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Habitat of Yilgarn Gold
- Fault and Worm Analysis

Barry Murphy University of Melbourne

Terry Lees Monash University

A1 - TT Database

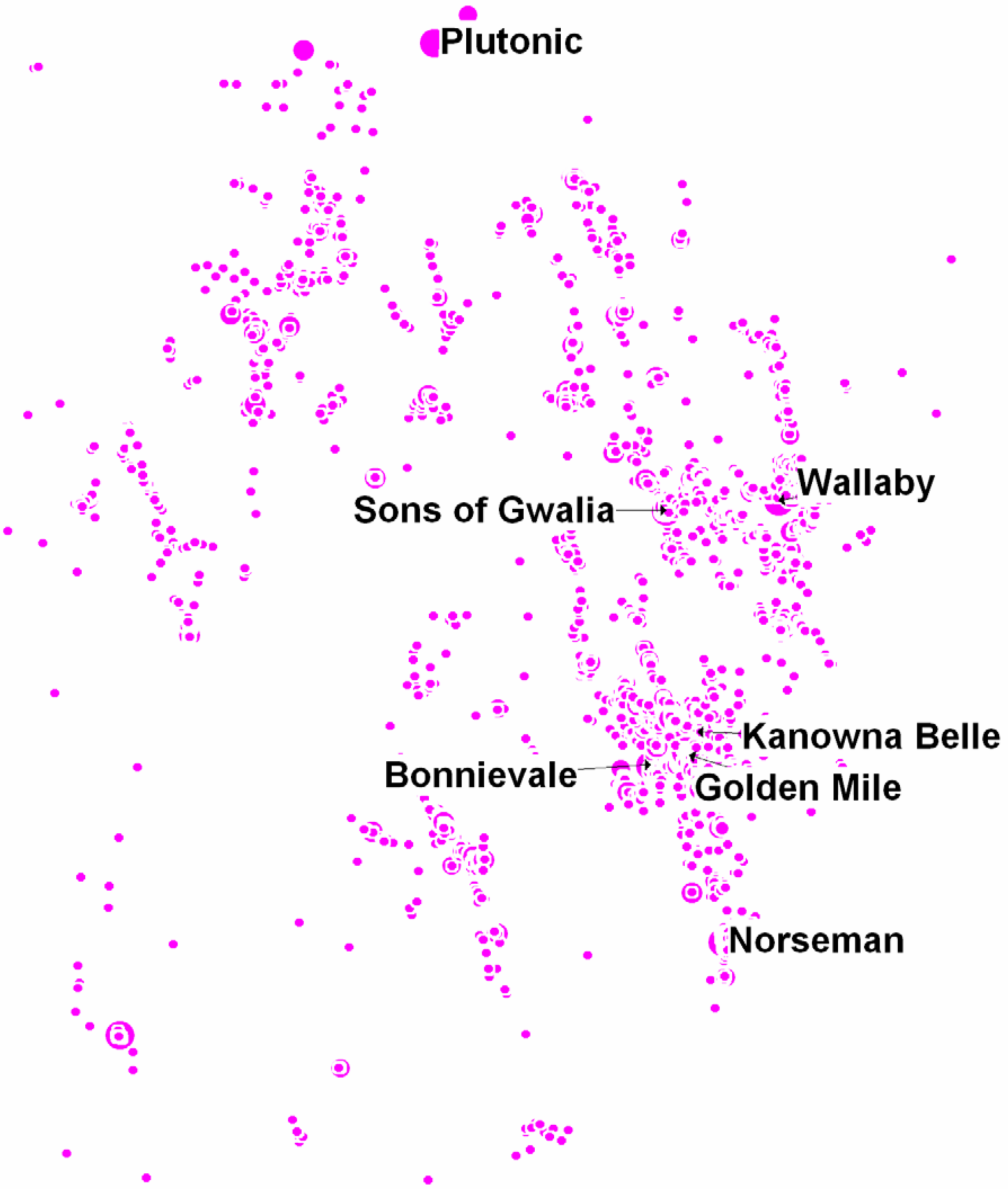
- “Why are some faults are more prospective than others?”
- What role do long, deep faults play in metal distributions?
- Informed by global TT database, but 100km length cutoff
- Terrane scale analysis, use total fault population
- Derive parameters for numerical modelling
- Reduce search area, increase chance of discovery

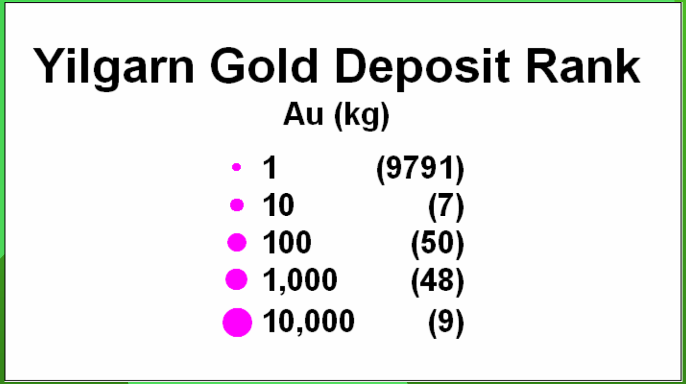
Content

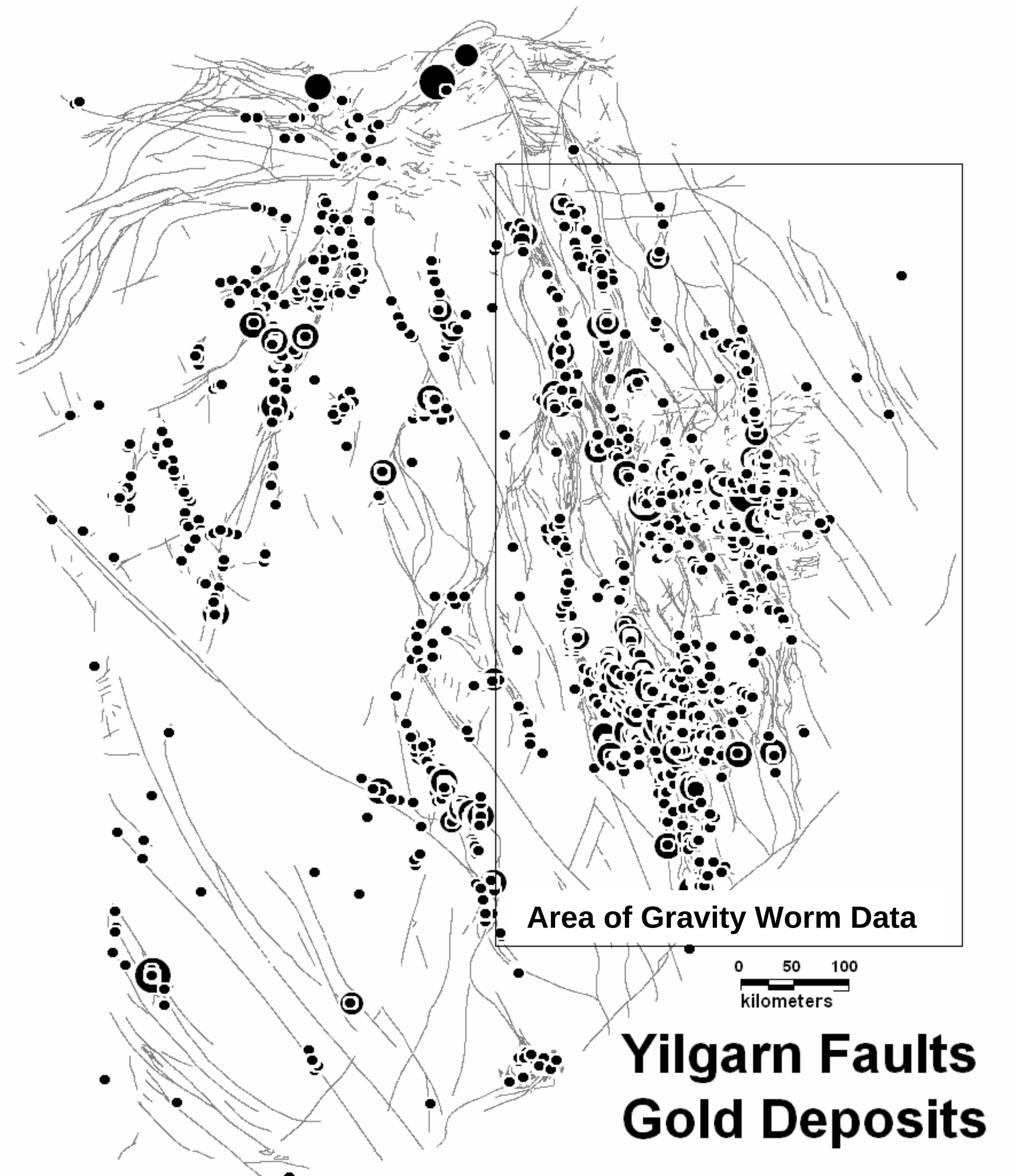
- Input Data – Deposits, Faults, Gravity Worms
- Data Processing and Output data
- Spatial Analysis – fixed and variable buffers
- Outcomes and Directions

Input 1 – Gold

- Deposits taken as a coherent population
- Ranked by size
  (kg Au)
  – ok, there are issues..



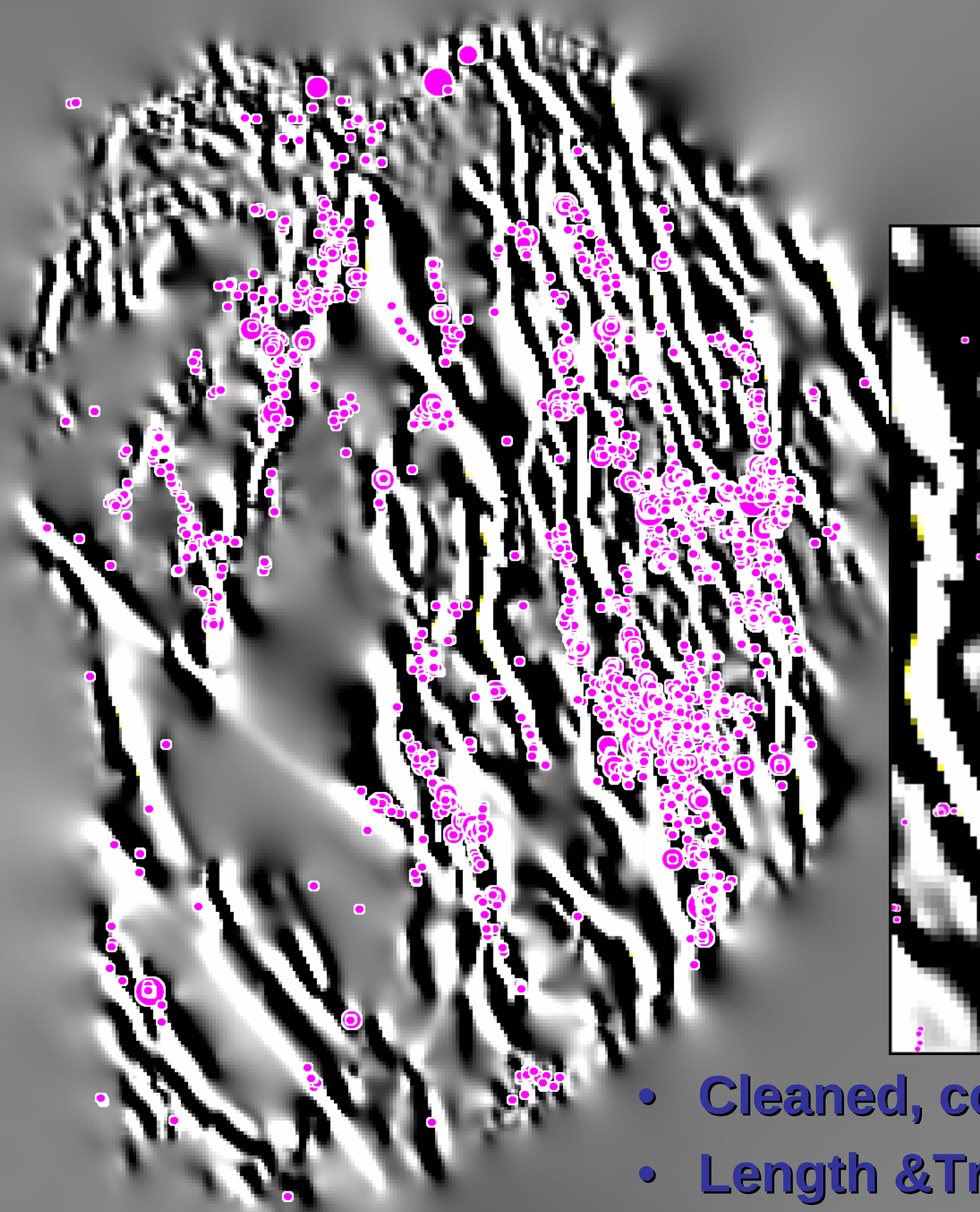


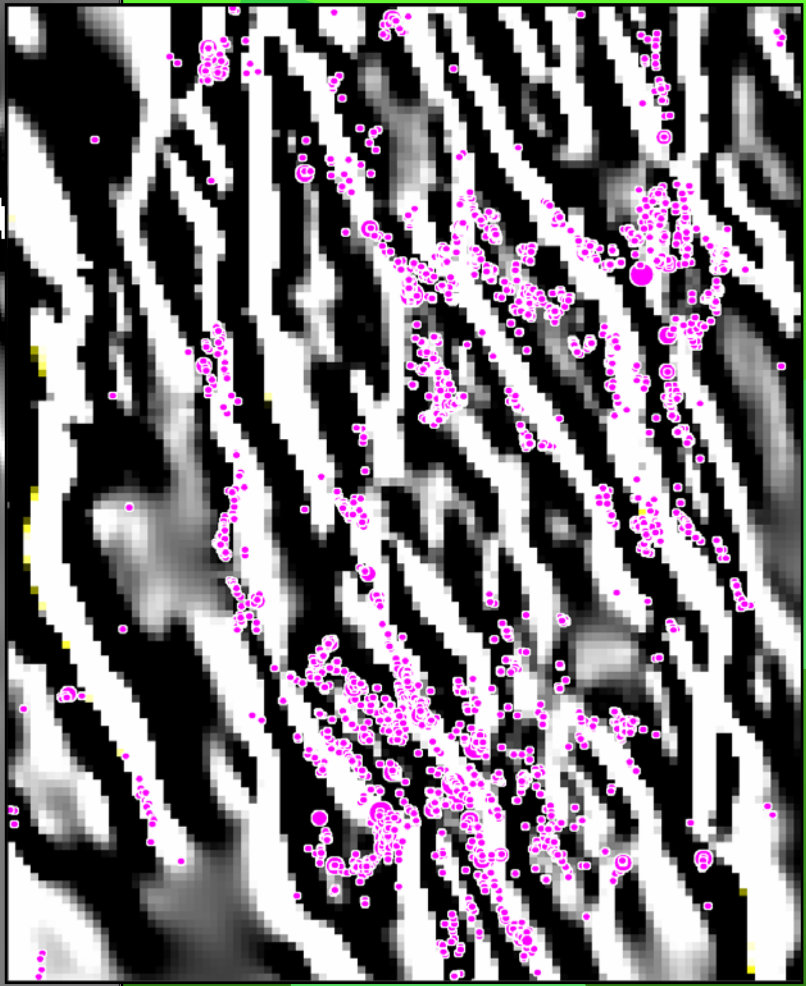


Input 2 - Faults

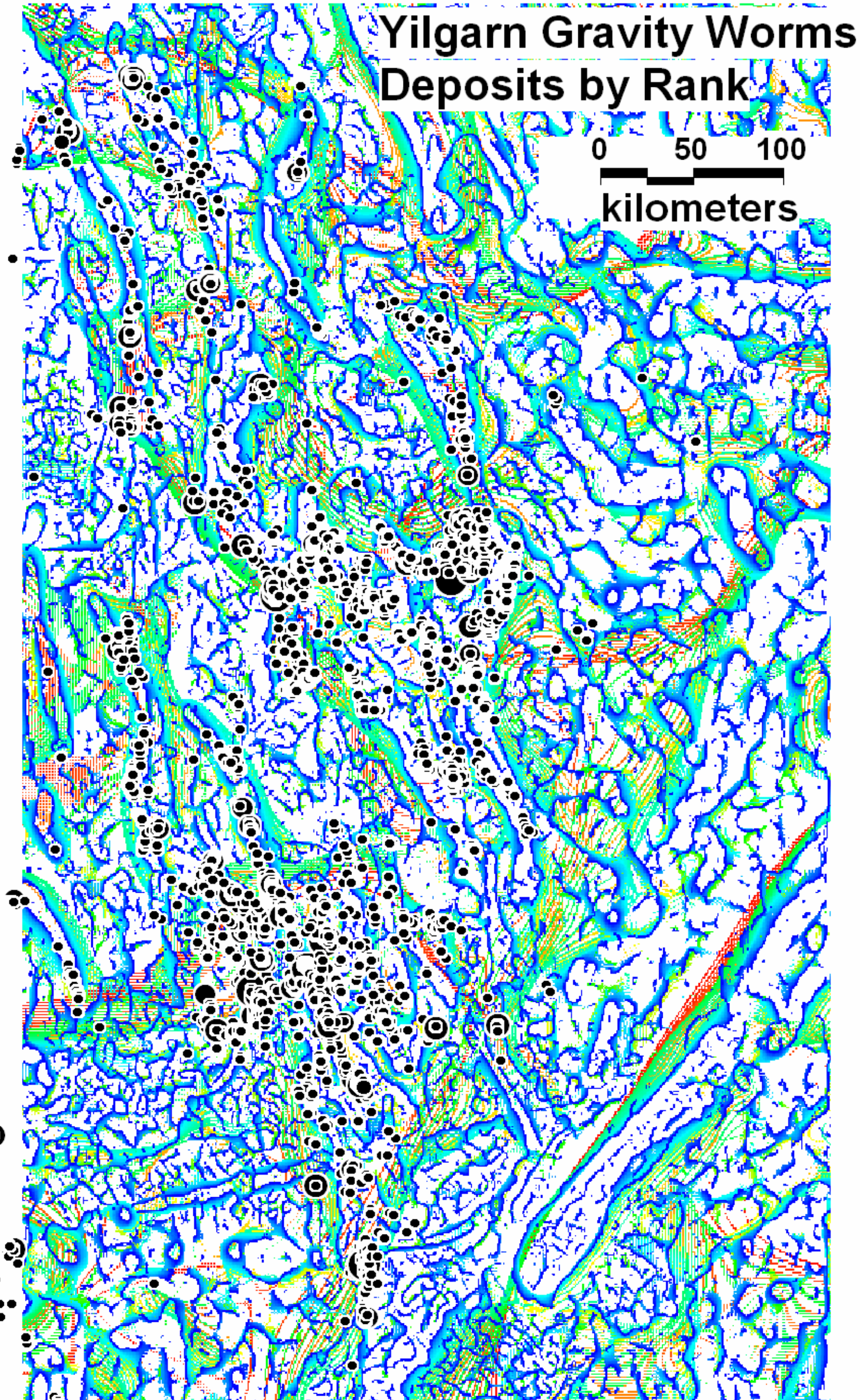
- Existing digital coverage
- Issues of quality and reliability

Fault Length Image





- Cleaned, concatenated
- Length &Trend attributes



Input 3 – Gravity Worms

- Upward continued to 66km (FracWormer™)
- Coloured by height (Z)
  - shallow, fine scale (blue)
  - high, coarse scale (red)

Gravity Worms

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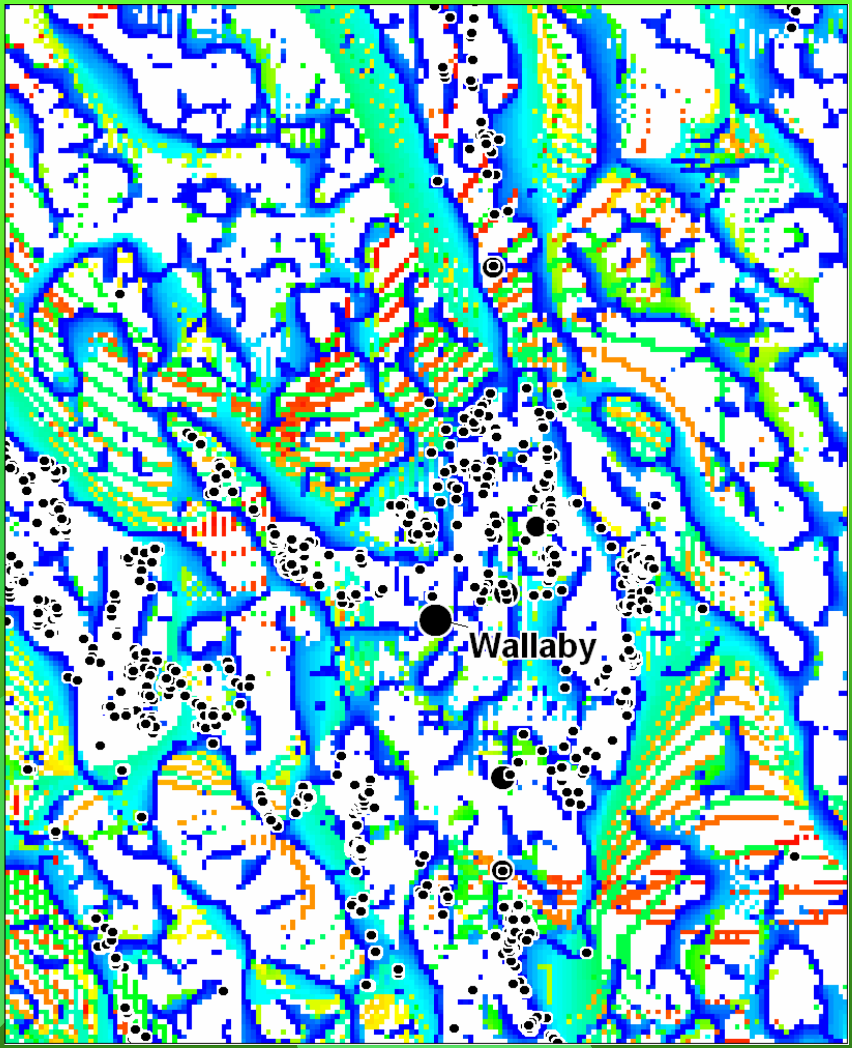
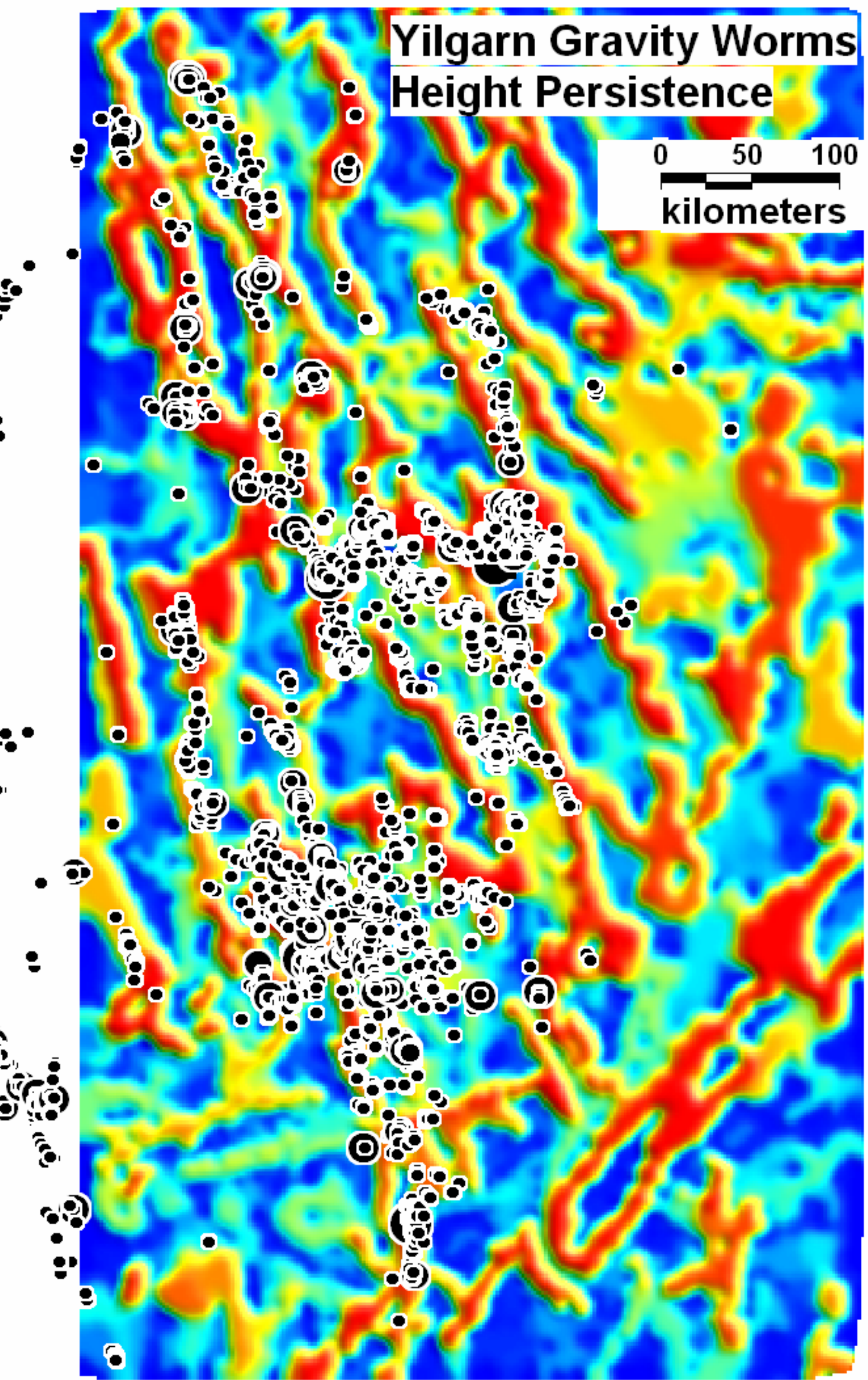
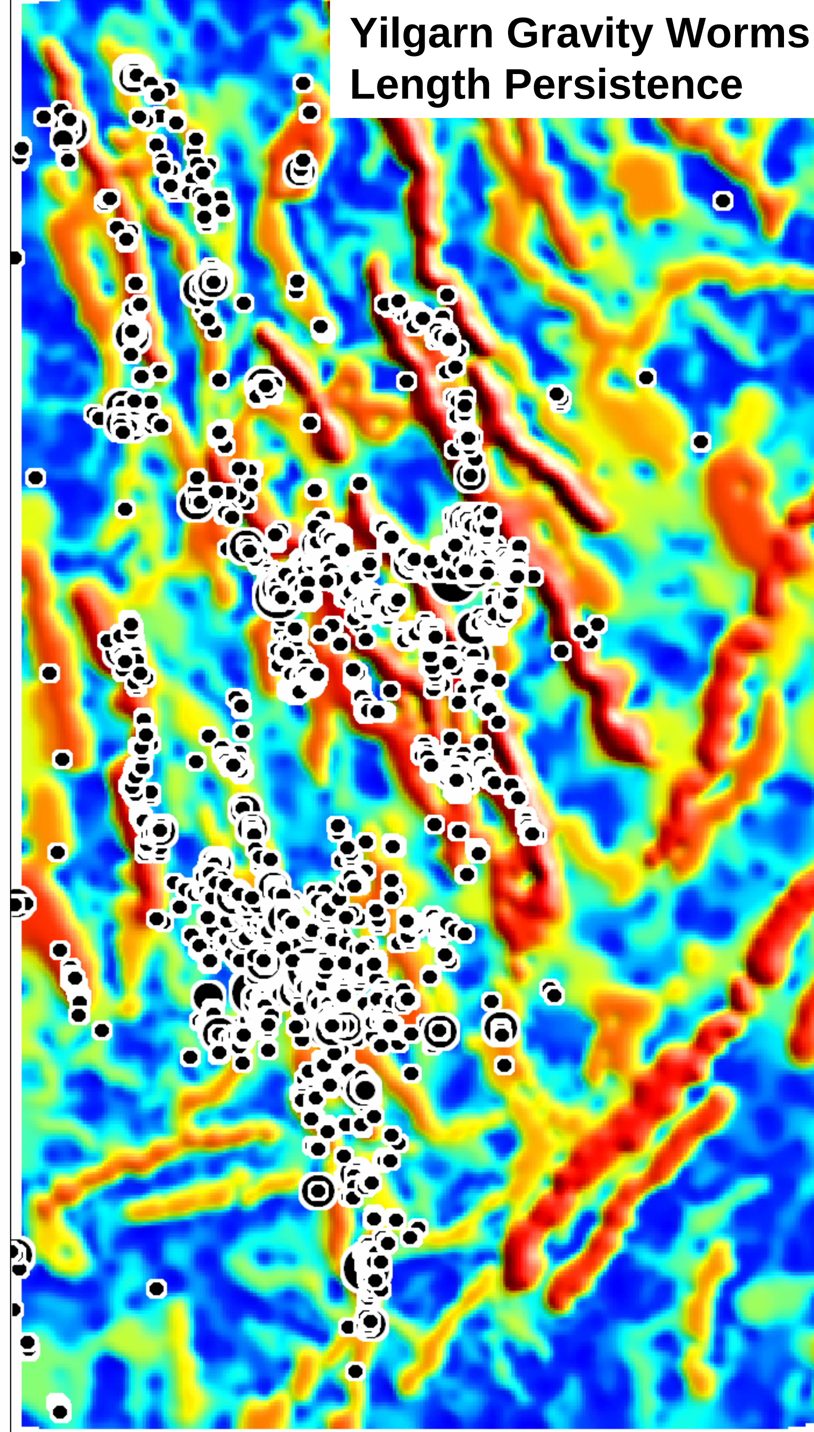
- Points of maximum gradient in 3D space (X, Y, Z)
- Edges with a measurable density contrast or amplitude (W)
- Post-processing - near-surface height weighted points
- Projection of 3D worm points (Z) to 2.5D points (Zwt) (Geoscope)
- Vector Edge Dimensions =
  - Height persistence (Zwt)
  - Length (L)
- Height a proxy for depth “~1/2”
- Amplitude (W) not used in current analysis





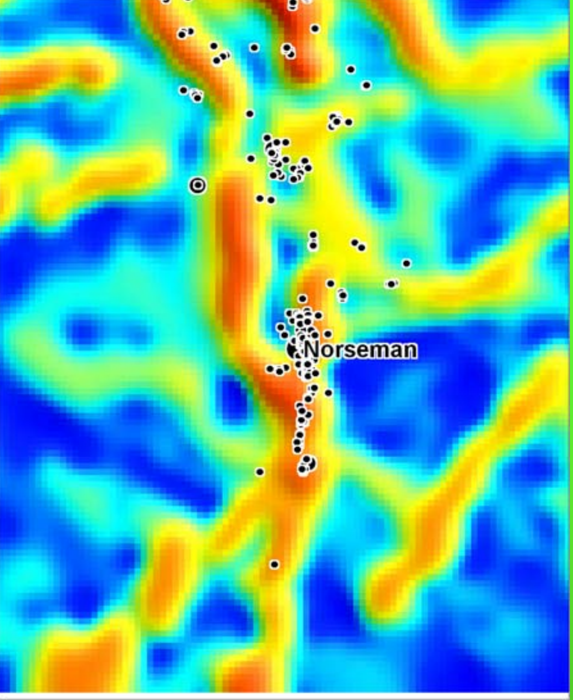
Yilgarn Gravity Worms
Height Persistence
0 50 100
kilometers



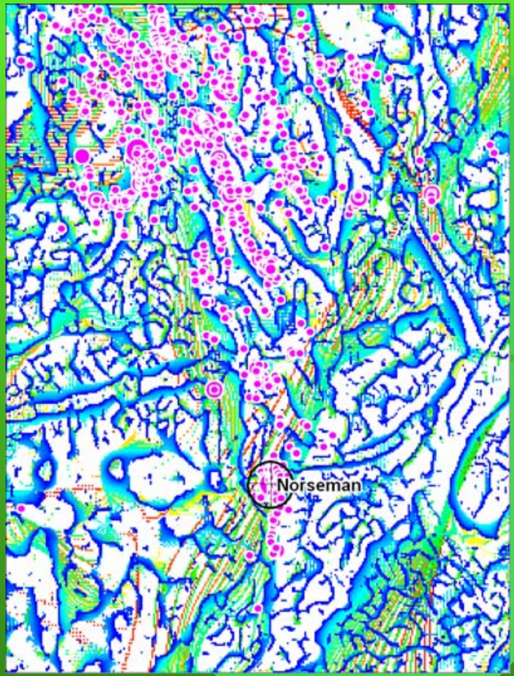
Yilgarn Gravity Worms
Length Persistence

Gravity Worms and Major Deposits

- Characterisation of Top 6 deposits

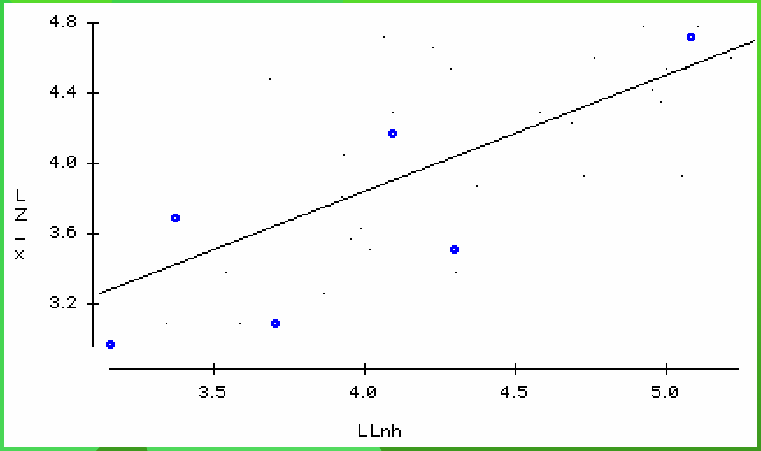


Length

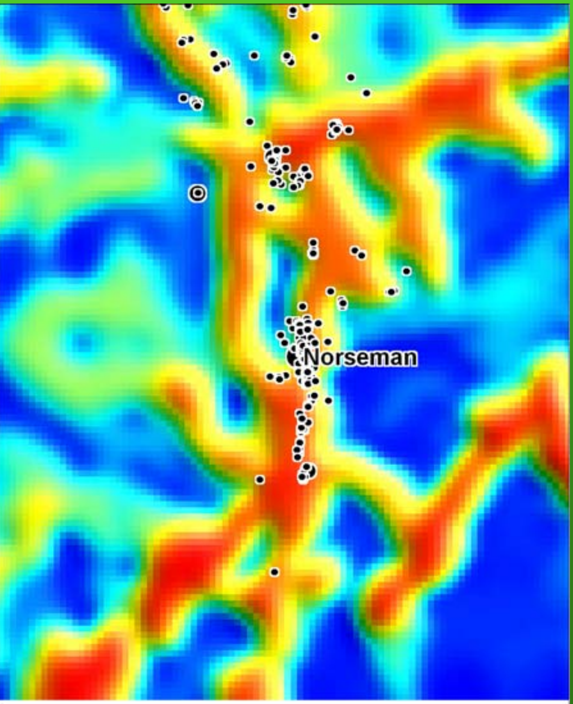


Worm Data

Norseman



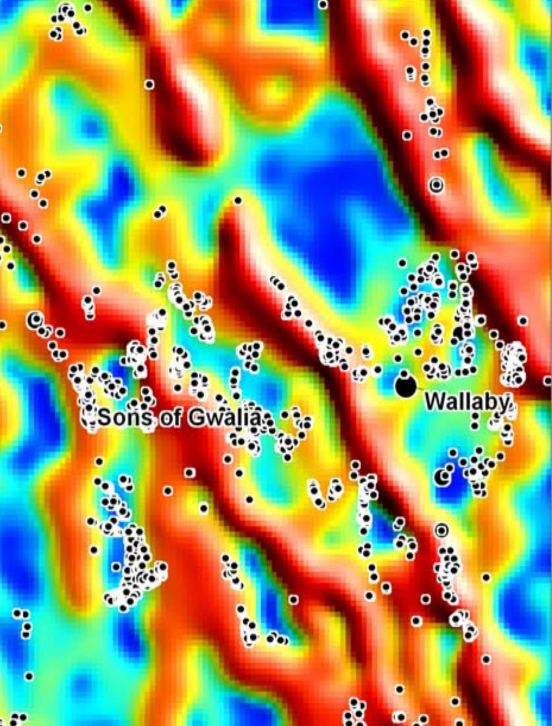
Log Zwt/Log Length
10km radius of deposit

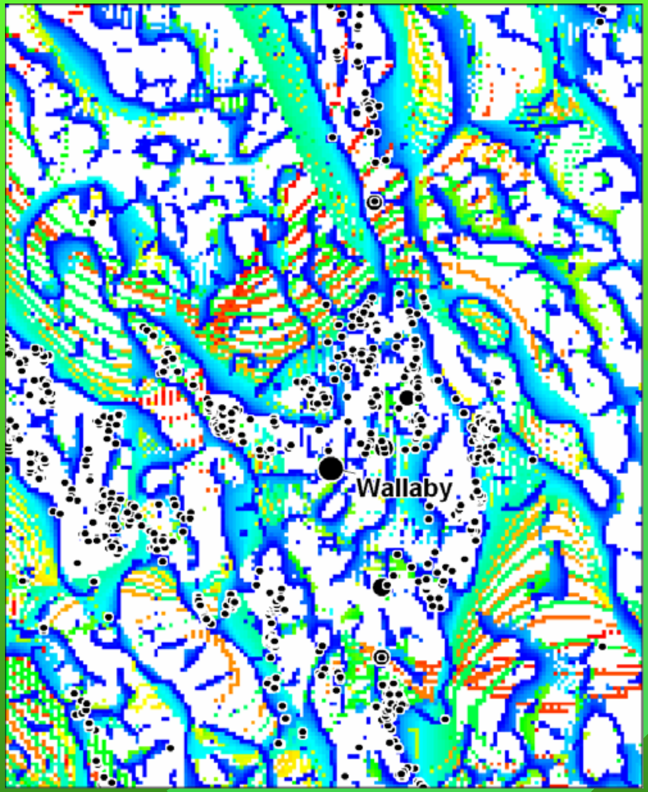


Zwt Max (Height)

Gravity Worms

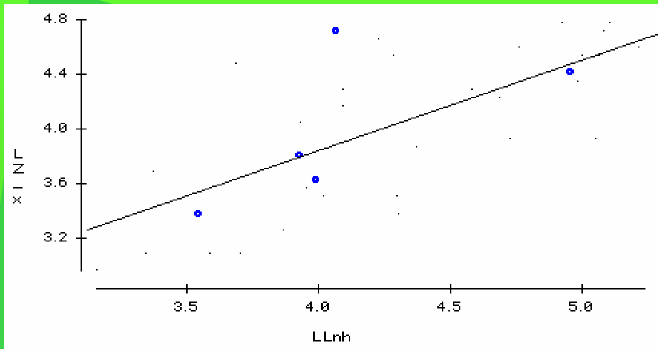
Length



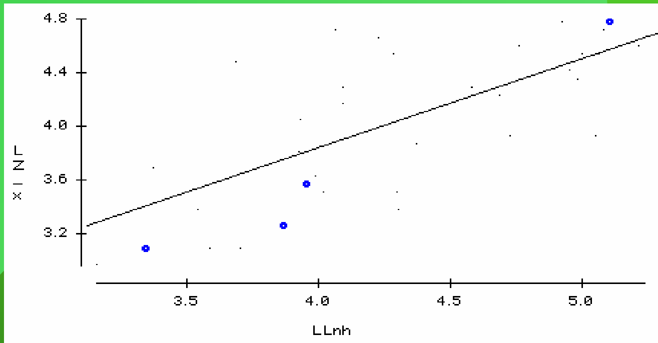


Worm Data

Wallaby



Sons of Gwalia



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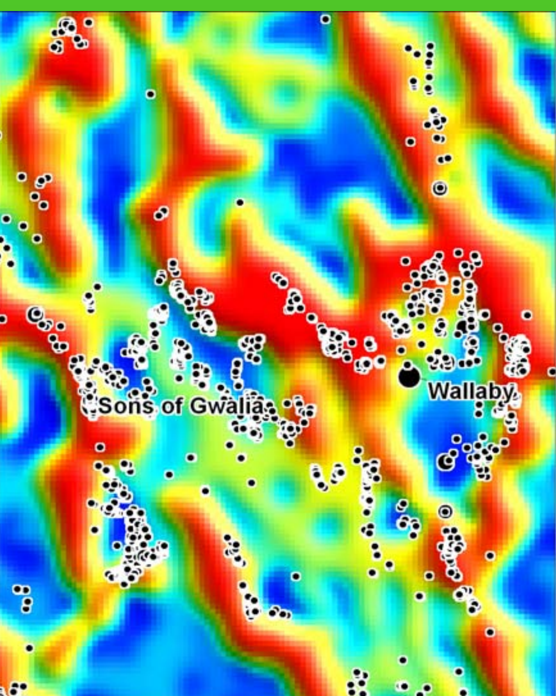
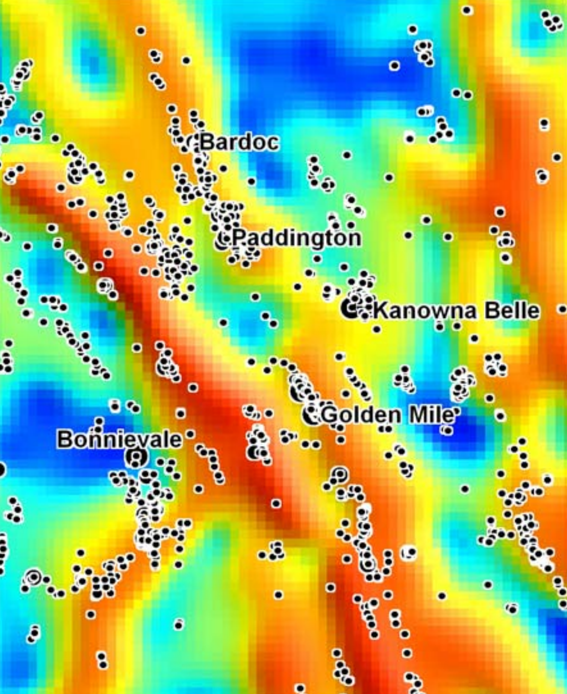
10km radius of deposit

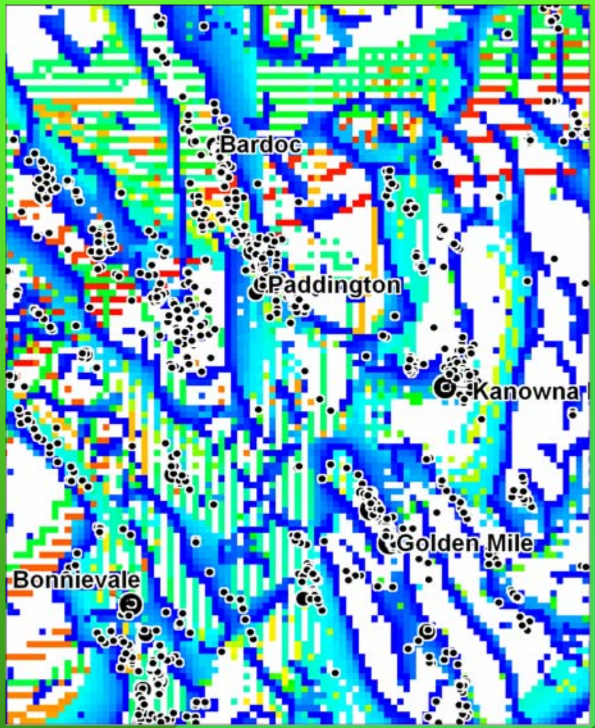


Zwt Max (Height)

Gravity Worms

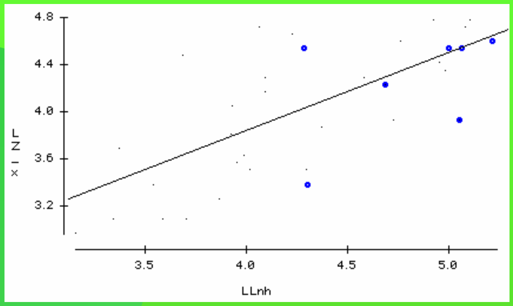


Length

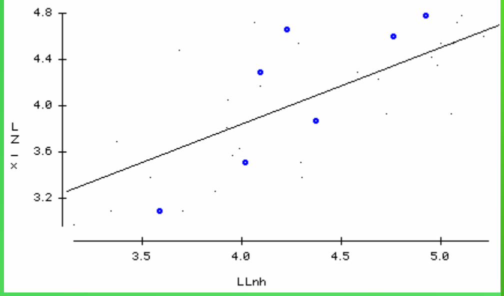


Worm Data

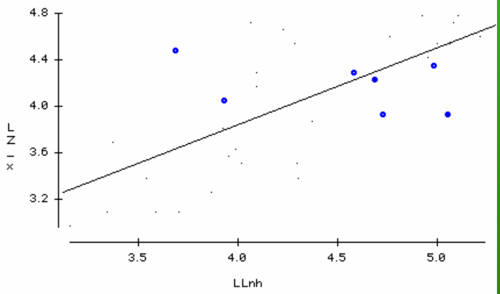
Golden Mile



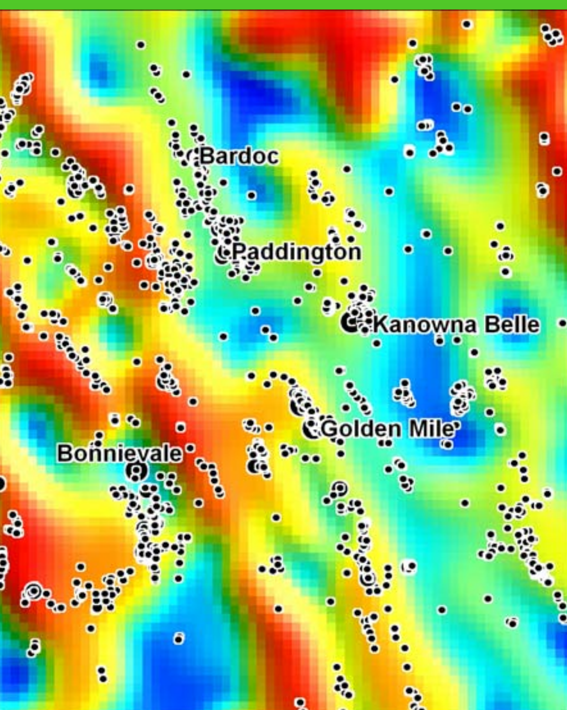
Bonnievale



Kanowna Belle



Log Zwt/Log Length
10km radius of deposit



Zwt Max (Height)

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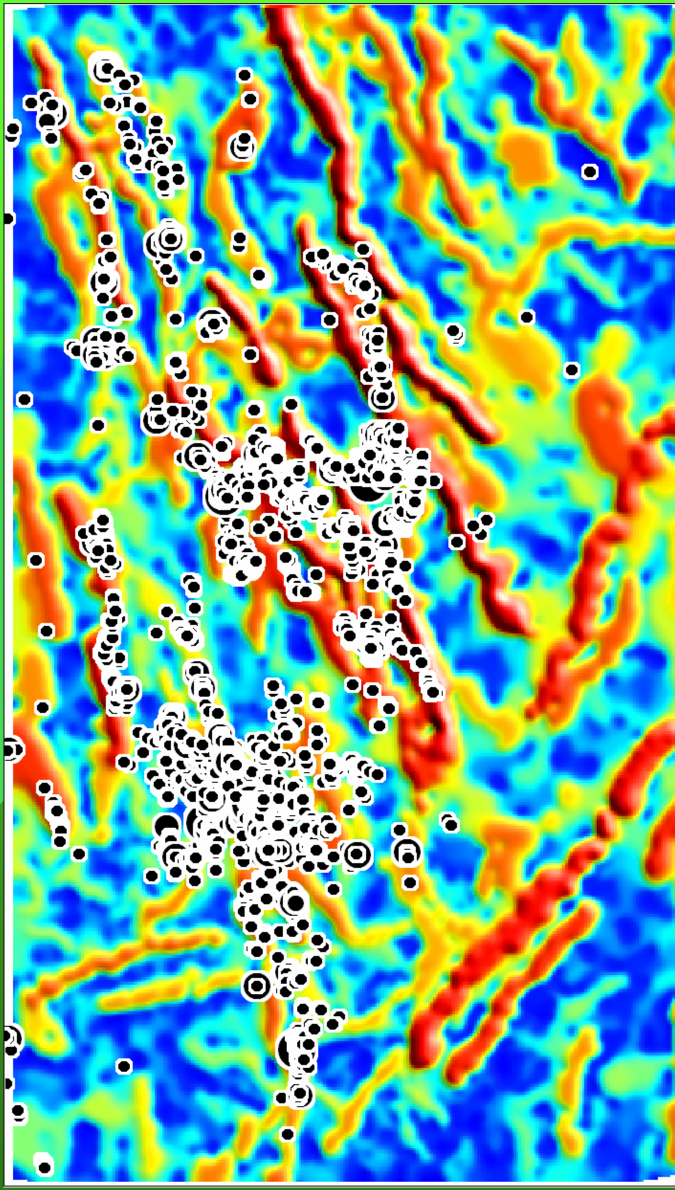
Spatial Analysis

- **Major Deposits and Major Worms – the plot thickens…**
- **Proximity to fault and worm edges**
  - **Sequential buffer windows on vector data**
  - **Buffer (Search) area increases with distance from fault/worm**
  - **Quantify metal content (deposit rank) per buffer window area**
  - **Measure of metal in proximity to fault/worm**



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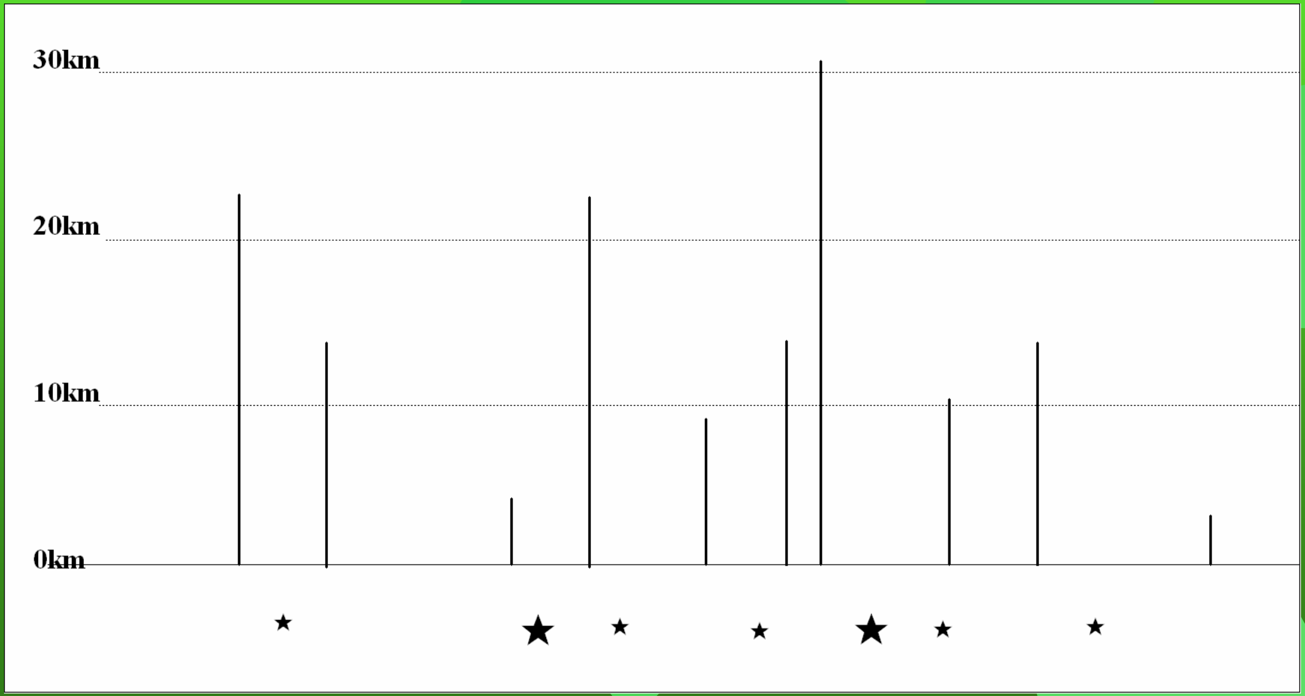
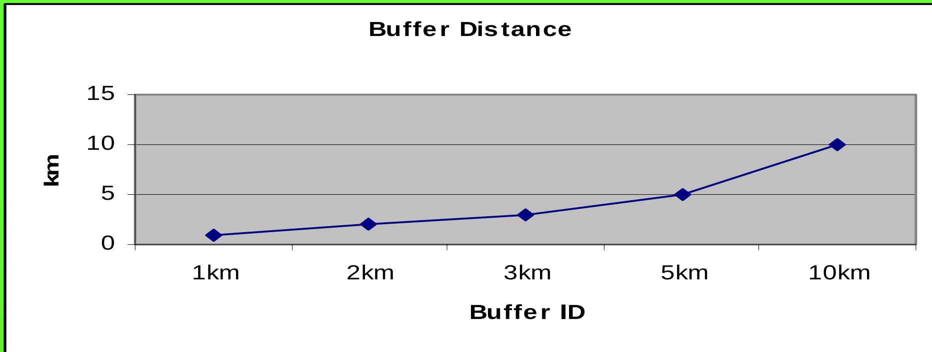
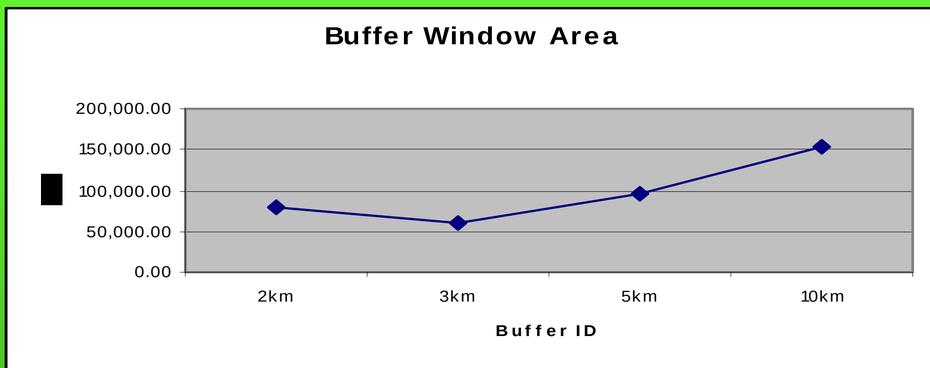
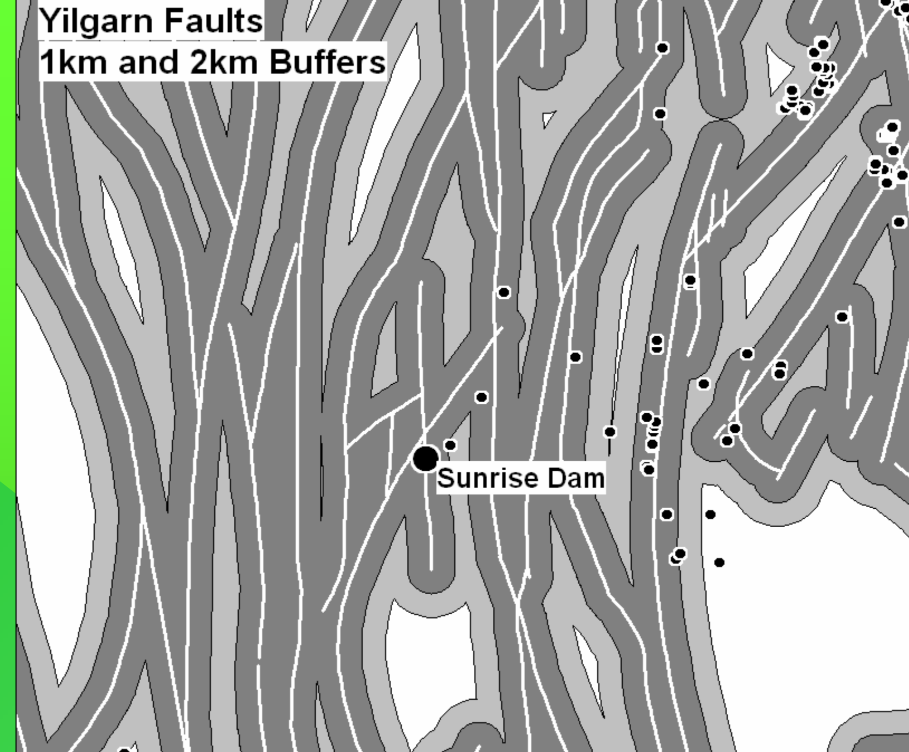
Spatial Analysis

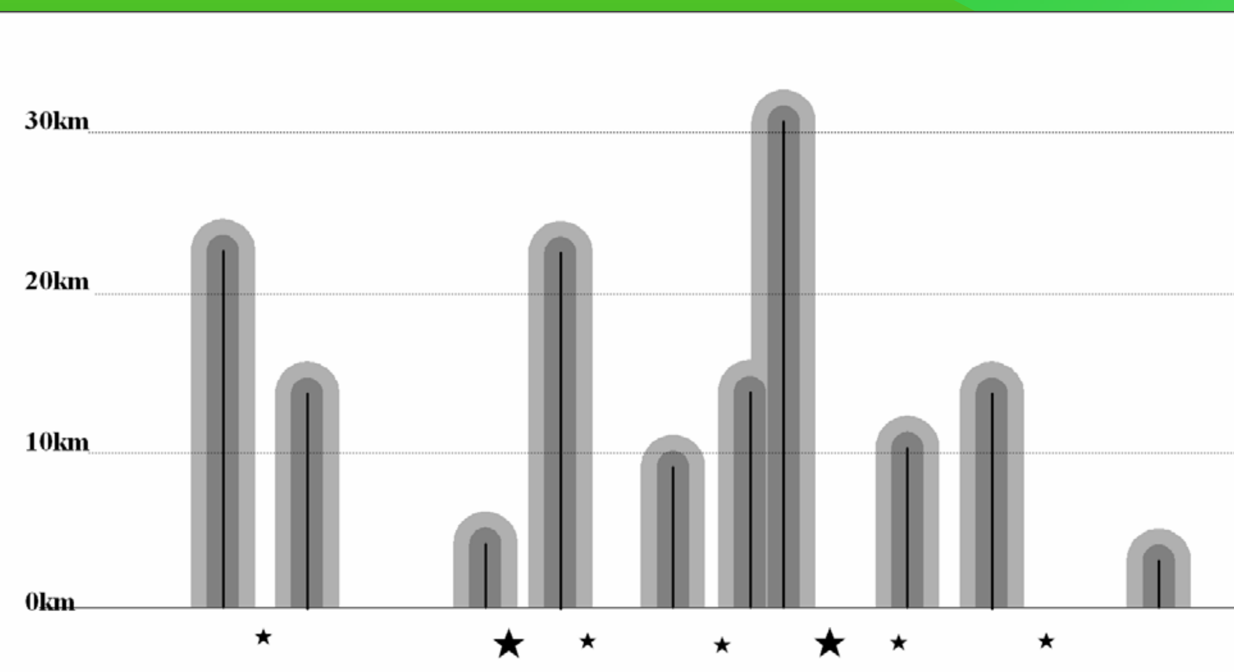
- Reduce the dimensions of the problem:
- Scanline survey of:
  - Faults (and Worms) of varying length (or Worm height)
  - Deposits of varying rank
- <u>Fixed width buffer</u> and <u>Variable width buffer</u> analysis







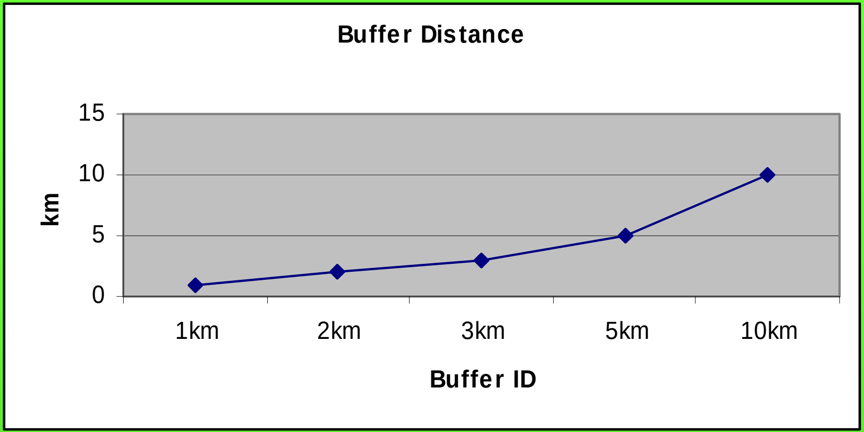


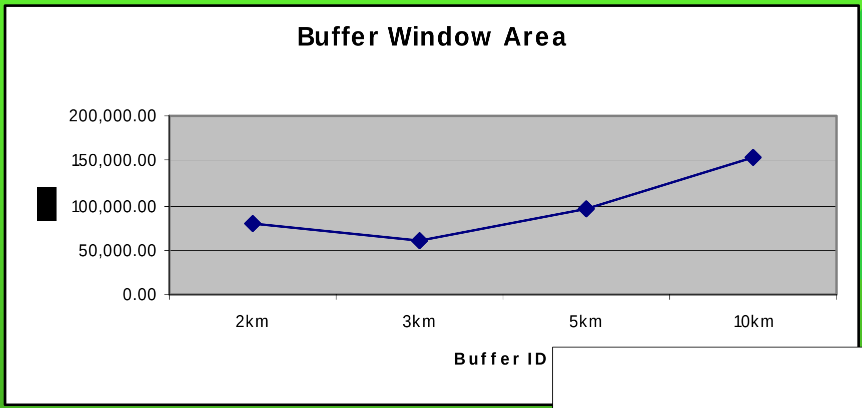


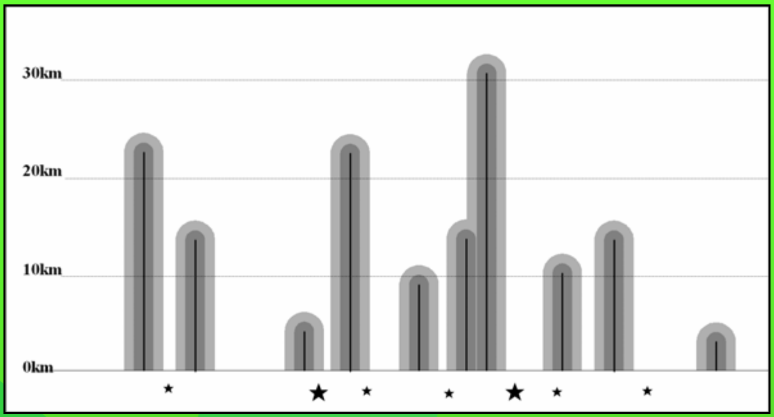
Fixed Width Buffers

- All faults same influence
- Buffer window area inc

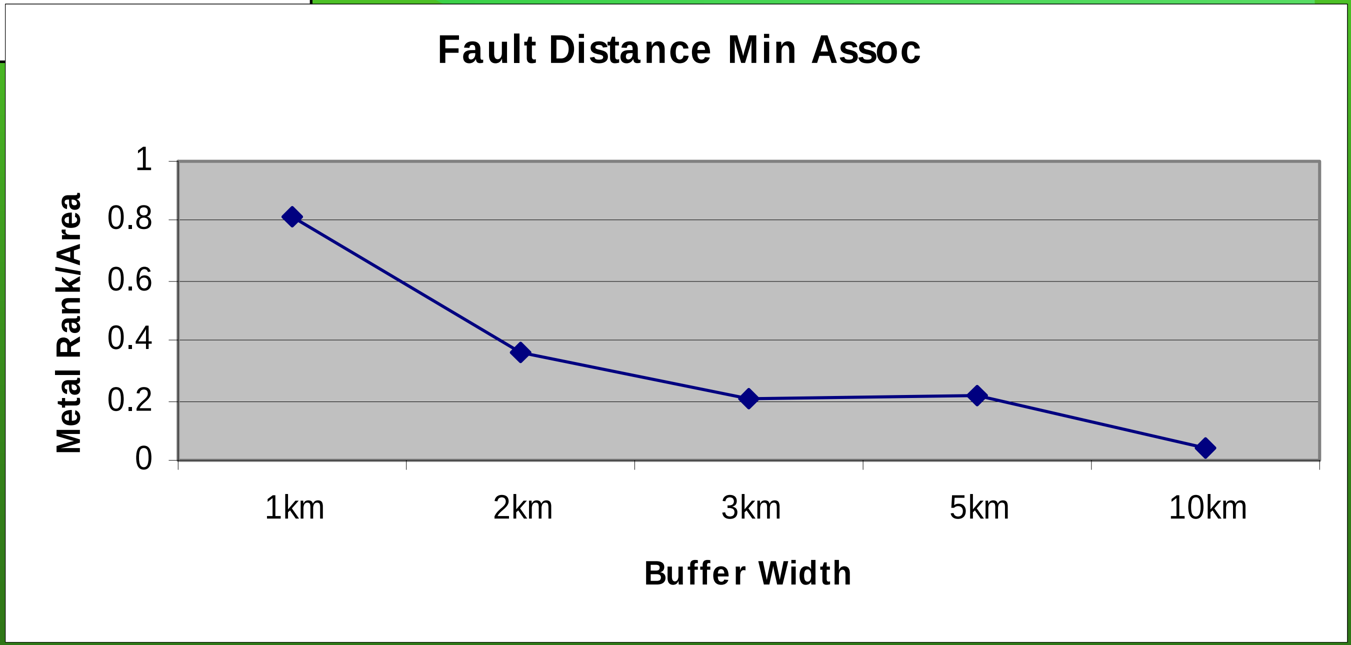
Fixed Width Buffers

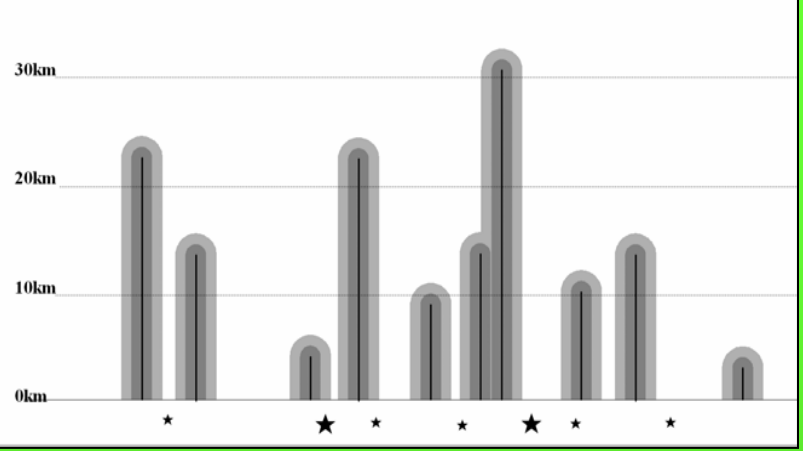






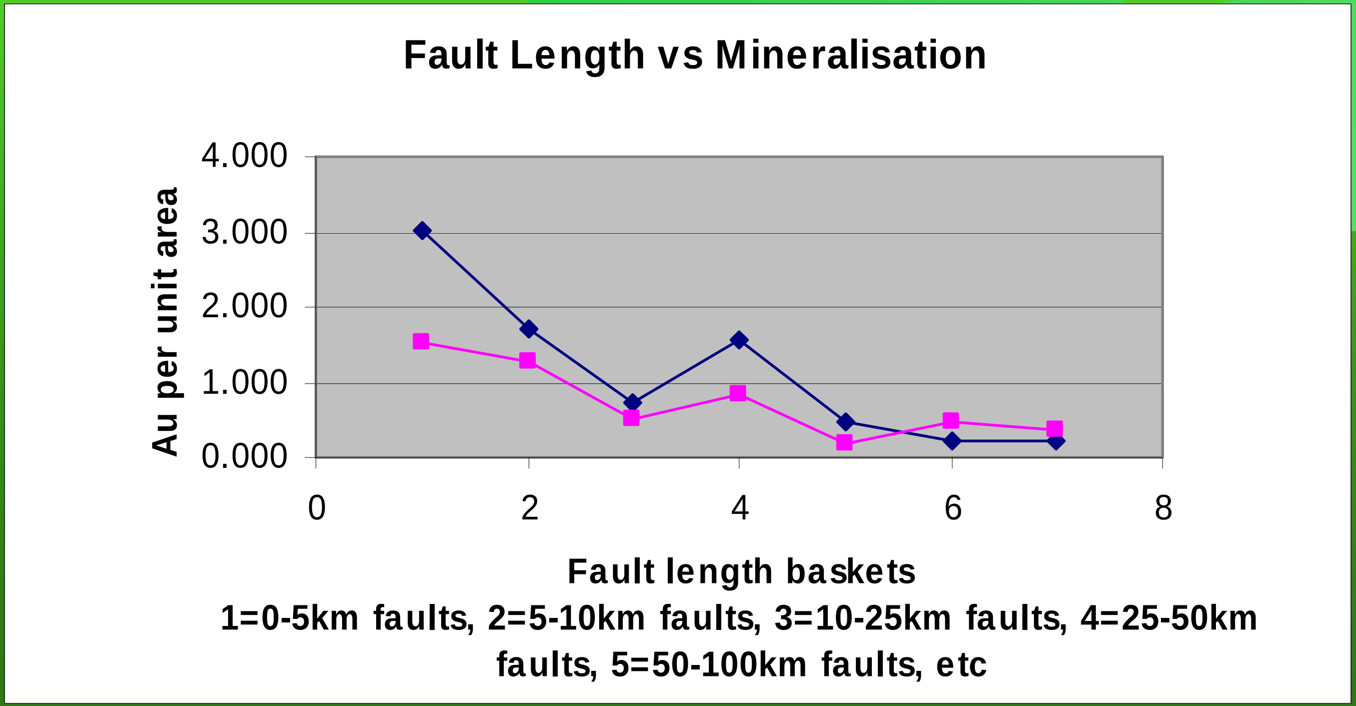
- Metal Rank/Area vs Buffer Width Plot
- **More metal closer to faults..!**

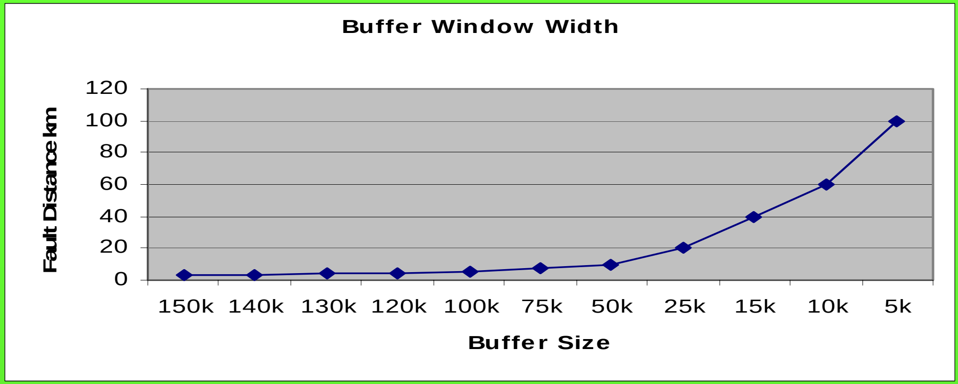


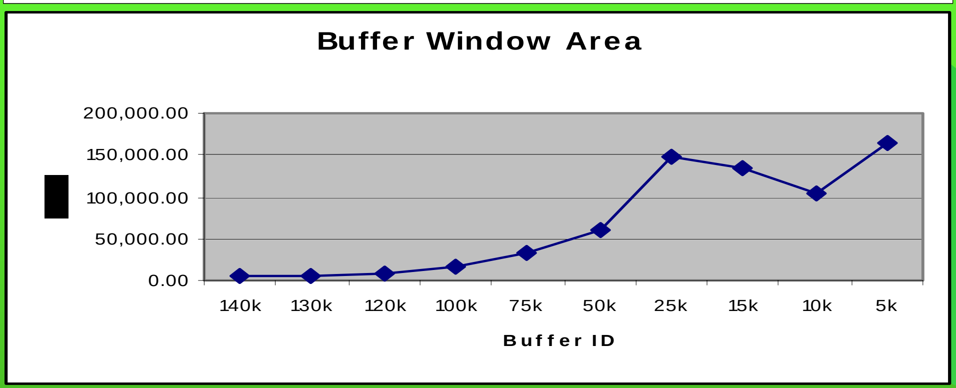


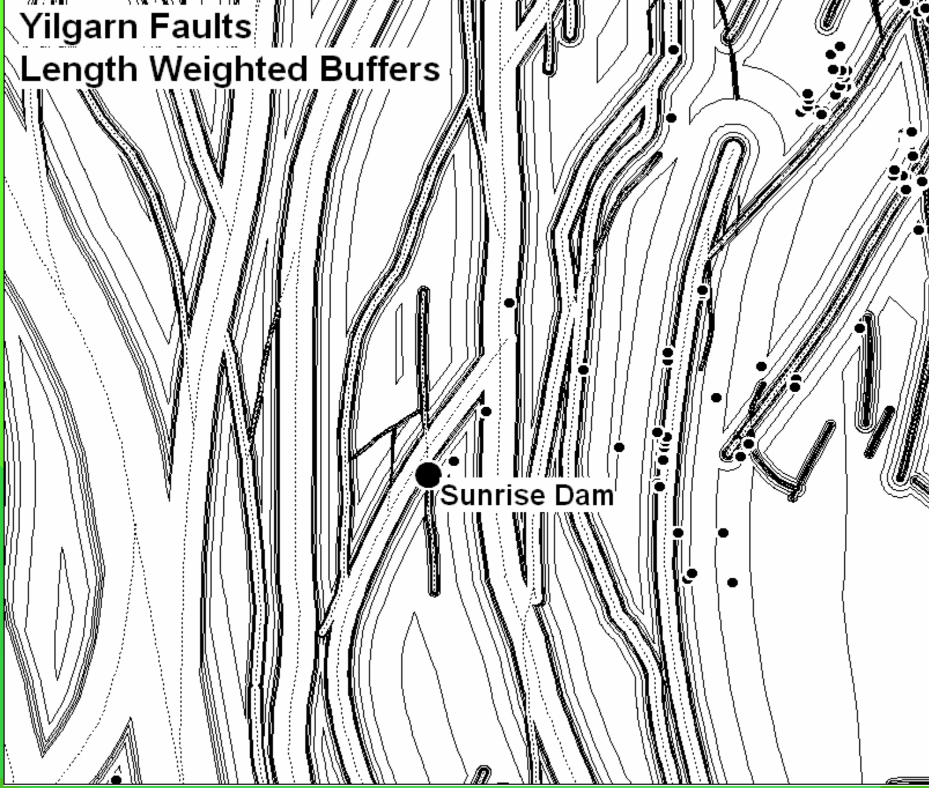
Faults - Fixed Width Buffers Using Length Baskets

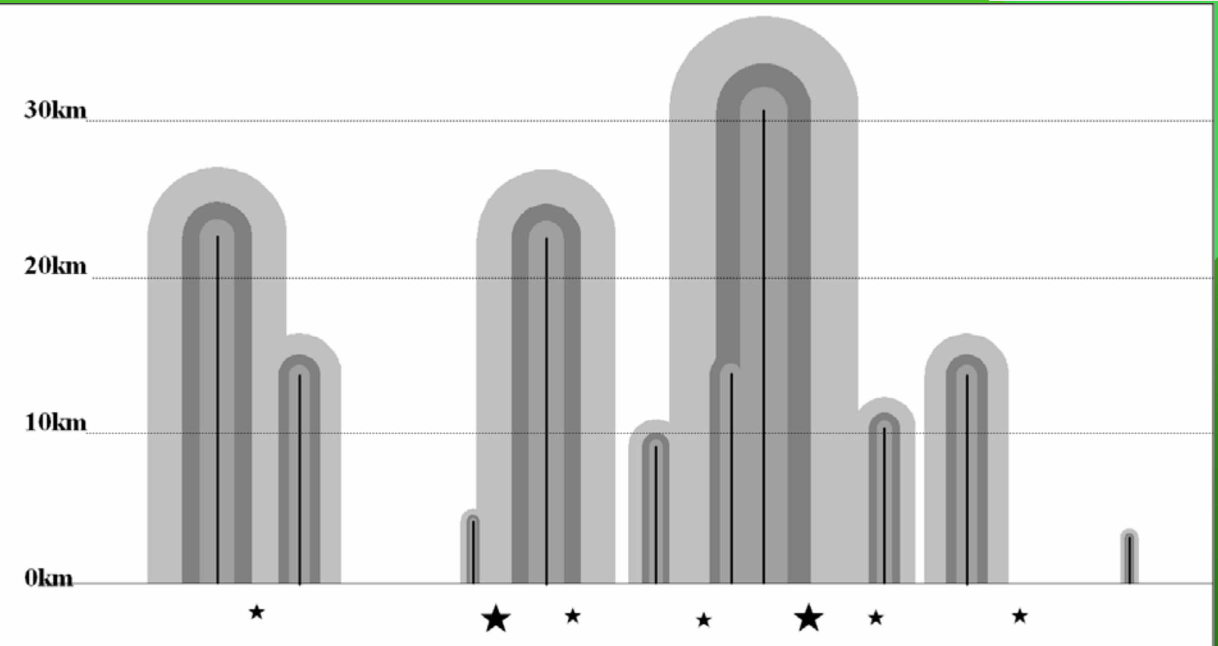
- Faults of specified length ranges (eg 1, 2km)
- Create 1km and 2km buffers
- **Find More metal in smaller faults**
- &/or more small faults around deposits
- Spike at 25-50km length
- Interesting pattern..
- but too many small faults to explore





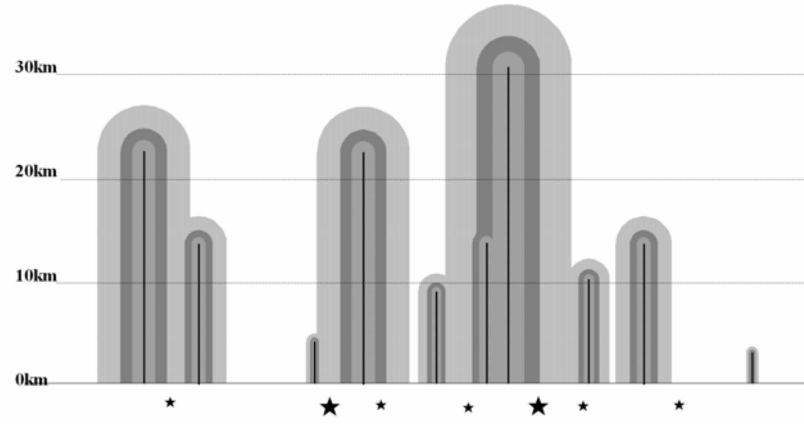






Variable Width Buffers

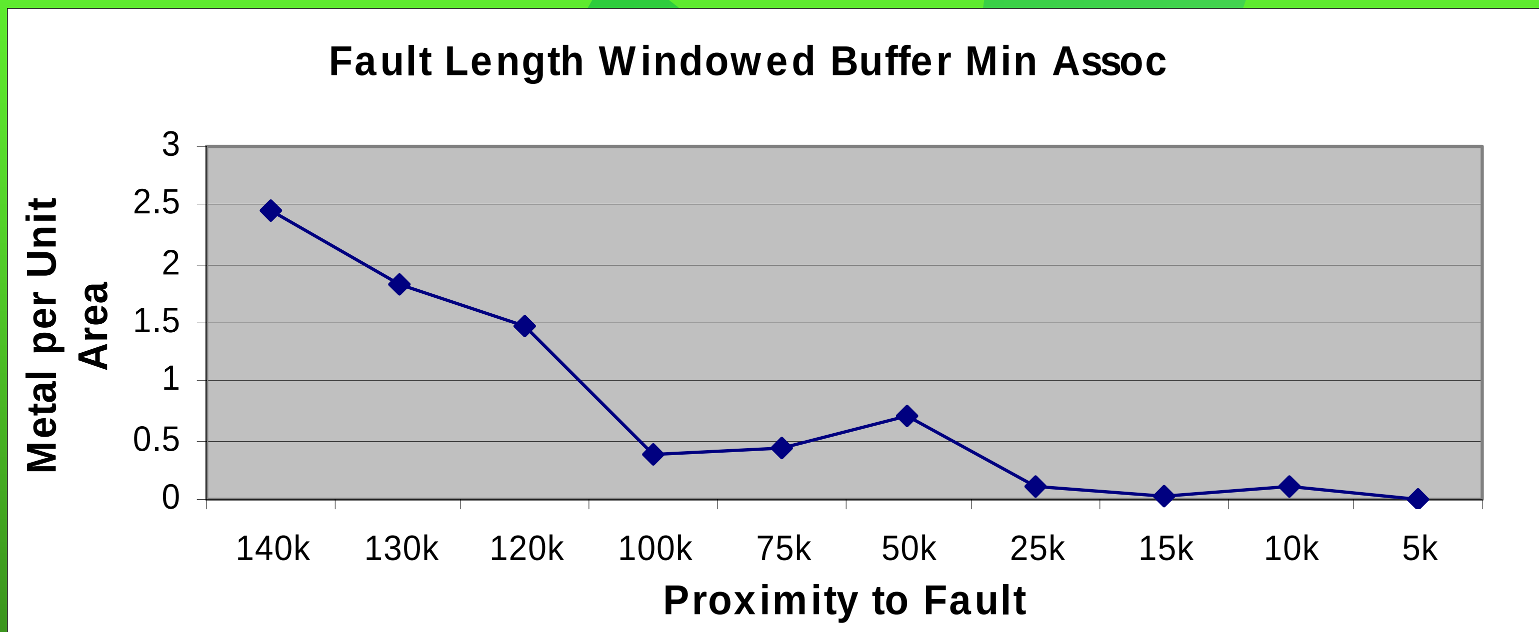
- Weighted variable (Length)
- Small faults, smaller influence
- Good theoretical basis
- Buffer window area inc

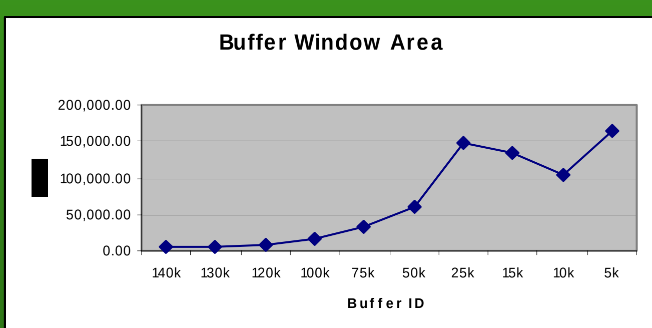


Faults – Variable width Buffers

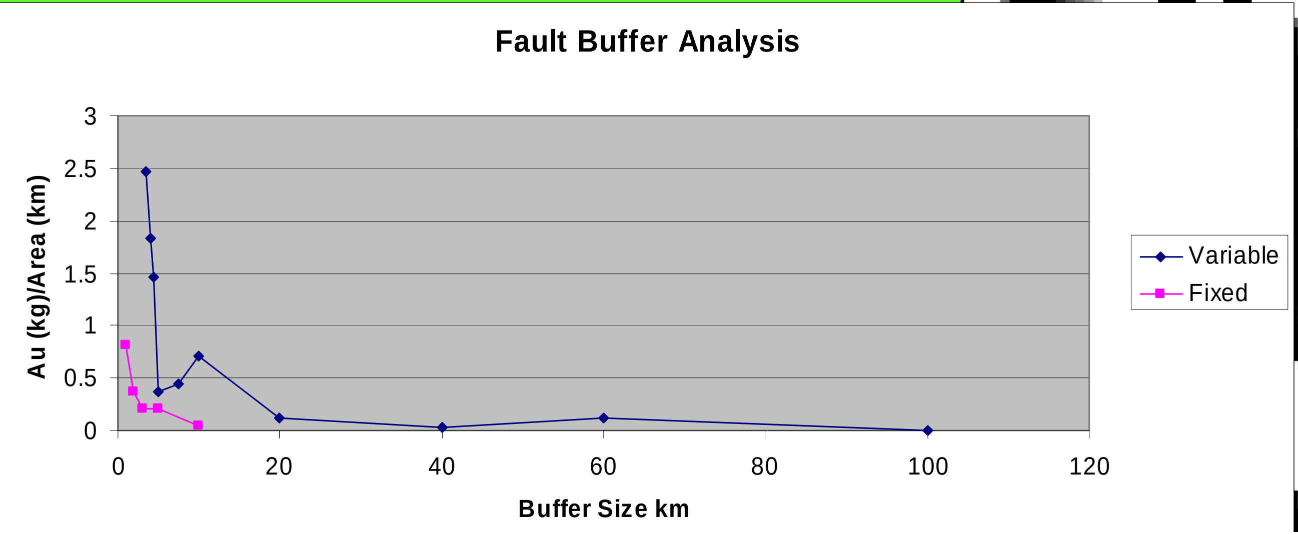
• Length weighted

- **Increased metal towards long faults**
- Commensurate with smaller search area
- Buffer width is a ratio of fault length

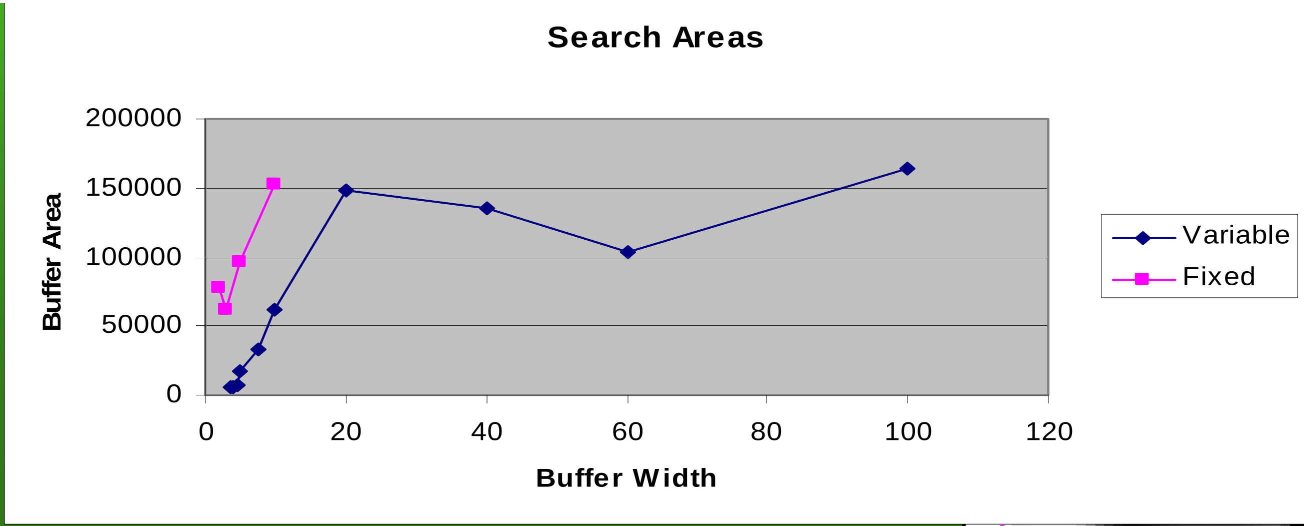


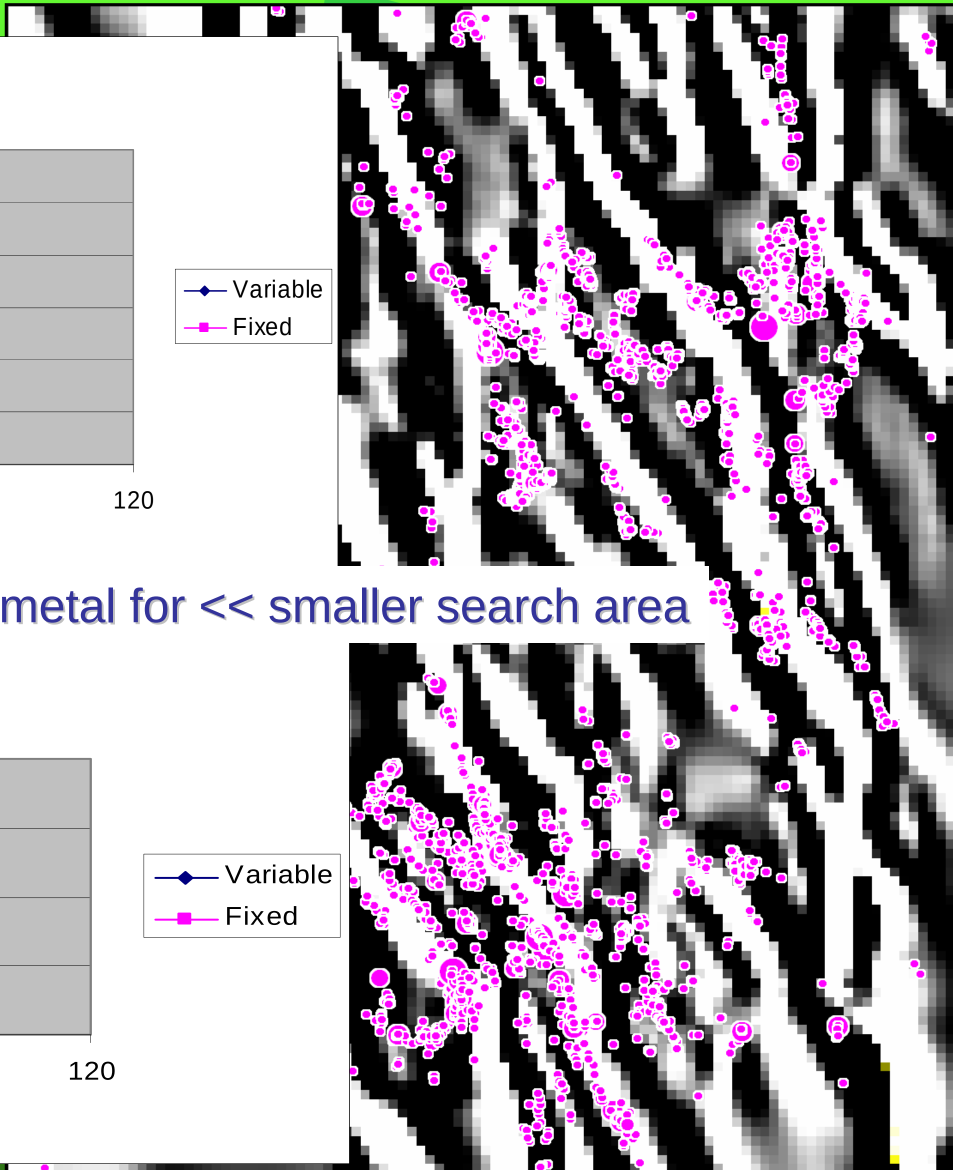


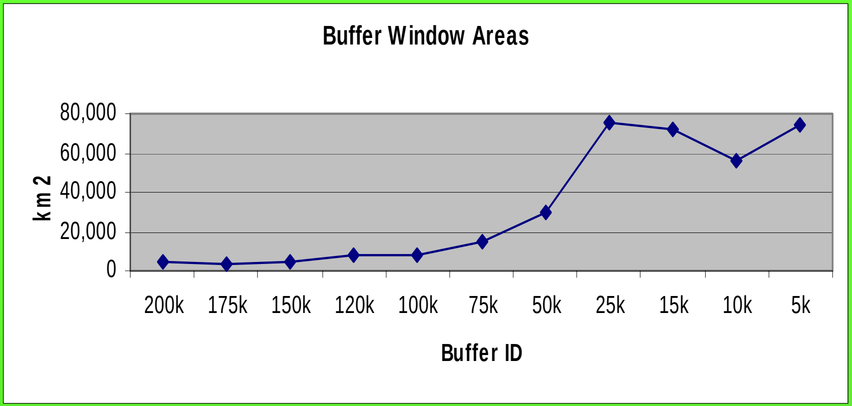
Apples and Oreanges



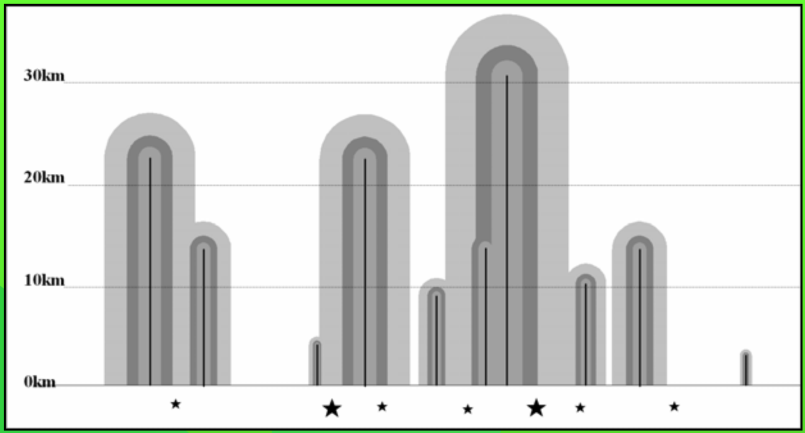
Length weighting - order of magnitude more metal for << smaller search area



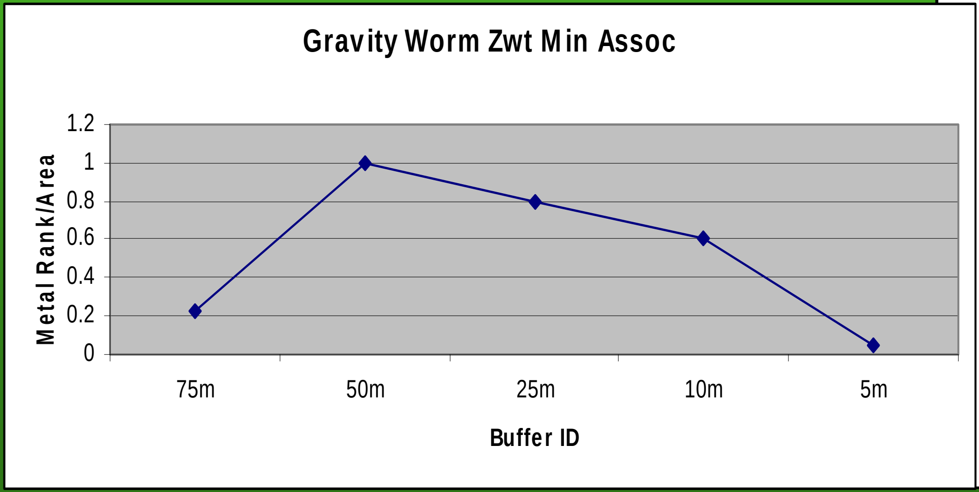


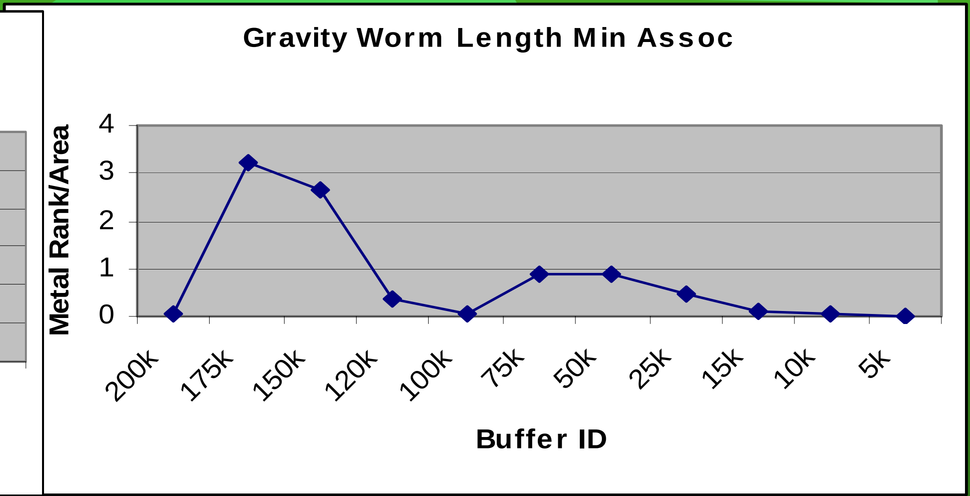


Gravity Worm – Weighted buffers



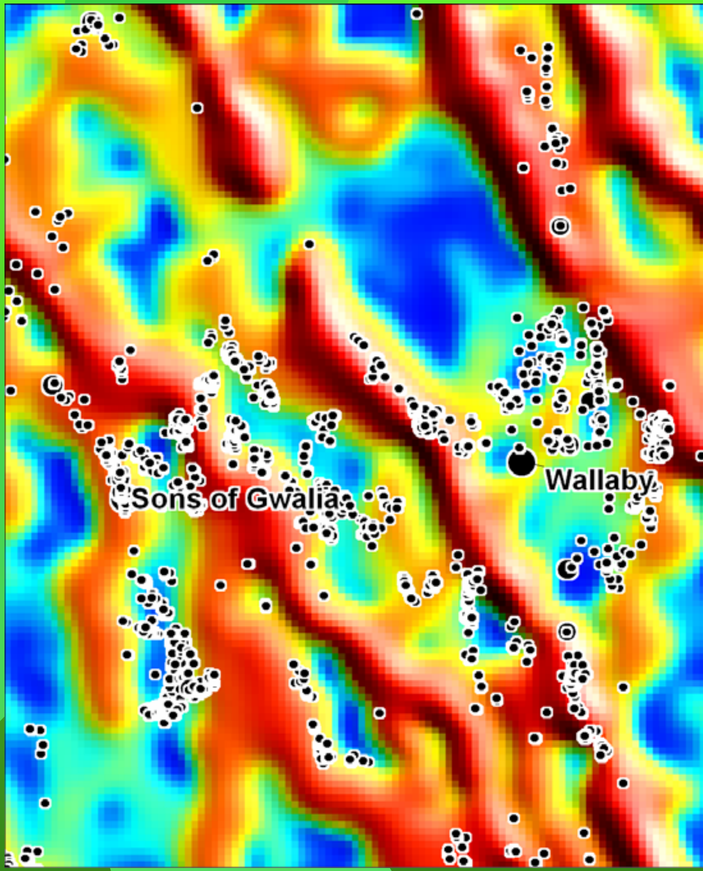
Overall increase in metal per unit area with proximity to long, high/deep worms





Critical Factors..?

- Affirms long held beliefs...no real surprises?
- Size is important, after all….!
- Strong fault control on Au distribution
- Gravity worms influence Au distribution
- Long faults - first order area selection filter
- Long, deep worms, especially under cover
- Au in small faults, close to long faults
- Penetrative structure provides the metal pathway, diffusion into smaller but not-too-distal fault traps
- Sniffs of permeability control



Research Direction

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- Aeromagnetic worms
- Incorporate geological controls
- Role of fault and worm intersections
- Evaluate “warm worms”– high W assoc?
- Input to TT database
- Extract parameters for numerical modelling