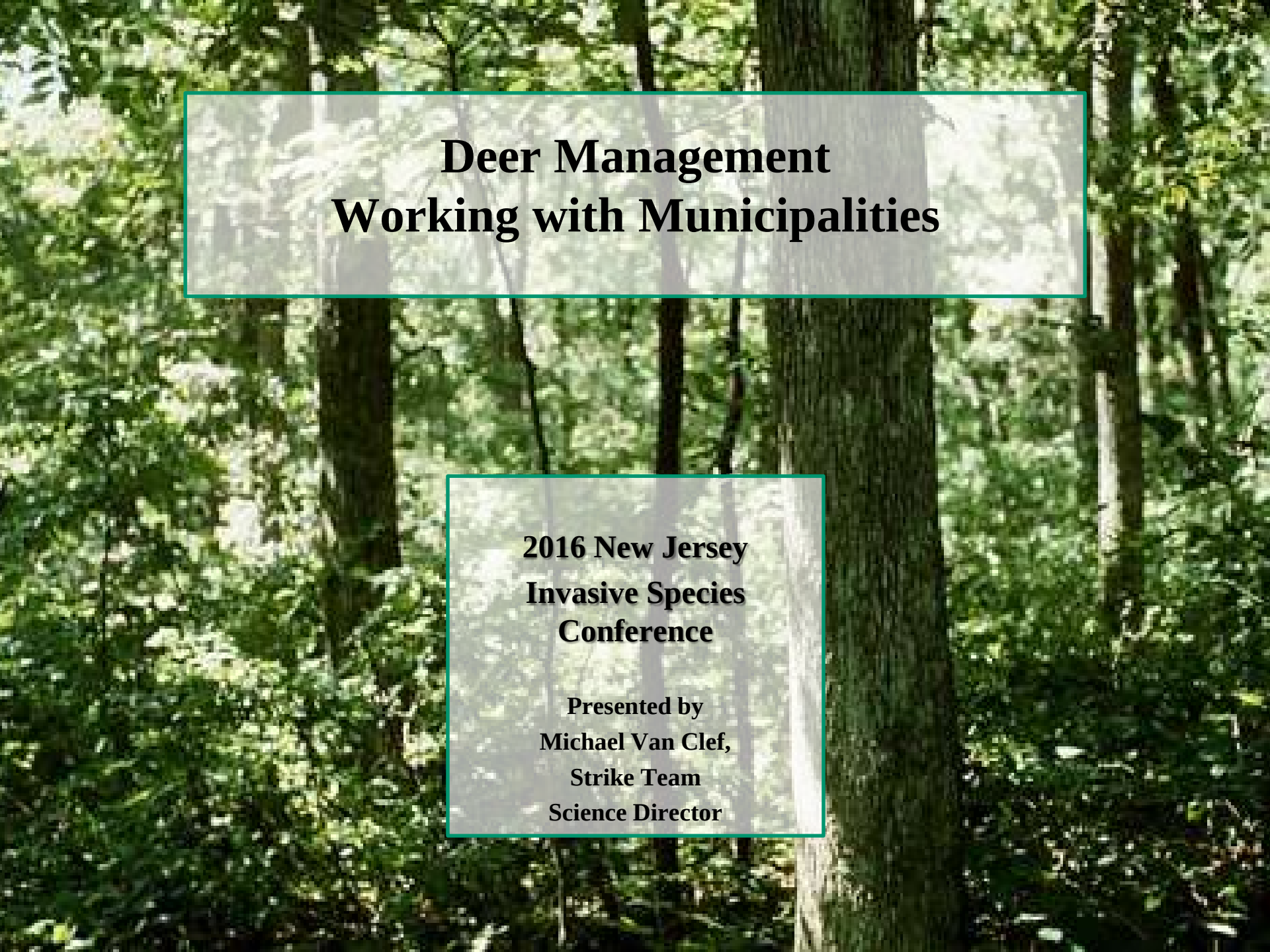


Deer Management
Working with Municipalities

2016 New Jersey Invasive Species Conference

Presented by
Michael Van Clef,
Strike Team
Science Director

The Goal

HEALTHY FORESTS!

Complete vertical structure
Advance regeneration
Species Diversity

Diverse herb layer, tree and shrub seedlings, mature shrubs, tree saplings, sub-canopy trees, canopy trees

Does this model explain forest health?

Suspected Relationship Between Native and Non-Native Plant Abundance in Relation to Land Use Intensity and Deer Abundance

Please note brief explanations provided below chart and species susceptibility table.

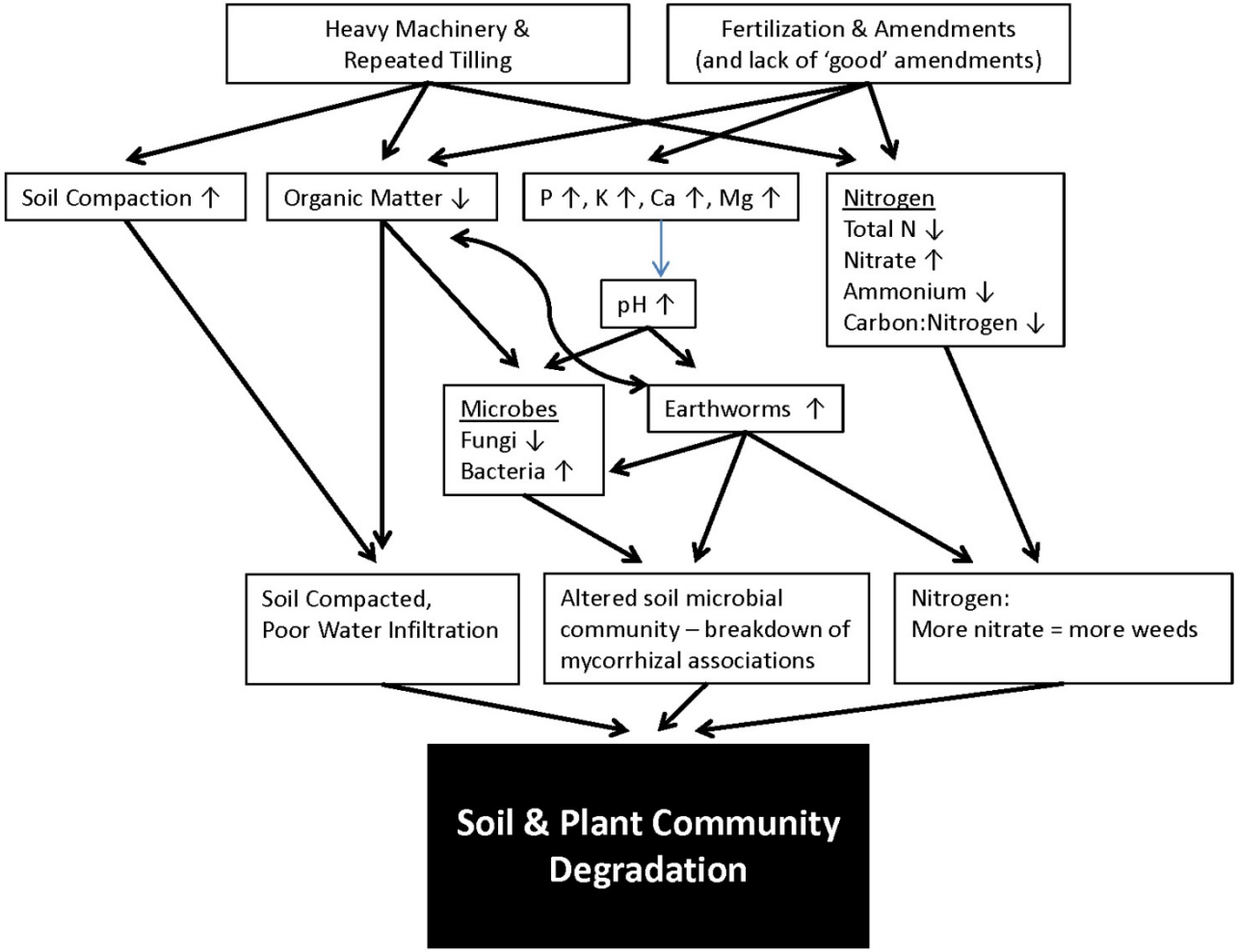
Deer Abundance	Past Agricultural Use: Present	Past Agricultural Use: Absent
High	Invasive Plants: ↑↑↑	Invasive Plants*: 0 ---> ↑
High	Native Plants: ↓↓↓	Native Plants: ↓↓↓
Low	Invasive Plants: ↑↑	Invasive Plants: ↓↓↓
Low	Native Plants: ↑	Native Plants: ↑↑↑

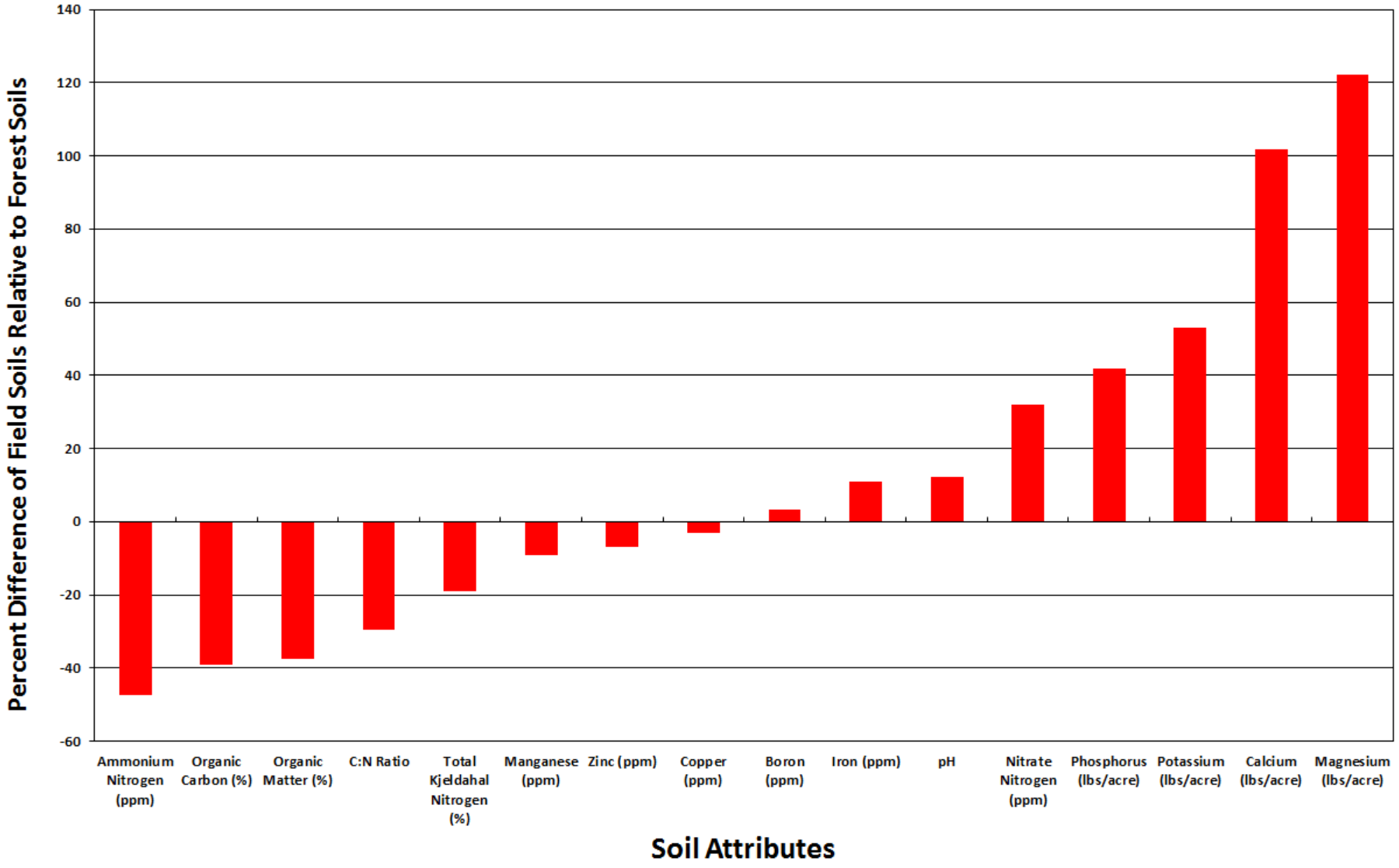
*Invasive plants are slow to establish on unaltered forest soils even when deer abundance is high. However, infestations often occur quickly in forest gaps after canopy trees fall (presumably in response to increased light).

PAST
LAND USE

STEWARDSHIP =
Mitigation of human
impacts on natural systems

Very long term soil changes (>>> 100 years?)
But really, it is way more complicated than it looks!




Percent Difference of Field Soils Relative to Forest Soils
140
120
100
80
60
40
20
0
-20
-40
-60
Ammonium Nitrogen (ppm)
Organic Carbon (%)
Organic Matter (%)
C:N Ratio
Total Kjeldahal Nitrogen (%)
Manganese (ppm)
Zinc (ppm)
Copper (ppm)
Boron (ppm)
Iron (ppm)
pH
Nitrate Nitrogen (ppm)
Phosphorus (lbs/acre)
Potassium (lbs/acre)
Calcium (lbs/acre)
Magnesium (lbs/acre)
Soil Attributes

INVASIVE SPECIES

STEWARDSHIP =
Mitigation of human
impacts on natural systems

The Root of the Problem: Invasive Species

- Steady flow of new species

- Drastic habitat modification
  - Fragmentation of forests
  - Altered soils from past agricultural use
  - Constant disturbances
  - Hydrological modifications

- Deer overpopulation
  - Preferences for native species
  - Succession slowed by browsing of tree/shrub seedlings
  - Forest understory being severely browsed

OVERABUNDANT DEER

STEWARDSHIP =
Mitigation of human
impacts on natural systems

The Root of the Problem: Deer Overabundance

Excellent deer Habitat ↓

Forest fragmentation produces excellent deer forage along with supplemental feeding from agriculture and suburbia

+

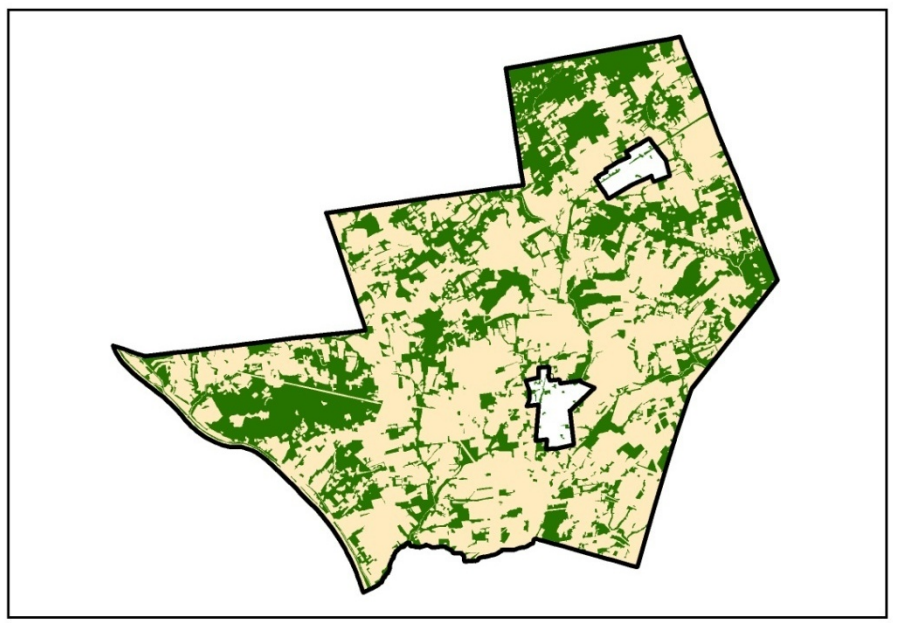
Insufficient deer management ↓

Lack of hunting access and focus on “trophy” bucks. Herd reduction requires a shift in focus to does.

=

Health, Economic, and Ecological Damage ↓

Lyme Disease
Deer-Vehicle Collisions
Agricultural Losses
Landscape Planting Losses
Degraded Forests

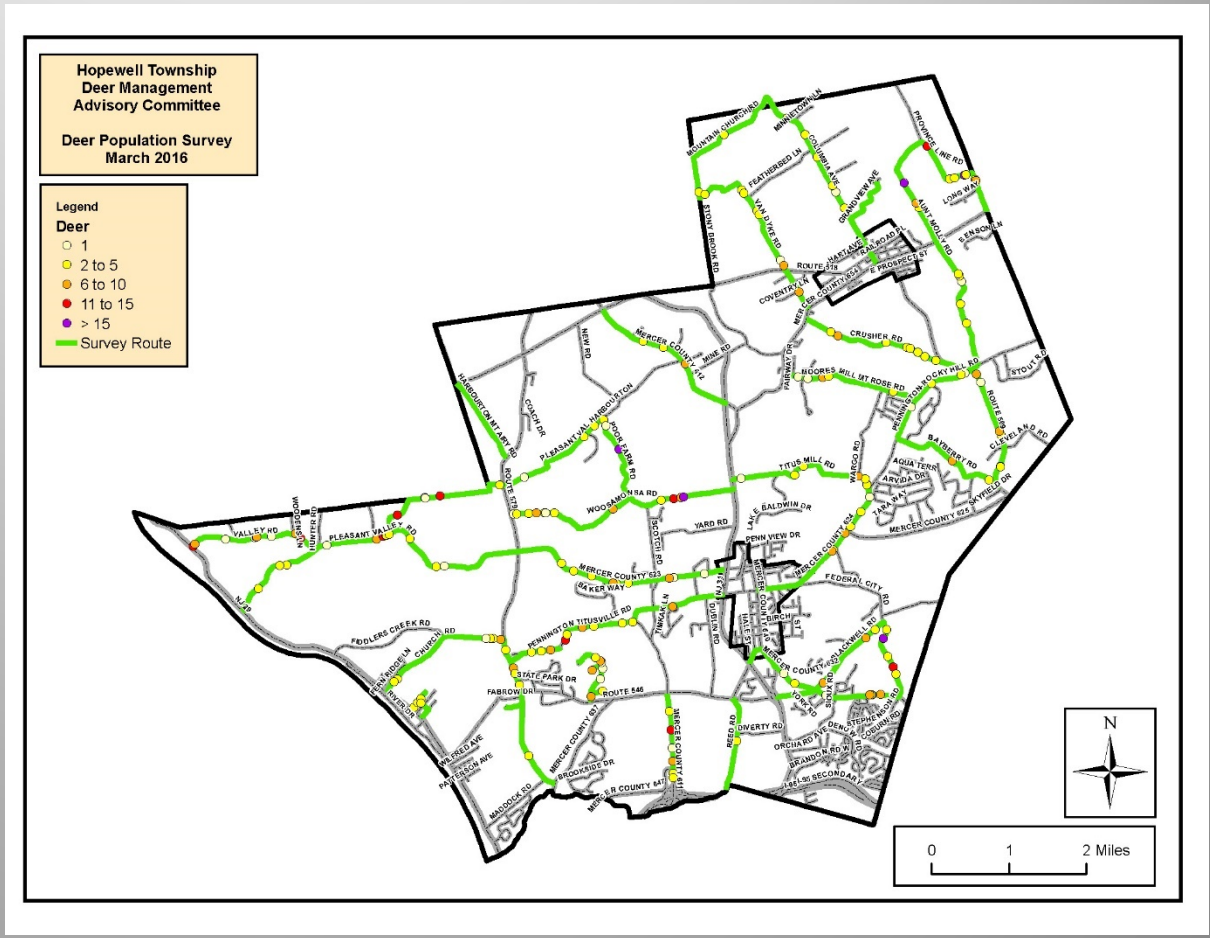


Forest Fragmentation in Hopewell Valley

While still containing over 15,000 acres of forest habitat (shown in green), forest edges, fields and suburban landscapes are numerous and serve as more productive deer habitat than forest interiors.

Deer Population Estimate Results

- In March 2014 & 2015:
  84 deer per square mile
- **In March 2016:**
  104 deer per square mile
- Published literature suggests that 10 deer per square mile is associated with low rates of Lyme disease, deer-vehicle collisions and healthy forests.
- Historic estimates also report 10 deer per square mile prior to European settlement of North America



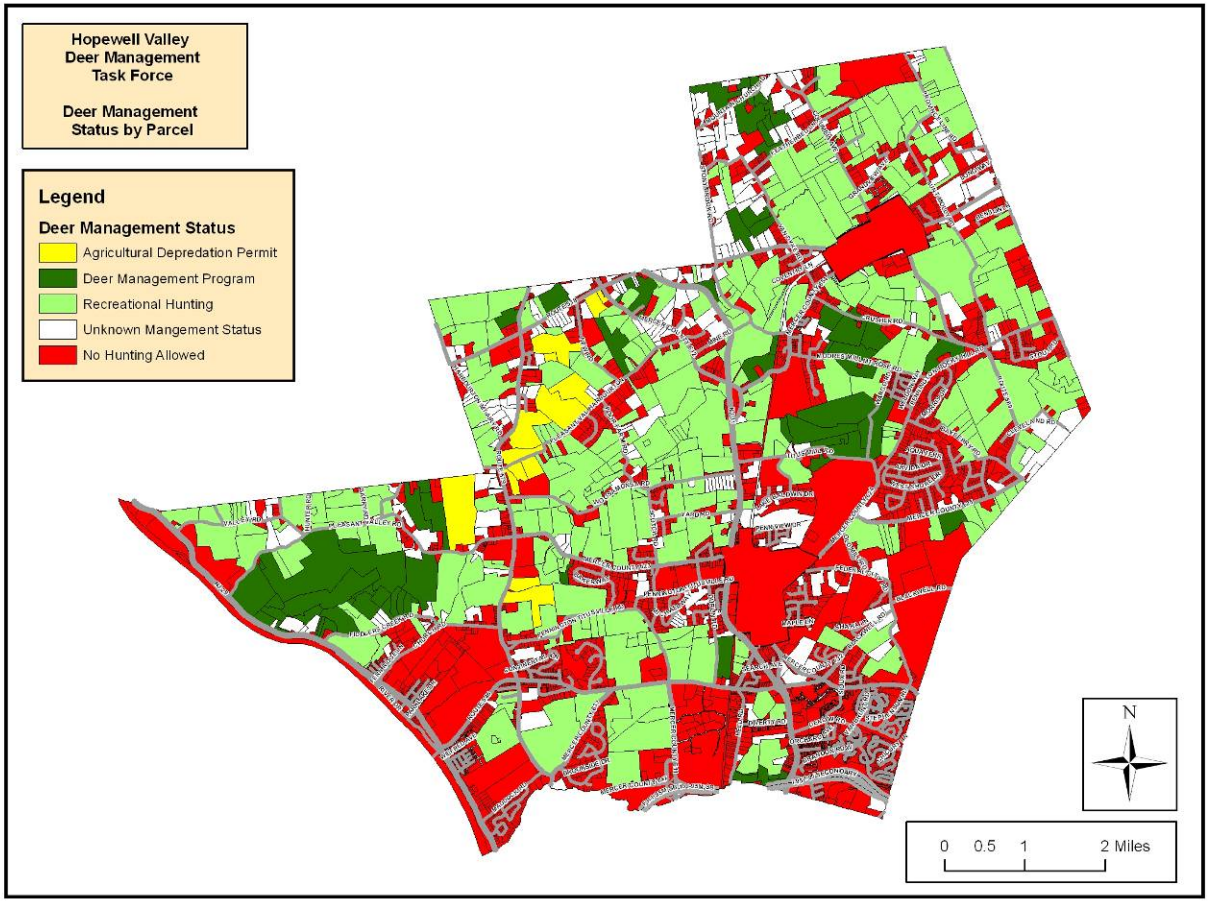
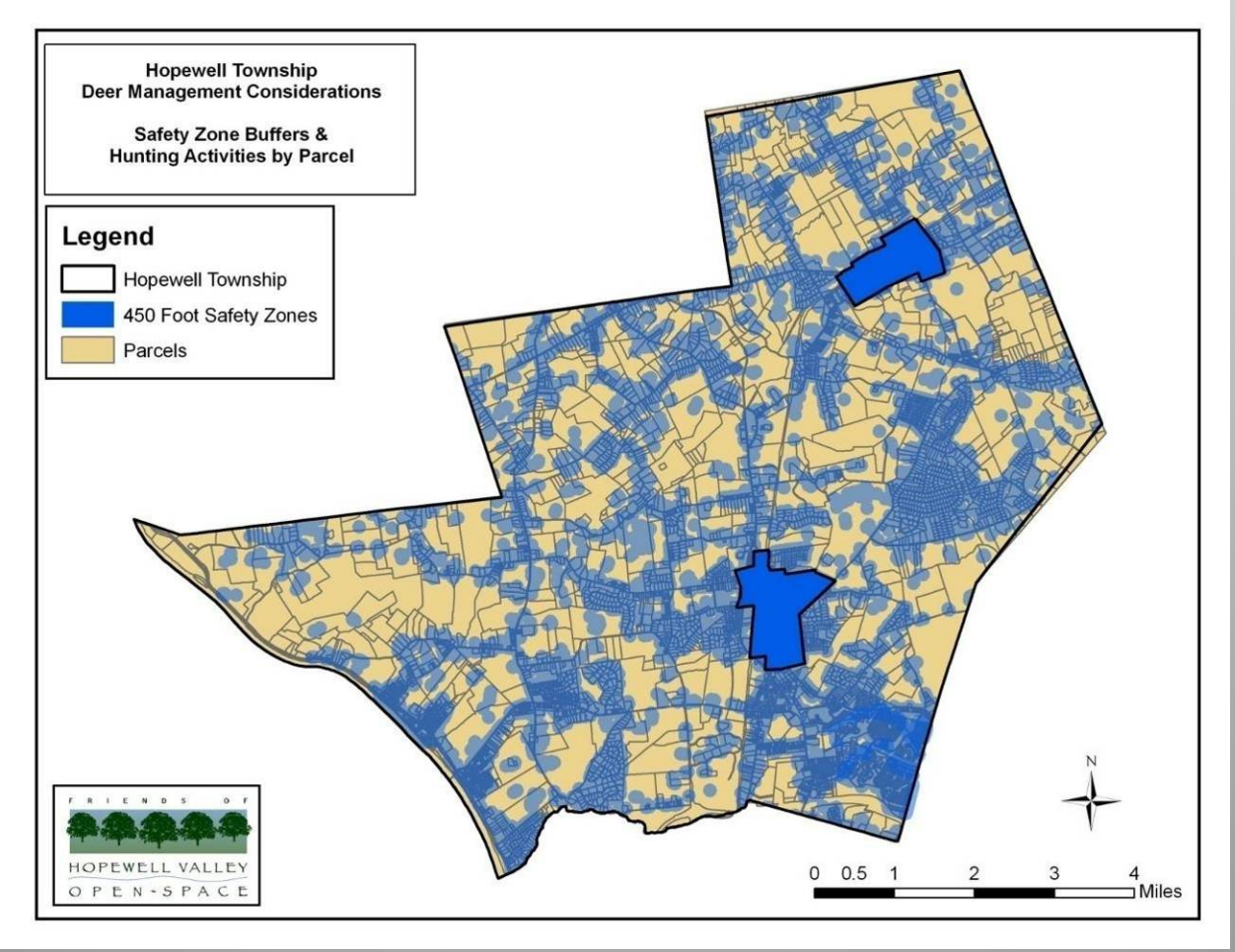


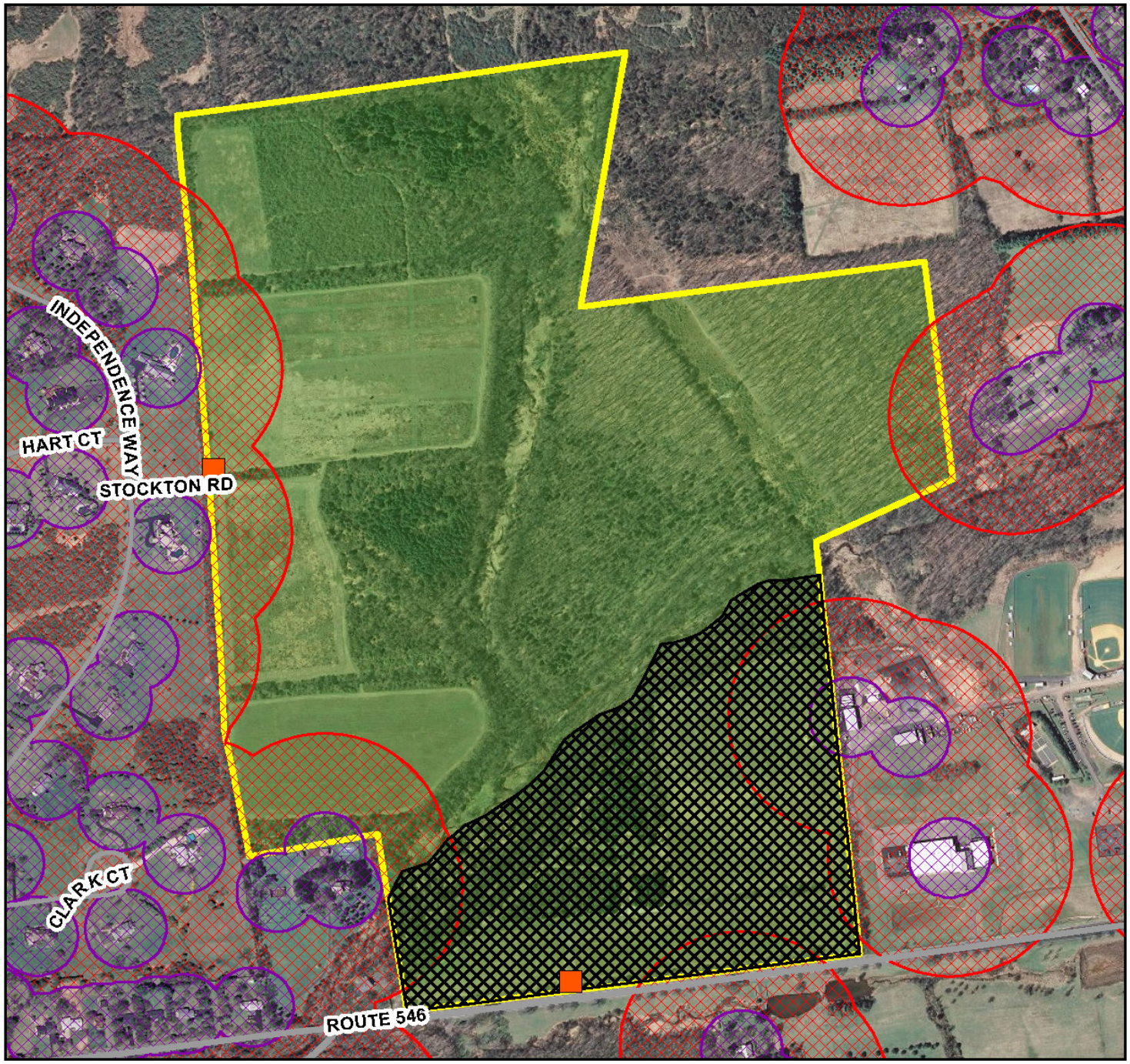
Table 4. Summary of Parcel-level Deer Management Status in the Hopewell Valley

Hunting Status	Number of Parcels	Acres	% of Hopewell Valley*
Agricultural Depredation Permit	14	929	2
Deer Management Program	76	3346	9
Recreational Hunting	335	13578	36
No Hunting Access	6968	14944	43
Unknown Hunting Access	304	3729	10
Totals	**7697**	**37601**	**100**

* Hopewell and Pennington Boroughs were assumed to have no hunting activity, but their acreage totals were considered for calculations.

Hunting safety zones around structures accounts for **50% of Hopewell**, which aggravates “pushing” and necessitates a coordinated strategy.





Hopewell Township Deer Management Program

Property Map

Property ID #: 10
Property Name: Alliger Park

Co-Owner(s): None

Block(s)/Lot(s):
92/9

Street Address:
Wasington Crossing-Pennington Road
Titusville, NJ 08560

Site Acreage: 166

Hunting Type: Firearm & Bow
Number of Hunters: 12

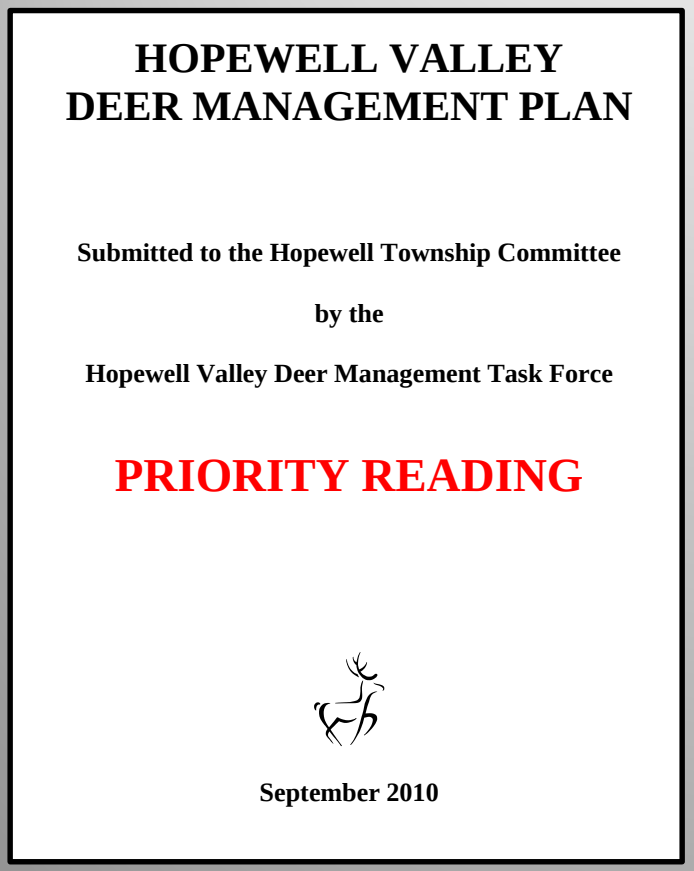
N

Legend

- Parking Access
- No Hunting Area - Alliger
- Safety Zone - 150'
- Safety Zone - 450'
- Property Boundary
- Preserved Farmland
- Protected Open Space
- Private Easements

0 100 200 300 400 500 Feet

Goals – Everyone has ‘skin in the game’



For all goals, the recommendation is a 25% reduction by 2013 and a 75% reduction by 2019.

Goal #1: Reduce Lyme Disease Cases

Goal #2: Reduce Deer Vehicle Collisions

Goal #3: Reduce Agricultural Losses

Goal #4: Reduce Landscape Planting Losses

Goal #5: Reduce Ecological Damage

Public Questionnaire Results

71% of responding households felt that
"Deer cause many problems and solutions are needed"

- 26% of responding households reported a case of Lyme disease
- 28% of responding households reported being involved in a deer-vehicle collision
- 55% of responding households reported severe to moderate landscape damage
- 27% of farmer respondents reported annual agricultural losses exceeding $5,000

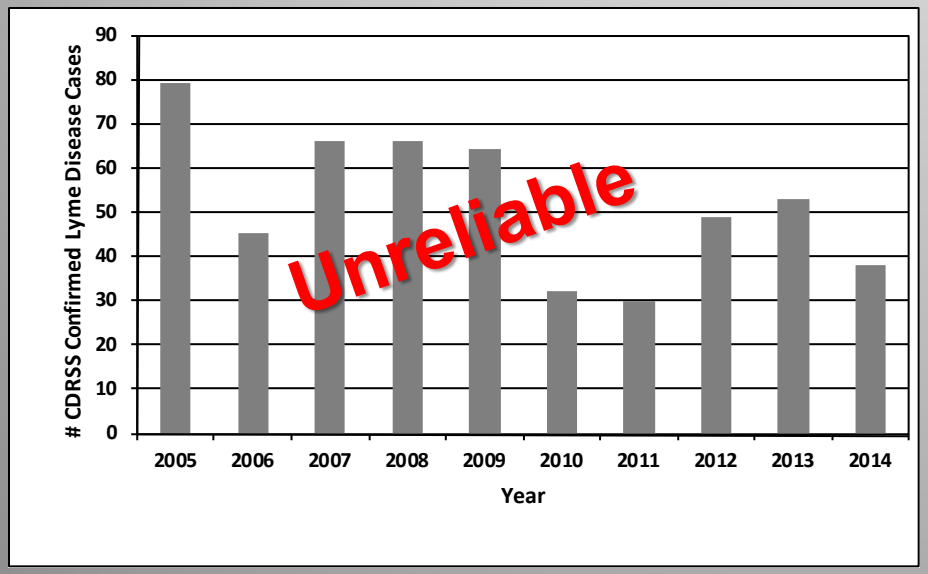
- 10% of responding households hunt deer
  - Harvest would increase with more land access (43% of Valley is not open to hunting)
  - Harvest would increase with more time to hunt
  - Harvest would increase with outlet to donate venison

Impacts of Deer Overabundance

Health and Property – Lyme Disease

Goal #1: Reduce Lyme Disease Cases

There has been an annual average of 65 reportable cases of Lyme disease from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (49 cases) and a 75% reduction goal by 2019 (16 cases).



Classic "Bull's Eye" rash of Lyme Disease

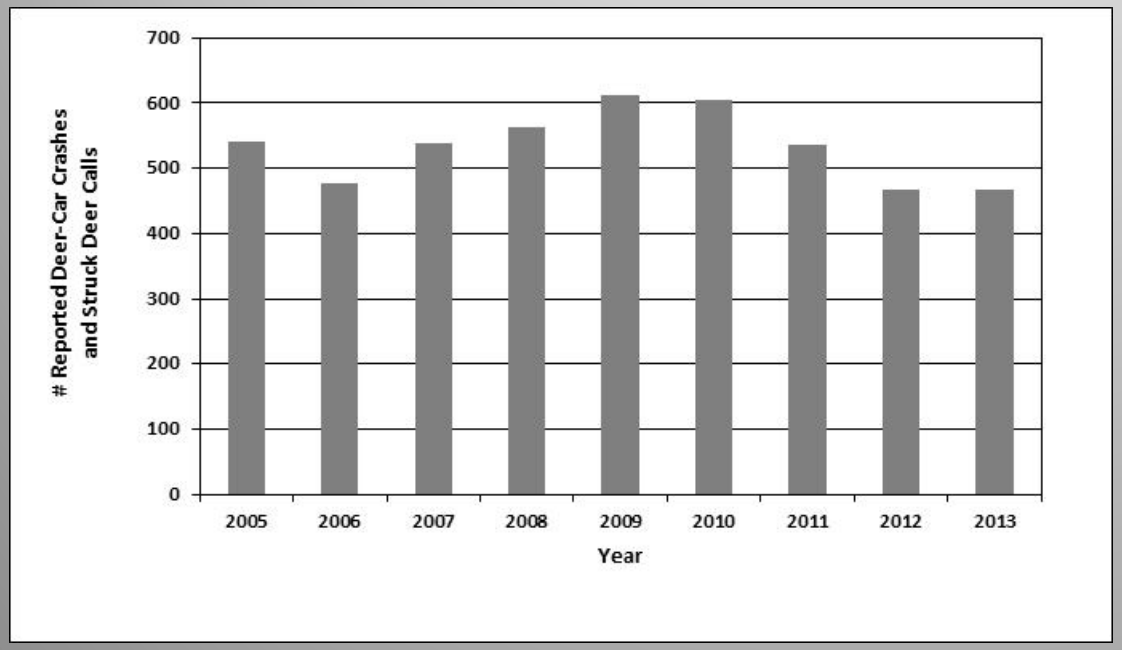
Many researchers have implicated high deer densities with increased incidences of Lyme Disease. Although deer do not carry the disease, they serve to increase the tick population.

Impacts of Deer Overabundance

Health and Property – Deer Vehicle Collisions

Goal #2: Reduce Deer Vehicle Collisions

There has been an annual average of 567 deer-vehicle collisions from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (425 collisions) and a 75% reduction goal by 2019 (142 collisions).



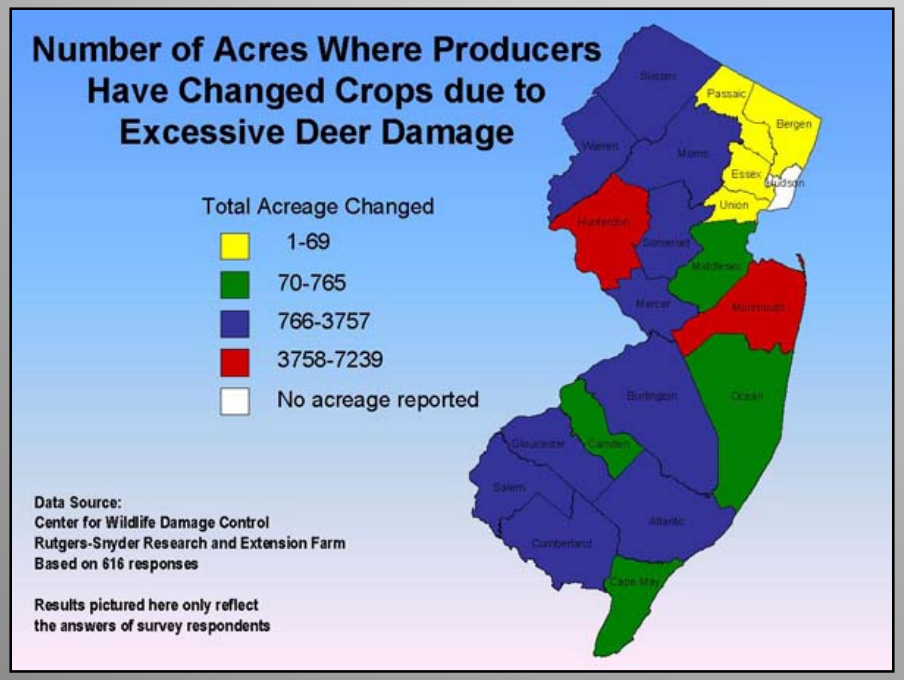
The insurance industry estimates an average cost of $2,500 per collision. Statewide, there are about 15,000 collisions at an annual cost of $37,500,000.

Impacts of Deer Overabundance

Health and Property - Agricultural Losses

Goal #3: Reduce Agricultural Losses

The public questionnaire results suggested that 27% of respondents had crop losses exceeding $5,000 per year. The Task Force recommends a 25% reduction goal by 2013 (20% of respondents) and a 75% reduction goal by 2019 (7% of respondents).



Other economic impacts include:

1) Land Abandonment
2) Switching to Less Palatable Crops
3) Planting 'Sacrificial' Crops
4) Deer Fencing Costs

Impacts of Deer Overabundance

Health and Property – Landscape Plant Losses

Goal #4: Reduce Landscape Planting Losses

The public questionnaire results suggested that 55% of respondents had severe or moderate landscape damage. The Task Force recommends a 25% reduction goal by 2013 (41% of respondents) and a 75% reduction goal by 2019 (14% of respondents).

Many residents suffer extensive deer damage to their landscape plants. Unfortunately, some residents are driven to plant invasive species that are unpalatable to deer. Invasive species spread from plantings and degrade natural habitats.

Left: Browse line on arborvitae; Right: Deer resistant invasive species – Chinese Silvergrass

Impacts of Deer Overabundance

Ecological Damage

The Good...

The Bad...

and The Ugly!

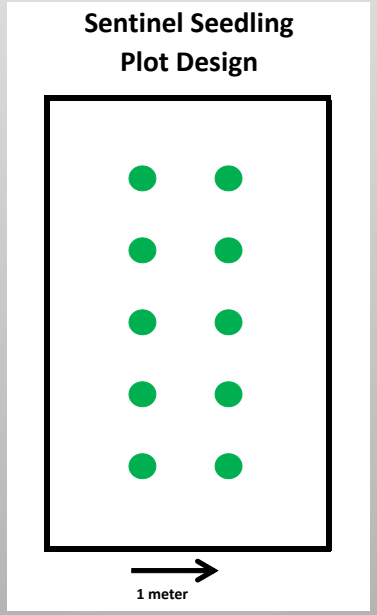
"I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too many deer may fail of replacement in as many decades."

-Aldo Leopold

Damage to Forest Health

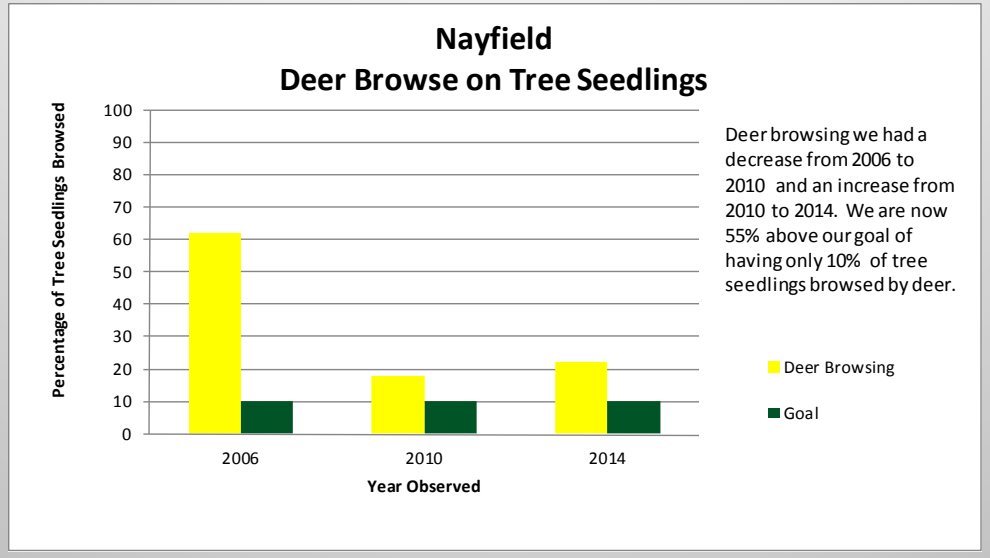
- Loss of native shrubs & herbs
- Loss of tree seedlings to replace fallen canopy trees
- Loss of native fauna dependent upon native flora
- Increases amount of invasive plants that are unpalatable to deer

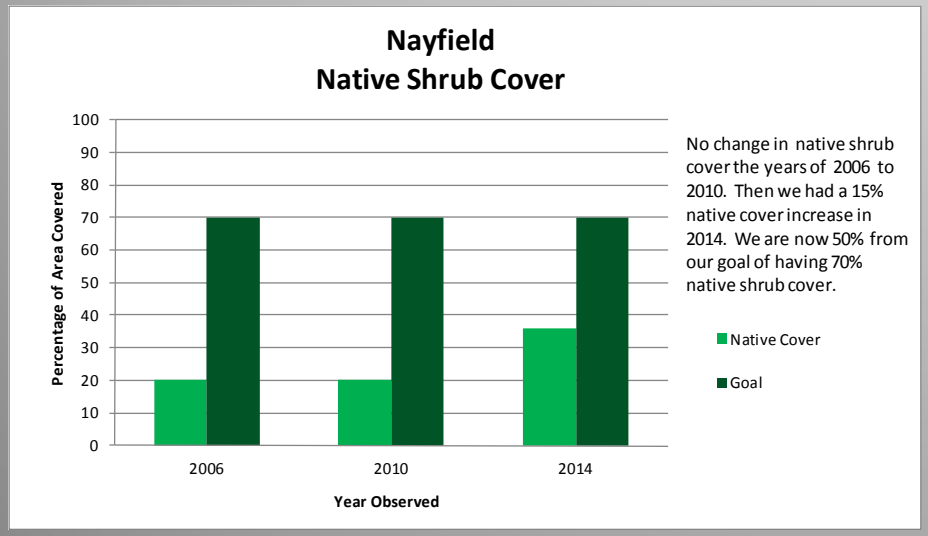
Forest Health Protocols –
Sentinel Seedlings & Forest Secchi

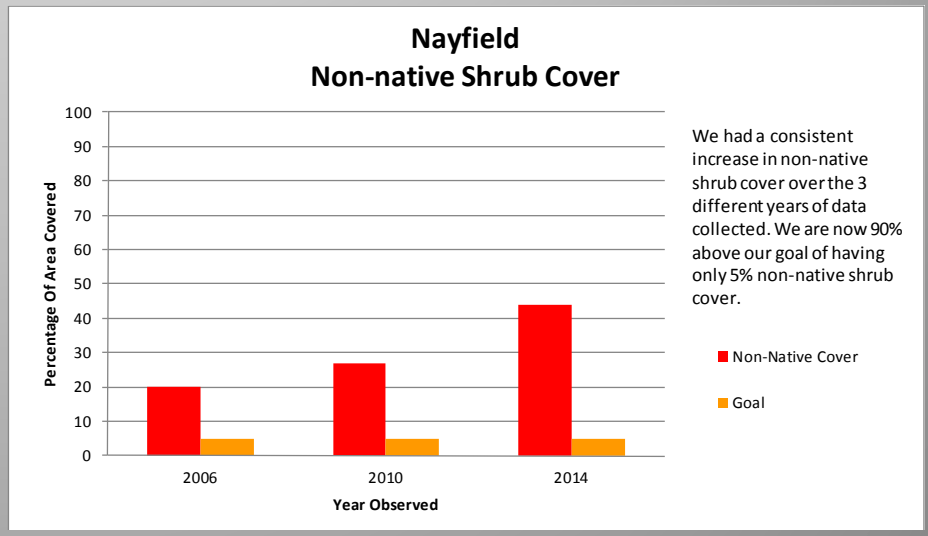


Hopewell Data Summary

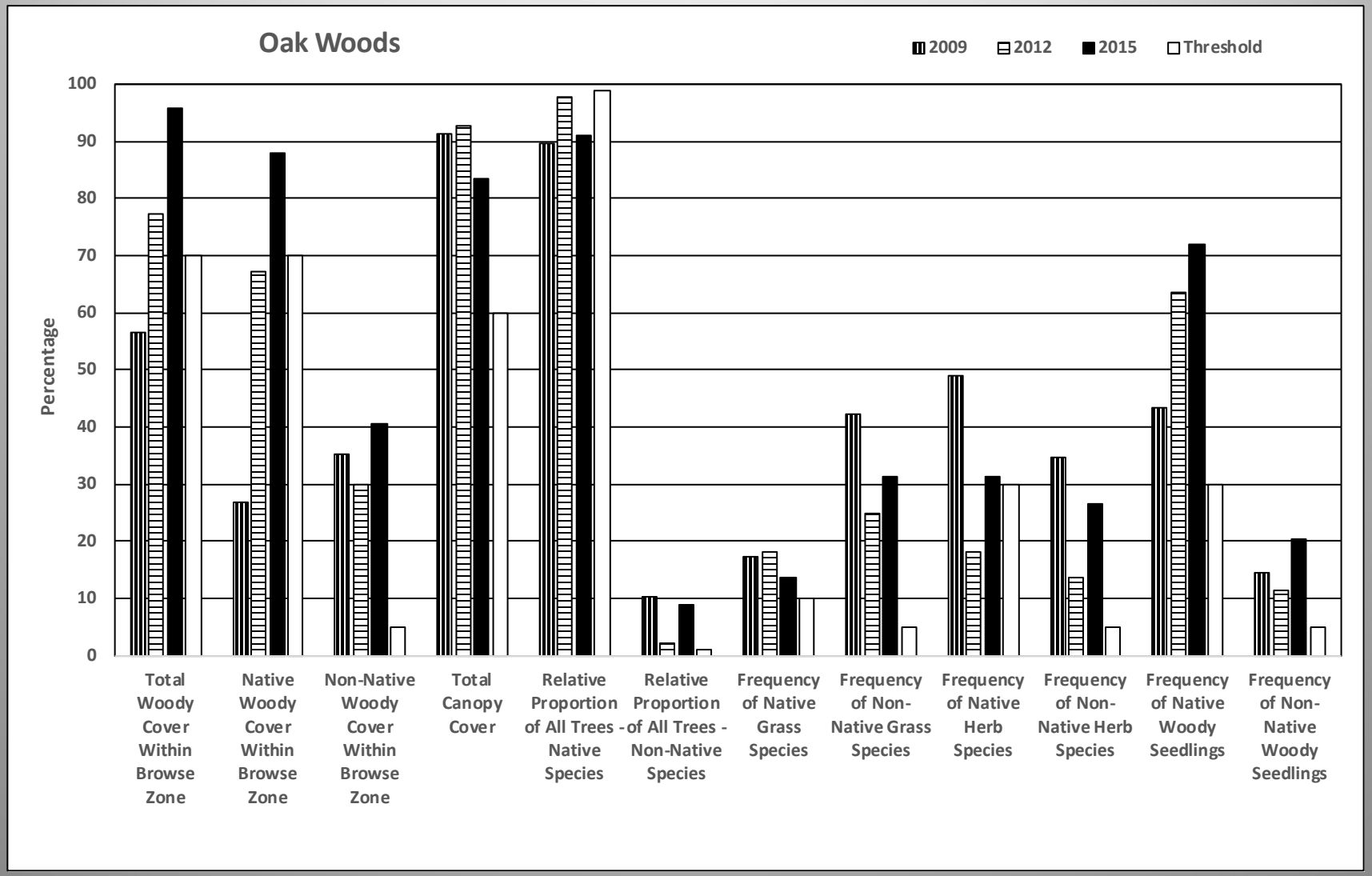
- At twenty sites with repeated measurements between 2007 and 2015
  - Deer Seedling Browse
    - **All sites have reduced browse**, > 80% of sites have reductions of > 20%
  - Native Woody Understory Cover
    - **Results mixed** – 40% of sites with positive change, 60% of sites with negative change
    - **Most sites with little change** -- 85% of sites have less than 10% change in either direction
    - 10% sites with > 10% increase of native cover.
  - Non-native Woody Understory Cover
    - **Results mixed** – 30% of sites with positive change, 70% of sites with negative change (roses…)
    - **Many sites with little change** -- 65% of sites have less than 10% change in either direction
    - 25% sites with > 10% increase in non-native cover


Nayfield
Deer Browse on Tree Seedlings
Percentage of Tree Seedlings Browsed
100
90
80
70
60
50
40
30
20
10
0
2006
2010
2014
Year Observed
Deer browsing we had a decrease from 2006 to 2010 and an increase from 2010 to 2014. We are now 55% above our goal of having only 10% of tree seedlings browsed by deer.
Deer Browsing
Goal

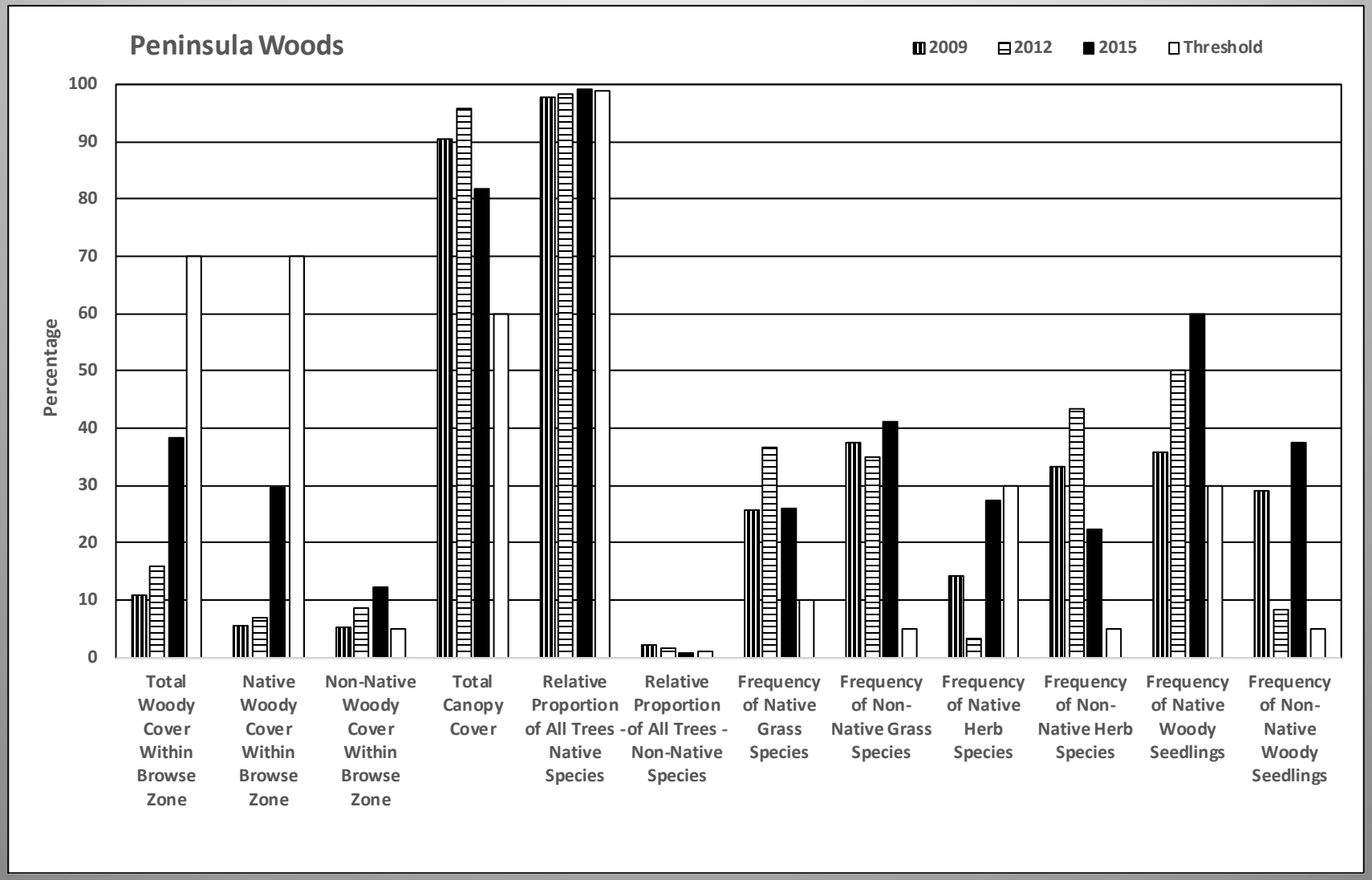

Nayfield
Native Shrub Cover
Percentage of Area Covered
100
90
80
70
60
50
40
30
20
10
0
2006
2010
2014
Year Observed
No change in native shrub cover the years of 2006 to 2010. Then we had a 15% native cover increase in 2014. We are now 50% from our goal of having 70% native shrub cover.
Native Cover
Goal


Nayfield
Non-native Shrub Cover
Percentage Of Area Covered
100
90
80
70
60
50
40
30
20
10
0
2006
2010
2014
Year Observed
We had a consistent increase in non-native shrub cover over the 3 different years of data collected. We are now 90% above our goal of having only 5% non-native shrub cover.
Non-Native Cover
Goal

Duke Farms – Exclosed Forest



Duke Farms – Unexclosed Forest

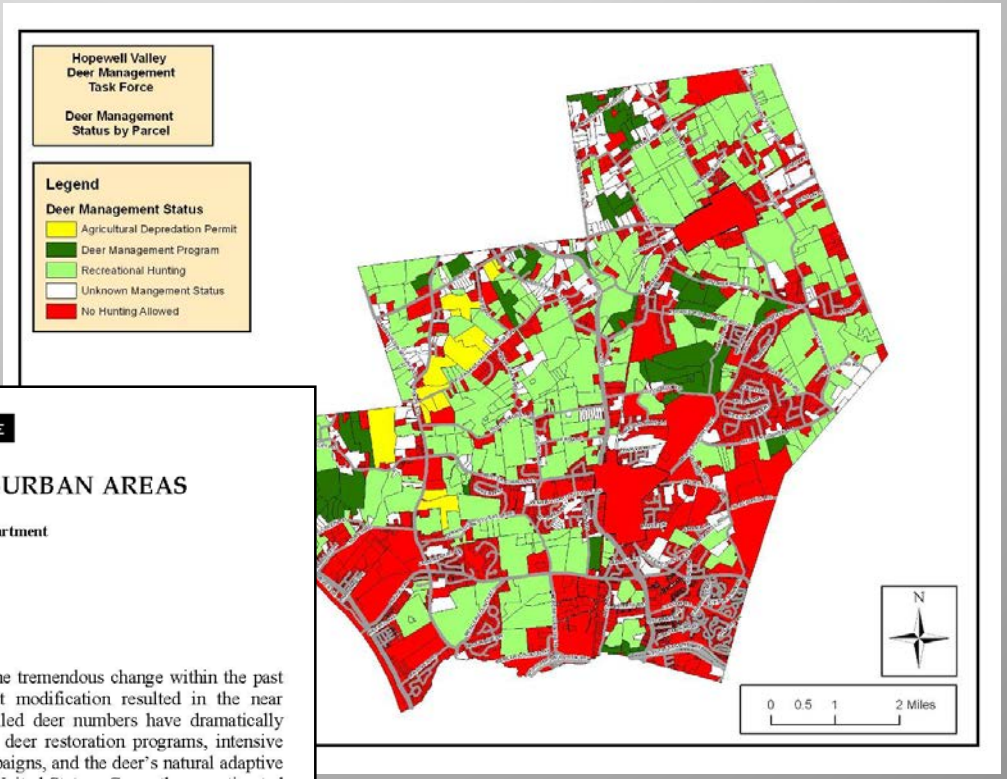


Summary of Strategies

Strategy Set #1: Improvement of Hunting Access

1A) Encourage and facilitate hunting access on public and private lands

1B) Develop strategies to access “pocket deer” in residential areas



TEXAS PARKS AND WILDLIFE

DEER MANAGEMENT WITHIN SUBURBAN AREAS

Greg Creacy, Texas Parks and Wildlife Department
April 2006

INTRODUCTION

White-tailed deer populations within the United States have undergone tremendous change within the past two centuries. Unregulated market hunting and extensive habitat modification resulted in the near extirpation of the species by the early 1900’s. However, white-tailed deer numbers have dramatically increased during the past few decades. Natural habitat succession, deer restoration programs, intensive management efforts, predator control programs, public education campaigns, and the deer’s natural adaptive abilities have all contributed to historic high deer densities across the United States. Currently, an estimated 4 million deer reside in Texas, alone. In many areas of the state, deer population densities have exceeded the land’s ability to sustain them. In other areas, deer densities have exceeded society’s ability to tolerate them. These unnaturally high deer densities can present significant ecological, social, and economic problems for a variety of stakeholders.

Summary of Strategies

Strategy Set #2: Improvement of Hunting Efficacy

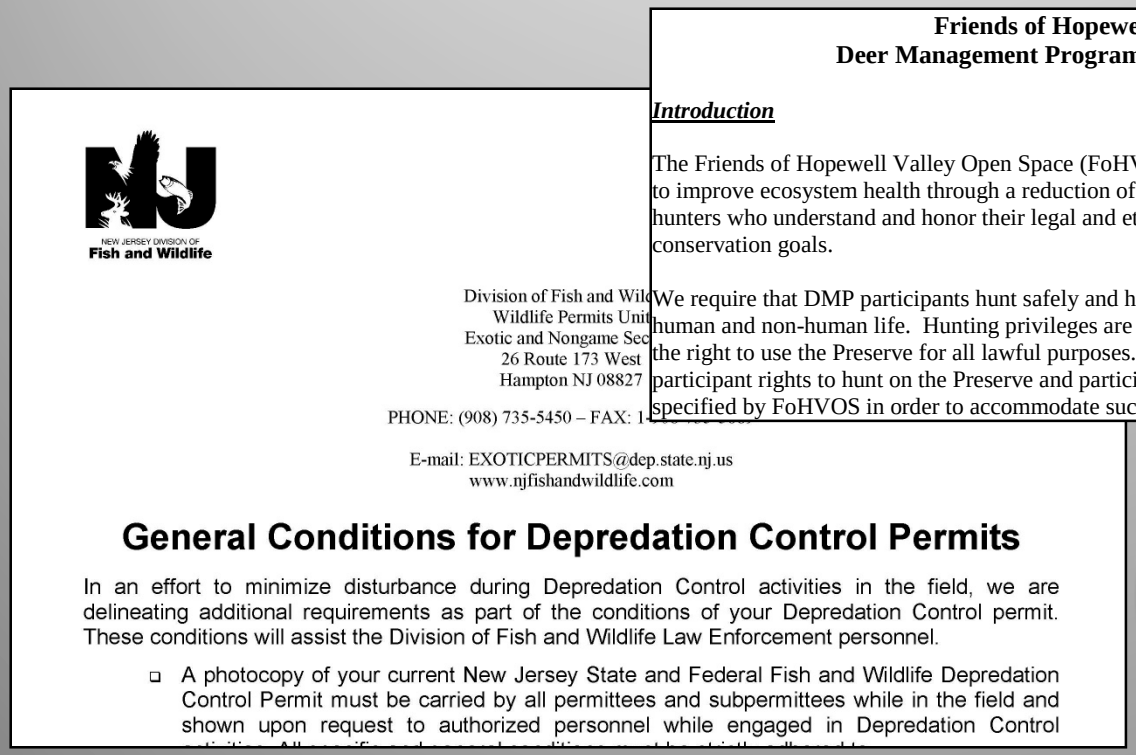
2A) Encourage and facilitate coordinated hunting activities among neighboring landowners

2B) Encourage and facilitate use of Agricultural Depredation Permits by farmers

2C) Encourage and facilitate Deer Management Programs that focus harvests on female deer

2D) Encourage and facilitate program for venison donation to local food banks

2E) Consult with the NJ Division of Fish & Wildlife and other wildlife professionals to facilitate strategies 1A through 2D



NEW JERSEY DIVISION OF
Fish and Wildlife

Division of Fish and Wild
Wildlife Permits Unit
Exotic and Nongame Sec
26 Route 173 West
Hampton NJ 08827

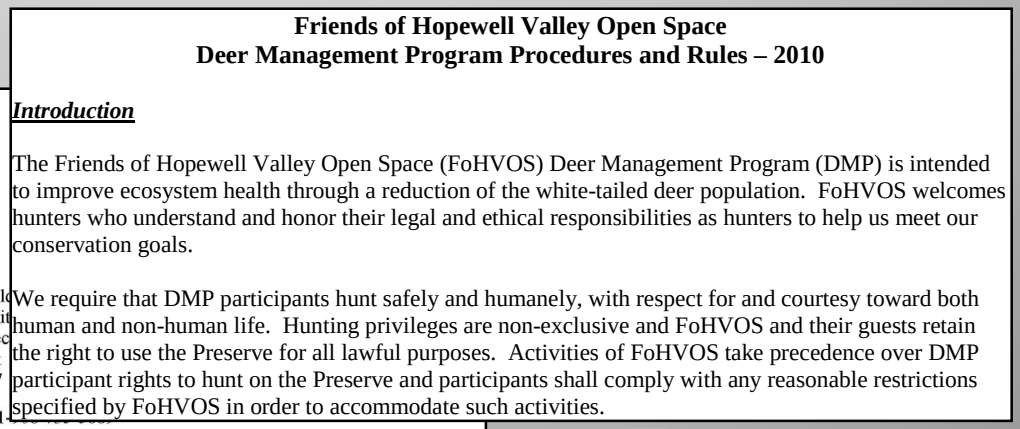
PHONE: (908) 735-5450 – FAX: 1

E-mail: EXOTICPERMITS@dep.state.nj.us
www.njfishandwildlife.com

General Conditions for Depredation Control Permits

In an effort to minimize disturbance during Depredation Control activities in the field, we are delineating additional requirements as part of the conditions of your Depredation Control permit. These conditions will assist the Division of Fish and Wildlife Law Enforcement personnel.

- A photocopy of your current New Jersey State and Federal Fish and Wildlife Depredation Control Permit must be carried by all permittees and subpermittees while in the field and shown upon request to authorized personnel while engaged in Depredation Control



Friends of Hopewell Valley Open Space
Deer Management Program Procedures and Rules – 2010

Introduction

The Friends of Hopewell Valley Open Space (FoHVOS) Deer Management Program (DMP) is intended to improve ecosystem health through a reduction of the white-tailed deer population. FoHVOS welcomes hunters who understand and honor their legal and ethical responsibilities as hunters to help us meet our conservation goals.

We require that DMP participants hunt safely and humanely, with respect for and courtesy toward both human and non-human life. Hunting privileges are non-exclusive and FoHVOS and their guests retain the right to use the Preserve for all lawful purposes. Activities of FoHVOS take precedence over DMP participant rights to hunt on the Preserve and participants shall comply with any reasonable restrictions specified by FoHVOS in order to accommodate such activities.

Agricultural Depredation Permits

- Benefits
  - No seasonal constraints (may occur whenever crop damage occurs)
  - Night hunting allowed (spotlighting)
  - Can be conducted from a vehicle
  - No harvest bag limits (but consumption tags are limited)

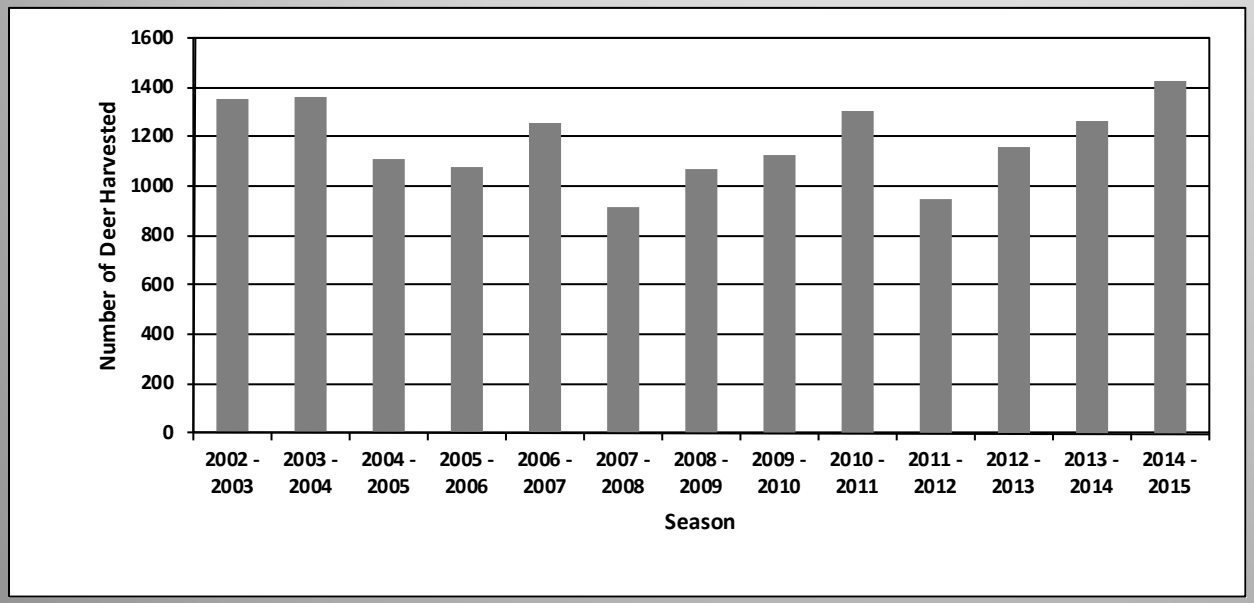
- Requirements
  - Simple application
  - Demonstrate crop damage to Division of F&W
  - Hunters must have firearms registered with law enforcement authorities

Division of Fish & Wildlife's Community Based Deer Management Program (CBDMP)

- Benefits
  - Season extensions
  - Use of alternate methodologies (e.g., sharpshooters)
  - Increased bag limits

- Requirements
  - Township resolution
  - Designate a "Special Deer Management Area"
  - Must document deer damage and/or deer population size
    - Crops, ornamental shrubs, deer-vehicle collisions, runway hazards, (ecological damage)
  - Application reviewed/approved by the Fish and Game Council
    - Generally approved whenever recreational hunting is considered inadequate/unsuitable

Hopewell Valley Deer Harvests

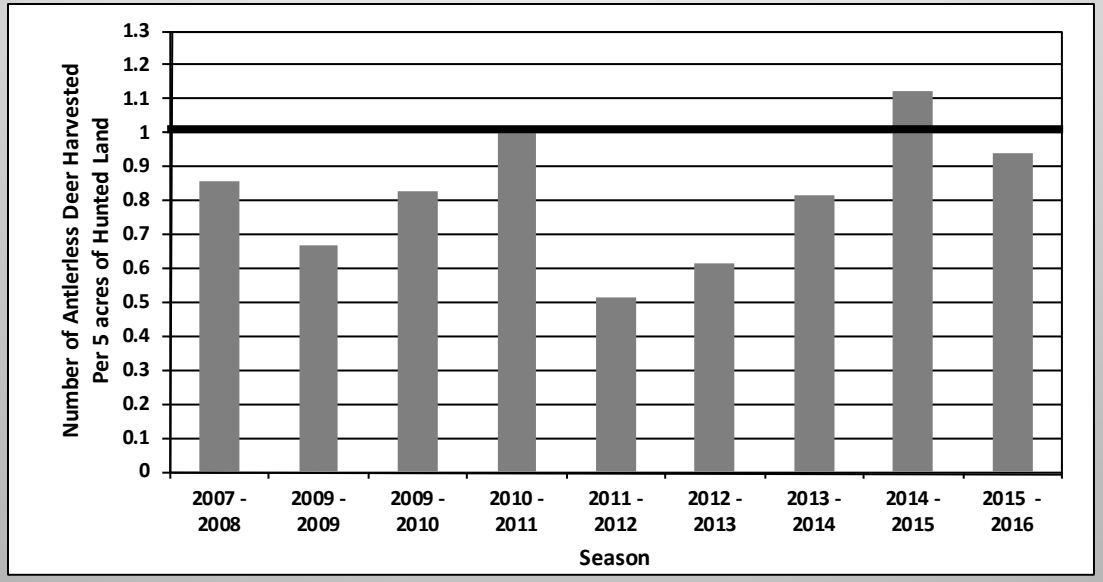


Population Reduction Goal	Harvest Required	Resulting Density
10	776	112
20	1,552	99
30	2,328	87
40	3,104	75
50	3,880	62
60	4,656	50
70	5,433	37
80	6,209	25
90	6,985	12

Measured Population Density	84
Post-Birthing Populatin Density	124
Hopewell Valley Populatin Size	7,761

Annual Hunter Harvest	1,181
Annual Deer-Vehicle Collisions	534
Annual Deer "Harvest"	1,715

FoHVOS Harvest Results



- 45 hunting days per year (where trails present)
- Unlimited hunting days (where trails absent)
- Site harvest goals: 1 antlerless deer per 5 acres
- Hunter harvest goals: 2 antlerless deer
- Number of hunters per site = 1 per 10 acres
- Fees: $75/hunter + 10 stewardship hours
    - Waived if 4 or more deer are harvested

Summary of Strategies

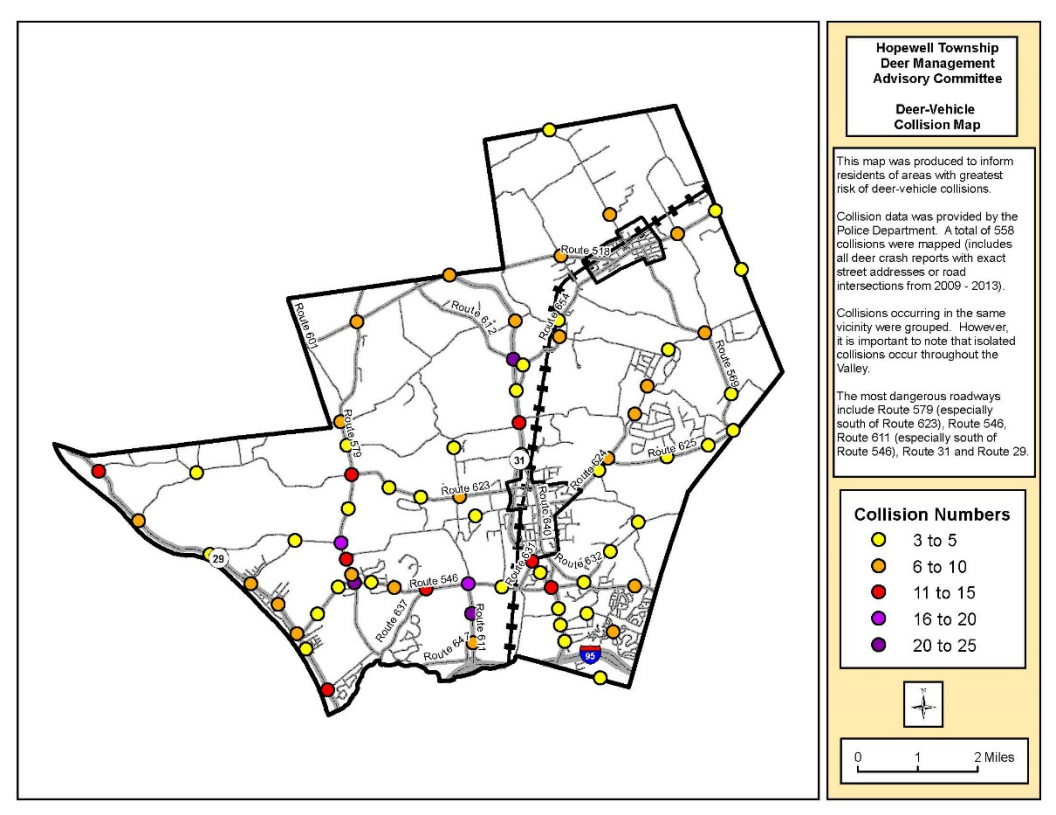
Strategy Set #3: Avoidance of Deer Impacts

3A) Improve awareness of methods that reduce Deer Vehicle Collisions

3B) Improve awareness of methods that reduce Lyme disease

3C) Improve awareness of methods that reduce landscape damage

3D) Discourage the intentional feeding of deer in non-hunting situations



Reason to imagine success...

The Deer Management Program at the Ted Stiles Preserve at Baldpate Mountain is bearing fruit. Native plants, freed from excessive deer browse, are outcompeting invasive plants.

Left: Photo of native spicebush thicket at the Ted Stiles Preserve at Baldpate Mountain.
Right: Close-up photo of thicket showing spicebush (larger leaves) overtopping the invasive Japanese barberry.