Feral pigs and the environment: an annotated bibliography

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Feral pigs (*Sus scrofa*) have been introduced by humans to many parts of the world where pigs did not exist historically. In areas where feral pigs are an exotic species, they are a joy to people who like to hunt them and a menace to people who are concerned about their effects on native flora and fauna. In this annotated bibliography, we examine the scientific literature to assess the impact of feral hogs on their environment. We emphasize studies conducted in areas where feral hogs are exotic species, but we have also included those conducted within their native range, along with papers dealing with the management of feral hogs.

In preparing this publication, we were faced with many situations where we had to make a decision about whether to include or exclude a particular paper from our bibliography. Our decision usually was to include the paper because we cannot tell which particular papers might be of interest to a reader. Because all papers are listed in the index by key words, there is little cost to the readers if our bibliography is exhaustive if papers can be found easily and rapidly using the index. We have, however, only provided a summary or abstract for those studies we believed to be most pertinent to the topic.

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2002


Animals that find food for themselves, food finders, often can be exploited by others who attempt to steal the food, exploiters. If the food finders are unable to cope with this occurrence, behavioral adaptations other than foraging can become favored. Methods of adaptation vary depending on the affected species. Primates use tactical deception while ground-feeding birds adopt a change in their periphery foraging. The authors believe pigs also may change their foraging behavior, taking on characteristics similar to that witnessed in species that are exploiters. To investigate this possibility, the authors observed the foraging strategies in exploited subordinate domestic pigs. Pairs of subordinate and dominant pigs were then selected and subjected to a foraging trial. Subordinate pigs were trained to find hidden food. When the trained subordinate pig found the hidden food, the dominant pig of the pair would steal the food. After repeated trials, logistic regression was used to analyze the data. The authors concluded that the food finders would show food directed behavior more prominently if they believed this behavior would allow them to spend more time around a food item before scroungers arrived.


Feral pigs have become increasingly abundant in Namadgi National Park, Australia which has increased the amount of rooting and decreased plant species richness. Rooting by pigs was concentrated mainly in drainage lines and on flat land at higher elevations. Rooting occurred throughout the year, but was most severe in October and least severe in June. Prior to the implementation of a population control plan designed to reduce pig numbers, the effect of the pigs on common plants in Namadgi National Park was noticeable when the rooting became widespread. Pigs preferentially dug up the shrub Bursaria spinosa, the bulbina lily (Bulbine sp.), the vanilla lily (Arthrodium milleflorum), and two orchid species (Gastrodia sp. and Chiloglottis valid). The species density declined in areas where rooting was intensive. Rare populations of plant species were also impacted due to the incidental removal by pigs rooting for common species. In order to reduce pig rooting damage, a large reduction in pig abundance is necessary. Control of pigs was accomplished with bait stations containing warfarin poisoned grain.

In the central part of the Netherlands a study was performed to determine the impacts of ungulates on the regeneration of indigenous broadleaved tree species. Red deer, roe deer, and wild boar were thought to have a large impact on regeneration dynamics. Twenty paired plots, 10 fenced and 10 unfenced, were compared for regeneration of broadleaved trees over a 10-year period. In the fenced plots, there was an increase of tree saplings and shrubs of all types. Conversely, in the unfenced plots, where red deer, roe deer and wild boar were allowed to feed, two species of oak and silver birch were too heavily browsed to show successful regeneration under an open canopy of Scot's pine. Because beech was less severely browsed, it was the only tree species able to regenerate in these unfenced plots. Due to the preference of browsers for oak and birch, these tree species will never become dominant in the forest canopy, but will be out-competed by beech and Scot's pine.


An introduced population of wild pigs in South Carolina built a series of farrowing nests and resting/loafing beds in which to rear their young. Thirteen farrowing nests and nine resting/loafing beds were studied. Physical description, size parameters, associated animals, and adjacent surroundings were recorded for each nest or bed. Pre-parturition sows excavated each farrowing nest, creating a depression in the ground. These nests had shapes ranging from round to oval, and they varied in size in correlation with the size of the sow that built them. Six of the nests were located beside trees, stumps, or logs, and all but one had vegetation incorporated into its structure. The materials used in nest building included a variety of plant species readily available around the nest site. Most of these plants were gathered from within 20 meters of the nest site, with younger sows gathering nesting materials very close to the site, while larger, older sows ventured much farther. These older sows also used nesting materials from younger forests more frequently than from older forests. All nests were in locations with a canopy and an open understory. The thirteen farrowing nests were compared and contrasted with the nine resting/loafing beds. In comparison to the farrowing nests, the resting/loafing beds built by the solitary pigs were much smaller, not always excavated to create a depression in the ground, and did not always contain vegetation.


Santa Cruz Island, off the coast of California, has been affected by the introduction of pigs. Native mainland golden eagles have now been able to colonize the California Channel islands due to the abundance of the feral pig as a prey species. The previous lack of an abundant prey species made it difficult for the eagles to establish colonies. Prior to the introduction of pigs, island foxes were numerous on the island. However, the eagle population could not be maintained on a prey base of island foxes alone, but had to be supplemented by another food source. The introduction of feral pigs supplemented the original prey of the eagles. Because feral pig populations can withstand predation by golden eagles, the presence of these pigs in Santa Cruz Island allowed the eagles to colonize the island. The introduction of the pigs has also changed the predatory and competitive relations between the island fox and the island spotted skunk. Since colonization of the island by golden eagles, the island fox population has decreased dramatically, and the species is now heading toward extinction. Because of a decrease in competition skunk numbers have increased as fox numbers have dropped. In summary, the introduction of feral pigs has resulted in an increase in golden eagle numbers. Subsequently, the golden eagles have had little impact on the pig population, but have reduced fox numbers to near extinction, and have indirectly caused an increase in the skunk population because of a lack of competition from foxes.

Saniga, M. 2002. Nest loss and chick mortality in capercaillie (Tetrao urogallus) and hazel grouse (Bonasa bonasia) in west Carpathians. Folia Zoologica 51: 205-214

The coexistence of the white-lipped peccary, collared peccary, and feral hog is a questionable theorem. The masticatory and craniodental characteristics reveal important information about the competition for food between these three species. The diets of the white-lipped peccary and the collared peccary are closely associated. They are both believed to consume fruits, hard seeds, and roots as their primary diet and insects, annelids, and small vertebrates as a complimentary diet. The feral hog also eats many of these organisms; thus it is in direct competition with the peccaries. The two species of peccary have similar hinge-like jaw joints with pre and post-glenoid processes, interlocking canines that constrain lateral jaw movement, and enamel reinforcement in molar teeth. Skulls on collared peccaries are smaller than those of white-lipped peccaries, giving the white-lipped peccary the advantage of being able to bite harder and consume harder seeds. The feral hog has a bite that is at least as powerful as the white-lipped peccary, allowing it to feed on all the foods peccaries depend upon. A difference in the temporal system of the peccaries and the feral hogs also gives the feral hogs an advantage in finding food. The temporal lobe in hogs is higher than in peccaries, allowing them to root more successfully. Because white-lipped peccaries eat hard seeds or roots while collared peccaries prefer soft food items, these two species are able to coexist with minimal competition. However, the diet of feral hogs includes all of these food types, resulting in competition between the hogs and the peccaries. Ultimately, this could lead to the demise of the peccaries.


Two hypotheses were tested in an attempt to discover the affects of forest fragmentation on populations of wild boars. The hypotheses were 1) that the wild boar would behave like other generalist species with high reproductive potential, broad food selection, and habitat generalization, and 2) that the landscape pattern would determine the response of the wild boar to forest fragmentation, with boar numbers being higher in large and juxtaposed patches than in small and distant patches. Four areas of study were chosen meeting 4 criteria. The criteria were 1) no more than 20 percent forest cover at the regional level, 2) a certain degree of usefulness in the gradient of fragment sizes, 3) greater than 25 meters separation between forest fragments, and 4) dominance of holm oak in the fragment. To estimate boar population size in a forest fragment, the number of scrapes in that fragment were observed and recorded. Sampling of vegetation structure was also included on the trails where scrapes were observed to determine if the vegetation affected the boar population. The results indicated boars preferred larger forest areas near mountains or large riparian woodlands, offering them a variety of vegetation. Boars were more heavily concentrated in areas that had remained relatively unchanged by humans, indicating that agricultural landscapes may impede the boar’s ability to disperse to different forest fragments.


2001


There is a great need in wildlife management for a way to index populations of feral swine. Knowledge of abundance and distribution is valuable for many management operations. This study was conducted in Florida in an area that is home to a variety of threatened plants and
animals. Swine are controlled in the area to reduce and control their negative impacts. A major deficiency at the moment is an inability to measure abundance. A passive tracking index, originally used to measure coyote abundance, was used to accurately estimate the abundance of feral swine. The tracking index is a useful means for assessing the changes in the feral pig population, and also provides information on population distribution.


California’s Channel Islands are home to a population of island foxes that are declining due to the presence of feral pigs. Heavy grazing and rootling by pigs and other introduced herbivores have changed the type of vegetation in the area and increased erosion, decreasing of usable habitat for foxes. Previously, the fox was the top carnivore on the islands and was not threatened by other animals. In addition, golden eagles failed to colonize the islands because of a scarce food supply and the presence of bald eagles. However, due to the introduction of feral hogs and the removal of bald eagles through DDT poisoning, shooting, and other disturbances, the golden eagle has successfully colonized the islands. This colonization was facilitated by the introduction of a large prey base consisting of piglets. Along with piglets, the eagles prey on the island foxes. This predation has seriously decreased the number of foxes. As long as feral pigs remain on the islands, the eagles will continue to migrate from the mainland. Thus, the removal of pigs is a priority.


This study dealt with the interaction between native collared peccaries (Tayassu tajacu) and introduced feral pigs (Sus scrofa) inhabiting the same area in southern Texas. From 1993-1995 these species were observed in 3 scales of resource partitioning. These scales were 1) seasonal home range, 2) microhabitat, and 3) temporal microhabitat. Multi-scale partitioning may provide additive and multiplicative habitat partitioning between these species and allow coexistence, even during harsh environmental conditions such as drought.


This study reports high density estimates for wild pigs (Sus scrofa) for a seasonal tropical forest site within the species native range. The site was Pasoh Forest Reserve, a 2500 ha area of lowland dipterocarp rainforest in Peninsular Malaysia. Line transects were used to estimate pig densities from May to October in 1996 and 1998. In 1996, 44 sightings found 166 individuals along 81 km of transects. In 1998, 39 sightings found 129 individuals along 79.9 km of transects. The estimated population densities were 47 pigs/km² in 1996 and 27 pigs/km² in 1998. The differences in densities between years coincided with a high abundance of dipterocarp seeds in 1996. Overall, the densities of pigs at the Pasoh Forest Reserve were much higher than the densities in other European and Asian forests in the pig’s native range. Two possible factors could increase the number of pigs in the forest: 1) the extinction of natural predators such as tigers and leopards; and 2) use of the abundant African oil palm fruit from bordering plantations as a food supply.


This study examined the extent that native wild pigs influence the dynamics of tree seedlings and saplings in West Malaysia by comparing the plant communities inside pig enclosures to control areas. After 2 years, tree seedlings were 3 times greater in the enclosures than in the unfenced control areas. Soil rooting and seed predation significantly influenced species richness, growth, and survival of woody plants in the understory. Measurements from Pasoh Forest Reserve indicate that the pigs are having a considerable impact on understory vegetation dynamics.


The wild boar partly compensates for a reduced availability of above ground acorns in the spring by predating on hoards collected in the winter by small mammals. The availability of acorns in the spring is critical to female boars because they need the extra nutrition for lactation. In the spring, wild boars actively search for buried acorns, excavating the acorns they find by rooting. When acorns are found, locations with burrows are excavated significantly more than those without burrows. This behavior may influence the population dynamics of boars and small mammals. Although the amount of roots eaten was low, deep rooting remained high in February and March as boars excavated burrows containing cached acorns. The cues wild boars use to locate underground acorns are not known, but it is clear that the number of acorns in a burrow does not influence the probability of rooting. One possible explanation is that wild boars use the presence of burrow holes to find hoards of acorns. This explanation seems reasonable due to the lack of small mammals in the diet of wild boars, suggesting that they root to find acorns and not small mammals.


2000


Several thousand hardwood seedlings were planted in a wetland restoration area as part of a mitigation effort to restore a bottomland hardwood community. The area was pretreated with herbicide and a controlled burn. Damage was assessed on foot after the rooting of the pigs was discovered. Four of the nine species of hardwood seedlings were affected by the pigs, while the remaining five were unaffected. The pretreatment procedures may have influenced the pigs ability to find particular areas, or other factors associated with odor and taste may have been influential resulting in the selective depredation. Removal of pigs from adjacent areas before treatment could resolve the problem of depredation when replanting an area.


Saunders, G. 2000. The principles and application of effective pest animal management-feral pigs. NSW Agriculture and Bureau of Rural Publication CD-ROM.


This study used the mark-sighting approach to estimate densities of wild hogs in the north and central coast regions of California in 1994 and 1995. During this study, hogs were captured, marked, and released. Later, hogs were sighted with an automatic camera, and the number of marked hogs sighted was recorded. Eighty and 149 pigs were captured, tagged, and released respectively. Of the 249 hogs marked, 202 (88%) were sited by the camera. The mark-sighting data was analyzed with the NOREMARK program to estimate the population size maintaining a 95% confidence interval. The mean population density in the area ranged from 0.7 to 3.8 wild hogs/km², and densities increased between 1994 to 1995. This study also found that wild hog densities were lower in areas open to hunting, which suggests that sport hunting may be effective at reducing pig numbers.


Digestibility and voluntary intake of fibrous roughages and acorns was studied in six wild boars and five Meishan pigs. Organic matter digestibility of acorns, mixed grass and wheat straw was higher in the wild boar, while the diet of the Meishan pig was highest in mixed grass hay and wheat straw. No relationship existed between voluntary food intake and neutral detergent fiber concentration. The author concluded that wild boars and domestic pigs should be able to maintain themselves on a diet consisting of all fresh grass as long as the neutral detergent fiber concentration of the diet does not exceed about 55g/kg, and the N concentration is adequate.


Rooting by wild boars in Sweden was studied in an attempt to determine the intensity and impact of rooting between habitats as well as seasonal differences in rooting patterns. The areas being rooted were categorized by habitat type, soil category, and year. The largest rooted patches were found in deciduous forests and areas containing damp soils, while the smallest were in grasslands and areas with dry soils. Most rooting occurs from mid-autumn to early spring, but rooting decreases when new shoots from herbs become available later in spring. Rooting intensity varies annually, depending on the abundance and availability of preferred foods, which results in yearly variations in soil disturbance by wild boars.

Feral hogs can be a source of significant wetland disturbance during dry portions of the hydrologic cycle. In this study, fenced enclosures were used to evaluate the effects of hog rooting on total plant cover, plant-defined microhabitat diversity, and species richness within the Kissimmee River floodplain. After being subjected to rooting, there was a significant increase in the diversity of species in the unfenced control plots. Rooting changes soil characteristics by allowing soil to become oxidized through exposure, changing the topography of the soil, and changing the moisture characteristics of the soil. Hog rooting can also lead to open areas that can be colonized by various avian and fish species when the marsh floods again. Thus, the disturbance created by hog rooting enhances the diversity of wetland plant assemblages in the Kissimmee River floodplain.


Statistical models can be used to predict the outcomes of management decisions.
Conventional methods assume that factors are linear, but this is not the case in most wildlife damage situations. The Artificial Neural Network (ANN) model is suggested for use in such cases. With ANN models the predictive value is 82% with a deviation of 10% from the range of observed models. ANN models are used in France to predict the damage caused by deer and wild boars on certain agricultural plots. Based on these models, managers can decide how much protection a plot needs. In this study, damage costs were negatively correlated with the proximity of roads, the proximity of houses, and the number of houses in the vicinity of sites studied. A positive relationship was observed between damage costs and both the degree of enclosure in the area and the density of surrounding vegetation. Wild boar density was found to have a linear relationship with damage costs.


1998


Herbivores can reduce below-ground plant production and expansion of the root zone. In areas where sediment deposits are low, herbivores may destroy habitat in coastal marshes. Sediment deposits may be able to offset the effects of grazing by herbivores when rates of sediment deposits are high, but herbivores can contribute to the loss of wetlands when the sediment deposit rates are too low. This study investigated the effects of habitat use by wild boars and other herbivores on a coastal marsh. Wild boars were present in large numbers and used patches within their larger range. The patchiness of their habitat use created “eat outs” in patches where most of the above-ground biomass was removed. The below-ground biomass was also significantly reduced by grazing. The results from this study indicate that herbivores can have a substantial negative effect on the soil building process.


Populations of wild pigs are present in 45 of California’s 58 counties. The presence of these populations is a concern because wild pigs can cause significant damage to rangelands, farms, livestock and natural resources. Rooting by pigs in search of roots, fungus, insects and grubs can result in destruction of crops. Rooting also damages irrigation systems, ponds, and native vegetation. Wild pigs also will attack, kill, and totally consume lambs and calves, leaving no evidence of the attack. A survey was sent to all County Agricultural Commissioners in California in order to collect data on damage caused by wild pigs. The 40 counties that responded to the survey reported damages totaling $1,731,920. Rooting was reported as the major cause of damage followed by the consumption of crops.


This paper summarizes the current range of wild boars, current trends in their expansion and introduction into new areas, and the negative impacts resulting from their presence. Expansion into new areas can result from transport for hunting, escape from confined facilities used for hunting, dispersal of wild populations, and escape of domestic swine from free ranging commercial
ranches. Presently, wild hogs are rapidly expanding their range northward. This expansion into new areas can have a negative impact on native communities. The negative impacts of expanding wild hogs on native communities include competition with native animals for food, soil erosion, modification of habitat, predation on the young and nests of ground birds, predation on small vertebrates, and crop damage. Wild hogs also can act as reservoirs for diseases that can be vectored to native wildlife or domestic hogs. These problems are exacerbated by the fact that eradication efforts are costly and not always successful once a population is established, which can increase the difficulty encountered by managers trying to solve hog damage problems.


A survey and assessment of crop damage was conducted in villages in and around the Sariska Tiger Reserve, Rajasthan, India. Nilgai and wild boar were reported to be responsible for half of the total crop damage caused by animals. Populations of nilgai and wild boar in the area increased after a ban on hunting, and this population increase was correlated with an increase in crop damage. Together, these two species accounted for 60% of the crop damage in the area. Although both species caused considerable damage, wild boar damage to corn, wheat and gram was greater than that caused by nilgai. From this survey and assessment, it was determined that wild boar were feeding nocturnally on crops in the mid to late growth phases. Crop losses were more severe in the areas near the reserve than they were farther from the reserve.


Feral pigs are known to have high reproductive rates. This study investigated reproduction of feral pigs in south Texas. Three age categories were important in this study: 1) juveniles less than 12 months old, 2) yearlings 12-21 months of age, and 3) adults over 21 months of age. Ovulation was detected in all age categories, but yearlings were less likely to have ovulated. Litter sizes in this study ranged from 4.8 to 7.5 young per litter, with two instances of 2 litters in one year. It was found that the average litter size did not vary by age, but that the overall reproductive success of adult pigs was higher. Litter size was also larger in Eurasian boars, with a male biased sex ratio that was not statistically significant unless the two study populations were combined. Breeding in this area took place in autumn, early winter and spring. Because of the high reproductive rates of wild hogs, these hog populations could affect the community structure of native ungulates. This effect has been shown in other studies where pig to perecyar densities have been inversely related even though their diets do not overlap substantially.


This study investigates predation rates relative to the edge of a fragment of habitat. Predation events were categorized as being committed by birds or mammals, but not specific species. It says that wild pigs are potential nest and/or seed predators and were observed at the various sites.
1997


This study assessed predation by feral pigs in the semi-arid rangelands of eastern Australia. In this study, lambs chased by pigs were never caught if the distance the pigs had to run was more than 40m or the duration of the attack was longer than 10 seconds. Thus, the size and strength of the lamb determined its ability to evade capture by a pig. Twin lambs are smaller and weaker than single lambs, making them easier for pigs to capture. Twin lambs in this study were 5-6 times more likely to be preyed upon by pigs than single lambs. Thus, identification of twin bearing ewes and intensive management during the lambing season may negate much of the effects that feral pigs have on lamb production. The overall trend showed that as pig density increased, lamb predation increased until the pig density reached a saturation point. After reaching this saturation point, competition among pigs caused a decrease in pig numbers that resulted in a decrease in predation on lambs.


Introduced ungulate species have destroyed Hawaii’s native flora and fauna through competition and predation. Among these introduced ungulates is the feral pig. There are many techniques used to control feral pig populations in Hawaii. Neck snares are often used in areas that are remote and not easily accessible. Agencies that use this form of control have come under scrutiny from animal rights groups that allege that this method is inhumane and that snared pigs may die slowly and painfully due to the remote location. As a result of this scrutiny, a workshop was held in an attempt to analyze different control methods. This workshop resulted in the development of short- and long-term research agendas designed to investigate the feasibility of alternative methods of capture and control of feral pigs.


The diets of the feral hogs in Texas are similar to the diets of hogs in other semi-arid areas. This study investigated the diets of feral hogs in the western South Texas Plains, and the effect of these hogs on several threatened species. As a result of the variation in food sources among seasons, the diet of hogs on the study site varied throughout the year. During spring and summer, their diet consisted mainly of vegetation, while acorns were their main winter food source. Their fall diet was composed of roots and corn. Animal matter consisting of deer, mourning doves, reptiles, and other birds represented a small portion of the hogs’ diet. Of these, reptiles were the most susceptible to predation. There was competition between deer and hogs during low mast years, and hogs were observed excluding deer from eating acorns. Competition may impact the deer population in the area. The authors did not investigate feral hog impacts to the plant community.


1996


The effects of rooting by wild boars on soil chemistry and forest regeneration was studied in deciduous and coniferous forests growing in podzolic soils in the Netherlands. Mast availability increased rooting activities in winter and negatively affected trees. Rooting intensity was always highest in deciduous forests, and juvenile plant mortality was high in some areas due to mechanical damage and uprooting. However, juvenile plant mortality may be counteracted by improved germination and growth conditions. For most trees rooting by feral pigs has no impact on their ability to regenerate. Rooting was intense enough to reduce regeneration in 3 oak species Quercus robur, Q. petraea, Q. rubra and beech (Fagus sylvatica).


This study assessed the impact of browsing by wild ungulates in mountain forests of the western Italian Alps. In this case, trees received the most damage of any vegetation type studied. Damage varied by tree species and by species of ungulate browsers. Because wild boars (Sus scrofa) are not browsers, they contributed little to overall tree damage. Boars did cause fraying damage, but this damage was subordinate to the severe damage caused by deer. Overall, damage increased as ungulate densities increased.


1995


This study looked at the roles of dingoes and feral buffaloes in regulating feral pig (Sus scrofa) populations in the Australian wet-dry tropics. Although dingo predation on hogs increased with an increase in hog population, dingo predation alone did not regulate feral pig populations. However, when combined with interference competition by feral water buffalo, dingo predation appeared to help regulate pig populations. These observations seem to indicate that the combination of predation and competition is more important in the regulation of feral pig populations than either factor alone.


In this study, an index of feral hog damage was developed by using the occurrence of ground rooting as an index of changes in native vegetation in the Namadgi National Park. The most intense rooting was done in wet locations which, in the Namadgi National Park, are at higher elevations. Without control, the population was expected to increase rapidly and cause more damage. Control was accomplished by warfarin poisoning combined with some trapping. This control method succeeded in greatly reducing the feral hog population within the study area.


Because peccary group size tends to be larger in areas without feral hogs, hogs are thought to have a negative impact on peccary density. This study investigated spatial use and group dynamics of collared peccaries and feral hogs in southern Texas. Feral hog home ranges on this site were larger in the summer than in the spring, but overall trends seemed to indicate that feral hog territory size was decreasing. Historical peccary decline may have resulted from feral hog invasion. However, this study suggests that the invasion of feral hogs may be subsiding because of a decrease in hog territory size observed in the study, indicating a reversal of the previous hog invasion.


This study looked at resource use in populations of collared peccaries and feral hogs in a southern Texas mesquite and live oak brushland. Researchers found that resource use varied by season with very little overlap between resources used by the two species. Although both suids followed crepuscular activity patterns, feral hogs were more reliant on water sources and used lakes and mesic areas more. Additionally, hogs were more dependent on grass. This suggests that each of these species fills its own niche without a great amount of competition for resources.


Grubbing by pigs entails breaking through the surface layer of vegetation and excavating the soil to a depth ranging from 5 to 15 cm. This study investigated the effects of feral pigs on meadows in northern California. During this study, grubbed areas revegetated rapidly, but grubbing had significant effects on the composition of the affected vegetation. Initially, species richness was reduced in grubbed areas, but over time species richness of grubbed areas exceeded undisturbed sites. This increase in species richness was due to the grubbed sites being colonized by native annuals. These data show that pigs can be seen either as enhancing or reducing biodiversity, depending upon the time scale of the measurement.


The expansion of feral hogs into Texas has created many problems, including damage to agricultural crops, negative interaction with native plants and animals, and the spread of disease to humans. Feral hogs transmit brucellosis and pseudorabies to livestock. Between 1989 and 1994, crop damage due to feral hogs was reported to be between $10,000 and $300,000. The fact that white tailed deer avoid areas that have been used by pigs causes problems for managers trying to increase the deer population. Depredation of bobwhite quail nests by feral hogs also may become a problem in the Rolling Plains area of Texas. While these problems cause many people to oppose the encroachment of pigs, many support the spread of the animal, because it offers a hunting opportunity that is more affordable than hunting other big game species. With no natural predators other than mountain lions, the population of hogs cannot be controlled unless they are hunted.


1994


In this study, the home ranges of wild boars in Italy were assessed using radio collars to locate the boars as they traveled throughout the day. Although there was no clear preference for habitat (probably due to the homogeneity of the study area), the data did not show any consistent patterns in home range size, there were some overall trends observed. The home ranges of males were flexible and less intensively used than those of females. The home ranges of females overlapped, while male home ranges were more exclusive. Some female home ranges overlapped cultivated areas. Each home range contained a core area with preferred resting sites and feeding areas. The resting areas were continuously occupied, but the feeding areas were only visited periodically. The wild boars on this study site were mostly active at night and rested during the daytime. These data suggest plasticity of the spatial and activity patterns of wild boars.

Brownlow, M. 1994. Towards a framework of understanding for the integration of forestry with domestic pig (Sus scrofa domesticus) and European wild boar (Sus scrofa scrofa) husbandry in the United Kingdom. Forestry 67: 189-218.


The use of radiolocation with 8 juvenile boars showed that their location relative to their postnatal range was independent of the mother and siblings. Juveniles showed a degree of attachment to their postnatal range, but the surrounding areas were preferred. Juveniles were just as likely to be found with their mother as without her, but tended to separate from their mothers at times of exploration outside the postnatal range.


Wild boars in the Netherlands were given supplementary feed in order to maintain their numbers in an area that would not otherwise support the animals. Once the supplemental feeding stopped, the main staple was mast. When mast was depleted the boars ate roots and wavy grass, but these did not supply enough nutrients. This resulted in decreased weight, decreased fat stores, and reproductive failure among wild boars in the area.


The Northern California Coast Range Preserve (NCCRP) contains meadows that are grubbed by feral pigs all year long. This study assessed the dynamics of grubbing by pigs on a site in this area. Pigs grubbed an average of seven percent of the total area in the study area. Although the average depth of grubbing was less than 4 inches,
grubbing removed, buried, and disturbed the seed bed and the surface vegetation. The removal of vegetation led to altered soil conditions such as increased soil temperatures and increased nitrogen content. Grubbing also created large, unattractive open spaces, reduced perennial cover, and encouraged alien annual grasses. However, there were also positive benefits of grubbing by feral hogs, such as increased diversity in native plants. However, this may not be the case in areas where native plants are not resistant to disturbance and cannot out-compete aggressive alien plants.


A mark-recapture study was conducted to assess the impact of wild hog rooting on small mammal populations in the beech forests in the Great Smoky Mountain National Park. Small mammals were captured using live traps and pitfalls. Microhabitat variables were measured near each live trap. Populations of deer mice showed no significant difference between rooted and unrooted sites indicating that they may not be affected by the rooting of pigs.


1993


Feral pig activity was monitored in Hawaii to obtain indices of population size and to evaluate the effectiveness of control methods. Several pigs were radio collared to determine home range and patterns of movement. Snaring was the main control method used, and it proved to be the most effective way of removing the largest number of the pigs in the study area. Hunters with dogs also were used to kill pigs that had become trap shy.


Using mark-recapture techniques to monitor trends in population densities of feral pigs made it possible to compare pig densities in woodland habitat with cereal crops to those areas without crops. Comparison of the two habitats showed that the presence of cereal crops increased the population density of feral pigs almost four-fold.


The effectiveness of trapping was examined to reduce feral pig populations and the tendency of trapping to preferentially remove sows. Trapping was done with food baits at 2 sites. Proportional bait take indicated that pig abundance was reduced 100% in 16 nights and 93% in 18 nights for the 2 sites where conventional trapping was used. Spotlight counts estimated reductions of 81% and 83% respectively. Although the sex ratios of pigs at both sites were equal before trapping, sex ratios of trapped pigs were biased in favor of females.


Feral pigs were systematically removed from the Hawaii Volcanoes National Park. The removal began in 1980 when 175 pigs were removed from the area. The main control method used was hunting with dogs. This study shows that continual control with high removal rates can effectively eradicate or reduce feral pig populations to low levels within a few years, but periodic control is less successful. Hunts conducted during breeding and farrowing periods are most successful, because capturing entire family groups is more probable during these times.


Studies were conducted on the effectiveness of shooting feral pigs to reduce population sizes. Estimated population reductions over two consecutive years were 80% and 65% respectively. However, within 12 months the population had recovered by 77%.


The purpose of this study was to assess the effects of feral pigs on soil microarthropods in a Hawaiian rain forest. The author concludes that depletion of the microarthropods is caused by the rooting of feral pigs which have devastated soil microarthropod communities. The author also reports that fencing and removal of pigs can restore the organism within 7 years. Unfortunately this is an anecdotal study in which the author compared a single site with pigs to 3 sites where pigs had been removed. Lack of replication and poor experimental design means that it may be unwise to draw firm conclusions from this study.

1992


1991


Results from this showed that the density of some exotic plant species was lower in areas where pigs root, the density of other exotic plants was higher in areas where pigs root, and the density of some exotic plants was unaffected by pig rooting in Hawaii Volcano National Park.


This study assessed the impact of feral hog rooting on wetland and lowland evergreen monsoon forests in northern Australia. These areas were thought to suffer adverse effects due to feral pig rooting. The vegetation in the area consisted of small patches that were of high value to nature conservation. The pigs used the rainforest during the heat of the day, but foraged in adjacent areas. This study indicated that the effect of pigs on the monsoon rainforest minimal.


area for one year decreased the density of worms by 70%. Although the hogs control the worms, their grubbing caused damage to tree roots, leaving the tree vulnerable to disease. Control of the false spruce webworm by confining large numbers of hogs in the area is recommended when an outbreak of C. abietis is already in progress, but doing so may cause more damage than good in some cases.


Santa Cruz Island, California has been subjected to the impacts of feral pigs and sheep since the 1850s. In 1987, The Nature Conservancy began a program designed to eradicate pigs from the island. Trapping was the most effective way to remove pigs, but pigs that were trap shy needed to be removed by other means. Hunters with dogs were effective at removing these trap shy pigs.

Feral pigs are having a serious impact on native ecosystems otherwise protected by park status. Because pigs prefer tree ferns as food, fern density and population structure can be affected by consumption and rooting. Plant species diversity is reduced and structure of vegetation near the ground is simplified when pigs forage in an area. This opening of the understory by pigs allows invasive plant species to become established, compete with native species, and alter ecosystem structure. Soil compaction and removal of plant cover by pigs increases rain runoff and erosion. Periodic disturbance by pig rooting can also lead to the permanent loss of soil organisms important for nutrient cycling and the decay of plant material.


Several studies were conducted to investigate the feeding habits of wild boars in a forest habitat. The results of these studies showed that from February to April wild boars mostly rooted in habitats containing coniferous forests. However, beginning in August they fed more intensively in deciduous habitats. There was also some indication that boars were able to consume large numbers of forest insect pests, making them beneficial in the management of forest insects.


1990


A vaccine for pseudorabies and/or swine brucellosis was placed in fish meal containing a marker designed to allow researchers to assess which animals received the vaccine. Although deer and other animals were present, the only non-target animals to take in the vaccine were raccoons. Approximately four baits were taken by each animal, and 95% of the baits were taken within 72 hours. Late summer was the best time to distribute baits, because natural food supplies are low during that season.


The growing number of hogs in the Great Smoky Mountains National Park compete with other wildlife for space and food and cause considerable damage to natural systems. Hog rooting has a tremendous impact on the vegetation in the forest. In fact, rooting in gray beech forests can reduce herbaceous understory cover to less than 5% of its expected value. The disturbed plant species exhibit changes in population structure and species composition that favor plants with deep or poisonous roots. Rooting also may aid in the proliferation of a fungus that infects beech trees. Enclosures were established to evaluate the impacts of hog rooting on vegetation. The total cover in these enclosures quickly returned to previous levels, but species composition was slow to return to prereooting levels. Red-back voles and short-tailed shrews that depend on leaf litter for habitat were nearly eliminated from some rooted areas. Furthermore, the red-cheeked salamander and the Jones middle-toothed snail are two potentially threatened species that are consumed by hogs. Direct predation and habitat destruction reduced the numbers of microinvertebrates in the soil by an estimated 80%. Rooting also accelerated soil erosion and increased siltation in rivers and streams.


1989


Diet composition and diversity in juvenile, yearling, and adult pigs were studied in the Parc Naturel Regional de Camarque by examining amounts of the 7 most common food taxa consumed by each group. Diversity of foods consumed was highest in adults, followed by juveniles.


This study assessed the effects of hunting on the age structure and sex ratio of feral pigs in the northern part of South Island, New Zealand. The age structure of 1,966 harvested pigs was determined by tooth replacement, wear, and cementum annuli in molars. The youngest age group was most affected by hunting. In fact, pigs less than 1 year of age accounting for 70% of the harvest. Thirteen percent of harvested pigs were 1-2 years of age, while 18% were over 2 years of age. The sex ratio of harvested pigs was 1 male to 0.7 females.


In Naimadgi National Park (NNP) in Australia, feral pigs caused an increase in shrubs and a loss of herbaceous plant species. In Hawaii Volcanoes National Parks (HAVO), the pigs affected plant species composition and diversity. Park managers used different methods to handle these problems. In NNP, the pig population was reduced by poisoning with warfarin. Although this method successfully reduced the pig population, rooting damage remained high. In HAVO, the goal was to eradicate pigs from the area through exclusion fencing, hunting, snaring, and trapping. Through use of these techniques, pigs were successfully eradicated in three of the management areas in HAVO and populations were reduced in other areas.


Feral pig depredation significantly reduced longleaf pine seedling establishment in regeneration areas, reducing pine seedling density from 500 per acre in fenced areas to 8 per acre in unfenced areas. The results from this study suggest that if large populations of feral hogs were to remain uncontrolled in areas with longleaf pine seedlings, crop failure could result. Methods to control hogs may be needed to protect longleaf pine regeneration in areas containing hogs.


1988


In Pakistan, vertebrate pest damage to groundnuts starts in mid-July and continues until harvest 3 months later. When wild boars feed on ground nuts, they eat the entire nut. They seem to be drawn to the nuts early in the season before the shells harden. Some plants have only the nuts eaten off but are otherwise unharmed. However, rooting by boars feeding on groundnut crops also causes root exposure, withering, and death in some plants. This damage causes problems for farmers who must devote a considerable amount of time and resources to dealing with hog problems each year before they are able to harvest the nuts.


Feral pigs in Northern Australia pose a significant health risk to humans because they can carry contagious diseases, which can infect domestic pigs and cattle. For example, helminth parasites are passed to humans through the consumption of uncooked feral pig meat. People, who consume feral pigs, should be sure to properly handle and prepare the meat to avoid the transfer of parasites or other diseases.


The most visible damage in Hawaii’s natural areas is caused by introduced ungulates. Feral pigs are present on all the major islands, and the highest populations of these pests inhabit the wetter forested areas. On these islands, pigs dig up forest ground cover consisting of delicate and rare species of plants. This creates disturbed areas that allow for the invasion of exotic weeds.


1987


This study was conducted to 1) determine the population density, home range, and reproductive biology of feral pigs on Isla Santiago, Galapagos, and 2) to develop methods for the elimination of pigs from the island. Feral pigs were shown to have adverse effects on several endemic animal species on the island, but they do not seem to have an impact on the native vegetation. This resistance by the plants may be linked to the fact that the native giant tortoise heavily used these plants in the past, so the plants naturally can
This study also revealed that feral pigs on the island eat a variety of animals including the eggs and hatchlings of green sea turtles, giant tortoises, and dark-rumped petrels. Trapping and snaring to control pig numbers were shown to be ineffective and costly, while baiting with poison (compound 1080) was successful and cost effective. Shooting was effective but time consuming. Complete eradication of pigs from the island was the most expensive option considered, and it may also be impossible to accomplish.


Mansouri, A. 1987. Feral hog fidelity to home range after exposure to supplemental feed. Thesis, Texas A&M University, College Station.


Male and female pigs were observed to be active approximately the same amount of time. However, wild pigs were observed to be more active than domestic pigs. These activity levels likely are linked to food availability. Because domestic pigs are fed by humans, they do not need to actively search for food. Conversely, wild pigs must find their own food, so they must engage in searching activity. Thus, searching for resources increases the overall activity levels of wild pigs.


1986


This study assessed density, home range, habitat use, and reproduction in feral pigs on Santa Catalina Island. During the dry seasons (July-Dec. 1980, and June-Sept. 1981) home ranges were smaller than those during the wet season (Jan-May 1981). According to radio-telemetry data, home ranges differed significantly among pigs, and the home ranges of boars were larger than those of sows. During the dry season, feral pigs preferred cool moist canyon bottoms due to a physiological need for free water as well as a behavioral response to high temperatures. Flat aspects and lower elevations were used most heavily, while ridge tops and southern aspects were avoided. Dense vegetation was more actively sought after than open areas such as grasslands. Out hay cultivations also were heavily exploited. During the wet season, habitat use was a function of food availability. Pigs were most active during crepuscular and nocturnal times. The population showed seasonality in the timing of births, with some pigs giving birth in winter and spring and some giving birth in summer and spring. Females are known to have about 5 young every 0.86 years, and some females have two liters per year. In this study, fertility continued to increase with age until it peaked at 2-3 years of age. Most of the sows were older than 1 year, so reproductive potential was high for this population of feral pigs. However, 58% of the piglets died before weaning. Mortality was highest in summer months.


Growth of American beech in nine high-elevation gaps was examined to determine the effects of wild pigs on these trees. This study compared the growth of American beech (Fagus grandifolia) before and after feral pigs inhabited the site. After the pigs arrived beech trees exhibited a significant...
increase in shoot elongation. This increase may be due to the enhancement of nutrient mobilization in the soils that are disturbed by pigs. These findings suggest that wild pig rooting can be beneficial to beech growth.


Poisoning with sodium monofluoracetate (1080) is the most popular method used to control feral pig numbers. Under experimental conditions, most pigs vomited within 1 to 4 hours after ingesting 1080. Vomiting may result in pigs receiving sublethal doses of the toxin. The survival of these pigs after receiving sublethal doses may result in an aversion to 1080. The use of anti-emetics, such as metoclopramide, thiethylperazine, and prochlorperazine did not suppress vomiting in pigs poisoned by 1080, but the amount of vomit was reduced by increasing anti-emetic doses. This reduction of vomiting amount may increase 1080 retention in poisoned pigs, thus increasing the chance of mortality. The concentration of 1080 in vomit was highest during the first bouts of vomiting, but decreased rapidly in subsequent bouts. This potentially high level of 1080 in feral pig vomit can be hazardous to nontarget species.


Vassant, J., and D. Breton. 1986. Reduction of damage to wheat fields (Triticum sativum) at the milk stage by the wild boar (Sus scrofa) a preliminary study of the effects of the distribution of maize (Zea mays) in adjoining forests. Gibier Faune Sauvage 3: 83-95.


1985


1984


Marked sites at Port Ross, Auckland Islands, were examined after 10 years to measure the changes in vegetation and assess the impacts of feral goats and pigs. Chionochloa antartica tussock was eliminated or greatly reduced in areas where goats and pigs occurred together, and tussock was reduced slightly where only pigs occurred. Woody vegetation replaced Chionochloa tussock grassland and occupies sites where tussock has been removed. Pig rooting and browsing will continue to reduce lowland Chionochloa in their range.


Wild pigs are highly adaptive, have a high reproductive rate, and are secretive. These attributes have allowed them to occupy both original and introduced ranges. Between April and August, pigs can root as much as 80% of the surface area of a forest floor in search of food. The authors compared heavily rooted areas with undisturbed or lightly rooted areas and found a lack of red-backed voles or short-tailed shrews in the heavily rooted stands. The lack of voles appeared to be due to the destruction of habitat by the disruption of leaf litter and the moving of logs, while the negative response of shrews seemed to be due to an 80% decline in macroinvertebrates. Salamander numbers were not different between the two types of rooted stands. Researchers also found acceleration of
decomposition and the loss of soil nutrients, such as nitrogen, in heavily rooted areas. Accelerated leaching of Ca, P, Zn, Cu, and Mg from leaf litter and soil was also found in these areas. Although there was a considerable amount of bare soil on rooted sites, the loamy soils of the Appalachians were quite porous, and erosional runoff was nota big factor. The results of this study suggest that, in an area of intensely rooted high elevation deciduous forests, wild pigs have had negative effects on 2 ground dwelling species, vegetation cover, and concentrations of soil nutrients.


Santa Cruz Island, California is 25,000 ha in size, and is of the Mediterranean type climate. Feral pigs have inhabited this island since the 1920s. This study investigated activity patterns and habitat use by feral pigs on Santa Cruz Island. The major factors influencing the activity and distribution of pigs were seasonal changes in temperature and food availability and the availability of escape cover. The milder weather of fall and late winter caused pigs to be more active in the morning and evening, while the short, cool, and often rainy days of winter caused midday activity. Nocturnal activity was most often observed when conditions were warm and dry. The adaptable pigs were able to quickly respond to seasonal changes in temperature and availability of food and water. These changes in the environment influenced pig movement among ridge tops, midlimps, and canyons. Acorns and new growth of grasses and forbs dominated the diets of the feral pigs. These results suggest that the concentration of pigs in areas of abundant food can have lasting effects on the vegetation of the island.


1983


1982


Horn Island is a barrier island located in the Gulf Islands National Seashore. The results indicated that the disturbances caused by feral hogs did not have a major impact on the vegetation on this island. Seasonal differences in hog rooting seemed to be a reflection of the change in diet during the year due to varying abundance of insects, crabs, and dead fish. Rooting increased in the winter when above-ground food items were not available. The vegetation on Horn Island quickly recovered following disturbances by hogs. In fact, areas disturbed in winter regained their original cover within 6 months to 1 year. This quick recovery may be linked to the fact that disturbance is natural on barrier islands.


1981


The goal of this study was to determine if feral pigs prey on ungulates. Feral pigs were observed attacking and killing lambs on ten occasions in the spring and autumn of 1978 and 1979, and another fifteen lamb deaths also were confirmed pig kills. When within 10 m of the flock, lone pigs would rush the flock, attack the closest lambs and ewes, and kill lambs by biting the thorax.


Feral pigs have a diverse diet, allowing them to occupy an incredible range of habitats. They rarely migrate seasonally and range sizes are dependent on food availability. The effect feral pigs have on an area is dependent upon the density of pigs and the relative sensitivity of the natural systems in the area. Impacts are most severe when there is a high density of feral pigs and/or the plant system is sensitive to disturbance. One study, conducted after 8 years of feral pig occupation in a national park, noted a significant reduction in plant cover, an increase in bare ground, and a reduction in litter horizon depth. Soil horizons mixed and decomposition rates increased. Thus, rooted areas were less likely than pristine stands to be occupied by shrews and voles. However, rooting stimulated the sprouting of beech.


1980


At the time of this study, Horn Island, Mississippi had been inhabited by feral hogs for about 140 years. Park personnel had noticed extensive rooting and were concerned about the impact on the dune vegetation. The vegetation types that were hit hardest were wet grassland, dry grassland, and pine savannah, but there were no statistical differences in the damage levels between unrooted and rooted areas. Recovery rates of rooted areas were rapid, and the vegetative cover increased tenfold. Thus, the researchers concluded that the pigs did not have a significant impact on the vegetation on the island. They felt that because of the island's harsh environment of salt, moving sand, hurricanes, and fire, the disturbance created by pigs was not intense enough to harm the vegetation that can withstand these harsh conditions.


This study was conducted in the Great Smoky Mountain National Park and analyzed the distribution of rooting along elevational and habitat gradient. The author investigated hog diet, rooting activity, and habitat utilization during a year of mast failure. The data showed that wild boar rooting is widespread, affecting a wide variety of communities. The impact of wild boar on different understory species is variable. Mast availability influences the intensity of rooting in different areas.


Results from this study indicate that feral pigs can seriously reduce pasture production by rooting in the soil. Pigs use the pastures during the winter when other foods become scarce. Rooting has a greater effect on native pasture than on introduced pasture, but this may have more to do with grazing than with food preference. Areas in the Eucalyptus forest are in continual states of disruption, thus pig rooting may not be destructive unless the rooting frequency is high.


For this study, exclosures were constructed on the floor of a shallow prehistoric pit crater to assess pig damage and vegetation recovery. Extensive pig activity was noted with much of the herbaceous layer severely damaged or absent. A steady increase in cover was evident in all species inside the exclosure. Outside the exclosure, pig damage increased from 40% to 70%. The high pig activity prevented the establishment of new seedlings and exposed tree roots. Pigs greatly reduced the herbaceous layer and the chance for seedlings to become established. Vegetation responded quickly once pigs were removed from the area.


Mauget, R. 1980. Regulations ecologiques, comportementales et physiologique (Fonction de reproduction) de l'adaptation du sanglier, Sus scrofa, au milieu. These, Universite de Tours-Orleans, France.


Pavlov, P. M. 1980. The diet and general ecology of the feral pig (Sus scrofa) at Girrillambone, NSW. Thesis, Monash University, Melbourne, Australia.


In this study, 6 feral hogs (3 boars and 3 sows) in South Carolina were tracked for more than 12 months through the use of collars and harnesses containing radio-transmitters. The average home range used by boars covered 226 ha, while the average home range size for sows was 181 ha. However, pooled t-tests showed no significant difference between the home range sizes of boars and sows. DieI home ranges were also studied. The average dieI home range size for boars was 15.5 ha, while for sows it was 16.2 ha. Once again, statistical tests showed no significant difference between the sexes. Six habitat types were identified, and use of these habitat types by hogs was recorded. During all seasons, the most heavily used habitat types were fresh-water marshes and brackish-water marshes. Radio-collared feral pigs did not use salt marshes. Other types of habitat, such as upland hardwoods, were used based on availability and foraging opportunities.


The stomach contents of 92 feral pigs were examined over a 12-month period during 1975 and 1976. Fruits, especially acorns, were the most common food type consumed in fall and winter; herbage and foliage were most common in the spring, and roots were most common in the summer. Invertebrates and vertebrates were also a source of food for the feral pigs, although not as important as vegetation. Use of different types of food, such as woody plant roots, may have been underestimated due to eating habits of feral pigs. For example, when pigs eat roots, they chew the root, swallow the sap and starches, and then discard the woody portion. This sap will not be detected in a survey of stomach contents. Impacts of feral hogs on other fauna were mainly the result of competition, especially for the acorn crop. This competition for resources could impact the local deer herd.

1979


Feral pigs are a menace to the practice of agriculture in New South Wales. They threaten the livestock industry with to the potential spread of exotic diseases. Feral pigs can act as reservoirs for foot and mouth disease, African swine fever, and trichinosis, all of which can be transferred to domestic livestock, as well as humans. Feral pigs also cause damage to pastures, vegetables crops, and gardens. In areas near the coast, towns are located near forests and swamps. Because of their locations, citizens living in these towns are subject to property damage when pigs dig up lawns, shrubs, and vegetable patches. Additionally, rooting and wallowing by pigs can cause erosion in creek beds. Because of the damage caused by feral pigs in New South Wales, various population control methods have been used in an attempt to decrease pig damage. The three most common population control methods used have been shooting, trapping, and poisoning with compound 1080.


1978


Feral pigs are widespread in sheep breeding areas and can cause serious losses to lambing flocks. The extent of lamb loss due to feral pig predation is difficult to assess because pigs may actively attack the lambs, or they may just scavenge lambs that have died of other causes. This study investigated neonatal lamb losses due to feral pig predation. During the study, no feral pigs were seen killing lambs, and only one was seen eating a lamb. However, the significant difference in lambing performance between an open paddock and one that excluded pigs indicated that feral pigs can have a large impact on the production of sheep.


1977


1976


1975


The author compared vegetation in gray beech forests in the Great Smoky Mountains. In areas where there feral pigs occurred, understory cover
was reduced by 50% and there was some loss of plant species diversity. The vegetation that
remained in an area after rooting damage by hogs
was not adapted to the severe disturbances that
occur yearly. The results of this sampling suggest
that the recovery of hog damaged understory
unlikely as long as the hogs are present.

Challies, C. N. 1975. Feral pigs (Sus scrofa) on Auckland
Island: status and effects on vegetation and
nesting sea birds. New Zealand Journal of

Since their release on Auckland Island in 1807,
feral pigs not only have affected the number
and distribution of some bird species, but have
also modified many plant communities. Pigs
feed on large-leaved endemic species on
Auckland Island. As a result of this behavior,
this vegetation is now limited to inaccessible
steep slopes and cliffs. The effects of pigs on
birds and their nests is difficult to determine,
due to the presence of feral cats that also have a
negative effect on these birds. Although
population control has been advocated,
eradication of feral pigs is impractical. Thus,
action was postponed until information
assessing the value of control and the most
efficient methods of control could be gathered.

Iff, U. 1975. Verhaltensbeobachtungen beim
schwarzwild. Feld Wald Wasser 3: 2-5, 8-10.

Jezierski, W., and M. Andrzej. 1975. Food
requirements of a wild boar population. Polish
Ecological Studies 1: 61-83.

Martin, J. T. 1975. Movement of feral pigs in North
Canterbury, New Zealand. Journal of
Mammalogy 56: 914-915.

Paslawski, T. 1975. Attempts to reduce damage to
fields by forest feeding of black game (Sus
scrofa). Beitrage zur Jagd – und
Wildforschung 9: 188-194.

Pucek, Z., B. Bobek, L. Labudski, L. Milkowski, K.
Andrzej, and T. Andrzej, 1975. Estimates of
density and number of ungulates. Polish
Ecological Studies 1: 121-135.

Schneider, E. 1975. Mouse in the stomach of wild boar
(Sus scrofa). Zeitschrift fuer Jagdwissenschaft
21: 190-192.

Scott, C. D., and M. R. Pelton. 1975. Seasonal food
habits of the European wild hog in the Great
Smoky Mountains National Park. Southeastern
Association of Game and Fish Commissioners
29: 585-593.

Springer, M. D. 1975. Food habits of European wild
boar X feral hog hybrids on the Gulf Coast.
American Society of Mammalogists 55: 19.

Springer, M. D. 1975. Food habits of wild hogs on the
Texas Gulf Coast. Thesis, Texas A & M
University, College Station.

Timofeeva, E. K. 1975. On the ecology of the boar in
the forest-steppe oak grove belgorodsk oblast.
Moskovskogo Obshchestvo Ispytatelei Prirody.

1974
boar (Sus scrofa) on the high elevation vernal
flora in Great Smoky Mountains National Park.

The European wild boar causes damage to the
native vernal flora of hardwood forests in the
Great Smoky Mountains National Park. Over
50 non-woody species are known to be eaten,
uprooted, or trampled by hogs. The hogs in the
park seek and eat bulbs of the Turks cap lily,
Lilium superbum, causing a serious decline in
the species. Disturbed species show changes in
population structure, favoring plants with deep
or toxic roots. Degradation by hogs causes a
reduction in herbaceous cover, with areas that
have been occupied the longest showing the
greatest decline in species.

Ehrmann, J. 1974. Ein beitrag zum helminthenbefall
von schweinen aus gross-und kleinbetrieben
sowie der wildschweine. Diss. Tieraerstl. Fak.
Muenchen, Germany.

Fadeev, E. V. 1974. Population dynamics of Sus scrofa
in the European part of the Russian SFSR.
Zoologichesski Zhurnal 52: 1214-1219.


Hennig, R. 1974. Schwarzwildhege im
wirtschaftswald. Waldhygiene 10: 207-212.

Lyubchenko, O. V. 1973. Wild boar in the Voronezh
reserve. Moskovkogo Obshchestvo Ispytatelej
Prirody. Otdel Biologicheskit Byulleten 78:
17-29.

Snehlage, K. 1974. Das schwarzwild. Verlag Paul
Parey, 6. Auflage.

Wacker, F. 1974. Intensitaa der schwarzwild –
bejagung in Verschiedene zeiteinheiten
1973


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1966
Henry, V. G. 1966. European wild hog hunting season recommendations based on reproductive data. Southeastern Association of Game and Fish Commissioners 20: 139-145.


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| 1973 | Henry & Matschke |       |
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**Census**

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**Mammals**

*See also Deer Mice, Dingo, Island Fox, peccary, sheep*

- 2002 Roemer et al.
- 2001 Fisher
- 1995 Corbett
- 1994 Lusk et al.
- 1988 Yarrow

**Management**

- 2003 Keller et al.
- 2002 Hone
- 2001 Dickson et al.
- 2000 Fleming et al.
- 1998 Mitchell
- 1997 Artois
- 1995 Choquenot et al.
- 1994 Cary et al.
- 1991 Izac & O'Brien
- 1990 Belden & Frakenberger
- 1989 Briedermann
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**Population Dynamics**

**Movement**

**Marsh Habitat**

**Mortality**

**Prey**

**Poison**

**Population Assessment**

**See also Daily Movement, Dispersal, Seasonal Activity**

**See also Warfarin, Compound 1080**

**See also Population Dynamics**
<p>| 1981  | Litinov     |
| 1976  | Wennrich   |
| 1975  | Schneider   |
|       | <strong>Public Relations</strong> |
| 1998  | Frederick   |
| 1997  | Maguire et al. |
| 1996  | Sweitzer et al. |
|       | Updike &amp; Waithman |
|       | <strong>Rain Forests</strong> |
| 1995  | Anderson    |
| 1993  | Anderson &amp; Stone |
|       | <strong>Rangeland</strong> |
| 1998  | Choquenot  |
| 1995  | Kotanen    |
|       | <strong>Reproduction</strong> |
| 2001  | Dickson    |
| 2000  | Fernandez-Llario &amp; Carranza |
|       | Gabor &amp; Hellgren |
| 1998  | Ashby &amp; Santapillai |
|       | Taylor et al. |
| 1997  | Warren &amp; Ford |
| 1996  | Massei et al. |
| 1995  | Ahmad et al. |
|       | Boitani et al. (C) |
|       | Fruziinski |
|       | Neet |
| 1994  | Groot-Bruinderink et al. |
| 1993  | Gaillard et al. |
| 1992  | Abaigar    |
| 1991  | Kanzaki &amp; Ohtsuka |
|       | Mauget   |
|       | Pavlov |
| 1990  | Neuhaeuser et al. |
| 1989  | Braza &amp; Alvarez |
|       | Bugzo |
| 1987  | Baber &amp; Coblelntz |
|       | Pepin et al. |
|       | Saez-Royuela &amp; Telleria |
| 1984  | Aumaitre et al. |
|       | Meynhardt (A) |
|       | Meynhardt (C) |
| 1983  | Meynhardt |
| 1980  | Baertig (A) |
|       | Strand &amp; Morris |
| 1979  | Belden &amp; Frankenberger (B) |
| 1978  | Meynhardt |
|       | Tuercke |
| 1974  | Sneathlage |
|       | <strong>Reptiles</strong> |
| 1999  | Perry &amp; Morton |
|       | Fernandez-Llario et al. |
|       | <strong>Rooting Behavior</strong> |
| 2002  | Hone     |
| 2000  | Focardi et al. |
|       | Welander (A) |
|       | Welander (B) |
| 1999  | Arrington et al. |
|       | <strong>1998</strong>     | Ford &amp; Grace |
|       | 1996         | Bialy |
|       |             | Groot-Bruinderink &amp; Hazebroek |
|       | 1995         | Gallo-Orsi et al. |
|       |             | Welander |
|       | 1994         | Lusk et al. |
|       | 1993         | Mauzeta |
|       | 1991         | Bowman &amp; McDonough |
|       |             | Szczegola |
|       | 1982         | Johnson et al. |
|       | 1976         | Belden &amp; Pelton |
|       | 1975         | Belden &amp; Pelton |
|       | <strong>Seasonal Activity</strong> |
| 1999  | Jayson &amp; Sridhara |
| 1994  | Groot-Bruinderink et al. |
| 1991  | Gerard et al. (A) |
|       | Labudzki &amp; Wazaleko |
| 1990  | Hone (A) |
| 1988  | Dardailion |
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| 1982  | Baertig |
| 1975  | Scott &amp; Pelton |
| 1973  | Ellisor |
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|       | Scott |
| 1972  | Henry &amp; Conley |
| 1966  | Henry |
|       | <strong>Seed Dispersal</strong> |
| 2001  | Ickes et al. |
| 1999  | Perry &amp; Morton |
| 1993  | Ish-Shalom-Gordon |
| 1990  | Middleton &amp; Mason |
|       | <strong>Seed Predation</strong> |
| 1998  | Wang et al. |
| 1996  | Berger et al. |
|       | <strong>Sex Ratios</strong> |
| 2000  | Koritin et al. |
| 1999  | Fernandez-Llario et al. |
| 1998  | Taylor et al. |
| 1995  | Boitani et al. (A) |
|       | Boitani et al. (C) |
|       | Mazzoni-della-Stella et al. (A) |
|       | Mazzoni-della-Stella et al. (B) |
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| 1985  | Hell &amp; Salko |
| 1982  | Baertig |
| 1979  | Belden &amp; Frankenberger (B) |
|       | <strong>Sheep</strong> |
| 1997  | Choquenot et al. |
| 1982  | Pavlov &amp; Hone |
|       | <strong>Social Behavior</strong> |
| 1995  | Janeau et al. (B) |
| 1991  | Tsarev |
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| 1987  | Altman   |
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|       | Hirota &amp; Nakatani |
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| 1981  | Martinez – Rica |
| 1978  | Meynhardt |
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|       | <strong>Soil</strong> |
|       | See also Rooting Behavior |
| 1998  | Ford &amp; Grace |
| 1996  | Bialy |
|       | Groot-Bruinderink &amp; Hazebroek |
| 1995  | Gallo-Orsi et al. |
|       | Welander |
| 1993  | Vtorov |
| 1983  | Lacki &amp; Lancia |
|       | <strong>Supplemental Feeding</strong> |
| 1998  | Geisser |
| 1994  | Groot-Bruinderink et al. (B) |
|       | <strong>Telemetry</strong> |
| 2000  | Gabor &amp; Hellgren |
| 1998  | Baubet et al. (A) |
|       | Hahn &amp; Eifeld |
| 1997  | Massei et al. |
|       | Russo et al. |
| 1995  | D’Andres et al. |
|       | Ilse &amp; Hellgren (A) |
|       | Ilse &amp; Hellgren (B) |
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|       | Muhl &amp; Fournier |
|       | Russo et al. |
|       | Spitz &amp; Janeau |
| 1994  | Boitani et al. |
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|       | Gerard et al. (A) |
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|       | Jullien et al. |
| 1990  | Cargnelutti et al. (A) |
|       | Jullien et al. |
|       | Saunders et al. |
|       | Spitz &amp; Janeau |
| 1989  | McClroy &amp; Sailllard |
| 1986  | Baber &amp; Coblerlntz |
| 1985  | Spitz &amp; Pepin (A) |
|       | Spitz &amp; Pepin (B) |
| 1984  | Belden &amp; Frankenberger |
|       | Dietrich |
|       | Janeau &amp; Spitz (B) |
|       | Mauget (B) |
| 1981  | Singer et al. |
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**Threatened Species**  
*See Endangered Species*

**Toxins**  
*See Compound 1080, Warfarin*

**Traps**
- 1997: Sweitzer et al.
- 1996: Sweitzer et al.
- 1994: Caley
- 1993: Choquenot et al.
- 1991: Sterner & Barrett, Taylor
- 1990: Peine & Farmer
- 1980: Diong
- 1979: Belden & Frankenberger (A)
- 1978: Henry & Conley
- 1969: Matschke & Henry
- 1968: Henry & Matschke
- 1962: Matschke

**Tropical Habitat**
- 1993: Caley
- 1991: Bowman & McDonough
- 1990: Hone (A)
- 1984: Katahira

**Warfarin**
- 2002: Hone
- 1990: Choquenot et al. (B)
- 1989: Hone & Stone
- 1984: Hone & Kleba

**Wetland Habitat**
- 1998: Ford & Grace
- 1991: Bowman & McDonough
- 1990: Middleton & Mason
- 1987: Dardaillon
- 1986: Dardaillon

**GEOGRAPHIC INDEX**

**Africa**
- 1997: Artois
- 1991: Macdonal & Faedrich

**Asia**
*See also Guam, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Russia, Singapore, Sri Lanka, Vietnam*
- 1991: Kanzaki & Ohstsuka
- 1979: Smiet et al.
- 1975: Timofeeva

**Australia**
- 2002: Hone
- 2000: Heise-Pavlov
- 1999: Mason & Flemming
- 1998: Choquenot
- 1997: Choquenot et al.
- 1995: Caley & Ottley
- 1994: Caley
- 1993: Caley
- 1991: Bowman & McDonough
- 1990: Choquenot et al.
- 1989: Hone & Stone
- 1984: Hone & Kleba

**Belgium**
- 1995: Groot-Bruinderink & Hazebroek
- 1994: Groot-Bruinderink et al. (A)
- 1994: Groot-Bruinderink et al. (B)
- 2002: Sicuro & Oliveira

**California**
- 2002: Sweitzer & Van Vuren
- 2001: Fisher
- 2000: Sweitzer et al.
- 1999: Waithman et al.
- 1998: Frederick, Sweitzer, Updike
- 1997: Sweitzer et al.
- 1996: Sweitzer et al.
- 1995: Kotanen
- 1993: Mautz
- 1991: Sterner & Barrett
- 1990: Peart & Pattern
- 1986: Schuss et al.
- 1985: Baber & Coblentz
- 1985: Baber
- 1984: Van Vuren
- 1982: Barrett (A)
- 1981: Barrett & Pine
- 1980: Schuss
- 1978: Barrett
- 1973: Pine & Gerdes
- 1965: MacGregor

**Canada**
- 1986: Barrette

**Costa Rica**
- 2001: Sierra (A)
- 2001: Sierra (B)

**Czechoslovakia**
- 1989: Pikula & Beklova
- 1986: Kraochvil et al.
- 1985: Hell & Salko

**Europe**
*See also Belgium, Czechoslovakia, France, Germany, Hungary, Italy, Luxembourg, Netherlands, Poland, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine*
- 1998: Woelfel & Reinecke
- 1997: Artois
- 1996: Daskalova & Tzvetkov
- 1994: Genov et al.
- 1992: Wlazeklo & Labudzki
- 1991: Labudzki & Wlazeklo
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