IVM to Improve Access, Reliability, Habitat, Economics, and Public Relations

Integrated Vegetation Management

IVM Partners

Managing Ecosystems Together!

Rick Johnstone, President

IVM Partners

Integrated Vegetation Management

Managing Ecosystems Together!

- 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

ROW occupy 60 million acres (148 million hectares) in United States

- Electric transmission system - **450,000 miles**
- Natural gas transmission system - **300,000 miles**
- Interstate highway system - **33,000 miles**
- Rural highway system - **3 million miles**
- Railroad system - **170,000 miles**

Manage to early successional habitat not to a T&E Specie

Rusty Patched Bumblebee

Monarch Butterfly

Maryland wetland meadow habitat restoration

1 YEAR AFTER BROADCAST TREATMENT

Broadcast followed by selective treatment

Restored Wetland Meadow

Maple removal allowed orchid germination

- State Heritage biologist was asked the origin of the rare orchids...

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

Phragmites Wetland Restoration
broadcast treat then burn thatch

Follow-up inspection & selective backpack treatment

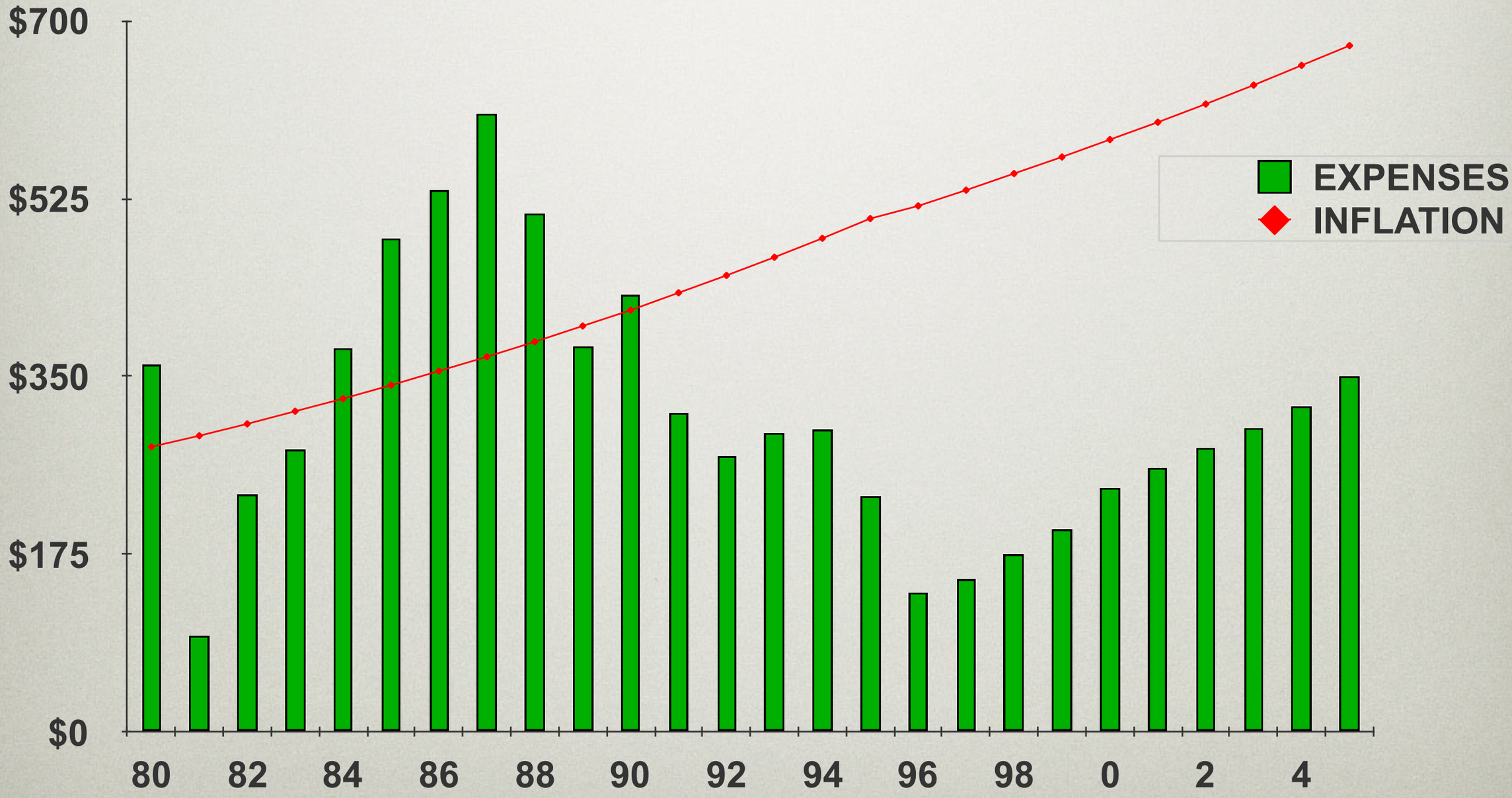
Germinating plants after Phragmites control

- 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

Plants provide cultural control as they compete for sunlight, water, nutrients and produce allelopathic chemicals

Birds/mammals provide biological control by consuming tree seeds & seedlings

IVM saved Delmarva Power $7,500,000 over 25 years



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

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

Mowing is a common maintenance practice

Mowers pollute greenhouse gases and increase carbon footprint

Mower tires rut wetland soils

Mowers leak oil, fuel and hydraulic fluid

Mowed ROW attracts ORVs that upset land owners

Cutting blades destroy wildlife and nesting sites

Migratory Bird Act April 15 - August 15

Fawns instinctively lie low when danger approaches

Removing vegetation along slopes is a potential erosion problem

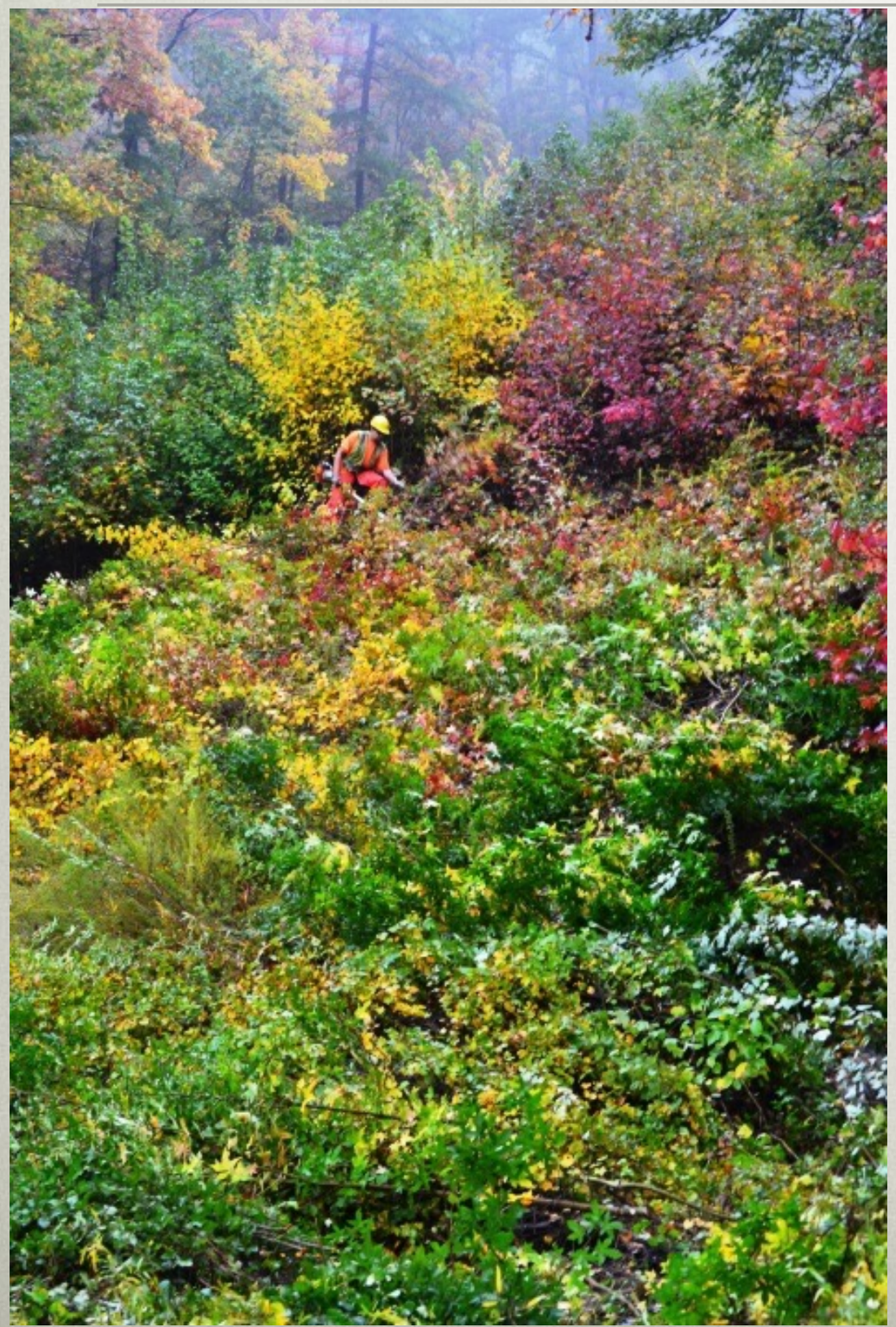
Clearing along stream riparian areas can cause heat and sediment pollution

Sediment can adversely affect fish & wildlife

Mowing is difficult on steep slopes

Mountain ROW hard to access

Hand-cutting is dangerous



Hazards of rocks, snow, ice

Invasive plants cannot be controlled with cutting

Non-native Forbs

Scotch broom

Cutting invasive plants along water acts as a vector for spreading their seeds downstream

With prolific seed production

Cutting encourages multiple sprouts, increased density of brush, and continued root growth

Brush impedes safe and efficient access

Herbicides are a necessary tool to convert plant communities

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

IVM uses a combination of control methods to **manage** for low-growing compatible 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**

Broadcast treatments may be used as first restoration step after years of mowing or cutting

Michigan study after mowing and treatment

60 EARLY SUCCESSIONAL SPECIES GERMINATED

Spring 2006

Spring 2008

Rare Blandings turtle using restored meadow habitat

ROW broadcast herbicides controlled Canada Thistle & Spotted knapweed

Bobwhite quail returned to oak savanna prairie

Case study 2 months after Buckthorn mowing

Broadcast treatment with selective chemistry

BOTANICAL STUDIES SPLIT TREAT AND CONTROL

Treatment study 2nd Year

Control study 2nd year

4-year case study
early successional or Trees/invasives

Broadcast treat lespedeza & Fescue
Patuxent NWR

Restore native grasses and forbs

Selective chemistry restores prairie habitat

Habitat restoration is the reward

ELECTRIC AND NATURAL GAS HAVE SIMILAR VEGETATIVE ISSUES

Columbia Gulf (TransCanada)
Army Corps of Engineers

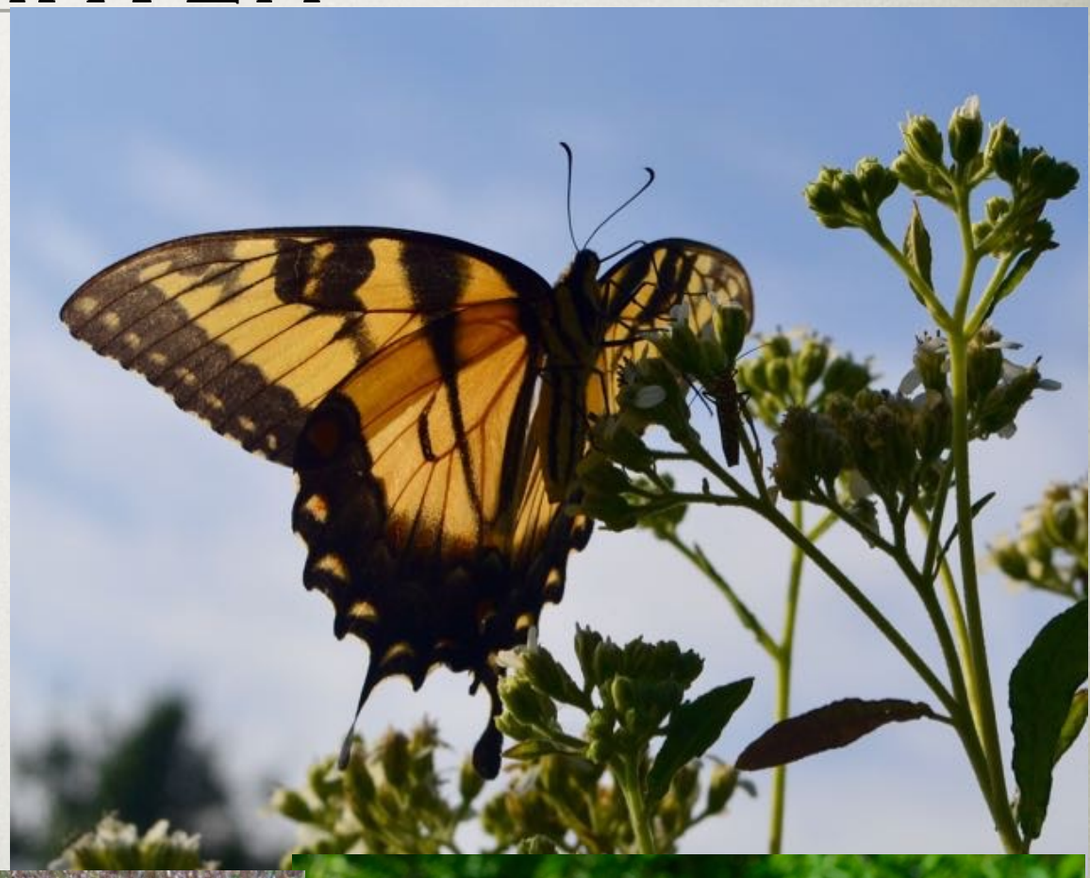
Tall brush mowed in winter

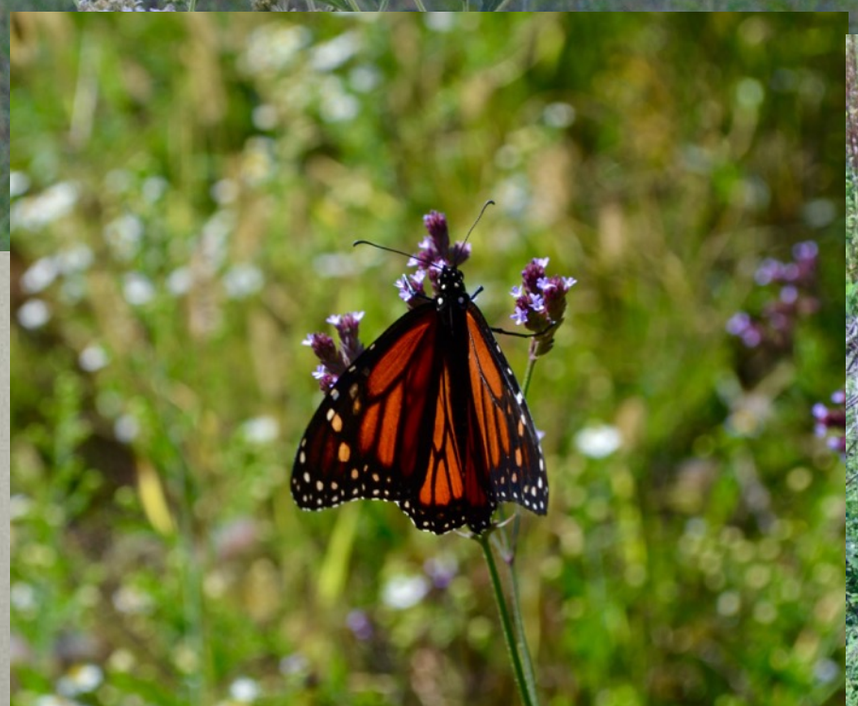
Broadcast treatment 1st year
Selective backpack 2nd year

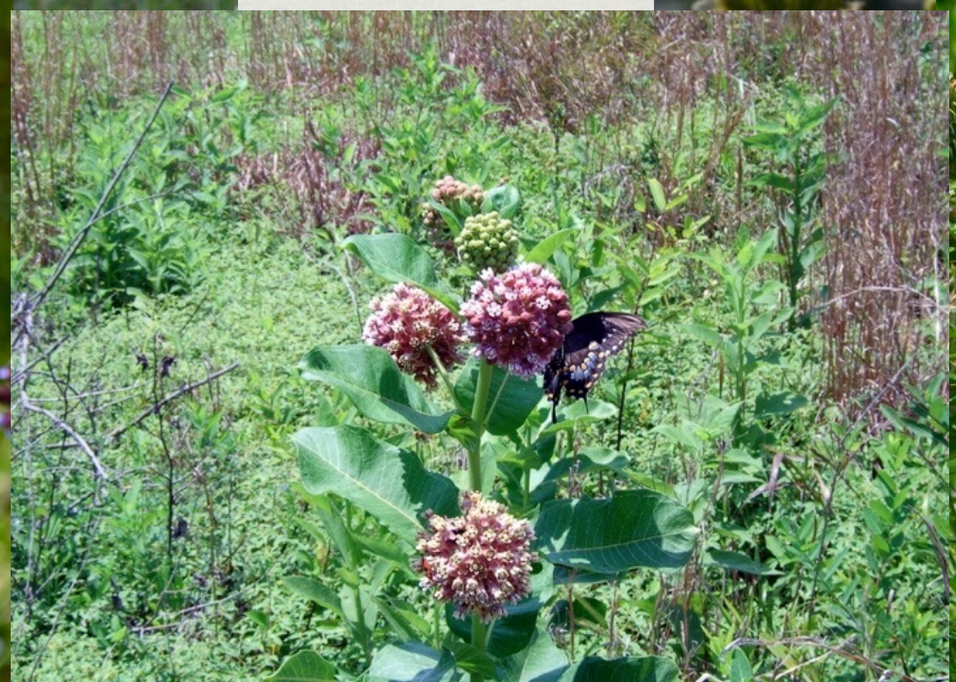
IVM took habitat from this

To this

Transforming ROW into butterfly haven



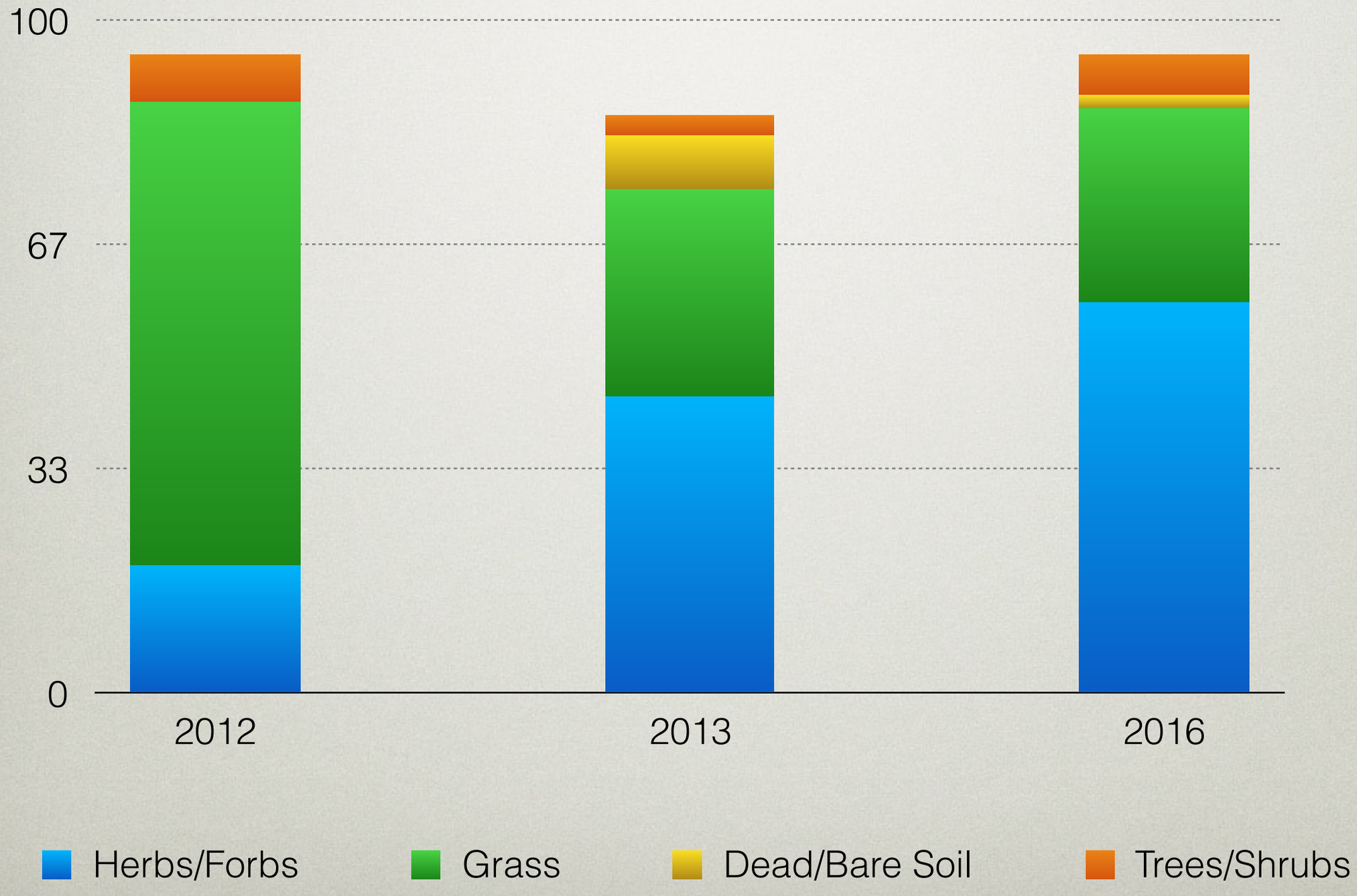




Pipeline ROW provides energy services and pollinator habitat

Mowed ROW removes pollinator habitat

Pollinator plants return in 1-year if mowing stops



Spray bands to develop Pipe zone - Border zone for uninhibited testing

Progressive Solutions
developed spray behind backpack

IVM manages pipe zone for access & border zone for pollinator habitat

IVM contrasts mowing on Enable Midstream Partners in Arkansas

Early successional plants quickly disappear after mowing

2015

2017

Mowing increases brush density that inhibits access

2014

2017

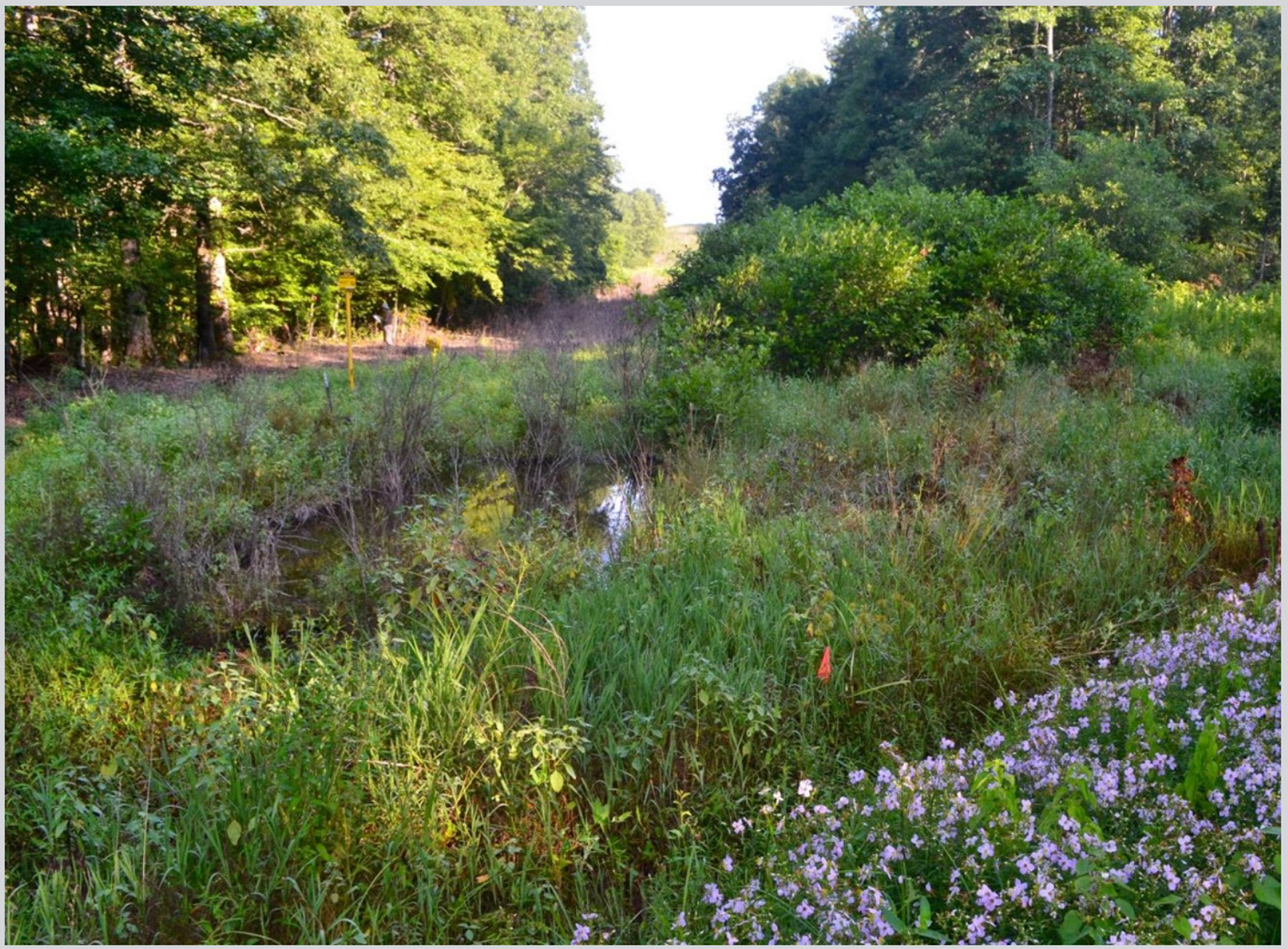
Little sunlight penetrates dense sprouts to allow forbs

FERC RULE ALLOWS CUTTING 10 FT-WIDE ALONG PIPE ROUTE IN WETLANDS

Invasives and problem brush remain but can be cut when 15-feet tall

Selectively treat wetland areas with EPA-approved herbicides

6/2014



8/2017

Pipe Zone - Border Zone

Enable Midstream and Arkansas Natural Heritage Partner to manage rare corkwood shrub

Brush was too tall to selectively treat and was mowed in winter and treated summer 2017

Releasing corkwood and marsh mallow

ENABLE MIDSTREAM IVM PROGRAM

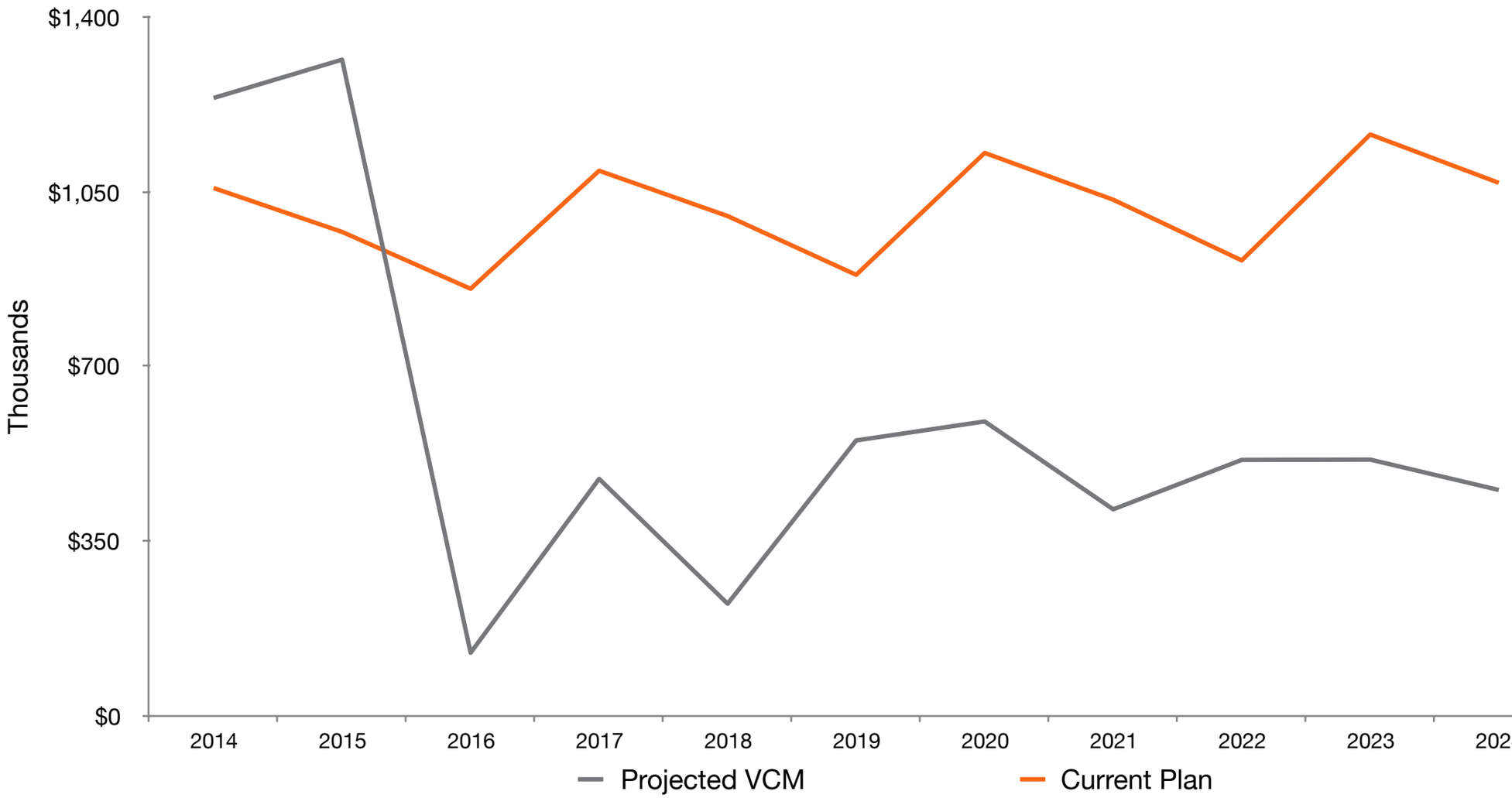
VMES
VEGETATION MANAGEMENT WITH ENVIRONMENTAL STEWARDSHIP

First 3 years are an investment phase where total cost will average $200k more per year than just continuing to mechanical cut

In addition to minimizing risk associated with a violation of FERC Plan, IVM avoids impacts to nesting migratory birds and a violation of the Migratory Bird Treaty Act.

7,000 acres restored in 4 years!

ECONOMIC RESULTS OF IVM



Economics

Integrated Vegetation Management

- Primary Objectives of Utilities, Railroads and Highways
  - Safety
  - Reliability
  - Access
  - Sight Distance
- Secondary Objectives of Agencies, Conservationists, Citizens
  - Erosion Control
  - Aesthetics
  - Birds and Wildlife
  - Butterflies, Bees and other Pollinators
  - Endangered Species
  - Invasive Weed Control
  - Wildfire Mitigation

Public Education

the floodplain

Trees in the floodplain of Stony Creek used to be routinely topped to prevent contact with overhead high voltage wires, which sag during high electricity use on hot summer days. Topping can damage trees by allowing rot to enter, making the branches subject to breakage during storms, and the trees cannot retain their natural form and beauty.

ITC and the Metroparks, knowing that tall trees should not grow directly under high voltage lines, have chosen to remove most trees and kill others where they stand. The Norway maple, a non-native tree that has displaced our native sugar maple in many places, is one of the trees targeted for removal. As they decompose, the standing trees may serve as homes for wood ducks, squirrels and raccoons, while the fallen trees will provide shelter for salamanders, shrews and snails.

The added sunlight to the forest floor allows shrubs, flowers and vines to grow, adding to the biodiversity of the park.

The corridor with the trees that had been topped.

The cleared corridor.

Wood Duck

Squirrel

Raccoon

Salamander

Shrew

Snail

Metropark Norway Maple in Wetland ROW

Trees are felled or topped & girdled to provide tree snag wildlife habitat

Full sunlight allows meadow germination

Restored floodplain meadow

Habitat restoration praised by USF&WS & USGS at field Workshop

Partner with agencies to document habitat restoration

Wire Zone - Border Zone

IVM used selective backpacks to retain shrubs in ravines and borders

Shrub habitat stabilizes soils and limits invasion by non-natives

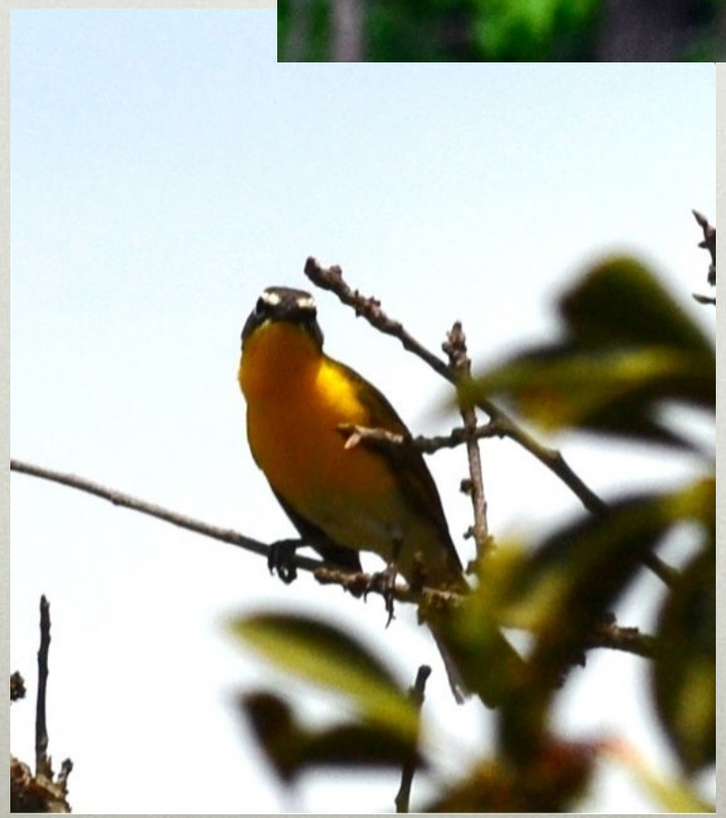
2009

2012

Partner to treat invasive plants like phragmites

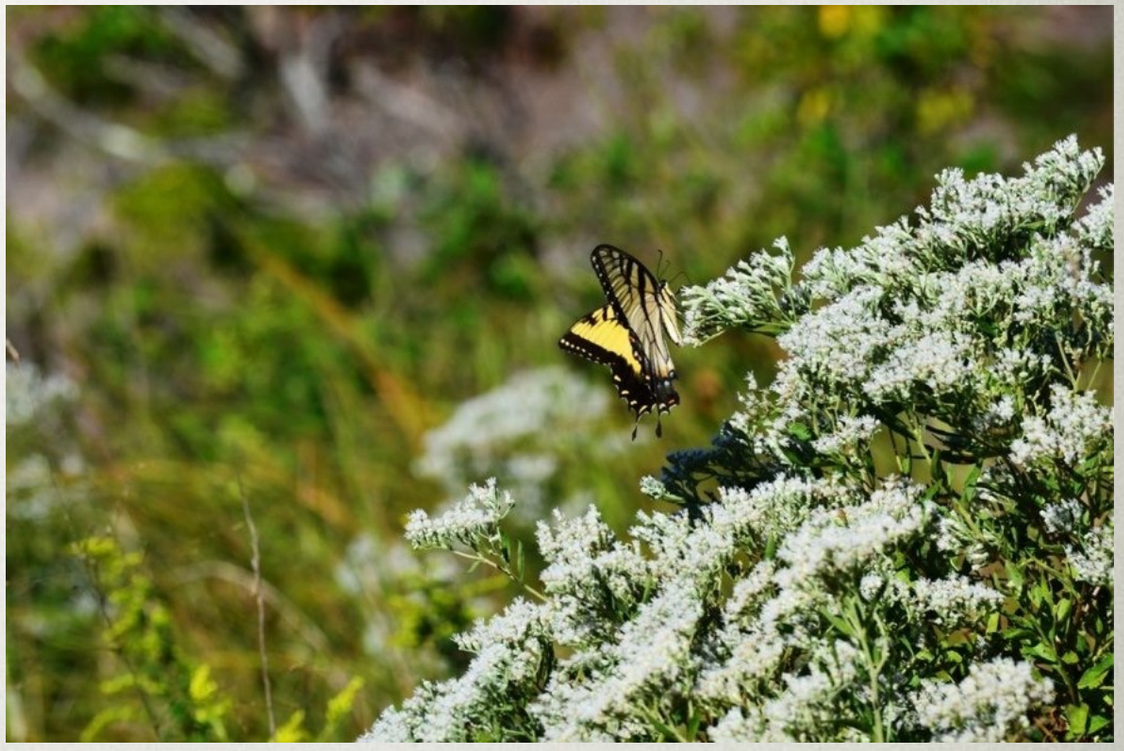
Restore native ecosystems

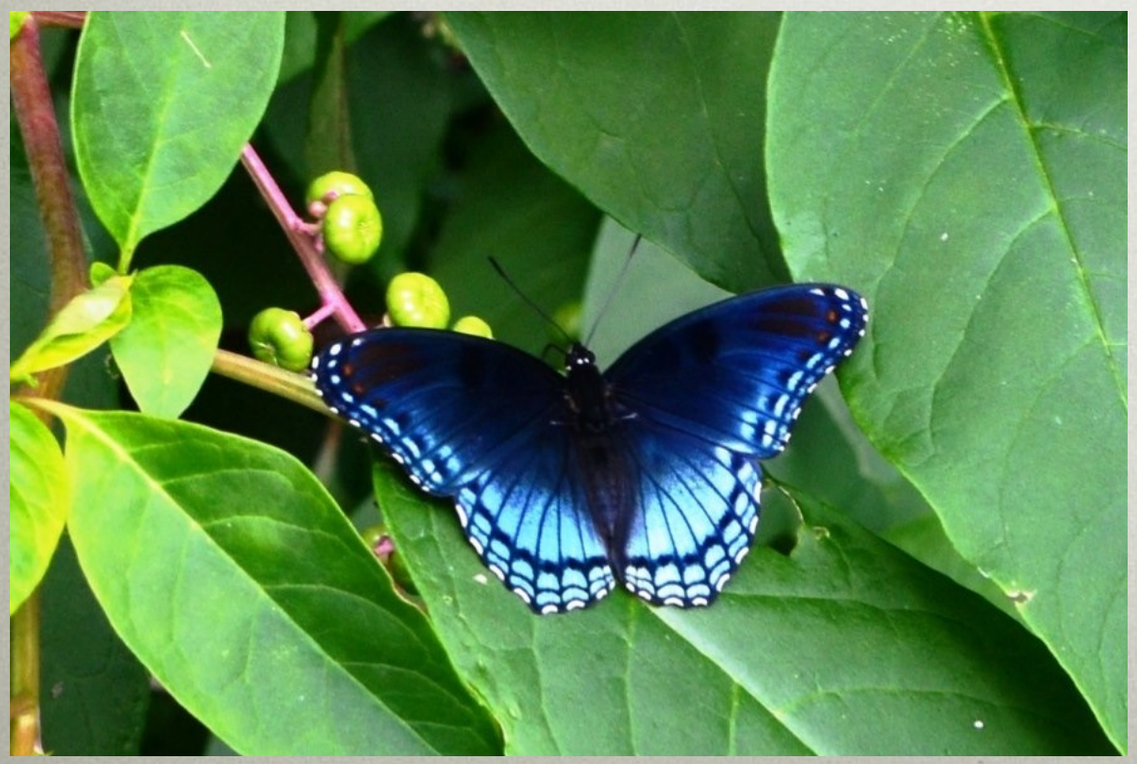
USF&WS and Audubon partners documented 120 species of birds



147 species of native Bees

40 Butterfly species





USGS Bee Expert Sam Droege:
"Best pollinator habitat in Mid-Atlantic States"

Suburban residents accept routine mowing

Clearing trees in wetlands and ravines brings complaints

BROKERED PARTNERSHIP
BGE - COLUMBIA - HOWARD COUNTY

Ecosystem restoration education for public

Hydraulic treatment of 2-year invasive Tree-of-heaven

Tree-of-heaven after fall treatment

Tree of Heaven following spring

Summer habitat restored

IVM was accepted to reclaim wetland habitat and stop mowing

Riparian restoration winter 2010 clearing

Riparian restoration
Fall 2010 application

Riparian restoration
Summer 2011

Riparian restoration
Summer 2016

Roadside aesthetics

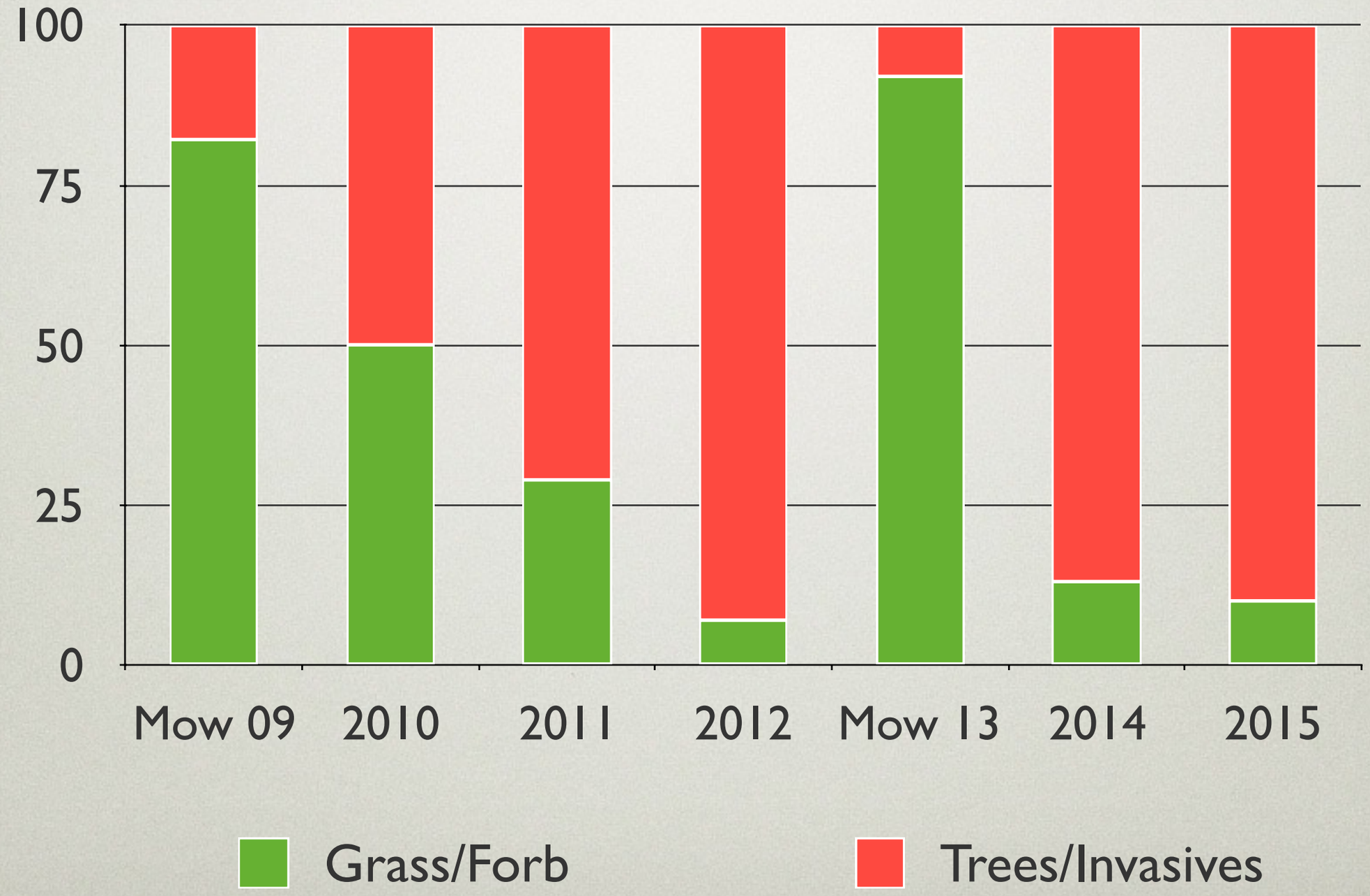
IVM CASE STUDIES DOCUMENTED CHANGES WITH CONTROL COMPARISONS

Spring 2010

Fall 2012

Through 2 maintenance cycles

Mowed plant community



IVM Plant Community

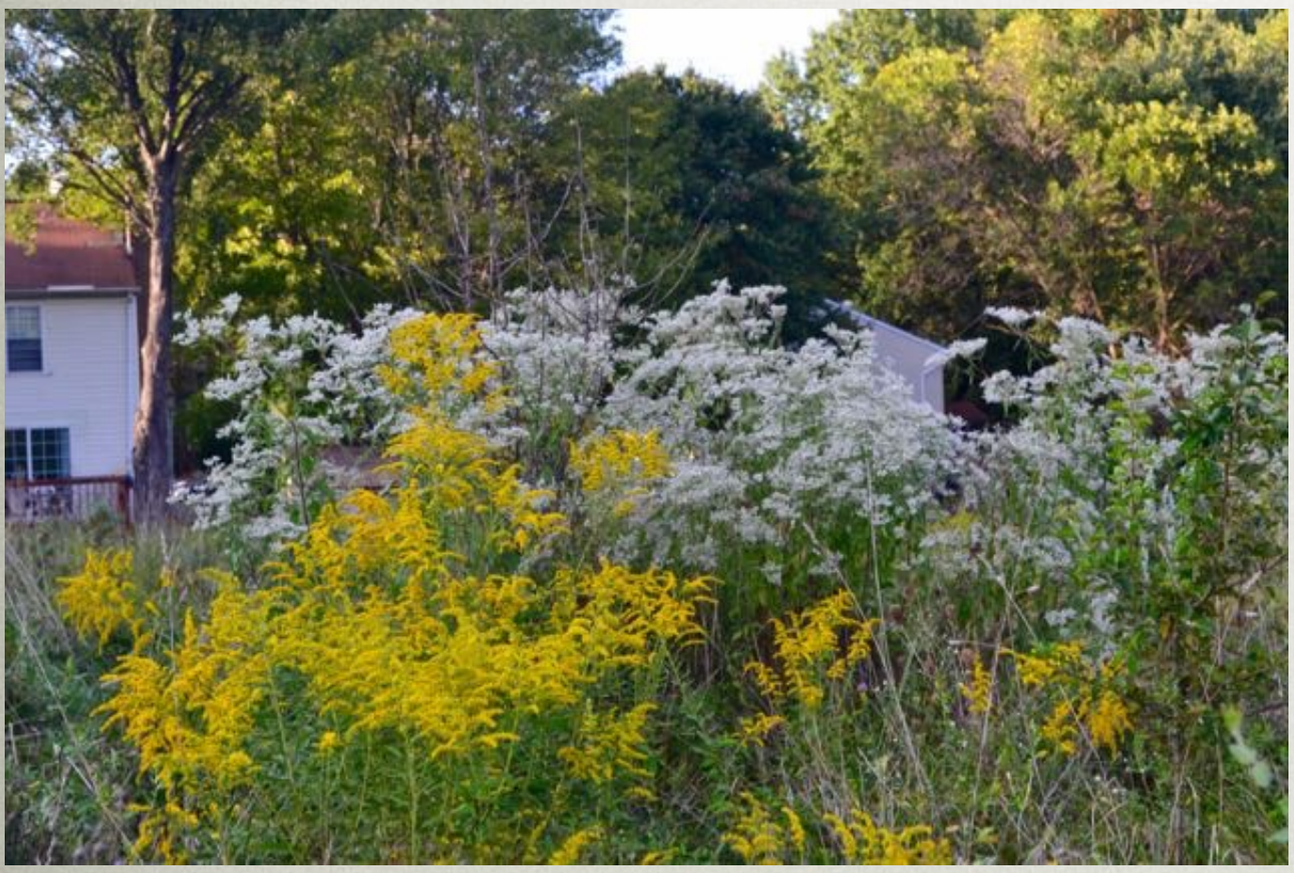
Educate agencies and public with side-by-side comparisons

Maryland Public Service Commission requires IVM for new ROW

Wind Turbine Generation Line

Don’t cut dead stems for aesthetics as they provide bee nesting habitat

Improved aesthetics & bird watching along nature trails



Public Education signs placed along community hike/bike trails

Instead of mowed terrain we restored native ecosystem

Releasing Milkweed

To the enjoyment of pollinators

Western wildfire concerns

ROW can serve as firebreak

Flammable ladder fuels must be removed

Cutting can reclaim a ROW

Lupine and wildflowers may germinate

Trees will sprout back

Oak & Pine will dominate in 1 growing season without herbicides

HIGH DESERT STUDY ADJOINING PRESCOTT NATIONAL FOREST

Post mowing 2009

2013 treatment

32

Prescott NF needed mowing and hand cutting in 2014

Side-by-side Comparison 2014

before cutting

Side-by-side Comparison 2015

after cutting

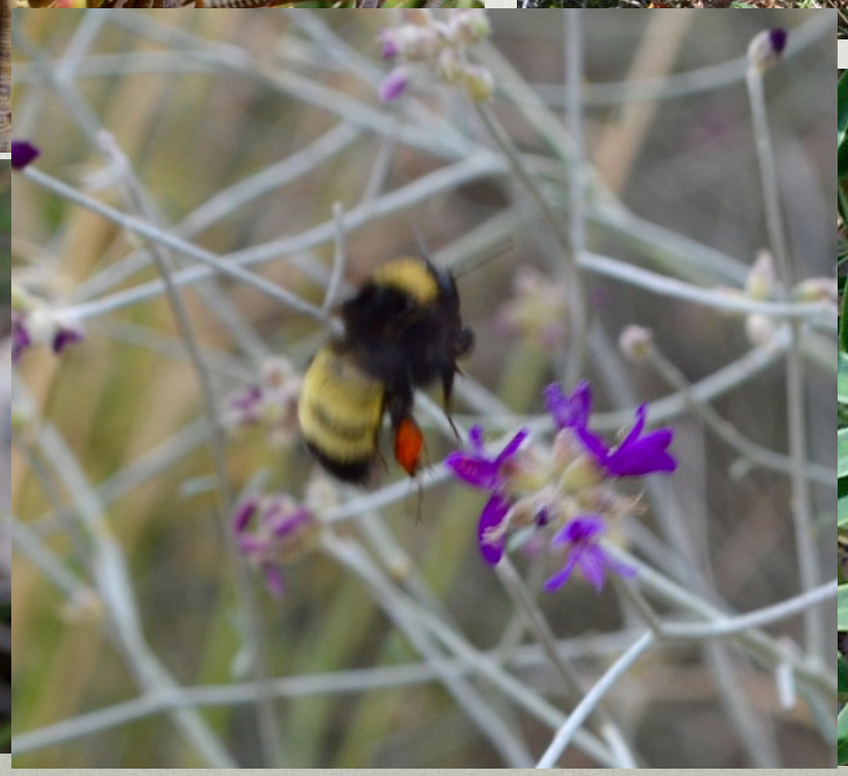
IVM required no maintenance

ROW cool burning plants provide defensible space

Cliff rose retained for pollinator habitat

Pollinator Habitat Restored

Provide pollen - nectar diversity



IVM education helped build partnership between APS and The Navajo Nation

Manage ROW to meet Tribal and Utility Needs

Improve livestock grazing and reduce erosion and runoff

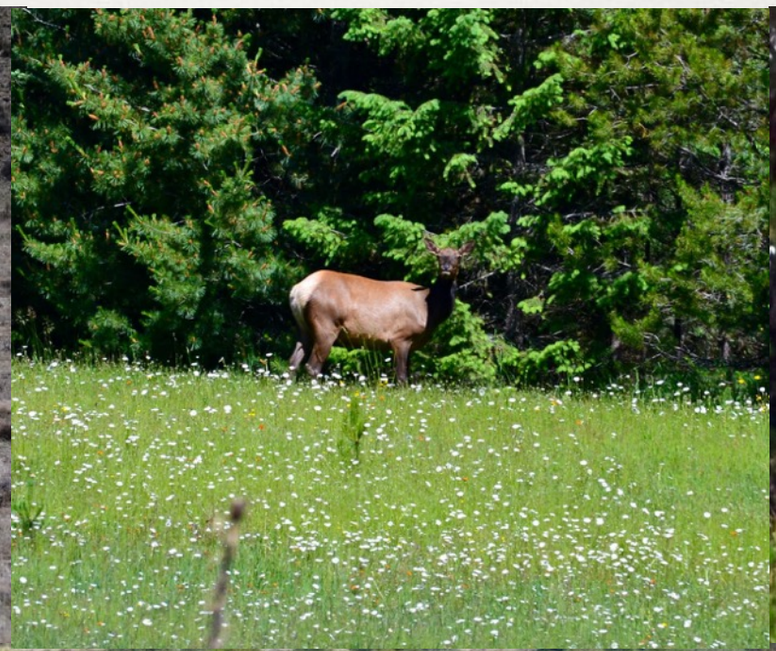
Control Salt Cedar and Russian Olive with utility as partner

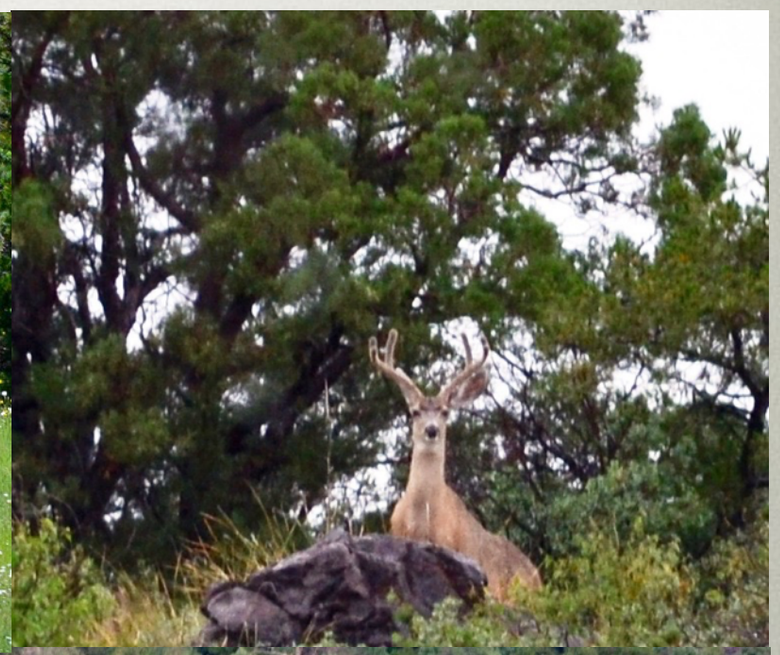
Release pollinator plants

Pollinators benefit

Hummingbird delight

Improve Wildlife habitat





Mammal Food and Bedding

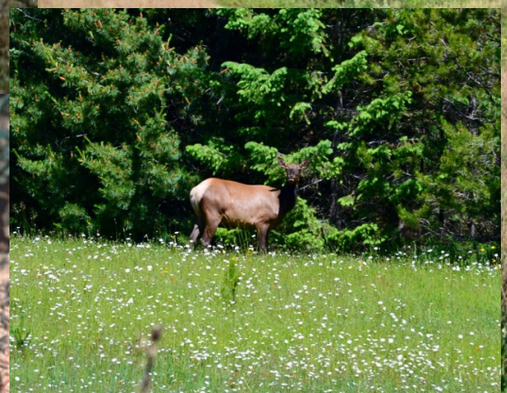




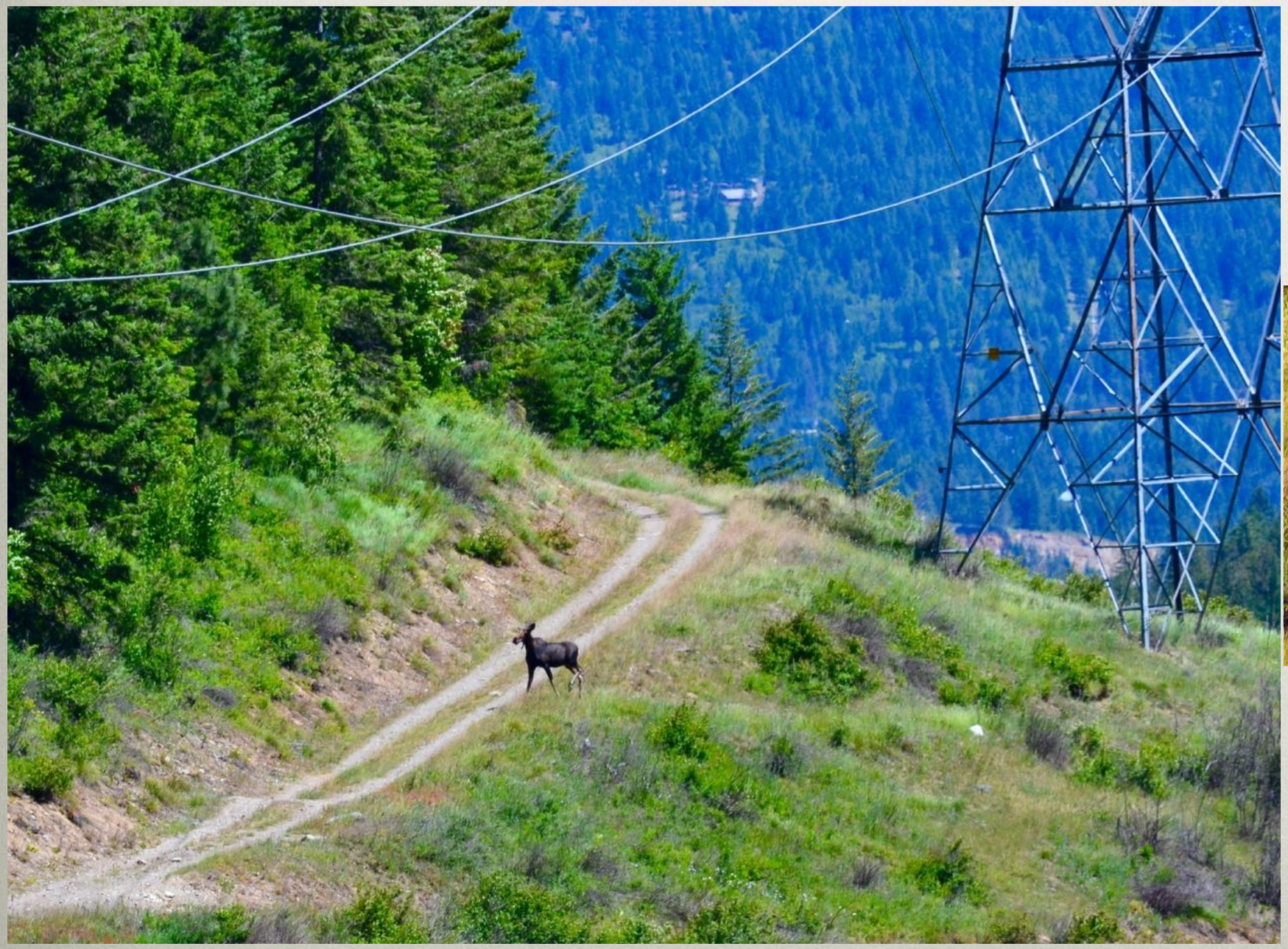






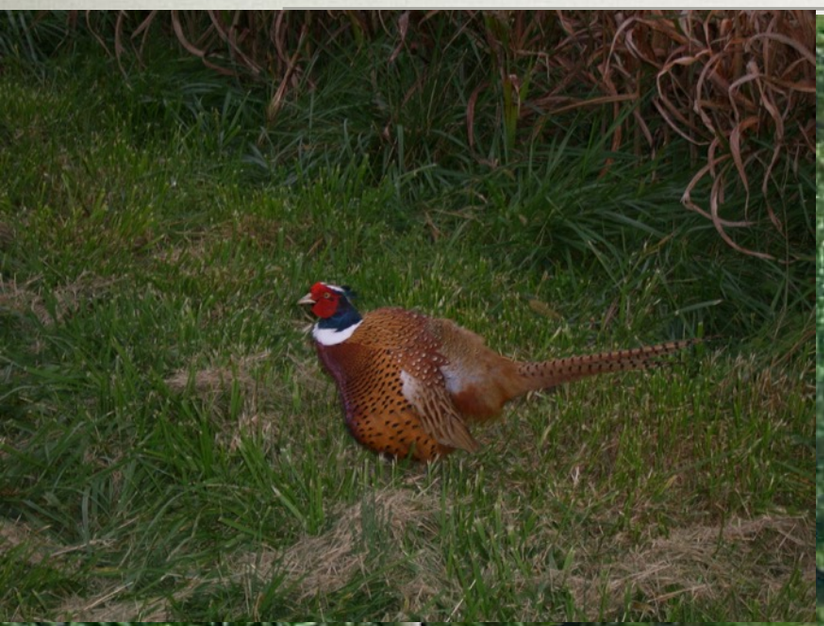




Moose feed in ROW



Bear feed in ROW

IVM improves habitat for a variety of wildlife

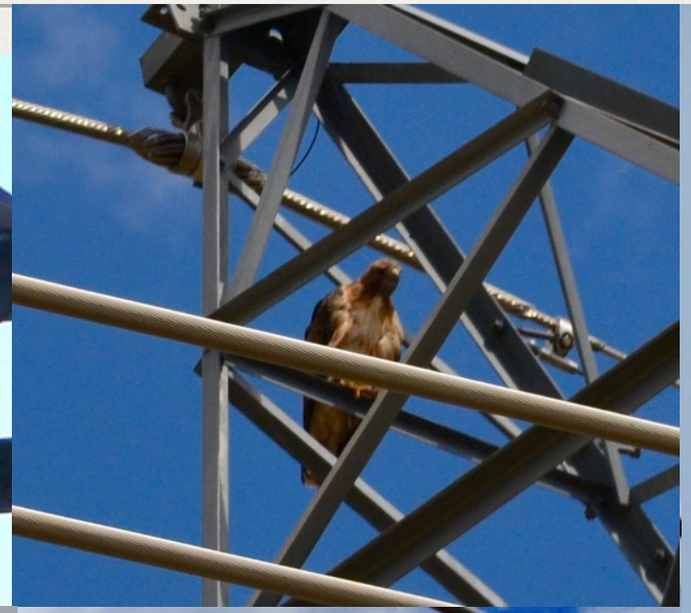


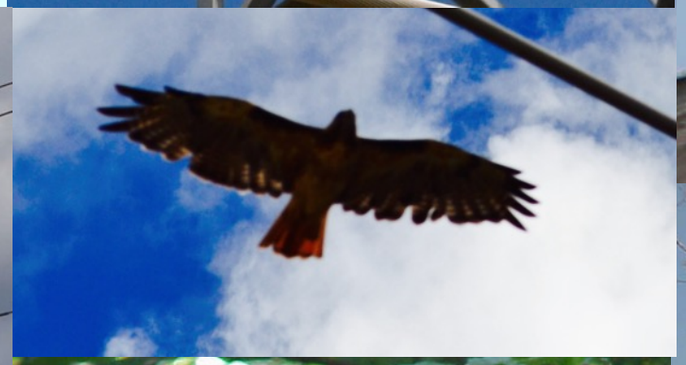







Raptors perch and patrol ROW





Pollinator Site Value Index (PSVI)

<u>Plant Taxonomic Orders</u>

- Asterales (Composites/Asters)
- Fabales (legumes)
- Lamiales (mints)
- Gentianales (milkweeds)
- Myrtales (Evening primroses)

Pollen and Nectar Production for Energy to Migrate

Developing Pollinator Site Value Index

A.	TARGET foci: SPECIE, GENUS, ORDER	Max Rating Range
1a	Species: *Apis mellifera, Bombus sp.*	
1b	Order: Hymenoptera	
B.	GEOGRAPHIC FIXED SITE METRICS	
2.	Right-of-way: oil & gas pipelines, electric, road side, RR, traffic use, other disturbances	150
3.	Location: Longitude/latitude /GDD (growing degree days)	150
4.	Size of area; width S/M/L (10:50:150)	150
5.	Adjacent habitat type: woodland, grassland, farmland, housing development, road, wetland	150
	SUB-TOTAL B (maximum) sum of lines 2-5 =	**600**
C.	SITE VEGETATION VARIABLE METRICS	
6.	Plant species inventory (##/site) (fm)	-
7.	Plant species % cover (cf)	-
8.	Nectar & pollen production months, i.e. flowering period (fm)	1-9
9.	Nectar quality by * rating (cf)	1-5
10.	Pollen quality by * rating (cf)	1-5
	Total Annual Estimate (TAEcf): sum of lines 6-10 = PSVI cf+fm. **SUB-TOTAL C (maximum) =**	**1000**
D.	OTHER SITE VARIABLE METRICS	
11.	Breeding and over wintering habitat quality. Bare ground, snags, pithy stems. Area S/M/L (10:50:150)	150
12.	Site management: mow cycle, hand cut, tillage, spray, IPM/IVM (0:0:250)	250
	SUB-TOTAL D (maximum score) sum of lines 11-12 =	**400**
	PSVI TOTAL MAXIMUM SCORE = SUM of B+C+D	**2000**

Autumn olive conversion to native grasses and forbs

Early successional habitat restored

PSVI Autumn olive Mown 2011

A	B	C	D	E
Vegetation type (VT)	# species ITIS code	Percent cover (%)	Pollen/nectar values (FSV_i)	Percent cover x FSV_i
Shrub large (SL)	1	1	3/3	3/3
Vines woody (VW)	1	0.13	3/3	0.39/0.39
Herbaceous forbs (HF)	3	0.12	3/3	0.36/0.36
Grasses-graminoids (GR)	2	0.25	0	0
Vines herbaceous (VH)	5	2.13	9/9	19.17/19.17
2011 Totals		3.63%	FSVp/n = 18/18	$PSVI_{cf}$ p/n= 22.92/22.92
Max PSVI = 1,000				**Total PSVI = 45.84**

PSVI cf Autumn olive IVM 2015

A	B	C	D	E
Vegetation type (VT)	# species ITIS code	Percent cover (%)	Pollen/nectar values (FSV_i)	Percent cover x FSV_i
Shrub large (SL)		0	0	0
Vines woody (VW)	1	0.5	3/3	1.5/1.5
Herbaceous forbs (HF)	12	22.9	14/16	320.6/366.4
Grasses-graminoids (GR)	6	66.1	0	0
Vines herbaceous (VH)	0	0		
2015 Totals		89.5%	FSVp/n = 17/19	$PSVI_{cf}$ p/n= 322.1/367.9
Max PSVI = 1,000				**Total PSVI = 690.0**

18X increase

Selective treatments keep it

Duke Energy Durham, NC case studies

5-16

10-17

Duke Energy Durham, NC case studies

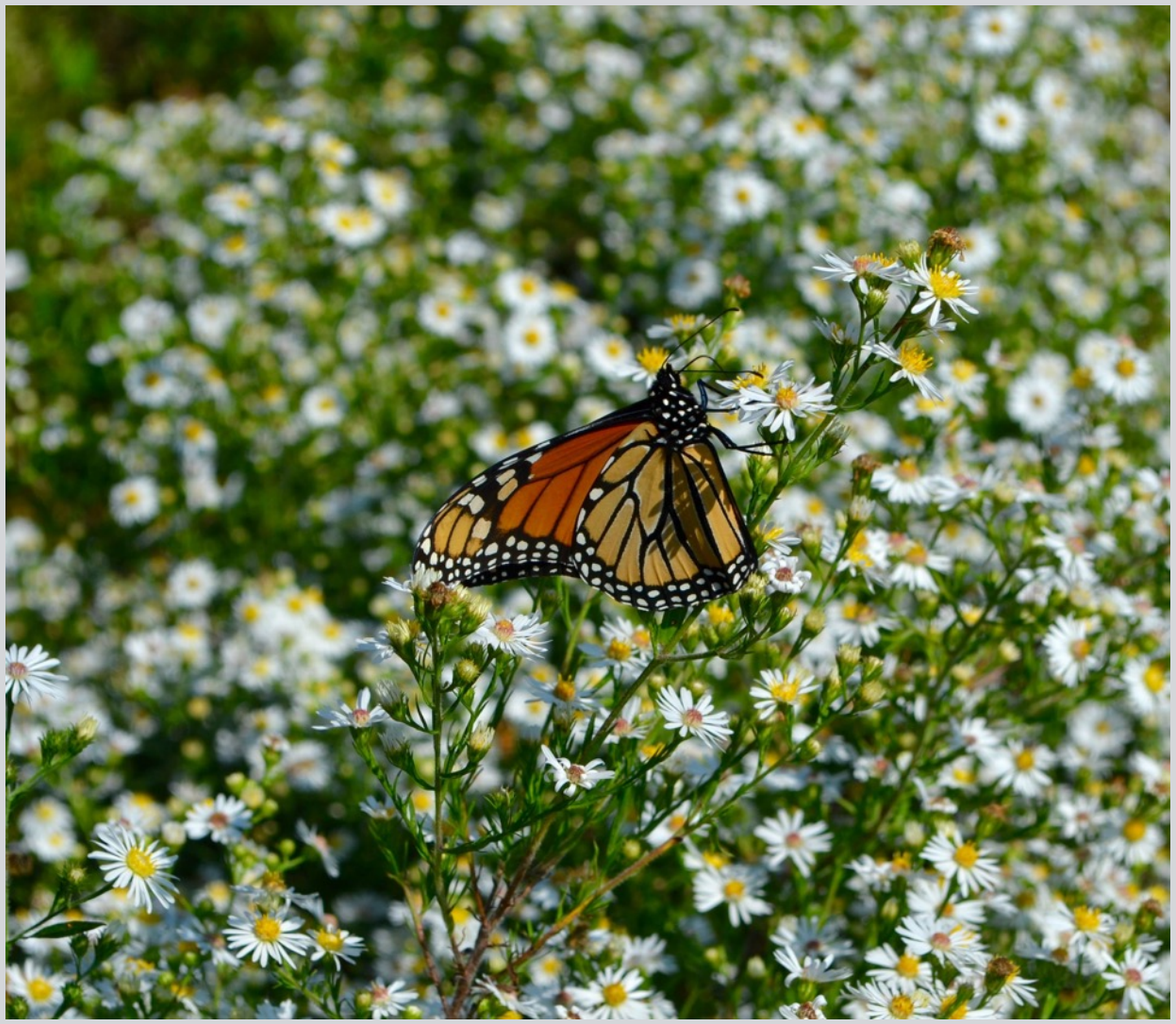
10-15

10-17

Duke Energy Durham, NC
Lespedeza case study

Pollinator General Assessment: Nectar/Pollen Fall Potential Production (PGA-fp)						
Site: LECU, Page Road, Durham, NC. PGA maximum N/P potential. Asterales spp. Dominant genera.						
A.	B.	C.	D.	E.	F.	G.
Year	Season	Forb species	% cover	Specific N/P*	Site N/P	
				Max 5/5^ per specie		
2015	Summer	Goldenrod sp.	8	3/4	0.24/0.32	
	June	Aster sp.	2	2/2	0.04/0.04	
		other	90	0/0	28/36	Total x100
			100%		Max 500/500	
2017	Fall	Boneset sp.	5	2/2	0.1/0.1	
	October	Dog fennel	30	3/2	0.9/0.6	
		Aster sp.	60	2/2	1.2/1.2	
		Other	5	0/0	0/0	
10x20m block			100%		220/190	Total x100
					Max 500/500	

Milkweed is important for Monarch larvae, but nectar and pollen are necessary for migration



Late blooming asters are vital

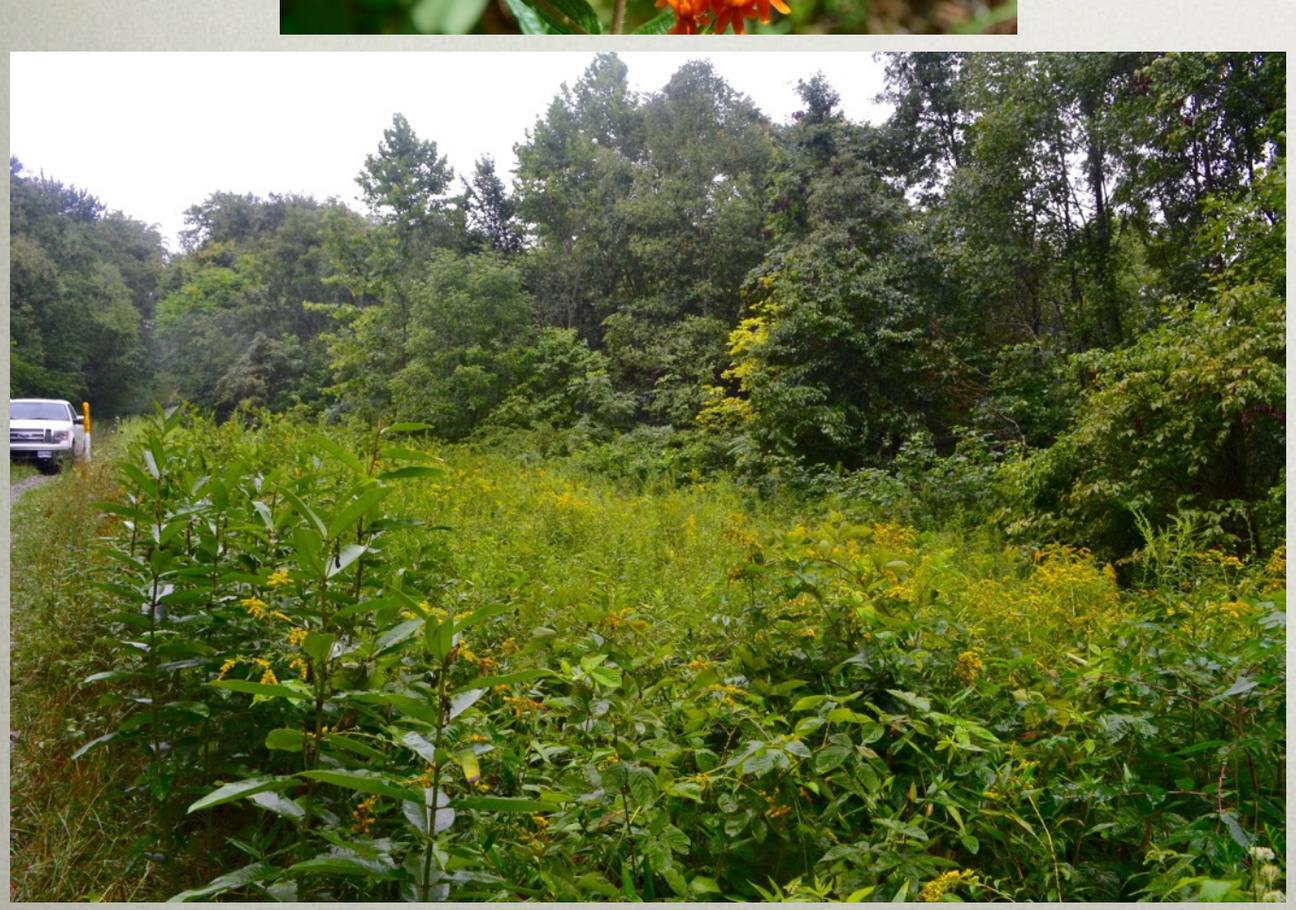
July 17

Sept 17

Milkweed no longer feeds

Late Summer ROW Mowing removes Forbs needed for pollinator nectar

Pollinators & forbs before cutting



Wildflower remnants after mowing

Ohio State University Shale Gas ROW pollinator Habitat research

Selective spraying protects flowers to feed migrating Monarchs

Native and honey bees also depend on late forbs

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.

City Grass height ordinance
mandatory mowing

Mowing should stop if IVM is practiced

Stop mowing and pollinator plants germinate without expensive landscaping

IVM for Dept of Agriculture CRP land
24 million acres

Drainage Ditches

ROW Habitat next to cropped field

IVM can restore habitat on landfills, mines and other open spaces

Control invasives and restore Native habitat

Pollinator landscape planting costs about $10,000 per acre

Plus high maintenance costs

Planting roadside trees to mow around them does not help the Chesapeake Bay

Mowing acreage can be reduced: don't mow to fence simply because the state owns the land

Selectively treat behind swale where pollinator plants can thrive

Tall growing trees and privet targeted in Alabama

Sumac retained for pollinators

Clover leaf can restore southeastern pine savanna

Stop routine mowing and practice IVM

University Maryland - State Highway Admin.

Only mow for sight distance and let dormant plants germinate

51 species sprouted

Stop mowing and manage natural germination of pollinator plants

40 Species in Florida

Selective treatments remove invasives while keeping pollinator Habitat

Utilities can Partner with DOT

Mow only to swale

MD SHA and Choptank Electric COOP

SHA stop mowing and allow IVM

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 Partners

Integrated Vegetation Management

Managing Ecosystems Together!

- IVM case studies on electric, gas and highway ROW
- Documented plant diversity from various management techniques
- Collaboration with conservation, university and agency pollinator and bird experts
- Findings presented at field workshops, conferences, journals, and web www.ivmpartners.org
- **Contact: 302-299-5919 ivmpartners@gmail.com**