



# Alpine Snow Mold



SK Schmidt



Thick mat on forest floor





SM 'Mat'



SM 'Net'

SM 'Coral'



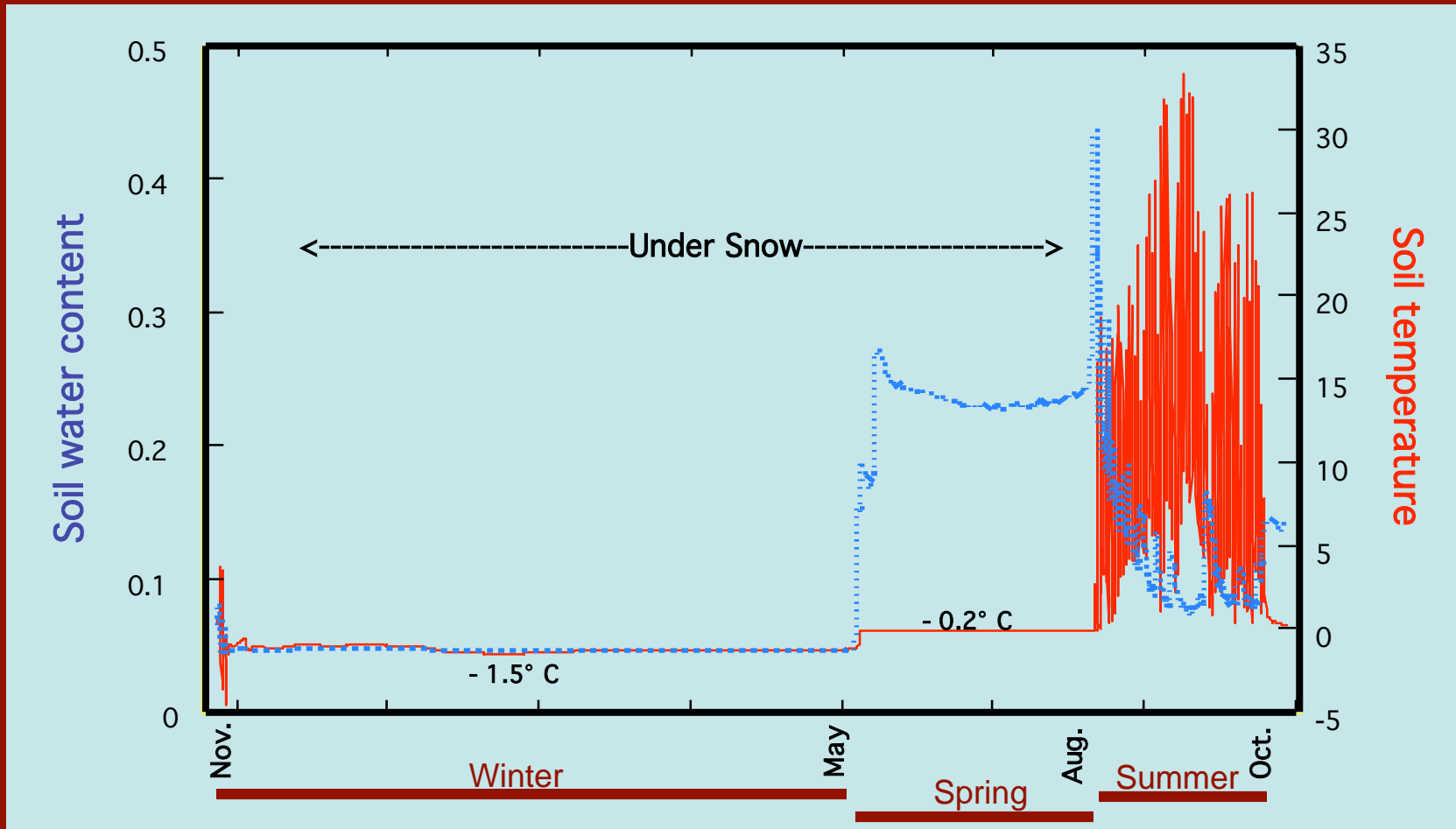






Ephemeral, rapidly disappear  
once the snow is gone

What conditions favor fungal growth?



From Ley, et al.. *Biogeochemistry* 68: 313-335 (2004)

Stable temperature and abundant moisture



Grows under snow

# Alpine Snow Mold Culture



KW Wilson

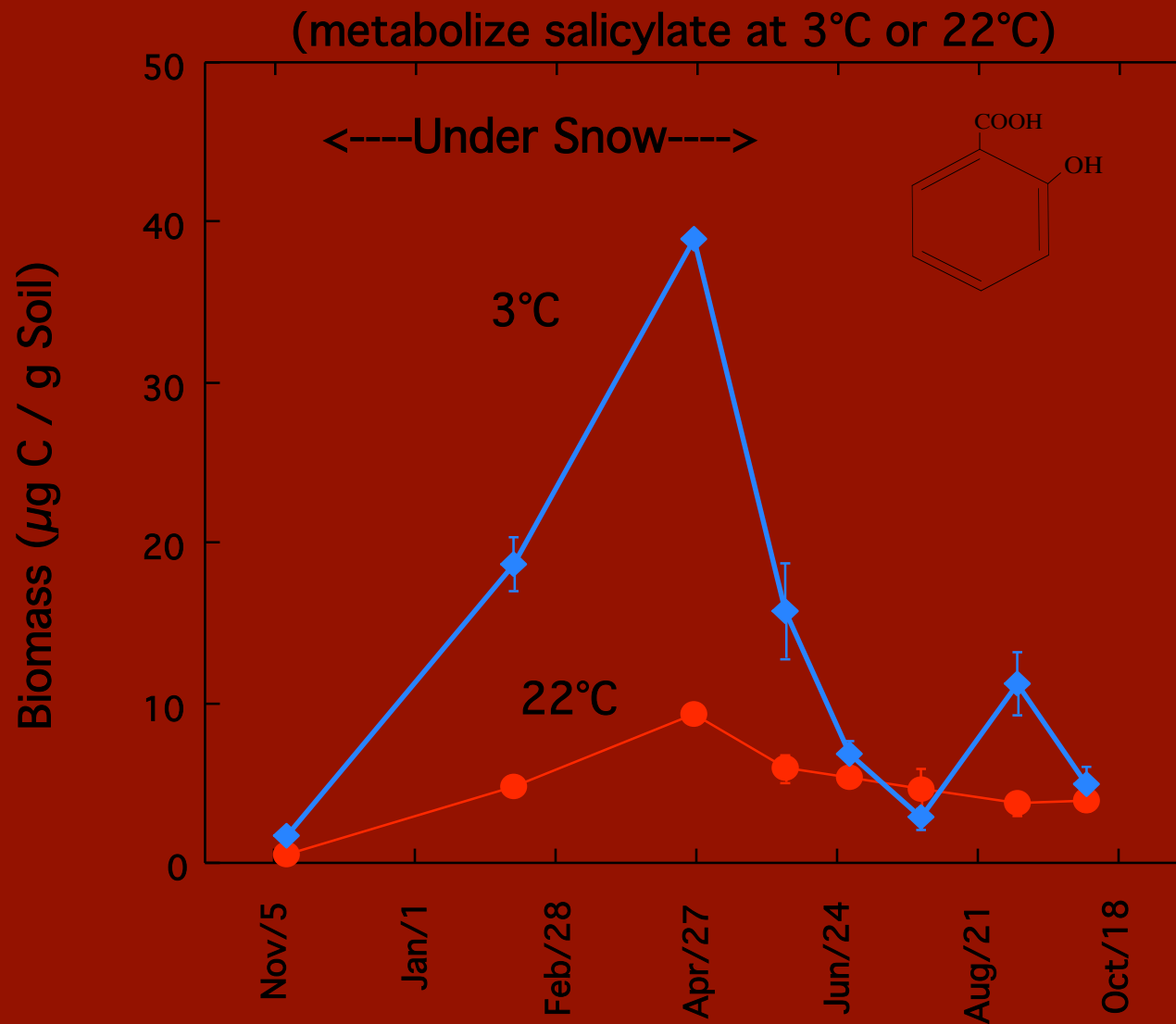
At Snowmelt...

# Large Fungal Community Crashes

SEASON	Biomass $\mu\text{g C / g}$ soil	F/B Ratio
Under- snow	363 (18)	15
Snowmelt	244 (21)	7
Summer	125 (32)	7

Schadt et al. 2003 *Science* 301: 1359

# Fungal biomass peaks under the snow

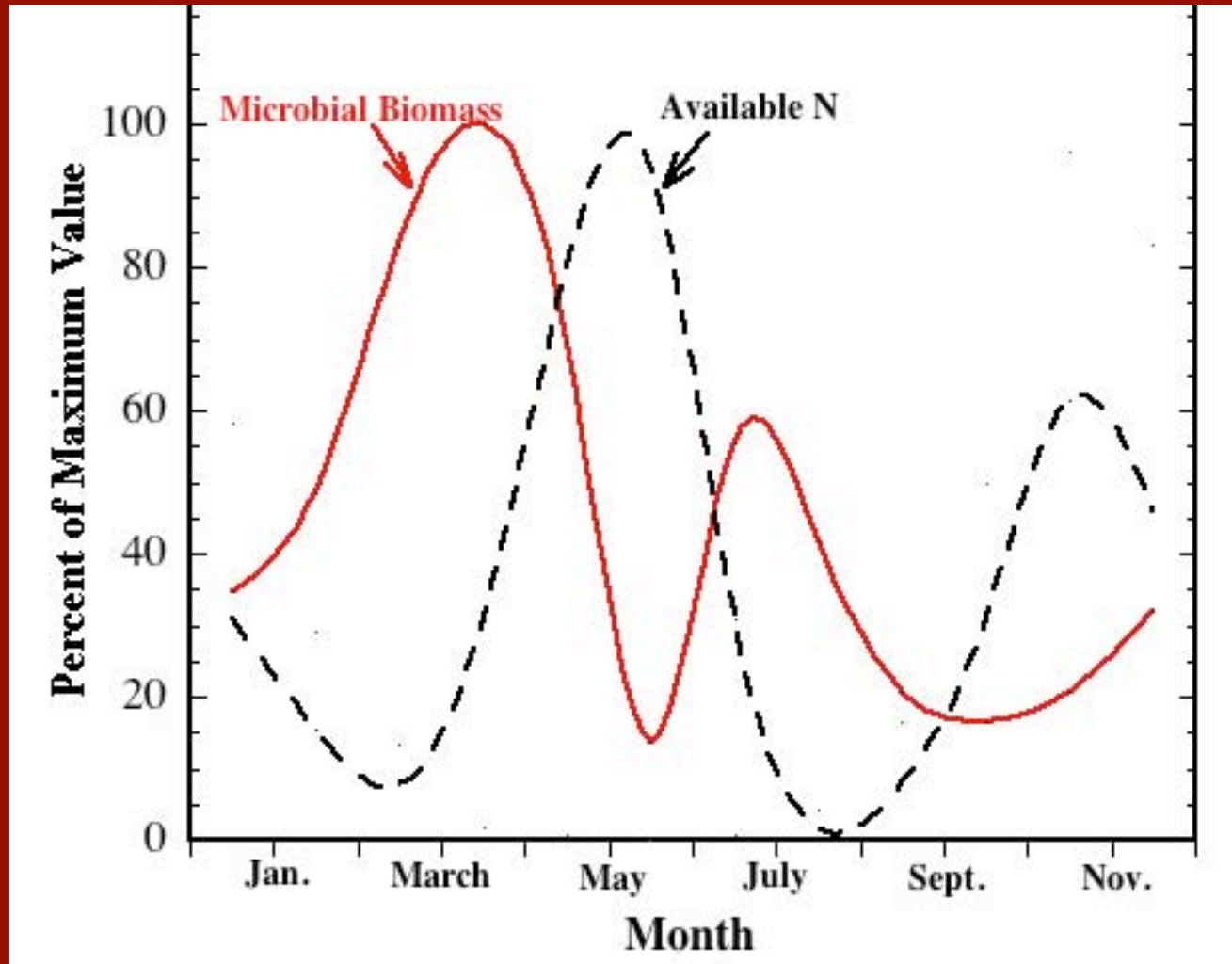


From Schmidt et al. 2007 *Ecology* 88:1379

What happens to  
disappearing biomass?

At Snowmelt...

# Flush of Nutrients



Seasonal fluctuations of microbial biomass and available N in alpine soils

From Schmidt and Lipson 2004 *Plant and Soil* 259: 1

# Major Carbon Source

- Half of yearly carbon fixed by plants is respired out by soil microbes under the snow pack
- Highest rates of CO<sub>2</sub> flux out of soils occur just prior to melt out.

Monson et al. 2006 *Nature* 439: 711

At Snowmelt...

# Appearance of Novel Groups

- Environmental clone libraries--fungi
- Zygomycetes
- Ascomycetes

# Research Program

Goal: understand microbial ecology of soil at snowmelt

- Culture snow molds & identify them
- Temperature dependent growth rates
- Enzyme attributes
- Substrate preferences

# Fast, Unique Zygomycetes

- Grow at -2C, similar to datalogger snowmelt soil temperatures
- Grow 10X faster than Antarctic soil Zygos
- Fastest recorded growth rates for filamentous fungi at -2C
- Grow fast enough to account for extensive snow mold mats

# Enzyme Profile

- Enzymes of 316-1 and 319-1 similar to free soil enzymes
- Different enzyme profiles suggest different niches for different SMs

# Proposed Niche for SM

- r-selected (fast, inefficient)
- Exploit high nutrient conditions under snow pack
- Receive nutrients from soil below
- Receive water and O<sub>2</sub> from snow pack above
- Responsible for high CO<sub>2</sub> fluxes from snow pack?

# Current and Future Studies

- Substrate preferences
- Grow 'Coral'
- Anaerobic growth--other members of community?
- Carbon dynamics--respiration, substrate use, isotope fractionation?