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SIR FREDERICK MACKENZIE MAXWELL

SOME INTERESTING BELIZEAN
PLACE-NAMES

FORESTRY IN BELIZE, PART II:
MODERN TIMES AND TRANSITION

A PICTURE FROM OUR PAST



FORESTRY IN BELIZE, PART II: MODERN TIMES AND TRANSITION

This is the second and concluding part of an extended examination of Belizean forestry from the early 1920's to the present day. The first part appeared in our March issue, and traced the "beginnings" of modern forestry in Belize.

If the birth of the Modern Forestry Industry in Belize can be traced to the basic thrusts and incentives suggested in the Hummel Report of 1921, then the acknowledged maturity of that industry and its integration with conservation can be traced to the British Honduras Forest Policy Report of 2 September, 1954. In ten basic interrelated points this report emphasized the major positions set forth in 1921 and further enunciated the relations between forestry, soil and water conservation, and sound ecosystem preservation (8).

THE 1954 POSITION

The first point of the 1954 report marked the establishment of a Crown Lands Forest Estate on particular types of lands such as those unsuited to agriculture yet adaptable to forestry, and on lands whose best financial return would come from forest products. A goal of this

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Estate was to function in soil and general conservation plus climate stabilization. The Estate was further to conserve land for supplying fuel, construction and industrial wood to local villages; land that from time to time could be, was set aside as natural reserves (3, 4). Table 1 gives some idea of the area contained in these state forests and their variation in size from 1960 to 1977 (1, 2, 4).

Point two stated the intention of public officials to survey, demarcate and constitute forest reserves by proclamation. Dereserving of land was to be done only because of overriding public necessity.

Point three stated the intent to maintain forest produce perpetually through Sustained Yield Management and controlled exploit. It suggested the need for enumeration, survey and increment calculation of timber inventories. It also encouraged the natural and artificial regeneration of forests by establishing and maintaining demarcation boundaries to assist administrators in protecting forests from fire, insects, disease, animals and trespassers.

The fourth point initiated the idea of Intensive Regeneration Centers in selected forest reserves. Coupled with the establishment of fully stocked plantations of domestic and exotic species in these Regeneration Centers, the hope was to supply raw lumber to a sawmill or processing plant of economic size located at or near each center.

Economics and marketing were the subjects of the fifth point, which encouraged increased production from forest reserves by insuring full use of prime hardwoods and pine. It further encouraged use of secondary hardwoods and other forest resources. Emphasis was placed on developing local and export markets and undertaking research to find alternative and additional uses for forest products, such as pulp wood for paper manufacture veneer production, etc.

Point six dealt with improving lumber quality, especially that being exported. It stressed the use of a strong and accurate grading system. It also encouraged accurate sawing, machining and seasoning of lumber.

Forestry on private, freehold lands was the subject of the seventh point. Emphasis was given to the importance of inspecting and marking trees of such major wood

species as mahogany and cedar. Such inspection was to be based on minimum girth regulations so that controlled felling could be undertaken. It encouraged assistance to private owners in their planning for sustained yields and silviculture.

The eighth point centered on controlled exploit of Crown Forests outside of reserves. Such control was to be effected by issuance of Forest Produce Licences so that non-reserve forests could augment yields from reserve forests especially while the latter were being brought to full production.

Education of the public to the aims and needs of forest conservation was the subject of point nine. Such education was to occur especially in schools and by means of radio.

Point ten emphasized the importance of the Forestry Department in executing this entire program and undertaking research. Ideally, the department would be staffed by local personnel trained at the university and technical levels.

MATURITY OF THE INDUSTRY

The maturity of the Forest Industry since 1954 is especially apparent in the greater efficiency in lumbering, improvement in lumber quality and what appears to be a decrease in the maturing time required for many tree species. This is the result of such practices as cutting only at or above the minimum girth limits, licensing loggers, increasing areas of reserve forests, Sustained Yield Management, and increased research. This greater efficiency is most apparent in the higher quality of logs coming out of the forests. A major goal of the 1954 Policy (point 6) was to improve the quality of forest products, especially of lumber (3). A trend toward better quality seems well established in Belize, particularly in private forests. Today, many of the logging areas of Belize Estates are producing smaller mahogany logs than 20 years ago. However, the incidence of decay is much less and therefore the volume of usable lumber (about 60 cu. ft.) from these smaller logs is about the same as the volume obtained from the larger but partially decayed logs years ago. Thus although logs are smaller than 20 years ago, the quality has improved (5).

A tree becomes more susceptible to disease, decay and general pest damage when it reaches maturity and

slows in its rate of growth. With the emphasis on cutting mature or over-mature trees, forest policy in the last 25 years has encouraged lumbermen to cut only harvestable trees and leave immature stock. This policy seems to be showing positive effects not only by raising general log quality but by decreasing the number of totally useless logs entering the mills. This helps cut milling costs. Especially regarding mahogany, trees today generally have smaller girths than 25 years ago. Fewer logs measure greater than the minimum girth of 6 ft. 6 in. (195 cm.). Most logs are very close, almost exactly 195 cm. in girth, because lumbermen keep a close watch on growth rates and cut the trees as soon as they reach the legal minimum. Trees also seem to reach the minimum limits faster today than in the past because forests are managed better (e. g. mahogany may mature in 50 years rather than 70) (5).

The Forest Industry in Belize has been undergoing a transition. This transition has involved many factors. Among other things, forest management has become more intensive. One cannot be sure when the transition began but it seems quite evident that the Hummel Report of 1921 and the policy instituted in 1954 have exerted appreciable effects in encouraging and accelerating this transition. The effects have only begun to become apparent in the last five to ten years.

LESSER KNOWN SPECIES

A point of question and much confusion, even to professional foresters, is the situation regarding Secondary Hardwoods, also called Lesser Known Species (LKS). Both the Hummel Report and the 1954 policy emphasized the need for Belize to develop the forestry and marketing of these LKS's. But Belizean forests had a world reputation for quality mahogany and that was what the markets demanded. Many of the Lesser Known Species were in fact unknown in many parts of the world.

A present hindrance to developing markets for the LKS's is the fact that some 40 to 45 species fall into this category. No one species dominates the field the way mahogany has. Rosewood and Santa Maria have historically had good reputations on world markets, but nowhere nearly as strong as mahogany. Thus in trying to market LKS's, one would necessarily have to concentrate on each species individually when advertising and making it better known on the various world markets. This could entail rather enormous costs and would have to be

done in a way that would not interfere with the mahogany or cedar markets. Each of the LKS's would ideally appeal to a particular market (special tastes, economies, societies, etc.). Hopefully, competition between species on various markets would be minimal since all species are products of Belize and self-competition would be undesirable. But such specialized markets require extraordinary economic research. In the past, few people were willing to invest the capital necessary for such research. Only after serious mahogany depletion did the LKS's begin to assume the economic importance which had been hoped for for so many years.

The LKS's are a point of debate among people, and diverse opinions I heard in my conversations with different foresters bear witness to this. Some private foresters say that mahogany and cedar are still the most important hardwoods being produced. A few say that the income from mahogany and cedar sales subsidizes the production of lumber from the LKS's, that the economic production of Lesser Known Species is not yet possible (5). This analysis seems true if these foresters serve primarily the world mahogany and cedar markets.

However, other foresters claim that the LKS's are now the most important economic species to Belizean Forestry (10). They base this analysis on the overall increased production and use of hardwoods (especially LKS's since about 1961) particularly by the domestic Belizean market (1, 2, 5, 10). These woods are used domestically for furniture but especially for construction (2). These foresters say that the main problem hindering increased production of LKS's is that private operators do not invest adequate capital into developing production, conservation and sustained yields of LKS's (10). The argument is further complicated by the fact that a fairly strong demand, both foreign and domestic, seems to exist for lumber from the LKS's. Studying trends over the important 24 year period from 1948 to 1971, reveals that the annual production of mahogany and cedar timber has generally been declining, while annual production of other hardwoods (i.e. LKS's) has generally been increasing (table 2).

Considering the various points involved in this debate, one sees a definite type of transition occurring whereby LKS's are taking on added importance. Lumbermen, both inside and outside of Belize, confirm that foreign markets exist for LKS's. This seems especially apparent in Jamaica, the United States and Great Britain (5, 9). Yet foresters are almost unanimously agreed that minimum



DOMESTIC SECONDARY INDUSTRIES, like boat-building, are supported by forestry. Above, Santa Maria wood is used in the shipwright's trade.



ON THE BANKS of the New River Lagoon at Hill Bank in the Orange Walk District, logs on land and "floater logs" in the lagoon (background) can be fastened together into rafts and navigated to Belize City.

volumes of raw timber (in increments of 100,000's of board feet) are necessary in order to make importation by a foreign buyer economically feasible (5, 9). Many LKS's cannot presently be supplied by Belize in these volumes and where new market demands cannot be met, the buyer loses interest, turns to another wood or to another supplier, and the market dies or is filled.

Historically, the strong world demand for Belizean mahogany seems to have developed naturally because of its beauty and the large volume which Belizean lumbermen could supply. This combination of beauty and volume made mahogany inexpensive (sometimes too inexpensive) yet very competitive with other woods on world markets. No special market development plans were necessary. Today one finds that most LKS's rival mahogany in their beauty, but the necessary volumes cannot be found to fill the demands of foreign buyers.

Besides minimal volumes, a second problem which lumbermen encounter when handling LKS's is the increased great difficulty of shipping the raw timber. Historically Belize has had poor road systems unable to handle heavy-duty traffic. For years the only economical means of transporting mahogany long distances was by water. The logs were fastened together, usually by chain, into rafts 150 to 200 yards long and floated to the mills (11). After the railroads began to make their impact in the 1840's, logs could also be shipped inexpensively overland (8). But the railroads declined and the roads have not improved to the point where they can handle heavy loads. Thus, just as 150 years ago, the only economical means of moving logs long distances is by water. This still works well for mahogany, but many LKS logs are more dense than mahogany and do not float. Loggers call them "non-floaters" and in order to move them long distances they must fasten non-floaters to floater logs and then form rafts which can be navigated to the mills (5). One of the longest runs of this kind was reported by Wright *et al*, in the 1950's. It operated from Hill Bank in the Orange Walk District beginning at the New River Lagoon, running some 60 miles down the New River to the coast, and then an additional 100 miles down the coast to Belize City (5, 11). This run still operates today. The expense of fashioning the mixed floater and non-floater log rafts drives the cost of transporting many LKS logs above that of mahogany logs (5).

A third factor which must be considered when plan-

ning for production and marketing of lumber from Lesser Known Species is the ease of culture. Single-species plantations of domestic hardwoods usually fail because of increased insect and pathogenic damage occurring in such pure stands. Mixed-species plantations (simulating the natural growth patterns in the native forests) are more successful in resisting damage from pests and thus are more successful in producing quality lumber. They are "plantations" only in a very broad sense in that only one or two tree species may actually be randomly planted. Most tree species naturally occur in this type of forest, but the forester can cause a change in the percent species complement of the forest by employing such activities as thinning, controlled burning, fertilizing, etc. Nature follows a forestry plan which has been and still is the foundation of the industry in Belize. The mixture of hardwood species naturally occurring in the domestic forests insures healthy survival for each species. Foresters have learned to work with this natural plan.

In working with this plan, foresters learn how to encourage regeneration of some hardwood species over others without disrupting the ecological balance in the forest. When encouraging greater growth of the LKS's over other species, foresters must be familiar with certain crucial cultural factors specific for each LKS. These factors include optimum population density in the forest, length of life cycle, susceptibility to specific diseases, interaction with other species, soil, moisture and edaphic requirements, etc. Mahogany can be grown economically at a density of about 1 tree on every 2 acres. Some species can be grown at densities greater than that. Yet if density per acre of any hardwood species in the Mixed-species plantation becomes too heavy, the same pathogenic factors affecting that hardwood in the Single-species plantation will begin to cause excessive damage even in the Mixed plantation.

Length of life cycle will heavily influence what percent of the species inventory in any forest can annually be cut. Generally, the shorter the cycle, the greater the percent of inventory that can be cut.

Most of these cultural factors are well documented for mahogany. But they are unique, and therefore must be documented for each of the LKS's. Table 3 shows the names of the more economically important LKS's of Belize. As when mahogany displaced logwood and became the dominant export of Belize, it seems that if any LKS is to

dominate the others, it will have to do so because it naturally surpasses the others in beauty, ease of production and supply. This seems unlikely with most of the indigenous LKS's. However two exotic (non-indigenous) LKS's show interesting trends in their patterns of growth and production.

Teak is an exotic which was introduced from Burma into Belize in the 1940's. The tree generally has a slow rate of growth but produces excellent quality logs which yield high quality lumber (6). Some commercial lumbermen find that it grows quite well in the southern part of the country, and annual commercial plantings are being made (5).

Gmelina is native to Southeast Asia. Foundation stock, however, was introduced into Belize from Sierra Leone, Africa, in 1954 (7, 10). It is a low-density hardwood (similar to many coniferous woods) whose lightly-toned, closed-grain appearance is not in the same class as most other LKS's or mahogany. But it lends itself well to construction and lower grade furniture manufacture. Its main advantages lie in its rapid rate of growth (i.e. the short life cycle which runs about 12 to 18 years) and the fact that being an exotic, it seems to adapt to planting in single-species stands without suffering unduly from the ravages of pests, as do most domestic LKS's (10). Some commercial foresters find its production especially suited to the northern part of Belize (5). Today, it is the best short-cycle hardwood timber species in Belize (7, 10). Although introduced in 1954, large-scale plantings did not begin until 1962 when 98 acres (39.5 ha.) were planted. Since 1971, some 200-300 acres (80-120 ha.) have annually been planted to Gmelina, and a total of about 1600 acres (645 ha.) of plantations are now growing in Belize (10). Trees planted in the early 1960's are annually yielding 60,000 to 70,000 board feet of wood (10). These are still small volumes, too small to interest foreign buyers. The wood is used mostly domestically. But if the early plantings are yielding these annual volumes of wood, the later plantings (those made in the early 1970's) could quite possibly be yielding 100,000 to 200,000 board feet annually by the mid-1980's, and this could interest international buyers.

The fact that some private commercial foresters are planting gmelina and teak each year lends credence to the theory that both woods (but especially gmelina) have bright futures and strong possibilities for filling

demands of international markets (5).

SUSTAINED YIELD MANAGEMENT (SYM)

Sustained Yield Management (SYM) involves a systematic harvesting of forest products coupled with encouraging a regeneration equal to the volume being cut so that no depletion of resources occurs. Belize Estates Limited began trials and investigations with SYM of mahogany and cedar in the 1950's (5). Although not all of their land is suited to lumber production, some 620,000 acres (250,000 ha.) is so suited, and they aimed for an annual cut of 4000 to 6000 trees off of this area (5). With an average yield of about 60 cubic feet of lumber per tree, the company was producing 240,000 to 360,000 cubic feet of mahogany and cedar annually. Yet over the years the company improved and refined the plan. In 1975 they undertook a computer analysis of their 20 year old SYM methods through the facilities of Oxford University in Great Britain. Results were quite encouraging in confirming that sustained yields were being achieved by felling about 6000 trees annually. However even today some mature, quality trees are inaccessible and realistically Belize Estates' felling activity is confined to cutting about 4500 trees yielding some 270,000 cubic feet of lumber annually. This controlled cutting coupled with an annual planting of 12,000 seedlings to supplement natural seedling regeneration, helps insure sustained yields of mahogany and cedar in the future (5).

MARKETING, PRICING & TAXATION

Controlled prices are set by the government on all woods according to grade. Table four shows the control prices set in 1975 on mahogany and LKS's as a group (5). Inflation makes necessary the constant re-evaluation of these control prices in order to permit realistic financial returns to producers. If control prices are not adjusted to inflation, foresters may divert their lumbering activities away from those woods whose profit return over royalty and cutting costs is too small. This is a claim made against the overall control price of LKS's. Some foresters say that a control price of \$0.48 per board foot for prime LKS lumber is more realistic than the present price of \$0.32 per board foot (5). For LKS's whose population density is sparse and cost of cutting is high, this claim seems true. Yet each LKS differs in population density and ease of culture. Thus, ideally, each should have its own control price; for some, the \$0.32 control price may be quite correct, for others it

may be too low. More information is needed about each LKS.

Royalty rates are paid by loggers on timber cut from public lands as well as by loggers operating on private land holdings if the private land holding involves over 100 acres (40 ha.) (7). Further, private land holders must pay a real estate tax on their land. Because the real estate tax is higher on non-productive land than on productive, it operates indirectly to encourage owners to make and keep land productive. However, no such similar incentive exists for private contractors who cut logs off of publically owned (Crown) lands. All they must pay is the royalty fee on each cubic foot of usable timber they cut. This may partially explain why the achievement of sustained yields seems to be a trend on private lands sooner than on public lands (5, 10).

SUMMARY & CONCLUSION

Lumbering has made a transition to Forestry. This, in one sentence, states what has occurred in Belizean forests over the last 50 to 60 years. Secondary forest products (i.e., palm oils, resins, etc.) have taken on added importance. Conservation of soil and water, plus stabilization of climates have begun to be integrated with lumbering operations to effect this transition from mere lumbering to full scale forestry.

Logwood was originally the main product which lumbermen sought from the forests of Belize. This was displaced by mahogany, and for years the forests were abused and poorly tended as lumbermen overcut and ravaged areas in search of only prime quality lumber. Little concern was shown for lower quality timber or for using the wide variety of woods which abound in Belizean forests. By 1900 lumbering as an industry was already in decline. But it took the harsh economic conditions of the 1930's, combined with the deplorable condition of the forests, to seriously implant the idea that reform in forest management was necessary.

Testing and experimentation with the exotic tree species began earnestly in the 1940's and continues today. Many of these exotics complement and supplement the lumber and forest products coming from domestic tree species.

Early research with plantation systems showed that short life cycle softwoods, like native and exotic conifer-

fers, plus some exotic hardwoods lend themselves well to pure stand single-species plantation management systems. But most domestic hardwoods like Mahogany, Rosewood, Santa Maria, etc., have long life cycles (usually 40 years or more). These hardwoods are the main economic base to the forest industry. Because of their longer life cycles and greater susceptibility to domestic pests, they cannot be easily cultured in pure or near pure stands. Thus foresters have learned to use Mixed-species timber stands whereby they encourage the natural forest complement of trees, but can affect the percent species composition. They operate with nature, not against it, in working toward maximized use of ecosystems without damaging the environment.

The public Reserve and Non-reserve forests play a key role in effecting research, conservation, protection and climate stabilization efforts. The cooperation of public foresters with owners of private forest land is crucial in helping the latter devise and execute efficient forest management plans.

Sustained Yield Management (SYM) which was only a dream 25 years ago, now appears to be operative on anywhere from 10 to 20 percent of the forest lands in Belize. Most of the lands which have achieved sustained yields seem to be in the hands of private owners. They can make greater investment per unit of land than can be made by public foresters on crown land. This is one explanation why the trend in achieving sustained yields seems to be on privately owned land sooner than on public land. But the greater motivation to intensify yields on private land vs. public land is a factor that requires further inquiry.

Management has intensified in the last 25 years and concurrently there has been an improvement in the quality of logs coming from the forests. Especially in regard to mahogany, logs are smaller now than 25 or 50 years ago. But there is less waste to each log and fewer logs are classified as totally useless than was the case in the past. Trees also seem to mature in less time.

A major transition over the last 50 years has been the greater emphasis on Lesser Known Species, although income from mahogany and cedar still seems to subsidize the overall LKS production. The trend toward LKS's will continue, but it seems that no one LKS will ever dominate the forestry scene the way mahogany did.

Coniferous species like the various pines, have been badly overcut in the same way mahogany was in many areas. But pine areas are recovering quickly and the short life cycles of pines (i.e. rapid rate of growth) plus the fact that they adapt to closer spacing (i.e. more dense population among their own species and among certain other species) than most hardwoods, lead some foresters to speculate that in about 15 to 30 years Belize will again be producing large volumes of woods from these species (10).

THE FUTURE

If the trends that appear from this study continue, the future of forestry in Belize seems very good. The industry is still in a trough of activity. Forests only now are beginning to recover from centuries of abuse. Forestry must continue to change in the future. Especially where conifers and exotic hardwoods are concerned, tree farming (which is not yet practiced in Belize) will begin to appear.

Sustained yields will continue to spread over private lands and will also begin to be achieved on public lands. Coupled with spreading sustained yields, will be more intensive yields per unit of forest land. As foresters strive for greater intensity of production, new girth limits not only for mahogany, but specific for each species, may have to be determined. As tree farming becomes important, methods other than girth measurement (e.g. core sampling) will allow foresters to check trees and determine specific growth rates in particular forests.

Lesser Known Species will continue to grow in importance but probably only a few (6 to 10) may become important enough to interest foreign markets. Whatever species these turn out to be, they will have to combine ease of culture with beauty and quality. As of now, two exotic hardwoods (i.e. teak and gmelina) show trends of achieving this. Gmelina especially may assume an importance in the next 10 or 15 years that will put it above any of the domestic LKS's.

Yet as the value of quality woods of special beauty rises on world markets, even species that are difficult to produce may find a ready domestic market from small manufacturers of veneer. Domestic veneer production warrants further study and encouragement. It seems a very efficient way to use quality logs of scarce species.

But it demands high capital investment per log both during the growing period and after cutting.

In terms of industrial uses, secondary forest products like palm oils, resins, naval stores and spices should continue to grow in importance. As conifer production returns to normal, pulp supplies may warrant encouragement of paper milling operations in Belize.

Finally, it seems that forestry will never be as important as it once was. Many of the soils of Belize are too fertile to be used only for forestry. Their prime importance lies in agriculture. However, the integration of agriculture and forestry operations such as grazing livestock in some forest areas, interplanting food crops under trees, etc., can take on added importance in the future.

Table One

STATE RESERVE FOREST AREAS FOR SELECTED
YEARS SINCE 1960 (6, 8, 1, 2)

<u>Year</u>	<u>Area (square miles)</u>
1960	1,326 (est./includes both Reserve and Nonreserve State Forests)
1966	2,029
1971	1,912
1977	2,500 (est.)

Table Two

PRODUCTION IN BOARD FEET OF MAJOR WOODS GROWN IN BELIZE
(years before & after the 1954 Forest Report) (1, 3, 4, 6)

<u>Year</u>	<u>Mahogany</u>	<u>Cedar</u>	<u>Pine</u>	<u>Santa Maria</u>	<u>Other Hardwood</u>
1948	7,945,000	1,030,000	10,562,000	703,000	-----
1957	8,991,000	939,996	9,253,992	702,000	-----
1962	6,740,508	590,604	7,503,060	1,177,548	578,732
1963	7,025,699	624,820	8,586,520	940,893	520,480
1965	6,410,184	884,400	13,884,000	-----	5,532,000
1966	4,606,116	1,126,308	3,375,876	-----	2,023,176
1967	4,242,420	955,692	3,839,640	-----	1,160,064
1968	9,727,980	961,368	5,528,664	-----	4,390,512
1969	4,316,640	842,256	5,514,000	-----	3,920,520
1970	7,560,000	2,070,252	4,993,200	-----	3,600,000
1971	5,889,072	416,232	3,166,572	-----	5,296,800

Table Three

SOME IMPORTANT "LESSER KNOWN SPECIES" OF BELIZE

<u>Common name</u>	<u>Species</u>
Banak ^L	<u>Virola koschnyi</u>
Yemeti	<u>Vochysia honduransis</u>
Balsa	<u>Ochroma lagopus</u>
Quamwood	<u>Schizolobium parahybum</u>
Nargusta ^L	<u>Terminalia amazonia</u>
Ziricote ^L	<u>Cordia dodecandra</u>
Cotton	<u>Ceiba pentandra</u>
Cypress ^L	<u>Cypressus sp.</u>
Mayflower ^L	<u>Tabeluia pentaphylla</u>
Palomulatto ^L	<u>Astronium graveolens</u>
Rosewood ^L	<u>Dalbergia stenenssoni</u>
Santa Maria ^L	<u>Calophyllum brasiliense</u>
Teak ^{e L}	<u>Tecona grandis</u>
Gmelina ^e	<u>Gmelina arborea</u>

e = exotic species, not indigenous to Belize

L = luxury hardwood

Table Four

CONTROL PRICES PER BOARD FOOT FOR BEST AND REJECT GRADES

<u>Species</u>	<u>Best</u>	<u>Rejects</u>
Mahogany	\$0.80	\$0.24
Lesser Known Species	0.32	0.16

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COMING IN OUR JULY ISSUE:

- Uniforms of the West India Regiment
- Belizean Nursing Education in the 19th Century
- The Battle of St. George's Caye:
A New Analysis (Part I)