Integrated Vegetation Management to Enhance Pollinator Habitat, Wildlife Habitat and Desirable Species Composition

Rick Johnstone, President
Professional Background

- Bachelor of Science in Forest Resource Management West Virginia University
- System Forester Allegheny Power (WV, OH)
- System Forester Delmarva Power and Atlantic City Electric (DE, MD, VA, NJ)
- Past President Utility Arborist Association
- Advisor U.S. - Canadian Blackout Report
- Technical Expert ROW Stewardship Accreditation
- Advisor ANSI A-300 Part 7 - IVM
- Advisor - Monarch Butterfly CCAA
Integrated Vegetation Management

- IVM is a system of managing plant communities to be compatible with the primary land management objective.

- Control methods are the processes through which managers achieve this primary objective, as well as site-specific secondary objectives.
Mowing is an accepted maintenance practice
Removing vegetation along slopes is a potential erosion problem.
Clearing along stream riparian areas can cause heat and sediment pollution.
Sediment can adversely affect fish & wildlife
Mower tires rut wetland soils
MOWERS LEAK OIL, FUEL AND HYDRAULIC FLUID
A “no herbicide” policy near water is not environmentally sound.
Cutting invasive plants along water acts as a vector for spreading their seeds downstream.

- Multi-flora rose
- Ailanthus
- Autumn olive
- Russian olive
With prolific seed production
Mowers pollute greenhouse gases and increase carbon footprint.
Mowed ROW attract ORVs that upset land owners
Cutting blades destroy wildlife and nesting sites.
Fawns instinctively lie low when danger approaches.
Cutting encourages multiple sprouts, increased density of brush, and continued root growth
Integrated Vegetation Management

• Control Methods
  • Manual: handsaw, chainsaw
  • Mechanical: mower, brush hog
  • Chemical: herbicide, growth regulator
  • Biological: insect, bird, mammal, plants
  • Cultural: landscape competition

• Best Practices
  • Use the right tool at the right time to achieve objectives with minimal input or cost to safety, economics or environment
Utilities could optimize wildlife benefits by managing ROW for 2 distinct plant types: Grass/forbs in the center wire zone, Shrub/scrub forest in border zone.
Concept used on Delmarva Power for 25 years
Develop appropriate plant community in each zone

Grass/herb center
Shrub/scrub border
Gradual tree height to edge
Started botanical documentation with Chesapeake Wildlife Heritage
Delaware Nature Society
School Education Site
Delmarva wetland meadow habitat restoration
Broadcast followed by selective treatment
Restored Wetland Meadow
Maple removal allowed orchid germination

• They can lie dormant for 150 years waiting for something to remove competition

• State Heritage biologist was asked the origin of the rare orchids...
IVM Partners, a 501-C-3 non-profit, was incorporated August 4, 2003

- act as liaison between industry, agencies, conservation and academia
- conduct research on IVM and Ecosystem Management best practices
- inform and educate land managers and public officials on IVM best practices
- develop partnerships between industry and government so that best IVM practices are used
- improve wildlife and endangered specie habitat while lowering invasive weeds
Dr. Harvey Holt - Prof. Emeritus Purdue University

Neil Thiessen - Thiessen Consulting

Brian Kortum - NiSource Gas Distribution

Aaron Hobbs - RISE (Responsible Industry for a Sound Environment)

E. Allen James - NC Agriculture & Life Sciences Research Foundation

Dr. James Kielbaso - Prof. Emeritus Michigan State University

Michael R. Haggie - Chesapeake Wildlife Heritage

Eric Hadaway - Daft-McCune-Walker, Inc.

Dr. Ray Forney - Corteva & CropLife International

Bryan Hall - Choptank Electric Cooperative
2005 IVM Workshop for EEI and Federal Agencies

- MOU signed by EEI and Federal Agencies 2006
Phragmites Control
broadcast treat then burn thatch
Follow-up inspection &
selective backpack treatment
## Germinating plants after Phragmites control

- Spotted cowbane
- Barnyard grass
- Smartweed
- Halberd & Arrow-leaved tear thumb
- Aster
- Rice cutgrass
- False nettle
- Sow thistle
- Water horehound
- Sedge
- St. John’s wort
- Dodder
- Horse weed
- Pepper bush
- Little bluestem
- Goldenrod
- Moss
- Giant foxtail
- Wild bean
- Cardinal flower
- False pimpernel
- Spike rush,
- Water plantain
- 3-way Sedge
- Rush
- Marsh skullcap
- Jewel weed
- Water hemlock
- Wood reed
- Climbing hempweed
- Boneset
- Beak rush
- Water purslane
- Tulip poplar
- Beggar tick
- Bed straw
Eastern Neck NWR Grant
invasive weed control
Restored native pollinator & wildlife habitat on 140 acres
NFWF grant to document plant changes in NJ pine barrens
Selective herbicide treatment of trees and Phragmites
Allowed rare Rose Pogonia orchids to germinate
Thousands of orchids only where herbicides applied
Herbicides are the ‘medicine’ to fix sick ecosystems

- Stop growth from tree roots and non-native invasive plants
- Modern chemistry affects only targeted plant species
- Various techniques are used depending on target density
- When ‘weeds’ are removed they allow growth of desired grasses and wildflowers
- Desirable plants compete for growing space and improve habitat for pollinators and wildlife
Plants provide cultural control as they compete for sunlight, water, nutrients and produce allelopathic chemicals.
Birds/mammals provided biological control by consuming tree seeds & seedlings
IVM uses a combination of methods to **Restore native vegetation**

- **Improve**
  - Safe access & sight distance
  - Utility costs
  - Homeland Security
  - Wildlife Habitat
  - Butterflies, bees & birds
  - Ecosystem Management

- **Promote**
  - Beneficial pollinator plants
  - Environmental stewardship

- **Control**
  - Invasive vegetation
  - Wildfires
IVM Case Studies on Electric, Natural Gas & Highway ROW

Alabama, Arizona, Arkansas, Delaware, Florida, Idaho

Maryland, Michigan, Missouri, Montana, Ohio, New Jersey

New Mexico, North Carolina, Tennessee

Navajo Nation, Santa Ana Pueblo
Baltimore Gas & Electric
Maryland Suburbia Clearing
MARYLAND SUBURBAN RESIDENTS ACCEPT ROUTINE MOWING
Clearing trees in wetlands and ravines brings complaints
Brokered Partnership
BGE - Columbia - Howard County
Ecosystem restoration education for public

Ecosystem Restoration

Signage Update

BGE maintains this right-of-way to ensure the safe and reliable delivery of electricity and natural gas to its customers. The right-of-way is currently maintained through extensive mowing. Over the years, mowing has allowed many invasive plant species, including tall-growing vegetation that threatens the power lines, to overtake beneficial native plants. BGE has partnered with the organizations listed below to identify a better way to manage vegetation on this right-of-way.

On or after October 1, this right-of-way will be treated with herbicides instead of heavy mowing – which produces lots of air, water and noise pollution. The herbicide treatment will target trees and non-native vegetation that, in the future, could cause major interruptions to gas or electric service. Careful one-time application of targeted herbicides on the whole right-of-way and point and short applications on stubborn vegetation, will eliminate the invasive plants and allow native plant species to flourish and enhance wildlife habitats.

While the herbicide will cause the right-of-way to lose its appearance for a few days, the treatment will result in more beneficial vegetation next spring, and in the years following.
Hydraulic treatment of 2-year invasive Tree-of-heaven
Tree-of-heaven after fall treatment
Tree of Heaven following spring
Summer habitat restored
Initial treatment with nature trail signage 2009
Restored native habitat 2015
IVM was accepted by community to reclaim habitat and stop mowing.
MARYLAND GAS RIPARIAN RESTORATION
Thinvert sticks, retains water & spreads across leaves improving efficacy
Retained Dogwood
Roadside aesthetics
BGE Columbia, MD
side-by-side IVM case studies documented changes thru 2 cycles (2009-2015)
% PLANT COMMUNITY CHANGES

Mow

Spray

Grass/Forb
Trees/Invasives
SIDE BY SIDE COMPARISON AT FIELD WORKSHOPS
IVM field workshops educate utilities, agencies, public
Public Education signs placed along community hike/bike trails.
Public accepts selective treatment near nature trail
Public praises IVM habitat restoration
BGE complaint turned positive with IVM
Instead of mowed terrain
IVM Produced Milkweed Grove
To the enjoyment of pollinators
Liaison for BGE to join South River Greenway Partnership

- US Fish & Wildlife Service
- MD/DC Audubon
- MD Environmental Trust
- MD DNR
- Scenic Rivers Land Trust
- South River Federation
- National Fish & Wildlife Foundation
- Biophilia Foundation
- Anne Arundel County
- Trust for Public Land
- Environmental Finance Center
Cutting trees to meet FAC-003 caused PR outrage.
USFWS understood clearing but not indiscriminate spraying
IVM used selective backpacks to retain shrubs in ravines and border zones
Shrub habitat stabilizes soils and limits invasion by non-natives
Partner to treat invasive plants like Phragmites
Restore native ecosystem
Selective chemistry converted upland areas to native meadows
IVM manages meadow & shrub habitats in appropriate zones

Mowed Wire Zone

IVM Prairie Wire Zone

Shrub border zone

2009 South River Greenway Study with Agency Documentation
Habitat restoration praised by USFWS & USGS at field Workshop
USGS Bee Expert Sam Droege: "Best pollinator habitat in Mid-Atlantic States"

2-year transition
Dead stems and bare soil provide native bee nesting habitat.
USFWS and Audubon partners documented 120 species of birds.
USGS, Rutgers, NJ Institute Technology documented 145 species of native Bees.
40 Lepidopteran 
(Butterfly and moth) species
USFWS asked for similar partnership for Patuxent National Research Refuge
Cooperative research 5.5 mile, 200 acre ROW
Reclaim without mowing
Patuxent Wildlife Research Refuge
Baltimore Gas & Electric

- Site restored without mowing using IVM
  - Undesirable trees and invasive plants herbicide treated in 2011 (reliability, access, safety, maintenance)

- Field Data
  - 2011 through 2015
  - Block surveys – 3 plots (24 x 30 m)
  - Plant species, dead stems, bare soil and percent
  - Sum of all species (dead or alive) and bare ground = 100%
Patuxent National Wildlife Refuge
Autumn olive and Callery pear conversion
to native grasses and forbs

2011 Treat

2012
Invasive Autumn Olive & Callery Pear Control
2015 Early successional habitat restored including milkweed
### 5 Core Elements of PSVI Model

<table>
<thead>
<tr>
<th>Target focus</th>
<th>Rating Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pollen quality rating *</td>
<td>1-5</td>
</tr>
<tr>
<td>2. Nectar quality rating *</td>
<td>1-5</td>
</tr>
<tr>
<td>3. Pollinator beneficial species</td>
<td># plants</td>
</tr>
<tr>
<td>4. Overwintering/Breeding habitat</td>
<td>% cover</td>
</tr>
<tr>
<td>5. Plant flowering months</td>
<td>1-12</td>
</tr>
</tbody>
</table>

PSVI (Pollinator Site Value Index)

(SITE VEGETATION VARIABLE METRICS)
(Derived from Dr. Peter Lindtner, University of Delaware)

<table>
<thead>
<tr>
<th></th>
<th>SITE VEGETATION VARIABLE METRICS</th>
<th>Max rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Forbs, vines &amp; small shrubs: pollinator plant species DIVERSITY INDEX (pollinator beneficial species/site)</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>Breeding and over wintering habitat quality. Bare ground, snags, pithy stems. Area S/M/L Rating = % survey</td>
<td>50</td>
</tr>
<tr>
<td>3.</td>
<td>Annual Nectar Source Value (NSV) total cf</td>
<td>500</td>
</tr>
<tr>
<td>4.</td>
<td>Annual Pollen Source Value (PSV) total cf</td>
<td>500</td>
</tr>
<tr>
<td>5.</td>
<td>FLOWERING MONTH RANGE: Month range value = May - October = 6</td>
<td>100</td>
</tr>
</tbody>
</table>

Total Annual Estimate (TAE cf): sum of lines C1 to C5 = PSVI cf.

<table>
<thead>
<tr>
<th></th>
<th>Rating Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant species % cover</td>
<td>1 - 100</td>
</tr>
<tr>
<td>Pollen quality per pollinator</td>
<td>1 - 5</td>
</tr>
<tr>
<td>Nectar quality per pollinator</td>
<td>1 - 5</td>
</tr>
</tbody>
</table>
## Apis (Honey Bee) and Bombus (Bumble Bee) Relative Benefit Pollinator Site Value Index

### Patuxent PSVI METRICS Lespedeza Case Study

<table>
<thead>
<tr>
<th>Metric Description</th>
<th>Max rating</th>
<th>2012 Apis</th>
<th>2014 Apis</th>
<th>2014 Bombus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Forbs, vines &amp; small shrubs: pollinator plant species DIVERSITY INDEX</td>
<td>50</td>
<td>12</td>
<td>23</td>
<td>23</td>
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<tr>
<td>2. Breeding and over wintering habitat quality. Bare ground, snags, pithy stems.</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Annual Nectar Source Value</td>
<td>500</td>
<td>4</td>
<td>72</td>
<td>106</td>
</tr>
<tr>
<td>4. Annual Pollen Source Value</td>
<td>500</td>
<td>2</td>
<td>45</td>
<td>81</td>
</tr>
<tr>
<td>5. FLOWERING MONTH RANGE: value = May - October = 6</td>
<td>100</td>
<td>8</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td><strong>Total Annual Estimate:</strong> sum of lines C1 to C4 = PSVI</td>
<td>1200</td>
<td>26</td>
<td>194</td>
<td>264</td>
</tr>
</tbody>
</table>

8 -10 X increase in pollinator habitat!
Utilities can help Agencies meet Pollinator habitat objectives

2012 Baseline
- Honey Bee: 26
- Bumble Bee: 26

2014 Treated
- Honey Bee: 194
- Bumble Bee: 264

Legend:
- Green: Honey Bee
- Red: Bumble Bee
Cooperative treatment of
Mile-a-minute weed on and off ROW
Broadcast treatment of selective herbicides to release native grasses and forbs
Selective application to retain shrubs
Partner to control trees and invasives
Manage to a healthy, native ecosystem
Dead trees provide habitat for bats and other wildlife
Documentation tells the story
Selective treatments keep it
Habitat restoration is the reward
Maryland Public Utility Commission requires IVM as condition for new ROW construction

- 138kV generator lead line for PA windmills
USFWS requested herbicide treatment of Dept of Defense Organic Farm
Work paid with grant from Chesapeake Bay Foundation
Duke Energy Durham, NC
Mowing Case Study
Baccharis and Lespedeza take over in 2018
Mowed plant community
Aggressive Plant Growth
Reduces Pollinator Habitat

Honey Bee
Bumble Bee

2015 Baseline: 165, 165
2017 Mow: 262, 257
2018 Mow: 88, 88
Duke Energy Durham, NC
Spraying Method Case Study
Baccharis and Lespedeza
Duke Energy Durham, NC

Method Case Study controls
Baccharis and Lespedeza
Method controls aggressive plants to increase Pollinator Habitat

Honey Bee  Bumble Bee

2015 Baseline  165  165
2017 Spray  150  146
2018 Spray  197  192
Advised White House Task Force to include ROW as they criss-cross Monarch and Bird migration routes.
ROW occupy 61 million acres (148 million hectares) in United States

<table>
<thead>
<tr>
<th>Rights-of-Way (ROW)</th>
<th>US total (vegetation acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railroad</td>
<td>1.7 million</td>
</tr>
<tr>
<td>Highways</td>
<td>11.0 million</td>
</tr>
<tr>
<td>Oil pipelines</td>
<td>0.8 million (Rhode Island)</td>
</tr>
<tr>
<td>Gas pipelines</td>
<td>5.0 million (New Jersey)</td>
</tr>
<tr>
<td>Electric transmission</td>
<td>43.0 million (Florida)</td>
</tr>
<tr>
<td>Total</td>
<td>61 million (Michigan)</td>
</tr>
<tr>
<td>2X Continental National Park System</td>
<td></td>
</tr>
</tbody>
</table>
Federal Strategy on Pollinators

. . . agencies shall evaluate permit and management practices on power line, pipeline, utility, and other rights-of-way and easements, and ... make any necessary and appropriate changes to enhance pollinator habitat . . . through the use of integrated vegetation . . . and pollinator-friendly best management practices.
Migratory Bird Act restricts mowing April - August to prevent destruction of nesting sites
Late Summer ROW Mowing removes Forbs needed for pollinator nectar

Mowing after migratory bird restriction April-August
ROW Managers must consider Pollinators due to U.S. Federal Strategy and T&E Listing of Species

Rusty Patched Bumblebee
Listed

IVM benefits pollinators

Monarch Butterfly
Dec 2020?
Voluntary agreement with non-Federal property owners designed to address concerns about providing conservation for a species that may be listed as endangered.

- CCAA must provide net conservation benefit to covered species and address all key threats under property owners’ control (manageable threats).
- USFWS assures that no additional conservation measures or restrictions beyond those described in the CCAA will be required.
Milkweed is important for Monarch larvae, but nectar and pollen are necessary for migration.
Late blooming asters are vital.

July

Milkweed no longer feeds

Sept
Ohio State University Shale Gas IVM Habitat Studies
Selective spraying protects flowers to feed migrating Monarchs
## ROW Pollinator Beneficial Plant Taxonomic Orders

<table>
<thead>
<tr>
<th>Taxonomic Order</th>
<th>Nectar</th>
<th>Pollen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sapindales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sumac</td>
<td>300</td>
<td>290</td>
</tr>
<tr>
<td><strong>Caryophyllales/Polygonales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smartweeds/pinks</td>
<td>257</td>
<td>114</td>
</tr>
<tr>
<td><strong>Rhamnales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grapes/Virginia creeper</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td><strong>Fabales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legumes</td>
<td>211</td>
<td>163</td>
</tr>
<tr>
<td><strong>Rosales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roses</td>
<td>210</td>
<td>217</td>
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<tr>
<td><strong>Asterales</strong></td>
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<tr>
<td>Sunflowers/composites</td>
<td>203</td>
<td>185</td>
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<tr>
<td><strong>Ericales</strong></td>
<td></td>
<td></td>
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<tr>
<td>Blueberries</td>
<td>183</td>
<td>133</td>
</tr>
<tr>
<td><strong>Gentianales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milkweeds/Dogbanes</td>
<td>183</td>
<td>150</td>
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<tr>
<td><strong>Dipsacales</strong></td>
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<td></td>
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<tr>
<td>Honeysuckles/Elder/Virburnum</td>
<td>180</td>
<td>200</td>
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<tr>
<td><strong>Geraniales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geraniums/woodsorrels</td>
<td>167</td>
<td>133</td>
</tr>
<tr>
<td><strong>Lamiales/Scrophulariales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mints/figworts</td>
<td>156</td>
<td>150</td>
</tr>
<tr>
<td><strong>Malpighiales/Theales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Johnswort/violets</td>
<td>150</td>
<td>175</td>
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<tr>
<td><strong>Liliales</strong></td>
<td></td>
<td></td>
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<tr>
<td>Greenbriers/lilies</td>
<td>140</td>
<td>120</td>
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<tr>
<td><strong>Solonales</strong></td>
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<td></td>
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<tr>
<td>Nightshades/morning glories</td>
<td>133</td>
<td>167</td>
</tr>
<tr>
<td><strong>Apiales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild carrot</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
CPG - Canaan Valley NWR
Pipeline Replacement Partnership to protect
Dewey Hayden's sedge (Carex haydenii)

North Vista
Spread Soil
Transplant

6/16

6/18

2/17

6/19
IVM Success Led to New Pipeline Research in Lewis Wetzel WMA
TransCanada - West Virginia DNR

Compare forest habitat to seeded ROW & natural regeneration
Reduced Mowing Along Roadsides

- allows budget resources to be used for higher priority maintenance needs such as storm water management, invasive weed control and aesthetic enhancement.
- reduces maintenance hazards.

Unnecessary mowing of large expanses consumes DelDOT resources and is both monotonous and environmentally unsound.

Native warm season grasses begin to develop during the first year of reduced mowing.

Released from regular mowing, a graceful stand of little bluestem provides attractive winter color.

Reduced Mowing Along Roadsides

- conserves a greater number of Delaware regional native plants.
- contributes to the health of soils and groundwater.

A neatly mowed edge presents a clean appearance and highlights the diversity in the median, which is mowed annually.

Released from regular mowing, a wealth of native goldenrods and thoroughworts blooms in profusion in the median.
Highway mowing is hazardous
DOT mowing acreage can be reduced: don’t mow to fence simply because the state owns the land.
Planting roadside trees to mow around them does not help the Chesapeake Bay.
Pollinator Demo plantings cost about $10,000 per acre
MOW TO SWALE AND SELECTIVELY TREAT
BEHIND SWALE WHERE POLLINATOR PLANTS
CAN THRIVE
IVM Workshop
Alabama - Georgia DOT
AL 275 HILL TARGETED TALL GROWING TREES AND PRIVET
Herbicides released
21 new species

Year
- 2015: 31 Species
- 2016: 38 Species
- 2018: 52 Species

Categories:
- Herbs/Forbs
- Grass
- Dead Veg/Bare Soil
- Trees/Und Shrubs
- Vines-herbaceous
- Blackberry
Florida DOT

Spring 2016

Fall 2018

Saving $500/acre
Stop mowing and manage natural germination of pollinator plants

31 species germinated
University Maryland - State Highway Admin.
Only mow for sight distance and let
dormant plants germinate

51 species sprouted
Crews are trained in plant identification prior to spraying.

Progressive Solutions Applicator
Selective treatments remove invasives while keeping pollinator habitat
Utilities can partner with DOT to reduce mowing and manage sight distance, reliability and pollinators.
• IVM is not only a best practice for electric ROW but for ALL land management

• IVM is used to create, promote, and conserve sustainable plant communities that are compatible with the intended use of the site, and manage incompatible plants that may conflict with the intended use

• Chemical methods should be used to transition plant community to sustainable, compatible species by facilitating biological controls
Partnership with USFWS to develop IVM Case Study Examples for various objectives starting with existing ROW

- Establish 100-mile field tour route from Washington, DC to Maryland’s Eastern Shore
- Patuxent NWR - Columbia, MD - South River Greenway - Queenstown Harbor Golf Course - Maryland State Highways - Chino Farm - HarborView Farms
- Collaborate research with Washington College and MD, DE, Rutgers, Penn State, WVU, OSU to develop IVM college curriculum
Goat Grazing Study
Choptank Electric Cooperative and
Washington College at Chino Farms, MD
Agricultural Conservation Reserve Program (CREP) and Ditches
Agricultural Drainage Ditch
Harborview Farms, Rock Hall, MD

Spring 19

Summer 19
CREP potential habitat 24 million acres
USFWS partner treatment of Golf Course Natural Areas
IVM can restore habitat on landfills, mines and other open spaces
**IVM Summary**

Mowing and hand cutting only maintain vegetation

Cutting spreads invasive plants

Herbicides are necessary to reclaim and restore habitat

Planting is usually not needed, Milkweed germinates naturally

Forbs provide nectar and pollen critical for migration

Plants and animals provide biological controls

IVM saves money

Selective treatments applicable for all land management
IVM research primarily funded by Bayer Crop Sciences
• Your $ help us establish IVM case studies on electric, gas, highway, agriculture, ranches, golf courses
• Document plant diversity based on techniques used and relative benefit to bees, butterflies, moths, birds
• Collaborate with agencies, chemical companies, conservationists, and universities
• Develop college curriculum
• Publish findings at workshops, conferences, journals
• Study map on web: www.ivmpartners.org
• Contact: 302-299-5919   ivmpartners@gmail.com