The applied side of phenology

Abe Miller-Rushing,
Schoodic Education and Research Center
and Acadia National Park
Bottom Line

- Phenological changes are changing most everything.
- There is lack of understanding of what changes mean for resource management.
- We can take steps to improve that.
Outline

• Ubiquity of impacts

• What does it mean for managers?

• Improving utility of phenology information
Natural resources

- Abundance and distribution of species
- Water, carbon, and nutrient cycles
- Virtually all ecological relationships and processes
- Evolutionary processes
Cultural resources

- Ways of life
- Cultural traditions
- Festivals
- Health
- Economics
Agriculture

- Farming, livestock, and forestry practices
- Horticulture
- Gardening
- Pests and pollination

Photo credit: Justin Scheetz
Outline

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Resource managers are aware of changes in phenology but are not aware of:

- The implications
- What to do about the changes
- How best to use phenology data
Can phenology information improve how I do my job?

If so, how?

Photo credit: NPS, Big Bend National Park
Optimize detection and management of pests and invasive species

Photo credit: Gil Wojciech
Plan for longer growing and monitoring seasons
(and flat or declining budgets)

Photo credit: NPS, Appalachian Highlands Network
Will changes in phenology affect my management priorities?
If so, how?

Photo credit: Matt Inden
Example prioritization criteria:

- Is the threat, problem, or need severe?
- Is the information essential for well-reasoned and legally defensible decisions?
- Will the information provide early warning of abnormal conditions?
- Is information actionable and will action solve the problem?
Species vulnerability assessments

Flowering time tracking

Species vulnerability assessments

Change in abundance or performance vs. Flowering time tracking

Species vulnerability assessments

Assessments for other management priorities

- Forest productivity
- Water
- Carbon sequestration
- Health
- Economic development

Photo credit: U.S. Department of Agriculture
How do I manage for changes in phenology?
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A three-pronged approach

- Improve phenology literacy
- Understand impacts most relevant to management and appropriate responses
- Integrate data and tools and make them easier to use
Phenology literacy

- Engage the right audience
- Show how to incorporate into what they already do
- Build case studies

Photo credit: Michael Singer
Research on impacts and actions

- Study management-relevant impacts
- Address how to manage for phenological change
- Build case studies

Photo credit: King Mountain Forestry
Data and tools

- Integrate
- Increase ease of use
- Build case studies
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