DEVELOPING A STANDARD PROTOCOL FOR ASSESSING SUBURBAN DEER IMPACTS TO VEGETATION

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Abstract: Over the past 30 years, populations of white-tailed deer (*Odocoileus virginianus*) have increased dramatically in suburban communities, causing significant economic and ecological impacts. Homeowners have observed such deer population explosions and must cope with the problems of living in close proximity to deer with few reliable solutions. By applying knowledge of deer biology, behavior, and habitat requirements, this assessment protocol provides a scale to estimate the severity of deer damage, and the potential success of control measures. It will prove valuable by achieving a greater understanding of suburban deer management through a methodical and standardized analysis of impact indicators. Furthermore, by instituting periodic assessments, reduction in plant damage can be optimized, leading to long-term coordination of effective solutions.

Key words: assessment, environmental impacts, suburban deer, white-tail deer

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INTRODUCTION

Continued growth of white-tailed deer *(Odocoileus virginianus)* populations and expanding suburbanization has significantly increased the degree of negative human-deer interactions (Gallagher et. al 2000). Records of damage to horticultural plants (Conover 1984, 1997, Drake et al. 2005), food crops (Conover 1994, Wywailowski 1994, Brown et al. 2004), young trees (Nolte et al. 1993, Marquis 1981), and the potential to alter ecological communities (Stromayer and Warren 1997), is extensive. Suburban homeowners have observed increased deer abundance and must cope with the problems of living in close proximity to deer. Their expensive landscaping may be devoured by these large herbivores. Some commercial deer deterrents may prove successful, while other repellents show less than desirable results. By applying knowledge of deer biology, behavior, and habitat requirements, we provide a standard protocol to estimate the severity of suburban deer damage and the potential success of various control measures.

What is a standard protocol for assessing suburban deer impacts?

This protocol can be used to assist wildlife managers, wildlife control operators, environmental researchers, public health biologists, and wildlife control operators in developing suburban deer management strategies. It is a standard list of factors and measurements to consider when examining a property for deer. Furthermore, we evaluate deer impacts, foraging pressure, and vital habitat requirements to help determine the desirability of the site. Impact variables

include estimated numbers of deer, times and frequency of feeding damage, and if possible, changes in behavior of local deer herds. Habitat components may include geographical features, landscape configurations, habitat quality, current land uses, human activities, and past and current management techniques. These factors, once identified and quantified, are combined to provide an estimated level of impact severity. Expectations for the success of deer management methods can be evaluated, and a consistent deterrent strategy applied. This assessment tool will prove valuable by achieving a greater understanding of suburban deer management through a methodical and standardized analysis of impact indicators. Furthermore, by instituting periodic assessments, damage abatement can be optimized, leading to long-term coordination of effective solutions.

How to use this protocol.

By working through each section, points are accumulated towards a total impact score. A high total score will indicate a high risk of deer impacts, desirability of the site, and the potential for success of various deterrents.

Each section is assigned a total point value which is weighted relative to the other sections. For example, Section 1 (Visual Deer Evidence) is weighted heavier than Section 4 (Property Uses), because witnessing deer on the property is direct evidence supporting deer presence, while human activities on the property have a more indirect effect. The same weighting is also applied to the questions and answers within each section.

It is important to read each statement clearly, select the most appropriate answer and circle its corresponding point score (found to the immediate left of the answer). Several questions may have multiple answers and points must be calculated according to the specific instructions located beneath the question in bold lettering. At the end of the section, accumulate circled point values, and write the final score in the box. Detailed instructions are described before each section.

PROTOCOL

Determining Deer Presence

The first two sections are essential in formulating an awareness of the number, sex, and age of deer utilizing the property. Additionally, they provide an understanding of the deer travel corridors and feeding behaviors. These two sections are "Visual Deer Evidence" and "Environmental Deer Evidence." The homeowner, or persons with knowledge of the site, must be present. Circle one answer for each question.

Question: Are there direct visual accounts of deer on the property?

Yes
No

Section 1: Visual Deer Evidence: Total possible = 95 points

1. The estimated number of deer seen on the property are:
   - 15 Less than or equal to 3 deer
   - 25 More than 3 deer
   - 0 Unknown

2. The sex and age of deer most frequently seen on the property are:
   - 10 Adult buck/s
   - 15 Adult doe/s
   - 15 Fawns/Yearlings
   - 20 All sexes/ages
   - 5 Unknown

3. Generally, the deer arrive on the site during:
   - 5 Sunrise
   - 8 Mid-day
   - 5 Dusk
   - 10 All hours of the day
   - 0 Unknown

4. The primary activity of the deer on the property is:
   - 10 Deer are just walking through (<5 minutes)
   - 15 Deer are foraging (<10 minutes)
   - 20 Deer are foraging and lingering (>15minutes)
   - 0 Unknown

5. In general, deer are affected by human presence (e.g, are easily frightened off by people).
   - 5 True
   - 20 False

Section 1 Total = _____

Section 2: Environmental Deer Evidence: Total possible = 90 Points

The following questions are based on the property's visible environmental evidence of deer impacts. The property should thoroughly be inspected and include areas of open lawn, high grass meadows, man-made surfaces, ornamental landscaping, gardens vegetable and/or herbaceous and bordering forests. Circle one point value for each question. Calculate the final score and write the total on the line at the end of the section.

1. Paths that deer utilize to enter and exit the property are well defined.
   - 20 True
   - 0 False

2. Multiple deer tracks are frequently seen.
   - 15 True
   - 0 False

3. The estimated amount of deer fecal piles seen on the property are:
   - 12 High (>10 scat piles observed on the property)
   - 8 Medium (5-10 scat piles observed)
   - 6 Low (1-4 scat piles)
   - 0 None

4. The current degree of rubs and/or browse on ornamental woody shrubs and ornamental trees may be considered:
   - 15 Heavy to Medium (Browse lines visible on shrubs or trees)
   - 10 Medium to Low (No browse line visible, but foraging damage is extensive)
   - 5 Low to very light (No browse line visible, foraging damage light)
   - 0 None

5. Visible evidence of deer damage to ornamental woody shrubs and ornamental trees on neighboring properties is:
   - 20 Heavy to Medium (Browse lines visible on shrubs or trees)
   - 15 Medium to Low (No browse line visible, but foraging damage is extensive)
   - 10 Low to very light (No browse line visible, foraging damage light)
   - 0 None

6. There are signs of deer browse on plants in pots and planters that are in close proximity to the house.
   - 10 True
   - 0 False

Section 2 Total =_____

Section 3: Food Sources: Total possible = 40 Points

A standard technique in wildlife management is to determine the preferred vs. unpalatable browse within an area. Many plant lists have been compiled by universities and government agencies for the Northeast region, and may be used as a reference. By identifying the property's food sources within each growing season, a biologist or manager can determine a general idea of deer's motivation to feed on the site. It is important to estimate the amount of potential food and accurately record its composition. Circle the appropriate score. Calculate the final score and write the total on the line at the end of the section.

1. Compared to the total size of the property, ornamental woody shrubs and trees make up proportion of the yard area:
   - 2 1-10%
   - 3 11-20%
   - 4 21-30%
   - 5 31-50%
   - 7 51-75%
   - 10 76-100%

2. The ornamental woody shrubs present on the property.
   Instructions: Choose either the Spring/Summer list or the Fall/Winter list depending on the season of the evaluation. In the appropriate table check all plants that are present, and assign the estimated percentage (0.05 to 1.00)of the overall choices that this item represents. Percentages must add up to 1.00. Multiply the percentage to the indicated score and record the number on the

adjacent line. Total all the lines for one summed score for this question. Round to the nearest whole number.

SPRING / SUMMER	Points	x	%	= Score
Annuals (Impatiens, Sunflowers, Geranium, etc.)	16	x	___	= ___
Bulbs (Tulips, Hyacinth, Asiatic or Oriental lilies, etc.)	10	x	___	= ___
Ferns	2	x	___	= ___
Ornamental Grasses (Foxgloves, sedges, bamboo, etc.)	3	x	___	= ___
Perennials (Daylilies, Black-Eyed Susans, Hostas, etc.)	15	x	___	= ___
Roses	12	x	___	= ___
Vines (English ivy, climbing hydrangea, etc.)	15	x	___	= ___
Vegetable garden	10	x	___	= ___
Compost pile	5	x	___	= ___
Fruit trees (crab apple, cherry, etc.)	10	x	___	= ___
Forest food sources (wildflowers, tree saplings, etc.)	8	x	___	= ___
Berries (strawberries, raspberries, etc.)	10	x	___	= ___
FALL / WINTER				
Oak trees/ acorns	25	x	___	= ___
Ferns/mushrooms/mosses	1	x	___	= ___
Evergreen shrubs (rhododendrons, azaleas, etc.)	20	x	___	= ___
Holly	10	x	___	= ___
Vines (English ivy, climbing hydrangea, etc.)	5	x	___	= ___
Needle-leaved evergreen (pine, spruce, etc.)	10	x	___	= ___
Scale-leaved evergreen (hemlock, yew, arborvitae, etc.)	25	x	___	= ___
Fruit trees (crab apple, cherry, etc.)	20	x	___	= ___
Vegetable garden	10	x	___	= ___
Compost pile	5	x	___	= ___
Forest food sources (wildflowers, tree saplings, etc.)	8	x	___	= ___
Berries (strawberries, raspberries, etc.)	10	x	___	= ___

3. The property owner, and/or neighbors, intentionally feed the deer.

5 True
0 False

Section 3 Total = _____

Section 4: Water Sources: Total possible = 35 points

The following questions are based on the running water sources available to the deer on, or in, the vicinity of the property. Commonly, the closer a stable water source, the greater the probability that deer would use a habitat. *Definitions:* Freshwater ON the site may include but not limited to decorative fish ponds, river, streams, wetlands and/or lakes. Freshwater WITHIN 1 QUARTER MILE includes only substantial large water sources; lakes, rivers and wetlands. *Instructions*: Circle the most appropriate combination answer and circle its corresponding section point score.

25 Water is on the property and within one quarter mile

35 Water is on the property and not within one quarter mile
15 Water is not on the property but is within one quarter mile
5 Water is neither on the property or within one quarter mile

Section 4 Total = _____

Section 5: Environmental Surroundings: Total possible = 25 points
The value of deer habitat is influenced strongly by the accessibility of cover and its proximity to food. Deer require cover for hiding, escape, and for regulating their body temperature. Hiding cover is particularly important from early to midsummer for young fawns; and for deer in areas subject to human disturbance. Thermal cover is used by deer to minimize their energy expenditure during winter and it typically provided by evergreen trees and large shrubs. High quality thermal cover is generally that which provides cool, moist environments during summer days, and wind breaks during winter nights. Protection from wind, snow, rain and sun are also features of desirable thermal cover. Overall, habitat quality is increased when all of these cover elements are in proximity to good foraging areas (California Department of Fish and Game 1998).

1. The adjacent or neighborhood forest consists of:
   5 Predominately mature evergreens
   1 Predominately mature deciduous
   3 Mixed forest (evergreens and deciduous)
   0 Not applicable (no forest in area)

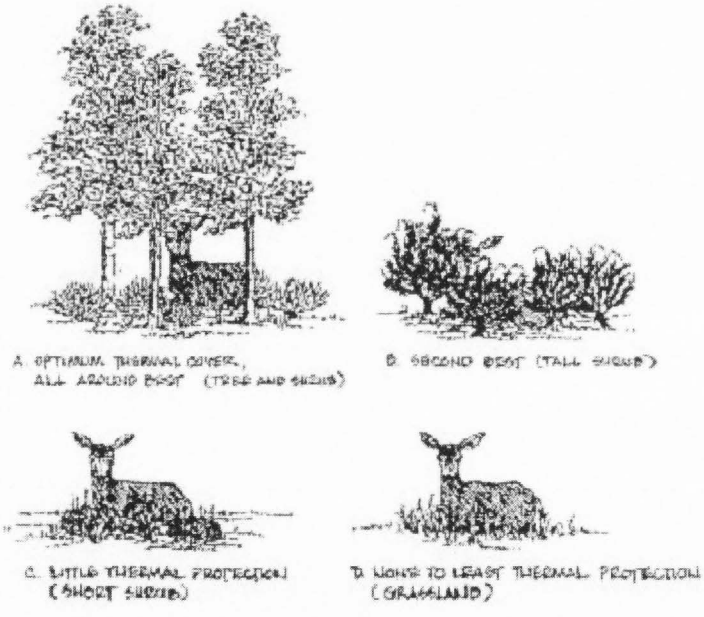

Figure 1. Descriptions of thermal cover categories for deer resting areas (adapted from California Department Fish and Game 1998).

2. Does the property have or border a suitable habitat for thermal cover? (refer to Figure 1).

5	Optimum thermal cover (trees and thick shrubs)
3	Second best (tall shrubs, no trees)
1	Little thermal cover (short shrubs, no trees)
0	None to least thermal protection (grasslands)

3. Does the property have or border an area that provides suitable hiding cover (refer to Figure 1).

5	Yes, less than 10% of the deer would be visible while bedding
0	No, more than 10% of the deer would be visible while bedding

4. The forest edge provides hiding cover that is within 100 feet of a food source (*example:* ornamental plantings).

5	True
0	False

5. The property has or borders the following features:

Instructions: Check all that apply and assign the estimated percentage (0.01-1.00) of the overall choices that this item represents. Percentages must add up to 1.00. Multiply the percentage to the indicated score and record the number on the adjacent line. Total all the lines for one summed score for this question.

	Points	x	%	= Score
Horse or cattle farm	3	x	___	= ___
Fields of agricultural crops	5	x	___	= ___
Fruit orchards (more then 5 trees)	5	x	___	= ___
A large old field/meadow	5	x	___	= ___
Commercial buildings (shopping plaza, parking lots, etc.)	0	x	___	= ___
Other houses/neighbors	2	x	___	= ___
Wildlife sanctuary/nature preserve	5	x	___	= ___
Relatively busy roads/highways	1	x	___	= ___

Section 5 Total = _____

Section 6: Previous and Current Preventative Methods: Total possible = 40 points

The following section is to help determine the deterrents currently in place and which have either proven successful or not. This section's answers will be helpful in determining the next course of action. Here, the points are reversed - stronger deterrent methods have lower scores.

1. The residence is occupied:

3	Year round
5	Summer only
3	Winter only

2. The property owner has an outdoor dog. An outdoor dog may be defined as a dog that spends a majority of the day outside, and is free-ranging (e.g., an invisible fence system).
   - 0 True
   - 5 False

3. The property has a well maintained deer fence at least 8 feet in height.
   - 0 True
   - 5 False

4. In addition to a deer fence, the driveway is:
   - 5 No deer fence
   - 0 Gated (closed at all times)
   - 1 Cattle guard
   - 5 Open driveway

5. The neighboring properties are bordered by deer fencing.
   - 5 True
   - 0 False

6. The trees, shrubs and/or gardens are protected by an enclosure.
   - 0 True
   - 5 False

7. Repellents are used on the property.
   - 0 True
   - 5 False

8. The property owner allows hunting on the property.
   - 0 True
   - 5 False

Section 6 Total = _____

Determining the Total Score

Section 1 – Visual Deer Evidence _____/95
Section 2 – Environmental Deer Evidence _____/90
Section 3 – Food Sources _____/40
Section 4 – Water Sources _____/35
Section 5 – Surroundings _____/25
Section 6 – Preventative methods _____/40

Total score (Sum sections 1-6) = _____

CONCLUSIONS

This information was developed for white-tailed deer conditions in the Northeastern United States. Use in other geographical areas may be inappropriate. The following statements are general descriptions of the potential deer impacts. We plan further field assessment and refinement of this standard protocol.

1. Severe Impacts (score total 225-325): The highest degree of deer impacts. The most aggressive deterrent methods may be needed, including implementing physical barriers.
2. High Impacts (score total 160-224): Frequent deer presence, with an elevated risk of deer damage. Therefore multiple deterrent methods may be required. Physical barriers may be needed in some situations for high-value plants.
3. Moderate Impacts (score total 95-159): A well-defined deer presence; the property appears attractive to deer but may lack some key habitat requirements. Short term or persistent deterrent methods may be required depending on the plant materials to be protected.
4. Low Impacts (score total 0-94): Little to no deer activity, some level of protection may be required for the few plants most susceptible to deer damage.

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