Establishment Potential Surface for *Sirex noctilio*

Data format: Raster Dataset - ESRI GRID

File or table name: Establishment

Coordinate system: Albers Conical Equal Area

Theme keywords: Forest Pathogen, Exotic, Sirex Woodwasp, *Sirex noctilio*, Establishment

Abstract: The Establishment Potential Surface for *Sirex noctilio* was produced for the conterminous United States in 1 square kilometer (km²) units by the U.S. Forest Service, Forest Health Technology Enterprise Team's (FHTET) Invasive Species Steering Committee.

FGDC and ESRI Metadata:

Metadata elements shown with blue text are defined in the Federal Geographic Data Committee's (FGDC) *Content Standard for Digital Geospatial Metadata (CSDGM)*. Elements shown with green text are defined in the *ESRI Profile of the CSDGM.* Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog. ArcCatalog adds hints indicating which FGDC elements are mandatory; these are shown with gray text.

Identification Information:

Citation:
Citation information:
Originators: Forest Health Technology Team (FHTET) USDA Forest Service

Title:
Establishment Potential Surface for *Sirex noctilio*
***File or table name:** establishment
Tool name: Sirex_newyork

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Publication date: 5-9-2006
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Description:
Abstract:
The Establishment Potential Surface for *Sirex noctilio* was produced for the conterminous United States in 1 square kilometer (km^2) units by the U.S. Forest Service (USFS), Forest Health Technology Enterprise Team's (FHTET) Invasive Species Steering Committee; a multidisciplinary team with participation from USFS and the USDA Animal and Plant Health Inspection Service (APHIS).

Purpose:
The product's intended use in conjunction with the Introduction Potential Surface is to develop a Susceptibility Potential Surface for *Sirex noctilio*. Four primary datasets with standardized values from 0 to 10 were used as variables in the analysis. Each dataset was multiplied by its arithmetic weight and the resultant values were combined in a weighted overlay. The final Establishment Potential Surface output values also range from 0 to 10; with 10 being the highest potential of establishment.

Supplemental information:
Four primary data sets were used in the construction of the Establishment potential. These primary data sets were: Total Pine Basal Area, Soil Wetness Dryness Index, Host Species, and Urban Forest.

1) **Total Pine Basal Area**. Source: Basal Area (BA) measurements from the US Forest Service, Forest Inventory and Analysis (FIA) data. North American pine species data from FIA were used. In places where *Sirex noctilio* is currently present, dense areas are attacked while thinned areas within the same stand are not. Therefore, total BA for host species were used to assign a risk value from 0 - 10 to each 1 square km pixel.

2) **Soil Wetness Dryness Index**. Source: USDA Forest Service Forest Health Technology Enterprise Team (FHTET) Fort Collins, Colorado. The Dryness Index (DI) is a measure of the wetness of a soil. The DI is designed to parallel the amount of water that a soil contains and makes available to plants under normal climatic conditions. Maps were generated by assigning a DI value to the dominate soil series in each of the polygons comprising the State Soil Geographic (STATSGO) database. The DI

values for each soil series were determined from the taxonomic subgroup, textural family, drainage class, and slope class of every soil series (USDA Forest Service FHTET "*Mapping Risk from Forest Insects and Diseases*" (in press)). These data have values that range from 0 – 100. Where 0 is very dry, 100 is open water, values close to 50 are considered optimal with respect to soil wetness dryness.

3) **Host Species**. Source: USDA Forest Service, Forest Inventory and Analysis (FIA) data.

4) **Urban Forest**. Source: Two primary data sets were used in the construction of the Urban forest: **A)** A polygon data set from Environmental Systems Research Institute (ESRI) that depicts Cities in the United States. These City polygons were included as standard spatial data with the shipment of ArcGIS ver 9.1 in the year 2005 and **B)** National Land Cover Data (NLCD) from the USDA Natural Resources Conservation Service (NRCS). Through inspection of the USDA Plant Hardiness map coupled with minimum temperatures where host species can exist from the USDA Plants data base it was concluded that all cities in the Lower 48 States of the US could grow host species in the very high susceptible category (Appendix B). First the City polygons were converted to 1000 meter cells (CITY GRID). Next a subset forest type of the NLCD data (at 30 meter resolution) was extracted. This NLCD forest type was labeled Evergreen Forest (GRID Value 42). The NLCD Evergreen Forest type was resampled to 1000 meter cell resolution; however, the percent of cells of 30 meter NLCD Evergreen Forest that made up the entire 1000 meter cell was maintained as an attribute (NLCD Evergreen Forest GRID). Finally, the City GRID was overlain with the NLCD Evergreen Forest GRID (where the NLCD Evergreen Forest GRID has 30 percent or more Evergreen forest). These data were combined with the Host Species data using a maximum overlay process. The Urban Forest was considered to be associated with highly susceptible host species.

Data were combined using a weighted overlay process (Basal Area = 40%, Host Species = 40%, and Soil_WDI = 20%).

*__Language of dataset:__ en

__Time period of content:__
__Time period information:__
__Single date/time:__
__Calendar date:__ 5-9-2006

__Currentness reference:__
publication date

__Status:__
__Progress:__ Planned
__Maintenance and update frequency:__ As needed

__Spatial domain:__
__Bounding coordinates:__
*__West bounding coordinate:__ -128.011472
*__East bounding coordinate:__ -51.920726
*__North bounding coordinate:__ 51.656290
*__South bounding coordinate:__ 17.299188

__Local bounding coordinates:__
*__Left bounding coordinate:__ -2364065.750000
*__Right bounding coordinate:__ 3376934.254584
*__Top bounding coordinate:__ 3178151.331894
*__Bottom bounding coordinate:__ -56848.670690

__Keywords:__

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Data Quality Information:

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Attribute accuracy report:
One kilometer

Lineage:
Process step:
Process description:
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Website URL: http://www.fs.fed.us/foresthealth/technology/products.shtml

The Establishment Potential Surface for *Sirex noctilio* was produced for the conterminous United States in 1 square kilometer (km^2) units by the U.S. Forest Service, Forest Health Technology Enterprise Team's (FHTET) Invasive Species Steering Committee. The product's intended use in conjunction with the Introduction Potential Surface is to develop a Susceptibility Potential Surface for *Sirex noctilio*. Four primary datasets with standardized values from 0 to 10 were used as variables in the analysis. Each dataset was multiplied by its arithmetic weight (Table 3) and the resultant values were combined in a weighted overlay (Eastman 1999). The final Establishment Potential Surface output values also range from 0 to 10; with 10 being the highest potential of establishment.

Four Primary Data sets were used in the construction of the Establishment Potential Surface. These primary data sets were: Total Pine Basal Area, Soil Wetness Dryness Index, Host Species, and Urban Forest.

Reference

Eastman, J.R. 1999. IDRISI 32: Guide to GIS and Image Processing Volume 2. Software Manual. Worcester, MA: Clark Labs, Clark University.

1) **Total Pine Basal Area**. Source: Basal Area (BA) measurements from the US Forest Service, Forest Inventory and Analysis (FIA) data. Units are in square feet of tree basal area per acre. All North American pine species data from FIA were used to create this data set (measurement years and cycles by location can be found in Appendix A). The "Total Pine Basal Area" data set is host species total basal area. In countries where *Sirex noctilio* is present, it has been seen that dense areas within a stand have been attacked and thinned areas within the same stand have not been attacked. Therefore, total basal area was used to assign a potential of attack value to each 1 kilometer pixel as shown in Table 1.

2) **Soil Wetness Dryness Index (SOIL_WDI)**. Source: USDA Forest Service Forest Health Technology Enterprise Team (FHTET) Fort Collins, Colorado. The Dryness Index (DI) is a measure of the wetness of a soil. The DI is designed to parallel the amount of water that a soil contains and makes available to plants under normal climatic conditions. Maps were generated by assigning a DI value to the dominate soil series in each of the polygons comprising the State Soil Geographic (STATSGO) database. The DI values for each soil series were determined from the taxonomic subgroup, textural family, drainage class, and slope class of every soil series (USDA Forest Service FHTET "*Mapping Risk from Forest Insects and Diseases*" (in press)). These data have values that range from 0 – 100. Where 0 is very dry, 100 is open water, values close to 50 are considered optimal with respect to soil wetness dryness. These data were reclassed into 10 classes using Table 2.

3) **Host Species**. Source: USDA Forest Service, Forest Inventory and Analysis (FIA) data. See Appendix B for a list of the host species and their potential to establishment.

4) **Urban Forest**. Source: Two primary data sets were used in the construction of the Urban forest: **A)** A polygon data set from Environmental Systems Research Institute (ESRI) that depicts Cities in the United States. These City polygons were included as standard spatial data with the shipment of ArcGIS ver 9.1 in the year 2005 and **B)** National Land Cover Data (NLCD) from the USDA Natural Resources Conservation Service (NRCS). Through inspection of the USDA Plant Hardiness map coupled with minimum temperatures where host species can exist from the USDA Plants data base it was concluded that all cities in the Lower 48 States of the US could grow host species in the very high susceptible category (Appendix B). First the City polygons were converted to 1000 meter cells (CITY GRID). Next a subset forest type of the NLCD data (at 30 meter resolution) was extracted. This NLCD forest type was labeled Evergreen Forest (GRID Value 42). The NLCD Evergreen Forest type was resampled to 1000 meter cell resolution; however, the percent of cells of 30 meter NLCD Evergreen Forest that made up the entire 1000 meter cell was maintained as an attribute (NLCD Evergreen Forest GRID). Finally, the City GRID was overlain with the NLCD Evergreen Forest GRID (where the NLCD Evergreen Forest GRID has 30 percent or more Evergreen forest). An additional data set depicting only Monterey Pine Forest for California (South of San Francisco county and North of Monterey County approximately 100 miles inland from the coast) were included in this Urban Forest Data set. These Monterey Pine Forest are from the USDA Forest Service Remote Sensing lab in Sacramento, California. These data were combined with the Host Species data using a maximum overlay process. The Urban Forest was considered to be comprised of highly susceptible host species.

All 4 data sets were combined into a weighted overlay with weight values found in Table 3.

Table 1

Basal Area (Square Feet of Basal Area per Acre)	Rating

GT or EQ to 1 and LT 5	1
GT or EQ to 5 and LT 16	2
GT or EQ to 16 and LT 29	3
GT or EQ to 29 and LT 44	4
GT or EQ to 44 and LT 62	5
GT or EQ to 62 and LT 82	6
GT or EQ to 82 and LT 106	7
GT or EQ to 106 and LT 136	8
GT or EQ to 136 and LT 181	9
GT 181	10

Table 2

Soil Wetness Dryness Value	**Value**
0 – 5	10
6 – 10	9
11 – 15	8
16 – 20	7
21 – 25	6
26 – 30	5
31 – 35	4
36 – 40	3
41 – 45	2
46 – 50	1
51 – 55	2
56 – 60	3
61 – 65	4
66 – 70	5
71 – 75	6
76 – 80	7
81 – 85	8
86 – 90	9
91 – 95	10
96 – 100	0

Table 3

Data Set	**Weight**
Basal Area	40%
*Host Species	40%
SOIL_WDI	20%

*Urban Forest was combined into the Host Species data set. The combination process was a maximum overlay. Urban Forest is considered to contain the highest susceptible host species for *Sirex noctilio*. Therefore, the maximum overlay process accounts for the highest susceptible species in the event of a spatial coincidence with the FIA host species data and urban forest data.

With four primary data sets the pixel values were standardized using a scale from 0 – 10 and combined into the final "Establishment Potential Surface." This is accomplished by multiplying the pixel value of each dataset by an arithmetic weight assigned to the dataset then summing the results (Eastman 1999). The arithmetic weights assigned to each dataset are as follows: Basal Area = 40%, Host Species = 40% and Soil Wetness Dryness Index = 20%. Note that the sum of the weights equals 100 percent. Therefore, the final output for the Establishment Potential Surface ranges from 0 - 10 where 0 has low establishment potential and 10 has the highest establishment potential.

Appendix A FIA Measurement Year

State	Source	Measyear	FIA Cycle	Notes		
Alabama	FIA Plots	1997	7			
Alabama	FIA Plots	1998	7			
Alabama	FIA Plots	1999	7			
Alabama	FIA Plots	2000	7			
Alabama	FIA Plots	2001	7			
Arizona	FIA Plots	1984	2			
Arizona	FIA Plots	1985	2			
Arizona	FIA Plots	1990	2			
Arizona	FIA Plots	1991	2			
Arizona	FIA Plots	1995	2			
Arizona	FIA Plots	1996	2			
Arizona	FIA Plots	1997	2			
Arizona	FIA Plots	1998	2			
Arizona	FIA Plots	1999	2			
Arizona	FIA Plots	2000	2			
Arizona	FIA Plots	2001	2			
Arkansas	FIA Plots	1900	1			
Arkansas	FIA Plots	1994	1			
Arkansas	FIA Plots	1995	1			
Arkansas	FIA Plots	1996	1			
California	FIA Plots	1991	3			
California	FIA Plots	1992	3			
California	FIA Plots	1993	3			
California	FIA Plots	1994	3			
California	FIA Plots	1997	3			
California	FIA Plots	1998	3			
California	Region 5, Pacific Southwest Region Plots				1980	N/A
California	Region 5, Pacific Southwest Region Plots				1984	N/A
California	Region 5, Pacific Southwest Region Plots				1993	N/A
California	Region 5, Pacific Southwest Region Plots				1994	N/A
California	Region 5, Pacific Southwest Region Plots				1995	N/A
California	Region 5, Pacific Southwest Region Plots				1996	N/A
California	Region 5, Pacific Southwest Region Plots				1997	N/A
California	Region 5, Pacific Southwest Region Plots				1998	N/A
California	Region 5, Pacific Southwest Region Plots				1999	N/A
California	Region 5, Pacific Southwest Region Plots				2000	N/A
California	Region 5, Pacific Southwest Region Plots				1993	N/A
California	Region 5, Pacific Southwest Region Plots				1995	N/A
California	Region 5, Pacific Southwest Region Plots				1996	N/A
California	Region 5, Pacific Southwest Region Plots				1997	N/A
Colorado	FIA Plots	1979	1			
Colorado	FIA Plots	1981	1			
Colorado	FIA Plots	1982	1			
Colorado	FIA Plots	1983	1			
Colorado	FIA Plots	1984	1			
Colorado	FIA Plots	1993	1			
Colorado	FIA Plots	1997	1			
Colorado	FIA Plots	2001	1	NF Lands Only		
Colorado	FIA Plots	2002	2	NF Lands Only		
Colorado	FIA Plots	2003	2	NF Lands Only		
Connecticut	FIA Plots	1997	4			
Connecticut	FIA Plots	1998	4			
Delaware	FIA Plots	1999	4			
Florida	FIA Plots	1900	2			
Georgia	FIA Plots	1900	7			
Idaho	FIA Plots	1981	1			
Idaho	FIA Plots	1990	1			
Idaho	FIA Plots	1991	1			
Idaho	FIA Plots	1992	1			

Idaho	FIA Plots	1993	1
Idaho	FIA Plots	1994	1
Idaho	FIA Plots	1995	1
Idaho	FIA Plots	1996	1
Idaho	FIA Plots	1997	1
Idaho	FIA Plots	1998	1
Idaho	FIA Plots	1999	1
Idaho	FIA Plots	2000	1
Idaho	FIA Plots	2001	1
Idaho	FIA Plots	2002	1
Idaho	FIA Plots	2004	1
Illinois	FIA Plots	No Year Listed	4
Illinois	FIA Plots	1987	4
Illinois	FIA Plots	1996	4
Illinois	FIA Plots	1997	4
Illinois	FIA Plots	1998	4
Indiana	FIA Plots	1998	5
Indiana	FIA Plots	1999	5
Indiana	FIA Plots	2000	5
Indiana	FIA Plots	2001	5
Indiana	FIA Plots	2002	5
Indiana	FIA Plots	2003	5
Iowa	FIA Plots	1999	4
Iowa	FIA Plots	2000	4
Iowa	FIA Plots	2001	4
Iowa	FIA Plots	2002	4
Iowa	FIA Plots	2003	4
Kansas	FIA Plots	1992	4
Kansas	FIA Plots	1993	4
Kansas	FIA Plots	1994	4
Kentucky	FIA Plots	1999	4
Kentucky	FIA Plots	2000	4
Kentucky	FIA Plots	2001	4
Kentucky	FIA Plots	2002	4
Kentucky	FIA Plots	2003	4
Louisiana	FIA Plots	2000	3
Louisiana	FIA Plots	2001	3
Louisiana	FIA Plots	2002	3
Louisiana	FIA Plots	2003	3
Louisiana	FIA Plots	2004	3
Maine	FIA Plots	1999	5
Maine	FIA Plots	2000	5
Maine	FIA Plots	2001	5
Maine	FIA Plots	2002	5
Maine	FIA Plots	2003	5
Maryland	FIA Plots	1999	5
Maryland	FIA Plots	2000	5
Massachusetts	FIA Plots	1997	4
Massachusetts	FIA Plots	1998	4
Michigan	FIA Plots	2000	6
Michigan	FIA Plots	2001	6
Michigan	FIA Plots	2002	6
Michigan	FIA Plots	2003	6
Minnesota	FIA Plots	1982	5
Minnesota	FIA Plots	1984	5
Minnesota	FIA Plots	1986	5
Minnesota	FIA Plots	1987	5
Minnesota	FIA Plots	1988	5
Minnesota	FIA Plots	1989	5
Minnesota	FIA Plots	1990	5
Minnesota	FIA Plots	1991	5
Mississippi	FIA Plots	1900	1
Mississippi	FIA Plots	1992	1

Mississippi	FIA Plots	1993	1
Mississippi	FIA Plots	1994	1
Missouri	FIA Plots	1998	5
Missouri	FIA Plots	1999	5
Missouri	FIA Plots	2000	5
Missouri	FIA Plots	2001	5
Missouri	FIA Plots	2002	5
Missouri	FIA Plots	2003	5
Montana	FIA Plots	1988	1
Montana	FIA Plots	1989	1
Montana	FIA Plots	1990	1
Montana	FIA Plots	1993	1
Montana	FIA Plots	1994	1
Montana	FIA Plots	1995	1
Montana	FIA Plots	1996	1
Montana	FIA Plots	1997	1
Montana	FIA Plots	1998	1
Montana	FIA Plots	1999	1
Montana	FIA Plots	2000	1
Montana	FIA Plots	2001	1
Nebraska	FIA Plots	2001	4
Nebraska	FIA Plots	2002	4
Nebraska	FIA Plots	2003	4
Nebraska	FIA Plots	2004	4
Nevada	FIA Plots	1978	1
Nevada	FIA Plots	1979	1
Nevada	FIA Plots	1980	1
Nevada	FIA Plots	1981	1
Nevada	FIA Plots	1982	1
Nevada	FIA Plots	1994	1
Nevada	FIA Plots	1995	1
Nevada	FIA Plots	1996	1
Nevada	FIA Plots	1997	1
New Hampshire	FIA Plots	1996	5
New Hampshire	FIA Plots	1997	5
New Jersey	FIA Plots	1998	4
New Jersey	FIA Plots	1999	4
New Mexico	FIA Plots	1986	2
New Mexico	FIA Plots	1987	2
New Mexico	FIA Plots	1993	2
New Mexico	FIA Plots	1994	2
New Mexico	FIA Plots	1996	2
New Mexico	FIA Plots	1997	2
New Mexico	FIA Plots	1998	2
New Mexico	FIA Plots	1999	2
New Mexico	FIA Plots	2000	2
New Mexico	FIA Plots	2001	2
New York	FIA Plots	1991	4
New York	FIA Plots	1992	4
New York	FIA Plots	1993	4
New York	FIA Plots	1994	4
North Carolina	FIA Plots	1998	3
North Carolina	FIA Plots	1999	3
North Carolina	FIA Plots	2000	3
North Carolina	FIA Plots	2001	3
North Carolina	FIA Plots	2002	3
North Dakota	FIA Plots	1992	3
North Dakota	FIA Plots	1994	3
Ohio	FIA Plots	1990	4
Ohio	FIA Plots	1991	4
Ohio	FIA Plots	1992	4
Oklahoma	FIA Plots	1900	1
Oklahoma	FIA Plots	1988	1

Oklahoma	FIA Plots	1989	1	
Oklahoma	FIA Plots	1990	1	
Oklahoma	FIA Plots	1992	1	
Oregon	FIA Plots	No Year Listed	4	
Oregon	FIA Plots	1995	4	
Oregon	FIA Plots	1996	4	
Oregon	FIA Plots	1997	4	
Oregon	FIA Plots	1998	4	
Oregon	FIA Plots	1999	4	
Oregon	Bureau of Land Management Western Oregon Plots	1997	N/A	
Oregon	Region 6, Pacific Northwest Region Plots	1993	N/A	
Oregon	Region 6, Pacific Northwest Region Plots	1994	N/A	
Oregon	Region 6, Pacific Northwest Region Plots	1995	N/A	
Oregon	Region 6, Pacific Northwest Region Plots	1996	N/A	
Oregon	Region 6, Pacific Northwest Region Plots	1997	N/A	
Pennsylvania	FIA Plots	2000	5	
Pennsylvania	FIA Plots	2001	5	
Pennsylvania	FIA Plots	2002	5	
Pennsylvania	FIA Plots	2003	5	
Rhode Island	FIA Plots	1998	4	
South Carolina	FIA Plots	1998	3	
South Carolina	FIA Plots	1999	3	
South Carolina	FIA Plots	2000	3	
South Carolina	FIA Plots	2001	3	
South Carolina	FIA Plots	2002	3	
South Dakota	FIA Plots	No Year Listed	4	
South Dakota	FIA Plots	1900	4	
South Dakota	FIA Plots	1994	4	
South Dakota	FIA Plots	1995	4	
South Dakota	FIA Plots	1996	4	
South Dakota	FIA Plots	1999	4	
Tennessee	FIA Plots	1900	6	
Tennessee	FIA Plots	1996	6	
Tennessee	FIA Plots	1997	6	
Tennessee	FIA Plots	1998	6	
Tennessee	FIA Plots	1999	6	
Texas	FIA Plots	2001	3	
Texas	FIA Plots	2002	3	
Texas	FIA Plots	2003	3	
Utah	FIA Plots	1988	1	
Utah	FIA Plots	1991	1	
Utah	FIA Plots	1992	1	
Utah	FIA Plots	1993	1	
Utah	FIA Plots	1994	1	
Utah	FIA Plots	1995	1	
Utah	FIA Plots	1996	1	
Vermont	FIA Plots	1996	5	
Vermont	FIA Plots	1997	5	
Vermont	FIA Plots	1998	5	
Virginia	FIA Plots	1997	3	
Virginia	FIA Plots	1998	3	
Virginia	FIA Plots	1999	3	
Virginia	FIA Plots	2000	3	
Virginia	FIA Plots	2001	3	
Virginia	FIA Plots	2002	3	
Washington	FIA Plots	1988	3	
Washington	FIA Plots	1989	3	
Washington	FIA Plots	1990	3	
Washington	FIA Plots	1991	3	
Washington	FIA Plots	1998	3	
Washington	Region 6, Pacific Northwest Region Plots	1993	N/A	
Washington	Region 6, Pacific Northwest Region Plots	1994	N/A	
Washington	Region 6, Pacific Northwest Region Plots	1995	N/A	

Washington	Region 6, Pacific Northwest Region Plots	1996	N/A
Washington	Region 6, Pacific Northwest Region Plots	1997	N/A
West Virginia	FIA Plots	1999	5
West Virginia	FIA Plots	2000	5
West Virginia	FIA Plots	2001	5
West Virginia	FIA Plots	2002	5
Wisconsin	FIA Plots	1999	6
Wisconsin	FIA Plots	2000	6
Wisconsin	FIA Plots	2001	6
Wisconsin	FIA Plots	2002	6
Wisconsin	FIA Plots	2003	6
Wyoming	FIA Plots	1998	2
Wyoming	FIA Plots	1999	2
Wyoming	FIA Plots	2000	2
Wyoming	FIA Plots	2001	2
Wyoming	FIA Plots	2002	2
Wyoming	FIA Plots	2004	2

Appendix B: Host Species

FIA Code	Common Name	Genus	Species	Potential
124	Monterey pine	*Pinus*	*radiata*	Very High
130	Scotch pine	*Pinus*	*sylvestris*	Very High
131	loblolly pine	*Pinus*	*taeda*	Very High
136	Austrian pine	*Pinus*	*nigra*	Very High
105	jack pine	*Pinus*	*banksiana*	High
108	lodgepole pine	*Pinus*	*contorta*	High
110	shortleaf pine	*Pinus*	*echinata*	High
111	slash pine	*Pinus*	*elliottii*	High
116	Jeffrey pine	*Pinus*	*jeffreyi*	High
122	ponderosa pine	*Pinus*	*ponderosa*	High
125	red pine	*Pinus*	*resinosa*	High
132	Virginia pine	*Pinus*	*virginiana*	High
103	knobcone pine	*Pinus*	*attenuata*	Medium
107	sand pine	*Pinus*	*clausa*	Medium
112	Apache pine	*Pinus*	*engelmannii*	Medium
115	spruce pine	*Pinus*	*glabra*	Medium
120	bishop pine	*Pinus*	*muricata*	Medium
121	longleaf pine	*Pinus*	*palustris*	Medium
123	Table Mountain pine	*Pinus*	*pungens*	Medium
126	pitch pine	*Pinus*	*rigida*	Medium
128	pond pine	*Pinus*	*serotina*	Medium
135	Arizona pine	*Pinus*	*arizonica*	Medium
137	Washoe pine	*Pinus*	*washoensis*	Medium
101	whitebark pine	*Pinus*	*albicaulis*	Low
102	bristlecone pine	*Pinus*	*aristata*	Low
104	foxtail pine	*Pinus*	*balfouriana*	Low
106	common pinyon	*Pinus*	*edulis*	Low
109	Coulter pine	*Pinus*	*coulteri*	Low
113	limber pine	*Pinus*	*flexilis*	Low
114	southwestern white pine	*Pinus*	*strobiformus*	Low
117	sugar pine	*Pinus*	*lambertiana*	Low
118	Chihuahua pine	*Pinus*	*leiophylla* var. *chihuahuana*	Low
119	western white pine	*Pinus*	*monticola*	Low
127	gray pine	*Pinus*	*sabiniana*	Low
129	eastern white pine	*Pinus*	*strobus*	Low
133	singleleaf pinyon	*Pinus*	*monophylla*	Low
134	border pinyon	*Pinus*	*discolor*	Low
138	four-needle pinyon	*Pinus*	*quadrifolia*	Low
139	Torrey pine	*Pinus*	*torreyana*	Low
140	Mexican pinyon pine	*Pinus*	*cembroides*	Low
142	Great Basin bristlecone pine	*Pinus*	*longaeva*	Low

143 Arizona pinyon pine *Pinus monophylla* var. *fallax* Low

Note: Introduction Potential Surface and the Establishment Potential Surface = Susceptibility Potential Surface

Reference
Eastman, J.R. 1999. IDRISI 32: Guide to GIS and Image Processing Volume 2. Software Manual. Worcester, MA: Clark Labs, Clark University.

Process software and version: ArcGIS ver 9.1, Spatial Analyst and Model Builder
Process date: 4-28-2006
Tool name: Sirex_newyork

Model Name: Sirex_fin

Process contact:
Contact information:
Contact organization primary:
Contact person: Marla C. Downing
Contact organization: Forest Health Technology Enterprise Team (FHTET) USDA Forest Service
Contact position: FHTET Lead, Biological Scientist

Contact address:
Address type: mailing and physical address
Address:
2150 Centre Avenue, Bldg A, Suite 331
City: Fort Collins
State or province: Colorado
Postal code: 80526-1891
Country: USA

Contact voice telephone: 970-295-5843

Contact electronic mail address: mdowning@fs.fed.us

Hours of service: 9:00 AM - 5:00 PM MT

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Spatial Data Organization Information:

***Direct spatial reference method:** Raster

Raster object information:
***Image format:** ESRI GRID
***Number of bands:** 1

*Row count: 3235
*Column count: 5741
*Vertical count: 1

Cell size X direction: 1000
Cell size Y direction: 1000

*Bits per pixel: 8
*Pyramid layers: FALSE
*Image colormap: FALSE
*Compression type: Default

*Raster object type: Grid Cell
*Raster display type: matrix values
*Raster origin: Upper Left

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Spatial Reference Information:

Horizontal coordinate system definition:
Coordinate system name:
*Projected coordinate system name: NAD_1983_Albers
*Geographic coordinate system name: GCS_North_American_1983

Planar:
Map projection:
*Map projection name: Albers Conical Equal Area
Albers conical equal area:
*Standard parallel: 29.500000
*Standard parallel: 45.500000
*Longitude of central meridian: -96.000000
*Latitude of projection origin: 23.000000
*False easting: 0.000000
*False northing: 0.000000

Planar coordinate information:
*Planar coordinate encoding method: row and column
Coordinate representation:
*Abscissa resolution: 1000
*Ordinate resolution: 1000
*Planar distance units: meters

Geodetic model:
*Horizontal datum name: North American Datum of 1983
*Ellipsoid name: Geodetic Reference System 80
*Semi-major axis: 6378137.000000
*Denominator of flattening ratio: 298.257222

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Entity and Attribute Information:

Detailed description:
*__Name:__ establishment

Entity type:
*__Entity type label:__ establishment
*__Entity type type:__ Table
*__Entity type count:__ 10
Entity type definition:
Establishment Potential Surface for *Sirex noctilio*

Attribute:
*__Attribute label:__ ObjectID
*__Attribute alias:__ ObjectID
*__Attribute definition:__
Internal feature number.
*__Attribute definition source:__
ESRI

*__Attribute type:__ OID
*__Attribute width:__ 4
*__Attribute precision:__ 0
*__Attribute scale:__ 0

Attribute domain values:
*__Unrepresentable domain:__
Sequential unique whole numbers that are automatically generated.

Attribute measurement frequency:
Unknown

Attribute:
*__Attribute label:__ Value
*__Attribute alias:__ Value
Attribute definition:
Integer Value from 0 - 10 where 0 equals low potential for establishment and 10 equals extremely high potential for establishment.

*__Attribute type:__ Integer
*__Attribute width:__ 0
*__Attribute precision:__ 0
*__Attribute scale:__ 0

Attribute value accuracy information:
Attribute value accuracy: As Reported

Attribute measurement frequency:
As needed

Attribute:
*__Attribute label:__ Count
*__Attribute alias:__ Count
Attribute definition:
The frequency of 1000 by 1000 meter GRID cells

Attribute definition source:
ESRI

***Attribute type:** Double
***Attribute width:** 0
***Attribute precision:** 0
***Attribute scale:** 0

Attribute measurement frequency:
As needed

Overview description:
Dataset overview:
The Establishment Potential Surface for *Sirex noctilio* was produced for the conterminous United States in 1 square kilometer (km^2) units by the U.S. Forest Service, Forest Health Technology Enterprise Team's (FHTET) Invasive Species Steering Committee. The product's intended use in conjunction with the Introduction Potential Surface is to develop a Susceptibility Potential Surface for *Sirex noctilio*. Four primary datasets with standardized values from 0 to 10 were used as variables in the analysis. Each dataset was multiplied by its arithmetic weight and the resultant values were combined in a weighted overlay (Eastman 1999). The final Establishment Potential Surface output values also range from 0 to 10; with 10 being the highest potential of establishment.

Reference
Eastman, J.R. 1999. IDRISI 32: Guide to GIS and Image Processing Volume 2. Software Manual. Worcester, MA: Clark Labs, Clark University.

Total Pine Basal Area. Source: Basal Area (BA) measurements from the US Forest Service, Forest Inventory and Analysis (FIA) data. North American pine species data from FIA were used (See Appendix A for measurement years). In places where *Sirex noctilio* is currently present, dense areas are attacked while thinned areas within the same stand are not. Therefore, total BA was used to assign a risk value from 0 – 10 to each 1 km pixel.

Host Species. Source: Species occurrence from the FIA data. Each species will undergo different levels of susceptibility from a *Sirex noctilio* attack. Susceptibility values were assigned to each species (e.g. very high, high, medium, and low) (Appendix B).
*Urban forest was added to these data as a very high susceptible host.

Soil Wetness Dryness Index (SOIL_WDI). The Dryness Index (DI) values for each soil series were determined from the taxonomic subgroup, textural family, drainage class, and slope class of every soil series (USDA Forest Service FHTET "*Mapping Risk from Forest Insects and Diseases*" (in press)). These data have values that range from 0 – 100. Where 0 is very dry, 100 is open water, values close to 50 are considered optimal with respect to soil wetness dryness. These data were reclassed into 10 classes using Table 3.

*Urban Forest is the result of the coincidence of urban areas and NLCD Evergreen Forest. These data were classified as highly susceptible host and combined into the Host Species data set using a maximum overlay process.

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Distribution Information:

Resource description: Downloadable Data

Standard order process:
Digital form:
Digital transfer information:
*__Transfer size:__ 2.039
*__Dataset size:__ 2.039

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Metadata Reference Information:

*__Metadata date:__ 20060509
Metadata review date: 20060509

*__Language of metadata:__ en

Metadata contact:
Contact information:
Contact organization primary:
Contact person: Marla C. Downing
Contact organization: Forest Health Technology Enterprise Team (FHTET) USDA Forest Service
Contact position: FHTET, Lead and Biological Scientist

Contact address:
Address type: mailing and physical address
Address:
2150 Centre Avenue, Bldg A, Suite 331
City: Fort Collins
State or province: Colorado
Postal code: 80526-1891
Country: USA

Contact voice telephone: 970-295-5843

Contact electronic mail address: mdowning@fs.fed.us

Hours of service: 9:00 AM - 5:00 PM MT

*__Metadata standard name:__ FGDC Content Standards for Digital Geospatial Metadata
*__Metadata standard version:__ FGDC-STD-001-1998
*__Metadata time convention:__ local time

Metadata security information:
Metadata security classification: Unclassified

Metadata extensions:
*__Online linkage:__ http://www.esri.com/metadata/esriprof80.html
*__Profile name:__ ESRI Metadata Profile

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