Using local knowledge, hydrologic, and climate data to develop a driftwood harvest model in interior Alaska

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INTRODUCTION

Rural Alaskan residents are concerned that the character of the summer discharge in the Yukon River is changing, which is affecting their ability to harvest driftwood. The Yukon River flows northwesterly through British Columbia and the Yukon Territory before flowing southwest through Alaska. In most summers, residents of Tanana, Alaska harvest driftwood from the Yukon River during two different periods. Typically, driftwood accompanies high flows on the Yukon River associated with spring break-up. A few weeks later, a second series of driftwood appears, associated with the "2nd rise," which is reported to occur during early June. This study examines the nature of the differential timing of high flow events in the Yukon River. Many communities in interior Alaska have grown to rely upon driftwood as an important source of wood, which is used in construction, carving, and as a fuel source. Increasingly, villages in rural Alaska are trying to lessen their dependence upon expensive fossil fuels. To achieve this goal, a number of Alaskan villages have recently installed wood chip-fired boilers to generate heat and/or electricity and additional boilers are slated to be installed in rural Alaska in the near future. These boilers are largely fed by driftwood, a cheap and easily processed wood source. Some Tanana residents have expressed concern that in recent years, driftwood was not readily available because the "2nd rise" flood event was absent. This is disconcerting for rural Alaskans that are becoming increasingly reliant upon the driftwood flows. Our goal is to determine if the perceived changes in driftwood availability are related to changes in river hydrology and if predicted changes in hydrology may affect driftwood flows and the livelihoods of rural Alaskans.

RESEARCH QUESTIONS

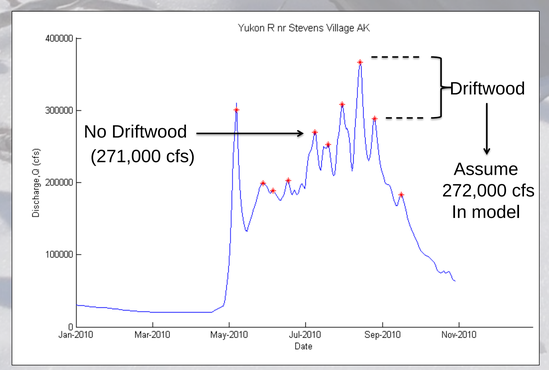
1. How reliable is the driftwood harvest in the Yukon River?
2. Have fluctuations in river hydrology affected the driftwood harvest?

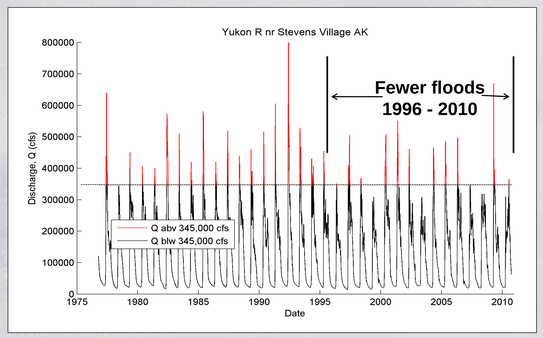
LOCAL KNOWLEDGE

1. Discussions with rural Alaskans about driftwood harvest, needs, and consumption
2. Hydrologic analyses of gaging station data
3. Driftwood harvest model based upon interviews and river hydrology
4. Incorporate climate model into runoff to model changes in river hydrology and potential driftwood harvest

Share results with local community and modify assumptions to better reflect reality

HYDROLOGIC ANALYSES

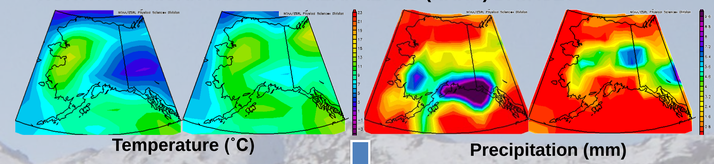


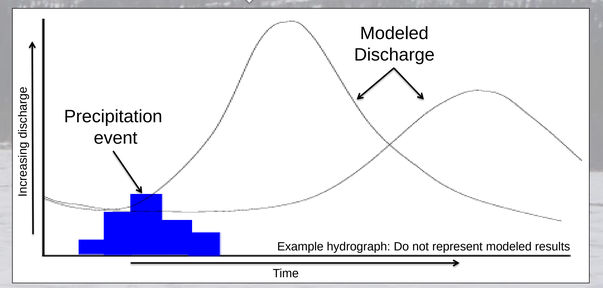


DRIFTWOOD MODEL

	Parameter	Period of interest 1977-1994	Period of interest 1995-2010
Hydrology	Avg. flood discharge (cfs)	501,000	434,000
	Avg. # floods (>272,000 cfs)	3.3	3.6
	Total number flood days	40	36
	Avg. harvest days/year	10.1	10.8
Local Resident	95% harvest rate (cord/yr)	30	30
	95% harvest rate (cords/day)	5	5
Household	# Households/community	130	130
	Total # harvesting households	20	20
	Household demand (cord/yr)	3.75	3.75
	Mean harvest (cord/house/day)	2.75	2.75
	Maximum Mean annual harvest (cord/house/yr)	28	30
	S.D. of mean (cord/house/yr)	5.25	5.25
Community	Mean annual harvest (cord/community/yr)	542	579
	Total community demand (cord/community/yr)	488	568
	Excess wood available (cord/community/yr)	**54**	**11.7**

NORTH AMERICAN REGIONAL REANALYSIS (NARR) DATASET





RESULTS & CONCLUSIONS

Since 1996, small flood events (1.25 year flood event; 345,000 cfs) on the Yukon River (Stevens Village) have decreased in magnitude compared to the period between 1977 and 1995, but small flood events have increased in duration and frequency. Based upon this analysis, our model estimated an *increase* in the maximum possible driftwood harvest since 1995, but since 2007 community demand has also increased. In the model, the presence of driftwood is limited to flood flows that exceed a threshold of 272,000 cfs. This value was based upon reports by Tanana residents regarding driftwood harvests in 2010. The increased number of small flood events exceeding our threshold was the primary factor affecting this result. Additional interviews may explain if and how our assumptions should be modified. Future efforts include examining potential changes in the harvest of driftwood under future climate scenarios. It is important to understand how the harvest of driftwood might change given the increasing reliance of rural Alaskans on wood for their fuel requirements.