NS481/581 - NSSI *wou:nssi:fluvlab2.wpd*

Field Techniques in Fluvial Analysis - Part II.

Determination of River Discharge and Recurrence Interval

II-1. See the attached cross section (Figure IIA) that shows a representative channel profile of the Luckiamute at Helmick Park, completed on the previous outing. Note the labeled channel section velocities and sub-areas.

Task 1. Using the continuity equation and related data on Figure 1 and Table 1 of Part I, calculate the discharge for each domain and sum them to derive total discharge for the channel. **Give your answers in both m^3/sec and ft^3/sec Fill in the Table Below.**

Channel Section	Area (sq. m)	Velocity (m/sec)	Section Q (cu m /sec)
1	________	________	________
2	________	________	________
3	________	________	________
4	________	________	________
5	________	________	________
		Total Q (cu m /sec)	________

Task 2. Using the discharge data estimated above, calculate the total stream power and unit stream power for the Luckiamute on the day of the field trip. **Answer in watts and watts/m, respectively.**

Historical Discharge Analysis / Recurrence Intervals.

The Luckiamute at Helmick State Park is gaged by the U.S. Geological Survey. Discharge data has been collected at the site since the 1940's. Table IIA is a summary of annual peak discharge data from the Luckiamute / Helmick gaging station. Peak annual discharge is simply the highest discharge recorded at the gauging station for a given year of the record.

<u>Recurrence Interval and Gumbel Plots</u>

The recurrence interval of a given flood discharge is commonly calculated from a set of historical data. The annual p discharges for the Luckiamute gaging station are listed in Table IIA. The "annual peak discharge" represents the maximum discharge recorded at the station for a given water year. Recurrence interval of annual peak discharge represents an estimation, based on the historical record, of the probability of a given flood discharge occurring over a given time period. For example, the "100 yr flood" is a flood-discharge magnitude that has a probability of occurring once every 100 yrs. Generally, the lower the magnitude of event, the statistically more frequent the chance of occurring, and vice-versa. Once the recurrence intervals for given discharges are calculated, the relations may be visually plotted on a Gumbel-type graph. Refer to the attached graph (Fig. IIB) showing Peak Annual Discharge (y axis) vs. Recurrenc Interval (x axis). This graph was produced from historic stream gauge data collected by the US Geological Survey over the past 60 years at Helmick Park.

Task 3. Use the Recurrence Interval plot in Figure IIB to determine the recurrence interval (years) of the total discharge you calculated for the Luckiamute in Task 1 above.

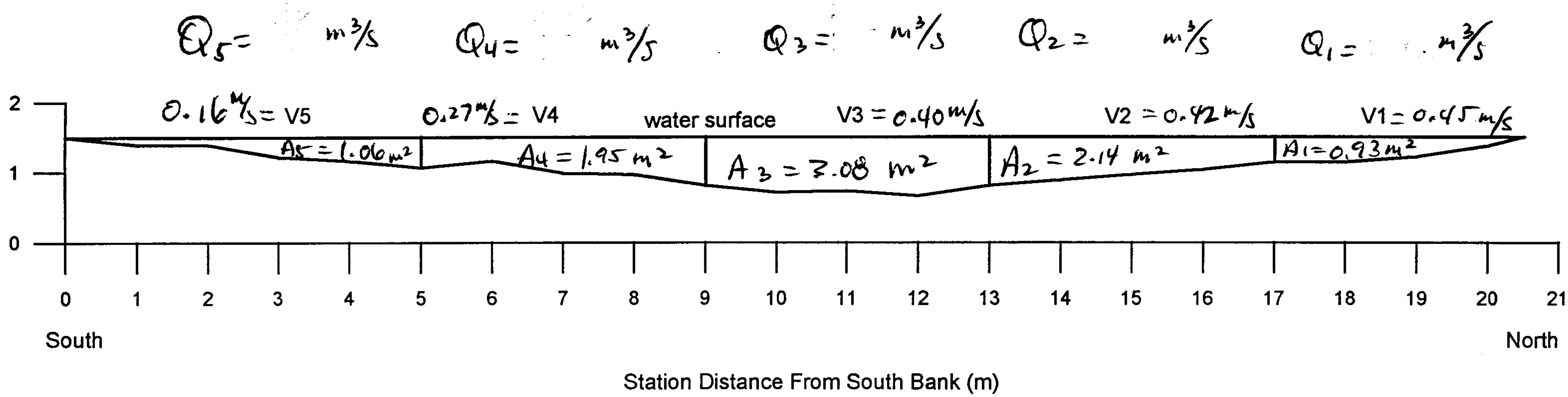
Thinking Question: Devise a method by which you could use the historic recurrence interval data, stream profile techniques, and the continuity equation to map out the 100-year floodplain of the Luckiamute River at Helmick State Park.

Thinking Question: What other ways could you possibly determine the 100 year floodplain?

FIG. IIA

TOTAL Q =

Figure 1. Luckiamute River Channel Profile
Helmick Road Bridge



Vertical Scale: 1 in = 2.1 m
Horizontal Scale: 1 in = 2.1 m
Vertical Exaggeration = x 1

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TABLE IIA.

Luckiamute Gage Data: Unit Conversion, Recurrence Interval,

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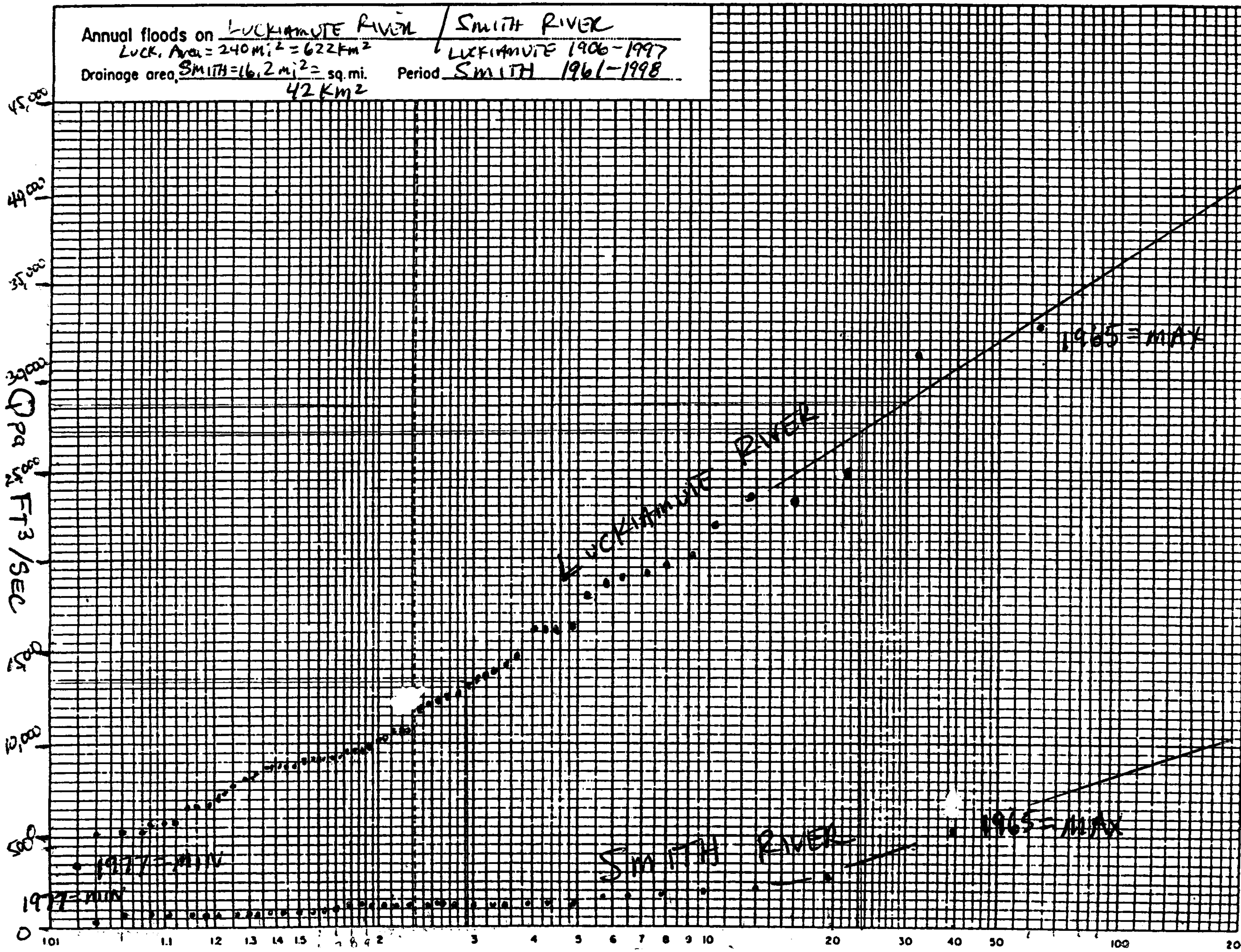
Water Year	Peak Discharge (ft3/sec)	Peak Discharge (m3/sec)	Rank	R.I. (yr)	Prob.
1965	32900	931.7	1	64.00	0.02
1972	31300	886.4	2	32.00	0.03
1995	24800	702.4	3	21.33	0.05
1949	23800	674.0	4	16.00	0.06
1981	23500	665.5	5	12.80	0.08
1907	22000	623.1	6	10.67	0.09
1947	20200	572.1	7	9.14	0.11
1911	19800	560.7	8	8.00	0.13
1978	19200	543.8	9	7.11	0.14
1910	19000	538.1	10	6.40	0.16
1974	18700	529.6	11	5.82	0.17
1909	18000	509.8	12	5.33	0.19
1976	16300	461.6	13	4.92	0.20
1908	16200	458.8	14	4.57	0.22
1956	16200	458.8	15	4.27	0.23
1961	16100	456.0	16	4.00	0.25
1953	14600	413.5	17	3.76	0.27
1943	14400	407.8	18	3.56	0.28
1982	14000	396.5	19	3.37	0.30
1971	13800	390.8	20	3.20	0.31
1966	13600	385.2	21	3.05	0.33
1948	13100	371.0	22	2.91	0.34
1964	12800	362.5	23	2.78	0.36
1996	12700	359.7	24	2.67	0.38
1987	12500	354.0	25	2.56	0.39
1988	12100	342.7	26	2.46	0.41
1946	12000	339.8	27	2.37	0.42
1951	10800	305.9	28	2.29	0.44
1958	10800	305.9	29	2.21	0.45
1967	10800	305.9	30	2.13	0.47
1986	10400	294.5	31	2.06	0.48
1970	10200	288.9	32	2.00	0.50
1993	9960	282.1	33	1.94	0.52
1983	9820	278.1	34	1.88	0.53
1980	9750	276.1	35	1.83	0.55
1973	9620	272.4	36	1.78	0.56
1954	9460	267.9	37	1.73	0.58
1952	9260	262.2	38	1.68	0.59
1968	9190	260.3	39	1.64	0.61
1950	9170	259.7	40	1.60	0.63
1960	9130	258.6	41	1.56	0.64
1994	9000	254.9	42	1.52	0.66
1990	8830	250.1	43	1.49	0.67
1962	8800	249.2	44	1.45	0.69
1963	8800	249.2	45	1.42	0.70
1945	8720	247.0	46	1.39	0.72
1959	8700	246.4	47	1.36	0.73
1969	8330	235.9	48	1.33	0.75
1906	8070	228.5	49	1.31	0.77
1942	8060	228.3	50	1.28	0.78
1984	7580	214.7	51	1.25	0.80
1985	7080	200.5	52	1.23	0.81
1975	7010	198.5	53	1.21	0.83
1957	6810	192.9	54	1.19	0.84
1955	6700	189.7	55	1.16	0.86
1941	6620	187.5	56	1.14	0.88
1997	5950	168.5	57	1.12	0.89
1979	5930	167.9	58	1.10	0.91
1944	5900	167.1	59	1.08	0.92
1989	5340	151.2	60	1.07	0.94
1992	5310	150.4	61	1.05	0.95
1991	5080	143.9	62	1.03	0.97
1977	3410	96.6	63	1.02	0.98

GUMBEL PLOT. FIG. II B



NOTE:

1965 = MAX Q_P FOR BOTH LUCKIAMUTE AND SMITH RIVERS — WHAT METEOROLOGICAL EVENT TRIGGERED THI

1977 = MIN Q_P FOR BOTH THE LUCKIAMUTE AND SMITH RIVERS

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SAME HYDROMETEOROLOGY BETWEEN EACH BASIN