

Woody Plants and Ecological Thresholds: Precursors to Exotic Invasive Species

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Thresholds and triggers

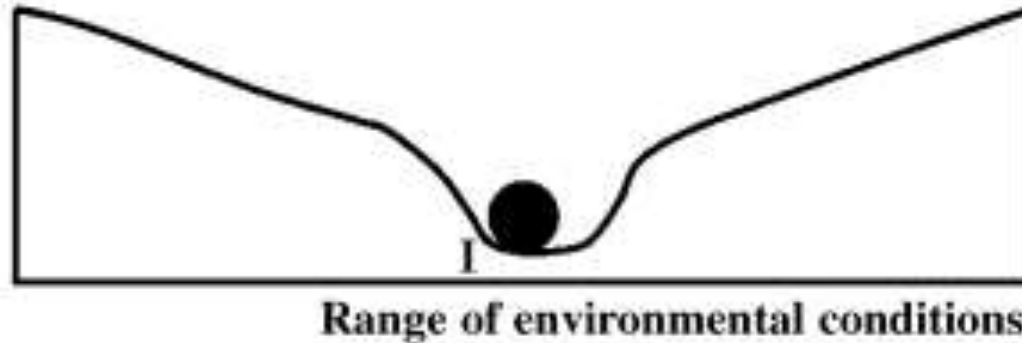
- **Thresholds:** “represent conditions sufficient to modify ecosystem structure beyond the limits of **ecological resilience**, resulting in the formation of alternative states”, their existence indicates a system that is not a **global equilibrium system** (Briske et al. 2008)

Ecological resilience

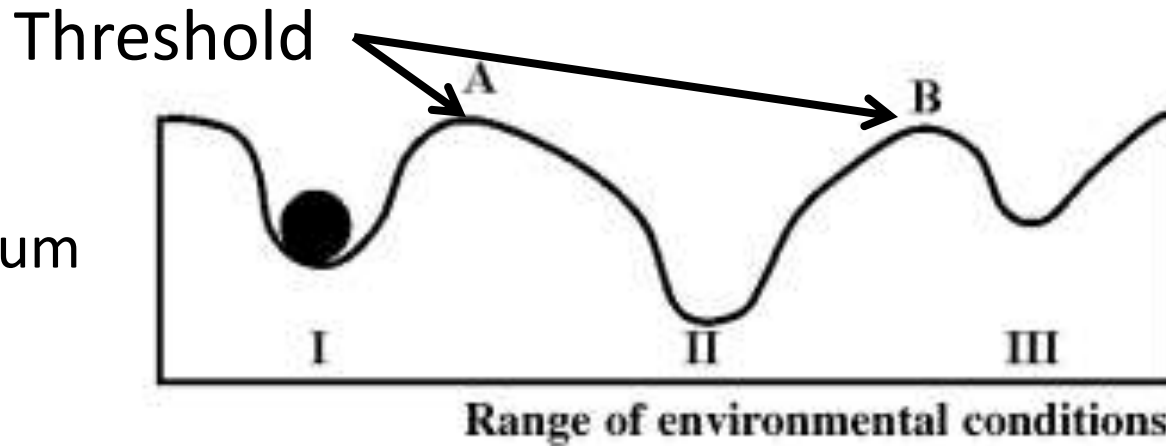
- **Resilience:** the rate at which a system returns to the original state following stress or disturbance (perturbation) (Barbour et al. 1999)
- **Resilience:** the amount of change or disruption that is tolerated before a system is transformed from being maintained by one set of mutually reinforcing processes and structures to a different set of processes and structures (Briske et al. 2008 , Peterson et al. 1998)

Types of equilibrium systems

Global
equilibrium
system

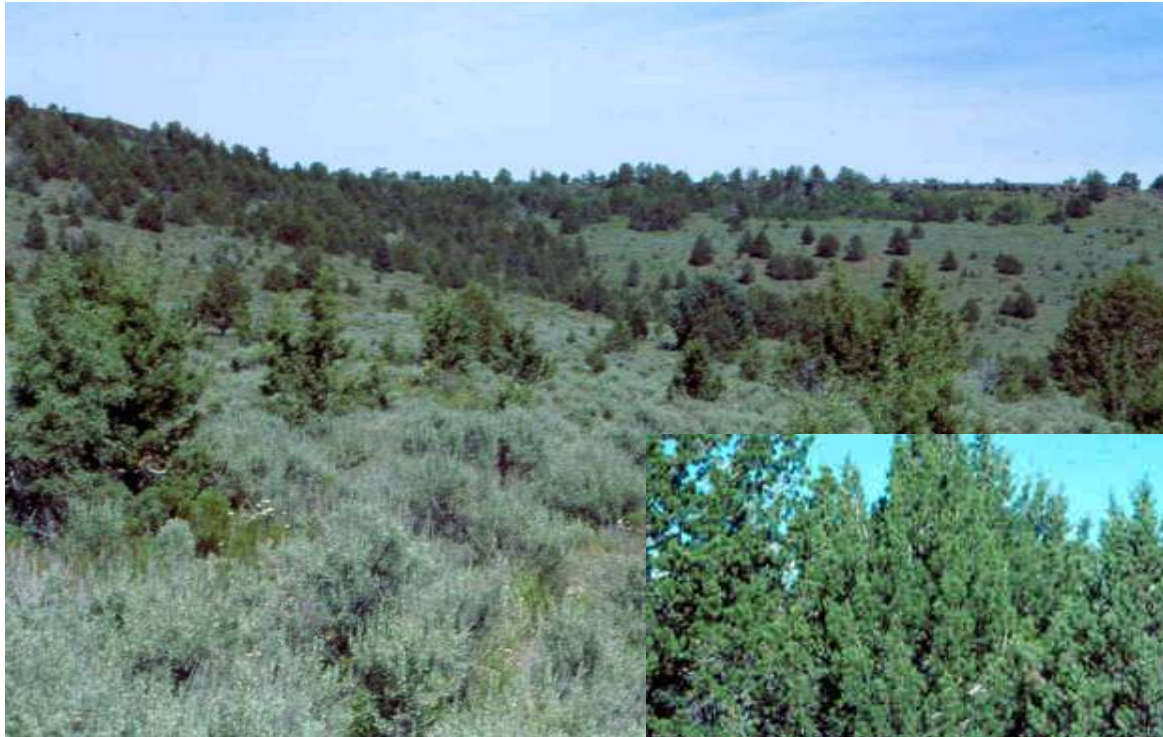


Local
equilibrium
system



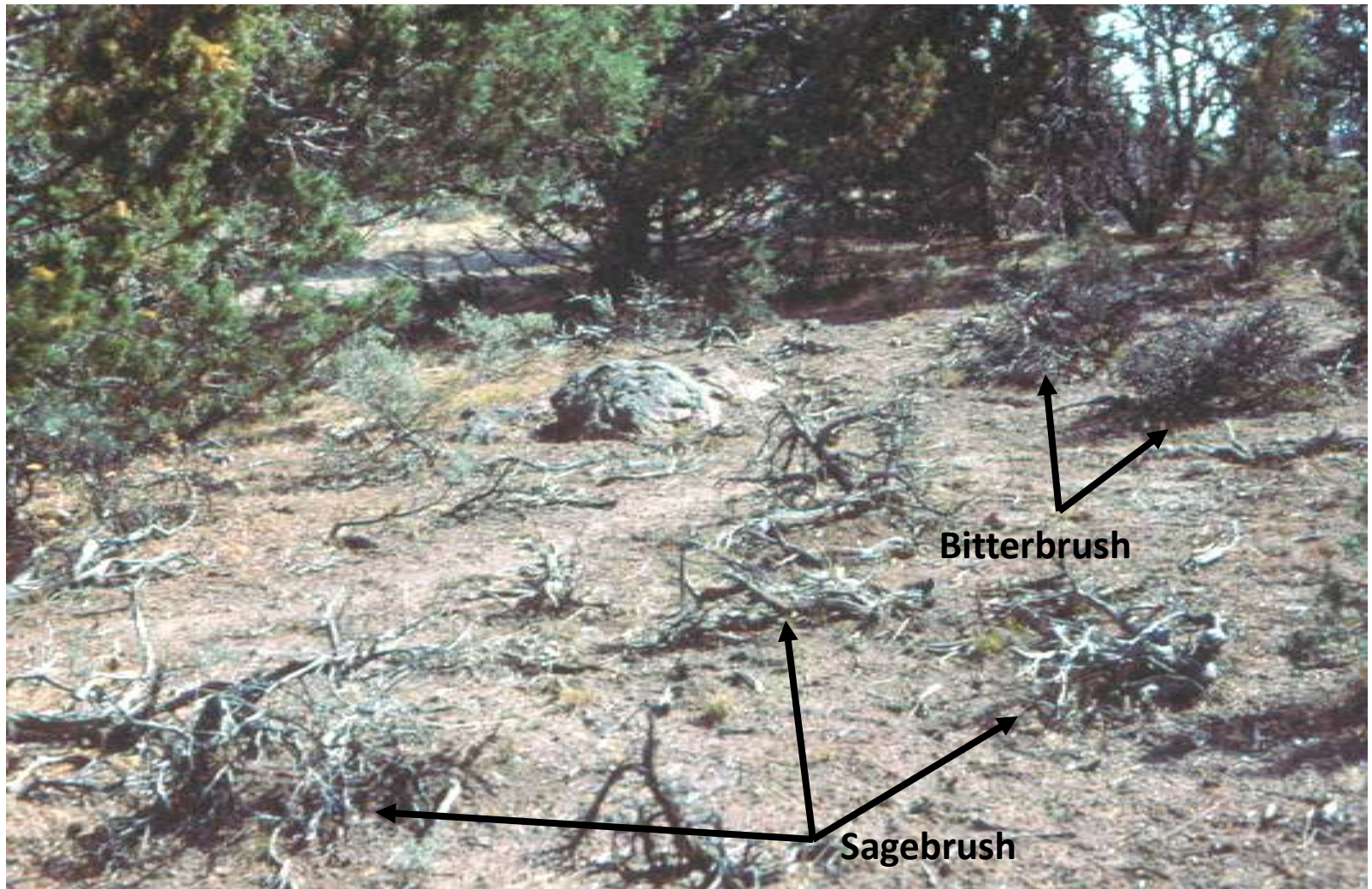
Thresholds and triggers

- **Thresholds:** “represent conditions sufficient to modify ecosystem structure beyond the limits of ecological resilience, resulting in the formation of alternative states”, their existence indicates a system that is not a global equilibrium system (Briske et al. 2008)
- **Triggers:** “represent biotic or abiotic variables or events, acting independently or in combination, that initiate threshold-related processes by contributing to the immediate loss of ecosystem resilience” (Briske et al. 2006, Scheffer & Carpenter 2003)



Western juniper
encroachment into
mountain big
sagebrush steppe





Western juniper woodland, southwestern Idaho, with dead and dying sagebrush in the understory.



Western juniper woodland, southwestern Idaho, 1st growing season following a September prescribed fire.



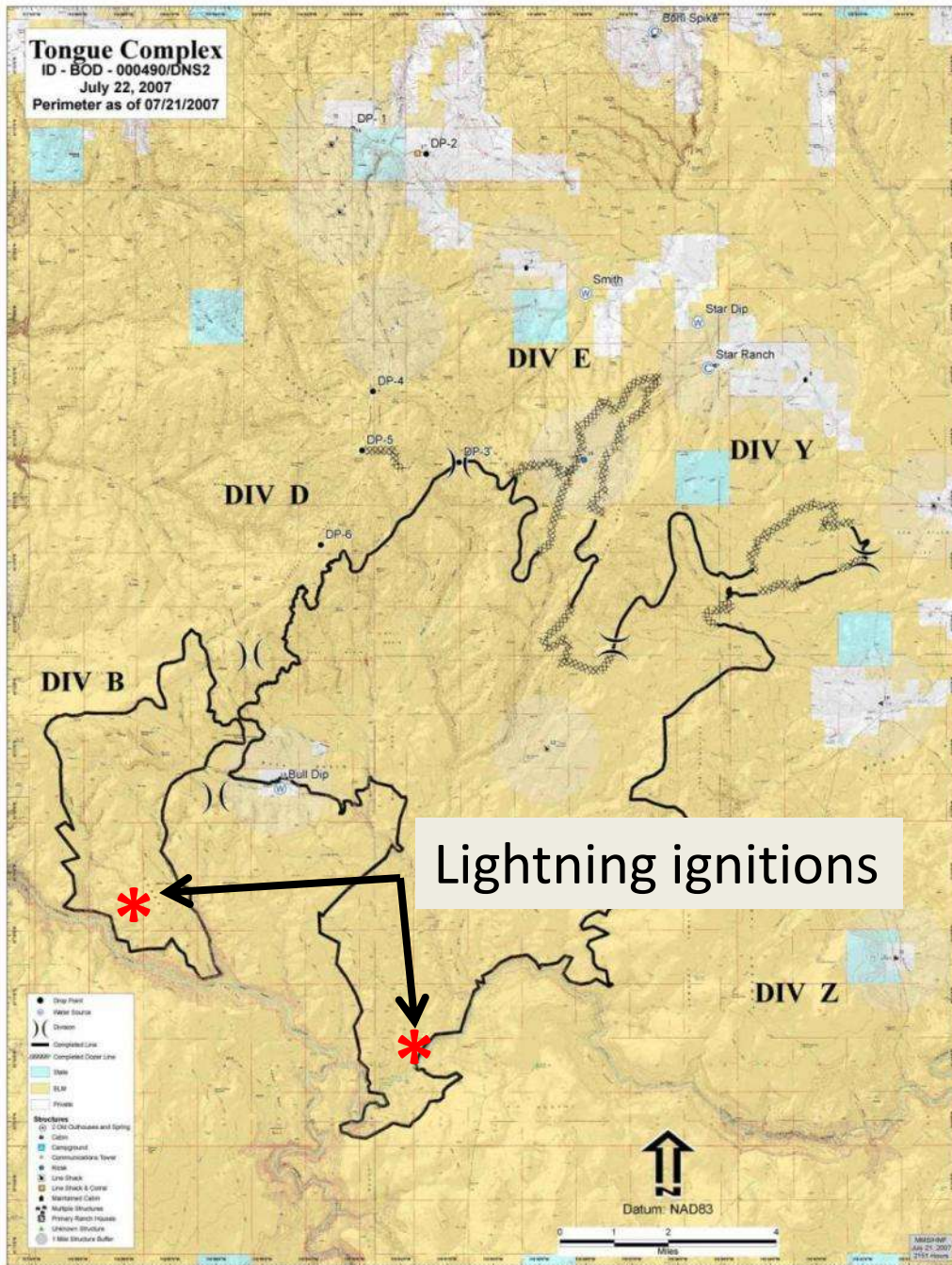
Western juniper woodland, southwestern Idaho, 2nd growing season.



Western juniper woodland, southwestern Idaho, 6th growing season post-fire



Western juniper woodland, southwestern Idaho, 11th growing season



Tongue Complex Fire

July 6-29, 2007

Total area: 46,680 acres

Ignition source: Lightning



Tongue Complex Fire 7-15-07

USDI BLM map and photo



Tongue Complex Wildfire 2007- Photo: July 2008



Tongue Complex Wildfire 2007- Photo: July 2008



Tongue Complex Wildfire 2007- Photo: July 2008



Tongue Complex Wildfire 2007- Photo: July 2008



Tongue Complex Wildfire 2007- Photo: July 2008



Prescribed fire 1980- Photo: July 2006



Pinyon-juniper woodland with cheatgrass understory

Photo courtesy of Sherm Swanson



Pinyon-juniper woodland with cheatgrass understory- postburn

Photo courtesy of Sherm Swanson



Utah juniper/big sagebrush with cheatgrass understory

Photo courtesy of Bruce Roundy



Utah juniper/big sagebrush with cheatgrass understory- postburn

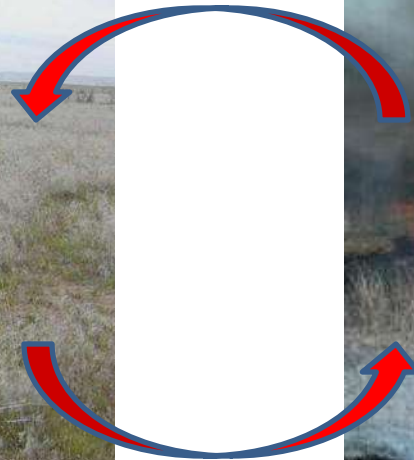
Photo courtesy of Bruce Roundy

Grass-wildfire cycle

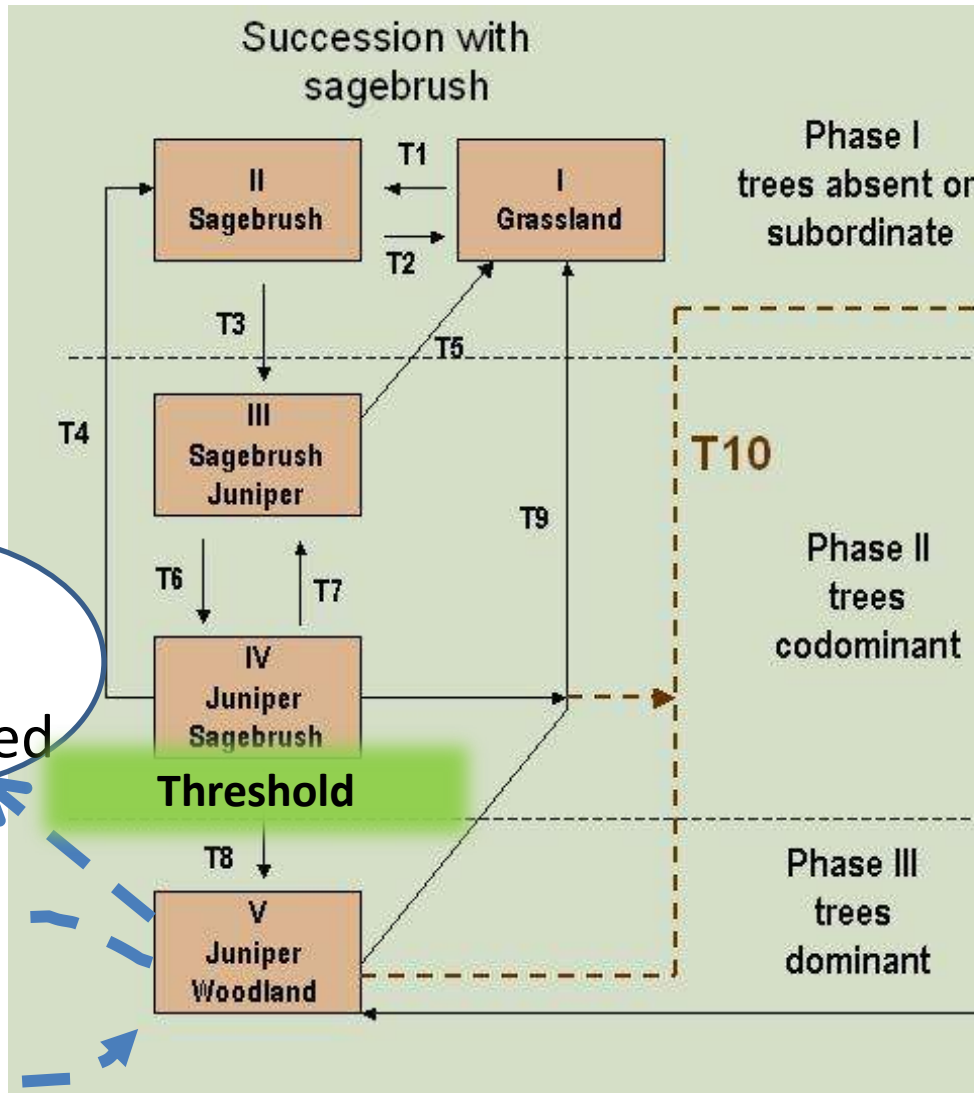


Positive feedback mechanism is related to:

- Longer fire seasons
- Greater fuel continuity
- Greater fine fuel loading



New secondary successional pathways



Miller et al. 2005, adapted by Strand 2008

The persistence of an alternative state may be enhanced through positive feedback mechanisms involving many simultaneously occurring factors such as:

- Increasing non-native species
- Loss of native species seed sources
- Reduced native species recruitment rates
- Change in fire regime
- Loss of soil fungal mycorrhizae
- Changes in soil characteristics (i.e. nutrients, soil biota)



- Legacy or history of the site



Literature Cited

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Wyoming big sagebrush steppe, east of Boise, Idaho



Wyoming big sagebrush steppe, 1st growing season after wildfire, southern Idaho



Murphy Complex Fire 2007- Photo August 2007



Wyoming big sagebrush steppe, 5th growing season after wildfire, southern Idaho