

# Information bulletin

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## The Rose Petal Theory: Implications for Localized Deer Management

Populations of white-tailed deer (*Odocoileus virginianus*) have grown significantly in the past 35 years throughout the eastern United States. In most states, deer harvests during the 1980's were at record levels. Deer populations on some areas not open to hunting, such as state and local parks or some national wildlife refuges, exceed 40 deer per km<sup>2</sup>. Similar densities are reported in suburban areas of cities such as Chicago, Minneapolis-Saint Paul, and Long Island.

As deer populations have grown, the animals have increasingly come into conflict with human activities. The severity of conflicts in local areas depends on the density of the deer populations and ranges from damage to ornamental plants and agricultural crops to vehicle collisions. A more widespread concern is the role of deer as hosts for ticks that carry Lyme disease bacteria. While such conflicts are most pronounced in parks and suburban areas where population management through large-scale hunting is not a viable option, these issues have national significance.

We developed an alternative management strategy, based on the social behavior of white-tailed deer, and refer to it as management by the rose-petal theory. Similar to many mammals, female deer are highly philopatric and form matrilineal social groups. The rose-petal theory describes the establishment of female home ranges within and among social groups. Based on our research, and similar studies conducted throughout the Midwest and Northeast, natal dispersal of female deer generally ranges from 5% to 20%. Home ranges are invariably established adjacent to and overlapping those of the female parent and sisters in a manner analogous to the petals unfolding on a rose (Figure 1). Home ranges of older, and presumably more dominant, deer are located near the center of this cluster. While individual home ranges can reach 250 ha, groups use up to 1,000 ha with much overlap among individuals. A six-year, radio-telemetry tracking of more than 100 adult, female deer in the central Adirondack Mountains in New York substantiates these patterns.

### Traditional Deer Management Has Limited Effectiveness in Localized Areas

Traditional deer management has focused on deer populations at the unit, county, state or regional level. Harvest quotas are set based on the proportion of the population removed by sex and age class. Harvest reductions often remove up to 40% of the females and 60% of the males. But this approach assumes a relatively even harvest pressure distributed over large (3 400 ha) areas to achieve a population-wide reduction. The problem with the population-wide approach is that managers rarely reduce the number of deer low enough in any one area to create a hole or void, which is desirable when managing for conflicts at a localized level.

Further complications arise from the traditional game management belief that any localized reduction in density (or creation of a void) leads to a rapid influx of deer from surrounding areas. Implicit is the idea that individuals diffuse from a more densely occupied adjacent habitat to less densely occupied areas until an equilibrium is reached. This notion is analogous to the diffusion of gas molecules seeking equilibrium in a vacant space by way of Brownian motion. Our research suggests that

localized reductions are possible and that the perception that deer behave as gas molecules is inaccurate.

### **The Rose Petal Metaphor Offers a New Perspective for Localized Management**

The rose-petal theory sheds new light on deer management. We suggest that it is possible to use a surgical approach to manage deer at local levels by focusing on the removal of social groups (Figure 2). Because of high female philopatry and low dispersal rates, the ideal management action would be to remove an entire family unit. The number of deer that need to be removed clearly depends on the size of the family. In practice it is not feasible to know the exact size or composition of the family group. However, continuous removal from a localized area will ultimately eliminate all family members from one or more groups. Because dispersal is low and philopatry is high, deer will not rapidly diffuse back into the area as traditionally believed.

The length of time the void lasts depends on several factors: the dispersal rate for that population; the likelihood that dispersing individuals will find a void; and how quickly adjacent groups encroach. Once a colonizer finds a void, the area will quickly repopulate depending on the recruitment rates of that female and her offspring. The removal of all deer in one rose-petal cluster may produce a long-term effect at low rates of recruitment and dispersal.

Highly localized or surgical management of deer populations by direct reduction of social groups provides a desirable alternative to large-scale hunting. The size of the impact area may be maximized while the size of the management area and the number of animals removed may be minimized. This approach should be considered in urban settings, parks or where indiscriminate hunting is not desirable or possible. It also has important implications for reintroduction efforts of social mammals. Tests of the rose petal management strategy are ongoing.

For further information, contact:

Nancy E. Mathews Texas Cooperative Fish and Wildlife  
Research Unit  
Texas Tech University  
Lubbock, TX 79409-2125

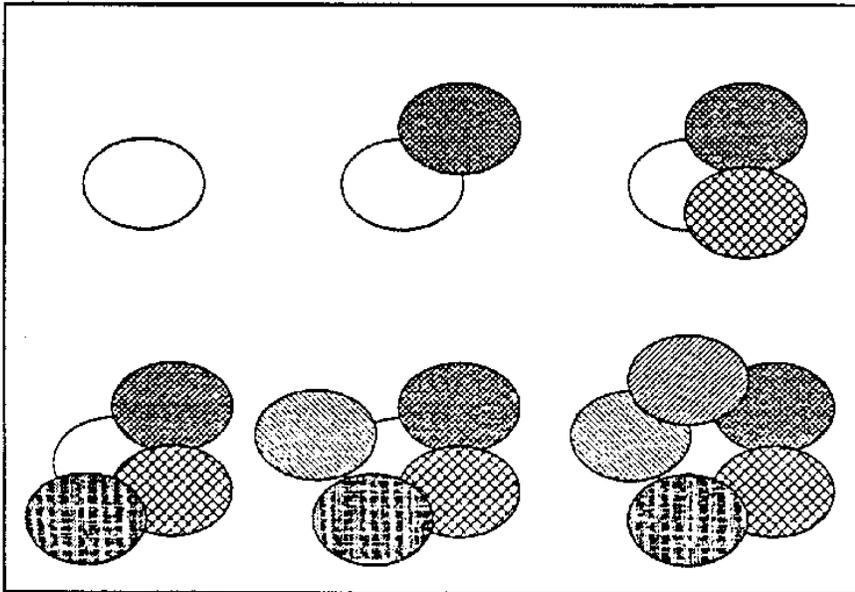
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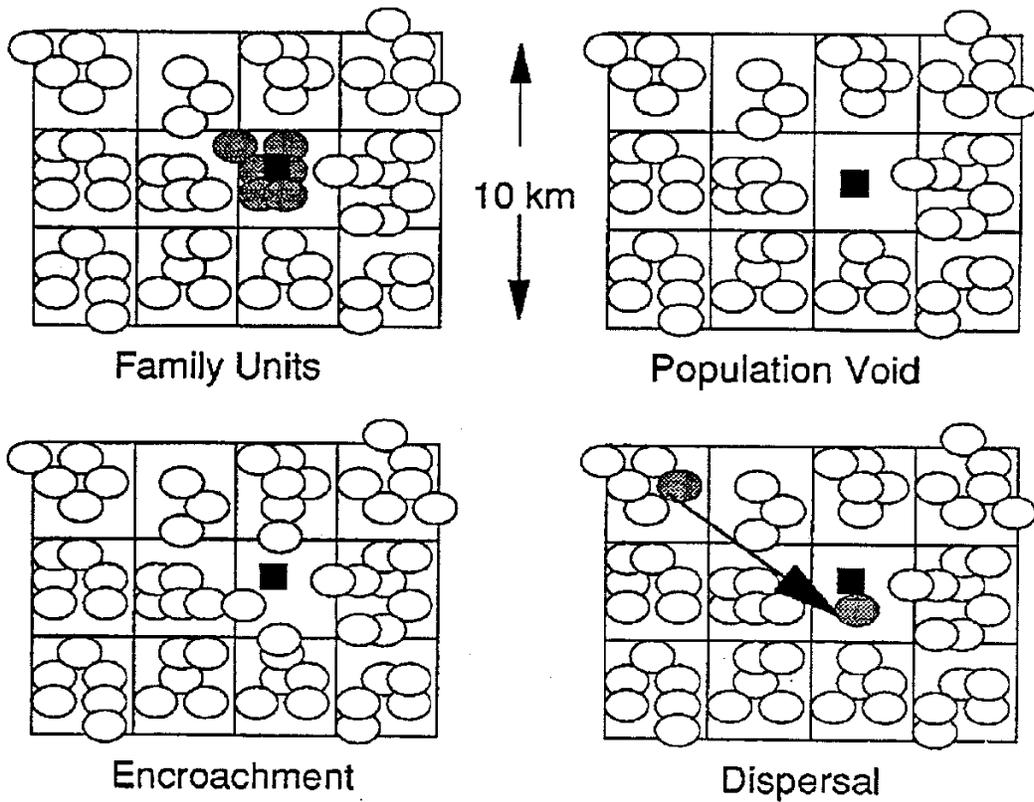
William F. Porter  
State University of New York-College of  
Environmental Science and Forester  
Syracuse, NY 13210

Comm. (315) 470-6798

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- **Figure 1.** Family units of deer expand in a form analogous to the petals on a rose. Ovals represent the overlapping home ranges of female offspring from several generations.



**Figure 2.** Hypothetical model of the distribution of white-tailed deer on a landscape. Each cell is 1,000 ha. The dark rectangle represents an area of management conflict.