

A Guide to Caribbean Vegetation Types:

Preliminary Classification System and Descriptions

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EROS - Earth Resources Observation Systems



Saving the Last Great Places

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Executive Summary

Background

Stretching almost 6,800 km. and composed of a chain of over 1,000 islands, the West Indies have been and continue today to be a center of evolution and ecological diversity. Their geologic histories are varied: some islands are young and still actively volcanic, others older uplifts of fossilized coral reefs, others are but vestiges of once massive volcanic mountain chains which formed large land masses that have been at varying times interconnected and isolated. This complex history has led to the presence of many unique vegetation types which provide habitat for an astonishing diversity of flora and fauna, some of which is endemic to the region, and an alarming proportion of which is also highly threatened. Ultimately, our ability to protect this vast array of species and communities is dependent at the coarse level on our ability to target and conserve representative examples of these vegetation types. Conserving biological diversity at the level of natural communities is an important complementary approach to single-species conservation efforts because natural communities contain important assemblages of species and the habitats that support these species.

Improved conservation of the distinct natural vegetation types that occur on Caribbean islands is greatly facilitated if these vegetation types are accurately understood, described, and mapped in a manner that is accepted and respected by the diversity of countries, cultures, and peoples that make up the Caribbean today. The Caribbean Vegetation Classification and Atlas Project has been a key step towards characterizing the natural vegetation and landcover of the region, island-by-island, based on a newly derived standardized vegetation and classification system.

This Project has involved the following key steps:

- ⇒ review of existing vegetation classification efforts
- ⇒ convening of a Caribbean Vegetation Ecology Working Group
- ⇒ development of a Standard Classification System for the Caribbean
- ⇒ production of a Vegetation and Landcover Atlas following the newly derived standard classification system

After an exhaustive review of existing vegetation classification systems, the Working Group and project team developed a standardized vegetation classification system and set of maps which characterize the vegetation types of the Caribbean in a scientifically consistent manner.

Review of Previous Classification Efforts

Many distinguished botanists have visited the West Indies over the past centuries, but most botanical expeditions and research efforts have targeted individual islands. In fact, no comprehensive flora or detailed vegetation map exists for the whole region. As a result of this situation, very few regional vegetation studies have been conducted which cover the entire Caribbean archipelago and which are sufficiently detailed to be of practical value in the assessment of vegetation community status and distribution.

Various systems of classification have, however, been proposed for the vegetation of a few groups of Caribbean islands, or for individual islands themselves. Extensive library research was conducted throughout the project to produce a comprehensive list of published papers (over 700 references, presented in Appendix Two) dealing with vegetation classification and vegetation mapping in the Caribbean islands. Nine different classification systems were found that had relevance to the Caribbean and had been developed at larger scales (e.g., worldwide, or for the tropics of the Western Hemisphere), yet none of these had sufficient detail to prove useful for landscapes with the high variability and degree of endemism that exists in the Caribbean. Over 20 different classification systems were reviewed that dealt with the vegetation of individual islands (e.g., Cuba, Jamaica, or Hispaniola) or smaller groups of islands (e.g. Trinidad and Tobago, the Bahamas, and the U.S. Virgin Islands/Puerto Rico). Yet none of these could be extrapolated across the entire Caribbean to provide a classification structure for assessments of conservation status or distribution of vegetation types. An extensive review of Caribbean vegetation classification efforts can be found in Chapter One.

Adopting a Standardized Classification System

To develop a standardized classification system that enables regional scale comparisons of vegetation condition and distribution, a Caribbean Vegetation Ecology Working Group was convened. This group provided advice and data on vegetation types and distributions from the different island nations to adopt and approve a standard vegetation classification system. The Working Group, composed of 30 vegetation experts, identified the International Classification of Ecological Communities (ICEC) system (see Chapter Two) as an appropriate standard from which to work. This system has been selected by the United States Federal Geographic Data Committee (FGDC 1997) as the standard for describing vegetation communities in the United States. This vegetation classification system is international in design and concept, and is being developed for vegetation communities throughout the Americas.

Originally developed by ecologists from The Nature Conservancy in partnership with scientists from the network of Natural Heritage Programs, Conservation Data Centers, government agencies, and academia, this classification system is based on earlier work by the United Nations Educational Scientific Cultural Organization (UNESCO 1973) and Driscoll et al (1984). Scientifically sound, consistent, and flexible, the system can be used to classify all types of vegetated communities, from natural to anthropogenic. One of its principal strengths is the standardized classification approach, enabling scientists from different areas to assess and compare the distribution and condition of vegetation types using a common “currency.” The classification system also permits these assessments and comparisons to be made at multiple levels of detail, depending on the amount and quality of data on vegetation patterns that are available.

The ICEC describes vegetation types in several hierarchical levels. The upper levels in the hierarchy are defined by vegetation structure, and the finer levels are defined by vegetation composition. The ICEC is further described in Chapter Two.

Classification Results

A total of 104 vegetation formations were recognized for the Caribbean region—24 of which are new to the ICEC system. These 104 units are estimated to cover about 95% of the theoretical total number of vegetation formations potentially existing in the Caribbean islands. Descriptions of the Caribbean vegetation formations were developed, arranged with respect to their subordinate position within each major category of the ICEC system. Each standard term corresponding to a formation was accompanied by a short, abbreviated name both in English and Spanish, to be used as a mapping label. The most important formations—according to this new Caribbean system—were crosslisted with their equivalent vegetation units used in previous local or regional classification systems in the Caribbean, and a table with 438 components was developed. This effort, presented in Chapter Four, reconciled 21 of the most important vegetation systems used throughout the Caribbean islands.

A detailed, preliminary system of classification of the vegetation communities of the Caribbean Islands at the more precise alliances and associations level was also developed. Given the complexity of an archipelago that is considered one of the richest in the world in terms of plants species and communities, this was an extraordinary task. The new Caribbean vegetation system, based upon FGDC's classification standards recognized, named, and described 187 alliances. In addition, 199 associations were recognized and named. More than 90% of the associations were also briefly described, based on

The hierarchical structural units are:

Class

Subclass

Group

Subgroup

Formation

Alliance

Association

the knowledge of the Vegetation Ecology Experts Working Group (See Appendix Three). This classification effort is estimated to have included about 50% of the theoretical total number of vegetation alliances and about 30% of all associations present in the Caribbean islands, many of which are still to be defined, named, and described. We estimate that there are about 350 vegetation alliances and 750 to 800 vegetation associations for the West Indian Islands.

The Caribbean Vegetation Atlas

To develop the Atlas, vegetation types at the formation level were mapped and organized into an atlas of Caribbean vegetation. This selection of existing vegetation maps of the West Indies covering most islands was digitally reproduced, and the polygons labeled with the original vegetation unit information. Depending upon island size and complexity of vegetation, working scales for these maps were determined individually, ranging from relatively small (1:500,000) to relatively large (1:24,000). These maps were carefully studied, then their mapping units were “crosswalked” (re-labeled) to reconcile them with the standardized classification. Only the names were changed; the actual mapped areas for each of the vegetation types were not altered. The resulting atlas, available at <http://edcintl.cr.usgs.gov/igdn/tnc/metadata.html>, although limited by the quality of the original data, provides the first ever consistently labeled and classified map of the vegetation units of the Caribbean.

Potential Uses of the Classification System and the Atlas

These final products will support Caribbean conservation practitioners in biodiversity conservation-related reporting, analysis, planning, monitoring, and decision making on both the site and regional scales. Although limited by currently available data, the classification and Atlas can be used for regional vegetation assessments, cross-regional comparisons of vegetation distribution, and other environmental applications (e.g., disaster preparedness, ecological restoration, and sustainable development projects) at regional scales. The products should also prove useful for similar applications at finer scales, both national and local (e.g., protected area network design, site conservation planning). The utility of the Atlas as a regional framework for economic, social, and natural resource development projects is potentially great.

Next Steps

The Atlas represents a comprehensive attempt to map Caribbean vegetation in a systematic fashion. It is a compilation of existing maps where vegetation has been relabeled into a singular, regional, standardized classification system. It is widely acknowledged, however, that some existing national

...the classification and Atlas can be used for regional vegetation assessments, cross-regional comparisons of vegetation distribution, and other environmental applications

vegetation maps for Caribbean islands may be out-of-date, erroneous, or lacking information.

To improve the accuracy of the Atlas, the authors are currently acquiring recent satellite imagery to update the island-by-island vegetation maps. This second phase of Caribbean vegetation mapping will also include a regional conservation assessment based on a Gap Analysis to identify unprotected or underprotected vegetation types. Field verification of mapped vegetation types will also be conducted during this second phase, and refinement of the vegetation classification system itself as necessary.

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Chapter One

Vegetation Classification and Vegetation Mapping of the Caribbean Islands—A Review

Background

The West Indies constitute a complex chain of more than 1,000 islands stretching nearly 4,800 kilometers south from the Bahamas, extending east through Cuba, Jamaica, Hispaniola, Puerto Rico, and the Virgin Islands; curving due south to Grenada and Trinidad; and ending with a westward tail comprised of Aruba, Bonaire, and Curaçao. They are divided primarily into three main geographical units:

- a) the Bahama Bank assemblage, located southeast of the Florida peninsula
- b) the partially elevated platform of the Greater Antilles, which supports a mature volcanic range peaking in Hispaniola and sloping west to Cuba and Jamaica and east to Puerto Rico
- c) the Lesser Antilles

This last group consists of an outer chain of islands composed of low coral and limestone arranged in a north-south direction from Anegada to Barbados, and an inner chain of steep volcanic islands which reach their peak in Dominica. The Lesser Antilles are further subdivided into the Leeward Islands, extending from the Virgin Islands to Guadeloupe, and the Windward Islands, stretching south from Dominica to Grenada.

Many distinguished botanists have visited the West Indies since the seventeenth century. The history of botanical interest in the Caribbean islands has been a long one, but it has been devoted primarily to the studies of individual islands from the times of Christopher Columbus to the nationalistic studies of island groups of more recent years (Howard 1973). In fact, no comprehensive flora or detailed vegetation map exists for the whole region. A project on the Flora of the Greater Antilles with an introductory chapter on vegetation has been initiated by the New York Botanical Gardens, but much remains to be done to make this document available. As a result of this situation, very few regional vegetation studies have been produced to cover the entire Caribbean archipelago, none of them is sufficiently detailed to be of current practical value. However,

various systems of classification have been proposed for the vegetation of some groups of Caribbean islands or for individual islands.

General Classification Systems Applicable to Caribbean Tropical Vegetation

Attempts to characterize and differentiate tropical vegetation ecosystems have generally involved grouping observations into classes, the members of which share common characteristics. This grouping may be followed by attempts to relate classes to underlying environmental conditions. However, generally acceptable classifications of tropical vegetation have proved somewhat elusive. As De Laubenfels (1975) pointed out, when external factors such as climate and soil are used as criteria, the resulting categories have lack validity. In fact, where vegetation characteristics reflect external factors, it makes more sense to use the vegetation characteristics as classifiers (Wadsworth 1997). Because of the great variety of physiognomic and environmental characteristics used to classify vegetation for various purposes, however, no classification has yet proven to be the most useful in all circumstances.

At the turn of the century, A. F. W. Schimper developed a system of classification in which plant communities were named reflecting general moisture and temperature regimes and local soil conditions as climatic or edaphic “formations.” He defined “woodland” as vegetation dominated by woody plants, and included “forest” (if closed), “bushwood” (if shrubs were more abundant than trees), and “shrubwood” (if entirely of shrubs). In the tropics, Schimper (1903) recognized five woodland categories of climatic vegetation units, and six categories of edaphic units (see Appendix Two). Although Schimper somewhat underestimated edaphic influences on vegetation types in the wet tropics, where they are less evident than in the seasonal tropics, there is no doubt that he provided much groundwork for followers interested in the study and characterization of tropical vegetation.

Another scientist built upon Schimper’s system to craft his own approach to classifying Caribbean vegetation. Chipp’s classification system combines vegetative physiognomy with edaphic and climatic bases (Tansley and Chipp 1926) (see Appendix Two). However, Chipp’s system did not cover all existing vegetation types (e.g. deciduous forests) and was vague as to the boundaries of some types. Yet another scientist, Champion, developed a system based on the use of physiognomy in classifying tropical forests (Champion 1936).

Tropical America’s climate and soils are conducive to the natural development of forests. Barbour (1942) recognized four primary forest types for tropical America and the Caribbean, based primarily on the climatic character of

their associations. The four types are dry forest, rain forest, deciduous forest and cloud forest. In his work, Barbour expressed his preference for the European concept of the forest—as established by Cajander in 1926—over the concept adopted by American foresters (see Forest Terminology, in *J. of Forestry*, 15(1), 1917). The European forest concept intimately relates the forest to its ecological factors, whereas the American forest concept recognizes and separates the forest types in a descriptive fashion, according to their composition. Because Barbour's four basic categories applied well to Caribbean forest formations, Stehlé (1945, 1946) used them in his own system of classification of the Lesser Antilles' forest types with the corresponding descriptive terms of Xerophytic, Mesophytic, Hygrophytic, and Altitudinal.

Holdridge (1967) proposed a classification of the world's plant formations (now more correctly termed "life zones") based solely on climate. He considered temperature and rainfall to prevail over other environmental factors in determining vegetation. Although the Holdridge system of bioclimatic units has been used in the West Indies [e.g. in the Dominican Republic (Tasaico 1967) and Puerto Rico (Tosi 1959, Kumme and Briscoe 1963, Ewel and Whitmore 1973)], it has never been applied extensively in the region to make it a useful tool for comparing different islands. Actually, the Holdridge model has not been shown to be very practical in the Caribbean where different types of soil, exposure, relief, and many other geological and geographical factors strongly influence its plant communities. Notwithstanding, it could be very useful as a baseline model for the main categories of an integrated system of mapping units for the Caribbean.

In 1978, a committee from UNESCO attempted to standardize the classification of vegetation worldwide. The UNESCO system includes many categories for tropical and subtropical forest formations. The UNESCO system establishes physiognomically and environmentally-separated vegetation types in a multiple-tiered classification hierarchy.

Major Vegetation Classification Systems and Vegetation Maps for the Greater Caribbean

The Caribbean Islands were the first area in the New World to receive attention from botanists. On his second trip to Hispaniola in 1493, Christopher Columbus carried along a naturalist to assess the potential value of the plants in the newly discovered land (Moscoso 1943). It was not until 200 years later that scientific knowledge of plants began to accumulate with Plumier's *Description des Plantes de l'Amerique* (1693) and Sloane's *Catalogus plantarum quae in insula Jamaica sponte proveniunt* (1696). Although these islands are geographically close to one another, they each have a separate, distinct botanical history, related to their

Spanish, French, and English colonial statuses. This history of botanical isolation has persisted to the present time, maintaining an almost 300 year old tradition.

The classification of the vegetation in the Caribbean islands has often been performed in order to map the islands. Because of the area's multinational composition, this task has been accomplished on an individual island basis (or groups of islands) and at rather different scales. Also, different systems of classification have been used, and the results generally reflect the biases of what the mapper regards as important vegetation types, without taking very much into consideration the regional biogeographical context.

Most important among the regional systems is the system Beard developed (1944, 1955). This author proposed a three-category vegetation classification system based on floristics, physiognomy, and habitat. The floristic grouping recognized the climax association, the physiognomic grouping recognized the formation, and the habitat grouping recognized the formation-series. The twenty-eight categories presented on the following page by Beard apply to all of tropical America, but not all are represented in the Antillean archipelago.

Beard's Classification Hierarchy

I. OPTIMUM FORMATION

1. Rain forest

II. SEASONAL FORMATIONS

2. Evergreen seasonal forest
3. Semi-evergreen seasonal forest
4. Deciduous seasonal forest
5. Thorn woodland
6. Cactus scrub
7. Desert

III. DRY EVERGREEN FORMATIONS

8. Dry rain forest
9. Dry evergreen forest
10. Dry evergreen woodland and littoral woodland
11. Dry evergreen thicket and littoral thicket
12. Evergreen bushland and littoral hedge
13. Rock pavement vegetation

IV. MONTANE FORMATIONS

14. Lower montane rain forest
15. Montane rain forest or cloud forest
16. Montane thicket
17. High mountain forest
18. Elfin woodland or mossy forest
19. Paramo
20. Tundra

V. SEASONAL SWAMP FORMATIONS

21. Seasonal swamp forest
22. Seasonal swamp woodland
23. Seasonal swamp thicket
24. Savanna

VI. SWAMP FORMATIONS

25. Swamp forest and mangrove forest
26. Swamp woodland
27. Swamp thicket
28. Herbaceous swamp

Richard Howard was the most recent scientist to develop a system to classify the vegetation of the entire region. Howard (1973) used a simplified system of classification of seventeen categories for his study on the composition, distribution and relationships of the vegetation of the Antilles (see Appendix Two).

Major Vegetation Classification Systems and Vegetation Maps for the Islands or Groups of Islands

Aruba, Bonaire, and Curaçao

For the Leeward Islands, Stoffers described 18 different vegetation types, in three groups, applying the terminology of Beard (1949):

1. Primary climatic climax communities
 2. Primary edaphic climax communities
 3. Secondary and sub-climax communities
-

Stoffers published three relatively detailed vegetation maps for Aruba, Bonaire, and Curaçao in his classic paper *Studies on the flora of Curaçao and other Caribbean islands, vol. 1* (1956). Since all the recognized vegetation types are not represented in the three islands, Stoffers used varying units for each of his maps (see Appendix Two).

Bahamas (Including Turks and Caicos)

In 1905, Coker wrote the first important paper on the vegetation of the Bahama Islands, including six formations and nine associations (see Appendix Five). A number of additional studies concerning the vegetation of these islands were conducted by: McCartney *et al.* (1986), Godfrey and Herchenreder (1986), Kass and Stephens (1990) and Kass *et al.* (1994), Smith and Vankat (1992) and Smith *et al.* (1992), and Frazer and Eshbaugh (1993, 1997). Detailed maps and classification systems describing the vegetation of many islands within the Bahamas archipelago are currently being developed.

Bermuda

Two major papers describing the floristics and vegetation of Bermuda were written by Britton (1918) and Herwitz (1992), respectively.

Cayman Islands

The Directorate of Overseas Surveys published a map (at a scale of 1:25,000) with units representing dominant species in the Caymans. Units utilized for Mangrove and Related Swamps are distinguished further by height classifications.

Cuba

Cuba is the largest island in the Greater Antilles. In 1943, Seifríz conducted the first vegetation research trip (*sensu stricto*) in Cuba using a geobotanic approach. From this trip he distinguished ten plant formations—thus providing a survey of the most important vegetation types of the island. León published the first vegetation map of Cuba in 1946 which appeared on the inside face of the cover of the first volume of the *Flora of Cuba* on a scale of 1:5,000,000. On the map, he distinguished eight vegetation types: Pinares (Pine forest/savanna), Manglares (Mangroves), Sabanas arenosas (Savannas on sandy soil), Vegetación de Mogotes (Limestone/serpentine vegetation), Vegetación Xerófila (Xerophilic vegetation), Sabanas arcillosas fértiles (Savannas on dry soil), Montes (Forests), Sabanas serpentinosas (Savannas on serpentine soil).

In 1954, E. Smith published *The Forests of Cuba*, a survey on valuable tree species found in Cuban forests. The report established a practical classification of forests from a forestry viewpoint and contained valuable data with qualitative lists and sample plot analyses. However, it is incomplete from a phytosociological angle.

Following the revolution in country in the 1960s, researchers from Czechoslovakia, East Germany, and Hungary began studying the vegetation of Cuba. V. Samek investigated the pine-woodlands and forests and the water vegetation of sandy lagoons (Samek and Moncada 1970) of western Cuba using the phytosociological methods of the Zürich-Montpellier School (Samek 1967, 1973a, 1973b). He also mapped the vegetation of the Isle of Pines in his work (Samek 1967, 1969). Hadac and Hadacová (1969, 1971) also contributed to the study of plant communities in the sandy regions of western Cuba. Borhidi, Muñiz, and del Risco published the first systematic review of Cuban plant communities in 1979. Subsequent intensive explorations of the plant communities have been made by Borhidi, Capote, and Balátová-Tulácková and collaborators (see Appendix Two).

Voronov and collaborators published the second map of Cuban vegetation on a scale of 1:1,500,000 in the *Atlas Nacional* (1970). However, this map does not distinguish among the different forest types, and the units cannot be identified with the generally accepted types shown by tropical vegetation maps. Areces-Mallea (1978) published a vegetation map of Cuba on a scale of 1:1,750,000. Due to the scale of this map, some closely related vegetation units are lumped together in major units. Thirty six vegetation units were mapped (see Appendix Five). A potential vegetation map at the scale of 1:375,000 was published by Borhidi (1974) containing 21 vegetation units. This map was the basis for a more detailed map distinguishing 34 vegetation units published in 1980, and revised in 1984. Capote and Berzaín (1984) developed a

classification system of all the vegetation formations of Cuba summarizing and describing the recognized units (see Appendix Five). An amended version of this system was used in the most recent Cuban vegetation map by Capote *et al.* (1989).

Hispaniola

Hispaniola, the second largest island of the Greater Antilles, has a complicated botanical history because of its bicultural colonial history.

Hispaniola, the second largest island of the Greater Antilles, has a complicated botanical history because of its bicultural colonial history. This is also complicated by Hispaniola's complex geological history and its diverse topography, with Pico Duarte reaching more than 3,100 m., the highest mountain in the Caribbean. In 1982, Liogier estimated the number of flowering plants on the island approaches 5,000 species.

Durland (1922) discussed Hispaniola's forest types, distinguishing six different categories of forests and savannas. His classification system is simple and not therefore not very useful in describing Hispaniola's highly diverse vegetation. Ciferri published the first detailed description of the Dominican Republic's vegetation in 1936. His treatment follows the concept of climax vegetation, organizing it in stages of succession. Currently, most of the vegetation types identified by Ciferri can still be located in Hispaniola. Ciferri's system of classification, in particular the vegetation units, are patterned after the European concepts of succession and hierarchy popular during the early part of this century. Most of the observations of the island published between 1920-1930 belong to Ciferri and Ekman.

Chardon (1939) classified the forests of the Dominican Republic into six main categories. Due to the fact that Chardon was only concerned with forest exploitation, he did not consider any noncommercial timber vegetation type.

More recently, the Holdridge system (1947) has been applied to the vegetation of the island. Tasaico (1967) prepared a map of the life zones on a scale of 1:250,000 with descriptions based on the aforementioned Holdridge system. The sources of data for the map are aerial photographs and topographic maps, on a scale of 1:50,000 from the Series E034 and E733 of 1962, completed by the Instituto Cartográfico Universitario of the Universidad Autónoma de Santo Domingo and the U.S. Army Map Service. This map is considered potential vegetation, based on the Holdridge system.

In addition to these life zones, Tasaico's work included another seven transition zones which are inadequately described and are often unrecognizable in the field. Several existing vegetation studies and maps dealt only with small areas, such as the Peninsula de Barahona (Dirección Nacional de Parques 1986),

the western Sierra de Baoruco (Fisher- Meerow & Judd 1989), several mountain ecosystems (Liogier 1981), the sand dunes of Baní (SEA/Departamento de Vida Silvestre 1988), Catalina Island (Zanoni *et al.* 1989), Loma Diego de Ocampo (Zanoni 1990), Loma Quita Espuela (Hager 1990), and Los Haitises (Zanoni *et al.* 1990).

In 1990, the Secretaria de Estado de Agricultura (SEA) developed a classification system for the Dominican Republic that is the most detailed of all the systems ever proposed for Hispaniola (Hager and Zanoni 1993). The vegetation of Parque Nacional del Este was described and mapped using this system in a Rapid Ecological Assessment (REA) of the area in 1994-95 (The Nature Conservancy 1997). A national vegetation map using this classification was recently published (Moscosoa 1999) and is likely to receive considerable attention and use in the Dominican Republic. Moreover, ongoing classification work and vegetation studies by M. Mejía and R. Garcia at the National Botanical Gardens promise to keep vegetation classification work at the forefront of Dominican conservation efforts.

Jamaica

Jamaica, only one-seventh the size of Hispaniola, has a flowering plant flora of more than 3,200 species. The first diagram of the topographic distribution of the different vegetation types was recorded in 1857 by Ørsted, a Danish naturalist. Almost 100 years later, a comprehensive categorization of Jamaican plant communities was written by Asprey and Robbins (see Appendix Two) following Beard's system for Caribbean vegetation (1944, 1955). Jamaica's first island-wide Rapid Ecological Assessment (REA) conducted by The Nature Conservancy in 1992 resulted in a new vegetation classification system (see Appendix Five, Grossman *et al.*) which resembles the categories of Beard (1944 and 1955) and Asprey & Robbins (1953).

A number of vegetation studies have greatly influenced the classification of communities within the Blue and John Crow Mountains National Park of Jamaica. These studies include montane vegetation descriptions developed by Shreve in 1914 and much more recent accounts focusing on the Blue and John Crow Mountains. Shreve was first to report a high altitude grassland in the Blue Mountains near High Peak, and he also distinguished between various forests by topography, ridges, windward and leeward slopes, and gullies.

Grubb and Tanner (1976) documented eight forest types for the Blue and Port Royal mountain ranges and two for the John Crow range. The establishment of permanent plots (1977) generated ecological baseline data for future studies (Healey 1990 and Tanner 1980a, 1980b, 1986). Bellingham collected

extensively along the ridges and the lesser explored northern slopes (1993) while Iremonger augmented the descriptions of the forests above 1,850 meters.

For the most part, the Blue Mountain lower montane forests have not been well described, although a survey was conducted by Asprey and Robbins in 1953. Their account was based on observations from the Cuna Cuna Pass area and the John Crow Mountain lower slopes. In contrast, the lower slopes of the John Crow Mountains was better described by Kelly and collaborators (1986, 1988). Permanent plots were established in these studies, resulting in good baseline data. The upper montane forests, however, have only been briefly described by Asprey and Robbins (1953) and Grubb and Tanner (1976). In 1994, The Nature Conservancy conducted a Rapid Ecological Assessment in the Blue and John Crow Mountains National Park, a survey which gathered more data about the vegetation of the Mountains.

The Lesser Antilles

The first major papers treating the vegetation of the Lesser Antilles was published in 1945 and 1946 by Stehlé, an agricultural and agronomic engineer based in Martinique.

In his system, Stehlé recognized fifteen forest facies, all dependent on altitudinal distribution, rainfall, and soil (see Appendix Five). Additionally, he published a simplified vegetation map of the Lesser Antilles on a scale 1:1,195,000 (1945), very general in coverage and only reflecting his aforementioned five major forest types.

In 1942, J. S. Beard, then of the Colonial Forest Service in Trinidad and Tobago, carried out an assessment of the forest resources of the Windward and Leeward island groups. Working with the guidance and financing of the British Treasury in London under the Colonial Development and Welfare Plan, Beard began a decade of work by questioning the existing classification systems.

Early in his investigations, he realized that the systems of classification then in use for these islands lacked any real ecological basis. He therefore proposed a new system of vegetation classification which led to the classic monograph, *The Natural Vegetation of the Windward and Leeward Islands* (1949). Beard defined his formations (climax natural vegetation types) according to physiognomy, structure, and life-form, arranging them in a series along environmental gradients (see Appendix Five). These formations were further subdivided into associations (communities) based on floristic compositions. In addition, he described the Lowland Rain Forest to be the “optimum” expression of vegetational development, with variations in formations representing deviations from the optimum. Deviations could consist of differences due to drought (seasonal formations) and poor soil conditions (edaphic formations), to

name a few examples. Additionally, Beard provided black-and-white maps recording the vegetation of the following islands: Antigua, Barbuda, Dominica, Grenada, Montserrat, Nevis, St. Kitts, St. Lucia, and St. Vincent.

The flora and vegetation of Dominica was described by Hodge, who listed five formations of plant community classifications (see Appendix Two).

Harris (1965) published an interesting ecological study of Antigua, Barbuda, and Anguilla describing nine vegetation types (see Appendix Two).

Portecop (1978) published an important, color, vegetation map (scale 1:75,000) for Martinique. Kimber (1988) describes the flora and all the vegetation units of this island in detail in his monograph of the island.

Other vegetation maps and papers published in the last decade covering the flora of different islands include:

- ❖ St. Lucia: Organization of American States, 1987
- ❖ St. Kitts: Meagher, 1996
- ❖ Anguilla, St. Martin, St. Barthélemy, Saba, St Eustasius, Barbuda, St. Kitts, Nevis, Antigua, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, Barbados, St. Vincent, St. Vincent Grenadines, Grenada Grenadines, and Grenada: The Eastern Caribbean Natural Area Management Program, 1980
- ❖ St. Vincent, St. Vincent Grenadines, St. Kitts, Nevis, St. Lucia, Dominica, Antigua, Barbuda, and Grenada: The Caribbean Conservation Association, 1991

A recent vegetation classification study was developed for the islands of Antigua, Barbuda, and Redonda (Lindsay and Horwith, 1997), adhering to the National Vegetation Classification System proposed by the U.S. Federal Geographic Data Committee (1996). Fifty-four alliances/associations were identified in this study.

Puerto Rico and the Virgin Islands

Puerto Rico, the smallest island in the Greater Antilles, has a long botanical history, and in addition to Cuba, has a number of vegetation studies and vegetation maps. Most important and useful are the classical studies of Gleason and Cook (1927) and Dansereau (1966). Little and Wadsworth (1964) and especially Ewel and Withmore (1973) published important maps, the latter based on the Holdridge system of life zones. More recently, Ramos and Lugo (1994) produced a vegetation map of the island interpreting a 1977-1978 set of aerial photographs. Other attempts at mapping of vegetation in Puerto Rico (e.g. Murphy 1916, and Picó 1954, 1969) provide more limited information and are not taken into consideration in this summary report.

Dansereau (1966) recognized and mapped six major vegetation zones, generalized and extrapolated from physiographic and climatic features. Within each zone he distinguished, but did not map, 34 different ecosystems, and within the ecosystems identified a number of vegetational units defined by their composition and structure (see Appendix Five). Ewel and Whitmore (1973) published a 1:250,000 color map of the Vegetation of Puerto Rico and its neighboring islands: Mona, Desecheo, Vieques and Culebra. The map also included the three U.S. Virgin Islands, St. Croix, St. Thomas, and St. John. The basis of classification used for this map was the life zone system devised by Holdridge (1947, 1967).

Ewel and Whitmore were not the first to introduce Holdridge's system in Puerto Rico. The system was applied first to the island by Tosi (1959), although the author applied the concept only to western Puerto Rico, and the work was done prior to the elimination of high temperatures in the calculation of biotemperature. Similarly, Kumme and Briscoe (1963) mapped the island using climatic data, but they modified the climatic limits of the life zone boundaries, rendering their work of limited value.

Ramos and Lugo's 1994 map meticulously interpreted a set of aerial photographs from 1977 and 1978, resulting in a map that reflects the actual vegetation coverage at that time. Twelve general categories of vegetation were recognized. However, this map does not accurately reflect the island's individual vegetation types.

In 1980, the Eastern Caribbean Natural Area Management Program published simple vegetation maps for Anegada, Virgin Gorda, and Tortola, (British Virgin Islands). In a similar manner, Foreman described the characteristics of the 10 distinctive ecosystem types, which are mostly based on vegetation (see Appendix Two).

Trinidad and Tobago

In 1939, Marshall published the one of the first maps with practical value of the major forest types of Trinidad and Tobago. He recognized 14 major forest types in his study.

A turning point in the vegetation knowledge of Trinidad occurred in 1946 when Beard published a highly detailed vegetation map of the island. Beard, then working for the Colonial Forest Service in Trinidad and Tobago, proposed 30 units in his classification system. This work built upon a previous black and

white map Beard developed of the islands recognizing 10 vegetation units) (see Appendix Two).

Concurrent with the publication of his major vegetation map and classification system for Trinidad, Beard published two smaller maps (1946b) dealing with specific forest types. He later published a map which focused on the savannas of Trinidad (1953). Additional maps detailing the vegetation of Trinidad were published by Beebe (1952) and Ross (1961). Brown and collaborators introduced a vegetation map of Tobago with six vegetation units in 1965.

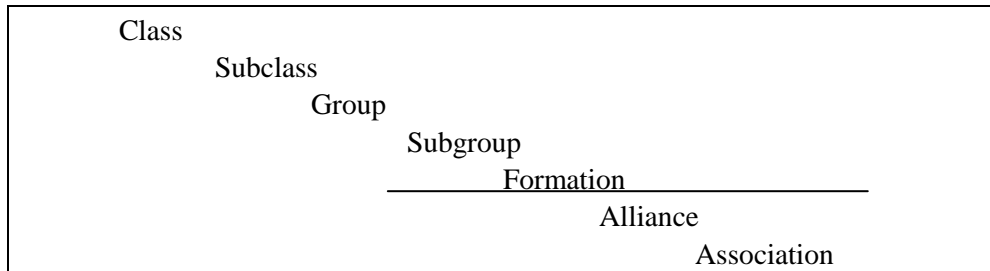
The following chapters will describe in detail the classification system adopted for this project, the units which form its hierarchy, and an explanation of terms utilized in describing these vegetation units.

Chapter Two
The International Classification of Ecological Communities (ICEC)

Overview

As has been seen in the previous chapter, a number of classification systems have been employed to describe Caribbean vegetation. A standardized classification system that described Caribbean vegetation in a unified, consistent manner would enable cross-island, regional scale comparisons of vegetation distribution. One such classification system, the International Classification of Ecological Communities (ICEC), groups vegetation communities in a standardized, globally compatible manner. The ICEC was selected by the Federal Geographic Data Committee (FGDC) as the national standard for describing vegetation in the United States, where it is also known as the U.S. National Vegetation Classification (USNVC) system.

The ICEC is a modified version of the UNESCO worldwide framework for classifying vegetation at coarse scales. In the UNESCO system, vegetation is classified by its physiognomic characteristics (vegetation structure). The ICEC adds newer, finer levels of classification which incorporate floristic characteristics (vegetation composition). The hierarchical levels that describe the ICEC are as follows:



The first five levels in the classification hierarchy separate vegetation types according to physiognomic differences. The two “lowest” tiers in the classification hierarchy, Alliance and Association, represent the finest classification of vegetation, incorporating floristic information as well. For more information on the ICEC, please consult Grossman et al. (1998) and Maybury (ed.), 1999.

The ICEC system was selected and refined for classifying and mapping the vegetation of the Caribbean. Vegetation types on Caribbean islands which had previously been classified using another system were reconciled to the ICEC by studying individual units in detail and “crosswalking” them to the appropriate level and unit in the ICEC.

Classification Units versus Mapping Units

It is important to note here that the classification units used to describe vegetation types are not always the same mapping units that are used to portray the distribution of vegetation on the ground. Mapping vegetation is normally accomplished by delineating areas or features discernible in imagery (aerial photographs or satellite images) onto a map base. These discernible features in imagery are usually the result of differences in spectral reflectance from objects on the ground. Since different vegetation types usually produce different spectral reflectances, it is generally possible to map different vegetation types from imagery. These map units, however, nearly always need to be reconciled with vegetation classification units, which distinguish vegetation types based on physiognomic (structure) and floristic (composition) differences, not spectral properties. Mapped vegetation types must always be interpreted in this regard, as there is rarely a one-to-one correspondence between vegetation types displayed on a map and vegetation types described in a vegetation classification system.

The remainder of this document presents the classification units which we developed for the Caribbean using the ICEC framework. The next chapter presents a glossary of terms to simplify understanding of the vegetation descriptions.

Chapter Three

Standardized Terminology for Classifying Vegetation

The following terms and definitions are used in the International Classification of Ecological Communities (ICEC). We include this glossary here, prior to presentation of the classification system, to simplify understanding of the vegetation descriptions.

Agricultural Field - Bare Soil, Crop Residue - Cropland, either tilled or untilled, which has little or no live crop vegetation present. Such areas may or may not have crop residue from previous crops on the surface. This category also includes cropland in a fallow state -- that is, cropland which has been left idle during the whole or greater portion of the growing season.

Alliance - A physiognomically uniform group of Associations sharing one or more diagnostic (dominant, differential, indicator, or character) species which, as a rule, are found in the uppermost stratum of the vegetation.

Alluvial - Characterized by the deposition of sediment by a stream or other running water at any point along its course.

Alpine - The zone on mountain tops between permanent snow and the cold limits of trees.

Annual - Plant species that complete their life-cycle within a single growing season.

Annual Close-Grown Forbs and Grasses - Annual (non-perennial) forbs and grasses which are drill-seeded or broadcast. Examples include wheat, barley, and oats.

Annual Row-Crop Forbs and Grasses - Annual (non-perennial) forbs and grasses planted in rows on a regular and generally consistent row and plant spacing. Examples include corn, soybeans, tomatoes, potatoes, sorghum, and cotton.

Annual Vegetation - Associations that persist for less than one year or are dominated by annual species.

Assemblages - Vegetative communities composed of several to many different species of plants that assemble themselves based on specific site conditions and the presence of seed.

Association - The finest level of the classification standard. The Association is a physiognomically uniform group of vegetation stands that share one or more diagnostic (dominant, differential, indicator, or character) overstory and

understory species. These elements occur as repeatable patterns of assemblages across the landscape, and are generally found under similar habitat conditions. (The Association refers to existing vegetation, not a potential vegetation type).

Biennial - Plant species that complete their life-cycles within two growing seasons.

Boreal - Northern biogeographical region typically referring to subpolar and cold temperate areas.

Brackish - Tidal water with a salinity of 0.5-30 parts per thousand.

Broad-leaved - A plant with leaves that have well-defined leaf blades and are relatively wide in outline (shape) as opposed to needle-like or linear; leaf area is typically greater than 500 square millimeters or 1 square inch.

Bryophyte - Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts.

Bunch Grass - Multi-stemmed (caespitose) life form of grasses characterized by clumps of erect shoots that slowly spread horizontally by tillers, generally creating distinct individual plants spaced across the ground; often applied to sedges and other graminoids with similar life forms.

Caespitose (cespitate) - Describes a low branching pattern from near the base that forms a multi-stemmed or a bunched appearance.

Canopy Cover - The proportion of ground, usually expressed as a percentage, that is occupied by the perpendicular projection down on to it of the aerial parts of the vegetation or the species under consideration. The additive cover of multiple strata or species may exceed 100%.

Canopy Stratum - Canopy layer.

Classification - The grouping of similar types (in this case – vegetation) according to criteria (in this case – physiognomic and floristic) which are considered significant for this purpose. The rules for classification must be clarified prior to identification of the types within the classification standard. The classification methods should be clear, precise, where possible quantitative, and based upon objective criteria, so that the outcome would be the same whoever performs the definition (or description). Classification necessarily involves definition of class boundaries (UNEP/FAO 1995).

Cliff - Any high, very steep to perpendicular, or overhanging face of a rock outcrop.

Closed Tree Canopy - A class of vegetation that is dominated by trees with interlocking crowns (generally forming 60-100% crown cover).

...The Association is a physiognomically uniform group of vegetation stands that share one or more diagnostic (dominant, differential, indicator, or character) overstory and understory species...

Crosswalk - Organizational and definitional property of a classification standard which provides that all its categories either share a common definition with an FGDC vegetation standard category at some level of the hierarchy, or represent a subset of one and only one category at a given level of the FGDC Vegetation Classification Standard. When a standard crosswalks with the FGDC Vegetation Classification, it means that all categories of the standard have one and only one place with the FGDC Standard where they logically exist. It does not mean that all categories of the standard must crosswalk to the same level of the FGDC Standard.

Cloud Forest - Tropical and subtropical montane forest characterized by a high incidence of low-level cloud cover, usually at the canopy level, promoting development of an abundance of vascular epiphytes.

Cold Deciduous - A class of vegetation where the leaves drop in the unfavorable season of winter frost and freeze. The foliage is dropped every year. Applied to vegetation adapted to cold season influences (temperate).

Conical-crowned - Describes a needle-leaved evergreen tree with a pyramidal or cone-shaped canopy or life form; for example, Douglas fir and silver fir (*Pseudotsuga menziesii* and *Abies amabilis*).

Cover - The area of ground covered by the vertical projection of the aerial parts of plants of one or more species.

Cover Type - A designation based upon the plant species forming a plurality of composition within a given area (e.g., Oak-Hickory).

Creeping - The pattern of stems growing at or just beneath the surface of the ground and usually producing roots at nodes.

Crustose Lichen - Lichen life form that grows in intimate contact with its substrate, lacks a lower cortex and rhizoids (root-like structures), and is impossible to separate from the substrate without destroying the thallus; lichen with an unlobed, flattened thallus, growing adnate to the substrate.

Cushion Plant - A low, woody, plant life form so densely branched that it forms a compact canopy that is pad- or bolster-like in appearance; usually with microphyllous foliage; characteristic of alpine and tundra plants.

Cylindrical-crowned - A needle-leaved evergreen tree with a narrow, essentially cylinder-shaped canopy or life form; for example, subalpine fir and black spruce (*Abies lasiocarpa* and *Picea mariana*).

Deciduous - A woody plant that seasonally loses all of its leaves and becomes temporarily bare-stemmed.

Deciduous Cover - Vegetation classes where 75% or more of the diagnostic vegetation is made up of tree or shrub species that shed foliage simultaneously in response to an unfavorable season. There is usually one "leaf-off" season every year.

Deciduous Vegetation - Associations in which deciduous woody plants generally contribute 75% or more to total dominant plant cover.

Diagnostic Species - a.k.a. **indicator species or phytometers**. Used to evaluate [i.e., diagnose] an area, or site, for some characteristic. For example, the presence and relative density of a *Vaccinium stamineum* var. *stamineum* (gooseberry) understory existing beneath a canopy of chestnut oak, black oak, and Virginia pine indicates that the site is xeric (or dry). The oaks and pines can inhabit a wide range of sites, wet to dry. But the gooseberry understory is the indicator of a drier habitat (which is probably due to a combination of factors including: soil type, slope, aspect, elevation, and site history).

Division - This is the first level in the classification standard separating Earth cover into either vegetated or non-vegetated categories (See also Order)

Dominance - The extent to which a given species or life form predominates in a community because of its size, abundance or cover, and affects the fitness of associated species. Dominance is interpreted in two different ways for vegetation classification purposes:

100% 25% 0%
|-----|-----|
Where one or more vegetation strata (life form) covers greater than 25% (represented by the ---- line), the life form greater than 25% which constitutes the uppermost canopy is referred to as the dominant life form.

100% 25% 0%
|-----|-----|
Where no vegetation life form covers greater than 25% (represented by the - - - line), the life form with the highest percent canopy cover is referred to as the dominant life form. In the case of a 'tie', the upper canopy will be referred to as the dominant life form.

Dominant - An organism, group of organisms, or taxon that by its size, abundance, or coverage exerts considerable influence upon an association's biotic (such as structure and function) and abiotic (such as shade and relative humidity) conditions.

Dominant Vegetation Stratum - see **Canopy Stratum** (above).

Drought Deciduous - Vegetation where the leaves drop in response to an annual unfavorable season characterized by drought. The foliage is dropped every year. Applied to vegetation adapted to climates with seasonal drought and little cold-season influence (tropical-subtropical).

Dwarf Shrubland - A class of vegetation dominated by a life form of shrubs and/or trees under 0.5 m tall. These types generally have greater than 25% cover of dwarf shrubs and less than 25% cover of trees and shrubs. Herbs and non-vascular plants may be present at any cover value. In rare cases (e.g., alpine and polar regions), dwarf shrub cover may exceed the cover of trees, shrubs, herbs and, non-vascular plants and be less than 25% of the total cover.

Dwarf Shrubs - Multi-stemmed woody plants with a life form at a height of less than 0.5 m due either to genetic or environmental constraints.

Earth Cover - The observed physical cover as seen on the ground or through remote sensing. Examples of earth cover classes might be vegetated, unvegetated, water and artificial cover (human construction). A given piece of land can only fit in one earth cover class that makes earth cover mutually exclusive at the same scale of mapping.

Ephemeral Forb Vegetation - Annual associations or synusiae that, during favorable periods, dominate areas that are usually sparsely vegetated or unvegetated for most of the year.

Epiphyte - Vascular plant that grows by germinating and rooting on other plants or other perched structures; sometimes called "air plants."

Episodic Forb Vegetation - Herbaceous-dominated associations that occupy areas periodically denuded of vegetation.

Ericoid - Plants of the Heath Family or Family Eriaceae; for example, heaths, rhododendrons, and blueberries (*Erica*, *Rhododendron*, and *Vaccinium*).

Established - Species that invade, occupy, and reproduce on a non-native site.

Evergreen - A plant that has green leaves all year round; or a plant that in xeric habitats has green stems or trunks and never produces leaves.

Evergreen Cover - Vegetation classes where 75% or more of the diagnostic vegetation consists of trees or shrubs having leaves all year. Canopy is never without green foliage. Examples are pine, spruce, juniper, laurel, Cefrela, Ceiba, Guaiacum, Live Oak, Magnolia, Mescal Bean, Texas Ebony, Palms, etc.

Evergreen Vegetation - Associations in which evergreen woody plants generally contribute 75% or more to total dominant plant cover; vegetation canopy is never without photosynthetic tissue.

Extremely Xeromorphic - Associations that are adapted primarily to growing in drought-persistent environments and are only secondarily adapted to other environmental stresses; plants typically have several well-developed xeromorphic characteristics.

Facultatively Deciduous - Evergreen species that shed leaves only under extreme conditions; this strategy is often associated with plants found in semiarid

saline/alkaline environments; for example, *Atriplex-Kochia* saltbush in Australia and North America.

Foliose Lichen - Lichen life form that is leafy in appearance and loosely attached to its substrate; lichen with a lobed, flattened thallus growing loosely attached to the substrate, the lobes flattened or inflated with distinctly differentiated upper and lower surfaces; umbilicate lichens are included.

Forb - A broad-leaved herbaceous plant.

Formation - A level in the classification based on ecological groupings of vegetation units with broadly defined environmental and additional physiognomic factors in common. This level is subject to revision as the vegetation Alliances and Associations are organized under the upper levels of the hierarchy. Different variables are applied to this hierarchical level in the sparsely vegetated class.

Fresh Water - Water with a salinity of less than 0.5 parts per thousand.

Fruit/Nut Shrubs and Vines (vineyards) - Areas dominated by fruit or nut shrubs and vines planted on a regular and generally consistent row and plant spacing. Vegetation is planted for the purpose of producing a fruit or nut crop. Examples include blueberries, cranberries, blackberries, and grapes.

Fruticose Lichen - Lichen life form that is bunched, shrubby or "hairy" in appearance and loosely attached to its substrate; lichen with the thallus branched, the branches solid, or hollow and round, or flattened without distinctly differentiated upper and lower surfaces; squamulose lichens are included.

Giant - Mature forests in which the height of a typical canopy exceeds 50 meters or 165 feet.

Graminoid - Grasses and grass-like plants, including sedges and rushes.

Grassland - Vegetation dominated by perennial graminoid plants.

Growth Form - The shape or appearance of a plant; it primarily reflects the influence of growing conditions.

Hemi-sclerophyllous - A plant with stiff, firm, leathery leaves that partially retain their rigidity during wilting; for example, rhododendron and salal (*Rhododendron* and *Gaultheria*).

Herb - A vascular plant without significant woody tissue above or at the ground; an annual, biennial, or perennial plant lacking significant thickening by secondary woody growth, with perennating buds borne at or below the ground surface (hemicryophytes, geophytes, helophytes, and therophytes of Raunkier).

Herbaceous - A class of vegetation dominated by non-woody plants known as herbs (graminoids, forbs and ferns). Herbs generally form at least 25% cover.

Trees, shrub and dwarf shrub generally have less than 25% cover. In rare cases, herbaceous cover exceeds the combined cover of trees, shrubs, dwarf shrubs, and non-vascular plants and is less than 25% cover. Height classes for the graminoids are short (<0.5 m), medium-tall (0.5-1 m) and tall (>1 m). Height classes for the forbs are low (<1 m) and tall (>1 m). For both graminoids and forbs, the height classes are measured when the inflorescences are fully developed.

Herbaceous Vegetation - Vegetation in which herbs (mostly graminoids, forbs, and ferns) form at least 25% cover, and woody vegetation has generally less than 25% cover; herbaceous cover may be less than 25% in cases where the cover of each of the other life forms present is less than 25% and herbaceous cover exceeds the cover of the other life forms.

Herbs - Non-woody vascular plants such as grasses, grass-like plants, and forbs.

Hydrophyte - A plant which has evolved with adaptations to live in aquatic or very wet habitats, e.g., cattail, water lily, water tupelo.

Hydromorphous Herbs - Herbaceous plants structurally adapted for life in water-dominated or aquatic habitats.

Intermittently Flooded - Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rainstorms. This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations. Equivalent to Cowardin's Intermittently Flooded modifier.

Krummholz - Growth form assumed by tree species at the upper treeline or in the alpine zone; characterized by a creeping and multi-stemmed growth pattern due to desiccation and physical damage caused by wind and blowing ice crystals near the upper treeline; the same species grows as an erect, single-stemmed tree at lower elevation.

Landscaped Urban/Suburban/Rural - Areas consisting of partially or entirely planted vegetation which is intensively managed for aesthetics, erosion control, horticultural, and/or recreation. Examples include vegetated areas around residential dwellings, industry, golf courses, transportation right-of-ways, and nurseries.

Legend - The list of classification types that are portrayed on a map. The legend will contain a subset of the total classes in the overall classification standard.

Lichen - An organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in symbiotic association.

Life Form (growth form) - A classification of plants based upon their size, morphology, habit, life span, and woodiness.

Lignified - A plant with woody tissue developed by secondary cell wall thickening by lignin and cellulose.

Low Forb - A broad-leaved herbaceous plant usually less than 1 meter or 3 feet tall when inflorescences are fully developed.

Lowland - A large land area with vegetation reflecting limits set by regional climate and soil/site conditions; an area where elevation is not the primary gradient affecting vegetation zonation.

Matted - A creeping plant that by reiterative growth has overlapping stems and forms a low, dense ground cover.

Medium-tall Grassland - Graminoid-dominated vegetation usually between 0.5 to 1 meter or 1.5 to 3 feet tall when inflorescences are fully developed in temperate zones and to 2 meters or 6 feet in tropical zones.

Metadata - Data about data. This describes the content, quality, condition, and other characteristics of data. Its purpose is to:

- ❖ help organize and maintain a organization's internal investment in spatial data
- ❖ provide information about an organization's data holdings to data catalogues, clearinghouses, and brokerages
- ❖ provide information to process and interpret data received through a transfer from an external source

Microphyllous - A plant with small leaves; individual leaf surface areas are less than 500 square millimeters or one square inch.

Mixed Evergreen-deciduous - Vegetation in which evergreen and deciduous species each generally contribute 25-75% to the total canopy cover.

Mixed Evergreen Deciduous Cover - A class of vegetation types where trees (or shrubs) are the dominant life form and neither deciduous nor evergreen species represent more than 75% of cover present.

Montane - The zone in mountainous regions where the influence of altitude (vertical relief) results in local climatic regimes that are sufficiently different from those in the adjacent lowlands as to cause a complex vertical climate-vegetation-soil zonation; includes vegetation at the base of a mountain when it is different from lowland vegetation.

Natural/Semi-natural - Areas dominated by native or established vegetation that has not been cultivated or treated with any annual management or manipulation regime. In cases where it cannot be assessed whether the

vegetation was planted or cultivated by humans, the vegetation is considered "Natural/Semi-Natural."

Needle-leaved - A plant with slender, elongated leaves; for example, pine and fir trees (*Pinus* and *Abies*).

Non-agricultural Disturbed Areas - Areas with little or no vegetation which have been disturbed by human activity other than for the production of agricultural crops. Examples include areas such as construction sites for urban and residential, mining operations, and landfills.

Non-vascular - Bryoids and lichens dominate with generally at least 25 % canopy cover, while trees, shrubs, dwarf shrubs, and herbs generally make up less than 25% cover. In some regions, non-vascular cover may exceed trees, shrubs, dwarf shrubs, and herbs and be less than 25% of the total cover.

Non-vascular Plant - A plant without specialized water or fluid conductive tissue (xylem and phloem); includes bryophytes, lichens, and algae.

Non-vascular Vegetation - Vegetation that is dominated by bryophytes and lichens, generally forming at least 25% cover, with other vegetation forming less than 25% cover; nonvascular cover may be less than 25% in cases where the cover of each of the other life forms present is less than 25% and nonvascular cover exceeds the cover of other life forms.

Non-vegetated - A class with less than 1 % of the surface area with vegetation cover naturally or from which vegetation is removed and replaced by man (human)-made surfaces or structures.

Open Tree Canopy - A class of vegetation types dominated by trees with crowns not touching, generally forming 25-60% cover. In rare cases, tree cover may exceed the combined cover of shrubs, dwarf shrubs, herbs and non-vascular plants and be less than 25% of the total cover.

Orchards and Groves - Areas dominated by fruit or nut trees planted on a regular and generally consistent row and plant spacing. Stands are planted for the purpose of producing a fruit or nut crop. Examples include areas used for the production of apples, peaches, oranges, pecans, walnuts, cherries, and bananas.

Order - This is the next level in the hierarchy under Division. The Orders within the Vegetated Division are generally defined by dominant life form (tree, shrub, dwarf shrub, herbaceous, or non-vascular).

Pavement - A relatively flat surface of consolidated material, generally exposed bedrock.

Perennial - Plant species with a life-cycle that characteristically lasts more than two growing seasons and persists for several years.

Perennial Forb Close-Grown Crops - Perennial forbs which are drill-seeded or broadcast. Examples include alfalfa, clover, and lespedeza.

Perennial Forb Row Crops - Perennial forb vegetation planted in rows on a regular and generally consistent row and plant spacing. Examples include strawberries.

Perennial Grass Crops (hayland, pastureland) - Areas of dominantly perennial grasses, either native or non-native species, planted and/or intensively managed as pure or mixed-species stands. Stands often managed for the production of feed or seed, or are grazed. Examples include hayland, pastureland, and native pasture.

Perennial Herbaceous Vegetation - Associations that persist for several years and are dominated by herbaceous species.

Permanently Flooded - Water that covers the land surface at all times of the year in all years. Equivalent to Cowardin's (1979) "permanently flooded".

Permanently Flooded-tidal - Salt water that covers the land surface at all times of the year in all years. This modifier applies only to permanently flooded areas irregularly flooded by fresh tidal water. Equivalent to Cowardin's (1979) "permanently flooded/tidal".

Physiognomic Class - A level in the classification hierarchy defined by the relative percent canopy cover of the tree, shrub, dwarf shrub, herb, and nonvascular life form in the uppermost strata during the peak of the growing season.

Physiognomic Group - A level in the classification defined by a combination of climate, leaf morphology, and leaf phenology. Different variables are applied to this hierarchical level in the sparsely vegetated class.

Physiognomic Subclass - A level in the classification determined by the predominant leaf phenology of classes defined by tree, shrub, or dwarf shrub stratum (evergreen, deciduous, mixed evergreen-deciduous), and the average vegetation height for the herbaceous stratum (tall, medium, short). Different variables are applied to this hierarchical level in the sparsely vegetated class.

Physiognomy - The structure and life form of a plant community.

Plantations - Areas dominated by trees planted on a regular and generally consistent row and plant spacing. Stands are planted for the purpose of producing a crop of timber, Christmas trees, or other products. Examples include planted hardwood and softwood timber stands.

Planted/Cultivated - Areas dominated with vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. The majority of vegetation in these areas is planted and/or maintained for the

production of food, feed, fiber, or seed. This includes: vegetation planted in built-up settings, for recreation, erosion control, or aesthetic purposes, all areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, cotton, wheat, and rice, grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, orchards, vineyards, and tree plantations planted for the production of fruit, nuts, fiber (wood), or ornamental. In cases where one can not assess whether it was planted by humans (e.g., some mature forests), the vegetation is consider "natural/semi-natural."

Plurality - The plant species that has the most numerous numbers on a site.

Polar - Geographically, the areas within the Arctic and Antarctic circles in which the sun is entirely not visible for six months and is constantly above the horizon for the next six months; climatically, polar regions are characterized by the lack of a period of warmth and by enduring cold; in polar climates the average temperature of each month is below 10° C (50° F).

Pulvinate Mosses - Mosses growing in cushion-like mats or clumps.

Rainforest - Vegetation in frost-free areas dominated by trees that are always wet from rain.

Repeatable Patterns of Assemblages - see **Cover Type**

Revolute - Rolled toward the lower surface of a leaf.

Rosulate - A plant with leaves arranged in rosettes (circular clusters).

Rounded-crowned - A needle-leaved evergreen tree with a basically semi-circular canopy or life form; for example, whitebark pine and alligator juniper (*Pinus albicaulis* and *Juniperus deppeana*).

Saltwater - Water with a salinity of greater than 30 parts per thousand.

Saturated - Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. Equivalent to Cowardin's (1979) Saturated modifier.

Scale-leaved - A plant with small, overlapping leaves that usually lie flat on the stem; for example, eastern redcedar and western redcedar (*Juniperus virginiana* and *Thuja plicata*).

Sclerophyllous - A plant with usually evergreen leaves that are stiff and firm and retain their stiffness even when wilted; they are common in, but not restricted to, regions with a long summer drought and predictable yet limited winter rain.

Scree - A sheet of coarse rock debris covering a mountain slope without an adjacent cliff.

Scrub - Vegetation dominated by shrubs, including thickets.

Seasonal - Showing periodicity related to the seasons; applied to vegetation exhibiting pronounced seasonal periodicity marked by conspicuous physiognomic changes.

Seasonal Evergreen Vegetation - Associations in which most of the upper canopy plants retain leaves year-round and drop some leaves during unfavorable seasons.

Seasonally Flooded - Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. Includes Cowardin's (1979) Seasonal, Seasonal-Saturated, and Seasonal Well Drained modifiers.

Semi-arid - A climatic region having an annual precipitation, usually between 25.4 and 50.8 centimeters or 10 and 20 inches, that is higher than a truly arid climate; typically, vegetation is composed of grasses with or without woody plant layers.

Semi-deciduous Vegetation - Associations (usually tropical and subtropical) in which most of the upper canopy trees are drought-deciduous and many of the understory trees and shrubs are evergreen. The evergreen and deciduous woody plants are not always separated by layers.

Semi-evergreen Vegetation - Associations in which evergreen and deciduous species each generally contribute 25-75% of total tree cover; specifically, this term refers to tropical and subtropical vegetation in which most of the upper canopy trees are evergreen mixed with drought-deciduous trees.

Semi-permanently Flooded - Surface waters persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. Includes Cowardin's (1979) Intermittently Exposed and Semi-permanently Flooded modifiers.

Short Grassland - Graminoid-dominated vegetation usually less than 0.5 meters or 1.5 feet tall when inflorescences are fully developed.

Shrubland - A class of vegetation defined by areas dominated by shrubs generally greater than 0.5 m tall with individuals or clumps not touching to interlocking. Shrub canopy cover is generally greater than 25% while tree cover is generally less than 25%. In rare cases, shrub cover exceeds the tree, dwarf shrub, herb, non-vascular plant cover and is less than 25% cover.

Shrubs - Woody plants greater than 0.5 m in height that generally exhibit several erect, spreading, or prostrate stems; and have a bushy appearance. In instances where life form cannot be determined, woody plants greater than 0.5 m in height, but less than 5 m in height will be considered shrubs.

Sod Grass - A life form of graminoids that tends to develop a solid mat of grass, sedge, etc. over the ground by vegetative increase of rhizomes or stolons; resulting vegetation generally has few spaces between plants.

Sparsely Vegetated - A class of vegetation types that are defined as having a surface area with 1-10% vegetation cover over the landscape at the peak of the growing season.

Stomata - Pores or openings for gas exchange that are generally concentrated on leaf surfaces.

Subalpine - Upper mountain vegetation immediately below the cold limits of tree and tall shrub growth.

Subdesert - An area of xerophytic shrubby vegetation with a poorly-developed herbaceous layer.

Subgroup - A level of the hierarchy that splits Natural/Semi-Natural vegetation types from the Planted/Cultivated vegetation types.

Submontane - An area where the influence of altitude (vertical relief) does not result in local climate regimes that are sufficiently different from the adjacent lowlands as to cause a complex vegetation-climate-soil zonation; generally includes the foothills of a mountain range; the lowland vegetation at the base of a mountain that displays vegetation zonation.

Subpolar - Geographically, the region immediately equator-ward of the Arctic and Antarctic circles; climatically, winters are long and extremely cold, and summers are very short; only one month per year has a monthly average warmer than 10° C (50° F); as a rule, the ground is completely covered by snow for at least half a year; the region between the tundra and cold temperate forests or steppes.

Subtropical - Pertains to areas within tropical regions with variable (seasonal) temperature and moisture regimes; climatically, it has seasonal variation marked by dry/wet seasons rather than cold/hot seasons; parts of this region are subject to sub-0° C (32° F) temperatures but rarely have freezing periods of 24 hours or longer; in the United States this term includes southern Florida and the southern tip of Texas.

Succulent - A plant with fleshy stems or leaves with specialized tissue for the conservation of water; a xeromorphic strategy for tolerating long periods of drought.

Suffruticose - A somewhat shrubby plant in which the upper vegetative and flowering shoots die back to leave only the lower parts to survive unfavorable seasons.

Synusia - An association of plant species with a similar life form and similar ecological requirements occurring together in the same habitat; sometimes called a "union"; most habitats are occupied by several synusiae, which may grow above each other in layers, beside each other, or in mixture; for example, an open tree synusia or layer over a grass-dominated synusia or layer.

Tall Forb - Broad-leaved herbaceous plants usually greater than 1 meter or 3 feet tall when inflorescences are fully developed.

Tall Grassland - Graminoid-dominated vegetation usually over 1 meter or 3 feet tall when inflorescences are fully developed in temperate zones and greater than 2 meters or 6 feet in tropical zones.

Talus - A sloping accumulation of coarse rock fragments at the base of a cliff.

Temperate - A geographically, the region between the polar and tropical regions; climatically, the region is moderate with distinct seasons of alternating long, warm summers and short, cold winters.

Temporarily Flooded - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. Equivalent to Cowardin's (1979) Temporary modifier.

Tidally Flooded - Areas flooded by the alternate rise and fall of the surface of oceans, seas, and the bays, rivers, etc. connected to them, caused by the attraction of the moon and sun [or by the back-up of water caused by unfavorable winds].

Trees - Woody plants that generally have a single main stem and have more or less definite crowns. In instances where life form cannot be determined, woody plants equal to or greater than 5 m in height will be considered trees.

Treeline - A zone where the normal growth of trees is limited, cold temperatures often combined with drought form the upper or arctic treeline, and drought combined with hot temperatures form lower or arid treeline.

Tropical - Geographically, the area between the Tropic of Cancer (23° 27' N) and the Tropic of Capricorn (23° 27' S), which includes tropical montane and alpine zones; climatically, the tropics are described as either the equatorial limits of freeze or, in temperate marine locations without freezing, the 65° F isotherm for the coldest month of the year; generally, tropical regions are characterized by high mean temperatures, small annual variation in temperature, and abundant rainfall throughout the year, although mountainous areas within the tropics are more variable.

Tuft-tree - Woody plant with large leaf-fronds or rosulate branches at the tips of major trunk(s); for example, palms and tree ferns.

Tundra - The treeless region north of the Arctic Circle (arctic tundra) or above the treeline of high mountains (alpine tundra) and on some sub-Antarctic islands; characterized by very low winter temperatures, short cool summers, permafrost

below a surface layer subject to summer melt, short growing season, and low precipitation.

Tussock - Graminoid life form consisting of bunch-like tufts, sometimes more than 1 meter or 3 feet tall, in which the hard, old, withered leaves are intermingled with the fresh, young, green leaves.

Vascular Plant - Plant with water and fluid conductive tissue (xylem and phloem); includes seed plants, ferns, and fern allies.

Vegetated - Areas having equal to or greater than 1% or more of the land or water surface with live vegetation cover at the peak of the growing season.

Vegetation - The collective plant cover over an area.

Vegetation Cover - Vegetation that covers or is visible at or above the land or water surface. It is a sub-category of Earth cover. The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants.

Vegetation Data - The attributes of the vegetation that are used to classify and characterize the vegetation type and to map a vegetation stand. These data come from the interpretation of remotely sensed imagery, field work, and other thematic data sources.

Vegetation Stands - Contiguous areas that are homogenous with respect to the current condition of vegetation; that is, these are plant communities possessing sufficient uniformity in regard to composition and structure to be clearly different from adjacent areas.

Winter-rain - A climatic regime characterized by precipitation that occurs mostly as rain during cool winters that alternate with dry, hot summers; often associated with sclerophyllous vegetation.

Woody Plant - Plant species life form with woody tissue and buds on that woody tissue near or at the ground surface or above; plants with limited to extensive thickening by secondary woody growth and with perennating buds; includes phanerophytes and chamaephytes of Raunkier.

Woody - Containing lignified plant tissue.

Xeromorphic (Scleromorphic) - Having structural characteristics common among plants adapted to drought, i.e., small thick leaves with sunken stomata or revolute margins, surfaces that are heavily pubescent, waxy or highly reflective and small vein islets.

Chapter Four

Vegetation of the Caribbean Islands: Formations

TOTAL NUMBER OF FORMATIONS RECOGNIZED: 104

Order: TREE DOMINATED Class: I. CLOSED TREE CANOPY Subclass: I.A. <u>EVERGREEN</u> <u>FOREST</u>

Group: *I.A.I. Tropical and subtropical rain forest (mainly broad-leaved evergreen trees, neither cold- nor drought-resistant)*

Subgroup: *I.A.I.N. Natural/Semi-natural*

Formations:

- λ *I.A.I.N.a.* **Lowland rain forest**
 Bosque pluvial de baja altitud
 (Lowland Tropical or subtropical rain forest)¹

- λ *I.A.I.N.b.* **Submontane rain forest**
 Bosque pluvial submontano
 (Submontane Tropical or subtropical rain forest)

- λ *I.A.I.N.c.* **Montane rain forest**
 Bosque pluvial montano
 (Montane tropical or subtropical rain forest)

- λ *I.A.I.N.d.* **Cloud forest**
 Bosque nublado
 (Montane tropical or subtropical cloud forest)

- λ *I.A.I.N.f.* **Seasonally flooded rain forest**
 Bosque pluvial estacionalmente inundado
 (Tropical or subtropical seasonally flooded rain forest)

- λ *I.A.I.N.j.* **Solution-hole evergreen forest**
 Bosque siempreverde de sumidero
 (Solution-hole tropical or subtropical broad-leaved evergreen forest)²

- λ *I.A.I.N.k.* **Riparian forest**
 Bosque ripario
 (Tropical or subtropical riparian forest)³

¹ The shorter term "forest" is preferred over the phrase "closed tree canopy". This lowland forest-type is here defined as having three canopy layers, the uppermost of which is completely closed and dominated by compound-leaves species often exceeding 30 m high. This formation occurs in areas of heavy rainfall, at least 2,000 mm of evenly distributed annual precipitation, mostly at elevations between 0 and 350-400 m . Corresponds to Borhidi's (1991) **Submontane rainforest** but not to Beard's (1944, 1949, 1955) **Rainforest** or Dansereau's (1966) **Lowland rainforest**.

² New Formation (*sensu* Lindsay & Horwith 1997)

³ New Formation.

Group: *I.A.3. Tropical and subtropical seasonal evergreen forest (mainly broad-leaved evergreen trees with some foliage reduction in dry season)*

Subgroup: *I.A.3.N. Natural/Semi-natural*

Formations:

- λ *I.A.3.N.a.* **Lowland seasonal evergreen forest**
Bosque estacional siempreverde de baja altitud
(*Lowland tropical or subtropical seasonal evergreen forest*)
- λ *I.A.3.N.b.* **Submontane seasonal evergreen forest**
Bosque estacional siempreverde submontano
(*Submontane tropical or subtropical seasonal evergreen forest*)
- λ *I.A.3.N.e.* **Seasonally/temporarily flooded seasonal evergreen forest**
Bosque estacional siempreverde estacionalmente/temporalmente inundado
(*Seasonally or temporarily flooded tropical or subtropical seasonal evergreen forest*)

Group: *I.A.5. Tropical or subtropical broad-leaved evergreen sclerophyllous closed tree canopy forest*

Subgroup: *I.A.5.N. Natural/Semi-natural*

Formations:

- λ *I.A.5.N.a.* **Lowland/submontane evergreen sclerophyllous forest**
Bosque siempreverde esclerófilo de baja altitud/submontano
(*Lowland or submontane⁴ tropical or subtropical broad-leaved evergreen sclerophyllous forest*)
- λ *I.A.5.N.d.* **Semi-permanently flooded evergreen sclerophyllous forest**
Bosque siempreverde esclerófilo semipermanentemente inundado
(*Semipermanently flooded tropical or subtropical broad-leaved evergreen sclerophyllous forest*)
- λ *I.A.5.N.e.* **Mangrove**
Manglar
(*Tidally flooded tropical or subtropical broad-leaved evergreen sclerophyllous forest*)

Group: *I.A.7. Tropical and subtropical needle-leaved (or needle-stemmed)⁵ evergreen forest*

Subgroup: *I.A.7.N. Natural/Semi-natural*

Formations:

- λ *I.A.7.N.a.* **Lowland/submontane pine forest**
Bosque de pinos de baja altitud/submontano
(*Lowland or submontane tropical or subtropical needle-leaved evergreen forest*)

Subgroup: *I.A.7.C. Planted/Cultivated*

Formations:

- λ *I.A.7.C.a.* **Lowland/submontane pine forest plantation**
Bosque plantado de pinos de baja altitud/submontano
(*Lowland or submontane tropical or subtropical needle-leaved evergreen forest plantation*)
- λ *I.A.7.C.b.* **Casuarina forest plantation**
Bosque plantado de Casuarina
(*Lowland or submontane tropical or subtropical needle-stemmed⁶ evergreen forest plantation*)

⁴ The term "submontane" is added, to include the lowland-submontane sclerophyllous evergreen oak forests of west Cuba.

⁵ The phrase "or needle-stemmed" in parenthesis is added, to include the Australian "pine" forest plantations.

⁶ New Formation, to include the needle-stemmed Australian "pine" forest plantations, under Subgroup C (Planted/Cultivated).

λ *I.A.7.N.b.* **Montane pine forest**
Bosque montano de pinos
(*Montane or subalpine tropical or subtropical needle-leaved evergreen forest*)

Group: *I.A.10. Mixed tropical and subtropical needle-leaved-broad-leaved evergreen forest*⁷
Subgroup: *I.A.10.N. Natural/Semi-Natural*

Formations:

λ *I.A.10.N.a.* **Mixed pine-broad-leaved forest**
Bosque mixto de pinos y latifolios
(*Mixed tropical and subtropical needle-leaved-broad-leaved evergreen forest*)⁸

Subclass: *I.B. DECIDUOUS FOREST*

Group: *I.B.1. Drought-deciduous forest*
Subgroup: *I.B.1.N. Natural/Semi-natural*

Formations:

λ *I.B.1.N.a.* **Lowland/submontane drought-deciduous forest**
Bosque seco deciduo de baja altitud/submontano
(*Lowland or submontane drought-deciduous forest*)

Subclass: *I.C. MIXED EVERGREEN-DECIDUOUS FOREST*

Group: *I.C.1. Tropical or subtropical semi-deciduous forest*

Subgroup: *I.C.1.N. Natural/Semi-natural*

Formations:

λ *I.C.1.N.a.* **Lowland semi-deciduous forest**
Bosque semi-deciduo de baja altitud
(*Lowland tropical or subtropical semi-deciduous forest*)

λ *I.C.1.N.b.* **Montane semi-deciduous forest**
Bosque semi-deciduo montano
(*Cloud or montane tropical or subtropical semi-deciduous forest*)

λ *I.C.1.N.c.* **Seasonally flooded/saturated semi-deciduous forest**
Bosque semi-deciduo estacionalmente inundado/saturado
(*Seasonally flooded or saturated tropical or subtropical semi-deciduous forest*)

Group: *I.C.4. Xeromorphic mixed evergreen-deciduous forest*⁹
Subgroup: *I.C.4.N. Natural/Semi-natural*

Formations:

λ *I.C.4.N.b.* **Xeromorphic semi-deciduous forest**
Bosque semi-deciduo xeromórfico
(*Xeromorphic mixed evergreen-deciduous forest*)¹⁰

New Group.

⁸ New Formation.

⁹ The term "extremely" has been removed to distinguish the presence of two different formations (xeromorphic vs. extremely xeromorphic).

¹⁰ New Formation, to include the semi-deciduous xeromorphic forests of central Cuba, which are physiognomically similar to the Brazilian "Cerrado" forests.

Class: **II. OPEN TREE CANOPY (WOODLAND)**¹¹

Subclass: **II.A. EVERGREEN WOODLAND**

Group: **II.A.I. Tropical or subtropical broad-leaved woodland**

Subgroup: **II.A.I.N. Natural/Semi-natural**

Formations:

- λ **II.A.I.N.a. Evergreen woodland**
Arboleda siempreverde
(*Tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.b. Seasonally/temporarily flooded evergreen woodland**
Arboleda siempreverde estacionalmente/temporalmente inundada
(*Seasonally or temporarily flooded tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.c. Seasonally flooded/saturated evergreen woodland**
Arboleda siempreverde estacionalmente inundada/saturada
(*Seasonally flooded/saturated tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.d. Semi-permanently flooded evergreen woodland**
Arboleda siempreverde semi-permanente inundada
(*Semi-permanently flooded tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.e. Tidally flooded evergreen woodland**
Arboleda siempreverde mareal
(*Tidally flooded tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.f. Hemisclerophyllous evergreen woodland**
Arboleda siempreverde hemiesclerófila
(*Hemisclerophyllous tropical or subtropical broad-leaved evergreen woodland*)¹²
- λ **II.A.I.N.g. Saturated evergreen woodland**
Arboleda siempreverde saturada
(*Saturated tropical or subtropical broad-leaved evergreen woodland*)
- λ **II.A.I.N.h. Solution-hole evergreen woodland**
Arboleda de sumidero
(*Solution-hole tropical or subtropical broad-leaved evergreen woodland*)¹³

Subgroup: **II.A.I.C. Planted/Cultivated**

Formations:

- λ **II.A.I.C.a. Orchards**
Frutales
(*Citrus, coconut and other fruit orchards*)

Group: **II.A.3. Tropical or subtropical needle-leaved (or needle-stemmed)**¹⁴ *evergreen woodland*

Subgroup: **II.A.3.N. Natural/Semi-natural**

Formations:

- λ **II.A.3.N.a. Pine woodland**
Arboleda de pinos
(*Tropical or subtropical needle-leaved evergreen woodland*)

Subgroup: **II.A.3.C. Planted/Cultivated**

¹¹ The shorter term "woodland" is preferred over the phrase "open tree canopy"

¹² New Formation, to include Stoffer's (1956) "Hippomane Woodlands".

¹³ New Formation.

¹⁴ The phrase "or needle-stemmed" in parenthesis is added, to include the Australian "pine" woodland plantations.

Formations:

- λ *II.A.3.C.a* **Casuarina woodland plantation**
Arboleda plantada de Casuarina
(*Tropical or subtropical needle-stemmed¹⁵ evergreen woodland plantation*)
- λ *II.A.3.N.d* **Saturated pine woodland**
Arboleda de pinos saturada
(*Saturated tropical or subtropical needle-leaved evergreen woodland*)

Group: *II.A.5. Extremely xeromorphic evergreen woodland*

Subgroup: *II.A.5.N. Natural/Semi-natural*

Formations:

- λ *II.A.5.N.a* **Sclerophyllous extremely xeromorphic woodland**
Arboleda esclerófila extremadamente xeromórfica
(*Sclerophyllous extremely xeromorphic evergreen woodland*)
- λ *II.A.5.N.b* **Cactus woodland**
Arboleda de cactus
(*Succulent extremely xeromorphic evergreen woodland*)

Subclass: *II.B. DECIDUOUS*
WOODLAND

Group: *II.B.1. Tropical or subtropical drought-deciduous woodland*

Subgroup: *II.B.1.N. Natural/Semi-natural*

Formations:

- λ *II.B.1.N.a* **Lowland/submontane drought-deciduous woodland**
Arboleda seca decidua de baja altitud/submontana
(*Lowland or submontane broad-leaved drought-deciduous woodland*)

Subclass: *II.C. MIXED*
EVERGREEN-DECIDUOUS
WOODLAND

Group: *II.C.1. Tropical or subtropical semi-deciduous woodland*

Subgroup: *II.C.1.N. Natural/Semi-natural*

Formations:

- λ *II.C.1.N.a* **Semi-deciduous woodland**
Arboleda semi-decidua
(*Tropical or subtropical semi-deciduous woodland*)
- λ *II.C.1.N.x* **Seasonally/temporarily flooded semi-deciduous woodland**
Arboleda semi-decidua estacionalmente/temporalmente inundada
(*Seasonally/temporarily flooded tropical or subtropical semi-deciduous woodland*)

Group: *II.C.4. Extremely xeromorphic mixed evergreen-deciduous woodland*

Subgroup: *II.C.4.N. Natural/Semi-natural*

Formations:

- λ *II.C.4.N.a* **Mixed evergreen-deciduous thorn woodland**
Arboleda espinosa mixta siempreverde-decidua
(*Mixed evergreen-deciduous thorn woodland*)

Order: ***SHRUB DOMINATED***
Class: ***III. SHRUBLAND***
(***SCRUB***)
Subclass: ***III.A. EVERGREEN***
SHRUBLAND (SCRUB)

med Australian "pine" woodland plantations, under Subgroup C

Group: *III.A.1. Tropical and subtropical broad-leaved evergreen shrubland*
Subgroup: *III.A.1.N. Natural/Semi-natural*

Formations:

- λ *III.A.1.N.a.* **Evergreen shrubland**
Matorral siempreverde
(*Tropical or subtropical broad-leaved evergreen shrubland. Includes bamboos and tuft-trees*)

- λ *III.A.1.N.b.* **Hemisclerophyllous evergreen shrubland**
Matorral siempreverde hemiesclerófilo
(*Hemisclerophyllous tropical or subtropical broad-leaved evergreen shrubland*)

- λ *III.A.1.N.c.* **Sclerophyllous evergreen shrubland**
Matorral siempreverde esclerófilo
(*Sclerophyllous tropical or subtropical broad-leaved evergreen shrubland*)

- λ *III.A.1.N.f.* **Seasonally flooded evergreen shrubland**
Matorral siempreverde estacionalmente inundado
(*Seasonally flooded tropical or subtropical broad-leaved evergreen shrubland*)

- λ *III.A.1.N.g.* **Semi-permanently flooded evergreen shrubland**
Matorral siempreverde semi-permanentemente inundado
(*Semi-permanently flooded tropical or subtropical broad-leaved evergreen shrubland*)

- λ *III.A.1.N.h.* **Tidally flooded evergreen shrubland**
Matorral siempreverde mareal
(*Tidally flooded tropical or subtropical broad-leaved evergreen shrubland*)

- λ *III.A.1.N.i.* **Evergreen montane shrubland**
Matorral siempreverde montano
(*Tropical or subtropical broad-leaved evergreen montane shrubland*)¹⁶

- λ *III.A.1.N.j.* **Solution-hole evergreen shrubland**
Matorral siempreverde de sumidero
(*Solution-hole tropical or subtropical evergreen shrubland*)¹⁷

Group: *III.A.4. Microphyllous evergreen shrubland*
Subgroup: *III.A.4.N. Natural/Semi-natural*

Formations:

- λ *III.A.4.N.a.* **Lowland microphyllous evergreen shrubland**
Matorral siempreverde micrófilo de baja altitud
(*Lowland microphyllous evergreen shrubland*)¹⁸

- λ *III.A.4.N.c.* **Microphyllous montane fumarole shrubland**
Matorral micrófilo montano de fumarolas
(*Microphyllous montane fumarole shrubland*)¹⁹

- λ *III.A.4.N.d.* **Microphyllous montane shrubland with succulents**

¹⁶ New Formation.

¹⁷ New Formation.

¹⁸ The term "lowland" is added.

¹⁹ New Formation.

Matorral micrófilo montano con suculentas
(*Microphyllous evergreen montane shrubland with succulents*)²⁰

Group: **III.A.5. Extremely xeromorphic evergreen shrubland**
Subgroup: **III.A.5.N. Natural/Semi-natural**

Formations:

- λ **III.A.5.N.a. Microphyllous evergreen extremely xeromorphic subdesert shrubland**
Matorral subdesértico siempreverde micrófilo extremadamente xeromorfo
(*Broad-leaved microphyllous evergreen extremely xeromorphic subdesert shrubland* [e.g. *creosote bush*])
- λ **III.A.5.N.b. Facultatively deciduous subdesert shrubland**
Matorral subdesértico facultativamente deciduo
(*Facultatively deciduous extremely xeromorphic subdesert shrubland*)
- λ **III.A.5.N.c. Succulent evergreen shrubland**
Matorral siempreverde suculento
(*Succulent extremely xeromorphic evergreen shrubland*)
- λ **III.A.5.N.d. Lowland/submontane serpentine shrubland**
Matorral de baja altitud/submontano de serpentinias
(*Lowland or submontane evergreen extremely xeromorphic serpentine shrubland*)²¹
- λ **III.A.5.N.e. Montane serpentine shrubland**
Matorral montano de serpentinias
(*Montane evergreen extremely xeromorphic serpentine shrubland*)²²
- λ **III.A.5.N.f. Lowland wind-sculpted shrubland**
Matorral ventoso-achaparrado de baja altitud
(*Wind-sculpted lowland evergreen extremely xeromorphic shrubland*)²³

Subclass: **III.B. DECIDUOUS**
SHRUBLAND (SCRUB)

Group: **III.B.1. Drought-deciduous shrubland**

Subgroup: **III.B.1.N. Natural/Semi-natural**

Formations:

- λ **III.B.1.N.a. Lowland drought-deciduous shrubland**
Matorral seco deciduo de baja altitud
(*Lowland drought-deciduous shrubland*)

Subclass: **III.C. MIXED**
EVERGREEN-DECIDUOUS
SHRUBLAND (SCRUB)

Group: **III.C.1. Mixed evergreen - drought-deciduous**

²⁰ New Formation.

²¹ New Formation, to include the Cuban microphyllous/nanophyllous dense thorny shrublands on serpentine-derived soils.

²² New Formation, to include the Cuban microphyllous dense montane shrublands on serpentine-derived soils, which correspond to a unique edaphic climax type developed under humid tropical rain forest climate.

²³ New Formation, to include the dense wind-sculpted shrublands of the coastal plain of Maisi, eastern end of Cuba. This Formation is characterized by a matted 1-3 m high shrub carpet with some leafless dwarf shrubs and sparse 8-25 m high emergent individuals of the palm species *Coccothrinax alexandri*. The occurrence of scattered globular, columnar and tree-shaped cacti is also characteristic.

Order: **HERB/NON**
VASCULAR DOMINATED
Class: **V. HERBACEOUS**
Subclass: **V.A. PERENNIAL**
GRAMINOID VEGETATION
(GRASSLANDS)

shrubland

Subgroup: **III.C.1.N. Natural/Semi-natural**

Formations:

- λ **III.C.1.N.a. Mixed evergreen - drought-deciduous shrubland with succulents**
Matorral mixto siempreverde-deciduo con suculentas
(Mixed evergreen - drought-deciduous shrubland with succulents)²⁴

Class: **IV. DWARF-**
SHRUBLAND (DWARF SCRUB)
Subclass: **IV.A. EVERGREEN**
DWARF-SHRUBLAND (DWARF-
SCRUB)

- λ **III.C.1.N.b. Lowland/submontane mixed**
evergreen - drought-deciduous shrubland
Matorral mixto siempreverde-
deciduo de baja altitud/submontano
(Lowland or submontane mixed evergreen
- drought-deciduous shrubland)²⁵

- λ **III.C.1.N.c. Seasonally flooded mixed**
evergreen - drought-deciduous shrubland
Matorral mixto siempreverde-deciduo estacionalmente inundado
(Seasonally flooded tropical or subtropical mixed evergreen - drought-deciduous
shrubland)²⁶

Group: **IV.A.2. Extremely xeromorphic evergreen dwarf-shrubland**

Subgroup: **IV.A.2.N. Natural/Semi-natural**

Formations:

- λ **IV.A.2.N.c. Tidally flooded evergreen dwarf-shrubland**
Matorral enano siempreverde mareal
(Tidally flooded needle-leaved or microphyllous evergreen dwarf-shrubland)

Subclass: **IV.C. MIXED**
EVERGREEN-DECIDUOUS DWARF
SHRUBLAND (DWARF SCRUB)

²⁴ New Formation (FGDC has not defined Formations of Subgroup **III.C.1.N.**).

²⁵ New Formation, to include the shrub-dominated forests of the Cuban "mogotes" on eroded limestone.

²⁶ New Formation (*sensu* Lindsay & Horwith 1997).

Group: *IV.C.1. Mixed evergreen - drought-deciduous dwarf-shrubland*
Subgroup: *IV.C.1.N. Natural/Semi-natural*

Formations:

- λ *IV.C.1.N.a.* **Mixed evergreen - drought-deciduous dwarf shrubland**
Matorral enano mixto siempreverde-deciduo
(*Mixed evergreen - drought-deciduous dwarf-shrubland*)
- λ *IV.C.1.N.c.* **Succulent-facultatively drought-deciduous dwarf shrubland**
Matorral enano suculento-facultativamente deciduo
(*Succulent-facultatively drought-deciduous dwarf-shrubland*)²⁷

Group: *V.A.1. Tropical or subtropical grassland*
Subgroup: *V.A.1.N. Natural/Semi-natural*

Formations:

- λ *V.A.1.N.a.* **Tall grassland**
Herbazal alto
(*Tall tropical or subtropical grassland*)
- λ *V.A.1.N.b.* **Medium-tall sod grassland**
Herbazal cespitoso mediano-alto
(*Medium-tall sod tropical or subtropical grassland*)
- λ *V.A.1.N.c.* **Medium-tall bunch grassland**
Herbazal de plantón mediano-alto
(*Medium-tall bunch tropical or subtropical grassland*)
- λ *V.A.1.N.d.* **Short sod grassland**
Herbazal cespitoso corto
(*Short sod tropical or subtropical grassland*)
- λ *V.A.1.N.f.* **Temporarily flooded grassland**
Herbazal temporalmente inundado
(*Temporarily flooded tropical or subtropical grassland*)
- λ *V.A.1.N.g.* **Seasonally flooded grassland**
Herbazal estacionalmente inundado
(*Seasonally flooded tropical or subtropical grassland*)
- λ *V.A.1.N.h.* **Semi-permanently flooded grassland**
Herbazal semi-permanentemente inundado
(*Semipermanently flooded tropical or subtropical grassland*)
- λ *V.A.1.N.i.* **Tidally flooded grassland**
Herbazal mareal
(*Tidally flooded tropical or subtropical grassland*)
- λ *V.A.1.N.x.* **Saturated grassland**
Herbazal saturado
(*Saturated tropical or subtropical grassland*)

Group: *V.A.2. Tropical or subtropical grassland with a tree layer (generally 10-25%)*
Subgroup: *V.A.2.N. Natural/Semi-natural*

Formations:

- λ *V.A.2.N.a.* **Tall grassland with broad-leaved evergreen trees**

²⁷ New Formation (*sensu* Lindsay Y Horwith 1997).

Herbazal alto con árboles latifolios siempreverdes

(Tall tropical or subtropical grassland with mainly broad-leaved evergreen trees)

- λ V.A.2.N.b. **Tall grassland with broad-leaved drought-deciduous trees**
Herbazal alto con árboles latifolios deciduos
(Tall tropical or subtropical grassland with broad-leaved drought-deciduous trees)
- λ V.A.2.N.c. **Medium-tall grassland with broad-leaved evergreen trees**
Herbazal mediano-alto con árboles latifolios siempreverdes
(Medium-tall tropical or subtropical grassland with broad-leaved evergreen trees)
- λ V.A.2.N.d. **Medium-tall grassland with broad-leaved drought-deciduous trees**
Herbazal mediano-alto con árboles latifolios deciduos
(Medium-tall tropical or subtropical grassland with broad-leaved drought-deciduous trees)
- λ V.A.2.N.e. **Medium-tall grassland with needle-leaved evergreen or mixed trees**
Herbazal mediano-alto con árboles aciculifolios siempreverdes o mixtos
(Medium-tall tropical or subtropical grassland with needle-leaved evergreen or mixed trees)
- λ V.A.2.N.f. **Medium-tall grassland with xeromorphic trees or succulents**
Herbazal mediano-alto con árboles xeromórficos o suculentas
(Medium-tall tropical or subtropical grassland with xeromorphic trees or succulents)
- λ V.A.2.N.g. **Seasonally/temporarily flooded grassland with broad-leaved evergreen trees**
Herbazal estacionalmente/temporalmente inundado con árboles siempreverdes latifolios
(Seasonally/temporarily flooded tropical grassland with broad-leaved evergreen trees)
- λ V.A.2.N.h. **Seasonally/temporarily flooded grassland with deciduous trees**
Herbazal estacionalmente/temporalmente inundado con árboles deciduos
(Seasonally/temporarily flooded tropical grassland with broad-leaved deciduous trees)
- λ V.A.2.N.i. **Seasonally flooded/ saturated grassland with pine trees**
Herbazal estacionalmente inundado/saturado con pinos
(Seasonally flooded/saturated tropical or subtropical grassland with needle-leaved evergreen trees)
- λ V.A.2.N.j. **Short grassland with pine or mixed trees**
Herbazal corto con pinos o árboles mixtos
(Short tropical or subtropical grassland with needle-leaved evergreen or mixed trees)²⁸
- λ V.A.2.N.k. **Short grassland with broad-leaved evergreen trees**
Herbazal corto con árboles latifolios siempreverdes
(Short tropical or subtropical grasslands with broad-leaved evergreen trees)²⁹

Group: V.A.3. *Tropical or subtropical grassland with a shrub layer (generally 10-25 %)*

Subgroup: V.A.3.N. *Natural/Semi-natural*

Formations:

- λ V.A.3.N.i. **Seasonally/temporarily flooded grassland with broad-leaved shrubs**
Herbazal estacionalmente/temporalmente inundado con arbustos latifolios
(Seasonally/temporarily flooded tropical or subtropical grassland with evergreen broad-leaved shrubs)

²⁸ New Formation.

²⁹ New Formation.

Subclass: V.D. **ANNUAL
GRAMINOID OR FORB
VEGETATION**

Group: V.A.4. *Tropical or subtropical grassland with a
dwarf-shrub layer (generally 10-25%)*
Subgroup: V.A.4.N. *Natural/Semi-natural*

Formations:

λ V.A.4.N.b. **Forb-grassland with dwarf-shrubs**

and succulents

**Herbatal de dicotiledóneas y gramíneas con arbustos enanos y
suculentas**

*(Tropical or subtropical forb-grassland with
dwarf-shrubs and succulents)³⁰*

Subclass: V.B. **PERENNIAL FORB
VEGETATION**

Group: V.B.1. *Tropical or subtropical
vegetation*

perennial forb

Subgroup: V.B.1.N. *Natural/Semi-natural*

Formations:

- λ V.B.1.N.b. **Low perennial forb vegetation**
Vegetación perenne de herbáceas no graminoides
*(Low tropical or subtropical perennial forb
vegetation)*
- λ V.B.1.N.d. **Saturated perennial forb vegetation**
Vegetación saturada perenne de herbáceas no graminoides
(Saturated tropical or subtropical perennial forb vegetation)
- λ V.B.1.N.e. **Tidally flooded perennial forb vegetation**
Vegetación mareal perenne de herbáceas no graminoides
(Tidally flooded tropical or subtropical perennial forb vegetation)

Subclass: V.C. **HYDROMORPHIC
VEGETATION**

Group: V.C.1. *Tropical or subtropical hydromorphic³¹ vegetation (without seasonal contrasts)*
Subgroup: V.C.1.N. *Natural/Semi-natural*

Formations:

- λ V.C.1.N.a. **Aquatic vegetation**
Vegetación acuática
(Permanently flooded tropical or subtropical hydromorphic³² vegetation)
- λ V.C.1.N.b. **Seagrass bed**
Pradera submarina
(Tidal permanently flooded tropical or subtropical hydromorphic rooted vegetation)

³⁰ New Formation, to include Lindsay & Horwith's Lantana camara forb-grassland Alliance, and Beer's *et al.* Aristida-Tephrosia type.

³¹ The term "rooted" was removed to include free-floating aquatic communities.

³² The term "rooted" was removed to include free-floating aquatic plants/communities of lakes, rivers and ponds. This complex vegetation unit may consist of : (1) free-floating non rooted plants; (2) Rooted floating-leaf plants; (3) Rooted emergent plants; (4) rooted submerged plants, and/or (5) non-rooted submerged plants.

Group: *V.D.I. Tropical or subtropical annual grasslands or forb vegetation*
Subgroup: *V.D.I.N. Natural/Semi-natural*

Formations:

- λ *V.D.I.N.b.* **Tall annual forb vegetation**
Vegetación alta anual de herbáceas no graminoides
(*Tall tropical or subtropical annual forb vegetation*)
- λ *V.D.I.N.d.* **Tidal annual forb vegetation**
Vegetación mareal anual de herbáceas no graminoides
(*Tidal tropical or subtropical annual forb vegetation*)

Order: ***VEGETATION NOT
DOMINANT***
Class: ***VII. SPARSE
VEGETATION***
Subclass: ***VII.A. CONSOLIDATED
ROCK SPARSE VEGETATION***

Group: *VII.A.I. Sparsely vegetated cliffs*

Subgroup: *VII.A.I.N. Natural/Semi-natural*

Formations:

- λ *VII.A.I.N.a.* **Cliff vegetation**
Vegetación de acantilados
(*Cliffs with sparse vascular vegetation*)

Group: *VII.A.2. Sparsely vegetated pavement*
Subgroup: *VII.A.2.N. Natural/Semi-natural*

Formations:

- λ *VII.A.2.N.a.* **Pavement vegetation**
Vegetación de costa rocosa
(*Pavement with sparse vascular vegetation*)

Subclass: ***VII.B. GRAVEL, COBBLE
OR TALUS ROCK SPARSE
VEGETATION***

Group: *VII.B.I. Sparsely vegetated talus/scree slopes*

Subgroup: *VII.B.I.N. Natural/Semi-natural*

Formations:

- λ *VII.B.I.N.a.* **Talus/scree vegetation**
Vegetación de talud gravelítico
(*Lowland or submontane talus/scree vegetation*)

Group: *VII.B.2. Sparsely vegetated rock flats ((boulders, cobble or gravel)*
Subgroup: *VII.B.2.N. Natural/Semi-natural*

Formations:

- λ *VII.B.2.N.a.* **Boulder field vegetation**
Vegetación sobre cantos rodados
(*Boulder field vegetation*)

Subclass: ***VII.C.
UNCONSOLIDATED MATERIAL
SPARSE VEGETATION***

Group: *VII.C.1. Sparsely vegetated sand dunes*
Subgroup: *VII.C.1.N. Natural/Semi-natural*

Formations:

- λ *VII.C.1.N.a.* **Dunes with sparse vegetation**
Dunas con vegetación abierta
(*Dunes with sparse herbaceous vegetation*)

Group: *VII.C.2. Sparsely vegetated sand flats*
Subgroup: *VII.C.2.N. Natural/Semi-natural*

Formations:

- λ *VII.C.2.N.b.* **Strand vegetation**
Vegetación de playa arenosa
(*Intermittently flooded sand beaches and shores*)

Group: *VII.C.3. Sparsely vegetated soil slopes*
Subgroup: *VII.C.3.N. Natural/Semi-natural*

Formations:

- λ *VII.C.3.N.c.* **Submontane fumerole vegetation**
Vegetación de fumarola submontana
(*Submontane fumeroles with sparse herbaceous vegetation*)³³
- λ *VII.C.3.N.d.* **Montane fumerole vegetation**
Vegetación de fumarola montana
(*Montane fumeroles with sparse herbaceous vegetation*)³⁴

Group: *VII.C.4. Sparsely vegetated soil flats*
Subgroup: *VII.C.4.N. Natural/Semi-natural*

Formations:

- λ *VII.C.4.N.c.* **Seasonally/temporarily flooded mud flats**
Lodazal estacionalmente/temporalmente inundado
Seasonally/temporarily flooded mud flats
- λ *VII.C.4.N.d.* **Tidally flooded mudflat**
Lodazal mareal
(*Tidally flooded mudflats*)

³³ New Formation, to include the pioneer communities of submontane active fumeroles in the volcanic Lesser Antilles. The growth of plants and species composition is usually conditioned by the poisonous gases, the acidity of the soil, gas and other temperatures, and to other edaphic factors.

³⁴ New Formation, to include the pioneer communities of montane active fumeroles in the volcanic Lesser Antilles. Similar to the submontane type (VIII.C.3.N.c.), the vegetation is, however, less dry.

Conclusion

This document and accompanying Atlas contain the preliminary results of a major undertaking to classify and map Caribbean vegetation types. Both the classification system and the mapping are works in progress. The classification system has a number of units which are not currently, or are incompletely, described. The maps need to be refined with current information obtained from remotely sensed imagery.

With the help of a wide range of scientists, institutions, and organizations, we have completed what we see as the first phase of a two-part project. Phase One gathered a group of vegetation experts from across the region in an October 1998 workshop to review available data and refine maps as necessary. This Caribbean Vegetation Ecology Working Group (CVEWG) identified the International Classification of Ecological Communities (ICEC) as the standard from which to classify vegetation types of the Caribbean islands. This standardization allowed the relabeling of vegetation types from existing maps with standardized vegetation units. These maps were then compiled into the Caribbean Vegetation Atlas (a separate publication), an island-by-island set of maps using the best scale available.

In Phase Two, we will fill in our data gaps by acquiring the best and most current Landsat, Spot, or IRS imagery for the entire insular Caribbean. We will engage expert scientists to rectify, subset, and cluster the imagery we obtain, and field verify this imagery. With this new data, we may need to revise our initial classification. After this revision, we will reconvene the CVEWG to review our Phase Two maps and classification unit descriptions. A gap analysis will follow to determine the extent of the protection of vegetation types. These data will then be disseminated widely for use on the ground. This Phase Two product can serve as a framework for regional development planners, with utility in areas such as conservation and development planning, carbon budgeting, and disaster preparedness.

Appendix One

Vegetation of the Caribbean Islands: Descriptions of Alliances and Associations

I.A.I.N.a. Lowland tropical or subtropical rain forest³⁵

Class: I. FORESTS

Subclass: I.A. EVERGREEN FOREST

Group: I.A.I. Tropical and subtropical rain forest (mainly broad-leaved evergreen trees, neither cold- nor drought-resistant)

Subgroup: I.A.I.N. Natural/Semi-natural

(LOWLAND RAIN FOREST)

(BOSQUE PLUVIAL DE BAJA ALTITUD)

I.A.I.N.a. *Carapa guianensis* Forest Alliance (*Carapa guianensis* lowland rain forests)

CONCEPT: Rain forest community usually occurring below 400 m altitude, on yellowish-red mountain soils, with essentially monospecific 30-35 m tall upper canopy layer of *Carapa guianensis*, and a second and third species-rich canopy layers.

DISTRIBUTION: North-east Cuba: Sagua-Baracoa ranges.

SYNONYMY: Calophyllo-Dipholion (Borhidi *et al.* 1979; Borhidi 1991), in part.

Carapa guianensis - *Calophyllum utile* Forest

DESCRIPTION: Closed upper canopy very strongly dominated by *Carapa guianensis*, or rarely mingled with some exceptionally tall individuals of the 20-25 m tall second canopy layer (e.g. *Calophyllum utile*). As opposed to the upper one, the second canopy layer is rich in species. Most common associates are *Calophyllum utile*, *Sloanea curatellifolia*, *Dipholis jubilla*, *Guarea guidonia*, *Cupania americana*, *Buchenavia capitata*, *Ficus wrightii*, and the Cuban royal palm *Roystonea regia*. Other palms (e.g. *Bactris cubensis*, *Prestoea montana*, and *Calyptronoma clementis ssp. orientensis*) are commonly found along creeks, between the second and third canopy layer. Most characteristic species of the 6-15 m tall third canopy layer are *Oxandra lanceolata*, *O. laurifolia*, *Cordia sulcata*, *Miconia elata*, *M. dodecandra*, *Cyathea araneosa* and *Hemitelia horrida*.

DISTRIBUTION: North-east Cuba: Moa region, and in the Toa, Jaguani and Duaba river basins.

COMMENTS: Although an essentially lowland community, the *Carapa guianensis* rain forest can also occur in a submontane situation, wherever annual precipitation exceeds 2,500 mm of evenly distributed rain throughout the year.

SYNONYMY: Manacales (León 1946), in part; Pluvilsilva submontana (Areces-Mallea 1978); Bosque pluvial de llanura (Capote & Berazaín 1984); Bosque pluvial de baja altitud (Capote *et al.* 1989); Submontane rainforests (Borhidi 1991), in part; Calophyllo-Carapetum guianensis (Borhidi 1991).

REFERENCES: Borhidi (1991).

³⁵ The shorter term "forest" is preferred over the phrase "close tree canopy". This lowland forest-type is here defined as having three canopy layers, the uppermost of which is completely closed and dominated by compound-leaves species and often exceeds 30 m high. This formation occurs in areas of heavy rainfall, at least 2,000 mm of evenly distributed annual precipitation, mostly at elevations between 0 and 350-400 m. Corresponds to Borhidi's (1991) **Submontane rainforest**, in part, but not to Beard's (1944, 1949, 1955) **Rainforest** or Dansereau's (1966) **Lowland rainforest**.

I.A.I.N.b. Submontane tropical or subtropical rain forest
(SUBMONTANE RAIN FOREST)
(BOSQUE PLUVIAL SUBMONTANO)

I.A.I.N.b. Cecropia peltata-Ochroma pyramidale Forest Alliance

CONCEPT: These are disturbed successional forests, with *Cecropia* and *Ochroma* as major components.

DISTRIBUTION: Puerto Rico, Martinique, widespread in tropics.

REFERENCES: Kimber (1988); Dansereau (1966).

Cecropia peltata - Andira inermis - Didymopanax morototoni Forest

DESCRIPTION: Successional forests. In Puerto Rico other associated species include *Andira inermis*, *Acrocomia aculeata*, *Erythrina poeppigiana*, *Didymopanax morototoni*, *Casearia spp.*, and *Ochroma pyramidale*.

DISTRIBUTION: Puerto Rico.

COMMENTS: This Alliance covers large portions of remaining forested lands in the lowland rain forest portions of Puerto Rico, at 0-250m in elevation.

SYNONYMY: Trumpet-wood forest (Dansereau 1966).

REFERENCES: Dansereau (1966).

Cecropia peltata - Ochroma pyramidale - Sterculia caribaea Forest

DESCRIPTION: Forests of landslides, hurricane blowdowns, and other disturbed areas, dominated by *Cecropia peltata*, *Ochroma pyramidale*, *Sterculia caribaea*, *Sapium caribaeum*, *Chimarrhis cymosa*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Silverleaf-balsa Stands (Kimber 1988).

REFERENCES: Kimber (1988).

I.A.I.N.b. Dacryodes excelsa - Sloanea berteriana Forest Alliance (Dacryodes excelsa - Sloanea berteriana submontane rain forests)

CONCEPT: Tropical forests dominated by *Dacryodes excelsa* and *Sloanea berteriana*, in Puerto Rico.

DISTRIBUTION: Puerto Rico.

COMMENTS: The floristic composition of these communities shows stronger relationships with the Greater Antilles than with the Lesser Antilles.

SYNONYMY: Rainforest-hygrophytia (Dansereau 1966).

Dacryodes excelsa-Sloanea berteriana-Manilkara bidentata ssp. surinamensis Forest

DESCRIPTION: This forest typically has a dense canopy 20-30m tall. The forest is dominated by *Dacryodes excelsa*, *Sloanea berteriana*, *Manilkara bidentata ssp. surinamensis*, and *Magnolia splendens*, with as many as 150 other tree species present, including *Tetrazygia urbanii*, *Ormosia krugii*, *Tabebuia heterophylla*, *Prestoea montana*, *Inga fagifolia*, *Hirtella rugosa*, and many others.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Rain forest (Gleason & Cook 1927), in part; Tabonuco forest (Dansereau 1966).

REFERENCES: Dansereau (1966); China *et al.* (1993).

I.A.I.N.b. Dacryodes excelsa - Sloanea massonii Forest Alliance (Dacryodes excelsa - Sloanea massonii submontane rain forests)

CONCEPT: Tropical submontane forests dominated by *Dacryodes excelsa*, *Sloanea massonii*, *Talauma dodecapetala* *Licania ternatensis* and a few other few species, in the Lesser Antilles.

DISTRIBUTION: Martinique, Guadeloupe, Dominica, Montserrat, St. Lucia, St. Vincent, Grenada, St. Kitts-Nevis and other islands in the Lesser Antilles.

COMMENTS: The floristic composition of these communities is dominated by species endemic to the Lesser Antilles.

SYNONYMY: Lower montane rain forest (Beard 1944); Forêt hygrophytique (Stehlé 1945-1946); Lower montane forest (Dansereau 1966), in part; Rainforest (Kimber 1988).

***Dacryodes excelsa* - *Sloanea massonii* - *Talauma dodecapetala* - *Licania ternatensis* Forest**

DESCRIPTION: Lowland but mostly submontane rain forest of the Lesser Antilles, with *Dacryodes excelsa* and other tree species in the upper canopy, and a middle story of trees usually dominated by members of the Lauraceae, especially species of the genera *Nectandra* and *Ocotea*. In Martinique it formerly occupied large portions of the island, from 300-900 m elevation on the windward side and from 500-1000 m elevation on the leeward side, with an average yearly rainfall of 1500-2200mm. *Dacryodes excelsa* is fairly widespread in the Lesser Antilles; *Sloanea massonii*, *Talauma dodecapetala* and *Licania ternatensis* are endemic to the Lesser Antilles. Depending on the island, the very diverse canopy layers may include other species, e.g. *Sterculia caribaea* (Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Trinidad-Tobago), *Tovomita plumieri* (Dominica, Martinique, St. Lucia), *Endlicheria sericea* (Guadeloupe, Marie Galante, Dominica, Martinique, St. Lucia, St. Vincent, Trinidad-Tobago), *Chimarrhis cymosa* (Antigua, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent), *Byrsonima trinitensis* (Antigua, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Grenada).

DISTRIBUTION: Lesser Antilles.

COMMENTS: Of all the above mentioned species, only *Dacryodes excelsa*, *Endlicheria sericea* and *Chimarrhis cymosa* are not endemic to the Lesser Antilles.

SYNONYMY: Dacryodes-Sloanea association (Beard 1949); Rainforest (Kimber 1988).

REFERENCES: Beard (1949); Kimber (1988).

***I.A.I.N.b. Hyeronima nipensis* Forest Alliance (*Hyeronima nipensis* submontane rain forests)**

CONCEPT: Tropical submontane rain forests dominated by *Hyeronima nipensis*, on acid ferralitic soils derived from serpentine bedrocks, in eastern Cuba.

DISTRIBUTION: East Cuba: Sierra de Nipe and Sierra Cristal.

SYNONYMY: Pluvilsilva montana de las serpentinitas (Areces-Mallea 1978), in part; Bosque pluvial submontano (Capote *et al.* 1989); Podocarpo-Byrsonimion orientensis (Borhidi *et al.* 1979), in part; Semi-arid montane serpentine rainforests (Borhidi 1991), in part.

***Hyeronima nipensis* - *Sloanea curatellifolia* - *Byrsonima coriacea* Forest**

DESCRIPTION: Serpentine rainforest community with two canopy layers, a rather dense shrub layer, and a poorly developed herb layer. The 18-25 m high upper canopy is dominated by *Hyeronima nipensis*, or co-dominated by this former species and other associates such as *Sloanea curatellifolia*, *Byrsonima coriacea*, and *Chionanthus (Linociera) domingensis*. This forest association is poor in tree-ferns, epiphytes, and bryophytes. Other common species may include, *Myrsine coriacea*, *Terminalia nipensis*, *Podocarpus ekmanii*, *Calophyllum utile*, *Ocotea cuneata*, *Coccoloba retusa*, *Chrysophyllum argenteum*, *Miconia serrulata*, *Dipholis cubensis*, etc.

DISTRIBUTION: East Cuba: Sierra de Nipe and Sierra Cristal, between 400 and 800 m elevation.

SYNONYMY: Hyeronimo-Sloanetum curatellifoliae (Borhidi 1991).

REFERENCES: Borhidi (1991).

***I.A.I.N.b. Laplacea haematoxylon* Forest Alliance (*Laplacea haematoxylon* submontane rain forests)**

CONCEPT: Submontane forest community co-dominated by *Laplacea haematoxylon*, occurring (at present) slightly above 600 m elevation in Jamaica, on dark-brown soils derived from shales or volcanic bedrocks.

DISTRIBUTION: Jamaica: The Blue Mountains.

SYNONYMY: Lower montane rain forest (Asprey & Robbins 1953; Grossman *et al.* 1993), in part.

***Laplacea haematoxylon* - *Solanum punctulatum* - *Turpinia occidentalis* Forest**

DESCRIPTION: Forest community with two tree strata, the 12-18 m upper one essentially co-dominated by three species: *Laplacea haematoxylon*,

Solanum punctulatum, and *Turpinia occidentalis*. The 4-10 m second canopy layer is richer in species: *Mecranium purpurascens*, *Psychotria corymbosa* and *Cestrum hirtum* are usually well represented, and tree-ferns are very frequent, particularly *Cyathea pubescens*. A characteristic diagnostic species of this association is *Boehmeria caudata*, which is absent from other forest types in the area. The shrub layer includes *Besleria lutea*, *Piper arboreum*, *Piper fadyenii*, *Acalypha virgata* and *Tournefortia glabra*, and the thick-stemmed woody climber *Marcgravia brownei* is present.

DISTRIBUTION: Jamaica: The Blue Mountains.

COMMENTS: The windward (north-facing) forests of this type differ from those in the leeward (south-facing) sides most noticeably in the abundance of pendent bryophytes and filmy ferns (Hymenophyllaceae), as well as a more hygrophilous ground flora.

SYNONYMY: Gully forest over shale or volcanic substrata (Grubb & Tanner 1976; Shreve 1914).

REFERENCES: Asprey & Robbins (1953); Grossman *et al.* (1993).

***Laplacea haematoxylon* - *Clethra occidentalis* - *Calophyllum calaba* Forest**

DESCRIPTION: Successional association established following disturbance of the former Laplacea-Solanum-Turpinia Forest, mostly by selective cutting of larger trees for timber. Small trees and tall weedy shrubs (e.g. *Piper* spp. and *Goldfusia colorata*) replace the original structure of the forest; the original association's species composition and coverage change by prevalence, under-representation, or absence of many of its associates. *Clethra occidentalis*, *Matayba apetala*, *Alchornea latifolia*, and small individuals of *Calophyllum calaba* are usually abundant. Other species may include *Laplacea haematoxylon*, *Guarea swartzii*, *Sapium jamaicense*, *Solanum punctulatum*, *Hedyosmum arborescens*, *Turpinia occidentalis*, and others.

DISTRIBUTION: Jamaica: The Blue Mountains range.

SYNONYMY: Disturbed gully forest (Grossman *et al.* 1993).

REFERENCES: Asprey & Robbins (1993); Grossman *et al.* (1993);

Muchoney *et al.* (1994).

***I.A.I.N.b. Mora abbottii* Forest Alliance (*Mora abbottii* submontane rain forest)**

CONCEPT: Tall evergreen forests of Hispaniola dominated by *Mora abbottii*, occurring below 800 m altitude in areas with an average yearly rainfall of more than 2,400 mm.

DISTRIBUTION: Dominican Republic: Cordillera Septentrional; Cordillera Central.

SYNONYMY: Bosque de *Mora abbottii* (Hager & Zanoni 1993).

***Mora abbottii* - *Cyrilla racemiflora* - *Ocotea leucoxylon* Forest**

DESCRIPTION: A 25 m tall evergreen forest with emergent trees up to 35 m tall co-dominated by *Mora abbottii*, *Cyrilla racemiflora*, and *Ocotea leucoxylon*. *Mora abbottii* is usually the prevalent species, sometimes covering 20% of the canopy strata. Other arboreal species may include *Pouteria domingensis*, *Calyptronoma dulcis*, *Carapa guianensis*, *Sloanea berteroa*, *Tabebuia* sp., and many others. A very common epiphyte in this association is *Vriesea ringens*. Despite the dominance of *Mora abbottii*, this is a fairly rich community and about 40 species of trees have been reported in just one hectare of forest. However, the understory is poor and mostly formed by offspring of the canopy trees.

DISTRIBUTION: Dominican Republic: northeastern Cordillera Septentrional (Moca-Nagua); eastern Cordillera Central (Sierra Prieta, Loma Peguera, Bonaó, Casabito, Panchole-San Cristóbal, Banilejo-Rancho Arriba).

COMMENTS: This association is mostly found at 400-800 m elevation.

However, some stands (i.e. Sierra Prieta and Loma Peguera/Bonaó) may occur at lower altitude (150 and 200 m, respectively).

SYNONYMY: Bosque de *Mora abbottii* (Hager & Zanoni 1993).

REFERENCES: Hager & Zanoni (1993).

***I.A.I.N.b. Oxandra laurifolia* - *Tetragastis balsamifera* Forest Alliance (*Oxandra laurifolia* lowland rain forests)**

CONCEPT: Lowland forest community on red soils, occurring in small protected valleys alternating with the steep-sided (haystack) limestone mountains of northeastern Hispaniola, in areas with 2,000-2,200 mm of evenly distributed annual rainfall. Two closed canopy layers are present.
DISTRIBUTION: Hispaniola: Dominican Republic, in Los Haitises; Haiti? (Cape Jackson?).
SYNONYMY: Foresta udica a livello del mare (Ciferri 1936), in part; Bosque de Los Haitises (Hager & Zanoni 1993), in part.

***Oxandra laurifolia* - *Tetragratis balsamifera* - *Dendropanax arboreus* Forest**

DESCRIPTION: The 25-30m tall upper canopy is mainly composed of *Oxandra laurifolia*, *Tetragratis balsamifera*, *Dendropanax arboreus*, *Guarea guidonea*, *Sloanea berteriana* and *Ocotea* spp. Typical associates of the 5-15 m tall second canopy layer include small individuals of the above mentioned species, but also *Prestoea montana*, *Turpinia occidentalis*, *Cordia sulcata*, *Ormosia krugii*, and *Calyptronoma* spp.

DISTRIBUTION: North-east Hispaniola (Dominican Republic): Los Haitises range.

SYNONYMY: Foresta udica a livello del mare (Ciferri 1936), in part; Vegetación de los Valles, in Bosque de Los Haitises (Hager & Zanoni 1993).

REFERENCES: Hager & Zanoni (1993).

***I.A.1.N.b. Sloanea berteriana* - *Ormosia krugii* Forest Alliance (*Sloanea berteriana* submontane rain forests)**

CONCEPT: Submontane tropical forests of Hispaniola with a dense canopy dominated by *Sloanea berteriana*, *Ormosia krugii* and others, in areas of average yearly rainfall exceeding 2,000 mm. These rich communities seem to have formerly occupied large areas in the Cordillera Central (Dominican Republic).

DISTRIBUTION: Hispaniola.

SYNONYMY: Foresta udica su suolo acido (Ciferri 1936).

***Sloanea berteriana* - *Ormosia krugii* - *Laetia procera* Forest**

DESCRIPTION: Tall submontane forest with two canopy layers, the uppermost may reach 25 m in height or slightly more. This association is dominated by *Sloanea berteriana*, *Ormosia krugii*, and *Laetia procera*. Other tree species of the upper canopy include *Buchenavia tetraphylla*, *Tetragratis balsamifera*, *Carapa guianensis*, *Oreopanax reticulatus* and many others. The second canopy layer may include *Byrsonima spicata*, *Ocotea leucoxydon*, *Guarea guidonia*, *Casearia arborea*, *Eugenia domingensis*, *Cyathea arborea*, *Bactris plumeriana*, *Prestoea montana*, etc. The shrub layer is mostly dominated by species of *Psychotria* such as *Psychotria uliginosa* and *Psychotria berteriana*.

DISTRIBUTION: Hispaniola: mostly in Cordillera Central.

COMMENTS: This community seems to be close to the submontane primeval forest association in central Hispaniola, which has been largely altered, or depleted. Small stands occur in Loma Herradura, south to Miches (Dominican Republic).

SYNONYMY: Associazione Sloanea-Ormosia (Ciferri 1936), in part; Bosque de la Cordillera Oriental (Hager & Zanoni 1993), in part.

REFERENCES: Ciferri (1936); Hager & Zanoni (1993).

***Didymopanax morototoni* - *Ormosia krugii* - *Inga fagifolia* - *Sloanea berteriana* Forest**

DESCRIPTION: Submontane forest community with two canopy layers, the uppermost 15-20 m high, with *Didymopanax morototoni*, *Ormosia krugii*, *Inga fagifolia*, *Sloanea berteriana*, *Zanthoxylum elephantiasis* and *Z. marticense* as prevalent species. Tree-ferns (*Cyathea* spp.), palms, and lianas such as *Securidaca virgata*, *Paullinia pinnata*, *Marcgravia rectiflora*, and *Entada gigas*, are usually abundant, while in many places *Urera baccifera* dominates the shrub layer. *Scleria melaleuca* is often abundant.

DISTRIBUTION: Hispaniola: mostly in Cordillera Central.

COMMENTS: This is a successional forest established following disturbance of the Sloanea-Ormosia-Laetia association.

SYNONYMY: Associazione Sloanea-Ormosia (Ciferri 1936), in part; Bosque de la Cordillera Oriental (Hager & Zanoni 1993), in part.

REFERENCES: Ciferri (1936); Hager & Zanoni (1993).

***I.A.I.N.b. Thespesia grandiflora* Forest Alliance**

CONCEPT: Forests on hill slopes, dominated by *Thespesia* (= *Montezuma*) *grandiflora*. These uncommon forests are often nearly monospecific, and are particularly prevalent following disturbance. They seem to have formerly occupied larger areas in the past.

DISTRIBUTION: Puerto Rico.

COMMENTS: This forest type is limited to Puerto Rico (the dominant species is endemic).

I.A.I.N.c. Montane tropical or subtropical rain forest

(MONTANE RAIN FOREST)

(BOSQUE PLUVIAL MONTANO)

***I.A.I.N.c. Alchornea latifolia - Solanum acropterum* Forest Alliance (*Alchornea latifolia - Solanum acropterum* montane rain forests)**

CONCEPT: Tropical montane rain forests of Jamaica on limestone-derived soils, over 900 m elevation, with *Alchornea latifolia*, *Solanum acropterum*, *Calyptronoma occidentale*, *Piper discolor*, and other species.

DISTRIBUTION: Jamaica: the John Crow Mountains.

SYNONYMY: Upper montane rain forest (Richards 1952; Grubb *et al.* 1963; Grossman *et al.* 1993), in part; Upper montane wet limestone forest (Grubb & Tanner 1976); Upper montane rain forest over limestone (Muchoney *et al.* 1994).

***Alchornea latifolia - Calyptronoma occidentale - Solanum acropterum - Piper discolor* Forest**

DESCRIPTION: Rain forest community on limestone-derived light-brown clay loam, with a rather dense 8-11 m high canopy composed of *Alchornea latifolia*, *Solanum acropterum*, *Calyptronoma occidentale*, *Clethra occidentale*, *Piper discolor*, *P. arboreum*, *Laplacea haematoxylon*, *Hedyosmum arborescens*, *Guarea swartzii*, *Cleyera thaeoides*, *Conostogia montana*, and others. This association shares a number of species with the lower *Psidium montanum* submontane rain forests on limestone soils, e.g. *Calyptronoma occidentale*, *Picramnia antidesma*, *Cordia elliptica*, *Ardisia brittonii*, *Psychotria discolor*, and *Syngonium auritum*, but the species *Solanum acropterum* has not been recorded in other montane forest types. Climbers are frequent and epiphytes abundant. The rather poor in species herb layer may be dominated almost exclusively by *Diplazium costale*.

DISTRIBUTION: Jamaica: the John Crow Mountains.

SYNONYMY: Upper montane wet limestone forest (Grubb & Tanner 1976); Typical variant of the upper montane rain forest over limestone (Muchoney *et al.* 1994).

REFERENCES: Grubb & Tanner (1976); Grossman *et al.* (1993); Muchoney *et al.* (1994)..

***Symphonia globulifera - Alchornea latifolia* Forest**

DESCRIPTION: Essentially similar in tree species composition to the *Alchornea latifolia - Calyptronoma occidentale - Solanum acropterum - Piper discolor* Forest, but distinguished by its more open appearance, the presence of *Symphonia globulifera* and other species which favour soils with impeded drainage, and the much greater cover of the herb layer. This can be composed of *Scleria cubensis*, *Dicranopteris pectinata* and *Odontosoria jennmanii*. This association is dispersed in patches among the above mentioned forest, influenced by impeded drainage, on a dark-brown clay loam with massive structure.

DISTRIBUTION: Jamaica: The John Crow Mountains.

SYNONYMY: Edaphic variant of the upper montane rain forest over limestone (Muchoney *et al.* 1994).

REFERENCES: Muchoney *et al.* 1994.

***I.A.I.N.c. Bonnetia cubensis* Forest Alliance (*Bonnetia cubensis* montane rain forests)**

CONCEPT: Tropical montane rain forests dominated or co-dominated by *Bonnetia cubensis*, on rather poor acid ferrallitic soils, in the serpentine plateaus of eastern Cuba between 800 and 900 m elevation.

DISTRIBUTION: East Cuba: Cuchillas de Moa and Toa.

SYNONYMY: *Pluvivilva montana* de las serpentinitas (Arecas-Mallea 1978), in part; *Podocarpus-Byrsonimion orientensis* (Borhidi *et al.* 1991), in part; Semi-arid montane serpentine rainforests (Borhidi 1991), in part.

***Bonnetia cubensis* - *Pera ekmanii* - *Podocarpus ekmanii* Forest**

DESCRIPTION: Serpentine rainforest community of the high plateaus of the Cuchillas de Moa and Toa, in eastern Cuba. Characteristic species include *Bonnetia cubensis*, *Pera ekmanii*, *Podocarpus ekmanii*, *Moacroton ekmanii*, *Tabebuia dubia*, *T. clementis*, *Laplacea moaensis*, and *Purdiaea moaensis*. Other associates that may be locally abundant include *Hyeronima nipensis*, *Jacquiiniella globosa*, *Chionanthus (Linociera) domingensis*, *Matayba domingensis*, *Spathelia pinetorum*, *Tapura cubensis*, *Bactris cubensis*, and the tree-fern *Alsophila aquilina*.

DISTRIBUTION: East Cuba: Cuchillas de Moa and Toa ranges.

COMMENTS: This association shares many east-Cuban serpentine endemics with the *Hyeronima nipensis* submontane rain forests of Sierra de Nipe and Sierra Cristal.

SYNONYMY: *Podocarpus-Bonnetietum cubensis* (Borhidi 1991).

REFERENCES: Borhidi (1991).

***I.A.I.N.c. Cordia elliptica* - *Chimarrhis cymosa* - *Tovomita plumieri* - *Pouteria chrysophylloides* Forest Alliance**

CONCEPT: Montane rainforest of Martinique. Forests occupying small areas at elevations of 900-1000m on the windward side and 1000-1100m on the leeward side of Martinique. Two tree strata without an emergent layer are present, and the canopy averages 20m in height. Common tree species include *Cordia elliptica*, *Chimarrhis cymosa*, *Tovomita plumieri*, *Pouteria chrysophylloides*, *Ocotea dominicana* (= *Nectandra dominicana*), *Sterculia caribaea*, *Cecropia peltata*, *Poeteria dussiana*, *Podocarpus coriaceus*, *Clusia plukenetii*, *Prestoea montana*, *Inga coruscans*, *Calyptanthus fasciculata*, *Myrcia martinicensis*, *Freziera undulata* var. *elegans*, *Cyathea arborea*, *Cyathea muricata*, *Myrcia deflexa*, *Byrsonima martinicensis*, *Hedyosmum arborescens*, *Genipa americana*, *Ilex* spp., *Pouteria hahniana*, and *Rondeletia* spp.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988). Nominal species will likely need revision.

SYNONYMY: Montane Forest (Kimber 1988).

***I.A.I.N.c. Cyathea arborea* Forest Alliance**

CONCEPT: Tree-fern forests of Puerto Rico, dominated by the tree ferns *Cyathea arborea* and other tree ferns, including *Cnemidaria horrida*.

DISTRIBUTION: Martinique, Puerto Rico.

COMMENTS: Should this be combined with the next alliance?

SYNONYMY: Fern Scrub -- 77.4 (Dansereau 1966).

REFERENCES: Dansereau (1966); Kimber (1988).

***Cyathea arborea* - *Cnemidaria horrida* / *Dicranopteris nervosa* - *Sticherus bifidus* Forest**

DESCRIPTION: Other species include *Odontosoria aculeata*, *Palhinhaea cernua*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Fern Savana -- 77.3 (Dansereau 1966).

***Cyathea muricata* - *Cyathea arborea* Forest**

DESCRIPTION: The 5-10m tall canopy is dominated by combinations of *Cyathea muricata* and *Cyathea arborea*. Other typical species include *Oreopanax capitatum* and *Didymopanax urbanianum*, *Guzmania plumieri*, *Pitcairnia* sp., *Blechnum binervatum*, and abundant lycopods, mosses, and grasses.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Tree Fern Colonies (Kimber 1988).

I.A.I.N.c. *Cyrilla racemiflora* - *Micropholis* spp. Forest Alliance

DISTRIBUTION: Puerto Rico.

REFERENCES: Weaver 1994.

***Cyrilla racemiflora* - *Micropholis guyanensis* - *Micropholis garciniifolia* - *Ocotea spathulata* Forest**

DESCRIPTION: Other typical species include *Magnolia splendens* (in Luquillo Mountains), *Magnolia portoricensis* (in the central mountains), *Didymopanax gleasonii*, *Micropholis chrysophylloides*, *Croton poecilanthus*, and *Prestoa montana*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Colorado Forest.

I.A.I.N.c. *Magnolia cubensis* ssp. *acunae* Forest Alliance (*Magnolia cubensis* ssp. *acunae* montane rain forests)

CONCEPT: Humid montane rain forests of central Cuba forming a vegetation belt between 800 and 1,100 m, on yellow tropical soils. Characteristic trees are *Magnolia cubensis* ssp. *acunae*, *Ocotea acunaiana*, *Torralsbasia lenticellata*, and others. This central-Cuban rain forest community is less rich and diverse than its climax equivalent in the ranges of eastern Cuba.

DISTRIBUTION: Central Cuba: Sierra del Escambray.

SYNONYMY: Pluvisilva montana de las rocas cuarcíferas (Areces-Mallea 1978), in part;

Magnolion cubensis (Borhidi *et al.* 1979), in part; Bosque pluvial montano (Capote & Berazaín 1984; Capote *et al.* 1989), in part; Wet montane rain forests (Borhidi 1991), in part.

***Magnolia cubensis* ssp. *acunae* - *Cyrilla racemiflora* Forest**

DESCRIPTION: Montane rain forest association characterized by *Magnolia cubensis* ssp. *acunae*, *Ocotea acunaiana*, *Ocotea floribunda*, *Torralsbasia lenticellata*, *Miconia cubensis*, *Miconia albescens*, *Gesneria viridiflora* ssp. *colorata*, and others. The presence of submontane elements and some endemic taxa in the herb and shrub layers, such as *Pilea clarana*, *Pilea cellulosa*, *Pilea clementis*, and *Psychotria martii*, are also typical.

DISTRIBUTION: Central Cuba: Sierra del Escambray ranges.

COMMENTS: This association often occurs as extrazonal stands in the mountain ranges of Escambray.

SYNONYMY: Magnolio acunae-Cyrilletum racemiflorae (Borhidi 1991).

REFERENCES: Borhidi (1991).

I.A.I.N.c. *Magnolia hamorii* Forest Alliance (*Magnolia hamorii* montane rain forests)

CONCEPT: Montane rain forests dominated or co-dominated by *Magnolia hamorii*, on the exposed summits of Sierra de Bahoruco Oriental (Hispaniola), between 950 and 1,500 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): Southwest to Barahona, in Sierra de Bahoruco Oriental.

SYNONYMY: Bosques de Ebano (Hager & Zanoni 1993), in part.

***Magnolia hamorii* - *Oreopanax capitatus* - *Didymopanax tremulus* Forest**

DESCRIPTION: Rain forest community with a scattered 15-20 m high upper canopy co-dominated by *Magnolia hamorii*, *Oreopanax capitatus*, *Didymopanax tremulus*, *Ficus maxima*, *Ocotea leucoxydon*, *Ocotea* sp., *Persea krugii*, *Beilschmiedia pendula*, *Chionanthus ligustrinus*, *Anthirea oligantha*, *Chione* sp., and *Obolonga Zanonii*. The denser 10-12 m high second canopy layer is formed by the offsprings of the tallest trees, and also by medium-size and small trees such as *Clusia clusioides*, *Prestoea montana*, *Miconia mirabilis*, *Myrsine coriacea*, *Ocotea nemodaphne*, and others. Shrubs include *Mecranium ovatum*, *Meriania involucrata*, *Cestrum daphnoides*, *Macrocarpea domingensis*, *Hedyosmum domingense*, *Psychotria berterii* and *Cyathea* sp.

DISTRIBUTION: Hispaniola (Dominican Republic): highlands between Loma Pie de Palo, Loma la Trocha de Rey (Monteada Nueva), Loma Remigio.

SYNONYMY: Bosque de *Magnolia hamorii* (Hager & Zanoni 1993), in part.

REFERENCES: S.E.A. (1990); Hager & Zanoni (1993).

***Magnolia hamorii* - *Brunellia comocladifolia* - *Alchornea latifolia* Forest**

DESCRIPTION: With a first canopy layer of rather dispersed tall trees (*Magnolia hamorii*, *Didymopanax tremulus*, and others), and a second canopy layer dominated by *Brunellia comocladifolia*, *Alchornea latifolia*, *Prestoea montana* and *Magnolia hamorii*. Bamboo-grass climbers (*Arthrostylidium* spp.) often become dominant in the understory.

DISTRIBUTION: Hispaniola (Dominican Republic): Highlands between Loma Pie de Palo, Loma la Trocha de Rey (Monteada Nueva), Loma Remigio.

COMMENTS: This is a successional community established in areas where the original *Magnolia hamorii* - *Oreopanax capitatus* - *Didymopanax tremulus* forest is disturbed, mostly because of mining and colonization.

SYNONYMY: Bosque de *Magnolia hamorii* (Hager & Zanoni 1993), in part.

REFERENCES: S.E.A. (1990); Hager & Zanoni (1993).

I.A.I.N.c. *Magnolia pallescens* Forest Alliance (*Magnolia pallescens* montane rain forests)

CONCEPT: Rain forest vegetation dominated or co-dominated by *Magnolia pallescens*, on the exposed summits and ridges of the Cordillera Central (Hispaniola), between 1,100 and 1,600 m elevation, on reddish or yellowish acidic montane soils.

DISTRIBUTION: Hispaniola (Dominican Republic); eastern Cordillera Central.

SYNONYMY: Bosques de Ebano (Hager & Zanoni 1993), in part.

***Magnolia pallescens* - *Didymopanax tremulus* - *Prestoea montana* Forest**

DESCRIPTION: With a scattered, rather open 15-20 m high upper canopy layer dominated by *Magnolia pallescens* and *Didymopanax tremulus*, and a 10-12 m high second tree layer with *Prestoea montana*, *Haenianthus salicifolius*, *Myrsine magnolifolia*, *Clusia clusioides*, *Ocotea nemodaphne*, *Miconia mirabilis*, *Podocarpus hispaniolanus*, *Guatteria blainii*, *Hedyosmum nutans*, etc. Tree-ferns (i.e. *Cyathea parvula*, *C. fulgens*) are common. A well developed shrub layer composed of *Psychotria* ssp. *Palicourea alpina*, *Cestrum inclusum*, *Gomidesia lindeniana*, *Scolosanthus grandifolius*, *Lunania ekmanii*, and others, is also present.

DISTRIBUTION: Hispaniola (Dominican Republic): Loma Golondrina; Loma La Sal, southwards (Casabito).

COMMENTS: This montane association can be readily distinguished from the *Magnolia pallescens*-*Tabebuia vinosa* cloud forest, by the presence of the conspicuous montane palm *Prestoea montana*, which is totally absent in the latter.

SYNONYMY: Bosque de *Magnolia pallescens* (Hager & Zanoni 1993), in part.

REFERENCES: Hager & Zanoni (1993).

I.A.I.N.c. *Ocotea ekmanii* - *Magnolia cubensis* ssp. *cubensis* Forest Alliance (*Ocotea ekmanii* - *Magnolia cubensis* ssp. *cubensis* montane rain forests)

CONCEPT: Humid montane rain forests of eastern Cuba forming a vegetation belt between 800 and 1600 m, on mountain yellow tropical soils. Prevalent trees in these forests are *Ocotea ekmanii* and *Magnolia cubensis* ssp. *cubensis*.

DISTRIBUTION: East Cuba: Sierra Maesta; Sierra del Purial.

SYNONYMY: Pluvial silva montana de las rocas cuarcíferas (Areces-Mallea 1978), in part;

Magnolion cubensis (Borhidi *et al.* 1979), in part; Bosque pluvial montano (Capote & Berazaín 1984; Capote *et al.* 1989), in part; Wet montane rainforests (Borhidi 1991), in part.

***Magnolia cubensis* ssp. *cubensis* - *Laplacea angustifolia* - *Ocotea ekmanii* Forest**

DESCRIPTION: Rich montane forest with two canopy layers, in areas of 1,700-3,000 mm of yearly rainfall. The rather closed 20-25 m high upper canopy is co-dominated by *Magnolia cubensis* ssp. *cubensis* and *Laplacea angustifolia*, accompanied by many other tree-species such as *Ocotea ekmanii*, *Ocotea cuneata*, *Guatteria blainii*, *Freziera grisebachii*, *Laplacea urbanii*, *Cleyera nimanimae*, and *Cyrilla racemiflora*. The second canopy layer is dominated by Melastomataceae and tree-ferns. Epiphytes are abundant and diverse. Other characteristic species of this association include *Torrabasia cuneifolia*, *Solonia reflexa*, *Ditta maestrensis*, *Lasianthus lanceolatus*,

Graffenrieda rufescens, *Ilex macfadyenii*, *Brunellia comocladifolia* and *Weinmannia pinnata*.

DISTRIBUTION: East Cuba: Sierra Maestra; Sierra del Purial.

COMMENTS: This association represents the climax vegetation between 800 and 1,600 m, in southeastern Cuba.

SYNONYMY: High open forests (Seifritz 1943); Fangales (León 1946); Magnolio-laplacetum angustifoliae (Borhidi 1991).

REFERENCES: Seifritz (1943); León (1946); Borhidi (1991).

***Ocotea ekmani* - *Cyrilla racemiflora* Forest**

DESCRIPTION: Somewhat drier and less diverse montane forest community dominated by *Ocotea ekmanii* and other microphyllous sclerophyllous trees such as *Cyrilla racemiflora*, *Persea similis*, *Tabebuia oligolepis* and *Myrsine coriacea*, on the steep dry ridges and slopes of the Sierra Maestra range in eastern Cuba. Another diagnostic character of this community with respect to the former one, is the total absence of tree-ferns in the second canopy layer.

DISTRIBUTION: East Cuba: Sierra Maestra range.

COMMENTS: This association occurs in the same mountain range (Sierra Maestra), and at the same altitudinal level as the former one. However its occurrence is conditioned edaphically to the humid sandstone outcrops, or mesoclimatically to the dry ridges and steep slopes.

SYNONYMY: *Ocotea ekmanii*-*Cyrillium racemiflorae* (Borhidi 1991).

REFERENCES: Borhidi (1991).

I.A.I.N.c. *Ocotea krugii* - *Ocotea dominicana* - *Ocotea coriacea* - *Ocotea cernua* Forest Alliance

CONCEPT: Laurel forests of montane situations in the Lesser Antilles. The concept and name may need some modification with additional information from more islands.

DISTRIBUTION: Martinique, others?

***Ocotea krugii* - *Ocotea dominicana* - *Ocotea coriacea* - *Ocotea cernua* Forest**

DESCRIPTION: Occurring in very limited areas on exposed spur ridges.

Canopy 15-20m tall is dominated by evergreen, mesophyll trees of the Lauraceae. Dominant and characteristic tree species are *Ocotea krugii* (= *Ocotea globosa*), *Ocotea dominicana* (= *Nectandra dominicana*), *Ocotea coriacea*, *Ocotea cernua*, *Styrax glaber*, *Cinnamomum elongatum*, *Persea urbaniana*, *Beilschmiedea pendula*, and *Anida ramageana*. The shrub layer is sparse, and includes *Endlicheria sericea*, *Chrysobalanus cuspidatus*, *Dahlbergia monetaria*, *Hedyosmum arborescens*, *Clibadium erosum*, *Charianthus corymbosus*, *Cestrum alternifolium*, *Piper reticulatum*, *Piper dussii*, *Piper glabrescens*, *Piper aequale*. The herb layer is rich and dense, and includes *Eupatorium magdalenae*, *Heliconia bihai*, *Heliconia caribaea*, *Blechnum ryanii*, *Pteris biaurita*, *Pityrogramma chrysophylla*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Laural Forest (Kimber 1988).

I.A.I.N.c. *Prestoea montana* Forest Alliance

Sierra Palm Forest Alliance; Palma de sierra Forest Alliance

CONCEPT: Forests on montane slopes dominated by *Prestoea montana*.

DISTRIBUTION: Cuba, Hispaniola, Puerto Rico, Martinique, [West Indies].

REFERENCES: Weaver 1994.

***Prestoea montana* / *Byrsonima martinicensis* - *Ilex sideroxyloides* Forest**

DESCRIPTION: This forest occurs at elevations of 250-800m in Martinique, on windward and interior, steep, very exposed slopes that are prone to landslide. The 3-8m tall canopy is dominated by *Prestoea montana*, with short, gnarled small trees of *Byrsonima martinicensis*, *Ilex sideroxyloides*, and *Hedyosmum arborescens*. Large herbs such as *Heliconia bihai*, *Anthurium spp.*, and *Asplundia rigida* are common. Mosses, ferns, and lycopods are abundant and diverse.

DISTRIBUTION: Martinique.

SYNONYMY: Palm Brake, in part (Kimber 1988).

***Prestoea montana* / *Cordia borinquensis* - *Miconia sintenisii* Forest**

DESCRIPTION: This forest occurs at elevations of 500-1100m in Puerto Rico, on steeper slopes and wetter soils than the associated *Cyrilla racemiflora*-*Micropholis guyanensis*-*Micropholis garciniifolia*-*Ocotea spathulata* Forest. *Prestoea montana* dominates the 8-15m canopy, with lesser amounts of *Croton poecilanthus*, *Henriettea squamulosum*, *Cordia borinquensis*, *Psychotria berteriana*, *Hillia parasitica*, *Cecropia peltata*, *Ocotea leucoxydon*, *Micropholis garciniifolia*, and *Miconia sintenisii*. Understory trees and shrubs include *Daphnopsis philippiana*, *Comocladia glabra*, *Hedyosmum arborescens*, *Alsophila bryophila*, and *Cesneria sintenisii*. Woody vines include *Schlegelia brachyantha*, *Clusia gundlachii*, *Marcgravia sintenisii*, and *Ipomoea repanda*. Herbs include *Thelypteris deltoidea*, *Cyathea borinquena*, *Pilea krugii*, *Pilea inequalis*, *Begonia decandra*, *Ichnanthus pallens*, and *Scleria sp.* Epiphytes include *Nephrolepis rivularis* and *Guzmania berteriana*.

DISTRIBUTION: Puerto Rico.

COMMENTS: Based on Weaver (1994). Communities dominated by *Prestoea* occur on islands of the Lesser Antilles; their similarity to this community are uncertain.

SYNONYMY: Palm Brake (Beard 1949); Palm Forest (Weaver 1994); Sierra-palm Forest -- 88.1b (Dansereau 1966).

***I.A.I.N.c. Syagrus amara* Forest Alliance**

CONCEPT: Palm forests of the Lesser Antilles dominated by *Syagrus amara*.

DISTRIBUTION: Martinique.

COMMENTS: *Syagrus amara* is sometimes called *Rhyticocos amara*. This palm occurs on Montserrat, Guadeloupe, Dominica, St. Lucia, and Martinique; the community might also occur on other islands than Martinique. This community is restricted to small areas at mid-elevations on north-facing slopes in northern Martinique.

SYNONYMY: Palm Brake, in part (Kimber 1988); "petit coco".

I.A.I.N.d. Montane tropical or subtropical cloud forest

(CLOUD FOREST)

(BOSQUE NUBLADO)

***I.A.I.N.d. Clusia plukenetii* Forest Alliance**

CONCEPT: Cloud forests of Martinique.

DISTRIBUTION: Martinique.

***Clusia plukenetii* - *Charianthus nodosus* - *Rondeletia stereocarpa* - *Didymopanax attenuatum* Forest -- G1**

DESCRIPTION: Occupying very small areas (totalling less than one thousand acres) near the summits of the highest peaks of Martinique, Mont Pelée, Piton Géle, and the Carbet Pitons. The canopy is wind-sheared and tight, from 5-12m tall. Typical species are *Clusia plukenetii*, *Charianthus nodosus*, *Rondeletia stereocarpa*, *Didymopanax attenuatum*, *Prestoea montana*, *Podocarpus coriaceus*, *Cyathea arborea*, *Dunalia arborescens*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Elfin Woodland (Kimber 1988).

***I.A.I.N.d. Didymopanax tremulus* - *Podocarpus aristulatus* Forest Alliance (*Didymopanax tremulus* - *Podocarpus aristulatus* cloud forests)**

CONCEPT: Montane cloud forests co-dominated by *Didymopanax tremulus* and *Podocarpus aristulatus*, on the highlands of Hispaniola, between 1,600 and 2,200 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): Cordillera Central, Sierra de Neiba, Sierra de Bahoruco.

SYNONYMY: Bosque nublado de la Zona Alta (Hager & Zanoni 1993), in part.

***Didymopanax tremulus - Podocarpus aristulatus - Ocotea wrightii* Forest**

DESCRIPTION: Montane cloud forest with a closed 8-13 m high canopy and scattered emergent *Didymopanax tremulus*, *Podocarpus aristulatus*, and *Ocotea wrightii* trees attaining 15, and eventually 20 m high. Most common species forming the dense 8-13 m tall tree layer are *Brunellia comocladifolia*, *Trema micrantha*, *Weinmannia pinnata*, *Oreopanax capitatus*, and the tree-ferns *Cyathea fulgens* and *Cyathea furfuracea*. Among the shrubs, probably *Miconia selleana* is most characteristic. All these component plants support an extensive layer of vascular and non-vascular epiphytes. *Arthrostylidium* sp. may become locally abundant, especially in disturbed areas.

DISTRIBUTION: Hispaniola (Dominican Republic): Sierra de Neiba Occidental; Sierra de Bahoruco; Cordillera Central.

SYNONYMY: Bosque de *Didymopanax tremulus* (Hager & Zanoni 1993).

REFERENCES: Hager & Zanoni (1993).

***Podocarpus aristulatus* Forest**

DESCRIPTION: Dense montane cloud forest dominated by *Podocarpus aristulatus*, or co-dominated by the former species and *Didymopanax tremulus*, on the summits of Sierra de Neiba and highlands of Cordillera Central, between 1,800 and 2,200 m elevation. Old trees may attain 25 m high with trunks ca. 1 m diameter at base. Other tree-species present in this association may include *Ocotea wrightii*, *O. cicatricosa* and *Persea krugii*. Vascular and non-vascular epiphytes are abundant.

DISTRIBUTION: Hispaniola (Dominican Republic): Sierra de Neiba; Cordillera Central, in La Nevera (Reserva de Valle Nuevo).

COMMENTS: Small patches of this vegetation type may be present in other high montane areas of Hispaniola.

SYNONYMY: Bosque de *Podocarpus aristulatus* (Hager & Zanoni 1993).

REFERENCES: Hager & Zanoni (1993).

***I.A.I.N.d. Magnolia pallescens - Tabebuia vinosa* Forest Alliance (*Magnolia pallescens - Tabebuia vinosa* cloud forests)**

CONCEPT: Montane cloud forests of Hispaniola, with *Magnolia pallescens* and other tree species dominating the canopy, on the exposed summits and ridges of Cordillera Central, over 1,700 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): eastern Cordillera Central.

COMMENTS: Floristically related with the *Magnolia pallescens* montane forest alliance, however *Prestoea montana* is typically absent in this cloud forest alliance.

SYNONYMY: Bosques de Ebano (Hager & Zanoni 1993), in part.

***Magnolia pallescens - Tabebuia vinosa - Didymopanax tremulus* Forest**

DESCRIPTION: The 8-10 m tall canopy is dominated by *Tabebuia vinosa*, *Brunellia comocladifolia*, *Myrsine coriacea*, *Trema micrantha*, and others. Scattered emergent *Magnolia pallescens* and *Didymopanax tremulus* trees up to 15-18 m high are usually present. This association occurs on the yellowish acidic montane soils of eastern Cordillera Central, between 1,700 and 2,100 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): South of Constanza, near Los Mañanguises, Los Montes Llanos, La Siberia, and Pinar Parejo.

COMMENTS: When this cloud forest community is degraded, usually a successional mixed *Pinus occidentalis* forest establishes itself in the disturbed area.

SYNONYMY: Bosque de *Magnolia pallescens* (Hager & Zanoni 1993), in part.

REFERENCES: Hager & Zanoni (1993).

***I.A.I.N.d. Tabebuia rigida - Ocotea spathulata* Forest Alliance**

CONCEPT: Cloud forests of eastern Puerto Rico.

DISTRIBUTION: Puerto Rico.

REFERENCES: Weaver 1994.

***Tabebuia rigida* - *Ocotea spathulata* - *Eugenia borinquensis* - *Calypttranthes krugii*
Forest**

DESCRIPTION: Forests dominated by *Tabebuia rigida*, *Ocotea spathulata*, and *Eugenia borinquensis*, with many other species as well, including *Clusia krugiana*, *Haenianthus salicifolius*, *Ilex sideroxyloides*, *Alsophila bryophila*, *Prestoea montana*, *Psychotria berteriana*, *Calypttranthes krugii*, *Marliera sintenisii*, *Miconia sintenisii*, *Henriettea squamulosum*, and *Weinmannia pinnata* (many of these species are endemic to the higher elevations of Puerto Rico).

DISTRIBUTION: Puerto Rico.

SYNONYMY: Dwarf Forest; Elfin Woodland; Mossy Forest; Montane Thicket.

REFERENCES: Weaver 1994.

I.A.I.N.f. Tropical or subtropical seasonally flooded rain forest

(SEASONALLY FLOODED RAIN FOREST)

(BOSQUE PLUVIAL ESTACIONALMENTE INUNDADO)

***I.A.I.N.f. Pterocarpus officinalis* Forest Alliance**

CONCEPT: Freshwater swamps associated with rivers, dominated by *Pterocarpus officinalis*.

DISTRIBUTION: Puerto Rico, Martinique.

COMMENTS: This forest can be also found in a permanently/semi-permanently flooded condition. *Manilkara bidentata* and *Calophyllum calaba* are often associated with *Pterocarpus officinalis* in non riparian basins, in Puerto Rico.

SYNONYMY: Pterocarpus Swamp -- 39.1 (Dansereau 1966); Pterocarpus Swamp Woodland (Kimber 1988); "mangle medaille".

***Pterocarpus officinalis* Forest**

DESCRIPTION:

DISTRIBUTION: Puerto Rico.

***Pterocarpus officinalis* - *Manilkara bidentata* ssp. *surinamensis* - *Calophyllum brasiliense* Forest**

DESCRIPTION: This association occurs in non-riparian basins in northern Puerto Rico. Other species may include *Roystonea* sp.

DISTRIBUTION: Puerto Rico.

***I.A.I.N.j. Solution-hole tropical or subtropical broad-leaved evergreen forest*³⁶**

(SOLUTION-HOLE EVERGREEN FOREST)

(BOSQUE SIEMPREVERDE DE SUMIDERO)

(TYPES TO BE DEFINED)

***I.A.I.N.k. Tropical or subtropical riparian (gallery) forest*³⁷**

(RIPARIAN FOREST)

(BOSQUE RIPARIO)

(TYPES TO BE DEFINED)

Group: *I.A.3. Tropical and subtropical seasonal evergreen forest (mainly broad-leaved evergreen trees with some foliage reduction in dry season)*

Subgroup: *I.A.3.N. Natural/Semi-natural*

³⁶ New Formation (*sensu* Lindsay & Horwith 1997).

³⁷ New Formation.

I.A.3.N.a. Lowland tropical or subtropical seasonal evergreen forest
(LOWLAND SEASONAL EVERGREEN FOREST)
(BOSQUE ESTACIONAL SIEMPREVERDE DE BAJA
ALTITUD)

I.A.3.N.a. Ceiba pentandra - Roystonea spp. Forest Alliance (Ceiba pentandra - Roystonea spp. forests)

CONCEPT: Lowland meso-macrophyllous seasonal evergreen forests with *Ceiba pentandra* and *Roystonea* spp., extending to the lower zone of the middle ranges of the Antilles, conditioned by a seasonal tropical climate with 1,400-2,000 mm annual precipitation and 2-4 dry months. Two canopy layers are present, with emergent deciduous trees. In addition to *Ceiba pentandra* and *Roystonea* spp., other characteristic species may include *Mastichodendron foetidissimum*, *Guazuma ulmifolia*, *Zanthoxylum flavum*, *Z. martinicense*, *Cedrela odorata*, *Swietenia mahagoni*, *Bumelia salicifolia*, *Lonchocarpus* spp., and many others.

DISTRIBUTION: Greater and Lesser Antilles.

SYNONYMY: Guazumo-Cupanion (Borhidi *et al.* 1979);

Ardisia obovata - Aechmea lingulata Forest (TNC 7572)

DESCRIPTION: Evergreen forest found in sheltered valleys above 200 m, in the southern hills of Antigua.

DISTRIBUTION: Antigua: northern slope of Sugarloaf Mountain

COMMENTS: Loveless (1960) labels this Seasonal Evergreen Formation

SYNONYMY: Seasonal Evergreen (Loveless, 1960)

REFERENCES: Lindsay & Horwith (1997).

Cordia spp. - Inga laurina Forest (TNC 7573)

DESCRIPTION:

DISTRIBUTION: Antigua: Wallings Hill.

COMMENTS:

SYNONYMY:

REFERENCES: Lindsay & Horwith (1997).

Guazuma ulmifolia - Ceiba pentandra - Roystonea regia Forest

DESCRIPTION: Lowland seasonal forest with two evergreen canopy layers; the 20-25 m high upper one is somewhat open while the 8-15 m high lower one is rather closed. The deciduous *Ceiba pentandra*, which may attain 30-40 m tall, is a typical emergent tree. Typical species include *Guazuma ulmifolia*, *Ceiba pentandra*, *Roystonea regia*, *Mastichodendron foetidissimum*, *Lonchocarpus domingensis*, *L. latifolius*, *Luehea speciosa*, *Spondias mombin*, *Ficus membranacea*, *Andira inermis*, *Chlorophora tinctoria*, *Cordia gerascanthus*, *C. collococca*, *Guarea guidonia*, *Cupania macrophylla*, and many others. Lianas are frequent and abundant, epiphytes occur rather rarely, and the herb layer is almost completely missing.

DISTRIBUTION: Cuba.

COMMENTS: This probably was the dominant zonal lowland forest community of Cuba, but it is everywhere destroyed and substituted by second-growth evergreen or deciduous forests, palm-brakes, savannas and sugarcane fields. The isolated remnant stands have slightly different species combination due to various kinds of natural causes and human impacts.

SYNONYMY: Guazumo-Ceibetum (Borhidi 1991).

REFERENCES: Borhidi 1991.

Ocotea leucoxylon - Eugenia spp. Forest (TNC 7574)

DESCRIPTION:

DISTRIBUTION: Antigua: Boggy Peak/Dark Valley/Christian Valley, Dunning Valley, Blubber Valley.

COMMENTS:

SYNONYMY:

REFERENCES: Lindsay & Horwith (1997).

Sideroxylon foetidissimum - Sideroxylon salicifolium - Roystonea regia Forest

DESCRIPTION: Seasonal evergreen forest community of the Cuban plains and hilly areas, on limestone-derived soils. The upper canopy layer is usually co-dominated by *Sideroxylon foetidissimum* (= *Mastichodendron foetidissimum*), *Sideroxylon salicifolium* (= *Bumelia salicifolia*), *Roystonea regia*, *Bursera simaruba* and *Ficus crassinervis*. Other common trees may include *Cordia gerascanthus*, *Zanthoxylum elephantiasis*, *Andira inermis*, *Cassine xylocarpa*, *Cecropia shreberiana*, *Exotea paniculata*, *Allophylus cominia*, *Cedrela odorata*, *Trichilia hirta*, *Celtis trinervia*, *Pseudolmedia spuria*, *Petitia domingensis*, *Citharexylum caudatum*, *Guazuma ulmifolia*, *Pithecellobium arboreum*, *Casearia hirsuta*, *Guettarda elliptica*, *Oxandra lanceolata*, *Eugenia maleolens*, *Savia sessiliflora*, *Adelia ricinella*, *Erythroxylon confusum*, *Pera bumeliaefolia* and *Schoepfia chrysophylloides*. Woody climbers such as *Cissus sicyoides*, *Gouania lupuloides*, *Platygyne hexandra*, and *Chiococca alba* are often present.

DISTRIBUTION: Cuba: widely distributed from the Guanacahabibes peninsula, south of Isle of Pines and in the foothills of the limestone middle ranges of west and central Cuba.

COMMENTS: Several subassociations may be recognized in this community, with slightly different species combinations..

SYNONYMY: Mastichodendro-Dipholietum salicifoliae (Borhidi 1991).

REFERENCES: Borhidi (1991).

***Spondias mombin* - *Roystonea hispaniolana* - *Pithecellobium arboreum* Forest**

DESCRIPTION: Successional evergreen seasonal forest with two canopy layers and *Ceiba pentandra* as emergent tree, in lowland areas of Hispaniola, on deep, limestone-derived soils. Common species may include *Spondias mombin*, *Roystonea hispaniolana*, *Pithecellobium arboreum*, *Andira jamaicensis*, *Bucida buceras*, *Sloanea amygdalina*, *Pseudolmedia spuria*, *Oxandra laurifolia*, *Nectandra coriacea*, *Calyptanthes suzygium*, *Myrciaria floribunda*, *Allophylus cominia*, *Quararibaea turbinata*, and many others.

DISTRIBUTION: Hispaniola, Haiti and Dominican Republic.

COMMENTS: This association described by Ciferri as a lowland rainforest ("foresta udica a suolo neutro"), is obviously a second-growth forest community on the sites formerly occupied by evergreen seasonal forests.

SYNONYMY: Associazione Spondias-Oreodoxa (Ciferri 1936).

REFERENCES: Ciferri (1936).

***Spondias mombin* - *Roystonea regia* - *Guazuma ulmifolia* Forest**

DESCRIPTION: Successional association established following disturbance of the former *Guazuma ulmifolia* - *Ceiba pentandra* - *Roystonea regia* seasonal evergreen forest in Cuba, mostly by selective cutting of trees for timber. The original association's species composition and coverage change by prevalence, under-representation, or absence of many of its associates. Different species combinations are recognizable, due to different human interferences. Most common species usually include *Spondias mombin*, *Roystonea regia*, *Guazuma ulmifolia*, *Ceiba pentandra*, *Oxandra lanceolata*, *Crescentia cujete*, *Pithecellobium cubense*, *Samanea saman*, *Cecropia shreberiana*, *Cordia collococca*, *Nectandra coriacea*, *Bursera simaruba*, *Allophylus cominia*, *Drypetes alba*, *Guettarda combsii*, *Ficus* spp., *Eugenia* spp., and others.

DISTRIBUTION: Cuba.

COMMENTS: This second-growth forest community represents the Cuban variant of the *Spondias mombin* - *Roystonea hispaniolana* - *Pithecellobium arboreum* seral forest association of Hispaniola.

SYNONYMY: Spondiato-Roystonietum Ciferri (1936) *sensu* Borhidi (1991).

REFERENCES: Ciferri (1936); Borhidi (1991).

***Swietenia mahagoni* - *Ceiba pentandra* - *Roystonea hispaniolana* Forest**

DESCRIPTION: Seasonal evergreen forests of Hispaniola with a 15-20 m upper canopy and the deciduous *Ceiba pentandra* as emergent. Common species include *Swietenia mahagoni*, *Coccoloba diversifolia*, *Capparis frondosa*, *Celtis trinervia*, *Zanthoxylum elephantiasis*, *Z. martinicense*, *Guarea*

guidonia, Guazuma ulmifolia, Krugiodendron ferreum, Mastichodendron foetidissimum, Trichila hirta, T. pallida, and Catalpa longissima.

DISTRIBUTION: Hispaniola: Dominican Republic; Haiti?

COMMENTS: Hager & Zanoni's (1993) broadly defined "Bosques de *Swietenia-Coccoloba*" includes two different forest types which correspond to two different formations: The dry variant is obviously a lowland/submontane deciduous forest, while the humid one is the above described *Swietenia-Ceiba-Rovstonea* seasonal evergreen forest community.

SYNONYMY: Bosques de *Swietenia-Coccoloba* (Hager & Zanoni 1993), in part (humid variant).

REFERENCES: Hager & Zanoni (1993).

I.A.3.N.a. Cedrela mexicana - Andira inermis - Hymenaea courbaril Forest Alliance

CONCEPT: Seasonal forests of Martinique, at elevations of 10-500m, formerly occupying large portions of the island.

DISTRIBUTION: Martinique.

Simarouba amara - Andira inermis - Manilkara bidentata ssp. surinamensis - Hymenaea courbaril Forest

DESCRIPTION: Seasonal forests of N. Martinique. Typical tree species include *Simarouba amara, Andira inermis, Manilkara bidentata ssp. surinamensis, Hymenaea courbaril, Calophyllum calaba, Sapium caribaeum, Ocotea martinicensis, Ocotea leucoxylon, Inga ingoides, Eugenia monticola, Eugenia lambertiana, Chimarrhis cymosa, Meliosma herbertii.*

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Seasonal Forest, in part (Kimber 1988).

Andira inermis - Lonchocarpus pentaphyllus - Zygia latifolia - Cedrela mexicana - Hymenaea courbaril Forest

DESCRIPTION: Seasonal forests of S. Martinique. Typical tree species include *Andira inermis, Lonchocarpus pentaphyllus, Zygia latifolia, Cedrela mexicana, Hymenaea courbaril, Byrsonima coriacea,* and others.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Seasonal Forest, in part (Kimber 1988).

I.A.3.N.a. Guapira discolor - Pithecellobium keyense - Reynosia septentrionalis - Metopium toxiferum Forest Alliance

DISTRIBUTION: FL, Cuba, Bahamas.

Reynosia septentrionalis - Sideroxylon americanum - Pithecellobium keyense - Jacquinia keyensis Forest

DISTRIBUTION: Bahamas.

SYNONYMY: Whiteland Community (Correll and Correll).

I.A.3.N.a. Manilkara bidentata ssp. surinamensis Forest Alliance (Manilkara bidentata surinamensis forests)

CONCEPT: Lowland seasonal evergreen forest community dominated or co-dominated by *Manilkara bidentata ssp. surinamensis*, occurring below 400 m altitude in areas of high rainfall, in Puerto Rico. *Dacryodes excelsa* is not present in this vegetation type.

DISTRIBUTION: Puerto Rico.

COMMENTS: Dansereau (1966:20) called this vegetation type a "lowland rainforest". He used the term "seasonal evergreen forest" for a drier formation than Beard's (1944a) community of the same name. Dansereau's seasonal evergreen forest should be classified as a semi-deciduous forest. For further discussion see also Borhidi 1991.

SYNONYMY: Lowland rain forest (Dansereau 1966); *Diospyros revoluta* Forest Alliance (Weakley, in checklist of the vegetation of the West Indies, unpubl.).

Manilkara bidentata ssp. surinamensis - Diospyros revoluta Forest

DESCRIPTION: Lowland seasonal evergreen forests with *Diospyros revoluta, Manilkara bidentata ssp. surinamensis, Pouteria multiflora, Mammea*

americana, *Cassipourea elliptica*, *Faramea occidentalis*, *Petitia domingensis*, *Quararibaea turbinata*, and presumably many other species, occurring at low elevations in areas of high rainfall.

DISTRIBUTION: Puerto Rico.

COMMENTS: This lowland seasonal evergreen forest association, which seems to have occupied very little area in Puerto Rico, has been largely depleted and cannot be observed anywhere in its primeval state. However, disturbed stands apparently belonging to this community can be seen at the present time at Dorado, and on the lower slopes of the Luquillo mountains.

SYNONYMY: Lowland rain forest (Dansereau 1966); Dry Rain Forest (Gleason & Cook); dry lowland rain forest; evergreen coastal forest; lowland coastal forest.

REFERENCES: Dansereau (1966).

**I.A.3.N.b. Submontane tropical or subtropical seasonal evergreen forest
(SUBMONTANE SEASONAL EVERGREEN FOREST)
(BOSQUE ESTACIONAL SIEMPREVERDE SUBMONTANO)**

I.A.3.N.b. *Alchornea latifolia* - *Pseudolmedia spuria* Forest Alliance (*Alchornea latifolia* - *Pseudolmedia spuria* forests)

CONCEPT: Seasonal evergreen forests with two canopy strata and scattered emergent trees, occurring between 300 and 800 m in western and central Cuba. Characteristic species of this community in Cuba are *Matayba oppositifolia*, *M. apetala*, *Alchornea latifolia*, *Pseudolmedia spuria*, *Trophis racemosa*, *Margaritaria nobilis*, *Tabebuia shaferi*, *Antirhea radiata*, *Terminalia intermedia*, *Sloanea amygdalina*, *Dendropanax arboreus*, *Zanthoxylum martinicense*, and *Z. ekmanii*.

DISTRIBUTION: Central America; west and central Cuba.

SYNONYMY: *Alchorneo-Pseudolmedion spuriae* (Borhidi *et al.* 1979).

***Matayba oppositifolia* - *Pseudolmedia spuria* Forest**

DESCRIPTION: Submontane successional forest co-dominated by *Matayba oppositifolia* and *Pseudolmedia spuria*, occurring at 200-600 m elevation in western Cuba. In the remaining stands of this forest community the tall emergent trees are usually absent and the most valuable timber-producing species such as *Cedrela odorata*, *Swietenia mahagoni*, *Manilkara grisebachii* and *Cynometra cubensis* are very rarely seen. This selective cutting and logging has led to the overwhelming dominance of *Matayba* and *Pseudolmedia*, and the overrepresentation of *Roystonea regia* as well. *Cecropia shreberiana* also may become abundant in places.

DISTRIBUTION: West Cuba: Sierra del Rosario, Pinar del Rio prov.

SYNONYMY: *Mataybaeo-Pseudolmedietum spuriae* (Capote *et al.* 1985).

REFERENCES: Capote *et al.* (1985); Borhidi (1991).

I.A.3.N.b. *Calophyllum calaba* - *Calyptronoma occidentale* Forest Alliance (*Calophyllum calaba* - *Calyptronoma occidentale* submontane rain forests)

CONCEPT: Submontane forest community with *Calophyllum calaba* and *Calyptronoma occidentale*, occurring between 500 and 800 m elevation in Jamaica, on yellowish-brown soils derived from limestone bedrocks.

DISTRIBUTION: Jamaica: John Crow Mountains

SYNONYMY: Lower Montane Rain Forest (Asprey & Robbins 1953; Grossman *et al.* 1993), in part.

***Calophyllum calaba* - *Calyptronoma occidentale* - *Symphonia globulifera* - *Drypetes alba* Forest**

DESCRIPTION: With two tree strata, the 26-28 m upper one with occasional huge emergent trees of *Psidium montanum* reaching up to 40 m high, sometimes accompanied by *Symphonia globulifera*. This upper canopy is not dense. A somewhat ill-defined second canopy layer occurs from 10-13 m, and include palms (*Calyptronoma occidentale*). A diagnostic species combination for this community is: *Calophyllum calaba*, *Calyptronoma occidentale*, *Drypetes alba*, *Heliconia caribaea*, and *Cyathea grevilleana*. Other species

may include *Alchornea latifolia*, *Exothea paniculata*, *Guarea swartzii*, *Matayba apetala*, *Pithecellobium alexandri*, *Faramea occidentalis*, *Trophis racemosa*, and others. *Pilea* spp. are usually abundant in the herb layer.
DISTRIBUTION: Jamaica: western slopes of the John Crow Mountains.
COMMENTS: The John Crow Mountains of Jamaica form the eastern boundary of the low-lying humid Rio Grande Valley, where, according to Asprey & Robbins (1953), Tropical Lowland Rain Forest may have flourished in the past. This vegetation type, however, cannot be recognized in Jamaica today.
SYNONYMY: Lower wet limestone forest (Grubb & Tanner 1976); Wet limestone forest (Kelly *et al.* 1988).
REFERENCES: Adams (1972); Grubb & Tanner (1976); Grossman *et al.* (1993); Muchoney *et al.* (1994).

***Cecropia peltata* - *Calophyllum calaba* - *Nectandra* spp. Forest**

DESCRIPTION: A successional community established following disturbance of the Calophyllum - Calyptronoma - Symphonia - Drypetes Forest, mostly by selective cutting for timber. This association is characterized by the strong presence of the opportunistic species *Cecropia peltata*. *Nectandra antillana* and *Nectandra coriacea* are usually present. Other characteristics of this association include a less diverse flora, a structurally diminished form of the original forest, and a strong presence of climbers. The climbers cover the tops of the trees, uniting adjacent individuals and forming a web of stems which droop to the ground.
DISTRIBUTION: Jamaica: the John Crow Mountains.
SYNONYMY: Disturbed wet limestone forest (Grossman *et al.* 1993), in part; Modified lower montane rain forest (Muchoney *et al.* 1994), in part.
REFERENCES: Asprey & Robbins (1953); Grossman *et al.* (1993); Muchoney *et al.* (1994).

***Calophyllum calaba* - *Hibiscus elatus* - *Cedrela odorata* Forest**

DESCRIPTION: Essentially a highly disturbed Calophyllum - Calyptronoma - Symphonia - Drypetes Forest with admixture of a few introduced timber species, primarily *Hibiscus elatus* and *Cedrela odorata*. These species may be sparsely scattered to dominant within the forest association. May include other non-native species of economic value such as *Cocos nucifera* and *Musa* spp.
DISTRIBUTION: Jamaica: the John Crow Mountains.
COMMENTS: In most cases this association represents old forestry plantations that have been idle for many years and are now reverting to secondary forests.
SYNONYMY: Disturbed wet limestone forest (Grossman *et al.* 1993), in part; Modified lower montane rain forest (Muchoney *et al.* 1994), in part.
REFERENCES: Grossman *et al.* (1993); Muchoney *et al.* (1994).

***I.A.3.N.b. Sideroxylon* spp. - *Roystonea regia* Forest Alliance (*Sideroxylon* spp. - *Roystonea regia* forests)**

CONCEPT: Submontane seasonal forest community with two evergreen canopy strata, and scattered deciduous emergent individuals of *Sideroxylon jubillum* (= *Dipholis jubilla*), *Sideroxylon salicifolium* (= *Dipholis salicifolia*) and/or *Cedrela mexicana*, occurring between 200 and 800 m elevation in Cuba, in areas with an annual rainfall of 1,400-1,800 mm and seasonal climate (1-3 dry months).

DISTRIBUTION: Cuba.

SYNONYMY: Calophyllo-Dipholion (Borhidi, in Borhidi *et al.* 1979), in part.

***Sideroxylon jubillum* - *Roystonea regia* Forest**

DESCRIPTION: With a 20-25 m high, rather closed upper canopy, and a 8-15 m high lower tree stratum. The buttressed *Sideroxylon jubillum* (= *Dipholis jubilla*) is the most common emergent tree in this forest. Characteristic species of the upper canopy layer are *Roystonea regia*, *Calophyllum calaba*, *Zizyphus rhodoxylon*, *Ficus berteroi*, *Zanthoxylum martinicense*, *Zanthoxylum cubense*, *Didymopanax morototoni*, *Sapium jamaicense*, *Faramea occidentalis*, *Guarea guidonia*, *Cupania glabra*, and *Cupania americana*. The lower tree stratum

may include *Oxandra lanceolata*, *Oxandra laurifolia*, *Chrysophyllum argenteum*, *Dendropanax arboreus*, *Lonchocarpus latifolius*, *Sloanea amygdalina*, *Wallenia laurifolia* and *Ateramnus lucidus*.

DISTRIBUTION: East Cuba: Sierra Maestra mountain range.

COMMENTS: This association only occurs on yellow-red mountain soils derived from andesite and/or granodiorite bedrocks.

SYNONYMY: Yayales (León 1946); Oxandro-Dipholietum jubillae (Borhidi 1991).

REFERENCES: León (1946); Borhidi (1991).

***Sideroxylon salicifolium* - *Cedrela odorata* - *Roystonea regia* Forest**

DESCRIPTION: This community is essentially similar in structure to the *Sideroxylon jubillum* - *Roystonea regia* Forest that as the former association, it differs slightly in species composition, especially of the upper canopy layer. While in the *Sideroxylon jubillum* - *Roystonea regia* Forest *Sideroxylon jubillum* (= *Dipholis jubilla*) is the dominant emergent, or more often the only emergent tree, in this association the former species is replaced by *Sideroxylon salicifolium* (= *Dipholis salicifolia*) and *Cedrela mexicana*.

DISTRIBUTION: East Cuba.

COMMENTS: Because the forest zone to which it belongs is particularly suitable for tropical agriculture, undisturbed stands of this forest type are not commonly seen in Cuba, at present.

SYNONYMY: None.

REFERENCES: Borhidi (1991).

I.A.3.N.e. Seasonally/temporarily flooded tropical or subtropical seasonal evergreen forest

**(SEASONALLY/TEMPORARILY FLOODED SEASONAL
EVERGREEN FOREST)
(BOSQUE ESTACIONAL SIEMPREVERDE
ESTACIONALMENTE/TEMPORALMENTE
INUNDADO)**

***I.A.3.N.e. Hibiscus elatus - Swietenia mahagoni* Forest Alliance (*Hibiscus elatus* - *Swietenia mahagoni* forests)**

CONCEPT: Seasonal evergreen forests of the regularly flooded alluvial plains and low, temporarily flooded basins at the edge of swamps in Cuba. This community depends upon the existence of a seasonal tropical climate with 2-4 dry months.

DISTRIBUTION: Cuba.

SYNONYMY: Hibisco-Swietenion mahagoni (Borhidi *et al.* 1979).

***Hibiscus elatus* - *Calophyllum calaba* Forest**

DESCRIPTION: Seasonally flooded evergreen forest community occurring on the somewhat higher plains of the swamp basins of Cuba, and in the supralittoral marsh-zone, mostly in the great flat peninsulas of quaternary limestone (Guanacahabibes, Zapata, south Isle of Pines), and along the low southern coastal area of the Cuban plain. This forest association is co-dominated by *Hibiscus elatus* and *Calophyllum calaba* and has a high frequency and abundance of macro- and mesophyllous climbers and xerophytic epiphytes (*Tillandsia* spp.).

DISTRIBUTION: Cuba.

SYNONYMY: Hibisco-Calophylletum antillanae (Borhidi 1991).

REFERENCES: Borhidi (1991).

***Lysiloma bahamensis* - *Metopium brownei* - *Swietenia mahagoni* Forest**

DESCRIPTION: Alluvial seasonal evergreen forest association on regularly flooded lowland limestone areas, with two canopy layers and some deciduous elements. Prevalent trees are *Lysiloma bahamensis*, *Metopium brownei*, and *Swietenia mahagoni*. Other species may include *Bucida buceras*, *Bursera simaruba*, *Linociera ligustrina*, *Nectandra coriacea*, *Chrysophyllum oliviforme*,

Erythroxylon rotundifolium, *Ficus citrifolia*, *Gymina latifolia*, *Ateramnus lucidus*, *Picrodendron macrocarpum*, *Pouteris dominguensis*, *Capparis cynophallophora*, *Capparis flexuosa*, *Eugenia ligustrina*, *Eugenia maleolens*, *Zanthoxylum fagara*, *Sabal parviflora*, *Myrica cerifera*, and others. Xerophytic epiphytes (*Tillandsia* spp.) are particularly abundant.
DISTRIBUTION: Cuba.
SYNONYMY: Lysilomo-Metopietum brownei (Borhidi 1991).
REFERENCES: Borhidi (1991)

***Calophyllum calaba* - *Swietenia mahogani* Forest**

COMMENTS: This association was not described nor published *vide* Borhidi (1991).
SYNONYMY: Calophyllo-Swietenietum mahagoni del Risco (ined.)
REFERENCES: Borhidi (1991)

Group: I.A.5. Tropical or subtropical broad-leaved evergreen sclerophyllous forest
Subgroup: I.A.5.N. Natural/Semi-natural

I.A.5.N.a. Lowland/submontane³⁸ tropical or subtropical broad-leaved evergreen sclerophyllous forests

**(LOWLAND/SUBMONTANE EVERGREEN
SCLEROPHYLLOUS FOREST)
(BOSQUE SIEMPREVERDE ESCLERÓFILO DE BAJA
ALTITUD/SUBMONTANO)**

I.A.5.N.a. *Calophyllum calaba* ssp. *pinetorum* Forest Alliance (*Calophyllum calaba* *pinetorum* forests)

CONCEPT: Evergreen tropical forests dominated by *Calophyllum calaba* ssp. *pinetorum*, and other sclerophyllous and microphyllous elements in the canopy and shrub layers. This vegetation occurs in West Cuba, on lixiviated yellowish-red fersiallitic soils derived from limestone but with substantial contributions from serpentine rocks.
DISTRIBUTION: West Cuba: Pinar del Rio prov.
SYNONYMY: Calophyllo-Guettardion valenzuelanae (Capote *et al.* 1985).

***Calophyllum calaba*-ssp. *pinetorum*-*Coccoloba retusa* Forest**

DESCRIPTION: Evergreen forest characterized by a great participation of sclerophyllous and microphyllous trees and shrubs. Prevalent elements in this association are *Calophyllum calaba* ssp. *pinetorum* and *Coccoloba retusa*. Other species may include *Dipholis neglecta*, *Zanthoxylum cubense*, *Dendropanax cuneifolius*, *Pachyanthus tetramerus*, *Trichilia trachyantha*, *Picramnia reticulata*, *Calyptanthes caroli*, *Myrcia valenzuelana*, *Acunaeanthus tinifolius*, *Lagetta wrightiana*, *Malpighia wrightiana*, and others.
DISTRIBUTION: West Cuba: Pinar del Rio prov.
SYNONYMY: Calophyllo-Coccolobetum retusae (Capote *et al.* 1985).
REFERENCES: Borhidi (1991).

I.A.5.N.a. *Quercus oleoides* ssp. *sagraeana* Forest Alliance (Cuban oak forests)

CONCEPT: Oak forests of west Cuba on deep, brownish-yellow soils derived from the "San Cayetano" slaty sandstone, rarely on white-sand areas.
DISTRIBUTION: West Cuba, Pinar del Rio prov.
SYNONYMY: Quercion sagraeanae (Borhidi *et al.* 1979).

***Quercus oleoides* ssp. *sagraeana* - *Miconia ibaguensis* - *Xylopia aromatica* Forest**

DESCRIPTION: With an essentially monodominant canopy of *Quercus oleoides* ssp. *sagraeana*. The understory consists of a mixture of both pine and semi-deciduous forest elements. Species commonly include *Miconia*

³⁸ The term "submontane" is added, to include the lowland-submontane sclerophyllous evergreen oak forests of west Cuba.

ibaguensis, *Miconia splendens*, *Xylopia aromatica*, *Amaioua corymbosa*,
Byrsonima crassifolia, *Clidemia hirta*, *Clidemia strigillosa*, *Hirtella*
americana, *Brya ebenus*, etc.

DISTRIBUTION: West Cuba, Pinar del Rio prov.

SYNONYMY: Miconio ibaguensi-Quercetum sagraeanae (Borhidi & Capote
in Borhidi 1991).

REFERENCES: Borhidi (1991).

***I.A.5.N.d. Semipermanently flooded tropical or subtropical broad-leaved evergreen
sclerophyllous forest***

**(SEMIPERMANENTLY FLOODED EVERGREEN
SCLEROPHYLLOUS FOREST)
(BOSQUE SIEMPREVERDE ESCLERÓFILO
SEMIPERMANENTEMENTE INUNDADO)**

I.A.5.N.d. Annona glabra Forest Alliance

CONCEPT: Freshwater or very slightly brackish depression or swale wetlands dominated by
Annona glabra. Physiognomy is variable, varying from dense canopies to open canopies,
depending on hydrology and disturbance.

DISTRIBUTION: Puerto Rico, Martinique.

SYNONYMY: *Annona* Swamp Woodland (Kimber 1988); "mamain swamp".

Annona glabra Forest

DISTRIBUTION: Puerto Rico.

COMMENTS: Bosque de Aguirre.

Annona glabra - Conocarpus erectus / Acrostichum aureum Forest

DISTRIBUTION: Puerto Rico.

SYNONYMY: Pond-apple Swamp -- 38.2 (Dansereau 1966).

Annona glabra / Cladium mariscus ssp. jamaicense Forest

DISTRIBUTION: Bahamas.

***I.A.5.N.f. Tidally flooded tropical or subtropical broad-leaved evergreen
sclerophyllous closed tree canopy***

**(MANGROVE)
(MANGLAR)**

***I.A.5.N.f. Avicennia germinans Forest Alliance (Black Mangrove Forest Alliance; Mangle
prieto Forest Alliance)***

CONCEPT: Mangrove forests dominated by *Avicennia germinans*, sometimes with an admixture
of *Rhizophora mangle*.

DISTRIBUTION: Cuba, Puerto Rico, Bahamas, Martinique, Caribbean.

SYNONYMY: *Avicennion occidentalis* (Cuatrecasas 1958); Black-mangrove Forest (Dansereau
1966); Mangrove Swamp Woodland (Kimber 1988), in part.

***Avicennia germinans Forest* (TNC 4827)**

DESCRIPTION: Dominated by *Avicennia germinans*. *Batis maritima* is
usually a common accompanying species. Others may include *Baccharis*
halimifolia, *Iva cheiranthifolia*, *Salicornia perennis*, *Heliotropium*
curassavicum, *Distichlis spicata*.

DISTRIBUTION: Cuba, Puerto Rico, Bahamas, Martinique, Caribbean.

COMMENTS: Based on Borhidi (1991); Dansereau (1966).

SYNONYMY: Batidi-Avicennietum germinantis Borhidi & Del Risco, in
Borhidi (1991); Black-mangrove forest (Dansereau 1966); Mangrove Swamp
Woodland (Kimber 1988), in part.

***Avicennia germinans - (Rhizophora mangle) / Batis maritima Forest* (TNC 7061)**

DESCRIPTION: This is a black mangrove community described from the Florida Keys, Cuba, and Texas. Mangrove canopy usually four to ten meters high and irregular in density.

DISTRIBUTION: FL, TX, [Cuba].

COMMENTS: Documented in southeastern Cuba at Guantanamo Bay Naval Base.

Synonymy: *Batidi-Avicennietum germinantis* Association (Borhidi 1991); ESU 2--Peaty Mangrove Woodland, in part (Ross et al. 1992).

References: Borhidi 1991; Ross et al. 1992.

I.A.5.N.f. *Conocarpus erecta* Forest Alliance

CONCEPT: Communities dominated by a 4-5 m tall *Conocarpus erecta* tree layer, at the inner side of the mangrove belt, mostly in lagoons with concentrated saltwater.

DISTRIBUTION: Cuba; Caribbean.

SYNONYMY: Conocarpo-Laguncularion (Borhidi et al. 1979).

***Conocarpus erecta* Forest Vegetation (TNC 7600)**

DESCRIPTION: With *Conocarpus erecta* as the dominant tree species (70-80% coverage), and the common presence of the fern *Acrostichum aureum* at the herb layer. Other species may include *Laguncularia racemosa*, *Acrostichum danaifolium*, *Cladium jamaicense*, *Fimbristylis spadicea*, *Schoenoplectus americanus*, *Eleocharis cellulosa*, *Baccharis halimifolia*.

DISTRIBUTION: Cuba; Caribbean.

COMMENTS: Based on Borhidi (1991).

SYNONYMY: Acrosticho-Conocarpetum erectae (Borhidi & Del Risco, in Borhidi 1991).

I.A.5.N.f. *Laguncularia racemosa* Forest Alliance (White Mangrove and Mixed Mangrove Forests)

CONCEPT: Most inland mangrove forest, least frequently tidally flooded, dominated by *Laguncularia racemosa* or mixtures of various mangroves.

DISTRIBUTION: Cuba, Hispaniola, Jamaica, Puerto Rico, Bahamas, Martinique, Caribbean.

SYNONYMY: Mangrove (Ciferri 1936), in part; Mangrove, facies marine (Stehlé 1946); Mangrove Woodland (Asprey & Robbins 1953); Mixed Mangrove Forest (Dansereau 1966); Mangrove Swamp Woodland (Kimber 1988), in part.

***Laguncularia racemosa* - *Rhizophora mangle* - *Avicennia germinans* - *Conocarpus erectus* Forest**

DESCRIPTION: Typically dominated by mixtures of small stands (mosaics) of the four nominal species of Caribbean mangroves.

DISTRIBUTION: Cuba, Hispaniola, Jamaica, Puerto Rico, Bahamas, Martinique, Caribbean.

COMMENTS: This association has been relatively well studied in different localities. Beside floristic surveys, some reports on the growth and regeneration, ecology, and nutrient cycling are available.

SYNONYMY: Associazione *Rhizophora-Avicennia-Laguncularia* (Ciferri 1936), in part; *Rhizophora mangle-Avicennia nitida* assoc. (Stehlé 1946); Mangrove Woodland (Asprey & Robbins 1953); Mixed Mangrove Forest (Dansereau 1966); Mangrove Swamp Woodland (Kimber 1988), in part.

I.A.5.N.f. *Rhizophora mangle* Forest Alliance (Red Mangrove Forests)

CONCEPT: Most oceanwards and frequently tidally flooded mangrove forest, dominated by *Rhizophora mangle*.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico, Martinique, Caribbean.

SYNONYMY: *Rhizophorion occidentalis* (Cuatrecasas 1958), in part; Red-mangrove Forest (Dansereau 1966); Mangrove Swamp Woodland, in part (Kimber 1988).

***Rhizophora mangle* - *Dalbergia ecastophyllum* - *Pavonia spicata* Forest Vegetation**

DESCRIPTION: Dominated by *Rhizophora mangle*, this association forms a narrow fringe along the margins of lowland rivers near to their estuaries. A scarce shrub layer formed by *Dalbergia ecastophyllum* and *Pavonia spicata* are characteristic features of this community, as well as the presence of lianas

(*Rhabdadenia biflora*, *Sarcostemma clausum*). Scattered individuals of *Laguncularia racemosa*, *Conocarpus erecta*, *Bucida palustris*, *Tabebuia angustata*, *Roystonea regia* and *Sabal parviflora* may also occur.

DISTRIBUTION: Cuba

COMMENTS: Based on Borhidi (1991).

SYNONYMY: Dalbergio-Rhizophoretum manglis (Borhidi 1991); Manglar (Areces-Mallea 1978), in part; Bosques de Mangle (Capote *et al.* 1989).

***Rhizophora mangle* Forest**

DESCRIPTION: An essentially monospecific association, with the pioneer *Rhizophora mangle* as the sole dominant.

DISTRIBUTION: Cuba: often in keys; Bahamas, Puerto Rico, Caribbean.

COMMENTS: This association represents pure, somewhat extensive stands of the priserial *Rhizophora* belt.

SYNONYMY: Red-mangrove forest (Dansereau 1966); Manglar (Areces-Mallea 1978), in part; Bosques de mangle (Capote *et al.* 1989).

REFERENCES: Ciferri (1936); Stehlé (1945); Dansereau (1966); Asprey & Robbins (1953); Borhidi (1991).

***I.A.5.N.f. Thespesia populnea* Forest Alliance**

CONCEPT: Wetland short forests (generally 3-8 m tall, dominated by *Thespesia populnea*, typically associated with mangroves, often adjoining them on the inland side, and generally not tidally flooded, except by storm floods.

DISTRIBUTION: Puerto Rico, others.

Group: I.A.7. Tropical and subtropical needle-leaved (or needle-stemmed)³⁹ evergreen forest
Subgroup: I.A.7.N. Natural/Semi-natural

I.A.7.N.a. Lowland or submontane tropical or subtropical needle-leaved evergreen forest

(LOWLAND/SUBMONTANE PINE FOREST)

(BOSQUE DE PINOS DE BAJA ALTITUD/SUBMONTANO)

***I.A.7.N.a. Pinus caribaea var. caribaea* Forest Alliance (Pinus caribaea forests, on ferritic soils)**

CONCEPT: Pine forest with canopy dominated by *Pinus caribaea* var. *caribaea*, on the ferritic soils of western Cuba (Cajálbana hills).

DISTRIBUTION: West Cuba: Cajálbana

SYNONYMY: Neomazaeo-Pinon caribaeae (Borhidi *et al.* 1979; Borhidi 1991), in part.

***Pinus caribaea var. caribaea - Neomazaea phialanthoides* Forest**

DESCRIPTION: The common low-altitude pine forest covering all the ridges and slopes on the northern part of the Cajálbana range, on ferritic soils, with a close canopy strongly dominated by *Pinus caribaea* var. *caribaea*. Typical species include *Neomazaea phialanthoides*, *Coccothrinax yuraguana*, *Phania cajalbanica*. A well developed herb layer dominated by grasses (e.g. *Andropogon gracilis*, *Aristida refracta*) is present.

DISTRIBUTION: West Cuba: Cajálbana.

COMMENTS: Based on Borhidi (1991).

SYNONYMY: Pinetum caribaeae cajalbanensis typicum (Samek 1973), in part; Neomazaeo-Pinetum caribaeae (Borhidi *et al.* 1979), in part.

***Pinus caribaea var. caribaea - Guettarda valenzuelana* Forest**

DESCRIPTION: Humid lowland pine forest on ferritic soils, occurring on flat areas and along creeks, in Cajálbana. The close canopy is dominated by *Pinus caribaea* var. *caribaea*, with relatively strong participation of some broad-leaved tree species. The shrub layer is richer than the one occurring in the

³⁹ The phrase "or needle-stemmed" in parenthesis is added, to include the Australian "pine" forest plantations.

former association, whereas the herb layer is poorer. Characteristic species of this community are *Guettarda valenzuelana*, *Guettarda calyptrata*, *Cyrilla racemiflora*, *Calophyllum calaba ssp. pinetorum*, *Gesneria ferruginea*, *Comocladia dentata*, *Rondeletia odorata*, etc.

DISTRIBUTION: West Cuba: Cajalbana

COMMENTS: Based on Borhidi *et al.* (1979); Borhidi (1991).

SYNONYMY: Pinetum cajalbanensis comocladietosum (Samek 1973), in part; Guettardo-Pinetum caribaeae (Borhidi *et al.* 1979).

I.A.7.N.a. *Pinus caribaea* var. *caribaea* - *Pachyanthus poiretii* Forest Alliance (*Pinus caribaea* forests, on slately sandstone)

CONCEPT: Submontane pine forests with canopy dominated by *Pinus caribaea* var. *caribaea*, on slately sandstone, in western Cuba.

DISTRIBUTION: West Cuba: Sierra de los Organos and Sierra del Rosario ranges, on typical "San Cayetano" Jurassic sandstone.

***Pinus caribaea* var. *caribaea* - *Pachyanthus poiretii* Forest**

DESCRIPTION: With canopy dominated by *Pinus caribaea* var. *caribaea*, and a well developed shrub layer rich in Melastomataceae species such as *Pachyanthus poiretii*, *P. cubensis*, *Clidemia strigillosa*, *C. neglecta*, *Ossaea parviflora*, *Miconia ibaguensis*, and *M. prasina*.

DISTRIBUTION: West Cuba: Submontane sandstone belt of Sierra de los Organos and Rosario ranges, in Pinar del Rio prov.

COMMENTS: Based on Samek (1969); Borhidi (1991).

SYNONYMY: Pinetum caribaeae (Samek 1969); Pinares de las pizarras (local name).

I.A.7.N.a. *Pinus cubensis* Forest Alliance (*Pinus cubensis* lowland forests, on ferritic soils)

CONCEPT: Lowland pine vegetation very rich in endemics, with a closed canopy strongly dominated by *Pinus cubensis*, on deep, acidic ferritic soils.

DISTRIBUTION: East Cuba: Sub-coastal plain between Moa and Baracoa.

SYNONYMY: Guettardo-Pinion cubensis (Borhidi *et al.* 1979), in part.

***Pinus cubensis* - *Dracaena cubensis* Forest (TNC 7624)**

DESCRIPTION: Rich pine forest with more than 70% of endemic species. The rather closed canopy is strongly dominated by *Pinus cubensis*. Other typical canopy species may be *Dracaena cubensis*, *Coccothrinax orientalis*, and *Gutteria moralesii*. Both the shrub and herbaceous layers are well developed in this community. Characteristic species are: *Schmidtottia sessiliflora*, *Schidottia shaferi*, *Psidium parviflorum*, *Casearia moaensis*, *Casearia bissei*, *Myrtus ophiticola*, *Guettarda crassipes*, *Guettarda ferruginea*, *Bumelia cubensis*, *Cyrilla cubensis*, *Ossaea pauciflora*, *Jacquinia roigii*, *Rhynchospora lindeniana*, *Chaetocarpus oblongatus*, *Eugenia pinetorum*, *Phyllanthus myrtilloides ssp. erythrinus*, and *Callicarpa oblanceolata*.

DISTRIBUTION: East Cuba: Lowlands and foothills between Moa and Baracoa.

COMMENTS: Based on Borhidi (1991).

SYNONYMY: Dracaeno-Pinetum cubensis (Borhidi 1991).

I.A.7.N.a. *Pinus tropicalis* - *Pinus caribaea* var. *caribaea* Forest Alliance (*Pinus tropicalis* - *Pinus caribaea* forests)

CONCEPT: Low-altitude pine forests of the hillsides of Isle of Pines (Cuba), dominated by *Pinus tropicalis* with substantial participation of *Pinus caribaea*.

DISTRIBUTION: Cuba: Isle of Pines.

SYNONYMY: Acoelorrhapho-Pinion tropicalis (Samek in Borhidi *et al.* 1979), in part.

***Pinus tropicalis* - *Pinus caribaea* var. *caribaea* Forest**

DESCRIPTION: Pine forest with *Pinus tropicalis* dominating the canopy. *Pinus caribaea* is also present. Other characteristic species include *Byrsonima wrightiana*, *Tetrazygia delicatula*, *Clitoria laurifolia*, *phyllanthus junceus*, *Lyonia myrtilloides*, and *Trachypogon filifolius*.

DISTRIBUTION: Cuba: colline belt of Isle of Pines.

COMMENTS: Based on Borhidi (1991).
SYNONYMY: Pinetum tropicalis-caribaeae (Samek 1969).

I.A.7.N.b. Montane or subalpine tropical or subtropical needle-leaved evergreen forest
(MONTANE PINE FOREST)
(BOSQUE MONTANO DE PINOS)

I.A.7.N.b. Pinus occidentalis Forest Alliance (Pinus occidentalis high-altitude forests)
CONCEPT: High-altitude montane pine forests with monospecific canopy of *Pinus occidentalis*, in the central range of Hispaniola.
DISTRIBUTION: Hispaniola
SYNONYMY: Belle forêts a pins (Sorre 1928), in part; Pinares (Hager & Zanoni 1993), in part

Pinus occidentalis / Lyonia urbaniana - Lyonia tuerkheimii / Pteridium caudatum Forest

DESCRIPTION: With monospecific canopy of *Pinus occidentalis*, and endemic-rich understory dominated by shrubs and ferns, in humid locations. Prevalent species include *Lyonia urbaniana*, *Lyonia tuerkheimii*, *Gaultheria domingensis*, *Garrya fadyenii*, *Senecio fuertesii*, *Senecio picardae*, *Satureja alpestris*, *Baccharis myrsinites*, *Hypericum pycnophyllum*, *Weinmania pinnata*, *Miconia krugii*, *Miconia viscidula*, *Miconia sphagnicola*, *Pteridium aquilinum*, *Lophosoria quadripinnata*, *Plagyogyria semicordata*.
DISTRIBUTION: Hispaniola: Cordillera Central, over 2,200 m altitude.
COMMENTS: Based on Ciferri (1936); Hager & Zanoni (1993).
SYNONYMY: Pineto Alto (Ciferri 1936), in part; Pinares de la zona alta de la Cordillera Central (Hager & Zanoni 1993), in part.

Pinus occidentalis / Danthonia domingensis Forest

DESCRIPTION: With monospecific canopy of *Pinus occidentalis*, and substantial ground coverage of grasses and other herbaceous plants, in drier and somewhat exposed areas. Some characteristic grasses include *Danthonia domingensis*, *Calamagrostis leonardii*, *Agrostis hyemalis*, and *Agristis perennis*.
DISTRIBUTION: Hispaniola: Cordillera Central, over 2,200 m altitude.
COMMENTS: Based on Ciferri (1936); Hager & Zanoni (1993).
SYNONYMY: Pineto Alto (Ciferri 1936), in part; Pinares de la zona alta de la Cordillera Central (Hager & Zanoni 1993), in part.

Group: *I.A.10. Mixed tropical and subtropical needle-leaved-broad-leaved evergreen forest*⁴⁰
Subgroup: *I.A.10.N. Natural/Semi-Natural*

***I.A.10.N.a. Mixed tropical and subtropical needle-leaved-broad-leaved evergreen forest*⁴¹**

(MIXED PINE-BROAD-LEAVED FOREST)
(BOSQUE MIXTO DE PINOS Y LATIFOLIOS)

I.A.10.N.a. Pinus caribaea var caribaea - Quercus oleoides ssp. sagraeana Forest Alliance (Pinus caribaea caribaea mixed forests)
CONCEPT: Submontane pine-oak mixed forests with canopy co-dominated by *Pinus caribaea* var. *caribaea* and *Quercus oleoides* ssp. *sagraeana*, on the slatey sandstones of western Cuba.
DISTRIBUTION: West Cuba: Sierra de los Organos and Sierra del Rosario ranges, on typical "San Cayetano" Jurassic sandstone.
SYNONYMY: Pachyantho poiretii-Pinion caribaeae (Borhidi *et al.* 1979), in part.

Pinus caribaea var. caribaea - Quercus oleoides ssp. sagraeana Forest

⁴⁰ New Group.

⁴¹ New Formation.

DESCRIPTION: Pine-oak mixed forest, on slatey sandstone. The canopy typically shows strong admixture of broad-leaved evergreen *Quercus sagraeana* ssp. *oleoides*. Other arboreal species that may be well represented in the canopy layer are: *Calophyllum calaba* ssp. *pinetorum*, *Pinus tropicalis*, *Matayba oppositifolia*, *Xylopia aromatica*, and *Clusia rosea*. As in the former association, the understory is rich in Melastomataceae species. Other species present may include *Didymopanax morototoni*, *Guarea guidonia*, *Rhus copallina* ssp. *leucantha*, *Amaioua corymbosa*, *Tabebuia lepidophylla*, *Alsophila myosuroides*, *Byrsonima pinetorum*, *Psychotria revoluta*, *Eugenia faramaeoides*, etc.

DISTRIBUTION: West Cuba: Submontane sandstone belt of Sierra de los Organos and Rosario ranges, in Pinar del Rio prov.

SYNONYMY: Quercum-Pinetum caribaeae Borhidi & Capote in Borhidi (1991).

REFERENCES: Borhidi (1991).

I.A.10.N.a. *Pinus cubensis* - *Tabebuia dubia* Forest Alliance (*Pinus cubensis* mixed forests)

CONCEPT: Montane mixed forests of *Pinus cubensis* and broad-leaved evergreen trees, in the serpentine ranges of eastern Cuba, on ferritic soils. The herb layer in this vegetation type is usually dense and tall. Characteristic canopy species include *Pinus cubensis*, *Tabebuia dubia*, *Hyeronima nipensis*, *Terminalia orientensis* and *Guatteria moralesii*.

DISTRIBUTION: Eastern Cuba: Sagua-Baracoa.

SYNONYMY: Andropogo-Pinon cubensis (Borhidi *et al.* 1979; Borhidi 1991).

***Pinus cubensis* / *Rhynchospora tenuis* - *Baccharis scoparioides* - *Vernonia urbaniana* Forest (TNC 7626)**

DESCRIPTION: Montane mixed pinewoods on relatively fertile, deep humid ferritic soils, in eastern Cuba. The herb layer is well developed and diverse, and may include *Andropogon gracilis*, *Andropogon reinoldii*, *Andropogon nashianus*, *Panicum aciculare*, *Panicum fusiforme*, *Panicum scoparium*, *Paspalum alainii*, *Aristida refracta*, and eight different species of *Rhynchospora*. Other prevalent associates are *Baccharis scoparioides*, *Vernonia urbaniana*, *Eupatorium polystictum*, *Dodonaea viscosa*, *Bactris cubensis*, *Casearia crassinervis*, and *Pteridium caudatum*.

DISTRIBUTION: East Cuba: Sierra de Nipe and Sierra Cristal.

SYNONYMY: Pinetum nipense typicum (Samek 1973), in part; Pinetum panicetusum (Samek 1973), in part; Rhynchosporo-Pinetum cubensis (Samek 1973, *sensu* Borhidi *et al.* 1979).

REFERENCES: Samek (1973); Borhidi *et al.* (1979); Borhidi (1991).

***Pinus cubensis* / *Bactris cubensis* - *Shafera platyphylla* Forest (TNC 7627)**

DESCRIPTION: Rich pine forest with a mixed upper canopy of *Pinus cubensis* and many evergreen trees, on deep, rather humid and fertile ferritic soils, in the high plateau of Moa (eastern Cuba). A second canopy layer composed of small trees such as *Bactris cubensis* and *Alsophila aquilina*, is always present. Other characteristic species include *Shafera platyphylla*, *Gomidesia lindeniana*, *Vaccinium alainii*, *Cordia toaensis*, *Lyonia glandulosa*, *Ficus wrightii*, *Ossaea navasensis*, *Ossaea pseudopinetorum*, *Gundlachia cubana*, *Clethra cubensis*, *Spirotecoma apiculata*, *Miconia cerasiflora*, etc.

DISTRIBUTION: East Cuba: Sierra del Maguey (Cupeyal del Norte).

SYNONYMY: Shafero-Pinetum cubensis (Borhidi & Muñiz in Borhidi 1991).

REFERENCES: Borhidi (1991).

I.A.10.N.a. *Pinus xmaestrensis* Forest Alliance (*Pinus maestrensis* mixed forests)

CONCEPT: Montane mixed pinewoods rich in tree-ferns, on yellow acidic soils derived from sandstone and andesitic tuffs, in southeastern Cuba. The uppermost of the two canopy layers is formed by *Pinus xmaestrensis* (*Pinus cubensis* x *Pinus occidentalis*), accompanied by evergreen broad-leaved trees. This vegetation type shows affinities to *Pinus tropicalis* mid-altitude mixed forests of Hispaniola; both units occur within the montane rainforest zone, and are typically successional.

DISTRIBUTION: Southeast Cuba: Sierra Maestra range.

SYNONYMY: Pinon maestrensis (Borhidi *et al.* 1979).

***Pinus xmaestrensis / Clethra cubensis - Cyathea arborea* Forest**

DESCRIPTION: Montane mixed pinewoods occurring as isolated stands in the mountain ranges of southeastern Cuba. The upper canopy is dominated by *Pinus xmaestrensis*, with strong admixture of broad-leaved trees such as *Myrsine coriacea*. Smaller trees, e.g. *Weinmania pinnata*, *Garrya fadyenii*, *Ilex macfadyenii*, and others, are often common. Very characteristic of this association is the constant presence of tree-ferns (i.e. *Cyathea arborea*, *Alsophila aspera*) and typical southeastern Cuban montane rain forest species such as *Clethra cubensis*, *Vaccinium leonis*, *Lyonia calycosa*, and *Myrica punctata*.

DISTRIBUTION: Southeast Cuba: Sierra Maestra (northern slopes) and Gran Piedra ranges.

SYNONYMY: Clethro-Pinetum maestrensis (Borhidi 1991).

REFERENCES: Borhidi *et al.* (1979); Borhidi (1991).

I.A.10.N.a. *Pinus occidentalis - Ilex microwrightioides* Forest Alliance (*Pinus occidentalis* mid-altitude mixed forests)

CONCEPT: Mid-altitude montane pine forests with canopy of *Pinus occidentalis* with admixture of broad-leaved tree species, in humid locations. Species of general distribution within this vegetation type include *Ilex microwrightioides*, *Ilex tuerckheimii*, *Eupatorium illitium*, *Gnaphalium eggersii*, *Calamagrostis leonardii*, *Vernonia stenophylla*, *Cordia dependens*, *Lyonia microcarpa*, *Satureja domingensis*, *Chamaecrista glandulosa* var. *picardae*, *Galactia rudolphoides* var. *haitiensis*, *Myrcia picardae*, *Psychotria dolichocalyx*, *Syderoxylon repens*, and *Buddleia domingensis*.

DISTRIBUTION: Hispaniola: Cordillera Central; Sierra de Bahoruco.

SYNONYMY: Pineto basso (Ciferri 1936), in part; Pinares de elevación intermedia (Hager & Zanoni 1993), in part.

***Pinus occidentalis / Tabebuia bullata - Eupatorium dictyoneurum* Forest**

DESCRIPTION: Mixed mid-altitude *Pinus occidentalis* forests of the central ranges of Hispaniola, on rather humid locations. A species-rich community with many associates coming from the neighboring rain forests. Characteristic species include *Tabebuia bullata*, *Eupatorium dictyoneurum*, *Mikania papillosa*, *Lyonia heptamera*, *Lyonia rubiginosa*, *Paepalanthus repens*, *Euphorbia tuerckheimii*, *Hypericum fuertesii*, *Hypericum constanzae*, *Hypericum polycladum*, *Satureja vimenca*, *Lepechinia urbanii*, *Salvia lavendula*, *Dendropemon pycnophyllus*, *Dendropemon constantiae*, *Alchemilla domingensis*, *Galium domingense*, *Scrophularia eggersii*, and *Viola domingensis*.

DISTRIBUTION: Hispaniola: Cordillera Central.

SYNONYMY: Pineto basso (Ciferri 1936), in part; Pinares de elevación intermedia (Hager & Zanoni 1993), in part; Pinares de la Cordillera Central (Hager & Zanoni 1993).

REFERENCES: S.E.A. (1990); Hager & Zanoni (1993).

***Pinus occidentalis / Senecio buchii - Tournefortia selleana* Forest**

DESCRIPTION: Mixed mid-altitude *Pinus occidentalis* forests, in Sierra de Bahoruco. Characteristic differential species include *Senecio buchii*, *Tournefortia selleana*, *Corcopsis buchii*, *Salvia bahorucana*, *Sophora albolineata*, *Polygala crucianclloides*, *Mitracarpus bahorucana*, *Scrophularia bahorucana*, *Cestrum humile*, *Symplocos domingensis*, and *Duranta arida* var. *serpentina*.

DISTRIBUTION: Hispaniola: Sierra de Bahoruco.

SYNONYMY: Pineto basso (Ciferri 1936), in part; Pinares de elevación intermedia (Hager & Zanoni 1993), in part; Pinares de la Sierra de Bahoruco (Hager & Zanoni 1993).

REFERENCES: S.E.A. (1990); Hager & Zanoni (1993).

I.A.10.N.a. *Pinus occidentalis - Magnolia pallescens* Forest Alliance (*Pinus occidentalis* high-altitude mixed forests)

CONCEPT: High-altitude mixed pine forests with canopy co-dominated by *Pinus occidentalis*, *Magnolia pallescens* and other broad-leaved tree species, on the exposed summits and ridges of Cordillera Central (Hispaniola), over 1,700 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): eastern Cordillera Central.

SYNONYMY: Bosque de *Magnolia pallescens* (Hager & Zanoni 1993), in part.

***Pinus occidentalis* - *Magnolia pallescens* - *Didymopanax tremulus* Forest**

DESCRIPTION: Mixed *Pinus occidentalis* forests, with strong admixture of broad-leaved trees such as *Magnolia pallescens*, *Didymopanax tremulus*, *Tabebuia vinosa*, *Brunellia comocladifolia*, *Myrsine coriacea*, and *Trema micrantha*, on the yellowish acidic montane soils of eastern Cordillera Central (Hispaniola), between 1,700 and 2,100 m elevation.

DISTRIBUTION: Hispaniola (Dominican Republic): south of Constanza.

COMMENTS: This is a successional community established within the cloud forest belt, in areas where the original *Magnolia pallescens* - *Tabebuia vinosa* - *Didymopanax tremulus* cloud forests were disturbed.

SYNONYMY: Bosque de *Magnolia pallescens* (Hager & Zanoni 1993), in part.

REFERENCES: Hager & Zanoni (1993).

Subclass: <i>I.B. DECIDUOUS FOREST</i>

Group: <i>I.B.1. Drought-deciduous forest</i>
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Subgroup: <i>I.B.1.N. Natural/Semi-natural</i>

I.B.1.N.a. Lowland or submontane drought-deciduous forest

(LOWLAND/SUBMONTANE DROUGHT-DECIDUOUS FOREST)

(BOSQUE SECO DECIDUO DE BAJA ALTITUD/SUBMONTANO)

(TYPES TO BE DEFINED)

Subclass: <i>I.C. MIXED EVERGREEN-DECIDUOUS FOREST</i>

Group: <i>I.C.1. Tropical or subtropical semi-deciduous forest</i>

Subgroup: <i>I.C.1.N. Natural/Semi-natural</i>

I.C.1.N.a. Lowland tropical or subtropical semi-deciduous forest

(LOWLAND SEMI-DECIDUOUS FORESTS)

(BOSQUE SEMI-DECIDUO DE BAJA ALTITUD)

(MOST TYPES TO BE DEFINED)

***I.C.1.N.a. Cocoloba diversifolia* Forest Alliance**

CONCEPT: Forests dominated or codominated by *Coccoloba diversifolia*. In Puerto Rico these forests occur at low elevations in NW. and NC. Puerto Rico on limestone hills (which make the vegetation somewhat xerophytic). In Puerto Rico other typical canopy species include *Bucida buceras*, *Quararibea turbinata*, *Guapira fragrans*, *Zanthoxylum martinicense*, and *Ficus citrifolia*. Terrestrial and epiphytic ferns are frequent and include *Blechnum occidentale*, *Tectaria heracleifolia*, *Cyclopeltis semicordata*, and *Adiantum tenerum*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Gateado forest -- 60.1 (Dansereau 1966); Llume - Gumbo-limbo Savana -- 62.3 (Dansereau 1966); Llume - Gumbo-limbo Scrub -- 62.4 (Dansereau 1966).

REFERENCES: Dansereau (1966).

***Coccoloba diversifolia* - *Bursera simaruba* - *Bucida buceras* - *Zanthoxylum martinicense* Forest**

DESCRIPTION: This is a characteristic forest of the mogote sides and tops, in northcentral and northwestern Puerto Rico. Other characteristic species include *Gaussia attenuata*, *Rondeletia inermis*, *Guettarda scabra*, *Eugenia confusa*, *Eugenia spp.*, *Coccothrinax alta*, *Thrinax morrisii*, *Aiphanes acanthophylla*.
DISTRIBUTION: Puerto Rico.

I.C.I.N.a. *Lysiloma latisiliqua* - *Swietenia mahagoni* - *Peltophorum adnatum* Forest Alliance

DISTRIBUTION:: Cuba.

COMMENTS: In southeastern Cuba (Guantanamo Bay).

Lysiloma latisiliqua - *Swietenia mahagoni* - *Peltophorum adnatum* - *Bucida spinosa* - *Pseudosamanea cubana* / *Tillandsia usneoides* Forest (TNC 7605)

SYNONYMY: Legume forest.

I.C.I.N.a. *Phyllostylon brasiliensis* Forest Alliance

DISTRIBUTION:: Cuba.

COMMENTS: In southeastern Cuba (Guantanamo Bay).

Phyllostylon brasiliensis - *Maytenus buxifolia* - *Pilosocereus brooksianus* - *Amyris elemifera* Forest (TNC 7606)

SYNONYMY: *Phyllostylon* forest.

Phyllostylon brasiliensis - *Senna insularis* - *Stenocereus peruvianus* - *Dendrocereus nudiflorus* Forest (TNC 7607)

SYNONYMY: *Phyllostylon*-cactus forest.

I.C.I.N.a.085. *Tabebuia heterophylla* - *Pisonia subcordata* Forest Alliance

CONCEPT:

DISTRIBUTION: Antigua and Barbuda.

REFERENCES: Lindsay and Horwith (1997).

Tabebuia heterophylla - *Pisonia subcordata* Forest (TNC 7609)

DISTRIBUTION: Antigua and Barbuda.

REFERENCES: Lindsay and Horwith (1997).

I.C.I.N.a. *Tabebuia pallida* - *Coccoloba swartzii* - *Bursera simaruba* Forest Alliance

CONCEPT: Semi-deciduous forests of Martinique (and possibly of wider occurrence in the Lesser Antilles), with a mixture of drought-deciduous and evergreen species in the canopy.

DISTRIBUTION: Martinique.

Tabebuia pallida - *Coccoloba swartzii* - *Bucida buceras* - *Bursera simaruba* / *Guettarda scabra* - *Zanthoxylum martinicense* Forest

DESCRIPTION: Semi-deciduous forest of the s. coast of Martinique, restricted to small areas on gently sloping land over vertisols high in montmorillonitic clays. The average annual temperature is 26 degrees C, the average annual rainfall 1300-1700mm, with a dry season of 1-2 months with less than 50mm of precipitation. Common canopy species include the deciduous trees, *Tabebuia pallida* and *Bursera simaruba*, and evergreens *Coccoloba swartzii*, *Bucida buceras*, *Inga laurina*, *Simarouba amara*, *Pimenta racemosa*, *Citharexylum fruticosum*, and *Lonchocarpus benthamianus*. The evergreen understory typically has *Guettarda scabra*, *Picramnia pentandra*, *Zanthoxylum martinicense*, and *Myrcia citrifolia*. Shrubs include *Randia aculeata*, *Zanthoxylum spinifex*, *Croton bixoides*, *Croton hircinus*, *Ardisia obovata*, and *Coccoloba pubescens*. Herbs include *Sporobolus indicus*, *Chloris barbata*, *Scleria lithosperma*, *Dichromena nervosa*, and *Kalanchoe pinnata*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Semideciduous Forest (Kimber 1988).

Tabebuia pallida - *Calophyllum calaba* - *Coccoloba swartzii* - *Bursera simaruba* - *Hippomane mancinella* - *Coccoloba uvifera* Forest

DESCRIPTION: Semi-deciduous forest originally occurring fairly extensively in a usually narrow band around the southern coast of Martinique. The average annual temperature is 26-27 degrees C, the average annual rainfall 900-1300mm, with occasional drought years with as little as 300-500 mm, and with a dry season in most years of 2-6 months with less than 50mm of precipitation. Canopy height ranges from 10-20m, with typical species including *Tabebuia pallida*, *Calophyllum calaba*, *Coccoloba swartzii*, *Bursera simaruba*, *Hippomane mancinella*, *Coccoloba uvifera*, *Lonchocarpus benthamianus*, *Pisonia fragrans*, *Erythrina berteroana*, *Capparis indica*, and *Thespesia populnea*. Understory vegetation is sparse.
DISTRIBUTION: Martinique.
COMMENTS: Based on Kimber (1988).
SYNONYMY: Littoral Woodland (Kimber 1988).

***Pisonia fragrans* - *Bursera simaruba* - *Tabebuia pallida* - *Ceiba pentandra* / *Pimenta racemosa* - *Cordia alliodora* Forest**

DESCRIPTION: Semi-deciduous forest originally occurring fairly extensively in a broad band around the southern coast of Martinique, inland from the *Tabebuia pallida* - *Calophyllum calaba* - *Coccoloba swartzii* - *Bursera simaruba* - *Hippomane mancinella* - *Coccoloba uvifera* Forest. The average annual temperature is 26-27 degrees C, the average annual rainfall 900-1300mm, with occasional drought years with as little as 300-500 mm, and with a dry season in most years of 2-6 months with less than 50mm of precipitation. Canopy height ranges from 20-25m, with typical species including *Pisonia fragrans*, *Bursera simaruba*, *Tabebuia pallida*, *Ceiba pentandra*. Shorter trees include *Pimenta racemosa*, *Cordia alliodora*, *Myrcia citrifolia*, and *Myrcia splendens*. A well-developed shrub layer includes species such as *Pithecellobium unguis-cati*, *Parkinsonia aculeata*, *Randia aculeata*, *Coccoloba swartzii*, *Rauvolfia viridis*, *Daphnopsis caribaea*, *Psychotria nervosa*, *Zanthoxylum punctatum*, *Capparis flexuosa*, *Croton* spp., *Acacia* spp., *Pilosocereus royenii*.
DISTRIBUTION: Martinique.
COMMENTS: Based on Kimber (1988).
SYNONYMY: Dry Woodland (Kimber 1988).

I.C.I.N.c. Seasonally flooded/saturated tropical or subtropical semi-deciduous closed tree canopy

**(SEASONALLY FLOODED/SATURATED SEMI-DECIDUOUS FOREST)
(BOSQUE SEMI-DECIDUO ESTACIONALMENTE INUNDADO/SATURADO)**

***I.C.I.N.c.002. Annona glabra* - *Bucida buceras* Seasonally Flooded Forest Alliance**

CONCEPT:
DISTRIBUTION: Antigua and Barbuda.
REFERENCES: Lindsay and Horwith (1997).

Class: <i>II. WOODLAND</i> ⁴² Subclass: <i>II.A. EVERGREEN WOODLAND</i> Group: <i>II.A.1. Tropical or subtropical broad-leaved woodland</i> Subgroup: <i>II.A.1.N. Natural/Semi-natural</i>

***II.A.1.N.a. Tropical or subtropical broad-leaved evergreen woodland*
(EVERGREEN WOODLAND)
(ARBOLEDA SIEMPREVERDE)**

⁴² The shorter term "woodland" is preferred over the phrase "open tree canopy"

***II.A.1.N.a. Acoelorrhaphe wrightii* Woodland Alliance (Silver Saw Palmetto Woodlands, on white sands)**

CONCEPT: Palm-dominated community with *Acoelorrhaphe wrightii*, in the white-sand areas of Cuba.

DISTRIBUTION: West Cuba: Pinar del Rio prov., in white-sand areas.

SYNONYMY: *Blechno-Acoelorrhaphion wrightii* (Hadac in Hadac & Hadacova 1971), in part.

***Acoelorrhaphe wrightii - Blechnum serrulatum* Woodland**

DESCRIPTION: Community with an open canopy dominated by the clumping palm species *Acaelorrhaphe wrightii*, in the humid sites of white-sand areas, usually along or near the drainage network surrounding shallow oligotrophic lakes. The fern *Blechnum serrulatum* often gives substantial coverage to the ground.

DISTRIBUTION: West Cuba: Pinar del Rio prov.

COMMENTS: Based on Hadac in Hadac & Hadacova (1971); Borhidi (1991).

SYNONYMY: *Blechnum-Acoelorrhaphetum wrightii* (Hadac in Hadac & Hadacova 1971).

***II.A.1.N.a. Coccolobina barbadensis* Woodland Alliance**

CONCEPT:

DISTRIBUTION: Antigua and Barbuda.

REFERENCES: Lindsay and Horwith (1997).

***Coccolobina barbadensis* Woodland (TNC 7614)**

DISTRIBUTION: Antigua and Barbuda.

REFERENCES: Lindsay and Horwith (1997).

***II.A.1.N.a. Colpothrinax wrightii* Woodland Alliance (*Colpothrinax wrightii* woodlands, on white sand)**

CONCEPT: Palm-dominated community with *Colpothrinax wrightii*, in the white-sand areas of Cuba.

DISTRIBUTION: West Cuba: Pinar del Rio prov., in white-sand areas.

SYNONYMY: *Blechno-Acoelorrhaphion wrightii* (Hadac in Hadac & Hadacova 1971, *sensu* Borhidi 1991), in part.

***Colpothrinax wrightii - Chrysobalanus icaco* Woodland**

DESCRIPTION: Open canopy dominated by the endemic palm species *Colpothrinax wrightii*, sometimes with scattered individuals of *Pinus tropicalis*, in white sand areas. *Chrysobalanus icaco* is a major component of the tall shrub layer.

DISTRIBUTION: West Cuba: Pinar del Rio prov.

COMMENTS: Some of the extant stands of this rather broad-leaf association can be interpreted as being natural, but the majority of them are second-growth communities developed as a result of cutting and logging original pine woodlands.

SYNONYMY: *Chrysobalano-Colpotrinacetum wrightii* (Borhidi & Capote, as mentioned in Borhidi 1991).

***II.A.1.N.a. Hippomane mancinella - Coccoloba uvifera* Woodland Alliance**

CONCEPT: This alliance occurs in coastal areas, with trees often stunted from wind. Other species may include *Thespesia populnea*, *Hippomane mancinella*, *Conocarpus erectus*, *Cocos nucifera* (alien), *Coccoloba uvifera*, *Terminalia catappa* (alien), and *Cordia sebestena*.

DISTRIBUTION: Antigua and Barbuda.

REFERENCES: Lindsay and Horwith (1997).

***II.A.1.N.a. Randia aculeata - Didymopanax morototoni* Woodland Alliance**

DISTRIBUTION: Puerto Rico.

SYNONYMY: Second-growth Woodland -- 48.2 (Dansereau 1966); Second-growth Savana -- 48.3 (Dansereau 1966).

II.A.1.N.b. Seasonally/temporarily flooded tropical or subtropical broad-leaved evergreen woodland

(SEASONALLY/TEMPORARILY FLOODED EVERGREEN
WOODLAND)
(ARBOLEDA SIEMPREVERDE
ESTACIONALMENTE/TEMPORALMENTE INUNDADA)

(TYPES TO BE DEFINED)

II.A.1.N.c. Seasonally flooded/saturated tropical or subtropical broad-leaved evergreen woodland

(SEASONALLY FLOODED/SATURATED EVERGREEN
WOODLAND)
(ARBOLEDA SIEMPREVERDE ESTACIONALMENTE
INUNDADA/SATURADA)

II.A.1.N.c. Sabal palmetto Woodland Alliance

DISTRIBUTION: Bahamas.

***Sabal palmetto* Bahamian Grove Woodland**

DESCRIPTION: *Sabal palmetto* groves occurring in isolated drainage basins with freshwater accumulation. A sparse herbaceous stratum is seasonally present.

DISTRIBUTION: Bahamas (except Andros).

SYNONYMY: 4.b. *Sabal palmetto* grove, in part (Freid 1998).

***Sabal palmetto* - *Conocarpus erecta* Woodland**

DESCRIPTION: Occurs in sandy soil, isolated drainage basins in the Exumas.

DISTRIBUTION: Bahamas (Exumas).

SYNONYMY: 4.b. *Sabal palmetto* grove, in part (Freid 1998).

II.A.1.N.d. Semi-permanently flooded tropical or subtropical broad-leaved evergreen woodland

(SEMI-PERMANENTLY FLOODED EVERGREEN
WOODLAND)
(ARBOLEDA SIEMPREVERDE SEMI-PERMANENTEMENTE
INUNDADA)

(TYPES TO BE DEFINED)

II.A.1.N.e. Tidally flooded tropical or subtropical broad-leaved evergreen woodland

(TIDALLY FLOODED EVERGREEN WOODLAND)
(ARBOLEDA SIEMPREVERDE MAREAL)

(TYPES TO BE DEFINED)

II.A.1.N.f. Hemisclerophyllous tropical or subtropical broad-leaved evergreen woodland⁴³

(HEMISCLEROPHYLLOUS EVERGREEN WOODLAND)
(ARBOLEDA SIEMPREVERDE HEMIESCLERÓFILA)

(TYPES TO BE DEFINED)

⁴³ New Formation, to include Stoffer's (1956) "Hippomane Woodlands"

II.A.1.N.x. Saturated tropical or subtropical broad-leaved evergreen woodland
(SATURATED EVERGREEN WOODLAND)
(ARBOLEDA SIEMPREVERDE SATURADA)

II.A.1.N.x. Bucida spinosa Woodland Alliance

DISTRIBUTION: Bahamas.

Bucida spinosa / Rhynchospora tenuis - Cladium mariscus ssp. jamaicense Woodland

DISTRIBUTION: Bahamas.

Group: ***II.A.3. Tropical or subtropical needle-leaved (or needle-stemmed)⁴⁴ evergreen woodland***

Subgroup: ***II.A.3.N. Natural/Semi-natural***

II.A.3.N.a. Tropical or subtropical needle-leaved evergreen woodland
(PINE WOODLAND)
(ARBOLEDA DE PINOS)

II.A.3.N.a. Pinus tropicalis Woodland Alliance (Pinus tropicalis woodlands, on white-sand or slates)

CONCEPT: Open pine woodlands of western Cuba, on white-sand soils and hard slate rocks, with a canopy dominated by *Pinus tropicalis*.

DISTRIBUTION: Cuba: Pinar del Rio prov., and western Isle of Pines.

SYNONYMY: Acoelorrhapho-Pinion tropicalis (Samek in Borhidi *et al.* 1979), in part.

Pinus tropicalis / -Byrsonima crassifolia - Tabebuia lepidophylla Woodland

DESCRIPTION: Open pine association on crystalline slates and white sand soils, with canopy dominated by *Pinus tropicalis*. Other species include *Colpothrinax wrightii*, *Byrsonima crassifolia*, *B. pinetorum*, *Tabebuia lepidophylla*, *Pachyanthus wrightii*, *Pachyanthus poiretii*, *Befaria cubensis*, *Brya depressa*, *Hyptis pedalipes*, *Aster grisebachii*, *Heptanthus cochlearifolius*, *Stenandrium ovatum*, etc.

DISTRIBUTION: Cuba: slate range of Sierra del Rosario, and white-sand area of south Pinar del Rio prov.

COMMENTS: Based on Borhidi & Capote in Borhidi (1991).

SYNONYMY: Byrsonimo-Pinetum tropicalis-caribaeae (Borhidi & Capote in Borhidi 1991).

Pinus tropicalis / Eragrostis cubensis Woodland

DESCRIPTION: Open canopy dominated by *Pinus tropicalis*, on white-sand areas, with substantial coverage of the ground by *Eragrostis cubensis* and other grasses.

DISTRIBUTION: West Cuba: Remates de Guane.

COMMENTS: Based on Samek in Hadac & Hadacova (1971).

SYNONYMY: Eragrosti cubensi-Pinetum tropicalis (Samek in Hadac & Hadacova 1971).

Pinus tropicalis / Paepalanthus seslerioides - Syngonanthus insularis Woodland

DESCRIPTION: Open pine association on white-sands, with the canopy dominated by *Pinus tropicalis*. Characteristic species are: *Paepalanthus seslerioides*, *Paepalanthus alsinoides*, *Syngonanthus insularis*, *Pachyanthus longifolius*, *Kalmiella aggregata*, *Kalmiella simulata*.

DISTRIBUTION: Cuba: western Isle of Pines.

COMMENTS: Based on Samek (1969); Borhidi (1991).

SYNONYMY: Paepalantho-Pinetum tropicalis (Samek 1969).

⁴⁴ The phrase "or needle-stemmed" in parenthesis is added, to include the Australian "pine" woodland plantations.

II.A.3.N.a. *Pinus caribaea* var. *bahamensis* Woodland Alliance (*Pinus caribaea bahamensis* woodlands, on limestone)

CONCEPT: "Pineyards" of the Bahamas, on limestone, with essentially monospecific canopy of *Pinus caribaea* var. *bahamensis*. These communities occur near the conceptual boundary between wetland (saturated or seasonally saturated) and upland situations.

DISTRIBUTION: Bahamas.

SYNONYMY: Pineyard, in part; Pineland, in part; Dry Pine Barren (Correll & Correll 1982).

***Pinus caribaea* var. *bahamensis* / *Coccothrinax argentea* - *Vernonia bahamense* - *Tabebuia bahamensis* Woodland (7620)**

DESCRIPTION: Pine woodlands of *Pinus caribaea* var. *bahamensis*, often with *Schizachyrium gracile*. Species that are more prevalent in this association are: *Coccothrinax argentea*, *Vernonia bahamense*, *Petitia domingensis*, *Duranta repens*, *Acacia choriophylla*, *Tetrazygia bicolor*, *Zanthoxylum fagara*, *Cordia bahamensis*, *Ernodea littoralis*, *Hypericum hypericoides*, *Turnera ulmifolia* and *Bletia purpurea*.

DISTRIBUTION: Bahamas: Grand Bahama, Abaco, New Providence, Andros, and Caicos Islands.

COMMENTS: Based on Correll & Correll (1982).

SYNONYMY: Dry Pine Barren (Correll & Correll 1982).

***Pinus caribaea* var. *bahamensis* / *Metopium toxiferum* - *Byrsonima lucida* Woodland (7628)**

DESCRIPTION: Prevalently associated to *Pinus caribaea* var. *bahamensis* in this woodland type are *Metopium toxiferum*, and *Byrsonima lucida*. Fewer palms than in *Pinus caribaea* var. *bahamensis* / *Coccothrinax argentea* - *Vernonia bahamense* - *Tabebuia bahamensis* Woodland (7620).

DISTRIBUTION: Bahamas: Grand Bahama, Abaco, New Providence, Andros.

COMMENTS: Many species occurring in this community are also found in the above described association. However, most of them are more prevalent in only but one of the two communities within the Alliance.

SYNONYMY: Wet Pine Barren (Correll & Correll 1882).

II.A.3.N.a. *Pinus occidentalis* Woodland Alliance (*Pinus occidentalis* woodlands)

CONCEPT: Mid-altitude pine woodland with essentially monospecific canopy of *Pinus occidentalis*.

DISTRIBUTION: Hispaniola (Dominican Republic).

SYNONYMY: Pineto Basso (Ciferri 1936), in part; Pinares de Elevación intermedia (Hager & Zaroni 1993), in part.

***Pinus occidentalis* Woodland**

DESCRIPTION: Pine woodland with essentially monospecific canopy of *Pinus occidentalis*, at mid elevations, in slopes usually facing south. This community occurs in relatively dry, rocky substrate. The understory is poor in species, and a herbaceous layer of *Andropogon* spp. and other grasses is often present. Other species may include *Agave antillana*, *Salvia* spp. and the exotic *Melinis minutiflora*.

DISTRIBUTION: Dominican Republic (Cordillera Central; Sierra de Bahoruco).

COMMENTS: Based on Hager & Zaroni (1993).

SYNONYMY: Pinares Secos (Hager & Zaroni 1993).

II.A.3.N.a. *Pinus caribaea* var. *caribaea* Woodland Alliance (*Pinus caribaea caribaea* woodlands, on serpentines and ferritic soils)

CONCEPT: Pine woodland with canopy dominated by *Pinus caribaea* var. *caribaea* on the ferritic soils and serpentine outcrops of western Cuba (Cajalbana hills).

DISTRIBUTION: West Cuba (Cajalbana).

SYNONYMY: Neomazaeo-Pinon caribaeae (Borhidi *et al.* 1979; Borhidi 1991), in part.

***Pinus caribaea* var. *caribaea* / *Aristida refracta* - *Andropogon gracilis* Woodland**

DESCRIPTION: Low-altitude pine woodland covering small areas of ridges and/or slopes on the northern part of the Cajalbana range, with an open canopy

dominated by *Pinus caribaea* var. *caribaea*, and substantial coverage by a grass-dominated herb layer.

DISTRIBUTION: West Cuba (Cajálbana).

COMMENTS: This community is basically a degraded *Pinus caribaea* var. *caribaea* forest on ferritic soils, with open canopy and well developed herb layer dominated by grasses.

SYNONYMY: Pinetum caribaeae cajalbanensis typicum (Samek 1973); Neomazaeo-Pinetum caribaeae (Borhidi *et al.* 1979), in part.

***Pinus caribaea* var. *caribaea* / *Agave cajalbanensis* Woodland**

DESCRIPTION: Pine community with open canopy dominated by *Pinus caribaea* var. *caribaea*, on the steep, rocky serpentine slopes of the Cajálbana range. This woodland is characterized by a number of heliophilous scrub elements rich in spiny species. Common associates include: *Agave cajalbanensis*, *Eugenia rigidifolia*, *Brya ebenus*, *Jacquinia brunnescens*, *Erythroxylon minutifolium*, *Malpighia horrida*, *Rheedia fruticosa*, *Lescaillea equisetiformis*, *Plumeria sericifolia*, *Garcinia serpentini*, *Buxus wrightii*, *Zanthoxylum dumosum*, *Machaonia dumosa*, *Plinia dermatodes*, *Scolosanthus acunae*.

DISTRIBUTION: West Cuba (Cajálbana).

COMMENTS: Based on Samek (1973); Borhidi (1991).

SYNONYMY: Agavo cajalbanensi-Pinetum caribaeae (Samek 1973).

***II.A.3.N.a. Pinus cubensis* Woodland Alliance (*Pinus cubensis* woodlands, on serpentine rocks)**

CONCEPT: Open woodlands with canopy dominated by *Pinus cubensis*, on bare serpentine rocks. *Coccothrinax orientalis* is usually present in the canopy. The species-rich, well developed microphyllous evergreen shrub layer is made up by the same endemic species found in the serpentine scrubs of eastern Cuba.

DISTRIBUTION: East Cuba (serpentine ranges of Sagua-Baracoa).

SYNONYMY: Guettardo-Pinion cubensis (Borhidi *et al.* 1979), in part.

***Pinus cubensis* / *Anemia coriacea* - *Anemia nipensis* - *Clerodendron nipense* Woodland (TNC 7622)**

DESCRIPTION: Xerophytic pine woodland community with canopy dominated by *Pinus cubensis*, on shallow ferritic soils often rich in hardpan on iron-oxide concretions, in the foothills and submontane serpentine belts of east Cuba. Characteristic species include *Pinus cubensis*, *Anemia coriacea*, *Anemia nipensis*, *Clerodendron nipense*, *Plumeria clusioides*, *Lyonia nipensis*, *L. macrophylla*, *Pachyanthus reticulatus*, *Tabebuia shaferi*, *Ouratea striata*, *Guettarda monocarpa*, *G. calyptrata*, *Casearia crassinervis*, *Vernonia urbaniana*, *Rondeletia myrtacea* and *Bletia floribunda*.

DISTRIBUTION: East Cuba (mainly in Sierra de Nipe, but also in the Sierra Cristal range).

REFERENCES: Samek (1973); Borhidi (1991).

SYNONYMY: Pinetum anemietosum Rhynchosia (Samek 1973); Anemio coriaceae-Pinetum cubensis (Borhidi *et al.* 1979).

***Pinus cubensis* / *Euphorbia helenae* Woodland (TNC 7625)**

DESCRIPTION: Pine woodland association with a 6-10 m tall canopy dominated by *Pinus cubensis*, on shallow, rather rocky ferritic soils, in the Sagua-Baracoa serpentine range of eastern Cuba. Dwarf palms are usually present in the well-developed shrub layer. Most characteristic species are: *Pinus cubensis*, *Coccothrinax yuraguana* ssp. *moaensis*, *Euphorbia helenae*, *Scaevola wrightii*, *Coccoloba oligantha*, *Croton monogynus*, *Eupatorium lantanifolium*, *Guettarda ferruginea*, *Gochnatia recurva*, *Hypericum styphelioides* ssp. *moaensis*, *Linodendron aronifolium*, *Malpighia cnide*, *Tabebuia pinetorum*, *Byrsonima minutifolia*, *Vaccinium alainii* and *Vernonia wrightii*.

DISTRIBUTION: East Cuba (in all the range of the Sagua-Baracoa massif, but especially on the eroded rocky ridges of Moa).

REFERENCES: Borhidi (1991).

SYNONYMY: *Euphorbia helenae*-Pinetum cubensis (Samek 1973) *sensu* Borhidi *et al.* (1979).

***Pinus cubensis* / *Agave shaferi* - *Ariadne shaferi* Woodland (TNC 7621)**

DESCRIPTION: Open *Pinus cubensis* woodland on the rocky peaks and steep rocky slopes of the serpentine ranges of eastern Cuba (Nipe-Cristal).

Characteristic species of this association include *Pinus cubensis*, *Agave shaferi*, *Ariadne shaferi*, *Coccothrinax orientalis*, *Aristida laevigata*, *Oplonia cubensis*, *Psychotria graminifolia*, *Callicarpa nipensis*, *Callicarpa lancifolia*, *Callicarpa cuneifolia*, *Clusia nipensis*, *Euphorbia podocarpifolia*, *Ossaea acunae*, *Phyllanthus shaferi*, *Xylosma buxifolium*, *Gesneria nipensis*, *Vaccinium cubense*, *Platygyne triandra*, and others.

DISTRIBUTION: East Cuba: Nipe and Cristal serpentine ranges.

REFERENCES: Borhidi (1991).

SYNONYMY: *Agave shaferi*-Pinetum cubensis (Samek 1973) *sensu* Borhidi *et al.* (1979).

***II.A.3.N.d. Saturated tropical or subtropical needle-leaved evergreen woodland*
(SATURATED PINE WOODLAND)
(ARBOLEDA DE PINOS SATURADA)**

***II.A.3.N.d. Pinus caribaea* var. *bahamensis* Woodland Alliance (*Pinus caribaea bahamensis* saturated woodlands)**

CONCEPT: Seasonally saturated "pineyards" of the Bahamas, limestone rocks, with essentially monospecific canopy of *Pinus caribaea* var. *bahamensis*.

DISTRIBUTION: Bahamas.

SYNONYMY: Pineyard, in part; Pineland, in part; Wet Pine Barren (Correll & Correll 1982).

REFERENCES: Correll & Correll 1982.

***Pinus caribaea* var. *bahamensis* / *Sabal palmetto* Woodland**

DESCRIPTION: Pine woodlands of *Pinus caribaea* var. *bahamensis*, associated to *Sabal palmetto* on typically honeycombed limestone strata.

DISTRIBUTION: Bahamas: Grand Bahama, Abaco, New Providence, Andros.

COMMENTS: Many species occurring in this community are also found in the association described below. However most of them are more prevalent in only but one of the two communities within the Alliance.

SYNONYMY: Wet Pine Barren (Correll & Correll 1982), in part.

REFERENCES: Correll & Correll 1982.

II.A.5. Extremely xeromorphic evergreen woodland

II.A.5.N. Natural/Semi-natural

II.A.5.N.b. Succulent extremely xeromorphic evergreen woodland

(CACTUS WOODLAND)

(ARBOLEDA DE CACTOS)

(MOST TYPES TO BE DEFINED)

***II.A.5.N.b. Stenocereus peruvianus* Woodland Alliance**

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

***Stenocereus peruvianus* / *Plumeria tuberculata* - *Neea shaferi* - *Capparis ferruginea* Woodland (TNC 7631)**

SYNONYMY: Cactus scrub.

REFERENCES: {Guant. Bay}

Subclass: ***II.B. DECIDUOUS WOODLAND***

Group: II.B.1. Tropical or subtropical drought-deciduous woodland
Subgroup: II.B.1.N. Natural/Semi-natural

II.B.1.N.a. Lowland or submontane broad-leaved drought-deciduous woodland

LOWLAND/SUBMONTANE DROUGHT-DECIDUOUS WOODLAND)

(ARBOLEDA SECA DECIDUA DE BAJA ALTITUD/SUBMONTANA)

II.B.1.N.a. *Bursera simaruba* Woodland Alliance

CONCEPT: Common shrubs include *Pilosocereus royenii*, *Thouinia striata* var. *portoricensis*, *Plumeria alba*, *Croton lucidus*, *Pictetia aculeata*, *Comocladia dodonaea*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Gumbolimbo Savana -- 64.3 (Dansereau 1966).

Subclass: II.C. MIXED EVERGREEN-DECIDUOUS WOODLAND

Group: II.C.1. Tropical or subtropical semi-deciduous woodland

Subgroup: II.C.1.N. Natural/Semi-natural

II.C.1.N.a. Tropical or subtropical semi-deciduous woodland

(SEMI-DECIDUOUS WOODLAND)

(ARBOLEDA SEMI-DECIDUA)

II.C.1.N.a. *Bucida buceras* Woodland Alliance

CONCEPT: *Bucida buceras*, with *Savia sessiliflora*, *Krugiodendron ferreum*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Bucaro Forest -- 64.1 (Dansereau 1966); Bucaro Woodland -- 64.2 (Dansereau 1966).

II.C.1.N.b. Seasonally flooded tropical or subtropical semi-deciduous woodland

(SEASONALLY FLOODED SEMI-DECIDUOUS WOODLAND)

(ARBOLEDA SEMI-DECIDUA ESTACIONALMENTE INUNDADA)

II.C.1.N.b. *Bucida spinosa* Seasonally Flooded Woodland Alliance

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

***Bucida spinosa* - *Harrisia taylori* / *Cordia globosa* - *Lycium americanum* Woodland**
(TNC 7634)

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

SYNONYMY: Bucida woodland.

***Cordia dentata* - *Citharexylum fruticosum* - *Capparis ferruginea* / *Cordia globosa* - *Lycium americanum* Woodland** (TNC 7635)

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

SYNONYMY: Bucida woodland.

II.C.1.N.x. Seasonally/temporarily flooded tropical or
subtropical semi-deciduous woodland
(SEASONALLY/TEMPORARILY FLOODED SEMI-
DECIDUOUS WOODLAND)
(ARBOLEDA SEMI-DECIDUA
ESTACIONALMENTE/TEMPORALMENTE INUNDADA)

(TYPES TO BE DEFINED)

<p>Class: III. SHRUBLAND (SCRUB) Subclass: III.A. EVERGREEN SHRUBLAND (SCRUB) Group: III.A.1. Tropical and subtropical broad-leaved evergreen shrubland Subgroup: III.A.1.N. Natural/Semi-natural</p>

**III.A.1.N.a. Tropical or subtropical broad-leaved evergreen shrubland (includes
bamboos and tuft-trees)**
(EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE)

III.A.1.N.a. *Cassia lineata* Shrubland Alliance
DISTRIBUTION: Bahamas.

***Cassia lineata* - *Gundlachia corymbosa* Shrubland (TNC XXXX)**

DESCRIPTION: This community occurs on ocean shorelines. Typical species are
Suriana maritima, *Strumpfia maritima*, *Antirhea myrtifolia*, *Cassia lineata*, *Salmia petrobioides*,
Gundlachia corymbosa, and sometimes *Scaevola plumieri*.

DISTRIBUTION: Bahamas.

SYNONYMY: 1.a. Beach strand, in part (Freid 1998).

III.A.1.N.a. *Clusia minor* - *Clusia clusioides* Shrubland Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Montane Broadleaf Scrub -- 87.4a (Dansereau 1966).

III.A.1.N.a. *Colubrina* spp. Shrubland Alliance

CONCEPT: *Oplonia spinosa*, *Comocladia dodonaea*, *Reynosia uncinata*, *Bromelia pinguin*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Snake-bark Scrub -- 22.4 (Dansereau 1966).

III.A.1.N.a. *Croton lucidus* Shrubland Alliance

DISTRIBUTION: Puerto Rico, Bahamas?

SYNONYMY: Firebrush Scrub -- 47.4 (Dansereau 1966).

III.A.1.N.a. *Dalbergia ecastaphyllum* Shrubland Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Maray-maray Scrub -- 21.4 (Dansereau 1966)

III.A.1.N.a. *Eugenia borinquensis*-*Tabebuia rigida* Shrubland Alliance

CONCEPT: Wind-sculpted scrub on summits of higher peaks in Puerto Rico, dominated by
Eugenia borinquensis, *Tabebuia rigida*, and others.

DISTRIBUTION: Puerto Rico.

***Eugenia borinquensis*-*Tabebuia rigida*-*Marcgravia sintenisii* Shrubland**

DESCRIPTION: This 1-3m tall shrubland occurs on the highest peaks (at elevations of
900-1050m) in the Luquillo Mountains in eastern Puerto Rico, associated with *Tabebuia rigida*-
Ocotea spathulata-*Eugenia borinquensis*-*Henriettea squamulosum* Forest. Dominant shrubs are
Eugenia borinquensis, *Tabebuia rigida*, *Ocotea spathulata*, *Micropholis garciniifolia*, *Daphnopsis*
philippiana, *Symphysia racemosa*, and *Ardisia luquillensis*. A dominant woody vine, often densely

draped over shrub species, is *Marcgravia sintenisii*. Other shrub and vine species include *Ilex sintenisii*, *Psychotria guadelupensis* ssp. *grosourdyana*, *Henriettea squamulosum*, *Miconia sintenisii*, *Miconia pachyphylla*, *Vriesea sintenisii*, *Sloanea berteriana*, *Cyathea borinquena*, *Alsophila bryophila*, *Ardisia luquillensis*, *Calyptanthus krugii*, *Ocotea leucoxydon*, *Mikania pachyphylla*, *Psychotria maleolens*, *Gesneria viridiflora* ssp. *sintenisii*, *Podocarpus coriaceus*, and *Prestoea montana*. Herbaceous species include *Guzmania berteriana*, *Olfersia cervina*, *Peperomia emarginella*, *Jacquemontia solanifolia*, *Pilea leptophylla*, *Diplazium lherminieri*, *Anthurium dominicense*, *Blechnum fragile*, *Thelypteris deltoidea*, *Isachne angustifolia*, and *Selaginella krugii*. Most of the dominant shrubs are endemic either to the Luquillo Mountains of eastern Puerto Rico, or somewhat more widespread endemics of montane Puerto Rico.

DISTRIBUTION: Puerto Rico.

SYNONYMY: High montane scrub -- 88.4b (Dansereau 1966).

III.A.1.N.a. *Gymnanthes lucida* Shrubland Alliance

CONCEPT: Shrublands dominated by *Gymnanthes lucida*, 2-5m in height. In Puerto Rico these are developed in thin soils over limestone, in hills in NC. and NW. Puerto Rico. *Eugenia monticola* is often co-dominant.

DISTRIBUTION: Puerto Rico, Bahamas, [West Indies].

COMMENTS: *Gymnanthes lucida* is called *Ateramnus lucidus* in some literature.

SYNONYMY: Crabwood scrub -- 60.4 (Dansereau 1966).

***Gymnanthes lucida* - *Eugenia monticola* Shrubland**

DESCRIPTION: Shrublands dominated by *Gymnanthes lucida*, 2-5m in height. In Puerto Rico these are developed in thin soils over limestone, in hills in nc. and nw. Puerto Rico. *Eugenia monticola* is often co-dominant.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Crabwood scrub -- 60.4 (Dansereau 1966).

III.A.1.N.a. *Pithecellobium unguis-cati* Shrubland Alliance

CONCEPT: Dry shrublands in near-coastal areas of Martinique.

DISTRIBUTION: Martinique.

***Pithecellobium unguis-cati*-*Cordia* spp.-*Croton* spp.-*Lantana* spp. Shrubland**

DESCRIPTION: Typical species of this dry shrubland include *Pithecellobium unguis-cati*, *Cordia* spp., *Croton* spp., *Lantana* spp., *Crossopetalum rhacoma*, *Pimenta racemosa*, *Erythroxylum brevipes*, *Erythroxylum ovatum*, *Capparis* spp.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber 1988).

SYNONYMY: Dry Bushland (Kimber 1988).

III.A.1.N.a. *Rondeletia martinicensis* - *Miconia martinicensis* Shrubland Alliance

CONCEPT: Wind-sculpted scrub on summits of higher peaks in Martinique, dominated by the Martinique endemics *Rondeletia martinicensis*, *Miconia martinicensis*, and others. These shrublands are associated with cloud forests.

DISTRIBUTION: Martinique.

***Rondeletia martinicensis* - *Miconia martinicensis* - *Ilex macfadyenii* Shrubland**

DESCRIPTION: Cloud shrublands on the summits of the higher peaks of Martinique, the Carbet Pitons, Morne Jacob, and Mont Pelée. The 2-4m tall shrubland is dominated by *Rondeletia martinicensis*, *Miconia martinicensis*, *Ilex macfadyenii*, *Didymopanax attenuatum*, *Chorizanthe* spp., melastomes, and ericads. Branches are densely covered with bryophytes, bromeliads, and orchids.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Montane Bushland (Kimber 1988).

III.A.1.N.a. *Schefflera gleasonii* Shrubland Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Montane Maquis -- 87.4 (Dansereau 1966).

III.A.1.N.a. *Tabebuia heterophylla* Shrubland Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Roble Prieto Scrub -- 63.4 (Dansereau 1966).

III.A.1.N.a. *Thrinax morrisii* - *Coccothrinax argentata* Shrubland Alliance

CONCEPT:

DISTRIBUTION: Bahamas (Exumas, San Salvador, East Caicos).

REFERENCES: Freid (unpublished).

***Thrinax morrisii* - *Coccothrinax argentata* Shrubland (XXXX)**

Description: This shore-associated community occurs on sand substrate, on old (stabilized) sand beaches. The community is dominated by 2-3 meter high thickets of *Thrinax morrisii* and *Coccothrinax argentata*, sometimes also with *Pseudophoenix sargentii*. Occurs on old (stabilized) sand beaches. Herb stratum is sparse, occasionally with *Heliotropium nanum*, *Fimbristylis sp.*, and occasionally with scattered shrubs *Reynosa septentrionalis* and *Bourreria ovata*.

Distribution: Bahamas (Exumas, San Salvador, East Caicos).

Synonymy: 4.a. *Thrinax/Coccothrinax* groves, in part (Freid 1998).

III.A.1.N.b. *Hemisclerophyllous tropical or subtropical broad-leaved evergreen shrubland*

**(HEMISCLEROPHYLLOUS EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE HEMIESCLERÓFILO)**

III.A.1.N.b. *Coccoloba uvifera* Shrubland Alliance

CONCEPT: Coastal strand or berm communities dominated by dwarfed *Coccoloba uvifera* and other salt aerosol sculpted shrubs.

DISTRIBUTION: Florida, Puerto Rico, Bahamas, Martinique.

SYNONYMY: Sea-grape Scrub -- 20.4 (Dansereau 1966)

***Coccoloba uvifera* - *Hura crepitans* - *Zanthoxylum spinifex* Shrubland**

DESCRIPTION: This community is a dense salt-pruned thicket oceanwards of the *Tabebuia pallida* - *Calophyllum calaba* - *Coccoloba swartzii* - *Bursera simaruba* - *Hippomane mancinella* - *Coccoloba uvifera* Forest. The primary species is *Coccoloba uvifera*, intermixed variously with *Hura crepitans*, *Zanthoxylum spinifex*, *Capparis baducca*, *Tabebuia pallida*, *Eugenia axillaris*, *Erithalis fruticosa*, *Maytenus laevigata*, and *Mancinella hippomane*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Littoral Hedge (Kimber 1988).

***Coccoloba uvifera* - *Thespesia populnea* Shrubland**

DISTRIBUTION: Puerto Rico.

III.A.1.N.c. Sclerophyllous tropical or subtropical broad-leaved evergreen shrubland

**(SCLEROPHYLLOUS EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE ESCLERÓFILO)**

III.A.1.N.c. *Strumpfia maritima* Shrubland Alliance

CONCEPT: Matted dwarf-shrubland, 1-5 dm tall, on flat to sloping limestone pavement on the coast of sw. Puerto Rico, dominated by old, salt-pruned *Conocarpus erectus*. Other species present include *Suriana maritima*, *Strumpfia maritima*, *Coccoloba uvifera*, and *Chamaesyce mesembrianthemifolia*.

DISTRIBUTION: Puerto Rico.

COMMENTS: Though stature indicates that this should be placed in dwarf-shrubland, it is not microphyllous, and is therefore placed (for now) in shrubland.

SYNONYMY: Button-mangrove Matted Scrub -- 15.9 (Dansereau 1966).

Conocarpus erectus - *Strumpfia maritima* - *Suriana maritima* Shrubland

DISTRIBUTION: Puerto Rico.

III.A.1.N.f. Seasonally flooded tropical or subtropical broad-leaved evergreen shrubland

**(SEASONALLY FLOODED EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE ESTACIONALMENTE
INUNDADO)**

III.A.1.N.f. *Chrysobalanus icaco* Seasonally Flooded Shrubland Alliance

Distribution: Puerto Rico.

***Chrysobalanus icaco* / *Blechnum serrulatum* Shrubland -- G?**

DISTRIBUTION: Puerto Rico.

SYNONYMY: Icao Scrub -- 37.4 (Dansereau 1966).

III.A.1.N.f. *Thrinax morrisii* - *Coccothrinax argentata* Seasonally Flooded Shrubland Alliance

***Thrinax morrisii* - *Coccothrinax argentata* / *Cladium mariscus* ssp. *jamaicense*
Shrubland (XXXX)**

DESCRIPTION: Dominated by mixtures of *Thrinax morrisii* and *Coccothrinax argentata*. This community occurs in seasonally flooded and semipermanently saturated situations, associated with *Cladium* marsh. The herbaceous stratum is well-developed, and consists of *Eleocharis* spp. and *Cladium mariscus* ssp. *jamaicense*.

DISTRIBUTION: Bahamas (North Andros, possibly Abaco, possibly Freeport).

SYNONYMY: 4.a. *Thrinax/Coccothrinax* groves, in part (Freid 1998).

III.A.1.N.g. Semi-permanently flooded tropical or subtropical broad-leaved evergreen shrubland

**(SEMI-PERMANENTLY FLOODED EVERGREEN
SHRUBLAND)
(MATORRAL SIEMPREVERDE SEMI-PERMANENTEMENTE
INUNDADO)**

III.A.1.N.g. *Rhizophora mangle* Semipermanently Flooded Shrubland Alliance

CONCEPT: Nontidal shrublands dominated by *Rhizophora*. Occurs in more stressed sites than *Rhizophora mangle* Forests and has shorter individuals (less than five meters, and usually only one-half to two meters tall) and often sparser as well.

DISTRIBUTION: FL, West Indies.

SYNONYMY: Scrub Mangrove Thicket (Hilsenbeck et al. 1979).

***Rhizophora mangle* / *Eleocharis cellulosa* Shrubland**

DESCRIPTION: Stunted *Rhizophora mangle* Shrubland, the mangroves typically 0.5 to 2.5 meters in height, and more likely to be intertwined by prop roots than by branches. This community occurs in seasonally to semipermanently flooded situations, in "gumbo marls" over oolite. Shrub cover is generally from 20-60 percent, and areas between the shrubs are dominated by *Eleocharis cellulosa*, with *Utricularia purpurea*, *Utricularia* spp., *Rhynchospora tracyi*, *Crinum americanum*, *Chara* sp., and with a dense marl periphyton. Bromeliads (*Tillandsia paucifolia*, *Tillandsia flexuosa*) may be common on the mangroves.

DISTRIBUTION: FL, Bahamas, West Indies.

SYNONYMY: Scrub Mangrove Thicket (Hilsenbeck et al. 1979).

III.A.1.N.h. Tidally flooded tropical or subtropical broad-leaved evergreen shrubland

(TIDALLY FLOODED EVERGREEN SHRUBLAND)

(MATORRAL SIEMPREVERDE MAREAL)

III.A.1.N.h. *Avicennia germinans* Tidal Shrubland Alliance

DISTRIBUTION: Florida, West Indies.

SYNONYMY: Black-mangrove Scrub -- 6.4 (Dansereau 1966).

***Avicennia germinans* / *Sarcocornia perennis* Shrubland**

DESCRIPTION: Mangrove communities growing on exposures of Miami Formation oolite in the lower Florida Keys. Dominated by a rather sparse stratum of *Avicennia germinans* (20-60 percent cover), mostly rooting in solution cavities, stunted by lack of soil and hypersaline conditions. Rarely *Laguncularia racemosa* may be present. *Sarcocornia perennis* (= *Salicornia virginica*) is scattered. No herbs are normally present. Oceanwards this community normally adjoins a deeper water *Rhizophora mangle* community. Landwards this community grades into a shrubless *Monanthochloe littoralis* community, which then grades into a *Conocarpus erectus* community.

DISTRIBUTION: Florida, West Indies.

III.A.1.N.h. *Conocarpus erectus* Tidal Shrubland Alliance

CONCEPT: Natural salinas on the southwest (dry) coast of Puerto Rico, with high salt concentrations, dominated by shrubby *Conocarpus erectus*.

DISTRIBUTION: Puerto Rico.

COMMENTS: Known from the Bosque Estatal de Guánica.

III.A.1.N.h. *Rhizophora mangle* Tidal Shrubland Alliance

CONCEPT: Shrublands dominated by *Rhizophora*. Occurs in more stressed sites than *Rhizophora mangle* Forests and has shorter individuals (less than 5 m, and usually only 0.5-2 m tall) and often sparser as well.

DISTRIBUTION: Florida, Puerto Rico, West Indies.

SYNONYMY: Tidal Swamp (FL 1990); ESU 3--Dwarf Mangrove Mudflats (Ross, O'Brien, and Flynn 1992).

***Rhizophora mangle* Shrubland**

DESCRIPTION: Generally monospecific shrublands in highly stressed situations (such as full saline, shallowly underlain by oolite). Sometimes grades landward to *Rhizophora mangle* Forest. Submerged for long periods, not on peats but on calcareous muds 2-30 cm deep over limestone. Structure varies from nearly closed to open (canopy closure 25-90 percent). Described from Florida Keys (Ross, O'Brien, & Flynn 1992). Other characteristic species include *Cladium mariscus* ssp. *jamaicense*, *Avicennia germinans*, *Salicornia virginica*.

DISTRIBUTION: Florida, Bahamas, West Indies, southwards.

SYNONYMY: Tidal Swamp (FL 1990); ESU 3--Dwarf Mangrove Mudflats (Ross, O'Brien, and Flynn 1992).

***Rhizophora mangle* - *Avicennia germinans* Shrubland**

DISTRIBUTION: Puerto Rico.

SYNONYMY: Red-mangrove Scrub -- 5.4 (Dansereau 1966).

***Rhizophora mangle* - *Avicennia germinans* - *Laguncularia racemosa* / *Batis maritima* Shrubland**

DISTRIBUTION: Puerto Rico.

SYNONYMY: Mixed Mangrove Scrub -- 7.4 (Dansereau 1966).

III.A.1.N.h. *Suriana maritima* Shrubland Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico.

SYNONYMY: Bay-cedar - Horse-bush Scrub -- 13.4 (Dansereau 1966); Bay-cedar Scrub -- 13.7 (Dansereau 1966).

***Suriana maritima* - *Gundlachia corymbosa* - *Borrchia arborescens* - *Conocarpus erectus* Shrubland**

DISTRIBUTION: Puerto Rico.

SYNONYMY: Bay-cedar - Horse-bush Scrub -- 13.4 (Dansereau 1966).

III.A.1.N.i. Tropical or subtropical broad-leaved evergreen montane shrubland⁴⁵
(EVERGREEN MONTANE SHRUBLAND)
(MATORRAL SIEMPREVERDE MONTANO)

Group: **III.A.4. Microphyllous evergreen shrubland**
Subgroup: **III.A.4.N. Natural/Semi-natural**

III.A.4.N.a. Lowland microphyllous evergreen shrubland⁴⁶
(LOWLAND MICROPHYLLOUS EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE MICRÓFILO DE BAJA
ALTITUD)

III.A.4.N.a. Rhachicallis americana Shrubland Alliance

Rhachicallis americana - Strumpfia maritima - Suriana maritima Shrubland (TNC XXXX)

DESCRIPTION: This community occurs on rocky (consolidated) limestone shores. The vegetation is dominated by *Rhachicallis americana*, *Strumpfia maritima*, and *Suriana maritima*. It is variable in height and density.

DISTRIBUTION: Bahamas, Greater Antilles (but not PR), US Virgin Islands.

SYNONYMY: Rocky shore (Freid 1998).

III.A.4.N.c. Microphyllous montane fumarole shrubland⁴⁷
(MICROPHYLLOUS MONTANE FUMAROLE SHRUBLAND)
(MATORRAL MICRÓFILO MONTANO DE FUMAROLAS)

III.A.4.N.c. (Alliance name has not been defined yet)

CONCEPT: Montane microphyllous shrubland of the active volcanic Lesser Antilles.

DISTRIBUTION: St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, St.

Lucia, St. Vincent and Grenada(?).

COMMENTS: Occurring in proximity to fumaroles. Beard considers this a subclimax community due to a lack of soil development or as he calls it "pioneer communities of volcanic ejecta".

SYNONYMY: Pioneer communities of volcanic ejecta (Beard, 1949).

III.A.4.N.d. Microphyllous evergreen montane shrubland with succulents⁴⁸
(MICROPHYLLOUS MONTANE SHRUBLAND WITH
SUCCULENTS)
(MATORRAL MICRÓFILO MONTANO CON SUCULENTAS)

III.A.4.N.c. Ilex turquinensis - Myrica cacuminis Shrubland Alliance (after Borhidi & Muñiz in Borhidi et al. 1979).

CONCEPT: Subalpine microphyllous shrublands of Cuba.

DISTRIBUTION: Cuba (1800-2000m altitude).

COMMENTS: Occurring at the summit of the highest mountains of Cuba slightly above the condensation belt, this vegetation type rich in herbaceous leaf-succulents and spiny plants is much drier than other West Indian non-microphyllous "elfin thickets" of the cloud zone, and thus treated separately.

⁴⁵ New Formation.

⁴⁶ The term "lowland" is added.

⁴⁷ New Formation.

⁴⁸ New Formation.

SYNONYMY: Alpine thicket (Seifritz 1943); Monte fresco in part (León 1946); Matorral fresco subalpino (Areces-Mallea 1978); Matorral sub-alpino (Capote & Berazaín 1984); Subpáramo (Capote et al. 1989); Elfin thicket (Borhidi 1991).

REFERENCES: Borhidi & Muñiz in Borhidi *et al.* 1979.

***Ilex turquinensis* - *Myrica cacuminis* - *Lyonia calycosa* - *Persea similis* Shrubland**

DESCRIPTION: Dense thicket composed of 1.5-3 m tall shrubs occupying the summits of the Pico Turquino massif. Typical species are *Ilex turquinensis*, *Myrica cacuminis*, *Persea similis*, *Lyonia calycosa*, *Peratanthe cubensis*, *Lobelia cacuminis*, *Torralsbasia cuneifolia*, *Ageratina paucibracteata* (= *Eupatorium*), *Vernonia parvuliceps* and *Vernonia praestans* ssp. *cacuminis*.

DISTRIBUTION: Southeastern Cuba.

***Agave pendentata* - *Mitracarpus acunae* - *Peratanthe cubensis* Shrubland**

DESCRIPTION: Low 0.5-1m tall thicket on the rather exposed upper rocky slopes of the Turquino group, with an endemic *Agave* species and many shrubs and dwarf shrubs (e.g. *Ilex nanophylla*, *Ilex turquinensis*, *Mitracarpus acunae*, *Cassia turquinae*, *Micromeria bucheri*, *Shoepfia stenophylla*, *Vernonia praestans* ssp. *cacuminis*). The shrubs are often intertwined by the lianes *Chusquea abietifolia* and *Arthrostylidium multispicatum*.

DISTRIBUTION: Southeastern Cuba.

Group: III.A.5. Extremely xeromorphic evergreen shrubland

Subgroup: III.A.5.N. Natural/Semi-natural

III.A.5.N.a. Broad-leaved microphyllous evergreen extremely xeromorphic subdesert shrubland (e.g. creosote bush)

(MICROPHYLLOUS EVERGREEN EXTREMELY XEROMORPHIC SUBDESERT SHRUBLAND)

(MATORRAL SUBDESÉRTICO SIEMPREVERDE)

MICRÓFILO EXTREMADAMENTE XEROMÓRFICO)

III.A.5.N.a. *Capparis ferruginea* - *Citharexylum fruticosum* Shrubland Alliance

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

***Capparis ferruginea* - *Henoonia brittonii* - *Colubrina elliptica* - *Erythroxylum havanense* - *Randia aculeata* Shrubland (TNC 7644)**

DISTRIBUTION: Cuba.

SYNONYMY: Thorn scrub.

III.A.5.N.a. *Coccothrinax fragrans* - *Croton (rosmarinioides, stenophyllus)* Shrubland Alliance

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

***Coccothrinax fragrans* - *Croton stenophyllus* - *Ateleia gummifera* / *Agave underwoodii* Shrubland (TNC 7645)**

DISTRIBUTION: Cuba.

SYNONYMY: *Coccothrinax* scrub.

***Croton stenophyllus* - *Exostema caribaeum* - *Coccothrinax fragrans* - *Pithecellobium circinale* Shrubland (TNC 7646)**

DISTRIBUTION: Cuba.

SYNONYMY: *Croton* - *Coccothrinax* scrub.

III.A.5.N.b. Facultatively deciduous extremely xeromorphic subdesert shrubland

(FACULTATIVELY DECIDUOUS SUBDESERT SHRUBLAND)

(MATORRAL SUBDESÉRTICO FACULTATIVAMENTE

DECIDUO)

(TYPES TO BE DEFINED)

III.A.5.N.c. Succulent extremely xeromorphic evergreen shrubland

(SUCCULENT EVERGREEN SHRUBLAND)
(MATORRAL SIEMPREVERDE SUCULENTO)

III.A.5.N.c. *Melocactus intortus* Shrubland Alliance

DISTRIBUTION: Puerto Rico.

Melocactus intortus - *Opuntia rubescens* - *Pilosocereus royenii* - *Stenocereus hystrix* - *Oplonia spinosa* - *Conocarpus erectus* Shrubland (TNC 7647)

DISTRIBUTION: Puerto Rico.

SYNONYMY: High Button-mangrove - Cactus Scrub -- 15.4 (Dansereau 1966); Sebucan - Tachuelo Thornscrub -- 16.4 (Dansereau 1966).

Melocactus intortus - *Conocarpus erectus* - *Krameria ixine* - *Comocladia dodonaea* - *Croton discolor* Shrubland (TNC 7648)

DESCRIPTION: Sparse shrubland on limestone pavement, in sw. Puerto Rico.

DISTRIBUTION: Puerto Rico.

SYNONYM: Low Button-mangrove - Cactus Scrub -- 15.4a (Dansereau 1966).

III.A.5.N.c. *Pilosocereus royenii* Shrubland Alliance

CONCEPT: Mixed cactus scrub on limestone pavement and receiving salt aerosol. Dominated by *Pilosocereus royenii* (= *Cephalocereus nobilis*), with thorny legumes, *Randia aculeata*, and *Croton* spp. Lower shrubs include *Opuntia* spp. and *Furcraea tuberosa*. Native grasses include *Dactyloctenium aegyptiacum*, *Cenchrus echinatus*, and *Sporobolus indicus*.

COMMENTS: Based on Kimber (1988). Needs to be assessed against other cactus scrub in the Greater and Lesser Antilles.

DISTRIBUTION: Martinique, Antigua and Barbuda.

SYNONYMY: Mixed Cactus Scrub (Kimber 1988).

Pilosocereus royenii - *Agave karatto* Shrubland (TNC XXXX)

DESCRIPTION: Typical species include *Pilosocereus royenii*, *Agave karatto*, *Pisonia subcordata*, *Pisonia aculeata*, *Capparis indica*, *Capparis cynophallophora*, *Leucaena leucocephala*, *Pithecellobium unguis-cati*, *Haematoxylon campechianum*, and *Clerodendrum aculeatum*.

DISTRIBUTION: Antigua, Barbuda.

SYNONYMY: *Pilosocereus royenii* - *Agave karatto* (Lindsay & Horwith 1997)

REFERENCES: Lindsay & Horwith (1997).

Subclass: III.B. DECIDUOUS SHRUBLAND (SCRUB)

Group: III.B.1. Drought-deciduous shrubland

Subgroup: III.B.1.N. Natural/Semi-natural

III.B.1.N.a. Lowland drought-deciduous shrubland

(LOWLAND DROUGHT-DECIDUOUS SHRUBLAND)
(MATORRAL SECO DECIDUO DE BAJA ALTITUD)

III.B.1.N.a. *Acacia macracantha* - *Acacia farnesiana* Shrubland Alliance

CONCEPT: Thorn-scrub on rocky hillsides, following disturbance. May vary structurally towards woodland or savanna structure.

DISTRIBUTION: Martinique.

COMMENTS: Based on Beard (1949).

III.B.1.N.a. *Leucaena leucocephala* Shrubland Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: *Leucaena* Woodland -- 23.2 (Dansereau 1966); *Leucaena* Thicket -- 23.4 (Dansereau 1966).

Subclass: III.C. MIXED EVERGREEN-DECIDUOUS SHRUBLAND (SCRUB)

Group: III.C.1. *Mixed evergreen - drought-deciduous shrubland*

Subgroup: III.C.1.N. *Natural/Semi-natural*

III.C.1.N.a. *Mixed evergreen - drought-deciduous shrubland with succulents*⁴⁹

(MIXED EVERGREEN - DROUGHT-DECIDUOUS

SHRUBLAND WITH SUCCULENTS)

(MATORRAL MIXTO SIEMPREVERDE-DECIDUO CON

SUCULENTAS)

III.C.1.N.a. *Tabebuia bahamensis - Psidium longipes - Stigmaphyllon sagraeanum* Shrubland Alliance

Tabebuia bahamensis - Psidium longipes - Stigmaphyllon sagraeanum - Manilkara bahamensis - Cocoloba

***northropiae - Cocoloba tenuifolia* Shrubland (TNC XXXX)**

DESCRIPTION: This community occurs on limestone pavement with sinkhole and dogtooth development, just above watertable. Characteristic species include *Pithecellobium bahamense*, *Guettarda scabra*, *Tabebuia bahamensis*, *Bursera simaruba*, *Psidium longipes*, *Cocoloba northropiae*, *Cocoloba tenuifolia*, *Bumelia americana*, *Stigmaphyllon sagraeanum*, *Manilkara bahamensis*, *Cephalocereus*, *Randia aculeata*, and *Cladium mariscus ssp. jamaicense*. Physiognomy is very variable, with some areas severely dwarfed (less than 2 decimeters), and other areas over 2 meters tall.

DISTRIBUTION: Bahamas (Andros, Exumas).

SYNONYMY: Open Scrub (Freid 1998).

III.C.3.N.a. *Colubrina elliptica* Shrubland Alliance

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

***Colubrina elliptica - Stenocereus peruvianus - Plumeria tuberculata - Neea shaferi - Capparis ferruginea* Shrubland (TNC 7649)**

DISTRIBUTION: Cuba.

COMMENTS: Present in southeastern Cuba (Guantanamo Bay).

SYNONYMY: *Colubrina* scrub.

III. C. 1.N.b. Lowland or submontane mixed evergreen - drought deciduous shrubland

**(LOWLAND/SUBMONTANE MIXED EVERGREEN-
DROUGHT-DECIDUOUS SHRUBLAND)**

**(MATORRAL MIXTO SIEMPREVERDE-DECIDUO DE BAJA
ALTITUD/SUBMONTANO)**

(TYPES TO BE DEFINED)

⁴⁹ New Formation (FGDC has not defined Formations of Subgroup *III.C.1.N.*).

*III.C.1.N.c. Seasonally flooded tropical or subtropical mixed evergreen - drought-deciduous shrubland*⁵⁰

(SEASONALLY FLOODED MIXED EVERGREEN -
DROUGHT-DECIDUOUS SHRUBLAND)
(MATORRAL MIXTO SIEMPREVERDE-DECIDUO
ESTACIONALMENTE INUNDADO)

(TYPES TO BE DEFINED)

Class: *IV. DWARF-SHRUBLAND (DWARF SCRUB)*
Subclass: *IV.A. EVERGREEN DWARF-SHRUBLAND (DWARF-SCRUB)*
Group: *IV.A.2. Extremely xeromorphic evergreen dwarf-shrubland*
Subgroup: *IV.A.2.N. Natural/Semi-natural*

IV.A.2.N.c. Tidally flooded needle-leaved or microphyllous evergreen dwarf-shrubland
(TIDALLY FLOODED EVERGREEN DWARF-SHRUBLAND)
(MATORRAL ENANO SIEMPREVERDE MAREAL)

IV.A.2.N.c. Batis maritima Dwarf-shrubland Alliance

CONCEPT: Salt flats dominated (usually essentially monospecific) dominated by *Batis maritima*.
DISTRIBUTION: Cuba, Puerto Rico, Bahamas, Jamaica, Martinique.
SYNONYMY: Saltwort Scrub -- 11.4 (Dansereau 1966).

Batis maritima Dwarf-shrubland

CONCEPT: Salt flats (usually essentially monospecific) dominated by *Batis maritima*.
DISTRIBUTION: Cuba, Puerto Rico, Bahamas, Jamaica, Martinique.

IV.A.2.N.c. Rhachicallis americana Dwarf-shrubland Alliance

CONCEPT: Monotypic stands dominated by *Rhachicallis americana*. Occurs in extensive tidal flat areas.
DISTRIBUTION: Bahamas (Andros, East Caicos).
SYNONYMY: *Rhachicallis americana* flats (Freid 1998).

Rhachicallis americana Tidal Dwarf-shrubland (TNC XXXX)

DESCRIPTION: Monotypic stands dominated by *Rhachicallis americana*. Occurs in extensive tidal flat areas.
DISTRIBUTION: Bahamas (Andros, East Caicos).
SYNONYMY: *Rhachicallis americana* flats (Freid 1998).

Subclass: *IV.C. MIXED EVERGREEN-DECIDUOUS DWARF SHRUBLAND (DWARF SCRUB)*
Group: *IV.C.1. Mixed evergreen - drought-deciduous dwarf-shrubland*
Subgroup: *IV.C.1.N. Natural/Semi-natural*

IV.C.1.N.a. Mixed evergreen - drought-deciduous dwarf-shrubland
(MIXED EVERGREEN - DROUGHT-DECIDUOUS DWARF-SHRUBLAND)
(MATORRAL ENANO MIXTO SIEMPREVERDE-DECIDUO)

(TYPES TO BE DEFINED)

*IV.C.1.N.c. Succulent-facultatively drought-deciduous dwarf-shrubland*⁵¹

⁵⁰ New Formation (*sensu* Lindsay & Horwith 1997).

⁵¹ New Formation (*sensu* Lindsay & Horwith 1997).

(SUCCULENT-FACULTATIVELY DROUGHT-DECIDUOUS
DWARF-SHRUBLAND)
(MATORRAL ENANO SUCULENTO FACULTATIVAMENTE
DECIDUO)

(TYPES TO BE DEFINED)

Class: V. HERBACEOUS Subclass: V.A. PERENNIAL GRAMINOID VEGETATION (GRASSLANDS) Group: V.A.I. Tropical or subtropical grassland Subgroup: V.A.I.N. Natural/Semi-natural
--

V.A.1.N.a. Tall tropical or subtropical grassland
(TALL GRASSLAND)
(HERBAZAL ALTO)

(TYPES TO BE DEFINED)

V.A.1.N.b. *Medium-tall sod tropical or subtropical grassland*
(MEDIUM-TALL SOD GRASSLAND)
(HERBAZAL CESPITOSO MEDIANO-ALTO)

V.A.1.N.b. *Andropogon bicornis* Herbaceous Alliance
CONCEPT:
DISTRIBUTION: Puerto Rico.
SYNONYMY: Bluestem Prairie -- 79.5 (Dansereau 1966).

V.A.1.N.b. *Arundinella confinis - Schizachyrium sanguineum var. sanguineum* Herbaceous Alliance
CONCEPT:
DISTRIBUTION: Puerto Rico.
SYNONYMY: Rabo-de-gato Pasture -- 68.5 (Dansereau 1966).

V.A.1.N.b. *Axonopus compressus* Herbaceous Alliance
CONCEPT:
DISTRIBUTION: Puerto Rico, Bahamas, Martinique?
SYNONYMY: Carpet-grass Sward -- 50.6 (Dansereau 1966).

V.A.1.N.b. *Bouteloua repens* Herbaceous Alliance
CONCEPT:
DISTRIBUTION: Puerto Rico.
SYNONYMY: Grama-grass Steppe -- 66.7 (Dansereau 1966); Lamilla.

V.A.1.N.b. *Cenchrus myosuroides* Herbaceous Alliance
CONCEPT: Maritime grasslands dominated by *Cenchrus myosuroides*, occurring in southwestern Puerto Rico.
DISTRIBUTION: Puerto Rico, Bahamas?, Cuba.

Cenchrus myosuroides Herbaceous Vegetation (TNC 7651)
SYNONYMY: Sandspur Ruderal Grassland.

V.A.1.N.b. *Dichanthium annulatum* Herbaceous Alliance
CONCEPT:
DISTRIBUTION: Puerto Rico.
SYNONYMY: Angleton-grass Sward -- 70.7 (Dansereau 1966).

V.A.I.N.b. *Spartina patens* Herbaceous Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: Salt-grass Prairie -- 18.5 Dansereau 1966); Salt-grass Steppe -- 18.7 (Dansereau 1966)

V.A.I.N.b. *Stenotaphrum secundatum* Herbaceous Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: St. Augustine Grass Sward -- 49.6 (Dansereau 1966).

**V.A.1.N.c. Medium-tall bunch tropical or subtropical grassland
(MEDIUM-TALL BUNCH GRASSLAND)
(HERBAZAL DE PLANTÓN MEDIANO-ALTO)**

V.A.I.N.c. *Leptochloopsis virgata* Herbaceous Alliance

CONCEPT: Tall bunch grasslands dominated by *Leptochloopsis virgata*.

DISTRIBUTION: PR, Bahamas, Cuba.

SYNONYMY: Wire-grass Steppe -- 65.7 (Dansereau 1966).

***Leptochloopsis virgata* Herbaceous Vegetation (TNC 7652)**

V.A.I.N.c. *Leptocoryphium lanatum* - *Aristida portoricensis* Herbaceous Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico.

SYNONYMY: Lanilla Pasture -- 69.6 (Dansereau 1966).

V.A.I.N.c. *Schizachyrium gracile* Herbaceous Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Wiry-beardgrass Sward -- 52.6 (Dansereau 1966).

V.A.I.N.c. *Sporobolus indicus* Herbaceous Alliance

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: Cerrillo-grass Sward -- 51.6 (Dansereau 1966).

**V.A.1.N.d. Short sod tropical or subtropical grassland
(SHORT SOD GRASSLAND)
(HERBAZAL CESPITOSO CORTO)**

V.A.I.N.d. *Isachne angustifolia* - *Scleria scandens* Herbaceous Alliance

CONCEPT: Montane meadows and landslide scars at upper elevations of the Luquillo Mountains of eastern Puerto Rico. Dominant graminoids are *Isachne angustifolia* and *Scleria scandens* (= *Scleria canescens*). Other species include *Clibadium erosum* and *Phytolacca rivinoides*.

DISTRIBUTION: Puerto Rico.

REFERENCES: Guariguata 1990.

***Isachne angustifolia* - *Scleria scandens* - *Clibadium erosum* - *Phytolacca rivinoides*
Herbaceous Vegetation (TNC 7655)**

DESCRIPTION: Montane meadows and landslide scars at upper elevations of the Luquillo Mountains of eastern Puerto Rico. Dominant graminoids are *Isachne angustifolia* and *Scleria scandens* (= *Scleria canescens*). Other species include *Clibadium erosum* and *Phytolacca rivinoides*.

DISTRIBUTION: PR.

REFERENCES: Guariguata (1990).

V.A.1.N.f. Temporarily flooded tropical or subtropical
grassland

(TEMPORARILY FLOODED GRASSLAND)
(HERBAZAL TEMPORALMENTE INUNDADO)

V.A.1.N.f. Cyperus heterophyllus Temporarily Flooded Herbaceous Alliance

CONCEPT: Human-altered grasslands dominated by *Cyperus heterophyllus*, along gravelly montane and submontane creeks and rivers in Cuba.

DISTRIBUTION: Cuba.

Cyperus heterophyllus Herbaceous Vegetation (TNC 7657)

DESCRIPTION: Human-altered grasslands dominated by *Cyperus heterophyllus*, along gravelly montane and submontane creeks and rivers in Cuba.

DISTRIBUTION: Cuba.

COMMENTS: Based on Borhidi (1991).

SYNONYMY: *Cyperion heterophylli* (Borhidi 1991).

REFERENCES: Borhidi (1991).

V.A.1.N.g. Seasonally flooded tropical or subtropical grassland

(SEASONALLY FLOODED GRASSLAND)
(HERBAZAL ESTACIONALMENTE INUNDADO)

V.A.1.N.g. Cladium mariscus ssp. jamaicense Seasonally Flooded Herbaceous Alliance

CONCEPT: Marshes (sometimes very extensive, such as the Everglades, though often much smaller) dominated by *Cladium mariscus ssp. jamaicense*, the alkaline chemistry provided by underlying calcareous rock (oolite) rather than by brackish tidal influence (contrast V.A.5.N.n.010).

DISTRIBUTION: Bahamas, Florida.

SYNONYMY: Sawgrass Marsh; Wet Prairie; Sawgrass Glade (Hilsenbeck et al. 1979).

Cladium mariscus ssp. jamaicense - Bacopa caroliniana Herbaceous Vegetation

DESCRIPTION: Dense, tall (1-3 m) *Cladium mariscus ssp. jamaicense*, with some *Pontederia cordata* (var. *lancifolia*), *Sagittaria lancifolia*, *Eleocharis cellulosa*, *Proserpinaca palustris*, *Bacopa caroliniana*, *Bacopa monnieri*, *Ludwigia repens*, *Leptochloa fascicularis* var. *fascicularis*, and *Utricularia gibba* (*Utricularia biflora*). This community has a 5-10 month hydroperiod and occupies relatively deep organic soils.

DISTRIBUTION: Florida, Bahamas.

SYNONYMY: Sawgrass Marsh; Sawgrass Glade, in part (Hilsenbeck et al. 1979).

Cladium mariscus ssp. jamaicense / algal periphyton Herbaceous Vegetation

DESCRIPTION: Sparse, fairly tall (0.7-1.5 m) *Cladium mariscus ssp. jamaicense*, much less productive than denser *Cladium* because of harsh site conditions, and with fewer other vascular plant species present. Algal periphyton is nearly continuous, and is better developed than in the *Cladium mariscus ssp. jamaicense - Bacopa caroliniana* Herbaceous Vegetation.

DISTRIBUTION: Florida, Bahamas.

SYNONYMY: Wet Prairie; Sawgrass Glade, in part (Hilsenbeck et al. 1979).

V.A.1.N.g. Eleocharis interstincta - Sagittaria lancifolia Herbaceous Alliance

CONCEPT: Freshwater wetlands dominated by *Eleocharis interstincta* and *Sagittaria lancifolia*, in shallow waters of lakes, ponds, and boggy areas, on muddy and peaty substrates.

DISTRIBUTION: Puerto Rico, Bahamas, Cuba.

SYNONYMY: Sagittario-Eleocharetum interstinctae (Borhidi 1991); Spike-rush Marsh -- 34.5 (Dansereau 1966).

Eleocharis interstincta - Sagittaria lancifolia Herbaceous Vegetation

DESCRIPTION: Freshwater wetlands dominated by *Eleocharis interstincta* and *Sagittaria lancifolia*, in shallow waters of lakes, ponds, and boggy areas, on muddy and peaty

substrates. Other species include *Pontederia lanceolata*, *Nuphar lutea ssp. macrophylla*, and *Nymphaea ampla*.

DISTRIBUTION: Bahamas, Cuba.

COMMENTS: Based on Borhidi (1991).

SYNONYMY: Sagittario-Eleocharetum interstinctae (Borhidi 1991).

V.A.1.N.g. *Gynerium sagittatum* Herbaceous Alliance

CONCEPT: Riverside thickets dominated by *Gynerium sagittatum*.

DISTRIBUTION: Puerto Rico, Cuba.

***Gynerium sagittatum* Herbaceous Vegetation**

DESCRIPTION: Community dominated by the giant cane *Gynerium sagittatum*, in dense stands.

DISTRIBUTION: Puerto Rico, Cuba.

SYNONYMY: Rivercane Brake -- 36.5 (Dansereau 1966); Gynerietum sagittati (Borhidi 1991).

V.A.1.N.g. *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance

CONCEPT: Tropical wet prairies (marshes) dominated by *Panicum hemitomon*.

DISTRIBUTION: FL, [Bahamas].

***Panicum hemitomon* Herbaceous Vegetation**

DESCRIPTION: This tropical wet prairie community of southern Florida occurs on peat and marl-peat soils, with 6-11 month hydroperiod (generally greater than that of associated *Cladium mariscus ssp. jamaicense* and *Eleocharis cellulosa* - *Rhynchospora tracyi* communities). *Panicum hemitomon* dominates; other species present in small amounts are *Cladium mariscus ssp. jamaicense*, *Sagittaria lancifolia*, *Salix caroliniana*, *Nuphar lutea ssp. advena*, *Nymphaea odorata*, *Paspalidium geminatum var. paludivagum*, and *Typha domingensis*.

DISTRIBUTION: Bahamas, Florida.

COMMENTS: Needs additional data and assessment.

SYNONYMY: Wet Prairie; Maidencane Flat (Hilsenbeck et al. 1979).

V.A.1.N.g. *Phragmites australis* Herbaceous Alliance

CONCEPT: Marshes dominated by *Phragmites australis*.

DISTRIBUTION: PR, Bahamas.

SYNONYMY: Reed-grass Marsh -- 33.5 (Dansereau 1966).

V.A.1.N.h. Semi-permanently flooded tropical or subtropical grassland

(SEMI-PERMANENTLY FLOODED GRASSLAND)

(HERBAZAL SEMI-PERMANENTEMENTE INUNDADO)

V.A.1.N.h. *Brachiaria mutica* - *Eriochloa polystachya* Herbaceous Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Para-carib-grass Marsh -- 30.5 (Dansereau 1966).

V.a.1.N.h. *Hymenachne amplexicaulis* - *Panicum aquaticum* Herbaceous Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Trompetilla-grass Marsh -- 31.5 (Dansereau 1966).

V.A.1.N.h. *Paspalidium geminatum var. paludivagum* Herbaceous Alliance

CONCEPT: Monodominant community dominated by *Paspalidium geminatum var. paludivagum*, of semi-permanently flooded zones of freshwater lakes.

DISTRIBUTION: Bahamas?, Cuba.

COMMENTS: *Paspalidium geminatum var. paludivagum* has often been called *Panicum geminatum*; recently it has been proposed as *Setaria geminata var. paludivaga*.

REFERENCES: Borhidi (1991).

***Paspalidium geminatum* var. *paludivagum* - *Hydrocotyle umbellata* Herbaceous Vegetation**

DESCRIPTION: In shallower water than *Paspalidium geminatum* var. *paludivagum*-*Vallisneria americana* Herbaceous Vegetation.

DISTRIBUTION: Cuba.

SYNONYMY: *Paspalidium* *paludivagi* subass. *typicum* (Borhidi 1991).

REFERENCES: Borhidi (1991).

***Paspalidium geminatum* var. *paludivagum* - *Vallisneria americana* Herbaceous Vegetation**

DESCRIPTION: In deeper water than *Paspalidium geminatum* var. *paludivagum*-*Hydrocotyle umbellata* Herbaceous Vegetation.

DISTRIBUTION: Cuba.

SYNONYMY: *Paspalidium* *paludivagi* subass. *vallisnerietosum* (Borhidi 1991).

REFERENCES: Borhidi (1991).

V.A.1.N.h. *Typha domingensis* Herbaceous Alliance

CONCEPT: Marshes dominated (usually in nearly pure stands) by *Typha domingensis*.

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: Cattail Marsh -- 32.5 (Dansereau 1966).

**V.A.1.N.i. Tidally flooded tropical or subtropical grassland
(TIDALLY FLOODED GRASSLAND)
(HERBAZAL MAREAL)**

V.A.1.N.i. *Bothriochloa pertusa* Herbaceous Alliance

CONCEPT: Littoral grasslands dominated by *Bothriochloa pertusa*, with scattered shrubs of *Capparis flexuosa*, *Lantana involucrata*, *Rauvolfia nitida*, *Coccoloba uvifera*, and *Sesuvium portulacastrum*.

DISTRIBUTION: Puerto Rico.

COMMENTS: Known from Reserva Natural Cabezas de San Juan.

V.A.1.N.i. *Cladium mariscus* ssp. *jamaicensis* Herbaceous Alliance

DISTRIBUTION: Bahamas.

V.A.1.N.i. *Fimbristylis spadicea* Herbaceous Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico.

SYNONYMY: Salt-sedge Meadow -- 14.6 (Dansereau 1966).

V.A.1.N.i. *Sporobolus virginicus* Tidal Herbaceous Alliance

DISTRIBUTION: Florida, Puerto Rico, Bahamas, Cuba, Martinique?, St. Kitts and Nevis.

SYNONYMY: Beach-grass Sward -- 19.6 (Dansereau 1966).

REFERENCES: Dansereau 1966.

***Sporobolus virginicus* - *Paspalum vaginatum* Herbaceous Vegetation (TNC 7662)**

DISTRIBUTION: Puerto Rico, Martinique?.

SYNONYMY: Beach-grass Sward -- 19.6 (Dansereau 1966).

***Sporobolus virginicus* - *Distichlis spicata* Herbaceous Vegetation (TNC 7663)**

DISTRIBUTION: Florida, Cuba.

**V.A.1.N.x. Saturated tropical or subtropical grassland
(SATURATED GRASSLAND)
(HERBAZAL SATURADO)**

V.A.1.N.x. *Kyllinga squamata*-*Isachne rigidifolia*-*Eleocharis* spp. Herbaceous Alliance

CONCEPT: Montane wet meadows in Martinique.
DISTRIBUTION: Martinique.

***Kyllinga squamata-Isachne rigidifolia-Eleocharis spp. Herbaceous Vegetation* (TNC 7656)**

DESCRIPTION: Small areas at high elevations in the mountains of Martinique, dominated by *Kyllinga squamata*, *Isachne rigidifolia*, *Eleocharis spp.*, and *Dicranopteris bifida*.

DISTRIBUTION: Martinique.

COMMENTS: Based on Kimber (1988).

SYNONYMY: Montane Meadow (Kimber 1988).

REFERENCES: Kimber 1988.

V.A.I.N.x. (Alliance name has not been defined yet)

CONCEPT: Permanently saturated herbaceous vegetation occurring in the splash or spray zone of waterfalls, streams and rivers.

DISTRIBUTION: St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent and Grenada.

COMMENTS: This plant community is adapted to the wet, saturated conditions of waterfalls, rapids and streams. Plants can be found growing on the vertical rock faces of waterfalls or on large boulders in streams. However, the flora of this community differs from the true aquatic flora in the species composition and growth form. There is an abundance of ferns, mosses, lichens, bromeliads, short low shrubs and other herbaceous growth, and Lycopodium and Selaginella.

SYNONYMY: None.

REFERENCES: Lindsay (ined.).

Group: V.A.2. Tropical or subtropical grassland with a tree layer (generally 10-25%)

Subgroup: V.A.2.N. Natural/Semi-natural

V.A.2.N.a. Tall tropical or subtropical grassland with mainly broad-leaved evergreen trees (includes tuft plants and broad-leaved semi-evergreen trees)

(TALL GRASSLAND WITH BROAD-LEAVED EVERGREEN TREES)

(HERBAZAL ALTO CON ÁRBOLES LATIFOLIOS SIEMPREVERDES)

(TYPES TO BE DEFINED)

V.A.2.N.b. Tall tropical or subtropical grassland with broad-leaved evergreen drought-deciduous trees

(TALL GRASSLAND WITH BROAD-LEAVED DROUGHT-DECIDUOUS TREES)

(HERBAZAL ALTO CON ÁRBOLES LATIFOLIOS DECIDUOS)

(TYPES TO BE DEFINED)

V.A.2.N.c. Medium-tall tropical or subtropical grassland with broad-leaved evergreen trees (includes tuft plants and semi-evergreen trees)

(MEDIUM-TALL GRASSLAND WITH BROAD-LEAVED EVERGREEN TREES)

(HERBAZAL MEDIANO-ALTO CON ÁRBOLES LATIFOLIOS SIEMPREVERDES)

(TYPES TO BE DEFINED)

V.A.2.N.d. Medium-tall tropical or subtropical grassland with broad-leaved drought-deciduous trees

**(MEDIUM-TALL GRASSLAND WITH BROAD-LEAVED
DROUGHT-DECIDUOUS TREES)
(HERBAZAL MEDIANO-ALTO CON ÁRBOLES LATIFOLIOS
DECIDUOS)**

(TYPES TO BE DEFINED)

V.A.2.N.e. Medium-tall tropical or subtropical grassland with needle-leaved evergreen or mixed trees

**(MEDIUM-TALL GRASSLAND WITH NEEDLE-LEAVED
EVERGREEN OR MIXED TREES)
(HERBAZAL MEDIANO-ALTO CON ÁRBOLES
ACICULIFOLIOS SIEMPREVERDES O MIXTOS)**

(TYPES TO BE DEFINED)

V.A.2.N.f. Medium-tall tropical or subtropical grassland with xeromorphic trees or succulents

**(MEDIUM-TALL GRASSLANDS WITH XEROMORPHIC
TREES OR SUCCULENTS)
(HERBAZAL MEDIANO-ALTO CON ÁRBOLES
XEROMÓRFICOS O SUCULENTAS)**

(TYPES TO BE DEFINED)

V.A.2.N.g. Seasonally/temporarily flooded tropical grassland with broad-leaved evergreen trees (includes tuft plants)

**(SEASONALLY/TEMPORARILY FLOODED GRASSLAND
WITH BROAD-LEAVED EVERGREEN TREES)
(HERBAZAL ESTACIONALMENTE/TEMPORALMENTE
INUNDADO CON ÁRBOLES SIEMPREVERDES LATIFOLIOS)**

(TYPES TO BE DEFINED)

V.A.2.N.h. Seasonally/temporarily flooded tropical grassland with broad-leaved deciduous trees

**(SEASONALLY/TEMPORARILY FLOODED GRASSLAND
WITH DECIDUOUS TREES)
(HERBAZAL ESTACIONALMENTE/TEMPORALMENTE
INUNDADO CON ÁRBOLES DECIDUOS)**

(TYPES TO BE DEFINED)

V.A.2.N.i. Seasonally flooded/saturated tropical or subtropical grassland with needle-leaved evergreen trees

**(SEASONALLY FLOODED/SATURATED GRASSLAND WITH
PINE TREES)**

**(HERBAZAL ESTACIONALMENTE INUNDADO/SATURADO
CON PINOS)**

(TYPES TO BE DEFINED)

V.A.2.N.j. Short tropical or subtropical grassland with needle-leaved evergreen or mixed trees⁵²

**(SHORT GRASSLAND WITH PINE OR MIXED TREES)
(HERBAZAL CORTO CON PINOS O ÁRBOLES MIXTOS)**

(TYPES TO BE DEFINED)

V.A.2.N.k. Short tropical or subtropical grasslands with broad-leaved evergreen trees⁵³

**(SHORT GRASSLAND WITH BROAD-LEAVED EVERGREEN
TREES)
(HERBAZAL CORTO CON ÁRBOLES LATIFOLIOS
SIEMPREVERDES)**

(TYPES TO BE DEFINED)

Group: V.A.3. Tropical or subtropical grassland with a shrub layer (generally 10-25 %)
Subgroup: V.A.3.N. Natural/Semi-natural

V.A.3.N.i. Seasonally/temporarily flooded tropical or subtropical grassland with evergreen broad-leaved shrubs

**(SEASONALLY/TEMPORARILY FLOODED GRASSLAND
WITH BROAD-LEAVED SHRUBS)
(HERBAZAL ESTACIONALMENTE/TEMPORALMENTE
INUNDADO CON ARBUSTOS LATIFOLIOS)**

(TYPES TO BE DEFINED)

Group: V.A.4. Tropical or subtropical grassland with a dwarf-shrub layer (generally 10-25%)
Subgroup: V.A.4.N. Natural/Semi-natural

V.A.4.N.b. Tropical or subtropical forb-grassland with dwarf-shrubs and succulents⁵⁴

**(FORB-GRASSLAND WITH DWARF-SHRUBS AND
SUCCULENTS)
(HERBAZAL DE DICOTILEDÓNEAS Y GRAMÍNEAS CON
ARBUSTOS ENANOS Y SUCULENTAS)**

(TYPES TO BE DEFINED)

Subclass: V.B. PERENNIAL FORB VEGETATION
Group: V.B.1. Tropical or subtropical perennial forb vegetation
Subgroup: V.B.1.N. Natural/Semi-natural

⁵² New Formation.

⁵³ New Formation.

⁵⁴ New Formation, to include Lindsay & Horwith's *Lantana camara* forb-grassland Alliance and Beers *et al.* *Aristida-Tephrosia* type.

**V.B.1.N.b. Low tropical or subtropical perennial forb vegetation
(LOW PERENNIAL FORB VEGETATION)
(VEGETACIÓN PERENNE DE HERBÁCEAS NO
GRAMINOIDES)**

V.B.1.N.b. *Chamaesyce mesembrianthemifolia* Dwarf-shrubland Alliance

CONCEPT: Rocky shores of limestone or sandstone, with moderately dense to very sparse pockets of shrubby and herbaceous plants.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Spurge-sedge Mat -- 14.7 (Dansereau 1966); Spurge Desert -- 14.8 (Dansereau 1966).

***Chamaesyce mesembrianthemifolia* - *Fimbristylis spadicea* Dwarf-shrubland**

DESCRIPTION: Rocky shores of limestone or sandstone, with moderately dense to very sparse pockets of shrubby and herbaceous plants.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Spurge-sedge Mat -- 14.7 (Dansereau 1966); Spurge Desert -- 14.8 (Dansereau 1966).

V.B.1.N.b. *Euphorbia blodgettii* Herbaceous Alliance

CONCEPT: This community occurs in hard-packed sand areas behind dunes. Characteristic species are *Euphorbia blodgettii*, *Cassia lineata*, *Ambrosia hispida*, *Heliotropium nanum*, *Erithalis*, and *Ipomoea imperati*.

DISTRIBUTION: Bahamas.

***Euphorbia blodgettii* Sand Plain Herbaceous Vegetation (TNC XXXX)**

DESCRIPTION: This community occurs in hard-packed sand areas behind dunes. Characteristic species are *Euphorbia blodgettii*, *Cassia lineata*, *Ambrosia hispida*, *Heliotropium nanum*, *Erithalis*, and *Ipomoea imperati*.

DISTRIBUTION: Bahamas.

SYNONYMY: 1.c. Coastal herb/shrub plain (Freid 1998).

V.B.1.N.b. *Ipomoea pes-caprae* Vine-shrubland Alliance

DISTRIBUTION: Puerto Rico, Hawaii, Bahamas, Martinique.

SYNONYMY: Morning-glory Festoon -- 17.6 (Dansereau 1966)

***Ipomoea pes-caprae* - *Canavalia rosea* Vine-shrubland Vegetation**

DISTRIBUTION: Puerto Rico, Bahamas.

***Ipomoea pes-caprae* - *Scaevola plumieri* - *Ambrosia hispida* Herbaceous Vegetation (TNC XXXX)**

DESCRIPTION: This community occurs on unconsolidated substrates on ocean shores. Characteristic species include *Ipomoea pes-caprae*, *Ambrosia hispida*, *Sporobolus virginicus*, *Scaevola plumieri*, and *Hymenocallis arenicola*.

Distribution: Bahamas.

Synonymy: 1.a. Beach strand, in part (Freid 1998).

V.B.1.N.b. *Sesuvium portulacastrum* Herbaceous Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico, Hawaii, Bahamas, Martinique.

SYNONYMY: Sea-purslane Mat -- 10.6 (Dansereau 1966); Littoral Meadow, in part (Kimber 1988).

**V.B.1.N.d. Saturated tropical or subtropical perennial forb
vegetation**

(SATURATED PERENNIAL FORB VEGETATION)

(VEGETACIÓN SATURADA PERENNE DE HERBÁCEAS NO GRAMINOIDES)

V.B.I.N.d. *Diffenbachia seguine* Herbaceous Alliance

CONCEPT: Permanently or semi-permanently saturated herbaceous community, usually in standing or slow moving water.

DISTRIBUTION: Antigua, Nevis(?), Guadeloupe, Martinique, St. Lucia, Grenada and St. Vincent.

COMMENTS: *Diffenbachia* may form pure stands, sometimes covering fairly extensive areas of the stream. Only the roots and lower stem are inundated. It may also grow in association with herbaceous *Commelina* spp.

V.B.1.N.e. Tidally flooded tropical or subtropical perennial forb vegetation

(TIDALLY FLOODED PERENNIAL FORB VEGETATION)

(VEGETACIÓN MAREAL PERENNE DE HERBÁCEAS NO GRAMINOIDES)

V.B.I.N.e. *Acrostichum aureum* - *Acrostichum danaeifolium* Herbaceous Alliance

CONCEPT: Marshes dominated by giant ferns, usually in association with mangrove shrublands or mangrove forests.

DISTRIBUTION: Puerto Rico, Bahamas, Martinique.

SYNONYMY: Salt-fern Prairie -- 12.5 (Dansereau 1966); Littoral Meadow, in part (Kimber 1988).

Subclass: V.C. ***HYDROMORPHIC VEGETATION***

Group: V.C.I. ***Tropical or subtropical hydromorphic***⁵⁵ *vegetation (without seasonal contrasts)*

Subgroup: V.C.I.N. ***Natural/Semi-natural***

V.C.I.N.a. Permanently flooded tropical or subtropical hydromorphic⁵⁶ *vegetation*

(AQUATIC VEGETATION)

(VEGETACIÓN ACUÁTICA)

V.C.I.N.a. *Cabomba piauhyensis* Herbaceous Alliance (*Cabomba piauhyensis* freshwater vegetation)

CONCEPT: Vegetation dominated by the submerged *Cabomba piauhyensis* in lakes and ponds.

DISTRIBUTION: Western Cuba (Borhidi 1991); Jamaica (Grossman *et al.* 1993).

SYNONYMY: *Ceratophyllo-Cabombion piauhyensis* (Samek & Moncada 1971).

***Cabomba piauhyensis* Herbaceous Vegetation**

DESCRIPTION: Essentially monodominant with *Cabomba piauhyensis*.

DISTRIBUTION: Western Cuba.

SYNONYMY: *Cabombetum piauhyensis* (Borhidi *et al.* 1983).

REFERENCES: Borhidi *et al.* (1983).

***Cabomba piauhyensis* - *Nymphaea odorata* Herbaceous Vegetation**

DESCRIPTION: Submerged and rooted aquatic vegetation of white sand wetlands of West Cuba. This community is strongly dominated by *Cabomba piauhyensis* in the first place, and *Nymphaea odorata* in the second place. Other species include: *Nymphoides aureum*, *Salvinia auriculata*, *Ludwigia inclinata* and *Hymenachne amplexicaulis*.

DISTRIBUTION: Western Cuba (Pinar del Rio prov.).

SYNONYMY: *Nymphaeo-Cabombetum piauhyensis* (Samek & Moncada 1971).

⁵⁵ The term "rooted" was removed to include free-floating aquatic communities.

⁵⁶ The term "rooted" was removed to include free-floating aquatic communities. This complex vegetation unit consists of: (1) free-floating non rooted communities; (2) Rooted floating-leaf communities; (3) Rooted underwater communities, and (4) non-rooted underwater communities.

REFERENCES: Samek & Moncada (1971); Borhidi (1991).

V.C.I.N.a. *Vallisneria americana* Herbaceous Alliance (*Vallisneria americana* freshwater vegetation)

CONCEPT: Submerged aquatic freshwater communities dominated by *Vallisneria americana* (including *V. neotropicalis*).

DISTRIBUTION: West and central Cuba; Hispaniola (Ciferri 1936); south east U.S. and Florida (Borhidi 1991).

SYNONYMY: *Vallisnerion americanae* (Borhidi *et al.* 1983).

***Vallisneria americana* Herbaceous Vegetation**

DESCRIPTION: The aquatic community is strongly dominated by *Vallisneria americana*. Other species may include *Hydrocotyle umbellata*, *Potamogeton nodosus*, *Utricularia foliosa*, *Panicum geminatum*.

DISTRIBUTION: Cuba: Laguna del Tesoro, Rio Zaza; Hispaniola.

SYNONYMY: *Vallisnerietum americanae* (Borhidi *et al.* 1983); *Vallisnerietum neotropicalis* (Borhidi *et al.* 1983); *Vegetazione delle lagune a caratteri intermediari* (Ciferri 1936), in part.

REFERENCES: Ciferri (1936); Borhidi *et al.* (1983).

V.C.I.N.a. *Mayaca fluviatilis* Herbaceous Alliance (*Mayaca fluviatilis* freshwater vegetation)

CONCEPT: Submerged or partially submerged communities along margins of montane creeks and oligotrophic lowland lakes. These communities are strongly dominated by two different ecotypes of *Mayaca fluviatilis*: *M. fluviatilis* var. *fluviatilis* and *M. fluviatilis* var. *wrightii*.

DISTRIBUTION: East and west Cuba.

SYNONYMY: *Mayacion fluviatilis* (Borhidi *et al.* 1983).

***Mayaca fluviatilis* var. *fluviatilis* Herbaceous Vegetation**

DESCRIPTION: Submerged rock pavement along margins of montane streams and rivers, in the mountains of eastern Cuba, especially over serpentine. *Mayaca fluviatilis* var. *fluviatilis* strongly dominates this community. Other species include: *Fimbristylis annua*, *Eleocharis elegans*, *Anemia nipensis*, *Utricularia pusilla*, *Heptanthus lobatus*, *Koehneola repens* (a number of which are Cuban endemics).

DISTRIBUTION: Mountain ranges of eastern Cuba.

SYNONYMY: *Mayacetum fluviatilis* (Borhidi *et al.* 1983).

REFERENCES: Borhidi (1991).

***Mayaca fluviatilis* var. *wrightii* Herbaceous Vegetation**

DESCRIPTION: Sandy littoral margins of white sand wetlands in western Cuba and the Isle of Pines, with *Mayaca fluviatilis* var. *wrightii* as the strong dominant. Other species include *Eleocharis interstincta*, *Eleocharis capillacea*, *Eleocharis minima*, *Eriocaulon lacustre*, *Pinguicula filifolia*, *Rhynchospora cyperoides*, *Websteria confervoides*, *Rhynchospora tracyi*, *Utricularia juncea*, *Andropogon sp.* This community shows strong affinities to Coastal Plain ponds of the se. United States.

DISTRIBUTION: Western Cuba: Pinar del Rio prov. and Isle of Pines.

SYNONYMY: *Mayacetum wrightii* (Borhidi *et al.* 1983).

REFERENCES: Borhidi (1991).

V.C.I.N.a. *Myriophyllum sparsiflorum* Herbaceous Alliance (*Myriophyllum sparsiflorum* freshwater vegetation)

CONCEPT: Characteristic communities of the centers of shallow white sand lakes in western Cuba, dominated by *Myriophyllum sparsiflorum*.

DISTRIBUTION: Cuba: White sand wetlands of western Cuba.

SYNONYMY: *Potamion illinoensis* (Borhidi *et al.* 1983), in part.

***Myriophyllum sparsiflorum* Herbaceous Vegetation**

DESCRIPTION: Shallow water community dominated by *Myriophyllum sparsiflorum*, also with *Proserpinaca palustris*, *Cabomba piauhyensis*, *Utricularia foliosa*, *Utricularia mixta*, *Mayaca fluviatilis* var. *wrightii*.

DISTRIBUTION: Western Cuba: Pinar del Rio prov.

SYNONYMY: *Myriophylletum sparsiflori* (Borhidi *et al.* 1983).

REFERENCES: Borhidi (1991).

V.C.I.N.a. *Utricularia foliosa* Herbaceous Alliance (*Utricularia foliosa* freshwater vegetation)
CONCEPT: Submerged or partially submerged plant community in deep water of dystrophic or eutrophic lakes with neutral to alkaline fresh water, with *Utricularia foliosa* as the dominant.
DISTRIBUTION: Western and central Cuba.
SYNONYMY: Aldrovando-Utricularion (Borhidi *et al.* 1983), in part.

***Utricularia foliosa* - *Utricularia mixta* Herbaceous Vegetation**

DESCRIPTION: Basically co-dominated by *Utricularia foliosa* and *Utricularia mixta*.
Other species may include *Ludwigia erecta*, *Spirodela polyrrhiza*, *Salvinia auriculata*.
DISTRIBUTION: Cuba: Lake Ariguanabo and Zapata swamp.
SYNONYMY: Utricularietum foliosae (Borhidi *et al.* 1983).
REFERENCES: Borhidi *et al.* (1983); Borhidi (1991).

V.C.I.N.a. *Utricularia pumila* Herbaceous Alliance (*Utricularia pumila* freshwater vegetation)
CONCEPT: Communities dominated by species of *Utricularia*, free-floating or partly rooted in shallow water of dystrophic or oligotrophic white-sand lakes with neutral to acidic fresh water.
DISTRIBUTION: West Cuba.
SYNONYMY: Aldrovando-Utricularion (Borhidi *et al.* 1983), in part.

***Utricularia juncea* - *Utricularia pumila* - *Utricularia pusilla* - *Utricularia virgulata* Herbaceous Vegetation**

DESCRIPTION: In shallow white-sand lakes of neutral or slightly acidic fresh water, with *Utricularia juncea* as a dominant to moderate component. Other species include *Utricularia pumila*, *Utricularia virgulata*, *Utricularia pusilla*, *Bulbostylis tenuifolia*.
DISTRIBUTION: West Cuba, in white-sand wetland areas.
SYNONYMY: Utricularietum juncea (Borhidi *et al.* 1983).
REFERENCES: Borhidi (1991).

***Utricularia resupinata* - *Utricularia pumila* - *Utricularia sclerocarpa* Herbaceous Vegetation**

CONCEPT: In shallow sublittoral sandy lakes of oligotrophic, acidic fresh water, dominated by *Utricularia resupinata*. Other species include *Utricularia pumila*, *Utricularia sclerocarpa*, *Bulbostylis tenuifolia*, *Bulbostylis areanaria*, *Caperonia cubana*.
DISTRIBUTION: West Cuba, in white-sand wetland areas.
SYNONYMY: Utricularietum resupinatae (Borhidi 1991).
REFERENCES: Borhidi (1991).

V.C.I.N.a. *Lemna perpusilla* Herbaceous Alliance (*Lemna perpusilla* freshwater vegetation)
CONCEPT: Free-floating freshwater vegetation formed by Lemnaceae and small water ferns, covering the surface of lakes, ponds, and slow streams.
DISTRIBUTION: Cuba: Batabanó, Ariguanabo, Zapata swamp (Borhidi & Muñiz 1983); Jamaica (Asprey & Robbins 1953; Grossman *et al.* 1993); Puerto Rico (Dansereau 1966); Lesser Antilles (Lindsay & Harwith 1997).
SYNONYMY: Azollaeo-Salvinion (Borhidi & Muñiz 1979); Nymphaea-Nelumbo-Pistia Alliance (Lindsay & Harwith 1997), in part.

***Lemna perpusilla* - *Azolla caroliniana* Herbaceous Vegetation** (Duckweed Herbaceous Vegetation)

DESCRIPTION: Association dominated by the free-floating *Lemna perpusilla* and *Azolla caroliniana*, in the ponds and streams of the Batabanó swamp, and in lake Ariguanabo (west Cuba).
DISTRIBUTION: West Cuba (Habana prov.); Jamaica (Ferry River); Puerto Rico.
SYNONYMY: Lemno-Azolletum carolinianae (Borhidi & Muñiz 1983); Duckweed crust (Dansereau 1966).
REFERENCES: Borhidi & Muñiz (1983); Asprey & Robbins (1953); Dansereau (1966).

***Salvinia auriculata* - *Spirodela polyrrhiza* - *Lemna perpusilla* Herbaceous Vegetation** (Water-fern Herbaceous Vegetation)

DESCRIPTION: Floating vegetation composed of *Salvinia auriculata*, *S. rotundifolia*, *Lemna perpusilla*, *Spirodela polyrrhiza* and *Pistia stratiotes*.
DISTRIBUTION: Cuba: Zapata and Batabanó swamps, lake Ariguanabo.

SYNONYMY: Spirodelo-Salvinietum auriculatae (Borhidi & Muñiz 1983).
REFERENCES: Borhidi & Muñiz (1983).

V.C.I.N.a. *Pistia stratiotes* Herbaceous Alliance (*Pistia stratiotes* freshwater vegetation)
CONCEPT: Floating or rooted (by stranding) aquatic vegetation occurring in slow-moving or stagnant tropical waters, dominated by *Pistia stratiotes*.
DISTRIBUTION: Florida, Cuba, Hispaniola, Jamaica, Puerto Rico, Lesser Antilles.
SYNONYMY: Eichhornion azureae (Borhidi *et al.* 1983), in part; Nymphaea-Nelumbo-Pistia Alliance (Lindsay & Harwith 1997), in part.

***Pistia stratiotes* Herbaceous Vegetation** (Water-lettuce Herbaceous Vegetation).
DESCRIPTION: Dominated (and often nearly monospecifically so) by *Pistia stratiotes*, sometimes also with *Salvinia auriculata*, *Spirodela polyrrhiza*, *Azolla caroliniana*, and other aquatics.
DISTRIBUTION: Cuba, Hispaniola, Jamaica, Puerto Rico.
SYNONYMY: Zona a Pistia (Ciferri 1936); Water-lettuce Mat (Dansereau 1966); Pistietum stratitidis (Borhidi 1991).
REFERENCES: Ciferri (1936); Asprey & Robbins (1953); Dansereau (1966); Borhidi *et al.* (1983), Borhidi (1991); Hager & Zanoni (1993); Grossman *et al.* (1993).

V.C.I.N.a. *Eichhornia crassipes* Herbaceous Alliance (*Eichhornia crassipes* freshwater vegetation)
CONCEPT: Floating or rooted (by stranding) aquatic vegetation in slow-moving or stagnant, usually eutrophic water of lakes, ponds and rivers, dominated by *Eichhornia crassipes*, and often essentially monospecific.
DISTRIBUTION: Florida, Cuba, Jamaica, Hispaniola, Puerto Rico, Bahamas, Lesser Antilles, Neotropics.
SYNONYMY: Eichhornion azureae (Borhidi *et al.* 1983), in part; Nymphaea-Nelumbo-Pistia Alliance (Lindsay & Harwith 1997), in part.

***Eichhornia crassipes* Herbaceous Vegetation** (Water-hyacinth Herbaceous Vegetation)
DESCRIPTION: Floating or rooted aquatic vegetation dominated by *Eichhornia crassipes*, and often essentially monospecific. Other species may include *Paspalidium geminatum*, *Lemna spp.*, *Azolla caroliniana*, *Pistia stratiotes*, *Spirodela polyrrhiza*, *Salvinia auriculata*.
DISTRIBUTION: Florida, Cuba, Jamaica, Puerto Rico, Bahamas.
SYNONYMY: Eichhornietum crassipedis (Samek & Moncada 1971); Water-hyacinth Mat (Dansereau 1966); Vegetazione dei fiumi a lento corso (Ciferri 1936), in part; Vegetazione delle Isole galleggianti (Ciferri 1936), in part.
REFERENCES: Samek & Moncada (1971); Asprey & Robbins (1953); Borhidi (1991); Grossman *et al.* (1993).

V.C.I.N.a. *Eichhornia azurea* Herbaceous Alliance (*Eichhornia azurea* freshwater vegetation)
CONCEPT: Floating or rooted (by stranding) aquatic vegetation of tropical areas, occurring in more oligotrophic situations than *Eichhornia crassipes* Herbaceous Vegetation.
DISTRIBUTION: Cuba, Hispaniola.
SYNONYMY: Eichhornion azureae (Borhidi *et al.* 1983), in part.

***Eichhornia azurea* Herbaceous Vegetation**
DESCRIPTION: Floating or rooted aquatic vegetation dominated by *Eichhornia azurea*, and often essentially monospecific. Other species may include *Pistia stratiotes*, *Azolla caroliniana*, *Salvinia auriculata*, *Panicum aquaticum*, *Polygonum spp.*
DISTRIBUTION: Cuba, Hispaniola.
SYNONYMY: Eichhornietum azureae (Borhidi *et al.* 1983); Vegetazione dei fiume a lento corso (Ciferri 1936), in part; Vegetazione delle isole galleggianti (Ciferri 1936), in part.
REFERENCES: Borhidi (1991); Ciferri (1936); Hager & Zanoni (1993).

V.C.I.N.a. *Potamogeton nodosus* Herbaceous Alliance (*Potamogeton nodosus* freshwater vegetation)
CONCEPT: Submerged or slightly emerged rooted vegetation dominated by *Potamogeton spp.*, often forming dense communities in slow-moving eutrophic freshwaters.
DISTRIBUTION: Cuba, Hispaniola, Jamaica.

SYNONYMY: *Potamion illinoensis* (Borhidi *et al.* 1983), in part; *Zona a Nymphaea* (Ciferri 1936), in part.

***Potamogeton nodosus* - *Potamogeton illinoensis* Herbaceous Vegetation**

DESCRIPTION: Rather dense aquatic community essentially formed by two co-dominant *Potamogeton* species. May include also *Utricularia foliosa*, *Hydrocotyle umbellata*, *Vallisneria neotropicalis*, *Paspalidium paludivagum*.

DISTRIBUTION: Cuba, Hispaniola, Jamaica, Puerto Rico?

SYNONYMY: *Potamogeton illinoensis-nodosus* (Borhidi *et al.* 1983); *Zona a Nymphaea* (Ciferri 1936), in part; Pondweed tangle? (Dansereau 1966).

REFERENCES: Ciferri (1936); Asprey & Robbins (1953); Dansereau (1966); Borhidi (1991); Grossman *et al.* (1993).

***Potamogeton nodosus* - *Nymphaea ampla* - *Utricularia foliosa* Herbaceous Vegetation**

DESCRIPTION: Occurring in shallower waters, this community prefers a muddier habitat. Other species may include *Sagittaria lancifolia*, *Utricularia mixta*, *Proserpinaca palustris*.

DISTRIBUTION: Cuba, Hispaniola.

SYNONYMY: *Nymphaeo-Potamogeton nodosus* (Borhidi *et al.* 1983); *Zona a Nymphaea* (Ciferri 1936), in part.

REFERENCES: Ciferri (1936); Borhidi *et al.* (1983); Borhidi (1991).

V.C.I.N.a. *Nymphaea ampla* Herbaceous Alliance (*Nymphaea ampla* freshwater vegetation)

CONCEPT: This is a common alliance of waterlily mats and other rooted aquatic plants with floating or emerged leaves, characterized by dominance or strong presence of *Nymphaea ampla*, widespread in the Greater Antilles, Lesser Antilles, and Central and South America.

DISTRIBUTION: Cuba, Hispaniola, Jamaica, Puerto Rico.

SYNONYMY: *Nelumbio-Nymphaeion amplae* (Samek & Moncada 1971), in part.

***Nymphaea ampla* Herbaceous Vegetation**

DESCRIPTION: This community occurs in eutrophic and dystrophic lakes, ponds, and oxbows, in the lowlands of the Greater Antilles (and very likely more widespread). *Nymphaea ampla* usually dominates strongly, with other species including *Brasenia schreberi*, *Nuphar luteum ssp. macrophyllum*, *Potamogeton nodosus*, *Utricularia foliosa*, *Eleocharis interstincta*, *Ludwigia erecta*.

DISTRIBUTION: Cuba, Hispaniola, Jamaica? Puerto Rico.

SYNONYMY: *Nymphaeetum amplae* (Borhidi *et al.* 1983); Waterlily Mat (Dansereau 1966); *Zona a Nymphaea* (Ciferri 1936); *Zona 3, Laguna Don Gregorio* (Hager & Zanoni 1993).

REFERENCES: Ciferri (1936); Dansereau (1966); Borhidi (1991); Grossman *et al.* (1993); Hager & Zanoni (1993).

***Brasenia schreberi* - *Nymphaea ampla* Herbaceous Vegetation**

DESCRIPTION: With about the same species composition as the former neighboring unit, in this association, however, *Brasenia schreberi* tends to dominate over *Nymphaea ampla*. Often occurs in the inner side of the waterlily mats, in somewhat deeper waters. Besides *Brasenia* and *Nymphaea* other common associates are *Nuphar luteum ssp. macrophyllum*, *Potamogeton nodosus*, *Utricularia foliosa*, *Eleocharis interstincta*, *Scirpus confervoides*.

DISTRIBUTION: Cuba.

SYNONYMY: *Brasenetum schreberi* (Borhidi *et al.* 1983).

REFERENCES: Borhidi *et al.* (1983); Borhidi (1991).

***Nuphar luteum* - *Nymphaea ampla* Herbaceous Vegetation**

DESCRIPTION: Co-dominated by *Nuphar luteum ssp. macrophyllum* and *Nymphaea ampla*, with other common associates of the typical waterlily mat (i.e. *Potamogeton nodosus*, *Utricularia foliosa*, *Eleocharis interstincta*). In somewhat muddier sites and shallower, more dystrophic waters than the *Nymphaea ampla* Herbaceous Vegetation community, to which it is often in contact. Other species may include *Sagittaria lancifolia*, *Polygonum punctatum*.

DISTRIBUTION: Cuba.

SYNONYMY: *Nupharetum macrophylli* (Borhidi *et al.* 1983).

REFERENCES: Borhidi (1991).

V.C.I.N.a. *Nelumbo lutea* Herbaceous Alliance (*Nelumbo lutea* freshwater vegetation)

CONCEPT: American lotus mat, characterized by the dominance of the emergent, large-leaved *Nelumbo lutea*, and the presence of other emerged and submersed aquatic plants in both eutrophic and oligotrophic freshwater lakes.

DISTRIBUTION: Cuba, Hispaniola, Lesser Antilles.

SYNONYMY: Nelumbio-Nymphaeion amplae (Samek & Moncada 1971), in part; Nymphaea-Nelumbo-Pistia Alliance (Lindsay & Horwith (1997), in part.

***Nelumbo lutea* - *Eleocharis interstincta* - *Nymphoides aureum* Herbaceous Vegetation**

DESCRIPTION: In oligotrophic lakes of Cuba, dominated by emergent *Nelumbo lutea*, with substantial coverage of other floating, emergent, and submersed species, such as *Eleocharis interstincta*, *Nymphoides aureum*, *Utricularia foliosa*, *Paspalidium geminatum*, *Rhynchospora cyperoides*, and *Panicum parvifolium*.

DISTRIBUTION: Cuba.

SYNONYMY: Nelumbonetum luteae (Samek & Moncada 1971) subass.
eleocharetosum interstinctae (Borhidi 1991).

REFERENCES: Samek & Moncada (1971), Borhidi (1991).

***Nelumbo lutea* - *Nymphaea ampla* - *Utricularia foliosa* Herbaceous Vegetation**

DESCRIPTION: In eutrophic lakes of Cuba, dominated by emergent *Nelumbo lutea*, with substantial coverage of other floating, emergent, and submersed species, such as *Nymphaea ampla*, *Schoenoplectus tabernaemontani*, *Utricularia foliosa*, and *U. mixta*.

DISTRIBUTION: Cuba, Hispaniola?

COMMENTS: This association seems to occur also in The Dominican Republic (Laguna Saladillo).

SYNONYMY: Nelumbonetum luteae (Samek & Moncada 1971) subass.
nymphaetosum amplae (Borhidi 1991).

REFERENCES: Borhidi (1991); Hager & Zanoni (1993).

***V.C.I.N.a. Nymphoides aurea* Herbaceous Alliance (*Nymphoides aurea* freshwater vegetation)**

CONCEPT: With *Nymphoides aurea* as a dominant or strong component, and presence of other rooted aquatic plants with floating leaves. Free-floating and/or submersed species can also occur. Typical in lakes of the white-sand area of west Cuba, in slightly oligotrophic or eutrophic waters.

DISTRIBUTION: West Cuba: Pinar del Rio prov.

SYNONYMY: Nelumbio-Nymphaeion amplae (Samek & Moncada 1971), in part.

***Nymphoides aurea* Herbaceous Vegetation**

DESCRIPTION: In shallow, slightly oligotrophic water, strongly dominated by *Nymphoides aurea*, with little coverage of other associates such as *Nymphaea odorata*, *Ludwigia inclinata*, *L. erecta*, *Hymenachne amplexicaulis*, *Cabomba piauhyensis* and *Caperonia palustris*.

DISTRIBUTION: West Cuba.

SYNONYMY: Nymphoidetum aureae (Borhidi *et al.* 1991).

REFERENCES: Borhidi (1991).

***Nymphoides aurea* - *Salvinia auriculata* - *Eichhornia heterosperma* Herbaceous Vegetation**

DESCRIPTION: In slightly oligotrophic to eutrophic water, dominated by *Nymphoides aurea*. Other species include the diagnostic water fern *Salvinia auriculata*, *Eichhornia heterosperma*, and occasionally *Ludwigia inclinata*.

DISTRIBUTION: West Cuba.

SYNONYMY: Eichhornio heterospermae-Nymphoidetum aureae (Samek & Moncada 1971) subass. typicum (Borhidi 1991).

REFERENCES: Samek & Moncada (1971), Borhidi (1991).

***Nymphoides aurea* - *Marsilea polycarpa* Herbaceous Vegetation**

DESCRIPTION: Co-dominated by *Nymphoides aurea* and the aquatic fern *Marsilea polycarpa*. Other species include *Polygonum punctatum*, *Eichhornia heterosperma*, *Salvinia auriculata*, *Cabomba piauhyensis*, *Hymenachne amplexicaulis*, *Ludwigia inclinata*.

DISTRIBUTION: West Cuba.

SYNONYMY: Eichhornio heterospermae-Nymphoidetum aureae (Samek & Moncada 1971) subass. marsilietosum (Borhidi 1991).

REFERENCES: Samek & Moncada (1971); Borhidi (1991).

***Nymphoides aurea* - *Cabomba piauhyensis* - *Eichhornia heterosperma* - *Nymphaea odorata* Herbaceous Vegetation**

DESCRIPTION: Characteristic community of three major associates (*Nymphoides aurea*, *Cabomba piauhyensis*, and *Eichhornia heterosperma*), usually with the strong presence of *Nymphaea odorata*.

DISTRIBUTION: West Cuba.

SYNONYMY: Eichhornio heterospermae-Nymphoidetum aureae (Samek & Moncada 1971) subass. cabombetosum (Borhidi 1991).

REFERENCES: Samek & Moncada (1971); Borhidi (1991).

V.C.I.N.a. *Nymphoides grayana* Herbaceous Alliance (*Nymphoides grayana* freshwater vegetation)

CONCEPT: A vicariant unit of the *Nymphoides aurea* Herbaceous Alliance, in the eutrophic water of the limestone pits of western Cuba. The differential dominant species is *Nymphoides grayana*.

DISTRIBUTION: West Cuba.

SYNONYMY: Nelumbio-Nymphaeion amplae (Samek & Moncada 1971), in part.

***Nymphoides grayana* Herbaceous Vegetation**

DESCRIPTION: *Nymphoides grayana* dominates strongly. Also with other species including *Cabomba piauhyensis*, *Nymphaea ampla*, *Hydrocotyle umbellata*, *Marsilea polycarpa*, *Salvinia natans*.

DISTRIBUTION: West Cuba: Guanacahabibes peninsula; southern Isle of Pines.

SYNONYMY: Nymphoidetum grayanae (Borhidi *et al.* 1983).

REFERENCES: Borhidi *et al.* (1983); Borhidi (1991).

V.C.I.N.a. *Hydrocotyle umbellata* Herbaceous Alliance (*Hydrocotyle umbellata* freshwater vegetation)

CONCEPT: Aquatic vegetation composed of two dominant components, an emerged and a submerged one. The emerged dominant is *Hydrocotyle umbellata*. Usually occurs in the transitional zone between the water-lily or water-lettuce mats and the sedge marsh, in shallow, eutrophic waters.

DISTRIBUTION: Cuba, Hispaniola?, Jamaica?

SYNONYMY: Potamion illinoensis (Borhidi *et al.* 1983), in part.

***Hydrocotyle umbellata* - *Vallisneria neotropicalis* Herbaceous Vegetation**

DESCRIPTION: Co-dominated by the emerged *Hydrocotyle umbellata* and the submerged *Vallisneria neotropicalis*. Usually also with *Utricularia foliosa*, *Scirpus validus*, *Paspalidium paludivagum*, *Polygonum punctatum*.

DISTRIBUTION: Cuba.

COMMENTS: A different association within the same Alliance seems to occur in the Dominican Republic, in Zone 4 (in part.) of Laguna Don Gregorio.

SYNONYMY: Hydrocotyletum umbellati (Borhidi *et al.* 1983).

REFERENCES: Asprey & Robbins (1953); Borhidi (1991); Hager & Zanoni (1993).

V.C.I.N.a. *Limnocharis flava* Herbaceous Alliance (*Limnocharis flava* freshwater vegetation)

CONCEPT: Emergent aquatic vegetation dominated by the yellow swamp lily *Limnocharis flava*, in the shallow eutrophic waters of slow-running rivers.

DISTRIBUTION: Cuba, Hispaniola.

SYNONYMY: Vegetazione dei fiumi a lento corso (Ciferri 1936), in part; Crino-Limnocharion flavae (Borhidi *et al.* 1979 *emend.* Borhidi 1983).

***Limnocharis flava* - *Fuirena umbellata* - *Crinum americanum* - *Rhynchospora cyperoides* Herbaceous Vegetation**

DESCRIPTION: Dense aquatic sward dominated by *Limnocharis flava*, on shallow waters, usually with strong participation of *Crinum* spp. and a number of species of Cyperaceae of relatively small size. Common associates may include *Crinum americanum*, *C. oliganthum*, *Fuirena umbellata*, *Rhynchospora cyperoides*, *R. stellata*, *Fimbristylis ovata*, *Eleocharis cellulosa*, and others.

DISTRIBUTION: Cuba, Hispaniola?

SYNONYMY: Limnocharietum flavae (Borhidi *et al.* 1983).

REFERENCES: Ciferri (1936); Borhidi (1991).

V.C.I.N.b. Tidal permanently flooded tropical or subtropical hydromorphic rooted vegetation

**(SEAGRASS BEDS)
(PRADERA SUBMARINA)**

***V.C.I.N.b. Ruppia maritima Herbaceous Alliance* (*Ruppia maritima* seagrass beds)**

CONCEPT: Estuarine and marine seagrass beds dominated by *Ruppia maritima*.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico, Martinique, Barbuda, Antigua, Caribbean region.

SYNONYMY: Ruppion maritimae; Ruppia-Najas Alliance (Lindsay & Harwith 1997), in part.

Ruppia maritima Herbaceous Vegetation

DESCRIPTION: Estuarine and marine seagrass beds dominated by *Ruppia maritima*, often nearly monospecific but sometimes with other species, including *Najas guadelupensis*, *Halodule beaudettii*, and *Cymodocea filiformis*.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico, Lesser Antilles, Caribbean region.

COMMENTS: This vegetation type tolerates well the highly saline waters of shallow muddy lagoons not colonized by mangroves.

SYNONYMY: Halodulo-Ruppium maritimae (Borhidi *et al.* 1983).

REFERENCES: Kimber (1988); Borhidi (1991).

***V.C.I.N.b. Thalassia testudinum Herbaceous Alliance* (*Thalassia testudinum* seagrass beds)**

CONCEPT: Estuarine and marine seagrass beds dominated or co-dominated by *Thalassia testudinum*, on seaward muddy bottoms.

DISTRIBUTION: Cuba, Hispaniola, Puerto Rico, Bahamas, Jamaica, Caribbean region.

SYNONYMY: Syringodio-Thalassion (Borhidi *et al.* 1983), in part.

Thalassia testudinum Herbaceous Vegetation

DESCRIPTION: Estuarine and marine seagrass beds essentially monodominant with *Thalassia testudinum*, on muddy or sandy substrate.

DISTRIBUTION: Cuba, Puerto Rico; Caribbean region.

SYNONYMY: Turtle-grass bed (Dansereau 1966).

REFERENCES: Dansereau (1966); Areces-Mallea (1986).

Thalassia testudinum - Cymodocea filiformis Herbaceous Vegetation

DESCRIPTION: Estuarine and marine seagrass beds co-dominated by *Thalassia testudinum* and *Cymodocea filiformis*. Occasionally may include *Halodule beaudettii*.

DISTRIBUTION: Cuba, Hispaniola, Jamaica, Caribbean region.

COMMENTS: This vegetation type, and the former one as well, often occur in dense, extensive stands along sandy beaches. As sea grasses are periodically uprooted by sea currents, turbulent waters, and exceptionally high tides, they are usually deposited in great masses on the beaches.

SYNONYMY: Associazione Thalassia-Cymodocea (Ciferri 1936), in part; Syringodio-Thalassietum (Borhidi *et al.* 1983), in part; *Thalassia testudinum-Cymodocea filiformis* colonies (Kimber 1988), in part.

REFERENCES: Ciferri (1936); Asprey & Robbins (1953); Areces-Mallea (1986); Kimber (1988); Borhidi (1991).

***V.C.I.N.b. Cymodocea filiformis Herbaceous Alliance* (*Cymodocea filiformis* seagrass beds)**

CONCEPT: Estuarine and marine seagrass beds dominated by *Cymodocea filiformis*.

DISTRIBUTION: Cuba, Bahamas, Caribbean region?.

SYNONYMY: Syringodio-Thalassietum (Borhidi *et al.* 1983), in part.

Cymodocea filiformis Herbaceous Vegetation

DESCRIPTION: Essentially monodominant with *Cymodocea filiformis*, on seaward muddy bottoms.

DISTRIBUTION: Florida, Cuba, Hispaniola, Puerto Rico, Bahamas, Jamaica, Martinique, Caribbean region?.

COMMENTS: Often occurring in patches throughout the *Thalassia testudinum-Cymodocea filiformis* vegetation.

SYNONYMY: Associazione Thalassia-Cymodocea (Ciferri 1936), in part; Syringodio-Thalassietum (Borhidi *et al.* 1983), in part; Thalassia testudinum-Cymodocea filiformis colonies (Kimber 1988), in part.

REFERENCES: Ciferri (1936); Asprey & Robbins (1953); Areces-Mallea (1986); Kimber (1988); Borhidi (1991).

V.C.I.N.b. *Halodule beaudettii* Herbaceous Alliance (*Halodule beaudettii* seagrass beds)

CONCEPT: Estuarine and marine seagrass beds dominated by *Halodule beaudettei*.

DISTRIBUTION: Florida, Bahamas, Caribbean?

SYNONYMY: None.

***Halodule beaudettii* Herbaceous Vegetation**

DESCRIPTION: Seagrass community with *Halodule beaudettii* as a major monodominant species.

DISTRIBUTION: Florida, Bahamas, Caribbean?

SYNONYMY: None.

REFERENCES: Borhidi (1991); Weakley's checklist of the vegetation of the West Indies (unpubl.).

V.C.I.N.b. *Limnobium laevigatum* Herbaceous Alliance (*Limnobium laevigatum* seagrass beds)

CONCEPT: Marine seagrass beds dominated by *Limnobium laevigatum*, in shallow sublittoral zone of sandy beaches.

DISTRIBUTION: Cuba, Caribbean?

SYNONYMY: Syringodio-Thalassion (Borhidi *et al.* 1983).

***Limnobium laevigatum* Herbaceous Vegetation**

DESCRIPTION: Dominated by *Limnobium laevigatum*. Other species may include *Halodule wrightii*, *Cymodocea filiformis*, *Ruppia maritima*, *Halophila baillonis*.

DISTRIBUTION: Cuba, Caribbean?

SYNONYMY: Limnobietum laevigati (Borhidi *et al.* 1983).

REFERENCES: Borhidi (1991).

Subclass: V.D. ANNUAL GRAMINOID OR FORB VEGETATION

Group: V.D.1. Tropical or subtropical annual grasslands or forb vegetation

Subgroup: V.D.1.N. Natural/Semi-natural

V.D.1.N.b. Tall tropical or subtropical annual forb vegetation

(TALL ANNUAL FORB VEGETATION)

(VEGETACIÓN ALTA ANUAL DE HERBÁCEAS NO GRAMINOIDES)

(TYPES TO BE DEFINED)

V.D.1.N.d. Tidal tropical or subtropical annual forb vegetation

(TIDAL ANNUAL FORB VEGETATION)

(VEGETACIÓN MAREAL ANUAL DE HERBÁCEAS NO GRAMINOIDES)

(TYPES TO BE DEFINED)

Class: VII. SPARSE VEGETATION

Subclass: VII.A. CONSOLIDATED ROCK SPARSE VEGETATION

Group: VII.A.1. Sparsely vegetated cliffs

Subgroup: VII.A.1.N. Natural/Semi-natural

VII.A.1.N.a. Cliffs with sparse vascular vegetation
(CLIFF VEGETATION)
(VEGETACIÓN DE ACANTILADOS)

(TYPES TO BE DEFINED)

Group: VII.A.2. *Sparsely vegetated pavement*
Subgroup: VII.A.2.N. *Natural/Semi-natural*

VII.A.2.N.a. *Pavement with sparse vascular vegetation*
(PAVEMENT VEGETATION)
(VEGETACIÓN DE COSTA ROCOSA)

VII.A.2.N.a. *Portulaca halimoides* Herbaceous Alliance

CONCEPT: Rocky shores.

DISTRIBUTION: Martinique.

SYNONYMY: Portulaca Zone (Kimber 1988).

Subclass: VII.B. GRAVEL, COBBLE OR TALUS ROCK SPARSE VEGETATION
Group: VII.B.1. *Sparsely vegetated talus/scree slopes*
Subgroup: VII.B.1.N. *Natural/Semi-natural*

VII.B.1.N.a. *Lowland or submontane talus/scree vegetation*
(TALUS/SCREE VEGETATION)
(VEGETACIÓN DE TALUD GRAVELÍTICO)

(TYPES TO BE DEFINED)

Group: VII.B.2. *Sparsely vegetated rock flats ((boulders, cobbel or gravel)*
Subgroup: VII.B.2.N. *Natural/Semi-natural*

VII.B.2.N.a. *Boulder field vegetation*
(BOULDER FIELD VEGETATION)
(VEGETACIÓN SOBRE CANTOS RODADOS)

(TYPES TO BE DEFINED)

Subclass: VII.C. UNCONSOLIDATED MATERIAL SPARSE VEGETATION
Group: VII.C.1. *Sparsely vegetated sand dunes*
Subgroup: VII.C.1.N. *Natural/Semi-natural*

VII.C.1.N.a. *Dunes with sparse herbaceous vegetation*
(DUNES WITH SPARSE VEGETATION)
(DUNAS CON VEGETACIÓN ABIERTA)

(TYPES TO BE DEFINED)

Group: VII.C.2. *Sparsely vegetated sand flats*
Subgroup: VII.C.2.N. *Natural/Semi-natural*

VII.C.2.N.b. *Intermittently flooded sand beaches and shores*

(STRAND VEGETATION)
(VEGETACIÓN DE PLAYA ARENOSA)

VII.C.2.N.b. *Cakile lanceolata* Herbaceous Alliance
CONCEPT: Beach vegetation, with scattered *Cakile lanceolata*.
DISTRIBUTION: Puerto Rico, Bahamas.
SYNONYMY: Sea-rocket Strip -- 17.8 (Dansereau 1966)

Group: VII.C.3. *Sparsely vegetated soil slopes*
Subgroup: VII.C.3.N. *Natural/Semi-natural*

VII.C.3.N.c. *Submontane fumeroles with sparse herbaceous vegetation*⁵⁷
(SUBMONTANE FUMEROLE VEGETATION)
(VEGETACIÓN DE FUMAROLA SUBMONTANA)

VII.C.3.N.c. (*Alliance name has not been defined yet*)
CONCEPT: Submontane microphyllous herbaceous community of the active, volcanic Lesser Antilles. Found around active fumeroles. The conditions may be somewhat drier than VII.C.3.N.d., but overall the vegetation is somewhat similar.
DISTRIBUTION: St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, Grenada(?) and St. Vincent.
COMMENTS: Occurring in proximity to fumeroles. Beard considers this a subclimax community. Both this and VII.C.3.N.c. are quite similar but differ somewhat due to elevation and to a lesser extent, the species composition. This alliance is found at lower elevations where conditions may be somewhat drier. They are both pioneer communities, and the growth of plants and species composition may be limited by the poisonous gases, the acidity of the soil, gas and other temperatures, and to other edaphic factors.
SYNONYMY: Sub-climax community, fumerole vegetation (Beard, 1949).

VII.C.3.N.d. *Montane fumeroles with sparse herbaceous vegetation*⁵⁸
(MONTANE FUMEROLE VEGETATION)
(VEGETACIÓN DE FUMAROLA MONTANA)

VII.C.3.N.d. (*Alliance name has not been defined yet*)
CONCEPT: Montane Microphyllous herbaceous community of active, volcanic Lesser Antilles. Found around active fumeroles.
DISTRIBUTION: St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, Grenada(?) and St. Vincent.
COMMENTS: Both this and VII.C.3.N.c. are quite similar but differ somewhat due to elevation and to a lesser extent, the species composition. They are both pioneer communities, and the growth of plants and the species composition may be limited by the poisonous gases, the acidity of the soil, gas and other temperatures, and to other edaphic factors.
SYNONYMY: Beard (1949) called this a "Sub-climax community, Fumerole Vegetation".

Group: VII.C.4. *Sparsely vegetated soil flats*
Subgroup: VII.C.4.N. *Natural/Semi-natural*

VII.C.4.N.c. *Seasonally/temporally flooded mud flats*
(SEASONALLY/TEMPORARILY FLOODED MUD FLAT)
(LODAZAL ESTACIONALMENTE/TEMPORALMENTE INUNDADO)

⁵⁷ New Formation.
⁵⁸ New formation.

(TYPES TO BE DEFINED)

VII.C.4.N.d. Tidally flooded mudflats
(TIDALLY FLOODED MUDFLAT)
(LODAZAL MAREAL)

(TYPES TO BE DEFINED)

EXOTIC AND ALTERED VEGETATION

***I.A.1.N.b. Bambusa vulgaris* Forest Alliance**

CONCEPT: Bamboo thickets dominated by the naturalized *Bambusa vulgaris*, generally very dense and nearly monospecific in the 10-25 m tall canopy.

DISTRIBUTION: Puerto Rico, Martinique.

***I.A.1.N.b. Mangifera indica* Forest Alliance**

CONCEPT: Forests dominated or codominated by the exotic *Mangifera indica*.

DISTRIBUTION: Puerto Rico.

***Mangifera indica* - *Artocarpus altilis* / *Musa spp.* Forest**

DESCRIPTION: Ruinate forests following disturbance and abandoned cultivation, dominated by exotic species.

DISTRIBUTION: Puerto Rico.

***I.A.1.N.b. Syzygium jambos* Forest Alliance**

CONCEPT: Short forests and thickets of the exotic *Syzygium jambos*.

DISTRIBUTION: Puerto Rico, Martinique.

SYNONYMY: Rose-apple Thicket -- 76.4 (Dansereau 1966).

COMMENTS: Based on Dansereau (1966), Beard (1949). *Syzygium jambos* is called *Eugenia jambos* in some older literature.

***I.A.1.N.b. Terminalia catappa* Forest Alliance**

CONCEPT: Disturbed areas, especially in lowland coastal areas, dominated by the exotic *Terminalia catappa*.

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: Malabar-almond Scrub -- 26.4 (Dansereau 1966).

***I.A.1.N.c. Eucalyptus robusta* Forest Alliance**

CONCEPT: Forests in montane portions of Puerto Rico, dominated by the exotic (planted and naturalized) *Eucalyptus robusta*.

DISTRIBUTION: Puerto Rico.

***I.A.7.C.a. Pinus caribaea* var. *hondurensis* Forest Plantation Alliance (*Pinus caribaea hondurensis* forest plantations)**

CONCEPT: Pine forest plantations with *Pinus caribaea* var. *hondurensis* dominating the canopy.

DISTRIBUTION: Jamaica.

SYNONYMY: Commercial forest (pine) plantation (Grossman *et al.* 1993).

ONE ASSOCIATION:

***I.A.7.C.a. Pinus caribaea* var. *hondurensis* Forest Plantation**

DESCRIPTION: Pine forest plantation with an essentially monodominant canopy of *Pinus caribaea* var. *hondurensis*. There is no understory, and the condition of the shrub and ground layers depend upon the prevailing forestry practices.

DISTRIBUTION: Jamaica: frequent in the Blue Mountains, and in central Jamaica.

COMMENTS: *Pinus caribaea* var. *hondurensis* is non-native to Jamaica.

SYNONYMY: Pine plantation (Grossman *et al.* 1993).

REFERENCES: (Grossman *et al.* 1993).

***I.A.7.C.b. Casuarina equisetifolia* Forest Plantation Alliance (Australian pine forest plantations)**

CONCEPT: Forests (varying to woodland structure) of the exotic *Casuarina equisetifolia*, generally in maritime situations, on beach sands.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico.

SYNONYMY: Australian-pine Screen (Dansereau 1966), in part.

ONE ASSOCIATION:

I.A.7.C.b. *Casuarina equisetifolia* Forest Plantation

DESCRIPTION: Commonly on disturbed sandy beaches, and essentially monodominant with *Casuarina equisetifolia*.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico.

COMMENTS: Stands of nearly pure Australian "pines" are common on sandy beaches of many keys of the Cuban archipelago.

SYNONYMY: Australian-Pine Screen (Dansereau 1966), in part.

I.C.1.N.b. *Inga vera* - *Erythrina poeppigiana* Forest Alliance

DISTRIBUTION: Puerto Rico.

I.C.1.N.b. *Inga vera* - *Erythrina poeppigiana* / *Coffea arabica* Forest

DESCRIPTION: Forests altered/managed/planted for coffee.

SYNONYMY: Inga-coffee Forest -- 75.1 (Dansereau 1966).

DISTRIBUTION: Puerto Rico.

II.A.1.C.a. *Cocos nucifera* Woodland Alliance

Coconut Forest Alliance; Coco Forest Alliance

CONCEPT: Forests (generally with a rather open canopy) of the exotic *Cocos nucifera*, generally occurring in maritime situations, such as beach sands.

DISTRIBUTION: Puerto Rico, Bahamas.

SYNONYMY: Coconut Plantation -- 24.2 (Dansereau 1966).

II.A.3.C.a. *Casuarina equisetifolia* Woodland Alliance (Australian pine woodland plantations)

CONCEPT: Woodlands (varying to forest structure) of the exotic *Casuarina equisetifolia*, generally in maritime situations, on beach sands.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico.

SYNONYMY: Australian-pine Screen (Dansereau 1966), in part.

ONE ASSOCIATION:

II.A.3.C.a. *Casuarina equisetifolia* Woodland Plantation

DESCRIPTION: Commonly on disturbed sandy beaches, and essentially monodominant with *Casuarina equisetifolia*.

DISTRIBUTION: Cuba, Bahamas, Puerto Rico.

COMMENTS: Open stands of nearly pure Australian "pines" are common on sandy beaches of many Keys of the Cuban archipelago.

SYNONYMY: Australian-pine Screen (Dansereau 1966), in part.

II.B.1.N.a. *Prosopis pallida*-(*Bucida buceras*) Woodland Alliance

DISTRIBUTION: Puerto Rico.

SYNONYMY: Mesquite Savana -- 72.3 (Dansereau 1966); Bucaro - Mesquite Savana -- 72.3a (Dansereau 1966).

***Prosopis pallida* / *Panicum maximum* Woodland -- GW**

DESCRIPTION: Open to very open canopy dominated by *Prosopis pallida*, sometimes accompanied by other trees including *Crescentia cujete*. Herb layer dominated by *Panicum maximum*. Present in sw. Puerto Rico.

DISTRIBUTION: Puerto Rico.

***Prosopis pallida* - (*Bucida buceras*) / *Chloris barbata* - *Dichanthium annulatum* Woodland -- GW**

DESCRIPTION: Other woody species include *Achyranthes aspera* var. *aspera*, *Parkinsonia aculeata*, *Capparis flexuosa*.

DISTRIBUTION: Puerto Rico.

III.A.1.N.a. *Lantana camara* Shrubland Alliance

CONCEPT: This shrubland, dominated by *Lantana camara*, is a disturbance type, following fire.

DISTRIBUTION: Bahamas, Martinique.

COMMENTS: Based on Beard (1949).

III.A.I.N.a. *Piper aduncum* Shrubland Alliance

CONCEPT: Abandoned pastures and fields dominated by the shrub *Piper aduncum*.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Pepper Scrub -- 46.4 (Dansereau 1966).

III.A.I.N.a. *Psidium guajava* Shrubland Alliance

CONCEPT:

DISTRIBUTION: Puerto Rico.

SYNONYMY: Guava Scrub -- 45.4 (Dansereau 1966).

V.A.I.N.c.003. *Panicum maximum* Herbaceous Alliance

CONCEPT: Herbaceous vegetation dominated by the exotic grass *Panicum maximum*. This vegetation now covers large parts of Puerto Rico, particularly in southwestern Puerto Rico.

DISTRIBUTION: Puerto Rico, Cuba.

COMMENTS: This is typically 1-2 m tall. If the criteria for tropical/subtropical tall vs. medium-tall grasslands are brought into agreement with the criteria for temperate/subpolar, this would be transferred to "tall."

SYNONYMY: Guinea-grass Prairie -- 67.5 (Dansereau 1966); Guinea-grass ruderal grassland.

***Panicum maximum* Herbaceous Vegetation (TNC 7653)**

DESCRIPTION: Vegetation usually strongly dominated by *Panicum maximum*. This community results from disturbance, and now covers large parts of Puerto Rico, particularly in southwestern Puerto Rico.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Guinea-grass ruderal grassland.

V.A.I.N.c.005. *Rhynchelytrum repens* Herbaceous Alliance

CONCEPT: Disturbed areas, such as old fields, vacant lots, roadsides, dominated by the exotic *Rhynchelytrum repens*.

DISTRIBUTION: Florida, Puerto Rico, Bahamas.

***Rhynchelytrum repens* Herbaceous Vegetation (TNC 7654)**

DESCRIPTION: Disturbed areas, such as old fields, vacant lots, roadsides, dominated by the exotic *Rhynchelytrum repens*.

DISTRIBUTION: Florida, Puerto Rico, Bahamas.

V.B.I.N.d. *Colocasia esculenta-Cyperus spp.* Herbaceous Alliance

CONCEPT: This vegetation occurs in disturbed wetland areas.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Aroid - sedge Belt -- 73.5 (Dansereau 1966).

V.D.I.N.b. *Cleome spinosa* Herbaceous Alliance

CONCEPT: Disturbed areas.

DISTRIBUTION: Puerto Rico.

SYNONYMY: Spider-flower Flat -- 41.7 (Dansereau 1966).

Appendix Two

Caribbean Vegetation Classification

References

Reference list organized by country/island

GENERAL

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