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Linking Policy Needs and Hydrologic Science Knowledge and Expertise

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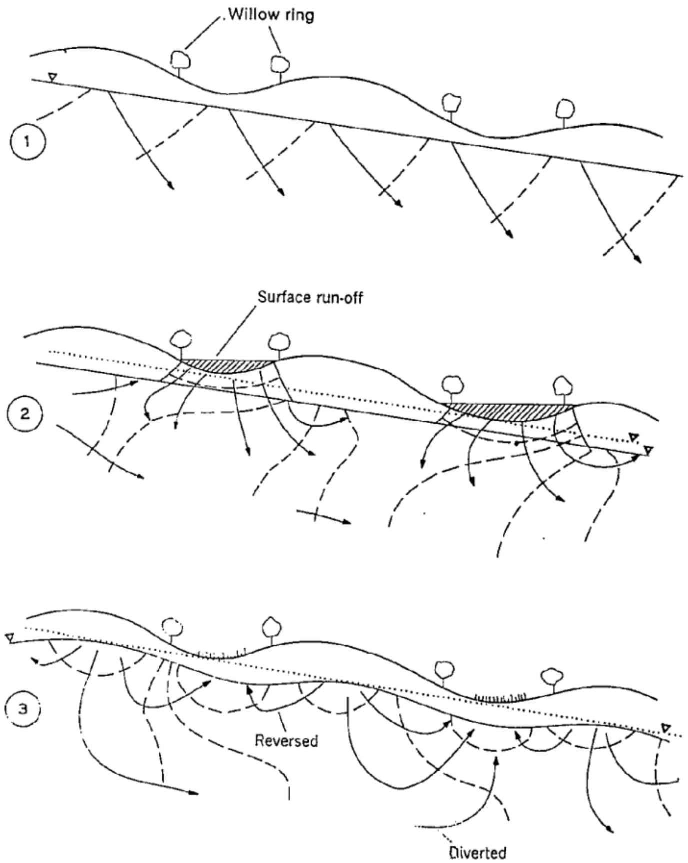
What do we think we know ?



Meyboom, 1966

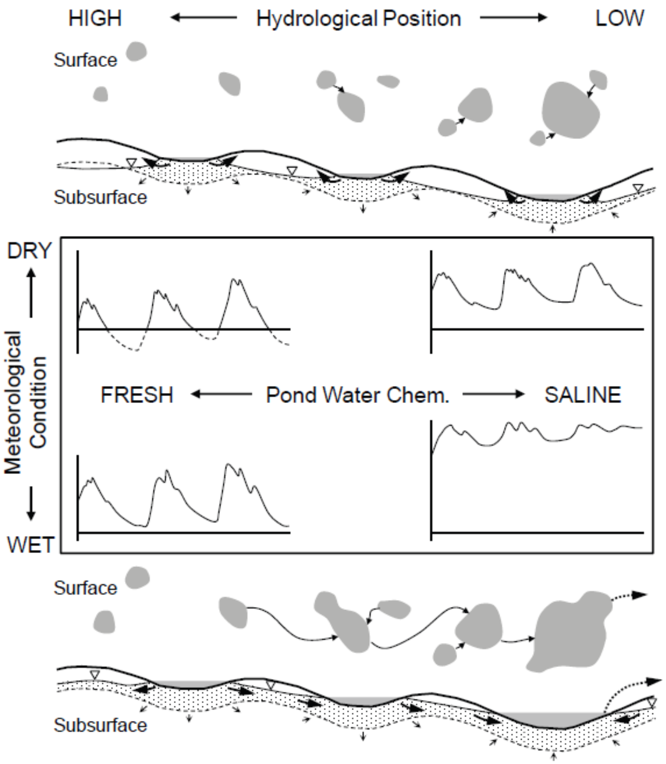


Figure 10 Revised hydrological elements of the wetland continuum (Euliss et al. 2004). The graphs represent idealized water level in two wetlands (high and low positions) under dry and wet conditions. The horizontal axis represents the hydrological positions within a landscape depicting the surface and subsurface connectivity. The vertical axis represents the meteorological conditions depicting persistently dry and wet periods. In general, wetland ponds in higher positions tend to have fresher water compared to those in lower positions.

Hayashi et al, 2016

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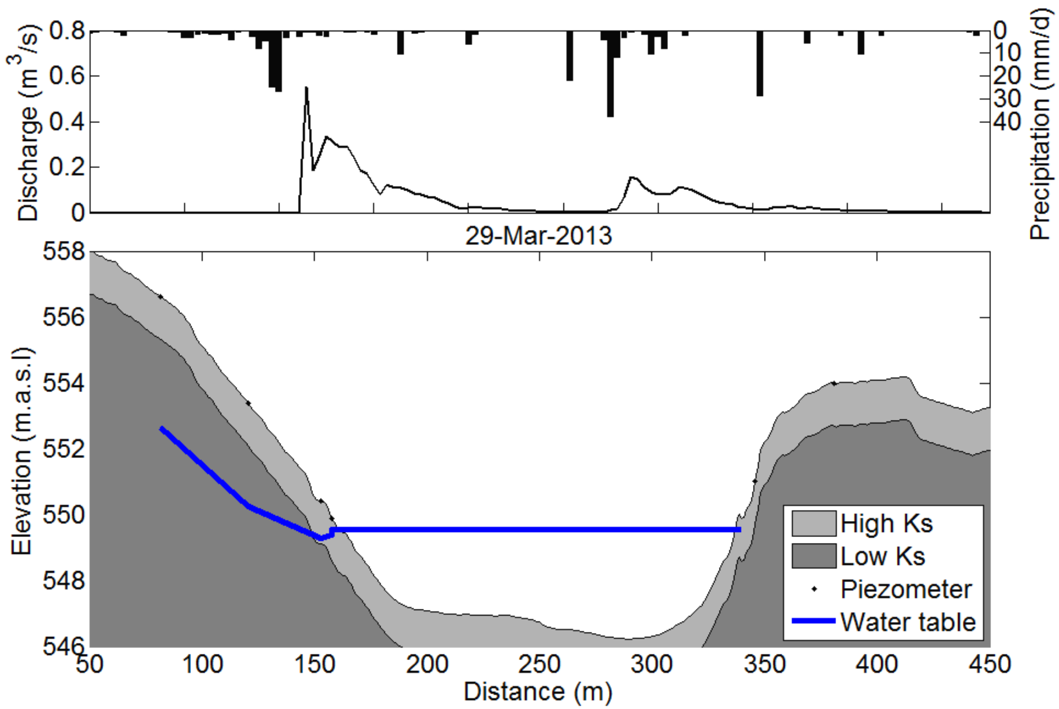
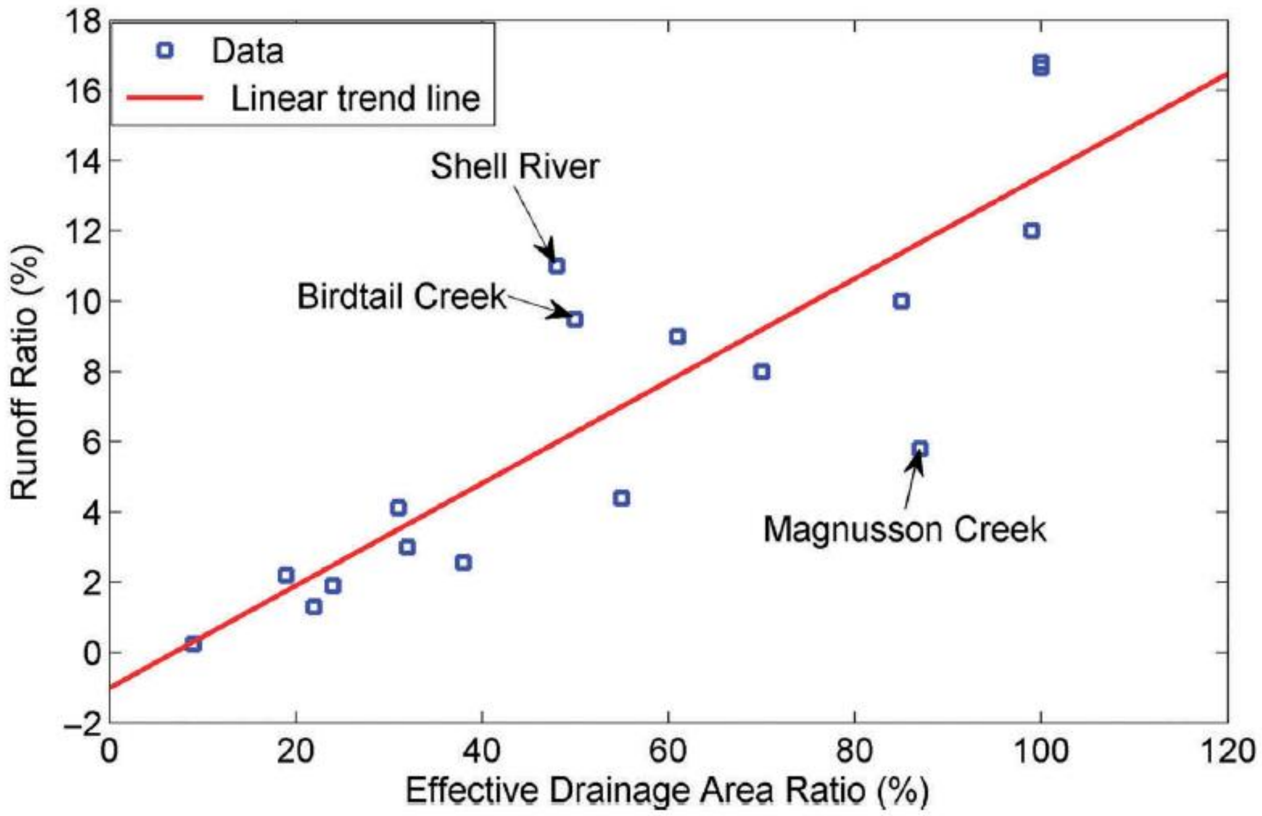
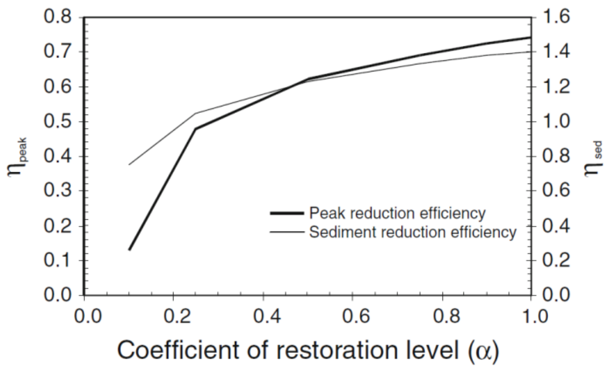
Hydrological connectivity



The role of contributing area

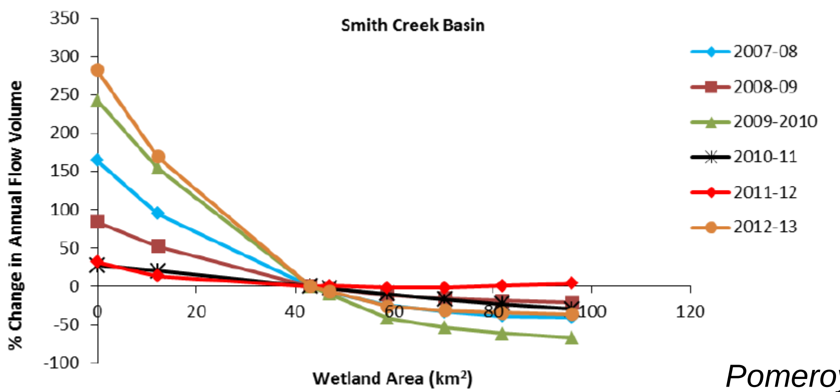


Small basin modelling



Yang et al., 2010

Fig. 4 Plot showing the peak reduction efficiency η_{peak} (Eq. 4) and sediment reduction efficiency η_{sed} (Eq. 5) versus the coefficient of restoration level α (Eq. 3) for the six restoration scenarios



Pomeroy et al., 2014

- Because of the lack of field studies that can separate the influence of wetland drainage on streamflow response, much of our understanding of the impacts are based on models – not observations.

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Wetland classification and inventory

- It is clear that wetlands need to be classified and inventoried in order to meet policy objectives.
- Inherent in these classifications are quantification of value.
- Coincidently, this value is related to the importance of what we think that wetland class ***does*** (e.g., from Saskatchewan: impact is defined as something that reduces the ability to use *or benefit from* that resource *and what is does*).

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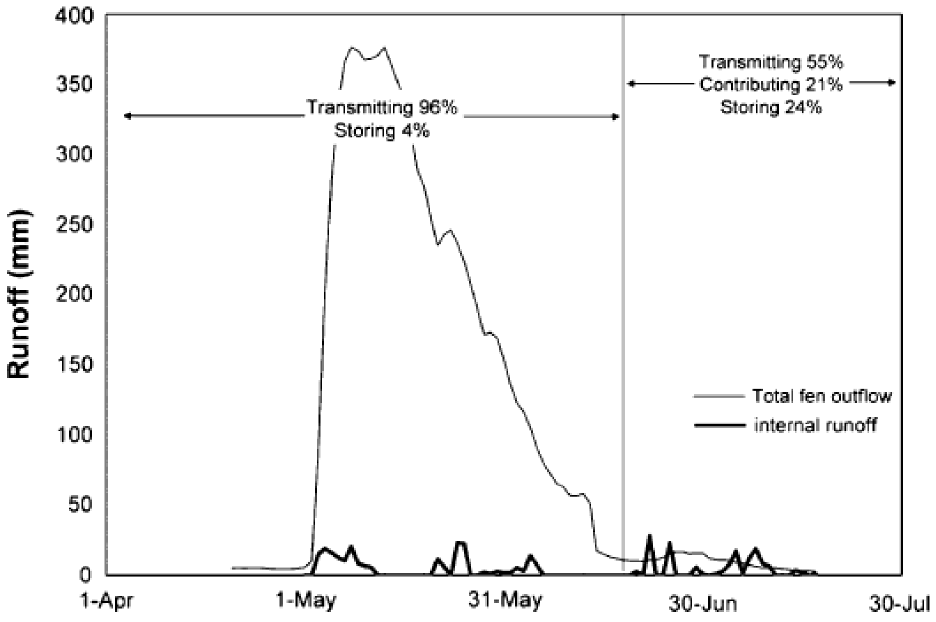
What a wetland does (i.e. function)

- Hydrological function can be classified as “collecting”, “storing”, and “discharging” water.
- “Discharging” can be subdivided into “contributing” and “transmitting”

Black, 1997; Spence and Woo, 2006

- What is the predominant function of the wetland?
- What is that function (e.g., storing or contributing) worth?



Spence et al., 2011

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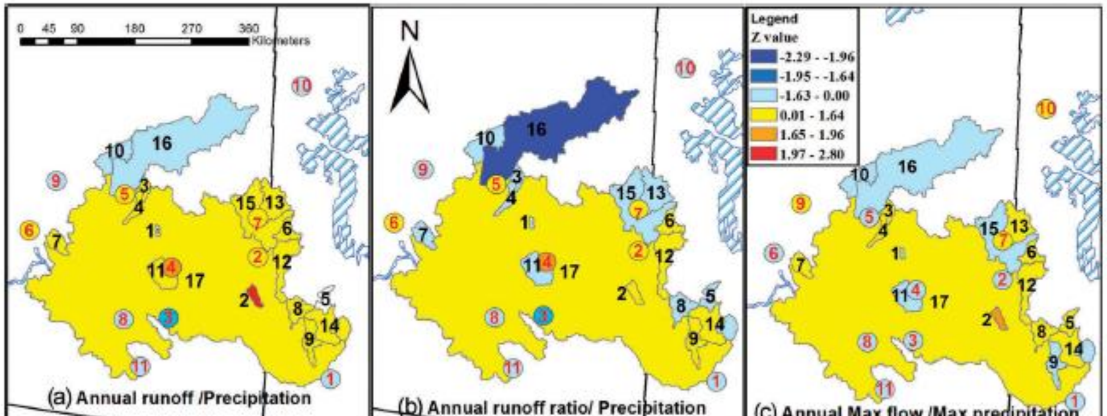
Watershed scale

Table 7. Trend analysis results (Z values) for flow metrics.

No.	Station ID	Station name	Annual runoff	Annual runoff ratio	Annual peak flow
1	05MA021	Magnusson Creek near Wynyard	−0.12	−1.18	−0.01
2	05ME007	Smith Creek near Marchwell	2.7	1.57	1.96
3	05MA016	Romance Creek near Watson	1.08	0	0.43
4	05MA012	Ironspring Creek near Watson	0.84	−0.41	0.97
5	05LJ012	Vermilion River near Dauphin	−0.3	−0.4	0.14
6	05LE005	Roaring River near Minitonas	0.62	0.05	0.33
7	05HG002	Brightwater Creek near Kenast	0.49	−0.26	0.29
8	05ME003	Birdtail Creek near Birtle	0.77	0.54	0.25
9	05MG004	Oak River near Rivers	0.71	0.26	−0.08
10	05KA001	Carrot River near Kinistino	−0.59	−0.57	−0.17
11	05JK004	Jumping Deer Creek near Lipton	−0.35	0.08	−1.61
12	05MD005	Shell River near Inglis	0.71	0.2	0.9
13	05LE004	Woody River near Bowsman	0.22	−0.94	0.45
14	05MF001	Little Saskatchewan River near Minnedosa	0.26	0.48	0.1
15	05LE006	Swan River near Minitonas	0.35	−0.53	−0.08
16	05KH007	Carrot River near Turnberry	−0.55	−2.29	−1.11
17	05MH013	Assiniboine River near Brandon	1.13	1.19	0.84



Ehsanzadeh et al, 2016

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The wetland complex

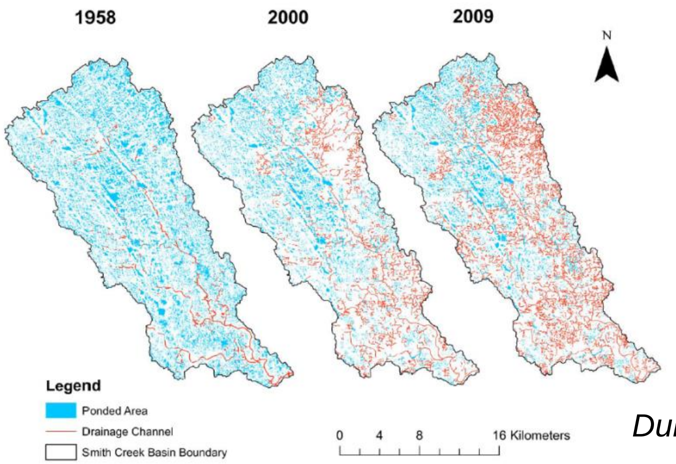
"Flood retention and groundwater recharge are commonly cited as the important "values" of wetlands, yet these perceived values are dependent on complex surface and subsurface hydrological processes. Different wetlands have different hydrological functions and values within a wetland complex."

"…..ecological integrity of the prairie landscape needs to be understood in the context of a wetland complex, rather than individual wetlands."

Hayashi and van der Kamp, 2016

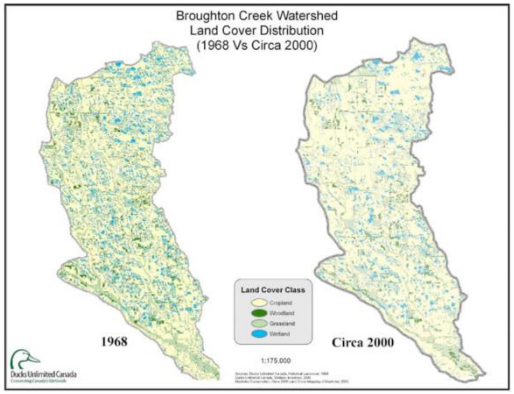
The wetland complex

- It is worth noting that there are documented cases that wetland removal has biased smaller wetlands, and restoration biases larger wetlands, which leads to an increase in average wetland size (Boychuk, 2008; Hebben, 2016).
- We should realize we are already on a path towards biasing that complex.



Dumanski, 2015

Figure 4.1: Ponded area and drainage network in SCRB in 1958, 2000 and 2009. Data provided by Lyle Boychuk, Ducks Unlimited Canada from aerial photograph analysis and mapped for the basin area determined by Fang et al. (2010).



Boychuk, 2015

Common needs

- There are two spatial scales of note; the wetland and the watershed;

Wetland	Watershed
In order to achieve quantification of benefit or worth there needs to be a better understanding of function duration and frequency and this needs to be the basis for classification.	In order to understand cumulative impacts at the watershed scale, we need to know how function upscales. It is clear not all wetlands provide the same benefits (perform the same functions), so how do we determine what really influences watershed scale streamflow response to a loss of function?

Common solutions

- A GIS tool that can predict hydrological function and be used for wetland classification;
- Inputs include depression morphology, relative topology, etc.;
- Data requirements include high resolution spatial data (i.e. LiDAR), long term data of inundation and hydrological connectivity dynamics across a diversity of wetlands and watersheds;
- Research of wetland and watershed water budgets; (e.g., observation programs in Saskatchewan before and after large network approval processes).
- Model development to reduce uncertainty in extrapolation; predict tipping points and thresholds; provide a means to upscale
- Evaluation of classifications to ensure that “no net loss” policies are attaining their goals.
- An app for rapid wetland classification on site.
- The only way our community can make achievements is collaboratively