

Rabbits, Hares and Pikas

Status Survey and Conservation Action Plan

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Sultanate of Oman



WWF

Chapter 5: The Cottontails

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Status and Summary

The cottontails (genus *Sylvilagus*) comprises 13 species. However, some believe there are 14 species in two subgenera; *Sylvilagus* and the monotypic *Brachylagus*. All *Sylvilagus* are New World forms and reach their greatest diversification in North America. The swamp rabbit *S. aquaticus*, Audubon's cottontail *S. audubonii*, brush rabbit *S. bachmani*, eastern cottontail *S. floridanus*, Nuttall's cottontail *S. nuttalli* and marsh rabbit *S. palustris* are important game species managed by state wildlife agencies in the United States. The forest rabbit *S. brasiliensis*, although widely distributed, is poorly known over much of its range, thus more information is needed about this species. The Mexican cottontail *S. cunicularius* is found over a large region in west central Mexico, where viable populations are located in many areas, and should be considered out of danger. Status surveys are recommended for Dice's cottontail *S. dicei* and the San Jose brush rabbit *S. mansuetus*. The Tres Marias *S. graysoni* and the Omilteme *S. insonus* cottontails are recommended for endangered status.

Overview

Cottontails are widely distributed throughout North, Central and the northern half of South America. The most widely distributed member of the genus is the eastern cottontail. It inhabits diverse habitats from southern Canada to northern South America. Other species have smaller distributions, with some found only on islands as insular forms (i.e. the San Jose brush rabbit and Tres Marias cottontail). The forest rabbit is the most successful of the southern forms. Its distribution extends from southern Mexico into northern Argentina and it is the only member of the genus occurring south of the equator.

Cottontails are true rabbits, with altricial young born naked in a nest or "form". Cottontails vary in size from the small pygmy rabbit (approx. 400g) to the largest member, the swamp rabbit (approx. 2,000g). Most are darkly colored on the back and light below. All cottontails have relatively large ears and feet. The skull of *Sylvilagus* is typically rabbit-like, with a highly fenestrated maxillary bone, a straight cutting edge on the upper incisors, and a second set of "peg" teeth posterior to the upper incisors. The presence of an interparietal bone distinguishes the genus *Sylvilagus* from the genus *Lepus*. The females are from one to ten per cent larger than

males in most *Sylvilagus* (Chapman, *et al* 1982).

Phylogenetic relationships have received considerable attention in recent years. The dendrogram in Fig. 5.1 is a composite of the systematic relationship among the ten species of *Sylvilagus* for which cytological data are available (Holden and Eabry 1970, Diersing and Wilson 1980, Robinson *et al.* 1983, 1984, Lorenzo *et al.* in press).

Seven of the 13 species of *Sylvilagus* apparently share a common ancestral link. The swamp rabbit and the marsh rabbit are closely related, as are the eastern cottontail, the Tres Marias cottontail and the Mexican cottontail (the last three forms share a basic diploid number of 42). Audubon's and Nuttall's cottontails are also closely related to each other. Cytological and morphological information suggests that the Tres Marias cottontail is more closely related to the Mexican cottontail than to the eastern cottontail (Diersing and Wilson, 1980; Lorenzo *et al.*, in press).

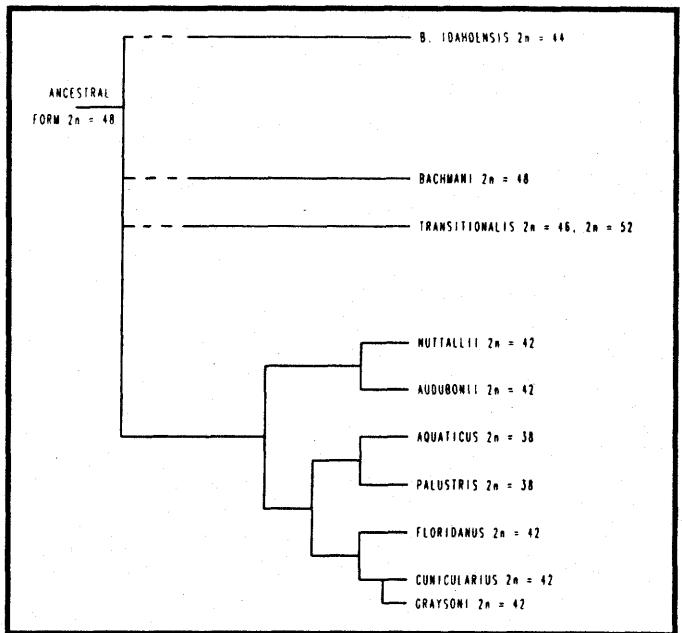


Figure 5.1 Composite dendrogram of the systematic relationships among the North American cottontails (*Sylvilagus* and *Brachylagus*). The basic dendrogram is taken from Robinson *et al.* 1984 and modified using material from Holden and Eabry 1970, Diersing and Wilson 1980, Robinson *et al.* 1983 and Lorenzo *et al.* in press.

No single vegetative community can be identified as cottontail habitat. Their habitat requirements are met in numerous diverse locations. Cottontails inhabit a wide variety of disturbed, successional and transitional habitats, often characterized by forbs and perennial grasses, with an abundance of well-distributed escape cover such as sage brush (*Artemisia* sp.), bramble (*Rubus* sp.) or Frailejones (*Espeletia* sp.). Cottontails have high rates of reproduction and their populations are regulated through mortality and dispersal. Escape cover is essential to their habitat requirements.

Population levels vary markedly between species and from year to year, depending on climate, habitat type and other factors. Local populations of the eastern cottontail have reached unusual densities of more than ten per ha. Densities of one to five per ha are probably the norm. In desert species such as Audubon's cottontail, densities of less than one rabbit per ha are more normal.

Cottontail behavior is stereotyped and fairly consistent with other rabbit species. Both non-social behavior, including basic postures, movements and vocalizations, and adult social behavior largely centered on reproductive interactions have been documented (Marsden and Holler 1964, Tefft and Chapman 1987).

The number of young produced annually by *Sylvilagus* varies among species, with an elevational and latitudinal gradient within species. Cottontails are iteroparous. The eastern cottontail is the most fecund member of the genus often producing 25-35 young per year, while the forest rabbit appears to be the least fecund, producing about ten young per year (Durant 1981, Chapman *et al.* 1982, Chapman 1984).

In general, cottontails are cyclic in abundance, thus long term trends are more useful in assessing their status than population levels in any one year. Even with the eastern cottontail, the most common species in North America, long-term declines in numbers probably occur. Habitat is the key to cottontail abundance. According to Chapman *et al.* (1982:99); "We can expect weather-related, local and short-term population increases, but the basic pattern (of population decline) will continue unless there is a major agricultural recession that leads to less intensive land use... Conservationists and wildlife managers should strive to develop and preserve grassland habitat whenever possible on public and private lands. The true plight of grassland animals such as the cottontail is only beginning to be appreciated". Despite the continued loss of cottontail habitat to agriculture and development, cottontails remain the most important game animals in North America (Chapman, *et al.* 1982). In those species with limited or patchy distributions, or which live in island habitats, such as the Tres Marias cottontail, Omilteme cottontail or New England cottontail, habitat protection is critical.

The biology and status of the 13 species of cottontails in the subgenus (*Sylvilagus*) are discussed below in detail. The genus was reviewed by Chapman *et al.* (1982).

Species Accounts

Swamp Rabbit

Sylvilagus aquaticus (Bachman 1837)

Subspecies: *Sylvilagus aquaticus aquaticus*, *Sylvilagus aquaticus littoralis*

Description and Taxonomy

The swamp rabbit is the largest member of the genus *Sylvilagus* (wt 2000g). Its back is blackish to rusty brown in color. The belly and underside of the tail are white. The species possesses a prominent cinnamon-colored eye-ring. Unlike other members of the genus, sexual dimorphism is not pronounced.

There are two subspecies of *S. aquaticus*. The more northern form *S. a. aquaticus* is found associated with mature forests, while the southern form *S. a. littoralis* is found associated with coastal and riparian areas. Detailed range maps are in Chapman and Feldhamer (1981).

Distribution

The swamp rabbit is found in the southeastern United States. (Fig. 5.2), including the states of Alabama, Louisiana, Mississippi, Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana, Tennessee, Georgia and South Carolina.

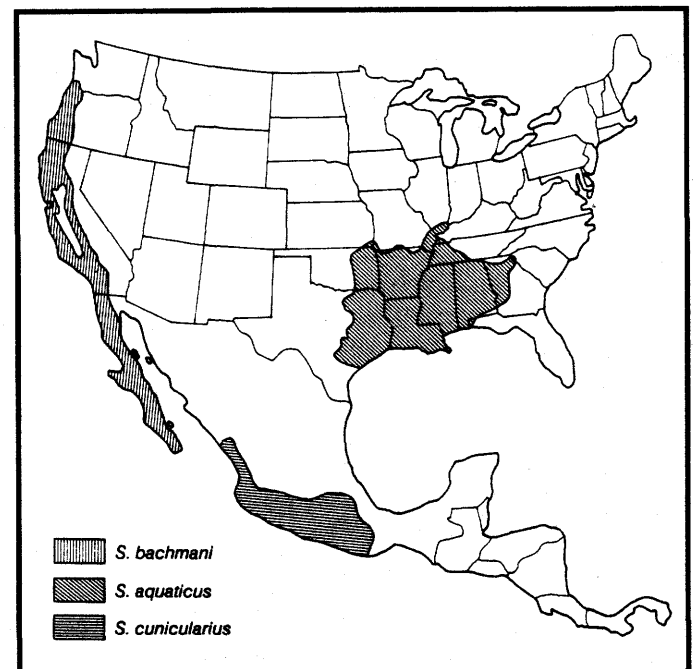


Figure 5.2 Distributions of the swamp rabbit *Sylvilagus aquaticus*, brush rabbit *S. bachmani* and Mexican cottontail *S. cunicularis*

Habitat and Ecology

The swamp rabbit is a subtropical species found in swamps, river bottoms and lowland areas. Its distribution in the north is limited to the southern swamp forest community-type at about the 24°C isotherm. Swamp rabbits are always associated with water (Lowe 1958, Hunt 1959, Terrel 1972). In the northern portion of their range, swamp rabbits are found in mature forests and regenerating forest tracts 15 years old (Terrel 1972), and in canebrake communities (Harrison and Hickie 1931). Much of this habitat has been eliminated. The swamp rabbit subspecies *S. a. aquaticus* has begun to decrease in the northern part of its range in the United States, apparently due to habitat alteration and riparian drainage. In Missouri, swamp rabbit habitat decreased from 850,000ha in 1870 to less than 40,000ha in 1973 as a result of the conversion of lowland hardwood forests to row crops (Korte and Fredrickson 1977). Despite the shrinkage of swamp rabbit habitat on the periphery of the range, there are still large areas of prime habitat in states such as Louisiana where they remain important game animals. Recent studies indicate a home range of about 0.5 and 1.0ha for female and male swamp rabbits, respectively. Densities in timbered habitat were estimated at two rabbits per ha (Kjølhaug and Woolf 1988).

Swamp rabbits feed on a variety of grasses, forbs and sedges. Their preferred food items appear to be *Carex* and other sedges (Toll *et al.* 1960, Terrel 1972).

Behavior

Swamp rabbits exhibit a linear dominance hierarchy among males that does not include females. They form breeding groups of several animals controlled by a dominant male. The male hierarchy has been characterized by: (1) less overt aggression between conspecific males during reproduction activities, (2) restriction of dominant-subdominant challenges between adult males, (3) a direct relationship between social status and frequency of male dominance displays, (4) a direct relationship between male social status and male-female interactions. Swamp rabbits are highly territorial and males may maintain their dominant status from year to year (Marsden and Holler 1964, Holler and Sorenson 1969, Sorenson *et al.* 1972).

Reproduction

The breeding season of the swamp rabbit varies throughout its range and from year to year. In the northern portion of their range the breeding season usually starts in February (Hill 1967). In the south they apparently breed year-round (Hunt 1959). Litter size varies from one to six. Females may produce two to five litters per year (Sorenson *et al.* 1968).

Status and Summary

Although there has been some reduction in its range, the swamp rabbit remains an abundant and important game species in the Gulf states. As a game species, its harvest is regulated by various state wildlife agencies. No additional conservation measures are needed. The species has been reviewed by Chapman and Feldhamer (1981).

Audubon's or Desert Cottontail *Sylvilagus audubonii* (Baird 1857)

Subspecies: *Sylvilagus audubonii arizonae*, *Sylvilagus audubonii audubonii*, *Sylvilagus audubonii baileyi*, *Sylvilagus audubonii cedrophilus*, *Sylvilagus audubonii confinis*, *Sylvilagus audubonii goldmani*, *Sylvilagus audubonii minor*, *Sylvilagus audubonii neomexicanus*, *Sylvilagus audubonii parualus*, *Sylvilagus audubonii sanctidiegi*, *Sylvilagus audubonii vallicola*, *Sylvilagus audubonii warreni*

Description

The Audubon's cottontail is relatively large for the genus *Sylvilagus* (weight 1,000g). The ears are long and sparsely haired on the inner surface. The tail is large and the feet sparsely haired. The upper body and tail are gray, the underside white. There are 12 subspecies.

Distribution

The species is found from near the Canadian border in Montana, south into central Mexico and from the Pacific coast of California, east into central Texas, Oklahoma, Kansas, Nebraska, South Dakota and North Dakota (Fig. 5.3). Detailed range maps for the subspecies are in Chapman and Willner (1978).

Habitat and Ecology

The Audubon cottontail is an inhabitant of arid regions, occurring from below sea level in Death Valley, California to at least 1,829m in mountainous regions (Orr 1940). It may be

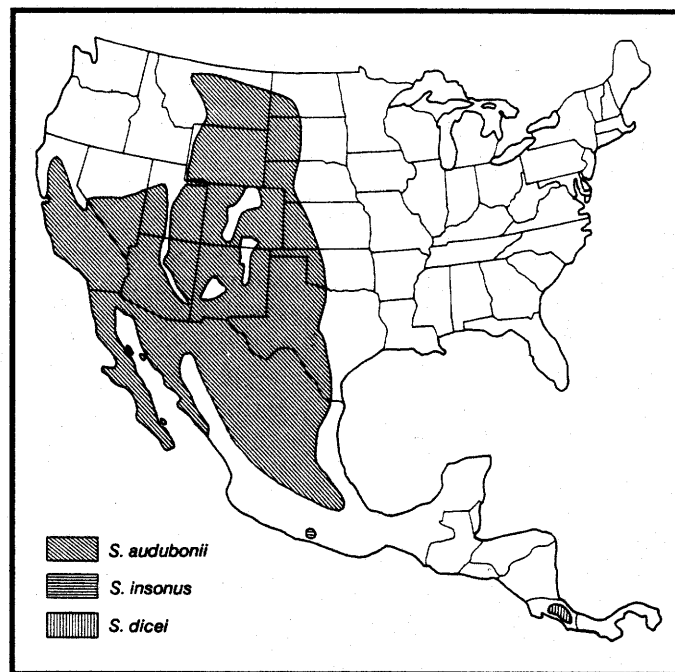
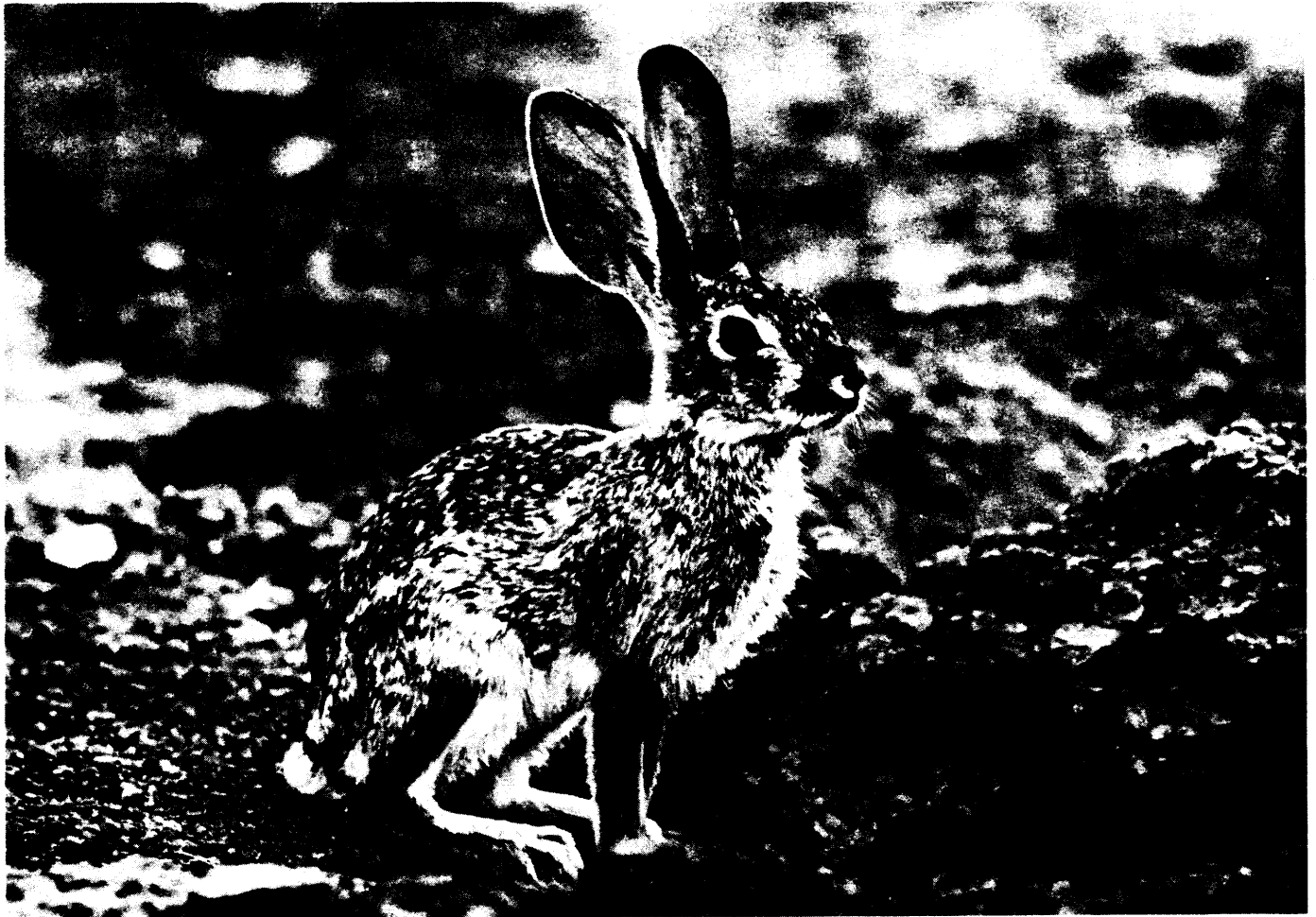


Figure 5.3 Distribution of Audubon's cottontail *Sylvilagus audubonii*, Dice's cottontail *S. dicei*, and Omilteme cottontail *S. insonus*



Audubon's cottontail *Sylvilagus audubonii* (Photo by Leonard Lee Rue III)

found in woodlands, grasslands and deserts at lower elevations throughout the southwestern United States (Findley 1969). The species is frequently found associated with riparian zones in arid regions.

Behavior

There have been no studies dealing directly with the behavior of Audubon's cottontails, however, some behavioral observations have been made. They are most active in the evening and early morning and inactive at temperatures above 80°F (Ingles 1941). This cottontail is not gregarious, uses low prominences such as stumps as lookout posts (Orr 1940) and may climb trees (Summer 1931, Ingles 1941).

Reproduction

The length of the breeding season varies from year-round to seven months depending on location. Usually, the breeding season begins in December or January and extends for seven to nine months. Litter sizes are small for the genus, averaging 2.6 to 3.6 young per litter (Orr 1940, Sows 1957, Chapman and Morgan 1974).

Status and Summary

The Audubon cottontail is an important game species and its status is monitored in many states. Land clearings and cattle grazing may effect Audubon cottontail population levels



Habitat of Audubon's cottontail *Sylvilagus audubonii* at Sonora, Mexico (Photo by G. Ceballos)

(Kundaeli and Reynolds 1972, Flinders and Hansen, 1975). In Mexico it is still common over much of its geographic range. None of the twelve subspecies is known to be under threat and no additional conservation measures are required.

Brush Rabbit

Sylvilagus bachmani (Waterhouse 1838)

Subspecies: *Sylvilagus bachmani bachmani*, *Sylvilagus bachmani cinerascens*, *Sylvilagus bachmani cerrosensis*, *Sylvilagus bachmani ubercolor*, *Sylvilagus bachmani exiguus*, *Sylvilagus bachmani mariposae*, *Sylvilagus bachmani virgulti*, *Sylvilagus bachmani howelli*, *Sylvilagus bachmani macrorhinus*, *Sylvilagus bachmani peninsularis*, *Sylvilagus bachmani riparius*, *Sylvilagus bachmani tehamae*, *Sylvilagus bachmani rosaphagus*

Description and Taxonomy

The brush rabbit is one of the smaller cottontails (weight up to 1,000g). The color of the back is dark brown to gray brown, while the belly and underside of the tail is whitish. The feet are small and sparsely haired. The legs, ears and tail are short.

There are 13 recognized subspecies, which are discussed in detail in Chapman (1974).

Distribution

The brush rabbit is confined to the Pacific coast, from the Columbia River in the north to the tip of Baja California in the south. It does not occur east of the Cascade/Sierra Nevada Mountain Ranges (Fig. 5.2). Its range has not changed appreciably in historic times.

Habitat and Ecology

Brush rabbits require dense bramble clumps (*Rubus*) or other thick brushy habitat (Orr 1940, Chapman 1971). These bramble clumps often have an extensive network of trails and runways. The species will occasionally use burrows, but does not dig its own. The home range is very small (less than 2,000m²) depending on the uniformity of the habitat (Shields 1960, Chapman 1971). Brush rabbits eat mainly edible grasses (Orr 1940), but also will take berries and other vegetation (Chapman 1974).

Behavior

The behavior of the brush rabbit has not been quantified although some behavioral observations have been made (Orr 1940, Zoloth 1969). Brush rabbits are extremely cautious when venturing from dense cover to feed. They exhibit a minimum individual distance of 0.3-8m (1-24ft) without an aggressive "chase" resulting. Nose touching and sniffing often precede a "chase". The species also exhibits stereotype grooming behavior (Zoloth 1969). Brush rabbits may climb low shrubs and trees, a behavior unusual in the Leporidae (Chapman 1974). In Oregon, the introduced eastern cottontail *S. floridanus* was reported to exhibit aggressive behavior toward the brush rabbit (Chapman and Verts 1969).

Reproduction

The breeding season varies from north to south. In Oregon, breeding begins in February and ends in August (Chapman and Harman 1972), while in California it begins in December and ends in May or June (Mossman 1955). Litter size also varies between regions. The average litter size was 2.8 in Oregon, 3.5 in northern and central California and 4.0 in west central California (Orr 1940, Mossman 1955, Chapman and Harman 1972). The brush rabbit is one of the less fecund members of the genus, producing about 15 young in five to six litters per year (Chapman and Harman 1972).

Status and Summary

The brush rabbit is a game species in both Oregon and California, but is hunted little. There is no detailed information on its status in Baja California, but it is still quite abundant. No additional conservation measures are proposed. The species was reviewed by Chapman (1974).

Forest Rabbit or Tapeti

Sylvilagus brasiliensis (Linnaeus 1758)

Subspecies: *Sylvilagus brasiliensis andinus*, *Sylvilagus brasiliensis appollinaris*, *Sylvilagus brasiliensis brasiliensis*, *Sylvilagus brasiliensis canarius*, *Sylvilagus brasiliensis capsalis*, *Sylvilagus brasiliensis caracsensis*, *Sylvilagus brasiliensis chillae*, *Sylvilagus brasiliensis chotanus*, *Sylvilagus brasiliensis consobrinus*, *Sylvilagus brasiliensis defilippi*, *Sylvilagus brasiliensis fulvescens*, *Sylvilagus brasiliensis gabbi*, *Sylvilagus brasiliensis gibsoni*, *Sylvilagus brasiliensis inca*, *Sylvilagus brasiliensis kelloggi*, *Sylvilagus brasiliensis meridensis*, *Sylvilagus brasiliensis mimensis*, *Sylvilagus brasiliensis paraquensis*, *Sylvilagus brasiliensis peruanus*, *Sylvilagus brasiliensis sanctaemartae*, *Sylvilagus brasiliensis surdaster*, *Sylvilagus brasiliensis tapetillus*, *Sylvilagus brasiliensis truei*



Habitat of the forest rabbit *Sylvilagus brasiliensis* in a tropical rain forest at Los Tuctlas, Veracruz, Mexico (Photo by G. Ceballos)

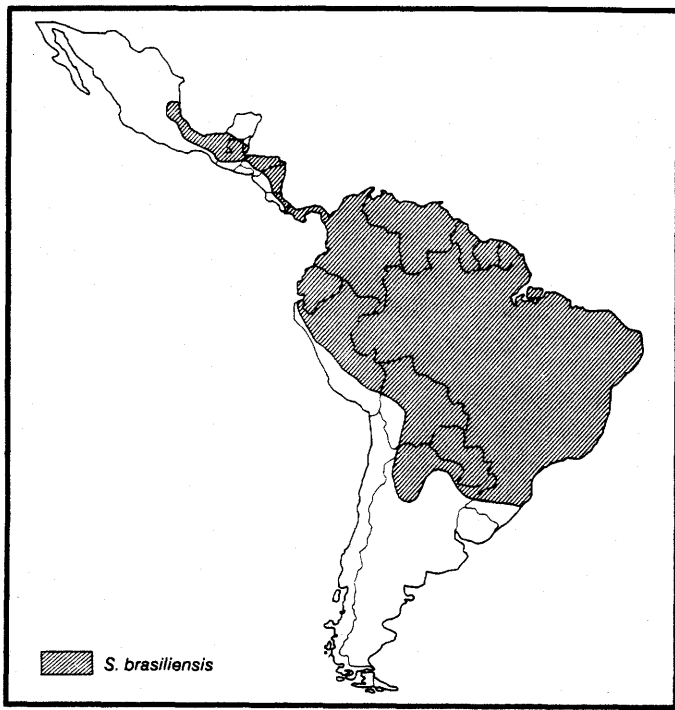


Figure 5.4 Distribution of the forest rabbit *Sylvilagus brasiliensis*

Description and Taxonomy

The forest rabbit is a small to medium-sized rabbit with a markedly small to rudimentary tail, short hind feet and very short ears. Its color ranges from light grey to almost black dorsally, slightly lighter on the sides of the body and the tail, and a whitish belly except for a dark throat patch. The tail is dark ventrally.

There are 23 recognized subspecies of the forest rabbit (Johnson and Chapman in press). However, the species is in need of systematic revision (see Diersing 1981 and Chapman and Johnson in press for examples).

Distribution

The forest rabbit occurs as far north as southern Tamaulipas, Mexico, southward along the eastern coast of Mexico and the Yucatan Peninsula (Quintana Roo, Yucatan and Campeche) to western Guatemala. It probably occurs southward to El Salvador. It does occur in Honduras, the eastern half of Nicaragua, eastern Costa Rica and Panama. Forest rabbits occur throughout South America except at high altitudes above snow line and in the Patagonian region south of the Argentine Chaco (Fig. 5.4). Little is known about the species distribution in the Amazonian Region (Herskovitz 1950, Diersing 1981, Chapman and Willner 1982, Chapman and Johnson in press).

Habitat and Ecology

Although widely distributed, the forest rabbit has been studied in some detail only in the Paramos of Venezuela (Durant, 1981, 1983). In Mexico and Central America this species is mainly found in tropical forests, including rain, deciduous and

second growth forests; it also occurs in pastures near forested habitats. In Los Tuxtlas, Veracruz, a representative habitat of the species in Mexico, the rain forest includes a well-developed canopy, with trees up to 50m high such as *Brosimum alicastrum* and *Nectandra ambigens*, and a sparse understory.

Behavior

The forest rabbit builds elaborate above-ground nests to rear its young. The nests are built of dry grasses and consist of a central chamber, with three to four small chambers at the end of a runway system (Durant 1981, Chapman and Willner-Chapman 1982).

Reproduction

In Chiapas, Mexico, this species reproduces throughout the year. The gestation period is around 28 days and the litter size is between three and eight (Alvarez del Toro 1977). In the Andean Paramos, the forest rabbit breeds year-round. They have a long gestation of 44 days and produce an average of 4.7 litters per year (*S. b. meridensis*). The mean litter size is 1.2, the smallest average litter-size reported for the genus (Durant 1981, 1983). Annual production of young is less than ten per year.

Status and Summary

In northwestern South America, habitats of the forest rabbit and the eastern cottontail *S. floridanus* appear to be mutually exclusive. Forest rabbits cling to dwindling forests and clearings within them and to the Paramos of the Andean crests. Cottontails are replacing forest rabbits in artificial savannas cutting through the original forests. Undoubtedly, the larger, more prolific and aggressive cottontail, together with the predators which follow it, is the most important factor contributing to the exclusion of the forest rabbit from the ever-expanding artificial savannas and scrublands of northwestern South America.



The forest rabbit *Sylvilagus brasiliensis meridensis*
(Photo by J. A. Chapman)



Habitat of the forest rabbit *Sylvilagus brasiliensis meridensis* in the Paramo de Mucabaji, Merida, Venezuela. The plant in the foreground is frailejones *Espeletia schultzei* a common plant of the Venezuelan Paramo (Photo by J. A. Chapman)

However, little knowledge is available regarding the impact of tropical deforestation on the abundance of this species. In Mexico, the abundance of the forest rabbit apparently declines when extensive areas are deforested. However, it survives well in second growth forests and pastures (Alvarez del Toro 1977). A systematic survey is needed to elucidate the status of the forest rabbit over much of its range. The South American forms of this species were reviewed by Chapman and Johnson (in press).

Mexican Cottontail *Sylvilagus cunicularius* (Waterhouse 1848)

Subspecies: *Sylvilagus cunicularius cunicularius*, *Sylvilagus cunicularius insolitus*, *Sylvilagus cunicularius pacificus*

Description and Taxonomy

The Mexican cottontail is large for the genus (weight 1,800-2,300g). The fur is coarse and brownish gray to reddish above, to white underneath.

Three subspecies of *S. cunicularius* are recognized (Hall 1981).

Distribution

The Mexican cottontail is found in the coastal lowlands of the Pacific coast and in the temperate forests of Central Mexico, including the states of Sinaloa, Nayarit, Jalisco, Colima, Michoacan, Guerrero, Oaxaca, Distrito Federal, Mexico, Morelos, Tlaxcala and Puebla (Fig. 5.2). It occurs from sea

level to 4,300m in Central Mexico (Leopold 1959; Ceballos and Galindo 1984, Armstrong and Jones 1971).

Habitat and Ecology

The Mexican cottontail occurs in temperate forests in central Mexico and in tropical dry deciduous and semi-deciduous forests in western Mexico (Leopold 1959, Ceballos and Galindo 1984, Ceballos and Miranda 1986). In central Mexico it is quite abundant in the pine and pine-oak forests with a dense cover of "zacatones" (bunch grasses; genera *Agrostis*, *Festuca* and *Muhlenbergia*). Extensive habitat is found along the mountains of the Transvolcanic belt, especially in the Popocatepetl, Iztaccihualtl, Pelado and Nevado de Toluca volcanoes. In the mountains south of Mexico City it is microsympatric with two other species of rabbits (eastern cottontail *S. floridanus* and volcano rabbit *Romerolagus diazi*).

In western Mexico it is found in dry deciduous forests and pastures, but is more abundant in pastures and other disturbed vegetation (Ceballos and Miranda 1986). In southern Sinaloa southward to western Michoacan, the Mexican cottontail occurs along the coastal plain from sea level to the mountain slopes. In the mountain slopes is parapatric with the eastern cottontail (Diersing and Wilson 1980).

Reproduction

The species is iteroparus and reproduction occurs throughout the year.

Status and Summary

Although this species has declined in some areas because of overgrazing, hunting, or the destruction of its habitat, it is still quite abundant throughout its geographic range. No additional conservation measures are required.

Dice's Cottontail *Sylvilagus dicei* Harris 1932

Description and Taxonomy

A large-bodied cottontail, with dorsal pelage a mixture of black and brown, blackish-gray sides, rudimentary blackish tail and whitish venter except for a brownish throat patch (Diersing 1981). No subspecies are recognized.

Distribution

Dice's cottontail is found in the higher elevations of Costa Rica and western Panama. According to Diersing (1981) it occurs from 3,800m at Cerro Chirripo to no lower than 1,640m at Cervantes, Costa Rica. In Panama it occurs to 1,180m at Rancho de Rio Jimenez (Fig. 5.3).

Status and Summary

Little is known about the biology, ecology or status of this species. A status survey is needed.

Eastern Cottontail
Sylvilagus floridanus (J.A. Allen 1890)

Subspecies: *Sylvilagus floridanus alacer*, *Sylvilagus floridanus ammophilus*, *Sylvilagus floridanus avius*, *Sylvilagus floridanus aztecus*, *Sylvilagus floridanus chapmani*, *Sylvilagus floridanus chiapensis*, *Sylvilagus floridanus cognatus*, *Sylvilagus floridanus connectens*, *Sylvilagus floridanus continentis*, *Sylvilagus floridanus costaricensis*, *Sylvilagus floridanus cumanicus*, *Sylvilagus floridanus floridanus*, *Sylvilagus floridanus hesperius*, *Sylvilagus floridanus hitchensi*, *Sylvilagus floridanus holzneri*, *Sylvilagus floridanus hondurensis*, *Sylvilagus floridanus llanensis*, *Sylvilagus floridanus mallurus*, *Sylvilagus floridanus margaritae*, *Sylvilagus floridanus mearnsi*, *Sylvilagus floridanus nelsoni*, *Sylvilagus floridanus nigronuchalis*, *Sylvilagus floridanus orinoci*, *Sylvilagus floridanus orizabae*, *Sylvilagus floridanus paulsoni*, *Sylvilagus floridanus purgatus*, *Sylvilagus floridanus restrictus*, *Sylvilagus floridanus robustus*, *Sylvilagus floridanus russatus*, *Sylvilagus floridanus similis*, *Sylvilagus floridanus subcinctus*, *Sylvilagus floridanus superciliaris*, *Sylvilagus floridanus valenciae*, *Sylvilagus floridanus yucatani-cus*

Description and Taxonomy

The eastern cottontail is a large member of the genus *Sylvilagus* (weight 1,300g). The fur is long and dense, grayish to brownish on the upper parts and white on the venter and tail. The South American forms have a nuchal patch varying from black to yellowish-brown, depending on subspecies.

There are 34 recognized subspecies of eastern cottontail (Chapman *et al.* 1980). However, the species is in need of systematic revision. There are five insular subspecies that are probably of recent origin, introduced by man, and of questionable subspecific status. These include *S. f. ammophilus*, *S. f. hitchensi*, *S. f. avius*, *S. f. margaritae* and *S. f. nigronuchalis*. The remainder are mainland subspecies.

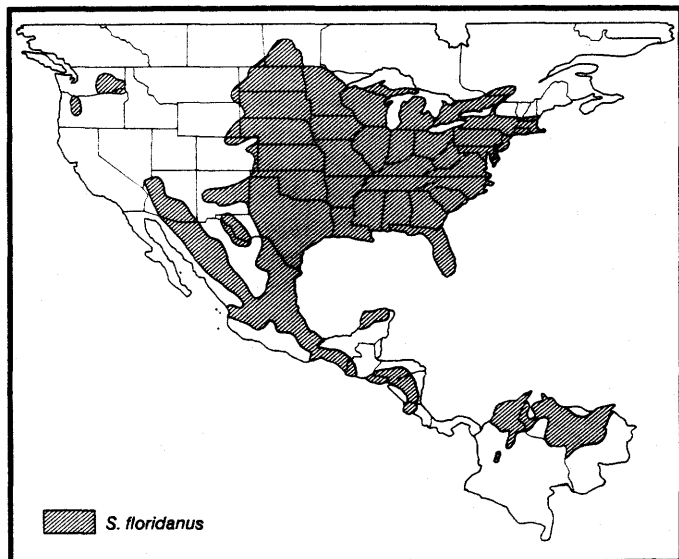


Figure 5.5 Distribution of the eastern cottontail *Sylvilagus floridanus*



Eastern cottontail *Sylvilagus floridanus*
(Photo by Jerry Focht, Leonard Rue Enterprises)

Distribution

The eastern cottontail occurs over broad geographic provinces from southern Canada to northwestern South America (Fig. 5.5) (Chapman, *et al.* 1980). The species has been widely transplanted in North America and Europe. It is an aggressive species (Chapman and Verts 1969) and may displace other Leporids.

Habitat and Ecology

The eastern cottontail is usually thought of as a mammal of farmland, fields and hedge rows; however, historically it was found in natural glades and woodlands, deserts, swamps, prairies, hardwood forests, tropical savannas, rain forests and boreal forests. Its range overlaps that of six species of *Sylvilagus* and six species of *Lepus*. Genetic studies of widely separated populations of the eastern cottontail indicate considerable intraspecific genetic variability within the species (Chapman and Morgan 1973, Morgan and Chapman 1981). This genetic variability may be related to the wide range of habitats the species occupies.

The eastern cottontail has been the subject of widespread introduction programs, especially in the eastern United States. These introductions have permanently altered the gene pool of the eastern cottontail (Chapman and Morgan 1973), appear to have made the species a highly efficient colonizer and may have contributed to the species' ability to displace sympatric cottontails, such as the New England cottontail *S. transitionalis*.

Eastern cottontails have relatively large home ranges. Home ranges of both sexes averaged about three hectares in Wisconsin (Dixon *et al.* 1981). However, home range size varies significantly depending on season, sex, age and individ-

ual rabbits (Chapman and Tretheway 1972). Peak densities of eight to ten rabbits per hectare have been recorded (Trent and Rongstad 1974, Bittner and Chapman 1981), but densities are normally much lower. Eastern cottontails feed on a wide variety of plants depending on the season and geographic location.

Behavior

The behavior of the eastern cottontail has been studied more than most other members of the genus (Marsden and Conway 1963, Marsden and Holler 1964, Bruch and Chapman 1983). However, much of the work has been descriptive in nature. The eastern cottontail exhibits two major categories of social behavior (1) basic postures, movements and vocalizations and (2) adult social interactions, which include reproductive interactions and dominant-subordinate interactions. As discussed earlier, eastern cottontails have a male dominance hierarchy which controls the social structure of their populations.

Reproduction

Onset of annual reproduction varies from population to population and from year to year, depending on weather, latitude and elevation. Diet and rainfall also appear to be important factors, especially in arid regions (Bothma and Teer 1977). Litter size varies, from 3.0 to 5.6. Five to seven litters per female have been reported as well as juvenile female breeding (Chapman *et al.* 1982). Annual production of young may reach 35 kittens per year under ideal climatic conditions.

Status and Summary

The eastern cottontail is the most important game animal in the United States (Chapman *et al.* 1982) and the species has been the subject of hundreds of research projects and publications. It has been widely introduced in North America and many island populations are probably of recent origin. The species has also been introduced into Europe, a practice which should be stopped (Sasse 1983). The species was reviewed by Chapman *et al.* (1980) and Chapman (1983).



Habitat of eastern cottontail *Sylvilagus floridanus* in Allegany County, Maryland, USA (Photo by J. A. Chapman)

Tres Marias Cottontail *Sylvilagus graysoni* (J.A. Allen 1877)

Subspecies: *Sylvilagus graysoni badistes*, *Sylvilagus graysoni graysoni*

Description

The Tres Marias cottontail is similar in appearance and size to the eastern cottontail *S. floridanus*. However, it is confined to the Tres Marias Islands, off Nayarit, Western Mexico, and there is no chance of confusing the two allopatric species. These rabbits are brownish to reddish dorsally, brownish to pale reddish on the sides, and whitish on the venter except for a brown throat patch (Diersing and Wilson 1980).

Distribution and Taxonomy

The species is endemic of the Tres Marias Islands, Nayarit, Mexico (Fig. 5.6). This group of continental islands is approximately 86km from mainland Nayarit. Two subspecies have been recognized: *S. g. graysoni*, found in the islands of Maria Madre, Maria Magdalena and Maria Cleofas, and *S. g. badistes*, found only in San Juanito island.

The species is closely related to the Mexican rabbit *S. cucularius* of the adjacent mainland. Both species are morphologically very similar and have the same diploid chromosome number of 42 (Diersing and Wilson 1980, Lorenzo *et al.*, in press). Diersing and Wilson (1980) suggested that the ancestors of *S. graysoni* invaded the Tres Marias Islands, that were very likely connected to the mainland during the maximum Pleistocene glaciation. The hypothesis that the islands and mainland were connected is supported by the presence of freshwater fishes on the islands.

Habitat and Ecology

The dominant vegetation formations of Tres Marias Islands are the tropical dry deciduous and moist forests, which are characterized by a dense cover, with many tree species. The Islands are used by the Mexican government as a high security prison and the presence of large numbers of people has resulted in extensive disturbance there. On Maria Madre and Maria Cleofas, large areas of the natural vegetation have been destroyed by local inhabitants. House rats *Rattus rattus* were accidentally introduced to all the Islands and white-tailed deer *Odocoileus virginianus* and domestic goats were deliberately introduced on Maria Magdalena. Introduced species have caused profound changes in the ecological conditions of the Islands, that are likely to cause (or have caused) strong impacts on the native wildlife.

In a field survey done by D. E. Wilson in 1976, the Tres Marias cottontail was relatively more abundant on the uninhabited islands (Maria Cleofas and San Juanito). However, about half of the vegetation of Maria Cleofas has now been cleared in preparation for settlement (Dooley 1987, pers. comm.). Maria Magdalena has recently been designated an Ecological Reserve by the Mexican government.

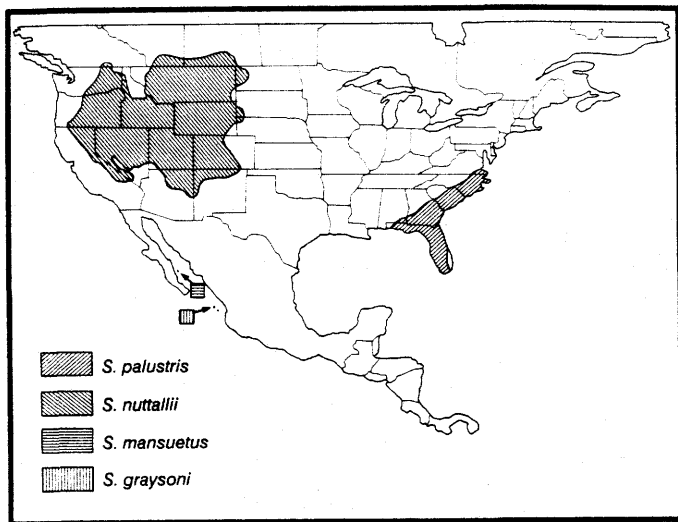


Figure 5.6 Distribution of the Tres Marias cottontail *Sylvilagus graysoni*, San Jose brush rabbit *S. mansuetus*, Nuttall's cottontail *S. nuttallii* and marsh rabbit *S. palustris*

Behavior

According to Wilson (1987, pers. comm.) these "rabbits are amazingly tame and easy to shoot."

Status and Summary

The Tres Marias cottontail is recommended for endangered status because of extensive habitat alterations on the Tres Marias and San Juanito Islands. Major threats are introduced species that compete for food, alter the native vegetation and prey upon the rabbits, and habitat destruction by inhabitants. This recommendation is supported by recent expeditions to the islands by the Oxford University (Dooley 1987, pers. comm.), the U.S. National Museum of Natural History (D.E. Wilson 1987, pers. comm.) and the National University of Mexico (Ceballos and Navarro, in press).

Additionally, a detailed, long-term study to identify the current status and basic biological characteristics of this species is strongly recommended.



Skin of Omilteme cottontail *Sylvilagus insonus*
(Photo by Don E. Wilson)

Omilteme Cottontail *Sylvilagus insonus* (Nelson 1904)

Description and Taxonomy

This is a large cottontail with a short tail, medium-sized hindfeet and long ears. The back is rufous in color and tinged with considerable black. The sides are grayish-black, the tail is reddish-black dorsally, the venter is dingy white except for a brownish throat patch, the hindfeet show considerable white dorsally (Diersing 1981). No subspecies of the Omilteme cottontail *S. insonus* are recognized.

Distribution

The species is known from less than ten specimens. It occurs only in the Sierra Madre del Sur, in the vicinity of Omilteme, Guerrero, Mexico, at elevations between 2,300m and 5,280m (see Fig.5.3).

Habitat and Ecology

The species is restricted to pine and pine-oak forests in the abrupt mountains of the Sierra Madre del Sur. Vegetation near Omilteme, the type locality, is dominated by pine forests with temperate elements such as *Pinus*, *Quercus* and *Alnus*; there are, however, cloud forests with tropical species in the deep "barrancas." The Omilteme cottontail occurs sympatrically with the eastern cottontail *S. floridanus*.

Status and Summary

S. insonus is one of the least known cottontails. It is recommended for endangered status because it has an extremely narrow distribution (<500km²) and it is quite rare (see also Ceballos and Navarro, in press). For example, none were seen in a recent year-long survey of the mammals from Omilteme by the National University of Mexico (J. Juarez, pers. comm.). Although Omilteme has been recently declared a State Reserve by the Mexican government, major threats to this cottontail are hunting and habitat destruction. The coniferous forests have been highly modified and fragmented by intense forestry and cattle grazing. Additionally, this species is of high priority for a status survey.

San Jose Brush Rabbit *Sylvilagus mansuetus* Nelson 1907

Description and Taxonomy

The San Jose brush rabbit *S. mansuetus* is an insular species closely related to the brush rabbit *S. bachmani*. The species resembles the brush rabbit but is lighter in overall color. Cranial features are most useful in separating these two species. No subspecies are recognized.

Distribution and Ecology

Found only in San Jose Island, Gulf of California, Baja California, Mexico (Fig. 5.6). San Jose island (194km²) is one of the largest islands of the California Gulf, probably originated

in the Pliocene, and is separated by five kilometres from mainland Baja California. Its arid vegetation is dominated by cacti and other succulent plants (Case and Cody 1983). Only six other native species of mammals are found on the island, but cats and rats have been accidentally introduced.

Status and Summary

Little is known about the biology, ecology or status of the San Jose brush rabbit. Thus, this species is of high priority for a status survey.

Nuttall's or Mountain Cottontail *Sylvilagus nuttallii* (Bachman 1837)

Subspecies: *Sylvilagus nuttallii grangeri*, *Sylvilagus nuttallii nuttallii*, *Sylvilagus nuttallii pinetis*

Description and Taxonomy

Nuttall's cottontail is small to medium in size (weight 850g). The ears are short and rounded at the tip. The legs are long for the genus and the feet are covered with long, dense hair. The back is grayish and the belly is white. The tail is large and grizzled in color.

Three subspecies of *S. nuttallii* are recognized. A detailed range map is presented in Chapman (1975).

Distribution

Nuttall's cottontail occurs in the intermountain region of North America (Fig.5.6). A recent northward expansion of this species' range into southern British Columbia has been noted by Cowan and Hatter (1940). In California, Nuttall's cottontail occurs from 1,500m to at least 3,450m (Orr 1940). The eastern cottontail *S. floridanus* has displaced Nuttall's cottontail over much of the latter's former range in southeastern North Dakota (Genoways and Jones 1972).

Habitat and Ecology

The habitat of Nuttall's cottontail varies considerably over its range. The species is primarily associated with sagebrush *Artemisa* sp. in the north, while in the southern part of its range it occurs in timbered areas (Hall 1951). Nuttall's cottontail is commonly associated with rocky, brushy and wooded areas (Orr 1940, Hall 1951). This cottontail uses both burrows and forms (Orr 1940); however, they apparently do not dig their own burrows.

Populations of Nuttall's cottontail vary in density from 0.06 to 2.5 per ha in shrub-juniper scrublands in central Oregon



Nuttall's or mountain cottontail *Sylvilagus nuttallii* (Photo by Irene Vandermolen)

(McKay and Verts 1978) and they appear to feed primarily on sagebrush. However, in the spring and summer grasses are selected (Orr 1940).

Reproduction

The onset and duration of the breeding season varies within the range of the species. In northeastern California, it begins in April and lasts into July (Orr 1940). In central Oregon the breeding season lasts from mid-February to the end of July (Powers and Verts 1971). In California each female normally produces two litters (Orr 1940) whereas four or five litters appear to be the norm in Oregon (Powers and Verts 1971). Average litter size is about four to six (range 1-8) and varies between locations within the species range (Orr 1940, Powers and Verts 1971). In Oregon, an adult female breeding throughout the reproduction season could produce 22 young per year. Juvenile breeding appears to be rare (Powers and Verts 1971).

Behavior

Nuttall's cottontail appear to be more solitary than other *Sylvilagus*. Its solitary nature may be attributed to the uniform, often sagebrush, habitat in which it is found. When disturbed the rabbit will usually run 5-15m into cover, then pause, with ears held erect. Feeding usually occurs in brush, or at least near cover (Orr 1940).

Status and Summary

Nuttall's cottontail is a common game species throughout the intermountain west of the United States. It is managed by state and provincial wildlife agencies, primarily through hunting seasons and bag limits. The species has been reviewed by Chapman (1975).

Marsh Rabbit

Sylvilagus palustris (Bachman, 1837)

Subspecies: *Sylvilagus palustris hefneri*, *Sylvilagus palustris paludicola*, *Sylvilagus palustris palustris*

Description and Taxonomy

The marsh rabbit is a large (1.1-1.6kg) dark brown rabbit with rough hair. Its feet are reddish-brown above, darker below. The small tail is inconspicuous and whitish below.

Three subspecies are recognized, *S. p. paludicola*, *S. p. palustris* (Chapman and Willner 1981) and *S. p. hefneri* (Lazell 1984).

Distribution

The marsh rabbit is found from the Dismal Swamp, Virginia, south along the coastal lowlands into the Florida Keys (Fig. 5.6).

Habitat and Ecology

The marsh rabbit is confined to marshy habitats. They are

most often found associated with brackish water areas, although historically have been found around freshwater marshes as well. They are often found associated with cattails *Typha* sp. and, unlike other leporids, the most important factor limiting their distribution is the availability of water (Blair 1936).

Behavior

Like many leporids, the marsh rabbit is nocturnal, spending much of the day resting in a form. Marsh rabbits are at home in the water and swim well. The species usually walks, rather than hopping about in rabbit fashion. Their home range is considered small (Tompkins 1935, Blair 1936).

Reproduction

Marsh rabbits breed year round. Approximately six litters are produced per year per adult female. Mean litter size is approximately three. Annual production of young ranges from 15 to 20.

Status and Summary

Very little is known about marsh rabbit biology and ecology. The species is considered a pest in some prime agricultural settings; however, the insular subspecies *S. p. hefneri* which occurs only on the Florida Keys, Monroe Co., Florida (Lazell 1984) has recently been listed as an endangered subspecies (Federal Register Vol. 55, No. 120; 25588). The species was reviewed by Chapman and Willner (1981). The taxonomic status of this species needs evaluation.

New England Cottontail

Sylvilagus transitionalis (Bangs 1895)

Description and Taxonomy

The New England cottontail is a medium to large rabbit (weight up to 1,000g). The dorsal body parts are pinkish buff to ocher in color. The back is overlain with distinct black hair. The ears are short and rounded and possess a distinct black edge. There is a distinct black spot between the ears, but never a white spot as may occur in the eastern cottontail *S. floridanus*. Because of the similarity in appearance of the New England and eastern cottontails, pelage characteristics are not always diagnostic. Cranial characteristics are the most reliable means of distinguishing the two species (Chapman and Morgan 1973, Chapman 1975). No subspecies of the New England cottontail are recognized.

Distribution

The New England cottontail occurs in a mosaic pattern from southeastern New England south along the Appalachians to Alabama (Fig. 5.7). Chapman and Stauffer (1981: 978-979) suggested that the New England cottontail is a refugial relict. Further, they hypothesized that "this mosaic distributional pattern resulted from a gradual change in the climate coupled with the reinvasion of lowland areas by *S. floridanus*." The



The New England cottontail *Sylvilagus transitionalis*
(Photo by K. B. Fuller)

process appears to be continuing in the northern Appalachians and is being accelerated by habitat alteration (Chapman and Stauffer 1981).

Habitat and Ecology

The New England cottontail is confined to the ericaceous vegetation zone of the Appalachian Mountains and New England. Chapman and Stauffer (1981) have postulated that much of their habitat is being invaded by populations of the eastern cottontail. The disappearance of New England cottontail throughout much of the northeastern USA has been documented by Linkkila (1971). The species is considered rare in Maryland but relatively abundant in certain portions of West Virginia where large blocks of suitable habitat still remain (Chapman and Morgan 1973).

In New England, habitat preferences of the New England and eastern cottontails were difficult to distinguish (Linkkila 1971, Johnston 1972, Jackson 1973). No clearly identifiable habitat type could be associated with either species. However, Jackson (1973) attributes the decline of the New England cottontail to natural succession. More recently, Hoff (1987:89) reported that in "Southeastern Massachusetts where maximum relief is less than 100m, the species has retreated to more cold, wet patches."

In the mid-Atlantic region, the eastern cottontail is confined to the higher elevations of the Appalachian mountains (Llewellyn and Handley 1945, Barbour 1951, Chapman and Morgan 1973, Blymyer 1976). The regions were characterized by presence of clear cuts, overgrown farmsteads or pockets of heath-conifer habitat. The common characteristic was dense cover and conifers.

In the southern Appalachians, New England cottontails are confined to mountain balds or areas of conifers and

scrubby vegetation such as *Kalmia*, *Vaccinium* and *Rhododendron*. The relationships between this vegetation, latitude and elevation are apparent (Chapman and Stauffer 1981).

The New England cottontail feeds on a variety of vegetation, but is the only species of cottontail which may feed extensively on conifer needles (Spencer and Chapman 1986).

Behavior

The behavior of the New England cottontail was studied by Tefft and Chapman (1987). They divided the behavioral repertoire of this species into non-social and social behavior. Non-social behavior included commonly observed activities of lone rabbits. Social behavior included basic postures, vocalizations, movements, reproductive interactions and dominant-subordinate interactions of young and adult males and females.

The basic behavior patterns of this cottontail were stereotyped and ritualized and similar to those reported for many other Leporidae. Access to females and reproduction are regulated by a dominance hierarchy in males. Reproductive behavior is most intense during the estrus period of females, with little social interaction occurring between estrus periods. Reproductive behavior begins two to three days before parturition and post-partum breeding (Tefft and Chapman 1987).



Figure 5.7 Distribution of the New England cottontail *Sylvilagus transitionalis*

Reproduction

The reproductive biology of the New England cottontail has been studied in Maryland and West Virginia (Chapman *et al* 1977). The breeding season of the species lasts from early March to early September, the peak being between March and July. New England cottontails are post-partum synchronous breeders. Juvenile breeding of females accounts for nearly 20% of the pregnancies. The litter size is about 3.5 and the average annual production of young is about 24 per female.

Status and Summary

The status of the New England cottontail has been of concern to biologists and resource agencies for nearly two decades. In 1979, Chapman and Stauffer (1981) suggested to the IUCN/SSC Lagomorph Specialist Group that the species be listed in a classification of *special concern*. Their recommendation was based on the fact that the species appears to differ significantly from the more common eastern cottontail, with which it shares much of its range. Considerable new information has been collected since 1979 and several States have begun to consider carefully the status of the New England cottontail (Feldhamer *et al.* 1984, Fies and Coggin 1985, MacCallum 1985, Hoff 1987). Of interest are the differences which may exist between the demes of this species, in particular the differences between the two cytotypes. The species has a northern cytotype (2N=52) and a southern cytotype (2N=46) (Holden and Eabry 1970, Robinson *et al.* 1983, Ruedas 1986). The species was reviewed by Chapman (1975).

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