

Michel de l'Atalaye as a wedge between the Massif du Nord and the Montagnes Noires. It is the northwestward prolongation of the San Juan Valley of the Dominican Republic.

The Montagnes Noires form a mountain system that is the northwestern prolongation of the northern part of the Sierra de Neiba of the Dominican Republic. At its northwest end it merges into the Massif du Nord forming a short arc that is convex southward.

The Artibonite Plain is a wedge extending southeastward between the Montagnes Noires and the Chaîne des Mateux together with the Montagnes du Trou d' Eau. The apex of the wedge is near the Dominican border, where the Montagnes Noires join the Montagnes du Trou d' Eau. The southeastern part of the Artibonite Plain, to which the name Artibonite Valley is applied, has a greater variety of surface features than the northwestern part—the plain proper. Morne Grammont is an isolated outlier of the Montagnes Noires in the plain southeast of Gonaïves.

The Chaîne des Mateux and its southeastward prolongation, the Montagnes du Trou d' Eau, extend southeastward from St.-Marc to the Dominican border as an arc that is convex southward and form the prolongation of the southern part of the Sierra de Neiba of the Dominican Republic.

The Cul-de-Sac Plain is part of a remarkable depression that extends across the island from Port-au-Prince Bay to Neiba Bay. The Dominican part of the depression is called the Hoya de Enriquillo. The plain is bounded on the north by the Montagnes du Trou d' Eau and on the south by the Massif de la Selle. It contains the largest inland body of water in the Republic, the Étang Saumâtre, which has no outlet.

The Massif de la Selle, which is named from Mont la Selle, the highest peak in the Republic, is the northwestward prolongation of the Sierra de Bahoruco of the Dominican Republic. It extends westward to the gap in the mountains along a line between Jacmel and Grand-Goave and includes a large coastal plain, the Léogane plain.

The Massif de la Hotte embraces the entire southern peninsula west of a line between Jacmel and Grand-Goave, where it merges into the Massif de la Selle. This region includes a large coastal plain, the Cayes Plain, and several interior lowlands, the largest of which is the Asile Valley. The remainder of the region consists of rugged mountains. The Massif de la Selle and the Massif de la Hotte form an arc convex northward.

Gonave Island is the largest outlying island belonging to the Republic. The southeastern half of the island is more rugged and has a greater variety of surface features than the northwestern half.

DRAINAGE.

GENERAL FEATURES.

The Republic of Haiti has a great many small streams. Most of them have short courses, and many of them flow directly down steep mountain

sides. All streams that contain water during most of the year in any part of their courses are called rivières, but this term does not have the significance of size commonly attached to it in other countries. Considerably more than 100 such streams enter the sea along the coast of the Republic. Not more than a third of these, however, are large streams,¹ and of these Rivière Artibonite is the largest.

Most of the streams are swift, shallow, and full of rapids, especially in the mountains, and the water is usually clear except during or immediately after rains. Rivière Artibonite, however, contains no rapids in its lower course, possibly as far up as La Chapelle, and near the sea it becomes rather sluggish. In this region it is also somewhat turbid all the time. Rivière de l'Estère is tidal for several kilometers above its mouth, and a few other streams are tidal for as much as a kilometer or a little more. In colonial days large barges were towed up Rivière Artibonite as far as Petite-Rivière de l'Artibonite. The other streams are navigable only for canoes or very small boats and generally not more than a few kilometers above their mouths.

DRAINAGE SLOPES AND PRINCIPAL STREAMS.

The streams of the Republic may be placed in four groups according to their outlet and general direction of flow. The groups and their principal members are as follows:

1. Streams flowing into the Atlantic Ocean: Rivière Massacre, Grande Rivière du Nord, Rivière du Limbé, Les Trois Rivières, Rivière de Jean Rabel.

2. Streams flowing westward into the Gonaïves Gulf: Rivière de l'Estère, Rivière Artibonite, Grande Rivière du Cul-de-Sac.

3. Streams flowing northward into the Gonaïves Gulf: Grande Rivière de Léogane or Rivière Momance, Grande Rivière de Nippes, Rivière des Baradères, Grande Rivière de Jérémie or Rivière de la Grande Anse.

4. Streams flowing southward into the Caribbean Sea: Rivière de l'Acul, La Ravine du Sud, and Rivière de l'Ilet on the Cayes Plain, Rivière de Cavaillon, Grande Rivière de Jacmel, Rivière de Fesle, and Rivière Pédernales.

The following list gives the approximate lengths of the principal streams, all minor sinuosities being omitted. No tributaries of Rivière Artibonite except Rivière Guayamouc are included. The figures are based on measurements made on two or three maps and data published by Tippenhauer and others. Though admittedly inaccurate the relative order of lengths is probably correct.

¹ Dantés Fortunat, in his *Nouvelle Géographie de l'île d'Haïti*, pp. 249-250, Paris, 1888, gives a list of forty-three principal rivers of the Republic, of which eight are tributaries of Rivière Artibonite.

Approximate length of principal streams.

	Kilometers.
Artibonite to headwaters in Dominican Republic ¹	236
Artibonite to farthest headwaters on Rivière Ténèbres near Carice ¹	262
Guayamouc, from Bouyaha to headwaters of Rivière Dorée near Marmelade	108
Les Trois Rivières.....	96
Grande Rivière du Nord.....	82
Estère	72
Grande Rivière des Nippes and Rivière Serpent.....	60
Grande Rivière de Léogane or Momance.....	56
Rivière Massacre	55
Grande Rivière de Jérémie	50
Grande Rivière du Cul-de-Sac.....	45

Rivière Artibonite is by far the largest of these streams and has the only extensive and complex drainage system. In the Republic of Haiti it drains an area of about 7,800 square kilometers, approximately three-tenths of the whole country, and in addition about 1,800 square kilometers of Dominican territory.² Its principal tributary, Rivière Guayamouc, drains about 2,675 square kilometers, all in the Republic of Haiti, and is probably the country's second largest stream.

Les Trois Rivières undoubtedly is next in order of size, but the others can not easily be placed without more accurate maps and streamflow data. Grande Rivière de Nippes, Rivière de Cavaillon, Grand Rivière de Jérémie, Grand Rivière du Nord, and Grand Rivière de Léogane are the largest streams except the tributaries of the Artibonite.

PECULIAR DRAINAGE FEATURES.

Certain areas have peculiar drainage, due to geologic or climatic conditions. Underground drainage in limestone is one of the commonest of these peculiar features. In areas of underground drainage the surface water disappears into sink holes or caves in limestone and there are no surface streams. The best example of such an area is on the northern slope of the southern peninsula from Baradères to Jérémie. This region is full of sink holes that have no outlets and contains few surface streams. Some of the surface streams disappear into limestone caverns; others, such as Rivière Salée, west of Baradères, appear suddenly from caverns. Areas of sink-hole drainage are common in regions where limestone is the surface rock, but most of them are not very large. Lost streams of the desert type, which disappear by evaporation or by infiltration into alluvium, are rather common in some areas. Usually they originate on moun-

¹ Tippenhauer and others have given the length of the Artibonite as 320 kilometers. This length must include many minor sinuosities, which in the lower course are very numerous.

² Areas measured by planimeter on Thomasset map. Although the map is not very accurate, the errors probably very nearly compensate one another.

tain slopes, where rainfall is abundant, and disappear at or near the arid lowlands. Rivière du Môle, at Môle St.-Nicolas, which disappears 2 kilometers from the sea, is a good example. Other examples are Rivière Blanche, which disappears on the Cul-de-Sac Plain, and, to some extent at least, Grande Rivière du Cul-de-Sac. These streams flow through to the sea, however, in time of flood. Some streams of this type are interrupted streams. They flow perennially in certain stretches where the structure of the rock brings the water to the surface and disappear in other stretches where the gravel fill is deep. Rivière Colombier at Terre-Neuve is a good example.

LAKES.

The Republic of Haiti contains a considerable number of small lakes, most of which occupy sink holes in limestone. Some of them are permanent; others are ephemeral. There are also a few small lakes of the desert-playa type, particularly on the Arbre Plain. Perhaps the Étang Bois-Neuf, south of St.-Marc, also is of this type. There are two rather large lakes, the Étang Saumâtre, at the eastern end of the Cul-de-Sac Plain, and the Étang de Miragoâne. The area of the Etang Saumâtre is about 180 square kilometers and that of the Étang de Miragoâne perhaps 25 square kilometers.¹ The Étang de Miragoâne overflows to the sea, but the Etang Saumâtre has no outlet. West of Étang Saumâtre is a shallow lake called Trou Caïman, which occasionally overflows to the sea.

DRAINAGE OF GONAVE AND TORTUE ISLANDS.

Gonave and Tortue islands are characterized generally by underground drainage in limestone. A few subterranean streams break out as springs and flow for short distances, but no perennial surface streams reach the sea.

RELATION OF DRAINAGE TO STRUCTURE.

The adjustment of the drainage to the structure of the rocks is discussed in Part III separately for each of the geographic provinces.

Rivière Artibonite and Les Trois Rivières are the only streams that traverse more than one geographic province, except many smaller streams that rise in mountains and flow into the larger plains. The Guayamouc and Artibonite drainage is closely adjusted to the structure in its upper and lower parts, but the middle part, between Las Cahobas and Mirebalais, is unrelated to the structure. Rivière Guayamouc flows southeastward in a plunging synclinal trough, and Rivière Artibonite below Mirebalais flows northwestward in a similar trough. The diversion of Rivière Artibonite across the Montagnes Noires is discussed on pages 381-382. Les Trois Rivières flows along the strike of the rocks from its headwaters

¹ Areas measured by planimeter from Thomasset map. The measurement gives 29 square kilometers for Étang de Miragoâne, but this probably is too great.

to Pilate and then cuts obliquely across the strike. At Gros-Morne it enters a downfaulted trough and follows this trough northward to the sea.

Detailed descriptions of the drainage with regard to water supply and power development are given on pages 513-595.

CLIMATE.

SOURCE OF DATA.

Nearly all the data regarding climate are taken from the bulletins of the Observatoire Météorologique du Séminaire-Collège St. Martial,¹ which have been published semiannually for the period from July, 1909, to the end of 1916, and annually since that time. The data contained in the bulletins were collected under the supervision of J. Scherer, Directeur de l'Observatoire. Records of rainfall and temperature at many stations extend back a few years prior to 1909 but are summed up in the Bulletin Semestriel for July to December of that year. Records at Port-au-Prince covering a much longer period of observation also are summarized in different issues of the bulletin. Data from Moreau de Saint-Méry² that are definite enough to be of value are used to a small extent to supplement those taken from the bulletins.

TEMPERATURE.

All parts of the Republic have a warm and notably equable temperature. Frost, snow, and ice probably do not form anywhere in the Republic,³ even at the highest altitudes, although the temperatures on the high mountain ranges are appreciably less than those at lower altitudes.

Most of the stations at which temperature observations have been made are at low altitudes on plains, in valleys, or near the sea. The records made represent the conditions under which the greater part of the population of the Republic lives, but they do not give an entirely correct idea of the purely physical aspect of the climate. Only one station, Furcy, is located at a really high altitude, and the records from this station, though incomplete, are sufficient to show a considerably lower temperature than that prevailing on the lowlands. The following tables give the mean monthly temperatures at a number of well-distributed stations over the period for which records are available. The averages of the monthly means for the years of record available also are given.

¹ Imprimerie Nationale, Port-au-Prince. The bulletin for 1919, published in 1920, was the most recent one used in compiling the tables. The bulletins for 1920 and 1921 have been published in the meantime.

² Moreau de Saint-Méry, L. E., Description topographique, physique, civile, et politique de la partie française de l'isle Saint-Domingue, 2 vols., Philadelphia, 1797-98.

³ Moreau de Saint-Méry (vol. 2, p. 505) states that in the Canton of Fond Jean-Noël, northwest of Sal-Trou, near the crest of Montagne de la Selle, "one experiences a sensation of coldness and sometimes one even sees a kind of frost." His statement is so qualified as to be rather doubtful, considering the lack of confirmatory evidence.