

The Effect Of the Mountain Pine Beetle On Allochthonous Input In High Elevation Watersheds

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OUTLINE

- MOTIVATION
- APPROACH
- RESULTS
- SUMMARY

A dark, atmospheric landscape photograph. In the foreground, there is a lush green field. Behind it, a dense forest of dark trees stretches across the middle ground. In the background, a range of rugged mountains with patches of snow or light-colored rock rises against a dark, overcast sky. The overall mood is somber and majestic.

MOTIVATION





S4700 10.0kV 20.3mm x300 SE(M) 8/2/2013 12:25

100um

Whitebark pine
(*Pinus albicaulis*)

NITROGEN DRIVEN PRODUCTIVITY



Pine needles

(terrestrially derived nutrients)



Microbial growth

(decomposition)



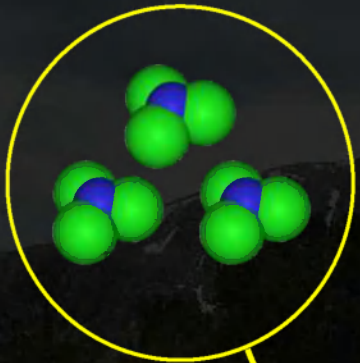
Macroinvertebrate
consumption

(additional decomposition)



Consumption of macroinvertebrates

NITROGEN DRIVEN PRODUCTIVITY



Green Needles (n=18)
53.72 Carbon : Nitrogen
0.94% Nitrogen

Production is limited by
nitrogen availability

NITROGEN DRIVEN PRODUCTIVITY



≠



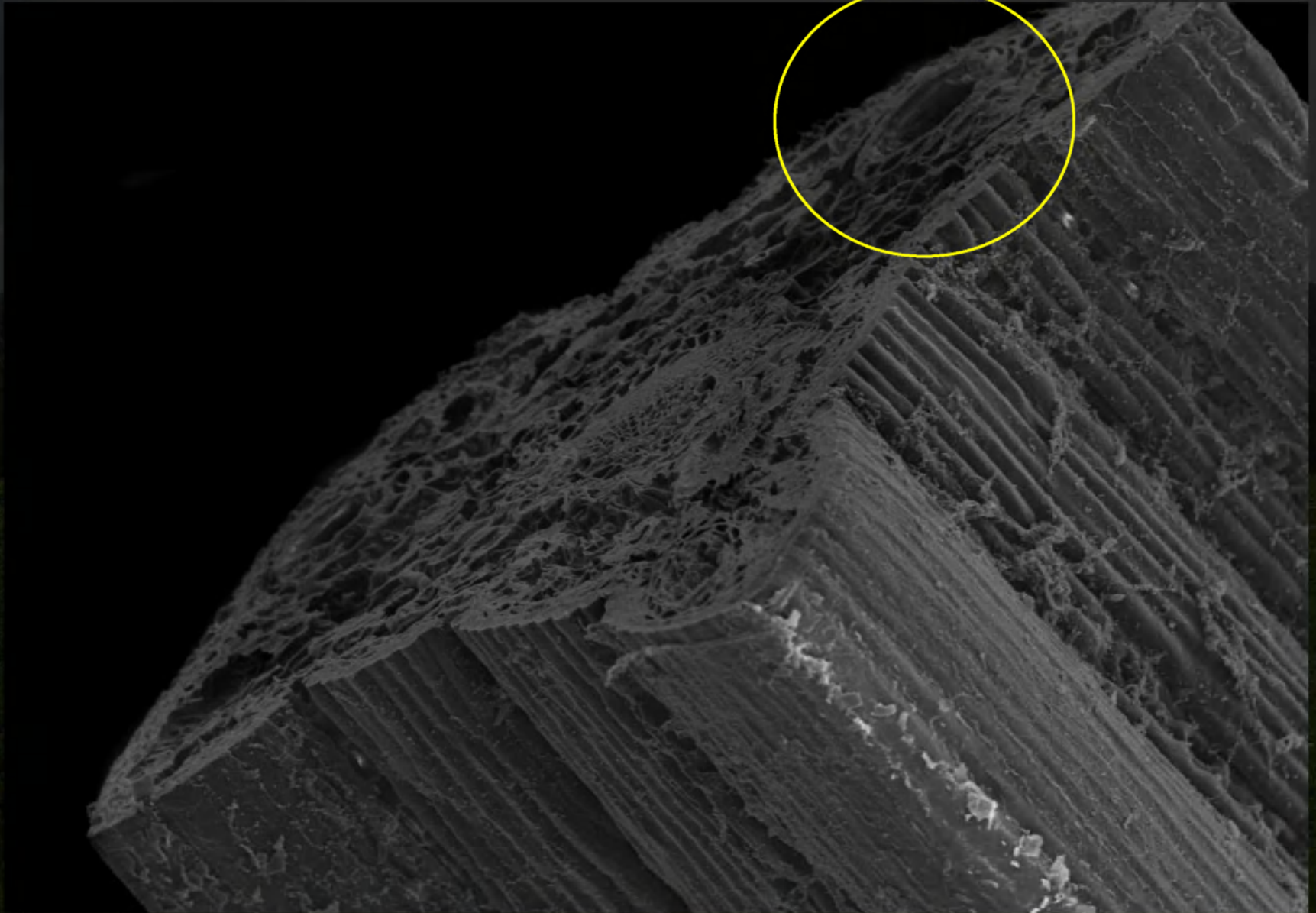
MPB (n=18)

47.52 Carbon : Nitrogen

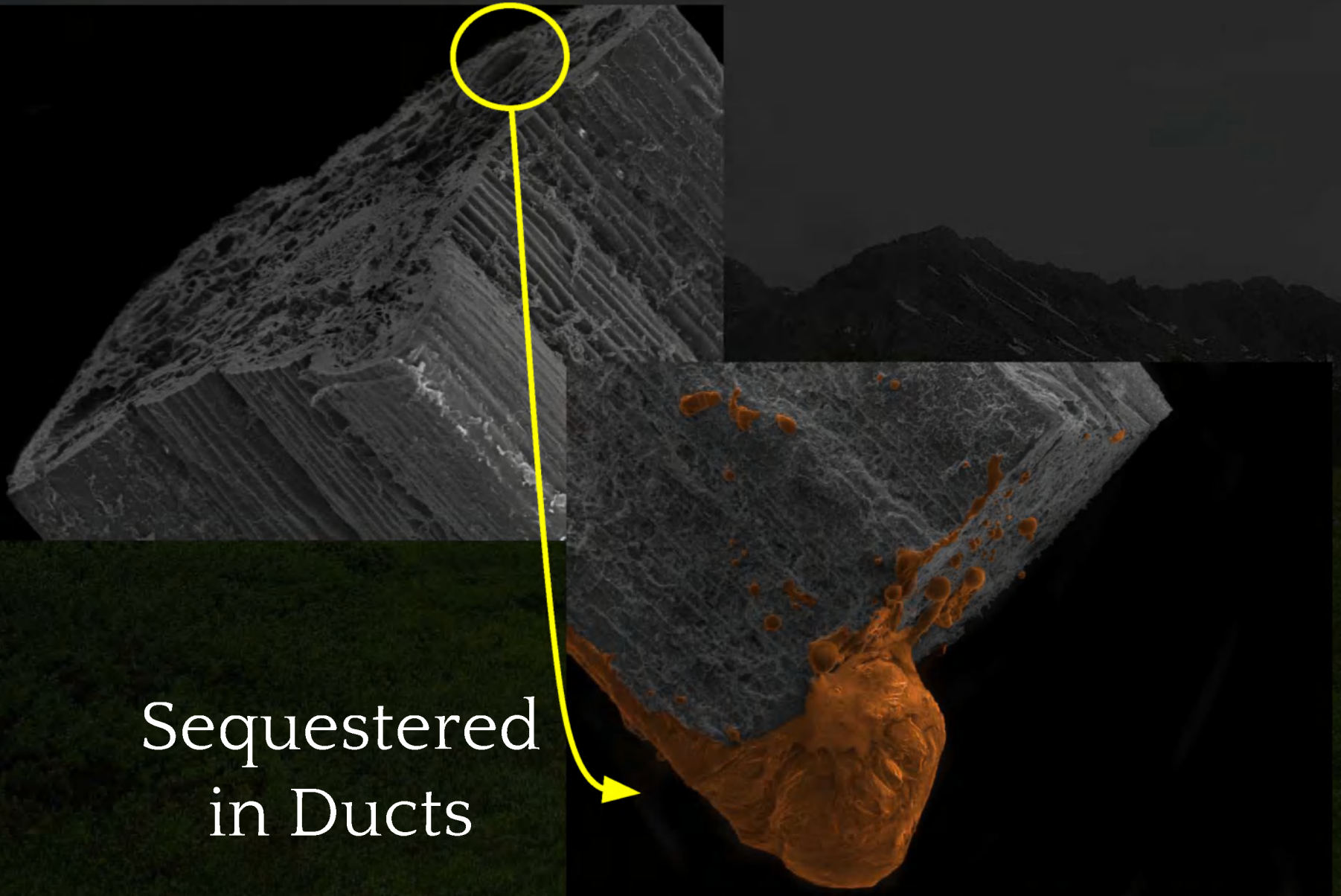
1.04% Nitrogen

Productivity increases
are not consistent

DECOMPOSITION CHALLENGES

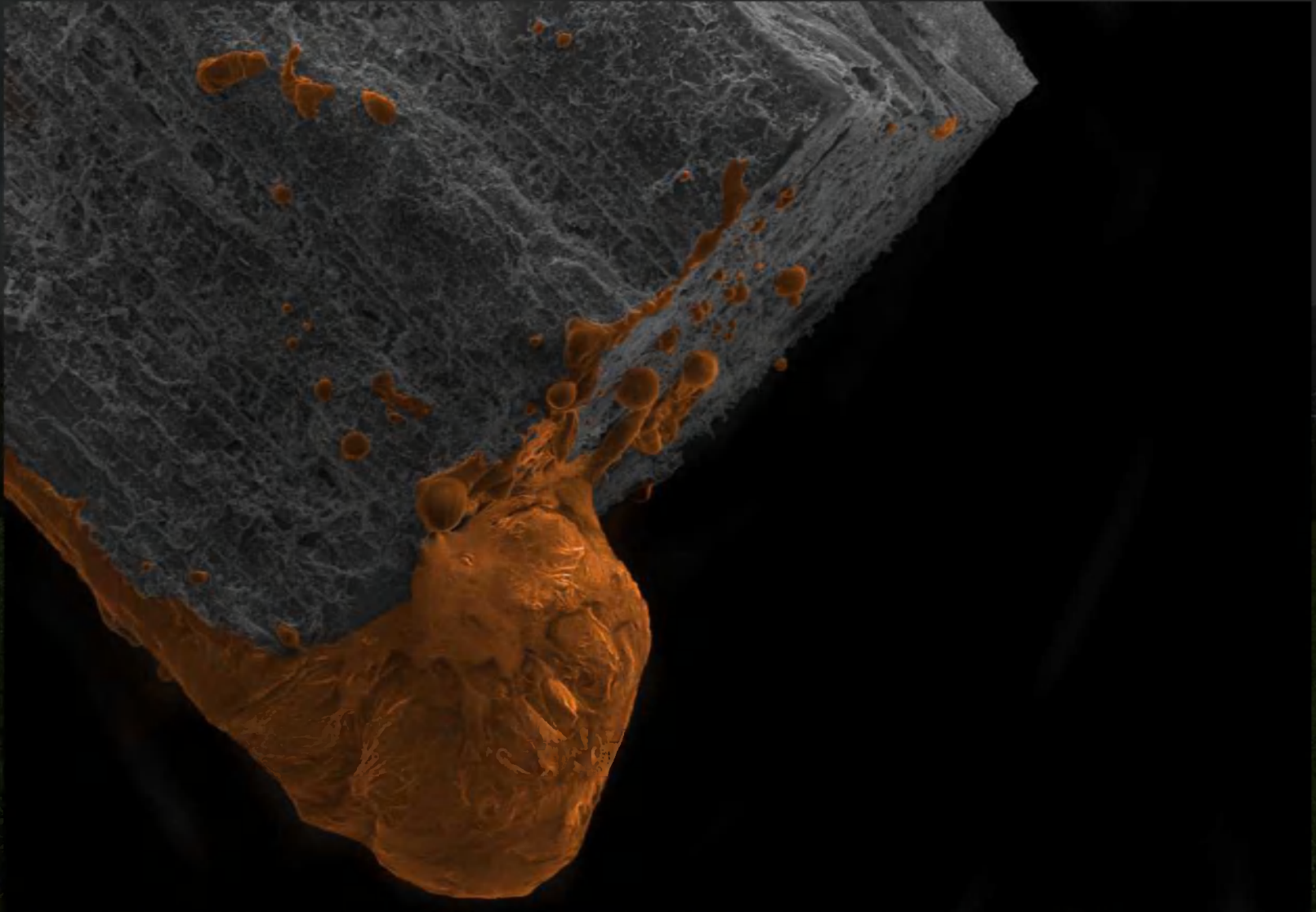


MONOTERPENES AND DITERPENES



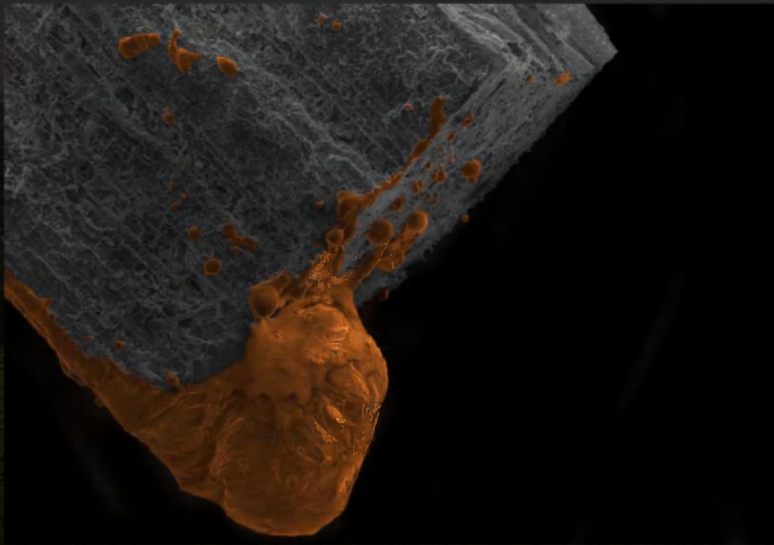
Sequestered
in Ducts

MONOTERPENES AND DITERPENES



Anti-microbial properties

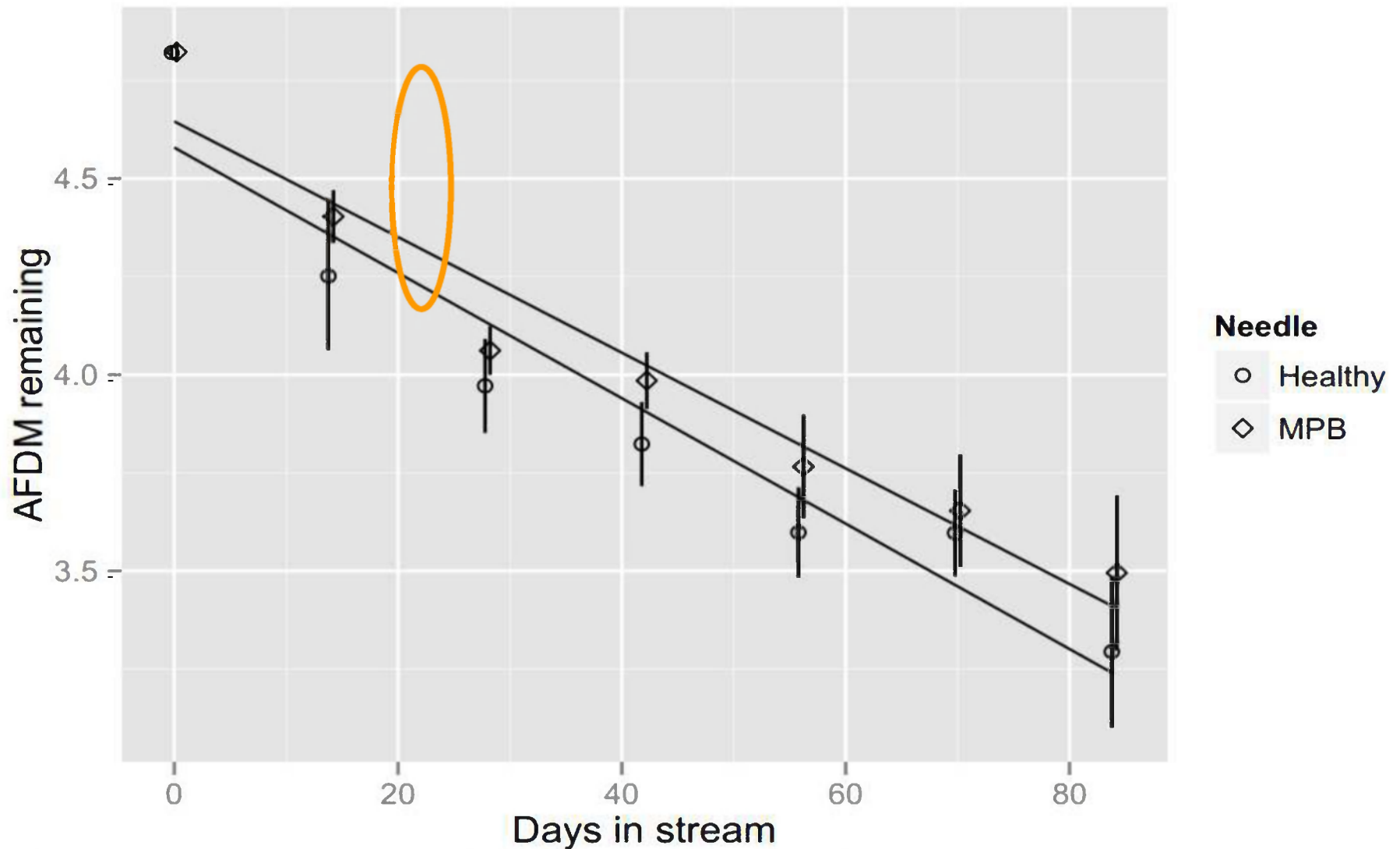
FLAME IONIZATION DETECTOR



4 X

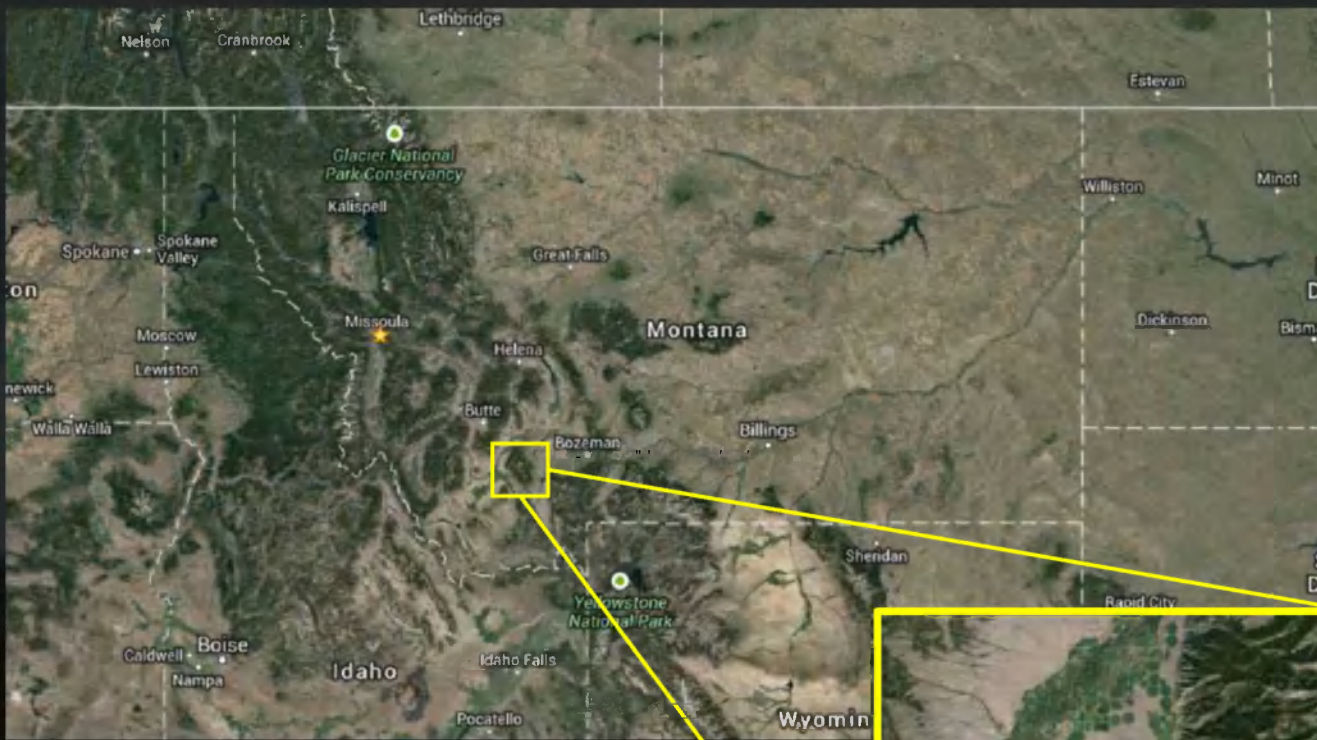
following mountain pine beetle attack

EXPECTED DECOMPOSITION RATE



A dark, atmospheric landscape photograph. In the foreground, there is a lush green field. Behind it, a dense forest of evergreen trees stretches across the middle ground. In the background, a range of rugged mountains with rocky peaks and patches of snow or light-colored rock is visible under a dark, overcast sky. The overall mood is somber and majestic.

APPROACH



HOLLOWTOP MOUNTAIN

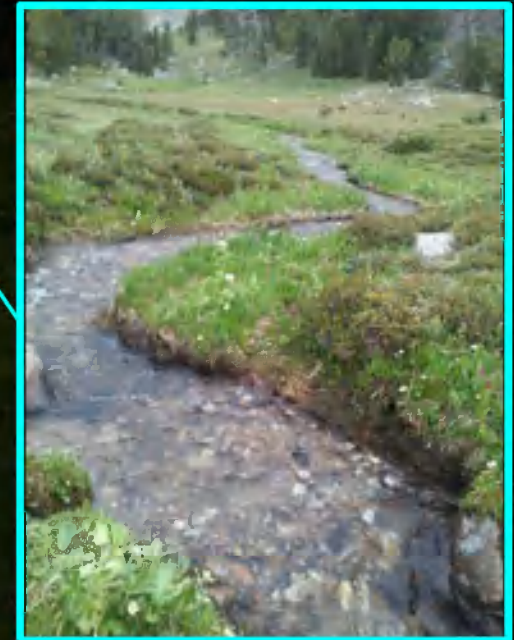
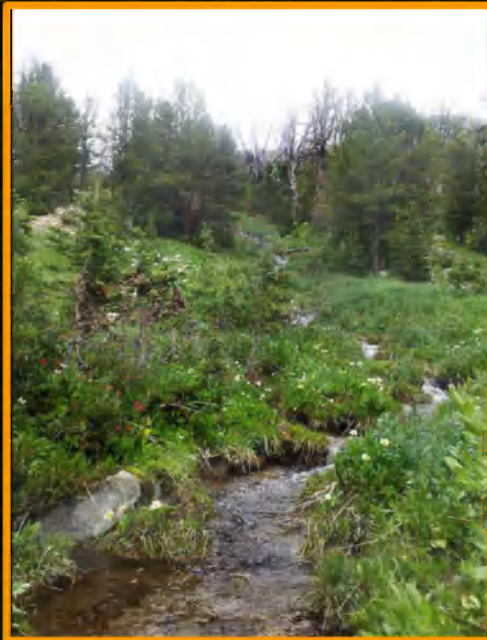
MONTANA



BRANHAM LAKES

LAKE ELEVATION: 9000 FT

SAMPLE SITES



Average number of
macroinvertebrates per sample site:
62

Elevation: 9000 - 10,000 ft.

COLLECTION



116

Baetis bicaudatus



Surber Sampling



22

Megarcys



37

Baetis tricaudatus



25

Sweltsa

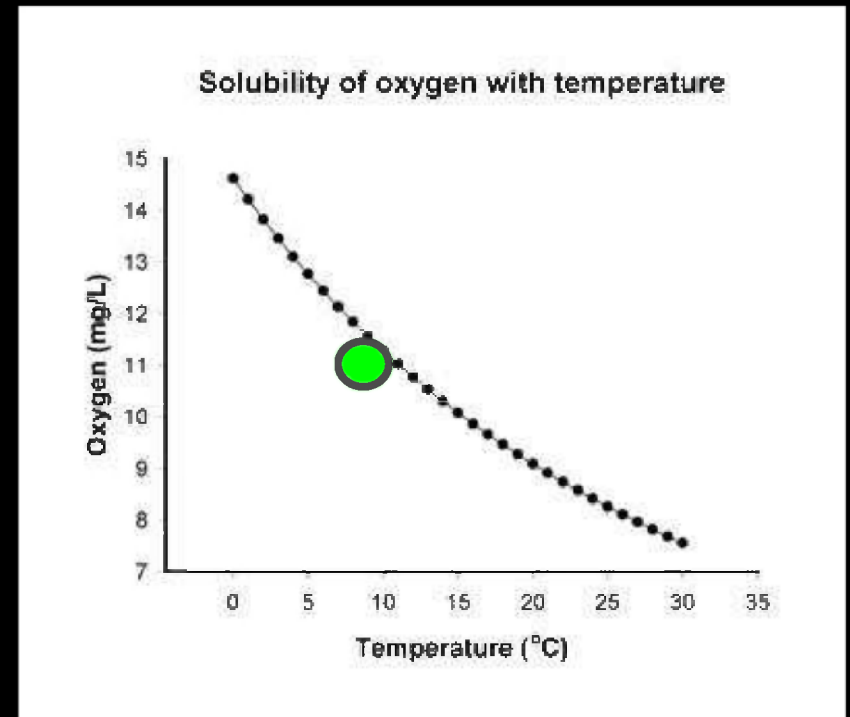
EXPERIMENTAL PHASE

Two groups:

- 100 macroinvertebrates - fed green needles
- 100 macroinvertebrates - fed MPB-killed needles



EXPERIMENTAL PHASE



Artificial
Habitat

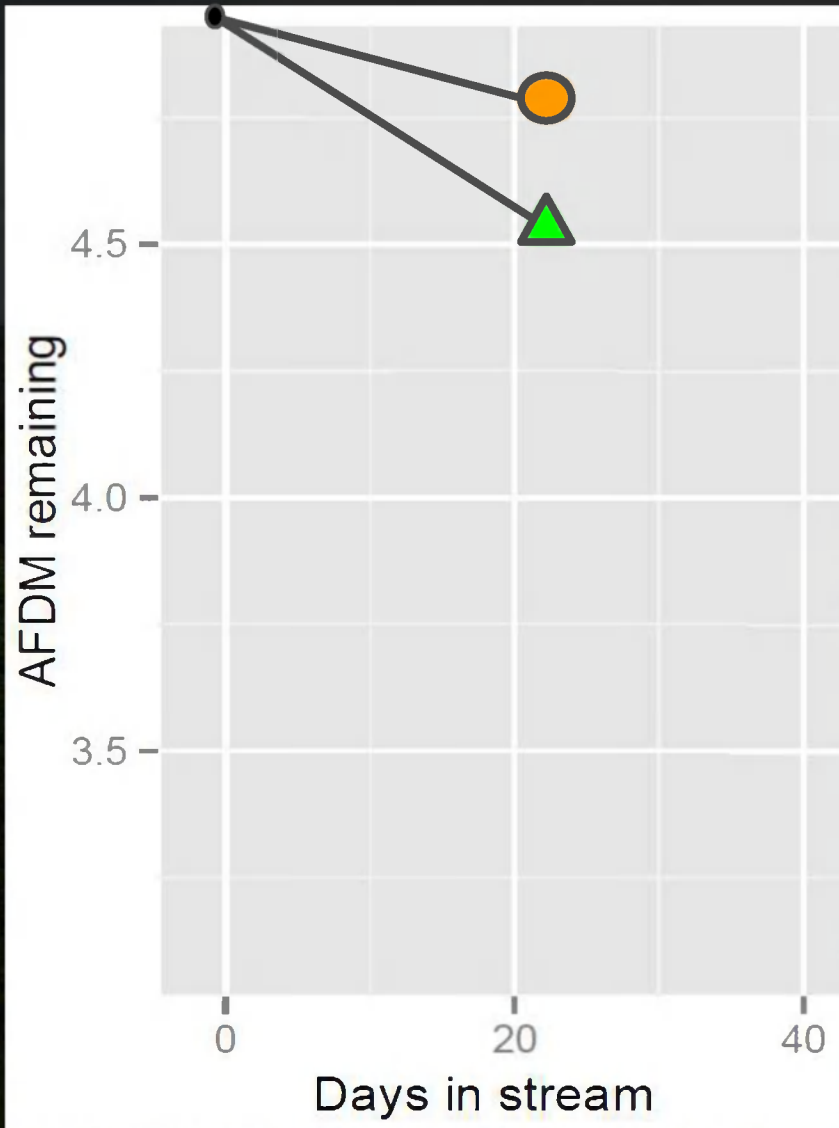


Reference
conditions



RESULTS

DECOMPOSITION RATE

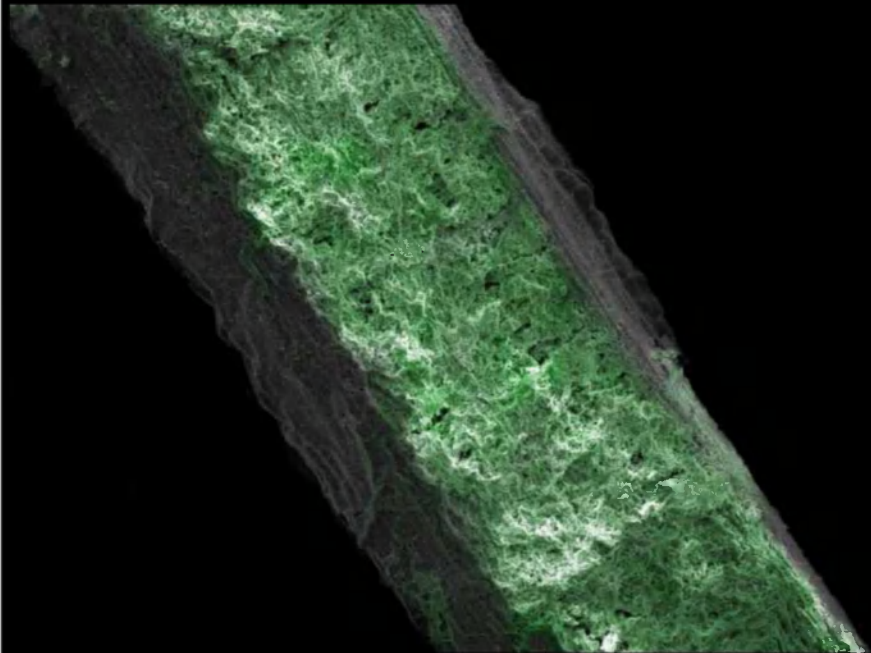


● Remaining mass of
MPB-killed needles:
4.76g

▲ Remaining mass of
green needles:
4.56g

P value (two tailed):
0.0053

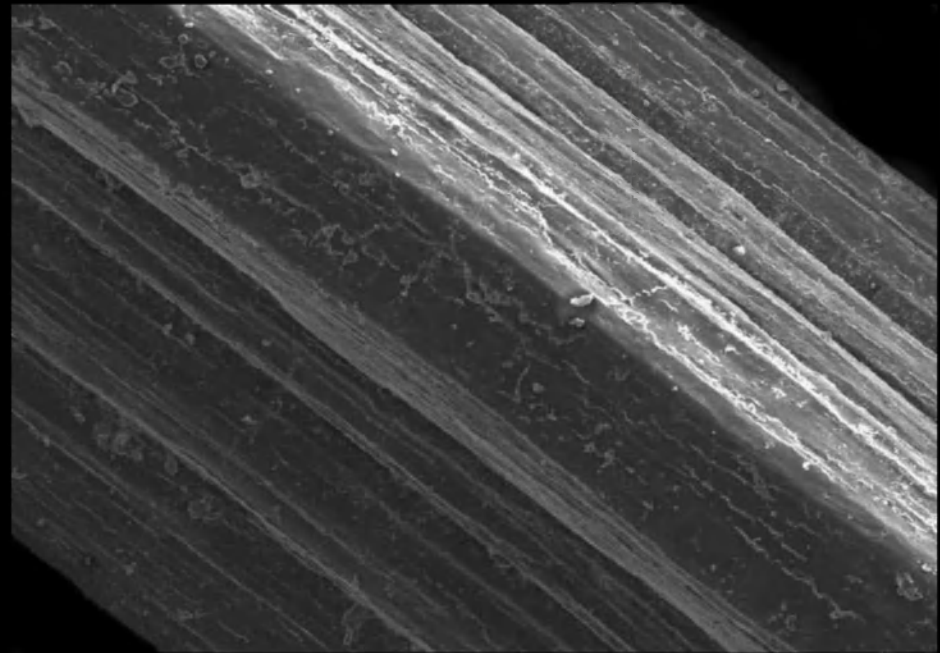
COMPARISON OF NEEDLE DECOMPOSITION



Day 21

8.7%

Mean change in biomass (n=5) : 0.434



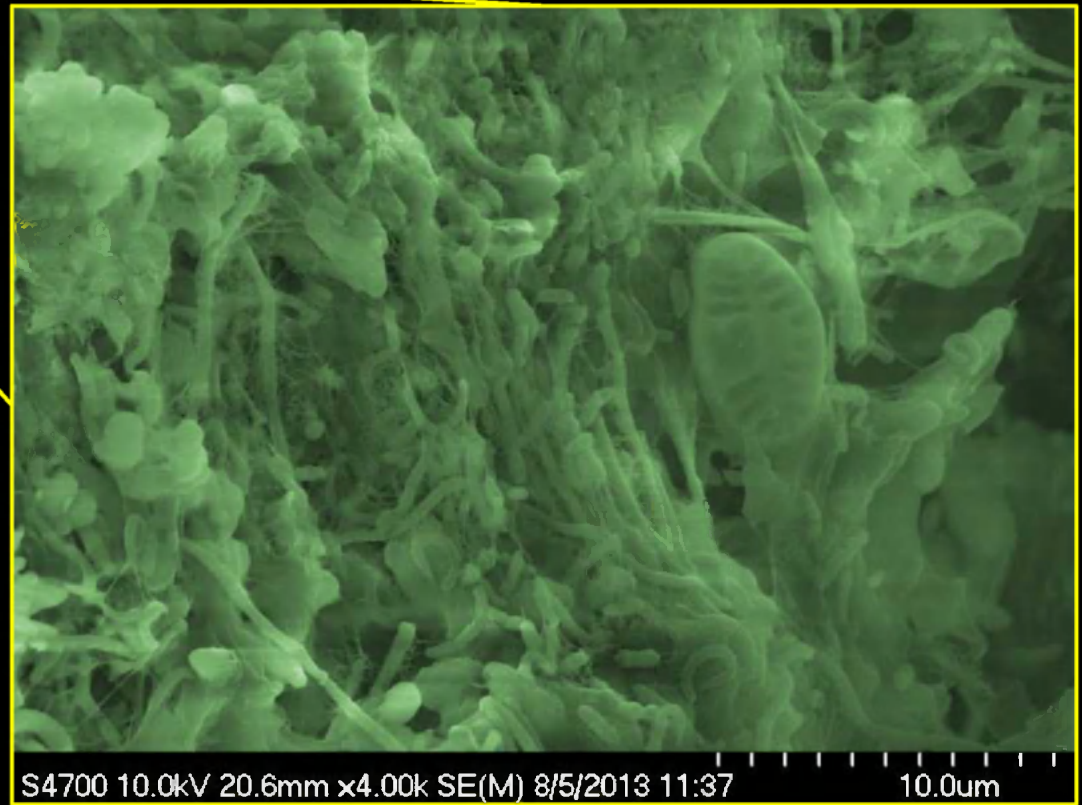
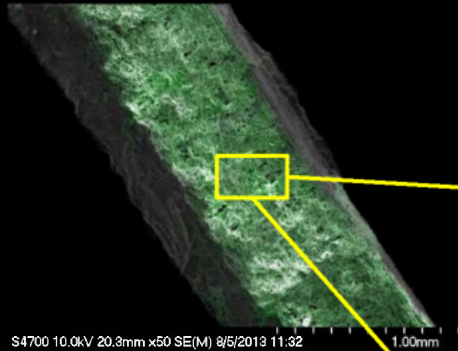
Day 21

5%

Mean change in biomass (n=5) : 0.24

vs.

GREEN NEEDLE DECOMPOSITION

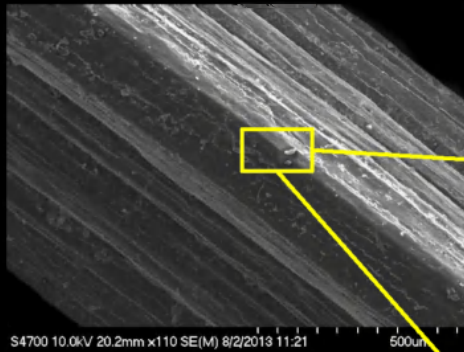


8.7%

Mean change in biomass (n=5) : 0.434

Day 21

MPB-KILLED NEEDLE DECOMPOSITION



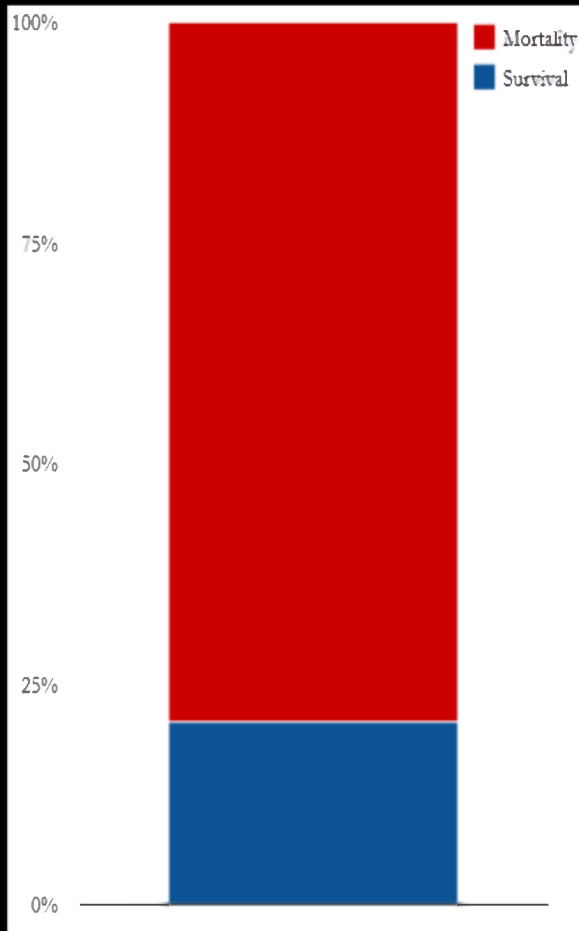
5%

Mean change in biomass (n=5) : 0.24

Day 21

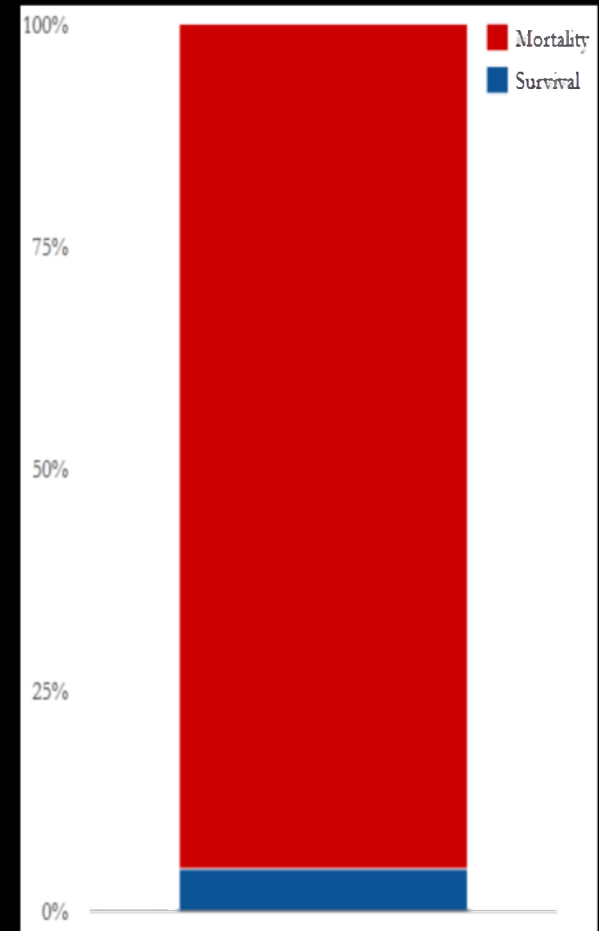
IN CONTEXT:

MORTALITY OF MACROINVERTEBRATES



79%

Green needles (n=100)



95%

MPB-killed needles (n=100)

IN CONTEXT:

PRODUCTIVITY



19%

macroinvertebrates

81% reduction
in food?

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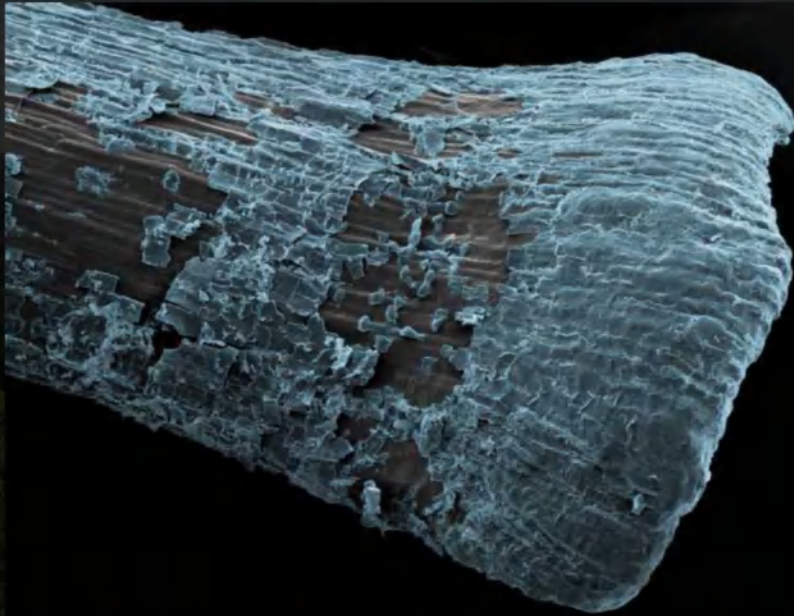
SUMMARY

UNDERSTANDING SYSTEM INTERACTIONS: ALTERNATE FOOD SOURCES

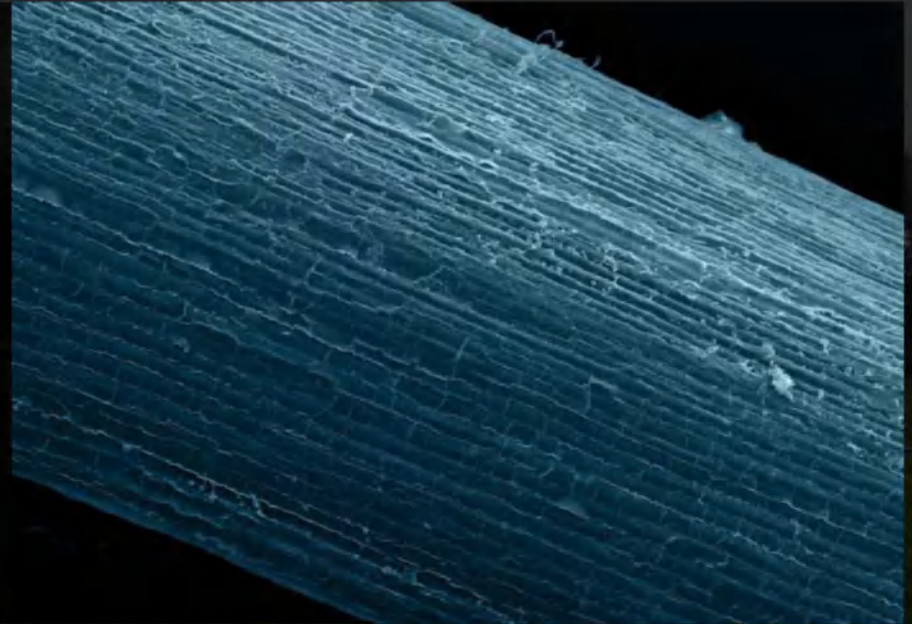


IN CONTEXT:

BUOYANCY



Green
Needles



MPB-killed
needles

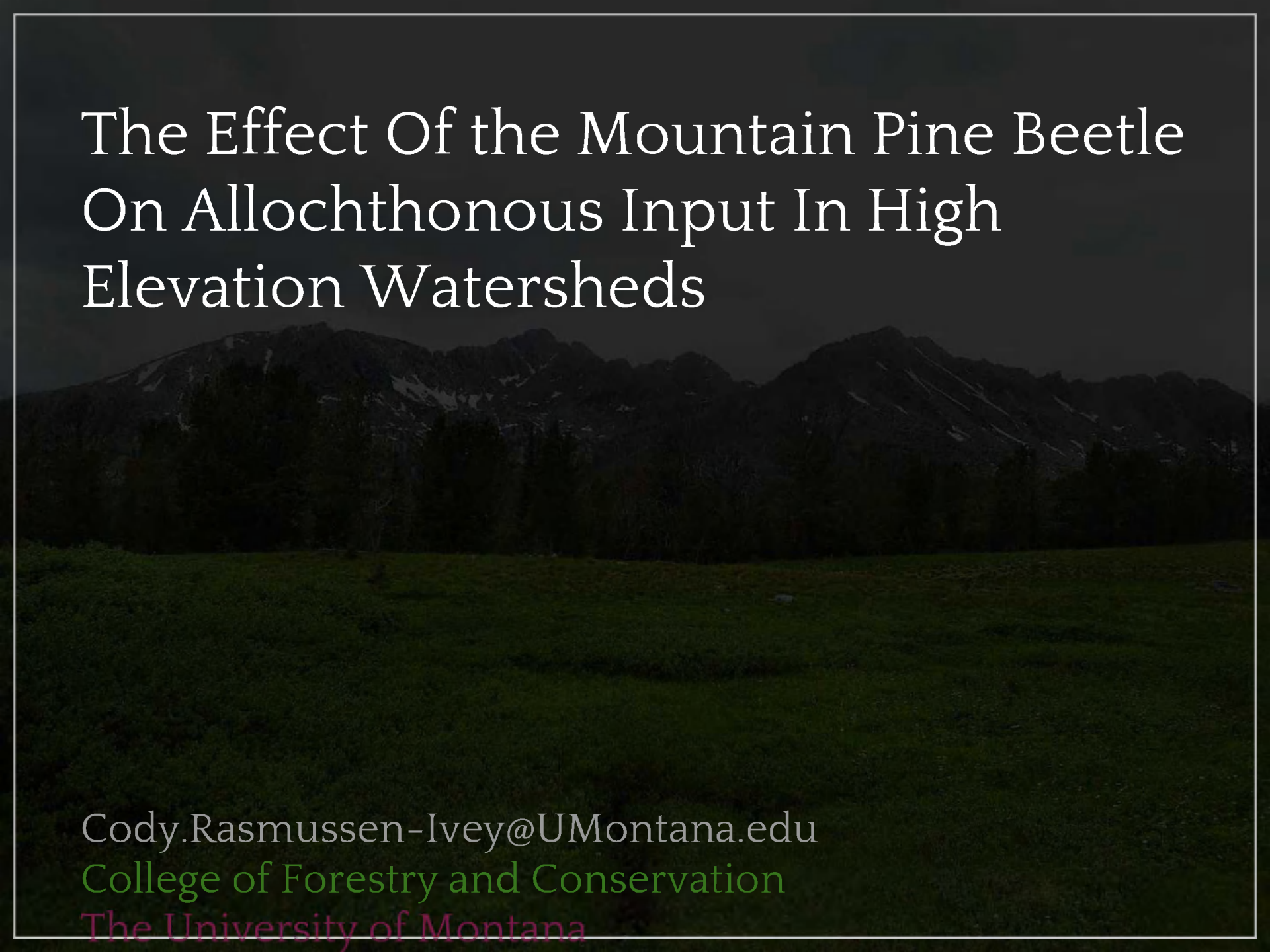
SYSTEM INTERACTIONS: DELAYED/SHIFTED PRODUCTIVITY



SYSTEM INTERACTIONS: FUTURE RESEARCH



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