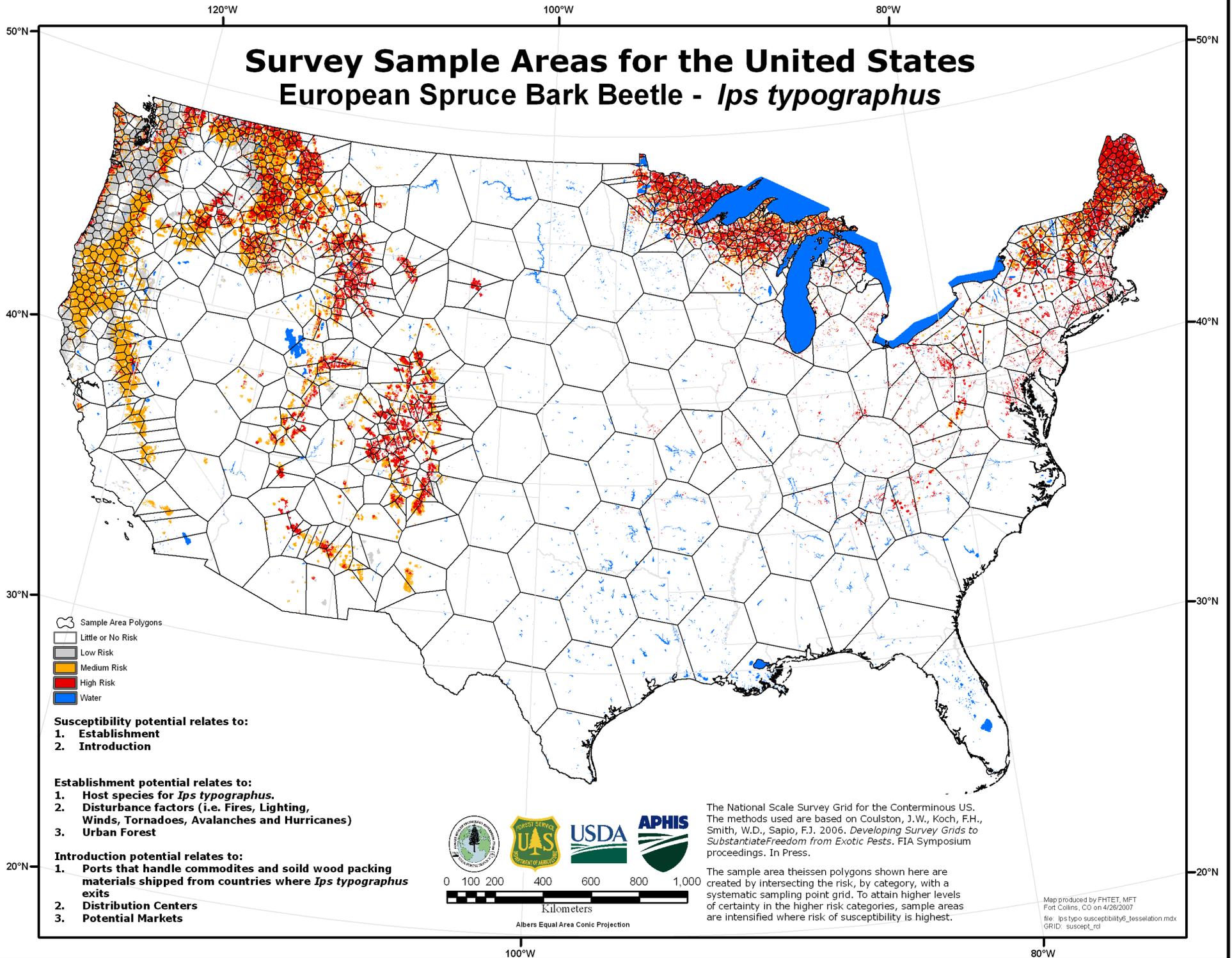# Survey Sample Areas for the United States
European Spruce Bark Beetle - *Ips typographus*

Legend:

- Sample Area Polygons
- Little or No Risk
- Low Risk
- Medium Risk
- High Risk
- Water

Susceptibility potential relates to:
1. Establishment
2. Introduction

Establishment potential relates to:
1. Host species for *Ips typographus*.
2. Disturbance factors (i.e. Fires, Lighting, Winds, Tornadoes, Avalanches and Hurricanes)
3. Urban Forest

Introduction potential relates to:
1. Ports that handle commodites and soild wood packing materials shipped from countries where *Ips typographus* exits
2. Distribution Centers
3. Potential Markets

0 100 200 400 600 800 1,000
Kilometers

Albers Equal Area Conic Projection

The National Scale Survey Grid for the Conterminous US. The methods used are based on Coulston, J.W., Koch, F.H., Smith, W.D., Sapio, F.J. 2006. *Developing Survey Grids to Substantiate Freedom from Exotic Pests*. FIA Symposium proceedings. In Press.

The sample area theissen polygons shown here are created by intersecting the risk, by category, with a systematic sampling point grid. To attain higher levels of certainty in the higher risk categories, sample areas are intensified where risk of susceptibility is highest.

Map produced by FHTET, MFT
Fort Collins, CO on 4/26/2007
file: Ips typo susceptibility6_tesselation.mdx
GRID: suscept_rcl

USDA   APHIS

Ips typographus National Scale Survey Sample Areas for the Conterminous US Summary

This project incorporates methods developed by Coulston, et. al. (2006) to develop national scale sampling areas based on the Forest Health Technology Enterprise Team (FHTET) *Ips typographus* Susceptibility Surface. The process involved:

1) reclassification of the susceptibility risk surface into four classes (0 - Little/No, 1 – Low, 2 – Medium, 3 – High);
2) estimating the intensification factor based on the required number of samples and the relative certainty for each risk category;
3) intensifying EMAP's North American hexagon to develop a systematic point grid for each risk stratum;
4) spatially intersecting the intensified point grids with the corresponding risk stratum;
5) merging each set of selected points from the stratum intersection;
6) creating the sample areas that are semi-regular tessellations of theissen polygons created from the merged grid intensification points.

For this project, the FHTET *Ips typographus* susceptibility risk surface was used and reclassed into the required four classes. A total of 1,200 sample areas were used for the intensification model. Relative certainties were assigned in order to create increasing plot intensifications for increasing risk stratum. A custom EXCEL application calculates the intensification factor and sequence number based on the number of points and desired relative certainty. The sequence for the point intensification is determined from a table supplied by the authors. Table 1 shows the risk class, area by class, and number of sample areas used for this project. The point grid intensification is based on the Environmental Monitoring and Assessment (EMAP) hexagon for the conterminous United States and is iteratively intensified using a custom ArcView 3.3 application. A new point file is created for each iterative intensification. The final intensification iterations for each class is intersected with a vector version of the susceptibility surface and merged to create a single point shape file. A sample area tessellation is then performed from the merged intensification points using a custom function in the ArcView 3.3 application that creates theissen polygons. These polygons become the sample areas, where the sample areas are based on the risk class. It is intended that each sample area polygon is given the same number of sample plots.

Citation
Coulston, John W., Koch, F.H., Smith, W.D., Sapio, F.J. 2006. *Developing Survey Grids to Substantiate Freedom from Exotic Pests*. FIA Symposium Proceedings. In Press.

Table 1. Summary Statistics

Risk Class	Relative Certainty	Area (km)	Sample Areas
Little/No (0)	0.25	6,967,330	96
Low (1)	0.4	152,453	170
Mod (2)	0.7	326,142	400
High (3)	0.8	338,740	535

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