Opinion

Bridging the disconnect between agencies and forest landowners to manage deer impact

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Key words: damage management, deer impact, forest landowners, *Odocoileus virginianus*, white-tailed deer, wildlife agency

WHITE-TAILED DEER (*Odocoileus virginianus*) are managed at 2 levels: by federal, state, or local resource agencies on large, heterogeneous landscapes usually >200 ha; and by individual property owners on smaller (generally <200 ha) and more discrete forestlands. This dichotomy results in a management disconnect: regulations controlling deer hunting (seasons and bag limits) are developed by agencies for landscapes the size of deer management units (DMU) and often are not sufficiently area-specific to meet management needs of individual forest landowners. Resource agencies manage hunters and regulate deer abundance by controlling harvest within DMUs, and they use license and permit fees paid by hunters to finance the costs of agency deer management, including law enforcement. Some, such as the Pennsylvania Game Commission (PGC), derive income from timber harvest on landscapes they manage (gamelands) as an additional source of revenue and may use it for habitat enhancement that favors deer and other wildlife species. Most deer management occurs on forestlands where habitat (forage, cover, water, plant composition) is manipulated by landowners. Landowners absorb the costs of management that affect deer habitat, abundance, and impact on natural resources. Costs include herbicide application to control unwanted vegetation resulting from overabundant deer; development and maintenance of roads hunters use to gain access to deer hunting; activities associated with managing deer harvest (posting boundaries, repairing road

damage); and measures, including fencing, to protect forest resources from damages caused by overabundant deer. Other costs, like thinning or timber harvest, which produce deer forage, are partially or wholly offset by the sale of resulting forest products. Unlike agencies, costs to forest landowners of managing deer and hunting access are rarely subsidized by hunters (a notable exception was the PGC program to provide deer fencing materials to protect tree regeneration on forest landowner properties), but rather are borne by forest landowners—unless landowners lease hunting rights to hunters for a fee.

The disconnect and resultant emphasis on deer management at the DMU level by agencies rather than individual forestlands favors the priorities of hunters (bigger and more deer) that conflict with those of landowners whose resources and revenues may be negatively impacted by high deer density. The situation results from the history of deer management, which must be placed in perspective along with the importance and influence of stakeholders, who affect an organization's objectives (Freeman 1984).

Brief history of deer management

By the end of the nineteenth century, white-tailed deer had been nearly extirpated from the eastern United States by market hunting (Frye 2006). Newly formed state natural resource agencies were charged with restoring white-tailed deer populations along with other game species. Deer hunting was prohibited or limited

to antlered deer only. Restriction on harvesting antlerless deer was combined with efforts to restore populations, including importing deer from other states. Once deer established a toehold and began to increase in abundance, the goal of state agencies was to maintain population growth until deer restocked native ranges at densities supporting hunting. Deer hunters were the primary stakeholders, as deer had not yet increased in abundance sufficiently to cause economic damages to other stakeholder groups (e.g., farmers, foresters, hunters of other game species, managers of nature preserves, motorists, and homeowners with landscaping).

For decades, Pennsylvania forest landowners tried to convince the PGC to reduce deer density to levels compatible with successful forest regeneration (Stout et al. 2013). Typical of many northeastern states however, the PGC was more influenced by the overwhelming numbers of hunters who wanted higher deer density—forest landowners had no political leverage as a voting bloc to influence deer management and no economic leverage with the agencies, as they provided no funding. As a consequence, deer hunters maintained sway over the natural resource agencies. Agencies had little incentive to manage deer density at levels acceptable to stakeholders other than deer hunters if such densities were lower than desired by hunters. What was lacking was the scientific basis for justifying reducing deer density and impact.

Scientific basis for deer management: monitoring deer density and impact

Because of the large scale of DMU-level information, estimates of deer density derived for them produce area-wide estimates that cannot be used for individual forest landowner properties within DMU landscapes; density is too heterogeneous within DMUs. Additionally, deCalesta and Stout (1997) determined that deer densities desired by hunters often approximate maximum sustained yield (highest density of harvestable deer surplus resulting from survival to reproductive age of maximum number of fawns), whereas density levels associated with successful regeneration of commercial tree species are lower, and

density levels associated with optimal diversity and number of plant and animal species are lower still. Landowners need property-specific information if they are to make decisions concerning management of deer density and impact within their properties. Dale and Beyeler (2001) stated that environmental stressors (e.g., white-tailed deer) affecting structure, composition, and function of ecological systems should be easily measured, sensitive to stresses, respond to the stresses in a predictable manner, and predict changes that can be avoided by management. Chevrier et al. (2012) stated that such indicators should respond predictably and sensitively to changes in deer density. Until recently, few methodologies for assessing deer impact on forest vegetation were linked to deer density. Now, techniques are available to forest landowners for estimating deer density and impact (Jacobson et al. 1997, deCalesta 2013, Pierson and deCalesta 2015). State natural resource agencies generically address forest landowner complaints about high deer density and impact by issuing permits to increase harvest of antlerless deer and reduce deer density and impact, but when such permits are issued at the DMU level, they do not allow individual forest landowners to direct hunters with permits to use them exclusively on their properties.

Agency adjustment of deer management to address forest landowner needs

The disconnect between agency and forest landowner deer management was addressed by the PGC when it revised its deer management strategy beginning in 2000. Gary Alt, tasked with revising deer management practice and policy for the PGC, identified and addressed the need to manage for deer on individual forest landowner properties by instituting the Deer Management Assistance Program (DMAP) during 2003. Under this program, forest landowners could request antlerless permits to reduce deer density on their properties, as the permits were property-specific. Owners could request the base number of permits (1 permit per 20-ha of impacted land) without documenting damage and could request additional permits if they provided property-specific evidence that deer impact on their

resources was too high. DMAP administrators had discretionary power to limit the number of additional antlerless permits to prevent overharvest and to investigate suspicious requests using wildlife conservation officers.

Collaboration and involvement with hunters

Participation by hunters is a key factor in managing deer density and impact on forest landowner properties. Values of hunters and forest landowners must intersect sufficiently so that both seek to establish and maintain deer abundance at densities that allow stakeholders to achieve their management goals. In the PGC program, Gary Alt identified deer densities that produced quality deer (for that segment of the hunting population that was more interested in quality than quantity of deer) and quality habitat, including successful regeneration of woody seedlings and enhancement of biodiversity. Such commonness of goals for both groups must be communicated to hunters, and forest landowners must establish and maintain trust and communication with hunters who hunt on their lands. Not all hunters will relate to deer densities required by forest landowners, but over time these hunters will cease hunting on the forest landowners' properties. It is essential to retain those hunters who will continue to hunt areas with reduced deer density, and this can be accomplished by incentives (e.g., reward hunters for bringing harvested antlerless deer to check stations, make provision of additional antlerless permits contingent upon successful harvest of antlerless deer in such areas) and communication (establish and maintain websites, blogs, and Facebook entities to provide successful hunters with current information and allow them to interact with program managers and each other).

Deer management model for forest landowners

At the same time, the PGC expanded its deer management program for forest landowners, a consortium of biologists from the Allegheny National Forest; private timber landowners; Extension foresters from Pennsylvania State University; forest/deer researchers from the Northeastern Research Station, USDA Forest Service (NERS); and local hunters collaborated to produce a demonstration model (the 30,000-ha Kinzua Quality Deer Cooperative [KQDC]: see deCalesta 2017) for implementing the DMAP program to benefit forest property owners.

Research from the NERS produced techniques for estimating and monitoring deer density and impact on individual forest landowner properties. Local public and private owners provided their forestlands, maintained access roads for hunting, and managed forage and cover for deer. The DMAP program was utilized to obtain numbers of antlerless permits based on deer density and impact. Pennsylvania Extension foresters developed a 1-day workshop to teach forest landowners how to estimate deer density and impact and also how to apply for DMAP permits. Annual monitoring of deer density and deer impact provided the forest landowners the flexibility to adjust number of deer harvested as changes in deer density and impact responded to changes in numbers of DMAP permits. The KQDC program succeeded in reducing deer density and impact to desired levels and has maintained those levels to the present (deCalesta 2017). Extension foresters have taken the workshop and its results statewide to educate over 2,000 workshop attendees in Pennsylvania since 2002.

Key factors in the success of the program were: 1) recognition by a state agency of the need for managing deer and habitat at the individual property level; 2) existence of a state agency-provided program (e.g., DMAP) for obtaining antlerless permits at the individual property level; 3) forest landowner use of research-proven methodology for quantifying deer density and impact and relating it to goals for natural resource management; 4) training for forest property owners so they could apply relevant monitoring and management information to reduce deer impact and to obtain antlerless permits for use on their properties; 5) gaining acceptance by hunters of target deer densities required to improve deer and habitat quality; and 6) including hunters as stakeholders and partners in program development to obtain their support and ensure their participation for reducing deer density. The process, components, and involvement of affected stakeholders in the successful KQDC

demonstration project can serve as a model for development of other programs for managing wildlife populations and habitat at the forest landowner level.

Methodologies for estimating deer density (pellet-group counts) and impact (levels of browsing on selected indicator seedling species) were developed in northeastern states (deCalesta 2013, Pierson and deCalesta 2015). Such techniques may not be applicable in other regions, requiring development and testing of methodologies for providing reliable estimates of deer density and impact. State wildlife agencies can enhance the effectiveness of DMAP-like programs by establishing late season additional antlerless deer hunts on properties utilizing antlerless deer permits. Research demonstrated that providing extra hunting days for antlerless deer under permit systems after regular hunting seasons are over can result in additional harvest of antlerless deer on forestlands where existing season length and bag limit did not achieve desired reductions in deer density and impact (Roseberry et al. 1969, deCalesta 1985). This option would provide additional assistance to forest landowners in their quest to reduce deer density and impact to levels that allow them to meet their management goals for deer and other forest resources.

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