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EPPO

**The emerald ash borer
in the Russian Federation:
30 years of the range expansions**

2003 – the first record of *Agrilus planipennis* in Moscow
(in the USA – 2002).

2007



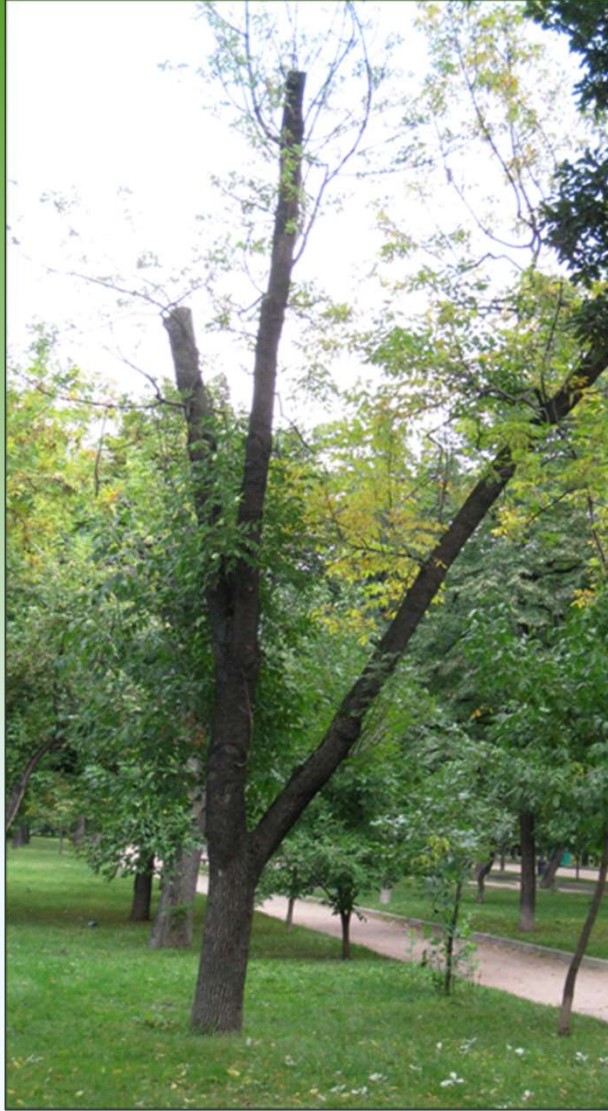
2008



2009



Photo by Y. Baranchikov



Moscow,
Gogol blvd.,
2011

Photo by Y. Baranchikov



ash
(used to be)

oak

**A forest shelter belt
in Voronezh Region, 2018**



Invasive range
in Europe

2005

administrative units



Invasive range in Europe

2013

administrative units

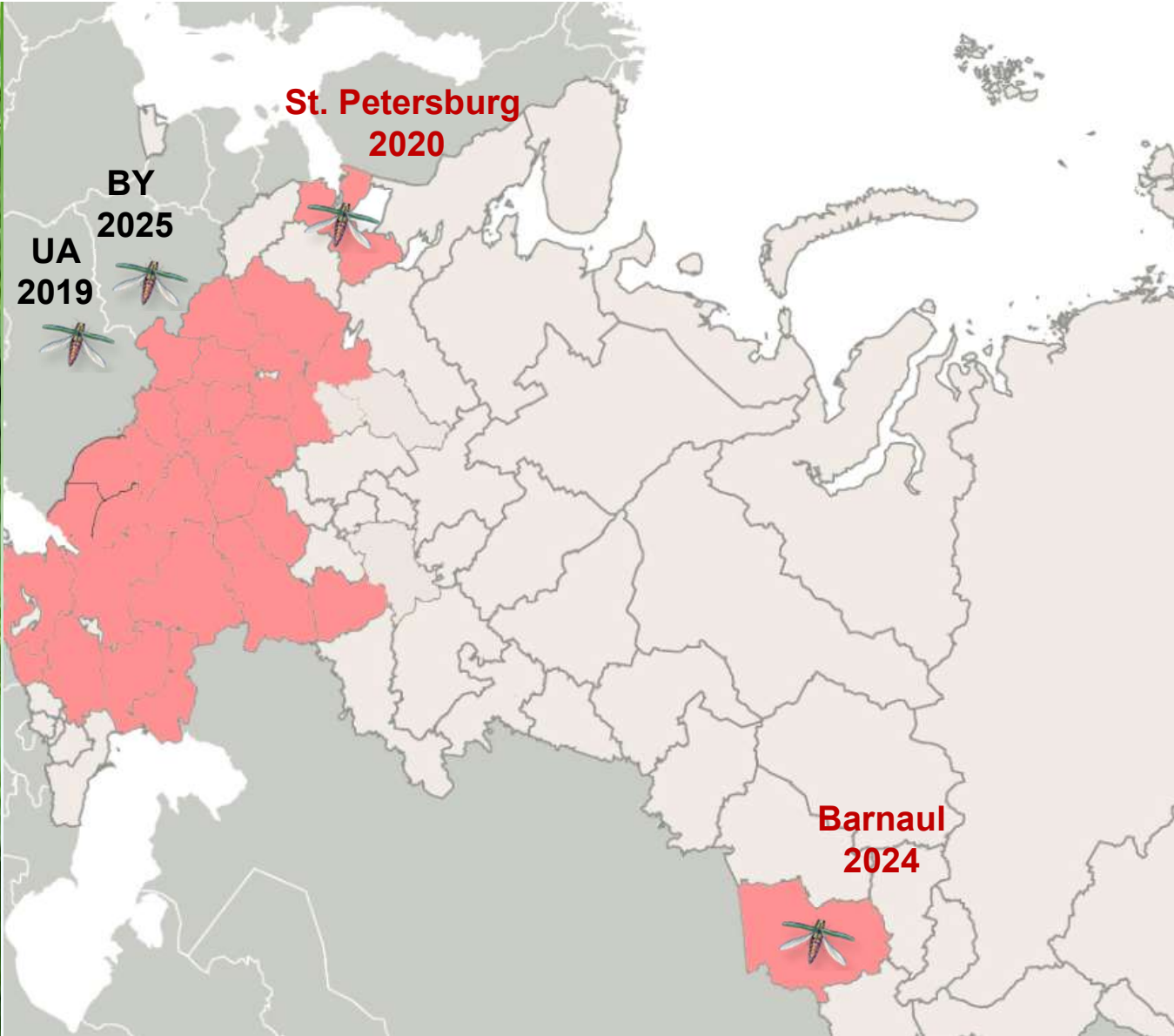


Invasive range
in Europe

2018

administrative units

8



**Invasive range
in Europe**

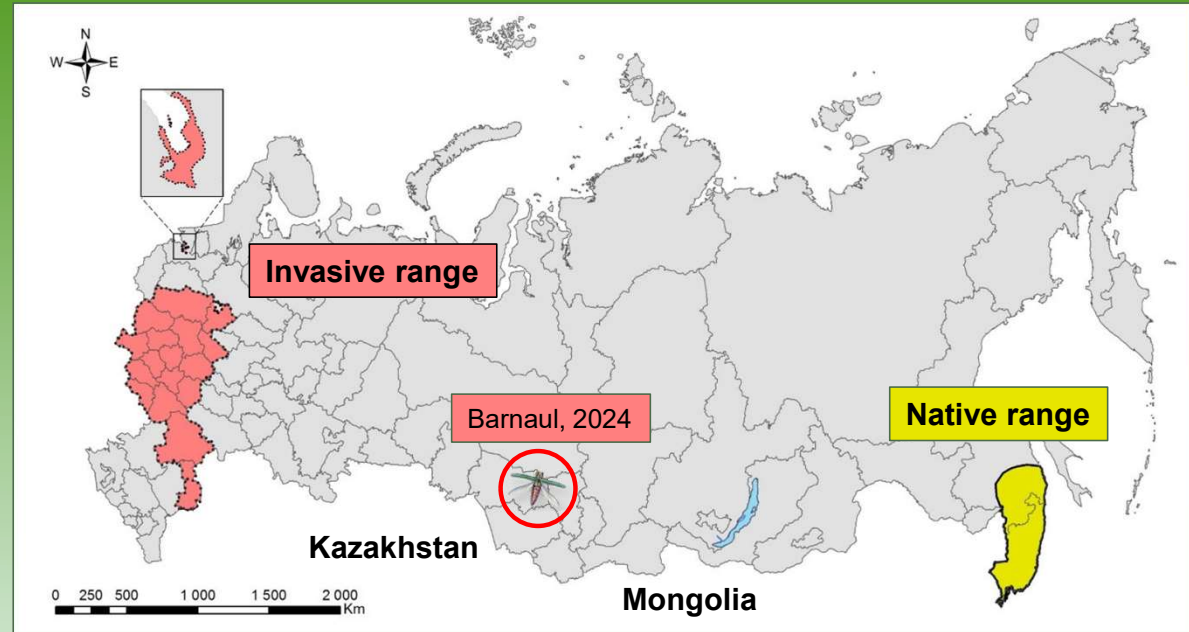
2019+

administrative units

9



In 2024, *A. planipennis* was recorded in Barnaul (Southern Siberia) on *F. pennsylvanica*



(Musolin et al., 2022)



How does the emerald ash borer spread in European Russia?



Not with firewood, plants for planting or logs – ash is rarely transported in these forms.



Natural spread – flight of adults, usually along forest shelter belts.



Long-distance dispersal is facilitated by **hitchhiking on or in transport**, which explains why infestations are concentrated along **railways** and major **roads**.

How to estimate the time of introduction?

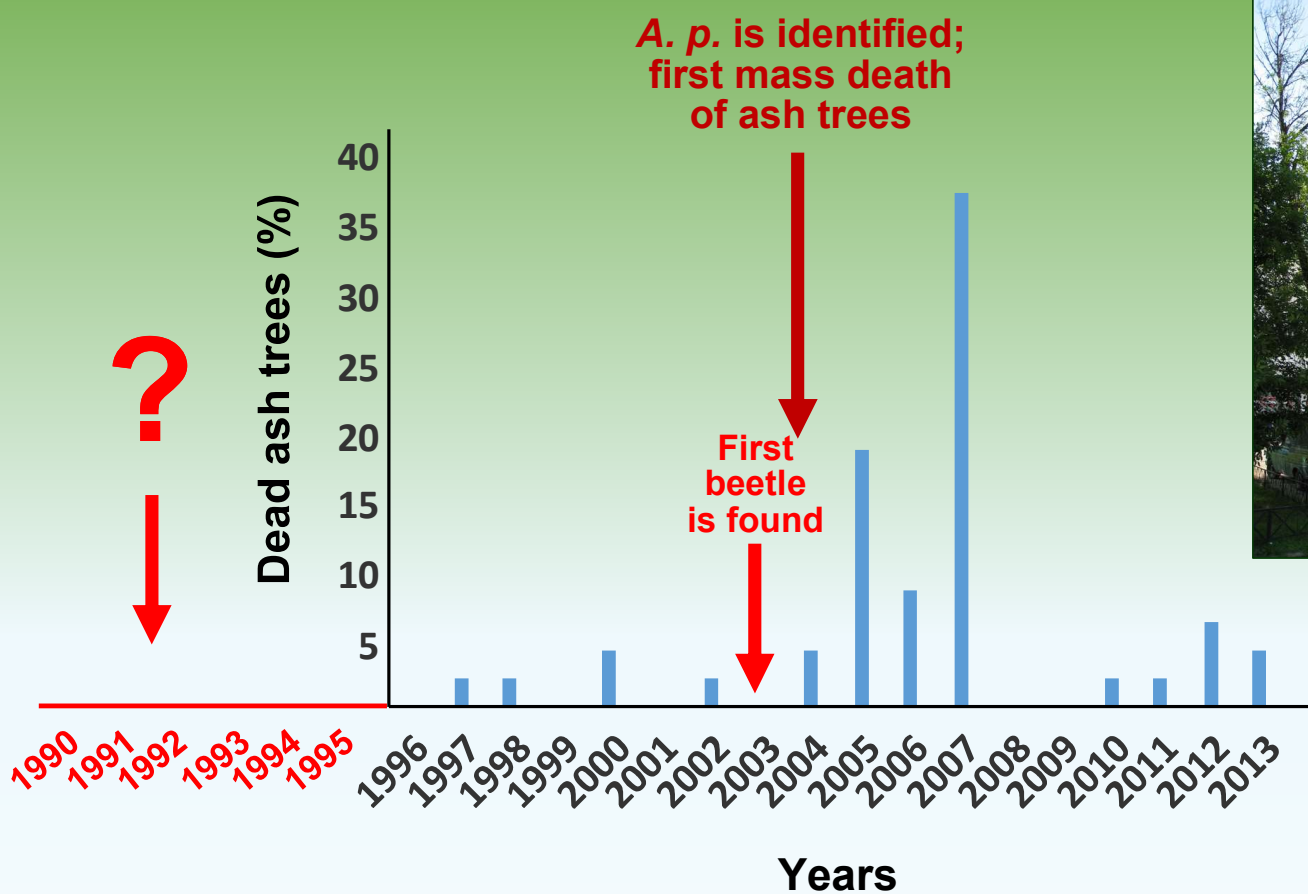
The timing of the invasion is usually based on qualitative accounts reported in the literature and media (2003).

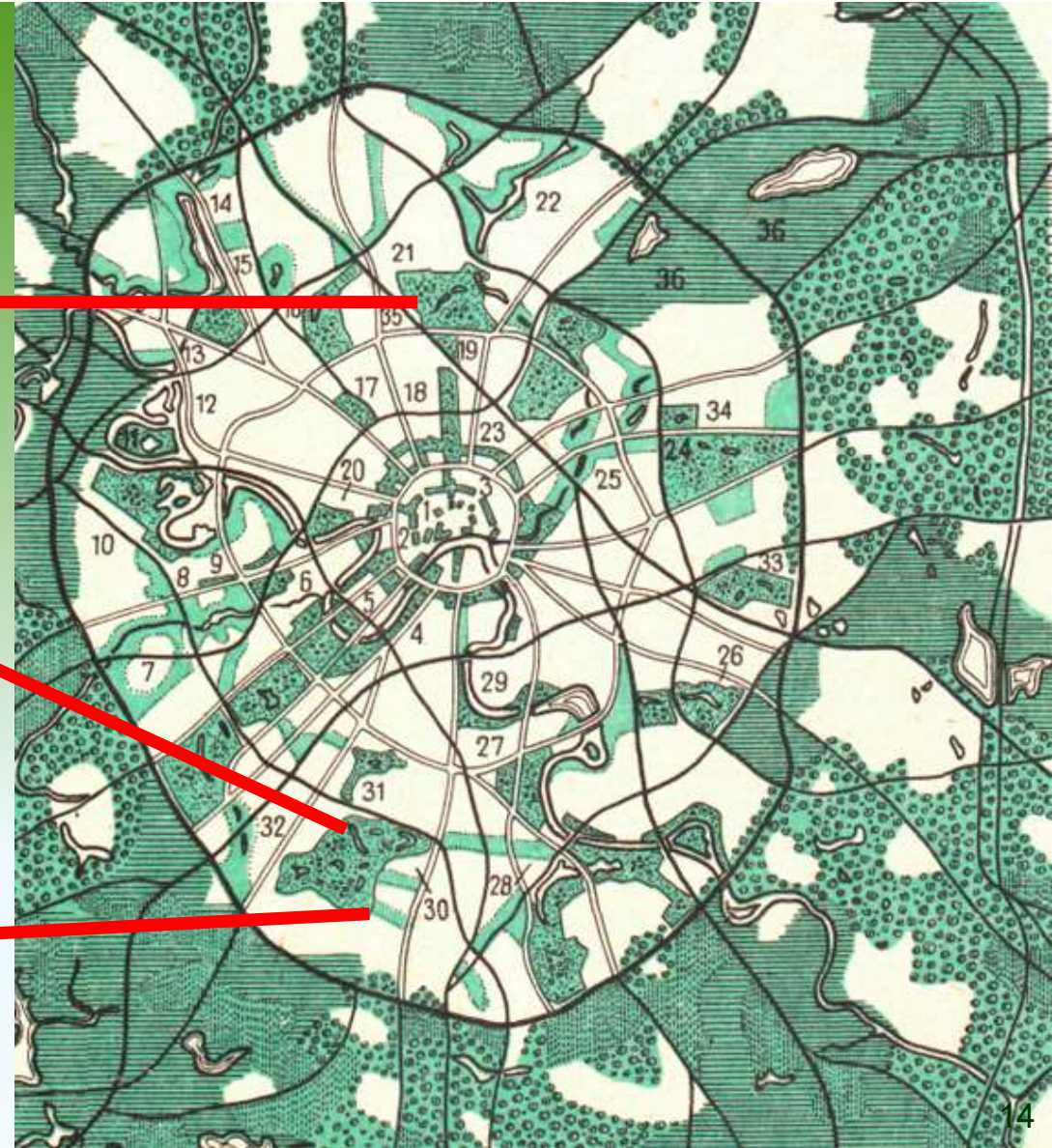
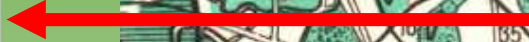
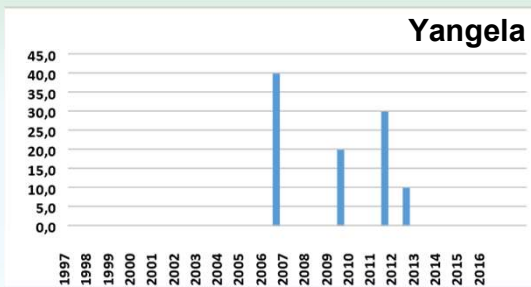
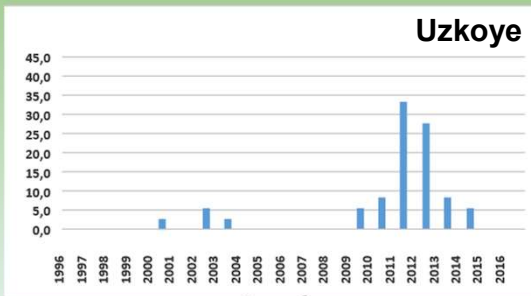
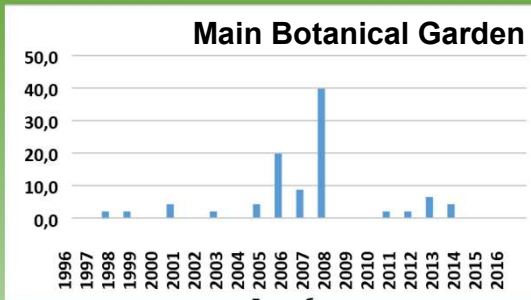
In 2012, a group from Krasnoyarsk started to use a **dendrochronological method**, but most of the ash trees that had died in the city **had already been removed**.

Several large groups of *F. pennsylvanica* killed by *A. planipennis* in Moscow and Vyazma were felled, and **the time of death of each tree** was determined from cross-sections using dendrochronology.



Reconstruction of mortality of *Fraxinus pennsylvanica* induced by *A. planipennis* in Main Botanical Garden (Moscow).

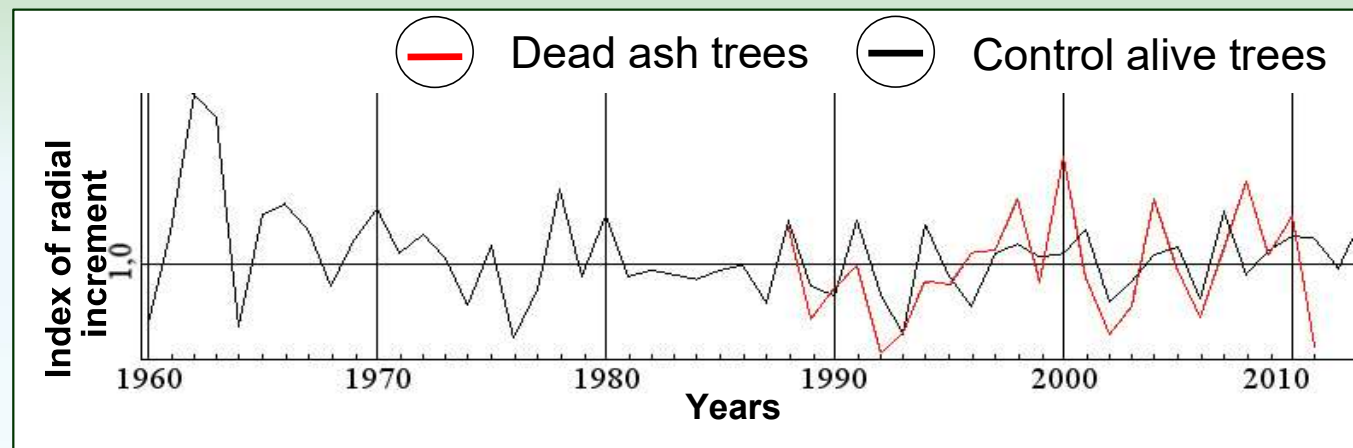
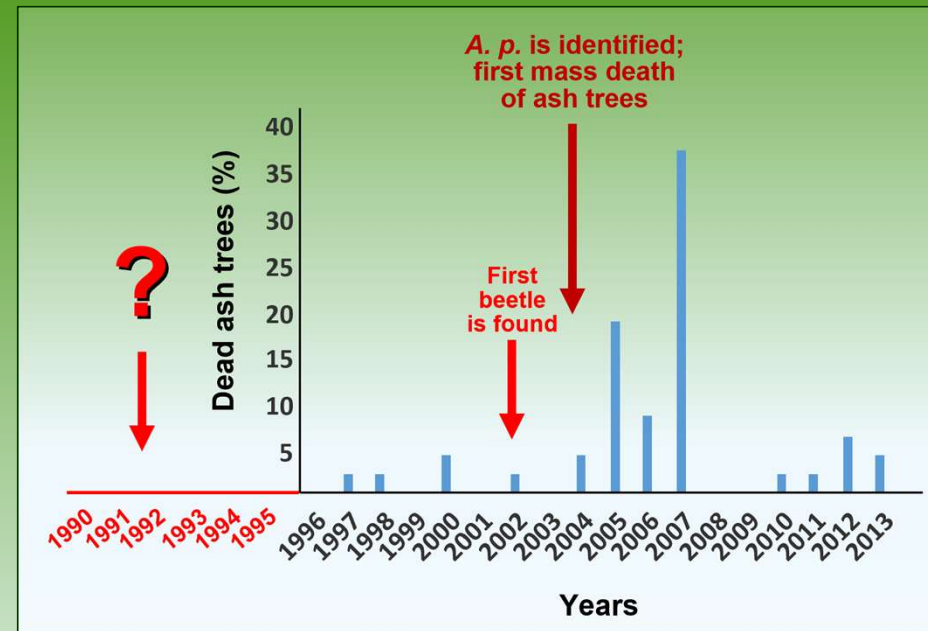






Using **dendrochronological methods**, it was demonstrated that *A. planipennis* arrived in Moscow in the early 1990s.

The rate of spread (e.g. toward the southwest) was about **10–12 km/year**.

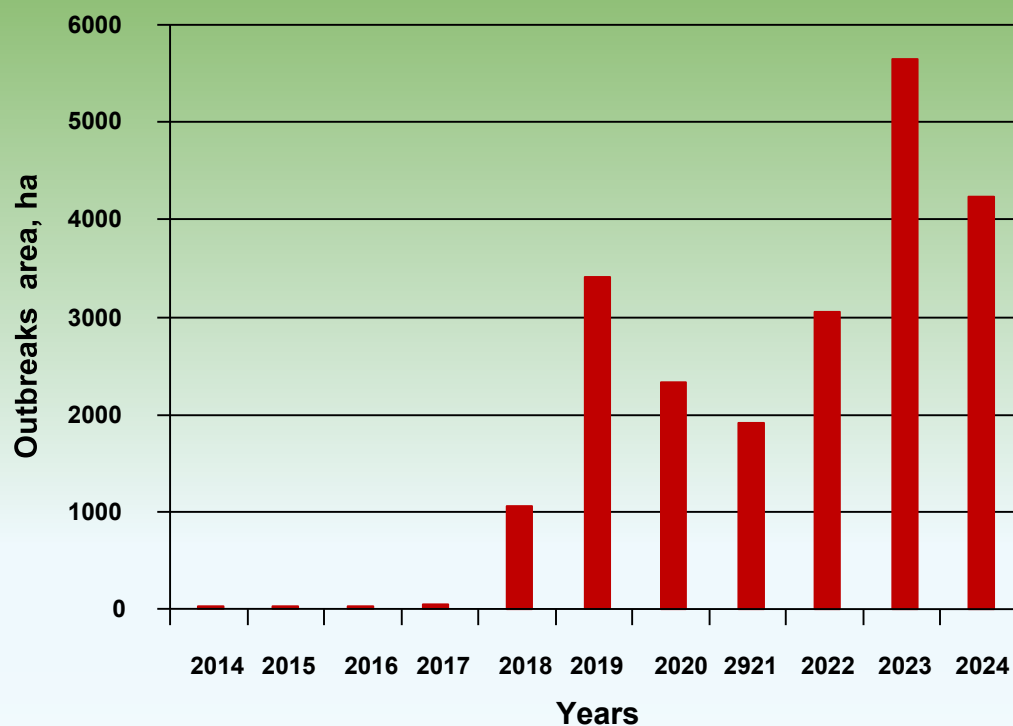


Street views (by Google or Yandex)

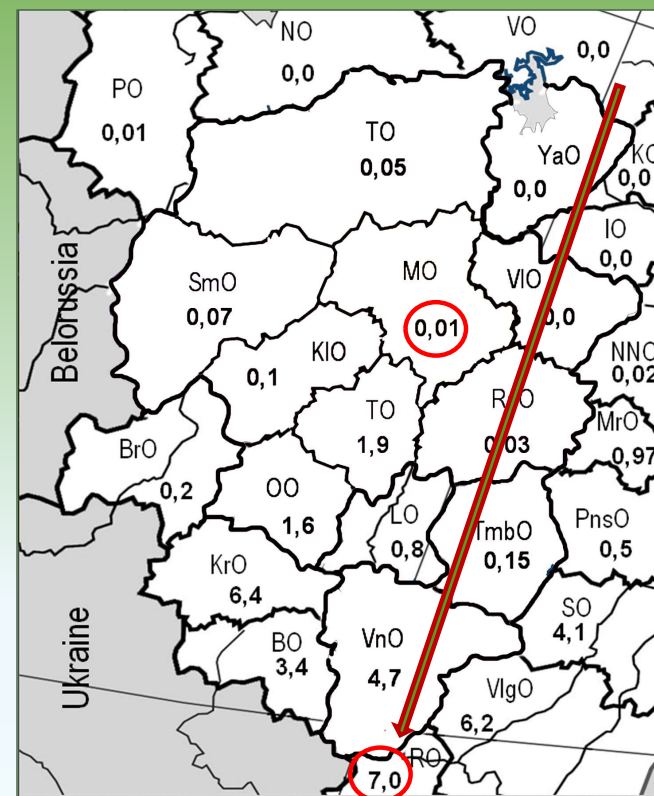




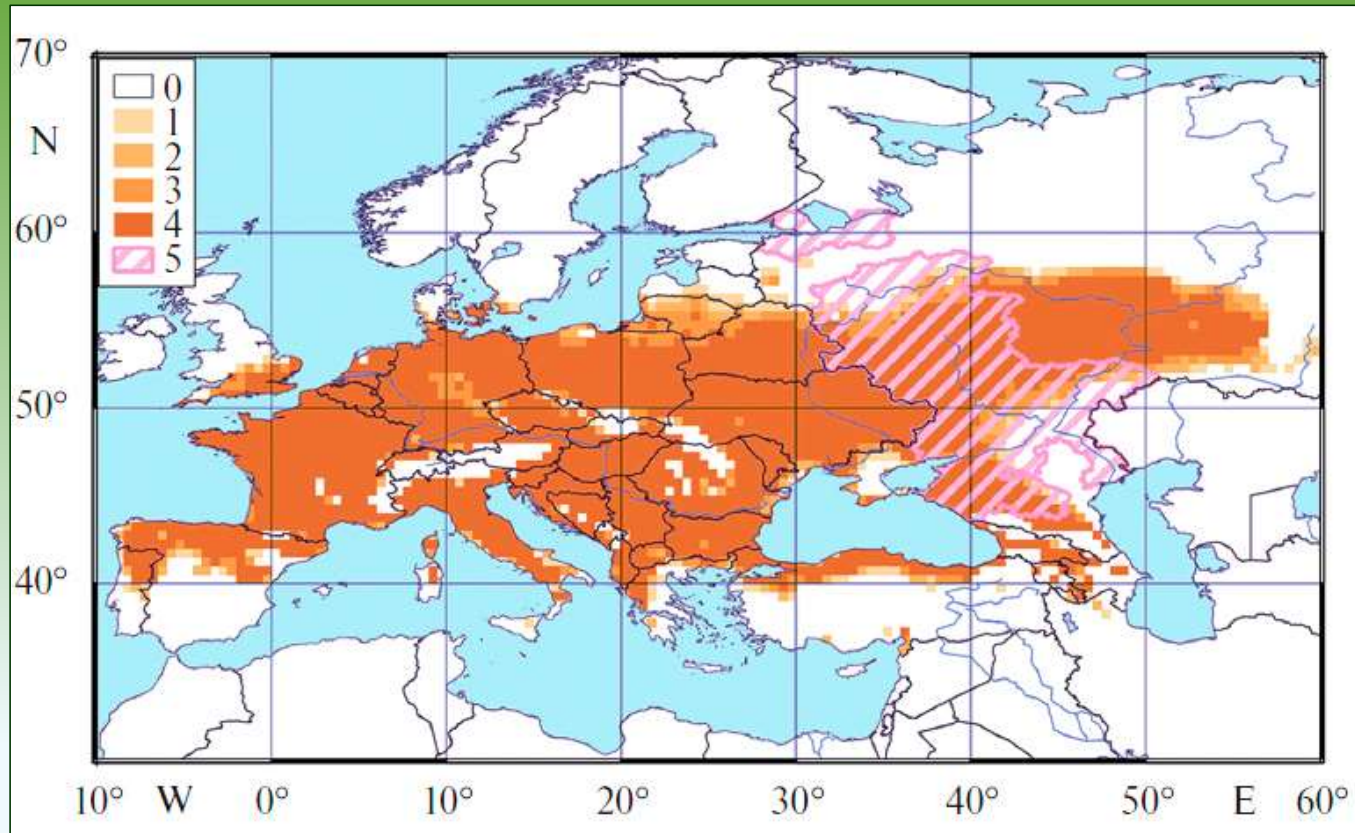
Area of registered outbreaks
of *A. planipennis* in state forests
with *Fraxinus excelsior*



Proportion (%) of ash forest in the
total forest area of administrative
region (State Forest Registry, 2014)



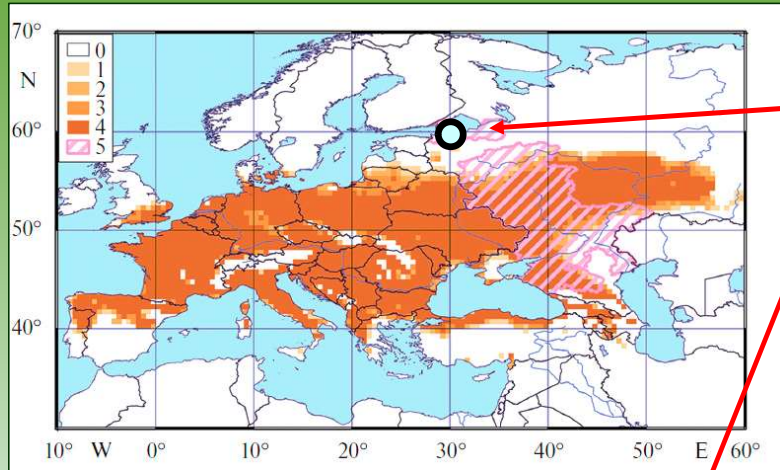
Climatic range of *A. planipennis* in 1990-1999 (recent climate)



Probability of a location falling within the climatic range:
(0) unlikely; (1) about as likely as not; (2) likely; (3) very likely;
(4) virtually certain; (5) current distribution.

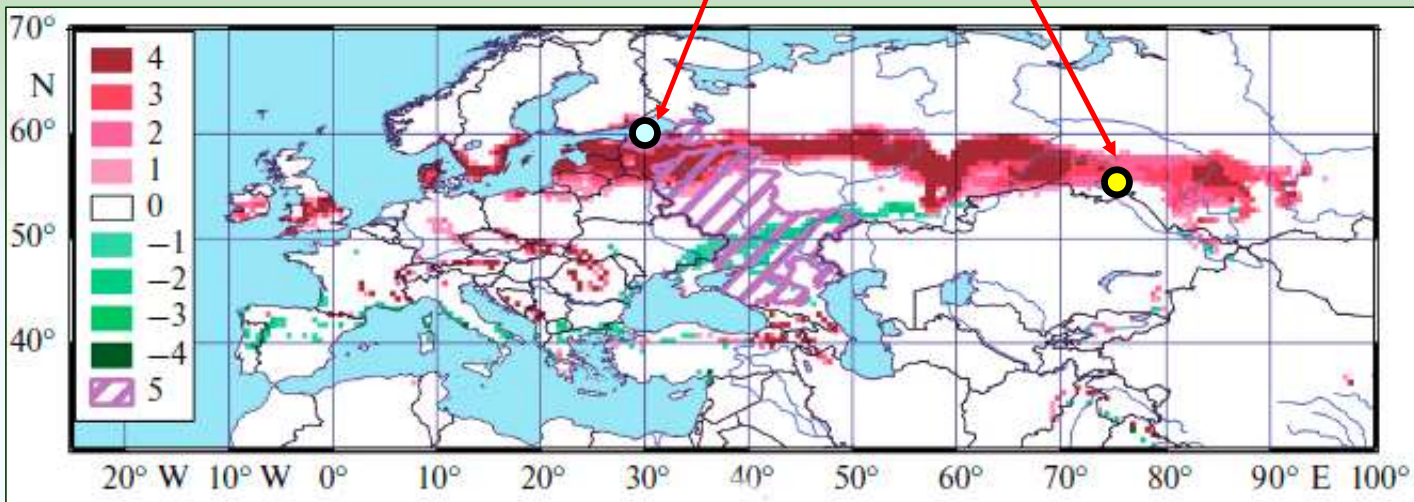


Climatic range of *A. planipennis*



St. Petersburg (2020)

**Recent climate
(1990–1999)**



Barnaul (2024)

**Future climate
(SSP 7.0 scenario:
2030–2039)**

(Baranchikov et al., 2024)

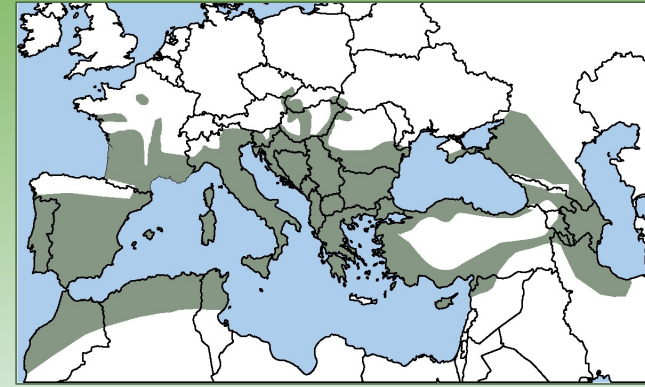
Distribution of European species of *Fraxinus*



F. excelsior



F. ornus



F. angustifolia



A. planipennis and ash trees dieback (in the collection of the Main Botanical Garden RAS, Moscow, 2010–2014)

Origin:
Far East

Europe

America

Ash species	Number of trees in 2010	Mortality by the end of 2014 (%)	
		Total	Killed by <i>A. p.</i>
<i>F. mandshurica</i>	20	65,0	0,0
<i>F. chinensis</i>	35	22,9	0,0
<i>F. excelsior</i>	64	75,0	70,3
<i>F. angustifolia</i>	19	78,9	78,9
<i>F. ornus</i>	3	100,0	100,0
<i>F. pennsylvanica</i>	54	88,9	88,9
<i>F. americana</i>	37	81,1	81,1

Fraxinus pennsylvanica is infested by *A. planipennis* and *Hymenoscyphus fraxineus* in Voronezh, 2018.

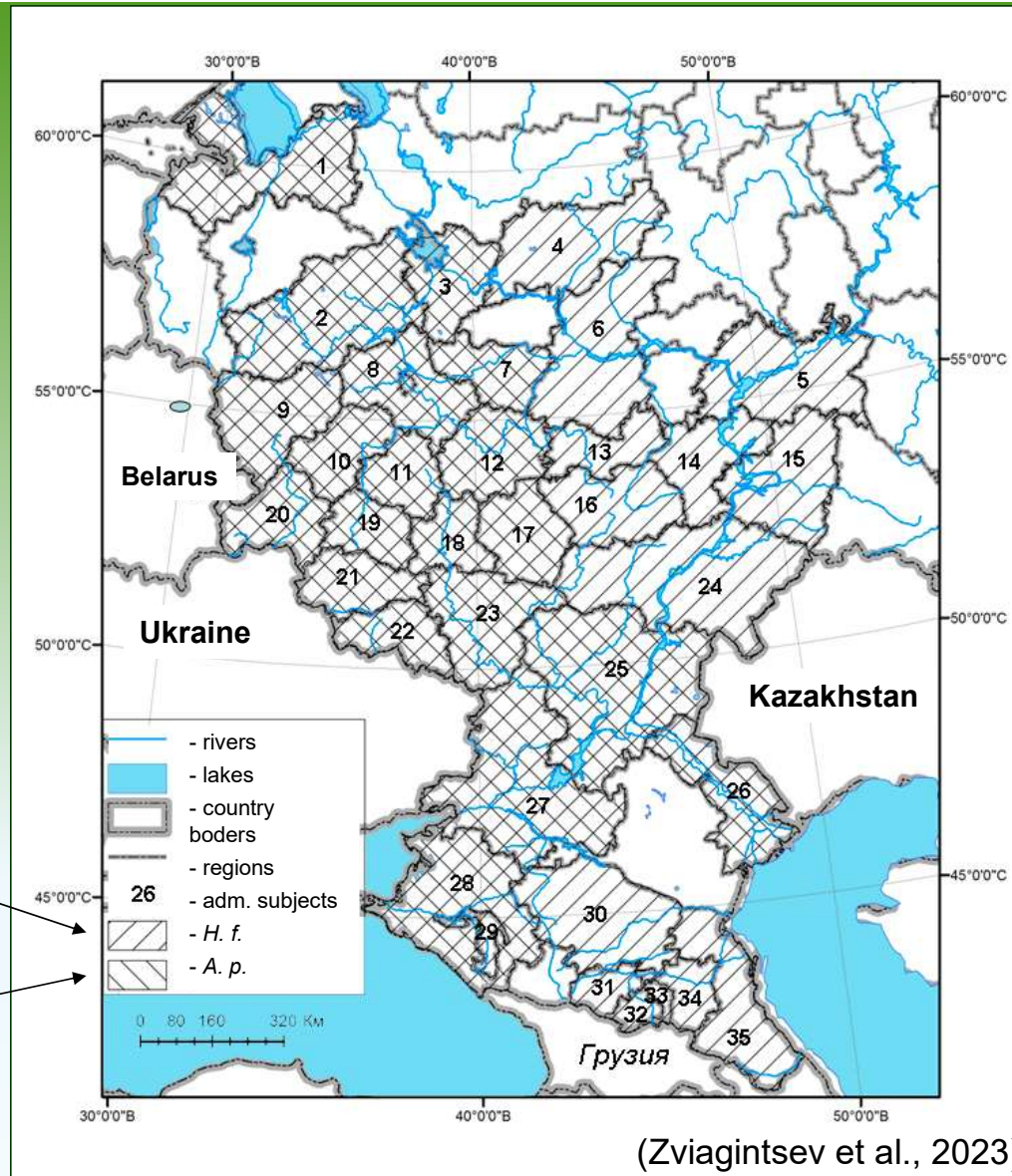




Invasion of *A. planipennis* and *Hymenoscyphus fraxineus* in European part of Russia (2021).

Hymenoscyphus fraxineus

Agrilus planipennis



How *A. planipennis* and *Hymenoscyphus fraxineus* influence each other?



How *A. planipennis* and *Hymenoscyphus fraxineus* influence each other?



No differences were detected in larval development of *A. planipennis* between ash trees affected by *H. fraxineus* and visually healthy ash trees.

However, by 2017, *A. planipennis* has almost disappeared in Moscow and many survived ash trees have recovered (to some extent).





Level of parasitism in larvae of *A. planipennis* in Moscow, in 2013 and 2014

(from: Gninenko et al., 2016)

Sample plots	Ash trees	2013		2014	
		Sampled larvae	Parasitized larvae, %	Sampled larvae	Parasitized larvae, %
1	34	320	81,2	19	63,2
2	50	417	70,0	15	60,0
3	21	200	70,0	17	58,8
4	42	378	74,3	18	39,0

mean: 65%

Spathius polonicus Niezabitowski
(Hymenoptera: Braconidae: Doryctinae)



(Orlova-Bienkowskaja, Belokobylskij, 2014)

***Spathius polonicus* Niezabitowski**
(Hymenoptera: Braconidae: Doryctinae)

Known hosts:

Agrilus suvorovi Obenberger, 1935

viridis Linnaeus, 1758 (on *Populus nigra*)

constantini Obenberger, 1927

Anthaxia sp.

Coraebus florentinus (Herbst, 1801)

Melanophila picta (Pallas, 1773)

picta decastigma (Fabricius, 1787)

Ovalisia mirifica (Mulsant, 1855)

Cratomerus sp.

Sphenoptera kaznakovi Jakovlev, 1899

davatchii Descarpentries, 1960

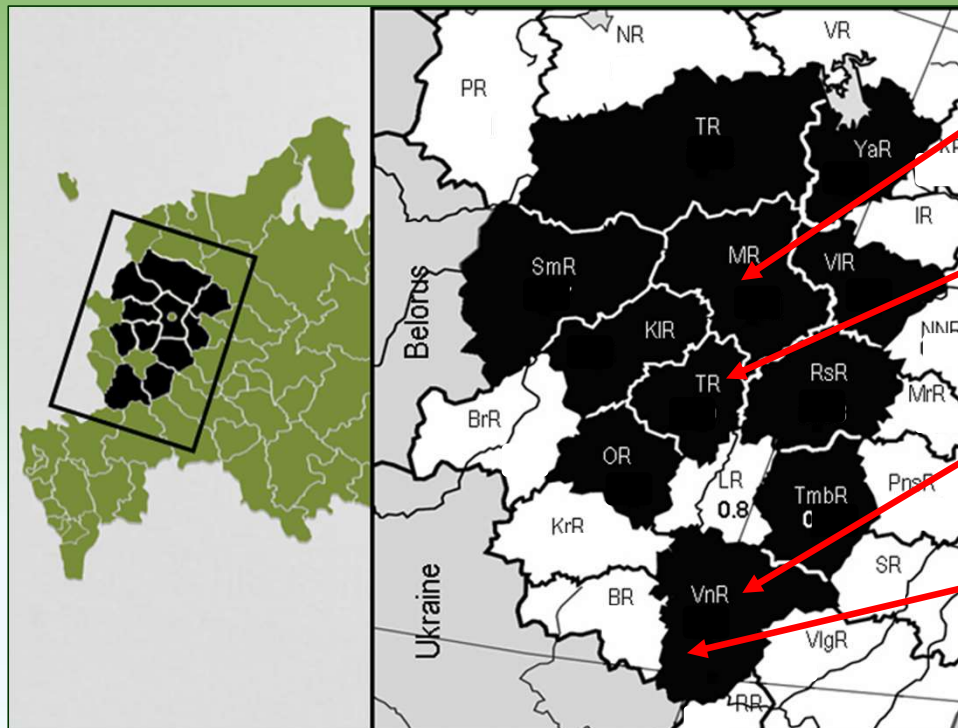
very seldom: *Scolytus* sp. (Curculionidae: Scolytinae)

(Kenis & Hilszczanski, 2007; Belokobylskij, 2003; Yu et al., 2012)





Level of parasitism of *Agrilus planipennis* in different parts of its invasive range (from: Baranchikov, 2018)



**Moscow: up to 82 %
(2013–2014)**

**Tula: < 2 %
(2017)**

**Voronezh: 4 %
(2017)**

**Rossosh: 25–40 %
(2018)**

Summary – 1



***Agrilus planipennis* has been present in Moscow since the early 1990s.**



The pest has not yet occupied fully its climatic range in Russia; the invasion is expected to continue expanding (first of all, towards south and east).



The primary host is the introduced *Fraxinus pennsylvanica*.



All three native European ash species are also susceptible.



The pest recently started to caused significant damage to forests dominated by *F. excelsior* in Russia.



The invasive range of *Hymenoscyphus fraxineus* in the European part of Russia covers more than 35 federal subjects, while the range of *A. planipennis* spans 30 subjects (2025). Their invasive ranges overlap.



No differences were detected in the larval development of *A. planipennis* between ash trees affected by *H. fraxineus* and visually healthy ash trees.

Summary – 2



Since 2016, *A. planipennis* has been included in the Quarantine List of the Eurasian Economic Union (A2).



In Russia, to date, there is no coordinated national program focusing on this pest or invasive pests of ash trees.



A. planipennis 'almost disappeared' in the core of invasion (Moscow Region), suggesting that local biota has effectively absorbed (i.e., started to control) the pest within just a quarter century after its arrival. This provides some degree of optimism for ash conservation in Europe.



European braconid wasp *Spathius polonicus* is the main parasitoid. Its biology and relationships with *A. planipennis* are poorly known and should be studied.



The zone where invasive ranges of *A. planipennis* and *H. fraxineus* overlap represents a unique ground for integrated research efforts aimed at identifying mechanisms of ash resistance and, ultimately, conserving ash species for the continent.

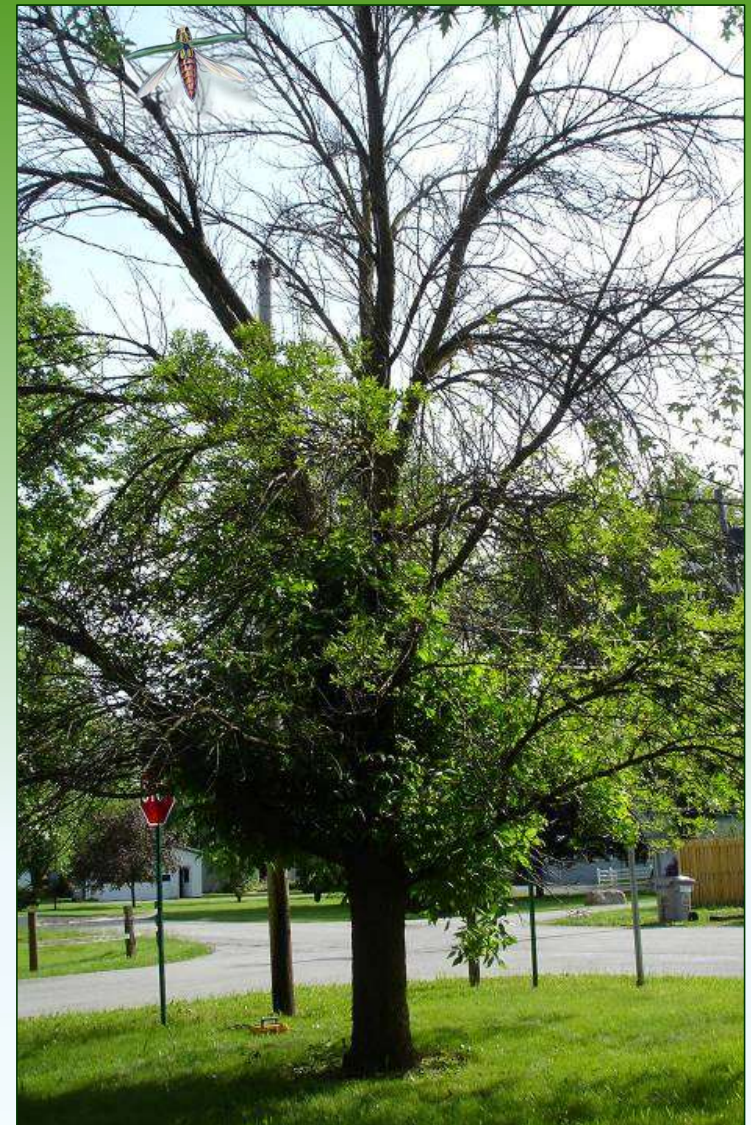


Giuseppe Penone
Elevazione
early 2000s
The Boboli Gardens
(Florence)



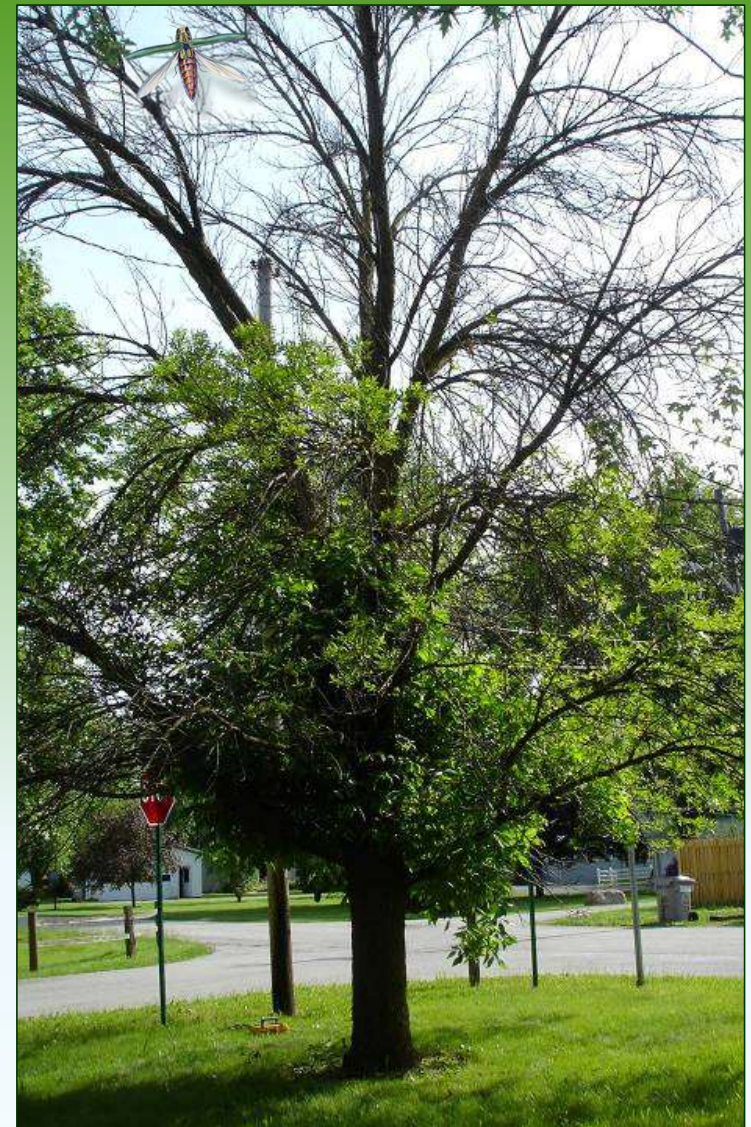


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Thank you for attention!

