INTERIM

WILD BOAR MANAGEMENT PLAN
GREAT SMOKY MOUNTAINS NATIONAL PARK

Problem Statement

It is the policy of the National Park Service to control or eradicate non-native animal species when "...they are undesirable in terms of public health...or when their presence threatens the perpetuation of significant scientific features, ecological communities, and native species, or where they are significantly harmful to the interests of adjacent landowners." This plan is in accordance with this Service-wide policy.

The European Wild Boar (Sus scrofa) was introduced into a private hunting preserve in 1912. It first entered the western end of the park about 1950. Wild boars are now present in about three-fourths of the park, and their population is estimated to number in excess of 2,000 individuals.

Of greatest concern to park management are the destructive effects of the wild boar on natural ecosystems and on native components of these ecosystems. Their rooting for food profoundly disrupts many natural vegetative communities, including some of the finest areas of wildflower display in the park. Vegetative impact includes the effect of boar rooting upon individual species populations, forest successional patterns, and entire vegetative communities.

Among individual plant populations significantly affected by boars are Turks Cap Lily (Lilium superbum), spring beauty (Claytonia virginica), fawn lily (Eryhronium americanum), wake robin (Lillium erectum), and others (Bratton, 1974). In some forest communities, such as grey beech forest, understory cover may be reduced to 5 percent of its normal cover, and changes in forest structure and composition have been identified (Huff, 1977).

Areas of boar disturbance often suffer high rates of soil erosion (Bratton, 1974a). In areas rooted adjacent to streams and springs, increased sediment loads have been observed, which may severely affect water quality in these areas. A preliminary survey has suggested greater amounts of coliform bacteria in boar-occupied drainages than in unoccupied ones (Longdon, 1977, in UT Annual Progress Report).

Studies of food habitats have shown that boar rooting causes direct disturbance of critical habitat for a number of plant and animal species which are endemic to the Southern Appalachian area or to the Smokies alone (Scott, 1973; Ackerman et al, 1978). Among the disturbed critical habitat is that of the Jordon's Red-Cheeked Salamander, which is endemic to the park (Ackerman et al, 1978), the Jones' Middle-Toothed Land Snail, which is proposed for the national endangered and threatened species list (Ackerman et al, 1978), and Grays Lily, on the Smithsonian list as a threatened species.

Direct predation of some species is also a factor attributable to wild boars. They eat large quantities of invertebrates, including snails, crayfish, and a variety of amphibians. The park has an international reputation for its variety and number of salamanders, and the Red-Cheeked Salamander, along with other salamander species, has been found in dissected boar stomachs (Ackerman et al, 1978).

Wild boars compete for foods, particularly acorn mast, with other species of wildlife such as black bear and deer. In plentiful mast years the competition is not keen, but it is possible that in years of poor food production or of expansion of boar populations, severe competition could significantly reduce available food for native species. However, this has not yet been documented by research.

Although not scientifically verifiable, the detrimental effect of boar rooting upon the aesthetic and wilderness values of the park has been increasingly noticed by park visitors. In the last several years, written and verbal complaints have increased concerning boar-rooting sign along hiking trails.

Management Efforts

The adjacent states of Tennessee and North Carolina regard the wild boar as a game animal, and cooperative agreements with the states provide for transfer of live trapped animals for stocking purposes on state lands. For 18 years, the park has engaged in boar control efforts--including trapping and transplants and killing in the field.

The European Wild Boar is highly mobile, intelligent, and nocturnal in habit. These traits make it a difficult animal to capture. They reach breeding age within 14 months after birth and bear large litters (up to six piglets), so harvested animals are quickly replaced. The most recent major range expansion (1972-1973) occurred in a year when acorn mast, their most important food source, was in short supply. Bratton (1974b) estimated that a 50 percent annual harvest (about 1,000 animals) would be needed to substantially reduce the population, and a 25 percent annual harvest to stabilize it at its present level. More elaborate mathematical models developed by Tipton (in press) indicate that these estimates are substantially correct. Until 1976, reduction was carried out on a "catch as catch can" basis, mainly by Park Rangers, whenever funding and personnel were available. Traps were bulky and could not be transported into the backcountry. Only 1,187 boars were removed from park populations, from 1959 through 1977.

In 1976, a four-man management team was added to the Resource Management Division to devote its time exclusively to boar control. The development of a light, portable nylon trap made backcountry trapping feasible. Evaluation of methods used in the 1976-1977 program by Resources Management and Visitor Protection (1978) showed that backcountry trapping was the most effective in terms of man-hours expended per boar removed, followed by backcountry shooting, frontcountry shooting and frontcountry trapping.

Research carried out by the Tennessee Fish and Game Commission and the University of Tennessee has produced a large body of information on the life history and ecology of the European Wild Boar (Reviewed in Singer, 1976). Since the Uplands Field Research Laboratory opened in 1975, extensive research has been conducted, along with development of more consistent reporting forms, to more fully assess the wild boar's impact on native ecosystems, and to gain detailed and accurate knowledge of their numbers and population structure. This program of research is designed to assist development of the long-term Wild Boar Management Plan.

A temporary halt was placed on the killing of boars in the park in late August 1977, and remains in effect pending assessment of the Management Plan and related documents and programs.

The Wild Boar Management Plan is adjunct to the Resources Management Plan which is currently being revised and updated.

Objectives of Wild Boar Management Program

I. Protect the native species and natural processes of the park ecosystems by reducing the impact of wild boars on these species and processes.

   1. Protect critical habitat of rare, endangered, and endemic species, and reduce boar impact upon identified areas which are particularly vulnerable to rooting, e.g., beech forests, ridgelines, cove wildflower areas.

   2. Protect rare, endangered, and endemic species which are presently or potentially affected by activities of wild boars, e.g., Red-Cheeked Salamander, Jones' Middle-Toothed Land Snail, Grays Lily.

   3. Reduce boar impact upon all native flora and fauna.

II. Ensure the opportunity for visitor experience of undisturbed natural processes by reducing the effect of boar activity upon aesthetic and wilderness values of the park.

III. Protect public health by closely monitoring quality of natural water systems which flow through areas of heavy boar rooting, and by examining boar populations and individual animals for possible diseases communicable to humans or wildlife.

IV. Minimize adverse effects of boars and control methods upon resources adjacent to the park.

V. Cooperate with state game agencies in accord with cooperative agreements to provide them, when feasible, with live boars which are in excess of those needed for park management and research purposes.

Methods of Control

Although presently it may not be possible at this time to completely eradicate the wild boar from the Park, it is both feasible and essential that all efforts be made to control population numbers and to reduce or eliminate their effect upon natural species and ecosystems.

At times it may be necessary to allocate a large amount of manpower and materials for a lower than average return of boars in order to optimize protection of threatened resources. For example, beech forests, high ridgetops, and lower cove wildflower communities are areas that need special protection efforts to preserve critical habitat, even though actual numbers of animals taken may be quite small. In meeting this objective, the specific locations of those critical areas must be identified, and control efforts made to eliminate boars from those specific areas. A number of special protection areas, already identified, are to be given protection priority.

Following the primary effort of special habitat or species protection is the secondary effort to protect all native species and ecosystems. This may be accomplished by optimizing control efficiency in terms of taking the greatest number of boars possible, in any areas where they are found. In meeting this objective, it is necessary to determine population movements both seasonally and daily, and to determine food availability, feeding patterns, and population structures.

Some of this information is known. For example, control efforts in the summer of 1977 were five times as effective as efforts in the winter, as boars concentrate to feed in the higher elevations along ridgelines from early April until early August, then disperse into lower elevations during winter months (Singer, 1978). Control is more effective in years of poor mast production than in years of good mast production. Also, it has been found that control efforts should be directed toward removal of mature sows rather than males in the population, unless it is known which males are dominant breeders (Singer, 1978). However, all sexes will be removed as taken.

Population simulations indicate that a single 50 percent harvest should be taken to have a significant and long-term effect upon the population, rather than two harvests of 25 percent over a period of time (Singer, 1978). Following is a description of boar management considerations and techniques:

> No methods of removing wild boars from the Park will be used that may jeopardize public safety or public health on State or Federal lands. Only methods that do not endanger native species will be used.

Cooperation

The cooperation of bordering State Game Agencies and Federal Agencies will be solicited to aid in the disposal of wild boars captured in the Park and when the captures occur in locations where it is feasible to remove them. Logistically it is not feasible to remove boars from any location more than one mile from a road open to vehicular traffic. Financially and physically neither the Park or State Agencies have the ability to transport wild boars across rough terrain and through dense vegetation by hand-carry methods.

Trapping

Wire cage and net type traps are now being used for boar capture,. Wire cage type traps are useful for those areas near roadways. Net traps are utilized for off-road trapping. Light-weight net type traps are much more portable in those situations where trapping is conducted off access roadways.

Large traps, capable of multiple boar captures, will be tested and may be used in locations where boars habitually concentrate during certain seasons and intensive disturbance to forest soils, critical habitat and associated biota is occurring.

Direct Reduction

Shooting of wild boars by qualified Park Service personnel has had limited success in reducing boar numbers in specific areas and will continue to be effective where boars foraging for food pose a threat to endangered or threatened native species, or any other species native to the Park.

Combination trapping and direct reduction efforts should result in better success ratios and more boars being removed from the Park ecosystem than one technique alone being used. Man-hours and equipment are more fully utilized when combination methods are in use simultaneously.

Methods of removing boars from those areas in the Park where wild boar activity poses a threat to any native species, public health or areas of special scientific or aesthetic interest will consist of both trapping and direct reduction.

Other Methods

New and better methods of removing wild boars from the Park will be identified as more expertise is acquired by resource personnel. New methods will be fully evaluated and applied

only if they do not jeopardize native species, public health and public safety on Park and State lands.

Fencing of some small areas that contain endangered or threatened species, or unique forest types may be required in order to be reasonably confident of protection. However, fencing of areas could conflict with wilderness values and definitions, and its effects on native species and natural processes would have to be carefully assessed.

Long-Term Management Considerations

A long-term approach toward control of the wild boar must emphasize minimization of its effects upon native species and ecosystems in the Park, and secondarily, a large-scale reduction of the boar population. Although the ideal is still to eradicate boars from the Park, more research may be necessary before it is known if this objective is biologically and practically feasible. In conducting such a long-term control program, the National Park Service at the present level of operation and manpower should:

1. Continue reduction of boars by live trapping and shooting.

2. Transfer animals to adjacent states, where feasible, mutually desirable, and in accordance with written agreements.

3. Continue to evaluate effects of wild boars on natural communities and ecosystems, and populations of native plant and animal species, and assess methods of restoring disrupted areas.

4. Continue to conduct management-oriented field observations and research in cooperation with Uplands Field Lab and outside researchers, to determine the following:

   a. numbers, locations, and movement patterns of wild boars within the Park, using whatever techniques yield the most dependable information.

   b. research into the biology of the wild boar, including foraging habits, social behavior, reproductive biology, physiology, genetics, etc.

   c. methods for predicting availability of food sources to boars (e.g., annual mast survey).

5. Further refine conventional management techniques and investigate new ones, using to the fullest extent possible the information gained through research and observation.

6. Periodically assess the management program to evaluate the benefit of individual control techniques in terms of (1) cost per boar removed, (2) overall effect of reduction efforts upon boar population, (3) potential of technique for reducing effects of wild boar on natural environment.

7. Annually review and update boar management plan including specific methods, justification of actions, and means of evaluation.

REFERENCES

Ackerman, B.B.; M.E. Harman and F.J. Singer, 1978. Studies of the European Wild Boar in Great Smoky Mountains National Park. First Annual Report, Part II: Seasonal Food Habits of European Wild Boar, 1977. Uplands Field Research Lab, Southeast Region, NPS, Great Smoky Mountains National Park, Gatlinburg, Tennessee.

Bratton, S.P. 1974a. The effect of the European wild boar (Sus scrofa) on the high-elevation vernal flora in Great Smoky Mountains National Park. Bulletin Torrey Botanical Club 101(4): 198-206.

Bratton, S.P. 1974b. An integrated ecological approach to the management of European wild boar (Sus scrofa) in Great Smoky Mountains National Park. Management Report No. 3, Uplands Field Research Lab, Southeast Region, NPS, Great Smoky Mountains National Park, Gatlinburg, Tennessee. 42p

Huff, M.H. 1977. The effect of European wild boar (Sus scrofa) on the woody vegetation of gray beech forest in the Great Smoky Mountains. Management Report No. 18, Uplands Field Research Lab, Southeast Region, NPS, Great Smoky Mountains National Park, Gatlinburg, Tennessee. 34p.

Langdon, S.A. 1977. Relation of European wild hog to the water quality of mountain watersheds: A bacteriological investigation on mountain streams and hog seats. Incomplete M.S. thesis, in 1977 Annual Progress Report: Wildlife Research Activities in the Great Smoky Mountains National Park Department of Forestry, Wildlife and Fisheries and Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee. pp. 16-23.

Resource Management & Visitor Protection, Great Smoky Mountains National Park, 1978. European wild boar management, Great Smoky Mountains National Park, 1959-1977. Report for the Superintendent, Great Smoky Mountains National Park, 18p.

Scott, C.D. 1973. Seasonal food habits of European wild hogs in the Great Smoky Mountains National Park. M.S. thesis, University of Tennessee, Knoxville, Tennessee. 54p.

Singer, F.J. 1976. Status of the European wild boar Project, Great Smoky Mountains National Park. Management Report No. 6, Uplands Field Research Lab, Southeast Region, NPS, Great Smoky Mountains National Park, Gatlinburg, Tennessee. 55p.

Singer, F.J.; B.B. Ackerman; M.E. Harmon and A.R. Tipton, 1978. Studies of the European wild boar in Great Smoky Mountains National Park. First Annual Report, Part I; Census, Trapping and Population Biology of European wild boar - 1977. Uplands Field Research Lab, Southeast Region, NPS, Great Smoky Mountains National Park, Gatlinburg, Tennessee. 38p.