



Esri Forestry GIS Solutions Conference

Hosted by the Esri Forestry Group | May 1–3, 2012

The Implications of Flow-Path Buffer Metrics on Harvested Watersheds

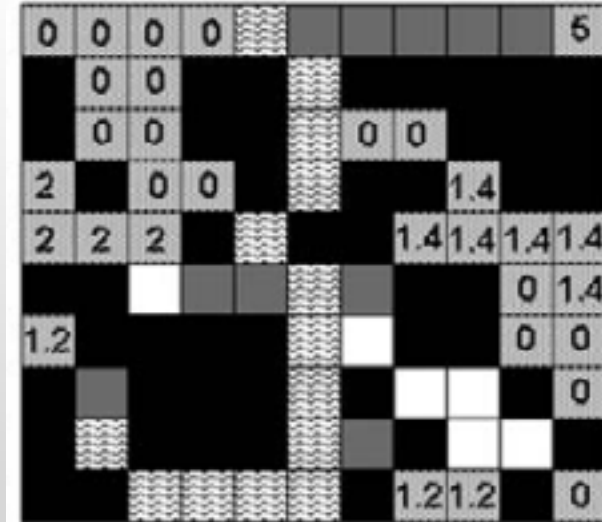
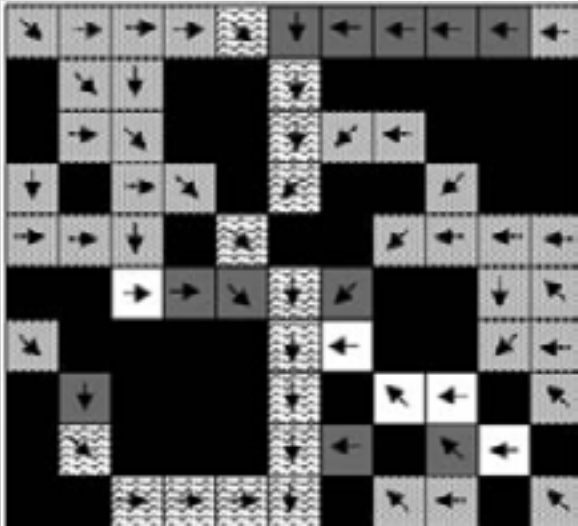
Toomas Parratt

S.S.Papadopoulos & Associates, Lakehead University

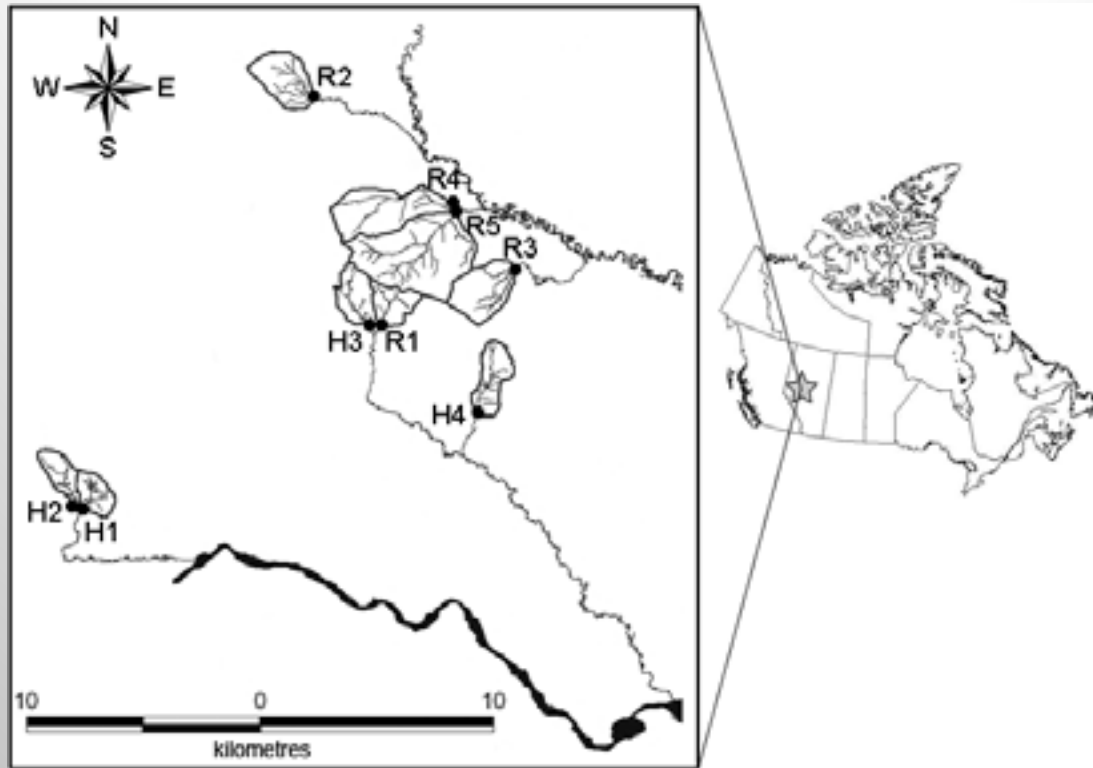


Flow-Path Metrics

- **Spatial Analysis of Riparian Buffers (Baker et al. 2006)**
- **Flow-path from a Disturbed pixel, TauDEM – Tarboton**
- **Flow-path Length (m); Forested Vs. Buffered**



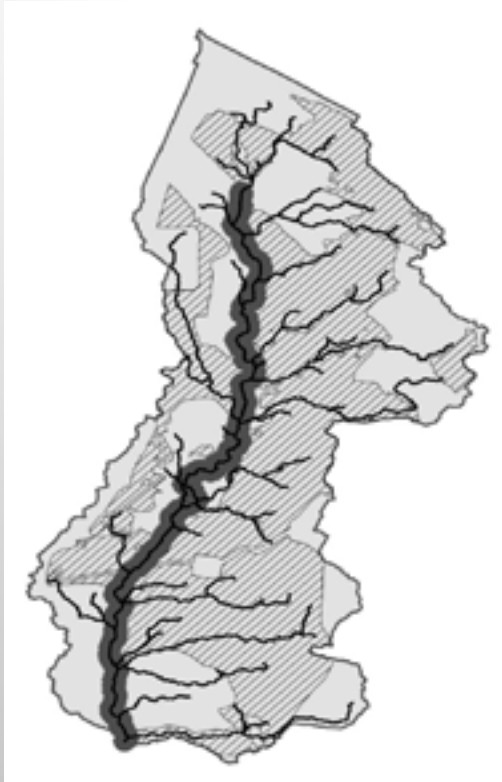
FORWARD Watersheds – 240 km NW of Edmonton, AB



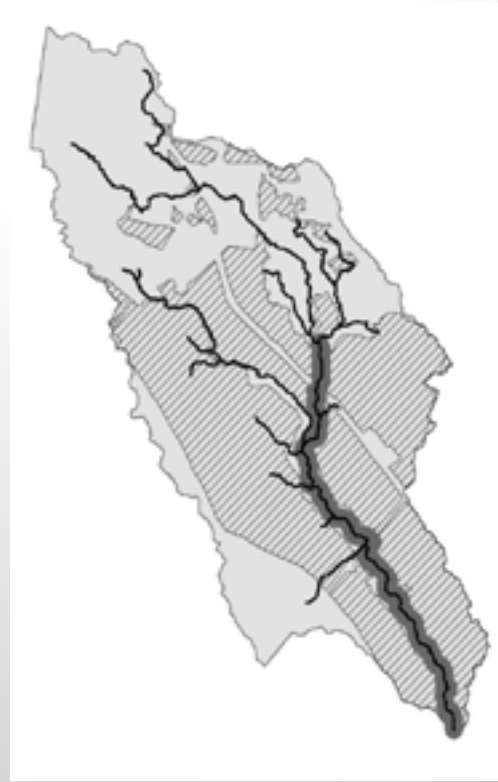
Harvested Watersheds H1 – H4

Watershed	Area (ha)	Harvest (% area)	Buffer width (m)	Wetland (% area)
RB1- H4	420	48	30	4
RB2 - H3	263	50	30	16
CS1 - H1	335	47	0	18
CS2 - H2	257	77	0	14

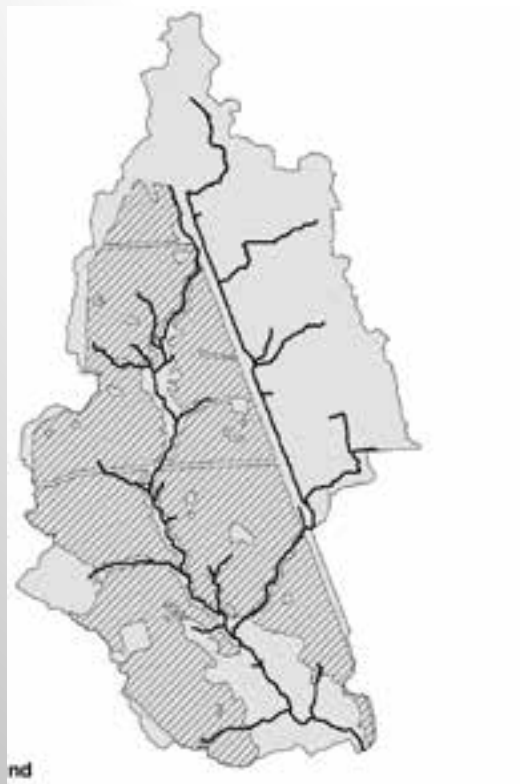
RB1



RB2



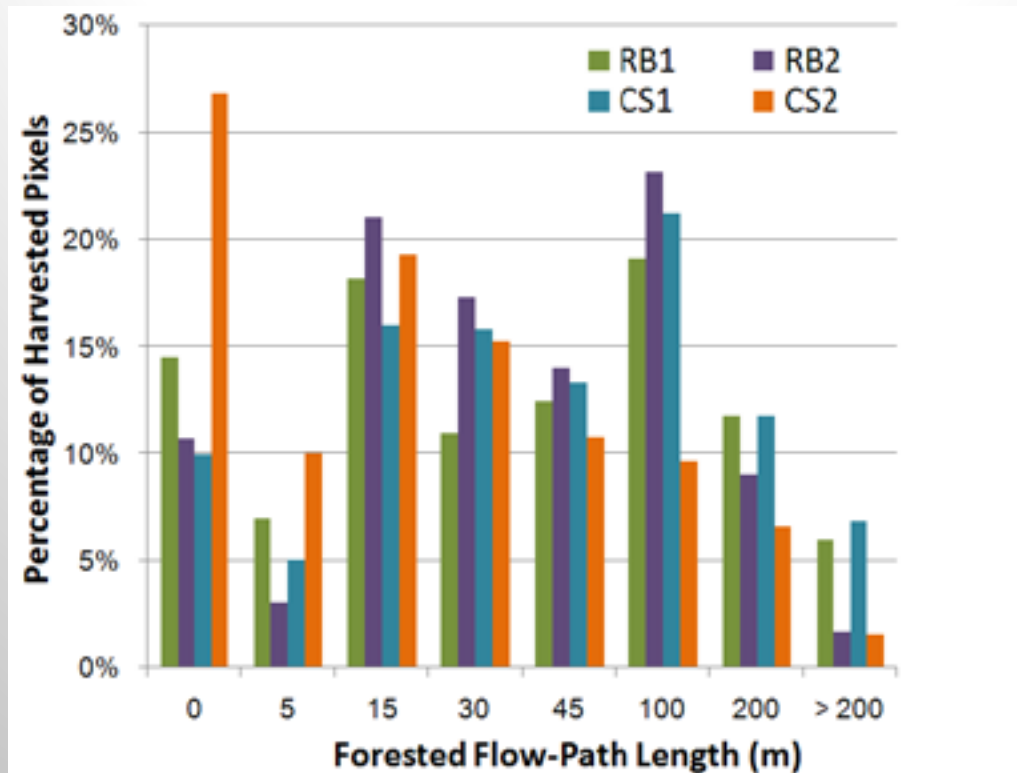
CS1



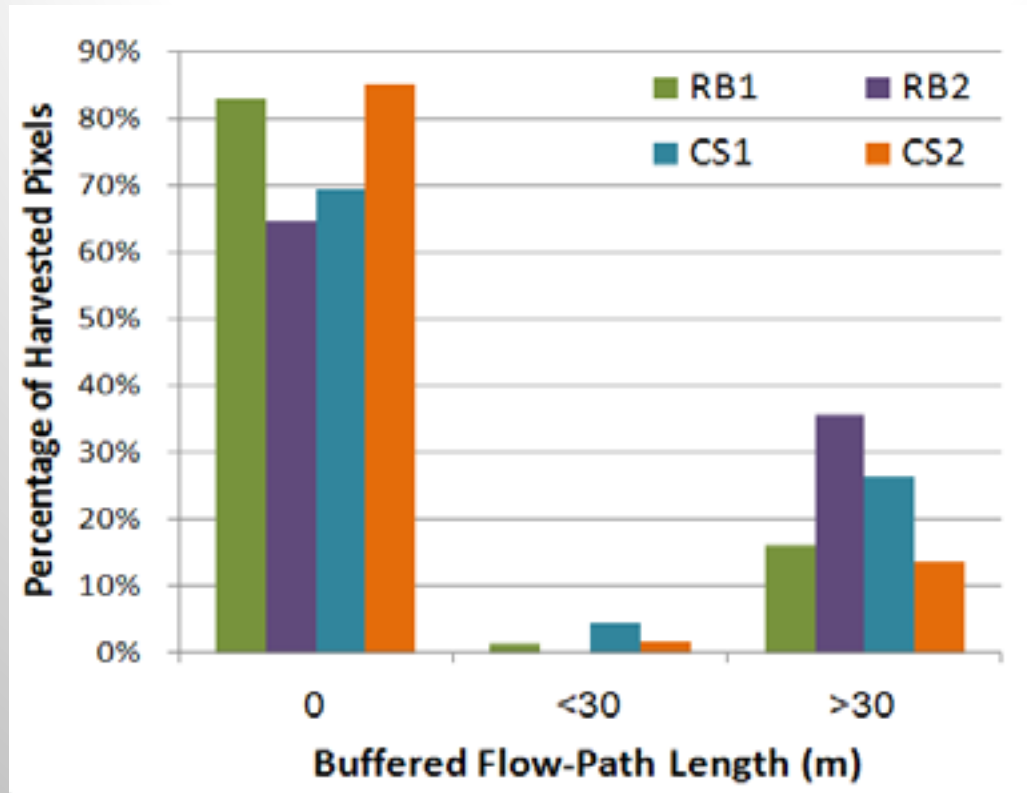
CS2



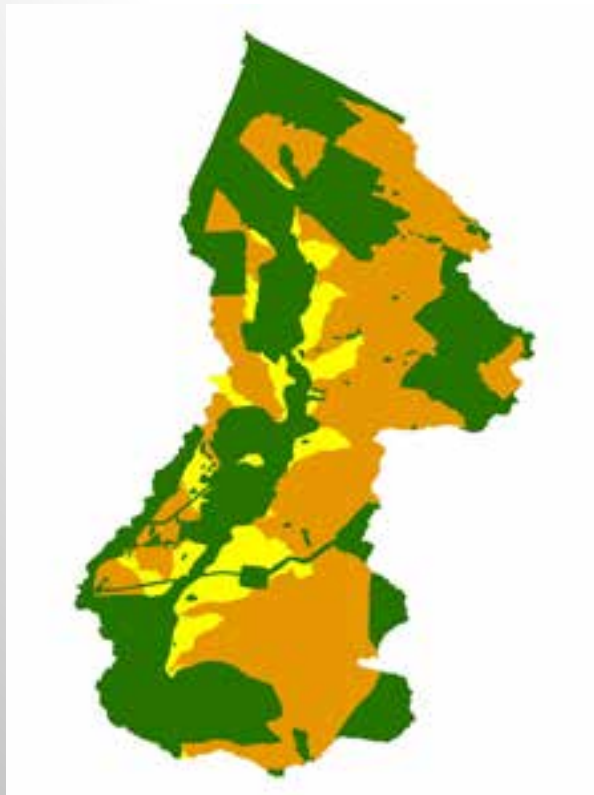
Forested Flow-Path Length



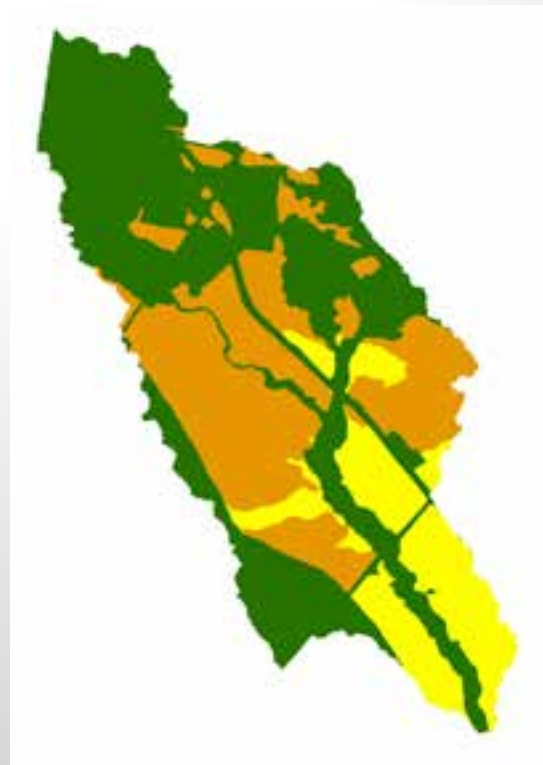
Buffered Flow-Path Length



RB1



RB2



CS1

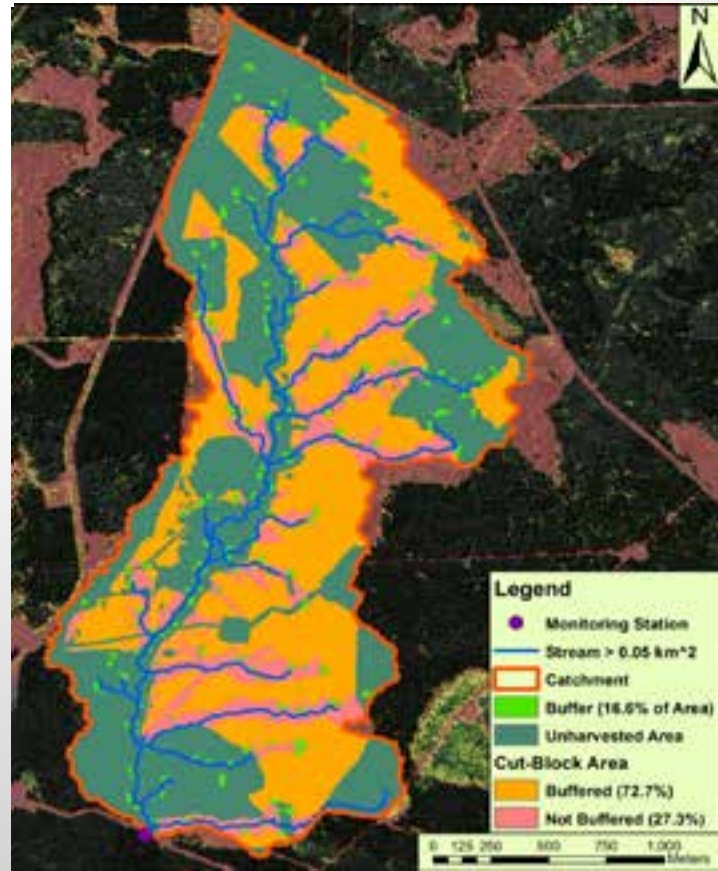


CS2

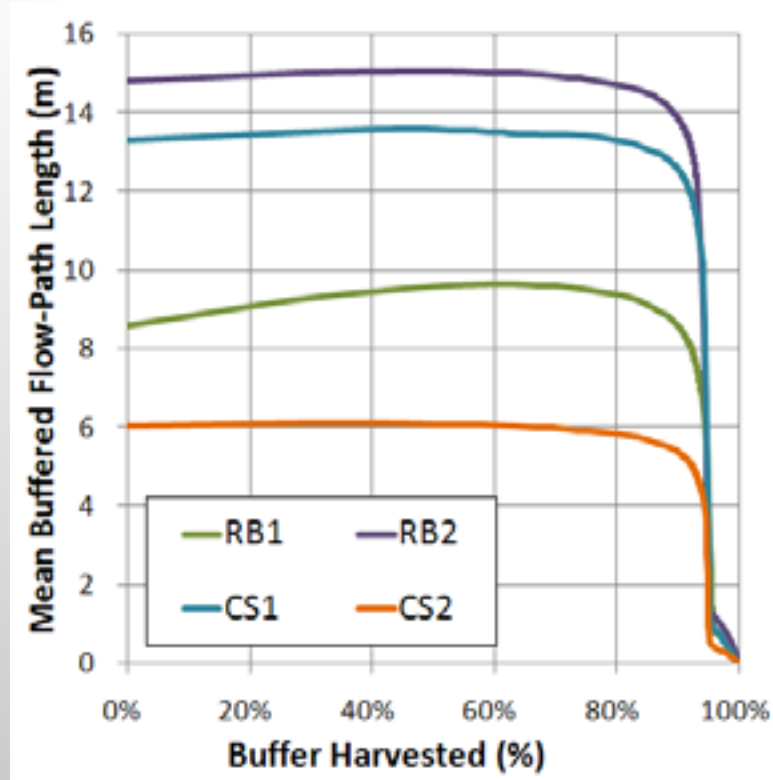


RB1 Buffer Scenarios

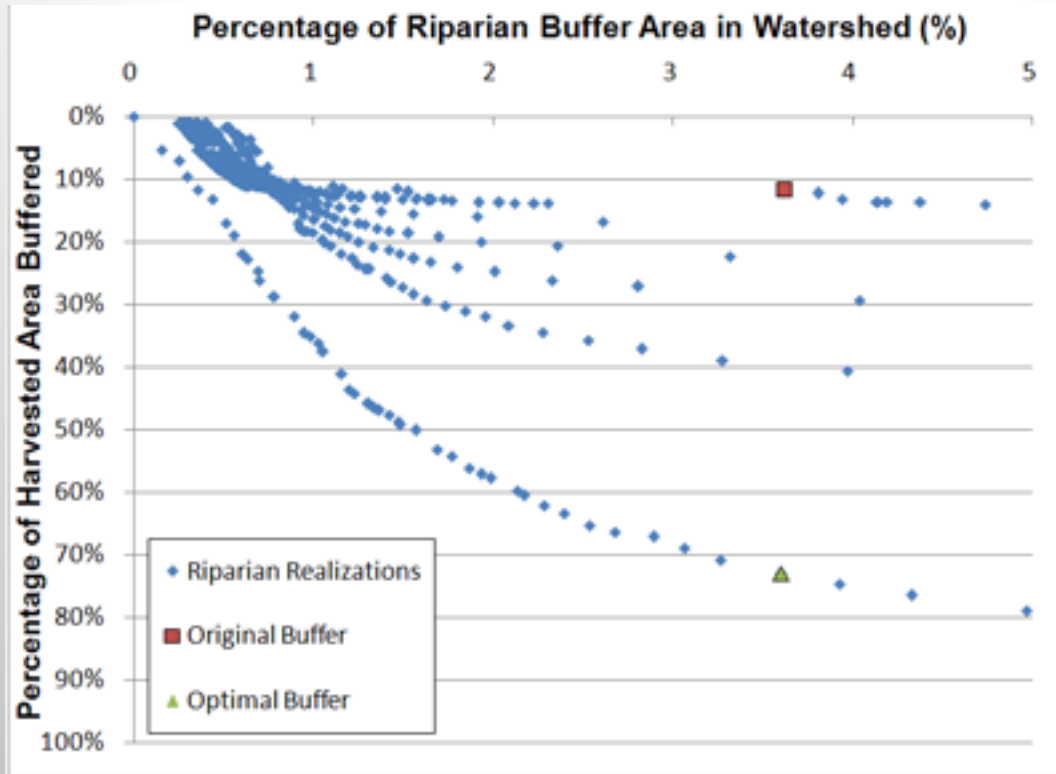
- Fixed-Width 30 ha - 17%
- Select Harvest 2 ha – 11%
- Optimal 5 ha – 73%



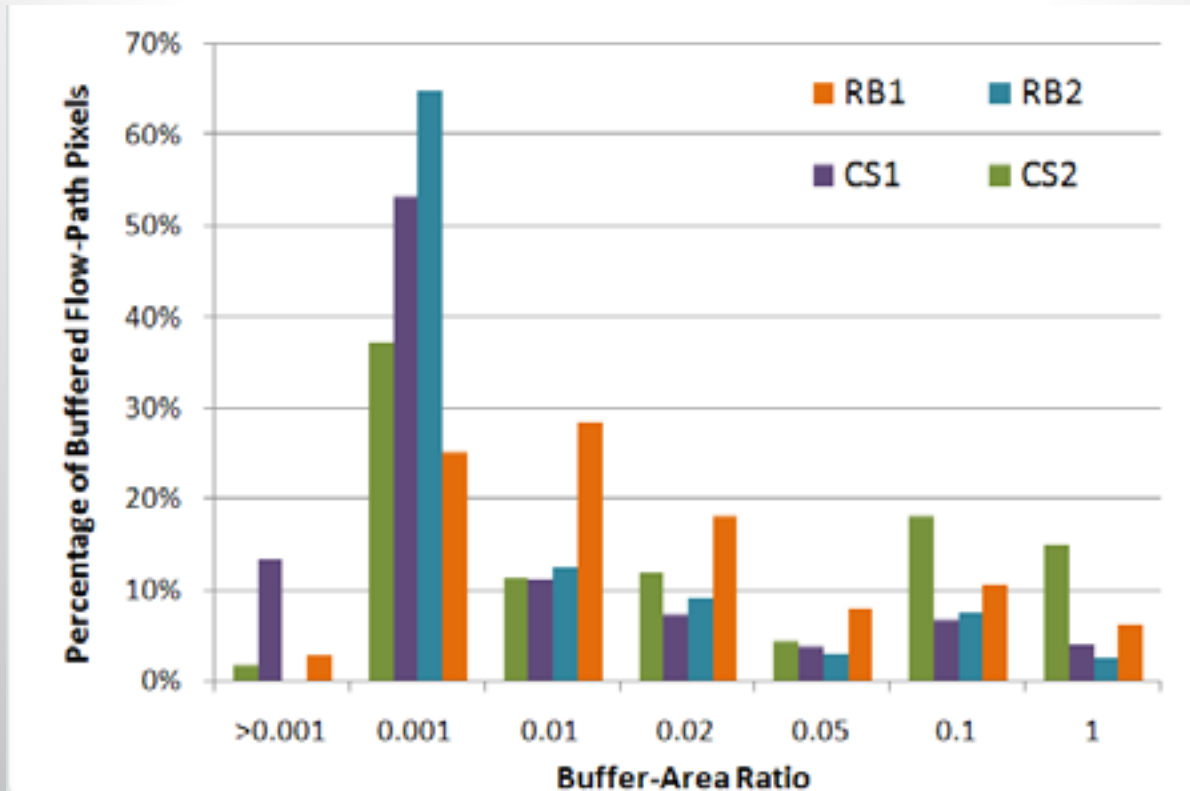
Selective Harvesting Buffer Realizations



Optimal Buffer Realizations

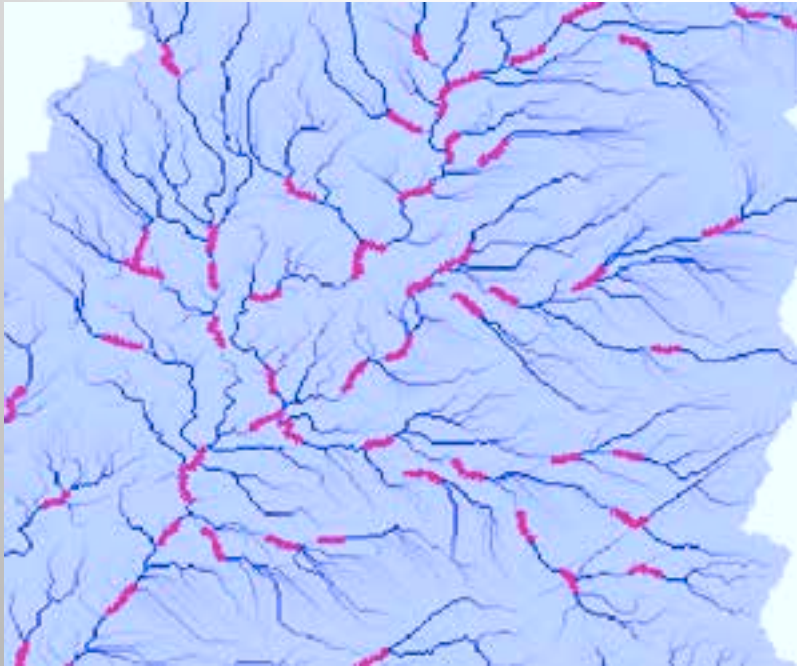


Buffer-Area Ratio



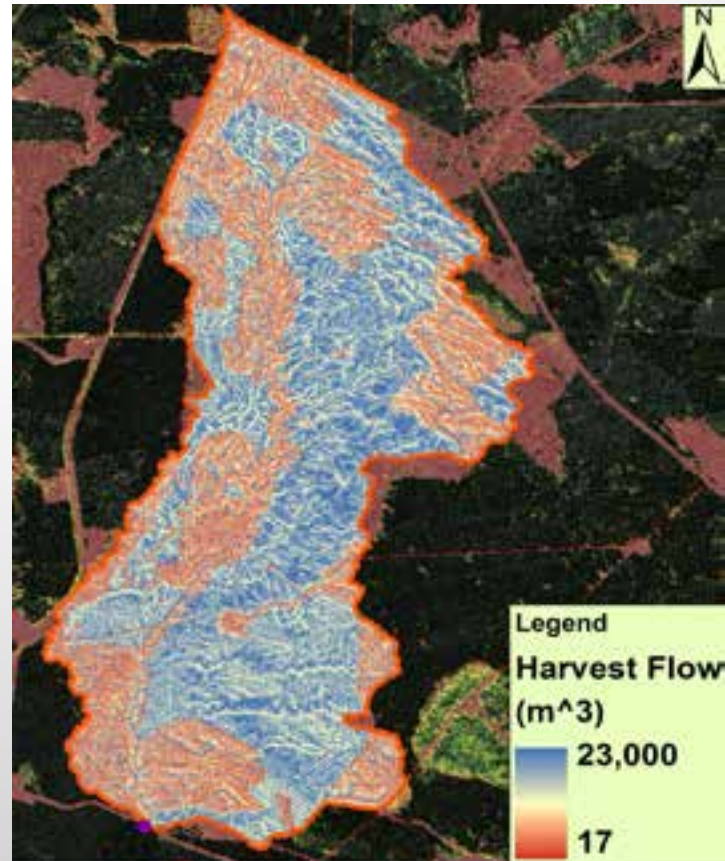
Landscape Buffer

- Set Buffer-Area Ratio & Width
- 50% of Fixed-Width Buffer



Flow Volume

- July 8, 2004 – 37 mm
- Observed Runoff 5.8 mm
- Predicted Runoff 6.6 mm
- SCS Runoff Curve #
Forest 5%; Harvest 32%

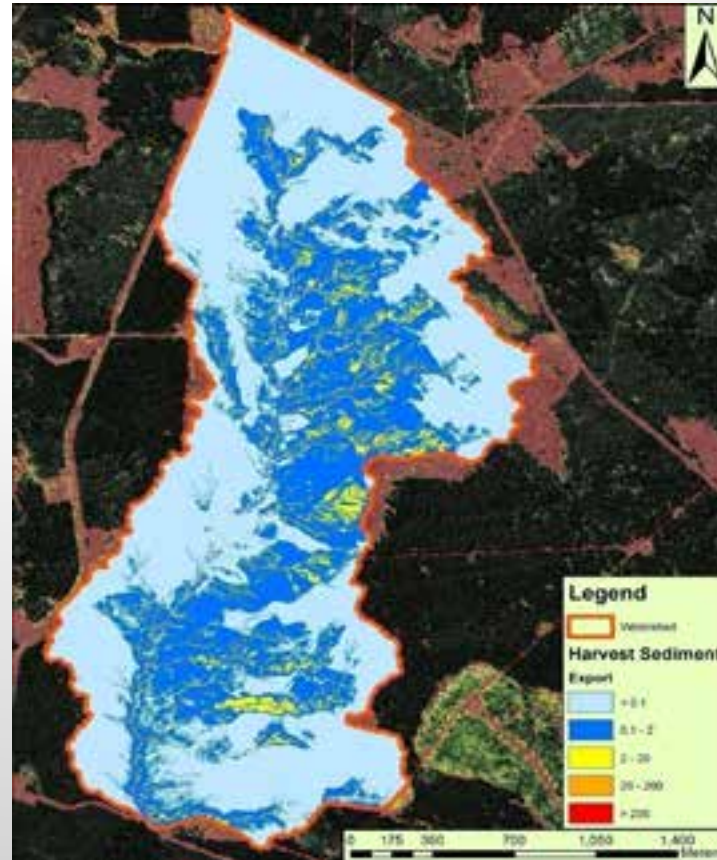


Sediment Export Index

- Energy of Water
- Sediment Exported
- Sediment Export Index

$$\Omega = \rho g q \tan \beta$$

$$D_p = (\alpha_d V_f / q)(T_c - g)$$



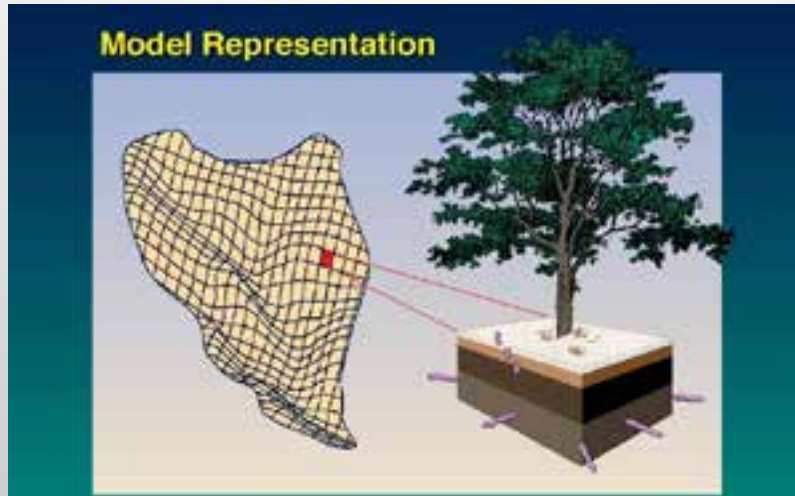
Sediment Buffer Design

- 14 ha or 50% of Fixed
- Sediment Factor of 10
- Buffers 73% Harvest Area



Future of Buffer Design

- **Fixed-width riparian buffers are ineffective!**
- **Forest management linked to surface waters flow paths**
- **GIS Automated Buffer Designs**



Many Thanks to all who Made this Possible

- **Ellie Prepas, Lakehead Univ.**
- **Gordon Putz, Univ. Saskatchewan**
- **Millar Western Forest Products**
- **S. S. Papadodulos & Associates**
- **Blue Ridge Lumber**
- **NSERC**





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