Regional Curves for Small & Medium Watercourses in Southern Ontario

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1 Background

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What's the Problem?

- Natural Channel Design is challenging
- Bankfull is critical
- Channels that need restoration seldom have reliable bankfull indicators

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What is a natural channel?

- Alluvial or semi-alluvial
- In grade
- Fluvial processes not excessive
- Some bank erosion or deposition is expected

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How is channel size estimated?

- HEC-RAS – Theoretical
- Reference Reach – Empirical (one site)
- Regional Curve – Empirical (many sites)

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How is channel size estimated?

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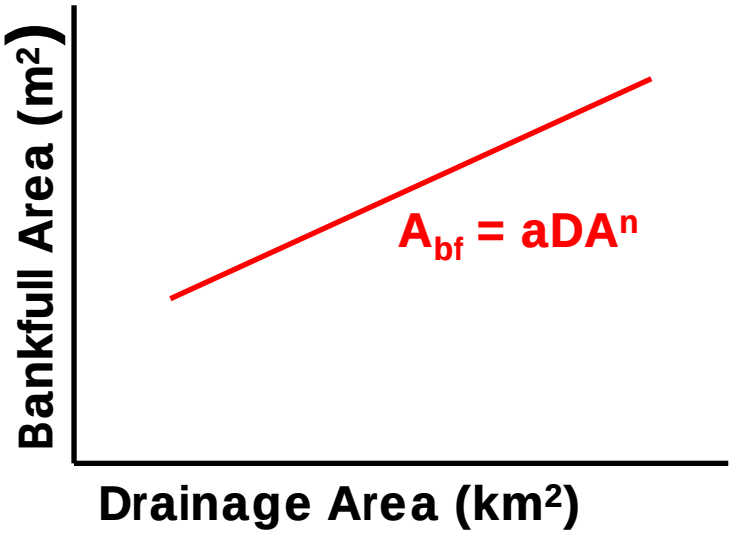
- Regional Curve – Empirical (many sites)

What is a Regional Curve?

Plot of bankfull area versus drainage area



Stantec Scientific Research and Experimental Development Grant: SCL-2013A-1603-07

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Why use Regional Curves?

- Aid to designers
- Aid to regulators
- Independent check of other methods
- Simple application

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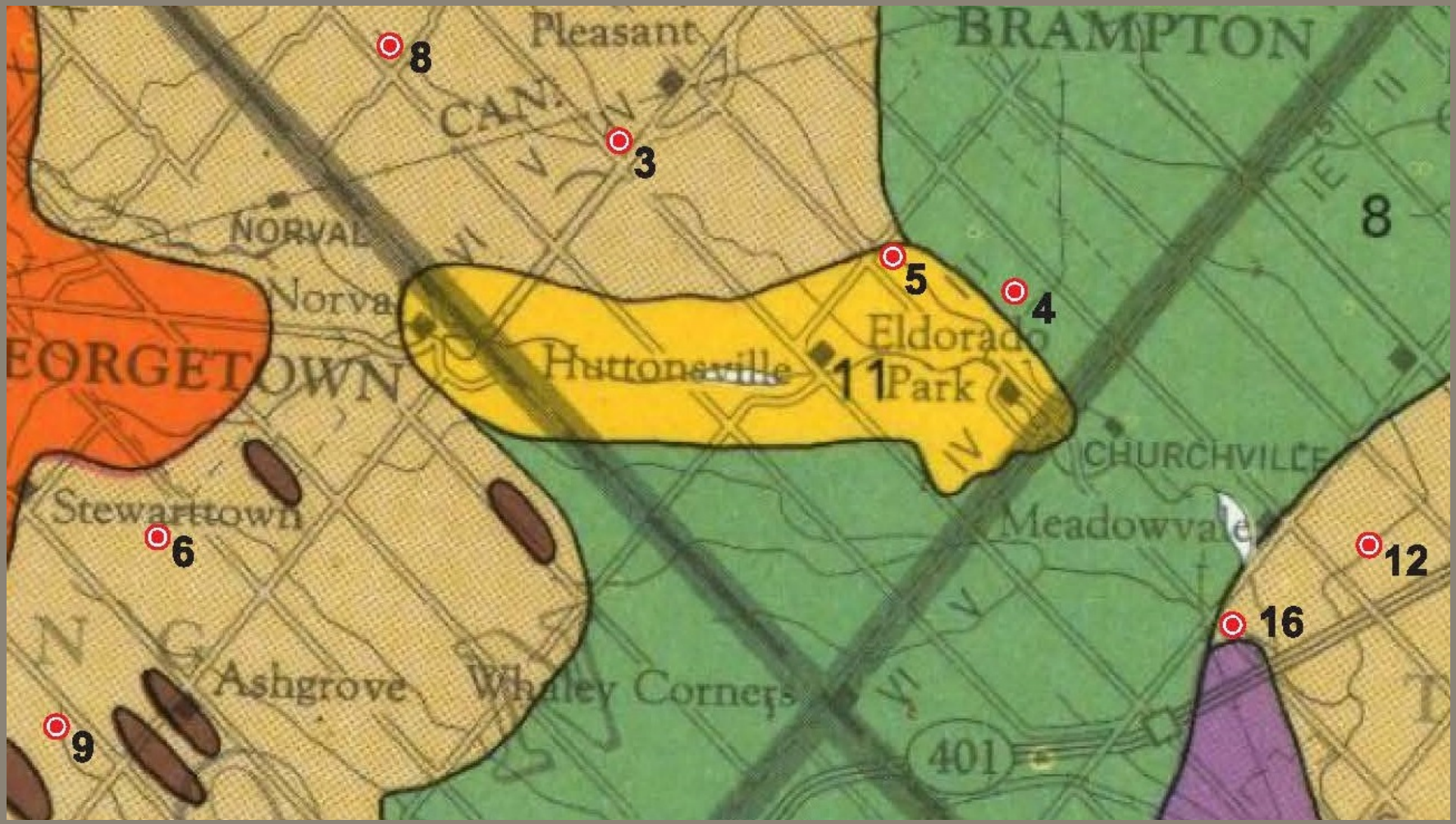
2 Site Selection



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Three Regions Selected

- Close to urban areas
- Areas where channel restoration likely

- **WATERLOO REGION**
- **PEEL REGION**
- **YORK-DURHAM REGION**

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Desktop Assessment

- Drainage areas 1 km^2 to 200 km^2
- Similar geology and precipitation
- Unregulated flows
- Slope 0.5% – 1.0%
- Safe access

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Field Verification

- Stable channel
  - Fluvial processes not excessive
  - Good floodplain connection
  - No sediment wedges
- Confirm geology
- Reliable bankfull features

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Field Verification

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3 Data Collection & Analysis

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Equipment

- Survey grade GPS
- Total station
- Engineering rod & level and tape

Data Collected

Identifying Bankfull

- Walk channel
- Look for consistency
- Local disturbances
- Inner berm

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Data Collected

- Channel cross-sections (width, depth, area)
- At riffles (3-4 if possible)
- Inner berm
- Slope, grain size
- Photographs

Data Analysis

- RiverMorph software
- Cross-sections plotted
- Dimension based on site average
- Plot bankfull dimension against drainage area
- Regression analysis

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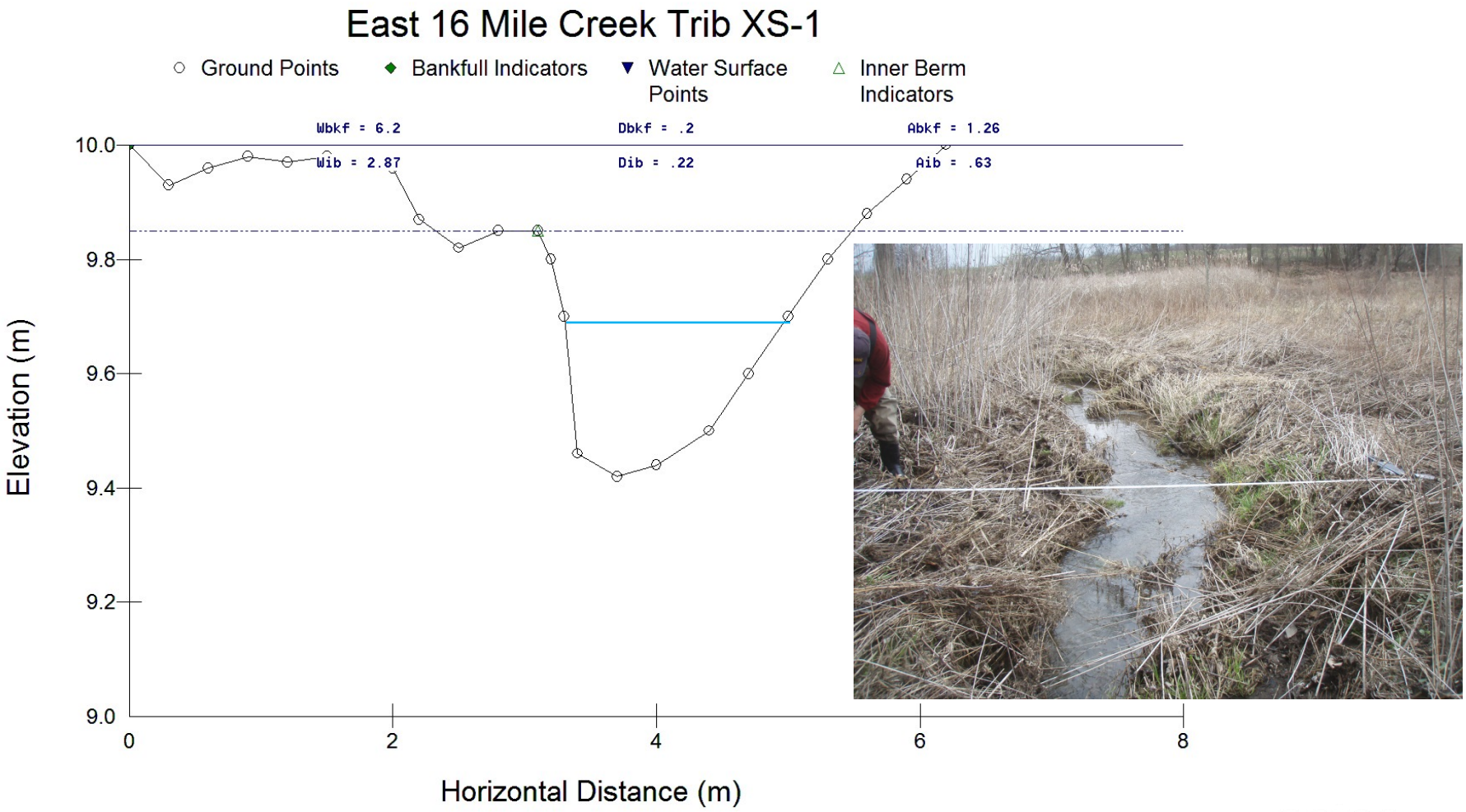
Inner Berm

- Common in alluvial channels
- Lower than bankfull
- Depositional feature
- Low flow channel
- Enhances habitat
- Enhances sediment transport

Data Analysis



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4 Regional Curve Development

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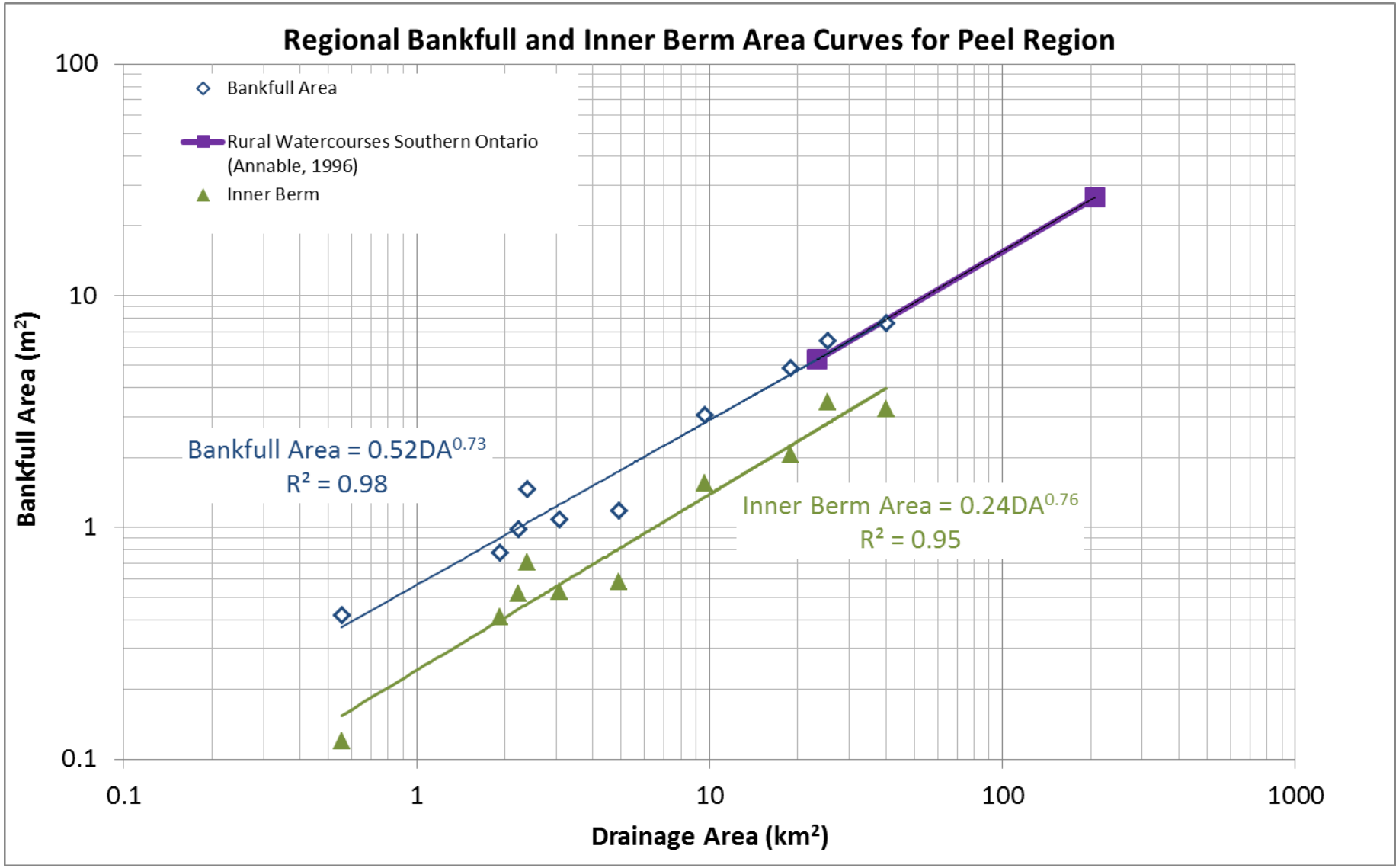
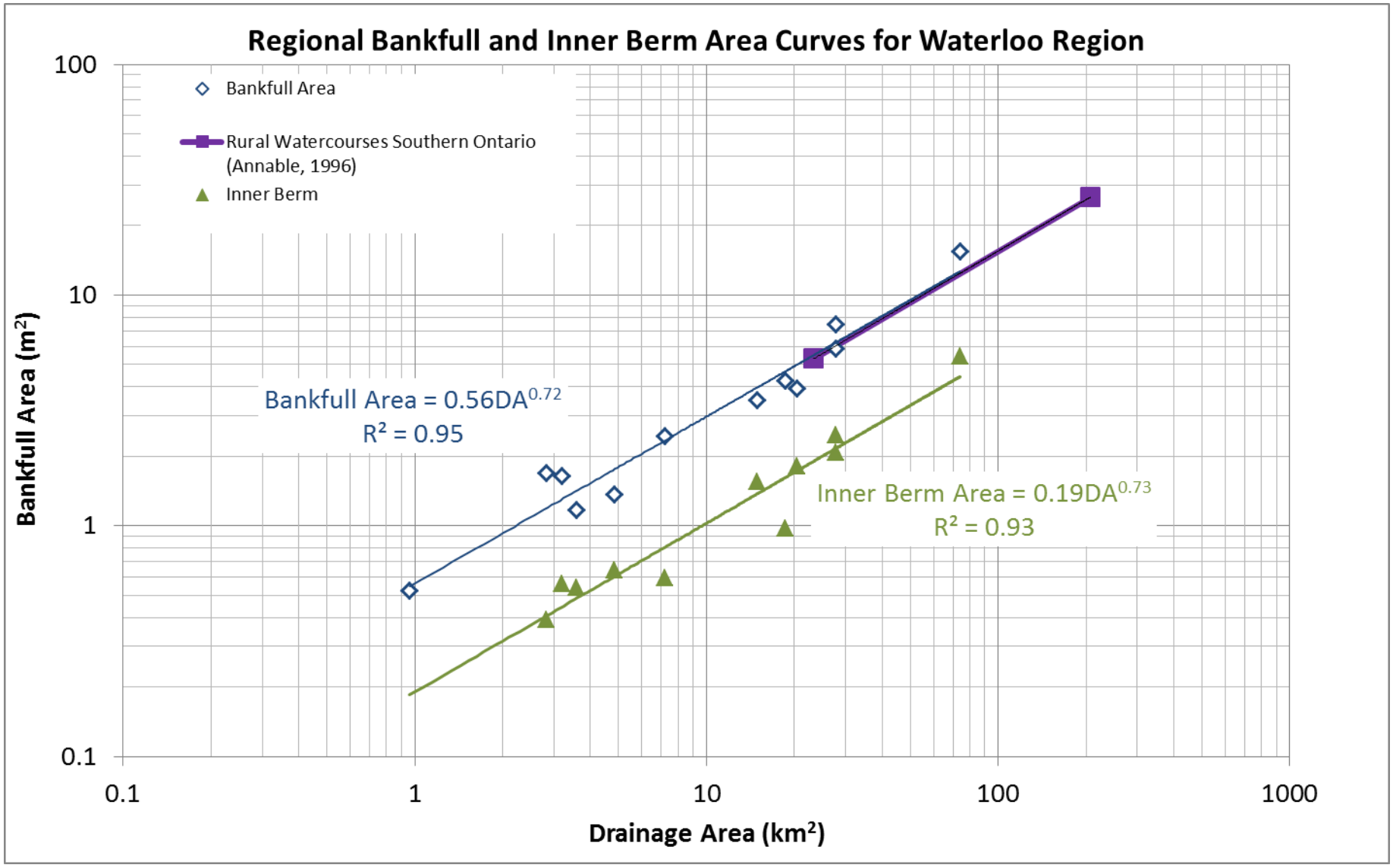
Peel Region

n = 10



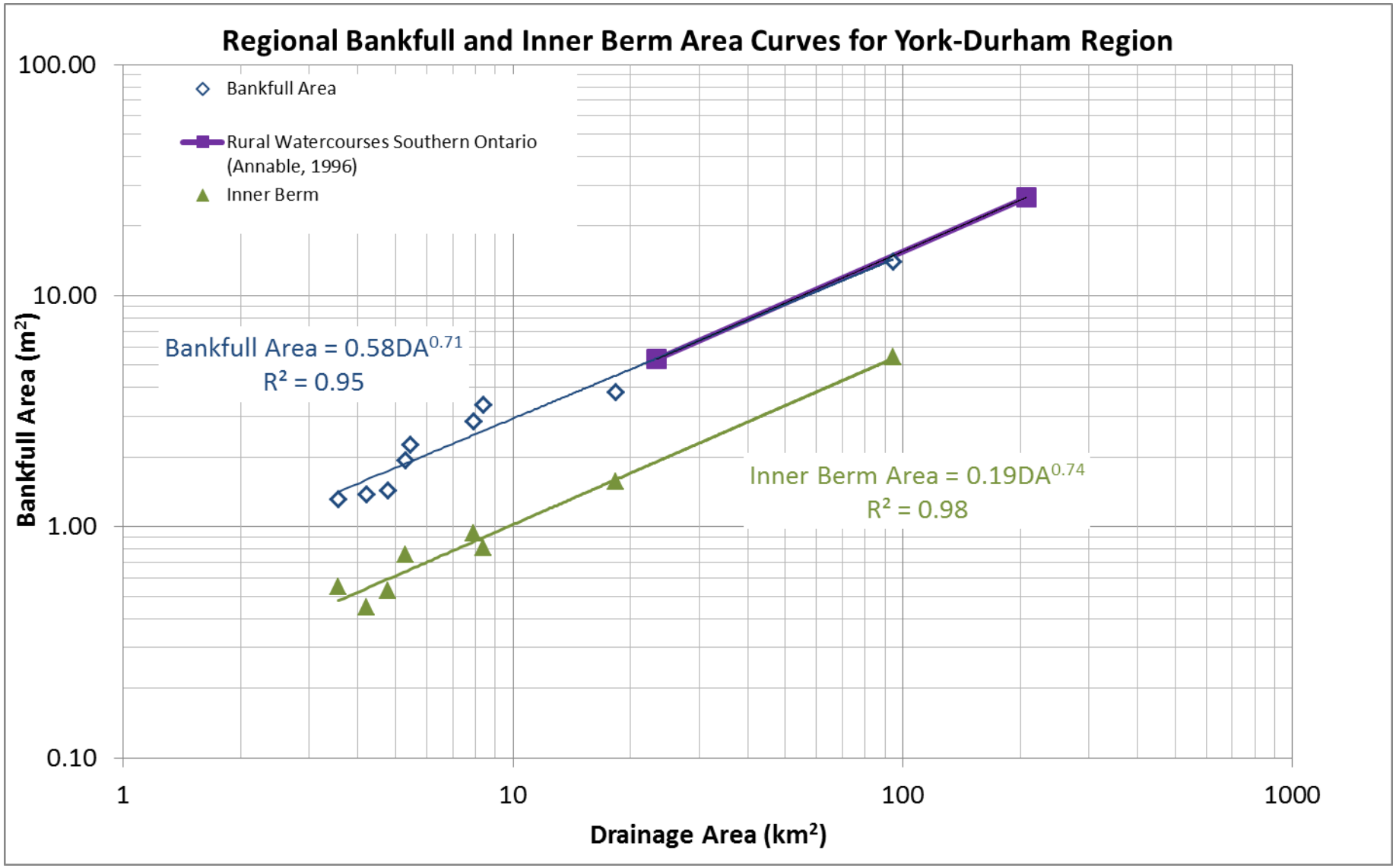
Waterloo Region

n = 12

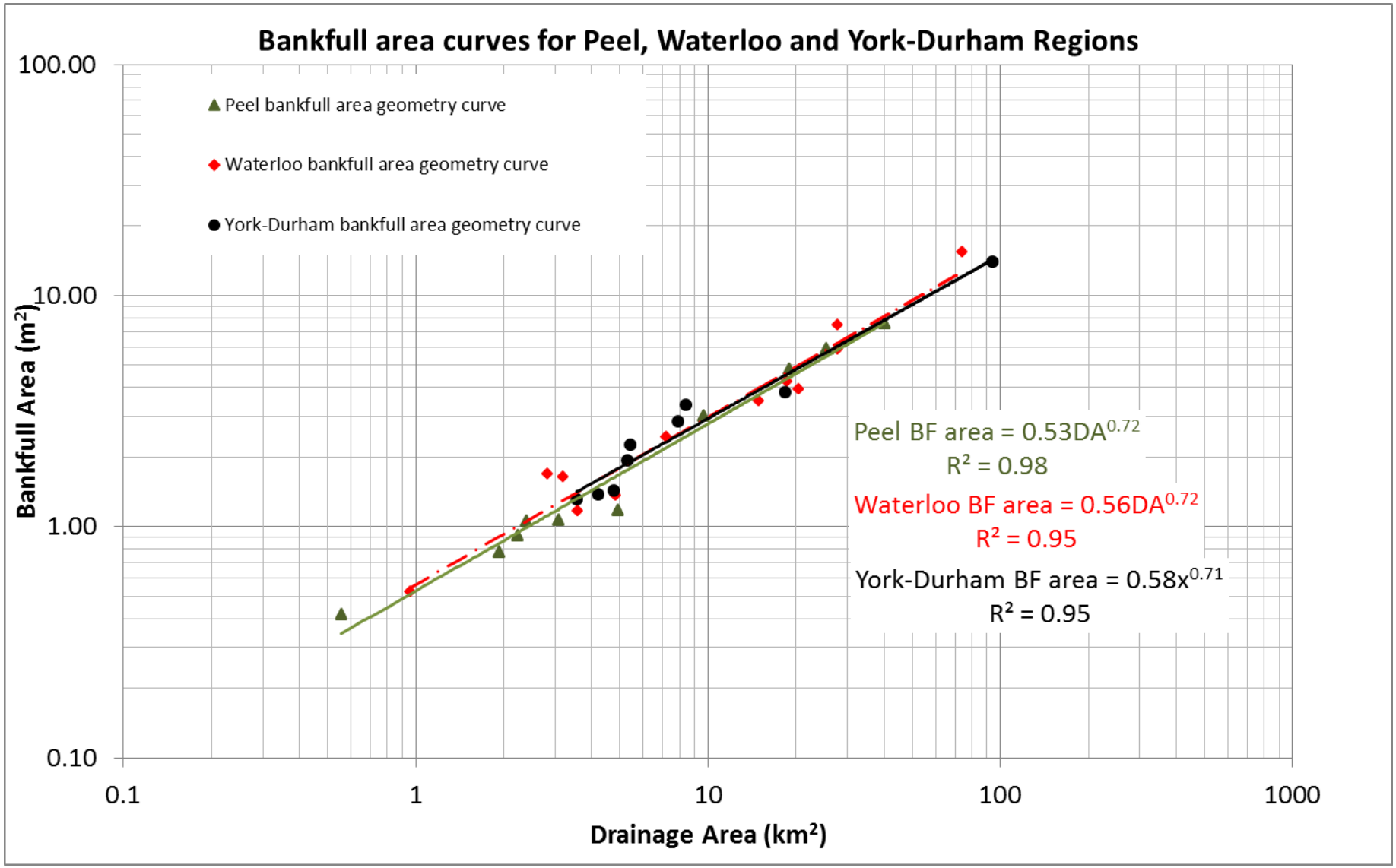


York Durham Region

n = 9

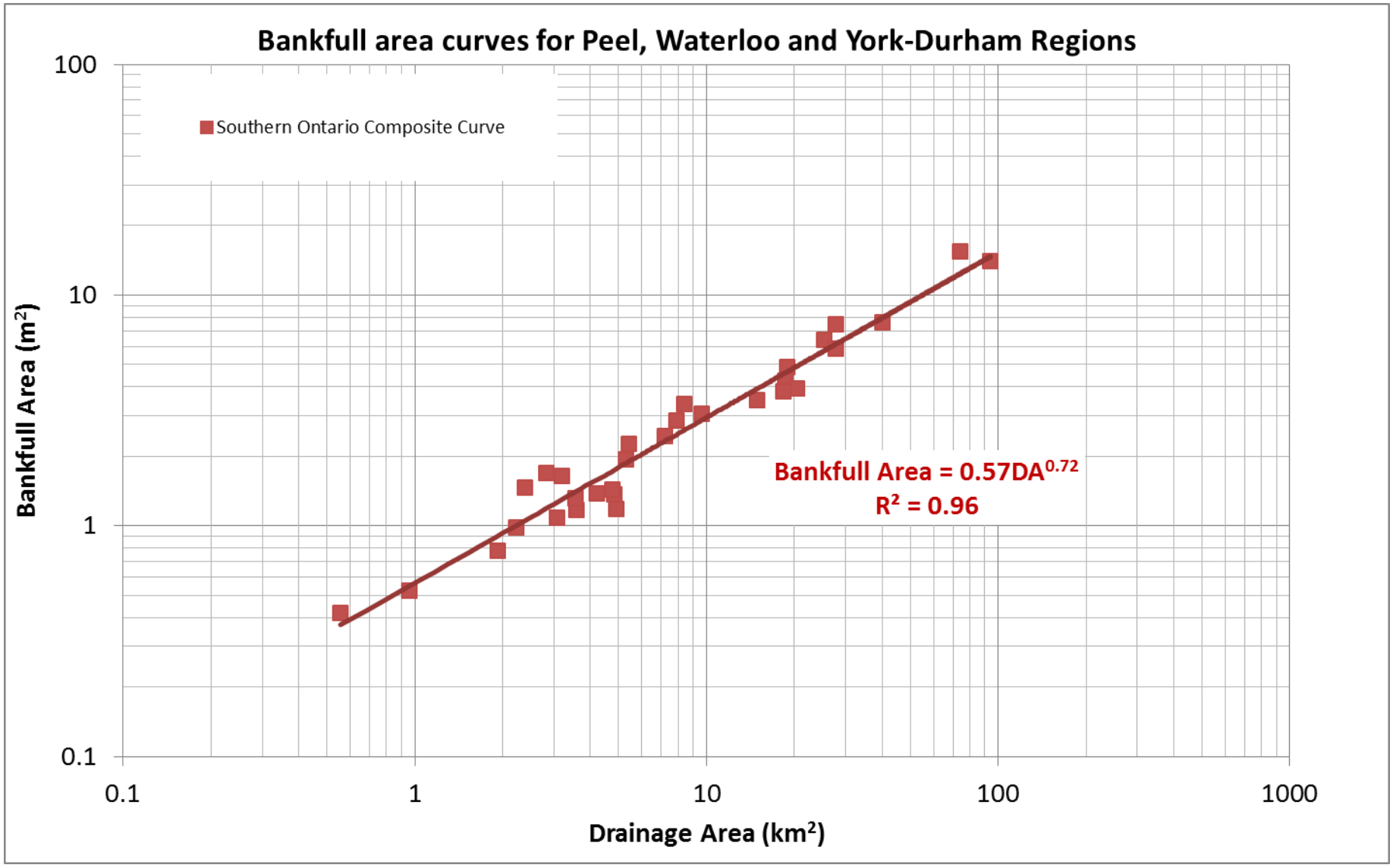


Regional Comparison



Composite Curve

n = 31



Composite Curve

- Estimates of bankfull area in glacial sediments
- Waterloo, Peel and York-Durham Regions
- Inner berm area more sensitive to region

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5 Summary

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Regional Curves

- High correlation
- Represent actual stream dimensions in a region
- Check of other estimates of bankfull dimension

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Regional Curves

- Support to designers
- Support to regulators
- Curve is incomplete

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Questions?