



Bull Run Overseas Ltd.: Project Design Document



January 2011

Executive Summary

The Bull Run Overseas project (“Project”) encompasses 4,650 ha of tropical pine forests, grasslands, and mature humid broadleaf forest in the Cayo District of Belize, Central America. The 20-year project plan, from 2009 to 2028, produces climate benefits by avoiding emissions from deforestation and increases biological sequestration by means of prescribed fire management in the pine component. Biodiversity benefits are produced by virtue of habitat protection. Community benefits are produced by maintaining relatively high paying jobs in a region of Belize with a high poverty rate.

Of the total 4,650 ha, 4,227 ha are available for industrial commercial logging and conversion to agricultural uses in the absence of finance from a carbon trade scheme. The baseline scenario for the tropical hardwood component is conversion to coffee (5 tons C/ha). The baseline scenario for the pine component is continued uncontrolled wildfire resulting in very slowly increasing biological sequestration for the life of the project. The proposed management plan would protect the tropical hardwood component and use prescribed fire, thinning and wildfire suppression in the pine component to eliminate catastrophic wildfires and restore the pine stands by the end of the project.

Climate, Community, and Biodiversity Standard Gold Level is achieved by virtue of the significant biodiversity resources conserved on the property including habitat for 16 IUCN listed species and most notably IUCN-Endangered Baird’s tapir (*Tapirus bairdii*).

Forest Carbon Offsets LLC (FCO) is the Project developer. The Conservation Management Institute (CMI) at Virginia Tech is the Project technical lead. Independent third party validation has been performed by Scientific Certification Systems (SCS). The Project follows the carbon accounting principles of conservatism, accuracy, completeness, transparency, consistency, and relevance. Validation under a carbon accounting standard such as the Voluntary Carbon Standard is planned. After this further step is successfully achieved, registration of voluntary emission reduction credits will be conducted with Markit Environmental Registry.

Cover photo: Bull Run Overseas (2010)

Table of Contents

Executive Summary	2
Table of Contents	3
Table of Figures	5
List of Tables	5
List of Equations	6
Facts	7
Acronyms	7
General Section	8
G1. Original Conditions in the Project Area.....	8
G1.1. Project Area Location and Physical Parameters.....	8
G1.2. Types and Condition of Vegetation within the Project Area.....	11
G1.3. Project Boundaries of the Project Area and the Project Zone.....	17
G1.4. Carbon Stocks within the Project Area.....	18
G1.5. Communities Located in the Project Zone.....	22
G1.6. Current Land Use and Land Tenure in the Project Zone.....	24
G1.7. Current Biodiversity within the Project Zone.....	25
G1.8. High Conservation Values within the Project Zone.....	26
G2. Baseline Projections.....	28
G2.1. Baseline Land Use.....	28
G2.2. Additionality.....	29
G2.3. Carbon Stock Changes.....	30
Tropical Hardwood Compartment.....	30
G2.4. Baseline Communities.....	34
G2.5. Baseline Biodiversity.....	34
G3. Project Design and Goals.....	35
G3.1. Major Climate, Community and Biodiversity Objectives.....	35
G3.2. Major Project Activities.....	35
G3.3. Location of Project Activities.....	35
G3.4. Time-frame and Project Accounting.....	35
G3.5. Project Risks and Mitigation Measures.....	36
G3.6. Maintenance of High Conservation Values.....	37
G3.7. Measures Taken to Enhance Climate, Community, Biodiversity Benefits.....	37
G3.8. Stakeholder Involvement.....	37
G3.9. Publicization of Public Comment Period.....	38
G3.10. Conflict Resolution Tools.....	38
G3.11. Project Financial Support.....	38
G4. Management Capacity and Best Practices.....	38
G4.1. Project Proponents.....	38
G4.2. Technical and Management Expertise.....	39
G4.3. Capacity Building.....	39
G4.4. Community Employment Opportunities.....	40
G4.5. Employment Laws.....	40
G4.6. Employee Safety.....	41

G4.7. Financial Health of the Implementing Organizations	42
G5. Legal Status and Property Rights	42
G5.1. Local Laws and Regulations	42
G5.2. Documentation of Legal Approval	44
G5.3. Free, Prior, and Informed Consent.....	44
G5.4. Involuntary Relocations	44
G5.5. Illegal Activities	44
G5.6. Carbon Rights	44
Climate Section.....	45
CL1. Net Positive Climate Impacts	45
CL1.1. Net Change in Carbon Stocks.....	45
CL1.2. Net Change in Non-CO ₂ Gases.....	45
CL1.3. Other GHG Emissions from Project Activities.....	45
CL1.4. Positive Net Climate Impact	45
CL1.5. Avoid Double-Counting	45
CL2. Offsite Climate Impacts	46
CL2.1. Types of Leakage.....	46
CL2.2. Mitigation of Negative Offsite Impacts	46
CL2.3. Unmitigated Negative Offsite Climate Impacts.....	46
CL2.4. Unmitigated Negative Offsite Non-CO ₂ Climate Impacts	46
CL3. Climate Impact Monitoring	46
CL3.1. Carbon Pool Selection and Monitoring	46
CL3.2. Monitoring Plan	47
Community Section.....	47
CM1. Net Positive Community Impacts	47
CM1.1. Community Benefits.....	47
CM1.2. Impact on High Conservation Values.....	49
CM2. Offsite Stakeholder Impacts	49
CM2.1. Potential Negative Offsite Stakeholder Impacts.....	49
CM2.2. Plans to Mitigate Potential Offsite Impacts.....	49
CM2.3. Unmitigated Offsite Impacts.....	49
CM3. Community Impact Monitoring.....	50
CM3.1. Community Impact Monitoring Plan.....	50
CM3.2. High Conservation Value Plan	50
CM3.3. Community Impact Monitoring Implementation	50
Biodiversity Section	50
B1. Net Positive Biodiversity Impacts.....	50
B1.1. Biodiversity Impacts	50
B1.2. Impact on High Conservation Values	51
B1.3. Species Used by the Project	51
B1.4. Exotic Species in the Project Area	52
B1.5. Genetically Modified Organisms	52
B2. Offsite Biodiversity Impacts	52
B2.1. Potential Negative Offsite Biodiversity Impacts.....	52
B2.2. Mitigation of Potential Negative Offsite Biodiversity Impacts	52

B2.3. Evaluation of Potential Negative Offsite Biodiversity Impacts	52
B3. Biodiversity Impact Monitoring	52
B3.1. Biodiversity Impact Monitoring Plan.....	52
B3.2. Biodiversity Impact Monitoring Effectiveness	53
B3.3. Biodiversity Impact Monitoring Implementation	53
Gold Level.....	54
GL3. Exceptional Biodiversity Benefits	54
GL3.1. Vulnerability or Irreplaceability	54
Literature Cited.....	55
Appendix A: Forest Plots	58
Appendix B: Hurricanes.....	61
Appendix C: Monitoring Plans	63
CL. Climate Impact Monitoring Plan	63
CM. Community Impact Monitoring Plan.....	66
B. Biodiversity Impact Monitoring Plan.....	67
GL. Exceptional Biodiversity Benefits Monitoring Plan.....	67

Table of Figures

Figure 1: Restored pine stand on Project site.....	8
Figure 2: Location of Bull Run Overseas (Green) and Project zone (Red) in the Cayo District of Belize (CIA).....	10
Figure 3: Regional ecotypes found in the Project area	13
Figure 4: Current submontane pine forest within the Project area after southern pine beetle outbreak and wildfire, photo by Verl Emrick 2010	16
Figure 5: Project area forest management compartments delineated based upon vegetation, soils and the growth potential of the site for pine	16
Figure 6: Location of the Project area and Project zone with the general ecotypes of the region	18
Figure 7: Graphic presentation of the distribution of plots sampled across four forest management compartments within the Project area	20
Figure 8: Unincorporated settlements within the Project zone.....	24
Figure 9: Mesoamerican Biological Corridor Map with BRO (Las Nubes 2011).....	28
Figure 10: Forest health monitoring crew comprised of CMI and BRO staff (August 2010).....	40
Figure 11: Bull Run Overseas settlement	48
Figure 12: Impact risks of tropical storms and hurricanes over the past 100 years.....	62

List of Tables

Table 1: Forest management compartments, description and hectares of each compartment type	16
Table 2: Data used to calculate sample size and sample size (n) required to achieve the desired precision and confidence for each forest management compartment.....	19
Table 3: Summary of mean C stocks with 95% confidence interval in the management compartments within the Project area.....	22
Table 4: Cayo District and Project zone 2009 midyear population estimates	23

Table 5: Project land title and registry information	24
Table 6: IUCN red list species	25
Table 7: High Conservation Values within the Project area and Project zone	26
Table 8: Summary of proxy areas used to inform deforestation rates	32
Table 9: Without-Project 2009-2028 summary of GHG emissions for baseline and with-Project	32
Table 10: Annual avoided GHG emissions 2009 to 2028	33
Table 11: Model parameters	34
Table 12: BRO Project timeline.....	36
Table 13: Staff safety	41
Table 14: Objectives of biodiversity monitoring	53
Table 15: IUCN red list species	54
Table 16: Plot numbers and coordinates (NAD 27) for plots used to calculate carbon stocks within the Project area at Bull Run Overseas	58
Table 17: Area of stratum	64
Table 18: Area of sample plot.....	64
Table 19: DBH.....	65
Table 20: Tree height	65
Table 21: Years between monitoring time.....	66

List of Equations

Equation 1: Sample size equation from Pearson et al (2005)	19
Equation 2: Four allometric equations from Pearson et al (2005) for calculation of above ground biomass at BRO	21
Equation 3: Below ground biomass regression.....	22

Facts

Title of the Proposed Project	Bull Run
Country	Belize
Nearest City	San Ignacio
Precise Coordinates	Latitude 17 ⁰ 04'00.00" N and Longitude 88 ⁰ 47'00.00" W
Technical Lead	Virginia Polytechnic Institute and State University, Conservation Management Institute (CMI) (http://www.cmiweb.org/)
Auditor	Scientific Certification Systems (SCS) (http://www.scscertified.com/)
Project Owner	Bull Run Overseas Limited (BRO) George Headley (headley@pobox.com)
Project Developer	Forest Carbon Offsets LLC (FCO) (http://www.forestcarbonoffsets.net/)
Project Contact Person	Jeff Waldon (jeffwaldon@forestcarbonoffsets.net)
Title	Chief Technical Officer
Address	2121 Eisenhower Avenue, Suite 200, Alexandria, Virginia 22314, USA
Telephone Number	+1 (540) 230-2854

Acronyms

BAPPA	Belize Association of Private Protected Areas
BZE-LC	Belize National List of Critical Species, least concern
BZE-NT	Belize National List of Critical Species, near threatened
BZE-VU	Belize National List of Critical Species, vulnerable
BRO	Bull Run Overseas
CCBA	Climate, Community, Biodiversity Standards Alliance
CMI	Conservation Management Institute, Virginia Tech
DBH	Diameter at breast height
FCO	Forest Carbon Offsets, LLC
IUCN	International Union for the Conservation of Nature, one or more levels of concern
IUCN-DD	International Union for the Conservation of Nature, data deficient
IUCN-EN	International Union for the Conservation of Nature, endangered
IUCN-LC	International Union for the Conservation of Nature, least concern
IUCN-NT	International Union for the Conservation of Nature, near threatened
IUCN-VU	International Union for the Conservation of Nature, vulnerable
mtCO ₂ e	metric ton CO ₂ equivalent
PDD	project design document
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard



Figure 1: Restored pine stand on Project site

General Section

Gen	Clim	Comm	Bio
G1.	Required		

G1. Original Conditions in the Project Area

G1.1. Project Area Location and Physical Parameters

Bull Run Overseas (the “Project”) is located in the Cayo District of Belize. The Project boundary encompasses 4,650 ha of which 4,227 ha are available for industrial commercial logging and conversion to agricultural uses in the absence of finance from a carbon trade scheme. A one-chain buffer surrounding perennial streams (personal communication Ministry of Natural Resources and Environment, Belize) (Figure 1: Restored pine stand on Project site) is excluded from consideration. There are no regulatory constraints on industrial commercial logging in the Project area.

The Project area is located at Latitude 17°04'00.00" N and Longitude 88°47'00.00" W in the Cayo District, Belize 23.5 km east-southeast of San Ignacio, Belize (Figure 2: Location of Bull Run Overseas (Green) and Project zone (Red) in the Cayo District of Belize). The Project area has in its Project zone: Hidden Valley Inn; Belize Forestry Department Ministry of Natural Resources including Thousand-Foot Falls National Park, Elijio Panti National Park, Mountain Pine Ridge Forest Reserve, Government of Belize Crown Lands and Privassion Enclave; Pine Lumber Company; Five Sisters Lodge; Pine Ridge Lodge; and Blancaneaux Lodge. There are no communities within the Project zone.

Belize has a diverse society, composed of many cultures and languages. Although Creole and Spanish are widely spoken among the populace, Belize is the only country in Central America where English is the official language. It is bordered by Mexico to the north, Guatemala to the south and west, and the Caribbean Sea to the east. With 22,960 km² of territory and 307,899 people (2008 est.), the population density is the lowest in the Central American region and one of the lowest in the world. However, the country's population growth rate, 2.15% (2009 est.), is the highest in the region and one of the highest in the western hemisphere (CIA 2010).

Belize has a subtropical to tropical climate with a mean annual rainfall across the country ranging from 1524 mm in the north to 4064 mm in the south. Except for the southern regions, the rainfall is variable from year to year. The Project area has two distinct seasons, a wet season from June to January and a dry season extending from February to May. Most of the year's rainfall occurs from June to November. The average rainfall per month near the Project ranges from a low of 50 mm in April to a high of 225 mm in July (Belize National Meteorological Service 2010).

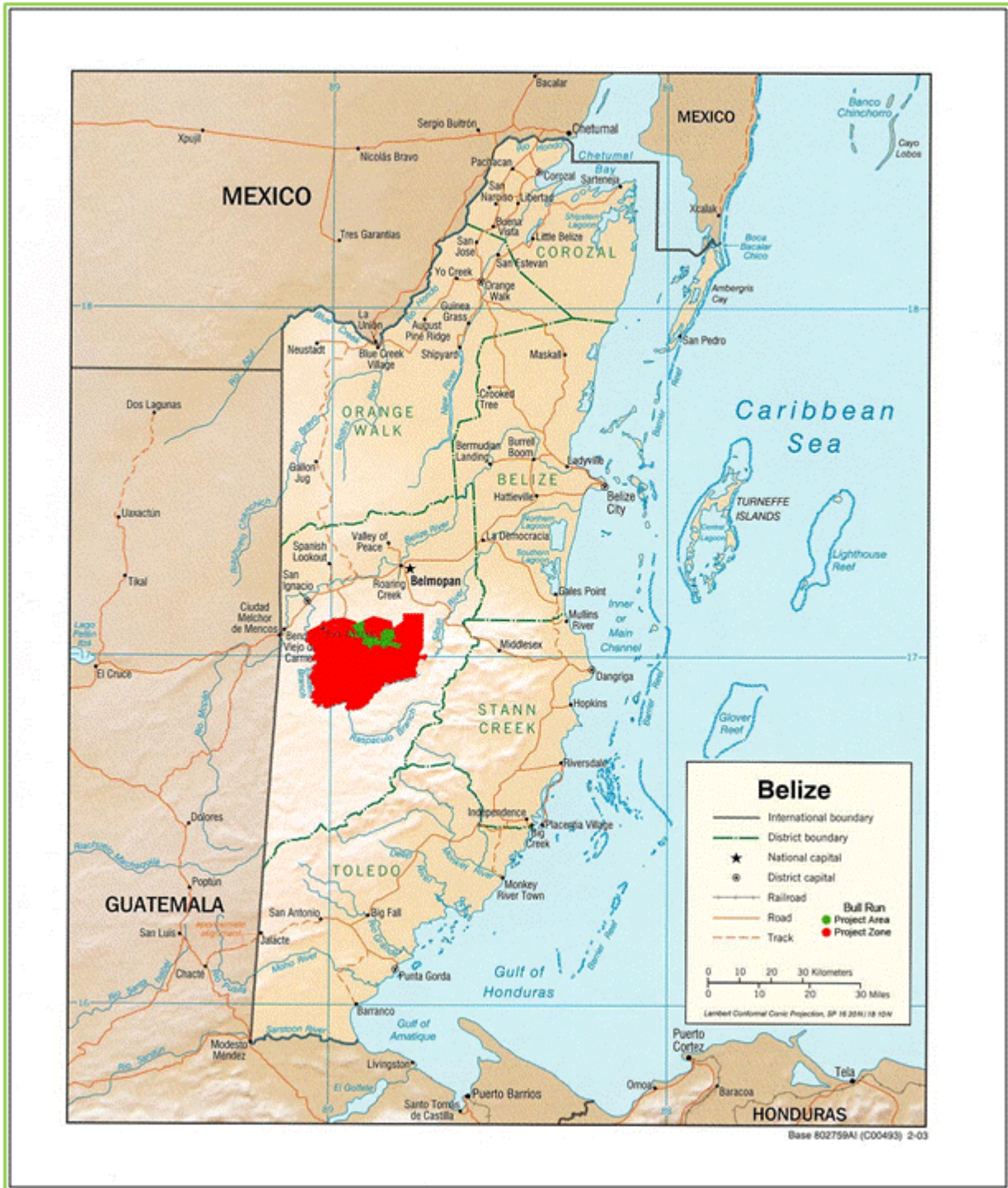


Figure 2: Location of Bull Run Overseas (Green) and Project zone (Red) in the Cayo District of Belize (CIA)

The Project area lies within the Mountain Pine Ridge ecotype. Much of the following information was gleaned from Ennion (1995) unless otherwise cited. The Mountain Pine Ridge is comprised of a granite plateau and adjacent metasedimentary terrain ranging from 400 m to 800

m elevation above mean sea level (Kellman & Meave 1997). Limestone capped hills remain in some areas, but the majority of the limestone mantel has eroded.

Temperatures throughout Belize vary across different districts with mean annual temperatures ranging from 27°C along the coast to 21°C in the hills (Belize National Meteorological Service 2010). The Mountain Pine Ridge has an average maximum of 25°C and an average minimum of 17.7°C (Belize National Meteorological Service 2010). January is on average the coldest month, while May is the warmest with minimum of temperatures of 5.5°C and 15°C respectively.

Soils are generally coarse textured and infertile ultisols (red clay soils) derived from granitic and metasedimentary material (Kellman & Miyanishi 1982). The soils tend to be acidic, contain few nutrients for plants, and usually have bedrock within a meter of the surface (Baillie et al 1993). The soils in the Project area are primarily in two suites: the Stopper suite and the Ossary suite. The Stopper suite is derived from granite and tends to be acidic and highly leached, contains few nutrients and susceptible to erosion (Baillie et al 1993). In the Project area, pinol is the main subsuite of the Stopper suite. The pinol subsuite is dominated by *Pinus caribaea*, is low in soil nutrients, and is commonly found on lower terrain. The Ossary suite, in contrast, is derived from metasedimentary parent material, and is the most common soil type in the Maya Mountains. Like the Stopper suite, the Ossary suite is acidic and low in available nutrients (Baillie et al 1993). This suite has three subsuites in the Project area: the cooma, chiquibul, and baldy. The cooma subsuite usually supports *Pinus oocarpa*, and when disturbed can be invaded by less desirable species including tiger bush (*Dicranopteris pectinata*) and dumb cane (*Tripsacum latifolium*). The chiquibul subsuite is often intermixed with cooma soils, but is comparatively shallower and less well developed than the cooma subsuite. The chiquibul subsuite is often downhill from cooma and has similar vegetation types. The baldy subsuite is much rockier than the cooma and chiquibul subsuites, very leached and acidic. These soils are usually dominated by grasses and small occasional *Pinus caribaea*. Of these four subsuites, the pinol and the cooma subsuites are the most common in the Project area.

G1.2. Types and Condition of Vegetation within the Project Area

There are several classification systems that can be used to map the vegetative communities within the Project area. The most useful is the basic ecotype classification described in the Biodiversity and Environmental Resource Data System of Belize (Meerman & Clabaugh 2010).

Project Area Basic Ecotypes

Meerman and Clabaugh (2010) identified five distinct basic ecotypes within the Project area (Figure 3: Regional ecotypes found in the Project area):

- Shrubland.
- Lowland Pine Forest.
- Submontane Pine Forest.
- Submontane Broadleaved Moist Forest.

- Lowland Broadleaved Moist Forest.

Shrubland

Occupies well drained slopes, with sandy soils, this cover type supports several fire tolerant woody and grass species. The altitude of this habitat type ranges between 500 m and 1000 m, and it averages roughly 2000 mm of rainfall per year. These areas are generally sparse, containing several species of grass, sedge, and scattered woody species such as: *Agarista sp.*, *Clusia sp.*, *Curatella americana*, *Byrsonima crassifolia*, *Pinus caribaea*, and *Quercus sp.*

Lowland Pine Forest

Generally characterized by uplands between 500 m and 1000 m comprised of *Pinus caribaea* as the dominant species, and mixed broadleaf species. Soils are well-drained, reddish or pinkish brown over sandy clay. Rainfall is on average less than 2500 mm, with a dry season associated with fire. In addition to *Pinus caribaea*, woody species include: *Agarista sp.*, *Byrsonima crassifolia*, *Clethra occidentalis*, *Clusia massoniana*, *Schippia concolor*, *Terminalia amazonia* and various *Quercus spp.* with an understory of grasses, sedges, and tigerbush (*Dicranopteris sp.*).

Submontane Pine Forest

Submontane pine forest contains more broadleaf species and *Pinus oocarpa*. This vegetation type is also fire adapted, has less than 2500 mm of rainfall per year, well drained soil over non-calcareous rock, and ranges between 500 m and 1000 m of elevation. Broadleaf species in this vegetation type include *Agarista sp.*, *Byrsonima crassifolia*, *Clethra occidentalis*, *Clusia massoniana*, *Curatella americana*, *Schippia concolor*, *Terminalia Amazonia*, *Quercus spp.*, and a grass and sedge understory commonly accompanied by St. John's wort shrubs (*Hypericum terrae-firmae*) and tigerbush (*Dicranopteris sp.*).

Submontane Broadleaved Moist Forest

This region occupies lower elevations with richer soils than pine dominated classes and soils are well drained reddish brown or gray sandy clays with stones, overlying quartzite. Average annual rainfall is less than 2500 mm. These two classes differ in elevation and species composition. occupies elevation of 500 m and 1000 m and commonly contains the tree species *Castilla elastica*, *Chrysophyllum cainito*, *Dendropanax arboreus*, *Dialium guianense*, *Euterpe precatoria*, *Ficus sp.*, *Guarea spp.*, *Licania platypus*, *Nectandra sp.*, *Attalea cohune*, *Podocarpus guatemalensis*, *Protium schippii*, *Pterocarpus rohrii*, *Quararibea sp.*, *Pourouma aspera*, *Rheedia sp.*, *Schizolobium parahybum*, *Simarouba glauca*, *Stemmadenia donnell-smithii*, *Swietenia macrophylla*, *Terminalia amazonia*, *Virola brachycarpa*, *Vismia ferruginea*, *Vochysia hondurensis*, *Xylopia frutescens*, and *Zanthoxylum sp.*, with *Astrocaryum mexicanum* and *Melastomes* in the understory.

Lowland Broadleaved Moist Forest

This type is found at elevations lower than 500 m and contains tree species including: *Attalea cohune*, *Bactris sp.*, *Calophyllum brasiliense*, *Castilla elastica*, *Clidemia sp.*, *Combretum farinosum*, *Dendropanax arboreus*, *Desmoncus orthacanthos*, *Dialium guianense*, *Dicranopteris sp.*, *Euterpe precatorea*, *Ficus sp.*, *Geonoma sp.*, *Guarea spp.*, *Heliconia vaginalis*, *Hirtella racemosa*, *Inga sp.*, *Licania platypus*, *Licania hypoleuca*, *Miconia spp.*, *Mimosa pigra*, *Mimosa watsoni*, *Mouriri myrtilloides*, *Nectandra sp.*, *Ochroma lagopus*, *Passiflora ambigua*, *Podocarpus guatemalensis*, *Pourouma aspera*, *Protium schippii*, *Psychotria poeppigiana*, *Pterocarpus rohrii*, *Quararibea sp.*, *Rheedia sp.*, *Schefflera morototoni*, *Schizolobium parahybum*, *Scleria bracteata*, *Simarouba glauca*, *Sloanea tuerckheimii*, *Souroubea sp.*, *Spondias mornbin*, *Stemmadenia donnell-smithii*, *Swietenia macrophylla*, *Symphonia globulifera*, *Terminalia amazonia*, *Tococca sp.*, *Trichospermum grewiifolium.*, *Virola koschnyi*, *Vismia ferruginea*, *Vochysia hondurensis*, *Xylopia frutescens* and *Zanthoxylum sp.*, with *Astrocaryum mexicanum* and *Melastomes* in the understory.

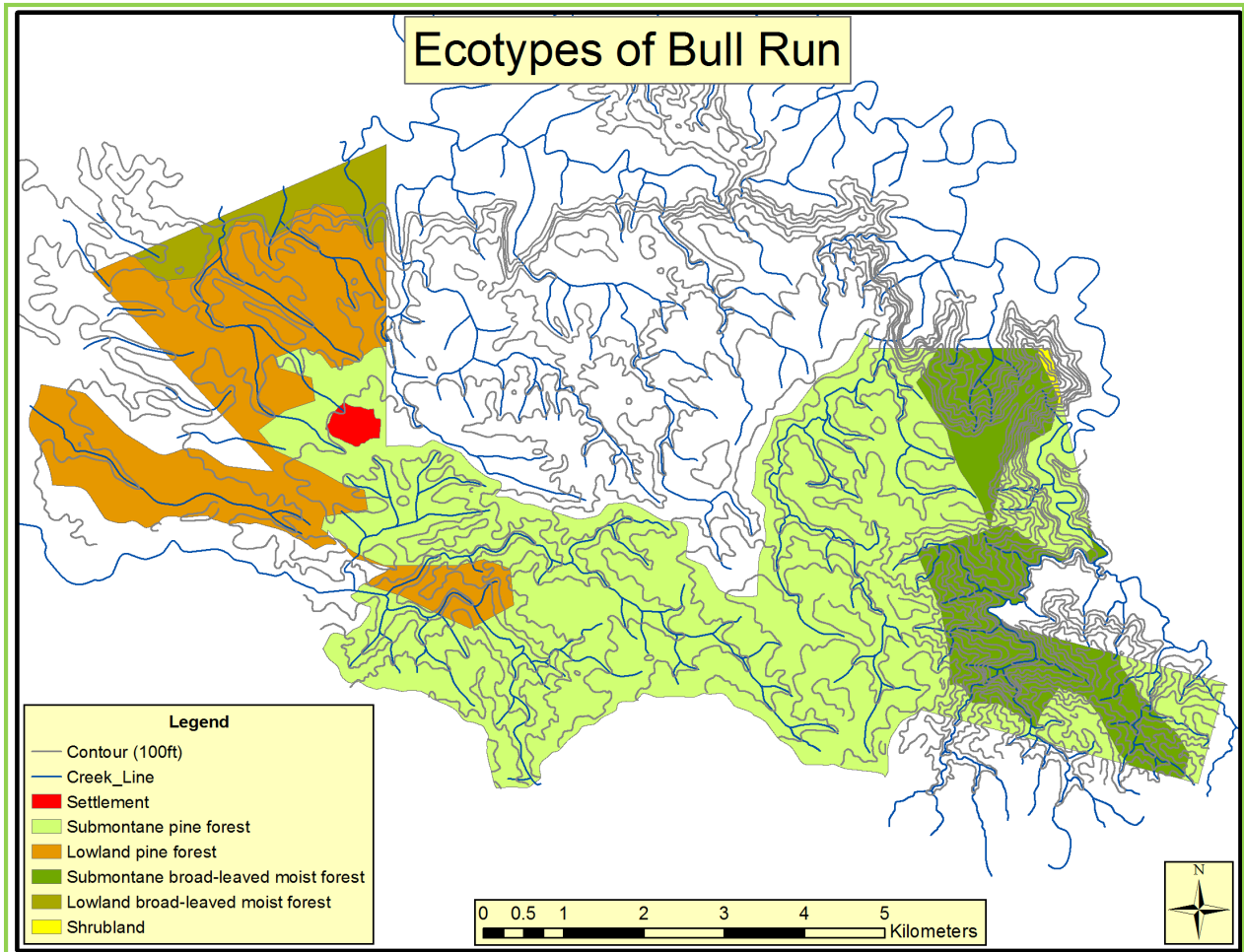


Figure 3: Regional ecotypes found in the Project area

These ecotypes, while useful at the regional and country scale, represent at best potential vegetation within the Project area due to multiple interactive disturbances from the southern pine

bark beetle and fire, both prescribed and wild. In order to fully understand the types and condition of vegetation in the Project area, it is necessary to understand the underlying disturbance patterns which drive the vegetation dynamics and ecosystem processes in the disturbance dependent Mountain Pine Ridge ecosystem.

Disturbance Patterns: Mountain Pine Ridge Ecosystem

The Mountain Pine Ridge ecosystem has been impacted by multiple natural and anthropogenic disturbances. In 1944 much of the Mountain Pine Ridge was set aside as a forest reserve (approximately 51,499 ha adjacent to the Project area). Fire protection was introduced to the land soon after it was declared a forest reserve, however inadequacies resulted in practically the entire area burning in 1949 (Johnson & Chaffey 1973). Road construction became a priority in the 1950s, and it was declared a production forest in 1952. When Hurricane Hattie struck in 1961 the new downed trees and debris increased fire danger, and steps were taken to improve fire control capabilities (Johnson & Chaffey 1973). For years the reserve fought to reduce the number and severity of fires in the Mountain Pine Ridge. However, the system has evolved with fire, whether started by humans for grazing/agriculture or naturally. Fire records from the Belize Department of Forestry show that from 1960 to the early 1980s, lightning strikes were responsible for six to seven fires per year in the Mountain Pine Ridge and human activity was responsible for three to four fires per year (Kellman 1984). With this high occurrence of natural fires the Mountain Pine Ridge ecosystem is a fire maintained and evolved system and the absence of fire results in the recruitment of fire intolerant species (Kellman & Miyanishi 1982). Thus, years of fire suppression resulted in unnaturally dense pine stands, increasing their susceptibility to more severe fires, disease, and insect pest outbreaks. As a management practice, low-intensity prescribed fires in pine stands that are at least ten-years old reduces competition through young tree mortality and increases tree resilience and stand resistance to catastrophic fire (Billings et al 2004). Also low-intensity fires consume fuels that have accumulated thus reducing the chance of future high-intensity fires causing mature pine mortality.

In addition to fire, threats to Central American pine forests include hurricanes, drought, logging, disease, and insect pests. None have been more devastating to the Central American pine forests than the southern pine beetle outbreak that occurred from 1999 to 2003, devastating an estimated 90,000 ha of pine forests (Billings et al 2004). This outbreak affected Belize, Guatemala, Honduras, and Nicaragua. The southern pine beetle breeds in the cambium layer in multiple species of pine, and can kill trees by girdling or by introducing a blue stain fungus which penetrates into the wood (Billings et al 2004; Belize Department of Forestry and FAO 2008). Although southern pine beetles are indigenous to the region and are very capable fliers, humans may still be responsible for spreading the beetle to new areas via shipping “unseasoned sawn wood and wooden crates with bark on them” (Belize Department of Forestry & FAO 2008).

Throughout 2000 and 2001 Belize was confronted with a major southern pine beetle outbreak, devastating over 25,000 ha of mature pine stands in the Mountain Pine Ridge. Over 60% of the Mountain Pine Ridge Forest Reserve and 80% of the Mountain Pine Ecosystem within the reserve were adversely affected (Billings et al 2004). The sheer volume of dead pine trees substantially increased fuel loads thus making most of the Mountain Pine Ridge vulnerable to

serious wildfires particularly during the dry season (Billings et al 2004). As a result, few mature pine stands exist in the Mountain Pine Ridge.

Project Area: Disturbance Dynamics

Since 2000, two major disturbances have substantially altered vegetation patterns and impacted ecosystem dynamics and biogeochemistry in the majority of the Project area. In 2002 the southern pine beetle outbreak that affected the entire Mountain Pine Ridge swept across the Project area. This outbreak was the most severe ever recorded in the Mountain Pine Ridge. Within the Project area over 90% of the mature *Pinus caribaea* trees were killed by the outbreak (Headley 2008). Consequently, with the added fuel loads, the severity and frequency of wildfires has increased substantially since the southern pine beetle outbreak. The result of the landscape scale interaction of two severe disturbances has been a significant degradation of the pine forests within the Project area (Figure 4: Current submontane pine forest within the Project area after southern pine beetle outbreak and wildfire, photo by Verl Emrick 2010). The increased severity of fire has eliminated or severely reduced regeneration in many areas, increased soil erosion and generally degraded ecosystem function. Without active management, recovery of the pine forests within the Project area will take many decades if not longer to occur.



Figure 4: Current submontane pine forest within the Project area after southern pine beetle outbreak and wildfire, photo by Verl Emrick 2010

Project Area: Forest Management Compartments

The accuracy of current regional vegetation maps and classification systems were not sufficient to use as the basis for management decisions or carbon stock calculations. As a result the Project area was partitioned into management compartments based upon vegetation, soils and the growth potential of the site for pine (Figure 5: Project area forest management compartments delineated based upon vegetation, soils and the growth potential of the site for pine). The growth potential is primarily a function of the soils, with the pinol subsuite having the lowest growth potential and the cooma subsuite the highest growth potential.

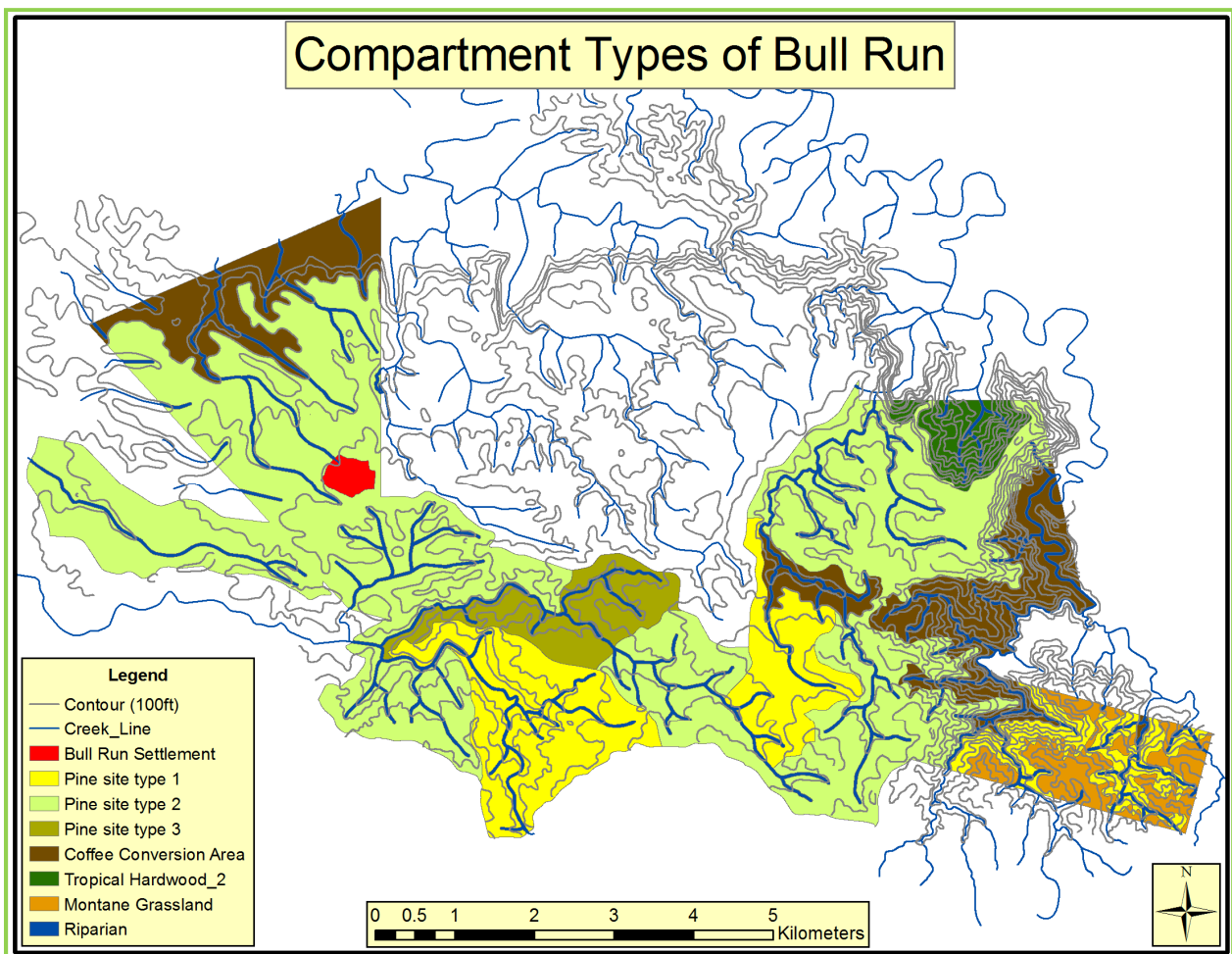


Figure 5: Project area forest management compartments delineated based upon vegetation, soils and the growth potential of the site for pine

Table 1: Forest management compartments, description and hectares of each compartment type

Compartment name	Description	Hectares
Bull Run settlement	Housing, storage buildings, garages, office, gardens and	25

	orchards.	
Montane grassland	High elevation grassland maintained by fire. Ecotype: shrubland.	161
Pine site type 1	Poor quality sites for pine growth. Ecotype: submontane pine.	720
Pine site type 2	Moderate quality sites for pine growth. Ecotypes: submontane pine and lowland pine.	2,442
Pine site type 3	High quality sites for pine growth. Ecotype: submontane pine.	205
Tropical hardwood	Hardwood forests. Ecotypes: submontane broadleaved moist forest and lowland broadleaved moist forest.	700
Riparian	One-chain buffer surrounding perennial streams.	397
Total		4,650

Each of the pine forest management compartments is dominated by Caribbean pine (*Pinus caribaea*) and represents approximately 72% of the Project area (Table 1: Forest management compartments, description and hectares of each compartment type). In the higher elevations Honduran pine (*Pinus oocarpa*) is locally dominant. Within each pine compartment, hardwoods such as black oak (*Quercus oleoides*), white oak (*Quercus peduncularis*), red oak (*Quercus perseifolia*), wild craboo (*Byrsonima crassifolia*), and *Clusia spp.* are relatively common components of the forest. All of the pine compartments were severely impacted by the southern pine bark beetle outbreak and subsequent wildfires and are severely degraded. In some locations the few trees left > 10 cm DBH are primarily hardwood species. The tropical hardwood forest management compartments are comprised of mature stands of broadleaved moist forest common to Belize and are typically found on the lower slopes and ravines. The soils are commonly deeper and / or higher in nutrients. While only representing 15% of the Project area these stands have not been subjected to the disturbances impacting the pine stands and thus have the highest above ground biomass of all the compartments. The montane grassland compartment is composed of high elevation grasslands with scattered pines maintained by natural and anthropogenic fire. The riparian compartment is the one-chain buffer area on either side of perennial streams within the Project area and is typically dominated by tropical hardwoods. The settlement compartment is the area around the BRO housing, working and storage areas and is comprised of orchards and scattered trees.

G1.3. Project Boundaries of the Project Area and the Project Zone

The 4,650 ha Project area has in its Project zone: Hidden Valley Inn; Belize Forestry Department Ministry of Natural Resources including Thousand-Foot Falls National Park, Elijio Panti National Park, Mountain Pine Ridge Forest Reserve, Government of Belize Crown Lands and Privassion Enclave; Pine Lumber Company; Five Sisters Lodge; Pine Ridge Lodge; and Blancaneaux Lodge. There are no communities within the Project zone. The 66,645 ha Project zone encompasses the entire Mountain Pine Ridge ecosystem in Belize and surrounding areas to and is bordered to the south and west by the Macal River (Figure 6: Location of the Project area

and Project zone with the general ecotypes of the region). There are no communities within the Project zone.

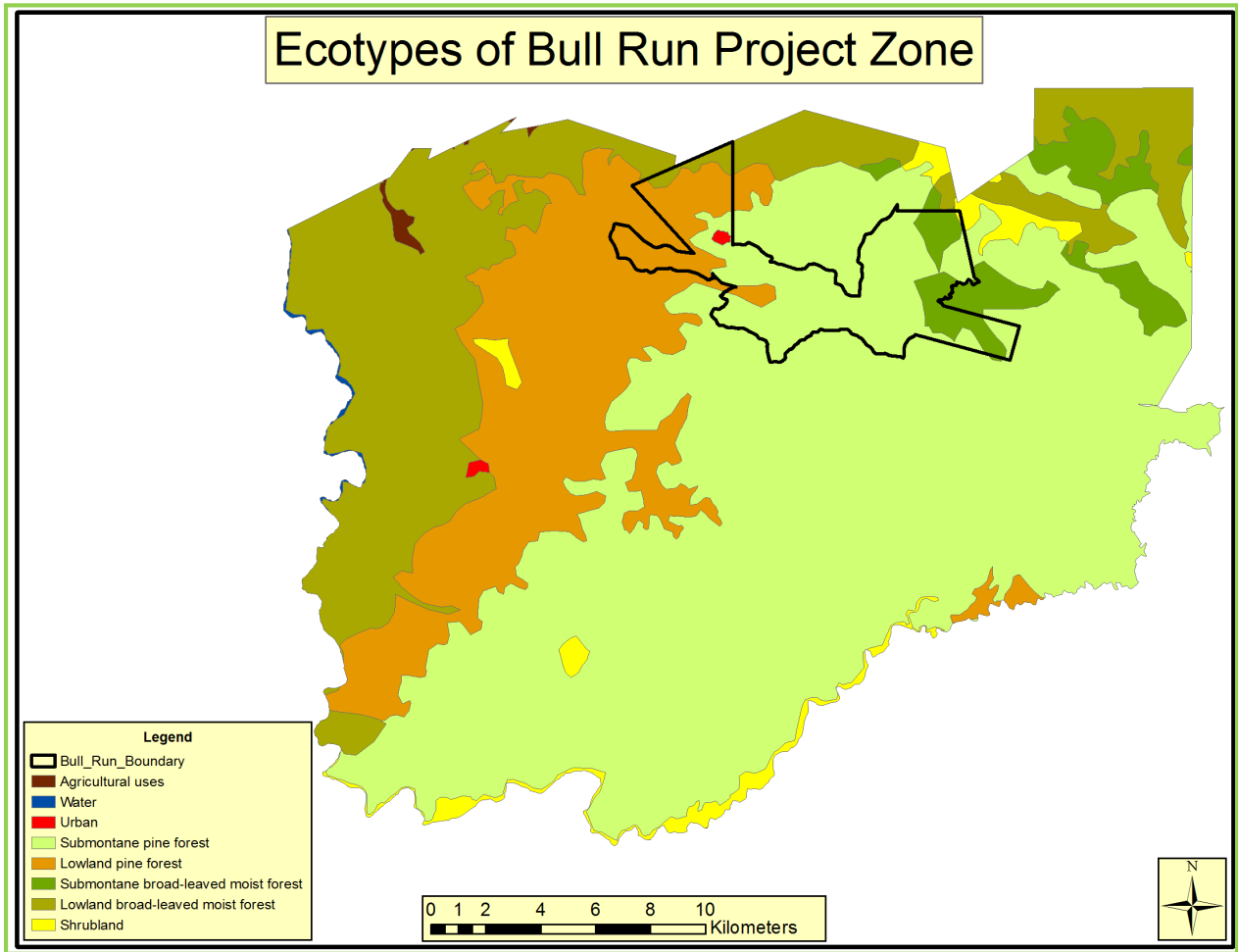


Figure 6: Location of the Project area and Project zone with the general ecotypes of the region

G1.4. Carbon Stocks within the Project Area

The approach to measuring carbon stocks in the Project area is based upon the *Sourcebook for Land Use, Land-Use Change and Forestry Projects* (Pearson et al 2005). These methods comply with the Intergovernmental Panel on Climate Change’s 2006 Guidelines for National GHG Inventories for Agriculture, Forestry and Other Land Use.

Carbon Pools

The carbon pools selected for measurements were the above ground tree > 5 cm DBH and below-ground biomass. Lianas, down or standing dead wood, or leaf litter were not measured, which resulted in a conservative estimation of carbon stocks.

Pilot Study, Sample Size and Plot Allocation

In May 2010, a pilot study was conducted to determine preliminary C tons per ha in the selected carbon pools. During the pilot study, 29 plots were established across all of the basic ecotypes within the Project area. All trees > 5 cm DBH were tallied and measured within an 11.3 m radius circular plot. Subsequently, all plots were placed into one of four forest management compartments. Carbon stock data was calculated using published allometric equations found in Pearson et al, 2005. From these data, the appropriate sample size was calculated for the baseline carbon stock assessment using a 20% precision level and a 90% confidence interval (Equation 1: Sample size equation from Pearson et al (2005)) for all four of the forest management compartments (i.e. strata) that constitute the majority of the Project area (Table 2: Data used to calculate sample size and sample size (n) required to achieve the desired precision and confidence for each forest management compartment).

Equation 1: Sample size equation from Pearson et al (2005)

$$n = \frac{\left(\sum_{h=1}^L N_h * S_h \right)^2}{\frac{N^2 * E^2}{t^2} + \left(\sum_{h=1}^L N_h * S_h^2 \right)}$$

Where:

E = allowable error or the desired half-width of the confidence interval. Calculated by multiplying the mean carbon stock by the desired precision,

t = the sample statistic from the t-distribution for the 95 percent confidence level. *t* is usually set at 2 as sample size is unknown at this stage,

N_h = number of sampling units for stratum *h* (= area of stratum in hectares/area of the plot in hectares),

n = number of sampling units in the population ($n = \sum N_h$)

s_h = standard deviation of stratum *h*.

Data used to calculate sample size from the pilot study is in Table 2: Data used to calculate sample size and sample size (n) required to achieve the desired precision and confidence for each forest management compartment.

Table 2: Data used to calculate sample size and sample size (n) required to achieve the desired precision and confidence for each forest management compartment

Forest compartment	E	s _h	N _h	t	n
Pine site type 1	0.2*21.84	9.25	781 / 0.04	1.645	16
Pine site type 2	0.2*19.29	13.3	2,628 / 0.04	1.645	78
Pine site type 3	0.2*26.51	10.88	223 / 0.04	1.645	5

Tropical hardwood	0.2*186.59	51.98	793 / 0.04	1.645	20
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Using a GIS of the compartments, plots were randomly allocated within each forest compartment (Figure 7: Graphic presentation of the distribution of plots sampled across four forest management compartments within the Project area). A table with UTM coordinates for each plot is provided in Appendix A (Table 16: Plot numbers and coordinates (NAD 27) for plots used to calculate carbon stocks within the Project area at Bull Run Overseas). Because of the rough and inaccessible terrain, only 11 of the 20 allocated tropical hardwood plots were sampled during this initial phase of the Project.

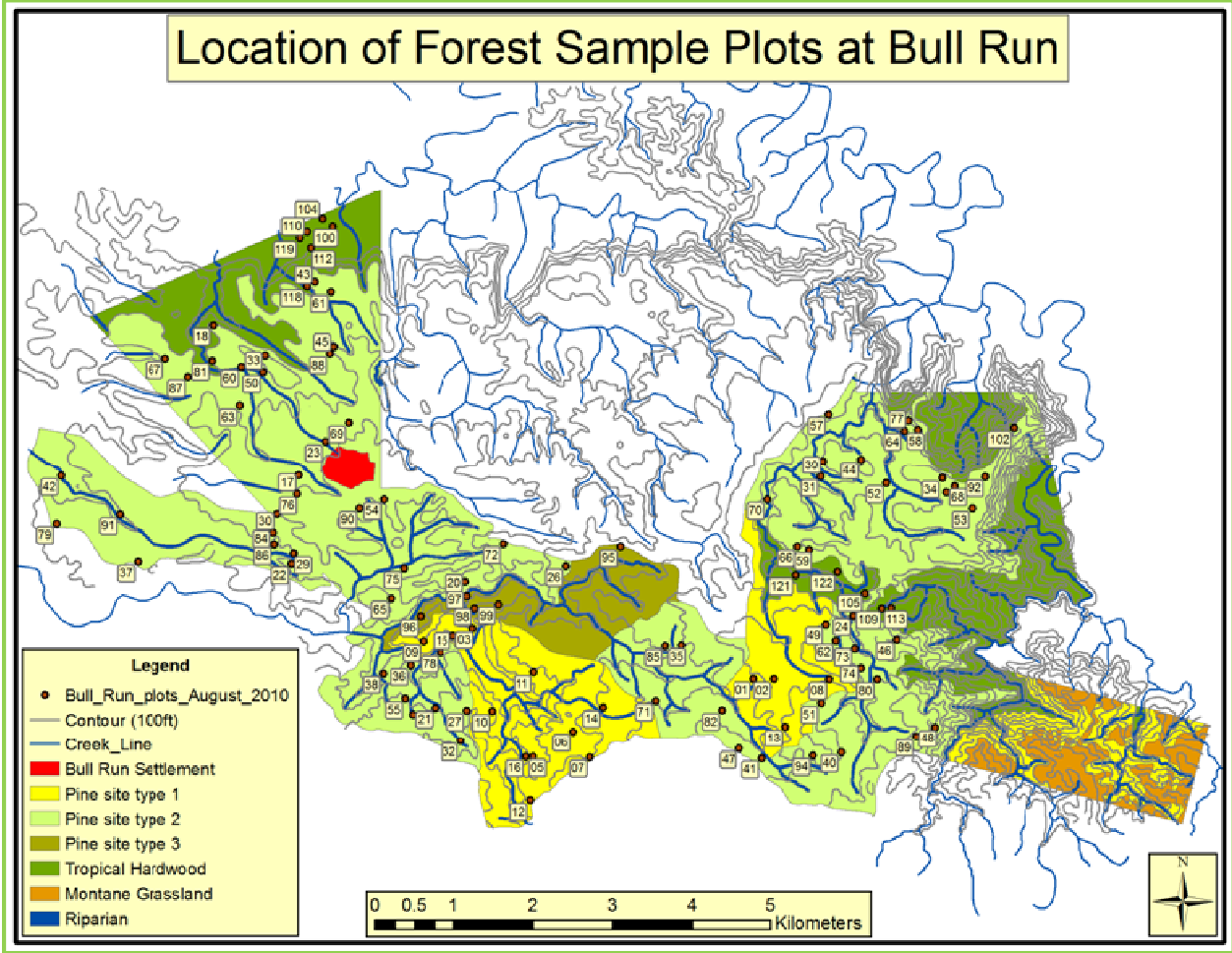


Figure 7: Graphic presentation of the distribution of plots sampled across four forest management compartments within the Project area

Field Measurements

The methods for measuring the carbon pools at BRO were based on the *Sourcebook for Land Use, Land-Use Change and Forestry Projects* (Pearson et al 2005). Because destructive sampling was not practical to measure above ground carbon stocks, published allometric equations were used to determine aboveground biomass based upon the DBH of hardwood trees,

pine trees and the height of palms. The following forest inventory techniques were used to collect the appropriate field data (Pearson et al 2005).

Once forest inventory plots were allocated, a field crew comprised of CMI staff and BRO staff, navigated to the plot locations using global positioning system (GPS) and filed maps. Data collection was based on a nested circular plot design described in Pearson et al (2005). All trees 5 - 20 cm DBH were tallied within a 4 m radius of the plot center, all trees 20 - 50 cm DBH were tallied within a 14 m radius of plot center, and all trees > 50 cm DBH were tallied within 20 m radius from plot center. Palms were selected for height measurements based upon the same criteria. Each tree was recorded to species with the help of the BRO staff. The DBH for each tree was recorded and placed into one of the following height classes:

- (A) 0 - 1 meter.
- (B) 1 - 3 meters.
- (C) 3 - 6 meters.
- (D) 6 - 10 meters.
- (E) 10 - 20 meters.
- (F) > 20 meters.

Every tree tallied was marked with a metal identification tag and given a unique identification number for future monitoring. Raw data were entered into a spreadsheet for data analysis and carbon calculations.

Carbon Stock Calculations

Four separate allometric equations were used to calculate above ground biomass using the field data collected (Equation 2: Four allometric equations from Pearson et al (2005) for calculation of above ground biomass at BRO). Because no peer reviewed allometric equations relating DBH to above ground biomass were available for Caribbean pine and Honduran pine, allometric equations for temperate pine from the eastern United States were used as a surrogate. For the hardwood species occurring in the tropical hardwood compartment and the pine compartments the moist hardwood equation was used because mean annual rainfall is below 4000 mm at the Project area (Pearson et al 2005). For the palms occurring in the tropical hardwood compartment, the allometric equation was based upon the height of the individual palm.

Equation 2: Four allometric equations from Pearson et al (2005) for calculation of above ground biomass at BRO

Classification	Species group	Equation	Maximum DBH or height
Moist hardwood	Tropical hardwood	$Biomass = \exp(-2.289 + 2.649 * \ln DBH - 0.021 * \ln DBH^2)$	148 cm
Pine	Caribbean and Honduran pine	$Biomass = 0.887 + ((10486 * DBH^{2.84}) / (DBH^{2.84} + 376907))$	56.1 cm

Palms	Palms	Biomass = 6.666 + 12.826 * height ^{0.5} * ln(height)	33 m maximum height (height classes E and F)
Palms	Palms	Biomass = 23.487 + 41.851 * ln(height) ²	11 m maximum height (height classes A, B, and C)

For below-ground biomass, the regression equation from Pearson et al (2005) was used (Equation 3: Below ground biomass regression).

Equation 3: Below ground biomass regression

Below ground biomass
$BB = \exp(-1.0587 + 0.8836 \times \ln ABD)$

Where:

BB = belowground biomass (tons/ha)
ABD = aboveground biomass (tons/ha)

Mean total C stocks were summarized with 95% confidence interval for the four forest management compartment within the Project area. In addition to the summary of total carbon in biomass, this figure was converted to CO₂ equivalent by multiplying the total C biomass stocks by 44/12. One plot allocated to the tropical hardwood compartment (#118 – see Table 16: Plot numbers and coordinates (NAD 27) for plots used to calculate carbon stocks within the Project area at Bull Run Overseas) was located on the border between a pine stand and a hardwood stand. Therefore this plot, #118, was not included in the calculations for either compartment. Summary of C stocks are in Table 3: Summary of mean C stocks with 95% confidence interval in the management compartments within the Project area.

Table 3: Summary of mean C stocks with 95% confidence interval in the management compartments within the Project area

Forest management compartment	Mean above-ground biomass (C mt /ha)	Mean below-ground biomass (C mt /ha)	Mean total biomass (C mt /ha)
Pine compartment 1	14.5 (+/- 7.50)	3.50 (+/-1.7)	18.06 (+/- 9.21)
Pine compartment 2	19.78 (+/- 4.61)	4.62 (+/- 0.96)	24.40 (+/- 5.56)
Pine compartment 3	30.35 (+/- 17.96)	6.98 (+/- 3.68)	37.33 (+/- 21.63)
Tropical hardwood	167.64 (+/- 42.15)	31.85 (+/- 7.15)	199.49 (+/- 49.29)

G1.5. Communities Located in the Project Zone

There are no communities within the Project zone (Figure 8: Unincorporated settlements within the Project zone). There are a few business-related unincorporated settlements in the Project Zone. The Project area has part-time habitants in its Project zone at Hidden Valley Inn; Belize

Forestry Department Ministry of Natural Resources including Thousand-Foot Falls National Park, Douglas Da Silva Forest Station and headquarters, private residences within the Privassion Enclave; Five Sisters Lodge; Pine Ridge Lodge; and Blancaneaux Lodge.

The Mountain Pine Ridge is sparsely populated and the majority of BRO staff are from San Antonio Village and villages nearby San Antonio Village. No official population statistics are available for the Mountain Pine Ridge or San Antonio Village specifically. For reference, Table 4: Cayo District and Project zone 2009 midyear population estimates displays population estimates for the Cayo District, the largest district in Belize.

Table 4: Cayo District and Project zone 2009 midyear population estimates

	Male	Female	Total
Cayo District	40,200	40,600	80,800
Cayo Urban	24,000	25,100	49,200
San Ignacio and Santa Elena	9,700	10,200	19,900
Benque Viejo del Carmen	4,500	4,700	9,300
Belmopan	9,800	10,100	20,000
Cayo Rural	16,200	15,400	31,600
San Antonio	(no data available)	(no data available)	(no data available)
Mountain Pine Ridge	(no data available)	(no data available)	(no data available)

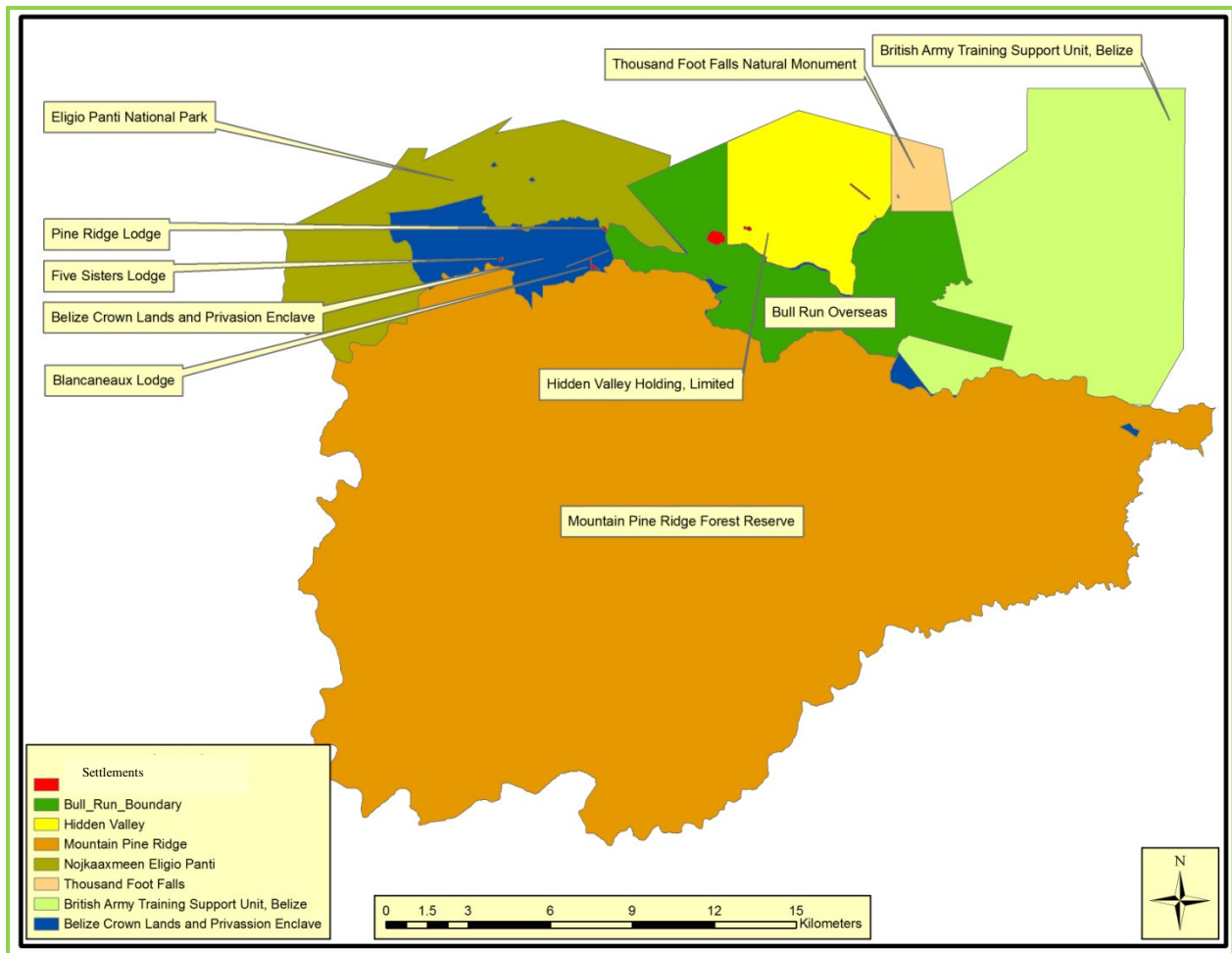


Figure 8: Unincorporated settlements within the Project zone

G1.6. Current Land Use and Land Tenure in the Project Zone

The Project does not encroach upon community property. The property is privately held and no approvals are required from the Government of Belize or the local communities. There is no historical context of communities living in the Mountain Pine Ridge (Morehart et al 2005). There are no ongoing property disputes with the Project property (Maya Atlas 1997). The property containing Thousand-Foot Falls National Park was originally owned by BRO. In 2000, Thousand-Foot Falls National Park was transferred by BRO to the Government of Belize. BRO Project title and registry are shown in Table 5: Project land title and registry information.

Table 5: Project land title and registry information

Title	Ha	Registry	Date recorded
East Point Farms, Ltd. Block 1	57	Grant Fiat, #904 of 2000	Sept. 28, 2000
Pine Tree Farms Ltd. Block 2	754	Grant Fiat, #905 of 2000	Sept. 28, 2000

Pine Tree Farms Ltd. Block 6	781	Transfer Certificate of Title, Volume 54 Folio 148	Sept. 2, 2009
Pine Tree Farms Ltd. Block 3	307	Grant Fiat, #906 of 2000	Sept. 28, 2000
East Point Farms, Ltd. Block 7	1,812	Transfer Certificate of Title, Volume 54 Folio 149	Sept. 2, 2009
M.P.R. Farms Ltd. Block 7	911	Transfer Certificate of Title, Volume 54 Folio 147	Sept. 2, 2009
Total ha	4,622		

G1.7. Current Biodiversity within the Project Zone

The Mountain Pine Ridge is an ecosystem that plays a crucial role in protecting native biodiversity for a wide range of Belizean fauna. The Mountain Pine Ridge ecosystem provides habitat for large predators such as the jaguar, puma, and ocelot along with a diverse array of prey species (Davis et al 2010). The Mountain Pine Ridge also provides suitable habitat for the IUCN-EN Baird's tapir, along with many more species of concern.

An initial biodiversity study was conducted in the Project area (Means 1997) which summarized biodiversity at BRO and Hidden Valley, concentrating on threatened, charismatic, and indicator taxa to provide key biological information for conservation management. The Project area provides habitat for at least 16 species listed on the IUCN Red List, and 15 on the Belize National List of Critical Species (BZE). The study summarized all species known to occur in the Project area based on previous publications and personal observation. The assessment summarized common plants, invertebrates (especially butterflies), amphibians, reptiles, mammals, and birds. The lists of plants, mammals, and birds are specific to BRO. The reptile and the amphibian lists are based on literature addressing the entire Mountain Pine Ridge.

This assessment resulted in the documentation of 37 mammal, 109 bird, and approximately 60 plant species in the Project area. Of the 37 mammals, the IUCN lists seven of the mammals as near-threatened or threatened, vulnerable and endangered. Among them are the IUCN-EN Baird's tapir. Seven of the bird species are listed on the Belize National List of Critical Species, and the IUCN includes six on the Red List. Two species of threatened plant species are listed by the IUCN and known to occur in the Project area. One IUCN listed amphibian, the Maya mountains frog, has been documented in the Mountain Pine Ridge but not in the Project area.

Table 6: IUCN red list species outlines the species of special concern in the Project zone. All species listed on the Belize National List of Critical Species, and the IUCN Red List are included. IUCN species of Least Concern are included only if listed by the Belize National List of Critical Species.

Table 6: IUCN red list species

Species common name	Species scientific name	IUCN	BZE
Mammals			

Baird's tapir	<i>Tapirus bairdii</i>	EN	VU
Southern river otter	<i>Lutra longicaudis</i>	DD	VU
Jaguar	<i>Panthera onca</i>	NT	NT
Margay	<i>Leopardus wiedii</i>	NT	VU
White-lipped peccary	<i>Tayassu pecari</i>	NT	VU
Ocelot	<i>Leopardus pardalis</i>	LC	VU
Puma	<i>Puma concolor</i>	LC	NT
Giant anteater	<i>Myrmecophaga tridactyla</i>	VU	
Birds			
Great curassow	<i>Crax rubra</i>	VU	VU
Ocellated turkey	<i>Meleagris ocellata</i>	NT	VU
Orange-breasted falcon	<i>Falco deiroleucus</i>	LC	VU
Stygian owl	<i>Asio stygius</i>	LC	VU
Crested guan	<i>Penelope purpurascens</i>	LC	VU
King vulture	<i>Sarcoramphus papa</i>	LC	VU
Yellow-headed parrot	<i>Amazona oratrix</i>	EN	EN
Plants			
Mahogany	<i>Swietenia macrophylla</i>	VU	VU
Silver palm	<i>Schippia concolor</i>	VU	LC

G1.8. High Conservation Values within the Project Zone

An assessment and evaluation of High Conservation Values with the Project zone and Project area is shown in Table 7: High Conservation Values within the Project area and Project zone.

Table 7: High Conservation Values within the Project area and Project zone

High Conservation Values	Project Description
8.1. Globally, regionally or nationally significant concentrations of biodiversity values; a. Protected areas b. Threatened species c. Endemic species d. Areas that support significant concentrations of a species during any time in their lifecycle (e.g. migrations, feeding grounds, breeding areas).	16 IUCN listed species are known to occur on the site. Multiple other species of concern are documented within the Project area.
8.2. Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;	Project site resides within the Mesoamerican Biological Corridor (Figure 9: Mesoamerican Biological Corridor Map with BRO). Project site within Conservation International Biodiversity Hotspot (Brooks et al 2002).
8.3. Threatened or rare ecosystems;	The Mountain Pine Ridge is an ecosystem of

	“exceptional importance” (Meerman & Wilson 2005).
8.4. Areas that provide critical ecosystem services (e.g., hydrological services, erosion control, fire control);	Headwaters of many of the major rivers in central Belize. Increased fire management and protection proposed in management plan.
8.5. Areas that are fundamental for meeting the basic needs of local communities (e.g., for essential food, fuel, fodder, medicines or building materials without readily available alternatives); and	None noted.
8.6. Areas that are critical for the traditional cultural identity of communities (e.g., areas of cultural, ecological, economic or religious significance identified in collaboration with the communities).	None noted.

This Project addresses multiple High Conservation Values in the form of threatened species (8.1.b) and globally and regionally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance (8.2). The threatened species are listed in Table 6: IUCN red list species.

The Project helps comprise the Mesoamerican Biological Corridor, and is a part of a Conservation International Biodiversity Hotspot (Figure 9: Mesoamerican Biological Corridor Map with BRO (Las Nubes 2011)). The Mesoamerican Biological Corridor spans across eight countries from the southern Mexico to northern Panama. Currently about 13% of the land area in the Mesoamerican Biological Corridor is under some sort of conservation. The Project incorporates protection of the globally rare Mountain Pine Ridge ecosystem. The Belize National Protected Areas System Plan (Meerman & Wilson 2005) states the Maya Mountains–Mountain Pine Ridge massif is one of three areas of “exceptional importance” in Belize. In 1944, the Mountain Pine Ridge Forest Reserve was established, setting aside roughly 43,000 ha of this unique ecosystem. The Project will provide increased fire protection for the BRO property and surrounding areas through improved fire management. The Project will allow funding for updating fire management equipment, thinning, and removing excess fuels. This fire protection regime will reduce the chances of high severity fires in the Mountain Pine Ridge.

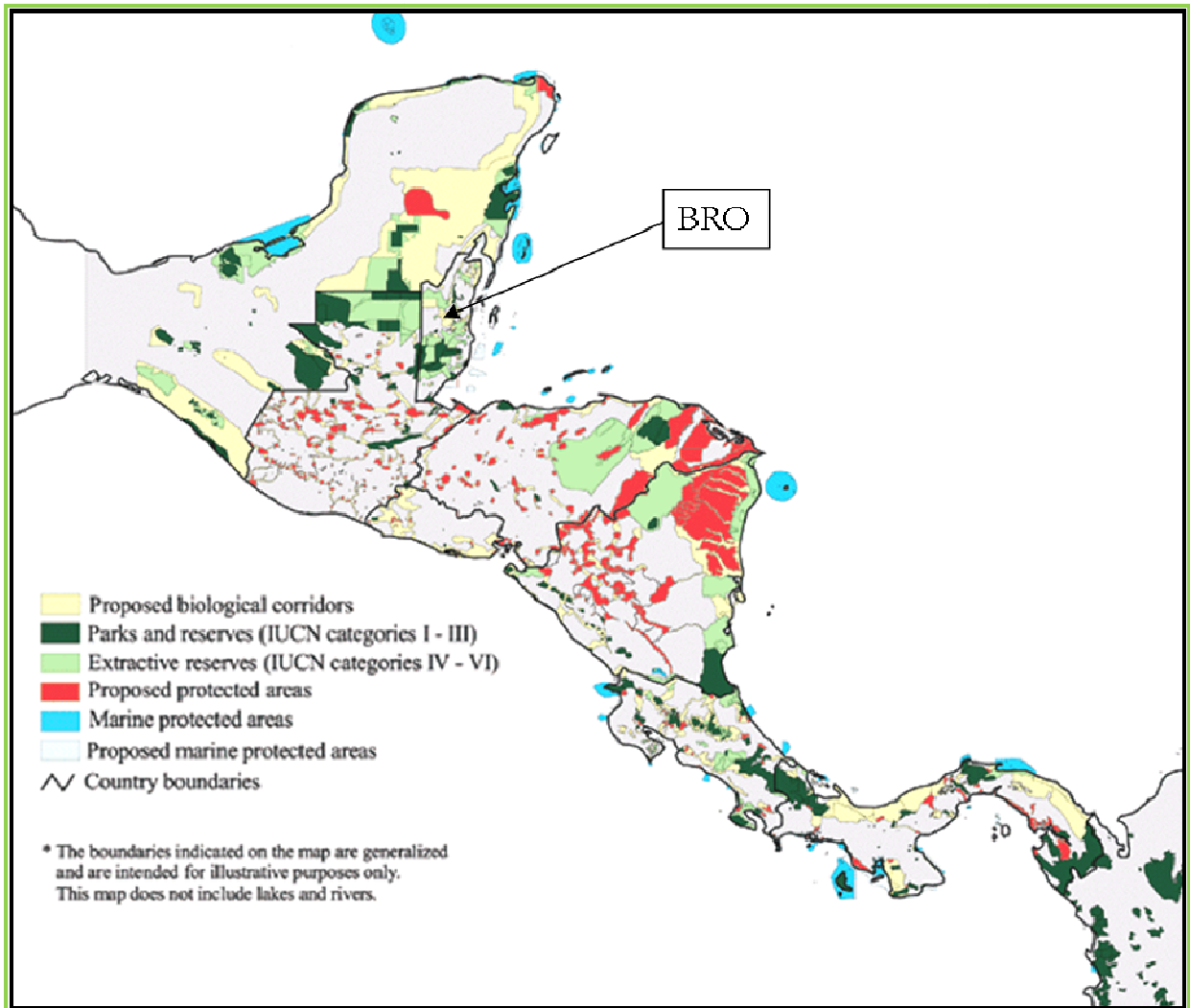


Figure 9: Mesoamerican Biological Corridor Map with BRO (Las Nubes 2011)

G2. Baseline Projections

G2.1. Baseline Land Use

The baseline land use in the without-Project scenario depends upon the land type.

Conversion to Agriculture

Conversion to agriculture is the most likely alternative land use scenario for the tropical hardwood compartment and is the most pervasive driver for deforestation and land use change in Belize. The conversion of forestland in Belize to agriculture is both a national and regional trend. The FAO (2003) estimated that by 1989 about 217,241 ha, or about 10%, of the national land area had been converted from forest to agricultural land. Furthermore, from 1989 to 1996, 25,000 ha of forested land were being lost annually due to conversion to agricultural land (FAO 2003).

Unconstrained Wildfire

Wildfire is a natural phenomenon in the Mountain Pine Ridge that has been exacerbated by a combination of fire suppression, the pine bark beetle outbreak, and then a cessation of fire suppression. If a more natural frequent low intensity fire regime is not instituted in the system, then repeated wildfires will suppress the recovery of the system for many decades and possibly a hundred years or more.

Pine Compartments

Under the without-Project scenario the pine compartments will continue in their current degraded state due to frequent fire and inadequate management inputs. The with-Project scenario involves fire protection, prescribed fire, and improved forest management that will allow the pine stands to naturally mature into vigorous healthy pine stands over the life of the Project. Under the with-project scenario each pine compartment will recover and increase C sequestration. The difference between the two scenarios represents the GHG savings for each of the pine compartments. FCO conservatively estimate that each compartment will recover up to 50% of its steady state C stocks, thus becoming a much greater net C sink compared to the without-Project scenario. However, comparing the two scenarios is a complex process involving the development of a multivariate, nonlinear, stand dynamics model using the 16 parameters populated with specific data for each compartment (Table 11: Model parameters). Because of the complexity of the model, FCO is not ready to submit for validation this model and thus does not count the GHG savings in this project design document.

G2.2. Additionality

The landowner evaluated conversion of land to coffee some years back and concluded that while the effort would be profitable and feasible, focusing on the pine lumber business was a better strategy. With the advent of the southern pine beetle and subsequent wildfires, the pine lumber business is defunct, and now the only option without carbon financing is to return to the coffee enterprise.

Without income from pine lumber sales, the business is reliant on investor funds and personal funds for operating capital, an unsustainable short-term approach. The current plan calls for clearing and leasing of the tropical hardwood component for conversion to agriculture to generate the operating capital needed to manage the pine component of the property. With carbon financing, the tropical hardwood component can be set aside and a management program of prescribed fire, thinning, and wildfire suppression can be instituted to restore the pine component.

Successful commercialization of the emission reduction credits from the Project will make the entire Project financially sustainable. Project financial accounts will be made available to the auditor to confirm the issue of financial stability.

The property owner is legally entitled to clear tropical hardwood component of the Project site with the exception of the 1-chain buffer around permanent streams. The Project team conducted an exhaustive law review including:

- Belize Private Forests (Conservation) Act, Chapter 217, Revised Edition 2000.
 - This is a revised edition of the law, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Laws of Belize, Revised Edition 1980 - 1990.
- Forests Act, Chapter 213, Revised Edition 2003.
 - This is a revised edition of the Subsidiary Laws, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Substantive Laws of Belize, Revised Edition 2000.
- Forest Fire Protection Act, Chapter 212, Revised Edition 2000.
- Water and Sewage Act, Chapter 222.
 - Defines riparian protection as “that the flow of the stream does not fall below the minimum quantity necessary to secure the interest of public health and the protection of the rights of riparian and other land-owners.” (p. 46)
- Water Industry Act, Chapter 222.
- Belize Agricultural Health Authority Act, Chapter 211.
- Fisheries Act, Chapter 210.
- Timber Industry Act, Chapter 341.
- Land Utilization Act, Chapter 188.
 - The Minister may, for the better utilization of land, make regulations-
 - to demarcate areas, water catchment areas or watersheds and prohibiting the clearing of any vegetation within those areas;
 - to provide for such other measures as may be required to prevent soil erosion;
 - restricting the construction of buildings within stipulated distances from the middle line of any road or street;
 - to demarcate specific areas as development areas and to stipulate the type of development that will be permitted within those areas;
 - for the clearing of any forest or the felling of any trees; and
 - to provide for all such other things as may be necessary for the better carrying out of the provisions of this Part of the Act.
- Citrus (Processing and Production) Act, Chapter 277.

G2.3. Carbon Stock Changes

Tropical Hardwood Compartment

In order to estimate potential carbon stock changes over the life of the Project, a detailed description of a plausible and realistic without-Project scenario is required. Based upon the analysis of alternative land use scenarios (section G2.1) the conversion to agriculture (coffee

plantation) is the most likely land use in the without-Project scenario. However based upon access slope and other factors only 595 ha of the 700 ha in the tropical hardwood compartment would be suitable for conversion. The areas suitable for conversion are those in which forest plots were allocated within the tropical hardwood compartment (Figure 7: Graphic presentation of the distribution of plots sampled across four forest management compartments within the Project area).

1. Rate of Deforestation and Agricultural Conversion

Given the small size of the area to be cleared, conversion is considered reasonable within two years of Project initiation. An independent estimate of feasibility of conversion was obtained from a land clearing company in Belize to confirm technical feasibility. A plan for conversion is available and will be made available to the auditors.

2. Estimate of Greenhouse Gas (GHG) Loss in the Without-Project Scenario

In order to estimate GHG loss under the without-Project scenario the following variables were required:

- Area of forest available for conversion,
- Baseline carbon stocks,
- Deforestation/conversion rates,
- Carbon stocks in agro-ecosystems, and
- Fate of long lived forest products from harvest and conversion.

3. Forest Area

The area of tropical hardwood forest available for conversion under the without-Project scenario is 595 ha. This figure is based upon maps derived Landsat TM data and landowner maintained GIS and represents the total forest areas minus a one-chain buffer along perennial streams.

4. Baseline Carbon Stocks

To measure GHG loss in the without-Project scenario, the same carbon pools were used as assessed in section G1.4 (above and below ground biomass) as the baseline C stocks. The mean carbon pool in 2010 for the tropical hardwood compartment was 199.49 C tons per ha.

5. Deforestation / Conversion Rates

For the without-Project scenario, a deforestation rate specific to the circumstances within the Project area was calculated. Thus the deforestation rate for the 595 ha of tropical hardwoods was set at a conservative 50% per year. Additional analysis of proxy areas was conducted to confirm that indeed this is common practice and deemed feasible and likely (Table 8: Summary of proxy areas used to inform deforestation rates).

Table 8: Summary of proxy areas used to inform deforestation rates

Proxy areas	Ha	Timeframe	Years	Ha deforested / year	Elevation	% of proxy area deforested/year
1	357.64	1/00 – 4/09	9.30	38.46	200 - 240 m	11%
2	408.30	1/00 – 4/09	9.30	43.90	160 - 200 m	0.11
3	620.41	1/00 – 4/09	9.30	66.71	180 -220 m	0.11
4	1125.17	1/00 – 4/09	9.30	120.99	40 - 60 m	0.11
5	661.78	1/00 – 4/09	9.30	71.16	80 - 120 m	0.11
6	3549.41	1/00 – 4/09	9.30	381.66	20 - 40 m	0.11

6. Fate of Forest Resources Lost to Agricultural Conversion

The standard practice in Belize for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. In the applied model results in Table 10: Annual avoided GHG emissions 2009 to 2028, accounting for C sequestration in long term wood products was included.

7. Without-Project Changes in Carbon Stocks

The basic model to estimate without-Project (i.e. baseline) carbon stock changes used the following steps and assumptions:

- Step 1: Identify carbon pools. From the carbon pools identified and carbon stocks calculated from field data assessments (G1.4), the base figure of 199.49 C tons per ha was derived for a 2010 starting point.
- Step 2: Choose an appropriate deforestation/conversion rate for the tropical hardwood compartment. The rate of 50% per year was chosen as a conservative estimate for clearing the 595 ha of the tropical hardwood compartment deemed suitable for conversion to coffee.
- Step 3: Determine the fraction of C stocks converted to long term wood products pool.
- Step 4: The conversion from tropical hardwood forest to coffee does not result in a 100% loss of carbon from the ecosystem. Because reliable data on the carbon accumulation / growth rates of coffee are not available for Belize, it is assumed that the acreage converted to citrus immediately reaches the maximum published carbon stocks of 5 tons/ha .
- Step 5: Determine baseline C stocks under the without-Project scenario.

Table 9: Without-Project 2009-2028 summary of GHG emissions for baseline and with-Project

	Cover class	20 year total for Project area
Without-Project	Tropical hardwood	261,132
	Coffee plantation	53,550
	Total	314,682
With-Project C stocks	Tropical hardwood	712,179
Difference		439,741

Delta		115,722
Total mtCO2e emissions avoided over 20 years		424,312

Table 10: Annual avoided GHG emissions 2009 to 2028

Year	Final carbon stocks (tons C)			With-Project total	Difference	Delta	mtCO2e
	Forest	Agriculture	Total				
2009	59,348	1,487	60,836	118,697	57,861	57,861	212,156
2010	0.00	2,975	2,975	118,697	115,722	57,861	212,156
2011	0.00	2,975	2,975	0.00	0.00	0.00	0
2012	0.00	2,975	2,975	0.00	0.00	0.00	0
2013	0.00	2,975	2,975	0.00	0.00	0.00	0
2014	0.00	2,975	2,975	0.00	0.00	0.00	0
2015	0.00	2,975	2,975	0.00	0.00	0.00	0
2016	0.00	2,975	2,975	0.00	0.00	0.00	0
2017	0.00	2,975	2,975	0.00	0.00	0.00	0
2018	0.00	2,975	2,975	0.00	0.00	0.00	0
2019	0.00	2,975	2,975	0.00	0.00	0.00	0
2020	0.00	2,975	2,975	0.00	0.00	0.00	0
2021	0.00	2,975	2,975	0.00	0.00	0.00	0
2022	0.00	2,975	2,975	0.00	0.00	0.00	0
2023	0.00	2,975	2,975	0.00	0.00	0.00	0
2024	0.00	2,975	2,975	0.00	0.00	0.00	0
2025	0.00	2,975	2,975	0.00	0.00	0.00	0
2026	0.00	2,975	2,975	0.00	0.00	0.00	0
2027	0.00	2,975	2,975	0.00	0.00	0.00	0
2028	0.00	2,975	2,975	0.00	0.00	0.00	0
Total	59,348	58,013	117,361	237,393	173,582	115,722	424,312

The available literature on steady state C stocks for coffee bushes varies widely depending upon geographic location. Belize has one small commercial grower thus there are no published data on C stocks for coffee bushes within Belize. Polzot (2004) found that the carbon stock of open grown (without-Project scenario) coffee bushes in Costa Rica ranged from 1.4 to 3.5 t C ha⁻¹. Thus, FCO uses a conservative figure of 5 t C ha⁻¹ to calculate the without-Project C stocks.

Therefore, the Project avoids emissions of 424,312 mtCO2e over a twenty year period from 2009 to 2028 (Table 10: Annual avoided GHG emissions 2009 to 2028 and Table 9: Without-Project 2009-2028 summary of GHG emissions for baseline and with-Project).

Pine compartments

Under the without-Project scenario the pine compartments will continue in their current degraded state due to frequent fire and no management inputs. The with-Project scenario involves fire

protection and management that will allow the stands to naturally mature into vigorous healthy pine stands over the life of the Project. Under the with-project scenario that each Pine compartment will recover and become an aggrading system in terms of C stocks. The difference between the two scenarios represents the GHG savings for those compartments. FCO conservatively estimate that each compartment will recover up to 50% of its steady state C stocks, thus becoming a net C sink compared to the without project scenario. However, comparing the two scenarios is a complex process involving the development of a multivariate, nonlinear, stand dynamics model using the following 16 parameters populated with specific data for each compartment (Table 11: Model parameters). Because of the complexity of the model FCO is not ready to submit for validation and thus do not count the GHG savings in this PDD.

Table 11: Model parameters

Model parameters
Baseline pine C stocks (2010 tons per ha)
Baseline hardwood C stocks (2010 tons per ha)
% pine C stocks > 10 cm DBH
% hardwood stocks > 10 cm DBH
% pine C stocks 5-10 cm DBH
% hardwood C stocks 5-10 cm DBH
C accumulation rates hardwood 5-10 cm DBH
C accumulation rates pine 5-10 cm DBH
C accumulation rates of pine > 10 cm DBH
C accumulation rates of hardwood > 10 cm DBH
% Reduction in C accumulation due to mortality of pine from prescribed fire 5-10 cm DBH
% Reduction in C accumulation due to mortality of hardwood from prescribed fire 5-10 cm DBH
% Reduction in C accumulation due to mortality of pine from prescribed fire > 10 cm DBH
% Reduction in C accumulation due to mortality of hardwood from prescribed fire > 10 cm DBH
% C stocks released from prescribed fire per year

G2.4. Baseline Communities

In the without-Project scenario, BRO would convert and lease the tropical hardwood component of the property for conversion to agriculture. The most substantial direct impact of the without-Project scenario would be a substantial reduction in number and quality of jobs with a near total loss of jobs for women. BRO employs over many individuals from central Belize at present and with successful implementation of the with-Project scenario that number is expected to increase over the life of the Project.

G2.5. Baseline Biodiversity

Biodiversity loss will be substantial in the tropical hardwood compartment in the without-Project scenario. Clearing the tropical hardwood compartment will result in significant landscape level

fragmentation. Species richness in the pine component is not expected to change appreciably between the baseline and with-project scenarios.

Gen	Clim	Comm	Bio
G3.		Required	

G3. Project Design and Goals

G3.1. Major Climate, Community and Biodiversity Objectives

The goal of the Project is to develop BRO as a carbon sink while maintaining the biodiversity values of the BRO property and enhancing the local economic environment with sustainable livelihoods in improved forest management. The climate objective is to avoid emissions from land clearing and increase carbon sequestration by restoring natural pine forest. The community objective is to provide jobs. The biodiversity objective is to conserve habitat for IUCN species of concern.

G3.2. Major Project Activities

The major Project activities are:

- Protect hardwood component,
- Control access to site through regular patrols,
- Deed restriction to ensure permanence,
- Restore mountain pine ridge ecosystem through prescribed fire management activities, and
- Monitor results.

A successful and financially stable BRO will provide employment for management of the property. Financial stability insures activities necessary to maintain and protect the property are sustainable. A substantial monitoring program will be undertaken by BRO according to CM3.1 within twelve months of validation against the Standards (see Appendix C).

G3.3. Location of Project Activities

Project activities will occur over the entire property. Patrols will occur routinely throughout the property. Carbon monitoring will occur at fixed plots (Figure 7: Graphic presentation of the distribution of plots sampled across four forest management compartments within the Project area).

G3.4. Time-frame and Project Accounting

The timeframe of the CCBA Project extends from 2009 through 2028 (Table 12: BRO Project timeline). While the Project began in 2003, due to the lingering effects of the pine beetle

outbreak, subsequent fires, and the lack of available financing for the carbon Project, the crediting period will begin in 2009 and will run through 2028. The final verification will take place the year after the Project ends in 2028. This Project will be validated using the CCBA protocol Climate, Community, and Biodiversity Project Design Standards Second Edition. Plans also include a validation against an appropriate methodology for carbon accounting approved by the Voluntary Carbon Standard.

Table 12: BRO Project timeline

Milestone	2003	2009	2010	2011	2016	2021	2026	2028	2029
Project started									
Crediting period begins									
Survey work conducted									
CCBA Project validation									
VCS Project validation									
Deed restriction									
1st verification									
2nd verification									
3rd verification									
4th verification									
Project ends									
5th verification									

G3.5. Project Risks and Mitigation Measures

Risks to the Project from instability in the Government or a change in leadership at BRO are considered minimal. In any case, BRO has agreed to a deed restriction for the life of the Project to ensure permanence.

To the best of FCO’s knowledge no oil or mineral resources occur on the Project site and exploration for mineral resources is not occurring nor is it expected to occur. If oil or gas is discovered on the site, it may belong to the Government of Belize. Similar sites in Belize where oil extraction is taking place have minimal above ground disturbance. Section 26 paragraph 6 of the National Petroleum Act states:

(6) Subject to this Act, where, in the course of conducting petroleum operations pursuant to a contract, the rights of the owner or lawful occupier of any land are disturbed or damage to any crops, trees, buildings, stock, works or other property thereon is caused, the contractor is liable to pay the owner or lawful occupier fair and reasonable compensation in respect of the disturbance or damage according to the respective rights or interests of the owner or lawful occupier concerned. The amount of compensation payable shall be determined by agreement between the parties or if the parties are

unable to reach agreement or the agreed compensation is not paid, the matter may be treated in accordance with the Arbitration Act.

Based on this, the contractor for the Government extracting the oil may be responsible for compensating the owner of the credits for any reversals suffered as a result of the oil extraction process.

The greatest natural risk to the Project are further impacts caused by unmanaged fire and pest outbreaks. The Mountain Pine Ridge exhibits low risk from hurricanes – see Appendix B.

G3.6. Maintenance of High Conservation Values

The primary strategy for maintaining High Conservation Values is protection through patrolling and managing the property for existing high quality habitats with no reduction in forest cover. No enhancement of HCVs is required or anticipated.

G3.7. Measures Taken to Enhance Climate, Community, Biodiversity Benefits

BRO intends for this Project to be a focal point for forest restoration in the Mountain Pine Ridge region and ecosystem demonstrating how carbon sequestration, biodiversity enhancement, and forest management can be achieved concurrently. Because of the Project's profile within Belize it is expected that the Project will act as a catalyst for other projects regionally. Discussions with the Belize Association of Private Protected Areas (BAPPA) have already resulted in contacts regarding additional conservation projects throughout Belize.

G3.8. Stakeholder Involvement

BRO has actively engaged local stakeholders in soliciting comments on the design of the CCB Project with various onsite consultations. Local stakeholders are primarily BRO staff. BRO staff will be actively engaged in Project activities including permanent sample plot measurements, setting up remote large mammal camera traps, conducting forest patrols, and engaging in other knowledge transfer activities. Stakeholder involvement has been solicited formally and informally over a period of time so as to inform stakeholders about the BRO Project and to receive their feedback.

Project zone stakeholder groups are:

- BRO owners and staff.
- Hidden Valley Inn owners and staff.
- Belize Forestry Department Ministry of Natural Resources including Thousand-Foot Falls National Park, Elijo Panti National Park, Mountain Pine Ridge Forest Reserve, Government of Belize Crown Lands and Privassion Enclave.
- Pine Lumber Company.
- British Army.
- The Peregrine Fund.

- Dr. Marcella Kelly’s Jaguar Project.
- Five Sisters Lodge owners and staff.
- Pine Ridge Lodge owners and staff.
- Blancaneaux Lodge owners and staff.
- UNFCCC Belize Focal Point and Designated National Authority.

G3.9. Publicization of Public Comment Period

BRO publicized its CCBA Project for public comment through the following avenues:

- Direct email and phone contact with Hidden Valley Inn owners and staff, Belize Forestry Department Ministry of Natural Resources, Pine Lumber Company, British Army, The Peregrine Fund, Dr. Marcella Kelly’s Jaguar Project, Five Sisters Lodge owner and staff, Pine Ridge Lodge owners and staff, Blancaneaux Lodge owners and staff, and UNFCCC Belize Focal Point and Designated National Authority.
- The PDD was made available on the CCBA webpage and open to public comments (<http://www.climate-standards.org/projects/index.html>) beginning January 2011.
- Public information meetings held 1/24/2011 and 1/25/2011 for stakeholders.
- Periodic BRO staff meetings describing the Project.

G3.10. Conflict Resolution Tools

BAPPA has tentatively agreed to serve as an independent 3rd party in country to receive and document grievances related to the CCB Project. BAPPA will tentatively serve as a mediator keeping all parties informed of the status of grievances and their resolution. A record of grievances and their resolution will be a part of the monitoring process for future verifications. Stakeholder grievances related to employment will be handled according to Belizean law through the Belize Labor Department.

G3.11. Project Financial Support

Primary expenses are to stabilize the Mountain Pine Ridge ecosystem by engaging ecologically appropriate fire suppression and management, pay for patrols, and pay for biodiversity, carbon sequestration, and community monitoring expenses. A complete financial plan was made available to the auditor during the validation audit.

Gen	Clim	Comm	Bio
G4.		Required	

G4. Management Capacity and Best Practices

G4.1. Project Proponents

BRO is the Project proponent. BRO has entered into an agency agreement with FCO to develop the strategy, implementation, and monitoring of the carbon credits generated by this Project. FCO has hired CMI to collect initial data, develop the monitoring protocol and conduct the baseline study for the monitoring program. Supporting documents are available by contacting FCO. Decisions on implementation of the Project activities are the responsibility of the BRO board.

G4.2. Technical and Management Expertise

The key technical skills to implement the Project are:

- The business skills required to successfully manage a large and complex operation,
- The managerial skills to manage the property effectively,
- The diplomatic skills to successfully interact with the local communities, and
- The technical skills to conduct monitoring on a periodic basis.

The leadership team at BRO has over twenty years of experience working in Belize and has skills in managing the property and its forest management operation. The property has been owned and managed by BRO for over fifty years.

Forest Carbon Offsets, LLC managerial experience is considerable with current biographies available at www.forestcarbonoffsets.net.

Conservation Management Institute (CMI) serves as technical support for Project design and monitoring. CMI is a research center within the College of Natural Resources at Virginia Tech in Blacksburg, VA. CMI has extensive experience in monitoring protocol development and implementation for natural resources throughout North America with additional experience in Belize, Dominican Republic, Peru, and Nepal.

G4.3. Capacity Building

BRO employs and trains local staff from central Belize. Staff are trained in the following roles:

- Rangers and patrols.
- Forest mensuration.
- Heavy equipment operations and maintenance.
- Assisting forest carbon data and biodiversity data collection.
- Prescribed fire and fire suppression.
- Personnel management.
- Maintenance.
- Cook.

Staff retention has not been a problem in the past at BRO. If and when there is staff turnover, measures will be taken not to lose local capacity and skills. Furthermore, this Project will

increase knowledge transfer across the public and private sectors within Belize focusing on carbon sequestration. BRO will serve as an example to the timber industry on the Mountain Pine Ridge demonstrating to them how carbon sequestration, biodiversity protection, and sustainable local economic development can co-exist within both the private and public sectors. Project team is shown in Figure 10: Forest health monitoring crew comprised of CMI and BRO staff (August 2010).



Figure 10: Forest health monitoring crew comprised of CMI and BRO staff (August 2010)

G4.4. Community Employment Opportunities

The Project employs individuals from the local communities patrolling and monitoring the Project area. Employment opportunities will be advertised. Employment at BRO will follow Belize labor law and codes. Women and underrepresented minorities will be encouraged to apply for the positions. Staff will be chosen based on capacity to meet the needs of BRO so that BRO can perform its business mission.

G4.5. Employment Laws

BRO will follow all applicable labor laws under Belize Labour Act Chapter 297, Labour Act 297S – Subsidiary Act, and Belize International Labour Organization Conventions Act Chapter 304:01 Revised Edition 2003. BRO is obliged, under Belizean laws to follow appropriate safe

labor practices toward the prevention of injuries in the workplace. Additionally BRO will comply with all other applicable local, district, and national workplace standards. Belize has the following relevant labor laws:

- International Labour Organization Conventions Act,
- Labour Act,
- Labour (Subsidiary Laws),
- Protection Against Sexual Harassment Act,
- Protection Against Sexual Harassment Commencement Act Order,
- Public Safety Act,
- Trade Unions Act,
- Trade Unions Regulations,
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act, and
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act (Commencement) Order.

Staff is made aware of their legal rights when they sign a contract to work for BRO. Currently, BRO staff is paid according to Belize labor standards and in a timely manner according to Belize labor standards. All staff is paid using automatic wire transfers to their bank accounts. If staff does not have a bank account, BRO will assist them with obtaining a bank account.

G4.6. Employee Safety

All local, district, and national workplace standards will be met at the moment of hiring of each staff member. Local regulations and safety concerns will be discussed with each staff with an emphasis on guaranteeing workplace safety according to Belizean law. Each staffer signs a work contract that certifies that safety information has been communicated. Safety information is available in Table 13: Staff safety.

Table 13: Staff safety

Hazard	Safety strategy and equipment
Snake bite	First aid training. Adequate boots. Radios. Minimum 2 person crews.
Poachers	Radios. Minimum 2 person crews.
Fire	First aid kit. Radios. Gloves. Eye protection. Hard hat. Fire resistant clothing.
Vehicle accidents	First aid training.

	Radios.
Machete cuts	First aid training. First aid kit. Radios. Minimum 2 person crews. Eye protection. Adequate boots. Gloves.
Chainsaw cuts	First aid training. First aid kit. Radios. Minimum 2 person crews. Eye and ear protection. Chaps. Adequate boots. Gloves.
Lightning strike	Develop procedures for avoiding lightning strikes. Radio.

G4.7. Financial Health of the Implementing Organizations

Forest Carbon Offsets LLC (FCO) is a United States registered private limited liability company and, as such, is governed by the corporation laws of the United States which ensure that, at all times, the company remain financially solvent and able to meet its liabilities. FCO is owned by independent shareholders of good standing and has a Board of Directors. It is sufficiently capitalized to ensure completion of the Project. More information about FCO is available on the FCO web site at <http://forestcarbonoffsets.net>. Carbon financing received after contractual obligations will fund BRO to pay for the management and monitoring activities. A management and financial plan was made available to the auditors.

Gen	Clim	Comm	Bio
G5.		Required	

G5. Legal Status and Property Rights

G5.1. Local Laws and Regulations

BRO complies will comply with all applicable local, district, and national labor standards. BRO follows all applicable environmental laws including the Belize Environmental Protection Act Chapter 328, Revised Edition 2000. Belize has the following relevant labor laws:

- International Labour Organization Conventions Act,
- Labour Act,

- Labour (Subsidiary Laws),
- Protection Against Sexual Harassment Act,
- Protection Against Sexual Harassment Commencement Act Order,
- Public Safety Act,
- Trade Unions Act,
- Trade Unions Regulations,
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act, and
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act (Commencement) Order.

The Project team conducted an exhaustive law review for the PDD:

- Belize Private Forests (Conservation) Act, Chapter 217, Revised Edition 2000.
 - This is a revised edition of the law, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Laws of Belize, Revised Edition 1980 - 1990.
- Forests Act, Chapter 213, Revised Edition 2003.
 - This is a revised edition of the Subsidiary Laws, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Substantive Laws of Belize, Revised Edition 2000.
- Forest Fire Protection Act, Chapter 212, Revised Edition 2000.
- Water and Sewage Act, Chapter 222.
 - Defines riparian protection as “that the flow of the stream does not fall below the minimum quantity necessary to secure the interest of public health and the protection of the rights of riparian and other land-owners.” (p. 46)
- Water Industry Act, Chapter 222.
- Belize Agricultural Health Authority Act, Chapter 211.
- Fisheries Act, Chapter 210.
- Timber Industry Act, Chapter 341.
- Land Utilization Act, Chapter 188.
 - The Minister may, for the better utilization of land, make regulations-
 - to demarcate areas, water catchment areas or watersheds and prohibiting the clearing of any vegetation within those areas;
 - to provide for such other measures as may be required to prevent soil erosion;
 - restricting the construction of buildings within stipulated distances from the middle line of any road or street;
 - to demarcate specific areas as special development areas and to stipulate the type of development that will be permitted within those areas;
 - for the clearing of any forest or the felling of any trees; and
 - to provide for all such other things as may be necessary for the better carrying out of the provisions of this Part of the Act.
- Citrus (Processing and Production) Act, Chapter 277.

From this analysis, it is clear that the tropical hardwood component of the BRO property could easily be converted legally to an agricultural plantation. The only caveat is that there should be a one-chain riparian buffer on either side of permanent streams (personal communication with the Ministry of Natural Resources and Environment, Belize). There are no property disputes within the Project area.

G5.2. Documentation of Legal Approval

FCO warrants that all actions and documentation for the Project establishment as a carbon sequestration Project have and will be met. Private legal documents have been shared with the auditor upon the auditor's request. Deeds have been reviewed and read by the auditor. The Mayan Atlas has been reviewed. The Project does not encroach upon community property. The property is privately held and no approvals are required from the Government of Belize or the local communities. There is no historical context of communities living in the Mountain Pine Ridge (Morehart et al 2005).

G5.3. Free, Prior, and Informed Consent

BRO owns the property fee simple. Fee simple ownership represents absolute ownership of real property. A title certification has been conducted and the titles and titles' certifications have been made available to the auditor. The Project does not encroach upon private property, community property, or government property. According to the Belize Forestry Ministry and the Maya Atlas (Maya Atlas 1997), the property has not been associated with any Maya communal land claims.

G5.4. Involuntary Relocations

FCO has verified by direct observation that the Project site does not have human inhabitants besides farm laborers, management, owners, and their families. Moreover, FCO has observed that the Project does not involve the relocation or inward migration of any people. If immigration were to occur, the Project's monitoring teams will work with all stakeholders using appropriate tools to engage towards a resolution.

G5.5. Illegal Activities

Project will include regular patrols to address illegal hunting, timber poaching, or wood gathering. No evidence of these activities was detected during site visits.

G5.6. Carbon Rights

FCO has a legally binding agreement with the landowner which transfers management of the environmental service rights of the property. The agreement also sets out the obligations and responsibilities placed on the landowners for the duration of the Project. BRO follows all applicable environmental laws including the Belize Environmental Protection Act Chapter 328, Revised Edition 2000. Belize ratified the Kyoto Protocol September 26, 2003. BRO title proof is

available if requested from the Department of Land and Surveys, Market Square, Belmopan, Belize (Table 5: Project land title and registry information).

Climate Section

Gen	Clim	Comm	Bio
CL1.	Required		

CL1. Net Positive Climate Impacts

CL1.1. Net Change in Carbon Stocks

CL1.2. Net Change in Non-CO₂ Gases

The Project does not expect the impact of non-CO₂ gases to be more than 5% increase or decrease of the Project's overall greenhouse gas impact. Carbon dioxide is the principal greenhouse gas emitted when a forest is cleared. Other gases such as methane (CH₄) and nitrous oxide (N₂O) are also emitted during deforestation, but in significantly lower quantities than CO₂. When compared to CO₂, the methane and nitrous oxide emissions from deforestation account for significantly less of the total potential of global warming effect from deforestation (Houghton 2005).

CL1.3. Other GHG Emissions from Project Activities

No other GHG emissions as previously mentioned are considered within the Project activities. While prescribed fire will be used to restore the pine component of the property, the difference in emissions between the current wildfire frequency and the envisioned prescribed fire frequency is considered de minimis. Emissions from equipment use are considered de minimis.

CL1.4. Positive Net Climate Impact

According to Sections CL1.1 and CL1.2 the contribution of the Project toward climate change mitigation by GHG emission reduction is evident by virtue of avoiding emissions from clearing the tropical hardwood component and increasing sequestration in the pine component.

CL1.5. Avoid Double-Counting

All of the Project's emission reductions will be registered and held by an independent third-party registry to guarantee avoidance of double counting.

Gen	Clim	Comm	Bio
CL2.	Required		

CL2. Offsite Climate Impacts

CL2.1. Types of Leakage

Leakage caused by the Project is expected to be minimal and have no discernible effects on offsite GHG emissions or decrease sequestration. BRO has owned the property since 1959. Since no commercial logging will occur during the Project's lifetime, as a result there are no activities that are being displaced as a result of the Project and thus no negative offsite impacts. Since the landowner is the deforestation agent, and the landowner has included all his lands in the Project, no leakage monitoring is required for deforestation attributable to land clearing for agriculture.

CL2.2. Mitigation of Negative Offsite Impacts

There are no foreseen negative offsite climate impacts.

CL2.3. Unmitigated Negative Offsite Climate Impacts

As described above, the Project has and will continue to create additional positive climate benefits within the community. Offsite negative climate impacts are expected to be zero. On the contrary, the most likely result of the Project is that more landowners conduct similar projects thereby increasing the climate benefits of the Project.

CL2.4. Unmitigated Negative Offsite Non-CO₂ Climate Impacts

As described above, the Project has no significant non-CO₂ emissions in either the with- or without-Project scenario.

Gen	Clim	Comm	Bio
CL3.	Required		

CL3. Climate Impact Monitoring

CL3.1. Carbon Pool Selection and Monitoring

The goal of the climate monitoring for BRO is insure that estimates of carbon stocks and GHG emissions are accurate and updated. The basis of the calculation of differences in GHG emissions is based on the growth rate of the recovering forests, the deforestation rate, and carbon stocks calculated from field data in 2010. There are two objectives for the monitoring plan at BRO:

Objective 1: Update Forest Growth Rates and Carbon Stocks

In 2010 CMI measured the above ground biomass (standing live tree) pool and interpolated the below ground biomass using accepted regression equations (see section G1.4). The above ground biomass was calculated using allometric equations based on the size of hardwood and softwood trees > 5 cm DBH. Data was collected in the field using nested fixed area plots. Each individual tree inventoried was tagged and given a unique ID for future monitoring. Each plot will be revisited at maximum of every five years. All of the tagged trees will be re-assessed and the DBH and height measured. The resultant data will be used to recalculate growth rates and above ground carbon stocks. These data will be compared to the estimated values and adjustments made to the growth rates and carbon stocks as required. The below ground biomass will be calculated using accepted regression equations based upon the updated above ground biomass data.

Objective 2: Updated Deforestation Rates

The deforestation rate used in the estimation of GHG emissions was the relatively conservative rate of 50%. In order improve the accuracy of estimated GHG emissions CMI will continue to monitor deforestation rates within the reference area and review all new published rates that applicable to the Project. Deforestation will be monitored on a periodic basis and incorporated into the estimations of GHG emissions.

CL3.2. Monitoring Plan

Forest Carbon Offsets LLC and their partners are committed to expanding on the above monitoring and create a full detailed monitoring plan within twelve months of validation and to make that plan available to the public. Carbon pools selected are above-ground, herbaceous, and below-ground biomass. Other potential pools are minor and would only add to the total climate benefit of the Project. See Appendix C.

Community Section

Gen	Clim	Comm	Bio
CM1.	Required		

CM1. Net Positive Community Impacts

CM1.1. Community Benefits

From the beginning of the Project in 2003, BRO has focused on improving local community benefits using the natural capital inherent within their local natural resources (Figure 11: Bull Run Overseas settlement). Measures of success within the community include economic, social, and environmental variables. Since the Project began, local sustainable economic activity has improved.

In 2002, the poverty rate for Cayo District stood at 27.4% (Mendoza and Hyde). The metric for long-term net positive community impacts for the Project is employment levels. This is the most important and most direct benefit to the communities within the Project zone. BRO has developed private sector non-farm rural labor employment opportunities that provide specific skill training in the following roles:

- Rangers and patrols.
- Assisting forest carbon data collection.
- Assisting biodiversity data collection.
- Heavy equipment operation.
- Fire suppression.
- Prescribed fire.
- Personnel management.
- Maintenance.
- Cook.



Figure 11: Bull Run Overseas settlement

The without-Project scenario assumes a direct staffing level of only four people resulting in an inability to perform professional fire management, improved silvicultural activities, biodiversity monitoring, and professional skills transfer. The without-Project scenario envisions clearing of land by the owner and development of the land into coffee agricultural.

The with-Project scenario proposes increasing current staffing levels, increased professional skills development in areas of fire management, improved silvicultural methods, biodiversity monitoring, and a program of reimbursing long-term employees with over 5 years employment for the educational expenses of their minor children. BRO leadership is committed to providing quality jobs that pay competitive rates, and health and safety workshops, including first aid. Also, provided to BRO staff free of charge are use community garden, housing, and food for staff and immediate family members. Additionally, BRO aids local stakeholders by providing valuable services in prescribed fire, fire fighting, and prevention. A fire tower was recently constructed to aid in early detection of wildfires to protect BRO and surrounding community lands.

CM1.2. Impact on High Conservation Values

No community High Conservation Values are located in the Project area.

Gen	Clim	Comm	Bio
CM2.		Required	

CM2. Offsite Stakeholder Impacts

CM2.1. Potential Negative Offsite Stakeholder Impacts

The Project is not expected to have any negative offsite impacts. If any negative impacts are detected, the negative impacts on the communities will be estimated in the same manner mentioned above in section CM1.1. through socio-economic indicators considered of great importance in Project area surrounding communities.

CM2.2. Plans to Mitigate Potential Offsite Impacts

If any negative impact is identified, the BRO team and its community representatives will address such problems. The issue will be discussed and mitigation actions will be designed.

CM2.3. Unmitigated Offsite Impacts

No unmitigated social or economic impacts are expected from the Project. To the contrary, the Project should have positive impacts on the local economy inside and outside the Project site, since the Project will promote economic development based on the sustainable use of natural resources promoting biodiversity enhancement and sustainable economic development.

Gen	Clim	Comm	Bio
CM3. Required			

CM3. Community Impact Monitoring

CM3.1. Community Impact Monitoring Plan

To measure the socio-economic impacts of the with-Project scenario, the monitoring metric will be annual employment of local community personnel in annual work-hours actualized for the Project and measured against the without-Project scenario. Monitoring data will include payroll records, annual audits, and records maintained by the Belize Labor Department. Comparisons will be made between Project metrics and the most recent Cayo District census to determine the number of full-time-equivalent jobs. This metric will be compared to the number of similar potential jobs provided by agricultural plantations. In addition, the with-Project scenario will be evaluated by monitoring educational reimbursements made to long-term employees with at least 5 years employment presuming there are qualifying employees with school-age children.

CM3.2. High Conservation Value Plan

No community based HCVs have been identified. If a community based HCV is identified at a later date, the BRO CCB PDD will be adjusted appropriately.

CM3.3. Community Impact Monitoring Implementation

Within twelve months of Project validation a monitoring plan will be developed and implemented according to CM3.1. See Appendix C.

Biodiversity Section

Gen	Clim	Comm	Bio
B1. Required			

B1. Net Positive Biodiversity Impacts

B1.1. Biodiversity Impacts

The biodiversity objective for the Project is to maintain existing biodiversity and HCVs to the extent possible barring set backs from natural processes.

With-Project Scenario

The with-Project scenario presumes that with proper protection of the site and through improved forest management, the exceptional existing biodiversity of the site will be maintained. Improved

silvicultural practices will lead to better fire management strategies, including updating fire management equipment, thinning, and removing excess fuels through prescribed fire. Improved forest management will allow pine regeneration to create landscape level mixed forest age classes, increasing carbon sequestration and wildlife habitat. In addition the Project will provide funding for more research and protection for HCV species. Large/medium mammal surveys will provide valuable information on several IUCN species. Patrols to eliminate potential hunting and illegal removal of tree cover will ensure existing populations and habitat will remain on the site. Any potential impacts to populations or habitat will be from natural causes only. The following surveys will be conducted:

- Large-medium mammals will be surveyed using remotely-triggered camera traps.
- Anecdotal observations of other species will be noted with particular emphasis on species of High Conservation value (those listed on the IUCN Red List and the Belize National List of Critical Species (Table 6: IUCN red list species).

Without-Project Scenario

The without-Project scenario presumes that the property will receive less fire protection, research, and protection for HCVs. Fuels would likely accumulate and chances of severe fires will increase. Patrols to eliminate hunting and illegal removal of forest cover would not occur, and expectations are that significant negative impacts to hunted species and predators that rely on hunted species may result.

Removal of tropical forest component will eliminate habitat for many species and severely degrade the value of riparian corridors within the property. Travel corridors across the property will be eliminated reducing migratory pathways between surrounding protected areas.

B1.2. Impact on High Conservation Values

The with-Project scenario will maintain existing HCVs by means of regular patrols and protection of habitat. This Project addresses multiple High Conservation Values (Table 7: High Conservation Values within the Project area and Project zone) in the form of threatened species (G1.8.1.b) and globally and regionally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance (G1.8.2) plus protection of Mountain Pine Ridge mitigating global climate change (G1.8.3).

The nature of the Project, improved forest management, should result in enhancing ecosystem services by virtue of preventing the degradation of the BRO property. Maintenance of natural vegetation will be required to secure Mesoamerican Biological Corridor and Conservation International Biodiversity Hotspot.

B1.3. Species Used by the Project

No species are being used by this Project since it is a natural native forest. All vegetation in the Project area is natural regeneration.

B1.4. Exotic Species in the Project Area

There are no exotic species used in the Project area.

B1.5. Genetically Modified Organisms

The Project will not use any genetically modified organisms in its operations.

Gen	Clim	Comm	Bio
B2. Required			

B2. Offsite Biodiversity Impacts

B2.1. Potential Negative Offsite Biodiversity Impacts

The Project does not anticipate any offsite negative biodiversity impacts. Offsite impacts will be positive since larger habitat and forest areas will improve the long-term viability of populations offsite. Avoiding overstory tree harvesting provides increased habitat for wildlife.

B2.2. Mitigation of Potential Negative Offsite Biodiversity Impacts

If any negative impact is identified, the BRO team and the stakeholder representative will address such problems with fast and effective solutions. The issue will be discussed and mitigation actions will be designed.

B2.3. Evaluation of Potential Negative Offsite Biodiversity Impacts

The Project does not anticipate any offsite negative biodiversity impacts. Most offsite impacts will be positive since larger habitat and forest areas will improve the long-term viability of populations offsite. Avoiding overstory tree harvesting provides natural areas for offsite wildlife to use.

Gen	Clim	Comm	Bio
B3. Required			

B3. Biodiversity Impact Monitoring

B3.1. Biodiversity Impact Monitoring Plan

The initial plan for biodiversity metrics is described in Table 14: Objectives of biodiversity monitoring.

Table 14: Objectives of biodiversity monitoring

Taxa	Why	Method	Analysis
Bat species assemblage.	Assessment of ecosystem health and ecological processes. This objective is optional.	Sampling array of remote acoustical detectors.	Diversity indices, species richness, species heterogeneity, species evenness, and relative activity indices.
Medium-large mammal assemblage.	Assessment of ecosystem health, and investigation of empty forest syndrome by human over-hunting pressures.	Sampling array of camera traps (15-20 stations minimum of 750 trap nights).	Diversity indices, species richness, species heterogeneity, species evenness, relative trap success, and population size analysis for individually identifiable species (e.g. jaguar).
Opportunistic observations of avian and mammalian IUCN listed species.	Document presence absence of additional IUCN species of concern.	Time constrained expert searches focused on target species in appropriate habitats during appropriate seasons.	Continued presence/absence documentation of species of global concern.

B3.2. Biodiversity Impact Monitoring Effectiveness

The primary strategy used to maintain the biodiversity HCVs is to protect the property through patrols and avoid conversion to agriculture. The monitoring metric is presence/absence of the biodiversity HCVs. Loss of an IUCN species is not necessarily considered a failure of the Project if that loss is not linked to anthropomorphic factors like hunting. Maintenance of forest cover (as determined by permanent plots and satellite imagery) and the habitats within the forest is the responsibility of the Project. Monitoring of selected biodiversity HCVs will be conducted and is expected to be 100% effective at determining presence/absence of those HCVs.

B3.3. Biodiversity Impact Monitoring Implementation

A full monitoring plan as described in section B3.1. Biodiversity Impact Monitoring Plan will be initiated within twelve months of validation against the Standards and to disseminate this plan and the results of monitoring. This monitoring plan will be made publicly available on the internet and shared with stakeholders for public comment. Once approved, the plan will be executed on BRO for the initial monitoring period. The same repeatable methodologies will be followed up again at least every five years by qualified trained biologists from the date of registration with the CCBA. See Appendix C.

Gold Level

Gen	Clim	Comm	Bio	Gold
GL3.		Optional		

GL3. Exceptional Biodiversity Benefits

GL3.1. Vulnerability or Irreplaceability

The Project site has a documented history of Baird’s tapir (*Tapirus bairdii*) onsite (Table 15: IUCN red list species). The Baird’s tapir is listed as IUCN-EN with declining populations. Historical records of the yellow-headed parrot (*Amazona oratrix*) indicate presence, but no observations on the project site have been made to date.

Table 15: IUCN red list species

Species common name	Species scientific name	IUCN	BZE
Mammals			
Baird’s tapir	<i>Tapirus bairdii</i>	EN	VU
Southern river otter	<i>Lutra longicaudis</i>	DD	VU
Jaguar	<i>Panthera onca</i>	NT	NT
Margay	<i>Leopardus wiedii</i>	NT	VU
White-lipped peccary	<i>Tayassu pecari</i>	NT	VU
Ocelot	<i>Leopardus pardalis</i>	LC	VU
Puma	<i>Puma concolor</i>	LC	NT
Giant anteater	<i>Myrmecophaga tridactyla</i>	VU	
Birds			
Great curassow	<i>Crax rubra</i>	VU	VU
Ocellated turkey	<i>Meleagris ocellata</i>	NT	VU
Orange-breasted falcon	<i>Falco deiroleucus</i>	LC	VU
Stygian owl	<i>Asio stygius</i>	LC	VU
Crested guan	<i>Penelope purpurascens</i>	LC	VU
King vulture	<i>Sarcoramphus papa</i>	LC	VU
Yellow-headed parrot	<i>Amazona oratrix</i>	EN	EN
Plants			
Mahogany	<i>Swietenia macrophylla</i>	VU	VU
Silver palm	<i>Schippia concolor</i>	VU	LC

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Appendix A: Forest Plots

Table 16: Plot numbers and coordinates (NAD 27) for plots used to calculate carbon stocks within the Project area at Bull Run Overseas

Plot number	Y_PROJ	X_PROJ	Forest compartment
1	1882886	301705	Pine site type 1
2	1882885	301963	Pine site type 1
3	1883517	298166	Pine site type 1
5	1881899	298926	Pine site type 1
6	1882219	299428	Pine site type 1
7	1881892	299641	Pine site type 1
8	1882882	302658	Pine site type 1
9	1883357	297534	Pine site type 1
10	1882475	298420	Pine site type 1
11	1882969	298936	Pine site type 1
12	1881342	298892	Pine site type 1
13	1882278	302107	Pine site type 1
14	1882525	299807	Pine site type 1
15	1883425	297920	Pine site type 1
16	1881895	298839	Pine site type 1
17	1885444	295974	Pine site type 2
18	1887339	294901	Pine site type 2
19	1882436	297403	Pine site type 2
20	1884101	298078	Pine site type 2
21	1882518	297684	Pine site type 2
22	1884329	295883	Pine site type 2
23	1885878	296308	Pine site type 2
24	1883681	302960	Pine site type 2
26	1884300	299339	Pine site type 2
27	1882485	298095	Pine site type 2
28	1885229	304125	Pine site type 2
29	1884460	295911	Pine site type 2
30	1884955	295697	Pine site type 2
31	1885431	302555	Pine site type 2
33	1886959	295554	Pine site type 2
34	1885407	304074	Pine site type 2
35	1883307	300783	Pine site type 2
36	1883055	297377	Pine site type 2
37	1884355	293939	Pine site type 2
38	1882955	297032	Pine site type 2
39	1885628	302581	Pine site type 2

40	1881953	302807	Pine site type 2
41	1881877	301810	Pine site type 2
42	1885441	292975	Pine site type 2
43	1887883	296178	Pine site type 2
44	1885651	303057	Pine site type 2
45	1887064	296413	Pine site type 2
46	1883379	303503	Pine site type 2
47	1882001	301527	Pine site type 2
48	1882273	303984	Pine site type 2
49	1883563	302613	Pine site type 2
50	1886749	295527	Pine site type 2
51	1882578	302557	Pine site type 2
52	1885350	303370	Pine site type 2
53	1885023	304451	Pine site type 2
54	1885135	297038	Pine site type 2
55	1882635	297310	Pine site type 2
57	1886222	302648	Pine site type 2
58	1886025	303765	Pine site type 2
59	1884504	302403	Pine site type 2
60	1886816	295254	Pine site type 2
61	1887753	296378	Pine site type 2
62	1883363	302741	Pine site type 2
63	1886329	295233	Pine site type 2
64	1886014	303597	Pine site type 2
65	1883897	297134	Pine site type 2
66	1884543	302262	Pine site type 2
67	1886920	294298	Pine site type 2
68	1885308	304227	Pine site type 2
69	1886113	296600	Pine site type 2
70	1885140	301881	Pine site type 2
71	1882611	300465	Pine site type 2
72	1884582	298555	Pine site type 2
73	1883265	302975	Pine site type 2
74	1883020	303056	Pine site type 2
75	1884271	297294	Pine site type 2
76	1885206	295954	Pine site type 2
77	1886145	303651	Pine site type 2
78	1883217	297756	Pine site type 2
79	1884832	292919	Pine site type 2
80	1882878	303254	Pine site type 2
81	1886894	294888	Pine site type 2

82	1882487	301298	Pine site type 2
84	1884719	295648	Pine site type 2
85	1883300	300582	Pine site type 2
86	1884573	295663	Pine site type 2
87	1886691	294583	Pine site type 2
88	1886979	296361	Pine site type 2
89	1882152	303745	Pine site type 2
90	1885025	296735	Pine site type 2
91	1884948	293716	Pine site type 2
92	1885424	304612	Pine site type 2
94	1881910	302456	Pine site type 2
102	1886049	304979	Pine site type 2
32	1882100	298016	Pine site type 2
95	1884543	300024	Pine site type 3
96	1883671	297504	Pine site type 3
97	1883922	298093	Pine site type 3
98	1883768	298193	Pine site type 3
99	1883821	298492	Pine site type 3
100	1888575	296399	Tropical hardwood
104	1888671	296270	Tropical hardwood
105	1883960	303107	Tropical hardwood
109	1883769	303310	Tropical hardwood
110	1888513	296080	Tropical hardwood
112	1888310	296123	Tropical hardwood
113	1883776	303434	Tropical hardwood
118	1887826	296077	Tropical hardwood
119	1888431	295983	Tropical hardwood
121	1884188	302239	Tropical hardwood
122	1884231	302765	Tropical hardwood

Appendix B: Hurricanes

Hurricanes and tropical storms occur within the Caribbean basin every year though the frequency of landfall varies greatly. The southern region of Belize has one of the lowest frequencies of hurricane landfall in the Caribbean with an average of one landfall every 23 years (Lugo et al. 2000). A review of storm tracks from the last 100 years (Konrad 1996) and recent updated information from the National Hurricane Center in Miami suggest that the Project is in the lower range of risk from the impact of hurricane force winds. While the Project does lie in an area of low risk from hurricanes and tropical storms, historically there have been hurricanes that peripherally impacted the Mountain Pine Ridge region of Belize (Figure 12: Impact risks of tropical storms and hurricanes over the past 100 years). The data supplied by the National Hurricane Center provides the dates, names and estimated wind speeds and category of each of these storms. Recorded storms for the southern area of Belize range from 1906 to 2007 with 12 tropical storms and 10 hurricanes. The hurricanes have comprised six Category 1, 3 Category 2 and a single Category 4 which was Hurricane Iris in 2001.

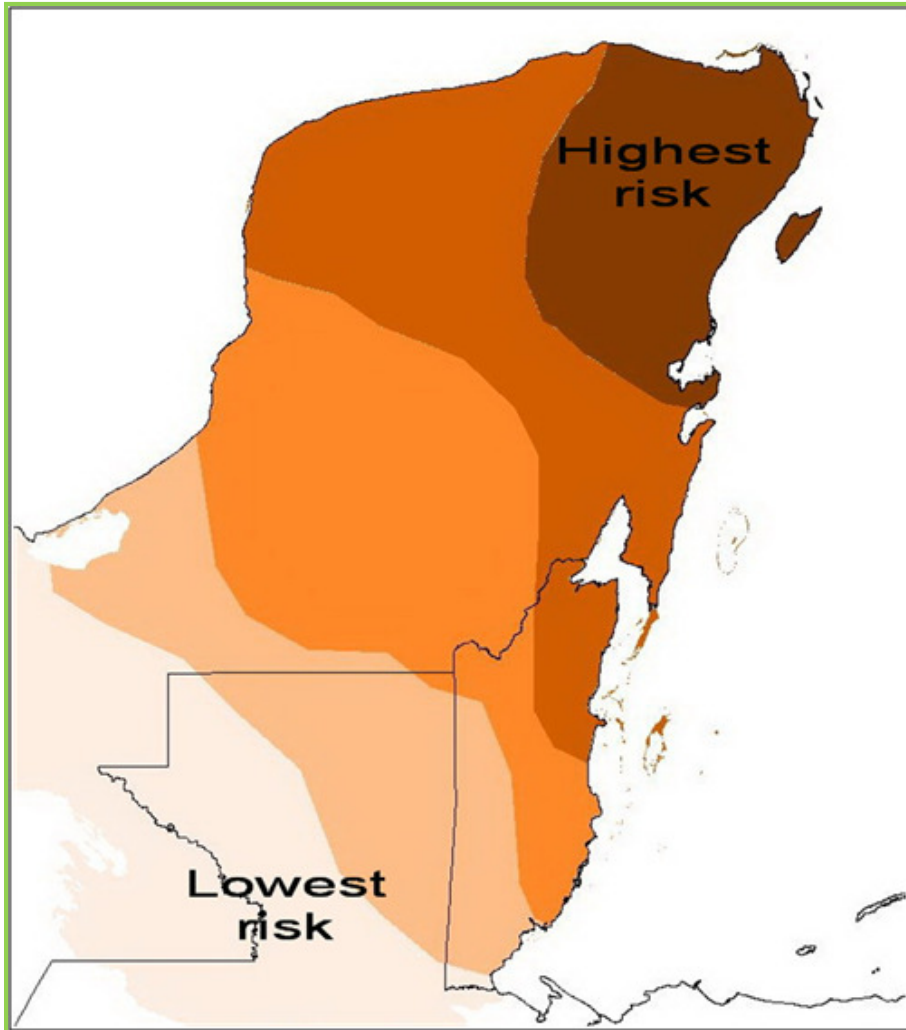


Figure 12: Impact risks of tropical storms and hurricanes over the past 100 years

In recent years there have been many studies on the impact of hurricanes on tropical forests and their biota and recovery rates. Frangi and Lugo (1998) found that five years after Hurricane Hugo struck the Luquillo Mountains of Puerto Rico that delayed tree mortality was twice as high as instantaneous tree mortality after the storm and affected dicotyledonous trees more than it did palms.

Appendix C: Monitoring Plans

CL. Climate Impact Monitoring Plan

The goal of the climate monitoring for BRO is insure that estimates of carbon stocks and GHG emissions are accurate and updated. The origin of the data will be from field observations made on an annual basis and verified by an independent third party auditor at least every five years. The monitoring times will be during the dry season, typically February through May of each year. Each permanent plot will be remeasured each year. Summaries will be produced for each verification event. The landowner has responsibility for monitoring and has budgeted personnel and funds for that purpose. The data quality will be assessed at each verification event. The monitoring protocol is available for review and includes a QA/QC component.

The overall plan is that the landowner's staff will be trained by the Conservation Management Institute to measure each permanent plot each year. At periodic intervals, no less frequently than every five years, the data will be summarized and evaluated by a qualified consultant and verified by an independent third party auditor.

FCO based the calculation of differences in GHG emissions on the growth rate of the recovering forests, the deforestation rate, and carbon stocks calculated from field data in 2010. FCO has two objectives for the monitoring plan at BRO.

Objective 1: Update Forest Growth Rates and Carbon Stocks

In 2010 FCO measured the above ground biomass (standing live tree) pool and interpolated the below ground biomass using accepted regression equations. The above ground biomass was calculated using allometric equations based on the size of hardwood trees > 5 cm DBH. Data was collected in the field using nested fixed area plots. Each individual tree inventoried was tagged and given a unique ID for future monitoring. Each plot will be revisited at maximum of every five years. All of the tagged trees will be re-assessed and the DBH and height measured. The resultant data will be used to recalculate growth rates and above ground carbon stocks. These data will be compared to the estimated values and adjustments made to the growth rates and carbon stocks as required. The below ground biomass will be recalculated using accepted regression equations based upon the updated above ground biomass data.

Objective 2: Updated Deforestation Rates

Deforestation rates will be monitored on an annual basis and incorporated into the appropriate estimations of GHG emissions. A validation of the climate benefits specific to the avoided emissions of CO₂ is planned using a methodology approved by the Voluntary Carbon Standard. Once that is complete, a unification of the climate benefits monitoring between this PDD and the VCS project document will occur with the VCS methodology taking precedence.

Monitoring Plan Description

The majority of this monitoring plan is taken directly from the methodology entitled “VM0003 Methodology for Improved Forest Management through Extension of Rotation Age, v1.0”. Carbon pools selected are above-ground and below-ground biomass. Other potential pools are minor and would only add to the total climate benefit of the Project. All data collected as part of monitoring will be archived electronically and kept at least for two years after the end of the Project. 100% of the data will be monitored if not indicated otherwise in tables below. All measurements must be conducted according to relevant standards. In addition, the monitoring provisions in the tools referred to in this methodology apply.

Data and Parameters Monitored

The following parameters will be monitored during the Project activity. These estimates shall be based on measured or existing published data where possible and the Project participants will retain a conservative approach: that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks will be selected. Field measurements will be conducted by revisiting the permanent plots on an annual basis. The monitored parameters are (see Table 17: Area of stratum, Table 18: Area of sample plot, Table 19: DBH, Table 20: Tree height, and Table 21: Years between monitoring time) with appropriate QA/ QC. Monitoring will occur at least once during the five year period after an audited and approved validation.

Table 17: Area of stratum

Data / Parameter	A_i .
Data unit	Ha.
Description	Area of stratum i .
Source of data to be used	Monitoring of strata and stand boundaries shall be done preferably using a Geographic Information System (GIS), which allows for integrating data from different sources (including GPS coordinates and Remote Sensing data).
Value of data applied for the purpose of calculating expected emission reductions	Data is essential to Project success.
Description of measurement methods and procedures to be applied	
QA/QC procedures to be applied	
Any comment	It shall be assumed ex-ante that stand boundaries and strata areas shall not change through time.

Table 18: Area of sample plot

Data / Parameter	A_p .
Data unit	m^2 .
Description	Area of sample plot.

Source of data to be used	Recording and archiving of size of sample plots.
Value of data applied for the purpose of calculating expected emission reductions	Data is essential to Project success.
Description of measurement methods and procedures to be applied	Ex-ante the size of plots shall be defined and recorded in the monitoring plan.
QA/QC procedures to be applied	Measurement is periodically checked by colleagues onsite.
Any comment	

Table 19: DBH

Data / Parameter	<i>DBH.</i>
Data unit	cm.
Description	Diameter at breast height of tree.
Source of data to be used	Field measurements in sample plots.
Value of data applied for the purpose of calculating expected emission reductions	Data is essential to Project success.
Description of measurement methods and procedures to be applied	Typically measured 1.3m above-ground. Measure all trees above some minimum DBH in the sample plots that result from the Project activity. The minimum DBH for all sites must not be more than 20cm.
QA/QC procedures to be applied	Measurement is periodically checked by colleagues onsite.
Any comment	Ex-ante the change in carbon stocks in all applicable pools will be modeled following the requirements in Section 4.1.

Table 20: Tree height

Data / Parameter	<i>H.</i>
Data unit	m.
Description	Height of tree.
Source of data to be used	Field measurements in sample plots.
Value of data applied for the purpose of calculating expected emission reductions	Data is essential to Project success.
Description of measurement methods and procedures to be applied	Height is ranked using height ranking class.
QA/QC procedures to be applied	Measurement is periodically checked by colleagues

	onsite.
Any comment	Ex-ante the change in carbon stocks in all applicable pools will be modeled following the requirements in Section 4.1.

Table 21: Years between monitoring time

Data / Parameter	<i>T</i> .
Data unit	Yr.
Description	Number of years between monitoring time <i>t</i> and <i>t1</i> ($T = t2 - t1$).
Source of data to be used	Calendar.
Value of data applied for the purpose of calculating expected emission reductions	Data is essential to Project success.
Description of measurement methods and procedures to be applied	Calendar.
QA/QC procedures to be applied	Monitoring will occur during dry season.
Any comment	Ex-ante the monitoring plan shall detail the planned monitoring intervals through the Project life.

CM. Community Impact Monitoring Plan

The metric for long-term net positive community impacts for the Project is employment levels. This is the most important and most direct benefit to the communities within the Project zone. BRO has developed private sector non-farm rural labor employment opportunities that provide specific skill training in the following roles:

- Rangers and patrols.
- Forest mensuration.
- Heavy equipment operations and maintenance.
- Assisting forest carbon data and biodiversity data collection.
- Prescribed fire and fire suppression.
- Personnel management.
- Maintenance.
- Cook.

The without-Project scenario assumes a staffing level of only four people resulting in an inability to perform professional fire management, improved silvicultural activities, biodiversity monitoring, and professional skills transfer.

B. Biodiversity Impact Monitoring Plan

The biodiversity objective for the Project is to maintain existing biodiversity and HCVs to the extent possible barring set backs from natural processes. The with-Project scenario presumes that with proper protection of the site, the existing biodiversity of the site will be maintained. Any potential impacts to populations or habitat will be from natural causes only. The following surveys were conducted:

- Large-medium mammals surveyed using large-mammal camera trap.
- Anecdotal Observations: Anecdotal observations of other species were noted.

The with-Project scenario will maintain existing HCVs by means of regular patrols. This Project addresses multiple High Conservation Values (Table 7: High Conservation Values within the Project area and Project zone) in the form of threatened species and globally and regionally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance (8.2).

The nature of the Project should result in enhancing ecosystem services by virtue of preventing the removal of natural vegetation. Maintenance of natural vegetation is required to secure populations of 16 IUCN species (Table 15: IUCN red list species). Maintenance of natural vegetation will be required to secure Mesoamerican Biological Corridor and Conservation International Biodiversity Hotspot. The initial plan for biodiversity metrics is described in Table 14: Objectives of biodiversity monitoring. The primary strategy used to maintain the biodiversity HCVs is to protect the property through patrols. The monitoring metric is presence/absence of the biodiversity HCVs. Loss of an IUCN species is not necessarily considered a failure of the Project if that loss is not linked to anthropomorphic factors like hunting. Maintenance of forest cover (as determined by permanent plots and satellite imagery) and the habitats within the forest is the responsibility of the Project. Monitoring of selected biodiversity HCVs will be conducted and is expected to be 100% effective at determining presence/absence of those HCVs.

The same repeatable methodologies will be followed up again at least every 5 years by qualified trained biologists from the date of registration with the CCBA.

GL. Exceptional Biodiversity Benefits Monitoring Plan

Project site protects habitat for at least 16 endangered IUCN endangered species detected and multiple species globally, nationally, or locally rare and endangered (Table 15: IUCN red list species). See B. Biodiversity Impact Monitoring Plan for details.