62D CONGRESS, 1st Session } SENATE { DOCUMENT No. 89

EVERGLADES OF FLORIDA

ACTS, REPORTS, AND OTHER PAPERS, STATE AND NATIONAL, RELATING TO THE EVERGLADES OF THE STATE OF FLORIDA AND THEIR RECLAMATION

WASHINGTON
GOVERNMENT PRINTING OFFICE
1911

IN THE SENATE OF THE UNITED STATES.

August 7, 1911.

Resolved, That there be printed as a public document, under the direction of the Joint Committee on Printing, a compilation of acts, reports, and other papers, State and National, relating to the reclamation of the Everglades of the State of Florida, with accompanying illustrations.

Attest:

CHARLES G. BENNETT, *Secretary*.

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PREFATORY NOTE.

As early as the year 1845, the attention of the Government of the United States was officially called to the Everglades of Florida. In that year the Legislature of Florida, by a joint resolution, instructed the Senators and requested the Representative from that State to press upon the National Congress the importance of examining and surveying the Everglades, with a view to their reclamation.

In 1847 Hon. J. D. Westcott, Jr., United States Senator from Florida, by a letter, requested the Secretary of the Treasury to appoint "an agent to make a reconnoissance of these lands, and make a report as to the probable practicability of the work (of reclamation), to be laid before Congress at its next session."

In response to this request, the Secretary of the Treasury, on June 18, 1847, appointed Mr. Buckingham Smith, of St. Augustine, Fla., to procure "authentic information in relation to what are generally called the 'Ever Glades' on the peninsula of Florida," "for the purpose of ascertaining the practicability and expediency of draining them."

On June 1, 1848, Mr. Smith submitted to the Secretary of the Treasury his celebrated report on the subject named. This report, accompanied by a collection of letters and other papers, was, on August 10, 1848, submitted by the Secretary of the Treasury to the Senate, and with it modern, scientific knowledge of the Everglades of Florida began. These papers the Senate of the United States published in full in its "Reports for the first session of the Thirtieth Congress." In the same year Senator Westcott procured the printing of extra copies of this report and appendix "for distribution," as he states, "where he hopes it may be of service."

In the 63 years which have since elapsed, interest in the reclamation of the Everglades, already keen in 1848, has become Nation-wide, and to-day the State of Florida, equipped with ample funds and expert supervision, is actually engaged with vigor in the drainage of this vast tract.

Through the activities of private individuals, the State of Florida, and the Nation itself knowledge of the Everglades region has at the same time materially increased, and public documents, national and State, pertaining to it have multiplied. These include formal reports by experts from the bureaus in Washington, messages from governors of Florida, and the findings of investigating committees appointed by the legislature of the State. The demand has now arisen that these State papers, in so far as still relevant, be brought together and made available to the general public. Accordingly, a compilation of acts, reports, and other papers, State and national, relating to the Everglades was submitted to the Committee on Printing by Hon. Duncan U. Fletcher, United States Senator from Florida, with the request that it be printed as a public document. In accordance therewith, Senate resolution No. 130, authorizing the printing of this compilation, was reported from the Committee on Printing, considered in the Senate by unanimous consent, and agreed to on August 7, 1911.

I. HISTORY OF DRAINAGE AND RECLAMATION WORK IN THE EVERGLADES OF FLORIDA.

By the treaty of February 22, 1819, the Kingdom of Spain ceded to the United States in full property and sovereignty all territories known by the name of East and West Florida.[1] After the United States acquired the territory known as East and West Florida, such territory was held subject to the Constitution and laws of the United States. The territory known as East and West Florida was, by act of Congress, approved March 3, 1845, admitted into the Union under the name of the State of Florida on an equal footing with the original States in all respects whatsoever, on the express condition that the State should never interfere with the primary disposal of the public lands lying within it. By this act the State of Florida became vested with all of the rights and powers, as to property and sovereignty, possessed by the original States of the Union. Thus the beds of the navigable rivers and lakes within her borders became vested in the sovereignty of Florida and remained for the free use of the citizens of the State. (State *v.* Gerbing, 56 Fla., 603.)

The Legislature of Florida in 1845 (see p. 34), and again in 1848 (see p. 39), adopted resolutions calling attention to the drainage of the Everglades, which resolutions formed the basis of the activity of Senator Westcott in his efforts to have the lands granted to Florida.

Act of Congress of 1850.—Through the efforts of Senator Westcott, one of the first United States Senators from Florida, the swamp and overflowed land-grant act was enacted, and by amendment made applicable to all the States of the Union, which is usually referred to as the act of Congress approved September 28, 1850. (See p. 67.) Under this act upward of 20,000,000 acres of land have been patented to the State of Florida, as will appear by the records of the Land Office and in the tabulated statement in the biennial report of the Commissioner of Agriculture of Florida for 1907. The primary purpose, as expressed in the act of Congress, is to aid the States to reclaim the swamp and overflowed lands within their limits by means of drains and levees.

The act of Congress granting the swamp and overflowed lands for the purpose of drainage and reclamation further provides that title thereto shall be conveyed to the various States by patents from the General Government; and, in pursuance thereof, patents were issued by the Government to the State of Florida conveying all the swamp and overflowed lands approved, subject to the disposal of the legislature.

[1] See page 31 of this document or Articles II and VIII of the complete treaty with Spain to be found in Fuller's Purchase of Florida, pp. 373–374, or Treaties, Conventions, etc., Senate Doc. 357, 61st Cong., p. 1651.

State laws of 1851 and 1855.—Following the enactment of the act of Congress approved September 28, 1850, the Legislature of the State of Florida passed an act (ch. 332), in 1851, accepting the grant aforesaid, and made provision for a board of internal improvement, composed of a membership from the various judicial circuits of the State. (See p. 67.) In 1854, this board, after some effort to handle the fund, prepared a report setting forth the reasons why the board found itself unable to handle the fund, and their efforts and views, accompanied by a bill, which it recommended that the legislature pass, and which became a law under date of January 6, 1855, and is known as chapter 610, Laws of Florida. This act creates Trustees of the Internal Improvement Fund, by designating the Governor, Comptroller, Treasurer, Attorney General, and Commissioner of Agriculture and their successors in office as Trustees (see note 1, p. 19), and grants to said Trustees irrevocably the lands granted to the State of Florida by the act of 1841 for internal improvement purposes remaining unsold, and also the lands granted to the State of Florida under the act approved September 28, 1850, for the purposes and trusts therein set forth, the main trust being the drainage and reclamation of the swamp and overflowed lands. (See p. 69.)

Policies of Trustees.—During the first 25 years of the management of the fund under the provisions of chapter 610, the Trustees and the executives of the various administrations, up to and including the year 1879, adhered strictly to the terms of the grant by Congress, its acceptance by the legislature in 1851, and the provisions made for the administration of the fund by chapter 610; and in each and every instance where the legislature sought to divert the Internal Improvement Fund, or the lands belonging thereto, to purposes other than as expressed therein within the strict rule and construction thereof making the fund applicable solely to the drainage and reclamation of the swamp and overflowed lands, this attempted legislation was vetoed by the then Governors, including the veto of Gov. Drew in 1879 of the first railroad land-grant acts that were passed by the State legislature, which resulted in the legislature inserting in acts thereafter attempting to grant lands to railroad companies provisions making said grants subject to the trusts and provisions of the act approved January 6, 1855, providing for the sale and disposition of the lands by the Trustees of the Internal Improvement Fund, and the application of the proceeds thereof, or the use of the lands in kind for the main purpose of the act, viz, the drainage and rendering fit for cultivation of the swamp and overflowed lands of the fund.

It appears from a close examination of the various acts of the legislature, beginning in 1879, and continuing down to a very recent date, attempting to grant swamp and overflowed lands to encourage the construction of railroads, aggregating 15,000,000 acres, that only a residuary interest therein was attempted to be granted by the legislature.

Immediately following the several acts of the legislature attempting to grant lands to aid in the construction of railroads, beginning with 1879, the Trustees of the Internal Improvement Fund established and observed the policy of regarding such acts as absolute grants of the lands mentioned therein, and of conveying such lands to the railroad companies in accordance with this interpretation of the meaning of such acts of the legislature; and from 1879 to 1900, inclusive, upward

of 8,000,000 acres of swamp and overflowed lands were deeded by the Trustees to railroad companies under legislative land grants.

Disston sale.—The efforts of the Trustees of the Internal Improvement Fund to handle the vast trust and discharge the duties devolving upon them were greatly disturbed by the effects arising from and during the War between the States. The fund, however, or its management, had never in any wise been changed by law nor had the powers and duties of the Trustees and their successors in office been curtailed or limited in any particular during this period of time, notwithstanding many large obligations against the fund matured that the fund did not have the ready money to meet, and caused its financial management to be placed temporarily in the hands of the United States court; this was relieved during the first term of Gov. Bloxham, beginning in 1881, by the sale to Hamilton Disston of 4,000,000 acres of swamp and overflowed lands. The application of the proceeds of the sale of these lands relieved the fund from its temporary embarrassment, and the entire fund was again left in the possession, control, and management of the Trustees.

First comprehensive drainage plan.—On February 26, 1881, a contract was entered into by and between the Trustees and Hamilton Disston and others in which it was agreed by Disston and his associates that they would drain and reclaim, at their own expense and charge, all the overflowed lands in the State of Florida lying south of township 23 and east of Peace Creek belonging to the State of Florida or the Internal Improvement Fund. (See note 2, p. 20.)

Under this agreement drainage operations began near Kissimmee and were prosecuted for some years, during which time many questions were raised about the drainage operations, resulting in an act of the legislature being passed (chap. 3639, Laws of Florida) authorizing the governor to appoint a committee to investigate and ascertain what quantity of land the Atlantic & Gulf Coast Canal & Okeechobee Land Co. (this being the corporation to which Hamilton Disston and associates assigned their contract with the Trustees) had reclaimed for the State, and other purposes, under which act the governor appointed Messrs. J. J. Daniel, W. H. Davison, and John Bradford. This committee made an extensive examination into the drainage operations, the number of canals dug, the length, width, and depth of the same, and the location thereof; they also examined the capacity of the canals for carrying off the water along the prescribed route, with their probable influence on the waters along said route, the actual effect produced upon the waters along said route, and the watershed or area of country which the canals were intended to relieve. The examination was made by the committee during the period of the year of the greatest annual depression of the waters of the rivers and lakes, which period was determined by information obtained from the Federal Government on the subject as well as by meteorological observations and reports of the Government and others. The committee quoted the paragraph in the Disston contract referring to the permanent lowering of the waters of Lake Okeechobee and the Kissimmee River, its lakes and tributaries, and stated that this was and is the main feature of the general plan of drainage as embodied in the contract made with the Trustees; that the lands can only so be reclaimed by permanently lowering and keeping reduced the waters of Okeechobee and its confluents, and that if their waters are not

permanently lowered and kept reduced the plan of drainage is not carried out and there can be no reclamation under the contract, inasmuch as the company had failed to reduce the lakes and rivers which were to be lowered in order to effect this reclamation. They further state that they had taken time to observe the waters in the drainage district at every season of the year in order to test the permanent character of the work and better assure themselves of the correctness of the conclusions reached. (See note 3, p. 21.)

The committee's report having been communicated to the Trustees of the Internal Improvement Fund, some further efforts were made to place the drainage operations in more satisfactory condition, which resulted in a modification of the original Disston contract, which appears to have failed to carry out the object that the Trustees had in contemplation when the modification was granted. The original contract established a drainage area or district embracing approximately 9,000,000 acres of land, the drainage company to receive for its expenditures in drainage operations deeds from the Trustees to alternate sections of land belonging to the State of Florida or to the Internal Improvement Fund within the terms of the contract which may be reclaimed and thus rendered fit for cultivation.

The Disston contract was amended August 17, 1888, under which amended contract the Trustees were to deed, for and in consideration of the cost of such drainage operations, to the Disston company 1 acre of land for each 25 cents that the company expended in such work. The change in the contract thus permitted drainage operations to be carried on in the Kissimmee Valley, many miles distant from Lake Okeechobee, and at a much higher altitude than the lake, and thus the only canals excavated by the Disston company that would have tended to reduce the waters of Lake Okeechobee and the Everglades, if they had been completed, were a canal from the southwest shore of Lake Okeechobee into the Caloosahatchee River and one extending south from Lake Okeechobee into the Glades without outlet. Drainage operations under the Disston contract ceased about 1889. (See Minutes of Trustees of Internal Improvement Fund, vol. 7, p. 416.)

Dr. H. W. Wiley, of the Bureau of Chemistry, in 1891, made a report to the Department of Agriculture on "The Muck Lands of the Florida Peninsula," which furnished valuable scientific data on the constitution of the soil and climatic conditions of the Everglades; and in 1905, Dr. Wiley filed a report on "Cane and Cassava Culture in Florida," containing analyses of Florida sugar cane. (See pp. 73–81.)

Plan adopted by Jennings's administration.—In the latter part of 1902 Gov. Jennings took up the question of draining the Everglades and had much data compiled touching the feasibility and practicability of draining the Everglades, the topography, rainfall, watershed, altitude above sea level, outlets, etc., and presented a reference thereto in his message to the legislature of 1903, with profile drawings showing the altitude of Lake Okeechobee, profiles of the Kissimmee River and lakes, including Okeechobee, and their elevations above tidewater, showing the normal elevation of Lake Okeechobee to be 20.42 feet above the level of the Gulf of Mexico and practically the same height above the Atlantic Ocean, with reference to the surveys or levels made by Gen. Gillmore, Col. Hopkins, Maj. Wurts, V. P. Keller, J. W. Newman, and W. H. Caldwell, assistant United States engineer. The message made reference to the expedition of Mr. James E. Ingraham,

the nature and character of the soil, its fertility and growths thereon, naming the principal drainage outlets to be deepened by the cutting of canals from Lake Okeechobee to the Gulf of Mexico and the waters of the Atlantic Ocean on the East. (See p. 84.)

The patent to the Everglades was obtained on April 29, 1903 (see p. 91), about the same time that Gov. Jennings's message was submitted to the legislature, and systematic effort was made to put in tangible form the records and minutes of the Trustees by having the minutes printed, which had not theretofore been done, and tables were prepared showing the status of the fund, both in lands and moneys, which showed that the fund was really without money or lands; that the railroad legislative land-grant claimants were claiming all of the lands that the fund had or could become entitled to.

A sale was made by the Trustees to Neill G. Wade (see Minutes of Trustees of Internal Improvement Fund, vol. 5, pp. 118, 119) of approximately 100,000 acres of land, proceeds to be used for drainage work, which land the railroad companies claimed belonged to them, and brought suit to recover the lands or the proceeds arising from the sale thereof, challenging the power of the Trustees to sell the lands and use the proceeds for any other purpose than to turn the moneys over to the railroad claimants. This caused the Trustees to examine more particularly into their powers and duties relating to the management and disposition of the lands of the fund, which resulted in the Trustees propounding questions to Hon. D. U. Fletcher, of the Jacksonville bar, Hon. R. W. Williams, of the Tallahassee bar, and Hon. T. L. Clarke, of the Monticello bar, asking for their written opinions on the subject, which were furnished in due course, which questions were answered in effect by all of them that the Trustees of the Internal Improvement Fund are clothed with full power under the laws of Florida to sell the swamp and overflowed lands granted under the act of Congress of September, 1850, for the purpose of carrying out the provisions of the laws on the subject and were limited by the objects of the grants of the Federal Government of 1850 to the drainage and reclamation of the swamp and overflowed lands.

This condition being presented to the Trustees of the Jennings administration caused them to make a comprehensive investigation into the whole subject matter and history of the Internal Improvement Fund, resulting in having the minutes published and statements prepared showing the status of all chartered railroad companies, of all land grants, of all lands conveyed to railroad companies and canal companies, the total acreage of the lands granted to Florida under the act of 1850, and the disposition thereof. A further result of this investigation was the adoption by the Trustees of a resolution asserting a superior title to the lands in the fund over that of the railroad land-grant claimants under subsequent and residuary legislative enactments, and declaring it to be the fixed determination and policy of the Trustees to defend the title to the lands for the purpose of performing the trust of drainage and reclamation. (See note 4, p. 24.)

During the early part of the year 1901 the representatives of various railroad companies made demand for hearings before the Trustees of the Internal Improvement Fund, to settle questions of priorities between claimants under railroad land-grant acts. The Trustees having arrived at the resolution above set forth, determined not to execute deeds under or by virtue of any railroad land-grant act of

the legislature; and upon the announcement of this decision and policy numerous suits were instituted to compel the Trustees to execute deeds under and by virtue of the various land grants represented by the various railroad companies, and active litigation followed, beginning in the year 1902.

During the Jennings administration, ending January 1, 1905, no deeds were executed by the Trustees of the Internal Improvement Fund under and by virtue of any railroad land-grant acts, either voluntarily or under compulsion by the courts.

Contention of Trustees sustained by court.—The contention of the Trustees of the Internal Improvement Fund, based upon the decision of the Trustees in 1901, and observed by them subsequently, has been expressly sustained by the courts, and does not appear to be longer a question of controversy. The whole subject matter was resolved in one case, that of the Southern States Land & Timber Co., before Judge Swayne, upon an application to enjoin the Trustees from the exercise of any discretionary power over the fund or any disposition of any of the lands for any purpose other than to deed them to railroad companies under their respective land grants made by the legislature, and especially as expressed in the prayer of the bill in this language:

> That the Trustees be enjoined from selling or disposing of any of the lands patented to the State of Florida by the act of Congress of September 28, 1850, and from pledging, encumbering, or otherwise charging the same or any part thereof for the purpose of drainage and reclamation, and further, for a perpetual writ of injunction enjoining and restraining said trustees from selling or otherwise disposing of or charging said lands for the purpose of drainage and reclamation under any contract or otherwise.

This proposition involved the entire fund. It was a test case, tacitly agreed upon by all the railroad companies, and so presented. The Trustees, on the one hand, claimed that they had the power to do all of the things complained of and full discretion to sell and dispose of the lands, and to use the proceeds thereof for purposes of drainage and reclamation; and, as it will be observed, the railroad land-grant claimants claimed that the lands of the entire fund belonged to them, and were not subject to sale and disposition by the Trustees for the purpose of drainage and reclamation. This whole case was raised by this bill of complaint, and the whole fund, its management and disposition, depended upon the result thereof. After argument, the court made provision under an order for a temporary injunction, as follows:

> That said Trustees shall have the right to sell or otherwise dispose of said lands a number of acres not exceeding 100,000, for the purpose of using the proceeds for purposes of drainage and reclamation, and shall have the right, after six months from this date, to make application to this court for further order touching the sale or disposition of said lands for purposes of drainage and reclamation and paying the expenses of the trust.

An order embracing the above was signed by Judge Swayne on the 2d day of May, 1907. It will be observed that he expressly authorized and empowered the Trustees to sell or otherwise dispose of said lands as stated, for the express purpose of using the proceeds for the purpose of drainage and reclamation, and to apply to the court for authority and permission to sell more lands at the end of six months, for the purpose of drainage and reclamation and paying the expenses of the trust. This is the most important decision rendered in connection with the fund during its 50 years' existence. It expressly upholds the contention of the Trustees and the policy adopted in 1901 and since observed and followed.

This decision was followed by notice and motion of counsel representing the various railroad companies for a modification of said injunction, and a request for an order in accordance with the prayer of the bill quoted above. The cause came on for hearing, and was reargued before Judge Swayne, argument closing on the 20th day of May, at which time the judge modified the order in some immaterial part, but declined to change or revoke the feature authorizing the Trustees to sell or dispose of or incumber any of said lands for the purpose of drainage and reclamation, which seemed to settle the whole subject of the main and general litigation against the Trustees, which was followed by the settlements mentioned, all of which were based upon questions of contracts or certificates issued by the Trustees of the Internal Improvement Fund prior to 1901.

In the case of Malone, a grantee of the Trustees, against Yoeman, in the sixth judicial circuit of the State of Florida in and for De Soto County, a decision was rendered squarely on the merits of the contention of the Trustees, which clearly established that the title vested in the Trustees is superior to the residuary interest granted to the railroad companies by the railroad land-grant acts of the legislature. This suit was in ejectment; the issues were made up upon a statutory declaration and plea of not guilty, the plaintiff claiming title by virtue of a deed from the Trustees of the Internal Improvement Fund; the defendant claiming title by deed based upon a legislative land grant to the Gainesville, Ocala & Charlotte Harbor Railroad Co., approved March 4, 1879.

Thus it will be seen that the litigation has been favorable to the Trustees of the Internal Improvement Fund, and that no suit has been neglected or lost or decided adversely to the Trustees, of the suits above enumerated, based upon open land-grant claims, or touching the powers and duties of the Trustees in the exercise of their discretion in the management of the fund, the sale of the land, and the use of the proceeds thereof for the purpose of drainage and reclamation.

Jennings's efforts to begin actual drainage.—During the latter part of the Jennings administration, a comprehensive plan for the drainage of the Everglades was prepared and submitted to the officers of the Southern States Land & Timber Co., the Consolidated Land Co., and other companies owning great areas of land in the Everglades, and several conferences were had between the officials of the land companies and the Trustees of the Internal Improvement Fund. These plans for drainage and reclamation work were merged in the subsequent settlements and plans for drainage followed by the subsequent administrations.

The policy of the Jennings administration, as will appear by the minutes adopted by the Trustees of the Internal Improvement Fund (vol. 5, p. 267), establishing and declaring the fixed policy of the administration to be that of drainage and reclamation, is further shown by the testimony of Gov. Jennings in the suit of the Louisville & Nashville Railroad Co. against the Trustees of the Internal Improvement Fund in the United States court, taken at Tallahassee, Fla., on November 28, 1904, in which he stated that he thought it was the purpose of the act of Congress, and that he as a Trustee understood and acted upon the belief, that his first and chief duty in handling the swamp and overflowed lands was to have these lands drained and reclaimed. (See note 5, p. 24.)

Gov. Jennings' term expired soon after this testimony was taken, viz, on January 3, 1905, at which date Gov. N. B. Broward was inaugurated. Within a few days thereafter former Gov. Jennings was employed as general counsel of the Trustees of the Internal Improvement Fund; and immediately thereafter Jennings wrote a letter to Gov. Broward, calling particular attention to the Louisville & Nashville Railroad suit and the purpose of the testimony, urging the immediate launching of a dredge, and the beginning of actual drainage operations in the Miami River, or that the Trustees should determine at which place the work should begin, at an early date. (See note 6, p. 25.)

Chamber survey.—Prior to the close of the Jennings administration the governor requested the Commissioner of Agriculture to prepare a plat or chamber survey of the Everglades, which was made and officially adopted by the Trustees of the Internal Improvement Fund on the 2d day of January, 1905, and appears in the minutes of the Trustees, volume 6, pages 1 to 7. (See pp. 97–98.) Further information relating to the map of the Everglades, and supplemental thereto, appears in volume 7, pages 66 to 71, and resolutions on the subject.

This map of the lands embraced in Everglades patent No. 137 was made by extending through the Everglades the Government township and range lines, as surveyed and located by the United States Government on the East, North, and West sides of the Everglades. The townships and ranges thus formed and platted in the Everglades are numbered according to the United States survey system, and with the same numbers they would be designated with if the Government survey were actually carried through the Everglades.

Drainage work under Gov. Broward's administration.—On September 21, 1905, Capt. J. O. Fries, civil engineer, reported to the Trustees of the Internal Improvement Fund a preliminary survey of a route between Lake Okeechobee and the Atlantic Ocean for the purpose of draining and reclaiming lands in that vicinity. (See note 7, p. 26.)

On November 6, 1905, V. P. Keller, a civil engineer, made for the Trustees a map of part of the Everglades, showing the profile of the drainage canals from Lake Okeechobee to Lake Worth. (See Minutes of Trustees of Internal Improvement Fund, vol. 6, p. 89.)

On November 9, 1905, the Trustees directed John W. Newman, engineer, to proceed to make a hydrographic and topographical survey of New River from Fort Lauderdale, including both the north and south branches of said river, to a point in the Everglades where the altitude approximates the mean low-water level of Lake Okeechobee, and to prepare profiles of said survey. (See Minutes of Trustees of Internal Improvement Fund, vol. 6, p. 91.)

On December 12, 1905, the route recommended by J. W. Newman, engineer, was adopted by the Trustees of the Internal Improvement Fund as the official route of the first drainage canal, from the mouth of Sabate Creek, in section 19, township 50 south, range 42 east, following the open Glades to the south end of Lake Okeechobee. (See note 8, p. 26.)

In a special message to the Legislature of Florida in 1905 Gov. Broward recommended the adoption of a drainage law, for the purpose of providing additional funds to insure the drainage and recla-

mation of the Everglades, some question having been raised by the railroad land grant claimants as to the powers and duties of the Trustees of the Internal Improvement Fund to use the proceeds of the sales of Everglades lands for the purpose of drainage and reclamation at that time.

The drainage-tax law and operations thereunder.—Pending the litigation referred to between the railroad land grant claimants against the Trustees of the Internal Improvement Fund as to the ownership of the Everglades, at the beginning of Gov. Broward's administration, January, 1905, former Gov. Jennings designed and prepared a drainage-tax law defining a drainage district embraced in the Everglades, and providing for an acreage tax of 5 cents per acre per annum, to be assessed against all of the lands in said drainage district, as an auxiliary or supplementary resource or fund to assure the drainage of the Everglades without regard to the ownership of the lands. (See note 9, p. 27.) This law was attacked as being unconstitutional, and during the lawsuit a great volume of testimony was taken touching the feasibility and practicability of drainage. The United States court having ruled against the constitutionality of the law, an amendment thereof was drafted by former Gov. Jennings, which was enacted by the legislature and approved May 28, 1907. (See note 10, p. 27.) This amended act was sustained by the decision of the United States circuit court and the United States circuit court of appeals, and the litigation was then amicably settled between the litigants and the State Board of Drainage Commissioners, resulting in the appointment of J. O. Wright, chief drainage engineer, and the Furst-Clark Construction Co.'s contract for the drainage of the Everglades, herein referred to.

It will therefore be observed that the drainage of the Everglades has two separate and distinct sources of revenue providing for the carrying on of the work of reclamation:

First. The Everglades lands proper, owned and controlled by the Trustees of the Internal Improvement Fund, who are authorized and fully empowered under the act of January 6, 1855, to sell such lands and apply the proceeds thereof to the purpose of drainage and reclamation. The drainage canals and other works which have been constructed by the Internal Improvement Board, out of the proceeds of the sales of Everglades lands, are properly within their powers and duties conferred on them by the acts of the legislature and the act of Congress of 1850.

Second. The new and additional source of revenue provided by the enactment of the drainage law, which assesses a tax on the area included in the drainage district of 5 cents per acre per annum, furnishing an annual net revenue of approximately $200,000.

After the enactment of the drainage law, and in the ensuing litigation, the most difficult problem and matter from the State's standpoint was the allegation made in the courts on behalf of the complainants seeking to enjoin the collection of the tax and to have the drainage law declared unconstitutional, to the effect that the State authorities did not have sufficient technical information touching the feasibility and practicability of the drainage of the Everglades to sustain a special assessment and the expenditure of public money.

Practicability of Everglades drainage.—To meet this charge the State officials, through Gov. Broward, applied to the Secretary of

Agriculture for assistance in the matter of designating a competent, expert drainage engineer to investigate the question of the feasibility and practicability of the drainage of the Everglades, by taking the levels and making such examination as was found necessary for this purpose, having in view the necessity of obtaining, to meet this allegation of the complainants' bills, as well as for the use of the State engineer in charge of the drainage of the Everglades, the most reliable and competent information that could be procured. The Secretary of Agriculture considered the request favorably and ordered the investigation to be made through the Office of Experiment Stations, Irrigation and Drainage Investigations, Elwood Meade, chief, by J. O. Wright, supervising drainage engineer. (See pp. 130 and 140 for texts of Wright reports.)

The State school fund.—Gov. Broward also caused an investigation to be made into the legal status and constitutional rights of the State school fund over the public lands, which resulted in an opinion of W. S. Jennings, general counsel for the Trustees of the Internal Improvement Fund, under date of October 19, 1907, transmitting a resolution for adoption by the State Board of Education on the subject, which was adopted and transmitted to the Trustees of the Internal Improvement Fund, accompanied by a demand for an accounting in accordance therewith, which was acceded to by the Trustees, and an accounting was ordered granting to the State Board of Education 25 per cent of the proceeds of the sales of public lands under the constitutional provision relating thereto. This was followed in February, 1908, by the opinion of W. H. Ellis, Attorney General, in reply to an inquiry on the subject by Gov. Broward, to the same effect, holding that the school fund, under the State constitution, was entitled to 25 per cent of the proceeds of the sales of all public lands of Florida. (See note 11, p. 28.)

As heretofore stated, the drainage act was passed, and afterwards an amendment thereto was recommended by the Governor, and likewise passed, and is the law.

During his administration Gov. Broward was a forceful champion and advocate of the drainage and reclamation of the Everglades, and devoted great effort and much ability to the work, as did his associate Trustees. The Trustees during the Broward administration caused to be constructed the dredge *Everglades*, which was launched at Fort Lauderdale on the 4th day of July, 1906; also the dredge *Okeechobee*, which was launched during the month of October, 1906. The dredges *Caloosahatchee* and *Miami* were constructed under contracts let by the Broward administration on August 17, 1908. The *Caloosahatchee* was launched in March, 1909. (See Minutes of Trustees of Internal Improvement Fund, vol. 7, p. 293.)

The litigation relating to the title to the lands was settled, and several important sales of Everglades lands were made to provide means to carry on the great drainage work, among them being sales to J. H. Tatum & Co.; W. R. Comfort, of New York; R. P. Davie, of Colorado; the Davie Realty Co.; and Richard J. Bolles. The sale of the greatest moment, and that gave impetus to the work, was that to Richard J. Bolles, providing a million-dollar fund for the work, which, it is claimed, practically insured its completion.

Gov. Gilchrist's administration.—Gov. Albert W. Gilchrist and his associate Trustees have likewise pursued the work of the drainage a[illegible]

reclamation of the Everglades with the greatest energy and determination. They rushed to completion the construction of the dredges *Caloosahatchee* and *Miami*, which were launched during the first few weeks of the Gilchrist administration and have been kept continually at work since. Special attention has been given to increasing the facilities for carrying on the work with greater rapidity and efficiency.

During the latter part of 1909 special effort was made to let the cutting of the canals by contract, for the purpose of interesting large dredging concerns to take charge of the work and complete it as soon as possible.

During the early part of 1910 the Trustees held important conferences with the officials of the land companies owning large areas of Everglades lands, among them being Pearl Wight, president of the Southern States Land & Timber Co., of New Orleans; W. S. Harvey, president of the Empire Land Co., of Philadelphia; W. F. Coachman, president of the Consolidated Land Co., of Florida; J. E. Ingraham, vice president of the Model Land Co. and of the Florida East Coast Railway Co., of Florida; a representative of the Florida Land & Timber Co., of Chicago; and R. J. Bolles, which resulted in the land companies named, who were complainants in the suits pending in the Supreme Court of the United States to enjoin the collection of the 5-cent acreage tax, dismissing their suits and the companies agreeing to pay all drainage taxes thereafter, and in R. J. Bolles agreeing to the anticipation of the deferred payments to aid in financing an amplified plan of drainage. Immediately thereafter J. O. Wright, supervising drainage engineer of the United States, was engaged as chief drainage engineer of the State of Florida, to have charge of all its drainage operations in the Everglades. (Minutes of Trustees of Internal Improvement Fund, vol. 8, p. 352.)

This was followed by the letting of a dredging contract to the Furst-Clark Construction Co., of Baltimore, and an increase in the number of dredges from four to eight, thus insuring the progress of the great work at a rate which far exceeds any previous progress in excavation, as will appear by the quarterly progress reports of the engineers. (See p. 200.)

In the meantime sales of Everglades lands by the Trustees and other owners of Everglades lands have increased the number of individual owners of lands in the Everglades from about a dozen owners in 1909 to upward of 15,000 on July 1, 1911, and the valuation of Everglades land has been greatly enhanced. A conservative estimate of the increase in the value of Everglades land may be obtained by comparing the price of $2 per acre realized by the State for the sales made prior to 1909 with the price of $15 per acre obtained by the State for lands sold in 1910. Since the latter date prices have risen considerably.

Government engineer's report.—Notwithstanding the efforts made by Gov. Broward and Gov. Gilchrist to secure copies, or the publication of the report in full, of the Government engineers investigating the Everglades, Florida has not been favored with the valuable data, or any part thereof, contained therein, other than was published in extracts from said report heretofore referred to as extracts from the report of J. O. Wright, supervising drainage engineer, dated February 25, 1909; and while the main canals were officially designated in the contract between the Trustees of the Internal Improvement Fund

and Richard J. Bolles, under date of December 23, 1908, and are being cut as therein provided, the information contained in the Government engineers' reports, as published herewith, will no doubt be of great value to the future work incident to the drainage of the Everglades.

Conclusion.—The entire plans have been laid out for the drainage and reclamation of the Everglades by means of lowering the waters in Lake Okeechobee, as outlined by the State authorities years ago, and the reduction of the water level in the Everglades, thus making, it is believed, available and habitable approximately 3,000,000 acres of exceedingly fertile lands greatly favored by climatic conditions, and funds have been provided to complete the work, which, it is claimed, has been progressing satisfactorily and is about one-third completed.

The act of Congress approved June 25, 1910, making appropriations for rivers and harbors, among other appropriations for river and harbor work in Florida, made an appropriation for a—

survey of the Kissimmee and Caloosahatchee Rivers, and Lake Okeechobee and its tributaries, with a view to adopting a plan of improvement of said waters which will harmonize as nearly as may be practicable with the general scheme of the State of Florida for the drainage of the Everglades.

This survey work has been practically completed under the supervision of the United States Engineers' office for the District of Florida. The field notes and profiles have been completed, but the report has not as yet been acted upon by the Board of Engineers for Rivers and Harbors.

In the report of Buckingham Smith, transmitted to the Senate of the United States by Senator Breese, Chairman of the Committee on Public Lands, in 1848 (see p. 44), will be found a comprehensive treatise on the subject of the Everglades and the hopes indulged in respect thereto, enumerating many tropical fruits that grow in this area and not elsewhere in the United States, and other products, and stating that the Everglades is the only region that can be looked to as capable of rendering us to any extent whatever independent of other countries with respect to those productions.

NOTES TO HISTORY OF DRAINAGE AND RECLAMATION WORK IN THE EVERGLADES OF FLORIDA.

NOTE NO. 1.—MEMBERS OF BOARD OF TRUSTEES OF INTERNAL IMPROVEMENT FUND, STATE OF FLORIDA, FROM 1855 TO 1912.

1855 to 1858.—James E. Broome, governor; N. B. Papy, attorney general; Davis S. Walker, register; Theo. W. Brevard, comptroller; Charles H. Austin, treasurer.

1858 to 1860.—M. S. Perry, governor; N. B. Papy, attorney general; Davis S. Walker, register; Theo. W. Brevard, comptroller; Charles H. Austin, treasurer

1860 to 1861.—M. S. Perry, governor; N. B. Papy, attorney general; H. A. Corley, register; Thos. W. Brevard, comptroller; Charles H. Austin, treasurer.

1861 to March 4, 1861.—M. S. Perry, governor; N. B. Papy, attorney general; H. A. Corley, register; R. C. Williams, comptroller; Charles H. Austin, treasurer.

March 4, 1861, to December 10, 1861.—M. S. Perry, governor; J. B. Galbraith, attorney general; H. A. Corley, register; R. C. Williams, comptroller; Charles H. Austin, treasurer.

December 10, 1861, to January 16, 1865.—John Milton, governor; J. B. Galbraith, attorney general; H. A. Corley, register; Walter Gwynn, comptroller; Charles H. Austin, treasurer.

January 16, 1865, to November 17, 1865.—A. K. Allison, governor; J. B. Galbraith, attorney general; H. A. Corley, register; Walter Gwynn, comptroller; Charles H. Austin, treasurer.

November 17, 1865, to January 9, 1866.—Charles H. Austin, temporary president; J. B. Galbraith, attorney general; H. A. Corley, register; Walter Gwynn, comptroller; William Marvin, provisional governor (not acting as trustee); Charles H. Austin, treasurer.

January 9, 1866, to July 1, 1868.—Davis S. Walker, governor; J. B. Galbraith, attorney general; H. A. Corley, register; John Beard, comptroller; Charles H. Austin, treasurer.

August 31, 1868, to January 7, 1872.—Harrison Reed, governor; A. R. Meek, attorney general; John S. Adams, commissioner of immigration; R. H. Gamble, comptroller; S. B. Conover, treasurer.

January 7, 1872, to February 26, 1872.—Harrison Reed, governor; J. B. C. Drew, attorney general; John S. Adams, commissioner of immigration; R. H. Gamble, comptroller; S. B. Conover, treasurer.

February 26, 1872, to May 7, 1872.—Samuel T. Day, governor; Horatio Bisbee, jr., attorney general; John S. Adams, commissioner of immigration; R. H. Gamble, comptroller; S. B. Conover, treasurer.

May 7, 1872, to January 11, 1873.—Harrison Reed, governor; J. P. C. Emmons, attorney general; John S. Adams, commissioner of immigration; R. H. Gamble, comptroller; S. B. Conover, treasurer.

January 11, 1873, to May 21, 1874.—O. B. Hart, governor; William Archer Cocke, attorney general; H. A. Corley, commissioner of lands and immigration; C. A. Cowgill, comptroller; Charles H. Foster, treasurer.

May 21, 1874, to January 16, 1877.—M. L. Stearns, governor; William Archer Cocke, attorney general; Dennis Eagan, commissioner of lands and immigration; C. A. Cowgill, comptroller; Charles H. Foster, treasurer.

January 16, 1877, to January 4, 1881.—George F. Drew, governor; George P. Rainey, attorney general; H. A. Corley, commissioner of lands and immigration; Columbus Drew, comptroller; Walter Gwynn, treasurer.

January 4, 1881, to March 8, 1882.—William D. Bloxham, governor; George P. Rainey, attorney general; H. A. Corley, commissioner of lands and immigration; William D. Barnes, comptroller; Henry L. Engle, treasurer.

March 8, 1882, to January 13, 1885.—William D. Bloxham, governor; George P. Rainey, attorney general; P. W. White, commissioner of lands and immigration; William D. Barnes, comptroller; Henry L. Engle, treasurer.

January 13, 1885, to January 9, 1889.—Edward A. Perry, governor; C. M. Cooper, attorney general; C. L. Mitchell, commissioner of lands and immigration; William D. Barnes, comptroller; Edward S. Crill, treasurer.

January 9, 1889, to May 8, 1890.—F. P. Fleming, governor; W. B. Barnes, comptroller; F. J. Pons, treasurer; W. B. Lamar, attorney general; L. B. Wombwell, commissioner of agriculture.

May 8, 1890, to January 5, 1892.—F. P. Fleming, governor; W. D. Bloxham, comptroller; F. J. Pons, treasurer; W. B. Lamar, attorney general; L. B. Wombwell, commissioner of agriculture.

January 5, 1892, to January, 1893.—F. P. Fleming, governor; W. D. Bloxham, comptroller; E. J. Triay, treasurer; W. B. Lamar, attorney general, N. B. Wombwell, commissioner of agriculture.

January, 1893, to January, 1897.—Henry L. Mitchell, governor; W. D. Bloxham, comptroller; C. B. Collins, treasurer; W. B. Lamar, attorney general; N. B. Wombwell, commissioner of agriculture.

January 7, 1897, to June, 1897.—W. D. Bloxham, governor; W. H. Reynolds, comptroller; C. B. Collins, treasurer; W. B. Lamar, attorney general; N. B. Wombwell, commissioner of agriculture.

June, 1897, to January, 1901.—W. D. Bloxham, governor; W. H. Reynolds, comptroller; J. B. Whitfield, treasurer; W. B. Lamar, attorney general; N. B. Wombwell, commissioner of agriculture.

January 4, 1901, to August 9, 1901.—W. S. Jennings, governor; W. H. Reynolds, comptroller; J. B. Whitfield, treasurer; W. B. Lamar, attorney general; B. E. McLin, commissioner of agriculture.

August 9, 1901, to February 18, 1903.—W. S. Jennings, governor; A. C. Croom, comptroller; J. B. Whitfield, treasurer; W. B. Lamar, attorney general; B. E. McLin, commissioner of agriculture.

March 23, 1903, to February 12, 1904.—W. S. Jennings, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; J. B. Whitfield, attorney general; B. E. McLin, commissioner of agriculture.

May 17, 1904, to January 4, 1905.—W. S. Jennings, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; W. H. Ellis, attorney general; B. E. McLin, commissioner of agriculture.

January 19, 1905, to January 4, 1909.—N. B. Broward, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; W. H. Ellis, attorney general; B. E. McLin, commissioner of agriculture.

January 6, 1909, to ———, 1912.—A. W. Gilchrist, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; Park M. Trammell, attorney general; B. E. McLin, commissioner of agriculture.

MEMBERS OF THE BOARD OF DRAINAGE COMMISSIONERS UNDER THE DRAINAGE TAX LAW.

1905 to 1909.—N. B. Broward, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; W. H. Ellis, attorney general; B. E. McLin, commissioner of agriculture.

1909 to 1912.—A. W. Gilchrist, governor; A. C. Croom, comptroller; W. V. Knott, treasurer; Park Trammell, attorney general; B. E. McLin, commissioner of agriculture.

NOTE NO. 2.—AGREEMENT BETWEEN HAMILTON DISSTON AND TRUSTEES OF THE INTERNAL IMPROVEMENT FUND FOR THE RECLAMATION OF OVERFLOWED LANDS.

Articles of agreement made and entered into this the 26th day of February, A. D. 1881, by and between Hamilton Disston, William H. Wright, and Whitfield H. Drake, of the city of Philadelphia, in the State of Pennsylvania, William C. Parsons, of Arizona, Albert B. Linderman, of the city of Philadelphia aforesaid, and Ingham Corvell, of the State of Florida, parties of the first part, and William D. Bloxham, governor of Florida, George P. Rainey, attorney general, Hugh A. Corley, commissioner of lands and immigration, Walter Gwynn, treasurer, and William D. Barnes, comptroller of said State, and ex officio the Trustees of the Internal Improvement Fund of the State of Florida, of the second part, witnesseth:

That the parties of the first part, for themselves, their heirs, executors, administrators, jointly and severally agree and bind themselves, at their own expense and charge, to drain and reclaim by draining all overflowed lands in the State of Florida practi-

cable and lying south of township 23 and east of Peace Creek, belonging to the State of Florida or said Internal Improvement Fund, now subject to overflow by Lake Okeechobee, the Kissimmee River and its branches, and the lakes contiguous to said river whose waters now flow into, or can be made to flow into, said river or into Lake Okeechobee, or into the Caloosahatchee River, or Miami River, or other outlets, by cuts or canals, including both those already patented as well as those that may hereafter be patented to said State by the United States, the said lands to be reclaimed and drained and rendered fit for cultivation by permanently lowering and keeping reduced the waters of Lake Okeechobee, and thereby permanently lowering and keeping reduced the high-water level of said river, and by thus lowering the waters of said lake creating an increased current in said river, and by the increased current thus created causing the bed of said river to cut or wash out, and by these means and by cutting off bends in said river to further increase the current of said river and permanently confine the water flow of said river within its natural banks, and thereby effectually and permanently prevent the overflow of the banks; it being understood and agreed that the drainage, reduction, or lowering of the waters of Lake Okeechobee may be made by a series of canals or cuts from the waters of said lake to the Caloosahatchee River, on the west, and by cuts and canals from said lake eastwardly to the waters of the St. Lucie, or other available points; and also by cuts or canals southwardly to some stream or streams through the Everglades; and also by cuts or canals on the southeast side of the Everglades to the Miami River and to any small streams heading or rising in the Everglades: *Provided, however*, That no canals or cuts shall be made, dug, or constructed unless the same be necessary to reduce the waters of said Lake Okeechobee, to effect the said object of drainage and permanently reclaim said lands. * * *

The parties of the second part, for themselves and their successors in office, do agree and bind themselves, and their successors in the administration of said trust, that they will, and their successors shall, pay, give, grant, convey, and deed the alternate sections of land, belonging to the State or to their fund, now patented or that may be hereafter acquired, within the limits of this contract, which may be reclaimed and thus rendered fit for cultivation; such lands to be conveyed in such quantities and at such times as may be justified by the progress of the work, and will be equitable and just to the said parties hereto; it being mutually agreed that the policy of the board of trustees will at all times be such as not to pay in excess of the work done, and yet to such extent and at such times at will facilitate and aid the faithful performance of the covenants of the parties of the first part: *Provided, however*, That no lands or compensation shall be conveyed or payable to said parties of the first part until some considerable quantity of lands, not less than 200,000 acres, shall have been reclaimed. * * *

It is further understood and agreed that all work shall be done in a substantial and first-class manner, and that time is to considered as the essence of this contract. * * *

(Minutes of the Trustees of the Internal Improvement Fund, vol. 2, pp. 463–466.)

NOTE NO. 3.—ABSTRACT OF REPORT BY J. J. DANIEL, W. H. DAVISON, AND JOHN BRADFORD, COMMITTEE APPOINTED BY THE GOVERNOR OF FLORIDA ON NOVEMBER 17, 1885.

To the GOVERNOR OF THE STATE OF FLORIDA.

SIR: Having been appointed by you, under date of November 17, 1885, to perform certain duties indicated and prescribed by chapter 3639 of the laws of the State of Florida, entitled "An act authorizing the governor to appoint a committee to investigate and ascertain what quantity of land and the number of acres the Atlantic and Gulf Canal and Okeechobee Land Company has reclaimed for the State, and other purposes," we respectfully report that we have concluded the investigation contemplated by said act and submit the following statement of facts as the result thereof:

* * * * * * *

The Atlantic & Gulf Canal & Okeechobee Land Co., which for greater brevity we will hereafter designate as the Drainage Co., has dug a canal from the East Tohopekaliga Lake, which is now known and will be designated in this report as East Lake, to and into Lake Tohopekaliga, the length of which is 3.2 miles, the width from 33 to 36 feet, and the depth from 4 to 7 feet.

The least depth of water found was 22 inches, and the average current 1½ miles per hour. From the south end of Lake Tohopekaliga, at a point near the former outlet of the Kissimmee River, now known as Southport, the company has dug a canal to

and into Cypress Lake, the length of which is 3.6 miles, the width 70 feet, and the depth from 5 to 8 feet, with an average current of 1½ miles per hour.

From Cypress Lake to Lake Hatchineha a canal has been dug 2.4 miles in length, 70 feet in width, and from 4 to 6½ feet in depth.

During the past summer a canal has been cut from Hatchineha in the direction of Lake Kissimmee and to within a few hundred yards of the latter lake. This canal has not been completed. Its width is reported to be 36 feet.

Below Lake Kissimmee there have been several cuts made across loops or bends in the river the entire length of which approximates 2 miles, the width varying from 45 to 60 feet, and depth from 2½ to 6 feet. These cuts are on the upper part of the river between Lake Kissimmee and Orange Bluff. This point is estimated to be about 30 miles from the south end of Kissimmee Lake, and below it to Lake Okeechobee there has been no work of any moment done by the Drainage Co. From a point on the southwest side of the Okeechobee a canal has been dug 25 feet in width and from 4 to 7 feet in depth, a distance of 2.57 miles, with an average current of 1½ miles per hour, connecting the waters of the Okeechobee with Lake Hicpochee.

From Lake Hicpochee to Lake Flirt a canal has been dug a distance of about 4 miles, the cut being 46 feet in width and from 4 to 10 feet in depth, with a current of 1½ miles per hour.

After reaching Lake Flirt a series of cuts have been made westward along and near this lake and into the headwaters of the Caloosahatchee River for a distance of about 9 miles, varying from 40 to 45 feet in width and from 2 to 7 feet in depth.

The width of these canals we give from actual measurements made at different points. Soundings were taken along their entire course and by cross sections at short intervals, and speed of current noted. The length we give as reported by the company's engineers, whose statements correspond substantially with our observations and measurements.

Below Lake Flirt the Drainage Co. has expended a good deal of work in opening and cleaning the channel of the Caloosahatchee, through a limestone ridge above Fort Thompson, at a point known as the rapids.

In addition to this work we find that the company has, by the use of a snag boat, cleared away the obstructions in Tiger Creek, an important tributary of the Kissimmee, which enters Lake Kissimmee from the west, connecting it with Tiger Lake, Lake Rosalie, and Walk-in-the-water Lake, making this stream practicable for the lighter class of steamers which navigate the river into Lake Rosalie, and under favorable circumstances, to a point above that lake.[1] * * *

Your committee reached Kissimmee City on the 20th of February, 1886, and proceeded from that point down the river, through the lakes to Fort Myers, making the examinations, the results of which, verified by the statements of reliable witnesses, as well as by subsequent observations, are given in this report. * * *

Your committee found by examination that the waters of East Lake, at the time of their last visit in the latter days of February, had been lowered about 6½ feet. This lowering of the waters was to be attributed largely, if not altogether, to the opening of the canal. * * *

Lake Tohopekaliga your committee found to be about 5½ feet below its highest level before the canal from Southport to Cypress was cut, as shown by persons long resident and familiar with the waters of the lakes. Proceeding southward along the Southport Canal, the level of the waters and adjacent marshes gradually approximated until, at a distance of a little more than 2 miles from the south end of the Tohopekaliga, being about two-thirds of the distance between the two lakes, the waters were no longer confined to the banks of the canal, but flowed freely over the lowlands on either side, and your committee found, on reaching Cypress Lake, from actual observation and the statements of persons connected with the drainage work from its inception, the waters of the lake were nearly at their normal height.

From this point southward to Lake Okeechobee, both from their own careful observations and from the statements of settlers and persons thoroughly acquainted with the river and lakes, your committee are satisfied that very little effect has been produced upon the waters along their route by the opening of these canals.

In other words, the facts show that from Cypress Lake to Lake Okeechobee the canals which have been dug have not thus far exhibited sufficient capacity to carry off the waters along the route or materially reduce their normal level.

That the canal from Lake Okeechobee to Lake Hicpochee had not materially lowered the waters of the former lake was evident, though even so small an outlet can not but have produced some effect. * * *

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[1] In the report of the general counsel for the Trustees of the Internal Improvement Fund for Sept. 16, 1908 (vol. 7, p. 416, of minutes), it is stated that "After this, the South Canal was cut 10 miles long and 40 feet in width, making an approximate total of 90 miles of canals cut, 70 miles of which being in the vicinity of the town of Kissimmee."

The canals below Lake Hicpochee and through Lake Flirt into the headwaters of the Caloosahatchee were evidently producing some results. * * *

From Fort Thompson westward to the Gulf the waters were at their normal level. No outlet had been provided by the Drainage Co., and no change could be expected. * * *

The permanent lowering of the waters of Lake Okeechobee, the Kissimmee River, its lakes and tributaries, was and is the main feature of the whole plan of drainage as embodied in the contract made with the Trustees. * * *

The effect of the lowering of the waters of Lake Tohopekaliga and East Lake, on the contiguous marshes adjacent to the country, when examined by the committee in February and March of 1886, was very marked. At Narcoosee, on the east side of the lake, at which point an English colony have located, and on the west side of this lake where the canal enters the cross prairie, and at Southport and several other places on the Tohopekaliga, extensive areas of marsh lands were ditched and being prepared for crops, plows were upturning the rich mold, and, notably at Southport, large crops of vegetables were in process of cultivation. The creeks leading into the lakes for some distance back were sensibly reduced and their waters running with rapid current, while the adjacent country, for a considerable distance, was visibly affected by the drainage operations.

From Cypress Lake southward, however, the committee found the waters of the lakes and rivers very nearly at their normal level; neither Okeechobee nor the rivers and lakes above had been either permanently or sensibly lowered by these canals. * * *

Below Lake Cypress they (the committee) did not find the watercourses sensibly lowered or reduced by the work of the company, except in Lake Flirt and the Caloosahatchee above Fort Thompson and in the lakes at the head of Tiger Creek. * * *

After mature and careful deliberation, the committee find, and so report, that the only lands that can be considered reclaimed are those lying on and adjacent to East Lake and the Tohopekaliga, and these lands can not be treated as permanently drained until relief is given to the rivers and lakes below.

The number of acres so reclaimed they estimate at about 80,000. The reclaimed lands around East Lake, with proper subsidiary drainage, may be considered as fit for cultivation in any ordinary season, provided the canal is freed and kept free from bars and obstructions. * * *

While the company has not progressed as rapidly as may have been desired and expected, the progress made has been sufficient to establish, beyond any reasonable doubt, the practicability of the drainage scheme and the admirable quality of the soil when brought into condition for the cultivation of crops.

The commissioners not only considered the reclamation of these lands practicable, but are impressed with the fact that both the State and the drainage company will greatly profit by the reclamation, if fully carried out as contemplated in the contract made with the Trustees.

In this connection, your committee desire to express, in very positive terms, their conviction that the interests of the State and of the Drainage Co. are reciprocal in this matter.

So far as the State is concerned, the beneficial results to be anticipated from the reclamation of these lands can not well be overestimated, while the company will be amply compensated for the expenditure of money, time, and labor required by the increased value of the reclaimed lands to which they will be entitled under their contracts. * * *

Notwithstanding the experience of the past summer, we are satisfied that the plan of drainage outlined in the contract between the Trustees and the Drainage Co. can be carried out and will accomplish the object proposed.

The scheme of drainage contemplated is one of great magnitude and of the utmost importance to the State. The area of country embraced is estimated at 15,000 square miles, or over 9,000,000 acres, extending from the foothills of Orange County to the southernmost point of the peninsula. Vast as is this area, and extensive as is the drainage required, we feel assured that the problem is capable of solution with an expenditure of money, time, and labor not disproportionate to the results to be reasonably anticipated; and that the plan outlined in the contract, if carried out in its fullness, will accomplish the object desired * * *.

The reduction of the waters is simply a question of sufficient capacity in the canals which may be dug for their relief.

Lake Okeechobee and the Everglades, which form a part of its great basin, furnish the receptacle for the drainage of the vast region embraced in the drainage district. The lake, at its normal level, is 20.24 feet above mean tidewater.

It needs no demonstration to show that if sufficient outlet is afforded, Lake Okeechobee may be reduced so as to receive, without engorgement, the waters which flow

into it. The lowering of this lake is, by the contract with the trustees, made the basing point of the whole drainage scheme. If sufficient vent be given to its waters and their level is sufficiently reduced, an opportunity is given to relieve the country above.

Without permanent lowering of the Okeechobee there can be no complete reclamation of the region above. This is the primal and most important factor in the entire plan, which, by the terms of their agreement, the Drainage Co. is to carry into effect * * *.

We suggest that the Trustees employ a thoroughly competent, reliable, and skilled engineer, whose duty it shall be to make a complete topographical survey of the entire drainage district, with a view to the intelligent determination of what is required for its relief, and to see that the interests of the State are protected, and that the Drainage Co. complies with the terms of its contract.

In addition to what we have before said as to the character of the lands which have been or may be reclaimed under this contract, we desire to say that the marsh lands around East Lake, on the Cross Prairie, and around the Tohopekaliga, are of the very finest kind. Capt. R. E. Rose has now under cultivation several hundred acres of these lands, the fertility of which can not but impress the most casual observer. His farm, which he calls St. Cloud, is at the upper end of the Cross Prairie. The same character of soil is to be found at Haresfoot Farm and at Southport on the Tohopekaliga.

The saw-grass marshes below we consider to be still better and more valuable. We estimate that of these rich, alluvial lands there will be brought into market, if the drainage is prosecuted, not less than 500,000 acres, and not less than 500,000 acres of secondary or intermediate lands. There will remain 5,000,000 acres more of lands, excluding such as may be considered unreclaimable, the value of which will be largely increased by the drainage work * * *.

The drainage of this territory has long been the subject of discussion and many theories have been advanced regarding it. However interesting these theories may be, we have only to do with the facts bearing upon the contract between the Atlantic & Gulf Coast Canal & Okeechobee Land Co. and the Trustees, under the instructions with which we have been charged.

We have taken time to observe the condition of the waters in the drainage district at every season of the year, in order to test the permanent character of the work and better assure ourselves as to the correctness of the conclusions which we have reached.

The general view of the drainage problem, which we present for the consideration of the board, as requested by you, we submit with distrust as to our ability to advise upon a subject so important in its character, without more careful and accurate investigation than we have been able to make, but with the earnest desire to impress upon both of the contracting parties our profound conviction of the magnitude of the work required, and the larger benefits, both to the State and the company, of its successful accomplishment.

The interests of both parties are alike involved in the speedy completion of the work.

J. J. Daniel.
W. H. Davison.
John Bradford.

Note No. 4.—Resolution of the Trustees of the Internal Improvement Fund.

Therefore,

Be it resolved by the Trustees of the Internal Improvement Fund, all being present, That the Trustees adhere strictly to the provisions of the act of January 6, 1855, chapter 610, Laws of Florida, as to their powers and duties and the purposes for which said trust was granted, and that they will assert their rights and defend the title to the lands granted and irrevocably vested in them for the purposes therein set forth of reclaiming said lands by means of levees and drains.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 5, p. 267.)

Note No. 5.—Gov. Jennings's Testimony.

In the suit of the Louisville & Nashville Railroad Co. against the Trustees of the Internal Improvement Fund, instituted in the early part of 1902, in which the railroad company claimed the lands of the fund as against the Trustees, who were asserting superior rights to the lands, that the same might be used for the purposes of drainage

and reclamation, and during the taking of the testimony, on November 28, 1904, Gov. Jennings was called to the stand as a witness and was asked by counsel for the railroad company this question:

"Q. Do you know of any other disposition of these funds during your trusteeship, except payment of debts, anteceding the time you became governor, and the payment of current expenses of the board?—A. I do not recall any.

"Q. Have there been any sums paid for reclamation or drainage?—A. I think not."

Recross-examination:

"Q. Have you, as a trustee, understood and acted upon the belief that your first and chief duty in handling the swamp and overflowed lands was to have these lands drained and reclaimed?—A. Yes, sir; I think that was the purpose of the act, but we found the fund in such condition, so many claims by the railroads and other claims against that fund, that we have not been able to undertake the work of draining and reclaiming any of the lands under the conditions surrounding the fund at the time.

"Q. Have you reason to believe, and do you believe, from your experience since you have been a trustee, that if the fund had not been tied up by litigation and held in the condition that it is on account of suits, advantageous arrangements might have been made to drain large parts of swamp and overflowed lands belonging to the fund?—A. I am under that impression. There was one small effort made in that Eloniah Canal matter, but most of it was under a former contract. We had hoped to carry out this policy, but have not been able to do so on account of the condition we found the fund in."

NOTE NO. 6.—LETTER OF W. S. JENNINGS, GENERAL COUNSEL OF THE TRUSTEES OF THE INTERNAL IMPROVEMENT FUND, TO GOV. N. B. BROWARD.

JANUARY 21, 1905.

Hon. N. B. BROWARD,
Governor and President Internal Improvement Board,
Tallahassee, Fla.

DEAR GOVERNOR: According to promise, I examined particularly into the question of the Louisville & Nashville Railroad suit and other matters that you discussed with me, and beg to thank you again for your expressed confidence.

I do not underestimate the burden that I am to assume in this work and am impressed with the importance of the work before the Trustees. While I am entirely confident of our former expressed views and conduct, I know that the railroad companies are relying with a great deal of confidence upon the stand they have taken and will find some decision tending to sustain them, which we must overcome. I can only repeat, as my only means of emphasizing the fact, that I deem it of the utmost importance to the success of the Trustees in the litigation that some work shall be begun to meet the allegations in the bill of the Louisville & Nashville Railroad, to the effect that the Trustees are not performing any of the trusts required of them under the law. This line of attack was clearly brought out during the taking of the testimony of the Louisville & Nashville Railroad suit some time last December; it was apparent that the effort there was to prove that the Trustees were not performing any of the trusts claimed by them in their pleadings.

Among other questions propounded to me as a witness was one inquiring, in effect, if I knew of any disposition of these funds during my trusteeship, except the payment of debts anteceding and during the time I was governor and the payment of the current expenses of the board, which I was unable to answer in the affirmative. I was further asked if there had been any sums paid for reclamation or drainage, which was likewise answered in the negative; but upon recross-examination I was asked by our counsel if I, as a trustee, understood and acted upon the belief that my first and chief duty in handling the swamp and overflowed lands was to have these lands drained and reclaimed, to which I answered in the affirmative, stating that I thought that was the purpose of the act, but that we found the fund in such condition—so many claims by the railroads and other claims against the fund—that we had not been able to undertake the work of drainage and reclaiming any of the lands under the conditions surrounding the fund at the time; that I had reason to believe, and did believe from my experience as a trustee, that if the fund had not been tied up by litigation and held in the condition that it is on account of suits advantageous arrangements might have been made to drain large bodies of swamp and overflowed lands belonging to the fund; that we hoped to carry out this policy, but had not been able to do so on account of the condition we found the fund in.

From our several conferences with Mr. Wisner I have become convinced that a suitable dredge could be purchased for from $25,000 to $35,000. In conversation some time ago with Mr. J. H. Tatum, of Miami, he informed me that he could procure, without any considerable cost to the Trustees, right of way over the waters of the Miami River into the Everglades and also suitable ground for dredge building and launching, which, I think, should be taken up at once and definite steps be taken to start even a small dredge, in order that our pleadings in these suits may be sustained by the facts and that the Trustees may be sustained in their efforts.

I have named the matter of financing the Trustees to Mr. Coachman, our president, and while no definite arrangement has been made about providing the money I feel confident that we can arrange with the Trustees to furnish them necessary funds up to $25,000 anyway for this purpose. I consider the launching of a dredge absolutely essential to the success of the litigation, and if you have not fully decided to start the dredge in the Miami River immediate steps should be taken to determine where the start should be made.

From my investigation of the law, I do not deem it advisable to propose a constitutional amendment on the subject of the drainage tax. I do think, however, that you should consider recommending to the legislature the adoption of a drainage law that would be fair to all landowners, without regard to ownership, so that in the event that the Trustees do not succeed in sustaining their views as heretofore expressed there will be a fund provided for carrying on the drainage work.

* * * * * * *

Yours, very truly,

W. S. JENNINGS, *General Counsel.*

NOTE NO. 7.—REPORT OF CAPT. J. O. FRIES ON PRELIMINARY SURVEY.

TALLAHASSEE, FLA., *September 21, 1905.*

* * * * * * *

Capt. J. O. Fries, civil engineer, appeared before the Trustees and reported the result of his labors in making a preliminary survey of a route between Lake Okeechobee and the Atlantic Ocean for the purpose of draining and reclaiming lands in that vicinity. He also presented an account for his services and expenses, amounting to $652.50, which was approved and ordered paid, after deducting the $150 already paid him on said account.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 6, p. 79.)

NOTE NO. 8.—RESOLUTION OF THE TRUSTEES OF THE INTERNAL IMPROVEMENT FUND ADOPTING CANAL ROUTE.

TALLAHASSEE, FLA., *December 12, 1905.*

* * * * * * *

It is resolved, That they adopt, as the route for the first canal to be dug by the Trustees of the Internal Improvement Fund, for the drainage and reclamation of the lands of the fund, and for the lowering of the waters of Lake Okeechobee to prevent their overflow, the route recommended by Mr. J. W. Newman, civil engineer, now in the employ of the Trustees, which route is described as follows: "Beginning at the mouth of Sabate Creek, at a stake marked 50, in section 19, township 50 S., R. 42 E., continuing thence south 70° W. 2,500 feet; thence N. 73° W. about 4½ miles to a stake marked 90; from this stake, turning north 32° W., following the open Glades to the south end of Lake Okeechobee."

The depth of the canal at the beginning is to be 10 feet; at the end of 1 mile it is to be 12.7 feet; at the end of 2 miles it is to be 14.6 feet; at the end of 3 miles it is to be 14.5 feet, continuing the same depth to stake No. 90, from which point the depth of the canal is to gradually diminish to 10 feet deep at Lake Okeechobee.

It is further resolved, That in digging northward, when we find waters having outlet to the Glades not through New River, but through some other river or creek, that we dig a canal eastward through such river or creek as an outlet for such waters.

The canal at the beginning to be 65 feet in width, and each outlet to the Everglades to be 50 feet in width, minimum dimensions.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 6, p. 96.)

NOTE NO. 9.—DRAINAGE TAX LAW APPROVED BY GOVERNOR MAY 27, 1905.

SECTION 1. The governor, the comptroller, the State treasurer, the attorney general, and the commissioner of agriculture of the State of Florida, and their successors in office, are hereby constituted and designated as a Board of Drainage Commissioners, and are hereby authorized and empowered to establish a system of canals, drains, levees, dikes, and reservoirs of such dimensions and depth as in the judgment of said Board of Drainage Commissioners is deemed advisable to drain and reclaim the swamp and overflowed lands within the State of Florida, or such parts or portions thereof as is deemed best by said Board of Drainage Commissioners from time to time, and to provide for the irrigation of the lands reclaimed, and to maintain such canals, drains, levees, dikes, and reservoirs in such manner as will be most advantageous to the territory so drained, the State of Florida, its inhabitants, and the commerce thereof.

SEC. 2. That the Board of Drainage Commissioners are hereby authorized and empowered to establish drainage districts and to fix the boundaries thereof in the State of Florida; that the Board of Drainage Commissioners be, and it is hereby, authorized and empowered to prepare a list or lists of all the alluvial or swamp and overflowed taxable lands within such drainage district or districts, and levy thereon an acreage tax not exceeding 10 cents per acre per annum to be fixed annually by said Board of Drainage Commissioners, and the various tax assessors of the various counties embraced in part or in whole within such drainage district or districts shall receive such list or lists and enter the same upon the tax rolls of the county or counties in which such lands may lie and the amount so levied by the Board of Drainage Commissioners in such manner and form as may be prescribed by the Board of Drainage Commissioners from time to time, which amount shall be collected by the various tax collectors of the counties wherein such levies have been made as other taxes are collected in accordance with law, and pay over said amounts collected to the Board of Drainage Commissioners.

SEC. 3. That the Board of Drainage Commissioners be, and it is hereby, authorized to exercise the right of eminent domain in the condemnation of lands for the location of its canals, drains, levees, dikes, and reservoirs for the purposes aforesaid, and may enter upon, take, and use such lands as it may, pending condemnation proceedings, deem necessary for such purposes, and in ascertaining the compensation to be paid for such land or right of way, benefits to be derived from such drainage shall be considered by the jury.

SEC. 4. That all laws and parts of laws in conflict with this act be and the same are hereby repealed.

SEC. 5. This act shall take effect upon its approval by the governor.

(Fla. Stats., chap. 5377, May 27, 1905.)

NOTE NO. 10.—DRAINAGE TAX LAW AS AMENDED MAY 28, 1907.

SEC. 2. That a drainage district is hereby established, beginning at the intersection of township line between townships 36 and 37, south and east, with the range line dividing ranges 31 and 32 and extending east along said township line to the intersection of the range line dividing ranges 39 and 40 and south to the intersection of township line dividing townships 41 and 42; thence east along said township to the intersection with the range line dividing ranges 41 and 42; thence south along said range line to the intersection of the township line dividing townships 51 and 52; thence west along said township line to the intersection of the section line dividing sections 3 and 4 in township 52, range 41 east; thence south along said section line to the waters of Biscayne Bay; thence along the coast line of said waters and the waters of the Gulf of Mexico to the point of the range line between ranges 31 and 32 intersecting with the coast line of the said Gulf of Mexico; thence north along said range line to the intersection of the township line between townships 36 and 37, the point of beginning. A tax of 5 cents per acre is hereby levied annually, including the year 1907, upon all the lands within said drainage district that were included in patents received by the State of Florida from the United States under act of Congress approved September 28, 1850. The net proceeds arising from said acreage tax shall be used and applied to the drainage and reclamation of the lands within said drainage district, described and established in this act. The Board of Drainage Commissioners shall prepare a list, or lists, of such patented lands and send them to the tax assessors of the several counties embraced in part or in whole within such drainage districts. And the tax assessors of the several counties embraced in part or in whole within such drainage district shall receive such list or lists and shall enter the same upon the tax rolls of the county or

counties within which said lands may lie, and the amount so levied by this act, and include said acreage tax in his warrant to the tax collector in the usual form prescribed by law, which amounts shall be collected by the several tax collectors of the counties wherein such levies have been made as other taxes are collected on real estate in accordance with law, and pay over said amounts so collected to the Board of Drainage Commissioners. Such moneys so collected shall be used exclusively for the purposes stated in this act within the said drainage district.

(Fla. Stats., chap. 5709, May 28, 1907.)

NOTE NO. 11.—LETTER AND MINUTES RELATING TO THE SCHOOL FUND.

OCTOBER 19, 1907.

Hon. N. B. BROWARD,
Chairman State Board of Education, Tallahassee, Fla.

DEAR SIR: I have prepared resolutions relating to the provisions found in the constitutions of 1868 and 1885 on the subject of the sources from which the common-school fund shall be derived, among them being 25 per cent of the sales of public lands, as stated in the said constitutions. I have given the matter considerable time, research, and thought, and have prepared resolutions along the lines that you suggested, which I am pleased to inclose herewith. My investigation of this question has resulted in findings as indicated and outlined by said resolutions, and leads me to conclude that, as counsel for the Trustees of the Internal Improvement Fund, I should not express an opinion thereon at this time.

Yours, very truly,

W. S. JENNINGS,
General Counsel, Trustees Internal Improvement Fund.

TALLAHASSEE, FLA., *March 30, 1908.*

* * * * * * *

The following certified copy of resolutions adopted by the State Board of Education were submitted to the Trustees:

Whereas section 4 of article 8 of the constitution of the State of Florida, adopted February 25, 1868, contains, among other provisions, the following:

> The common-school fund * * * shall be derived from the following sources: The proceeds of land or other property which may accrue to the State by escheat or foreclosure; the proceeds of all property granted to the State when the purpose of such grant shall not be specified; * * * 25 per cent of the sales of public lands which are now or may hereafter be owned by the State;

And whereas large areas of public lands had been granted the State of Florida by the Congress of the United States, two of the most important grants being the act of Congress approved March 3, 1841, and the act of Congress approved September 28, 1850, commonly known as the swamp and overflowed land grant act, under which acts the State of Florida became seized and possessed of upward of 20,000,000 acres of land, the greater portion of which lands had been vested in the State of Florida, prior to and at the date of the adoption of the aforesaid constitutional provision on the 23d day of February, 1868, and subsequent thereto;

And whereas the constitution of the State of Florida, adopted by the convention of 1885, that became effective January 1, 1887, contains among other things, at section 4, Article XII, under the subject of education, the following provision:

> That the State school fund * * * shall be derived from the following sources;

Among them being enumerated the following items:

> Twenty-five per cent of the sales of public lands which are now or may hereafter be owned by the State;

And whereas public lands are defined by high legal authority in the following language:

> "Public lands" is habitually used in legislation to describe such lands as are subject to sale or other disposal under general laws. (Anderson's Law Dictionary, Newhall *v.* Sanger, 92 U. S., 763; Worth *v.* Branson, 98 U. S., 118.)

And the second headnote in the Newhall *v.* Sanger case, above cited, reads as follows:

> The words "public lands" used in our legislation mean such as are subject to sale or other disposal under general laws.

And in delivering the opinion of the court in the above-entitled case, Justice Davis of the Supreme Court of the United States uses this language:

The words "public lands" are habitually used in our legislation to describe such as are subject to sale or other disposal under general laws. (Text, first page of decision.)

Whereas the State of Florida has disposed of several million acres of said public lands since the adoption of said constitutional provisions, which have been in full force and effect continuously since the adoption of the first provision in 1868, without any accounting or distribution or payment to the State Board of Education, or otherwise applying said constitutional proportion of 25 per cent or any other amount or per cent, to said fund as required by the constitution of the State of Florida, and the State Board of Education is advised that said constitutional provisions are in full force and effect, and that said school fund is entitled to 25 per cent of the sales of all public lands affected and under the provisions of the constitution above referred to: Now, therefore, be it, by the State Board of Education,

(1) *Resolved*, That it is the opinion of the State Board of Education that the State school fund, under said constitutional provisions, is entitled to receive and recover 25 per cent of the sales of all public lands of the State of Florida from the date that the constitution of 1868 became effective to the present time, being the proceeds from the sale of said public lands which have been owned by the State of Florida since the constitution of 1868 became effective, or may hereafter by owned by the State of Florida.

(2) *Resolved*, That an accounting be demanded of the Trustees of the Internal Improvement Fund of the State of Florida under the clauses of the constitution of 1868 and of the constitution of 1885, requiring that 25 per cent of the sales of public lands be paid to the State Board of Education for the use of the common-school fund as provided by the said constitutions, showing the total acreage of the public lands as of the date of February 23, 1868, the number of acres of public lands that have been vested in the State of Florida since the adoption of said constitution of 1868, the acreage sold since that date by the State of Florida, or by its authority or consent, the amounts of money received from said sales, the amounts paid over to the said common-school fund or to the State Board of Education for said fund, since said constitution of 1868 became effective, if any, and the total acreage of public lands vested in the State of Florida, or her grantees in trust not disposed of.

(3) *Resolved*, That the Trustees of the Internal Improvement Fund of the State of Florida be furnished with a copy of these resolutions, that the commissioner of agriculture of the State of Florida be furnished with a copy of these resolutions, and that the land clerk of the State Board of Education be furnished with a copy of these resolutions, and that said land clerk shall assist in the preparation and compilation of such data in the making and stating of the account referred to in the foregoing resolution.

N. B. BROWARD, *Governor*.

Attest:
W. M. HOLLOWAY, *Secretary*.

Adopted 22d day of October, 1907.

Upon motion it was

Resolved, That the accounting requested by the State Board of Education in said resolutions be made by the Trustees; and

Resolved further, That the secretary of the Trustees do proceed to make up an account and report same to the Trustees showing the total acreage of the land held by the Trustees as to the date of February 23, 1868, the number of acres of public lands that have been vested in the Trustees since the adoption of the State constitution of 1868, the acreage sold since that date by the Trustees or by their authority, the amounts of money received from said sales, the amounts paid over to the State school fund or to the State Board of Education for said fund since said constitution of 1868 became effective, if any, and the total acreage of public lands vested in the Trustees not disposed of.

Resolved further, That the secretary is directed to proceed at once to make up such accounting, and to continue the same with all reasonable dispatch, without intermission, until the said account shall be made up and submitted to the Trustees.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 7, p. 240.)

TALLAHASSEE, FLA., *September 2, 1908.*

* * * * * * *

Whereas on the 22d day of October, 1907, the State Board of Education of Florida adopted certain resolutions which were transmitted to the Trustees of the Internal Improvement Fund:

And whereas on the 21st day of November, 1907, the governor addressed a communication to the attorney general, as follows:

NOVEMBER 21, 1907.

Hon. W. H. ELLIS,
Attorney General, Tallahassee, Fla.

SIR: Section 4 of article 8 of the constitution of Florida contains among other provisions the following: "The common-school fund * * * shall be derived from the following sources, among others, 25 per cent of the sales of public lands which are now, or may hereafter be, owned by the State."

I have the honor to ask for your opinion as to whether or not this clause of the constitution is of full force and effect and is applicable to the lands in the hands of the Trustees of the Internal Improvement Fund of the State of Florida; and, if so, from what date and to what sales of public lands is the State school board entitled to an accounting and recovery?

I have the honor to be, very respectfully, N. B. BROWARD, *Governor.*

And whereas on the 5th day of February, 1908, the attorney general submitted to the governor his answer to said communication, as follows:

TALLAHASSEE, FLA., *February 5, 1908.*

Hon. N. B. BROWARD,
Governor, Tallahassee, Fla.

DEAR SIR: Your letter of recent date, requesting my opinion as to whether section 4, Article XII of the constitution, which provides among other things that "the common-school fund * * * shall be derived from the following sources * * * among others, 25 per cent of the sales of public lands which are now or may hereafter be owned by the State," is of full force and effect and is applicable to the lands in the hands of the Trustees of the Internal Improvement Fund of the State of Florida; and, if so, from what date and to what sales of said public lands is the State school board entitled to an accounting and recovery?

* * * * * * *

In my opinion the provision of the constitution of 1868, as well as that of 1885, is self-executing; it is a present application of public money arising from sale of public lands. The treasurer was the custodian of all funds. The superintendent of public instruction under the constitution of 1868 had the "administrative supervision" of all matters pertaining to public instruction, and the provision of the constitution referred to as applying 25 per cent of the sales of public lands to the common-school fund was a direction to the Trustees to so apply such portion of the sales.

The constitution of 1885 makes no material change, except vesting a "State Board of Education of Florida" with the power and duty of managing and investing all State school funds. The State Board of Education, therefore, has the right to demand an accounting from the Trustees of the Internal Improvement Fund of the State of Florida for 25 per cent of the proceeds of the sales of all lands contained in the Internal Improvement Fund from February 25, 1868 (or that have since been acquired and placed into said fund), to date, excluding only such sales as were made for the purpose of discharging a lien upon the fund held by the bondholders of the railroads which had acquired rights under the act of 1855 and such liens as may have been acquired prior to February 25, 1868.

Very respectfully,

W. H. ELLIS,
Attorney General.

And whereas on the 30th day of March, 1908, it was resolved by the Trustees of the Internal Improvement Fund that an accounting as aforesaid be made to the State Board of Education, and directed that the secretary of the Trustees do proceed to make up such account and report same to the Trustees;

And whereas such account has not yet been reported to the Trustees, on account of which it has not yet been practicable to make or offer any settlement between the Trustees and the State Board of Education on said account covering the period between said February 25, 1868, to said February 5, 1908;

And whereas it appears from the records of the Trustees of the Internal Improvement Fund that the Trustees have received, as proceeds of the sale of public lands between said February 5, 1908, and the 31st day of August, 1908, both inclusive, the sum of $33,299.75;

And whereas under the constitution and laws of Florida, as construed by the attorney general, 25 per cent of said amount of $33,299.75, said 25 per cent amounting to $8,324.94, is due and payable to the State Board of Education of Florida by the Trustees aforesaid:

It is therefore ordered by the Trustees of the Internal Improvement Fund that the said sum of $8,324.94 be this day paid to the State Board of Education of Florida.

And it is further ordered that hereafter, on the first day of each month, 25 per cent of the proceeds of all sales of public lands by the Trustees of the Internal Improvement Fund during the next preceding month shall be paid by the Trustees to the State Board of Education of Florida.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 7, pp. 313–322.)

II. TREATY, ACTS, RESOLUTIONS, REPORTS, AND PAPERS RELATING TO THE EVERGLADES OF FLORIDA.

TREATY OF 1819 WITH SPAIN CEDING FLORIDA TO THE UNITED STATES.

The United States of America and His Catholic Majesty, desiring to consolidate, on a permanent basis, the friendship and good correspondence which happily prevails between the two parties, have determined to settle and terminate all their differences and pretensions by a treaty, which shall designate, with precision, the limits of their respective bordering territories in North America.

With this intention the President of the United States has furnished with their full powers John Quincy Adams, Secretary of State of the said United States; and His Catholic Majesty has appointed the most excellent Lord Don Luis De Onis, Gonzales, Lopez y Vara, Lord of the town of Rayaces, Perpetual Regidor of the Corporation of the city of Salamanca, Knight Grand Cross of the Royal American Order of Isabella the Catholic, decorated with the Lys of La Vendee, Knight-Pensioner of the Royal and Distinguished Spanish Order of Charles the Third, Member of the Supreme Assembly of the said Royal Order; of the Council of His Catholic Majesty; His Secretary, with Exercise of Decrees, and His Envoy Extraordinary and Minister Plenipotentiary near the United States of America;

And the said Plenipotentiaries, after having exchanged their powers, have agreed upon and concluded the following articles:

ARTICLE 1. There shall be a firm and inviolable peace and sincere friendship between the United States and their citizens and His Catholic Majesty, his successors and subjects, without exception of persons or places.

ART. 2. His Catholic Majesty cedes to the United States, in full property and sovereignty, all the territories which belong to him, situated to the eastward of the Mississippi, known by the name of East and West Florida. The adjacent islands dependent on said provinces, all public lots and squares, vacant lands, public edifices, fortifications, barracks, and other buildings, which are not private property, archives and documents, which relate directly to the property and sovereignty of said provinces, are included in this article. The said archives and documents shall be left in possession of the commissioners or officers of the United States, duly authorized to receive them.

ART. 3. The boundary line between the two countries, west of the Mississippi, shall begin on the Gulph of Mexico, at the mouth of

the River Sabine, in the sea, continuing north, along the western bank of that river, to the 32° of latitude; thence, by a line due north, to the degree of latitude where it strikes the Rio Roxo of Natchitoches, or Red River; then, following the course to the Rio Roxo westward, to the degree of longitude 100 west from London and 23 from Washington; then, crossing the said Red River, and running thence, by a line due north, to the river Arkansas; thence, following the course of the southern bank of the Arkansas, to its source, in latitude 42° north; and thence, by that parallel of latitude, to the South Sea. The whole being as laid down in Melish's map of the United States, published at Philadelphia, improved to the 1st of January, 1818. But if the source of the Arkansas River shall be found to fall north or south of latitude 42°, then the line shall run from the said source due south or north, as the case may be, till it meets the said parallel of latitude 42°, and thence, along the said parallel, to the South Sea:

All the islands in the Sabine and the said Red and Arkansas Rivers, throughout the course thus described, to belong to the United States; but the use of the waters, and the navigation of the Sabine to the sea, and of the said rivers Roxo and Arkansas, throughout the extent of the said boundary, on their respective banks, shall be common to the respective inhabitants of both nations.

The two high contracting parties agree to cede and renounce all their rights, claims, and pretensions, to the territories described by the said line, that is to say: The United States hereby cede to His Catholic Majesty, and renounce forever, all their rights, claims, and pretensions, to the territories lying west and south of the above-described line; and, in like manner, His Catholic Majesty cedes to the said United States all his rights, claims, and pretensions to any territories east and north of the said line, and for himself, his heirs, and successors, renounces all claim to the said territories forever.

* * * * * * *

ART. 15. The United States, to give to His Majesty a proof of their desire to cement the relations of amity subsisting between the two nations, and to favor the commerce of the subjects of His Catholic Majesty, agree that Spanish vessels, coming laden only with productions of Spanish growth or manufactures, directly from the ports of Spain, or of her colonies, shall be admitted for the term of 12 years, to the ports of Pensacola and St. Augustine, in the Floridas, without paying other or higher duties on their cargoes, or of tonnage, than will be paid by the vessels of the United States. During the said term no other nation shall enjoy the same privileges within the ceded territories. The twelve years shall commence three months after the exchange of the ratifications of this treaty.

ART. 16. The present treaty shall be ratified in due form, by the contracting parties, and the ratifications shall be exchanged in six months from this time, or sooner if possible.

In witness whereof we, the underwritten Plenipotentiaries of the United States of America and of His Catholic Majesty, have signed, by virtue of our powers, the present treaty of amity, settlement, and limits, and have hereunto affixed our seals, respectively.

Done at Washington this twenty-second day of February, eighteen hundred and nineteen.

JOHN QUINCY ADAMS. [SEAL.]
LUIS DE ONIS. [SEAL.]

The foregoing treaty was ratified by the Senate of the United States, February 24, 1819, and on October 24, 1820 by His Catholic Majesty, Ferdinand the Seventh, King of the Spains, who declared it to be his deliberate will that this ratification be as valid and firm and produce the same effects as if it had been done within the determined period (six months from February 22, 1819). By the same ratification His Catholic Majesty annulled three grants of Florida lands made in favor of the Duke of Alagon, the Count of Punonrostro, and Don Pedro de Vargas. (See Treaties, Conventions, etc.; S. Doc. No. 357, 61st Cong., pp. 1651, 1657.)

ACTS OF THE CONGRESS OF THE UNITED STATES.

AN ACT To appropriate proceeds of sales of public lands and granting one-half million acres to Florida.

[5 U. S. Stat. L., 455.]

* * * * * * * *

And there shall be, and hereby is, granted to each new State that shall be hereafter admitted into the Union, upon such admission, so much land as, including such quantity as may have been granted to such State before its admission and while under a Territorial government, for purposes of internal improvement as aforesaid, as shall make five hundred thousand acres of land, to be selected and located as aforesaid.

Approved, September 4, 1841.

AN ACT For the admission of the States of Iowa and Florida into the Union.

[5 U. S. Stat. L., 742, 743.]

Whereas the people of the Territory of Iowa did, on the 7th day of October, 1844, by a convention of delegates called and assembled for that purpose, form for themselves a constitution and State government; and

Whereas the people of the Territory of Florida did, in like manner, by their delegates, on the 11th day of January, 1839, form for themselves a constitution and State government, both of which said constitutions are republican; and said conventions having asked the admission of their respective Territories into the Union as States, on equal footing with the original States:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the States of Iowa and Florida be, and the same are hereby, declared to be States of the United States of America, and are hereby admitted into the Union on equal footing with the original States, in all respects whatsoever.

* * * * * * *

SECTION 5. *And be it further enacted,* That said State of Florida shall embrace the Territories of East and West Florida, which by the treaty of amity, settlement, and limits between the United States and Spain, on the twenty-second day of February, eighteen hundred and nineteen, were ceded to the United States.

SECTION 7. *And be it further enacted*, That the said States of Iowa and Florida are admitted into the Union on the express condition that they shall never interfere with the primary disposal of the public lands lying within them, nor levy any tax on the same whilst remaining the property of the United States: *Provided*, That the ordinance of the convention that formed the constitution of Iowa, and which is appended to the said constitution, shall not be deemed or take(n) to have any effect or validity, or to be recognized as in any manner obligatory upon the Government of the United States.

Approved, March 3, 1845.

AN ACT Supplemental to the act for the admission of Florida and Iowa into the Union, and for other purposes.

[5 U. S. Stat. L., 788.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in consideration of the concessions made by the State of Florida in respect to the public lands, there be granted to the State eight entire sections of land for the purpose of fixing their seat of government; also section numbered sixteen in every township, or other lands equivalent thereto, for the use of the inhabitants of such township, for the support of public schools; also two entire townships of land, in addition to the two townships already reserved, for the use of two seminaries of learning, one to be located east and the other west of the Suwanee River; also five per centum of the net proceeds of the sale of lands within said State, which shall be hereafter sold by Congress, after deducting all expenses incident to the same; and which said net proceeds shall be applied by said State for the purposes of education.

* * * * * * *

Approved, March 3, 1845.

RESOLUTION BY THE LEGISLATURE OF FLORIDA.

PREAMBLE And resolution by the Legislature of Florida, adopted December 10, 1845, recommending the adoption of measures for reclaiming the Everglade lands in that State.

Whereas there is a vast and extensive region, commonly termed the Everglades, in the southern section of this State, embracing no inconsiderable portion of its entire peninsula, which has hitherto been regarded as wholly valueless in consequence of being covered by water at stated periods of the year, and the supposed impracticability of draining it. And whereas recent information, derived from the most respectable sources, has induced the belief, which is daily strengthening, that these opinions are without foundation, and, on the contrary, that at a comparatively small expense the aforesaid region can be entirely reclaimed, thus opening to the habitation of man an immense and hitherto unexplored domain perhaps not surpassed in fertility and every natural advantage by any other on the globe. And whereas it is no less the interest of the General Government than of Florida, with its vast donation of unlocated land, to

adopt some early and efficient measures to test the accuracy of these representations:

Be it therefore resolved by the senate and house of representatives in general assembly convened, That our Senators in Congress be instructed, and our Representative requested, to bring this important subject to the attention of Congress at the earliest day, and earnestly press upon its consideration the propriety and policy of forthwith appointing competent engineers to examine and survey the aforesaid region.

Resolved, That immediately upon their passage and approval his excellency the governor be requested to transmit to the persons above named, to the Commissioner of the General Land Office, and to the President of the United States certified copies of the foregoing preamble and resolution, and to communicate with the latter officer, and furnish him with all the information in his possession in reference to a subject of deep interest to the General Government as well as to our own.

Passed by the senate December 2, 1845. Passed by the house of representatives December 4, 1845. Adopted by the governor December 10, 1845.

STATE OF FLORIDA:

I, James T. Archer, secretary of state of the State aforesaid, do hereby certify that the foregoing contains a true transcript from the preamble and resolutions in my said office.

Witness my hand and the great seal of the State of Florida, at the capitol, in Tallahassee, this 11th day of December, A. D. 1845, and seventieth year of American independence.

[L. S.]

JAMES T. ARCHER,
Secretary of State, Florida.

EXTRACT FROM LETTER FROM HON. JAMES D. WESTCOTT, JR., TO THE SECRETARY OF THE TREASURY.

WASHINGTON, *May 11, 1847.*

SIR: Referring to the conversations I have had with you, and the letters I have written on the subject of measures being adopted by the Government to reclaim the vast quantity of valuable lands on the peninsula of Florida, called the "Everglades," now submerged by fresh water, I will recapitulate my views as to the incipient steps advisable to be taken. You have the opinions of that intelligent and able gentleman, and practical engineer, Gen. Gadsden, in a letter addressed to you at my request. He has promised to give them more particularly and in detail. This subject has, since 1822, attracted no little attention in Florida. Years before the cession the project was partially attempted by the Spaniards, but was not carried out, because those who undertook it were not competent to the task. Gen. Charles F. Mercer, of Virginia, some years ago examined the subject, and wrote an elaborate essay for the public prints, setting forth the advantages of the measure to the country. Petitions have been repeatedly proposed to our local legislature for its aid, and it has more than once passed resolutions invoking the action of the General Government to effect the reclaim-

ing of those lands. I have before inclosed to you a printed copy, as laid before Congress, of those adopted at a recent session. The project has been favorably referred to in more than one official report of the United States officers on duty in Florida. Gen. Gadsden, more than 20 years ago, noticed it approvingly. Gen. Worth, or the late Lieut. Blake, topographical engineer, and others of high reputation, have, I believe, called the attention of the Government to it in official correspondence or reports. I have caused maps and plats, exhibiting the general character of that region and of the face of the country, to be submitted to you, from which you can, I think, form a pretty safe opinion of the practicability of the plan proposed. I am no engineer—know but little of such matters, but any man can venture to decide that if, as is alleged, the waters in the Gulf or Straits of Florida opposite the Everglades, are some 6, 7, or 8, and perhaps 10 feet, below the waters in the Glades, and that the general depth of the waters in the Glades, when there is no freshet, is but from 1 to 5 feet, except in channels and some deep ponds across the peninsula; and that the distance from the edge of the Glades to the shores of the Florida Straits is in many places less than 6 miles; and that the actual distance to the heads of several navigable streams emptying into the straits is not more than a mile; and that the narrow ridge which separates them from the waters of the Glades is of soft coral rock, requiring excavation, easily made, of but 10 or 12 feet at most to unite the fresh and salt waters, and drain the lands in the Glades, the scheme is feasible and without very great risk. What would be the value of the now subaqueous lands, reclaimed by such work, I will not pretend to say. Of course, it would depend on their quality. As to this, I rely greatly on the representations of the Hon. John P. Baldwin, Col. Wm. F. English, Col. Richard Fitzpatrick, and George McKay, Esq., all of whom have resided in their vicinity, and who have repeatedly informed me that many of them would be the best sugar and rice lands in the United States. I believe they would, at all events, give us the desideratum of lands that could enable us to rear the tropical fruits we now import from Cuba and the West Indies, even if not sufficiently fertile for, or adapted to, rice or sugar. Their being reclaimed would also occasion settlements to be made at least on some of them, and it is important for the country that South Florida should be densely populated. All the gentlemen I have last above named are of the highest respectability and intelligence, and Mr. McKay is a United States surveyor, who surveyed most of the contiguous coast of the Atlantic or straits, and up to the margin or "rim of the basin" of the Glades. Doubtless, on draining the vast lake called the Everglades—nearly 90 miles in length and from 50 to 70 in breadth—interspersed with islands, and what are now bogs or morasses, there would be left rivers and channels running through it, and some of the spongy morasses might be irreclaimable for any valuable purpose for years hence. Doubtless, too, the sudden exposure of such a vast extent of soil, so long covered with fresh water, to the action of an almost vertical sun, and the immense quantity of dead fish and vegetable substances thereby exposed to decomposition upon it, might occasion temporary pestilence in its neighborhood, but it would probably not extend beyond one season, and could be guarded against; and this, in fact, furnishes a reason why the work should be done

before many settlements are made on the coast. The quantity of lands that would probably be reclaimed has been variously estimated from one to two, or even three, millions of acres, and indeed more. I do not consider it practicable to estimate it at anything like certainty.

The waters in the Gulf of Mexico opposite the Glades are said to be considerably below those in the Glades, but not so much as the waters of the straits. It is also said they sometimes mingle through the lagoons and creeks in the bayous and coves above Cape Sable and below the northwest point of Charlotte Harbor. If so, it is not a chimerical idea to anticipate a cut from the Gulf to the Glades would effect a channel for at least small coasting vessels and steamboats through that part of the peninsula at comparatively small expense, and it is not improbable that passes on the Gulf coast may have to be stopped and the shore in some places leveed to promote this object and aid in the keeping such channel open. * * *

Now, sir, under this responsibility I do not hesitate to say that I regard it important that this work should be undertaken and completed as soon as possible. It is decidedly advisable that the Government should satisfy itself—send an agent to make a reconnoissance of these lands and make report as to the probable practicability of the work, to be laid before Congress at its next session. * * *

I assure you of my high respect.

Your obedient servant,

JAMES D. WESTCOTT, JR.

Hon. R. J. WALKER,
Secretary of the Treasury.

EXTRACTS FROM INSTRUCTIONS TO BUCKINGHAM SMITH, ESQ., BY THE SECRETARY OF THE TREASURY.

TREASURY DEPARTMENT, *June 18, 1847.*

SIR: You are hereby designated, under the eleventh section of the act of Congress of August 6, 1846, "providing for the better organization of the Treasury Department and for the collection, safe-keeping, transfer, and disbursement of the public revenue," an agent to examine the land offices at Tallahassee, Newnansville, and St. Augustine, in the State of Florida, said examination to be prosecuted and completed with all convenient dispatch and to be concluded before the 1st day of November next, and full report thereof made to this department. * * *

But the most important service expected of you is the procurement of authentic information in relation to what are generally called the "Everglades" on the peninsula of Florida.

It has been represented to the department that there are several millions of acres of public lands in the vast lake called by that name, and which can be reclaimed and rendered valuable at an expense comparatively small with the advantages resulting from such measure. It is represented that these lands can be drained by two or three small canals, from the lake into the rivers opposite to it, emptying into the Gulf of Mexico, and into the straits of Florida. Copies of sundry communications to this department on this subject are inclosed to

you. They are for your own consideration and to be returned to the department with your report. You will please give them an attentive perusal, with a view in your report of correcting any errors of fact or opinion they may contain. The legislature of the State of Florida has, by resolution, asked the action of the Federal Government in relation to draining these lands. This department is not in possession of any official information in relation to them which would justify its recommendation of such measure; but the opinion is entertained, from the representations made, that the measure is not only practicable, but would be beneficial to the public interests. The department relies upon you to procure and furnish, in your report, full information on this subject. It is expected that you will visit personally and make a reconnoissance of that section of the peninsula. You are herewith furnished sundry maps, charts, etc., of portions of it, some of which, though not regarded as entirely correct, may still be of service to you. You are not expected to make a survey of the country, either topographical or otherwise, but it is desired that your reconnoissance should be as full and complete as practicable.

You can doubtless, without ascertainment by instruments of the levels, approximate to the relative elevation of the waters in the rivers on the Gulf and Atlantic coasts, opposite to the Everglades, with the waters in the Everglades; and you can ascertain pretty correctly the general depth of the water in the lake and the probable quantity of land that can be reclaimed by draining it by canals into those rivers. You can ascertain the opinions of intelligent persons and you can obtain data for the formation of your own opinion as to the quality of those lands so susceptible of being reclaimed and their value and their adaptation to the cultivation of different products. You will particularly specify those products. This information will be important. You will examine personally, if you can, the region where the proposed cuts will have to be made; state its character; geological formation; the probable length and breadth and depth of the proposed cuts or canals; the probable excavation necessary; and also the character and anticipated expense and results of the work sought to be undertaken. Any information that you can obtain in writing, from intelligent citizens acquainted with this subject, you will communicate with your report, and you will seek from them facts and specific data showing the grounds of opinions that may be given. It is to these, rather than mere opinions, that Congress and the department must look to justify action on any subject. * * *

The department relies with confidence on your impartial fulfillment of this service, free from any sectional or local predilections, and that your report will confirm the character for intelligence (which it) has received in relation to you from your friends of different sections of the Union.

I am, sir, very respectfully, your obedient servant,

R. J. WALKER,
Secretary of the Treasury.

BUCKINGHAM SMITH, Esq.,
St. Augustine, East Florida.

RESOLUTION BY THE LEGISLATURE OF FLORIDA, APPROVED JANUARY 6, 1848.

PREAMBLE And resolution in relation to draining the Everglades.

Whereas large tracts of the public lands lying in the vicinity of Lake Okeechobee, and in that region south of said lake, called "The Everglades," being covered with water, are incapable of being surveyed and subdivided, and are therefore valueless to the United States; and

Whereas it is believed that a large portion of said lands may be drained by canals, reclaimed, and made valuable for the cultivation of tropical plants and fruits; and

Whereas it is believed that these lands, if reclaimed, would not only remunerate this State for the expense of such reclamation, but would yield a considerable surplus above such expense: Therefore

Resolved by the Senate and House of Representatives of the State of Florida in general assembly convened, That Congress be requested to grant to this State all of said lands lying south of Carloosa Hatchee River and of the northern shore of Lake Okeechobee, and between the Gulf of Mexico and the Atlantic Ocean, on condition that the State will drain them and apply the proceeds of the sale thereof, after defraying the expense of draining, to purposes of education.

Passed the senate December 30, 1847.

C. W. DOWNING,
Secretary of the Senate.
D. G. MCLEAN,
President of the Senate.

Passed the house of representatives January 6, 1848.

W. R. LANCASTER,
Clerk House of Representatives.
JOHN CHAIN,
Speaker House of Representatives.

Approved, January 6, 1848.

W. D. MOSELEY.

STATE OF FLORIDA:

I, James T. Archer, secretary of state of Florida, do hereby certify that the foregoing is a correct transcript of a resolution on file in my office entitled "Resolution in relation to draining the Everglades."

Witness my official signature and the great seal of the State aforesaid, at Tallahassee, this 22d day of February, A. D. 1848.

[L. S.]

JAMES T. ARCHER,
Secretary of State.

REPORT OF THE SECRETARY OF THE TREASURY TO THE SENATE OF THE UNITED STATES.

TREASURY DEPARTMENT, *August 10, 1848.*

SIR: In compliance with the resolution of the Senate of the 9th instant, requiring "that the Secretary of the Treasury be directed to communicate to the Senate any information in his department as

to the practicability of reclaiming the Everglades in the State of Florida, or as to the expediency of ceding them to the said State for that purpose; and his opinion as to the best mode and means of accomplishing such object," I have the honor to transmit to the Senate a copy of the report of Buckingham Smith, Esq., a gentleman of character and intelligence, who was in 1847 employed by this department to examine the land offices in Florida, and directed also to make a reconnoissance of the Everglades as a part of the public lands, for the purpose of ascertaining the practicability and expediency of draining them, etc., and appended to which are sundry documents and letters furnishing information on the same subject. Annexed hereto are also copies of the instructions of this department to Mr. Smith and to Lieut. Martin, commanding the revenue cutter *Wolcott*, who assisted Mr. Smith in his examinations, and also copies of the application to the department, in compliance with which the examinations were directed.

Herewith likewise is submitted a letter from the Commissioner of the General Land Office to this department in reply to inquiries as to the quantity of public lands at the southern end of the Florida Peninsula, specifying the quantity of lands that have been surveyed, and those that are generally covered with water, and those that are only occasionally covered with water, and those that are capable of being surveyed or are too valueless for survey.

The papers transmitted contain all the information on the files of this department on the subject mentioned in said resolution.

As to the practicability of draining the Everglades, these data would seem to indicate that it is practicable, and at an expense probably not exceeding $500,000, as estimated by Mr. Smith in his report. Of the value of the lands reclaimed by such draining, I am unable to give any decided opinion. Whether they will be worth the expense of the work is questioned by intelligent men acquainted with the country, and, on the other hand, equally intelligent men have expressed the opinion, which would seem most probable, that their value will far exceed the cost of draining the Glades and adjoining swamps. The test of experience can alone solve the doubt. These lands are, however, utterly worthless to the Government at this time, as stated in the letter of the Commissioner of the General Land Office.

The Committee on Public Lands of the Senate have transmitted to me a copy of the bill now before said committee, to cede said lands to the State of Florida, for the purpose of effecting their draining, and requesting my opinion as to its provisions. Upon a perusal of that bill it seems to me that its provisions are well calculated to insure the accomplishment of the object and by means more eligible than if attempted by the Federal Government. The cession to the State of these lands and of all others within it of similar character would seem to be the most proper and advantageous disposition that can be made of them.

I have the honor to be, very respectfully, your obedient servant,

R. J. WALKER,
Secretary of the Treasury.

To the PRESIDENT OF THE SENATE.

LETTER FROM THE COMMISSIONER OF THE GENERAL LAND OFFICE TO THE SECRETARY OF THE TREASURY.

GENERAL LAND OFFICE, *August 10, 1848.*

SIR: In reply to your inquiries of this office as to any information in its possession respecting the Everglades in the State of Florida, and the lands in said State, below the line dividing townships 36 and 37, south of the base line in said State, I have the honor to state:

That the name "Everglades" designates that region of the peninsula of Florida lying south of Lake Okeechobee, and generally covered by water from 2 to 7 feet deep at least for some months in every year.

That the greater part of the peninsula below this line between townships 36 and 37, and which it is proposed by the bill now before the Committee of Public Lands of the Senate (which bill has been submitted to me by Messrs. Westcott and Cabell, of said State) to be ceded to the State of Florida, being unsurveyed, and there not being any nautical surveys of the western coast below Tampa in this office, an approximate estimate only can be made of the area of the peninsula and keys, including the lands and interior waters south of said line, and excluding the islands and keys south and east of Cape Sable. It is supposed, however, that such area may be stated at about 7,800,000 acres of land and water.

Of this aggregate area, it is estimated that there is always covered with water about 4,300,000 acres.

This estimate includes rivers, lagoons, sounds, and Lake Okeechobee, and other lakes south of said line, that it is not proposed to drain and can not be drained. It includes also the swamps and all those portions of country comprising parts of the region called the Everglades, the greater part of which it is not supposed can be reclaimed.

Of the aggregate before stated, it is estimated there are about 1,000,000 of acres that are only occasionally covered with water, i. e., for some months during and after the rainy seasons in each year; much of which, however, on the eastern and southern margins of the Glades, are represented as valueless until the Glades are drained, in consequence of such annual overflow, and of which also a considerable portion it is not anticipated will ever be made valuable by such draining.

Of the remaining 2,500,000 acres, the quantity of 1,000,000 acres has been surveyed (about 590,682 into sections and 409,318 by the exterior lines of townships), mostly of very inferior quality, judging from the small quantity (only 360 acres) sold since a large portion of them were brought into market. The residue of said lands, being 1,500,000 acres, are represented as poor and valueless generally, and most of them probably not worth the expense of surveying.

No sufficient data, on which to base a correct statement of the quantity of lands within said limits legally subject to patent under the acts for the armed occupation and settlement of Florida, is in this office, but it is considered that 16,000 acres will certainly cover all such claims that can be legally established.

Twenty-three thousand and three acres have been granted by special acts of Congress to Dr. H. Perrine and his widow and heirs, within said limits, for the cultivation of tropical fruits and plants,

and which grant is allowed by law to be located in separate sections, and the reasonable presumption is, that they have located the choicest lands in that part of the country.

There are, it is believed, several claims under Spanish grants within said limits, amounting to many thousand acres; but inasmuch as they have not all yet been definitely confirmed, and the surveys thereof finally concluded, this office is without certain data whereon to base a precise statement of the aggregate quantity of such claims. The great Alagon claim covers two-thirds of the entire district proposed to be ceded to the State of Florida, and extends much higher up (north) than the line before specified. This claim is in suit, but it is not supposed there is the slightest danger of the claimants succeeding in such suit.

The project of draining the Everglades, if successful, may perhaps reclaim for cultivation, within the limits of the proposed grant to Florida, about a million of acres of these lands, now covered with water; some continually, and the residue occasionally only. It can not be anticipated to reclaim but a part of the Everglades, a part of the Atseenahoofa or Big Cypress Swamp, a part of the Halpatiokee Swamp, and the skirt of poor lands on the margin of the Glades, covered with water some months of every year, and which is very barren. Much of the subaqueous lands will still remain inundated; and no one can expect that the parts that are so drained can all be made susceptible of cultivation.

The entire peninsula south of the northern line of the proposed grant to Florida, whether occasionally covered with water or not subject to overflow, is, at this time, utterly worthless to the United States for any purpose whatever. Col. Robert Butler, the surveyor general of that State, in his official report, made October 2, 1847, says: "I now ask your attention to the Everglades, which can not be surveyed without first being drained;" and that officer recommends the cession of a moiety of that region to the State of Florida, for the purpose of having them reclaimed.

Draining the Glades, as suggested, will, it is supposed, still leave large rivers, lakes, ponds, and channels in the Glades filled with water; and, as before observed, many of the lands drained will also remain valueless. But the results of the proposed work can only be ascertained by actual experiment.

The great depth of Lake Okeechobee forbids the idea of draining it entirely; and, indeed, I learn from Mr. Smith's report, it is contemplated only to decrease its waters but a few feet, leaving it of sufficient depth to be navigated by vessels that may be able to navigate the canals from said lake to the Gulf and to the Atlantic. As before observed, the lagoons, bays, sounds, and rivers, within the said district will not be affected by the contemplated work.

The bill before the Committee on Public Lands of the Senate grants to the State of Florida alternate sections of the surveyed lands below said line dividing townships 36 and 37—the nearest township line to the north end of Lake Okeechobee. In consideration of the fact before adverted to, that the value of these lands, now esteemed of but little amount, will be perhaps enhanced by the proposed improvement to the legal minimum price of the public lands, and in consideration also, of the reclaiming of several hundred thousand acres of bottom land on the banks of the Kissimmee River and its tributaries outside and

north of the proposed grant, and the benefit of which will inure solely and directly to the Federal Treasury, it is deemed that this provision is equitable and just.

In my annual report I had the honor to express my convictions as to the policy of the Federal Government with respect to all such lands as those proposed to be ceded, situate in any of the States, and I had the honor of advancing the principles I conceived to be sound on that subject, and I am gratified to find that the proposed bill sustains what I then deemed it my duty to say.

I transmit with this letter the map of this region, prepared at this office for Mr. Smith, which gives a better idea of it than can be given by any description.

I have the honor to remain, with great respect, your obedient servant,

RICHARD M. YOUNG, *Commissioner.*

Hon. ROBERT J. WALKER,
Secretary of the Treasury.

BILL FOR DRAINING OF EVERGLADES, INTRODUCED IN THE THIRTIETH (1848) CONGRESS BY SENATOR WESTCOTT.

[Senate 338, public, 30th Cong., 1st sess.]

Mr. Westcott, of Florida, introduced the following bill, which was read twice and referred to the Committee on Public Lands:

A BILL To authorize the draining of the Everglades, in the State of Florida, by said State, and to grant the same to said State for that purpose.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there be, and hereby is, granted to the State of Florida and its assignees, all the lands, lakes, and water-courses, with the appurtenances, situated in said State, and south of the line of the public land surveys therein, running due east from the Gulf of Mexico to the Atlantic Ocean, being the line dividing townships thirty-six and thirty-seven south, in said State; said grant to include the islands or keys adjacent to the coast north of Cape Sable, and not to include any such islands or keys that are south and east of said cape; and said grant is made to said State upon the following conditions, to be accepted by said State, by act of the legislature thereof, or this grant to be void, viz:

First. The said State shall, on or before the first day of January, eighteen hundred and fifty-one, cause to be commenced, under the direction of a competent engineer, to be appointed under authority of a law of said State, the construction of drains and canals, to be sufficient, if practicable, for draining the Everglades aforesaid, and for reclaiming the subaqueous land thereof, and for decreasing the waters of the Lake Okeechobee, and draining and reclaiming the swamps and low lands contiguous thereto, within said boundaries; and drains and canals for draining and reclaiming the swamps and low lands between the Everglades, and between said lake and the Atlantic and Gulf coasts and the coasts of the Straits of Florida, and so that, if practicable, a communication may be made by such canals, for vessels, between the Gulf and the Atlantic waters; and said State shall cause said works to be completed and finished within ten years from the time the same shall be commenced as aforesaid.

Second. That said State shall not sell, alien, transfer, pledge, or mortgage, or otherwise dispose of said lands, or any part thereof, or any of the rights or privileges derived from this grant, except to effect the full and faithful fulfillment of said condition above stated; and the entire avails and proceeds of any disposition thereof, or any part thereof, made by said State shall be exclusively and sacredly appropriated to the completion of said work.

Third. No sale of any of said lands shall be made for a less price than one dollar and a quarter per acre (and this restriction shall extend to lands within said boundaries not reclaimed as well as other lands) until said works are fully completed.

Fourth. Until the President of the United States shall authorize the same in writing, no entry or encroachment shall be made or allowed by said State, into or upon the district reserved for the Seminole Indians yet remaining in Florida, part of which is within said boundaries; and for any delay occasioned to the commencement or completion of said work by the withholding of such authority, the period stipulated for such commencement and completion in said first condition shall be extended a corresponding term.

Fifth. One thirty-sixth part of all said lands within said boundaries shall be reserved by said State, and appropriated to the use of common schools for the inhabitants of said lands, in lieu of the sixteenth section now so appropriated in each township of the public lands in said State; the said one thirty-sixth portion to be designated in such mode and manner as the legislature of said State may, by law, direct.

Sixth. Of the public lands south of said line, and surveys of which have been completed and approved prior to the passage of this Act, one-half is excepted from this grant; the same to be reserved by the Secretary of the Treasury for the United States, in alternate sections; and when there are fractional sections, one-half of such fraction to be reserved for the United States, the State, however, to have the right of way for said works through said lands. And the President of the United States may, at any time within two years from the passage of this Act, reserve for the United States, at such points, within said grant as may be reported after examination and survey by a proper officer, to be advisable, such tracts not exceeding half a section at each point, as may be necessary for lighthouses, forts, docks, arsenals, navy yards, or other public works within said boundaries, to be used by the United States for such public works, but upon relinquishment of such reservations, to revert to said State, conformably to this Act. And this Act shall in no wise affect rights acquired under any Spanish grant, heretofore or hereafter confirmed to any of said lands, or any rights acquired under any public sale by the United States, or by private entry of any of said lands, or under any donation or other grant by the United States, or under the preemption acts, or under the acts respecting the armed occupation and settlement of Florida.

Seventh. Any residue or surplus of the avails, or proceeds, of said sales of said lands, after defraying the expenses of said works stipulated to be completed in said first condition, as aforesaid, shall be devoted by the legislature of said State exclusively to the purposes of education within said territory hereby granted; the principal of such residue to be invested as the legislature of said State may by law direct, as a permanent perpetual fund, and the interest thereon only to be expended as aforesaid.

Eighth. No tolls or charges shall be exacted for passing through any of said canals, from vessels or boats of the United States, or in the service of the United States, or laden exclusively with public stores, munitions of war, or other freight of the United States, or the United States mails, or transporting, as aforesaid, troops in the service of the United States, through any of said canals; nor shall tolls or charges be exacted for any freight or mails of the United States or for such troops; but such reasonable tolls may be charged and collected from other vessels, and freight, and persons, as said legislature may by law allow, to be applied to keeping the said works in repair.

Ninth. *Be it further enacted*, That the surveys of the said lands by said State shall conform, as nearly as practicable, to the form and plan of the surveys by the United States of public lands in said States.

Report of the Committee on Public Lands to the United States Senate on the Westcott bill for the drainage of the Everglades.

[Senate Rep. Com., No. 242, 30th Cong., 1st sess.]

Mr. Breese made the following report to accompany bill S. 338:

The Committee on Public Lands, to whom was referred bill No. 338, "to authorize the draining of the Everglades, in the State of Florida, by said State, and to grant the same to said State for that purpose;" and to which was also referred the report of the Secretary of the Treasury respecting said measure, and the accompanying documents, report:

That from the data submitted to the committee, and accompanying the report of the Secretary of the Treasury, the committee has been induced to believe the measure proposed by this bill should be adopted.

The region proposed to be granted to the State of Florida, to enable that State to effect the desired improvement, is now nearly or quite valueless to the United States; and will so remain until reclaimed by draining it by means of canals. More than

six-sevenths of it is yet unsurveyed, and it is officially reported by the surveyor general of Florida that "it can not be surveyed without first being drained;" the correctness of which report is corroborated by all the evidence adduced on the subject. The portion that has been surveyed is also reported as being of little worth; and that the fact that but one-half section, out of 590,132 acres that has been surveyed in sections, has been sold fully proves the correctness of such statement. The suggested improvement, it is believed, may make some of these surveyed lands salable.

The cost of the proposed canals, it is estimated, will be about half a million of dollars.

The quantity of lands capable of being reclaimed and rendered fit for cultivation, it is estimated, is about 1,000,000 acres. But on this point and also as to the anticipated enhanced value of the other lands (besides those now covered with water within the region proposed to be granted to the State of Florida), to be affected by the proposed work, no certain calculation can be made based upon data obtained from mere explorations, or even from surveys of the most particular character. The true consequences and results can only be ascertained by the experiment being actually made.

The propriety of the Federal Government undertaking this work, even if it could do so with profit, is doubted by the committee.

It is believed that the work suggested can, for the reasons given in the documents appended to this report, and the cogency of which must be conceded by every practical mind, be best undertaken and completed by the State of Florida, or by associations of individuals under its authority. The improvements can in such case be made to effect not merely the draining of those now covered with water, but the enhancement of the value and price of the other public lands, and also the promotion of important local interests of that region in many respects, and at the same time the interests of the Union generally (beyond the pecuniary interest in these lands) may be advanced. The proposed canals being made channels of communication by vessels across the peninsula from the Atlantic to the Gulf waters, thus avoiding the perilous reefs farther south, is a consideration of no trifling moment to the navigating interests of the Union.

The bill referred to the committee provides for a grant to the State of Florida, with such view, of all the lands below a specified line of the public surveys, near the northern end of Lake Okeechobee, with certain reservations; and it contains stipulations and conditions which (if the State accepts the grant with such conditions) will, it is believed, insure the completion of the work as far as it can be effected.

By the proposed improvement, if successfully carried out, it is believed the United States will derive great immediate pecuniary benefit by the draining of several hundred thousand acres (outside of the boundary of the district proposed to be granted to Florida), being the bottom lands on the Kissimmee River and its tributaries, now valueless by reason of their annual overflow. The committee agree with the Commissioner of the Land Office that this is a full consideration for the grant made by the bill of the alternate sections of the surveyed lands below the northern boundary of the proposed grant, even if no other existed.

The committee will not enlarge on other important results beneficial to the whole Union, which may be anticipated, if the proposed work is successfully carried out. They are fully set forth in the documents annexed to the report of the Secretary of the Treasury, being the opinions of some of the most intelligent citizens of the United States, and well qualified to judge correctly on such subjects, and several of whom have personal knowledge of the region in question.

Nor do the committee deem it necessary to comment on the particular details of the proposed bill. These details have received the approval of the Secretary of the Treasury and of the Commissioner of the General Land Office, and they are deemed proper and suitable for the protection of the respective rights and the promotion of the respective interests of the Federal Government and of the State of Florida, with reference to the territory included in the proposed grant, and of those citizens who may become residents within its boundaries, and of all others; and they authorize, in the judgment of the committee, the measures best calculated to insure the successful accomplishment of the work, if it can be accomplished at all.

The committee therefore report the bill without amendment and recommend its passage.

REPORT OF BUCKINGHAM SMITH, ESQ., ON HIS RECONNOISSANCE OF THE EVERGLADES 1848).

WASHINGTON CITY, *June 1, 1848.*

Hon. R. J. WALKER,
Secretary of the Treasury.

SIR: Having made a report to you upon so much of the duties assigned to me by your instructions of the 18th of June, 1847, as related to the land offices of Florida, and other subjects, I have now the honor to submit the report of my reconnoissance of the Everglades, excepted from my former reports, to enable me to obtain additional information deemed important. * * *

There is a faint tradition that the draining of the Everglades was contemplated and, indeed, undertaken a century or more since by either the Spanish Government or an association of Spanish subjects in Cuba, though abandoned perhaps on account of difficulties with the peninsula Indians. Some of the old maps seem to indicate something like cuts or canals from the Everglades to the waters emptying into the Gulf of Mexico; and during the late war with the Seminoles a canal was found on the northeastern border of Lake Flirt leading to the prairie of Lake Hicpochee and in the direction of Lake Okeechobee, a work, it is supposed, too considerable to have been undertaken by the Indians of Florida.

During the 21 years that Florida was a British province, from 1763 to 1784, surveys of the eastern coast were made by William Gerard De Brahm, Esq., an engineer officer of reputation in the service of that Government, and who was its "surveyor general for the southern district of North America." The official reports of these surveys and others of Georgia and Carolina have never been fully published, and, indeed, it has not been generally known in this country how far they had been perfected. * * *

The Everglades extend from the southern margin of Lake Okeechobee some 90 miles toward Cape Sable, the southern extremity of the peninsula of Florida, and are in width from 30 to 50 miles. They lie in a vast basin of lime rock. Their waters are entirely fresh, varying from 1 to 6 feet in depth. Their usual level is, I am satisfied, more than 12 feet above that of the waters of the straits of Florida and of the Atlantic Ocean, but of course not so great above the Gulf of Mexico. As the Everglades extend southwardly from Lake Okeechobee they gradually decline and their waters move in the same course. They have their origin in the copious rains which fall in that latitude during the autumn and fall and in the overflow of Lake Okeechobee through swamps between it and the Everglades.

Lake Okeechobee is the reservoir of the waters of the Kissimmee River, which rises up the peninsula some hundred and odd miles, and of streams of minor extent, flowing into the lake from the country contiguous to it. It is of fresh water, said to be deep, and its average

diameter is about 30 miles. It contains a few islands, each of them several acres in extent. Its location is given on the annexed map, prepared at the General Land Office.

The rim of the basin is of lime rock. The waters of the Glades are at different distances from the coast of the Gulf, of the straits, and of the ocean. On the eastern and southern sides of the peninsula they are within from 2 to 10 miles of the shores of the straits and ocean, while on the western side they are from 10 to 50 miles from the Gulf.

On the southern and eastern sides the lands between the basin and the coast are generally rocky, though tracts are found of limited extent that could be made fertile. Many small rivers or creeks empty into the bays and sounds on the southern and eastern sides. In wet seasons, when the basin is full, its waters find outlets over the low places in the rim and form rivulets running into the necks of the rivers; and there are instances where the waters of the Glades find subterranean passages to the sea.

On the eastern side, commencing at Cape Sable, are North Creek, Miami River, Little River, Arch Creek, River Ratones, New River, Snook Creek, and Hillsboro River, as is indicated on the map accompanying this report. Farther north are the Rivers Locahatchee and San Lucia, rising westwardly from their mouths, the former rising a few miles from Lake Okeechobee and outside the somewhat elevated lands that separate the lake from the extensive swamp of Halpatiokee, which supplies the waters of both rivers.

On the western side of the peninsula the coast is somewhat different. A cluster of low keys or mangrove islands (quite as correctly delineated on the map as they can be without an expensive and useless survey), the channels between which contain salt water, and the islands being of mud, upon which mangrove trees are thickly growing, extend from the Bay of Ponce de Leon, or Chatham, into White Water Bay, and inwardly farther north from about 5 to 25 miles from the Gulf. The waters of the Everglades fall into these channels by many small rivulets running over the margin of the basin into them, and in times of very high water in the Glades wide sheets of shallow depth are found rippling slowly through the dense shrubbery growing on the margin, which in this region is apparently of a more level surface than at other points.

The western rim of the Everglades, farther northward, deflects from the Gulf coast eastwardly until it comes near to Lake Okeechobee and the country contiguous to the Caloosahatchee, where it is due east from that coast about 50 miles. Between it and the coast on the west is the Atseenahoofa, or Big Cypress Swamp, which contains several hundred thousand acres of land, now useless to civilized man for any purpose. It can only be made valuable by draining the Everglades. Its waters are chiefly supplied from them by passageways, shallow, deep in mud, and often obstructed by dense thickets of shrubbery and vines and by large trees. From the character of its connection with the Glades in many places it may be considered a part of them. Several streams running into the Gulf have their sources in this swamp.

Commencing at Cape Sable and passing up the western coast are Shark River, Harney River, Chittohatchee, Delaware or Gallivans River, the two Caximbas Rivers, Corkscrew River, and Otsego River,

the two last emptying into Otsego Bay. They will be found described on the map with sufficient accuracy to enable a correct opinion to be formed respecting their connection with the Glades and the use that can be made of them in draining the Glades and the Big Cypress Swamp.

Farther north the Caloosahatchee finds its source some 90 miles from its mouth in the low lands outside of the western margin of Lake Okeechobee and in the swamp at the north end of the Everglades. It is, in fact, connected by sloughs of shallow depth with both the lake and the Glades at different points and receives supplies of water from both. It is supplied also by minor streams that drain the neighboring country and by Lake Flirt and Lake Hicpochee. The map indicates the old canal before spoken of to connect the waters of Lake Flirt and Lake Okeechobee.

The margin of the region of the Everglades nearest to the Caloosahatchee and Lake Okeechobee, as before described, is interspersed with sloughs and swamps, through which the waters of all, in wet seasons, mingle by shallow passages. More eastwardly the waters of Lake Okeechobee and of the Glades are said to be in like manner connected with the Lochahatchee, which receives also some of the surplus waters of the Halpatiokee Swamp, which extends up the coast some 50 miles, and being from 12 to 15 miles in breadth. The sources of the San Lucia are also toward the northernmost extremity of that swamp.

The geology of the southern portion of the peninsula of Florida is similar to that of the seacoasts of Georgia and South Carolina. Oolitic limerock, filled with the shells and corals of species that still exist, forms the great geological feature of the country. The rock is porous and susceptible of easy excavation. Exposure to air hardens it and renders it useful for building purposes. On the eastern side of the peninsula this rock shows itself through the thin coating of vegetable matter, or mud or sand, that ordinarily covers it; and it is also in detached pieces of different sizes, scattered above the ground. It contributes to the fertility of the soil, and being from its porous nature long retentive of moisture, affords sustenance to trees and plants in seasons of drought. The rim of the Everglades is generally of this character. Along the eastern verge of the Glades, and between them and the sea, there are spots of wet and black prairie land; there are also spots grown up in pine trees, the roots of which are imbedded in a dark soil of vegetable mold, lodged in the crevices and fissures of the rock; and there are tracts of what is called "dry hammock," covered with trees of various kinds growing in the same manner. Such land is more valuable for cultivation than any other part of the rim.

The same rock forms the bottoms of the openings through the rim of the Everglades to an unknown depth. It composes the floor of Biscayne Bay, of the other bays and sounds, and of the rivers along the coasts on both sides of the peninsula, and also of the basin of the Everglades. It belongs to the post-Pliocene formation of Lyell. The fossils are not very obviously identical with those in the rock of the Georgia and Carolina seacoast; but this arises from the effects of the different latitudes of the two regions upon similar living animals, of which the fossils are the remains.

The rise of the tide at the mouth of the Miami, as marked by the wearing of the soft rock, is 2 feet; at the mouth of the Little River

about 15 inches, and on the western side of the peninsula, at the Mangrove Islands, its rise was much greater than at any other place on the coast visited by me. At the mouth of the Caloosahatchee it is about 3 feet.

The rise of the land from the seacoast toward the Glades is manifest from the appearance of the banks of the rivers. At the mouth of the Miami the bank shows an elevation of from 2 to 3 feet above the water at the mouth of the river, to 12 feet or more at the head of the river. At this last point, within the distance of 150 yards the rise is 6 feet. Places exist where the rocky rim approaches the coast at a greater elevation than at the Miami, and on a level with the margin of the Glades, and at such places it is precipitous, 12 or 14 feet. This is the case a few miles to the north of the Miami. The vaulted rock across Arch Creek is 2 miles from the mouth, and above and below it the waters rush with great force through perpendicular rocks that, for 150 yards, overhang them on both sides the height of a dozen feet, and where the stream is about 15 yards in width.

Inside the basin, near the heads of the rivers of the eastern coast, there are covers or indentations in the shore of the Glades about 2 miles in depth. The nearest point touches the margin of the rim where the waters of the Glades approach the heads of the rivers, and where these waters are about a foot in depth. There are within the coves, channels, converging to such point, and in which the waters are from 1½ to 2½ feet in depth. The shallow places between them are covered with mud and rank saw grass. There are also sinks or holes of water several feet deep. Near the head of Little River these sinks or holes have 6 feet or more water, and similar depressions near to the head of the Miami have 11 feet. Immediately east of them, and on the line where the waters of the glades fall into the heads of the rivers, over rocky passages of not more than 15 or 20 yards wide, and from 50 to 150 yards in length, the waters run through rapids scarcely a foot in depth. The fall of these rapids is, as before stated, upwards of 6 feet, and drains or canals could easily be cut at these points. But to draw off 4 of 5 feet of water in the Glades, such drains must extend several miles from the river into the basin. I refer to the map as exhibiting all the data on this point that I have obtained.

The distance in a straight line from the navigable waters of the Caloosahatchee to the Lake Okeechobee, it is estimated, does not exceed 15 miles, and on the eastern side it is believed that canals of similar distance will connect the waters of the lake with those of the Lochahatchee of more than 6 feet depth, and, with like waters in the San Lucia, and as to all three, it is certain the fall is sufficient for such canals.

To reclaim the Everglades and the Atseenahoofa and Halpatiokee Swamps and the lowlands on the margin of the Kissimmee River and its tributaries, and the other rivers emptying into Lake Okeechobee, this lake must be tapped by such canals running into the Caloosahatchee on the one side and into the Lochahatchee or San Lucia, or both, on the other, and cuts must also be made from the streams on both sides of the peninsula into the Glades. Besides, after the height of the waters in the Glades should be decreased, even as much as 5 feet, there will probably be a necessity for several drains through the

Glades and those swamps, by which the waters accumulating from the rains may be conducted to the ocean or gulf.

That the level of the waters of the Everglades is several feet above the level of the waters outside the peninsula is demonstrated to any intelligent man who visits that region, not merely by the facts I have stated, but he must observe that, on the eastern side, the effect of the tides is not perceived a short distance up from the mouths of the streams, and that above the influence of the tides there are, when the waters are high in the Glades, continued rapid currents of fresh water from them. I am informed that when the waters in the Glades decrease during the dry season the beds of these currents near the Glades become dry. The elevation from the sea to the top of the rim that encompasses the Glades, and which is but little above the surface of the waters in the basin, is as certain as if it had been ascertained with leveling instruments in the hands of an engineer. The general opinion on this point is fortified by that of several gentlemen, some of them officers of the Navy and Army, expressed in letters which I have appended to this report, and, in fact, by one of these letters I am informed that "a line of levels was run from the ocean to the Glades at the mouth of the Miami" by a scientific officer of the Army in 1840 or 1841, which proves the correctness of that opinion beyond all doubt. It is not probable that the elevation of the waters of Lake Okeechobee is much higher than that of the waters in the basin of the Glades; nor can the waters of the Atlantic rivers opposite the lake be much lower than the streams farther south; but it is not, in my judgment, necessary that the fact should be otherwise to establish the practicability of draining the Everglades. If the modes herein suggested are not pursued, some other, devised by a skilful engineer, can be adopted. The difference of the levels that I have stated (12 feet) of the respective waters is sufficient to enable the draining to be effected. But it is believed this difference is understated. It is the opinion of one of the most distinguished and intelligent military officers of the United States that the waters of the Glades, and of the lake, are much higher above the level of the sea.[1] The distance from the lake to the eastern coast of the peninsula is less than 40 miles in a direct line, and not exceeding 15 miles to navigable waters emptying into the ocean; and if the judgment of that officer be correct the favorable success of the undertaking can not be questioned. * * *

As to the effect, so confidently predicted by many of superior intelligence and judgment in such matters to myself, that the draining of the Everglades of 4 or 5 feet of its waters will reclaim, for the profitable cultivation of coffee, sugar, tropical fruits, and other productions of tropical climates, large tracts of the present subaqueous soil of the basin and the lowlands of the Atseenahoofa and Halpatiokee Swamps; or for the successful raising of cotton, corn, rice, and tobacco the facts I may give as to the characteristics of those regions will perhaps be more satisfactory than the expression of my individual opinion. Unless the effect is as has been anticipated, at least partially, most of the region south of the northern end of Lake Okeechobee will remain valueless for ages to come. The borders of the Everglades and adjacent lands susceptible of profitable cultivation can not now sustain any very dense or very numerous population. The acquisition of the

[1] See Gen. Jesup's letter in appendix, No. 3, p. 56.

advantages and benefits I have adverted to, as resulting to the Union from such population being there, depends, therefore, on the favorable success of the project of reclaiming the lands mentioned.

The appearance of the interior of the Everglades is unlike that of any region of which I have ever heard, and certainly it is in some respects the most remarkable on this continent.

Imagine a vast lake of fresh water extending in every direction from shore to shore beyond the reach of human vision, ordinarily unruffled by a ripple on its surface, studded with thousands of islands of various sizes, from one-fourth of an acre to hundreds of acres in area, and which are generally covered with dense thickets of shrubbery and vines. Occasionally an island is found with lofty pines and palmettos upon it, but oftener they are without any, and not unusually a solitary majestic palmetto is seen, the only tree upon an island, as if to guide in approaching it, or as a place of signal or lookout for its former denizens. The surrounding waters, except in places that at first seem like channel ways (but which are not), are covered with the tall saw grass, shooting up its straight and slender stem from the shallow bottom of the lake to the height often of 10 feet above the surface and covering all but a few rods around from your view. The water is pure and limpid and almost imperceptibly moves, not in partial currents, but, as it seems, in a mass, silently and slowly to the southward. The bottom of the lake at the distance of from 3 to 6 feet is covered with a deposit of decayed vegetable substance, the accumulated product of ages, generally 2 or 3 feet in depth on the white sand and rock that underlies it over the entire surface of the basin. The flexible grass bending gently to the breeze protects the waters from its influence. Lilies and other aquatic flowers of every variety and hue are to be seen on every side, in pleasant contrast with the pale green of the saw grass, and as you draw near an island the beauty of the scene is increased by the rich foliage and blooming flowers of the wild myrtle and the honeysuckle and other shrubs and vines that generally adorn its shores. The profound and wild solitude of the place, the solemn silence that pervades it, unless broken by the splashing of a paddle of the canoe or light batteau, with which only can you traverse the Pahayokee, or by the voices of your "compagnons du voyage," add to awakened and excited curiosity feelings bordering on awe. No human being, civilized or savage, inhabits the secluded interior of the Glades. The Seminoles reside in the region between them and the Gulf. Except for the occasional flight of an eagle or a bittern, startled by the strange invaders of their privacy, or for a view of the fishes in the shallow waters gliding swiftly from your boat as it goes near to them your eye would not rest on living thing abiding in this wilderness of "grass waters," shrubbery, and flowers. Reflections upon the past history of the region around you, unbidden, force themselves upon the visitor to the interior of the Glades. On these islands, in ages that have long since passsed away, the haughty and ferocious Carib cacique dwelt. He and his people were driven from their homes by more powerful people, who were in turn expelled by stronger foes. Here the daring and reckless buccaneer of later times came, after his cruise for plunder, to revel in safety upon his unhallowed spoils. Once in this secluded spot the Catholic missionary pursued the heavenly vocation of teaching the benighted pagan the truths of the gospel; and here he sealed his devotion to his God by yielding up his

life to the vengeance of the infidel savage. Part of these Glades are now in the allotted district of the wily and intrepid Arpiarka, the chief of those of his tribe that fought so fiercely and so obstinately in resisting the enforcement of the policy of the Federal Government of removing them west; and who finally succeeded in constraining the United States to abandon that policy and allow them to remain still longer on the hunting grounds and near the graves of their fathers. The recollection also that the sacred name of "Laguna del Espiritu Santo" was given to this region by the Spanish discoverers is not without influence upon the visitor. The effect of such visit to the Pahayokee upon a person of romantic imagination and who indulges his fancies on such subjects, it may be presumed, would be somewhat poetic. But if the visitor is a man of practical, utilitarian turn of thought, the first and the abiding impression is the utter worthlessness to civilized man, in its present condition, for any useful or practical object, of the entire region. A solitary inducement can not now be offered to a decent white man to settle in the interior of the Everglades. Some of the islands may be fertile, but their inaccessibility, except by small boats, and the entire isolation from society their residents would have to encounter, would deter most men (who did not desire to avoid their fellows either from misanthropy or fear of justice for crimes committed) from making the Glades their homestead.

Of the practicability of abstracting 5 feet or more in depth of the waters from the basin of the Everglades and from the Atseenahoofa and Halpatiokee Swamps near the Glades by the means suggested I have given my opinion and the data on which it is founded. When the waters are thus abstracted, the deposit beneath them in the basin, generally from 2 to 3 feet in depth and sometimes more before the rock is found, will be left exposed and become dry. Whether it is of such character that without any admixture of loam or other soil it can be relied upon for the cultivation of anything can only be determined by actual experiment. This deposit is exceedingly light and when dry and broken to pieces becomes an impalpable powder. If it should be found to be a good compost, its speedy exhaustion and its liability when dry and exposed to the surface to be removed by the winds are obstacles to its extensive successful use in the cultivation of sugar, rice, tobacco, cotton, or corn that should be anticipated. But even then, that the basin may be advantageously appropriated to the rearing of tropical fruit trees and plants, by excavations if necessary in the rock of its bottom and filling them with the deposit and soil in their vicinity, I have little doubt; and that large tracts of fertile and valuable lands, adapted to the cultivation of any of the products named, can be reclaimed in the Atseenahoofa and Halpatiokee Swamps by the undertaking suggested, if properly carried out, I do not question. I do not hesitate also to state my conviction that the increased value of the lands thus reclaimed would equal the cost of such undertaking. Besides, by decreasing the waters of Lake Okeechobee 5 or 6 feet, hundreds of thousands of acres of the best bottom lands on the shores of the River Kissimmee and other rivers tributary to that lake (those on the Kissimmee extending the distance of 100 miles up that river) would be also reclaimed, and a large quantity northeastwardly of that lake may likewise be drained by proper canals, as suggested, connecting the lake with the ocean and lateral drains running into the prairies there situated. * * *

The Everglades are entirely below the region of frost, and the meteorological and barometrical statistics of different times within the last 80 years, furnished by several different writers, prove that the climate is as favorable to the cultivation of tropical fruits as that of any country between the twenty-eighth and twenty-fourth parallels of either north or south latitude. De Brahm, in his manuscript work, before noticed, has compendious tables which he calls "Ephemerides," containing useful information of this character, in relation to different points of the Peninsula of Florida. Dr. Perrine has furnished similar tables, and he states that most of the productions, natural to the tropical latitudes, can be best cultivated on the borders of the temperate latitudes, nearest the Equator; and experience verifies his statement. It is known that in China many productions, originally from between the Tropics, have become acclimated, and are reared successfully as high as the fortieth degree of latitude. * * *

If the hopes indulged of the favorable success of draining the Everglades should be but partially realized; if the interior of the Glades, from the causes I have intimated, or others, should be proved, by the test of experiment, not to be adapted to the cultivation of sugar, cotton, rice, and tobacco, corn, sisal hemp, and the other most important products, specified in the documents and publications referred to; and the extensive region in the basin now subaqueous is, in consequence, as I have little doubt it can be, appropriated profitably to the growing of tropical trees and plants bearing fruits, as I have suggested, the result will still be highly beneficial to the Union, and, in my judgment, will fully compensate for the expenses incurred. If the large quantities of lemons, limes, oranges, bananas, plantains, figs, olives, pineapples, coconuts, and other tropical fruits, enumerated in the publications cited, now imported, at high prices, from the West Indies and elsewhere, could be supplied, or only in part supplied, from this region, it would be of no trifling advantage to the whole country. Such fruits could be shipped to any part of the United States in less time, in better preservation, and, of course, at much less loss, and cheaper than from any part of the world, and without the payment of any export or import duties. This region, it should not be forgotten, is the only section of the Union the climate of which is congenial to such productions in such degree that any expectation may be entertained of rearing them for shipment, and the only region that can be looked to as capable of rendering us to any extent whatever independent of other countries with respect to those productions. But if it should be ascertained that the more important staples of sugar, etc., before specified, can also be advantageously cultivated in south Florida, after this undertaking is finished, then, that the results must be of inestimable value to the whole Confederacy, will be so clearly manifest, as to render comment wholly superfluous.

Eminent statesmen and philosophers have, in estimating the services of individuals to their country and to their fellow men, advanced the opinion that he who causes two sheaves of wheat to grow where one only grew before, better deserves the thanks of his race than the author, the legislator, or the victorious general. The degree of merit awarded by them to the particular act first specified may be extravagant, but no one of sound moral judgment will, it is presumed, deny that the increase of the agricultural resources, and the promotion of the agricultural interests of a people already polit-

ically free, is the very highest service that can be rendered them, and most conducive to the preservation of their independence, prosperity, and happiness. The citizen, whether in executive or legislative station, or without either, who succeeds in making fit for cultivation, even if but partially, a region equal in extent to either of the three smallest States of this Confederacy, now as useless as the deserts of Africa, will earn a rich meed of praise from the people of Florida and of the Union. The Everglades are now suitable only for the haunt of noxious vermin, or the resort of pestilent reptiles. The statesman whose exertions shall cause the millions of acres they contain, now worse than worthless, to teem with the products of agricultural industry; to be changed into a garden in which can be reared many and various exotics, introduced for the first time for cultivation into the United States, whether necessaries of life, or conveniences, or luxuries merely; that man who thus adds to the resources and wealth and independence of his country, who contributes by such means to the comfort of his fellow men, will merit a high place in public favor, not only with this own generation, but with posterity. He will have created a State. I feel that to be connected with the inception of a measure which, if carried out properly, will probably produce such results; to be identified, even in a secondary position, with the commencement of an undertaking that must be so eminently beneficial to my country, is a privilege of no mean consideration. * * *

Though it is not anticipated that the draining of the Everglades, and the settlement of south Florida, and the cultivation of exotics of the kinds mentioned on the many thousands of square miles of land in that region, will change the destiny of the confederacy, or either cause or prevent any great revolution on this continent, yet, looking at the past incidents I have alluded to, it may, without extravagance, I think, be foretold that if anything approximating to the sanguine expectations of many intelligent officers and citizens are realized, in less than 10 years a new, independent State may be added to the Union, formed out of east and south Florida, dissevering the unnatural connection now existing between them and middle and west Florida, sections totally dissimilar in pursuits, interests, and habits from the former; and the enterprise, industry, and progressive spirit of our citizens of other portions of the Union, now led elsewhere, may be directed into channels equally profitable and more conducive to the peace, prosperity, and permanent happiness of the Union and the perpetuity of our republican institutions.

I have thus given to you all the information upon the subject submitted to my examination that I can furnish. Whether the undertaking which, if it succeeds as hoped, promises to be so eminently beneficial to the country should not be commenced forthwith, I submit to your patriotic and enlightened consideration. In my judgment the experiment is worth a trial.

I have the honor to subscribe myself, with high respect, your obedient servant,

BUCKINGHAM SMITH.

NOTE.—(a) Prof. Nicolet, in his sketch of the history of St. Louis, Mo., in page 92, Senate Document No. 237, printed February 10, 1841, second session Twenty-sixth Congress, says:

"Is it not surprising that during the 32 years that Spain had possession of upper Louisiana the province was never settled by native Spaniards, excepting the officers

who ruled over it and a few fur traders? The inhabitants were French or the descendants of French from Canada or lower Louisiana; and the Spaniards have left no remembrances of themselves, saving their land register—no institutions, no works, not a single monument of public utility. Doubtless the golden treasures buried in the mountains of Mexico and of South America were too alluring to allow emigrants to be tempted from them and engage themselves in the labors of agriculture in the rich valley of the Mississippi. But taking a retrospect, when Spain was the greatest of maritime powers, when during the reign of Ferdinand and Isabella her navigators discovered new worlds, giving her an empire on which the sun never set; when the great armada struck terror in the bosom of the haughty Elizabeth, it becomes painful to think how ephemeral is the ascendancy even of the bravest and most prosperous nations, how truly rapid their decline and fall!"

APPENDIX TO REPORT OF BUCKINGHAM SMITH.

No. 1.—Extract from the Report of Col. R. Butler, Surveyor General of Florida in 1847, to the Commissioner of General Land Office.

[See Ex. Doc. No. 2, first session 30th Cong., p. 155.]

I now ask your attention to the Everglades, which can not be surveyed without first being drained. You will observe, from the diagram map accompanied, that the surveys have been extended around a large portion of them, and I am led to believe that, if drained, a region of valuable land would be reclaimed and rendered very productive; but being interior and without any navigable stream flowing from them, a question arises whether the draining of them by the United States would not conflict with State sovereignty; and if Congress should so determine, might not a grant, for specific purposes (making roads and building bridges to facilitate intercourse), be made to the State of Florida of one moiety, in a definite form, conditioned that the State authorities cause them to be drained at the State's proper cost and within a given period, of which I believe them susceptible. The United States would thus realize, for survey and sale, the other moiety, and the State acquire a valuable fund for the purposes above stated, after meeting the expenses of draining, and thus would be opened a large fertile surface for the habitation of man, cultivating sugar and tropical fruits extensively thereon.

No. 2.—Letter of Gen. James Gadsden, of South Carolina, to Hon. R. J. Walker, Secretary of the Treasury.

Washington, D. C., *May 4, 1847.*

Dear Sir: At the request of Hon. Mr. Westcott, of Florida, stating at the same time that it would be acceptable to you, I take the occasion of expressing an opinion favorable to the practicability of draining the Everglades and, with them, by same process, most of the lowlands and prairies forming the basin of the upper St. Johns River.

In the years 1823 and 1824 I was engaged in defining the Indian boundaries, under the treaty of Fort Moultrie, and at the same time in examining into the practicability of a road from St. Augustine to Cape Florida.

In the surveys and examinations connected with the performance of these operations, I was forcibly struck with the fact of the elevation of these regions above the level of the sea, and which had been supposed to be submerged, forming lakes, impenetrable swamps, and lagoons.

The elevation of the Everglades and prairies of the St. Johns above tidewater proved the capability of their being drained, while the inlets along the coast and the number of small rivers and creeks, which at seasons relieved the overflowings of the interior basin of Florida, showed that by deepening these natural outlets at their heads and multiplying the number of parallel and artificial cuts at favorable points the whole country, at times submerged, might be reclaimed and brought into profitable cultivation. If I did not advert to these views in a report made at that early period to the Department of War, I have subsequently mentioned them in conversation, and, I think, at one time gave publicity to them with some details through the columns of a newspaper.

The subject is one of great public interest, in my estimation, and merits investigation, for should the basin of the interior of southern Florida be susceptible of reclamation it will open to the United States the only portion of her territory capable of

competing with tropical latitudes in all those productions which enrich them. I write in great haste and would, if desirable, when more at leisure, enlarge on the views herein so briefly conveyed.

Respectfully, your obedient servant,

JAMES GADSDEN.

Hon. R. J. WALKER,
Secretary of the Treasury.

No. 3.—LETTER FROM GEN. THOMAS S. JESUP, QUARTERMASTER GENERAL, TO HON. J. D. WESTCOTT, JR., UNITED STATES SENATOR.

WASHINGTON, *February 12, 1848.*

MY DEAR SIR: In reply to your inquiry whether it would be practicable to drain the Everglades in south Florida and what would be the advantages, political and military, of that measure, I have to remark that I entertain no doubt of the practicability of the measure.

From my own observation, when commanding the army operating in that country 10 years ago, as well as from reports made by and information derived from intelligent officers who operated near and who explored the Everglades and the large lake (Okeechobee) north of them, I have no doubt both the glades and the lake are from 30 to 50 feet above the level of the sea in the most violent storms. The practicability of draining both I take for granted. As to the expense, that can be determined only by accurate surveys. The effect of the measure would be to reclaim many hundred thousand acres of valuable land, without including the bed of the Everglades, now subject to inundation for several months in every year. The Kissimmee River is the outlet of Lake Tohopekaliga, and connects that lake with the great lake Okeechobee. It is a sluggish stream, bordered by a large body of as rich lands as any in the South, which it inundates to a vast extent during the rainy season. Were the surface of the lake and the Everglades lowered, those fine lands would be reclaimed and would soon be converted into as valuable sugar plantations as any in the world. The hammocks in this part of the country are all extremely rich and would all soon be converted into sugar plantations. The swamps are generally peat swamps, which, if drained, would soon be converted into olive, lime, and orange plantations and would be cultivated by a numerous white population, which would be interposed between the sugar plantations, cultivated by slaves and the free blacks of the West Indies. This, in a military point of view, would be highly important and add greatly to the strength and security of the South.

To protect our valuable and growing western and southwestern commerce, we must command the communication between the Atlantic and the Gulf of Mexico. This can be done only by fortifications on the Florida Keys, combined with war steamers; to support those fortifications we require a numerous population in their rear.

One of the effects of reclaiming the inundated lands of south Florida will be to give us this population, whose labors will render us as independent of the West Indies, as regards most of the tropical products, as their presence will protect us from the influence of the policy adopted in the British Islands.

You must take these crude and hasty remarks for what they are worth; for, pressed as I am by official engagements, I can do justice neither to the subject nor to myself—I have not time, even, to read what I have written.

I am, most respectfully, your obedient servant, TH. S. JESUP.

The Hon. J. D. WESTCOTT, Jr.,
Senate United States, Washington.

No. 4.—LETTER FROM GEN. WILLIAM S. HARNEY, UNITED STATES ARMY, TO BUCKINGHAM SMITH, ESQ.

WASHINGTON, *January 23, 1848.*

DEAR SIR: I cheerfully comply with your request to state to you, in this form, my knowledge of that region of your State called the "Everglades," and my judgment as to the feasibility of draining them, and as to the mode of draining them, and the benefits that would ensue therefrom.

During the late Seminole War I was repeatedly in the Everglades and on the rim or margin at different points, and crossed it from Miami to Shark River. It is a vast, fresh-water lake, of shallow depth, from 60 to 90 miles in length, and from 25 to 50 miles in width. Its general depth is from 2½ to 6 feet of water, over (say from

2 to 6 feet of) soft mud, or vegetable deposit. It is interspersed with thousands of islands, from a quarter of an acre to several acres in area and generally having a few trees on them. Water grasses of several feet in height above the water cover its entire surface, except in a few channels or where there are small ponds of water with sand bottom from 3 to 5 feet deep. There are no trees in the waters of the interior of the Everglades, but the margin of the "Glades," running out about on an average 1 mile, is full of fine cypress trees. The Everglades are supplied with water, in my opinion, from two sources: First, the rains that fall in it; second, from the lake Okeechobee, lying on its northern extremity and separated from it by a very narrow strip of grass swamp. This is proved by the fact of which I have been informed, and of the truth of which I am satisfied, that in seasons of drought the water in the Everglades is very much diminished, and its fall in such seasons corresponds to the fall in the adjacent lake. The lake is a deep reservoir for the rains that fall on the eastern, northern, and western sides of it for many miles (the country for some distance depressing as its shores are approached). On its northern side it receives all the waters of the Kissimmee River and its tributaries, rising over a hundred miles farther up the peninsula and being the natural drains for that distance for the whole region, except that contiguous to the sea and gulf coast, or the River St. Johns, and the lakes at its source.

The bottom of the Everglades, below the deposit I have mentioned, is of lime-rock, common in that region, and its general level, I am fully satisfied, is several feet above the level of high water in the Gulf of Mexico on the west, or the Straits of Florida on the east and south—a few miles only distant from the rim or margin, for 50 or 60 miles from its southern extremity. Of the practicability of draining them I have no question. That such work would reclaim millions of acres of highly valuable lands, now utterly valueless because incapable of use, I have no doubt. My plan for doing the work would be to dig a large and deep canal from Lake Okeechobee into the Caloosahatchee River on the west side and a like canal from the lake to the head of the Loxahatchee River on its east side, and smaller canals from the Glades through the river into the head of the Ratones, Little River, Arch Creek, Miami, Shark River, and other outlets on both sides of the peninsula. I am satisfied these canals and drains once opened the Glades will become dry; I am also convinced these canals could be easily kept open by the water running through them. Of the cheapest mode, and of the cost of such undertaking I can not pretend to make an accurate estimate. The two chief canals would not probably be more than 10, or at the outside 15, miles in length each, 30 feet wide, and from 5 to 15 feet deep; and the others need be but small drains or ditches of from 3 to 5 miles in length. No person can say with positive certainty what the soil of the Everglades when drained would or would not produce; but it is my opinion it would be the best sugar land in the South and also excellent for rice and corn. But if not, it could at any rate in that latitude be made valuable for the raising of tropical fruits, and it is the only region of the present United States in which they can be raised. Its being made susceptible of cultivation (and instead of being as now a waste of waters fit only for the resort of reptiles) would be a happy epoch for Florida. I do not know of a project that I regard as more calculated to benefit the country than this, if successful. If it does succeed, it affords the Union just the kind of cultivable land that is wanted to render us to a great extent independent of the West Indies. If it does succeed, in less than five years that region will, I have no doubt, have a population of a hundred thousand souls and more. Our coast in south Florida is now extremely exposed in time of war. This population would protect it and afford security to the whole commerce of the western country passing along its shores. It would also tend to the security of the entire southern portion of the Union in an eminent degree. But it is not necessary for me to advert to these considerations. This letter is already tedious, and I close it with the assurance that

I am, respectfully, your obedient servant,

WM. S. HARNEY,
Colonel, United States Army.

TO BUCKINGHAM SMITH, Esq.

No. 5.—LETTER FROM LIEUT. COL. S. H. LONG, TOPOGRAPHICAL ENGINEERS, TO HON. J. D. WESTCOTT, JR., UNITED STATES SENATOR.

PITTSBURG, *February 7, 1848.*

SIR: I have perused with interest and satisfaction the several papers you did me the honor to exhibit for my inspection in relation to the Everglades of your State.

Although I have never had an opportunity of visiting that part of the country, yet from the documents above mentioned and from conversations with several intelligent

gentlemen who have explored the Everglades I have obtained much authentic and valuable information in regard to the character and aspect of the district of country designated by that name.

The main body of this district appears to be situated between 25° 31′ and 27° of north latitude, and between 80° 30′ and 81° 15′ of west longitude from Greenwich. Its extent from north to south is about 100 miles, and its average width from east to west about 50 miles. It is bounded on the north by Lake Okeechobee, which may be regarded as an extensive water sheet covering a portion of the Everglades and holding it in a state of constant submersion, and on the east, south, and west by a sort of rim or margin, elevated a few feet above the common level of the included district and of the circumjacent country. A profusion of insular tracts of greater or less extent and of elevations about equal to that of the rim, or a few feet above the common level of the district, are scattered in every direction over the surface of the district.

With the exception of these insulated tracts and the rim with which it is bounded the entire district is subject to periodical overflows of water to the depth of 2 or 4 feet during the rainy season, which usually prevails from August or September to February or March of every year. These overflows are supposed to have their principal origin in the country northward of Lake Okeechobee and to be brought down to the lake through the channel and valley of the Kissimmee River.

The entire district embraces an area of about 5,000 square miles, nearly one-half of which, agreeably to the best information I can obtain, is susceptible of drainage, and when thus reclaimed would present fields of vast magnitude adapted to the cultivation of sugar, rice, and numerous tropical products of great value. The method of drainage that has been proposed and recommended is as follows, viz:

First. A spacious canal or drain leading from Lake Okeechobee westward, through the valley or pass of Caloosahatchee River to the Gulf of Mexico;

Second. A similar canal leading from the same lake eastward, through the valley of Lochahatchee River to the Atlantic Ocean; and

Third. Numerous drains of much smaller size leading across the rim and communicating, respectively, with one or more of the numerous rivulets that rise in the vicinity of the rim and empty into the Gulf of Mexico and Atlantic at various points along the coast of Florida.

It is believed by many that the two large canals first mentioned will amply subserve the purposes of drainage; but should they prove inadequate that the desired end may be effectually attained by means of the smaller drains mentioned in the third proposition.

The practicability of draining the Everglades must of course depend on the elevation of Lake Okeechobee and of the Everglades themselves above the level of the high tides in the ocean. This elevation is supposed to be from 12 to 20 feet. The difference of the levels alluded to, so far as I can learn, has never been determined by instrumental surveys. Its accurate determination should unquestionably precede any attempts to accomplish the object in view.

By means of the two canals connecting Lake Okeechobee with tidewater, together with a lock in each (if found necessary) of suitable dimensions to admit small coasters and steamers, it is supposed that a line of continuous navigation may be opened entirely across the isthmus of Florida from the Atlantic to the Gulf of Mexico. In case the locks should be found expedient and proper they should be accompanied by spacious waste weirs or sluices and perhaps flood gates in order to afford a full and free discharge of water from the lake, etc.

The portion of the Everglades believed to be susceptible of drainage in the manner herein contemplated embraces an area of at least 1,000,000 acres, and the cost of drainage, surveys, etc., included, it is also believed, will not exceed $300,000, or 30 cents per acre.

The benefits likely to result not only to the State of Florida, but to the United States generally, are incalculable. These advantages will manifest themselves not only in giving great value to lands now entirely waste and useless, but in adding an incalculable amount of the choicest and richest products to the means of subsistence and to the comforts of human life. An early appropriation to the amount above mentioned, viz, $300,000, is deemed advisable and is hereby most respectfully recommended. I have the honor to be, sir,

Very respectfully, your obedient servant,

S. H. LONG,
Lieutenant Colonel, Topographical Engineers.

Hon. J. D. WESTCOTT, Jr.,
United States Senate.

No. 6.—LETTER FROM MAJ. J. D. GRAHAM, TOPOGRAPHICAL ENGINEERS, TO HON. J. D. WESTCOTT, JR.

WASHINGTON, *March 1, 1848.*

SIR: Having considered the very interesting and important subject of draining the submerged district of country within the State of Florida known by the popular name of "the Everglades," I cheerfully say that I fully concur in the views and opinions expressed in the letter of Lieut. Col. S. H. Long, of the Corps of Topographical Engineers, addressed to you from Pittsburg, under date of the 7th of February ultimo.

I will only add that in my opinion the drainage should be effected through the channels of rivers already communicating with the sea. This would be done by artificial canals made to draw the water from "the Everglades" into the head branches of these rivers.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Major, Topographical Engineers.

Hon. J. D. WESTCOTT, JR.,
United States Senate.

No. 7.—LETTER FROM CAPT. J. MCCLELLAND, TOPOGRAPHICAL ENGINEERS, UNITED STATES ARMY, TO HON. J. D. WESTCOTT, JR., UNITED STATES SENATOR.

WASHINGTON CITY, *February 25, 1848.*

DEAR SIR: In reply to the inquiries made by you a few days since, in regard to the character of the Everglades of Florida, the nature of their soil and of that of the country in their vicinity, and of the possibility of draining them, I give you with pleasure the following information obtained by me in the course of an expedition to them and the Big Cypress Swamp against the Seminole Indians in January, 1841:

After leaving the Caloosahatchee River at a point about 30 miles above its mouth, we traversed a prairie in a southwesterly direction, and at the distance of 25 miles reached the north side of the Big Cypress Swamp. Our direction was then changed to the east, and, after marching a distance of 30 miles, we reached the west side of the Everglades. We observed that the prairie had been overflowed and that the water had receded to the Everglades, showing a descent toward them. The soil of the prairie is a rich limestone, rocks of which were visible in many places. The surface of the ground was covered with a rich coat of grass, the best evidence of fertility, and the soil of the hummocks, with which the prairie is interspersed, can not be exceeded for richness. It is to be presumed that as the prairie when overflowed is part of the Everglades that the character of their bottom corresponds with that of the prairie in composition and fertility.

The overflow of the country west of the Everglades is caused by the rush of water from Lake Okeechobee first to the Everglades, and the slowness of its escape to the Atlantic causes it to spread westward, so that by draining the Everglades you would secure from inundation this rich prairie, and in all there would be reclaimed in the Everglades a tract of the richest sugar and cotton land of 2,700 and in the prairie 800 or 900 square miles; and by the means used for effecting your purpose a canal 12 miles in length, from the lake to the head of Caloosahatchee, and another, say, from 10 to 18 miles long, from the lake to the head of the Lochahatchee, you would obtain a water communication (canal and river) between the Atlantic and Gulf, and at a cost probably not more than three or four hundred thousand dollars, depending upon the dimensions adopted for the canals and other drains, but certainly inconsiderable compared with the great benefit to be derived from the expenditure.

The Everglades were traversed in various directions during the campaigns against the Seminoles, and the description given of them by the officers engaged in the expedition agree that "they are interspersed with islands in every direction, varying in size, but all having a rich soil and luxuriant growth upon them."

In the course of the year 1840 or 1841 I was informed by the late Capt. J. R. Vinton, Third Artillery, that he had run a line of levels from the Atlantic Ocean to the Glades, and found their elevation above it from 10 to 15 feet. This was taken at Fort Dallas, at the mouth of Miami River, which empties into Biscayne Bay. The height of Lake Okeechobee must be considerably greater than this.

I am, very respectfully, your obedient servant,

J. MCCLELLAND,
Captain, Topographical Engineers.

Hon J. D. WESTCOTT, JR.,
United States Senate.

No. 8.—Letter from Commander L. M. Powell, United States Navy, to Hon. J. D. Westcott, Jr., United States Senate.

Washington, *March 1, 1848.*

My Dear Sir: I have read with great interest the papers submitted by several officers familiar with the topography of southern Florida, touching your proposed plan for the drainage of the great basin of the Everglades, and, without presuming to offer an opinion as to the expense of so great an undertaking (great in its results, I mean), I may be pardoned if I express my entire conviction of its practicability—an opinion formed in 1837, when I first viewed the Everglades, and not changed upon a subsequent partial exploration.

I have entered the Glades from several points on the eastern coast of Florida, and never failed to find a decided current between the tidal water level and that of the waters of the lake, the rivers, heading in the Glades, obstructed at or near the junction by rapids, or as at the Miami by a pretty fall of 15 or 20 feet.

This surely indicates a level to the bottom of the basin of the Glades, when the known depth, a foot or two at most, is considered much above the level of tide water, which strips the question of thorough drainage of its most imposing difficulty.

Again, the margin of the Everglades, wherever I have viewed it closely—as, for example, where the waters of the lake break through it and form the sources of the eastern rivers—is composed of a ledge of limestone, which crops out and makes a rim to this shallow but extensive basin. I have seen this formation at different points, and, from the uniformity of its geological features, do not doubt that it is characteristic of that portion of South Florida known as the Everglades—the Okeechobee included, which is only the deepest and least obstructed part.

A knowledge of this fact indicates the remedy for the second difficulty to be encountered in the proposed work. If mere drainage of the waters be desired only, a bountiful Providence has already pointed out the way, and has partially accomplished it. The surplus waters of the great lake have, at several points, and by the nearest route, worn down the narrow rocky girdle and opened a deep and ample channel beyond it to the sea. We have only to follow up the work, and break down the barrier to the proper level at these natural outlets to empty out the basin.

Should the bottom of the Okeechobee Lake be found, on survey, to be below the necessary level for drainage merely, so much the better. A canal or cut, from the head of one of the rivers on the eastern side, would connect the lake with the Atlantic Ocean, and, in conjunction with the taps made into the wall of the great basin farther south, as at the Miami, Arch Creek, Ratones, New River, etc., would open a navigation to the interior and effect the desired drainage.

The results of such a work as this are beyond mere speculation. A vast extent of fertile lands which, if not within the Tropics actually, have truly a tropical climate to mature the products of the soil, would be reclaimed to the use and enjoyment of man.

I am, dear sir, yours, faithfully,

L. M. Powell,
Commander United States Navy.

Hon. J. D. Westcott, Jr.

No. 9.—Letter from Lieut. C. R. P. Rodgers, United States Navy, to Hon. James D. Westcott, Jr., United States Senator.

Washington, *February 14, 1848.*

Sir: During my three years' service in Florida, I traversed in canoes the greater part of the Everglades, and became familiar with their peculiarities and character; but, as nearly six years have elapsed since I last crossed them, and as I have not in Washington my notes of the expeditions in which I shared, I fear that the information I can give you may seem somewhat meager. The map of Florida published in 1846 (a copy of which you have kindly furnished me) will give a good idea of the extent of the Everglades and an approximate idea of the position of their most important islands.

The Everglades seem a large basin of limestone, covered with pure fresh water, varying in depth from 6 inches to 5 feet; the rock, in many places bare, is generally covered with a pure vegetable deposit, producing a growth of rank, useless grass. Vast plains covered with this grass make up the greater portion of the Everglades. Innumerable islands are scattered over these plains, varying in extent from a few yards to many acres, and covered with a black soil of no great depth, but of remarkable richness. These islands are shaded by large trees of various kinds, and, where cultivated, appear to have amply rewarded the labors of the Indian husbandman. They seem to be

constantly increasing in size, and may be observed in every stage of formation, from the first gathering of soil around the roots of a few mangrove bushes, to the island covered with lofty trees, cultivated fields, and the villages of its Indian inhabitants. I have never visited the portions of the Everglades which approach Lake Okeechobee, and therefore will express no opinion as to the probability of their waters being drawn from the overflow of that lake. I can remember no spring in any part of the Everglades, nor do I think that the fall of rain would supply the water which is continually pouring itself into the sea through the numerous rivers on both sides of the peninsula.

The freshness of these rivers, the rapidity of their currents at all seasons, taken in connection with the shallowness of the Everglades, abundantly prove that the bottom of these Glades is considerably above the level of the sea. It may be well for me to state, in conclusion, that after observing the climate of the Everglades at every season, I consider it one of the most healthy in the world.

I am, sir, very respectfully, yours,

C. R. P. RODGERS,
Lieutenant, United States Navy.

Hon. JAMES D. WESTCOTT, Jr.

No. 10.—LETTER FROM A. H. JONES, ESQ., UNITED STATES SURVEYOR, TO BUCKINGHAM SMITH, ESQ.

ST. AUGUSTINE, EAST FLORIDA,
November 12, 1847.

SIR: In reply to your letter of inquiry upon the practicability of draining the Everglades, together with other questions connected with the same subject, I have to state that two years' professional labor as a Government surveyor in the country bordering the Everglades upon the Atlantic side have rendered me well acquainted with its peculiar characteristics.

The scene of my operations has embraced the headwaters of the St. Johns River and the country extending from Jupiter Inlet to Lake Okeechobee, thence south to the lower end of Lake Worth.

At the time of "working up" the country included between the Okeechobee and the Atlantic my instructions compelled me to extend my lines as far into the Everglades as was practicable, the whole being bounded on the west by the Everglades or the distance of 25 miles.

So far as I have understood the instructions given by the department to govern you in your reconnoissance, the most important facts to be ascertained are:

First. To discover whether sufficient fall exists between the Atlantic, the Gulf of Mexico, and these Glades to make their drainage practicable.

Second. To ascertain the sources of the vast volume of water that periodically accumulates in the Everglades.

Third. If sufficient fall is found to effectually drain them, whether the quantity and quality of land capable of being reclaimed will guarantee the propriety of incurring the expense.

In answer to the first inquiry, I know of no actual level ever having been taken of this country, and am, therefore, only governed by an experience of five years as an engineer upon the canals of Pennsylvania and Ohio in stating my belief that a fall of at least 12 feet will be found upon a proper examination with instruments.

The numerous rivers that have their rise in the Everglades have a strong and permanent current until they meet tidewater. The savannas that intersect each other through the pine woods extend from the rim of the Everglades to the Atlantic, thereby affording a vent also for the escape of the surplus water during the rainy season where the Everglades are overflowing.

The accumulation of water originates from two causes, viz: The actual fall of water over this wide extent of swamp land in the rainy season, which usually begins in May and continues until the last of June, and sometimes longer. It is also a reservoir into which flows all the surplus water of the surrounding country that falls for 50 miles north. The water that accumulates in the Kissimmee prairies and Tohopekaliga Lake find a vent through the Kissimmee River into Okeechobee Lake, thence into the Everglades. This lake is a magnificent sheet of fresh water, having an extent of 40 miles north and south and a width of 20 miles. It has no regular outlet to the ocean or Gulf, but looms south, gradually losing its borders amidst the saw-grass marshes of the Everglades, and is thereby proved to be an important auxiliary in keeping them constantly overflowed.

In relation to the quantity and quality of land capable of being reclaimed, I, of course, can only speak of such portions as I have examined. I never heard or read of so vast an accumulation of decayed vegetable substance as is found in the north-

eastern section of the Everglades. I frequently extended my lines for a mile or two into them when closing my township corners; and when placing posts and making embankments around them I have thrust my Jacob's staff (measuring 5 feet) with all ease up to the top—even then, apparently, not striking the under strata of sand or rock. Throughout the whole distance examined by me this extraordinary deposit of decayed vegetable substance existed, the whole being covered by a very high and thick growth of saw grass. This high grass is known to be of annual growth, so that in the course of time, if nature be allowed to take her own way, the marsh must eventually fill up from the continued decay of so vast a top growth. As it is now, however, it strikes the eye like the outcrop of creation, where nature has as yet only been half made up.

The most certain plan to be adopted effectually to drain this large extent of swamp land would be to connect Lake Okeechobee with the Miami River by means of a ditch running through the heart of the Everglades, since that lake, as before stated, is the great reservoir that constantly supplies the surrounding lowlands with water. The fall properly made use of to inundate the surrounding swamp at the proper season would furnish the largest extent of valuable rice land that could be found in the United States.

Ditches simply running across the pine ridge from the rim of the Everglades to the ocean would not be sufficient; they must extend into the heart—tap the principal fountain—to make the drainage constant and sure; otherwise the accumulation of water in the rainy season would still exist and the undertaking prove abortive.

The amount of good valuable land that could be thus reclaimed might exceed a million of acres, suitable to the growth of two of the most important products of southern agriculture, viz, sugar cane and rice. The extent of country adapted to their successful growth is limited in the United States, and it behooves our Government whenever it is in her power to adopt such measures as are best calculated to advance and encourage their cultivation.

The practicability of draining the Everglades is, then, a subject of vast importance not only to the prosperity of Florida but the interests of the whole southern country would receive an impetus in its successful accomplishment.

I do not hesitate to pronounce in its favor and would recommend an early and more thorough examination with instruments in order to obtain true scientific results.

Respectfully, yours, etc.,

A. H. JONES.

To BUCKINGHAM SMITH, Esq.

No. 11.—MEMORANDA FROM S. R. MALLORY, ESQ., COLLECTOR OF CUSTOMS OF THE UNITED STATES AT KEY WEST, TO B. SMITH, ESQ., 1847.

KEY WEST, *September, 1847.*

The Everglades, extending from Jupiter Inlet on the east to the Caloosahatchee on the west, and from 30 to 50 miles wide, are no more than what their Indian name, Pah-hay-okee, denotes, viz, "Grassy water." This immense grassy plain, covered in the wet season—i. e., from July to January—with an average depth of 26 inches water. Large fields of dense saw grass shooting up from 3 to 5 feet in wet, and from 6 to 8 in dry, seasons render the effort to penetrate it difficult at all times and impassable in very dry seasons. Canoes or very light narrow boats are the proper means at all times. The Everglades have never been topographically surveyed or even carefully examined, though many persons have penetrated and crossed them. In all charts that I have seen, distances in them are overrated, which, I suppose, is the result of the labor and difficulty employed in getting through them, as compared with the time consumed, and also by the fact that a haze, produced by the constant and great evaporation, always hangs over them and gives objects the appearance of increased distance. The earth upon which these fields of saw grass grow is a blackish mud, in places from 2 to 8 feet deep, but frequently only 18 inches or two feet, and the bottoms of the small gulleys or channels through which voyagers are compelled to pass are in almost all cases the hard, white limestone, against which the oar or pole sounds ringingly, and rebounds. These channels, as a general rule, are from 4 to 6 feet deep, but many are found for short distances to be as deep as 10 feet. The Everglades are studded with many islands, among which the two Pine Islands, from 4½ to 7 miles south of the south branch of New River and Sam Jones Island off Arch Creek, are good specimens. To visit these islands, and all others in the Glades in the wet season, is to find but small pieces of land free of water; but in the dry season ten times the surface, perhaps, is exposed. I have always found that the ridges and beds of

saw grass were dense about these islands. On Sam Jones Island very rich hammock is found on its north side and where live oaks of immense age and size may be found. These islands generally contain more or less rich land. The Everglades on the west and north are fringed with cypress swamp, in which they run in wet seasons to a depth of from 20 inches to 3 feet; and back of these swamps the pine land lies, down to the vicinity of the seaboard on the eastern coast. A cane grass, of which cattle are very fond, grows in abundance at the margin of these Glades between the pine and cypress lands. The piny woods are very rocky, the growth usually smaller than that of Alabama, Georgia, or Carolina, and the wood very knotty and pitchy, excellent for tar.

In the neighborhood of New River, upon all its forks and branches, and between its two principal arms, there is much good land lying in small detached parcels and upon which tropical fruits will readily grow; the cocoanut, lemon, and lime have been successfully tried. This, just about New River, is a fine country for a man with small means, say three or four hands, who wishes to be independent. The woods and streams abound with game and fish, frost is rarely seen, the coomty grows profusely, and its preparation is a bagatelle. The most indolent man I ever knew prospered there. New River bar may be crossed in 4½ feet and at times more water. I have seen two large steamboats 7 miles up. It runs parallel with the seacoast in a direct line and separated from the sea only by a ridge of land from 75 to 250 yards wide for 5 miles and then branches off, the best branch being the left or south one, along which Fitzpatrick and Cooly were located with others. Cooly's hammock on the right side of this branch is good land. The left side of this 5-mile stretch of New River is bordered by salt-marsh land from one-fourth to three-fourths of a mile wide. This land is worth an examination, as it is said to be rich. The pine woods are covered with the saw palmetto, and contain many ponds, low grounds, in which the water during the wet seasons collects. In all the streams emanating from the Everglades, from Jupiter to the Miami, rapids are found near their junction with the Glades. These rapids are nothing more than water, running at about 7 knots in wet seasons over the elevated ledges of rocks, which there form the bottom, and are about from 9 to 28 inches deep. The land in the cypress swamps here appears to be neither rich nor deep, being apparently but pure silex with an admixture of sediment. The good land of all this country on the east side of the Glades (the west shores have never been examined), that which is always above water and such as would invite the cultivator, from Jupiter to Key Biscayne Bay, lies in small bodies and is in small proportion to the poor land. A few good spots are found at the hunting ground 12 miles below the Miami. It is a very easy matter to go from New River to the Miami and thence to Shark River on the west coast through the Glades. An Indian may be procured at Fort Brooke, Chico, who can be relied on, for a small reward. But little fish or game can be found in the Glades, and no Indians live there.

Whether sound policy and expediency, keeping in view the expense and the lands to be reclaimed, dictate the attempt to drain these Everglades; and whether it be possible to accomplish it to any considerable extent are questions which a careful examination of the lands and streams, a knowledge of the quantity of water falling per annum, and a connected system of levels can only adjust or solve. I am not competent to express a valuable opinion; but I have been in the Glades and about them, from Jupiter to the Miami, much. I have ate of its fish, drank of its waters, smelt of its snakes and alligators, and waded through its mud to my middle for weeks, and am au fait upon all these, besides possessing some little acquaintance with its mosquitoes and horse flies, both of which can be recommended. I have also, together with a friend, taken soundings with poles, marked for the purpose, from our boats for miles and miles; all of which labor might as well have been expended in surveying the moon. Dr. Lightner, my friend, was engaged in the botany of Florida (a fertile field), and was also anxious to establish or refute the practicability (not the policy) of draining the Glades. My own impression is that large tracts of the Glades are fully as low as the adjoining sea, and can never be drained; that some lands around the margins may be reclaimed by drainage or by dyking, but that it will be found wholly out of the question to drain all the Everglades. As the country now is, healthy and mild, with its good lands in small parcels, with water at hand anywhere for irrigation, I think it offers inducements to small capitalists, men with from 1 to 10 hands, to go there and raise fruits. Fruit will grow well there.

S. R. M.

No. 12.—Everglades.—Extracts from Manuscript of John Lee Williams, Esq.

The Pay-hah-o-kee, or Grass-water, extends from 25° 36′ nearly to the 27° of north latitude, or about 120 to 130 miles long, and 70 miles at its widest part. It is bounded on the south by large islands, which separate it from the Florida Keys; on the west by small islands and the Big Cypress Swamp; on the north by Pine Islands and the Lochahatchee Swamp; and on the east by large islands, which separate it from the Atlantic. It is a large basin of water sprinkled with small islets, overgrown with saw-grass from 4 to 6 feet high. The average depth of water is from 2 to 4 feet, but cut up with many meandering channels of open water, sometimes not more than 1 foot wide, and in other places spreading into small ponds. In these channels have been discovered deep round holes of clear water. Whether these are springs or sinkholes is unknown. They, however, abound with fish and turtle, and sometimes, though rarely, they are haunted by the manatee or seacow, a large, shy amphibious animal. One of these animals was taken by Col. Harney which weighed 800 or 900 pounds and had a skin three-quarters of an inch thick. They yield a large quantity of valuable oil and their bones are an excellent substitute for ivory. The Everglades are based upon the soft limestone rock which we have before described as the substratum of the whole territory. Its elevation above the tide has not yet been accurately leveled, but is believed to be full 20 feet. The grass is so thick in some places as to prevent the passage of canoes or boats. Generally speaking, however, the grass is much more sparse. Many of the islands are but little above the level of the water; but some of them are from 2 to 3 feet high, with a soil as rich as any that can be formed. Others are more sandy. The principal timber on most of the rich islands is liveoak, wild fig, papaya, and cabbage palmetto, thickly festooned with a great variety of vines. All the islands are surrounded with dense grass circles, from 100 to 500 yards wide. Boats can only approach the outward edge of this circle. A circle of mangroves is often formed inside of the grass. The Indians cultivate the inside of the islands only, leaving a border of liveoak and wild fig, which are very ornamental trees. The wild fig is, by the Spaniards, called havi. It is a little fig about the size of a kernel of corn—a perfect fig in miniature. In their fields they plant corn, pumpkins, tobacco, squashes, melons, and lima beans in abundance. Coconuts, plantains, bananas, and sweet potatoes are found on some of the islands. It is very probable that coffee would grow here, as frost never reaches these islands. Chitto-tus-te-nug-gee, or Snake-warrior, * * * took possession of an island about 20 miles west of Little River; had procured to be cleared about 20 acres of first-rate land; built upon it two small towns, and drew to it, from Sam Jones's men, near 60 inhabitants. About 3 miles west of Chittos Island is situated Tuscones. It is inhabited by an Indian family, who have erected a few houses and cultivated some small fields of corn and cane. The island cultivated and usually inhabited by Sam Jones is about 20 miles west of Tuscones. It is about half a mile long, but not quite so wide. It had three villages and as many hunting grounds. Attached to this are many smaller islands, all cultivated for provisions, but no houses. Narrow channels of water separate them from each other. The old chief is said to have here 70 warriors, many of them with families. Most of these islands swarm with fleas, cockroaches, and mosquitoes. A great many islands were found near there highly cultivated; but it is not probable that one-tenth part of the islands have ever been visited by the whites. On the southern route from the Miami River, and about 40 miles from that stream, there is a beautiful island called Hocomothlacco. Around this island there is a circle of grass, or mud, 400 yards wide. It is highly cultivated with provisions. Seven miles north and northwest of this lies Efanoc-co-qu-chee. This is not cultivated, but has some cleared land on it. It is used as a kind of caravansary or stopping place for boats on their route across the Big Cypress. Six miles northwest is Co-chok-o-ne-ha-jo. This island is cleared and cultivated. It is near the center of the Glades. Six miles farther is In-tas-kee, a large island inhabited and richly cultivated. From this island the current passes to the east; after passing it the current sets to the southwest. This circumstance gives credence to a statement made by a respectable gentleman who resides near the border of the Glades, and who has often visited them. He states that not far from the center of the Everglades there is an immense spring rising from the earth, covering an extent of several acres, and throwing up a large quantity of water with great force, and supplying the Everglades with all the water flowing through them. This is rendered somewhat probable, as the Lake Okeechobee receives two large rivers (the Kis-sim-mee and Thloth-to-pop-ko-hachee), without any apparent outlet. The northeast part of the Everglades terminates in the Loxahatchee Swamp.

No. 13.—Extracts from Letter of George Mackay, Esq., United States Surveyor, to Buckingham Smith, Esq.

Florida, *December 6, 1847.*

Sir: In compliance with your request, to furnish you with such data as I may possess in relation to the practicability of draining the Everglades of Florida, I must refer you to other communications that I have made on the subject, and can only say that, without a proper survey or examination, no certainty can be arrived at as to the extent of the fall of water or the feasibility of effective reclamation.

Although I executed the public surveys upon the eastern margin of these Glades and extended the township lines into them every 6 miles for nearly a hundred miles, yet so different were the observations and conclusions attending the termination of each of these lines, it was with much difficulty and, indeed, not until I had completed the whole survey, that I formed an opinion that a large portion of them might be drained. They may be divided into north and south Everglades, distinctive in their general character, as may be readily discovered in traversing their rim or shore. In the region southwest of the head currents of the Miami River, when the rainy season had made the water superabundant, I observed that there were currents and counter currents running in every direction, frequently quite rapid, and in the dry season I found that the course of these currents was, owing to numerous rock basins, in many instances perforated with holes in the bottom like a colander, into which these currents poured and disappeared; and in the pine woods, between these Glades and the Bay of Biscayne, may often be heard the rippling sound of running water, and frequently, in the fissures of the rock, it may be seen at from 6 to 8 feet below the general surface of the ground; and there are springs in the midst of the bay, where, by very indifferent means to shut out the salt water, pure fresh water has been raised 3 or 4 feet above the surface of the ocean; taken in connection with the falls of the Miami River, which came under your immediate observation, together with the facts of the difference of elevation between the Gulf of Mexico and the Gulf of Florida, and that there are large rivers running into both gulfs, and that the waters generally in the Glades do not rise above 20 inches, no reasonable man can doubt a considerable fall of water to the ocean. Passing from these southern Glades, which have generally a rocky surface or foundation, to the head currents of New River, large islands, extending to the westward, covered with a variety of timber, by their continuous succession seem to be a sort of barrier or terminus of the rocky Glades. Here begin the groves of cypress upon the rim or margin, and a more general uniformity of surface and depth of water throughout. Here also begins the appearance of regular channels, which seem to have been cut off from their confluence with the ocean by the cypress groves extending across and forming an impassable dam for several miles.

There is a point in this region which appears to have been one of the main outlets of the basin, which must have commenced damming some centuries ago, and by a succession of rains and droughts so filled it up with decayed vegetation that whenever the water rises above a certain height it rushes through the cypress, or falls generally over the margin like a flowing bowl, and passes, by way of the lagoons, to the sea. This is, perhaps, the most interesting point that I can bring to your notice. A broad channel, about 1¼ miles wide, with fresh-water grass, evidently filling up, commences directly underneath this cypress dam, and has its outlet into Hillsboro and New River Lagoons. After passing Snook Creek, and still farther north, the pine woods and the Everglades are more intimately associated for several miles, when the cypress again commences and continues without interruption, with one exception, to the Okeechobee. This exception is a channel of considerable magnitude, communicating about midway of Lake Worth, but now grown up with cypress or filled with saw grass, yet the waters seem still to find some passage to Lake Worth, which is fresh water, extending along parallel with the sea, and at many points not more than 30 yards distant, having a discharge into the Ebtenchatchee and Jupiter Bay.

I was forcibly impressed with the peculiarity of the southern Glades—a vast rock of interstices and partitions, something in the form of a honeycomb—the interstices or cells, filled with soil, saw grass, or water, are barren, and varying from 1 acre to 20,000 acres or more, the partition varying from 1 chain to 1 mile wide, barren, with islands of trees, traversable with canoes in high water, and upon horseback in low water, the whole presenting the most romantic view of grass, prairie, and water, with gems of islands of rare timber and shrubbery.

Very little can be known of the north Glades. They are uniformly saw grass. It is impossible to penetrate them with canoes in high water, and in low water they are so generally boggy it is impossible to explore them on foot. They are universally bespangled with myrtle and willow and coesplum clumps of bushes.

On the subject of the settlement of the islands of the Everglades, I saw nothing that indicated civilization, excepting upon a small island at the head of the Miami River, where are to be seen the fallen walls of a stone building, broken earthenware, and bottles of a shape I have never before seen, and of an age I will not venture to determine.

* * * * * * *

I am, sir, very respectfully, your obedient servant,

GEORGE MACKAY.

BUCKINGHAM SMITH, Esq.

No. 14.—EXTRACTS FROM LETTER OF MAJ. W. H. CHASE, UNITED STATES ARMY, CORPS OF ENGINEERS, TO HON. J. D. WESTCOTT, JR.

WASHINGTON, *August, 1848.*

MY DEAR SIR: I have read the letters and memoranda which you placed in my hands relating to the Everglades of Florida.

These papers, authorized by engineers, surveyors, and other observers, can not fail to be interesting to those who have given thought to the subject.

The opinions of all these are almost unanimous as to the practicability of draining this portion of Florida. By taking these opinions, then, and adding to them my own observations made at and near the Miami River, I can not fail to arrive at the conclusion that a system of drainage, adopted after a careful survey had been made of the country, would result in reclaiming, perhaps, 1,000,000 acres of land, a part of which would be suitable to the culture, not only of the great staples of cotton, sugar, rice, and tobacco, but possibly of coffee, and certainly of most of the tropical fruits.

With the exception of a single line of levels run by Capt. Vinton, of the Army, no accurate measurement on this score has been made, so that the heights of the basin above the Atlantic, expressed in the various estimates, are entirely conjectural.

The line of levels, however, run by Capt. Vinton, showing the elevation of the Glades to be some 10 feet or more higher than the sea, is surprisingly coincident with the opinions expressed by the various writers on the subject, affording, in this way, much encouragement for the prosecution of systematic surveys, by which the truth may be brought out.

I will not dwell here upon the great advantages that would accrue to the United States in general, and to the State of Florida especially, if the drainage of the Everglades could be effected; and I will content myself by saying that the strategic positions in the Florida Straits would be relieved at once of the only disadvantage they labor under could the southern portion of Florida be brought within the pale of cultivation, for ample supplies of every possible description required for the food of an army would then be drawn thence without hindrance from an enemy.

* * * * * * *

In the event of success, while the States in which the land lays would be amply remunerated, the United States would be doubly so by increased productions, not only in quantity, but variety. Indeed, it might then be claimed that nothing that any other climate produced could not be produced within the limits of "the present United States."

I am, very truly, your obedient servant, WM. H. CHASE.

The HON. J. D. WESTCOTT, JR.,
Of the United States Senate, Washington.

ACT OF CONGRESS (1850) TO ENABLE STATES TO RECLAIM "SWAMP LANDS."

AN ACT To enable the State of Arkansas and other States to reclaim the "Swamp Lands" within their limits.

[9 U. S. Stat. L., 519, 520.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That to enable the State of Arkansas to construct the necessary levees and drains to reclaim the swamp and overflowed lands therein, the whole of those swamp and overflowed lands, made unfit thereby for cultivation, which shall remain unsold at the passage of this act, shall be, and the same are hereby, granted to said State.

SEC. 2. *And be it further enacted*, That it shall be the duty of the Secretary of the Interior, as soon as may be practicable after the passage of this act, to make out an accurate list and plats of the lands described as aforesaid, and transmit the same to the governor of the State of Arkansas, and at the request of said governor cause a patent to be issued to the State therefor; and on that patent, the fee simple to said lands shall vest in the said State of Arkansas, subject to the disposal of the legislature thereof: *Provided, however*, That the proceeds of said lands, whether from sale or by direct appropriation in kind, shall be applied, exclusively, as far as necessary, to the purpose of reclaiming said lands by means of the levees and drains aforesaid.

SEC. 3. *And be it further enacted*, That in making out a list and plats of the land aforesaid, all legal subdivisions, the greater part of which is "wet and unfit for cultivation," shall be included in said list and plats; but when the greater part of a subdivision is not of that character, the whole of it shall be excluded therefrom.

SEC. 4. *And be it further enacted*, That the provisions of this act be extended to, and the benefits be conferred upon, each of the other States of the Union in which such swamp and overflowed lands, known as (and) designated as aforesaid, may be situated.

Approved, September 28, 1850.

ACTS OF FLORIDA LEGISLATURES (1851–1855) RELATING TO THE EVERGLADES.

AN ACT To secure the swamp and overflowed lands lately granted to the State, and for other purposes.

[Fla. Stats., No. 21, chap. 332.]

SECTION 1. *Be it enacted by the Senate and House of Representatives of the State of Florida in general assembly convened*, That the governor is authorized, and hereby requested, to take such measures as to him

may seem expedient and most to the interests of this State, in securing and classifying the lands lately granted to this State, designated as "swamp or overflowed lands," and that the plats of said land, as soon as secured, shall be delivered to the register of this State, and said lands shall be subject to sale under the same rules, regulations, and restrictions as are now, or may hereafter be, imposed upon the sale of Seminary lands.

SEC. 2. *Be it further enacted*, That all the necessary expenses of examining the lands to be secured, or in procuring maps, plats, records, field notes, or other evidence touching the title and description of said lands, shall be paid out of any moneys received from the sale of said lands: *Provided further*, That the accounts shall be first audited by the comptroller, and his warrant drawn therefor, as in other cases.

SEC. 3. *Be it further enacted*, That there shall be, and hereby is, created and constituted, a board of internal improvement for the State of Florida, to consist of the governor, attorney general, treasurer, comptroller, and State register of public lands, for the time being, who shall be, ex officio, members thereof, and one member from each of the judicial districts of this State, to be elected by the general assembly, to serve two years, and until their successors shall be elected, which said members, ex officio and elected, shall constitute the board of internal improvement of the State of Florida, and shall hold an annual meeting on the first Monday in December in each year.

SEC. 4. *Be it further enacted*, That the treasurer shall keep a separate and distinct account of all moneys or bonds received from the sales of all swamp or overflowed lands, and shall make an annual statement of the same to his excellency the governor, to be laid before the general assembly at their regular session.

SEC. 5. *Be it further enacted*, That the said register shall report biennially to the governor, at least ten days before the meeting of the general assembly, to be laid by him before them, upon the several matters committed to his charge, the progress made in securing the said lands, and such other matters as may be deemed proper in connection therewith, and shall report at all other times to the governor when he may think the public interest may require it to be done.

SEC. 6. *Be it further enacted*, That settlers on said lands shall be entitled to the benefit of the present preemption laws as on other lands.

Passed the house of representatives January 23, 1851. Passed the senate January 23, 1851. Approved by the governor January 24, 1851.

AN ACT To amend "An act to secure the swamp and overflowed lands lately granted to the State, and for other purposes."

[Fla. Stats., No. 17, chap. 496.]

SECTION 1. *Be it enacted by the Senate and House of Representatives of the State of Florida in general assembly convened*, That the third section of the act to which this is an amendment, approved January twenty-fourth, eighteen hundred and fifty-one, be, and is hereby, repealed, and that the following be substituted in lieu thereof, viz: That there shall be, and hereby is, created and constituted a board

of internal improvement for the State of Florida, to consist of the State engineer as president and eight commissioners to be elected by the general assembly, to wit, two of said commissioners shall be appointed from each judicial district, to hold their offices for four years and until their successors are appointed, and in case of vacancy from any cause, the governor is empowered to fill such vacancy until the next meeting of the general assembly; the engineer, with the two commissioners of each district, shall be a competent board to determine upon and recommend plans for the reclamation of swamp lands and to appraise the value of said lands, either before or after reclamation of said lands, as may be deemed by them most advisable, in the respective districts in which said lands may be situated, and they shall also be competent to determine and recommend any plans for local works of internal improvements, to be laid before the general assembly for its action; the State engineer is hereby authorized and empowered, whenever he may deem that the interest of the State requires it, to convene a general meeting of the board of internal improvement by giving at least thirty days' notice by letter to each commissioner, informing him of the time of said meeting, and for such and any service the commissioners shall receive from the swamp-land fund or any moneys which may be in the hands of the treasurer belonging to said fund, while engaged in such service, the same per diem and mileage as are paid to members of the general assembly.

SEC. 2. *Be it further enacted*, That if, in the opinion of the governor and board of internal improvement, there is any work connected with the reclamation of swamp lands which it is deemed advisable to be done during the interval of the sessions of the general assembly, the governor, with the consent of the board of internal improvement, may authorize the State engineer to contract with persons or companies to reclaim swamp lands for a portion of said lands, not exceeding one-half of said lands so reclaimed; the State engineer shall make a biennial report of his proceedings to the governor, to be laid before the general assembly, and he may report at such other times as he may deem the public interest to require it.

Passed the house of representatives, December 30, 1852. Passed the senate, January 5, 1853. Approved by the governor, January 10, 1853.

AN ACT To provide for and encourage a liberal system of internal improvements in this State.

[Fla. Stats., No. 1, chap. 610.]

Whereas the constitution of this State declares "that a liberal system of internal improvements, being essential to the development of the resources of the country, shall be encouraged by the government of this State, and it shall be the duty of the general assembly, as soon as practicable, to ascertain by law, proper objects of improvement in relation to roads, canals, and navigable streams, and to provide for a suitable application of such funds as may be appropriated for such improvements": Therefore—

SECTION 1. *Be it enacted by the Senate and House of Representatives of the State of Florida in general assembly convened*, That so much of the five hundred thousand acres of land granted to this State for

internal improvement purposes, by an act of Congress passed the third day of March, anno Domini eighteen hundred and forty-five, as remains unsold, and the proceeds of the sales of such of said lands heretofore sold as now remain on hand and unappropriated, and all proceeds that may hereafter accrue from the sales of said lands; also all the swamp land or lands subject to overflow, granted to this State by an act of Congress approved September twenty-eighth, anno Domini eighteen hundred and fifty, together with all the proceeds that have accrued or may hereafter accrue to the State from the sale of said lands, are hereby set apart and declared a distinct and separate fund, to be called the Internal Improvement Fund of the State of Florida, and are to be strictly applied according to the provision of this act.

SEC. 2. *Be it further enacted*, That for the purpose of assuring a proper application of said fund for the purposes herein declared, said lands and all the funds arising from the sales thereof, after paying the necessary expenses of selections, management, and sale, are hereby irrevocably vested in five trustees, to wit: In the governor of this State, the comptroller of public accounts, the State treasurer, the attorney general, and the register of State lands, and their successors in office, to hold the same in trust for the uses and purposes hereinafter provided, with the power to sell and transfer said lands to the purchasers and receive payment for the same and invest the surplus moneys arising therefrom, from time to time.

* * * * * * *

SEC. 16. *Be it further enacted*, That the trustees of the internal improvement fund shall hereafter fix the price of the public lands included in the trust, having due regard to their location, value for agricultural purposes, or on account of timber or naval stores, and make such arrangements for the drainage of the swamp or overflowed lands, as in their judgment may be most advantageous to the internal improvement fund, and the settlement and cultivation of the land, and the said trustees shall encourage actual settlement and cultivation of said lands by allowing preemptions under such rules and regulations as they may deem advisable: *Provided*, That in no case shall a preemption for more than one section of land be granted to any one settler.

Passed the house of representatives December 29, 1854. Passed the senate January 2, 1855. Approved by the governor January 6, 1855.

MEMOIR TO ACCOMPANY A MILITARY MAP OF THE EVERGLADES, COMPILED BY LIEUT. J. C. IVES, UNITED STATES ARMY, IN 1856, BY ORDER OF THE HON. JEFFERSON DAVIS, SECRETARY OF WAR.

The first authentic description of the Everglades of Florida, with maps, profiles, and levels, was doubtless the Memoir to Accompany a Military Map, compiled by Lieut. J. C. Ives, topographical engineer, under the general direction of Capt. A. A. Humphreys, topographical engineer, by order of the Hon. Jefferson Davis, Secretary of War, published in 1856, and commonly known as the "Davis map." The following quotations are taken therefrom:

The Everglades of Florida cover an area of about 4,000 square miles; embracing more than half of the portion of the State south of Lake Okeechobee. The subsoil of this vast region is coralline limestone. Upon the surface of this, which is very rough and irregular, lies an immense accumulation of sand, alluvial deposits, and decayed vegetable matter; forming a mass of quicksand and soft mud, from 3 to 10 feet or more in depth, that overspreads all but a few points of the first stratum. Upon the mud rests a sheet of water, the depth varying with the conformation of the bottom, but seldom, at dry seasons, greater than 3 feet. The whole is filled with a rank growth of coarse and tough grass, from 8 to 10 feet high, having a sharp, serrated edge like a saw, from which it obtains its name of saw grass. In many portions of the Everglades this saw grass is so thick as to be impenetrable, but it is intersected by numerous narrow and tortuous channels that form a kind of labyrinth, where outlets present themselves in every direction, most of them, however, terminating, at longer or shorter distances, in an impassable barrier of grass, mud, and quicksand. The surface of water is quickly affected by rains; the alternate rising and falling during wet seasons being very rapid. The difference of level between the highest and lowest stages of water is from 2 to 3 feet. The general surface of the Everglades is therefore subject to great changes; the character of marshy lake or mud flat predominating according to the wetness or dryness of the season. It is probable that, sometimes, more than one-half of the surface has no water upon it. Besides the mud islands, small keys are here and there met with which are dry at all seasons. Upon these the soil is very rich. There are many such, undoubtedly, that are often made the sites of Indian gardens.

In the year 1855, Capt. Dawson, First Artillery, made two explorations into the Everglades. The first was undertaken during the month of March, which is one of the dryest of the year, June and October being ordinarily the rainy months. * * * The water at first was very shallow, but in 5 miles increased in depth to 20 inches, * * * The general direction was west, though the route was extremely winding and circuitous. * * * At the end of 18 miles it was found the usual course to the western side was impracticable, * * * long mud banks were encountered, in which the men sank to their middles while dragging their boats. The course through the intervening ponds was greatly obstructed by fungi, clumps of trees, and bushes, and innumerable keys could be seen in all directions, the ground everywhere being boggy and wet. The third day the water became in many places too shoal to float the canoes, the breaks between the ponds were of greater extent, and the men were annoyed by the saw grass cutting their feet and limbs while forcing a way along. On the fourth day all the difficulties increased, breaks occurring 200 or 300 yards in length, grown up with old saw grass and without water. The ponds were but a few yards across and filled with fungi. The keys were smaller, however, and fewer in number. At the end of the day the command had reached a point 43 miles by the trail and 27½ in a direct line from Adams's Landing, when all progress was barred by a sea of tall saw grass, extending as far as the eye could reach; occasional small keys being seen, but no water.

A second exploration by Capt. Dawson was undertaken during the month of June, at which time the surface water was more than a foot deeper than before. After six days of difficult and laborious exertion he succeeded in obtaining a point a few miles northeast of Prophet's Landing, where further advance was stopped by want of water. * * * The edge of the Big Cypress was approached to within 3 miles, but it was impossible to get any nearer. The distance in a direct line from Fort Dallas to the place where the party turned back was 53 miles. By the trail it was estimated to be 120 miles. For 18 miles * * * the canoes had to be dragged through the mud and saw grass. * * *

In December, 1841, the command of Maj. Childs crossed in four days, from Fort Dallas to Prophet's and Waxy Hadjo's Landing, and afterwards recrossed the Everglades to Fort Lauderdale in about the same time. The first line passed over was undoubtedly the same as that traversed by Capt. Dawson, but no such obstacles were encountered as were experienced by the latter. There appears to have been at that time a passage for canoes without having to resort to hauling. The Indian guide who accompanied Capt. Dawson stated that the country was greatly changed since he had crossed it 16 years before, and that the keys were larger and more numerous. Settlers, who have resided upon the Miami River for 10 or 12 years, assert that the gradual filling up of the Everglades has been very perceptible. It would be reasonable to infer from the nature of the country that this must have been the case. The filling up appears to have been greatest toward the north and west, the southeastern portions always containing the most water. The late examinations would seem to establish the fact that, at present, during dry seasons, the Everglades are impassable. Only during high stages of the water would it be possible to cross. Even then the passage would be attended with great difficulties.

REPORT BY LIEUT. COL. Q. A. GILLMORE, CORPS OF ENGINEERS, IN 1882, UPON SURVEY MADE WITH A VIEW OF OPENING A STEAMBOAT COMMUNICATION FROM THE ST. JOHNS RIVER, FLA., BY WAY OF TOHOPEKALIGA LAKE, TO CHARLOTTE HARBOR OR PEACE CREEK.

Lieut. Col. Gillmore, whose observations were made largely within the limits of the drainage district, in speaking of the nature of the soil, said:

The subsoil is a well-stocked receptacle and storage magazine of the rain water thus absorbed, from which, by innumerable veins and rivulets, the lakes and ponds are fed. This condition is very favorable to the employment of the large lakes as natural reservoirs for a canal with locks, since the demand for water to operate such a canal would be moderate enough to cause no violent disturbance of the existing hydraulic relations. But an open and comparatively deep cut would soon cause a very active flow of these subterranean waters to its bed, which would probably be abundantly provided with water from that source for a certain length of time. But gradually the level of these subterranean waters will be lowered by the unceasing drain, the stock of stored-up water will become exhausted, and while the swamps may be reclaimed by the operation, their usefulness, as direct or indirect feeding reservoirs to the canal, will be destroyed or very materially impaired. (Ex. Doc. 189, 47th Cong., 1st sess., May 23, 1882, p. 5.)

REPORT BY DR. H. W. WILEY, OF THE BUREAU OF CHEMISTRY, UNITED STATES DEPARTMENT OF AGRICULTURE, IN 1891, ON THE MUCK LANDS OF THE FLORIDA PENINSULA.

[See Annual Report, Secretary of Agriculture, 1891, pp. 163-171.]

The establishment by this department of an experimental station at Runnymede, Fla., for investigating the growth of sugar cane in reclaimed swamp muck has rendered some account of that kind of soil important.

The possibilities of bringing into successful cultivation the swamp lands of Florida have occupied the minds of capitalists for several years. It has now been about 10 years since Mr. Hamilton Disston, of Philadelphia, formed the plan of reclaiming the swamp lands of Florida for agricultural purposes by drainage canals. These lands are found in detached localities over the whole State, but the parts of them which demand our attention at the present time are found extending from near the central portion of the peninsula in a southerly direction to Lake Okeechobee, and thence into the Everglades to the Gulf. It is on these lands that the experiments of reclamation have been made, and several thousand acres of swamp lands have been already freed of water and made ready for cultivation. Of these lands, at the present time, about 2,000 acres are planted in sugar cane, from 5,000 to 6,000 acres in rice, and quite a large area in gardens.

Vast tracts of reclaimed land, however, are still in the wild state, the water simply having been taken off them, but no attempts having been made to fit them for cultivation.

The muck lands, which form the subject of the present paper, begin near the headwaters of the St. Johns, about 20 miles southeast of the town of Orlando. These lands form the borders of the lakes and rivers, but the chief deposits are about the lakes. The configuration of the internal lakes of Florida is of the simplest nature. About the edges of the lakes the waves have thrown up a ridge of sand and muck, and this ridge is usually covered with cypress trees. Back of these come the swamp lands proper, which, during the greater part of the year, before the system of drainage was established, were under water. These swamp lands vary in width from a very few feet to many miles, and are bordered in turn by the sand and pine lands.

The first of these lakes in geographical order is known as Lake Hart. A canal has been cut from this lake to the headwaters of the St. Johns, and a large area of rich vegetable mold has been recovered. All other systems of drainage in the lands to which reference is made are drained toward the south, Lake Hart marking the watershed between the headwaters of the St. Johns and the headwaters of the Kissimmee. Only a few miles south of Lake Hart is found Lake East Tohopekaliga. This lake has been drained by a canal into Lake Tohopekaliga, on the shores of which is found the town of Kissimmee.

Lake Tohopekaliga has also been connected by a drainage canal with Lake Cypress, and Lake Cypress by another drainage canal with Lake Kissimmee. Lying east of Lake East Tohopekaliga is found another series of lakes, viz, Lake Preston, the most northern one, Lake Alligator, central, and Lake Gentry, the most southern of the three. These lakes are soon to be connected by drainage canals, and the last one, Lake Gentry, is to be opened into Lake Cypress. About 60 sections of land, or, in all, about 40,000 acres of rich muck land, will be recovered as soon as these canals are finished.

Passing from Lake Kissimmee into the Kissimmee River, we find a stream bordered on both sides by rich deposits of muck passing gradually into the sand and pine lands back of them. The river is extremely tortuous, and while the distance from Lake Kissimmee to Lake Okeechobee is only about 60 miles in a direct line, a boat, following the course of the river, passes nearly 150 miles in order to reach the lake.

No attempts have been made so far to reclaim the muck lands bordering the Kissimmee River by canals, and it is not possible to accomplish this by natural drainage. The level of the Kissimmee River, even at low water, is almost the same as that of the muck lands bordering it, and during the rainy season, lasting from June till October, the river becomes a veritable lake. There would, therefore, be no possibility of natural drainage for these lands, but by the construction of levees along the river and the introduction of pumps many thousands of acres could be recovered. Artificial drainage is no longer an experiment, but in many parts of the country it is practiced with entire success. The plantations on the Mississippi River below New Orleans are nearly all provided with artificial drainage systems, inasmuch as the natural drainage in that locality is entirely insufficient to free the lands from water. The great fertility of the Florida muck soils would render such a system of drainage profitable as soon as the country is opened up to the markets of the North.

Passing from the Kissimmee River through Lake Okeechobee, we come to the largest body of muck lands in the world. The northern shores of Lake Okeechobee are fringed with a very little muck, but as you approach the southern border the muck deposits become deep and wide, until finally they merge into those vast deposits of muck which form the northern border of the Everglades. The exact extent southward of this body of muck is not known, but it has been accurately surveyed for a distance of about 50 miles and found to be of excellent character throughout the whole of this distance.

As has been said before, the problem of drainage for the muck lands for the central portion of the peninsula, beginning with Lake Hart and continuing to Lake Cypress, is an exceedingly simple one. All that is necessary to secure the drainage is the construction of canals. This is easily done by dredge boats, inasmuch as the muck is easily moved and a good dredge boat is able to cut 300 feet of muck a day, 8 feet deep and 50 feet wide. When, however, we come to the vast deposits of muck on the Okeechobee, the problem is quite a different one. Two methods of procedure have been proposed. One of these contemplates nothing else than the drainage of Lake Okeechobee itself. This body of water is a peculiar one. It receives through its principal tributaries and the Kissimmee River most of the drain-

age of the central peninsula of Florida. It has, however, no outlet except the overflow through the Everglades into the Gulf and westerly through the marshes into the headwaters of the Caloosahatchee. The building of a canal to the Atlantic Ocean, which would remove the surplus water of the Okeechobee and permanently lower its level, would be an undertaking of considerable magnitude. The nearest distance is about 40 miles directly eastward from the central eastern part of the lake. The whole of this distance, however, would be through sand, which, of course, is much more difficult to move, on account of its greater compactness and greater weight, than the muck itself; it is therefore probable that it would be more economical to cut the canal in a southerly direction from the center of the southern border of the lake directly through the muck into the Everglades. A careful computation of the amount of drainage received by Lake Okeechobee would show that for the purpose of securing open drainage during the rainy season, the canal would have to be 300 feet wide and 12 feet deep. Such a canal would permanently lower the water 6 feet in the lake and would make ready for cultivation the vast body of muck lands already described.

The second method proposed is one which is now actually in operation, viz, the drainage of a portion of the muck lands of the Okeechobee. The system which is proposed, and which is now largely completed, looks to the recovery of only a portion of the land on the southwestern border of the lake. Lake Hicpochee is a small body of water, which, at its nearest point, is distant only about 6 miles from Lake Okeechobee. A canal has been constructed from Lake Okeechobee to Lake Hicpochee. A longer canal, about 18 miles, has also been built almost directly east from Lake Hicpochee to connect with Lake Okeechobee at another point. Westerly from Lake Hicpochee a canal has already been built into Lake Bonnet and Lake Flirt connecting them with the headwaters of the Caloosahatchee.

The next step in this scheme for the reclamation of this body of land consists in the erection of a levee along the borders of the lake. This levee is to extend to the pine lands at two points, one about 15 miles north of Lake Hicpochee and another at some point south of it, at such convenient distance as may be found necessary for the work. The levee along the bank of the Okeechobee will completely protect this portion of the land from any overflow from this lake. The drainage through the system of canals established to the headwaters of the Caloosahatchee will be sufficient to carry off the natural rainfall of this body of land. About 50,000 acres of land are included already in the canals which are under construction, and a very little additional expense would increase this area to 100,000.

Col. J. M. Kreamer, at my request, has made an approximate estimate of the total amount of muck lands indicated in the scheme already given. He estimates the amount at 1,000,000 acres. He says:

> These lands are found in bodies of greater or less extent throughout the Kissimmee Valley, the northern limit being in the vicinity of Lake Hart. A map of the region west of Lake Okeechobee shows, in detail, the extent and depth of saw grass or muck soil, and the ease with which it can be reclaimed and cultivated by labor-saving appliances was fully discussed by us during your recent trip through the Okeechobee country. This tract is now (July 22, 1891) virtually dry, due to the low stage of water in Okeechobee and vicinity. The surface of the soil is at least 30 inches above the water level. Reports from Okeechobee show that the muck lands south of the lake

are all at present above the water level from 18 inches to 2 feet. We are cutting a canal to the southwest from a point on the shore of Lake Okeechobee near Rita River.

By the single canal connecting Lake Okeechobee with Lake Hicpochee and thence to the Caloosahatchee, the level of the water in the Okeechobee has been permanently lowered from a foot to 18 inches. If one small canal, through the imperfect drainage system of the Caloosahatchee River, can secure this result, we can easily imagine the success which would attend the construction of the large canal mentioned above.

The total elevation of the highest point of this muck-land system, viz, Lake Hart, above the tide level is about 72 feet. Lake Okeechobee itself is 20 feet above the tide. It is thus seen that there is abundant natural fall to carry off the whole of the water, provided a canal of sufficient size can be constructed.

The origin of the muck soil is, of course, vegetable matter. There are no data for estimating the length of time required for the formation of these muck deposits. It is known that it must have been of great duration. For this reason it is not probable that the flora which is found over the muck region at the present time would represent accurately the character of the vegetation in prehistoric times. I have had samples collected of the principal vegetable growths which cover the muck lands at the present time. The whole of the Okeechobee muck lands is covered almost exclusively by saw grass. This is a cyperaceous plant of the genus *Cladium;* its botanical name is *Cladium Mariscus* or *C. effusum.* During the winter and early spring months this dense growth of grass often becomes dry enough to burn, and large areas are often burned over. Other plants which are at present contributing to the growth of muck, are as follows:

Common name.	Botanical name.
Yellow pond lily	Nymphea flava.
Maiden cane grass	Panicum Curtisii.
Alligator wampee	Pontederia cordata var.
Sedge	Cyperus sp.
Fernbrake	Osmunda sp.
Mallow	Malva sp.
Broom sedge	Andropogon sp.
Arrow weed	Sagittaria.

In regard to the depth of the soil, it varies from the merest covering at the edges near the sand to from 15 to 16 feet in its deepest portions. The greater part of the muck lands, as before indicated, will vary from 3 to 6 feet in depth, while along the Okeechobee the average depth is much greater. The soil varies in color from almost jet black to black brown.

The subsoil lying under the muck in the upper region around Kissimmee is pure sand. The Okeechobee muck, however, is underlaid with a thick stratum of shell marl containing pebbles very rich in phosphorus, and this rests upon a coraline or limestone formation. This limestone formation is very porous in structure, full of cavities of varying sizes, capable of being ground with extreme ease and thus prepared for application to the soil. At distances which vary from 2 or 3 miles to perhaps 15 or 20 from the shore of the lake this limestone formation comes nearest to the surface and forms a kind of a natural dam for the waters of the lake. This line of demarcation may properly be considered as the border between the lower and upper Everglades.

Of course every plan of constructing a canal through the muck lands must include the breaking up of this crust when it approaches the surface. This, however, is most easily done and would oppose no great barrier to the progress of the work. This crust has already been broken through by the drainage company in opening the Upper Caloosahatchee to a freer connection with Lake Okeechobee, through Lakes Flirt and Bonnet, by the system of canals already described.

As will be seen farther on the muck soils of Florida are markedly deficient in mineral constituents. The presence, therefore, of so large a body of limestone, mingled with phosphatic pebbles, is a matter of no mean importance when the agricultural future of these lands is considered. A few of these pebbles were picked up at the headwaters of the Caloosahatchee and examined for phosphoric acid. The mean percentage of phosphoric acid found was 0.697. This region has not been prospected at all for phosphate deposits, but it would not be surprising if they were discovered to exist here in great abundance, as they are found from 60 to 100 miles farther west, in the Peace River region.

The question of the subsidence of these soils under cultivation is also one of considerable importance. If the organic matter which they contain should decay there would, of course, be a marked depression in the level of the soil. The oldest portions of the muck land in cultivation have now been tilled for about eight years. In these lands where sugar cane was planted it has been found that there has been a subsidence of several inches, so that the stubble of the sugar cane has been left protruding to this distance above the surface. This depression, however, seems to have occurred chiefly in the first two or three years of the cultivation, and there seems to have been no such marked lowering in the surface of the soil since that time. It is not likely, therefore, that the soil will ever again be sufficiently depressed to bring it under the level of the water, although it must be confessed that the period of observation has been entirely too short to make any definite prophecy in regard to the future.

The organic matter, however, of the muck lands does not seem to be subject to complete decomposition by the natural processes of decay. The humic bodies, consisting largely of carbon, appear to be capable of resisting partially, if not altogether, the oxidation to which they are exposed by cultivation. There is considerable danger, however, from fire, especially during the dry season. When fires are once started with dry muck they continue to burn until the lands are flooded on the accession of the rainy season. But even in cases where a complete burning of the soils by conflagrations of this kind is observed the depression does not appear to be very great, and these places are entirely above the water line, except, perhaps, in times of very severe rains. There is, therefore, it is thought, no danger in the future of such a depression of the land as to render unavailing the drainage which has been accomplished.

The question of climate is also one of prime importance, especially in consideration of the culture of sugar and rice.

In regard to precipitation the climate of Florida is divided distinctly into a rainy and a dry season. The rainy season begins early in the summer, in the latter part of May or June, and continues until about the middle of September or the 1st of October. From October to June the climate of the central peninsula of Florida is essentially

dry, although showers may frequently occur. This distribution of the rainfall has its advantages and disadvantages. So far as the culture of rice is concerned, it is extremely advantageous. The rainy season occurs during the time when the rice fields are to be flooded, and thus the necessity for artificial flooding is greatly diminished by the great rainfall of the summer. There is also an advantage to the growing cane crop in having the rainfall come during the hot months, at the period of most rapid growth. It is equally as advantageous, however, during the manufacturing period, to have a dry season. For this reason the period of the manufacture of sugar in Florida has many advantages over the same time of the year in Louisiana. In Louisiana, especially after November, the planter is exposed to frequent and protracted rains, rendering the fields muddy and the roads over which the cane is to be hauled almost impassable.

The Florida planter can confidently count on a continuous manufacturing season, being rarely interrupted by rains. The disadvantages of the dry season in the central peninsula of Florida are chiefly felt by the growers of vegetables. These vegetables are grown for the early northern markets, and the gardening period in central Florida begins about the last of December and ends about the 1st of May. It is during this season that rains are most infrequent, and therefore the gardener is subjected to grave dangers from drought. It is during the same period, too, that the spring planting of sugar cane takes place, and, owing to the dry weather, the planted cane may be affected with dry rot. The disadvantages, however, of the dry season are easily overcome by artificial irrigation, which, on account of the level surface of the soil and the short distance which the water must be pumped, is rendered particularly easy. By establishing a pump near a branch of the lake and raising the water about 8 feet the whole of the muck lands can be easily irrigated. It is not necessary that the water be brought to the surface of the soil at all, as, on account of the porous nature of the muck, the land is thoroughly moistened by subirrigation; it is only necessary to bring the water high enough to allow it to flow into the drainage ditch to secure a complete permeation of the soil with moisture. Upon the whole, therefore, in regard to precipitation, it may be said that the climate of the central peninsula of Florida is favorable, not only to the growth of the staples—sugar and rice—but also for market gardening.

In regard to the temperature, equally favorable conditions obtain. Frosts are of rare occurrence, and when they do occur usually do but little injury. Only twice in eight years have the eyes of the cane been injured by frost, and even in these cases they were not all killed. In no instance has cane been known to freeze in the Florida peninsula, during the period over which these observations extend. It may be said, therefore, that no danger need be apprehended by the planter, even in the central portion of the peninsula, from frost. On account of this immunity from frost, the cane may be allowed to ripen during the months of November and December, and grinding operations need not begin until January or even later. The climatic conditions of temperature, therefore, in this respect, approach those of the island of Cuba. This being true of the central portion of the peninsula, it is true in a much greater degree of the lower portion, viz, the Okeechobee section. In this region frosts are almost entirely unknown. The coconut and the date palm flourish, and tropical plants of every

description predominate over the subtropical. In March, 1891, during a visit to this region, numerous fields of cane were seen along the Caloosahatchee which had not yet been cut, and which, although not entirely green, were only affected in color by the maturity of the plant presenting a rich yellowish green. In this region the sugar cane is absolutely free from any danger from frost, although occasionally light frosts have been known to injure more delicate plants. It may be said, then, with confidence that in the region of the Okeechobee Lake the lands which may be recovered for sugar-making purposes have all the advantages of the climate of Cuba.

The manufacture of sugar from the cane in this region may be postponed with perfect safety until the beginning of February, and the months of February, March, and April be the months of greatest activity in sugar manufacture.

On account of the ease of irrigation, the whole area of the muck lands of Florida is particularly well suited to the growth of rice. In regard to the actual success of rice culture, however, it is not possible to speak from any but theoretical considerations, inasmuch as until the present year no experiments of any consequence have been made in rice culture. During the present season several thousand acres have been planted in rice on the muck and semimuck lands of the State, and the result of this trial will be awaited with interest by those interested in the agriculture of that region.

In regard to the culture of rice, it may be said that it can be grown on the muck lands of slight depth, known as prairie lands. These lands often have a covering of only a few inches of muck, underneath of which is found firm, hard, white sand. These lands are not suitable to the culture of cane, but are supposed to be well suited to the growth of rice.

Another important consideration in connection with the muck lands of the Okeechobee country is found in the method contemplated for their cultivation. These lands will be intersected by numerous drainage canals, and by means of these canals not only can the land be cultivated by steam from engines carried on boats in the canals themselves, but also the products of the fields can be transported on the same canal, with an economy which will render the competition of mule or horsepower methods of cultivation almost impossible. Competent engineers have made estimates for the actual cost of steam cultivation, on the canal system indicated above, and, allowing for all contingencies of unexpected expenses, it appears reasonable to say that, with the yield of cane which can be secured on such lands, it will be possible to place the cane at the doors of the factories, by means of a system of canals used in irrigation and cultivation, at an expense which will fall below $2 per ton. This expense includes all the cost of cultivation, harvesting, and transportation.

It is not necessary to dwell upon the fact that with cane produced at such a cost, even the island of Cuba could not compete with Florida in the production of sugar. There is practically no other body of land in the world which presents such remarkable possibilities of development as the muck lands bordering the southern shores of Lake Okeechobee. With a depth of soil averaging, perhaps, 8 feet, and an extent of nearly half a million acres, with a surface almost absolutely level, it affords promise of development which reaches beyond the limits of prophecy

THE CONSTITUTION OF THE MUCK SOILS.

Preliminary examinations of the muck lands of Florida have been made by Mr. D. C. Sutton, of the Department of Agriculture, assistant in charge of the experiment station at Runnymede. Three samples of the soil were taken by him, of which No. 1 was from the oldest cultivated land on the estate of the Florida Sugar Manufacturing Co's. station, about 4 miles from the experimental field at Runnymede. Soil No. 2 was from a portion of the field which had been in cultivation for only a short time. No. 3 was taken from a spot farther back, on the lands of the same company near the prairies. The results of the analyses are given in the following table:

	No. 1.	No. 2.	No. 3.
Insoluble matter	23.21	21.45	40.80
Soluble silica	.02	.02	.08
Potash	.11	.10	.07
Soda	.17	.15	.10
Lime	.16	.16	.10
Magnesia	.01	.01	.007
Peroxide of iron, alumina	3.06	2.79	1.83
Phosphoric acid	.19	.16	.09
Sulphuric acid	.01	.01	.01
Organic matter	68.11	70.52	53.65
Carbonic acid, chlorine, and loss	4.95	4.63	2.263
	100.00	100.00	100.00

These analyses were made before the establishment of the experiment station at Runnymede. On the establishment of this station it was deemed advisable to make a more complete analysis of the soils from the station itself. For this purpose, four samples of soil were taken, two of them from the station and two from old cultivated land, in order to determine the degree of change which would take place during cultivation. The two samples which were taken from the station are shown.

Sample No. 1 was taken from the front part of the station, near the cypress grove. Sample No. 2 was taken from the back part of the station land, near the pine land. These two samples show the two distinctive characters of the muck. The first sample is a muck of a brown color which drains easily and is very porous. No. 2 is a muck of a deep black color, more compact, and less easily drained. Sample No. 3 was taken from the orchard of the St. Cloud plantation, about 4 miles from the station, from a portion of land which, at present, is planted in grapes and has been in cultivation for five years, principally in vegetables. Sample No. 4 was taken from a field on the St. Cloud plantation which has been in cultivation in cane for five years.

In samples 1 and 2 is shown a complete section of the soil from the top and the sand below. Samples 3 and 4 were purposely taken from the surface in order to show the effect of cultivation and oxidation on the character of the soil.

Florida soils.

[Dried at 110°.]

	Carbon.	Hydrogen.	Volatile.	Absorption.	Nitrogen.
Soil No. 1:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
8976, first foot	57.67	4.48	90.60	145.14	2.24
8977, second foot	47.07	5.15	72.00	108.50	1.40
8978, third foot	8.52	.53	15.00	46.68	.31
Soil No. 2:					
8979, first foot	56.21	6.08	91.70	151.15	2.33
8980, second foot	58.57	6.04	96.50	188.32	2.83
8981, third foot	48.27	6.34	96.76	156.98	2.33
8982, fourth foot	21.72	2.03	40.88	81.05	.95
Soil No. 3, 8983	18.72	2.72	45.60	114.03	1.26
Soil No. 4, 8984	19.48	2.69	45.70	167.95	1.18

The above figures show the composition of the soil in layers of 1 foot. Sample No. 1 had a depth of 3 feet, but the last foot was largely mixed with sand, as is shown by the decrease in carbon, hydrogen, nitrogen, and absorptive power and the increase in mineral or nonvolatile matter.

Under the column "Absorption" is given the percentage of water which the perfectly dry soils will absorb. It is seen that the pure muck, where unmixed with sand, will absorb more than its own weight of water—in one case almost double its weight. The importance of this property in times of drought and in relation to subirrigation must not be overlooked. The quantity of nitrogen in the layer of muck immediately above the sand is much less than in other parts of the soil, but this is not due to any impoverishment of the muck itself, but to the great admixture of sand. In the dry muck which has not been cultivated the value of the nitrogen reaches in one case $10.19 per ton, estimating nitrogen at 18 cents a pound. Cultivation for a few years reduces the percentage of nitrogen in the surface soils, as is indicated by the numbers obtained with samples 3 and 4. * * *

CANE AND CASSAVA CULTURE IN FLORIDA.

[Address by Dr. H. W. Wiley before Florida Agricultural Society at Jacksonville, Fla. In Bulletin No. 70 of Bureau of Chemistry, U. S. Department of Agriculture; Manufacture of Table Sirups from Sugar Cane, 1902, pp. 9, 10.]

The problems connected with the sugar and starch products are four or five in number.

First of all, the soil is to be considered, and therefore agricultural interests should pay some attention to staple crops—that is, crops that have a market the year round, and can be preserved and marketed at any time. Sugar and starch are types of such crops. These substances take absolutely nothing from the soil; they are fabricated by the plant from the atmosphere and water; hence the sale of such products does not tend to impoverish the soil.

The soils of Florida are largely of a sandy nature—that is, they have been deposited from water; they are typically different from the soils of the great Northwest, which were produced by the grinding effect of moving icebergs, and represent the richest soils, probably, in the world. Sandy soils are not suitable for producing wheat, for

instance, but they are well adapted to producing sugar and starch. In Florida it is more a question of climate than of soil, since, with a favorable climate, scientific agriculture will produce a crop from almost any kind of soil.

The second problem to be considered is that of fertilizers. Perhaps there is no State more favorably situated than Florida in respect to fertilizers. You have here inexhaustible deposits of phosphate. In the leguminous crops which grow here, namely, peas, beans, alfalfa, and beggar-weed grass, you have a most valuable means of assimilating nitrogen from the air. In cotton seed, fish scrap, and other animal refuse you have access to large stores of nitrogen. Through your seaports stores of fertilizing materials, such as nitrate of soda and potash salts, can be brought from South America and Germany. It would be hard to find any other portion of our country where fertilizers could be sold more cheaply than in this State.

CHARACTER OF THE MARKET.

The third problem is the character of the market. This country is the greatest sugar and starch consumer in the world. We use more than 2,000,000 tons of sugar annually. Of this quantity, before the Spanish War, we made only about 300,000 tons—about one-seventh of all.

Since the Spanish War we have acquired Hawaii, Porto Rico, and the Philippines, all of which give us large additional quantities of sugar. This year we will produce about 100,000 tons of beet sugar, so that at the present time it may be said that we produce about one-third of all the sugar we consume; but still there is a vast foreign market which we might supply with the home product. There is no danger, therefore, of overstocking our home market with increased sugar production, nor is there danger of the beet sugar driving the cane sugar out of the market. For many purposes, as, for instance, the manufacture of sirup, beet sugar is unsuitable, and there will always be a demand for all the cane sugar that can be made.

The sugar crop of the whole world for the present year is about 10,000,000 tons, of which nearly 7,000,000 are made from the sugar beet.

THE SUGAR BEET.

The sugar beet can not, however, be grown in Florida profitably. Here you must depend on the sugar cane for sugar and upon the cassava and potato for starch. From starch glucose can also be made, and it seems to me that in the near future the glucose industry will pass from the indian-corn belt to the cassava and potato belt. In one particular industry Florida and the southern parts of Georgia and Alabama stand preeminent, and that is the manufacture of table sirup from sugar cane. It is important, however, to secure uniform grades to hold the markets of the world, and this can only be accomplished by mixing together the products of small farmers or by the establishment of central factories, where the cane grown in the neighborhood can be manufactured under standard conditions.

By the development of these great industries, sugar and starch making, including table sirups, untold wealth will in the near future flow into Florida. From by-products of the factories immense quan-

tities of cattle food can be obtained, both from sugar cane and the starch-producing plants. Thus a dairy industry can be established in connection with sugar and starch making, which will add much to the wealth of the State.

FLORIDA CANES.

[In Bulletin No. 103, by Dr. H. W. Wiley, of Bureau of Chemistry, U. S. Department of Agriculture: Experimental Work in the Production of Table Sirup at Waycross, Ga., 1906, p. 11.]

It is interesting to compare the canes of Georgia with some grown below the frost line in Florida. The figures given in the following table show that in southern Florida, where the canes continue to grow throughout the winter without being frost bitten, they attain a remarkable degree of sweetness. There is a minimum quantity of reducing sugar present, which probably would be indicated as zero by the ordinary volumetric method. It may be considered that the amounts of reducing sugar obtained in the mature cane were in most cases due to the action of the reagents upon the cane sugar. In other words, the canes have apparently attained their normal maturity.

The increasing richness of the canes is shown by comparing those harvested in March with those from the same locality analyzed in November. The cane received on November 11 contained 13.50 per cent of sucrose, while the canes from the same locality received on March 31, and cut probably three days previously, contained 20.90 per cent of sucrose. The purity of the juice received on November 21 is 79 per cent, while that of the juice received on March 31 is 91.30 per cent, the richest cane ever analyzed in this bureau.

Canes of this degree of richness would be of exceptionally fine quality for sugar making, but it would be rather difficult to make a sirup from them which would not crystallize. In other words, the ordinary inversion from evaporation would scarcely be sufficient to prevent crystallization of the finished product.

TABLE III.—*Analyses of Florida canes.*

Serial No.	Description.	Date.	Sucrose.	Reducing sugar.	Purity.
			Per cent.	*Per cent.*	
3800	Red cane, Orange County, Fla.	Nov. 21, 1905	13.50	0.30	79.00
	Manatee County, Fla.:[1]				
4022	D 74	Feb. 19, 1906	15.60	.24	87.20
4023	D 95	do	17.65	.26	89.40
4042	Ribbon cane	Mar. 8, 1906	15.00	.14	88.20
4043	D 95	do	16.40	.15	89.60
4051	D 74	Mar. 31, 1906	16.50	.10	86.00
4052	Green or Simpson cane	do	20.90	.22	91.30

[1] Grown by H. L. Abel at Terra Ceia.

MESSAGE OF GOV. W. S. JENNINGS TO THE LEGISLATURE OF FLORIDA RELATIVE TO RECLAMATION OF EVERGLADES.

EXECUTIVE OFFICE,
Tallahassee, April 7, 1905.

Gentlemen of the Senate and House of Representatives:

* * * * * * *

From a careful study of the history of our State and its wonderful development and progress, there seems to have been no question that has caused greater research and effort on the part of my predecessors as far back as the territorial days and almost continuously since than the problem of drainage and reclamation of the swamp and overflowed lands of our State. This question was discussed as of national importance as early as 1835 by men of national character, position, and reputation. It was the paramount question with our first Senators in the Congress of the United States, which culminated in the act of Congress granting to the State the swamp and overflowed lands in 1850, which was, in turn, granted by the State to the Trustees of the Internal Improvement Fund irrevocably for the purpose of aiding in the drainage and reclamation of the lands of the character designated as "swamp and overflowed." You must admit that, notwithstanding strenuous efforts have been put forth to solve this problem, it is to-day the paramount question before the people of Florida and is of sufficient importance to invite the attention of the lawmakers of the Nation to accomplish what the forefathers provided for. Notwithstanding the comparatively large acreage of lands granted by the General Government to the State of Florida for the purposes mentioned, it has been a gigantic undertaking—one that will require time, great skill, and a large sum of available money to carry out. We must realize that the acreage of lands granted have not been available. They have not been available nor salable for the reason that they are of the character of land designated as "swamp and overflowed," not tillable and without commercial value, and therefore it has been impossible to utilize such lands to drain and reclaim themselves, and thus the State has been placed in the attitude of the man who undertook to lift himself and so far has been almost as helpless in accomplishing the task.

EVERGLADES.

The Everglades of Florida cover an area of about 4,000 square miles, embracing more than one-half of that portion of the State south of Lake Okeechobee.

Little effort has been made to drain and reclaim this large area. One great difficulty in the way of reclamation has been the uncertain

condition of the title thereto, no patent having been issued by the United States Government to the State of Florida confirming the grant of the swamp and overflowed lands under the act of Congress of 1850. It has been held by decision of the Interior Department of the United States that the department retained jurisdiction over the titles to all lands granted under said act of Congress until the patent had been issued and delivered to the governor of the State and that any orders or approval by the department of any list of land numbers was subject to revocation and cancellation by the department at any time before the issuance of patents without notice. In 1897 the swamp land department prepared, examined, and approved list No. 87, embracing 2,942,000 acres, which list was approved by the Commissioner of the General Land Office, also by the Assistant Attorney General for the Interior Department and the Secretary of the Interior, and regularly transmitted to the land office in Florida, which only awaited demands for the issuance of the patent.

Soon after the transmittal of said list the attention of the Secretary of the Interior was called to the probable effect the issuance of this patent would have upon the supposed interest of the Seminole Indians in Florida, suggesting that the Indians might have some rights in the premises that had not been considered, whereupon the Secretary of the Interior suspended the order approving said list and appointed Maj. Duncan as Indian inspector to visit the Everglades and inspect the condition of the country as to the character of the lands, rights of the Indians, etc., and upon his report a survey was ordered of a portion of said lands, which resulted in an appeal being taken from the findings of the Commissioner of the General Land Office, which was sustained by the Secretary of the Interior and the approved list, No. 87, was canceled and revoked by the Secretary of the Interior as of the date of May 18, 1898. The land office of Florida was not informed officially, formally, or otherwise of any of the proceedings which resulted in the revocation and cancellation of said list No. 87, and it was assumed that the lands therein embraced remained subject to patent to the State of Florida whenever proper request was made for such patent. With a view to perfecting the State's title to these lands, I proceeded to Washington on the 21st day of March, 1903, and was then for the first time advised of the rulings above stated, which had been made subsequent to the issuance of the original list of 1898. A new list was then prepared, in accordance with the rulings of the Secretary of the Interior, embracing the same territory as that embraced in the former list (No. 87), except that thirteen 40-acre tracts (520 acres) were eliminated as "non-swamp land," together with the sixteen sections that had been erroneously embraced in the former list, said sections having been granted under act of Congress of 1845 for school purposes, and the patent has been obtained for the lands embraced in said list, aggregating 2,862,280 acres. * * *

The excerpt from the memoir of the peninsula of Florida (1841–55) is submitted to show the steady change going on in that portion of the State. Since the last exploration nearly 50 years have elapsed, almost four eras of 14 years. If from 1841 to 1855 the change was so great, what must have been the changes in the corresponding periods since that time? The Everglades have been crossed and

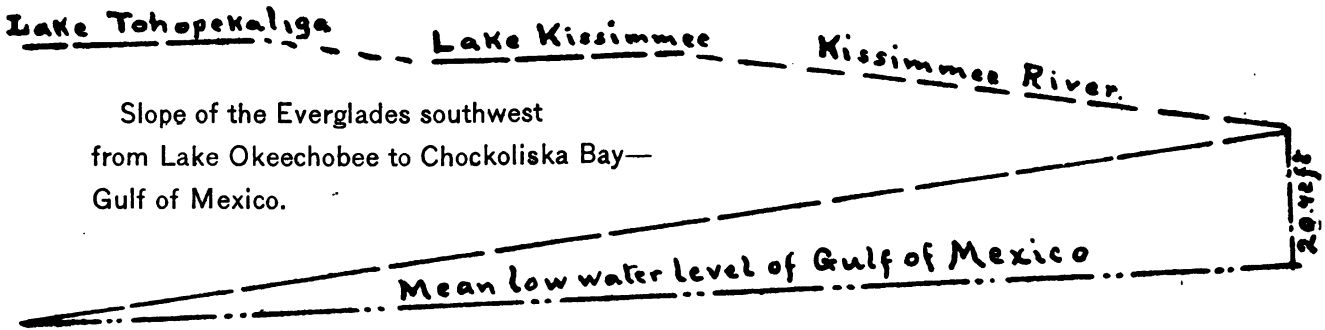
recrossed many times and in different directions since, always with more or less difficulty.

The few reports of surveyors and explorers added little new information about the Everglades until 1881, when the State contracted with Hamilton Disston to drain a large area of land bordering Lake Okeechobee and including part of the Everglades. In 1880–1882 a line of levels was made by Gen. Gillmore, under the direction of the United States Senate, to discover a practicable route for a ship canal across the peninsula. These and other surveys by Col. Charles Hopkins, Maj. Wirts, V. P. Keller, J. W. Newman, and others established the altitude of Lake Okeechobee, "the head of the Glades," at 21 to 23 feet above tide level, the difference in levels being accounted for by the different seasons at which the surveys were made. A subsequent observation and examination, made by W. H. Caldwell, assistant United States engineer, December, 1901, shows the level of the lake to be 20.42 feet above mean low-water level of the Gulf of Mexico. Lake Okeechobee covers an area of 1,080,000 acres. The bottom is hard sand and mud, water from 5 to 10 feet in depth, except in a few places of small dimensions, where the depth is 20 to 22 feet. There are four large islands in its southern portion. These observations show that the bottom of the lake at the deepest point is over 9 feet, saving these deep basins of small area, above mean low tide in the Gulf. Accompanying this is a profile showing the Kissimmee River and lakes, including Okeechobee, with their levels above tidewater.

In this connection it is interesting and important to speculate as to what would be the result were a ship canal cut through the Everglades with its bottom level 39 feet below the bottom level of Lake Okeechobee. What would become of the lakes that now make the peninsula so desirable? Would not a canal of the description proposed cut all the underground waterways and destroy all the lakes? A profile of the surface of the Everglades by J. W. Newman, civil engineer, is also submitted herewith. That the Everglades can be drained does not seem to be questionable, nor is it to be doubted that the simple drainage would redound greatly to the State, but the inauguration of any project that would exhaust the water from Lake Tohopekaliga, Cypress, Istokpoga, Okeechobee and others, and destroy them, deserves profound consideration.

Col. Charles Hopkins made a reconnoissance in 1883 from Lake Okeechobee to Shark River. James E. Ingraham made an expedition and crossed the Everglades in 1892, occupying 22 days. The reports of these and others confirm the early reports of the officers of both the Army and Navy as to the character of the soil, depth of water, and the fertility of the land. The report of Col. James M. Kreamer, chief engineer of the Okeechobee Drainage Co., made in 1886, says:

> The surface of this soil is at times exposed, and it is only during or subsequent to a heavy rainy season it is possible to penetrate with a light skiff, and then advantage must be taken of the natural drains of the vast area. If there was an absence of the dense saw grass, no difficulty would be experienced in traversing the country in any direction. A 4-foot reduction of the surface of the waters of this region would be sufficient for cultivation. The surface of the lower Glades is well elevated above tide level, but, due to the rim of outcropping lime-rock extending along the Gulf and Atlantic borders, the waters are in a great measure impounded and retained at varying elevations above the tide. Levels and measurements taken at Lake Worth establish the



Slope of the Everglades southwest from Lake Okeechobee to Chockoliska Bay—Gulf of Mexico.

Scale: 28′ to inch, vertical.
18 miles to the inch, horizontal.

Lake Okeechobee is 20.42′ above M. L. W. level of Gulf. From Lake Okeechobee to the Gulf by the present canals and meanderings of streams is 87.25 miles; air line, 54 miles. Lake Tohopekaliga is 65.26′ above mean low water of the Gulf or 40′ above Lake Okeechobee. From the Everglades (center) to Ponce de Leon Bay, 66 miles. From the center of the Everglades to Chockoliska Bay and the waters of the thousand islands, distance, is 54 miles, making the fall 5.78′ per mile.

surface of the fresh water of the Everglades to be 10½ feet above the tide water of the Atlantic, and that a canal 1,100 feet long would afford relief to a vast area westward. It would be entirely feasible to cut the rim at frequent intervals and permit the impounded water to flow into the Gulf or Atlantic. This would result in exposing great tracts of soil now practically valueless. * * *

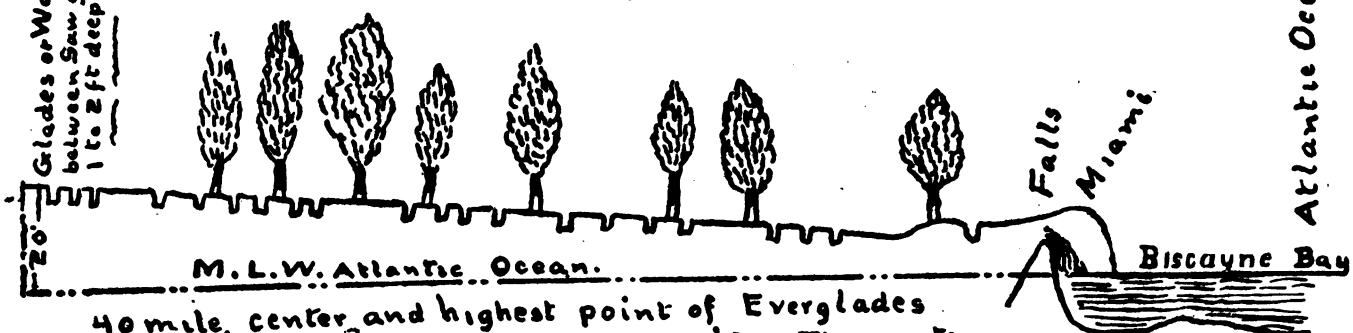
By reference to the profile maps, submitted as follows, it will be seen that the normal surface of Lake Okeechobee is 20.42 feet above the mean low-water level of the Gulf of Mexico, which is only 60 miles west, in an air line, and practically the same height above the Atlantic Ocean, 36 miles distant on the east. Draining the lake and the Everglades are numerous rivers and streams, beginning at the lower end of St. Lucie Sound, on the Atlantic, and extending around the southern extremity of the peninsula to Charlotte Harbor or the Gulf, as follows: Halpatiokee, Jupiter, and Hillsboro Rivers, Ratones and Cypress Creeks, West Fork and South Fork of Middle River, New River, South Fork of New River, Snake River, Arch Creek, Little Arch Creek, Little River, Miami River, Chi's Cut, Albahatchee River, Shark River, Harney's River, Fatsallehonetha River, Roger's, Chittahatchee, Fatlathatchee, Alcatapachee and Lakpahatchee Rivers, Wekiva Inlet, Gallivan, Falsewater, Malso, Corkscrew and Caloosahatchee Rivers, and five small unnamed streams that fall into the Gulf of Mexico. From the rapidity of current and the number of these rivers, notably the Miami, and the steady flow of water, it is evident that these streams have their source—not a spring—(because the quantity of water varies with the season) in a great reservoir. This being true, then the cutting through this barrier or reservoir wall, as suggested by the eminent authorities quoted, would drain the water from the surface of this vast area and make it tillable without in anywise endangering the water supply of other sections of the southern peninsula.

Observant stockmen, and other Floridians familiar with the Everglades, all concur in saying that the reclamation of this vast area is entirely feasible and that the cost would, in comparison with the value of the redeemed territory, be a mere bagatelle. John R. Mizell, in a communication addressed to and published in the Times-Union (newspaper) January 22, 1902, says:

For a more complete description, we will compare this wonderful formation to a large bowl with two rims; the inner basin consists of Lake Okeechobee, a small inland sea within itself. The normal condition of the Glades proper is rarely ever affected as to depths of water on the surface, until the inner basin is taxed by its tributaries beyond its capacity to relieve itself by the flow of water down the Caloosahatchee River, which flows south into the Gulf of Mexico, except such as flows to the east through the numerous small rivers and streams into the Atlantic. All the short streams on the Atlantic side have been produced in the prehistoric past by some extraordinary heavy head of water overflowing the inner basin, and being unable to force its way down the Caloosahatchee River, sought the most available places to force its way to the eastward across the outer basin which has a narrow rock rim in most places within a few miles of the coast.

Slope of the Everglades Southeast to Miami

These islands are from 5 to 10 miles apart in the middle of the Everglades — and from one sq. yard to 5 acres, and from 1 to 2 ft higher than the general surface.



40 mile, center and highest point of Everglades

Fall of the Everglades is 6" to the mile. The water on the surface is held by this natural rock wall or dam, which has been cut through in a number of places by the action of the water in its effort to escape.

Thus it will appear that the drainage of the Everglades is entirely feasible and practicable, thus reclaiming 3,760,000 acres, a large percentage of which would be available, and the most valuable agricultural land in the Southern States. Again, those who are now undertaking to reclaim, in a small way, the most elevated tracts, and utilize them by cultivating vegetables that grow and mature during the driest season of the year, and of short crop seasons, hazard their entire year's work and expenses by undertaking to plant and grow crops in the most selected spots under present conditions, as the experience of the past few weeks bears witness. It is reported that from 70 to 90 per cent of the entire crop planted within this region has been destroyed within the past month by high water, which is a loss to the citizenship of that portion of our State, and falling upon those who are not able to bear the loss of their all, amounting to more than a half million of dollars in value. This of itself would justify the expenditure of an amount necessary to complete the drainage and reclamation of the Everglades to protect the small acreage already under cultivation. This disaster only emphasizes the great importance of undertaking energetically and determinedly to reclaim this vast and rich territory; and, therefore, I recommend that the Congress of the United States be memorialized for an appropriation of $1,000,000 to this end.

W. S. JENNINGS, *Governor.*

PATENT TO THE EVERGLADES, 1903.

THE UNITED STATES OF AMERICA.

To all whom these presents shall come, greeting:

Whereas by the act of Congress approved September 28, 1850, entitled "An act to enable the State of Arkansas and other States to reclaim the 'swamp lands' within their limits," it is provided that all the "swamp and overflowed lands," made unfit thereby for cultivation, within the State of Florida which remained unsold at the passage of said act shall be granted to said State; and

Whereas, in pursuance of instructions from the General Land Office of the United States, the several tracts or parcels of land hereinafter described have been selected as "swamp and overflowed lands," inuring to the said State under the act aforesaid, situate in the district of lands subject to sale at Gainesville, Fla., to wit:

The Everglades, being the swamp and overflowed lands within the following metes and bounds: Commencing at the southwest corner of T. 60 S., R. 37 E., where the west line of said township touches the water; then run north along said west line of said T. 60 S., R. 37 E., to the northwest corner of said township; then east along the north line of said township to the southwest corner of T. 59 S., R. 38 E.; thence north along the west line of Tps. 59, 58, and 57 S., R. 38 E., to the northwest corner of T. 57 S., R. 38 E.; thence east along the north line of said T. 57 to the northeast corner of sec. 6, T. 57 S., R. 38 E.; thence north along the west line of secs. 32, 29, 20, 17, 8, and 5, T. 56 S., R. 38 E., to the northwest corner of sec. 5; thence east along the north line of T. 56 S., R. 38 E., to the southwest corner of T. 55, R. 39; thence north along the west line of said T. 55 to the northwest corner of said township; thence east along the north line T. 55, Rs. 39 and 40, to the northwest corner of sec. 3 of said T. 55, R. 40; thence north along the west line of secs. 34 and 27, T. 54 S., R. 40 E., to the northwest corner of sec. 27; thence east along the north line of sec. 27 to the northeast corner of said section; thence north along the west line of secs. 23, 14, 11, and 2, T. 54, R. 40, to the southwest corner of sec. 2; thence east along the north line of secs. 2 and 1 of said T. 54 to the northeast corner of sec. 1; thence north along the west line of Tps. 53 and 52 S., 41 E., to the southwest corner of T. 52; thence east along the north line of T. 52, R. 41, to the northeast corner of said township; thence north along the west line of Tps. 51, 50, 49, 48, and 47, R. 42, to the northeast corner of said T. 47; thence west along the north line of T. 47 to the northwest corner of sec. 2, T. 47; thence north along the west line of secs. 35, 26, 23, 14, and 11, T. 46, R. 41, to the northwest corner of sec. 11; thence east along the north line of sec. 11, T. 46, to the middle of said section; thence north along the middle line of sec. 2, T. 46, R. 41, and sec. 35, T. 45, R. 41, to the middle of the south line of sec. 26, T. 45, R. 41; thence west along the south line of sec. 26 to the southwest corner of said section; thence north along the west line of

secs. 26, 23, 14, 11, and 2, T. 45, R. 41, to the northwest corner of sec. 2; thence west along the south line of T. 44, R. 41, to the southwest corner of said township; thence north along the west line of said T. 44 to the northwest corner of said township; thence west along the south line of T. 43, R. 40, to the southwest corner of said township; thence north along the west line of said T. 43 to the northwest corner of said township; thence west along the north line of T. 43, R. 39, to the northwest corner of said township; thence north along the west line of T. 42, R. 39, to the northwest corner of said township; thence north along the west line of T. 41, R. 39, to the southwest corner of sec. 19, T. 41, R. 39; thence west along the north line of sec. 24, T. 41, R. 38, to the southwest corner of said sec. 24; thence north along the west line of said sec. 24 to the northwest corner thereof; thence west along the south line of sec. 14, said T. 41, R. 38, to the southwest corner thereof; thence north along the west line of said sec. 14 to the northwest corner thereof; thence west along the south line of sec. 10, same township and range, to the southwest corner of said section; thence north along the west line of said sec. 10 to the northwest corner of said section; thence west along the south line of sec. 4, same township, to the southwest corner of said section; thence north along the west line of said sec. 4 to the northwest corner thereof; thence west along the north line of T. 41, Rs. 38 and 37, to the waters of Lake Okeechobee; thence southerly and westerly around the shores of Lake Okeechobee and northerly along said lake to a point in T. 41 S., R. 32 E., where the north line of said township strikes the lake; thence west on the north township line of T. 41, R. 32, to the northeast corner of lot 1 of sec. 5, in said T. 41, R. 32; thence along the meander line, in a southerly direction, of secs. 5, 8, 17, 16, 21, 28, 32, and 31, in T. 41, R. 32; thence southerly along the meander line of sec. 6, T. 42, R. 32; thence along the meander line southwesterly of secs. 1, 11, 14, 22, 21, 28, 29, and 30, T. 42, R. 31; thence south along the west line of said T. 42, R. 31, to the southwest corner thereof; thence east along the north line of T. 43, R. 31 E., to the northeast corner of fractional sec. 4; thence south along the east lines of fractional sec. 4 and of sec. 9 to the southeast corner of said sec. 9; thence east along the north line of sec. 15 to the northeast corner of the W. ½ NW. ¼ of said sec. 15; thence south along the east line of the W. ½ NW. ¼ and W. ½ SW. ¼ of said sec. 15, and the east line of the W. ½ NW. ¼ sec. 22, to the southeast corner of the W. ½ NW. ¼ of said sec. 22, same township; thence east along the middle line of sec. 22, to the northeast corner of the SW. ¼ of said sec. 22; thence south to the center of sec. 34, in the same township; thence east along the middle line of secs. 34, 35, and 36, to the east township line; thence from the northeast corner of the SE. ¼ of said sec. 36, to the southeast corner of said section; thence east along the north line of T. 44 S., R. 32 E., to the northeast corner of said T. 44 S., R. 32 E., thence south along the east line of said township 44 to the southeast corner thereof; thence east along the north line of T. 45, R. 33, to the northeast corner of said T. 45; thence south along the east line of Tps. 45 and 46, R. 33, to the southeast corner of T. 46; thence east along the north line of T. 47, R. 34, to the northeast corner of lot 1, sec. 5, T. 47 S., R. 34 E.; thence south to the center of sec. 5; thence east to the northeast corner of the SE. ¼ sec. 5; thence south along the east line of secs. 5, 8, 17, and 20 to the northeast corner

of the SE. ¼ of said sec. 20; thence east to the center of sec. 21; thence south along the middle line of secs. 21 and 28 to the southeast corner of the SW. ¼ sec. 28; thence east along the south line of sec. 28 to the northeast corner of sec. 33; thence south along the east line of sec. 33 of said T. 47, R. 34, to the southeast corner of said sec. 33; thence east along the north line of T. 48, R. 34, to the northeast corner of said township; thence south along the east line of Tps. 48 and 49 to the southeast corner of T. 49, R. 34; thence west along the south line of said T. 49 to the southwest corner of said T. 49 S., R. 34 E.; thence south along the east line of T. 50, R. 33, to the southeast corner thereof; thence east along the south line of T. 50, R. 34, to the southeast corner thereof; thence south along the west line of Tps. 51 and 52 to the southeast corner of T. 52, R. 34; thence west along the north line of T. 53 to the northwest corner of T. 53, R. 33; thence south along the west line of T. 53, R. 33, to the southwest corner thereof; thence west along the north line of T. 54, Rs. 32, 31, 30, and 29, to the waters of the Gulf of Mexico; then following the mainland in a southerly direction to the point of beginning in T. 60 S., R. 37 E. There are eliminated and excepted from the above all islands in the Gulf of Mexico adjacent to the mainland, all of what would be the school sections if the lands were surveyed, and the following descriptions, viz:

The SE. ¼ SW. ¼ sec. 23, and the NW. ¼ NE. ¼ sec. 25, T. 50 S., R. 40 E.; the NE. ¼ SW. ¼ sec. 20, T. 50 S., R. 41 E., the W. ½ NE. ¼, E. ½ NW. ¼, SW. ¼ NW. ¼, NW. ¼ SE. ¼, and N. ½ SW. ¼ sec. 1, and the E. ½ SE. ¼ sec. 2, T. 51 S., R. 41 E., as surveyed by Special Agent J. O. Fries in 1898, and as designated on a special plat approved November 16, 1899, accepted April 25, 1900, containing in the aggregate an estimated area of 2,862,080 acres, and for which the governor of the State of Florida did on the 6th day of April, 1903, request a patent to be issued to the said State as required in the aforesaid act.

Now, therefore, know ye, that the United States of America, in consideration of the premises, and in conformity with the act of Congress aforesaid, have given and granted, and by these presents do give and grant, unto the said State of Florida, in fee simple, subject to the disposal of the legislature thereof, the tracts of land above described; to have and to hold the same, together with all the rights, privileges, immunities, and appurtenances thereto belonging, unto the said State Florida, in fee simple, and to its assigns forever.

In testimony whereof, I, Theodore Roosevelt, President of the United States of America, have caused these letters to be made patent and the seal of the General Land Office to be hereunto affixed.

(Imprint of the seal of the General Land Office.)

Given under my hand at the city of Washington, the 29th day of April in the year of our Lord 1903, and of the Independence of the United States the one hundred and twenty-seventh.

By the President:

T. ROOSEVELT.
By F. M. MCKEAN, *Secretary.*

C. H. BRUSH,
Recorder of the General Land Office.

Recorded V. 3, pp. 333–336, inc.

Also filed in the office of commissioner of agriculture of the State of Florida, at Tallahassee, Fla.

STATUS OF THE SWAMP AND OVERFLOWED LANDS PATENTED TO THE STATE TO AUGUST 6, 1904.

	Acres.
Total number of acres of swamp and overflowed lands patented to the State to Aug. 6, 1904	20,133,837.42
Deeded to railroad companies	8,242,317.69
Deeded to canal companies	2,252,816.96
Deeded to Hamilton Disston	4,000,000.00
Deeded to Dickerson	248,802.98
Deeded to Jackson	113,064.80
Deeded to individuals not under legislative grants	2,200,130.31
Total disposed of prior to Aug. 6, 1904	17,056,932.74
Leaving a balance on hand Aug. 6, 1904	3,076,904.68

(Annual Report, General Counsel, of the Internal Improvement Fund, Florida, 1908–9, p. 14.)

AREA OF FLORIDA AND OF WET LANDS UNPATENTED, 1904.

The Government's statement shows the total area of the land surface of Florida to be 35,072,640 acres; that 33,895,534 acres have been heretofore patented, leaving remaining after deducting homestead lands, reservations, and water surface an estimated area of only 200,000 acres of swamp and overflowed lands.

(Annual Report, General Counsel, of the Internal Improvement Fund, Florida, 1908–9, p. 15.)

DRAINAGE INVESTIGATIONS, 1904, BY C. G. ELLIOTT, ENGINEER, U. S. DEPARTMENT OF AGRICULTURE, IN CHARGE.

United States Department of Agriculture, Office of Experiment Stations, Irrigation and Drainage Investigations, Elwood Meade, chief. Extract from Separate No. 9, Office of Experiment Stations, Bulletin No. 158, Annual Report of Irrigation and Drainage Investigations, 1904, by C. G. Elliott, engineer in charge of drainage investigations, pp. 714-717.]

The Everglades of southern Florida are attracting attention by reason of their ability, under proper drainage and management, to produce vegetables for the northern winter market and subtropical fruits of acknowledged excellence. A reconnoissance of lands in the vicinity of Miami was made for the purpose of determining upon the feasibility of draining a small tract of Everglade land for experimental use.

The part examined comprises a belt of land extending about 60 miles north and 25 miles south of the city of Miami and for various distances from the coast line toward the Everglades. The topography of the land near the coast and its relation to the Everglades which occupy the interior are interesting and important. The rise of the general surface from the coast line westward for a distance of 3 or 4 miles is 9 to 16 feet. From this, westward across the Everglades, the rate is about 0.3 foot per mile, as ascertained by two separate surveys made under the direction of the Florida East Coast Railway Co. The dividing line between the slopes toward the Gulf and the Atlantic is about 22 feet above tide and extends south from near the center line of Lake Okeechobee. The belt of land 3 or 4 miles wide first mentioned may be regarded as a rim which prevents the ready flow of water from the Everglades southeasterly to the ocean. Numerous small streams extend from the edge of the

Glades proper through this rim and are the only natural facilities for draining the Glades.

The rock found in this part of the State is the coral breccia, which crops out at the surface over the entire width of the rim and is covered with pine timber and palmetto, with the exception of small areas termed "hammocks," which are covered with hardwood trees. Arms of the Glade land 0.5 to 2 miles wide extend from the head end of these small streams back into the Everglades proper for a distance of 2 or 3 miles, bordered by pine woods, beyond which is the open expanse known as the Everglades. These lands are called "prairies" and are covered with saw grass. Two types are best known, the marl and the sand prairies. The soil varies in depth from 1 inch to several feet and in all cases rests upon a base of coral rock. In some instances the rock is known as "plate rock," which is apparently smooth and solid. In other cases the rock is filled with potholes, making an irregular base upon which the soil rests. In some portions of the northern part of the tract examined muck and peat lands are found in quite extended beds, but they usually thin out and pass into the prevailing marl formation.

A great deal of money has been expended in drainage works by the Florida East Coast Railway Co. The operations of this company so far have been directed toward opening and enlarging the natural streams for the purpose of lowering the water of the arms of the Glades during the winter season, in order to facilitate the growing of winter vegetables. This drainage has also permitted some fruit growers owning small detached tracts of Glade land to so drain them that trees are now successfully grown.

The average annual rainfall of that portion of the State is about 63 inches. The so-called dry season or portion of the year in which there is the least rainfall occurs between the months of November and March, during which time the normal precipitation is about 11.5 inches, ranging from 1.5 to 2.5 inches per month. During this season portions of the prairie lands are planted to vegetables, principally tomatoes, which are more profitable for shipping to the northern market than others and when properly fertilized produce large crops. The remainder of the year these lands are frequently covered with water and are largely abandoned until the opening of the winter season, when they are again plowed and planted.

None of the Glade land proper, as far as examined, has been so drained as to be suitable for the growing of trees or of vegetables requiring the entire season, except openings which are sufficiently high to be protected from the volume of water of the interior, and which, by reason of their more elevated situation, have been artificially drained.

There are some features of climate, soil, and geological structure peculiar to this section which have an important bearing upon the success of any reclamation project that may be considered. The soil, both the marl and the sand, lacks those natural elements of fertility commonly found in other low-lying lands, and requires the liberal use of artificial fertilizers to produce either fruits or vegetables. The soil-water table may be 8 to 20 inches from the surface without injuring the growth of fruit trees, and it is observed that plants usually are not as sensitive to a saturated condition of the soil as they are in colder latitudes, where clay is a leading element in the composition of the soil.

The porous and absorbent nature of the coral rock has an important effect upon the water problems of the country. It is known that cavities exist in the rock at various depths, as shown by drilled wells, which occasionally penetrate reservoirs of water 4 to 6 feet in depth. It is also noted by truck farmers occupying cleared land near the coast that water comes upon their fields in some cases from the underlying rock when the water of the Glades is at high stages. It is quite probable that this open and irregular structure is more strongly characteristic of the rim or coast belt than of land nearer the Glades since, as we approach the latter, the plate or solid rock seems to predominate. This point, however, has not been demonstrated and is one of the undetermined factors entering into the drainage of this portion of the Everglades.

The channels of the streams which now form the overflow outlets of the interior prairies disappear at the outer border of this vast expanse at an elevation of 9 to 13 feet above tide. As a result of surveys made across the Glades, as before stated, it is reported that they have a slope of 0.3 foot per mile in a southeasterly direction. Should these streams be deepened, enlarged, and extended through the prairies, a grade of 0.4 foot per mile might possibly be obtained for the channels, part of which would necessarily be excavated through the rock.

In case only one channel should be made, it would tap the waters of the entire area at flood time, but would afford no more than flood relief, even if the canal were fully ample to carry the water of the entire area, for the reason that this expanse is practically level, and the water will not flow to this channel rapidly enough to give good drainage. This makes it necessary to dredge all of the natural streams into or through the Glades as far as the divide between the eastern and western slopes, which is reported to be 22 feet above tide and to lie in a line extending south from the center of Lake Okeechobee. For the reasons above mentioned, all of this work must be done before this area of approximately 3,500 square miles can be drained sufficiently for summer culture.

The practicability of draining small tracts about the border of the Glades has been demonstrated only for the production of winter vegetables. While these areas may be somewhat increased and the risk of winter flooding diminished by the improvement of natural channels, it will be impossible to extend the area of these lands for fruit growing or make the Glades more than temporary winter fields until more effective drainage is provided. The problem which confronts the investor and cultivator is not so much the possibility of draining the tract as a whole as what may be done in this direction within the limit of individual means to fit portions of this land for the production of crops.

Investigation of this portion of the Glades was made with the view of ascertaining whether some plan might not be devised for reclaiming small areas. An experimental plan for determining whether portions of the marl land could not be inclosed by dikes to protect them from outside water and the interior be kept dry by pumping was proposed and a tract selected for the experiment, but it has not yet been put in operation.

The success of this method of drainage will depend upon whether a good dike can be made of the marl soil and also whether the head of

water back of the dike may not force water through the underlying porous tracts into the inclosed area in greater quantities than can be profitably removed. The plan merits a trial. Such a method of improvement would admit of gradually pushing the drainage of the Glades away from the higher rock lands, leaving an overflowed space of sufficient width to allow for the passage of the interior water. The dikes would be 4 feet high, and the total lift of water about 6 feet.

The economic advisability of such work will depend upon the value of the product. The prestige of Florida fruit in the market is encouraging and indicates that the State may easily lead in the quality of many of her fruits. The value of fruit products during the last two years, as reliably reported, has been $200 to $1,000 per acre, which amount would justify considerable expenditure for reclamation improvements. The expense of preparing the rock land for trees is not less than $100 per acre, while the reclamation by levees, if such were found practicable, will not be more than $50 per acre, though there would be a continuous expense for maintenance. Shallow drainage channels should accompany the levee system to provide relief from flood water from the Glades and to carry off the water pumped from the land inclosed by levees.

A combination of the two plans will admit of the gradual development of the Glade lands as the demand for their products increases.

OFFICIAL STATE MAP OF THE EVERGLADES, ADOPTED IN 1905.

[Adopted at a meeting of the Trustees of the Internal Improvement Fund of Florida, held in Tallahassee on Jan. 2, 1905.]

The following proceedings were had:

Governor Jennings presented the following letter, together with a map of the Everglades:

TALLAHASSEE, FLA., *January 2, 1905.*

Hon. W. S. JENNINGS,
Chairman Trustees Internal Improvement Fund, Tallahassee, Fla.

SIR: In compliance with your request I here hand you a map which has been prepared in the land office, showing the area of the Everglade patent, known as No. 137.

We have extended the lines by rule from the surveyed lines on the east and the west side of the Everglades, which is as near a location of the sections, townships, and ranges as we can furnish without an actual survey of the same.

I trust the same will be satisfactory.

Yours, very truly,

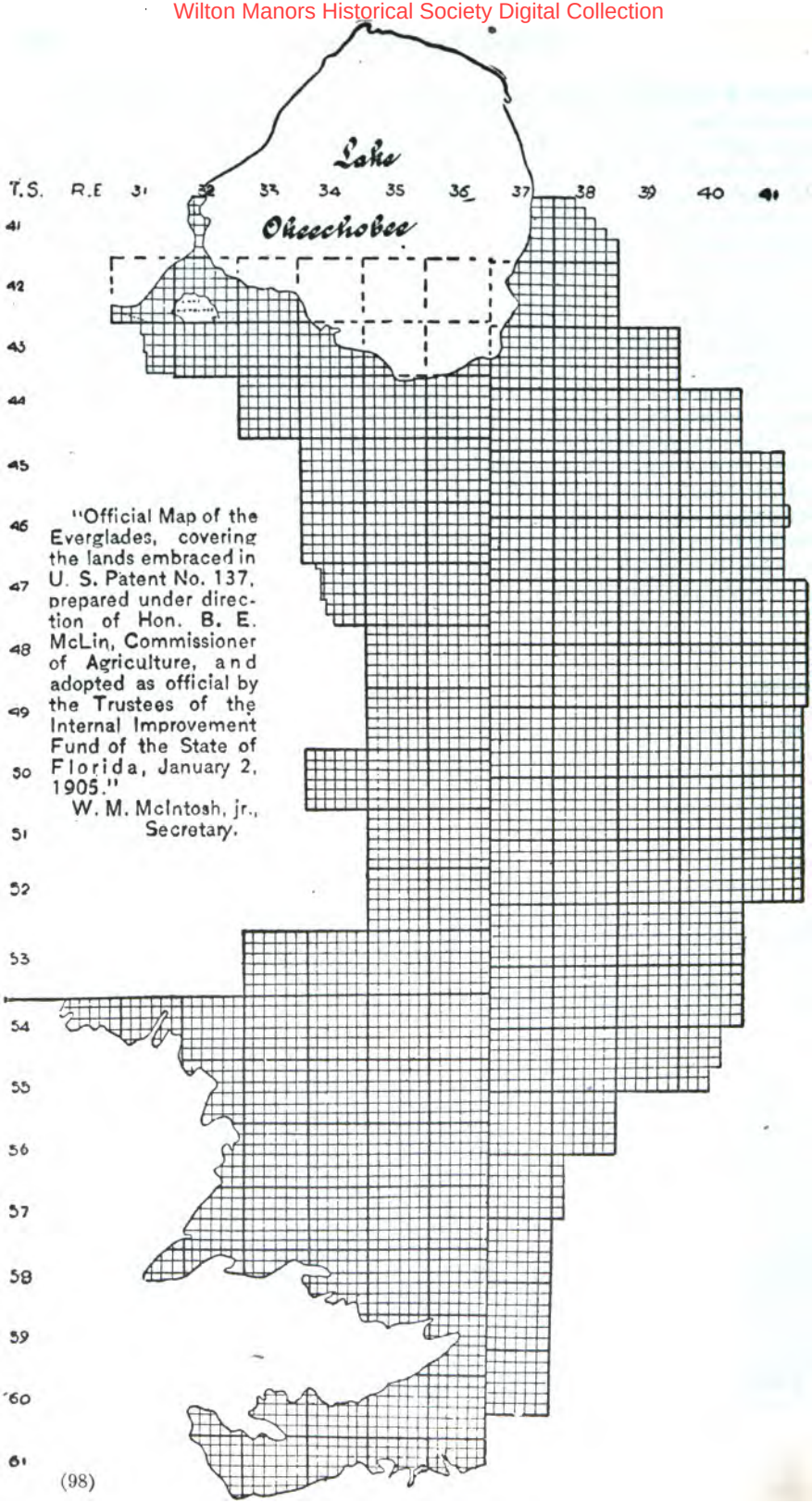
B. E. McLIN,
Commissioner of Agriculture.

After consideration, the following resolution was adopted:

"*Resolved*, That the letter of Hon. B. E. McLin, commissioner of agriculture, be spread on the minutes of the Trustees and that the map of the Everglades, as prepared under his direction, be, and the same is hereby, adopted as the official map of the Everglades land, embracing the lands in United States Patent No. 137, containing 2,862,280 acres, and that said map be identified by the secretary indorsing thereon the following words and figures, viz:

"'Official map of the Everglades, covering the lands embraced in U. S. Patent No. 137, prepared under direction of Hon. B. E. McLin, commissioner of agriculture, and adopted as official by the Trustees of the Internal Improvement Fund of the State of Florida, January 2nd, 1905.'

"*Be it further resolved*, That the map be entered on record on a separate page of the minute book of the Trustees of the Internal Improvement Fund of the State of Florida, and that a copy of said map, duly certified as aforesaid, be filed in the office of the Hon. B. E. McLin, commissioner of agriculture * * *." (Minutes of the Trustees of the Internal Improvement Fund, vol. 6, pp. 5–7.)



"Official Map of the Everglades, covering the lands embraced in U. S. Patent No. 137, prepared under direction of Hon. B. E. McLin, Commissioner of Agriculture, and adopted as official by the Trustees of the Internal Improvement Fund of the State of Florida, January 2, 1905."

W. M. McIntosh, jr.,
Secretary.

MESSAGE OF GOV. N. B. BROWARD TO THE LEGISLATURE OF FLORIDA RELATIVE TO RECLAMATION OF EVERGLADES.

EXECUTIVE OFFICE,
Tallahassee, May 3, 1905.

Gentlemen of the Senate and House of Representatives:

I desire to submit to you the following information in regard to the present status and future prospects of the trust reposed by the legislature of 1855 in the Trustees of the Internal Improvement Fund of the State of Florida.

* * * * * * *

From this review of the history of the Trustees of the Internal Improvement Fund and their powers and duties under the act creating them and vesting them with the lands I am convinced that it is their duty and within their powers to drain and reclaim the swamp and overflowed lands now left in the fund. The question then is:

Is the lowering of Lake Okeechobee and the drainage of the Everglades feasible?

The question has been decided in the affirmative by many authorities of the highest standing.

In 1880 and 1882 a line of levels was made by Gen. Gillmore under the direction of the United States Senate. These and other surveys by Col. Charles Hopkins, Maj. Wirts, V. P. Keller, and J. W. Newman fix the elevation of the Everglades at from 21 to 23 feet above tidewater level. The difference in these figures is accounted for by the depth of the water on the glades when the surveys were made.

In 1891 a survey made by W. H. Caldwell, assistant United States engineer, fixed the level of Lake Okeechobee at 20.42 feet above tidewater level.

There are seasons of the year when a large portion of the Glades are dry. I have been in Lake Okeechobee twice within the last six months. Once with Mr. B. H. Barnett and Mr. William M. Bostwick, jr., of Jacksonville, on the steamer *Naomo* of Fort Myers, or Kissimmee, commanded by Capt. Hall. During the first part of February of the present year, with Attorney General Ellis and State Treasurer W. V. Knott, and the State chemist, Capt. R. E. Rose, and ex-Gov. W. S. Jennings. On the last trip we boarded a steamer at Fort Myers, proceeded up through the Caloosahatchee River and several canals into Lake Okeechobee and investigated two canals leading out of Lake Okeechobee south into the Everglades, then along the east side of the lake about three-eighths of a mile from the shore, going ashore once, until we arrived at Taylor's Creek, on the north end of the lake, where we replenished our supply of wood.

I took frequent soundings of the water for about 20 miles, and found the water to be uniformly 18 feet deep at three-eighths of a mile from the east shore. Once, when about a mile from the shore, I found the water to be 21 feet.

I find Lake Okeechobee to be a beautiful body of clear water, with clearly defined shores, no lily pads or hyacinths, and, except in times of freshets, the water remains within its rim or banks, and can be lowered 6 feet and have ample water left for the purpose of navigation over the lake and quite near the shores. I would judge from the soundings made that the bottom and sides of the lake may be likened to those of a saucer; if the water was lowered from 3 to 6 feet, there would be a white sand beach around the lake. On the east side of the lake, after passing over a narrow rim of sand beach, which was about 2 feet above water, one would enter a swamp of cypress, gum, and other woods, with some palmetto trees which follow the shore line of the lake to about the center of the north end; then some pine land and oak hammock is visible, with a few houses occupied by fishermen.

From where the Kissimmee River enters the lake, there is a wide expanse of muck and saw grass, extending to the north and west for 8 to 10 miles; on the west side the pine land approaches the lake to where low prairies from the lake shore come down to where the Caloosahatchee River enters it, where a broad expanse of saw grass again commences, and except for a sparse fringe of custard apple and cypress trees, continues around the entire south and southeast sides of the lake. After passing through this fringe of custard apple and cypress trees, by the way of the Rita River Canal south, a vast sea, as it were, of saw grass comes into view, which extends as far as the eye can reach in every direction, with a few inches of water over the mud, upon which the saw grass grows. The saw grass extends in a southerly direction 100 miles or more, and is from 40 to 65 miles wide, interspersed by a few small wooded islands.

The acreage that will be affected by the drainage or lowering of Lake Okeechobee will aggregate more than 6,000,000 acres. That one may more easily comprehend the vastness of 6,000,000 acres of land, I will say that it is more than six times as great as is the entire cultivated acreage of Florida, including gardens as well as farms. Of the 6,000,000 acres nearly if not quite 3,000,000 acres of it is covered only with grass, most of it saw grass, no trees or bushes. Once in a decade the water, on account of continuous rains, rises out of the bed of the Everglades and overflows a large part of the pine lands adjoining. Along the Caloosahatchee River, on the west, it is impracticable to cultivate the land above Fort Thompson, which is 16 miles or more in a direct line west from Lake Okeechobee. Orange groves that were 10 or 12 feet above the normal height of the water have been drowned out in this vicinity as far as La Belle.

Notable among the groves that were destroyed was the grove of Capt. Hendry, of La Belle, who for many years represented Lee County in the legislature, and 2 miles above his place the grove of Mr. George Hendry, his son, was covered by water, so I am informed, for a period of six weeks, almost entirely destroying his grove. * * *

The lowering of Lake Okeechobee, not exceeding 4 feet, would give protection from this overflow to these crops and groves. * * *

Considerable discussion has been had at different times as to the climatic effect upon the glades and adjacent lands if the same were drained. The fear has been expressed that the climate would be colder on removal of the vast body of water off the glades. This reasoning would probably be correct if the body of water in the glades

was not a very shallow and cold body, or if the large body of warm water in Lake Okeechobee was to be materially affected.

To lower Lake Okeechobee 6 feet, the maximum amount contemplated, would leave a body of warm water averaging 12 feet deep over an area of 1,000 square miles. This lowering of Lake Okeechobee would remove the shallow, cold water off the glades, leaving a dry, warm soil radiating heat which now absorbs heat from the warm airs off Lake Okeechobee.

While a large body of deep water to the northwest is certainly a protection from cold in Florida, a marsh or shallow body of water on the northwest is a menace. This has been so frequently illustrated that argument is unnecessary.

The drainage of the glades would certainly not increase the danger of frost; on the contrary, it would have the opposite effect. This position I believe will be sustained by all scientific as well as practical men familiar with the conditions.

The Trustees have already conveyed 1,652,711.80 acres of these valuable lands to the Disston drainage project, for which was cut about 80 miles of canals, about Kissimmee and into Lake Okeechobee, the greater part of which would be made available by a canal from Lake Okeechobee to the St. Lucie River lowering Lake Okeechobee.

You will perceive, by referring to the report of Col. Kreamer, quoted below, that he expected to make all the canals of the Disston Co. available by completing the Rita River Canal, as outlined in the said report.

By digging 22 miles into the St. Lucie a navigable canal, which can be quickly done, then by digging 10 miles from Tomoka River into Haw Creek, which empties into Dunns Lake, which empties into St. Johns River above Palatka, or by digging from the head of North River into Julington Creek, a distance of 8 or 10 miles, we can open for transportation and connect through St. Johns River with North and Matanzas Rivers, with the Halifax and Indian Rivers, St. Lucie River with Lake Okeechobee, which has a coast line of 130 miles, and 309 miles of the Kissimmee and Caloosahatchee Rivers, and into the Gulf of Mexico at Fort Myers. Thus by digging 30 miles of canal we will prevent Okeechobee overflowing its banks, and at once make "lowlands" instead of "overflowed lands" of the Everglades, and connect by this 30 miles of cutting all of the above waterways, which would become by this means a waterway across the State from Fort Myers to Indian River, and would also connect Indian River with the St. Johns River, so that freight steamers from Jacksonville and Indian River, as well as steamers from the Gulf of Mexico via Fort Myers and Caloosahatchee River, and also steamers from Kissimmee via Kissimmee River, could all pass through Lake Okeechobee and do business throughout the 740 miles of inland waterways that would by this 30 miles of cutting be connected together. The remainder of the work would be merely the digging of ditches or small canals, which would be done at a little cost per mile, and as to cost of digging I refer you to the report herein made by Col. Kreamer and printed herewith.

The report of Col. James M. Kreamer, chief engineer of the Okeechobee Drainage Co., made in 1886, says:

The surface of this soil is at times exposed, and it is only during or subsequent to a heavy rainy season that it is possible to penetrate with a light skiff, and then advantage

must be taken of the natural drains of the vast area. If there was any absence of the dense saw grass, no difficulty would be experienced in traversing the country in any direction. A 4-foot reduction of the surface of the waters of this region would be sufficient for cultivation. The surface of the lower glades is well elevated above tide level, but, due to the rim of outcropping lime rock extending along the Gulf and Atlantic borders, the waters are in a great measure impounded and retained at varying elevations above the tide. Levels and measurements taken at Lake Worth establish the surface of the fresh water of the Everglades to be 10½ feet above the tidewater of the Atlantic, and that a canal 1,100 feet long would be entirely feasible to cut the rim at frequent intervals and permit the impounded waters to flow into the Gulf or Atlantic. This would result in exposing great tracts of soil now practically valueless.

REPORT ON MAIN DRAINAGE CANAL FOR LAKE OKEECHOBEE.

Agreeably to the request of the executive committee of the Disston Land Co. of Florida, I herewith present a brief report covering the question of supplementing the partial drainage of Lake Okeechobee effected by the A. & G. C. C. & O. L. Co., by constructing a large canal or canals which it is believed will afford positive drainage for the lands bordering Okeechobee Lake, and thus render the said lands cultivatable and thereby give a specific value to the muck lands of the Disston Land Co. in that vicinity, which said lands are at present in a condition unfit for tillage and without value for agricultural purposes.

As chief engineer of the A. & G. C. C. & O. L. Co., I have frequently recommended the construction of drainage canals throughout the district controlled by the operations of the drainage company, which canals would, if completed, have afforded relief for a very large percentage of the marsh lands, and effectually reclaim, at a moderate expense, all of these rich lands which could be brought into successful cultivation.

In this connection it was urged that a proper system of drainage be given the lands adjacent Lake Okeechobee.

In recognition of these recommendations three small canals leading from Lake Okeechobee have been constructed, two of which connect with Lake Hicpochee and thence by a canal of cross section equal to the combined area of the two canals noted, the drainage is carried into the upper Caloosahatchee River at Fort Thompson. The third canal is partly completed, and is cut from the southern margin of Lake Okeechobee, beginning at a favorable point on Rita River, and penetrates in a due southerly line for a distance of 10.5 miles and empties into the western margin of the Everglades, this drainage reaching the Gulf via Harney and Shark Rivers.

Due to the fact that before the completion of the canal on the southern route the A. & G. C. C. & O. L. Co. completed its contract with the State of Florida, it was not deemed expedient by the drainage company to still further prosecute the work of drainage in the Okeechobee Basin, and as a consequence, the great area of rich land in that vicinity is at present in a state unfit for cultivation. Exhaustive surveys have been made to determine the most practicable, efficient, and, in cost of construction, economical route for a large drainage canal for the permanent lowering of Lake Okeechobee.

Lines of drainage to the St. Lucie River, Lake Worth, New River, Miami River, and the Bow Legs Landing route, via the western margin of the Everglades, have been carefully considered.

Further drainage through the Caloosahatchee River is barred from the fact that the capacity of the upper Caloosahatchee River at Fort Thompson is fully taxed at present to carry the water reaching that point via the drainage canals already constructed; and the residents of that region are petitioning the internal improvement board to provide relief during and subsequent to the rainy season by closing the canal at a point just west of Lake Hicpochee.

The presence of the sand and lime-rock rim extending for many miles from the Atlantic coast toward Lake Okeechobee renders the cutting of a drainage canal on any of the lines named east from Lake Okeechobee very costly. In addition to the presence of difficult material in excavation, the lines from Lake Okeechobee to Lake Worth, New River, and Miami River are respectively 10, 28, and 32 miles longer than the route south from Rita River via Bow Legs Landing route.

This last-named route is 24 miles long, the New River route being 52 miles long.

In 1883 Col. C. F. Hopkins, deputy United States surveyor, was engaged by the drainage company to accompany the New Orleans Times-Democrat expedition on a reconnoissance from the south shore of Lake Okeechobee, in a line due south through the Everglades to a point about opposite the north end of the Ten Thousand Islands, and thence in a southwesterly direction to the headwaters of the Shark or Harney Rivers.

In addition to other instructions, Col. Hopkins was directed to carefully note the depth of muck on the line of travel.

In his report he clearly states that he made daily soundings, and no rock or sand was encountered at any point on the line of travel at a depth of 10 feet below the surface until the party reached a distance of 30 miles south of Lake Okeechobee, when rock was found at a depth of 8½ feet below the surface of the muck, which showed that the surface of the underlying rock at that point was practically at tide level.

During the year 1887, a line of levels was run southward from Lakes Hicpochee and Okeechobee on the western margin of the Everglades to ascertain the possibility of securing a feasible route for drainage in that direction. It was found that on the margin of the marsh in the north range of sections in township 48 south of range 34 east, the elevation of the muck was 12.76 feet below the surface of Lake Okeechobee, and distant therefrom 24 miles; the level of Lake Okeechobee being 22 feet above tide level.

A careful study of this problem clearly demonstrates that the Bow Legs Landing route is the shortest possible distance in which effective drainage can be secured, that the material for excavation is entirely of pure muck, that the effective discharge of this canal would be greater than of a canal of like cross section on any other route named, and that the cost of construction of the canal on the Bow Legs Landing route will be 60 per cent less than the New River route under the most favored conditions.

The canal proper already completed south from Rita River is 50 feet wide and 10½ miles long.

Including labor, fuel, repairs, and all extraordinary charges due to breakdowns, etc., the present canal cost an average of 1.6 cents per cubic yard. This does not include cost of dredges or general superintendence.

The Bow Legs route for the same cross section of canal will discharge from 10 to 30 per cent more water than either of the other routes named.

It is proposed on the lines of the Bow Legs Landing route to construct a canal 150 feet wide and 10 feet deep at Lake Okeechobee and 6 feet deep at its terminus, 24 miles distant, and having a gradual gradient on its bed.

The canals from Lake Okeechobee to Lake Hicpochee and from Lake Hicpochee to Sugar Barry Hammock have been in successful use since 1883. They were constructed through precisely the same grade of material as is found on the Bow Legs Landing route. These canals already constructed have not only at all times remained free and open and clear of all deposits, but they have by scour enlarged in cross section both in width and depth. They were originally cut 5½ feet deep; they have scoured to the bedrock, and in many places are 11 feet deep. They have also become wider, due to the erosive action of the current.

A stream running with the velocity of one-third of a mile per hour will transport soft clay.

A velocity of a half mile an hour will carry sand as large as linseed.

A velocity of two-thirds of a mile an hour will sweep along fine gravel, and a mile and a half an hour will roll along round pebbles.

Disintegrated muck is much more easily transported than clay or sand.

There has never been any muck deposit formed within the canals leading from Lake Okeechobee.

The initial current through the Bow Legs Canal will be at a rate of 1.876 miles per hour, which is sufficient to roll along large pebbles and will sweep every vestige of muck from within the confines of the canal margin.

The efficiency of the canal west from Okeechobee indicates that a canal cut on the same general lines will be equally effective.

It is proposed, therefore, to construct the canal on the Bow Legs Landing route on the same plan as adopted at Okeechobee and Hicpochee Canals.

The Bow Legs Canal will have a cross section 150 feet wide at the narrowest point and be 10 feet deep at Okeechobee Lake and 6 feet deep at its terminus, 24 miles distant. Or it may be deemed desirable to construct two or more parallel canals whose combined cross section would equal that of the main canal just proposed. At least two powerful excavators should be used on the work.

In view of the increased distance for transporting fuel, and other possible contingencies, I set the extreme cost of excavation at 2 cents per cubic yard. A canal 150 feet wide by 8 feet deep and 24 miles long would represent 5,631,858 cubic yards; at 2 cents per cubic yard the cost will be $112,637. Deducting the cost of canal already constructed, $12,101, the completed Bow Legs Landing route would cost $100,536. To this should be added the cost of two dredges and barges and necessary outfit, which, in round numbers, would amount to $50,000 additional.

The above information is compiled from reliable and specific data, and clearly shows that of all possible routes for a canal to permanently lower the waters of Lake Okeechobee, and render the adjacent muck land cultivatable, that for the length of canal to be built, favorable material in excavation, economy of construction, and effectiveness of drainage, the Bow Legs Landing route is preferable to any other which could possibly be selected.

The accompanying map shows the location of the several canals named: Canal to St. Lucie River is marked "No. 1"; canal to Lake Worth is marked "No. 2"; canal to New River is marked "No. 3"; canal to Miami River is marked "No. 4"; canal to Bow Legs Landing route is marked "No. 5".

I also submit for your inspection a profile of the New River and Bow Legs Landing route which clearly shows the advantage claimed for the Bow Legs Landing route for the drainage of Lake Okeechobee.

Yours, respectfully,

J. H. KREAMER,
Chief Engineer A. & G. C. C. & O. L. Co.

AUGUST, 1896.

The fact that we would have open waterways in three directions from Lake Okeechobee large enough for transportation purposes, connecting with three lines of railroads, at Fort Myers, Kissimmee, and Stuart, will aid in making the land reclaimed valuable at once. For the production of sugar, there is no other such available and desirable land in the United States. There is consumed annually in the United States, 2,844,626 tons of sugar, of which there is produced in the United States of beet sugar, 163,126 tons; of sugar-cane sugar, 275,000 tons, which shows that there is imported, upon which a tariff is paid, 2,406,500 tons, which, at 5 cents per pound, is worth $240,000,000. The adaptability of the Everglades, when drained, for the growth of sugar cane, as to climatic condition, soil, and productiveness, is well shown by the following extract from a paper read at the Cane Growers' Convention, at Jacksonville, May 6, by W. L. Van Duzor; and also by the extracts from Success, contributed by James E. Ingraham, vice president of the Florida East Coast Railroad Co., and also a report by Prof. H. W. Wiley, Chief Chemist, United States Agricultural Department.

HEALTHFUL REGION.

The healthfulness of a region is of the utmost importance to any enterprise, and especially is this true when the operatives must become permanent residents. It can be positively stated that the reclaimed lands of the Kissimmee Valley are free from malaria. The employees of the drainage company were white men exclusively. These men were recruited from all parts of the country. Many of them entered into the service of the company before they became acclimated. During a period of over 11 years, the company never employed a physician or lost an employee from death, never did any of the men leave the service of the company from the fact they could not stand the climate.

Malaria and chills are absolutely unknown.

Within a radius of 20 miles of Kissimmee is an area of at least 30,000 acres of excellent sugar lands, in tracts of from 500 to 2,000 acres, which possesses every requisite in points of elevation, components of soil, and the natural facilities with which they can be put in cultivation. These rich sugar lands are admirably located, a greater part of them bordering on the beautiful lakes of that region, extending from Lake Hart to Lake Kissimmee, thus affording pleasant farm and plantation sites, insuring an abundance of water for irrigation when necessary, and an elevation of about 75 feet above tidewater. It has also sufficient natural grade, by which easy subdrainage is afforded.

The following analysis of muck will be found interesting to those familiar with the subject of sugar culture:

Moisture	16.84	Potash	0.13
Organic matter and combined water	75.65	Soda	.38
Silica and insoluble silicates	.91	Phosphoric acid	.18
Oxide of iron	1.47	Sulphuric acid	.51
Lime	3.17	Chlorine	.43
Magnesia	.18	Nitrogen (in organic matter)	2.17

The chemical analysis has been substantiated by practical experience. Muck lands have been found to be suitable to a great variety of crops, especially sugar cane.

CAPT. ROSE'S WORK.

Capt. R. E. Rose, who is now chemist of Florida, was superintendent of the drainage company's operations the first few years of its operations. In the fall of 1889 he planted the first sugar cane planted on reclaimed muck land in Florida, at South Port, which is located at the south end of Lake Tohopekaliga, 12 miles south of Kissimmee. The land planted had been permanently inundated up to February of the same year. Capt. Clay Johnson had charge of this farm.

The sugar cane grown at South Port was exhibited at the New Orleans Cotton Centennial during February and March, 1885, taking first premium over Cuba, Louisiana, and Mexico. A delegation of Louisiana sugar cane planters visited South Port in March, 1885. They brought with them Dr. Sands, an expert sugar chemist, who reported 65 tons of sugar cane per acre, with 17 per cent sucrose and but one-half per cent glucose.

YIELD TESTED.

Capt. Rose ground this crop in April and May, 1885. South Port farm is still producing enormous crops of vegetables, and about 15 acres are devoted to sugar cane.

In March, 1902, I personally tested the yield of cane on this farm, by measuring the land, cutting and topping the cane as it would go to the mill, and by actually weighing it found the yield to be over 63 tons to the acre. The samples of cane taken at the same time and tested by the Agricultural Department at Washington showed 12 to 13 per cent sucrose, which Prof. H. W. Wiley stated would yield 200 pounds of sugar to the ton of cane, or 12,600 pounds to the acre. This marvelous yield, after a continuous cropping of 20 years without 1 pound of fertilizer of any description. This farm is also growing 50 bushels of choice corn to the acre, and one of the thriftiest young orange groves in the State is growing on a portion of this farm, bearing heavy crops of choice fruit.

In 1885 Capt. Rose purchased the tract of muck which afterwards became the great St. Cloud sugar plantation.

In 1886 and 1887, 110 acres of cane was ground, making an average of 4,800 pounds of granulated sugar per acre, with a very inferior mill. Soon afterwards Capt. Rose disposed of his interest to Mr. Hamilton Disston. The mill was rebuilt and a first-class roller process mill was installed. From the crop of 1888 and 1889, 374 acres of cane was ground, making 1,200,000 pounds of granulated

sugar and 200,000 pounds of second sugars. This plantation continued to produce good crops of cane each year after until the death of Hamilton Disston, when operations ceased, and muck lands and the sugar interests in Florida lost their greatest friend and champion. His faith in the great value of this fertile soil never wavered.

My knowledge of muck lands and their adaptability for growing various crops comes from association with the drainage company as its superintendent from 1889 until the completion of its contract in 1893 and the sale of its land and by the actual cultivation of muck for the last 12 years.[1]

Many others attest to the fertility and productiveness of muck lands who are much better known to the agricultural world than myself.

* * * * * * *[2]

Messrs. Aug. Voelcker & Sons, agricultural chemists of London, refer to the high percentage of vegetable and nitrogenous matter and character of the new lands.

Prof. D. Tackle, director of the Peat Experiment Station, Bremen, submits a careful analysis of the soil. Dr. Tackle says:

In respect to contents of potash, phosphoric acid, and lime, the samples of soil from Florida are quite similar to those from northwestern Germany, overgrown with heather. It is distinguished, however, with a much higher content of nitrogen and by a much more perfect decomposition. Very likely the nitrogen is contained in a form more available to plant growth than in northwestern Germany peat lands. Undoubtedly the soil, as represented by the samples, will become very productive.

APPROVED BY MR. SPRECKELS.

Mr. Claus Spreckels, probably the greatest authority on sugar production in the world, pays a high compliment to the richness and value of muck lands for the production of sugar. He says:

PHILADELPHIA, PA., *March 22, 1890.*

DEAR SIR: In answer to yours of the 20th instant, in which you ask my opinion regarding Florida as a sugar-producing State, I take pleasure in saying that, during my recent trip to inspect your sugar operations, my surprise was great at finding such a country for the growth of sugar cane. The soil is as rich as any that I have ever seen, and, with proper cultivation, the yield should be equal to that of any other country on the face of the globe.

I congratulate you upon the bright prospect for the future of the sugar business in the State of Florida.

Yours, truly,

CLAUS SPRECKELS.

MR. HAMILTON DISSTON.

THE DRAINING OF THE EVERGLADES.

Mr. J. E. Ingraham, in Success, says:

There are great agricultural possibilities in the Florida Everglades. Though they are yet merely an expansive waste of swamp and lake and jungle, I venture to predict that they will be the location of hundreds of fertile farms within 10 years, and will by degrees develop into one of the most productive tracts of land in the world. The barrier to the utilization of the Everglades has been, of course, the water which covers the greatest part of them to a depth of from 1 to 6 feet. But it has been found entirely practicable to drain off the water. Work to this end has already been begun, and is being pushed rapidly. When it is completed, a tract of land 160 miles long and 60

[1] Evidently a quotation from Capt. R. E. Rose.
[2] Prof. Wiley's views, which are here omitted from Gov. Broward's message, are to be found on pages 73, 81, and 83 of this document.

wide will have been opened to civilization. The size of this region is not as important as the remarkable productivity of the soil. The latter is not only absolutely virgin, but has been fertilized by animal and vegetable life through many centuries. I am confident that its crops will lift Florida to a place among the leading agricultural States.

The project of draining the Everglades attracted the attention of Henry B. Plant in the early nineties, but he was by no means sure that the scheme was feasible; so I, acting under his direction, undertook an expedition through the region. Despite its proximity to centers of population, it was then for the first time thoroughly explored by white men. Ours was virtually a voyage of discovery. We paddled our light boats on lakes, and camped on islands, that I have good reason to believe had never before been visited by any human beings but Seminole Indians, and by these rarely. We underwent so many hardships that some of our party were compelled to turn back, but our efforts were not in vain, for we ascertained the important fact that the Everglades, along the whole 160 miles of the eastern side, are rimmed by a rock ledge. We furthermore learned that all of the lakes are several feet above sea level, and we decided that there was nothing whatever to prevent the water of the lakes from flowing into the ocean and leaving the land drained, if vents could be made in this long ledge of rock. The chief question before us pertained to the practicability of cutting through the ledge in various places, and dredging out outlets into the Atlantic, which is not more than 2 or 3 miles away at numerous points.

Experiment proved that this work would present no great difficulties. It was merely a matter of a great deal of digging. Henry M. Flagler took up the project, and it is being carried out by his lieutenants. We are not only making artificial outlets through the rock, but are also, by ditching and dredging, turning large bodies of water into rivers and creeks which flow to the ocean. The work has progressed far enough to enable me to predict confidently the opening in Florida, within a very few years, of a great tract of land of almost unprecedented fertility.

I have been in correspondence with the largest builders of dredges adapted for the work necessary to be done in the drainage of the region around Lake Okeechobee, and find that, with the use of 4 dredges, efficiently equipped, the cut 200 feet wide and 15 feet deep from Lake Okeechobee to St. Lucie River, a distance of 24 miles, can be cut in 18 months, at a cost of approximately $250,000, basing the cost at the figures made in the report of Col. J. M. Kreamer, previously cited, and upon a personal knowledge of the character and quantity of work to be done, and these dredges could be at work in 6 months after being contracted for.

By the opening of this canal, as suggested, and further deepening the waterways connected with the Caloosahatchee River, a continuous waterway for freight traffic would be opened up from Fort Myers on the west, to the Indian River on the east, and, upon the completion of the Florida East Coast Canal, direct to Jacksonville, where connection with steamship lines to northern ports could be had.

This canal, by lowering the water of Lake Okeechobee not more than 3 or 4 feet, to be controlled by proper locks, would drain a vast acreage of the most fertile land in the world, opening up to cultivation in the territory immediately surrounding Lake Okeechobee a larger acreage of cultivable land than is now under cultivation in the whole State of Florida; and with the drainage extended through the Everglades to the south, ultimately about 6,000,000 acres of the finest land in the country would be rendered cultivable—an area capable of producing the entire tonnage of cane sugar used in this country, a crop which alone would be of untold value to the State.

The vital importance of the questions and the best interests involved, together with the array of legal talent employed by the railroad and canal companies, claimants, under the alleged land grants against the Trustees, made it necessary that the Trustees em-

ploy able counsel to represent the great trusts imposed upon them, and they have employed Col. R. W. Williams, of Tallahassee; Messrs. Bryan & Bryan and Hon. W. S. Jennings, of Jacksonville; and Hon. W. B. Farley, of Marianna.

I became firmly convinced many months ago that the lands belong to the Internal Improvement Fund for the purposes of drainage and reclamation, and have so publicly expressed these views throughout the State of Florida. Upon more thorough investigation, having been more fully advised and having assumed the responsibility of the trusteeship, I am more and more impressed with the correctness of my former views, and I am more fully determined to exert every proper effort to discharge the duties devolving upon me, in part, as trustee, and solely as governor, to the end that the remainder of this fund now available may be used for the purposes and trusts expressed in the laws heretofore referred to. It can not be said that the Trustees have, in the past, recognized the right of the railroads, under legislative land grants, as being superior to the duties of the Trustees to drain, when drainage contracts to convey the title to large areas of the land have, from time to time, been made by the Trustees since the grants were made to the railroads and claimed to have been earned by them.

In 1898, when the railroads were claiming more lands than had been patented, and when the governor, then one of the Trustees, had been a Trustee from 1881 to 1885 as governor, and from 1890 to 1897 Trustee as comptroller, and from 1897 Trustee as governor, and when the attorney general and the commissioner of agriculture, two of the Trustees, had been such since 1889, and when the regularly retained legal adviser of the Trustees was one of the Trustees from 1877 to 1885, during which period nearly all of the land grants were made and claimed to have been earned, contract for drainage was made by the Trustees which provided for a conveyance of about 800,000 acres of land then claimed by the railroads as having been granted to and earned by them (p. 437, Minutes of the Trustees, 1898) the validity of that contract was never seriously questioned.

The acts of the Trustees in the past are not inconsistent with the recognition of their primary duties to carry out the trusts, as expressed in the internal-improvement act, to drain and reclaim the swamp and overflowed lands in this State, as therein provided for. There being an estimated area of 6,000,000 acres of swamp and overflowed lands unfit for cultivation and available in the territory of the Kissimmee Valley, Lake Okeechobee, and the Everglades—3,000,000 acres of which territory have heretofore been deeded by the Trustees of the Internal Improvement Fund to the various railroad and canal corporations, which 3,000,000 acres would be greatly benefited by the successful drainage and reclamation of the 3,000,000 acres now vested in the Trustees and under their control and management, it has become necessary, in considering the plan of drainage and reclamation of the Everglades, to consider the benefits of this adjacent territory; and it is found that a constitutional amendment is necessary to enable the Trustees to require a proper contribution on the part of the owners of the lands heretofore deeded in proportion to benefits that the land will derive by means of such drainage and reclamation. I therefore recommend that a constitutional amendment be proposed, creating a drainage district, embracing the Everglades and the adja-

cent swamp and overflowed lands, including the Kissimmee Valley and the right to establish other drainage districts, authorizing a drainage commission to levy an acreage tax for a reasonable amount, to be levied and collected annually, to be used in the drainage and reclamation of said territory; and in the aid of the great purposes and the trusts accepted by the State of Florida in its acceptance of the magnificent domain patented to her by the United States Government.

As a difference of opinion exists as to the necessity for such a constitutional amendment, and as it is the purpose of the Trustees to proceed with the drainage and reclamation of the 3,000,000 acres now under their control as speedily as possible, I also recommend, in addition thereto, that a statute authorizing the creation of drainage districts by the Trustees and the assessment of benefits and damages be enacted.

Respectfully submitted.

N. B. BROWARD, *Governor.*

REPORT OF THE JOINT COMMITTEE OF THE FLORIDA LEGISLATURE FOR THE YEAR 1907, ON THE DRAINAGE OF THE EVERGLADES.

Hon. EUGENE S. MATTHEWS,
Speaker of the House of Representatives.

DEAR SIR: Your committee appointed under house concurrent resolution No. 7, same being as follows:

Whereas, The governor of Florida, in a special message to the legislature transmitting the report of the Trustees of the Internal Improvement Fund, recommended the appointment of a committee from both houses to inspect the work that had been done by the Trustees in the matter of building dredges and digging canals in the neighborhood of New River, and to visit Caloosahatchee River, and consider all the facts and data relating to such operation: Therefore

Be it resolved by the senate, the house of representatives concurring, That a committee of four from the house and three from the senate be appointed to visit the scene of the work now being carried on by the Trustees of the Internal Improvement Fund in the vicinity of New River and to inspect the same; to inspect the building of dredges and the work of digging canals, which is now being carried on by the Trustees; also to visit the Caloosahatchee River and consider all the facts and data bearing upon the drainage and reclamation of the swamp and overflowed lands and make report thereof to the legislature,

Have the honor to make the following report, to wit: We left Tallahassee and proceeded to Fort Lauderdale, situated on New River, where we observed and investigated the method of construction of the dredges, the character of the dredges constructed, and the work so far done by them, its value, its effect upon adjacent territory, and its relative cost as compared with the increased value of the territory through which they are digging.

We found two dredges built by the Trustees of the Internal Improvement Fund during the last two years, each of them 105 feet long by 38 feet breadth of hull by 8 feet in depth of hold, and each with two

parallel bulkheads, built staunch and strong throughout of wood and iron, and three decks, with commodious living apartments, all well kept, clean, and manned by crews energetic and industrious.

Each of the dredges is equipped with main engines of the dimensions of 14 inches diameter of cylinder by 20 inches stroke, well geared with steel gearing, and apparently strong and durable, with swinging engines, 8 inches in diameter of bore of cylinder by 10 inches stroke, steel geared wheels. One of the dredges has a steam boiler of Scotch pattern. Two corrugated furnaces allowed a steam pressure of 130 pounds. The other dredge contains a locomotive pattern of boiler, with one furnace and the usual number and sizes of tubes, and allowed same steam pressure. Both of the boilers are covered with asbestos and appear to be in good condition. Both dredges are equipped throughout with a complete system of electric lights, permitting work to be done day and night. The engines also on each of the dredges look clean and run as smoothly as any dredge machinery is expected to run. The dippers used on each of the dredges in the present work (that of excavating rock and earth) are of the rock-dipper type, of 2½ cubic yards capacity, water measurement.

We found quite a large supply of extra parts of those parts of the machinery most likely to break down or wear out rapidly, and two clay dippers of the capacity of 4½ cubic yards, water measurement, one for each of the dredges, which will increase the output of excavation each day very materially as soon as the dredges have cut through the rock rim to the Everglades, which rim is about 3 miles in width from the river, into the soft muck of the broad Everglades beyond. The dredge *Everglades* has passed through her hardest and deepest rock cutting.

As further information, we submit herewith the report of the civil engineer in charge, Mr. John W. Newman:

ANSWERS TO WRITTEN QUESTIONS OF THE COMMITTEE FOR INVESTIGATING DRAINAGE.

1. Estimated cost of two dredges, $100,000.
2. Character and quantity of material excavated: Of rock, 107,870 cubic yards; of dirt, 42,213 cubic yards; total, 150,183 cubic yards excavated by dredge *Everglades*. Estimated cost of entire work of dredge *Everglades*, including repairs, $12,907.65.
3. Monthly expenses: Costs of six months from October 1, 1906, $7,948.69; average cost per month, $1,324.80. Moved in six months, 78,000 cubic yards of rock and 30,000 cubic yards of dirt; total, 108,000 cubic yards. Cost per cubic yard in six months, rock 8 cents, dirt 6½ cents.
4. Length of canal April 1, 5,886 feet; average width, 60 feet; average depth, 11 feet 10 inches.
5. Value of land before drained, nothing. Value of land after draining, $30 per acre.
6. Depth of dirt on rock rim in first mile, which is dug before reaching the unsurveyed land, is 0 to 1 foot. Depth of dirt in second and third mile, 5 to 10 feet; fourth and fifth mile, no rock found; sounding, 12 feet.
7. Nature of land west of rock: At 3 miles from mouth of canal in New River no rock is found, sounding every hundred feet with a 12-foot rod, but good muck 3 to 6 feet deep; under this a stratum of hard sand, 3 to 5 feet deep, then soft material, supposed to be muck.
8. Quantity of land drained per mile of canal: Estimated from evident effects of present work, complete drainage will result at average of 906 acres per mile, or 6 miles will drain 5,440 acres, worth when drained, $163,200.

JOHN W. NEWMAN.
Engineer for Trustees of Internal Improvement Fund.

Question No. 3 is answered as to the dredge *Everglades*, giving you the average monthly expenses for six months beginning October 1, 1906.

Answer No. 2 embraces all work done by *Everglades* to April 1, 1907.

JOHN W. NEWMAN,
Engineer for Trustees of Internal Improvement Fund.

We found by inquiry that no one had been sick on either of the dredges and that the public in that vicinity enjoys good health. We also found the country comparatively free of mosquitoes, and we were informed that no malaria prevails in that country.

The dredge *Okeechobee* is cutting in a southerly and westerly direction, following the narrow stream which constitutes the headwaters of the New River, widening and deepening it to a point near section 25, township 50 south, range 41 east, from which point she will proceed west three-fourths of a mile to the deep muck of the Everglades. From the dredge we were shown the flag marking the western boundary of the rock rim at the intersection of the deep muck.

The estimated area of the territory already drained by the cutting of the first canal is about 750 acres, the character of which land is, in the opinion of this committee, rich in quality and very valuable. In the opinion of those living in the vicinity, the land, after being reclaimed, will be worth about $30 an acre. Along the banks of this canal your committee observed several truck farms. They stopped and examined a crop of tomatoes growing on land which they were informed was from 12 to 18 inches under water before this drainage canal was cut. This piece of land was about 1 acre in area, and the character of the crop was finer than anything of the kind ever seen by any member of this committee. The estimated value of the crop on this land was about $700. The soil of this reclaimed land is apparently a very rich alluvial deposit, and is not peaty in character. Although it had not rained for months in that section, moisture was near the surface, and although it rained during the visit of the committee, the committee visited the same land the following day and found it firm and not sloppy and boggy.

The canals being made have a depth of about 10 feet by about 60 feet in width, and are now and will be of great value as highways for commerce.

We found the depth of water in New River to be on an average of about 20 feet. We passed up the river from its mouth, to where the dredges are in the Everglades. We find that it is a waterway of considerable importance even now. Many launches and lighters are used in the transportation of the products of that section and for other purposes. Your committee could clearly see that the effect of the canal has been to drain the land for, say, one-half mile or more on either side of the canal and for a considerable distance in front of it.

Of course, in estimating the ultimate value of the work done by the canal we must take into consideration that its object is not only the drainage of the land along its banks, but also the lowering of Lake Okeechobee, thus lowering the water level throughout this whole territory, and providing an open waterway from the Atlantic Ocean through Lake Okeechobee and down a system of canals already cut into the Caloosahatchee River on into the Gulf of Mexico.

We proceeded from New River to Miami, for the purpose of observing the depth of the Miami River, and to note the fall from the Everglades land into the waters of the Miami River, and the practicability of draining the lands in that vicinity, and to estimate the value of canals and the effect of drainage to the Everglades at the head of the Miami River.

The members of your committee were taken in charge by officers of the board of trade of Miami and shown every courtesy possible. We were first taken in an automobile to a very valuable place in the edge of the Everglades, where we found a tract of 20 acres of land on which had been planted a splendid young orange grove, and on which we found a vegetable farm comprising most of the vegetables grown in Florida. The lands of the Everglades visible from this point were of the same character as those observed at New River. We were also taken in a launch up the Miami River to its head, where there is an observatory tower from which the land of the Everglades can be seen for miles ahead. The incline from the surface of the water in the Miami River and to the Glades was very perceptible to the naked eye, and we are informed that the actual fall in 1,500 feet is about 7 feet. We are informed that the current in the upper portion of the river, near the water in the Glades, during the rainy season, is so swift that it is difficult for a powerful launch to ply upstream.

For the information of the legislature, and as a means of enlightening ourselves as to the actual cost of excavating and dredging through material such as is being cut by the dredges *Everglades* and *Okeechobee*, we obtained from Maj. Francis R. Shunk, United States Corps of Engineers, located at Jacksonville, Fla., the cost of excavating by the United States under the competitive-bid system and as done by the United States Government itself, and we were kindly furnished the following information from the records in his office:

COMPETITIVE CONTRACT WORK BY UNITED STATES GOVERNMENT BIDS.

	Soft material.	Rock.
St. Johns River, Orange Mills Flats	$0.107	.....
St. Johns River, Jacksonville to ocean	.0823	$4.33
	.099	
Biscayne Bay	.24	1.78
Tampa	.15	.....
	.1199	
Withlacoochee	.16	3.50
Hillsborough	.14	4.90
	.119½	4.89

10 per cent should be added to the above.

GOVERNMENT WORK DONE BY UNITED STATES GOVERNMENT ITSELF.

Key West	$0.1494	.....
Anclote River	.116	.....
Kissimmee River	.24	$2.60
Sarasota Bay	.181	1.33
Manatee River	.177	.....

It will be seen that the United States Government is paying, and has been paying, for excavating soft material, from 8.23 cents per cubic yard minimum price, in the St. Johns River, Jacksonville to the ocean, up to 24 cents per cubic yard in Biscayne Bay and Kissimmee River, and that for excavating rock the United States Government is paying and has paid from $1.33 per cubic yard minimum in Sarasota Bay up to $4.90 per cubic yard in Hillsborough Bay at Tampa, while in the Kissimmee River, which flows into Lake Okeechobee, the Government has paid 24 cents per cubic yard for soft material and

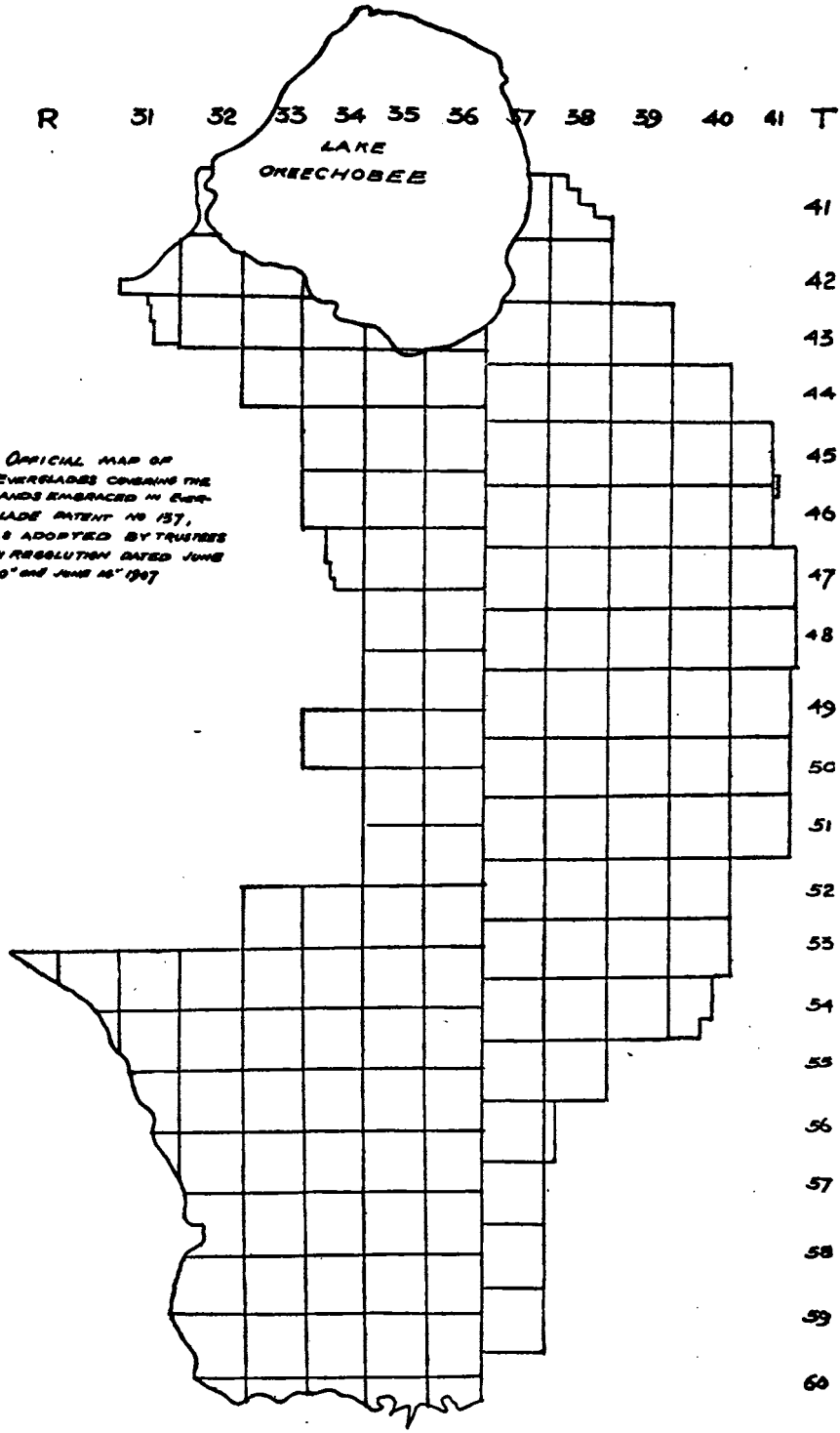
$2.60 per cubic yard for excavating rock. The lowest price paid by the United States Government in Biscayne Bay, at Miami, is 24 cents per cubic yard for soft material and $1.78 for rock. These figures, when contrasted with the actual cost shown in the report of Engineer Newman for excavating done by the two State dredges, which is an average of 8 cents per cubic yard for rock and 6¼ cents for soft material, is very great and shows that the work is being done at a minimum cost.

We did not visit the Caloosahatchee River, as instructed by the resolution, for the reason that we received information on the trip that the water was so low above Fort Thompson in the river and the canals leading into Okeechobee that it was barely possible that we would be able to successfully reach Lake Okeechobee or be able in any practical way to obtain any information by observing the land in that vicinity, but from an examination of profiles made from the survey of Gen. J. W. Sackett, under the direction of Capt. Black, United States Engineer, and from other maps and profiles and from interrogating persons who have personal knowledge of the lands and waters between the Caloosahatchee River and Lake Okeechobee, it is our opinion that it will be necessary for the protection of the people living on the Caloosahatchee River and in the valley of said river that the present canal leading from Fort Thompson to Lake Okeechobee should be deepened at least 5 feet, and that the Caloosahatchee be cleared out and straightened to a point near Fort Denaud.

All of which is respectfully submitted.

R. J. McCUTCHEON, *Chairman.*
JAMES E. CRANE, *Secretary.*
S. W. CLARKE.
C. L. LEGGETT.
H. C. PEEPLES.
CHAS. L. KNOWLES.
WM. A. RUSSELL.

5644°—S. Doc. 89, 62-1——8



OFFICIAL MAP OF EVERGLADES CONTAINING THE LANDS EMBRACED IN EVERGLADE PATENT NO 137, AS ADOPTED BY TRUSTEES IN RESOLUTION DATED JUNE 10TH AND JUNE 15TH 1907

AMENDED OFFICIAL STATE MAP OF THE EVERGLADES, ADOPTED IN 1907.

The following additional action regarding the official State map of the Everglades was taken by the Trustees of the Internal Improvement Fund as shown by their minutes:

TALLAHASSEE, FLA., *June 10, 1907—3 p. m.*

* * * * * * *

Hon. B. E. McLin, commissioner of agriculture, having prepared an amended map of the lands embraced in United States patent No. 137, in accordance with the request of the Trustees, and the same having been presented, examined, and approved, it was

Resolved, That the amended official map of the Everglades, covering the lands embraced in United States patent No. 137, prepared under the direction of the Hon. B. E. McLin, commissioner of agriculture, be, and the same is hereby, adopted as official by the Trustees of the Internal Improvement Fund of the State of Florida, on this, the 10th day of June, A. D. 1907; and,

Resolved further, That the amended map be entered of record on a separate page of the minute book of the Trustees of the Internal Improvement Fund, and that a copy of said map, duly certified by the secretary of the Trustees, be filed in the office of the commissioner of agriculture.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 7, pp. 66–67.)

TALLAHASSEE, FLA., *June 14, 1907.*

* * * * * * *

The following resolutions were adopted:

Resolved by the Trustees of the Internal Improvement Fund of the State of Florida, That the townships, ranges, and sections of the official map of the Everglades adopted by the Trustees under date of January 2, 1905, and as amended by resolution of said Trustees of June 10, 1907, embracing the lands in the United States patent No. 137, be, and the same are hereby, adopted and ratified as the townships, ranges, and sections of said map, which townships, ranges, and sections, as the same appear to be designated upon said official map of the Everglades, were so designated and determined by projecting on said map the township, range, and section lines of the original United States survey as the same appear on said map, and that the sections indicated on said official map of the Everglades, as adopted by the Trustees of the Internal Improvement Fund of the State of Florida, as aforesaid, be numbered similarly and under the same plan and systems as sections are numbered under the township, range, and section system adopted by the United States, and of the same force and effect, beginning with section 1 and continuing to section 36, inclusive, fractional townships to be numbered under the same system, being designated by such numbers as will make them uniform with the system of the United States."

This resolution to be written on the official plats or maps and signed by the Trustees, where such official plat is furnished by or under the direction of the Trustees.

(Minutes of the Trustees of the Internal Improvement Fund, vol. 7, pp. 70–71.)

OWNERSHIP OF THE EVERGLADES.

[Extract from Annual Report of General Counsel of the Internal Improvement Fund of the State of Florida for the year 1908-9, p. 29.]

The question of the ultimate ownership of the lands was definitely answered in the plan for the adjustment and settlement of the claims of prior land grants and conveyances by railroad land-grant claimants to the State Board of Education of a sufficient acreage of lands by

deeds and assignments of certificates, reservations, etc., embracing and covering the remaining 2,000,000 acres of lands now owned by the fund, which had previously been granted as the residuary interest in said lands by legislatures, perhaps improvidently, but doubtless in good faith, which is the final disposition of the whole landed interest, both the main title under the grant of 1855 to the Trustees, and the residuary interest remaining in the State as beneficiary by subsequent legislatures, and by their legal transfers and conveyances vesting the residuary interest in the State Board of Education, and thereby removes the question from further claims or legislative disposition.

PRESENT ACREAGE IN THE FUND.

The total acreage now on hand in the fund is approximately 2,000,000 acres, subject to sale, management, and control by the Trustees of the Internal Improvement Fund for purposes expressed in the act of 1855, the main purpose being that of drainage and reclamation. The State Board of Education of Florida holds conveyances completely including the entire acreage that shall remain in the fund after the purposes thereof have been accomplished.

CONCERNING EVERGLADES LAND.

[Extracts from pamphlet prepared by the Florida Commissioner of Agriculture under direction of the Trustees of the Internal Improvement Fund.]

The Everglades district of Florida having been brought so prominently before the public since the Trustees of the Internal Improvement Fund commenced the work of drainage in said territory, we find it impossible to answer by letter the many applications for general information concerning this territory and the work being done by the Trustees. To meet these conditions the best we can, the Trustees directed the commissioner of agriculture to prepare a printed circular or pamphlet covering the history and present status of the territory and work being done in the Everglades or "drainage district."

The following compiled data is submitted in as condensed form as the subject will admit of.[1] * * *

While doubtless the Everglade basin has been to a large extent filled up by the enormous vegetable growth, the drainage by the various streams, whose heads or rapids are gradually working farther into the body of the Glades, has had much to do with this apparent filling up. The evidence is that the drainage has had more effect on the apparent altitude of the surface than has the filling up.

Large areas covering many square miles which but a few years ago were marshes covered with saw grass and rushes are now open meadows, dry all seasons, excepting the rainy months, affording pasture for many thousand heads of cattle. The fall or rapids at the heads of all streams running from the Glades have evidently receded toward the center of the Glades and Lake Okeechobee several miles since the report quoted was made.

Excepting a few reports by surveyors and explorers little new information as to the Everglades was procured until 1881, when the State

[1] Most of the matter originally published in this paper is found elsewhere in this collection of documents.

of Florida contracted with the late Hamilton Disston to drain a large area of lands bordering Lake Okeechobee and including part of the Glades. This company, known generally as the Okeechobee Drainage Co., or the Disston Drainage Co., had numerous surveys and levels made by its engineers. In 1880–1882 a line of levels was made by Gen. Gillmore, under direction of the United States Senate, to discover a practical route for a ship canal across the peninsula of Florida. These and other surveys, by Col. Charles Hopkins, Maj. Wirts, V. P. Keller, J. W. Newman, and others, established the altitude of Lake Okeechobee, "the head of the Glades," at 21 to 23 feet above tide level, the difference in levels being accounted for by the different seasons at which the surveys were made. A reconnoissance under Col. Hopkins was made during 1883 from Lake Okeechobee to Shark River; another expedition, under James E. Ingraham, across the Glades in 1892, occupying 22 days in crossing. The reports of these and others confirm the early reports by the officers of the United States Army and Navy, quoted as to character of soil, depth of water, and extreme fertility of the region. The report of Col. James M. Kreamer, chief engineer of the Okeechobee Drainage Co., made in 1886, accompanied by detailed maps and profiles, states:

As before noted, the surface of this soil is at times exposed, and it is only during or subsequent to a heavy rainy season that it is possible to penetrate with a light skiff, and then advantage must be taken of the natural drains of this vast area. If there was an absence of the dense saw grass no difficulty would be experienced in traversing this country in any direction. A 4-foot reduction of the surface of the waters of this region would be sufficient for the purpose of cultivation, etc.

Levels and measurements taken at Lake Worth establish the surface of the fresh water of the Everglades to be 10½ feet above the tidewaters of the Atlantic, and that a canal 1,100 feet long would afford relief for a vast area westward. Examinations at Miami and other points disclose the presence of this rocky ridge, whose crest was elevated above the normal level of the waters of the interior. It would be perfectly feasible to cut this rim at frequent intervals and permit the impounded water to flow into the Gulf or Atlantic. This would result in exposing great tracts of soil, now practically valueless. From these points drainage canals could be projected into the interior. * * *

HEALTHFULNESS OF THE EVERGLADES.

[By R. E. Rose, Florida State chemist.]

The healthfulness of a region is of the utmost importance to any enterprise, and especially is this true when the operatives must become permanent residents. It can be positively stated that the reclaimed lands of the Kissimmee Valley are free from malaria. The employees of the drainage company were white men exclusively. These men were recruited from all parts of the country. Many of them entered into the service of the company before they became acclimated. During a period of over 11 years the company never employed a physician nor lost an employee from death; never did any of the men leave the service of the company from the fact they could not stand the climate. Malaria and chills are absolutely unknown.

ANALYSIS OF MUCK.

The following analysis of muck will be found interesting to those familiar with the subject of sugar culture:

Moisture	16.84
Organic matter and combined water	75.65
Silica and insoluble silicates	.91
Oxide of iron	1.47
Lime	3.17
Magnesia	.18

Potash	0.13
Soda	.38
Phosphoric acid	.18
Sulphuric acid	.51
Chlorine	.43
Nitrogen (in organic matter)	2.17

The chemical analysis has been substantiated by practical experience. Muck lands have been found to be suitable to a great variety of crops, especially sugar cane. * * *

ANALYSIS OF SUGAR CANE.

The following is an analysis of a sample of sugar cane from an old field on an island in the Everglades, west of Miami. This analysis was made in the State laboratory, 1908, T. E. Bridges, analyst; R. E. Rose, State chemist.

M. 926.—Cane juice.

Brix		22.31
Baumé		12.60
Sucrose	per cent	20.51
Invert sugar	do	1.78
Solids not sugar	do	.02
Coefficient of purity	do	91.97

From J. W. Newman, Fort Lauderdale, Fla.

EXTRACT FROM LETTER OF EX-GOV. BROWARD.

The Florida Everglades may be described as a wet prairie, being a strip of land about 150 miles long by 55 miles wide, and lying between the pine and swamp lands which have grown over two reefs of rock running parallel with each other from north to south. No rivers penetrate into the Glades beyond these rock reefs on either side and the land is very level, only about 21½ feet above the sea level, being composed chiefly of muck and sand, lying in a basin with a rock bottom. The annual rainfall over this territory averages nearly 60 inches. It has for this reason, and because this rainfall has no outlet over these reefs, been and is too wet for cultivation. The muck which overlies the sand and rock varies from about 2 feet on the edge of the Glades to a depth of 20 feet in the middle, and would average over the whole territory a depth of between 6 and 8 feet. The land is free from trees and stumps and almost free from bushes, the item of clearing being of no consideration whatever, simply requiring mowing down the grass and burning it, when the soil is ready to be tilled, as soon as the excess water is run off.

The soil, as compared with other portions of the country, taking into consideration its natural richness, location, and climate, is more valuable for agricultural purposes than any that is known, being particularly adapted to the growth of cane, cotton, Irish potatoes, celery, tomatoes, cabbage, turnips, beets, and in fact any crop will grow well on these lands except such as require a colder climate.

The few persons who have as yet cultivated Everglades land as a business have found the yield per acre very large, and prices high for their crops grown at a season when they can not be grown anywhere else in the United States.

The quantity of land now reclaimed is very small, perhaps not over 12,000 acres, but two other dredges will be put to work within a few days, and the work of reclamation will be pushed rapidly, and by the middle of the year there should be reclaimed, monthly, from 10,000 to 15,000 acres. The people living on and about this land are healthy. It is free from malaria and fevers, and it is my opinion that within a few years it will constitute one of the most valuable agricultural areas in the United States.

Four powerful dredges have been built especially for this work, and on the southern end the most difficult part of the work in cutting through solid rock has already been accomplished. The balance of the work on this route will be through sand and muck, principally the latter, which is very rich and will be wonderfully productive. The part of the canal already constructed has demonstrated the feasibility

and great value of the drainage work. Another canal will be opened by the new steel hull dredge *Miami* from the Miami River to connect with the canal from the south. The new steel hull dredge *Caloosahatchee* will open up the channel of the Caloosahatchee River on the west between Lake Okeechobee and the Gulf of Mexico, and other dredges will go south and east from Lake Okeechobee by the different routes into the Atlantic Ocean. It is the purpose of the Trustees to push the work to completion as rapidly as possible, and additional dredges will probably be built and put into commission for that purpose as the Trustees find they have means available.

You are cordially invited to visit and inspect the work already completed and to witness the operation of the powerful dredges now at work. Such inspection will convince any reasonable person of the feasibility of the plan for drainage, the magnitude of the work, and the inestimable value and utility of the canals and waterways, when completed, both for drainage and transportation purposes. The plans contemplate a continuous waterway from the Atlantic Ocean to the Gulf of Mexico, using the Caloosahatchee River on the west as a part of the route, and other streams on the east. Lateral canals of various sizes are now being built and contracted for by various property owners in the Everglades, and the cultivation of land already reclaimed is in progress.

In addition to the funds being used by the Trustees for drainage, the legislature of 1907 levied a tax of 5 cents per acre on the land in the drainage district for drainage purposes, and the United States district court for the southern district of Florida decided that the tax was legal and this decision has been sustained by the United States court of appeals.

Large tracts of lands lying in the Everglades or drainage district are owned by private individuals, companies, and corporations. The Trustees of the Internal Improvement Fund have nothing whatever to do with these companies, know nothing of their plans, methods of selling or contracting to sell their holdings. Their financial standing must be found through other channels. While we have no cause to doubt their good faith, we can not in any way indorse or recommend any private enterprise.

STATEMENT SHOWING THE STATUS OF ALL SWAMP AND OVERFLOWED LANDS PATENTED TO THE STATE PRIOR TO JANUARY 1, 1909, UNDER ACT OF CONGRESS OF SEPTEMBER 28, 1850.

[Annual Report of General Counsel of Trustees of Internal Improvement Fund for 1908, pp. 42-44.]

Number of acres patented to the State	20,204,311.16
Number of acres conveyed to railroad companies	8,720,461.33
Number of acres deeded to canal and drainage companies	2,779,772.68
Number of acres deeded E. N. Dickerson in 1867 for coupons on Florida R. R. bonds, which fell due prior to 1866	248,602.98
Number of acres deeded Wm. E. Jackson in 1868 for coupons on Florida Atlantic & Gulf Central R. R. bonds	113,064.80
Wells & Randolph, agents of the State, to select swamp and overflowed lands, under contract with the governor of Florida of Nov. 8, 1851, received the proceeds from sale of about	100,000.00
Number of acres deeded on account of L. G. Dennis, agent of the State, to procure and receive patents for swamp and overflowed lands at Washington, under contract with the governor of Florida of Nov. 10, 1875 (see orders of trustees of July 5, 1881, and Apr. 14, 1883)	5,800.27
Number of acres deeded on account of Williams & Swann, agents of the State, to select swamp and overflowed lands under contract with the Trustees of the Internal Improvement Fund of Mar. 5, 1871 (other lands were deeded on account of Williams & Swann under above contract, belonging to the Internal Improvement Fund proper, embracing 4,837.98 acres, which are not embraced in this statement, as they were not swamp and overflowed lands)	39,480.27
Number of acres deeded on account of Williams, Swann & Corley, agents of the State, to select swamp and overflowed lands under contract with the Trustees of the Internal Improvement Fund of May 18, 1873 (other lands were deeded on account of Williams, Swann & Corley, under above contract, belonging to the Internal Improvement Fund proper, amounting to 15,153.56 acres, which are not embraced in this statement, as they were not swamp and overflowed lands)	13,542.61
Number of acres deeded on account of Sydney I. Wailes, agent of the State, to procure patents for swamp and overflowed lands at Washington, under contracts with the Trustees of the Internal Improvement Fund of Apr. 13 and Oct. 19, 1878	224,562.80
Number of acres deeded on account of John A. Henderson, agent of the State, to select swamp and overflowed lands under contract with the Trustees of the Internal Improvement Fund, of Mar. 15, 1884 (other lands were deeded on account of J. A. Henderson, amounting to 3,685.72 acres, which have not been patented and are not embraced in this statement, as they are not patented)	161,134.68
Number of acres deeded on account of S. W. Teague, agent of the State, to select swamp and overflowed lands under contract with the Trustees of the Internal Improvement Fund of Mar. 22, 1902	5,778.07
Number of acres deeded in Disston sale	4,000,000.03
Number of acres deeded to all other persons	2,260,847.55
Total disposed of	18,673,148.34
Leaving balance on hand, Jan. 1, 1909	1,531,162.82

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REPORT OF THE SPECIAL JOINT COMMITTEE OF THE FLORIDA LEGISLATURE FOR THE YEAR 1909, ON THE DRAINAGE OF THE EVERGLADES.

To the Hon. F. M. Hudson, President of the Senate, and Hon. Ion L. Farris, Speaker of the House of Representatives, of the State of Florida:

Pursuant to the provisions of house concurrent resolution No. 1, we, your committee, beg to submit the following report:

We assembled at the Green Tree Inn, Miami, Fla., on the morning of May 11, where we were met by a delegation of the hospitable citizens of Miami with an automobile, in which we were transported to the falls or headwaters of the Miami River. They then led the way on foot to an observatory located near the Everglades. From this eminence we were enabled to examine the Glades as far as the eye could reach, as well as the precipitous incline and falls of the Miami River. From this tower we proceeded down the river below the falls to a point where the new steel dredge *Miami* had begun the initial and trial work of cutting through the vein or wall of rock which forms a dam of Lake Okeechobee, and through which the waters of the Miami River have formed the falls. The dredge *Miami* began her task of cutting the Miami Canal, as projected by the engineers, at this point.

It was a part of the contract with the builders of this dredge that she should be subjected to a trial test of 15 days under the supervision of the Trustees before final payment was made. She was at this time undergoing this test, with every prospect of success, and the Tampa Foundry & Machine Co. and the Marion Steam Shovel Co., of Marion, Ohio, are to be congratulated for the work on this dredge.

Here we witnessed two blasts in water and rock which gave evidence of competency and effectiveness, even to the killing of alligators, one of which was floating down the stream after the blast, and was secured and placed on board by the men.

After the examination of the work of this dredge we retraced our steps to the bridge across the Miami River and boarded the automobile, which rapidly conveyed us to the place of Mr. Walter Waldin, a prosperous farmer, formerly of Iowa, where we were shown a fine young grove of orange and grapefruit trees about 5 years old, in bearing. This land is situated on the edge of the Glades and is irrigated by water from the Glades, conveyed by a canal cut by Mr. Waldin, and we here quote his answers to our inquiries:

I have cropped here on this class of land five years, and my average on irrigated Glades land for the first four years has been a trifle over $800 per acre per year net. This year I have been obliged to curtail my crop, as the trees (grapefruit) are beginning to interfere, as they have a considerable spread. I have netted about $500 this year on this land per acre. I think a net of from $300 to $500 can be made per acre on drained Everglades land by intelligent culture and close application to the following crops: Tomatoes, beans, eggplants, cucumbers, Irish potatoes, mango peppers,

and squash. I am also of the opinion that one-half as much as this can be made in many farm crops, such as sugar cane, bananas, etc., and a valuable grove can be made either of oranges or grapefruit in the meantime. You will notice I have left considerable margin between what I have accomplished and what I claim can be done by the average gardener, but as it takes a little study and knowledge to do this I wished to be very conservative in this matter, so as not to mislead anyone.

As to the value of a bearing grapefruit or orange grove in this land I am not able to say conclusively, as the price of these fruits fluctuates considerably; of a few things, however, I can speak intelligently: Such a grove can be grown for practically nothing (by growing any of these crops between the rows to pay expenses); that the fruit will remain longer in juice I am able to say positively, also to state that the quality is of the very best.

As to the value of the land: Analysis gives from 2 to 4 per cent of ammonia. The fact that it can be drained cheaply and irrigated cheaply should make this land the most valuable, especially when the exceptionally favorable climatic conditions are taken into consideration. The matter of transportation will, in addition to this, be an important factor, as this can be and will be accomplished through larger drainage canals.

His hobby seemed to be bananas. Many specimens of fine varieties were shown us growing along the edge of the Everglades.

On the morning of May 12 we left Miami on the launch *Scout* and proceeded through Biscayne Bay and Arch Creek to the canal which is now being constantly used by the Coast Line Canal & Transportation Co.

When we came to New River we ascended same to Fort Lauderdale, where we disembarked and boarded one of the boats used by the Trustees to transport fuel and supplies to the dredges, and were then conveyed to the North River Canal; thence up the same to the first dam, which, owing to the fall of the water, was constructed to keep the dredge afloat while excavating the canal. Here we disembarked and examined a fine orange grove and some very large guava trees. Then we were met by Mr. Savage, one of the civil engineers employed by the Trustees on this work, and then retraced our steps to New River; thence south and up the river to where the second canal is being cut. From New River into the Glades on our way up this canal we disembarked and examined several crops of vegetables being grown on the partly reclaimed Glades lands.

A Mr. Linard, an owner of one of these farms, courteously led us over his land, telling us of his successful work even under adverse circumstances, showing us some fine specimens of Irish potatoes, and assured us that the yield of the crop on the land now about ready for harvesting on a conservative basis would not be less than 90 barrels to the acre, and supported this estimate by an actual shipment and sale over that amount from adjoining lands this year.

Farther westward into the Glades we examined a crop of tomatoes which gave evidence of a fine yield and good quality. Besides this, we saw corn and other vegetables, which left no doubt in our minds that all this land when properly drained would be exceedingly productive and invaluable owing to the fact of its situation, practically below the frost line, and cheap transportation therefrom.

We proceeded on our way to the first dam on this canal, where it became necessary to leave our boat and climb over or around the dam, where we found other boats which transported us to the dredge *Okeechobee*, which we found busily engaged in excavating this canal heading toward the Miami Canal to a point where an intersection is to be made according to plans laid out by the engineers in charge. We boarded the dredge *Okeechobee*, and with much interest we saw the

wonderful and almost intellectual work of this monster dredge, moving about 4½ cubic yards of muck and rock every 40 seconds. From the upper deck of this dredge we examined the Glades for miles in every direction, presenting one unbroken sameness as far as the eye could reach.

On our return to Fort Lauderdale we expected to examine the first canal, but owing to the lateness of the hour, and the fact that the dredge *Everglades* was temporarily stopped for some minor repairs, we did not penetrate this canal farther than the first dam.

The next morning we boarded the *Scout*, and after a few snapshots at a few Seminole Indians, we proceeded up the Coast Line Canal to West Palm Beach and passed through some very fine reclaimed lands under cultivation, where we saw thousands of crates of tomatoes in transit, on the banks, and in packing houses. One of the owners at a point where we made a temporary stop assured us that he had gathered and sold as many as 500 to 1,000 crates of tomatoes per acre, which averaged him $2 net per crate.

From Palm Beach we proceeded by rail to Dayton, for the reason that the greater portion of the water route between these points was composed of bays, rivers, and lagoons, and partly under the control and in the possession of the Federal Government, and here we learned that the Federal Government had authorized Capt. Bie and certain assistants to make a survey of this inland waterway, the particulars of which will be mentioned hereinafter.

Between Fort Lauderdale and Palm Beach we passed many fine truck farms and groves, upon which was growing in rich profusion on the lands reclaimed by the drainage afforded by the Coast Canal fruits and vegetables, which lands were absolutely worthless before this drainage.

On the morning of the 14th instant we again embarked in a launch for St. Augustine, and after passing through the Halifax River we entered the canal connecting it and the Matanzas River. Here we encountered the heaviest and most difficult work of the canal company, a portion of which was cut through solid rock, and there we passed one of the company's suction dredges cleaning out the shoals. Not far from the Matanzas River, near the Matanzas Inlet, we passed the historic Matanzas fort, now fast decaying, which should be repaired and protected as one of our oldest relics.

On Saturday, the 15th instant, we left St. Augustine at 5 o'clock in the morning and proceeded by launch to the head of North River; thence through the canal to where the company was constructing a temporary dam. There we took rowboats to where the dredge *South Carolina*, one of the canal company's dredges, was at work at the head of the completed canal. From this point we proceeded in rowboats and on foot to a point where two land excavators were busily at work tearing up stumps and roots and excavating about 6 feet of soil and sand. This was in the midst of a virgin forest and was very heavy work.

From this point we proceeded by team to Pablo Creek, where we again embarked in a launch up Pablo Creek to where the canal company had another dredge at work headed for the point we left by team and where the land excavators were at work. After a short stay watching the work of this dredge we reversed our course down

the creek by launch to St. Johns River. Near the mouth of Pablo Creek we passed another of the canal company's dredges at work straightening this creek, which will materially shorten the distance to its mouth. Passing this dredge we entered the St. Johns River, and in a short time landed at Mayport, where we took a train for Jacksonville.

The canal company has only about 5 miles of incomplete solid work to do to have an open waterway for small craft from the St. Johns to Key West, and the company assured us this would be completed on or before November 1, 1910.

We secured the following information from a reliable source, which we deem of interest and importance, and which we insert:

UNITED STATES SURVEY OF INLAND WATERWAYS COMMENCED.

The United States steamer *McGuire*, in charge of Capt. O. N. Bie, assistant to Capt. Spalding of the United States Engineer Corps, arrived at St. Augustine some days ago and left the harbor the first of last week for Key West via the inland route. It is, we are told, the intention of the party under the direction of Capt. Bie to make a survey of the canals of the Florida Coast Line Canal & Transportation Co. and of the intervening natural waters with a view of ascertaining the quantity and character of the material which it would be necessary to remove in order to secure a channel which, in the opinion of the Government engineers, will be sufficiently large to accommodate the present and prospective traffic which would naturally seek water transportation.

By a recent act of Congress appropriations have been made for survey of this proposed inland waterway along the Atlantic coast from Boston to Key West, the idea being to estimate and report on the cost of a ship canal from Boston to Beaufort, N. C., and a barge canal from Beaufort to Key West. The dimensions of the canals do not seem to have been definitely fixed by act of Congress, and this question will no doubt be decided by the Corps of Engineers. From Boston the proposed inland route will follow Barnstable (or Cape Cod) Bay to the cape, thence via a canal across Cape Cod to Long Island Sound, and via the Sound and the East River into New York Harbor. From New York the waterway will probably follow the route of the Delaware & Raritan Canal to the Delaware River and via that river past Philadelphia and Wilmington to Delaware City, where it will doubtless enter the Chesapeake & Delaware Canal and follow the line of that canal to Chesapeake Bay, and on through the bay and past the city of Baltimore to Norfolk, Va.; from Norfolk either the route of the Albemarle Canal will be followed or that of the old Dismal Swamp Canal, which was enlarged about 10 years ago, but which has the disadvantage of being a locked waterway, though it could no doubt be easily enough transformed into tide-level canal. After leaving whichever of the above-mentioned canals may be selected the waterway will follow the great North Carolina sounds to Beaufort Inlet, where the survey for the ship canal will terminate, and that for the barge canal will commence. This latter survey means, we understand, the investigation of the character of all classes of material to a depth of 12 feet below mean low-water level, as well as the selection of the most feasible route, though it is left to the

Government engineers to decide the depth necessary to accommodate the traffic on each particular section of this inland waterway. From Beaufort, N. C., to a point a short distance north of Charleston there is practically no natural continuous inside passage now existing, though there are several disconnected lagoons which can be utilized by the Government by joining them by canals and deepening the natural channels where necessary. From Charleston, S. C., however, to the St. Johns River there is a continuous natural inland passage varying in depth, via Port Royal Sound and the various other sounds and creeks along the South Carolina and Georgia coasts to Cumberland Sound, past the cities of Savannah and Brunswick to Fernandina, Fla., and from that city via Nassau Sound and the Sisters Creek to the great St. Johns River near its entrance to the sea, about 25 miles east of Jacksonville.

From the St. Johns River the channel of Pablo Creek, which continues the inside waterway to the south, is now being improved by the Florida Coast Line Canal & Transportation Co. under a permit from the War Department, and a canal is being cut by the same company through a heavily timbered country from a point at the southern end of Pablo Creek to the North Matanzas River, which it enters about 20 miles north of St. Augustine. From St. Augustine south to Biscayne Bay an inside passage has been constructed by the canal company under a charter from the State, and when the above-mentioned canal, extending north toward the St. Johns River, is completed, and Pablo Creek straightened and otherwise improved, the inside waterway along the whole of the east coast of Florida will be navigable from Fernandina and Jacksonville to Key West, as there is a natural protected passage inside the Keys from Biscayne Bay to the latter city.

This great waterway means much more to the people of the east coast counties of Florida than they realize at the present time. The canals so far built have drained vast areas of swamp land, which are now producing vegetables and fruits of various kinds in large quantities, and when the work is fully completed the waterway will serve two useful purposes, as it will not only help the drainage of the territory through which it passes, but it will also provide an inexpensive transportation route and insure the establishment of reasonable freight and passenger rates to and from all points on the coast between Jacksonville and Key West. At the present time the canal company has the right to charge tolls on all vessels using its canals, said tolls to be fixed by the company and approved by the Trustees of the Internal Improvement Fund; but it is hoped that the survey now in progress under Capt. Bie's direction will result in the acquisition of the rights of the canal company by the Government (thus making it free to the public) and the enlargement of the canals and natural inside channels along the whole coast.

If this great work between Boston and Key West is seriously undertaken by the United States, if will provide a marvelous line of defense along the whole Atlantic coast, as light-draft vessels equipped with heavy guns, each vessel being practically a floating (or movable) fort, would have a strong influence in keeping hostile warships well offshore, while patrols of light-draft gunboats would undoubtedly prevent attempts being made in time of war to land large bodies of men on what, without this inside waterway, would be absolutely isolated and undefended sections of the coast line.

During the Spanish War, when the transportation companies of the country were charging the highest rates obtainable from the Government on all war supplies, the services of the Florida Coast Line Canal were called into requisition, and by using the canal the Government saved $6,500 in freight charges alone on the delivery of three mortar carriages at the fort at Key West. The canal company transported these carriages from Titusville to Key West for $2,500, whereas the lowest rate obtainable from Tampa to any other point of delivery in Florida (from rail to water) to Key West amounted to $9,000, showing a saving to the Government of $6,500.

This gives one instance of the value of an inside waterway in time of war, and its effect on the commercial interest of the country in time of peace will no doubt prove equally beneficial.

To the Hon. J. E. Ransdell, president of the National Rivers and Harbors Congress, and Hon. J. Hampton Moore, president of the Atlantic Deeper Waterways Association, is due the credit of securing the appropriations for the surveys above named.

We did not have the time or the means at hand to determine the exact depth or width of the Coast Canal, but from the draft of the launches used, the frequent soundings with poles, we feel justified in the conclusion that in so far as the canal is completed it has been done according to contract, with the exception of certain shoals, which are now being removed by the suction dredges hereinbefore mentioned. That this canal will be of incalculable value to the people of the Nation, which is evident by the saving in freight as above shown to the Government during the Cuban War, we firmly believe and affirm.

We took train at Jacksonville for Fort Myers at 9 o'clock and arrived there about noon on the 16th instant. We secured a launch, in which we were transported up the Caloosahatchee River to Fort Thompson, where we arrived about 9 o'clock at night. Here we had to change to a launch of lighter draft, and after a walk of about a half mile up the rapids or falls we proceeded up the river on the morning of the 17th to Lake Okeechobee, passing through several canals and lakes before reaching Okeechobee, which we did about 4 o'clock of the same evening. After a brief examination of this lake we retraced our course down the canal and through Lake Hicpochee to the dredge *Caloosahatchee*, which is a new steel dredge of powerful capacity and upon which we found comfortable quarters for part of the night, having arrived there between 12 and 1 o'clock at night.

On the morning of the 18th we were invited to a very good breakfast on board of the dredge, and promptly at 6 o'clock the whistle blew and the crew, like trained soldiers, every man at his post, began their work for the day, and it was a most interesting sight to see this monster steel dredge, 42 feet beam by 100 feet long, plow her way through sand, rock, and soil, often breaking in twain the hidden trees, placing them easily on either side of the river, making room for herself and for other craft headed for the Glades and Lake Okeechobee.

After spending one and a half hours watching this wonderful machine, we boarded our boat for Fort Myers and had a most interesting trip down the Caloosahatchee, passing some fine groves of orange and grapefruit trees and some nice homes, churches, and

schoolhouses, also some unique houses and outhouses framed and latticed and then neatly thatched with cabbage palmetto leaves. We spent part of one night at Fort Thompson Park Hotel, the hotel being near the falls. Here we found an enterprising man of wide experience, intelligence, and wealth. He has 8,000 acres of land, a large portion of which is Glades land, which he most positively affirmed $100 per acre would not buy, and from the appearance of his horses and cattle, which are numbered in the hundreds, many of which were high grades, this price did not seem high when compared with many lands not so good at a higher price.

Arriving at Fort Myers we were met by the mayor of the town, who very kindly furnished an automobile and gave the committee an opportunity to see the many advantages of the town and some beautiful residences, among which was the residence of the "electric wizard," Thomas A. Edison, which was surrounded by a grove of mangoes of fine size and in full bearing. After a hurried dinner we boarded the train bound for Tallahassee by way of Jacksonville, where we arrived on the evening of the 19th instant.

To give you definite and authoritative information as to the assets of the State, the work performed, the cost so far of the same, the source from which the money has been derived, the amount of money on hand belonging to this fund and due to it, we append the report rendered the trustees, which we hope will be of interest and value to you.

The following report of John W. Newman, engineer in charge, shows the cost of the drainage operations from April 1, 1907, to February 1, 1909, including the number of cubic yards of rock and earth removed, and the cost per cubic yard:

MARCH 12, 1909.

GOV. A. W. GILCHRIST: Complying with your orders wired me March 9, by Mr. W. M. McIntosh, jr., secretary of the Internal Improvement Fund, I beg to hand you herewith a tabulated statement of the work of each dredge since they began, up to March 1:

Column of "costs" includes all working expenses, repairs and supplies, and are ascertained each month for preceding month, all bills being reported to me for that purpose by the purchasing agent, Mr. R. A. Bryan.

In this statement the costs for February can not be given, as the bills for that month have not yet been reported to me.

Permit me to say that it is not practicable to separate cost of rock digging from dirt digging, both being done together and the rock being very irregular.

Work of dredge "Okeechobee" Apr. 1, 1907, to Feb. 1, 1909.

Year.	Rock.	Earth.	Total.	Cost.	Per cubic yard.	Length.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*		*Cents.*	*Feet.*
Nine months, 1907	170,000	33,434	203,434	$20,398.35	10.1	10,166
All, 1908	200,000	356,431	556,431	28,382.76	5.1	24,231
January, 1909	5,000	100,884	105,884	3,935.63	3.71	5,956
Total			865,749	52,716.74	6.09	40,352
February, 1909	16,133	30,000	46,133	Not stated.		2,259

The figures for February, 1909, are given for information, but are not included in the totals, as cost could not be stated.

Length of South Canal with branch, February 1, 7 miles and 3,392 feet. Average cost per cubic yard, 6.09 cents.

Work of dredge "Everglades" July 4, 1906, to Feb. 1, 1909.

Year.	Rock.	Earth.	Total.	Cost.	Per cubic yard.	Length.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*		*Cents.*	*Feet.*
Six months, 1906	63,000	20,455	83,455	$7,702.89	9.23	3,661
All, 1907	85,829	114,962	300,791	25,599.15	8.51	9,758
All, 1908	12,200	518,780	530,980	25,962.49	4.89	21,934
January, 1909		71,964	71,964	22,493.31	3.46	4,048
Total			987,190	61,761.83	6.25	39,401
February, 1909		40,000	40,000			2,250

Length of North Canal with branch, February 1, 1909, 7 miles 2,441 feet. Average cost per cubic yard, 6.25 cents.

February not included, because I have not yet the costs.

Respectfully,

JOHN W. NEWMAN, *Engineer in Charge.*

The total length of the two canals dug to March 1, 1909, was 15.1 miles, each of the two canals being approximately 7½ miles long. These canals are 60 feet wide by 10 feet deep. The total cost of operating dredges (see Newman's figures) is $114,478.57. The average cost per mile is $7,591.36. The total outlay by Trustees on account of operating dredges, including cost of two new dredges, is $377,642.72. By comparing the cost per cubic yard of the work done by the *Everglades* in January, 1909, in which there was no rock excavated, cost 3.46 cents, with the cost of the work done in 1907, when it was part rock and part dirt, the cost being 8.51 cents per yard, the natural inference is that the remainder of the work will be done more cheaply. It will not, however, be done proportionately more cheaply, because as the canals increase in length the cost of transportation of materials, provisions, fuel, etc., proportionately increases. However, it is safe to say that the average cost of the work will be more cheaply done than heretofore, owing to the fact that there will not be so much rock.

It will be observed that the dredge *Everglades* commenced work July 4, 1906. It is digging a canal on the continuation of the North Fork of New River to Lake Okeechobee. To February 1, 1909, this canal had been cut nearly 7½ miles. It is working with a day force only. During the month of January, where there was no rock, it cut about four-fifths of a mile. From Fort Lauderdale to Lake Okeechobee the distance is estimated to be about 50 miles.

The dredge *Okeechobee* commenced work in April, 1907, It uses both a day and a night force. It has cut somewhat over 7½ miles. It is working in the prolongation of the South Fork of the New River. It is the intention of the Trustees to have this dredge continue its course for about 6 miles in a westward direction, at which point it will turn southwestwardly toward Miami.

Two dredges have recently been completed at Tampa, Fla. One, the *Caloosahatchee,* was towed up the Caloosahatchee River and is now at work cutting its way into Lake Okeechobee. After entering Okeechobee, it is intended to go southward for a few miles, and thence southeastwardly in continuation of the canal being cut toward Miami by the dredge *Okeechobee.*

The other dredge, *Miami,* was towed to Miami and is now at work cutting a canal from the Miami River. It will work northwestward to meet the dredge *Okeechobee* coming toward Miami.

The money to continue the drainage will be derived from the following amounts due the Trustees of the Internal Improvement Fund on account of land sold:

R. J. Bolles:	
Jan. 1, 1910	$50,000.00
Jan. 1, 1911	50,000.00
Jan. 1, 1912	50,000.00
Jan. 1, 1913	50,000.00
Jan. 1, 1914	50,000.00
Jan. 1, 1915	100,000.00
Jan. 1, 1916	100,000.00
Drainage fund under Bolles's contract, $100,000 per annum, due in quarterly payments of $25,000:	
July 1, 1909	25,000.00
Oct. 1, 1909	25,000.00
Jan. 1, 1910	25,000.00
Apr. 1, 1910	25,000.00
July 1, 1910	25,000.00
Oct. 1, 1910	25,000.00
Jan. 1, 1911	25,000.00
Apr. 1, 1911	25,000.00
July 1, 1911	25,000.00
Oct. 1, 1911	25,000.00
Drainage fund under Bolles's contract, $100,000 per annum, due in quarterly payments of $25,000—Contd.	
Jan. 1, 1912	$25,000.00
Apr. 1, 1912	25,000.00
July 1, 1912	25,000.00
Oct. 1, 1912	25,000.00
Jan. 1, 1913	25,000.00
Apr. 1, 1913	25,000.00
July 1, 1913	25,000.00
Oct. 1, 1913	25,000.00
Jan. 1, 1914	25,000.00
Apr. 1, 1914	25,000.00
Davie Realty Co.:	
On or before Nov. 1, 1909.	33,333.33
On or before Nov. 1, 1910.	33,333.33
R. P. Davie:	
On or before June 1,1909.	18,333.18
S. M. Tatum:	
Oct. 5, 1909	5,000.00
Jan. 5, 1910	6,200.00

In addition to this, it is expected that the drainage board will be successful in the matter of the collection of the drainage tax on the land drained or to be drained in the Everglades, and will prosecute a part of the work of drainage with the money so received.

The Trustees have withdrawn the lands in the Everglades from sale, as the value thereof is constantly being enhanced by the drainage operations, and unless something unforeseen happens the State school fund will be greatly benefited by the proceeds of these lands after the drainage is completed. Not one cent of the money paid by the taxpayers of this State has ever been used in the drainage of the Everglades, and the money so raised can never be used for that purpose unless appropriated by the legislature. No person owning land outside of the Everglades need have the slightest apprehension that any tax will ever be levied or collected on his land or on any of his property for the drainage of the Everglades.

From looking over the report made by John W. Newman, engineer in charge of drainage work, for the year 1907, we find the cost per cubic yard for materials excavated by the dredge *Okeechobee* 10 cents during that year. For the next year, 1908, we notice that the cost was 5 cents per cubic yard for the same dredge, and we observe from the records that for three months of the year 1908 this dredge was cleaning out and removing dams in canals already constructed, for which three months she was not allowed any credit for excavation; therefore the expenses for operating during the three months should be deducted, and if done would leave the amount of actual cost at about 4 cents per cubic yard. During the latter year there was a bonus paid the crew of 1 cent per cubic yard for all material excavated in excess of 20,000 yards per month. For the month of January, 1909, the dredge, under the bonus system, running day and night, excavated 105,804 cubic yards, at a cost of 3.70 cents per cubic yard. The month of February, 1909, after the system was changed, the

excavation amounted for the month to 46,143 yards, and for the next two months succeeding that the yardage amounted to about the same as that of February; and the work of the Everglades, under the same system, shows about the same relative difference in cost during the same period, which demonstrates to this committee the fact that the bonus of 1 cent per cubic yard has proved to be a great incentive to the crews to work. We also notice from the report of the work of the dredges that the work can be advanced far more rapidly when run day and night, and as these dredges are worth approximately $50,000 each, and the four dredges working day and night can be made to do the work of eight dredges run only half of each 24 hours, it is the opinion of the committee that they should be operated day and night, and we do so recommend.

We were fortunate enough to secure a copy of a valuable and pertinent report made by the United States engineers, which is hereto attached:[1]

[United States Department of Agriculture, Office of Experiment Stations.]

DRAINAGE INVESTIGATIONS.

[Extract from a report on the drainage of the Everglades of Florida, by J. O. Wright, supervising drainage engineer, Feb. 25, 1909.]

INTRODUCTION.

At the earnest solicitation of Gov. N. B. Broward and others interested in the reclamation of the Everglades of Florida, the Office of Experiment Stations, United States Department of Agriculture, was authorized to make such a survey and examination as might be deemed necessary for the preparation of a report and plan of drainage. For this purpose a preliminary examination was made in November of 1906 and a field party organized and a survey commenced in December of the same year. The chief of the party was instructed:

1. To determine the topography of the country lying south of township 41, so as to locate proper channels for carrying the overflow of Lake Okeechobee to the sea along the natural and most practical routes.
2. To determine approximately the extent, area, and character of the watershed that drains into Lake Okeechobee, so as to calculate the discharge capacity of the channel or channels necessary to prevent the overflow of the lake.
3. To determine the depth of muck and to locate the rim of the stone which encircles the lake or skirts or crosses the Everglades.
4. To analyze the different kinds of soil found and determine their value for agriculture.
5. To make plans and estimates of cost of a complete system of drainage.

To acquire the above information the field work was continued under great difficulties, owing to the flooded country, until the end of April, 1907. In the following December another party of engineers was placed in the field and continued the work until the 1st of May, 1908, at which time sufficient data had been collected to make a report on the engineering features of the project. In addition to the surveys made by our engineers, all reports of other investigations and examinations made by the Army engineers and private companies and explorers were carefully examined and such

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[1] Permission to submit an abstract of a report by J. O. Wright, supervising drainage engineer, on the Everglades of Florida to the legislature of that State was granted to Gov. Albert W. Gilchrist by Secretary of Agriculture Wilson in the following letter:

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, March 27, 1909.

Hon. ALBERT W. GILCHRIST,
Governor of Florida, Tallahassee, Fla.

SIR: I have the honor to acknowledge the receipt of your letter of March 11, requesting permission to use an abstract of a report upon the Everglades of Florida, transmitted to you upon March 6 and prepared by the Office of Experiment Stations of this department.

Since this report relates to the conditions which prevail in the lands tributary to Lake Okeechobee, and proposes a plan for the drainage of the Everglades, I see no reason why it should not be submitted to the legislature as a portion of the forthcoming report which will be published by this department in the near future. I take pleasure in granting you this request, trusting that, as a progress report upon the Everglades, it may be of use to the State.

Respectfully, JAMES WILSON, *Secretary.*

data tabulated as had a bearing upon these investigations. From the vast amount of information gathered this office is now preparing for publication a report covering the entire subject.

At the special request of the parties who are deeply interested in the matter, the following extract from the forthcoming report has been prepared. This extract deals exclusively with the drainage features and shows the plan recommended for draining Lake Okeechobee and the surrounding country, with an estimate of the cost of the work. The full report will be completed at an early date and will give additional information pertaining to this work.

Immediately north of the Everglades lies Lake Okeechobee, the largest fresh-water lake wholly within the United States except Lake Michigan. At mean level it contains an area of 468,860 acres. At high stage its surface is about 22½ feet above tide level and at low stage about 19. The lake is quite shallow, the deepest places not exceeding 22 feet at low water and the average depth being about 12 feet. In the southern portions it contains several islands, some of which are 2 or 3 miles in extent, very low and swampy, and covered with a dense growth of custard apples, scrub oak, myrtle, and in some places a few cypress, all interwoven with a network of vines. The shores of Lake Okeechobee are not well defined except on the east coast, where there is a stretch of 25 miles of sandy beach with well-defined banks. The rest of the coast line is flat and marshy and is covered with a thick growth of vegetation. As the lake rises its waters inundate this flat country and the shore line moves out in places several miles, so that the area of the lake is much larger at high than at low water. Even the bed of the lake on the south and west sides is covered with a growth of aquatic plants that impedes the progress of a boat and makes navigation impossible in some places. The bed of the lake, except in the southern part, is a fine hard sand and presents a comparatively smooth and even surface.

The soundings disclose no deep holes or channels and no rock is found except in the vicinity of Chancy Bay. The lake has no tide, but its surface is easily affected by the wind, and it is not uncommon to find the water at least 1 foot higher on one side than the other, due wholly to the influence of the wind pressure. The water in the lake, when not agitated, is clear and wholesome and is regarded by hunters and fishermen who frequent the lake as extremely healthful. Until within recent years this lake had no well defined outlet to the sea, but during the rainy season its waters rose to an elevation of about 21 feet, when it commenced to overflow its banks from the mouth of Fish Eating Creek on the west around the south side to a point on the east several miles north of Pelican Lake, a distance of probably 70 miles. With such a width of overflow it matters not how hard it might rain, it would be impossible for the lake to reach a higher level than 22.5 feet.

About 1884 a canal 70 feet wide and 6 feet deep was completed from the Caloosahatchee River at Fort Thompson up through Lake Flirt, Bonnet Lake, and Lake Hicpochee, making a direct and well-defined channel into the lake. During the period of high water this channel furnishes a good stage for navigation, but during the dry season, when the surface of the lake is lowered to an elevation of 20 feet or less, there is not enough water in those canals to make a boating stage for anything but small gasoline launches.

Since these canals have been cut and the current of water turned into the Caloosahatchee River, it has overflowed its banks below Fort Thompson, doing great injury to the orange and grapefruit groves that line the banks of this stream on both sides for many miles. In order to lessen or prevent this overflow a fund was raised by the interested parties and a dam constructed across the canal at the west end of Lake Hicpochee. This interfered with the navigation of the stream, and it was blown out by parties who opposed the work. If something is not done to control the flow of water in the Caloosahatchee, it is quite certain that many of the fine groves on the river will be materially damaged or destroyed.

Lying north and west of Lake Okeechobee is a watershed, as shown on the map, seven and one-half times as large as the lake. This drainage area is comparatively level, having a gentle slope from the north toward the south, and discharges all of its run-off into Lake Okeechobee. Its surface is fine sand, or sandy loam, with numerous strips of marsh and muck ponds. About 60 per cent of this watershed is covered with a scattered growth of small pines, with cypress strands or sloughs extending through it at irregular intervals. The remainder of the area is made up of open prairie, covered with wire grass or sedge, and saw palmettos. Throughout the area are numerous lakes, the largest of which are Tohopekaliga, Lake Kissimmee, and Istopoga. During the rainy season, the rainfall not removed by evaporation is poured down from Fish Eating Creek, the Kissimmee River, Taylors Creek, and the numerous sloughs and low depressions on the north into Lake Okeechobee. This lake, not having an adequate outlet, discharges its water over its southern shore into the Everglades, from

which it slowly finds its way to the sea. These, in brief, are the conditions as they exist to-day, and which constitute the drainage problem to be solved.

From an analysis of the existing conditions it is apparent that in order to reclaim the Everglades as a whole it is necessary to control the level of the water in Lake Okeechobee. A narrow strip along the east edge may be reclaimed in pieces by building a substantial embankment on the western border and cutting drainage ditches into the small streams that flow into the Atlantic Ocean, but this plan would not provide for the reclamation of that part of the Everglades adjacent to Lake Okeechobee, which is considered to be the richest and best portion. In order to reclaim this part, it must be protected from the overflow of Okeechobee. So long as this lake receives the drainage from a watershed seven and a half times its own area, it will continue to inundate the Everglades at each recurring high water, unless some plan is devised to control the discharge.

It has been claimed by some explorers that the lake is fed by subterranean streams or large springs, and that its overflow can not be controlled or regulated, but such does not seem to be the fact. A thorough examination at low water failed to disclose any such sources of supply, and if there be any, they are so small that they have no appreciable effect on the level of the lake. The height to which the lake rises depends upon the amount and intensity of the rainfall, and its low stage to the duration of the period in which there is but little or no precipitation.

The rational solution of this drainage problem resolves itself into two parts, and will be considered and discussed under two heads: First, the best means of controlling the water in Lake Okeechobee, so that it will not overflow its banks during the rainy season, and, at the same time, have sufficient water at all times to irrigate the lands if needed, and to maintain a sufficient stage for navigation in the outlet canals throughout the year; second, to provide adequate and proper drainage for the lands, when protected from overflow from the lake. The first part of this improvement is absolutely essential to the completion of the second.

Two plans have been proposed for preventing the overflow of Lake Okeechobee. One is to build a levee from the highland on the west around the south shore to the high bank on the east, and thus impound or hold back the rainfall during the wet season, and the other is to construct one or more canals from Lake Okeechobee to the Atlantic Ocean and the Gulf of Mexico, and discharge sufficient water in this manner to prevent the lake from overflowing its banks.

The first plan proposed is open to many serious objections. Owing to the depth of muck, which ranges from 8 to 14 feet along the margin of the lake on the south side, and the absence of suitable material along the line of proposed levee, with which to build it, such a plan would be very expensive. The muck might be removed by dredges and solid material hauled in from the pine woods, and a levee constructed, but this would necessitate the building of a trestle to support a track on which to bring in the material, which, together with the expensive methods of handling, would make the cost prohibitive.

The lake in its present condition does not rise to a higher stage than 22½ feet above sea level, and can not rise higher than this elevation because when this stage is reached it overflows its banks along the entire south shore. But if its waters were confined by the levee it would undoubtedly reach a much greater height, probably 25 or 26 feet.

A levee to hold back this head of water, and be strong enough to withstand the action of the wind and waves, would have to be at least 3 feet above any possible level the lake might attain. Assuming 25 feet above sea level to be the maximum height of the lake, the top of the levee should be at least 28 feet, to have a reasonable margin of safety. The elevation of the muck is approximately 22 feet above sea level, and its average depth along the line of the proposed levee, 12 feet. Under these conditions, a levee, to hold back the water of the lake, should be at least 18 feet high, with a 3 to 1 slope on the shore side and a 2 to 1 on the land side. Such a levee would contain 190,080 cubic yards per mile, and, at the current prices for such work, including the excavation of the muck channel, building trestle for track, and loading and transporting suitable material, would cost at least 35 cents per cubic yard. This estimate makes the cost of the levee $66,528 per mile, and the cost of 80 miles $5,302,240. In addition to the enormous cost, this plan has other objections. It would back the water up on the opposite side of the lake and impair the drainage of a large area of land, some of which can be reclaimed and made fit for agriculture, and it makes no provision for water transportation across the State, which is a matter of the highest importance.

Since the mean elevation of Lake Okeechobee is 20½ feet above sea level, it is evident that by digging canals of sufficient capacity to tidewater, it can be practically drained of all its water, or its surface can be lowered to any height desired.

The character of the soil in the Everglades is such that it would not only be injurious, but positively ruinous to completely drain Lake Okeechobee. A large part of this muck land is of such a nature that if robbed of its moisture it would become a barren waste. During the winter and spring months the precipitation in southern Florida is not sufficient, if the ground is removed, to supply the needs of growing crops. In many places, even where there is a retentive clay subsoil, the citrus groves and vegetables suffer greatly from lack of moisture, and irrigation must be employed to get a profitable yield. Where a light muck, possessing in a high degree the power of evaporation, has the plane of soil water reduced below the reach of capillarity there can be but a scant plant growth. In order to preserve the fertility of the Everglades and make them productive, enough water must be stored in Lake Okeechobee to supply the deficiency during the dry period, and the excess must be removed in such a way as to prevent damage by overflow. This can best be accomplished by a system of outlet canals, provided at the upper end with gates to regulate the flow of water in them. The best location for these canals depends upon the cost of their construction, and the character of the land along their course to be reclaimed, and their value as a means of transportation. The proper size to make these canals will be determined by the amount of water to be discharged by them and the most economical cross section of canal to excavate.

The watershed drained by Lake Okeechobee, including the area of the lake, is approximately 4,000,000 acres. There is no authentic record of the rainfall in this area except at Kissimmee in the northern portion, so we must assume that the rainfall at this station represents fairly accurately that of the entire watershed. The average annual rainfall at Kissimmee for the past nine years is 53 inches, with a minimum of 40.22 inches in 1902 and maximum of 70.92 inches in 1887. If this amount of rainfall was uniformly distributed throughout the year, it would not be a difficult matter to take care of it, but it is excessive during the summer and fall, often exceeding 12 inches in a single month. It is this period of heavy rain that must be considered in planning the drainage of this section. In the months of July and August, 1905, there was a total rainfall of 27.95 inches recorded at Kissimmee. During the same period, there was but 20 inches at Jupiter, 24 inches at Fort Myers, and 25 at Miami. This would seem to indicate that the rain at Kissimmee was increased by some local influence that did not exist throughout the peninsula, and that probably the rainfall over the entire drainage area did not exceed 26 inches. As a fall of 26 inches in any other two consecutives months is the closest approach to this amount, it is safe to conclude that 26 inches is an extraordinary rainfall, not likely to occur except at rare intervals, and it would hardly be wise or prudent to base the carrying capacity of the drains on this amount. Since a rainfall of 18 to 22 inches in two consecutive months has occurred three times during the last decade, we may reasonably expect the same amount in the future. In order to have a fair margin of safety in the storage capacity of Lake Okeechobee, canals should be provided having sufficient discharge to remove a maximum rainfall of 24 inches from the entire watershed in two consecutive months.

The next important step is to determine how much of this rainfall is removed by evaporation and how much runs off into Lake Okeechobee. This is a difficult problem, since no observations have been made in southern Florida to determine the loss by evaporation in that latitude. Careful experiments, however, have been carried on for a number of years in some of the Northern States, in the arid West, and in Europe to determine what per cent of the rainfall is run off and what per cent is removed by evaporation. The results obtained vary with the local conditions and should be used with judgment and discretion in their application to localities where the conditions are different. Certain general laws, however, have been established by these experiments from which we may deduce fairly accurate conclusions. The most complete, as well as the best known series of observations on the evaporation from the surface of the soil are those made by Gilbert and Lawes at Rothamstead, England, 1870 to 1890, and those of the Floral Park Meteorological Station, Nassau County, N. Y., made in 1893. The English experiments show that in June, July, August, and September, 76 per cent of the total rainfall during these months was removed by evaporation. Similar experiments in other parts of England verify this result. At Floral Park, N. Y., the evaporation for July, August, and September, 1903, from a bare, sandy loam, was found to be 11.85 inches, or 62 per cent of the total rainfall. From an inspection of the table from which these figures were taken, it is quite apparent that the factors that determine the amount of evaporation of the soil surface are: First, the per cent of saturation from the soil; second, the temperature of the air; third, the wind velocity; and fourth, the degree of humidity of the atmosphere. A change in any one of these may increase or decrease the amount of evaporation. Prof. E. F. Ladd, of the Agricultural College at Fargo, N. Dak., conducted

a series of experiments in 1902 to 1905 to determine the loss by evaporation from a water surface. The average daily evaporation as shown by his report is as follows: May, 0.17; June, 0.21; July, 0.26; August, 0.24; September, 0.11 inch. The Croton River watershed in Massachusetts for a period of 32 years shows a mean annual evaporation of 25.74 inches, or 53 per cent of the rainfall, and the greater portion of this evaporation occurred during the months of June, July, August, and September. At least 70 per cent of the total rainfall is evaporated during these months. From these experiments we conclude that where the surface of the ground is very wet or covered with water, the temperature high—80° to 95°—with a gentle breeze blowing most of the time, both day and night, and the per cent of humidity less than 85, the conditions are extremely favorable for a high rate of evaporation.

During the months of July and August, 1905, when the rainfall was 22 inches at Kissimmee, the following conditions prevailed, as shown by the United States Weather Bureau, over the peninsula of Florida. (See table.) The ground was either saturated or covered with water. The mean temperature was 79°, the average wind velocity 8.5 miles per hour, and the humidity of the atmosphere 82 per cent. Under these conditions the rate of evaporation must have been greater than at any of the stations cited, and was at least 0.25 inch per day for the entire period. This amount is still further increased by the density and character of the vegetation that covers the ground. Where the vegetation is quick growth, dense and rank, a much larger amount of moisture will be collected and thrown off as evaporation than from a barren surface or from one scantily covered. The amount of water required for the growth of vegetation has been determined by many experimenters. The best known estimates are, perhaps, those of Risler, in Germany, and Prof. King, of Wisconsin. Prof. Risler states that meadow grass consumes 0.134 to 0.267 inch per day; i. e., the depth of water from the entire surface covered that is taken up by the roots of the plants and exhaled through foliage into the atmosphere as evaporation ranges from 0.13 to 0.26 inch in 24 hours. The experiments of Prof. King, at Madison, Wis., as to the amount of water required to produce a pound of dry vegetable matter show that when an abundant supply of water is furnished some crops will absorb as much as 25 inches of water in the growing season. In the forests of Germany experiments show that the amount of water transpired by the leaves of trees is equal to 33 to 36 per cent of the evaporation from a water surface of the same area as the forest. Mr. M. W. Harrington, Bulletin No. 7, United States Department of Agriculture, fixes the amount of transpiration from forests in southern Europe at about 25 per cent of the rainfall. From his own and experiments conducted by others the following table is deduced, showing the relation of the evaporation from different surfaces to the evaporation of a water surface and to the precipitation during the season May to September:

Evaporation from various kinds of vegetation.

[Harrington.]

	Proportion of—	
	Evaporation from a free water surface.	Precipitation.
	Inches.	*Inches.*
Sod	1.92	0.96
Cereals	1.73	.86
Forest	1.51	.75
Mixed vegetation	1.44	.72
Bare soil	.60	.30

From examination of the data available it appears that the amount of moisture removed by a mixed growth of vegetation, such as trees, bushes, and grass, is at least 0.10 inch per day. All the Okeechobee watershed, however, is covered with a thick growth of vegetation, there being numerous lakes and ponds and extensive areas of almost barren soil, but if this vegetation were concentrated on one-half of the area it would cover it quite densely; so, instead of estimating the water removed by the plant growth at 0.10 inch for the entire watershed, we will restrict it to one-half the area, as more nearly representing the conditions in southern Florida. Assuming 0.25 inch to be removed by free evaporation and 0.05 inch by plant growth, we have 0.30 inch per day, or a total of 9 inches per month taken up by these two methods.

This is 75 per cent of the mean rainfall for July and August, which amount agrees quite closely with the results obtained in other places where careful and continued experiments have been made.

Since the maximum rainfall that is likely to occur in July and August is 24 inches, the mean daily precipitation for these two months equals 24 divided by 62 equals 0.387 inch. The difference between this amount and 0.30 inch, the amount removed by evaporation, is 0.087 inch, which is the mean daily run-off from the entire watershed. This amount of run-off, although not obtained by actual measurements, is supported by the results of the most careful experiments that have been carried on in this country, Europe, and India.

The land surface that drains into the lake is seven and a half times the area of the lake; so a run-off of 0.087 inch in 24 hours causes a rise in the lake of seven and a half times this amount, or 0.6525 inch per day. Should this continue throughout the months of July and August, a period of 62 days, it would cause the lake to rise 40.455 inches, to which must be added the rainfall on the lake, not removed by evaporation, during this period. The daily rainfall being 0.387 inch and the free evaporation 0.25 inch, there is an excess of 0.137 inch not removed by evaporation, which raises the lake this amount, exclusive of the run-off from the land surface. In 62 days this would raise the lake 8.494 inches, which added to the run-off, 40.455 inches, gives a total of 48.949 inches, the amount the lake would be raised, should there be no discharge during the months of July and August. If the lake should be full when the period of intense rainfall occurs, and no water should be allowed to escape, this run-off would raise the surface of the lake to an elevation of 25 feet, but as it begins to overflow its banks at a stage of 21 feet, this level has never been reached.

From a study of the above facts it appears that the most feasible way to control the level of Lake Okeechobee is to dig sufficient canals from the lake to tidewater to reduce its level just before the rainy season sets in to an elevation of 16 feet, and provide a storage capacity for 36 inches of the run-off. There will then remain to be removed by drainage through the canals 12.95 inches during the 62 days, or 0.2088 inch in 24 hours. To remove this depth from the entire surface of the lake in 24 hours will require canals having an aggregate discharge of 3,938 cubic feet per second.

In determining the number of and proper location for these canals, the cost of their construction, and character of the land to be reclaimed through which they pass, and their use for transportation must be considered. A canal 40 to 80 feet wide and 5 to 10 feet deep can be cut by a modern dredge and the material placed on the bank without rehandling. This size is more economically constructed than a larger canal. If one large channel, having the necessary discharge capacity, was constructed, there would not be as much land benefited as would be if the same capacity was secured by cutting two or more canals extending in different directions from the lake. The advantages are, therefore, decidedly in favor of cutting a number of small canals having the necessary carrying capacity rather than one large one.

The proper location for these canals must be determined largely by their length and the character of the land through which they pass. Deep cutting and stone must be avoided as far as is practicable.

Since transportation across the State is a matter of great importance, it is desirable that the drainage be so planned as to form an all-water route from the Atlantic Ocean to the Gulf of Mexico. With these ends in view the plan here recommended provides for a series of canals of ample capacity to regulate the stage of water in Lake Okeechobee, and provides adequate drainage for the lands through which they pass. (See Plate IV facing page 168.)

The first of these canals, marked "A–A" on the map, passes down the Caloosahatchee Valley, following the course of the present drainage. This has the advantage of being the shortest route and will have the greatest fall per mile, but there will be a larger per cent of rock to excavate than on some of the other lines. This is a disadvantage, as it will materially increase the cost, but for the purpose of navigation it is very necessary that this route be selected.

In addition to taking off part of the excess from Lake Okeechobee, this canal will furnish adequate drainage for the entire Caloosahatchee Valley, and reclaim and make fit for agricultural purposes a large body of extremely fertile land.

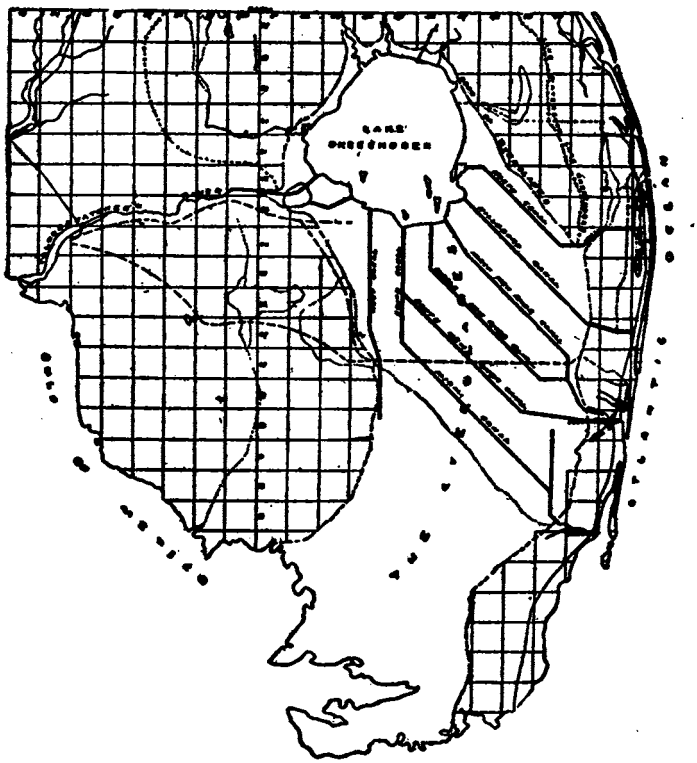
There is a grave apprehension that any enlargement of the upper portion of the Caloosahatchee will cause it to overflow its banks along its lower course and damage the citrus groves. Such will not be the case when Okeechobee is lowered and the discharge brought under control. There will not be as much water brought down this channel as is now carried by it in time of high water. The flow is to be regulated by locks at the upper end and only as much water allowed to enter the canal as the stream can carry without damage to the property along its course. One object of the improvement is to make the flow more uniform and maintain a good boating stage during the period of low water.

The canal second in importance, marked "B-B" on the map, is the Hillsboro route, which leaves Okeechobee at Pelican Bay and extends in a southeasterly direction to the head of Hillsboro River. This route is not as short as one directly east from Lake Okeechobee to the Loxahatchee River, but the cutting is not so deep, and it affords drainage for a much larger area of good agricultural lands.

These two canals, "A-A" and "B-B," are intended chiefly as a relief to Lake Okeechobee, and for transportation across the State. They are made deeper than the other canals shown on the plan and with proper locks a depth of 5 feet may be maintained throughout the year. This will furnish a good boating stage and be of great value to the agricultural and commercial interests of the State.

The other canals shown on the map are primarily drainage canals, although they would be navigable for light draft boats and barges and would be very useful in bringing in fertilizer and other supplies desired, and transporting to the market the crops produced.

Map showing the lines of canal recommended by J. O. Wright, supervising drainage engineer, U. S. Department of Agriculture, February 25, 1909.



In determining the size of the several canals it must be borne in mind that in addition to discharging 3,938 cubic feet per second from Lake Okeechobee, they must take the run-off from the territory through which they pass. Computing this run-off at the same depth that was determined for the watershed of Lake Okeechobee, there must be removed 90 cubic feet per second from each township, below Lake Okeechobee, discharging into these canals. This requires that the several canals be increased from the lake toward their outlets to carry this additional quantity without overflowing their lands during the period of heavy rains.

The functions and dimensions of the several canals located on the map, together with the approximate amount of excavation required in their construction, are given in tabulated form in Table 1. (See p. 169 for this table of estimated excavations in proposed canals.)

* * * * * * *

It is not possible to determine the exact amount of excavation without a survey and profile of each separate line of canal, but this estimate is sufficiently accurate to serve as a basis for computing the probable cost of the work. It was not deemed expedient to make this detail survey until it was determined that the work would be undertaken according to the proposed plans. Another element entering into the cost of the work is the proportion of rock and muck to be removed. This can only be known after the lines of canal are definitely located and soundings made to determine the depth of the muck.

From the investigations made by this office the results indicate that about 20 per cent of the excavation required will be a mixture of sand and porous rock, similar to that found at New River, and the remainder will be pure muck or muck underlaid with fine sand. On this basis of classification there will be 7,745,844 cubic yards of muck excavation and 30,983,760 of muck and sand.

From the work at Fort Lauderdale, it has been demonstrated that with a good dipper dredge the rock can be handled at a cost not exceeding 8 cents per cubic yard. With a suitable equipment there is no doubt that the muck can be removed at a cost of less than 4 cents per cubic yard. At these prices the total cost of the excavation would be:

7,745,844 yards, at 8 cents	$619,667.52
30,983,376 yards, at 4 cents	1,239,335.04
Total	1,859,002.56

This is approximately $1 per acre on the lands designated on the map as the upper glades.

In order to control the water in these canals and regulate the flow, they should be provided with gates or locks at both the upper and lower ends, and in some cases at intermediate points. Because of the slight head these will be comparatively inexpensive structures.

The canals represented on the map are for the purpose of regulating the height of the water in the lake and providing an outlet for the lands through which they pass. In addition to these, lateral feeders and small field ditches will depend largely upon the use to which the land is to be put. It will not require as much drainage for growing rice and grass as for cultivated crops. These field ditches will be small and not deep. Their cost will probably range from $2 to $4 per acre, according to the crop to be grown and the method of cultivation adopted.

J. O. WRIGHT,
Supervising Drainage Engineer.

We fully indorse this report, and it is our opinion, after a personal examination of the Everglades from the east and west approaches thereto, and the careful reading of this report, we feel perfectly justified in saying that the drainage of the Glades is absolutely feasible and practicable and its success depends alone upon the number and size of the canals that are cut through them to Lake Okeechobee. We had the advantage of low water, as the season there was a dry one.

Owing to the fact that the Everglades are very inaccessible, personal financial interests prompt the circulation of false reports or statements, which, in a large measure, accounts for the misinformation and prejudice now existing with reference to the Everglades, and believing that the importance of this matter justifies your committee in its effort to give you full and accurate information, as far as possible, considering the time devoted to the work, we feel justified in presenting you with the information above set out, though it be a little long and possibly tedious. However, we think it is correct and reliable in detail, and it is our opinion that it is a matter of so much interest and importance to the State of Florida that every means should be exerted to inform our people as to the facts pertaining thereto and so enlist the cooperation of every citizen of the State in preserving and retaining what is left to them of this vast and invaluable domain.

It is our opinion that if after reasonable development of these Glades the Federal Government is made acquainted with the facts in this case and the advantages to be derived from making a canal from Jupiter or Hillsborough Inlets on the east coast, thence to Lake Okeechobee and down the Caloosahatchee River to its mouth on the west coast, its cooperation can be easily obtained, thus furnishing a public highway from ocean to gulf which will be the pride of every Floridian and the wonder and admiration of the world.

If the Government lands were sold at the prices now prevailing, which we do not advise, a vast sum of money could be obtained, aggregating millions for the State of Florida, and besides this, if a good system of irrigation be established, based upon sound business principles, and this right be reserved in all sales of lands, an annual income of from $2,000,000 to $4,000,000 may be obtained from irrigation alone and then furnish landowners water for irrigation cheaper by far than any has ever been furnished up to this time.

We suggest that the remaining State lands be sold only in small parcels and then sold only to settlers and cultivators, and that none be sold now or in the near future unless for drainage purposes, for two reasons: First, you do not desire to bring the State lands in competition with lands sold in bulk; and, second, you want, when sold, to get much better prices because of the enhanced value by reason of the completion of drainage.

We recommend to the Trustees that they push with all possible dispatch the work on the Glades, and if possible let several of these canals on contract to reliable responsible bidders, who should be required under heavy bond to do the work under the supervision and in exact accordance with the contract, besides a deposit of a good bonus as an evidence of good faith.

Also that they secure at once a good suction dredge furnished with dipper for light work, which must be used to clear out the dams and shoals, thus opening up the canals for the transportation of supplies which is becoming daily more expensive as the work advances, the cost of which suction dredge would soon be saved by eliminating the transferring of everything at each dam, and besides this giving very much better drainage than is now possible.

We advise that the contract made with Mr. Bolles that an additional dredge be constructed by the Trustees and put to work excavating canals connecting with other canals and other outlets leading to the sea from Lake Okeechobee as soon as is possible and practicable.

THEOP. WEST, *Chairman.*
J. R. MILLER, *Secretary.*
J. W. HATCHER.
J. H. B. MILLER.
A. J. PEADEN.

RESOLUTIONS OF THE FLORIDA HOUSE OF REPRESENTATIVES.

The following resolution (H. R. No. 131) was adopted by the Florida House of Representatives, May 31, 1909:

Resolved by the house of representatives, That in view of the magnitude of the operations involved in the drainage of the swamp and overflowed lands of the State, and of the vast importance thereof, and of the great benefit to be derived therefrom, it is of vital interest to the people of the State that the drainage operations now being conducted by the Trustees of the Internal Improvement Fund should be prosecuted with vigor and economy, to the end that large areas of immensely valuable lands may be placed upon the market by the State, to secure desirable immigrants and to encourage the development and use of the almost limitless natural resources of the State, thereby increasing the wealth of the State and leading to a corresponding reduction in tax burdens. It is earnestly recommended that the Trustees use every proper means in their power to facilitate the work of drainage and reclamation at the lowest possible cost, and that some one of the Trustees do make personal visits to and careful inspection of said drainage operations, and all the details thereof, at frequent intervals, in order that the Trustees and the public may be kept fully advised of the progress of the work.

The following resolution (H. R. No. 138) was adopted in the Florida House of Representatives:

Whereas on the thirty-first day of May the House of Representatives of the State of Florida adopted House Resolution Numbered One hundred and thirty-one, expressing the wish of this house concerning the drainage of our swamp lands by the Trustees of the Internal Improvement Fund:

Therefore be it resolved, That the secretary of the house of representatives is hereby instructed to deliver a copy of the said resolution to the secretary of the Trustees of the Internal Improvement Fund of the State of Florida.

The following resolution (H. R. No. 141) was adopted in the Florida House of Representatives, June 4, 1909:

Resolved by the house of representatives, That it is the sense of the house that the Board of Drainage Commissioners of the State of Florida are to be congratulated upon the successful outcome of the litigation against the railroad land-grant claimants that have refused to share in the burden of draining and reclaiming their own lands within the drainage district created in the wisdom of the Legislature of Florida, and that the board should continue vigorously their efforts to enforce the law.

And further, That the chief clerk transmit a certified copy of this resolution to the honorable Board of Drainage Commissioners of the State of Florida.

REPORT ON THE DRAINAGE OF THE EVERGLADES OF FLORIDA, BY J. O. WRIGHT, SUPERVISING DRAINAGE ENGINEER.

[Prepared under the direction of C. G. Elliott, Chief of Drainage Investigations.]

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., June 25, 1909.

SIR: I have the honor to transmit herewith a report on the drainage of the Everglades of Florida, prepared from examinations and surveys made by John T. Stewart and Lawrence Brett, drainage engineers, under the general direction of J. O. Wright, supervising drainage engineer of this office.

The field examinations were made during the winters of 1906–7 and 1907–8 at the request of the Board of Trustees of the Internal Improvement Fund of the State of Florida, for the purpose of ascertaining the practicability of draining the Everglades and making them profitable for agriculture. The Trustees cooperated by placing at the disposal of this office all data which had been collected by the board relating to the lands which were examined, and furnishing a boat and a man to manage it in making the examination of Lake Okeechobee.

The report proposes a plan for draining the land and discusses its probable value for agriculture. In view of the public interest now shown in the reclamation of wet and swamp lands throughout the country, I recommend that the report be published as a bulletin of this office.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.

INTRODUCTION.

Since the discovery of Florida by Ponce de Leon in 1513 much interest has from time to time been manifested in the southern part of the peninsula. It has been the field of national strife and its history discloses a series of interesting and exciting events. Both the British and Spanish Governments long regarded it as a land of inestimable wealth, occupying a highly stragetic position. In the endeavor of European nations to secure and hold this coveted treasure it became the theater of war and bloodshed. Prior to its acquisition by the United States it twice changed ownership, inhabitants, and policies, and was regarded as the legitimate prey of unscrupulous rovers of the sea and fortune seekers of the Old World.

When finally acquired by the United States, the southern part became a refuge for the Seminole Indians, whom the Government failed to entirely remove or subdue. Under such conditions any material development of its natural resources could not be expected. During this early period the information pertaining to the interior of the country, particularly the Everglades, was more fanciful than real. Its fertility and possibilities were extolled by those who ventured beyond the settlements along the coast, but reliable geographic and scientific data were entirely lacking.

EARLY DESCRIPTIONS OF THE EVERGLADES.

That portion of the peninsula lying south of Lake Okeechobee, called by the Indians "Pah-hah-okee" or "Grassy Water," is commonly known as "the Everglades." It has never been surveyed by the United States Land Office, but is designated on the maps by those who surveyed the adjacent lands as an impenetrable marsh. In the school geographies it is described as "An extensive muck swamp covered with a dense saw grass, evergreen pines, and palmettos, and dotted here and there with wooded islets. It is the favorite haunt of aquatic birds, alligators, and numerous snakes and other reptiles." This description of the Everglades is commonly accepted throughout the country.

The first authentic information concerning this part of Florida was gathered during the Seminole War by the United States Army officers, who made extended explorations in small boats during the periods of high water, and transmitted quite full descriptions of the country to the Secretary of War.

On June 18, 1847, Hon. J. R. Walker, Secretary of the Treasury, appointed Buckingham Smith, of St. Augustine, Fla., to make an examination and report on the Everglades. The scope and character of the work intrusted to this gentleman can best be shown by extracts from the letter of instructions issued to him. (See p. 37.)

"It has been reported to the department that there are several thousand acres of public lands in the vast lake called "the Everglades," which can be reclaimed and rendered valuable at an expense comparatively small with the advantages resulting from such measure. It is reported that these lands can be drained by two or three small canals, from the lake into the river opposite to it, emptying into the Gulf of Mexico and into the Straits of Florida. This department is not in possession of any official information in relation to them which would justify its recommendation of such a measure, but the opinion is entertained, from the representations made, that the measure is not only practicable, but would be beneficial to the public interests. The department relies upon you to procure and furnish in your report full information on this subject. * * * You will examine personally, if you can, the region where the proposed cuts will have to be made. State its character, geological formation, the probable length, breadth, and depth of the proposed cuts or canals, the probable excavation necessary, and also the character and anticipated expense and results of the work sought to be undertaken. Any information you can obtain in writing from intelligent citizens acquainted with the subject you will communicate with your report. And you will cull from these facts specific data showing the correctness of the opinions given. Congress and the department must look to you to justify action on this subject.

On June 1 of the following year Mr. Smith made an extended and comprehensive report of his investigations and submitted numerous papers and letters to support such conclusions as he saw fit to submit. The report is too long to be inserted here, but anyone interested can

find it in Senate Report No. 242, Thirtieth Congress, first session. (See p. 46.) With reference to draining the Everglades, he says:

To reclaim the Everglades, Okeechobee must be tapped by canals running into the Caloosahatchee on the one side and the Loxahatchee or St. Lucie, or both, on the other, and cuts must also be made from the streams on both sides of the peninsula into the Glades. Besides, after the height of water in the Glades shall be decreased, even as much as 5 feet, there will probably be a necessity for several drains through the Glades, by which the waters accumulating from the rains may be conducted to the ocean or Gulf.

A later description of the Everglades appeared in a memoir published in 1856 to accompany a military map known as the "Davis map." (See p. 71.) The name of the writer does not appear, but his description is so accurate and clear that it is here reproduced:

The Everglades of Florida cover an area of about 4,000 square miles, embracing more than one-half of the portion of the State south of Lake Okeechobee. The subsoil of this vast region is coralline limestone. Upon the surface of this, which is very rough and irregular, lies an immense accumulation of sand, alluvial deposits, and decayed vegetable matter, forming a mass of quicksand and soft mud, from 3 to 10 feet or more in depth, that overspreads all but a few points of the first stratum. Upon the mud rests a sheet of water, the depth varying with the conformation of the bottom, but seldom, at dry seasons, greater than 3 feet. The whole is filled with a rank growth of coarse and tough grass from 8 to 10 feet high, having a sharp edge like a saw, from which it obtains its name of saw grass. In many portions of the Everglades this saw grass is so thick as to be impenetrable, but is intersected by numerous narrow and tortuous channels that form a kind of labyrinth where outlets present themselves in every direction, most of them, however, terminating at longer or shorter distances in an impassable barrier of grass, mud, and quicksand. The surface water is quickly affected by rains, the alternate rising and falling during the wet seasons being very rapid. The difference of level between the highest and lowest stages of water is from 2 to 3 feet. The general surface of the Everglades is therefore subject to great changes, the character of marshy lake or mud flat predominating according to the wetness or dryness of the season. It is probable that sometimes more than one-half of the surface has no water upon it. Besides the mud islands small keys are here and there met with, which are dry at all seasons. Upon these the soil is very rich. There are many such, undoubtedly, that are often made the sites of Indian gardens. In some places they will be grown up with bushes, appearing in the distance like a continuous wood, and occasionally there are clumps of pine, cabbage palmetto, cypress, and live oak.

THEORY OF THE FORMATION OF THE EVERGLADES.

At one time it was taught by geologists that the southern part of Florida was of coral origin, but recent examinations lead them to believe that its formation is similar to that of the coast of Georgia and South Carolina, and belongs to the "post-Pliocene age." The present surface rests on a bed of oolitic limestone, embedded with sand and shells. The underlying rock is nearly horizontal, dipping slightly toward the south, but does not denote any sudden upheaval. Its surface is irregular, being full of potholes, deep fissures, varied by irregular and jagged ridges and seams. It is not stratified, but is homogeneous in character, and is rotten or porous and susceptible of being easily excavated. In places it is quite retentive of moisture, but hardens when exposed to the air and makes a good surface for roads. This rock foundation underlying the entire southern part of the peninsula was at one time the bed of an inland sea. Along the eastern edge, parallel with the Atlantic coast, is a rock rim, or barrier, from 3 to 5 miles wide, that rises at the north end, opposite Lake Okeechobee, 10 or 12 feet higher than the bedrock in the center of the Glades, opposite this point. As this ridge extends south its elevation

gradually approaches the level of the bedrock, and at the mouth of the Miami River it has but a slight elevation above the level of the interior of the basin. South of Miami the ridge disappears, and the entire peninsula from the Atlantic to the Gulf coast is a rocky surface, dipping slightly toward the south and west. On the west coast there is a rock rim wider than on the east coast, but not so high. The backbone of the ridge is found at Fort Thompson, about 20 miles west of Lake Okeechobee, and extends in a southerly direction, almost parallel with the rim on the east coast; it gradually decreases in elevation until it is finally lost by merging into the bedrock at a point about west from Miami. The area inclosed by these rock rims, lying south of Lake Okeechobee, is about 90 miles long and 40 miles wide, and constitutes what is, strictly speaking, the Everglades. People who live in that locality, however, are accustomed to speak of any large marshy territory covered with grass as a part of the Everglades, whether it is within the inclosure formed by these rock rims or not.

There is no doubt that at one time this basin was an open sea, but by the action of the wind and waves, sands and particles of stone were carried in and deposited, until the water was sufficiently shallow for plant life to exist. Aquatic plants then sprang up, and by constant accretions through a succession of years the entire basin has been filled to the level of the marginal rims with a deposit of sand and muck, so that the surface of the Everglades is now a plane with a gentle slope from the north to the south.

NATURAL DRAINAGE.

During this formative period water that was discharged by the Kissimmee River into Lake Okeechobee while endeavoring to find an outlet to the sea broke through the rock rim in many places, both on the east and the west coast, and by its constant action eroded the rock, so that there are numerous channels through which the surface water now flows quite freely from the Everglades, both into the Atlantic Ocean and the Gulf of Mexico. In many places these channels are worn down several feet deep, but do not extend far beyond the rim into the interior. The water is brought from the margin of the Glades in small rivulets to the heads of these streams, which increase in size as they approach the outlets. The difference in elevation between sea level and the source of these streams gives many of them sufficient fall to cut out large and deep channels. The streams on the east coast, beginning at Rock Ledge and going south, are as follows: Sebastian River, St. Lucie River, Loxahatchee River, Hillsboro River, Cypress Creek, New River, Snake Creek, Arch Creek, Little River, and Miami River. These streams are shorter and have more fall per mile than those on the west coast. None of them are connected directly with Lake Okeechobee, although they receive more or less water from it during the period of heavy rains. On the west coast the conditions are somewhat different.

The Caloosahatchee River, a stream of considerable importance, takes its water directly from Lake Okeechobee and the adjacent country on the west, and flows southwest to Fort Myers. Along the upper part of its course it passes through some canals that were constructed by the Disston Co. 18 years ago, and thence through Bonnet

Lake and Lake Flirt, which are large marshy areas that are covered with water 4 or 5 feet deep during the rainy season, but are practically dry the remainder of the year. From Lake Flirt to Fort Denaud the channel passes through the rock rim, which is harder than the stone found on the east side. The action of the water is quite slow in cutting away this rim, and some work has been done by interested parties in widening and deepening this portion of the channel to improve navigation. South from Fort Myers the Gulf coast is not well defined, but is low and characterized by numerous indentations filled with mud flats and little islands called "keys," which are overgrown with mangrove. Many of these inlets extend several miles into the land, but they are so tortuous in their course and so thickly covered with mangrove that they are difficult to follow. The tide ebbs and flows in and out among these keys and extends many miles inland, forming a vast swamp. Much of the drainage from Lake Okeechobee and the west side of the Everglades finds its way slowly through the dense growth of saw grass to the south and west, and finally empties into this vast mangrove swamp. There are not so many streams on the west as on the east coast, the principal ones being the Caloosahatchee, Harneys, and Shark Rivers.

TEMPERATURE.

Highly favorable conditions in regard to temperature obtain in that portion of Florida south of Lake Okeechobee. Frosts are of rare occurrence, and when they do occur usually cause but little injury.

The following tables, compiled from the records of the United States Weather Bureau, give the mean annual temperature and the highest and lowest temperatures at Jupiter and Fort Myers for a period of nine years:

Mean annual, highest, and lowest temperatures at Jupiter and Fort Myers, 1898–1906.

Years.	Jupiter.			Fort Myers.		
	Annual mean temperature.	Highest during the year.	Lowest during the year.	Annual mean temperature.	Highest during the year.	Lowest during the year.
	°F.	°F.	°F.	°F.	°F.	°F.
1898	73.7	91	31	72.6	94	28
1899	74.4	93	28	73.1	93	28
1900	74.3	93	31	72.3	92	34
1901	72.6	92	38	70.3	94	32
1902	74.4	96	38	72.2	94	31
1903	74.1	96	36	71.8	94	35
1904	73.8	94	39	.....	94	34
1905	74.6	94	24	73.5	94	27
1906	73.7	91	30	72.4	92	31

These stations are both north of the main body of the Everglades, and no doubt show from 2° to 4° lower temperature than would be registered in the center of the Glades. The minimum temperature here is higher than that of the sugar district in Louisiana south of New Orleans, where cane is seldom injured by frost. On account of this immunity from cold, sugar cane has a longer season in which

to grow and ripen, and is consequently much richer in sucrose. The grinding operation need not be commenced before the cane is fully matured, which greatly increases the yield of sugar per acre. Although light frosts have been known occasionally to injure more delicate plants, yet sugar cane and the hardy vegetables, as cabbage and potatoes, grow in the open field all winter.

The summers in this district are not as hot as one would naturally expect from its latitude. During the period 1898 to 1906 the maximum temperature at Jupiter was 96° F. and at Fort Myers 94° F., which is less than that of Minnesota or North Dakota during the same period. The summer weather in southern Florida is usually attended with a sea breeze of 4 to 8 miles per hour, which makes it quite pleasant in the shade. At night this breeze increases, so there is little discomfort from the heat.

The following table gives the mean daily temperature, velocity of the wind, and the relative humidity of the atmosphere for the months of July and August, 1905, at Jupiter:

Weather conditions for July and August, 1905.

Days of month.	Mean daily temperature.				Velocity of wind per hour.		Relative humidity.	
	Kissimmee.		Jupiter.		Jupiter.		Jupiter.	
	July.	August.	July.	August.	July.	August.	July.	August.
	°F.	°F.	°F.	°F.	Miles.	Miles.	Per ct.	Per ct.
1	80	79	82	84	3.0	9.5	85	83
2	81	79	82	80	4.5	5.0	84	92
3	82	78	84	78	6.0	9.0	83	89
4	82	79	84	83	9.0	8.0	87	84
5	81	76	82	84	5.5	7.5	86	83
6	76	81	81	80	8.5	3.5	76	85
7	80	81	80	78	9.0	4.0	84	83
8	80	80	81	81	10.0	10.0	80	74
9	80	81	80	84	6.0	10.0	90	78
10	80	83	80	83	6.5	6.5	80	82
11	80	82	80	81	8.5	5.5	83	84
12	[1] 72	82	80	82	6.0	8.5	87	84
13	[1] 71	82	76	82	7.5	17.0	89	79
14	[1] 71	83	80	82	4.5	5.5	93	87
15	80	80	79	80	11.0	6.0	76	89
16	80	79	81	82	9.0	5.0	72	89
17	81	79	80	82	7.5	5.5	80	90
18	82	81	82	78	6.5	5.5	70	90
19	83	81	84	83	5.0	5.5	78	84
20	84	80	84	83	5.5	5.0	76	80
21	81	80	83	82	7.0	3.5	78	89
22	83	81	84	82	5.5	6.0	81	84
23	81	83	82	84	11.5	9.0	78	76
24	81	83	83	83	12.5	6.0	72	82
25	82	80	82	80	7.5	6.0	85	82
26	83	79	84	80	9.0	7.0	80	85
27	80	78	82	82	7.5	9.0	72	82
28	80	79	82	81	7.5	6.5	75	86
29	83	82	83	80	5.0	4.0	78	86
30	81	82	82	82	8.5	2.0	82	85
31	82	82	84	83	7.5	4.0	82	85

[1] Minimum.

RAINFALL.

In regard to the precipitation, the climate of the peninsula of Florida may be divided into a wet and a dry season, the wet season commencing about the middle of May and continuing three or four

months. Like other conditions of climate this feature is not governed by any hard and fast rule, but is subject to marked exceptions. During the dry season, October to May, there are frequent showers and often heavy rains. In February, 1899, there was a total rainfall of 11.53 inches at Kissimmee, while in the three months of July, August, and September the following year there was only 13.49 inches rainfall.

The following tables give the records of the rainfall at Kissimmee, in the northern part of the watershed, and at Jupiter, on the east coast opposite Lake Okeechobee, for a period of nine years, and represent fairly well the rainfall that may be anticipated in the Everglades:

Total rainfall, number of days of rainfall, and the maximum rainfall in 24 hours, for each month of the years 1898 to 1906, inclusive.

KISSIMMEE, OSCEOLA COUNTY, FLA.

Months.	1898			1899			1900			1901			1902		
	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.
January	0.23	1	0.23	5.72	9	1.11	4.22	8	1.16	0.92	3	0.55	0.19	1	0.19
February	1.12	3	.42	11.53	7	4.75	2.65	5	.91	2.46	5	.94	6.07	6	2.65
March	.....	.....	.....	1.68	4	.91	6.07	6	1.91	3.51	6	.80	1.88	4	1.17
April	.12	1	.12	3.06	4	1.64	3.02	6	1.06	3.23	3	2.91	1.73	4	1.00
May	.35	1	.35	1.60	1	1.60	5.84	7	3.00	2.96	3	2.30	.34	2	.23
June	5.75	6	1.50	3.06	7	.87	8.18	15	1.40	8.78	12	1.66	5.85	7	3.30
July	7.90	10	2.25	8.37	15	2.59	5.66	14	1.23	2.84	10	.58	5.36	12	2.10
August	11.41	15	2.20	11.06	15	2.95	3.23	4	1.48	9.91	19	1.35	7.27	9	2.39
September	4.52	10	1.47	7.03	10	2.68	4.50	7	1.96	12.95	11	4.60	6.35	15	1.35
October	5.17	13	1.43	15.98	7	9.50	4.83	8	2.67	1.18	3	.57	3.07	8	.76
November	.88	4	.25	.23	1	.23	1.62	3	1.00	.67	2	.52	1.15	3	.87
December	3.02	9	1.45	1.60	4	.94	5.09	6	3.25	1.35	3	.80	.96	2	.66
	40.47	....	.....	70.92	....	.....	54.91	....	.....	50.76	....	.....	40.22	....	.....

Months.	1903			1904			1905			1906		
	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.
January	4.76	8	1.66	4.16	8	1.40	0.70	2	0.62	6.43	6	3.34
February	5.04	6	2.71	5.16	5	2.12	.91	4	.67	1.49	4	.56
March	5.84	10	2.00	.80	3	.60	3.88	8	1.25	2.74	7	.93
April	.25	1	.25	2.25	4	.85	1.82	6	.60	1.48	4	.68
May	6.68	9	2.35	.51	4	.25	7.17	12	2.05	6.77	11	2.24
June	10.12	14	1.45	8.19	14	1.50	4.46	11	2.25	10.21	15	1.70
July	6.07	13	1.58	8.56	9	2.55	14.05	22	2.10	6.65	14	2.10
August	4.31	8	1.10	4.53	9	1.20	13.90	23	2.70	2.59	6	.82
September	12.06	14	2.95	4.66	10	1.30	4.94	9	1.50	3.26	8	.84
October	1.02	5	.31	6.72	12	1.55	3.19	5	1.40	2.00	6	.66
November	3.56	5	2.30	3.15	5	1.73	Trace.	....	Trace	.16	1	.16
December	1.51	3	1.09	.80	2	.70	9.43	15	3.20	.04	2	.02
	61.22	....	.....	49.49	....	.....	64.45	....	.....	43.82	....	.....

Total rainfall, number of days of rainfall, and the maximum rainfall in 24 hours, for each month of the years 1898 to 1906, inclusive—Continued.

JUPITER, DADE COUNTY, FLA.

Months.	1898			1899			1900			1901			1902		
	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.
January	0.36	6	0.13	4.30	17	0.94	3.49	15	1.01	8.29	12	4.94	0.98	5	0.75
February	.95	5	.55	4.64	12	1.78	2.28	12	.45	1.07	5	.40	4.64	7	1.70
March	3.26	7	2.28	3.58	5	2.05	8.20	8	3.69	2.30	8	.75	.97	7	.34
April	1.90	6	1.67	3.11	7	1.51	2.16	7	1.10	2.13	5	1.36	.97	5	.44
May	1.15	5	.60	1.65	7	.64	7.43	15	2.18	3.63	7	2.02	4.83	7	2.27
June	.12	3	.06	3.45	12	1.32	2.90	16	.73	17.41	13	7.45	3.92	10	1.69
July	6.80	11	1.70	3.35	14	.87	3.49	15	1.38	7.23	18	2.09	4.73	11	1.21
August	6.62	15	1.52	5.96	11	1.78	1.12	6	.48	12.13	21	1.77	1.91	13	.46
September	3.38	24	1.14	11.27	23	2.76	7.62	13	3.44	9.71	16	3.03	6.01	20	1.81
October	10.89	19	2.52	16.66	15	4.96	10.11	20	2.61	7.08	24	1.02	13.74	17	4.58
November	1.11	8	.71	.99	9	.53	.73	5	.50	.94	7	.82	2.38	13	.68
December	2.56	8	.87	2.97	13	1.37	3.10	11	.82	4.17	10	2.69	.71	3	.55
	39.10	....	.....	61.93	....	.....	52.63	....	.....	76.09	....	.....	45.79	....	.....

Months.	1903			1904			1905			1906		
	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.	Total rainfall.	Number of days of rainfall.	Maximum rainfall in 24 hours.
January	6.98	15	3.33	2.56	13	0.93	1.40	8	0.76	2.62	13	1.19
February	4.50	9	2.41	2.10	6	.91	1.50	10	.95	6.44	9	3.62
March	9.27	17	2.49	3.06	9	2.30	5.39	11	1.88	2.50	12	.98
April	.44	5	.31	2.85	6	2.52	3.14	7	2.47	2.57	7	.96
May	2.71	9	1.26	2.42	14	.77	3.35	8	1.01	7.04	16	2.64
June	7.01	18	1.52	10.54	18	2.46	2.08	11	.93	11.90	12	5.75
July	3.23	15	.88	4.38	14	1.08	9.12	18	1.83	7.97	20	2.71
August	2.47	14	.69	5.79	15	2.00	10.72	21	1.78	8.55	22	2.02
September	15.82	21	6.59	8.92	16	2.44	10.77	16	2.32	8.37	10	5.62
October	1.81	10	1.05	21.39	14	10.48	4.26	16	1.46	8.31	17	5.08
November	2.50	14	1.12	3.68	13	1.20	2.88	9	2.01	4.53	4	3.16
December	.56	5	.21	.49	8	.19	15.18	26	5.75	.05	1	.05
	57.30	....	.....	68.18	....	.....	69.79	....	.....	70.85	....	.....

EARLY STATE LEGISLATION RELATING TO THE EVERGLADES.

Florida was admitted into the Union in 1845, previous to which time the agricultural possibilities of the Everglades had scarcely been noticed. The soil was supposed to be fertile, but nothing positive was known upon this point. It was suspected by some that the interior might be lower than sea level, in which case the drainage of so large an area would be difficult. The first act of the State legislature was the adoption of the following joint resolution. (See p. 34):

Whereas there is a vast and extensive region, commonly termed "The Everglades," in the southern section of this State, embracing no inconsiderable portion of its entire peninsula, which has been hitherto regarded as wholly valueless in consequence of being covered by water at stated periods of the year and the supposed impracticability of draining it; and

Whereas recent information, derived from the most respectable sources, has induced the belief, which is daily strengthening, that these opinions are without foundation and, on the contrary, that at a comparatively small expense the aforesaid region can be entirely reclaimed, thus opening to the habitation of man an immense and hitherto unexplored domain, perhaps not surpassed in fertility and every natural advantage by any other on the globe; and

Whereas it is no less the interest of the General Government than of Florida, with its vast donation of unlocated land, to adopt some early and efficient measures to test the accuracy of these representations: Be it therefore

Resolved by the Senate and House of Representatives of the State of Florida in General Assembly convened, That our Senators in Congress be instructed, and our Representatives requested, to bring this important subject to the attention of Congress at the earliest day, and earnestly press upon its consideration the propriety and policy of forthwith appointing competent engineers to examine and survey the aforesaid region.

This resolution was properly signed and transmitted to the President, James K. Polk. Evidently no action was taken by Congress, and two years later, 1847, the Legislature of Florida passed resolution No. 14, which reads as follows. (See p. 39):

Whereas large tracts of the public lands lying in the vicinity of Lake Okeechobee, and in that region south of said lake called "The Everglades," being covered with water, are incapable of being surveyed and subdivided and are therefore valueless to the United States; and

Whereas it is believed that a large portion of said lands may be drained by canals, reclaimed, and made valuable for the cultivation of tropical plants and fruits; and

Whereas it is believed that these lands, if reclaimed, would not only remunerate this State for the expense of such reclamation, but would yield a considerable surplus above such expense: Therefore,

Resolved by the Senate and House of Representatives of the State of Florida in General Assembly convened, That Congress be requested to grant to this State all of said lands lying south of Caloosahatchee River and of the northern shore of Lake Okeechobee, and between the Gulf of Mexico and the Atlantic Ocean, on condition that the State will drain them and apply the proceeds of the sale thereof, after defraying the expense of draining, to purposes of education.

Like requests were made of Congress by Louisiana, Arkansas, and other States for the swamp and overflowed lands within their respective domains. In response to these numerous appeals from the several States, Congress passed in 1850 an act commonly known as the "swamp-land grant," which was approved by the President and became effective September 28, the same year. This law (sec. 2479, Rev. Stat.) reads as follows. (See p. 67):

To enable the several States to construct necessary levees and drains to reclaim the swamp and overflowed lands therein, the whole of the swamp and overflowed lands made unfit thereby for cultivation and remaining unsold on and after the 28th day of September, A. D. 1850, are granted and belong to the several States, respectively, in which the said lands are situated.

Section 2480 of the same statutes provides as follows:

The proceeds of said lands, whether from sale or direct appropriation in kind, shall be applied exclusively, as far as necessary, to reclaiming said lands by means of levees and drains.

THE SWAMP LANDS OF FLORIDA AND THEIR MANAGEMENT.

Under this grant the State of Florida has received and accepted from the Federal Government up to June 30, 1907, 20,458,866 acres of swamp and overflowed land, which is nearly two and one-half times the combined area of the States of New Jersey, Connecticut, and Rhode Island.

By an act of the legislature passed January 6, 1855, the State of Florida created a Board of Trustees of the Internal Improvement Fund of the State, consisting of the governor, attorney general, comptroller, treasurer, and commissioner of agriculture, and vested in said Trustees title to all of said swamp and overflowed lands for the use and purpose mentioned in said act. (See p. 69.) There has been more or less discussion as to the obligation imposed upon the several States by the acceptance of swamp and overflowed land from the Federal Government. In the case of Kimball *v.* The Reclamation Fund Commissioners (45 Cal., 344), the supreme court of that State said:

> In accepting this grant the State was bound to carry out in good faith the objects for which it was made. It would practically defeat the whole cause of reclamation contemplated by Congress if the mere sale of land to private proprietors should have the effect to exempt it from the power of the legislature to reclaim it. Such a result would be a flagrant violation of its duty toward the Federal Government.

In Fourth Wallace, page 143, the Supreme Court of the United States held that the acceptance of this grant by the State constituted a contract, and that the contract required the State to appropriate the lands granted to it for the purpose of reclaiming them.

The personnel of the board of trustees of the Internal Improvement Fund has been frequently changed by the election of new State officers. (See p. 19.) These changes have been detrimental to the adoption and carrying out of any fixed policy concerning the drainage of the State swamp lands. The Trustees have usually held the opinion that these lands should be drained, but how or by whom has been an open question. Plans for draining the land have been proposed from time to time, and spasmodic efforts have been made to discharge the obligation imposed on the State by the acceptance of these lands from the Federal Government, but comparatively little has been accomplished along these lines.

A CONTRACT TO DRAIN THE EVERGLADES.

In February, 1881, the Trustees of the Internal Improvement Fund entered into a contract with Hamilton Disston and his associates, of Philadelphia, Pa., under the terms of which agreement the said Disston and his associates agreed to drain and reclaim all the overflowed lands in the State of Florida practicable to be drained, lying south of township 23 and east of Peace Creek. (See p. 20.)

Disston subsequently formed a corporation under the laws of the State of Florida, known as the Atlantic & Gulf Coast Canal & Okeechobee Land Co., for the purpose of carrying out his contract with the State, and the Trustees of the Internal Improvement Fund, on September 1, 1881, accepted this corporation, in lieu of Disston and his associates, for draining these lands.

The boundary of the area to be drained was changed from time to time, but was permanently fixed by a resolution of the Board of Trustees as approved. (Vol. 3, p. 223, of the published proceedings.) As its compensation for draining these lands the drainage company was to receive a part of the land as set forth in the contract. The company constructed some dredges and entered upon the work as provided for in its contract and dug a number of canals in the northern part of Osceola County, near Kissimmee, which lowered the level of some lakes in that vicinity and drained a large amount of

marsh land adjacent to the canals and lakes. The company also dug some canals south and west of Lake Okeechobee, but they did not lower the water sufficiently to afford drainage for any part of the lands in that section of the country. The location of the several canals constructed by this company is shown on the map. The value of the work accomplished and the amount of land drained became a matter of much public discussion and criticism. During the years 1883 and 1884 the Trustees of the Internal Improvement Fund evidently acknowledged that the terms of the contract were being carried out, and in payment for work claimed to have been done deeded to the drainage company 1,175,303 acres of land. Frequent complaints and public utterances concerning the matter created a certain amount of friction between the Atlantic & Gulf Coast Canal & Okeechobee Land Co., and the Trustees of the Internal Improvement Fund, and ultimately attracted the notice of the Legislature of the State of Florida, which enacted a statute in 1887 authorizing the Trustees to make an amicable adjustment of the differences existing between them and the drainage company and arrange a compromise that would protect the interests of the State and secure a prompt and vigorous prosecution of the work of drainage and reclamation agreed upon under the terms of the contract. A compromise was effected and a new contract entered into that took the place of and superseded all previous contracts that had been made. Under the terms of this new contract it was agreed that the drainage reserve of said company should be reduced and limited so as to secure to the company a total of 2,000,000 acres of land, including that which had already been conveyed to the company. These lands were to be selected in a body as near as might be of alternate sections within the reserve held for said company, and such selections were to be filed with the Trustees.

This compromise contract stipulated that upon the completion of certain work, estimated to cost $75,000, which was partly constructed, the Board of Trustees should release all claims for land previously conveyed to the drainage company. It was further agreed that in the reclamation of the land still left in the drainage area the Atlantic & Gulf Coast Canal & Okeechobee Land Co. should expend the further sum of $206,264 and should receive in payment 1 acre of land for each 25 cents expended in drainage, which would make the total amount of land to be received by this drainage company from the State of Florida 2,000,000 acres.

The work was continued under this contract, and on December 31, 1893, the Atlantic & Gulf Coast Canal & Okeechobee Land Co. filed a statement setting forth that they had economically and in good faith expended in the completion of the work within the drainage area the entire sum specified in said contract, and had moreover expended $27,154.58 in excess of the requirements of the contract in the belief that the Trustees would extend the contract on similar terms. The Trustees, however, refused to do this, and the work ceased at that time. Numerous controversies arose, growing out of this contract, which have not yet been fully settled. In 1895 and 1898 the drainage company received deeds from the Trustees for 542,918 acres of land, making a total of 1,652,247 acres, and is still seeking to recover 347,753 acres more in order to complete the total of 2,000,000 acres provided for in the compromise contract.

FIG. 1.—STATE DREDGE OKEECHOBEE CUTTING THROUGH THE ROCK RIM ON THE EAST SIDE OF THE EVERGLADES.

FIG. 2.—NINE-YEAR-OLD ORANGE GROVE ON DRAINED SAW-GRASS MUCK AT THE SOUTH END OF LAKE TOHOPEKALIGA.

DRAINAGE WORK BY THE STATE.

From the time the work was suspended by the Disston Land Co. in 1893 until 1904 the matter was frequently discussed, but no drainage operations were undertaken by the board. In that year the question of draining the Everglades became one of the leading issues in the State election. The Hon. N. B. Broward was elected governor and became ex officio president of the Board of Trustees of the Internal Improvement Fund, which board was pledged to the people to drain this land. In 1906 the Trustees erected two large dipper dredges in New River, near Fort Lauderdale, and commenced the work of cutting two canals 70 feet wide and 10 feet deep in a westerly direction into the Everglades. (Pl. I., fig. 1.) This action on the part of the board aroused a sharp discussion upon the feasibility of the undertaking, its value to the State, and the probability of the successful completion of the work and ultimate conversion of the Everglades into productive lands. The operations of the Disston Land Co. had been confined to the lands lying above Lake Okeechobee, although tentative plans for draining the Everglades had from time to time been proposed. It was urged by objectors that too little reliable information regarding the problem was at hand to warrant so large an undertaking. While the State board possessed the data gathered by various expeditions, some being of an engineering character, but for the most part purely casual and descriptive, it was desired that an investigation be made to obtain accurate data and gather information concerning the physical characteristics of the Everglades and their economic value, should complete reclamation be found feasible, in order that a plan of drainage might be developed.

INVESTIGATIONS BY THE UNITED STATES DEPARTMENT OF AGRICULTURE.

In order to secure such an investigation, the State Board of Trustees of the Internal Improvement Fund requested the cooperation of the Secretary of Agriculture. The magnitude of the work and the public interest manifested in the agricultural possibilities of the Everglades led to a favorable consideration of the matter, and the Office of Experiment Stations, which has direction of drainage investigations of the department, was authorized in 1906 to proceed with such work as would be required to secure the desired information.

In outlining a plan of procedure it was decided that the office would utilize all the reliable data that had been collected by others, and also carry on a line of original examinations and surveys to get specific data necessary for the proper consideration of the drainage problem. Much useful information was found in the reports of the United States Army officers and engineers and in special reports submitted to Congress. The surveys made by the Disston Co. and maps and documents collected by the Board of Trustees of the Internal Improvement Fund were also valuable. These various documents were carefully studied and such facts as had a bearing on the work were compiled and classified for further consideration. From these sources a comprehensive view of the general features of the existing status of the project was obtained. Many of the examinations recorded in these reports, however, had been confined to the coast and rivers, so that information regarding the interior was meager and unsatisfactory.

PRELIMINARY INSPECTION.

With a view of selecting the best place to commence this survey and determine the methods to be followed in carrying it on, J. O. Wright, supervising drainage engineer, who was placed in general charge of the investigation, made an examination of the southern part of Florida in November, 1906. After skirting the Everglades on both the east and west sides and ascending the Caloosahatchee River as far as Lake Hicpochee and interviewing numerous trappers and hunters, the magnitude of the undertaking and the difficulties attending the work became more apparent. This inspection disclosed the fact that from Palm Beach to Miami, though there are frequent towns along the Florida East Coast Railroad, there are no settlements that extend more than 2 miles west of the railroad. The swamp and saw-grass marsh present an unbroken front for more than 60 miles. Not a road or permanent trail crosses this vast wilderness south of Lake Okeechobee. Not a sign of habitation, except possibly an occasional Indian hut, is found in all this 4,000,000 acres of almost impenetrable swamp. Beyond the fringe of timber, 2 to 8 miles wide along the coast, the ground is so soft and miry that a horse or ox can not walk on it. In a few places circuitous leads of shallow water were found, through which a small boat could be pushed with a pole, but they were not sufficiently connected to be of any use to an exploring party. The prospect of entering the Glades from the east side with a camp equipment and implements for doing engineering work was not inviting. The hunters and trappers who had some knowledge of the interior maintained that it was a physical impossibility to cross the Everglades except in small boats during periods of high water.

An examination of the west side of the peninsula revealed the fact that there was a large area of low, flat woods bordering the Everglades, with but a single settlement, consisting of a trading post and a mission church, located 25 miles south of Lake Okeechobee and 70 miles from Fort Myers. This settlement is commonly known as "Brown's store" or the "Glade Cross Mission."

The supplies for this settlement are brought overland from Fort Myers in wagons usually drawn by oxen. Owing to the impassable condition of the roads, or rather to the lack of roads, it takes a week to make a trip, and but half a ton of merchandise can be hauled at one load. From Brown's store north to the Caloosahatchee River the woods are comparatively open and can be crossed with horses by avoiding the numerous ponds and some of the deepest sloughs. A few miles south of Brown's store the forest is more dense and the ground so soft that a team of any kind can not be used. Some of the higher ridges in this section are inhabited by the Seminole Indians, whose number is estimated at from 500 to 700. They live by hunting and fishing, and Brown's store is their principal rendezvous. These Indians are not savage, but entertain a distrust and hatred toward any employee of the United States Government, and would render no assistance either as guides or helpers.

After considering the difficulties that had to be met in carrying on this survey, it was decided that it would be more practicable to commence operations at Fort Myers, establish a base of supplies at Brown's store, and cross the Glades from west to east. Under this

plan, if it became necessary from any cause for the field party to change its course in the interior of the Glades and come out at a point farther north or south than had been planned, means of communication and stores where supplies could be procured would be found near at hand; while if crossing from east to west, should it be impossible to land at Brown's store, there would be no means of communication near by and no supplies within a week's journey. Furthermore, the Caloosahatchee River is the only navigable outlet from Lake Okeechobee, and it seemed desirable to use it as a means of entering the lake.

ORGANIZATION AND WORK OF THE FIELD PARTIES.

In accordance with the above plan, field parties were assembled at Fort Myers in January, 1907, in charge of John T. Stewart, drainage engineer of this office; Lawrence Brett, of Kansas; E. W. Chadwick, of Pennsylvania; and Paul Funderhide, of North Dakota, being commissioned assistants. Local helpers were employed as needed, including I. S. Singletary, of Fort Myers, who served as guide during a part of the investigations. The following general instructions, setting forth the object of the investigation about to be undertaken, were issued to the party:

(1) To determine the topography of the country lying south of township 41, so as to locate proper channels to carry the overflow of Lake Okeechobee to the sea along the natural and most practicable routes.

(2) To determine approximately the extent, area, and character of the watershed of Lake Okeechobee, so as to calculate the discharge capacity of the channel or channels necessary to prevent the overflow of the lake.

(3) To determine the depth of muck and to locate the rim of the stone which encircles the lake or skirts or crosses the Everglades.

(4) To analyze the different kinds of soil found and determine their value for agriculture.

(5) Make plans and estimates of cost of a complete system of drainage.

A mean Gulf tide level was determined at Fort Myers, and a permanent bench mark was established. This was checked by a bench mark previously established by the United States Army engineers. Level party No. 1, consisting of four men in charge of Mr. Brett, with team and wagon, 9 by 9 foot tent, necessary camp equipment, and rations for 25 days, started from Fort Myers January 10 and ran a line of levels east along the Caloosahatchee Valley to Lake Hicpochee, as shown on the map. Frequent measurements were made of the river channel to determine its carrying capacity. There is a fairly good road from Fort Myers to Fort Thompson, and but little difficulty was experienced in this portion of the work; but from Fort Thompson to Lake Okeechobee there is no road, and some parts of the way were so swampy that it was difficult to transport the camp equipment. It was not possible to take the team beyond the point marked "Travers House" on the map. The men waded the swamp and continued the line in the direction of Lake Okeechobee until a point was reached where there was no slope in the surface of the water for several miles. This condition extended to the open water of Lake Okeechobee.

From the "Travers House" the line of levels was turned in a southerly direction, continuing along the edge of the flat woods skirting the Everglades to Brown's store. Side levels were run occasionally eastward into the body of the saw grass. This part of the route abounds in ponds and sloughs and no little difficulty was experienced both in running the line and in moving camp. Along the entire course from Fort Myers to Brown's store numerous bench marks were established whose description and elevations are given in the latter part of this report.

The notes of this survey show that the water level of Lake Okeechobee at that time was 20.6 feet above mean tide at Fort Myers. Turning south along the western boundary of the Everglades, at a distance of 10 miles the elevation is 20.1 feet; at 20 miles, 18.8 feet; at 23 miles, 18.2 feet; at 27 miles (at point opposite Brown's store and the beginning of a line run eastward across the Everglades), 14.2 feet, thus showing a fall of 4.6 feet toward the south in the last 7 miles of the course and also showing that the surface at this point was 6.4 feet below the surface of the water in the lake.

Level party No. 2, in charge of Paul Funderhide, with rodman and teamster, supplied with 15 days' rations, ran a level line from Fort Myers southeasterly along the trail to Brown's store. The two parties reached Brown's store about the same time, February 9, and closed the circuit of levels. The close agreement of the two lines established the accuracy of the work. This line passes over the divide between the waters of the ocean and the Gulf which, near Immokalee, reaches an elevation of about 38 feet. Two of the men were sick and had to return to Fort Myers with the team that brought out supplies, and another was so affected by rheumatism that he could hardly walk.

LAND CONDITIONS WEST OF THE EVERGLADES.

While the two level parties were running the lines described above, John T. Stewart, in addition to sending supplies from Fort Myers to Brown's store, made an examination of the country between these two points and also of that on the west side of the Everglades from the Caloosahatchee River to a point 14 miles south of Brown's store. He was accompanied by I. S. Singletary, a guide, timber estimator, and surveyor, the trips being made in a light 2-horse wagon.

The following definitions of the terms commonly used in describing the vegetation peculiar to Florida in and about the Everglades are taken from I. S. Singletary's notes. They are essential to a clear understanding of the condition of the country as given in this report.

Pine timber land.—"Flat wood" or "slash pine," the trees being tall and straight, 80 feet high and sometimes 4 feet in diameter. The pine forests are interspersed with flag ponds and long open sloughs. The soil is sandy and in some cases rocky and is usually dry when other land is covered by water.

Cypress timber land.—This is true swamp and is covered with water the greater part of the time. The soil is largely muck, but outcroppings of sand and rock occur. The trees are draped with gray moss.

Prairie.—The Florida prairie is open flat land covered with wire grass, saw grass, saw palmetto, and sometimes dotted with thickets and pine islands.

Saw palmetto beds.—The saw palmetto is an unusual and characteristic growth of the drier lands. It is common in the pine lands and on the prairies where a slight elevation occurs. It consists of clumps of fanlike leaves which may attain a height of 6 feet but usually not more than 3 feet. The fans shoot out from large root stocks 5 or more inches in diameter, which creep along on the surface, sometimes reaching a length of 9 feet.

Pine islands.—These are isolated clumps of pine timber ranging in size from a few trees to many hundred acres, and are scattered throughout the prairie and cypress country. They indicate a dry and sandy soil.

Cypress heads.—Like pine islands, cypress also appears in isolated clumps, but these heads always indicate low, wet ground, which is usually covered with water during the entire year.

Hammocks.—A hammock is distinguished by its growth of hardwood trees and a noticeable absence of pine. It is usually a little higher than the surrounding land and possesses a dark sandy soil.

Ponds.—These are depressions which are filled with water during the rainy season and support a luxurious growth of vegetation. They are usually designated by the vegetation which is most prominent.

(1) Saw-grass ponds. The grass is found growing from 2 to 12 feet high in either muck or marl land. It has a saw-tooth edge and is often so rank and thick as to be impenetrable.

(2) Pop-ash ponds. These are low, containing as much as 2 feet of water in the summer. The pop ash is a low scrubby tree seldom growing higher than 25 feet. It grows in clusters, 12 or more stems often coming from a single root.

(3) Flag ponds. In these grow the "fire flag," a kind of lily, which reaches a height of 10 feet, and has a leaf similar to the banana plant; also the "lily flag," which is found in both sand and muck soils, and resembles the stiff-stemmed lily of the north.

(4) Maiden-cane ponds. The bottom of these ponds is usually white sand. The cane is a tall, slim, graceful grass, which grows from 2 to 6 feet high. Good drinking water may always be found in these ponds at a depth of a few feet.

A brief description of the country traversed by the trail followed by level party No. 2 from Fort Myers to Brown's store is important as showing the relation of its topography and vegetation to that of the Everglades.

From Fort Myers for a distance of 32 miles the land is sandy and the woods are sufficiently open to permit a view for a half mile in any direction. At Immokalee is a hammock covered with hardwood trees, the surface being 38 feet above sea level and the highest point on the route. It is estimated that about one-fourth of the land is open prairie and the whole is diversified by sloughs and an occasional lake. Cypress heads are found in the deeper channels. The course of drainage in the sloughs is southward, the fall of the surface from Immokalee southeasterly to the Everglades at Brown's store being 23 feet.

Passing from Brown's store south for about 14 miles through alternate prairies and cypress swamp the "Big Cypress" was reached. This was so soft and boggy that a horse could not be driven over it. At this point the water from the Everglades breaks over toward the west into the "Big Cypress." North of this point the alternate

sloughs and ridges parallel the border of the Everglades in such a manner as to prevent the drainage of the country from entering the Everglades except during times of excessively high water.

THE SURVEY ACROSS THE EVERGLADES.

An important part of this investigation was to extend a level line across the Everglades in order to ascertain the elevation of representative points in the interior, to learn the character of the vegetation and soil, and particularly the depth of the muck to the underlying rock. As previously stated, the elevation of a point at Brown's store had been checked by two lines of levels. Of the two parties which had run the levels only a sufficient number remained to equip one. Mr. Stewart placed Lawrence Brett in charge, with E. W. Chadwick and Paul Funderhide as assistant engineers, and Bob McCloud and Rob Allen, of Fort Myers, and S. A. Anderson, of Miami, as boatmen and general helpers. The following account of the equipment used and progress made in running a line of levels directly west across the Everglades from Brown's store is taken from Mr. Brett's notes:

As boats are necessary for travel and transportation of equipment in the Everglades, three Indian canoes were secured at Brown's store. These were "dugouts" made from cypress logs, being from 14 to 20 feet long and 16 to 30 inches wide, and were poled along by a man standing in the stern. It can readily be seen that it required considerable practice to navigate these successfully through the narrow and tortuous leads through the saw grass. They were of light draft, however, and well suited to the work. A most meager camp outfit was carried. One 9 by 12 feet tent fly sufficed for the party, and in addition each man had his own roll of bedding, consisting of a small comfort, a double blanket, and that necessary adjunct, a mosquito bar. These latter were of box shape, with heavy muslin tops and sides of cheese cloth, sufficiently long to tuck under the blankets and prevent the intrusion of insects, frogs, and occasional snakes. As no wood is obtainable in the western part of the Glades, a 2-burner oil stove was used, making it necessary to carry a considerable amount of oil. The rations consisted of such staples as rice, bacon, ham, corn meal, sugar, coffee, and a few canned goods.

The surveying outfit comprised a Y level equipped with standia wires, several prismatic compasses, and a pair of field glasses. The regular level tripod was soon found too short for use in the soft, mucky soil; so seasoned cypress poles, 9 feet long, were substituted for the regular legs.

An experimental trip was first made by running a line of levels for 8 miles into the Glades. Finally, on Monday, February 18, all but one of the party left Brown's store with the hope of carrying the line at least to the center of the Glades. The bench mark, where the line had formerly ended, was reached by a day's trip, and the next morning the line of levels was once more taken up. The mean depth of the muck was nearly 6 feet and the saw-grass strands made very rough traveling, thus making it very difficult for the supply boats to keep up with the level party.

The daily routine was as follows: On breaking camp in the morning the level party would start from their turning point, which was a 6-foot steel pipe, with an extra joint for emergencies. This could be pushed through the soft muck to the solid sand or rock beneath and gave for each location the depths of both surface water and muck and the elevation above sea level of the sand or rock bottom. Fire was employed to clear the path for the instrument men, for the growth on the saw-grass strands with its accumulation of dead grass was so dense in some places as to form an impassable barrier. The saw grass, being of cellular structure, explodes when burning, so that when large bodies of it are burned the sound of the many reports may be heard for miles and the densely black smoke given off may be seen a great distance. The Indians at the mission kept track of the daily progress of the party by this smoke or "sign," as it is locally called.

After the first 10 miles the wide saw-grass strands caused much labor, as the boats had to be dragged one at a time from one lead to another. This work often took the united effort of the entire crew, thus, of course, much delaying the instrument work. As these leads run generally north and south it would have been much easier to run the line in that direction. Usually at 4 o'clock in the afternoon the whole party prepared camp for the night. A pile of saw grass about 9 feet wide by 12 feet long was made, using scythes to cut the grass. When the pile was sufficiently high the

tent fly was spread over it and the mosquito bars were hung from horizontal poles which were lashed to the boat poles stuck upright in the muck. These camps were known as "gator nests," from their resemblance to the original. It took four members of the party to make camp while the others were preparing supper. The oil stove proved difficult to handle in the steady trade winds which sweep across the Everglades, consequently the cooking was none too elaborate. The only bread it was possible to make was a thick flour pancake. Coffee, bacon, and rice were easily prepared, and the monotony of the last two articles was varied by substituting at times ham and grits. If sundown came before supper was finished it was necessary to complete the repast in bed, as the mosquitoes made any other location untenable.

When the line had been continued for 18 miles from Brown's store the oil gave out, so the entire party returned to the mission for oil and supplies, taking three days for the trip. As the water in the Glades was lowering rapidly, on March 4 a new start was made with three canoes heavily loaded with supplies, and on the evening of March 6 the bench mark was reached, and early the next day the line to the east was continued. On the evening of March 11 the middle of the Everglades was reached, and the water in the leads and shallow ponds gave out. A large area of nearly dry land was encountered, so after a day had been spent in exploring north, south, and east from the line, with no trace of water except to the west, the boats had to be abandoned. Another day was spent in preparing for the new mode of travel. All the remaining flour was fried into hard cakes, the rice, bacon, coffee, and sugar were placed in cloth bags, about two-thirds of the personal belongings and bedding was discarded, and the tent fly was cut up to make pack straps. Each man carried his own bedding and a portion of the rations and surveying equipment. The levelmen and rodmen carried their shares as rolls, while the others made shoulder packs. The average weight of each pack was 75 pounds.

For two days splendid progress was made, as the saw-grass strands were much more solid than previously. Drinking water was obtained by digging holes with the hands, sometimes a foot deep, and the way was cleared by keeping fires burning almost continually. The next day, March 16, the nature of the Glades again greatly changed, the leads becoming deeper and in many places very soft and boggy in the bottom. The saw-grass strands were also grown up with myrtle bushes, which, from a distance, gave the impression of a low line of timber. About noon a small hammock or willow head was reached. The tallest trees, about 15 feet high, were climbed, and all the party were convinced that they saw the timber on the east coast. "Hellelujah Hammock" was the name given to the place as indicative of the feelings of the party, and a flag was hoisted bearing the inscription "U. S. Department of Agriculture," as well as the names of the members of the party. Notes were also left on the trees for the benefit of later comers. In the afternoon very slow progress was made and a terrific thunder and wind storm caught the party with no camp made, so the supper consisted of some of the fried cakes. At 7.30 o'clock that same night the spirits of the party were once more raised upon discovering the flash of a searchlight against the black clouds, and on examining the map it was concluded that the flash came from some ocean vessel in the vicinity of Miami. The next day was St. Patrick's Day, as well as Sunday, and the leads were so deep and the men so hampered with their loads that but a half mile's progress was made in the afternoon. That night an inventory disclosed the fact that, even by cutting each man's rations in two, there was only food enough left for two days. It was therefore imperative to abandon the line for the time being and get to the east coast as quickly as possible. Most of the equipment was left on a pile of saw grass, covered by an oileloth, and early the next morning the party pushed on, each carrying only his mosquito bar, blankets, and rations. The long-continued work in the water had scalded all the men's feet, and the many wounds and scratches from the saw grass had become poisoned from the various water plants and exposure, so the whole party were seriously crippled. Two days were spent in reaching the edge of the Glades, and on March 20 the breakfastless party left the Glades and continued east through the cypress and pine woods until they reached a road which brought them to Pompano at 1.30 o'clock in the afternoon. The greater part of the next week was spent in eating, sleeping, and curing the injured feet and wounds. Five and six meals per day was a not uncommon program, as the exertions and privations of the party had been extreme.

A new outfit having been procured, a new start was made on March 26 from Fort Lauderdale, following the north fork of the New River into the Glades. The party, consisting of Brett, Funderhide, McCloud, and John Ashley, was equipped with two canoes and supplied for 10 days. Five days were spent in reaching the point where the line had been abandoned, as, on account of the canoes, much zigzagging north and south was necessary in order to make the few miles toward the west. On Easter Sunday the line was continued, and at noon of April 4 the edge of the Glades was reached and the line tied to a bench mark set by Chadwick and Rob Allen, who had remained in order to bring the tide elevation of the Atlantic to this point.

As may be surmised from the above, many difficulties and dangers were encountered, but, although there were narrow escapes from the numerous snakes, and some alligators were encountered, and uncontrolled fires often became very threatening, still none of the party was seriously injured or ill. During the 52 days occupied in running this, the first line of accurate levels through the heart of the Everglades from the Gulf to the Atlantic, the greatest loyalty, perseverance, and endurance was shown by every member of the party, and much valuable data of an engineering nature was secured. As the men were worn out from their arduous task, it was decided to discontinue the work till another season.

Reviewing the course of the survey party for a record of further details, some interesting and valuable facts should be noted. The season was more than usually dry, as indicated by the constant lowering of the water as the line was pushed across the expanse of the Glades. A profile of the level line across the State beginning at tide level at Fort Myers and extending to Brown's store and thence east across the Everglades to tidewater on the Atlantic coast is shown on Plate II, figure 1. A representative section of the Glades is shown on Plate III, in which the relation of the surface and underlying sand or rock appears.

The following condensed statement represents the prominent characteristics of the country as given in the notes of Mr. Stewart and Mr. Brett:

Elevations southeasterly from Fort Myers to Brown's store.

	Feet.
Sea level at Fort Myers	0.0
General surface, 3 miles southeasterly	19.9
General surface, 12 miles southeasterly	27.7
General surface, 20 miles southeasterly	30.7
General surface, 25 miles southeasterly	25.0
General surface, at Immokalee	37.7
Water surface of Lake Trafford	20.0
High-water mark, Lake Trafford	22.0
General surface, 6 miles east of Immokalee	28.0
Water surface of Okaloacoochee slough	25.3
Surface of land near Okaloacoochee slough	27.0
Surface near Rock Lake	24.0
Water surface of lake	21.0
Surface, 8 miles southeasterly from Rock Lake	21.0
Surface, 4 miles west of Brown's store	17.7
Surface, 1 mile west of Brown's store	17.0
Extreme high-water mark of Everglades at Brown's store	16.3
General surface of muck at Brown's store	14.6

Elevations across the Everglades east from Brown's store.

	Feet.
Surface of muck, 5 miles east of Brown's store	14.0
Surface of muck, 20 miles east of Brown's store	13.0
Surface of rock, 20 miles east of Brown's store	8.0
Surface of muck, 30 miles east of Brown's store	12.6
Surface of rock, 30 miles east of Brown's store	8.0
Surface of muck, 40 miles east of Brown's store	11.6
Surface of rock, 40 miles east of Brown's store	10.0
Ridge at Osceola's Camp	18.7
Surface, 4 miles west of Pompano	12.3
Surface, at Pompano	11.0
Low tide at Fort Lauderdale (one observation)	.6

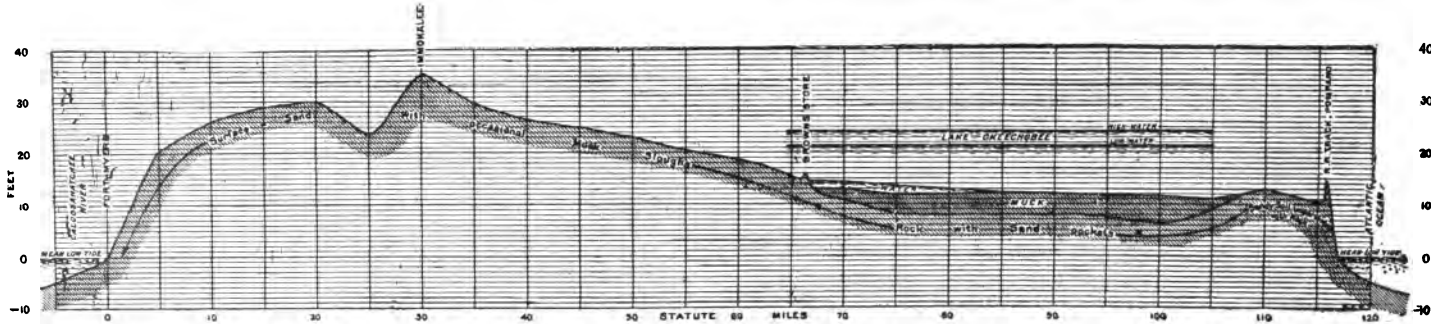


FIG. 1.—CONDENSED PROFILE, FORT MYERS TO POMPANO, FLA.; CROSSING THE EVERGLADES.

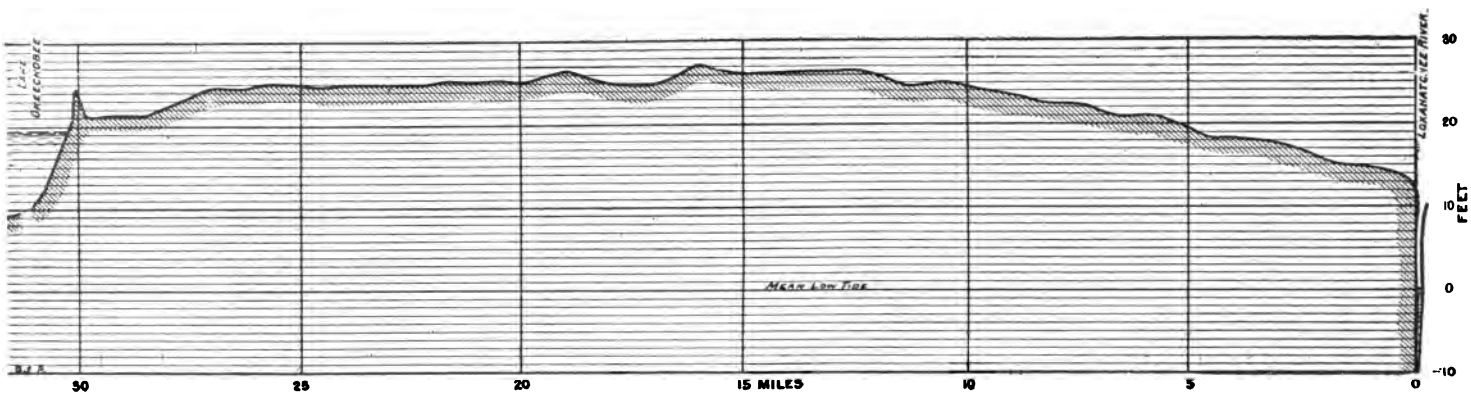
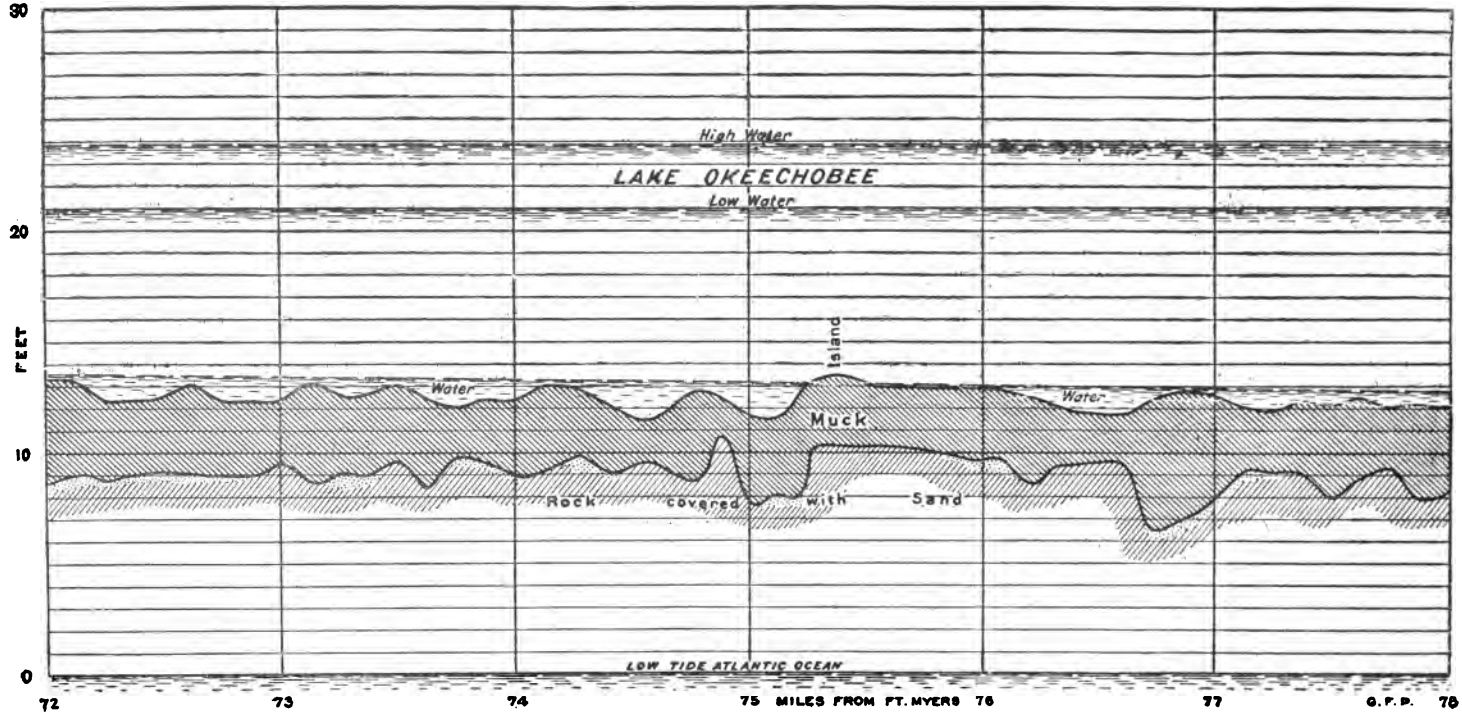


FIG. 2.—PROFILE ALONG SURVEYED LINES FROM LOXAHATCHEE RIVER TO LAKE OKEECHOBEE, FLORIDA.

PLATE II.



CHARACTERISTIC PROFILE OF PORTION OF SURVEYED LINE THROUGH THE EVERGLADES, FLORIDA.

PLATE III.

The depth of the muck along this line varies from 1 to 6 feet, averaging possibly about 4½ feet. The top soil is a turf composed largely of grass roots, except in the leads and shallow basins, where the saw grass does not grow. Here the vegetation is more completely decayed and is so loose when saturated with water that the pedestrian sinks to the bottom sand or rock. The "leads" filled with water and lilies alternating with saw grass give a deceptive undulating appearance as one looks across the expanse, though, as will be noted, the slope easterly in a distance of 40 miles is only 32 inches. Scattered at random throughout the saw-grass marsh, but more particularly near the eastern edge, there are small islands or portions of the surface which are elevated slightly above the marsh level. At these places the sand or rock is usually found near the surface. They are covered with a growth of scrub bushes with occasionally a clump of pines or cypress trees. The combined area of such islands, however, is insignificant, being probably less than one-half of 1 per cent of the entire saw-grass marsh.

The people of southern Florida speak of the "upper and lower" Glades, the former term being applied in general to the marsh between Okeechobee and the north line of township 51 and the latter to the territory south of that line. This division is shown on the map, though there is in reality no defined line between the two. There is but little soil on the rock in the lower Glades, and the saw grass is less dense than in the upper Glades. The upper Glades, covering approximately 2,000,000 acres, have the deeper muck and much the greater agricultural possibilities. The State dredges which were found working near Fort Lauderdale uncovered numerous salt-water shells in the sand at a depth of 13 feet below the surface. There are water trails through the Everglades well known to the Seminole Indians, who frequently traverse them in their dugout canoes during periods of high water. They rarely penetrate the saw grass of the interior, but confine themselves principally to the islands and the timbered edges of the Glades and the water leads through which they make their way to the east coast when in need of supplies.

The results of the few months' work may be briefly outlined as follows: A line of levels had been run across the State, and the depth of the muck along the line where it crossed the Everglades had been determined by soundings taken along its entire length. A fall of 2.7 feet had been found from west to east across the Everglades. The surface along a line 30 miles south of Lake Okeechobee is 9 feet lower than the ordinary stage of the water in the lake and 11.6 feet above sea level. The rock rim on the east side of the Glades is from 5 to 7 feet higher than the surface of the Everglades. The high-water level of the lake is 22 feet above tide. The Everglades lie high enough above the sea to admit of drainage by gravity. The surface of the upper Glades slopes southeasterly. The overflow from Lake Okeechobee floods the Everglades except in the dry season of the year.

A portion of the water in the southwestern part of the upper Glades flows southwesterly through the Big Cypress Swamp and thence to the Gulf.

INVESTIGATIONS DURING THE WINTER OF 1907–8.

Examinations so far had shown that Lake Okeechobee would be a controlling factor in any plan that might be developed for draining the Everglades. The water of the lake should be so controlled that it would not overflow along the south border and flood the marsh land, as now happens each year.

The fact was recognized that if the surface of the lake should be permanently lowered 4 or 5 feet a considerable zone of land adjoining the lake shore would be favorably affected. The shortest line from the lake to the ocean, that easterly to the Atlantic, had not been examined. The investigations which it now appeared wise to make were:

(1) To ascertain by a line of levels and by soundings the feasibility of a drainage channel from the lake easterly to the Atlantic coast.

(2) To estimate the probable effect of lowering the lake upon the lands which immediately border it and also to determine the character of this land.

(3) To canvass the feasibility of improving the Caloosahatchee River and making it a more complete outlet for the lake westerly into the Gulf.

With the purpose of pursuing investigations along these lines Mr. Lawrence Brett and party began the investigation of a line from Palm Beach northerly and westerly to the lake.

A sea-level bench mark was established and levels were run along possible outlet lines, entering the lake at the point on the southeastern coast of the lake. This line is 30¼ miles long and is the shortest route from the lake to tidewater. No rock was encountered on this line, and the highest point, 27 feet above tide, is shown on Plate II, Figure 2.

EXAMINATION OF LAKE OKEECHOBEE.

In order to facilitate the examination of the lake, the Board of Internal Improvement Fund furnished a gasoline launch with attendant, which started with the party from Fort Myers the latter part of March, 1908.

The only means of getting into Lake Okeechobee is by way of the Caloosahatchee River and the connecting canals. At the time the party went into the lake the upper river was very low and much difficulty was experienced in getting a boat of 13-feet beam and drawing 26 inches of water up this stream. There was a good stage of water from Fort Myers to Labelle, and this portion of the journey was made in 1 day, while it required 15 days of hard work to complete the remainder of the journey to the lake.

At Fort Thompson the river cuts its way through a rock ledge which comes to the surface and extends a long distance both north and south. At low-water stage the rapids here are very swift and there is a fall of about 3 feet in one-fourth of a mile. It was necessary to build a dam in order to get the boat over these rapids. About one-half a mile above the rapids is Lake Flirt, a large shallow body of water whose average depth is not over 3 feet during the rainy season. The bed of the lake has been filled by sedimentation and the growth of aquatic plants. It became necessary to turn the boat around and cut a channel through the vegetation and sediment with

the propeller in order to effect a passage. This required much time and patience, but was the only means by which the boat could be taken through the lake. A canal known as the Wood Yard Canal is cut through the upper end of the lake for a distance of about 3 miles. This canal was originally 50 feet wide and 6 feet deep. It is filled with sediment until it now has a cross section at low water of about 3 by 10 feet. Above this canal is upper Lake Flirt, very shallow and having no definite channel for navigation. Above Lake Flirt there are 2 miles of canal 60 feet wide by 5 feet deep, but grown full of reeds and aquatic plants. Bonnet Lake lies between this canal and the upper Caloosahatchee River. It, too, like Lake Flirt, is shallow and filled with sand and vegetation, which greatly impedes navigation. From the upper Caloosahatchee the Reedy Canal, 60 feet wide by 7 feet deep, leads to Lake Hicpochee.

This canal is in fair condition, but its bed is covered with weeds and moss, which wrapped around the shaft of the propeller and made it frequently necessary for one of the party to climb overboard and dive under the boat and clean the wheel. From Lake Hicpochee to Lake Okeechobee there are two canals. The northern one, known as the "Three-mile Canal," is the one usually traveled; the southern one, the "Nine-mile Canal," is badly grown up with hyacinth and water lettuce, and at most seasons of the year is almost impassable, even for a small canoe. With the exception of a few temporary fish camps around the borders of the lake, its shore is absolutely uninhabited, and it is said to be the loneliest body of water in the United States. The only industry around the lake is the fish trade. Catfish are caught in nets in great abundance, carried to Fort Myers, and shipped from that point to St. Louis and other inland towns. The fish boats furnish the only means of communication between Lake Okeechobee and Fort Myers. Above Fort Thompson there is no settler except Mr. Woodhull, a fisherman, who has a camp on the bank of the Three-mile Canal near the lake.

Lake Okeechobee is circular in shape, about 30 miles in diameter, and is the largest fresh-water lake wholly within the United States, except Lake Michigan. At mean level it contains an area of 468,860 acres. At high stage its surface is about 22 feet above tide level, and at low stage about 19. The lake is quite shallow, the deepest places not exceeding 22 feet at low water, and the average depth being about 12 feet. In the southern portion it contains several islands, some of which are 2 or 3 miles in extent, very low and swampy, and covered with a dense growth of custard apple, scrub oak, myrtle, and in some places a few cypress, all interwoven with a network of vines.

The shores of Lake Okeechobee are not well defined, except on the east coast, where there is a stretch of 25 miles of sandy beach, with well-defined banks. The rest of the coast line is flat and marshy and is covered with a thick growth of vegetation. As the lake rises its waters inundate this flat country and the shore line moves out, in places several miles, so that the area of the lake is much greater at high than at low water. Even the bed of the lake on the south and west side is covered with a growth of aquatic plants that impedes the progress of a boat and in some places makes navigation impossible. The bed of the lake, except in the southern part, is a fine, hard sand, and presents a comparatively smooth and even surface. The soundings disclose no deep holes or channels,

and no rock is found except in the vicinity of Chancy Bay. The lake has no tide, but its surface is easily affected by the wind, and it is not uncommon to find the water at least 1 foot higher on one side than the other, due wholly to the influence of wind pressure. The water in the lake, when not agitated, is clear and wholesome, and is regarded by hunters and fishermen, who frequent the lake, as extremely healthful. Until within recent years this lake had no well-defined outlet to the sea, but during the rainy season its water rose to an elevation of about 21 feet, when it commenced to overflow its banks from the mouth of Fish Eating Creek on the west, around the south side, to a point on the east several miles north of Pelican Lake, a distance of probably 70 miles. With such width of overflow, it matters not how hard it might rain, it would be impossible for the lake to reach a higher level than 22.5 feet.

At the southern end of the lake there are half a dozen streams varying from one-quarter of a mile to a mile in length which flow out into the saw grass of the Everglades and gradually subdivide until they disappear. During the dry season, when the lake is low, the water from these streams flows into the lake. From the south shore of the lake is a canal known as "South Canal," which extends 13 miles into the heart of the Glades. At periods of high water the lake overflows through all these channels on the south side and spreads its waters over the vast area of saw-grass marsh.

About 1884 a canal 70 feet wide and 6 feet deep was completed from the Caloosahatchee River at Fort Thompson up through Lake Flirt, Bonnet Lake, and Lake Hicpochee, making a direct and well-defined channel into the lake. During the period of high water this channel furnishes a good stage for navigation, but during the dry season, when the surface of the lake is lowered to an elevation of 20 feet or less, there is not enough water in these canals to make a boating stage for anything but small gasoline launches.

Since these canals have been cut and the current of the water turned into the Caloosahatchee River, it has overflowed its banks below Fort Thompson, doing great injury to the orange and grapefruit groves that line the banks of this stream on both sides for many miles. In order to lessen or prevent this overflow, a fund was raised by the interested parties and a dam constructed across the canal at the west end of Lake Hicpochee. This interfered with the navigation of the stream and it was destroyed by parties who opposed the work.

THE COUNTRY SURROUNDING LAKE OKEECHOBEE.

The flat woods are found east of the Kissimmee River and Lake Okeechobee, extending from the north line of the watershed to the Hillsboro River in township 47, and on the west side cover a greater part of Polk, De Soto, and Lee Counties. This scope of flat pine land is by no means all covered with timber. It is crossed at random by numerous sloughs and marshes a mile or more in width and is dotted here and there with ponds in which are no trees, and in many places there are broad stretches of sedge and wire-grass prairie. The combined area of these open stretches is probably 40 per cent of the entire area herein designated as "flat woods." The pine trees are not thick on the ground except in a few places. They average about 15 inches in diameter, are from 60 to 100 feet tall, and contain a great deal of

pitch, which is objectionable in lumber. They make excellent piles and yield large quantities of turpentine. The soil of the pine land is sandy and as a rule is dry when the rest of the country is under water, so that the occurrence of pine is looked upon as an indication of high land, but even such land in a rainy season is covered with water many inches deep. A large percentage of the pine woods is covered with saw-palmetto beds which choke out every other form of vegetation. The palmetto bed is no indication of good soil; and the plant, so far as known, has no use.

That portion of the pine woods not covered with palmetto beds produces a growth of wire grass and sedge which makes fair grazing for cattle. If the palmetto could be killed out the value of the flat woods for grazing would be greatly increased, but as it withstands both dry and wet weather much better than the grasses it is apparently on the increase. In some places crossing the flat woods there are sloughs or depressions, more or less connected, a little lower than the adjacent country, in which is found an alluvial soil underlaid with clay. This land is frequently covered with small cypress or a dense undergrowth of vines and small trees. The copious rainfall of the wet season drenches the entire land, and every depression, little or big, becomes a natural reservoir, storing up the water in quantities, which frequently last throughout the year. Here and there in these pools is found a luxuriant growth of grasses, whose growth and decay through centuries has formed in the bottom of the ponds a deposit of rich muck. The different species of grasses do not flourish together, so each has occupied certain ponds exclusively. These ponds are designated locally by the kind of vegetation growing in them, as saw-grass pond, lily pond, flag pond, and maiden-cane pond. They are numerous, but not large, and the soil in them appears to be fertile.

The sedge and wire-grass prairies are most extensive north and west of Lake Okeechobee, often extending for 20 or 30 miles, unbroken except by a few scattering pines, but in which occur frequent beds of saw palmetto. These prairies have a smooth surface, are apparently perfectly level, and during the rainy season are covered many inches deep with water. The soil is usually a white sand with occasional spots of loam. There are prairies of the same kind scattered throughout the woods on the east side of Lake Okeechobee. Some attempts have been made to cultivate some of them, but owing to the lack of drainage the crops have been destroyed during the wet season and most of the projects undertaken have been abandoned. An inspection was made of a piece of this kind of land in cultivation about 8 miles west of Lantana on the east coast. It was surrounded by an embankment to keep out the water and by using plenty of commercial fertilizer produced good crops of tomatoes, but there was no provision made for pumping the water out from within the embankment, so when the rainy season came on the field was a pond instead of a vegetable garden.

The most prominent of the streams which enter the lake on the north is the Kissimmee River, which has a valley 4 to 12 miles wide covered with saw grass, which grows luxuriantly on a deep muck soil. The channel is bordered by a growth of willows, pop ash, scrub oak, custard apple, and myrtle. It winds back and forth across the valley in a tortuous course, the distance in direct line between Lake Kissim-

mee and Lake Okeechobee being 60 miles, while the boat must pass a distance of 150 miles in going from one lake to the other. The level of the river even at low water is nearly the same as the surface of the muck lands bordering it, while during the rainy season the entire valley becomes a lake. This river, with Fish Eating Creek from the northwest and numerous smaller streams from the northeast, bring to the lake vast volumes of water during the rainy season, which is from June to October. This lake, having no adequate outlet, discharges its surplus water over the south border into the Everglades through the small fanlike channels before described. Thence the water passes slowly through the "leads" and vegetation of the marsh until it reaches the sea.

METHODS OF DRAINING THE EVERGLADES.

From an analysis of the existing conditions it is clear that in order to reclaim the Everglades as a whole it will be necessary to control the level of the water in Lake Okeechobee. A narrow strip along the east edge of the Everglades could probably be reclaimed in parcels by building a substantial embankment on the western border of a tract and cutting drainage ditches into the small streams that flow into the Atlantic Ocean, but this plan would not accomplish the reclamation of that part of the Everglades adjacent to Lake Okeechobee, which is considered the most fertile and valuable land. This part in particular must be protected from the overflow of Okeechobee if it is to be utilized for agriculture.

It has been claimed by some explorers that the lake is fed by subterranean streams or large springs, and for that reason its overflow can not be controlled or regulated. A thorough examination at low water failed to disclose any such sources of supply. If there be any, they are so small that they have no appreciable effect on the level of the lake. The height to which the lake rises depends entirely upon the amount and intensity of the rainfall over its watershed and its stage of water at the beginning of the rainy season.

The drainage of the Everglades involves the consideration of two problems:

First. The best means of controlling the water in Lake Okeechobee, so that it will not overflow its banks during the rainy season and yet will retain sufficient water to irrigate the lands when needed, and also to maintain a sufficient stage of water in the outlet canals for navigation.

Second. To provide adequate and proper drainage for the lands when protected from the overflow of the lake.

Both are equally important and merit careful and critical consideration.

Two plans have been proposed for preventing the overflow of Lake Okeechobee. One is to build a levee from the highland on the west around the south shore to the high bank on the east, and thus impound or hold back the rainfall during the wet season, and the other is to construct one or more canals from Lake Okeechobee to the Atlantic Ocean and to the Gulf of Mexico, and discharge sufficient water in this manner to prevent the lake from overflowing its banks.

The first plan is open to many serious objections. Owing to the depth of muck, which ranges from 8 to 14 feet along the south mar-

gin of the lake, and the absence of suitable material along the line of the proposed levee with which to build it, its construction would be very expensive. The muck might be removed by dredges and solid material hauled in from the pine woods, and a levee constructed, but this would necessitate the building of a trestle to support a track on which to bring in the material, which, together with the expensive methods of handling, would make the cost prohibitive.

The lake in its present condition does not rise to a higher stage than 22½ feet above sea level, because the lake then overflows its banks along the entire south shore. If its waters were confined by the levee it would reach a greater height, probably 25 or 26 feet. A levee to hold back this head of water and be strong enough to withstand the action of the wind and waves should be at least 3 feet above any possible level the lake might attain. Assuming 25 feet above sea level to be the maximum height of the lake, the top of the levee should be at least 28 feet to have a reasonable margin for safety. The elevation of the muck is approximately 22 feet above sea level and its average depth along the line of the proposed levee 12 feet. Under these conditions a levee to hold back the water of the lake should be at least 18 feet high, with a 3-to-1 slope on the shore side and a 2-to-1 on the land side. Such a levee would contain 190,080 cubic yards per mile, and, at the current prices for such work, including the excavation of the muck channel, building trestle for track, and loading and transporting suitable material, would cost at least 35 cents per cubic yard. This estimate makes the cost of the levee $66,528 per mile and the cost of 80 miles $5,302,240. In addition to the enormous cost this plan has other objections. It would back the water up on the opposite side of the lake and impair the drainage of a large area of land, some of which can be reclaimed and made fit for agriculture. Nor does it provide for water transportation across the State, which is a matter of no little importance.

The character of the soil in the Everglades is such that a constant supply of moisture is required to support and mature plants. During the winter and spring months the precipitation in southern Florida is not sufficient to supply the need of growing crops if the ground water is too far removed. In order to develop the fertility of the Everglades and make them sufficiently productive, water should be stored in Lake Okeechobee to supply the deficiency to the land during the dry period and provision should be made to remove the excess water so as to prevent overflow. This can best be accomplished by a system of outlet canals, provided at the upper end with gates, to regulate the flow of water into them.

The watershed drained by Lake Okeechobee, including the area of the lake, is approximately 4,000,000 acres. There is no authentic record of the rainfall in this area except at Kissimmee, in the northern portion, but it will be safe to assume that the rainfall at this station represents fairly accurately that of the entire watershed. The average annual rainfall at Kissimmee for the past nine years was 53 inches (see table, p. 146), with a minimum of 40.22 inches in 1902 and a maximum of 70.92 inches in 1899. This amount of rainfall is not uniformly distributed throughout the year, but is excessive during the summer and fall, often exceeding 12 inches in a single month. In the months of July and August, 1905, the total rainfall recorded at Kissimmee was 27.95 inches. During the same period there were

but 20 inches at Jupiter, 24 inches at Fort Myers, and 25 inches at Miami. This would seem to indicate that the rain at Kissimmee was due to some local influence, and that probably the rainfall over the entire drainage area for that time did not exceed 26 inches. As a fall of 26 inches in any other two consecutive months is the nearest approach to this amount, it is safe to conclude that 26 inches in two successive months is an extraordinary rainfall, not likely to occur except at rare intervals. Since a rainfall of 18 to 22 inches in two consecutive months has occurred three times during the last decade, we may reasonably expect the same amount in the future. In order to have a fair margin of safety, it will be assumed in these considerations that the maximum rainfall upon the entire watershed in two consecutive months is 24 inches.

EVAPORATION.

Rainfall disappears in two forms: (1) Run-off or free water which flows away in streams, and (2) evaporation, which includes water taken up by growing plants as well as that which passes into the atmosphere as vapor.

No observations have been made in southern Florida to determine the loss by evaporation in that latitude. Careful experiments, however, have been carried on in some of the Northern States, in the arid West, and in Europe to determine what percentage of the rainfall is run-off and what percentage is evaporation. While the results obtained vary with the local conditions, some general laws have been established by these experiments from which we may deduce fairly accurate conclusions. The most complete as well as the best-known series of observations on the evaporation from the surface of the soil are those made by Gilbert and Lawes at Rothamstead, England, 1870 to 1890. The English experiments show that in June, July, August, and September 76 per cent of the total rainfall during these months was removed by evaporation. Prof. E. F. Ladd, of the Agricultural College at Fargo, N. Dak., conducted a series of experiments in 1902 to 1905 to determine the loss by evaporation from a water surface. The average daily evaporation as shown by his report is as follows: May, 0.17; June, 0.21; July, 0.26; August, 0.24; and September, 0.11 inch.

The Croton River watershed in New York for a period of 32 years shows a mean annual evaporation of 25.74 inches, or 53 per cent of the rainfall, the greater portion of this evaporation occurring during the months of June, July, August, and September. At least 70 per cent of the total rainfall during these months is evaporated.

The volume of water which is taken up by vegetation during the growing season is large. Prof. F. H. King showed in experiments at Madison, Wis., which were made to determine the amount of water required to produce a pound of vegetable dry matter, that some crops use water equivalent to 25 inches of rainfall in the growing season.

Experiments made at Emdrup, Denmark, and quoted by J. T. Fanning,[1] show the following relative evaporation from water and long grass as determined by observations during a period of 10 years:

[1] Hydraulic and Water Supply Engineering, by J. T. Fanning.

From water surface, mean for June and July, 10.5 inches; from long grass, mean for June and July, 17 inches.

Mr. Fanning quotes experiments made in Lancashire, England, and at Whitehaven, England, to determine the evaporation from bare earth. At the former place the amount in June and July was 7.8 inches, and at the latter 8.3 inches.

A study of the details of numerous experiments of this character leads to the conclusion that where the surface is wet or covered with water, or with dense vegetation, and where the temperature is high—80° to 95° F.—and the percentage of humidity is less than 85, the conditions are favorable for a high rate of evaporation. It also shows that the evaporation from land covered with dense, short vegetation is much greater than from a water surface or from bare earth.

Reference has been made to the foregoing data for the purpose of showing the importance of evaporation as a factor in the drainage problem rather than of furnishing a specific guide in estimating the evaporation from the watershed of Lake Okeechobee.

Turning to the area under consideration, during the months of July and August, 1905, when 28 inches of rain fell at Kissimmee (see table, p. 146), the following conditions prevailed over the peninsula of Florida: The ground was either saturated or covered with water. The mean temperature was 79° F., the average wind velocity 8.5 miles per hour, and the humidity of the atmosphere 82 per cent. Under this condition of the atmosphere, and a dense vegetation covering a large part of the area, the evaporation was at least 0.3 inch per day during the entire period. This would be 9 inches per month, or 75 per cent of the rainfall for the months of July and August, which passed off as evaporation from the watershed of Lake Okeechobee.

RUN-OFF.

The difference between rainfall and evaporation is the run-off or drainage that must be provided for. It is estimated that the maximum rainfall that is likely to occur in July and August is 24 inches, or a mean daily precipitation of 0.387 inch. The difference between this amount and 0.3 inch, the estimated amount of evaporation, is 0.087 inch, which is the estimated mean daily run-off from the entire watershed.

The effect of the run-off from the land into the lake will be as follows: The land surface which discharges its run-off into the lake is seven and one-half times the area of the lake. The run-off being estimated at 0.087 inch per day, the lake would be raised 7.5 times that amount, or 0.65 inch per day, or 40.45 inches during July and August. The daily evaporation from the lake being estimated at 0.25 inch and the rainfall 0.387 inch, there remains 0.137 inch of water in the lake, or 8.49 inches, which, added to the run-off from the land, makes 48.94 inches, the amount which the level of the lake would be raised during July and August should the banks be high enough to retain it.

From the above facts it appears that the most feasible way to control the level of Lake Okeechobee is to dig canals from the lake to tidewater of sufficient capacity to reduce its level to an elevation of 16 feet just before the rainy season sets in, and allow a storage capacity for 36 inches of the run-off. There will then remain to be removed through the canals 12.94 inches during the 62 days, or 0.2088 inch in 24 hours. To accomplish this will require canals having an aggregate discharge of 3,938 cubic feet per second.

SIZE AND ARRANGEMENT OF CANALS.

In determining the number and proper location of these canals it will be wise to consider the cost of their construction, the character of the land through which they pass, and their possible use for transportation. A canal 40 to 80 feet wide and 5 to 10 feet deep can be cut by a modern dredge and the material placed on the bank without rehandling. Such a canal is more economically constructed than one of larger dimensions. If one large channel having the necessary capacity were constructed, not as much of the Everglade land would be benefited as though the same capacity were secured by cutting two or more canals extending in different directions from the lake. The advantages are, therefore, decidedly in favor of cutting a number of small canals having the necessary capacity instead of one large canal.

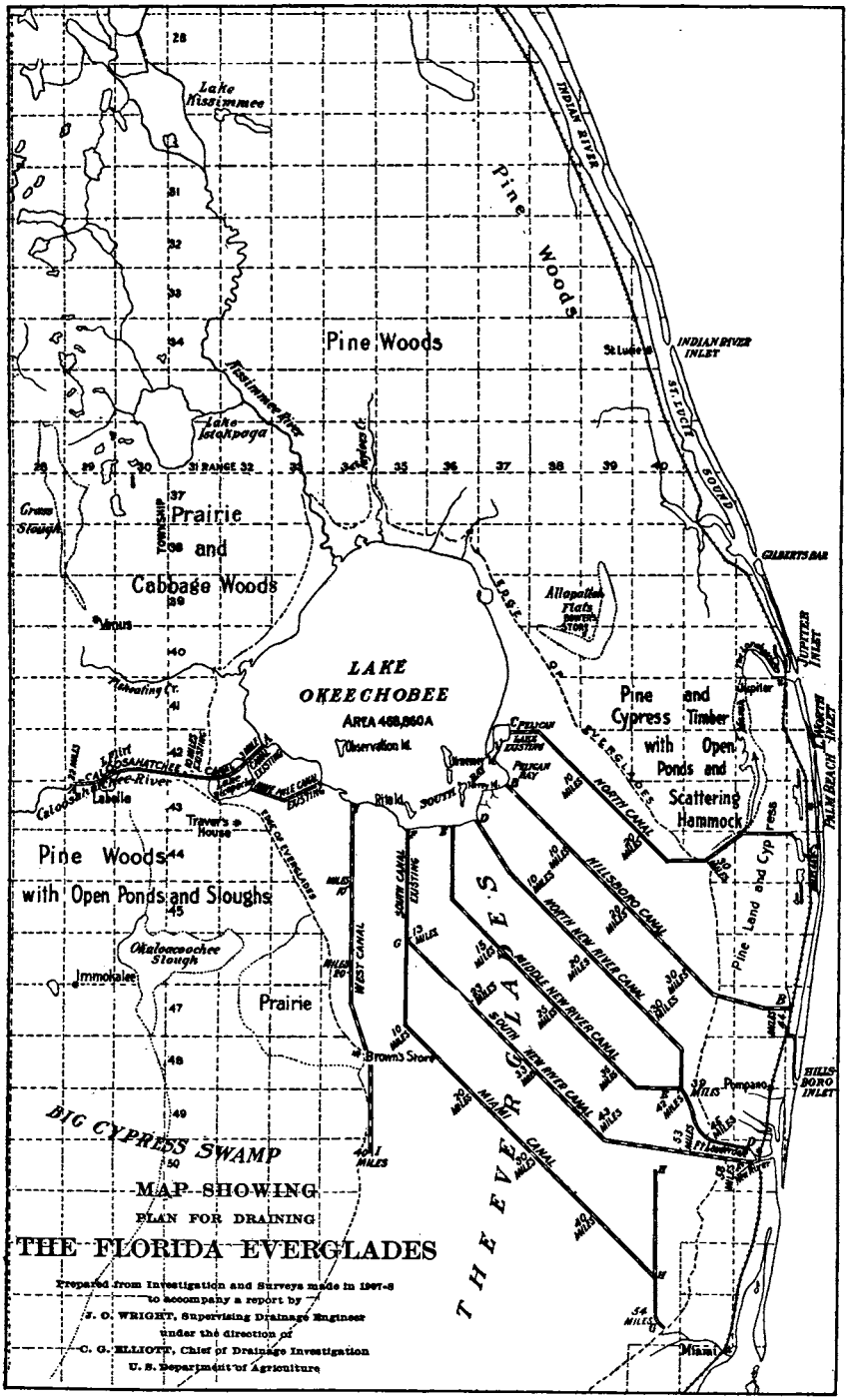
Since transportation across the State is a matter of great importance, it is desirable that the drains be so planned as to form an all-water route from the Atlantic Ocean to the Gulf of Mexico. The plan here recommended provides for a series of canals of sufficient capacity to regulate the stage of water in Lake Okeechobee and also provides adequate drainage for the lands through which they pass.

The first of these canals, marked "A–A" on the map (Plate IV), passes down the Caloosahatchee Valley, following the course of the present drainage. This has the advantage of being the shortest route and having the greatest fall per mile, but there will be a larger percentage of rock to excavate than on some of the other lines. This will materially increase the cost, but for the purpose of navigation it is desirable that this route to tidewater be used. In addition to taking off part of the excess from Lake Okeechobee, this canal will furnish adequate drainage for the entire Caloosahatchee Valley, and reclaim and make fit for agricultural purposes a large body of extremely fertile land.

There is grave apprehension that any enlargement of the upper portion of the Caloosahatchee will cause it to overflow its banks along its lower course and damage the citrus groves. Such will not be the case when Lake Okeechobee is lowered and the discharge brought under control. There will not be as much water brought down this channel as is now carried by it in time of high water. The flow is to be regulated by locks at the upper end, and only as much water permitted to enter the canal as the stream can carry without damage to property along its course. One object of the entire system of improvement is to make the flow more uniform and maintain a good boating stage during the period of low water.

The canal second in importance, marked "B–B" on the map, is the Hillsboro route, which leaves Okeechobee at Pelican Bay and extends in a southeasterly direction to the head of Hillsboro River. This route is not as short as one directly east from Lake Okeechobee to the Loxahatchee River, but the cutting is not so deep, and it affords drainage for a much larger area of agricultural lands.

These two canals, "A–A" and "B–B," are intended chiefly as a relief to Lake Okeechobee and for transportation across the State. They are made deeper than the other canals shown on the plan, and with proper locks a depth of 5 feet may be maintained throughout the year. This will furnish a good boating stage and be of great value to the agricultural and commercial interests of the State.



The other canals shown on the map, and which are approximately 8 miles apart, are primarily drainage canals, although they would be navigable for light-draft boats and barges, and would be useful in bringing in fertilizer and other supplies desired and transporting to market the crops produced. In addition to these, lateral feeders and small field ditches will be necessary to make the land fit for cultivation. The number and size of these ditches will depend largely upon the use to which the land is to be put. It will not require as much drainage for growing rice and grass as for cultivated crops. These field ditches will be small and not deep. Their cost will probably range from $2 to $4 per acre, according to the crop to be grown and the method of cultivation adopted.

In determining the size of the several canals it must be borne in mind that in addition to discharging 3,938 cubic feet per second from Lake Okeechobee, they must take the run-off from the territory through which they pass. Computing this run-off at the same depth that was determined for the watershed of Lake Okeechobee, there must be removed 90 cubic feet per second from each township below Lake Okeechobee discharging into these canals. This requires that the several canals be increased from the lake toward their outlets to carry this additional quantity without overflowing their banks during the period of heavy rains.

The dimensions of the several canals located on the map, together with the approximate amount of excavation required in their construction, are given in the following table:

Estimated excavation in proposed canals.

CALOOSAHATCHEE—A-A.

Section of ditch.	Length.	Fall per mile.	Depth of flow.	Velocity.	Average width.	Discharge.	Depth of cut.	Total excavation.	Amount removed.	Net excavation.
	Miles.	*Feet.*	*Feet.*	*Ft. per sec.*	*Feet.*	*Cu. ft. per sec.*	*Feet.*	*Cubic yards.*	*Cubic yds.*	*Cubic yards.*
0 to 10....	10	0.86	8	3.00	60	1,440	10	1,173,400	586,700	586,700
10 to 22....	12	.86	8	3.10	70	1,736	10	1,649,150	494,500	1,154,650

HILLSBORO—B-B.

0 to 10....	10	0.30	8	1.80	50	720	10	981,560	.....	981,560
10 to 20....	10	.30	8	1.90	60	912	10	1,177,870	.....	1,177,800
20 to 30....	10	.30	8	2.00	70	1,120	11	1,511,560	.....	1,511,560
30 to 44....	14	.50	8	2.40	70	1,340	12	2,226,600	.....	2,226,600

NORTH CANAL—C-C.

0 to 10....	10	0.26	5	1.25	50	312	7	689,000	.....	689,000
10 to 20....	10	.26	5	1.30	80	520	7	1,099,200	.....	1,099,200
20 to 30....	10	.53	5	1.90	80	720	7	1,266,200	.....	1,266,200
30 to 45....	15	.53	6	2.00	80	960	8	1,884,150	.....	1,884,150

NORTH NEW RIVER—D-D.

0 to 10....	10	0.26	5	1,25	50	312	7	689,000	.....	689,000
10 to 20....	10	.26	5	1.25	80	520	7	1,099,200	.....	.....
20 to 30....	10	.53	5	1.90	80	720	7	1,266,200	.....	1,266,200
30 to 39....	9	.53	6	2.00	80	960	7	1,130,500	.....	1,130,500
39 to 45....	6	.53	8	2.50	100	2,000	12	1,400,200	800,000	600,200

Estimated excavation in proposed canals—Continued.

MIDDLE NEW RIVER—E-E.

Section of ditch.	Length.	Fall per mile.	Depth of flow.	Velocity.	Average width.	Discharge.	Depth of cut.	Total excavation.	Amount removed.	Net excavation.
	Miles.	*Feet.*	*Feet.*	*Ft. per sec.*	*Feet.*	*Cu. ft. per sec.*	*Feet.*	*Cubic yards.*	*Cubic yds.*	*Cubic yards.*
0 to 15....	15	0.26	5	1.25	50	312	7	1,033,500	.....	1,033,500
15 to 25....	10	.26	5	1.25	80	520	7	1,099,200	.....	1,099,200
25 to 35....	10	.53	5	1.90	80	720	7	1,099,200	.....	1,099,200
35 to 42....	7	.53	6	2.00	80	960	7	753,600	.....	753,600

SOUTH NEW RIVER—F-F.

0 to 13....	13	0.26	5	1.25	50	312	7	895,700	447,850	447,850
13 to 23....	10	.26	5	1.20	40	240	7	549,600	.....	549,600
23 to 33....	10	.26	5	1.30	70	455	7	962,000	.....	962,000
33 to 43....	10	.26	5.5	1.40	90	693	8	1,413,000	.....	1,413,000
43 to 53....	10	.53	5.5	1.90	90	940	9	1,590,000	.....	1,590,000
53 to 58....	5	.53	6	2.10	100	1,134	11	2,159,200	1,000,000	1,159,200

MIAMI CANAL—G-G.

0 to 10....	10	0.26	5	1.25	40	240	7	549,600	.....	549,600
10 to 20....	10	.26	5	1.25	70	455	7	962,000	.....	962,000
20 to 30....	10	.26	5.5	1.40	90	693	7	1,236,500	.....	1,236,500
30 to 40....	10	.26	6	1.50	90	810	8	1,413,000	.....	1,413,000
40 to 54....	14	.36	6	1.70	90	918	9	2,226,000	.....	2,226,000

WEST CANAL—I-I.

0 to 10....	10	0.26	5	1.30	90	585	7	1,236,500	.....	1,236,500
10 to 20....	10	.26	5	1.30	120	785	7	1,648,700	.....	1,648,700
20 to 30....	10	.26	5	1.30	150	1,010	6	1,766,500	.....	1,766,500
30 to 40....	10	.26	5	1.30	175	1,137	4	878,000	.....	878,000
Total .	350	.....	.....	.....	.....	.....	.....	.....	.....	38,287,270

NOTE.—Channels are computed rectangular. Combined discharge at lake, 3,993 cubic feet per second; combined discharge at outlets, 9,145 cubic feet per second.

ESTIMATE OF COST.

It is not possible to determine the exact amount of excavation without a survey of each separate line of canal, but the above estimate is sufficiently accurate to serve as a basis for computing the probable cost of the work. One important element entering into the cost is the amount of rock to be removed. This can only be known after the lines of canal have been definitely located and soundings made along each line to determine the depth of muck.

From examinations so far made it is estimated that about 20 per cent of the excavation required will be a mixture of sand and porous rock, similar to that found at New River, and the remainder will be pure muck or muck underlaid with fine sand. On this basis of classification there will be 7,657,454 cubic yards of rock excavation and 30,629,816 of muck and sand.

From the work done at Fort Lauderdale it has been demonstrated that with a good dipper dredge the rock can be handled at a cost not exceeding 8 cents per cubic yard. With a suitable equipment there

is no doubt that the muck can be removed at a cost of less than 4 cents per cubic yard. At these prices the total cost of the excavation would be:

7,657,454 cubic yards, at 8 cents	$612,596.32
30,629,816 cubic yards, at 4 cents	1,225,192.64
Total	1,837,788.96

This is approximately $1 per acre on the lands designated on the map as the upper Glades.

In order to control the water in these canals and regulate the flow they should be provided with gates or locks at both the upper and lower ends, and in some cases at intermediate points. Because of the slight heads, these would be comparatively inexpensive structures.

SOIL OF THE EVERGLADES.

The soil and natural vegetation of the Everglades has been incidentally described on previous pages. The possible value of the soil for agricultural production is a matter of the greatest importance to the State and is the sole reason for investigating the feasibility of draining the Everglades. The natural fertility of the soil, its lasting qualities, the staple crops it will produce, and the treatment which the land will require to yield a profit to the owner are subjects of sufficient moment to warrant a full discussion of the soils of the Everglades and a description of such examples of productiveness as will throw light upon this not yet fully settled question. The soil throughout the area is of vegetable origin and may be classed as either peat or muck. A definition of these two types as given by the Bureau of Soils [1] United States Department of Agriculture, is as follows:

Peat.—This is a vegetable matter consisting of roots and fibers, moss, etc., in various stages of decomposition, occurring as turf or bog, usually in low situations, always more or less saturated with water, and representing an advanced stage of swamp with drainage partially established.

Muck.—This type consists of black, more or less thoroughly decomposed vegetable mold from 1 to 3 feet or more in depth and occupying low, damp places, with little or no natural drainage. Muck may be considered an advanced stage of peat brought about by the more complete decomposition from water or from aeolian sources, resulting in a finer texture and closer structure. When drained, muck is very productive and is adapted to corn, potatoes, cabbage, onions, celery, peppermint, and similar crops.

The soils that may be classed as peat and those which may be called muck are frequently not clearly distinguished. They grade off from one to the other quite gradually and are disposed in an irregular way throughout the entire area. In general, the soil around the lakes, adjacent to the rivers, and along the course of the deepest and most constant flow of water is more thoroughly decomposed and contains a larger percentage of mineral matter than those portions which are less frequently submerged. The tributaries of Lake Okeechobee are not silt-bearing streams, and hence but little silt has been deposited in the Everglades. Under present conditions much of the fibrous matter, consisting largely of carbon, appears to be capable of resisting decomposition, even when exposed to the air. It dries out readily and when ignited burns slowly.

[1] Soil Survey Field Book, 1906, p. 266.

The principal growth in these peat and muck lands is saw grass (*Cladium effusum*), which grows from 5 to 12 feet high during summer and in winter and spring gets dry enough to burn. Large areas are often burned over by hunters and trappers. Other plants that are frequently found throughout the Glades are yellow pond lily, maiden cane, Wampee or pickerel weed, arrow weed, some sedges, and a few other aquatic plants.

In formation, structure, and composition of soil much of this land resembles quite closely some of the large swamps in southern Louisiana that have been drained and brought under cultivation and which to-day are yielding good crops of sugar cane, onions, and potatoes. The Louisiana marshes, however, have a larger percentage of silt mixed with the vegetable matter than the Everglade marsh, but are quite like the lands around Lake Okeechobee along the Caloosahatchee River and many of the smaller marshes throughout the wooded section. Numerous swamps in other parts of the country which bear a close resemblance to the Everglade land in color, texture, and formation have been drained and, after proper treatment, yield good crops, particularly of corn and vegetables. From these comparisons it appears that the stage of decomposition reached and the amount of mineral matter contained in the muck has a marked influence on its productiveness.

Examples of the productiveness of the saw-grass lands of Florida are not wanting, though there are none in the interior of the Everglades. In January and February, 1908, the land in the vicinity of Fort Lauderdale, where the State dredges had been operating, was inspected. The ditches had partially reclaimed some of the land and several fields were in cultivation. At that time the water in the canal was 2 feet below the level of the marsh.

The saw grass had been burned, leaving a heavy stubble. Large areas had been planted in tomatoes and small patches in potatoes, eggplant, snap beans, peppers, and turnips. The land was firm enough on the surface for a man to walk over it without sinking; but it was too soft to carry the weight of a horse and could not be plowed. A line was stretched to indicate the rows, and small hills were made with a hoe at intervals of 30 inches. A handful of fertilizer was mixed with the earth and the sprout or seed planted. The hills are cultivated with a hoe, and during the season practically all the "middles" between the rows are chopped out. It is claimed that the second year the land is in much better condition for cultivation. Two or three applications of fertilizer are usually made during the year at the time the plant is cultivated. This, the growers claim, is necessary to get marketable fruit. Without fertilizer the tomato vine grows tall and rank, but bears few tomatoes.

Near the banks of the canals and on some land along New River that had been in cultivation two or more years the ground was much more firm and would carry the weight of a team of horses. When the drainage is completed, so as to prevent the annual overflow of this land, and the soil water is kept 3 or 4 feet below the surface, there is little doubt that these lands can be plowed and cultivated by the usual methods. At the present time cultivation is expensive, as the work has to be done by hand and the fertilizer distributed through the fields by means of wheelbarrows moved on boards laid down to form a temporary run-

way. The products also have to be carried out in baskets or taken out in wheelbarrows over these runways.

On the edge of the Everglades, northwest of Miami, another truck farm was inspected. Here the muck was not so deep and contained a larger percentage of silt than did the saw-grass marsh above described. The land had been broken and cultivated with teams in the ordinary way. On February 26 the tomatoes were large enough to commence shipping. The crop was fair and would probably yield 100 crates per acre.

On the west shore of Lake Okeechobee, at the entrance of Three-mile Canal, another cultivated tract was inspected. The vegetation has been removed from a typical piece of saw-grass muck, the surface of which was flooded during the period of high water; but at the time of the visit, March 25, 1908, it was 28 inches above water level. The muck on this tract was firm on top and soft below for a depth of 12 feet. The proprietor was growing Irish potatoes, onions, beets, cabbage, snap beans, corn, tomatoes, lettuce, and peas. Everything was in a most flourishing state—potatoes as large as hen's eggs, beets 6 inches in diameter, onions almost as large, cabbages with solid heads 20 inches in diameter, snap beans in bloom, and corn a foot high. No fertilizer or manure of any kind had been used. The muck at this place was well decomposed and contained more mineral matter than the fibrous soil in some other localities.

On the south shore of Pelican Lake two trappers were found who had a small garden. They were growing onions, cabbage, peas, turnips, and tomatoes. The muck was 14 feet deep and the water, at the time of the visit, 24 inches below the surface. No fertilizer had been used and the plants were thrifty and promised an abundant yield.

On the north shore of Lake Okeechobee, near the mouth of Taylors Creek, a small portion of land had been cleared by the fishermen who were located there and planted in oranges and grape fruit. The trees were large enough to begin to bear and gave promise of producing an abundance of good merchantable fruit.

The most extensive test of the possibilities of these muck lands when drained was made a number of years ago near Kissimmee, Fla. Here the Disston Land Co. drained about 1,400 acres of saw-grass muck around Lake Tohopekaliga and cultivated extensive fields of sugar cane. The land was well drained by large open canals, and some of it was underdrained by means of mole ditches. Prof. W. L. Van Dusen, who was connected with the Disston enterprise at St. Cloud for a number of years, states that he personally tested the yield of a field of cane on this farm by measuring the land and weighing the crop that went to the mill, and by actual weight he found it to be 63 tons per acre. (See Pl. V.) Samples of this cane were taken at the time and tested by the Bureau of Chemistry of this department and showed 12 to 13 per cent sucrose. This, the chemist states, would yield 200 pounds of sugar per ton of cane.

Mr. J. O. Wright visited this sugar plantation in January, 1892, and saw large quantities of sugar cane that had been grown on these drained muck lands and which was being ground and manufactured into yellow clarified sugar at the sugarhouse erected by the Disston Co. at St. Cloud. Since that time the cultivation of cane has been abandoned, the sugarhouse has been dismantled, and the machinery

and appliances shipped to Mexico. The question is often asked, What brought about this change; why was the land which produced such great crops of cane abandoned and the expensive sugar mill removed? An investigation seems to indicate that the failure was due to mismanagement and lack of experience on the part of those conducting the business rather than to a failure of the lands to produce profitable crops of sugar cane. Laborers employed on the place for a number of years say that where the land was properly cultivated it yielded a heavy tonnage of cane, but a great loss was sustained in harvesting this cane and manufacturing it into sugar. The vegetation now growing on this land indicates that with proper methods of cultivation it would yield profitable crops.

At Southport, 16 miles south of Kissimmee, on a tract of drained saw-grass marsh, an orange grove with trees nine years old was inspected. (See Pl. I, fig. 2, facing p. 150.) These trees are strong and vigorous, and bore a large crop of oranges in 1907. Mr. Lee, the owner, says he never used a pound of fertilizer on these trees until 1908, when he gave the land a dressing, as he thought it might improve the quality of the fruit. This orchard, when visited in March, 1908, was very dry, and its condition would have been improved by irrigation.

CHEMICAL COMPOSITION.

Chemical analyses of muck soils are useful and instructive when studied in connection with climatic conditions and vegetation. One of the earlier investigations of Florida muck lands was made at the experiment station established by this department at Runnymede, Osceola County, about 200 miles north of the south shore of Lake Okeechobee. The following analyses, with explanations and comments, are taken from the report of the work at that station for 1891.[1]

Analyses of muck at Runnymede.

Samples dried at 110°.	Carbon.	Hydrogen.	Volatile.	Absorption.	Nitrogen.
Soil No. 1:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
First foot	57.67	4.48	90.00	145.14	2.24
Second foot	47.07	5.15	72.00	108.50	1.40
Third foot	8.52	.53	15.00	46.68	.31
Soil No. 2:					
First foot	56.21	6.08	91.70	151.15	2.33
Second foot	58.57	6.04	96.50	188.32	2.83
Third foot	48.27	6.34	96.76	156.98	2.33
Fourth foot	21.72	2.03	40.88	81.05	.95
Soil No. 3	18.72	2.72	45.60	114.03	1.26
Soil No. 4	19.48	2.69	45.70	167.95	1.18

Sample No. 1 was taken from the front part of the station near the cypress grove, and No. 2 from the back part of the station near the pine land. They represent two distinct characters of muck. The first has a brown color, is very porous, and drains easily. No. 2 has a deep black color, is more compact, and is less easily drained. No. 3 was taken from a field on the St. Cloud plantation which has been cultivated in vegetables for five years. No. 4 was taken from a field on the St. Cloud plantation which has been in cultivation in sugar cane for five years.

Under the column "Absorption" is given the percentage of water which perfectly dry soils will absorb. It is seen that the pure muck, where unmixed with sand, will absorb more than its own weight of water; in one case almost double its weight. The

[1] Report of the Secretary of Agriculture for 1891.

HARVESTING SUGAR CANE, ST. CLOUD PLANTATION.

importance of this property in times of drought and in relation to subirrigation must not be overlooked. In dry muck which has not been cultivated the value of the nitrogen reaches in one case $10.19 per ton, estimating nitrogen at 18 cents a pound. Cultivation for a few years reduces the percentage of nitrogen in the surface soils, as indicated by the numbers obtained with samples 3 and 4.

Analyses of several muck soils were made at the State experiment station of Florida in 1896. A few are here quoted, together with the comments which accompany them.

Florida muck soils.[1]

	Sample No. 16.	Sample No. 53.	Sample No. 98.[2]		Sample No. 16.	Sample No. 53.	Sample No. 98.[2]
	Per cent.	*Per cent.*	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*
Nitrogen	1.23	1.45	1.39	Phosphoric acid	0.15	0.11	Trace.
Insoluble residue	59.80	43.06	50.38	Chlorin	Trace.	Trace.	0.01
Potash	.02	Trace.	.51	Sulphuric acid	.14	.12	.05
Soda	.50	.13	.02	Carbonic acid	3.49	.00	.....
Lime	4.00	.15	Trace.	Water and organic matter	29.66	53.07	35.69
Magnesia	.00	.09	Trace.				
Ferric oxid	.39	3.25	3.66				
Alumina	2.20		9.03				
					100.35	99.98	99.35

[1] Florida Sta. Bul. 43.
[2] Analyzed by Bureau of Chemistry, U. S. Department of Agriculture.

Sample No. 16 was sent from Lemon City, Dade County, and is a mixture of soil and subsoil to a depth of 3 feet. The growth upon it is principally saw grass interspersed with maiden cane, lilies, etc. It appears to be seriously deficient only in potash. It is unusually rich in both nitrogen and lime, and is well supplied with phosphoric acid.

Sample No. 53 is reclaimed bay muck in the vicinity of Kissimmee, taken at a depth of 14 inches. The growth upon it was bay, cypress, willow, etc., and was more decomposed than the subsoil. It is very deficient in potash.

Sample No. 98 was taken at the depth of tillage from a field at St. Cloud which had been cultivated in cane for five years.

Several samples of muck were collected by Mr. Brett and his party while running the level line across the Everglades in February and March, 1907, from which two representative ones were selected for chemical analysis. They were examined for lime, potash, phosphoric acid, and nitrogen only.

Muck soils from the interior of the Everglades.

	Soil No. 8.[2]	Soil No. 11.[3]
	Per cent.	*Per cent.*
Lime	2.25	2.21
Potash	.15	.08
Phosphoric acid	.19	.19
Nitrogen	3.16	2.58

[1] Analyses by the Bureau of Soils, U. S. Department of Agriculture.
[2] Taken 8 miles west of Pompano.
[3] Taken 18 miles west of Pompano.

The samples were brown in color and composed largely of undecayed roots and other vegetable matter.

A comparison of these analyses shows that the saw-grass muck of the Everglades is strikingly similar to that of the Kissimmee Valley in the essential elements of plant food. The soils may, however, be quite dissimilar in compactness and density, the same volume of soil from different localities containing quite variable quantities of

plant elements. It is noted also that the nitrogen shows a material diminution after five years of cropping. Soundings made at various points indicate quite definitely that the muck in the vicinity of Lake Okeechobee, especially on the south side, is deeper and more compact than on the greater part of the land farther south. It is safe to assume that the deeper muck will be the more lasting under cultivation.

With the help of the analyses of several samples of muck soils in the State, some taken from fields newly reclaimed, some from fields which have been cultivated for five years, and others from the heart of the Everglades, a fairly intelligent opinion of the fertility of the Everglade lands can be formed. In this connection, however, it may be well to heed the caution of A. W. Blair, chemist for the Florida Agricultural Experiment Station, expressed in a bulletin upon soil studies.[1] With reference to the value of such analyses he says:

> It is generally admitted that the productiveness of a soil can not be determined by a mere chemical analysis alone. The analysis will show what elements are present and in what quantities, but it does not show what is absolutely available for the immediate use of the plant. Of two soils showing great similarity in chemical composition the one may be highly productive and the other unproductive. The reasons for this may possibly be found in different moisture conditions, or a difference in the physical texture, or in the difference in the amount of available plant food, or in a combination of all these differences. The chemical analysis, however, is of value in showing what the possibilities are under proper treatment.

Dr. Albert R. Leeds, of Stevens Institute of Technology, Hoboken, N. J., made a special examination of the Everglades to determine the fitness of the climate and soil for the growth of sugar cane. In his report, made in 1897, he says:

> Summing up all of the evidence that I have been able to obtain, both in the laboratory and by actual observation on the spot, I am convinced that the cultivation of sugar cane on the reclaimed muck lands around Okeechobee would be successful and the investment of the necessary large capital to cultivate and mill the sugar cane at this locality would be rewarded with an unusually large profit.

Osgood Welsh, another expert on the production of sugar, in comparing the muck lands of Florida with the sugar lands of Cuba, says:

> The Hicpochee-Okeechobee district is an ideal field for the agriculturist, and is, in my judgment, a place in which sugar cane can be produced at the least cost, because it possesses advantages of climate, soil, drainage, irrigation, fertilizer, cheap transportation, and the best facilities for the use of mechanical power in all the details of agricultural art.

While the above are mere opinions upon the matter, they are entitled to consideration, since they are based upon both chemical and physical examinations.

WILL DRAINING THE EVERGLADES AFFECT THE CLIMATE?

According to the best authorities on climatology, large bodies of water tend to temper the climate of land along their shores, due to the fact that water both absorbs and gives off heat at a much slower rate than land, thus maintaining a more constant temperature, and that air, having passed over water, would be cooler on a warm day and warmer on a cool day than the land over which it passes. There is some question as to how far this influence is perceptible, especially from air passing over comparatively small bodies of water such as lakes.

[1] Florida Sta. Bul. 87, p. 19.

Prof. Winchell, from South Carolina, who made examinations on Lake Michigan, says:

> If the Lakes have any influence on the temperatures, it must be only a slight differential effect. Isotherms for July show that stations on opposite sides of Lake Michigan have precisely the same temperature. Experiments on Lake Ontario show the same results. Isotherms for January show that the west coast of the lake is 5° to 10° cooler than the east; that is to say, air between 20° and 30° grows slightly warmer by blowing over the frozen lake.

The area of Lake Okeechobee is small when compared with Lake Michigan or Lake Ontario, and its influence on the climate of the adjacent lands must be correspondingly less. If it has any effect on the air passing over its surface tending toward the prevention of frost it is very slight and extends but a few miles. In the plan of drainage here proposed it is not intended to drain Lake Okeechobee, but to lower its level about 4 feet, so that any climatic influence it may possess will not be destroyed.

Prof. R. De C. Ward, assistant professor of climatology in Harvard University, in concluding some remarks on this subject, says:

> Finally, it is clear that man, whether by reforestation or deforestation, flooding a desert or draining a swamp, can produce no important or extended modifications of natural climate, which is governed by factors beyond human control.

After reviewing the available evidence upon the subject it appears, because of the comparative narrowness of the peninsula and the great expanse of water upon either side, that the small amount of water on the surface of the Everglades does not have any appreciable effect upon the climate. It should be observed that this portion of Florida lies in the same latitude as the extreme southern part of Texas, where frosts rarely occur, though protected by water on one side only.

CONSERVATION OF WATER.

Muck lands in general are peculiarly susceptible to drought. The Everglades, lacking the silt and clay constituents in the soil and resting on sand or rock, will at times become too dry for crops unless provision is made to control the height of the water in the proposed drainage ditches. There will be danger from fire unless the soil be kept in a moist condition by means of controlling gates or stops in the ditches.

On the lands near Fort Lauderdale, adjacent to the canals recently constructed, the water plane was lowered 2½ feet and held at that level during the season. The truck growers cut the grass on this land with a scythe, let it dry a few days in the sun, and then set fire to it. It burned up clean without igniting the muck. The same was true on some lands that were cleared at the head of the Three Mile Canal. In the vicinity of Kissimmee, where the water has been kept 5 or 6 feet below the surface for several years, the muck becomes quite combustible during a dry season, and in some instances has caught fire and burned over several acres a foot or more in depth. This does not occur where the water in the ditch is held near enough to the surface to keep the soil moist nor where the muck is thoroughly decomposed.

The unequal distribution of rain is one of the characteristics of the Florida climate. The trucking season begins in September and lasts until May. It is during this season that rains are less frequent, and

frequently the grower is subject to grave danger from drought. The citrus groves and vegetables often suffer at this time from lack of moisture. It is during this same period that sugar cane is planted, and if the ground is too dry the cane may be affected by dry rot.

The ideal condition for agriculture is one in which the amount of moisture is under control. When there is too much moisture there should be some means of promptly removing the excess, and when there is too little a method of supplying the deficiency. By using Lake Okeechobee as a reservoir and the drainage ditches or canals for distributing the water this can be readily accomplished. There will be no necessity for expensive pumping plants, but with suitable gates the level of the water can be regulated in the ditches to supply the crops by the ordinary methods of subirrigation at a comparatively small cost. Few places are as favorably located for both drainage and irrigation as the country lying south of Lake Okeechobee.

HEALTHFULNESS AND TRANSPORTATION FACILITIES.

The climate of the Everglades is subtropical. The long summers produce a feeling of lassitude and are extremely irksome, especially to persons accustomed to a northern climate, but do not impair the health or cause disease. Mr. Brown, the proprietor of the store on the west border of the Everglades, has reared a family at that place without serious sickness among its members. The workmen on the State dredges have as good health as those engaged in similar work in the Northern States. The members of the party who made the survey across the Everglades in 1907–8 drank the water of the Everglades without discomfort or injurious effects. It should be noted, however, that the trip was made during the winter, when the climate is more agreeable than at any other season. There are mosquitoes in every part of the Glades, and while not particularly troublesome during the day they swarm in myriads about sundown, making it necessary for the traveler to seek protection behind a substantial mosquito netting.

Dade County, in which the Everglades are situated, has an area of 4,424 square miles and (in 1900) a population of 4,955. The Florida East Coast Railroad, running from St. Augustine to Miami, near the Atlantic coast, furnishes at present the most convenient facilities for reaching the Glades. The stations on this line directly east of the Glades are Miami, Fort Lauderdale, West Palm Beach, and several other smaller shipping stations. Beyond a distance of 1 or 2 miles west of the railroad there are no settlers, except a few truck farmers in the vicinity of New River. From the settlements along the railroad there are numerous wagon trails leading out in the direction of the Everglades, but terminating at the edge of the swampy ground. The only way of entering the Glades from these points is by wading or by small push boats, such as have been described in a previous part of this report.

The only town on the west side of the peninsula from which the Glades can be reached is Fort Myers, the county seat of Lee County, on the Caloosahatchee River. It is reached by the Atlantic Coast Line Railway and by boats of shallow draft from the Gulf. It had a population of 1,500 in 1900 and is a distributing point for the entire Caloosahatchee Valley. The only way of reaching the Ever-

glades from this city is by boat up the river to Lake Okeechobee or by a drive of 70 miles over sand roads and through sloughs to the west side of the glades in the vicinity of Brown's store.

It does not come within the province of this bulletin to discuss all the various phases of this reclamation project. Among these are the sale and colonization of the vast area, the canvass of the world's markets for disposing of the products that can be grown, the speculative value of the lands, and numerous other important matters which are closely interwoven with every land-development project.

Attention, however, may be called to several points which should be helpful to those who have the reclamation of the Everglades under consideration. The feasibility and general plan of draining these lands have been pointed out and also the characteristics of the soil and its possibilities, though it should be understood that the latter are largely undetermined.

The effect of permanently lowering the water in Lake Okeechobee, which is an essential part of the plan to drain the Everglades, will beneficially affect a zone of land on the north side of the lake and the lower part of the Kissimmee Valley.

After the muck lands have been drained a settlement of the surface will probably take place equal to about one-half of the depth from the present surface to the permanent water table, the amount varying with the compactness of the muck.

While the absence of silt and clay in the vegetable matter and the presence of an underlying sand and rock foundation instead of clay, detracts from the lasting qualities of the soil, the latter makes it possible to erect needed buildings and other structures upon a secure foundation.

First-class roads can be made in the glades after drainage by using the underlying rock, which can be quarried at convenient points in the Glades, the value of which for this purpose has been demonstrated along the east coast. Ordinary public and farm roads can be made by covering the muck with sand, which makes the surface sufficiently compact for road use. Roads are made in this manner through the reclaimed moor lands of Germany wherever they are underlaid with sand or rock.

The following is presented as a brief summary of the results of the investigations in the Florida Everglades, with reference to their reclamation for agriculture:

SUMMARY.

The upper Everglades comprise an area of approximately 1,850,000 acres, lying south of Lake Okeechobee, and is the only part in which the depth of the muck will warrant the expense of reclaiming.

The high-water stage of Lake Okeechobee is 22 feet and the low-water stage is 19 feet above mean sea level. The surface of the land at the south border of the lake is 21 feet and at a point 30 miles south of the lake is 13 feet above sea level.

The depth of the muck for several miles south of the lake is from 7 to 15 feet. Along a line across the Glades easterly from Brown's store the muck varies from 2 to 6 feet deep, with occasional points where the rock crops out upon the surface. The entire area is underlaid with porous or shelly lime rock, upon which, in many places, is a covering of sand.

As far as can be ascertained, the quality and fertility of the muck south of the lake is the same as the saw-grass muck of the Kissimmee River Valley, and that at St. Cloud, in Osceola County, where sugar cane and truck crops were successfully grown by the Disston Land Co. (so called) from 1893 to 1898, and also at the United States experiment station at Runnymede. The depth and compactness of the muck found in different parts of the Everglades are not uniform.

The drainage of the land by means of gravity canals and controlling gates is feasible. The plan recommended consists of main canals approximately 8 miles apart, leading from Lake Okeechobee southeasterly to the Atlantic Ocean, one of these canals to be for navigation in connection with the improvement of the Caloosahatchee River by means of which boats may pass from tide water on either side into Lake Okeechobee.

The plan proposed provides for the control of the water of Lake Okeechobee and of the main canals required to drain the Glades. The laterals and other interior drains which will later be required in the complete reclamation of the land for agriculture are not indicated.

BENCH MARKS.

The following bench marks were established by the United States Department of Agriculture:

Location, description, and elevation of bench marks.

Bench mark.	Location and description.	Elevation.
	West coast.	
		Feet.
No. 1	Fort Myers, Heitman's grocery store, corner First and Jackson Streets: Raised part of iron plate at corner of brick, under Jackson Street window.	7.68
No. 2	Fort Myers, Buckingham's store, marked "Warehouse": Cross on east doorsill	14.97
No. 3	Fort Myers, north side of lane to Goodno Dock: Nail in root of blazed oak tree	12.09
No. 4	Travers House, 300 feet north of pens: Nail in root of blazed pine tree	25.43
No. 5	Immokalee road, east of Kenneday Carson's house: Spike in root of pine tree	24.90
No. 6	Immokalee, 100 feet northwest of schoolhouse: Spike in root of pine tree	38.07
No. 7	Glade Cross Road, one-half mile west of Leaning Oak: Spike in root of palmetto	26.54
No. 8	Rock Lake, west side: Spike in cypress tree	24.65
No. 9	Glade Cross Mission, south side of hammock near cottage: Spike in palmetto	17.86
No. 10	Brown's store, edge of boat trail: Top of iron wagon axle driven into sand.	17.25
	East coast.	
No. 1	West Palm Beach, city dock: Top of tide gauge	3.70
No. 2	Riveria Station: Cross on middle brick pier	16.55
No. 3	Section corner ¼ ¼ T. 43 S., R. 42 E.; 33 feet west: Nail in root of blazed pine	19.46
No. 4	Government road, east side below Lantana truck farms: Nail in root of blazed pine	19.50
No. 5	Government road, west side, one-fourth mile north of Hillsboro cypress: Nail in root of small blazed pine	15.83
No. 6	In Everglades at end of staked Hillsboro line of State dredge ditch survey; Cypress butt squared up and marked thus: On east side, "U. S. B. M.;" on south side, "Elev. 17.4;" on north side, "Sta. 57+130"	17.39
No. 7	East beach of Lake Okeechobee at entrance of Loxahatchee-Okeechobee line: Nail in notch of big cypress tree	23.40
No. 8	Loxahatchee-Okeechobee line, about Station 265+250: Nail in root of blazed pine tree	25.23
No. 9	Loxahatchee-Okeechobee line, near Station 192: Nail in blazed cypress tree	26.90
No. 10	Loxahatchee-Okeechobee line, near Station 89: Nail in blazed pine tree	24.26
No. 11	Loxahatchee River Bend known as "Cowhead," just south of Station 0+350 and 350 feet from bend: Nail in root of blazed pine	13.97

Datum, mean sea level.

SENATE BILL FOR SURVEY OF THE EVERGLADES.

[S. 7305. Sixty-first Congress, second session, Mar. 22, 1910.]

In the Senate of the United States Mr. Fletcher, on March 22, 1910, introduced the following bill, which was read twice and referred to the Committee on Public Lands:

A BILL Providing for a survey of the unsurveyed lands known as the Everglades of Florida.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior cause to have a survey or surveys made of the lands in Florida known as the Everglades, and to make all necessary plats or maps of such survey or surveys, for which purpose the sum of ten thousand dollars, or so much of said sum as is necessary, is hereby appropriated.

INSTRUCTIONS FOR SURVEYING THE LAND EMBRACED IN UNITED STATES PATENT NO. 137, KNOWN AS THE EVERGLADES.

[Adopted by the Trustees of the Internal Improvement Fund of Florida, Dec. 29, 1910.]

The Trustees having, at their meeting of October 29, 1910, referred the making of a survey of the Everglades, or such portion thereof as was considered practicable, to J. O. Wright, chief drainage engineer, in response to said request Mr. Wright presented the following report on the matter:

TALLAHASSEE, FLA., *November 15, 1910.*

TRUSTEES OF THE INTERNAL IMPROVEMENT FUND,
Tallahassee, Fla.

GENTLEMEN: On October 31 I received a letter from your secretary, Mr. Luning, transmitting a copy of a portion of the minutes of a meeting of October 29, in which the matter of subdividing the unsurveyed lands in the Everglades is referred to me for consideration and report thereon.

The United States Government has adopted a plan known as the rectangular subdivision of public lands, under which practically all of the public lands of the United States have been surveyed and subdivided by the United States Government.

This law provides, in general, that the public lands of the United States shall be divided by north and south lines run according to the true meridian and by others crossing them at right angles, so as to form townships 6 miles square. Also that the townships shall be divided into 36 sections, each of which shall contain 640 acres, as nearly as may be, by a system of two sets of parallel lines, one governed by the true meridian and the other by parallels of latitude, the latter intersecting the former at right angles and at intervals of 1 mile.

Under this act the survey of the public lands in Florida is founded on a true meridian running north and south through Tallahassee and a base line running east and west at right angles to the meridian through this point. The ranges and townships are numbered from this true meridian and base line.

In the execution of the public surveys under the existing law, it is apparent that the requirements that the lines of the survey shall conform to the true meridian and that the townships shall be 6 miles square, taken together, involves a mathematical impossibility due to the convergence of the meridians.

In order to harmonize the incompatibilities of the requirements of the law with the application of mathematics thereto, the manual of instruction provides for the establishment of standard parallels conforming to the parallels of latitude initiated from the true meridian at intervals of 24 miles and extending east and west of the same. Also the establishment of guide meridians conforming to the true meridian initiated at the

base line and successive standard parallels at intervals of 24 miles running north and south, resulting in tracts of land 24 miles square, as nearly as may be, which are subsequently divided into tracts of land 6 miles square by two sets of lines, one conforming to the true meridians, crossed by others conforming to parallels of latitude at intervals of 6 miles, containing 23,040 acres, as nearly as may be, designated as a township.

Such townships are subdivided into 36 tracts, called sections, each of which shall contain 640 acres, as nearly as may be, by two sets of parallel lines, one set parallel to the true meridian and the other conforming to parallels of latitude, mutually intersecting at intervals of 1 mile and at right angles, as nearly as may be. In subdividing the township into sections, all excess, or deficiency, of the regulation section of 640 acres shall be added to or deducted from the western and northern tiers of sections, of half sections, in such townships.

Practically all of the public lands of Florida, except the Everglades, have been subdivided by the United States Government in accordance with the general provisions above specified. The tract commonly known as the Everglades has not been subdivided, but the greater part of the adjacent lands surrounding this tract has been surveyed by the United States Government and the township and section corners located and marked by suitable monuments.

The only action of the Trustees that is of record affecting the subdivision of this unsurveyed territory is a resolution of the board, adopted January 2, 1905, and published on pages 5, 6, and 7, Volume VI, of the Minutes of the Trustees of the Internal Improvement Fund; a resolution adopted June 10, 1907, and published on page 66, Volume VII, of the Minutes of the Trustees. Accompanying these resolutions was an official map of the United States, patent No. 137, known as the Everglades. The blue print accompanying this report is a copy of said amended map on an enlarged scale. On June 14, 1907, the following resolution was adopted, as appears on pages 70 and 71, of Volume VII, of the published Minutes of the Trustees:

"*Resolved by the Trustees of the Internal Improvement Fund of the State of Florida*, That the townships, ranges, and sections of the official map of the Everglades, adopted by the Trustees under date of January 2, 1905, and as amended by the resolution of said Trustees, June 10, 1907, embracing the lands in the United States patent No. 137, be, and the same are hereby, adopted and ratified as the townships, sections, and ranges of said map, which townships, ranges, and sections, as the same appear to be designated upon said official map of the Everglades, were so designated and determined by projecting on said map the township, range, and section lines of the original United States survey as the same appears on said map, and that the sections indicated on said official map of the Everglades, as adopted by the trustees of the internal improvement fund of the State of Florida, as aforesaid, be numbered similarly and under the same plan and systems as sections are numbered under the township, range, and section system adopted by the United States and of the same force and effect, beginning with section 1 and continuing to section 36, inclusive; fractional townships to be numbered under the same system, being designated by such numbers as will make them uniform with the system of the United States."

J. W. Newman, a surveyor employed by the Trustees, made a subdivision of that part of township 50 south, range 41 east, that lies south of the North New River Canal, and also the east half of township 51 south, range 41 east. These surveys and plats have been officially adopted by your honorable body, are placed of record, and land has been sold in accordance with such surveys.

These acts of the Trustees, the adoption of the official map; and the resolutions accompanying the same, and the plats of the Newman survey, can not be modified or materially changed in the survey and subdivision of the Everglades. Any work done must be in accordance with the intent and meaning of the resolutions above cited. In order to carry out this intent in an actual survey, and run the lines and establish corners, as provided on the official map, some definite instructions should be adopted, setting forth the manner in which the work shall be done.

In order to carry out a survey, it is necessary to have some fixed point, or points, the location of which is undisputed, from which to initiate and carry forward the work. It is a well-established fact that a line, or corner, located by the United States Government under an official survey, can not be changed, even if it is afterwards proved to have been wrongly placed. The same law, I think, would hold in reference to the survey made by Mr. Newman.

In the plan I here recommend to you I have selected the southwest corner of township 50 south, range 41 east, as established by the Newman survey, above mentioned, as the initial point, marked "O" on the map, from which the survey of that part of the territory lying east of the range line between ranges 36 and 37 east shall be made. From the point O a parallel shall be run due west 24 miles to the point M on the map. On this line township corners shall be established at intervals of 6

miles, marked "O′," "O″, and "O‴." Through the point M a meridian shall be established, extending north to the south shore of Lake Okeechobee and south to the line of the United States survey dividing townships 59 and 60, or the prolongation of said line. This meridian shall be run due north and south and become the range line between ranges 36 and 37 east. From the point O, the west line of township 51 south, range 41 east, shall be run to close with the northwest corner of township 52 south, range 41 east. From the point O, a guide meridian shall be run due north to the township line between townships 46 and 47, or this line produced, marked "P" on the map. From the point P, a guide parallel shall be run due west to intercept the meridian between ranges 36 and 37 at the point S. From the northwest corners of townships 55 south, range 40 east; 55 south, range 39 east; 57 south, range 38 east; meridians shall be run due north to intercept the guide parallel OM.

From the township corners, marked "O′," "O″," and "O‴" on the map, located on the parellel OM, meridians shall be run due north to intercept the guide parallel PS. From the southwest corners of townships 44 south, range 41 east; 43 south, range 40 east; 42 south, range 39 east; and 40 south, range 38 east, meridians shall be run due south to intercept the guide parallel PS.

From the southwest corner of townships 41 south, range 39 east; 42 south, range 39 east; 43 south, range 40 east; 44 south, range 41 east; and from the southwest corner of section 36, township 45 south, range 41 east, parallels shall be run due west to intercept the range line between ranges 36 and 37, or the east shore of Lake Okeechobee.

From the northwest corner of townships 52 south, range 41 east; 53 south, range 41 east; from the northwest corner of section 2, township 54 south, range 40 east; from the northwest corner of township 55 south, range 39 east; northwest corner section 5, township 56 south, range 38 east; northwest corner of townships 57 south, range 38 east; 58 south, range 38 east, and 59 south, range 38 east, lines shall be run due west to intercept the range line between ranges 36 and 37.

The townships thus established shall be subdivided into sections of 640 acres, as nearly as may be, according to the rules and methods employed by the United States General Land Office in the survey and subdivision of public lands.

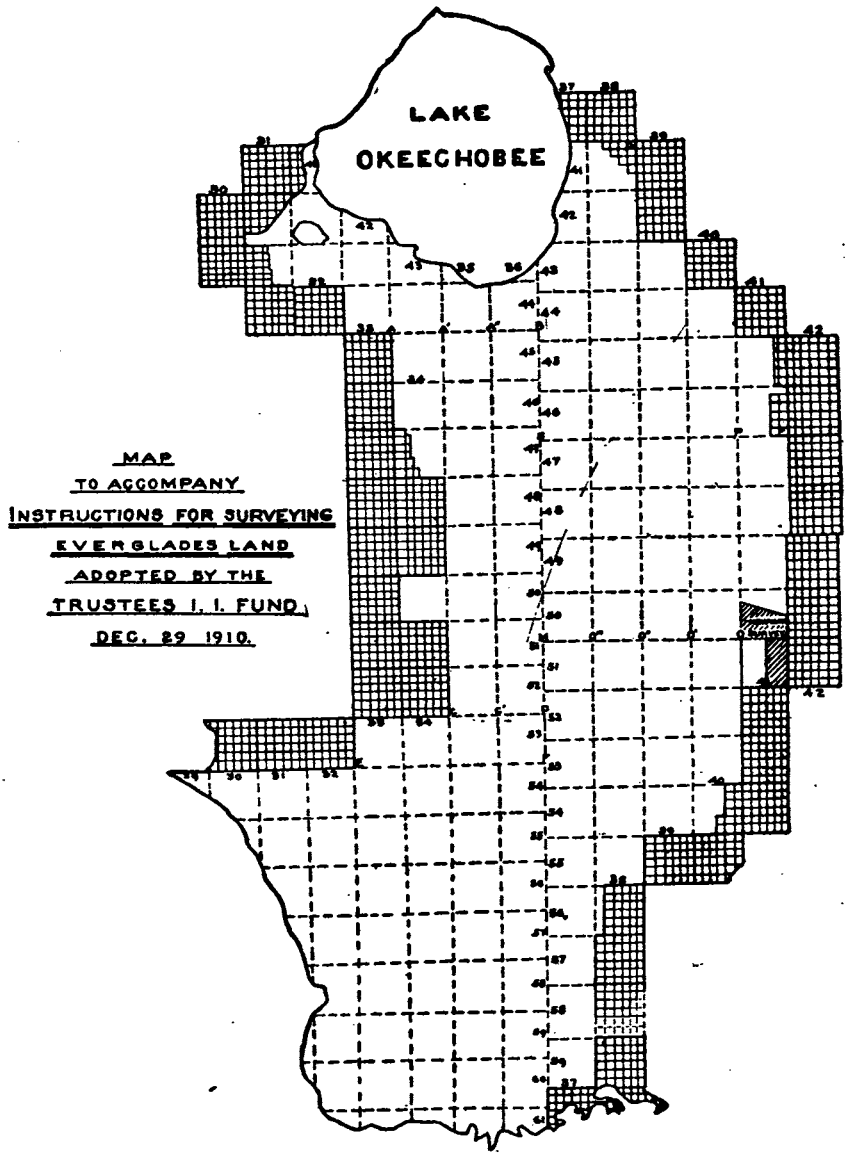
In subdividing the territory west of the range line between ranges 36 and 37 the following method shall be followed:

The northeast corner of township 45 south, range 33 east, marked "A" on the map, shall be taken as the initial point. If the monument at this corner can not be found, it shall be relocated according to the directions issued by the United States General Land Office for reestablishing lost corners. From this point a parallel shall be run due east to intercept the range line between ranges 36 and 37, at B. On this township line corners shall be established at intervals of 6 miles from A at A′ and A″. The other township lines subdividing the unsurveyed territory west of the range line between ranges 36 and 37 shall be run from the township corners established by the United States Government on the west side of this unsurveyed territory due east, parallel with the controlling line, AB, until they intercept the range line between ranges 36 and 37.

From the southeast corner of township 52 south, range 34 east, marked "C" on the map, a second controlling parallel shall be run due east to intercept the range line between ranges 36 and 37 at the point marked "D" on the map. On this parallel, 6 miles east of the point C, a township corner shall be established, marked "C′." From this township corner, and also from the southeast corners of township 52 south, range 34 east; township 52 south, range 33 east; township 53 south, range 32 east; township 53 south, range 31 east; township 53 south, range 30 east, meridian lines shall be run due south to tidewater, dividing the territory into ranges. From the southeast corner of township 53 south, range 32 east, a parallel shall be run due east to intercept the guide meridian at the point F. Measuring south on the guide meridian from the point F, township corners shall be established at intervals of 6 miles and parallels run west from these corners to the coast on the west to divide the territory into townships. From the township corners A, A′, and A″ meridian lines shall be run due north to the south shore of Lake Okeechobee. From the point A″ a meridian shall be run due south to intercept the guide parallel between townships 52 and 53, and from the northeast corner of township 48 south, range 34 east, a meridian shall be run north to intercept the line AB. From the northeast corner of township 44 south, range 32 east, a meridian shall be run north to intercept the south shore of Lake Okeechobee. The remainder of townships 42 south and 43 south, range 3 east, shall be completed in accordance with the work previously done by the United States Land Office.

All of the townships thus formed shall be subdivided into sections one mile square, as nearly as may be, according to the rules and practice of the General Land Office for subdividing townships.

In order that there may be no conflict in the surveys made by different surveyors in this territory, it is necessary that there be established and permanently marked one or more standard meridians. These should be located at some convenient point, preferably in the vicinity of Fort Lauderdale or Miami for surveys on the east side and at some place on the south shore of Lake Okeechobee for surveys on the west side of the standard meridian.



In a book of instructions issued by the General Land Office, June 1, 1909, it is stated that the General Land Office prohibits its employees and contracting surveyors from depending to any extent upon courses derived from the needle. It also declines to advise other surveyors what variations to use in their own regions. The difference in the variations used, and careless and inaccurate measurements, are the chief causes of conflicting surveys. To avoid this, I recommend that a standard meridian be

established in the vicinity of Fort Lauderdale by taking numerous observations on Polaris and taking the mean or the average of these observations; that this line be permanently marked by suitable stone or concrete monuments, with copper plugs embedded in the same, marked with a cross to indicate the exact position of the line; that a similar line be established at some place on the south shore of Lake Okeechobee; that engineers or surveyors making a survey east of the guide meridian, between ranges 36 and 37, be required to test their instruments with this standard line and use such variation as this line may indicate at the time the survey is made, and that persons making surveys west of the guide meridian shall compare their instruments with the standard meridian near the south shore of Lake Okeechobee and use the variation as shown by this line when making such surveys; that complete copies of all field notes and plats of surveys made in this territory be filed with the Trustees of the Internal Improvement Fund.

Respectfully submitted.

J. O. WRIGHT,
Chief Drainage Engineer.

The Trustees adopted the above recommendations of Mr. Wright respecting a survey of the Everglades lands, and authorized him to have such a number of copies of the report printed as he deemed necessary.

TALLAHASSEE, FLA., *January 31, 1911.*

I hereby certify that the above and foregoing is a true and correct copy of a portion of the minutes of the Trustees of the Internal Improvement Fund of the State of Florida of December 29, 1910.

[SEAL.] J. C. LUNING, *Secretary.*

Mr. J. O. Wright, chief drainage engineer, requesting more definite instructions relative to the matter of a survey of the Everglades lands, the Trustees adopted the following resolution appertaining to said survey:

Whereas at a meeting of the Trustees of the Internal Improvement Fund held on the 29th day of December, 1910, a plan for surveying the lands embraced in United States patent No. 137, known as the Everglades, was presented by the chief drainage engineer and approved by the board: Now, therefore,

Be it resolved, That the chief drainage engineer is hereby authorized and directed to proceed with the survey of the said land by running the township and range lines and establishing the township corners and the section corners on the township and range lines, in accordance with plan adopted, as rapidly as the condition of the land will permit, the work to be done economically.

TALLAHASSEE, FLA., *January 31, 1911.*

I hereby certify that the above and foregoing is a true and correct copy of a portion of the minutes of the Trustees of the Internal Improvement Fund of the State of Florida of January 27, 1911.

[SEAL.] J. C. LUNING, *Secretary.*

GENERAL CLASSIFICATION OF FLORIDA SOILS.

[Quarterly Bulletin of the Florida State Agricultural Department, April 1, 1911.]

SWAMP LANDS.

The swamp lands are unquestionably the most durable rich lands in the State. They are the most recently formed lands and are still annually receiving additions to their surface. They are intrinsically the most valuable lands, because they are as fertile as the hammocks and more durable. They are alluvial in character and occupy

natural depressions or basins which have gradually filled up by deposits of vegetable débris, etc., washed in from the adjacent and higher lands. Drainage is indispensable to all of them in their preparation for successful cultivation. Properly prepared, however, their inexhaustible fertility sustains a succession of the most exhausting crops with astonishing vigor. These lands have been known to produce as much as 600 gallons of sirup, or about 5,000 pounds of sugar, per acre without fertilizer. We mention sugar cane in this connection as showing the fertility of the soil, because it is known to be one of the most exhausting crops. It is not, however, quite fair to make this the measure of fertility of similar lands situated in different climates and countries, for we find on the richest lands in the State of Louisiana the product of sugar is little more than about half what it is in Florida.

But this great disparity in the product of these countries is accounted for not by any inferiority in the lands of Louisiana or Texas, but by the fact that the early visitations of frosts in both these States render it necessary to cut the cane in October, which is long before it has reached maturity, while in Florida it is permitted to stand, without fear of frost, till the last of November or December or till such time as it is fully matured. It is well known that it "tassels" in south Florida, and it never does so in either Louisiana or Texas. When cane "tassels," it is evidence of its having reached full maturity. In consequence of the considerable outlay of capital required in the preparation of this description of land for cultivation and from the facility formerly existing for obtaining hammock land, which requires no ditching or draining, swamp land has been but little sought after by persons engaged in planting in Florida until in recent years; now, however, there is a great and ever-increasing demand for these lands by individuals and incorporated companies, thus suddenly recognizing their immense productive value.

The greater part of what are known as swamp lands proper are mostly located in east and south Florida, although there are numerous and quite extensive bodies in north, middle, and west Florida.

THE EVERGLADES.

While the soils of this region differ little in their general characteristics from the swamp lands above considered, still, owing to their prominence as such and as the greatest reclamation undertaking in recent times, also their unique geographical position, we submit a brief description under their own heading. These lands are being rapidly and successfully drained by the State, as well as by private and corporate owners.

The Everglades of Florida cover an area of about 4,000 square miles, embracing more than half of the portion of the State south of Lake Okeechobee. The subsoil of this vast region is a coraline limestone. * * * Upon this surface lies an immense accumulation of sand, alluvial deposits, and decayed vegetable matter, forming a mass of sand and mud from 2 feet to 10 feet or more in depth that overspreads all but a few points of the first strata.

Upon the mud rests a sheet of water, the depth varying with the conformation of the bottom, but seldom at dry seasons greater than 3 feet. The whole is filled with rank growth of coarse grass, 8 or 10 feet high, having a serrated edge like a saw, from which it obtains its name of "saw grass."

In many portions of the Everglades the saw grass is so thick as to be almost impenetrable; but it is intersected by numerous and tortuous channels that form a kind of labyrinth, where outlets present themselves in every direction, however, terminating at long or short distances in apparently impenetrable barriers of grass. The surface of water is quickly affected by rain, the alternate rising and falling during the wet seasons being rapid. The difference of level between highest and lowest stages of water is from 2 to 3 feet. The general surface of the Everglades was thus subject to great changes prior to the inauguration of the system of drainage now so successfully under way. Small keys or, in reality, hammocks, are here and there met with which are dry at all seasons; upon them the soil is very rich. There are many such. Undoubtedly they were often made the site of Indian gardens.

Large areas, covering many square miles, which but a few years ago were marshes covered with saw grass and rushes, are now open meadows, dry all seasons excepting the rainy months, affording pasture for many thousand heads of cattle. The fall or rapids at the heads of all streams running from the Glades have receded toward the center of the Glades and Lake Okeechobee several miles.

The Florida Everglades at present may be described as a wet prairie, being a strip of land about 150 miles long by 55 miles wide, and lying between the pine and swamp lands which have grown over two reefs of rock running parallel with each other from north to south. No rivers penetrate into the Glades beyond these rock reefs on either side and the land is very level, being composed chiefly of muck and sand lying in a basin with a rock bottom. The annual rainfall over this territory averages nearly 60 inches. It has for this reason, and because this rainfall has no other outlet over these reefs, been and is too wet for cultivation. The muck which overlies the sand and rock varies from about 2 feet on the edge of the Glades to a depth of 20 feet in the middle, and would average over the whole territory a depth of between 6 and 8 feet. The land is free from trees and stumps and almost free from bushes, the item of clearing being of no consideration whatever, simply requiring mowing down the grass and burning it, when the soil is ready to be tilled as soon as the excess water is run off by the drainage canals.

The soil, as compared with other portions of the country, taking into consideration its natural richness, location, and climate, is more valuable for agricultural purposes than any that is known, being particularly adapted to the growth of cane, cotton, Irish potatoes, celery, tomatoes, cabbage, turnips, beets, onions, and, in fact, any crop will grow well on these lands except such as require a colder climate.

The composition of the soil being almost entirely decomposed vegetable matter, is rich in nitrogen, but lacking to a great extent in the mineral constituents necessary to make a perfect soil; consequently, phosphoric acid and potash will have to be supplied in varying quantities for a majority of crops in some of these muck soils, especially where rock or clay is absent or too far below the surface to exert any appreciable influence. With these additions, when necessary, however, these soils will without doubt be the most productive in this country and the equal of any in the world. Without the addition of the chemical fertilizers mentioned, these soils will not equal in productiveness the first grade of swamp lands.

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MESSAGE OF GOV. A. W. GILCHRIST TO THE FLORIDA STATE LEGISLATURE, 1911—EXTRACTS RELATIVE TO RECLAMATION OF EVERGLADES.

EXECUTIVE OFFICE,
Tallahassee, Fla., April 4, 1911.

Gentlemen of the Legislature of the State of Florida:

* * * * * * *

Your attention is invited to the following report of the secretary to the Trustees of the Internal Improvement Fund, dated March 25, 1911. The introductory words are omitted:

REPORT.

The dredge *Everglades* began work July 4, 1906, and excavated 915,156 cubic yards of material of all kinds and moved 6.52 miles on the North New River Canal to January 1, 1909 (beginning of present administration).

The dredge *Okeechobee* began work on the 1st of April, 1907, and excavated 759,865 cubic yards of material of all kinds and moved 6.72 miles on the North New River Canal to January 1, 1909.

The total cost of constructing the dredges *Everglades* and *Okeechobee* and operating these dredges to January 1, 1909, was $275,374.59. The amount expended on construction of the dredges *Caloosahatchee* and *Miami* up to January 1, 1909, was $31,577.80, making a total expenditure of cost of construction of dredges and excavation of canals from the beginning of work to January 1, 1909, of $306,592.39. Deducting the amount received for the dredges *Everglades* and *Okeechobee*, $60,000, and the proportionate amount received for the dredges *Caloosahatchee* and *Miami*, $28,050, when these dredges were sold to the Furst-Clark Construction Co., makes a total of $88,050 received from the sale of dredges, leaving the sum of $218,542.39 actually expended in drainage operations from the beginning of the work until the 1st day of January, 1909, at a cost of 13.1 cents per cubic yard.

OPERATIONS FROM JANUARY 1, 1909, TO JULY 1, 1910.

The dredge *Everglades* excavated 436,901 cubic yards of material of all kinds and moved 4.67 miles in the North New River Canal. This dredge was taken off the work on May 29, 1909, for repairs and was not placed back at work until the 1st of January, 1910.

(NOTE BY THE GOVERNOR.—The dredge *Everglades* was practically ruined, owing to the failure to use dynamite in rock excavations, the entire strain being thrown upon the dredge. The repairs cost $33,550.88. It was sold to the Furst-Clark Construction Co. for $35,000, about the cost of repairing the same. In my opinion 50 per cent or more of this entire amount should be charged against the previous administration, thereby increasing the cost of excavation under the same and diminishing the said cost under the present administration.)

The dredge *Okeechobee* excavated 667,278 cubic yards of material of all kinds and moved 6.92 miles in the South New River Canal.

The dredge *Miami* began work in May, 1909, and excavated 481,355 cubic yards of material of all kinds, four-fifths of which was rock, and moved 4.25 miles in the Miami Canal.

The dredge *Caloosahatchee* began work in July, 1909, in the Caloosahatchee River and was engaged the entire period in deepening, straightening, and in some instances widening the Caloosahatchee River, and excavated 418,819 cubic yards of material of all kinds.

The total cost of completing the construction of the dredges *Caloosahatchee* and *Miami*, repairing the Everglades, and operating the entire force of dredges was $307,533.06. Of this total expense $33,550.88 was expended in repairing the Everglades. Deducting this amount and the proportion of the $85,000 received from the sale of the *Caloosahatchee* and *Miami* to the Furst-Clark Construction Co., $56,950, from the total expenditures during this period leaves the sum of $217,032.18 expended in actual operations, at a cost of 10.8 cents per cubic yard of excavation.

Operations from July 1, 1910, to March, 1911.

In June, 1910, a contract was let to the Furst-Clark Construction Co., of Baltimore, Md., to excavate about 184 miles of canal in the Everglades, and they purchased the dredges *Everglades*, *Okeechobee*, *Caloosahatchee*, and *Miami*, paying the sums, respectively, of $35,000, $25,000, $45,000, and $40,000 for the same, the contract for excavation being 20 cents per cubic yard for rock and 8 cents per cubic yard for excavation of all other character of material. From July 1, 1910, to March 1, 1911, they excavated in the—

	Miles.
North New River Canal	5.30
Upper North New River Canal	3.72
South New River Canal	1.70
Upper South New River Canal	6.60
Miami Canal	5.00
Hillsboro Canal	1.74
Total	24.06

SUMMARY.

Number of miles of canal excavated by State to Jan. 1, 1909:	
North New River Canal	6.52
South New River Canal	6.72
Total	13.24
Number of miles of canal excavated by State from Jan. 1, 1909, to July 1, 1910:	
North New River Canal	4.67
South New River Canal	6.92
Miami Canal	4.25
Caloosahatchee	(1)
Total	15.84
Number of miles of canal excavated by Furst-Clark Construction Co.:	
Upper North New River Canal	3.72
North New River Canal	5.30
Upper South New River Canal	6.60
South New River Canal	1.70
Miami Canal	5.00
Hillsboro Canal	1.74
Total	24.06
Grand total of mileage of all canals excavated to Mar. 1, 1911	53.14

The total length of the canals now being constructed is 205.79, leaving on March 1, 1911, 152.65 miles to be excavated.

The Furst-Clark Construction Co. excavated 2,309,869 cubic yards of material of all kinds from July 1, 1910, to March 1, 1911, at a cost of $241,148.12, making the cost per cubic yard 10.43 cents. Of this material removed 469,655 cubic yards was rock and 1,840,214 cubic yards was earth and all material other than rock. As the work progresses it shows that the percentage of rock is gradually getting less. For instance, in July, 1910, the cost of excavation per cubic yard was 11.38 cents; in February, 1911, the cost of excavation per cubic yard was only 10.02 cents per cubic yard; and as the work nears Lake Okeechobee it is reasonable to suppose that the percentage of rock will continue to be less, thus further reducing the cost of excavation per cubic yard, making the cost per cubic yard of the entire excavation by the Furst-Clark Construction Co. about 9 cents. As shown above, it cost the State prior to January 1, 1909, 13.01 cents per cubic yard for excavation, and from January 1, 1909, to July 1, 1910, 10.08 cents per cubic yard, and as the work of excavation advanced towards Lake Okeechobee, getting farther and farther from the base of supplies, making it more difficult to get supplies and fuel to the dredges, the cost of excavation per cubic yard would have naturally increased.

[1] It is impossible to estimate the relative number of miles of excavation by the dredge *Caloosahatchee*.

The fact that it is being demonstrated that by contract the cost of excavation per cubic yard will in all probability be about 9 cents, or 1.08 cents per cubic yard less than the lowest figure that the State was able to do the work for, unmistakably demonstrates the economy of letting the contract, to say nothing of the matter of greatly advancing the completion of the work, the contract calling for the completion of same on or before June 25, 1913.

NOTE.—You will notice that in this estimate the cost per cubic yard for excavation for the period ending January 1, 1909, is given as 13.1 cents, and in a report made to the trustees on December 31, 1910, of the cost per cubic yard for excavation during the same period it is given as 12.64, a difference of 0.46 cent per cubic yard. This difference is caused by the fact that in the December estimate interest of $7,200 is figured on the investment, no interest being included in this estimate. Interest was likewise figured on the investment in the December, 1910, estimate for operations from January 1, 1909, to July 1, 1910, and no interest is figured on the investment for the same period in this estimate, nor is the sum of $33,550.80, expended in repairing the Everglades, included in the estimate of December, 1910, which accounts for the difference given in the cost per cubic yard between that estimate and this of 0.22 cent for the period ending July 1, 1910.

The figures of amount of excavation given in this report are taken from reports submitted by Engineer John W. Newman for the period ending January 1, 1909, by Engineer P. F. Jenkins for the period ending July 1, 1910, and by Engineer J. O. Wright for the period ending March 1, 1911, these engineers being, respectively, in charge of the work during those periods.

Respectfully submitted.

J. C. LUNING, *Secretary*.

The secretary of the Trustees, Mr. W. M. McIntosh, jr., was also chief clerk in the comptroller's office, which position in the comptroller's office rendered it impossible for Mr. McIntosh to give to the position of secretary the time and attention which was necessary. He was offered the position of secretary with the understanding that he was to resign any other position he might have. He declined it. To such position Mr. J. C. Luning was elected in December, 1909. On December 3, 1909, the comptroller, at his own request, was relieved of the duty of treasurer, upon which it was resolved:

That the treasurer of the State of Florida be, and is hereby, declared to be the custodian of all bonds, notes, and securities of every kind belonging to or held as security by the Trustees, etc.

On January 3, 1910, a memorandum of agreement was entered upon by the Trustees and the Board of Drainage Commissioners, hereafter referred to simply as the Trustees, and Richard J. Bolles, and the representatives of certain land companies, and the Florida East Coast Railway Co., by which it was agreed "that the suits of these companies against the drainage commissioners to enjoin the collection of the drainage tax now pending in the Supreme Court of the United States shall be dismissed, each party paying its own cost." "That the land companies shall pay the drainage taxes assessed upon their lands, respectively, for the years 1907–1912, inclusive," etc. The said Richard J. Bolles agreed to pay his taxes in the same manner, and the said Bolles agreed to pay the notes executed by him within the time specified, these said notes having been made payable under the sale to him of December, 1908, so much annually, the last note being payable in 1916. This agreement was to become binding upon the Trustees and the Board of Drainage Commissioners, accepting a bid and entering upon a contract or contracts for the performance of the drainage work herein contemplated. If no such contract was made, then the agreement contemplated a "new conference" among the parties thereto. The location and excavation of 200 miles of

canals or less was determined upon. The Trustees were also to submit to the legislature certain territory subject to tidal overflow and not capable of reclamation and certain lands which were designated as a watershed and reservoir constituting the fresh-water supply of the city of Key West and stations along the Florida east coast extension, the same not being capable of being drained. The governor was to request the legislature to amend the drainage act by eliminating these lands from the drainage district. (See vol. 8, pp. 301–310.) Specific information on this subject will be communicated to you later by special message. On April 2, 1910, the tentative agreement not having been ratified, the trustees declared the agreement abrogated, calling for another conference, which conference was held April 7. The second agreement was practically the same as the former agreement, with the exception that one certain canal which was represented in the first agreement was stricken out of the second. This was the real object of the Trustees in calling the second conference. The following appears in this agreement, referring to said Richard J. Bolles:

> And that he will pay all of said notes within two years from date, except a certain note for $100,000, due January, 1916.

It might be stated here that on March 4, 1911, the said R. J. Bolles appeared before the Trustees in relation to certain business matters and upon the necessity being made known to him, he agreed to pay said note within the time in which the other notes were to be paid. On June 15, 1910, agreeable to certain advertisements, bids were opened for excavation of certain drainage canals in the Everglades. There were several bidders. The Furst-Clark Construction Co. of Baltimore made the lowest and best bid for same, being 8.4 cents per cubic yard for earth excavation and 20.2 cents per cubic yard for rock excavation. A contract was finally let to this company at 8 cents and at 20 cents flat, per cubic yard. These parties agreed to take the dredges owned by the trustees at the price fixed upon by the trustees in the advertisement for bids. Mr. J. O. Wright, chief engineer of drainage, stated:

> As the work progresses, the dredges will be going farther and farther from the base of supplies and the cost of operating will increase. The price submitted is probably less than it would cost the State to do the work by owning and operating its own dredges.

This contract provides for the excavation of fully 20,000,000 cubic yards, 184 miles of canals; this in addition to the work already done, the same to be completed within three years from July 1, 1910. The Trustees sold for a good price their dredges. Had they continued the work themselves, these would eventually have been so much junk. One of the dredges, the *Everglades*, was repaired, repairs commencing June 21, 1909, costing $33,550.88, almost as much as a new dredge. The necessity for this heavy repairing was due somewhat to the fact that while operating in rock dynamite was not used, or, if used, very scantily. The strain, therefore, was thrown largely on the dredge. In addition to the cost of excavation being practically the same under the contract, or probably less, the specifications under the contract call for better work than that done under the preceding or under the present administration. This is embraced under specifications as to slopes of the canals, width of the berms, and as to the dumps. These

specifications relate beneficially to the work done and add to the initial expense of the work. In addition to this, the litigation as to the payment of taxes was stopped, the parties agreed to pay the same from 1907 to 1912 inclusive, and R. J. Bolles agreed to make all of his payments within that time, his notes all having been distributed up to and including the year 1916. By the terms of the contract, the 20,000,000 cubic yards are to be excavated within 3 years commencing July 1, 1910. By means of this contract, the work was largely expedited. The work in the Everglades involves the drainage and after drainage, irrigation and transportation. For irrigation and transportation, the trustees are having permanent locks placed in the canals. It is highly probable that railroads will be built on the banks of the canals. The railroads will, of course, pay for the embankment and right of way, eventually diminishing the cost of the canals. There are now employed in the work of excavation 6 dredges. Within the next few months, another dredge will be placed in commission. On March 1, 1911, the dredge *Everglades*, being in the North New River and going toward Lake Okeechobee, was 34 miles from the dredge *Caloosahatchee*, going southeastward toward this dredge. They are approaching each other at the rate of 2½ or 3 miles per month. Within 12 or 13 months it is safe to say that the Atlantic Ocean will be connected by canals with Lake Okeechobee. Lake Okeechobee has already been connected by canal with the Gulf of Mexico. There are numerous little streams also called "rivers" making from the Everglades toward the Atlantic Ocean. The trustees realize the necessity of having these various streams opened up into the Everglades as soon as possible. Many of these are outside of the drainage area. There should be some law passed by which lands to the eastward of the present drainage district should be taxed, in order that the cost of opening up these streams may be borne by the land owners of the property, in more or less close proximity to the same. The opening up of these streams will be beneficial to this property which is now untaxed. Of the lands situated in the Everglades now owned by private individuals much of the same has been sold in small quantities to different individuals. The necessity for prompt reclamation of these lands, in order that they may be more quickly prepared for settlement and cultivation, is quite apparent. Under the preceding administration lands were sold in alternate sections. As laterals will have to be constructed, it is the policy of the present administration to solidify their holdings as much as possible.

On the 19th day of February, 1909, the Trustees completed the purchase of one-half interest of the only outstanding certificated lands, same having been certificated years ago to the Palatka & Indian River Railroad Co., paying therefor for 67,500 acres at the rate of 10 cents per acre. The remaining one-half of the certificates had been purchased by the East Coast Railway Co. Afterwards, upon the advice of W. S. Jennings, attorney, and Attorney General Park Trammell, that one-half purchased by the East Coast Railway Co. was conveyed to said company, said company agreeing to pay up all the drainage taxes. The idea was that the land was either the property of this company or not. If it was, the sooner the title was settled, the better it was for all parties. The East Coast Railway Co. agreed to take the alternate townships instead of the alternate sec-

tions. Their certificate called for the alternate sections. The negotiations for the purchase of the alternate sections by the Trustees was commenced under the previous administration.

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Very respectfully,

ALBERT W. GILCHRIST, *Governor.*

REPORT OF THE JOINT COMMITTEE OF THE FLORIDA LEGISLATURE FOR THE YEAR 1911, ON THE DRAINAGE OF THE EVERGLADES.

TALLAHASSEE, FLA., *May 31, 1911.*

To the Hon. Fred P. Cone, president of the senate, and the Hon. T. Albert Jennings, speaker of the house of representatives.

SIRS: Pursuant to senate concurrent resolution No. 2, we, your committee, beg to submit the following:

Under the provisions of said resolution we were required to visit and inspect the progress and conditions of the work of reclaiming the Everglades now being carried on by the Trustees of the Internal Improvement Fund, and to make a report of the conditions of said works, the condition of the Everglades, including the drained and undrained portions, the area actually drained, the area partially drained and the area contemplated to be drained, and the area, if any, not contemplated in the present drainage plans; also to report the number, size, width, depth, and length of canals now completed, and also the number, length, width, and depth of those in course of construction, and the portion of each completed, and the work done on any incompleted portions, and the number, length, width, and depth of those contemplated and not yet begun; also the cost up to the present time in money and lands, and the estimated cost to complete those under construction, and the estimated cost of those contemplated; also the value of the reclaimed lands as to money valuation, and any other matter, thing, or fact concerning the same of value, importance, or useful information.

Your committee viewed the North New River Canal, also South New River Canal, the Miami Canal, and the Hillsboro Canal, and examined the same both at their mouths where excavations had been made and at Lake Okeechobee, and we herewith submit and attach to this our report, Map A and Table A, showing the length of the various canals that have been excavated from the commencement of the work to May 1, 1911, distances given in miles, and also Table No. 1, showing the progress made on the canals, done by the Furst-Clark Construction Co., during the three months ending September, 1910; also Table No. 2, showing the work done by the Furst-Clark Construction Co. during the three months ending December 31, 1910; also Table No. 3, showing the work done by the Furst-Clark Construction Co. during the three months ending March 31, 1911.

As to the area actually drained, we are of the opinion that there will be no land completely drained until the canals now under construction are completed through to Lake Okeechobee, and the water in the lake is lowered, thereby making an immense reservoir, so that when the rainy season begins this reservoir will hold the excessive

rainfall, and by means of opening the canals the rainfall can be carried to the sea without the lake overflowing its banks.

There is an area that is partially drained, of about 15,000 acres, adjacent to the outlet of these canals in the vicinity of Fort Lauderdale and Miami that are still subject to overflow during the rainy season, but will permit of cultivation of early vegetables, as the rainy season is then over.

The drainage district created by the legislature contains 4,300,000 acres. It is our opinion that all of this land will be more or less benefited by the drainage operations as planned, and that at least three-fourths of this amount will be protected against overflow and be provided with good outlet canals so that when suitable laterals and field ditches are constructed it will be reclaimed for agriculture.

The scope of drainage planned includes other canals than those now under construction, particularly the one marked "EE" on the map, and possibly the one from Hillsboro Canal to West Palm Beach, and these two named may have to be constructed before all of the lands in the drainage district will be provided with suitable outlets and protection from overflow from Lake Okeechobee.

Of the canals now under construction, none are fully completed. We attach to this report tabulated statements for the work marked "A" and Tables 1, 2, and 3.

The last river and harbor bill passed by the United States Congress carried an appropriation of $200,000 to make a survey of the Caloosahatchee River and the Kissimmee River, with a view of improving them for navigation in harmony with the plans of the State for draining the Everglades. Capt. Spalding, of the Jacksonville office, who has charge of this expenditure, is now having a comprehensive survey made of the Caloosahatchee River. We passed his surveying camps on the banks of the Caloosahatchee River on our way to Fort Myers. We feel confident that he will recommend that the United States Government improve this river, thereby relieving the State from any further expenditures on Caloosahatchee River.

The United States Government has consented to the lowering of Lake Okeechobee, but provides that there must be locks or controlling works at the upper ends of the drainage canals to control the amount of water taken out of the lake. In this connection we desire to call the attention of the legislature, and especially the Internal Improvement Board, to the necessity for locks at the lower ends of the canals and all along said canals at distances not exceeding 8 to 12 miles apart in order to control the water in the canals for navigation and for irrigation. This, in our opinion, is a matter of the utmost importance in this reclamation scheme; otherwise irrigation will be impaired and the navigation by boats almost made impossible.

Your committee found that there had been about 15 miles excavated on the lower end of the North New River Canal and on the upper end of said canal about 11 miles. Of the upper portion about one-half is completed and of the lower portion it is completed with the exception of a suction dredge that should go over and take out some mud that has settled in places, raising it above the required depth. We found that the dredge on the lower end was cutting at a rate of about a mile a month and that the dredge on the upper end was cutting at a rate of about 2 miles a month. It is believed that these dredges will meet about July, 1912.

Your committee first examined the lower end of the Miami Canal and found that there had been excavated about 10 miles, which were practically completed. We also found on the lower part of South New River there had been excavated about 16½ miles, practically completed. On this portion of the canal there was a lock being put in about 8 miles from the mouth of the canal and on the upper end of this canal we found there were about 8½ miles excavated and that this portion of the canal was completed, making a total of about 25 miles of completed canal on the South New River Canal.

On the North New River Canal we found on the southern portion something over 18 miles of canal which were practically completed and on the upper end of the canal, next to Lake Okeechobee, we found about 11½ miles excavated, one-half of which was practically completed.

On the Hillsboro Canal, next to Lake Okeechobee, we found there had been excavated about 4½ miles, one-half of which was completed.

The total miles of canals that we found completed amounted to about 62. The remaining portion to be completed amounts to about 125 miles. This remaining portion, as stated here, is under contract, and we find that there is about enough money at the disposal of the Internal Improvement Board to complete these canals.

Upon investigation we found that on January 1, 1905, the Internal Improvement Board owned 2,534,151.23 acres of Everglade lands, of which 118,276.67 acres were school lands. It will be noted that the Internal Improvement Board has no control over school lands. As to the lands that have been deeded by the Internal Improvement Board since January 1, 1905, we refer you to schedule marked "C," attached to this report.

The United Land Co., which had acquired the rights of the Atlantic & Gulf Coast Canal & Okeechobee Land Co., claimed 347,753.02 acres. This claim was settled December 15, 1908, for 68,818.60 acres. (See resolution of Trustees of Nov. 20, 1908, and Dec. 15, 1908. Also, the record of the Trustees, vol. 4, p. 269.) The minutes show that the Atlantic & Gulf Coast Canal & Okeechobee Land Co. reconveyed 68,821.77 acres of land back to the Trustees that had been conveyed to said canal company and the Trustees, by resolution adopted on this date, decided that they would deed a similar acreage of land back to the canal company, lying within the drainage district as then defined when the lands within said drainage district had been selected and patented.

We find that $614,485.45 has been spent in cost of construction of dredges and drainage operations from the beginning up to the 1st day of July, 1910, the date work was begun by the contractors, Furst-Clark Construction Co. It is estimated that the cost of the work let to contractors will be in the neighborhood of $2,000,000, of which amount $281,563.82 has been accomplished by the contractors.

The cost of building and equipping the dredges *Everglades*, *Okeechobee*, *Miami*, and *Caloosahatchee* was $203,570. The total cost of drainage operations, including the dredges, from the time of beginning of the drainage operations until the 1st day of July, 1910, was $614,485.45. The Furst-Clark Co. took charge under their contract the 1st of July, 1910. The cost of superintendence of the drainage operations up to May 1, 1911, was $13,857. We are of the opinion that much of the land adjacent to the canals, when the same are completed, will be sufficiently drained to cultivate, and with the cutting

of smaller or subsidiary canals into the completed canals and farm ditches, the land between the main completed canals will be drained sufficiently to cultivate. We do not, however, believe that the canals now being dug will suffice to drain all of the Everglades. It will be necessary to cut the canal to the Gulf of Mexico, as contemplated in the drainage operations. We find that there is an agreement by which the present contractors will cut this canal upon the same terms as those now being dug, should the Internal Improvement Board desire them to do so. When the Furst-Clark Co. took charge of the drainage operations, they contracted to pay the State for the State-owned dredges $145,000.

The State receives taxes on the entire amount of land sold by the State, less 50,600 acres sold by the trustees on the 16th day of November, 1910, which land was not deeded, as were the other sales, but a contract for sale made, the purchaser paying so much cash and giving notes for the deferred payments. However, it was stipulated in the contract for sale that the purchaser was to pay the drainage taxes on the land, beginning with the year 1911. The State owns in the Everglades, north of an imaginary line running due west from Miami, 676,650 acres. Up to the present time the State has received $834,730.35 from the sale of Everglade lands sold since January 1, 1905. Of this amount 25 per cent has been paid into the school fund under the constitutional provision providing that 25 per cent of all the proceeds arising from the sale of all public lands shall be paid into the school fund of the State.

On the 1st day of May, 1911, the Trustees of the Internal Improvement Fund and the board of drainage commissioners had $439,993.95 in cash on hand and resources in the nature of amounts due by purchasers of land, dredges, etc., and drainage taxes to be due during the life of the present drainage contract of $1,578,864, making a total of cash and valuable resources of $2,018,857.

All the land in the Everglades drainage district is taxed 5 cents per acre per year. The State still owns about 1,200,000 acres of land in the Everglades.

We are advised that about 35,000 acres of land in the Everglades had been sold in small tracts by promoters at prices as high as $80 per acre, under an agreement that the promoters would cut a canal at certain places which is supposed to be sufficient to carry off the water and make the lands suitable for cultivation. Parties buying the lands are fully advised, so far as we can ascertain, of the existing conditions and of the progress of the drainage operations.

We recommend that the Internal Improvement Board sell off tracts of land to bona fide settlers in tracts ranging in size from 5 acres and multiples thereof, at prices according to location, depth of soil, and other advantages determining its value, and that the same be sold when necessary upon the installment plan, the title remaining in the State until the last payment is made. We believe that this plan would yield much more into our treasury and would bring many immigrants into the State.

In our opinion there should be remaining to the State of Florida about 1,000,000 acres of Everglade land, exclusive of school lands, when the present drainage contract is completed. These lands, in our opinion, should not be worth less than $25 per acre on an average, if sold on the plans above stated.

On November 16, 1910, 50,600 acres of land in the Everglades were sold to one E. C. Chambers for a sum of $15 per acre. This is not listed in our report, for the reason that no deed was executed, the land being sold to Mr. Chambers on payments and a contract being drawn up between the Trustees and the said Chambers in lieu of a deed to the land. Most of the deeds listed were issued in amounts of from 5 to 80 acres and were issued to parties who had settled upon the lands several years prior to the issuance of the deeds, and who had made improvements thereon, and this fact, we are advised, was taken into consideration by the Trustees in making a price upon these lands. We here refer to those small tracts sold for from $1.25 to $1.50 per acre.

Your committee also crossed Lake Okeechobee, which covers approximately an area of 500,000 acres, and is situated in the northwest part of the drainage district. This lake, during heavy and continued rains, overflows its banks and overflows the land to the south and southeast, which lands are commonly called the "Everglades." The intention of the drainage operations is to lower the level of this lake about 6 feet, and by means of locks and dams control its flood waters and afford an outlet for draining the lands through which the canals pass, and also for means of transportation and irrigation. There are four of these canals now being constructed. The approximate location of these canals is shown on the accompanying map, although their entire course has not been definitely determined, except on the North New River Canal. They vary in width from 50 to 70 feet, and range in depth from 8 to 12 feet. The material that is dug from the canals is placed far enough back from the edge of the canals so as to not wash in again. This mud and rock may be leveled down and made into a fine roadbed, and we think that there is sufficient material to make a roadbed for a suburban line of motor cars, and we think that in the near future there will be a line of cars running from Fort Myers on the west to Miami and Fort Lauderdale on the east along the banks of these canals. We recommend that the Internal Improvement Board encourage the construction of the same by donating a right of way along the banks of the canals and giving this waste material for the construction of roadbeds. We know of nothing that would develop the Everglades more rapidly, except of course the drainage operations now in progress. We are advised that this waste material on one side of the canals has been given to the counties in which the canals are dug for road purposes.

All the canals under contract are to be completed within three years from July 1, 1910.

We find that the Internal Improvement Board has well in hand the drainage operations, and under J. O. Wright, supervising drainage engineer, there is a thorough check on all the proceedings, and that everything is well mapped out and planned, and we do not believe a more competent, honest, energetic, and thorough man could be found anywhere than Mr. Wright. So long as he is in charge of the actual construction, it is our opinion that the interests of the State will be thoroughly protected in every particular. At the same time, no mean advantage will be taken of the contractors.

Your committee believes that the lands are exceedingly fertile. With transportation facilities, irrigation, and climate, we believe that the Everglades would rank among the garden spots of the world.

For some 3 miles on the southeast side of Lake Okeechobee the tenderest plants survive without blight from cold. It is impossible for one not having seen that vast stretch of country to have a proper conception of its immensity. One can be on Lake Okeechobee and travel for hours out of sight of land, so vast is the surface of the lake. We find vegetation, especially such as grow in gardens, grown in profusion both at the mouths of the canals and on the banks of Lake Okeechobee. Every kind of vegetable and farm product that we saw under cultivation seemed to be grown successfully, with the exception of corn. We saw no cotton. On the banks of Lake Okeechobee we saw cabbage growing that were about 4 feet across, and were assured that fertilizer of no kind was used. We were told that they sold a cabbage the week before our visit that weighed 28 pounds, and which was grown on the south side of the lake without fertilizer. We found alfalfa growing most luxuriantly on the banks of the canal on the south shore of Lake Okeechobee. The soil is said to be as rich in ammonia as the highest class fertilizer, ranging from 2 to 4 per cent. Fertilizer containing potash and phosphate causes the soil to yield more abundantly, especially near the mouths of the canals, where the soil seems to be newer.

On the South New River Canal, some 4 to 5 miles out in the Glades, we found a settlement of some 8 or 10 families who have been conducting vegetable gardens for the season past, and they were well pleased. They had raised cabbage, tomatoes, beans, Irish potatoes, and all kinds of garden truck profitably. One person there stated that he had grown 126 hampers of beans on a half acre and sold them at an average price of $3.25 per hamper; that the average crop of beans was about 300 hampers to the acre. They raise about 500 crates of tomatoes to the acre and have grown as high as 850 crates to the acre, which yielded them from $1.50 to $3.50 per crate.

We found one farm in the Glades consisting of about three sections, with lateral ditches running into the main canal about one-quarter of a mile apart and three-quarters of a mile long. At the time we were there, about 55 acres were in actual cultivation. The lands were new, having been cultivated about 15 months. We often found along the banks of the canal houses, boat landings, etc., that had been taken possession of by settlers. We recommend that the Internal Improvement Board at once take proper steps to secure the interest of the State in the same, so that these parties may not later claim it by right of their possession, and where it is deemed best that the State may lease to them the right to occupy the same for a given number of years at an annual rental.

Your committee is of the opinion that speed of power boats will have to be limited to 6 miles per hour in passing up and down the canals, as the swash from fast-moving boats washes down the banks and sucks rocks of great size into the canals.

We notice on the South New River Canal where the water mark was about 5 feet above the level of the land, caused by the great overflow from Lake Okeechobee during the last rainy season. This shows conclusively that the Glades can not be drained to prevent overflow until the lake is lowered and converted into a reservoir.

Your committee saw ditching machines that would move right along over the Glades and cut a mile of a ditch a day about 4 feet wide at the top and 3½ feet deep, and 3 feet wide at the bottom.

This machine could be operated, so we were informed, by one person. The dirt dug was placed in a row about 8 feet from the canal, and could be easily leveled down and made into a driveway.

Your committee is of the opinion that the drainage operation will ultimately be a great success and is one of the greatest undertakings of the age, and will convert the Everglades—once a watery waste—into one of the garden spots of the world. We believe, however, before it has reached perfection that individuals will have to spend for farm ditches and lateral canals a sum approximating $2 per acre. When completed, the farmer need not fear cold, droughts, nor floods, and has the consciousness of knowing that he is tilling as rich a soil as is to be found within the bounds of the South.

There seems to be great doubt existing in the minds of many people throughout the State as to whether or not the lake can be lowered and the Everglades drained by means of canals. This is purely a matter of mathematics. That portion of the State from which the waters run to Lake Okeechobee is well defined and known. The average rainfall upon this territory is also known, as is also the rainfall upon the Glades. It is also known what per cent of the water is taken up by evaporation and what per cent goes into the ground. It is also known how many gallons of water per second pass through each of the canals at a given point. The canals are so constructed as to receive from the lake the excessive rainfall that pours into the lake over and above its capacity to hold the same when once lowered to 6 feet below its banks, which lowering will take place in the dry season—which season lasts about eight months—and as the canals pass through the Glades toward the sea and Gulf they are constantly widened and deepened, and even divided so as to carry off the extra water furnished by the Glades themselves. There is absolutely no occasion to doubt the practicability of the drainage operations. Of course, a canal will not drain a portion of the Everglades 5 to 10 miles away, as the lands are flat, unless there be lateral canals dug.

We highly indorse the drainage operations and recommend that the same be pushed with all vigor, and are in hopes that no obstacle will intervene to stop or delay the completion of the canals now contracted for and any others that may be found necessary to reclaim at least the more fertile parts of the glades.

We would further recommend, in case it is found that the canals now under construction and embraced in the plan of drainage are not sufficient to control the level of Lake Okeechobee, that a canal of proper dimensions be cut from some point on the east shore of the lake, north of Pelican Bay, in a southeast and easterly direction, along the most feasible route, if found most advisable by the engineer in chief, to Lake Worth in the vicinity of West Palm Beach, such a canal being, in our opinion, the most direct and nearest route to the ocean.

Respectfully submitted.

J. A. WILLIAMS,
Chairman of Senate Committee.
C. T. CULPEPPER.
GEO. W. WARD,
Chairman of House Committee.
SAMUEL A. ROBINSON.
JAS. E. CADE.

Statement showing length of the various canals that have been excavated from the commencement of the work to May 1, 1911, in the Everglades drainage canals.

Names of canals.	Beginning to Jan. 1, 1909.	Jan. 1, 1909, to July 1, 1910.	July 1, 1910, to May 1, 1911.	Total excavated.	Excavated to completed cross section.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*
North New River Canal	6.52	4.67	7.01	18.20	18.20
Upper North New River Canal	.....	.....	11.51	11.51	6.71
South New River Canal	6.72	6.92	2.77	16.41	16.41
Upper South New River Canal	.....	.....	8.55	8.55	8.55
Miami Canal	.....	4.25	5.68	9.93	9.93
Upper Hillsboro Canal	.....	.....	4.52	4.52	2.27
Total miles of canal excavated to May 1, 1911	.....	.....	.....	69.12	.....
Total miles of canal excavated to completed cross section May 1, 1911	.....	.....	.....	.....	62.07

Total yardage included under Furst-Clark Co.'s contract July 1, 1910, to complete these canals	19,000,000
Total yardage removed by Furst-Clark Co.'s contract July 1, 1910, to May 1, 1911	3,040,279
Per cent of Furst-Clark Co.'s contract completed	16
Approximate per cent of all the above canals completed May 1, 1911	30

J. O. WRIGHT, *Chief Drainage Engineer.*

TALLAHASSEE, *May 12, 1911.*

PROGRESS STATEMENT No. 1.—*Everglades drainage canals.*

The following table shows the work done by the Furst-Clark Construction Co. during the three months ending September, 1910:

Names of canals.	July.		August.		September.		Total.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
South New River Canal AA	51,723	11,365	88,878	16,744	53,052	14,655	193,653	42,764
North New River Canal BB	18,419	9,282	46,009	28,975	46,654	32,115	111,082	70,372
Miami Branch Canal CC	36,675	22,841	41,206	34,216	28,645	50,589	106,526	107,646
Total	106,812	43,488	176,093	79,935	128,351	97,359	411,261	220,782

SUMMARY.

Earth and rock removed to date	cubic yards	632,043
New canal excavated to date	miles	4.8
Old canal enlarged to date	do	5.0
Per cent of entire contract completed		3.4

J. O. WRIGHT, *Chief Drainage Engineer.*

PROGRESS STATEMENT No. 2.—*Everglades drainage canals.*

The following table shows the work done by the Furst-Clark Construction Co. during the three months ending December 31, 1910:

Names of canals	October.		November.		December.		Total.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
South New River Canal AA	47,031	17,575	75,509	9,877	81,012	.....	203,552	27,452
North New River Canal BB	89,737	22,203	148,263	18,649	155,097	15,816	393,097	56,668
Miami Branch Canal CC	40,011	27,611	35,397	22,105	78,025	22,421	153,433	72,137
Hillsboro Canal DD	6,324	.....	36,985	.....	51,428	.....	94,737	.....
Total	183,103	67,389	296,154	50,631	365,562	38,237	844,819	156,251

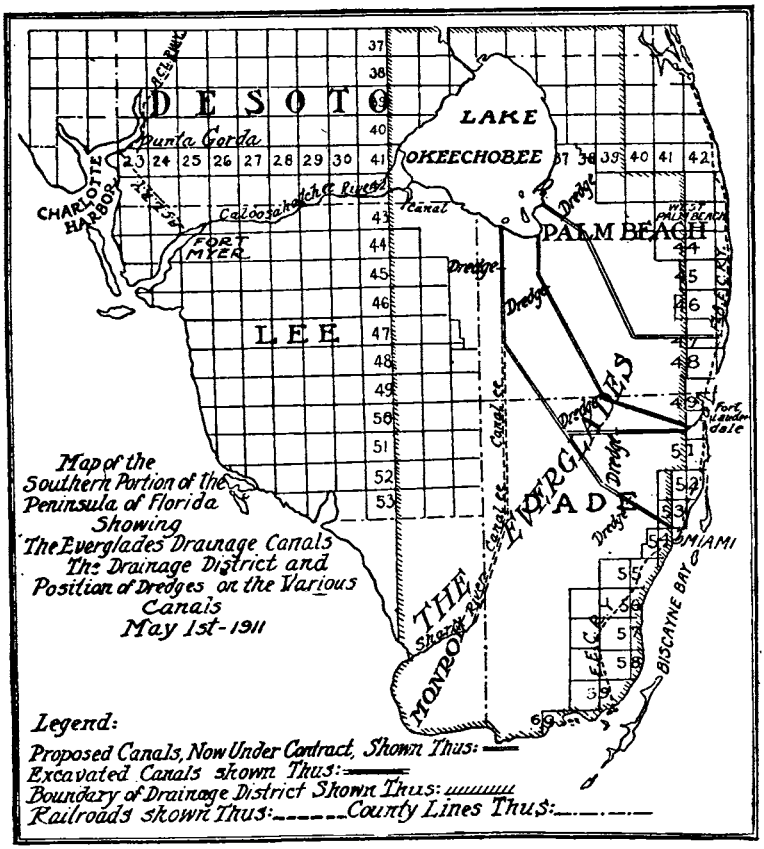
SUMMARY.

Earth and rock removed to date	cubic yards	1,633,100
New canal excavated to date	miles	12.1
Old canal excavated to date	do	5.0
Per cent of entire contract completed		8.6

J. O. WRIGHT, *Chief Drainage Engineer.*

TALLAHASSEE, FLA., *Jan. 1, 1911.*

PLATE VI.



PROGRESS STATEMENT No. 3.—*Everglades drainage canals.*

The following table shows the work done by the Furst-Clark Construction Co. during the three months ending March 31, 1911:

Names of canals.	January.		February.		March.		Total.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
South New River Canal AA	71,042	.....	101,092	.....	134,615	12,309	306,749	12,309
North New River Canal BB	137,141	16,566	137,513	34,858	122,630	26,696	397,284	78,120
Miami Branch Canal CC	21,152	12,442	48,346	28,750	10,245	5,953	79,743	47,145
Hillsboro Canal DD	34,848	.....	33,000	.....	34,200	.....	102,048	.....
Total	264,183	29,008	319,951	63,608	301,690	44,958	885,824	137,574

SUMMARY.

Earth and rock removed to date	cubic yards..	2,656,517
New canal excavated to date	miles..	22.81
Old canal excavated to date	do....	8.36
Per cent of entire contract completed		13.98

J. O. WRIGHT, *Chief Drainage Engineer.*

TALLAHASSEE, FLA., *April 1, 1911.*

PROGRESS STATEMENT No. 4.—*Everglades drainage canals.*

The following table shows the work done by the Furst-Clark Construction Co. during three months ending June 30, 1911:

Names of canals.	April.		May.		June.		Total.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
South New River Canal AA	29,817	8,348	.....	.....	5,127	5,367	34,944	13,715
North New River Canal BB	193,907	31,697	269,998	22,365	475,509	17,088	939,414	71,150
Miami Branch Canal CC	47,871	25,562	33,318	35,667	31,411	36,899	112,600	98,128
Hillsboro Canal DD	46,560	.....	67,520	.....	83,736	.....	197,816	.....
Total	318,155	65,607	370,836	58,032	595,783	59,354	1,284,774	182,993

SUMMARY.

Earth and rock removed to date	cubic yards..	4,124,284
New canal excavated to date	miles..	35.26
Old canal excavated to date	do....	8.36
Per cent of entire contract completed		25.2

J. O. WRIGHT, *Chief Drainage Engineer.*

TALLAHASSEE, FLA., *July 1, 1911.*

PROGRESS STATEMENT No. 5.—*Everglades drainage canals.*

The following table shows the work done by the Furst-Clark Construction Co. during the three months ending September 30, 1911:

Names of canals.	July.		August.		September.		Total.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
South New River Canal AA	.....	.....	.....	.....	.....	.....	.....	.....
North New River Canal BB	480,910	15,183	191,528	6,075	167,560	11,836	839,998	33,094
Miami Branch Canal CC	48,087	16,842	73,224	.....	55,104	.....	176,415	16,842
Hillsboro Canal DD	86,592	.....	105,596	.....	311,500	.....	503,688	.....
Total	615,589	32,025	370,348	6,075	534,164	11,836	1,520,101	49,936

SUMMARY.

Earth and rock removed to date	cubic yards..	5,694,321
New canal excavated to date	miles..	49.99
Old canal excavated to date	do....	8.36
Per cent of entire contract completed		33.1

J. O. WRIGHT, *Chief Drainage Engineer.*

TALLAHASSEE, FLA., *October 1, 1911.*

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