Over the Limit?

How can you tell if deer exceed the carrying capacity of your habitat? With a browse impact survey.

This witch hazel seedling has been "hedged" – repeatedly browsed by deer until it is only a gnarled stump. When even low-preference foods are heavily browsed, it is a red flag for the deer and the habitat.

By John Donoughe and Mike Wolf

In the February 2007 issue of Quality Whitetails, we described how pellet count surveys can be used to get a handle on local deer densities. Members of one Pennsylvania club, the Brush Mountain Sportsmen's Association, attended a Deer Density and Carrying Capacity Workshop developed by the Society of American Foresters' Pennsylvania Deer, Farm and Forest Committee and Penn State Cooperative Extension. That workshop also detailed a second component of annual surveys. In this article, we will teach you how to add a new component to your pellet count survey: the browse impact survey.

For decades traditional hunters have resisted the message of wildlife biologists: when habitat condition is poor, the number of deer often needs to be reduced and maintained at a low level. Only after the habitat improves should deer populations be permitted to rebound.

Pennsylvania has been the front line in the "deer war," and one club, the Brush Mountain Sportsmen's Association (BMSA), has been the scene of many skirmishes. When the deer harvest in a given year was low, traditional hunters would demand a ban on doe harvests the following year. The argument in favor of such measures seemed logical – if you want more deer spare the breeders – and resistance was met with considerable angst. In 2007, attitudes turned 180 degrees. The BMSA applied for, received, and will attempt to fill 12 DMAP (Deer Management Assistance Program) antlerless tags on its 600-plus acres. The aim is to attempt to bring some balance to a sex ratio skewed heavily in favor of females. Just a few years ago this would have been labeled sacrilege at the club. How did the turnaround come about? Through the hands-on education of hunters who sought training to turn a critical eye to indicators of habitat health.

A core group of eight BMSA members took the initiative to learn the fundamentals of Quality Deer Management, including quality forest management. They attended seminars offered by the Laurel Highlands Branch of the QDMA, Penn State Cooperative Extension, and the Pennsylvania Game Commission. They also invited other foresters and biologists to tour club property. The message of the experts was clear: In areas of medium to high deer density, deer management and forest management are so inextricably linked that one cannot be considered without the other. Browse impact surveys would become the BMSA's primary tool of habitat assessment.

Steve Lantz, John Donoughe and Randy Geiner, all members of the Brush Mountain Sportsmen's Association, study browse patterns on deer forages. Conducted in the spring in conjuction with their pellet-count surveys, their browse impact surveys have helped document the need for better herd and habitat management.

***Above**: BMSA habitat committee chairman John Steinbugl (right) examines habitat with exceptional regeneration and abundant browse on a tour led by wildlife biologist Jeff Krause of the U.S. Army Corps of Engineers. **Left**: In great contrast to the above photo, in a severely overbrowsed habitat only the least-preferred seedlings survive. Ken Smithmyer of the BMSA habitat committee points out a low-preference American beech that has been severely browsed.*

In seeking professional guidance, the main objective of the BMSA members was to plan timber harvests that would improve deer and wildlife habitat and produce sustainable income over decades and generations. What they learned has been invaluable in planning long-term management strategies and has increased the membership's appreciation for their forest resources. More specifically, the club has learned to recognize the impact of browsing when deer populations exceed carrying capacity.

You may not need to change attitudes; you probably already practice QDM, but if you are unskilled at evaluating levels of browse impact, you may be missing one of the most valuable deer and forest management tools available.

What Browse Impact Surveys Can Tell Us

According to Dr. Tim Pierson, a senior educator with Penn State Cooperative Extension and a driving force behind pellet count and browse survey usage in Pennsylvania, hunting clubs like the BMSA are in good company. Browse impact surveys are also used by the Pennsylvania DCNR-Bureau of Forestry, the Allegheny National Forest, and numerous private cooperatives and clubs.

"The New York Department of Environmental Conservation received training this year and will be adapting the survey techniques to assist them on lands they manage," Tim said. The annual surveys, which include both pellet counting and browse impact assessment provide:

- An additional tool to estimate overwintering deer densities (as described in the article "Happiness is a Large Pellet Pile," *Quality Whitetails*, February 2007).
- An annual measurement of deer impact upon available browse.
- An annual measurement of the quality of forest regeneration.

How are the results used by the pros? According to Tim, "Typically, organizations, hunt clubs and landowners utilize the deer density and habitat impact survey results to help them understand the present condition and relationship between the deer herd and the habitat. Understanding the make up of your deer herd and its impact on the habitat is actually an essential component of any QDM program."

The results of browse impact surveys can help land and deer managers determine if the deer population needs to be reduced based upon the ability of the forest to produce deer food (browse) as well as trees to replace those that will eventually die or be harvested. Next, managers can keep tabs on the quality and relative quantity of browse as its availability changes from year to year. Finally, managers can determine if regeneration of tree species is of sufficient quantity and of the desirable species to conduct timber harvests.

Browse and Browsing Defined

The whitetail's diet changes with the seasons and with availability of items like mast, forbs, tender leaves, agricultural crops and supplemental food plots. Woody browse, however, plays a large role in a deer's diet regardless of season. Browse can be thought of simply as buds and/or small branches of woody plants. The term browse can also be used as a verb – describing a deer's act of eating woody plant buds.

If you've ever watched unspooked deer browse (verb!) in good forested habitat, you've witnessed one of nature's most delicate dances. Deer will feed along slowly, typically into the wind. Their heads bob as they snip off the end buds of trees and shrubs. Their near-constant forward movement distributes browse impact over the landscape. As a deer moves along, nipping an end bud here and there, the impact on individual trees is negligible. Here in Pennsylvania, an average deer will eat as much as 8 pounds of browse in a day. This browsing intensity occurs over a period of up to seven months. In degraded habitats, available browse is nearly nonexistent. When a deer finds a morsel within reach, the hungry deer stops and eats every available bud. The result to the tree can be death or "hedging" – a disfiguring result of repeated browsing. In such conditions the habitat can get locked in a downward spiral unless managers take corrective action. This may include intensive forest management and providing supplemental forage in addition to judicious antlerless harvests.

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How Overbrowsing Slowly Degrades Habitat Quality

Carrying capacity is the number of animals a habitat can support while maintaining the health of the animals and the habitat. In general, when deer densities are lower than carrying capacity, food is abundant. As deer numbers climb over carrying capacity, both the deer and the habitat are stressed. No one can pin an exact number on the carrying capacity for a given piece of habitat. Truth is, there's no glass ceiling. Even if we knew that a given habitat could support 22 deer per square mile, a 23rd or 24th deer would not spell instant disaster. Even an experienced biologist would have trouble seeing indications of overpopulation for many years. Overpopulation can be a gradual process, and indicators of habitat degradation are sometimes subtle. Also, knowing today's exact carrying capacity is of little value because carrying capacity changes annually, seasonally and sometimes daily.

At the BMSA the condition of the habitat is abysmal. In four years of sampling, using 60 sample points each year, club members have recorded a grand total of less than a half dozen seedlings in their sample plots. Outside the sample plots, only a few scattered and severely hedged American beech seedlings have been found. In the April 2004 survey, club members also found seven winter-killed deer carcasses. Those results, indicating a forest health emergency, helped spur the club to take the actions described in the introduction.

Forest health can diminish for many reasons ranging from insect pests and plant diseases to invasive species and poorly conducted timber harvests, but one cause of forest decline, overbrowsing, is common and easily diagnosed. Better yet, the primary method of control is something we all enjoy – deer hunting.

How Browse Impact Surveys Work

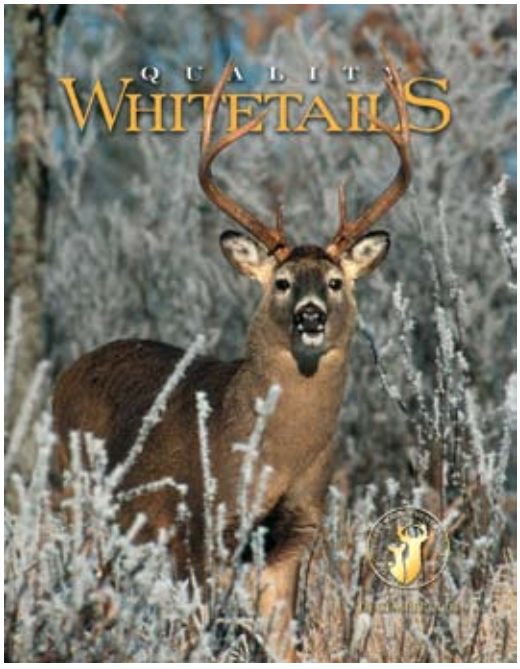
As with pellet counts, the scientific technique used in browse impact surveys is known as the point-sampling method. Point-sampling is a time-tested method for collecting field data. Basically, data collectors use small areas called sample plots that are randomly selected and spread across all habitat types. At each site data is collected and results are assumed to be representative of the entire study area, with some acceptable margin of error. A very thorough explanation of point sampling is given in Part 1 of this two-part series in the February 2007 *Quality Whitetails*. If you don't have that issue, you can find the text of that article at www.QDMA.com, under "Featured Articles" on the home page.

Conducting the Survey

First, it's important to note that the browse impact survey method is usually taught as a full-day seminar with hands-on experience. The following has been condensed and adapted for *Quality Whitetails* by the authors. For an in-depth look at the information presented in the day-long course, refer to the website for the Kinzua Quality Deer Cooperative (KQDC) – a 74,000 acre public hunting area in northwestern Pennsylvania – at www.kqdc.com. A host of wildlife and forestry professionals work with the KQDC and willingly make their knowledge and research results available. You may also contact Penn State Extension's Dr. Tim Pierson who has co-developed the course and supplemental materials at tgp2@psu.edu.

Step One: Develop a Plan

A browse impact survey is set up in exactly the same way as



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a pellet count survey. You will first obtain an aerial photo or map of the property, mark transects on the map that cross all habitat types in roughly representative proportions, and decide how many sample plots will be examined. Remember, larger sample size (more plots) equates to greater accuracy, but sampling a large number is less critical here than with pellet counting. When pellet counts and browse surveys are conducted simultaneously, browse impact data is recorded only at every other sample plot.

Step Two: Select Indicator Species

You will need to compile a list of six indicator tree species. These species should be common trees in your area, and ideally they are well-represented in the forest canopy. Two of these species will fit into each of the following categories: high, medium, and low-preference deer browse. Where this protocol was developed in northwestern Pennsylvania, red maple and sugar maple are the highly preferred browse. Hemlock and black cherry are medium preference, and beech and striped maple are least preferred.

To develop its own tally sheets, the BMSA compiled a list of the most common trees in the forest overstory and compared that to lists of deer browse preferences provided by local biologists. Due to an abundance of oak and a lack of sugar maple, oak replaced sugar maple as the most highly-preferred browse on the BMSA tally sheet.

We recommend that you take a similar approach. Meet with a professional to tour your property. Examine the tree species present in the canopy. Have a professional give you pointers in identifying indicator seedlings in leafless condition. He or she can point out bark and bud characteristics that will help. You may also want to consider ease of identification as a criterion for inclusion on your list of indicator trees.

Step Three: Assign Teams

Divide your crew into teams of two or more. At least one member of each team needs to be proficient in identifying the indicator trees. Assign each team to a transect. The required equipment is the same as for pellet count surveys. Each team should have a blank tally form (sample on page 56), clipboard, pencil, compass or GPS, and 4-foot string or stick to measure the radius of each sample plot. You may also want to take along tree identification "cheat sheets" for the six selected indicator species. Radios also help so that all teams can stay in contact with the survey chief. Real-time "coaching" is often necessary during the first year a browse impact survey is conducted.

Step Four: Collect Data

Each team walks its transect, using a compass or GPS to maintain a straight line, and stops at regular intervals that become sample plots. The interval will vary with property size and available manpower. Browse impact research calls for 200 feet between plots. The BMSA has settled on 300 feet as best suited for their annual work. Pacing will suffice for estimating distances between sample points. Each sample plot is a circle with a radius of 4 feet.

What are we looking for? At each sample point the survey team will examine indicator tree seedlings between 6 inches and 6 feet in height. The goal is to determine what degree of browse

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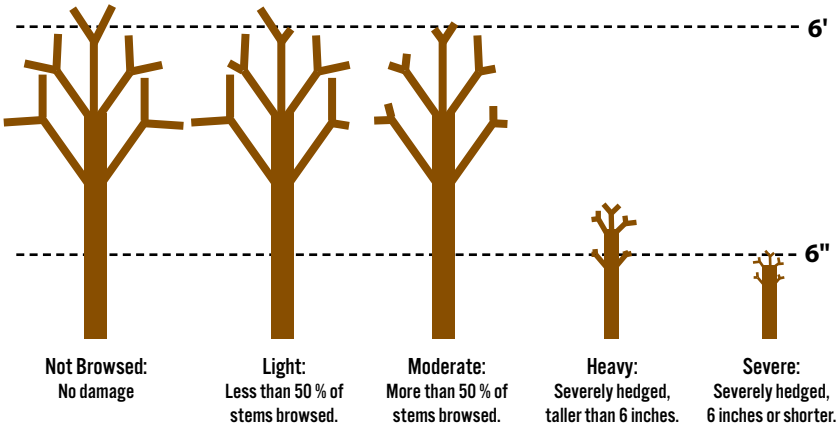
impact is evident on each of the indicator seedlings found within the sample plot (refer to the "Browse Intensity" diagram on this page). If there are no trees between 6 inches and 6 feet in height within the sample plot, record "no regeneration" and move on. Remember, for the purposes of this survey, only the impact on the six indicator species is recorded.

If there are indicator seedlings between 6 inches and 6 feet in height within the sample plot, and the end buds have been untouched by deer, record "no impact" and move on. If indicator seedlings are present, and are between 6 inches and 6 feet in height, and show evidence of browsing, determine the browse impact for each. Follow this process at each sample plot along your transect.

Determining Browse Intensity



Step Five: Interpret Results

The pattern of habitat degradation is fairly straightforward. Deer browse their favorite species first and hit them harder than less preferred species. If local deer populations are permitted to exceed carrying capacity, the first species lost from the understory will be those that deer find most tasty. As the numbers of those favored species go down, species lower on the preference list become more heavily impacted. Wildlife, including deer, suffer as well. Whitetail body weights, fawn recruitment, and antler size all diminish as food becomes more scarce. The downward spiral eventually leads to winter mortality, especially in the northern United States.

Summarize your results by compiling all of the data collected by the teams onto one, new data sheet. Add all the numbers from each team's tally form to show the totals for the whole property. This summary sheet will be used for interpretation initially but will also be valuable in years to come as trends in habitat health become evident.

"The key here is that landowners, sportsmen and land managers need to follow up annually to be aware of changes in the relationship between the deer herd and the habitat," said Tim. "The only way this can be done is by getting out there and objectively observing both the deer herd and the impact on the habitat on a regular basis."

Now look at your summary data sheet (sample below). A clear pattern may emerge. Do you have regeneration in most sample plots? Are preferred species well-represented and only lightly browsed? If so, your habitat is likely in very good condition and your results indicate that no corrective action is necessary.

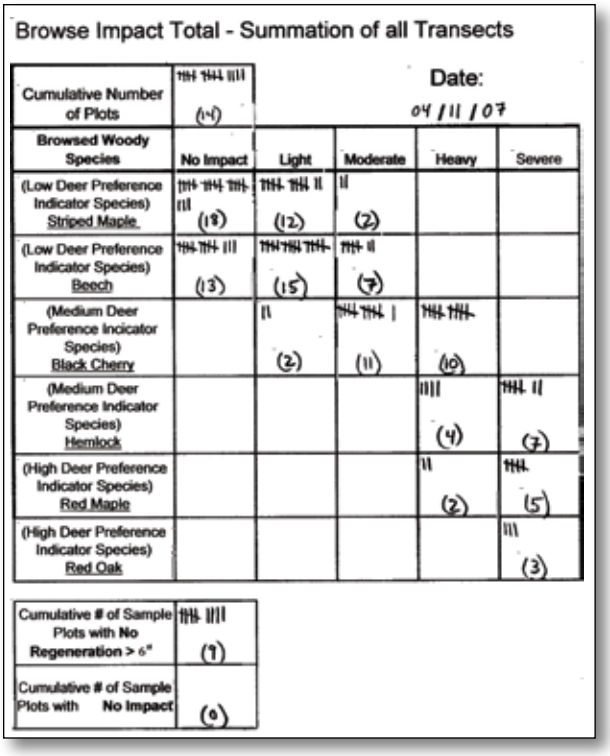
If, on the other hand, a large percentage of your plots have no regeneration, preferred species are

Sample Browse Survey Data Sheet

Browsed Woody Species	No Impact	Light	Moderate	Heavy	Severe
(Low Preference Indicator Species) _____					
(Low Preference Indicator Species) _____					
(Medium Preference Indicator Species) _____					
(Medium Preference Indicator Species) _____					
(High Preference Indicator Species) _____					
(High Preference Indicator Species) _____					

Cumulative No. of Sample Plots with No Seedlings taller than 6 inches	
Cumulative No. of Sample Plots with No Browse Impact	

Reproduce this data sheet to use in your browse survey. Each team fills out a data sheet. Data is then transferred to a single, new data sheet to form the "Browse Impact Summary" data (example shown on the right).



Browse Impact Total - Summation of all Transects

Cumulative Number of Plots: 14

Date: 04 / 11 / 07

Browsed Woody Species	No Impact	Light	Moderate	Heavy	Severe
(Low Deer Preference Indicator Species) Striped Maple	18	12	2		
(Low Deer Preference Indicator Species) Beech	13	15	7		
(Medium Deer Preference Incicator Species) Black Cherry		2	11	10	
(Medium Deer Preference Indicator Species) Hemlock				4	7
(High Deer Preference Indicator Species) Red Maple				2	5
(High Deer Preference Indicator Species) Red Oak					3

Cumulative # of Sample Plots with No Regeneration > 6"	9
Cumulative # of Sample Plots with No Impact	0

absent or rarely reach a height of more than 6 inches, and indicator species of all preference levels are heavily browsed, mark your property with a big red flag. The habitat has been severely degraded by overbrowsing and a program of intense herd management should be developed and implemented.

Most properties will likely yield results between the two extremes. Take a look at the spectrum below and decide where your indicator species fall; then judge your property as a whole.

Light Impact: Habitat shows signs of decline. Loss of shrub layer and shrub species.
Moderate Impact: Seedlings of preferred species disappear.
Heavy Impact: Obvious browse line with little or no vegetation below 5 feet. Only browse-resistant seedlings remain.
Severe Impact: Herbs, shrubs, seedlings gone. Only heavily browse-resistant plants remain.

If you glance over the example summary data sheet on page 56, you can easily begin to see where each indicator species falls on the impact scale. For example, look at striped maple – over half of them showed no impact. Then, look at red oak – only three were found out of 14 sample plots and all three were severely impacted. How about the other species? Would you be happy with these results? Take a close look at the bottom of the chart – there were nine out of 14 plots that contained "no regeneration." What we are looking at in this example is a forest in trouble and a carrying capacity that has been greatly lowered by overbrowsing.

Note that if your property shows little regeneration of desirable browse seedlings and heavy browse impact, overabundant deer are the likely culprit, but herd reduction alone may not be the remedy. Have an experienced forester help you decide if other factors such as competing plants or insufficient light may be compounding the problem. Those factors may need to be addressed along with herd reduction.

Through pellet-count and browse-impact surveys, and browse enclosures like the one shown here, members of the BMSA hunting club have grasped the magnitude of their problem and are working to reverse the damage of years of traditional deer management.

How Much Browse Impact is Too Much?

That's the $64 question. From an ecological and ethical standpoint we should not permit an overabundance of deer to change the species composition of the forest. The deer themselves will eventually suffer, and a ripple effect of habitat degradation extends to other game and non-game wildlife. As conservationists, we don't want our legacy to be that we passed on habitat in poor condition because we had a desire to overstock the woods with desirable targets. As hunters, we want to ensure that the next generation can benefit from the same forest resources that we've had the opportunity to enjoy.

Conclusion

Pellet counts and browse impact surveys can be done simultaneously or separately. If you are considering beginning either of these for the first time, we recommend that you keep things simple at first. Start this year with only one of the two surveys – either a pellet count or browse impact survey. After your volunteers become comfortable with one method, they will more easily transition into doing both simultaneously. Browse impact surveys are easy to accomplish with a little practice and provide data that can help steer your deer and forest management strategies.

"The methodology we have created provides both an inexpensive and fairly quick means of gauging the deer herd and an indicator of habitat condition," said Tim. "It is also a fun outdoor activity when there are no hunting seasons."

And you just might be surprised by what you find.

***About the Authors**: John Donoughe is a high school environmental science teacher and freelance outdoor writer. He is a QDMA member and a current member and past-president of the Brush Mountain Sportsmen's Association.*

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