CHAPTER 14

Summary of Selected Tributary Studies

14.1 SUMMARY OF SELECTED TRIBUTARY STUDIES (Figure 14.1)

1) With the exception of Vernon and Kelowna Creeks there appear to be no consumptive use deficits under present methods of operation. It should be emphasized that the models have been limited to operation over single drought years and it has not been possible because of lack of hydrometric data to run through the standard study period 1921 to 1970 (which contained the 1929 to 1932 drought) as had been done for the mainstem computer model. Thus, while the tributary models indicate that there would be carry over storage under the historic method of operation in the larger reservoirs at the end of one drought year to augment the flows should a second successive drought year occur a continuation of such conditions into a third year as happened in the 1929-32 could prove very critical.

2) With the exception of Penticton Creek (which is not considered a fishery stream) a modified regulation of the upstream reservoirs has been carried out with the objective of meeting both consumptive use requirements throughout the sub-basin and minimum fishery flows the mouths of the seven selected tributaries. While this should not be regarded as a recommended method for multi-purpose operation, it does show that for a single year starting with full reservoirs such operation can improve significantly the fishery flows. However, such improvements result in practically complete depletion of the headwater reservoir storage which carry over storage is normally held in anticipation of the occurrence of a subsequent drought year.

Should a drought occur or a series of successive droughts such as happened in 1929-32 the modified operation would have a much more adverse affect on agriculture than the historic operation.

3) The relative importance of each tributary with respect to inflow to Okanagan Lake is shown in Table 14.1 for Dry, Average and Wet Years.

4) The potential for increased storage within the tributaries can be found in Table 14.2 Estimates of natural runoff to reservoirs (as shown on Tables elsewhere) indicate that some are developed to capacity while others are not. Although the study does not encompass consideration of the engineering feasibility of reservoir construction, those which appear to be underdeveloped deserve a close scrutiny where extra storage is required. Where reservoirs

TABLE. 14.1

CONTRIBUTION TO OKANAGAN LAKE INFLOW OF EIGHT MAJOR TRIBUTARIES UNDER PRESENT (1970) DEVELOPMENT FOR DRY, AVERAGE AND WET YEAR

	Dry	Average	Wet
Okanagan Lake Tributary * Inflow (1970 Development) Expressed in acre feet	279,200	516,000	796,000
Tributary Contribution to Okanagan Lake Inflow Expressed as a Percentage of the Total Tributary Inflow			
Mission Creek	23.6	20.8	25.4
Trout Creek	4.2	8.0	13.6
Vernon Creek	4.0	5.6	10.2
Penticton Creek	4.0	4.6	5.9
Equesis Creek	3.3	3.3	4.1
Peachland Creek	2.5	2.4	3.1
Powers Creek	1.0	1.6	2.6
Kelowna Creek	0.8	1.4	2.9
Total for 8 Tributaries	43.4	47.7	67.8

* Peripheral Inflow to Okanagan Lake from All Sources, at 1970 Development. Includes Surface and Subsurface (Groundwater) Inflows.

TABLE 14.2

RESERVOIRS IN WHICH DRY YEAR NATURAL INFLOW EXCEEDS STORAGE CAPACITY BY 20% OR MORE QUANTITIES GIVEN IN ACRE-FEET

Tributary	Storage Reservoirs		Installed Upstream Capacity	Total	Dry Year Natural Inflow	Excess Inflow in Dry Year
	Name	Active Capacity				
Trout Ck.	Thirsk	2,628	5,678	8,306	10,163	+ 22%
	Isintok	870	0	870	1,099	+ 26%
Peachland Ck.	Wilson	81	0	81	204	+ 152%
Powers Ck.	Dobbin	104	62	166	322	+ 94%
	Islaht	343	166	509	681	+ 34%
Kelowna Ck.	James	1,112	0	1,112	1,343	+ 21%
	Scotty	140	1,112	1,252	1,510	+ 21%
Mission Ck.	Mission	600	0	600	1,250	+ 108%
	Graystoke	2,107	0	2,107	4,360	+ 107%
	Loch Long	400	0	400	1,000	+ 150%
	Hydraulic #9	231	0	231	4,247	+1,740%
	Canyon	304	0	304	402	+ 32%

Note: 1) The above is based on 1970 development and hence does not acknowledge change in storage since that time. e.g. Hydraulic #9 is now breached and forms part of an enlarged McCulloch reservoir.

2) While Crooked Lake on Vernon Creek has an active storage capacity of 2,445 acre-feet compared to a dry year natural inflow of 3,374 acre-feet this excess inflow is needed to partially replenish the Swalwell Lake reservoir active storage immediately downstream.

are in series, one flowing into another, it is their total capacity which must be weighed against annual natural runoff.

5) A number of key hydrometric stations, established for the study, should be continued to provide an increasingly accurate assessment of tributary water supplies.

6) During the latter part of the study, Trepanier Creek was briefly studied with respect to its regulation primarily for sport fishery. However, because of the lack of potential storage sites, it was concluded that the most feasible method of providing adequate discharges for the Kokanee and Rainbow Trout would be by pumping from Okanagan Lake to a point near its mouth.

7) The tributary modelling results presented in this chapter can only be con-sidered first estimates of probable flows since in roost cases they are based on very limited data and reflect only monthly discharges. It is estimated their accuracy is in the order of j_ 20%.

8) The models are conservative in that there is no allowance for return flow to the tributaries and are based on severe drought conditions as well as average inflow years.

9) The next step for those tributaries considered for multiple use such as Mission Creek would be the refinement of the model to a weekly or even daily basis during the freshet period with field operation program to prove up the theoretical regulation. These more sophisticated models are also important in improving the nutrient input estimates made in the water quality studies.

10) Even with these refinements, tributary modelling falls far short of the main-stem model which with 50 years of record provides a basis for good statistical analysis of extreme events. With proper monitoring over the next 25 years as outlined in the Final Report and in Technical Supplement 12, it should be possible to develop an adequate statistical base for the principal tributaries and through correlations equivalent information for the minor tributaries.

14.2 DETAILED CONCLUSIONS

With respect to specific tributaries, the following conclusions can be made:

14.2.1 Trout Creek

a) No consumptive use deficiencies at 1970 stage of development.
b) Considerable non-consumptive use deficiencies may be greatly reduced by modifying the present pattern of storage release.

14.2.2 Peachland Creek

a) Effective flow regulation from storage is achieved by one large, modern dam which creates Peachland Lake. Because of a surplus of live storage in this reservoir, no consumptive use deficiencies are anticipated.

b) Sizeable non-consumptive use deficiencies are indicated during late summer and fall under the present system of regulation. These deficiencies could be relieved entirely by releases of storage from Peachland Lake. However, since increased storage releases would result in a wider range of drawdown on Peachland Lake, the present recreational uses of the lake would suffer.

14.2.3 Powers Creek

a) The large number (7) of controlled lakes in the Powers Creek sub-basin, although rather small, provide adequate water to meet all consumptive use demands in 1970 and the foreseeable future.

b) Serious non-consumptive use deficiencies are apparent only in August of an average year but are almost year around in a "dry" year. Modified operation of storage can relieve non-consumptive deficiencies almost entirely.

14.2.4 Equesis Creek

a) There are no consumptive use deficiencies foreseen for this sub-basin.

b) Small non-consumptive use deficiencies appear, especially in winter of a dry year, as shown by computer print-outs. These deficiencies are apparent more than real and may be relieved entirely by modifications to storage release.

c) This sub-basin appears to be ideally suited to a form of development which accents recreational fishing over agriculture or urbanization.

14.2.5 Vernon Creek

a) The diversion of flow from Duteau Creek to the Vernon Creek watershed is of such magnitude and importance that it must be regarded as an integral part of the Vernon Creek sub-basin.

b) There are no consumptive use deficiencies at the 1970 stage of development.

Small deficiencies are indicated on BX Creek but no shortages are experienced since an alternative source of supply (Kalamalka Lake) is available to the user (City of Vernon).

c) Non-consumptive use deficiencies at the creek mouth are small and may be relieved entirely by modifying storage release. Deficiencies apparent in the upper reaches of Coldstream and BX Creeks may not be met, however, since it appears that natural water supplies are inadequate to meet the stated requirements.

d) There appears to be little opportunity to provide sufficient new, useful storage to meet future water needs.

e) In June 1971 Hiram Walker Distillery began discharging an estimated 560 acre-

feet per month at MP3. This water is pumped from Okanagan Lake .and, hence, is a net gain to the Vernon Creek system. The effect of this additional flow is excluded from 1970 data given here. However, assuming that this diversion was operated continuously, it would provide 6,000 to 7,000 acre-feet of water to the mainstem of Vernon Creek between MP3 and Okanagan Lake, thereby, eliminating both consumptive and non-consumptive deficiencies.

14.2.6 Kelowna Creek

a) Consumptive use deficiencies are estimated to approach 60 to 80 per cent of demand at 1970 stage of development. This is due primarily to large diversions to Glenmore Irrigation District and would be relieved, by 1972, by Moore Lake reservoir.

b) Non-consumptive use deficiencies are evident in all but the freshet months. Although modified methods of storage operation may be expected to improve the situation, deficiencies are likely to be an occasional and continuing problem.

c) Increasing development of the area threatens to bring increasing likelihood of both consumptive and non-consumptive water deficiencies.

14.2.7 Mission Creek

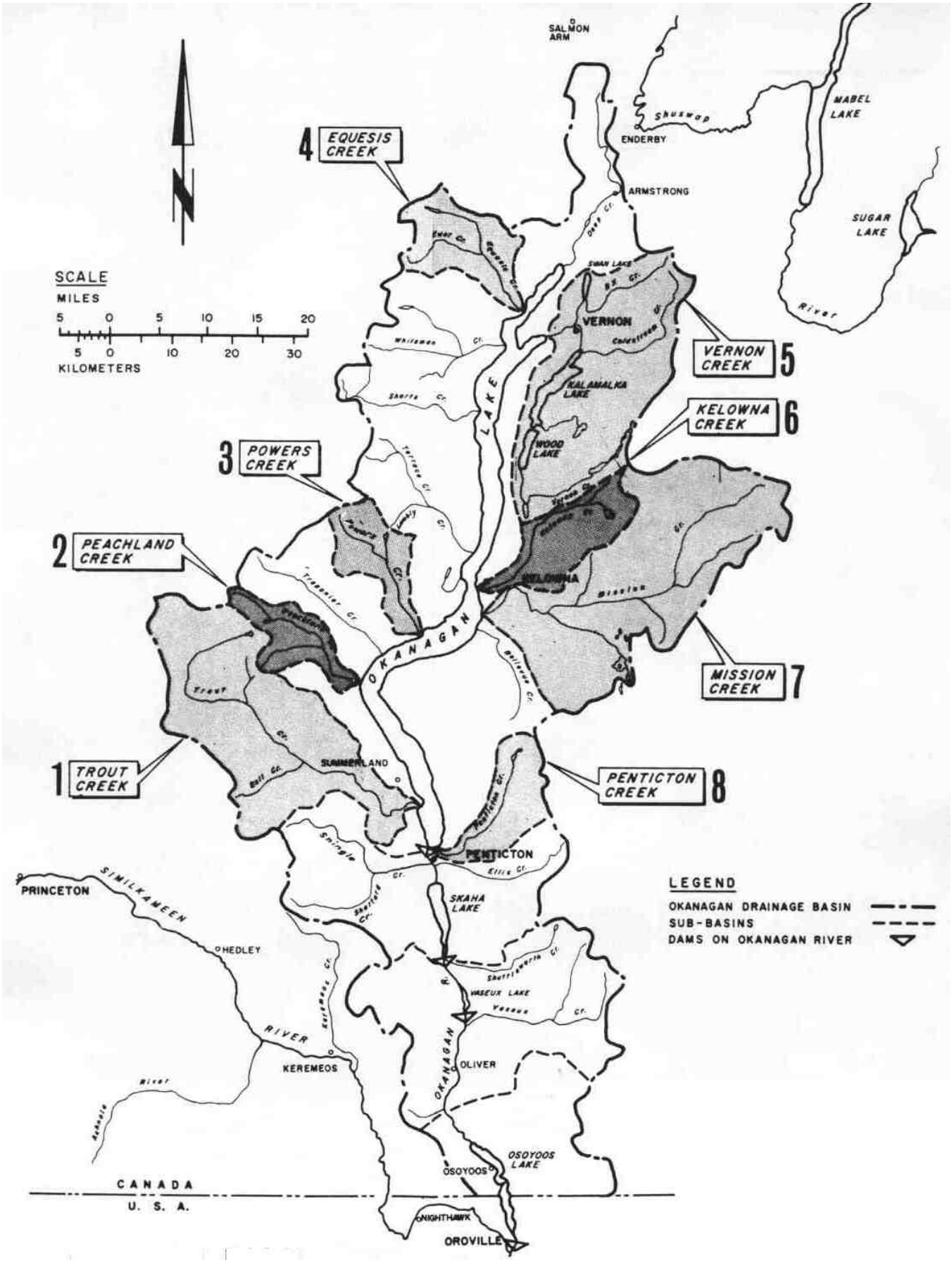
a) There are no consumptive use water deficiencies to be noted even in a dry year.

b) There are considerable non-consumptive water shortages, particularly in August and September, even in an average year. Modification of storage release patterns is unlikely to relieve this shortage to an appreciable extent. It seems probable that requirements exceed the creek's natural ability to generate flow.

14.2.8 Penticton Creek

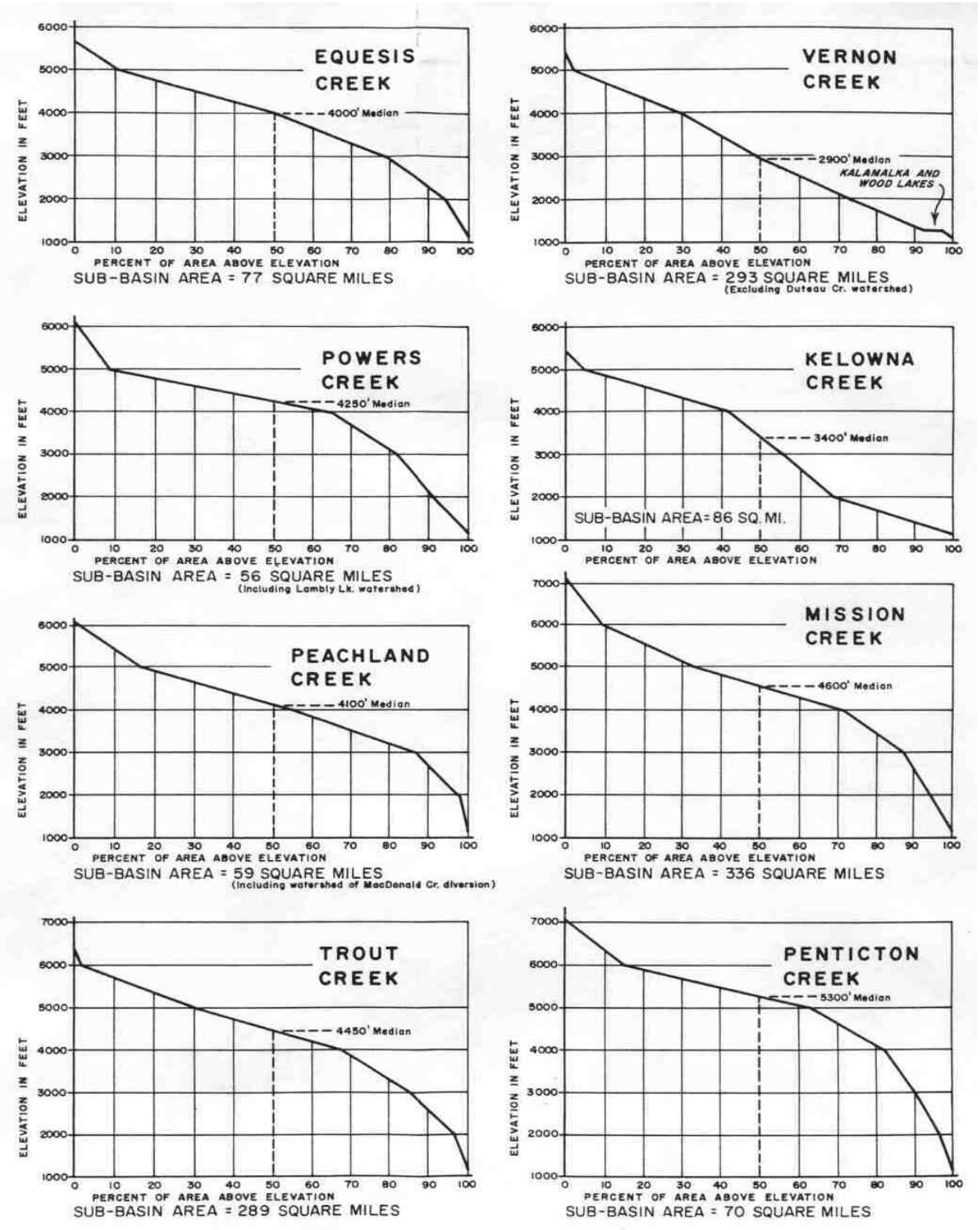
a) Water supply appears to be quite adequate to meet present and future consumptive use demands, based on the present method of operation of storage.

b) Although there are no stated non-consumptive water requirements, computations have indicated the frequent occurrence of a dry creek bed. This would be unsatisfactory and would constitute a deficiency for Fisheries purposes.



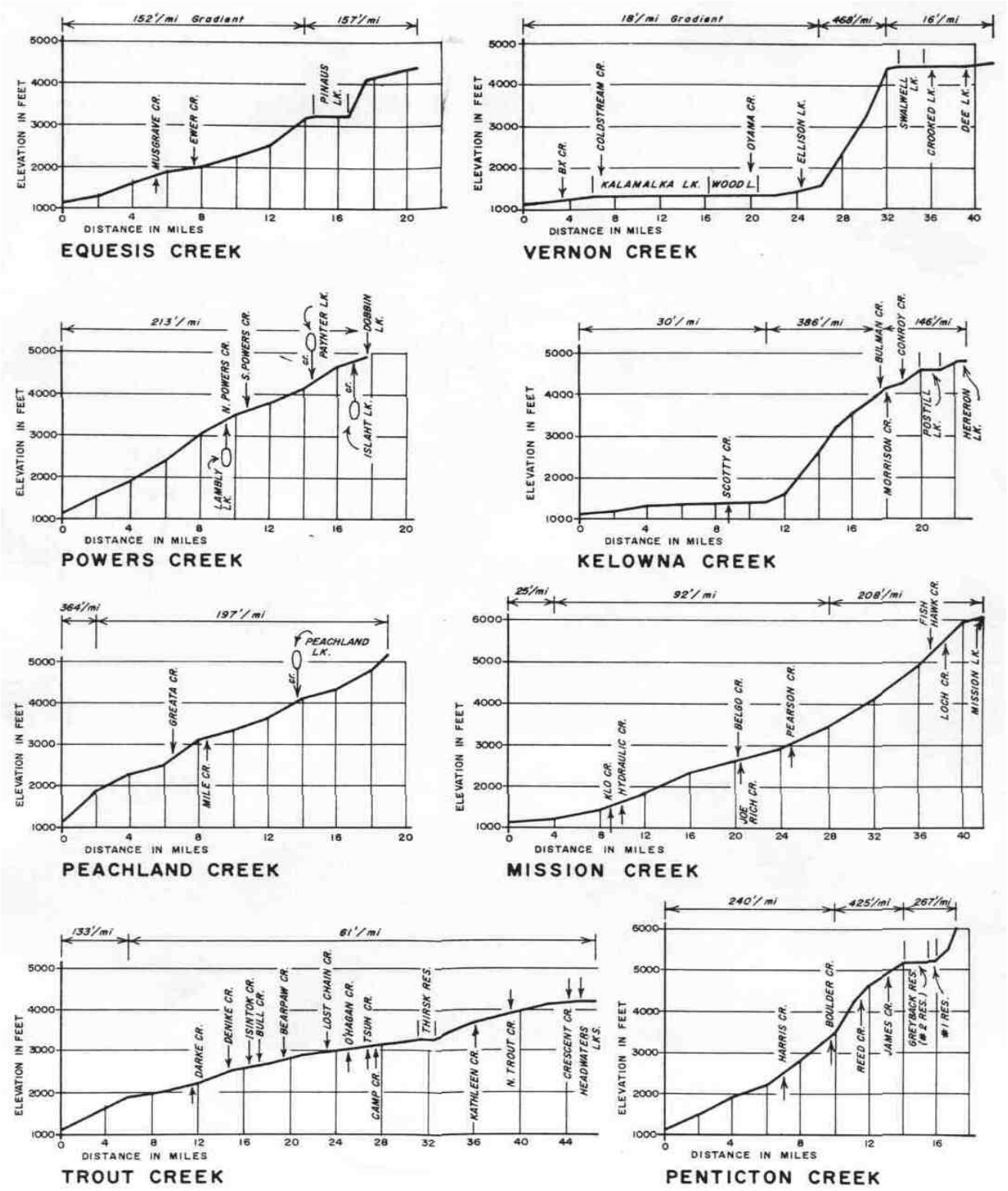
OKANAGAN BASIN
LOCATION MAP

Figure 14.1



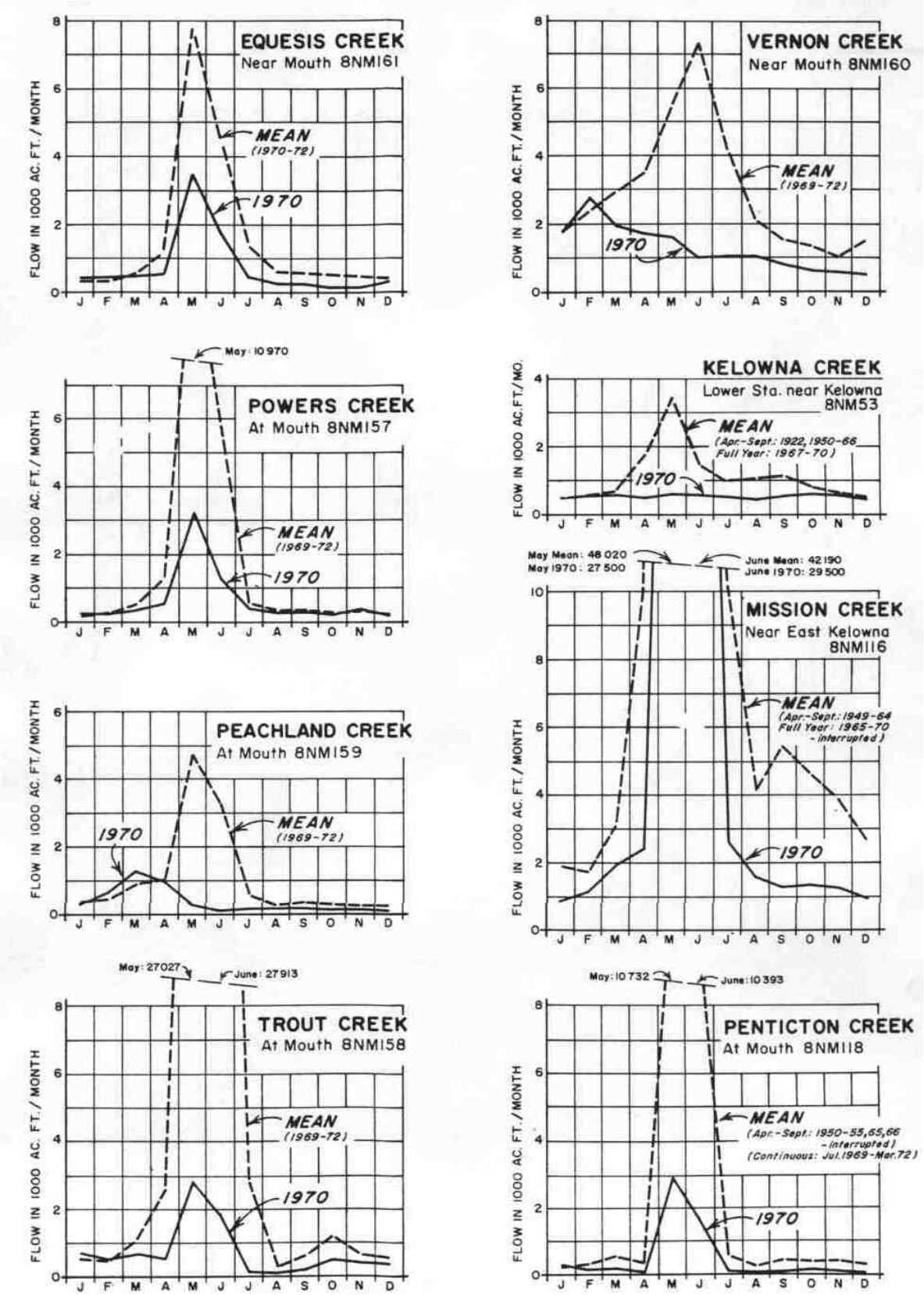
NOTE:
Elevation in feet
above mean sea level

AREA-ELEVATION CURVES Figure 14.2



NOTE:
Elevation in feet
above mean sea level

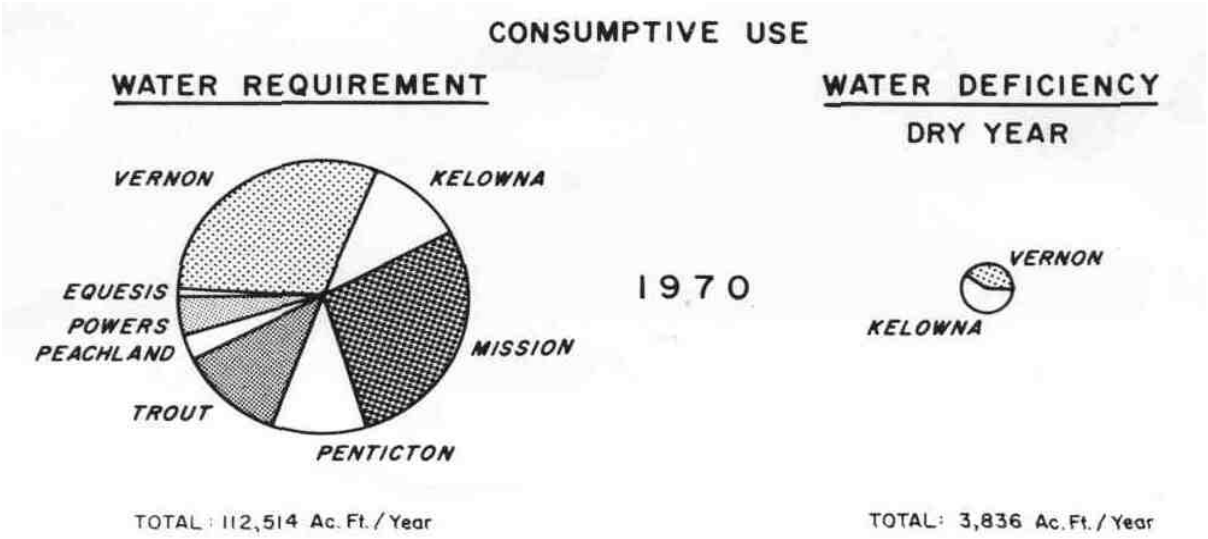
CREEK PROFILES Figure 14.3



HYDROGRAPHS Figure 14.4

		TROUT CR.	PEACHLAND CR.	POWERS CR.	EQUESIS CR.	VERNON CR.	KELOWNA CR.	MISSION CR.	PENTICTON CR.	TOTALS
Area	Sq. Miles	289	59	56	77	358	86	336	70	1,331
Natural Flow at Mouth (Ac.Ft. x 100)	Dry Year	237	89	80	102	391	99	969	219	2,186
	Av. Year	544	150	138	178	678	170	1,429	348	3,635
	Wet Year	1,220	275	258	341	1,382	343	2,392	582	6,793
Active Storage (Ac.Ft.)	1970 Development	10,332	9,656	3,754	2,156	46,719	5,715	17,981	10,240	106,543
Storage Licences (Ac.Ft.)	1970 Development	11,940	12,505	5,493	2,190	54,485	7,735	25,725	13,355	130,603
Area Under Irrigation (acres)	1970 Development	4,306	617	1,637	356	14,075	4,848	10,135	1,666	37,640
Population (Persons)	1970 Development	5,960	1,444	3,490	90	24,360	10,420	10,340	18,146	74,250
Diversion Licences (Ac.Ft.)	1970 Development	14,818	16,629	5,201	3,429	74,600	16,481	47,033	10,610	185,714
Water Requirement (Diversion) (Ac.Ft)	1970 Development	13,384	3,416	5,293	1,021	33,525	12,888	31,814	11,173	112,514
Consumptive Use Deficiency in Dry Year (Ac.Ft.)	1970 Development	0	0	0	0	1,540	2,296	0	0	3,836

NOTE: 1. Vernon Cr. includes the major Duteau Cr. diversion.
2. All diversions refer to consumptive use.



BASIC DATA (ALL CREEKS) Figure 14.5