henry Tsarnas	120.96885778000
Humboldt	1-05NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	Henry Tsarnas	35.92482268980
Humboldt	1-05NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	Henry Tsarnas	3.60944275180
Humboldt	1-05NTMP-021	Rehabilitation - Understocked		Tractor or Skidder	Approved	Crabtree Ranch	2.91777922130
Humboldt	1-05NTMP-021	Transition		Tractor or Skidder	Approved	Crabtree Ranch	27.19543136110
Humboldt	1-05NTMP-021	Transition		Tractor or Skidder	Approved	Crabtree Ranch	88.78897266330
Humboldt	1-05NTMP-021	Transition		Tractor or Skidder	Approved	Crabtree Ranch	87.24799291440
Humboldt	1-05NTMP-021	Transition		Tractor or Skidder	Approved	Crabtree Ranch	31.97546000210
Humboldt	1-05NTMP-021	Rehabilitation - Understocked		Tractor or Skidder	Approved	Crabtree Ranch	13.87827505980
Humboldt	1-05NTMP-021	Rehabilitation - Understocked		Tractor or Skidder	Approved	Crabtree Ranch	2.75989800201
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	6.03508915273
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	23.61037764310
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	131.21104783600
Humboldt	1-06NTMP-005	Transition		Tractor/Cable option	Approved	I. Brashear/B. Robinson	12.88771889200
Humboldt	1-06NTMP-005	Transition		Cable System	Approved	I. Brashear/B. Robinson	23.34334046900
Humboldt	1-06NTMP-005	Group Selection		Balloon or Helicopter	Approved	I. Brashear/B. Robinson	23.19749051740
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	4.89751026448
Humboldt	1-06NTMP-005	Group Selection		Tractor/Cable option	Approved	I. Brashear/B. Robinson	4.85077776526
Humboldt	1-06NTMP-005	Transition		Balloon or Helicopter	Approved	I. Brashear/B. Robinson	44.94375068790
Humboldt	1-06NTMP-005	Transition		Cable System	Approved	I. Brashear/B. Robinson	3.58957428623
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	1.68873216086
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	0.48016955462
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	10.52137383050
Humboldt	1-06NTMP-005	Transition		Cable System	Approved	I. Brashear/B. Robinson	21.07111513430
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	6.73849660837
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	7.25590935727
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	43.34054770150
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	20.43671581230
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	72.34231433600

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Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	44.75432081010
Humboldt	1-06NTMP-005	Group Selection		Tractor/Cable option	Approved	I. Brashear/B. Robinson	31.24511910570
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	19.17650256700
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	9.59742590336
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	29.29988799800
Humboldt	1-06NTMP-005	Transition		Tractor/Cable option	Approved	I. Brashear/B. Robinson	11.66005112230
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	7.47852672821
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	5.60570582675
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	2.89458579032
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	1.63942618146
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	1.35377905601
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	7.39835643255
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	10.30650633420
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	16.36166098880
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	5.33003962756
Humboldt	1-06NTMP-005	Transition		Tractor/Cable option	Approved	I. Brashear/B. Robinson	13.14668701280
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	2.99606907750
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	12.75616838290
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	2.90015080738
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	4.23949471206
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	7.98006372801
Humboldt	1-06NTMP-005	Transition		Tractor or Skidder	Approved	I. Brashear/B. Robinson	0.86903059883
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	7.26386123975
Humboldt	1-06NTMP-005	Transition		Cable System	Approved	I. Brashear/B. Robinson	4.95178128268
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	3.64230571851
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	143.91369375900
Humboldt	1-06NTMP-005	Group Selection		Balloon or Helicopter	Approved	I. Brashear/B. Robinson	63.14950573060
Humboldt	1-06NTMP-005	Group Selection		Tractor/Cable option	Approved	I. Brashear/B. Robinson	30.13070759180
Humboldt	1-06NTMP-005	Group Selection		Balloon or Helicopter	Approved	I. Brashear/B. Robinson	12.83470584510
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor or Skidder	Approved	I. Brashear/B. Robinson	29.87510111780
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Tractor/Cable option	Approved	I. Brashear/B. Robinson	1.86787163020
Humboldt	1-06NTMP-005	Group Selection		Cable System	Approved	I. Brashear/B. Robinson	1.86120286750
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	15.99514915010
Humboldt	1-06NTMP-005	Rehabilitation - Understocked		Cable System	Approved	I. Brashear/B. Robinson	3.92775754260
Humboldt	1-06NTMP-005	Group Selection		Tractor or Skidder	Approved	I. Brashear/B. Robinson	3.93972742639
Humboldt	1-06NTMP-008	Selection		Tractor or Skidder	Approved	Sandra Klingel	28.01828995520
Humboldt	1-06NTMP-013	Selection		Tractor or Skidder	Approved	Robert & Arlene Manzi	18.11308450770
Humboldt	1-06NTMP-013	Group Selection		Tractor or Skidder	Approved	Robert & Arlene Manzi	19.21261405800
Humboldt	1-06NTMP-023	Group Selection		Tractor/Cable option	Approved	John & Virginia Coleman	19.02462249240
Humboldt	1-06NTMP-023	Group Selection		Tractor/Cable option	Approved	Jeff & Laura Lewis	32.19492451060
Humboldt	1-06NTMP-024	Group Selection		Tractor or Skidder	Approved	Mark & Dina Moore	77.87362096180
Humboldt	1-06NTMP-024	Group Selection		Tractor or Skidder	Approved	Mark & Dina Moore	5.45707305069
Humboldt	1-07NTMP-007	Selection		Tractor or Skidder	Approved	David & Cindy Trobitz	21.71981652770
Humboldt	1-07NTMP-007	Rehabilitation - Understocked		Tractor or Skidder	Approved	David & Cindy Trobitz	10.67226263800
Humboldt	1-07NTMP-007	Selection		Tractor or Skidder	Approved	David & Cindy Trobitz	8.83023529084

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Humboldt	1-07NTMP-019	Selection		Tractor or Skidder	Approved	Jack Rice	32.22861098400
Humboldt	1-08NTMP-001	Selection		Balloon or Helicopter	Pending	Clorina Paine	2.12590488670
Humboldt	1-08NTMP-001	Selection		Cable System	Pending	Clorina Paine	154.60868105500
Humboldt	1-08NTMP-001	Selection		Cable System	Pending	Clorina Paine	7.20922355531
Humboldt	1-08NTMP-001	Selection		Cable System	Pending	Clorina Paine	25.12327089530
Humboldt	1-08NTMP-001	Selection		Tractor/Cable option	Pending	Clorina Paine	21.90584026380
Humboldt	1-08NTMP-001	Selection		Tractor/Cable option	Pending	Clorina Paine	24.50282903360
Humboldt	1-08NTMP-001	Selection		Cable System	Pending	Clorina Paine	1.34130179521
Humboldt	1-08NTMP-001	Selection		Cable System	Pending	Clorina Paine	1.77050407489
Humboldt	1-08NTMP-001	Selection		Tractor/Cable option	Pending	Clorina Paine	35.44345551280
Humboldt	1-08NTMP-003	Group Selection		Tractor or Skidder	Pending	Leslie Westfall, et al	205.45191565900
Humboldt	1-08NTMP-003	Group Selection		Tractor or Skidder	Pending	Leslie Westfall, et al	205.45191565900
Humboldt	1-08NTMP-005	Selection		Tractor/Cable option	Pending	Kenneth & Rena Stiver	30.57817933470
Humboldt	1-08NTMP-007	Selection		Tractor/Cable option	Pending	Robert Stark	18.37113527300
Humboldt	1-08NTMP-007	Selection		Tractor/Cable option	Pending	Sallie Speaker	11.79093647140
Humboldt	1-08NTMP-007	Selection		Tractor/Cable option	Pending	Sallie Speaker	1.30253480976
Humboldt	1-08NTMP-007	No Harvest Area		Tractor/Cable option	Pending	Sallie Speaker	1.13939354153
Humboldt	1-08NTMP-007	No Harvest Area		Tractor/Cable option	Pending	Sallie Speaker	0.54127729133
Humboldt	1-08NTMP-007	Group Selection		Tractor/Cable option	Pending	Robert Stark	1.23503565728
Humboldt	1-08NTMP-007	Selection		Tractor/Cable option	Pending	Robert Stark	2.65333005457
Humboldt	1-08NTMP-007	No Harvest Area			Pending	Robert Stark	0.20649402296
Humboldt	1-08NTMP-007	Selection		Tractor/Cable option	Pending	Robert Stark	0.01051589958
Humboldt	1-08NTMP-007	No Harvest Area			Pending	Robert Stark	0.80535733345
Humboldt	1-08NTMP-017	Group Selection		Tractor/Cable option	Pending	RACE Investments LLC	39.26201401660
Humboldt	1-08NTMP-017	Group Selection		Cable System	Pending	RACE Investments LLC	4.56039371268
Humboldt	1-08NTMP-017	Group Selection		Cable System	Pending	RACE Investments LLC	9.11388891321
Humboldt	1-08NTMP-017	Group Selection		Tractor or Skidder	Pending	RACE Investments LLC	62.69158901350
Humboldt	1-08NTMP-017	Group Selection		Tractor or Skidder	Pending	RACE Investments LLC	30.21057881400
Humboldt	1-08NTMP-017	Group Selection		Cable System	Pending	RACE Investments LLC	1.07261227866
Humboldt	1-08NTMP-017	Group Selection		Cable System	Pending	RACE Investments LLC	1.43722413869
Humboldt	1-08NTMP-017	Group Selection		Tractor/Cable option	Pending	RACE Investments LLC	2.50758703543
Humboldt	1-08NTMP-017	Group Selection		Tractor or Skidder	Pending	RACE Investments LLC	3.23706954183
Humboldt	1-08NTMP-019	Group Selection			Approved	Joe & Jill Rice	69.44057734170
Humboldt	1-08NTMP-020	Group Selection			Approved	Don & Stacey Schoenhofer	12.95244686700
Humboldt	1-08NTMP-020	Group Selection			Approved	Don & Stacey Schoenhofer	33.81770133310
Humboldt	1-08NTMP-020	No Harvest Area			Approved	Don & Stacey Schoenhofer	6.74191310686
Humboldt	1-09NTMP-002	Group Selection			Approved	John Henry Hornstein	75.85821888830
Humboldt	1-09NTMP-003	Selection			Approved	Thomas Monroe & Catherine Mace	34.97428776610
Humboldt	1-09NTMP-003	No Harvest Area			Approved	Thomas Monroe & Catherine Mace	1.27573507438
Humboldt	1-09NTMP-003	No Harvest Area			Approved	Thomas Monroe & Catherine Mace	1.27573507438
Humboldt	1-09NTMP-005	Transition	Group Selection		Approved	Bob Howard	56.13705918910
Humboldt	1-09NTMP-007	Group Selection			Approved	Kenneth & Linda Cook	162.50694574000
Humboldt	1-09NTMP-008	Group Selection			Approved	E&M Whitney, S Decker, M Baker	225.92071676100
Humboldt	1-09NTMP-008	No Harvest Area			Approved	E&M Whitney, S Decker, M Baker	13.97742120030
Humboldt	1-09NTMP-009	Selection			Approved	James & Barbara Evans	28.02202160980

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-09NTMP-009	Selection			Approved	James & Barbara Evans	22.21810278970
Humboldt	1-09NTMP-010	Group Selection			Approved	Jon Cook	24.92939431110
Humboldt	1-09NTMP-011	Selection			Pending	B Carter and K&B Heaton	361.34327799300
Humboldt	1-09NTMP-012	Group Selection			Pending	Bill Robelen	87.93835298260
Humboldt	1-09NTMP-013	Transition			Pending	Larry & Linda Burgh	256.28561063600
Humboldt	1-09NTMP-013	Rehabilitation - Understocked			Pending	Larry & Linda Burgh	11.01484434380
Humboldt	1-09NTMP-013	Rehabilitation - Understocked			Pending	Larry & Linda Burgh	18.72039707580
Humboldt	1-09NTMP-013	Transition			Pending	Larry & Linda Burgh	52.35961152470
Humboldt	1-09NTMP-013	Rehabilitation - Understocked			Pending	Larry & Linda Burgh	111.35664668800
Humboldt	1-92NTMP-002	Unevenaged Management			Approved	Wojcik & Guerriero	371.56743446700
Humboldt	1-92NTMP-006	Unevenaged Management			Approved	Forrest & Chestine Kan	47.10552627990
Humboldt	1-93NTMP-001	Unevenaged Management			Approved	Tom Grudman & Lynn McGill	316.88364342500
Humboldt	1-93NTMP-005	Selection		Tractor or Skidder	Approved	Steven Smith	59.83208387650
Humboldt	1-93NTMP-008	Selection		Tractor or Skidder	Approved	Mary Tauzer	21.41255077450
Humboldt	1-93NTMP-008	Selection		Tractor/Cable option	Approved	Mary Tauzer	654.67442290000
Humboldt	1-93NTMP-008	Selection		Tractor or Skidder	Approved	Mary Tauzer	149.76665314900
Humboldt	1-93NTMP-008	Selection		Tractor/Cable option	Approved	Mary Tauzer	246.21763343400
Humboldt	1-93NTMP-008	Selection		Tractor/Cable option	Approved	Mary Tauzer	654.67442290000
Humboldt	1-93NTMP-008	Selection		Tractor or Skidder	Approved	Mary Tauzer	149.76665314900
Humboldt	1-93NTMP-008	Selection		Tractor/Cable option	Approved	Mary Tauzer	246.21763343400
Humboldt	1-93NTMP-010	Selection		Tractor or Skidder	Approved	Pearl Arvidson	219.20374601500
Humboldt	1-93NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Virginia C Dwight, E R Connick Trust	2073.98255427000
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	344.70518260600
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	464.82983305100
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	386.73535818100
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	522.70767540900
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	706.31520762300
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	483.32367258700
Humboldt	1-94NTMP-006	Selection		Tractor/Cable option	Approved	Martin Gift	419.85883708900
Humboldt	1-94NTMP-011	Selection		Balloon or Helicopter	Approved	Patricia Dorn	214.05580799900
Humboldt	1-94NTMP-011	Selection		Cable System	Approved	Patricia Dorn	408.31304520300
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	34.67601279030
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	39.86518447630
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	37.57344730720
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	26.13065110760
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	25.33530140770
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	6.02082151005
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	78.61680313880
Humboldt	1-94NTMP-011	Selection		Cable System	Approved	Patricia Dorn	22.08107909910
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	7.29927228220
Humboldt	1-94NTMP-011	Selection		Tractor or Skidder	Approved	Patricia Dorn	9.76110238974
Humboldt	1-94NTMP-013	Selection		Tractor or Skidder	Approved	Hansen, ODay, Ash	213.94304903300
Humboldt	1-94NTMP-013	Selection		Tractor/Cable option	Approved	Hansen, ODay, Ash	2794.00243339000
Humboldt	1-94NTMP-013	Selection		Tractor/Cable option	Approved	Hansen, ODay, Ash	71.99782760320
Humboldt	1-94NTMP-013	Selection		Tractor or Skidder	Approved	Hansen, ODay, Ash	62.41378071940

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-94NTMP-013	Selection		Cable System	Approved	Hansen, ODay, Ash	91.09448974950
Humboldt	1-94NTMP-013	Selection		Cable System	Approved	Hansen, ODay, Ash	110.93321687700
Humboldt	1-94NTMP-013	Selection		Cable System	Approved	Hansen, ODay, Ash	122.20627994900
Humboldt	1-94NTMP-013	Selection		Cable System	Approved	Hansen, ODay, Ash	28.16840493390
Humboldt	1-94NTMP-015	Selection		Tractor or Skidder	Approved	Connick & Dwight	2973.14132334000
Humboldt	1-95NTMP-002	Selection		Tractor or Skidder	Approved	Donald & David Felt	151.46801282200
Humboldt	1-95NTMP-005	Selection	Group Selection	Tractor or Skidder	Withdrawn	Michael Hill	85.03231618950
Humboldt	1-95NTMP-006	Selection		Tractor or Skidder	Approved	Richard McClure Trust	68.26858757220
Humboldt	1-95NTMP-008	Selection		Tractor or Skidder	Approved	Maxine Bolt	151.42901928700
Humboldt	1-95NTMP-010	Selection		Tractor or Skidder	Approved	Andrew Westfall	500.71865080600
Humboldt	1-95NTMP-010	Selection		Tractor or Skidder	Approved	Andrew Westfall	452.13613820300
Humboldt	1-95NTMP-011	Unevenaged Management			Approved	Vern M. Buell	9.91092986680
Humboldt	1-95NTMP-011	Unevenaged Management			Approved	Vern M. Buell	21.22142941260
Humboldt	1-95NTMP-012	Unevenaged Management			Approved	Cynthia Brown Forsyth	86.36400841920
Humboldt	1-95NTMP-013	Selection		Tractor or Skidder	Approved	Victor Guynup	1157.60483406000
Humboldt	1-95NTMP-014	Selection		Tractor or Skidder	Approved	Walsh Timber Co	807.12435119500
Humboldt	1-95NTMP-014	Unevenaged Management			Approved	Walsh Timber Co	549.42483958000
Humboldt	1-95NTMP-015	Selection		Tractor or Skidder	Approved	Charles & Shirley Ciancio	15.37002978920
Humboldt	1-95NTMP-016	Selection		Tractor or Skidder	Approved	William & Angelica Beal	1071.09905761000
Humboldt	1-95NTMP-016	Selection		Tractor or Skidder	Approved	William & Angelica Beal	932.12160432600
Humboldt	1-95NTMP-016	Selection		Tractor or Skidder	Approved	William & Angelica Beal	794.04949514100
Humboldt	1-96NTMP-002	Unevenaged Management			Approved	Helen Gibbens, Daniel Gib	159.69577904800
Humboldt	1-96NTMP-002	Unevenaged Management			Approved	Helen Gibbens, Daniel Gib	80.16759392570
Humboldt	1-96NTMP-002	Unevenaged Management			Approved	Helen Gibbens, Daniel Gib	1.55351321387
Humboldt	1-96NTMP-006	Selection		Tractor or Skidder	Approved	Richard Hawks	49.17654255680
Humboldt	1-96NTMP-007	Selection		Tractor or Skidder	Approved	Carol MacMillan	131.96298660100
Humboldt	1-96NTMP-007	Selection		Tractor or Skidder	Approved	Carol MacMillan	105.16255386700
Humboldt	1-96NTMP-007	Selection		Tractor or Skidder	Approved	Carol MacMillan	75.56430517320
Humboldt	1-96NTMP-007	Selection		Tractor or Skidder	Approved	Carol MacMillan	54.16036047180
Humboldt	1-96NTMP-009	Selection		Tractor or Skidder	Approved	Pete Bussman	96.30861958180
Humboldt	1-96NTMP-009	Selection		Tractor or Skidder	Approved	Pete Bussman	8.22269824859
Humboldt	1-96NTMP-010	Unevenaged Management			Approved	Riber Timberlands, et al	325.00198935100
Humboldt	1-96NTMP-011	Selection		Tractor or Skidder	Approved	Twyman & Betty Teasley	47.12752655120
Humboldt	1-96NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Fred van Eck Forest Trust	478.16201010600
Humboldt	1-96NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Fred van Eck Forest Trust	561.47273870700
Humboldt	1-96NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Fred van Eck Forest Trust	744.21337710900
Humboldt	1-96NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Fred van Eck Forest Trust	333.67944764200
Humboldt	1-96NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Fred van Eck Forest Trust	18.65086941470
Humboldt	1-96NTMP-014	Commercial Thin		Tractor or Skidder	Approved	Adrian Bruce	39.11745554380
Humboldt	1-96NTMP-016	Selection		Tractor or Skidder	Approved	Forster-Gill Inc.	181.62388850500
Humboldt	1-96NTMP-016	Selection		Tractor or Skidder	Approved	Robert Britt	21.45115369060
Humboldt	1-96NTMP-020	Unevenaged Management			Approved	Andrew McBride	2962.62925540000
Humboldt	1-96NTMP-021	Rehabilitation - Understocked		Tractor or Skidder	Approved	Theodore Anvick	93.31620261810
Humboldt	1-96NTMP-021	Selection		Tractor or Skidder	Approved	Theodore Anvick	18.15656093680
Humboldt	1-96NTMP-021	Rehabilitation - Understocked		Tractor or Skidder	Approved	Theodore Anvick	33.16653318700

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-96NTMP-022	Selection		Tractor or Skidder	Approved	Don Jaunarena et al	198.25731926800
Humboldt	1-96NTMP-027	Selection	Group Selection	Tractor or Skidder	Approved	Scott & Sharilee Penfold	19.64757338650
Humboldt	1-96NTMP-030	Unevenaged Management			Approved	Downs Family Trust et al	983.38569961600
Humboldt	1-96NTMP-030	Unevenaged Management			Approved	Downs Family Trust et al	41.47154358920
Humboldt	1-96NTMP-031	Selection		Tractor or Skidder	Approved	Linda Hess	63.92331555340
Humboldt	1-96NTMP-031	Commercial Thin		Tractor or Skidder	Approved	Linda Hess	17.14261496170
Humboldt	1-96NTMP-032	Selection		Tractor or Skidder	Approved	John & Linda Gaffin	32.04581175560
Humboldt	1-96NTMP-034	Unevenaged Management			Approved	R Patrick Scanlon, Robert Scanlon	201.94523590600
Humboldt	1-96NTMP-035	Selection		Tractor or Skidder	Approved	William Moore	159.48499528800
Humboldt	1-97NTMP-001	Unevenaged Management			Approved	Diamond R Ranch et al	146.02671257700
Humboldt	1-97NTMP-001	Unevenaged Management			Approved	Diamond R Ranch et al	1.90237867609
Humboldt	1-97NTMP-001	Unevenaged Management			Approved	Diamond R Ranch et al	585.44564516400
Humboldt	1-97NTMP-001	Unevenaged Management			Approved	Diamond R Ranch et al	61.38922022230
Humboldt	1-97NTMP-004	Selection		Tractor or Skidder	Approved	Steven and Valerie Dowty	21.22914979760
Humboldt	1-97NTMP-006	Selection		Tractor or Skidder	Approved	4S Management	745.74171390900
Humboldt	1-97NTMP-008	Selection		Tractor or Skidder	Approved	Tom & Barbara Borgers	23.66904026050
Humboldt	1-97NTMP-010	Selection		Tractor or Skidder	Approved	William, Scott, Judy Dunn	56.11003026730
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Tractor or Skidder	Approved	William, Scott, Judy Dunn	1.97240390626
Humboldt	1-97NTMP-010	Selection		Tractor or Skidder	Approved	William, Scott, Judy Dunn	5.85967974176
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Tractor or Skidder	Approved	William, Scott, Judy Dunn	5.34681501057
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Tractor or Skidder	Approved	William, Scott, Judy Dunn	1.44547128622
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Cable/Tractor option	Approved	William, Scott, Judy Dunn	41.47430197040
Humboldt	1-97NTMP-010	Selection		Cable/Tractor option	Approved	William, Scott, Judy Dunn	12.65512858220
Humboldt	1-97NTMP-010	Selection		Cable/Tractor option	Approved	William, Scott, Judy Dunn	21.32140247160
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Tractor or Skidder	Approved	William, Scott, Judy Dunn	2.91813956106
Humboldt	1-97NTMP-010	No Harvest Area		Tractor or Skidder	Approved	William, Scott, Judy Dunn	46.77306610480
Humboldt	1-97NTMP-010	Selection		Tractor or Skidder	Approved	William, Scott, Judy Dunn	24.41387735530
Humboldt	1-97NTMP-010	Selection		Cable/Tractor option	Approved	William, Scott, Judy Dunn	0.85576009131
Humboldt	1-97NTMP-010	Selection		Tractor or Skidder	Approved	William, Scott, Judy Dunn	524.05817634500
Humboldt	1-97NTMP-010	Rehabilitation - Understocked		Tractor or Skidder	Approved	William, Scott, Judy Dunn	11.90327522350
Humboldt	1-97NTMP-010	Selection		Cable/Tractor option	Approved	William, Scott, Judy Dunn	5.69201087772
Humboldt	1-97NTMP-010	No Harvest Area		Tractor or Skidder	Approved	William, Scott, Judy Dunn	5.23123700885
Humboldt	1-97NTMP-010	Selection		Cable/Tractor option	Approved	William, Scott, Judy Dunn	6.39265132434
Humboldt	1-97NTMP-012	Commercial Thin		Tractor or Skidder	Approved	Donna Moxon	133.56116689400
Humboldt	1-97NTMP-013	Selection		Tractor or Skidder	Approved	Chris & Paul Christensen	41.28274248980
Humboldt	1-97NTMP-016	Unevenaged Management			Approved	Richard & Howard Gilchrist	151.78634127400
Humboldt	1-97NTMP-017	Selection		Tractor or Skidder	Approved	Forster-Gill Inc.	228.44938407200
Humboldt	1-97NTMP-019	Selection		Tractor or Skidder	Approved	James Timmons	95.57274174980
Humboldt	1-97NTMP-019	Selection		Tractor or Skidder	Approved	James Timmons	710.43273521800
Humboldt	1-97NTMP-019	Selection		Tractor or Skidder	Approved	James Timmons	17.91889476070
Humboldt	1-97NTMP-022	Selection		Tractor or Skidder	Approved	Don Jaunarena et al	3.76835609547
Humboldt	1-97NTMP-022	Selection		Tractor or Skidder	Approved	Don Jaunarena et al	99.97428960590
Humboldt	1-97NTMP-022	Unevenaged Management			Approved	Don Jaunarena et al	3.38575292283
Humboldt	1-97NTMP-022	Unevenaged Management			Approved	Don Jaunarena et al	1.54606377457
Humboldt	1-97NTMP-022	Unevenaged Management			Approved	Don Jaunarena et al	147.05258878700

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	660.19351856400
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	86.82257023870
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.46641833307
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.44625325552
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.13898322647
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	1.03870427308
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.63639444604
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	1.76261706378
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.44592922542
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	338.46519230100
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	1.07434121506
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	5.30948671411
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	0.82061542953
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	41.36405784910
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	44.80688478650
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	1.11422610893
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	33.75774464670
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	9.10787480388
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	112.70386094500
Humboldt	1-97NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Perry Ranch LLC	50.41666096480
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	76.02141399910
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	21.57813085980
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	7.55880687122
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	10.14114860360
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	91.21916846300
Humboldt	1-97NTMP-028	Selection		Tractor or Skidder	Approved	Perry Ranch LLC	1.87016868534
Humboldt	1-97NTMP-028	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Ranch LLC	30.09973321060
Humboldt	1-97NTMP-030	Selection			Approved	Andy & Seth Johannesen	103.22478050400
Humboldt	1-97NTMP-030	Selection			Approved	Andy & Seth Johannesen	11.10252962380
Humboldt	1-97NTMP-030	Selection			Approved	Andy & Seth Johannesen	34.71586257810
Humboldt	1-97NTMP-030	Selection			Approved	Andy & Seth Johannesen	34.96239842920
Humboldt	1-97NTMP-030	Selection			Approved	Andy & Seth Johannesen	69.58141922890
Humboldt	1-97NTMP-031	Unevenaged Management			Approved	Michael Torbert	469.68564196200
Humboldt	1-97NTMP-034	Selection		Tractor or Skidder	Approved	George Patmore	38.15510137250
Humboldt	1-97NTMP-034	Selection		Tractor or Skidder	Approved	George Patmore	82.04000040520
Humboldt	1-97NTMP-035	Selection		Tractor or Skidder	Approved	Eddie& Diana Mendes et al	23.36827613700
Humboldt	1-97NTMP-037	Commercial Thin		Tractor/Cable option	Approved	Babich Agricultural Trust	137.50264084900
Humboldt	1-97NTMP-039	Unevenaged Management			Approved	R Anderson, A Freedlund, M Ryan, T DeProsper	159.90207837400
Humboldt	1-97NTMP-042	Unevenaged Management			Approved	D Lemm, E Giddings	76.29342851800
Humboldt	1-98NTMP-001	Selection		Tractor or Skidder	Approved	James & Lois Hunt	614.83251555500
Humboldt	1-98NTMP-001	Selection		Tractor or Skidder	Approved	James & Lois Hunt	575.95115568300
Humboldt	1-98NTMP-001	Selection		Tractor or Skidder	Approved	James & Lois Hunt	1237.32648281000
Humboldt	1-98NTMP-001	Selection		Tractor or Skidder	Approved	James & Lois Hunt	44.40633135800
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	94.92062122200
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	190.48613600200

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	120.28764603000
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	135.57879199500
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	47.95568166110
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	160.84287213300
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	0.91183301856
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	5.74987555553
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	0.69629401585
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	20.04293898680
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	16.47911137360
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	348.47002282900
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	12.23034107410
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	97.93520891510
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	42.45582571670
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Edra Moore	27.00603483420
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	45.83661013090
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	24.90870367210
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	59.18606821450
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	148.66547502400
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	395.68217272900
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Edra Moore	0.78034418890
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	2.53423455992
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	2.41869366843
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	2.21666202685
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	8.41070333994
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	81.01782664470
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	14.14911036980
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	3.57371098106
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Edra Moore	23.16390637710
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	95.69213267520
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	1.12661606061
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	34.23719392090
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	1.97668745957
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	30.49126437220
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	33.57287255710
Humboldt	1-98NTMP-003	Selection		Cable System	Approved	Edra Moore	2.71464954493
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Edra Moore	40.17035258270
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Tractor/Cable option	Approved	Edra Moore	41.69432913610
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	1.84914265398
Humboldt	1-98NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Edra Moore	31.28389471550
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	0.92464103989
Humboldt	1-98NTMP-003	Selection		Tractor/Cable option	Approved	Edra Moore	3.96521891432
Humboldt	1-98NTMP-004	Selection		Tractor or Skidder	Approved	Dallas & Pat Dunham	49.39778870990
Humboldt	1-98NTMP-005	Selection		Tractor or Skidder	Approved	George Milton Cole	33.90629711150
Humboldt	1-98NTMP-006	Selection		Tractor/Cable option	Approved	Wendell & Karen Larkin	35.60220356590
Humboldt	1-98NTMP-009	Selection		Tractor or Skidder	Approved	Frederick & Susan Summers	81.38178385350

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-98NTMP-012	Selection		Tractor or Skidder	Approved	William & Doris Mullen	106.19514753900
Humboldt	1-98NTMP-012	Selection		Cable System	Approved	William & Doris Mullen	20.81706839680
Humboldt	1-98NTMP-012	Selection		Tractor or Skidder	Approved	William & Doris Mullen	155.70202343200
Humboldt	1-98NTMP-012	Selection		Cable System	Approved	William & Doris Mullen	17.63455933310
Humboldt	1-98NTMP-012	No Harvest Area			Approved	William & Doris Mullen	9.13568406145
Humboldt	1-98NTMP-012	Selection		Tractor or Skidder	Approved	William & Doris Mullen	12.20106703400
Humboldt	1-98NTMP-012	Selection		Cable System	Approved	William & Doris Mullen	6.88628661670
Humboldt	1-98NTMP-012	Transition		Cable System	Approved	William & Doris Mullen	27.70243927290
Humboldt	1-98NTMP-012	Transition		Tractor or Skidder	Approved	William & Doris Mullen	31.45701750480
Humboldt	1-98NTMP-012	Transition		Cable System	Approved	William & Doris Mullen	13.30932114280
Humboldt	1-98NTMP-012	Transition		Tractor or Skidder	Approved	William & Doris Mullen	6.96715529001
Humboldt	1-98NTMP-012	Transition		Cable System	Approved	William & Doris Mullen	19.54571771500
Humboldt	1-98NTMP-012	Transition		Tractor or Skidder	Approved	William & Doris Mullen	13.64900208810
Humboldt	1-98NTMP-013	Unevenaged Management			Approved	John B Pierson et al	59.17873009030
Humboldt	1-98NTMP-014	Rehabilitation - Understocked		Tractor/Cable option	Approved	Rodney Eldridge	65.61732092450
Humboldt	1-98NTMP-014	Selection		Tractor/Cable option	Approved	Rodney Eldridge	7.53420230174
Humboldt	1-98NTMP-017	Selection		Tractor or Skidder	Approved	Kenneth & Pamela Johnson	362.62407534500
Humboldt	1-98NTMP-026	Selection		Tractor or Skidder	Approved	H & C Oliveira et al	82.26580152550
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	23.04668387120
Humboldt	1-98NTMP-027	Selection		Tractor or Skidder	Approved	Mullen Survivor Trust	1072.42175748000
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	7.79661089452
Humboldt	1-98NTMP-027	Selection		Tractor or Skidder	Approved	Mullen Survivor Trust	116.73063213400
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	102.49386073100
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	9.33625030390
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	15.02595365200
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	9.12664046005
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	9.06331260538
Humboldt	1-98NTMP-027	Selection		Tractor or Skidder	Approved	Mullen Survivor Trust	10.26232918370
Humboldt	1-98NTMP-027	Selection		Cable/Helicopter option	Approved	Mullen Survivor Trust	11.58388594530
Humboldt	1-98NTMP-029	Selection		Tractor or Skidder	Approved	Lewis Land Investment	509.11047687700
Humboldt	1-98NTMP-030	Rehabilitation - Understocked		Tractor/Cable option	Approved	Cookson Ranch Foundation	63.72106690420
Humboldt	1-98NTMP-030	Selection		Tractor/Cable option	Approved	Cookson Ranch Foundation	174.67688888900
Humboldt	1-98NTMP-030	Rehabilitation - Understocked		Tractor/Cable option	Approved	Cookson Ranch Foundation	107.72196427200
Humboldt	1-98NTMP-030	Commercial Thin		Tractor/Cable option	Approved	Cookson Ranch Foundation	10.65127089930
Humboldt	1-98NTMP-031	Selection		Tractor or Skidder	Approved	Joseph & Wileeta Philbric	1356.97483505000
Humboldt	1-98NTMP-032	Selection		Tractor or Skidder	Approved	Chuck & Theresa Landis	26.94631971830
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	126.69739240800
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	0.98369842234
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	2.39326984370
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	2.27306823419
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	5.24651942160
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	0.06832758716
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	0.06759542465
Humboldt	1-98NTMP-036	Selection		Tractor or Skidder	Approved	Berle & Linda Murray	0.26775080023
Humboldt	1-98NTMP-038	Selection		Tractor or Skidder	Approved	Larry Chapman Family LP	3209.36400435000

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-98NTMP-039	Selection		Tractor or Skidder	Approved	Marshall Rousseau	65.97552206690
Humboldt	1-98NTMP-039	Selection		Tractor or Skidder	Approved	Marshall Rousseau	38.53488236550
Humboldt	1-99NTMP-002	Unevenaged Management		Tractor/Cable option	Approved	Edra & Mark Moore	812.12698880400
Humboldt	1-99NTMP-010	Selection		Tractor or Skidder	Approved	Paul Soward	75.57232906360
Humboldt	1-99NTMP-013	Selection		Tractor or Skidder	Approved	William Jackson	252.19572621400
Humboldt	1-99NTMP-014	Selection		Tractor or Skidder	Approved	Vertrees, Muecke, McAdams	2180.45048634000
Humboldt	1-99NTMP-014	Selection		Tractor or Skidder	Approved	Vertrees, Muecke, McAdams	1245.28156899000
Humboldt	1-99NTMP-014	Selection		Tractor or Skidder	Approved	Vertrees, Muecke, McAdams	1245.28156899000
Humboldt	1-99NTMP-015	Selection		Tractor or Skidder	Approved	Orazem Unified Trust	121.06909784800
Humboldt	1-99NTMP-016	Selection		Tractor/Cable option	Approved	Wahlund & Dimmick	594.67105566700
Humboldt	1-99NTMP-019	Selection		Tractor or Skidder	Approved	Robin & Steven Childs	41.53907165780
Humboldt	1-99NTMP-020	Selection		Tractor or Skidder	Approved	Harn & Barry	116.62021800100
Humboldt	1-99NTMP-023	Selection		Tractor/Cable option	Approved	Ron & Orinda Samuelson	2043.45782031000
Humboldt	1-99NTMP-024	Selection		Tractor or Skidder	Approved	Alexander Boomer	46.12851226390
Humboldt	1-99NTMP-029	Selection		Tractor or Skidder	Approved	Duey & Johnson	177.60695705100
Humboldt	1-99NTMP-030	Selection		Tractor/Cable option	Approved	Robert Prior	1990.36093292000
Humboldt	1-99NTMP-032	Selection		Tractor or Skidder	Approved	Seneca Real Estate Dev	1.03108716216
Humboldt	1-99NTMP-032	Selection		Tractor or Skidder	Approved	Seneca Real Estate Dev	12.91747030820
Humboldt	1-99NTMP-032	Selection		Tractor or Skidder	Approved	Seneca Real Estate Dev	3.42777886097
Humboldt	1-99NTMP-032	Selection		Tractor or Skidder	Approved	Seneca Real Estate Dev	1.60974766466
Humboldt	1-99NTMP-033	Selection		Tractor or Skidder	Approved	City of Arcata	621.86639986100
Humboldt	1-99NTMP-033	Selection		Tractor or Skidder	Approved	City of Arcata	459.17671557900
Humboldt	1-99NTMP-036	Selection		Tractor or Skidder	Approved	Christopherson et al	6.03532438902
Humboldt	1-99NTMP-036	Group Selection		Tractor or Skidder	Approved	Christopherson et al	0.17020579052
Humboldt	1-99NTMP-036	Selection		Tractor or Skidder	Approved	Christopherson et al	5.78530834911
Humboldt	1-99NTMP-036	Selection		Tractor or Skidder	Approved	Christopherson et al	2.28511969785
Humboldt	1-99NTMP-037	Selection		Tractor or Skidder	Approved	Dublin Heights Ranch	2137.35504351000
Humboldt	1-99NTMP-037	Selection		Tractor or Skidder	Approved	Dublin Heights Ranch	14.37817251480
Humboldt	1-99NTMP-037	Selection		Tractor or Skidder	Approved	Dublin Heights Ranch	2.40911364463
Humboldt	1-99NTMP-038	Selection		Tractor/Cable option	Approved	Arlan & Joanne King	1937.45739672000
Humboldt	1-99NTMP-042	Sanitation Salvage		Tractor or Skidder	Approved	Donald & Helen Bushnell	410.49974325100
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	19.71182165670
Humboldt	1-99NTMP-042	Sanitation Salvage		Tractor or Skidder	Approved	Donald & Helen Bushnell	14.80212475910
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	0.84142799591
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	2.97396755758
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	0.78857871435
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	3.94312314713
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	22.69353248200
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	12.61501110630
Humboldt	1-99NTMP-042	Sanitation Salvage		Tractor or Skidder	Approved	Donald & Helen Bushnell	5.71440018102
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	5.01270888870
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	11.50129296550
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	30.26362450210
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	3.02146371902
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	3.78723505309

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	26.72466834790
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	63.05355374750
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	1.33033093037
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	0.71390700527
Humboldt	1-99NTMP-042	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald & Helen Bushnell	19.11433694050
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	2.27128691197
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	3.46746300992
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	40.55689301100
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	0.51428052891
Humboldt	1-99NTMP-042	Sanitation Salvage		Tractor or Skidder	Approved	Donald & Helen Bushnell	9.63487538598
Humboldt	1-99NTMP-042	Selection		Tractor or Skidder	Approved	Donald & Helen Bushnell	6.56190852541
Humboldt	1-99NTMP-043	Selection		Tractor or Skidder	Approved	Forester-Gill, Inc.	324.59425107700
Humboldt	1-99NTMP-044	Selection		Tractor or Skidder	Approved	Sherman Hensell	126.57677567300
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	48.26763304340
Humboldt	1-99NTMP-046	Selection		Tractor/Cable option	Approved	Fredrickson	10.68558066990
Humboldt	1-99NTMP-046	Selection		Tractor/Cable option	Approved	Fredrickson	895.86240477500
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	6.22118435004
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	4.11737791674
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	4.76954630631
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	1.42176883192
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	15.15552479920
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	1.88117197898
Humboldt	1-99NTMP-046	Selection		Tractor/Cable option	Approved	Fredrickson	2.02361184168
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	0.89490527321
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	33.18747030300
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	1.35436672780
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	4.33510300916
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	9.56686449838
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	9.07184200002
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	3.64346404464
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	0.89892984372
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	1.82584866545
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	4.49113961585
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	3.88444927688
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	1.51070166192
Humboldt	1-99NTMP-046	Rehabilitation - Understocked		Tractor/Cable option	Approved	Fredrickson	0.64772525066
Humboldt	1-99NTMP-046	Selection		Tractor/Cable option	Approved	Fredrickson	0.55566089004
Humboldt	1-99NTMP-048	Selection		Tractor or Skidder	Approved	Clyde Cummings	326.78265779800
Humboldt	1-99NTMP-050	Selection		Tractor or Skidder	Approved	Forster-Gill Inc	26.99837227820
Humboldt	1-99NTMP-051	Selection			Approved	Nancy Kirtley	754.62324174500
Humboldt	1-99NTMP-056	Selection		Tractor or Skidder	Approved	William Carlson	3.80611736410
Humboldt	1-99NTMP-056	Selection		Tractor or Skidder	Approved	William Carlson	1.53353888633
Humboldt	1-99NTMP-056	Selection		Tractor or Skidder	Approved	William Carlson	80.56722699360
Humboldt	1-99NTMP-056	Rehabilitation - Understocked		Cable System	Approved	William Carlson	15.07201448940
Lake	1-07NTMP-021	Group Selection			Pending	Dennis Kilkenny	151.63268218500

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Lake	1-07NTMP-021	Group Selection			Pending	Kilkenny Family Inc	616.29809866700
Lake	1-07NTMP-021	Group Selection			Pending	Kilkenny Family Inc	156.50368758200
Lake	1-99NTMP-017	No Harvest Area		Tractor or Skidder	Approved	Donald Carter	14.76271097810
Lake	1-99NTMP-017	Selection		Tractor or Skidder	Approved	Donald Carder	944.75189960200
Lake	1-99NTMP-017	Rehabilitation - Understocked		Tractor or Skidder	Approved	Donald Carder	53.66223874170
Mendocino	1-00NTMP-001	Transition		Tractor or Skidder	Approved	Philbrick Family Trust et al	15.14606042540
Mendocino	1-00NTMP-001	Transition		Cable System	Approved	Philbrick Family Trust et al	84.20037368420
Mendocino	1-00NTMP-001	Selection		Tractor or Skidder	Approved	Philbrick Family Trust et al	16.14593979290
Mendocino	1-00NTMP-001	Transition		Tractor or Skidder	Approved	Philbrick Family Trust et al	504.98462542700
Mendocino	1-00NTMP-001	Selection		Tractor or Skidder	Approved	Philbrick Family Trust et al	14.38206911380
Mendocino	1-00NTMP-001	Selection		Tractor or Skidder	Approved	Philbrick Family Trust et al	47.13144251370
Mendocino	1-00NTMP-001	Selection		Tractor or Skidder	Approved	Philbrick Family Trust et al	27.26445767720
Mendocino	1-00NTMP-001	Transition		Tractor or Skidder	Approved	Philbrick Family Trust et al	0.68449395257
Mendocino	1-00NTMP-002	Selection		Tractor or Skidder	Approved	Paul, Mark & Dana Weir	250.21637886000
Mendocino	1-00NTMP-002	Selection		Cable System	Approved	Paul, Mark & Dana Weir	7.79832603634
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	64.07017317780
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	14.96830008450
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	15.73137821820
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	9.97247732515
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	5.72890333722
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	21.19629035810
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	6.90286111947
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	6.13854034850
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	15.25914541460
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	28.08385503120
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	10.28453266570
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	2.81712458201
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	4.73464598183
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	7.11048908172
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	5.63272208152
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	18.56194867430
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	0.73750076580
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	1.74671475589
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	0.44419137897
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	48.36996131970
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	1.32494666475
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	4.08964902757
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	20.79319882570
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	23.87504131390
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	8.56143075501
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	11.98280911540
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	8.69486509254
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	2.78711967798
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	1.14834415763
Mendocino	1-00NTMP-015	Commercial Thin		Tractor or Skidder	Approved	Theodore & Martha Griffinger	6.41913415074

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	0.50181750615
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	9.12959000304
Mendocino	1-00NTMP-015	Commercial Thin		Cable System	Approved	Theodore & Martha Griffinger	0.41765116209
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	2.69186300457
Mendocino	1-00NTMP-015	Selection		Cable System	Approved	Theodore & Martha Griffinger	0.90800267994
Mendocino	1-00NTMP-015	Selection		Tractor or Skidder	Approved	Theodore & Martha Griffinger	2.63168556821
Mendocino	1-00NTMP-019	Selection		Tractor or Skidder	Approved	McKee et al	114.01390923100
Mendocino	1-00NTMP-019	Selection		Tractor or Skidder	Approved	McKee et al	201.97037895400
Mendocino	1-00NTMP-019	Selection		Tractor or Skidder	Approved	Sandra McKee et al	235.27036253500
Mendocino	1-00NTMP-019	Transition		Tractor or Skidder	Approved	Sandra McKee et al	258.62342245300
Mendocino	1-00NTMP-021	Selection		Cable System	Approved	Mountain View Tree Farms	14.93186429150
Mendocino	1-00NTMP-021	Selection		Tractor or Skidder	Approved	Mountain View Tree Farms	199.78971769400
Mendocino	1-00NTMP-021	Selection		Cable System	Approved	Mountain View Tree Farms	156.05924207600
Mendocino	1-00NTMP-021	Selection		Tractor or Skidder	Approved	Mountain View Tree Farms	4.89102718583
Mendocino	1-00NTMP-021	Selection		Cable System	Approved	Mountain View Tree Farms	4.86694390528
Mendocino	1-00NTMP-021	Selection		Tractor or Skidder	Approved	Mountain View Tree Farms	199.78971769400
Mendocino	1-00NTMP-022	Selection		Cable System	Approved	Al & Wilda Mimms	4.90747794367
Mendocino	1-00NTMP-022	Selection		Tractor/Cable option	Approved	Al & Wilda Mimms	92.67238315310
Mendocino	1-00NTMP-022	Selection		Cable System	Approved	Al & Wilda Mimms	2.75121081126
Mendocino	1-00NTMP-022	Selection		Cable System	Approved	Al & Wilda Mimms	7.13011128846
Mendocino	1-00NTMP-022	Selection		Tractor/Cable option	Approved	Oscar Smith	0.67551303731
Mendocino	1-00NTMP-022	Selection		Tractor/Cable option	Approved	Oscar Smith	3.27413559126
Mendocino	1-00NTMP-022	Selection		Tractor/Cable option	Approved	Oscar Smith	6.56581662929
Mendocino	1-00NTMP-027	Selection		Tractor or Skidder	Approved	Beth Van Sickle	55.77963003050
Mendocino	1-00NTMP-029	Selection		Tractor or Skidder	Approved	Trees Inc dba Wages Creek	161.06281282100
Mendocino	1-00NTMP-029	Selection		Tractor or Skidder	Approved	Trees Inc dba Wages Creek	161.06281282100
Mendocino	1-00NTMP-030	Selection			Approved	Joseph & Claudia Ayres	411.91991079500
Mendocino	1-00NTMP-031	Selection		Tractor or Skidder	Approved	Margaret Stensgard	38.68626852530
Mendocino	1-00NTMP-031	Selection		Tractor or Skidder	Approved	Margaret Stensgard	65.95132006470
Mendocino	1-00NTMP-031	Selection		Tractor or Skidder	Approved	Margaret Stensgard	0.19539273557
Mendocino	1-00NTMP-031	Selection		Tractor or Skidder	Approved	Margaret Stensgard	0.05551158347
Mendocino	1-00NTMP-032	Selection		Tractor or Skidder	Approved	Robert & Joanne Neff	19.19380093530
Mendocino	1-00NTMP-033	Selection		Tractor or Skidder	Approved	John Allan	40.26963975700
Mendocino	1-00NTMP-040	Transition		Tractor or Skidder	Approved	John & Jeanette Johnson	21.08281932400
Mendocino	1-00NTMP-043	Selection		Tractor or Skidder	Approved	Robert Schieffer et al	714.73972264200
Mendocino	1-00NTMP-047	Selection		Tractor/Cable option	Approved	Wanda Lester, Royce Padua, Monica Woodman	152.72951442700
Mendocino	1-00NTMP-050	Selection	Group Selection	Tractor or Skidder	Approved	Jeffrey Thomas et al	9.64633312786
Mendocino	1-00NTMP-050	No Harvest Area		Tractor or Skidder	Approved	Jeffrey Thomas et al	1.43093721265
Mendocino	1-00NTMP-050	Selection	Group Selection	Cable System	Approved	Jeffrey Thomas et al	10.49485465370
Mendocino	1-00NTMP-050	Selection	Group Selection	Cable System	Approved	Jeffrey Thomas et al	22.09491138270
Mendocino	1-00NTMP-050	Selection	Group Selection	Tractor or Skidder	Approved	Jeffrey Thomas et al	14.53975864730
Mendocino	1-00NTMP-050	No Harvest Area		Tractor or Skidder	Approved	Jeffrey Thomas et al	2.27447266084
Mendocino	1-00NTMP-051	Selection		Tractor or Skidder	Approved	Guido Pronsolino et al	183.02960829400
Mendocino	1-00NTMP-051	Selection		Tractor or Skidder	Approved	Guido Pronsolino et al	183.02960829400
Mendocino	1-00NTMP-051	Selection		Tractor or Skidder	Approved	Guido Pronsolino et al	183.02960829400

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-00NTMP-053	Unevenaged Management			Approved	Sharon King	13.33750148600
Mendocino	1-00NTMP-053	Unevenaged Management			Approved	Sharon King	5.56327166572
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Tractor or Skidder	Approved	Chuck Hasty et al	20.57325118980
Mendocino	1-00NTMP-058	Selection		Tractor or Skidder	Approved	Chuck Hasty et al	0.54143241318
Mendocino	1-00NTMP-058	Selection		Cable/Tractor option	Approved	Chuck Hasty et al	41.31109039430
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Cable/Tractor option	Approved	Chuck Hasty et al	7.40492692437
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Cable/Tractor option	Approved	Chuck Hasty et al	13.63260816290
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Cable/Tractor option	Approved	Chuck Hasty et al	3.14145629082
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Tractor or Skidder	Approved	Chuck Hasty et al	160.31488020300
Mendocino	1-00NTMP-058	Group Selection	Sanitation Salvage	Cable/Tractor option	Approved	Chuck Hasty et al	43.07581000530
Mendocino	1-00NTMP-058	Selection		Tractor or Skidder	Approved	Chuck Hasty et al	4.97246273182
Mendocino	1-00NTMP-061	Selection		Tractor/Cable option	Approved	Elizabeth Runner	191.49630526200
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	63.74447834910
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.16495067679
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.28237350883
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.06039580290
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.08315033734
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.05203862827
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.10114853521
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.17858182784
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	26.15067180720
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.04658544326
Mendocino	1-00NTMP-062	Selection		Tractor or Skidder	Approved	Al & Wilda Mimms	0.03937685736
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	142.05453166900
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.95978563438
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.16706012275
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.32224903845
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	6.38067229392
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.05408542851
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.09003911755
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.04408173832
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.17208809169
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.33203975813
Mendocino	1-00NTMP-063	Selection		Tractor or Skidder	Approved	Oscar Smith, Al & Wilda Mimms	0.19018635280
Mendocino	1-00NTMP-071	Selection		Tractor or Skidder	Approved	Biaggi Family Partnership	1302.69047069000
Mendocino	1-00NTMP-071	Selection		Tractor or Skidder	Approved	Biaggi Family Partnership	181.76992241800
Mendocino	1-00NTMP-072	Unevenaged Management		Tractor or Skidder	Approved	Daniel & Christiana Gates	49.76294388060
Mendocino	1-00NTMP-072	Unevenaged Management		Tractor or Skidder	Approved	Daniel & Christiana Gates	19.01344789350
Mendocino	1-00NTMP-074	Selection		Tractor or Skidder	Approved	Sauer Family Trust	36.52712471230
Mendocino	1-00NTMP-074	Selection		Tractor or Skidder	Approved	Sauer Family Trust	26.52836914280
Mendocino	1-01NTMP-002	Selection		Tractor or Skidder	Approved	Linney Family Trust	27.57142380110
Mendocino	1-01NTMP-002	Selection		Cable System	Approved	Linney Family Trust	37.05903499030
Mendocino	1-01NTMP-002	Selection		Cable System	Approved	Linney Family Trust	12.68293733170
Mendocino	1-01NTMP-005	Selection		Tractor or Skidder	Approved	Weger Interests Ltd	875.13324251400
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	323.84929116600

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	53.76304174620
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	95.94960853930
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	22.27459247640
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	170.50478426700
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	42.99129473290
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	42.54462999900
Mendocino	1-01NTMP-005	Selection		Tractor or Skidder	Approved	Weger Interests Ltd	919.32178188400
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	35.78635173050
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	34.34653038510
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	159.88803713400
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	115.21021477900
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	18.90532755570
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	36.53713003240
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	37.12205429190
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	170.44821705000
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	18.47861651120
Mendocino	1-01NTMP-005	Selection		Cable System	Approved	Weger Interests Ltd	13.96366332140
Mendocino	1-01NTMP-007	Unevenaged Management			Approved	Bernard Agrons	205.46004985900
Mendocino	1-01NTMP-010	Selection		Tractor or Skidder	Approved	Barbara Duncan	36.50300496660
Mendocino	1-01NTMP-010	Selection		Cable System	Approved	Barbara Duncan	1.09415563488
Mendocino	1-01NTMP-013	Selection		Cable/Tractor option	Approved	Peter Reimuller	5.02530077593
Mendocino	1-01NTMP-013	Selection		Tractor or Skidder	Approved	Peter Reimuller	47.66432104800
Mendocino	1-01NTMP-015	Selection		Tractor or Skidder	Approved	William & Celia Taylor	30.38761767750
Mendocino	1-01NTMP-015	Transition		Tractor or Skidder	Approved	William & Celia Taylor	6.19053102665
Mendocino	1-01NTMP-015	Selection		Tractor or Skidder	Approved	William & Celia Taylor	0.74332502055
Mendocino	1-01NTMP-015	Transition		Tractor or Skidder	Approved	William & Celia Taylor	46.07677528720
Mendocino	1-01NTMP-015	No Harvest Area		Tractor or Skidder	Approved	William & Celia Taylor	3.29318179201
Mendocino	1-01NTMP-015	Selection		Tractor or Skidder	Approved	William & Celia Taylor	41.05509286980
Mendocino	1-01NTMP-015	Transition		Tractor or Skidder	Approved	William & Celia Taylor	47.29285210270
Mendocino	1-01NTMP-015	No Harvest Area		Tractor or Skidder	Approved	William & Celia Taylor	9.47818704807
Mendocino	1-01NTMP-015	Rehabilitation - Understocked		Tractor or Skidder	Approved	William & Celia Taylor	1.35002000833
Mendocino	1-01NTMP-015	Rehabilitation - Understocked		Tractor or Skidder	Approved	William & Celia Taylor	3.69666719220
Mendocino	1-01NTMP-015	No Harvest Area		Tractor or Skidder	Approved	William & Celia Taylor	0.86299153197
Mendocino	1-01NTMP-015	No Harvest Area		Tractor or Skidder	Approved	William & Celia Taylor	0.38324006686
Mendocino	1-01NTMP-015	No Harvest Area		Tractor or Skidder	Approved	William & Celia Taylor	12.62062208690
Mendocino	1-01NTMP-019	Selection	Sanitation Salvage	Tractor or Skidder	Approved	Bill & Jean Coulson	73.96711555230
Mendocino	1-01NTMP-021	Group Selection		Tractor/Cable option	Approved	Survivors Trust U T D	112.19366439100
Mendocino	1-01NTMP-022	Selection		Tractor or Skidder	Approved	Frank Iacuaniello	72.06154913990
Mendocino	1-01NTMP-023	Selection	Group Selection	Tractor or Skidder	Approved	Thomas & Nona Russell	287.36245568700
Mendocino	1-01NTMP-023	Selection	Group Selection	Cable System	Approved	Thomas & Nona Russell	19.83499330660
Mendocino	1-01NTMP-023	Selection	Group Selection	Cable System	Approved	Thomas & Nona Russell	27.04655555900
Mendocino	1-01NTMP-023	Selection	Group Selection	Cable System	Approved	Thomas & Nona Russell	4.30527451247
Mendocino	1-01NTMP-023	Selection	Group Selection	Cable System	Approved	Thomas & Nona Russell	102.45837818200
Mendocino	1-01NTMP-023	Selection	Group Selection	Cable System	Approved	Thomas & Nona Russell	12.55872106310
Mendocino	1-01NTMP-024	Selection		Tractor/Helicopter option	Approved	Bewley Motluck Family LP	4389.86839855000

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-01NTMP-026	No Harvest Area		Tractor or Skidder	Approved	Karl & Marolyn Peterman	28.86673779210
Mendocino	1-01NTMP-026	Selection		Tractor or Skidder	Approved	Karl & Marolyn Peterman	44.25040142990
Mendocino	1-01NTMP-026	Selection		Tractor or Skidder	Approved	Karl & Marolyn Peterman	2.15848831252
Mendocino	1-01NTMP-029	Selection	Group Selection	Tractor or Skidder	Approved	Michael & Susan Addison	69.05766117570
Mendocino	1-01NTMP-029	Selection	Group Selection	Cable System	Approved	Michael & Susan Addison	10.94790360370
Mendocino	1-01NTMP-029	Selection	Group Selection	Cable System	Approved	Michael & Susan Addison	38.72564258500
Mendocino	1-01NTMP-029	Selection	Group Selection	Tractor or Skidder	Approved	Michael & Susan Addison	21.28948852710
Mendocino	1-01NTMP-029	Selection	Group Selection	Tractor or Skidder	Approved	Michael & Susan Addison	18.59098821280
Mendocino	1-01NTMP-029	Selection	Group Selection	Tractor or Skidder	Approved	Michael & Susan Addison	41.49187481610
Mendocino	1-01NTMP-030	Selection		Tractor or Skidder	Approved	Max & Margot Bollock	13.88629107450
Mendocino	1-01NTMP-030	Selection		Tractor/Cable option	Approved	Max & Margot Bollock	19.03517606900
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	20.55752060840
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	2.82668535944
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	18.69946145340
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	12.98971980490
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	5.46053834418
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	30.65892321130
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	5.62873404616
Mendocino	1-01NTMP-031	Selection		Tractor/Cable option	Approved	Poonkinney Ranches Inc	34.42867870360
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	38.16292614240
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	79.08907284740
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	20.47819845940
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	1.16340479261
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	169.54016060300
Mendocino	1-01NTMP-031	Transition		Tractor/Cable option	Approved	Poonkinney Ranches Inc	3.51686124463
Mendocino	1-01NTMP-033	Group Selection		Tractor or Skidder	Approved	Everett Liljeberg et al	151.54776909000
Mendocino	1-01NTMP-037	Unevenaged Management		Tractor or Skidder	Approved	Kevin & Kim Berg	11.36822367760
Mendocino	1-01NTMP-039	Selection		Tractor or Skidder	Approved	Gladys Nunes, Jean Leal	181.03992462300
Mendocino	1-01NTMP-039	Selection		Cable System	Approved	Gladys Nunes, Jean Leal	4.07418480711
Mendocino	1-01NTMP-039	Selection		Cable System	Approved	Gladys Nunes, Jean Leal	31.18907772630
Mendocino	1-01NTMP-040	Selection		Tractor or Skidder	Approved	John Urban et al	217.88292718200
Mendocino	1-01NTMP-040	Selection		Cable System	Approved	John Urban et al	18.32544664540
Mendocino	1-01NTMP-040	Selection		Cable System	Approved	John Urban et al	30.72203599420
Mendocino	1-01NTMP-040	Selection		Cable System	Approved	John Urban et al	93.15381984270
Mendocino	1-01NTMP-040	Selection		Cable System	Approved	John Urban et al	1.42252052874
Mendocino	1-01NTMP-041	Selection	Group Selection	Tractor or Skidder	Approved	Peter & Patricia Boudoures	142.59286340800
Mendocino	1-01NTMP-041	No Harvest Area			Approved	Peter & Patricia Boudoures	1.08155079743
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	42.50673262200
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	6.97172636071
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	170.71976162900
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	160.16029767100
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	31.80957050670
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	269.05033042600
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	8.32053570177
Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	3.79800292158

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Mendocino	1-01NTMP-042	Selection		Tractor or Skidder	Withdrawn	White Cloud Resources	1.80070762639
Mendocino	1-01NTMP-044	Group Selection		Tractor or Skidder	Approved	Paul & Cheryl Grunden et al	85.25133880910
Mendocino	1-01NTMP-045	Unevenaged Management		Tractor or Skidder	Approved	Paul Satterfield Jr, Raymond Coolidge	111.54107032200
Mendocino	1-01NTMP-056	Selection		Tractor/Helicopter option	Approved	Thomas Bickell	688.73552255500
Mendocino	1-01NTMP-056	Sanitation Salvage		Tractor/Helicopter option	Approved	Thomas Bickell	19.80095503950
Mendocino	1-01NTMP-056	Sanitation Salvage		Tractor/Helicopter option	Approved	Thomas Bickell	12.75554141670
Mendocino	1-01NTMP-056	Sanitation Salvage		Tractor/Helicopter option	Approved	Thomas Bickell	22.79661355440
Mendocino	1-01NTMP-056	Sanitation Salvage		Tractor/Helicopter option	Approved	Thomas Bickell	21.22154964770
Mendocino	1-01NTMP-056	Selection		Tractor/Helicopter option	Approved	Thomas Bickell	688.73552255500
Mendocino	1-01NTMP-057	Unevenaged Management			Approved	John Clapperton, Mary O'Brien	75.31901283090
Mendocino	1-01NTMP-057	Unevenaged Management			Approved	John Clapperton, Mary O'Brien	1.07614346120
Mendocino	1-01NTMP-058	Selection		Tractor or Skidder	Approved	Jack & Nancy Boone	6.53435429704
Mendocino	1-01NTMP-058	Selection		Cable System	Approved	Jack & Nancy Boone	4.18815796849
Mendocino	1-01NTMP-058	Selection		Tractor or Skidder	Approved	Jack & Nancy Boone	85.73190759000
Mendocino	1-01NTMP-058	Selection		Cable System	Approved	Jack & Nancy Boone	4.02393520960
Mendocino	1-01NTMP-058	Selection		Cable System	Approved	Jack & Nancy Boone	10.66501888380
Mendocino	1-02NTMP-001	Selection		Tractor or Skidder	Approved	Anderson Hinsch	214.69645297500
Mendocino	1-02NTMP-001	Selection		Cable System	Approved	Anderson Hinsch	30.17242774200
Mendocino	1-02NTMP-001	Selection		Cable System	Approved	Anderson Hinsch	34.79925620140
Mendocino	1-02NTMP-001	Selection		Tractor or Skidder	Approved	Anderson Hinsch	6.67337331653
Mendocino	1-02NTMP-001	Selection		Cable System	Approved	Anderson Hinsch	40.77398977460
Mendocino	1-02NTMP-010	Selection		Tractor or Skidder	Approved	John & Susan Zeh, Patricia Claus	85.26975193140
Mendocino	1-02NTMP-010	Selection		Cable System	Approved	John & Susan Zeh, Patricia Claus	5.97308513508
Mendocino	1-02NTMP-018	Selection		Tractor or Skidder	Approved	James & Helen Sansi, William Westfall	72.86375099050
Mendocino	1-02NTMP-020	Unevenaged Management			Approved	George Weger	427.45062917900
Mendocino	1-02NTMP-020	Unevenaged Management			Approved	George Weger	295.78144389100
Mendocino	1-02NTMP-021	Transition		Tractor or Skidder	Approved	Stephen Arietta,Elizabeth Arietta, Albina Arietta	115.21392303700
Mendocino	1-02NTMP-022	Selection		Tractor or Skidder	Approved	Ann Maxwell	45.36741766400
Mendocino	1-02NTMP-022	Selection		Tractor or Skidder	Approved	Ann Maxwell	78.93255263650
Mendocino	1-02NTMP-023	Selection		Tractor or Skidder	Approved	Holmes Family Trust	40.92902748910
Mendocino	1-02NTMP-028	Transition		Tractor or Skidder	Approved	Don Shanley, Laura Quatrochi	93.63366296070
Mendocino	1-02NTMP-036	Selection		Tractor or Skidder	Approved	Guy & Sandra Pronsolino et al	79.45314625660
Mendocino	1-02NTMP-037	Selection		Tractor or Skidder	Approved	Revocable Living Trust	122.93855205200
Mendocino	1-02NTMP-037	Selection		Tractor or Skidder	Approved	Revocable Living Trust	230.54259280800
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	66.22688504600
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	2.44729329843
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	15.86518593970
Mendocino	1-02NTMP-041	Transition		Tractor or Skidder	Approved	Clive & Tamara Adams	8.03199277545
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	93.95250454650
Mendocino	1-02NTMP-041	Transition		Tractor or Skidder	Approved	Clive & Tamara Adams	15.91421560920
Mendocino	1-02NTMP-041	Transition		Tractor or Skidder	Approved	Clive & Tamara Adams	1.92082668990
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	5.12654849661
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	0.71003624834
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	12.92971538540
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	3.45448879375

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Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	5.29433471357
Mendocino	1-02NTMP-041	Rehabilitation - Understocked		Tractor or Skidder	Approved	Clive & Tamara Adams	44.78715642780
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	226.94590324700
Mendocino	1-02NTMP-041	Transition		Tractor or Skidder	Approved	Clive & Tamara Adams	135.61565542900
Mendocino	1-02NTMP-041	Selection		Cable System	Approved	Clive & Tamara Adams	7.17372448451
Mendocino	1-02NTMP-041	Selection		Cable System	Approved	Clive & Tamara Adams	7.16356919845
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	13.80754792560
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	8.92026378572
Mendocino	1-02NTMP-041	Transition		Cable System	Approved	Clive & Tamara Adams	32.38705431800
Mendocino	1-02NTMP-041	Rehabilitation - Understocked		Tractor or Skidder	Approved	Clive & Tamara Adams	28.21975663870
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	2.39601624278
Mendocino	1-02NTMP-041	Selection		Cable System	Approved	Clive & Tamara Adams	4.77083554304
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	12.48123454400
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	97.14547632230
Mendocino	1-02NTMP-041	Rehabilitation - Understocked		Tractor or Skidder	Approved	Clive & Tamara Adams	29.76084011920
Mendocino	1-02NTMP-041	Selection		Cable System	Approved	Clive & Tamara Adams	12.43339442240
Mendocino	1-02NTMP-041	Transition		Cable System	Approved	Clive & Tamara Adams	34.08299200940
Mendocino	1-02NTMP-041	Rehabilitation - Understocked		Cable System	Approved	Clive & Tamara Adams	1.40254172044
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	9.21595502341
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	16.44917147570
Mendocino	1-02NTMP-041	Selection		Tractor or Skidder	Approved	Clive & Tamara Adams	11.54159693670
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	4.74039465688
Mendocino	1-02NTMP-041	No Harvest Area			Approved	Clive & Tamara Adams	0.55056049418
Mendocino	1-03NTMP-001	Selection		Tractor or Skidder	Approved	Gary Ballard et al	65.16758982720
Mendocino	1-03NTMP-001	Selection		Cable System	Approved	Gary Ballard et al	49.35053625390
Mendocino	1-03NTMP-002	Selection		Tractor or Skidder	Approved	Gary Newman, Miriam Newman, James Newmai	266.11997917400
Mendocino	1-03NTMP-002	Selection		Cable System	Approved	Gary Newman, Miriam Newman, James Newmai	58.46060381700
Mendocino	1-03NTMP-002	Selection		Cable System	Approved	Gary Newman, Miriam Newman, James Newmai	72.49916754300
Mendocino	1-03NTMP-002	Selection		Cable System	Approved	Gary Newman, Miriam Newman, James Newmai	104.65956893600
Mendocino	1-03NTMP-003	Selection		Tractor or Skidder	Approved	Richard Herr et al	120.49816756800
Mendocino	1-03NTMP-005	Selection		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	385.99316764200
Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	11.19566319060
Mendocino	1-03NTMP-005	No Harvest Area		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	0.94528409335
Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	11.46533154100
Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	5.52916949308
Mendocino	1-03NTMP-005	Selection		Cable System	Approved	James & Karen Calvert, Calvert Family Trust	14.11239790610
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	1.37690678595
Mendocino	1-03NTMP-005	Selection		Cable System	Approved	James & Karen Calvert, Calvert Family Trust	7.08527360891
Mendocino	1-03NTMP-005	Selection		Cable System	Approved	James & Karen Calvert, Calvert Family Trust	26.80319654690
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	6.32847666807
Mendocino	1-03NTMP-005	Selection		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	202.05464177200
Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	7.49610384801
Mendocino	1-03NTMP-005	Selection		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	160.30435719300
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	21.66248323240
Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	5.73761376665

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Mendocino	1-03NTMP-005	Selection		Cable/Tractor option	Approved	James & Karen Calvert, Calvert Family Trust	5.07638860847
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	33.23306731310
Mendocino	1-03NTMP-005	Selection		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	20.97324984100
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	2.75556144359
Mendocino	1-03NTMP-005	Transition		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	1.03899233736
Mendocino	1-03NTMP-005	Selection		Tractor or Skidder	Approved	James & Karen Calvert, Calvert Family Trust	3.99289386400
Mendocino	1-03NTMP-006	Selection		Tractor or Skidder	Approved	Chip & Joan Farley	98.26809055550
Mendocino	1-03NTMP-006	Selection		Cable System	Approved	Chip & Joan Farley	56.68422634950
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	47.29755661470
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	13.13599335250
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	482.82707100900
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	76.29420140210
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	151.75355235200
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	26.35955436420
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	45.75918618870
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	40.44184003010
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	41.58160602740
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	13.11315095740
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	10.30636730360
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	27.10608816180
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	74.91161777160
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	38.44701750060
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	486.13330143200
Mendocino	1-03NTMP-007	Selection		Tractor or Skidder	Approved	SF Boys & Girls Club	5.16540544599
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	70.70666200510
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	79.16393640840
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	7.50099295464
Mendocino	1-03NTMP-007	Selection		Cable System	Approved	SF Boys & Girls Club	53.74350581490
Mendocino	1-03NTMP-009	Selection		Tractor or Skidder	Approved	George Apsley et al	19.18469824830
Mendocino	1-03NTMP-009	Selection		Tractor or Skidder	Approved	George Apsley et al	76.54950846080
Mendocino	1-03NTMP-011	Group Selection		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	61.12904380670
Mendocino	1-03NTMP-011	No Harvest Area		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	3.00356862297
Mendocino	1-03NTMP-011	Selection		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	30.69929217030
Mendocino	1-03NTMP-011	No Harvest Area			Approved	Barton Burstein & Leslie White Trust et al	3.41184034769
Mendocino	1-03NTMP-011	Selection		Cable System	Approved	Barton Burstein & Leslie White Trust et al	22.56298709840
Mendocino	1-03NTMP-011	Selection		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	32.28445772420
Mendocino	1-03NTMP-011	Selection		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	1.59640911736
Mendocino	1-03NTMP-011	No Harvest Area			Approved	Barton Burstein & Leslie White Trust et al	2.77509695791
Mendocino	1-03NTMP-011	Selection		Tractor or Skidder	Approved	Barton Burstein & Leslie White Trust et al	5.06828628007
Mendocino	1-03NTMP-011	No Harvest Area			Approved	Barton Burstein & Leslie White Trust et al	8.61559772700
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	757.73876628500
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	4.91693035957
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.38131762093
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.12789758579
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	7.39414836925

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Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	1.73588908464
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	10.80658072600
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	71.64152436340
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	21.09276423860
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	5.08663503394
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	11.21748341440
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	0.71040074906
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	6.32021825517
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	6.62170826093
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	11.69091695340
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	15.63345240810
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	8.40413866734
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	2.13123335501
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	4.69189325553
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	7.51176021339
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	89.78547680090
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	143.93584368900
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	11.74757399940
Mendocino	1-03NTMP-012	Selection		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	31.84709048810
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	2.24197646665
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.96313205603
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.99730437829
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	4.55019140358
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.83842844210
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	2.83712570255
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	21.27233720390
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	2.62139407672
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	4.27601799963
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	1.22565092458
Mendocino	1-03NTMP-012	Selection		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	12.44772951110
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	7.51188112846
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	1.53884642344
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	0.51785646899
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.32385505717
Mendocino	1-03NTMP-012	Selection		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	48.17896935300
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.85475755274
Mendocino	1-03NTMP-012	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	17.94186986700
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	4.54594409908
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	151.29316258900
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	101.68043361900
Mendocino	1-03NTMP-012	Selection		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	10.69477227800
Mendocino	1-03NTMP-012	Selection		Balloon or Helicopter	Approved	Esther Harpe Trust, Harold Pedersen	105.94589935400
Mendocino	1-03NTMP-012	Selection		Cable/Tractor option	Approved	Esther Harpe Trust, Harold Pedersen	2.87331078913
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	3.29835298629
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	102.13378653600

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-03NTMP-012	Selection		Cable/Helicopter option	Approved	Esther Harpe Trust, Harold Pedersen	2.38484797604
Mendocino	1-03NTMP-012	Selection		Tractor or Skidder	Approved	Esther Harpe Trust, Harold Pedersen	102.13378653600
Mendocino	1-03NTMP-015	Selection		Tractor or Skidder	Approved	L Harrison-Mackie, Jane Harris	176.58750289800
Mendocino	1-03NTMP-016	Transition		Tractor or Skidder	Approved	Robert Benfield	42.97538869400
Mendocino	1-03NTMP-019	Selection		Tractor or Skidder	Approved	Douglas & Nancy McLelland	17.93057352660
Mendocino	1-03NTMP-019	Conversion		Tractor or Skidder	Approved	Douglas & Nancy McLelland	4.16253555042
Mendocino	1-03NTMP-019	Selection		Cable System	Approved	Douglas & Nancy McLelland	18.86176665540
Mendocino	1-03NTMP-020	Selection		Cable System	Approved	Harvey Hoechstetter, Lari Shea	21.31033170930
Mendocino	1-03NTMP-020	Selection		Cable System	Approved	Harvey Hoechstetter, Lari Shea	272.06709483000
Mendocino	1-03NTMP-020	Selection		Cable System	Approved	Harvey Hoechstetter, Lari Shea	8.31626241677
Mendocino	1-03NTMP-021	Alternative Prescription		Tractor or Skidder	Approved	VanderHorst Family Trust	190.20216353400
Mendocino	1-03NTMP-021	Alternative Prescription		Cable System	Approved	VanderHorst Family Trust	5.63830913978
Mendocino	1-03NTMP-021	Alternative Prescription		Cable System	Approved	VanderHorst Family Trust	10.16597845980
Mendocino	1-03NTMP-021	Alternative Prescription		Cable System	Approved	VanderHorst Family Trust	1.84803921924
Mendocino	1-03NTMP-023	Selection		Tractor or Skidder	Approved	Grover & Pauline Taylor, James Smith	1049.26112028000
Mendocino	1-03NTMP-023	Selection		Tractor or Skidder	Approved	Grover & Pauline Taylor, James Smith	41.10298649080
Mendocino	1-03NTMP-023	Selection		Cable System	Approved	Grover & Pauline Taylor, James Smith	477.93496938100
Mendocino	1-03NTMP-023	Selection		Tractor or Skidder	Approved	Grover & Pauline Taylor, James Smith	257.73652561600
Mendocino	1-03NTMP-023	Selection		Cable System	Approved	Grover & Pauline Taylor, James Smith	8.00588780210
Mendocino	1-03NTMP-023	Selection		Cable System	Approved	Grover & Pauline Taylor, James Smith	20.10300009290
Mendocino	1-03NTMP-023	Selection		Cable System	Approved	Grover & Pauline Taylor, James Smith	25.49509940920
Mendocino	1-03NTMP-026	Group Selection		Tractor or Skidder	Approved	Roland & Barbara Wentzel	16.97279512780
Mendocino	1-03NTMP-026	Transition		Tractor or Skidder	Approved	Roland & Barbara Wentzel	71.68604918100
Mendocino	1-03NTMP-026	Group Selection		Tractor or Skidder	Approved	Roland & Barbara Wentzel	11.33205577910
Mendocino	1-03NTMP-026	Group Selection		Tractor or Skidder	Approved	Roland & Barbara Wentzel	3.74189652538
Mendocino	1-03NTMP-026	Group Selection		Tractor or Skidder	Approved	Roland & Barbara Wentzel	5.03176908623
Mendocino	1-03NTMP-026	Group Selection		Tractor or Skidder	Approved	Roland & Barbara Wentzel	0.46509759674
Mendocino	1-03NTMP-026	Transition		Tractor or Skidder	Approved	Roland & Barbara Wentzel	90.01141881100
Mendocino	1-03NTMP-026	Transition		Cable System	Approved	Roland & Barbara Wentzel	18.14155493930
Mendocino	1-03NTMP-028	Selection		Tractor or Skidder	Approved	Mark & Fianna Combs, Walter Herbert	26.15971458150
Mendocino	1-03NTMP-030	Group Selection		Tractor or Skidder	Approved	Alice Fashauer	11.31452243520
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	99.50796848020
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	1.43196676151
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Tractor or Skidder	Approved	The Morosi 1991 Trust	4.33035583243
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	0.85665387915
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Cable System	Approved	The Morosi 1991 Trust	0.16698195211
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	0.36503063176
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Tractor or Skidder	Approved	The Morosi 1991 Trust	1.77082931322
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	1.34406624358
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Cable System	Approved	The Morosi 1991 Trust	1.32692285956
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Tractor or Skidder	Approved	The Morosi 1991 Trust	10.77026241540
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	4.25331312751
Mendocino	1-03NTMP-035	Selection	Sanitation Salvage	Tractor or Skidder	Approved	The Morosi 1991 Trust	94.61406215720
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	10.77709586380
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	3.92788074487

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	11.58673577400
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Cable System	Approved	The Morosi 1991 Trust	1.79921021782
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	5.43386781450
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	0.95233295306
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Cable System	Approved	The Morosi 1991 Trust	0.81673657603
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Tractor or Skidder	Approved	The Morosi 1991 Trust	9.89546542254
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Cable System	Approved	The Morosi 1991 Trust	0.03537467044
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Tractor or Skidder	Approved	The Morosi 1991 Trust	2.03445842687
Mendocino	1-03NTMP-035	Selection	Sanitation Salvage	Cable System	Approved	The Morosi 1991 Trust	1.23917241830
Mendocino	1-03NTMP-035	Selection	Rehabilitation - Underst	Cable System	Approved	The Morosi 1991 Trust	0.66477078172
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	0.98313253521
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	3.94184488968
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	4.48400589443
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	7.42685672083
Mendocino	1-03NTMP-035	Selection	Commercial Thin	Tractor or Skidder	Approved	The Morosi 1991 Trust	1.10558256527
Mendocino	1-03NTMP-036	Selection		Tractor or Skidder	Approved	Les & Linda Plack	23.24326761140
Mendocino	1-03NTMP-038	Selection		Tractor or Skidder	Approved	Lynn & Gary Baker et. al.	41.62114273750
Mendocino	1-03NTMP-038	Selection		Tractor/Cable option	Approved	Lynn & Gary Baker et. al.	12.60976669260
Mendocino	1-03NTMP-038	Selection		Tractor/Cable option	Approved	Lynn & Gary Baker et. al.	9.10814739047
Mendocino	1-03NTMP-038	Selection		Cable System	Approved	Lynn & Gary Baker et. al.	3.70602026242
Mendocino	1-03NTMP-039	Selection		Tractor or Skidder	Approved	Linda Mercurio	22.15023347530
Mendocino	1-03NTMP-039	Selection		Cable System	Approved	Linda Mercurio	47.50748582010
Mendocino	1-03NTMP-039	Selection		Tractor or Skidder	Approved	Linda Mercurio	17.76190858920
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	48.72732902410
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.87925208359
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	2.07929164890
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	40.84773957960
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	74.28578434990
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	13.37049093960
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	12.05783284890
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	59.71881804220
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	5.91228853743
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	81.58660037550
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	26.62099463600
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.70925373979
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.92971482368
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	9.89533346794
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	98.11301122330
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	203.27236088800
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	6.12839142462
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.45791808148
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	51.31877546010
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	6.51108869748
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	5.67522654691
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.43600653823

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	10.12545884350
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.12629619620
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	11.24410470490
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	28.51140310150
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.41643188264
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	96.50673469570
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	16.92396443090
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	5.96666974842
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.16152254440
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	89.08466756410
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	12.91704416920
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.75164561822
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.12040760456
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	0.90570466205
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	11.02204495990
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	2.43425881177
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.72375103453
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.10078949419
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	2.77544841777
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	8.07426567235
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	1.35526736108
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	5.81717401989
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	20.72847546940
Mendocino	1-04NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Peter & Helen Miller	42.48705047300
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	3.67845423366
Mendocino	1-04NTMP-002	Alternative Prescription		Tractor or Skidder	Approved	Peter & Helen Miller	5.14607171173
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	38.25503935090
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	2.91911362406
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.49089411299
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	22.08139175110
Mendocino	1-04NTMP-002	No Harvest Area		Tractor or Skidder	Approved	Peter & Helen Miller	1.19895660808
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	34.08197786590
Mendocino	1-04NTMP-002	Selection		Tractor or Skidder	Approved	Peter & Helen Miller	2.86933206435
Mendocino	1-04NTMP-002	Transition		Tractor or Skidder	Approved	Peter & Helen Miller	10.59708857050
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	133.11730748200
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	4.89074640533
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	57.56272097870
Mendocino	1-04NTMP-003	Selection		Balloon or Helicopter	Approved	Eaton Roughs Land Partnership	16.10027179190
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	10.44044159090
Mendocino	1-04NTMP-003	Selection		Tractor/Cable option	Approved	Eaton Roughs Land Partnership	13.57251924450
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	25.19294197810
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	31.15596988850
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	168.73253614800
Mendocino	1-04NTMP-003	Selection		Balloon or Helicopter	Approved	Eaton Roughs Land Partnership	1.69187777465
Mendocino	1-04NTMP-003	Selection		Tractor/Cable option	Approved	Eaton Roughs Land Partnership	49.52851110270

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	19.41207422390
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	21.75217704620
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	3.97965420168
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	10.52738290360
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	5.56455981075
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	176.26050969800
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	8.62715492217
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	12.08767734250
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	14.16776856650
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	21.89670476810
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	8.97174069828
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	1.04225373525
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	13.06181974280
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	7.03603122076
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	72.05606505500
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	133.70446321400
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	37.06815595450
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	4.79576547872
Mendocino	1-04NTMP-003	Selection		Tractor or Skidder	Approved	Eaton Roughs Land Partnership	6.64928287962
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	14.39454171610
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	27.56284546300
Mendocino	1-04NTMP-003	Selection		Tractor/Cable option	Approved	Eaton Roughs Land Partnership	3.08231180103
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	36.92555572060
Mendocino	1-04NTMP-003	Selection		Cable System	Approved	Eaton Roughs Land Partnership	13.99826373090
Mendocino	1-04NTMP-006	Transition		Tractor or Skidder	Approved	Ellen & David Saxe, Ronald Karish	12.92413417040
Mendocino	1-04NTMP-006	Group Selection		Tractor or Skidder	Approved	Ellen & David Saxe	21.46890538670
Mendocino	1-04NTMP-007	Selection		Tractor or Skidder	Approved	Ronald Atkinson	4.60675779762
Mendocino	1-04NTMP-007	Selection		Tractor or Skidder	Approved	Ronald Atkinson	13.49654753170
Mendocino	1-04NTMP-008	Selection		Tractor or Skidder	Approved	Orrs Springs Properties	371.01743324800
Mendocino	1-04NTMP-008	Selection		Cable System	Approved	Orrs Springs Properties	136.01094778200
Mendocino	1-04NTMP-008	Selection		Cable System	Approved	Orrs Springs Properties	95.41255274240
Mendocino	1-04NTMP-010	Transition		Cable System	Approved	Moore Trust	105.65075970900
Mendocino	1-04NTMP-010	Group Selection		Cable System	Approved	Moore Trust	31.99921737200
Mendocino	1-04NTMP-010	Group Selection		Tractor or Skidder	Approved	Moore Trust	8.11313212917
Mendocino	1-04NTMP-010	Transition		Tractor or Skidder	Approved	Moore Trust	6.17570675947
Mendocino	1-04NTMP-010	Transition		Tractor or Skidder	Approved	Moore Trust	45.29127042020
Mendocino	1-04NTMP-010	Group Selection		Cable System	Approved	Moore Trust	2.92497263055
Mendocino	1-04NTMP-010	Group Selection		Tractor or Skidder	Approved	Moore Trust	49.13491175400
Mendocino	1-04NTMP-010	Transition		Cable System	Approved	Moore Trust	67.93319712830
Mendocino	1-04NTMP-010	Transition		Tractor or Skidder	Approved	Moore Trust	21.52030717530
Mendocino	1-04NTMP-010	Transition		Tractor or Skidder	Approved	Moore Trust	23.19760481860
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	0.26558979090
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	0.23241674986
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	67.31849620320
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	0.21709008128

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	0.17398498774
Mendocino	1-04NTMP-013	Selection		Tractor or Skidder	Approved	Premier Pacific Vineyards	0.19031237439
Mendocino	1-04NTMP-014	Group Selection		Tractor or Skidder	Approved	Ben Pill, Cecil Pill, Lucille Pill	39.25501845000
Mendocino	1-04NTMP-015	Transition		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	290.99787571200
Mendocino	1-04NTMP-015	Transition		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	252.13693634100
Mendocino	1-04NTMP-015	Rehabilitation - Understocked		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	99.26847677080
Mendocino	1-04NTMP-015	Rehabilitation - Understocked		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	188.31616787000
Mendocino	1-04NTMP-015	Transition		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	201.58503042100
Mendocino	1-04NTMP-015	Selection		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	133.15484755900
Mendocino	1-04NTMP-015	Transition		Tractor or Skidder	Approved	Stevens-Sherwood Ranch	2.26413116920
Mendocino	1-04NTMP-016	Group Selection		Cable System	Approved	Lorenz Spring, Dale Spring	37.14870327400
Mendocino	1-04NTMP-016	Group Selection		Tractor or Skidder	Approved	Lorenz Spring, Dale Spring	162.55136150600
Mendocino	1-04NTMP-016	Group Selection		Cable System	Approved	Lorenz Spring, Dale Spring	14.35443571070
Mendocino	1-04NTMP-019	Selection		Tractor or Skidder	Approved	Thomas Arens	8.05281044383
Mendocino	1-04NTMP-021	Group Selection		Tractor or Skidder	Approved	Anne Fashauer	107.84122065000
Mendocino	1-04NTMP-021	Transition		Tractor or Skidder	Approved	Anne Fashauer	47.55278350680
Mendocino	1-04NTMP-021	No Harvest Area			Approved	Anne Fashauer	50.89038560290
Mendocino	1-04NTMP-021	No Harvest Area			Approved	Anne Fashauer	4.27786145588
Mendocino	1-05NTMP-001	Selection		Tractor or Skidder	Approved	Elody Masolini et al	22.26437581880
Mendocino	1-05NTMP-001	Selection		Tractor or Skidder	Approved	Elody Masolini et al	1.43852167278
Mendocino	1-05NTMP-001	Selection		Tractor or Skidder	Approved	Elody Masolini et al	26.52745182360
Mendocino	1-05NTMP-002	Group Selection		Tractor or Skidder	Approved	Keene Wood Trust	106.24632503900
Mendocino	1-05NTMP-002	No Harvest Area			Approved	Keene Wood Trust	6.41494570376
Mendocino	1-05NTMP-002	No Harvest Area			Approved	Keene Wood Trust	4.98987935377
Mendocino	1-05NTMP-004	Selection		Tractor or Skidder	Approved	Charles Peavey, Ana Munoz	14.11821899950
Mendocino	1-05NTMP-005	Group Selection	Selection	Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	586.38167167900
Mendocino	1-05NTMP-005	No Harvest Area		Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	3.65823810851
Mendocino	1-05NTMP-005	No Harvest Area		Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	3.27007320533
Mendocino	1-05NTMP-005	No Harvest Area		Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	63.72906467360
Mendocino	1-05NTMP-005	No Harvest Area		Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	8.88438132357
Mendocino	1-05NTMP-005	No Harvest Area		Cable/Tractor option	Approved	Richard Cuneo, Mary Sebastiani Cuneo	5.37938354538
Mendocino	1-05NTMP-006	Group Selection		Tractor or Skidder	Approved	Gonzalo Sanchez et al	56.40023770960
Mendocino	1-05NTMP-006	Group Selection		Cable System	Approved	Gonzalo Sanchez et al	66.98867948470
Mendocino	1-05NTMP-006	Commercial Thin		Tractor or Skidder	Approved	Gonzalo Sanchez et al	16.25619533910
Mendocino	1-05NTMP-008	Group Selection		Cable/Tractor option	Approved	Stuart Titus, Steve Titus	48.11004282400
Mendocino	1-05NTMP-008	Group Selection		Cable/Tractor option	Approved	Stuart Titus, Steve Titus	152.09903186600
Mendocino	1-05NTMP-008	Group Selection		Cable/Tractor option	Approved	Stuart Titus, Steve Titus	10.59191556600
Mendocino	1-05NTMP-008	Group Selection		Cable/Tractor option	Approved	Stuart Titus, Steve Titus	5.97261449094
Mendocino	1-05NTMP-009	Group Selection		Tractor or Skidder	Withdrawn	Ranks Forest LLC	52.60062206200
Mendocino	1-05NTMP-009	Rehabilitation - Understocked		Tractor or Skidder	Withdrawn	Ranks Forest LLC	5.20237458236
Mendocino	1-05NTMP-009	Group Selection		Cable System	Withdrawn	Ranks Forest LLC	9.01885564433
Mendocino	1-05NTMP-010	Selection			Approved	Anita Johnston et al	1262.38715469000
Mendocino	1-05NTMP-011	Selection		Tractor or Skidder	Approved	Karen Calvert	32.99193417980
Mendocino	1-05NTMP-011	Selection		Tractor/Cable option	Approved	Karen Calvert	11.19675867270
Mendocino	1-05NTMP-011	Selection		Tractor or Skidder	Approved	Karen Calvert	3.14954464718

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-05NTMP-011	No Harvest Area			Approved	Karen Calvert	1.72706820503
Mendocino	1-05NTMP-012	Unevenaged Management			Approved	R Falk/Mendocino Investments	72.34249044930
Mendocino	1-05NTMP-012	Unevenaged Management			Approved	Mendocino Investment Co	541.99549114200
Mendocino	1-05NTMP-016	Group Selection		Tractor or Skidder	Approved	Orbrad & Maura Darbro	362.09412144000
Mendocino	1-05NTMP-018	Selection		Tractor or Skidder	Approved	Boy Scouts/Redwood Empire	81.37724063940
Mendocino	1-05NTMP-019	Selection		Tractor or Skidder	Approved	Ben & Tawny MacMillan	53.57708130160
Mendocino	1-05NTMP-019	Selection		Cable System	Approved	Ben & Tawny MacMillan	26.58783654620
Mendocino	1-05NTMP-025	Group Selection		Tractor or Skidder	Approved	Robin & Anne Marie Bird	28.60064355840
Mendocino	1-05NTMP-025	Group Selection		Cable System	Approved	Robin & Anne Marie Bird	8.85397009390
Mendocino	1-05NTMP-027	Selection		Tractor or Skidder	Approved	Edythe Hall	207.74150666200
Mendocino	1-05NTMP-027	Selection		Cable System	Approved	Edythe Hall	10.71402912480
Mendocino	1-05NTMP-027	Selection		Cable System	Approved	Edythe Hall	16.91736342470
Mendocino	1-05NTMP-027	Selection		Tractor or Skidder	Approved	Edythe Hall	13.64532811570
Mendocino	1-06NTMP-004	Group Selection		Tractor/Cable option	Approved	Nicely Nicely Farms Inc	211.32950625700
Mendocino	1-06NTMP-006	Selection		Tractor or Skidder	Approved	BALU Inc	46.58734611680
Mendocino	1-06NTMP-006	Selection		Cable System	Approved	BALU Inc	127.62857848000
Mendocino	1-06NTMP-006	Selection		Tractor or Skidder	Approved	BALU Inc	9.82094244991
Mendocino	1-06NTMP-006	Selection		Tractor or Skidder	Approved	BALU Inc	3.80151720264
Mendocino	1-06NTMP-006	Selection		Tractor or Skidder	Approved	BALU Inc	12.31829284670
Mendocino	1-06NTMP-006	Selection		Tractor or Skidder	Approved	BALU Inc	4.89487967325
Mendocino	1-06NTMP-007	Transition		Tractor or Skidder	Approved	Mary Comerio, Michael Teitz	51.90038824440
Mendocino	1-06NTMP-016	Selection		Tractor or Skidder	Approved	Donald & Brenda Phillips	40.49671462740
Mendocino	1-06NTMP-016	No Harvest Area		Tractor or Skidder	Approved	Donald & Brenda Phillips	4.19897271579
Mendocino	1-06NTMP-016	Selection		Cable System	Approved	Donald & Brenda Phillips	11.53198117650
Mendocino	1-06NTMP-016	Selection		Cable System	Approved	Donald & Brenda Phillips	19.57205624560
Mendocino	1-06NTMP-018	Selection		Tractor or Skidder	Approved	Robert & Luanne Smiley	51.84318557610
Mendocino	1-06NTMP-020	Selection		Balloon or Helicopter	Approved	Henry Gundling, Soper LLC	41.23242722430
Mendocino	1-06NTMP-020	Selection		Tractor/Helicopter option	Approved	Henry Gundling, Soper LLC	40.50850162270
Mendocino	1-06NTMP-022	Selection		Tractor or Skidder	Approved	Carla & William Schneiderman	22.01856530800
Mendocino	1-06NTMP-022	Selection		Cable System	Approved	Carla & William Schneiderman	18.59225880290
Mendocino	1-06NTMP-025	Selection		Tractor or Skidder	Approved	William & Margaret Owens	3.37276359641
Mendocino	1-06NTMP-025	Selection		Cable System	Approved	William & Margaret Owens	7.01076188957
Mendocino	1-06NTMP-025	Selection		Tractor or Skidder	Approved	William & Margaret Owens	212.49070725400
Mendocino	1-06NTMP-025	Selection		Cable System	Approved	William & Margaret Owens	2.03661698686
Mendocino	1-06NTMP-025	Selection		Cable System	Approved	William & Margaret Owens	9.43989087397
Mendocino	1-06NTMP-026	Selection		Tractor or Skidder	Approved	Ed Powers, Gregg Kulijian	47.97190306000
Mendocino	1-06NTMP-026	No Harvest Area			Approved	Ed Powers, Gregg Kulijian	2.01854592111
Mendocino	1-06NTMP-026	Selection		Cable System	Approved	Ed Powers, Gregg Kulijian	42.45650407650
Mendocino	1-06NTMP-026	Selection		Cable System	Approved	Ed Powers, Gregg Kulijian	43.44792901670
Mendocino	1-06NTMP-026	Selection		Tractor or Skidder	Approved	Ed Powers, Gregg Kulijian	13.06448050510
Mendocino	1-06NTMP-026	Selection		Tractor or Skidder	Approved	Ed Powers, Gregg Kulijian	34.98432119600
Mendocino	1-06NTMP-027	Selection		Tractor or Skidder	Approved	Peter & Beatrice Coukoulis	130.29244392200
Mendocino	1-06NTMP-027	Selection		Cable System	Approved	Peter & Beatrice Coukoulis	150.40830596400
Mendocino	1-06NTMP-027	Selection		Cable System	Approved	Peter & Beatrice Coukoulis	4.98215763073
Mendocino	1-06NTMP-027	Selection		Cable System	Approved	Peter & Beatrice Coukoulis	19.08250023740

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Tractor or Skidder	Approved	Jean & Anne DuVigneaud	6.12404516031
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Cable System	Approved	Jean & Anne DuVigneaud	15.10372015760
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Tractor or Skidder	Approved	Jean & Anne DuVigneaud	9.54306848061
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Cable System	Approved	Jean & Anne DuVigneaud	57.08466305830
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Tractor or Skidder	Approved	Jean & Anne DuVigneaud	6.66228558938
Mendocino	1-06NTMP-028	Alternative Prescription	Selection	Tractor or Skidder	Approved	Jean & Anne DuVigneaud	43.32746810350
Mendocino	1-07NTMP-002	Group Selection		Tractor or Skidder	Approved	Paul & Marsha Douglas	36.10263976920
Mendocino	1-07NTMP-002	No Harvest Area			Approved	Paul & Marsha Douglas	4.25283756997
Mendocino	1-07NTMP-002	No Harvest Area			Approved	Paul & Marsha Douglas	0.88888045829
Mendocino	1-07NTMP-002	Group Selection		Tractor or Skidder	Approved	Paul & Marsha Douglas	0.47774488411
Mendocino	1-07NTMP-002	No Harvest Area			Approved	Paul & Marsha Douglas	0.98141329461
Mendocino	1-07NTMP-006	Transition		Tractor or Skidder	Approved	David & Lucienne Allen	55.65813835050
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	51.85004308800
Mendocino	1-07NTMP-008	No Harvest Area		Tractor or Skidder	Approved	Anderson Enterprises et al	6.86344113082
Mendocino	1-07NTMP-008	Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	3.01931296662
Mendocino	1-07NTMP-008	No Harvest Area		Tractor or Skidder	Approved	Anderson Enterprises et al	1.81674171870
Mendocino	1-07NTMP-008	Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	70.25534290070
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	13.05282012540
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	79.08030435680
Mendocino	1-07NTMP-008	No Harvest Area		Tractor or Skidder	Approved	Anderson Enterprises et al	2.41960257897
Mendocino	1-07NTMP-008	No Harvest Area		Tractor or Skidder	Approved	Anderson Enterprises et al	7.91982352195
Mendocino	1-07NTMP-008	Group Selection		Cable System	Approved	Anderson Enterprises et al	6.95365440345
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	0.68568492916
Mendocino	1-07NTMP-008	Selection		Cable System	Approved	Anderson Enterprises et al	14.06710755000
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	185.15477941500
Mendocino	1-07NTMP-008	Group Selection		Cable System	Approved	Anderson Enterprises et al	2.62248275009
Mendocino	1-07NTMP-008	Group Selection		Cable System	Approved	Anderson Enterprises et al	3.88793763423
Mendocino	1-07NTMP-008	Selection		Cable System	Approved	Anderson Enterprises et al	32.06124933810
Mendocino	1-07NTMP-008	No Harvest Area		Tractor or Skidder	Approved	Anderson Enterprises et al	0.78348709491
Mendocino	1-07NTMP-008	Group Selection		Tractor or Skidder	Approved	Anderson Enterprises et al	1.60217936398
Mendocino	1-07NTMP-010	Group Selection		Tractor or Skidder	Approved	Beverly Newton, Vanlee Waters	0.22139684170
Mendocino	1-07NTMP-010	Group Selection		Tractor or Skidder	Approved	Beverly Newton, Vanlee Waters	0.92884627632
Mendocino	1-07NTMP-010	Group Selection		Tractor or Skidder	Approved	Beverly Newton, Vanlee Waters	22.92330965750
Mendocino	1-07NTMP-011	Group Selection		Tractor or Skidder	Approved	Kantaer Bartis Trust	30.51566780050
Mendocino	1-07NTMP-011	Group Selection		Cable System	Approved	Kantaer Bartis Trust	9.68984770160
Mendocino	1-07NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Galen Hathaway	18.27975881010
Mendocino	1-07NTMP-012	Transition		Tractor or Skidder	Approved	Galen Hathaway	16.80458214590
Mendocino	1-07NTMP-012	Selection		Tractor or Skidder	Approved	Galen Hathaway	80.56593172770
Mendocino	1-07NTMP-012	Transition		Tractor or Skidder	Approved	Galen Hathaway	8.10051107766
Mendocino	1-07NTMP-012	Transition		Tractor or Skidder	Approved	Galen Hathaway	0.72459128515
Mendocino	1-07NTMP-012	Rehabilitation - Understocked		Tractor or Skidder	Approved	Galen Hathaway	13.45048262510
Mendocino	1-07NTMP-013	Transition		Tractor or Skidder	Pending	Gary & Carole Galeazzi	3.68423922907
Mendocino	1-07NTMP-013	Transition		Cable System	Pending	Gary & Carole Galeazzi	129.97570868000
Mendocino	1-07NTMP-013	Transition		Tractor or Skidder	Pending	Gary & Carole Galeazzi	6.57024609891
Mendocino	1-07NTMP-013	Transition		Tractor or Skidder	Pending	Gary & Carole Galeazzi	20.55583189470

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-07NTMP-013	Transition		Cable System	Pending	Gary & Carole Galeazzi	249.42921800300
Mendocino	1-07NTMP-013	Transition		Cable System	Pending	Gary & Carole Galeazzi	45.46412867100
Mendocino	1-07NTMP-013	Transition		Balloon or Helicopter	Pending	Gary & Carole Galeazzi	75.21032940470
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	3.10460639257
Mendocino	1-07NTMP-014	Rehabilitation - Understocked		Tractor or Skidder	Approved	Charles & Marie Myers et al	3.67947817144
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	24.81077595200
Mendocino	1-07NTMP-014	Rehabilitation - Understocked		Tractor or Skidder	Approved	Charles & Marie Myers et al	7.31696785786
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	143.88351763900
Mendocino	1-07NTMP-014	Selection		Tractor or Skidder	Approved	Charles & Marie Myers et al	15.15642267290
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	8.79159184775
Mendocino	1-07NTMP-014	Rehabilitation - Understocked		Tractor or Skidder	Approved	Charles & Marie Myers et al	19.11978678360
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	1.04688236732
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	2.05440260715
Mendocino	1-07NTMP-014	Transition		Tractor or Skidder	Approved	Charles & Marie Myers et al	4.61278240917
Mendocino	1-07NTMP-014	Rehabilitation - Understocked		Tractor or Skidder	Approved	Charles & Marie Myers et al	9.97885453162
Mendocino	1-07NTMP-015	Transition		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	73.51239416730
Mendocino	1-07NTMP-015	No Harvest Area		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	108.24555314100
Mendocino	1-07NTMP-015	Group Selection		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	24.81194140000
Mendocino	1-07NTMP-015	Group Selection		Cable System	Pending	Joseph & Joanne Fashauer et al	91.85361226420
Mendocino	1-07NTMP-015	Group Selection		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	105.57564333600
Mendocino	1-07NTMP-015	No Harvest Area		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	112.19989637500
Mendocino	1-07NTMP-015	No Harvest Area		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	20.84335044370
Mendocino	1-07NTMP-015	Transition		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	34.52969845360
Mendocino	1-07NTMP-015	Transition		Cable System	Pending	Joseph & Joanne Fashauer et al	77.02065972030
Mendocino	1-07NTMP-015	Group Selection		Cable System	Pending	Joseph & Joanne Fashauer et al	28.13280150840
Mendocino	1-07NTMP-015	Group Selection		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	1.75596055374
Mendocino	1-07NTMP-015	Group Selection		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	10.99852333210
Mendocino	1-07NTMP-015	Group Selection		Cable System	Pending	Joseph & Joanne Fashauer et al	8.20375528745
Mendocino	1-07NTMP-015	No Harvest Area		Tractor or Skidder	Pending	Joseph & Joanne Fashauer et al	14.35822316280
Mendocino	1-07NTMP-015	Group Selection		Cable System	Pending	Joseph & Joanne Fashauer et al	12.78956866160
Mendocino	1-07NTMP-017	Transition			Pending	James Calvert	413.03196047800
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	0.74731090810
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	3.00741459286
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	2.98390858820
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	4.12982683880
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	31.22752714060
Mendocino	1-07NTMP-017	Transition			Pending	James Calvert	108.60708756200
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	1.83461412979
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	9.19094192842
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	2.71519769609
Mendocino	1-07NTMP-017	No Harvest Area			Pending	James Calvert	14.81666148620
Mendocino	1-07NTMP-017	Transition			Pending	James Calvert	2.96175120400
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	21.14956060230
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	10.92131178440
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	9.64997414873

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	9.73842225390
Mendocino	1-07NTMP-017	Transition			Pending	James Calvert	413.03196047800
Mendocino	1-07NTMP-017	Selection			Pending	James Calvert	31.22752714060
Mendocino	1-07NTMP-017	Transition			Pending	James Calvert	108.60708756200
Mendocino	1-07NTMP-018	Group Selection		Cable/Tractor option	Approved	Rustic Retirement LLC	56.42186289620
Mendocino	1-07NTMP-018	Group Selection		Balloon or Helicopter	Approved	Rustic Retirement LLC	35.21472419110
Mendocino	1-07NTMP-018	Group Selection		Tractor or Skidder	Approved	Rustic Retirement LLC	2.44881683464
Mendocino	1-07NTMP-018	Group Selection		Tractor or Skidder	Approved	Rustic Retirement LLC	0.70087277479
Mendocino	1-08NTMP-002	Group Selection		Tractor or Skidder	Pending	Melbourne Berkeley Oakland, Tunzi Inc	74.74203969600
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	John & Margaret Bower	73.30129802610
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	Bower Limited Partnership	4.77346135961
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	North Gualala Water Company	49.78813599170
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	128.43606932300
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	83.30877710120
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	John & Margaret Bower	10.50711660570
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	45.58557269810
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	6.48111169526
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	62.38405262560
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	John & Margaret Bower	8.46156455926
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	John & Margaret Bower	2.51998372836
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	North Gualala Water Company	5.60585218513
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	North Gualala Water Company	6.72025118419
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	North Gualala Water Company	24.32055994840
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	8.52666888380
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	Bower Limited Partnership	30.56401946370
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	Bower Limited Partnership	2.57958428742
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	9.43527304833
Mendocino	1-08NTMP-009	Group Selection		Cable System	Pending	Bower Limited Partnership	26.91465774840
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	Bower Limited Partnership	7.69252895992
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	John & Margaret Bower	6.96376521178
Mendocino	1-08NTMP-009	Group Selection		Tractor or Skidder	Pending	John & Margaret Bower	8.53726478184
Mendocino	1-08NTMP-012	Selection		Tractor or Skidder	Pending	Doris Spurlock	81.36135027570
Mendocino	1-08NTMP-012	Selection		Cable System	Pending	Doris Spurlock	11.03098536080
Mendocino	1-08NTMP-012	Selection		Tractor or Skidder	Pending	Doris Spurlock	2.67265297727
Mendocino	1-08NTMP-012	Selection		Tractor or Skidder	Pending	Doris Spurlock	30.06764144580
Mendocino	1-08NTMP-013	Selection	Group Selection	Tractor or Skidder	Pending	Joseph and Debra Lennox	44.68949905630
Mendocino	1-08NTMP-014	Selection		Tractor or Skidder	Approved	Allen Overfield	15.05147443560
Mendocino	1-08NTMP-015	Selection		Tractor or Skidder	Approved	Margaret Cameron Miniclier	21.69095462080
Mendocino	1-08NTMP-016	Selection			Approved	Harold Roddy Jr	41.30356027470
Mendocino	1-09NTMP-004	Selection		Tractor or Skidder	Approved	Bibi Sillem	24.68385550760
Mendocino	1-09NTMP-006	Group Selection		Tractor or Skidder	Approved	Larry & April Erlei	75.70590097470
Mendocino	1-09NTMP-006	Group Selection		Tractor or Skidder	Approved	Larry & April Erlei	12.64031991580
Mendocino	1-09NTMP-014	Selection			Pending	Paul & Kendra Kolling	65.66474537660
Mendocino	1-09NTMP-015	Selection			Pending	J, D & D Koski, L Wilkins	47.78421825930
Mendocino	1-91NTMP-001	Selection		Tractor or Skidder	Approved	Robert & Sarah Ballard	34.12604686240

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	252.71893470600
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	65.55615810150
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	165.85757130900
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	51.56878600210
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	266.19027925500
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	152.41359906900
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	145.42854687200
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	95.31854514050
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	138.33857615100
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	158.15663623800
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	231.08383547900
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	58.83164123730
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	128.53590684300
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	152.41359906900
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	165.85757130900
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	95.31854514050
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	95.31854514050
Mendocino	1-92NTMP-001	Unevenaged Management			Approved	Wayne Miller	231.08383547900
Mendocino	1-92NTMP-003	Unevenaged Management			Approved	George, Aletta & Anne Hollister	422.05772248100
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	141.46206776300
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	181.54272950800
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	226.25676143500
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	243.65730005800
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	198.83940564200
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	152.32556375200
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	226.27550312700
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	178.33931212800
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	296.25117007200
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	137.83338220800
Mendocino	1-92NTMP-005	Unevenaged Management			Approved	Parker Land & Timber Partnership	181.54272950800
Mendocino	1-93NTMP-002	Unevenaged Management			Approved	George Masterson	20.68671328360
Mendocino	1-93NTMP-002	Unevenaged Management			Approved	George Masterson	61.37769622220
Mendocino	1-93NTMP-002	Unevenaged Management			Approved	George Masterson	28.94540815570
Mendocino	1-93NTMP-002	Unevenaged Management			Approved	George Masterson	39.57983180420
Mendocino	1-93NTMP-002	Unevenaged Management			Approved	George Masterson	9.42247457184
Mendocino	1-93NTMP-003	Selection		Tractor or Skidder	Approved	Tunzi Inc	418.76785507600
Mendocino	1-93NTMP-003	Selection		Tractor or Skidder	Approved	Tunzi Inc	73.14062116760
Mendocino	1-93NTMP-003	Selection		Tractor or Skidder	Approved	Tunzi Inc	73.14062116760
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust	127.57705191400
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust c/o Leon	62.59240714390
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust c/o Leon	1010.36136407000
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust c/o Leon	18.93638522790
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust c/o Leon	577.20763398400
Mendocino	1-93NTMP-004	Unevenaged Management			Approved	Eddie Farm Trust c/o Leon	24.49543869180
Mendocino	1-93NTMP-006	Unevenaged Management			Approved	Ted Rabinowitsh	23.13847134730

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-93NTMP-007	Unevenaged Management		Tractor or Skidder	Approved	Stephanie Pardini et al	89.87634731150
Mendocino	1-93NTMP-007	Unevenaged Management		Cable System	Approved	Steffanie Pardini, Mark S	8.69147164533
Mendocino	1-93NTMP-007	Unevenaged Management		Cable System	Approved	Steffanie Pardini, Mark S	17.36581058260
Mendocino	1-93NTMP-007	Unevenaged Management		Cable System	Approved	Steffanie Pardini, Mark S	8.82045583857
Mendocino	1-93NTMP-009	No Harvest Area			Approved	Save the Redwoods League, Melvin Thompson	163.68942493600
Mendocino	1-93NTMP-009	Unevenaged Management			Approved	Save the Redwoods League, Melvin Thompson	15.45346046900
Mendocino	1-93NTMP-009	Unevenaged Management			Approved	Save the Redwoods League, Melvin Thompson	41.63201767430
Mendocino	1-93NTMP-009	Unevenaged Management			Approved	Save the Redwoods League, Melvin Thompson	52.22883064010
Mendocino	1-93NTMP-009	Unevenaged Management			Approved	Save the Redwoods League, Melvin Thompson	60.46632668020
Mendocino	1-93NTMP-009	Unevenaged Management			Approved	Save the Redwoods League, Melvin Thompson	76.79017668090
Mendocino	1-93NTMP-011	Selection		Tractor or Skidder	Approved	John H Swanson Family Trust	92.17758349340
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	52.79072977140
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	49.62545911320
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	123.30723301100
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	89.84180125870
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	90.50816149190
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	145.88687266900
Mendocino	1-94NTMP-002	Unevenaged Management			Approved	Henry Smith	78.26450183310
Mendocino	1-94NTMP-002	Selection		Tractor or Skidder	Approved	Henry Smith	7.63621440200
Mendocino	1-94NTMP-003	Unevenaged Management			Approved	Harry & Suzanne Babcock	99.61379234310
Mendocino	1-94NTMP-004	Transition		Tractor or Skidder	Approved	Marc Jameson	12.10033540010
Mendocino	1-94NTMP-004	Selection		Tractor or Skidder	Approved	Marc Jameson	25.81276900360
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	382.78590386000
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	239.26935277400
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	7.03456027203
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	22.65832408050
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	11.01983233000
Mendocino	1-94NTMP-007	Unevenaged Management			Approved	Lois W Hurt Trust, Keiths Meat Marks Inc	11.96568239050
Mendocino	1-94NTMP-008	Selection		Tractor or Skidder	Approved	Don Pedro Ranch Corp, Axel Schleyer	1535.65316325000
Mendocino	1-94NTMP-009	Selection		Tractor or Skidder	Approved	Margaret Macdonald	40.89226701250
Mendocino	1-94NTMP-009	Selection		Tractor or Skidder	Approved	Margaret Macdonald	160.00601995600
Mendocino	1-94NTMP-012	Selection		Tractor or Skidder	Approved	Ray Pinoli	51.33078331320
Mendocino	1-94NTMP-012	Selection		Tractor or Skidder	Approved	Ray Pinoli	28.40778289400
Mendocino	1-94NTMP-012	Selection		Cable/Tractor option	Approved	Ray Pinoli	28.11795245160
Mendocino	1-94NTMP-014	Selection		Tractor or Skidder	Approved	De La Motte Revocable Trust	96.64299227180
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	159.06644240400
Mendocino	1-95NTMP-003	Selection		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	36.50396502930
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	1.00323779683
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	0.81510887075
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	0.93747515717
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	0.14225780678
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	0.61518275594
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	0.28780693359
Mendocino	1-95NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	9.33142343336
Mendocino	1-95NTMP-003	Selection		Tractor or Skidder	Approved	Surprise Valley Ranch Inc, David & Kathleen Kin	100.13665232100

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-95NTMP-004	Selection		Tractor or Skidder	Approved	Drinkwater Rancho Laguna Family LP et al	164.45911434400
Mendocino	1-95NTMP-004	Selection		Cable System	Approved	Drinkwater Rancho Laguna Family LP et al	64.47439608350
Mendocino	1-95NTMP-007	Selection		Tractor/Cable option	Approved	Jess Davis et al	728.46271274200
Mendocino	1-95NTMP-009	Unevenaged Management			Approved	Forster-Gill et al	740.60592264900
Mendocino	1-95NTMP-009	Unevenaged Management			Approved	Nolan-Benbow Inc	159.02743152400
Mendocino	1-95NTMP-017	Selection		Tractor or Skidder	Approved	Robert Ketchum	29.71574399390
Mendocino	1-95NTMP-018	Unevenaged Management		Tractor or Skidder	Approved	Steve & Alicia Galliani et al	463.99650235300
Mendocino	1-95NTMP-018	Unevenaged Management		Cable System	Approved	Steve & Alicia Galliani et al	16.36612090550
Mendocino	1-95NTMP-018	Unevenaged Management		Cable System	Approved	Steve & Alicia Galliani et al	2.47483638708
Mendocino	1-95NTMP-018	Unevenaged Management		Cable System	Approved	Steve & Alicia Galliani et al	9.43922548993
Mendocino	1-96NTMP-001	Unevenaged Management			Approved	Jerry & Patricia Westfall	22.95061778800
Mendocino	1-96NTMP-008	Unevenaged Management			Approved	A & E Gray Estate	25.79634006120
Mendocino	1-96NTMP-017	Unevenaged Management			Approved	Warren Yager et al	34.40835441560
Mendocino	1-96NTMP-019	Selection		Tractor or Skidder	Approved	Parducci et al	33.27307075120
Mendocino	1-96NTMP-025	No Harvest Area		Tractor or Skidder	Approved	Kaijankoski Family Trust	35.01805103440
Mendocino	1-96NTMP-025	Selection		Tractor or Skidder	Approved	Kaijankoski Family Trust	29.60830373610
Mendocino	1-96NTMP-025	Selection		Tractor or Skidder	Approved	Kaijankoski Family Trust	2.16311690694
Mendocino	1-96NTMP-025	Sanitation Salvage		Tractor or Skidder	Approved	Kaijankoski Family Trust	11.33059525420
Mendocino	1-96NTMP-026	Selection		Tractor or Skidder	Approved	Robert & Sharon Hansen	680.22783910300
Mendocino	1-96NTMP-029	Unevenaged Management			Approved	John & Betty Shandel	57.79898242070
Mendocino	1-96NTMP-029	Unevenaged Management			Approved	Drew Family	75.72759265820
Mendocino	1-96NTMP-029	Unevenaged Management			Approved	Thomas Family Trust	44.29406465230
Mendocino	1-96NTMP-029	Unevenaged Management			Approved	James & Denise Tenzel	28.59528684900
Mendocino	1-96NTMP-029	Unevenaged Management			Approved	Rolf Shandel	37.54467862090
Mendocino	1-96NTMP-033	Selection		Cable System	Approved	Robert & Janet Grundman	3.04857095344
Mendocino	1-96NTMP-033	Selection		Tractor or Skidder	Approved	Robert & Janet Grundman	18.56902928730
Mendocino	1-96NTMP-033	Selection		Cable System	Approved	Robert & Janet Grundman	3.90897773199
Mendocino	1-96NTMP-033	Selection		Tractor or Skidder	Approved	Robert & Janet Grundman	0.55727227072
Mendocino	1-96NTMP-036	Selection		Tractor or Skidder	Approved	Ralston Ross et al	190.22165196300
Mendocino	1-96NTMP-037	Selection		Tractor or Skidder	Approved	Annemarie Dietzgen	76.06381449550
Mendocino	1-96NTMP-037	Selection		Cable System	Approved	Annemarie Dietzgen	74.20240673220
Mendocino	1-96NTMP-037	Selection		Cable System	Approved	Annemarie Dietzgen	13.06250380490
Mendocino	1-96NTMP-037	Selection		Cable System	Approved	Annemarie Dietzgen	9.06735092962
Mendocino	1-96NTMP-038	Selection		Tractor or Skidder	Approved	Lynn Caughey	36.62887682660
Mendocino	1-96NTMP-038	Selection		Tractor or Skidder	Approved	Lynn Caughey	6.26631064238
Mendocino	1-96NTMP-038	Selection		Tractor or Skidder	Approved	Lynn Caughey	1.45061304029
Mendocino	1-97NTMP-002	Unevenaged Management		Tractor or Skidder	Approved	County of Mendocino	66.30317617500
Mendocino	1-97NTMP-002	Unevenaged Management		Tractor/Cable option	Approved	County of Mendocino	2.94777698716
Mendocino	1-97NTMP-003	Selection		Tractor or Skidder	Approved	John & Mary Hooper	169.35468303600
Mendocino	1-97NTMP-003	Selection			Approved	John & Mary Hooper	72.55103668820
Mendocino	1-97NTMP-005	Unevenaged Management			Approved	Christopher & Rose Hayes	241.63456283900
Mendocino	1-97NTMP-005	Group Selection		Tractor or Skidder	Approved	Christopher & Rose Hayes	240.06988481100
Mendocino	1-97NTMP-005	Group Selection		Tractor or Skidder	Approved	Christopher & Rose Hayes	240.06988481100
Mendocino	1-97NTMP-007	Unevenaged Management			Approved	Angelo & Eileen Pronsolino	130.45632975700
Mendocino	1-97NTMP-007	Unevenaged Management			Approved	Angelo & Eileen Pronsolino	95.27089908350

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-97NTMP-009	Selection		Tractor or Skidder	Approved	Sandra Booth	66.31258020270
Mendocino	1-97NTMP-009	Selection		Cable System	Approved	Sandra Booth	16.72736250290
Mendocino	1-97NTMP-009	Selection		Tractor or Skidder	Approved	Sandra Booth	63.76502535500
Mendocino	1-97NTMP-009	Selection		Cable System	Approved	Sandra Booth	87.82600262200
Mendocino	1-97NTMP-014	Selection		Tractor or Skidder	Approved	Bowen et al	1742.56761759000
Mendocino	1-97NTMP-018	Selection		Cable System	Approved	Bill Walsh	78.85018604330
Mendocino	1-97NTMP-018	Transition		Cable System	Approved	Bill Walsh	10.69036226280
Mendocino	1-97NTMP-018	Transition		Tractor or Skidder	Approved	Bill Walsh	67.04304541600
Mendocino	1-97NTMP-018	Selection		Tractor or Skidder	Approved	Bill Walsh	154.81488322700
Mendocino	1-97NTMP-018	Transition		Tractor or Skidder	Approved	Bill Walsh	2.39475193526
Mendocino	1-97NTMP-018	Selection		Cable/Tractor option	Approved	Bill Walsh	10.43038334480
Mendocino	1-97NTMP-018	Selection		Cable/Tractor option	Approved	Bill Walsh	137.19538758700
Mendocino	1-97NTMP-018	Selection		Tractor or Skidder	Approved	Bill Walsh	1.03615682691
Mendocino	1-97NTMP-018	Selection		Balloon or Helicopter	Approved	Bill Walsh	128.60513746900
Mendocino	1-97NTMP-018	Transition		Tractor or Skidder	Approved	Bill Walsh	67.04304541600
Mendocino	1-97NTMP-018	Selection		Cable/Tractor option	Approved	Bill Walsh	10.43038334480
Mendocino	1-97NTMP-021	Unevenaged Management			Approved	Charles & Vanna Bello	115.64270512900
Mendocino	1-97NTMP-022	Unevenaged Management			Approved	Dennis Balassi et al	88.26187502770
Mendocino	1-97NTMP-022	Unevenaged Management			Approved	Dennis Balassi et al	32.14289014910
Mendocino	1-97NTMP-022	Unevenaged Management			Approved	Dennis Balassi et al	38.41019533990
Mendocino	1-97NTMP-022	Unevenaged Management			Approved	Dennis Balassi et al	71.82946997290
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	2043.57784436000
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	10.90015829140
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.41345786278
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.84388800330
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	19.93851932020
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	102.70469114800
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.85487757990
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	10.25052267030
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.93376189914
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.96201495918
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.13107190388
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.21817866871
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.82344486880
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	2.27212884821
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	16.72858350240
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.14049445899
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	99.96603452590
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.29500028302
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.64902065387
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	0.39676663695
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	1.19788566597
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Whittaker Familly Trust, Robert Whittaker	3.31895128811
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Robert Whittaker	1.07700964804
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Robert Whittaker	4.22467194443

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-97NTMP-023	Unevenaged Management			Approved	Robert Whittaker	0.39736394213
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	10.64512780360
Mendocino	1-97NTMP-024	No Harvest Area			Approved	John Schick, Jacques Ullman	10.34574465330
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	1.55144616595
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	1.88887653013
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	13.64089978650
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	6.30181564470
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	0.61351473563
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	1.06850037549
Mendocino	1-97NTMP-024	No Harvest Area			Approved	John Schick, Jacques Ullman	8.31965978352
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	2.28068307834
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	8.41985667452
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.52379936471
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	11.81433111500
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.27380061238
Mendocino	1-97NTMP-024	No Harvest Area			Approved	John Schick, Jacques Ullman	2.03449110002
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	9.32885598840
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	1.51527608149
Mendocino	1-97NTMP-024	No Harvest Area			Approved	John Schick, Jacques Ullman	15.27166408170
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.15670164767
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	17.91825671670
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	0.50911880376
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	2.15854830312
Mendocino	1-97NTMP-024	No Harvest Area			Approved	John Schick, Jacques Ullman	1.25654708478
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.48917267834
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.39112720539
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	2.37932321086
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	10.42405679990
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	7.50042712232
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	19.07685975240
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.31114507932
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	6.74852043818
Mendocino	1-97NTMP-024	No Harvest Area		Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.51432466735
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.32130300286
Mendocino	1-97NTMP-024	Rehabilitation - Understocked	Sanitation Salvage	Tractor or Skidder	Approved	John Schick, Jacques Ullman	0.35649105255
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.60502316246
Mendocino	1-97NTMP-024	Transition	Sanitation Salvage	Cable/Helicopter option	Approved	John Schick, Jacques Ullman	0.34494670777
Mendocino	1-97NTMP-025	Selection		Tractor or Skidder	Approved	Thelma Ray	97.95323848480
Mendocino	1-97NTMP-025	Selection		Cable System	Approved	Thelma Ray	29.77973276990
Mendocino	1-97NTMP-029	Selection		Tractor or Skidder	Approved	Little River Inn	79.94822371210
Mendocino	1-97NTMP-032	Unevenaged Management			Approved	Glen Jarvis, John Schick, Jacques Ullman	38.62997396260
Mendocino	1-97NTMP-036	Selection		Tractor or Skidder	Approved	Randal MacDonald, Ruth Ayres	277.98686934900
Mendocino	1-97NTMP-036	Unevenaged Management			Approved	Randal MacDonald, Ruth Ayres	52.25525853400
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	34.69496358920
Mendocino	1-97NTMP-038	Group Selection		Tractor or Skidder	Approved	Guido & Betty Pronsolino	2.06482245098

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	2.20161726028
Mendocino	1-97NTMP-038	Commercial Thin		Tractor or Skidder	Approved	Guido & Betty Pronsolino	30.23883299370
Mendocino	1-97NTMP-038	Commercial Thin		Tractor or Skidder	Approved	Guido & Betty Pronsolino	5.12269245333
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	50.75452563610
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	158.01686516900
Mendocino	1-97NTMP-038	Group Selection		Tractor or Skidder	Approved	Guido & Betty Pronsolino	2.37028677753
Mendocino	1-97NTMP-038	Group Selection		Tractor or Skidder	Approved	Guido & Betty Pronsolino	68.14546055560
Mendocino	1-97NTMP-038	Transition		Cable System	Approved	Guido & Betty Pronsolino	37.00795145370
Mendocino	1-97NTMP-038	Group Selection		Tractor or Skidder	Approved	Guido & Betty Pronsolino	2.88083916079
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	194.01120306700
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	11.87682794660
Mendocino	1-97NTMP-038	Transition		Cable System	Approved	Guido & Betty Pronsolino	24.01946373130
Mendocino	1-97NTMP-038	Group Selection		Tractor or Skidder	Approved	Guido & Betty Pronsolino	4.29977994700
Mendocino	1-97NTMP-038	Transition		Cable System	Approved	Guido & Betty Pronsolino	109.75827931600
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	59.59371214410
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	27.12726876260
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	7.19472132758
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	158.01686516900
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	158.01686516900
Mendocino	1-97NTMP-038	Rehabilitation - Understocked		Tractor or Skidder	Approved	Guido & Betty Pronsolino	158.01686516900
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	194.01120306700
Mendocino	1-97NTMP-038	Transition		Tractor or Skidder	Approved	Guido & Betty Pronsolino	194.01120306700
Mendocino	1-97NTMP-040	Selection		Tractor or Skidder	Approved	Wallace & Geraldine Young	236.09016066300
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	364.49446151500
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	39.44762713110
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	10.55674024630
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	William Charles Trust	95.71718418150
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	430.10604795600
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	41.83840679770
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	453.75747658700
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	9.36265040434
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	88.57621543140
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	11.44205443320
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	26.73646681260
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	11.27966590330
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	7.02246557713
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	311.25602273200
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	400.73649474500
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	11.64380122740
Mendocino	1-97NTMP-043	Selection		Tractor/Cable option	Approved	Peter Bradford	139.58559908900
Mendocino	1-98NTMP-008	Selection		Tractor or Skidder	Approved	Florence Scott, Brent Fox	36.81733704040
Mendocino	1-98NTMP-008	Selection		Cable System	Approved	Florence Scott, Brent Fox	3.26392886745
Mendocino	1-98NTMP-008	Selection		Tractor or Skidder	Approved	Florence Scott, Brent Fox	26.87221105060
Mendocino	1-98NTMP-008	Selection		Cable System	Approved	Florence Scott, Brent Fox	8.95762786784
Mendocino	1-98NTMP-011	Unevenaged Management			Approved	Steven & Pamela Brown	38.90433638550

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-98NTMP-015	Rehabilitation - Understocked		Tractor or Skidder	Approved	Fred & Mary Corson Corson Family Ltd Partners	1060.38274324000
Mendocino	1-98NTMP-016	Unevenaged Management			Approved	Comptche Community Farm	59.29904822410
Mendocino	1-98NTMP-018	Unevenaged Management			Approved	William & Arleen Barr	1159.04997623000
Mendocino	1-98NTMP-020	Unevenaged Management			Approved	Kristine Reiber	160.10514281100
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	76.99607456230
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	188.68211838700
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	246.75537090600
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	130.37662182300
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	7.84721776706
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	6.05566902362
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	2.86761879132
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	48.76858430140
Mendocino	1-98NTMP-023	Unevenaged Management			Approved	Brian Hurt et al	2.86541212490
Mendocino	1-98NTMP-025	Unevenaged Management			Approved	Merle & Patricia Schreiner	50.07735302180
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	8.37545089935
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	28.33307178710
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	4.20748437648
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	44.09644800990
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	5.62454853736
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	1.80438709221
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	2.09124266246
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.65352249621
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	1.44708571395
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	2.47654459482
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	7.76637801020
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	7.40485294996
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	0.77511909536
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	3.00445711922
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	110.09904700000
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	9.64748876652
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	3.51561666998
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.56662819161
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.43589093345
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	4.00418259731
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.81697175561
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.24512813155
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	5.78834571512
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	3.07423783423
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	3.90448395651
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	6.26511687662
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.81358646102
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	4.61394678458
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	4.71435719954
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	9.75593578851
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	3.65299966397

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	158.34833138600
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.75583165516
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	6.05395734259
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.45504614687
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	1.24986788368
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	2.89977861739
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	5.35031242051
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	2.62989347841
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.71807307378
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	1.38528202505
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.34757510214
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	12.72152064460
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	2.03537833108
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.01436011007
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	3.95824323582
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	52.45510972940
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	7.46473789621
Mendocino	1-98NTMP-028	Sanitation Salvage			Approved	Golden Rule Church Assn	2.23669127646
Mendocino	1-98NTMP-028	Sanitation Salvage			Approved	Golden Rule Church Assn	16.81024727880
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	10.41298124260
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.91891238797
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	1.91357109818
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	3.96556372272
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	146.95479880900
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	11.29867324880
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.98162882014
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	3.81830948463
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	5.79458741749
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	96.76729370650
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	4.03847923522
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.86934898280
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.09619493784
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	4.62704001158
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.79686207537
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.77990354584
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	1.50832965398
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	2.75051100544
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	45.89871160770
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	2.82355436720
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	6.06793505167
Mendocino	1-98NTMP-028	Alternative Prescription	Selection		Approved	Golden Rule Church Assn	11.59943825260
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	2.75259383177
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.53215025907
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.61650789517
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.43041347139

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.18510734309
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	10.59374764850
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.71095882850
Mendocino	1-98NTMP-028	Rehabilitation - Understocked			Approved	Golden Rule Church Assn	3.24820641249
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	39.22848665290
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.14884997057
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.58571254080
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.66996799125
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.81717718585
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	0.95820861589
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	2.93942838001
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.95639149210
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	20.66357834080
Mendocino	1-98NTMP-028	Selection			Approved	Golden Rule Church Assn	1.60441146221
Mendocino	1-98NTMP-037	Selection		Tractor or Skidder	Approved	William CharlesTrust, Nancy CharlesTrust	807.42408202100
Mendocino	1-99NTMP-001	Selection		Tractor or Skidder	Approved	Thomas McCreary	849.52856000800
Mendocino	1-99NTMP-005	Unevenaged Management			Approved	Robert Vanderbosch, Sarah OLeary	191.07990425300
Mendocino	1-99NTMP-008	Selection		Tractor or Skidder	Approved	Edward Mitchell	5536.66589510000
Mendocino	1-99NTMP-009	Unevenaged Management			Approved	Sky View Estate LLC, Coastal View Associates	93.83843387570
Mendocino	1-99NTMP-011	Transition		Tractor or Skidder	Approved	Walter Johnson et al	172.10915790100
Mendocino	1-99NTMP-011	Transition		Tractor or Skidder	Approved	Walter Johnson et al	5.22829216926
Mendocino	1-99NTMP-011	Transition		Tractor or Skidder	Approved	Walter Johnson et al	14.25315604090
Mendocino	1-99NTMP-011	Selection		Tractor or Skidder	Approved	Walter Johnson et al	52.02297554000
Mendocino	1-99NTMP-011	Commercial Thin		Tractor or Skidder	Approved	Walter Johnson et al	364.46273697600
Mendocino	1-99NTMP-011	Selection		Tractor or Skidder	Approved	Walter Johnson et al	24.15152306460
Mendocino	1-99NTMP-011	Selection		Tractor or Skidder	Approved	Walter Johnson et al	3.73052095816
Mendocino	1-99NTMP-011	No Harvest Area		Tractor or Skidder	Approved	Walter Johnson et al	12.93570435810
Mendocino	1-99NTMP-022	Selection		Tractor or Skidder	Approved	Franklin & Lilis Moyles, Irma Zern	168.41879065200
Mendocino	1-99NTMP-022	Selection		Cable System	Approved	Franklin & Lilis Moyles, Irma Zern	9.98510005395
Mendocino	1-99NTMP-025	Selection		Tractor or Skidder	Approved	Richard Mitchell	11.28371592050
Mendocino	1-99NTMP-025	Selection		Cable System	Approved	Richard Mitchell	67.01543989170
Mendocino	1-99NTMP-025	Selection		Tractor or Skidder	Approved	Richard Mitchell	17.22556802680
Mendocino	1-99NTMP-025	Selection		Tractor or Skidder	Approved	Richard Mitchell	257.53716628100
Mendocino	1-99NTMP-025	Selection		Cable System	Approved	Richard Mitchell	28.01258700640
Mendocino	1-99NTMP-025	Selection		Cable System	Approved	Richard Mitchell	15.05257448440
Mendocino	1-99NTMP-026	Selection		Tractor or Skidder	Approved	Peter & Sara Goorijian	38.89713751710
Mendocino	1-99NTMP-027	Selection		Tractor or Skidder	Approved	Elizabeth Koch	1474.92382711000
Mendocino	1-99NTMP-028	Selection		Tractor or Skidder	Approved	Douglas Moyer et al	70.60962786620
Mendocino	1-99NTMP-028	Selection		Tractor or Skidder	Approved	Douglas Moyer et al	42.18820334070
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	1101.37702680000
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	36.92329847610
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	1.69603377942
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	4.07716714171
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	3.10014596081
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	5.02099077505

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	93.19031920420
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	1.13410641129
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	0.88339246373
Mendocino	1-99NTMP-034	Commercial Thin		Tractor/Cable option	Approved	DGS Land Co et al	10.26738525590
Mendocino	1-99NTMP-035	Selection		Tractor or Skidder	Approved	Windspirit Aum et al	37.09710599570
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	3.98661736549
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	35.79003255800
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	2.70419102690
Mendocino	1-99NTMP-039	Selection		Cable System	Approved	Perry Gulch Ranch	24.96990462630
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	351.86169927200
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	1.96774574542
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	6.06614903924
Mendocino	1-99NTMP-039	Selection		Cable System	Approved	Perry Gulch Ranch	64.99620541550
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	2.13133713970
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	1.34545072830
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	24.95791877490
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable/Tractor option	Approved	Perry Gulch Ranch	0.99178587840
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	8.78778078858
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	1.47674017043
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	2.23581536727
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	2.64625838728
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	0.80370536557
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	0.32983255389
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	1.91377230718
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	0.88631364564
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	62.54433374900
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	20.86453548070
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	20.64387554830
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	3.44306031855
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	2.76922587231
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	4.33866082593
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	0.26993200915
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	2.18491851947
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	0.55848795748
Mendocino	1-99NTMP-039	Selection		Cable System	Approved	Perry Gulch Ranch	207.85634733800
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable/Tractor option	Approved	Perry Gulch Ranch	0.27297832285
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	0.96406748566
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	1.12164916229
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	7.70477472772
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	8.95574409503
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	2.05465780918
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	2.42015411541
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	10.83663795730
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	2.12348793330
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	3.79930581293

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	29.22413515640
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	4.88753863889
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	0.94407147696
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	7.25718183172
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	12.98882496470
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	35.61193538660
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	0.30482102799
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	10.47995709640
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	5.84628894928
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	2.04082136039
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	0.73622790546
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	23.14226901360
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	2.44867813513
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	6.36565841226
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	9.91717023223
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	11.31445051300
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	0.04180670116
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	1.37756060261
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	10.61940941720
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	0.29209154024
Mendocino	1-99NTMP-039	Selection		Tractor or Skidder	Approved	Perry Gulch Ranch	64.74534673310
Mendocino	1-99NTMP-039	Selection		Cable System	Approved	Perry Gulch Ranch	12.87501193140
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Tractor or Skidder	Approved	Perry Gulch Ranch	7.57153777962
Mendocino	1-99NTMP-039	Selection		Cable/Tractor option	Approved	Perry Gulch Ranch	2.71386495522
Mendocino	1-99NTMP-039	Alternative Prescription	Selection	Cable System	Approved	Perry Gulch Ranch	12.03925013210
Mendocino	1-99NTMP-039	Selection		Cable System	Approved	Perry Gulch Ranch	0.31461024880
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Tractor or Skidder	Approved	Perry Gulch Ranch	4.89871612090
Mendocino	1-99NTMP-039	Rehabilitation - Understocked		Cable System	Approved	Perry Gulch Ranch	2.91020760340
Mendocino	1-99NTMP-041	Selection		Tractor or Skidder	Approved	Donald & Wendy Roberts	17.81281967610
Mendocino	1-99NTMP-041	Selection		Tractor or Skidder	Approved	Donald & Wendy Roberts	3.40889335321
Mendocino	1-99NTMP-045	Transition		Tractor or Skidder	Approved	Strickler et al	14.53770680080
Mendocino	1-99NTMP-045	Commercial Thin		Tractor or Skidder	Approved	Strickler et al	93.63271682350
Mendocino	1-99NTMP-045	Transition		Tractor or Skidder	Approved	Strickler et al	3.20829434947
Mendocino	1-99NTMP-045	Transition		Tractor or Skidder	Approved	Strickler et al	24.81593956680
Mendocino	1-99NTMP-045	Selection		Tractor or Skidder	Approved	Strickler et al	3.33782211385
Mendocino	1-99NTMP-045	Sanitation Salvage		Tractor or Skidder	Approved	Strickler et al	0.81257682909
Mendocino	1-99NTMP-045	Commercial Thin		Tractor or Skidder	Approved	Strickler et al	3.00187010222
Mendocino	1-99NTMP-045	Transition		Tractor or Skidder	Approved	Bruce Strickler et al	76.46861613920
Mendocino	1-99NTMP-045	Commercial Thin		Tractor or Skidder	Approved	Bruce Strickler et al	0.35269272689
Mendocino	1-99NTMP-045	Transition		Tractor or Skidder	Approved	Bruce Strickler et al	22.43092729610
Mendocino	1-99NTMP-045	Sanitation Salvage		Cable System	Approved	Bruce Strickler et al	1.83939485969
Mendocino	1-99NTMP-045	Sanitation Salvage		Tractor or Skidder	Approved	Bruce Strickler et al	4.39513793079
Mendocino	1-99NTMP-045	Sanitation Salvage		Tractor or Skidder	Approved	Bruce Strickler et al	1.68986980431
Mendocino	1-99NTMP-045	Selection		Tractor or Skidder	Approved	Bruce Strickler et al	18.77191406830
Mendocino	1-99NTMP-045	Sanitation Salvage		Tractor or Skidder	Approved	Bruce Strickler et al	3.55539312353

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Mendocino	1-99NTMP-045	Commercial Thin		Cable System	Approved	Bruce Strickler et al	0.39887134431
Mendocino	1-99NTMP-045	Commercial Thin		Tractor or Skidder	Approved	Bruce Strickler et al	32.17496324030
Mendocino	1-99NTMP-049	Selection		Tractor or Skidder	Approved	Nicholas King	56.23558413350
Mendocino	1-99NTMP-049	Selection		Tractor or Skidder	Approved	Nicholas King	49.09005551060
Mendocino	1-99NTMP-052	Selection		Tractor or Skidder	Approved	Richard & Ginger Wells	56.06927764260
Mendocino	1-99NTMP-052	Selection		Tractor/Cable option	Approved	Richard & Ginger Wells	13.06859291320
Mendocino	1-99NTMP-052	Selection		Tractor/Cable option	Approved	Richard & Ginger Wells	9.65387546483
Mendocino	1-99NTMP-052	Selection		Tractor/Cable option	Approved	Richard & Ginger Wells	199.31382356500
Mendocino	1-99NTMP-052	Selection		Tractor/Cable option	Approved	Richard & Ginger Wells	41.99757165390
Mendocino	1-99NTMP-052	Rehabilitation - Understocked		Tractor/Cable option	Approved	Richard & Ginger Wells	11.20797033410
Siskiyou	2-09NTMP-003	Unevenaged Management		Tractor or Skidder	Pending	June Tassie	61.82087524850
Siskiyou	2-95NTMP-008	Unevenaged Management		Tractor or Skidder	Approved	James Bengard	48.28039343560
Siskiyou	2-95NTMP-008	Unevenaged Management		Cable System	Approved	James Bengard	65.63557765160
Siskiyou	2-95NTMP-008	Unevenaged Management		Tractor or Skidder	Approved	James Bengard	45.99246028930
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	193.30473531100
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	22.24660057570
Siskiyou	2-98NTMP-003	No Harvest Area		Tractor or Skidder	Approved	Donald Lovelace	299.79460796100
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	1.15459045606
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	1.61308799867
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	3.18554929274
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	1.12658455143
Siskiyou	2-98NTMP-003	No Harvest Area		Tractor or Skidder	Approved	Donald Lovelace	11.21424955740
Siskiyou	2-98NTMP-003	No Harvest Area		Tractor or Skidder	Approved	Donald Lovelace	4.52779130658
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	28.19638988640
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	25.81371566270
Siskiyou	2-98NTMP-003	Alternative Prescription		Tractor or Skidder	Approved	Donald Lovelace	6.25226062265
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	1.24271802712
Siskiyou	2-98NTMP-003	Unevenaged Management		Tractor or Skidder	Approved	Donald Lovelace	79.16197235080
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	11.92508963390
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Wes & Betty Romine	15.94281181730
Sonoma	1-00NTMP-003	Transition		Balloon or Helicopter	Approved	Wes & Betty Romine	8.98292304658
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Wes & Betty Romine	26.93737367420
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	24.00904979470
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Wes & Betty Romine	5.30637524472
Sonoma	1-00NTMP-003	Transition		Tractor or Skidder	Approved	Wes & Betty Romine	52.51547256630
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	34.02839001600
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	28.59352154640
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	4.23091968471
Sonoma	1-00NTMP-003	Transition		Cable System	Approved	Wes & Betty Romine	66.47121836620
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	1.06498176154
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	4.49686675934
Sonoma	1-00NTMP-003	Transition		Cable System	Approved	Wes & Betty Romine	92.44694763970
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	1.21857593221
Sonoma	1-00NTMP-003	Transition		Tractor or Skidder	Approved	Wes & Betty Romine	5.52527374188
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	2.51087060180

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	2.24544956624
Sonoma	1-00NTMP-003	Selection		Cable System	Approved	Wes & Betty Romine	5.53599116052
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	0.40998261665
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	0.39876954499
Sonoma	1-00NTMP-003	Selection		Tractor or Skidder	Approved	Wes & Betty Romine	1.20070149176
Sonoma	1-00NTMP-003	Selection		Cable System	Approved	Wes & Betty Romine	12.62453973970
Sonoma	1-00NTMP-003	Transition		Tractor or Skidder	Approved	Wes & Betty Romine	10.13019890670
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Balloon or Helicopter	Approved	Wes & Betty Romine	19.08627258550
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Tractor or Skidder	Approved	Wes & Betty Romine	0.50967330664
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	10.72157370120
Sonoma	1-00NTMP-003	Rehabilitation - Understocked		Cable System	Approved	Wes & Betty Romine	2.17052731369
Sonoma	1-00NTMP-039	Transition		Tractor or Skidder	Approved	Arthur Rasmason	237.92027253000
Sonoma	1-00NTMP-041	Selection		Tractor or Skidder	Approved	Michael & Tonna Wilkins	26.45094681270
Sonoma	1-00NTMP-057	Selection		Tractor or Skidder	Approved	Alfred Tichenor	20.24184452790
Sonoma	1-00NTMP-073	Selection		Tractor or Skidder	Approved	Alice Fiscus Trust, Darrell Rogers	170.16030601400
Sonoma	1-01NTMP-003	Selection		Tractor or Skidder	Approved	Michael Harrison	207.94515034100
Sonoma	1-01NTMP-008	Selection		Tractor or Skidder	Approved	Archer Richardson	642.32366597000
Sonoma	1-01NTMP-008	Selection		Cable System	Approved	Archer Richardson	81.98992968880
Sonoma	1-01NTMP-048	Selection		Tractor or Skidder	Approved	Alice Garrett	145.63093997100
Sonoma	1-01NTMP-048	Transition		Tractor or Skidder	Approved	Alice Garrett	12.29178100550
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	790.42719866000
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	9.76392840451
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	2.73883025119
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	1.68166250555
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	19.54686730490
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	3.51225993828
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	0.81142584742
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	0.92095287940
Sonoma	1-02NTMP-026	Selection		Tractor/Helicopter option	Approved	Kim Thompson et al	7.03572685572
Sonoma	1-02NTMP-032	Transition		Tractor or Skidder	Approved	Mt Gilead Bible Camp & Conference Ctr	235.94506798700
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	12.50407323810
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	7.10306681819
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	6.90086870390
Sonoma	1-02NTMP-033	Selection		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.33074483378
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	22.20717235290
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	11.70309542110
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	87.20815004230
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	137.81887170600
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	7.75105003646
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	4.00595261551
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.48840557607
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	21.41304333530
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	5.01655348238
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	8.01137801824
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	20.26287002830

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	7.70618764595
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	2.66119683111
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	3.68157164223
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	0.94395116735
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	10.53148203720
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.25681665510
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.64165004950
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	6.05572446332
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	2.00890048565
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	34.51776744170
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	4.60106555912
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	45.93187431700
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.90646290153
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	36.76515873060
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.70926856789
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	3.96948967550
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	30.09811716690
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	6.59102336525
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.87489373724
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.05298588270
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	46.69537154970
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	6.62995732676
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	21.74391642880
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.99248863069
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	60.46160057000
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	9.62009290160
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	2.79971717106
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.55319311560
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	9.01365733103
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	6.29720300853
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	0.71702535500
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.46118676174
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.98133861068
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.17075054087
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	19.10680396790
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	0.57164392205
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	3.74287545094
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	6.54872633587
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	2.69792073361
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	19.43259793350
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	7.22458912905
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	5.57709200229
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.69918300232
Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	3.39640384014
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	15.68797045590

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Sonoma	1-02NTMP-033	Transition		Cable System	Approved	Ernest Ohlson Jr	17.60137781870
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	8.48962037509
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	5.91298959208
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Tractor or Skidder	Approved	Ernest Ohlson Jr	2.44909934123
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	2.72070172187
Sonoma	1-02NTMP-033	Rehabilitation - Understocked		Cable System	Approved	Ernest Ohlson Jr	6.77649573282
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	1.79531575729
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	2.81156659121
Sonoma	1-02NTMP-033	Transition		Tractor or Skidder	Approved	Ernest Ohlson Jr	6.45773518419
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	451.54585088800
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	4.07206544548
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	10.78088001790
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	5.79850347399
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	66.13784723840
Sonoma	1-03NTMP-017	Selection		Tractor/Helicopter option	Approved	Bohemia Ranch LLC, Bohemian Waterfall Park E	10.40294403740
Sonoma	1-04NTMP-001	Selection		Tractor or Skidder	Approved	Jim & Cindy Ragle et al	35.36362328630
Sonoma	1-04NTMP-001	Selection		Tractor or Skidder	Approved	Jim & Cindy Ragle et al	27.15076364440
Sonoma	1-04NTMP-001	Selection		Cable System	Approved	Jim & Cindy Ragle et al	8.90330623695
Sonoma	1-04NTMP-004	Group Selection		Tractor/Cable option	Approved	John Hutchinson	80.65272216440
Sonoma	1-04NTMP-004	No Harvest Area			Approved	John Hutchinson	0.81477219729
Sonoma	1-04NTMP-004	No Harvest Area			Approved	John Hutchinson	1.39910507283
Sonoma	1-04NTMP-004	Selection		Tractor/Cable option	Approved	John Hutchinson	6.19051479195
Sonoma	1-04NTMP-004	No Harvest Area			Approved	John Hutchinson	0.77642515445
Sonoma	1-04NTMP-004	Selection		Tractor/Cable option	Approved	John Hutchinson	8.48050314858
Sonoma	1-04NTMP-009	Unevenaged Management		Cable System	Approved	Rosson Family Trust	10.36875805830
Sonoma	1-04NTMP-009	Unevenaged Management		Tractor or Skidder	Approved	Rosson Family Trust	335.98042141100
Sonoma	1-05NTMP-007	Unevenaged Management			Approved	Vimark Inc	1682.95330822000
Sonoma	1-05NTMP-007	Unevenaged Management			Approved	Vimark Inc	439.88009715200
Sonoma	1-05NTMP-007	Unevenaged Management			Approved	Vimark Inc	277.68072498500
Sonoma	1-05NTMP-013	Selection		Tractor or Skidder	Approved	Rae Radtkey	157.30547662600
Sonoma	1-05NTMP-017	Unevenaged Management			Approved	Lester Gray	123.92716088200
Sonoma	1-05NTMP-026	Selection		Tractor or Skidder	Approved	Kay & Kent Tichenor Trust	63.02763473510
Sonoma	1-06NTMP-001	Group Selection		Tractor/Cable option	Approved	Phil Campbell et al	644.01681512600
Sonoma	1-06NTMP-001	Selection		Tractor/Cable option	Approved	Phil Campbell et al	10.29875939180
Sonoma	1-06NTMP-002	Selection		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	26.91842292550
Sonoma	1-06NTMP-002	Transition		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	50.00881647880
Sonoma	1-06NTMP-002	Transition		Cable System	Approved	Earl & Lenore Farnsworth	10.96545259070
Sonoma	1-06NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	5.36865522678
Sonoma	1-06NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	26.71448341610
Sonoma	1-06NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	10.66316282240
Sonoma	1-06NTMP-002	Rehabilitation - Understocked		Cable System	Approved	Earl & Lenore Farnsworth	0.67078149057
Sonoma	1-06NTMP-002	Transition		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	2.72731774727
Sonoma	1-06NTMP-002	Transition		Cable System	Approved	Earl & Lenore Farnsworth	3.71629742727
Sonoma	1-06NTMP-002	Transition		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	18.87388355410
Sonoma	1-06NTMP-002	Transition		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	4.78626011041

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Sonoma	1-06NTMP-002	Rehabilitation - Understocked		Tractor or Skidder	Approved	Earl & Lenore Farnsworth	1.52745024391
Sonoma	1-06NTMP-003	Selection		Tractor or Skidder	Approved	Frederick Euphrat	302.10369504400
Sonoma	1-06NTMP-003	Group Selection		Tractor or Skidder	Approved	Frederick Euphrat	43.94652377900
Sonoma	1-06NTMP-003	Group Selection		Tractor or Skidder	Approved	Frederick Euphrat	9.20190854763
Sonoma	1-06NTMP-003	Group Selection		Tractor or Skidder	Approved	Frederick Euphrat	24.50855071200
Sonoma	1-06NTMP-009	Group Selection		Tractor or Skidder	Approved	Raul Hernandez et al	19.71659865270
Sonoma	1-06NTMP-009	Group Selection		Cable System	Approved	Raul Hernandez et al	20.11519697530
Sonoma	1-06NTMP-009	Group Selection		Tractor or Skidder	Approved	Raul Hernandez et al	79.91405563490
Sonoma	1-06NTMP-009	Group Selection		Cable System	Approved	Raul Hernandez et al	9.49183595873
Sonoma	1-06NTMP-009	Group Selection		Tractor or Skidder	Approved	Raul Hernandez et al	71.96205686200
Sonoma	1-06NTMP-009	Group Selection		Cable System	Approved	Raul Hernandez et al	8.64993586536
Sonoma	1-06NTMP-010	Selection		Tractor or Skidder	Approved	Edson McCullough et al	144.87743698400
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	119.28260159800
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	0.95486812166
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	8.60280613322
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	1.97903272473
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	1.63922615923
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	12.36987728080
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	7.76237821729
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	1.31614623519
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	13.86012787660
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	3.72502767110
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	6.69170221326
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	14.99265631500
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	4.07894570132
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	1.14951354152
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	13.18532056170
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	0.77350966658
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	36.28410346830
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	2.47081177142
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	23.72281353090
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	6.70768156170
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	3.06955802083
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	0.69820360183
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	0.95253963390
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	49.45620448710
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	1.40201597131
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	47.14587950200
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	5.79920794610
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	2.90046860682
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	3.59562266226
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	7.12963818598
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	10.07477323240
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	13.75121279700
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	6.00456728046

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Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	0.12968589611
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	4.96140358085
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	5.18296429275
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	247.54445424600
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	35.88695864720
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Tractor or Skidder	Pending	Bohemian Club	9.47048124137
Sonoma	1-06NTMP-011	Rehabilitation - Understocked		Cable System	Pending	Bohemian Club	13.29834676650
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	139.35440225700
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	123.91023640100
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	116.24171021200
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	47.04352413110
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	14.68474610120
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	9.92370401907
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	31.13691224850
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	55.60274814840
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	0.44440607146
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	20.90576769380
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	4.65266464787
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	5.71364399946
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	645.11139495300
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	4.54720024352
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	4.75596331823
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	72.17053397020
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	0.30986738315
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	1.23806577606
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	176.86774880200
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	23.12221639870
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	29.80942296480
Sonoma	1-06NTMP-011	Group Selection		Cable System	Pending	Bohemian Club	7.60938587135
Sonoma	1-06NTMP-011	Transition		Cable System	Pending	Bohemian Club	27.86021946480
Sonoma	1-06NTMP-011	Transition		Tractor or Skidder	Pending	Bohemian Club	5.43615639383
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	72.17053397020
Sonoma	1-06NTMP-011	Group Selection		Tractor or Skidder	Pending	Bohemian Club	72.17053397020
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	2.13046308871
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.91610034283
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.52473586041
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.69585367504
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	92.81034093300
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	63.33901191730
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	6.92800870521
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	14.10068473460
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	4.34092788911
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	14.71410262240
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.89800973687
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	40.79810828180

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	39.19798712150
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.20794022129
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	8.47102532654
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	7.04155116526
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	0.31368986417
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	58.92496450530
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	1.72418445858
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	54.63797031530
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	15.81784505320
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	86.18647957320
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	3.45298486145
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	3.75260342288
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	76.92423036360
Sonoma	1-06NTMP-015	Unevenaged Management			Approved	Merlo Family Limited Partnership	94.46468449410
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	24.47494117600
Sonoma	1-07NTMP-001	Group Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	98.11254561860
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	0.47342814160
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	4.92702759957
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	1.66917127506
Sonoma	1-07NTMP-001	Group Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	5.92393588615
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	1.04248571086
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	5.79285657258
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	48.48662292880
Sonoma	1-07NTMP-001	Group Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	49.63929337280
Sonoma	1-07NTMP-001	Rehabilitation - Understocked		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	19.16124786820
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	11.67756251920
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	7.64067480705
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	2.17692777247
Sonoma	1-07NTMP-001	Group Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	14.45005133900
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	32.93316330320
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	13.37993349870
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	12.43063430200
Sonoma	1-07NTMP-001	Selection		Tractor or Skidder	Approved	Duncan Mills Redwood Forest Enterprise, Russia	4.60361587444
Sonoma	1-07NTMP-003	Group Selection		Tractor or Skidder	Approved	Vera H Kreck Trust	365.04745072300
Sonoma	1-07NTMP-003	Group Selection		Cable System	Approved	Vera H Kreck Trust	172.72251859500
Sonoma	1-07NTMP-003	Group Selection		Tractor or Skidder	Approved	Vera H Kreck Trust	12.68715280630
Sonoma	1-07NTMP-003	Group Selection		Tractor or Skidder	Approved	Vera H Kreck Trust	10.52480630180
Sonoma	1-07NTMP-005	Selection		Tractor or Skidder	Approved	David & Suzanne Brown	32.64468316920
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family LLC	48.32264805610
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	7.32250537001
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	18.54159952360
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	15.59720527890
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	2.18289836504
Sonoma	1-07NTMP-016	Transition		Tractor or Skidder	Pending	Dale & Ronda Silva Family	130.13114377500
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	1.43586812519

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Sonoma	1-07NTMP-016	Transition		Cable System	Pending	Dale & Ronda Silva Family	58.28484090180
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	0.78959548080
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	27.77285475850
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	48.88536404440
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	1.70780205816
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	19.45612517740
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	1.93141034420
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	84.11701349460
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	5.81419397342
Sonoma	1-07NTMP-016	Transition		Cable System	Pending	Dale & Ronda Silva Family	17.85111086820
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	0.76712590360
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	268.21321813300
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	22.54704920110
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	254.45888590500
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	2.66706647663
Sonoma	1-07NTMP-016	Transition		Tractor or Skidder	Pending	Dale & Ronda Silva Family	46.22507145070
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	14.67719532120
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	31.20991945510
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	11.34312575680
Sonoma	1-07NTMP-016	Transition		Tractor or Skidder	Pending	Dale & Ronda Silva Family	11.19964124120
Sonoma	1-07NTMP-016	Transition		Cable System	Pending	Dale & Ronda Silva Family	6.81993238291
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	6.70431168114
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	72.14630673090
Sonoma	1-07NTMP-016	No Harvest Area		Tractor or Skidder	Pending	Dale & Ronda Silva Family	16.37877588600
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	28.43010178420
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	6.32725953239
Sonoma	1-07NTMP-016	Selection		Cable System	Pending	Dale & Ronda Silva Family	15.93005778320
Sonoma	1-07NTMP-016	Selection		Tractor or Skidder	Pending	Dale & Ronda Silva Family	3.35091994302
Sonoma	1-07NTMP-016	Transition		Tractor or Skidder	Pending	Dale & Ronda Silva Family	15.44707072420
Sonoma	1-08NTMP-006	Selection		Cable System	Pending	Lee & Carolyn Martinelli	40.69775589890
Sonoma	1-08NTMP-006	Selection		Tractor or Skidder	Pending	Lee & Carolyn Martinelli	3.33084423526
Sonoma	1-08NTMP-006	Selection		Cable System	Pending	Lee & Carolyn Martinelli	2.02282702155
Sonoma	1-08NTMP-006	Selection		Tractor or Skidder	Pending	Lee & Carolyn Martinelli	7.69001947860
Sonoma	1-08NTMP-006	Selection		Tractor or Skidder	Pending	Lee & Carolyn Martinelli	0.48431385024
Sonoma	1-08NTMP-006	Selection		Tractor or Skidder	Pending	Lee & Carolyn Martinelli	0.26605591429
Sonoma	1-08NTMP-011	Selection	Transition	Tractor or Skidder	Pending	Darrell Rogers	14.23140019940
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	15.31101071750
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	77.88428109850
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	0.35065357490
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	20.25669590280
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	3.03863670348
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	0.91000994666
Sonoma	1-95NTMP-019	Selection		Tractor or Skidder	Approved	Mary Colette & Elizabeth Hanlein	1.42236730893
Sonoma	1-96NTMP-004	Unevenaged Management			Approved	Judith Charter	6.69231409107
Sonoma	1-96NTMP-004	Unevenaged Management			Approved	Judith Charter	64.97001690480

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Sonoma	1-96NTMP-004	Unevenaged Management			Approved	Judith Charter	1.60052762036
Sonoma	1-96NTMP-004	Unevenaged Management			Approved	Judith Charter	1.40278626173
Sonoma	1-96NTMP-004	Unevenaged Management			Approved	Judith Charter	6.05215324410
Sonoma	1-96NTMP-013	Selection			Approved	George & James Howlett	1300.14456584000
Sonoma	1-96NTMP-023	Selection		Tractor or Skidder	Approved	James Gehring	205.09811670100
Sonoma	1-96NTMP-023	Selection		Tractor or Skidder	Approved	James Gehring	5.14800352753
Sonoma	1-96NTMP-023	Selection		Tractor or Skidder	Approved	James Gehring	18.36784406180
Sonoma	1-96NTMP-023	Selection		Tractor or Skidder	Approved	James Gehring	2.34474621181
Sonoma	1-96NTMP-024	Selection			Approved	JHM Properties	280.95823464600
Sonoma	1-97NTMP-033	Selection		Tractor or Skidder	Approved	Gardner Family Trust	159.53559806600
Sonoma	1-98NTMP-002	Selection		Tractor/Cable option	Approved	John & Janice Hadzess et al	80.06152405990
Sonoma	1-98NTMP-007	Selection		Tractor or Skidder	Approved	James & Marcia Joyce	42.33318909040
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	1541.48762671000
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	353.15672863400
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	285.93661093700
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	35.83438575900
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	31.20331317740
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	43.87540231920
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	87.67668243430
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	33.94077926880
Sonoma	1-98NTMP-024	Unevenaged Management			Approved	Barbara Baxter et al	44.74912633060
Sonoma	1-98NTMP-040	Selection		Tractor or Skidder	Approved	Eugenia McKenzie et al	68.24136635810
Sonoma	1-99NTMP-021	Selection		Tractor or Skidder	Approved	Todd & Jamie Curlee	39.53013163310
Sonoma	1-99NTMP-054	Selection		Tractor or Skidder	Approved	Plantation Forest	471.49974910300
Sonoma	1-99NTMP-054	Selection		Cable System	Approved	Plantation Forest	0.41374612020
Sonoma	1-99NTMP-054	Selection		Cable System	Approved	Plantation Forest	7.92376364826
Trinity	1-00NTMP-020	Group Selection		Tractor/Cable option	Approved	Frank & Gary Trone	134.66290431200
Trinity	1-00NTMP-020	Group Selection		Tractor/Cable option	Approved	Frank & Gary Trone	143.49891561700
Trinity	1-00NTMP-020	Group Selection		Cable System	Approved	Frank & Gary Trone	17.61546376070
Trinity	1-00NTMP-028	Transition		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	43.82665929450
Trinity	1-00NTMP-028	Selection		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	287.29637332700
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	44.89896643250
Trinity	1-00NTMP-028	Transition		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	13.86754848840
Trinity	1-00NTMP-028	Transition		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	15.29844724800
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	12.60185076670
Trinity	1-00NTMP-028	Selection		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	130.99382247100
Trinity	1-00NTMP-028	Transition		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	7.39614759314
Trinity	1-00NTMP-028	Transition		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	43.53995997180
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	0.23106504003
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	262.10576095400
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	43.42411191370
Trinity	1-00NTMP-028	Selection		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	35.68529649230
Trinity	1-00NTMP-028	Selection		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	281.85626873400
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	4.38250194662
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	2.98994176582

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	5.80263537615
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	14.90526862050
Trinity	1-00NTMP-028	Sanitation Salvage		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	13.62188324260
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	15.41223436500
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	3.49141709833
Trinity	1-00NTMP-028	Commercial Thin		Tractor or Skidder	Approved	Anne Witter-Gillette Trust, Lone Pine Ranch	1.85348689121
Trinity	1-01NTMP-009	Transition		Tractor/Cable option	Approved	Norman Burgess	1005.43553303000
Trinity	1-01NTMP-009	Transition		Tractor/Cable option	Approved	Norman Burgess	171.57379891600
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Cable System	Approved	John & Claudia Lima et al	121.28306011600
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	0.94293053181
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor/Cable option	Approved	John & Claudia Lima et al	1.02770568643
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor/Cable option	Approved	John & Claudia Lima et al	28.09837140110
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	12.63011194540
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor/Cable option	Approved	John & Claudia Lima et al	5.43308767099
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	7.56065034283
Trinity	1-01NTMP-020	Selection		Tractor or Skidder	Approved	John & Claudia Lima et al	1.73832414725
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor or Skidder	Approved	John & Claudia Lima et al	17.16589300320
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Cable System	Approved	John & Claudia Lima et al	8.64591336465
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor/Cable option	Approved	John & Claudia Lima et al	5.34867188347
Trinity	1-01NTMP-020	Selection		Tractor or Skidder	Approved	John & Claudia Lima et al	4.27815311824
Trinity	1-01NTMP-020	Selection		Tractor or Skidder	Approved	John & Claudia Lima et al	14.42022790380
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Cable System	Approved	John & Claudia Lima et al	3.62325053114
Trinity	1-01NTMP-020	Selection		Tractor/Cable option	Approved	John & Claudia Lima et al	9.17099329846
Trinity	1-01NTMP-020	Selection		Tractor or Skidder	Approved	John & Claudia Lima et al	2.02038595394
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	0.58637211815
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Cable System	Approved	John & Claudia Lima et al	3.48191622786
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	7.62609894766
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	0.53215805489
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor or Skidder	Approved	John & Claudia Lima et al	19.63552782410
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor/Cable option	Approved	John & Claudia Lima et al	3.04147625064
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Cable System	Approved	John & Claudia Lima et al	0.72739972987
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor or Skidder	Approved	John & Claudia Lima et al	4.07176293360
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	1.02852793344
Trinity	1-01NTMP-020	Selection		Tractor/Cable option	Approved	John & Claudia Lima et al	1.99903844158
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor/Cable option	Approved	John & Claudia Lima et al	7.87720631023
Trinity	1-01NTMP-020	Selection		Tractor/Cable option	Approved	John & Claudia Lima et al	1.78286176114
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor/Cable option	Approved	John & Claudia Lima et al	1.70811815321
Trinity	1-01NTMP-020	Alternative Prescription	Rehabilitation - Underst	Tractor or Skidder	Approved	John & Claudia Lima et al	5.95548786737
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Cable System	Approved	John & Claudia Lima et al	10.01383244090
Trinity	1-01NTMP-020	Rehabilitation - Understocked		Tractor or Skidder	Approved	John & Claudia Lima et al	2.44698995480
Trinity	1-01NTMP-028	Selection		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	115.43555049700
Trinity	1-01NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	79.20723244800
Trinity	1-01NTMP-028	Selection		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	60.98772729210
Trinity	1-01NTMP-028	Transition		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	10.57770337480
Trinity	1-01NTMP-028	Transition		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	207.10853712600

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Trinity	1-01NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	2.07513815519
Trinity	1-01NTMP-028	Selection		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	24.31748871710
Trinity	1-01NTMP-028	Selection		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	4.47885005474
Trinity	1-01NTMP-028	Transition		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	11.19052803340
Trinity	1-01NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	1.79722195504
Trinity	1-01NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	4.04520928820
Trinity	1-01NTMP-028	No Harvest Area		Tractor or Skidder	Approved	Roy & Cynthia OFerrall	6.08088057286
Trinity	1-01NTMP-053	Transition		Tractor/Cable option	Approved	Vernon & Patricia Carmichael	286.12429838200
Trinity	1-01NTMP-055	Selection		Tractor/Cable option	Approved	Ted & Charlene Goforth, Lone Pine Ranch	167.31619770000
Trinity	1-02NTMP-004	Selection		Tractor or Skidder	Approved	Arden Stilwell	273.68426138600
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	242.68416165100
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	204.06007224200
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	688.21472230300
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	1.00300346735
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	138.12039855500
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	31.86011827850
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	13.99870977650
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	13.73924820570
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	38.86495011960
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	211.57029503800
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	29.20641040040
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	50.16354322870
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	14.10346139630
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	1.62528785184
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	6.08542589402
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	40.03798815520
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	131.18269148000
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	2.37314994581
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	19.28039991500
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	15.05415736390
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	1.21473313829
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	64.51154824990
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	119.67639304600
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	8.54712699836
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	12.07749154550
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	12.40689591890
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	14.07846860790
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	196.56643300600
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	22.54972465750
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	145.43754934700
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	8.26165208126
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	109.60376249600
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	30.91173859250
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	5.20608566612
Trinity	1-02NTMP-035	Selection		Tractor/Cable option	Approved	Stewart Ranches Inc	31.49997111250

County	HarvestDoc	Silviculture	Silviculture	Yarding	Completion	Landowner	GIS Acres
Trinity	1-03NTMP-037	Group Selection		Tractor/Cable option	Approved	Ronald & Carol Michener	29.01402510940
Trinity	1-03NTMP-037	Group Selection		Tractor/Cable option	Approved	Ronald & Carol Michener	135.12770484800
Trinity	1-06NTMP-019	Selection		Tractor or Skidder	Approved	Ken & Carlene Richardson	83.19019185780
Trinity	1-06NTMP-019	Selection		Tractor or Skidder	Approved	Ken & Carlene Richardson	16.51528409090
Trinity	1-94NTMP-005	Selection		Tractor or Skidder	Approved	John & LaVerna Bartlett	166.39325441800
Trinity	1-99NTMP-012	Selection		Tractor or Skidder	Approved	Jean Henson	447.69384755700
Trinity	1-99NTMP-031	Selection		Tractor or Skidder	Approved	Hansen 1998 Revocable Trust	371.50610546800

County	HarvestDoc	CALWNUM	town_rng
Del Norte	1-04NTMP-020	1103.110003	16N 01W H
Del Norte	1-97NTMP-015	1101.000001	18N 01W H
Del Norte	1-97NTMP-015	1101.000002	18N 01W H
Glenn	2-96NTMP-002	1111.630201	20N 09W M
Glenn	2-96NTMP-002	1111.730102	20N 09W M
Glenn	2-96NTMP-002	1111.730103	20N 09W M
Glenn	2-96NTMP-002	1111.730103	20N 09W M
Humboldt	1-00NTMP-004	1111.120102	01S 02E H
Humboldt	1-00NTMP-004	1111.130300	01S 02E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-005	1107.200301	08N 03E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-007	1110.000104	04N 01E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.100104	06N 02E H
Humboldt	1-00NTMP-008	1109.200001	06N 02E H
Humboldt	1-00NTMP-009	1111.320802	04S 03E H
Humboldt	1-00NTMP-009	1111.320802	04S 03E H
Humboldt	1-00NTMP-010	1109.300501	05N 03E H
Humboldt	1-00NTMP-011	1109.100105	06N 01E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H
Humboldt	1-00NTMP-013	1107.200102	06N 03E H

Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-013	1107.200102	06N	03E	H
Humboldt	1-00NTMP-014	1111.320505	05S	03E	H
Humboldt	1-00NTMP-014	1111.320702	05S	03E	H
Humboldt	1-00NTMP-014	1111.320702	05S	03E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130101	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-016	1111.130202	01S	04E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H

Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-017	1107.200102	06N	03E	H
Humboldt	1-00NTMP-024	1105.120101	10N	06E	H
Humboldt	1-00NTMP-024	1105.120101	11N	06E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320701	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	04S	02E	H
Humboldt	1-00NTMP-026	1111.320703	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	04S	03E	H
Humboldt	1-00NTMP-026	1111.320703	05S	02E	H
Humboldt	1-00NTMP-026	1111.320703	05S	02E	H
Humboldt	1-00NTMP-026	1111.320703	05S	02E	H
Humboldt	1-00NTMP-026	1111.320703	05S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	04S	03E	H
Humboldt	1-00NTMP-026	1111.320801	05S	02E	H
Humboldt	1-00NTMP-026	1111.320801	05S	03E	H
Humboldt	1-00NTMP-034	1109.300501	04N	03E	H
Humboldt	1-00NTMP-034	1109.300501	05N	03E	H
Humboldt	1-00NTMP-034	1109.300503	04N	03E	H
Humboldt	1-00NTMP-034	1109.300503	05N	03E	H
Humboldt	1-00NTMP-035	1109.300501	05N	03E	H
Humboldt	1-00NTMP-036	1111.220503	01N	03E	H
Humboldt	1-00NTMP-036	1111.220503	02N	03E	H
Humboldt	1-00NTMP-036	1111.220602	01N	03E	H
Humboldt	1-00NTMP-036	1111.220602	02N	03E	H
Humboldt	1-00NTMP-036	1111.220605	01N	03E	H

Humboldt	1-00NTMP-036	1111.220605	02N	03E	H
Humboldt	1-00NTMP-037	1111.310102	02S	03E	H
Humboldt	1-00NTMP-038	1109.300602	05N	02E	H
Humboldt	1-00NTMP-042	1110.000102	04N	01E	H
Humboldt	1-00NTMP-042	1110.000102	05N	01E	H
Humboldt	1-00NTMP-042	1110.000105	04N	01E	H
Humboldt	1-00NTMP-042	1110.000105	05N	01E	H
Humboldt	1-00NTMP-044	1111.120101	01N	02E	H
Humboldt	1-00NTMP-048	1111.320701	04S	02E	H
Humboldt	1-00NTMP-048	1111.320701	04S	03E	H
Humboldt	1-00NTMP-048	1111.320701	05S	03E	H
Humboldt	1-00NTMP-048	1111.320702	04S	02E	H
Humboldt	1-00NTMP-048	1111.320702	04S	03E	H
Humboldt	1-00NTMP-048	1111.320702	05S	03E	H
Humboldt	1-00NTMP-048	1111.320703	04S	02E	H
Humboldt	1-00NTMP-048	1111.320703	04S	02E	H
Humboldt	1-00NTMP-048	1111.320703	04S	03E	H
Humboldt	1-00NTMP-048	1111.320703	04S	03E	H
Humboldt	1-00NTMP-048	1111.320703	05S	02E	H
Humboldt	1-00NTMP-048	1111.320703	05S	03E	H
Humboldt	1-00NTMP-048	1111.320703	05S	03E	H
Humboldt	1-00NTMP-048	1111.320801	04S	02E	H
Humboldt	1-00NTMP-048	1111.320801	04S	03E	H
Humboldt	1-00NTMP-048	1111.320801	05S	03E	H
Humboldt	1-00NTMP-049	1111.130201	01N	03E	H
Humboldt	1-00NTMP-049	1111.130201	01N	04E	H
Humboldt	1-00NTMP-049	1111.130201	01S	03E	H
Humboldt	1-00NTMP-049	1111.130201	01S	04E	H
Humboldt	1-00NTMP-049	1111.130202	01N	03E	H
Humboldt	1-00NTMP-049	1111.130202	01N	04E	H
Humboldt	1-00NTMP-049	1111.130202	01S	03E	H
Humboldt	1-00NTMP-049	1111.130202	01S	04E	H
Humboldt	1-00NTMP-049	1111.220403	01N	03E	H
Humboldt	1-00NTMP-049	1111.220403	01N	04E	H
Humboldt	1-00NTMP-049	1111.220403	01S	03E	H
Humboldt	1-00NTMP-049	1111.220403	01S	04E	H
Humboldt	1-00NTMP-049	1111.220504	01N	03E	H
Humboldt	1-00NTMP-049	1111.220504	01N	04E	H
Humboldt	1-00NTMP-049	1111.220504	01S	03E	H
Humboldt	1-00NTMP-049	1111.220504	01S	04E	H
Humboldt	1-00NTMP-052	1111.230201	04N	02E	H
Humboldt	1-00NTMP-052	1111.230201	04N	02E	H
Humboldt	1-00NTMP-052	1111.230201	04N	02E	H
Humboldt	1-00NTMP-054	1111.220602	01N	03E	H
Humboldt	1-00NTMP-054	1111.220602	02N	03E	H
Humboldt	1-00NTMP-055	1110.000103	04N	01E	H
Humboldt	1-00NTMP-056	1111.320504	05S	03E	H
Humboldt	1-00NTMP-056	1111.320504	05S	03E	H
Humboldt	1-00NTMP-056	1111.320504	05S	03E	H
Humboldt	1-00NTMP-056	1111.320505	05S	03E	H
Humboldt	1-00NTMP-056	1111.320505	05S	03E	H
Humboldt	1-00NTMP-056	1111.320505	05S	03E	H

Humboldt	1-00NTMP-059	1109.100104	06N 02E H
Humboldt	1-00NTMP-059	1109.200001	06N 02E H
Humboldt	1-00NTMP-059	1109.200003	06N 02E H
Humboldt	1-00NTMP-059	1109.200004	06N 02E H
Humboldt	1-00NTMP-060	1109.100104	06N 02E H
Humboldt	1-00NTMP-060	1109.200004	06N 02E H
Humboldt	1-00NTMP-064	1109.100105	06N 01E H
Humboldt	1-00NTMP-067	1109.100105	06N 01E H
Humboldt	1-00NTMP-067	1109.100105	06N 02E H
Humboldt	1-00NTMP-068	1111.410602	01S 03E H
Humboldt	1-00NTMP-068	1111.410602	02S 03E H
Humboldt	1-01NTMP-001	1111.310102	02S 03E H
Humboldt	1-01NTMP-004	1110.000402	04N 01W H
Humboldt	1-01NTMP-004	1110.000603	04N 01W H
Humboldt	1-01NTMP-006	1109.300602	05N 02E H
Humboldt	1-01NTMP-006	1110.000504	05N 02E H
Humboldt	1-01NTMP-011	1109.300501	04N 03E H
Humboldt	1-01NTMP-011	1109.300501	05N 02E H
Humboldt	1-01NTMP-011	1109.300501	05N 03E H
Humboldt	1-01NTMP-011	1109.300503	04N 03E H
Humboldt	1-01NTMP-011	1109.300503	05N 02E H
Humboldt	1-01NTMP-011	1109.300503	05N 03E H
Humboldt	1-01NTMP-011	1109.300601	04N 03E H
Humboldt	1-01NTMP-011	1109.300601	05N 02E H
Humboldt	1-01NTMP-011	1109.300601	05N 03E H
Humboldt	1-01NTMP-012	1110.000104	05N 01W H
Humboldt	1-01NTMP-014	1109.100105	06N 01E H
Humboldt	1-01NTMP-014	1109.300602	05N 02E H
Humboldt	1-01NTMP-014	1110.000504	05N 02E H
Humboldt	1-01NTMP-025	1109.100106	07N 01E H
Humboldt	1-01NTMP-025	1109.100106	07N 01E H
Humboldt	1-01NTMP-025	1109.100106	07N 01E H
Humboldt	1-01NTMP-027	1110.000104	05N 01E H
Humboldt	1-01NTMP-034	1111.320702	04S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-034	1111.320702	05S 03E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-035	1110.000503	05N 01E H
Humboldt	1-01NTMP-036	1112.300201	03S 01E H
Humboldt	1-01NTMP-036	1112.300201	04S 01E H
Humboldt	1-01NTMP-036	1112.300201	04S 01E H
Humboldt	1-01NTMP-036	1112.300201	04S 01E H
Humboldt	1-01NTMP-038	1111.410601	01S 03E H
Humboldt	1-01NTMP-043	1111.110202	03N 01W H

Humboldt	1-01NTMP-043	1111.110202	03N 01W H
Humboldt	1-01NTMP-046	1111.310101	02S 03E H
Humboldt	1-01NTMP-046	1111.410501	02S 03E H
Humboldt	1-01NTMP-047	1110.000102	04N 01E H
Humboldt	1-01NTMP-047	1110.000102	04N 01E H
Humboldt	1-01NTMP-047	1110.000102	05N 01E H
Humboldt	1-01NTMP-049	1111.130201	01N 04E H
Humboldt	1-01NTMP-049	1111.130201	01S 04E H
Humboldt	1-01NTMP-049	1111.130202	01N 04E H
Humboldt	1-01NTMP-049	1111.130202	01S 04E H
Humboldt	1-01NTMP-049	1111.130202	01S 04E H
Humboldt	1-01NTMP-049	1111.220403	01N 04E H
Humboldt	1-01NTMP-049	1111.220403	01S 04E H
Humboldt	1-01NTMP-050	1111.310101	02S 03E H
Humboldt	1-01NTMP-050	1111.310102	02S 03E H
Humboldt	1-01NTMP-051	1110.000402	04N 01W H
Humboldt	1-01NTMP-051	1110.000402	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-051	1110.000603	04N 01W H
Humboldt	1-01NTMP-054	1108.100002	08N 01E H
Humboldt	1-01NTMP-054	1108.100002	08N 01W H
Humboldt	1-02NTMP-002	1109.100101	06N 01E H
Humboldt	1-02NTMP-002	1109.100101	06N 01E H
Humboldt	1-02NTMP-002	1109.100102	06N 01E H
Humboldt	1-02NTMP-002	1109.100102	06N 01E H
Humboldt	1-02NTMP-002	1109.100103	06N 01E H
Humboldt	1-02NTMP-002	1109.100103	06N 01E H
Humboldt	1-02NTMP-002	1109.100103	06N 01E H
Humboldt	1-02NTMP-002	1109.100103	06N 01E H
Humboldt	1-02NTMP-003	1111.310102	02S 03E H
Humboldt	1-02NTMP-005	1109.100104	06N 01E H
Humboldt	1-02NTMP-006	1110.000101	04N 02E H
Humboldt	1-02NTMP-006	1110.000101	04N 02E H
Humboldt	1-02NTMP-006	1110.000101	04N 02E H
Humboldt	1-02NTMP-006	1110.000402	04N 01W H
Humboldt	1-02NTMP-006	1110.000402	04N 01W H
Humboldt	1-02NTMP-006	1110.000402	04N 01W H
Humboldt	1-02NTMP-006	1110.000603	04N 01W H
Humboldt	1-02NTMP-006	1110.000603	04N 01W H
Humboldt	1-02NTMP-006	1110.000603	04N 01W H
Humboldt	1-02NTMP-006	1111.230201	04N 02E H
Humboldt	1-02NTMP-008	1109.100300	07N 01E H
Humboldt	1-02NTMP-009	1111.410101	02S 05E H

Humboldt	1-02NTMP-009	1111.410101	02S 06E H
Humboldt	1-02NTMP-009	1111.410101	02S 06E H
Humboldt	1-02NTMP-009	1111.410101	03S 05E H
Humboldt	1-02NTMP-009	1111.410101	03S 06E H
Humboldt	1-02NTMP-009	1111.410101	03S 06E H
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Humboldt	1-02NTMP-009	1111.410102	02S 06E H
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Humboldt	1-02NTMP-009	1111.410102	03S 06E H
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Humboldt	1-02NTMP-009	1111.410203	02S 05E H
Humboldt	1-02NTMP-009	1111.410203	02S 06E H
Humboldt	1-02NTMP-009	1111.410203	02S 06E H
Humboldt	1-02NTMP-009	1111.410203	03S 05E H
Humboldt	1-02NTMP-009	1111.410203	03S 06E H
Humboldt	1-02NTMP-009	1111.410203	03S 06E H
Humboldt	1-02NTMP-012	1108.100002	08N 01W H
Humboldt	1-02NTMP-012	1108.100002	09N 01W H
Humboldt	1-02NTMP-013	1109.100104	05N 01E H
Humboldt	1-02NTMP-013	1109.100104	06N 01E H
Humboldt	1-02NTMP-013	1109.100104	06N 01E H
Humboldt	1-02NTMP-013	1110.000502	05N 01E H
Humboldt	1-02NTMP-013	1110.000502	06N 01E H
Humboldt	1-02NTMP-013	1110.000502	06N 01E H
Humboldt	1-02NTMP-014	1110.000102	04N 01E H
Humboldt	1-02NTMP-014	1110.000102	05N 01E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
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Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
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Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
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Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H
Humboldt	1-02NTMP-016	1111.310102	03S 03E H

Humboldt	1-02NTMP-016	1111.310102	03S	03E	H
Humboldt	1-02NTMP-016	1111.310202	03S	03E	H
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Humboldt	1-02NTMP-016	1111.310202	03S	03E	H
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Humboldt	1-02NTMP-016	1111.310202	03S	03E	H
Humboldt	1-02NTMP-016	1111.310202	03S	03E	H
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Humboldt	1-02NTMP-016	1111.310202	03S	03E	H
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Humboldt	1-02NTMP-016	1111.310202	03S	03E	H

Humboldt	1-02NTMP-016	1111.310202	03S 03E H
Humboldt	1-02NTMP-016	1111.310202	03S 03E H
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Humboldt	1-02NTMP-016	1111.320804	03S 03E H
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Humboldt	1-02NTMP-016	1111.320804	03S 03E H
Humboldt	1-02NTMP-017	1109.100104	06N 02E H
Humboldt	1-02NTMP-019	1109.100300	07N 01E H
Humboldt	1-02NTMP-024	1111.220601	01N 03E H
Humboldt	1-02NTMP-024	1111.220601	01N 03E H
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Humboldt	1-02NTMP-024	1111.220605	01N 03E H
Humboldt	1-02NTMP-024	1111.220605	01N 03E H
Humboldt	1-02NTMP-024	1111.220605	01N 03E H
Humboldt	1-02NTMP-027	1111.110101	02N 01E H
Humboldt	1-02NTMP-027	1111.110101	02N 01W H
Humboldt	1-02NTMP-027	1111.110101	02N 01W H
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Humboldt	1-02NTMP-027	1111.110201	02N 01W H
Humboldt	1-02NTMP-027	1111.110202	03N 01W H
Humboldt	1-02NTMP-027	1111.110303	02N 02W H
Humboldt	1-02NTMP-027	1111.210002	02N 01E H
Humboldt	1-02NTMP-027	1111.210002	02N 01W H
Humboldt	1-02NTMP-029	1111.110102	02N 01W H
Humboldt	1-02NTMP-030	1110.000102	05N 01E H
Humboldt	1-02NTMP-031	1110.000503	05N 01E H
Humboldt	1-02NTMP-034	1110.000104	04N 01W H
Humboldt	1-02NTMP-034	1110.000402	04N 01W H
Humboldt	1-02NTMP-039	1111.110201	02N 01W H
Humboldt	1-02NTMP-039	1111.110303	02N 01W H
Humboldt	1-02NTMP-042	1110.000103	04N 01E H
Humboldt	1-02NTMP-043	1109.100104	05N 01E H
Humboldt	1-02NTMP-043	1109.100104	05N 01E H
Humboldt	1-02NTMP-043	1109.100104	05N 01E H
Humboldt	1-02NTMP-043	1109.100104	05N 01E H
Humboldt	1-02NTMP-043	1109.100104	05N 01E H

Humboldt	1-02NTMP-043	1109.100104	06N 01E H
Humboldt	1-02NTMP-043	1109.100104	06N 01E H
Humboldt	1-02NTMP-043	1109.100104	06N 01E H
Humboldt	1-02NTMP-043	1110.000503	05N 01E H
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Humboldt	1-02NTMP-043	1110.000503	05N 01E H
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Humboldt	1-02NTMP-043	1110.000503	05N 01E H
Humboldt	1-02NTMP-043	1110.000503	06N 01E H
Humboldt	1-03NTMP-004	1107.300103	04N 04E H
Humboldt	1-03NTMP-004	1109.300503	04N 04E H
Humboldt	1-03NTMP-010	1111.410102	03S 05E H
Humboldt	1-03NTMP-013	1110.000104	04N 01W H
Humboldt	1-03NTMP-013	1110.000401	04N 01W H
Humboldt	1-03NTMP-013	1110.000402	04N 01W H
Humboldt	1-03NTMP-014	1111.220604	01N 02E H
Humboldt	1-03NTMP-014	1111.220604	01N 02E H
Humboldt	1-03NTMP-018	1109.300101	02N 04E H
Humboldt	1-03NTMP-018	1109.300101	02N 04E H
Humboldt	1-03NTMP-018	1109.300101	02N 04E H
Humboldt	1-03NTMP-018	1109.300301	02N 04E H
Humboldt	1-03NTMP-018	1109.300302	02N 04E H
Humboldt	1-03NTMP-018	1111.220501	02N 04E H
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Humboldt	1-03NTMP-018	1111.220501	02N 04E H
Humboldt	1-03NTMP-018	1111.220501	02N 04E H
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Humboldt	1-03NTMP-018	1111.220501	02N 04E H
Humboldt	1-03NTMP-018	1111.220501	02N 04E H
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Humboldt	1-03NTMP-018	1111.220505	02N 04E H
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Humboldt	1-03NTMP-018	1111.220505	02N 04E H
Humboldt	1-03NTMP-018	1111.220505	02N 04E H
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Humboldt	1-03NTMP-018	1111.220505	02N 04E H
Humboldt	1-03NTMP-022	1111.110201	02N 01W H
Humboldt	1-03NTMP-022	1111.110201	02N 01W H
Humboldt	1-03NTMP-022	1111.110201	02N 01W H
Humboldt	1-03NTMP-022	1111.110201	02N 01W H

Humboldt	1-03NTMP-022	1111.110303	02N	01W	H
Humboldt	1-03NTMP-022	1111.110303	02N	01W	H
Humboldt	1-03NTMP-025	1110.000503	05N	01E	H
Humboldt	1-03NTMP-027	1110.000101	04N	02E	H
Humboldt	1-03NTMP-029	1110.000102	05N	01E	H
Humboldt	1-03NTMP-029	1110.000504	05N	01E	H
Humboldt	1-03NTMP-032	1109.300405	04N	02E	H
Humboldt	1-03NTMP-032	1109.300405	04N	02E	H
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Humboldt	1-03NTMP-032	1110.000101	04N 02E H
Humboldt	1-03NTMP-033	1106.210203	03N 05E H
Humboldt	1-03NTMP-033	1106.220003	03N 05E H
Humboldt	1-03NTMP-033	1106.220003	03N 05E H
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Humboldt	1-04NTMP-012	1111.310101	02S 03E H
Humboldt	1-04NTMP-012	1111.310101	02S 03E H
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Humboldt	1-04NTMP-012	1111.310101	02S 03E H
Humboldt	1-04NTMP-018	1111.110102	02N 01W H
Humboldt	1-05NTMP-003	1110.000101	04N 01E H
Humboldt	1-05NTMP-003	1110.000101	04N 02E H
Humboldt	1-05NTMP-014	1110.000503	05N 01E H
Humboldt	1-05NTMP-015	1109.100105	06N 01E H
Humboldt	1-05NTMP-015	1109.100105	06N 01E H
Humboldt	1-05NTMP-015	1109.100105	06N 01E H
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Humboldt	1-05NTMP-021	1111.230303	02N 02E H

Humboldt	1-05NTMP-021	1111.230303	02N 02E H
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Humboldt	1-06NTMP-005	1112.200102	01S 01W H
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Humboldt	1-06NTMP-005	1112.200102	01S 01W H
Humboldt	1-06NTMP-005	1112.200201	01S 01W H
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Humboldt	1-06NTMP-013	1111.110101	01N 01W H
Humboldt	1-06NTMP-013	1111.110101	01N 01W H
Humboldt	1-06NTMP-023	1111.110103	01N 01W H
Humboldt	1-06NTMP-023	1111.110103	01N 01W H
Humboldt	1-06NTMP-024	1109.300403	03N 03E H
Humboldt	1-06NTMP-024	1111.230101	03N 03E H
Humboldt	1-06NTMP-024	1111.230101	03N 03E H
Humboldt	1-07NTMP-007	1109.100103	06N 01E H
Humboldt	1-07NTMP-007	1109.100103	06N 01E H
Humboldt	1-07NTMP-007	1109.100104	06N 01E H
Humboldt	1-07NTMP-007	1109.100104	06N 02E H
Humboldt	1-07NTMP-007	1109.100105	06N 01E H
Humboldt	1-07NTMP-007	1109.100105	06N 01E H
Humboldt	1-07NTMP-019	1111.120102	01N 02E H
Humboldt	1-08NTMP-001	1111.110303	02N 01W H
Humboldt	1-08NTMP-001	1111.110303	02N 01W H
Humboldt	1-08NTMP-001	1111.110303	02N 02W H
Humboldt	1-08NTMP-001	1111.110303	02N 02W H
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Humboldt	1-08NTMP-003	1111.220402	01N 04E H
Humboldt	1-08NTMP-003	1111.220403	01N 04E H
Humboldt	1-08NTMP-003	1111.220505	01N 04E H
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Humboldt	1-08NTMP-005	1111.110203	02N 01E H
Humboldt	1-08NTMP-007	1109.100106	07N 01E H
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Humboldt	1-08NTMP-017	1110.000104	04N	01E	H
Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
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Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
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Humboldt	1-08NTMP-017	1110.000104	05N	01E	H
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Humboldt	1-08NTMP-019	1110.000602	03N	01W	H
Humboldt	1-08NTMP-020	1111.110203	02N	01W	H
Humboldt	1-08NTMP-020	1111.110203	03N	01W	H
Humboldt	1-08NTMP-020	1111.310101	02S	03E	H
Humboldt	1-08NTMP-020	1111.310102	02S	03E	H
Humboldt	1-08NTMP-020	1111.310102	02S	03E	H
Humboldt	1-09NTMP-002	1110.000503	05N	01E	H
Humboldt	1-09NTMP-003	1110.000105	05N	01E	H
Humboldt	1-09NTMP-003	1110.000105	05N	01E	H
Humboldt	1-09NTMP-003	1110.000105	05N	01E	H
Humboldt	1-09NTMP-005	1111.320505	05S	03E	H
Humboldt	1-09NTMP-005	1111.320505	05S	04E	H
Humboldt	1-09NTMP-005	1111.320702	05S	03E	H
Humboldt	1-09NTMP-005	1111.320702	05S	04E	H
Humboldt	1-09NTMP-007	1110.000101	04N	02E	H
Humboldt	1-09NTMP-007	1111.230201	04N	02E	H
Humboldt	1-09NTMP-008	1112.200201	01N	02W	H
Humboldt	1-09NTMP-008	1112.200205	01N	02W	H
Humboldt	1-09NTMP-008	1112.200205	01N	02W	H
Humboldt	1-09NTMP-009	1111.110103	02N	01E	H
Humboldt	1-09NTMP-009	1111.110103	02N	01E	H
Humboldt	1-09NTMP-010	1111.110203	03N	01E	H
Humboldt	1-09NTMP-010	1111.110203	03N	01W	H
Humboldt	1-09NTMP-011	1111.220402	01N	04E	H
Humboldt	1-09NTMP-011	1111.220402	01N	05E	H
Humboldt	1-09NTMP-011	1111.220403	01N	04E	H
Humboldt	1-09NTMP-011	1111.220403	01N	05E	H
Humboldt	1-09NTMP-012	1111.220301	01N	05E	H
Humboldt	1-09NTMP-013	1111.310101	02S	03E	H
Humboldt	1-09NTMP-013	1111.310101	02S	03E	H
Humboldt	1-09NTMP-013	1111.310102	02S	03E	H
Humboldt	1-09NTMP-013	1111.310102	02S	03E	H
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Humboldt	1-09NTMP-013	1111.310102	02S	03E	H
Humboldt	1-09NTMP-013	1111.310102	02S	03E	H
Humboldt	1-92NTMP-002	1111.220402	01N	04E	H

Humboldt	1-92NTMP-002	1111.220403	01N 04E H
Humboldt	1-92NTMP-002	1111.220504	01N 04E H
Humboldt	1-92NTMP-002	1111.220505	01N 04E H
Humboldt	1-92NTMP-006	1111.320801	04S 03E H
Humboldt	1-92NTMP-006	1111.320802	04S 03E H
Humboldt	1-93NTMP-001	1111.230205	04N 02E H
Humboldt	1-93NTMP-001	1111.230205	04N 03E H
Humboldt	1-93NTMP-005	1111.220402	01N 04E H
Humboldt	1-93NTMP-005	1111.220505	01N 04E H
Humboldt	1-93NTMP-008	1109.200004	05N 02E H
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Humboldt	1-93NTMP-008	1109.200004	05N 02E H
Humboldt	1-93NTMP-008	1109.200004	06N 02E H
Humboldt	1-93NTMP-008	1109.200004	06N 02E H
Humboldt	1-93NTMP-008	1109.200004	06N 02E H
Humboldt	1-93NTMP-008	1109.200004	06N 02E H
Humboldt	1-93NTMP-008	1109.200004	06N 02E H
Humboldt	1-93NTMP-008	1109.300602	05N 02E H
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Humboldt	1-93NTMP-008	1109.300602	05N 02E H
Humboldt	1-93NTMP-008	1109.300602	06N 02E H
Humboldt	1-93NTMP-008	1109.300602	06N 02E H
Humboldt	1-93NTMP-008	1109.300602	06N 02E H
Humboldt	1-93NTMP-008	1109.300602	06N 02E H
Humboldt	1-93NTMP-010	1111.410201	02S 05E H
Humboldt	1-93NTMP-010	1111.410203	02S 05E H
Humboldt	1-93NTMP-012	1111.110102	01N 01W H
Humboldt	1-93NTMP-012	1111.110102	01N 02W H
Humboldt	1-93NTMP-012	1111.110102	02N 02W H
Humboldt	1-93NTMP-012	1112.200205	01N 01W H
Humboldt	1-93NTMP-012	1112.200205	01N 02W H
Humboldt	1-93NTMP-012	1112.200205	02N 02W H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230104	03N 02E H
Humboldt	1-94NTMP-006	1111.230202	03N 02E H
Humboldt	1-94NTMP-006	1111.230202	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230203	03N 02E H
Humboldt	1-94NTMP-006	1111.230204	03N 02E H
Humboldt	1-94NTMP-006	1111.230302	03N 02E H

Humboldt	1-94NTMP-011	1111.320802	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	03S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-011	1111.320804	04S	03E	H
Humboldt	1-94NTMP-013	1111.220503	02N	03E	H
Humboldt	1-94NTMP-013	1111.220503	02N	03E	H
Humboldt	1-94NTMP-013	1111.220503	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.220602	02N	03E	H
Humboldt	1-94NTMP-013	1111.230303	02N	03E	H
Humboldt	1-94NTMP-013	1111.230303	02N	03E	H
Humboldt	1-94NTMP-013	1111.230303	02N	03E	H
Humboldt	1-94NTMP-013	1111.230303	02N	03E	H
Humboldt	1-94NTMP-015	1112.100001	01N	02W	H
Humboldt	1-94NTMP-015	1112.100001	01N	03W	H
Humboldt	1-94NTMP-015	1112.100001	02N	02W	H
Humboldt	1-94NTMP-015	1112.100001	02N	03W	H
Humboldt	1-94NTMP-015	1112.200202	01N	02W	H
Humboldt	1-94NTMP-015	1112.200202	01N	03W	H
Humboldt	1-94NTMP-015	1112.200202	02N	02W	H
Humboldt	1-94NTMP-015	1112.200202	02N	03W	H
Humboldt	1-95NTMP-002	1111.310101	02S	03E	H
Humboldt	1-95NTMP-002	1111.310103	02S	03E	H
Humboldt	1-95NTMP-005	1110.000101	04N	02E	H
Humboldt	1-95NTMP-005	1110.000504	04N	02E	H
Humboldt	1-95NTMP-006	1109.100104	06N	02E	H
Humboldt	1-95NTMP-008	1109.100105	07N	01E	H
Humboldt	1-95NTMP-008	1109.100106	07N	01E	H
Humboldt	1-95NTMP-010	1111.110102	01N	02W	H
Humboldt	1-95NTMP-010	1111.110102	02N	02W	H
Humboldt	1-95NTMP-010	1111.110301	02N	02W	H
Humboldt	1-95NTMP-010	1111.110303	02N	02W	H
Humboldt	1-95NTMP-010	1112.100001	01N	02W	H
Humboldt	1-95NTMP-010	1112.100001	02N	02W	H
Humboldt	1-95NTMP-010	1112.100002	01N	02W	H
Humboldt	1-95NTMP-010	1112.100002	02N	02W	H
Humboldt	1-95NTMP-010	1112.100002	02N	02W	H

Humboldt	1-95NTMP-011	1110.000102	05N 01E H
Humboldt	1-95NTMP-011	1110.000504	05N 01E H
Humboldt	1-95NTMP-011	1110.000504	05N 01E H
Humboldt	1-95NTMP-012	1110.000501	06N 01E H
Humboldt	1-95NTMP-012	1110.000502	06N 01E H
Humboldt	1-95NTMP-013	1108.200002	07N 01E H
Humboldt	1-95NTMP-013	1109.100106	07N 01E H
Humboldt	1-95NTMP-014	1110.000604	03N 01E H
Humboldt	1-95NTMP-014	1110.000604	03N 01W H
Humboldt	1-95NTMP-014	1111.110202	03N 01E H
Humboldt	1-95NTMP-014	1111.110202	03N 01W H
Humboldt	1-95NTMP-014	1111.410602	01S 03E H
Humboldt	1-95NTMP-014	1111.410602	02S 03E H
Humboldt	1-95NTMP-015	1110.000104	04N 01W H
Humboldt	1-95NTMP-016	1111.110101	01N 01W H
Humboldt	1-95NTMP-016	1111.110101	01N 01W H
Humboldt	1-95NTMP-016	1111.110102	01N 01W H
Humboldt	1-95NTMP-016	1112.200102	01N 01W H
Humboldt	1-95NTMP-016	1112.200205	01N 01W H
Humboldt	1-95NTMP-016	1112.200205	01N 02W H
Humboldt	1-96NTMP-002	1105.110204	10N 03E H
Humboldt	1-96NTMP-002	1105.110204	10N 03E H
Humboldt	1-96NTMP-002	1105.110204	10N 03E H
Humboldt	1-96NTMP-002	1105.110204	11N 03E H
Humboldt	1-96NTMP-002	1105.110304	10N 03E H
Humboldt	1-96NTMP-002	1105.110304	11N 03E H
Humboldt	1-96NTMP-006	1111.310303	02S 02E H
Humboldt	1-96NTMP-007	1111.210001	02N 02E H
Humboldt	1-96NTMP-007	1111.210001	02N 02E H
Humboldt	1-96NTMP-007	1111.210001	02N 02E H
Humboldt	1-96NTMP-007	1111.210001	02N 02E H
Humboldt	1-96NTMP-007	1111.210003	02N 02E H
Humboldt	1-96NTMP-007	1111.210003	02N 02E H
Humboldt	1-96NTMP-007	1111.210003	02N 02E H
Humboldt	1-96NTMP-007	1111.230303	02N 02E H
Humboldt	1-96NTMP-007	1111.230303	02N 02E H
Humboldt	1-96NTMP-007	1111.230303	02N 02E H
Humboldt	1-96NTMP-009	1109.100104	06N 02E H
Humboldt	1-96NTMP-009	1109.100104	06N 02E H
Humboldt	1-96NTMP-010	1110.000503	05N 01E H
Humboldt	1-96NTMP-011	1111.310303	01S 02E H
Humboldt	1-96NTMP-011	1111.310303	02S 02E H
Humboldt	1-96NTMP-011	1111.410601	01S 02E H
Humboldt	1-96NTMP-011	1111.410601	02S 02E H
Humboldt	1-96NTMP-012	1108.100002	07N 01E H
Humboldt	1-96NTMP-012	1108.100002	08N 01E H
Humboldt	1-96NTMP-012	1108.200002	07N 01E H
Humboldt	1-96NTMP-012	1108.200002	08N 01E H
Humboldt	1-96NTMP-012	1109.100105	06N 01E H
Humboldt	1-96NTMP-012	1109.100105	06N 01E H
Humboldt	1-96NTMP-012	1109.100105	06N 01E H
Humboldt	1-96NTMP-012	1109.100105	06N 02E H

Humboldt	1-96NTMP-012	1109.100105	07N 01E H
Humboldt	1-96NTMP-012	1109.100105	07N 01E H
Humboldt	1-96NTMP-012	1109.100105	07N 02E H
Humboldt	1-96NTMP-012	1109.100106	06N 01E H
Humboldt	1-96NTMP-012	1109.100106	06N 01E H
Humboldt	1-96NTMP-012	1109.100106	06N 02E H
Humboldt	1-96NTMP-012	1109.100106	07N 01E H
Humboldt	1-96NTMP-012	1109.100106	07N 01E H
Humboldt	1-96NTMP-012	1109.100106	07N 01E H
Humboldt	1-96NTMP-012	1109.100106	07N 02E H
Humboldt	1-96NTMP-012	1109.100300	07N 01E H
Humboldt	1-96NTMP-014	1109.200002	06N 03E H
Humboldt	1-96NTMP-016	1109.100103	06N 01E H
Humboldt	1-96NTMP-016	1110.000104	05N 01E H
Humboldt	1-96NTMP-016	1110.000104	05N 01W H
Humboldt	1-96NTMP-016	1110.000501	06N 01E H
Humboldt	1-96NTMP-020	1112.100001	01N 02W H
Humboldt	1-96NTMP-020	1112.100001	01N 03W H
Humboldt	1-96NTMP-020	1112.200202	01N 02W H
Humboldt	1-96NTMP-020	1112.200202	01N 03W H
Humboldt	1-96NTMP-020	1112.200203	01N 02W H
Humboldt	1-96NTMP-020	1112.200203	01N 03W H
Humboldt	1-96NTMP-021	1107.300102	05N 03E H
Humboldt	1-96NTMP-021	1107.300102	05N 03E H
Humboldt	1-96NTMP-021	1107.300102	05N 03E H
Humboldt	1-96NTMP-021	1107.300102	05N 04E H
Humboldt	1-96NTMP-022	1111.110101	01N 01W H
Humboldt	1-96NTMP-022	1111.110102	01N 01W H
Humboldt	1-96NTMP-027	1109.100106	07N 01E H
Humboldt	1-96NTMP-030	1105.120101	11N 05E H
Humboldt	1-96NTMP-030	1105.120101	11N 06E H
Humboldt	1-96NTMP-030	1105.120104	11N 05E H
Humboldt	1-96NTMP-030	1105.120104	11N 06E H
Humboldt	1-96NTMP-030	1105.120104	11N 06E H
Humboldt	1-96NTMP-030	1105.120203	11N 05E H
Humboldt	1-96NTMP-030	1105.120203	11N 06E H
Humboldt	1-96NTMP-030	1105.120203	11N 06E H
Humboldt	1-96NTMP-031	1111.220402	01N 05E H
Humboldt	1-96NTMP-031	1111.220402	01N 05E H
Humboldt	1-96NTMP-032	1111.310101	02S 03E H
Humboldt	1-96NTMP-032	1111.410501	02S 03E H
Humboldt	1-96NTMP-034	1110.000105	05N 01E H
Humboldt	1-96NTMP-035	1112.200101	01N 01W H
Humboldt	1-96NTMP-035	1112.200102	01N 01W H
Humboldt	1-97NTMP-001	1111.110101	02N 01W H
Humboldt	1-97NTMP-001	1111.110102	02N 01W H
Humboldt	1-97NTMP-001	1111.110102	02N 01W H
Humboldt	1-97NTMP-001	1111.110203	02N 01E H
Humboldt	1-97NTMP-001	1111.110203	02N 01E H
Humboldt	1-97NTMP-004	1110.000504	05N 01E H
Humboldt	1-97NTMP-006	1111.110102	02N 01W H
Humboldt	1-97NTMP-006	1111.110102	02N 02W H

Humboldt	1-97NTMP-006	1111.110303	02N 01W H
Humboldt	1-97NTMP-006	1111.110303	02N 02W H
Humboldt	1-97NTMP-008	1110.000504	05N 01E H
Humboldt	1-97NTMP-010	1111.220601	01N 02E H
Humboldt	1-97NTMP-010	1111.220601	01N 02E H
Humboldt	1-97NTMP-010	1111.220601	01N 02E H
Humboldt	1-97NTMP-010	1111.220601	01N 02E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220601	01N 03E H
Humboldt	1-97NTMP-010	1111.220602	01N 03E H
Humboldt	1-97NTMP-012	1109.100101	06N 01E H
Humboldt	1-97NTMP-012	1109.100102	06N 01E H
Humboldt	1-97NTMP-013	1111.110103	01N 01E H
Humboldt	1-97NTMP-013	1111.110103	01N 01W H
Humboldt	1-97NTMP-016	1111.410501	02S 03E H
Humboldt	1-97NTMP-016	1111.410501	02S 04E H
Humboldt	1-97NTMP-017	1109.100104	06N 02E H
Humboldt	1-97NTMP-017	1109.200004	06N 02E H
Humboldt	1-97NTMP-019	1109.100103	06N 01E H
Humboldt	1-97NTMP-019	1109.100105	06N 01E H
Humboldt	1-97NTMP-019	1109.100105	06N 01E H
Humboldt	1-97NTMP-019	1109.100105	07N 01E H
Humboldt	1-97NTMP-019	1109.100106	06N 01E H
Humboldt	1-97NTMP-019	1109.100106	07N 01E H
Humboldt	1-97NTMP-019	1109.100106	07N 01E H
Humboldt	1-97NTMP-022	1112.200102	01N 01W H
Humboldt	1-97NTMP-022	1112.200102	01N 02W H
Humboldt	1-97NTMP-022	1112.200205	01N 01W H
Humboldt	1-97NTMP-022	1112.200205	01N 02W H
Humboldt	1-97NTMP-022	1112.200205	01N 02W H
Humboldt	1-97NTMP-022	1112.200205	01N 02W H
Humboldt	1-97NTMP-022	1112.200205	01N 02W H
Humboldt	1-97NTMP-022	1112.200205	01N 02W H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H

Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	01S 04E H
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Humboldt	1-97NTMP-028	1111.130202	01S 04E H
Humboldt	1-97NTMP-028	1111.130202	02S 04E H
Humboldt	1-97NTMP-028	1111.130202	02S 04E H
Humboldt	1-97NTMP-028	1111.130202	02S 04E H
Humboldt	1-97NTMP-028	1111.130202	02S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	01S 04E H
Humboldt	1-97NTMP-028	1111.410501	02S 04E H
Humboldt	1-97NTMP-028	1111.410501	02S 04E H
Humboldt	1-97NTMP-028	1111.410501	02S 04E H
Humboldt	1-97NTMP-028	1111.410501	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	01S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
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Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-028	1111.410502	02S 04E H
Humboldt	1-97NTMP-030	1111.320703	05S 02E H
Humboldt	1-97NTMP-030	1112.300101	05S 02E H
Humboldt	1-97NTMP-030	1112.300101	05S 02E H
Humboldt	1-97NTMP-030	1112.300101	05S 02E H
Humboldt	1-97NTMP-030	1112.300101	05S 02E H
Humboldt	1-97NTMP-030	1112.300101	05S 02E H
Humboldt	1-97NTMP-031	1112.300102	04S 02E H
Humboldt	1-97NTMP-031	1112.300103	04S 02E H
Humboldt	1-97NTMP-034	1111.410601	01S 02E H
Humboldt	1-97NTMP-034	1111.410601	01S 03E H
Humboldt	1-97NTMP-034	1111.410601	01S 03E H
Humboldt	1-97NTMP-035	1111.110202	03N 01W H
Humboldt	1-97NTMP-035	1111.110203	03N 01W H
Humboldt	1-97NTMP-037	1108.200002	07N 01E H
Humboldt	1-97NTMP-039	1112.300701	02S 02W H
Humboldt	1-97NTMP-039	1112.300804	02S 02W H

Humboldt	1-97NTMP-042	1110.000201	04N 01W H
Humboldt	1-97NTMP-042	1110.000402	04N 01W H
Humboldt	1-98NTMP-001	1109.300301	02N 04E H
Humboldt	1-98NTMP-001	1109.300301	02N 04E H
Humboldt	1-98NTMP-001	1109.300301	02N 04E H
Humboldt	1-98NTMP-001	1109.300301	02N 05E H
Humboldt	1-98NTMP-001	1109.300301	03N 04E H
Humboldt	1-98NTMP-001	1109.300302	02N 04E H
Humboldt	1-98NTMP-001	1109.300302	02N 04E H
Humboldt	1-98NTMP-001	1109.300302	03N 04E H
Humboldt	1-98NTMP-001	1109.300304	02N 04E H
Humboldt	1-98NTMP-001	1109.300304	02N 05E H
Humboldt	1-98NTMP-001	1111.220501	02N 04E H
Humboldt	1-98NTMP-001	1111.230106	02N 04E H
Humboldt	1-98NTMP-003	1109.300402	03N 03E H
Humboldt	1-98NTMP-003	1109.300403	03N 03E H
Humboldt	1-98NTMP-003	1109.300403	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230101	03N 03E H
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Humboldt	1-98NTMP-003	1111.230101	03N 03E H
Humboldt	1-98NTMP-003	1111.230104	03N 02E H
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Humboldt	1-98NTMP-004	1110.000602	03N 01W H
Humboldt	1-98NTMP-004	1111.110202	03N 01W H
Humboldt	1-98NTMP-005	1110.000102	04N 01E H
Humboldt	1-98NTMP-006	1107.200102	06N 03E H
Humboldt	1-98NTMP-009	1111.110301	02N 02W H
Humboldt	1-98NTMP-012	1111.230205	03N 02E H
Humboldt	1-98NTMP-012	1111.230205	04N 02E H
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Humboldt	1-98NTMP-014	1112.300101	05S 02E H
Humboldt	1-98NTMP-014	1112.300101	05S 02E H
Humboldt	1-98NTMP-017	1110.000101	04N 02E H
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Humboldt	1-98NTMP-027	1111.230201	03N 02E H
Humboldt	1-98NTMP-027	1111.230201	04N 02E H
Humboldt	1-98NTMP-027	1111.230202	03N 02E H
Humboldt	1-98NTMP-027	1111.230202	03N 02E H
Humboldt	1-98NTMP-027	1111.230202	04N 02E H
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Humboldt	1-98NTMP-029	1111.130102	02S 05E H
Humboldt	1-98NTMP-029	1111.410202	02S 05E H
Humboldt	1-98NTMP-030	1107.200301	07N 03E H
Humboldt	1-98NTMP-030	1107.200301	08N 03E H
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Humboldt	1-98NTMP-031	1111.110301	02N 02W H
Humboldt	1-98NTMP-031	1112.100002	02N 02W H
Humboldt	1-98NTMP-032	1110.000504	05N 01E H
Humboldt	1-98NTMP-036	1111.410202	02S 05E H
Humboldt	1-98NTMP-036	1111.410202	02S 05E H
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Humboldt	1-98NTMP-039	1110.000101	04N 02E H
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Humboldt	1-99NTMP-014	1109.100104	05N 02E H
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Humboldt	1-99NTMP-023	1111.220605	01N 03E H
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Humboldt	1-99NTMP-029	1111.220403	01N 04E H
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Humboldt	1-99NTMP-033	1109.100104	06N 01E H
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Humboldt	1-99NTMP-033	1110.000502	06N 01E H
Humboldt	1-99NTMP-033	1110.000504	05N 02E H
Humboldt	1-99NTMP-036	1109.100104	06N 01E H
Humboldt	1-99NTMP-036	1109.100104	06N 01E H
Humboldt	1-99NTMP-036	1109.100104	06N 01E H
Humboldt	1-99NTMP-036	1109.100104	06N 01E H
Humboldt	1-99NTMP-036	1109.100104	06N 02E H
Humboldt	1-99NTMP-037	1112.200201	01N 02W H
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Humboldt	1-99NTMP-050	1110.000503	05N 01E H
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Humboldt	1-99NTMP-056	1109.300503	05N	03E	H
Lake	1-07NTMP-021	1111.630304	18N	09W	M
Lake	1-07NTMP-021	1111.630304	19N	09W	M
Lake	1-07NTMP-021	1111.630402	18N	09W	M
Lake	1-07NTMP-021	1111.630502	18N	09W	M
Lake	1-07NTMP-021	1111.630502	18N	09W	M
Lake	1-07NTMP-021	1111.630502	19N	09W	M
Lake	1-07NTMP-021	1111.630502	19N	09W	M
Lake	1-07NTMP-021	1111.630502	19N	10W	M
Lake	1-99NTMP-017	1114.260104	11N	08W	M
Lake	1-99NTMP-017	1114.260104	11N	08W	M
Lake	1-99NTMP-017	1114.260104	11N	08W	M
Lake	1-99NTMP-017	5512.300101	11N	08W	M
Lake	1-99NTMP-017	5513.550103	11N	08W	M
Lake	1-99NTMP-017	5513.550103	11N	08W	M
Mendocino	1-00NTMP-001	1113.300103	16N	15W	M
Mendocino	1-00NTMP-001	1113.300103	16N	15W	M
Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
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Mendocino	1-00NTMP-001	1113.500601	16N	15W	M
Mendocino	1-00NTMP-002	1113.500601	16N	15W	M
Mendocino	1-00NTMP-002	1113.500601	16N	15W	M
Mendocino	1-00NTMP-015	1113.700105	12N	13W	M
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Mendocino	1-00NTMP-032	1113.500707	15N	17W	M
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Mendocino	1-01NTMP-007	1111.320302	23N	17W	M
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Mendocino	1-01NTMP-013	1113.700302	12N	16W	M
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Mendocino	1-01NTMP-044	1111.500607	24N	13W	M
Mendocino	1-01NTMP-044	1111.500607	24N	14W	M
Mendocino	1-01NTMP-045	1113.300406	17N	16W	M

Mendocino	1-01NTMP-045	1113.400006	17N	16W	M
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Mendocino	1-03NTMP-023	1113.500602	16N	16W	M
Mendocino	1-03NTMP-023	1113.500602	16N	16W	M
Mendocino	1-03NTMP-023	1113.500704	16N	15W	M
Mendocino	1-03NTMP-023	1113.500704	16N	16W	M
Mendocino	1-03NTMP-023	1113.500705	16N	15W	M
Mendocino	1-03NTMP-023	1113.500705	16N	16W	M
Mendocino	1-03NTMP-023	1113.500705	16N	16W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500202	14N	14W	M
Mendocino	1-03NTMP-026	1113.500303	14N	14W	M
Mendocino	1-03NTMP-026	1113.500303	14N	14W	M
Mendocino	1-03NTMP-026	1113.500303	14N	14W	M
Mendocino	1-03NTMP-026	1113.500303	14N	14W	M

Mendocino	1-03NTMP-028	1113.700301	11N	15W	M
Mendocino	1-03NTMP-030	1113.500703	15N	16W	M
Mendocino	1-03NTMP-030	1113.610001	15N	16W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	20N	14W	M
Mendocino	1-03NTMP-035	1111.610301	21N	14W	M
Mendocino	1-03NTMP-035	1111.610301	21N	14W	M
Mendocino	1-03NTMP-035	1111.610301	21N	14W	M
Mendocino	1-03NTMP-035	1111.610301	21N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	20N	14W	M
Mendocino	1-03NTMP-035	1111.610303	21N	14W	M
Mendocino	1-03NTMP-036	1113.400005	15N	17W	M
Mendocino	1-03NTMP-036	1113.500707	15N	17W	M
Mendocino	1-03NTMP-038	1111.110203	02N	01E	H
Mendocino	1-03NTMP-038	1111.110203	02N	01E	H
Mendocino	1-03NTMP-038	1111.110203	02N	01E	H
Mendocino	1-03NTMP-038	1111.110203	02N	01E	H
Mendocino	1-03NTMP-039	1113.400004	16N	16W	M
Mendocino	1-03NTMP-039	1113.400004	16N	16W	M
Mendocino	1-03NTMP-039	1113.400004	16N	17W	M
Mendocino	1-03NTMP-039	1113.400004	16N	17W	M
Mendocino	1-03NTMP-039	1113.400004	16N	17W	M

Mendocino	1-04NTMP-002	1111.420301	23N	15W	M
Mendocino	1-04NTMP-002	1111.420301	24N	15W	M
Mendocino	1-04NTMP-002	1111.420301	24N	15W	M
Mendocino	1-04NTMP-002	1111.420301	24N	15W	M
Mendocino	1-04NTMP-002	1111.420301	24N	15W	M
Mendocino	1-04NTMP-002	1111.420301	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	23N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M

Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-002	1111.420303	24N	15W	M
Mendocino	1-04NTMP-003	1111.220301	01N	04E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	01N	05E	H
Mendocino	1-04NTMP-003	1111.220301	02N	05E	H
Mendocino	1-04NTMP-003	1111.220501	02N	04E	H
Mendocino	1-04NTMP-003	1111.220501	02N	04E	H
Mendocino	1-04NTMP-003	1111.220501	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	04E	H
Mendocino	1-04NTMP-003	1111.220505	01N	05E	H
Mendocino	1-04NTMP-003	1111.220505	01N	05E	H
Mendocino	1-04NTMP-003	1111.220505	01N	05E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H

Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	04E	H
Mendocino	1-04NTMP-003	1111.220505	02N	05E	H
Mendocino	1-04NTMP-003	1111.220505	02N	05E	H
Mendocino	1-04NTMP-006	1113.500703	15N	16W	M
Mendocino	1-04NTMP-006	1113.500703	15N	16W	M
Mendocino	1-04NTMP-006	1113.610001	15N	16W	M
Mendocino	1-04NTMP-007	1113.400004	16N	17W	M
Mendocino	1-04NTMP-007	1113.400004	16N	17W	M
Mendocino	1-04NTMP-008	1113.300101	16N	14W	M
Mendocino	1-04NTMP-008	1113.300101	16N	14W	M
Mendocino	1-04NTMP-008	1113.300101	17N	14W	M
Mendocino	1-04NTMP-008	1113.300103	16N	14W	M
Mendocino	1-04NTMP-008	1113.300103	16N	14W	M
Mendocino	1-04NTMP-008	1113.300103	17N	14W	M
Mendocino	1-04NTMP-008	1113.300202	16N	14W	M
Mendocino	1-04NTMP-008	1113.300202	17N	14W	M
Mendocino	1-04NTMP-008	1113.300203	16N	14W	M
Mendocino	1-04NTMP-008	1113.300203	17N	14W	M
Mendocino	1-04NTMP-010	1113.700201	12N	15W	M
Mendocino	1-04NTMP-010	1113.700201	12N	15W	M
Mendocino	1-04NTMP-010	1113.700201	12N	15W	M
Mendocino	1-04NTMP-010	1113.700201	12N	15W	M
Mendocino	1-04NTMP-010	1113.700202	12N	15W	M
Mendocino	1-04NTMP-010	1113.700204	12N	15W	M
Mendocino	1-04NTMP-010	1113.700204	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-010	1113.700205	12N	15W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-013	1113.500303	14N	14W	M
Mendocino	1-04NTMP-014	1113.120201	21N	17W	M

Mendocino	1-04NTMP-015	1111.610201	19N	14W	M
Mendocino	1-04NTMP-015	1111.610201	19N	14W	M
Mendocino	1-04NTMP-015	1111.610201	19N	14W	M
Mendocino	1-04NTMP-015	1111.610201	19N	14W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	19N	15W	M
Mendocino	1-04NTMP-015	1111.610201	20N	15W	M
Mendocino	1-04NTMP-015	1113.130204	19N	15W	M
Mendocino	1-04NTMP-015	1113.130204	20N	15W	M
Mendocino	1-04NTMP-015	1113.200103	19N	14W	M
Mendocino	1-04NTMP-015	1113.200103	19N	14W	M
Mendocino	1-04NTMP-015	1113.200103	19N	15W	M
Mendocino	1-04NTMP-015	1113.200103	19N	15W	M
Mendocino	1-04NTMP-016	1113.300406	17N	15W	M
Mendocino	1-04NTMP-016	1113.300406	17N	15W	M
Mendocino	1-04NTMP-016	1113.300406	17N	15W	M
Mendocino	1-04NTMP-016	1113.300406	17N	16W	M
Mendocino	1-04NTMP-016	1113.400006	17N	15W	M
Mendocino	1-04NTMP-016	1113.400006	17N	16W	M
Mendocino	1-04NTMP-019	1113.200501	19N	17W	M
Mendocino	1-04NTMP-021	1113.500203	14N	15W	M
Mendocino	1-04NTMP-021	1113.500701	14N	15W	M
Mendocino	1-04NTMP-021	1113.500701	14N	15W	M
Mendocino	1-04NTMP-021	1113.610003	14N	15W	M
Mendocino	1-04NTMP-021	1113.610003	14N	15W	M
Mendocino	1-04NTMP-021	1113.610003	14N	15W	M
Mendocino	1-04NTMP-021	1113.610003	14N	15W	M
Mendocino	1-05NTMP-001	1113.120202	21N	17W	M
Mendocino	1-05NTMP-001	1113.120202	21N	17W	M
Mendocino	1-05NTMP-001	1113.120202	21N	17W	M
Mendocino	1-05NTMP-002	1113.400006	16N	15W	M
Mendocino	1-05NTMP-002	1113.400006	16N	15W	M
Mendocino	1-05NTMP-002	1113.400006	16N	15W	M
Mendocino	1-05NTMP-004	1113.200403	18N	17W	M
Mendocino	1-05NTMP-005	1113.500201	13N	15W	M
Mendocino	1-05NTMP-005	1113.500201	13N	15W	M
Mendocino	1-05NTMP-005	1113.500201	13N	15W	M
Mendocino	1-05NTMP-005	1113.500201	13N	15W	M
Mendocino	1-05NTMP-005	1113.500201	13N	15W	M
Mendocino	1-05NTMP-005	1113.630003	13N	15W	M
Mendocino	1-05NTMP-005	1113.630003	13N	15W	M
Mendocino	1-05NTMP-005	1113.630003	13N	15W	M
Mendocino	1-05NTMP-005	1113.630003	13N	15W	M
Mendocino	1-05NTMP-005	1113.630003	13N	15W	M
Mendocino	1-05NTMP-006	1113.200303	18N	17W	M
Mendocino	1-05NTMP-006	1113.200401	18N	17W	M
Mendocino	1-05NTMP-006	1113.200401	18N	17W	M

Mendocino	1-05NTMP-006	1113.200401	18N 17W M
Mendocino	1-05NTMP-006	1113.200403	18N 17W M
Mendocino	1-05NTMP-008	1113.640001	13N 16W M
Mendocino	1-05NTMP-008	1113.640001	13N 16W M
Mendocino	1-05NTMP-008	1113.640001	13N 16W M
Mendocino	1-05NTMP-008	1113.640001	13N 16W M
Mendocino	1-05NTMP-008	1113.700205	13N 16W M
Mendocino	1-05NTMP-008	1113.700206	13N 16W M
Mendocino	1-05NTMP-008	1113.700206	13N 16W M
Mendocino	1-05NTMP-009	1113.700301	11N 16W M
Mendocino	1-05NTMP-009	1113.700301	11N 16W M
Mendocino	1-05NTMP-009	1113.700301	11N 16W M
Mendocino	1-05NTMP-010	1111.330303	21N 16W M
Mendocino	1-05NTMP-010	1111.330304	21N 16W M
Mendocino	1-05NTMP-011	1113.400003	16N 17W M
Mendocino	1-05NTMP-011	1113.400005	16N 17W M
Mendocino	1-05NTMP-011	1113.400005	16N 17W M
Mendocino	1-05NTMP-011	1113.400005	16N 17W M
Mendocino	1-05NTMP-011	1113.400005	16N 17W M
Mendocino	1-05NTMP-012	1111.320503	05S 02E H
Mendocino	1-05NTMP-012	1111.320503	05S 02E H
Mendocino	1-05NTMP-012	1111.320503	05S 03E H
Mendocino	1-05NTMP-012	1112.300104	05S 02E H
Mendocino	1-05NTMP-012	1112.300104	05S 02E H
Mendocino	1-05NTMP-012	1112.300104	05S 03E H
Mendocino	1-05NTMP-016	1113.700206	12N 16W M
Mendocino	1-05NTMP-018	1113.500602	15N 15W M
Mendocino	1-05NTMP-018	1113.500602	15N 16W M
Mendocino	1-05NTMP-018	1113.500704	15N 15W M
Mendocino	1-05NTMP-018	1113.500704	15N 16W M
Mendocino	1-05NTMP-019	1113.610001	15N 16W M
Mendocino	1-05NTMP-019	1113.610001	15N 16W M
Mendocino	1-05NTMP-025	1113.610003	14N 15W M
Mendocino	1-05NTMP-025	1113.610003	14N 15W M
Mendocino	1-05NTMP-027	1113.500707	15N 17W M
Mendocino	1-05NTMP-027	1113.610002	15N 17W M
Mendocino	1-05NTMP-027	1113.610002	15N 17W M
Mendocino	1-05NTMP-027	1113.610002	15N 17W M
Mendocino	1-05NTMP-027	1113.610002	15N 17W M
Mendocino	1-06NTMP-004	1113.620001	14N 16W M
Mendocino	1-06NTMP-004	1113.620001	14N 17W M
Mendocino	1-06NTMP-004	1113.630002	14N 16W M
Mendocino	1-06NTMP-004	1113.630002	14N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-006	1113.120202	21N 17W M
Mendocino	1-06NTMP-007	1113.500703	15N 16W M
Mendocino	1-06NTMP-016	1113.700204	12N 15W M
Mendocino	1-06NTMP-016	1113.700204	12N 15W M

Mendocino	1-06NTMP-016	1113.700204	12N 15W M
Mendocino	1-06NTMP-016	1113.700204	12N 15W M
Mendocino	1-06NTMP-016	1113.700205	12N 15W M
Mendocino	1-06NTMP-018	1113.630002	14N 16W M
Mendocino	1-06NTMP-020	1113.700206	13N 16W M
Mendocino	1-06NTMP-020	1113.700206	13N 16W M
Mendocino	1-06NTMP-022	1113.130601	20N 17W M
Mendocino	1-06NTMP-022	1113.130603	20N 17W M
Mendocino	1-06NTMP-022	1113.130603	20N 17W M
Mendocino	1-06NTMP-025	1113.700302	12N 16W M
Mendocino	1-06NTMP-025	1113.700302	12N 16W M
Mendocino	1-06NTMP-025	1113.700302	12N 16W M
Mendocino	1-06NTMP-025	1113.700302	12N 16W M
Mendocino	1-06NTMP-025	1113.700302	12N 16W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 17W M
Mendocino	1-06NTMP-026	1113.300404	17N 18W M
Mendocino	1-06NTMP-026	1113.300405	17N 17W M
Mendocino	1-06NTMP-026	1113.300405	17N 17W M
Mendocino	1-06NTMP-026	1113.300405	17N 18W M
Mendocino	1-06NTMP-027	1113.500704	15N 16W M
Mendocino	1-06NTMP-027	1113.500704	15N 16W M
Mendocino	1-06NTMP-027	1113.500704	15N 16W M
Mendocino	1-06NTMP-027	1113.500704	15N 16W M
Mendocino	1-06NTMP-027	1113.500705	15N 16W M
Mendocino	1-06NTMP-027	1113.500705	15N 16W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.500203	14N 15W M
Mendocino	1-06NTMP-028	1113.610003	14N 15W M
Mendocino	1-07NTMP-002	1113.400006	16N 16W M
Mendocino	1-07NTMP-002	1113.400006	16N 16W M
Mendocino	1-07NTMP-002	1113.400006	16N 16W M
Mendocino	1-07NTMP-002	1113.400006	16N 16W M
Mendocino	1-07NTMP-002	1113.400006	16N 16W M
Mendocino	1-07NTMP-006	1113.700301	11N 15W M
Mendocino	1-07NTMP-008	1111.320501	05S 03E H
Mendocino	1-07NTMP-008	1111.320501	24N 17W M
Mendocino	1-07NTMP-008	1111.320501	24N 17W M
Mendocino	1-07NTMP-008	1111.320501	24N 18W M
Mendocino	1-07NTMP-008	1111.320501	24N 18W M
Mendocino	1-07NTMP-008	1111.320501	24N 18W M
Mendocino	1-07NTMP-008	1111.320501	24N 18W M
Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	05S 03E H

Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	05S 03E H
Mendocino	1-07NTMP-008	1111.320502	24N 17W M
Mendocino	1-07NTMP-008	1111.320502	24N 18W M
Mendocino	1-07NTMP-008	1111.320502	24N 18W M
Mendocino	1-07NTMP-008	1111.320502	24N 18W M
Mendocino	1-07NTMP-008	1111.320502	24N 18W M
Mendocino	1-07NTMP-008	1111.320502	24N 18W M
Mendocino	1-07NTMP-008	1111.320504	05S 03E H
Mendocino	1-07NTMP-008	1111.320504	05S 03E H
Mendocino	1-07NTMP-008	1111.320504	05S 03E H
Mendocino	1-07NTMP-008	1111.320504	05S 03E H
Mendocino	1-07NTMP-008	1111.320504	05S 03E H
Mendocino	1-07NTMP-008	1111.320504	24N 18W M
Mendocino	1-07NTMP-008	1111.320505	05S 03E H
Mendocino	1-07NTMP-008	1111.320505	05S 03E H
Mendocino	1-07NTMP-008	1111.320505	05S 03E H
Mendocino	1-07NTMP-008	1111.320505	05S 03E H
Mendocino	1-07NTMP-008	1111.320505	05S 03E H
Mendocino	1-07NTMP-010	1113.400006	16N 16W M
Mendocino	1-07NTMP-010	1113.400006	17N 16W M
Mendocino	1-07NTMP-010	1113.400006	17N 16W M
Mendocino	1-07NTMP-010	1113.400006	17N 16W M
Mendocino	1-07NTMP-011	1113.610001	15N 16W M
Mendocino	1-07NTMP-011	1113.610001	15N 16W M
Mendocino	1-07NTMP-012	1111.330304	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-012	1111.330401	22N 16W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-013	1114.240102	12N 12W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M
Mendocino	1-07NTMP-014	1114.310302	15N 13W M

Mendocino	1-07NTMP-014	1114.310302	15N	13W	M
Mendocino	1-07NTMP-014	1114.310302	15N	13W	M
Mendocino	1-07NTMP-014	1114.310400	15N	13W	M
Mendocino	1-07NTMP-014	1114.310400	15N	13W	M
Mendocino	1-07NTMP-015	1113.500201	13N	15W	M
Mendocino	1-07NTMP-015	1113.500201	13N	15W	M
Mendocino	1-07NTMP-015	1113.500201	13N	15W	M
Mendocino	1-07NTMP-015	1113.500201	14N	15W	M
Mendocino	1-07NTMP-015	1113.500203	13N	15W	M
Mendocino	1-07NTMP-015	1113.500203	13N	15W	M
Mendocino	1-07NTMP-015	1113.500203	14N	15W	M
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Mendocino	1-07NTMP-015	1113.620002	13N	15W	M
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Mendocino	1-07NTMP-015	1113.630003	13N	15W	M
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Mendocino	1-07NTMP-015	1113.630003	14N	15W	M
Mendocino	1-07NTMP-017	1113.500402	14N	14W	M
Mendocino	1-07NTMP-017	1113.500402	14N	14W	M
Mendocino	1-07NTMP-017	1113.500402	14N	14W	M
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Mendocino	1-07NTMP-017	1113.500402	14N	14W	M
Mendocino	1-07NTMP-017	1113.500402	14N	14W	M

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Mendocino	1-07NTMP-017	1113.500402	14N	14W	M
Mendocino	1-07NTMP-018	1113.500303	14N	14W	M
Mendocino	1-07NTMP-018	1113.500303	14N	14W	M
Mendocino	1-07NTMP-018	1113.500303	14N	14W	M
Mendocino	1-07NTMP-018	1113.500303	14N	14W	M
Mendocino	1-08NTMP-002	1113.400001	16N	16W	M
Mendocino	1-08NTMP-002	1113.400001	17N	16W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
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Mendocino	1-08NTMP-009	1113.700301	11N	15W	M
Mendocino	1-08NTMP-009	1113.810002	11N	15W	M
Mendocino	1-08NTMP-009	1113.810003	11N	15W	M
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Mendocino	1-08NTMP-009	1113.850201	11N	15W	M
Mendocino	1-08NTMP-009	1113.850201	11N	15W	M
Mendocino	1-08NTMP-009	1113.850201	11N	15W	M
Mendocino	1-08NTMP-009	1113.850201	11N	15W	M
Mendocino	1-08NTMP-012	1113.700301	11N	15W	M
Mendocino	1-08NTMP-012	1113.700301	11N	16W	M
Mendocino	1-08NTMP-012	1113.700302	12N	16W	M
Mendocino	1-08NTMP-012	1113.700302	12N	16W	M
Mendocino	1-08NTMP-012	1113.700302	12N	16W	M
Mendocino	1-08NTMP-013	1113.400006	17N	16W	M
Mendocino	1-08NTMP-014	1113.400006	16N	16W	M
Mendocino	1-08NTMP-015	1113.500702	15N	15W	M
Mendocino	1-08NTMP-015	1113.500708	15N	15W	M
Mendocino	1-08NTMP-016	1113.700204	12N	16W	M
Mendocino	1-09NTMP-004	1113.400003	16N	16W	M
Mendocino	1-09NTMP-004	1113.400005	16N	16W	M
Mendocino	1-09NTMP-006	1113.500702	15N	15W	M
Mendocino	1-09NTMP-006	1113.500704	15N	15W	M
Mendocino	1-09NTMP-006	1113.500704	15N	15W	M
Mendocino	1-09NTMP-014	1113.700302	12N	16W	M
Mendocino	1-09NTMP-015	1113.300401	17N	16W	M

Mendocino	1-09NTMP-015	1113.400001	17N	16W	M
Mendocino	1-91NTMP-001	1113.120202	21N	17W	M
Mendocino	1-92NTMP-001	1113.120202	20N	17W	M
Mendocino	1-92NTMP-001	1113.120202	20N	17W	M
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Mendocino	1-92NTMP-001	1113.120202	21N	17W	M
Mendocino	1-92NTMP-001	1113.130401	20N	17W	M
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Mendocino	1-92NTMP-001	1113.130401	21N	17W	M
Mendocino	1-92NTMP-001	1113.130401	21N	17W	M
Mendocino	1-92NTMP-001	1113.130401	21N	17W	M
Mendocino	1-92NTMP-001	1113.130401	21N	17W	M
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Mendocino	1-92NTMP-001	1113.130602	20N	17W	M
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Mendocino	1-92NTMP-001	1113.130602	21N	17W	M
Mendocino	1-92NTMP-001	1113.130602	21N	17W	M
Mendocino	1-92NTMP-003	1113.400006	16N	15W	M
Mendocino	1-92NTMP-003	1113.400006	16N	16W	M
Mendocino	1-92NTMP-003	1113.400006	17N	15W	M
Mendocino	1-92NTMP-005	1113.130203	20N	17W	M
Mendocino	1-92NTMP-005	1113.130401	20N	17W	M
Mendocino	1-92NTMP-005	1113.130401	20N	17W	M
Mendocino	1-92NTMP-005	1113.130401	20N	17W	M
Mendocino	1-92NTMP-005	1113.130402	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M

Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130501	20N	17W	M
Mendocino	1-92NTMP-005	1113.130502	20N	17W	M
Mendocino	1-92NTMP-005	1113.130603	20N	17W	M
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Mendocino	1-99NTMP-034	1111.720302	23N	13W	M
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Siskiyou	2-09NTMP-003	1105.830100	43N	01W	M
Siskiyou	2-95NTMP-008	1105.500605	41N	05W	M
Siskiyou	2-95NTMP-008	1105.500605	41N	05W	M
Siskiyou	2-95NTMP-008	1105.500605	41N	05W	M
Siskiyou	2-98NTMP-003	1105.500104	44N	07W	M
Siskiyou	2-98NTMP-003	1105.500104	44N	07W	M
Siskiyou	2-98NTMP-003	1105.500203	44N	07W	M
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Sonoma	1-00NTMP-003	1113.840103	11N	12W	M
Sonoma	1-00NTMP-039	1113.840301	09N	13W	M
Sonoma	1-00NTMP-039	1113.840301	10N	13W	M
Sonoma	1-00NTMP-039	1113.840304	09N	13W	M
Sonoma	1-00NTMP-039	1113.840304	10N	13W	M
Sonoma	1-00NTMP-041	1113.830004	10N	14W	M
Sonoma	1-00NTMP-041	1113.840303	10N	14W	M
Sonoma	1-00NTMP-057	1114.110201	06N	09W	M
Sonoma	1-00NTMP-073	1113.830004	10N	14W	M
Sonoma	1-00NTMP-073	1113.840303	10N	14W	M
Sonoma	1-01NTMP-003	1113.850303	08N	13W	M
Sonoma	1-01NTMP-008	1113.850103	09N	14W	M
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Sonoma	1-01NTMP-008	1113.850301	09N	14W	M
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Sonoma	1-01NTMP-048	1113.850202	10N	14W	M
Sonoma	1-02NTMP-026	1114.110101	08N	10W	M

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Sonoma	1-04NTMP-001	1113.840303	10N	14W	M
Sonoma	1-04NTMP-001	1113.840303	10N	14W	M
Sonoma	1-04NTMP-001	1113.840303	10N	14W	M
Sonoma	1-04NTMP-004	1114.110301	07N	10W	M
Sonoma	1-04NTMP-004	1114.110301	07N	10W	M
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Sonoma	1-04NTMP-004	1114.110301	07N	10W	M
Sonoma	1-04NTMP-009	1113.850303	08N	13W	M
Sonoma	1-04NTMP-009	1113.850303	08N	13W	M
Sonoma	1-05NTMP-007	1113.820001	11N	13W	M
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Sonoma	1-05NTMP-007	1113.830005	11N	13W	M
Sonoma	1-05NTMP-007	1113.830005	11N	13W	M
Sonoma	1-05NTMP-013	1113.830004	10N	14W	M
Sonoma	1-05NTMP-013	1113.850202	10N	14W	M
Sonoma	1-05NTMP-017	1113.830004	10N	14W	M
Sonoma	1-05NTMP-017	1113.840303	10N	14W	M
Sonoma	1-05NTMP-026	1113.850104	09N	13W	M
Sonoma	1-05NTMP-026	1113.850302	09N	13W	M
Sonoma	1-06NTMP-001	1113.830003	10N	13W	M
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Sonoma	1-06NTMP-001	1113.840302	10N	14W	M
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Sonoma	1-06NTMP-009	1113.830004	10N	14W	M
Sonoma	1-06NTMP-010	1113.850104	09N	13W	M
Sonoma	1-06NTMP-010	1113.850302	09N	13W	M

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Sonoma	1-08NTMP-011	1113.840303	10N	14W	M
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