

SCOPE

This specification serves as a guide for selecting and implementing the **Upland Wildlife Habitat Management** practice. This document contains a list of considerations for the applicant and the NRCS requirements and constraints of this practice. This document will be given to all producers who apply for NRCS financial and technical assistance to conduct **Upland Wildlife Habitat Management**.

DEFINITION

Provide and manage upland habitats and connectivity within the landscape for wildlife.



Photo by Mike Morel. NRCS Caribbean Area Upland Wildlife Habitat Management

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- To treat upland wildlife habitat concerns identified during the conservation planning process to enable movement or provide shelter, cover, and food in proper amounts, locations and times to sustain wild animals that inhabit uplands during a portion of their life cycle.



CONDITIONS WHERE PRACTICE APPLIES

This conservation practice can be applied on all lands where the decision maker has identified an objective to conserve a wild animal species, suite or ecosystem and/or on lands within the range of targeted wildlife species and capable of supporting the desired habitat.

BACKGROUND

All land provides habitat for some wildlife species. The term “wildlife” means non-domesticated birds, fish, reptiles, amphibians, invertebrates, and mammals. The term “wildlife habitat” refers to the aquatic and terrestrial environments required for fish and wildlife to complete their life cycles, providing air, food, cover, water, and spatial requirements. Not all elements may apply to every habitat type. Consider the following:

- **Food:** Types of food, quantity, quality, distribution, and seasonal availability.
- **Cover:** Types of cover (for nesting, brood rearing, fawning, resting, roosting, escape from predators, summer shade, travel corridors), quantity, quality, and distribution.
- **Water:** Quantity, quality, accessibility, and seasonal availability.
- **Interspersion and Connectedness:** Distance and connections to food, cover, and water.

Cropland, pastureland and woodland all produce and support wildlife by providing some or all of the basic habitat elements. Landowners can address some habitat shortcomings on their property by providing food plots (wildlife habitat planting), nesting boxes, brush piles, watering facilities, and other structures. However, maintaining a sustainable wildlife population often requires cooperation of multiple landowners. Simply having considerable amounts of food, cover, or water does not ensure a sustainable wildlife population. Within any area, large quantities of potential food, water, or cover may go unused because they are too far apart in relation to the customary travels of the animals in that area. An animal could travel a long distance to find water if necessary, but it would do little good if the animal was preyed upon along the way. Properly arranging the habitat components across a landscape is important to ensure that each component benefits the species of concern. Accomplishing this goal requires an understanding of the specific habitat needs of the managed species.

Habitat value depends on the quality, quantity, and interspersion of food, water, cover, and living space. To provide complete habitat, all requirements for the target species must be found within its home range.

Upland Wildlife Habitat Management is a resource management system, not a single practice. To accomplish the goals of the resource management system, a variety of NRCS practices can be employed to maintain and enhance wildlife habitat.



Planning assistance may apply to two levels of wildlife habitat management. The first level is for situations where wildlife production is the primary land use. The second level applies to planning units where wildlife is a secondary land use.

Steps to use this Practice Specification

1. Identify the objectives: what are the goals or results expected to achieve?
2. Identify the current conditions of the habitat, the missing components (food, cover, water, and spatial requirements) and the target species.
3. Use the Target species in order to create, protect or enhance the habitat to guarantee their life cycles, providing air, food, cover, water, and spatial requirements. Not all elements may apply to every habitat type. The data provided in Appendices 1 to 8 include specific information regarding several requirements or characteristics for numerous Caribbean Area wildlife species. This information can be used to develop recommendations or to conduct an on-farm inventory.

GENERAL CONSIDERATIONS

Consider the following items when managing an area for upland wildlife:

- Purpose of the project, including identification of the wildlife species or groups of species to be supported and the habitat needs that can be met on the managed property.
- Surrounding landscape and its relationship to the project location; farms located adjacent to or near State forests, secondary forests, federal forests, reserves, or waterbodies may require establishment of a buffer zone or transitional zone.
- Site conditions such as soils, available water sources, water quality and quantity, and existing vegetation; all habitats will be planned and managed according to soil capabilities.
- The feasibility of providing food, cover, and water for the desired wildlife species at the appropriate time of year.
- When establish vegetation is recommended, include documentation of the essential fish or wildlife species that will be benefited. Encourage plant diversity and native vegetation.
- The positive and negative impacts that upland wildlife may have on the successful management of the site as well as on surrounding areas. Also consider the potential for attracting nuisance wildlife into an area.



- The effects of management on plants and plant diversity, including the potential for invasion by undesirable and invasive species.
- The effects of timing of management on wildlife.
- The effects of management on non-targeted species, especially threatened and endangered species, and other species of concern. NRCS wildlife habitat planning assistance will not adversely impact a federally listed Threatened, Endangered, or Candidate species or its habitat. This also applies to State Species of Special Concern.
- The potential use of ecological services in place of mechanical or chemical treatments to achieve management goals (e.g., services provided by grazers).
- The effects of management actions on compliance with federal and state hunting regulations (e.g., baiting).
- Other constraints such as recurring costs, availability of equipment, access to the site, regulatory or cost-share program requirements, social effects, and visual aspects such as compatibility with the natural landscape.

PLANNING CONSIDERATIONS:

i. Planning Criteria

A planning criterion is a quantitative or qualitative method to assess the existing condition of the natural resources on a site to determine whether additional treatment is needed to address habitat degradation or inadequate habitat for the fish and wildlife resource concern.

ii. Planning Consideration

A planning consideration is a description of potential actions or activities that should be considered to help address an identified resource concern or to address unintended consequences of an action.

It is recommended to use one of the following tools for a basic assessment:

- a) Generalized Caribbean Wildlife Habitat Evaluation Guide (WHEG) according to the land use (crop, pastureland, forest, riparian, wetland)
- b) Species-specific wildlife habitat assessment tool
- c) Stream Visual Assessment Protocol_2

Other considerations or questions that are important to consider:



- a) Do the conservation practice or management activities that are in place meet species or guild-specific habitat model thresholds? or
- b) Are the availability of food, cover or water in the quantity and quality to support habitat requirements for the species of interest? or
- c) Is the connectivity of habitat components adequate to support stable populations of the targeted species?

Planning alternatives for wildlife will be based on a habitat appraisal. NRCS recommends use of the Caribbean Area Wildlife Habitat Evaluation Guide (WHEG). These guides evaluate habitat for overall wildlife species diversity. When a habitat appraisal for a particular wildlife species is desired, consult the NRCS State Biologist.

WILDLIFE OBSERVATIONS AND MONITORING (Data Recording)

To implement the upland wildlife habitat management practice, it is crucial to maintain a record of observations and implement adaptive management activities to achieve the habitat objectives and goals. For that reason, it is necessary to keep a record of those observations and implemented management actions. Some activities to be recorded and performed can be two or four monitoring efforts that require less than 2 people and less than 8 hours per effort (for this practice). Recommended adaptive management actions (2 - 5 efforts) may include cutting limbs that impede bird access of into nesting boxes, replacing damaged fence markers, and cleaning nest structures and debris around other structures. These actions require hand labor and light equipment, a 2-person crew, and less than one day per effort. All observations and activities performed need to be recorded and implemented annually for the best application of this practice.

This is a management practice that needs to be implemented in conjunction with other supporting conservation practices such as Tree/Shrub Establishment (Code 612), Riparian Forest Buffer (Code 391), Riparian Herbaceous Cover (Code 390), Hedgerow Planting (Code 422), Wildlife Habitat Planting (Code 420), Early Successional Habitat Development, Aquatic Organism Passage (Code 396) and Management (Code 647), Stream Habitat Improvement and Management (Code 395), Structure for Wildlife (Code 649) or Multi-Story Cropping (Code 379).

WILDLIFE SPECIES INFORMATION

The NRCS conservationist's primary wildlife management tool is the manipulation of vegetative habitat components. Use the information in this section as guidance to identify and evaluate wildlife species requirements, habitats, and distribution and for planning to improve or establish habitat.



1. River Fish

A healthy river supports aquatic life such as shrimp, crabs, snails, aquatic insects and insect larvae. In Puerto Rico, most fish and shrimp river species have complex life cycles requiring them to spend a portion of their lives in estuaries or the sea, moving downstream or upstream as needed. Dams, water intakes, or river channelization affect most of these species, preventing free movement. Rivers have also been impacted either accidentally or deliberately by discharges that carry toxic substances or increase nutrients and organic load, thus decreasing available oxygen.

High elevation, steep streams are dominated by shrimp species and the Sirajo goby fish. Coastal plain streams are dominated by large shrimp, fish, and eels.

Consider the following conservation measures for river fish:

- Maintain minimum river flows.
- Reduce obstructions to migration (dams, water intake).
- Maintain habitat variety (riffles, pools, meanders).
- Avoid using agricultural chemicals near rivers or streams.
- Enhance and maintain riparian forest buffer at least 15ft wide; do not cut any trees or shrubs in the riparian area.
- Reduce bank erosion.
- Clean up trash in rivers, streams or guts.
- Do not release non-native fish

See Appendix 1 for Native Caribbean Area River Fauna. Table developed by Beverly Yoshioka, US Fish and Wildlife Service.

2. Birds

Birds are one of the most prevalent forms of wildlife present in the Caribbean Area. Most bird species listed in the Appendices are found in both Puerto Rico and the U.S. Virgin Islands. Birds may provide ecological services for agricultural activities but may not always be beneficial; sometimes birds can impact agricultural yield. Intensive agricultural production can also threaten bird species. Appendix 2 includes the habitat, nesting and feeding descriptions for some representative Caribbean Area birds. Appendix 3 identifies their nesting periods. When planning to attract birds to the farm, consider the following conservation practices:

- Plant native trees.
- Plant a variety of flowering trees and shrubs to provide year-round food for birds.
- Prune trees and shrubs to promote healthier plants that provide more flowers and fruits to benefit wildlife.



- Promote agroforestry conservation practices.
- Provide wildlife escape ramps in the water troughs.
- Avoid using agricultural chemicals in the bird habitat.
- Install buffers, hedgerows, and similar plant structures.

3. Reptiles

Reptiles work as biological controls for several crops because they feed on harmful invertebrates and insects. Reptiles are also an important component in the food web for their diversity and abundance. Appendix 4 identifies endemic reptiles for PR and the USVI: in Puerto Rico there are 51 native species of reptiles and in the USVI there are 16 native reptiles. Their diet consists mainly of terrestrial prey, such as insects.

Conservation measures recommended for reptiles include:

- Build brush piles (to create cover, provide additional structure to existing habitat and enhance prey availability).
- Plant native trees.
- Avoid the introduction of exotic reptile species.
- Maintain structures used for shelter or protection, such as ponds.
- Increase the area of habitat suitable for reptiles.
- Pile rocks in a sunny spot to provide basking sites.
- Consider planting shade-tolerant groundcovers under trees and leaving a thick layer of leaves to provide temperature shelter.
- Placing stumps, logs, and rock piles in a shady spot.
- Maintain a mosaic of open habitats and scrub.
- Maintain a diversity vegetation structures.
- Avoid using agricultural chemicals in the reptile habitat.

4. Amphibians

Amphibians are characterized as being dependent on water for reproduction. They have smooth semi-permeable skin, unlike the scaly skin of reptiles. Some amphibian species gather at freshwater sources to spawn and their aquatic larvae hatch out of gelatinous eggs to mature in the water. Other species produce eggs that have direct development (no aquatic larvae) and used humid forested areas.

Amphibians are important for agricultural activity. An example of this are the Coquis treefrogs that provide biological control of insects that are harmful to crops. See Appendix 5 for information regarding several amphibian endemic to Puerto Rico and the USVI. Their diet consists mainly of insects, termites and small ants, spiders, and other invertebrates.



Conservation measures recommended for amphibians include:

- Build a rock pile under some shrubs.
- Avoid using agricultural chemicals.
- Enhance and maintain riparian forest buffers.
- Reduce streambank erosion.
- Clean up trash in rivers, streams, or guts.
- Maintain ground cover and leaf-litter.
- Do not use pesticides. Even those considered “safe” by industrial standards might have potential toxic effects on amphibians.
- Protect streams, waterbodies, ponds, and guts.

5. Pollinators

The word pollinator brings to mind honeybees. However, pollinators may also include butterflies, moths, wasps, flies, beetles, ants, bats and even some birds.

A pollinator habitat enhancement includes the improvement, restoration, enhancement, or expansion of flower-rich habitat that supports native and/or managed pollinators. This action provides pollen, nectar, and nesting sites. It is also very important protect the pollinator from pesticides. For this reason, when recommending this conservation practice focus on the fundamentals: forage, nesting sites and protection from pesticides. Follow these three rules: (1) diversity; (2) variety of flowers (different sizes, colors, and shapes); and (3) blooming the entire year. Appendix 6 includes detailed information regarding bees and their relationship with several crops. Appendix 7 includes several plants that will be recommended in order to provide habitat to support bees.

A. Bees

To establish bee pollinator habitat:

Recommend native plants, flowering legumes, trees or forbs. On grazing lands consider long rest periods to allow for pollinator and plant recovery.

Plant a variety of flowering forbs, legumes, trees and shrubs to provide year-round food for pollinators.

Locate pollinator habitat where chemical drift will not be a concern.

Avoid spraying herbicides or insecticides on field borders, filter strips, hedgerows and field windbreaks.

Select undisturbed areas, the best site for habitat area on the least erosive portion of the field. Do not install pollinator habitat across areas of concentrated water flow.

Implement no-till farming to reduce disturbance of ground-nesting insects, especially for cropland adjacent to diverse herbaceous or woody cover.

Reduce or eliminate the use of insecticides. If possible, select pesticide formulations that are less toxic to pollinators (for example, liquid forms are generally less toxic than granular powders, which are less noxious than dust) or break down faster. Avoid microencapsulated formulations since they mimic pollen. Choose ground applications over aerial spraying. Time spray operations very early or late in the day when pollinators are less active.

Provide woody structures such as downed tree structures to make an artificial nesting site. Soil removed from drainage ditches can be piled to create potential bee ground-nesting habitat.



Photos of nests of *Xylocopa mordax* (cigarron).

B. Bats

Bats are beneficial to agricultural activities. Bat species can provide pollination and pest management. Appendix 8 has a summary of bat species present in Puerto Rico and the USVI. Chapter 4 of the book *Biodiversidad de Puerto Rico* identifies some species that provide food for bats: Higuillos (*Piper sp.*), Maria (*Calophyllum calaba*), Moca (*Andira inermis*), Mameyuelo (*Colubrina arborescens*), Maga (*Thespesia grandiflora*), Jagüey (*Ficus sp.*), Berenjena cimarrona (*Solanum torvum*), Yagrumo (*Cecropia schreberiana*), Ausubo (*Manilkara bidentata*), Palma de sierra (*Prestoea montana*).



6. Plant Species for Wildlife

Many tree and shrub species are excellent sources of food for wildlife. Proper selection of plant material can meet both the aesthetic needs of the landowner and the food and shelter needs of wildlife. When recommending establishing plants, include documentation of the essential fish or wildlife species that will be benefited.

Encourage plant diversity and native vegetation that occur in the area. It is extremely important to recommend native species. Native plants provide shelter and food for a diversity of wildlife; are adapted to local soil, rainfall and temperature conditions; have developed natural defenses to many insects and diseases; require minimal irrigation; flourish without fertilizers; promote local biological diversity; and are unlikely to become weedy.

Several fruit crops such as citrus, papaya, soursop and others are suitable food for wildlife. However, establishment of a monoculture crop is not considered adequate management for wildlife. It is necessary to plant a diversity of species (e.g.: 5 citrus trees, 5 soursop, 5 papayas or others), a multi-storied plant canopy of forbs, as well as juvenile and mature shrubs and trees, to provide a variety of above-ground habitat for birds and other wildlife, and below-ground habitat for burrowing animals and soil organisms.

Practice specifications for conservation practices Tree/shrubs Establishment (Code 612), Riparian Forest Buffer (Code 391), Hedgerow Planting (Code 422) and Wildlife Habitat Planting (Code 420) located in the eFOTG identify some plant species to consider for wildlife habitat. The list does not include all options. The objective of the list is to provide a guide to use to inventory existing plants or select plants to establish, enhance or create habitat.

7. Conservation Practices

Application of most conservation practices is generally considered to be beneficial for wildlife. However, some practices can reduce wildlife food and cover when applied without consideration for wildlife habitat. The effect of conservation practice installation on wildlife habitat largely depends on practice selection, design and plant species used.



Appendix 1. Caribbean native river fauna¹

SPECIES	Group	LH	Use	Preferred Habitat	Feeding Type
<i>Atya innocous</i>	Shrimp	A	E	mid-high river	filter/deposit
<i>A. lanipes</i>	Shrimp	A	E	mid-high river	filter/deposit
<i>A. scabra</i>	Shrimp	A	E	mid-high river	filter
<i>Micratyapoeyi</i>	Shrimp	A		mid-high river	deposit/filter
<i>Potimirim americana</i>	Shrimp	A		low-mid river	deposit/filter
<i>P. mexicana</i>	Shrimp	A		low-mid river	deposit/filter
<i>P. glabra</i>	Shrimp	A		low-mid river	deposit/filter
<i>Janga serrei</i>	Shrimp	A		low river	deposit/filter
<i>Xiphocaris elongata</i>	Shrimp	A	B	whole river	deposit, omnivore
<i>Macrobrachium carcinus</i>	Shrimp	A	E	whole river	predator
<i>M acanthurus</i>	Shrimp	A	E	low river	predator
<i>M faustinum</i>	Shrimp	A	B	entire river	predator
<i>M. creriulatum</i>	Shrimp	A	B	whole river	predator
<i>M. heterochirus</i>	Shrimp	A	E	whole river	predator
<i>Epilobocera sinuatifrons</i>	Crab	NM	E	whole river	predator
<i>Anguilla rostrate</i> /American eel	Fish	C	E	whole river	predator
<i>Awaous tajasica</i>	Fish	A	E	low-mid river	predator
<i>Eleotris Pisonis/morón</i>	Fish	A	B	low river	predator
<i>Gobiomorus dormitar</i> /bigmouth sleeper/guabina	Fish	A	E	whole river	predator
<i>Sicydium plumieri</i> /sirajo goby/cetí	Fish	A	E	mid-high river	herbivore
<i>Agonostomus monticola</i> / mountain mullet/dajao	Fish	A	E	whole river	omnivore

(1) Source Puerto Rico River Fauna, US Fish and Wildlife Service.

A - amphidromous, adult life and reproduction in the river, eggs or larvae released to move downstream and develop in the estuary, juveniles migrate back upstream.

C - catadromous, adults migrate to ocean to reproduce, larvae enter into rivers and develop

NM- non-migratory, larval stages passed in the eggs

E - edible, fished for sport and artisanal for human consumption




B - used for bait Habitat preferences do not consider obstacles such as dams or high falls.

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Appendix 2. Representative Caribbean Bird Species Characteristics

Scientific (Spanish/English Name)	Photo	Identification	Habitat	Nest	Feeding
<i>Agelaius xanthomus</i> (Mariquita de Puerto Rico/Yellow-shouldered blackbird)		Black bird with yellow "shoulder" patches, and a pointed bill	Open, dry forests and mangroves of southwestern Puerto Rico.	Cup nest in mangroves, palms, and other trees or in a tree cavity or nest box.	Insects and seeds. Prey includes weevils, other beetles, caterpillars, moths, crickets, earwigs, wasps, flies, spiders, and occasional snails and seeds.
<i>Amazona vittata</i> (Cotorra de Puerto Rico/Puerto Rican parrot)		Green with a red forehead and white eye ring	Yunque Forest, Rio Abajo Forest (Utuado y Arecibo) and Maricao Forest	A large tree cavity in a tree trunk, usually palo colorado tree (<i>Cyrilla racemiflora</i>).	Seeds, fruits and flowers, important food tree: sierra palm (<i>Prestoea montana</i>).
<i>Anthracothorax viridis</i> (Zumbador verde de P.R./Green Mango)		Hummingbird with a curved bill. Both sexes are green above and below, with a bluish tail. The intensity of the color depends on the sun's angle.	Coffee plantations, forest central and western mountains.	Cup-shaped nest that is coated with lichens, typically placed on a tree limb.	Insects (such as beetles, flies, lantern flies), spiders, and flower nectar.

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<p><i>Caprimulgus noctitherus</i> (Guabairo/Puerton Rican Nightjag)</p>		<p>Night bird that is well camouflaged with mottled brown plumage.</p>	<p>Dry, semideciduous forest with open understory and dense leaf litter layer on the ground for nesting, Forest areas of southwestern Puerto Rico.</p>	<p>Normal clutch and these are laid directly on the leaf litter on the forest floor beneath the brush.</p>	<p>Nocturnal flying insects</p>
<p><i>Chlorostilbon maugaeus</i> (Zumbadorcito de Puerto Rico/Puerto Rican Emerald)</p>		<p>Body is iridescent green, with a black, forked tail. The lower bill is flesh-colored or red with a black tip. The female is light below and has a white-tipped tail.</p>	<p>Mountain forest, it is also found irregularly on the coast (drier south).</p>	<p>Tiny cup made of lichens, tree ferns, and other plant material.</p>	<p>Insects (lantern flies, mosquitoes, and other fly species), spiders, and nectar.</p>
<p><i>Coccyzus vieilloti</i> (Pájaro Bobo Mayor/Puerto Rican Lizard-Cuckoo)</p>		<p>A large forest bird with a gray breast and rufous belly. It has a red eye ring, a long tail with prominent white spots underneath, and a long, relatively straight bill.</p>	<p>Thick forests, coffee plantations limestone hills, and even suburban neighborhoods adjacent to dense vegetation.</p>	<p>Twig platform in a tree or bush.</p>	<p>Small lizards, large spiders and insects including cicadas, beetles, stick insects, and caterpillars.</p>

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<p><i>Dendroica adelaidae</i> (Reinita Mariposera/ Adelaide's Warbler)</p>		<p>Underparts bluish-gray, throat and breast yellow, eyebrow stripe yellow or white. Female is similar but the crown stripe edge is less pronounced and less white in tail.</p>	<p>Dry, lowland forests and some moist forest areas, with tangles of vines and thickets, especially in the southwest and the northern limestone hills.</p>	<p>Finely woven cup-shaped located in a tree or dense thicket, cup placed 3-20 feet high in a tree or shrub.</p>	<p>Lantern flies, grasshoppers, caterpillars, stink bugs, flies, weevils, other beetles and spiders.</p>
<p><i>Dendroica angelae</i> (Reinita del Bosque Enano/Elfin-woods Warbler)</p>		<p>Black dorsally, white ventrally. White eyebrow stripe, white patches on ears and neck, incomplete eyeing. Immature is grayish-green dorsally.</p>	<p>Mountain cloud forest and lower montane forest from 370-1030 meters in elevation (Sierra de Luquillo, Siera de Cayey, Toro Negro and Maricao State Forest)</p>	<p>Tightly woven cup in aerial leaf litter trapped in vegetation or vines.</p>	<p>Insects</p>
<p><i>Icterus portoricensis</i> (Calandria de Puerto Rico/Puerto Rican oriole)</p>		<p>The adult is black, with a yellow wing patch, and yellow patches on the rump and on the underside at the base of the tail. Immature birds are olive green.</p>	<p>Dry and moist forests, including shade-grown coffee plantations, citrus orchards, mangroves, palm groves, urban gardens.</p>	<p>Fibrous, hanging nest and is often placed in a palm tree.</p>	<p>Eats mostly insects (earwigs, crickets, grasshoppers, roaches, cicadas, weevils, caterpillars, ants and wasps). Also eats spiders and consume forest fruits and juices of overripe oranges.</p>

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<p><i>Loxigilla portoricensis</i> (Come ñame de Puerto Rico/Puerto Rican bullfinch)</p>		<p>A thick-billed, black, with large reddish patches above the eyes, on the throat, and under the base of the tail. The female is slightly smaller and duller colored than the male.</p>	<p>Moist and dry forest with thick brushy areas, and coffee plantations (not found from Fajardo to Ceiba).</p>	<p>Open or domed with an entrance in the side.</p>	<p>Seeds, fruits and buds.</p>
<p><i>Megascops nudipes</i> (Múcaro Común/Puerto Rican Screech-Owl)</p>		<p>White "eyebrows"; dark brown above and white below, with dark vertical streaking on the breast</p>	<p>Wooded areas, dense tree stands. Prefers woods with a well-developed understory, plus large hardwood trees or palms for nest cavities.</p>	<p>Tree cavity, hole in a tree.</p>	<p>Large insects (crickets, grasshoppers, roaches, beetles, moths, caterpillars).</p>
<p><i>Melanerpes portoricensis</i> (Carpintero de Puerto Rico/Puerto Rican woodpecker)</p>		<p>Solid black upper parts, with a bright red throat and breast, and a white forehead. The lower abdomen and flanks are buffy colored. Its white rump patch is striking in flight. The female has less red below than the male.</p>	<p>Forest, coffee plantations, mangroves, palm grove, parks and gardens.</p>	<p>Nest cavities are usually high in trees.</p>	<p>Insects, lizards, scorpions, frogs and several native tree fruits.</p>

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<p><i>Myiarchus antillarum</i> (Jui/Puerto Rican flycatcher)</p>		<p>Dark brown back and light undersides. There is sometimes a slight hint of two faint, buff wing bars.</p>	<p>Shade coffee plantations and lower elevation forests, especially in coastal scrub forests.</p>	<p>Tree hole</p>	<p>Weevils, caterpillars, bees, wasps, dragonflies, and hemipteran insects, wild fruit and berries, occasionally snails, lizards and frogs.</p>
<p><i>Nesospingus speculifrus</i> (Llorosa de P.R. /Puerto Rican tanager)</p>		<p>A noisy forest bird with an olive-brown back, darker on top of the head and white below with dusky stripes on the breast and conspicuous white spot in the wing. The adult has a small, square, white wing patch.</p>	<p>Mountain forests, shade coffee plantations, and gardens at higher elevations.</p>	<p>Cup-shaped made of roots, vines and strands of fungus, lined with strips of palm leaves.</p>	<p>Insects, (moths, caterpillars, beetles, grasshoppers, ants), spiders, snails, and lizards) fruit and some seeds.</p>
<p><i>Spindalis portoricensis</i> (Reina Mora/Puerto Rican Spindalis)</p>		<p>Male has a white stripe in the black head, yellow ventrally, reddish-orange neck and breast. Female is olive-brown dorsally, dull white with gray streaks ventrally.</p>	<p>Forests, suburban gardens, and plantations with fruiting plants</p>	<p>Ranging from a small cup, to bulky, deeper nests.</p>	<p>Berries and fruits such as figs, blackberries and Cecropia fruits, but will consume some aphids and other insects.</p>

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<p><i>Todus mexicanus</i> (San Pedrito de Puerto Rico/Puerto Rican Tody)</p>		<p>Small bright green compact body, red throat and bill, yellow flanks</p>	<p>Forest types with dense thickets and vines, as long as there are earthen banks or road cuts for nesting, arid area in the south.</p>	<p>Excavates a curved burrow with a terminal nest chamber into an earth bank.</p>	<p>Insects, including katydids, grasshoppers, crickets, earwigs, dragonflies, flies (Diptera), and beetles (Coleoptera), as well as spiders, and occasional small lizards and fruits.</p>
<p><i>Vireo latimeri</i> (Bien-Te- Veo de Puerto Rico/Puerto Rican vireo)</p>		<p>Gray head, white breast and light-yellow belly. There are white crescents above and below the eye.</p>	<p>Mountain forest, coffee plantation, coastal karst and thorn forest with vine tangles.</p>	<p>Deep, cup-shaped, low to moderate elevation.</p>	<p>Insects (grasshopper, cicadas, beetles, aphid and caterpillars).</p>



Appendix 3. Birds' Nesting Period

Spanish name	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
<i>Agelaius xanthomus</i> (Mariquita de Puerto Rico/Yellow-shouldered blackbird)					1	1						
<i>Amazona vittata</i> (Cotorra de Puerto Rico/Puerto Rican parrot)		1	1	1	1	1						
<i>Anthracothorax viridis</i> (Zumbador verde de P.R./Green Mango)	1	1								1	1	1
<i>Caprimulgus noctitherus</i> (Guabairo/Puertor Rican Nightjag)		1	1	1	1	1	1					
<i>Chlorostilbon maugaeus</i> (Zumbadorcito de Puerto Rico/Puerto Rican Emerald)		1	1	1	1							
<i>Coccyzus vieilloti</i> (Pájaro Bobo Mayor/Puerto Rican Lizard-Cuckoo)		1	1	1								
<i>Dendroica adelaidae</i> (Reinita Mariposera/ Adelaide's Warbler)			1	1	1	1						
<i>Dendroica angelae</i> (Reinita del Bosque Enano/Elfin-woods Warbler)	1	1	1	1								1
<i>Icterus portoricencis</i> (Calandria de Puerto Rico/Puerto Rican oriole)			1	1	1	1						
<i>Loxigilla portoricencis</i> (Come ñame de Puerto Rico/Puerto Rican bullfinch)		1	1	1	1	1						
<i>Megascops nudipes</i> (Múcaro Común/Puerto Rican Screech-Owl)				1	1	1						
<i>Melanerpes portoricencis</i> (Carpintero de Puerto Rico/Puerto Rican woodpecker)	1	1	1	1								
<i>Myiarchus antillarum</i> (Jui/Puerto Rican flycatcher)		1	1	1	1	1	1					
<i>Nesospingus speculifrus</i> (Llorosa de P.R. /Puerto Rican tanager)	1	1	1	1	1	1	1	1				
<i>Spindalis portoricencis</i> (Reina Mora/Puerto Rican Spindalis)	1	1	1	1	1	1						
<i>Todus mexicanus</i> (San Pedrito de Puerto Rico/Puerto Rican Tody)		1	1	1	1							
<i>Vireo latimeri</i> (Bien-Te-Veo de Puerto Rico/Puerto Rican vireo)				1	1	1						

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Appendix 4. Characteristics of Caribbean Area Reptiles

Scientific (Spanish/English) Name	Habitat-Range
<i>Trachemys s. stejnegeri</i> (Hicotea, Jicotea)	Lives in ponds, lakes, reservoirs, rivers and streams. Laguna Tortuguero, (Vega Baja) Wildlife Refuge Humacao, Caño Tiburones, Irrigation canals Guanica, Mans made ponds in Isabela and Piñones. Feeds in water but sunbaths are taken on exposed rocks or trees trunks lying near water edge. Feeds on both animals and vegetables (snails, shrimps, pieces of fish, lettuce or some other tender leaves.)
<i>Sphaerodactylus gaigeae</i> (Salamanquita de Pandura/Gaige's Dwarf Gecko)	Under leaf litter, rocks and logs in coffee plantations. Sierra de Panduras between Maunabo and Yabucoa, Cayo Santiago, Vieques, Isla Piñeros
<i>Sphaerodactylus klauberi</i> (Salamanquita Negra/Klauber's Dwarf Gecko)	It is an inhabitant of interior, upland moist habitats occurring mostly in leaf-litter, and is present in tabonuco forest type. Carite, Toro Negro and Río Abajo state forests.
<i>Sphaerodactylus levinsi</i> (Salamanquita del Desecheo/Desecheo Gecko)	It has been observed in areas densely forested with <i>Bursera simaruba</i> and <i>Amyris elemifera</i> , where the floor consisted of loose soil and a dense layer of leaves and forest litter over it. Is only found in the Island of Desecheo
<i>Sphaerodactylus grandisquamis</i> (Salamanquita Común/Common Dwarf Gecko)	Moist forests but also semi-xeric coastal coconut groves in northeastern Puerto Rico. Vieques, Culebra and their keys, and the US Virgin Islands. Central Mountain Range at 2,800 ft., being also identified at Boquerón, Susúa, and Playa de Ponce.
<i>Sphaerodactylus micropithecus</i> (Salamanquita de Monito/Monito Gecko)	Xeric scrub vegetation which consists of cacti, shrubs, and stunted trees. Is only found in Monito Island.
<i>Sphaerodactylus monensis</i> (Salamanquita de la Mona/Mona Dwarf Gecko)	Under coral rock, under palm trash and during the daytime over leaf covered floor of mahogany and Casuarina forests. It is considered a xerophilic to semimesophilic species. Is only found in Mona Island.
<i>Sphaerodactylus nicholsi</i> (Salamanquita Pigmea/Puerto Rican Crescent Sphaero)	This species has been found in a range of habitats including both xeric and coastal forests, open areas and beaches, plantations, semi-evergreen ravines, and grass and brush scrubland. Individuals of this species are known to occur in anthropogenic environments, such as gardens. Puerto Rico (Puerto Rico (main island)) This species is found along the southern, western and north-central coasts of Puerto Rico
<i>Sphaerodactylus roosevelti</i> (Salamanquita de Roosevelt/Roosevelt'S Dwarf Gecko)	It is considered a xerophilic species inhabiting dry forests. This species is found along the south west Puerto Rico, Caja de Muertos and Vieques islands
<i>Sphaerodactylus townsendi</i> (Salamanquita del sureste/Townsend's Dwarf Gecko)	Xerophilic to semi-mesophilic, and inhabits leaf litter, decomposing logs, and palm trash Is found in Cabezas de San Juan in northeastern Puerto Rico, south-central coast west to Playa de Ponce, Caja de Muertos Island, Piñeros Island, Platillo or Morillito Island, and Vieques Island.
<i>Pholidoscelis alboguttata</i> (Siguana de la Mona/Puerto Rican Ground Lizard)	Xeric environments more commonly encountered on sandy soils in somewhat arid open areas. Is only found in Mona Island.



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<i>Pholidoscelis desecheensis</i> (Siguana del Desecheo/Puerto Rican Ground Lizard)	This species prefers xerophitic environments, more commonly encountered on sandy soils in somewhat arid open areas. Is only found in Desecheo Island.
<i>Pholidoscelis exsul</i> (Siguana Común/Puerto Rican Ground Lizard)	Lawns, sugar cane fields, vacant lots, roadsides, city parks and plazas, around human habitations, and along mangrove border. Is found in Puerto Rico mainland, offshore islands Vieques and Culebra and many cays. Has been observed in the US Virgin Islands.
<i>Pholidoscelis wetmorei</i> (Siguana de Rabo Azul/Blue-Tailed Ground Lizard)	It has been classified as xerophilic. Found in southwestern Puerto Rico including Magueyes, Caja de Muertos, and Morrillito islands.
<i>Diploglossus pleei</i> (Culebra de Cuatro Patas/Puerto Rican Galliwasp)	Deep forest, widely distributed in Puerto Rico, at the Cambalache State Forest, coffee plantations, and other mesic wooded situations such as borders of pastures and sugarcane fields, limestone ridges and semi-dry haystack hills.
<i>Ctenonotus cooki</i> (Lagartijo del Seco/Cook's Anole)	Dry forest and coastal scrub in portions of the subtropical dry forest life zone. It has also been associated with dry evergreen seasonal woodland found in the lowlands of southwestern Puerto Rico (Cabo Rojo to Guayanilla, and Caja de Muertos Island).
<i>Ctenonotus cristatellus</i> (Lagartijo Común/Puerto Rican crested anole)	Open areas such as open forests, fields and mostly deforested areas. It is commonly found in roadsides, poles, and fences. It has been observed in both shaded and sunny coffee plantations. Distributed in mainland Puerto Rico and many of its offshore islands, including Vieques, Culebra and Culebrita.
<i>Xiphosurus cuvieri</i> (Lagarto VerdePuerto/ Rican Giant Anole)	Evergreen formations, prefer the shady, cool coffee plantations at intermediate elevations such areas as close to the coast up to the upper Central and Luquillo Mountain Ranges.
<i>Ctenonotus desecheensis</i> (Lagartijo de Desecheo/Desecheo Anole)	Xerophilic species, only lives in the Island of Desecheo Island.
<i>Ctenonotus evermanni</i> (Lagartijo Verde/Emerald Anole)	Prefer mesic and deep wet forest habitats. It occurs on shrubs and low trees in coffee plantations and where palms occur. It may also be found in thick stems of bamboo. It has been consistently observed in forests dominated by tabonuco (<i>Dacryodes excelsa</i>), and sierra palm (<i>Prestonea montana</i>). It is found in Maricao, Mayagüez, Dorado, and at Tortuguero Lagoon, Sierra de Panduras, Central Mountain Range, Sierra de Luquillo.
<i>Ctenonotus gundlachi</i> (Lagartijo Barba amarilla/Yellow-Bearded Anole)	Distributed throughout Puerto Rico but is restricted to the dense forest, coffee belt" and higher forested areas, although it reaches the coastal plain in some places. A trunk-crown species, it also perches on shrubs.
<i>Ctenonotus s krugi</i> (Lagartijo Jardinero de Montaña/Upland Grass Anole)	Mountains where it prefers areas that are open but also shady, low bushes, vines and ferns alongside roads or trails. It can be found in the mountain ranges of Cayey and Pandura along the south coast, near Guayama.
<i>Ctenonotus monensis</i> (Lagartijo de la Mona/Mona Anole)	It is a trunk-ground anoline that is more arboreal in its habits than <i>A. cristatellus</i> . However, it seems to occur also in open pastures. Found in Mona and Monito islands.



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<i>Deiroptyx occulta</i> (Lagartijo Pigeo/Puerto Rican Pygmy Anole)	Mainland Puerto Rico, semi-dry type of vegetation. It may be found in the forest canopy, but it may also occupy peripheral vegetation, including bushes, ferns, upper surface of broad leaves, on the ground, and on the outer leaflets of bromeliads on the forest floor. Found Maricao State Forest, El Yunque, El Verde, the Cayey Mountain Range, and at haystack area west of Manatí.
<i>Ctenonotus poncensis</i> (Lagartijo Jardinero de Ponce/Dryland Grass Anole)	Subtropical dry forest, and it can be found in pastures, exposed grassy areas, and shrub areas. Found in southwest Puerto Rico from the towns of Cabo Rojo to Salinas, or perhaps Guayama, and it is also found on the Coamo hills. It is also present in Caja de Muertos Island
<i>Ctenonotus pulchellus</i> (Lagartijo Jardinero/ Common Grass Anole)	Prefers grasses, also occur in bushes and plants but seldom on trees. It has been observed in coffee plantations and on <i>Coccoloba</i> shrubs of coastal regions. It is considered a xerophilic to semi-mesophilic lizard. Puerto Rico and its adjacent islands of Vieques and Culebra, abundant on St. Thomas.
<i>Xiphosurus roosevelti</i> (Lagartijo Gigante de Culebra/Culebra Island Giant)	Forests of tall gumbo limbo (<i>Bursera</i>) and Ficus trees, where it forages for fruits on the branches (USFWS 1982). Culebra Island, has probably become extinct.
<i>Ctenonotus stratulus</i> (Lagartijo Manchado/Barred Anole)	It is associated with xeric to mesic environments. It is considered trunk-crown lizard that is most frequently observed on tree trunks, although it may also be seen on grasses. Puerto Rico, Vieques and Culebra islands. It is also present in some of the U.S. Virgin Islands.
<i>Cyclura cornuta stejnegeri</i> (Iguana de la Mona)	Is restricted to Mona Island.
<i>Amphisbaena bakeri</i> (Culebrita ciega de Baker/Baker's Legless Lizard)	Rotten logs along edge of clearings with short weedy vegetation. It also inhabits grassy pastures in doline bottoms, central, coffee plantations, western portion of the Island.
<i>Amphisbaena caeca</i> (Culebrita ciega común/Puerto Rican Worm Lizard)	If occurs throughout the Island (except perhaps the arid southwest, and up to elevation of at least 2200 ft.), in shaded habitats including upland coffee plantations, coastal Terminalia woods, mesic woods adjacent to pasture, exposed ravine side, shady ravine woods. Individuals of this species have also been seen in Cocos plantations 100 yards away from shore.
<i>Amphisbaena schmidti</i> (Culebrita ciega de Schmidt/Schmidt's Worm lizard)	Acacia scrub, at exposed edges of coffee plantations, Psidium scrub at rim of doline pasture. If occurs in the main island and it is mostly concentrated in the northwestern limestone region. It has been collected in the limestone section from the towns of Aguadilla to Dorado and south to Utuado.
<i>Amphisbaena xera</i> (Culebrita ciega del seco/North American Worm Lizard)	This species has been observed in xeric woods with leaf litter cover, mesic woods with spiny palm <i>Acronomia sp.</i> and transitional areas between xeric lowlands and mesic highlands (Puerto Rico southwest and Caja de Muertos Island).
<i>Antillotyphlops granti</i> (Víbora de Grant/Grant'S Blind Snake)	Subtropical dry forest where it usually occurs under rocks and trunks. Has been observed in the southwestern Puerto Rico, (la Parguera east to vicinity of Guánica and Caja de Muertos Island). It has also been collected at Campamento Santiago.
<i>Antillotyphlops hypomethes</i> (Víbora universitaria/Blind Snak)	Usually move through yielding soil through paths of least resistance but do not create tunnels.



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<i>Antillotyphlops monensis</i> (Víbora de la Mona/Mona Blind Snake)	Usually move through yielding soil through paths of least resistance but do not create tunnels, endemic species in Mona Island.
<i>Antillotyphlops platycephalus</i> (Víbora decabeza aplastada/Flat-Headed Blindsnak)	Occurs in open and semi-open habitat, such as areas containing pasture bordered by forested limestone hills with numerous limestone rocks. They occur under rocks in pasture-edge habitats. Is the most widely distributed blind snake in Puerto Rico
<i>Typhlops rostellatus</i> (Víbora de pico/Puerto Rican Wetland Blind Snake)	Coffee plantations, rocky hillsides, open pastures, forested and upland habitats, and can be found under fallen logs and rocks, widely distributed in the northern part of the island.
<i>Chilabothrus inornatus</i> (Culebrón/Puerto Rican Boa)	It occupies a wide range of habitats, from wet montane forest to dry forest environments, including offshore cays and pastureland with patches of exotic trees.
<i>Chilabothrus monensis</i> (Culebrón de la Mona/Mona Boa)	Subtropical dry forest, and it's adapted to xeric environments, restricted to Mona Island
<i>Magliophis exiguum</i> (Culebra de jardín/Ground Snake)	Prefers the forest floor under rocks, leaf litter or dead logs and branches in lower to middle sections of montane wet and dry forests. It also may often occur in urban and rural garden settings. <i>Arrhyton exiguum</i> was reclassified taxonomically to <i>Magliophis exiguum</i> by Hedges et al., (2009). Widely distributed across Puerto Rico, it is also present on St. Thomas and St. Johns, but it is absent from St. Croix (Platenberg et al. 2005).
<i>Borikenophis portoricensis</i> (Culebra corredora/ Puerto Rican Racer)	Is a diurnal (active during the daytime) and terrestrial (ground dwelling) snake, although be found in trees. Occurs throughout the main island of Puerto Rico from coastal plain to forested middle elevations. Also occurs in Virgin Island.



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Appendix 5. Characteristic of Amphibians

Scientific (Spanish/English) Name	Habitat- Range
<i>Eleutherodactylus antillensis</i> (Coquí churi/Antillean Frog)	Mainland Puerto Rico, and the islands of Vieques, Culebra pastures and other open lowland terrains. It is also found in low vegetation in urban areas, and at the edge of forests.
<i>Eleutherodactylus brittoni</i> (Coquí de las yerbas/Grass Coqui)	Island wide distribution found in exposed grasslands, tall grass prairies, in pastures along roads, particularly in areas exposed to the sun, forest edges at lower elevations, and young sugar cane fields.
<i>Eleutherodactylus cochranae</i> (Coquí pitito/Whistling Frog)	Throughout Puerto Rico and appears to have a peripheral distribution. It is also present in Isla Vieques, Isla Culebra, and U.S. Virgin Islands. Found in banana plants, in low plants and bushes, on cacti, on grass, but also in the upper reaches of trees.
<i>Eleutherodactylus cooki</i> (Coquí guajón/Rock Coqui)	strictly associated with caves formed by large boulders of granite rock known as “guajonales” but it also occurs in streams containing rocks and surrounded by secondary forest.
<i>Eleutherodactylus coqui</i> (Coquí común/Common Coqui)	Widespread throughout Puerto Rico. It has been introduced in Vieques and Culebra islands, and also in St. Thomas, St. John, and St. Croix, U.S. Virgin Islands. The ground up to the canopy. It is, however, uncommon in the southwest region.
<i>Eleutherodactylus eneidae</i> (Coquí de Eneida/Eneida's Coqui)	It is now presumed extinct.
<i>Eleutherodactylus gryllus</i> (Coquí grillo/Cricket Coqui)	Most common in forests such as Luquillo, Cayey, and Maricao. It is also found in banana plantations. It makes use of bromeliads and mosses on rocks.
<i>Eleutherodactylus hedricki</i> (Coquí de Hedrick/Tree-Hole Frog)	Found in the interior uplands, Reserva Forestal de Toro Negro and vicinity, El Verde, the west flank of El Yunque, and the Bosque Experimental de Luquillo. Is mostly associated to mesic broadleaf forest. Its habitat is limited to heavy forest and it is not found in the forest edges. It is typically associated with trunk holes to which it retreats during the daytime.
<i>Eleutherodactylus jasperii</i> (Coquí dorado/Golden Coqui)	It is now possibly extinct. Only ovoviviparous anuran amphibian of the New World. Its distribution range includes Carite Forest and Cayey Mountain Range, preferring xeric forest types.
<i>Eleutherodactylus karlschmidti</i> (Coquí palmeado)	It possibly extinct.



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<i>Eleutherodactylus locustus</i> (Coquí martillito/Warty Coqui)	Observed in the southeastern mountains east of Cayey, east of Carite State Forest, El Yunque region and the western part of Panduras Mountain Range. It is found in upland mesic broadleaf forest, but also in dwarf forest above 700 m. It seems to prefer dense forest openings and forest borders such as the ones along roads and trails. It occurs in low bushes, grasses or ferns and mossy trunks.
<i>Eleutherodactylus monensis</i> (Coquí de La Mona/Mona Coqui)	Observed on and within leaf litter and fallen vegetation, on <i>Ipomea pescaprae</i> leaves, and palm fronds close to the floor, on the walls of shallow caves containing water, sinkholes and manmade water reservoirs.
<i>Eleutherodactylus portoricensis</i> (Coquí de la montaña/Puerto Rican Coqui)	This species inhabits mountain forests (Maricao, El Yunque, Carite, Toro Negro), such as mesic upland broadleaf forests, and it can be found in shrubs, palms, herbaceous plants, bromeliads, tree holes, and under rocks, trunks, roots and leafage.
<i>Eleutherodactylus richmondi</i> (Coquí Caoba/Ground Coqui)	This frog inhabits wet forest of the island interior, and mesic wooded situations in general (Jaicoa Mountain Range, Guarionex Mountains and south to Quebrada de los Cedros creek, Maricao, Toro Negro, Cayey, and Sierra Pandura). Under rocks, logs, dried mud and trash where it retreats during the day.
<i>Eleutherodactylus unicolor</i> (Coquí duende/Burrowing Coqui)	Is found in the elfin forest or dwarf forest of El Yunque under moss, rocks and roots in elfin forest.
<i>Eleutherodactylus wightmanae</i> /Coquí melodioso	Restricted to the interior forested uplands; Yunque National Forest and the Guanica State Forest.
<i>Leptodactylus albilabris</i> (Ranita de labio blanco/White-Lipped Frog)	This species is native to Puerto Rico and United States Virgin Islands (IUCN et al. 2004). It is considered a terrestrial and semiaquatic species that is seldom observed far from streams, ditches.
<i>Peltophryne lémur</i> (Sapo concho/ Puerto Rican Crested Toad)	Is endemic presently in a single large population in the southwest coast and a few small populations on the north coast. Threats to this species include filling and drainage of its breeding sites and direct loss of adults and their habitat during land development.
Introduced species	
<i>Lithobates catesbeianus</i> - rana mujidora, sapo toro, Cane toad	
<i>Lithobates grylio</i> - rana cerdo o rana grillo	
<i>Osteopilus septentrionalis</i> - rana platanera	
<i>Hyla cinerea</i> -hila verde;	
<i>Scinax ruber</i> - hila inquieta	
<i>Rhinella marina</i> - sapo común/Giant Toad;	The Giant Toad can be found in mainland Puerto Rico and in Vieques Island. It was introduced to control sugar cane pests in the 1920's



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Appendix 6 and 7: Bees that pollinate crops in the Caribbean Area and Vegetation for wildflowers.

Crop	Pollinator Bee Species				
	<i>Ceratina guarnacciana</i>	<i>Exomalopsis spp</i>	<i>Megachile lanata</i>	<i>Melissodes trifasciata</i>	<i>Xylocopa mordax</i>
Avocado Aguacate					X
Eggplant Berenjena		X			X
Pumpkin Calabaza			X	X	X
Pigeon pea Gandul			X		X
Lemon Limon					X
Watermelon Melon		X			X
Pepper Pimiento	X	X		X	
Tomato Tomate					X

Plant Name	Pollinator Bee Species			
	<i>Exomalopsis spp</i>	<i>Megachile</i>	<i>Melissodes trifasciata</i>	<i>Xylocopa mordax</i>
<i>Amaranthus dubius</i>	X			
<i>Asystasia gangetica</i>	X			
<i>Centrosema virginianum</i>				X
<i>Chamaesyce prostrata</i>	X			
<i>Cleome gynandra</i>	X			
<i>Cleome viscosa</i>	X			
<i>Euphorbia heterophylla</i>	X			
Girasol (<i>Helianthus annuus</i>)				X
Jantar (<i>Sesbania aegyptica</i>)		X		
<i>Kallstroemia maxima</i>	X			
<i>Lantana spp.</i>				X
<i>Ludwigia octovalvis</i>	X			
<i>Macroptilium lathyroides</i>			X	X
<i>Malvastrum coromandelianum</i>	X			
<i>Melochia pyramidata</i>	X		X	



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<i>Merremia quinquefolia</i>	x			
Otras plantas en la familia de gandules (leguminosas)		x		
<i>Prosopis</i>		x		



Appendix 8. Characteristics of Bats

Scientific (Spanish/English) Name	Diet	Species roost
<i>Noctilio leporinus</i> (Murciélago Pescador/Fisherman o Bulldog bat)	Fish-fresh/salt waterbodies.	Caves and trees such as <i>Ceiba petandra</i> (Ceiba), <i>Rhizophora mangle</i> (Mangle Rojo) and <i>Manilkara bidentata</i> (asubo).
<i>Pteronotus portoricensis</i> (Murciélago Bigotudo Mayor/Parnell's mustached bat)	Insects	Caves (high temperature and humidity). Endemic.
<i>Pteronotus quadridens</i> (Murciélago Bigotudo Menor/ Sooty mustached bat)	Insects,	Caves (high temperature and humidity).
<i>Mormoops blainvillii</i> (Murciélago Barbicacho/Blainville's leaf-chinned bat)	Insects	Caves (high temperature and humidity).
<i>Monophyllus redmani</i> (Murciélago Lengüilargo/Greater Antillean Long-tongued bat)	Nectar, insects, fruit	Caves (high temperature and humidity).
<i>Erophylla bombifrons</i> (Murciélago de las Flores/Brown flower bat)	Fruit	Caves (high temperature and humidity).
<i>Artibeus jamaicensis</i> (Murciélago Frutero Común/Fruit bat)	Fruit	During the day it occurs primarily in cool caves but can be found frequently in the foliage or hollow trunks.
<i>Stenoderma rufum</i> (Murciélago Hocico de Cerdo/Cave bat),	Fruit	It is shelter in trees during the day, it is one or two endemic bats of Puerto Rico
<i>Brachyphylla cavernarum</i> (Murciélago Hocico de Cerdo /Cave bat)	Fruits	Caves
<i>Eptesicus fuscus</i> (Murciélago Ali-oscuro /Big Brown bat)	Insects	Caves and buildings
<i>Lasirus minor</i> (Murciélago Rabi-Peludo /Red bat)	Insects	Foliage of trees
<i>Tadarida brasiliensis</i> (Murciélago Viejo/Mexican free-tailed bat)	Insects	Well ventilated caves
<i>Molossus molossus</i> (Murciélago de Techos /Velvety free-tailed bat)	Insects	Ceiling and walls of houses

Source: <http://facultad.bayamon.inter.edu/arodriguez/murcielagos/murcielagos.htm>



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