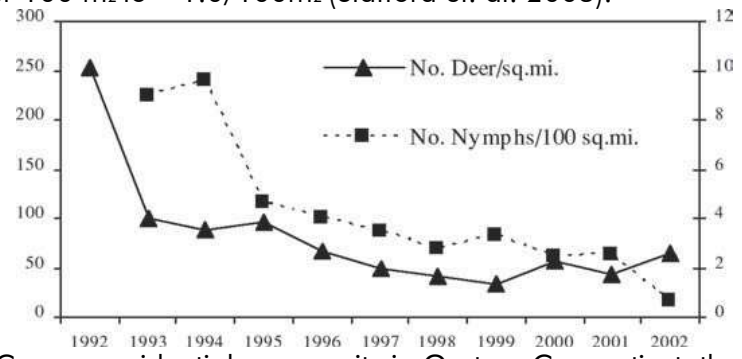
Deer Reduction and Management

Some communities have explored the reduction of white-tailed deer through regulated hunting or controlled hunts to reduce problems associated with deer overabundance, particularly related to Lyme disease. A major question has been how far deer densities must be lowered to reduce tick exposure and human disease. The incremental removal, reduction or elimination of deer has clearly been shown to substantially reduce tick abundance in many studies. Observational studies and computer models suggest that a reduction of deer densities to less than twenty deer per square mile may significantly reduce tick bite risk, while lower levels (~8 deer/sq. mi.) would interrupt the enzootic cycle of Lyme disease and transmission of *B. burgdorferi* to wildlife and humans. Fewer ticks have been reported at deer densities less than 18 animals/sq. mi. in one study. Because of issues related to locations where most deer reduction studies have been conducted and limited human case reports, data on the impact on human disease are more limited. However, reductions in human tick-associated disease with the lowering of deer densities have been reported.

Select Deer Reduction Studies on the Blacklegged Tick and Lyme Disease

- The reduction of deer on Great Island (a peninsula on Cape Cod, MA) by 97% from an estimated 32 deer to 1 animal from 1982 to 1984 (52 deer in all) resulted in ~80 and ~55% average reductions in larvae and nymphs on mice in the 3 years following the intervention. Continued maintenance of a density >6 deer/sq. mi. has reduced tick-borne disease incidence from 16% of a community of 220 people to only 3 cases since 1986 (Telford 2002; Wilson et. al. 1988).
- In the coastal community of Ipswich, MA, removal of deer over a 7-year deer period from 160 deer/sq. mi. to 27 deer/sq. mi. (~83%) reduced the average number of larval and nymphal *I. scapularis* on mice by 50 and 41%, respectively (Deblinger et. al. 1993).
- In Connecticut, deer were reduced from over 200/sq. mi. to ~30/sq. mi. (~84%) at the Bluff Point Coastal Preserve and a geographically isolated tract in Bridgeport (see figure below) producing a substantial (>90%) decline in tick abundance from 9-12 nymphal *I. scapularis* per 100 m_2 to ~1.0/100m_2 (Stafford et. al. 2003).



- In Mumford Cove, a residential community in Groton, Connecticut, the deer population was reduced 92% from ~100/sq. mi. to ~12/sq. mi. and the number of Lyme disease cases was reported to have dropped from 30 to less than 5 within three years. Although part of this reduction was due to a regional decrease in tick activity and in reported Lyme disease cases during the same period, tick abundance was reduced and a regional increase in tick numbers and reported Lyme disease cases in 2005 was not reflected in the Mumford Cove community (Kilpatrick & LaBonte 2003; Stafford, unpublished data).

- Deer were completely eliminated from Monhegan Island, Maine over a 28-month period resulting in the steady disappearance of *I. scapularis* from the island (Rand et. al. 2004).
- Computer simulations with a program called LYMESIM suggest that a 70% reduction in deer density and maintenance level of 19 deer per square mile (7.5/km$_2$) would achieve ~40% reduction in infected nymphs within 4 years. The virtual elimination of deer would result in a 99% reduction in infected nymphs (Mount et. al. 1997).

While adult ticks also feed on opossums, raccoons, coyotes, and skunks, it doubtful that *I. scapularis* can be maintained in significant numbers just from feeding on these medium-sized alternate animal hosts. They are less abundant than deer and, in the case of raccoons, ticks are frequently removed while grooming. Some ticks still may continue to be introduced into an area on migrating birds, even with the complete removal of deer. A few adult ticks have been recovered from deer-free islands. Interestingly, the number of adult ticks on remaining deer and the 'apparent' adult tick host-questing abundance will increase for several years following deer reductions as questing adult ticks, many of which would have fed on deer, become available to other hosts. The prevalence of *B. burgdorferi* in the ticks will initially rise as a greater proportion of immature ticks feed on reservoir competent hosts before dropping in subsequent years. The time that is required for reductions in the questing tick population is due, in part, to the 2 year life cycle of the tick. Although deer and tick reductions have been successfully carried out on some islands, peninsulas or some other defined geographical tracts, it is not clear if a deer population can be reduced sufficiently to achieve a satisfactory level of tick control in more densely populated areas on the mainland. Conversely, unregulated deer populations may potentially lead to an increasing tick population. Lethal management options for deer are effective, though controversial, while the use of anti-fertility agents remains experimental and labor intensive. A community that wishes to implement a deer management program, especially in densely populated urban and suburban areas must deal with hunting restrictions, real or perceived safety or liability concerns, and conflicting attitudes on managing wildlife. Since most land in the northeast is privately held, homeowner views and hunter access are important to deer management. Any deer population control program would require an initial reduction phase to lower high densities of deer and a maintenance phase to keep the deer population at the desired targeted level. Deer capacity for reproduction is high and deer herds can potentially double in size in one year. Management would be an ongoing process.