Operationalizing *Resilience* for Ecological Restoration

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Top 3 Tips for Avoiding Resilience Pitfalls
Tip 1: Define resilience in the context of your system
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*Resilience = ability of a system to return to a steady state after disturbance.*
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Resilience = ability of a system to return to a steady state after disturbance.

Resilience = amount of disturbance a system can absorb without changing state.
Steady State = Single Equilibrium Endpoint
Tip 1: Define the Concept

Time required for the system to return to a steady state after disturbance.
Single equilibrium states?

- Small regional species pool
Single equilibrium states?

- Small regional species pool
- Low productivity (resource limited)
Single equilibrium states?

- Small regional species pool
- Low productivity (resource limited)
- High connectivity among patches
Multiple equilibrium states?

- Large regional species pool
- Relatively productive
- Low connectivity among patches
<table>
<thead>
<tr>
<th>Factor</th>
<th>Probability of Multiple States (β Diversity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional diversity (γ)</td>
<td>+</td>
</tr>
<tr>
<td>Among-patch connectivity</td>
<td>—</td>
</tr>
<tr>
<td>- rate of dispersal</td>
<td></td>
</tr>
<tr>
<td>Productivity (low to moderate)</td>
<td>+</td>
</tr>
<tr>
<td>Disturbance frequency (low to moderate)</td>
<td>—</td>
</tr>
<tr>
<td>Other</td>
<td>?</td>
</tr>
</tbody>
</table>
Tip 2: Assess Whether Resilience is an Appropriate Goal
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Cote and Darling 2010
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Tip 2: Assess Whether Resilience is an Appropriate Goal
Tip 3: Specify Resilience Parameters in Management Plans
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- Attribute
- Target
- Action
- Quantity/status:
- Time frame
- Location

Modified from Elzinga et al. 2001
• Restore resilience in fire-adapted forests

• Restore ecological resilience to wildfire by increasing cover of fire-adapted native understory vegetation in the treated area by 20% within 5 years

• Restore socio-ecological resilience to wildfire within 5 miles of Seeley Lake by reducing rate of crown fire spread under extreme weather conditions by 60% in 10 years
Summary: Alternate Usages of Resilience
On the one hand, just a substitute for "health"

On the other hand

Summary: Alternate Usages of Resilience

fuzzy idea
Summary: Alternate Usages of Resilience

- fuzzy idea
- key ecological concept
EARLY EXPERIMENTS IN TRANSPORTATION