

# Dr. Faith Campbell

- Ph.D. in politics from Princeton University
- 45 years working as an advocate for biological conservation for a series of environmental advocacy organizations, e.g.,  
Natural Resources Defense Council,  
American Lands Alliance, and  
The Nature Conservancy
- Currently president of Center for Invasive Species Prevention



# Invasive Species Threats to West Virginia





# What is an invasive species?

Defined in Presidential Executive order(E.O.) 13112 (1999) as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.”

- 1) “Alien” ( or “non-native”) = an organism introduced to an area outside the historic range of that species;
- 2) That organism was transported across natural boundaries by human activity;
- 3) That organism persists and proliferates to the point that it causes harm to the native ecosystem.

# Why are invasive species a concern?

- Threaten ecological integrity, biodiversity, outcompete or kill native species, create monocultures.
- Destroy natural and cultural resources.
- Adversely affect habitat, wildlife, and people.
- Adversely affect recreational opportunities.
- Are costly to manage.
- Decrease our well-being by degrading the ecosystem services we depend upon to stay healthy.



# Invasive Species - National legislation

- Injurious wildlife and wildlife diseases – Lacey Act 1900 & 1960
- Plant pests (including forest pests) – 1911; 1970; 2000 (Plant Protection Act)
- Noxious weeds – Federal Noxious Weed Act of 1974
- Aquatic animal invaders -1990  
Nonindigenous Aquatic Nuisance  
Prevention and Control Act
- Aquatic Carp Protection and Control Act  
July 27, 2018



# West Virginia Policies on Invasive Species

- Quarantines
  - 1967 White pine blister rust
  - 1990s- Barberry & black stem rusts, gypsy moth, plant-eating snails
- Plant Pest Act 1967
  - TITLE 61 LEGISLATIVE RULES DEPARTMENT OF AGRICULTURE SERIES 14 WEST VIRGINIA PLANT PEST ACT RULE
- WV Noxious Weed Act 1976 (WVDA)
  - 1990s Japanese knotweed, multiflora rose, listed.
  - Importation or sale of Multiflora rose unlawful
- Legislation to manage fish stocking 2003 (WVDNR)
  - Prevents largemouth bass virus.
  - Release of aquatic organisms prohibited without DNR stocking permit
  - WV Code 13 whirling disease, infectious pancreatic necrosis, viral hemorrhagic septicemia or other diseases which may threaten fish stocks within the state

# Authorities to Manage Invasive Species Scattered Among Agencies Based on Wider Responsibilities (1a)



**Division of Natural Resources** –conservation, development, protection, enjoyment and use of state’s natural resources. Manages invasive species on Wildlife Management Areas.



**State Parks** – protect natural areas of unique or exceptional scenic, scientific, cultural, archaeological, or historical significance; provides outdoor recreational opportunities; some state parks have partnered with various organizations to manage invasive plant species.



**Division of Forestry** - promotes sustainable utilization of state’s forest resources as a major contributor to the state's economy. Manages invasive species on state forests and advises management on private lands.

# Authorities to Manage Invasive Species Scattered Among Agencies Based on Wider Responsibilities (1b)



**Department of Agriculture** – protects plant, animal and human health and the state's food supply; to provide vision, strategic planning and emergency response for agricultural emergencies; manages agricultural plant pests (including those in forests) & those invasive plants determined to be noxious weeds.

The WVDA Plant Industries Division convenes the Invasive Species Working Group (WVISWG), with a focus on education and information-sharing. First meeting 2007; paused during COVID?



# West Virginia Agencies' Invasive Species Roles (2)



**Division of Highways** - manages invasive plants in rights of way linked to highways and roads, public airports, railroads, electric utilities, pipelines, public surface drainage ways, areas around locks and dams, and bicycle, bridle, and other public paths or trails.



**Department of Environmental Protection** - issues State 401 water quality permits; regulates mines; oversees watershed groups.



**Conservation Agency** - promote the protection and conservation of West Virginia's soil, land, water and related resources for the health, safety and general welfare of the state's citizens and works with all groups in flood related issues.

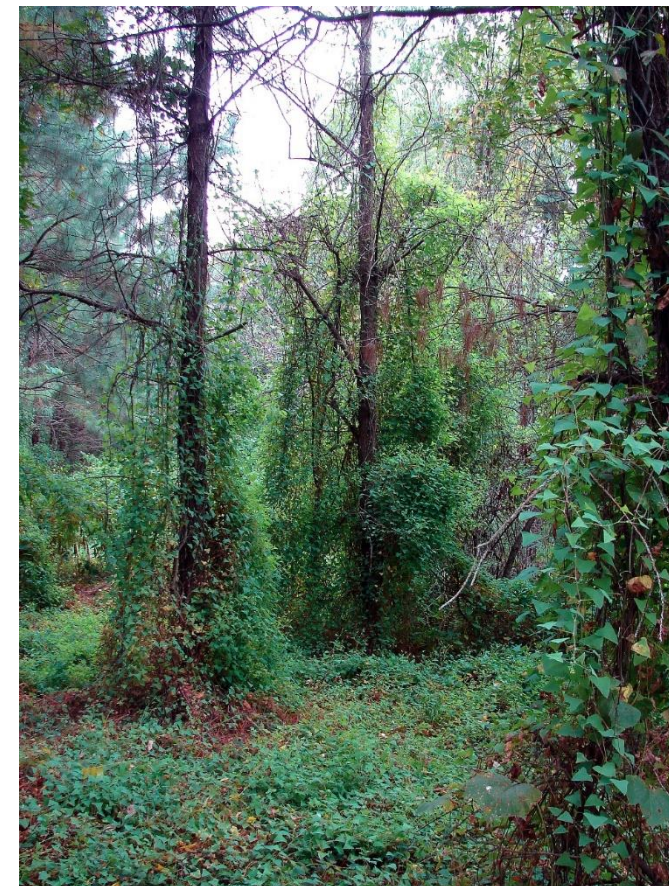


# Mile-A-Minute vine

- Grows rapidly and smothers vegetation, including tree seedlings
- Reduces photosynthesis and physically stresses plants growing underneath
- Reduces native herb and forb populations



*Rhinoncomimus latipes*; USFS led effort; WV DoA releasing

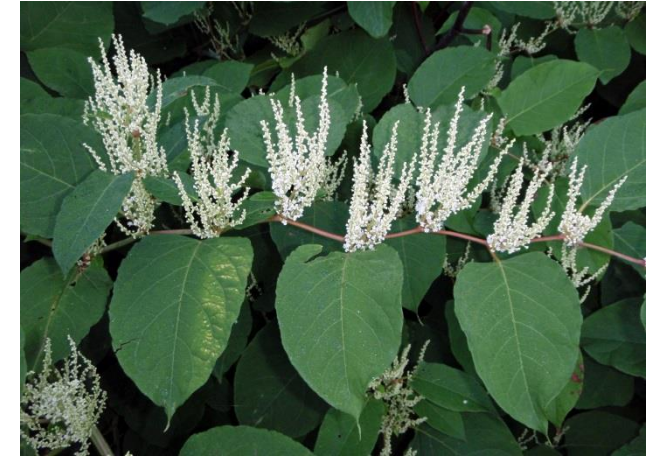




# Japanese Knotweed



- Grows aggressively in dense stands, suppresses native plants.
- Forms dense thickets, reduces waterway access.
- Mud/sediment release buries trout spawning gravel, suffocates eggs.



**Flowers:** branched sprays



- Infested Elk River: threatens critically endangered diamond darter, *Crystallaria cincotta*.





# Japanese Stiltgrass



1-2 flower spikes on top of each stem late August to Sept.

- Disrupts ecosystem functions.
- Impacts diversity of native species.
- Replaces native species
- Deer do not graze this plant.
- Reduces wildlife habitat.



**Leaf:** silvery midrib of reflective hairs on upper surface.



Fruit with awn, spreads easily due to weak root system; washes everywhere.

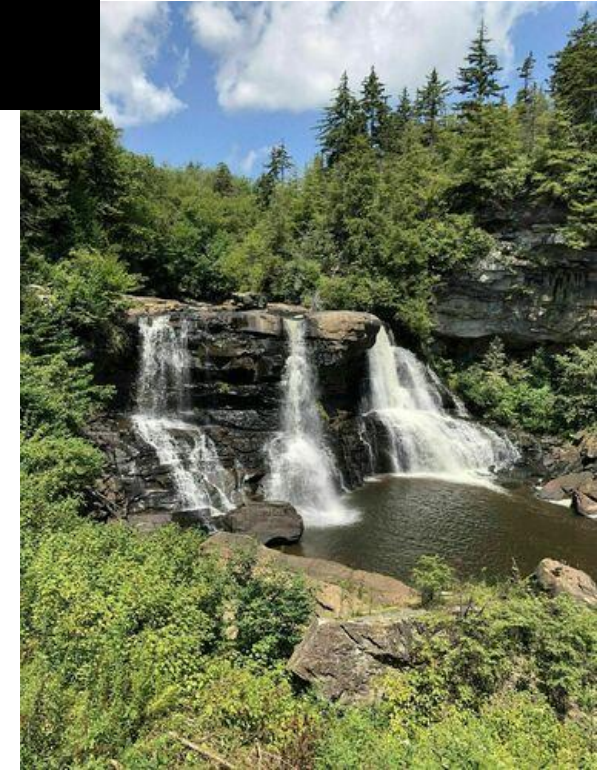
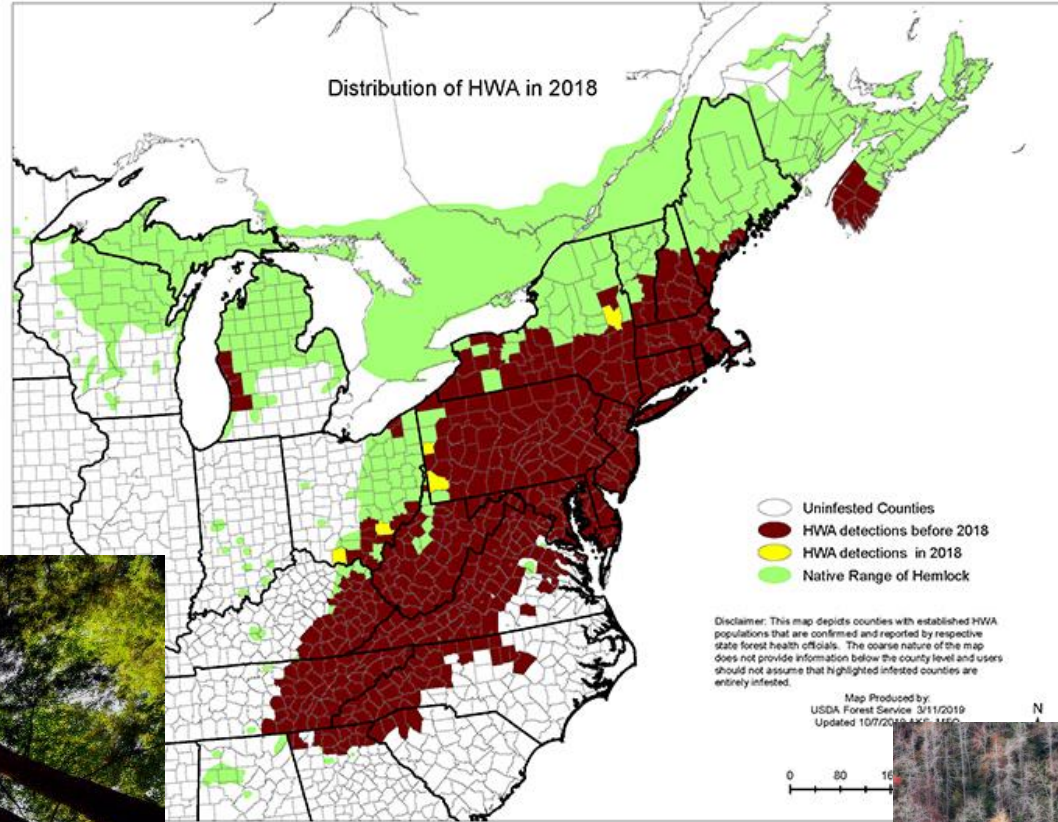


# Hemlock Woolly Adelgid

A Keystone pest that has caused major ecological destruction.



Cathedral State Park –  
oldgrowth hemlocks

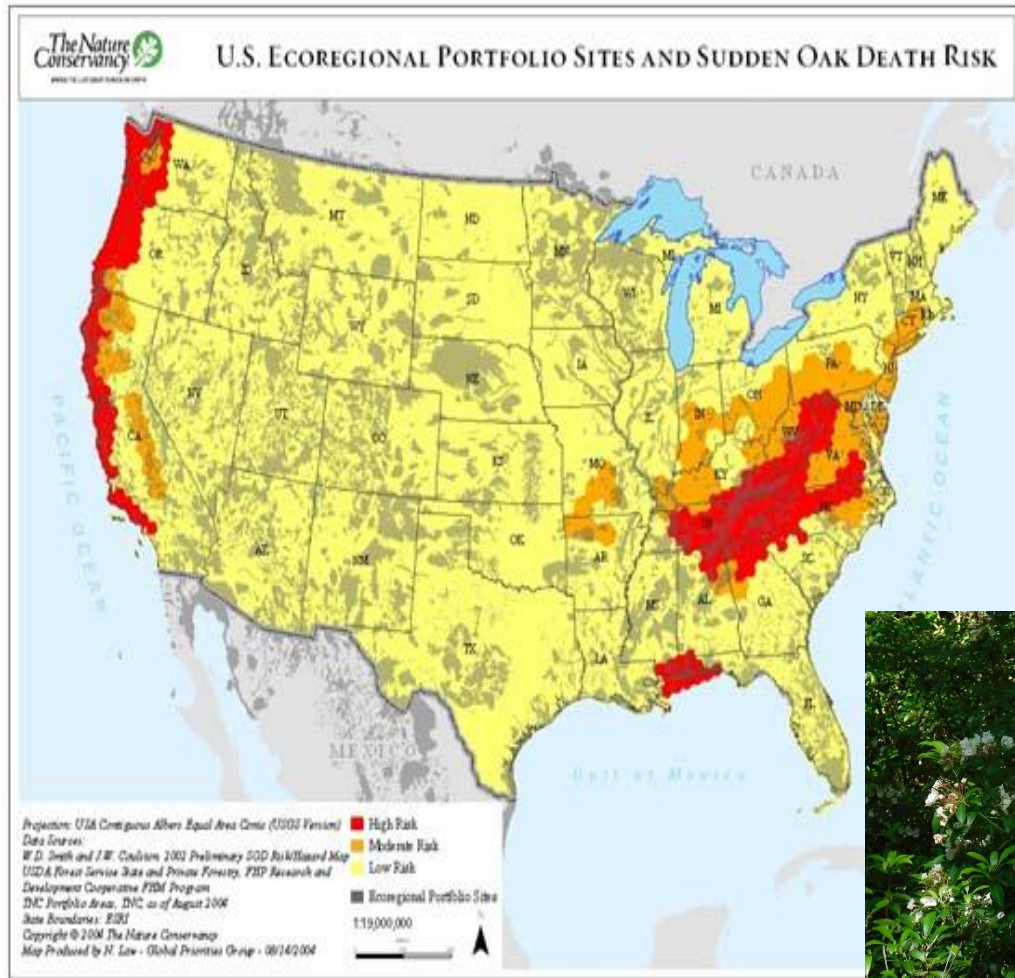


Blackwater Falls State Park





# Sudden Oak Death (SOD)



Rhododendron plants infected by SOD pathogen;  
sent to 18 states in 2019;  
36 states in 2021



Chestnut oak, white oak,  
northern red oak,  
mountain laurel

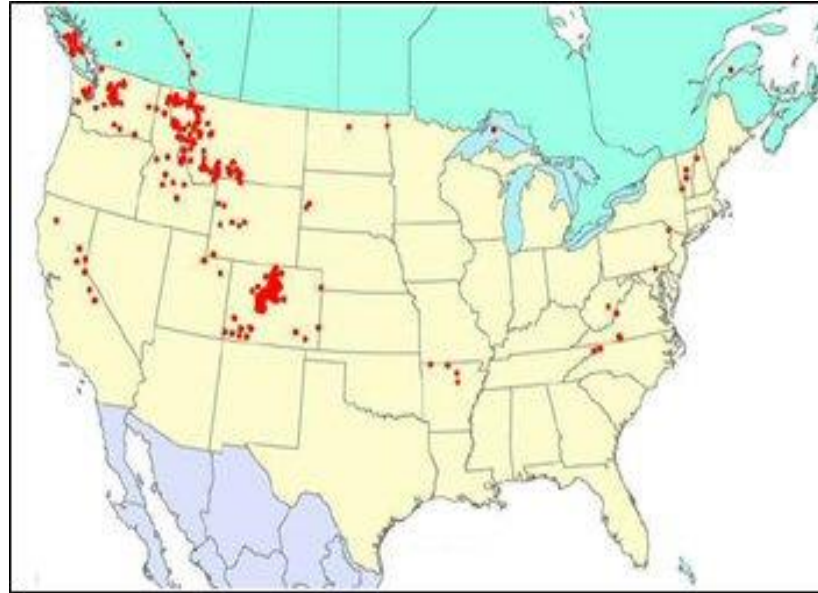
black locust, flowering dogwood, sassafras, multiflora rose ...



# Didymo (Rock Snot) - Invasive diatom



- Freshwater diatom.
- Forms dense mats.
- Kills native mussels, aquatic insects.
- Deprives fish of oxygen.
- Affects local economy: clogs pipes & irrigation canals, hydropower.
- Impacts recreation, aesthetic value.

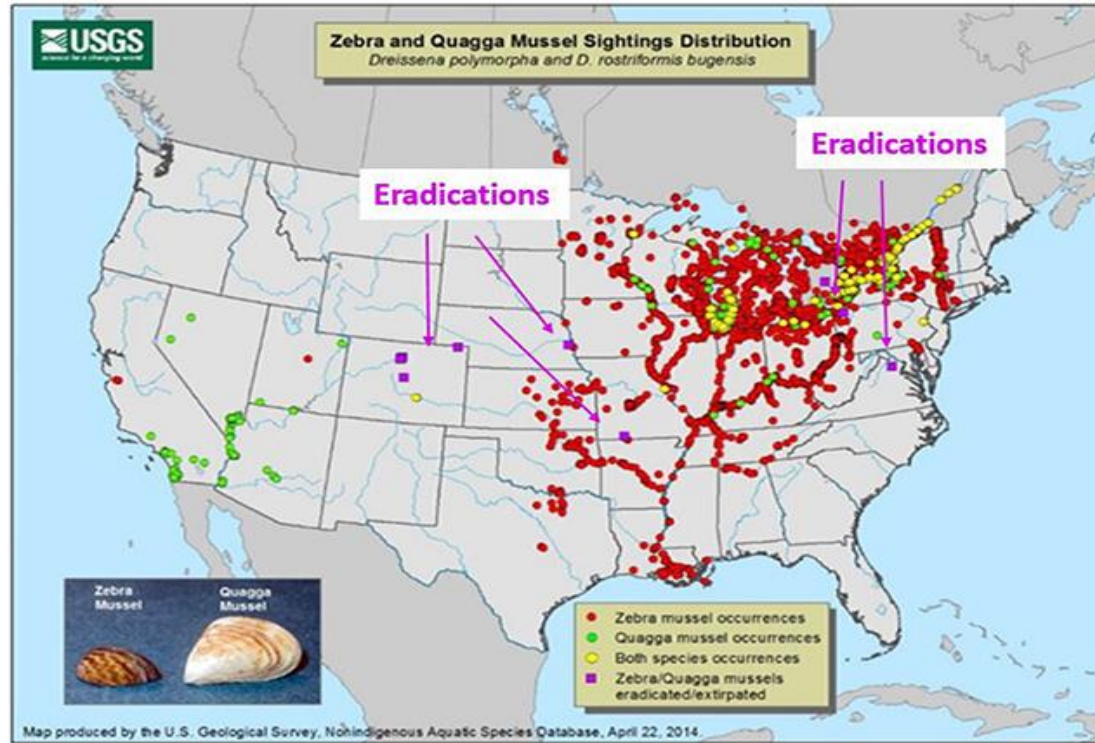




# Zebra and Quagga Mussels



Nonnative zebra and quagga mussels on native mussel



a) Comparison of quagga (left) and zebra (right) mussels (photo by Michigan Sea Grant).



(b) Boat propeller encrusted with Dreissenid mussels

(photo by Protect Our Freshwater)



c) Crayfish covered in mussels leading to a slow death (photo by SLELO PRISM).



# Non-native earthworms



*Amyntas agrestis*

## Example: Asian “jumping” worms

One of the most serious causes of ecological deterioration in temperate deciduous forests of North America

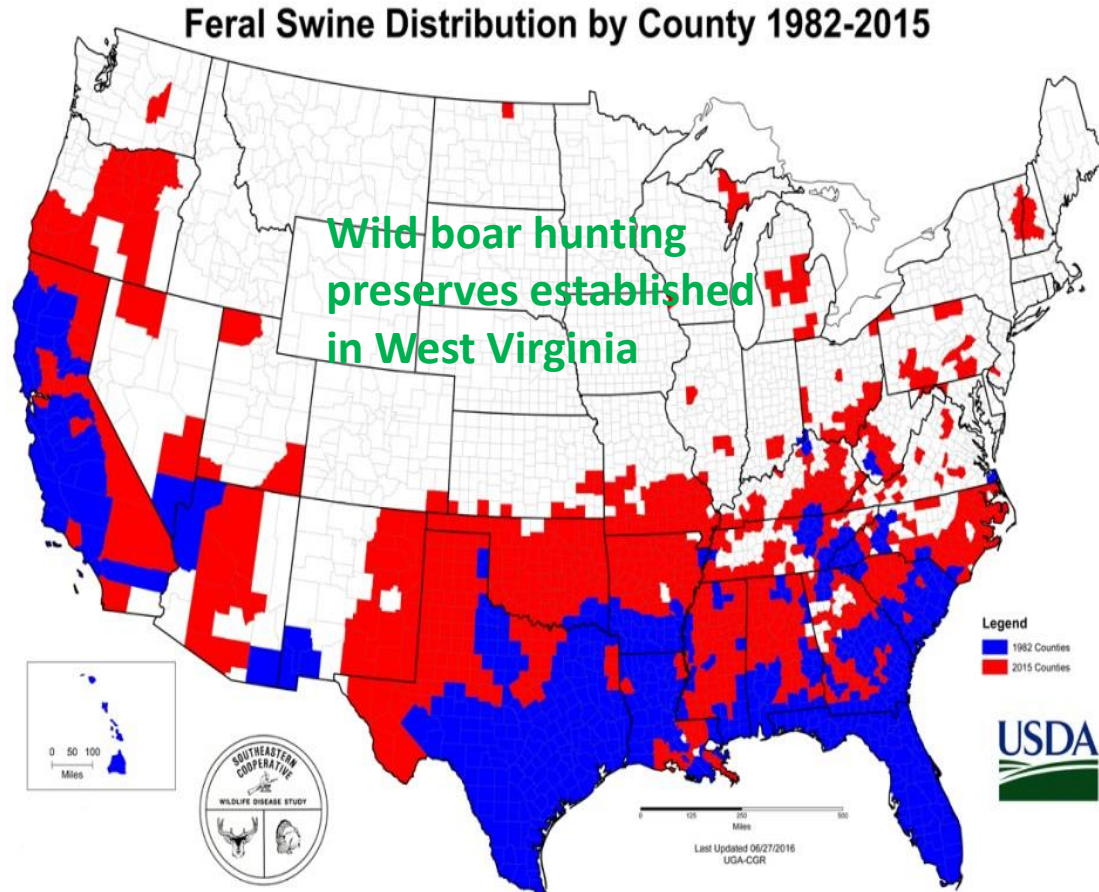
- Change soil carbon dynamics and nutrient availability (soil fertility).
- Affect animals of all trophic groups that rely on soil and the leaf litter layer for habitat, food, and shelter.





# Feral Hogs

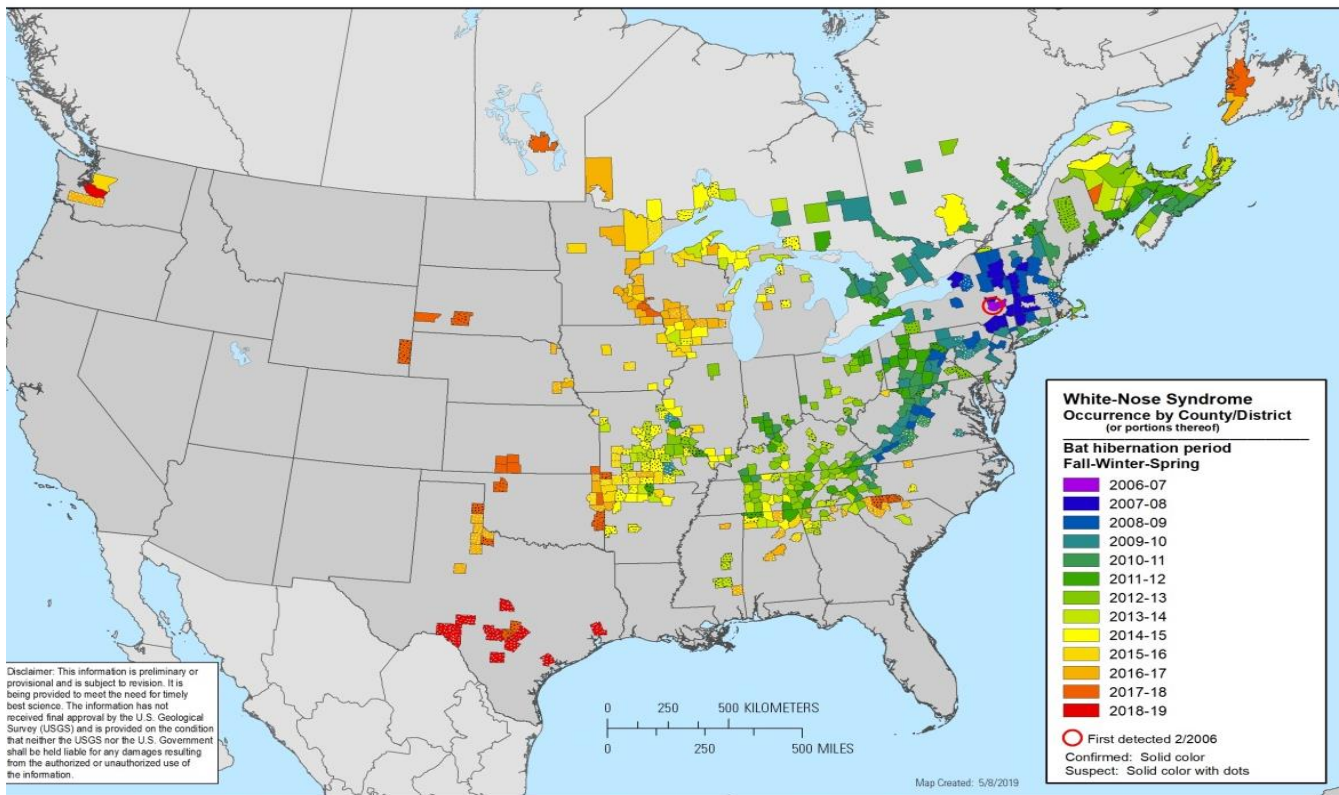
- Agriculture** - pasture livestock, horticulture;
- Pets and people**- bacterial diseases, parasites;
- Property destruction**- through rooting;
- Cultural and historic sites**- damage & destruction;
- Aquatic** severe sedimentation=algal blooms, fish kill.



- Natural resources**- reduces ground vegetative cover/leaf litter, accelerates leaching of nutrients, soil & water quality, spreads invasive plant species, destruction of understory forest; accelerates erosion, slope failure, downgrade sedimentation.



# White Nose Syndrome in Little Brown Bats



White-nose syndrome occurrence map - by year (2019). Data Last Updated: 5/8/2019. Available at: <https://www.whitenosesyndrome.org/static-page/wns-spread-maps>.



Credit: Marvin Moriarty/USFWS



Credit: Ryan von Linden, NY Dept. of Environmental Conservation.

# Common Traits of Invasive Species

- Fast growth.
- Rapid reproduction.
- High dispersal ability.
- Adaptable –
  - can alter growth form to suit current conditions
  - Tolerate a wide range of environmental conditions.



Multiflora rose; James H. Miller, Bugwood



Asian longhorned beetle; Gillian Allard, FAO of United Nations, Bugwood.org



oriental bittersweet [Leslie J. Mehrhoff](#), Univ. Of Connecticut, [Bugwod.org](#)



Garlic mustard, Illinois Invaders



# Invasive Pathways: How do they get to WV?

## People move invasives species!

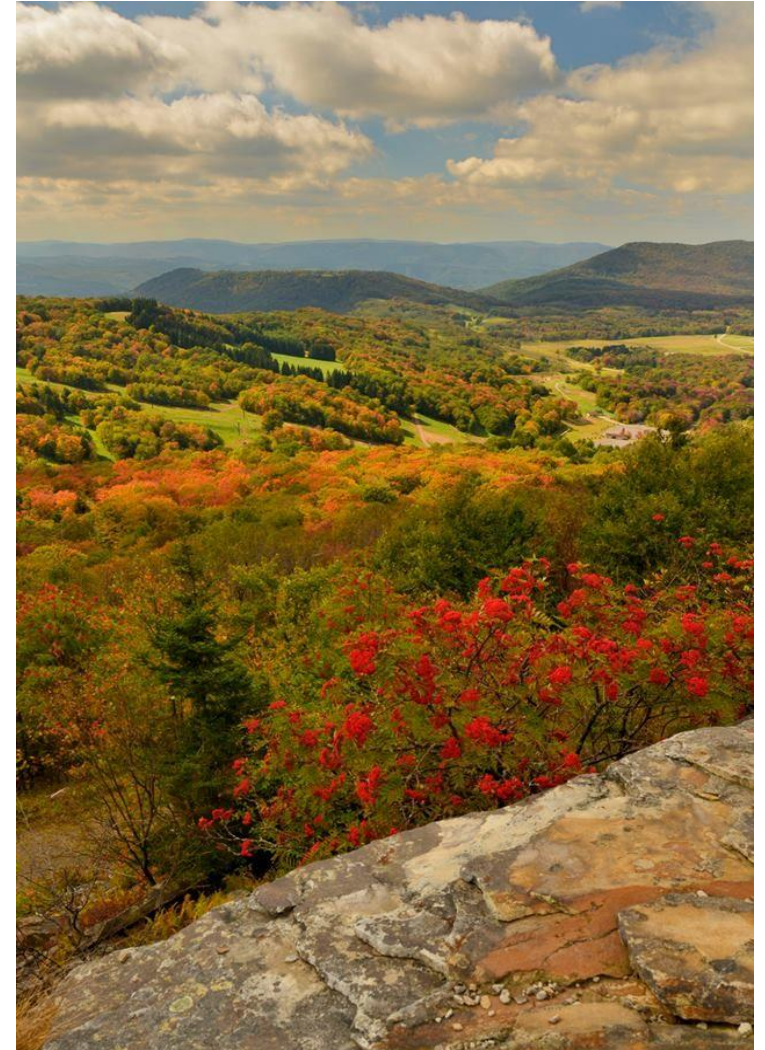
- General lack of awareness
  - deliberate introduction: hogs, shrubs & vines, e.g., Russian olive
- Careless release from confinement
  - aquarium fish, bait fish, pets (e.g., snakes, birds)
- Transported on vehicles
  - spotted lanternfly & gypsy moth, weed seeds
- Transported in packaging or firewood
  - Asian longhorned beetle, emerald ash borer; Japanese stiltgrass, etc.
- Transported on nursery plants
  - sudden oak death, hemlock wooly adelgid, emerald ash borer
- Construction via contaminated mulch, gravel, fill dirt, or equipment
- Transported by people on
  - boots, bike tires, clothing, ATVs, boats, fishing gear: e.g. Didymo, zebra mussels, amphibian diseases, invasive weed seeds.

# WV's Economy Depends on Healthy Natural Resources

- **Wood products industry** = more than \$2.5 B annually; nearly 11,000 jobs. 2nd only to coal in economic impact.
- **Outdoor recreation** = \$7.6 B in consumer spending every year; \$2 B in wages and salaries, 82,000 jobs, and \$532 M in state and local tax revenue.
- **Agriculture** – more than \$710 M.
- **Water supplies** (local and regional); quality & quantity affected by aquatic invaders & invasive plants
- Other ecosystem services – hunting and fishing licenses, bird watching

# Biodiversity Hotspot: Central and Southern Appalachians

- The Central and Southern Appalachians are unrivaled in the U.S. for aquatic species diversity and comparable only to China for forest diversity.
- Approximately 198 species in this region are federally listed as threatened or endangered; of these 108 (54%) are aquatic species (primarily mussels and fish).
- The Appalachian Mountains are also a critical migration corridor for over 64 high priority migratory bird species.



Bald Knob, Canaan Valley



# Diversity: Salamander Hot Spot

Due to the area's diverse forest and freshwater ecosystems, the Southern Appalachian Mountains Region is the Salamander Capital of the World – the region has more salamander species than anywhere else on Earth

(Smithsonian Conservation Biology Institute)





# Effective Management of Invasive Species Threats

- Prevent new introductions to U.S.
- Prevent or slow interstate spread.
- Detect early so can attack ASAP.
- Develop, test, utilize effective IPM strategies – physical, chemical, biological.
- Explore potential resistance to pest & deploy.
- Outreach to and education of citizens.



# Management of any species involves multiple players

## Example: invasive plants

### Agencies which manage lands on which grow:

- Road verges – WVDOH
- State lands -
  - WVDNR Wildlife Management Areas
  - WVDOF State Forests
  - State Parks

**WV Department of Agriculture**

**Private landowners**

With WVDQA & Conservation Agency

**Nursery industry**

**Universities**

**Stakeholders, e.g., conservation organizations**

## Example: aquatic species

### Agencies which manage waters in which grow:

- WVDNR Wildlife Management Areas
- WVDOF State Forests
- State Parks

**Private landowners**

With Conservation Agency

**Bait & fishing supply industries**

**Universities**

**Stakeholders, e.g., conservation organizations, fishing guides, tourist facility owners**

# Example: managing non-native forest pests requires strategies not restricted to geographic realm

- Curtail introduction & spread - Pathways

- hard-sided cargo (stone, metal, etc.) (SLF; AGM)
- nursery stock (SOD, other Phytophthoras, rusts)
- pallets, crates, other wood packaging [wood borers, e.g., ALB, EAB, redbay ambrosia beetle (RAB)]
- firewood (EAB, GM )
- transport/general merchandise (SLF)
- movement of household goods, trailers, etc. (GMs, SLF)

- Reduce impact

- Search for & deploy biocontrol agents
- Breed trees resistant to the pest



# Collaboration

Situation:

- Large geographic areas
- Many land managing entities
- Many stakeholders with divergent points of view ...



**Vital to establish collaborative efforts**



# Existing collaborations – Models for Additional Efforts

- Central Appalachian Spruce Restoration Initiative (CASRI)
- Cooperative Hemlock Conservation Group
- Gypsy Moth Working Group
- West Virginia Invasive Species Working Group (WISWG)
- Potomac Highlands Cooperative Weed and Pest Management Area (PHCWPMMA)
- Rivers and Gorges Cooperative Weed and Pest Management Area (RGCWPMMA)
- Eastern Brook Trout Joint Venture
- USFWS Partners Program
- Backcountry Hunters and Anglers

# Potential Future Collaboration

- A coordinated effort of the WV agencies could reduce the spread of invasive species.
- Issues that would benefit greatly from collaboration include education on invasive species associated with:
  - Firewood,
  - Nursery stock, commercial plantings, gardening
  - Aquarium & pet trade
  - Bait
  - Weed free hay
  - Recreational biking, hiking, boating

**[National Invasive Species Awareness Week]**





# Example

**Partner** with power companies to manage ROWs on state land using IVM integrated vegetation management strategy.

## Benefits:

- Complies with North American Electric Reliability Corp FAC-003 clearance standards.
- Increases diversity of native species, creates pollinator and other wildlife, habitat.
- Reduces invasive species.
- Reduces herbicide use.
- Reduces cost.



BGE ROW in Patuxent National Wildlife Refuge showing retained shrubs in tree treated border zone.

## Manage ROW Habitat and Reliability

Baltimore Gas and Electric Co. partners to optimize vegetation management in a highly sensitive area and gain transferable insights.

By Richard A. Johnstone, IVM Partners Inc.; William Rees, Baltimore Gas and Electric Co. (retired); Richard Mason, U.S. Fish and Wildlife Service; and Michael Robin Haggie, Haggie IVM

**A** long-term integrated vegetation management pilot project began in 2008, near Annapolis, Maryland, after trees and brush were cleared from high-voltage electric transmission rights-of-way. The clearing was done to ensure compliance with North American Electric Reliability Corporation (NERC) FAC-003 clearance standards. After the clearing, an opportunity emerged for a partnership—facilitated by IVM Partners Inc.—with Baltimore Gas

and Electric Co. (BGE) and the U.S. Fish and Wildlife Service (USFWS) to create an integrated vegetation management (IVM) plan.

Developed for a 5-mile section of rights-of-way (ROW) through the South River Greenway, an IVM plan was formed to meet the safety, access and reliability needs of the electric utility while also improving the habitat for birds, pollinators and other wildlife as well as reducing the erosion and sedi-

# Engagement to support federal programs that can help protect WV state treasures

- State lobbying efforts – urge federal agencies and Congress to strengthen invasive species programs & raise funding levels
- Through associations of state agencies (e.g., National Association of State Foresters, National Plant Board, National Association of State Departments of Agriculture, Association of Fish and Wildlife Agencies), lobby for the same
- Through National Governors' Association & - in collaboration with county governments – through National Association of Counties





# Work with non-governmental partners

Encourage non-governmental partners, *e.g.*, The Nature Conservancy, Trout Unlimited, West Virginia Rivers, Eastern brook trout joint venture, regional watershed groups, Garden Clubs, Master Naturalists, forest landowners, farmers, mountain bike riders ... to use own lobbying efforts to do the same







Protect  
West Virginia's Treasures  
For Future Generations