

Ask A Professional

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Landowner questions are addressed by foresters and other natural resources professionals. Landowners should be careful when interpreting answers and applying this general advice to their property because landowner objectives and property conditions will affect specific management options. When in doubt, check with your regional DEC office or other service providers. Landowners are also encouraged to be active participants in Cornell Cooperative Extension and NYFOA programs to gain additional, often site-specific, answers to questions. To submit a question, email to Peter Smallidge at pjs23@cornell.edu with an explicit mention of "Ask a Professional." Additional reading on various topics is available at www.forestconnect.info

Regenerating Your Forest: Keys to Success

Editor's note: This article is one of many supporting the on-going theme in NYFOA related to the regeneration of forests.

Have you ever wondered what it takes to regenerate your forest? You have just completed a timber harvest and now you are ready to regenerate. All you have to do is let nature take its course, or plant some seedlings to help things along. What could be easier? However, some NY forest owners have discovered that forest regeneration is not so simple.

Understanding barriers to forest regeneration is valuable because owners and managers can adjust their management practices to offset the dominant barriers for a particular stand or site. Focusing attention on those barriers most limiting to seedling growth will improve the likelihood of successful regeneration and contribute to the goal of sustainable woodlands in New York. The key to successful tree regeneration depends on three critical components: (1) appropriate silvicultural applications, (2) removal of competing vegetation, and (3) protecting young seedlings from deer herbivory (browsing). Each of these management actions are interrelated, thus if any one of these components is ignored, the likelihood of successful

hardwood regeneration is poor in much of the state.

Appropriate Silvicultural Applications

Regeneration of valuable timber species requires favorable site and forest conditions to establish seedlings. Owners can expect very little regeneration until the canopy is opened sufficiently to provide light on the forest floor to stimulate new

plant growth. First, there must be either adequately dense numbers of desirable seedlings already established on the forest floor, ready to shoot up after opening of the canopy, or there must be an adequate and timely source of seeds that will provide the source of new seedlings. Some species will propagate from stump or root suckers, but for many species and stems these are subject to poor form and less desirable than seedlings. Various harvest regimes are designed to provide suitable conditions of light and seed source to "jump start" the process of regeneration. For example, using seed-tree or clear-cutting harvest regimes, will provide favorable conditions for regeneration of species that require lots of light (e.g., aspen and cherry). Assessing current conditions and choosing the right manner by which to start the regeneration process is dependent on many variables such as soil conditions, stand history, dominant species in the canopy, desired tree species, the size of the area cut for regeneration, and likely impact of deer browsing. Selectively removing a few trees from a stand has a poor chance of creating suitable regeneration where



Figure 1. Fenced enclosure to prevent deer foraging and evaluate the impacts of deer on forest regeneration.

deer populations are too high, as deer can quickly consume species they prefer. Consult a professional forester for harvest recommendations to meet your management goals.

Removal of Competing Vegetation

Even with sufficient light reaching the forest floor, problems could still occur. Often as a result of a too-abundant deer herd, in combination with relatively low light levels, an understory composed of deer-resistant plants such as American beech or hay-scented ferns, or exotic invasive species such as garlic mustard or European buckthorn, will dominate the understory. Opening the canopy (via a harvest or thinning) under such conditions will allow those species to flourish, creating beech or buckthorn thickets, and/or a mat of ferns at the ground level. Under such conditions few tree seeds survive through the germination and establishment phase. Those that survive will grow slowly due to dense shade, and thus are unable to attain a height of five or more feet needed to escape deer browsing. As you can see, successful regeneration of desirable tree species is dependent on devising a forest management plan that addresses a combination of interacting factors. Under such conditions various mechanical or herbicide treatments may be needed to control competing vegetation. See other issues of the NY Forest Owner or at www.ForestConnect.info for more information about this topic.

Protecting Young Seedlings from Deer Browsing

Once tree seedlings are established, an adequate number of seedling having good form must eventually escape herbivory, especially from white-tailed deer, for regeneration to be successful. Herbivory is believed to be a severe limitation on regeneration for many woody plants because of high deer densities. For example, in much of southern New York deer abundance

	Statewide	Adirondacks	Southern Highlands	Other Regions
Highly successful	13	12	16	8
Moderately successful	17	31	13	16
Marginally successful	45	50	47	38
Complete failure	25	7	24	38

Table 1. Potential regeneration success of forest stands in 2008 based on expert opinion of New York foresters.

exceeds 35 deer per square mile. With this level of foraging pressure from deer, preferred seedlings such as oaks, maple, and ash, have little chance for successful reestablishment. Species that deer generally avoid, such as American beech, black birch, hophornbeam, striped maple, and numerous invasive species may dominate the seedling layer in such forests. Foresters and wildlife biologists generally agree a deer density of fewer than 20 deer per square mile will allow for regeneration of desired trees if deer have alternative food sources, such as farm crops. However, where deer must live primarily on tree browse (such as in parts of the Catskill or Adirondack Mountains), deer densities of as low as 8 to 10 per square mile can result in complete regeneration failure.

The extent of deer impacts on forest regeneration in New York State was assessed in 2009. To obtain this information statewide, we conducted a mail survey to gather the expert opinions of foresters currently working in the state. A total of 514

practicing foresters was identified and we received a 54% response rate of usable surveys. While the intent of the research was to assess the relative impact of deer on forest regeneration, the questionnaire did not highlight deer in any way, to avoid the potential for biasing respondents. The survey dealt with foresters' general experiences with forest regeneration, barriers to successful regeneration, management activities they would recommend, and activities they thought landowners would implement.

Respondents indicated that they had examined almost 5,000 properties during 2008, during times when snow depth did not limit their ability to assess forest regeneration. This represents almost 17,000 stands and 700,000 acres examined. Two-thirds of respondents (65%) indicated that they always look for evidence of forest regeneration when inspecting a forest stand. Another 27% said they looked most of the time. Only 8% said they looked only some of the time or rarely.

Foresters said that 31% of all the

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Barriers That Caused Marginal or Failed Regeneration (% of stands)

	Statewide	Adirondacks	Southern Highlands	Other Regions
Deer browsing	72	38	76	81
Interfering vegetation	50	42	60	39
Landowner lack of interest or knowledge	27	9	23	40
Landowner did not invest adequate \$\$	14	16	17	9
Soil or site limitation	14	14	11	19
Forest health	10	11	6	15

Table 2. Barriers to regeneration in New York forests, 2008.

stands (and 30% of all the acreage) they evaluated in 2008 were ready to be regenerated. “Successful” regeneration was defined as desirable species that had reached a height of at least 5 feet, and occupy the stand with an adequate number of stems per acre. About one-quarter (28%) of all the stands, and 27% of all the acreage that foresters inspected had a harvest in the last 10 years that was sufficiently intense to open the canopy for sunlight that could establish a new age class of trees. Foresters who responded to the survey anticipated regeneration success of those stands, statewide, would be largely unsuccessful. For stands where foresters could assess regeneration, statewide regeneration was moderately or highly successful only 30% of the time (Table 1).

Barriers to regeneration success were linked primarily to deer and the abundance of interfering vegetation. Foresters indicated that 72% of all the marginally-successful or completely-failed stands statewide were impacted by deer browsing (Table 2). Half

of all stands were also impacted by interfering vegetation. Once again, note that these barriers are interacting forces, and it is impossible to separate out their singular impact. Forest health or soil/site limitations seldom



Figure 2. White-tailed deer will selectively browse and removed preferred tree seedlings from the forest up to a height of 5 to 6 feet.

were considered barriers to tree regeneration. Survey findings indicated that forest regeneration is a serious problem in much of New York State. Given current landowner perceptions on deer, interfering vegetation, and unsustainable harvesting practices, such issues with poor regeneration will compound over time.

Where we have constructed small deer exclosures (Figure 1) to evaluate the impacts of deer on vegetation, the results are often striking in just a few years. Ferns and other deer-resistant plants dominate vegetation outside fences. Inside the exclosures, plant diversity and height is much greater after as little as three years. Results have been similar in trials conducted in the Southern Tier and in Adirondack forests. Even relatively low deer densities can have impacts in areas with poor soils or short growing seasons. Multiple barriers could impact forest regeneration, and if there are existing site limitations, abundant deer will only compound those problems.

Foresters often recommend a specific regime for timber harvest or stand improvement to encourage successful regeneration. The harvest regime is chosen in consideration of the likelihood of achieving ownership

goals, given the barriers present. In areas outside the Adirondacks, most foresters also recommend antlerless deer harvest. Fencing to exclude deer is effective, but rarely recommended presumably because the cost of fencing will not allow adequate return on the investment when the sawtimber is sold several decades later. However, small fenced deer exclosures can highlight the local impacts of deer on forest regeneration (Figure 1.)

Given the impacts, the management of deer (Figure 2) and competing vegetation limit the future sustainability of many forests across the state. If regeneration of stands is to be successful, many landowners must consider deer management. Hunting is the only management alternative that can address deer numbers and associated impacts at a landscape scale. Landowners should promote harvest of antlerless deer to attain lower densities several years prior to a harvest designed to start the regeneration process. Based on typical

parcel sizes, it may be necessary to work with several neighbors to coordinate deer management efforts. Based on our experiences on university forest lands, it will take years of sustained hunting pressure and removal of adult does to lower deer densities sufficiently to achieve adequate seedling regeneration. This will be difficult to achieve for landowners in many parts of the state given the overall quality of deer habitat, resulting in high reproductive potential for the herd and abundant deer across much of the landscape. 🏞️

Resources:

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Shirer, R and C Zimmerman. 2010. Forest regeneration in New York State. The Nature Conservancy. 25 pp. http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newyork/placesweprotect/easternnewyork/final_nys_regen_091410_2.pdf
 Regenerating Hardwood Forests: Managing Competing Plants, Deer and Light. Penn State University, State College, PA. 7pp. <http://pubs.cas.psu.edu/freepubs/pdfs/uh181.pdf>
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