BOTANICAL SURVEY
OF PARTS OF PORTLAND RIDGE, CLARENDON

PREPARED FOR CARIBBEAN COASTAL AREA MANAGEMENT FOUNDATION (C-CAM)

Funded by Critical Ecosystems Partnership Fund

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1 TERMS OF REFERENCE

The consultant was requested to conduct a botanical survey in Portland Ridge, Jamaica, part of Portland Bight Protected Area (PBPA) in southern Clarendon, and to prepare a report on its flora, ecology, environmental impacts and related conservation issues. The survey was commissioned by the Caribbean Coastal Area Management Foundation (C-CAM) who is the managers of PBPA. Due to severe funding restrictions, the field work had to be limited to five days.

Under the leadership of the consultant, a small team of researchers stayed at the PWD Hunting and Sporting Club's lodge in the eastern part of the peninsula, which was generously rented to the team at a nominal fee. The members of the team were Andreas Oberli, Plant Conservationist and lead consultant; Patrick Lewis, Herbarium Curator, University of the West Indies (UWI), Mona; Damion Whyte, Environmental Officer, Urban Development Corporation (UDC); and Cecil Bartley a.k.a. One Son, field guide. In addition, the following joined for shorter periods of time: Keron Campbell, Botanist, Institute of Jamaica (IOJ); Brandon Hay, Scientific Officer, C-CAM; Cory Enger, US Peace Corps; and Wayne Chai Chong, President, PWD Gun and Sporting Club. Norman Daley, the lodge custodian, was also the team's cook and, together with One Son, contributed essential support to the team and the success of the field work. Brandon Hay arranged access to the western part of the peninsula, controlled by the Jackson Bay Gun Club, for a one day trip. The use of a 4x4 pick-up truck was provided by the consultant.

2 SITE LOCATION AND DESCRIPTION

Portland Ridge is the most southern peninsula of Jamaica with a highest elevation of 156 meters above sea level (510 feet), at the lodge/lighthouse. It is located between 17°42'20"N and17°45'24"N latitude and 77°07'30"W and 77°14'W longitude, and has a surface of approximately 40 km2.

The geology of Portland Ridge is White Limestone in the Newport formation with no elevated reefs nor Coastal Group. The nearest elevations are several kilometers away: Round Hill and Kemps Hill to the NW, Brazilletto Mountain to the N, and Great Goat Island and Hellshire Hills to the NE – all in the same White Limestone/Newport formation. The only connection with the main land is through seasonally flooded marshes and alluvial deposits, making Portland Ridge a geological "island".

1

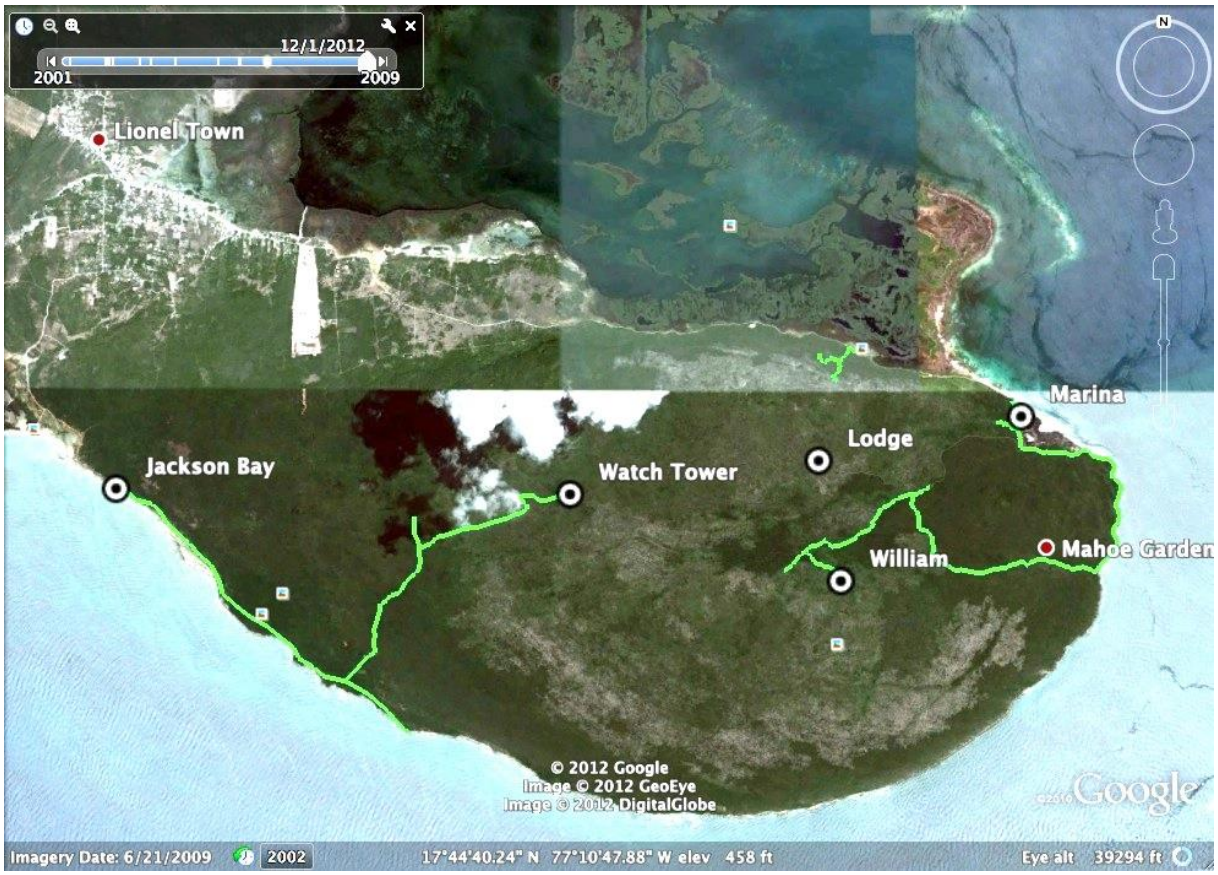
Almost the entire Portland Ridge area is controlled by the PWD Hunting and Sporting Club and the Jackson Bay Gun Club through long term leases between them and the Commissioner of Lands, with the exception of some agricultural intrusion from the north, mainly from Portland Cottage. The two gun clubs control approximately half of the peninsula each.

3 METHODOLOGY

The consultant has worked in tropical dry forests in Jamaica for thirty years, especially at Long Mountain, Puerto Bueno Mountain (Bengal Cliff), Braco Mountain, Gun Hill, parts of Hellshire, coastal St. Elizabeth, Negril Hill, etc., and is also familiar with the same forest type in several other Caribbean islands. He had previously visited Portland Ridge. The survey took place during the second week of October, 2012, just before the onset of the rainy season and before the passage of Hurricane Sandy.

On the basis of Google Earth photographs, the team decided to concentrate on forest areas not or less impacted by the extensive forest fires of 2005. However, the team passed through fire-damaged areas on almost all of the trips.

The survey took place along unpaved private forest roads, footpaths between the forest roads and the many shooting stands, through virgin and dense forest without roads or paths, and along beaches, marshes and rocky seashores. All surveys were registered by GPS, as shown in Phot. 1 below. GPS waypoints were taken for rare plants.



Species identification took place on site and, in some instances, vegetative material was collected for identification or verification at the herbaria of the University of the West Indies and the Institute of Jamaica. Vouchers were also collected for rare species. Voucher specimens are being prepared at both herbaria. A species list was established, including common names, national occurrence sensu CD Adams, 1972, and DAFOR site occurrence (see Chapter 7).

4 ECOLOGY

Portland Ridge is part of a system of **tropical dry forests** in Jamaica which includes the Hellshire Hills, Canoe Valley, Brazilletto Mountain, Long Mountain, Dallas Mountain and several other, usually isolated hills and small mountains along the south and north coasts. Together, they represent one of the largest tropical dry forest systems in the Caribbean. Not only are they home to many Jamaican endemic plant and animal species, but they also contain species endemic to the particular areas (e.g. *Portlandia albiflora*, a Long Mountain/Dallas Mountain endemic) and native plants that have become threatened such as *Swietenia mahagoni* (West Indian Mahogany) and *Guaiacum officinale* (Lignum Vitae).

All tropical dry forest hills and mountains in Jamaica are **under threat** from regulated and illegal marl quarrying, ill conceived routing of highways, poorly planned housing, tourism and recreational developments, illegal land settlement ("squatting"), slash-and-burn farming, charcoal burning, logging, and extensive cutting of small hardwood trees for fish-pots, construction props and yam sticks. Being located on or near the coast makes them highly accessible by land and sea and somewhat more vulnerable than the inland forest ecosystems of higher elevations. Portland Ridge has been considered one of the most intact tropical dry forests in Jamaica (see also Chapter 6).

The use of the forest for seasonal recreational **hunting** and the long term leases of the two properties for the past approximately 70 years for this particular purpose have resulted in a considerable amount of habitat protection and species conservation for most of the Portland Ridge peninsula. Hunting in Jamaica is quite strictly regulated and limited to usually five non-endemic pigeon species and presently between four and six weekends per year.

However, anthropogenic interference in the recent past in combination with a natural event has escalated to considerable damage of the forest at an extent of approximately 20 square kilometers or about half of the peninsula. Hurricane Ivan in September 2004 had a strong impact on the forest by stripping it of all leaves and about half of all branches and tree tops in most parts of the peninsula. Large numbers of trees, if not most, survived the storm, including tall ones thanks to the diverse adaptation mechanics that have evolved over time (e.g. elasticity in soft wood species and palms; disconnection of branches and upper parts in hardwood species). Relatively few, surface rooted trees (mostly *Ficus* spp.) were uprooted. The large majority of trees are deep rooted even on solid rock, thanks to the vertical solution holes and cracks provided by karst limestone and especially the honeycomb karst present in most areas of Portland Ridge. The following year, 2005, the enormous amounts of debris between the surviving trees had sufficiently dried for initially small **fires** to rapidly increase in size and intensity and spread south into the heart land. Apparently they had been started on the north side of the peninsula, set by small farmers from Portland Cottage and possibly elsewhere in temporary fields on the edge of and inside the forest. We estimate that 50 to 60% of the forest are affected by these fires on PWD Gun Club property and 40 to 50% on Jackson Bay Gun Club property (see Phot. 2).

Phot. 2. Google Earth, October 5, 2006.

What is the situation in the **burnt areas** on Portland Ridge today? It appears that they are not as finally destroyed as is the case in the many areas on the metamorphic slopes of the Port Royal and Blue Mountains; honeycomb limestone is not prone to soil erosion after forest fires. In the areas we have visited, approximately 10% of trees have survived. The landscape is covered in vines, very visible and prevalent, but there are no alien, non-native species, with the exception of *Cryptostegia madagascariensis*, the Purple Alamanda or Rubber Vine, which is highly invasive in alluvial coastal areas, on the edge of the forest and is often a threat to *Guaiacum officinale* (Lignum Vitae) in Jamaica (see Phot. 3).

Phot. 3. Purple Alamanda (*Cryptostegia madagascariensis*) outcompeting native vegetation.

The following native vines have been identified in the burnt forest: *Pisonia aculeata* (Cockspur), *Trichostigma octandrum* (Basket Withe), two species of *Cissus, sicyoides* and *trifoliata* (Snake Withe and Sorrel Vine), *Echites umbellata* and *Urechites lutea* (Nightshade), *Galactia pendula, Stigmaphyllon emarginatum, Eupatorium odoratum* (Jack-in-the-Bush) and *Notoptera hirsuta*. They are locally very common and grow on the burnt remains of shrubs and trees, and also on young live trees, apparently not killing them. It therefore appears that with increasing growth of trees, the vine population will lose its dominance and eventually be shaded out and reduced to smaller numbers (see Phot. 4). Further investigation should determine if this is in fact a trend in Portland Ridge, which would mean, that the forest regenerates and eventually could return to a similar species composition to what it had before the destruction, and similar to the unaffected areas.

Phot. 4. Snake Vine and Sorrel Vine (*Cissus* spp.), two of the dominant native vines in a burnt area with fresh growth (red leaves) of emerging young hardwood trees in the middle of the picture.

A second type of anthropogenic intervention – with few visible consequences yet on the ecology of Portland Ridge, but with the potential of eventually having a negative impact – is the introduction of **non-native plant species**, some of them with proven invasive characteristics. The four species of immediate concern are:

1. *Acacia auriculiformis*, an invasive species from Australia, introduced by the Forestry Department as a fast growing firewood species, about 30 years ago, and still being distributed and sold in Jamaica (see Phot. 5).

2. *Casuarina equisetifolia* (locally called Willow or Whistling Pine), one of the most aggressive species worldwide from Australia, invading coastal areas and wetlands with negative effects on water table. It is now legally banned in some countries.

3. *Syzygium cumini* (Jambolan, Java Plum, locally called Ribena), a widespread Asian species. "Introduced into Hawaii for its fruit, it has run wild (because birds distribute the seeds) and is considered a noxious weed that shades out more desirable forage plants." [National Academy of Sciences. (1980). Firewood Crops. Washington D.C.]
4. *Leucaena leucocephala* (Lead Tree). One relatively short variety (to 5 m) is apparently native in Jamaica, however, other fast growing varieties (to 20 m) have been introduced from Central America. "*Leucaena*'s reputation has suffered in some areas because of a rugged, persistent variety that has become a weed." (Op. cit.)

The other introduced species in Portland Ridge are of lesser or no concern, since they seem to be less common, not spreading or are known for not replacing native species (E.g. *Aloe vera, Clitoria, Carica papaya* [Papaw]). *Spondias mombin* (Hog Plum) seems to be established in some disturbed areas, probably planted by feral pigs, and tends to grow in pure stands. This species deserves observation. The Purple Alamanda, mentioned above, requires close attention as it is rapidly spreading on the fringes of the forest on the north side. It has also been planted at Jackson Bay on the south coast.

Phot. 5. *Acacia auriculiformis*, a potentially invasive Australian species.

A third man-made element observed in Portland Ridge is the presence of large numbers of **feral pigs**. They were introduced as European house pigs starting about 500 years ago under Spanish occupation. The numbers of sightings in broad daylight and the evidence of dug-up forest floor on average every 50 meters on the peninsula are higher than in other parts of Jamaica. Neither goats nor mongooses were seen.

It appears that periodic **small farming** has taken place for a long time. Pre-2004 Google Earth pictures indicate many burnt areas all over the peninsula, also near the south shore (accessed by boat). Reports are that cash crop farming is on the decline, at least partially as a result of the increasing pig population that has a negative effect on yields. Only *Cannabis* seems to survive as a viable crop, since pigs do not feed on it (Pers. comm. by One Son). It has also been reported that large amounts of small hardwood trees have been cut in the past for fish-pots, yam sticks and construction props. These activities seem to have taken place on the south shore as well, through Big Miller's Bay by boat and by way of the coastal road inside Jackson Bay Gun Club.

In the longer term historic context, evidence of the presence of the **Taínos** on the entire peninsula is significant. Jackson Bay, Little Miller's Bay, Holmes Bay and adjacent escarpments, but also the interior, e.g. Mortar Ridge, are known places for their presence. The team found evidence in all visited areas, the most disturbing ones in the plundered burial caves above Holmes Bay (human remains and destroyed artifacts scattered throughout the small caves). The Taínos' effect on the Portland Ridge ecosystem is not immediately readable, but could be the subject of further studies.

The following **birds** were observed: John Crow or Turkey Vulture, by far the most visible and most common of all at this time of the year, using the light house beside the lodge as a roosting "tree", Pea Dove, Caribbean Dove, Ground Dove, Bahama Mocking Bird, several Warblers (unfortunately time restrictions did not allow to identify them), Northern Potoo, Belted Kingfisher, many unidentified shore birds on the mudflats at Holmes Bay, and Peregrine Falcon. The visited large caves on the north side all contained bats. The most outstanding lizard observed was *Anolis valencienni*, the White Lizard.

5 BOTANY

One hundred and fifty species of mostly woody plants, trees and shrubs, monocots and vines have been identified (see Chapter 7). Of these, **19 species are Jamaican endemics** [the total numbers for Portland Ridge at the Institute of Jamaica herbarium are 189 and 21 respectively]. 13 species are non-native and introduced, most of them naturalized, five of them are potentially invasive (they are invasive in other countries), and one is already invasive in Jamaica and in Portland Ridge (*Cryptostegia madagascariensis* [Purple Alamanda]). Many native species are bird feeders (see Chapter 7).

The **dominant trees** in this forest are *Thrinax parviflora* (Broom Thatch), *Bursera simaruba*, the endemic *Bursera lunanii* (Red Birch and Black Birch respectively), *Metopium brownii* (Burn Wood), *Tabebuia heterophylla* (White Cedar or White Poui), *Peltophorum linnaei* (Braziletto), *Piscidia piscipula* (Dogwood), *Cordia gerascanthus* (Spanish Elm) and *Acacia tortuosa* (Wild Poponax). **Dominant genera** with three or more species are: *Coccoloba, Zanthoxylum, Bursera, Croton* and *Cordia*, and possibly also *Tillandsia, Ficus, Capparis,*

Eugenia, Sideroxylon and *Ipomoea*. The **dominant monocots** are the three fan palms in *Thrinax* and *Coccothrinax* and the *Agave*, all but one endemic.

Two significant discoveries were the very rare endemic ***Bursera hollickii*** (Hollick's Birch, "Grey Bark Birch"), for which Portland Ridge is now a new location, and one specimen of ***Swietenia mahagoni*** (West Indian Mahogany), which is exceedingly rare in the wild in Jamaica.

Phot. 6. Red Birch (*Bursera simaruba*) and the endemic Broom Thatch (*Thrinax parviflora*), two of the dominant species, the latter an important bird feeder.

Bursera hollickii was described from a specimen on Port Henderson Hill by N.L. Britton in 1908 and, as far as we know, never reported again until 2000, when four individuals were found on Long Mountain. In recent years, six were reported from Hellshire and during the

present field work in Portland Ridge, we found a total of eleven trees! It is one of the most outstanding and attractive trees in the forest, by its big size and silver-grey, smooth bark on long, often curving branchless trunks. It is larger than its two relatives *Bursera simaruba* (Red Birch) and *Bursera lunanii* (Black Birch), reaches 25 to 30 meters and is therefore the second tallest tree after *Ceiba pentandra* (Silk Cotton Tree) in this forest. We were told of a few more specimens between Pinnacle Hole and William and that several were killed by the fires in 2005. It is by no means a common tree, even after these recent discoveries, but for the first time and the first area in Jamaica, we were able to move it from "rare" to "occasional" on the DAFOR scale. Encouraging is also the fact that the individuals in Portland Ridge are widespread. We found three on the Jackson Bay side, and of the eight in PWD territory, two were on the escarpment above the north shore, three between Pinnacle and Big Miller's Bay (see Phot. 7) and three between Pinnacle and Mortar Ridge.

Phot. 7. The very rare endemic Hollick's Birch (*Bursera hollickii*), one of the 21 known trees.

The discovery of a ***Swietenia mahagoni*** tree in Portland Ridge coincides with the one of a small group in Hellshire a few months ago. Our local guide, One Son, had never seen a Mahogany in the wild, neither anybody else in the group, except the author (ca. 25 years ago, one in St Thomas). The one in Portland Ridge is a mature specimen of about 70 to 100 years of age, and, although it is now standing near a small unpaved driving road, we believe that it had not been planted, since at the beginning of the 20th century little access to that area would have existed. Although it was bearing several capsules ("fruits"), there were no seedlings in the vicinity of the tree. Reasons for this could be prolonged drought (seed

viability in the wild is only a few months), fire (a large area just south of the tree is completely burned), or foraging feral pigs. Finding isolated wild populations of the West Indian Mahogany in Jamaica is of particular importance since the introduction and distribution of the South and Central American Big Leaf Mahogany (*Swietenia macrophylla*) by the Forestry Department is threatening the native Mahogany with extinction through hybridization.

Phot. 8. West Indian Mahogany (*Swietenia mahagoni*) in the interior of Portland Ridge.

Two species that have over the years become less common have been found: the endemic *Psidium montanum* (Mountain Guava) and *Hippomane mancinella*, the highly poisonous Manchineel. Both trees have been excessively cut, the former for its very hard wood, the latter apparently to reduce the danger of being poisoned (children, domestic animals).

Of the three species listed by C-CAM as threatened, ***Hymenocallis***, a Spider Lily, has been located in several places. It appears to be the same species Proctor mentioned as a possibly new species, found, according to him, only on Portland Ridge. Proctor deposited a live specimen in the author's collection several years ago, after having collected it on Portland Ridge. The plant in the collection and the ones in situ seem to be identical. There are probably several ***Eugenia*** species in Portland Ridge, but so far ***eperforata*** has not been identified there. This species was in the past only known from one area in the interior hills of St Ann. ***Acanthodesmos distichus*** is only known from a small, now partially highly disturbed area SE of Portland Cottage. This plant is the only species in the endemic genus. Although the team was in this area on two days, the plant was not seen.

Phot. 9. A possibly new species of Spider Lily (*Hymenocallis* sp.).

Two **endemic species of concern in the Cactaceae**, *Opuntia* (*Consolea*) *spinosissima*, the Prickly Pear Tree, and *Melocactus communis* (Turk's Cap), expected to be present on the east and south shores, were not seen. Like many coastal species, they are declining in numbers due to housing developments. In addition, *Melocactus communis* has been collected by so called "landscapers" for the beautification of gas stations and shopping malls. *Opuntia spinosissima*'s only healthy population is on the east shore of Hellshire, adjacent to

expanding suburban sprawl. It has a special handicap, being functionally dioecious, a fact discovered in 1997 by the author and published a few years later [Strittmatter L.I. et al. (2002). Subdioecy in *Consolea spinosissima* (Cactaceae): Breeding System and Embryological Studies. American Journal of Botany 89(9)]. Isolated individuals have been seen in the past in St Thomas and on the Palisadoes tombolo, and a few small populations in St Elizabeth. *Opuntia spinosissima* is probably already CR (critically endangered) and *Melocactus communis* VU or EN (vulnerable or endangered) according to IUCN red listing.

6 DISCUSSION AND RECOMMENDATIONS

Portland Ridge has high levels of biological diversity and, in parts, good quality primary and secondary forest. It is of local, national, regional and global importance for biodiversity conservation, cultural heritage preservation, scientific research and education. It has been used, over the period of the last seventy years, by two private membership societies (the two above mentioned Gun Clubs) for government regulated seasonal hunting and sports fishing. Occasionally, environmentalists, scientists and environmental NGOs have been invited to access the two properties, mainly for bird watching. The human footprint related to these particular activities has been very light. We are not in a position to say if annual hunting of five non-endemic pigeon species has a negative impact on the species themselves, other species or the ecosystem. Numbers of these species are monitored by the gun clubs themselves and the National Environment and Planning Agency. Indications are that concerns about detrimental effects of human activities on the Portland Ridge ecosystem would be taken seriously and would be addressed by leaders and membership of the two societies.

Compared to other similar ecosystems in the country (i.e. tropical dry forest on limestone), the relatively limited legal and regulated use of the peninsula over this period of time has in fact been beneficial. Environmental degradation and destruction have increased dramatically in Jamaica. Large parts of Brazilletto and Harris Savannah have been almost entirely destroyed. The impact of poorly planned housing developments on Hellshire's dry limestone forest is the total and final destruction of the affected areas in that particular ecosystem. Illegal and "regulated" quarries and the construction of wide highways in the wrong places have severely damaged the integrity of forest ecosystems and fragmented their plant and animal populations on most limestone hills along the north coast and elsewhere on the island. An important terrestrial part of the so called Negril Protected Area – the dry limestone forest of Negril Hill with its unique plant and animal species – is now suburban sprawl with oversized villas, concrete parking and driveways, green lawns and a few coconut trees.

However, Portland Ridge has had its share of environmental problems for a long time through illegal and unregulated uses – or abuses. The pressure on the Portland Ridge dry limestone forest is increasing from rapidly growing human communities to the northwest. Slash-and-burn farming of legal and illegal crops on the fringes and inside the forest is responsible for the 2005 **fire** disaster. This calamity needs to be analyzed and defence strategies must be implemented. One particular observation we made during the survey is interesting: Evidence in the field and the Google Earth images of October 2006 and June 2009 show the effectiveness of a well maintained (bushed and brushed) road as a fire brake. The road from the marina to the lodge and the one to Mortar Ridge stopped the fires and saved large forested areas on the other side. Without the roads the east side of the forest would have been burnt as well.

In addition to our own observations of native and introduced (alien) animals, discussions with personnel of PWD Gun Club have resulted in the following assessments: Although there are relatively high numbers of feral pigs, only very few are hunted, between half and one dozen per year by club members and an unknown but probably slightly higher number by locals entering the forest from the south by boat and setting rope traps. The reason for the low number of pigs shot is that they are quite shy and not easy to get in front of a gun. There is also some reluctance to hunt them because of the aggressive nature of wild boars and the resulting casualties among hunting dogs.

An increase in feral house cats has been observed for the past three years, and the acquisition of live traps is being considered by the PWD Club. The East Indian Mongoose does not seem to be common, except for some areas near human settlements, e.g. Portland Cottage. Feral goats are occasionally seen in the northern parts of the forest, near Portland Cottage, and appear to be difficult to shoot.

The population of Ball Plate pigeons was almost normal after Hurricane Ivan in 2004 and in the early parts of 2005. However, after the extensive fires of 2005, it collapsed and no birds of this species were seen for six consecutive years! Only in early 2012 the first Ball Plates appeared again. Accordingly, the regeneration of native forest trees is thought to have experienced a setback, since important seed dispersers were absent for several years.

Hutias are known to live in Portland Ridge, particularly on the north side where there are many small caves. They do not seem to be hunted. Boas (Yellow Snake) were common until 2005 and were seen virtually everywhere, around the lodge, in the interior of the forest and even on the southern beaches. The fires seem to have destroyed large numbers. *Cyclura* have been absent apparently for a long time, possibly two hundred years or more. There are areas with deep soil on Portland Ridge, however it is not clear if the high numbers of feral pigs would interfere with the reproduction of Iguanas once they were re-introduced in this forest (B. Wilson had no conclusive answer to this question).

The situation at Portland Ridge is one of regulated, legal and environmentally beneficial uses versus increasing unregulated, illegal and environmentally destructive activities and is, in our view, approaching a tipping point. Without strict protection and conservation measures, this ecosystem will not survive. A next large fire could be fatal and final. Taking the above into consideration, we are making the following recommendations:

6.1 Regulated and legal land use and human footprint on Portland Ridge should continue unchanged in its existing form. Lease agreements with the two hunting clubs should be renewed.

6.2 If necessary, amendments in favour of integrity of the ecosystem and the health of the environment should be made. As in the past, construction of infrastructure should be kept to a minimum, in agreement with upkeep and management needs of the estates.

6.3 The concept of membership club should be retained. This allows for establishing and maintaining carrying capacity, enforcing rules and regulations and earning regular income for the maintenance of the estates.

6.4 Use of the estates and their infrastructure can be widened to non-hunting members, bird watchers, botanists, ecologists, environmentalists. The infrastructure of small unpaved forest roads and miles of tracks and foot paths is ideal for walking, hiking and observing. This would enlarge membership and increase income, part of which could pay for future conservation measures (see: 6.5).

6.5 Activities such as slash-and-burn farming, coal burning, harvesting of construction props and yam sticks, and grazing of domestic animals – some of which will become feral – must be stopped. The installation of a fence of approximately six to seven km along the edge of the forest between the two access points, the PWD gate on the north shore and the Jackson Bay gate on the southwest shore is strongly suggested, if we want Portland Ridge to survive as a forest in the long-term.

6.6 The threat of human intrusion from the sea needs to be addressed with patrols by boat and on foot along the south shore. This can be achieved by members of the two clubs, in collaboration with C-CAM and, if necessary, the security forces.

6.7 The Jackson Bay gate needs to become less permeable. Members of the surrounding communities who presently enter the property for line fishing, harvesting of *Acacia* wood and possibly other activities must have permits and be registered at entry and exit.

6.8 The planting of non-native and potentially invasive tree species (see Chapter 4) should be replaced by enhancement planting of native species, such as Mountain Grape, Sea Grape, Pigeon Plum, Cloven Berries, Scarlet Seed, Burn Wood, Bird Cherry, Pimento, etc. The author has been made aware of published and unpublished research on feeding habits of the White-crowned Pigeon (Ball Plate) in Jamaica, Cuba, South Florida, etc., areas with similar forest communities and often identical tree species, and will pursue further studies on this topic. More information might also be available from members of the gun clubs and the local community.

6.9 Ex situ conservation collections of the rare species should be established in form of a nursery. At the same time, the above mentioned native bird feeder species should also be grown in the nursery in sufficient quantities to be planted out in the forest. An ideal location could be on the border between public land (the community, e.g. Portland Cottage) and the Gun Club property, complete with resident caretaker/foreman.

6.10 West Indian Mahogany and Lignum Vitae, both native in Portland Ridge and both threatened species in Jamaica, could be planted, to establish safe in situ germplasm and seed banks. In addition, they could be distributed in the nearby communities to be planted along streets, in schoolyards, etc.

6.11 A medium to long-term research project should be written, funded and implemented on the effects of forest fires on plant and animal population composition and possible changes, plant re-generation and invasive species [A similar long-term study was started in the western Blue Mountains (Cinchona) in the early 1970s and is still continuing, including annual field expeditions, providing data for managers of the Blue & John Crow National Park]. This project should be planned and funded for long term comparative studies and include permanent plots in burnt areas and adjacent forest.

6.12 Further field investigations need to cover the yet unexplored areas and search for the elusive and rare species, such as *Acanthadesmos,* the two cacti mentioned above

Opuntia spinosissima and *Melocactus communis*, the native Mahogany, Hollick's Birch, a *Portlandia* species previously reported but not found this time, etc. More voucher specimens need to be collected of the many *Coccoloba* ("Grape"), *Eugenia, Ficus, Croton and Cordia* species in order to clarify their taxonomy.

6.13 Red listing of all threatened plant species in accordance with the IUCN protocols should be planned, funded and implemented in Portland Ridge, the other tropical dry forests of the PBPA and adjacent areas.

6.14 Consultants, faculty, students, extramural resource persons and professionals must be properly remunerated for their field and office work; cost of living in Jamaica must be taken into consideration. Too often in recent times could consultancies advertised by government or international NGOs not be pursued for lack of appropriate funding.

6.15 Results from field work and research should be published, both in scientific papers and in more widely accessible publications like Natural History Society Newsletter, Jamaica Journal etc. These results must also reach the local communities through interaction with teachers, youth groups and church leaders via C-CAM, US Peace Corps and others. Funding agencies should be reminded of the value of environmental and biological knowledge flowing into Public Relations and primary and secondary education. The production and dissemination of this kind of information must be included in funding.

It is our view that Portland Ridge has the potential to serve as a model in biodiversity conservation and become an important self-sustaining element within the Portland Bight Protected Area. Collaboration between the two established and well managed gun clubs (who's members have accumulated a wealth of ecological knowledge over time), the national and international scientific community, and the environmental non-governmental organization (C-CAM) that has been given the mandate to plan and oversee the increasingly complex task of safeguarding the natural integrity and environmental health of the area, has gained momentum. Continuous communication among the stakeholders should result in resolving some of the issues mentioned in this report.

7 PORTLAND RIDGE LIST OF TREES, SHRUBS AND OTHER PLANTS

7.1 *MONOCOTYLEDONES*

Bromeliaceae				
Tillandsia recurvata	Old Man's Beard	**1**)	common **2**)	F **3**)
Tillandsia utriculata			common	O
Liliaceae				
Aloe vera	Sinkle Bible	introduced		O
Arecaceae				

Coccothrinax jamaicensis	Silver Thatch	**endemic** 4)	common	A
Thrinax parviflora	Broom Thatch	**endemic**	common	D
Thrinax radiata	Sea Thatch		common	O
Amaryllidaceae				
Hymenocallis sp.				O
Agavaceae				
Agave sobolifera	Coratoe, May Pole	**endemic**	locally abundant	A
Orchidaceae				
Broughtonia sanguinea		**endemic**	common	F
Vanilla claviculata	Greenwithe, Green Wis		locally common	R

7.2 *DICOTYLEDONES*

Casuarinaceae				
Casuarina equisetifolia	Casuarina, Willow, Whistling Pine	introd. 5)	common	O
Piperaceae				
Peperomia amplexicaulis	Jackie's Saddle	**endemic**	very common	O
Picrodendraceae				
Picrodendron baccatum	Jamaican Walnut		local	O
Ulmaceae				
Celtis trinervia	Bastard Fustic		frequent	R
Moraceae				
Brosimum alicastrum	Breadnut		locally common	O
Cecropia peltata	Trumpet Tree		common	O
Chlorophora tinctoria	Fustic Tree		common	R
Ficus citrifolia	Fig	4)	locally common	A
Ficus maxima	Fig	4)	frequent	O
Loranthaceae				
Phoradendron sp.				R
Polygonaceae				
Coccoloba diversifolia	Wild Grape, Pigeon Plum	4)	occasional	O
Coccoloba krugii	Mountain Grape	4)	common	F
Coccoloba tenuifolia		4)	common	F
Coccoloba uvifera	Sea Grape	4)	common	O
Coccoloba sp.		4)		O
Nyctaginaceae				
aff. *Neea*				O
Pisonia aculeata	Cockspur, Fingrigo, Wait-a-Bit		common	F
Phytolaccaceae				
Trichostigma octandrum	Hoop With, Basket Withe	4)	common	F
Portulacaceae				

Portulaca pilosa	Crimson-flowered Purslane,		occasional	O
Talinum triangulare			occasional	F
Cactaceae				
Harrisia gracilis	Torchwood Dildo	4)	common	O
Hylocereus triangularis	God Okra, Prickle Withe	**endemic** 4)	locally common	A
Opuntia dillenii	Prickly Pear, Seaside Tuna		frequent	O
Pilosocereus swartzii		4)	locally common	F
Selenicereus grandiflorus	Queen-of-the-Night	4)	common	F
Stenocereus hystrix	Dildo, Dildo Pear	4)	locally common	O
Annonaceae				
Annona squamosa	Sweet Sop, Sugar Apple	4)	common	O
Oxandra lanceolata ?	Black Lancewood	4)	occasional	
Xylopia muricata	Lancewood	**endemic**	uncommon	O
Lauraceae				
Nectandra coriacea	Sweetwood	4)	common	O
Canellaceae				
Canella winterana	Canella, Wild Cinnamon		common	F
Ranunculaceae				
Clematis dioica	Wild Clematis		common	R
Clusiaceae				
Clusia flava	Card Gum, Tar Pot		common	O
Capparaceae				
Capparis ferruginea	Mustard Shrub		common	F
Capparis flexuosa	Bottle-cod Root			O
Leguminosae – Caesalpinioideae				
Bauhinia divaricata	Bull Hoof, Moco John		common	A
Cassia emarginata	Senna Tree, Yellow Candle Wood		common	A
Haematoxylum campechianum	Logwood	introd. 5)	locally common	O
Peltophorum linnaei	Braziletto		locally common	D
Leguminosae – Mimosoideae				
Acacia auriculiformis		introd. 5)	occasional	O
Acacia tortuosa	Wild Poponax		very common	D
Leucaena leucocephala	Lead Tree	[planted?]	common	A
Leguminosae – Papilionoideae				
Brya ebenus	West Indian Ebony		locally common	F
Clitoria ternatea	Blue Pea	introduced	common	F
Galactia pendula		**endemic**	common	F
Piscidia piscipula	Dogwood		common	D
Erythroxylaceae				
Erythroxylum confusum	Greenheart, Barberry Bullet		common	O
Zygophyllaceae				

Guaiacum officinale	Lignum Vitae		locally common	O
Rutaceae				
Amyris elemifera	Torchwood		common	F
Zanthoxylum flavum	Jamaican Satinwood	4)	Frequent	F
Zanthoxylum pterota	Bastard Ironwood, Saven Tree		locally common	R
Zanthoxylum spinosum	Licca Tree, Suarra Wood, Lignum Rorum		common	F
Burseraceae				
Bursera hollickii	Hollick's Birch, "Grey Bark Birch"	**endemic** 4)?	**rare, local**	O
Bursera lunanii	Black Birch	**endemic**	locally common	D
Bursera simaruba	Red Birch	4)	common	D
Meliaceae				
Swietenia mahagoni	West Indian Mahogany		**rare**	**R**
Malpighiaceae				
Stigmaphyllon emarginatum			common	A
Euphorbiaceae				
Acalypha scabrosa		**endemic**	common	O
Argythamnia candicans			common	A
Ateramnus lucidus	Crab Wood, Boxwood?		common	A
Bernardia dichotoma			common	F
Croton eluteria	Cascarilla Bark		common	O
Croton linearis	Rosemary		very common	A
Croton lucidus (*nitens*?)	Basket Hoop		frequent	O
aff. *Croton* (#038)				R
Euphorbia nudiflora			locally common	A
Euphorbia punicea		**endemic**	common	O
Hippomane mancinella	Manchineel		uncommon	R
Jatropha gossypiifolia	Belly-ache Bush, Cassada Marble		locally common	F
Phyllanthus angustifolius	Seaside Laurel		common	F
Phyllanthus nutans			common	R
Anacardiaceae				
Comocladia velutina	Velvet-leaved Maiden Plum	**endemic**	common	A
Mangifera indica	Mango	introduced		O
Metopium brownii	Burn Wood	4)	common	D
Spondias mombin	Hog Plum	introduced	common	A
Sapindaceae				
Allophylus cominia			common	O
Blighia sapida	Ackee	introd. 4)		O
Hypelate trifoliata	Ketto		common	F
Melicoccus bijugatus	Guinep	introduced		O
Paullinia barbadensis	Supple Jack	**endemic**	frequent	O
Celastraceae				
Schaefferia frutescens		4)	common	O

Rhamnaceae				
Ziziphus sarcomphalus	Bastard Lignum Vitae	**endemic**	common	F
Vitaceae				
Cissus sicyoides	Snake Withe, Soldier Withe, Pudding Withe		very common	A
Cissus trifoliata	Sorrel Vine		common	A
Malvaceae				
Gossypium hirsutum var. *marie-galante*	Sea Island Cotton		common	O
Hibiscus clypeatus	Congo Mahoe		frequent	F
Thespesia populnea	Seaside Mahoe		common	F
Bombacaceae				
Ceiba pentandra	Silk Cotton Tree		occasional	O
Sterculiaceae				
Guazuma ulmifolia	Bastard Cedar	4)	common	A
Helicteres jamaicensis	Screw Tree	4)?	common	O
Melochia tomentosa	Tea Bush, Raichie		frequent	A
Flacourtiaceae				
Casearia hirsuta	Cloven Berries, Wild Coffee, White Wattle	4)	common	F
Laetia thamnia	Scarlet Seed	4)	common	O
Turneraceae				
Turnera ulmifolia	Ram-Goat Dashalong		common	O
Passifloraceae				
Passiflora suberosa		4)	common	O
Caricaceae				
Carica papaya	Papaw	introd. 4)		O
Cucurbitaceae				
Momordica charantia	Wild Cerasee		very common	O
Rhizophoraceae				
Rhizophora mangle	Red Mangrove		common	F
Combretaceae				
Conocarpus erectus	Button Mangrove		common	O
Laguncularia racemosa	White Mangrove		common	F
Myrtaceae				
Eugenia maleolens		4)	locally common	F
Eugenia sp.	Bird Cherry	4)		O
Pimenta dioica	Pimento, Allspice	[planted] 4)	common	R
Psidium montanum	Mountain Guava	**endemic**	occasional	**R**
Syzygium cumini	Ribena, Damson Tree, Jambolan, Java Plum	introd. 5) 4)	occasional	O
Theophrastaceae				
Jacquinia arborea		4)	common	O

Plumbaginaceae				
Plumbago scandens	Wild Plumbago		common	F
Sapotaceae				
Chrysophyllum oliviforme	Wild Star Apple		locally common	R
Sideroxylon americanum			frequent	O
Sideroxylon salicifolium	White Bullet, White Bully		common	F
Ebenaceae				
Diospyros tetrasperma	Clamberry	4)?	common	O
Apocynaceae				
Echites umbellata	Deadly Nightshade		common	F
Mandevilla torosa			common	F
Plumeria obtusa	Wild Frangipani		locally common	F
Rhabdadenia biflora			locally common	F
Urechites lutea	Nightshade, Nightsage		common	F
Asclepiadaceae				
Cryptostegia madagascariensis	Purple Alamanda, Rubber Vine	introd. 6)	locally common	A
Convolvulaceae				
Ipomoea horsfalliae			frequent	R
Boraginaceae				
Bourreria sp.				O
Cordia gerascanthus	Spanish Elm, Panchallon		common	D
Cordia globosa var. *humilis*	Wild Sage, Gout Tea		very common	O
Cordia sebestena	Red or Scarlet Cordia		locally common	O
Tournefortia poliochros			occasional	O
Verbenaceae				
Citharexylum fruticosum	Yellow Fiddlewood	4)	locally common	O
Lantana camara	White Sage, Wild Sage		very common	F
Petitia domingensis	Fiddlewood	4)	common	O
Avicenniaceae				
Avicennia germinans	Black Mangrove		common	A
Solanaceae				
Capsicum baccatum	Bird Pepper		common	R
Solanum bahamense	Canker Berry	4)	common	O
Solanum erianthum	Wild Susumber, "Bad Susumber"	introd. 4)	frequent	O
Bignoniaceae				
Tabebuia heterophylla	White Cedar		common	D
Rubiaceae				
Exostema caribaeum	Jesuit Bark		fairly common	O
Guettarda elliptica	Velvet Seed	4)	common	O
Morinda royoc	Red Gal, Strong Back		very common	F
Phialanthus revolutus		**endemic**	**very rare**	**R**

Psychotria balbisiana		**endemic**	very common	O
Psychotria sp.				O
Randia aculeata	Ink Berry, Indigo Berry		common	O

Asteraceae

Eupatorium odoratum	Christmas Bush, Jack-in-the-Bush		very common	F
Notoptera hirsuta		**endemic**	locally common	O
Pluchea carolinensis	Wild Tobacco		common	O

Notes: **1**) All species other than endemic or introduced are native.

2) National occurrence sensu CD Adams, 1972, Flowering Plants of Jamaica. Adams' indications of occurrence might have changed over time. Most of these plants are only common, locally common etc. as long as their habitats are intact. Many forests and woodlands have been disturbed and reduced in size in the past 40 years, since Adams' publication.

3) DAFOR site occurrence:
D=dominant, **A**=abundant, **F**=frequent, **O**=occasional, **R**=rare

4) Bird feeder

5) Potential alien (non-native) invasive species

6) Alien invasive species

2/12/2012/AO