



Bird Flyways

**B**IRDS flying northward, as heralds before the face of the returning spring-time sun, follow paths as definite as those laid out for pilots of transcontinental planes. These can be traced by noting numbers on leg-bands of captured birds and then releasing them again, and also in a more general way by observers stationed at strategic points along the "flyways."

North America has four major flyways, with of course a number of feeders and branches. The four great paths follow Atlantic and Pacific coastlines, and in the interior, one along the east flank of the Rockies, over the Plains, and one down the great central valley with the Mississippi as a guideline.

Europe likewise has well-established flyways. Two of them cross Switzerland. One, originating in Russia, skirts the Baltic countries, Poland, and Germany, and thence into northwestern Switzerland. The second comes from Finland and northern Scandinavia. At the Rhine delta it divides. One branch toward the south goes via the coast of France and the Iberian peninsula. The other swings inland along the Rhine and eventually reaches northwestern Switzerland.

Unlike our North American birds, the birds of Europe that follow these inland routes have mountain barriers to climb. Passes become as important to them as to land animals—or even to airplanes. Thus it has come to pass that Switzerland is a strategic center for the study of migrating birds, and also that Swiss refuges possess high importance for the conservation of European bird life. In view of the ominous clouds now hanging over all Europe, it is perhaps well for the birds that this is so.

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## ECOLOGY

# Domestic Animals Run Wild Ruin Vegetation and Soil

**H**AWAII seems to have been a paradise that escaped the trampling hoofs and devouring mouths of the Age of Mammals almost entirely until the coming of that most troublesome of all mammals—Man. To introductions and changes wrought by human agency are traceable most of the damage and destruction to the unique vegetation of the islands.

Some of these disturbances were described before the North American Wildlife Conference at its Baltimore meeting recently by Samuel H. Lamb, assistant park naturalist of Hawaii National Park. Although Mr. Lamb confined his discussion to problems within the national park boundaries, he stated that in many ways these are typical of conditions for the countryside at large.

The only mammal that seems to have found its own way to Hawaii unaided by man is the bat. The original brown-skinned immigrants brought dogs and perhaps pigs, and they may have carried rats and mice as stowaways. Other students of the problem believe that the pigs, rats and mice date from a supposed visit by the Spaniards in the sixteenth century. Goats were brought by Vancouver in 1794, and other livestock came later.

## Feral Goats and Pigs

Of them all, most destructive to Hawaiian native vegetation are goats and pigs, escaped from domestication and now living as wild animals in the rough, wild interior, in part thickly forested, in part grassland and semi-desert lava fields. Goats are notorious everywhere as destructive feeders. Pigs are even worse, for they root underground, devouring bulbs and rootstocks, and breaking the ground cover to give alien grasses and weeds a chance to gain foothold.

Efforts to save at least part of the native vegetation include goat-tight fences around selected areas, followed by concerted drives to eliminate the feral animals within them. In broken lands where fencing cannot be carried out, the only thing that appears practicable is to permit and even encourage wholesale shooting of the goats and pigs.

In Hawaii, domestic animals that have run wild have made much mis-

chief in short time. Longer time has permitted more harm in a region where man has lived—and kept goats—since the dawn of civilization.

The goat, irrepressible, omnivorous, cropping every living shoot level with the bare soil, is pointed out as the "goat" of the age-old soil-erosion problem of southern Italy, Greece, and other Mediterranean countries by Sir Daniel Hall, director of the John Innes Horticultural Institution, in England.

First, the forests were stripped from the hills, and no provision made for their replacement. Then came the pressure to extend the limits of grazing.

"Grazing is all very well if regulated," said Sir Daniel, "but unfortunately in these Mediterranean countries goats are among the chief grazing animals.

## Goat is Chief Sinner

"It is no accident that old tradition has represented the Evil One with the hooves of a goat, for of all animals the goat plays the devil with land. Hungry goats will eat anything that grows; they destroy every seedling tree as fast as it gets its head up; they complete and extend the destruction the wood-cutters have begun."

Then comes the cycle all too familiar to Americans who have seen over-grazed land: the animals' sharp hooves cut the surface of the soil; they beat down hard little paths, invitations to runnels of water when the rains come. These become first little gullies, then great gashes, and presently the slope is slashed into badlands.

"Such has been the history of much of the fairest land on the seaboard of the Levant," mourned Sir Daniel. "On the heights bare rock where once forest and meadow flourished, rivers that are torrents in winter and dry in summer, old seaports no longer accessible.

"The destruction of the forest was thus a major factor in the decay of Greece and Rome itself; it meant in the first place the loss of farming land and of the agricultural population which formed the backbone of the early armies of the republic."

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A warthog always enters his home backwards.