

Columbia River Forest Reserve Research Synthesis



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Introduction

This study is prepared at the request of the Ya'axché Conservation Trust and was funded through the U.S. Fish and Wildlife Service. The purpose of this paper is to write a synthesis of biodiversity research that has taken place within the Columbia River Forest Reserve (CRFR). Particular attention is given to that part of the CRFR that constitutes the Golden Stream watershed and is therefore of direct interest to the management of the Golden Stream Corridor Preserve. But for the interest of completeness all information within the CRFR is added and to some degree, information pertaining to adjacent protected areas such as Bladen Nature Reserve and Golden Stream Corridor Preserve is added, if nothing else, at least to the

literature database (see also figure 2 for a map of the area of interest). Also note that the delineation of the Golden Stream Watershed is not confirmed. The headwaters of the Golden Stream are within karstic terrain with streams going underground and/or disappearing completely.

The CRFR has undergone many changes during the past decade. To facilitate better timber management, the original CRFR and the Maya Mountains Forest Reserve South (MMFRS) were consolidated into one Forest Reserve (Columbia River Forest Reserve), now with an area of 60,000 hectares (148,357 acres). This consolidation was officially gazetted by the Minister of Natural Resources in Statutory Instrument No. 115 of November 1997.

The CRFR Reserve lies approximately at Latitude 16°20'N and Longitude 89°58' W (see figure 1). The terrain within the reserve varies from 300-1,100 meters above sea level. Rainfall figures are unknown but assumed to average over 2,540 mm (100 inches) per year, but due to the complex topography, figures are likely to vary greatly between one location and the other. The geology of the CRFR is highly complex but consists mostly of limestone and associated karst features.



Figure 1. Area under consideration (black square). Protected areas within this area are indicated in aqua.

Further data on the CRFR can be found at

http://www.biodiversity.bz/find/protected_area/profile.phtml?pa_id=87

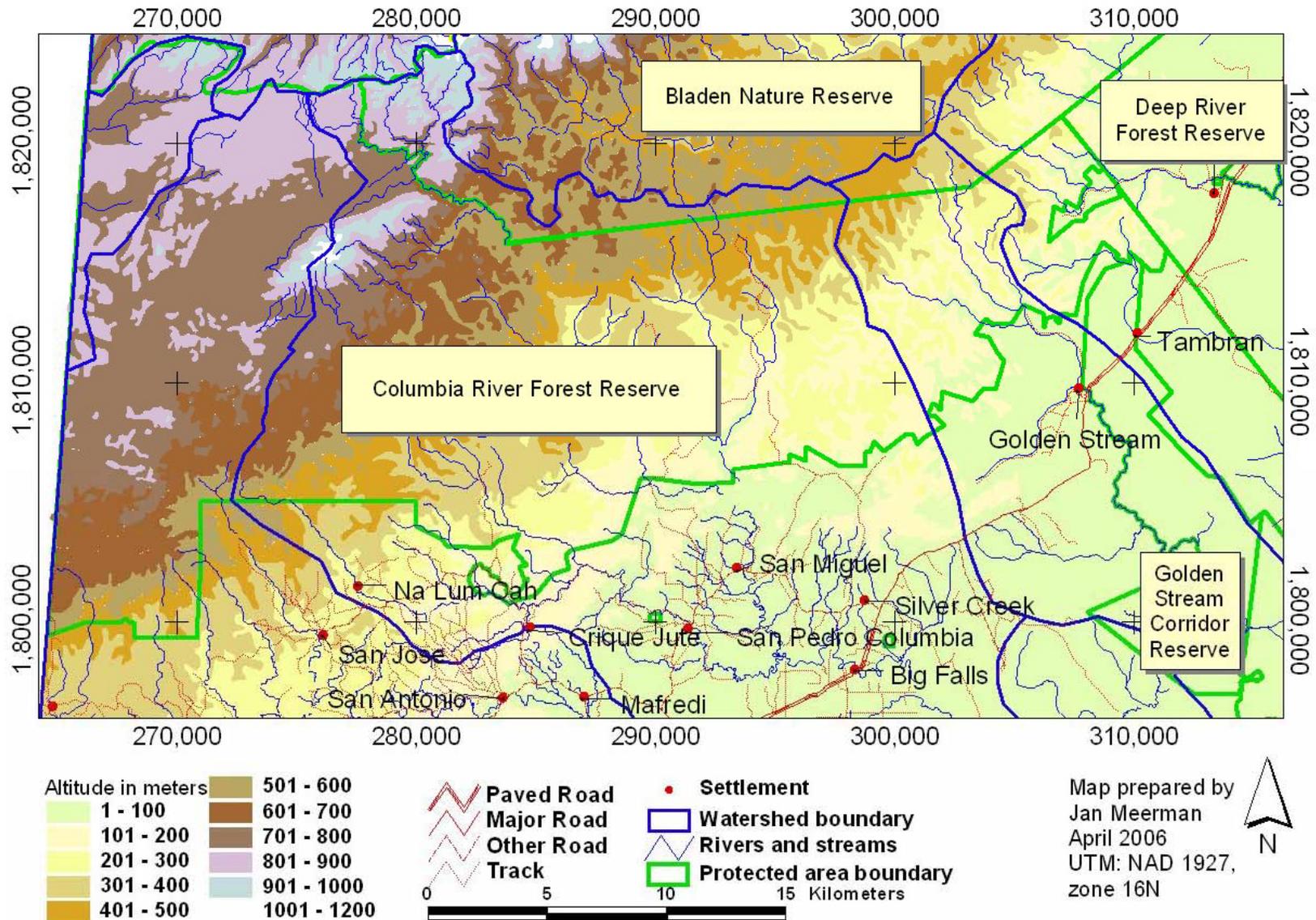


Figure 2. Map of the area of interest with watersheds, protected areas and communities indicated.

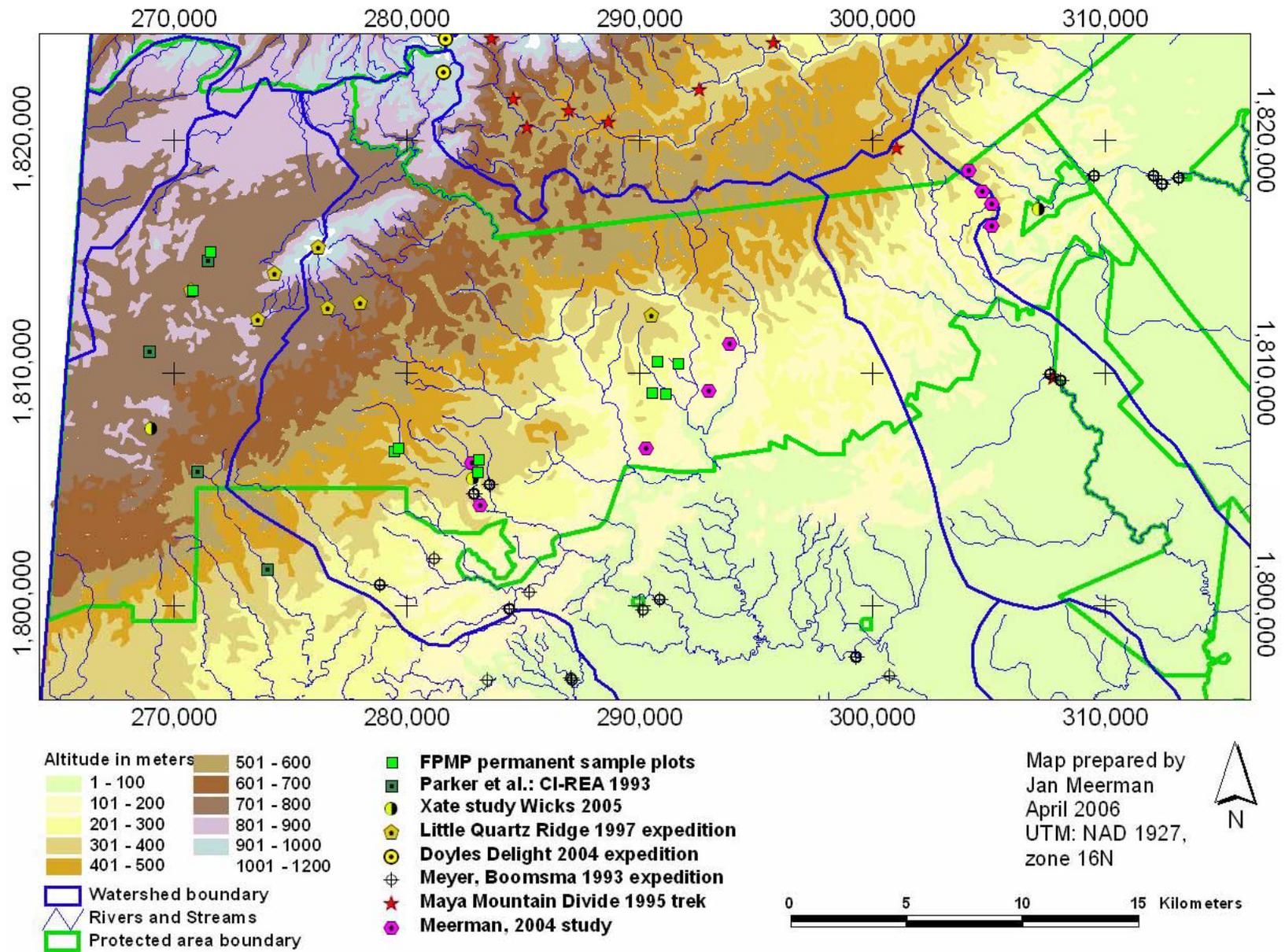


Figure 3. Map of the area of interest with watersheds, protected areas and many research locations indicated.

History of research in the Columbia River Forest Reserve

The early years

The forests of the Columbia River Forest Reserve were first studied in the 1920's. L. H. Ower, an Australian geologist, examined the area for mineral resources between 1921-26 (Ower, 1928). When the boundary line between British Honduras and Guatemala was cut between 1920-26, an opportunity for botanical collections was opened, and a Belizean botanist, William A. Schipp, made the first collections there (Lowden, 1970). Subsequently, D.G. Dixon (1955) prepared a geological map of southern British Honduras from fieldwork, which was carried out from 1950-56. This pioneer work gave rise to the basic understanding of the geology and soils. Emerging from this, were some of the more obvious relationships between rock-soil-plant communities, and placed on record in the Land Use Survey report (Wright et al., 1959). Declared a Forest Reserve in June 1954, over twenty years passed before any further inventories or fieldwork were undertaken in the CRFR and Maya Mountains Forest Reserve (South) (Forest Department, 1978, Wilson, 1981, Evans, 1983). However, by this time, most of the primary timbers, cedar *Cedrela odorata*, mahogany *Swietenia macrophylla* and rosewood *Dalbergia stevensonii* had been extracted. The years 1925-1960 were those of maximum timber and chicle extraction within the CRFR and MMFR.

From logging to Biodiversity.

The logging component of The CRFR and MMFR continued to play a role in the 1990ies with the development of management plans under the Forest Planning and Management Project (FPMP)(Bird 1993, 1994, Campbell & Mitchel 1998, Ennion 1994, 1996, King 1995, McCalla 1995). The most important results of this were the amalgamation of the MMFR south with the CRFR in 1997 and the formation of a management plan for the combined areas (Bird, 1994).

Notable was the research component of the MPFP. A number of Permanent sampling plots were established throughout the country, 10 of which within the CRFR (see locations in figure 3). These 1 ha (100 x 100m) permanent sampling plots collect data in a standardized way that enables long term monitoring of tree growth and mortality. All trees with a stem diameter of 10 cm or more at diameter at breast height (dbh = 1.3 m) were measured and identified. In addition, in a central 20 x 20 m quadrant within each 1 ha plot, all trees greater than 1 cm dbh were measured, allowing for the gathering of recruitment information.

The permanent sampling plot efforts and findings were published in "Sustaining the Yield: Improved timber practices in Belize 1992-1998" (Bird, 1998). This dataset is one of tremendous importance. Unfortunately, many of the species identifications are questionable (Bridgewater pers. comm.). The original FPMP data are lodged at the Forest Department in Belmopan. The data are stored on a set of 3.5" floppy disks. These floppy disk were

reviewed by this author and salvageable data were transferred to a CD-Rom. A Note from Jan Meerman dated 26 October 2004 accompanying this CD-Rom states:

- Several diskettes can no longer be read.
- The Reference Diskettes "Re-analysis of Broadleaf Inventory Data" are in Card Format Data Files which need to be de-Archive with Xtree Gold 303g-15FD". XTREE Gold is no longer current software. There are various successors but I did not manage to open the *.xtg files using any of them. This in essence is a backup system capable of storing large file sets on multiple diskettes. But with some diskettes having become unreadable, the entire archive can no longer be opened.
- The dataset "Oxford Data Files and Documentations" contains GIS Files stored as "TSIA Guide Reference Files for use with Cons. Rep 14". TSIA is a small DOS program written by the FPMP. It appears to be corrupted. I could not get it to work.
- The GIS files are incomplete. Some are hotlinks to other files none of which can be found.

In other words, although some of the FPMP data could be salvaged (but now lodged at an unknown location in the Forest Department), an unknown quantity has to be considered irretrievably lost.

Apart from the strict forestry component of the FPMP, there was also a strong biodiversity component. This was reflected in the collection of data of non-timber forest species in the permanent sampling plots and the re-vamping of the herbarium housed at the Forest Department (Vargas & Shawe, 1997) and research into medicinal plants by Robin Coleman (no published results).

Simultaneously, the interest for conservation in Belize was growing. A number of researchers traveled into the CRFR and Bladen Nature Reserve and established the first biodiversity baseline data for the area:

- Hubrecht 1986: Maya Mountains looking for Primates
- Brokaw & Evans 1987: Bladen
- Matola 1989: Doyle's Delight

Also a number of scientific descriptions and species lists were starting to come forward:

- McCarthy & Blake 1987: Bats
- McCarthy 1988: Bats
- Hillis and de Sá 1988: Amphibians

Important was the Critical Habitat Survey conducted by the Belize Center for Environmental Studies (BCES) in 1990 which noted that the Columbia River Forest Reserve was in need of an ecological assessment. This led to a first rapid assessment of the area in December of that same year (Matola, 1991). This expedition included the recording of several caves by the Archaeology Department. This report created a growing interest in the area for more biological inventories. Some of the more interesting findings during that short field investigation included notation of a great diversity of tree species within the area. A more detailed Rapid Biological Assessment of the Columbia River Forest Reserve in 1992

brought in a number of researchers from a variety of disciplines (Plants, Amphibians, Reptiles, Birds, Mammals). Focusing on the area between San Jose village and Little Quartz Ridge (see locations in figure 3). This RBA yielded several new plant genera and plant families for Belize. Many of the species recorded were only known from a few botanical collections (Parker et al., 1993). Another important find during this expedition was the observation of over 100 Caerulean Warblers, an endangered migratory bird.

While it was clear that the limited fieldwork having occurred in the Columbia River Forest Reserve so far provided a window into its unique biological resources, what became obvious was the need for further investigations (Hoare, 1993). This was underscored in the Draft Forest Management Plan for the Columbia River Forest Reserve (Bird, 1994). This Management Plan not only attempted to regulate the ongoing logging activities in the Forest Reserve but also saw a need to base this management on sound scientific footing.

Several smaller expeditions entered the area shortly after that:

- Robbins et al 1992: Migratory Birds,
- Conway 1993: Birds,
- Boomsma 1993: Lepidoptera & Odonata (see locations in figure 3),
- Meyer 1993: Amphibians (see locations in figure 3).
- Matola 1995: General biology of Doyle's Delight including amphibians (Meyer 1995).
- Meerman & Williams 1995: Observations during a Maya Mountain Divide trek (see locations in figure 3)
- Gilardi 1997: Birds culminating in a CD-Rom with bird sounds of the CRFR.
- Janovec & Neill in 1999 conducted research into several plant families (Arecaceae, Myristicaceae and Zamiaceae) within the CRFR. No results were ever published (See Janovec & Neill 2001, 2003) but specimens are deposited at various herbaria.

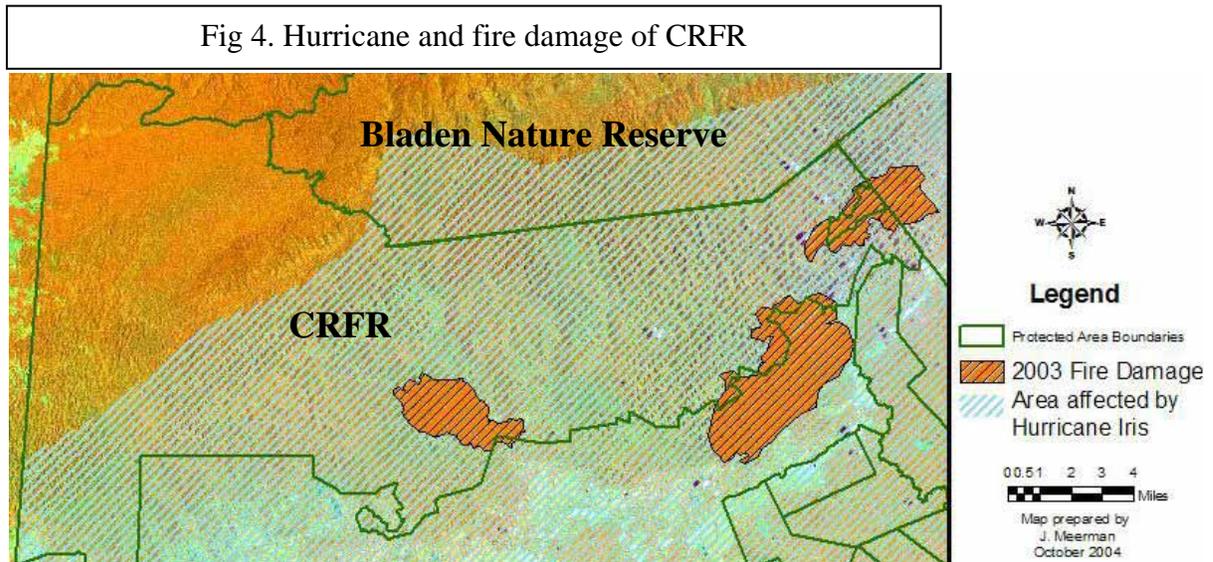
The latter study is indicative of some of the problems with research carried out within the CRFR. In many cases no permits were obtained and/or no reports were produced. In particular vegetation studies typically generate many herbarium specimens but no reports or the reports take years to produce (due to slow identification process). Searching herbaria for data could potentially reveal such specimens and research activities. However, the herbarium at the Forest Department has in effect not been updated since the ending of the FPMP in 1998.

The next major expedition was an expedition into the Little Quartz Ridge area in 1997 (Meerman & Matola, 2003, see locations in figure 3) which was sponsored by National Resource Institute-Forest Planning and Management Project (NRI/FPMP), and with assistance from Conservation International (CI). Again this expedition brought together a large number of disciplines (Flora, Insects, Amphibians, Reptiles, Birds, and Mammals) together for a 2 week survey in February 1997. While the February 1997 expedition focused on the area immediately south of the Little Quartz Ridge, this 2003 report also includes results from expeditions into other areas of the Columbia River Forest Reserve (Former Maya Mountains Forest Reserve, see location in figure 3) later that same year (Meerman, 1997).

Meanwhile archaeological expeditions were being conducted throughout the Maya Mountains (Dunham et al 1994, Dunham & Pesek 2000) as part of the Maya Mountains Archaeological Project MMAP. Research took mostly place in the Bladen Nature Reserve and the eastern part of the CRFR (Former MMFRS). During the Archaeological surveys biologists were sometimes present. Studies varied (Corbo 2000) but principal focus of interest during these biological studies was the occurrence of *Cacao Theobroma cacao* among ancient Maya settlements. The theory was that these Cacao stands were remnants of ancient Maya plantation and that the Cacao diversity found in the Maya Mountains was the result of cultivation (and importation) of Cacao by the ancient Maya (Pesek & Buchanan 2000). Apart from attention to Cacao, identifications of various organisms were made. Some attempt was made to confirm the reputed presence of White-faced Capuchin Monkeys in the Southern Maya Mountains (but such records apparently refer to very light faced Spider Monkeys. Also observations on Amphibians and Reptiles were made. A quick assessment of these species list showed that many of these identifications need to be treated with caution, since the biologists on site were not necessarily familiar with the Central American flora and fauna. Several plant specimens were collected and deposited at the Missouri Botanical Gardens.

Hurricane Iris

In 1991, a strong hurricane “Iris” ploughed through the Toledo district affecting most of the current area of interest. The destruction to natural ecosystems was mapped by Meerman (2001)(figure 4).



This hurricane proved an important setback for research in the CRFR. Much of the forest was leveled and several areas with much hurricane debris were affected by wildfires resulting

from agricultural activities at the fringes of the CRFR. Most notably several of the permanent sampling plots were heavily affected.

Following the hurricane three studies were conducted dealing with the changed ecological circumstances. Meerman 2004a+b (see locations in figure 3), studied the effects of the hurricane and subsequent salvage logging operations on the regeneration of the CRFR and paid attention to *Chamaedorea* palms as part of the new interest in these as “Xaté” harvesting. More recent Wicks et al (2006) published a draft report on further findings on Xaté in the CRFR (see locations in figure 3). Both Meerman (2004) and Wicks et al (2006) come to the conclusion that harvesting of Xaté in the CRFR is not practical due to the dense mass of hurricane debris and re-growth.

Meanwhile, within the CRFR Melinda Welton (2004-2006) is conducting research into the Caerulean Warbler following up on the 1992 observations by Ted Parker. No results have been published as yet.

Importantly, key bird and mammal monitoring has recently been implemented by the Ya'axché Conservation trust for the Golden Stream & Deep River watersheds. Since this project is in the implementation phase, no results have been published as yet.

On the edges of the area of interest, Doyle's Delight (Meerman & Matola 2005 – see locations in figure 3) was the focus of a Rapid Biological Assessment studying Flora, Fungi, Lepidoptera, Amphibians, Reptiles, Birds and Mammals. As in the previous Biological Assessments in the CRFR, many new species for Belize were found including species new to science, showing how many surprises these areas still hold for biological research.

Conclusions and Recommendations

Based on the experience of the current author, even though the amount of research and data presented above may appear scant, the CRFR is actually one of the better researched protected areas in Belize. Biggest problem is the scattered nature of the actual data and the data storage problems outlined in the section dealing with the FPMP permanent sampling plots. Currently biodiversity data can be stored at the Biodiversity and Environmental Resource Data System for Belize (BERDS: <http://www.biodiversity.bz>), which hopefully can prevent similar problems in the future. At this moment biodiversity data for the CRFR can be accessed at http://www.biodiversity.bz/find/protected_area/profile.phtml?pa_id=87 and generate species list (at the bottom of the page).

Based on figure 3 the coverage of data of the CRFR is not uniform and ironically, a major gap appears to exist in that portion of the CRFR that lies within the Golden Stream Watershed!

Based on the previous, recommendations for research in the CRFR are to conduct further baseline studies, particularly in the Golden Stream Watershed area including:

- Verification of ecosystems (reference to the Belize Ecosystems Map)
- Biodiversity data collection of all major groups: plants, fish, amphibians, reptiles, birds and mammals.
- Given the karstic nature of the terrain, caves should be abundant and special attention should be given to cave fauna, particularly bats.
- Karst hills in particular have been found to harbor rare and endemic species including Zamiaceae (Meerman, 2005). Zamiaceae and other karst obligates should also be the focus of further investigations.
- Based on experience elsewhere in the CRFR, particularly the higher elevations are ill researched and constantly yield new species. Therefore, particular attention needs to be given to the higher elevations within the project area.
- Much of the area is recovering from the impacts of Hurricane Iris in 2001. This recovery process needs to be monitored, as it is critical for the understanding of ecosystem variation and resilience in this area.
- Monitoring and data collection needs to continue on pre-existing vegetation transects and permanent sampling plots.
- Studies will need to be conducted that ultimately lead to the preparation of a Management Plan of the Eastern/Golden Stream Watershed section of the CRFR. While all of the above are important, on a short term basis (2-6 months) these studies should focus on:
 - Timber species
 - Rare and endemic species such as the various karst obligates
 - Critical wildlife species as per the current monitoring protocols

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