

Of Cheatgrass, Cutworms, and Bears



Salo

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Cheatgrass (*Bromus tectorum*) is an exotic annual grass that moves into disturbed areas and fuels wildfire in the West. Wildfire kills sagebrush and perennial grasses weakened by human activities. Sagebrush steppe is home to sage grouse (*Centrocercus urophasianus*), a species in decline.



Spivey



Hafting


Land managers often point to cheatgrass as the sole cause of wildfire, which overlooks humans' role in the disturbance that allows cheatgrass to spread and thrive. Cheatgrass cannot invade vigorous stands of perennial grasses.

UP IN SMOKE:



Fire and Invasives on Western Rangelands

https://www.youtube.com/watch?v=eqDI1_-MUio

Watch on  YouTube

Cheatgrass is one of the biggest invasive species problems in the western U.S.
It is estimated to cover up to 70 million acres.

In June, 2003, a Bureau of Land Management employee in Winnemucca, NV called me at the USGS about missing cheatgrass. He sent this photo of bare soil with gray litter and robust perennial grasses.



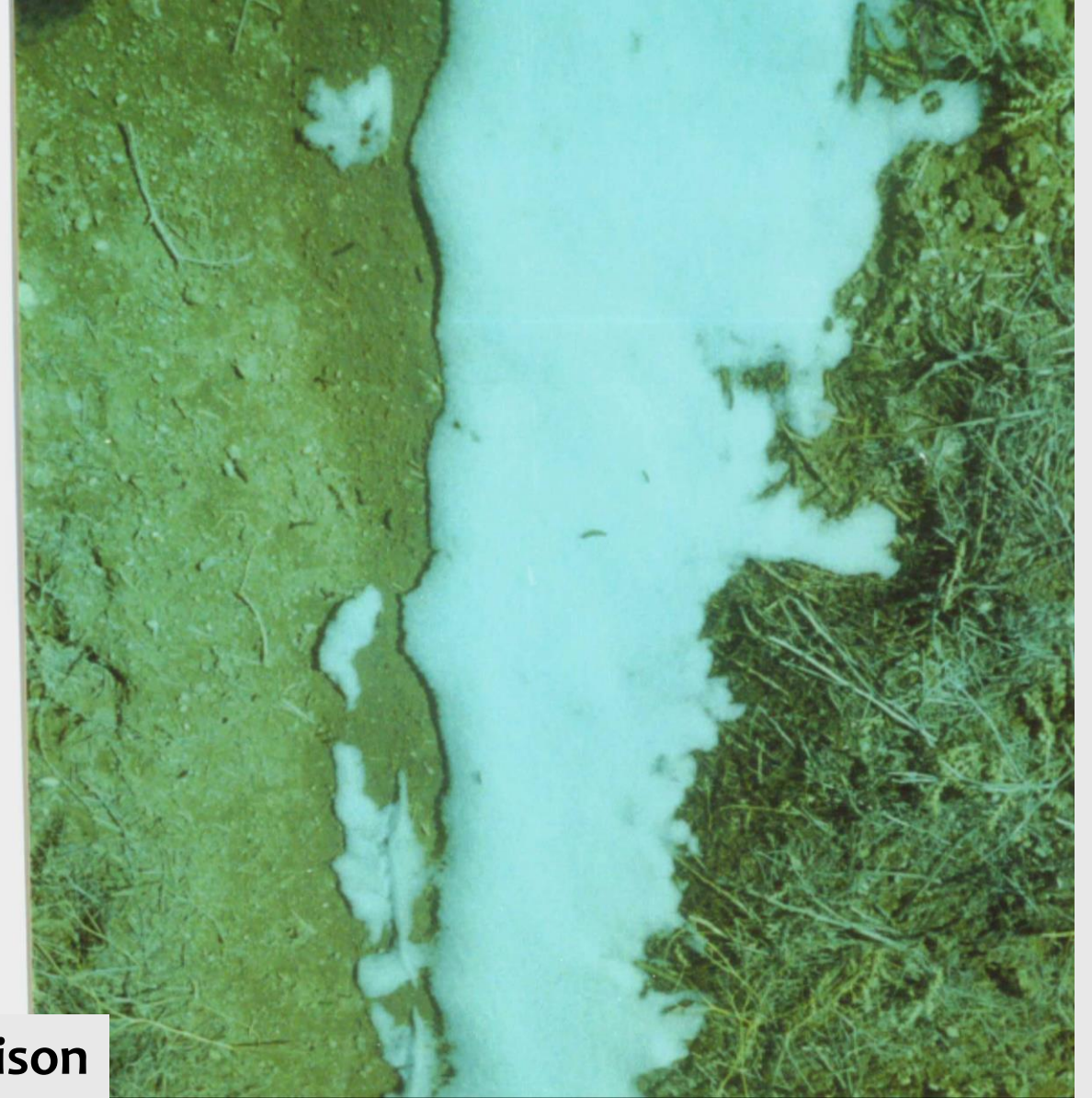
I visited and found bare areas with sharp boundaries surrounded by normal-appearing cheatgrass stands. I didn't know what caused the die-offs.



This die-off included healthy-looking shrubs, with a nearby ranch. A woman there told me her son said army cutworms caused the die-offs.



Jim Christison saw larvae eating every green shoot one night in January, 2014. He took pictures and identified the larvae as army cutworms.



Christison

Army cutworms are native insects and well-known pests of (exotic) crops such as wheat on the Great Plains. The adult moths migrate from the Great Plains to the northern Rockies in summer. Much less is known about ACW in the West.



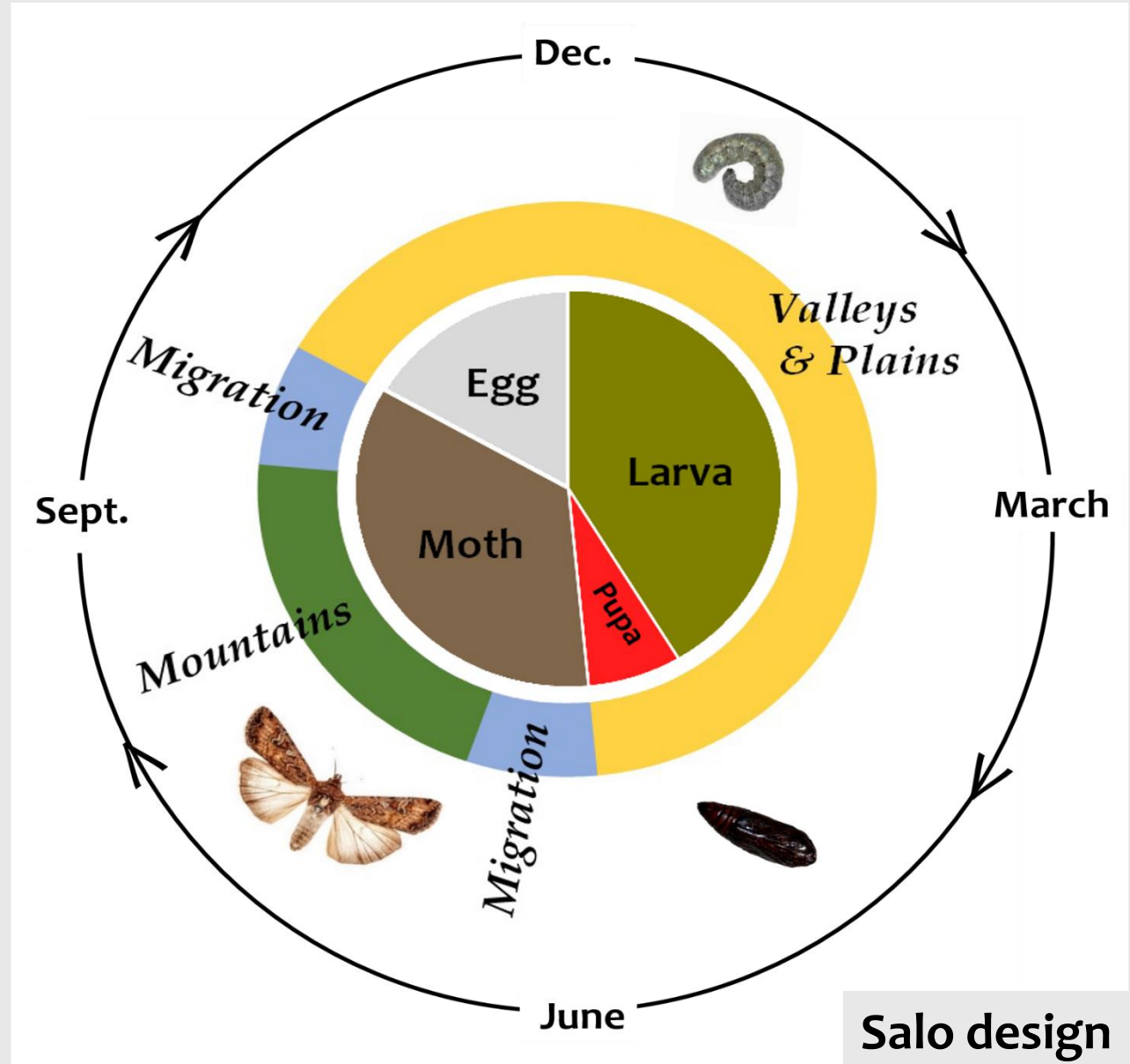
Army cutworm moths are an important food for grizzly bears in the northern Rockies. Bears find the fat-filled insects congregating in talus slopes during the day. See recent research at BearButter.org.



Army cutworm lifecycle

SW Idaho and
NW Nevada

Army cutworms have one generation per year. Adult moths lay eggs at low elevations, where larvae feed until they pupate. Emerged adults migrate to higher elevations for the summer.



These are not army cutworms



Cabbage looper
Trichoplusia ni

OkSU



Corn earworm
Helicoverpa zea

NDSU

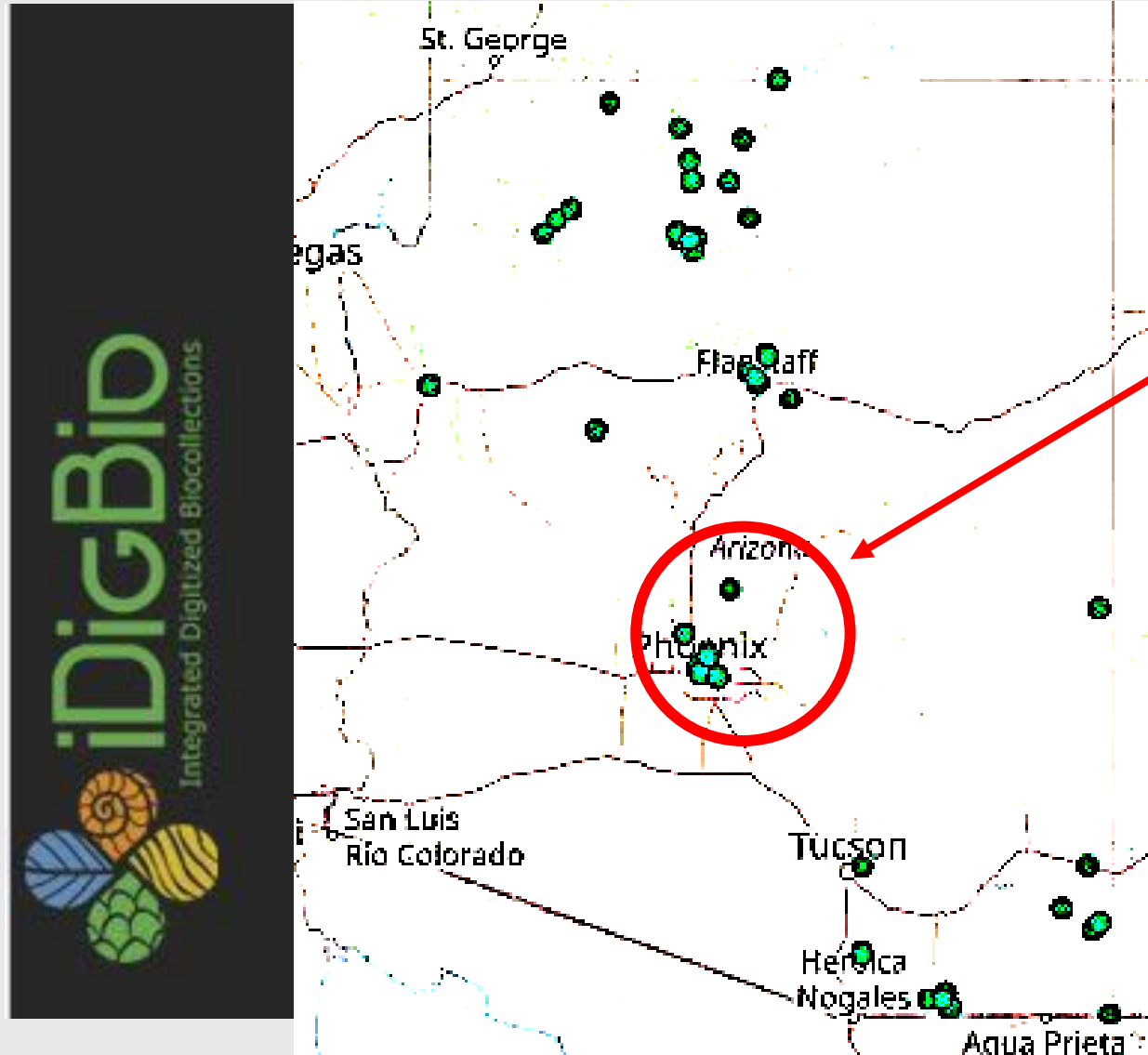


Fall armyworm
Spodoptera frugiperda

FAO

ACW are larvae *only* during the winter.

Army cutworms in Arizona



**Army cutworm
larvae and red
brome overlap?**

**Do army
cutworms also eat
red brome?**

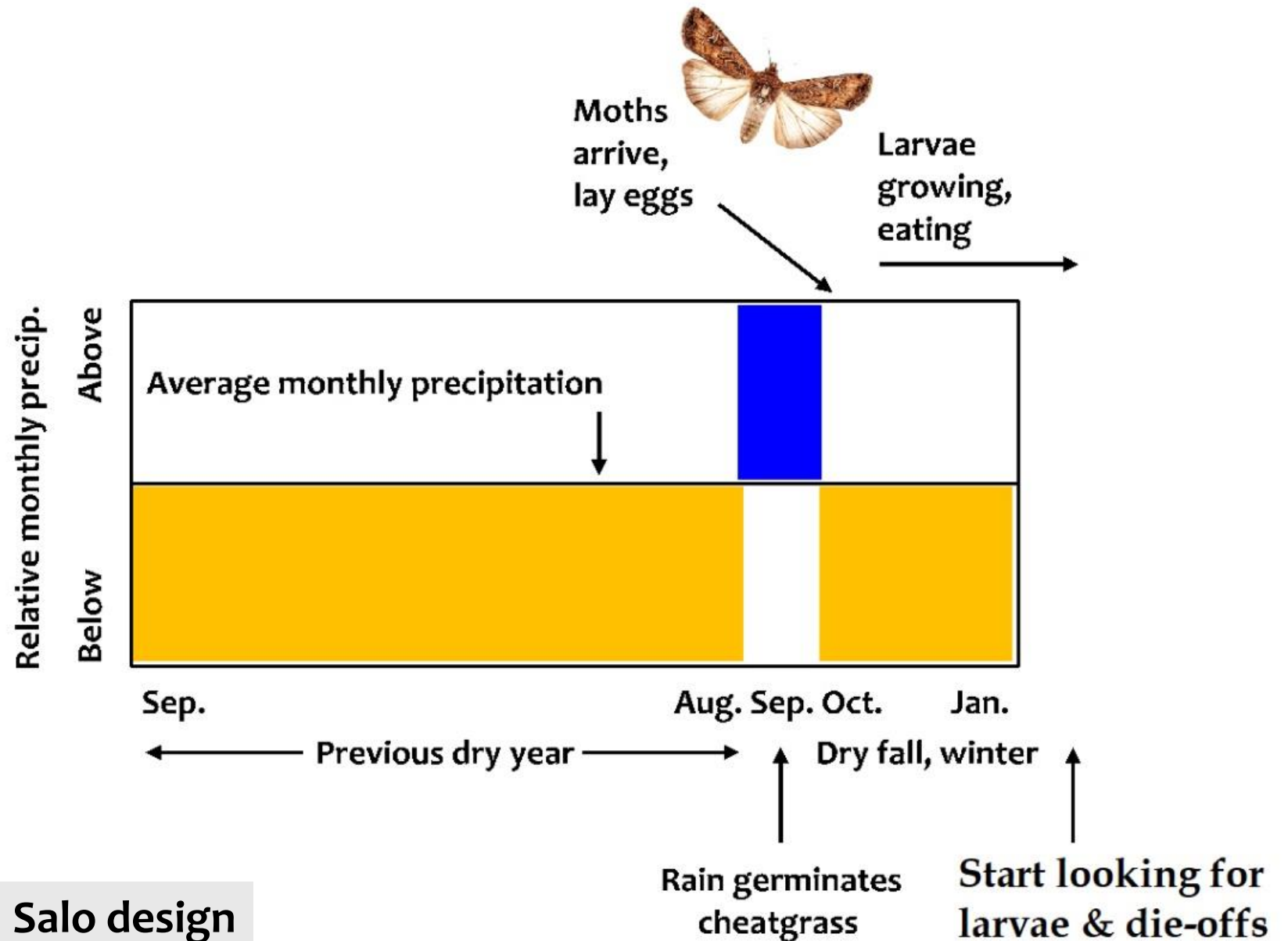
Bob Hammon, at Colorado State University Extension in Grand Junction, saw serious crop damage from army cutworms in early 2003.



Hammon

Army cutworm outbreaks

Bob Hammon recorded the conditions that led to the army cutworm outbreak in 2003.



Nancy Shaw, at the Forest Service Research Station in Boise, spotted photos of cheatgrass die-offs from the 1930s--1960s in F.S. archives. Conditions before each were similar to those Hammon recorded.



R-665
9/21/60 J. O. Klemmedson
Deadman Flat, 3½ mi. east of
Saylor Cr. Experimental
Range, Idaho

Photo shows extensive winterkill of cheatgrass on the north edge of Deadman Flat. Slopes in the background are predominately south. Light areas in immediate foreground and left center are patches of cheatgrass which did not winterkill. Russian thistle is the only living plant in the winterkill area.

Meanwhile, federal research funding supported studies of fungi as the cause of cheatgrass die-offs.

A Race for Survival: Can *Bromus tectorum* Seeds Escape *Pyrenophora semeniperda*-caused Mortality by Germinating Quickly?

JULIE BECKSTEAD^{1,*}, SUSAN E. MEYER², CHE

Cheatgrass (*Bromus tectorum*) Biocontrol Using Indigenous Fungal Pathogens

Mycelial growth rate and toxin production of pathogen *Pyrenophora semeniperda*: resc temporally varying selection

Susan E. Meyer, David L. Nelson, Suzette Clement, and Julie Beckstead

S. E. Meyer^{a*}, M. Masi^b, S. Clement^a, T

The quick and the deadly: growth vs virulence in a seed bank pathogen

Susan E. Meyer¹, Thomas E. Stewart² and Suzette Clement¹

Indirect effects of an invasive annual grass on seed fates of two native perennial grass species

Susan E. Meyer · Katherine T. Merrill · Phil S. Allen ·
Julie Beckstead · Anna S. Norte

The research failed to find a link between fungi and die-offs. Owen Baughman continued to study cheatgrass die-offs.

Is *Pyrenophora semeniperda* the Cause of Downy Brome (*Bromus tectorum*) Die-offs?

Owen W. Baughman and Susan E. Meyer*

Downy brome (cheatgrass) is a highly successful, exotic, winter annual invader in semi-arid western North America, forming near-monocultures across many landscapes. A frequent but poorly understood phenomenon in these heavily invaded areas is periodic 'die-off' or complete stand failure. The fungal pathogen *Pyrenophora semeniperda* is abundant in cheatgrass seed banks and causes high mortality. To determine whether this pathogen could be responsible for stand failure, we quantified late spring seed banks in die-off areas and adjacent cheatgrass stands at nine sites. Seed bank analysis showed that **this pathogen was not a die-off causal agent** at those sites. We determined that seed bank sampling and litter data could be used to estimate time since die-off. Seed bank patterns in our recent die-offs indicated that the die-off causal agent does not significantly impact seeds in the persistent seed bank.

Nomenclature: Downy brome, *Bromus tectorum* L.; black fingers of death, *Pyrenophora semeniperda* (Brittleb. & D.B. Adam) Shoemaker.

Key words: Cheatgrass, Great Basin, seed bank, seed pathogen, stand failure.

In January 2014, I recognized the same conditions Bob Hammon recorded before the 2003 army cutworm outbreak. I sent out Wanted posters; ACW were first spotted in southwest Idaho in February.

January 23, 2014

Help solve a mystery and foil cheatgrass:

Watch for flocks of birds on the ground in the Boise foothills this winter

While you're hiking, biking, or commuting in the foothills on cloudy winter days, watch for birds feeding on the ground; they might be eating army cutworms. The cutworms might be eating cheatgrass. Let's find out.

Army cutworms hide in the soil and come above ground to eat young plants at night or on cloudy days—and they love cheatgrass. Birds eat the larvae and are much easier to see than the ½- to 1-inch long insects. We had a bumper crop of adult miller moths last fall. The moths laid eggs in the soil, which hatched into army cutworms. I want to find the larvae to learn where they feed and how much cheatgrass they eat.

Why this is important Cheatgrass sprouts from seeds in winter and turns the Boise foothills brown in summer. It carries fires that burn our native plants.

A large hatch of army cutworms can eat every cheatgrass plant in an area. If we know how to find the larvae, we can be ready to reseed areas where they've removed the cheatgrass. With the cheatgrass gone, native

WANTED: Army Cutworm



Frank Peabody, Colorado State University, Bugwood.org

March 1 and 4, 2014



After consuming cheatgrass, ACW ate leaves and bark of sagebrush, saltbushes, and other native shrubs. Sagebrush had dropped leaves during drought, making it hard to separate ACW feeding.

All, Salo

April 26, 2014



All, Salo

A site with saltbushes was almost completely defoliated. ACW avoided one branch on most shrubs. Do shrubs always produce anti-feedants in one branch? Or did they produce them in response to ACW feeding?

The saltbushes leaved out again by June, presumably using the leaves on untouched branches to restart photosynthesis.

June 2, 2014



Salo

April 26, 2014



By July, summer weeds grew on the saltbush site, using water and nutrients not used by cheatgrass the previous spring.

July 21, 2014



All, Salo

April 19, 2014



Salo

One sagebrush site produced a second crop of cheatgrass in April. The seeds germinate in fall or spring.

February 15, 2015



June 19, 2015



All, Salo

Another sagebrush site was still devoid of cheatgrass and sagebrush leaves the following spring. Cheatgrass and sagebrush recovered there by that summer.

Army Cutworm Outbreak Produced Cheatgrass Die-offs and Defoliated Shrubs in Southwest Idaho in 2014

By Cindy Salo

Salo. (2018) Army cutworm outbreak produced cheatgrass "die-offs" and defoliated shrubs in southwest Idaho in 2014. *Rangelands* 40(4), 99-105.

RANGELAND NEWS

A QUARTERLY PUBLICATION OF SRM

2018 ISSUE NO. 3

Rangelands Highlight

*Army Cutworm Outbreak Produced Cheatgrass Die-offs
Idaho in 2014*

"...establishes a baseline and proposes a meaningful research direction...the first stages of the scientific method."

"The field of rangeland management would be well served by more of this type of article."

My paper on the ACW outbreak got a nice shout-out from the journal editor.

Owen
Baughman's
study in 2014
found that
reseeding
cheatgrass die-
offs can give
perennial
grasses a head
start on
cheatgrass.

Cheatgrass Die-Offs: A Unique Restoration Opportunity in Northern Nevada

By Owen W. Baughman, Robert Burton, Mark Williams,
Thomas E. Dilts, and Elizabeth A. Leger

On the Ground

- The phenomenon of cheatgrass die-off is a common and naturally occurring stand failure that eliminates the presence of this annual grass for a year or more, affecting tens of thousands of hectares in some years.
- We designed a study to determine if the temporary lack of cheatgrass caused by die-offs is a restoration opportunity. We seeded native perennial species at three die-offs in the Winnemucca, Nevada, area.
- Native grass establishment in die-offs was almost

Many more sown
perennial grasses grew
in die-offs than
adjacent areas.

Baughman et al. (2017) Cheatgrass Die-Offs: A Unique Restoration Opportunity in Northern Nevada. *Rangelands* 39(6), 165-173.

“Blizzards”
of ACW
moths were
found
summering
in eastern
Nevada
mountains
after the
2014
outbreak.

Lepidoptera BioBlitz Nets Hundreds of Additional Species

By Paul Opler, Colorado State University

Great Basin National Park held its sixth annual Bioblitz on July 12-14, focusing on Lepidoptera (butterflies and moths). The purpose of the BioBlitz was to discover as much as possible about the diversity of Lepidoptera in Great Basin National Park and to engage citizen scientists of all ages so that they learn about and foster a relationship with Lepidoptera in Great Basin National Park.

Prior to the BioBlitz, 88 butterfly species were known in the park,



Dr. Paul Opler leads a trip to identify butterflies near Stella Lake.

Opler. (2014) Lepidoptera BioBlitz Nets Hundreds of Additional Species. The Midden, newsletter of Great Basin National Park, summer, 8-9.



USDA

United States Department of Agriculture

Science Framework for Conservation
and Restoration of the Sagebrush Biome:
Linking the Department of the Interior's
Integrated Rangeland Fire Management
Strategy to Long-Term Strategic
Conservation Actions

Part 2. Management Actions

THE INTEGRATED
RANGELAND FIRE
MANAGEMENT
STRATEGY ACTIONABLE
SCIENCE PLAN



October 2016

- Cheatgrass die-offs are a good time to reseed with perennial plants.
- Cheatgrass die-offs are caused by fungi.

General Technical Report
RMRS-GTR-389

May 2019

Federal reports in 2016 and 2019 recognized that cheatgrass die-offs are opportunities for reseeding, but both said die-offs are caused by fungi.

Chapter 7
Community Ecology of Fungal Pathogens
on *Bromus tectorum*

Susan E. Meyer, Julie Beckstead, and JanaLynn Pearce

Abstract *Bromus tectorum* L. (cheatgrass or downy brome) presents a rich resource

Meyer et al. (2016)
Community Ecology
of Fungal Pathogens
on *Bromus tectorum*.
In: Germino et al.
(eds) Exotic Brome-
Grasses in Arid and
Semiarid Ecosystems.

Both federal reports cite the same source, which overlooks research results and knowledge of ACW, fungi, and die-offs.

Army cutworms vs. fungi		
	Army cutworms	Fungi
Weather	Dry	Wet
Damage	Complete	Spotty
Persistence	Migratory	Resident

Of Cheatgrass, Cutworms, and Bears

Cindy Salo

- Army cutworms are native insects that feed on exotic crops and weeds, including cheatgrass.
- ACW are well-known pests of crops in the Great Plains and create cheatgrass die-offs in the West during their periodic outbreaks.
- ACW moths summer in mountains and are an important food of grizzly bears.
- ACW outbreaks in the West follow a year of dry weather, late summer rains, a large number of adult moths returning in fall, and dry weather through winter.
- Cheatgrass die-offs are opportunities to reseed cheatgrass-dominated areas with desirable species.
- I continue to study army cutworms eating cheatgrass in the West.

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