

All-Russian Center of Plant Quarantine,
Bykovo, Moscow Region, Russia (Email: okulinich@mail.ru)

**EMERALD ASH BORER, *AGRILUS PLANIPENNIS*
IN THE RUSSIAN FEDERATION: ITS SPREAD, DAMAGE
AND CONTROL**

Oleg Kulinich, Dmitry Ryaskin

EPPO Network of experts working on surveillance, monitoring, and
control of the Emerald ash borer, *Agrilus planipennis*

5 December 2024



Introduction

The first survey associated with the extent of Emerald ash borer (EAB) in the European part of Russia was conducted in the early 2000s during research efforts that addressed the abundant ash tree mortality in Moscow.



Emerald ash borer in Moscow, 2005-2007
(Photo by E.G. Mozolevskaya, A.I. Ismailov).

КАРАНТИН

УДК 632.92

Очаги ясеневой златки в Московском регионе

Е.Г. МОЗОЛЕВСКАЯ,
С.С. ИЖЕВСКИЙ,
профессора
Московского государственного

Явные признаки какого-либо заболевания у ослабленных и сухостершинных деревьев отсутствовали;

а под корой – личиночные ходы узкотелой златки (рис. 2). По своим размерам они были заметно крупнее, чем у известных аборигенных видов златок этого рода (*A. viridis*, *A. ater* и др.). Энтомологом службы защиты растений Мосзеленхоза В.Н. Зволь был отловлен один жук, еще один был найден в городе колеоптерологом Н.Б. Никитским. Опре-

One of the first references associated with detecting the ash borer outbreaks in the European part of the Russian Federation (Moscow, Moscow Region) Mozolevskaya E.G., Izhevskiy S.S. Outbreak of ash borer in the Moscow Region // Plant Protection and Quarantine, No. 5, 2007. P. 28-29



Adult, larva of *Agrilus planipennis* Fairmaire, 1888 and adult emergent holes on the bole of an ash tree
(Photos by A.V. Petrov, D.I. Ryaskin, S.N. Selyavkin).

ВНИИКР



Introduction



- The native range of the Emerald ash borer is the Russian Far East (Primorsky Krai and the southern portion of Khabarovskiy Krai) in addition to the countries of China, Mongolia, South Korea, North Korea and Japan.
- In the Russian Far East, EAB is considered an endemic species where populations are associated with dying or stressed ash trees.

Native range of the Emerald ash borer, *A. planipennis* in Eurasia as of 2013 (<https://ru.wikipedia.org>)

ВНИИКР



In Russia, there are several species of ash trees that serve as hosts

- In the **Russian Far East**, **Manchurian ash**, *Fraxinus mandshurica* is the predominant ash species. **Chinese ash**, *F. chinensis* is also common. In this region, the Emerald ash borer usually only infests severely weakened ash of either species.
- In the **European part of Russia**, **European ash**, *F. excelsior* and **Green ash**, *F. pennsylvanica* are the most common ash species. **Southern ash**, *F. angustifolia* is very limited in the European portion of Russia.
- **Green ash is an introduced species.** Within Russia, it has been used in urban landscapes for more than 100 years and **is the most susceptible ash to EAB infestations.**

Host Plants

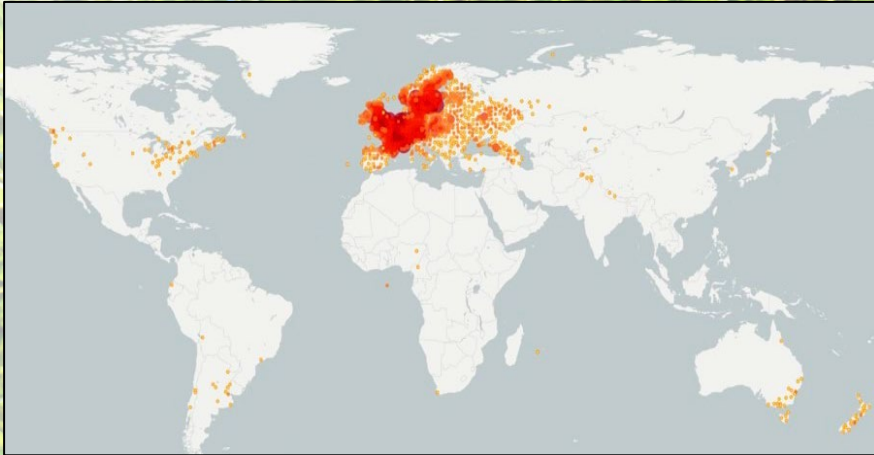


Dead ash trees exhibiting symptoms of *Agrilus planipennis* infestation in different districts of the Voronezh Region
(Photo by D.I. Ryaskin)

ВНИИКР



Host Plants

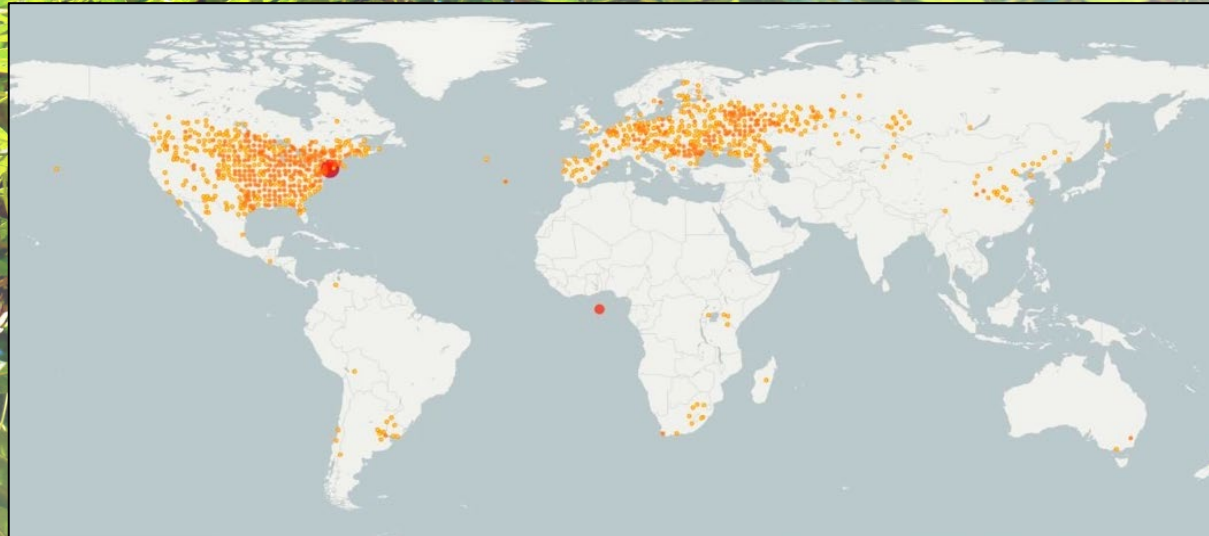


European ash (*Fraxinus excelsior*)



Southern ash (*Fraxinus angustifolia*)

- The area of ash-dominated forest in Russia is about 6.12 thousand km², with approximately 2 thousand km² in the European part and over 4 thousand km² in the Asian part (Primorsky and Khabarovsk Krai) that includes Manchurian ash, *F. mandshurica* and Chinese ash, *F. chinensis*.
- The total wood volume of ash in Russia is about 71.6 million m³.



Green ash (*Fraxinus pennsylvanica*)

Distribution of some species of ash trees in the Russian Federation and in the world (<https://www.gbif.org>)

Spread of the Emerald Ash Borer in the Russian Federation

The first detection of the Emerald ash borer in European Russia was reported in 2007 on the website of the Zoological Institute of the Russian Academy of Sciences.



Инвазия узкотелой златки *Agrilus planipennis* в Московском регионе (автор очерка - Евгений Шанхиза)

Е.В. Шанхиза

В середине июня 2003 года в Москве недалеко от станции метро Алексеевская я поймал неизвестную мне златку из рода *Agrilus*. Длина тела ее была больше 10 мм, и по определению она не подходила ни под один средневропейский вид. Не удалось также выяснить ее кормовое растение – златка была поймана, сидевшей на асфальте. В июне 2005 года И.Мельник в районе метро Шухинская поймал еще два экземпляра этого вида, опять же сидящими на асфальте. Сравнивая пойманные экземпляры с другими *Agrilus* из разных регионов России, И.Мельнику удалось выяснить видовую принадлежность златки. Вид оказался идентичным дальневосточному *Agrilus marcopoli* и легко проходил по ключам «Определителя насекомых Дальнего Востока» (т. III, ч. I). Ареал его охватывает Приморье, СВ Китай и Японию; жук развивается на ильмовых. Стало ясно, что вид пережил у нас не одну зиму.

Shanghisa E.B. 2007. Invasion of the narrow-bodied borer, *Agrilus planipennis* in the Moscow region.
[<https://www.zin.ru/animalia/coleoptera/rus/fraxxx.htm>]



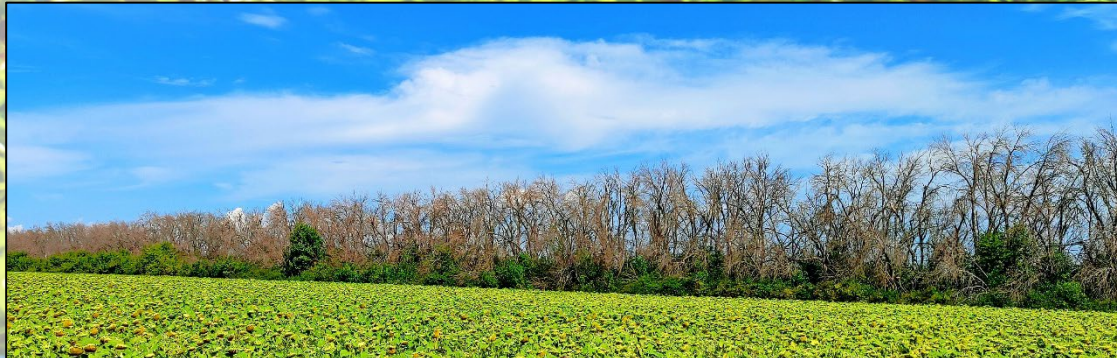
Ash trees in Moscow Region, heavily damaged by *Agrilus planipennis*.
Left - Moscow, 2005 (photo by E. Shanhiza), Right - Moscow, Tsaritsino Park, 2010

ВНИИКР

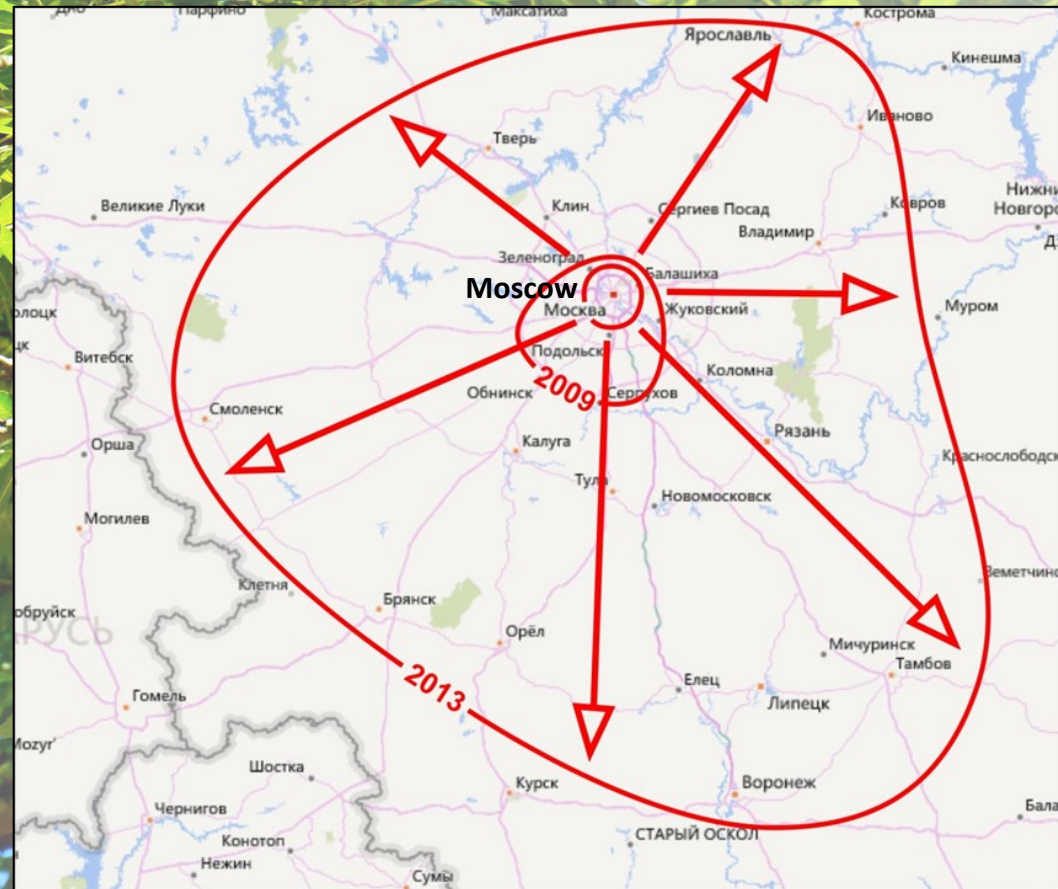
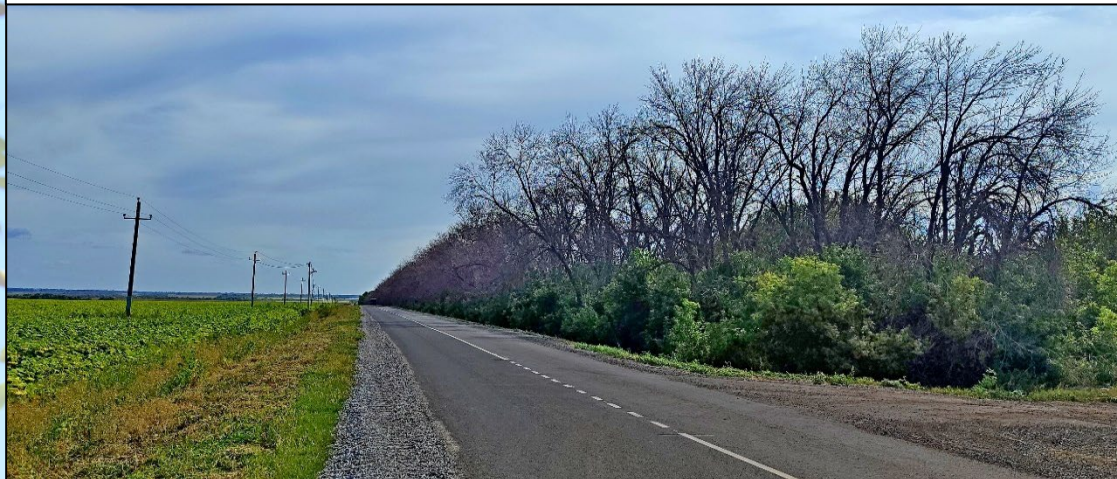


The Emerald Ash Borer Range Expansion in the Russian Federation

- Surveys conducted in 2013 indicate that the Emerald ash borer was present in 13 regions of the Russian Federation. However, EAB infested only limited landscapes in populated areas, along highways and field-protective forest belts.



Ash forest plantations infested by *Agrilus planipennis* in Voronezh Region (Photo by S.N. Selyavkin) (2018)



The Emerald Ash Borer Range Expansion in the Russian Federation

➤ Over a 20-year period, the Emerald ash borer infestation expanded over 600 km to the southwest reaching Ukraine. To the south, *A. planipennis* extended its range over 1300 km, reaching the Astrakhan Region. In 2024, EAB was detected in the Altai Territory, which is more than 3000 km east of Moscow.



The Emerald Ash Borer Range Expansion in the Russian Federation

Detection of the Emerald ash borer in the European part of Russia since 2003 (compiled from published scientific references and official data; some detection records require official confirmation).

Native range of EAB in the Russia Federation: Primorsky Krai, Khabarovsk Krai

- 1, 2 - 2003** beginning of invasion on the territory of the European part of the Russia (Moscow and Moscow Region)
- 3 - 2012** r. Tula, Kaluga, Tver, Smolensk Regions
- 4 - 2013** r. Orel, Lipetsk, Voronezh, Tambov, Yaroslavl, Ryazan and Vladimir Regions
- 5 - 2018** r. Volgograd Region
- 6 - 2019** Bryansk, Belgorod, Kursk Regions and LNR
- 7 - 2020** r. Astrakhan, Leningrad Regions, St. Petersburg city
- 8 - 2021** Rostov Region
- 9 - 2022** Krasnodar Region
- 10 - 2023** Saratov Region, Stavropol Krai
- 11 - 2024** Penza, Nizhny Novgorod, Ivanovo Regions, Republic of Adygea, Republic of Kalmykia, Altai Krai

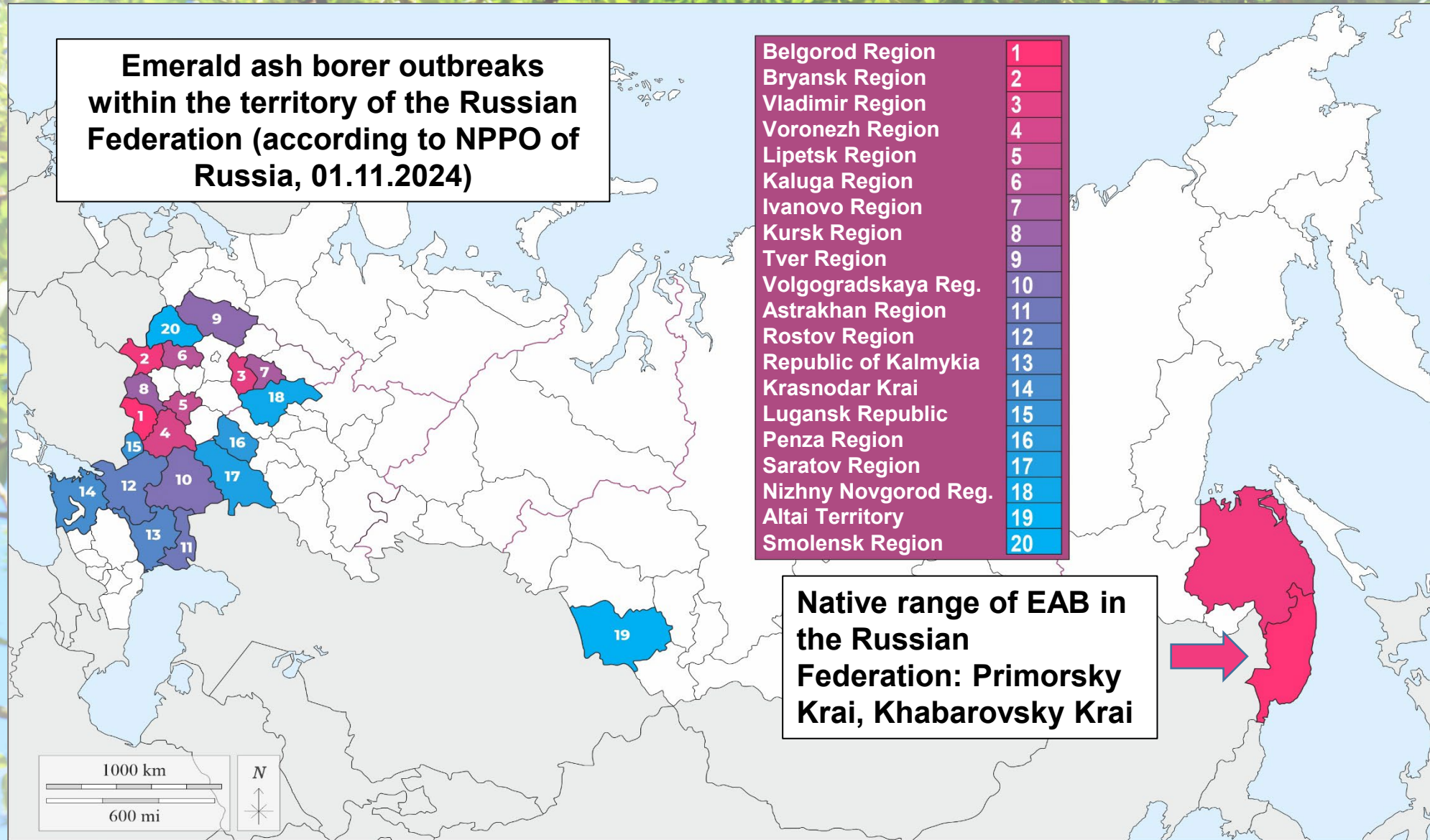


The Emerald Ash Borer Range Expansion in the Russian Federation

Emerald ash borer outbreaks within the territory of the Russian Federation (according to NPPO of Russia, 01.11.2024)

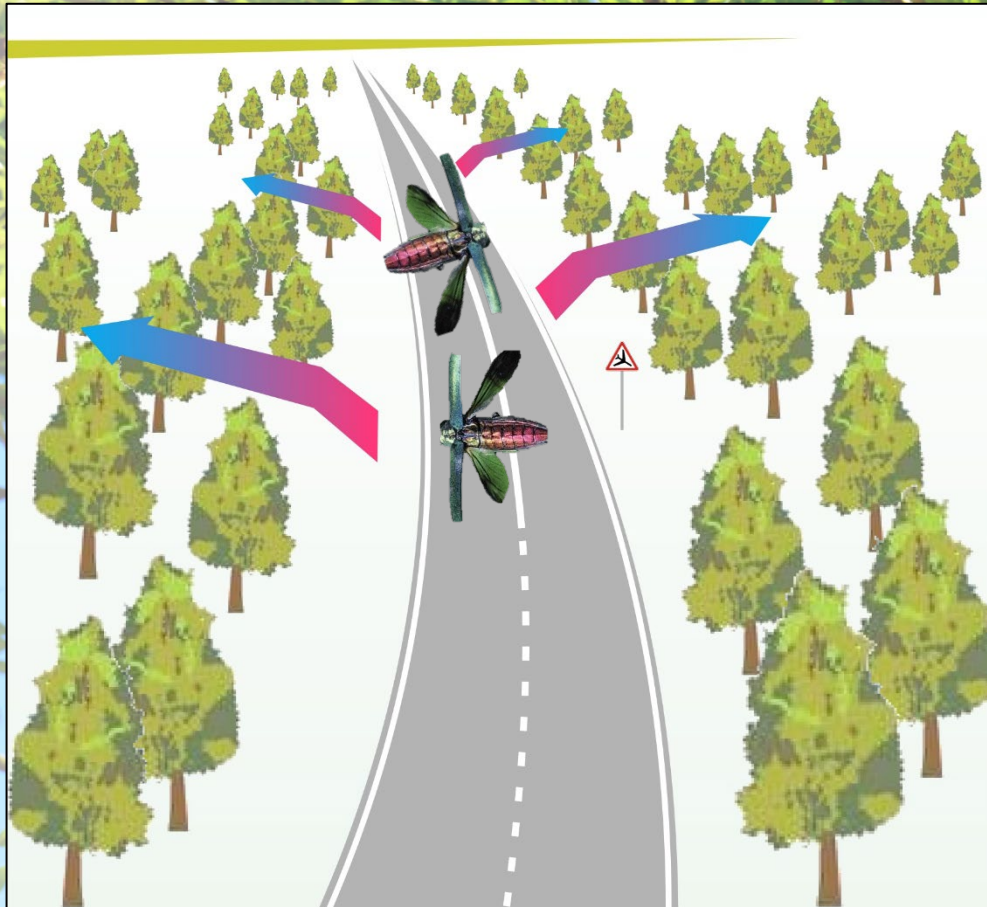
Belgorod Region	1
Bryansk Region	2
Vladimir Region	3
Voronezh Region	4
Lipetsk Region	5
Kaluga Region	6
Ivanovo Region	7
Kursk Region	8
Tver Region	9
Volgogradskaya Reg.	10
Astrakhan Region	11
Rostov Region	12
Republic of Kalmykia	13
Krasnodar Krai	14
Lugansk Republic	15
Penza Region	16
Saratov Region	17
Nizhny Novgorod Reg.	18
Altai Territory	19
Smolensk Region	20

Native range of EAB in the Russian Federation: Primorsky Krai, Khabarovsk Krai



The Emerald Ash Borer Adult Dispersal in the Russian Federation

- The spread of *Agrilus planipennis* in the European part of Russia initially occurs forest belts along roads and railways where Green or European ash trees are commonly found.
- Spread then continues into interior stands adjacent to these areas.



Arrows depicting spread of Emerald ash borer dispersal along roads



Ash forest plantations infested by the Emerald ash borer in the Voronezh Region (Photos by O.A. Kulinich, D.I. Ryaskin)



Damage

- In the invasive range the Emerald ash borer attacks healthy trees of the genus *Fraxinus* causing significant physiological damage resulting in tree mortality within two to three years.
- The size of adult *Agrilus planipennis* varies greatly depending on tree diameter. Adults emerging from ash saplings are significantly smaller in size than adults from mature trees.



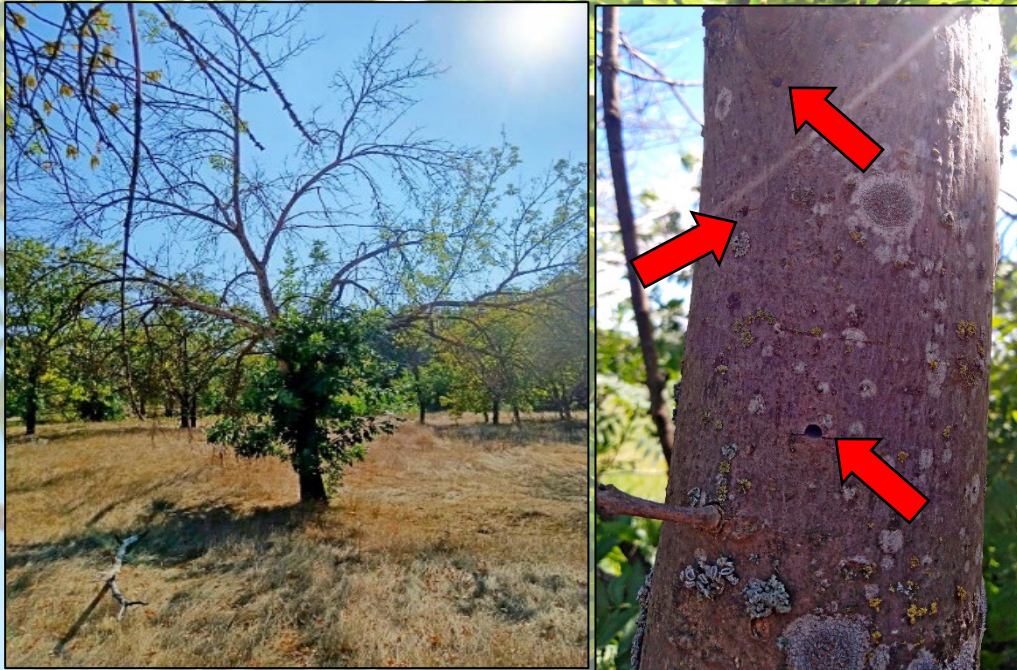
Agrilus planipennis adults collected from large ash trees from the Buturlinovskiy District in 2018 (left) and from young saplings in the Bogucharskiy District (right) in the Voronezh Region (Photo by D.I. Ryaskin - 2023)



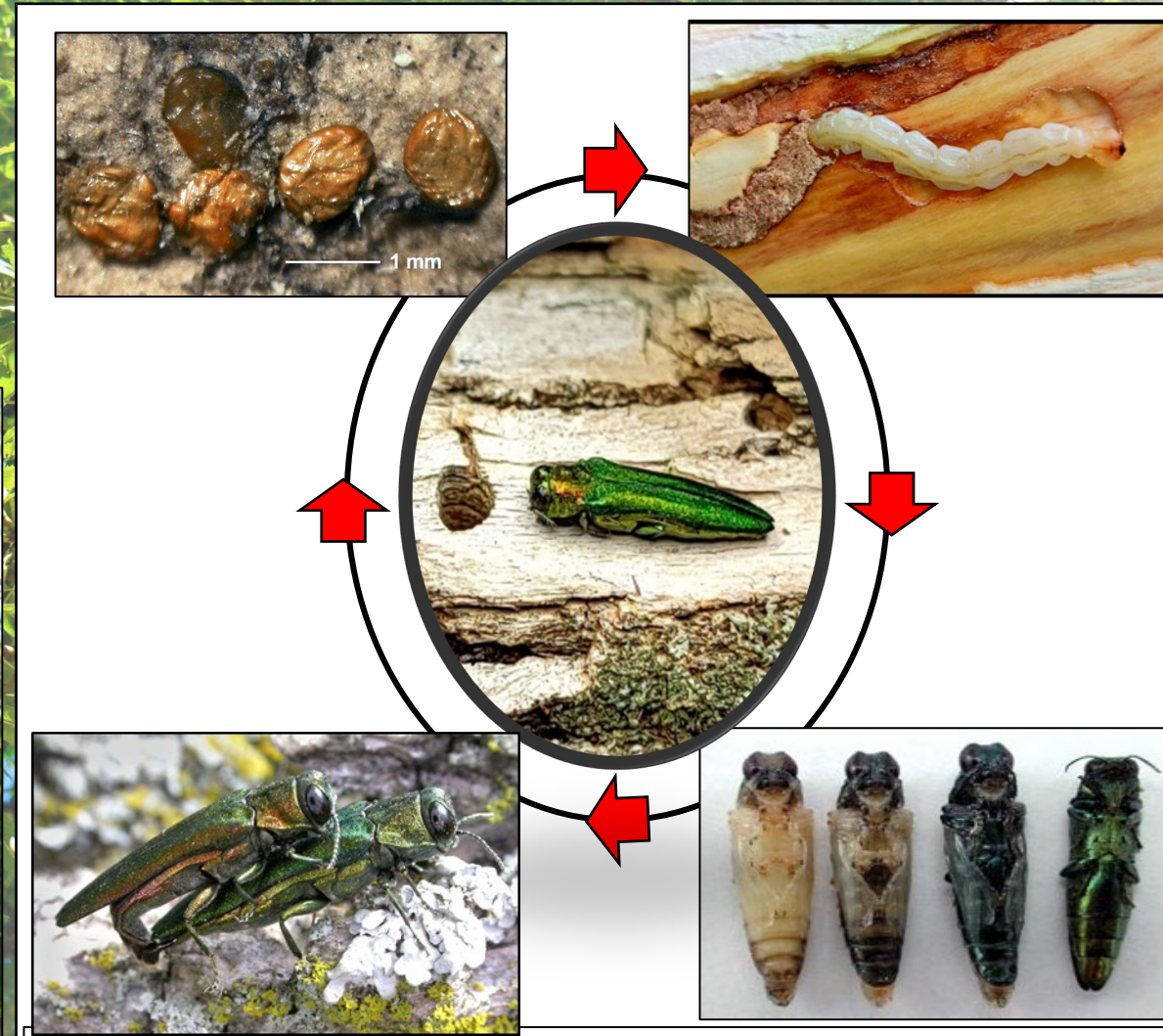
New infestation of ash trees *Agrilus planipennis* in forests of Voronezh Region in 2024 (Photo by D.I. Ryaskin)

Signs and Symptoms

- Infestation of host plants begins as eggs hatch and larvae bore into the tree bole.
- **Signs of infestation are such symptoms as:**
 - crown dieback,
 - epicormic sprouting at the base of the tree,
 - larval galleries under the outer bark,
 - D-shaped adult emergence holes 3 to 4 mm wide on trunks and main branches.



Symptoms of Emerald ash borer infestation
(Photo by D.I. Ryaskin)



The live cycle of the *A. planipennis* in the Moscow Region is two-year (Photo by D.I. Ryaskin, Quadell - <https://ru.wikipedia.org>; Cappaert D., Bugwood.org).

Adult Maturation Feeding on Saplings and Parasitoid Feeding on EAB Larvae

- Smaller new ash stems which are not susceptible to *A. planipennis*.
- Only the foliage of smaller ash trees is affected by adult maturation feeding.
- EAB larval parasitism.



Adult maturation feeding of *Agrilus planipennis*
(Photo by D.I. Ryaskin)

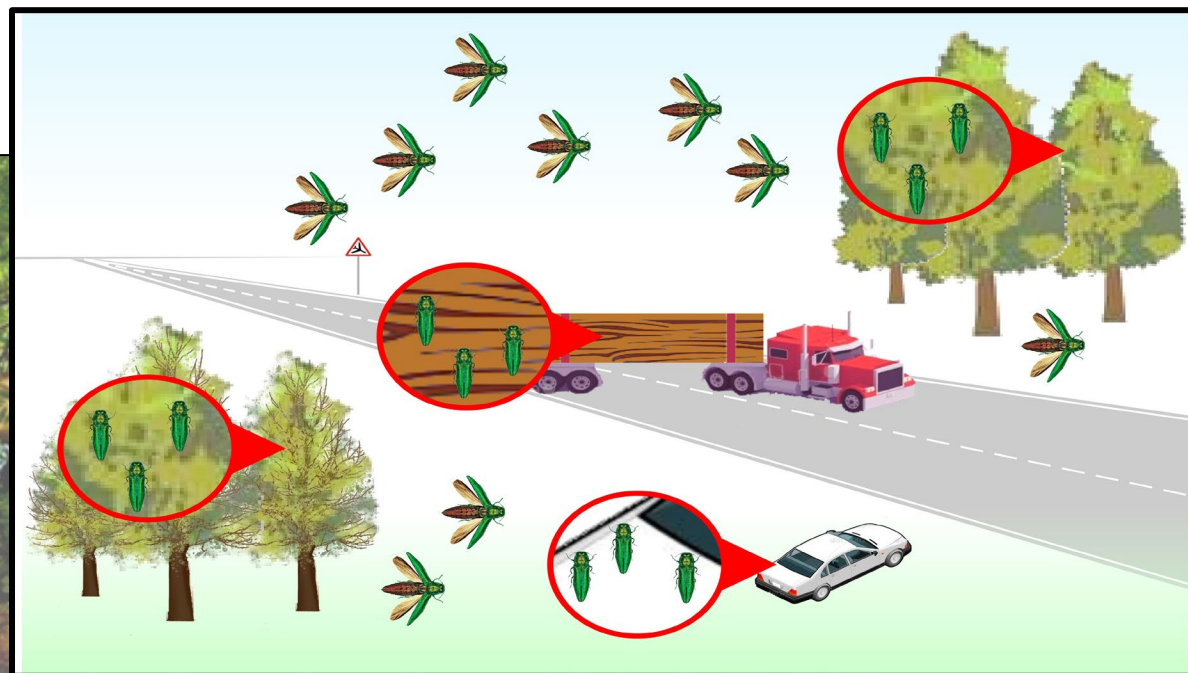


Parasitoid feeding on EAB larvae
Voronezh Region, 2024
(Photo by D.I. Ryaskin)

Agrilus planipennis Principle Means of Spread

The spread of *A. planipennis* can occur by:

- 1) natural flight (primarily in forest belts along roads and railways). Adult EAB can fly up to 10 km, but they usually do not spread far from where they emerge. However, they can occasionally fly long distances under the right conditions;
- 2) movement of infested wood or wood material (plants for planting, infested firewood);
- 3) hitchhiking.



The spread of *Agrilus planipennis*



Detection

- Immediately after detection of *A. planipennis* in Moscow, the Russian NPPO organized monitoring in the Moscow Region and neighboring regions. Various Russian and American manufactured pheromone traps were deployed for detection.
- Detection methods were developed to locate the Emerald ash borer outbreaks in the Russian Federation.



Phytosanitary inspection of forest ash stands for the presence of *Agrilus planipennis* outbreaks, Voronezh Region (Photo by S.N. Selyavkina)



Pheromone monitoring for the *A. planipennis* detection (<https://www.csalomontraps.com>)

Федеральное государственное бюджетное учреждение
«ВСЕРОССИЙСКИЙ ЦЕНТР КАРАНТИНА РАСТЕНИЙ»
(ФГБУ «ВНИИКР»)

СТАНДАРТ ОРГАНИЗАЦИИ

СТО ВНИИКР 2.053—2017

ЯСЕНЕВАЯ ИЗУМРУДНАЯ ЗЛАТКА
AGRILUS PLANIPENNIS FAIRMAIRE
Правила проведения карантинных фитосанитарных обследований
подкарантинных объектов и установления карантинной
зоны для объектов, подлежащих карантинному надзору

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ВЕТЕРИНАРНОМУ
И ФИТОСАНИТАРНОМУ НАДЗОРУ

Федеральное государственное бюджетное учреждение
«ВСЕРОССИЙСКИЙ ЦЕНТР КАРАНТИНА РАСТЕНИЙ»
(ФГБУ «ВНИИКР»)

УТВЕРЖДАЮ
Директор ФГБУ «Всероссийский
центр карантина растений»
(ФГБУ «ВНИИКР») _____
У.Ш. Магомедов
27 июля 2013 г.

МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ
ПО ВЫЯВЛЕНИЮ И ИДЕНТИФИКАЦИИ
ЯСЕНЕВОЙ ИЗУМРУДНОЙ ЗЛАТКИ
Agrilus planipennis Fairmaire

ОФИЦИАЛЬНАЯ КОПИЯ № _____
_____ 20 ____ г.

ФИО, должность, подпись

Москва - 2013 г.

Biological Control

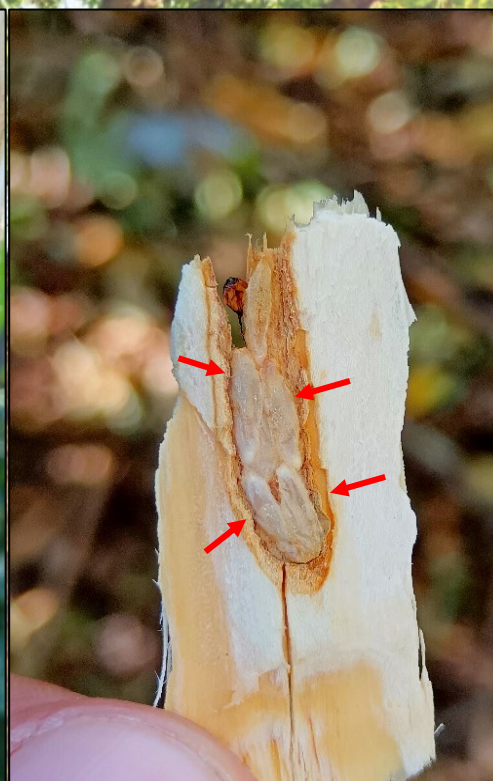
- Research studies in the Russian Federation highlight the importance of biological control agents.
- 3-4 years after outbreak of *Agrilus planipennis*, the populations decline, the pest population continues to decrease as a result of the activity of larval parasitoids combined with the loss of susceptible hosts.
- Various parasitoids have been found on the Emerald ash borer that significantly reduce the pest's abundance. The most widespread parasitoid feeding of *A. planipennis* in the European part of Russia is *Spathius polonicus* (Hymenoptera: Braconidae).



Parasitoids of genera *Spathius* (top) and *Atanycolus* (bottom) (Hymenoptera: Braconidae) found in larvae of ash borer. Voronezh Region (Photo by D.I. Ryaskin)



Cocoons (red arrows) of the parasitoid *Spathius* sp. (Hymenoptera: Braconidae) 2023-2024 (Photo by S.N. Selyavkin, D.I. Ryaskin)



A wasp of the family Braconidae found at the entrance to the ash borer adult emergence hole. Voronezh Region, 2024 (Photo by D.I. Ryaskin)



Suppression and Eradication

- The Russian NPPO ("Rosselkhoz nadzor") is actively working on the eradication of the EAB outbreaks in regions where it is present.
- The primary treatment methods are limited to felling and elimination of infested trees by subsequent burning of wood or processing into wood chips, in accordance with EPPO recommendations.



Thank you for your attention!

