

MARMOT CREEK BASIN: MANAGING FORESTS FOR WATER



CABIN AND TWIN CREEK EXPERIMENTS 1962-1987





MARMOT CREEK SUBBASINS

Subbasin	Drainage	Treatment
	Area (ha)	(completion date)
Cabin Creek	212 (50%)*	Commercial cut (1974)
Middle Creek	285	None (control)
Twin Creek	264 (50%)	Honeycomb cut (1979)

*Percentage below tree line

OBJECTIVE OF CABIN CREEK TREATMENT

To determine if the guidelines of the Alberta Forest Service for commercial cutting in spruce-fir forests were satisfactory for maintaining the volume of high quality water that these watersheds yield

(Swanson et al., 1986)



ALBERTA FOREST SERVICE GUIDELINES

- No debris from road construction and maintenance, and logging shall be allowed to enter any water courses
- Roads shall be located and constructed so as to cause a minimum of soil erosion and sediment deposition in streams, and no road shall restrict the natural flow of streams
- Abandoned skid roads and trails shall have adequate drainage to prevent erosion
- No green timber shall be cut within 100 feet of the high water mark of any water course
- Logging methods (i.e. skidding) shall be confined to the use of horses, rubber tired skidders or crawler tractors

(Rothwell 1977)

THE COMMERCIAL CUTTING ON CABIN CREEK SUBBASIN



(Rothwell, 1977)





OBSERVED AND PREDICTED SWE ON CABIN SUBBASIN BELOW TREELINE AT MAXIMUM SNOW PACK, 1975-1977



PREDICTED VS OBSERVED STREAMFLOWS FOR CABIN CREEK DURING THE POSTTREATMENT PERIOD



OBJECTIVE OF TWIN CREEK TREATMENT

To prolong recession flow from snowmelt and/or

delay the time to peak runoff

(Research Coordinating Committee, Alberta Watershed Research Program, 1977)

HYDROGRAPHS ILLUSTRATING OBJECTIVE OF THE TWIN CREEK TREATMENT







Mean maximum snow accumulation, 1973-1976, in forest openings at James River, near Caroline. (*After Golding 1977*)



Opening diameter (tree heights (H))

Mean snow accumulation at last measurement of the season, 1973-1976, James River, near Caroline (After Golding, 1977)



DETAILS OF TWIN CREEK SUBBASIN TREATMENT

- Based on the James River results, treatment of Twin consisted of 2103 circular clearings of 15 m and 20 m diameter, or 3/4 to 1 1/2 times the height of the surrounding forest
- 40% (52.8 ha) of the forested area cleared
- Mechanical clearing over most of the subbasin
- Clearings centred on alternate intersections of a square grid 15 or 20 m apart
- Slash and non-merchantable trees were flattened
- Merchantable trees were removed in tree lengths with rubber-tired skidders. Horse logging was tried on a small portion of the subbasin

(Golding and Swanson, 1986)

HONEYCOMB TREATMENT APPLIED TO TWIN CREEK SUBBASIN



(Golding and Swanson, 1986)

SNOW ACCUMULATION ON TWIN SUBBASIN BELOW TREELINE AT MAXIMUM SNOWPACK, MARCH 1980-1982 (410 MEASUREMENT POINTS)



(After Golding and Swanson 1986)



EFFECTS OF TWIN TREATMENT ON STREAMFLOW

- Nakiska resort and ski runs were built between 1985 and 1987; some ski runs intruded on Twin Creek subbasin (also snow- making machines?)
- Streamflow was measured on Cabin, Middle and Twin Creeks up to the end of 1986
- This suggests that there are five years of post-treatment streamflow data (1980 -1984) that can be used to evaluate the effects of the Twin treatment, or 4 years if we exclude the year following treatment
- I used all the data available for Middle Creek and Twin Creek to obtain some tentative results. I defined 1964 – 1977 as the pretreatment period and 1980 – 1986 as the posttreatment period

CALIBRATION FOR PREDICTING TWIN CREEK JUNE STREAMFLOW



Water Survey of Canada data



PREDICTED VS OBSERVED STREAMFLOWS FOR TWIN CREEK DURING THE POST- TREATMENT PERIOD



