



Aspen health and damage agents on the Black Hills National Forest

Blodgett, J.T., Ambourn, A.K., and Allen, K.K.



Objectives:

- Evaluate tree and regeneration health
- Quantify frequencies of damage agents
- Analyze mortality in relation to site, tree, climate, damage agents

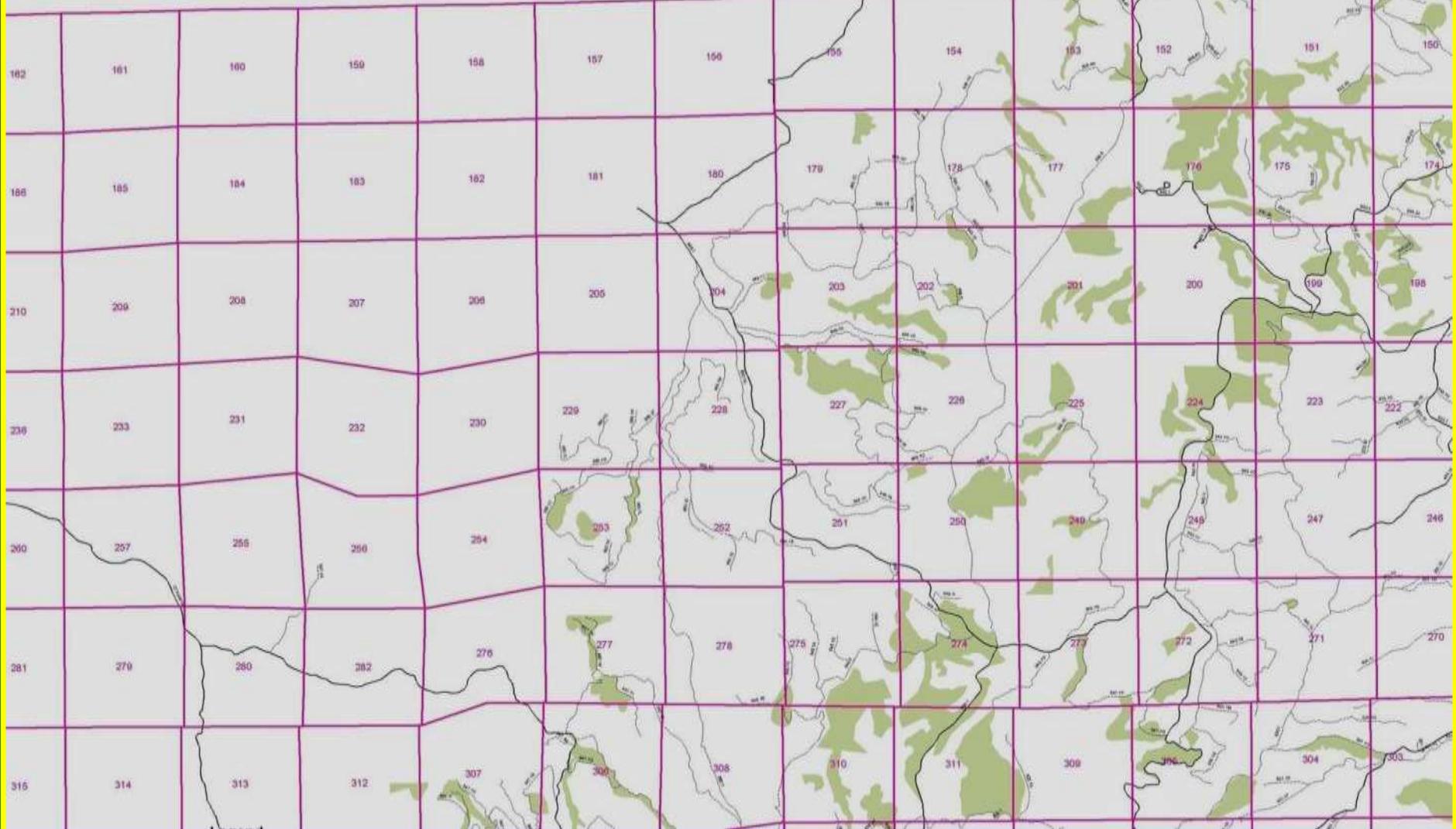


Sampling design:

- Permanent plots selected systematically 2008
- Reexamined plots in 2012, next 2015
- $\geq 50\%$ aspen, ≥ 2 acres, 1 miles between
- 3 plots per stand at 43.7 yd spacing
- 1/50 acre plots for trees
- 1/500 acre plots for seedlings/saplings



Aspen Cover Type Black Hills National Forest



Data collected:

- **Latitude, longitude, altitude**
- **Slope, aspect, slope position**
- **Trees: species, DBH, health (live/recent dead/old dead), percentage live crown, age, site index**
- **Seedlings/saplings: species, health (live/dead), count**
- **Damage agents**
- **Root disease – on/off plot**
- **Climate data**

Cankers:

Cytospora
Sooty bark
Hypoxylon
Black
Cryptosphaeria
Nectria
Diplodia
Other or Unknown

Peniophora polygonia
Daldinia concentrica
Antrodia serialis
Coprinus atramentarius
Coniophora puleana
Flammulina populicola
Fomitopsis pinicola
Other or Unknown

Leafroller
Cottonwood dagger
moth
Redhumped caterpillar
Aspen leaf beetle
American aspen beetle
Aspen leaf miner
Aspen blotchminer
Sawflies
Poplar leaf aphid
Aspen two-leaf tier
Cottonwood leaf curl
Poplar aphid
Mite
Other or Unknown

Damage:

Animal browsing
Animal trampling
Animal rubbing/barking
Sapsuckers
Woodpecker
Beaver
Mechanical- nonanimal
Dead top
Broken top
Dead branch
Broken branch
Lightning
Frost
Drought
Sunscald
Fire
Other or Unknown

Root/Butt Rot:

Ganoderma applanatum
Armillaria spp.
Other or Unknown

Wood Borers:

Bronze poplar
Poplar
Generic roundhead
Generic flat head
Generic branch
Poplar twig saperda
Poplar branch
Poplar butt
Aspen root girdler
Other or Unknown

Foliar/Shoot Diseases:

Marssonina leaf spot
Melampsora rust
Ink spot
Wetwood
Shepherd's crook
Tobacco necrosis virus
Leaf blister
Shepherd's crook
Other or Unknown

Misc Insects:

Procryphalus bark
beetle
Ambrosia beetle
Bark moth
Oystershell scale
Eriophyid gall-forming
mite
Cicadas
Twig gall fly
Poplar petiole gall
Other or Unknown

Stem Decays:

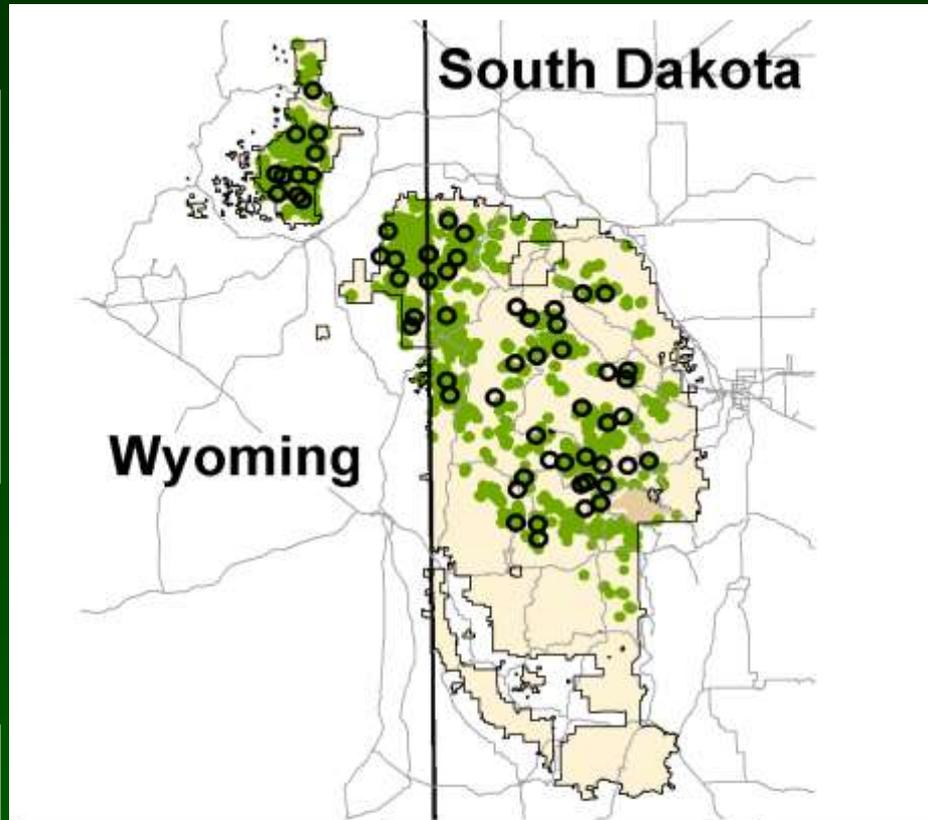
Phellinus tremulae
Chondrostereum
purpureum
Pholiota squarrosa
Pleurotus ostreatus
Sistotrema raduloides

Foliar Insects:

Western tent caterpillar
Large aspen tortrix
Forest tent caterpillar
Leafhoppers
Aspen leaf tier
Fall cankerworm
Pepper & salt moth

Location of plots and aspen cover type

Black Hills (180)



Aspen survey western South Dakota



0 5 10 20 30 40 50 Miles

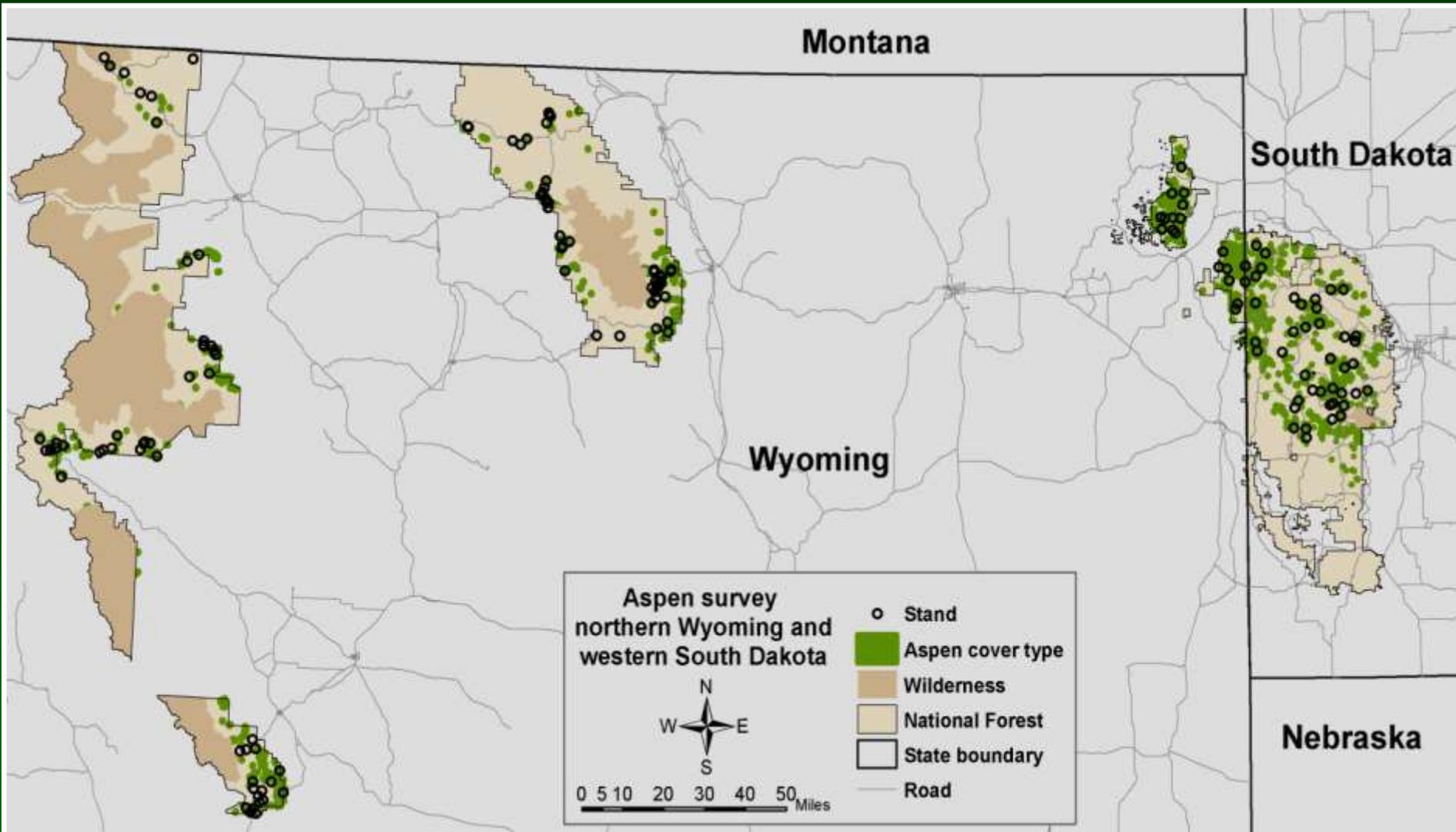
- Stand
- Aspen cover type
- Wilderness
- National Forest
- State boundary
- Road

Location of plots and aspen cover type

Shoshone (150)

Bighorn (135)

Black Hills (180)



Percentage of stems with damage agents in the three forests

Damage agent in trees	Shoshone (%)	Bighorn (%)	Black Hills (%)
Cytospora canker ↑ *	51	41	50
Sooty-bark canker *	22	10	39
Aspen trunk rot *	9	7	28
Bronze poplar borer ↑ *	17	3	18
Poplar borer ↑ *	17	7	17
Animal debarking *	5	20	1
Black canker *	7	4	9
Cryptosphaeria canker *	7	2	4
All other agents (25)	15	10	8

Percentage of stems with damage agents in the three forests

Damage agent in trees	Shoshone (<i>R-square</i>)	Bighorn (<i>R-square</i>)	Black Hills (<i>R-square</i>)
<i>Cytospora</i> spp.	.50	.30	.38
<i>Encoelia pruinosa</i>	.23	.14	.51
<i>Phellinus tremulae</i>	.	.	.
<i>Agrilus liragus</i>	.32	.	.30
<i>Saperda calcarata</i>	.	.	.
Animal debarking	.	.	.
<i>Ceratocystis fimbriata</i>	.	.	.
<i>Cryptosphaeria lignyota</i>	.32	.10	.16
All other agents (25)	.	.	.

Percentage of stems with damage agents in the three forests

Damage agent in regeneration	Shoshone (%)	Bighorn (%)	Black Hills (%)
Animal browsing *	10	27	32
Cankers ↑	15	13	24
Foliage diseases	1	5	4
All other agents (27)	3	5	4



Other results:

- 33 damage agents in trees
- 30 damage agents in regeneration
- Mean aspen:
 - tree mortality rate 6%/year (6%/year),
 - regeneration 4364 (3083) stems/acre
- White mottled rot (*G. applanatum*) in all forests, 28% (13%) of stands
- *Armillaria* spp. in all forests, 97% (55%) of stands (13%)
- Live crown %, 10-yr growth, % recent/old dead trees 1st yr



Cankers:

- * **Cytospora**
- * **Sooty bark**
- Hypoxylon**
- Black**
- * **Cryptosphaeria**
- Nectria**
- Diplodia**
- Other or Unknown**

Root/Butt Rot:

- * **Ganoderma applanatum**
- Armillaria spp.**
- Other or Unknown**

Foliar/Shoot Diseases:

- Marssonina leaf spot**
- Melampsora rust**
- Ink spot**
- Wetwood**
- Tobacco necrosis virus
- Leaf blister
- Shepherd's crook**
- Other or Unknown**

Stem Decays:

- Phellinus tremulae**
- Chondrostereum**
- purpureum**
- Pholiota squarrosa**
- Pleurotus ostreatus**
- Sistotrema raduloides**
- Peniophora polygonia**

- Daldinia concentrica**
- Antrodia serialis**
- Coprinus atramentarius**
- Coniophora puleana**
- Flammulina populicola**
- Fomitopsis pinicola**
- Other or Unknown**

Wood Borers:

- * **Bronze poplar**
- Poplar**
- Generic roundhead**
- Generic flat head**
- Generic branch
- Poplar twig saperda
- Poplar branch
- Poplar butt
- Aspen root girdler
- Other or Unknown**

Foliar Insects:

- Western tent caterpillar
- Large aspen tortrix**
- Forest tent caterpillar**
- Leafhopper**
- Aspen leaf tier
- Fall cankerworm
- Pepper & salt moth
- Leafroller**

- Cottonwood dagger moth
- Redhumped caterpillar
- Aspen leaf beetle
- American aspen beetle
- Aspen leaf miner**
- Aspen blotchminer
- Sawflies
- Poplar leaf aphid
- Aspen two-leaf tier
- Cottonwood leaf curl
- Poplar aphid**
- Mite
- Other or Unknown**

Misc Insects:

- Procryphalus bark beetle**
- Ambrosia beetle**
- Bark moth
- Oystershell scale**
- Eriophyid gall-forming mite**
- Cicadas**
- Twig gall fly
- Poplar petiole gall
- Other or Unknown**

Damage:

- Animal browsing**
- Animal trampling**
- Animal rubbing/barking**
- Sapsuckers**
- Woodpecker**
- Beaver**
- Mechanical- nonanimal**
- Dead top**
- Broken top**
- Dead branch**
- Broken branch**
- Lightning**
- Frost
- Drought
- Sunscald
- Fire**
- Other or Unknown**

Conclusion:

- Most of the stands in the three forests are healthy
 - Trees: 75% of the stands had $\leq 8\%$ mortality
 - Regen: 80% of the stands had ≥ 1000 stems/acre
- Many causal agents were observed, but only 5 agents were correlated with tree mortality
 - Sooty-bark canker
 - To a lesser degree Cytospora canker, bronze poplar borer, white mottled rot (*G. applanatum*)

