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

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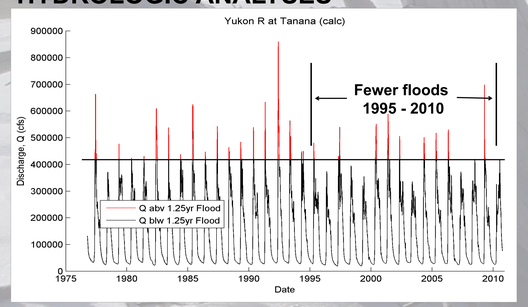
INTRODUCTION

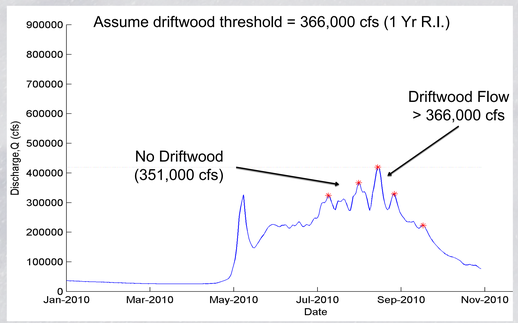
Many rural Alaskan residents rely on harvested driftwood from the Yukon River for fuel and construction materials, however they have stated that the character of the summer discharge in the Yukon River is changing and affecting their ability to harvest this resource. We examined whether the perceived changes in driftwood availability are related to changes in river hydrology and how changes in hydrology may affect future driftwood flows and the livelihoods of rural Alaskans. The Yukon River flows northwesterly through British Columbia and the Yukon Territory before flowing southwest through Alaska. In most summers, major driftwood flows occur in 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 "June rise," which is reported to occur during early June, which is when the rural residents of Tanana, Alaska plan to harvest their annual supply of driftwood. This study examined the nature of the differential timing of high flow events in the Yukon River. 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 June rise flood event was absent. Rural Alaskans find this disconcerting because they have offset a dependence on fossil fuel use

LOCAL KNOWLEDGE

HYDROLOGIC ANALYSES



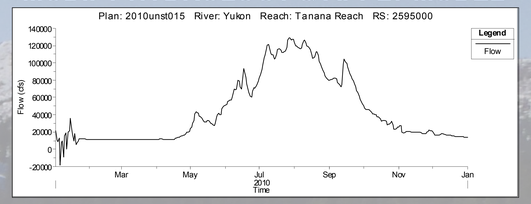
	1977 to 1994	1995 to 2010
Spring break-up peak flows	May 23 +/- 10 days	May 21 +/- 9 days
June Rise / Driftwood flows	June 6 +/- 6.5 days	June 19 +/- 21 days
Merged peak	41%	40%



DRIFTWOOD MODEL

	Parameter	Period of interest 1977-1994	Period of interest 1995-2010
Local Resident Hydrology		501,00	
	Avg. flood discharge (cfs)	0	434,000
	Avg. # floods (>366,000 cfs)	3.3	3.6
	Total number flood days	40	36
	Avg. harvest days/year	10.1	10.8
	95% harvest rate (cord/yr)	30	30
Household	95% harvest rate (cords/day)	5	5
	# 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		

FUTURE WORK: MODIFY HYDROLOGY & APPLY MODEL



We will use HEC-RAS to model the combined Yukon and Tanana River flows at Tanana; modify flows by +/- 5 and +/- 10%; apply driftwood model; and analyze the results. This should help to inform the community about how changes in hydrology might affect them.

RESULTS & CONCLUSIONS

Since 1995, small flood events (1.25 year flood events; ~419,000 cfs) on the Yukon River (Tanana) have decreased in magnitude compared to the period between 1977 and 1994, 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 366,000 cfs. This value was based upon reports by Tanana residents regarding driftwood harvest 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 will model the potential changes in the harvest of driftwood under scenarios that modify river flows. It is important to understand how the availability of driftwood might change given the increasing