When good animals love bad restored habitats: how maladaptive habitat selection can constrain restoration

Rob Hale and Steve Swearer
• Apologies to Battin (2004)……..

“When good animals love bad habitats: ecological traps and the conservation of animal populations”
Conservation Biology 18 1482-1491

• Large-scale efforts and significant $ 
  – UN 2012 Conference on Sustainable Development target restoration of 150 million ha by 2020  
  – Estimated cost US$18 billion/year

• What factors underlie success/failure?
The “field of dreams”

STRUCTURAL HABITAT = FUNCTIONAL HABITAT

P. Reich
1. Restoration improves structural habitat

2. Animals must be available to colonise restored habitats

3. Understanding the process underlying habitat selection and colonisation is critical

4. Restored sites must provide resources that match the requirements of target species

5. Restored sites have a net reproductive rate greater than one
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  - Site history
  - Landscape context
- Proximity to sources
- Barriers to colonisation
- Size, shape, location of restored habitats
  - Connectivity
  - Matrix characteristics
    - Life history traits
- Habitat selection behaviour
- Effects of physiology and natal experience on habitat selection
- Habitat requirements
- Species interactions
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Habitat restoration

Perceptual traps: high quality restored habitats avoided

Ecological traps: restored sites preferred but poor quality
Ecological traps: animals prefer restored sites where their fitness is reduced.

Perceptual traps: animals avoid high quality restored sites.

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Why do traps matter?

- Perceptual traps – no response
- Ecological traps - compromise local and regional persistence (e.g. Hale et al. 2015a)
- Management activities could cause both (e.g. Hale et al. 2015b)
- Few studies in freshwater (Hale and Swearer 2016)


Direct effects of traps

Severns (2011) Insect Conservation and Diversity, 4, 184-191
Direct effects of traps

Restored

Natural

Severns (2011) Insect Conservation and Diversity, 4, 184-191
Direct effects of traps

Severns (2011) Insect Conservation and Diversity, 4, 184-191
Restored – flood seasonally

Natural – doesn’t flood

Seven-fold decrease in larval survival
Indirect effects of traps

Hawlena, D et al. (2010) Conservation Biology, 24, 803-809
Indirect effects of traps

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Indirect effects of traps

Hawlena, D et al. (2010) Conservation Biology, 24, 803-809
Spatial mismatches

Diverse range of habitats downstream

Poor quality habitat upstream

Temporal mismatches

- Australian grayling
- Downstream spawning migrations triggered by flow releases

![Graph showing abundance over time for grayling and food](image)
• What is a good habitat?

• How do animals assess habitats?

• How do we mitigate problematic behaviours?
Vanreusel & Van Dyck (2007) Biological Conservation

1. What resources required?
2. Mark recapture and surveys

22% of total habitat contained >80% of butterflies
Fixing problematic behaviours

- Animal cognition – Greggor et al. (2014)
  TREE

- What cue causes behaviour? How perceived?
- Can cue be changed?
- What is appropriate cognitive mechanism?
• What is a good habitat? How do animals assess habitats?

• Restoration traps – potentially important?

• Traps vs. other constraints
  – Commonality
  – Consequences
  – Mitigation