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11 **Invasive Wild Pigs: A Significant Threat to America's Forest Resources**

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13 By John J. ("Jack") Mayer, Ph.D.
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15 In spite of having been present since the 1500s in what would later become the United States,
16 introduced wild pigs belonging to the species *Sus scrofa* have only recently been recognized in
17 our country as a very destructive invasive species. The damage done by these non-native pigs
18 greatly impacts both the human and the nature environments in this country.
19

20 *[Insert Figure 1]*
21

22 Pigs were introduced to North American during the early exploration and colonial time period on
23 this continent as a prolific source of domesticated meat. Free-ranging livestock husbandry
24 practices and escaped individuals led to wild-living populations of these early domestic pigs in
25 rural areas. Domestic pigs that go wild are technically called feral pigs. Starting in the late 1800s,
26 Eurasian wild boar were introduced into the United States to provide a new huntable big game
27 species. These wild boar were released into private fenced shooting preserves variously located
28 in New Hampshire, New York, North Carolina and Texas. Within a few years, the boar had
29 escaped each of these fenced enclosures, scattering into the surrounding forested lands. With
30 wild boar being the same species as feral pigs, in areas where these two types of pigs were found,

hybridization occurred. After 90 years of very stable numbers and distribution, these invasive pigs in the United States underwent a nationwide population explosion after 1990. In just three decades, this explosion, largely manmade from illegal releases and escaped animals from fenced enclosures, has gone from about 2 million up to almost 7 million pigs nationwide, and from a reported presence in 20 states up to a maximum of 48 states.

[Insert Figure 2]

Along with this population explosion has come an enormous increase in the damage that these pigs cause. Wild pig damage to the agricultural industry, specifically impacts to cultivated crops and domestic livestock, has been widely publicized. Such damage is estimated to cost the United States several billions of dollars annually. Although wild pig damage to agricultural resources receives most of the attention from researchers and the media, wild pigs also severely impact forestry and timber resources in this country. Such impacts to America's forest products industry have been recognized since the early 1900s.

Forested habitats are preferred by wild pigs, especially those associated with bottomland or swampy areas, although upland hardwood and pine forests are also occupied by these animals. Because of the amount of time spent in such forested habitats, wild pigs have the potential to cause considerable damage there. Being very resourceful opportunistic omnivores, as elsewhere, most damage to forests caused by wild pigs is due to their foraging. However, in addition to their foraging, wild pigs can also impact a number of different types of forest resources through their other daily activities. For example, wild pigs can girdle mature pine trees through rubbing, cause

54 damage to the bark of trees through a form of scent marking called tusking, and creating wallows
55 that can degrade forested wetlands through siltation and fecal deposition. Such nonforaging types
56 of impacts can be extensive. As an example, 90% of the pine trees found at one nature preserve
57 in California were impacted by wild pig girdling.

58
59 *[Insert Figure 3]*
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61 Within the spectrum of wild pig damage to forest resources, the most widespread and
62 economically costliest type is the depredation of planted pine seedlings. This has primarily
63 involved the grass stage of longleaf pines, but has also included slash pine, loblolly pine, and
64 pitch pine seedlings. This type of pig damage has been documented from several areas in the
65 southeastern United States. This involves the seedlings being pulled out of the ground or rooted
66 up by wild pigs, which then chew up the plant's rootstock and lower portion of the stem. The
67 pigs are attracted to these pine seedlings because the root system is high in carbohydrates. Wild
68 pigs will then systematically go from one seedling to the next in a planted row in pine
69 regeneration plots, ultimately depredating almost the entire crop. Wild pigs have been observed
70 destroying young trees at the rate of six per minute per animal, with sustained damage of as
71 many as 400 to 1,000 seedlings per day has been recorded. During the early to mid-1900s, in a
72 period of intensive planting of longleaf and slash pine by the U.S. Forest Service, entire pine
73 plantations in Alabama, Florida, Louisiana, and Mississippi were reported to be complete
74 failures because of wild pig depredations. This type of damage has continued through the
75 present, with pine regeneration plots being impacted wherever wild pigs occur.

77 *[Insert Figure 4]*

78
79 Wild pig damage to hardwood tree species has also been reported. Similar to pines, wild pigs dig
80 up and consume the root stock of planted hardwood seedlings. In one wetland restoration project
81 in South Carolina, the local wild pigs showed a preference for cherrybark oak, swamp chestnut
82 oak, water hickory, and swamp tupelo planted seedlings. In Europe, wild boar have been found
83 to selectively forage on the germinating seedlings and saplings of oak and beech species, having
84 a special interest in the highly digestible and protein rich roots in the late winter and spring. In
85 general, regular rooting by wild pigs negatively affects the regeneration potential of many
86 deciduous woody species. Rooting can also cause juvenile tree mortality through mechanical
87 damage and uprooting.

88
89 In the fall and early winter months, wild pigs forage extensively on the mast crop, primarily
90 acorns, beechnuts, chestnuts, and hickory nuts. Of these, oak acorns appear to be the most
91 important and preferred. This is evidenced by both the preponderant usage of this food when
92 available and the effect that the abundance of this resource has on reproductive success within
93 pig populations. Wild pigs will selectively consume acorns for as long as this forage resource is
94 available. Such extensive selective foraging reduces acorn survival and, therefore, reduces the
95 availability of acorns for both natural germination and consumption by native wildlife species. In
96 pursuit of this resource, wild pigs will even raid the ground-level acorn caches made by native
97 rodents such as squirrels, chipmunks, and mice. Although seldom recognized as such, their
98 extensive foraging on acorns is one of the biggest impacts that these pigs can have on forest
99 resources.

100

101 Wild pigs are also described as “ecosystems engineers” because of their ability to physically
102 change the environments that they occupy through extreme habitat modification. Both understory
103 and ground-story habitats can be severely impacted through wild pig rooting and foraging. This
104 is primarily due to the extreme and destructive alteration that these activities have on such
105 near-surface habitat types. Wild pig rooting and foraging results in a decreased plant cover and a
106 reduction in the litter-layer mass. Severely rooting sloped areas can be subject to erosion and
107 slumping. Areas of disturbed soil can also be more susceptible to invasion or population
108 expansion by exotic plant species. Small rodents and shrews that occupy these forest floor
109 habitats can also be impacted, and in areas that are intensively rooted, these mammals are
110 completely precluded from being able to occupy those now destroyed and unsuitable habitats.
111 Rooting and chewing by these wild pigs can also result in destruction to mature pines through
112 either exposure of or actual damage to the roots systems or bases of these trees. With respect to
113 impacts to timber management practices, extensive rooting and surface foraging by wild pigs can
114 also serve as functional fire breaks, creating difficulties in conducting prescribed burns in pine
115 flatwoods.

116

117 Rooting and subsurface foraging by wild pigs also modifies the chemistry and nutrient cycling
118 within the forest’s soil column. It mixes the upper soil horizons, reduces ground vegetative cover
119 and leaf litter, and accelerates the leaching of micronutrients from the leaf litter and upper soil
120 horizons. In Hawaiian native forests, researchers determined that wild pig rooting influences soil
121 respiration, which can subsequently impact terrestrial carbon cycling. With the widespread

targeted removal of earthworms, another favorite and sought-after food item of the wild pig, this subsurface foraging can also interfere with the decomposition cycle in forest soils.

[Insert Figure 5]

Wild pig damage to forestry resources has also been documented to cause problems with the control of insect pests, invasive species, and pathogens. Wild pigs forage on and damage tree fern logs in Hawaii, which then became preferred breeding sites of mosquitoes that transmit avian malaria. Wild pigs have been identified as one of the primary agents for the dispersal of invasive plant species such as the strawberry guava, guava, kahili ginger, banana poke, fennel, tropical soda apple, prickly-pear cactus and mesquite. Rubbing by wild pigs on the bark layer can leave trees more vulnerable to harmful insects and plant disease causing agents. Finally, in addition to the direct damage to floral species, wild pigs have been implicated in the transmission of plant diseases such as root rot fungus and other plant pathogens (bacteria, fungi, and viruses).

Wild pigs have also been described as ecological generalists. Very simply, this means that wild pigs can survive in almost any nonpolar habitat and eat almost any type of plant or animal material present in that area. As such, the specific composition of the diet of any one wild pig population is largely dependent upon what foods are available in the local area at any point in time. Their foraging preferences shift seasonally at any one location but encompass the various types of impacts described in the preceding paragraphs.

144 In contrast to agricultural resources, there has not been a nationwide estimate for the annual
145 damage cost for timber resources in the United States. However, Dr. Shari Rodriguez, Clemson
146 University, estimated that wild pigs cost South Carolina \$129,034,790 annually in losses to
147 timber resources. Extrapolating that figure from one state to the entire country would easily
148 result in losses in the billions of dollars. To better understand the significance of this type of
149 damage, this is an area of needed future research regarding invasive wild pigs.

150
151 With respect to management objectives on forested lands, for those areas with no wild pigs, these
152 forest resource managers need to have a goal to stay “pig free” while monitoring for wild pig
153 field sign (for example, rooting, tracks, sightings). If wild pigs appear, these managers need to
154 implement a rapid response eradication effort to stay pig free. They should not wait until these
155 animals turn out to be a problem, because then it becomes more expensive and potentially
156 impossible to achieve eradication. For areas with an established wild pig population, these forest
157 resource managers should maintain an ongoing directed control program. In addition, they
158 should not periodically back off on control efforts; one year of deferring control activities can set
159 you back five years in population reduction levels. Very simply, one can decrease the wild pig
160 damage in area by reducing the pig numbers found locally.

161
162 At present, viable management or control options for dealing with wild pigs include either lethal
163 removal or exclusion. Lethal removal entails shooting, trapping, dogging, or snaring. The use of
164 pig-specific toxins or poisons is being researched at the moment, but these substances have not
165 been approved by either federal or state governments for use in the field at this time. Exclusion
166 entails erecting pig-proof fencing to prevent these animals from accessing areas that need to be

protected. While this is viable option, it can be very expensive to build and maintain such fencing over large areas or tracts of land. One should, however, consider fencing for smaller critical or sensitive areas and habitats. In general, with wild pig management and control, there is no single viable option. Keep a variety of options in your toolbox and deploy each of those as appropriate.

[Insert Figure 6]

[Insert Figure 7]

In summary, when everything is considered, invasive wild pigs represent a very significant threat to forest resources in the United States. Considered by some as a desirable game animal, the damage caused by wild pigs is extensive, and very simply, the negatives greatly outweigh the positives. As such, wild pigs are a problem that cannot be ignored. New management and control options for these animals are being explored including, for example, pig-specific oral contraceptives that would be put into bait. However, waiting for such “silver bullets” is not an option. Invasive wild pigs have been described as the greatest emerging wildlife management challenge that this country faces in the 21st Century.

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Figure Legends

Figure 1. Wild pigs found in the United States vary in appearance from animals that look like domestic pigs (upper image) to animals that resemble Eurasian wild boar (lower image).

Figure 2. The origin and types of wild pigs found in the United States.

Figure 3. Pine killed through girdling by wild pigs rubbing on it.

Figure 4. Longleaf pine seedling is a preferred food item for wild pigs.

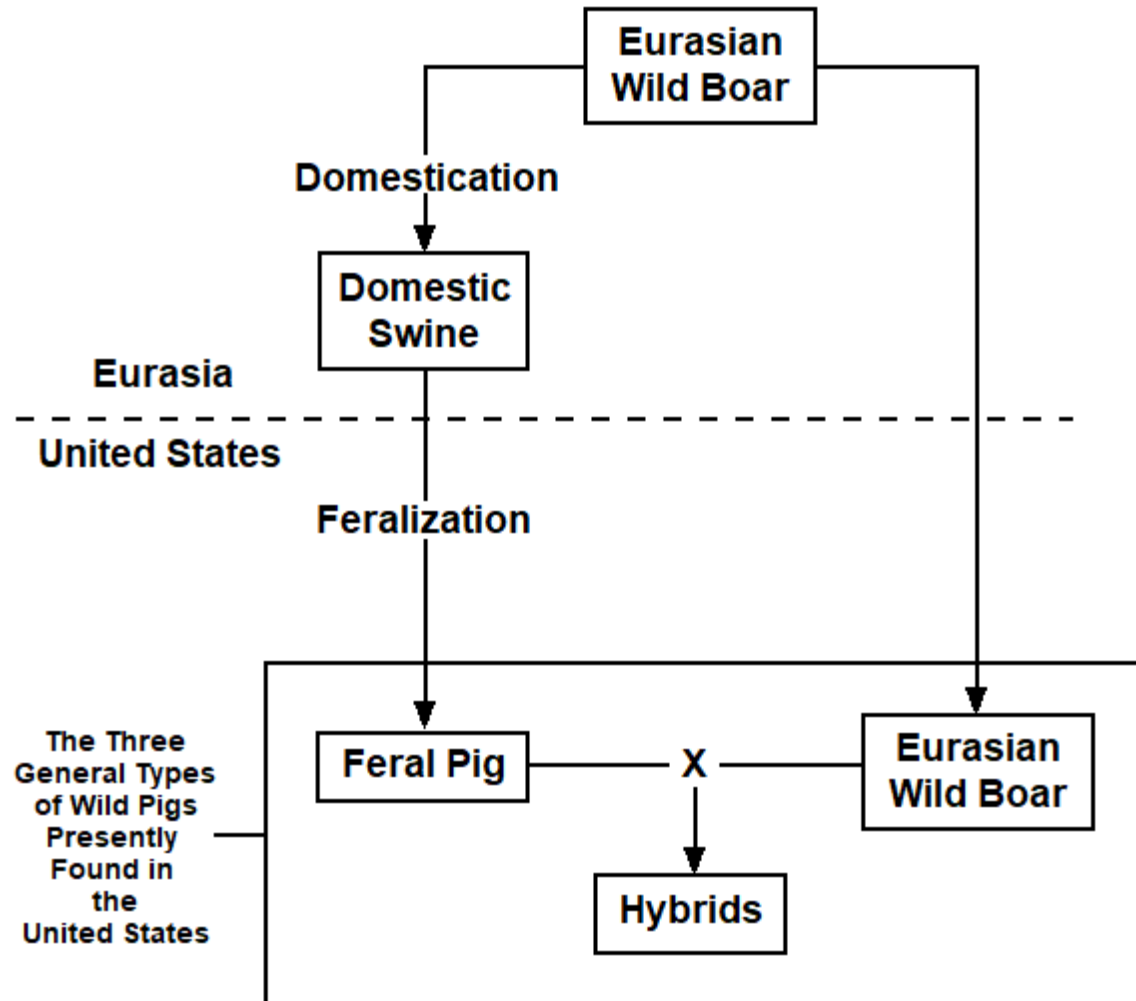
Figure 5. Wild pig rooting damage can be extensive.

Figure 6. High-tech corral trapping is one of the most effective ways to control wild pig numbers.

Figure 7. The base of pig-proof fence must be buried in the ground to be effective.

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