

# Aspen Ecology

Read Hessl, 2002

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Why have a whole lecture for a single species?

*Populus tremuloides* is the most **widespread** tree in N. America and 2<sup>nd</sup> most widely distributed tree species in the world

<http://pubs.usgs.gov/pp/1999/p1650-a/>

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*Populus tremuloides*



## Why aspen (con't)?

- Important role in ecosystem succession, wildlife habitat, biodiversity and landscape ecology
- Aspen roots may live for thousands of years, but hard to date
- Aspen clones can be as large as 40 ha (one single genet with many stems, or ramets)
- Aspen is declining, according to some accounts

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## Emblem of the West Is Dying, and No One Can Figure Out Why



Dr. Wayne Shepperd  
in North Park Valley,  
Colo. , NY Times,  
Sept. 26, 2006

- Insects, disease, grazing by elk and cattle, drought, climate stress, fire suppression
- Mature stands hit harder than young stands

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<http://www.fs.fed.us/wildflowers/communities/aspen/decline.shtml>

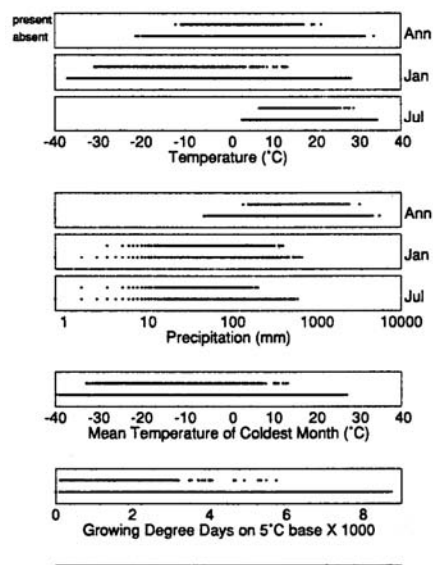
## Aspen habitats

- Broad **ecological amplitude**; occurs from treeline to grasslands and sagebrush steppe
- Cool, wet conditions required for seedling **establishment**, but mature trees use less water than lodgepole, spruce or fir
- Aspen may be an extension of the boreal forest (like RM coniferous forests), and perhaps a **relict** from last ice age

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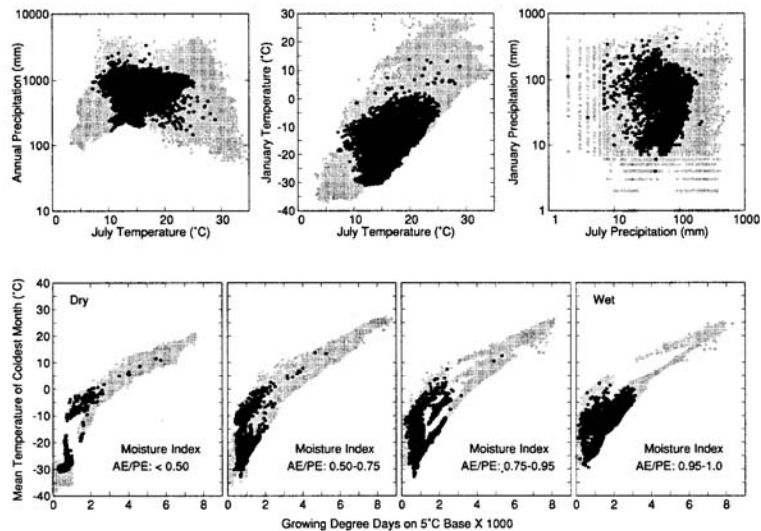
## Aspen habitats (2)



- Upper line: aspen present; lower line: aspen absent
- The two lines together represent climate for all of N. America
- Why is aspen both absent and present in a given climate condition?

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## Aspen habitats (3)



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This info available for all trees at  
<http://pubs.usgs.gov/pp/1999/p1650-a/>

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## Aspen succession

- Early seral type where conifers are climax, in many different types of conifer forest types

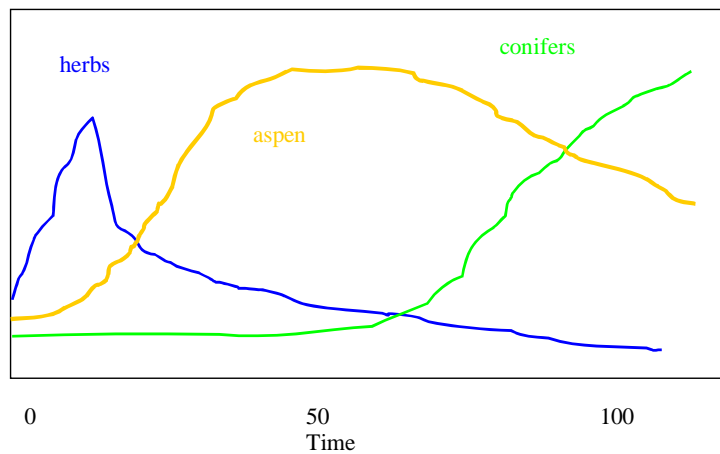


Aspen/subalpine fir type is successional to a climax conifer forest. As conifer canopy closes, herbs in the understory will be shaded out and biodiversity will decline

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## Generalized successional pattern



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## Aspen succession (2)

- **Climax** species in some areas
- **Suckers sprout rapidly** from roots following fires
- Establishment from seed is **infrequent**

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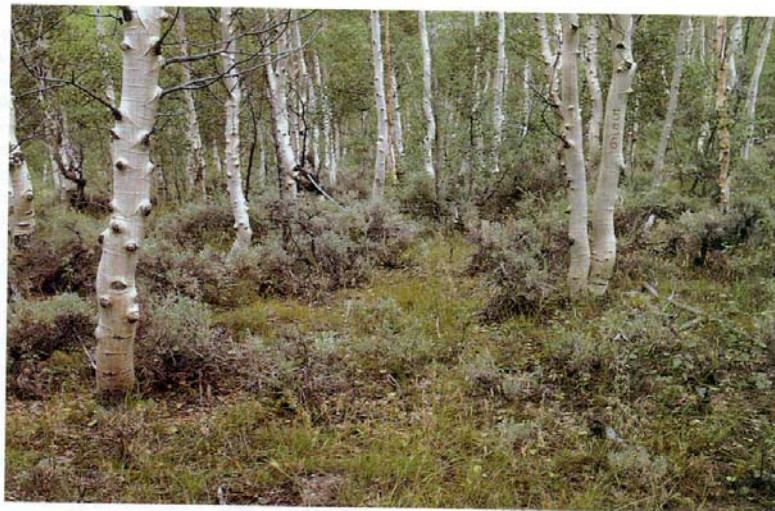
## Some important community types



Aspen/serviceberry/snowberry/meadow rue type is structurally diverse: trees, tall and low shrubs, herbs. High biodiversity especially in herb layer. Important in NW WY.

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Aspen/big sagebrush is common on dry sites in Nevada; aspen is a climax species forming an open stand

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Aspen/bracken fern type is broadly distributed but occurs in small patches. Aspen is regenerating in the understory here too.

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Aspen/bluegrass type has reduced biodiversity in the herb layer because of a long history of overgrazing.

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Aspen/tall forb type degraded by grazing has an herb layer dominated by annuals such as bedstraw and buckwheat. Also note the bent stems from snow-loading on the slope.

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## Aspen ecosystem management

- Human institutions and ecological processes operate at different temporal and spatial **scales**
- Eventually this results in ineffective policies and **ecological surprises**
- A better understanding of aspen ecosystems is needed, from a historical perspective, to evaluate and establish sound **management policies**
- Dendrochronology can be used to establish aspen **population dynamics** over time

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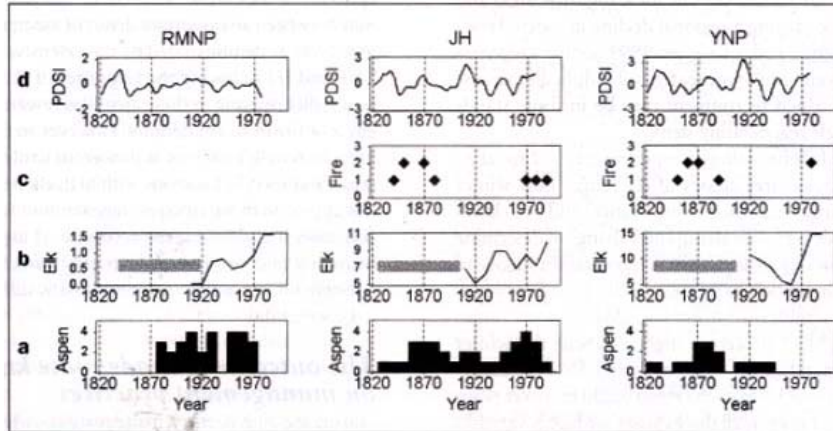
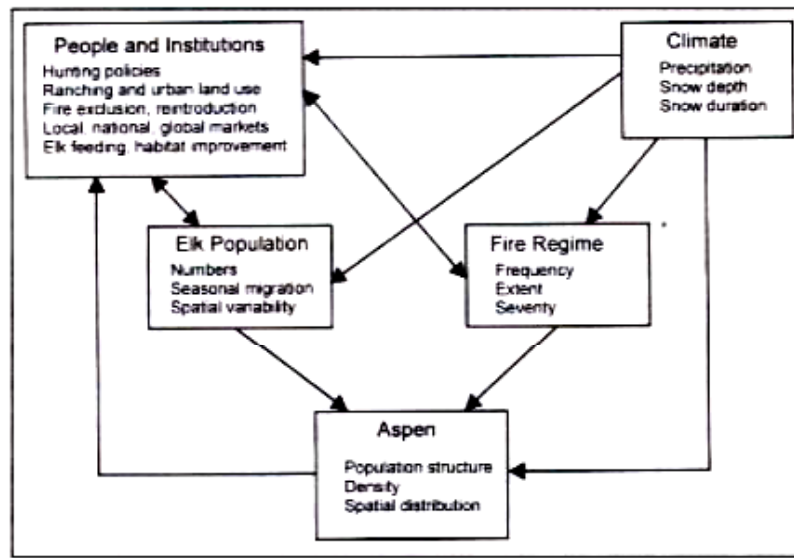


Fig. 4, Hessl, 2002. **Aspen regeneration** (a) on a relative scale determined from tree-ring studies in Rocky Mtn NP (RMNP), Jackson Hole area (JH), and Yellowstone NP (YNP) compared with (b) estimated elk populations, (c) fire history and (d) a drought index, PDSI, where negative values are dry and positive values are wet.

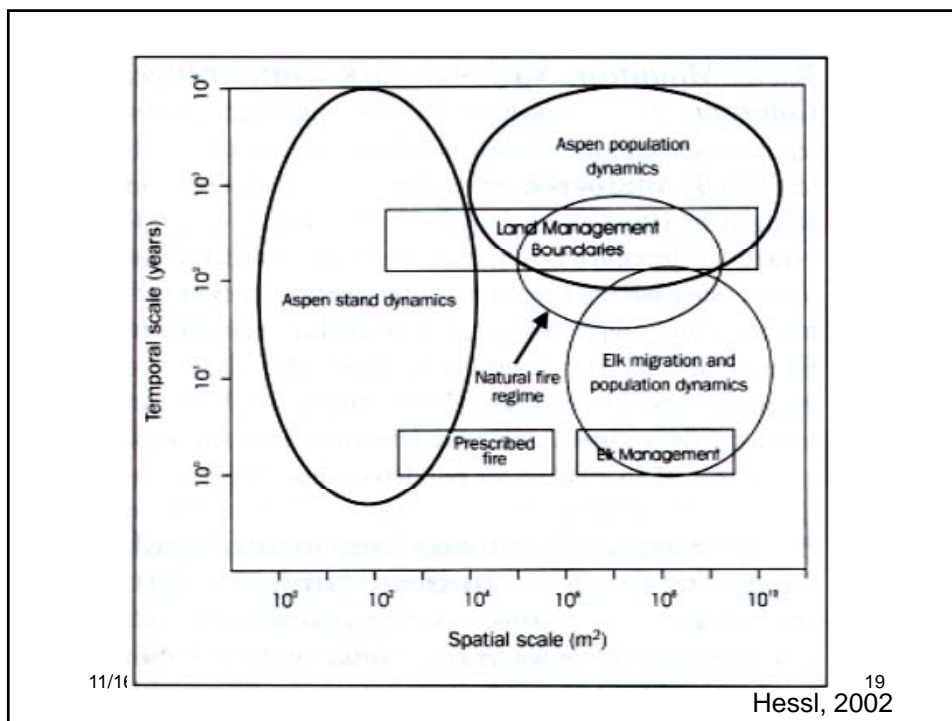
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## Aspen ecosystems and management



Hessl, 2002



## Some things to think about

- Policies tend to be developed and implemented in response to unusual, short-term events
- A lack of long-term perspective is prevalent among most management agencies
- How long do aspen clones live?
- Frequency and spatial scale of recruitment from **seed** is poorly understood
- Spatial variability at landscape scales is often unrecognized, leading to policies that are less effective in some areas than others
- On western slope of Rockies, **aspen extent has actually been increasing** at the expense of range cover types such as meadows, over the last 80-100 yrs

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## References:

- Romme, WH, Turner, MG, Wallace, LL, Walker, JS. 1995. Aspen, elk and fire in northern Yellowstone National Park, USA. *Ecology* 76:2097-2106.
- Manier, DJ, Laven, RD. 2002. Changes in landscape patterns associated with the persistence of aspen on the western slope of the Rocky Mountains, Colorado. *Forest Ecology and Management* 167:263-284.
- Hessler, A. 2002. Aspen, elk and fire: the effects of human institutions on ecosystem processes. *Bioscience* 52:1011-1022.