

Invasive plant data collection by NRS Forest Inventory and Analysis

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Importance

Another threat is from the spread of invasive species. These are species that evolved in one place and wound up in another, where the ecological controls they evolved with are missing. They take advantage of their new surroundings to crowd out or kill off native species, destroying habitat for native wildlife. ...—at a cost that is in the billions.

Four Threats to the Nation's Forests and Grasslands

Forest Service Chief Dale Bosworth

Idaho Environmental Forum

Boise, Idaho—January 16, 2004

<http://fsweb.wo.fs.fed.us/pao/four-threats/>

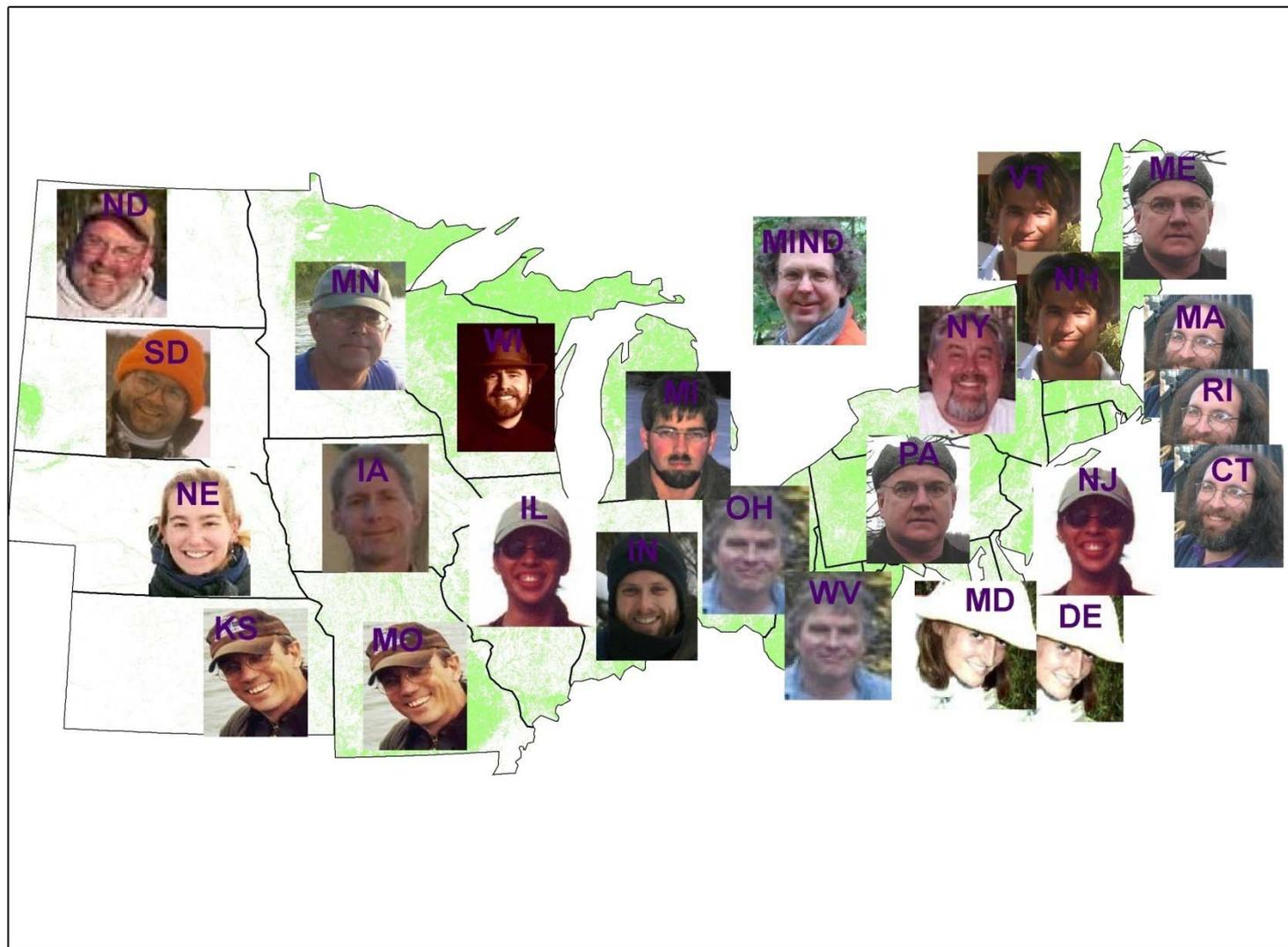
Introduction

- The impact of non-native invasive plants may be known at the local level but their abundance, regional impact, range, and rate of spread are not well known.
- Collect information on non-native invasive plant species.

Methodology

- FIA design
- NNIS sampling scheme
- The species of interest

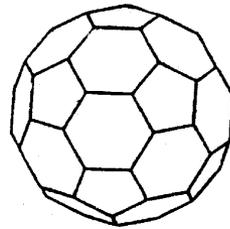
Northern Research Station FIA



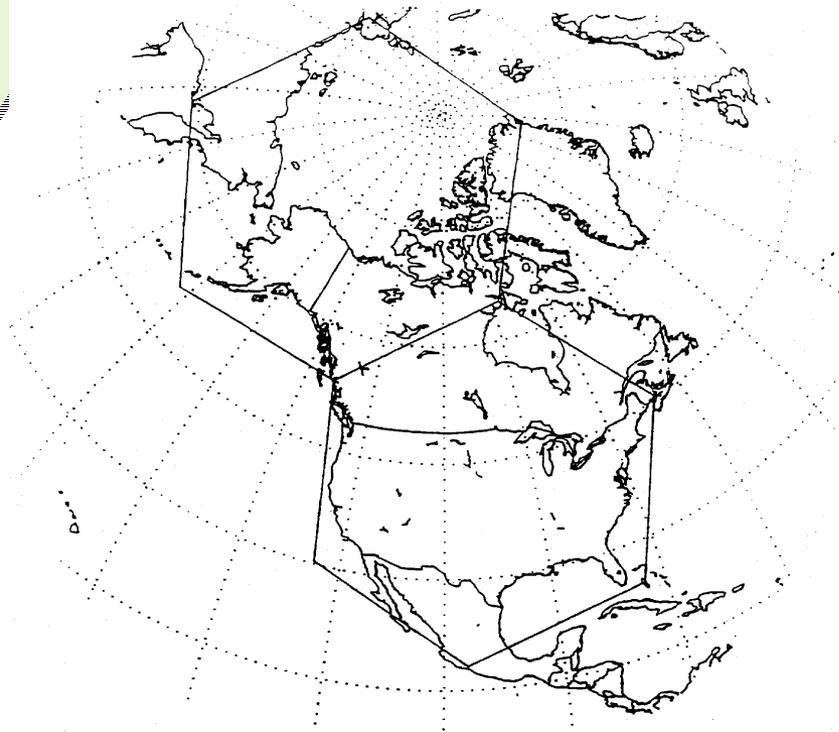
FIA: A three-phase inventory

- **Phase 1:** (Remote sensing)
 - Obtain initial plot land cover observations
 - Stratify land areas to increasing precision of estimates
- **Phase 2:** (Field data)
 - Accessible forest land
 - Traditional mensurational variables
- **Phase 3:** (Forest Health)
 - Additional variables (Soils, DWM, Veg, Lichens, etc.)
 - 1/16th of Phase 2 plots during summer growing season

Pre-field: sampling design



Truncated Icosahedron



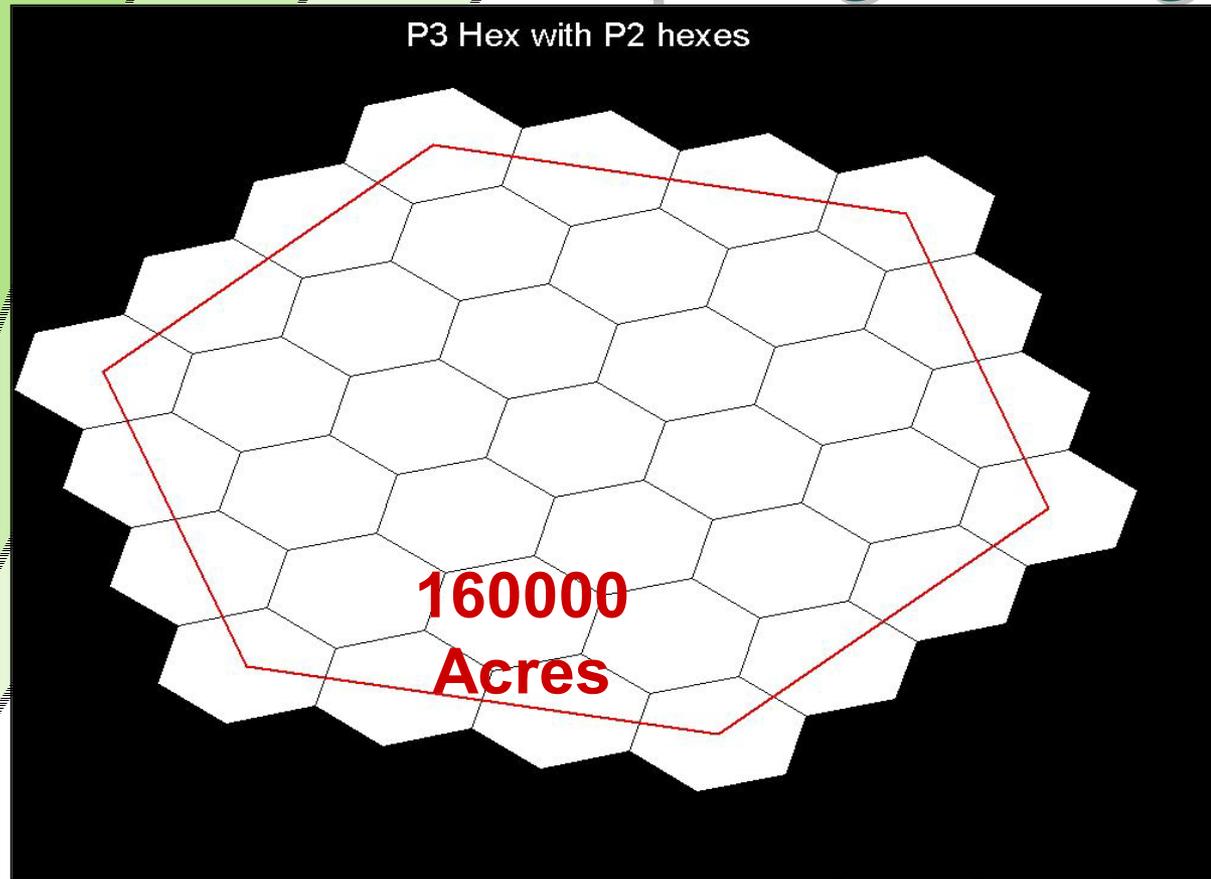
Hexagons of the truncated icosahedron covering North America.

The basis for locating P2 and P3 plots is the EPA Environmental Monitoring and Assessment Program (EMAP) soccer ball view of the world. We are interested in the hexagon covering the conterminous US.

Pre-field: sampling design

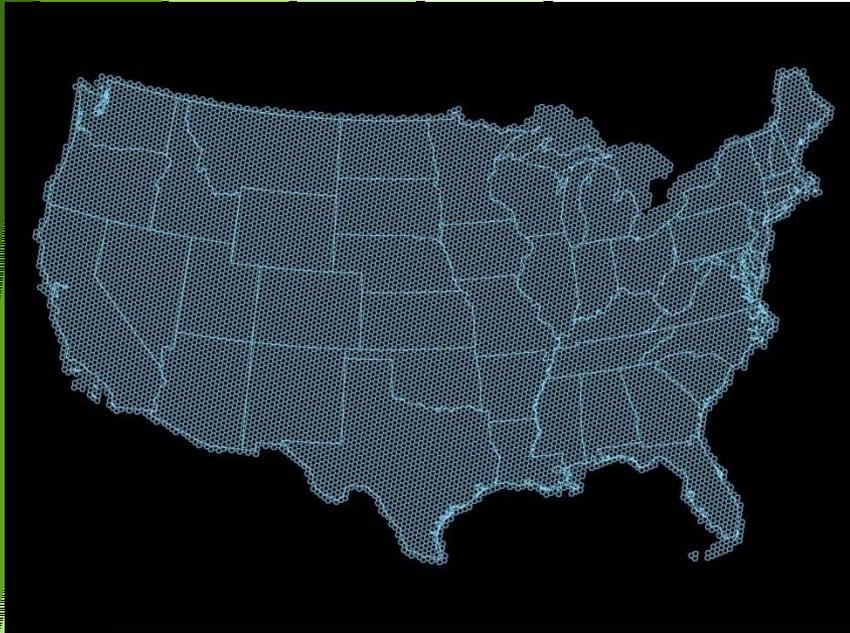
FHM

FIA

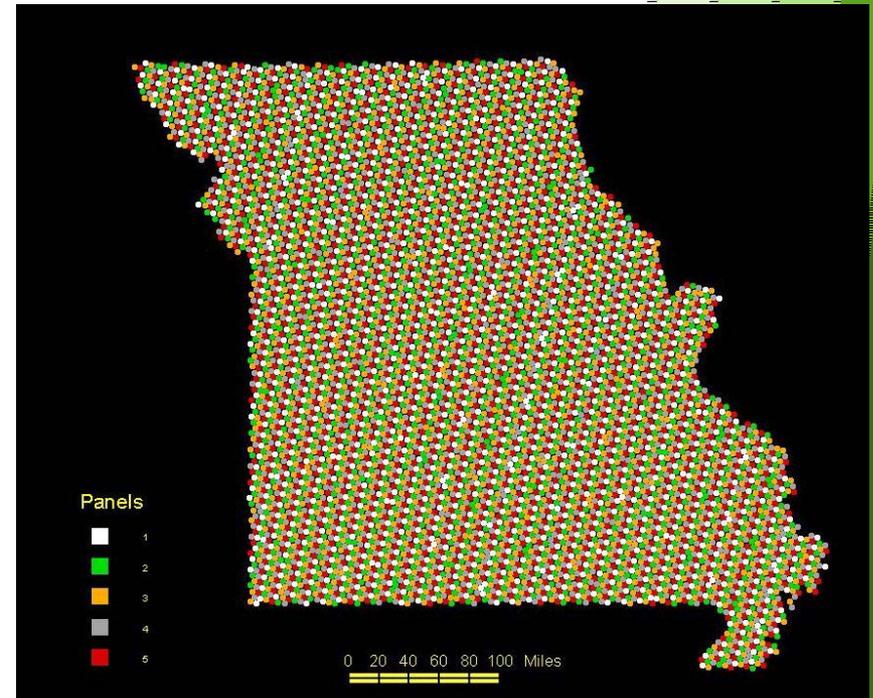


The US hexagon was divided into hexagons of about 64,800 hectares (160,000 acres) in size for FHM sampling. These in turn received a 27 factor enhancement to produce hexagons for FIA sampling. Upon integration of the FHM and FIA programs, the sampling intensity of the FHM plots was increased to about 1 for every 16 FIA plots. The two types of plots are now called phase 3 or P3 and phase 2 or P2 respectively. One P2 plot is located in each FIA hexagon except in states where partners have chosen to pay for intensification.

Phase 3 (FHM) hexagons and Missouri Phase 2 hexagons



P-3 hex = 96,000 ac (38,700 ha)

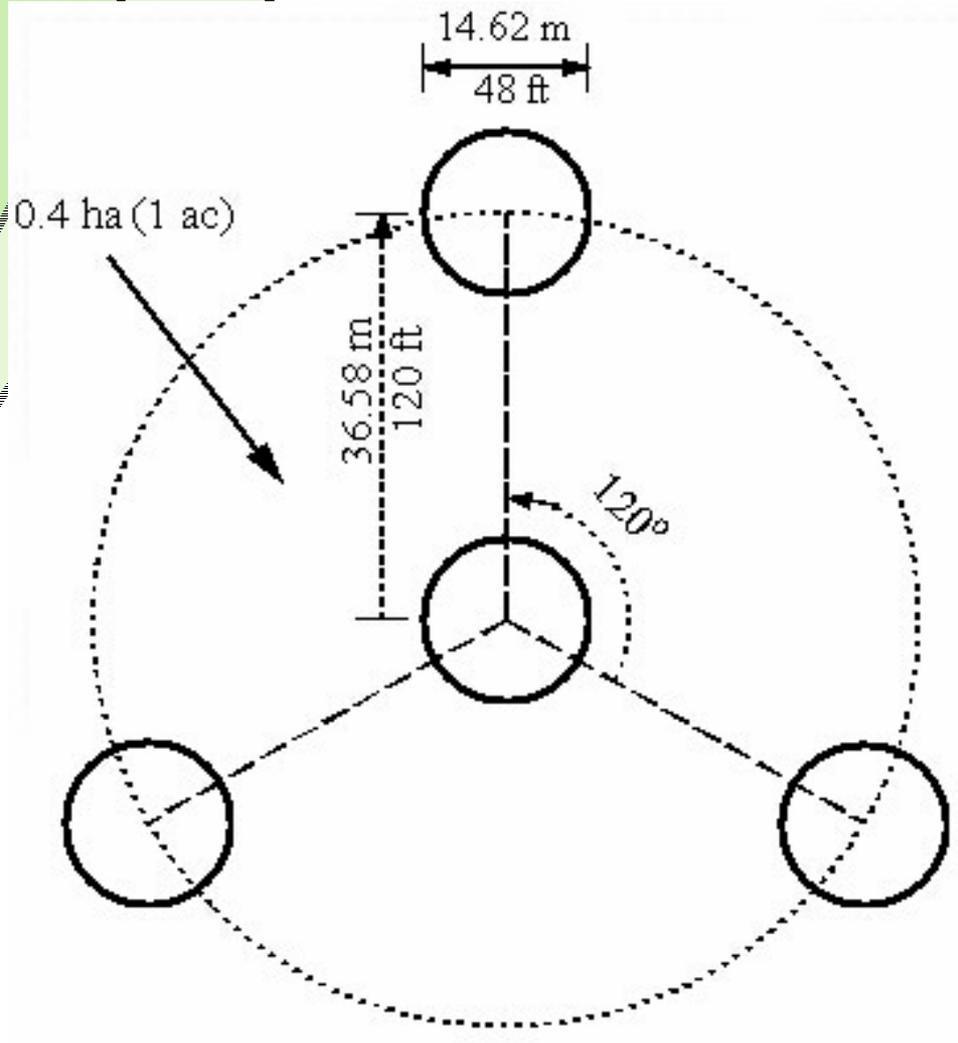


P-2 hex = 6,000 ac (2,400 ha)

FIA Plot Layout

- The standard FIA plots measured here are clusters of 4 points arranged such that point 1 is central, with points 2-4 located 36.58 m from point 1 at azimuths of 0, 120, and 240 degrees.
- Each point in the cluster is surrounded by a 7.32-m fixed-radius subplot where trees 12.7 cm diameter and larger were measured. The combined sample area of the 4 subplots is .0672 ha.
- Each subplot contains a 2.07-m fixed-radius microplot where trees 2.54-12.45 cm in diameter was measured. All 4 microplots total .00540 ha. Microplots are offset from subplot centers 3.66 m at an azimuth of 90 degrees.

FIA Phase 2 plot design



Uses of the Data

- **Core Reporting**
 - **Report on Forest Resources**
 - State or regional level
 - National Forest or other administrative units
 - **Report on the Use/Importance of Forest Resources**
 - Timber products output/pulpwood surveys
 - Woodland owner survey
 - **Report on Special or Unique Situations**
 - Birch bark, maple syrup, balsam bough production
- **Value-added Research**
 - Stratification and Sampling Techniques
 - National Mapping
 - Phase 3 Analyses
 - Invasives
 - Forest Health/Diversity
 - SpaRRS
 - Wildfire Probability

NNIS Sampling

- **FY 2005 and 2006**
 - 100 percent of P-2 plots in 11 Midwestern States
- **FY 2007 and beyond**
 - Reduced sample of P-2 plots (~20%) throughout all 24 states of Northern Station FIA
 - Re-establishment of P-3 vegetation plots throughout Northern Station

NNIS of interest 2005-6

Multiflora rose	<i>Rosa multiflora</i>	Common burdock	<i>Arctium minus</i>
Japanese barberry	<i>Berberis thunbergii</i>	Japanese knotweed	<i>Polygonum cuspidatum</i>
Common buckthorn	<i>Rhamnus cathartica</i>	Marsh thistle	<i>Cirsium palustre</i>
Glossy buckthorn	<i>Frangula alnus</i>	Kudzu	<i>Pueraria montana</i>
Autumn olive	<i>Elaeagnus umbellata</i>	Porcelain berry	<i>Ampelopsis brevipedunculata</i>
Non-native bush honeysuckles	<i>Lonicera</i> spp.	Asian bittersweet	<i>Celastrus orbiculatus</i>
European privet	<i>Ligustrum vulgare</i>	Japanese honeysuckle	<i>Lonicera japonica</i>
Garlic mustard	<i>Alliaria petiolata</i>	Chinese yam	<i>Dioscorea oppositifolia</i>
Leafy spurge	<i>Euphorbia esula</i>	Black swallowwort	<i>Cynanchum louiseae</i>
Spotted knapweed	<i>Centaurea biebersteinii</i>	Wintercreeper	<i>Euonymus fortunei</i>
Dame's rocket	<i>Hesperis matronalis</i>	Reed canary grass	<i>Phalaris arundinacea</i>
Mile-a-minute weed, Asiatic tearthumb	<i>Polygonum perfoliatum</i>	Phragmites, Common reed	<i>Phragmites australis</i>
		Nepalese browntop, Japanese stiltgrass	<i>Microstegium vimineum</i>

Tree Species 2007+

- *Acer platanoides* (Norway maple)
- *Ailanthus altissima* (tree-of-heaven)
- *Albizia julibrissin* (silktree)
- *Elaeagnus angustifolia* (Russian olive)
- *Melaleuca quinquenervia* (punktree)
- *Melia azedarach* (Chinaberry)
- *Paulownia tomentosa* (princesstree)
- *Robinia pseudoacacia* (black locust)
- *Tamarix ramosissima* (saltcedar)
- *Triadica sebifera* (tallow tree)
- *Ulmus pumila* (Siberian elm)

Woody Species 2007+

- ***Berberis thunbergii* (Japanese barberry)**
- *Berberis vulgaris* (common barberry)
- ***Elaeagnus umbellata* (Autumn-olive)**
- ***Frangula alnus* (Glossy buckthorn)**
- ***Ligustrum vulgare* (European privet)**
- *Lonicera x.bella* (showy fly honeysuckle)
- ***Lonicera maackii* (Amur honeysuckle)**
- ***Lonicera morrowii* (Morrow's honeysuckle)**
- *Lonicera tatarica* (Tatarian bush honeysuckle)
- ***Rhamnus cathartica* (Common buckthorn)**
- ***Rosa multiflora* (Multiflora rose)**
- *Spiraea japonica* (Japanese meadowsweet)
- *Viburnum opulus* (European cranberrybush)

Herbaceous 2007+

- ***Alliaria petiolata* (Garlic mustard)**
- ***Centaurea biebersteinii* (Spotted knapweed)**
- ***Cirsium arvense* (Canada thistle)**
- *Cirsium vulgare* (bull thistle)
- ***Cynanchum louiseae* (black swallow-wort)**
- *Cynanchum rossicum* (European swallow-wort)
- ***Euphorbia esula* (Leafy spurge)**
- ***Hesperis matronalis* (Dame's rocket)**
- *Lysimachia nummularia* (creeping jenny)
- ***Lythrum salicaria* (purple loosestrife)**
- ***Polygonum cuspidatum* (Japanese knotweed)**
- *Polygonum x.bohemicum* (*P. cuspidatum*/*P. sachalinense* hybrid)
- *Polygonum sachalinense* (giant knotweed)

Vines and Grasses 2007+

- **Vine Species**

- ***Celastrus orbiculatus* (Asian bittersweet)**
- *Hedera helix* (English ivy)
- ***Lonicera japonica* (Japanese honeysuckle)**

- **Grass Species**

- ***Microstegium vimineum* (Japanese stiltgrass)**
- ***Phalaris arundinaceae* (Reed canary grass)**
- ***Phragmites australis* (Common reed)**

Percent Plant Cover

- Only on the forested subplots or forested portions of a subplot.

2005-6

- Record the code that best describes the plant cover.
- In winter, treat plants as if in a leaf-on condition.

2007+

- Actual percentage

2005-6 classes

“1” = <1%, trace

“2” = 1 to 5%

“3” = 6 to 10%

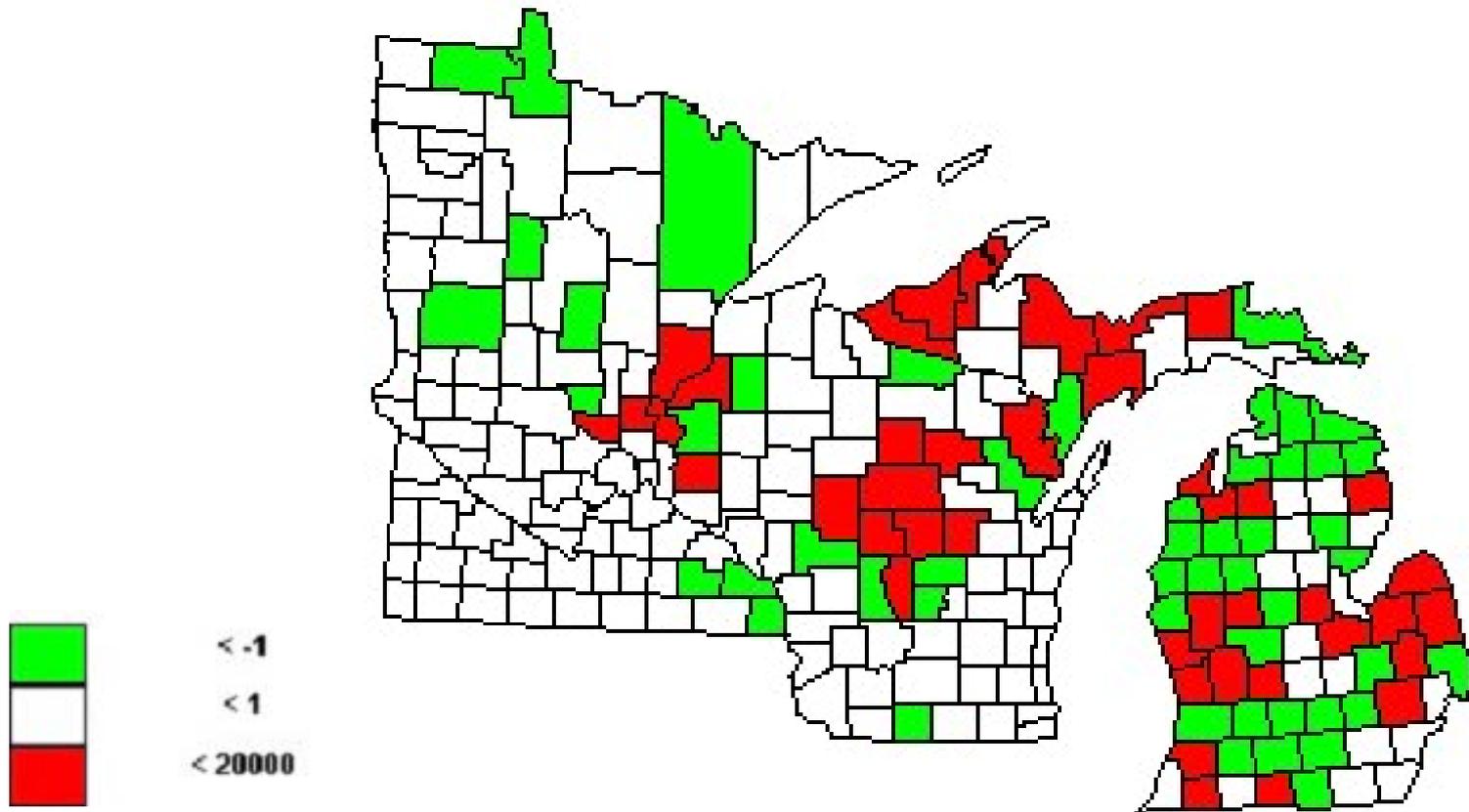
“4” = 11 to 25%

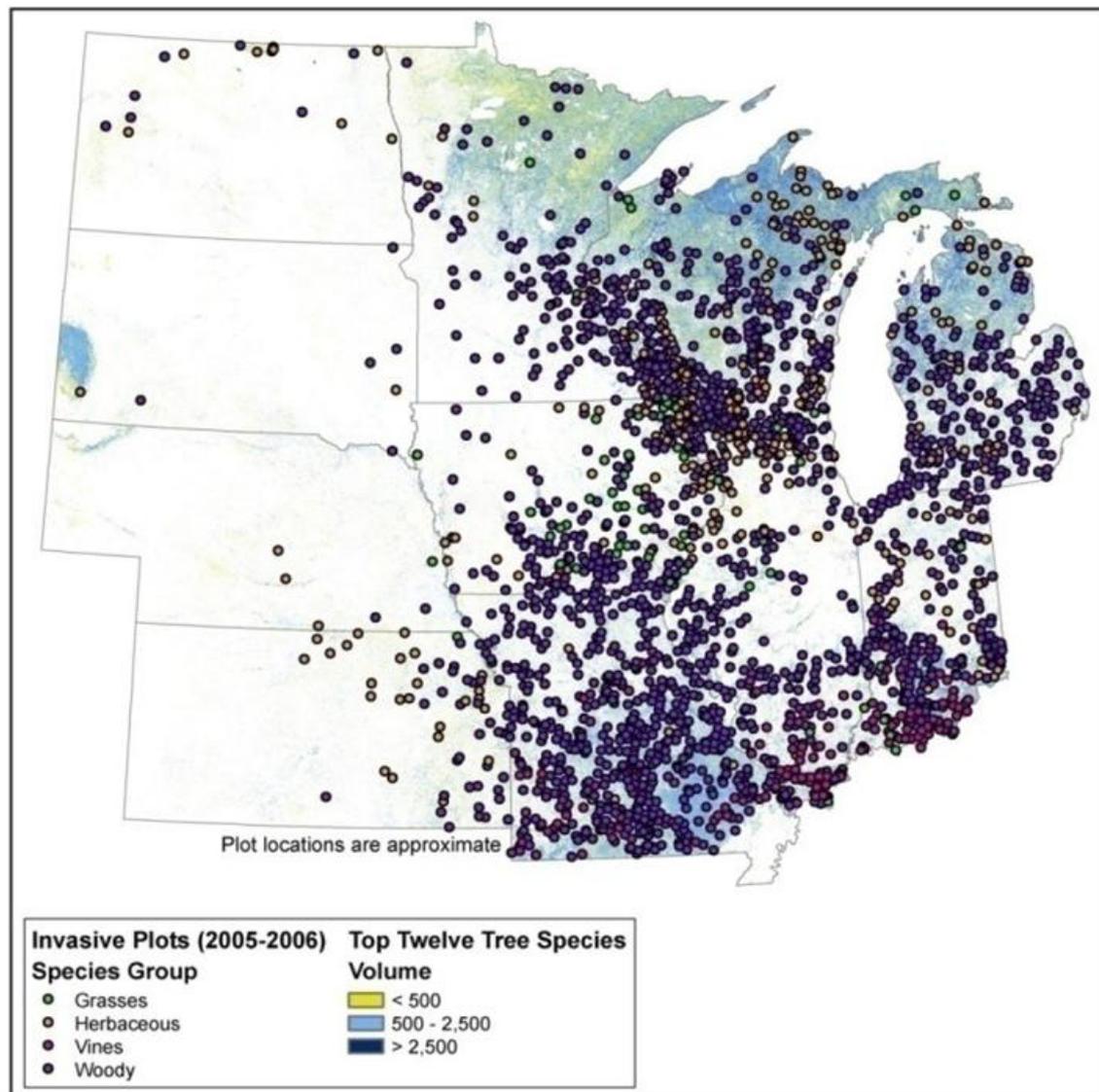
“5” = 26 to 50%

“6” = 51 to 75%

“7” = 76 to
100%

Change in Lake States timberland with Scotch Pine – 1990 to 2000





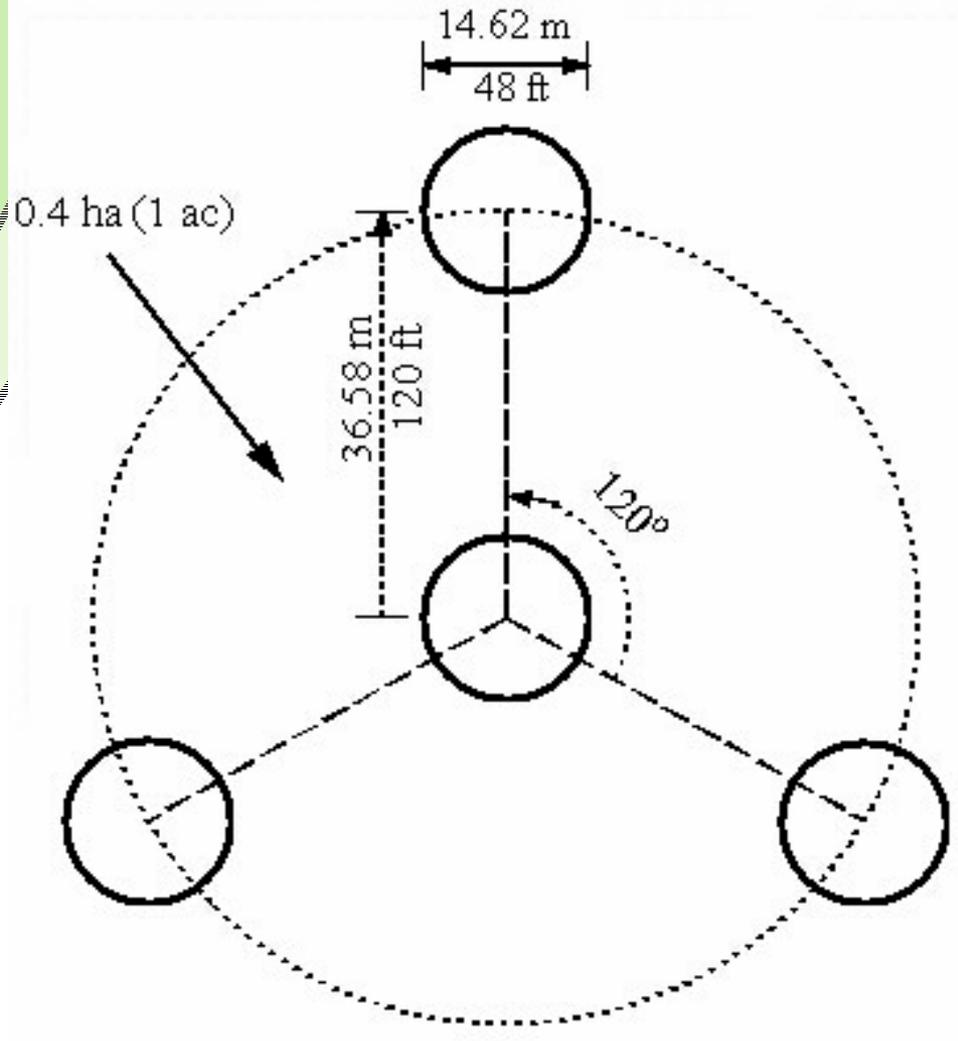
Example of P-2 NNIP Data Analysis

Distribution of plots with invasives in the Upper Midwest, by life form in 2005-2006.

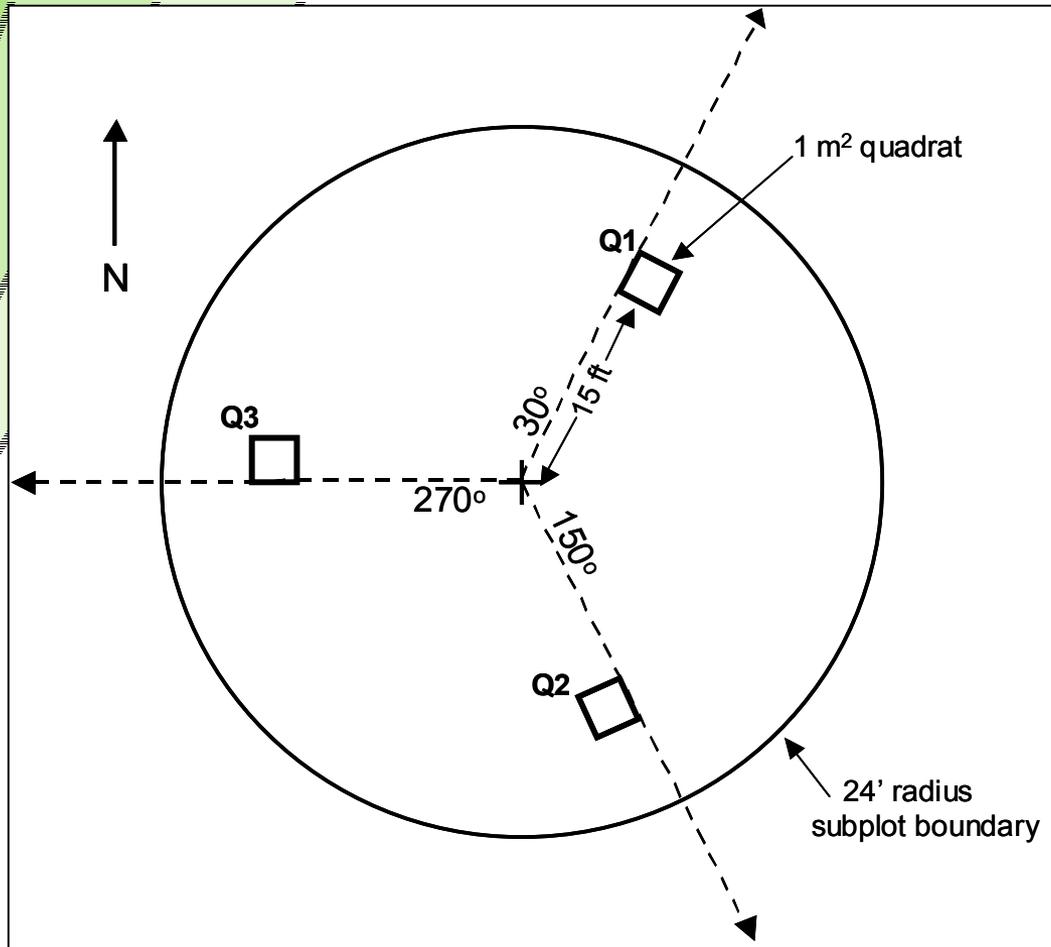
Phase 3 Vegetation

- **1/16th intensity**
- **All vegetation, not just exotic invasives**

FIA Phase 2 plot design



Location of vegetation quadrats in each subplot



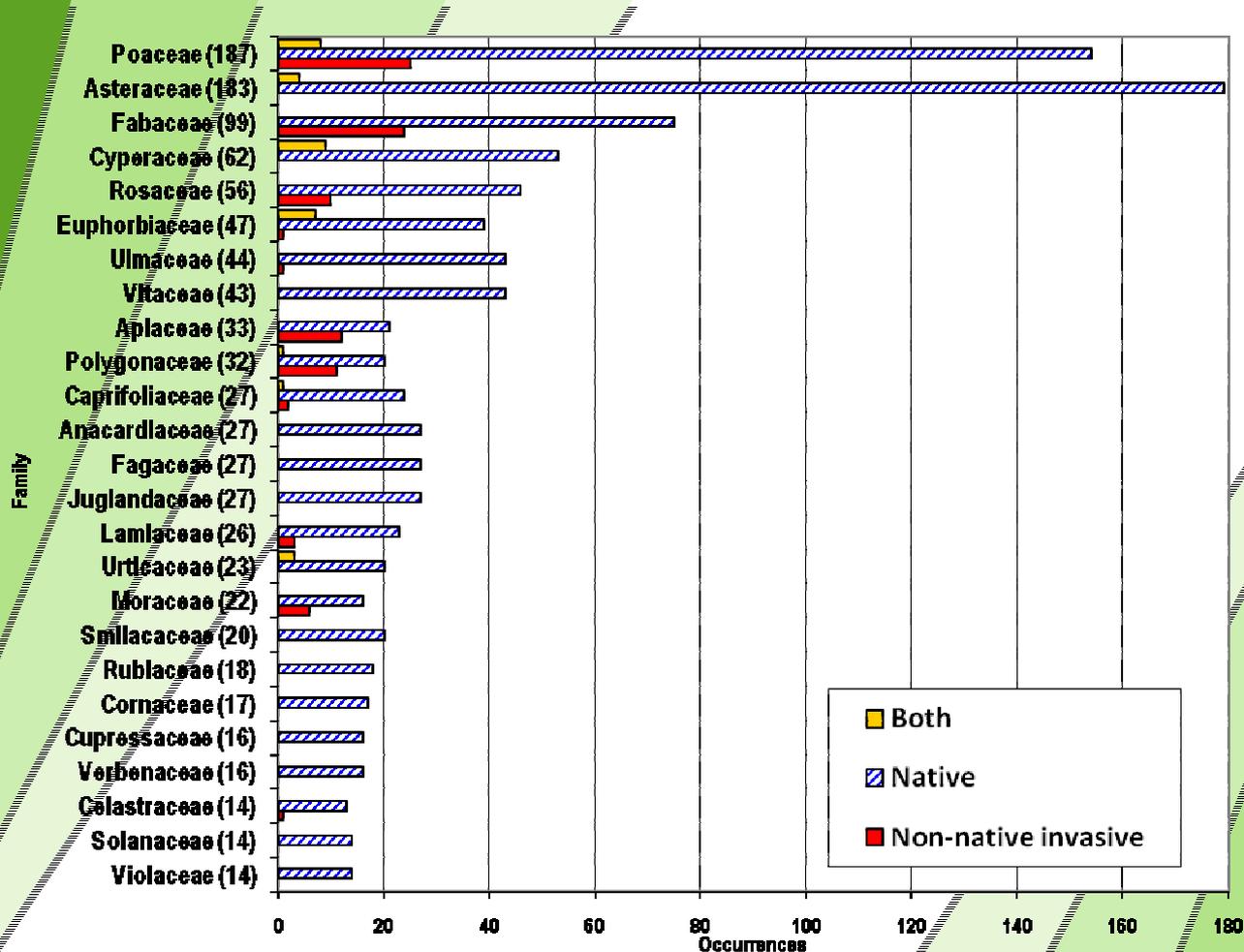
Vegetation Quadrat Data

- **Total subplot canopy cover by layer**
 - 0-2 feet
 - 2-6 feet
 - 6-16 feet
 - > 16 feet

- **Percent cover**
 - Cryptobiotic crust
 - Lichen
 - Litter/duff
 - Mineral soil
 - Moss
 - Road/trail
 - Rock
 - Standing water/flooded
 - Stream/lake
 - Trash/junk
 - Wood

Data (continued)

- Species code (PLANTS database)
- Collected and other provisions for unknown or uncertain samples
- Quadrat presence/absence
- Subplot total percent canopy cover (for every species on quadrats)
 - Layer 1 and 2
 - 0-6 feet
 - Layer 3
 - 6-16 feet
 - Layer 4
 - > 16 feet



Example of P-3 Data Analysis

Presence of understory plants found on P-3 plots, for the top 25 families by number of occurrences, by native, non-native invasive, or both (by genus) categories, Kansas, 2001-2003.

Data Availability

P-2 Invasives

- **2005-2006**

- Not in publicly accessible database
- Special request only

- **2007+**

- Developing a format for public access
- In progress

P-3 Vegetation

- Working now to standardize format for our national database

Future

- **Nationally-standardized records**
- **Must retain regional emphases**
 - **Customer driven**