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# GAME BIRDS SUITABLE FOR NATURALIZING IN THE UNITED STATES<sup>1</sup>

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## INTRODUCTION

Sportsmen share the admiration of nature students for native game birds and will cooperate to the fullest extent in preventing their extermination, but they see the necessity for using exotic species also if the game supply is to be maintained or increased. Such increase is widely demanded and will continue to be demanded, and to effect it necessitates the fostering of birds that respond most profitably to game-propagation methods. Where native game birds are abundant there is little or no need to plant exotic species; but where native species do not supply the demand, foreign game birds are being introduced. Let the native game birds enjoy the protection of game sanctuaries as numerous and extensive as can be afforded, but on those parts of our domain where public shooting is practiced and its continuance is desired, the practical necessities of the situation require the use of species of game birds that will produce the best results, regardless of their origin.

In considering possible sources of game birds for acclimatization in the United States, it is natural for one to turn first to Europe and Asia, not only because of similarity of climate, but also because Eurasian stock has so frequently proved its hardiness and adaptability. Reflect upon the origin of the domesticated animals and cultivated plants. Almost all are of Old-World stock—the horse, the cow, the pig, all poultry except the turkey; wheat, oats, barley, rye,

<sup>1</sup> The history of the introduction of game birds into the United States is given in the following publication: PHILLIPS, J. C., WILD BIRDS INTRODUCED OR TRANSPLANTED IN NORTH AMERICA. U. S. Dept. Agr. Tech. Bul. 61, 64 p. 1928.

every grain of importance except maize; apples, pears, peaches, cherries, all citrus fruits; in fact, most of the high-ranking cultivated fruits. Consider the chamois of the Alps, the ibex of the Pyrenees, the bustards of southern Europe, and the pheasants of densely populated China. They have maintained their existence in close contact with man for centuries, while similar representatives of our fauna, with untold millions of acres to range over, have faded away before the hunters like mist before the morning sun. It is true that these native American animals have been pursued by more numerous and better-armed hunters than were the wild Eurasian stock, and the contrast between methods of the chase in the Old World and in the New may well be further analyzed.

In this country, a fully armed population imbued with the theory of free shooting hunted to the verge of extinction a fauna wholly unused to the presence of a large population, almost before becoming aware of the impending result. In the Old World the number of hunters and firearms has always been restricted, so the game perhaps has not had to face so withering a barrage. However, the fewer hunters have customarily taken larger bags, and snaring, trapping, and other methods of securing game have been practiced for ages. The Eurasian game birds and animals doubtless had time through the centuries to develop defenses against man's slowly improving armament and a tolerance for the changes in natural conditions resulting from increased population.

American species, on the other hand, adapted to conditions in a country sparsely populated and primitively armed, were suddenly called upon to face the destructive influences of an effectively armed and ever-growing population. It is no reflection on the stamina of our fauna that it could not cope with a change in conditions that came on so rapidly that there was not time for the slow processes of adaptation. Whatever the reasons, there is little doubt that the wild life of the Old World, in general, has shown far greater ability than that of the New to survive despite human occupation of the land. Nothing is more logical, therefore, when seeking game birds for transplanting to a country that is now well populated, than to utilize species that have been tested and tempered by ages of close association with man.

#### POSSIBLE DANGERS FROM IMPORTATIONS

Many pests among the insects and weeds, and smaller numbers among other groups of organisms, tell the same story of greater adaptability of the Old-World fauna and flora to modern conditions. Very few American plants have become established in other lands, while the principal weeds not only of this country but of others widely spaced over the globe are of Eurasian origin. Similarly the English sparrow and the European starling have become thoroughly established in the avifauna of the United States, and various other birds from the same countries have become common in Australia and New Zealand. The Asiatic mynas have flourished wherever introduced, and one of them is now spreading in British Columbia. No American bird has exhibited such aggressive tendencies.

A lesson has been drawn from such instances, and now the introduction of practically all kinds of exotic animals and plants that may become pests is forbidden—an injunction enforced by adequate inspection service. There is little fear, however, that any of the large and highly edible species classed as game birds will continue for any period as pests. Should they exhibit destructive tendencies their numbers can easily be cut down by extension of the open season and increase in the bag limits. No bird that is widely prized for food is ever likely to become destructively abundant in the United States.

Fear has been expressed also that the introduction of foreign game birds might carry with it the introduction of diseases that would disastrously affect our native or domestic species. This is possible, of course, but it does not seem an argument to which much weight should be given, in view of the fact that domestic poultry is constantly being introduced, abounds in all parts of the country, and constitutes a source and reservoir of most of the diseases to which our game birds are susceptible. In other words, the disease hazard is scarcely likely to be notably increased by further introductions of game birds. There should, of course, be proper inspection of imported birds and exclusion or quarantine when found necessary.

Depletion of the food supply for native birds also has been cited as one possible bad effect of introducing additional species. The food supply for game birds can be increased almost indefinitely, however, if the effort be made. No introductions should be considered without prior attention to the food supply, and effectively increasing it if necessary.

#### SUCCESS IN NATURALIZING EXOTIC GAME BIRDS

Almost innumerable unsuccessful attempts have been made to introduce various exotic game birds, but these results condemn not the whole project of game-bird introduction, but only those ill-conceived and haphazard methods that have prevailed. Under these methods many unsuccessful introductions have been made of the same species that later or elsewhere have become established and have thrived beyond expectation. Thus the birds with which greatest success has been achieved may have appeared unsuitable on numerous earlier trials, and there is no way in which the success of a new introduction can be foretold. Methods can be improved, however, and it can be made certain that a desirable species has fair trial before it is dropped from further consideration.

Among the foreign game birds that have been naturalized in the United States, the ring-necked pheasant (including *Phasianus colchicus torquatus* and other subspecies and their hybrids) (fig. 1) now has an almost continuous distribution over the Northern States from coast to coast. (Fig. 2.) It has proved hardy as to climatic conditions, wary as to enemies, and without doubt is more numerous than any native game bird in the area occupied. The success of the introduction of pheasants in the Northwestern States is well known, but how amazingly the birds have thrived in certain other sections is not generally appreciated. In South Dakota, according to the director of the State Department of Game and Fish, pheasants increased

steadily from the first, a fact justifying almost steady lengthening of the open season and increase in the daily bag limit. The total bag in 1926 was estimated at a million birds, and in 1927 at from one and a half to two millions, a record that has scarcely been approached in all our history by a single species of game bird in a single State.

The Hungarian, also known as the European, or gray, partridge (*Perdix perdix*) (fig. 3), a later introduction, is showing the same ability as the pheasant to occupy and hold territory and to increase in numbers. These partridges are well established in various localities in the East and abound in the Northwest (fig. 4); 10 years after their introduction in Okanogan County, Wash., they had fully occupied the country for a radius of 150 miles, and on feeding

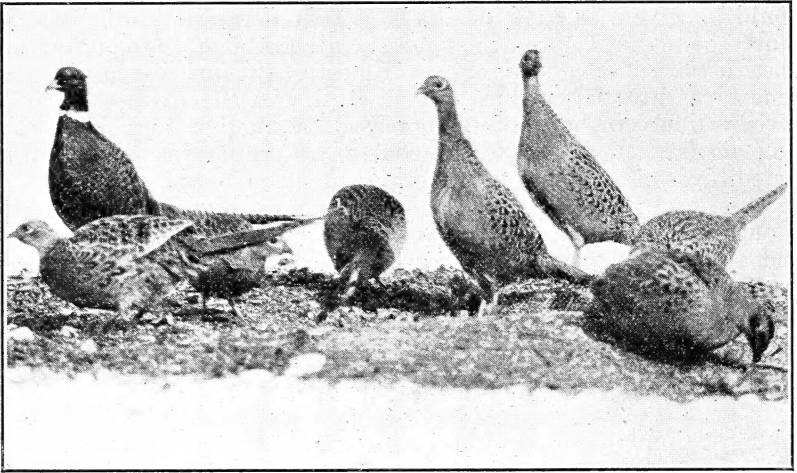


FIGURE 1.—Ring-necked pheasants

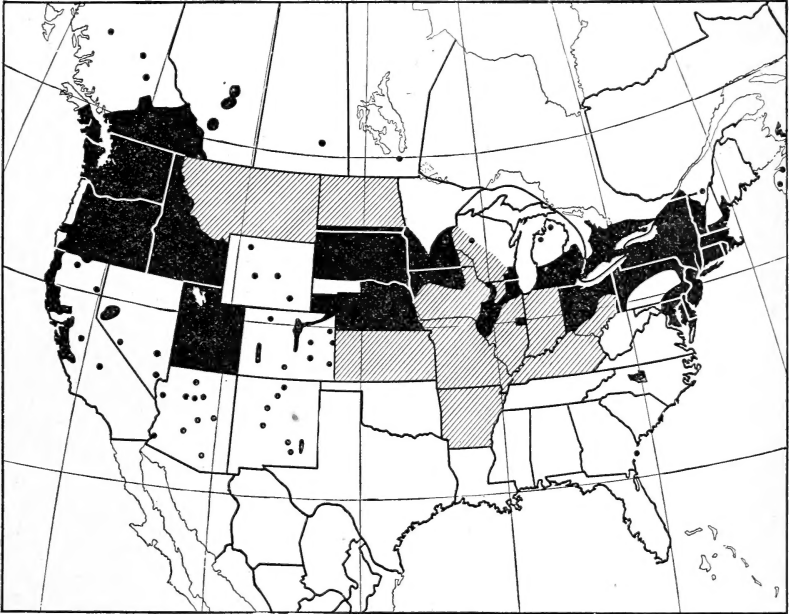
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grounds established after the shooting season, they gathered literally in thousands. The game warden of Okanogan County established a feeding ground about 30 miles west of Tonasket, where on 160 acres he counted and estimated proportionally 8,000 Hungarian partridges. In Alberta, where the partridge was first introduced in 1908, an open season of 30 days with a daily bag limit of 5 birds was permitted in 1912; limits later were extended until in 1927 the open season was 3 months and the bag limit 15 birds a day.

The State game warden of Oregon asserts that the Chinese pheasant and the Hungarian partridge produce probably 90 per cent of the upland bird shooting in Oregon and bear promise of doing likewise in many other States.

The case of Eurasian *v.* American game birds is fully made out in the experience with the pheasant and partridge in the Northwest. The native birds had equal opportunity with the foreign ones to respond to feeding and legal protection, yet with their advantage of close adaptation to country and climate, and priority of occupation, they failed to make good. In fact, only a single native upland

game bird — the bobwhite (*Colinus virginianus*) — has responded at all encouragingly to efforts to increase its numbers. If upland shooting is to be preserved in the face of an increasing number of hunters, birds must be utilized that can easily be distributed and increased; in other words, birds that can be handled and depended upon as a crop. Shall the efforts stop with present successes, or shall the activities of the agricultural explorers be emulated in ransacking the earth for forms that can be used to increase production? Success of the method in agriculture, and already in game-bird propagation itself, indicates further introductions as the most promising means of really increasing game-bird production.



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FIGURE 2.—American range of ring-necked pheasants, 1929. Solid black indicates localities where established; crosshatching, areas where systematic distribution has been carried on, the exact results not reported

#### SOURCES OF ADDITIONAL IMPORTATIONS

The common domesticated animals and plants and the game birds that have already been successfully naturalized have been derived chiefly from the Temperate Zone of Europe and Asia. Agricultural explorers of the Office of Foreign Plant Introduction of the Bureau of Plant Industry also have resorted most frequently to that region. Japan, China, Mongolia, and southern Siberia seem to be the most likely sources of novelties that will thrive under conditions prevalent over large areas in the United States. Suitable local surroundings also can easily be found for desirable game birds that live in almost any part of Europe. Along the Gulf of Mexico are small areas that may be inhabited by game birds of the subtropics of other countries, but, in general, stock for introduction must come chiefly from tem-

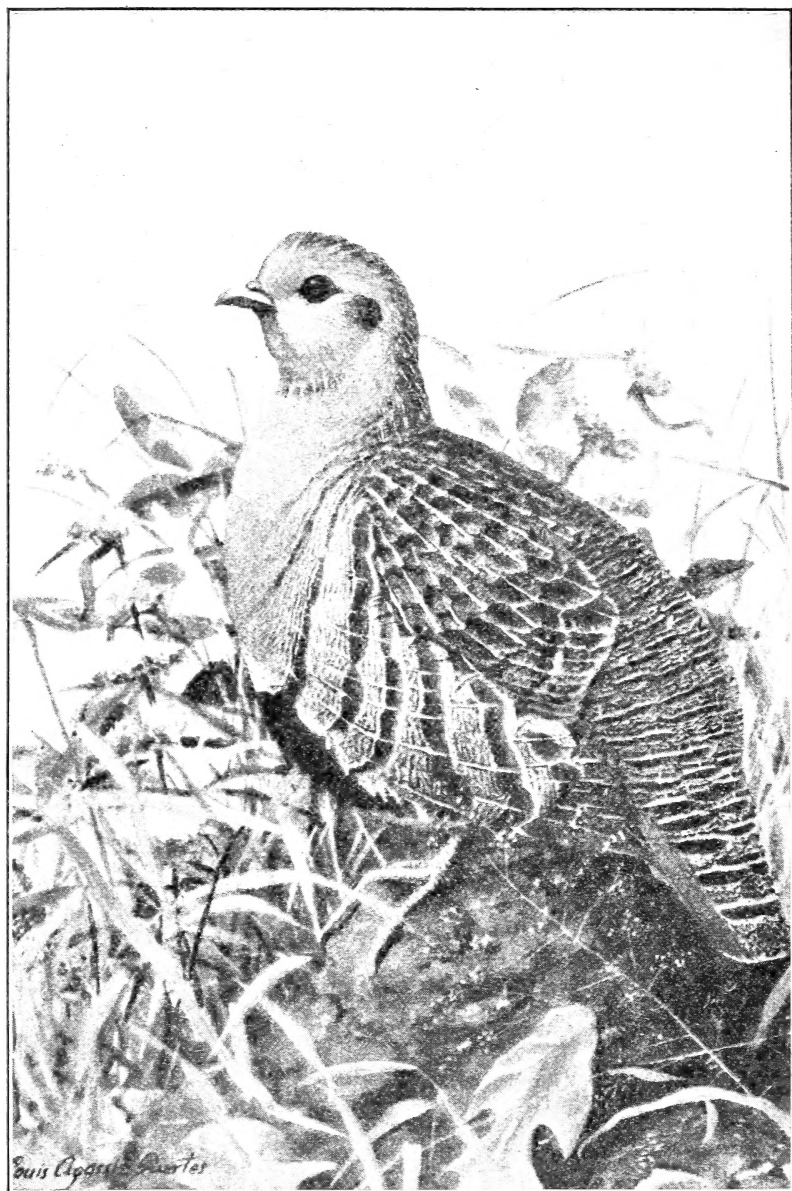


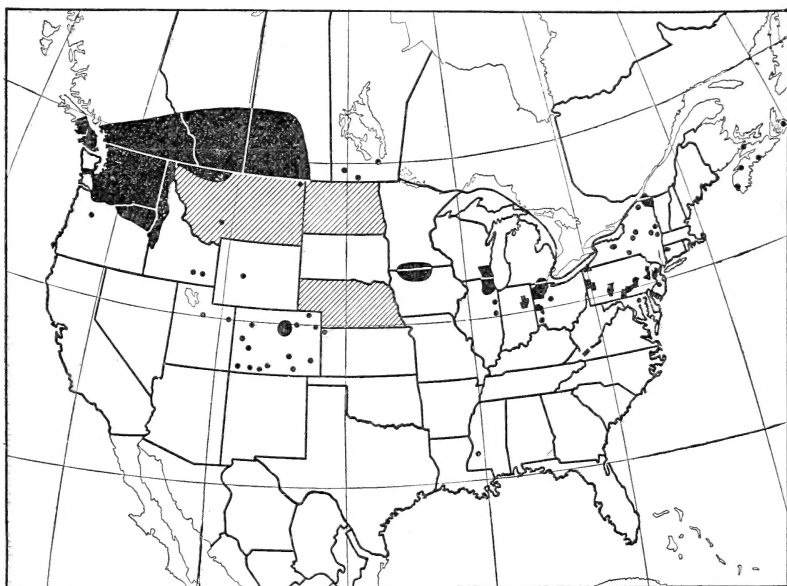
FIGURE 3.—Hungarian partridge

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perate regions. The Temperate Zone south of the Equator may be found as satisfactory as that north of it as a source of acclimatable species, but the available birds are not so well known, nor have they so often been tried. In some cases also the difficulty of transporting them through the Torrid Zone may prove a formidable obstacle to introduction.

In canvassing species to be recommended for introduction, the writer has taken into consideration the latitude, temperature, and precipitation of the regions inhabited, as given in standard works



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FIGURE 4.—American range of the Hungarian partridge, 1929. Solid black indicates localities where established; crosshatching areas where systematic distribution has been carried on, the exact results not reported

on meteorology, and has attempted to point out comparable areas in the United States. Maps such as those reproduced by courtesy of the Weather Bureau and the Bureau of Plant Industry in Figures 5 to 8 inclusive are of great aid in making general comparisons of climatic factors of parts of this country with those in other continents. In the case of a desirable bird, if the rainfall and temperature of its native home can be fairly well matched, it is safe to assume that other conditions can be so altered and controlled as to make them favorable to its naturalization. Suggestions along this line are contained in a subsequent section (p. 23).

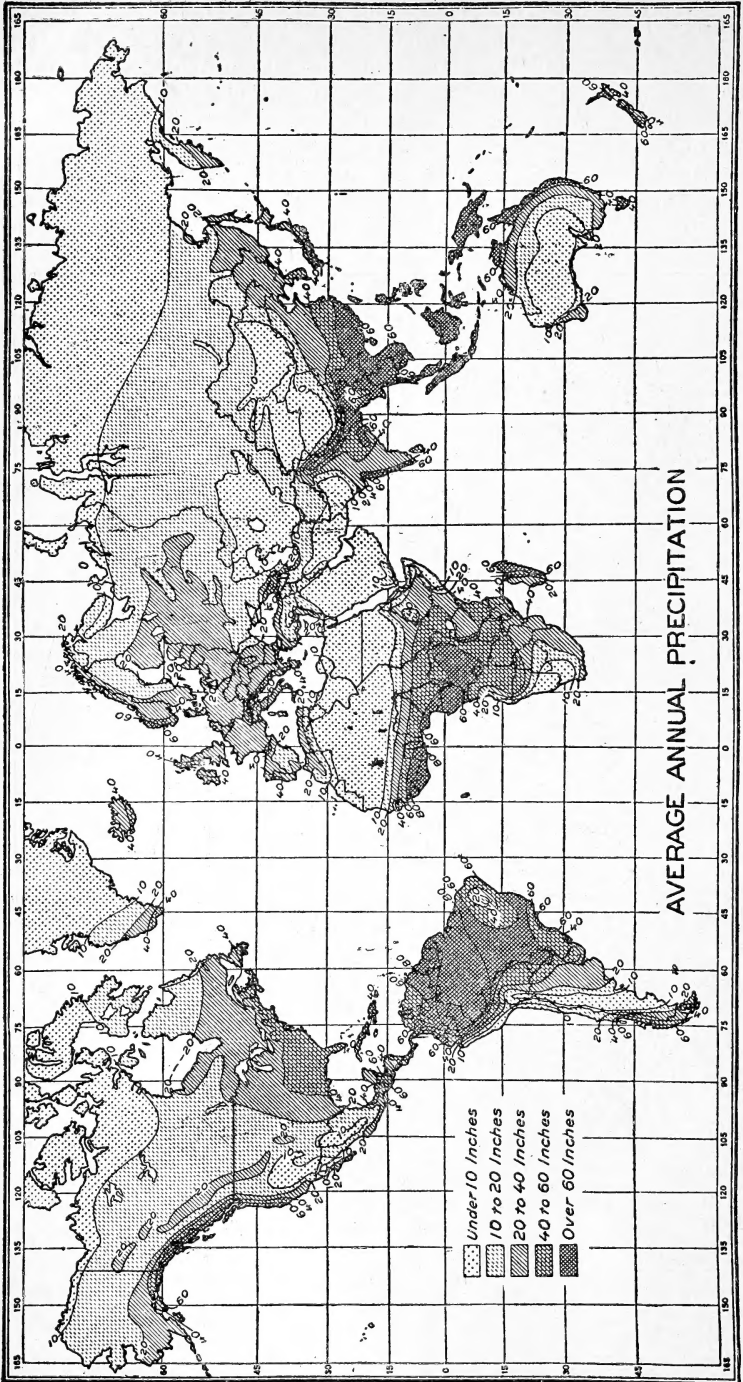


FIGURE 5.—This map shows in a very generalized way the world distribution of annual precipitation, which correlates broadly with the natural vegetation shown in Figure 6. In general, there are deserts where the precipitation is less than 10 inches, and primarily grasslands where it is between 10 and 20 inches. (From Agriculture Yearbook, 1924, p. 465)

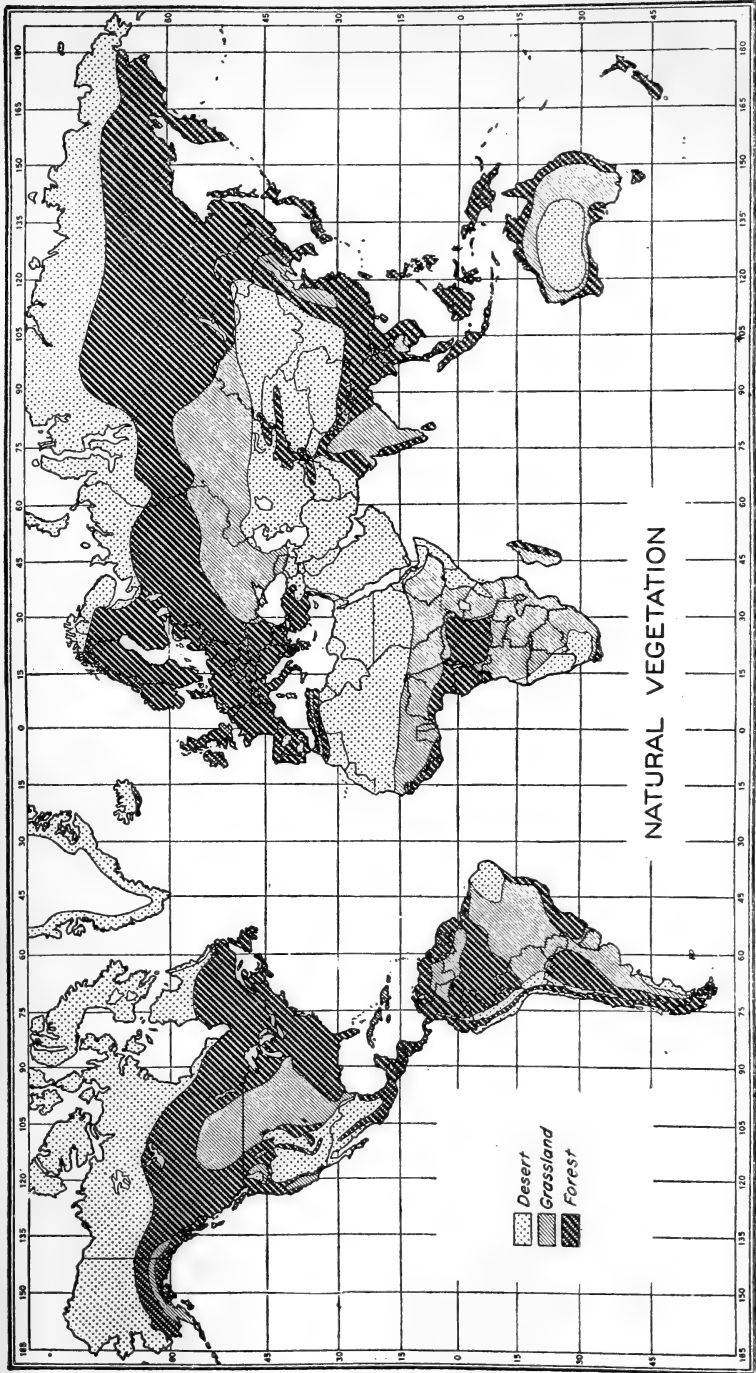


FIGURE 6.—A very generalized map of the natural vegetation of the world. Only three major divisions of vegetation have been attempted, including forests of all kinds, grasslands, and deserts. The principal forests are found in the well-watered areas, the grasslands in regions of scanty precipitation, and deserts where rainfall is very light or the temperature too low for vegetative growth. (From Agriculture Yearbook, 1924, P. 467)

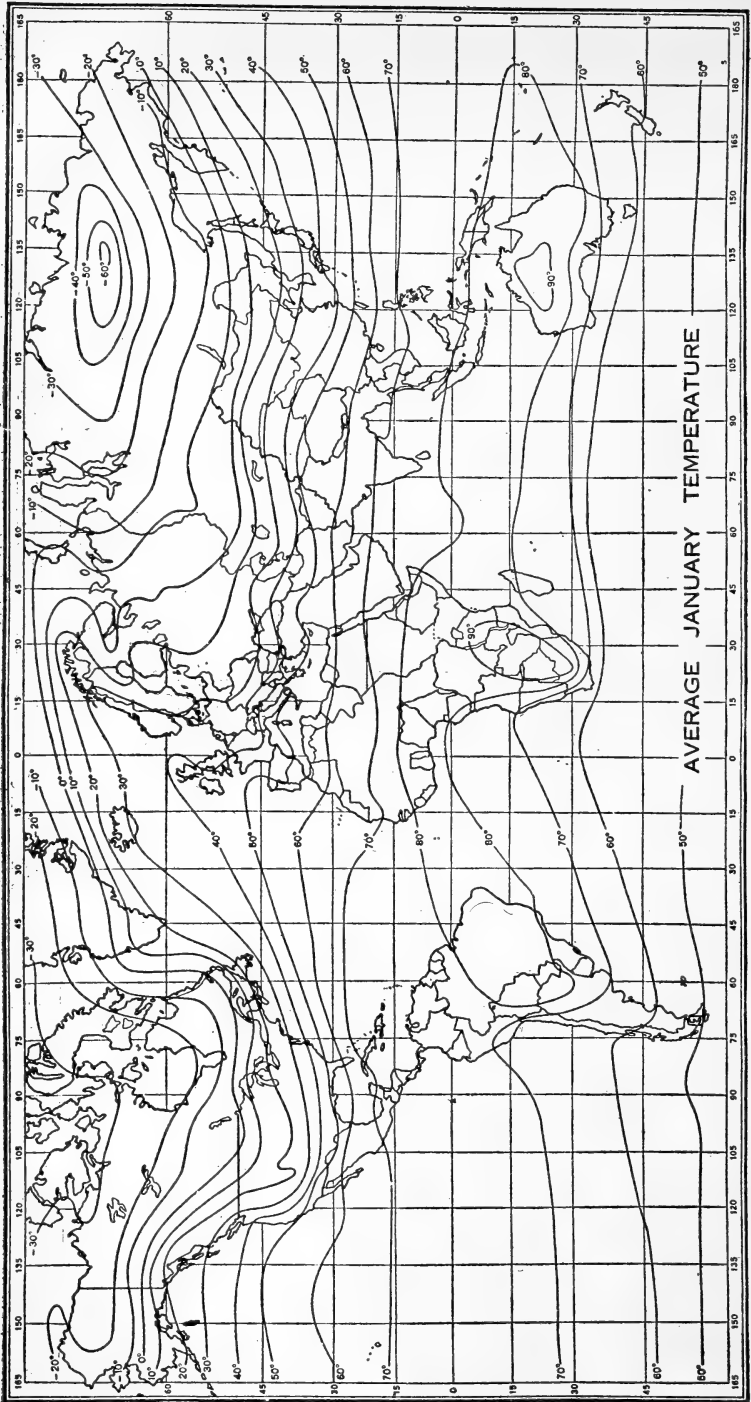


FIGURE 7.—Mean temperature in degrees Fahrenheit, for the month of January in different parts of the world. (From Agriculture Yearbook, 1924, p. 470)

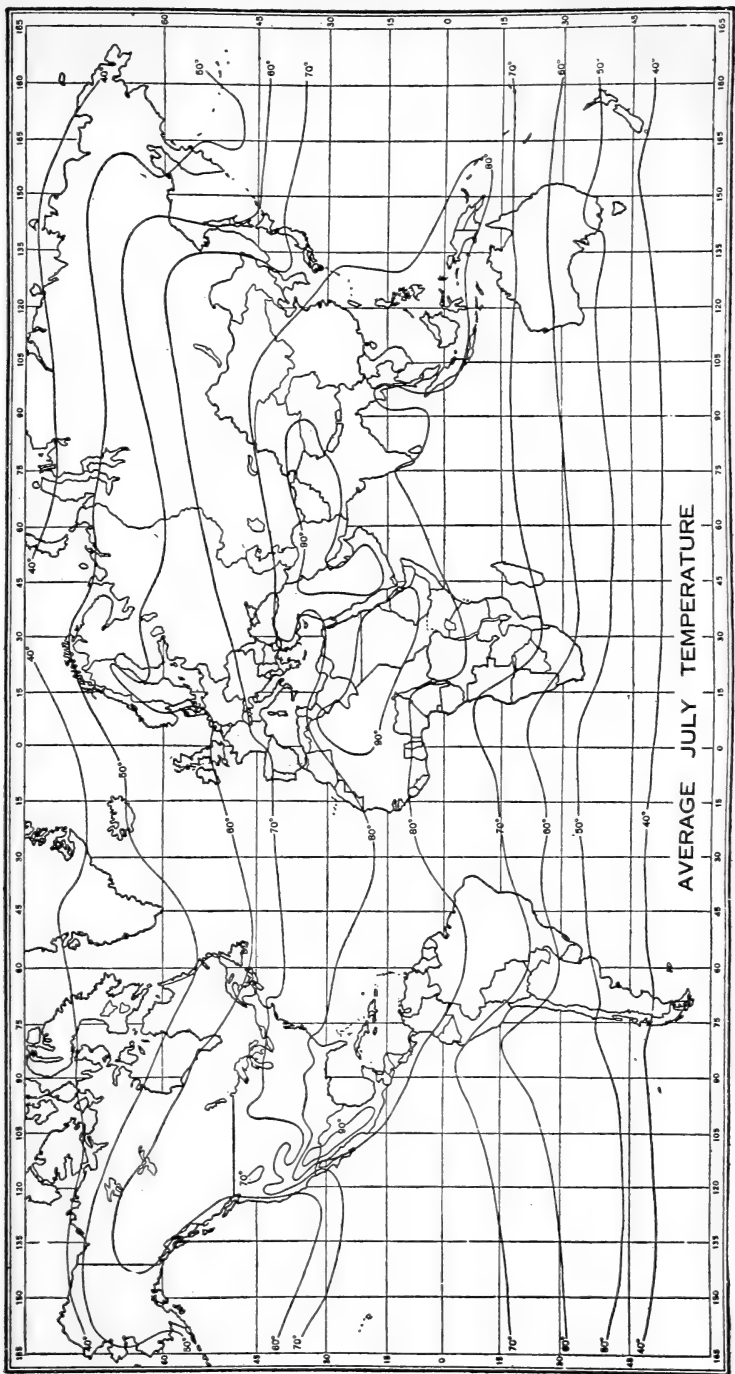


FIGURE 8.—Mean temperature in degrees Fahrenheit, for the month of July in different parts of the world. (From Agriculture Yearbook, 1924, p. 471)

## SPECIES RECOMMENDED

The birds that man has most successfully exploited have chiefly been wide-ranging forms of evident hardiness, having adaptability to a great diversity of environment and to extremes of climate. The jungle fowl, ancestor of all domesticated fowls, ranges from the equatorial jungles of Sumatra to the southern slopes of the Himalayas. The common pheasant in a complex group of closely related forms occurs from Asia Minor to Japan and Java. The so-called Hungarian partridge, the same species as the gray or common partridge of Great Britain, extends in a chain of subspecies from the British Isles to Siberia and India.

As possibilities for introduction there are not many species so promising as these from the standpoint of known adaptability, but there are some fairly comparable, as well as others suited to special

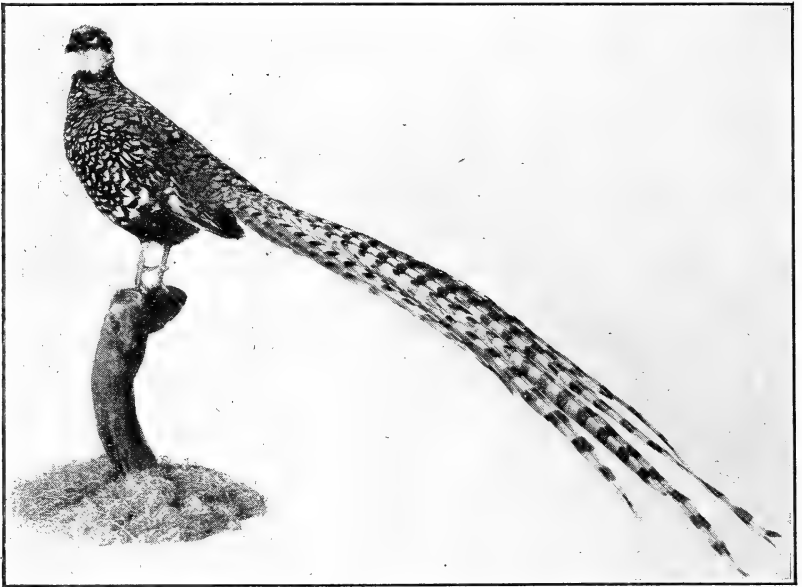


FIGURE 9.—Reeves's pheasant

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environments where now there are either no game birds or only species of an unsatisfactory type.

The greatest group of game birds available for introductive exploitation is the family of pheasants. There are about 80 species of pheasants in Asia, all large birds, most of them beautifully plumaged, and, as a group, characterized by keen senses, great wariness, and ability to look out for themselves both in relation to man and to natural enemies. Reeves's pheasant, the golden pheasant, the Lady Amherst pheasant, and the Japanese pheasant all have been naturalized in the British Isles, and the Indian peafowl has been established in various places outside its native range. Thus the possibilities of successful introduction of birds of the pheasant tribe are not limited to a very few species.

## REEVES'S PHEASANT

Reeves's pheasant (*Syrnaticus reevesii*) (fig. 9) is one of the handsomest of its family and the largest of the true pheasants, the long white-and-black barred tail alone of the male sometimes attaining a length of 6 feet. Marco Polo, the famous Venetian traveler of the thirteenth century, evidently saw Reeves's pheasant. In the language and orthography of his original translator he is made to state: "There be plenty of Feysants, and very greate, for 1 of them is as big as 2 of ours, with tayles of eyght, 9 and tenne spannes long, from the Kingdom of Erguyl or Arguill, the W. side of Tartary." This description is applicable only to the magnificent Reeves's pheasant, or "arrow fowl" of the Chinese, so-called from the appearance

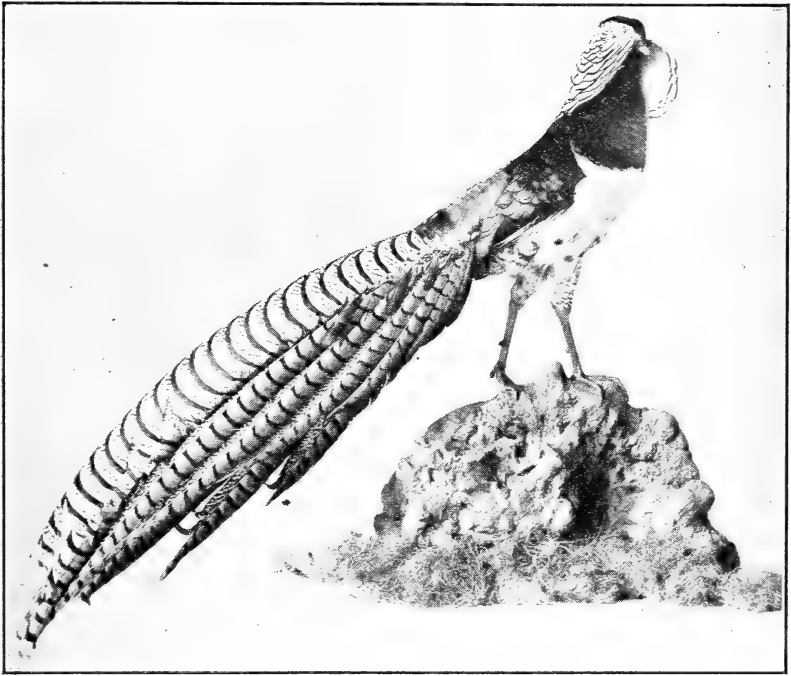


FIGURE 10.—Lady Amherst pheasant

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of these long-tailed birds in flight. This species usually occurs in small coveys, and for pace and strength of flight has no equal among pheasants. The males are great fighters, but their habit of drifting toward high points in their range keeps them separate for the most part from the common pheasant, which tends toward low ground. Reeves's pheasant is hardy and inhabits rugged mountainous country of from 2,000 to 5,000 feet altitude in central China. The southern Alleghenies and the northern California coast ranges seem to offer conditions similar to its native home, but it is probable that the species will thrive in rough and wild areas anywhere in the humid sections of moderate temperatures in the United States.

## GOLDEN AND LADY AMHERST PHEASANTS

The golden pheasant (*Chrysolophus pictus*) and the Lady Amherst pheasant (*C. amherstiae*) (fig. 10), also from the mountains of China, have plumage that is as wonderful in form as it is glorious in color. Their brilliant feathers have won for them in their native land the names of "fowl of gold," and "flower fowl." Both species are readily obtained and easily reared, both are hardy, and both have been acclimatized in Ireland and Great Britain. They are runners rather than fliers, however, and hence do not rank high as objects of sport. Probably they will do best in this country in districts having plenty of rainfall and a rather higher mean annual temperature than in the Northern States.

## JAPANESE PHEASANT

The Japanese pheasant (*Phasianus versicolor*), an inhabitant of the mountains of Japan up to 5,000 feet elevation, is the most gorgeously colored of the common, or ring-necked, group of pheasants. Although good flyers, the birds show little disposition to stray. They cross freely with other pheasants of their group, and as is usual in such cases the hybrids seem to be even more desirable from the sporting point of view than the parent races. This bird will succeed anywhere that the ring-necked pheasant does.

## INDIAN PEAFOWL

The Indian, or common, peafowl (*Pavo cristatus*), the remaining species of the pheasant family that is known to have been established in countries far from its native home, is so frequent in domestication as to be familiar to all. The peafowl was brought by the early Phoenician voyagers from India to the Pharaohs of Egypt; the bird is mentioned in the Bible, figured in Greek mythology, and later was symbolized in heraldry. The display of its elaborately and gorgeously colored upper tail coverts, which it spreads as it struts, has won the admiration of all observers. Its feathers are reputed to bring ill luck to their possessors, a bit of superstition that no doubt has often aided the bird in keeping them for its own purposes. The Indian peafowl, originally an inhabitant of low hot countries, even of deserts, is said to be extensively acclimatized in Hungary, has become naturalized in the Andaman Islands and St. Helena, and in this country has generally proved able to care for itself with the sole assistance of some grain-feeding. The birds thrive in large city parks and zoological gardens in all parts of the land and in various localities have maintained themselves practically in a wild state. At times they exhibit their strong powers of flight by getting up in the air and flying for miles. The peafowl are not likely to prove satisfactory object of sport, but they are unsurpassed as living ornaments for large estates.



## BROWN EARED PHEASANT

One of the pheasants most available for introduction is the brown eared pheasant (*Crossoptilon mantchuricum*). (Fig. 11.) It is not a good sporting bird, however, for when pursued it habitually runs to some high point and then scales off downhill. If regardless of this fault the introduction of the bird is sought, it will be found amenable to captivity, soon becoming tame and having evident predilections toward domestication. The eared pheasant is more of a digger in its search for food than the ringneck, and feeds upon tubers and rootlets in addition to insects, buds, and acorns. Its digging propensities might make it objectionable on farms, a point to be kept in mind when considering its introduction. Brown eared pheasants ordinarily associate in flocks of 10 to 30. They inhabit the bleak and barren plains and hills of northern China (apparently not of Manchuria), which are swept by damp cold winds and frequent bitter storms. Eared pheasants should succeed everywhere

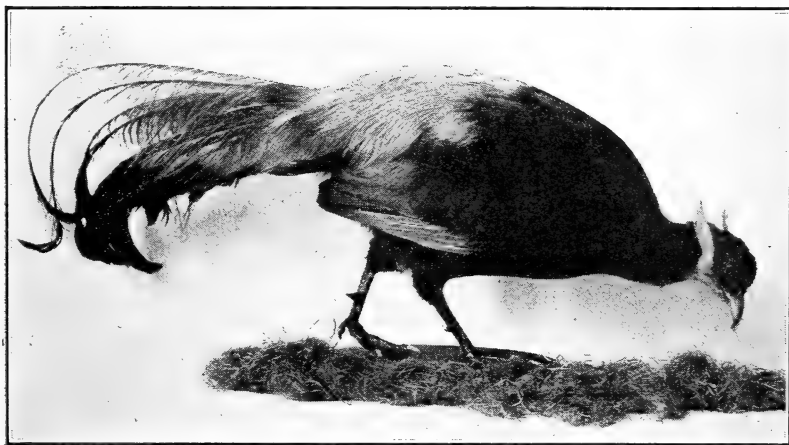


FIGURE 11.—Brown eared pheasant

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that the ringneck has succeeded, and even in areas where more severe winter weather prevails, and in those of a more barren type. Localities suggested for experimentation are western Nebraska and Kansas and other parts of the northern Great Plains, the eastern foothills of the Rocky and Cascade Mountains, and the eastern slopes of the mountains of central California.

## ELLIOT'S PHEASANT

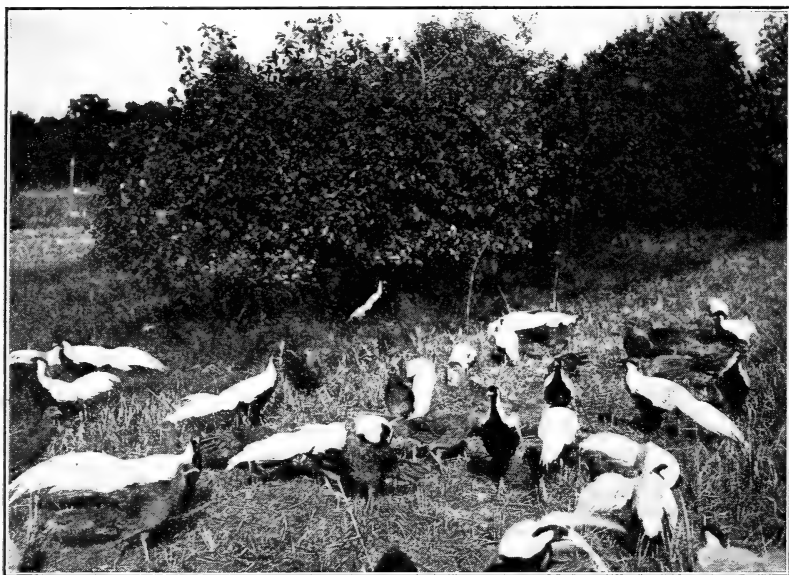
Adapted to still more barren country than the eared pheasant is the Chinese "fowl of the dry places," or Elliot's pheasant (*Syrnaticus ellioti*), a long-tailed bird with chiefly rich golden-bay plumage. Its natural home is the mountains of southeastern China, and it should be possible to acclimatize it in the mountains of western Texas and southern Arizona and New Mexico.

## CHEER PHEASANT

The cheer pheasant (*Catreus wallichii*), an alert, crested bird of the west-central Himalayas, seems adapted to fill a niche for which there is no native bird of real sporting class. This pheasant lives in coveys among precipices covered with heathlike vegetation on the edges of rainy forested areas of from 4,000 to 10,000 feet elevation and would seem a valuable species for introduction to similar situations from northern California to Washington.

## OTHER PHEASANTS

The pheasant race includes species suited to a greater variety of habitats than this country has to offer. It can not be hoped to acclimatize the species of tropical jungles, though if it could be given suffi-



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FIGURE 12.—Silver pheasants. (Photo by Samuel Evans)

cient protection, the Siamese crested fireback (*Lophura diardi*), of Siam and Cochin China, might be established in humid jungle country of Florida. If game birds are desired for country of from 9,000 to 16,000 feet elevation, the introduction of some of the blood pheasants (*Ithagenes* sp.) could be attempted, although the difficulties in the case of these birds of the mountains would be tremendous. They keep close to the snow line at all seasons and probably would have to be transported in artificially cooled vivariums. As they are runners rather than flyers, they are not in the first rank of game species. The Cascades and southern Allegheny Mountains should prove hospitable to some of the other pheasants, such as the tragopans, (*Tragopan* sp.), kaleeges (*Gennaesus* sp.) (including the common silver pheasant, *G. nycthemerus*, fig. 12), and the copper pheasants, (*Syrnaticus soemmerringi*).

Much more can be done with the ring-necked group of pheasants also than has been done to date. Covering so vast a range, these birds are adapted in numerous local races or subspecies to a number of different types of environment. For instance, Prince of Wales's pheasant (*Phasianus colchicus principalis*) inhabits grass jungles along rivers; the Chinese ringneck (*P. c. torquatus*) takes cover in reed beds and forages in open woods and cultivated fields; Strauch's pheasant (*P. c. strauschi*) ranges up to an altitude of 10,000 feet in the mountains of western China, and it could be used to extend the vertical distribution of pheasants in the United States, which now scarcely exceeds 2,500 feet; the Persian pheasant (*P. c. persicus*) lives on plains and feeds on juniper berries, which it could do on the Oregon and Washington deserts; and the Mongolian pheasant (*P. c. mongolicus*) lives among tamarisk-covered sand dunes, similar to some stretches of American seashores. The Japanese pheasant (p. 14) has been established in Hawaii; hence it seems better adapted to warm climes than most of its relatives. If such specialized birds were introduced into parts of the country having local conditions similar to those of their native homes, probably a large part of the whole country might be occupied by a population of intergrading local races of ring-necked pheasants, much as in their present great Asiatic range.

#### HUNGARIAN PARTRIDGE<sup>2</sup>

The Hungarian partridge (*Perdix perdix*) already widely introduced, is a game bird of the same type as that favorite of the American sportsman, the bobwhite. It lies as well to dogs as does the bobwhite and has the same great burst of speed when flushed. It is a larger and hardier species, however, and should solve the long-standing problem of maintaining a game bird of its type in the Northern States, where the bobwhite is killed out every few years by a severe winter. It has already proved a great success in southwestern Canada and should be perfectly hardy in all the Northern States. Partridges prefer rolling and partly cultivated land. They frequent grainfields before cutting, and the stubble afterward and have shown their fondness for cornfields where the shocks have been left standing. Their suitability for this country has been demonstrated, and their range here can be almost indefinitely extended.

#### RED-LEGGED PARTRIDGES

Red-legged partridges (*Alectoris* spp.), relatives of the Hungarian partridges, but trusting as much to their legs as to their wings and on that account not so popular with sportsmen, inhabit southern Europe and northern Africa and penetrate into Asia as far as India. They might be used to supplement a waning game supply in any part of the Southern States where the bobwhite can not be maintained in abundance, and include some species suited even to desert conditions. The red-legged partridges have the advantage of frequenting more barren tracts than the Hungarian partridge.

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<sup>2</sup> See pp. 6 and 7.

## GUINEA FOWLS

Game birds suitable also for the South, particularly to supplement the bobwhite, with which they would scarcely conflict, are the guinea fowls. The common guinea fowl (*Numida meleagris*) a native of west Africa, was introduced and has run wild in the Cape Verde Islands, in some of the Greater Antilles, and on Ascension Island. Several other species of guinea fowl occur in Africa, some of which have also been introduced into foreign countries. The guinea fowls evidently are promising material for acclimatization, and it is certain also that they would be popular in the gastronomic sense, for domesticated guineas have long been used by American hotels for "game" dinners.

## MEXICAN QUAIL

Mexican quail (*Colinus virginianus texanus*), extensively introduced in the United States, have become established in various States, where as a rule they have hybridized with the native bobwhite. Their introduction, however, is merely a time-saving substitute for propagation measures that should be more generally taken to increase the numbers of the native bird.

## AMERICAN SPECIES

Possibly in the Western Hemisphere there may be some other species of game birds that can be used to add to the stock of the United States, but the probability is not so apparent as in the case of the Old World. The rock ptarmigan (*Lagopus rupestris*) of our Arctic coasts might be successfully introduced on some of the higher mountains of the Western States. The pulletlike but noisy chachalaca (*Ortalis vetula*) from Central America, although scarcely a game bird from the American point of view, has been introduced and has bred successfully on Sapelo Island, Ga., and the common curassow (*Crax globicera*), a pugnacious bird rivaling the wild turkey in size, from the same native home, tried at the same locality, has shown some indications of being adapted for naturalization. The tinamous (Tinamidæ), of southern South America, a group numerous in species and ranging in size from that of quail to that of guinea fowl, inhabit both forested and more open areas. Some are true savanna species, which might succeed in grasslands that are not overgrazed. Whether they would do any better under existing conditions than our native prairie chickens (*Tympanuchus americanus*) is unknown, but experimenting with them could do no harm.

## BUSTARDS

Magnificent game birds that would be distinct acquisitions for our typical ranch country are the bustards, of which there are a number of species in Europe, Asia, and Africa. There is nothing like them in the United States and they have proved their ability to live in populated districts. The great bustard (*Otis tarda*), a bird of the open country, attaining a weight of from 20 to 30 or more pounds, survives to-day in southern Europe and northern Africa. The lesser

bustard (*O. tetrax*) occupies the southern portion of this range. Both species live on ranches in Spain, where they have been objects of sport for centuries. The lesser bustard in particular is described as so keen a game bird as practically to defy every method of hunting. The larger ranches of our Great Plains seem to offer proper conditions for the bustards.

#### SAND GROUSE

America has no game birds comparable with the sand grouse (Pteroclidæ), and as the common name of the bird indicates, they are adapted to arid regions, areas where game birds are a great desideratum. An interesting adaptation of these birds to progress on sand is the fusion of all the front toes in a feathered paw, with only the claws protruding; the hind toe is missing. Sand grouse have long pointed wings and tails, look like plovers when on the wing, and have great powers of flight. They are nomadic rather than migratory, and occasionally make a great exodus from their usual home. Sand grouse are native to southern Europe, Asia, and Africa, and once established no doubt would find the deserts of southwestern United States congenial.

#### SPECIES CONSIDERED UNDESIRABLE

A list of game birds desirable for introduction is given added value when some attention is called also to those that are undesirable. For instance, it would seem unwise to attempt introduction of that premier game bird of the British Isles, the red grouse (*Lagopus scoticus*), because the bird feeds upon, and its life otherwise is very closely bound up with, heather, and the United States has no extensive areas of heather. The same remark applies to the black grouse (*Tetrao tetrix*). The capercaillie (*T. urogallus*) and the Himalayan snow cock (*Tetraogallus himalayensis*), while temptingly large, have the same fault as our spruce grouse (*Canachites canadensis*) of feeding so largely on the needles of coniferous trees that their flesh at times is heavily impregnated with turpentine and therefore becomes inedible. The migratory quail (*Coturnix coturnix*) has already been tried extensively in this country, but it does not become established. The migratory instinct of these birds carries them far away to the southward and they do not get back. The European wood pigeon (*Columba palumbus*) has been unsuccessfully introduced on a small scale, and further efforts have been urged, but this should not be encouraged, as the bird too frequently is a pest in its native land.

In fact, the habits of any species that is being considered for introduction should be closely scrutinized, and if the bird seems to have markedly injurious tendencies it should be passed over and some less objectionable species selected. No wild birds can be imported into the United States without permit from the Bureau of Biological Survey, and permits will not be issued for the importation of species known to have injurious habits.

## HABITATS FOR THE SPECIES RECOMMENDED

A legitimate question to ask the proponent of game-bird introduction is whether there is any place to put introduced birds. This is by no means an embarrassing query, for there are voids both small and great that, metaphorically speaking, are crying to be filled. For instance, in the States where the ring-necked pheasant has become well established, the bird has settled just between the ruffed grouse, a denizen of woodland, and the bobwhite, a lover of cultivated fields and their immediate surroundings. The pheasant hardly comes into competition with either of these birds, as shrubby pastures, brushy gullies, and marshy tracts are its preference. The Hungarian partridge, while favoring the same local surroundings as the bobwhite, occupies them in a range farther north than the bobwhite can endure the winters. Thus even in areas having a rather high degree of cultivation, space can be found for introduced game birds that will materially increase the total supply of game and at the same time interfere to a minimum degree with the native stock. Birds besides those mentioned that seem suitable for establishing in farming regions are the Japanese pheasant, the guinea fowl, the peafowl, and the red-legged partridges.

Forests and cut-over lands that should be reforested comprise about a fourth of the total land area of the United States. (Fig. 13.) Included in this are sections like the scrub-oak plains of Long Island and Marthas Vineyard, the blueberry barrens of Maine, the pine barrens of New Jersey and of the South Atlantic States, areas that never have had a dense growth of trees and now have no important native game-bird population except for the bobwhite in the South. On these and other open types of forest land can be placed in the Northern States Reeves's pheasant, and more southwardly the golden and Lady Amherst pheasants, tragopans, kaleege and copper pheasants, and chachalacas; and on high mountains, Strauch's and the cheer pheasants.

Besides the fourth of our areas that is in actual or potential forest, more than another fourth (fig. 14) of the whole is so arid that it will not support agriculture. This land varies from the grazing areas of the Great Plains to the barren deserts of the Southwest, and in general it has a scanty game-bird population. Space here is almost unlimited for the species that are adapted to the conditions, and it is here perhaps that the greatest opportunity is afforded to add to the game stock of the country. If sand grouse could be established in the deserts, how much more attractive these areas would become, not to the sportsman alone, but to all observers who are interested in wild life. There are numerous species in this group, some of which might be established under one set of conditions and others in different environments. Perfectly adapted to sand and to desert life, sand grouse could be planted near water supplies to hold them; later they would spread, as they readily fly long distances for water. On moderately arid land, but always within reach of water, Elliot's pheasant, the brown eared pheasant, and the Persian pheasant can be used, while on ranches where hay-producing crops thrive, tinamous and bustards should prove suitable.

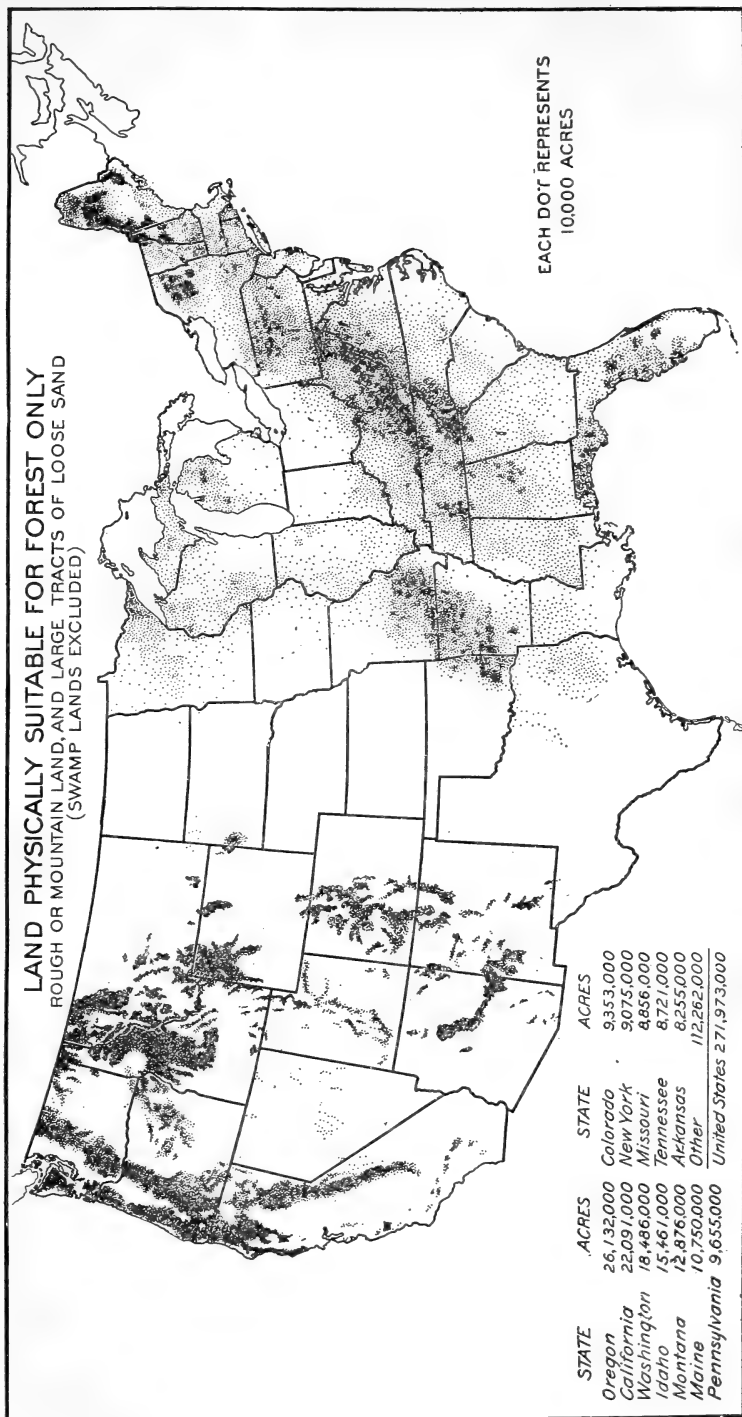


FIGURE 13.—Land physically suitable for forest only. (From Agriculture Yearbook, 1923, p. 432)

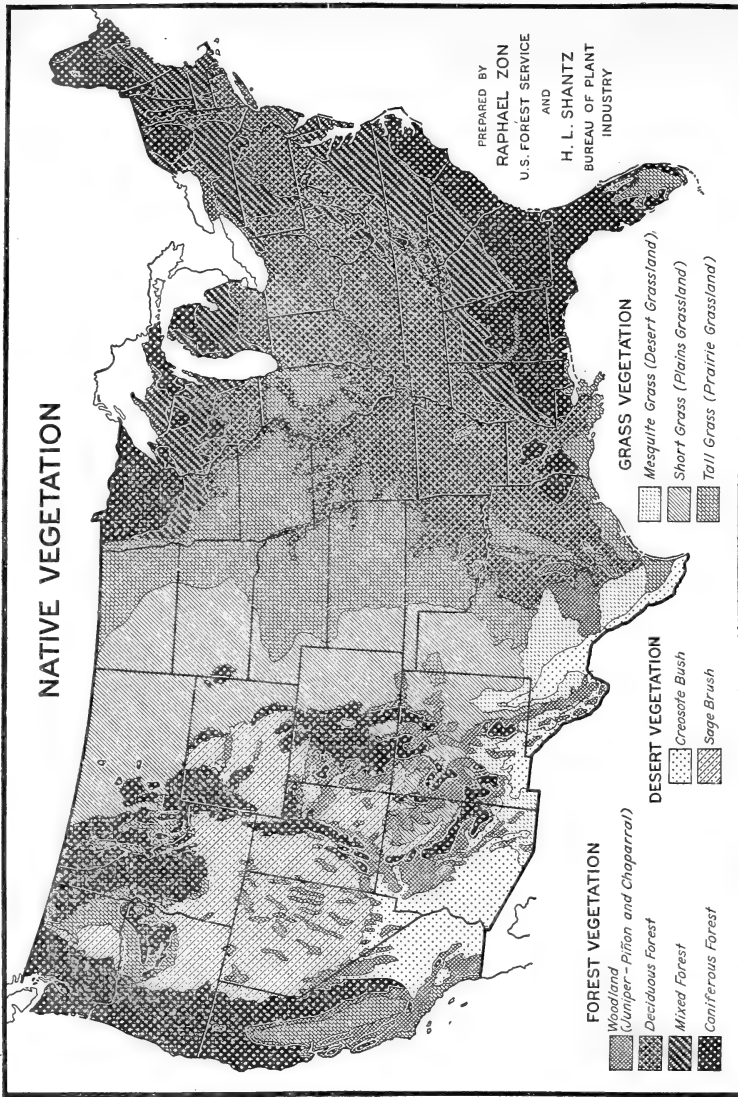


FIGURE 14.—Native vegetation of the United States. Practically all the desert grassland and the areas covered with sagebrush and creosote bush are too dry for farming. They comprise a domain that in part can be devoted indifferently to game production, if species can be found that will thrive there. (Map by Bureau of Agricultural Economics, revised from Agriculture Yearbook, 1921, p. 421)



## SUGGESTIONS AS TO METHODS OF NATURALIZING GAME BIRDS

The introduction of game birds, like other human endeavors, is likely to be successful in proportion to the thought and effort devoted to it. The method that has usually been followed in the past of importing birds and liberating them without regard to their condition, to the suitability of the range, or to the abundance of natural enemies is most uncertain and wasteful and has resulted in far more failures than successes.

Attempts to add valuable species to the American list of game birds should be well planned, particularly when they involve substantial expenditures. Preliminary investigation concerning the desirability of introducing a given species should take account of the relation of the bird to agricultural interests in its native home, as well as its sporting qualities and its known reactions to restraint and to game-propagation routine. Is the species in every respect a desirable type of game bird, is it adaptable, and is there a suitable place for it? In the case of birds not readily obtainable from responsible dealers, planning should extend to the initial capture of the birds, and should cover their crating, feeding, watering, and any special treatment deemed advisable during transportation. Valuable lots of birds should have an attendant qualified to care for them, and upon arrival in the United States they should be placed in the charge of the best game breeder available.

In all attempts to introduce new species it probably will give quicker and more ample returns to hold the original stock by the methods prevailing on high-class game farms<sup>3</sup> and to use the eggs and young that may be obtained for planting. In the case of birds at all exacting in their habitat preferences, quarters should be provided as near as practicable to the proposed place of liberation. Eggs obtained can be set under domestic hens, and the young birds released when well grown, or with regard to size, eggs can be distributed, when plentiful, to the nests of native or introduced game birds.

The area in which liberation is planned to be made should be carefully selected for its general suitability as regards temperature, rainfall, and cover and food conditions, and it should be freed so far as possible from natural enemies of the birds. Suppression of enemies and improvement in cover and food conditions are matters to be attended to in advance, and supplementing the growing food supply by artificial feeding should be continued as long as it seems helpful. It must always be borne in mind that no game bird, either native or foreign, will maintain its numbers in the face of much shooting without continued artificial propagation. For this reason the species most desirable for naturalizing always are those that have proved adapted to rearing on game farms.

Game-bird introduction and propagation are production activities, and the benefits from them will be reaped in proportion as energy and material are put into them. Expenditure, hard work, and, above all, constant exercise of wisdom, foresight, and judgment are necessary to success.

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<sup>3</sup>Information on these methods, including nature of equipment, handling the birds, control of enemies, improvement of coverts, and the like, is contained in the following publication, which may be obtained free upon request to the U. S. Department of Agriculture: McATEE, W. L., PROPAGATION OF UPLAND GAME BIRDS. U. S. Dept. Agr. Farmers' Bul. 1613. 1929.

## ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

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