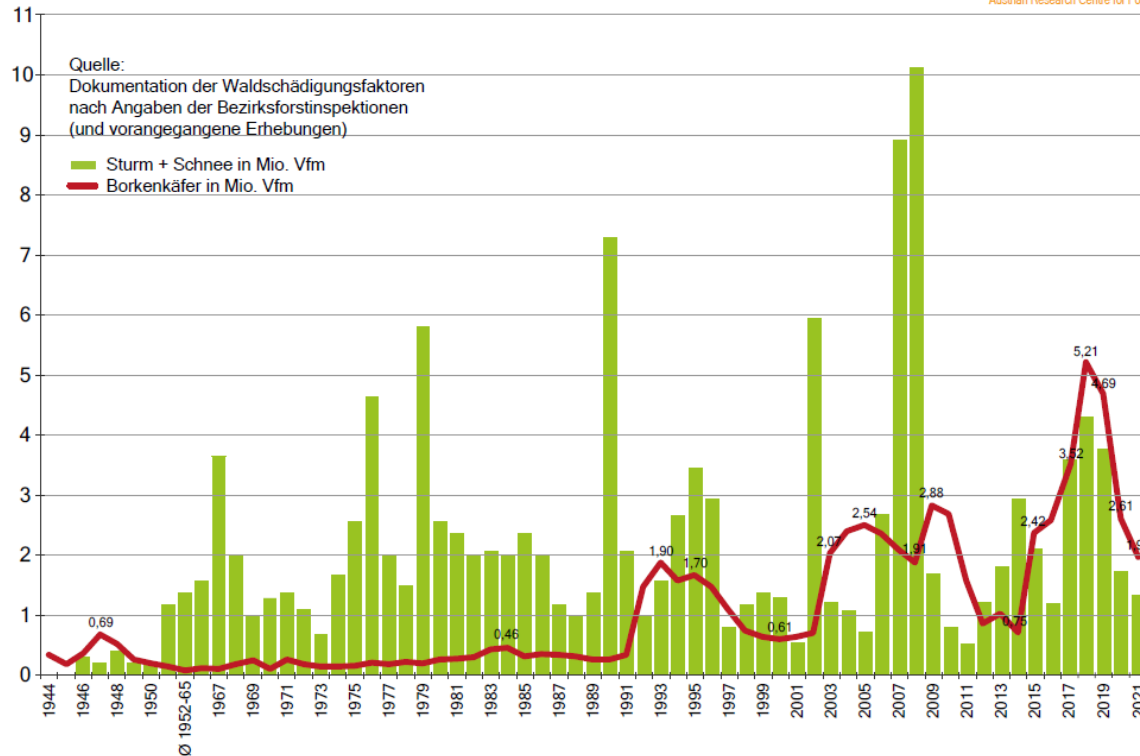


It ain't over... A new bark beetle outbreak in Austria 2021

Gernot Hoch & Gottfried Steyrer
BFW – Austrian Research Centre for Forests



Schadholzmengen durch Sturm, Schnee und Borkenkäferbefall



Comparison
Total harvest

2021: 18.4
2020: 16.8
2019: 18.9
2018: 19.2

Annual damage (million m³) by bark beetles (red line) and storm plus snow (green columns) in Austrian forests. Data: Documentation of Forest Damaging Factors (BFW, 2022)

Unprecedented outbreak of *Ips typographus* started in north of Austria in Summer 2015

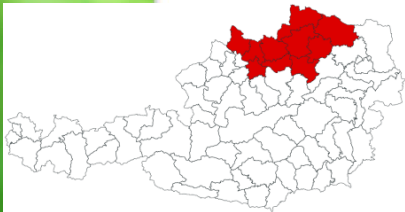
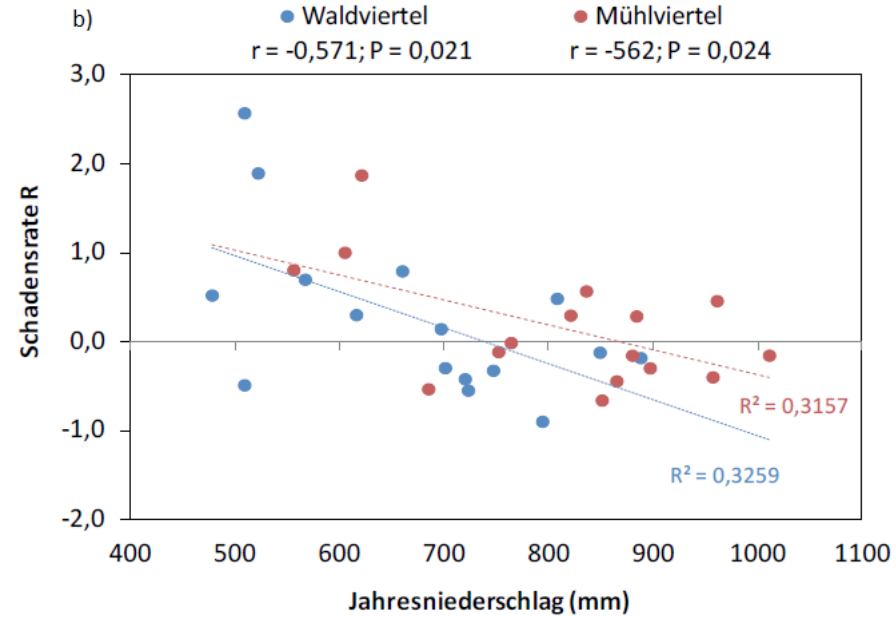
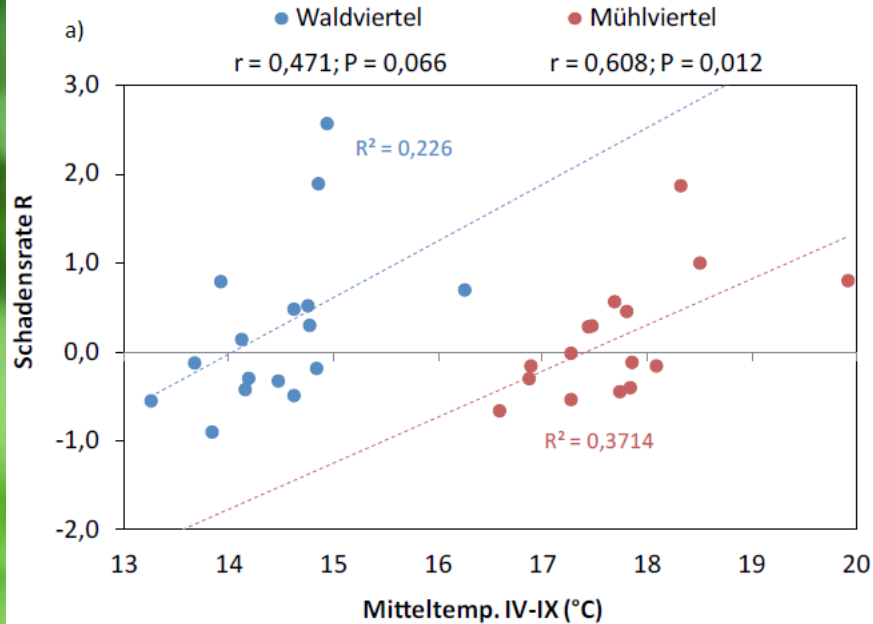
Driven by drought and warm temperature
without preceding storm/snow damage

Bez. Waidhofen/Thaya, 27.4.2019

Photo: Hoch, BFW

Better (faster) brood development at higher temperatures

Reduced defense capacity of spruce under drought stress



Correlation between bark beetle damage rate ($R = \ln(\text{damage}_t / \text{damage}_{t-1})$) with a) mean temperature April-September and b) annual precipitation for regions Waldviertel and Mühlviertel (r = Pearson correlation coefficient), 2002-2018.

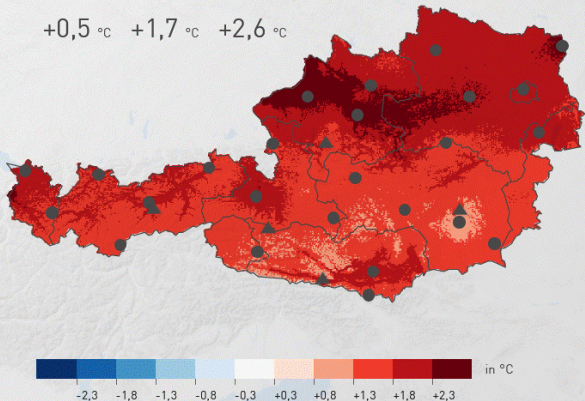
Hoch & Steyrer 2020: CCCA Fact Sheet #31

Mean annual temperature

Lufttemperatur für 2018

< Abweichung zum Bezugszeitraum 1981-2010 >

Minimum Flächenmittel Maximum
 +0,5 °C +1,7 °C +2,6 °C



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Annual precipitation

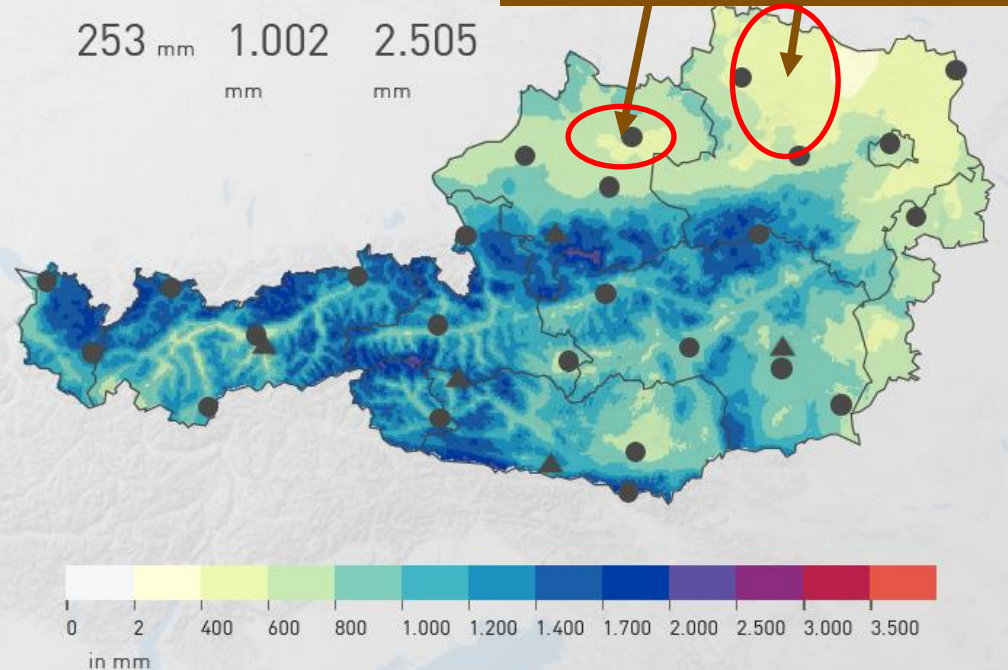
für 2018

< Absolutwert

Minimum	Summe	Maximum
253 mm	1.002 mm	2.505 mm

Hotspots of the outbreak:
 Ann. precipitation < 600 mm

Deficit since 2015



powered by ZAMG data + cyLEDGE skills

Bezirk Zwettl, 18.7.2019

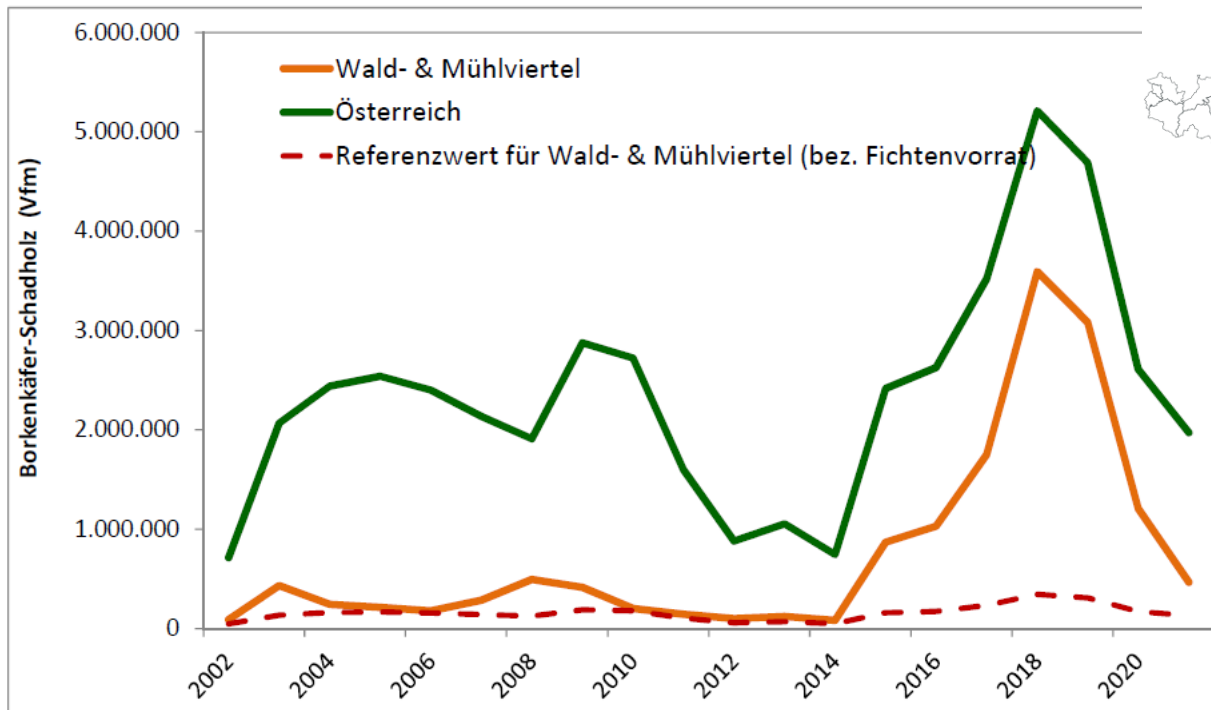


Photo: Hoch, BFW



Logistic problems in years with extreme amount of damaged wood...

Good timber market in 2021 helped to get infested wood out of the forest



Damage by bark beetles (total) (Documentation of forest damaging factors, **DWF**): Wald- und Mühlviertel (i.e., **northern Austria**) in comparison to **Austria total** (Referenzwert = expected value based on spruce stock).

Just when you think it's over....

A new outbreak in mountaneus areas in Southern Austria



**"Classical" population dynamics
following storm/snow, unusual
intensity**

20.8.2021

Photo: Hoch, BFW

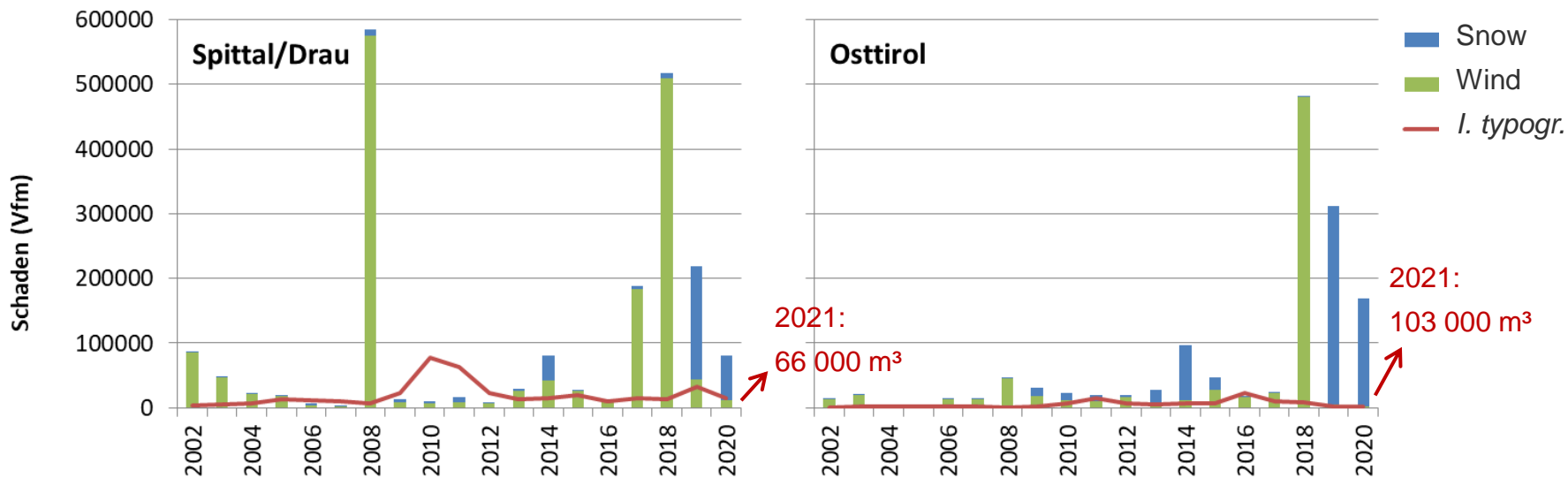


19.8.2021

Photo: Hoch, BFW

Storm Vaia in fall 2018

Extreme snowfall in winters 2019/20 and 2020/21

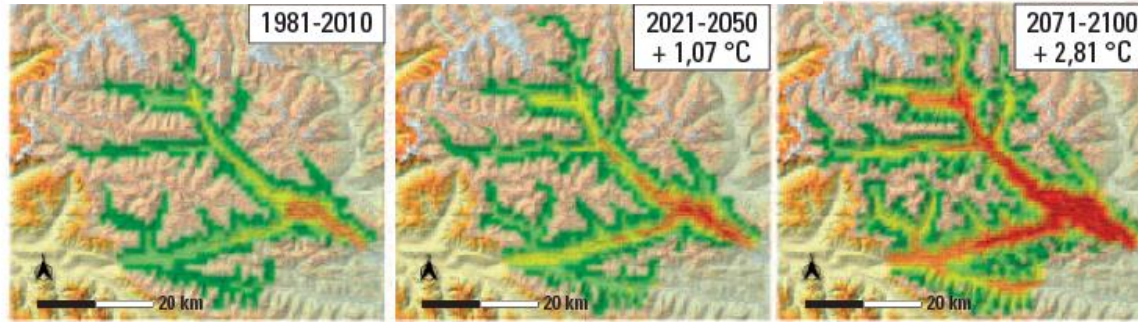


Annual damage by snow (blue), storm (green) and spruce bark beetle (red) in two districts in southern Austria

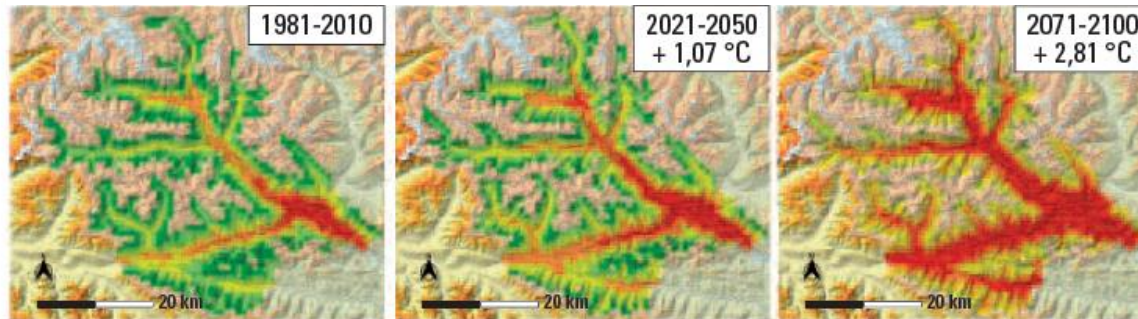
(Data: Documentation of Forest Damaging Factors)



Potential development in forest stands



Potential development in open areas and exposed edges



Potential development of *I. typographus* in East Tyrol under different climate scenarios (model PHENIPS)

(Schopf & Hoch 2019, modified after Schopf et al. 2016)

Annual mean temperatures

Meteo station
Lienz

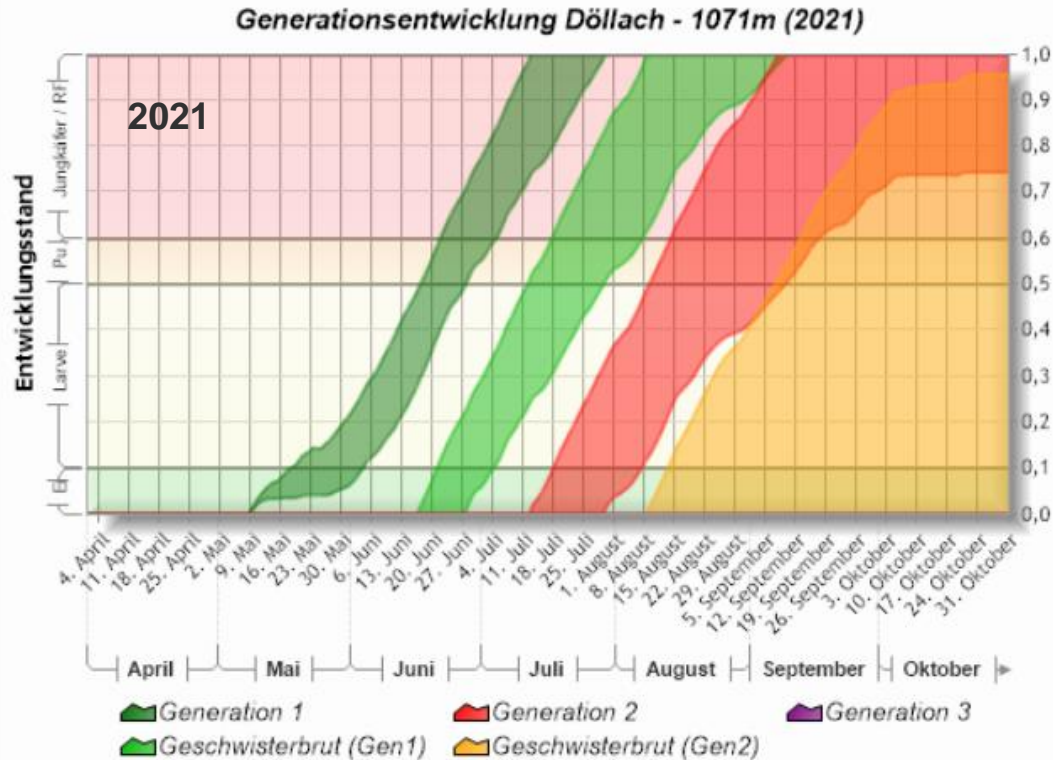
2019: 10.1 °C

2020: 9.6 °C

2021: 8.4 °C

1981-2010: 8.3 °C

www.zamg.ac.at



Two generations developed also at high elevation

→ faster increase of population densities

Development of *Ips typographus* (Modell PHENIPS, BOKU University) at climate station Döllach (Bez. Spittal/Drau, elevation: 1071 m)

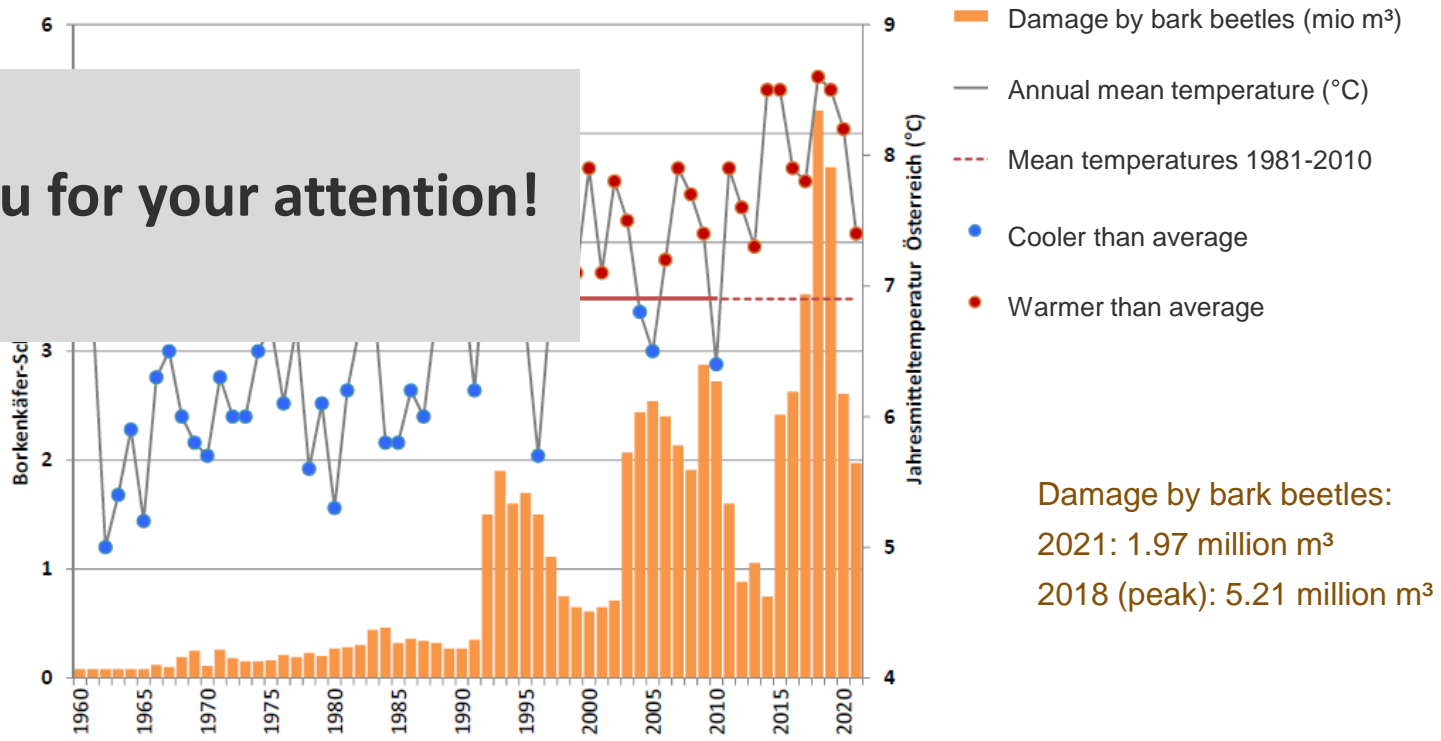


Conclusions



- Total numbers suggest a relief in the bark beetle situation in Austria with a decline of the outbreak in the north of the country.
- Development in the Alps and particularly in the south indicate that levels of damage will remain high.
- Extreme lack of precipitation in the first months of 2022 in all regions in Austria brought a challenging start of the growing season.
- Overall, increasing bark beetle damage is expected considering climate change.

Thank you for your attention!



Damage by bark beetles:
 2021: 1.97 million m³
 2018 (peak): 5.21 million m³

Increasing **annual damage by bark beetles in Austria** and increasing **mean annual temperature**

(updated from Hoch & Steyrer 2020: CCCA Fact Sheet #31)