Threshold Indicator Taxa Analysis (TITAN) – a potential tool for ecological management?

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SOSMART Spring Meeting
April 10, 2015
Ecological thresholds

What are they?

• Transition points (or zones of rapid change) in biological community in response to small, continuous increases in a stressor

(Baker and King 2010)
Ecological thresholds

Why are they important?

• Anthropogenic environmental gradients/stressors can represent evolutionarily novel physical/chemical conditions
• A biological community may abruptly respond at a critical point along novel gradient
• Ecological management applications

(Baker and King 2010)
Predecessors/Alternatives to TITAN

• Most models
  – Are univariate, not multivariate
  – At ecosystem-scale, not particular biological community
  – Assume species respond in a linear fashion
  – Exclude rare species, but these species may be more sensitive to stressor
Advantages of TITAN

• Based on individual species response, assesses when there is threshold response in biological communities to an increasing stressor

• Distinguishes the strength and direction of species response

• Identifies when most species respond = community threshold

• Useful:
  – For species rich communities
  – If most species occur infrequently
Advantages of TITAN

- Non-parametric
- Currently only available in R
- No complicated statistical analysis, just interpret graph!
- Not a hypothesis test, no p values
- Similar to ordinations, this analysis is exploratory
2013 benthic invertebrate data
- OBBN sampling
- LPL identification (genus/species)
- 130 sites, 9 watersheds across TRCA jurisdiction
- >XXX taxa

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- Est. chloride based on conductivity on sampling date

Summary

- TITAN provides a fairly straight-forward yet robust method for identifying ecological community thresholds along an environmental gradient.
- Does TITAN results agree with other urban/impervious study results? i.e. <10% imperviousness?

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Useful References