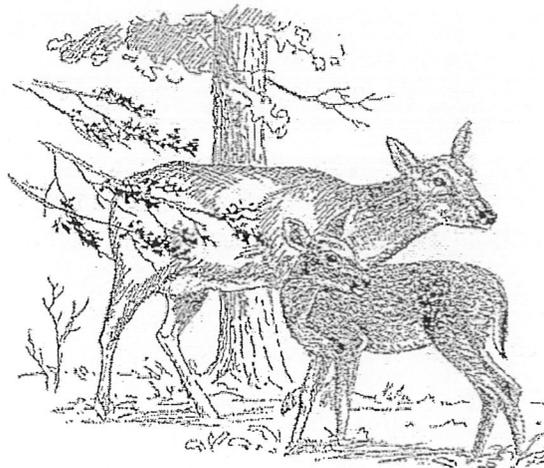


Learning by Doing: Deer Management in Urban and Suburban Communities



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EXECUTIVE SUMMARY

Introduction

The purpose of this study was to develop an understanding of the role that learning plays in community-based deer management. Suburban and urban deer management is a growing problem in many parts of the United States. Some communities have been trying to address deer problems for many years and have accumulated a considerable body of deer management experience. We sought to synthesize the lessons learned from this experience in an effort to help other communities find an easier path toward progress on deer management issues.

We used the policy learning literature to develop the conceptual framework for the study and explore the role that learning plays in the evolution of urban and suburban deer management issues. Four basic types of learning can contribute to public policy making.

- *Technical learning* involves efforts to find new policies to accomplish objectives, but does not include reconsideration of the objectives.
- *Conceptual learning* consists of the search for new objectives and new ways of defining the problem that is being addressed.
- *Social learning* focuses on relationships between stakeholders and the quality of dialogue between them. It involves learning about how to promote effective communication and interaction between stakeholders.
- *Political learning* involves learning how to advance the recognition of particular public problems or how to garner support for one's ideas.

We explored the role that learning played in community-based deer management. Our objectives were:

- Trace the evolution of deer management issues in selected communities.
- Determine what types of policy learning have occurred in these communities in relation to deer management.
- Determine which stakeholders do what types of learning.
- Identify the impacts of learning on deer management.
- Assess the factors that promote or inhibit learning.

Methods

We used a case study approach. Six communities in different states were included as cases:

- Cuyahoga Valley, OH
- Fox Chapel, PA
- Jackson County, MO
- Lynchburg, VA
- Princeton, NJ
- Tuxedo Park, NY

Archival materials were used to develop an initial understanding of how deer management had evolved at each site and to supplement and verify the data collected through the interviews. Between four and six stakeholders from each site were interviewed by telephone or in person. Interviews included a series of open-ended questions following an interview guide that identified important interview topics.

Interviews were tape recorded and transcribed. The interview data were coded – broken into meaningful segments (sentence or paragraphs) and assigned to descriptive categories. Coding indicators of learning in the interview data allowed us to ascertain not only the extent of learning that occurred, but what particular lessons were learned. The summary of these lessons, and the influence they had on management, forms a major portion of the results.

Results and Discussion

Evolution of Deer Management

We traced the evolution of deer management in our study sites from the time that deer-related problems began to increase. We describe a series of stages through which deer management issues may progress. Each community did not evolve through every stage, and the order of the stages sometimes varied and overlapped:

- Anti-hunting: Anti-hunting sentiment surfaces as deer populations grow.
- Early Nuisance: Deer begin to be viewed as a nuisance.
- Stalemate: State agencies advocate hunting to manage deer, but communities resist this advice.
- Late Nuisance: Deer-related problems continue to increase. Feeling pressured, local decision makers try to assess public opinion related to deer issues.
- Local Action: Local officials take action, often by forming a “deer committee” to recommend solutions to deer problems. Most recommendations included a combination of lethal control methods, deterrents, and public education.
- State Agency Evolution: State agencies recognize the need to treat deer management in urban and suburban areas differently from management in rural areas.
- Opposition: Opposition to lethal methods is galvanized as implementation of these methods nears.
- Implementation: Lethal deer control measures are initiated. Public acceptance of these methods increases.
- Adaptation: Communities incorporate new approaches to target hard-to-reach areas.

Lessons Learned

Technical learning. All communities concluded that lethal methods were necessary for reducing deer-related problems. Many communities also concluded that, because of access problems, hunting alone would not be sufficient to manage the deer herd. Consequently, hunting was often used in combination with some other type of lethal control measure. Technical learning took place through two primary mechanisms – gathering and interpreting information

before management actions were chosen and learning through experience with management actions that were implemented.

Conceptual learning: For communities, accepting that deer populations needed to be controlled was the key conceptual shift. This transition was particularly difficult where opposition to hunting or killing existed. For agencies, the recognition that urban and suburban deer management needed to be approached differently than rural deer management was the key transition. Conceptual learning was facilitated by dialogue, and each community structured opportunities for dialogue such as public meetings and workshops, surveys, and deer committees. The implementation of management actions often seemed to reinforce conceptual learning, and residents were more willing to accept controversial control methods after implementation began.

Social learning: Social learning occurred through transference of lessons learned in other settings – local government, state agencies, and individuals all brought experience about how to structure public dialogue on controversial policy issues. Many communities promoted dialogue through the creation of a “deer committee” to make recommendations about deer management. Communities also learned to reach out to local residents through surveys, public meetings, workshops, informal contacts, and mass media. State agencies learned to relate to urban and suburban communities in different ways – although often openly advocating hunting, many agencies tended to see themselves as advisors helping communities make the decisions that were right for them.

Political learning: Political learning often occurred through trial and error. Citizens and local leaders tried successively more aggressive approaches to win support for public action. Communities that had management plans blocked by lawsuits or protests developed new approaches based on these obstacles. Establishing deer committees to recommend solutions to deer-related problems was an important step in building support for the management actions – particularly if the committees were broadly representative, included local government leaders, and reached out to other segments of the community for input.

Factors Affecting Learning

Various factors can promote or inhibit learning. These include:

- Severity of Problems: The more deer-related problems a community experienced, the more motivated it was to seek solutions to those problems.
- Experience: Communities learned by experience, but to gain experience, they needed the opportunity to experiment with different deer management options. Their ability to try out particular options depended on: (a) whether state and local laws and regulations allowed them; and (b) whether public attitudes supported them.
- Key Stakeholders: Making progress on deer management, particularly in areas where it was controversial, required dedication and perseverance. In the communities we studied, progress depended on the motivation of a small number of key individuals who were willing to commit considerable energy to the issue.

- Relationships: The relationships of communities with other communities, state agencies, state legislatures, nongovernmental organizations, and key individuals (such as technical experts) proved important in learning. Relationships contributed to the exchange of information and mutual education.
- Social Structures: Sometimes relationships were formalized in particular social structures; these structures provided the same type of learning benefits as informal relationships. They fostered dialogue between individuals who were able to generate and implement new ideas.
- Resources: Learning about deer management depended on a wide variety of resources – financial, intellectual, and labor. Taken together, the substantial financial and human resources required for learning about deer management suggests that wealthier and better educated communities are in a superior position to develop workable local programs.

Interrelationships Among Learning Types

In *communities*, technical learning often received the primary emphasis after deer-related problems began to rise, but a community could not determine how to manage deer while widespread disagreement existed about deer management objectives. Consequently, conceptual learning must precede meaningful technical learning. Often the most difficult challenge in conceptual learning was prioritizing different objectives in a community. Prioritizing these objectives inevitably depended on meaningful dialogue and relationships between key stakeholders within the community. Learning how to foster that dialogue became a key consideration in promoting conceptual learning. Thus, conceptual learning depended on social learning.

Political learning at the community level was arguably influenced by all three other types of learning. Thorough technical learning convinced community members that decision makers had adequate justification for the deer management methods they proposed and had considered their concerns seriously in the development of these methods. Community-wide conceptual learning led to widespread agreement on deer management objectives – an indication of the amount of support a community had to move forward on an issue. Social learning – cultivating relationships and dialogue – built public ownership of decision-making processes; people were more willing to support decisions in which they felt ownership.

As *state management agencies* learned about community-based deer management, the learning types also interrelated. Many agencies considered their technical learning adequate when urban and suburban communities first began to approach them for aid in addressing deer-related problems. What was lacking for agencies initially was not technical learning, but conceptual learning. Little recognition existed that urban and suburban areas were different, and approaches that worked in rural areas might not be suitable for urban and suburban ones. This conceptual learning occurred in all of the contexts we studied and was heavily influenced by social learning. As relationships and mutual respect between communities and agencies improved, most agencies eventually reached the point of working to advise communities on how they could achieve their deer management objectives – rather than trying to tell them what they must do.

Recommendations

Our work suggests that both communities and agencies may benefit by recognizing some of the time-consuming pitfalls that have entrapped others. The specifics of how management can most constructively proceed depends on the local context. If widespread agreement exists that the deer population needs to be controlled, deer management challenges will primarily be technical in nature, but if strong differences of opinion exist about what local deer management objectives should be, attempts to treat deer management as a technical problem will be doomed to failure if they are made before these conceptual differences are resolved. Resolving conceptual differences may be aided by:

- creating deer committees to study and recommend solutions to deer-related problems.
- communicating actively with stakeholders who are not able to serve on deer committees.
- giving special consideration to how to address animal welfare concerns. These may include taking the concerns of people interested in deer welfare seriously, providing them with opportunities to contribute to policy discussions, and investigating suggestions they make and ways in which management actions can be tailored to consider deer welfare as much as possible

Once agreement on objectives has been reached, technical issues become more important. A number of technical lessons were common among the communities we studied:

- Lethal management will likely be needed.
- Multiple methods – including a mix of both lethal and nonlethal methods – also may be necessary.
- Hunting is often a cost-effective way to control deer populations, and it may even be necessary politically if communities want state agencies to approve other management methods they seek.
- Management methods will need to be fine-tuned after implementation begins.
- Access must be provided to sites for hunting or culling deer.
- Changes in local and state laws and regulations may be necessary for management to occur.

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INTRODUCTION

Suburban and urban deer management is a growing problem in many parts of the United States. Deer herds are large and increasing, and deer-related problems have become common in suburban and urban areas (Warren 1997). Communities throughout the country are struggling with how to manage these herds – a problem that poses both technical and human dimensions challenges.

A considerable body of human dimensions research has been conducted on community-based deer management with the aim of generating knowledge that will help communities address these problems (e.g., Green et al. 1997, Kilpatrick and Walter 1997, Lauber and Knuth 2000, Stout et al. 1997). This research has made important contributions, but also suffers limitations. Perhaps most importantly, much of the research focuses on narrow windows in time – e.g., the period during which a management decision is made (Green et al. 1997, Kilpatrick and Walter 1997); the evaluation of a communication program (Stout et al. 1997); or the public response to the implementation of a management action (Lauber and Knuth 2000).

Case histories suggest, however, that deer management issues may change and evolve over time (Butfiloski et al. 1997; Kilpatrick et al. 1997; Peck and Stahl 1997). New stakeholders become involved. Issues are defined in more inclusive ways. Different management strategies are adopted. Understanding how and why issues evolve as they do may give managers insights that can be used to manage these issues effectively. Such understanding may also be helpful to local communities that find themselves in the midst of a deer management problem.

The policy learning literature can help in understanding the evolution of public policy issues. This literature:

- explores how learning influences public policy;
- identifies different types of learning that occur; and
- discusses ways to recognize evidence of learning.

The theoretical foundation provided by this literature can, therefore, help decision makers understand the role that learning plays in urban and suburban deer management. Understanding the role of learning, in turn, may help state wildlife managers and local government officials to:

- recognize the types of learning that are needed for issues to evolve productively; and
- identify strategies that can help promote these types of learning.

THEORETICAL BACKGROUND

The traditional view of policy scientists was that public policy change occurred in response to conflict between opposing interests, but Hecllo (1974) questioned that interpretation and argued that policy change could be better explained as the result of learning. Since that time, numerous studies have considered the role that “policy learning” plays in public policy formation.

Fiorino (2001) identified three basic questions that are addressed in the policy learning literature:

- What is learned?
- What are the results of learning?
- Who learns?

In addition, a fourth question of interest is also explored in the literature:

- How is learning facilitated or inhibited?

What is Learned?

The literature distinguishes several types of learning that are relevant to public policy making (Bennett and Howlett 1992, May 1992, Glasbergen 1996, Peterson 1997, Fiorino 2001). Schemes for classifying these types overlap conceptually, but use different terminology and distinguish learning types in somewhat different ways. Fiorino (2001) argued that Glasbergen (1996) provided one of the more expansive views of what is learned – focusing not just on how to achieve public policy objectives, but other considerations as well. Fiorino (2001) and Glasbergen (1996) identified three basic types of learning.

- *Technical learning* involves efforts to find new policies to accomplish objectives, but does not include reconsideration of the objectives.
- *Conceptual learning* consists of the search for new objectives and new ways of defining the problem that is being addressed. As conceptual learning occurs, objectives are publicly debated, the way people think about issues changes, and new concepts are developed.
- *Social learning*¹ focuses on relationships between stakeholders and the quality of dialogue between them. It involves learning about how to promote effective communication and interaction between stakeholders.

May (1992) identified a fourth type of learning relevant to public policy making:

- *Political learning* involves learning how to advance the recognition of particular public problems or how to garner support for one's ideas.

As public policy issues evolve, the type of learning that occurs is likely to change (Glasbergen 1996, Fiorino 2001).

¹ The use of the term “social learning” by Fiorino (2001) differs from its use in some other sources. Other sources may define social learning as either individual learning that occurs in a social context or learning by social groups. As Fiorino (2001) uses the term, social learning refers to learning about social processes and their influence on public policy.

What are the Results of Learning?

Policy learning results in some type of change, which depends on the type of learning. Although he used a slightly different scheme for classifying types of learning, May (1992) described indicators of learning that can be related to Fiorino's (2001) learning types.

- *Technical learning* leads to changes in policies or how policies are operationalized.
- *Conceptual learning* leads to changes in policy making objectives.
- *Social learning* leads to changes in the stakeholder groups who are involved in policy making and changes in how they are involved.
- *Political learning* leads to changes in political strategies used to advance stakeholder agendas.

Change is necessary to demonstrate learning, but it is not sufficient. May (1992) points out change can occur without learning, so it is important to try to assess the cause of a change and not just its existence.

Who Learns?

More than one set of stakeholders can influence the policy process through their learning (Bennett and Howlett 1992, Fiorino 2001, Peterson 1997). Learning by state wildlife managers, local government officials, technical experts, organized interest groups, and individual citizens may be important in deer management policy making.

How is Learning Facilitated or Inhibited?

The question of what factors influence policy learning is least thoroughly addressed in the literature. Perhaps one reason for this is that policy learning is a slow process. Sabatier (1988, 1991) argued that long periods of time – perhaps as long as a decade or more – are required for learning to have a meaningful influence on public policy. Nevertheless, certain common perspectives regarding factors influencing learning emerge from the literature. Several authors have argued that experiences of failure or frustration can serve as powerful stimuli for learning, although they will not do so necessarily (May 1992, Walsh 2000). Some of the factors that can constrain learning include (May 1992, Rose 1993, Peterson 1997, Walsh 2000):

- confusion over what it takes to achieve desired outcomes;
- lack of interest in learning by policy makers or other key stakeholders;
- unwillingness of key stakeholders to reconsider core beliefs;
- social structures that limit the ability to incorporate new understandings in policy design;
- policy legacies that create structural effects that indirectly influence potential learning; and
- narrowly specialized interest groups that inhibit the exchange of new ideas.

Objectives and Hypotheses

We explored the role that learning played in community-based deer management – deer management occurring in particular geographic communities in which local government played a strong role in making and implementing decisions. Our objectives were:

- Trace the evolution of deer management issues in selected communities.
- Determine what types of policy and political learning have occurred in these communities in relation to deer management.
- Determine which stakeholders do what types of learning.
- Identify the impacts of learning on deer management.
- Assess the factors that promote or inhibit learning.

Although the policy learning literature is relevant to urban and suburban deer management, it is not a perfect fit. Most of the literature has focused on policy making at state and national levels where formulation of new laws and regulations is the dominant concern. These concerns are also important to community-based deer management, but so are a variety of issues surrounding the implementation of management actions (e.g., the timing of deer culls, the training of personnel, etc.). Consequently, we expected many of the findings of the policy learning literature to apply in our study, but anticipated that new findings would emerge, as well. The specific hypotheses we formulated were:

- Technical and political learning will be the most common types of learning.
- Technical learning will be punctuated by periods of conceptual learning, in which deer management problems are reconceptualized.
- Social learning will occur late in the process – only after communities have had some experience with deer management. In some cases, however, state agencies and Cooperative Extension staff may be able to transfer social learning insights they have gained from work in other communities.
- Technical learning will lead to the improved ability to meet deer management objectives.
- Political learning will lead to the improved ability to initiate management actions.
- Social and conceptual learning will lead to more acceptable deer management.

METHODS

We used a case study approach in this study (Yin 1984). We relied on multiple sources of information to recreate the history of urban and suburban deer management in selected communities – with a particular focus on the learning that occurred throughout those histories. Six communities in different states were included as cases:

- Cuyahoga Valley, OH
- Fox Chapel, PA
- Jackson County, MO
- Lynchburg, VA

- Princeton, NJ
- Tuxedo Park, NY

We selected only sites that had been attempting to address deer management issues for years and in which local leaders were satisfied that at least some progress was being made toward deer management objectives. Sites differed, however, according to a number of important variables related to deer management, including which state agency had management authority, state and local laws and regulations, local attitudes toward deer management, land area, and ownership of land on which deer were a concern. In most study sites, we focused on community-wide deer management programs, but Cuyahoga Valley and Jackson County are larger regions with numerous communities within them. In Cuyahoga Valley, we focused on deer management in Cuyahoga Valley National Park and the regional park systems. In Jackson County, we focused on deer management in county parks and state-owned conservation areas

Multiple case studies in diverse geographic areas were conducted to increase our ability to generalize our results to other settings. Findings which were replicated at most sites were considered more robust. When findings varied with certain characteristics of the site, they generated insights into the reasons issues evolved according to particular patterns in particular contexts.

Key contacts at each site helped us identify important stakeholders and other sources of information relevant to local deer management history. Written documents, including agency reports and memos, professional publications, and newspaper and magazine stories, were used to develop an initial understanding of how deer management had evolved at each site and to supplement and verify the data collected through the interviews.

Between four and six stakeholders from each site were interviewed by telephone (or occasionally in person). Interviewees included state and local government representatives and concerned citizens. We chose interviewees who were: (a) knowledgeable about local deer management; and (b) concerned about trying to resolve deer-related problems.

Interviews included a series of open-ended questions following an interview guide that identified important interview topics. The particular order in which these topics were covered, however, varied for respondents according to the role they played in deer management and their preferred communication style. Key interview topics included:

- how respondents had been involved in local deer management and their reasons for involvement;
- respondents' understanding of the history of deer management in the community, focusing particularly on changes in:
 - management objectives;
 - management actions;
 - interactions among stakeholders; and
 - political strategies;

- respondents' insights into:
 - why approaches to management have changed;
 - the role of learning in management; and
 - factors that influenced learning.

Interviews were tape recorded and transcribed. The interview data was complex – respondents' thinking about interview questions developed during the course of the interviews and touched on a wide variety of different topics. Transcriptions allowed for more careful analysis of interview data in that interview data could be reviewed repeatedly with greater ease to probe the meaning of the data in more depth. Unexpected, but valuable data, was easier to recognize through transcriptions.

Transcribing the interviews also allowed interview data to be coded – broken into meaningful segments (sentence or paragraphs) and assigned to descriptive categories. Coding improved the ease and quality of data interpretation. It also allowed patterns in the data to be explored using qualitative data analysis software (e.g., exploration of what types of learning were typically linked with what types of management actions).

During the coding process, we were particularly attentive to: (a) indicators of policy and political learning; and (b) factors that influenced learning. Based on the literature, we used the following indicators of policy and political learning:

- Indicators of *technical learning* included the proposal or implementation of management actions intended to achieve existing objectives in new ways (e.g., selective culling, trapping and euthanization, etc.).
- Indicators of *conceptual learning* included: (a) explicit discussion of management objectives; and (b) the proposal or implementation of management actions intended to achieve new or reformulated objectives (e.g., public education about how to avoid deer-related problems, attempts to modify habitat, etc.).
- Indicators of *social learning* included new methods for involving stakeholders in deer management (e.g., citizen task forces, attempts to build relationships between stakeholders, etc.).
- Indicators of *political learning* included changes in political strategies (e.g., use of lawsuits, public education efforts, etc.).

Coding indicators of learning in the interview data allowed us to ascertain not only the extent of learning that occurred, but what particular lessons were learned. The summary of these lessons, and the influence they had on management, forms a major portion of the results.

Because the identification of factors influencing learning is less well-developed in the policy learning literature, we began the data analysis without a pre-conceived idea of what these factors would be. Rather, we identified these factors inductively during coding of the interview data.

For each community, we prepared a timeline of that community's deer management history (Appendix A) and a written description of the role learning had played in that history.

We asked the individuals we interviewed in each community to review these descriptions for accuracy before preparing this final report.

Description of Study Sites

Cuyahoga Valley, Ohio:

Cuyahoga Valley National Park (CVNP) lies between Akron and Cleveland along the Cuyahoga River. Extending 22 miles along the River, the Park and its vicinity include multiple cities, villages, and townships. Two regional park systems, Cleveland Metroparks and Metro Parks Serving Summit County own land in and around CVNP's boundaries. Deer began to be a concern in Cuyahoga Valley in the late 1980s. In the 1990s, the Cuyahoga Valley Communities Council, a non-profit corporation organized in 1975 to address matters of common interest to different units of government in the vicinity of CVNP, began to consider how to address deer problems in cooperation with the Ohio Division of Wildlife. In this study, we focused on deer management in CVNP and the regional park systems.

Fox Chapel, Pennsylvania:

Fox Chapel is a residential community of 5,600 residents on the outskirts of Pittsburgh. One- to three-acre residential lots comprise a large portion of the 5,400 acres in the Borough with 365 acres of heavily wooded parkland intermixed. Included in this parkland is the "Trillium Trail" – an area with an abundance of trillium, which previously drew numerous visitors when the flowers were in bloom each spring. Although Fox Chapel contains no commercial development, it does include two golf courses, a racquet club, four churches, and a private school. Deer damage began to concern Fox Chapel residents in the late 1970s, and Fox Chapel developed a deer management plan with the assistance of the Pennsylvania Game Commission in the early 1990s.

Jackson County, Missouri:

Jackson County covers 607 square miles of the west side of Missouri, including most of Kansas City and 17 other cities and towns. The county population is 650,000. With a 22,000 acre county park system and a number of state owned conservation areas, deer habitat is plentiful. Concerns about deer in Jackson County began to arise in the late 1980s. Jackson County Parks and Recreation and the Missouri Department of Conservation have since worked to address deer problems both in county parks and the state owned conservation areas; these parks and conservation areas were the focus of our research in Jackson County.

Lynchburg, Virginia:

Lynchburg is a city of 65,000 people on the eastern edge of the Blue Ridge Mountains in central Virginia. The city covers 32,000 acres of mostly hilly terrain. Because much of the development is confined to the hilltops, Lynchburg contains numerous natural areas providing good deer habitat. Concerns about deer began to arise in Lynchburg during the 1980s. In the early 1990s, the City of Lynchburg, with the help of the Virginia Department of Game and Inland Fisheries, began to address those problems.

Princeton, New Jersey:

Princeton Township is a community of about 16,000 residents in west central New Jersey. Many private homes on residential lots are intermixed with hundreds of acres of public and private parkland. After the passage of a local ordinance banning the discharge of firearms in 1972, residents soon began to experience deer-related problems. Since the late 1970s, Princeton has been working to resolve those problems with the assistance of the New Jersey Division of Fish and Wildlife.

Tuxedo Park, New York:

The Village of Tuxedo Park is a small gated community of about 730 residents about 28 miles north of New York City. Only 3.25 square miles in area, about one-fifth of Tuxedo Park is covered by lakes or ponds. In the late 1970s, some residents began to experience deer-related problems. The Village, with the advice and guidance of the New York State Department of Environmental Conservation, began working to develop effective deer management policies during the 1980s.

RESULTS AND DISCUSSION

Evolution of Deer Management

Deer management in the United States has been characterized by different concerns during different periods. Following European colonization, a long period of uncontrolled exploitation of the deer herd and destruction of habitat occurred. These forces resulted in the extirpation, or near extirpation, of deer in many areas by about 1900. At this time, states began to make an effort to cultivate deer as a scarce resource – marking a dramatic shift from past practices. Game laws were passed restricting deer harvest (particularly doe harvest) in an effort to bolster the population. Many state game commissions and agencies were created to give an institutional framework for deer management efforts. As a result, deer populations began to recover. By the 1970s or 1980s, deer populations were again sizable in the states we studied.

The recovery of the deer herd brought a new set of concerns, however. Problems associated with large populations of deer (property damage, vehicle collisions, environmental damage, etc.) began to grow, and urban and suburban communities began to attempt to formulate plans to address these problems. We traced the evolution of deer management in our study sites from the time that deer-related problems began to increase.

Although the way deer management evolved in each of the six communities was unique, certain patterns of issue evolution were evident. We have described a series of stages through which urban and suburban deer management issues may progress. These stages are characterized by the status of the local deer population and deer-related problems, dominant public attitudes, and/or steps taken as part of decision-making processes. They should not be interpreted as stages that *must* occur for deer management to progress constructively but as stages, constructive or not, that *did* tend to occur in the communities we studied. Each community did not evolve through every stage, and the order of the stages sometimes varied and

overlapped. Nevertheless, these stages clarify some of the basic developments that occurred as communities learned to manage deer.

Anti-hunting:

In some of our study sites, anti-hunting sentiment began to surface as deer populations recovered, and this sentiment resulted in the passage of local no-discharge laws (i.e., laws banning or restricting the discharge of firearms and/or bows). Although states, not municipalities, have the authority to regulate hunting, communities found they could effectively limit or ban hunting through these local ordinances. Anti-hunting sentiment was not important in all of our study sites, however. The local culture in Lynchburg and Jackson County has remained supportive of hunting to the present day.

Early Nuisance:

At some point in each community, deer began to be viewed as a nuisance – although this viewpoint was more widespread in some communities than in others. Deer-related concerns increased very gradually. As far back as the 1940s, states began modifying game laws so hunting could be used to control deer populations and their associated problems. In the communities we studied, however, deer-related problems typically manifested themselves to policy makers in the 1970s and 1980s. At this time, residents began to lobby local governments to implement management changes intended to mitigate deer-related impacts and numbers.

Stalemate:

When community concerns about deer became prominent, local government officials began to contact state wildlife management agencies for assistance. State agencies typically advocated hunting as the way to manage deer, but communities with strong anti-hunting sentiment or local no-discharge laws often resisted this advice. Most state agencies were unwilling to consider management options other than liberalizing hunting regulations. Consequently, communities relied on strategies that were locally supported – such as educating the public about how to avoid deer-related problems and deterring deer from causing problems. Methods to control the deer population, however, were not implemented.

Late Nuisance:

Without effective population control, deer populations and deer-related problems continued to increase. Feeling pressured both by constituents seeking relief from deer problems and constituents opposed to hunting or lethal control, local decision makers often tried to assess public opinion related to deer issues. These efforts may have included public meetings and/or surveys. With the continued increase in deer-related problems, opposition to hunting and lethal control began to decline.

Local Action:

Concerns about deer-related problems in each community grew until local officials were motivated to take action to confront them. Sometimes action followed the election of a local

leader who was willing to accept the political repercussions of trying to address the problem seriously. In all communities except Jackson County, a deer committee composed of local officials and/or residents was formed to study and recommend solutions to deer-related problems. These committees tended to recommend a combination of lethal control methods, deterrents, and public education. Experimentation with fertility control was also considered in most communities, but actively pursued only in Princeton and parts of Cuyahoga Valley. In each case, local government officials eventually accepted the committee's recommendations, although sometimes not for many years. Local ordinances – particularly no-discharge laws – often needed to be modified to implement committee recommendations. Modification of these laws tended to be controversial.

State Agency Evolution:

While issues evolve at a community level, state agencies often evolve in parallel. The most significant element of this evolution was the growing recognition of the need to treat deer management in urban and suburban areas differently from management in rural areas. Agencies grew more flexible in the management options they were willing to consider. Often implementation of more novel management strategies required modification of state laws and regulations. In all cases, state agencies continue to advocate hunting as the preferred solution to deer management problems, but they became willing to negotiate about other methods.

Opposition:

Except in Jackson County and Lynchburg, local government attempts to control deer with lethal methods was met by opposition. The level of opposition, which included both protests and lawsuits, varied from community to community. In most cases, lawsuits were eventually decided in favor of local attempts to control deer, paving the way from management to begin.

Implementation:

In all communities, lethal deer control measures were eventually initiated. In the early years of implementation, control measures usually required fine tuning of operational procedures to increase efficiency. Public acceptance of lethal methods tended to increase after these methods began to be implemented.

Adaptation:

The lethal methods first implemented in each community could not be used in all parts of the community because of state and local regulations, the reluctance of some property owners to grant permission, or practical constraints. In general, decision makers concluded that a single method was not sufficient for the entire community. Most communities, therefore, incorporated new approaches to better target these areas. These techniques may have included new or modified hunts or entirely different techniques for culling deer.

Lessons Learned

Technical Learning:

How learning occurs. Technical learning (learning how to achieve deer management objectives) took place through two primary mechanisms – gathering and interpreting information before management actions were chosen and learning through experience with management actions that were implemented.

The creation of “deer committees” was critical in most communities for gathering and interpreting information prior to selecting management actions. These committees took slightly different form in each community, but all shared certain traits. They were initiated at the local level, they included local residents and/or local government representatives, and they were given the task of evaluating deer-related problems and suggesting appropriate solutions to these problems. The committees often did a substantial amount of work:

The advisory committee [did] a comprehensive study. It had taken about a year and a half in which the committee basically studied all elements of deer populations and viable strategies which a community could apply. The report . . . provided a number of alternatives and . . . covered everything from purpose to study methods, background, ecology models of deer management, specific management conclusions, as well as committee study briefs. We studied the legal implications. . . . We conducted a census. We had access to public opinion.

Although one could argue that none of the deer committees generated any ideas that were truly new, they played a crucial role in helping key local stakeholders understand deer management better, accept conclusions others had reached previously (such as the need for lethal control), and determine how management methods could be tailored to the local context. These committees worked through a variety of means:

- They consulted with deer management “experts” – state wildlife managers, university faculty and staff, and independent consultants.
- They conducted research – reviewing reports of deer management in other communities, speaking with members of these communities, and gathering data from their own community.
- They deliberated about whether local problems needed to be addressed and what methods would be most fruitful for addressing those problems.

Many key stakeholders stressed the importance of these committees:

One of the advantages of having a wildlife committee . . . is that you have a mechanism to say, we've got [a] wildlife problem. . . . It relieves a board of having to hire consultants. You save money. It relieves the board of having to do this themselves – a lot of work. But communities will have ongoing wildlife issues and the more you have a committee

that is experienced dealing with this kind of stuff – it becomes a great value. These are educated, knowledgeable people.

Of the six communities we studied, only Jackson County has not organized some type of deer committee. Jackson County has some other unique characteristics. First, residents of Jackson County are more tolerant of hunting than residents of the other communities (except for Lynchburg):

There's just a different culture here. People here are much more frontier-oriented. Hunting is an accepted way of life in many ways compared to that eastern city mentality. So that has . . . a lot to do with what we were able to do in [Jackson County].

Second, in Jackson County we focused on deer management that has occurred on public land – allowing management methods to be implemented without the acceptance and cooperation of numerous private landowners. Many of these lands are state-owned, allowing the Missouri Department of Conservation to make the final decision about management methods (within the confines of local laws).

After communities began to implement deer management actions, they also learned by experience. This experience helped them fine tune the implementation of actions to increase their efficiency, recognize actions that were ineffective, and identify areas where additional management strategies were needed. To learn by experience, however, means that communities had to reach the point of implementation. A variety of barriers – public opposition, lawsuits, restrictive laws and regulations, etc. – had to be overcome before implementation could occur. These issues are discussed more in other sections of this report.

What is learned. After deciding that deer population reduction was necessary (a form of conceptual learning), all communities eventually concluded that lethal methods were necessary for achieving this objective. Accepting the need for lethal management methods took place both through research and experience. Prior research led most of the communities to conclude other methods for controlling the deer population were either insufficiently developed (e.g., contraception and sterilization) or impractical for some other reason (e.g., trap and transfer). Princeton and Cuyahoga Valley, however, have both proceeded with limited experiments with fertility control in an effort to develop these methods further:

They are using contraception . . . and [it] isn't working very well. . . . So it's actually not an effective means at this point, but they are experimenting with it to see. . . . It gives us information and it's helpful to us to know.

In some communities, nonlethal management methods were tried first. Based on this experience, most communities concluded nonlethal methods – such as deer deterrents, educating residents about how to avoid deer problems, and anti-feeding ordinances – were necessary, but not sufficient to control deer problems.

Typical lethal methods included recreational hunting, controlled hunts (in which hunters must apply to participate and must agree to follow restrictive guidelines), sharpshooting by

experts with or without bait, and capture and euthanasia of deer. The methods that could be employed in each community were determined by state and local laws and regulations. Each state permits recreational hunting and typically also offers special permits to kill nuisance deer. State agencies learned to modify regulations and advocate for the passage of new laws to increase the ability of urban and suburban communities to take deer. Changes included increasing bag limits and season length, permitting the taking of nuisance deer under new programs, and legalizing new means to take deer. State and local laws also regulated bow and/or firearm discharge. Local laws may prohibit the discharge of some types of firearms, and state and local laws may specify minimum parcel sizes and distances from dwellings for discharge to occur. Many of these laws had the effect of preventing or restricting the efficiency of deer take.

In addition to recognizing the need for lethal management methods, most communities also learned that management methods must be used in combination to address deer-related problems adequately. Many communities and state agencies reached the conclusion that hunting by itself was not sufficient to manage the deer herd in suburban and urban areas. Too many areas were inaccessible to hunters because private landowners were unwilling to allow access or because characteristics of these areas made them unsuitable for hunting:

Liberalizing the hunting season is definitely the first step. We have to give the hunters the means to take more deer. But that liberalization of the regulations did little to help the suburban communities because hunting just wasn't happening in our more urban regions of the state – but deer were living in between houses. We realized that we had to do something to address that problem. That's why they developed the community-based deer management that really allowed things other than hunting. . . . It was specifically designed to help those communities where hunting alone or hunting at all could not address the deer problem.

The only community that has not reached this conclusion is Jackson County, where most of the concerns about deer have centered around parks and conservation areas where hunting is an option.

Consequently, hunting was typically used in combination with some other type of lethal control measure – culling deer over bait sites, culling deer from the back of a pick up truck, trapping and euthanizing deer, etc. The common characteristic was that an attempt was made to find methods for culling deer that could work in the local context. Flexibility in laws and regulations was essential to allow communities to test and improve methods for taking deer.

One of the key considerations in this process was how to get access to deer. Suburban and urban communities have many areas where it is not safe or acceptable to discharge firearms or even bows. Consequently, identifying sites where deer can be hunted or culled was an important consideration, and had to be learned through experience. Residents of Tuxedo Park have gone so far as to drive deer towards hunters, rather than hoping that hunters will be able to find the deer.

Remaining challenges: Despite at least some success in all communities at taking deer and/or reducing the local deer population, several challenges still remain where additional

technical learning will be required. Finding ways to get access to the deer remains a concern – both for hunting and culling programs. To some degree, access issues can be addressed by social learning. Princeton and Fox Chapel, for example, worked hard to establish relationships between hunters and landowners, so that landowners would be more willing to allow hunters on their properties.

Furthermore, none of the communities has yet reached what they consider an ideal deer population level. Certain parts of most communities continue to experience high densities of deer. Certain deer-related problems have yet to be adequately addressed. Some key stakeholders have concluded that they may have reached the limit of what they can accomplish with current management methods:

I think early on our managed hunt program was very successful, because we had like upper sixties deer per square mile – now we're down to low fifties, high forties, and I think it works to get extreme cases . . . at least more manageable. . . . But to get the ideal ratio of deer per square mile, I honestly believe is unattainable. . . . I don't know. The verdict is still out. . . . This is a long term project that we're doing, but I'm looking at historical data right now and it was a nice upward trend of harvest numbers and . . . now we're on this big plateau.

Consequently, continued experimentation with management methods, and the development of new methods, will likely be needed to continue progress toward management goals.

Conceptual Learning:

How learning occurs: Conceptual learning – changing goals and objectives regarding deer management – was a gradual process. It often seemed to begin on an individual level. As people began to experience the negative impacts of deer personally – damage to yard plantings, deer-vehicle accidents, Lyme disease, etc. – they began to believe that deer control was needed. As problems grew worse, this learning accelerated. For example, in Princeton, the advent of Lyme disease in the late 1980s was seen as a critical factor in public acceptance of the need for deer control:

There had been quite a change in the opinion, and people were more anxious to do something about the deer. . . . Lyme disease, which . . . never came up [in earlier years] suddenly became a major issue.

Dialogue was necessary, however, for conceptual learning to move from an individual to a community level. Consequently, determining how to have constructive dialogue was a critical question for community conceptual learning. Much of this dialogue may have been informal, but each community structured formal opportunities for dialogue, too. Public meetings and workshops were common. Surveys of residents allowed decision makers to synthesize public perspectives and disseminate that information to the wider community. Deer committees proved to be valuable for fostering conceptual learning, just as they had for technical learning. In sum, conceptual learning – the revision of deer management objectives – depended on social learning – fostering relationships and dialogue.

Conceptual learning often depended on the opportunity for community members to study the deer problem and deer management on their own and not simply have information provided to them by others. Many of the deer committees made efforts to assess the local deer population size and the frequency of certain deer-related problems. They then compared these figures to other communities where deer control had been implemented to determine whether deer control was needed in their own community.

Some people involved with these issues argued this work was not necessary; the actual population size and prevalence of problems was less important than whether the community found the level of problems acceptable or not:

The questions that needed to be answered as a community [were] do we have a problem? If so, what level is the problem? And it doesn't really matter . . . whether there are ten deer per square mile or forty. All you come up with really are numbers. It doesn't change the fact that people have reached their level of tolerance for deer, regardless of what the number is.

While this argument has merit, the community-level research seemed to fill an important role nonetheless. The research process helped the communities think through and refine their perspectives, asking important questions such as whether deer-related problems were really excessive or whether the community was simply intolerant of them.

The implementation of management actions often seemed to reinforce conceptual learning. More than one community reported residents appeared to increasingly accept the need for deer control and the acceptability of control methods after implementation began:

After . . . we [first] implemented the program, and had all the picketers and so on, there hasn't been a peep.

The reason for this shift is not entirely clear. It may be that concrete experience with management techniques – and the subsequent realization that some of the fears associated with these techniques were unfounded – may convince people that the objective of controlling deer-related problems can be pursued without jeopardizing other important objectives (e.g., protecting public safety).

Certainly, conceptual learning took time in many of our study sites – often years were involved. Conceptual learning in individuals was followed by learning in deer committees (as they studied the deer problem), local government (as they deliberated over and eventually accepted the deer committees' recommendations), and finally the entire community (once management actions were implemented).

What is learned. From the perspective of this study, accepting that deer populations needed to be controlled was the key conceptual shift. This transition was difficult because it conflicted with other perspectives on deer. First, the perspective that deer needed to be controlled was only partially compatible with the perspective that tended to dominate state wildlife management agencies – that deer were a recreational resource for hunting. As long as

hunting was the management tool used to control deer, the two perspectives were not in conflict. However, if community leaders concluded that hunting would not be effective, safe, or otherwise appropriate for their communities – and wanted to consider other population control measures – state agencies tended to resist:

We had to lobby [the state wildlife management agency] and make them understand that we were not going to be an impediment to their hunting seasons. That we were not going to take away all the deer for the hunters.

Even more difficult to resolve at the local level, however, was the issue of how to balance the need for deer control with anti-hunting or anti-killing concerns. Accepting that deer needed to be controlled was, to some people, simply a prelude to the use of hunting or other lethal methods to control deer. Therefore, they tended to resist this conclusion. Indeed, anti-hunting attitudes were considered partially responsible for deer overpopulation in those communities in which the rise of deer-related problems was closely correlated with the passage of local no-discharge ordinances that effectively made hunting illegal:

[Local government], under great pressure, eliminated shotgun hunting. . . . That took a little bit of fancy footwork because technically the state controls hunting, and a local municipality doesn't, but they were able to pass an ordinance that forbade the discharge of firearms and that effectively ended shotgun hunting. . . . And in that [following] 10 year period . . . the deer-car accidents tripled.

Consequently, in communities where anti-hunting sentiment was strong, reaching the conclusion that deer control was necessary required considerable time – sometimes decades. (In communities, such as Lynchburg and Jackson County, the shift was much less difficult.) As argued above, conceptual learning depended to some degree on social learning – communities could not resolve contentious conceptual issues related to deer management until they learned how to cultivate relationships between key stakeholders and engage in dialogue constructively. On the other hand, technical learning tended to depend on conceptual learning because communities could not determine how they could accomplish their objectives until they decided what their objectives were.

Throughout this process, deciding how to balance the importance of deer control against other community objectives was critical:

Wildlife actions . . . should incorporate the community's concerns for humaneness, specificity, social environment, and economic benefits.

Some of these other objectives – such as safety, humane treatment of deer, and minimizing costs – may conflict to some degree with controlling deer as effectively and efficiently as possible. How much weight deer control ultimately received at the local level relative to these other objectives was one influence on how successful communities were at resolving deer-related problems.

Within state wildlife management agencies, conceptual learning took a different form. Because state agencies have been in the business of managing deer to provide hunting opportunities, anti-hunting perspectives never played an important internal role. For agencies, the primary conceptual struggle was how to balance the desire to control deer in urban and suburban communities against the desire to protect hunting opportunities. Where communities wanted to control deer through means other than hunting, these two objectives were in conflict. Many agencies held fast to the perspective that hunting was an effective and efficient means to control deer, and if communities chose not to utilize it, they would have to live with the consequences (Predl 1993). Gradually, however, most agencies came to see urban and suburban deer management as special cases with unique social components as much as biological ones:

Previously, it was "don't bother us, we've got farmers to deal with." And I think, looking back to the suburban/urban deer management brochure and the other efforts that we put out in the mid 90s, I think it certainly was an awareness on our part that there needs to be still another flavor of how we dealt with the public in terms of deer management issues.

While continuing to advocate hunting, agencies have also begun to accept that hunting may not be sufficient to manage deer in all communities for both biological and social reasons. Standard management tools used in rural communities, such as hunting, can not always be applied in urban and suburban contexts. Rather, agencies are helping communities to make sense of deer issues, establish deer management objectives, and provide greater flexibility with the management approaches they will allow.

Remaining challenges: Some issues surrounding deer management objectives remain difficult to resolve in the communities we have studied. Although all of these communities have accepted the need to kill deer, killing deer remains a controversial issue in some communities. Related to this issue is deciding what methods of killing are ethical and humane. This point has been particularly contentious in Princeton, which has explored a variety of approaches to deer management. In recent years, Princeton has used a "captive bolt" method to kill deer, in which deer are first trapped and then killed with a bolt to the head using a device similar to that used in slaughterhouses. This method continues to be extremely controversial.

A second challenge is deciding how much deer control is enough. Although all of these communities have made progress in lowering the local deer population (or at least taking deer), none of them have reached what they consider to be acceptable deer population levels. Certain areas have proven to be very hard to target with the control methods that are available, and certain types of problems have proven to be very difficult to reduce. For example, the ideal deer population for forest health has been argued to be no more than 20 deer per square mile, and none of the communities have reached this herd size. Where forest health has been a concern, it remains a concern, with the regeneration of valuable native plants considered grossly inadequate. Whether communities will find some way to bring deer populations down further, or whether they will simply adjust their ideas about what an acceptable deer population level is remains to be seen.

Social Learning:

How learning occurs: Social learning – learning how to improve relationships and dialogue – often occurred in deer management through transference of lessons learned in other settings. This finding is logical given that local leaders trying to address controversial public deer issues had had to address other types of controversial public issues in the past. Critical decisions about how to structure public meetings, whether to conduct public opinion surveys, and whether to establish a deer committee were informed by methods used to address other controversies successfully in the past. It was not just experience in local government that informed social learning, however. Many of the individuals who became involved in deer management efforts had experience in business, academia, or other settings that influenced their ideas about how to address the social elements of management. For example:

I have over forty years of business experience . . . I applied fundamental management techniques, and I think this was an important aspect of it – having businesspeople approach this as a business problem.

State wildlife management agencies were also a critical source of knowledge relevant to social learning. Any given agency has to address urban and suburban deer management in many different communities. Learning how those controversies had been handled successfully in some settings led to recommendations to community leaders about possible approaches at some of our study sites. One agency staff member recommended a public attitudes survey be conducted:

There was a study done . . . at my recommendation. Just about attitudes about deer within the community. A fellow . . . was under contract to determine attitudes towards deer within the community. . . . It's a pretty good report . . . I thought.

In addition to applying lessons learned in other settings to deer management issues, key stakeholders also reasoned creatively in response to obstacles they encounter along the way. For example, many communities recognized that providing hunters with access to private lands was important if hunting was to contribute to deer management objectives. However, many private landowners hesitated to allow access to hunters whom they do not know. Consequently, in both Fox Chapel and Princeton, efforts were made to establish relationships between hunters and landowners to improve access (see below).

What is learned. One of the key lessons learned about how to promote constructive dialogue about deer management was the need to create some type of “deer committee” to study and make recommendations about deer management. Local government officials would have difficulty devoting enough time to explore an issue that is both technically complex and controversial in sufficient depth, but a deer committee can:

This was a permanently established committee. . . . And so it has been ongoing and it's headed by one of the Trustees. . . . We try to . . . get interested people involved in it, and have them serve over a long period of time. They become knowledgeable. And these are not social committees, these are work committees.

In Cuyahoga Valley, which involved a broader regional effort than our other study sites, the “deer committee” helped coordinate approaches among the numerous governmental entities that had authority in the region. Only Jackson County did not appoint a deer committee and, as discussed earlier, Jackson County had a low level of controversy and most management activities concentrated on larger blocks of public lands (where hunting could be most effective).

Establishing deer committees alone, however, was not enough to guarantee constructive dialogue and relationships. These committees also required leadership by people who were skilled at group dynamics and committed to addressing deer problems. Prior to the 1990s, the “deer committee” in Tuxedo Park was either a committee in name only (with some committee chairs not even scheduling meetings) or deadlocked in conflict among committee members. When a new Village Trustee took over the committee, however, he brought both a commitment to addressing deer-related problems and knowledge about how such a committee should function. The committee subsequently produced a report with clear management recommendations that have served as the basis for actions. Raik et al. (in press) also have stressed the importance of local leadership in collaborative community-based management.

The deer committees, however, only involved a limited number of people. The communities we studied also valued reaching out to all local residents through a variety of information sharing and gathering techniques. These techniques included surveys, public meetings, workshops, informal contacts, and mass media. The use of mass media was considered particularly effective at laying the groundwork for management decisions in Jackson County:

The department hired a media specialist who came to us with previous radio-tv journalist background – very, very knowledgeable. . . . And he was able to infiltrate and use television and radio to put a lot of information out about what too many deer are doing. . . . He would run specials on – look what happened in so and so's yard to all their ornamentals, and he'd get real footage of deer there eating stuff and so on. Probably for about a two year period, off and on, ran a lot of that information, and I think it had a lot to do with the acceptance of needing to manage these animals.

Education and informative communication were also found to be key elements in promoting successful suburban deer management by Raik et al. (in press).

The role that local residents have been given in management has varied from community to community. In Tuxedo Park, Princeton, and Lynchburg, they played key roles on the deer committees drafting management recommendations. In other communities, they were informed and consulted, but not actually given a role in formulating recommendations.

One question that frequently arose within communities was the role to give to animal welfare advocates who were concerned about protecting the deer but not necessarily about resolving deer-related problems. People interviewed believed that some of these advocates would do what they could to obstruct deer management, but were not interested in genuine dialogue:

The opposition group . . . were quite radical. . . . They would have . . . not probably offered much that was constructive. . . . For example, they did . . . an evaluation of our report. They didn't even get that to me. . . . I learned about it . . . I said "Gee, shouldn't we have the courtesy of looking at that?" And it was a very one-sided piece of work. . . . They were stating conclusions about the deer population. So I wrote them what I thought was a very polite letter saying "I'd like to really know what the basis for that conclusion is because maybe you're right and maybe we should know about it." Well, they never responded. That kind of thing. They didn't want any dialogue.

In most communities, the conclusion was reached that stakeholders who gave a high priority to deer welfare should be heard from, but given a limited role in decision making. Communities addressed this in different ways. Tuxedo Park learned by experience that for its deer committee to function effectively, it must include only people with a commitment to addressing deer-related problems.

[A former committee chair] said, "Well we want to have people with different points of view." So she invited the person who's the most against doing anything to get rid of the deer. . . . She invited him to be on the committee. And it was useless. . . . Nothing happened because every time we would try to do something . . . he'd just come out against everything. Then one night one of the other committee members . . . insulted him. . . . And our deer lover . . . left in a huff. And actually that committee member who drove him out probably did the most important thing that happened on that committee.

Princeton discovered that most of the opponents of its deer management efforts were coming from outside the community, and so they always allowed community members to speak first at public meetings.

I really became very strict about how these meetings were going to be held. Much to the dismay of the protesters. . . . I said "We will listen to those from Princeton Township first, and we'll put pros and cons on the Princeton Township sign-up sheets. Then we will listen to Princeton Borough, our neighboring community here. And then we will take the out of area people – pros and cons. . . ." And when I would get to Princeton Township there would be a HUGE list of pros [pro-deer control]. Very few cons. . . . And then we did it with the Borough, and the Borough is very much the same. . . . But then the out-of-towners signed up. And all the out-of-towners were against the program, and they came from . . . all over the state.

Another way communities addressed the concerns of those interested in deer welfare was to explore their ideas fully. At most of our study sites, nonlethal methods of resolving deer-related problems advocated by some were considered. Princeton and Cuyahoga Valley are both investigating fertility control methods such as contraception and sterilization:

We got familiar with the contraception people: (a) because we wanted to and (b) because there were a lot of people in town insisting that we do that.

Another lesson of social learning has focused on hunters' access to huntable lands. Hunting can be an effective population control measure, but its effectiveness was often limited because private landowners were unwilling to allow hunters access to their properties. One presumed reason for this unwillingness was discomfort with having strangers hunt on their property. Princeton and Fox Chapel, having recognized this, put considerable energy into trying to establish relationships between hunters and landowners. To some degree, this work was successful and these relationships have provided hunters with access to lands they otherwise would not have had.

Social learning also occurred in how state agencies choose to relate to communities. Many state agencies traditionally viewed themselves as technical experts uniquely qualified to make deer management decisions, and this view influenced how they worked with communities. As stated above, they originally believed that hunting was the only appropriate method for managing urban and suburban deer problems. This perspective changed through social learning. Although still viewing themselves as technical experts, and often openly advocating hunting, state agencies recognize the social component of deer management and tend to see themselves as advisors helping communities make the decisions that are right for them. This stance moves agencies away from the center of controversies, allowing communities to balance costs and benefits involved in any approach to management, as this exchange between two agency staff members attests:

Respondent 1: It's pretty critical that we remain a technical adviser and not be viewed as a government – "I'm here to help you and here is what you HAVE to do."

Respondent 2: Absolutely. In some cases . . . people . . . were looking for advocacy. For us to take a side one way or the other. . . . I would just reiterate – "These are the tools we can make available to you as a resident or as a community. What the community does with those tools, that's up to the community itself." And that was one of the things that I think was important – that we did remain somewhat neutral. Otherwise, I think in either case you're bound to lose.

Respondent 1: There's always a suspicion that we have some sort of vested interest. And perhaps we do in terms of advocating for a lethal removal of deer as a population control. . . . There's a suspicion that we have some sort of personal gain. I think we need to be very cognizant of that.

Raik et al. (in press) also reported that a clearly articulated agency perspective is important in helping create the kind of environment in which community-based deer management can succeed.

Remaining challenges: Although communities have made some productive decisions about how they want to involve people with strong animal welfare interests in deer management, this remains a challenging area. Some view it as a "damned if you do, damned if you don't" scenario – if animal welfare interests are included in deliberations, it will be impossible to reach an agreement; if they are not, they will attempt to block any agreement that others reach. Advice from the literature typically suggests including all affected interests in decision making, but also recognizes that deliberations may be unsuccessful if basic value differences exist (on issues such

as animal welfare). Finding the right way to involve animal welfare interests will likely remain a challenge for some time.

Key stakeholders from several communities also have begun to recognize the need to work beyond community boundaries if deer management is to be effective. Because deer do not confine themselves to political boundaries, even aggressive deer control programs in communities may have limited success if surrounding communities are not engaged in similar efforts. Consequently, several stakeholders have argued that a key social challenge is the need to establish collaborative relationships with other communities in their region and address deer management in a coordinate way.

Their problem . . . is being surrounded by . . . fairly substantial deer densities. So that if it was just their deer they had to deal with, they would have it well under control. But I've got a feeling they get a lot of deer moving in from around them. . . . It's surrounded by a lot of deer country, so they are really now in that situation where they are shooting other people's deer for the most part, not so much their own. But you know, that's the one thing, how do you get other communities to get on board and start dealing with this?

Cuyahoga Valley has come closest to this. Their decision-making process involved numerous municipalities, the National Park Service, and two regional park systems in a regionwide task force. However, the task force's recommendations remained advisory only, and many municipalities that participated have not yet opted to take action to control deer.

Political Learning:

How learning occurs: Political learning – learning how to build recognition of deer-related problems or support for deer management actions – occurred on a variety of levels. Community residents had to convince local leaders of the need for relief from deer problems. Local leaders had to win approval of state agencies for novel management plans. Communities had to overcome vociferous opposition to lethal management actions – including protests and lawsuits. In one case, local government leaders and state agency officials had to convince the state legislature to pass new laws permitting new approaches to management.

Often, learning how to advance such agendas occurred through trial and error. Citizens and local leaders tried successively more aggressive approaches to win support for public action. These ranged from informal contacts with decision makers to formal requests by individuals to coordinated campaigns by numerous individuals or communities to building bridges between disparate groups (such as suburban communities, farmers, and airport operators) who were all suffering deer-related problems. When less aggressive approaches failed to garner support, more aggressive strategies were implemented.

Winning support was not the only aim of political learning, however; overcoming political obstacles was equally important. Communities were faced with protests or lawsuits, and they had to learn how to proceed despite these obstacles. In some cases, learning could be transferred from other domains. Local leaders or residents who had experience addressing other public policy conflicts were able to suggest strategies for overcoming such obstacles based on this experience. In other cases, failure was a powerful stimulus to political learning.

Communities that had management plans blocked by lawsuits or protests developed new approaches based on these experiences of failure.

What is learned. One lesson that was cited directly by some stakeholders and was implicitly evident in other communities was that community leaders (both elected leaders and concerned residents) had to take responsibility themselves for acting if they want deer-related problems to be addressed.

The state [legislature] doesn't have too much interest in helping on this. One of the things that we concluded from this – these become local issues. The [state wildlife management agency] will give advice and counsel. Your state politicians have no interest in raising the furor of the pro-wildlife people. You get no response from the state politicians. . . . You have to organize and take action locally. Whatever the action is. And this we figured out early on.

Local residents who were concerned about deer-related problems, therefore, had to be persistent in their advocacy to get action taken. Indeed, in Tuxedo Park, much of the deer control action to date has been initiated by loosely organized private citizens rather than the Village government. At some point in each community, however, elected or appointed local government leaders surfaced who were willing to stand behind potentially controversial decisions.

Promoting dialogue and building relationships between stakeholders was often critical to building political support for management, and, therefore, social learning – and the lessons about how to encourage social learning – are relevant to political learning, too. One of the key lessons of social learning we described was the need to form some type of “deer committee” to study and recommend solutions to deer-related problems. Establishing a committee was not enough to build support for the committee’s recommendations, however. Princeton’s deer committee was unable for many years to build support for some of the deer management recommendations it thought were most important.

Several key steps were taken to make support for deer committee recommendations more likely. As described earlier, some stakeholders believed there were drawbacks involved in including people on committees with strong animal welfare interests. On the other hand, including too many members with strong hunting interests can make recommendations for deer hunting appear self-serving, so many of these committees tried to foster diverse membership:

What happened was [one committee member] is a professor of Forestry and he's a hunter. [A second committee member] was a birdwatcher, naturalist . . . businessperson and non-hunter, and I think they were looking for someone who was going to come at it from a public health angle. And the concern was Lyme disease and car accidents. So I think that's how they found me.

Second, it helped to include elected or appointed local government leaders on some committees because these leaders were more likely to understand and support the committee’s decision-making processes.

And that's why an advisory committee is a good approach – headed by a Trustee or somebody from municipal government.

Finally, most of the deer committees found it was important to reach out to a broader segment of the local community to solicit their opinions and concerns. Mechanisms such as surveys and public meetings helped to convince local government leaders that deer committees had taken public concerns into consideration and made them more likely to support their recommendations.

You don't hear from the majority who support you. They believe you will prevail I guess. So you don't hear from them. . . . But the social survey did indicate that that majority is still out there and they do support actions, even including lethal action. . . .

Community leaders also learned that they needed to generate high quality information in defense of management plans they proposed. Such information was generated by involving knowledgeable individuals, conducting extensive background research, and, in some cases, experimenting with novel methods, such as fertility control. These actions helped to convince the public that community leaders had not simply reached a predetermined decision to kill deer. This information also proved crucial in the successful defense against lawsuits:

And my overall opinion is that a community facing this issue does itself a favor by overstudying the issue as professionally as they can because every time you conclude something and move to an action, you will be sued. And if you go to court and you say, "Look we studied this to the best of our ability, and these are the numbers, these are the facts. . . ." I won three court cases on this study. So, was it worth it? You bet!

The National Park Service in Cuyahoga Valley, on the other hand, chose to abandon initial plans to cull deer when faced with a lawsuit. However, the Park Service was unique in the communities we studied because as a federal agency it faced unusually strict procedural requirements for any deer management proposal.

In some communities, the management actions sought by community leaders required state legislative action. Deer management objectives have traditionally been achieved through recreational hunting and state laws may not allow for other options to be used. Princeton worked with the New Jersey Division of Fish and Wildlife, other municipalities, and agricultural interests to build support for a new Community Based Deer Management Program with the New Jersey Legislature – a program providing greater flexibility in management options in certain situations. This new program allowed Princeton to pursue a variety of deer management options. In Lynchburg, local leaders worked with the State legislature to reverse a change in State law that had restricted the use of kill permits (used to harvest overabundant deer) to agricultural interests.

Another key lesson learned by many communities was that the acceptance of some form of recreational hunting as part of its deer management plan was often necessary to satisfy state wildlife management agencies. In most states we studied, communities could effectively ban hunting with the passage of no discharge laws, and did not always see the need to allow hunting as part of their management plans. State agencies, however, had a greater investment in and

commitment to hunting than many urban and suburban communities, and often insisted communities allow hunting as part of management programs. In Fox Chapel:

Negotiations with the game commission over the use of deer control agents continued throughout the spring and early summer of 1993. Finally, the commission agreed that it would allow the Borough to use such agents, but only if bow hunting was also allowed to the maximum extent possible.

Princeton's deer management plan also had to be approved by the state Game Commission. To gain approval, Princeton agreed to allow all legal hunting seasons to take place within its boundaries. Thus, a balance of power often existed between communities and state agencies. Communities could effectively ban hunting, but agencies could withhold approval for unusual deer management approaches.

In contrast to their efforts to broadly involve the public during the decision making stages of management, several of the communities made a deliberate effort to keep a low profile during implementation. They believed that by keeping management activities as inconspicuous as possible they could avoid attracting protests and help convince the public that the management actions could be taken without undue disruption.

One of the things that we purposely did was keep a very low profile on this. Most people, 95% of the residents, didn't even know there was culling going on. That's why we wanted to work with one agent. One piece of land at a time. Low profile.

In fact, several communities showed evidence of growing public acceptance of management actions once implementation began, suggesting that winning approval for implementation is the critical step in the process.

Remaining challenges: Although all six of the communities we studied achieved some measure of success at culling deer and/or reducing deer-related problems, none of them has been completely successful. Tuxedo Park has harvested deer but has not achieved a noticeable reduction in deer-related problems from the perspectives of those local residents most concerned about deer. Princeton has had great success with some management actions but faces continuing resistance to others with which they are trying to target less accessible areas. Lynchburg's program had considerable success initially, but deer problems have once again increased and generated concern among residents. Cleveland MetroParks has been successfully managing deer for several years in Cuyahoga Valley, but most other entities in the valley have not yet taken action. Fox Chapel has reduced deer-vehicle collisions and property damage, but has not successfully restored sensitive ecological areas. Jackson County has implemented successful controlled hunts in some parks and conservation areas, but many other areas remain in which deer control is needed. Given the limitations all communities have had at controlling deer, it is likely that they will each need to build support for additional management actions if they wish to achieve their objectives.

Factors Affecting Learning

We found that various factors could promote or inhibit learning in several different ways:

- They provided or removed the motivation for learning.
- They promoted or inhibited the exchange of ideas.
- They influenced willingness to try (and learn from) new approaches.

We identified six primary factors influencing policy and political learning related to deer management in the communities we studied.

Severity of Problems

All of the communities were motivated to learn by deer-related problems growing to unacceptable levels. The worse the problems became, the greater was their motivation to learn. In some cases, problems continued to worsen even after communities had been making efforts to address them for many years. This motivation was important because in locations where deer management methods were controversial, community leaders also had strong disincentives to grapple with deer management in a serious way. This finding is in keeping with the work of May (1992), Walsh (2000), and others, who have argued that experiences of failure or frustration are often key to promoting policy learning.

Experience

Both successful and unsuccessful deer management efforts generate experience – one of the primary vehicles of policy learning (Rose 1993, Peterson 1997). Communities needed the opportunity to put different ideas into practice to gain experience. Whether ideas could be put into practice depended on both (a) laws and regulations and (b) public attitudes.

Laws and regulations: Laws and regulations had a considerable influence on whether management methods can be put into practice. State laws were often designed to facilitate hunting, but local no-discharge laws prevented it in some cases. Furthermore, both states and municipalities restricted how management methods could be implemented (e.g., by regulating how close to a dwelling a bow or firearm could be discharged). Such restrictions severely limited the ability to use hunting as a management tool in some communities. State laws and regulations also determined which management options other than hunting could be used. For example, until the New Jersey Legislature created its Community Based Deer Management Program, many of the management methods Princeton now uses to control its deer herd were not available.

Laws and regulations influenced the ability to implement management actions in less direct ways, too. For example, the National Park Service in Cuyahoga Valley, as a federal agency, had to abide by the requirements of the National Environmental Policy Act before taking any action (including deer management actions) that could have a significant effect on the environment. This Act established stringent procedural requirements, that the Park Service must fulfill before implementing actions – making it much more difficult for the Park Service to experiment with deer management methods.

Laws also established authority structures for the administration of public lands, such as parks, which were the focus of deer management in some of our communities. The structure of a park system's administration may determine how subject it is to political pressure. For example, Cuyahoga Valley's Cleveland MetroParks is controlled by a 3-member board, whose members are appointed by a probate judge. This authority structure provides an unusual degree of insulation from political pressures for the Park System's Board, who do not have to worry about being replaced every election cycle. This structure perhaps made the Board more willing to implement, and learn from, controversial management options.

Public attitudes: Public attitudes were another major factor influencing whether ideas could be put into practice. When lethal methods were unpopular or controversial, local decision makers were much less willing to take the risk of trying to promote them. Even small groups of citizens sometimes had a large effect over what management actions could be tried by organizing protests and filing lawsuits. Public attitudes both helped and hindered experimentation. In Lynchburg and Jackson County, the public was generally supportive of lethal management methods, and this facilitated the ability of these communities to implement such options.

Laws, regulations, and public attitudes influenced the ability of communities to put new ideas into practice and gain experience. This finding is consistent with the work of Walsh (2000), who argued that it is easier for new ideas to influence policy if: (a) management authority is not fragmented; and (b) opposition to these new ideas is low. Fragmented authority increases the influence of laws and regulations over management actions because decision makers must work within the confines of the laws and regulations of multiple levels of government. Such was often the case in our study sites where both state and local laws and regulations restricted management choices.

Key Stakeholders

Making progress on deer management, particularly in areas where it was controversial, required dedication and perseverance. In the communities we studied, progress depended on the motivation of a small number of key individuals who were willing to commit time and energy to the issue. Their energy contributed to keeping deer management on the public agenda, gathering technical information to serve as the basis for management plans, building support for controversial actions, and even helping to implement those actions.

Key individuals included both private citizens and local officials. In more than one community, a handful of local residents were identified as pivotal at getting attention focused on deer:

The very first person that comes to mind as a spark plug for anything getting done there was [one resident]. . . . She was right there from day one. . . . She had extensive deer damage as did many of her neighbors. Certainly what impressed me was . . . her sincerity – she really wanted to try and deal with the situation, and she thought like she was the little Dutch girl with the finger in the dike.

If it had not been for [him] doing what he did, saying whatever it is he said, or pushing the right buttons . . . we certainly wouldn't have the . . . deer program as it is today, or at least with the lengthy history that it has today. In other words I think he was just the right person at the right place that asked the right questions of the right people at the right time. And he was tenacious. He didn't want to hear the word no. . . . He was a man on a mission. He was determined. And I attribute the program in its implementation that followed shortly thereafter to his efforts. At least he was the starting force and the initial catalyst.

Local residents also contributed time and energy to work on local deer committees – sometimes over decades:

And three of us were appointed [to the deer committee]. . . . One of the other members is now a member of the committee evaluating the program, twenty years later. . . . So the two of us have been involved for twenty years now.

Local officials both helped and hindered learning. Local officials who were concerned about controversy often would not grapple with deer management in more than a token way.

However, the deer committee . . . the [Village] trustee who was the head of it never called a meeting. And . . . really had no interest in doing anything but telling people that we had a "deer committee. . . ." And it did nothing. . . . Nothing was taken very seriously.

In some communities, however, the election of local officials sincerely interested in trying to resolve deer management problems was seen as critical in helping to promote learning and productive management.

I give her a lot of credit. . . . I think she's been very gutsy on this thing, and she's been unswerving in her desire to do something.

In communities where police departments have played a critical role in the implementation of deer management programs, the commitment of the police chief to the efforts has also been viewed as instrumental in deer management:

The individual that was the police chief at that time . . . he basically knew what had to be done in order to get this program to work, and I think that was a major part of the success of this program. . . . He's saying, "Listen, you want to get rid of these deer you got to let people come in here and hunt. They are hunting with archery equipment, and they are hunting out of elevated tree stands, and we're going to tell them where they can and can't hunt, and it's going to be safe. . . . If you don't do something with these deer there's going to be far more people injured driving the streets . . . then there are from archery hunters." I think he was instrumental in getting the program started.

Relationships

The relationships of communities with other communities, state agencies, state legislatures, nongovernmental organizations, and key individuals (such as technical experts) proved important in learning. Relationships between communities and state management agencies were perhaps most important. Management agencies have statutory authority over deer management, but communities have considerable influence over which management options can be implemented in their boundaries. Bad relationships between communities and agencies hindered learning, while good relationships facilitated it.

Princeton's relationship with the New Jersey Division of Fish and Wildlife (NJDFW) ran the gamut over its deer management history. In the 1970s, when deer management problems first arose in Princeton, the NJDFW and Princeton were often at odds over the community's refusal to modify local laws to allow shotgun hunting. During this period, the relationship was acrimonious and not conducive to developing new understandings that could improve deer management. As the years went by, however, both Princeton and NJDFW worked to better understand each other's perspective. Although differences in opinion remain to this day, their mutual cooperation has helped facilitate learning and novel, constructive approaches to management that meet both parties concerns.

Some states, such as Missouri, have official guidelines for how agencies should interact with communities on urban and suburban deer management issues. These guidelines are considered helpful at structuring community-agency relationships:

It talked about how to get involved with communities . . . what has to take place, who should be involved from a staff level, what our role is. I think a big factor in our guidelines was our role is not a lead role. We are not going to say you should be harvesting deer, you should be hunting deer, you should be reducing your deer population or anything. But . . . if you identify an issue that requires the management of this deer herd, we are going to be available to provide that technical assistance to you.

Of all the types of relationships that benefit community-based deer management, perhaps inter-community relationships are most in need of improvement. In an earlier section, we identified the problem of "getting other communities on board" as a key deer management challenge because communities are always affected by the actions taken (or not taken) in surrounding communities. With the exception of Cuyahoga Valley, no community worked to foster a coordinated regional approach to deer management problems, although several noted the importance of doing just that if their deer management efforts were ultimately to be successful. In Cuyahoga Valley, the regional effort was fostered by a unique regional organization discussed in more detail below.

Relationships with the media also cultivated learning about deer management. Of the communities we studied, Jackson County benefited most from its relationships with the media. As discussed in an earlier section, much of this had to do with the Missouri Department of Conservation having a media specialist on staff. The person in that position was able to devote energy to ensuring that deer management issues were covered in the media. By many accounts,

this effort was critical in laying the groundwork for public acceptance of deer management efforts.

The importance of relationships to learning is consistent with ideas that have been discussed extensively in the policy learning literature. Numerous authors have stressed the importance of social networks to learning (Sabatier 1988, Knoepfel and Kissling-Naf 1998, Pemberton 2000). For learning to occur, dialogue must take place – ideas must be shared and evaluated if they are to be accepted (Knoepfel and Kissling-Naf 1998). Relationships are understandably critical to this process.

Social Structures

Sometimes relationships were formalized in particular social structures; these structures provided the same type of learning benefits as informal relationships. They fostered dialogue between individuals who were able to generate and implement new ideas. The most common formal social structures we encountered were the “deer committees” set up to study and recommend solution to deer management problems. These committees facilitated learning by establishing a network of people to discuss and focus attention on deer-related problems.

A distinct, but related structure, was the Cuyahoga Valley Communities Council (CVCC). This Council was established to facilitate discussion among park systems and local government in the Cuyahoga Valley over regional issues related to the operation of the Cuyahoga Valley National Park; it had been in existence many years before deer-related problems became a concern. The CVCC was an effective structure in which to base discussions about regional deer management issues, and it established a special deer committee of its own for this purpose. The preceding existence of the CVCC allowed the deer committee to have a broad regional focus. It thus facilitated dialogue among a much larger number of municipalities and other government agencies than occurred in the other communities we studied.

State wildlife management agencies and game commissions are social structures that exerted a mixed effect on learning related to community-based deer management. Agencies and game commissions were sometimes closely aligned with recreational hunting. In some cases, they were initially reluctant to pursue novel approaches to deer management, which many communities seemed to prefer. This reluctance tended to slow the implementation of novel management ideas. However, agencies also provided an important counter-perspective to those ideas most frequently discussed in urban and suburban communities. Without the influence of agencies, many communities would not have begun to consider the role that hunting could play in management. Even for communities that initially opposed hunting, hunting has often gone on to play an important role in management programs.

Finally, police departments in several communities played valuable roles as social structures for implementing deer management programs. Because of their role in public safety and the training of their members in the use of firearms, police departments were often a logical organization to involve in deer management programs. In Tuxedo Park, Fox Chapel, and Lynchburg, police departments played a key role in the development and implementation of management programs.

Resources

Learning about deer management depended on a wide variety of resources – financial, intellectual, and labor. Clearly, financial resources influenced the ability of communities to learn about deer management. Several interviewees referred to the importance of “*deep pockets*” in getting community-based deer management programs initiated. Money was needed to study a problem thoroughly, to engage the public, to implement and learn from management actions, and, often, to defend against lawsuits. A lack of money also served as a constraint to ideal approaches to deer management. Lynchburg has been reluctant to implement a managed hunt because of concerns about the money required. Jackson County has implemented managed hunts in key natural areas, but may lack the resources to hold them in all the areas that need them.

Respondents also stressed the importance of human resources. Having “*educated, knowledgeable people*” from the community working to address deer management concerns was considered invaluable in helping to develop workable policies. Local labor was also needed to advance learning. The effort necessary to initiate and refine local deer management programs could be exhausting:

It was very difficult, because the testing, the background check. I mean – our police chief would take each hunter to each home and introduce the hunter to the home owner and vice versa, and make arrangements, know what car they were going to drive, where they would park, things like that. So it was very labor intensive the first couple of years.

Taken together, the substantial financial and human resources required for learning about deer management suggests that wealthier and better educated communities are in a superior position to develop workable local programs.

Interrelationships Among Learning Types

In our discussion of technical, conceptual, social, and political learning, we alluded to apparent interrelationships between these learning types. Many such interrelationships were suggested by the data. We focus on what we consider the most important and widespread of these here.

In *communities*, technical learning often received the primary initial emphasis after deer-related problems begin to rise. Local residents and/or leaders began to grapple with the question of what needed to be done to mitigate deer-related problems. Technical learning, however, depended heavily on conceptual learning. A community could not determine how to accomplish its objectives while widespread disagreement existed about what those objectives should be. As deer-related problems began to rise in some communities, perspectives varied on what the real problem was; some believed the deer population should be controlled; some thought deer-related problems could be controlled without managing the population; and others thought the real problem was a lack of tolerance for nature – that the problems caused by deer were trivial. Efforts to learn how to address “the problem” thus tended to be fragmented until agreement was reached about how to identify “the problem.”

Conceptual learning, therefore, had to precede meaningful technical learning. Often the most difficult challenge in conceptual learning was prioritizing different concerns in a community. For some, reducing deer-related problems was of primary importance. For others, deer-related problems were less of a concern than humane treatment of deer, minimizing public expenditures, or protecting public safety (from accidents with firearms). Communities had to consider the relative importance of these objectives as part of the conceptual learning process.

Prioritizing these objectives was an involved process that took time. In some communities, the process was more involved than in others. In Lynchburg and Jackson County, the process was expedited because strong opposition to killing deer did not exist; one less issue needed to be considered in the conceptual learning process. For Jackson County, the learning process was simpler than for Lynchburg because the deer management efforts to date have focused on larger parcels of public land where safety is less of a concern than on the private parcels where much management attention is focused in Lynchburg. Indeed, a number of these parcels are state-owned conservation areas administered by the Missouri Department of Conservation – the same agency that regulates hunting in Missouri. Consequently, authority over deer management decisions is concentrated in one agency to a greater degree than in many urban and suburban deer management areas.

These differences are consistent with ideas developed by Walsh (2000), who argued it is more difficult for learning to influence policy in contexts in which strong opposition to particular new ideas exist (e.g., opposition to killing deer on humane grounds) or authority is fragmented (e.g., the partial authority of local and state government over urban and suburban deer management). In the light of our findings, it seems that in communities with strong animal welfare concerns or fragmented authority over deer management, conceptual learning must address more issues and involve more stakeholders before technical learning insights can lead to new deer management policies.

Conceptual learning also occurred at different rates *within* communities. Some individuals or groups reached resolution about their community's deer management objectives sooner than others – a finding similar to one reported by Raik (2003). If only segments of the community agreed on deer management objectives, however, the community did not have the conceptual clarity to move forward with technical learning about how to reach those objectives. Agreement on management objectives had to be widespread among key deer management stakeholders.

Consequently, communities had to discover ways to move a majority of its members toward resolution about determining its deer management objectives. This process inevitably depended on meaningful dialogue and relationships between key stakeholders within the community. Learning how to foster that dialogue became a key consideration in promoting conceptual learning. Thus, conceptual learning depended on social learning.

Social learning led to the implementation of a variety of meetings, workshops, surveys, and, perhaps most importantly, deer committees in many communities. The approach communities took to such techniques was often trial and error. They implemented a succession of stakeholder involvement techniques while periodically taking the pulse of the community

regarding deer management. At some point, agreement relating to deer management objectives was widespread enough that technical learning could progress. Social learning also led to technical learning more directly, too. Social structures, such as deer committees, created in the process of reaching objectives, also served as fertile avenues for pursuing technical questions relating to how to reach objectives.

Political learning at the community level was arguably influenced by all three other types of learning – technical, conceptual, and social learning helped a community win support and overcome opposition as they attempted to implement deer management programs. Thorough technical learning convinced community members that decision makers had adequate justification for the deer management methods they proposed and had considered their concerns seriously in the development of these methods. Technical learning also helped communities defend themselves during lawsuits. Community-wide conceptual learning led to widespread agreement on deer management objectives – an indication of the amount of support a community had to move forward on the issue. Social learning – cultivating relationships and dialogue – built public ownership of decision-making processes; people were more willing to support decisions in which they felt ownership.

As state management agencies learned about community-based deer management, the learning types also interrelated. Many agencies considered their technical learning adequate when urban and suburban communities first began to approach them for aid in addressing deer-related problems. They argued that, through recreational hunting programs, they had the technology needed to control deer problems if communities wanted to use it. Many communities were not satisfied with this answer.

What was lacking for agencies initially was not technical learning, but conceptual learning. They did not realize the problem was not solely one of controlling deer populations but of how to control deer-related problems while considering other important community concerns. Little recognition existed that urban and suburban areas were different, and approaches that worked in rural areas might not be suitable for urban and suburban ones.

This conceptual learning occurred in all of the contexts we studied and was heavily influenced by social learning. While communities and state agencies were in disagreement about management methods, hostile relationships between them sometimes led to entrenchment in positions. Over time, however, relationships and mutual respect improved, and, as they did, communities and agencies became more willing to try to understand each other's concerns. While still actively promoting recreational hunting, most agencies eventually reached the point of working to advise communities on how they could achieve their deer management objectives – rather than trying to tell them what they must do. This approach tended to foster new efforts at technical learning as agencies explored how to craft laws and regulations that would help communities control their deer herds without jeopardizing other important community concerns.

Thus, in both communities and agencies, we found that technical learning depended on conceptual learning, which in turn depended on social learning (with political learning, at least at the community level, depending on all three). This finding suggests that social learning must occur before conceptual learning which must occur before technical learning. In contrast,

Fiorino (2001) and Glasbergen (1996) reported the opposite. They argued that environmental policy making tends to be characterized by technical learning first, followed by conceptual learning, followed by social learning.

On the surface, these findings seem incompatible with our own. In actuality, they are more compatible than they appear. We report the order in which learning must progress for communities to make progress in addressing their deer management problems. Many communities, however, do not attempt to learn in this order. Communities may initially attempt to focus their learning on technical concerns, but they turn their focus to conceptual learning when they find that they can only progress so far without it. In turn, they discover that conceptual learning can only progress so far without social learning. Thus, the movement from technical to conceptual to social learning can be understood as a movement to progressively higher levels of learning – conceptual learning opens up new possibilities for technical learning, and social learning opens up new possibilities for conceptual learning

On the other hand, progressing to higher levels of learning also makes learning more complex. Technical learning is easier than reformulating problems through conceptual learning. Reformulating problems is easier than involving numerous diverse stakeholders in their reformulation. Thus, communities are only likely to move to higher levels of learning if they feel they have no other option. If they can not address their problems satisfactorily at one level of learning, they will move on to the next level.

This phenomenon is the one Fiorino (2001) and Glasbergen (1996) documented. In their studies of the formulation of national environmental policy, they found that technical learning characterized the early stages, followed by conceptual learning in the middle stages, and social learning in the most recent stages. As policy makers reached the limits of progress they could make with one type of learning, they moved on to focus on the next and higher level.

Learning and Deer Management Evolution

We believe learning and the evolution of deer management are related in urban and suburban communities. Learning may propel a community into a new stage of deer management. Particular types of learning may become important in particular stages. In this section, we review the role that learning plays in the stages of deer management evolution we identified previously.

Anti-hunting:

The beginning of the anti-hunting stage in the communities where it occurred marked an episode of conceptual learning – a shift in societal objectives regarding deer. As in the recovery stage, this conceptual shift was followed by technical learning – learning how to design local laws to restrict or prevent hunting.

Early Nuisance:

This stage was characterized by the early stages of conceptual learning that was most relevant to this study – the shift to the perspective that deer could become overabundant and need

control. During this stage, however, this conceptual learning was sporadic and not widespread within communities. Political learning also began to become important in this stage as community residents started to lobby local government for relief from deer problems.

Stalemate:

As local government officials began to seek help on deer management from state agencies, political learning became more relevant. Because of their limited success, however, we characterize political learning as minimal at this stage. Without any widespread agreement that deer needed to be controlled, technical learning also was minimal, although most communities explored strategies such as deer deterrents and public education for minimizing deer-related problems.

Late Nuisance:

Facing growing numbers of deer-related problems, social learning began in this stage as local officials struggled to establish a dialogue that could lead to problem resolution. Conceptual learning advanced through this process as the perspective that deer control is needed became more widespread.

Local Action:

As communities began to take deer-related problems seriously, social learning continued, often with the creation of deer committees to address these problems. Conceptual learning culminated in this stage as the work of these committees stimulated widespread agreement that deer needed to be controlled. The committees also led to rapid technical learning through research and consultation, and communities developed clear ideas about how they would like to manage deer.

State Evolution:

This stage was characterized by conceptual learning at the state agency level. As agencies adopted the perspective that urban and suburban deer management required special approaches, it also opened up the door for technical learning about how these approaches could be pursued.

Opposition:

The opposition stage was characterized by political learning. By this point, communities had formulated clear policies they would like to pursue, but still must overcome political obstacles in order to pursue them.

Implementation:

Implementation was primarily characterized by some technical learning as communities refined their approaches to managing deer. The final stages of conceptual learning also occurred

as any remaining resistance decreased as management actions were implemented without incident.

Adaptation:

Technical learning increased again in this stage as communities worked to adapt their management programs to areas that were resistant to deer control.

RECOMMENDATIONS

A major purpose of this study was to help communities and agencies struggling with urban and suburban deer management problems. Given that some communities we studied had been trying to address deer problems for many years, they had accumulated a considerable body of deer management experience. We sought to synthesize the lessons learned from this experience in an effort to help other communities find, if possible, an easier path toward progress on deer management issues. Our work suggests that both communities and agencies may benefit by recognizing some of the time-consuming pitfalls that have entrapped others.

The agencies that have been most effective at helping communities set and achieve deer management objectives are those that recognize the uniqueness of urban and suburban deer management. For both physical and social reasons, urban and suburban areas differ from the more typical rural context for deer management. The patchwork of land types and ownership in urban and suburban areas may make hunting, the traditional deer management tool, ineffective, while the dominant social values in these areas may make hunting unacceptable. If agencies simply advocate the same approaches in urban and suburban areas that they do in rural ones, they can become trapped in long stalemates with communities over whether to hunt deer. Greater agency flexibility in considering a wide variety of deer management options played a critical role in promoting constructive deer management at our study sites. Rather than maintaining a take-it-or-leave-it stance toward hunting, by the time of our study the agencies involved with our study sites tended to approach communities as advisors – informing them which methods were legal and effective, and working together with them to develop mutually acceptable management plans.

At the community level, we found it was critical for local leaders to take on the responsibility for formulating deer management plans, a finding also reported in Raik et al. (in press). The specifics of how local leaders can most constructively proceed depends on the local context. First, the need for learning in the community must be evaluated. If widespread agreement exists that the deer population needs to be controlled and no incompatible perspectives (e.g., strong opposition to killing deer) exist, deer management challenges will primarily be technical in nature, and the technical considerations (described below) can be addressed. But if strong differences of opinion exist about what local deer management objectives should be, attempts to treat deer management as a technical problem will be doomed to failure if they are made before these conceptual differences are resolved.

Rather, communities such as these must reach agreement on objectives first. This process may not be a quick or simple one, but it can be facilitated by considering some of the

lessons learned by the communities we studied. First, we found conceptual learning heavily dependent on social learning. Consequently, communities trying to reach agreement on objectives need to promote dialogue and relationships among diverse stakeholders – a conclusion similar to one reached by Raik et al. (in press). Lessons on how to promote dialogue and relationships came from our section on social learning:

- Create deer committees. Of all the strategies for trying to develop deer management plans, creation of deer committees may be one of the most fruitful – providing the concentrated attention needed to address such complex issues. Deer committees are not fail-safe mechanisms, however. Membership of the committees must be considered with care. Biasing a committee toward hunters may make people distrust the committee's recommendations. Including strong deer welfare advocates may result in a stalemate. Efforts to ensure committee members are motivated, vested, and have unique contributions to make to the group will be worthwhile.
- Communicate, communicate, communicate. Because deer committees can only involve a tiny percentage of a community's residents, decision makers must find other means of involving the rest of the community in deliberation over objectives – something Raik et al. (in press) also recommended. A variety of stakeholder involvement mechanisms – public meetings, workshops, etc. – may be used. Use of the mass media is another way to communicate. A good relationship with the mass media was very important in Jackson County. The Missouri Department of Conservation's media specialist position gave the opportunity to be proactive in the agency-media relationship and kept the public educated about deer management issues. The resulting public understanding of deer management issues, in turn, was believed to facilitate decision making.
- Give special consideration to animal welfare concerns. Of all the difficulties faced in developing urban and suburban deer management plans, the most difficult is undoubtedly how to address the deeply held concerns some community members may have regarding killing deer. These concerns are difficult to address because effective population control typically requires killing deer. The challenge is how to involve animal welfare advocates meaningfully in public policy deliberations without allowing them to block deer control measures if a community decides lethal measures are needed. No easy answers on how to do this exist. However, we suggest a few general guidelines. Take the concerns of people interested in deer welfare seriously and provide them with opportunities to contribute to policy discussions. Investigate suggestions they make and ways in which management actions can be tailored to consider deer welfare as much as possible. If a community does conclude that deer population control is necessary, it may not be constructive to include deer welfare advocates in the development of control measures because control measures are often lethal.

Once agreement on objectives has been reached, technical issues become more important. A number of technical lessons were common among the communities we studied:

- Use multiple methods – including a mix of both lethal and nonlethal methods. Because of the complex patchwork of habitat and property types in urban and suburban

communities, any one management method is unlikely to be successful throughout an entire community.

- Lethal management will likely be needed. If a community needs to control deer – and many communities conclude they do – it is not yet possible to accomplish this control without lethal management methods. Fertility control (contraception and sterilization) is rapidly developing, but is not yet feasible in most contexts.
- Hunting is often a cost-effective way to control deer populations, and it may even be necessary politically if communities want state agencies to approve other management methods they seek. Hunting alone, however, is often insufficient – particularly in communities consisting of numerous private properties.
- Expect to fine-tune management methods after implementation begins. Urban and suburban communities are unique and complex enough that it is impossible to expect to make all the best implementation decisions without the experience that implementation brings.
- Access must be provided to sites for hunting or culling deer. Access is often one of the primary barriers to effective urban and suburban deer management. To the extent that communities can facilitate this access, they will improve their management results.
- Changes in local and state laws and regulations may be necessary for management to occur. Many state laws were developed to protect deer populations and, once deer control became important, to control deer through hunting. Consequently, some of the novel deer control techniques communities wish to implement may not be possible under current laws. Local laws, on the other hand, may have been developed to prevent hunting and, as a consequence, prevent many other lethal control measures, too.

A final critical lesson in urban and suburban deer management is to be prepared to be sued. If deer welfare is an important concern in a community, any management plan proposing lethal control is likely to be challenged in court. Communities and agencies must be able to defend the procedures they used to develop management plans or face additional delays in trying to address deer-related problems. For some entities (federal agencies such as the National Park Service) the procedural requirements are more stringent than for others. In many cases, however, communities may have to document both the need for management and the rationale for choosing particular management actions.

Throughout the management process, patience is critical. Making progress on suburban and urban deer management clearly takes time, even considering the lessons that can be learned from other communities. Reaching agreement about appropriate management objectives is often particularly time consuming. Indeed, the “lessons” of urban and suburban deer management do not eliminate the need for difficult and lengthy decision making within communities. Rather, these lessons can help communities and agencies avoid some of the worst pitfalls of deer management – avoiding situations in which years may be spent deadlocked over objectives or actions with no progress being made addressing the underlying concerns.

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APPENDIX A

Cuyahoga Valley, OH, Timeline

- 1974 The Cuyahoga Valley National Recreation Area created. (It becomes Cuyahoga Valley National Park in 2000.)
- 1980s The deer population grows rapidly in Ohio.
- 1988 The National Park Service (NPS) begins monitoring the deer herd in CVNP because of concerns about deer-related problems.
- 1993 CVCC convenes a public meeting to propose establishing a deer management task force to study and recommend solutions to deer-related problems in area. Based on public response at the meeting, the task force is created. The task force includes mayors of four cities and villages, trustees of tow townships, and representatives of Cleveland Metroparks, Metro Parks Serving Summit County, Ohio Division of Wildlife (DOW), National Park Service, and Ohio Farm Bureau Federation. From 1993 to 1996, the task force holds monthly meetings which are open to the public.
- 1994 The deer management task force conducts: (1) a public opinion survey of local residents to learn their attitudes about deer, the extent of damage to their properties, and other deer-related problems; and (2) a survey of farmers to assess deer damage to agriculture. DOW initiates a program allowing hunters to take an additional 4 antlerless deer in 5 Urban Deer Zones in Ohio. (Akron-Cleveland is one of the 5 Urban Deer Zones.)
- 1995 An aerial survey by the task force estimates 6,000 deer in 178 square mile area. The deer population is expected to double in area by 2000. Annual deer-vehicle accidents reach 533 in the area – more than double the number of accidents in 1988. In October, the task force holds a public Open House attended by 250-300 persons to present its findings of problems and alternative solutions and to obtain views prior to drafting its final report.
- 1996 The deer management task force publishes a report on deer problems and possible solutions. The report concludes that the deer density is too high and should be reduced to 20-40 deer per square mile (with 10-20 deer per square mile in park areas). The task force recommends both lethal and nonlethal management methods. The report is advisory only – parks, municipalities, and townships in Cuyahoga Valley must each decide whether and how to address deer problems.
- 1997 CVNP releases a draft environmental assessment for management of white-tailed deer in the park². CVNP hopes to protect biodiversity by reducing the deer population through sharpshooting, capture and euthanasia, and fertility control where practical. Environmental assessment is challenged through a lawsuit. CVNP withdraws the environmental assessment when it appears likely they will be required to complete a full environmental impact statement.

² Federal agencies must consider the potential environmental impacts of all actions they undertake. An environmental assessment is prepared to determine if the impacts of an action will be significant. If not, the agency may proceed with the action. Otherwise, a more extensive environmental impact statement must be prepared.

- 1998-1999 Cleveland Metroparks plans to begin culling deer within its lands. After a lawsuit challenging the legality of culling program is dismissed, culling begins and continues each year.
- 2001 CVNP publishes a study of public attitudes toward deer and deer management within the park. The study finds stronger support for lethal control of deer than for taking no action.

Fox Chapel, PA, Timeline

- 1977 The Fox Chapel Borough Council begins to receive complaints about deer from local residents.
- 1978 The Borough Council concludes that hunting is needed to reduce the local deer herd, but opposition among local residents prevents hunting from occurring.
- Mid 1980s Residents concerns about deer-related problems resurface.
- 1988 The Borough Council surveys Fox Chapel residents to assess their concerns about deer and attitudes toward deer management. Most residents oppose hunting to reduce the size of the deer herd. The Pennsylvania Supreme Court rules that municipalities can not pass ordinances to ban hunting.
- 1992 The Pennsylvania Game Commission (PGC) attends a meeting of the Borough Council and recommends that Fox Chapel develop a strategic deer management plan. The Council creates a Wildlife Management Committee to study the issue. The Wildlife Management Committee resurveys Borough residents and finds the majority now support some form of deer management. The Committee drafts a deer management plan specifying criteria for determining whether deer control is needed and recommending deer control methods. The principal method recommended is culling deer at night over baits sites. The Borough Council submits the plan to the PGC for approval in December.
- 1993 An aerial survey estimates the deer density in Fox Chapel at 91 per square mile of habitat. Eighty-one deer-vehicle accidents occur in Borough. Extensive damage to the forest understory and the Trillium Tail is documented. PGC approves Fox Chapel's management plan provided that the Borough encourages bowhunting as much as possible. The Borough Council develops a program to pair bowhunters with property owners desiring deer control. Deer welfare advocates file a lawsuit to block Fox Chapel's deer management program – Fox Chapel wins the suit. The bowhunting program takes 120 deer.
- 1994 An aerial survey estimates the deer density in Fox Chapel at 103 per square mile of habitat. Seventy-seven deer-vehicle accidents occur in Borough. The bowhunting program takes 185 deer. A survey of Borough residents finds that more than three-quarters support Fox Chapel's deer management program. PGC adopts regulations allowing communities to cull deer using qualifying agents.
- 1995 Fifty deer-vehicle accidents occur in Fox Chapel. The bowhunting program takes 202 deer. Deer culling in Fox Chapel is initiated. The culling program takes 28 deer.
- 1997 Twenty-seven deer-vehicle accidents occur in Fox Chapel. The bowhunting program takes 176 deer. The culling program takes 46 deer.

- 2000 Twenty-seven deer-vehicle accidents occur in Fox Chapel. The bowhunting program takes 125 deer. The culling program takes 66 deer.
- 2001 Twenty-six deer-vehicle accidents occur in Fox Chapel. The bowhunting program takes 145 deer. The culling program takes 110 deer.
- 2002 Twenty-four deer-vehicle accidents occur in Fox Chapel – a low since the initiation of the management program.

Jackson County, MO, Parks and Conservation Areas Timeline

- Late 1980s Concerns about deer-related problems begin to increase in Jackson County. The Missouri Department of Conservation (MDC) begins spotlight surveys to monitor the deer herd size in some conservation areas.
- 1992 In order to meet the increasing demands for assistance from urban locations such as Jackson County, MDC develops urban deer management guidelines.
- 1993 Urban biologist positions are filled in key areas of Kansas City and St. Louis. MDC's James A. Reed Conservation Area, with an estimated deer density of 68 deer per square mile, implements the first managed deer hunt in Jackson County.
- 1994 The deer density in MDC's Burr Oak Woods Conservation Area is estimated at 82 deer per square mile. The deer density reaches 195 deer per square mile in Jackson County's Fleming Park. Crop loss estimates of adjacent farmers are at 40-60%. Jackson County Parks and Recreation (JCPR) and MDC begin discussing setting up a managed deer hunt in Fleming Park. The first managed muzzleloader deer hunts are held in the county's Fleming Park and MDC's Bridger Conservation Area. A managed archery hunt is simultaneously implemented around county-maintained Blue Springs Lake.
- 1995 MDC's Burr Oak Woods Conservation Area holds its first managed archery deer hunt in January.
- 1996 Deer on the east side of Fleming Park have been reduced to acceptable levels. A managed hunt is initiated on the west side of Fleming Park. The archery hunt at Blue Springs Lake is eliminated due to lack of participation and harvest. MDC's Urban Deer Task Force is created to address urban deer issues in the state. A survey of St. Louis and Kansas City residents is performed to assess urban residents attitudes toward deer.
- 1997 The archery hunt at Burr Oak Woods Conservation Area is switched to November – the deer harvest doubles, but the deer density increases to 99 deer per square mile.
- 1999 MDC revises its urban deer management guidelines. The guidelines became official policy with approval by Missouri's Conservation Commission (MDC's governing body).
- 2000 The deer density at Burr Oak Woods Conservation Area reaches 110 deer per square mile. The deer density at James A. Reed Conservation Area is estimated at 44 deer per square mile.
- 2001 Burr Oak Woods Conservation Area begins a managed muzzleloader hunt in addition to its managed archery hunt.
- 2003 Jackson County prepares to open a muzzleloader hunt on Monkey Mountain Park in December.

Lynchburg, VA, Timeline

- 1980 The statewide deer population in Virginia is estimated at 422,000.
- 1980s The deer population in Lynchburg multiplies rapidly, and deer-related problems begin to increase.
- 1987 The statewide deer population in Virginia is estimated at 575,000.
- 1991 The Lynchburg City Council creates the Wildlife Study Commission and charges it with studying deer-related problems in the city and recommending solutions. The Commission recommends: (a) public education; (b) shotgun hunting on contiguous parcels that make up more than 25 acres³; and (c) hiring a wildlife management specialist to cull deer on parcels with state-approved kill permits⁴.
- 1992 The Lynchburg City Council accepts the Wildlife Study Commission's recommendations and hires a part-time wildlife management specialist to cull deer on both public and private property (with the landowners' permission).
- 1993 A second part-time wildlife management specialist is hired.
- 1996 VDGIF begins development of its first statewide deer management plan. An effort is made to consider the interests of diverse stakeholders during plan development.
- 1997 The Virginia Administrative Code is amended to allow VDGIF to develop an urban deer management program (DPOP), which could permit either extended hunting seasons or the use of sharpshooters to control deer in certain localities.
- 1998 Deer-related problems in Lynchburg begin to increase again. The statewide deer population in Virginia is estimated at nearly 1,000,000. VDGIF's statewide deer management plan is completed. State law is changed so that kill permits can no longer be used to control deer causing damage on non-commercial properties – this change temporarily stops much of Lynchburg's deer culling efforts.
- 2000 Lynchburg obtains its first permit to cull deer under DPOP. Culling under this program is used to replace culling that previously occurred under kill permits.
- 2002 The deer population in Lynchburg is estimated at 3,000 to 5,000 (60-110 deer/square mile). The Lynchburg City Council is petitioned by 1,000 residents to take further actions to control the deer herd. The city manager prepares a report with further recommendations for controlling the deer herd. Lynchburg revises its laws so that: (a) landowners who obtain permits from the city to hunt on their property must also allow the city's wildlife management specialists access to their property to cull deer; and (b) bowhunting can take place on contiguous parcels that make up over 5 acres. Lynchburg begins to implement the state's early urban archery program.
- 2003 State law is changed so that kill permits may once again be used on non-commercial properties to control deer causing damage.

³ Shotgun hunting had previously been allowed only on single parcels of 25 acres or more.

⁴ Virginia issues "kill permits" to take deer causing property damage.

Princeton, NJ, Timeline

- 1972 In response to residents' concerns about hunting safety, Princeton's Township Committee passes a no-firearms discharge law – making firearms hunting illegal.
- Late 1970s Public concern grows over the increase in deer-car collisions. Princeton proposes designating the Township as a new and separate Deer Management Zone to New Jersey Division of Fish, Game, and Wildlife (NJDFGW) but the proposal is rejected.
- 1982 An ad hoc deer committee is formed by Princeton Township to study and recommend solutions to deer problems. The committee recommends a return to shotgun hunting to the Township Committee, but the Committee rejects the recommendation.
- 1984 A poll of Township residents finds that while most believe there are too many deer-related problems, two-thirds oppose the repeal of the no-firearms discharge law to allow hunting. The ad hoc deer committee recommends addressing deer problems through education and encouraging bowhunting. The recommendation is accepted by Township Committee.
- 1985 The deer committee is reconstituted as permanent subcommittee of the Princeton Environmental Commission. Deer crossing signs and roadside reflectors begin to be installed.
- 1987 The deer committee formulates the "Princeton Plan." The plan involves promoting deer deterrents, educating the community about deer problems, and matching bowhunters with landowners willing to allow hunting. The first Lyme disease cases are reported in Princeton Township.
- 1991 The deer committee repeats the 1984 survey of Township residents. It finds more people have experienced deer problems, more people have taken action to control deer problems, and more people willing to accept shotgun hunting. The township Committee unanimously approves a suspension of the no-discharge ordinance on special-permit shotgun hunting days beginning in 1991.
- 1995 The New Jersey Division of Fish and Wildlife (NJDFW) creates the Community Based Deer Management Program, which allows communities to utilize alternative deer control methods. Flexibility in the program is not great enough to allow Princeton to hire an agent that uses rifles and suppressors to shoot deer at night, however.
- 1997 The Wildlife Committee (formerly called the Deer Committee) recommends a deer management program to the Township Committee. The program includes: (1) negotiating a special permit with NJDFW to cull deer with sharpshooters; (2) experimenting with contraception; and (3) emphasizing antlerless deer in hunting programs.
- 2000 The New Jersey Legislature liberalizes the Community Based Deer Management Program. Princeton Township contracts with White Buffalo, Inc. to reduce the deer herd. Several lawsuits seek to block the culling, but none are ultimately successful.
- 2001 White Buffalo culls 322 deer by sharpshooting. Under pressure from NJDFW, Princeton modifies its local ordinances to allow all legal hunting seasons to take place.

- 2002 In addition to sharpshooting, White Buffalo begins netting and bolting deer. The latter method proves controversial. The Deer Program Evaluation Committee recommends continuation of lethal control, experimenting with contraception and sterilization, and ongoing monitoring of deer population and problems.
- 2003 The NJ Fish and Game Council originally rejects Princeton's application to continue with the third year of the culling program, but reverses itself after changes are made to ensure continuation and expansion of hunting opportunities in Princeton.

Tuxedo Park, NY, Timeline

- 1880s Deer are a valued resource. Tuxedo Park is fenced to retain deer. Deer are transported to Tuxedo Park from Mexico to increase the population.
- Early 1900s The "great garden" era occurs in Tuxedo Park. Deer occasionally damage the gardens. Problem deer are shot by individual landowners.
- 1940s-1960s The deer population is growing in Tuxedo Park.
- Early 1970s A law banning the discharge of firearms and bows is passed in Tuxedo Park in response to residents' concerns about the safety and ethics of hunting.
- Mid-1970s Deer-related problems begin to increase in Tuxedo Park.
- Early 1980s Local residents begin to lobby Village Trustees asking for some type of action to address the deer-related problems. Some residents seek nuisance permits⁵ from the New York State Department of Environmental Conservation (NYSDEC), but can not use them because of no-discharge law.
- 1987 The first in a series of "deer committees" is organized by the Village of Tuxedo Park to recommend actions to address deer-related problems. The committee studies Lyme disease, but does not reach agreement on any recommendations.
- 1991 A Tuxedo Park resident obtains deer nuisance permits from NYSDEC. Other residents become aware that deer are taken under these permits and threaten a lawsuit (under the local no-discharge law). Further use of nuisance permits is deterred.
- 1995 A study of Village residents' attitudes toward deer and deer-related problems is conducted. The study finds most residents are concerned about deer, believe action is needed to address deer-related problems, and accept lethal measures to control deer.
- 1996 A new Village Trustee takes responsibility for the deer committee.
- 1997-1998 The deer committee conducts an extensive study of deer issue. The study focuses on the deer population size, public attitudes, legal considerations, and deer management alternatives.
- 1998 The deer committee releases its study and recommends modification of Village ordinances to allow the discharge of bows or firearms so that NYSDEC nuisance permits may be used (with additional stipulations on use to be added by the Village).
- 1998-2000 A series of Village Board meetings is held to consider the deer committee's recommendations. Several changes in local ordinances are enacted to allow adoption of the deer committee's recommendations and improve local deer

⁵ Nuisance permits allow landowners experiencing deer damage to take a specified number of deer out of season.

management. Ordinance changes include – modification of the no-discharge law, modification of a law prohibiting landowners from erecting fences on their properties, and adoption of a law prohibiting feeding of deer. Three lawsuits attempt to block the use of nuisance permits – all three are decided in favor of the village.

2000-2002 Deer are taken by the Village each year under nuisance permits. Permits were also obtained by the Village under NYSDEC's Deer Management Assistance Program (DMAP)⁶ in 2002, but no deer were taken on these permits. Village residents owning land adjacent to the Village obtain DMAP permits and organize to drive deer from the Village onto these lands where they can be culled. Adjustments are made by Village and Village residents each year to increase the efficiency of the deer take.

⁶ DMAP allows landowners experiencing deer damage to provide additional antlerless deer tags to licensed hunters during the hunter season.