

**Vegetative key and descriptions of tree
species of the tropical dry forests of upland
Sector Santa Rosa, Area de Conservación
Guanacaste, Costa Rica**



Brian J. Enquist and Jon J. Sullivan

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Introduction

This guide allows the user to identify the common and rare trees of the upland dry forests of Sector Santa Rosa of the Area de Conservación Guanacaste (ACG), Costa Rica. The guide focuses on the tree flora of areas within a 5 km radius of the Santa Rosa Biological Station, namely Bosque San Emilio, Bosque Humedo, and the surrounding young secondary forests and regenerating pastures. These are the sites where the vast amount biological and ecological research occurs in Sector Santa Rosa. Included are all common and most rare free standing woody plant species that can achieve a DBH > 3 cm. A vegetative key and descriptions are provided for the 180 locally common to rare tree species. To avoid potential misidentifications, notes are also provided for 26 additional lowland Guanacaste species that are very rare or absent from upland Santa Rosa.

The Area de Conservación Guanacaste is an expanding 120,000 hectare protected area in northwestern Costa Rica. It was established to restore and conserve the neotropical dry forest, the tropical forest ecosystem most damaged by human development in Central America, and to ensure its longterm survival by integrating the ecosystem into the surrounding biological and human communities (Janzen 1986, 1988a,b, 1992, 1999). Sector Santa Rosa of the ACG is the 30,000 hectare core of this ecosystem restoration project, and is connected through other sectors to adjacent ecosystems of cloud forest, rain forest, and the marine environment. The majority of Santa Rosa and the neighboring sectors of the ACG are mosaics of pasture and farmland of differing ages in various stages of forest regeneration, surrounding the occasional fragment of old growth forest.

The upland dry forests surrounding the Santa Rosa Biological Station (300 m elevation) occupy part of a massive 1.5 million year old Pleistocene volcanic plateau that covers most of the northern part of Costa Rica's Guanacaste Province (Castillo-Muñoz 1983). Water erosion channels have etched a complex topography of shallow valleys into this plateau of young volcanic bedrock. The local climate is highly seasonal, being dominated by a pronounced six month dry season from December to mid May when virtually no rain falls. During the dry season, most trees in all but the oldest fragments of forest are leafless, contrasting with the regular rains and foliated forests of the wet season. Mean annual rainfall at the biological station is 1503 mm (sd = 524.64, 1972-1991).

In 1980, Janzen and Liesner published an annotated checklist of the plants of lowland Guanacaste, focusing on the forests of Sector Santa Rosa. This publication is not intended as an update to Janzen and Liesner, but rather a complement to it. The annotations in Janzen and Liesner's (1980) list were designed for botanists well familiar with tropical plants. They include very brief comments, often on reproductive tissues, designed to allow these neotropical botanists to distinguish between the resident species. Janzen and Liesner's list has been of limited use to the most biologists in Sector Santa Rosa who have wanted to learn the local woody flora but were unfamiliar with neotropical tree genera and families. Our guide is designed specifically for this type of user.

Nineteen years is a long time for neotropical species level taxonomy, and many of the species names used by Janzen and Liesner (1980) have changed to comply with improved systems of

classification. We have included as many of these changes and associated synonyms that we know of. We apologize in advance for any name changes that we have missed. This taxonomic information is now coming online at the Missouri Botanical Garden (w³TROPICOS, <http://mobot.mobot.org/W3T/Search/vast.html>).

We have created species-level wet season key and list to guide biologists into the Santa Rosa tree flora. The detailed annotations to the species list allow the user to confirm that the keyed out species is indeed the species before them. This guide is centered on vegetative and ecological characters a field biologist is likely to encounter (rather than of focusing on floral characters which are often not readily encountered at any given point of time). In particular, it highlights the salient characters associated with leaf morphology, smell, plant architecture, trunk characteristics, and local distribution that are easily seen in the field. Most importantly, we have tried to direct the user to descriptions of closely resembling species that may cause identification problems.

Inspiration for this key stems from a long-term forest monitoring project started in 1976. This project has mapped the spatial position of approximately 50,000 juvenile and adult woody individuals within the San Emilio forest of Sector Santa Rosa. A second mapping was completed in 1996 (Enquist, Finnance Enquist, and Stevens, unpublished). During this re-map we found it necessary to document and standardize species identifications for the benefit of future surveys of this rapidly changing forest. In this sense, this paper serves to document the identification protocol for the long-term San Emilio monitoring project.

The annotations of the species list should also be useful in other dry forest areas of the ACG and lowland Guanacaste. However, the key will inevitably begin to breakdown away from upland Santa Rosa, The fidelity of the species found throughout the dry forests of the ACG can vary considerably with elevation and distance away from the Santa Rosa Biological Station. Most notably, the flora of lowland Santa Rosa and serpentine soils of the Santa Elena Peninsula can differ remarkably from upland Santa Rosa.

Users of this guide will also benefit from exploring the ACG World Wide Web site (<http://www.acguancaste.ac.cr>), which is beginning to include Species Homepages for many of the conservation area's species, including dry forest trees. These promise to be a further and invaluable resource for biologists wanting to familiarize themselves with the dry forest woody flora.

Acknowledgments:

While many of the identification characters used in this guide are the result of our personal experiences with identifying the woody plants of Sector Santa Rosa, the bulk of the identification information that we synthesize in this paper was passed on to us by many talented and generous people who work in or have worked in the ACG. To several of these people we are particularly indebted: N. Zamora, D. H. Janzen, M. Chavaria, G. C. Stevens, A. Heinrich, R. Blancke, C. F. Enquist, A. Masis, C. Camargo, D. Benitez, L. Rose, T. Gillispie, G. Pereira, L. Rios, M. Pereira, E. Cantillano, O. Espinoza, R. Franco, H. Ramirez, G. Sihezar, R. Moraga, A. Perez, J. Klemens, and J. H. Brown. Also, we wish to acknowledge the use of the facilities of the Instituto Nacional de Biodiversidad, the National Herbarium of Costa Rica, and the University of New Mexico (UNM) Herbarium. We thank the staff of Sector Santa Rosa for support and inspiration, notably R. Blanco. BJE was supported via a Fulbright Fellowship, the Nature Conservancy, Tinker Foundation, GRAC and SRAC grants from the Dept. of Biology and UNM, and NSF grants (DEB-9318096) to J. H. Brown and NSF grant GER-9553623. JJS was supported by a New Zealand-USA Fulbright Travel Grant, the Sigma Xi Scientific Research Society, and NSF grant DEB-9705072 to D. H. Janzen.

SPECIES KEY:

All species identified using the key should be confirmed with the additional details in the annotated species list below and, if at all possible, with a vouchered herbarium specimen. In the tropics it is always possible that you will have: (1) encountered a rare individual of tree species not in the key, especially (but not exclusively) if you are not in upland Santa Rosa, and (2) sampled a rare genetic variant. All common trees and most of the rare trees that we know to occur in upland Santa Rosa are in the following key. Where appropriate, we have also included notes in the species descriptions on other lowland Guanacaste species that could potentially be confused with those identified by the key.

We have tried to make the key as fail-safe as possible. However, undoubtedly the key will occasionally fail. If this should happen, make sure to look up all species that ‘key out’ nearby as they will have additional information to help you make sure the species you have in front of you is in fact covered in this key. If you do find errors or have potential additions to the key and/or the descriptions, please contact us as additional information will be included in future revisions.

To identify most of the species present in this key you will need to be versed in the basic terminology of leaf types, shapes, and arrangements. We have tried to keep our use of botanical jargon to a minimum, although non-botanists may find a botanical dictionary useful.

Leaf sizes encompass the length from the tip of the leaf to the joining of petiole to the stem and are given as rough approximations. The reader should note that leaf length can be a highly variable character. The leaf lengths presented are an indication of the lengths most commonly observed. Some species are notorious for variable leaf lengths in juvenile trees and in shaded conditions. Juvenile trees in particular often have leaf sizes up to an order of magnitude larger than adults. Note also that the number of leaflet pairs described for pinnately-odd compound leaves does not include the terminal leaflet.

Many species can be easily identified by unique punctations in the leaves, readily seen by holding the leaf up toward the sun. Punctations are translucent areas that when held up to the light show up as distinctive points or lines between the veins. Using a hand lens or viewing the leaf through the opposite end of binoculars usually reveals them.

The key also uses non-leaf characteristics such as the presence of latex, branching architecture, trunk characteristics, and smell. In checking for presence of latex, break off a leaf petiole or a very small branch, and if necessary make a slight slash or cut (see below) on the trunk. In times of drought stress, latex production can drop even in species characterized by ‘copious’ flow. During these times, one may need to squeeze the petiole with the thumb and/or feel for stickiness with the fingers. Nevertheless, of these species, most can be easily identified by the presence of latex throughout the year. Please note that non-destructive sampling techniques are stressed in this key. This is necessary due to the importance of long-term monitoring by several researchers in this area. For the few species where a ‘trunk-slash’ is necessary, this can often be done by making a small cut with a pocket knife.

When asked below to "select from the following" species, a combination of several characters used in a species description, sometimes including reproductive characters, will be needed to easily distinguish it from the other listed species.

Key outline:

Simple leaves with palmate venation.....3 (page 7)

Alternate simple leaves with pinnate venation.....15 (page 8)

Opposite or whorled simple leaves with pinnate venation.....96 (page 14)

Clustered or ambiguously arranged simple leaves with pinnate venation.....135 (page 18)

Bifoliate or trifoliate compound leaves.....153 (page 19)

Palmately compound leaves.....162 (page 20)

Pinnately compound-even leaves (no terminal leaflet).....171 (page 21)

Pinnately compound-odd leaves (with terminal leaflet).....186 (page 22)

1.	Leaves simple (make sure to always look carefully for a lateral leaf bud at the base of each presumed leaf).....	2
	Leaves compound.....	153
2.	Leaves with pinnate venation (i.e., a single dominant primary vein with smaller secondary veins radiating from the primary vein).....	13
	Leaves with palmate venation (i.e., several primary veins radiating from the leaf base).....	3
3.	Leaves with two or more tips/lobes to leaf lamina.....	8
	Leaves with only one prominent tip.....	4
4.	Young stems do not have spines.....	5
	Young stems have 1-2 long (1 cm) spines.....	<i>Ziziphus guatemalensis</i>
5.	Leaf underside is green and not notably tomentose.....	6
	Leaf underside is brown and tomentose (dense, felty hairs).....	<i>Miconia argentea</i>
6.	Leaves are serrated; nodes are not notably swollen.....	7
	Leaves are not serrated; nodes are notably swollen.....	<i>Piper amalga</i>
7.	Simple leaf serrations (i.e., all the same length).....	<i>Prockia crucis</i>
	Double leaf serrations (i.e., alternates between two lengths).....	<i>Bernardia nicaraguensis</i>
8.	Leaves with more than two tips/lobes.....	9
	Simple leaves with two tips/lobes (leaf shaped like a cow's hoof).....	<i>Bauhinia unguolata</i>
9.	Leaf margins are entire.....	11
	Leaf margins are finely serrated.....	10
10.	Leaves are pubescent, usually with three tips/lobes.....	<i>Malvaviscus arboreus</i>
	Leaves are glabrous, usually with five tips/lobes.....	<i>Cochlospermum vitifolium</i>
11.	Broken leaves don't produce latex.....	12
	Broken leaves exude abundant latex.....	<i>Jatropha curcas</i>
12.	Most leaves of adult trees have 7-9 tips; fallen dry leaves are brown above and white below; trunk is light gray with transverse "joints".....	<i>Cecropia peltata</i>
	Most leaves of adult trees have 3-5 tips; trunk is smooth dark brown to bronze; large trees often have small but distinctive buttresses.....	<i>Sterculia apetala</i>
13.	Leaf arrangement is alternate.....	15
	Leaf arrangement is not alternate.....	14
14.	Leaves have an opposite or whorled arrangement.....	96
	Leaves are clustered or ambiguously arranged.....	135

ALTERNATE SIMPLE LEAVES

15. Broken leaves exude no latex at petiole.....16
Broken leaves exude latex at petiole.....80
16. Leaf margin is serrated.....17
Leaf margin is not serrated.....18
17. Leaf margin is not obviously double serrated.....54
Leaf margin is obviously double serrated (i.e., serrations alternate between two sizes)...77
18. Underside of leaf is visibly pubescent/hairy (look closely, especially along the mid rib of the vein).....19
Underside of leaf is hairless.....30
19. Leaves about 30 cm in length or greater.....29
Leaves much less than 30 cm in length.....20
20. Leaf underside has one/two small black glands near petiole.....*Diospyros nicaraguensis*
Leaf underside has no glands near petiole.....21
21. Young stem branching junctions (careful, *not* nodes) are swollen.....*Cordia alliodora*
Young stem branching junctions are not swollen.....22
22. Leaves are without a very rough "sandpaper" feel.....23
Leaves have a very rough "sandpaper" feel.....*Cordia panamensis*
23. At the petiole base of young leaves are a pair of intrapetiolar stipules.....24
At the petiole base is only a bud- there are no intrapetiolar stipules.....26
24. Petioles are usually <1 cm long.....25
Petioles are usually >3 cm long.....*Croton morifolius*
25. Intrapetiolar stipules are small and scale-like..... *Margaritaria nobilis*
Intrapetiolar stipules are hair-like and 5-10 cm long.....*Hirtella racemosa*
26. Underside of mature leaves is white with dense hairs.....*Quercus oleoides*
Leaf underside has scattered hairs and is green.....27
27. Nodes are not swollen; leaf arrangement is scattered along the stem.....28
Nodes are swollen; leaves are arranged in a plane along the stem...*Piper jaquemontianum*
28. Crushed leaves have a strong smell, like tomato leaves or tar.....*Solanum hazenii*
Crushed leaves don't have a strong smell (2-3 forked branching).....*Cordia gerascanthus*
29. Upper surface of leaf lamina is softly pubescent to the touch.....*Sapranthus palanga*
Upper surface is not softly pubescent to the touch.....*Annona purpurea*

30. Leaves have a very rough "sandpaper" feel; most leaves > 15 cm long.....31
 Leaves are without a very rough "sandpaper" feel; most leaves < 15 cm long.....32
31. Leaves are light green on both surfaces.....*Curatella americana*
 Leaves with dark green upper surface and pale lower surface.....*Licania arborea*
 (Note: the sprawling woody liana *Petrea volubilis* will also key out here)
32. Leaf petioles are usually less than 3 cm.....34
 Leaf petioles are usually greater than 3 cm.....33
33. Petioles up to 6 cm long, not grooved.....*Capparis frondosa*
 Petioles 3-4 cm long, with distinctive central groove.....*Coccoloba guanacastensis*
34. Undersides of leaves have no obvious small gold flecks (stellate trichomes).....35
 Undersides of leaves with obvious small waxy flecks of wax (stellate trichomes)
*Capparis indica*
35. Leaves are usually greater than 8 cm in length.....43
 Leaves are usually less than 8 cm in length.....36
36. Crushed leaves and stems usually smell spicy/peppery.....*Ocotea veraguensis*
 Crushed leaves do not have an obvious spicy/peppery smell.....37
37. Leaves lack a small, very sharp tip or spine.....38
 Leaves have a small, very sharp tip or spine.....*Jacquinia nervosa*
38. Young branches have occasional small spines.....39
 Young branches and stems have no spines.....40
39. Stems are 5-6 sided in cross-section.....*Ximenia americana*
 Stems are circular in cross-section.....*Adelia triloba*
40. Hair-like intrapetiolar stipules (10 mm) projecting from petiole base...*Hirtella racemosa*
 No intrapetiolar stipule, or if present, stipule is not hair-like.....41
41. Venation on the leaf underside is not unusual.....42
 Reticulate venation on the leaf underside is very fine and much more pronounced in a
 band along the leaf margin than near the midrib (giving a "shattered glass" appearance)
*Erythroxylon havanense*
42. Stems have two alternating internode lengths; leaves don't easily snap in two when bent
*Krugiodendron ferreum*
 Internode lengths are not bimodal; leaves almost succulent, easily snap in two when bent
*Agonandra macrocarpa*
 (Note: see also *Adelia triloba*, which has spine-like projections from older stems.)
43. Crushed leaves or stems have an obvious spicy/peppery or perfume smell.....44
 Crushed leaves or stems have no obvious or unusual smell.....46

44. Narrow leaves with a wavy margin (crushed leaves, stems usually smell spicy/peppery)
.....*Ocotea veraguensis*
Leaves are flat, without a wavy margin.....45
45. Leaves somewhat succulent and easily snap in two when bent; leaves usually 8-9 cm in
length; crushed leaves usually have a rank galic odor.....*Schoepfia schreberi*
Leaves not succulent; usually 10-15 cm in length; crushed leaves usually smell
perfume/citrus.....*Annona reticulata*
46. Leaf base is chordate (i.e., lobed).....47
Leaf base is not chordate.....48
47. Leaf length usually 3 x width; venation on the upper surface of the leaf is raised
.....*Sloanea terniflora*
Leaf length usually < 2 x width; venation on the upper leaf surface is not raised
.....*Capparis verrucosa*
48. Leaf margins gently undulate (may be slightly serrated)*Maytenus segoviarum*
Leaf margins entire and without undulations.....49
49. Leaf petioles are not uncommonly short.....50
Leaf petioles very short (nearly sessile).....*Desmopsis bioracteata*
50. Leaves don't easily snap in two when bent.....51
Leaves almost succulent and easily snap in two when bent.....*Agonandra macrocarpa*
51. No strong smell to crushed leaves; secondary venation not pronounced and/or not widely
spaced.....52
Crushed leaves usually have a perfume/citrus smell; leaves with obvious well-spaced
secondary venation.....*Annona reticulata*
52. Petioles up to 7 cm in length.....*Sideroxylon capiri*
Petioles much less than 7 cm in length.....53
53. Usually a sheath over growing tip; petiole with distinctive central groove
.....*Coccoloba guanacastensis*
No sheath over growing tip, petiole without distinctive central groove (note: usually
white latex).....*Manilkara chicle*
54. Intrapetiolar stipules at the base of petioles of young leaves (i.e., small leaf-like
projections of green tissue).....55
Base of petioles lack leaf-like intrapetiolar stipules (only a lateral bud at the base of each
young leaf)60

(Note: there is a 2-3 m high herbaceous herb, *Verbesina gigantea* (Asteraceae), which has up to 60 cm long, strongly lobed leaves, and young stems with lateral wings of photosynthetic tissues).

55. Leaves with hairs; serrations are not sharp to touch.....56
 Leaves glabrous; serrations are sharp to touch.....*Ouratea lucens*
56. Almost all leaves are greater than 14 cm in length.....57
 Almost all leaves are less than 14 cm in length.....59
57. Leaf lower surface is covered with white hairs, and the upper surface is glossy green and comparatively hairless; most leaves are 14 - 20 cm in length.....58
 Both leaf surfaces covered in brown hairs; most leaves are >20 cm in length
*Apeiba tibourbou*
58. Select from the following: *Luehea speciosa*, *Luehea candida*
59. Leaves up to 12 cm in length, rounded-heart shaped; intrapetiolar stipules are "drip shaped" and serrated.....*Prockia crucis*
 Leaves are about 5 cm in length, intrapetiolar stipules are narrow and pointed (2 cm long woody spiraled fruit usually present on plant or ground).....*Helicteres guazumaefolia*
60. Leaf tissue contains many punctations (tiny translucent "windows, slits, or points" when the leaf is held up to the sun).....73
 Leaf lack punctations.....61
61. Leaves without strongly asymmetrical leaf bases.....63
 Leaves with strongly asymmetrical leaf bases.....62
62. Leaf undersides are sticky to the touch.....*Muntingia calabura*
 Leaf undersides not sticky to touch.....*Guazuma ulmifolia*
63. Leaves pubescent or with hairs/trichomes noticeable to the touch (look closely).....64
 Leaves not pubescent or with hairs.....66
64. Leaves softly pubescent.....*Malvaviscus arboreus*
 Leaves not softly pubescent (more a a rough sandpaper feel).....65
65. Leaves usually <10 cm long.....*Cordia guanacastensis*
 Leaves usually > 20 cm long.....*Cordia panamensis*
- (Note: a common vine *Tetracera volubilis* will also key out here)
66. Trunk and/or young stems lack spines.....68
 Trunk and/or young stems have spines.....67
67. Ovoid leaves with three distinctive main veins (i.e., trinervate); a pair of sharp 1 cm spines at the base of each leaf.....*Ziziphus guatemalensis*
 Ovoid leaves without three distinctive main veins.....*Xylosma flexuosa*

68.	Crushed leaves don't have distinctive smell.....69	
	Crushed leaves smell like rancid tuna fish (this is adult foliage, juvenile plants have compound leaves).....	<i>Roupala montana</i>
69.	Most leaves < 10 cm in length.....70	
	Most leaves > 10 cm in length.....72	
70.	Leaves without plastic feel; apex of leaf drip tips have no dimple.....71	
	Leaves with plastic feel; apex of leaf tips have a slight dimple.....	<i>Krugiodendron ferreum</i>
71.	Obvious serrations; apparent secondary venation.....	<i>Casearia praecox</i>
	Subtle, smooth serrations that gently undulate along the leaf margin; fine, obscure secondary venation.....	<i>Maytenus segoviarum</i>
72.	Narrow lanceolate leaves; tree with shaggy peeling bark.....	<i>Erblichia odorata</i>
	Leaves often deltoid in shape; shrub to treelet with corky bark.....	<i>Vernonia triflosculosa</i>
73.	Leaf base is lobed to slightly lobes (often covering petiole).....74	
	Leaf base not lobed.....75	
74.	Leaves about 20 cm in length, and softly pubescent.....	<i>Zuelania guidonia</i>
	Leaves about 6-12 cm in length, and lacking hairs.....	<i>Casearia corymbosa</i>
75.	Leaves are usually greater than 8 cm in length.....	<i>Casearia arguta</i>
	Leaves are usually less than 8 cm in length.....76	
76.	Select from the following <i>Casearia</i> species:	
		<i>Casearia sylvestris, Casearia tremula, Casearia praecox</i>
77.	Leaf bases asymmetrical.....	<i>Guazuma ulmifolia</i>
	Leaf bases not-asymmetrical.....78	
78.	Double leaf serrations (i.e., alternates between two lengths).....79	
	Simple leaf serrations (i.e., all the same length).....	<i>Helicteres guazumaefolia</i>
79.	Chordate leaf base; woody, whorled fruit (look on ground).....	<i>Helicteres baruensis</i>
	Leaf without chordate base; fruit not woody whorls.....	<i>Bernardia nicaraguensis</i>
80.	Leaf underside is hairless or largely hairless.....82	
	Leaves are covered in orange brown hairs.....81	
81.	Leaves greater than 10cm in length.....	<i>Stemademia obovata</i>
	Leaves less than 10cm in length.....	<i>Castilla elastica</i> (see also <i>Ficus</i> sp.)
82.	Leaf margins have serrations.....83	
	Leaf margins without serrations.....87	

83. Leaf petiole has a pair of small, raised glands.....*Sapium thelocarpum*
 Leaf petiole has no raised glands.....84
84. Latex is a tan / 'cafe con leche' color.....*Maclura tinctoria*
 Latex is white.....85
85. Leaf underside is notably paler than the upper surface.....86
 Both leaf surfaces are not notably different in colour/tone.....*Sebastiania pavoniana*
86. Elliptical leaves, some with asymmetrical lobes/indentations.....*Trophis racemosa*
 Lanceolate, symmetrical leaves.....*Mabea occidentalis*
87. Trunk has no conical spines.....88
 Trunk covered with numerous characteristic, small, sharp conical spines (simple ovoid leaves with noticeably long petioles).....*Hura crepitans*
88. Large leaves, usually 20 cm in length or greater.....89
 Leaves usually less than 20 cm in length.....90
89. Young stems swollen (succulent appearance) with blunt apex.....*Plumeria rubra*
 Young stems not swollen, without a blunt apex.....*Thevetia ovata*
90. Width of leaf lamina is definitely widest near the tip of the leaf.....91
 Width of leaf lamina is widest near the middle or base of the leaf.....93
91. Leaf petioles are much less than a third the length of the leaf lamina.....92
 Large leaf petiole (3-7 cm long), about 1/3rd the leaf lamina length.....*Sideroxylon capiri*
92. Leaf without a prominent drip tip; leaves usually >10 cm in length.....*Manilkara chicle*
 Leaf with a prominent drip tip; leaves usually <10 cm in length...*Chrysophyllum brenessi*
93. Some leaves may have distinctive lobes or slight serrations.....*Trophis racemosa*
 Leaf margins are unlobed and entire.....94
94. Leaf petioles not noticeably long.....95
 Long leaf petioles, up to 3 cm in length (leaves up to 20 cm long).....*Pouteria reticulata*
95. Select from the following: *Brosimum alicastrum*, *Ficus sp.* (see also *Trophis racemosa*)

OPPOSITE/WHORLED SIMPLE LEAVES

96. Leaf arrangement opposite (two leaves per node).....98
 Leaves arranged in whorls of more than two leaves per node.....97
97. Leaves present along stems in whorls of 3 or 4.....*Hamelia patens*
 Leaves present along stems in whorls of 4-7.....*Euphorbia schlechtendalii*
98. Broken leaves exude latex.....99
 Broken leaves exude no latex.....101

99. White latex exudes from broken leaves, leaves are not notably thick.....100
Brown sticky sap oozes from broken leaves; leaves are thick pads.....*Clusia rosea*
100. Leaves oval-elliptic shaped; leaves often with scattered hairs.....*Stemmadenia obovata*
Leave lanceolate in shape; no leaf hairs.....*Garcinia intermedia*
(Note: the common vine *Forsteronia spicata* will also key out here).
101. Leaf margin is serrated.....102
Leaf margin is entire.....108
102. Undersides of leaves are brown to tan in color.....*Miconia argentea*
Undersides of leaves are not brown to tan in color.....103
103. Youngest stems are square in cross-section.....*Cornutia grandifolia*
Youngest stems are not square in cross-section.....104
104. Leaves have a distinctive drip-tip or strongly acuminate tip.....105
Leaves lack a distinctive drip tip.....*Semialarium mexicanum*
105. Upper surface of leaves are rough with scattered with hairs.....106
Upper sides of leaves are glabrous (without hairs).....107
106. Stiff hairs along the top of the leaf make it difficult to rub your finger along the surface
toward the petiole..... *Lasianthaea fruticosa*
Hairs along the leaf are soft making it easy to move your finger along the surface
.....*Lantana trifolia*
107. Dark green leaves, younger stems with distinctive ridges/angles...*Critonia quadangulare*
Leaves flimsy, lanceolate, with trinervate venation.....*Koanophyllon albicaule*
108. There are no spines on young stems.....110
A pair of spines per node on young stems (pointed stipule, corky lined tan bark).....109
109. Two spines at each node.....*Chomelia spinosa*
Four spines at each node.....*Randia monantha*
110. Interpetiolar stipules are visible on some stems, especially at younger nodes, and
interpetiolar stipule scars (a horizontal line between leaves) are otherwise visible.....111
There are no interpetiolar stipules.....121
111. Growing tip does not have 2 long hair-like projections.....112
Growing tip has 2 long hair-like projections, approximately 1 cm in length (dark green
leaves with yellow venation and a drip tip).....*Faramea occidentalis*
112. Underside of leaf surface does not have numerous black dots.....113
When held up to the light the underside of leaf has numerous small black dots
.....*Karwinskia caldronii*

113. Trunk and branches are orange and white colored, with peeling thin strips of bark.
.....*Calycophyllum candidissimum*
Trunk and branches are not orange and white in color.....114
114. When held up to bright light, leaf margins have a distinctive fringe of scattered hair
(adults have smooth purple to gray bark that peels in pocks).....*Guettarda macrosperma*
Leaf margins do not have a fringe of hair.....115
115. Interpetiolar stipules either do not persist for many nodes or persist and remain green;
leaf lengths are usually less than 3 times their width.....116
Obvious papery brown, triangular interpetiolar stipules persist for many nodes; lanceolate
leaves 3-4 times longer than they are wide (13-15 cm in length).....*Alibertia edulis*
116. Leaves usually greater than 20 cm in length.....*Genipa americana*
Leaves less than 20 cm in length.....117
117. Petiole and leaf undersides has hairs (Note, hairs are noticeable to the touch)
.....*Psychotria pubescens*
Petiole and leaf underside do not have noticeable hairs.....118
118. Leaves usually 8-6 cm in length or less.....*Psychotria horizontalis*
Leaves usually longer than 8-6 cm.....119
119. Interpetiolar stipules with a prominent ridge running down the center. *Coutarea hexandra*
Interpetiolar stipules lack a prominent ridge running down the center.....120
120. Leaves not usually clumped at branch tips; triangular stipules that do not cover up most
of the region between leaves.....*Exostema mexicanum*
Leaves usually clumped at young branch tips; broad, conspicuous stipules tend to cover
up most of the region between leaves.....*Ixora floribunda*
121. Leaf underside is not brown with hairs/trichomes.....124
Underside of leaves is brownish coloured by hairs/trichomes.....122
122. Leaf venation has a single midrib with many less pronounced primary veins123
Leaf has a two large basal primary veins parallel to the midrib.....*Miconia argentea*
123. New leaves are clasped tightly over shoot tip; lanceolate leaves.....*Vismia baccifera*
New leaves are not clasped tightly over shoot tip; oval leaves.....*Byrsonima crassifolia*
124. Leaves lack translucent points when held up to the light.....125
Leaves have small translucent points when held up to the light (some hairs on petioles
and young stems only; distinctive ‘Y’ stem branching).....*Psidium sartorianum*
125. No pair of glands on the leaf.....126
On the underside of the leaf, near the base of the petiole, there is usually a pair of small
points (ocellate glands) dark to orange in color.....*Bunchosia biocellata*

126. Round or oval leaves, length less than 2 times the width, excluding petiole.....127
 Acuminate leaves, longer than 2 times the width, excluding petiole.....131
127. Basal primary veins are not prominent; leaf not rolled upwards.....128
 Two basal primary veins are prominent and follow most of the leaf edge; leaf is rolled upwards.....*Rehdera trinervis*
128. Leaves usually less than 10 cm long.....130
 Leaves usually up to 15-20 cm long.....129
129. Leaves oval-shaped, thick pads, therefore lacking punctations.....*Clusea rosea*
 Leaves elliptical, normal thickness, usually with punctations.....*Eugenia salamensis*
130. Leaves usually 6-9 cm in length with a felt-like feel due to trichomes.*Eugenia hypargirea*
 Leaves usually 2-7 cm in length, without a felt like feel.....*Malpighia glabra*
131. Secondary leaf venation is very fine and may be difficult to see.....132
 Leaf venation is prominent and easily visible.....133
132. Leaf petioles are extremely short (most leaves 6-7 cm in length; wavy leaf margin; leaves arranged in plane; understory shrub).....*Mouriri myrtilloides*
 Leaf petiole is apparent (although short) (most leaves 8-15 cm in length; tough leathery leaf with margins slightly rolled under).....*Garcinia intermedia*
133. Leaf tip is pointed (acuminate).....134
 Leaf tip is rounded.....*Eugenia salamensis*
134. Undersides of leaves have a distinctive parallel secondary leaf venation ("fish-skeleton like" venation), also leaf undersides are a whitish green..... *Karwinskia caldronii*
 Leaf venation is not distinctively parallel but is instead "normal" and reticulate (stem appears slightly swollen where leaves attach to young branches).....*Malpighia glabra*

CLUSTERED OR AMBIGUOUSLY ARRANGED SIMPLE LEAVES

135. Some stems have spines.....136
 All stems lack spines.....139
136. Spines usually arranged in two paired spines.....138
 Single spines and not usually not arranged in pairs.....137
137. Spine arranged in whorls of 4 at the end of stems.....*Randia monantha*
 Single spine-like projections (not true spines).....*Adelia triloba*
138. Young stem branching angle is 90 degrees, leaves 10-15 cm in length...*Pisonia aculeata*
 Young stem branching angle is 30 degrees, leaves 5 cm in length.....*Randia thurberi*
139. Leaves have no hairs.....142
 Leaves softly pubescent/hairy to touch.....140

140. Leaf margin entire.....141
 Leaf margin serrated.....*Lantana trifolia*
141. Crushed leaves smell like tomato leaves or tar, stem branchings normal...*Solanum hazenii*
 Leaves with no distinctive smell; swollen, hollow stem branchings.....*Cordia alliodora*
142. Petiole or young stems exudes a milky white latex.....143
 Leaves lacking white latex.....145
143. Large leaves, usually 20 cm in length or longer.....144
 Leaves less than 20 cm in length (young branches have distinctive "candelabra"
 branching)*Manilkara chicle*
144. Young stems swollen (succulent appearance) with blunt apex.....*Plumeria rubra*
 Young stems not swollen, without a blunt apex.....*Thevetia ovata*
145. Leaves > 3 cm in length.....146
 Leaves < 3 cm in length (round leaves with entire margin; secondary venation is obscure)
*Erythroxylon rotundifolium*
146. Leaf margins are entire.....147
 Leaf margins are serrated (oval shaped and often rolled upwards; can smell like rancid
 tuna fish when crushed; note that juvenile plants have compound-odd leaves).
*Roupala montana*
147. Bark on branches and the trunk is not orange and white striped.....148
 Bark on branches and the trunk is orange and white striped (peels in strips)
*Calycophyllum candidissimum*
148. When held up to bright light, leaf margins have a distinctive fringe of hair (adults have
 smooth purple to gray bark that peels in pocks).....*Guettarda macrosperma*
 Leaf margins do not have a fringe of hair.....149
149. Leaves usually greater than 20 cm in length.....*Genipa americana*
 Leaves less than 20 cm in length.....150
150. Prominent triangular stipules (approximately 5 mm in length) present at the bases of
 leaves (check younger stems).....*Ixora floribunda*
 No prominent stipules.....151
151. Elliptical leaves, usually up to 20 cm in length (leaf upper surface dark green and
 glabrous).....*Ardisia revoluta*
 Leaves tending toward obovate to round (although may be elliptical), usually less than
 20 cm in length.....152
152. Leaves somewhat thick (almost succulent), leaf venation is faint..*Agonandra macrocarpa*
 Leaves not obviously thick, leaf venation is prominent.....*Adelia triloba*

LEAVES COMPOUND

153. Compound leaves with more than 2 leaflets.....154
Compound leaves with 2 leaflets (bifoliate).....*Hymenaea courbaril*
154. Compound leaflets with more than 3 leaflets.....159
Compound leaves with 3 leaflets (trifoliate).....155
155. Leaflet margins are entire.....156
Leaflet margins are serrated (leaflets 10-13 cm in length, soft with small white hairs;
rachis and young stems also hairy).....*Allophyllus occidentalis*
156. Petiole is not winged.....157
Petiole is winged, and looks like a fourth leaflet (leaf is "crucifix" shaped; flowers and
canon ball fruits on trunk and branches; common pasture tree).....*Crescentia alata*
157. Leaflets are hairless.....158
Leaflet underside is softly pubescent with scattered white hairs; petiole is red above
.....*Bursera permollis*
158. Leaves usually 25-30 cm long; tip of terminal leaflet pointed...*Platymiscium parviflorum*
Leaves usually 10-15 cm in length; terminal leaflet tends to have an indented tip (dimple)
.....*Trichilia trifolia*
159. Leaves with more than 4 leaflets.....161
Leaves with 4 or fewer leaflets.....160
160. Leaflets arranged along a central rachis.....*Senna hayesiana*
2 pairs of leaflets at the ends of a Y-branched rachis*Pithecellobium dulce*
161. Leaves palmately compound (i.e., all leaflets connected to one central point).....162
Leaves not palmately compound.....168

PALMATELY COMPOUND LEAVES

162. Leaves have an alternate arrangement.....163
Leaves have an opposite arrangement.....165
163. Leaves have 5 leaflets (trunk is covered in solid spines).....*Pachira quinatum*
Leaves have 7 leaflets.....164
164. Trunk has no spines and has green smooth vertical stripes amongst rougher old purplish
bark.....*Pseudobombax septinatum*
Trunk has spines and green stripes (young trees) or no spines and no green stripes
(adults).....*Ceiba pentandra*
165. Leaves have 5 leaflets.....166
Leaves have 7 leaflets (soft to touch).....*Godmania aesculifolia*

166. Leaves glabrous.....167
 Leaves are hairy (on leaves of adult trees; the underside is thick tomentose white)
*Tabebuia ochracea*
167. Tough, thick leaves; rachis diameter 4-6 mm; crushed leaves without distinctive odor
*Tabebuia rosea*
 Leaves not noticeably tough or thick; rachis diameter 2-4 mm; crushed leaves have a
 distinctive odor.....*Tabebuia impetiginosa*
168. Tree is a palm (long thin leaves with parallel venation; all leaves grow from one central
 meristem).....169
 Tree is not a palm.....170
169. Up to 10 m high palm with bottle brush spiny leaves.....*Acrocomia vinifera*
 Up to 3 m high palm also with spines, trunk diameter usually < 3 cm.....*Bactris guinensis*
170. Most leaves have an even number of leaflets (i.e., compound-even leaves).....171
 Most leaves have an odd number of leaflets (i.e., compound-odd leaves).....186

PINNATELY COMPOUND-EVEN LEAVES

171. Leaf petiole and rachis are not winged.....172
 Leaf petiole and rachis are winged (with nectaries at the base of each pair of leaflets)
*Inga vera*
172. Leaflets are very small (less than 1 cm in length).....173
 Leaflets are much greater than 1 cm in length.....177
173. Stems have spines or thorns.....174
 Stems lack spines or thorns.....176
174. Small tree covered with symbiotic ants, inhabiting swollen hollow thorns.....175
 Tree without symbiotic ants, and with spines not swollen.....*Acacia farnesiana*
175. Select from the following: *Acacia collinsii* , *A. cornigera*
176. Leaves have two nectaries on their rachis; one near the basal pair of leaflets, and another
 near the terminal pairs of leaflets (trees have shaggy brown bark)...*Lysiloma divaricatum*
 Leaves have only a single nectary in the middle of the petiole before the leaflets begin
 (trees have smooth light gray bark; fruit is a dark brown crescent disc 7-8 cm across)
*Enterolobium cyclocarpum*
- (Note, the common vine *Acacia tenuifolia* will also key out here).
177. Leaflets are on secondary rachis (bipinnate leaves).....178
 Leaflets are on the primary rachis (pinnate leaves).....180

178	Leaflet undersides are hairless (or with few, scattered hairs).....	179
	Leaflet undersides are notably hairy.....	<i>Samanea saman</i>
179.	One extra-floral nectary at the base of the primary rachis.....	<i>Albizia adinocephala</i>
	Extra-floral nectaries at the end of each primary and secondary rachis	<i>Pithecellobium lanceolatum</i>
180.	Leaves usually have 3-5 pairs of leaflets.....	182
	Leaves usually have >8 pairs of leaflets.....	181
181.	Dark deeply furrowed trunk; leaves usually have 8-10 pairs of leaflets....	<i>Cedrela odorata</i>
	Pale, non-furrowed trunk; leaves usually have 10-30 pairs of leaflets.....	<i>Cassia grandis</i>
182.	Leaflet margins are entire.....	183
	Leaflet margins are serrated.....	<i>Cupania guatemalensis</i>
183.	Leaflets are paired along the leaf rachis; no leaves are compound-odd.....	184
	Leaflets are usually arranged alternately along the leaf rachis; leaves often compound-odd.....	<i>Simaruba glauca</i>
184.	Leaflets are glabrous.....	185
	Leaflets are softly pubescent to touch.....	<i>Senna atomaria</i>
185.	Leaflet bases usually asymmetrical.....	<i>Swietenia macrophylla</i>
	Leaflet bases usually symmetrical.....	<i>Guarea glabra</i>

PINNATELY COMPOUND-ODD LEAVES

186.	Leaf rachis is winged (has a leaf like projection along rachis).....	187
	Leaf rachis is not winged.....	188
187.	Leaflet margins are serrated, with brown hairs.....	<i>Bursera tomentosa</i>
	Leaflet margins are entire, with no hairs.....	<i>Swartzia cubensis</i>
188.	Leaflet margins are serrated (look closely).....	189
	Leaflet margins are entire.....	195
189.	Leaflets are on the primary rachis (leaves pinnate).....	191
	Leaflets are not on the primary rachis (leaves bi- or tripinnate).....	190
190.	Leaflets are on secondary rachis (i.e., bipinnate leaves).....	<i>Dipterodendron costaricensis</i>
	Leaflets are on tertiary rachis (i.e., tripinnate leaves).....	<i>Sciadodendron excelsum</i>
191.	Leaflets have hairs on lamina (look closely - can usually tell by touch).....	192
	Leaflet lamina are hairless.....	193

192. Spines on trunk and branches, 7-10 pairs of lanceolate leaflets, (leaves about 35 cm in length; leaflet serration is subtle; citrus smell to crushed leaves)....*Zanthoxylum setulosum*
 No spines on trunk, 3-4 pairs of oval leaflets (leaves about 20 cm in length; leaflet serration is obvious; leaflets grow like alternately arranged leaves; with a bud like point at the base of the offset terminal leaflet).....*Cupania guatemalensis*
193. Leaflets and branches have a distinctive odor (usually turpentine like).....194
 Leaflets without a distinctive unusual odor (leaflets long and thin (resemble thick grass blades) and are arranged just off opposite.....*Thouinidium decandrum*
194. Leaflets leathery, strongly asymmetrical, and smell like rancid tuna fish when crushed (this is the foliage of juvenile plants, adult plants have simple leaves)..*Roupala montana*
 Leaflets smell like green mango/turpentine when crushed (leaflet margins often have spherical galls).....*Astronium graveolens*
- (See also *Spondias mombin* and *S. purpurea*.)
195. Crushed leaves have a turpentine (green mango) smell.....196
 Crushed leaves don't have a turpentine smell.....199
196. Thin orange outer bark peels from inner photosynthetic green bark.....*Bursera simaruba*
 Trunk has no green, photosynthetic bark exposed.....197
197. Leaves with four pairs of leaflets.....*Astronium graveolens*
 Leaves with many more than four pairs of leaflets.....198
198. Leaves usually with 12-14 pairs of leaflets, each 4-6 cm in length.....*Spondias purpurea*
 Leaves usually with 7-11 pairs of leaflets, each 8-13 cm in length.....*Spondias mombin*
199. Tip of each leaflet is indented or has a small 'hair-like' point (look closely).....200
 Tip of each leaflet is not indented.....206
200. When held up to the light, leaflets have noticeable translucent points and lines
*Myrospermum frutescens*
 Leaflets do not have translucent points or lines.....201
201. Leaves with 5-7 pairs of leaflets).....202
 Leaves have fewer than 4 or fewer pairs of leaflets.....203
202. Leaflets symmetrical, pronounced swelling (pulvinus) at the leaf (rachis) base
*Dalbergia retusa*
 Leaflets asymmetrical, swelling at the rachis base is not pronounced.....*Simarouba glauca*
203. Leaves usually with 6 or more pairs of leaflets.....204
 Leaves usually with 5 or fewer pairs of leaflets.....205
204. Trunk and young branches have spines (look closely).....*Machaerium biovulatum*
 Tree trunks and young branches do not have spines.....*Diphysa robinioides*

205.	Leaflet ends in a blunt drip tip with an indentation at the end, leaflets to 8 cm in length <i>Acosmium panamense</i> Leaflet end indented without drip tip, leaflets 4-5 cm in length..... <i>Coursetia elliptica</i> (See also <i>Lonchocarpus phlebophyllus</i> .)	
206.	Leaves usually with 5 or more pairs of leaflets.....207 Leaves usually with 4 or fewer pairs of leaflets.....220	
207.	Leaflet bases are notably asymmetrical.....208 Leaflet bases are not notably asymmetrical.....214	
208.	Leaflets not obviously pubescent to the touch.....210 Leaflets obviously pubescent to the touch.....209	
209.	Leaflets usually greater than 4 cm in length..... <i>Trichilia americana</i> Leaflets usually less than 4 cm in length..... <i>Ateleia herbert-smithii</i>	
210.	Young stems are hairy/pubescent to touch.....211 Young stems are not hairy/pubescent to touch.....212	
211.	Strongly asymmetrical leaflets with no 'goldish flecks' underneath.. <i>Picramnia quaternaria</i> Leaflets are not strongly asymmetrical; 'goldish flecks' on leaf underside (best observed in the sun) <i>Ateleia herbert-smithii</i>	
212.	Leaflet tip is usually rounded or with a dimple.....213 Leaflet tip is always pointed..... <i>Trichilia glabra</i>	
213.	Base of petiole is distinctly swollen; leaflets usually closely paired..... <i>Dalbergia retusa</i> Base of petiole not distinctly swollen; leaflets often not closely paired.... <i>Simaruba glauca</i>	
214.	No stipule-like projections along the leaf rachis.....215 Distinctive pairs of stipules-like projections along the rachis at the base of each pair of leaflets (lanceolate leaflets with wavy margins)..... <i>Andira inermis</i>	
215.	Leaflets with a rounded tip.....216 Leaflets with a pointed tip.....219	
216.	Leaflets bases have translucent point and lines when held under bright light <i>Myrospermum frutescens</i> Leaflets with no translucent points.....217	
217.	Leaflets pubescent.....218 Leaflets glabrous..... <i>Simarouba glauca</i>	

218. Ovoid leaflets, 10-15 cm in length.....*Lonchocarpus felipei*
 Rectangular to acuminate leaflets approximately 5 cm in length.....*Lonchocarpus rugosus*
- (Note, the common woody vine/scrambling shrub, *Rourea glabra* will key out here; has swollen base to leaflets and rachis).
219. Underside of leaflets have gold flecks that are apparent in the sunlight; bark is smooth with vertical "pin-stripes"*Ateleia herbert-smithii*
 Underside of leaflets lack gold flecks; bark is not "pin-striped"*Gliricidia sepium*
220. Terminal leaflet usually >10 cm in length.....221
 Terminal leaflets usually <8 cm in length.....222
221. Select from the following: *Trichilia cuneata*, *Pterocarpus sp.*
222. Basal leaflets are obviously shorter than the terminal leaflets.....223
 Basal leaflets are approximately the same length as terminal leaflets.....225
223. Venation on leaflet undersides is not obviously pronounced.....224
 Venation on leaflet undersides is pronounced.....*Lonchocarpus phlebophyllus*
224. Leaves usually <20 cm in length.....*Trichilia hirta*
 Leaves usually >20 cm in length.....*Lonchocarpus minimiflorus*
225. Select from the following:*Lonchocarpus parviflorus*, *L. acuminatus*
- Note, the common woody vine/scrambling shrub, *Rourea glabra* will key out here (has swollen base to leaflets and rachis).

ANNOTATED SPECIES LIST:

Each species is followed by its Costa Rican common name(s) in parentheses and its family in upper case. The common name frequently used in and around Santa Rosa is placed first, between “quotation marks” and names that we have not heard being used locally, but which are present in the Costa Rican literature, are placed in (brackets). Species not also listed in Janzen and Liesner (1980) are marked with an asterisk (*). Old species names are listed in brackets after the current name. When there has been a recent genus level name change, we have also included the old name in the alphabetical listing of species, with a reference to the current name. Note also that the alphabetical listing of species will allow biologists unfamiliar with tropical plant families to access the brief comments in Janzen and Liesner (1980) which are instead listed by plant family.

Phenologies are based on our local observations (from 1993 through 1999) and are not taken from observations or herbarium samples from other parts of Central America. We are especially grateful for access to the phenology data sets of Lisa Rose (Washington University, USA) and Andreas Heinrich (University of Osnabrueck, Germany). While lack of observed flowering and fruiting times might indicate reproductive lapses within the local populations, it is more likely to indicate that reproduction was simply not noticed, due to factors such as rarity, nocturnality, or other types of cryptic phenology. Local distribution and phenologies are given as a rough guide to help in identification. Therefore, caution should be taken in any sort of conclusions based on the phenology statements. Like phenology, distribution data are also based solely on local observations unless otherwise indicated.

Flowering and fruiting phenologies conform to the following convention: early wet season (mid-May -June), mid wet season (July-August), late wet season (September-November), early dry season (December-January), mid dry season (February-March), and late dry season (April-mid-May). Only times when mature fruit are present are given (with maturity, where possible, judged by observed dispersal). The amount of time that immature fruits will be evident on a tree prior to seed dispersal varies greatly among species.

We have tried to indicate similar species that might be confused with the described species. For these cases, characteristics that will (usually) allow one to distinguish between species have been included. Sometimes if multiple species are listed, distinguishing characteristics may only be listed within the species description of the similar species. Therefore, it is highly advised to read the species descriptions of all species listed.

Acacia collinsii Safford (= *A. costaricensis* Schenck) "Cornizuelo, Bull's horn acacia"; FABACEAE (MIMOSOIDEAE). **Description:** Common understory treelet to small tree, with compound bi-pinnate leaves. At the base of each rachis are extrafloral nectaries. Leaflets are approximately 1 cm in length. Trunk covered with "bull's horn" spines with pronounced swollen, hollow bases. Individuals are usually covered with highly aggressive ants (*Pseudomyrmex* spp.) that live in the spines. Yellow inflorescences are 3 cm long. Fruits are dark, woody pods that dehisce open to expose many small black seeds enclosed in vivid yellow arils. **Habitat and Phenology:** Common in regenerating pasture and secondary forest. Flowers late early to mid dry season. Mature fruit late dry season. **Similar Species:** *A. cornigera* (also with protective ants, less common; occurs in wetter areas; different fruit); *A. farnesiana* (no protective ants). **Comments:** Ants are fed carbohydrates from the nectaries at the base of each rachis, and protein/lipid rich "Beltian bodies" off the tips of young leaflets.

Acacia cornigera L. (= *A. nicoyensis* Schenck = *Acacia spadicigera* Schlecht. & Cham.) "Cornizuelo"; FABACEAE (MIMOSOIDEAE). **Description:** Small treelet to shrub, with compound bi-pinnate leaves. At the base of each rachis are extrafloral nectaries. Leaflets are approximately 1 cm in length. Hollow spines can be much longer than *A. collinsii* (up to 9 cm) and are less likely to be curved and swollen at the base. Small yellow 'bottlebrush' inflorescences. Indehiscent fruit pods are about 10 cm in length and maroon colored with a pointed tip. **Habitat and Phenology:** Encountered in secondary pastures in more moist, riparian areas. Mature fruit late dry season to early wet season. **Similar Species:** *Acacia collinsii* (much more common); *A. farnesiana* (no protective ants).

Acacia farnesiana (L.) Willd. "Espino blanco, (Aromo)"; FABACEAE (MIMOSOIDEAE). **Description:** Shrub, with compound bi-pinnate leaves approximately 8 cm in length. Lacks a protective ant colony. Rachis is very slightly pubescent. Paired elongated spines at leaf base (not swollen, nor hollow). Small circular gland near base of rachis. Trunk pale and smooth. **Similar Species:** *Acacia collinsii* (protective ants); *A. cornigera* (protective ants); *Lysiloma divaricatum* (no spines).

Acosmium panamense (Benth.) Yakoul. (= *Sweetia panamensis* Benh.) "Carboncillo"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree, with compound-odd leaves. Leaf 20 cm in length, leaflets up to 8 cm in length. Leaves with three to five pairs of leaflets, usually four. Characteristic dimple at the end of the leaflet's (blunt) drip tip. Leaflets closest to leaf base slightly smaller and rounder than the more elongated terminal leaflets. Leaflets glabrous and slightly glossy on top. Upper surface of rachis has a slight groove. Corky bark, trunk tan-orange to -yellow in color. Trunk slash oxidizes from bright yellow to orange. Inflorescences of small, off-white flowers. **Habitat and Phenology:** Deciduous tree, more common in young deciduous forest. Flowers late wet season. **Similar Species:** *Dalbergia retusa* (larger leaflets); *Ateleia herbert-smithii* (gold sheen to undersides of leaflets).

Acrocomia vinifera Oerst. "Coyol"; ARECACEAE(PALMAE). **Description:** Medium sized palm tree, with fronds, several meters in length, and an erect, straight trunk. Long black toxic spines occur along frond midrib and on trunk. Hard spherical fruit about 2 cm diameter.

Habitat and Phenology: Common palm tree of regenerating pasture. Uncommon to absent in old secondary forest. Mature fruit late dry season to early wet season. **Similar Species:** *Bactris guinensis* (the only other palm species in Santa Rosa; much smaller and clonal).

Adelia triloba (Mull. Arg.) Hemsl. (*); EUPHORBIACEAE. **Description:** Small to medium sized tree. Leaves usually clumped, and 5-9 cm in length. Leaf shape can be variable, usually obovate but ranging to lanceolate. Petiole is usually quite short, 1 mm to 2 mm in length. Occasional spine-like projections on branches from what appears to be old broken small branches from older stems. **Habitat and Phenology:** Rare tree, but can be locally abundant. **Similar Species:** *Pisonia macranthocarpa* (blackish cylindrical young stems); *Ximenia americana* (dark red-brown, 5-6 sided young stems).

Agonandra macrocarpa L.O. Wms.; OPILIACEAE. **Description:** Medium to large sized tree. Simple, alternate light green leaves, usually 4-10 cm in length. Leaves are thick and slightly succulent and easily 'snap in two' when bent. They tend to be clumped at regular nodes on older branches. Young trees have numerous conspicuous round lenticels on the trunk. A trunk slash usually reveals an inner layer of green photosynthetic bark. Trunk is straight and orange-brown in color. Fruit is light green and oval in shape (approximately 4 cm in length). **Habitat and Phenology:** Somewhat rare tree of deciduous forest. Mature fruit late dry season to early wet season. **Similar Species:** *Schoepfia schreberi* (can easily confuse with but has no inner green photosynthetic layer under bark); *Pisonia macranthocarpa* (blackish young stems).

Albizia adinocephala (Donn. Sm.) Britt. and Rose "Gavilancillo"; FABACEAE (MIMOSOIDEAE). **Description:** Medium sized tree. Bi-pinnate compound-even leaves, usually 10-23 cm in length. Leaflets somewhat diamond/rhombic to oval shaped and dark green and glabrous above. Leaflets acuminate and ranging in length from 3-8 cm in length, and usually increasing in size from the base of the rachis to the tip. **Habitat and Phenology:** Tends to be evergreen. **Similar Species:** *Lonchocarpus acuminatus* (similar trunk; very different leaves); *Caesalpinia exostemma* (not listed here; a shrub/small tree encountered near Playa Naranjo; also with bi-pinnate compound leaves; 4-6 pairs of leaflets per 4-5 pairs of secondary rachises plus a terminal secondary rachis, leaflets oval and about 2 cm long); *Pithecellobium lanceolatum* (shrub/treelet also with bi-pinnate compound-even leaves; slight wings on the leaf rachis; paired spines on stems).

Alibertia edulis A.Rich.; RUBIACEAE. **Description:** Shrub to small treelet, sometimes with a sprawling vine-like appearance. Simple, opposite leaves, usually 13-15 cm in length, highly lanceolate, glabrous, and dark green. Leaves tend to be clustered at branch tips. Leaf margin entire, with the occasional indentation. Prominent dark triangular interpetiolar stipule (8-10 mm in length), usually with a small ridge running down its center. Bark distinctively lightly furrowed with long fibrous flakes. Flowers are white and tubular. Fruit is a 2-4 cm diameter sphere containing numerous small seeds. **Habitat and Phenology:** Tending to be evergreen. Flowers early wet season. Mature fruit mid to late wet season.

Allophyllus occidentalis (Sw.) Radlk.; SAPINDACEAE. **Description:** Understory treelet. Leaf arrangement alternate with tri-foliolate compound leaves, usually 15-25 cm in length

including a 5-8 cm long rachis. Leaflets usually 10-13 cm in length, with serrated margins. Leaflets and rachis softly pubescent. Pubescence is most dense underneath leaflets and on the petiole. Lateral infructescences of 5 mm diameter, round, orange to red fleshy fruits. **Habitat and Phenology:** Generally occurring in the secondary scrub. Mature fruit mid to late wet season. **Similar Species:** *Essenbeckia litoralis* (Rutaceae, not included in this list as is locally very rare; leaves have punctations when held up to bright light); *Trichilia trifolia* (has smaller leaflets with dimples on tips and does not have serrations on leaflets); *Crataeva tapia* (Capparidaceae, not listed here as is locally very rare; has trifoliolate leaves with a noticeably longer rachis before leaflets and is more common in lowland moist forest of Santa Rosa).

Andira inermis (Wright) H.B.K. "Almendro de monte, (Carne asada)"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree with compound-odd, alternate leaves, approximately 27 cm in length. Leaflets approximately 7 cm in length, with entire margins. Leaflets slightly rectangular in shape and tend to be opposite. Characterized by a pair of stipule-like projections along the rachis near the terminal leaflet and at each leaflet pair junction. Rough bark, flaking off in irregular pieces. **Habitat and Phenology:** Tends to be a rare evergreen tree, although may be locally abundant. **Similar Species:** *Thouinidium decandrum* (lacks the pseudo-stipules and has longer, thinner leaflets and rounded serrations); *Astronium graveolens* (also lacks the pseudo-stipules, and has wider, serrated leaflets).

Annona purpurea Moc. & Sesse "Soncoya, Toreta, Gallina gorda"; ANNONACEAE. **Description:** Medium sized tree. Large, simple, pubescent to slightly pubescent, alternate, rhomboid/elliptical leaves (up to 30 cm in length) with small drip tip. Leaf margins are entire. Prominent leaf venation with many parallel secondary veins. Bark smooth/gray and sometimes with horizontal 'pinstripes'. Bark slash has a cool/pleasant-perfume smell. Flowers tan to purple/pink. Petals are thick and fleshy have a rather musty odor. Fruit is a large (10-15 cm in diameter), round, and 'mace-like' with prominent blunt spikes. **Habitat and Phenology:** Somewhat common tree of deciduous forest. Flowers early wet season. Mature fruit mid to late wet season. **Similar Species:** *Genipa americana* (opposite leaves); *Sapranthus palanga*. (also with pubescent, rounder leaves; characterized by a thicker 'fringe' of hairs along the leaf margin; trunk "warty"); *Ateleia herbert-smithii* (bark patterning similar, but *Ateleia* leaves are compound); *Annona holosericea* (Annonaceae, not listed, present in wetter northern Santa Rosa/Santa Elena and Cerro del Hacha, similar mace-like fruit, pubescent leaves are generally smaller (20 cm long), more ovoid, and lack a drip tip).

Annona reticulata L. "Anono, (Anonillo, Anona de redecilla)" ANNONACEAE. **Description:** Small to medium sized tree. Dark green glabrous leaves with drip tip, usually 10-15 cm in length, lanceolate to elliptic in shape. Leaves simple and alternate. Trunk slash smells slightly perfume (lemon-like) and quickly oxidizes color from light yellow color to rust orange. Leaves usually dry a dark black to dark green in color. The delicious fruit has warty skin and is approximately the size of an avocado, though is not as pointed. **Habitat and Phenology:** Somewhat rare tree scattered throughout moister areas of forest. Mature fruit early to mid dry season. **Similar Species:** *A. purpurea* (larger, pubescent leaves), *Cordia panamensis* ('Y' branching in younger stems).

Apeiba tibourbou Aubl. "Peine de mico, (Peinecillo)"; TILIACEAE. **Description:** Small to medium sized tree. Leaves are simple, alternate, serrated and large, usually greater than 30 cm in length. Leaves are 'spade' shaped and are lobed at the base (lobes can be pointed). Leaves and young stems are also densely tomentose with yellow hairs. Flowers yellow in small inflorescences, 5 cm diameter. Fruit is very conspicuous, looks like a dark brown spiny sea urchin, 10 cm in diameter. **Habitat and Phenology:** *Apeiba* is a common deciduous tree in young, dry secondary forest. Flowers early wet season. Mature fruit late dry season to early wet season. **Similar Species:** *Castilla elastica* (copious white latex; larger, more elongated and lanceolate leaves).

Ardisia revoluta H.B.K.; MYRSINACEAE. **Description:** Understory treelet to shrub. Glabrous dark green leaves, up to 20 cm in length including long petioles. Leaf undersides are lighter green. Leaf venation is extremely fine and hard to see. Younger individuals have smooth bark resembling *Licania arborea*. Fruits are small, round, purple and approximately 2 mm when mature. Fruits are clustered below leaves and are very tasty. **Habitat and Phenology:** Mature fruit throughout dry season. **Similar Species:** *Manilkara chicle* (white latex and more prominent parallel leaf venation).

Astronium graveolens Jacq. (= *A. fraxinifolium* Schott) "Ron-ron"; ANACARDIACEAE. **Description:** Medium to large tree. Pinnately compound-odd leaves, usually 20-25 cm in length, with leaflets 6-9 cm in length. Sometimes, slight pubescence along main leaflet vein. Leaves have four pairs of leaflets, with yellow veins and often with serrated edges. 'Serrations' are more indentations in the leaf than proper serrations, and are usually absent from canopy foliage of adult trees. When crushed, leaves have a distinct Anacardiaceae mango/turpentine smell. Bark often dark and smooth and can have pronounced lichens (white) on bark. When big, bark peels off in large pocks leaving a smooth but uneven pocked surface. Large trees have pronounced buttresses. Inflorescences of masses of small white flowers. Infructescence of many 10-15 mm long 5-walled capsules. **Habitat and Phenology:** Very abundant tree in older secondary deciduous forest. Flowers early to mid dry season. Mature fruit mid to late dry season. **Similar Species:** *Spondias mombin* (many more leaflets which always lack serrations); *Trichilia hirta* (softly pubescent leaves lacking serrations). **Comments:** Leaves often heavily infested with gall forming insect.

Ateleia herbert-smithii Pittier; FABACEAE (PAPILIONOIDEAE). **Description:** Usually a small to medium tree in size, but can become a large emergent. Pinnately compound (usually odd), alternate leaves 20-30 cm in length. Up to five-six pairs of leaflets, usually elliptic in shape, and varying in size. Terminal leaflet up to 11 cm in length while more basal leaflets are approximately 6 cm in length. Base of leaflets are sometimes asymmetrical. Underside of leaflets have small 'gold flecks', or a golden sheen when held in the sun. When crushed or scratched stems and bark have a characteristic condensed green-bean smell. Usually, a thumbnail scratch from the trunk or stem can yield the smell. Bark is smooth and light in color. The trunk of small to medium sized individuals have many characteristic small vertical 'pin-stripes'. Inflorescences of many tiny white to green flowers. Seeds are flattened wind-dispersed asymmetrical 3 cm long pods. **Habitat and Phenology:** Can be a common, medium to large tree usually in secondary deciduous forest. Santa Rosa population flowers at

two-year intervals (Janzen 1989). Flowers late wet season to early wet season. Mature fruit late dry season. **Similar Species:** *Gliricidia sepium* (lacks odor, trunk stripes, and small gold flecks on the undersides of leaves). **Comments:** Dioecious tree. *Ateleia* is apparently the only known wind pollinated legume (Janzen 1989).

Bactris guinensis (L.) H.E. Moore (= *B. minor* Jacq.); ARECACEAE(PALMAE).

Description: Small palm (3-5m in height) with long spines, growing in dense, clonal stands. Diameter of stems rarely exceeds 3 centimeters in diameter. It is impossible to travel through dense stands. **Habitat and Phenology:** Tends to be found in understory of deciduous forests. **Similar Species:** *Acrocomia vinifera* (the other Santa Rosa palm; much larger).

Bauhinia unguolata L. "Casco de venado"; FABACEAE (CAESALPINOIDEAE).

Description: Treelet to small sized tree, with sometimes weedy growth. Characterized by distinctive unguulate hoof shaped, alternate leaves. Leaves usually 9-13 cm in length. Bark is brown/dark brown, corky, furrowed, and peels in strips. Terminal inflorescences of approximately 5 cm long, white, tubular nocturnal flowers with long protruding stamens and styles. **Habitat and Phenology:** More common in secondary forest and recently abandoned pasture. Flowers late wet season to early dry season. **Similar Species:** *Hymenaea courbaril* (leaves are compound, tougher and glossy); *Guettarda macrosperma* (similar architecturally, opposite, simple leaves)

Bernardia nicaraguensis Standl.; EUPHORBIACEAE **Description:** Treelet to small sized tree. Simple, alternate leaves, rhombic to elliptic in shape without a cordate base. Leaves have doubly serrated margins and somewhat palmate secondary venation. Leaf length is highly variable, usually 10 cm to over 15 cm in length. Leaves are softly pubescent to the touch especially on leaf undersides and on younger stems. Smooth bark tending to be dark in color. **Habitat and Phenology:** Usually rare, but can be locally abundant in patches within the understory of deciduous forest. Mature fruit early dry season. **Similar Species:** *Helicteres baruensis* (more rounded leaves with distinctively cordate bases; very different fruit).

Bombacopsis quinata (Jacq.) Dugand (= *B. quinatum* = *B. fendlerium*) See *Pachira quinata*.

Brosimum alicastrum Swartz. "Ojoche"; MORACEAE. **Description:** Medium to large tree. Alternate leaves, usually 7-12 cm in length, with noticeable white sticky latex. The undersides of the leaves have a distinctive collecting vein along the margin of the leaf (also visible on upper surface). Upper side of the leaf is glabrous and dark green, with a paler dark green underside. Leaf has pointed drip-tip. On young branches, internodes 'zig-zag' between leaves. End of branch is characterized by the distinctive conical stipules that covers the apical bud (characteristic of Moraceae - however, some other families contain this character too). Smooth pale orange brown bark. Trunk can develop large buttresses. **Habitat and Phenology:** This can be a very large evergreen tree apparently more abundant in moister areas. Supposedly flowers and fruits throughout the year. **Similar Species:** *Trophis racemosa* (some leaves deeply lobed, occasionally serrated, less symmetrical secondary venation and collecting vein). **Comments:** Leaves often heavily infested with small oblong galls protruding from the upper surface.

Bunchosia biocellata Schlecht.; MALPIGHIACEAE **Description:** Small to medium sized tree. Opposite leaves, usually 10-17 cm in length and elliptic in shape, with a small swollen 'joint' at each leaf node. Underside of leaves contain slight, difficult to see 'hair-like' pubescence sometimes in patches. Leaves are flimsy and dark to olive green in color. On the underside of the leaf, near the base of the petiole, there are usually a pair of characteristic dark to orange dots (ocellate glands). At first look, they are the size of a pen tip and often look like a blemish. Leaves usually dry yellow-olive in color. Trunk has a fluted, sinuous or roped appearance and tends to be dark and rather 'dirty' looking. **Habitat and Phenology:** Locally rare to somewhat common tree of deciduous forest. Mature fruit mid wet season. **Similar Species:** *Exostema mexicanum* (interpetiolar stipules; no ocellate glands); *Coutaria hexandra* (interpetiolar stipules; no ocellate glands).

Bursera permollis Standl. and Steyerl.; BURSERACEAE. **Description:** Small to medium sized tree. Trifoliolate leaflets with red tinged rachis and acuminate tip, approximately 15 cm in length. Round to oval leaflets up to 7 cm in length. Rachis and undersides of leaflets are softly pubescent. Crushed leaves may have slight turpentine smell usually commonplace in the Burseraceae but several individuals encountered do not have this smell. Peeling orange to red trunk essentially identical to *B. simaruba*. **Habitat and Phenology:** More likely encountered near dry mesa tops, dry secondary forest. **Similar Species:** *Bursera simaruba* (similar bark but without trifoliolate leaves).

Bursera simaruba (L.) Sarg. "Indio desnudo"; BURSERACEAE. **Description:** Medium to large sized tree. Pinnately compound-odd leaves, usually greater than 20-25 cm in length and with 2-9 oval, acuminate, (sometimes asymmetrical) leaflets. Leaves have a pronounced turpentine smell when crushed. Leaf rachis is often red. Bark is extremely smooth and green (especially when young) with fine peeling paper orange bark. Wood is very soft and moist when cut. Infructescences of 9-12 mm long, three lobed, oblong fruits. The fruits remain green throughout the wet season, and ripen in the following dry season. **Habitat and Phenology:** Deciduous dioecious tree. Tree often used as a fence post (old fence post trees are occasionally seen in regenerating forest). Quite common in deciduous forest, especially in drier areas. Flowers late dry season. Mature fruit the following dry season. **Similar Species:** *Spondias mombin* (similar leaves but very different trunk). **Comments:** Dioecious tree.

Bursera tomentosa (Jacq.) Triana and Planch. "Caraño"; BURSERACEAE. **Description:** Medium sized tree. Leaf arrangement alternate. Pinnately compound-odd leaf, usually with 9 leaflets, with a winged rachis. Leaflets are elliptical, serrated and pubescent. When crushed the leaves have a strong turpentine smell. Bark smooth and white/gray. **Habitat and Phenology:** Deciduous. Somewhat rare, although locally common, found generally in dry secondary deciduous forest. **Similar Species:** *Swartzia cubensis* (also with a winged rachis, but leaflets lack serrations); *Inga vera* (also with a winged rachis, pinnately compound-even leaf, leaflets lack serrations).

Byrsonima crassifolia (L.) H.B.K. "Nancite, Nance"; MALPIGHIACEAE. **Description:** Small to medium sized scrubby tree. Leaves opposite, round to elliptic in shape, usually 5-10 cm in length. Leaf undersides are densely brown pubescent and felt-like (hairs can be easily rubbed off from the upper surface). Small intrapetiolar stipules on young shoots. Bark

smooth, shedding jigsaw shaped chunks. Yellow to red malpighiaceae flowers, in terminal inflorescences. Ripe fruits are yellow, obovate spheres 1 cm in diameter, with dense flesh around a single seed. Tasty to some (commonly sold at Guanacaste bus stations). **Habitat and Phenology:** Common in young secondary forest, becoming dominant in frequently burned areas and savannas. Flowers mid to late dry season. Mature fruit throughout the wet season, especially mid wet season. **Similar Species:** *Eugenia salamensis* (no pubescence, punctations); *Psidium sartorianum* (punctations).

Calycophyllum candidissimum (Vahl.) DC. "Madroño, (Guayabo color)"; RUBIACEAE. **Description:** Medium sized tree. Simple, opposite leaves, usually 10-14 cm in length, clustered near branch tips. Round to obovate in shape with leaf lamina gently tapering to petiole. Undersides of leaves and petioles sometimes marked by the presence of small hairs but, for the most part, the leaves are glabrous. Small triangular interpetiolar stipules, often only present at the youngest node. Best identifying characteristic is the very distinct 'calico cat' orange to orange/yellow and white peeling bark. Bark peels in thin strips. Saplings have orange non-peeling bark, while some old trees have predominantly white bark. Large flowers with creamy white petals about 2 cm in length. **Habitat and Phenology:** Common deciduous tree in dry areas of deciduous forest. Flowers late wet season. Mature fruit mid wet season. **Similar Species:** *Ixora floribunda* (lacks calico bark); *Guettarda macrosperma* (also lacks calico bark). There is a vine (*Tetracera volubilis*) that has bark, when large, that looks just like *Calycophyllum* (*Tetracera* leaves are rough and deeply serrated). **Comments:** National tree of Nicaragua.

Capparis frondosa Jacq. (= *C. baducca* L) "Talcacao"; CAPPARIDACEAE. **Description:** Shrub to treelet. Simple, alternate leaves, usually 8-20 cm in length. Leaves are characterized by long petioles, although often greatly varying in length (1-6 cm in length). Leaves tend to be lanceolate, glabrous, and leathery. The leaf base tapers toward the petiole. **Habitat and Phenology:** Forest understory, not very common. **Similar Species:** *Coccoloba guanacastensis* (upwardly curved petioles with a distinctive central groove); *Morrisonia americana* (Capparidaceae, not listed here as is locally very rare; leaf base tends to be rounded; spherical fruit); *C. pachaca* (not listed here, locally rare but present in lowland Guanacaste; leaves have more uniformly short petioles).

Capparis indica (L.) Fawc. and Rendle (= *C. tonduzii* Brig. = *Breynia indica*); CAPPARIDACEAE. **Description:** A small to medium sized tree. Simple, stiff, leathery leaves and somewhat lanceolate. Leaves approximately 7 cm long although this is variable. Leaf arrangement alternate. Leaves undersides have distinctive (stellate) trichomes that look like many small flecks of wax on the leaf underside, and can show up as 'gold' flecks when the leaf is held up to the sun. The end of each leaf often has a small, stiff point. Bark is a dark charcoal to blue black with a very smooth and 'hard' looking appearance. Inflorescences of about 6 flowers with 1 cm long white petals and a spray of long white anthers around a central style. Fruit is a 6-9 cm long dangling pod that dehisces to reveal a fluorescent a brightly colored orange/red innards and small (8 mm in length) seeds. **Habitat and Phenology:** Common tree in more mature secondary deciduous forest. Tending to be evergreen. Flowers late dry season. Mature fruit mid wet season. **Similar Species:**

Semialarium mexicanum (opposite leaves); *C. odoratissima* (not listed here; more common near the Pacific coast of the ACG; tends to be a shrub; rounder leaves than *C. indica*).

Capparis verrucosa Jacq. (= *C. brevipes* Benth.); CAPPARIDACEAE. Understory treelet to shrub. Leathery simple, alternate leaves, usually 5-8 cm in length. Leaf bases are distinctively lobed and can cover the petiole. Fruit is approximately 5 cm in length with a warty purple/red and green surface. Dehisces to reveal round seeds, 1-1.5 cm in diameter, surrounded by a white fleshy/fibrous surface. **Habitat and Phenology:** Locally rare in deciduous forest. Mature fruit early wet season. **Similar Species:** *Capparis indica* (obvious 'gold sheen' stellate trichomes on leaf underside); *Casearia corymbosa* (serrations, punctations).

Casearia arguta H.B.K. "Mata cartago"; FLACOURTIACEAE. **Description:** Small tree. Simple, alternate planar serrated leaves. Leaves tend to be lanceolate, usually 10-15 cm in length, and are sharply serrated and flimsy. When held up to bright light, leaves have translucent punctations (small points). Venation is raised on upper surface. Trunk has corky light bark. Resembles a more weedy understory treelet. **Habitat and Phenology:** More commonly encountered in moister areas and hill bases of secondary deciduous forest. Mature fruit late dry season to early wet season. **Similar Species:** All five *Casearia* species in Santa Rosa can potentially be mis-identified with each other.

Casearia corymbosa H.B.K (= *C. nitida*) "Cerillo, (Cerito, Raspa Lengua)"; FLACOURTIACEAE. **Description:** Small tree to treelet. Simple, alternate leaves, usually 6-12 cm in length, although variable. Distinguished by larger leaves with slightly lobed leaf bases that cover petiole when viewed from above. When held up to bright light leaves have distinctive punctations (small points). Round orange/red fruit (1.5 cm in diameter), three lobed, containing a single seed. **Habitat and Phenology:** Mature fruit mid to late wet season. **Similar Species:** All five *Casearia* species in Santa Rosa can potentially be mis-identified with each other. Also, *Semialarium mexicanum* (opposite leaves, no punctations); *Margaritaria nobilis* (no punctations); *Adelia triloba* (no punctations, clumped leaves).

Casearia praecox Griseb.; FLACOURTIACEAE. **Description:** Rare small to medium sized tree. Simple, alternate, serrated leaves, usually 6-8 cm in length. Leaves tend to be more deltoid/round in shape when compared with other *Casearia* species. However, leaves can also be lanceolate in shape. Leaves when backlit in bright light apparently lack the small translucent 'points' of light that are apparent in the other *Casearia* species. Bark is smooth and pale in color. **Similar Species:** All five *Casearia* species in Santa Rosa can potentially be mis-identified with each other. Also, *Sebastiania pavoniana* (prominent latex); *Krugiodendron ferreum* (plastic feeling to leaves).

Casearia sylvestris Sw. "Quiura, Sombra de armado, Huesillo"; FLACOURTIACEAE. **Description:** Common understory treelet. Simple, alternate (planar) leaves, usually 5-8 cm in length, with pronounced drip-tips. Internodes zigzag between leaves. Weakly serrated to non-serrated leaves. When held up to the light leaves usually have very slight translucent points (punctations), although they may be quite small. Leaves are dark green, young leaves look and feel somewhat 'plastic-like'. Pale gray trunk has smooth bark. Individuals tend to grow

by vegetative suckering with many stems forming a clump. Fruit are small spheres 2 mm in diameter, dehiscent to reveal a three valved fruit with seeds embedded within an orange aril.

Habitat and Phenology: Appears to be most abundant in moister areas of deciduous and evergreen forest. Tends to be evergreen. Flowers mid dry season. Mature fruit late dry season. **Similar Species:** All five *Casearia* species in Santa Rosa can potentially be mis-identified with each other. **Comments:** Although this species is very common, it is not uncommon to stumble upon individuals that 'don't quite look right'. This species may hybridize with *C. arguta* as the leaves of the two can be (rarely) polymorphic.

Casearia tremula (Griseb.) Wright (= *Synandrina riparia* Standl. and L. Wms.);

FLACOURTIACEAE. **Description:** Small tree to treelet. Simple, alternate, flimsy light green leaves, usually 4-11 cm in length including long petioles. Leaf margins are gently undulating with dull and slightly curved serrations tending to vary in depth. Bark light, smooth with white lenticels. Trunk slash is yellow/pale and oxidizes red after a few minutes. Ovoid fruit are 3 valved 3-4 cm long, colored green with streaks of red (like a crab apple). The valves split open to reveal many seeds covered in orange arils. **Habitat and Phenology:** Locally rare tree, more common near Playa Naranjo. Mature fruit mid wet season. **Similar Species:** All five *Casearia* species in Santa Rosa can potentially be mis-identified with each other.

Cassia grandis L. "Carao"; FABACEAE (CAESALPINOIDEAE). **Description:** Medium sized tree. Pinnately compound-even leaves, >20 cm in length, with 10-30 pairs of leaflets, distinctively rectangular in shape. Inflorescences of many pink, 2 cm high, pea-like flowers. Fruit is a long, dark, woody pod, around 40 cm in length, 5 cm in width, and contains several seeds surrounded by a dark and sticky molasses like liquid. Relatively smooth, unfurrowed trunk. **Habitat and Phenology:** Overall a rare deciduous tree, but is common in some areas. Flowers late dry season. **Similar Species:** *Cedrela odorata* (rank garlic smell of crushed leaves, deeply furrowed bark); *Lonchocarpus rugosus* (compound-odd leaves with many fewer leaflets); *Machaerium biovulatum* (compound-odd leaves).

Cassia emarginata See *Senna hayesiana*

Castilla elastica Cerv. "Hule"; MORACEAE. **Description:** Medium sized tree. Leaves are large, often, densely pubescent (usually 30-40 cm in length or more). Young stems are also very pubescent. Pubescence is orange/yellow in color. Regular spacings of tufts of hairs along the leaf margin give the appearance of serrations (ciliate margins). Copious white latex from stem petioles and trunk. Smooth trunk with small vertical dark 'pin-strips'. Tree architecture characterized by horizontal branching with large leaves regularly spaced in a horizontal plane. **Habitat and Phenology:** Tending to be deciduous. Appears to grow in moister and more mature forest. **Similar Species:** *Apeiba tibourbou* (lacks copious white latex).

Cecropia peltata L. (= *C. asperrima* Pitt.) "Guarumo"; MORACEAE. **Description:** Medium sized tree. Characterized by distinctive 7-9 lobed palmate simple leaves, usually 15-60 cm in length, and tomentose white underneath. Fallen dried leaves are conspicuously white. Pale gray trunk and stems are characterized by numerous parallel transverse ridges. Stems

(resembling bamboo), are hollow and contain protective ants (usually *Azteca* species). Infructescences are bunches of gray, sausage-shaped fruits about 6 cm in length. **Habitat and Phenology:** Very fast growing pioneer species with soft wood. Most common along roadsides, disturbed areas, and tree-fall gaps. Mature fruit late dry season to early wet season. **Similar Species:** Sapling *Sterculia apetala* (leaves not pubescent).

Cedrela odorata L. (= *C. mexicana* Roem.) "Cedro, (Cedro amargo)"; MELIACEAE. **Description:** Large emergent tree. Dark green and glabrous leaves are alternate, pinnately compound-even. Leaves range up to 50 cm in length with 8-10 pairs of leaflets approximately 14 cm in length. Leaflets have asymmetrical bases. When crushed leaves give off a distinctive rank garlic-like smell. Trunk slash is red and also contains a rather rank smell. Bark is dark and furrowed with broad pale stripes. Produces small white tubular flowers with a distinctive musky/food type odor. Fruit a woody five valved capsule (five sided star) that dehisces to release many flat, paper-like, winged wind-dispersed seeds. **Habitat and Phenology:** Flowers early wet season. Mature fruit the following late dry season to early wet season. **Similar Species:** *Spondias mombin* (compound-odd leaves; no rank odor); *Swietenia macrophylla*. (3-4 pairs of leaflets); *Guarea glabra* (3-4 pairs of leaflets).

Ceiba pentandra (L.) Gaerth. "Ceiba, (Pachote de pelota)"; BOMBACEAE. **Description:** Can become a very large emergent tree. Palmately compound leaf, usually greater than 10 cm in length, with 7 leaflets. Leaflets are lanceolate with entire margins. Young saplings have green striped bark that resembles *Pseudobombax septinatum* but with spines. Adults often have a swollen trunk with smooth silver to gray bark. Dehiscent woody fruits and wind dispersed seeds embedded in a 'cotton-like' kapok. **Habitat and Phenology:** Widespread but locally rare tree. **Similar Species:** *C. aesculifolia* (not listed here; vegetatively almost identical to *C. pentandra* but characterized by serrated leaflet margins, spiny trunk).

Chlorophora tinctoria (L.) Gaud. See *Maclura tinctoria* (L.) Don.

Chomelia spinosa Jacq. "Malacaguite, (Chocolatico)"; RUBIACEAE. **Description:** Small tree. Simple, opposite leaves tending to cluster at the end of the branch. Leaves usually 7-12 cm in length with a rough upper surface and somewhat softly pubescent underside. Leaves have prominent secondary venation. Stems usually contain paired spines (approximately 2 cm in length) above each leaf node. Note, however, that spines can be absent from some areas of the tree (younger branches). Prominent dark, pointed, triangular interpetiolar stipules (up to 7 mm in length, sometimes hair-like). Distinctive corky, lined, light tan bark. Lateral inflorescences are of 15-20 thin, tubular, 2 cm long yellow-cream white flowers. Infructescences of small black oblong berries. **Habitat and Phenology:** Common understory tree in deciduous forest. Flowers mid wet season. Mature fruit late wet season to early dry season. **Similar Species:** *Semialarium mexicanum* (similar in bark color and texture; lacks spines and stipules); *Pisonia macranthocarpa* (black stems).

Chrysophyllum brenessii Cronquist (*); SAPOTACEAE. **Description:** Small to medium sized tree. Simple, alternate leaves, approximately 8 cm in length, with white latex. Leaves slightly obovate to elliptic in shape with leaf base tapering to petiole. Prominent drip tips

tend to become rounded and blunt at the tips. Leaf margins tend to slightly curve downward. Petioles are long and tend to bend upwards. Small groove present on petioles. **Habitat and Phenology:** Tends to be an evergreen tree, somewhat rare. **Similar species:** *Sideroxylon capiri*, *Brosimum alicastrum*, and *Mabea occidentalis*.

Clusia rosea Jacq. GUTTIFERAE. **Description:** Small tree, sometimes with several, thin trunks. Simple, opposite oval-shaped leaves, distinctly very thick. Venation is not apparent. Leaf edge curls under. Sticky brown sap exudes from broken petioles and stems. **Habitat and Phenology:** Found on cliffs and alongside steep streams in northern Santa Rosa/Santa Elena. Epiphytic in wetter habitats.

Cochlospermum vitifolium (Willd.) Spreng. "Poroporo"; COCHLOSPERMACEAE. **Description:** Small to medium sized tree. Palmate simple, alternate leaves, usually 20-30 cm in length, with 5 tips (on some leaves 3), and with a distinctly red petiole (young leaves may lack the red pigmentation). Petiole is quite long, approaching 20 cm in length (leaf lamina 10-15 cm in length). Trunk smooth and pale gray-white in color, sometimes with gray stripes. Very soft wood with a swollen appearance to the trunk base. Trunk sometimes has a watery cafe-con-leche colored latex. Very fast growing pioneer species. Large, bright yellow, radially symmetrical flowers. Dehiscent 6 cm long ovoid fruit pods contain many small (3 mm) semi-circular seeds within a mass of wind-dispersed white cotton-like fluff. **Habitat and Phenology:** Tends to be common in young pastures, secondary forest and disturbed areas. Flowers early to mid dry season. Mature fruit mid to late dry season.

Coccoloba guanacastensis W.C. Burger; POLYGONACEAE. **Description:** Small to medium sized tree. Simple, alternate leaves, approximately 15 cm in length. Acuminate leathery leaves, oval in shape, with entire margins, on long (2-3 cm) upwardly curved petioles. Petioles have a distinctive central groove. Growing tip usually has a cylindrical sheath covering the growing tip and younger petioles. Leaves usually dry to an olive/pale green color. **Habitat and Phenology:** Overall a rare tree but sometimes locally abundant. **Similar Species:** *Eugenia salamensis*.

Cordia alliodora (R. and P.) Oken "Laurel"; BORAGENACEAE. **Description:** Medium sized tree. Simple, alternate leaves, lanceolate/elliptic to obovate in shape, usually 8-11 cm in length with slight drip tips. Leaves with a slight rough to sandpaper feel. Undersides and upper side of leaves pubescent with brown stellate trichomes and white hairs. Architecture is distinctive as many of the younger stems arise from characteristically swollen, hollow, multi-branching nodes. Ants live in these nodes in a seemingly mutualistic relationship. Another distinctive feature is that the trunk slash rapidly turns from yellow/orange to dark red to black in about one minute. Wind dispersed seeds < 1 cm long with 5 wide propeller-like wings. **Habitat and Phenology:** Common medium sized tree in secondary forest and abandoned pastures. Flowers early to mid dry season. Mature fruit late dry season. **Similar Species:** *Cordia gerascanthus* (lacks the swollen hollow nodes for ants); *Diospyros nicaraguensis* (also lacks the swollen hollow nodes for ants; leaves tend to have a black glandular point(s) on the underside of the leaf near the petiole). **Comments:** This very fast growing tree is an important native timber species.

Cordia panamensis Riley (= *C. toqueve*) "Guacalmanono"; BORAGINACEAE.

Description: Medium sized tree. Elliptic to oval shaped, simple and alternate leaves, usually 10-20 cm in length. Leaves have scattered hairs on top, bottom, and petioles. Hairs, especially on the upper surface, give the leaves a distinctive coarse/sandpaper feel to them. Leaf margins usually entire, although serrations can be present (variable among and within individuals). Younger stems have a conspicuous 'Y' branching architecture. At the junction of each young 'Y' branch there is a leaf. This is often a useful distinguishing character. Trunk tends to be yellow to cream in color. Wood is relatively soft. Bark slash often oxidizes from a yellow color to orange/red. Infructescences of pale green, translucent, fleshy, spherical fruits 5-10 mm in diameter. **Habitat and Phenology:** Somewhat abundant tree in deciduous forest. Flowers early wet season. Mature fruit late wet season. **Similar Species:** *Apeiba tibourbou*; *Castilla elastica*.

Cordia guanacastensis Standl.; BORAGINACEAE. **Description:** Small scrubby treelet to shrub. Simple, rhombic/lanceolate, alternate leaves, usually 5-7 cm in length, with small sharp serrations. Hair-like trichomes over the surface of the leaves give a rough and coarse feeling. Long 'hair-like' projections along young stems. Fruit is a red 'berry-like'. **Habitat and Phenology:** Common along Playa Naranjo road near pastures and young regenerating pasture. Mature fruit mid wet season.

Cordia gerascanthus L. "Laurel Negro, (Muñeco)"; BORAGINACEAE. **Description:** Medium sized tree. Simple and alternate lanceolate leaves, usually 8-14 cm in length, with characteristic 2-3 forked *Cordia* branching. Undersides and upper side of leaves are lightly pubescent with white hairs. Wind dispersed seeds > 1 cm in length (larger than *C. alliodora*) with 5 wide propeller-like wings. **Habitat and Phenology:** More common towards Playa Naranjo. **Similar Species:** *C. alliodora* (swollen nodes usually containing ant colonies; leaves with brown stellate trichomes); *Diospyros nicaraguensis* (leaves tend to have a black glandular point(s) on the underside of the leaf near the petiole).

Cornutia grandifolia (Schlecht. and Cham.) Schau.; VERBENACEAE. **Description:** Small to medium sized tree. Simple, somewhat round to obovate, serrated opposite leaves, variable in size, up to 15-20 cm in length. Leaf lamina tapers into the petiole base, and is very pubescent to touch. Perhaps the best distinguishing character is the square stems on young, green shoots. Young stems look weedy and herbaceous. Crushed leaves have a distinctive rank odor. Terminal inflorescences of colorful lavender-blue bilaterally symmetrical flowers with a yellow band on lower lip. **Habitat and Phenology:** More readily encountered in young secondary deciduous forest. Flowers mid wet season. **Similar Species:** *Cordia alliodora* (trunk similar but leaves and branch architecture are very different).

Coursetia eliptica M. Sousa & Rudd (*); FABACEAE (PAPILIONOIDEAE). **Description:** Treelet to small tree. Small pinnately compound-odd leaves, approximately 10 cm in length, with elongate flimsy leaflets highly polymorphic in size and usually elliptic to oval in shape. Leaflets are characterized by a distinctive dimple at the tip. Leaflet margins tending to curve upwards, and leaflet undersides are pale green in color. Basal leaflets usually are smaller in size than terminal leaflet. Bark is slightly furrowed and corky. Yellow 'pea-like' flowers. **Habitat and Phenology:** Tends to be a small treelet growing in clumps in secondary

deciduous forest. **Similar Species:** *Lonchocarpus parviflorus*; *L. acuminatus*.

Coutarea hexandra (Jacq.) Schum.; RUBIACEAE. **Description:** Small, scrubby, understory treelet. Simple opposite, round to oval, dark green leaves, usually 8 to 15 cm in length. Prominent interpetiolar stipules at leaf base. Trunk tending to be somewhat corky, tan to dark tan in color. Showy terminal inflorescences of 4-6 hanging white 5-7 cm long tubular flowers. Fruit is a small, slightly flattened capsule approximately 3 cm in length. **Habitat and Phenology:** A somewhat rare tree usually encountered in deciduous forest. Flowers mid wet season. Fruit late wet season. **Similar Species:** *Exostema mexicanum* (vegetatively very similar – *Exostema* tends to be a larger tree with lighter green leaves and bark which is more smooth when young, and leaf stipules have a prominent raised ridge down the middle that *Coutaria* lacks); *Chomelia spinosa* (paired spines; prominent secondary venation).

Crescentia alata H.B.K. "Jicaro, (Saca-guacal, Guacal)"; BIGNONIACEAE. **Description:** Scrubby tree with distinctive 'crucifix' shaped glossy-green compound leaves, usually 8-10 cm in length. Clumps of leaves emerge from woody stems. Fruit is a 15-20 cm diameter, round gourd born along the trunk and primary branches. Nocturnal, bat pollinated, unpleasant smelling flowers emerging from the trunk and woody stems. **Habitat and Phenology:** Common in recently abandoned pastures. Flowers throughout the wet season. Mature fruits late dry season to early wet season. **Similar Species:** *Crescentia cujete* (not listed; simple leaves and larger fruits; a very rare species in Santa Rosa probably a remnant of past agriculture, D. H. Janzen pers. com.).

Critonia quadangularis (DC.) R.M. King & H. Rob (*); ASTERACEAE. **Description:** Understory shrub. Simple, lanceolate, opposite, leaves, usually 10-15 cm in length, dark green with sharply serrated margins. The growth form reminiscent to that of bamboo (clumped with long dark green stems). Stems have characteristic distinctive ridges/angles running along the length. **Habitat and Phenology:** Observed in moister areas, where soil appears to be saturated with water during the wettest times of the year. **Similar Species:** *Lasianthea fruticosa*.

Croton morifolius Willd. (*); EUPHORBIACEAE. **Description:** Small treelet to shrub. Simple, flimsy, alternate leaves, approximately 14 cm in length including the approximately 4 cm long petiole. Leaves spade to lanceolate in shape, with long drip-tips. Leaf bases have a white pubescence. Intrapetiolar stipules on young stems. Small 2 mm flowers. **Habitat and Phenology:** Usually rare but can be locally abundant. Flowers mid wet season. **Similar species:** There are several *Croton* species of shrub that can be found in Santa Rosa (see Janzen and Liesner 1980).

Cupania guatemalensis (Turcz.) Radlk.; SAPINDACEAE. **Description:** Small to medium sized tree. Pinnately compound leaves, usually 20-25 cm in length, usually with 3 to 5 pairs of leaflets. Leaflets are 5-12 cm in length, symmetrical, with brown pubescence, and are often heavily serrated (although serrations can be highly variable in depth and degree of sharpness). Leaflets alternate along the rachis (if not careful, leaflets can be identified as simple leaves), and are variably compound-even and compound-odd. The tip of the rachis has a small projected growing point. **Habitat and Phenology:** Most common in wetter areas

of closed canopy forest.

Curatella americana L.; DILLENIACEAE. **Description:** Small to medium sized scrubby tree. Leathery alternate leaves, usually 15-25 cm in length, oval in shape with wavy entire margins. Distinctive sand paper texture to the leaves. Bark smooth and gray. Small spherical fruits open to expose a dark seed covered with a white aril. **Habitat and Phenology:** Common scrubby pasture tree in fire prone savannas becoming slightly larger in regenerating pastures. Flowers mid dry season. Mature fruits late dry season. **Similar Species:** *Licania arborea* (leaves are not wavy and are pale on underside).

Dalbergia retusa Hemsl. (= *D. lineata* Pittier = *D. hypoleuca* Pittier) "Cocobolo (Ñámbaro)"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd, alternate leaves, approximately 20 cm in length. About 7 pairs of leaflets, distinctly glabrous and glossy on top. Most leaflets have a distinctive, small dimple at the tip of the leaf. Leaflets usually round to oval in shape and 4-10 cm in length. Terminal leaflet is sometimes obovate. Leaflet attachment to the rachis is uneven (opposite to alternate). Younger leaves tend to have leaf-like intrapetiolar stipules, although this can be missing on older leaves. Base of rachis is swollen. Flowers white. Fruits are an elongated 10 cm long flattened dry pod, usually containing only one seed. **Habitat and Phenology:** Flowers early to mid dry season. Mature fruit the following dry season. **Similar Species:** *Simarouba glauca* (leaflet tips lack small dimples; rachis base is not swollen).

Desmopsis bibracteata (Rob.) Safford "Flor de guinea"; ANNONACEAE. **Description:** Small understory treelet. Simple, alternate and slightly lanceolate leaves, usually 5-12 cm in length. Leaves small, with very short petioles (nearly sessile). Glabrous dark green and rather thick leaves with blunt drip tip. Flowers are creamy yellow to tan colored. Flower petals are thick and rather succulent. Peduncle has a small but distinctive 'leaf-like stipules' at base. **Habitat and Phenology:** Appears to be restricted to moister areas of forest. Flowers early wet season.

Diospyros nicaraguensis Standl. "Nanciguiste"; EBENACEAE. **Description:** Small to medium sized tree. Simple and alternate leaves, usually 10-13 cm in length. Leaves are slightly obovate to lanceolate and tapered toward the petiole. Young stems, petioles, underside of leaf and usually top side of leaf are conspicuously pubescent. Leaf margins also have a distinctive fringe of pubescence. Undersides of leaf lamina, close to petiole, usually have one to a few black spots (approximately 1 mm in diameter). This black spot is most likely a gland and is usually located about 1-2 cm from the petiole and resemble a dark blemish. Bark is somewhat smooth, and pale gray in color. Bark slash reveals a white smooth inner cambium surface, especially on younger individuals. Tends to have very small furrows or lines giving the surface a mesh appearance. **Habitat and Phenology:** Somewhat common tree on mesa tops, and occasionally encountered in younger secondary forest. **Similar Species:** *Cordia alliodora*.

Diphysa robinoides Benth. (= *D. humilis* = *D. carthagenensis* Jacq.) "Guachipelín"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd dark green leaf. Leaf arrangement usually alternate (but this is variable). Leaflets

approximately 2 cm in length, flimsy and oval in shape, with slight indentation at tip. Leaflets are often (but not always) offset along the rachis. As the name implies, the tree looks like a *Robinia* species. Bark is dark and characteristically deeply furrowed. Flowers are bright yellow, in showy inflorescences. Fruits are indehiscent wind dispersed. **Habitat and Phenology:** Somewhat rare tree but more abundant in secondary growth. Flowers late wet season to early dry season. **Similar Species:** *Myrospermum frutescens* (leaves have translucent lines when held up under the light); *Willardia schiedeana* (Papilionoideae, not listed here but occurs in lowland Guanacaste; leaflets are tightly opposite and tend to increase in size from the base of the rachis to the tip; flowers are blue).

Dipterodendron costaricensis Radlk. "Iguano"; SAPINDACEAE. **Description:** Medium to large sized tree. Dark green bi-pinnate compound alternate leaves, usually greater than 30 cm in length. Leaves characterized with numerous (usually < 50) 2-3 cm long lanceolate leaflets. Leaflets have sharply serrated margins. Leaflet upper surface hairless except for midrib base, while there are scattered hairs on the underside and on the petioles. Leaves tend to be clumped. Smooth and dark trunk, usually covered with many lichens. Infructescences of up to approximately 20 "eye-ball" sized fruit, each a red capsule that dehisces open to expose two black seeds. **Habitat and Phenology:** Common on moist cliff ledges/bases and sides of large hills. Mature fruit late dry season. **Similar Species:** *Sciadodendron excelsum* (leaves tri-pinnate compound; leaflet serrations not as pronounced).

Enterolobium cyclocarpum (Jacq.) Griseb. (= *E. cyclocarpa*) "Guanacaste"; FABACEAE (MIMOSOIDEAE). **Description:** Pasture tree attaining large size, usually with a distinctive spreading umbrella shaped crown. Alternate bipinnate compound leaves, usually 15-25 cm in length, with many (at least 60 pairs) small leaflets approximately 1 cm in length. One extrafloral nectary at the base of the rachis and another near the rachis tip. Trunk corky and light gray to tan in color. Flowers are white 'pom-poms' showing a spherical splay of anthers. Fruit is a dark brown, round, flat disk (approximately 10 cm in diameter) curved in an ear shape with several embedded seeds along the periphery. **Habitat and Phenology:** Found commonly associated with pastures. Flowers mid dry season. Mature fruits are dropped mid to late dry season of the following year. **Similar Species:** *Lysiloma divaricatum* (two extrafloral nectaries at the rachis tip; shaggy brown bark), *Mimosa guanacastensis* (not listed here, a Santa Rosa shrub; similar leaves, many sharp, recurved spines along stems).

Erblichia odorata Seem., TURNERACEAE. **Description:** Medium to large tree. Characterized by long 'willow-like' lanceolate and simple, alternate leaves approximately 20 cm in length. Leaves glabrous with gently undulating, serrated leaf margins, giving a weeping willow appearance. Leaves hang down and dangle from branch. "Shaggy" gray-brown bark, peeling in strips. **Habitat and Phenology:** More commonly observed in evergreen, moist forest (Bosque Humedo).

Erythroxyton havanense Jacq.; ERYTHROXYLACEAE. **Description:** Small understory shrub to treelet. Leaves simple, alternate, and up to 7 cm in length. Leaves are round to obovate and are characterized by unique reticulate secondary venation patterning on the leaf underside. Venation on the leaf underside rarely branches near the midrib but is heavily branched and more pronounced away from the midrib. This gives the appearance of

‘shattered glass’ surrounding a blank region near the midrib. Secondary venation on upper surface is not apparent. **Habitat and Phenology:** Common understory treelet apparently more abundant in dry areas, cliffs, and mesa tops of deciduous forest. **Similar Species:** *E. rotundifolium*.

Erythroxylon rotundifolium Lunan; ERYTHROXYLACEAE. **Description:** Small treelet to shrub. Distinctively round, simple, alternate leaves 1-2.5 cm in length, in clumps along stem. Leaf underside is pale to light green, with very faint secondary venation. **Habitat and Phenology:** Understory plant of dry deciduous forest. Rare, although locally common in some parts of Santa Rosa. **Similar Species:** *E. havanense*.

Eugenia hypargyrea Standl.; MYRTACEAE. **Description:** Small tree. Simple and opposite ovoid leaves, 6-9 cm in length, with leaf margin tending to curl downwards. The upper surface is glossy green while the underside has a pale sheen from trichomes. The leaves have a felt-like feel. Flowers are small (1 cm diameter), with four white petals. These petals are retained by the up to 15 mm long ovoid fruit. Fruit is red to deep purple and fleshy when ripe. **Habitat and Phenology:** Tends to be found in young forest and regenerating pasture. More common near the coast. **Similar Species:** *Eugenia salamensis* (larger leaves, usually with punctations; larger fruit); *Rehdera trinervis* (leaves have asymmetrical trinervate venation, leaf margin does not curl under).

Eugenia salamensis Donn. Sm. "Fruta de pava"; MYRTACEAE. **Description:** Small to medium sized tree. Opposite, planar, round to elliptic shaped leaves, usually 12-20 cm in length. Scattered tiny white hairs more common on the underside. When held up to bright light leaves usually have numerous, tiny punctations (there may be exceptions). Leaves tend to have a slightly lobed leaf base. Fleshy oblong fruits up to 30 mm in length, varying in color from yellow-orange to purple. **Habitat and Phenology:** Usually found in secondary forest and regenerating pasture. Fruit late wet season. **Similar Species:** *E. hypargyrea* (smaller leaves); *Psidium guineense* (Myrtaceae, not listed here; tends to have pubescent leaves, with a slight point on the tip and a tapered leaf base).

Euphorbia schlechtendalii Boiss.; EUPHORBIACEAE. **Description:** Small to medium sized tree. Simple, glabrous, oval leaves, usually 4-7 cm in length, including a 1-3 cm long petiole. Leaves are arranged in distinctive whorls of 5-7 (occasionally 8). Leaf underside is pale. Copious white latex from broken petioles and stems. Trunk with peeling thin papery bark. **Habitat and Phenology:** Rare tree.

Exostema mexicanum A. Gray; RUBIACEAE. **Description:** Medium sized tree. Simple, opposite, glabrous leaves, usually 11-18 cm in length, with distinctive interpetiolar stipules at leaf bases. Stipules are triangular with a distinctive longitudinal ridge. Young branches have a distinctive ‘Y’ forking branching architecture. Large trees have tan bark that peels in small strips giving individuals a ‘shaggy’ appearance. When young, however, bark is smooth (quite different from adult trees). Blooms sprays of several small white flowers. Infructescences of many 1-2 cm long oblong pointed fruits. **Habitat and Phenology:** Common deciduous, medium-sized tree in deciduous forest. Flowers mid wet season. Mature fruits late wet season. **Similar Species:** *Coutaria hexandra*.

Faramea occidentalis (L.) A. Rich.; RUBIACEAE. **Description:** Small treelet/tree. Opposite leaves glabrous dark green, elliptic in shape, with distinctive drip tips and prominent yellow venation. Branching architecture is distinct with young branches stemming immediately above older pair of leaves to yield a pitchfork branching architecture. Growing tip has two approximately 2 cm long hair-like interpetiolar stipules, that are also present with thickened bases at the nodes of young shoots. When present, distinctive hair-like stipules are up to approximately 1.2 cm in length. **Habitat and Phenology:** Understory component and apparently tending to be evergreen. More common in evergreen, moist forest (Bosque Humedo).

Ficus sp. "Higuerón" MORACEAE. **Description:** Local *Ficus* species are usually rather difficult to distinguish due to the need to check morphological characteristics of the fig. All have alternate leaves, although may be clumped. Copious white latex exudes from broken petioles, young stems, and trunk. Secondary venation is often prominently parallel with a distinctive collecting vein running along the margins of the leaf. Stem growing tips are characterized by the Moraceae conical stipules. Bark is usually quite smooth and tan to yellow in color. Most individuals are stranglers, germinating in the canopy of another tree and growing there to eventually strangle it. In the process individuals send down aerial roots often giving individuals a sinuous flowing or melting look. Trunks are often characterized by multiple fluted stems.

Ficus goldmanii Standl. (also called "Matapalo") Leaves elongated, elliptical in shape, 15-22 cm in length, with a rounded leaf base. Leaves dark green and glabrous. Figs 2-3 cm in diameter. More commonly encountered as a pasture tree with distinctive spreading, umbrella-like canopy.

Ficus insipida Willd. (= *Ficus glabrata* H.B.K.) Distinguished by the lanceolate-shaped simple leaf, 12 cm in length. Leaves with distinctive collecting vein around the leaf margin. Has a sappy legume smell to broken stems. Large tree with white smooth bark with thin longitudinal folds.

Ficus ovalis (Liebm.) Miq. and *F. cotinifolia* H.B.K. Vegetatively, both appear to be identical. Petioles around 5 cm in length. Round, oval, to obovate leaves are small to medium in size, 6-15 cm in length (not including petiole). Usually with no drip tip and entire margins. Pubescence is not noticeable to touch, but with a magnifying glass some hairs can be present. Figs of both are approximately 1-1.5 cm in diameter, but can be differentiated by the morphology of the fig ostiole (the entrance for the fig wasp, located at the tip of the fig). *F. ovalis* does not have a raised ring of swollen tissue around the ostiole, whereas *F. cotinifolia* does have a raised rim around the ostiole. Both are common strangler figs in the area.

Ficus hondurensis Standl. Vegetatively very similar to *F. ovalis* and *F. cotinifolia*. Distinguished by the presence of noticeably dense pubescence on the undersides of the leaf and the 1.5 cm diameter fig.

Ficus popenoei Standl. Large tree, with densely tomentose leaves. Petioles, young

branches, and figs also pubescent. When dry, pubescence appears yellow orange in color. Figs 2-3 cm in diameter. Ostiole is in a strongly sunken depression.

Ficus morazaniana Burger. Not a strangler fig. Figs are distinctively large, 2-3 cm in diameter. Leaves and figs are slightly tomentose.

Garcinia intermedia (Pittier) Hammel (= *Rheedia edulis* Triana & Planch); CLUSIACEAE.

Description: Small to medium sized tree. Opposite, lanceolate, usually dark green leaves, 8-13 cm in length. Relatively thick and leathery leaves with entire, gently undulating margins. Undersides of leaves have very fine and characteristic tight parallel secondary venation. Apparently a dioecious tree. **Habitat and Phenology:** More common in evergreen, moist forest (Bosque Humedo). Fruits are pendulous yellow 'pods' that dehisce to release a seed covered by red fleshy tissue that dangles. **Similar Species:** *Ouratea lucens* (serrated leaves); *Tabernaemontana chrysocarpa* (Apocynaceae, not listed here; encountered near coast, 15 cm long leaves, secondary venation is not dense and tightly parallel).

Genipa americana L. (= *Genipa caruto* H.B.K.) "Guaitil"; RUBIACEAE. **Description:**

Medium sized tree. Very large, opposite, obovate leaves, 15-40 cm in length, with acuminate tip. Leaves are glossy, glabrous dark green on the upper surface. At the base of each petiole (especially on younger branches) is a prominent long stipule approximately 1.8 cm in length. Leaf undersides are slightly pubescent to the touch. Fruit is a pale racquetball-sized (70 mm diameter) sphere, containing 2 hemispheres of fleshy pulp and seeds. Trunk is light gray and smooth. Inflorescence terminal, with 8-10 thick yellow flowers. Yellow fleshy petals on flowers. **Habitat and Phenology:** Somewhat common deciduous tree. Flowers early to mid wet season. Mature fruits mid dry season to early wet season. **Similar Species:** *Stemmadenia obovata* (white latex).

Gliricidia sepium (Jacq.) Steud. "Madero negro"; FABACEAE (PAPILIONOIDEAE).

Description: Small to medium sized tree. Pinnately compound-odd, alternate leaves usually up to 25 cm in length. 5-6 pairs of leaflets per leaf, approximately 7 cm in length, which tend to be strictly opposite and almost rhombic in shape. Secondary venation is bright light green to yellow. Bitter odor to crushed leaves. Bark pale brown. Inflorescences of showy yellow, lavender and white flowers. Young fruit are large flattened green pods (10 cm in length) with red tips. These become woody and dry over 2-3 weeks before explosively dehiscing spirally to scatter many small seeds. **Habitat and Phenology:** Common in early secondary vegetation and along roads. Flowers mid dry season. Mature fruits late dry season. **Similar Species:** *Ateleia herbert-smithii*; *Lonchocarpus* sp. **Comments:** Deciduous tree often used as living fence posts.

Godmania aesculifolia (H.B.K.) Standl. "Corteza blanca, Corteza de chivo";

BIGNONIACEAE. **Description:** Small to medium sized tree. Palmately compound, opposite leaves, with 7 leaflets 10-14 cm in length. Proximal leaflets are smaller than distal leaflets. Leaves are softly pubescent. Leaf margins on adult trees are usually entire, although leaves of juvenile trees tend to be serrated. Leaves and stem also have a characteristic unpleasant odor when broken. Bark is an even tan colour with a corky consistency. Flowers are small, yellow to red in color. Fruits are long and spiraled woody dehiscent pods which slip open to

release many winged wind-dispersed seeds. **Habitat and Phenology:** Deciduous small tree, often encountered in dry secondary forest. Flowers mid or late dry season. Mature fruits late dry season. **Comments:** *G. aesculifolia* is the only local tree species with opposite arranged palmately compound leaves with 7 leaflets.

Guarea glabra Vahl. (= *G. excelsa* H.B.K.); MELIACEAE. **Description:** Small to medium sized tree. Compound-even leaves up to 15 cm in length (often smaller), usually with 2-4 pairs of leaflets. Leaflets up to 10 cm in length and elliptic in shape with drip tips. Leaves with a characteristic 'terminal bud/growing tip' between the terminal leaflet pair. **Habitat and Phenology:** Tending to be an evergreen tree. Apparently restricted to hill bases and moister evergreen areas of forest. **Similar Species:** *Swietenia macrophylla* (very similar leaves; *S. macrophylla* leaflet bases are asymmetrical while *G. glabra* leaflet bases are more symmetrical); *Haematoxylon brasiletto* (not listed here; keys out with *G. glabra*; coastal distribution, 1 cm long spines on stem, 3-4 pairs of triangular to heart-shaped leaflets per leaf, and a contorted fig-like black trunk).

Guazuma ulmifolia Lam. "Guácimo, (Caulote)"; STERCULIACEAE. **Description:** Small to medium sized tree. Simple alternate leaves, usually 10-15 cm in length, with serrated edges. Leaves softly pubescent to touch. Serrations are blunt and tend to be of two sizes, one larger than the other. Leaf base is usually asymmetrical. At the base of the leaf petiole is a pair of hair-like intrapetiolar stipules. Bark is dark with small furrows, developing slight buttresses when large. Fruit are small black, indehiscent rough woody balls about 2 cm in diameter. **Habitat and Phenology:** Common deciduous tree in secondary forest and regenerating pasture. Flowers most strongly early wet season. However, it is not unusual to see flowers and fruit throughout the year. **Similar Species:** *Luehea speciosa* and *L. candida* (leaf-like, green intrapetiolar stipules; very different woody fruits); *Muntingia glabra* (undersides of leaves are 'sticky' to the touch; fleshy fruits).

Guettarda macrosperma Donn. Sm. "Madroño negro"; RUBIACEAE. **Description:** Medium-sized tree. Simple, opposite leaves, usually 10-24 cm in length, elliptic to ovoid or even heart-shaped. Leaf margins tend to be entire. Leaves usually clumped at the ends of branches. Leaf surfaces rough from raised venation, with a diffuse scattering of tiny white hairs. Intrapetiolar stipules triangular in shape, approximately 6 mm in length, usually covered with hair-like pubescence. When held up to the light leaf margins usually have a slight fringe of scattered hairs. Young individuals tend to have branches with prominent sharp 'knobs', remnants of old secondary branches, that project at 90 degree angles. The trunk is distinctively sinuous, smooth, and convoluted, with dark-purple gray bark that peels in large pocks and flakes. Fleshy oval fruits approximately 2.5 cm in diameter, with a pale to bright red surface and white succulent flesh. **Habitat and Phenology:** Somewhat common deciduous tree. Fruits mid to late wet season. **Similar Species:** *Bernardia nicaraguensis* (leaves have slight serrations on leaf margins and are obviously pubescent to the touch); *Calycophyllum candidissimum* (white and orange trunk; leaf margins lack a fringe of hairs).

Gymnanthes lucida See *Sebastiania pavoniana* Muell. Arg.

Hamelia patens Jacq.; RUBIACEAE. **Description:** Small understory tree to treelet. Simple,

largely glabrous leaves, usually 6-10 cm in length, arranged in characteristic whorls of 4 (occasionally 3) from stem nodes. There are 4 interpetiolar stipules per node, one between each leaf base. Leaves elliptic obovate in shape with drip tip. Small orange to red tubular flowers, in numerous terminal inflorescences. **Habitat and Phenology:** More common in tree fall gaps and along roadsides. Flowers mid dry season.

Helicteres baruensis Jacq.; STERCULIACEAE. **Description:** Shrub to small tree. Simple, alternate heart-shaped leaves, approximately 15 cm in length, with double-serrated leaf margins. Leaf undersides are tomentose white. Fruit a 4 cm long woody cylinder of five twisted woody folds, resembling a swirled vanilla ice cream cone. Generally some fruits can be found on or below most plants at any time during at least the wet season. Young fruit are green and coated with white hairs. Mature fruit are woody and brown. As it dries, the fruit unwinds, and each "arm" splits open to release many small brown spherical seeds. **Habitat and Phenology:** Commonly encountered along roadsides, and in clearings. **Similar Species:** *Helicteres guazumaefolia*; *Bernardia nicaraguensis* (very similar leaves; lack the characteristic *Helicteres* fruits).

Helicteres guazumaefolia H.B.K. ; STERCULIACEAE. **Description:** Shrub to small tree. Simple, alternate leaves, approximately 5 cm in length, with distinct simple serrations. Leaves, petioles, and young stems can be densely pubescent. Fruit a 2-3 cm long woody cylinder of five twisted woody folds, resembling a swirled vanilla ice cream cone. Generally some fruits can be found on or below most plants at any time during at least the wet season. Tubular flowers are deep red in color, superficially resembling flowers of the Malvaceae family. **Habitat and Phenology:** Common along roadsides and in dry deciduous and regenerating pasture. **Similar Species:** *Helicteres baruensis* (double serrations on leaf; larger leaves and fruit).

Hemiangium excelsum (H.B.K.) A.C. Smith See *Semialarium mexicanum*

Hirtella racemosa Lam. "Serrecillo, Serrecio"; CHRYSOBALANACEAE. **Description:** Shrub to small treelet. Simple, alternate (planar) leaves, usually 5-7 cm in length, elliptic/lanceolate in shape with drip tip. Leaves have very short petioles (nearly sessile). Leaves are glabrous on top and leaf margins tend to have a slight fringe of hairs. A pair of 5-10 mm long hair-like intrapetiolar stipules are obvious at the petiole bases on young branches. Young stems, petioles, and main vein slightly pubescent. Younger woody stems are red in color. Pink showy flowers. **Habitat and Phenology:** Understory shrub, more common in wet areas and around cliff edges. Common in the old growth Bosque Humedo. Flowers late dry season to early wet season. **Similar Species:** *Casearia sylvestris* (leaves without intrapetiolar stipules); *Mouriri myrtilloides* (opposite leaves).

Hura crepitans L. "Javillo"; EUPHORBIACEAE. **Description:** Can be a large emergent tree. Simple, alternate leaves, usually 12-15 cm in length including a 4-6 cm petiole. Leaf is ovoid to heart shaped with lobed bases (similar in shape to poplar (*Populus* sp.) leaves of the northern temperate deciduous forests), with noticeably long petioles. There are two distinctive glands at the base of the lamina, and the petiole is generally at a steep angle to the leaf blade. Trunk covered with numerous characteristic, small, sharp conical spines. Caution:

inner bark has a watery caustic latex. Inflorescences are moroon-red 3 cm long "fingers" on a long peduncle. **Habitat and Phenology:** Rare in upland Santa Rosa, but more common around Playa Naranjo and wetter forests. Flowering has been observed around the Playa Naranjo area early wet season. **Comments:** The three local species with many spines on their trunks can be easily separated by their leaf form: simple leaves = *Hura crepitans*, palmately compound leaves = *Pachira quinata*, pinnate compound leaves = *Zanthoxylum setulosum*.

Hymenaea courbaril L. "Guapinol"; FABACEAE (CAESALPINOIDEAE). **Description:** Large emergent tree. Dark green glabrous, compound, alternate leaves with two leaflets. Each leaflet is usually 6-8 cm in length. Upper sides of leaflets are glossy and have many translucent points when held up to bright light. Distinctive smooth light gray trunk. Fruit are hard indehiscent woody pods 5-15 cm in length. **Habitat and Phenology:** Large evergreen canopy tree, apparently restricted to moister, more mature forest and cliff bases. The dominant tree in Bosque Humedo. Flowers late dry season. Apparently mast fruits infrequently, although some fruits are produced early wet season of each year. Individuals shed leaves briefly and synchronously during mid dry season **Similar Species:** *Bauhinia unguolata* (simple leaves; small tree).

Inga vera Willd. (includes *Inga spuria* H.&B. ex Willd.) "Guabo, Guaba"; FABACEAE (MIMOSOIDEAE). **Description:** Medium sized tree. Pinnately compound-even alternate leaves, usually 15-30 cm in length, with a distinctive winged rachis. Usually 5-7 pairs of opposite leaflets, each approximately 10 cm in length. Leaflet lengths increase from the base to the tip of the leaf. Circular extrafloral nectaries are present on the rachis at the joining of each pair of leaflets. Fruit a narrow legume pod covered in brown hairs, seeds with white, tasty flesh. Fruit is a small version of the *Inga* ("guaba") fruits eaten locally. **Habitat and Phenology:** More common tree around wet areas of forest, especially near streams and water holes. Flowers mid to late dry season. Fruits mid wet season. **Similar Species:** The two other species with leaves with a winged rachis are *Bursera tomentosa* (serrated leaflets) and *Swartzia cubensis* (entire leaflets, rachis lacks extrafloral nectaries); *Pithecellobium lanceolatum* (bipinnate leaves with flattened secondary rachises).

Ixora floribunda (A.Rich.) Griseb.; RUBIACEAE. **Description:** Small to medium sized tree. Opposite, simple leaves, usually 9 to 15 cm in length, with small blunt drip tip. Leaves usually clumped at young branch tips. Individuals have broad and conspicuous stipules (approximately 5 mm in length) sometimes with a hair-like tuft. On young branches, stipules tend to cover up most of the region between leaves. **Habitat and Phenology:** Appearing to be evergreen and apparently more prevalent in the understory of moist evergreen forest (Bosque Humedo). **Similar Species:** *Guettarda macrosperma* (convoluted black trunk); *Calycophyllum candidissimum* (orange and white trunk). See also *Couteria hexandra* and *Exostema mexicanum*.

Jacquinia nervosa C. Presl. "Burriquita, Siempre vive"; THEOPHRASTACEAE. **Description:** Treelet to shrub with individuals characterized by a very stunted appearance. Small, simple leaves, usually 4-7 cm in length, with a prominent small, sharp, spine at the end. Unique in that individuals are deciduous in the wet season. Small tubular orange-red flowers. Fruit are small hard 1-1.5 cm diameter yellow-green spheres, with a small sharp

spine at the tip. **Habitat and Phenology:** Usually associated in early secondary forest and on dry ridges or mesa tops. Flowers early to mid dry season. Mature fruit mid to late wet season. **Comments:** In the past it appears that this species was incorrectly referred to locally as *Jaquinia pungens* A. Gray.

Jatropha curcas L. "Coquito"; EUPHORBIACEAE. **Description:** Small understory tree. Distinctive square to pentagon shaped leaves, usually 20-25 cm long, approximately half of which is petiole. Leaf arrangement disordered. Abundant white (sometimes clear) latex from broken stems and leaves. Bark pale and peels in papery shreds, reminiscent of *Bursera*. Flowers small, green petals with yellow organs, on lateral inflorescences. Fleshy oblong fruit, about 2.5 cm in length, pale yellow when ripe, containing three 2 cm long oblong black seeds. **Habitat and Phenology:** Common in the young forest around the Sendero Natural but apparently absent elsewhere. Appears to be an introduced tree (Janzen and Liesner 1980) and seems to be spreading locally. Flowers early wet season. Mature fruit late wet season. **Similar Species:** *Manihot aesculifolia* (not listed here; keys out with *J. curcas*; the wild yucca, a shrub occasionally encountered in regenerating pasture; has deeply lobed palmate leaves with wavy/indented margins).

Karwinskia caldronii Standl.; RHAMNACEAE. **Description:** Medium to large tree. Simple, opposite, leaves, usually 5-10 cm in length, with distinctive venation. Leaves lanceolate to elliptic in shape ascending to an acuminate tip. Secondary venation splits from main vein at approximately 30 degree angles, and is strongly parallel, giving a distinctive 'fish-skeleton' look. Underside of leaves pale green to white in color. When held up to the light undersides of leaves tend to have small black dots. Fruit is spherical, about 1 cm in length, purple to red skin with green pulp surrounding a single seed, 1-3 fruits per infructescence. **Habitat and Phenology:** More commonly encountered in deciduous forest. Mature fruit early to mid dry season.

Koanophyllon albicaule (Klatt.) K.&R. (= *Eupatorium albicaule* Sch. Bip. ex Klatt.); ASTERACEAE. **Description:** Treelet to shrub. Opposite, lanceolate to elliptic shaped leaves, approximately 10 cm in length, with slight trinervate venation. Leaves serrated, dark green and flimsy with prominent acuminate tip. Weedy type of growth. **Habitat and Phenology:** Rare understory shrub. **Similar Species:** *Lasianthaea fruticosa*; *Critonia quadangulare*.

Krugiodendron ferreum (Vahl) Urb.; RHAMNACEAE. **Description:** Small treelet. Simple alternate leaves, usually 3-6 cm in length, and round lanceolate to oval in shape. The two internode lengths can make the leaves appear opposite. Base of leaf can be slightly lobed. Leaves have a plastic feel to them. Margins with gentle undulating serrations. Leaf tips sometimes have slight dimples at apex. Fruits oblong, orange-red when ripe, containing two black disc shaped seeds. **Habitat and Phenology:** Tending to be rare. Mature fruits mid wet season.

Lantana trifolia L.; VERBENACEAE. **Description:** Small woody shrub to treelet. Simple opposite leaves, tend to be clumped and very 'mint-like' in appearance. Young stems have characteristically square stems. Leaf shape rhombic to lanceolate. Leaves with serrated edges

and softly pubescent, along petiole, leaf surface and base. Leaf length is approximately 10 cm. When crushed, leaves have a very pleasant, cool, wintergreen/perfume smell. **Habitat and Phenology:** Locally rare. **Similar Species:** *Cornutia grandifolia* (lacks square stems).

Lasianthaea fruticosa (L.) K. Becker [= *Zexmenia frutescens* (Miller) Blake];

ASTERACEAE. **Description:** Small shrubby understory tree. Simple, opposite leaves with serrated edges, up to 17 cm in length including approximately 2 cm long petioles. Flimsy leaves, lanceolate to rhombic in shape, with slightly pubescent petioles and long drip tips. Leaf surfaces have small hair like trichomes that appear like small dents on surface. Trichomes can be felt by gently rubbing finger from the tip of the leaf toward the petiole (there is no resistance rubbing towards the leaf tip). Branching is characterized by slightly swollen nodes. Yellow composite flowers with mustard-yellow ray flowers. **Habitat and Phenology:** This is the most common composite (= Asteraceae) understory treelet. Flowers mid wet season. **Similar Species:** *Solanum hazenii* (crushed leaves with 'tar' smell); see also *Koanophyllon albicaule*.

Licania arborea Seem. "Alcornoque, Roble Blanco"; CHRYSOBALANACEAE.

Description: This can be a very large emergent tree. Characterized by very stiff leather/sandpaper-like simple alternate leaves, up to 20 cm in length. Leaves ovoid, dark green and glabrous on top with a light pale coloring underneath. Margins of leaves entire and slightly undulating. Dark gray to pale trunk. Bark may peel in pocks. Fruit is a small, oval, 3 cm long, woody infructescence. **Habitat and Phenology:** Common emergent, evergreen tree in secondary forest. Mature fruit mid to late dry season.

Lonchocarpus acuminatus (Schltdl.) M. Sousa "Chaperno"; FABACEAE

(PAPILIONOIDEAE). **Description:** Small to medium sized tree. Small compound-odd leaves, usually 10-20 cm in length, with seven leaflets, usually 4-8 cm in length. All leaflets of a leaflet are a similar length. Fruit is a dry, thin (almost translucent), flat pod. Trunk is generally smooth and pale to white in color. **Habitat and Phenology:** Flowers late wet season to early dry season. Mature fruit late dry season. **Similar Species:** *L. parviflorus* (smaller, more rounded leaflets, with less prominent venation). **Comments:** Locally, *L. acuminatus* is less abundant than *L. minimiflorus*.

Lonchocarpus felipei N. Zamora (= Santa Rosa *L. costaricensis* (Donn. Sm.)Pitt.) "Siete cueros, Corteza de venado, Chaperno"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd alternate leaves, approximately 30 cm in length (but highly variable). 2-3 pairs of ovoid leaflets are generally very large (10-15 cm in length) with distinctively rounded tips, sometimes with a very small drip tip. Leaflets are somewhat smaller and more round near rachis base. Leaflets have prominent secondary venation and are also softly pubescent. Inflorescences of many crimson flowers. Fruit are large flattened woody pods, about 10 cm in length. **Habitat and Phenology:** More readily encountered in dry deciduous forest. Flowers early to mid dry season. Mature fruits mid to late dry season. **Similar Species:** *Trichilia cuneata* (leaflet tips pointed); *L. eriocarinalis*, (not listed here; rectangular/lanceolate pubescent leaflets with brown pubescent rachis; parallel secondary venation).

Lonchocarpus minimiflorus Donn. Smith "Chaperno, Carao"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd leaves, up to 15 cm in length, and usually with 3 pairs of leaflets. Leaflets usually 1.5-6 cm in length, elliptic in shape. First pair of leaflets close to leaf base are markedly smaller and more round than secondary and tertiary leaflets. Inflorescences of many pink-violet small pea-like flowers. Small dry wind dispersed fruits. Smooth trunk pale to white in color. **Habitat and Phenology:** Common canopy member in early secondary forest. Flowers late wet season. Mature fruit late dry season. **Similar Species:** *L. acuminatus* (larger, less rounded leaflets with more prominent venation); *L. parviflorus* (leaves very similar to *L. minimiflorus* except leaflets don't vary greatly in size per leaf; small tree); *L. orotinus* (not listed here, locally very rare; 4-5 pairs of leaflets; more obovate leaflets). See also *L. oliganthus* (below).

Lonchocarpus oliganthus F. J. Herm.; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd leaves with 2-3 pairs of leaflets with drip tips. Leaflets tending to be opposite. Upper leaflet surface is glabrous and dark green. Single ridge down upper surface of leaflet attachment to rachis. When dry, leaflet attachments appear to dry a dark brown. **Habitat and Phenology:** Unclear, from herbarium samples appears more common in wetter areas of Costa Rica (e.g., La Selva, Braulio Carrillo) **Similar Species:** *L. acuminatus*, *L. minimiflorus*, and *L. parviflorus* (very similar vegetatively; *L. oliganthus* has less pronounced secondary venation and swollen leaflet rachises).

Lonchocarpus parviflorus Benth.; FABACEAE (PAPILIONOIDEAE). **Description:** Small sized tree. Pinnately compound-odd leaflets, usually with 3 pairs of leaflets. Leaflets usually 4-6 cm in length, elliptic in shape. All leaflets per leaf are of a similar length per leaf. **Habitat and Phenology:** Locally rare in upland Santa Rosa, but more common towards the coast. **Similar Species:** *L. acuminatus* (larger, less rounded leaflets with more prominent venation); *L. minimiflorus* (leaves very similar to *L. parviflorus* except leaflets vary greatly in size per leaf; medium sized tree); *L. orotinus* (not listed here, locally very rare; 4-5 pairs of leaflets; more obovate leaflets).

Lonchocarpus phlebophyllus Standl. & Steyerm.; FABACEAE (PAPILIONOIDEAE). **Description:** Small to medium sized tree. Pinnately compound-odd leaflets, with usually seven leaflets. Leaflets usually 4 to 6 cm in length, round in shape. The venation on the underside of leaflets is very pronounced. **Habitat and Phenology:** Apparently more common on dry rocky sites. **Similar Species:** *L. acuminatus* (larger, less rounded leaflets); *L. minimiflorus*, *L. orotinus*, and *L. parviflorus* (much less prominent venation leaves; leaflets elliptic rather than round).

Lonchocarpus rugosus Benth.; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Pinnately compound-odd leaves up to 20 cm in length, with up to 7 pairs of leaflets. Leaflets rectangular with a rounded tip, approximately 5 cm in length, with little variation in length within a leaf. Leaflets tough, with brown hairs, and with margin curling downwards. Trunk straight with non-fissured pale gray-brown bark. Inflorescences of small dark pink pea-like flowers. **Habitat and Phenology:** Occurs in young regenerating forest. Flowers mid wet season. Fruits late wet season to early dry season. **Similar Species:** *L. eriocarinalis* (not listed here; 2-3 pairs of 10 cm long leaflets).

Luehea candida (T. C.) Mart. "Guácimo Molenillo"; TILIACEAE. **Description:** Medium sized tree. Simple, alternate oblong, serrate leaves, usually 12-20 cm in length, with a prominently 3-veined at leaf base. Leaf undersides, petioles, and young stems softly pubescent, with distinctively white pubescent on leaf undersides. Upper surface of leaves is dark green and somewhat rough to the touch. Characterized by a pair of distinctive 'leaf-like' intrapetiolar stipules at each petiole base of young leaves. Flowers are yellow-white and fragrant (8 cm diameter) usually opening at night with showy petals and numerous anthers. Fruit woody, 6 cm in length, dehiscent along five distinctive raised ridges to release numerous winged seeds. **Habitat and Phenology:** Tree more common in secondary dry forest and along roadsides. Flowers early to mid wet season. Mature fruit mid to late dry season. **Similar Species:** *L. speciosa* (vegetatively nearly identical; easily distinguished using the smaller, non-ridged fruit – if a tree is not bearing fruit, old fruit capsules can be found on the ground); *Guazuma ulmifolia* (smaller leaves with double serrations; small spherical woody fruit).

Luehea speciosa Willd. "Guácimo Macho, (Guácimo Blanco)"; TILIACEAE. **Description:** Medium sized tree. Simple, alternate oblong, serrate leaves, usually 12-20 cm in length, with a prominently 3-veined leaf base. Leaf undersides, petioles, and young stems softly pubescent, with distinctively white pubescent on leaf undersides. Secondary veination are parallel to each other. Petioles are swollen. Upper surface of leaves is dark green and somewhat rough to the touch. Characterized by a pair of distinctive 'leaf-like' intrapetiolar stipules at each petiole base of young leaves. Flowers white, and similar in appearance to *L. candida*. Fruit woody, 3 cm in length, oval smooth 5-valved capsule with winged wind dispersed seeds. **Habitat and Phenology:** Common canopy tree in secondary deciduous forest. Flowers late wet season to early dry season. Fruits mid to late dry season. **Similar Species:** *L. candida* (see above); *Guazuma ulmifolia* (smaller leaves with double serrations; small spherical woody fruit).

Lysiloma divaricatum (Jacq.) Macbride "Ardillo, Quebracho"; FABACEAE (MIMOSOIDEAE). **Description:** Small to medium sized tree. Bi-pinnately compound 'mimosa-like' leaves, usually 5-15 cm in length, with very small leaflets, usually about 0.5 cm in length. Rachis has prominent nectary glands (one at the rachis base and two at and near the tip). On young juveniles and young branches, leaves have a prominent leaflet-like intrapetiolar stipules. Young stems can be slightly pubescent. Adult trees characterized by tan shaggy bark. **Habitat and Phenology:** More readily encountered in young deciduous forest. **Similar Species:** *Acacia* species (all with spines); *Enterolobium cyclocarpum* (two extrafloral nectaries per rachis; trunk not shaggy); *Albizzia caribaea* (not listed here, but occurs in lowland Guanacaste; large tree with gray bark occurring in swampy areas); *Leucaena leucocephala* (not listed here, vegetatively similar, has recurved 'spines' along the rachis base that can be felt by running the finger along the base); *Mimosa guanacastensis* (not listed here, a Santa Rosa shrub; similar leaves, many sharp, recurved spines along stems). **Comments:** Note, Janzen and Liesner (1980) list *L. demostachys* and *L. seemannii*—these names should be dropped from being present in Sector Santa Rosa. It appears that both of these old identifications are in fact *L. divaricatum*.

Mabea occidentalis Benth.; EUPHORBIACEAE. **Description:** Simple, weakly serrated, lanceolate, alternate leaves, approximately 10 cm in length. Leaf edge curls under slightly. Occasional hairs can be present on leaf venation. Leaf upper surface is glossy dark green while the underside is pale green/white. Broken petiole or young stem may produce white latex. Small tree to shrub. **Habitat and Phenology:** Locally a rare tree, most abundant in moist evergreen forest.

Machaerium biovulatum Micheli "Jarro caliente"; FABACEAE (PAPILIONOIDEAE).

Description: Medium sized tree. Pinnately compound, alternate leaves, usually 15-25 cm in length, with leaflets usually 4- 6 cm in length. Leaflets are light green below and dark green above. Leaflets tend to be more rectangular in shape, and are each terminated by a slight dimple at leaflet tip. At the tip of the leaflet the main vein can terminate in a small tip that protrudes from the leaflet apex. Secondary venation is very fine and parallel. Leaflets are covered with slight pubescence along the main vein and rachis. At the base of the rachis are a pair of triangular brown intrapetiolar stipules. Trunk is usually smooth, with occasional paired spines or scars on the trunk (less evident on some individuals). For problem individuals, scanning both old and young stems should reveal the presence of spines. Seeds are 5 cm long winged and wind dispersed. **Habitat and Phenology:** Deciduous. Flowers mid to late wet season. Mature fruit late wet season to early dry season. **Similar Species:** *Lonchocarpus rugosus* (no spines, secondary venation is parallel but not very fine); *Cassia grandis* (no spines; compound-even leaves). Note, the woody liana *M. kegelii* has similar leaves and large recurved spines.

Maclura tinctoria (L.) Don (= *Chlorophora tinctoria* (L.) Gaud.) "Mora"; MORACEAE.

Description: Medium to large tree. Simple, alternate leaves, usually 8-13 cm in length, with pronounced, sharp, angular, serrations. Leaves acuminate having a pronounced drip-tip. Young leaves often mimic insect "bites" with large false holes on the sides of leaves. Young branches tend to "zigzag" between nodes. Young individuals usually have pronounced thin, sharp spines on stems. Trunk is dirty white to yellow tan with yellow buttresses when large. Bark has pronounced raised large lenticels and when rubbed with the hand lenticels fall off, resembling saw-dust. Characteristic yellow/tan 'cafe-con-leche latex' from trunk slash and petioles. Fruit is a small globular sphere, approximately 1.5 cm in diameter, and light green in color. Male flowers are pendulous (> 3 cm in length), drooping catkins. Wind pollinated. **Habitat and Phenology:** Dioecious soft-wooded tree. More commonly encountered in older secondary forest. Flowers mid wet season. Mature fruit late wet season.

Malpighia glabra L.; MALPIGHIACEAE. **Description:** Understory treelet. Small opposite leaves, usually 2-7 cm in length (but highly variable). Leaves deltoid in shape with acuminate leaf tip. Where leaves attach to branch there is a small swollen 'joint' or flared region. Red 2 cm diameter ovoid fruit, 1-3 seeded, with a 6 mm long peduncle. **Habitat and Phenology:** Somewhat rare tree. Mature fruit early to mid wet season. **Similar Species:** *Casearia sylvestris* (alternate leaves).

Malvaviscus arboreus Cav.; MALVACEAE. **Description:** Understory small shrub to treelet. Simple softly pubescent acuminate leaves, approximately 12-15 cm in length, with rounded, cordate bases. Leaf margins are serrated, and venation is palmate with the leaf having three

distinct tips (somewhat like a maple, *Acer* species, of northern temperate forests). Flowers are distinctive, bright red, 5 cm in length, and hummingbird pollinated. **Habitat and Phenology:** Common understory component. Flowers more or less continuously throughout the year, with peaks in July and during the dry season. Stamens clumped in a central 'column' (monodelphus stamen) **Similar Species:** *Prockia crucis* (leaf-like intrapetiolar stipules).

Manilkara chicle (Pittier) Gilly "Nispero, chicle"; SAPOTACEAE. **Description:** Medium to large tree. Simple clumped leaves, usually 13-19 cm in length, elliptic to obovate in shape with a slight drip tip. Leaves glabrous on upper surface, with very fine and parallel secondary venation. Branching pattern of younger branches has a distinctive 'candelabra' architecture. White latex from leaf and trunk (note that latex flow can be very reduced in small plants after dry spells). Bark dark, and characteristically furrowed in rectangular blocks, especially on larger individuals. Lateral inflorescences, multitude of white flowers. Spherical light brown leathery fruit, about 2 cm in diameter, with fleshy red pulp about a large woody seed. **Habitat and Phenology:** Largely evergreen tree, common in moister and more mature forest. Flowers early wet season. Mature fruits late wet season to early dry season. **Similar Species:** *Ardisia revulata* (vegetatively very similar, no white latex); *Sideroxylon capiri* (very long petioles); *Pouteria reticulata* (long petioles); *M. zapota* (not listed here, occurs in wetter parts of lowland Gunacaste; vegetatively near identical; not recorded from Sector Santa Rosa.). **Comments:** Some large individuals have V-shaped 'tapping scars' along trunk from harvesting chicle (chewing gum) early in the century.

Margaritaria nobilis L.f. (= *Phyllanthus nobilis* (L.f.) M.Arg.); EUPHORBIACEAE. **Description:** Understory treelet to small tree. Simple alternate leaves, usually 6-10 cm in length, rather small, thin, entire, and rhombic/elliptic in shape. Leaves have a scattering of small hairs that are more prevalent on undersides and newly formed stems. Pair of small scale-like intrapetiolar stipules at the base of petiole. Crushed leaves have a pleasant perfume smell. Younger stems have several small, white lenticels. Bark has a characteristic deep red trunk slash. Small round, 2 mm in diameter, sized fleshy fruit. **Habitat and Phenology:** Flowers early wet season. Mature fruit mid wet season. **Similar Species:** *Casearia corymbosa* (serrated leaves with punctations with held up to the light).

Mastichodendron capiri (A. DC.) Cron. See *Siderosylon capiri* (A. DC.) Pitter

Maytenus segoviarum Standl. & Steyerl.; CELASTRACEAE. **Description:** Small shrub to treelet. Simple, alternate leaves, approximately 8 cm in length, and very thick and leathery (similar in feel as that of *Capparis indica*). Leaves glabrous light green to olive green in color, with very fine secondary venation difficult to see. Leaf margins have smooth serrations that gently undulate along leaf margin. Blunt drip tip (not sharply pointed). Leaves drying to a uniform pale olive gray color. Small yellow-green flowers and 1 cm long, ovoid, orange fleshy fruit. **Habitat and Phenology:** Rare understory treelet. **Similar Species:** *Capparis* species (no serrations), *Casearia* species (no serrations, punctations), *Manilkara chicle* (no serrations, white latex).

Miconia argentea (Swartz) DC. "María"; MELASTOMATACEAE. **Description:**

Understory tree. Simple opposite leaves approximately 20 cm in length. Leaves round to oval in shape. Leaf undersides (also petioles and young stems) are characteristically tan brown and slightly tomentose. Leaf margins have slight, barely noticeable, serrations. Leaves have the characteristic Melastomataceae venation of 1-2 pairs of large veins running parallel to the midrib, with near perpendicular connecting secondary venation. Terminal infructescence of many small spherical hairy fleshy fruit. **Habitat and Phenology:** Usually found in more wet areas, mature forest, and near cliff edges. Mature fruits early wet season.

Mouriri myrtilloides (Sw.); MELASTOMATACEAE. **Description:** Small tree to shrub. Small dark green leaves, with opposite planar arrangement, approximately 4-6 cm in length. Leaf shape is lancolate. Leaf margin entire and loosely undulating. Secondary venation is not readily apparent – hence no obvious Melastomataceae-like venation (see *Miconia*). Young stems with characteristic ‘Y’ branching. Fruit small fleshy sphere about 5 mm diameter containing a single seed, positioned singularly and laterally on a short stalk. **Habitat and Phenology:** Evergreen understory treelet. Common in moist, evergreen forest (Bosque Humedo). Mature fruit early to mid wet season. **Similar Species:** *Hirtella racemosa* (alternate leaves); *Casearia sylvestris* (alternate leaves with punctations), *Psidium sartorianum* (leaves with punctations).

Muntingia calabura (Swartz)DC. "Capulín"; FLACOURTIACEAE. **Description:** Small treelet. Simple alternate leaves approximately 7 cm in length. Leaf margins serrated and leaf bases strongly asymmetrical. Leaf undersides and young stems are tomentose white/green, and are distinctive in being slightly sticky to touch. Approximately 1 cm diameter white radially symmetrical flowers. Spherical 1 cm diameter fleshy yellow to red fruits which are tasty when ripe. Fruit suspended on stalk, 1-1.5 cm in length, smells slightly of dirty socks. **Habitat and Phenology:** Usually associated with more scrubby secondary forest and roadsides. Peak flowering late dry season to early wet season, although some individuals can be found in flower throughout the year. Peak mature fruit abundance early to mid wet season, but again is highly variable **Similar Species:** *Guazuma ulmifolia* (woody spherical fruits; non-sticky leaf undersides). **Comments:** This species was previously placed in the Elaeocarpaceae.

Myrospermum frutescens Jacq. "Caraño, Arco"; FABACEAE (PAPILIONOIDEAE). **Description:** Small to medium sized tree. Pinnately compound alternate leaves, usually 10-15 cm in length, pale blue-green in color. Leaves are usually usually compound-odd but this is variable. Usually 7-10 pairs of leaflets, approximately 2-3 cm in length, which when held in the light, leaflets show distinctive translucent lines (punctations). Undersides of leaves have fine venation. Trunk is smooth and white. When young, bark is pale, with distinctive vertical stripes of lenticels. Thin papery woody dehiscent fruit pods approximately 15 cm long and 2 cm wide. **Habitat and Phenology:** Somewhat rare tree in deciduous secondary forest. Mature fruits late wet season to early dry season. **Similar Species:** *Diphysa robinoides* (leaflets lack punctations, deeply furrowed bark); *Machaerium biovulatum* (leaflets lack punctations).

Ocotea veraguensis (Meisn.)Mez "Canelo"; LAURACEAE. **Description:** Small to (occasionally) medium sized tree. Simple, alternate leaves, usually 6-11 cm in length, elliptic

in shape, and often dark green and somewhat glossy with mottled coloring. Leaves glabrous, with somewhat wavy margins. 'Bay-leaf' ('laurel de hoja') like leaves which are easy to crush or tear, and yield a distinctive laurel sweet/spicy or peppery smell. This odor may not be as pronounced when fruiting. The bark contains this odor too and can usually be smelled by a thumbnail scratch of the surface. When young, trunk is smooth and has pronounced large lenticels on a dark gray background. When larger, architecture is often crooked. Fruit is acorn sized (approximately 2-3 cm in length) and glossy green (unripe) to dark purple-black (ripe), capped by a receptacle that turns bright red when ripe. **Habitat and Phenology:** Evergreen tree, usually in the understory, seemingly restricted to cliff bases and moist areas and evergreen patches of forest. Mature fruits early wet season. **Similar Species:** *Manilkara chicle* (white latex; no distinctive smell).

Ouratea lucens (H.B.K.) Engler; OCHNACEAE. **Description:** Small to medium sized tree. Simple, glabrous, alternate leaves, usually 8-16 cm in length. Leaves elongated and elliptic/lanceolate in shape, with *sharply* serrated leaf margins, serrations becoming elongated at leaf apex. Fine, parallel, strongly curved secondary venation is distinctive. Petiole is relatively thick and swollen. At the base of the petiole are a pair of elongated intrapetiolar stipules, approximately 7.5 mm in length. **Habitat and Phenology:** More commonly encountered in moister and more mature forest (Bosque Humedo). **Similar Species:** *Garcinia intermedia* (leaves lack serrations).

Pachira quinata [= *Bombacopsis quinata* (Jacq.) Dugand = *B. quinatum* = *B. fendlerium*] "Pochote"; BOMBACACEAE. **Description:** Can be a large tree. Palmately compound alternate leaves, usually 18-25 cm in length, with five leaflets. Rachis can be partially red. Bark dark gray with slight furrowing, and very prominent spines covering most of the trunk (although individuals vary in the degree of 'spininess,' with some almost lacking spines). Spine base is circular in cross section. Flowers red/orange sprays of anthers. Fruits dehisce to release numerous small seeds embedded in a cotton-like fluff (kapok). **Habitat and Phenology:** Common deciduous tree in dry secondary forest. Flowers mid to late dry season. **Similar Species:** *P. quinata* is the only common local species with five foliate palmately compound alternate leaves. **Comments:** The three local species with many spines on their trunks can be easily separated by their leaf form: simple leaves = *Hura crepitans*, palmately compound leaves = *Pachira quinata*, pinnate compound leaves = *Zanthoxylum setulosum*. *Ceiba aesculifolia* (not listed here, occurs in Guanacaste; looks like *P. quinata* but with reduced spine number, see Janzen and Liesner, 1980).

Picramnia quaternaria Donn. Sm. "Caregre"; SIMAROUBACEAE. **Description:** Small tree to shrub. Pinnately compound, alternate leaves, usually 10-21 cm in length. 5-7 pairs of strongly asymmetrical leaflets oval to elliptic in shape and usually 4-5 cm in length. Leaflets are largely glabrous, although the leaf margins have a small fringe of tiny hairs and the leaf rachis is also slightly pubescent. Leaflets closer to rachis base are more round than terminal leaflets. Leaflets have a long drip tip with rounded tip. **Habitat and Phenology:** More commonly encountered as an understory component in mature moist forest (Bosque Humedo). **Similar Species:** *Spondius purpurea* (distinctive lemony smell to crushed leaves; woody pseudo-spines on trunk); *Trichilia hirta* (softly pubescent leaflets).

Piper amalago L. "Estrella, (Candela, Candelillos)"; PIPERACEAE. **Description:** Small understory shrub, usually growing in dense clumps. Oval-spade shaped leaves, usually 6-13 cm in length. Dark green, glabrous, flimsy leaves with an acuminate tip. Obvious distinct jointed stems, swollen at each node. Very distinctive 'anise' smell to crushed leaves. Fruit distinctive, vertically raised, 6 cm long, "catkin" like. **Habitat and Phenology:** Understory shrublet, more common in moist areas of evergreen forest and hill bases of deciduous forests. Fruits seen mid June 1994. **Similar Species:** Can be separated from *Piper jaquemontianum* and other local *Piper* species (see Janzen and Liesner 1980) by the 6-13 cm oval-spade shaped leaves, and by its distinctive anise smell.

Piper jaquemontianum Kunth "Candela, Candelillos"; PIPERACEAE. **Description:** Understory shrub. Elliptical dark green glabrous leaves, with acuminate tip (15-20 cm in length). The underside of the leaf midvein has characteristic white hairs, continuing onto the petiole. Leaves arranged in a plane. Jointed, stems, swollen at the nodes. Inflorescence and infructescence are rod-like and held upright, one per node (8-10 cm in length). **Habitat and Phenology:** Understory shrub, more common in moist areas of evergreen forest. Flowers/fruits mid to late wet season. **Similar species:** Can be separated from *Piper amalago* and other local *Piper* species (see Janzen and Liesner 1980) by the white hairs on the underside of the leaf midvein.

Pisonia aculeata L. (= *P. macranthocarpa* Donn. Smith) "Petrono"; NYCTAGINACEAE. **Description:** Medium to large sized tree. Small simple, opposite (clumped) leaves, usually 10-15 cm in length. Leaves are dark green and obovate and are characterized by prominent secondary (yellow) venation and collecting vein. Architecture is very distinctive; branching is at distinct 90 degrees, and young stems are dark black in color. Spines are present on younger branches, usually in pairs but can be single. Infructescences of about eight ovoid 5-sided, 2 cm long fruit, each on a 1.5 cm long pedicel. **Habitat and Phenology:** Usually an understory tree, tends to be evergreen. Fruits late wet season. **Similar Species:** *Chomelia spinosa* (green to tan stems without *Pisonia*'s 90 degree branching); *Agonandra macranthocarpa* (no spines).

Pithecellobium dulce (Roxb.) Benth. "Michiguiste"; FABACEAE (MIMOSOIDEAE). **Description:** Small tree. Bi-pinnate compound-even, alternate leaves, usually 5-8 cm in length. Leaf shape is very distinctive, bifurcating to pair of 4-5 cm long leaflets on each of the two secondary rachises. There are 3 extra-floral nectaries per leaf (at petiole junction and the base of each leaflet), and a pair of spines per node. Flowers white, conspicuous tufts of stamens. **Habitat and Phenology:** Occasional individuals in secondary forest and regenerating pasture. Flowers early wet season.

Pithecellobium lanceolatum (H. and B.) Benth.; FABACEAE (MIMOSOIDEAE). **Description:** Shrub to small treelet. Bi-pinnate compound-even leaves, usually 6-12 cm in length. Small leaves have only one pair of secondary rachis (the leaf is "Y" shaped) and 4 pairs of leaflets, while larger leaves have two pairs of secondary rachises and approximately 12 pairs of leaflets. Glabrous leaflets are 3-6 cm long with entire margins. The secondary rachis is slightly winged (flattened). There is a protruding extrafloral nectary at the distal end of the primary rachis and each secondary rachis. At the base of the rachis are a pair of small

intrapetiolar stipules. Stems have paired short spines. **Habitat and Phenology:** Occurs in wetter areas. **Similar Species:** *Pithecellobium dulce* (leaves never have more than a pair of secondary rachises); *Albizia adenocephala* (extrafloral nectary at the rachis base and not tip; scattered white hairs on leaflets)

Pithecellobium saman (Jacq.) Benth. See *Samanea saman*

Platymiscium parviflorum Benth. (= Santa Rosa *P. pleiostachyum* Donn. Sm.) "Christóbal"; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree. Trifoliolate compound, glabrous, opposite leaves, usually 25-30 cm in length, with three ovoid leaflets usually 10-16 cm in length. Leaflets are ovoid with a drip tip. The primary rachis swells near the base of the terminal leaflet. Green stems with raised small white lenticels. Dark bark with rough longitudinal fissures. **Habitat and Phenology:** Generally rare deciduous tree, although can be locally common. **Similar Species:** *Xylophragma seemannianum* (Bignoniaceae, not listed here; a liana that can be a free standing shrub when young, large trifoliolate leaves with simple tendrils); *Erythrina berteroana* (Papilionoideae, not listed here, very rare in Sector Santa Rosa; alternate trifoliolate leaves with broad heart-shaped leaflets and gland-like flaps of tissue at the base of each leaflet; sparse, squat spines on trunk). **Comments:** It is unusual for a fabaceous tree to have opposite leaves.

Plumeria rubra L. (= *P. acutifolia* Poiret) "Flor blanca, (Frangipani)"; APOCYNACEAE. **Description:** Medium sized tree. Very large, 35 cm and longer, simple, elongated elliptical leaves. Copious white latex from cut stems and leaves. Branches are distinctly stout and stems are swollen at their tips. Leaves tend to be clustered at the tips of these thick branches. Showy white tubular flowers have yellow centers and a pleasant fragrance. Large woody fruit pods are about 30 cm in length and curved. Pod walls dehisce upwards to release wind-dispersed seeds, leaving two woody "horns" on the end of branches for some months afterwards. **Habitat and Phenology:** Widely distributed tree. More abundant on dry exposed ridge tops and rocky ledges in deciduous forest. Flowers especially early wet season. Mature fruit early dry season. **Similar Species:** *Genipa americana*. (no latex; stems not swollen). See also *Thevetia ovata* (leaves about 20 cm long, stem tips not swollen).

Pouteria reticulata (Engl.) Eyma; SAPOTACEAE. **Description:** Medium sized tree. Simple, alternate, slightly lanceolate, dark green leaves, up to 20 cm long. Distinctively pronounced with long drip tips and slightly undulating margins. Leaves are glabrous and tend to be glossy on top. Petioles relatively long, and may range up to 3 cm in length. Leaf width tends to be widest near the middle of the leaf. Slight white latex, usually in the petiole. **Habitat and Phenology:** Tending to be evergreen. More readily encountered around Playa Naranjo and the Naranjo Mirador area, in more mature evergreen forest. **Similar Species:** *Sideroxylon capiri* (longer petioles; leaves widest near the tip and clustered near stem tip).

Prockia crucis L.; FLACOURTIACEAE. **Description:** Small understory treelet to shrub. Simple, ovoid, serrated, alternate, planar, leaves, usually 9-12 cm in length with palmate venation. Undersides of leaves are soft to touch due to white hairs on the venation. Leaf bases can be slightly lobed. Very prominent and characteristic expanded intrapetiolar stipules (resembling a small leaf) at the bases of petioles of young shoots. Inflorescence of about

three black fleshy fruits spherical (4 mm diameter), each above three relatively large "sepals." Both fruit and sepals covered in fine white hairs. **Habitat and Phenology:** Mature fruits mid- late wet season. **Similar Species:** *Luehea* species (larger, tougher leaves). *Helicteres baruensis* (narrow intrapetiolar stipule, double serrations, whorled woody fruit), *H. guazumaefolia* (narrow intrapetiolar stipule, whorled woody fruit); *Hibiscus tiliaceus* (Malvaceae, not listed here, keys out with *P. crucis*, a coastal shrub/small tree, no intrapetiolar stipules).

Pseudobombax septinatum (Jacq.) Dugand "Ceibo, Ceibo barrigón"; BOMBACACEAE. **Description:** Large deciduous tree. Palmately compound leaves, usually 35-45 cm in length, with 7 entire leaflets. Upper surface of leaf center characterized by a blue-green pad of flattened tissue. The upper surface of the rachis has two ridges. When large, the trunk is slightly swollen at base. Trunk is smooth and is easily identified by the presence of large, distinctively smooth green vertical stripes amongst the rougher old purple gray bark. Fruits are about 20 cm long dehiscent pods that open to expose many small wind dispersed seeds embedded in copious amounts of brown cottony 'fluff' or kapok. **Habitat and Phenology:** Mature fruit late dry season. **Similar Species:** *Ceiba pentandra* (juveniles also have bark with green stripes, but with spines); *Pachira quinata* (5 foliate leaves; no green stripes in the bark).

Psidium sartorianum (Berg) Ndzu.; MYRTACEAE. **Description:** Treelet. Simple opposite leaves, elliptic in shape and approximately 6 cm in length. Leaves have small punctations when held to the light. Leaves, glabrous but slightly pubescent on petioles and young stems. Very slight blunt drip tip. Distinctive 'Y' branching architecture. **Habitat and Phenology:** Appears to be more common as an understory component in mature, moist forest (Bosque Humedo). **Similar Species:** *Mouriri myrtilloides* (no punctations); *Hirtella racemosa* (alternate leaves, no punctations); *Casearia sylvestris* (alternate leaves).

Psychotria pubescens Sw.; RUBIACEAE. **Description:** Understory shrub. Simple, elliptical, opposite leaves, up to 15 cm in length. Young stems and undersides of leaves are slightly pubescent. Prominent yellow secondary venation. Basal stem diameter apparently does not often exceed 2 cm. Small round white flowers in clusters. Fruit is a small fleshy berry. **Habitat and Phenology:** Flowers early wet season. **Similar Species:** *P. horizontalis* (vegetatively near identical, but lacking pubescence on the underside of leaves and young stems); *Exostema mexicanum* (no pubescence); *Coutarea hexandra* (no pubescence).

Psychotria horizontalis Sw.; RUBIACEAE. **Description:** Shrub. Opposite leaves, 6-8 cm in length, with acuminate tips. Leaves elliptical in shape and have prominent secondary venation. Fruit is a small, round fleshy berry approximately 3-5 mm in diameter and is bright cherry red in color. **Habitat and Phenology:** Somewhat rare understory component in local forests. Mature fruit late wet season. **Similar Species:** *P. pubescens* (pubescence on the underside of leaves and young stems); *Psychotria carthaginensis* (not listed here but occurs in lowland Guanacaste; leaves usually more narrowly obovate to lancolate in shape with distinctive leaf venation).

Pterocarpus sp.; FABACEAE (PAPILIONOIDEAE). **Description:** Medium sized tree.

Pinnately compound leaves approximately 20 cm in length with round/elliptic leaflets usually 7-12 cm in length. Leaves usually with 7 leaflets. Basal leaflets may be smaller in size and rounder in shape. Leaflets have a wide but sharp drip tip and have a slightly swollen attachment to the rachis. Circular fruit. **Habitat and Phenology:** Locally a rare tree.

Comments: According to Nelson Zamora (Instituto Nacional de Biodiversidad), *Pterocarpus* species are difficult to identify past the generic level based on vegetative samples alone.

Quercus oleoides Schlecht. & Cham. "Roble Encino"; FAGACEAE. **Description:** Medium to large oak tree. Simple, alternate leaves, upper surface glabrous, under surface, (and variably the petiole and stem tips) pale gray-green pubescent. Leaf length and shape variable, from 7-12 cm in length. Fruits are acorns. **Habitat and Phenology:** Most abundant on poor soils. Common in pasture forest of the Santa Rosa dry mesa top highlands, and the sectors on Santa Rosa's eastern border. Fruit production peaks early to mid dry season.

Randia thurberi S. Watson (= Santa Rosa *R. karstenii* Pol.) "Crucillo"; RUBIACEAE. **Description:** Small treelet. Simple opposite leaves, usually 1.5-2.5 cm in length, which are clumped at nodes along branches. Characterized by distinctive branching architecture. Branching angle of young stems at 30 degrees (or close) with prominent, long, paired spines. Fruit is a small sphere, 1.5-2.5 cm in diameter. **Habitat and Phenology:** Understory treelet in deciduous forest. Flowers late wet season. **Similar Species:** *Chomelia spinosa* (leaves 7-12 cm in length) **Comments:** *R. monantha* and *R. thurberi* are the only two commonly encountered *Randia* species in Sector Santa Rosa.

Randia monantha Benth. (= *R. subcordata* Stanl.); RUBIACEAE. **Description:** Shrublet to small tree. Simple opposite leaves, usually 7-11 cm in length, clumped at the ends of branches. Leaves are pubescent, small, and oval in shape. This species can be readily identified by a distinctive whorl of four spines. The fluted tan trunk peels off in small sections revealing a green (photosynthetic) inner bark. Architecture can be very similar to a vine, often sprawling over low vegetation. Fruit a sphere approximately 4 cm in diameter, with a small 'tuft' from the calyx at its top. **Habitat and Phenology:** Common understory tree in deciduous and young secondary forest. Mature fruit especially late wet season. **Comments:** *R. monantha* and *R. thurberi* are the only two commonly encountered *Randia* species in Sector Santa Rosa. At one time *R. monantha* was also called *R. subcordata* in Santa Rosa.

Rehdera trinervis (Blake) Mold. "Yayo"; VERBENACEAE. **Description:** Medium sized tree. Simple, obovate to round, opposite leaves, usually 7-9 cm in length, which are usually curled upwards. Leaves lightly glabrous above and can be slightly pubescent underneath and along mid-rib. Leaf undersides are characterized by a strong trinervate, and slightly asymmetrical venation. Trunk is slightly corky, slender, and vertically roped/sinuuous. Very small white tubular flowers, corolla appears united. **Habitat and Phenology:** Deciduous tree commonly found near drier areas, cliff edges, and mesa tops in deciduous forest. Flowers early wet season. **Similar Species:** *Eugenia hypargirea* (leaves lack trinervate venation). **Comments:** Some leaves on most plants have one or two small yellow dots, perhaps viral infections.

Rheedia edulis Triana and Planch See *Garcinia intermedia* (Pittier) Hammel.

Roupala montana Aubl. (= *R. complicata* Kunth.) "Danto hediondo" PROTEACEAE.

Description: Small to medium sized tree. Leaves of juvenile trees are pinnately compound, alternate, serrated, and usually 15-20 cm long, with 5-7 approximately 3 cm long leaflets. Leaflet bases are strongly asymmetrical, stiff and sharp, and curl upwards. In stark contrast, the leaves of adult trees are simple, alternate, with limited serrations, and are usually 6-12 cm long. Leaves of both juveniles and adults are tough and leathery. The species is easy to recognize by a trunk slash often smelling of "rancid tuna fish" (although smell may differ between individuals). Crushed leaves also give this distinctive odor, although less strongly. Fruits are 8 cm long infructescences of dry brown capsules that release winged wind dispersed seeds (2 cm in length). **Habitat and Phenology:** Usually found on cliff and mesa top edges, rocky savannas and dry exposed hillsides, and commonly burned pasture areas.

Samanea saman (Jacq.) Merr. (= *Pithecellobium saman* (Jacq.) Benth.) "Cenízaro"; FABACEAE (MIMOSOIDEAE). **Description:** Can become a large tree with spreading, umbrella-like canopy. Bipinnately compound, alternate leaves, up to 30 cm long, without terminal leaflets. Usually > 20 pairs of leaflets, up to 4 cm in length, which are rhombic shaped, dark green, and glabrous. Undersides of leaflets and the rachis are densely hairy. Petiole is square in cross-section. Extra-floral nectaries along the primary petiole. Large short basal trunk with a round spreading crown, similar to *Enterolobium*. Bark is shaggy and dark. Flowers pink-white, with conspicuous tufts of stamens. Fruit is a flattened dark brown woody pod containing several hard seeds. **Habitat and Phenology:** Large evergreen tree often associated with pastures and young secondary forest. Flowers mid to late dry season. Mature fruit late dry season. **Similar Species:** *Enterolobium cyclocarpum* (very similar growth form and architecture; many more and much smaller leaflets); *Albizia guachapele* (not listed here but found in lowland Guanacaste; rounded leaflets); *Caesalpinia exostemma* (not listed here; a shrub/small tree encountered near Playa Naranjo; also with bi-pinnate compound leaves; 4-6 pairs of leaflets per 4-5 pairs of secondary rachises plus a terminal secondary rachis, leaflets oval and about 2 cm long);

Sapium thelocarpum Schm.y Pitt. "Juche, (Olivo macho, Yos)" EUPHORBIACEAE.

Description: Medium sized tree. Simple, lanceolate, alternate leaves, usually 12-20 cm long with small, sharp serrations. Petiole tends to be long (up to approximately 3 cm). At the base of the leaf, there is a characteristic pair of nectaries on the petiole that appear as two small 2 mm nubs. Broken stems exude copious white latex. Bark is smooth and white to silver in color with small darker furrows running vertically. Bark is also characterized by horizontal lateral branch scars. When larger can develop small buttresses. Terminal infructescence of six-lobed, spherical, dehiscent, brown, woody fruit (8 mm diameter). Each fruit contains up to 3 small hard brown circular seeds. **Habitat and Phenology:** Somewhat abundant deciduous tree in secondary deciduous forest. Inflorescences early wet season. Mature fruits late wet season. 1994. **Similar Species:** *Plumeria rubra* (larger leaves lacking nectaries).

Sapranthus palanga Fries "Palanco, (Guineo)" ANNONACEAE. **Description:** Small to medium sized tree. Easy to identify due to the presence of flowering scars and/or cauliflorous flowering on the surface of a dark trunk. Flowering scars resemble large pimples or blisters

on the main trunk. Simple, round to elliptic, alternate leaves usually over 25 cm long. Leaves are very pubescent, and have a slight drip tip. Leaf margins are entire with a characteristic fringe of hair around the leaf. Crushed leaves have a somewhat legume ('green bean') smell. Cauliflorous flowers are light green when young and purple/black when mature. They smell horrible, like rotten flesh. Fruit on the tree has the appearance of a swollen green banana. The fruit falls green then turns black on the forest floor. **Habitat and Phenology:** Common component of secondary and more dry forest. Flowers early to mid dry season. Mature fruit mid wet season. **Similar Species:** *Annona purpurea* (leaves not pubescent).

Schoepfia schreberi J.F.Gemel.; OLACACEAE. **Description:** Small to medium sized tree. Simple, deltoid, alternate leaves, usually 8-9 cm in length. Dark green leaves with very faint secondary venation. Venation is highly reticulate but difficult to see. Leaves are somewhat succulent and (when fresh) 'snap in two' easily when bent. Crushed leaves have a distinctive odor, somewhat reminiscent of rank garlic. Trunk is corky, dark, and slightly furrowed. **Habitat and Phenology:** Tending to be an evergreen tree, more commonly encountered in deciduous forest. **Similar Species:** *Agonandra macrocarpa* (orange-brown bark with a green photosynthetic inner bark).

Sciadodendron excelsum Griseb. "Jobo Lagarto"; ARALIACEAE. **Description:** Medium to large tree. Very large tri-pinnate compound leaves up to 1 m long. Leaflets with tiny "knobbed" serrations. At first glance, leaves may appear simple. Bark in more mature trees have an extremely gray to brown tan mottled/stucco look. Flowers are 'tufts' mid way up younger branches, resembling a parasitic mistletoe from a distance. Terminal infructescence of many small 'blueberry' like fruits. **Habitat and Phenology:** Somewhat rare to locally common deciduous tree. More readily encountered in secondary deciduous forest. Flowers late dry season. Fruits early wet season. **Similar Species:** *Dipterodendron costaricensis* (large bi-pinnate compound leaves; leaflets with deep pointed serrations).

Sebastiania pavoniana Muell. Arg. (= *Gymnanthes lucida*); EUPHORBIACEAE. **Description:** Small to medium sized tree. Simple alternate light green leaves, usually 7-11 cm in length. Leaves uniformly a creamy green color and have a 'plastic' feel. Leaves slightly elliptic in shape with a pronounced drip tip and serrated margins. Secondary venation is strongly curved along leaf margin. Yellow bark with copious yellow/tan latex when trunk is slashed. Small flowers (1 mm in diameter) on a terminal spike. Fruit is three-valved dehiscent pod (15 mm diameter), each valve containing one small black seed. **Habitat and Phenology:** More commonly encountered in deciduous forest. Flowers late dry season. Mature fruit early wet season. **Similar Species:** *Hippomane mancinella* (not listed here, keys out with *S. pavoniana*, a tree restricted to coastal areas, with long petiole at 45 degrees to leaf lamina, very fine serrations - caution:poisonous latex). **Comments:** This is the infamous "Mexican Jumping-Bean", because of the larvae of a caterpillar (*Cydia deslaisiana* Tortricidae) which infest the fruits and cause the dry pods to "jump" when warm (presumably to move the larvae to shadier spots on the forest floor).

Semialarium mexicanum (Miers) Mennega (= *Hemiangium excelsum* (H.B.K.) A.C. Smith) "Guácharo"; HIPPOCRATEACEAE. **Description:** Small tree. Simple, opposite leaves, usually 7-10 cm in length, with serrations varying in strength between leaves. Tough leaves

with a yellow-green petiole. Branching tends to be at 90 degrees. Leaves light green in color, and when dried are olive green. Leaves are often placed in different planes to one another and tend to shoot off in various directions. Distinctive three-fanned, flattened woody fruit, with each fan containing a cluster of about five winged seeds, released when each fan splits along its mid-line. **Habitat and Phenology:** Common understory tree in dry deciduous forest, also a common member of young scrubby forest. Flowers late dry season. Mature fruits mid wet season. **Similar Species:** *Chomelia spinosa* (very similar bark but with spines on stems); *Casearia sylvestris* and *C. corymbosa* (alternate leaves with punctations).

Senna hayesiana (B.&R.)I.&B. (= *Cassia hayesiana* (B.&R.) Standl.); FABACEAE (CAESALPINOIDEAE). **Description:** Small tree. Pinnately compound-even leaves with two pairs of opposite leaflets. Leaflets usually 10-17 cm in length with basal leaflets smaller in size with a slight drip tip. Between leaflets there usually is a 'stipule-like' projection from the rachis. **Habitat and Phenology:** Apparently a rare tree of deciduous forest. **Similar Species:** *Swietenia macrophylla* (more than two pairs of leaflets).

Senna atomaria (L.) H. S. Irwin & Barneby (= *Cassia emarginata* L.); FABACEAE (CAESALPINOIDEAE). **Description:** Small to medium sized tree. Compound-even leaves, usually 13-16 cm in length, with usually 3-4 pairs of leaflets. Leaflets are generally oval in shape and softly pubescent to the touch. Leaflet tips are sometimes indented with often a small protruding hair-like tip. Trunk is dirt white to dark with raised lenticels. When young bark is smooth, red colored with raised lenticels. Many small yellow flowers. Fruit is dark, flat, dehiscent woody pod approximately 30 cm long and 1-1.5 cm wide. **Habitat and Phenology:** Somewhat rare deciduous tree of dry secondary deciduous forest. Mature fruit early to mid dry season. **Similar Species:** *S. hayesiana* (only 2 leaflets); *Swietenia macrophylla* (leaflets not pubescent to touch).

Sideroxylon capiri (A. DC.)Pitter (= *Mastichodendron capiri* (A. DC.) Cron. "Tempisque"; SAPOTACEAE. **Description:** Large, canopy tree. Simple, dark green, alternate leaves, usually 7-15 cm in length, including very long petioles, usually 3-7 cm, petioles. Elongated leaves, slightly obovate in shape. Leaves widest near the tip and gently tapering towards the petiole. Leaf apex has a small drip tip. Leaves tend to be whorled around younger branches and sometimes bleeds white latex from a cut petiole. Fruit green and round/elongated, 'grape-like'. **Habitat and Phenology:** Emergent evergreen tree. More common along moist hill bases and in older secondary, and moist forest. **Similar Species:** *Manilkara chicle* (leaves with short petioles and fine strongly parallel secondary venation; copious white latex); *Pouteria reticulata* (leaves more elliptical in shape with the widest part of the leaf near the middle).

Simarouba glauca DC. "Aceítuno, (Olivo, Negrito)"; SIMAROUBACEAE. **Description:** Medium sized tree. Pinnately compound alternate leaves, usually 25-35 cm long, with usually 5-7 pairs of leaflets each approximately 7 cm in length. Leaves are usually compound-odd, but sometimes compound-even. Dark green leaflets are somewhat rectangular in shape and often alternate along rachis. Upper sides of leaflets thick and very glossy. Undersides of leaflets white/pale green with very fine, parallel, secondary venation, and sometimes lightly pubescent. Leaflets have rounded and somewhat curved margins with a tapered base. Fruit

ovoid, about 3 cm long, with glossy purple skin and purple flesh about a single seed. **Habitat and Phenology:** Mature fruit throughout dry season, peaking in mid dry season. **Similar Species:** *Dalbergia retusa* (leaflets with pronounced reticulate secondary venation and a dimple at the tip).

Sloanea terniflora (Moc. and Sesse) Stanl. "Terciopelo"; ELAEOCARPACEAE.

Description: Medium to very large tree. Simple alternate leaves, usually 10-12 cm in length, and slightly obovate to elliptic in shape. Base of leaf is slightly cordate or lobed. Leaves are glabrous, somewhat leathery, dark green, with all venation raised on both surfaces. Secondary venation with a prominent outside collecting vein. Leaf base is slightly lobed. Trunk is dark brown and can be strongly buttressed when large. Buttresses can reach impressive size but can be quite thin. Fruits are 15 mm long, ovoid, with a thick coating of velvet purple hairs around a single seed. Caution: these purple hairs are terribly urticating, resembling fiberglass! **Habitat and Phenology:** Somewhat rare evergreen tree more abundant in wetter areas. Mature fruit especially mid dry season. **Similar Species:** *Sideroxylon capiri* and *Pouteria reticulata* (relatively long petioles; non-lobed base of leaf lamina), *Manilkara chicle* (very fine secondary venation, white latex from stems and trunk); *Trophis racemosa* (prominent outside collecting vein; white latex).

Solanum hazenii Britt. ; SOLANACEAE. **Description:** Small tree to shrub with weedy type of growth. When crushed the leaf smells like a tomato leaf, reminiscent of tar. Simple alternate leaves, usually 10-20 cm in length, and elliptic to lanceolate in shape. Leaves and young stems pubescent and rough to touch. Bark of the treelet is (orange)-beige with small raised lenticels. Lateral inflorescence of small white flowers. Infructescences of spherical green fruits around 1 cm in diameter. **Habitat and Phenology:** More common along roadsides and light gaps. Flowers peak early wet season (also observed mid and late wet season). Mature fruits early to mid wet season.

Spondias mombin L. "Jocote Jobo, (Jobo)"; ANACARDIACEAE. **Description:** Medium to large tree. Pinnately compound-odd leaves, up to 45-50 cm in length, with 7-11 pairs of leaflets (sometimes more). Leaflets generally about 11 cm in length although leaflet size increases from leaf base to leaf tip. Leaflets of juvenile trees can be weakly serrated. Crushed leaf smells of turpenes with a slight mango smell. Trunk tends to have a 'mauve' color with wide raised chunky and rough ridges. Inner bark is usually red colored, reminiscent of pepperoni, and tends to have a pleasant perfume smell. Infructescences of single seeded, oval, fleshy orange fruits, with a sour citrus-like taste (tasty to many). **Habitat and Phenology:** Common deciduous tree of secondary forest. Flowers early to mid wet season. Mature fruits mid to late wet season. **Similar Species:** *Bursera simaruba* (fewer leaflets); *Cedrela odorata*. (compound-even leaves); *Spondius radlkoferi*, (not listed here, agricultural and thought to be introduced, occurs in lowland Guanacaste and Las Islas Murcielagos of the ACG, but is generally thought to be absent from Sector Santa Rosa; vegetatively very similar; trunk lacks the characteristic deep furrowing of *S. mombin*, D. H. Janzen, pers. com.).

Spondias purpurea L. "Jocote, (Jocote iguanero)"; ANACARDIACEAE. **Description:** Medium to large tree. Pinnately compound-odd leaves up to 30 cm in length (longer in juveniles) usually with 12-14 pairs of leaflets usually 4-6 cm long. Leaflets of juvenile trees

can be weakly serrated. Bark is smooth and silver/white. The trunk appears spiny, by the presence of old small protruding stems that have broken off. Fruits are oval, red, approximately 4 cm in length, and fleshy. **Habitat and Phenology:** Trees largely restricted to near old roads. Mature fruit late dry season. *S. purpurea* is almost undoubtedly an introduced agricultural species, occurring only around roadsides and not persisting for long in closed canopy forest (D. H. Janzen, pers. com.). **Similar Species:** *S. mombin* (much larger leaves; rough, ridged bark; stems without stem-break “spines”, yellow fruit). **Comments:** Local people often chew on the leaves, which have a tasty citrus-like flavor.

Stemmadenia obovata (Hook & Arm.) Schum. "Huevos de Burro, Huevos de Caballo"; APOCYNACEAE. **Description:** Small to medium sized tree. Simple, opposite leaves, usually 20-25 cm long. Leaves obovate in shape with a slight drip-tip, and slightly pubescent to hairless except for tiny white hairs along the veins of the leaf underside. Broken stems or petiole produce copious white latex. Trunk is smooth and pale gray with prominent raised round lenticels. Inner bark is green and apparently photosynthetic. Large, yellow, radially symmetrical tubular flowers (6 cm long tube and 8 cm diameter whorl of petals). Paired oval fruits are green and dehisce to expose a bright orange center with arilate seeds when ripe. **Habitat and Phenology:** Somewhat common tree of secondary, dry, deciduous forest. Flowers throughout dry and wet season, with distinct pulses around the beginning of the wet season. Mature fruit mid wet season to early dry season. **Similar Species:** *Genipa americana* (no copious white latex).

Sterculia apetala (Jacq.) Karst. "Panamá"; STERCULIACEAE. **Description:** Medium to large tree. Palmately compound leaves, which differ in form and size between juvenile and adult trees. Sapling leaves are approximately 40 cm in length and have large, ‘*Cecropia*-like’, palmately compound, five to seven lobed leaves. Leaves of adult trees are much smaller (approximately 20 cm in length) and are three to five lobed. The leaf underside of adult trees is pubescent, but not for young juveniles. Trunk of adult trees is smooth and dark brown to bronze in color. Larger individuals tend to develop small but distinctive buttresses. Fruit are large (up to 10 cm in radius), dehiscent black spheres. **Habitat and Phenology:** Locally rare tree but apparently more abundant in moister and mature areas of forest. **Similar Species:** *Cecropia pelatata* (leaves with 7-9 lobes, and white tomentose underneath).

Swartzia cubensis (Britt. and Wilson) Standley; FABACEAE (CAESALPINOIDEAE). **Description:** Medium to large tree. Pinnately compound-odd alternate leaves, usually 20-30 cm long (variable). Usually 4 pairs of leaflets, 9-15 cm in length, with distinct drip tips. Rachis is partially winged, with the wing increasing in size toward the leaf tip. Leaflets greatly increase in size from the leaf base to the leaf tip. **Habitat and Phenology:** Evergreen tree restricted to moister areas of forest. **Similar Species:** *Inga vera* (extrafloral nectaries along the (winged) rachis). **Comments:** The family level classification of the tribe Swartzieae is uncertain (Gentry 1993).

Sweetia panamensis Benh. See *Acosmium panamense* (Benth.) Yakoul.

Swietenia macrophylla G.King "Caoba"; MELIACEAE. **Description:** Medium to large tree. Pinnately compound-even, glabrous, alternate leaves, usually 15-30 cm in length. Usually 3-

5 pairs of leaflets which vary in sizes across individuals and shading conditions. Leaflets are lanceolate to elliptic in shape with a slight drip tip, and asymmetrical bases. Bark dark and furrowed. Upper surface of leaves is dark green. Larger individuals have pronounced buttresses. Fruit is a pendulous woody elongated sphere on a heavy stalk. It is dehiscent with large, 10-15 cm long, winged, wind dispersed seeds. **Habitat and Phenology:** Potentially a large tree, somewhat deciduous. Most likely was locally more abundant before selective logging of the area. Mature fruit late dry season to early wet season. **Similar Species:** *Cedrela odorata* (more leaflets); *Guarea glabra* (usually fewer and more symmetrical leaflets); *Sweitenia humilis* (not listed here but present in the Guanacaste province).

Tabebuia impetiginosa (Martius ex De Candolle) Standl. "Corteza negra (Roble negro)"; BIGNONIACEAE. **Description:** Small to medium sized tree. Palmately compound, opposite leaves, usually 30-40 cm in length, with 5 leaflets. Leaves are glabrous (except for an indistinct patch of hairs at the bases of the secondary veins on the leaf underside), with a gently undulating entire margin. Crushed leaves have a distinctive astringent smell. Purple-magenta bilaterally symmetrical showy flowers approximately 8 cm in length. Fruit a 20-40 cm long glabrous pod, releasing many dry winged seeds. **Habitat and Phenology:** Of the local *Tabebuia* species, *T. impetiginosa* is the rarest of the three, although it can be locally common in some areas. More common near the Pacific coast. Populations flower synchronously mid to late dry season. **Similar Species:** *T. ochracea* (pubescent leaves, most notably on the undersides of leaves of adult trees); *T. rosea* (leaves are much tougher and thicker than those of *T. impetiginosa* leaves; no astringent smell when leaves crushed; rachis diameter 4-6 mm versus 2-4 mm for *T. impetiginosa*). **Comments:** Only the three *Tabebuia* species locally have palmately compound, opposite leaves with five leaflets.

Tabebuia ochracea Standl. "Corteza amarilla"; BIGNONIACEAE. **Description:** Small to medium sized tree. Palmately compound, opposite leaves, usually 30-40 cm in length, with five leaflets. Leaves and petioles brown pubescent. The underside of mature leaves is white pubescent, giving the tree foliage a distinctive brown-white color. Young trees don't have this white pubescence on the underside of the leaves but are still hairy. Leaflet margins are occasionally serrated in young trees. Trunk form is often not straight. Trunk is pale gray and slightly furrowed. Bright yellow, bilaterally symmetrical, showy flowers, approximately 8 cm in length. Fruit a 20-40 cm long brown pubescent pod, releasing many dry winged seeds. **Habitat and Phenology:** Common deciduous tree. Tends to be more abundant in young forest, and dry ridges and mesa tops. Blooms very conspicuous yellow flowers in the dry season. Populations synchronously produce flowers for 4-5 days in mid to late dry season, cued by an unusual spell of cold air or rain. **Similar Species:** *T. rosea* and *T. impetiginosa* (see *T. impetiginosa* above).

Tabebuia rosea (Bertol.)DC. "Roble de sabana"; BIGNONIACEAE. **Description:** Medium sized tree. Palmately compound, opposite leaves, usually 40-60 cm in length, with five leaflets. Leaves are tough, dark green and glabrous. Trunk tends to be straighter, darker, and more furrowed than *T. ochracea*. Pale pink to magenta bilaterally symmetrical, showy flowers approximately 8 cm in length. Fruit a 20-40 cm long glabrous pod, releasing many dry winged seeds. **Habitat and Phenology:** Occasional to common deciduous tree. Tends to

be more abundant in moister areas of forest. Flowers mid to late dry season. **Similar Species:** *T. ochracea* and *T. impetiginosa* (see above).

Thevetia ovata (Cav.) A.DC. "Chirca"; APOCYNACEAE. **Description:** Small to medium sized tree. Elongate to lanceolate simple alternate leaves, approximately 20 cm in length, with entire margins and that bleed copious white latex when removed or crushed. Somewhat parallel secondary venation with a distinctive collecting vein running along the leaf margin. Flowers yellow. **Similar Species:** *Plumeria rubra* (larger, more obovate leaves; swollen stem tips); *Sapium thelocarpum* (pair of nectaries on leaf petiole; trunk will tend to have horizontal branching scars).

Thouinidium decandrum (H.&B.) Radlk. "Escobillo (Mata pulgas, Canilla de mula)"; SAPINDACEAE. **Description:** Medium sized tree, although some attain large size. Compound pinnately-even alternate leaves, usually 10-25 cm in length, with narrow to lanceolate leaflets, 4-10 cm in length. Leaflets are very narrow (can resemble grass blades when the canopy is viewed from below) with small but distinct serrations and are arranged alternately along the rachis. Fruit a wind dispersed samara, very much like a maple seed (*Acer* species of northern temperate forests). **Habitat and Phenology:** Tending to be an evergreen tree. **Similar Species:** *Andira inermis* (opposite leaflets without serrations, and intrapetiolar stipules at the leaflet bases).

Trichilia americana (Sesse & Mocino) T.D. Penn. (*T. colimana* = *T. anisopleura*) "Manteco, Cedro Macho"; MELIACEAE. **Description:** Medium sized tree. Pinnately compound-odd alternate leaves often greater than 50 cm in length, with usually 7-8 pairs of leaflets approximately 12 cm in length. Leaflets are often drooping giving a wilted appearance. Leaflets and young stems are softly pubescent (almost velvet like). Bark creamy/orange to cafe color. When large, tan bark exfoliates with prominent pock marks and indentations. Dehiscent fruit with a three valve capsule, 1 cm in diameter. When open, reveals an orange, aril covered seed. Flowers are small (1 cm diameter), radially symmetrical, with four yellow-white petals, in large lateral inflorescences (30 cm in length). **Habitat and Phenology:** Flowers late to early wet season. Mature fruits mid wet season. **Similar Species:** *Spondius mombin* (leaves not softly pubescent to the touch); *Cedrella odorata* (leaves compound-even, and also not softly pubescent to the touch).

Trichilia cuneata Radlk. (= *T. tomentosa*); MELIACEAE. **Description:** Medium sized tree. Pinnately compound-odd alternate leaves, usually greater than 25 cm in length, with leaflets increasing in size toward the terminal leaflet. Leaves with 3-4 pairs of leaflets. The terminal leaflet is the largest and is often obovate in shape. All leaflets usually have an acuminate tip. Leaflets, rachis, and young stems softly pubescent. The trunks of older individuals are covered with conspicuous pock marks. When larger, trunk can be tan and shaggy. Lateral infructescence with three valve orange hairy fruit, that dehisces to reveal three orange aril covered seeds. **Habitat and Phenology:** Tends to be evergreen but this may vary. More common in moister areas of deciduous forest. Mature fruit mid wet season. **Similar Species:** *Exostema mexicana* (similar bark characteristics, but simple leaves); *Lonchocarpus costaricensis* (round leaflets without drip tips).

Trichilia hirta L. "Cedrillo, Cedro Macho"; MELIACEAE. **Description:** Small to medium sized tree. Pinnately compound-odd alternate leaves, usually greater than 20 cm in length. 3-5 pairs of dark green leaflets, approximately 7 cm in length, which are softly pubescent on the undersides. Leaves tend to be slightly clustered and whorled near the end of the younger branches. Leaflet size increases from base of the rachis to the tip. Bark is usually dark in color. **Habitat and Phenology:** Appears to be more common in moister secondary forest. **Similar Species:** *Astronium graveolens* (leaflets with slight serrations; mango/turpentine smell when leaves crushed).

Trichilia glabra L.; MELIACEAE. **Description:** Medium sized tree. Pinnately compound-odd alternate leaves, approximately 15 cm in length (leaves of saplings can be up to 35 cm in length). 4-5 pairs of elliptic glabrous leaflets, with glossy dark green upper surfaces, entire margins, and drip tips. Leaflets usually 3-8 cm long, with leaflet length increasing towards the tip of the leaf. When the bark is scraped off, there is an almost anacard sweet terpenine-like smell emitted. The stem wood is red brown, while the trunk woody is more pale brown in color. Contorted trunk with lots of infolded nooks and crannies, with shaggy bark flaking off in wide strips. **Habitat and Phenology:** Apparently a rare tree. Appears to be more common in moister secondary forest. **Similar Species:** *Bursera simaruba* (distinctive red and green trunk; red on leaf rachis); *Guettarda macrosperma* (similarly dark, contorted trunk; leaves simple).

Trichilia trifolia L.; MELIACEAE. **Description:** Small tree to treelet. Trifoliolate, glabrous, alternate leaves, approximately 11 cm in length. The larger central leaflet tends to be obovate in shape and have a dimple at the leaf tip. Leaf margin entire. **Habitat and Phenology:** Understory, rare treelet, although may be locally common. **Similar Species:** *Essenbeckia litoralis* (Rutaceae; not listed here, apparently more common near the Pacific coast; punctations and a slight citrus smell when leaf is crushed;); *Allophylus occidentalis* (softly pubescent, serrated leaflets).

Trophis racemosa (L.) Urban "Ojoche negro"; MORACEAE. **Description:** Medium sized tree. Simple, alternate leaves, usually 10-15 cm in length, with prominent drip-tip. Leaves arranged in a plane. Upper sides of leaves glabrous and dark green. Leaf undersides are lighter with distinctive lighter venation and prominent collecting vein along leaf margins. White latex in petioles and trunk. Leaves of young trees often have characteristic asymmetrical, deeply lobed ('fiddle-shaped') leaves that perhaps mimic insect damaged leaves. Leaves occasionally with dull serrations. Fruit is usually small and black, oval in shape, 1-1.5 cm long with a single seed. **Habitat and Phenology:** Evergreen tree appears to be restricted to moister areas of forest. Mature fruits mid dry season. **Similar Species:** *Brosimum alicastrum* (leaves never deeply lobed and never serrated; secondary venation and collecting vein are much more even and symmetrical than *T. racemosa*).

Vernonia triflosculosa Kunth (*); ASTERACEAE. **Description:** Understory tree that can have a shrubby architecture. Simple alternate leaves, approximately 13 cm in length. Leaf shape is often highly lanceolate to deltoid in shape with dull to sharply serrated margins. Serrations often end in a narrow, hair-like, point. Leaf tip is often very pronounced and narrow. Leaves often have a flimsy look to them. Secondary venation is distinct and sharply

curved toward the leaf tip. Bark is often quite corky and dirty tan in color. **Similar Species:** *Casearia* species (punctations in leaves).

Vismia baccifera (L.) Triana & Planch.; GUTTIFERAE. **Description:** Shrub to small sized tree. Simple, opposite leaves, usually 15-20 cm in length. Acuminate leaves with brown pubescent. Young leaves are characteristically clasped together over the shoot tip. **Habitat and Phenology:** Can be common in regenerating pastures in moister areas.

Ximenia americana L. "Limoncillo, Penance"; OLACACEAE. **Description:** Small to medium sized tree. Simple, leathery-thick, alternate leaves, usually 4-8 cm in length. Leaves rhombic to oval in shape. Young stems tend to be dark red brown with distinctive 5-6 sides or angles. Young stems may also have small 3-6 mm spines. Dried leaves turn a green to olive green color. **Habitat and Phenology:** Appears to be more abundant along the tops cliffs or hills. **Similar Species:** *Adelia triloba* (stem circular in cross section).

Xylosma flexuosa (Kunth) Hemsl. (= *X. anisophylla*); FLACOURTIACEAE. **Description:** Small tree. Simple alternate leaves, 6-12 cm in length. Leaves are oval in shape with relatively large, rounded, serrations. Leaf tip tends to be rounded, often terminating in an inward curving "dimple". Sometimes young stems have 2-6 cm long, thin, sharp spines. Spines may also protrude from the trunk. **Habitat and Phenology:** Rare understory tree.

Zanthoxylum setulosum P. Wilson "Largato"; RUTACEAE. **Description:** Medium sized tree. Pinnately compound-odd alternate leaves, approximately 40 cm in length (but variable), with dark green lanceolate leaflets. Leaves with about 7-10 pairs of lanceolate leaflets up to 13 cm in length. Leaflet size usually increases from leaf base to leaf tip. Leaflets can be slightly serrated. Leaves are usually clustered at stem ends. Easily recognized by prominent spines on trunk, and sometimes on young branches and on rachis of leaf. Trunk spines distinctively are angular and not circular in cross-section. Leaves have a strong citrus smell when crushed. **Habitat and Phenology:** Flowers mid dry season. **Comments:** The three local species with many spines on their trunks can be easily separated by their leaf form: simple leaves = *Hura crepitans*, palmately compound leaves = *Pachira quinata*, pinnate compound leaves = *Zanthoxylum setulosum*.

Zexmenia frutescens (Miller) Blake See *Lasianthaea fruticosa* (L.) K.Becker.

Zuelania guidonia (Sw.) Britton & Millsp.; FLACOURTIACEAE. **Description:** Medium sized tree. Simple, somewhat lanceolate, alternate leaves, approximately 20 cm in length, orientated in a plane. Petiole, leaf underside, and midrib of leaf upper surface are pubescent. The upper surface is dark green and glabrous. Small punctations in leaf when held up to the light. Small, indistinct intrapetiolar stipules. Yellow colored corky trunk, bark flakes off in small pieces when rubbed with the hand. Fruit is a racquetball-sized sphere, 5 cm in diameter, that partially dehisce to reveal a three valve capsule with orange innards. **Habitat and Phenology:** Mature fruit late dry season. **Similar Species:** *Apeiba tibourbou* (larger leaves with obvious intrapetiolar stipules); *Castilla elastica* (larger leaves with copious white latex).

Ziziphus guatemalensis Hemsl. "Naranjillo"; RHAMNACEAE. **Description:** Small to medium sized tree. Simple alternate leaves, mainly round in shape, although some may be elliptical, 5-7 cm in length. Leaf venation is distinctively trinervate, reminiscent of some *Piper* species or Melastomataceae. Leaf margins tending to be slightly serrated. Leaves are glabrous for the most part, although there are a few hairs present on the petiole and at the base of the trinervate venation. In general leaves are light green in color. One (sometimes two) 1 cm long spines per node are common on young branches but scattered on older branches. **Habitat and Phenology:** Locally a somewhat rare dry forest tree although it does become more abundant near the Pacific coast of the ACG. **Similar Species:** *Miconia argentea* and *Piper amalago* (both lack spines).

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