



The emerging risk of the bronze birch borer

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Highly aggressive on Eurasian birches

Katovich et.al. 2005:

“Bronze birch borers (*Agrilus anxius*) are known to attack all native and introduced birch species, although birch susceptibility varies”

Severely attacked

European white birch, *Betula pendula*

Whitebarked Himalayan birch, *Betula jacquemontii*

Commonly attacked

Paper birch, *Betula papyrifera*

Gray birch, *Betula populifolia*

Sweet birch, *Betula lenta*

Yellow birch, *Betula alleghaniensis*

Rarely attacked

River birch, *Betula nigra*

Exported N American birch - More infestations during drought years

High tree mortality in experiment

- Large block experiment with eight different birch species (Ohio)
- 100% mortality for the most widespread birch species in Northern Europe, *Betula pendula*, *B. pubescens*, and Asian *B. szetchuanica*

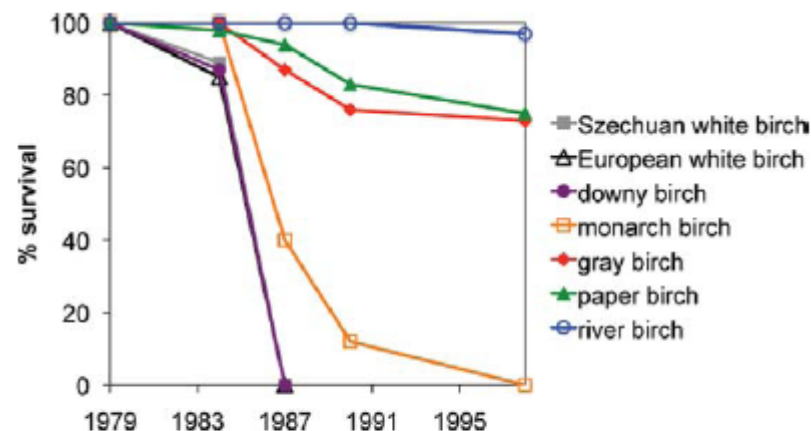


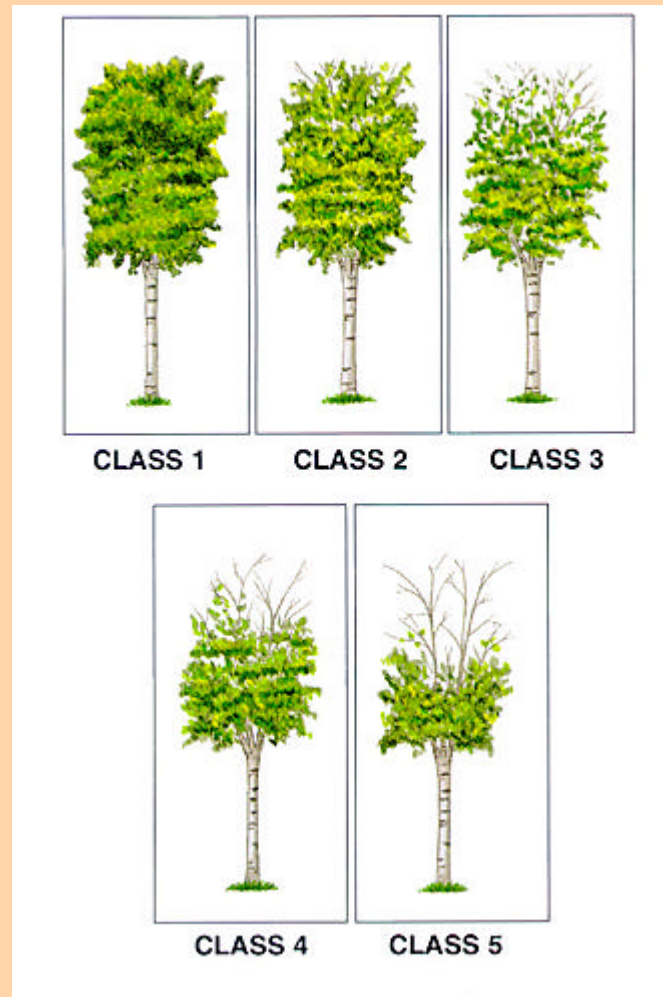
Fig. 1. Percent survival of seven birch (*Betula*) species in a common garden in Wooster, OH, USA from year of planting as two-year-old seedlings in 1979 through 1998.

Nielsen, D. G., Muilenburg, V. L. & Herms, D. A. 2011. Interspecific variation in resistance of Asian, European, and North American birches (*Betula* spp.) to bronze birch borer (Coleoptera: Buprestidae). *Environmental Entomology*, 40, 648-653

Meandering larva on birch



Early detection difficult – first attack in canopy



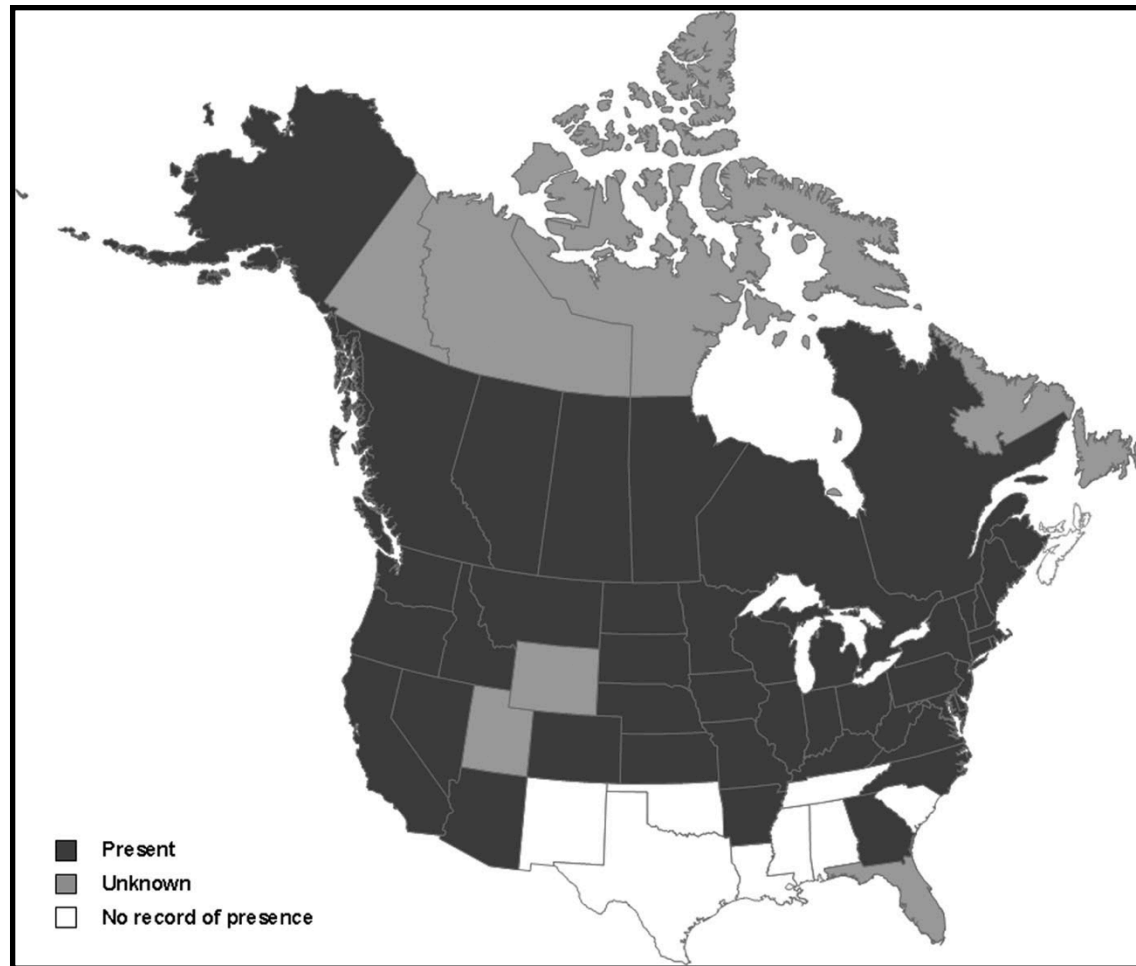
Debarking is not enough

- Pupation takes place into the wood (xylem)
- *Agrilus planipennis* individuals survived chipping*
- *Agrilus anxius* smaller than *A. planipennis*



*McCullough DG, Poland TM, Cappaert D, Clark EL, Fraser I, Mastro V, Smith S and Pell C (2007) Effects of chipping, grinding, and heat on survival of emerald ash borer, *Agrilus planipennis* (Coleoptera : Buprestidae), in chips. *Journal of Economic Entomology* 100:1304-1315.

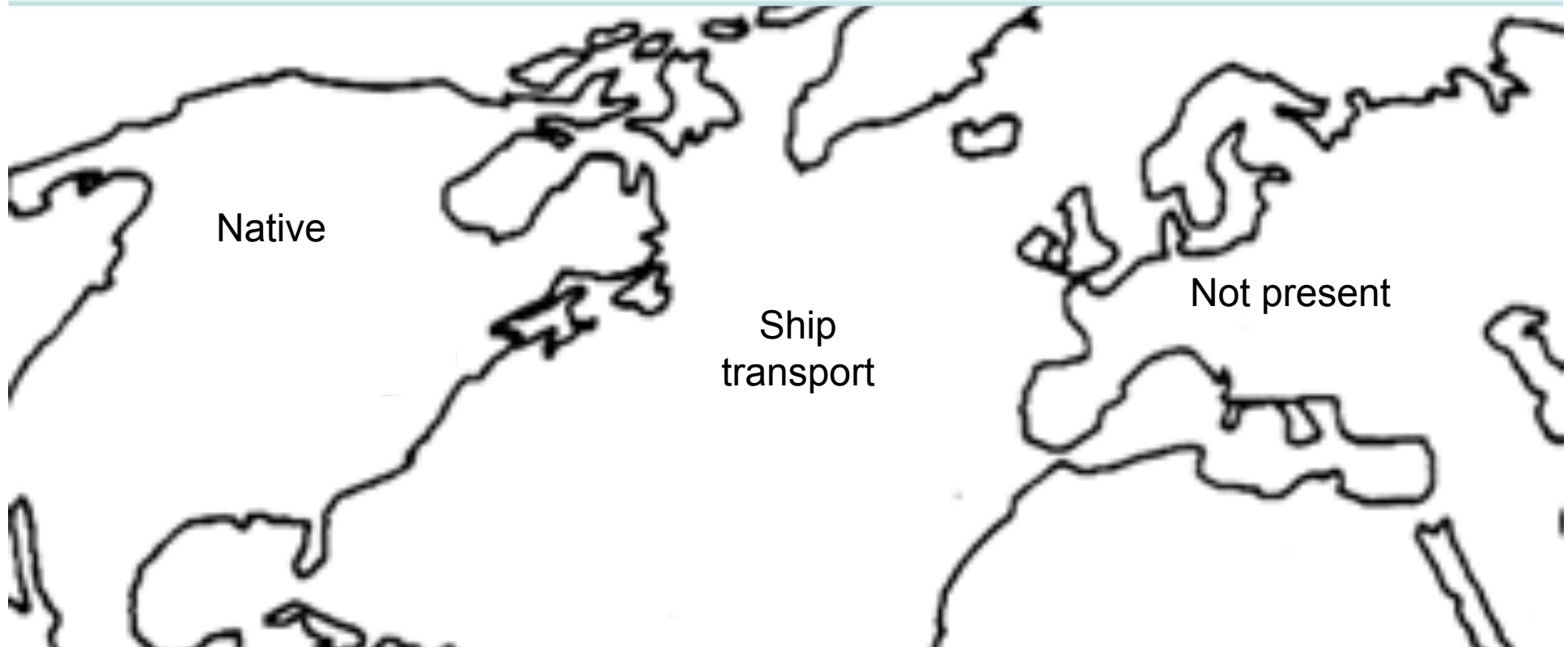
Endemic and widespread in North America



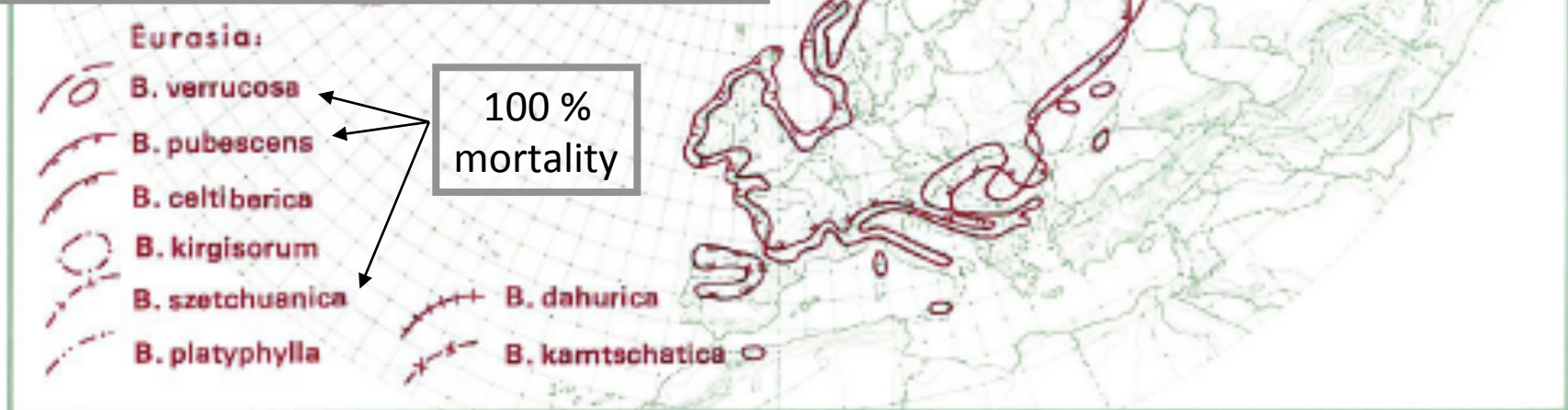
Europe: absent.
Asia: absent.
Africa: absent

Bronze birch borer to Europe and Asia?

- Transport overseas is necessary for arrival
- Import crucial factor for whole Eurasia



Birch in 11 time zones!



Birch is important in Northern Europe

- Big part of the forest volume in the Nordic countries, ranging from 11.6 % in Sweden to 28.2 % in Latvia.
- Used for various building and industry purposes
- Large areal cover, as for example about 30 % of the total forest cover in Norway
- Dominant tree species in large areas of forests ecosystems in Northern Europe
- High mortality indicates possible ecosystem effects

- EPPO alert list in 2010
- EPPO PRA in 2011 – A1 quarantine pests
- Norway: regulated in 2017

European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

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Agrilus anxius (Coleoptera: Buprestidae)

Bronze birch borer

NOTE: *Agrilus anxius* has now been added to the EPPO A1 List. A full datasheet is being prepared, in the meantime you can view here the data which was previously available from the EPPO Alert List.

Why: The NPPO of Norway recently suggested that *Agrilus anxius* (Coleoptera: Buprestidae - bronze birch borer) could usefully be added to the EPPO Alert List. *A. anxius* originates from North America where it is considered as a serious pest of birch trees (*Betula* spp.). *A. anxius* primarily attacks birches that are weakened or stressed but it is suspected that under certain circumstances (e.g. large populations) it can also attack healthy trees. In North America, tree mortality has been observed more particularly on birches planted for ornamental purposes, but *A. anxius* is also causing problems in forests.

Where: *A. anxius* is native to North America and occurs throughout the range of birches in Canada and the USA.
EPPO region: absent.

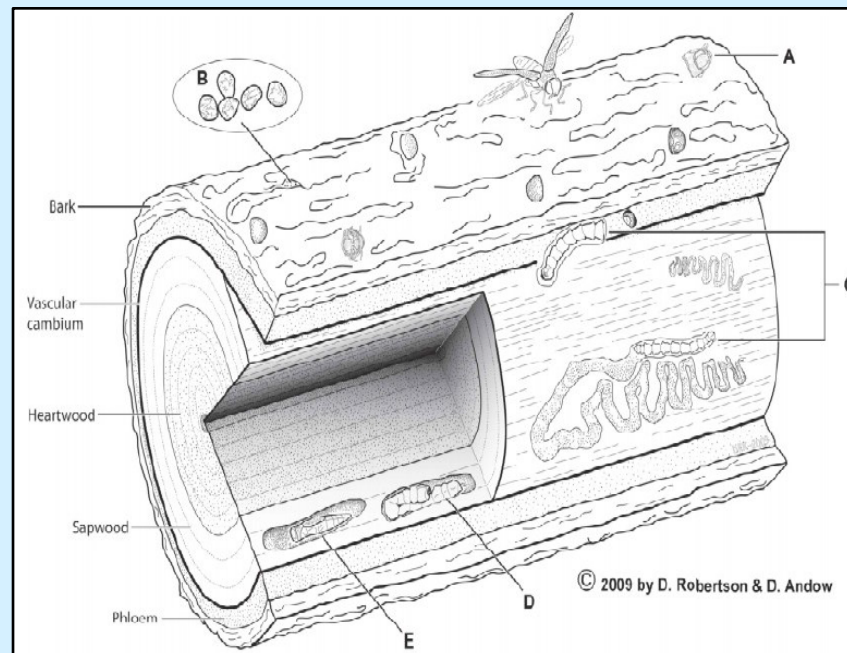
North America: Canada (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan), USA (Alaska, Colorado, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Tennessee, Utah, Washington, West Virginia, Wisconsin, Wyoming).



Agrilus anxius adult and a D-shaped emergence hole.
Steven Katovich - USDA Forest Service (US) - Bugwood.org

Pathways Betula from pest area (Canada,USA)

- Wood chips:
(chipping not enough, heat treatment, fumigation)
- Plants for planting:
(insect-proof conditions and inspections)
- Wood with or without bark:
(heat treatment, remove outer sapwood)
- Furniture and other objects of untreated birch:
(heat treatment, irradiation)



Wood chips of hosts regulated in UK and Norway

Table 2 GB entry requirements for non-coniferous woodchip originating outside the EU.

Species	Country of Origin	Entry Requirement
Birch (<i>Betula</i>)	Canada, USA	Official statement that it originates in a country known to be free of <i>Agrilus anxius</i>

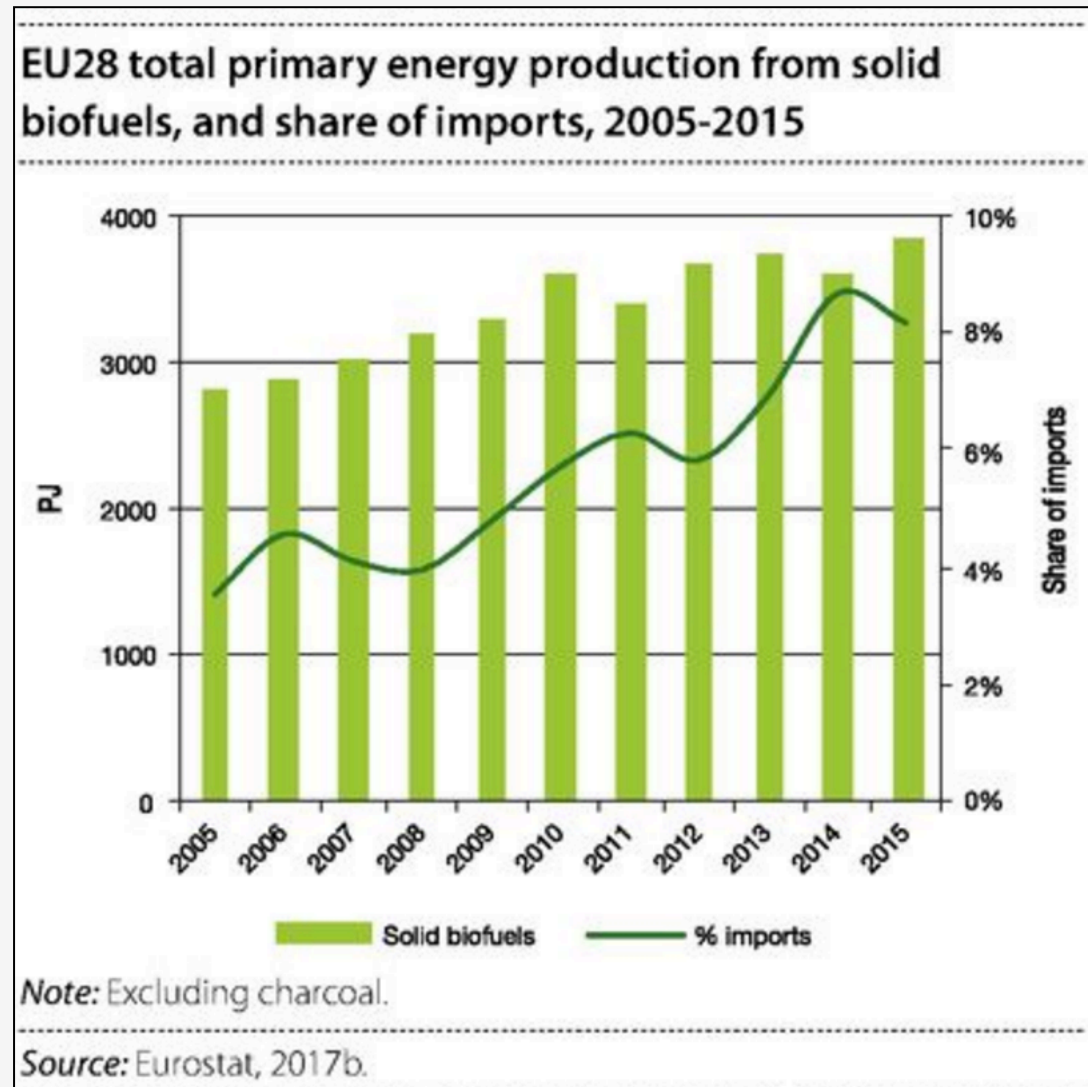
From: Forestry Commission in UK

Plants or plant parts that are prohibited to import if they originate from:

<i>Betula</i>	Woodchip of <i>Betula</i>	Canada, USA
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From: Norwegian Food Safety Authority

Threefold increase solid biofuels



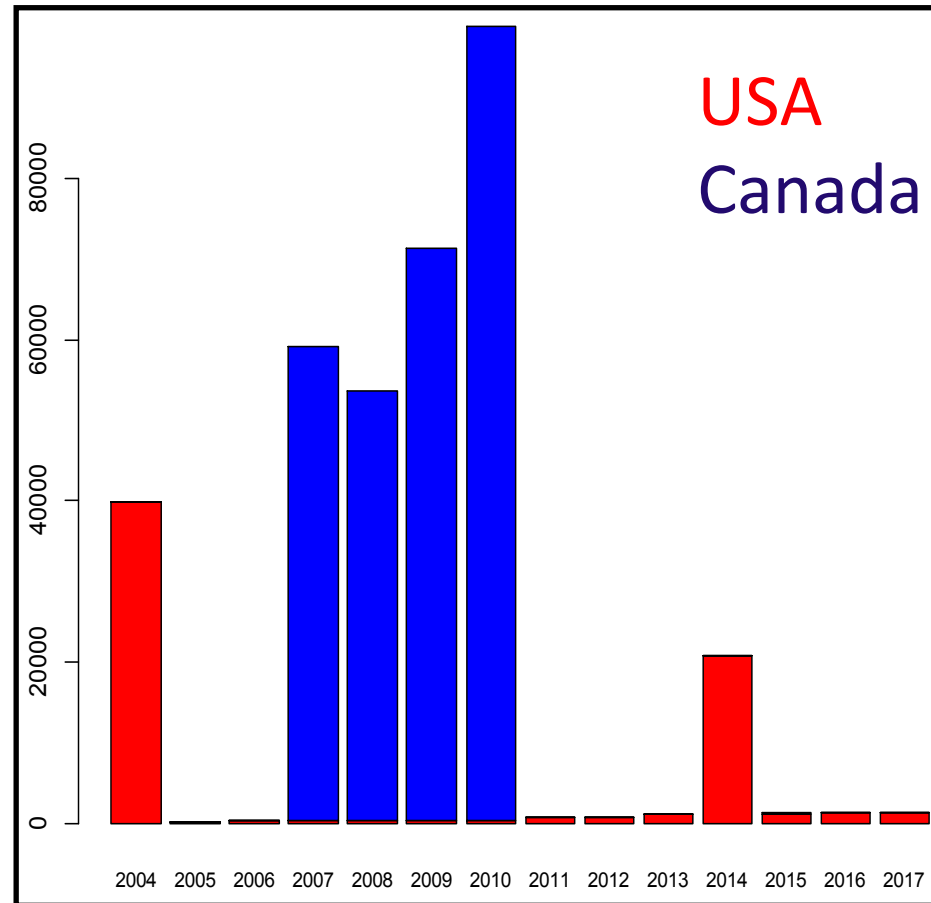
Pathways:

- Firewood
- Wood chips

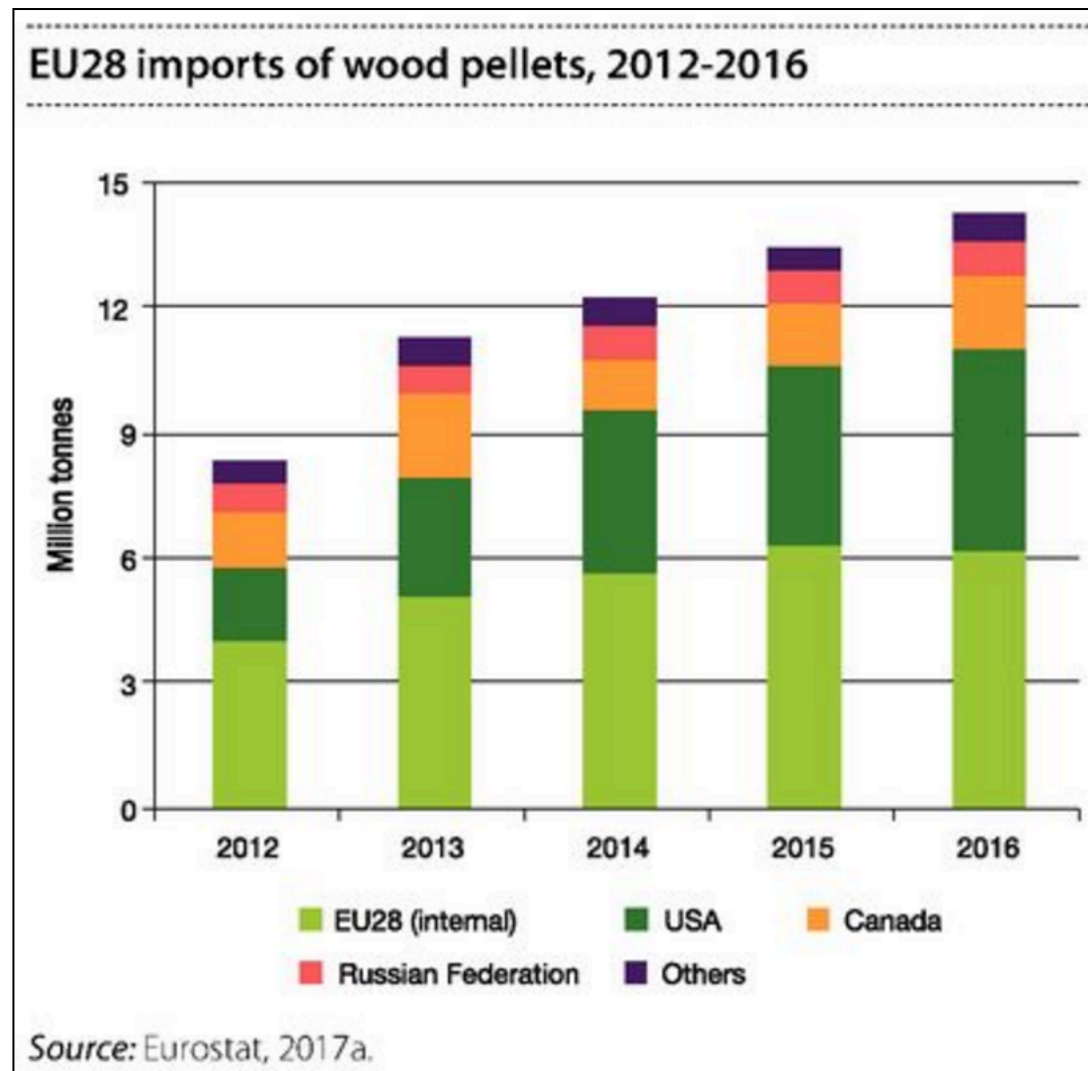
Safe:

- Pellets
- Sawdust

SLOWDOWN EXPORT WOOD CHIPS TO EU IN LAST YEARS



Import of wood pellets increasing



Case: wood chips imported to Biowood pellets factory in Western Norway in 2010



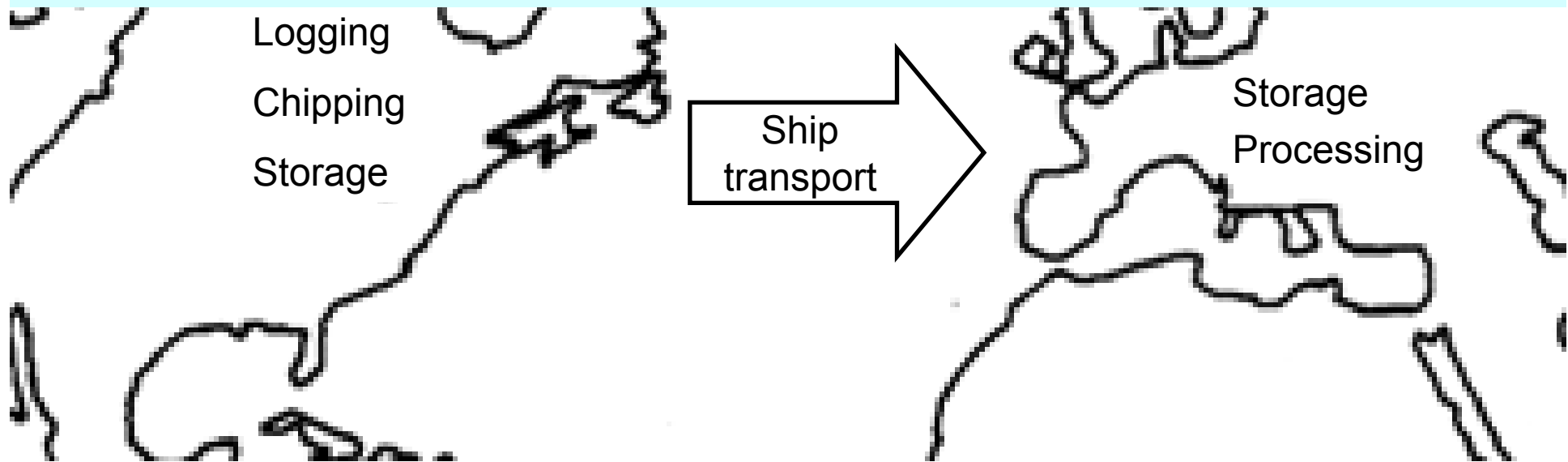
1 month production - 1 shipload ~100 mill. litres of chips
Pathway for bronze birch borer and emerald ash borer
NPPO plant inspection: sample 60 litres per boat

NPPO asked us to analyse their 60 litre inspection sample from first boat:

- 25% yellow birch (*Betula alleghaniensis*)
- 5% white birch (*Betula papyrifera*)
- Range 1.6 – 22.9 cm



Analysis of required sampling size per ship for detection of BBB by inspection control



- The probability of pest detection for current sampling protocols used by port inspectors was very low (< 0.00005)
- A 90 % chance of detection may require sampling **27 million litres of wood chips** per shipload

Økland, B., Haack, R.A. & Wilhelmsen, G. 2012. Detection probability of forest pests in current inspection protocols - A case study of the bronze birch borer. *Scandinavian Journal of Forest Research* 27: 285-297.

Is chipping to a smaller size a solution?

- (pre)pupae 7- 12 mm
- chips size < 6 mm not feasible



Two dimensions not sufficient



A comparison of two “one inch” wood chips with adult Emerald Ash Borers. The smaller chip is about one inch square. The larger chip is about one inch on two sides and is, apparently, considered a non-regulated item under Michigan’s Quarantine regulations. From Roberts and Kuchera (2006).

Roberts D. and Kuchera J. 2006. The Survival of EAB in Wood Chips: Does Size Matter? *The Landsculptor*: 19-21.

In practice:

Leftover material included in shiploads



Detection by traps or dogs in ports of entry?

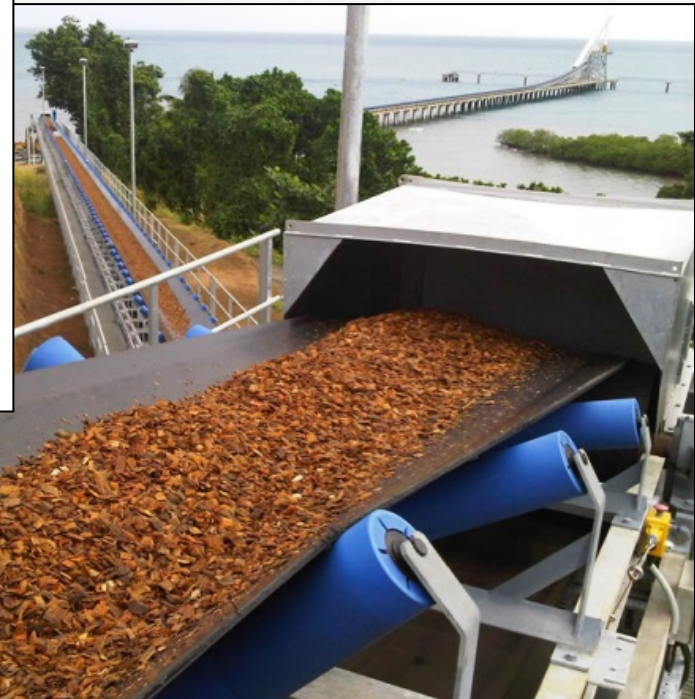
Depends on purpose

Inspection for return of individual consignments:

- Detection must be ~100%
- Return of ship too late

General survey of pathway:

- Verify presence of pest



Tree species composition did not match the declaration

Check of compliance:

- Checking each chip for insects – time consuming and tedious
- Tree taxa - microscopy work
- Tree genera - not tree species

Declared:

Acer rubrum, 70%

Betula alleghaniensis, 25%

Betula papyrifera, 5%

Also found:

Wood chips of *Fraxinus*

Tunnels and exit holes of *Agrilus*

Coniferous wood chips (*Picea*)

Challenge due to mixtures of tree species

- Tenfold more tree species in North America than in Europe
- Careful and qualified logging necessary (possible?)
- Tree species content often deviates from declaration
- Import control of tree species composition not feasible

➡ Regulation of the commodity wood chips,
rather than wood chips of individual tree species

