

ICE STORM CALAMITY OF LATE FEBRUARY 2014, AND STORM "VAIA" IN OCTOBER 2018

TWO CLIMATIC EVENTS THAT INCITED THE MOST SEVERE SPRUCE BARK BEETLE
OUTBREAK IN THE LONG HISTORY OF ORGANIZED FORESTRY **IN CROATIA**

Boris Hrašovec*, Milivoj Franjević*, Željko Kauzlarić**, Darko Pleskalt**
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* University of Zagreb, Faculty of Forestry and Wood Technology

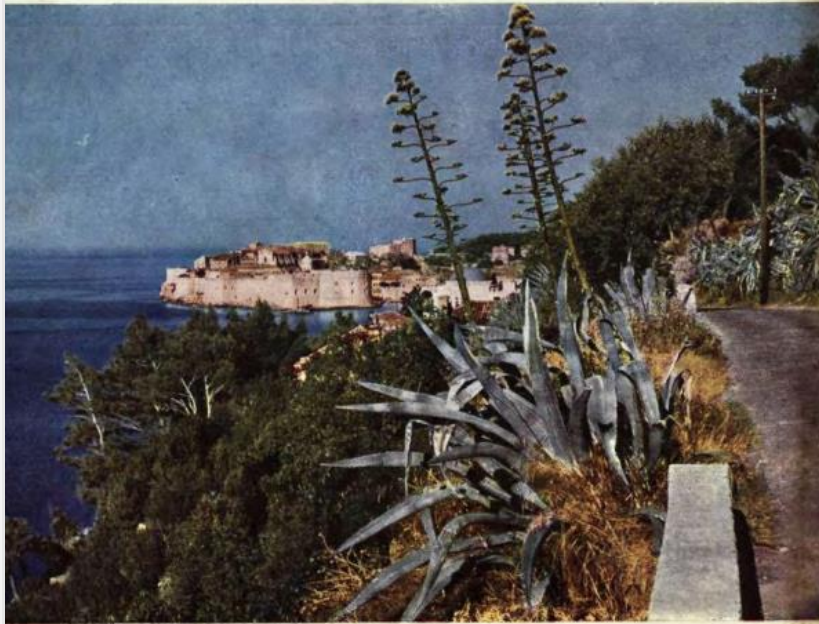
** „Hrvatske šume” LLC („Croatian Forests”, a state owned forestry company)



Forests' future 2021
Consequences of Bark Beetle Calamity for the Future of Forestry in Central Europe
Two day on-line meeting march 23rd – 24th 2021

One „worthy” historical record of *Ips typographus* outbreak in Croatia (Journal of Forestry – Šumarski list)

1-12 JUBILARNI BROJ O DESET-
GODIŠNJICI OSLOBOĐENJA
1955 MCMXLV·MCMLV



Published continuously since 1877 !!

ŠUMARSKI LIST

Starting with windstorms and forest fires around 1940, **an area of 600 ha** (1950-1955) is mentioned as bark beetle „consumed” in the mountainous North Velebit area (today’s North Velebit National Park)

Smrča

Šume smrče nalaze se kod nas uglavnom u Gorskom Kotaru i Velebitu. I za ove šume može se reći da su povoljnog zdravstvenog stanja, naročito u Gorskom Kotaru, osim meni jednog poznatog slučaja masovnog sušenja



Sl. 8. Orkanom poharana sastojina smreke, Lomska duliba, šumarija Krasno. Snimljeno 1955. g. t. j. oko 18 god. nakon nastanka štete. Windbruch im Fichtenbestand. (Aufgenommen 18 Jahre nach der Verheerung).

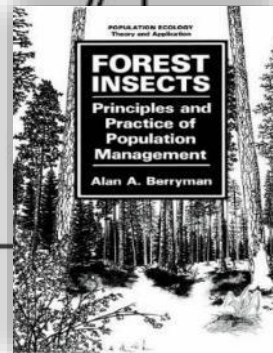
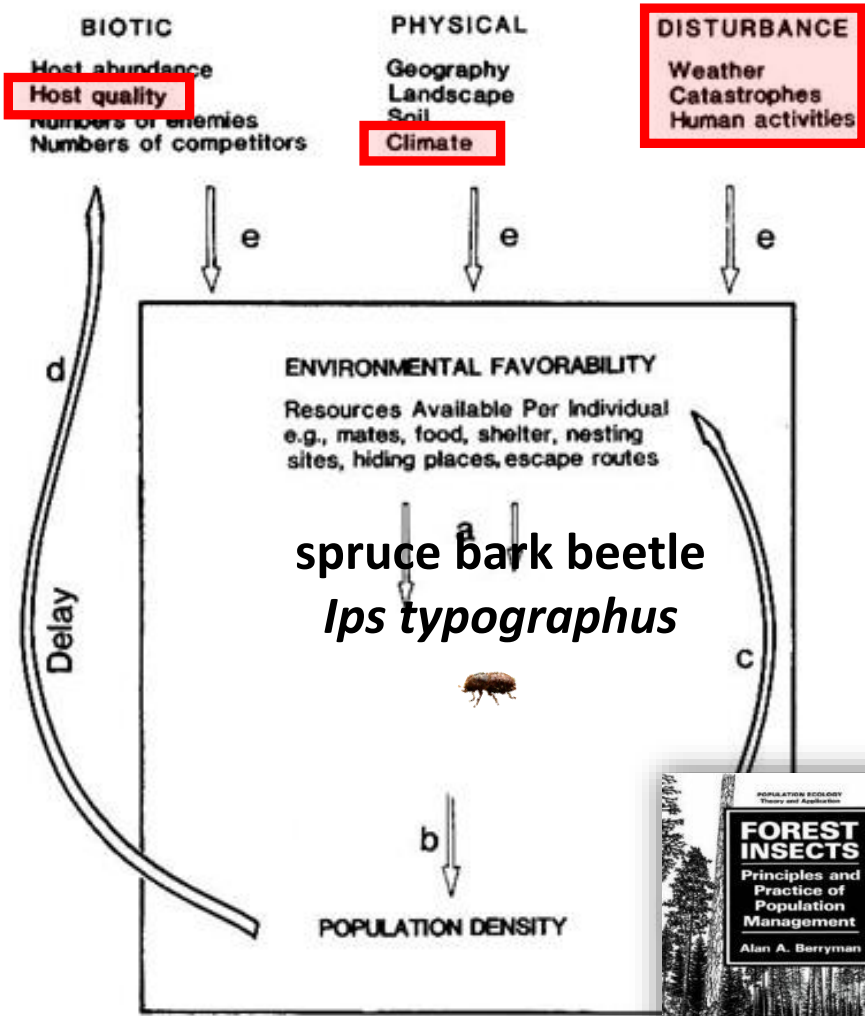
Lomskoj Dulibi postoji upravo katastrofalno sušenje smrče zbog napadaja potkornjaka. Uslove za masovni razvoj potkornjaka stvorili su požari i orkani, koji su se tu desili unatrag petnaestak godina. Stalnim vadenjem sušaca, sve nova i nova stabla dopijevaju u izloženi položaj pa oluja i snijeg skoro svake godine izvaljuju stotine pa i hiljade novih stabala. Zbog doskorašnjeg nedostatka izvazne ceste prelomljeni i izvaljeni materijal ostajao

Climate and bark beetles



Brussels, 16 June 2017

BASIC ENVIRONMENT



SUMMARY RECORD

Meeting of the Standing Forestry Committee

15 June 2017

Chairman: Mauro Poinelli (HoU D.4)

Delegations present: All Member States were present or represented, except DK, EL, LU, MT, NL and RO.

1. WELCOME AND INTRODUCTION

The chairman welcomed the participants, informed about interpretation and introduced the items to be discussed.

2. ADOPTION OF THE AGENDA

The draft agenda was adopted.

3. BIO-ECONOMY STRATEGY AND CONTRIBUTION FROM THE FOREST-BASED SECTOR

DG RTD presented the EU's bio-economy strategy review, followed by a discussion centred on two open questions for debate.

4. FACILITATE ACCESS TO FUNDING FOR INNOVATION AND ADAPTATION TO CHANGE (HORIZON 2020)

DG RTD presented the funding possibilities for innovation and adaptation to change in the forest-based sector, followed by a discussion.

5. ADAPTATION TO CLIMATE CHANGE IN FORESTRY

The Committee heard presentations on Adaptation to climate change in forests, and on the EU Adaptation Strategy & Forestry given by respectively a representative from the European Environment Agency (EEA) and DG CLIMA. The presentations were followed by a discussion.

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BASIC ENVIRONMENT

BIOTIC

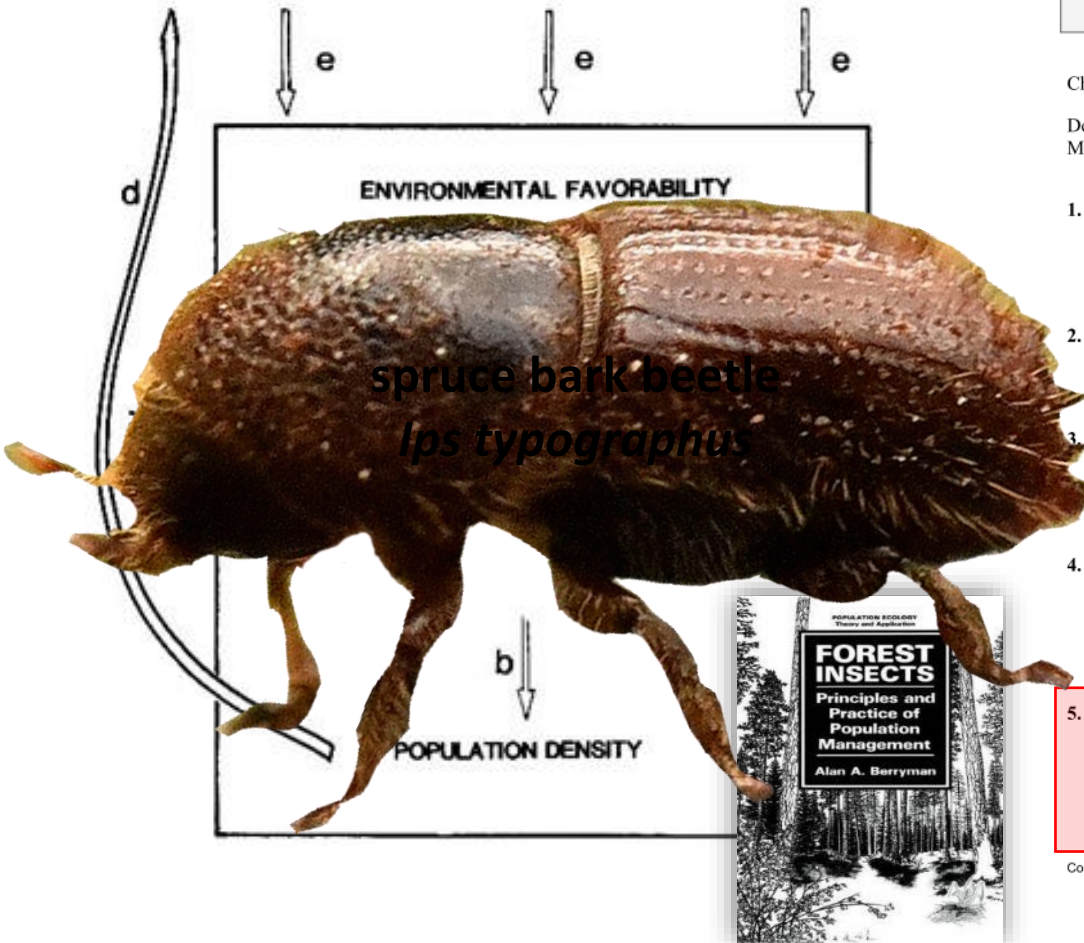
Host abundance
Host quality
 Numbers of enemies
 Numbers of competitors

PHYSICAL

Geography
 Landscape
 Soil
Climate

DISTURBANCE

Weather
 Catastrophes
 Human activities



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„Scale aspect”...

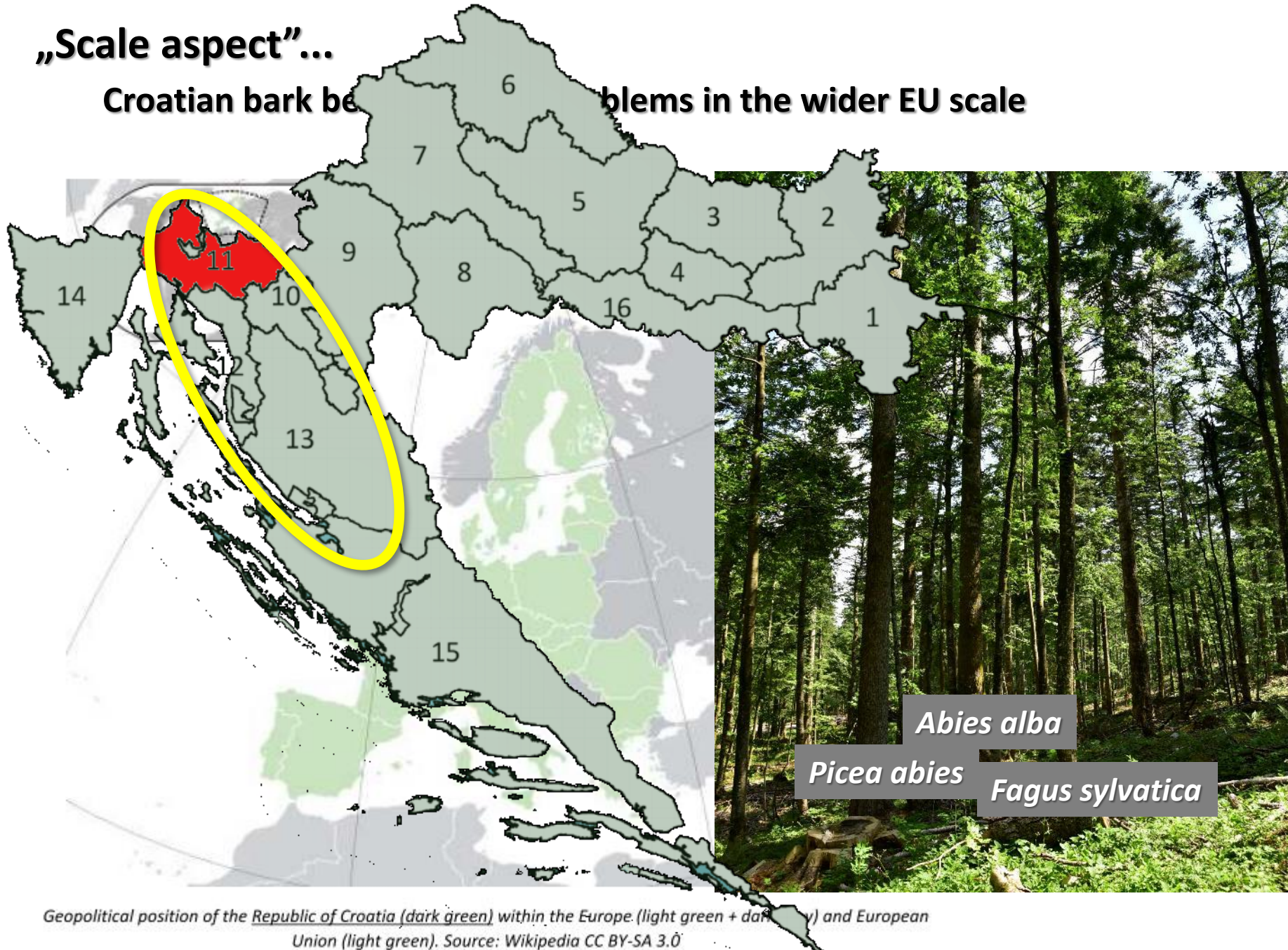
Croatian bark beetle related problems in the wider EU scale



Geopolitical position of the Republic of Croatia (dark green) within the Europe (light green + dark grey) and European Union (light green). Source: Wikipedia CC BY-SA 3.0

„Scale aspect”...

Croatian bark beetles in the wider EU scale



Geopolitical position of the Republic of Croatia (dark green) within the Europe (light green + dark green) and European Union (light green). Source: Wikipedia CC BY-SA 3.0

Ice storm in February 2014



Ice storm, NW Croatia, January 31th - February 6th 2014



TABLE 1. Forest area affected by natural hazards (FA Delnice, FA Senj, FA Ogulin)

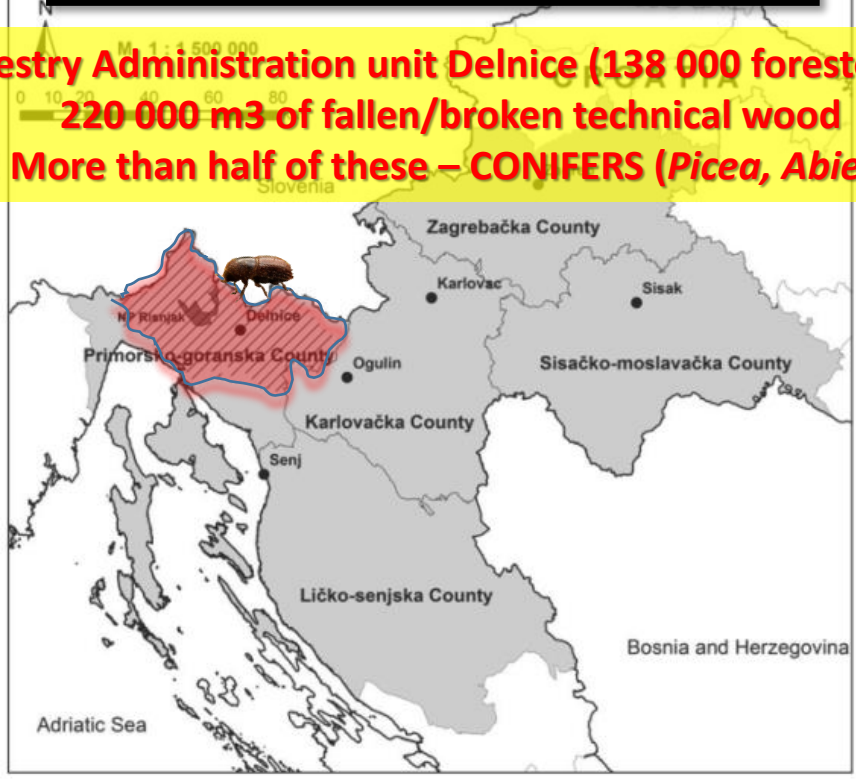
Ownership	Overall affected area (ha)	Damaged forest stands (ha)	Destroyed forest stands (ha)
State-owned	45 821.90	9 522.36	7 377.36
Privately-owned	10 199.78	9 723.43	2 430.86
Total	56 021.68	19 245.79	9 808.22

TABLE 2. Loss of values of damaged and destroyed forests (FA Delnice, FA Senj, FA Ogulin)

1A. Loss of reduced values of damaged wood volume				
Ownership	Area (ha)	Technical wood	Fuel wood	Total
				Damaged wood volume (m ³)
State-owned	45 821.90	2 170 686	1 241 299	3 411 985
Privately-owned	10 199.78	325 471	535 026	860 497
Total	56 021.68	2 496 157	1 776 325	4 272 482
Destroyed wood volume (m ³)				
Ownership	Area (ha)	Technical wood	Fuel wood	Total
State-owned	7 169.74	743 615	419 522	1 163 137
Privately-owned	2 430.86	180 956	300 853	481 809
Total	9 600.59	924 570	720 376	1 644 946
Total loss (€)				
State-owned	45 821.90	1 827 580	827 164	2 250 053
Privately-owned	10 199.78	144 515	234 173	378 688
Total	56 021.68	1 972 095	1 061 337	2 628 741
Total loss (€)				26 287 409
1B. Loss of value of destroyed wood volume				
Ownership	Area (ha)	Destroyed (technical and fuel) wood volume		
		(m ³)	(€)	
State-owned	2 160.26	1 163 137	31 923 551	
Privately-owned	9 723.43	481 809	9 317 539	
Total	11 883.69	1 644 946	41 241 089	

**Forestry Administration unit Delnice (138 000 forested ha)
220 000 m³ of fallen/broken technical wood
! More than half of these – CONIFERS (*Picea*, *Abies*) !**

**56 000 ha affected area in total
cca 10 000 ha of destroyed stands
425 000 m³ of fallen/broken technical wood**



Ice storm, NW Croatia, January 31th - February 6th 2014



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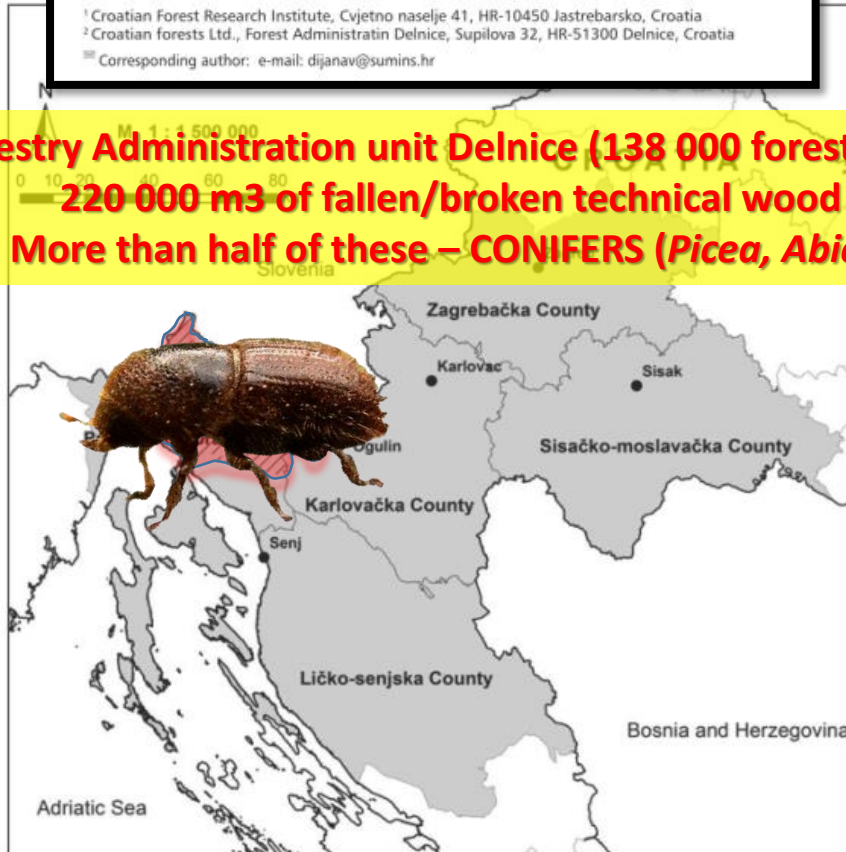


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STORM „VAIA”

October 29, 2018

Passo Vezena, Veneto, Italy
Drone footage by Massimo Martello, Italy

Dimensione dei danni causati dalla tempesta "Vaia"

Regione	Danni (in m ³)	Note
Veneto	11.000.000	15 mln. m ³ secondo FederlegnoArredo (sono state rilevazioni per Alto Adige e Veneto)
Alto Adige	1.500.000	ufficiale: 1 mln. m ³
Trentino	1.500.000	prima rilevazione ufficiale
Friuli	1.000.000	non ci sono dati ufficiali
Carinzia	1.000.000	confermato 1 mln. m ³ , rilevazione precisa durante questa settimana
Tirolo orientale	350.000	ufficiale
Slovenia	250.000	confermate "centinaia di migliaia" di metri cubi
Svizzera	200.000	non ci sono dati ufficiali
Stiria	250.000	prima rilevazione ufficiale
Totale	17.050.000	

EUROPA

Circa 17 milioni di m³ a terra

Un articolo di [Martina Nöstler](#) (tradotto da [Eva Guzely](#)) |
07.11.2018 - 10:45

Dalle prime rilevazioni in Italia, Austria, Slovenia e Svizzera emerge che "Vaia" ha danneggiato 17 mln. m³ di alberi, piazzandosi al decimo posto per la quantità di legno danneggiato da tempeste negli scorsi trent'anni.

Damaged wood | 2017/2018

Beetle-infested wood and windthrow in 1000 sm³

Country	2017			2018		
	Beetle-infested wood	Windthrow	Damaged timber	Beetle-infested wood	Windthrow	Damaged timber
Germany	6,000	4,650	10,650	10,000	17,000	27,000
	2018 Sturm "Friederike" caused 17 m. sm ³ ; 10 m. sm ³ beetle-infested wood estimation					
Austria	3,500	3,000	6,500	3,500	1,300	4,800
	Conservative assumption: beetle-infested wood this year like 2017; Logging +7% com wood (Carinthia 1 m. sm ³) plus thunderstorms (300,000 sm ³)					
Switzerland	320	50	370	400	1,300	1,700
	Beetles 2018: upward tendency, but no explosion					
Czech Republic	2,500	7,500	10,000	17,500	550	18,050
	March storm; beetle-infested wood 15 to 20 m. sm ³					
Total	12,320	15,200	27,520	31,400	20,150	51,550
	+90 % 2017 auf 2018					

* Logging: Germany 2017 Destatis; Austria: assumption +7%; Switzerland 2017 logging statistics; Czech 5.6 m. sm³



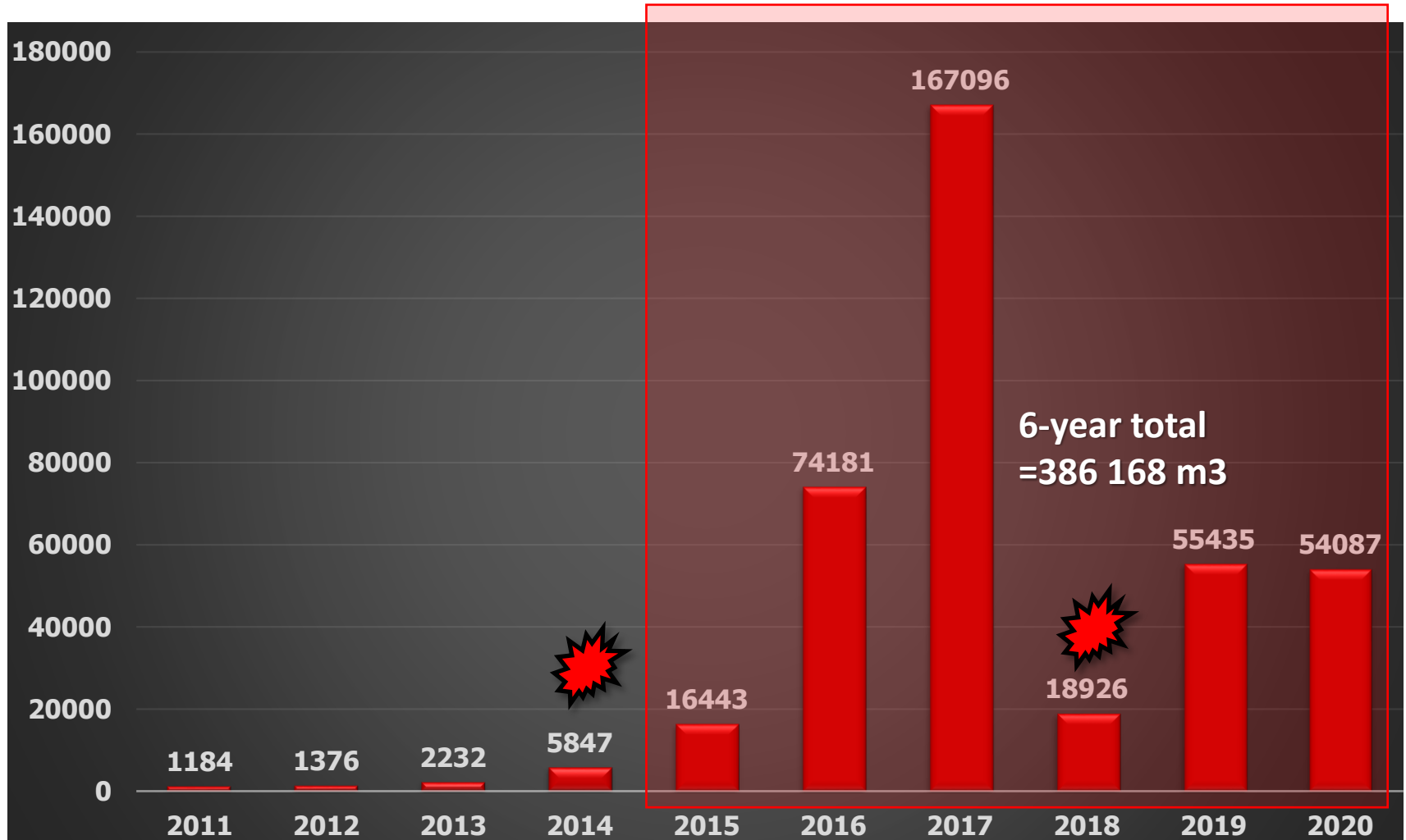
April 2018, one of the areas affected by wind storms that affected the NW part of the country (among which „Vaia” was one of them). Footage is meant to illustrate how the stands where *P. abies*, *A. alba* and *F. sylvatica* grows. Regeneration is practically guaranteed



Salvage cutting of bark beetle attacked spruce trees in 2011-2020

Delnice Forestry Administration Unit

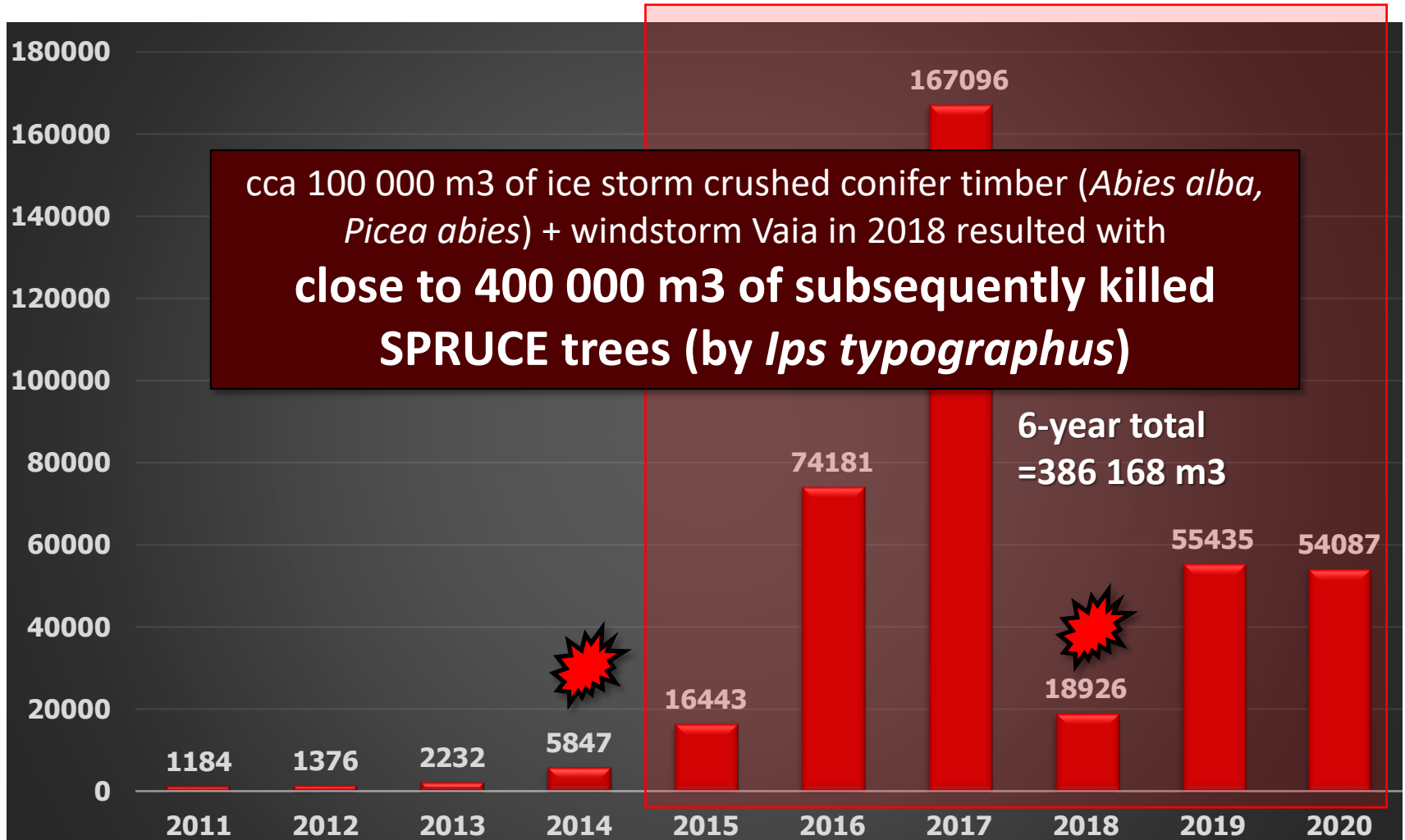
spruce bark beetle attacked and harvested trees (technical timber) in m3



Salvage cutting of bark beetle attacked spruce trees in 2011-2020

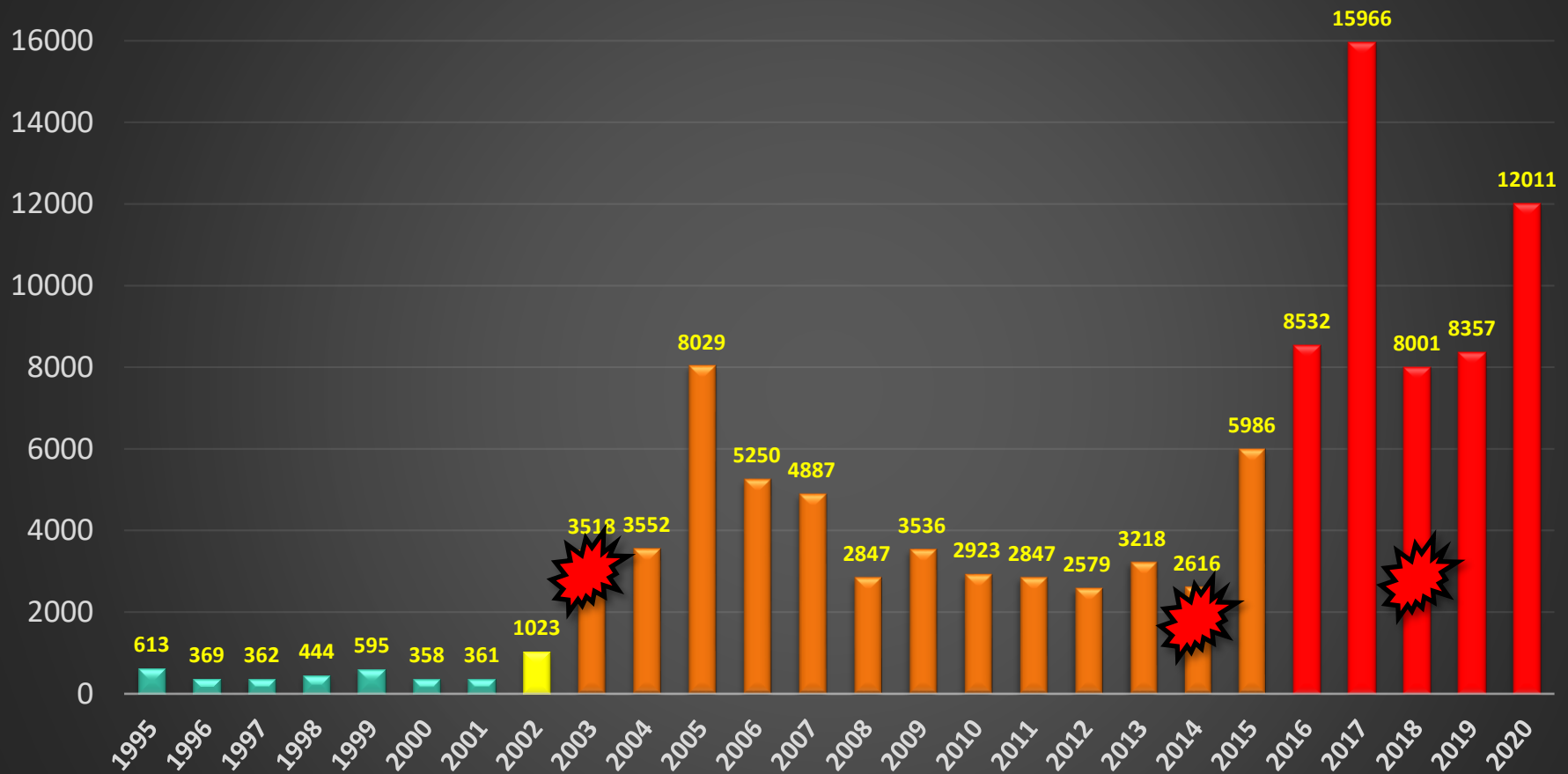
Delnice Forestry Administration Unit

spruce bark beetle attacked and harvested trees (technical timber) in m3



Spruce bark beetle (*Ips typographus*)

26-year pheromone monitoring within the Delnice Forestry Administration Unit
41 fixed plots, same traps and lures
(yearly catches per single trap)



SMREKOV PISAR – RAZVOJNI STADIJI

Slika 1: Jaje (1-2) – jajnja kuglica, 0,3-0,4 mm, bijela, s tamnim prugama. Razvijaju se u jajnja kuglica, 0,3-0,4 mm, bijela, s tamnim prugama. Razvijaju se u jajnja kuglica, 0,3-0,4 mm, bijela, s tamnim prugama.

Slika 2: Larve prvog razvojnog stadija – male, bijele, s tamnim prugama. Razvijaju se u larve prvog razvojnog stadija, male, bijele, s tamnim prugama.

Slika 3: Larve drugog razvojnog stadija – veće, bijele, s tamnim prugama. Razvijaju se u larve drugog razvojnog stadija, veće, bijele, s tamnim prugama.

Slika 4: Larve trećeg razvojnog stadija – još veće, bijele, s tamnim prugama. Razvijaju se u larve trećeg razvojnog stadija, još veće, bijele, s tamnim prugama.

Slika 5: Larve četvrtog razvojnog stadija – najveće, bijele, s tamnim prugama. Razvijaju se u larve četvrtog razvojnog stadija, najveće, bijele, s tamnim prugama.

Slika 6: Pupa – bijela, s tamnim prugama. Razvijaju se u pupu, bijela, s tamnim prugama.

Slika 7: Imago – odrasla mušica, tamna, s bijelim prugama. Razvijaju se u imago, odrasla mušica, tamna, s bijelim prugama.

RAZVOJNI CIKLUS SMREKOVOG PISARA

Slika 8: Razvojni ciklus smrekovog pisara. Odrasla mušica (imago) polaže jaja na iglicama smreke. Jaja se razvijaju u larve prvog razvojnog stadija, koje se razvijaju u larve drugog, trećeg i četvrtog razvojnog stadija. Nakon četvrtog stadija, larva se pretvara u pupu, koja se razvijaju u odraslu mušicu (imago).

Slika 9: Odrasla mušica (imago) polaže jaja na iglicama smreke. Jaja se razvijaju u larve prvog razvojnog stadija, koje se razvijaju u larve drugog, trećeg i četvrtog razvojnog stadija. Nakon četvrtog stadija, larva se pretvara u pupu, koja se razvijaju u odraslu mušicu (imago).

RANI SIMPTOMI NAPADA NA KORU

Slika 10: Prvi simptomi napada na koru – male, bijele, s tamnim prugama. Razvijaju se u prvi simptomi napada na koru, male, bijele, s tamnim prugama.

Slika 11: Prvi simptomi napada na koru – male, bijele, s tamnim prugama. Razvijaju se u prvi simptomi napada na koru, male, bijele, s tamnim prugama.

Slika 12: Prvi simptomi napada na koru – male, bijele, s tamnim prugama. Razvijaju se u prvi simptomi napada na koru, male, bijele, s tamnim prugama.

KASNI SIMPTOMI NAPADA U KROŠNJI

Slika 13: Kasni simptomi napada u krošnji – male, bijele, s tamnim prugama. Razvijaju se u kasni simptomi napada u krošnji, male, bijele, s tamnim prugama.

Slika 14: Kasni simptomi napada u krošnji – male, bijele, s tamnim prugama. Razvijaju se u kasni simptomi napada u krošnji, male, bijele, s tamnim prugama.

Slika 15: Kasni simptomi napada u krošnji – male, bijele, s tamnim prugama. Razvijaju se u kasni simptomi napada u krošnji, male, bijele, s tamnim prugama.

Autori: tekst i fotografije: Prof. dr. sc. Boris Hraščević, Sveučilište u Zagrebu, Šumarski fakultet, Zavod za zaštitu šuma i lovno gospodarstvo, Svetosimunova cesta 55, 10000 Zagreb, Hrvatska

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ortzi i oblikovanje naslovnice: Sanja Mirmić, mag. ing. silv., Hrvatski šumarski institut, Cvjetno naselje 41, 10450 Jastrebarsko, Hrvatska, smam@sumin.hr

Izdavač: Hrvatski šumarski institut, Cvjetno naselje 41, 10450 Jastrebarsko, Hrvatska

Za izdavača: Dražica Džanja Vučetić

Dva publikacija izdana je sredstvima Ministarstva poljoprivrede koje financira Program radova za izvršavanje prognoze poslova u šumarstvu. Ovdje su navedeni stavovi ne moraju nužno odražavati stavove Ministarstva poljoprivrede. Program Radova za izvršavanje prognoze poslova u šumarstvu provodi se sredstvima Ministarstva poljoprivrede.

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FEROMONSKI MONITORING

Slika 16: Feromonski nadzor – postavljanje zamki. Razvijaju se u feromonski nadzor, postavljanje zamki.

Slika 17: Feromonski nadzor – postavljanje zamki. Razvijaju se u feromonski nadzor, postavljanje zamki.

Slika 18: Feromonski nadzor – postavljanje zamki. Razvijaju se u feromonski nadzor, postavljanje zamki.

MEHANIČKE MJERE SUZBIJANJA

Slika 19: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

Slika 20: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

Slika 21: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

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Slika 22: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

Slika 23: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

Slika 24: Mehaničke mjere suzbijanja – uklanjanje kore. Razvijaju se u mehaničke mjere suzbijanja, uklanjanje kore.

KEMIJSKE I OSTALE MJERE SUZBIJANJA

Slika 25: Kemijske i ostale mjere suzbijanja – primjena insekticida. Razvijaju se u kemijske i ostale mjere suzbijanja, primjena insekticida.

Slika 26: Kemijske i ostale mjere suzbijanja – primjena insekticida. Razvijaju se u kemijske i ostale mjere suzbijanja, primjena insekticida.

Slika 27: Kemijske i ostale mjere suzbijanja – primjena insekticida. Razvijaju se u kemijske i ostale mjere suzbijanja, primjena insekticida.

SMREKOV PISAR

Ips typographus

razvojni ciklus
simptomi napada
monitoring populacije
mjere suzbijanja

prosinac 2016.

MINISTARSTVO POLJOPRIVREDE

Ministry of Agriculture of the Republic of Croatia
Decree on measures to be implemented against the spread and
control of spruce bark beetle
(*Ips typographus*) (November 11th 2016)

NARODNE NOVINE
SLUŽBENI LIST REPUBLIKE HRVATSKE

Naredba o poduzimanju mjera za sprječavanje širenja i suzbijanja štetnog organizma
Ips typographus (L.) – osmerozubi smrekov pisar

MINISTARSTVO POLJOPRIVREDE

2195

Na temelju članka 50. točke 7. Zakona o biljnom zdravstvu (»Narodne novine« br. 75/05 i 55/11), a u svezi s člankom 38. Zakona o šumama (»Narodne novine« br. 140/05, 82/06, 129/08, 80/10, 124/10, 25/12, 18/13 i 94/14) ministar poljoprivrede donosi

NAREDBU

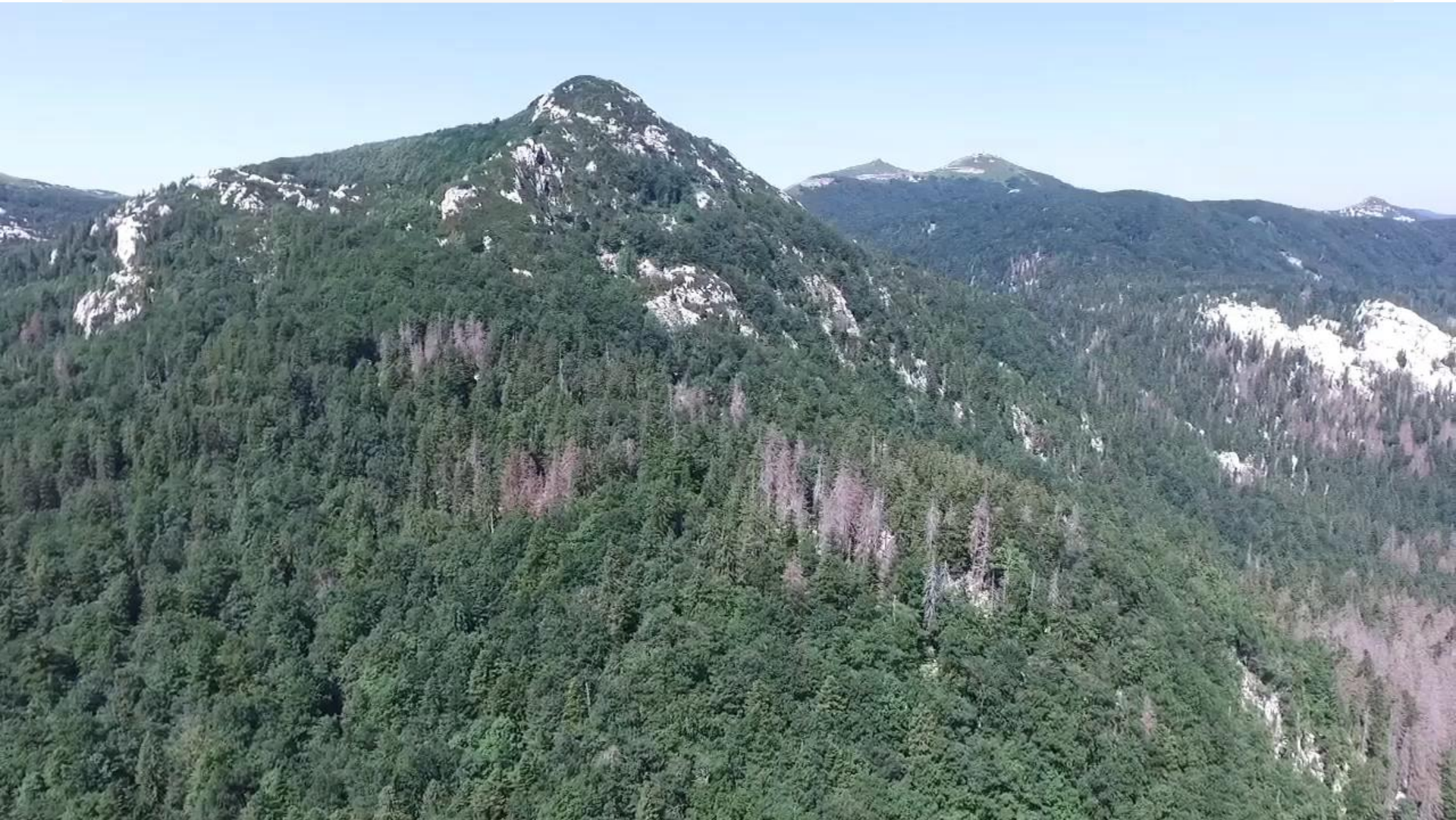
**O PODUZIMANJU MJERA ZA SPRJEČAVANJE ŠIRENJA I SUZBIJANJE ŠTETNOG
ORGANIZMA *Ips typographus* (L.) – osmerozubi smrekov pisar**

I.

Ovom se Naredbom propisuju mjere za sprječavanje širenja i suzbijanja štetnog organizma *Ips typographus* (L.) – osmerozubi smrekov pisar (u daljnjem tekstu: štetni organizam), zaraženo područje, nadležna tijela i sredstva za provedbu mjera.

..

**June 2019, drone footage of the mountainous area affected by *Ips typographus* outbreak (NP Risnjak area with no intervention and nearby managed forest where dead spruces have been removed)
comment: so far the „picture” looks the same – no further spread even in the NP area**



CONCLUDING THOUGHTS ...

- **Climatic extremes** have intensified in Croatia in the past 20-30 years, acting as a **strong triggers** in the already eroded stand conditions where conifers grow (*Picea abies* as well)
- Around the turn of the century (20/21), majority of the formerly applied protective measures in harvesting fresh and bark beetle attacked conifer timber (**timely debarking**, transporting, chemical treatments) **have been abandoned or legally forbidden !**
- At the same time, new „wave” of nature conservation policy resulted in establishment of new protected areas (National parks, Nature parks, Natura 2000, etc...) **in some of the spruce (and other) forests, formerly managed for 250 years through organized forestry in Croatia !**
- Conifer forests in Croatia have been able to „escape” harsh climatic abnormalities for quite a long time, mostly as a result of close to natural stand composition (hence tree’s resilience). It looks like this era is ending, and ending fast. More **dedicated and labour/resource intensive approach is urgently needed** in order to save forestry as an important driver of national/EU economy.