



Flood hazard and risk – assessment, mapping and mitigation –

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Water Security**
USASK



Ice Jam in Winnipeg, Canada



photo by Karl-Erich Lindenschmidt (6 April 2011)

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ORIGINAL ARTICLE

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Evaluation of the implications of ice-jam flood mitigation measures

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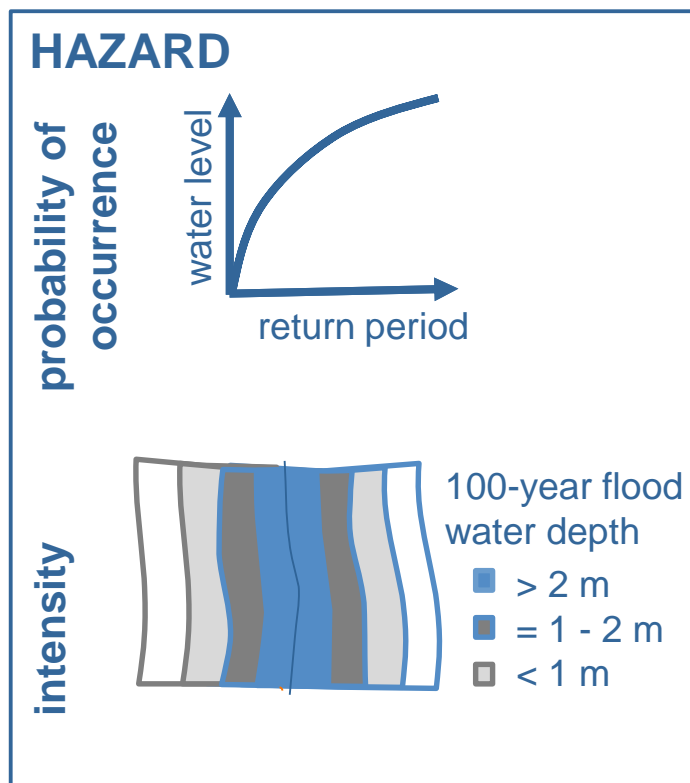
Abstract

Ice-jam flood risk management requires new approaches to reduce flood damages. Although many structural and non-structural measures are implemented to reduce the impacts of ice-jam flooding, there are still many challenges in identifying appropriate strategies to reduce the ice-jam flood risk along northern rivers. The main purpose of this study is to provide a novel methodological framework to assess the feasibility of various ice-jam flood mitigation measures based on risk analysis. A total of three ice-jam flood mitigation measures (artificial breakup, sediment dredging and dike installation) were examined

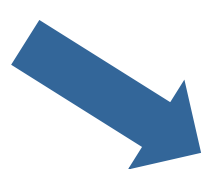
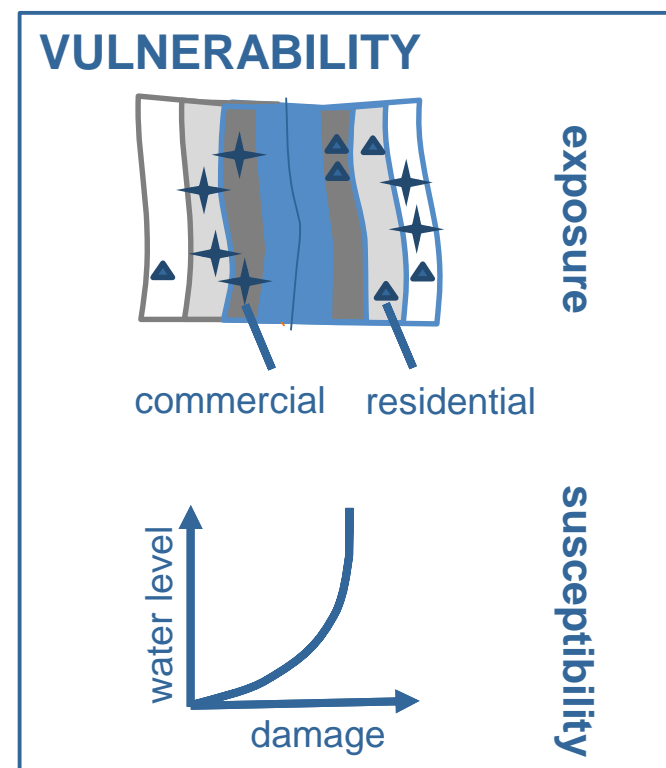
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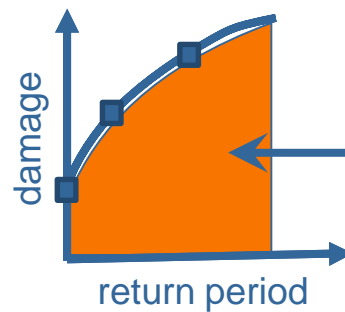
$$\text{Risk} = \text{Hazard} \times \text{Vulnerability}$$



X



expected
damages

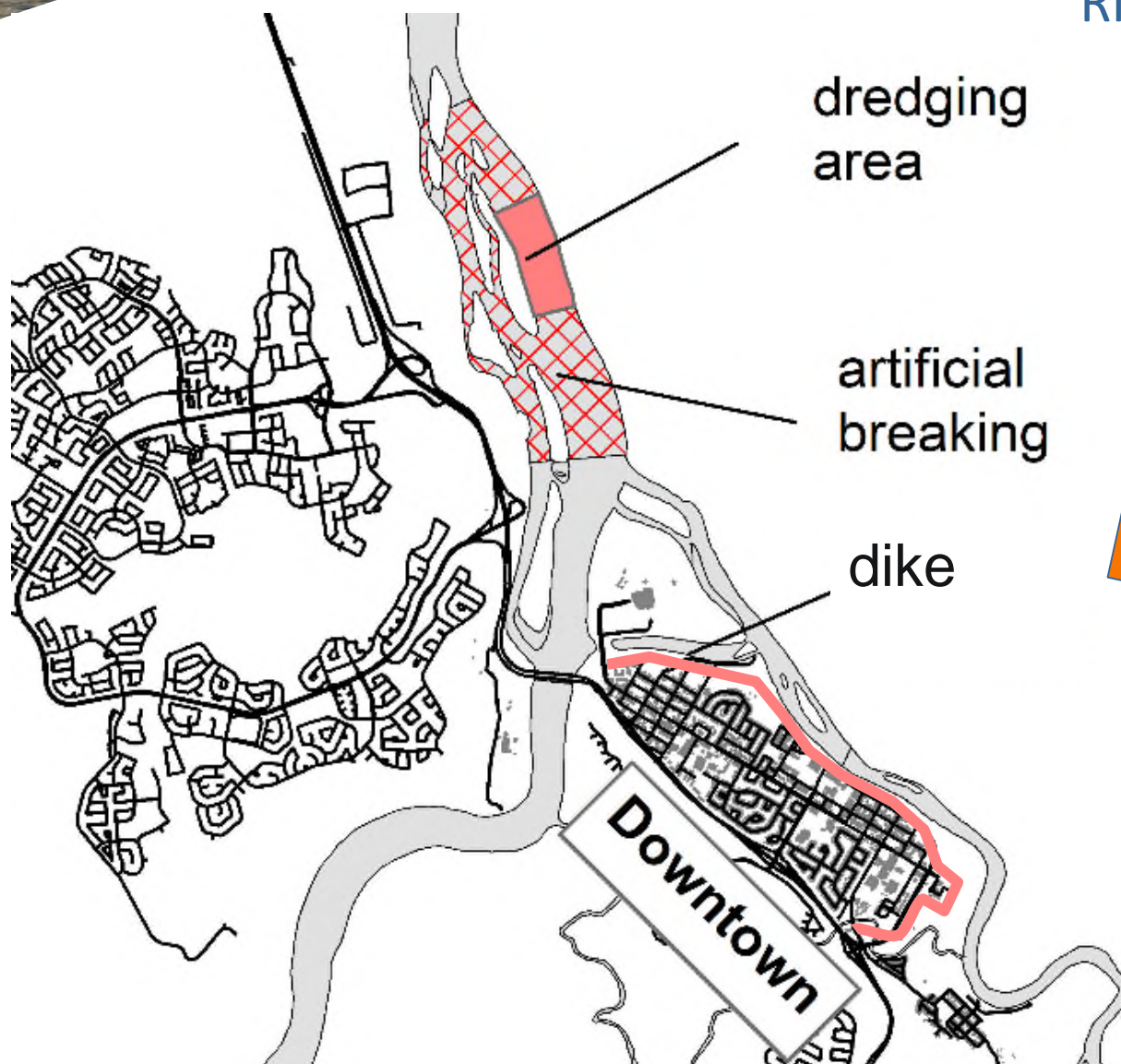


RISK



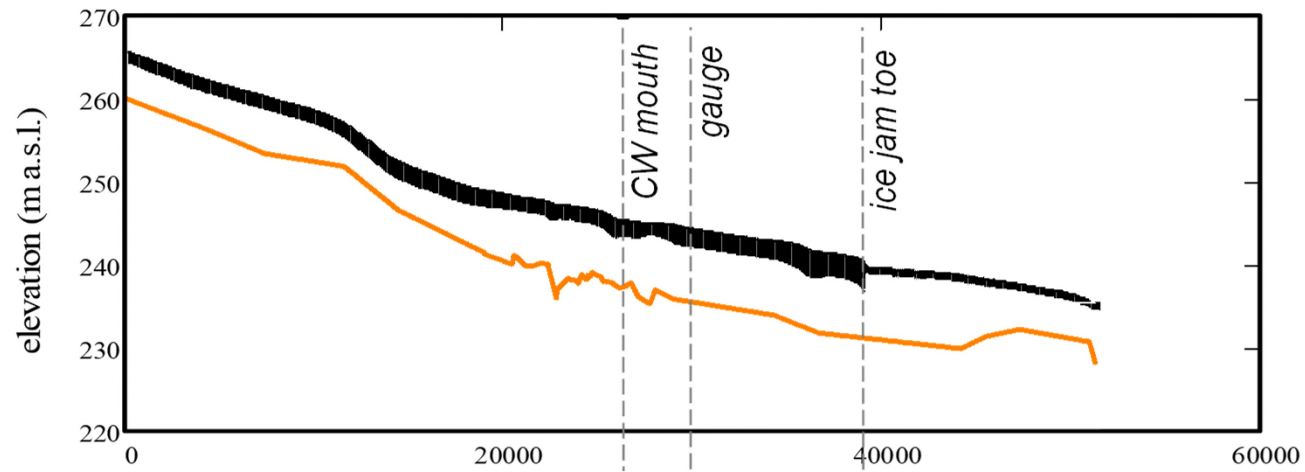


Study site of the Athabasca River at Fort McMurray





Cross-sections lowered to mimic sediment dredged

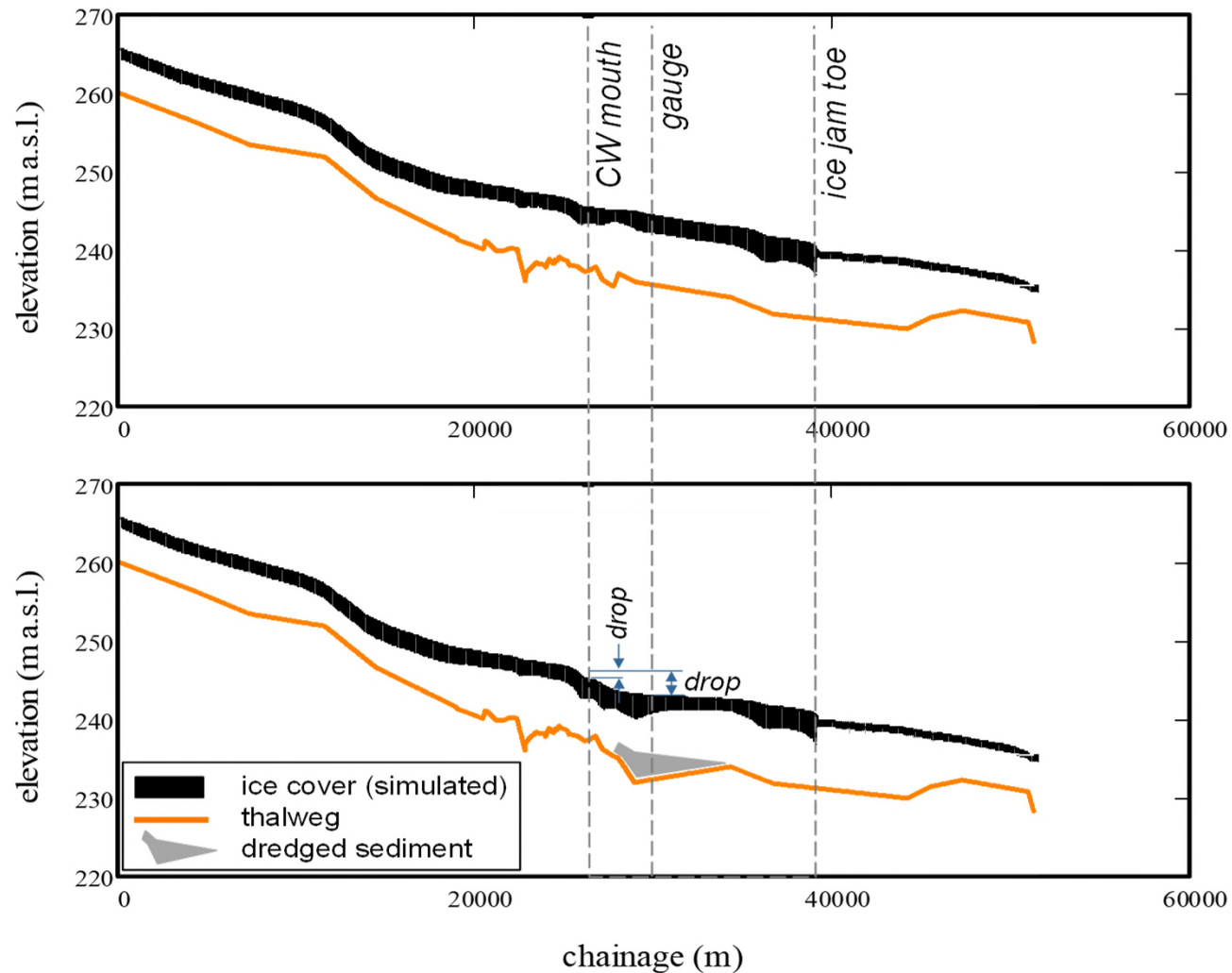


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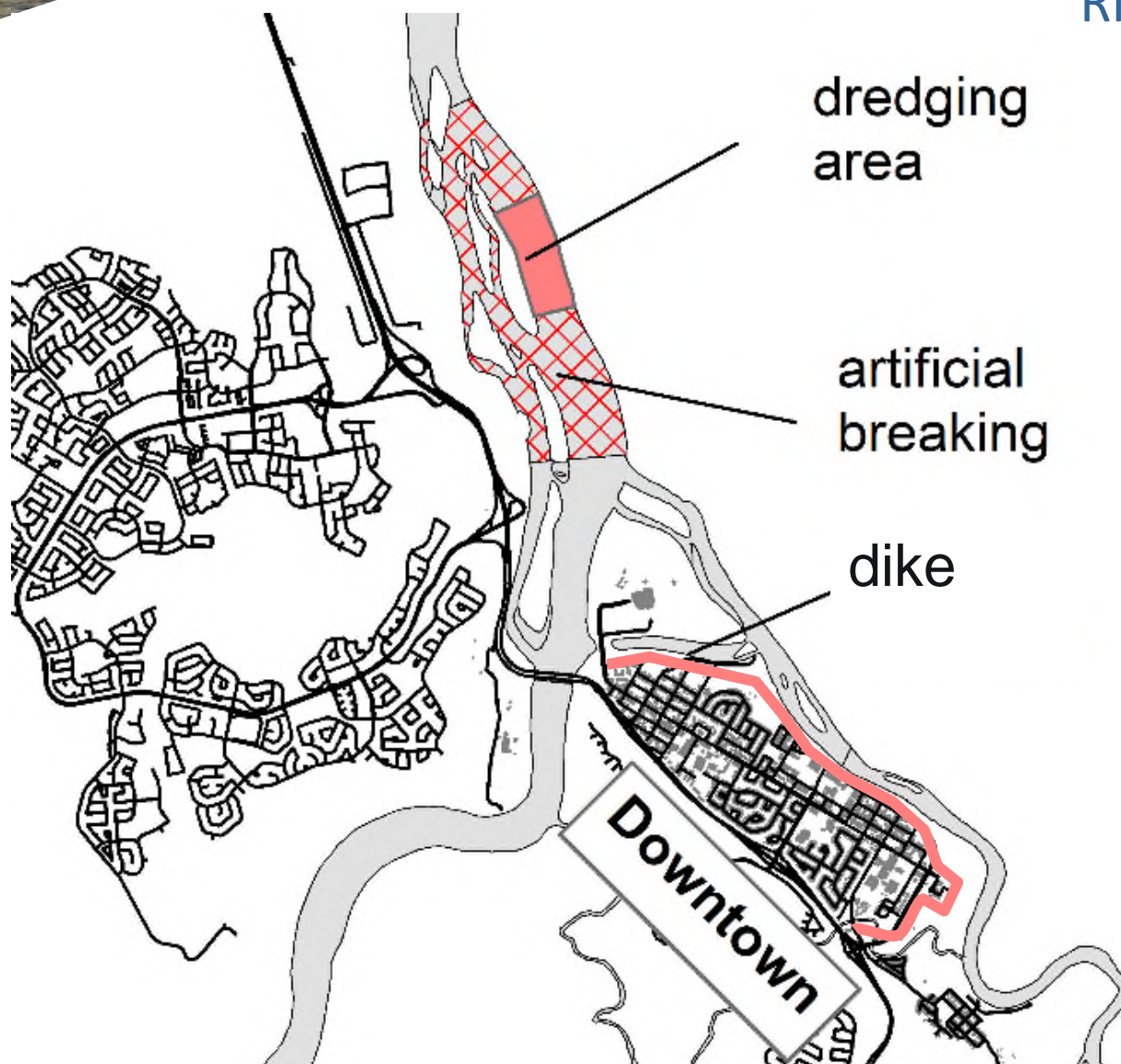


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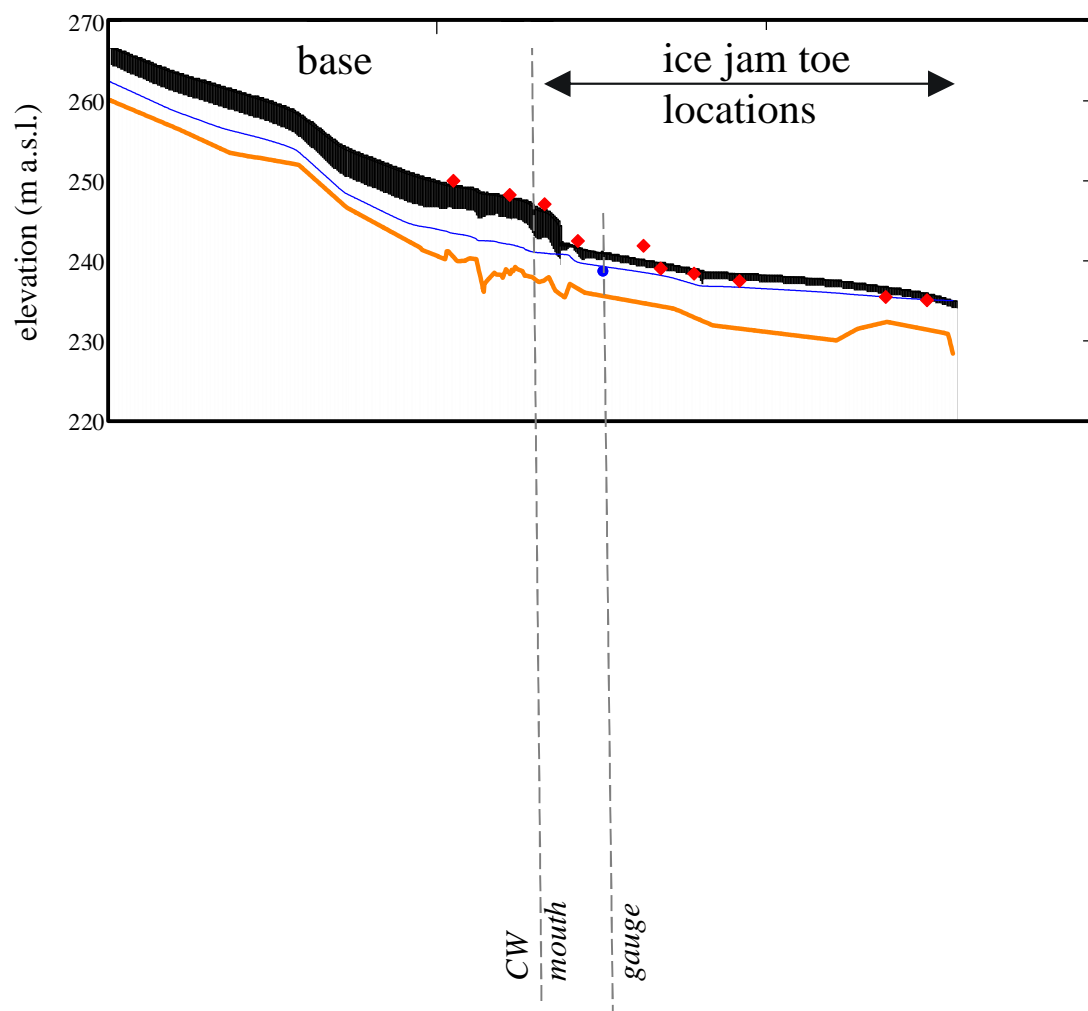
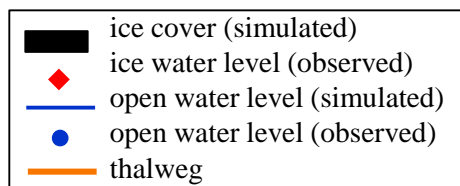


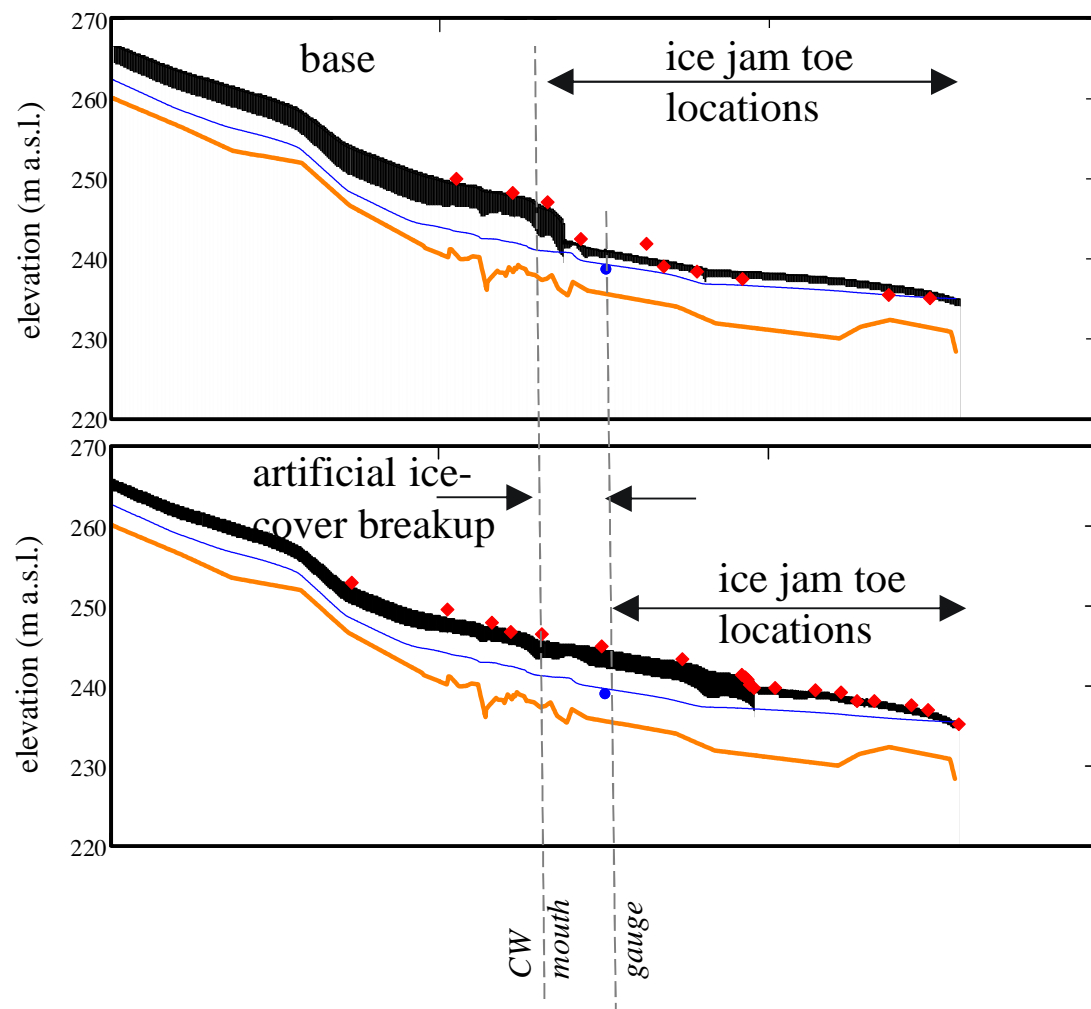
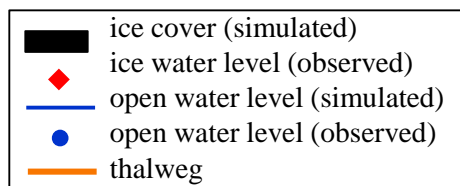


Artificially broken up ice cover along Red River, Canada



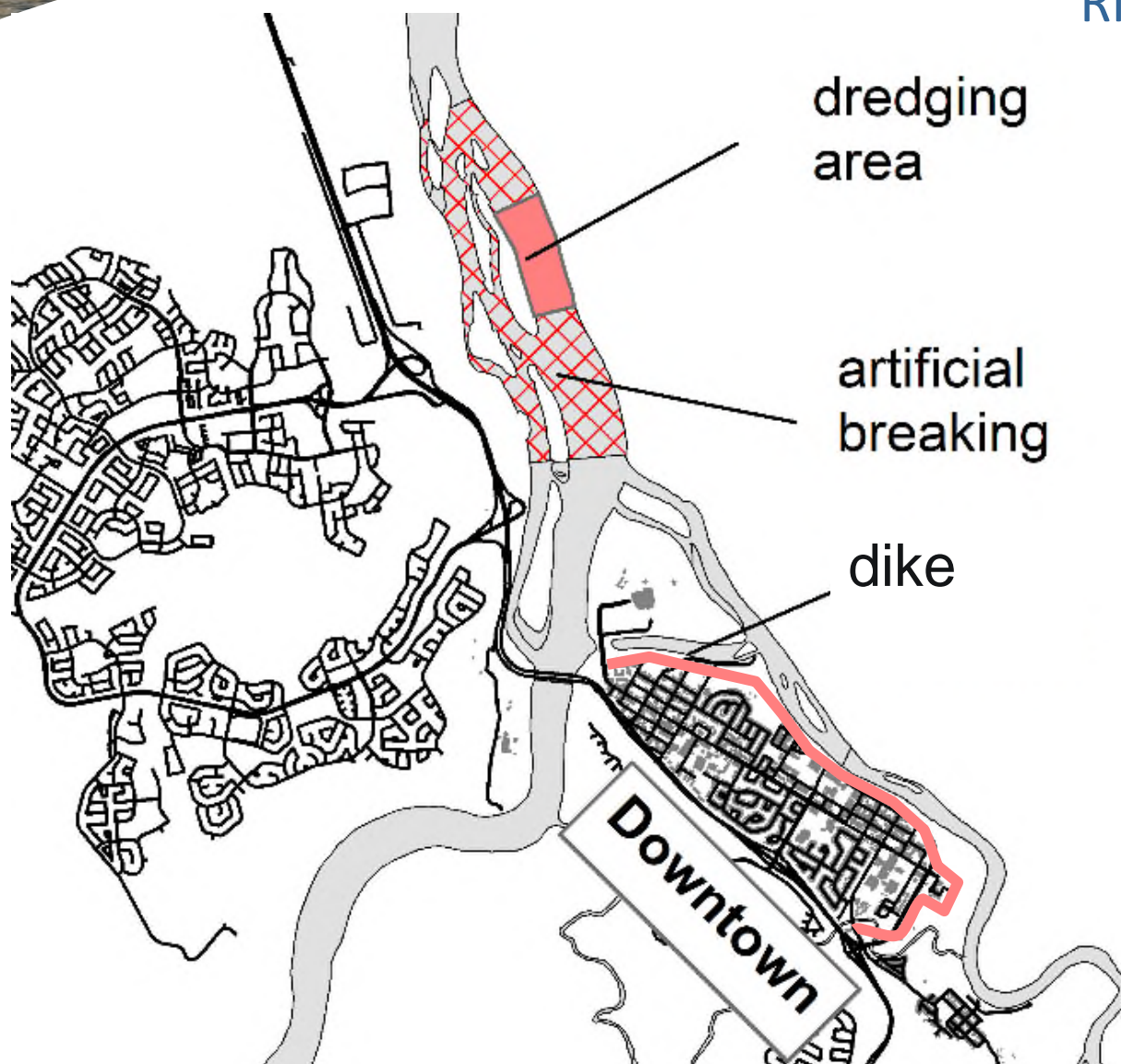
photo by Karl-Erich Lindenschmidt (6 April 2011)







Study site of the Athabasca River at Fort McMurray





Dike in Dawson City, Yukon Territory, Canada

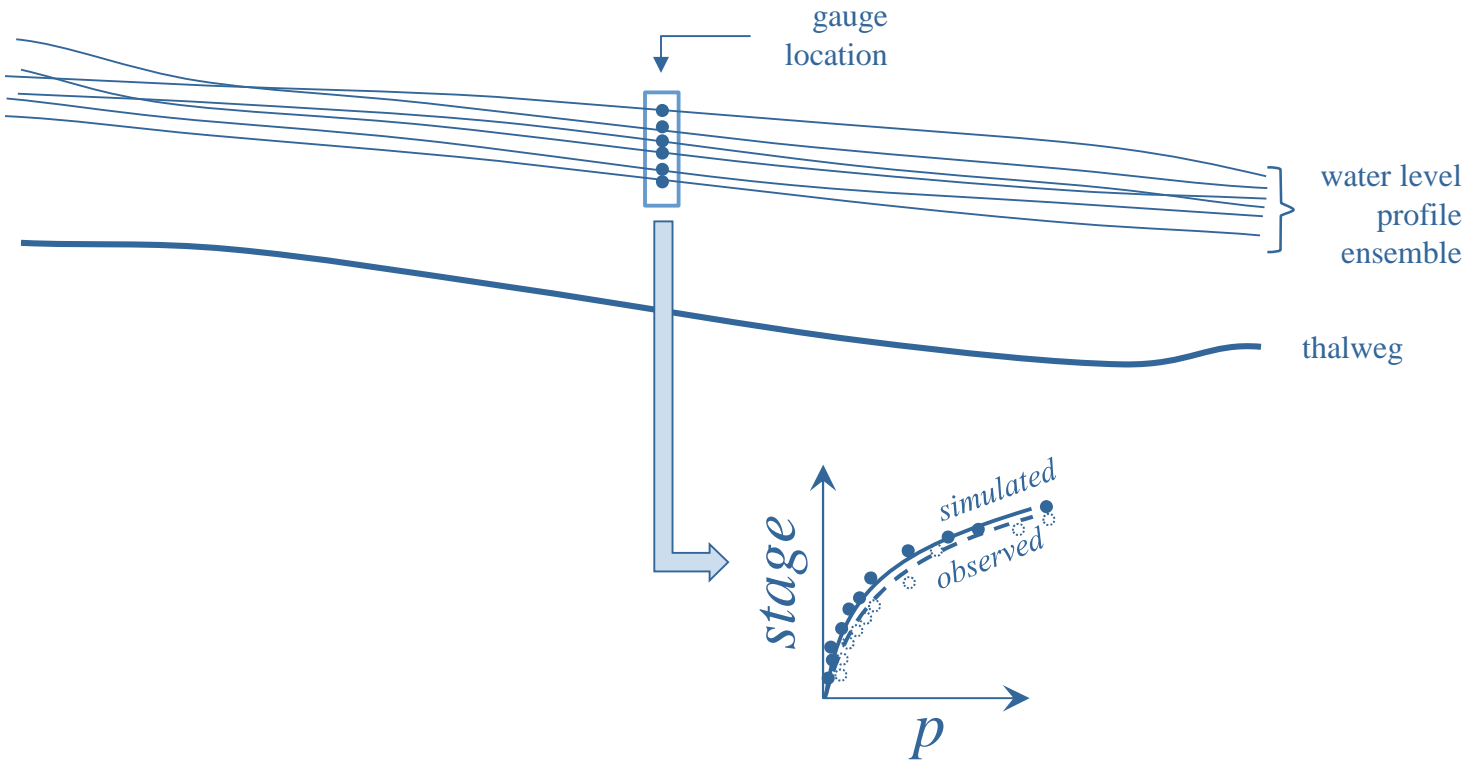
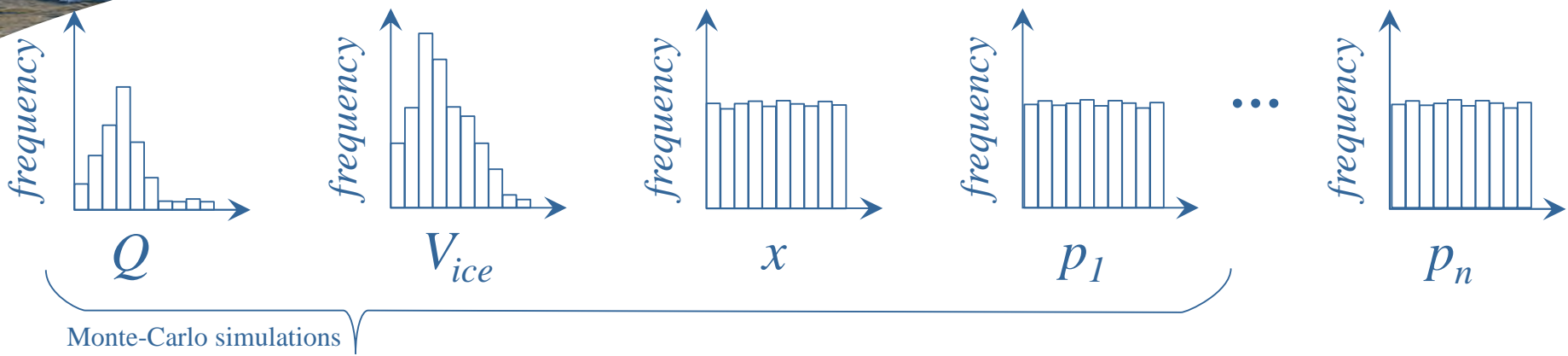


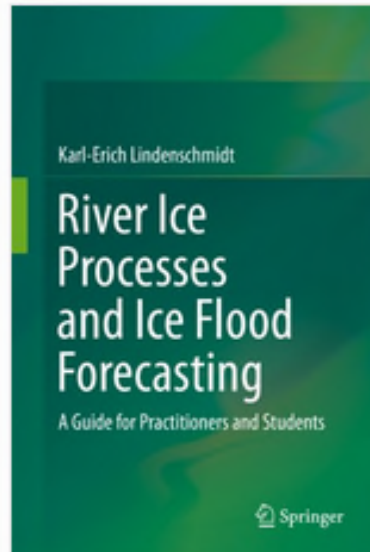
lower
dike
terrace

walkway
along dike
crest



Monte-Carlo analysis setup





River Ice Processes and Ice Flood Forecasting

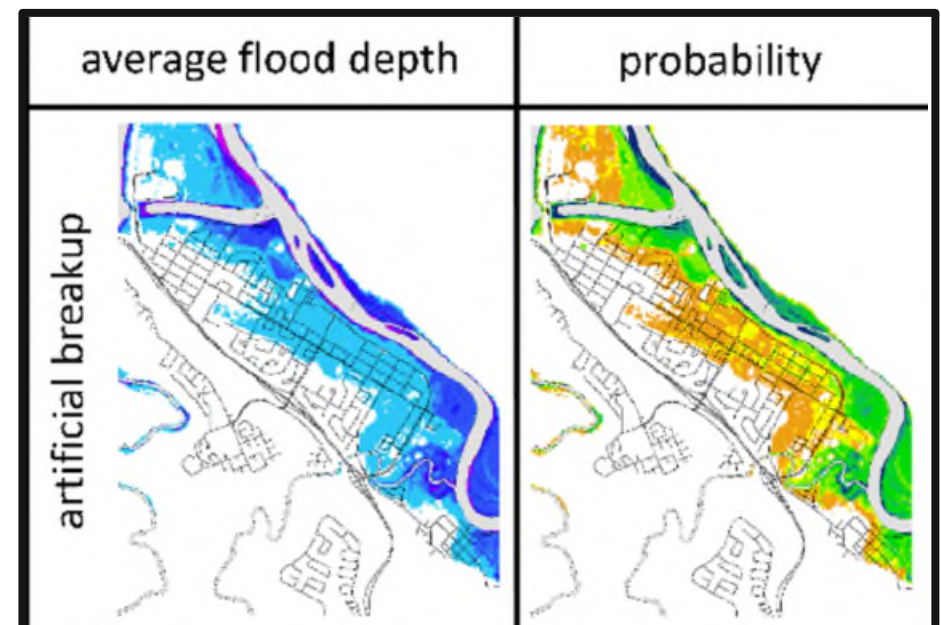
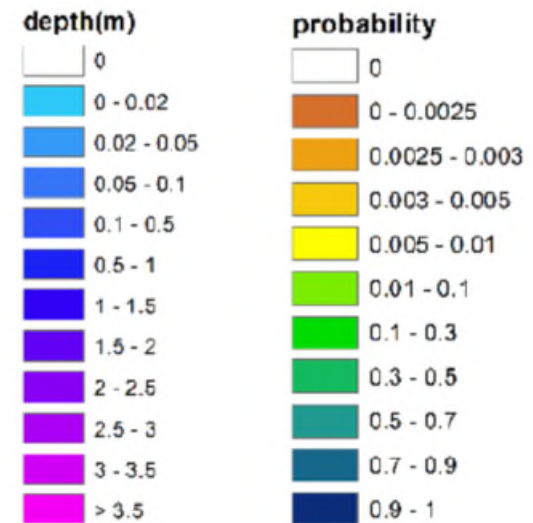
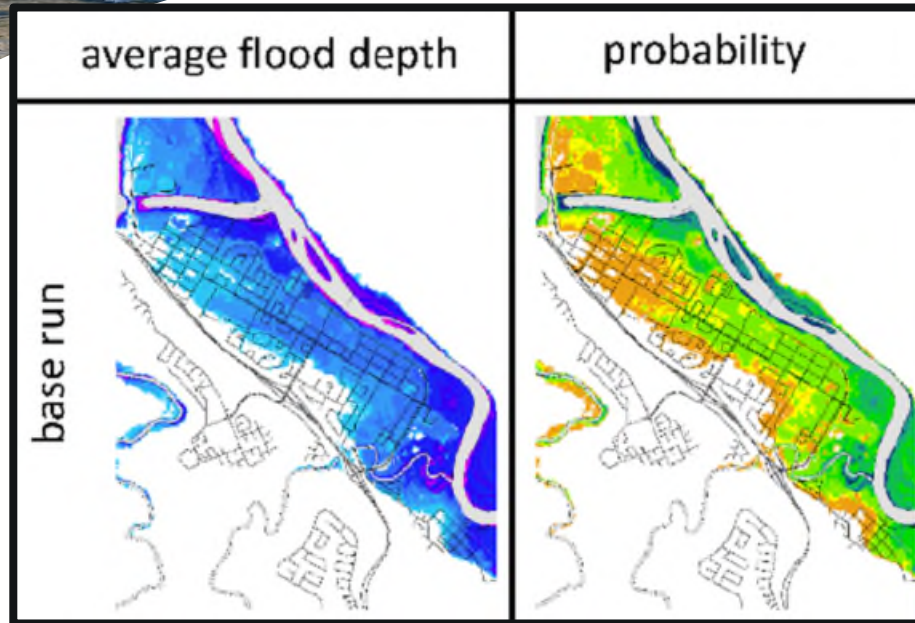
A Guide for Practitioners and Students

Authors ([view affiliations](#))

Karl-Erich Lindenschmidt

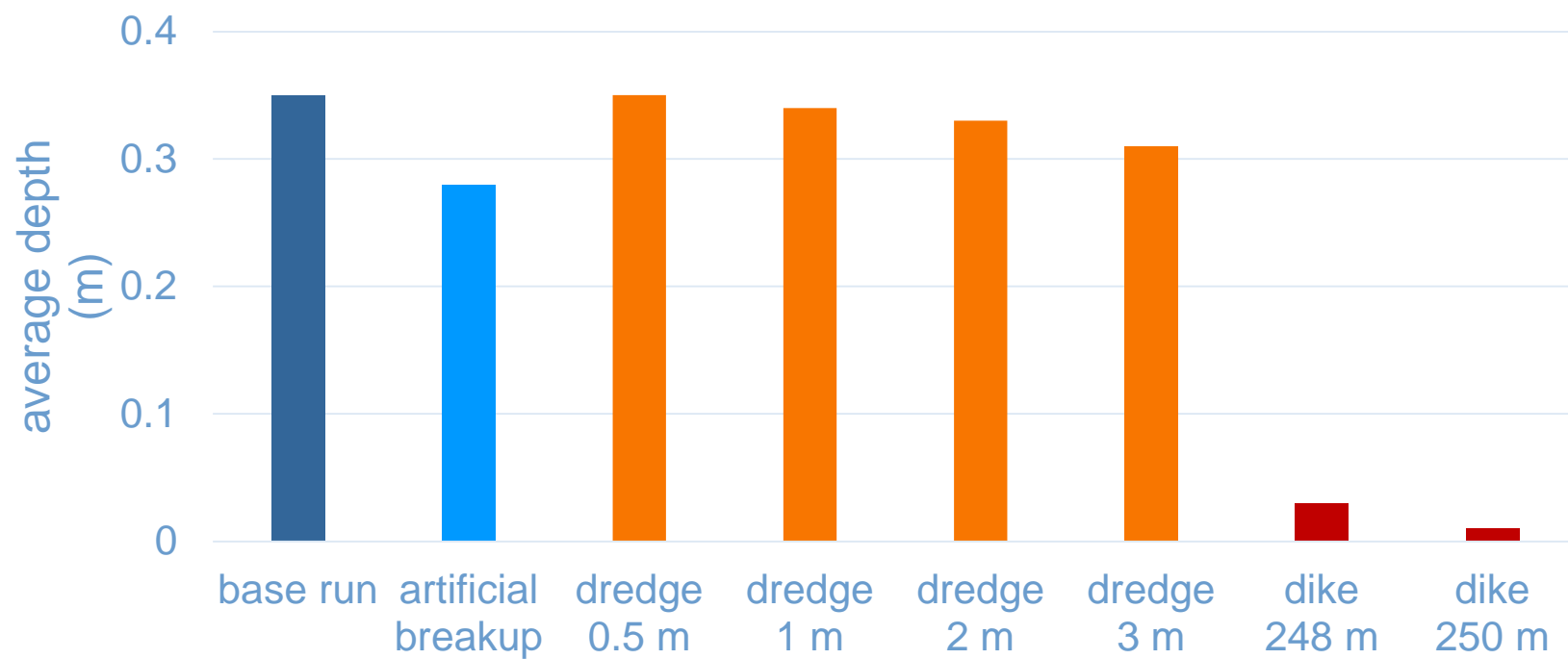
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Ice-jam flood probability maps



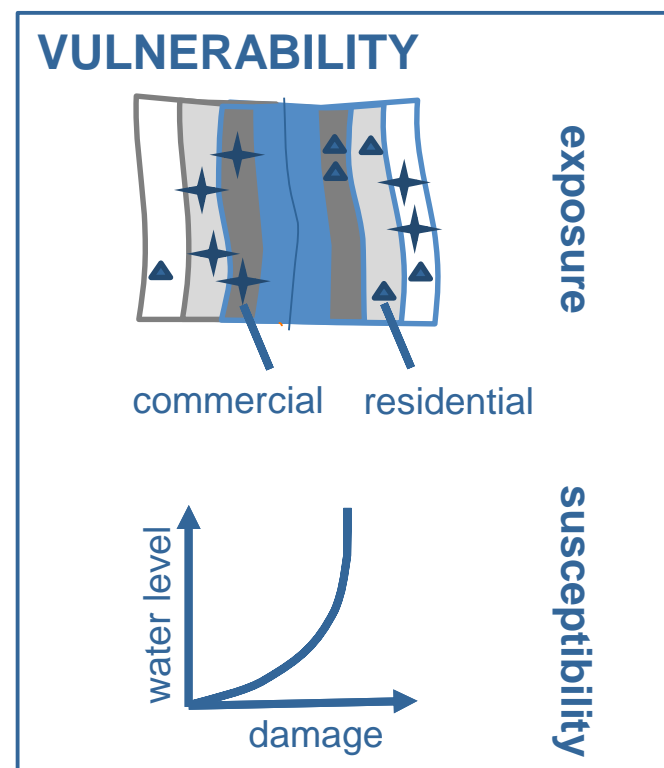
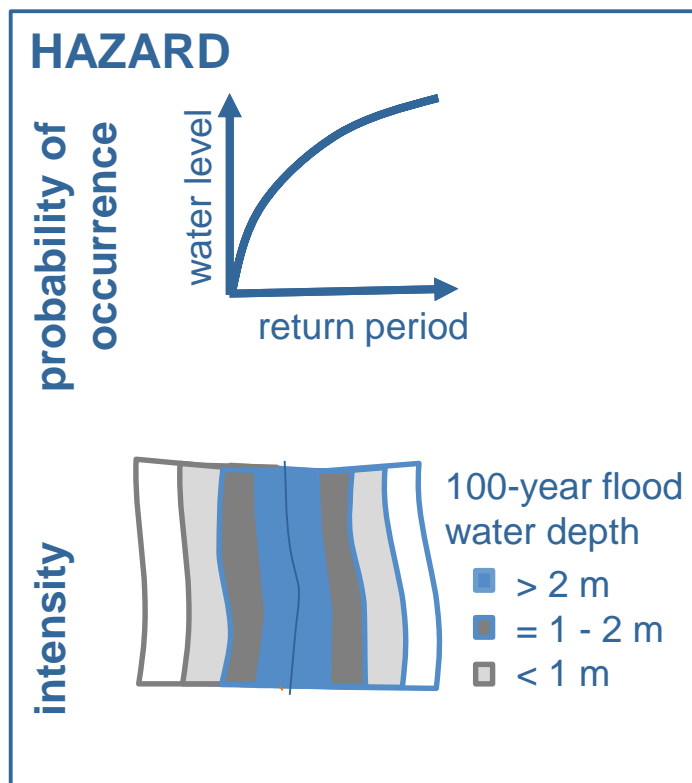


Average flood depth for each mitigation option

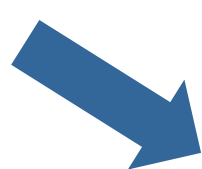




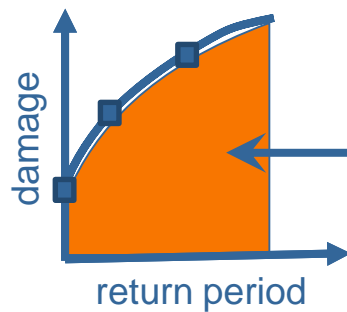
$$\text{Risk} = \text{Hazard} \times \text{Vulnerability}$$



X

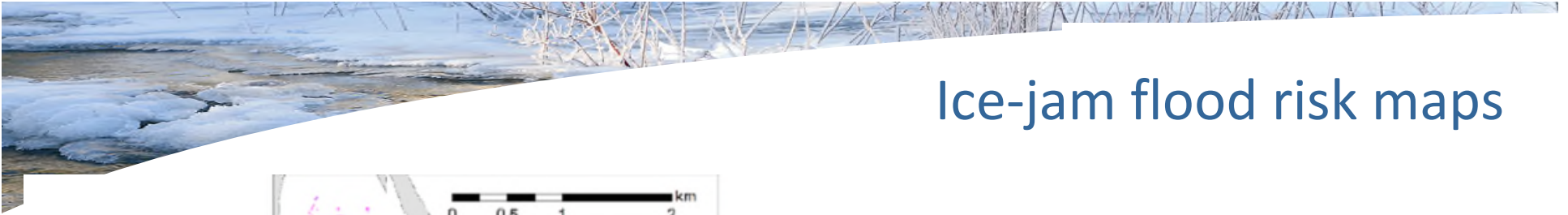


expected
damages



RISK



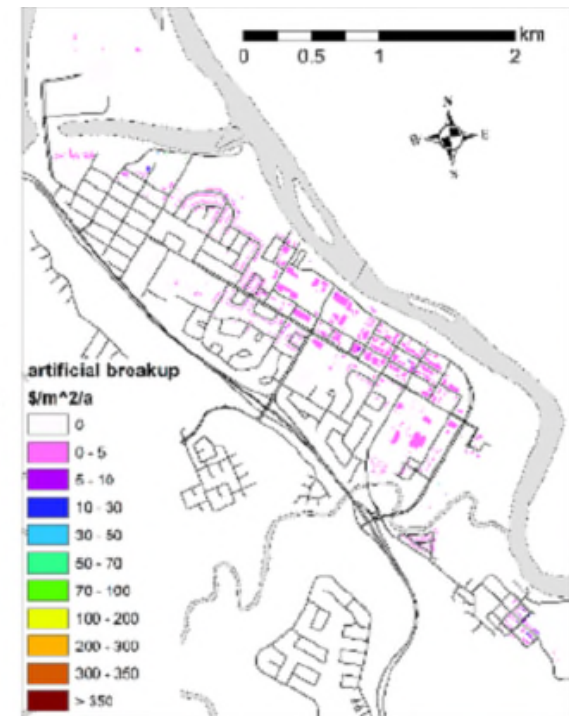


Ice-jam flood risk maps

**base
run**

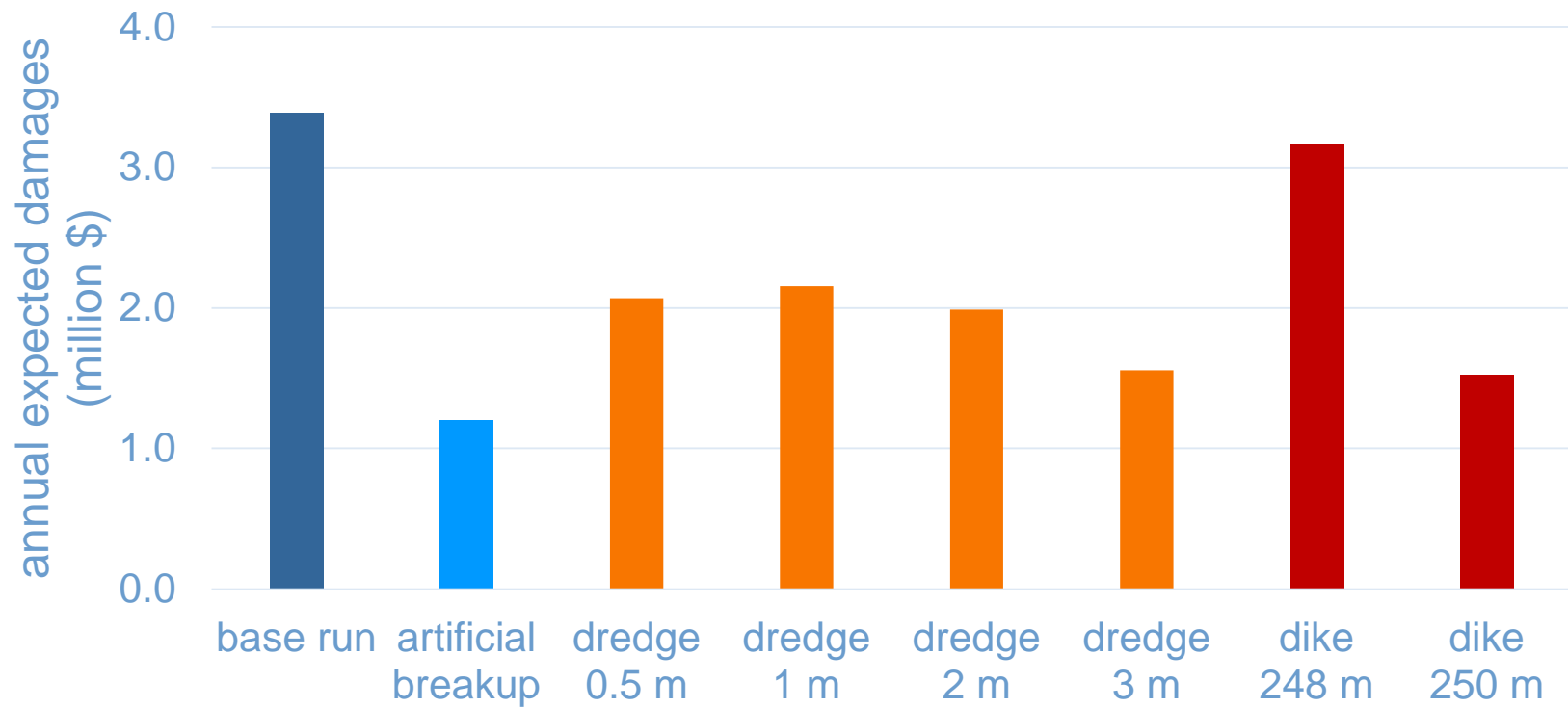


**artificial
breakup**





Total risk for each mitigation option





Thank you



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