*REPORT OF THE SURVEY OF SEDIMENT BELOW STREAM GAGING SITES 1, 2, AND 3 IN THE H.J. ANDREWS EXPERIMENTAL FOREST WATER YEAR 1991

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* Refer to Water Year 1990 report for site history, methods, and calculations.

SEDIMENT BASIN SUMMARY - WATER YEAR 1991

The sediment basin survey at WS#1 was done on August 20, 1991. Surveys at WS#2 and WS#3 were done on August 22 and August 23, 1991. None of the basins were cleaned in 1991. Survey results show that very small quantities of bedload material were produced by the watersheds during WY 1991 (Table 3).

Storm season precipitation was below average (Table 1), continuing the trend of below average precipitation (Figure 2). No major storms were recorded on the H.J. Andrews (Table 1), but there were two storms systems that produced flows adaquate to transport bedload material (Table 2).

The first peak flows of the season occured on Nov.25, 1990 (Table 2). The peak flows were the result of two days of intense rainfall on near saturated soils . On Nov. 24, 1990 27.94mm of precipitation fell. The storm on Nov. 25, 1990 produced 58.93mm of rainfall. Streams began rising by 1800 hrs on Nov.24, 1990. By 1130 hrs on Nov.25, 1990,all streams had reached peak flows.

The second and largest peak flows of the year occured on Jan. 12, 1991. The flows were the result of a period of cool, moderate intensity storms which slowly melted a 7-9cm snow pack at lower elevations. This was followed by a large, two-day storm with warmer temperatures. This storm produced 66.29mm of precipitation, and quickly melted the remainder of the snowpack. Streams began to rise on Jan. 9, 1991 after a four-day series of small storms. A larger storm on Jan. 10, 1991 produced a small peak flow which fell slowly. On Jan. 11,1991 the stream flows began to rise untill peak flows occured at about 0600hrs on Jan. 12, 1991.

Analysis of field observations indicate that the January storm produced the larger quantity of bedload material. The field crew reported only a light coating of fines had accumulated in the basins after the November event. After the January event the field crew observed accumulations of gravels and cobbles at all sediment basins. They also reported a small slump into the basin at WS#1. No other new bedload material was reported over the remainder of the water year.

The storm bedload estimates at WS#1 were not useful in determining the timing of bedload material (Figure 3) . No measurments were taken at WS#1 before the November event, so no comparison could be made to the January event. The estimates do show some accumulation after the January event, but this deposit was redistributed by the next measurement.

None of the sediment basins were cleaned ,nor were the gravels at WS#1 spread over the basin due to the small depositions in WY 1991. Cleaning will occur next year if needed.

DISCUSSION - SEDIMENT BASINS - WATER YEAR 1990

Long term precipitation patterns from the H.J. Andrews Climatic Station raingage show that the 1980's began with a period of increasing precipitation, and ended with a drying trend which started in 1984 (Figure 2). During the period from 1984 to 1991 precipitation was slightly less than the long term average.

Sediment production values from the study watersheds do not closely reflect precipitation trends (Figure 4). The number of storms and storm intensity appear to determine sediment production. Since no large mass movements were reported in the study watersheds during the report period, bedload production was derived from channel storage or from small bankside failures. Intense precipitatiion on saturated soils or a snow pack can trigger such small failures, and can produce stream discharge high enough to overturn the stream bed and redistribute sediments. This was the case for both major storm events that occured in 1991.

Sediment production values since 1977 suggest a pulse-like behavior of sediment production. The trend seems to be that a period of low production is followed by a period of larger production which declines over time into another period of very low production. This would suggest that some sort of recharging is taking place either in the stream channels or the features which deliver bedload material to the stream, or it could indicate a pattern of major storm distribution. To date not enough data is present to verify these assumptions, but they should be tested to increase our understanding of this process.

The ratio of sediment production between the control watershed (WS#2), and the two logged watersheds (WS#1 and WS#3) has been in a downward trend since the second year after logging activities were completed (Figure 5). This suggests that disturbances within the watersheds may affect the quantity of bedload material produced by a watershed, but their influence declines as the watershed recovers from the disturbance.

In WY1991 the January storm produced the greatest amount of bedload discharge. This seems to be a common pattern of production in the study watersheds. It is thought that early storms flush out material that has accumulated in the active summer stream channel and the adjacent channel area. Later storms of near equal intensity tend to produce little new material unless they are of great enough intensity to overturn the streambed.

The small production of bedload materials from the study watersheds were most likely due to the absence of a major storm event (Table 1). This may also explain why WS#3 produced the largest volume of bedload material of the three watersheds for the first time since 1965 (Figure 4).

Plans have been made to begin a manuscript addressing the sediment relationships in watersheds 1,2, and 3. The role of storm frequency, storm intensity, and melting snow in sediment production will be investigated further in this work.

Table 1 Storm Season Precipitation (October - April)

WATER YEAR	PPT. (mm)	(in)	#MAJOR* STORMS	PERCENT STORM SEASON MEAN
1981	1741	68.59	3	89.5
1982	2473	97.42	7	127.1
1983	2244	88.41	4	115.4
1984	2223	87.59	2	114.3
1985	1785	70.31	0	91.7
1986	1941	76.49	2	99.8
1987	1510	59.50	2	77.6
1988	1612	63.53	2	82.9
1989	1975	77.83	2	101.4
1990	1634	64.33	2	83.9
1991	1632	64.16	0	86.3

Mean of storm season precipitation 1957 - 1991 = 1947 mm
* A storm during which peak discharge at WS#2 exceeds 7.6 cfs

Table 2 Major storms for Water Year 1991 , Peak Flow

WY	Date	Watershed 1 (ft)	Watershed 1 (cfsm)	Watershed 2 (ft)	Watershed 2 (cfsm)	Watershed 3 (ft)	Watershed 3 (cfsm)
1991	11-25-90	0.723	34.06	0.456	20.89	0.676	25.76
	01-12-91	0.873	49.78	0.548	28.01	0.734	29.92
	04-09-91	0.663	29.32	0.393	16.49	0.564	18.53

Table 3 Sediment Accumulation Water Year 1988 - 1991

Site	Survey Points	Mean Bottom Elevation (m)	Change Bottom Elevation (m)	Total Accumulation (m^3)	Sediment Production (m^3/ha)	Ratio
			WATER YEAR 1988			
WS-1	184	97.86				
	184	98.01	0.15	29.02	0.30	0.00
WS-2	172	98.17				
	172	98.16	-0.01*	0.00	0.00	
WS-3	162	97.12				
	162	97.11	-0.01*	0.00	0.00	0.00
			WATER YEAR 1989			
WS-1	184	98.01				
	184	98.42	0.41	80.97	0.84	2.47
WS-2	172	98.16				
	172	98.26	0.12	20.37	0.34	
WS-3	162	97.11				
	162	97.40	0.29	24.10	0.24	0.71
			WATER YEAR 1990			
WS-1	190	98.22	0.17	34.08	0.36	0.00
	190	98.39				
WS-2	172	98.28	-0.02@	0.00	0.00	
	172	98.26				
WS-3	185	97.15	0.11	8.21	0.08	0.00
	185	97.26				
			WATER YEAR 1991			
WS-1	198	98.39				
	198	98.41	0.02	3.77	0.03	2.00
WS-2	172	98.28				
	172	98.29	0.01	1.26	0.02	
WS-3	233	97.13				
	233	97.21	0.08	5.39	0.05	2.50

* - A value of ± .01m is below the resolution of the bed load survey. Values are included for purposes of comparison only. No sediment accumulation is reported for WS-2 and WS-3 during WY 1988.
@- The negitive value at WS#2 in 1990 was due to the introduction of a old growth tree near the basin entryway. The tree altered the flow into the basin and disturbed the material in the basin allowing easy transport. For purposes of comparison, no sediment accumulation will be reported at WS#2 for 1990.

	WS-1	WS-2	WS-3
Watershed area (ha)	96	60	101
Sediment basin area (m^2)	198	175	83 (1990-1991 value = 71)

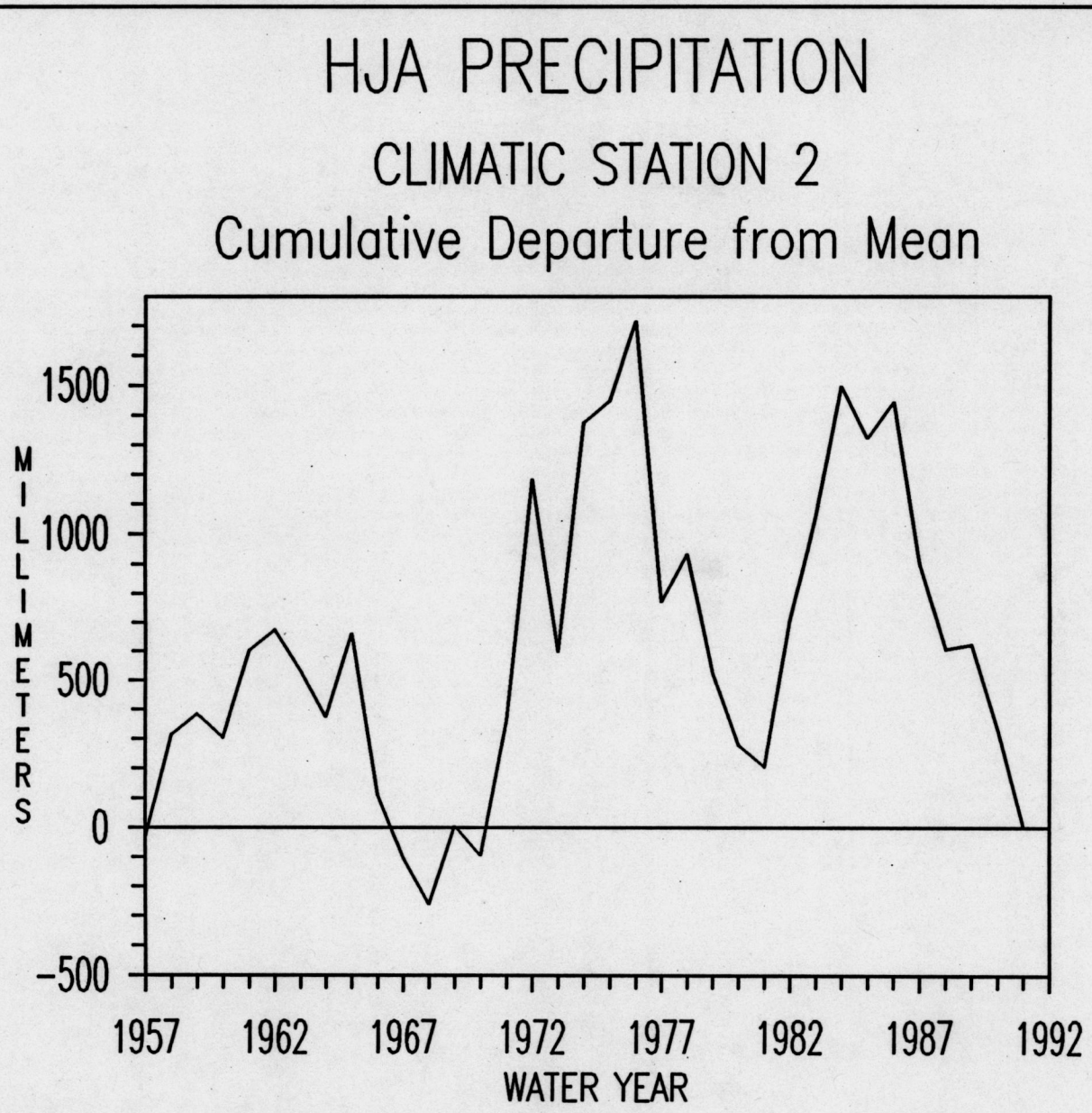

Figure 2) A drying trend beginning in 1984 continued through 1991.

WY 1991 BEDLOAD ESTIMATE

HJA WATERSHED 1

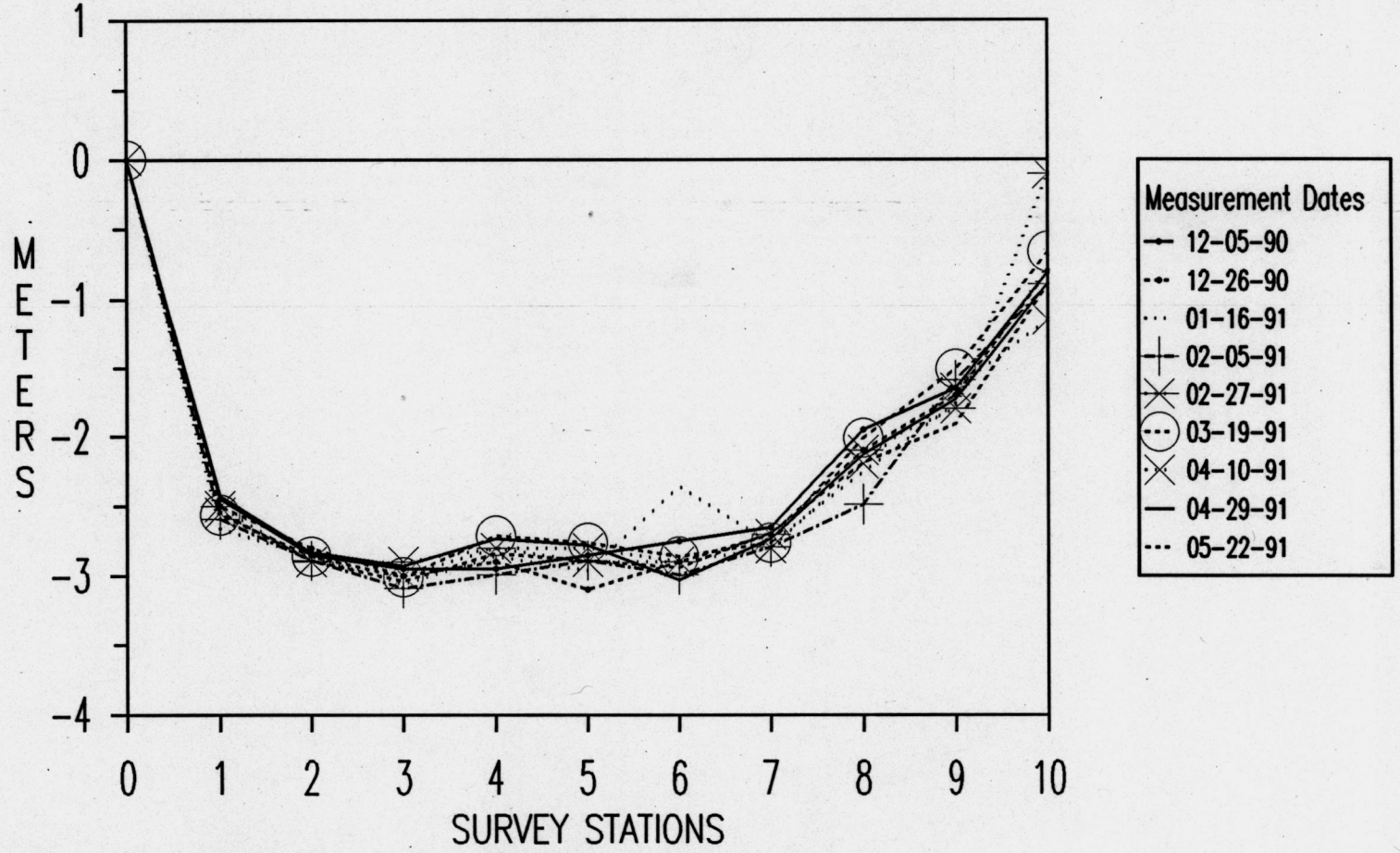

Figure 3) The January storm produced only a small amount of bedload material. By the next measurement the material had been redistributed in the basin.

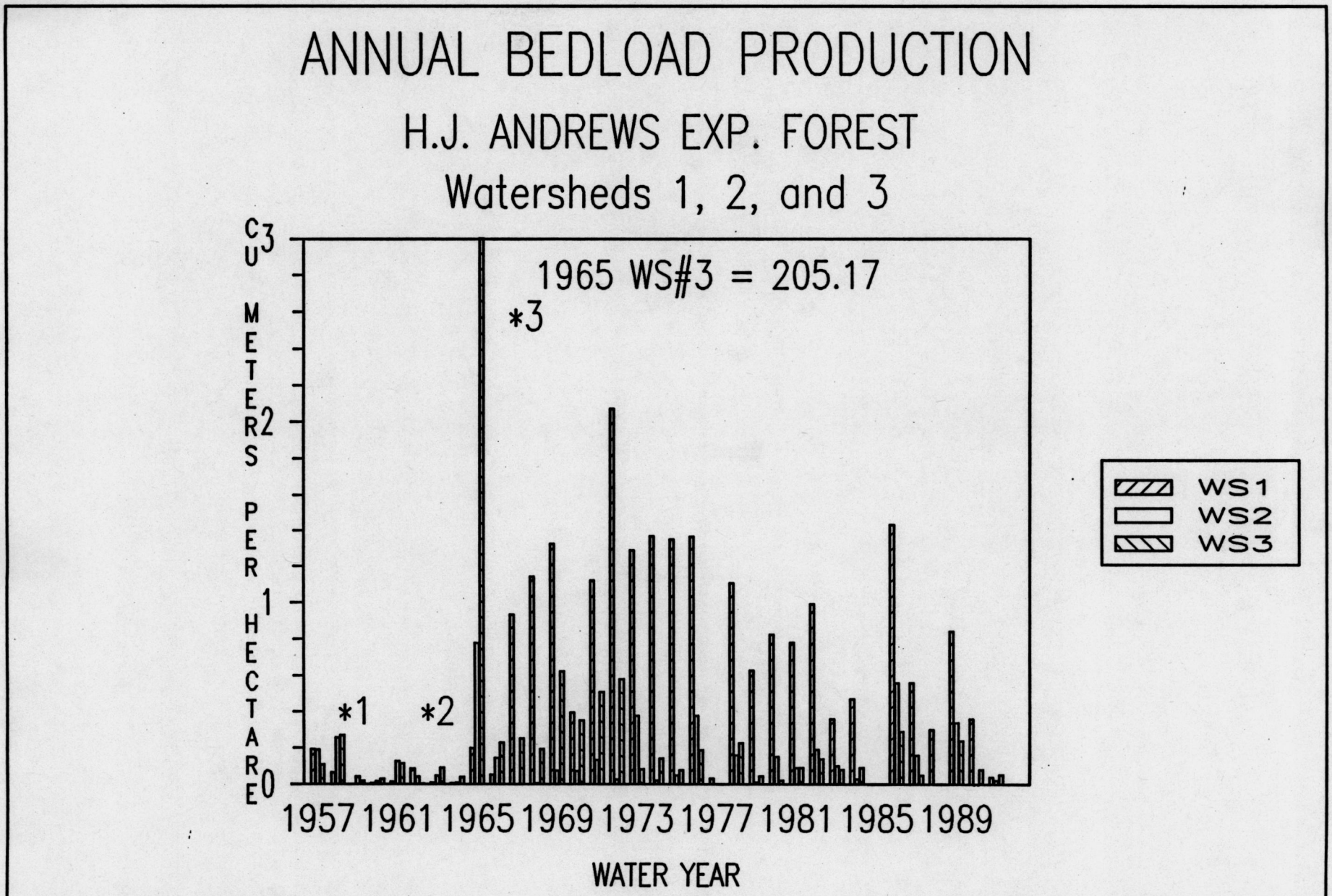

Figure 4) No trend is apparent in bedload production since the drought in 1977. In 1991 WS#3 produced the largest volume of bedload of the three watersheds for the first time since 1965. *1 Road building completed in WS#3. *2 Logging completed in WS#3. *3 Logging and slash burning completed in WS#1.

BEDLOAD PRODUCTION RATIO

H.J. ANDREWS EXP. FOREST

WS#1 and WS#3 vs WS#2

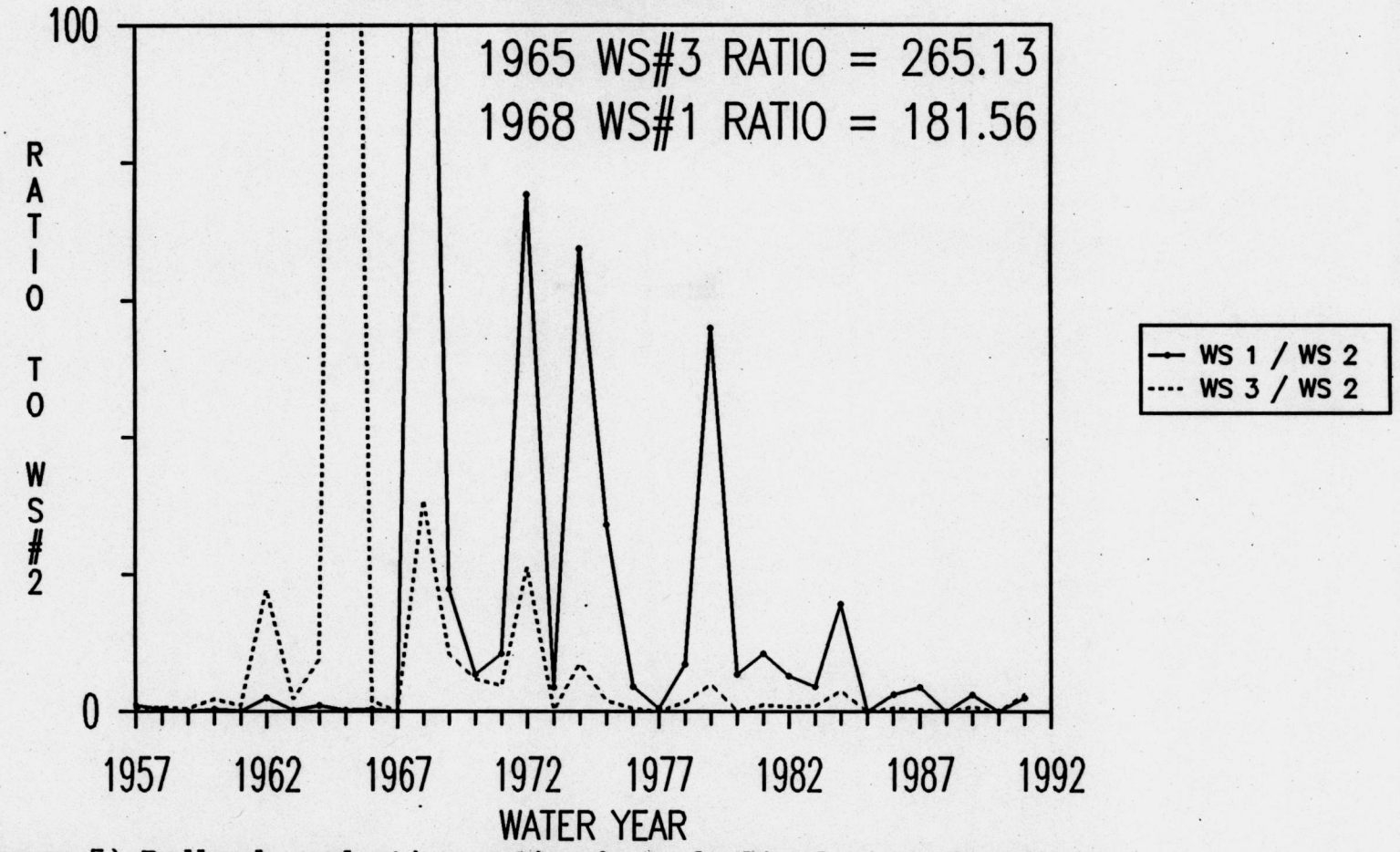

Figure 5) Bedload production ratios have declined since logging was completed at WS# 3 in 1963, and in 1967 at WS#1. WY 1991 is the first year that WS#3 has produced a larger bedload ratio than WS#1 since WS#1 was logged.