Managing Forests for Water

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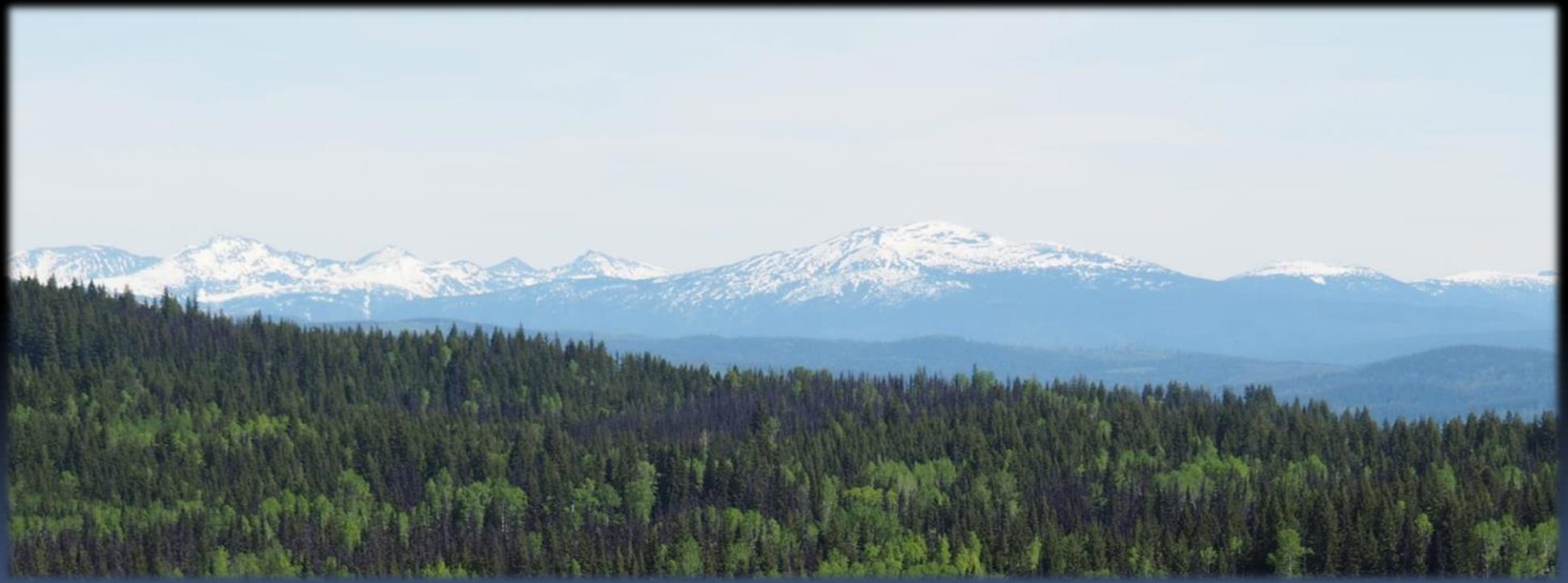


Outline

Some random hydrologic thoughts about forests and water, water from forests, water for forests …

Cartoon (minus hearts) from: Toews and Brownlee 1981

The current focus in forest/water management

FRPA objective 8.2 – Community watersheds

(2) The objective set by government for water being diverted for human consumption through a licensed waterworks in a community watershed is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities within the community watershed from resulting in …….

(3) The objective set by government under subsection (2) applies only to the extent that it
does not unduly reduce
the supply of timber
from British Columbia's forests.

Some world examples

California/Colorado

- burning, thinning and patch cutting to increase snow catch, reduce evaporation losses, extend melt season, increase reservoir inflow and provide additional water for remaining trees
- "forests to faucets" initiative to get water utilities and hydropower producers to pay for thinning to sustain water supplies

New Mexico

- "water for forests" –thinning, mulching and irrigation to reduce forest vulnerability to increasing water stress

Brazil

- water availability zoning, water efficient species selection, 'mosaic' plantation management strategies, use of the 'catchment' as the planning unit for water conservation in forest management plans

Europe

- "hydrology-oriented silviculture", thinning to reduce influence of climate change on tree growth, to enhance infiltration to groundwater and sustain reservoir inflows

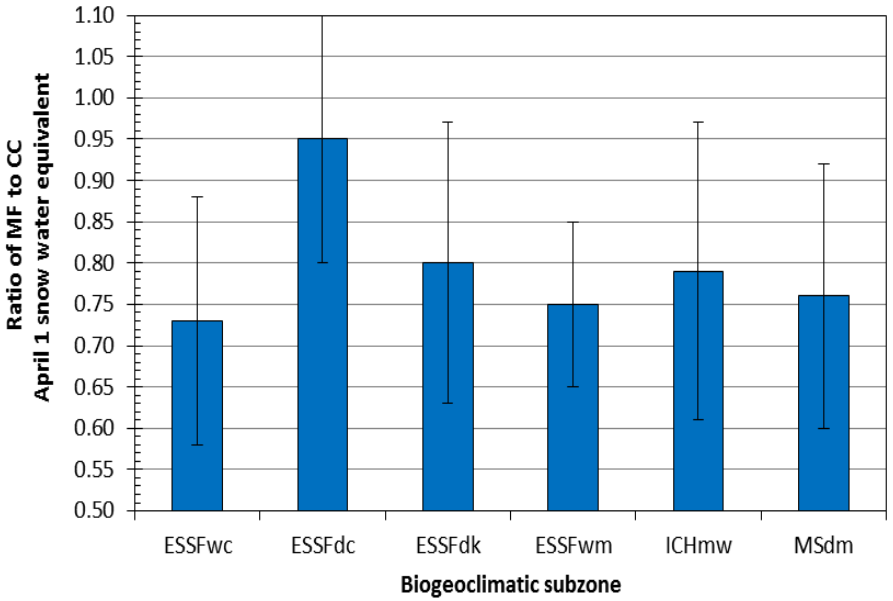
What if the focus in BC changed?

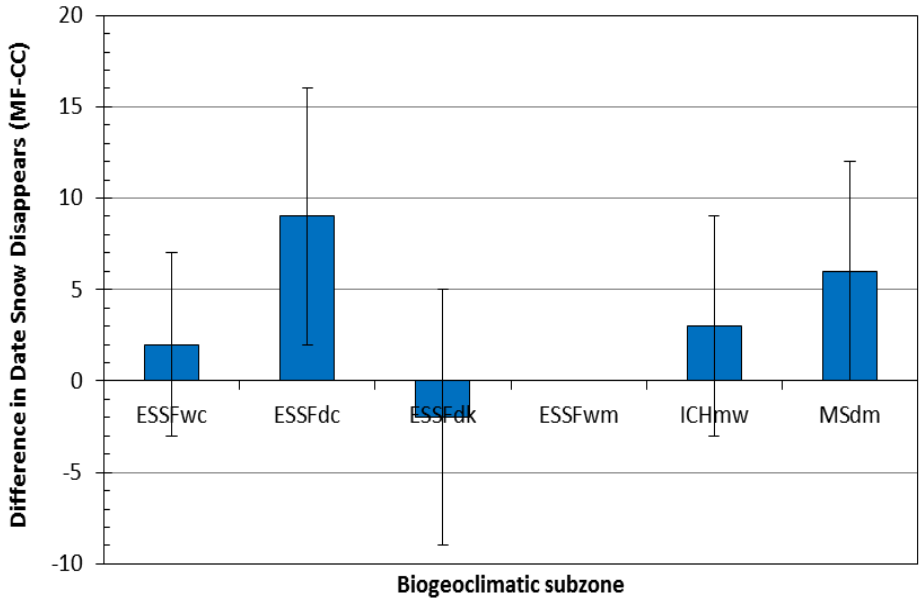
- making water the primary resource value in and from forests and, therefore, the key environmental variable considered in future forest management

Local data relevant to hydrology-oriented silviculture

Clearcutting:

(southern interior locations by BEC unit = 11, 4, 1,2, 14, 4; survey sites and years of survey vary)





5 to 30% less snow water (SWE) in mature forest than clearcut

snow disappears a few days earlier to 9 days later

with tremendous spatial and annual variability

Is this a little or a lot of water, where does it all go, and does timing matter?

Partial Cutting: Berry Creek

- ESSFwc, 1635 m, S-aspect
- reduced live stems by ~50% (2590 to 1360 sph)
- basal area by 70% (50 m^2/ha to 15)



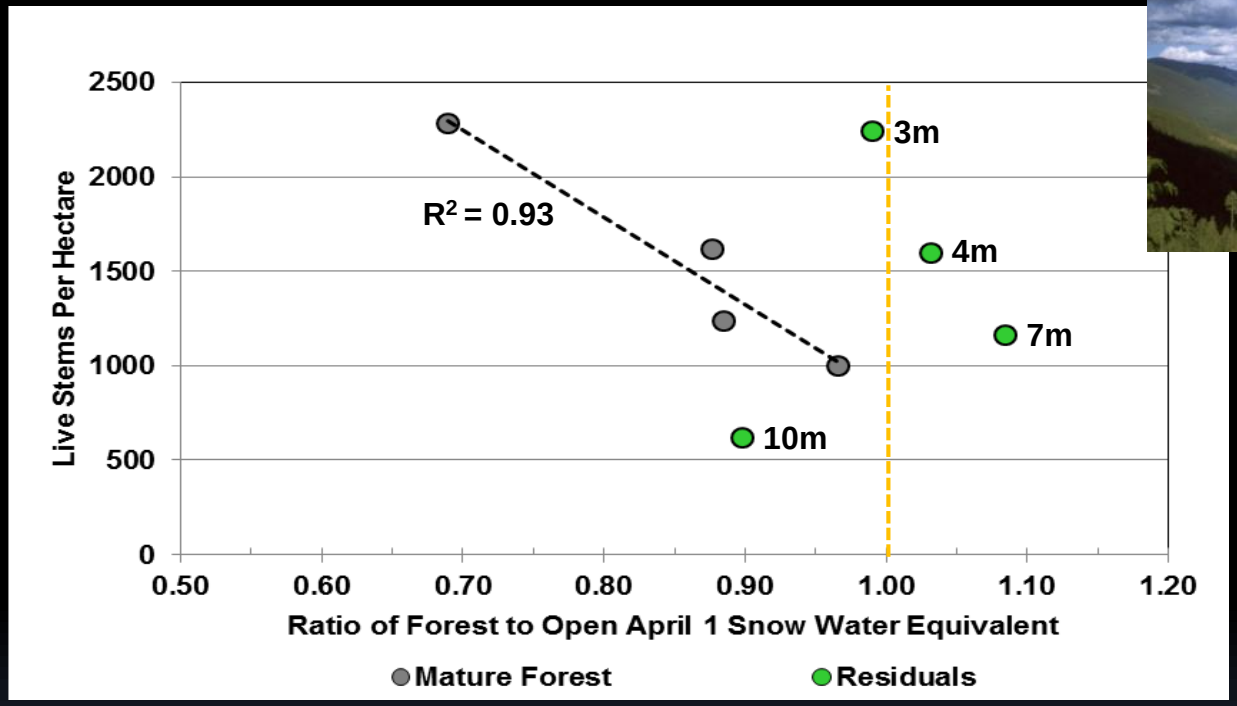

Over a three-year survey period,

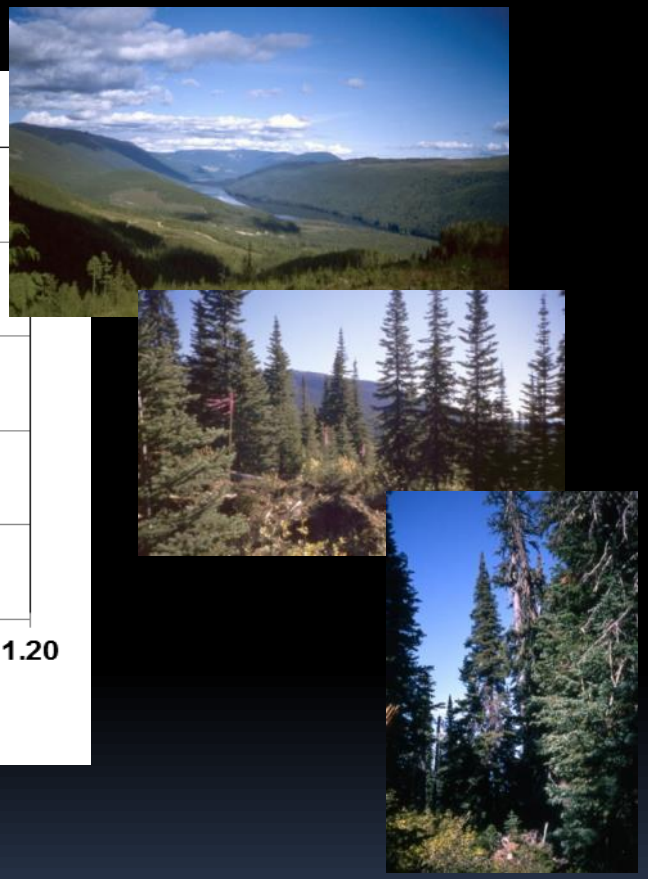
- average Apr1 snow water equivalent in the clearcut = 660 mm
- no significant difference in snow variables between sites

- by year, 5% less, 8 and 3% more water on Apr 1in partial cut than forest (27 mm less and 48 and 18 mm more)

Retention: Birk Creek

- ESSFdc, 1550–1750 m, flat, retained young subalpine fir
- average Apr 1 SWE in clearcut = 534 mm



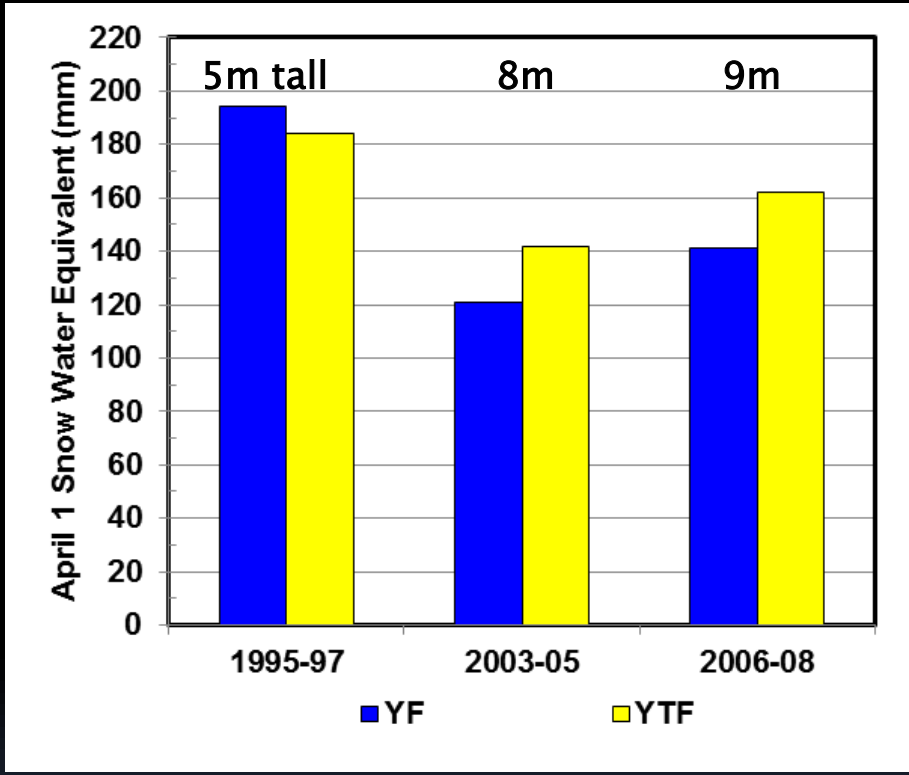


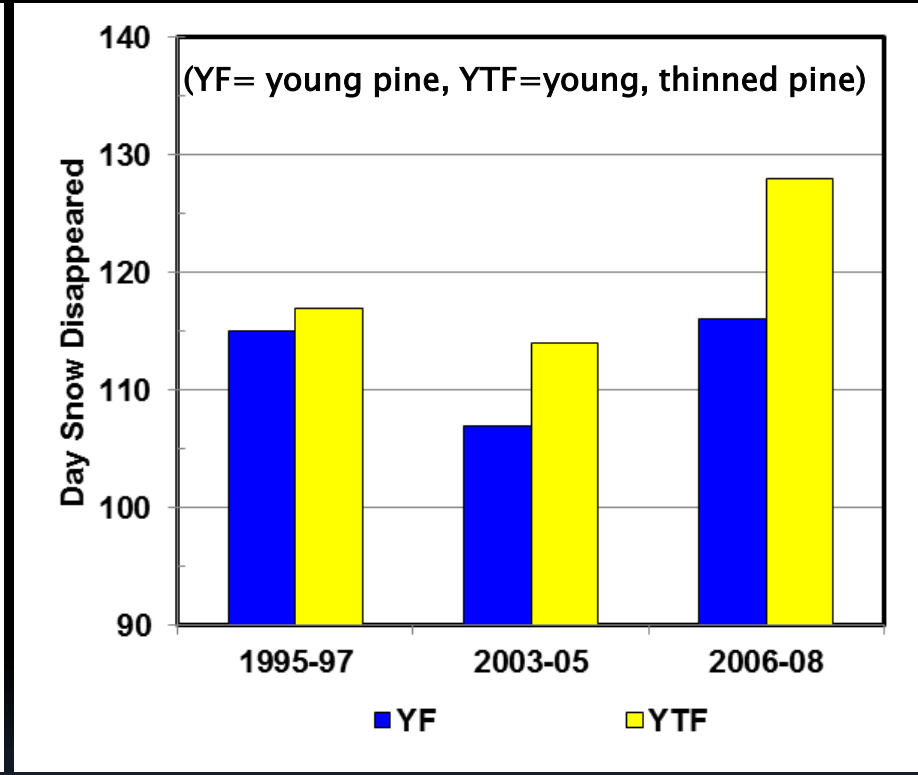
Over a four-year survey period,

- ~2% (~10mm) more water as snow on Apr 1 for every 100 sph reduction in mature stand density
- more to 10% less SWE in residual stands than clearcut

Thinning: Mayson Lake

- MSdm, 1300 m, flat, young pine thinned from 2600 sph to 1000 sph





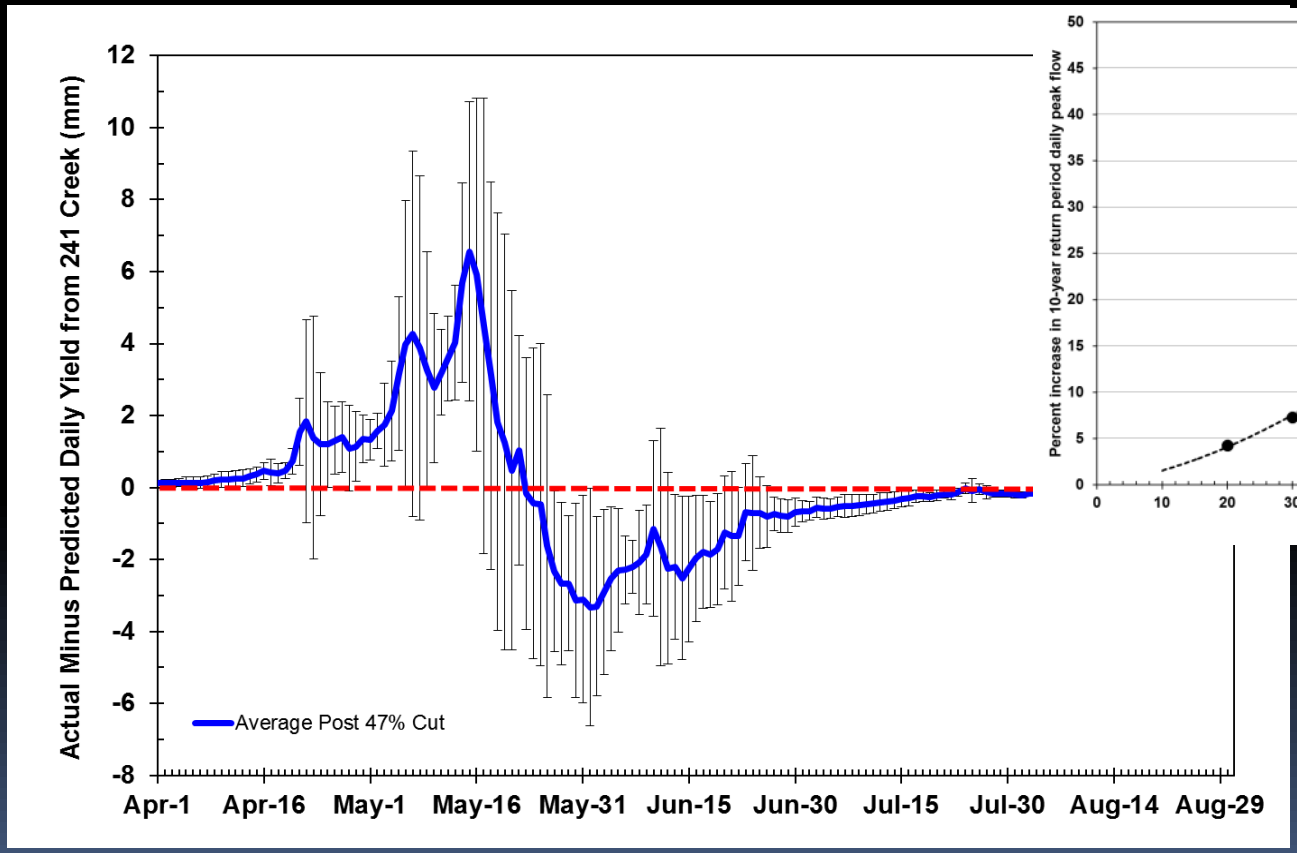
Average by survey period:
5% less, 11, 10% more in thinned

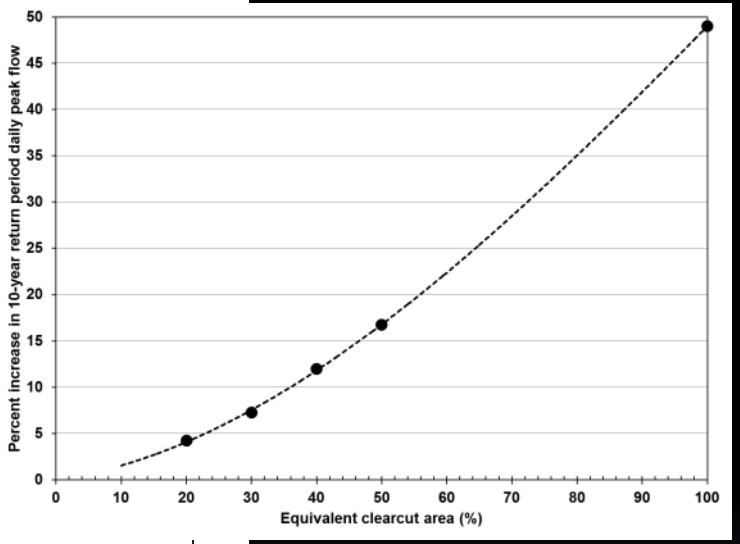
2-17 days later in thinned

(~20 mm more water at onset of melt)

Is any of this important/useful, hydrologically or silviculturally, on site, downslope or downstream?

Small upland watershed response to clearcutting





Questions to ponder and research

What do these stand/upland changes mean where it counts:

- water availability (at the site and watershed scales, during high and low flow seasons, proportion to groundwater, climate change)
- snowfree date (timing of soil moisture input and peak runoff, growing season, climate change)
- how do we choose (ecological vs economic/social demands, forests and water, water from forests, water for forests)

Cartoon from: Toews and Brownlee 1981

Thank you