# Memorandum

To:

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From:

Department of Forestry and Fire Protection

Subject:

Elk River Peak Flow Analysis

The effects of past harvesting and an annual harvest of 600 clearcut equivalent acres on peak flows in the Elk River watershed are summarized in attached Tables 1, 2, and 3. These peak flow changes were determined using Equation 1 in Lisle et al. (2000). Factors considered in this approach are limited to canopy removal, watershed wetness, flow return periods, and number of years since harvest. Attached Table 4 provides an example of the spreadsheets that were used to calculate changes in flow.

Canopy removal values were based on harvesting levels included in past, recently approved, and currently proposed Elk River watershed THPs, as summarized in Table 5, with adjustments for different silvicultural treatments based on coefficients given in Lisle et al (2000).

Overall, these results support the general conclusion that canopy removal rates of up to 600 acres per year do not result in an increase in peak flow over current conditions.

#### References

Lisle, T., L. Reid, and R. Ziemer. 2000. Addendum: Review of Freshwater Flooding Analysis Summary. Report prepared by the USDA, Forest Service, Pacific Southwest Research Station in Arcata for the California Department of Forestry and Fire Protection, Sacramento, CA. 16 p.

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Lewis, Jack, S. R. Mori, E. T. Keppeler, and R.R. Ziemer. 2001. Impacts of logging on storm peak flows, flow volumes and suspended sediment loads in Caspar Creek, California. *In:* Mark S. Wigmosta and Steven J. Burges (eds.) Land Use and Watersheds: Human Influence on Hydrology and Geomorphology in Urban and Forested Areas. Water Science and Application Volume 2, American Geophysical Union, Washington, D.C., p. 85-125.

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### ELK RIVER PEAK FLOW SUMMARY January 14, 2002

Table 1: PRIOR YEARS PEAK FLOW INCREASE

Harvest	Retun Period	Weti	ness	Peak Flow
Year	(yrs)	Rating	Value	Increase (%)
1999	2	Average	304	4.66
2000	2	Average	304	4.02
2001	2	Average	304	3.67

#### Table 2: FUTURE YEARS PEAK FLOW ALTERNATIVES

Harvest	Retun Period	Wet	ness	Harvest Area	Peak Flow
Year	(yrs)	Rating	Value	(CCE ac.)	Increase (%)
2002	2	Average	304	600	3.54
2003	2	Average	304	600	3.45
2004	2	Average	304	600	3.39

Table 3: RETURN PERIOD AND WETNESS EFFECTS ON PEAK FLOWS

I	Return				ncrease (%)
	Period	Wetr	ness	2001 w/	2002 w/
	(yrs)	Rating	Value	no harvest	600 ac CCE
	2	Dry	50	10.25	9.88
	2	Average	304	3.67	3.56
	2	Wet	400	2.67	2.58
	15	Dry	50	9.24	8.91
	15	Average	304	2.67	2.57
	15	Wet	400	1.67	1.61

Table 4: ELK RIVER PEAK FLOW CALCULATION FOR 600 CLEARCUT EQUIVALENT ACRES IN 2002 AND AVERAGE WATERSHED WETNESS

## January 14, 2002

Recurrance Interval (yrs)	2
Index Logging Year	2002
Logging Recovery Coef. (B2)	-0.0771
Constant (B4)	1.1030
Storm Size Coef. (B5)	-0.0963
Watershed Wetness Coef. (B6)	-0.2343
Watershed Wetness Index (w)	304
Control Peak Flow (ynfc)	0.0091
Expected Control Pk. Flow (yc)	0.0073
Watershed Size (ac)	29376

Year	Clearcut Equiv. (ac.)	ST/SW Equiv. (ac.)	Selection Equiv. (ac.)	Canopy Equiv. (ac.)	Proportion Wtrshd. Logged (c)	Summers Since Logged (t)	Observed/ Expected Peak Flow Ratio	Annual Peak Flow Change (%)
1989	137.0	644.1	555.7	897.9	0.03057	13	1.00054	0.054
1990	33.0	1617.3	55.7	1273.8	0.04336	12	1.00156	0.156
1991	132.7	0.0	829.4	547.4	0.01863	11	1.00101	0.101
1992	575.3	225.1	68.9	778.6	0.02650	10	1.00193	0.193
1993	358.5	552.6	396.5	971.2	0.03306	9	1.00301	0.301
1994	425.8	910.9	434.6	1326.3	0.04515	8	1.00494	0.494
1995	302.8	988.4	1064.9	1576.6	0.05367	7	1.00686	0.686
1996	308.8	341.7	843.7	986.9	0.03360	6	1.00491	0.491
1997	89.9	138.6	286.3	337.0	0.01147	5	1.00188	0.188
1998	11.7	0.0	193.4	108.4	0.00369	4	1.00067	0.067
1999	0.0	0.0	41.5	20.8	0.00071	3	1.00014	0.014
2000	6.2	0.0	0.0	6.2	0.00021	2	1.00005	0.005
2001	0.0	84.0	522.8	324.4	0.01104	1	1.00262	0.262
2002	600.0	0.0	0.0	600.0	0.02042	0	1.00523	0.523
Sum								3.536

Table 5: Elk River Combined Canopy Equivalent Acres January 14, 2002

Treatments within						Transcription deconduction or a	A	cres Ha	Acres Harvested	-,	The state of the s	THE PARTY OF THE P	A CONTRACTOR OF THE PARTY OF TH	A SPACE AND A SECURE AND A SECURE ASSESSMENT OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE	ACCURATION AND ACCURATIONS		Pending
Watersheds	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
North Fork Elk River				With the state of					COLUMN DESIGNATION OF THE PERSON	AND THE PERSON NAMED AND THE P	Marine management of the last	PRINCIPLE AND THE PROPERTY OF	ACCOMPANDA CONTRACTOR			Control of the last of the las	MINISTER BANKSCAN SECTIONS
Clearcut Equiv.	0.0	0.0	2.4	133.0	24.2	83.3	63.1	261.3	406.3	294.4	75.5	89.9	0.0	0.0	6.2	6.2	7.27.7
ST/SW Equiv.	0.0	0.0	0.0 1288.4	116.6	793.6	0.0	93.5	355.4	221.6	988.4	216.2	138.6	0.0	0.0	0.0	0.0	158.7
Selection Equiv.	0.0	0.0	0.0	476.1	55.4	775.6	10.5	356.3		311.0 1042.6	503.8	30.9	159.3	41.5	0.0	0.0	648.4
South Fork Elk River															,		
Clearcut Equiv.	3.5	0.0	0.0	4.0	8.8	9.0	274.7	97.3	0.0	0.0	233.3	0.0	0.0	0.0	0.0	0.0	63.4
ST/SW Equiv.	0.0	0.0	508.1	93.6	810.0	0.0	131.7	197.2	678.2	0.0	0.0	0.0	0.0	0.0	0.0	84.0	0.0
Selection Equiv.	0.0	0.0	56.1	9.62	0.3	0.1	18.7	0.0	100.3	0.0	324.5	0.0	0.0	0.0	0.0	522.8	672.6
Lower Elk River																	
Clearcut Equiv.	0.0	0.0	0.0	0.0	0.0	48.8	237.5	0.0	19.6	8.4	0.0	0.0	11.7	0.0	0.0	0.0	0.0
ST/SW Equiv.	0.0	0.0	0.0	434.0	13.7	0.0	0.0	0.0	11.0	0.0	125.6	0.0	0.0	0.0	0.0	0.0	0.0
Selection Equiv.	0.0	0.0	1.6	0.0	0.0	53.8	39.7	40.2	23.2	22.3	15.5	255.5	34.1	0.0	0.0	0.0	0.0
Elk River Sum																	Mercel and the second s
Clearcut Equiv.	3.5	0.0	2.4	2.4 137.0	33.0	132.7	575.3	358.5	425.8	302.8	308.8	89.9	11.7	0.0	6.2	6.2	821.0
ST/SW Equiv.	0.0	0.0	0.0 1796.5 644.1		1617.3	0.0	225.1	552.6	910.9	988.4	341.7	222.6	0.0	0.0	0.0	84.0	158.7
Selection Equiv.	0.0	0.0	57.7	555.7	55.7	829.4	68.9	396.5	434.6	434.6 1064.9	843.7	809.1	193.4	41.5	0.0	522.8	1321.0