Birds, Landslides and Pastures: A Biogeographic Conundrum

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Landslides are naturally occurring, highly disturbed narrow yet transient landscape features. Landslides create a heterogeneous mix of cleared forest, linear strips of secondary forest, and unaltered pristine forest. Pastures and Crop Fields are broader and more permanent than landslides. Both are common in Northern Andes.

**Threatened Restricted Range Bird Species**

White-faced Nunbird (Huanucopia castanea)

Toucan Barbet (Surniculus truncatus)

Plate-billed Mountain-Toucan (Andigena laminirostris)

Photographs courtesy of Iain Campbell and Nicholas Athanas

**Study Area**

Valley - 6 km long, 1650 - 2350 m
Slopes - 20-60°
Thick, highly-weathered soils
296 bird sp. observed

**Models**

**Landslide and Succession Trajectories**

Typical slopes
Model 1: Landslide → Secondary Forest → Forest
Typical slopes/w/exotic grass colonization
Model 2: Landslide → Grasses w/patches of bamboo & secondary forest
Hollow or chute or 1st order stream channel
Model 3: Landslide → Secondary Forest (if TF ratio >1)
Model 4: Landslide → Grasses (if colonized by exotic grasses)

**Abandoned Crop Field/Pasture and Succession Trajectories**

Abandoned crop field
Model 5: Crop field → Secondary Forest → Forest
Abandoned crop field (>34° slopes)
Model 6: Crop field → strips of Secondary Forest and landslide scars
Abandoned Pasture seeded w/indigenous grasses
Model 7: Pasture → Secondary Forest → Forest (typically more rapid transition than Model 5)
Abandoned Pasture seeded w/exotic grasses
Model 9: Pasture → Grasses w/chunks of bamboo and isolated trees

**Field Data (1998, 2001)**

<table>
<thead>
<tr>
<th>Time since pasture or type of site</th>
<th>Current 2 yrs</th>
<th>5 yrs</th>
<th>6 yrs</th>
<th>pristine</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 yrs</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
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<tr>
<td>2 yrs</td>
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<td>40</td>
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<td>60</td>
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<tr>
<td>5 yrs</td>
<td>70</td>
<td>80</td>
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<tr>
<td>6 yrs</td>
<td>90</td>
<td>100</td>
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<tr>
<td>&gt; 20 yrs</td>
<td>100</td>
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<tr>
<td>&gt; 50 yrs</td>
<td>110</td>
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</tbody>
</table>

**Common & rare birds recorded in pastures and in landslide scars**

<table>
<thead>
<tr>
<th>Species recorded over 2 field seasons</th>
<th>7</th>
<th>17</th>
<th>33</th>
<th>31</th>
<th>73</th>
<th>3</th>
<th>9</th>
<th>4</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current 2 yrs</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
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<td>40</td>
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</tbody>
</table>

**Models and Pasture Data**

**Unconstrained Succession - 1, 2, 3, 4**

- Rapid increase in bird species w/time from disturbance
- 5 yrs - many restricted-range sp. observed

**Limited Succession - 1, 2, 3**

- 2 yrs and 6 yrs → Models 2, 3, 6, 8
- Slower increase in bird species

**Fully Constrained Succession - 1**

- Current = Models 4, 9
- Very few bird species observed
- Rare White-faced Nunbird bred in landslide (possible landslide specialist)

**Preliminary Data on Rare or Restricted Range Birds recorded singing in or breeding (B) both pastures and landslide scars undergoing succession:**

- White-faced Nunbird (B)
- Giant Antpitta
- Tanager-phon (B)
- Tucan Barbet
- Plate-billed Mountain-Toucan

**Birds in (1)**

- Azara’s Spinetail
- Plain-tailed Wren

**Birds in (2)**

- Yellow-bellied Chat-Tyrant
- Slaty-throated White-eye
- Russet-crowned Warbler
- Turquoise Jay
- Chestnut-crowned Antpitta
- Speckled Hummingbird
- Spillmann’s Tapaculo*

**Birds in (3)**

- Spillmann’s Tapaculo*
- Chestnut-crowned Antpitta
- Azara’s Spinetail
- Strong-billed Woodcreeper
- Striped Tanager
- Russet-crowned Warbler
- Black-crowned Wren
- Masked Flowerpiercer
- Smoke-colored Pewee

**Birds in (4)**

- Russet-crowned Wabler
- Spillmann’s Tapaculo*
- Chestnut-crowned Antpitta
- Striped Tanager
- Masked Trogan
- Speckled Hummingbird
- Green Violet-ear
- Plain-tailed Wren
- Smoke-colored Pewee
- Glossy-black Thralls
- Black-crowned Wabler

**Transient Form Ratio (Brunsden and Thomas, 1978)**

- $TF > 1$: Because the mean recurrence time of events capable of producing change is shorter than the time taken for the system (or component of the system) to recover, there is likely to be a poor correspondence between agents and resulting forms; that is, forms will be predominantly transient.

- $TF < 1$: the system has the potential to adjust to new conditions before the next major disturbance so that characteristic forms will tend to prevail after the initial recovery period, leading to more reliable process-response relationships.
Landslide and Succession Dynamics

Typical slopes
Model 1: Landslide $\rightarrow$ Secondary Forest $\rightarrow$ Forest

Typical slopes w/exotic grass colonization
Model 2: Landslide $\rightarrow$ Grasses w/patches of bamboo and secondary forest

Hollow or chute or 1st order stream channel
Model 3: Landslide $\rightarrow$ Secondary Forest (if TF ratio $>1$)
Model 4: Landslide $\rightarrow$ Grasses (if colonized by exotic grasses)
Abandoned Crop field/Pasture and Succession Dynamics

**Abandoned crop field**
Model 5: Crop field $\rightarrow$ Secondary Forest $\rightarrow$ Forest

**Abandoned crop field (>34° slopes)**
Model 6: Crop field $\rightarrow$ strips of Secondary Forest and landslide scars

**Abandoned Pasture seeded w/indigenous grasses**
Model 7: Pasture $\rightarrow$ Secondary Forest $\rightarrow$ Forest (typically more rapid transition than Model 5)

**Abandoned Pasture seeded w/indigenous grasses subsequently periodically burnt or re-used**
Model 8: Pasture $\rightarrow$ Secondary Forest (if TF ratio $>1$)

**Abandoned Pasture seeded w/exotic grasses**
Model 9: Pasture $\rightarrow$ Grasses w/clumps of bamboo and isolated trees
Guild Representation in Pastures

Data for 1998

- Control 1 (>20 yrs)
- Control 2 (>50 yrs)
- Site 1 (2 yrs)
- Site 2 (5 yrs)
- Site 3 pasture (0 yrs)
- Site 4 (6 yrs)
- Site 3 border

Species recorded over 2 field seasons

- 1998 Data
- 2001 - new sp. only

- Current
- 2 yrs
- 5 yrs
- 6 yrs
- Pristine

Percentage of each guild

- Raptorial
- Gran
- Omnivore
- Fruit
- Nectar
- Insect

Species recorded over 2 field seasons

- 7
- 17
- 33
- 31
- 73
- 3
- 9
- 4
- 7
- 1

0 20 40 60 80 100

Percentage of each guild
**Unconstrained Succession**
Current, 5 yrs, >20 yrs, >50 yrs = Models 1, 5, 7
- Rapid increase in bird species w/time from disturbance
- 5 yrs - many restricted-range sp. observed

**Limited Succession**
2 yrs and 6 yrs = Models 2, 3, 6, 8
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**Fully Constrained Succession**
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Brunsden and Thornes (1979)

TF > 1: Because the mean recurrence time of events capable of producing change is shorter than the time taken for the system (or component of the system) to recover, there is likely to be a poor correspondence between agents and resulting forms; that is, forms will be predominantly transient.

TF < 1: the system has the potential to adjust to new conditions before the next major disturbance so that characteristic forms will tend to prevail after the initial recovery period, leading to more reliable process-response relationships.
Unconstrained Succession 1, 2, 3, 4
Limited Succession 1, 2, 3
Fully Constrained Succession 1
**Commo Birds in (4)**

- Russet-crowned Warbler
- Spillmann’s Tapaculo
- Chestnut-crowned Antpitta
- Striped Treehunter
- Masked Trogon
- Speckled Hummingbird
- Green Violet-ear
- Plain-tailed Wren
- Smoke-colored Pewee
- Glossy-black Thrush
- Black-crested Warbler