



***Information Technology and Data Management Tools
Used to Support US Agricultural Safeguarding
Initiatives***

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Topics to be Covered

- Overview of Today's Talk
- Databases and Systems
- Interactive Review of Systems
- Self-Organizing Maps (Building Emergent Pest Lists)
- Summary



An Overview of Today's Talk

- The creation of response and recovery documents requires access to a wealth of up-to-date information about the emergent pest species
- USDA Plant Protection and Quarantine has taken a proactive approach in attempting to collect and manage information about invasive pest species of agricultural concern
- The NSF Center for Integrated Pest Management has partnered with the USDA's Center for Plant Health, Science and Technology to build, populate and manage a number of information systems that support invasive species data management and dissemination



An Overview of Today's Talk

- In this talk, I will present an interactive overview of some of the systems used by the NPRG team in the creation of USDA invasive species response guidelines
- Additionally, I will give a brief overview of how the analysis of invasive pest distribution data using Self-Organizing Maps can be used to generate an objective initial list of pre-emergent invasive pests



Databases and Systems

- Global Pest and Disease Database (GPDD)
- New Pest Advisory Group (NPAG)
- NAPPFAST



Interactive Overview of Systems and Databases

<https://www.gpdd.info>

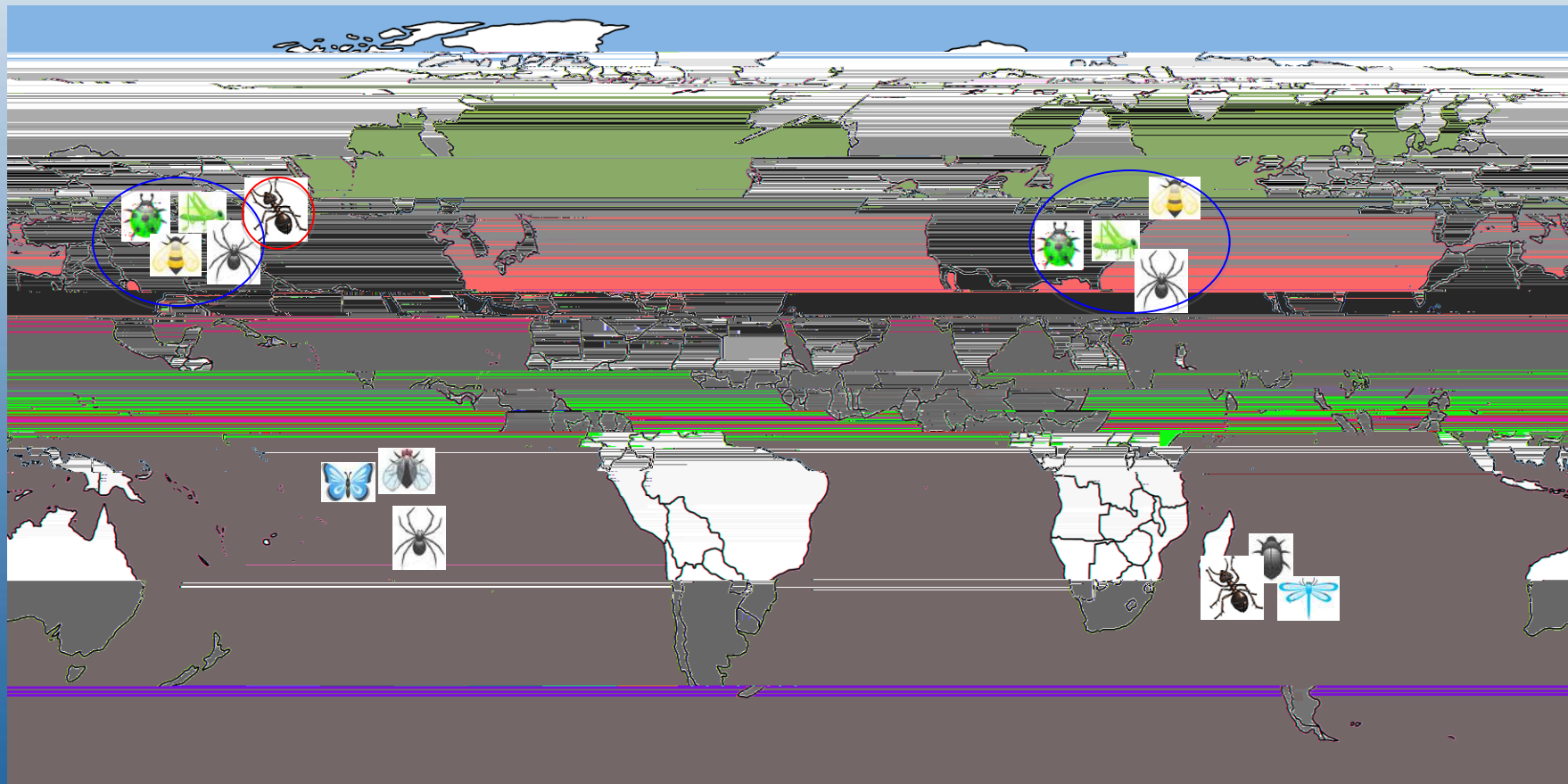


Self-Organizing Maps

- Developed in 1982 by Teuvo Kohonen
- Neural network algorithm using unsupervised competitive learning
- Primarily used for the organization and visualization of complex data
- Uses world-wide invasive pest distribution data
- Use of region Best Matching Unit (BMU) neuron weights can be used to assign risk rankings to pests not known to occur in a region
- Objective prioritization and ranking of pests



Self-Organizing Maps – Pest Assemblages



Self-Organizing Maps Output – All Pests

Ranking	Pest
0.83887	Helicoverpa armigera (Old World Bollworm)
0.83798	Hippotion celerio (Taro Hawkmoth)
0.83341	Venturia pyrina (black spot of pear)
0.78131	Agrotis segetum (Turnip Moth)
0.78040	Chromatomyia horticola (Pea Leaf Miner)
0.77556	Mamestra brassicae (Cabbage Moth)
0.77401	Pycreus globosus (Rumput Toyan)
0.76005	Ralstonia solanacearum race 3 (brown rot of potato)
0.75170	Laodelphax striatellus (Small Brown Planthopper)
0.73861	Autographa gamma (Silver Y Moth)
0.72679	Cortaderia selloana (pampas grass)
0.71439	Hylastes ater (Black Pine Bark Beetle)
0.69867	Amphitetranychus viennensis (Fruit Tree Spider Mite)
0.69676	Empoasca vitis (Smaller Green Leafhopper)
0.68901	Ascochyta fabae (Spot on Broad Bean)
0.68390	Erysiphe cruciferarum (powdery mildew of crucifers)
0.68046	Bemisia afer (Sycamore Whitefly)
0.67555	Unaspis yanonensis (Arrowhead Scale)
0.66543	Aporia crataegi (Black-veined White)
0.66341	Cydia funebrana (Plum Fruit Moth)
0.65628	Lymantria monacha (Nun Moth)
0.65624	Inachis io (European Peacock Butterfly)
0.64553	Pantoea ananatis (fruitlet rot of pineapple)
0.64161	Colletotrichum musae (tip rot of banana)



Self-Organizing Maps Output - Pathogens

Ranking	Pest
0.83341	Venturia pyrina (black spot of pear)
0.76005	Ralstonia solanacearum race 3 (brown rot of potato)
0.68901	Ascochyta fabae (Spot on Broad Bean)
0.68390	Erysiphe cruciferarum (powdery mildew of crucifers)
0.64553	Pantoea ananatis (fruitlet rot of pineapple)
0.64161	Colletotrichum musae (tip rot of banana)
0.62016	Phytoplasma SPL (Sweet potato little leaf phytoplasma)
0.59864	Barley yellow mosaic virus (Bymovirus Barley yellow mosaic virus)
0.58686	Phytophthora melonis (Late Blight of Cucumber)
0.58548	Sweetpotato latent virus (Potyvirus Sweetpotato latent virus)
0.58330	Pseudomonas syringae pv. actinidiae (Bacterial Canker of Kiwifruit)
0.57686	Citrus leprosis virus (leprosis of citrus)
0.56727	Aecidium mori (Mulberry Rust)
0.56333	Mycosphaerella gibsonii (Needle Blight of Pine)
0.56308	Cercospora pini-densiflorae (Needle Blight)
0.56197	Helicobasidium mompa (Violet Root Rot)
0.56158	Phytophthora lepironiae (Stem Spot)
0.54120	Hemileia vastatrix (coffee leaf rust)
0.54002	Xanthomonas axonopodis pv. manihotis (cassava bacterial blight)
0.53139	Pseudomonas fuscovaginae (sheath brown rot)
0.53074	Colletotrichum boninense ()
0.52601	Rice dwarf virus (Phytoreovirus Rice dwarf virus)
0.52576	Mycosphaerella nawae (Circular Leaf Spot of Persimmon)



Summary

- USDA PPQ databases and information systems facilitate the creation of new NPRG recovery guidelines
- Analysis of pest distribution data using Self-Organizing Maps can provide valuable information about pre-emergent pests. In conjunction with other data (interception and trade/economic data) and tools (AHP - Analytic Hierarchy Process), these analyses can provide new insights into pest prioritization

