Update to 2014's *Forest Pest Introduction Pathways* and *Forest Pest Impacts and Economic Damage* Continental Dialogue Factsheets: Additional current information about the wood packaging pathway

- Several of the most damaging tree-killing pests introduced to the U.S. are wood-boring beetles, which are most commonly transported as larvae living in the wood used to make crates, pallets, spools, and other forms of packaging.
- Since 1985, at least 58 non-native species of wood- or bark-boring insects have been detected in the United States.[1]
- A 2011 study found that if no protective actions were taken, there is a one in three chance that another, highly destructive, woodborer species will invade the United States in the next 10 years.[2]
- USDA APHIS and its foreign counterparts have adopted International Standard on Phytosanitary Measures (ISPM) #15, which requires all wood packaging to be treated to prevent pests' presence.
- APHIS applied ISPM#15 to wood packaging entering the United States effective in 2006.

Despite these actions, a small proportion of wood packaging entering the U.S. still carries wood-boring insects. The most thorough study estimates the infestation rate at 0.001% (1/10th of 1%).[3]

This may sound like a very small risk. However, more than 27 million shipping containers entered the U.S. in 2016. It has been estimated that wood packaging is used in about 75% of these containers. Therefore, even if merely 1/10th of 1% of the wood packaging in these shipments contained a tree-killing pest, 20,000 containers harboring pests probably enter the country each year. That is 55 potential pest arrivals per day.[4]

Imported goods that are heavy are more likely to be packaged in wood and that thus pose the greatest pest risk. The highest risk commodities are

- machinery (including electronics) and metals;
- tile and decorative stone (such as marble or granite counter tops).[5] Indeed, **more pests have been found in wood supporting tiles and stone than any other type of commodity in 24 of the past 25 years**.[6]

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The metropolitan areas which receive the highest volumes of these goods have been identified.[7] The Port of New York leads all other cities in the country in imports of both machinery and decorative tiles and stone from Asia, Europe, and Central America.

These recent introductions pile on top of those introduced earlier during the course of nearly 400 years of trade between ports of the Northeast and Mid-Atlantic with Europe and Asia. As the map on the next page illustrates, the not-surprising result is that these states have more established pests than anywhere else in the country: 62 in New York; 58 in Pennsylvania; 57 in Connecticut; 55 in New Jersey (55); 48 in Maryland, 42 in Virginia. Even the inland state of West Virginia has 41 pests.

Top cities for receipts of machinery (left) & metals (right)

- New York City
- Atlanta
- Philadelphia
- Houston
- Washington, D.C. metropolitan area
- Boston
- Chicago
- Baltimore
- Virginia Beach
- Pittsburgh
- Jacksonville
- Seattle
- Los Angeles/Long Beach
- San Francisco

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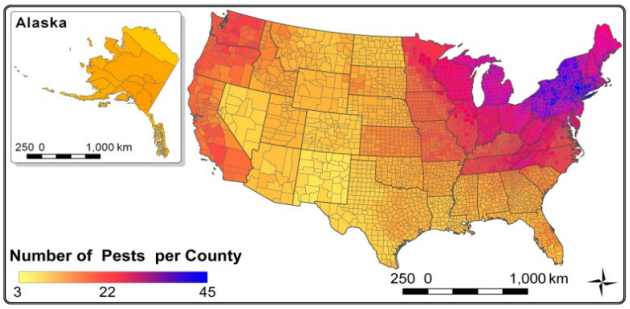
This factsheet last updated 1/22/2018

Top cities for receipt of tile & decorative stone

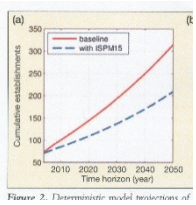
- New York City
- Boston
- Houston
- Atlanta
- Philadelphia
- Washington, D.C. metro area
- Jacksonville
- Columbia, SC
- Seattle
- Long Beach/Los Angeles
- Portland, OR
- San Francisco
- Dallas, TX
- Richmond
- Virginia Beach
- Providence, RI
- Tampa, FL



Map showing number of non-native pests found by county; from Liebhold, A.M., D.G. McCullough, L.M. Blackburn, S.J. Frankel, B. Von Holle, J.E. Aukema. 2013. A highly aggregated geographical distribution of forest pest invasions in the USA. Diversity and Distributions. (2013) 1-9; available at http://foresthealth.fs.usda.gov; click on "AFPE Database"

The Pacific coast states have been engaged in regular trade with other continents for only about 150 years, rather than 400. Nevertheless, they are catching up: during this short time, Pacific states have been invaded by about two-thirds the number of pests introduced to the Mid-Atlantic states: 42 in California; 41 in Washington; 36 in Oregon. In California, non-native forest pests now make up one-third of the damaging pests in the state – whereas they represented only 10% 50 years ago.[8]

Although ISPM#15 has not proved as effective as hoped, the damage caused by these beetles is so great that even a partially-effective measure is worth the cost. Leung et al. (2014)[9] found that implementing the standard will provide more than $11 billion in cumulative net benefits by the year 2050. This is because the number of pests expected to enter the country under the conditions created by the standard will be considerably fewer than would be introduced in the absence of the requirements.



Graph showing difference in introductions with (blue) and without (red) implementation of ISPM#15 From Leung et al. 2014

[1] Leung, B., M.R. Springborn, J.A. Turner, E.G. Brockerhoff. 2014. Pathway-level risk analysis: the net present value of an invasive species policy in the US. The Ecological Society of America. Frontiers of Ecology.org

[2] Aukema, J.E., B. Leung, K. Kovacs, C. Chivers, K.O. Britton, J. Englin, S.J. Frankel, R. G. Haight, T. P. Holmes, A. M. Liebhold, D.G. McCullough, and B. Von Holle. 2011. Economic impacts of non-native forest insects in the continental United States. PLoS One 6(9): e24587. doi:10.1371/journal.pone.0024587. Accessed June 17, 2013.

[3] Haack RA, Britton KO, Brockerhoff EG, Cavey JF, Garrett LJ, et al. (2014) Effectiveness of the International Phytosanitary Standard ISPM No. 15 on Reducing Wood Borer Infestation Rates in Wood Packaging Material Entering the United States. PLoS ONE 9(5): e96611. doi:10.1371/journal.pone.0096611

[4] Haack *et al*. (2014); CBP data on incoming containers; Meissner, H.; Lemay, A.; Bertone, C.; Schwartzburg, K.; Ferguson, L.; Newton, L. 2009. Evaluation of pathways for exotic plant pest movement into and within the greater Caribbean Region. Raleigh, NC, USA: Caribbean Invasive Species Working Group, USDA APHIS Center for Plant Health Science and Technology. https://naldc.nal.usda.gov/download/32155/PDF

[5] CBP Powerpoint; and Haack RA, Britton KO, Brockerhoff EG, Cavey JF, Garrett LJ, et al. (2014) Effectiveness of the International Phytosanitary Standard ISPM No. 15 on Reducing Wood Borer Infestation Rates in Wood Packaging Material Entering the United States. PLoS ONE 9(5): e96611. doi:10.1371/journal.pone.0096611

[6] Haack *et al*. (2014)

[7] Data taken from Colunga-Garcia, M., M., R.A. Haack, and A.O. Adelaja. 2009. Freight Transportation and the Potential for Invasions of Exotic Insects in Urban and Periurban Forests of the US. J. Econ. Entomol. 102(1): 237-246 (2009) ; or from raw data provided by the lead author.

[8] California State Forest Assessment

[9] Leung *et al*. (2014)

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This factsheet last updated 1/22/2018