EXAMINATION OF FERRY (CADDO) LAKE

Volume I

Miscellaneous Documents

U.S. Department of the Interior 1914

Compiled for the Shreveport to Daingerfield Study

INTRODUCTORY NOTES

By: Jacques D. Bagur

In 1913-14, the U.S. Department of the Interior conducted a major study of the Louisiana side of Caddo Lake, which was then known as Ferry Lake. Oil had been discovered in the area, and there were disputes over public versus private ownership and among private interests. The disputes resulted in a number of court cases called collectively the "Ferry Lake Cases," some of which went to the U.S. Supreme Court.

A lot of money was at stake, and the various parties to the disputes had their own teams of lawyers and technical experts. The Department of the Interior was brought into these disputes because it was necessary to answer certain technical questions that could only be answered through a large, detailed, and objective study that could stand up in the face of minute analysis and intense questioning.

There were three principal investigators in the study. Arthur Kidder, the Supervisor of Surveys for the General Land Office of the Department of the Interior, was in charge of the study. Major contributions were made by Frank Leverett, a geologist with the U.S. Geological Survey, and Lionel Janes, an ecologist with the General Land Office. They were assisted by a large team of technicians.

The study had three major purposes:

- To determine whether Caddo Lake existed and was a navigable body of water in 1812 when Louisiana entered the Union. This needed to be done because public claim to waterbodies is based on navigability.
- To determine the mean (or ordinary) high water level on the lake in 1812 and in 1839 when the original state survey of the Caddo Lake area was conducted by A. W. Warren of the Louisiana General Land Office. This was done because mean high water is the dividing line between public and private property.
- To determine whether Warren had correctly meandered Caddo Lake (that is, whether Warren's survey maps correctly showed the mean high water line).

The question of when Caddo Lake came into existence had been addressed by Arthur Veatch in 1899 in a report on the geology of Louisiana published by the Louisiana Geological Survey. Veatch had provided an estimate of 1777 on the basis of the upward rate of movement of the Red River Raft. Janes provided a similar estimate on the basis of an analysis of the age of trees that could have only come into existence after the lake was formed.

Navigability of the lake for later periods was easily determined through historic texts and personal testimony, although there was considerable controversy as to whether the lake was

navigable outside of the old channel of Cypress Bayou. The only thing the study team needed to determine was whether these conditions prevailed in 1812.

The bulk of the study effort was, therefore, directed toward establishing the historic mean high water level on Caddo Lake and rerunning Warren's survey to determine corrections and establish greater precision in the survey line. Since there were no records of the historic mean high water level on the lake, it was necessary to establish one through geologic and ecologic evidence. The primary piece of geologic evidence was the escarpment formed on the lake edge by the lapping of water at the mean high water level line. The primary piece of ecologic evidence was the types of trees along the shoreline (cypress grows in a water fluctuation zone up to the mean high water line).

The studies went beyond the question of mean high water levels. The stumps in the bed of Caddo Lake were analyzed to determine the composition of the forest in the valley of Cypress Bayou before the lake came into existence. The channel of Cypress Bayou below lake waters was located and mapped. Numerous historic texts relating to the issues at hand were collected and analyzed.

The investigations by the Department of the Interior and the responses to those investigations by a multitude of interested parties resulted in many thousands of pages of documents, legal briefs, and court testimony. Most of the materials produced by the Department of the Interior were collected by the National Archives. These files were obtained from the National Archives on microfilm, and the key documents have been reproduced in a three-volume set, of which this is the first volume.

Volume I contains the following documents:

- 1. List of papers and exhibits through June 1915
- 2. Decision of Commissioner of General Land Office
- Letter directing that the investigation be conducted
- Special instructions to Arthur Kidder
- 5. Kidder's transmittal letter for the reports
- Kidder's report
- Frank Leverett's summary report
- Leverett's main report.

Volume II contains the reports by the ecologist Lionel Janes, including his summary report, main report, and description of wood specimens. Volume III is Janes' photographic folio.

The maps produced in conjunction with these reports can be found elsewhere in this depository and include:

- 1. Janes' six ecological survey plats
- 2. A hydrographic and topographic map of the study area (two parts)
- 3. A general drainage map of the Caddo Lake and Red River areas
- A traced enlargement of a portion of the general drainage map (two parts)
- 5. A resurvey plat of the study area
- A supplemental topographic map of Mooringsport.

These three volumes, with the accompanying maps, contain all of the primary documents produced in conjunction with the Department of the Interior investigation, with the exception of Kidder's field notes.

If there are any questions about these documents, about other materials obtained from the Department of the Interior relating to the investigation, or about subsequent court testimony and briefs, please contact me at (504) 336-4606, or write to 1650 Blouin Avenue, Baton Rouge, Louisiana 70808.



LIST OF PAPERS AND TXHIBITS COMPRISING THE RECORD IN THE CASE INVOLVING THE QUESTION OF TITLE TO SO-CALLED FERRY LAKE IN T. 20 N., R. 16 W., CADDO PARISH, LOUISIANA.

1. Prior to the Commissioner's decision of January 10, 1915.

1. Application of Thomas D. Singleton, Jr. and Tom Hinton, dated December 8, 1909, for survey of unsurveyed lands.

2. June 17, 1910, amended application of J. B. King et al.

3. April 22, 1910-36251, Fred J. Grace, Register of State Land Office, Baton Rouge, to Commissioner G.L.O., stating that it is the intontion of the State to survey and dispose of dried up lake beds and requesting expression of opinion as to whether or not the government will claim Ferry Lake. Jopies of the following affidavits relative to the navigability of the lake were submitted: By W. F. Buckalew, B. W. Marston, Janes S. Moel, P. Youree, C. G. Rives, Levi Cooper, A. Kahn, D. B. Hamilton, W. F. Dillon, S. N. Eirley, John R. Jones, F. A. Leonard, M. L. Scovell, W. H. B. Croom, and N. C. Blanchard.

4. June 2, 1910, 122623, J. A. Tellier, Attorney at Law, Little Rock, Arkansas, submitted abstract and brief with book of exhibits A to T, inclusive.

5. Printed notice of publication relative to intention of filing application for survey published in December 3, 1909, issue of the Vivian, Louisiana, "Tr-State Sun".

6. November 1, 1909, returned registered letter receipts of notices served upon all riparian owners of record by the applicants for the survey.

7. Appearances were filed by the following Attorneys: April 26, 1910, F. E. Chapin as Attorney for the Gulf Refining Company.

May 2, 1910, F. E. Chapin as Attorney for the Caddo Leves Board and the State of Louisiana.

July 27, 1910, Andrew B. Duval advised that he is associated with Mr. F. E. Chapin.

September 28, 1910, Mesars. Britton and Gray as Attorneys for the Cadio Levee Board.

June 14, 1912, B. W. Marshall as Attorney for the applicants.

January 14, 1913, B. W. Marshall as Attorney for the applicants.

March 28, 1913, the firm of Britton and Gray withdrew from the case.

May 22, 1913, Duane E. Fox, Frank Boughton For and Newton K. For as Attorneys for the applicatns.

May 13, 1913, Governor of Louisiana filed notice with the Secretary of the Interior that Ruffin G. Pleasant, Attorney General, and G. A. Gondran, Assistant Attorney General, are empowered to represent the State.

8. June 4, 1910, a revocation of the power of attorney of John J. Lentz was filed by C. B. Kelly and L. A. Byrne, applicants, and J. A. Tellier was appointed sole attorney for them.

9. The following exhibits were filed by the applicants for the survey:

(a) Affidavits by Thomas Singleton, Charles H. Miller
(2), C. L. Haylock, J. B. King, Joshua Whealdon, H. J. Hamilton (2), D. M. Evans, Charles F. Davis, M. G. Angell, N. W.
Green, J. D. Winters, W. M. Mahoney, J. E. Irwin, V. M. Aiken, and C. B. Zelly (4).

(b) Photolithographic copies of the plats of T. 20 N., R. 16 W., dated 1839, 1871 and 1896; profile of traverse line of 1839; blue print of Caddo Oil Field showing the seventy-one mineral locations of the petitioners; Van Dyke print by Charles H. Miller showing water surroundings and corrected meander line with reference to the traverse line of the survey of 1839; a map made by Charles H. Miller showing the lines of his suvey made in April, 1909, and the location of certain trees referred to in W. W. Green's affidavit.

(c) Nine photographs taken by Joshua Whealdon and six photographs taken by W. W. Green.

(d) Cross sections of four different oak trees alleged to have grown on unsurveyed lands within the Ferry Lake area.

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(e) Marked pages from the following reports:

Annual Reports of Chief of Engineers of the United States Army for 1890 and 1901; Report of Geological Survey of Louisiana for 1899; House Document 785, 59th Congress, 1st Session; Professional Paper No. 46 of the Geological Survey, published as House Document No. 488, 59th Congress, 1st Session; Senate Document No. 101, 54th Cong., 1st Session.

(f) Notice to Register and Receiver, Natchitoches, Louisiana.

(g) Copy of Oil Lease entered into between the Caddo Levee Board and the Gulf Refining Company, dated Hovember 4, 1910, together with a blue print showing the area leased which is the same as the area of so-called Ferry Lake, submitted by J. B. King.

(h) Abstract and brief by J. A. Tellier.

(1) Reply brief by Tellier and Webster.

10. The following exhibits were filed by the protestants against the survey:

(a) Affidavits by Frank E. Chalk (S), Frederick A.
Leonard, Robert H. Harrell, W. A. Ellett, C. B. Croom, C.
E. Black, Frank M. Kerr, R. Dresse, Walter B. Pyron.

(b) An explanatory map and a topographical map of Ferry Lake by Frank E. Chalk.

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(c) Nine photographs taken by Frank E. Chalk.

(d) Marked pages in the following documents:

Professional Paper No. 46 of the Geological Survey, published as House Document 488, 59th Congress, 1st Session; Report of Geological Survey of Louisiana for 1899; Message and Documents, War Department, Part 2, 1873-1874; Executive Document No. 1, 43rd Congress, 1st Session, containing reports of the Chief Engineers of the United States Army.

The above exhibits were filed by F. E. Chapin October 26, 1911, and February 19, 1912, and December 20, 1911.

(e) A protest against the allowance of the application for survey and a brief in support thereof filed October 31, 1910, by F. E. Chapin.

The following papers have also been made a part of the record:

A copy of the withdrawal order of December 15, 1908, by the Secretary of the Interior, and the correspondence leading up to the issuance of said order; a copy of the oil restoration of June 3, 1910, containing the description of the lands restored; and a copy of the Executive Order of withdrawal for Petroleum Reserve No. 4, issued July 1, 1910, and approved July 2, 1910, by the President, together with correspondence relating thereto.

A report made by United States Charles M. Pidgeon,

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dated April 24, 1911, based upon his investigation made during February of that year, together with a plat prepared by him showing thereupon high lands erroneously ommitted from the original surveys and a set of field notes based upon his supplemental surveys.

forrespondence from the firm of Blanchard, Barret and Smith, Attorneys, Shreveport, Louisians, relating to a portion of the Ferry Lake area claimed by the Jeems Bayou Fishing and Hunting Club, together with a copy of a brief by said attorneys filed by them in the suit of the Caddo Levee District against said Club, filed in the District Court of the First Judicial District of Louisiann, Suit Ho. 13707, and a copy of the opinion rendered in said suit March 8, 1911, by Judge E. T. Sutherlin, and a copy of a plat prepared by Mesars. Crawford and Barnes, Surveyors, under direction of the court; also a copy of a reply brief by said attorneys.

A copy of the opinion of the court in the case of Sapp v. Frazier et al., rendered by Blanchard, Judge, 51 Ann., (La) 1718, involving the status of a certain area shown upon the official plats as Lake Bistineau.

II Papers and exhibits filed subsequent to the Commissioner's decision of January 10, 1913(copy herewith):

1. January 18, 1913, request filed by Attorneys F.

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E. Chapin and A. B. Duvall for extension of sixty days for filing of brief.

2. January 27, 1913, notice by Department that ertension was allowed. Notice was also served upon Attorney B. W. Marshall.

3. February 7, 1913, R. G. Pleasant, Attorney General of Louisiana, applies for extension of sixty days for filing of briefs on behalf of the State and requests that oral argument be permitted.

4. February 17, 1913, Assistant Secretary of Interior grants extension for filing of briefs.

5. March 24, 1913, Department of the Interior serves notice upon Attorneys Chapin, Marshall, Pleasant, and the firm of Britton and Gray, that oral argument will be allowed April 16, 1913.

6. The date of oral argument was afterwards changed to May 23 and 24, 1913, on which days the attorneys for all parties in interest were present and submitted arguments.

7. After the oral arguments the following printed briefs were submitted:

(a) For the applicants:

Brief on behalf of the applicants by Duane E. Fox, Frank Boughton Fox, Newton K. Fox, and Burgess W. Marshall, Attorneys for the applicants, Charles A. Towne of counsel.

Reply brief by the same on behalf of the applicants.

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(b) For the protestants:

Brief on behalf of the State of Louisiana by R. G. Fleasant, Attorney General, and G. A. Gondran, Assistant to the Attorney General of Louisiana, Daniel Wendling of counsel.

Brief on behalf of the Caddo Levee District and the Gulf Refining Company by F. E. Chapin, A. B. Duval, D. Edward Greer, J. A. Thigpen, and S. L. Herold, Attorneys, F. C. Proctor of counsel.

Reply brief on behalf of the protestants by R. G. Pleasant, G. A. Gondran, Thigpen and Herold, F. E. Chapin, A. B. Duval, D. Edward Greer, and F. C. Proctor.

8. April 24, 1913-63080-13-296302, Chief of Field Division E. D. Stanford submitted a report showing that between May 4, 1911, to April 1, 1913, the Gulf Refining Company working under a lease from the Caddo Levee Board had extracted approximately 720,000 barrels of oil from unsurveyed lands within the area of Ferry Lake.

9. August 26, 1913, Director of Gelogical Survey to Acting Secretary A. A. Jones, referring to informal instructions and stating that George C. Matson, Associate Geologist had been detailed to make a geological investigation of the Ferry Lake area.

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10. September 3, 1913-76049 (D-19739), First Assistant Secretary to the Commissioner of the General Land Office, di-

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recting that a competent surveyor be detailed to rake an investigation of the Ferry Lake area.

11. September 27, 1913, detailed instructions issued to Supervisor of Surveys Arthur D. Kidder to make the investigation directed by the Acting Secretary.

(About this time Ecologist Lionel L. Janes of the Forest Service, temporarily within the employ of the General Land Office, was detailed to work with the Geologist and Surveyor in investigating the Ferry Lake area. There were no formal instructions issued to him as he was directed to work under the supervision of Mr. Midder. His report is referred to hereafter).

(The services of Professor E. C. Cowles of the University of Chicago, one of the most eminent ecological authorities in the world, were secured and he acted as a sort of supervisor of the ecological investigation for a short time. Ee did not submit any report, however).

12. Investigations wore made duting the fall of 1913, the winter of 1913 and 1914, and the spring of 1914, by Messrs. Kidder, Janes and Matson. Mr. Matson, however, did not complete his investigation and has no report with the record. He was superseded by Ecologist Frank Levorett, who submitted a report in his stead.

The following reports based upon the above referred to

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investigations have been submitted:

(a) By Geologist Frank Leverett:

His report of July 17, 1914, and his summary report submitted on the same date through the Director of the Geological Survey.

(b) By Supervisor of Surveys Arthur D. Midder:

His report of October 14, 1914.

The copy of the report or journal of the Joint Commission appointed for the survey of the Texas-Louisiana boundary line.

A map designated sheet No. 7, showing the hydrographic and topographic features of T. 20 M., R. 16 W.

A map designated sheet No. 8, showing the drainage systems of Red River and the raft formed lakes; also a portion of the map of the Freeman-Curtis expedition of 1806.

A map designated aheet No. 9, constituting a resurvey plat of T. 20 N., R. 16 W.

A map designated sheet No. 10, showing the incorrect and the correct location of the townsite of Mooringsport in Sec. 25, T. 20 M., R. 16 W.

Three books of field notes pertaining to:

1. The reastablishment of the south, east and north boundaries of T. 20 N., R. 16 T.

2. The reestablishment of the boundary line between Texas and Louisiana. 3. The reestablishment of the subdivisional and meander lines of T. 20 N., R. 16 N.

A piece of an original bearing tree from A. W. Warren's survey of 1839.

(c) By Ecologist Lionel L. Janes:

His report of July 14, 1914.

A photographic folio containing seventy-one pictures with explanations.

Six plats upon which are mapped the various species of trees within six separate localities investigated by him.

Twelve pieces of wood submitted as specimens collected by him from trees within the submerged area of so-called Ferry Lake.

13. September 24, 1914, Commissioner of the General Land Office to First Assistant Secretary Jones requesting advice relative to submitting reports based upon the above referred to investigations.

14. September 26, 1914-376480, Private Secretary John Harvey to Commissioner General Land Office returning Ecologist Janes' report and advising that First Assistant Secretary Jones desires this office to reconsider the case.

15. Humber of miscellaneous letters relating to the question of status of the lands involved in this case.

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GENERAL LAND OFFICE

Wassension January 10, 1913.

Re application of John B. King. et al. for the survey of cortain alleged unsurveyed land within the area of Ferry Lake, Louis tana.

The Honorable,

The Secretary of the Interior. Sir:

On December 8, 1909; Thomas D. Singleton, Jr., and. Tom Hinton executed and filed with the Commissioner of the General Land Office, through their attorneys J. A. Tellier of Little Rock, Arkansas, and John J. Lentz, of Columbus, Ohio, an application for the survey of the unsurveyed portions of Sections 10, 11, 12, 13 and 24, T.20 N., R. 16 W., formerly Natchitoches, now Baton Rouge, Louisiane, land district.

On June 17, 1910, Attorney J. A. Tellier transmitted to the Commissioner of the General Land Office an amended application for survey of the same lands, said application having been executed by John B. King. Texarkana. Texas,

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L. A. Bone, Texarkana, Arkansas, and C. B. Kelley, Homan, Arkansas, and J. E. Ritchie, Texarkana, Texas, and requested that the amended application operate <u>nunc pro tunc</u> as of December 8, 1909. Thereafter the case has been designated as application of J. B. King; et al.

The interests claimed by the efforementioned applicants are based upon seventy-one locations for petroleum, gas and other mineral substances made under the provisions contained in Chapter VI, Title 32, U.S.R.S., and extended by the Act of February 11, 1897 (29 Stat., 526). The area covered by said locations comprises approximately 1241.26 acres of land the greater part of which is submerged under the waters of sc-called Ceddo or Fairy or Ferry Lake. Hereafter it will be designated Ferry Lake. Subsequently other locations of the same character ware made by some of the above mentioned parties in Sections 14, 15, 22 and 23, township and range aforesaid. All of the aforementioned locations were recorded in the office of the Recorder or Caddo Parish, at Shreveport, Louisiana.

In an affidavit executed June 14, 1910, C. B. Kelley alleged that he had been informed that one C. . Green had since located mineral claims on the same lands.

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It is contended by the applicants that the primary question involved is the correction of an erroneous survey by the Dited States Government and that unless such correction be made speedily needless local litigation will arise which will prejudice the rights of the applicants.

One H. J. Hamilton, in affidavits executed by him July 26, 1910, and Outober 13, 1910, alleges that he discovered gas on locations Nos. 10, 12 and 13.

J. B. King, in an affidavit executed December 8, 1909, states that he had exercised all dus diligence in his effort to find the claimants to the lands bounding on the meander lines of so-called Ferry Lake, that is adjacent property owners of the surveyed fractional Sections 10, 11, 12, 13 and 24, T. 20 N., R. 16 W; that such persons were unknown to him; that he was unable to find them; that under date of November 1, 1909, he mailed registered to the record addresses of said persons sopies of the notice setting forth that on December 8, 1909, the aforementioned applicants would appear befors the Commissioner of the General Land Office for the purpose of filing an application for the survey of the unsurveyed lands embraced within the area of 'their mineral locations. The aforesaid mailing

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is evidenced by registry receipts numbers from 1776 to 1794, inclusive, attached to the affidavit.

Notice was also served by publication commencing with the issue of November 5, 1909, and ending with the issue of December 3, 1909, five insertions, in the Tri-State Sun, a weekly paper published at Vivian, Louisiana, as attested by an affidavit shorn to by its publisher. Charles A. Taylor, May 23, 1910. Following are the parties upon whom notice was served by the aforesaid publication:

The Secretary of State and the Attorney General of Louisiana; Fresident of the Caddo Levee Board; Gulf Refining Company; Producers Oil Company; C. W. Lane; Matthew VanLear: Annie E. McGowan (or Annie E. Brown); Maggie J. Pitts; Caddo Gas and Oil Company; R. L. Gilbert; Surry Oil and Development Company; T. M. Richardson; W. H. Langsford; S. Z. Mcss. Widow of A. B. Liggest. his administrators, executors and heirs; A. P. Baldwin, M. L. Cotter; W. E. Green; L. L. Jester; M. W. Travers; W. B. McCormick, Receiver of Caddo Lake and Pipe Line Company; D. C. Richardson and S. H. Minnelsy; Louisians - Texas Oil and Pipe Line Company; William Redersdorff; Emma T. Marshall; Gussie Marshall; Pearl Marshall; Sammie Marshall; Mrs. Mand M.

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Webb, Mrs. Minnie VenTyne, heirs of Thaddeus W. Marshall. Jeems Bayou Fishing and Hunting Club.

On December 8, 1909, the date on which the application was noted as formally filed, an oral hearing was held and oral argument made by the attorneys of the applicants before the Commissioner of the General Land Office. On December 23, 1909, James L. Autry, Houston, Texas, informed this office that he represented as attorney some of the parties interested in this case. He did not, however, file his formal appearance, nor has he done so since.

Appearances were filed in this office by attorneys as follows:

April 26, 1910, F. E. Chapin, Washington, D. C., representing the Gulf Refining Company.

May 2, 1910, F. E. Chapin, representing the State of Louisiana and the Caddo Levee Board.

September 28, 1910, Britton and Gray, Washington, D. C., representing the Caddo Levee Board.

On June 4, 1910, a revocation of the power of attorney to John J. Lentz, was filed by C. B. Kelley and L. A. Byrne, and said J. A. Tellier was appointed sole attorney as to them.

On June 14, 1912, B. W. Marshall, Weshington, D. C. filed his appearance as one of the attorneys for the applicance.

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Briefs have been filed by the following parties:

1.- J. A. Tellier, as attorney for the applicants named herein.

2.- F. E. Chapin, as attorney for the Caddo Levee Board.

3.- A supplemental brief by J. A. Tellier.

Additional to the above referred to briefs, the following exhibits have been filed as svidence:

1:- For the applicants:

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(a) Affidavits by Thomas Singleton, Charles H.

Miller (2), C. L. Haydock, J. E. King, Joshue Wheeldon, H. J. Hemilton (2), D. M. Evans, Charles F. Davis, M. G. Angell, W. W. Green, J. D. Winters, W. M. Mahoney, J. E. Irwin, V. M. Aiken, C. B. Kelley (4).

(b) Photolithographic plats of the surveys of T.

20 N., R. 15 W., dated 1839, 1971 and 1895. profile of traverse line of 1839; blue print of Caddo Oil Field showing the seventy-one mineral locations of the petitioners: profile of the traverse line of the survey of 1839; Vandyke print by Charles H. Miller showing water. surroundings, and corrected meander line with reference to the traverse line of the survey of 1839; a map made by Oharles H. Miller showing the lines of his survey made in

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April, 1909, and the location of cartain trees referred to in W. W. Green's affidevat.

- (c) Nine photographs taken by Joshua Whealdon; six photographs taken by W. W. Green.
- (d) Cross sections of four different oak trees which grew on unsurveyed lands within the meanders of so-called Ferry Lake.

(e) Pages taken from the following reports.

Annual reports of Chief Engineers, 1890; 1901; Geological Survey report of Louisiana for 1899; House Document 785, 59th Congress: professional paper No. 46, 1906, H. R. Document 488, 59th Congress, 1st Session, United States Geological Survey.

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(f) Notice to Register and Receiver, Natchitoches, Louisiana.

2:- By F. E. Chapin on behalf of the protestants, the Caddo Levee Board and the State of Louisiana.

(a) Affidavits by Frank E. Chalk (3), Frederick
A. Leonard, Robert H. Harrell, W. A. Ellett, C. B. Crown,
C. N. Black, Frank M. Kerr, R. Dresse; Walter B. Pyron.

(b) An explanatory map and a topographical map of Ferry Lake by Frank E. Chalk.

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"E" 09-122623 - DMG. (P)

- (c) Nine photographs taken by Frank E. Chalk.
- (d) Professional papers No. 46, 1906, H. R.

Document 488, 59th Congress, let Session Geological Survey, Geological Survey report of Louisiana for 1899; Message and Documents, War Department, Part 2, 1873, 1874, Executive Document No. 1, 43rā Congress, let Session containing report of Chief Engineers.

3:- By Fred J. Grace, Register of the Louisiana State Land Office:

(a) Affidavits by W. F. Buckalew, B. W. Marston;

James S. Noel, F. Yourse, C. G. Rives, Levi Cooper. A. Kahn, D. B. Hamilton, W. F. Dillon, S. N. Kirley, John R. Jones, F. A. Leonard, M. L. Scovell, W. H. B. Croom. N. C. Blanchard.

4:- By the firm of Blanchard, Barret and Smith, Attorneys, Shreveport, Louisiana, on behalf of Jeems Bayou Fishing and Hunting Club, one of the protestants herein:

(a) Copies of a brief and of the decision by the

District Court of the 1st Judicial District of Louisiana, in the suit of the aforementioned club against Board of Commissioners of the Caddo Levee District involving title to certain adjacent lands in this township.

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(b) A map made by Crawford and Barnes, Surveyors by direction of the aforementioned court.

J. A. Tellier, attorney for the applicants, contends in his brief that:

(1) Certain of the unsurveyed lends in Sections

10, 11, 12, 13, 14, 15, 22, 23 and 24. T. 20 N., R. 16 W., Louisiana, were erromeously omitted from the original surveys as executed by Government surveyors and are therefore, lands of the United States.

(2) That the bed of Ferry Lake, except its chan-

nel, which is in reality the channel of Cypress Bayou, was at one time and prior to 1777, a thickly wooded valley covered by a forest of oak and cypress; that the formation of the "Great Raft" in the Red River caused said valley to become overflowed, thus forming Ferry Lake.

(3) That Ferry Lake except the part which was

originally Cypress Bayou is nonnavigable, and that its bed therefore, being land, mineral in character did not pass to the state of Louisiana under the Swamp Land Grant of March 2, 1849 (9 Stat., 352), and is still lands of the United States.

(4) That if it be found that the bed of Ferry

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The estimates for the state and the Conternant Beard ended that the accureps hards freighted of "-17 Lake passed to the State of Lexistan, edthys,

(1) On the commutant of the State by white .

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(2) II Issie the where the protest is ...

Swarp Land Count of March 2, 1812 1914 (352). The attornage for the whire by the filler of the lands claim that, in the event that the lake is in the other the unsurveyed lands adjoining the surveyed lands, was parallel been uncovered should be the ripe for which is in the

the doctrine of auguisition by acception or tollow.

The same raised heating as therefore, a state of title to the heat of the late 2 constraint. Take as originally swerls of the Trited State 2 constraint. Enrysyons.

Standiff Forty Dike as easting the state of the state of shows shows to be the the state of the

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Townships 19, 20, and 21 N., Range 16 W., and Township 20 N., Range 15 W., in the State of Louisiana, and the balance of it in the State of Texas. The original surveys of the aforesaid townships were approved on the following dates:

T. 19 N., R. 15 W., February 13, 1839.
T. 20 N., R. 16 W., August 31, 1839.
T. 21 N., R. 16 W., February 13, 1839.
T. 20 N., R. 15 W., August 31, 1839.

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The actual field work in Township 21 N., R. 16 W., was done during the fourth quarter of 1837. The whole township was surveyed and while lines were run showing the boundaries of so-called Ferry Lake, and the name was placed upon the plat, yet all of the section lines appear on the plat and the land designated "Ferry Lake" in that township was subsequently patented to the State of Louisiana unde: the provisions of the Swamp Land Grant.

The actual field work in Townships 20 N., Ranges 15 and 16 W., was done during the first quarter of 1839. The plat of the latter township showed 10,328.09 ecres to be land and the balance 12,711.91 acres to be open lake The plat of the former township does not give the total

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Abreage if land surveyed therein. It was, however, approximately, 4,000 works of Rani and the balance about IT,000 abres was provided and designeets is parts of so-wolled Clear, 3rd: out Ferry Lakes.

During 1971, giat approved January 3, 1972, a resurvey of Fornably 20 M., B. 15 W., was made and the late of what were originally insignated in 1832 as Clear. Sola and Perry Lekes, were shown as land and were subsequently Approved to the State of Lowislans under the provisitors of the Swarm Land Grant. The latest plate in this office how show that there are no open lakes in Township 20 N., Ro 15 W., and T. 21 M., R. 16 W.

The same sirestion appears with references Tryaship 21 N., R. 15 W., Te. 19 and 20 N., R. I4 W., "The driginal plats of 1039 showed the greater packs of these towarships to be from Labor. The order great reference of 1872 showed ther wit he be land and the state afterwards of 1872 them under the Swarp Land Grant,

Leto: testarene d' T. 20 M. P. 14 W., were cofe. 28 fullows.

1354 - Afding 55.45 shows to See. 31. and 45.04 acres to See. 32, taual 90.44 series of land not previously ' E' 09-162023 - B10. (P)

shown on the plat.

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1871 - Adding 24.16 Hores, 179.60 mires, 76.01 acres, 121.33 acres, 23, 96 cores. 101.90 acres, and 27.83 mores to Sees. 4. 9, 11, 5, 8, 17 and 20 respectively. total 566.89 cores not previously shown on the plats -1839 and 1854.

So-called Cross Lake in T. 18 M., Rs. 14, 15 and 16 W., and T. 17 N., Rs. 14 and 15 W., containing approximately 18,000 scres as shown on the original plats was similarly circumstanced. The resurveys of 1871 show it to be land. The state acquired it also under the Swamp Land Grant.

At the date of the filing of the application bersin referred to it appears that T. 20 H., R. 16 W., and I. 19 N., R. 15 W., are the only ones showing parts thereat to be meaniered as lakes. The adjoining townships show only land and that too extends to the pery bundaries of those townships. Thus for instance, the eastern out f Perry Lake, according to the plats of survey on file in this office. Is out off by etraight times and no autlet is shown connecting it with successed Sode Lake. This is a noticeable peopleanty and bespecks either an abrint and

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elong the boundary line between Tps. CO H., R. 16 W., and Tp. 20 N., R. 15 W. of 12 erronsons survey of one of these . two townships. Such, then is the topography as shown by the plate based upon the Covernment surveys.

The applicants herein ast up the following contac-

(1) That there are pertain considerable areas of high land between the actual water boundary and the meander lines of the latest Covernment survey, which have never been permanently covered with water and that the same should be declared Government land and surveyed.

(2) That the bed of scenelled Ferry Lake between the water boundary and a well defined channel which was originally Cypress Bayon, is entirely covered with stumps of oak and cypress and was, before the formation of the Breet Raft in the Red River, a low wooded calley; that this scen should also be declared to be land as contradistinguished from vater. that it should also be surveyed, and that, in view of the fact that the land contains minerals consisting of cil and ges, the State of Louisians, cannot acquire it under the providence of the Swamp Land Grant and the title thereto remains and must remain untal disposed of under the placer mining lars,

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ic the Dairol Scatter Government.

(3) That there is a well defined channel through so-called Ferry Lake known originally as Cypress Bayon, which is teach mically mavigable and that this channel should be considered comparate and opert from the hed of specalled Ferry Lake proper.

The evidence submitted in the form of affidatits, photographs and plate, in support of and against the aforesaid contentions is somewast conflicting. Each contention will be considered in the order above set forth.

(1) One Charles H. Miller, a civil engineer, Little Rock Arkanses, prepared a map, which is filled as a part of the evidence, based upon an alleged actual field survey, on which he has shown by broken and fotted lines the actual vater's edge at two different periods, viz: April, 1909 and November 8, 1011, respectively. On the former date the water's edge 15 shown to have been a considerable distance inside of the so-colled iske from the menuist line as originally drawn at date of original survey. The latter line is still farther inside. These lines show considerable area: of land between the water's edge and the original monder line. This fast leads to the ecclusion that this land either bas always been high dry land or that it was at one time covered with we end.

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and that the recession of the waters has left it above the present edge of the lake.

A plat was filed on behalf of the protectants, prepared by one Frank E. Chelk, a civil engineer. Gaddo Parish, Louisiana, on which the water's sage at the date he made his survey. September, 1911, is above to have been far within the lake from the original meander line. In his effidavit, however, which accompanies his plat, he states that his survey was made at a stage of unusually low water; that by assertaining the mean high water level as it was before the removal of the Great Raft from the Red River, and tracing a line showing the boundary of the lake at that level, his line corresponded to the meander line run by the Government surveyor at date of original survey in 1839.

H. J. Hamilton, Oil City, Louisians, alleges in an affilavit that he out three overoup oak trees, ranging in age from 101 to 103 years, from land situated between the original meander line and the water's edge; that the land was dry and that numerous other trees of the same species and of equal size are still growing upon this land. Gross .Actions of the three above referred to trees were submitted with the record and their losstant as designated on the plat

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prepared by Charles H. Miller, referred to above.

Photographs alleged to have been taken by one W. W. Green, also of Oil City, on the so-called lake side of the original meander line show much of the land to be dry and heavily wooded with a species of trees that to not grow on land permenently overflowed.

One D. M. Evens, Oil City, Louisians, states in ac affidavit that the land slopse gradually toward the lake and that there are no defined banks around the lake. There are, however, a few hillocks and elevations which extend from the mainlend toward the lake, that the action of high water has in some instances caused these to ercde.

Frank E. Chalk, referred to above deniss in affidavits the above allegations and states that no oak trees are to be found on the lake side of the original meander line and submits photographs, which he states show the difference in the topography and physical features of the land on the land wide and on the lake side of the line originally meandared. He mays that whatever growth is found on the lake side of the line is of a species which is indigenous to land overflowed with water. Said Chalk together with Frederick A. Leonard. Robert H. Herrell, W. A. Ellett, C. E. Croom, Welter E. Fyron

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and 0. 1. Black, all furniched offidavity an which they alleged that there are well defined banks to somealled Ferry Lake and that the original meander line was run along the edge of said banks; and that the existence of dry land now in the lake side of the land is due to the revession of the waters onused by the removal of the Great Raft from Red River.

On January 13, 1911, Obarles M. Fidgeon, a United States Surveyor in the employ of the Sensrel Land Office was directed to make an investigation relative to the survey of the meander line of Ferry Lake. Accordingly during February. 1911, he made an investigation as directed and on April 24. 1911, submitted a report thersupon. In that report he stated that he found small areas of land in Sections 3, 4, 9, 10. 12, 23, 15 and 16, T. 20 No. R. 15 W., which had been prreneously omitted from the original surveys executed to 1839 and 1871, that he surveyed waid area and submitted a plat and field notes based thereupon. The resurveyed area comprises 429.93 acres and it is referred to an the field potes prepared by Surveyor Pidgeon as being seaond take agricultural land, mostly covared with large pine, oak and hickory trees, which sould not have grown or lived long in mater.

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In the opinion of this office, notwithstending the

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contradictory systemes submitted on behalf of the protestants. it is clearly evident that the original surveys ware erroneous and that at least 420.93 scree were omitted which should have been surveyed. Before recommending action relative to this omitted area, however, the question of ownership of that part of the co-called lake covered with water will be considered.

(2) The affidevite and photographs submitted on behalf of the applicants show that stumps of dead trade protruis from the bed of the greater part of Ferry Lake.

D. H. Evens states in his affidavit that Ferry Laks is entirely covered with projecting takes stumps with constinally oppress stumps: that the latter are mostly found along the banks of what were formerly Jemes Bayon and Cypress Eayou; that he can recall when said trees were alive and growing; that said trees were killed by the action of salt water and oil escaping from an adjacent well.

Charles F. Davis, in an affilarit, states that the water was during November, 1911, at its low stage; that it was of an average depth of from one to two feet for a distance of one will from its edge toward the centar of the lake. He coproborated D. M. Evans' allegation, viz: that the bed of the so-called lake in entirely filled with test stumps.

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M. G. Angell also correborates the above statements. He further states that the former channels of Jemes Bayou and Cypress Bayou are discernible by the presence of large Sypress stumps along their former banks.

Charles H. Miller in an affidavit executed April 15, 1910, alleged that he made soundings in the channel of Cypress Bayou through Ferry Lake within the course marked by the War Department of the United States, and found the water in said channel to be from nine to fifteen feet deep.

The affidavits submitted on behalf of the protestants do not convey much specific information relative to the character or size of the stunps in the bed of the lake, except to say that the trace were of a species indigenous to land overflowed with water.

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The attorneys for the state and for the Caddo Levy Board contend that Ferry Lake was and still is a navigable body of water: that it was such at the date of admission to the Union; that the bed of the lake therefore, belongs to the state or its grantees through the right of its soverieignty over navigable waters within the state.

Fred J. Grace, Register of the Lonisiane State Land Office submitted effiderits sworn to by W. F. Buckalew, B. W.

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Merston. James S. Noel, P. Yourse, C. G. Rives, Levi Cooper, A. Kahn, D. B. Hamilton, W. F. Dillon, S. N. Kirley, John R. Jones, F. A. Leonari, M. L. Soovell, W. H. B. Groom, and U. C. Blanchard, all of whom testify that the river had been navigable for a considerable period of time. From the testimony of the above referred to deponents, however, it appears that the lake or some portions of it became unnavigable a number of years ago owing to the recession of the waters and the closing of the outlets from the Red River into the lakes.

Surveyor Pidgeon stated in his report of April 24, 1911, referred to above, that the part of the lake inside of the water's edge and embraced within the area included within the aforesaid placer claims was at the date of his investigation covered with water from three to six feet in depth Evidently the water was much lower in November, 1911, than it was when the aforesaid investigation was made.

Surveyor Didgeon stated further that Ferry Lake occupies a low area in the valley of the Red River but that it has no large area subject to regular overflow with a slight rise of the lake since the shore around the lake within a faw rods of the water's edge is high enough to confine the water at any ordinary rise; that it does not appear that the waters

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of the Red River ever sotually flowed through Ferry Lake, but through Soda Lake, with its connecting channels above and below the Great Reft. that Ferry Lake drains into Soda Lake so that the rise of water in the latter from freshets in Red River cause, during excessive high water, a backing up of water into Ferry Lake. He concluded that Ferry Lake is and has been since the original surveys in 1839, a navagable lake.

The question that naturally arises from the foregoing evidence is what cause or causes led to the formation of Ferry Lake, if in fact it has not always been a permanent lake. The most authentic information obtainable upon this point is to be found in,

(1) The official report of the Geological Survey of Louisiana for 1899

(2) Professional Paper No. 46, U. S. Geological Survey: 905.

(3) Annual Report of the Chief of Engineers, 1890.

(4) Annual report of the Chief of Engineers, 190., and

(5) House Document No. 785, 59th Congress, 1st Session. page from which have been filed on behalf of the applicants as a part of the record. The two first mentioned of the above

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reports together with a report by the War Department contain a report of the Chief of Engineers for the years 1873 and . 1874 were also filed on behalf of the protestants.

The formation of the Great Reft in the Red River is discussed somewhat at length in the above referred to documents.

It appears from the best information obtainable that this Raft commanded to form on the old course of Red River along the Bayous Boeuf and Teche and its head reached a point in the flood plain near Alexandria, Louisiana, in the latter part of the Fifteenth Century. It was more properly a series of log jams each completely filling the river, starting with a more or less accidental jamming of trees and drift wood. The effect of the initial jam was to pond the water immedistely above it and to force the river to form a new outlet in a low place in the bank above the jem and to flow off through the adjoining timbered bottom lands. Drift wood quickly accumulated about this new outlet and formed another jam and in this meaner the Great Reft gradually moved up the river.As the raft advanced it blocked the outlets of the tributaries, streams and channels draining the low Lands between the higher front lands and the bordering hills and

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by preventing the discharge of the water from them at a level equal to the original low water of the main channel, produced a series of lakes. (See Professional Paper No. 46, U. S. Geologial Survey, 1906, page 60).

E. A. Woodruff, First Lieutenant of Engineers in a report mide by him in 1972. See messages and documents War Department Pt.2 1873-74, page 649, stated that it is loubt less true that lakes Fairy (Ferry) and Soda were once comparatively dry; that Cypress Bayou, or astream formed by the junction of the three Cypresses and Black Bayou, had well defined banks throughout the greater part of the present site of these lakes; that these banks were at that time during low water seasons distinctly traceable by the decayed trunks of large cypress, which once bordered the stream; that yellow pine stumps were found in parts of the lake at thot time always covered with several feet of water, and that thousends of eak stumps were found in Soda lake.

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On pages 185 and 185, of the Geological Survey of Louisiana, 1899, the writer states that the logs in the upper part of Red River valley, including Ferry and Soda Lakes must have been of comparatively recent originand refers to the fact that certain Caddo Indians had related to some of the

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planters of the Red River bottoms that about one hundred and flifty years prior the land now occupied by Soda Lake was an oak ridge and that all the water flowed in a nerrow oypress fringed bayou in the center: that the Indians used to cultiwate corn fields on land adjacent to these oak and pine stumps which was at the date that the writer obtained his information covered with water to the same depth as that in the entire lake. They further stated that the entire country was above overflow.

On page 198 of the above referred to report it is stated that it seems probable that the lakes owe their formetion to the raft and that it is possible to approximate the date of the formation of Cross and Ferry Lakes as about 1777.

On Page 168, of the same report it is stated that when the raft in its progress up the river approached the mouth of the Little creek which drained Cross Lake velley the water was backed up into the valley; that as the distance between the mouth of the little stream and the raft diminished the level of the water in the valley was raised and when the raft reached the mouth of the orsek the water in the valley reached a level equal to the banks of the river; that when

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the mouth of Iwelve Mile Bayer was reached the lower part of the Shreveport-Blankton's Blaffs bottom-basin was filled with water from Soda Lake: that the water was also backed up into the Ferry Lake valley; that the flooding of Ferry Lake valley killed all of the treas, that after a time the tops of the dead trees were broken off by the wind, leaving only the stumps exposed.

On Page 62 of Professional Paper No. 46, supra, it is stated that it is safe to assume that had there been no raft there would have been no large lake in Red River valley and that any classification of lakes by origin must regard these temporary bodies of water as unique: that the presence of these lakes on the maps of today is in many cases due not to their existence, but to the fact that all of these maps are based on the old land office surveys made in the early part of the Einsteenth Century.

On pages 1915, 1915, 1917 and 1918 of the Annus! Report of the Obler of Engineers for 1890, it is stated that Cypress Bayou was evidently an unnewigable stream until after the advance of the Red River raft converted its bottom lands into what are now known as Cross, Soda and Fairy (Ferry) Lakes, that Cypress Bayou proper is a small stream passing

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Jefferson Texas, and debouching into the head of Ferry Lake and is thus commasted with the Red River by a chain of lakes known as the Soda Laker, that Jefferson, Texas, is at the head of mavigation in Syprese Bayou; that from that point down to the head of Ferry Lake, a distance of twenty miles the bayou is narrow, tertuous, and before improved was shallow and greatly obstructed by timber; that Ferry lake from its head for about one-half of its length is thickly studded with cypress trees, stumps and fallen timber, through which the oll channel of Cypress Bayou may yet be traced at low water and if cleared would afford low water navigation of about 2 feet, that in high water this channel is partly followed by steam boats and partly sycided by use of what is known as out roads; that at date of the report much of the old channel of Cypress Bayou, through the lake, hed been obliteratin by deposit.

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Wilter H. Pope. Assistant Engineer in a report dated Cotober 28, 1905, see House Document No. 785, 59th Congress lat. Session, pages 8 and 9, stated that Ferry Lake was once a timbered valley bordering on Cypress Dayou, which way then a body of water verying in width from 800 to 3800 meters, and with the exception of where the old bayou bed winds its

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crocked way and a portion of the deeper part of the lake as studded with decayed (ak and typrass trees.

At various times schemes were advanced for the removal of the Great Raft in the Red River in order to restore that river do its original stage and schemes were also advanced for the purpose of improving navigation in the Red River valley. In a report made by W. M. Weshburn, a civil engineer datied October 23, 1858, addressed to Dr. T. P. Ectchkiss, Commissioner of the Third Swamp Land District of Lemisians. published in the Annual Report of the Board of Swamp Land Commissioners, and submitted to the Legislature of that State, (a copy may be found in the Congressional Library). it is stated that with a view of ascertaining the affect which the shutting off of the water from the sastern side of Red River would have upon the lands of the west bank thereof a thorough examination of the bayous and lakes as high up as Ferry and Clear Lakes, which convey the water displiced by the raft around the raft to the river below. was made. The engancer then states that Ferry Lake was a beautiful lake of clear water surrounded by bluff backs; that is had no connection with upper Red River but was fed by backwater from the other lakes and by Cypress Beyon.

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That Ferry lake differs from the other lakes, except Cross Lake, in being of recent origin, that before the formation of the raft the surface new covered by Gross and Ferry Lakes was as is known by the remains of timber, only alluvial bottom bordering the bayons which ran through them and subject only to short inclustions from freshets in the obsances of the bayous. That Caddo preirie was a few years since femed for its fartility, but the wandering water now covers it and it is deserted. He then discusses the feesibility of making one water course either through the bayous or through the Red River itself, since there was not enough water for both, and says that if the improvements should be made as suggested by him Caddo prairie will again be restored to cultivation.

Attention on the part of the Government towards the removal of the raft was first directed in 1828 and at varies periods thereafter attempts were made to remove the raft until its final removed in 1878. See Geological Survey Report for Louisians. 1899, rages 164 and 165. The removed of the raft restored a number of the so-called lakes in the Red River basin to their original condition and the entire beds of a number of said lakes, namely, Gross, Soda and Glear

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ere now shown on the Government plats to be land. The complete return of the entire region to pre-raft conditions has been considerably retarded, however, by a number of causes among which are the deposits of the raft period which entirely filled the old channels of the tributeries leveloping small rapids and water falls. These are gradually wearing back and draining the lakes. See Professional Paper No. 46, supre, page 61. The gradual recession of the water in Ferry Lake is the best swidence svailable to show that the lake bed is being gradually restored to its former condition and that at some future date the land now submerged will again be dry and suitable for cultivation.

Improvements with a view of making Gypress Bayon and Ferry Lake mavigable and keeping them so have been comsidered from time to time. In the Annual Report of the Chief of Engineers for 1901, page 415, it is stated that navigation between Shreveport and Jefferson can be restored only by a cetly system of looks and dame upon which a large sum might be expended without adequate returns of commerce. It was the opinion of the district officer as well as that of the Chief of Engineers that the expenditure of the svallablfunds for dredging would afford no relief to navigation.

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In House Document We. 765. Supre, page 5, the Bourd of Engineers was of the opinion that the improvements of Ead River had get progressed to the extent sufficient to justify the permanent improvement of the tributary streams through the raft region and it considered it doubtful if Cypress Bayou were improved that it would be eveilable for natigation eight months during the year. It concluded that the improvement of Cypress Bayou was not at that time worthy of being undertaken by the United States.

An affidavit executed by one Frank M. Kerr, for the past thirty-three years a member of the Board of State Engineers of Louisiana, and during part of the time Chief State Engineer was filed on behalf of the protestants. He stated that he was thoroughly familiar with the physical features of the so-called lakes in the Red River basin and that Ferry Lake prevents no difference in character and appearance to the other so-called lakes. He does not seem to place much eredit in the contention that the bad of Ferry Lake was at one time a sunken flat. He does state, however, that before the removal of the Raft the whole valley of Red River, north of Shreveport, including the bed of Ferry Lake was samually submerged many feet deep by the water of Red River esceping

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over the banks of the Lake. That the water levels in said basin are now much lower than they used to be.

The foregoing evidence strongly tends to show that prior to 1777 Oypress Bayor was a narrow, torthous winding stream finding its way into Red River: that the present bed of so-called Ferry Lake was a low-lying wooded valley; that this valley became suddenly submerged by the backing up of the water in the Red River caused by the Great Reft; that in time this submerged land will again reappear.

The question that, therefore, arises is to whom this submerged land, locally called Ferry Lake, belongs. The claimants may be reduced to three classes:

(1) The State of Louisiana or Caddo Leves Board.

- (2) Riparian claimants,
- (3) The United States.

The State or Laves Board bases its claim upon the assumption that either:

(1) So-salled Ferry Lake was, at the date of the State's admission, a navigable body of water and that the lake-bed belongs to the state by virtue of her right of sovereignty, or,

(2) Not being a navigable body of water, the sccalled lake is coarflowed land and belonge to the state by virtue of its rights under the swamp land grant.

The second class of claimants assume that so-called Ferry Lake was a permanent body of water, and allege ownership to only that portion of the lake had which is now uncovered by the waters of the lake and which lies between the meander line and the water's edgs, through the doctring of some the or reliction.

In 1682 La Salle completed the work of discovery of the Mississippi Pirar and took possession of the country which he mamed Louisiana in honor of Louis IIV, in the rans of France. In 1762 that part of Louisians west of the Mississippi River, bagether with the island of Orleans was ceded to spein by the Treaty of Fountainablean. By the Freaties of San Ildefonse, October (1800, and Madrid, March 21, 1801, the King of Spain usded to France, on estain conditions precodent, all of his inversats to and in the territory of Louisians, which had previously been acquired by the former from the latter. By the Treaty of Paris dated April 30, 1803, the French Republic codel the above referred to territory to the United States. The exabling act of February 20, 1811, (2 Stat., 541), anthorized the reople of Orleans to become a state and on April 9, 1812, (2 State, 701), the State of Louisiana was formally admitted to the Union. Thus it may be seen that, at the time the land bordering on Cypress Bayou is supposed to have become submerged, that is in 1777 my the land previous to that data having been dry but subsequently covered with waver, belonged to the Spanish Griwin.

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an empire works no forfeiture to pre-existing vested rights to property, and the United States Government, therefore, as grantee, acquired all the interests which had formerly vested in the King of Spein. Tevert vs. Raylor, (9 C., 43, 50); Trustees of Darthmouth College vs. Woodward (4 W., 551 707).

The lands, driginally bordering on Cypress Bayou as it appeared before 1777, valled the hed of Ferry Laks by the protestants herein, were at the fate that Louisians was admitted to statehood, as were other lands similarly circumstanced in the Red River basin, submerged. One of the conditions in the Ast of February 20, 1811, supra, was that the title to wasta or umproprinted lands within the territory should remain in the United States Government. The applicants for the survey have put considerable stress upon this prevision.

Subsequently the swamp land acts of March 2, 1849, (9 Stat., 352), and C September 28, 1850 (9 Stat., 519). were enaoted. The firmer set was passed for the purpase of aiding the State of Louisiana in draining the swamp lands therein.

Article 509 of Merrick's revised civil code of Louisiana, 1900, declared that the accestions which are formed successively and imperceptibly to any soil on the shore of a river or other stream are called alluvion and that such alluvion belongs to the owner of the soil situatid on the

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edge of the water, whether the stream he navigable or not. The above article was based upon article 555 of the Code Napoleon.

Article 510 declares that the same rule applies to derelictions.

Article 518, Code Mapolaon 553, declares that if a river or stream, whether navigable or not, opens itself a new bed by leaving its former channel, the owners of the soil newly occupied shall take, by way of indemnification, the former bed of the river, every one in proporation to the quantity of lend he has lost. They shall again take their former property if the river or stream returns to its former channel.

The last referred to article enuncietes the destrine of the reappearance of submerged land which was recognized in England under the common law (Hale's De Jure Maris, Chapter 6, and Elackstone's Commentaries, Book II, page 262), and has been recognized in a number of cases by the courts of this country. See Hughes, at ex v. Heirs of Birney, et al (107 La., 664); Mulry v. Norton, (100 N.Y., 425); and Fowler v. Wood (73 Kan., 511, 85 Pac., 763).

Act No. 258 (1910) passed by the General Assembly of the State of Louisiana declares that waters and beds of all bayous, lagcons, lakes and bays and of all navigable streams

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shall henceforth be the property of the state, subject, however, to the right of acquisition by alluvion or accretion.

In one part of their brief the protestants lay considerable stress upon the contention that so-called Ferry Lake is a navigable body of water, while the applicants consider it of equal importance to show that it is non-navigable.

There is thus presented in the case at hand a mixed question, 1. e., of law and of fact. The state of Louisiana, while it has, through its legislature, asserted ownership of the beds of navigable and non-navigable bodies of water, so long as they shall be covered with water, has expressly declared that the principles of alluvion and accretion shall be applicable when these beds shall become uncovered by the disappearance of the water. The State, therefore, recognizes two classes of proprietors, viz:

(1) Proprietor by avaision, i. e., the reversion to the original owner of land suddenly lost but subsequently restored, and

(2) Proprietor by accretion or reliction, i. s., where the change is imperceptible.

Which one of the two above referred to proprietorships is to be applied depends upon a question of fact. It is only upon water courses that riparian (ripas) rights exist. Child v. Starr, (4 Hill, (N.Y.) 375); Chamberlain v. Hemmingway

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(63 Conm., 1; 27 Atl., 239, 38 Am. St. Rep., 330). As legally defined, a water course is a stream usually flowing in a particular direction in a definite channel, and discharging into some other stream or body of water. It need not flow continually. It may sometimes be dry. It must, however, flow in a definite channel, having a bed, sides or banks. It must be something more than a merë surface drainage over the entire face of a tract of lend occasioned by unusual freshets or other extraordinary causes. Howt v. City of Hudson, (27 Wis., 556); Lather v. Winnisimmet Co., (6 Mass. (9 Cush) 171); Neal V. Ohio River, (47 W. V8., 316), 34 SE, 914); and Chamberlain v. Hemmingway, supra.

The question that naturally arises is whether or not so-celled Ferry Lake is a water course in the legal sense. At this late day it is impossible to obtain word of month evidence to describe the changes which took place in the Red River Basin resultant from the formation of the Great Raft. We must, therefore, accept the next best evidence obtainable. The formation of the Great Raft is a historical fact of which judicial notive may be taken. That its formation resulted in great changes in the Red River Basin is a natural inference. In the annual reports of the Chief of Engineers there are statements that certain of the Great:

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Indians related that the valley, bordering on Cypress Bayou proper, now covered with the waters of so-called Ferry Lake, was once dry and unusually fertile. The Engineers referred to above are all of one accord in saying that the land under so-called Ferry Lake was once dry and that the valley was heavily timbered with a species that do not grow in water. In 1858 W. M. Washburn, Civil Engineer, referred to above, stated that so-called Ferry Lake was then of recent origin. Much weight should be given to his statements. At that time there were undoubtedly living witnesses who could testify to the changes that had actually taken place. None of the engineers above mentioned had any interest in the case at hand. They were men who were placed in a position to obtain authentic information relative to the peculiar conditions which existed and their reports are worthy of more consideration than ordinary witnesses. From the foregoing it may logically be deducted that about or just prior to 1777 what is now locally termed the bed of Ferry Lake was a dry fertile valley through which Cypress Bayou wound its tortuous course, the banks of which could for many years be plainly discerned. Thus in a legal sense Cypress Bayou was the real water course and scecalled Ferry Lake, which was formed by the water overflowing the valley, through which Cypress Bayou flowed, is not a watercourse and that

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"E" 09-122623-DMG. (P)

being so, riparian rights do not attach to the submarged lands. What is called Ferry Lake is not in reality a lake at all, and the land, now submarged, which was originally dry, is not a lake bad. The submarging of the land was the result of an extraordinary event. Naturally in a country where the land is but slightly above sea lavel, sudden ohange: must be expected. The elogging up of the mouth of a river may submarge a whole region and cause fortile fields to appear like a vast lake.

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The question arises whether or not water, which due to the fact that for some cause its volume is so great that a water course is unable to contain it within its banks, overflows low lands bordering on the watercourse, becomes a part of the watercourse, thus forming a larger watercourse. Should the unswer be in the affirmative, the doctrine of riparish ownership would then be applieable, and the elements to land bordering on the water ocvering the submerged fand would take by momentian or reliation. But a watercourse heither includes overflowed lands beyond its bank, nor includes in its bed swemps or low grounds liable to be overflowed, but reclaimable for mealows or agriculture, or waising too low for realization. (heigh not always covered of instances of the realization of the submerged for the story way be used for cattle to range upon, as interval or

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uninclosed pasture. Howard v. Ingersell, (13 How., 381). In the onse of MoDads T. Possier Laves Board, (109 Lo., 626, 33 So., 528), involving the title to the bed of Red Shoot Lake, which had become dry, the court held that the land was not to be considered as a lake bed except in the sense in which permanently waterocversal swamps are lakes. It referred to Act Mc. 247 (1855) Louisians Legislature, which classified the shallow lake beds in the state as land. The court further held that the Submerged land called Rei Shoct Leke wes swamp land and pair beent acquired by the state as such. The township in which the lake wes situated had been surveyed and the lake meandered. The space decupied by the lake had been left blank. The state heurapoured the Eurveyed land bordering on the Take under the Swamp land grant. The court held that the state had lacouired title to the bed of the lake also; that the conveyance of all of the surrounding lands as swamp carried with the unsurveyed land designated as lake.

The protestants seem to take it for Granted that the state in like manner acquired title, to the bed of so-called Ferry Lake.

The state of Louisians considered the bods of Soda, Gross, and Clear Lakes, all within the vicinity of so-called

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Forry Lake, also as swamp land and the same were calected and acquired by the state under the provisions of the swamp land grant.

It, therefore, becomes important to assocrtain whether or not the so-called bed of Ferry Lake is land of a character to be controlled by the swamp land grants. If it is of that character the state of Louisians has acquired an equitable title to it.

It is to be observed from the foregoing that this office has concluded that so-called Ferry Lake bed was not in reality a lake bed at all: that it was submersed land covered with water by an extraordinary occurance. The same testimony upon which sail conclusion was based shows alloc that the submerged land was righty fartils from to the submergence. It was land of a character to produce listdwood, these. It is a well known fast that trees of the species, which the testimony shows grow on this submerged land, will not grow on swamp lands. The testimony further shows that when the water shall have disappeared, leaving the land again uncovered, it will possees as equal a degree of feptility as it did prior to its submergence.

It would, therefore, he erroneous to conclude that this Certile land, which was submerged, temporarily and not natural-, from the effects of drift wood and other debris damming

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and ponding up the waters of a bayou, was just such worthless, unfertile, sour, or marshy land as to come within the purview of the swamp land grant. In a case like the one at hand the character of the Land is to be istermined not from its condition during its temporary submergence, but by its condition prior thereto and after the accidental cause of .ts submersion shell have been removed. New it has already been said that the Great Raft or a part of the same has been removel. The testimony. however, tends to show that the ponding up of the water in the low valley, bordering on Cypress Bayou, resulted in another condition independent of the Great Raft itself; vis: the scouring of the valley and the clogging up of the ortlet from Cypress Bayou into somcalled Soda Lake. If that outlet had been opened there can be no doubt that the surface water submerging the low lying, stump covered valley would have disappeared and the valley's original fertility would have been evidenced by cultivated fields.

Relying upon the foregoing testimony as the most suthentic obtainable, and of sufficient weight in sustaining the conclusion that the low lying land in the valley, borderng on Cypress Bayou as it originally flowed through the vally on its course to Red River, is to be held to be submerged lad and not of the character to be within the provisions of

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the swamp land grant, it is next in order to consider what law is to be applied. The doctrine of the reappearance of submerged land, referred to above, is obvicually applicable in a case like this, not that of accretion or reliction. The case of Hardin v. Jordan (140 U. S., 371), and other similar cases relied upon by the protestants are not in point. According to the former doctrine, if land is suddenly submerged and it afterwards reappears, the proprietorship of the land which was lost to the original owner reverts back to him provided that its identity can be established, nor does the lapse of time during which the submergence continues ber the right of such owner to enter upon the land reclaimed, and asserts his proprietorship. Mulry v. Norton, supra.

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If the land bordering on Cypress Bayou had been dry at the date of the admission of the state of Louisians and was subsequently submerged, then upon its resppearance there could he no doubt as to its ownership, if title had not previously passed out of the Government. The United States would be the rightful owner. The question, therefore, prises as to whether or not the fact that the land was temporarily submerged prior to the date of admission of the states or even prior to the purchase of the territory by the United States from France, changes the upplication of the doctrine. The land in question was

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undoutitedly dry land during the greater period that the territory of Louisiana belonged to the Spanish Crown. If the territory had remained a Spanish possession to this day there could be so doubt that the temporarily submerged land, upon its reappearance would have been Grown land. When France soquired the territory of Louisians from Spain the former became subrogated to the rights of the latter in the ceded terratory. The purchase of the territory by the United States bastowed upon the last mentioned country all of the rights which France had acquared from Spain. If the proprietorship to the temporarily submerged land would have reverted to Spain, had that country not ceded the territory, then the same proprietorship would naturally revert to Spain's grantees since there was no restriction in the grant. The doctrine of prescription is not applicable as against the United States. Such is the status up to the line of the admission of Louisiana as a state.

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The United States, therefore, as grantee from France, owns all of the temporarily submerged land, bordering on what was originally Cypress Bayon, which has reappeared as land. provided that it has not disposed of its title. In the case of McDade v. Bossier Levee Board, supre, the court said in substance that the bed of Red Shoot Lake like all other lands in the State of Louisiana, not held in private ownership, passed to the United States under the terms of the Treaty by which France

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ceded the Territory of Louisians in the United States The status of the submodul factors of Control 100 feact mission of the Territory of Louisians is a state of here otherwise rould be as illegian, and three we'll as a control that such administry of the of Louisians for if all of the states for the Territory of the bills of Louisians for the state of the United States and placed it in the several states.

Both the applicants and the protestants have laid much stress upon the question of whether or not what they have called Ferry Lake is navigable. The former contend that while Cypress Bayou may be technically navigable, that part called Ferry Lake is non-navigable, and have cited the cases of Harrison v. Fite, et al., (148 Fed., 781) and Howard v. Ingersoll, sugra, to sustain their contentions that Ferry Lake itself may be separated from Cypress Bayou. The latter have submitted affidavits to the effect that Ferry leke is navagable according to the definitions of navigability contained in numerous cases which the protestants have cited. If the doctrine of the reuppearance of land is to be applied, then, in the State of Louisians, it is immaterial whether the water, referred to above as Farry Lake, is navigable or non-navigable. It is true that the State of Louisians has jurisdiction over the navigable waters within the state and the water over the

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the submerged land is subservient to the public survitude so long as it remains susceptible of navigability. But the state had expressly enacted into law a provision to the effect that land, submerged by a navigable river. shall. upon its reappearance, revert to its original cwner, and Act No. 258 (1910) of the Louisiana Legislature, supra, could not abrogate that provision. The property in submerged land is a vosted right to said land and the submergence does not cut off that right. Therefore, chould the state of Louisiane attempt to deprive the original owner of his title without just compensation or by due process of law such attempt would be unconstitutional and void. See Federal Constitution Amendments V and XIV. This office interprets the intention of the act to be to give to the state the contiol over the waters of the state and also over the lands beseath said waters, so long as they remain submerged, but that upon the reappearance of any land covered by said waters. the laws previously in force shall be applicable.

The records of the General Land Office show that the land contained in the fractional surveyed sections bordering on what was meandered as so-called Ferry Lake, have been conveyed by the fovernment to various grantees, including a grant to the State of Louisiana of 640.45 sores

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in 7. 20 N., R. 16 N., all in Sees. 5 and 17, under the provisions of the Swamp Land Grant.

Those claiming as riparian claimants under the afcressid grants contend that the body of water meandered as a lake is in reality a mavigable body of water and that under the laws of the State of Louisians they are entitled to whatever land is formed by accretion or reliction.

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If this office be incorrect in its contention that the land benasth schoolled Ferry Lake is merely submerged land, and that so-called Ferry Lake is in reality a lake. which, however, it does not admit, then the swidence is such as to lead to the conclusion that that part of the body of water, not included in Cypress Bayou, is non-mayigable in a legal sense. The case seems to be parallel with that of Reelfoot Lake, involved in the case of Webster st di., v. Harris, of all, (111 Tenn., 668). It is probably the that Cypress Bayou proper has been technically havagaple for the greater part of the period since the formation of the Great Reft, but it is doubtful if even Cypress Eayou was navigable or could have been navigable prior to that period. The stump covered overflowed lands locally called Ferry Lake on either side of Cypress Bayou cannot be said to be susceptible to navigability except through artificial means. It has been observed in the case of Howard v. Inger wi

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be separated from the adjasent cverflowed lands.

In the case of Louisiann 7. Glassell (120 La., 400) one of the cases relied upon by the protestants, the Supreme Court of Louisiann held that the state had the right to sell the bed of somealled Big Pass on the ground that it. like the beds of other shallow lakes situated in the State of Louisiann had been acquired under the provisions of the Swamp Land Grant.

In the case of Sapr v. Frazier, et al., (51 Le. Ann. 1718), it was held that that part of the lake bed of Lake Bistineau, which had become uncovered by the waters of the lake is a public place open to the legitimate use of all alive. No one person has a claim to such land superior to another. It was further held that the plaintiffs had no title to any part of the lake bed in front of their property. It did not undertake to determine, however, whether the lake bed constituted a part of the public domain of the United States. or belonged to the State of Lowissians. That fact could be idjudicated only in a direct proceeding to which the United states must be a party and not in a collecteral proceeding such as that involved in the case here referred to.

In case No. 13707, First District Court, Caddo Pavis.

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Louisians, the Jaems Bayon Pishing and Hunting Club v. Board of Commissioners of Caddo Levee District, a dispute over the title to certain land in fractional Section 10. T. 20 No. R. 16 We, berdering on so-called Ferry Lake was considered and the Gourt rules in favor of the plaintiff which was a grantee from one of the patentees from the Government. The Court ordered a survey to be made and determined that the fractional quarter section in dispute comprised more land than the Levee District admitted. The Government was not a party to the suit and could not be bound by the decision. The court did not undertake to day termine what were the rights of the parties as against the Dnited States, but merely said that as between the parties to the suit the glaintiff scened to have the better title.

It has been previously stated that the Supreme Court of Louisians in the same of MoDade v. Bossier Levee Board supra, considered these shallow momcalled lake beds land an contradistinguished from water. They could not, therefore, have been considered as mavigable bodies of water and to bold that the water covering the low lands bordering on Oypress Bayon, are mavigable would be to put a strained interpretation on the term mavigability. The question of navigability of non-tidal fresh water streens is one of term

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And the burden of proof must be accouncied by him who claims them to be such. Geston *. Made (25 Am. St. Reps. 948). Railway Company V. Ramsay (53 Arks. 314). The test of navigability is discussed in Harrison 7. Fite, supra; Webster et al. V. Harris, et al., Supra, and concervus other cases. To be navigable water must have a useful capacity as a public highway and more depth of water without profitable utility will not render it navigable in the legal sense so as to subject it to the public servitude.

If, then, so-called Ferry Lake could be considered as a permanent non-mavigable body of fresh water, which. however, this office does not admit, then it would be necessary to determine the rights of the purchasers of the freetional surveyed subdivisions bordering on said body of water. i.e. whether or not the dostrine laid down in the cases of Hardin v. Jordan and Mitchell v. Smals, (140 U. S., 37) and 406), respectively, governs. Those of the protestants in the case at hand base their interests in the uncovered lands upon the dostrine laid lown in the safet above referred to cases.

Now the United States under the Articles of Confederation, was the owner of the public domain, however, acquired, and succe the adoption of the Constitution, the

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United States had also possessed, in full proprietorship the public domean, from whatever source its title had been derived. See Kent's Commentaries Vol. 1, page 257; Johnson v. McIntosh, (2 Wasato, 543); Irvine v. Marshall (20 Haw. 558). Land covered by water within the public domain of the United States is as much a part thereof as the dry land. Illinois Central Railroad Company v. City of Chicago (176 U. S., 546). "Lands are not the less land for being covered with water". Regine F. Leeds and Liverpool Company (7 Ad. & El. 571). The above language is not applicable to navigable waters. The Daited States has jurisdiction over its non-navigable waters as well as over its lands and questions of law arising thereunder are to be determined by the laws of the United States, not those of the States. Congress has been vested with power to dispose of and make all needful rules and regulations respecting the territory or other property of the United States. State legislation cannot interfare with the power of Congress to dispose of the public property of the United States. See United States v. Gratirov(14 Pat., 526); Gibson v. Chetsan (13 Wall., 92).

The Marval of Instructions issued by the General Land Office on February 22, 1855, relative to surveys contained among others the following provision:

> " 3 You are also to meander. in manner afcressid, all lakes and deep ponds of the area of twenty-five scres and upwards; also navigable beyons; shallow ponds, readily to

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be drained, or likely to dry up, are not to be meandered."

See 1 Lester Land Laws, page 714.

The above referred to Manual was approved by Act of May 30, 1862 (12 Stat., 409). This Manual was merely a revised edition of previous instructions on the subject. Commissioner's report 1868, page 131.

The question that arises, therefore, is whether the United States by running meander lines and disposing of the fractional sections bordering on these temporarily submerged lands, lost title thereto.

The practice of the Government was to run a meander line not only along navigable waters, but also wherever there was a non-navigable body of water, an Indian Reservation, a private land claim or ab impassable morass or swamp. In fact whenever the Deputy Surveyor encountered an obstacle which would lead him to believe that it would be unprofitable at that time to survey beyond he would run a meander line. Fractional sections would be shown under all of the above conditions. Beyond the meander line, therefore, may be found forest or prarie, land or water, Government or Indian Reservation. Niles v. Cedar Point Club, (175 U. S., 300).

The mere running of a meander line does not affect

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the title of the United States to the land within such meanders. Gazzam v. Phillips. (20 How., 372); United States v. Mission Rock Company, (189 U. S., 391); Horne v. Smith, (159 U. S., 40); French-Glenn Live Stock Company v. Springer, 185 U. S., 47); Kirwan v. Murphy, (189 U. S., 35); Niles v. Cedar Point Club, supre; Copp's Public Land Laws, 1875, page 765.

When the United States patented the fractional lots bordering on this temporarily submerged body of land, it did not transfer to the patentee such submerged lands within the meander lines. The laws of the United States except as provided in special cases, confer no authority to transfer un-Kurveyed land.

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The contention advanced on behalf of the State of Louisians is that if the State did not acquire the bed of so-called Ferry Lake by virtue of its sovereignty then it did acquire it through the terms of the Swamp Land Grant. It will be necessary, therefore, to consider the merits of the aforesaid contention.

The State of Louisians has acquired the dried lands formerly covered by the waters of so-called Soda, Clear, Cross, and other lakes, the same having been surveyed

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and approved to the State with selection of these lands. In the case of MoDaie v. Sossier Laves Basid, supra, Red Shint Lake had been meandered. The State of Louisians had acquired all of the surrounding land under the Swamp Land Grants. The court, while it suid that under meither of the Swamp Land Grants can the title to lands pass from the General Government to the State without there having been a survey under authorized the General Government and a selection by the State and an approval by the General Land Office, held that the conveyance of all of the surrounding lands as Eweny carried with it the unsurveyed land designated as lake, in: which it (the Court) considered of a character falling within the purview of the Swamp Land Grant.

The acts of March 2, 1849 (9 Stat., 352), and September 28, 1850 (9 Stat., 519), granted to the State of Louisiane all "swamp and overflowed lands unfit for oultavation", in that State. The latter act was substantially a reanactment of the former act us to Louisiana. Under the former act the legal title passed to the State upon approval by the Secretary of the Interior of lists of swamp lands to be made out and partified to by the isputies and surveyorogeneral. Under the latter act a patent was to be issued. The State of Louisians sgread to rely upon the field usies

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of the surveyors for istermination of the character of the land. It was necessary then that there he either a certification to or a selection by the State of the lands claimed to be swamp. For the manner of selection see 5 L. D., 398.

The act of 1850 contemplates that the Secretary of the Interior wall identify the lands described therein and it is his duty to determize what lands were of the character granted. (2 L. D., 568); United States T. Lonisiana (123 U. 5., 32); Wright v. Reseberry, (121 D. S., 488). The clair of the state wast depend upon the character of the land at the data of the grant (3 L. D., 476). If there is doubt as to the character of the land at that time the decision must be against the grantes (5 L. D., 514 and 581). If the land covered by the waters of so-called Ferry Laks was of a oharacter to come within the purview of the Swamp Land Grants in 1849 and 1850, the State of Louisiana acquirei an equit. able title to it. Upon its issignation as Swamp land on't its approval as such by the Secretary of the Interior the equitable title would be enlarged into a legal bitle. See Rogers Locomptive Works v. American Emigrant Company (19) U. S., 559); Brown v. Eltoncock (173 U. S., 473).

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The land covered by the waters of so-called First Lake has never been surveyed by the United States Government; it has rever been solected by the State of Louisian

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as swamp land, it has never been approved to the State as swamp land by the Secretary of the Interior; the State of Louisiana acquired only a small percentage of the surrounding lands. It is true that there have been cases where the legal title to swamp lands have been acquired by a State without the requirement of a Covernment survey. But such cases are exceptions. The case of the Everglades in Florida is one of these exceptions, (18 L. D., 96; 19 L. D., 251). But even then there must have been selections made in sccordance with existing regulations and the entire body of land must be of the character granted. (7 L. D., 369; S L. D., 65).

It is apparent that in 1849 and 1850 the land beneath so-called Ferry Lake was powered with several feet of water. It, therefore, becomes important to ascertain whether or not it was at that time land of a character to be pomtrolled by the Swamp Land Grants. Land powered by the payigable waters of a State is not to be considered every land. (4 L. D., 416). Lands, pwerflowed by melting snow on which, when the mater subsides, crops of hay grow, are not overflowed lands within the meaning of the swamp land grants. (2 L. D., 551). If at the date of the grant a tract of land was covered with water of an apparently permanent character

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the title of the land would not pass though by subsequent recession hand of a swampy character name into existence. (1 L. D., 321 and 14 L. D., 253). The latter pass is closely in point with the case

involved herein. The S-arctary said that important questions may arise as to the right of the United States to survey. and as to what disposition whill be made of the lands that were formerly the bed of the lake. He was not called upon, however, to make that decision at that time. The above decision was reaffirmed in the cases of Morrow et al. v. State of Oregon, et al., (17 L. D., 571); State of Oregon v. Willey (21 L. D., 397); and State of Hilinois, (26 L. D., 505).

For the two reasons above set forth, vis:

(1) That the bed of Ferry Lake has never been surveyed and,

 (2) That it was not land of the character covered by the swamp land grant at the date of the passage of the acts.
The State of Louisians never acquired either a legal or an equitable title under these acts.

The applicants have called attention to the fact that Congress expressly reserved waste or unappropriated hands when the territory was admitted as a State and argued that it was the interntion of Congress to include these submerged lands, so-called lakes, within the term Facety lands".

This office is not aware of any decision in which the

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subject has been considered. The terms "waste lands" and "swamp and overflowed lands unfit for cultivation", may be here synomous. However, the reservation does not appear to have any material bearing upon this case, whatever its interpretation.

The attorneys for the applicants have raised another issue to the effect that the land described in their applications is mineral in character, and, therefore, cannot be acquired by the State of Louisiana as swamp land. The swamp land grants of March 2, 1849 and September 28, 1850, supra, contain no reference to mineral lands.

While this point has perhaps never been directly considered either by the Department or by the courts, it may be concluded that the Department is justified in holding that lands swampy in character and otherwise falling within the purview of the swamp land grants did not pass to the states under those grants if, prior to or at the date of the spproval of the survey of such lands, it be ascertained that they are mineral in character, since the United States Supreme Court has held in a California case that Sections16 and 36 did not become vested in the State as school sections if, prior to or at the date of survey thereof the lands embraced

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therein were known to be mineral in character. See Mining Company v. Consolidated Mining Company (102 U. S., 167). The question of the passing of lands out of the control of the Government by the swamp lend grants and by the school land laws, when the land is mineral, seems to be analogous in both classes of cases, and the holding in the latter class is equally applicable in the former. The admission of California as a state and the date of the passage of the act granting to the state sections 16 and 36, as school sections were nearly contemporaneous with the passage of the swamp land grants referred to herein. None of the aforesaid acts contained any reservation reserving to the Government lands mineral in character. But as was held in the case of Mining Company v. Consolidated Mining Company, supra, such lands (mineral lands) were by the settled policy of the General Government excluded from all grants. The case of Morton v. Nebraska (21 Wall., 560), was an earlier decision in which the above stated policy was emphasized. It is true that. et the date of the passage of the swamp land grants, Congress had not enacted into law any general plan by which title to mineral lands could be acquired. It was the policy of Congress, however, to reserve such lands until such time as it saw proper

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to adopt a system for their disposition. Furthermore, it is a familiar rule of construction that where a statute operates as a grant of public property or the relinquishment of a public interest, and there is doubt as to the meaning of its tearms or as to its original purpose, that construction should be adopted which will support the claim of the Government. See Rice v. Railroad Company (1 Black., 358); Slidell v. Grandjean (111 U. S., 412); Wisconsin Central Railroad v. United States, (164 U. S., 190).

It must be concluded, therefore, that the State of Louisians does not acquire title to swamp lands under the provisions of the acts of March 2, 1849, supra, and September 28, 1850, supra, when those lands are of ascertained mineral character either prior to or at the date of the approval of the Government surveys thereof. In the case at hand the lands in question have not been surveyed. If a proper showing be made which shall disclose the fact that the lands involved herein are actually mineral in character, then the contention of the applicants as to this point will be considered as sustained. The State of Louisians is subject to the United States Mining Laws, See 31 L. D., 135.

It does not appear necessary to show how the Caddo

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Leves Board was created and what rights were acquired by it from the State of Louisians. Since that State had no title to the temporarily submerged land beneath the waters of socalled Ferry Lake, which it could convey to said Leves Board.

The records of this office show that the unappropriated public lands in TS. 15 to 23 N., RS. 10 to 16 W., inclusive, were, by order of the Secretary of the Interior, December 15, 1908, withdrawn from settlement, entry and appropriation, for classification and in aid of legislation affecting the use and disposition of petroleum deposits belonging to the United States. On July 1, 1910, the Director of the Geological Survey recommended that the aforementioned order of withdrawal be approved and designated as Petroleum Reserve No. 4, On July 2, 1910, the same was approved by the President.

The records of this office further show that on April 28, and April 29, 1908, the Register and Receiver, at Natchitoches, Louisiana, transmitted the applications of Leon 7. Euckins and Royden D. Elmore to locate Valentine Scrip,E. 323 and 159, respectively, upon portions of the unsurveyed lands in Secs. 13 and 12; Ts. 20 N., R. 15 W., between the water's edge and the meander line of the lake. By letters "E" of June 10 and June 28, 1908, the scrip and papers accompanying the same were returned to the local officers to be retained by them pending the determination of the question through the application

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for survey herein, as to whether or not the land belongs to the United States.

It is well settled that the Department has jurisdiction to determine whether or not the Government surveys are erroneous or fraudulent, and, in the event that error or fraud is found to exist after an investigation has been made, to cause the surveys to be corrected. See Palo Alto County, Iowa, (32 L. D., 545); Kirwan v. Murphy. supra; Miles v. Gedar Point Club, supra; Hornev, Smith, supra, and numerous other cases. In view of the fact that the evidence conclusively shows that the 429.93 acres referred to above was erroneously omitted from the Government surveys it is the duty of the proper branch of the Covernment to cause the same to be surveyed.

With respect to any other land between the edge of the aforesaid 429.93 acres or between the meander line of the so-called lake as it now exists on the plats in other places, and the present water's edge uncovered by the recession of the waters, it is the duty of the General Land Office to cause the same to be surveyed. As was said, in the case of Kizwan v. Murphy, supra, the Land Department must necessarily consider and determine what are public lands, and the fact that no steps were taken during all of these years to assert title cannot in any manner affect the Government's right to assert

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title at this time. The right can be asserted at its leisure and the presumption which might obtain in other places from the inaction of the Government is in respect to its public lands of this character of no significance and the silence or inaction of the Government creates no presumption in favor of an adverse claiment. Ely's Administrator v. United States (171 U. S., 220).

In a latter dated April 22, 1910, addressed to the Commissioner of the General Land Office by the Register of the Louisiana State Land Office a request was made for an opinion relative to the title to the bed of Ferry Leke. He stated that it is the intention of the State, to have these dried lake lands surveyed for the purpose of putting them upon the market and that it would be exceedingly difficult to obtain purchasers where there may be a possibility of the United States claiming title at some future date. He further stated that the Attorney General of the State had expressed his opinion to the effect that these lands belong to the State under its right of sovereignty.

This office, therefore, concludes that the title to the land within the meandars of so-called Ferry Laks belongs to the United Status for the following reasons:

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(1) That the land was originally dry and afterwards be-

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came temporarily submarged as the result of the formation of the Great Raft,

(2) That during Spain's propriatorship over the Territory

of Louisians, said dry land was a part of the Crown possessions.

(3) That France and afterwards the United States, grantees of Spain, acquired the title which Spain originally had.

(4) That the afcredescribed temporarily submerged land was not of such a character at the date of the Swamp Land Grants as to come within the purview of those grants if.

- (a) It was temporarily overflowed, but subject to cultivation after subsidence of the waters,
- (b) It was ascertained to be mineral in character prior to or at the date of survey.
- (5) That the United States had never conveyed away its title to said lands.
- (6) That the doctrine of the reappearance of temporarily submerged lands is emply sustained by law, in Louisiana and elsewhere.

(7) That the doctrine of sequisition by ascretion or raliction is not applicable, to the case at hand.

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The State of Louisiana through the action of its land agents and the actions of its courts in holding that shallow so-called lakes in the State are to be considered

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land as contradistinguished from water has astorped itself from claiming that the submarged land covered by socalled Ferry Lake 18 not land. Especially in view of the fact that this so-called lake was formed in a similar manner as were so-called Soda, Gross, Clear and other lakes in the Red River Rasin, the land ander which the State selected as swemp land, a Government survey having been made after the land had become ing.

If this office had concluded that the doctrine of the reappearance of submarged land could not be sustained by law, it would still be of the opinion that the title to the land under so-called Ferry Lake is still in the dovernment, notwithstanding that said so-called lake may have been held to have been a permenent body of water, for the following reasons:

(1) That so-valled Ferry Lake could be considered distinct and upart from Cypress Bayou proper.

(2) That, although Oypress. Dayou might have been hevi-

gable, so-celled Ferry Lake was not nevigable in a legal sense.

 (3) That the grantees from the Covernment to the lands bordering on the meander line acquired the amounts of land designated in their patents and no more. (Cie Gragin v. Powell, 128 U. S., 091; Jones on Conveyancing, Page 424).

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(4) That said sc-called lake bed was not overflowed land

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within the meaning of the Swamp Lara Grants at the dates of those grants.

(5) That the allegation, viz: that the temperarily submer-

ged land is mineral in character, if true, precludes the state from claiming said land under the swamp land grants since the land has never been surveyed.

For the foregoing reasons the Government is undoubtedly the proprietor of the aforesaid submerged land bordering on Cypress Bayou proper. There are probably now considerable areas of land additional to the 429.93 acres referred to above, between the present water's edge and the original meander line, which were omitted from the Government surveys and which have been wholly uncovered by the recession of the waters caused by the removal of the Raft, If so, jurisdiction over said land is vested in the Interior Department.

I, therefore, recommend that the protests made by the State of Louisiana, the Caddo Levee Board and the Riparian claimants be dismissed and that this office be authorized to approve the survey made by Surveyor Charles M. Pidgeon during April, 1911, and that it be further suthorized to cause all of the unsurveyed land between the present water's sige and the meander line to be surveyed in accordance with the

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laws governing the public land surveys. If this recommendetion is concurred in by you and said townships are subsequently restored to entry or disposal, this office can then determine whether or not said placer claims should be allowed.

The record is enclosed herewith.

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Commissioner.

DEPARTMENT OF THE INTERIOR

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WASHINGTON

D-19739.

The Commissioner of the

General Land Office.

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Sir:

The Department has carefully considered your letter of January 10, 1913, relative to the survey of certain land, alleged to be unsurveyed public land of the United States, within the meander line of Ferry Lake, in T.20 N., R.16 W., Baton Rouge, Louisiana, land district. In your said letter you recommended the approval of the survey executed by Surveyor Pidgeon of certain areas in sections 3, 4, 9, 10, 12, 13, 15, and 16, which he reported as having been erroneously omitted from the survey of the township.

In view of the comprehensive statement contained in your letter, it is unnecessary to repeat the history of the surveys made within the township under consideration or to refer to the great mass of information that has been presented on behalf of those who seek, and those who cppose the survey, as public land of the United States, lands within the meander line of Ferry Lake as represented upon the plat of survey executed by Surveyor Warren during the

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in an interest in the face about the

first quarter of the year 1839.

The questions presented by this record are first, did Ferry Lake exist, as a navigable body of water, in the year 1812, when Louisiana was admitted into the Union; second, did Warren's survey correctly meander Ferry Lake as it existed at the date of the admission of Louisiana into the Union?

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After a careful consideration of the record and of the written and oral arguments of counsel, the Department is not satisfied that all sources of information that would assist in the determination of the questions involved have been exhausted. In view of the magnitude of the interests involved, it is important that the decision to be rendered in the premises should be based upon every ascertainable fact that might tend toward a just judgment upon the issues presented.

It appears from the report of Surveyor Pidgeon that few, if any, evidences remain of Warren's survey east and north of the lake, within this township. No effort appears to have been made to ascertain what, if any, evidences of that survey remain along the south side of the township, or along the line dividing the States of Iouisiana and Texas. It is obvious that no conclusion can be

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reached until the precise locus of Warren's meander line can be ascertained and the area covered by the Lake in 1839 definitely fixed. To determine the locus and area of the Lake in 1839, it is vitally important, if it be possible, to know the elevation of the surface of the lake above mean gulf level. The survey executed by the commissioners appointed to fix the boundary between Louisiana and Texas and Deputy Surveyor Morse's remeasurement of this line in 1846, which included the meander of a the west side of Ferry Lake, tend to show that the level of the lake at the time of those surveys was the same as in the year 1839. It is probable that monuments of these surveys remain and that an examination thereof in the field will materially assist in the determination of the correctness of Warren's meander line of the west side of the lake, as well as the water level thereof from 1839 to 1846.

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You are, therefore, directed to have a competent surveyor of your bureau make, with the least possible delay, a careful reexamination and survey upon the ground, to the end that Warren's survey of the meander line may be definitely fixed with respect to the subdivisional lines of the township and the area actually covered by

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the waters of Ferry Lake in 1839, and at the present time. In making the survey hereby directed, the surveyor should be instructed to neglect no evidence bearing upon the location of monuments and corners of the Warren survey or the locus of Ferry Lake in 1839. The Director of the Geological Survey has been instructed to prepare a full statement of the history of this lake, citing every ascertainable fact in connection with its past and present condition, and it is suggested that you consult with him fully in the preparation of your instructions to the surveyor detailed to do the work, and, if necessary, in the actual field work of the survey. It is not unlikely that there exist upon the ground evidences of the locus of the lake in 1839, which would be apparent to and could be pointed out by a trained geologist which a surveyor, however capable, would overlook.

..

The Department desires that the survey to be made as herein before indicated, not only show with accuracy the position of Ferry Lake with respect to the other lands in the township, both now and in 1859, but that the surveyor to be detailed by your bureau and a representative of the Geological Survey make an exhaustive investigation for such evidence as may now exist of the locus of the lake

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in 1812. Every fact, so ascertained, will be incorporated in their report, as well as the names of such persons, if any, as may be able, from long acquaintance with the locality, to intelligently testify as to conditions affecting the lake.

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You are directed to advise the State of Louisiana and its allied interests and the applicants for survey of their right to have a representative present during the field work to be done under these instructions.

Respectfully,

adres First/Assistant Secretary.

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T.C.H. J.H.B. D.M.G.

DEPARTMENT OF THE INTERIOR

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GENERAL LAND OFFICE

WASHINGTON September 27, 1913.

ADDRESS ONLY THE COMMISSIONER OF THE GENERAL LAND OFFICE

SPECIAL INSTRUCTIONS

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Reexamination and surveys in T. 20 N., R 16 N., Louisiana Meridian, "Farry Lake," Louisiana.

Mr. Arthur D. Kidder, Supervisor of Surveys, General Land Office.

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Sir:

Pursuant to instructions contained in letter of the First Assistant Secretary of the Interior dated September 3, 1913, you are directed to proceed, with the least possible deley, to T. 20 N., R. 16 W., Louisians Meridian, Louisians, and there make a careful examination of the original surveys of the exterior, subdivisional and meander lines of said township and such additional land, topographic and hydrographic surveys as may be necessary to accurately and minutely carry out the instructions contained in the above named letter, a copy of which is handed to you herewith.

Limits and Character of Work.

This assignment provides for the necessary field er-

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amination to definitely determine the position of the original meander line of Ferry Lake with relation to the exterior and subdivisional lines of T. 20 N., R. 16 W., including the Louisiana- Texas boundary line, as shown upon the official plats approved August 31, 1839, July 24, 1846, March 31, 1854, August 18, 1871, and May 29, 1896, and to further determine, if possible, the relation of said lines to the area actually covered by the waters of Ferry Lake in 1812, in 1839 and at the present time.

You will cooperate with Mr. G. O.Matson, Associate Geologist, assigned by the Director of the U. S. Geological Survey, in making an exhaustive investigation of such evidence as may now exist bearing upon the locus of the lake in 1812 and 1839, and carefully consider and report upon all evidence of geological, topographical or hydrographical character, physical conditions respecting timber growth both past and present, within and without the surveyed meander line, including the testimony of parsons long acquainted with the locality, to the end that every ascertainable fact may be reported to the Secretary of the Interior upon which may be based his answers to the questions (first) did Ferry Lake exist as a navigable body of water, in the year 1812, when Louisiana was admitted into the Union; (second) did Warren's

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survey correctly meander Ferry Lake as it existed at the date of the admission of Louisiana interthe Uniton? Before the second question can be answered it is vitally important to determine whether or not Deputy Warren correctly meandered Ferry Lake as it existed in the year 1839, when his survey was executed.

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Data.

For your guidance in making the examination, survey and investigation herein provided for, you will be furnished with photolithographic copies of all official plats of Ts. 19, 20 and 21 K., Rs. 15 and 16 W. (twelve in number), and complete transcripts of the field notes of the official surveys of the exterior, subdivisional and meander lines of T. 20 H., R. 16 W., including the Louisiana-Texas boundary line and the contiguous exterior, subdivisional and meander lines of the adjoining townships.

Method and Order of Procedure.

Your first duty in the field will be to identify the evidence of the existing monuments of the original surveys, and thereafter to neglect no evidence offered by property corners, court records, local surveyors and citizens able to give clear and convincing testimony tending to the recovery

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of obliterated corners. All identified and recovered corner points will then be remonumented in their respective original positions. You will thereafter resetablish all lost corners by proportionate measurement, following strictly the provisions of the pamphlet on "Restoration of Lost or Obliterated Corners", revision of June 1, 1909.

The next step in the field will be the fixation of the original meander line as returned in the official field notes. A retracement will be made based upon the courses and distances so returned in the original field notes, and the closing error determined; the errors in latitude and departure will then be distributed along each course in proportion to the lengths thereof. The several angle points along the reestablished meander line will be perpetuated by suitable monuments.

While the above examination and survey are in progress it may be presumed that the geologist will be engaged in developing evidence relative to the true locus of the area covered by the waters of Ferry Lake in 1812 and in 1839.

All points of definite geological or historical interest will be carefully located with respect to the reestablished survey monuments, and such additional topographic and hydrographic surveys will be made, as may be deemed

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advisable and helpful towards the ultimate answers to the questions herein set forth, including the datum reference of the elevation of the surface of Ferry Lake above mean gulf level.

Returns.

You will be required to submit the usual complete field notes of the resurvey and to prepare a correct resurvey plat of T. 20 N., R. 16 W., upon which plat will be mapped all points of historical interest and all features of topographical and hydrographical importance developed in your survey.

Your field notes and plat will be supplemented by such general report of your field operations and observations as may be necessary to fully place before the Department all excertainable facts relevant to the subject matter of this assignment.

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Interested Parties.

You are directed to permit authorized representatives of the State of Louisiana, interested property owners or claimants, or their attorneys or surveyors, to be present during the progress of your field work, and to explain to them, if requested, the significance of any momment estab"E" A D K

lished by you, or of any line projected by you for the purpose of carrying out these instructions.

Should any objections be raised to the course pursued, the same should be filed in writing with you to be carefully considered and forwarded with your report with such comments thereon as you may desire to submit.

Very respectfully.

(Signed) C. M. Bruce.

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Commissioner.

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DEPARTMENT OF THE INTERIOR,

Div. "FS": Trans. report of reexamination of Ferry Lake in T. 20 N., R. 16 W., Louisiana, 09-122623.

GENERAL LAND OFFICE.

Washington, D. C., October 24, 191

The Commissioner, General Land Office, Washington, D. C.



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Sir:

I have the honor to transmit herewith the report of my examination into the character and history of Ferry Lake, in T. 20 N., R. 16 W., La. Mer., Louisiana, provided for in my instructions "E" dated September 27, 1913, said instructions having been issued in pursuance of directions contained in letter "FS-09-122623", dated September 8, 1913, and Departmental letter dated September 3, 1913. My report consists of the following papers, maps and exhibits:

1. A general report,

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- A transcript of Book "A" of the field notes: reestablishment of the south, east, and north boundaries of T. 20 N., R. 16 W.,
- 3. A transcript of Book "B" of the field notes: reestablishment of the boundary line between the States of Louisiana and Texas from the 45th to the 54th mile posts,
- 4. A transcript of Book "C" of the field notes: reestablishment of the subdivisional and meander lines of T. 20 N., R. 16 W.,
- 5. A certified copy of the journal of the Joint Commission which marked the boundary line between the United States and

the Republic of Texas in the year 1841, obtained from the Register of the State Land Office at Baton Rouge, La.,

- Sheet No. 1: An ecologic map of a sample plot on the border of Ferry Lake in Sec. 32,
- Sheet No. 2: An ecologic map of a sample plot on the border of Ferry Lake in Sec. 32,
- Sheet No. 3: An ecologic map of a sample plot on the border of Ferry Lake in Sec. 33,
- Sheet No. 4: An ecologic map of a sample plot on the border of Ferry Lake in Sec. 13,
- Sheet No. 5: An ecologic map of a sample plot on the border of James Bayou in Sec. 4,
- Sheet No. 6: An ecologic map of a sample plot on the border of Clear Lake in Sec. 1,
- Sheet No. 7: A hydrographic and topographic map of a portion of T. 20 N., R. 16 W.,
- 13. Sheet No. 8: A general drainage map of Ferry Lake and Red River and neighboring bayous connecting with other raft-formed lakes; a topographic map of Red River at the mouth of Willow Chute; a map of the Freeman-Custis Expedition of 1806; profiles of Ferry Lake, Twelve Mile Bayou and Red River; and an index of the identified corners of the original survey,
- 14. Sheet No. 9: A copy of the resurvey plat of T. 20 N., R. 16 W.,
- Sheet No. 10: A supplemental topographic map of Sec. 25, T. 20 N., R. 16 W.,
- 16. A blue print map of the crossing of Ferry

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Lake on the state boundary line by the Joint Commission in 1841, and

17. A block of wood taken from a bearing tree at the quarter section corner between Secs. 10 and 11, T. 20 N., R. 16 W., exhibiting the original marks made by A. W. Warren, D. S., in 1839.

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With my letter (FS) dated August 21, 1914, I transmitted the report of the ecologic survey of Ferry Lake, in T. 20 N., R. 16 W., accomplished by Mr. Lionel L. Janes, Ecologist, and with my letter (E) dated October 14, 1914, I transmitted the original resurvey plat of T. 20 N., R. 16 W., and the three original books of field notes of the reestablishment of the exterior, subdivisional and meander lines of T. 20 N., R. 16 W., books "A", "B" and "C" as noted above.

The report of the history and geological character of Ferry Lake by Mr. Frank Leverett, Geologist, was submitted by him to the Director of the Geological Survey.

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Very respectfully,

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Supervisor of Surveys.

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GENERAL REPORT Arthur Kidder

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GENERAL REPORT EXAMINATION OF FERRY LAKE CADDO PARISH, LOUISIANA T. 20 N., R. 16 W., LA. MER. 3

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Prepared and submitted by Arthur D. Kidder, Supervisor of Surveys, in pursuance of instructions issued by the Commissioner of the General Land Office under date of September 27, 1913.

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DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE.

Washington, D. C., October 14,1914.

GENERAL REPORT

Reexamination and surveys in T. 20 N., R. 16 W., La. Mer., Ferry Lake, Louisiana.

The Honorable Commissioner, General Land Office, Washington, D. C.

Sir:

The following general report concerns many phases of the field operations and observations in connection with the exhaustive investigation into the history and character of Ferry Lake in T. 20 N., R. 16 W., La. Mer., Louisiana, made in pursuance of special instructions to me under date of September 27, 1913, which have not been covered in the regular field notes of the resurvey.

The total period of field work extended from October 21, 1913, to May 8, 1914, during which time I made my headquarters at Mooringsport, Louisiana. The period was exceptionally favorable for an investigation of this character.

I was assisted by Mr. Fred D. Spofford, U. S. Surveyor, from Nov. 9th to May 8th; by Mr. A. N. Kimmell, U. S. Surveyor, from Dec. 18th to Mar. 29th; and by Mr. W. N. Ross, Draftsman 2.35

and Computer, throughout my entire detail to this duty, both in the field and in the office. All assisted materially in accomplishing the purpose of my instructions.

The surveying organization cooperated extensively with Messrs. Lionel L. Janes, Ecologist, of the General Land Office, and with Messrs. Geo. C. Matson and Frank Leverett, Geologists, of the U. S. Geological Survey, in the necessary surveying and mapping incident to the conduct of their special expert investigations into the technical questions involved in this case.

The various parties in interest followed the field work closely both in person and by representation through their attorneys, geologists, ecologists, consulting engineers, and surveyors, of the highest professional standing. The presence of such interested parties was provided for in my instructions and in no way obstructed the work; the conduct of those present was in every case courteous and as discussions of facts and issues were avoided as far as possible I welcomed the presence of those interested in the execution of the field work. The local surveyors retained by the various oil companies. rendered especially valuable assistance in the identification of the evidence of the early surveys. The maps and data relative to the history of Ferry Lake have been considered of a confidential nature until filed, and have therefore been withheld from public view.

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The Major Questions.

The field investigation and survey provided for under this assignment were directed to obtaining facts leading to the answere to two specific and distinct questions:

(1) Did Ferry Lake exist, as a navigable body of water, in the year 1812, when Louisiana was admitted into the Union;

(2) Did Warren's survey correctly meander Ferry Lake as it existed at the date of the admission of Louisiana into the Union?

The legal significance of the above questions introduces a factor precluding direct answers by the surveyor, but the following attempt is made to clearly present the facts upon which the answers to the said questions must ultimately be based.

An Outline of the Facts.

Prior to the year 1777 the unsurveyed area in T. 20 N., R. 16 W. was embraced in the valleys of Cypress, James and Black Bayous, and was covered by a heavy forest, mostly of upland species; thereafter the greater portion was overflowed to depths ranging from 0 to 15 feet and the drowned forests were given the names Ferry Lake, Clear Lake and James Bayou.

The overflow has been traced to the great raft in the Red River, and it was found when the raft was removed in 1873, to restore navigation in said river, that the old outlet of Cypress, James and Black Bayous leading to the river had become largely

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covered with sediment carried in from Red River, to such depths that a new outlet, Twelve Mile Bayou, was created and forced to make a new trench through hard clay, at a higher elevation and considerably removed towards the bluffs bordering the bottom lands of Red River, thus continuing the overflow, or lake condition, through such a time as nature may require to cut the bed of Twelve Mile Bayou to the elevation of the beds of the old Cypress, James and Black Bayous, thereby restoring the pre-raft conditions.

The contour 173.09 feet above mean gulf level has been determined to represent the mean high water elevation in the year 1812, when Louisiana was admitted into the Union, and in the year 1839, when the township was originally subdivided. The average high water elevation of the present time is approximately 167 feet above mean gulf level.

The major portion of the meander line agrees consistently with the mean high water elevation of Ferry and Clear Lakes and James Bayou during the raft period, but in places the surveyed meander line departs from the mean high water elevation without apparent reason, omitting large areas of upland.

The several parcels of upland located above the contour representing the mean high water elevation of Ferry Lake in the year 1812, but found to have been omitted from the original surveys, graphically and accurately shown upon the resurvey plat,

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do not differ in geologic or topographic formation, or in forest growth, or in any other essential feature, from the adjacent surveyed lands.

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Thousands of general hardwood stumps of great age still exist in Ferry Lake bearing mute evidence of a great virgin forest preceding the overflow, while the former forest along the lake border has been superceded by two distinct forest species which are characteristic and bear evidence upon the age of Ferry Lake and the mean high water elevation during the raft period: (1st) a new hardwood forest belt made up of species common to lands inundated a small portion of the year, the overcup oak predominates, and this timber belt is found immediately above the contour 173.09 feet above mean gulf level; and (2nd) a new forest belt made up of species common to lands inundated a considerable portion of the year, the cypress predominates, and this timber belt is found immediately below the contour 173.09 feet above mean gulf level. The forest trees constituting these two timber belts are of different characteristics than those of the general hardwood species formerly occuping the same areas, and the ecologist reports that the present growth has germinated since Ferry Lake came into existence and that the larger and older trees vary from 90 to 120 years of age.

The channels of Cypress and James Bayous have been distinctly traced through the lake bed, but the geologists report that

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the old channel is lost below the foot of Ferry Lake. The present outlet is through a new natural trench called Twelve Mile Bayou in which rapids exist at one place with an aggregate fall of about fourteen feet, gradually working headward, cutting the hard clay barrier, and tending again to reproduce the former drainage conditions.

The data handed to me for review prior to taking up the field work, consisting of papers and attorney's briefs in the Ferry Lake case, contains many historical references to the actual navigation on or through Ferry Lake. I have made no attempt to prove or disprove the statements therein contained as the character of the navigation at all times has depended entirely upon the character of the body of water, depending upon its stages or depths and the obstructions in the lake, the true nature of all of which is brought out in the various reports and maps.

The Reports and Maps.

Mr. Janes has prepared an exhaustive report of his ecologic survey of Ferry Lake, consisting of a detailed technical discussion, a photographic folio, wood samples and a summary report, also six maps, Sheets Nos. 1 to 6, incl., exhibiting the ecologic conditions obtaining upon selected sample plots bordering Ferry and Clear Lakes and James Bayou, said maps being the product of

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cooperative field work. The topography of the sample plots is represented on these maps by contour lines (lines of equal elevation) spaced at an interval of one foot difference in elevation between the successive contour lines, while the various forest trees are accurately located for position, with the various species indicated by unique symbols. In special instances the forest trees have been given serial numbers, shown on the maps for ready reference in the ecologic report.

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Mr. Leverett has submitted a compilation of important records bearing upon the history of the great raft in the Red River in relation to drainage conditions effecting several raft-formed lakes, which he has carefully reviewed in a summary statement concerning the geological and drainage features of Ferry Lake and vicinity.

Messrs. Matson and Leverett cooperated with the surveying organization in the production of two maps, Sheets Nos. 7 and 8, which exhibit the hydrographic and topographic features of important consideration, as follows:

Sheet No. 7: Hydrographic and topographic map of a portion of T. 20 N., R. 16 W., showing the true configuration of the bed and border of Ferry and Clear Lakes and James Bayou with respect to the surveyed lands in T. 20 N., R. 16 W., illustrating particularly the successive hydrographic conditions obtaining in this region, (1st) during the wooded valley and stream

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stage prior to the year 1777; (2nd) during the raft stage in the Red River in the year 1812 when Louisiana was admitted into the Union and in the year 1839 when the township was originally subdivided; and (3rd) during the trenching of a new outlet, Twelve Mile Bayou, at the present stage of Ferry Lake. The surveyed lands are accurately mapped, and in each section are shown the quantities of three classes of lands, (1st) the surveyed areas as taken from the original approved township plats; (2nd) the areas of the unsurveyed upland, based on the mean high water elevation in 1812; and (3rd) the submerged areas based on the same mean high water elevation. The topographical features of the entire area are shown by contour lines spaced at an interval of five feet difference in elevation between the successive contour lines, while the details of the banks and bed of the submerged old channels of Cypress and James Bayous are shown by contour lines spaced at an interval of one foot difference in elevation. On the same map are also shown the locations of the present oil wells in the entire area omitted from the original surveys and in other places bordering closely the reestablished meander line.

Sheet No. 8: This is a general drainage map of Red River and neighboring raft-formed lakes and bayous connecting with Ferry Lake; on the same sheet are shown a portion of the map of the Freeman expedition of 1806 and our topographic map of a portion

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of the Red River at the mouth of Willow Chute, both of which are of the greatest importance in their bearing upon the existence of Ferry Lake in 1812. On the same map are also shown several illustrative profiles, and , for convenience, an index of the location of authentic evidence bearing upon the identification of the early public land surveys.

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My special instructions provided particularly for the necessary field examination to definitely determine the position of the original meander line of Ferry Lake with relation to the exterior and subdivisional lines of T. 20 N., R. 16 W.; this involved an identification of the evidence of the existing monuments of the original surveys and careful consideration of any other evidence leading to the relocation of obliterated corners. I was also required to permanently monument the identified and recovered corner points, to reestablish the lost corners, and to adjust and permanently monument the several angle points of the original meander line. All of this amounted to a regular resurvey of the exterior, subdivisional and meander lines of T. 20 N., R. 16 W., in a manner dependent upon the position of the original lines and corners.

Sheet No. 9 is a regular resurvey plat of T. 20 N., R. 16 W., upon which is also shown the position of the contour 173.09 feet above mean gulf level, representing the mean high water elevation of Ferry and Clear Lakes and James Bayou in the years 1812 and 1839.

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The resurvey process consisted of a retracement of the lines of the original surveys, for the purpose of identifying the existing evidence of the original lines and corners, followed by a reestablishment of the lost corners by proportionate measurement, and a remonumenting of all corners with iron posts having caps suitably marked, and witnessed by new bearing trees. Titles and areas based upon the original approved plats remain undisturbed for position and description.

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Much of the virgin timber has been removed, which obliterates a large part of the best evidence of the original surveys, but the isolated fragments of authentic evidence were found to connect in a very consistent and creditable manner leaving no doubt of the identification of the individual work of each of the several surveyors who engaged in the execution of the original surveys. The standard of the alinement and measurement of the individual surveyors was found to be remarkably uniform when the work of each surveyor was considered separately, but the work of each was found to be distinctly different from that of the others, and these characteristics were accordingly given careful consideration in making the reestablishments.

There is an apparent clerical error in the field notes of Warren's meander line in sec. 25, which is found in both the original notes on file with the Register of State Lands at Baton Rouge, La., and in the Washington transcript, but a striking agreement exists between the configuration of the bluff fronting Ferry Lake and the calls of Warren's field notes of four of the meander

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courses which after careful study enabled me to make an excellent adjustment.

Sheet No. 10 is a supplemental topographic map of Sec. 25, T. 20 N., R. 16 W., covering a portion of the Townsite of Mooringsport, Louisiana, which exhibits a protracted position of the meander line surveyed by A. Warren, D. S., in 1839, as erroneously recorded in the field notes of the original survey, and the relation of this protracted line to the section and meander lines as actually reestablished after careful consideration of the conditions presented.

Complete, detailed, regular field notes of the resurvey have been prepared, and are submitted in three books entitled:

- "A": Reestablishment of the south, east and north boundaries of T. 20 N., R. 16 W.
- "B": Reestablishment of the boundary line between the States of Louisiana and Texas from the 45th to the 54th mile posts.
- "C": Reestablishment of the subdivisional and meander lines of T. 20 N., R. 16 W.

Introducing the Field Work.

No living man can relate personal observations of conditions in T. 20 N., R. 16 W., in the year 1812. I talked with three men who related conditions there as far back as the year 1870, and doubtless other men are living who might give testimony regarding conditions several decades earlier, but to prove or disprove the existence of Ferry Lake in 1812, and its mean high water elevation in that year, if then in existence, appeared at first to be a most difficult detail. Many theories have

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been advanced accounting for the overflow which produced Ferry Lake, and its age, etc., and many historical references and public documents are available bearing upon this and other neighboring lakes, but the theories are contradictory in various particulars, and none could be accepted unless made to harmonize with the existing evidence on the ground, nor could we accept the historical data unless substantiated.

The ecologist and geologists have gone deep into a disproof of all erroneous theories accounting for Ferry Lake, which requires no review on my part. The geologists have shown beyond a shadow of doubt that Ferry Lake owes its existence to an overflow due to the great raft in the Red River. The main features relative to the history of the great raft do not require further substantiation, and having determined upon this cause for Ferry Lake attention must be directed to a consideration of particular details as to the position of the raft at certain dates and the extent of the resulting overflow of the Red River bottom lands and tributary stream basins. The lake condition left certain shore markings of important meaning quickly noticed by the geologists, and the overflow resulted in drowning the former virgin forest up to the limit of the average flood stage and produced conditions favoring new forest growths, already mentioned, which were carefully studied and interpreted by the ecologist.

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The ecological and geological features existing on the ground

today bear evidence upon the age, elevation and effect of the overflow which produced Ferry Lake. The details were most carefully studied by the geologists and the ecologist and independently interpreted and found to harmonize as to their meaning and with the accepted cause of Ferry Lake.

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The conclusions were reached only after many months of earnest field work, and the facts upon which they are based are fully presented in the reports submitted by the special experts.

The Elevation Datum.

The instructions required that the elevation of the surface of Ferry Lake above mean gulf level be determined, if possible; the mean gulf level datum was accordingly used in reference to all elevations determined in this survey.

The Engineering Corps of the War Department, U. S. A., have established several precise bench marks in this vicinity in connection with their surveys made in 1891 and in 1911. One of the bench marks (Precise Bench Mark No. 3) is located at Mooringsport (Sheet No. 7) and others are located along Twelve Mile Bayou and Red River. These bench marks were especially helpful in basing the levelling operations upon the desired datum. The bench marks were satisfactorily identified in accordance with the descriptions furnished, and the latest information relative to proper reference to mean gulf level was furnished by Major T. H. Jackson, Corps of Engineers, Dallas, Texas.

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The Contour 173.09 Ft., M. G. L.

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Early in the progress of the field work, before the original meander line had been reestablished or much authentic evidence obtained relating to the position of the original section lines or corners, and before any theory relative to the cause of Ferry Lake was substantiated or disproven, a joint reconnoissance survey of the bed and border of Ferry Lake in T. 20 N., R. 16 W. was made by Mr. Matson, Mr. Janes and myself, which resulted in directing special attention to certain terraces or beaches surrounding the lake upon which occurs a belting of distinctly different forest species. In many places there appeared to be a slight escarpment, the result of wave action, occurring quite generally on the line separating the cypress timber belt from the overcup oak, but more often lost in those places where exposed tree roots indicated much soil erosion.

A considerable number of temporary stakes were set in the reconnoissance survey, located jointly by Messrs. Matson and Janes to mark the base of the most prominent terrace, at points just above the escarpment mentioned in the preceding paragraph, and so located as to best define the margin between the cypress and overcup oak timber belts. These stakes were widely separated and were distributed along several miles of the lake front.

The above system of temporary stakes were later connected by the surveying party and their respective elevations reduced to a common datum. A few of the stakes appeared to have been poorly

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located, i. e. too high or too low, but 9/10ths of the temporary stakes were found to agree for elevation within a limit of about one foot of the common average. It was then determined to survey a contour line around the entire border of Ferry and Clear Lakes and James Bayou, in T. 20 N., R. 16 W., located at the average elevation of the temporary stakes set in the reconnoissance survey.

The contour line could be utilized for many purposes by the special experts and also in subsequent surveying operations. This line was therefore located with great care and marked on the ground for future reference by stakes bearing serial numbers. A system of bench marks was carried ahead of the contour line survey to be used for reference and checking purposes. The system of contour stakes was later connected to each section line and all stakes definitely located for position by an accurate traverse.

The above special contour was everywhere found to closely follow the margin of the overcup oak and cypress timber belts and to agree well with the base of the aforementioned principal lake terrace wherever the latter was at all well defined. This contour is shown on Sheet No. 9 by a continuous black dotted line, and on all the other sheets by a full red line. The elevation of the special contour, when connected to Precise Bench Mark No. 3, War Department, was found to be 173.09 feet above mean gulf level, Biloxi, Miss., datum.

The reports of the ecologist and the geologists show that the

contour 173.09 feet above mean gulf level represents to all practical purposes, reliably and accurately, the mean high water elevation of Ferry Lake during the raft period. Below this line are found only such forest trees as are adapted to lands inundated a considerable portion of the year. Above this line and occurring on the aforementioned lake terrace are found such hardwood forest trees as are adapted to lands inundated for a brief period of the year. For emphasis it is again stated that the forest trees comprising the above timber belts have all germinated since Ferry Lake came into existence, and that these timber belts have superceded, in part, the former virgin, general hardwood forest which occupied the same area preceding the great overflow.

The special experts agree that little if any practical change occurred in the mean high water elevation of Ferry Lake during the raft period from the year 1812, when Louisiana was admitted into the Union, to the year 1839, when the township was originally subdivided.

The Contour 167 Ft., M. G. L.

It was noted, early in the progress of the field work, that the present mean high water level of Ferry Lake is several feet lower than the former mean high water level during the raft period.

Gauge readings by the Engineering Corps of the War Department, taken daily at Mooringsport since June 1, 1912, were accessible, which accurately recorded the actual water elevation of Ferry Lake. These gave the most reliable information relative to the mean high

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water elevation of Ferry Lake at the present time. Average high water occurs generally between December first and June first, and the gauge readings for this six months period only were used. The gauge readings thus selected, when reduced to the desired mean gulf level datum, indicates that the average high water elevation of Ferry Lake is now 167 feet above mean gulf level. The contour representing this level is shown on all of the sheets, excepting No. 9, by a continuous green line. The present average high water level of Ferry Lake is 6.09 feet lower than the mean high water elevation during the raft period.

Prior to the influence of a concrete dam, now under construction across the foot of Ferry Lake, in Sec. 21, T. 20 N., R. 15 W., see Sheet No. 8, the extreme low water elevation of Ferry Lake was determined by the elevation of the natural clay barrier at the foot of Soda Lake at the head of the rapids entering Twelve Mile Bayou, this extreme low water elevation is approximately 164 feet above mean gulf level. During the period of the field work the elevation of Ferry Lake varied considerably, reaching a maximum of 174.2 feet on April 6th; the lowest levels are practically controlled by the dam, while the highest level was an extreme flood stage following protracted heavy rainfall in the water-shed tributary to the Ferry Lake basin. The lake averaged from 166 to 168 feet most of the time during the examination. The Topographic Survey.

After the section and meander lines had been definitely located, and the bench marks and contour 173.09 feet had been carried ahead, the surveying organization proceeded with a plane table survey of the border of Ferry Lake, mapping the surface slopes or elevations by contour lines spaced at an interval of five feet difference in elevation, ranging from the contour 165 feet above mean gulf level upward to cover the entire area omitted from the original surveys and yet somewhat higher to clearly indicate the elevations and slopes traversed by the surveyed meander line. The entire border of Ferry and Clear Lakes and James Bayou in T. 20 N., R. 16 W. was covered by the plane table survey, and all of the field maps have been assembled on Sheet No. 7, with conventional brown contour lines.

No attempt was made to show buildings, dwellings, pump stations, pipe lines, etc., on the topographic map, but the various oil wells were located as noted on the date of survey.

The Hydrographic Survey.

The geologists gave major importance to a study of the character of the bed of Ferry Lake, and after noting the apparent existence of submerged stream channels, it was arranged to make a complete survey of the bed of Ferry and Clear Lakes and James Bayou in T. 20 N., R. 16 W.

About sixty triangulation stations were located to control

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the entire area, about one-fourth of these stations were located on special platforms in the lake and the remainder were distributed along the border of the lake. In the progress of the hydrographic survey two stations were occupied at the same time, so selected as to control a line of soundings, with an instrument operator and recorder located at each station. Calm days were selected for this work in order to use the water surface as a level plane. The elevation of the water surface having been read, the boat crew proceeded with a line of soundings, noting the depth with a graduated rod about once in each boat length and stopping to signal for observation from the triangulation stations at the intersection with each contour line. In this way the entire area was covered by many lines of soundings, and a map produced which clearly shows the submerged channels of the old Cypress and James Bayous, the detail of which is brought out on Sheet No. 7 by blue contour lines spaced at a difference in elevation of one foot. The regular five foot contours on the bed of the lake are shown in brown.

As brought, in the geological report there is more or less soft material deposited over the bed of the lake, carried in by the water since the lake came into existence. The deposit of soft material is generally very slight except in the old stream channels. The significance of the slight deposit over the bottom of the lake has been fully discussed by Mr. Leverett and it suffices for the surveyor to report that all depths in the lake as shown 1993

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on Sheet No. 7 are based on soundings taken to the top of the soft material.

The Wooded Valley and Stream Stage.

Sheet No. 7 may be used for a map of T. 20 N., R. 16 W. during the wooded valley and stream stage of this region prior to the year 1777. To consider the map from this view-point the red and green contour lines lose their significance as water margins, and the sheet becomes a true topographic map of a stream basin tributary to the Red River, the upper water-shed of the streams, Cypress and James Bayous, comprising an area of approximately 2850 square miles. The entire area of the map, except the stream channels, was at that time covered with a heavy, virgin, hardwood forest, the remains of which are still in abundant evidence.

The relation of the Cypress Bayou drainage basin to the Red River is shown on Sheet No. 8. The position of the old meander lines of Ferry and Soda Lakes in Tps. 19 and 20 N., R. 15 W. falls along the base of the bluffs bordering the bottom lands of Red River. The old Cypress Bayou is lost under the sediment carried in from the Red River by Cottonwood Bayou, during the raft period, the sediment having been discharged in large quantities in the neighborhood where the latter bayou now joins Twelve Mile Bayou. For the reason just mentioned no attempt has been made to show the actual junction of the old Cypress Bayou with the Red River.

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The banks of Cypress and James Bayous range from 158 to 160 ft. above mean gulf level and the bottom of the soft material in the channel is some 8 or 10 ft. deeper, while the bed of Red River at the outlet of Twelve Mile Bayou is about 16 ft. still lower, ranging from 130 to 134 ft. above mean gulf level. These drainage features are fully covered in the geological report, wherein Mr. Leverett states that prior to the silting up of the region at the foot of Ferry Lake there was sufficient fall toward the Red River to give Cypress Bayou complete drainage.

The wooded valley and stream stage covered a period of many centuries prior to the year 1777 about which date the influence of the great raft in the Red River began to be felt in T. 20 N., R. 16 W.

The Raft Stage, 173.09 Ft., M. G. L.

The ponding of the waters in the basin of Cypress Bayou had reached its maximun stage prior to the year 1812, when Louisiana was admitted into the Union, and remained nearly stationary until after the year 1839, when T. 20 N., R. 16 W., was originally subdivided. The proofs of these conclusions and the discussion of the subject have been fully covered in the reports of the special experts.

Considering Sheet No. 7 during this period, the contour 173.09 feet above mean gulf level becomes a water margin representing the mean high water elevation of Ferry and Clear Lakes and

James Bayou. The red line contour marks the water's edge at the mean high water elevation during the raft period; above this line extend the uplands of that period, and below this line extend the overflowed lands or lake.

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Maximum flood stages were felt up to the 180 ft. contour, below which the former hardwood forest was soon drowned, yielding its life to the control of the water, yet defying its ravages to the present day. In time conditions became favorable for the germination of new forest species; one belt, mainly of overcup oak, began to grow in the region between the 173.09 and the 180 foot contour lines, and another belt, mainly of cypress, germinated on the lower land in the region immediately below the 173.09 foot contour. This data is clearly shown on Sheets Nos. 1 to 6, incl. The characteristics of these and other local forest species and the significance of their growth has been exhaustively covered in the report prepared by Mr. Janes.

The relation of the meander line of Ferry Lake to the mean high water elevation during the raft period is best shown on Sheet No. 7, but it is also shown on Sheets Nos. 8, 9 and 10. No attempt has been made to test the accuracy of the original meander lines of the neighboring raft-formed lakes, but all have been shown on Sheet No. 8, mapped in accordance with the most reliable data at hand.

On the northeast the meander line of Ferry Lake connects

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with the meander line of Clear Lake, which may be followed around on Sheet No. 8 to the point where the south boundary of T. 21 N., R. 15 W. was originally discontinued. On the southeast the meander line of Ferry Lake connects with the meander line of Soda Lake, which in turn connects with the original meander line of Cross Lake, Cross Bayou and Red River.

The major portion of the upland of the region on Sheet No. 8 was subdivided in the years 1837 to 1839, at which time large areas of the overflowed lands were omitted, but these lands were subsequently subdivided, in part, at the dates shown on the map.

Navigation was at its best during the raft period, when at suitable water stages boats could enter or leave the Red River through the numerous bayous leading to or away from the main stream, but so far as the waters in T. 20 N., R. 16 ". may be under consideration, it appears certain that actual navigation was confined to the submerged former stream channels, outside of which stood a heavy drowned forest impenetrable to other than small craft. This condition was especially true during the early raft period, as even now after more than one hundred years skill is required to avoid the numerous tree stumps which offer obstruction to free passage. The depth of water at any point mapped on Sheet No. 7 under condition of the mean high water elevation of the raft period is readily obtained by reference to the contour lines representing the configuration of the bed 18533

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of the lake.

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A most important authentic report of conditions on Ferry Lake during the raft period is found in the journal of the Joint Commission which, in the year 1841, marked the boundary line between the United States and the Republic of Texas. The record of the Commission relative to the crossing of Ferry Lake is quoted herewith:

"Advanced the encampment about three miles north to the shore of Ferry Lake, a short distance to the east of the Boundary. Established the 44th. & 45th, miles. The course of the Lake at this point is NE. and SW. and appears at some very distant period from the quantity of large dead cypress, standing now in water, ranging in depth from 6 to 15 and even 20 feet, to have been once a large cypress swamp, bordering at various distances back on each side, from 1 to ½ mile, a large Bayou called the Cypress which runs into the lake, or rather forms it at its North western extremity. The channel of this Bayou is still traced by its greater depth of water, throughout the whole extent of the Lake, and the entire exemption from standing timber, within its banks. The numerous arms or bays, on this Lake, formed at the mouth of its various tributaries, and the great

quantity of dead timber and stumps, render its navigation extremely difficult and dangerous. May 19th. & 20th. Encampment stationary, the operatives employed in cutting from the 45th. mile to the open lake, on the border of which was a thick undergrowth. At section line, 3025 feet north of the 45th. mound, measured to half mile section stake and found it to be 200 feet west, thereby making the boundary 2840 feet east of the line dividing 16th. and 17th. Ranges. 21st. Despatched Mr. Conway U. S. Surveyor in search of a boat to transport the party and baggage train across the Lake. The men employed in cutting through a small island, which we called Neutral Island, the 46th, miles mound falling near thecenter and terminating on a base line previously marked by Col. Kearney for triangulating across the Lake. The angle made at the intersection of the Meridian Boundary with the base line was 80° 55' 18". This mound was erected of 30 feet base and 10 feet perpendicular height. The Engineers were engaged in taking the angles for the determination of the distance

across and transferring the boundary to the

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opposite shore of the Lake. The correctness of the Line, which was ascertained by a Meridian Line established with a transit, by Col. Kearney reflects great credit upon Lt. Sitgreaves, the officer charged with the instrument used, in tracing the boundary. 22nd. Party sent with Mr. Conway in search of a boat arrived in charge of a large ferry scow and were engaged in repairing it, the remainder of the day. 23rd,24th and 25th. Employed in transportating men, baggage, provisions, wagons & c & c across the Lake, which was found to be three miles and 367 feet on the Meridian Boundary, and pitched the camp, about $\frac{1}{4}$ mile west of the line.26th. It was found impossible from the many arms, projections and swamps to continue the meridian Boundary, for some distance on the North side of the Lake, without the most appalling difficulties as shewn by the plans. Thereupon, the meridian as extended across the Lake by Col. Kearny, was taken up and continued to 2357 feet North of the 52nd. mile, when an offset was made back to the Meridian Boundary, and

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the line resumed. Mr. Rives' plantation was run through by the line, throwing the greater part on the Texas side. Whereever it was practicable, offsets were made to the Meridian Boundary, and mounds erected, and the line traced as shewn by the accompanying plans. At the first section line on the North side of the Lake, the distance to the Range line was ascertained to be, one mile and 2635 feet west of the boundary, making a difference of a mile, in the Public Surveys on the two sides of the Lake."

The progress of the great raft as it extended farther and farther from year to year in its course up the Red River, average about one mile per year, and its effect in causing the overflow which produced Ferry Lake, is brought out in the report of Mr. Leverett. The position of the head of the raft at definite dates is shown as correctly as possible on Sheet No. 8.

One factor of importance is the topography of the region immediately east of the Red River above the mouth of Willow Chute. Here the bluffs extend to the river and on the opposite or west side are found the bottom lands extending to the meander line of Clear, Ferry, Soda and Cross Lakes. On the south side of Cross Bayou the western bluffs extend to the river at Shreveport. After the raft had progressed up stream beyond the mouth of Willow Chute, the Red River drainage sought the natural slope of the bottom lands west of the river, this slope is to the southwest.

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The principal drainage from Red River at this time was carried by Cottonwood, Dooley's, Red and Black Bayous, southwesterly to the <u>old</u> natural outlet of <u>Cypress Bayou</u>, and thence the drainage returned southeasterly to the river. Slack water prevailed in the lower extremities of the aforementioned bayous and in this region was precipitated the silt carried by the waters of Red River.

The silt deposits were sufficient in places, shown on Sheet No. 8, to completely fill and obscure the old natural outlet of Cypress Bayou, causing a new Foute of drainage at a higher elevation and considerably removed towards the clay bluffs. The pre-raft drainage conditions having become disturbed, the overflow was continued above the region of the silt deposits even after the removal of the great raft from the Red River, and the restoration of navigation and natural drainage in that stream. On Sheet No. 8 are shown a profile and map of the new drainage course; the arrows and profile indicate the exact localities where the silt is sufficient to prevent the present drainage of Ferry Lake.

Mr. Leverett has discussed at length the report of the Freeman-Custis Expedition of 1806, which bears upon the position

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of the raft and the elevation of the water of Red River in that year. It was desired to confirm the report of the expedition by field observation and determine the relation of the water in the Red River to that of Ferry Lake. A copy of that part of the map of the Freeman expedition of interest is shown on Sheet No. 8.

After considering the report of the Freeman expedition we proceeded to make a reconnoissance survey of the region where the expedition returned to the Red River for the purpose of identifying the exact locality, if possible. The map of the route of the expedition is accurately drawn to scale and various stations are shown thereon where latitude observations were made in 1806, the same being verified by the printed report. By scaling the map the latitude 32°39'42"N. is obtained for the point where the expedition returned to Red River after having detoured to the east of the great raft. This latitude is found to fall in T. 19 N., R. 13 W., traversed by the Red River, where numerous bayous lead to or away from the river channel.

The surveying party proceeded to the above township, in January, 1914, and made a topographic map embracing both sides of the river in the region of the stated latitude, referring all elevations to mean gulf level for ready comparison with the Ferry Lake surveys. The party verified the latitude by meridional altitude observation of the sun. Through this line of investi-

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gation the mouth of "Willow Chute" was clearly identified as the point where the Freeman expedition succeeded in returning to the channel of Red River. The latitude of this point was found by observation to be 32°40'10"N., which compares quite closely with the latitude taken from the map of the expedition.

The 175 and 180 ft. contours, above mean gulf level, are found to parallel the banks of Willow Chute and "Old River", and a maximum elevation of 1841 ft. is found at one point a short distance east of the east bank of Willow Chute. A minimum elevation of 171.3 ft. was found in the bed of Willow Chute at its outlet, the reading having been taken on the top of the soft material which is found in this outlet.

The topographic map, Sheet No. 8, shows the river bend to the right of the mouth of Willow Chute which was ascended as the Freeman expedition entered the Red River. This bend was accurately mapped by the expedition, as were also the courses ascending Red River above this point, all of which is graphically shown on Sheet No. 8.

Thus the report of the Freeman expedition serves to show the actual raft stage at or near the 173.09 foot contour as early as the year 1806.

The report of the State Boundary Commission shows that the 46th mile post was established on "Neutral Island", in 1841. This serves to confirm the elevation of the water within close

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limits at that time. Reference is again made to a profile shown on Sheet No. 8. The section "A - B" is along the boundary line between the States of Louisiana and Texas, showing the crossing of Ferry Lake, Cypress Bayou and Neutral Island. A comparatively slight fall (4ft.) in the elevation of Ferry Lake, below the 173.09 foot level would serve to make "Neutral Island" a part of the main upland, and indeed, during the average high water of the present time this land is not an island.

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The subdivisional and meander lines of T. 20 N., R. 16 W., were surveyed during the raft period. It would be natural for the surveyors to discontinue their section lines at points somewhat above the mean high water elevation of Ferry Lake. Personal judgment would differ somewhat in this particular. In a number of instances the meander corners were established at elevations above the prominent escarpment produced by the flood stages of Ferry Lake, but the ground elevation of these corners could not have any bearing upon the mean high water elevation. I have determined the elevation of the ground surface at all of the meander corners bordering Ferry and Clear Lakes and James Bayou in T. 20 N., R. 16 W., and from the whole have selected twenty five section lines which were terminated on Ferry Lake at elevations ranging from 170.00 to 177.22 feet above mean gulf level, the average of the ground elevations at the twenty five meander corners being 174.33 feet. This shows conclusively that the surveyors recognized a reliable and nearly uniform standard for

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the mean high water elevation of Ferry Lake agreeing substantially with the proofs brought out by ecological and geological evidence.

The Present Lake Stage, 167 Ft., M. G. L.

Sheets Nos. 7 and 8 are again utilized to map the present average high water elevation of Ferry Lake, 167 feet above mean gulf level, at which stage the green contour line represents the actual water margin. The tree stumps in Ferry Lake persist by the thousands and the lake bottom has a gradual slope to the submerged stream channels. This condition is unique and would not be understood without knowing the history of the great raft in the Red River, but the lake condition continues even though the raft has been removed and one must make a survey of the outlet of Ferry Lake to find the reason for the existence of the lake today.

The bottom of Ferry Lake in T. 20 N., R. 16 W. was accurately mapped by the surveying organization, but the maps of the Engineering Corps were utilized to obtain data by which to show the lake outlet as mapped on Sheet No. 8.

The submerged channels of Cypress and James Bayous, Sheets Nos. 7 and 8, are shown with depths to the top of the soft material ranging as low as 155 feet, but owing to a greater filling of soft material the present depth at the east side of T. 20 N., R. 16 W. is but 158 ft. An even greater depth of filling is found lower down which will prevent drainage to the 158 or 155 ft.

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level until Twelve Mile Bayou has cut to that depth in the clay trench constituting its course.

The arrows mapped on Sheet No. 8 show the course of the deepest water proceeding down stream from the eastern boundary of T. 20 N., R. 16 W. In the places where the arrows are shown the depth is insufficient to drain Ferry Lake. The arrows are omitted where the greater depths indicate that the old channel has not been obscured, and which if again opened would drain Ferry Lake. The route of the present channel is shown in a deep blue, and to either side is shown in a light tint the approximate water surface during the raft period.

The arrows lead to a rapids at the head of Twelve Mile Bayou where an effective drop of twelve feet in the drainage level defines the lower limit of the present lake condition. From the foot of the rapids to the Red River there exists a continuous deep channel. The pre-raft drainage conditions have now been restored below the foot of the rapids in Twelve Mile Bayou where that portion of the Soda Lake of the raft period is again merely a part of the Red River bottom lands, dry in most seasons, but occasionally overflowed during flood stages. The profiles shown on Sheet No. 8 graphically represent the drainage conditions of the present time.

Every precaution was taken in the field to confirm the data taken from the maps of the Engineering Corps. The triangulation 426

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stations and bench marks of their 1891 and 1911 surveys were identified in the field and one system connected to the other, and many soundings and borings were taken to determine the depth and character of the material in the bottom above and below the rapids.

The region at the mouth of Cottonwood Bayou is illustrative. Here the trench constituting the head of Twelve Mile Bayou has out into the hard clay, which is similar in character to the material on its right bank and that to the southwest towards the bluffs bordering the bottom lands. To the northeast beyond the left bank of the channel the Red River silt is in plain evidence and found in abundant quantities.

The profile reveals the headward progress of the rapids and the actual cutting during the period from 1891 to 1911, the dates of the two hydrographic surveys by the Engineering Corps; the distance headward in this time was approximately four miles, and the effective cutting approximately fourteen feet.

A continuation of the headward trenching of Twelve Mile Bayou for the same length of time will, apparently, drain Ferry Lake. This conclusion overlooks the effect of the dam across the foot of Ferry Lake in Section 21, T. 20 N., R. 15 W. A grade line designed to drain Ferry Lake is shown on the longitudinal profile along the outlet. This gives a praphic suggestion of the material remaining to be removed as compared with that which has been removed by the rapids in the past twenty years.

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It appears that most of the extension surveys across the areas omitted from the early subdivisional surveys were executed after the pre-raft drainage conditions had been restored, but this is true in T. 20 N., R. 15 W., in part only. The profile and map show clearly that the foot of Ferry Lake in this township is still controlled by the same drainage conditions that obtain for the lake in T. 20 N., R. 16 W.

The "Dependent Resurvey" of T. 20 N., R. 16 W. The identification of the original surveys of the exterior, subdivisional and meander lines of T. 20 N., R. 16 W. was a special feature of the field work of the surveying organization who were called upon to show the relation of these lines to the area actually covered by the waters of Ferry Lake in the year 1812.

It is the belief of the surveyors that we have succeeded in a large measure in positively identifying the location of the original lines and corners. The local surveyors employed by the oil companies freely gave us the information at their disposal relative to the location of original corners. These known corners were connected by a careful retracement and thereafter additional thorough search was made at each and every unknown corner point which lead to the recovery of several additional corners, and in sections 4, 9, 25, 31 and 32, the striking agreement of the configuration of the lake front with the recorded meander courses lead to the development of additional points with every certainty

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of correctness.

The restoration of the lost or obliterated corners was made as nearly as possible in conformity with surveying rules, solving the various problems of restoration in accordance with the conditions presented. It is anticipated that you will consider the plat and field notes of the resurvey in the usual manner and hold the same for approval or correction in accordance with your official finding developed by such examination.

The location of the identified original corners are shown on Sheet No. 8 by unique symbols, and the relation of the reestablished lines to the area actually covered by Ferry Lake at mean high water elevation during the raft period is shown on Sheets Nos. 7, 8, 9 and 10, Sheets Nos. 7 and 9 being the most comprehensive.

With only one exception the original section lines as terminated upon the border of Ferry Lake show a proper recognition of the mean high water elevation of the raft period. I would not criticise the surveyors' judgment in the location of but one meander corner in the entire township and the meander lines along the lake front in Secs. 1, 5, 8, 11, 17, 20, 26, 28, 31, 33 and 35, are reasonably correct.

The faithfullness of the early surveyors deputized by the United States to the performance of the great trust of establishing and marking for all time the lines defining the rights of her land patentees has been well demonstrated by the positive identification and recovery of the original lines after a period far beyond the span of the average human life. The deputy surveyors were called upon to explore and map a wild and remote virgin forest and swamp, to transport themselves and equipment by primitive methods, and to subsist themselves largely by hunting and fishing as best they could.

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The progress of civilization has paid little respect to the sacredness of the early land survey monuments, and indeed the demands of timber exploitation have destroyed much of the best evidence of the original surveys. The surveyors "blazed" their lines by cutting into the bark of the forest trees along the section lines, and at the corner points green wood posts, which was the only material at hand, were marked and planted, and "witnessed" by"bearing trees". The wood posts rot after a few years and the bearing trees become of major importance; these trees were chosen in the immediate vicinity of the corner posts and after smoothing off a small surface the surveyors "scribed" the proper numbers and letters on the bearing tree to designate the corner, and then connected the tree to the post by course and distance. The blazes on the forest trees heal over in time, but leave a scar, which when uncovered on a sound tree will reveal the original Through this line of abundant evidence the original surmarks. veys in T. 20 N., R. 16 W. have been identified, but the cutting of the forest timber has been ruthless, and much of the best evidence of the original surveys has been destroyed, limiting identifi-

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cation to those trees which have so far escaped destruction.

All corners have been remonumented with iron posts having caps suitably marked and witnessed by new bearing trees, and all titles based upon the original approved township plats remain undisturbed for both position and description. No section lines have been extended beyond the limits of the original surveys, no land has been omitted which was included in the original surveys, and no land has been included which was omitted from the original approved surveys.

In 1839, A. W. Warren, D. S., discontinued the survey of the line between secs. 3 and 10 upon an arm of James Bayou, at the proper elevation for a meander corner, but nearly a mile east of the final border of the upland. In 1871, B. B. Bristol, D. S., extended the section line discontinued by Warren, but in running south between Secs. 9 and 10 Bristol terminated his survey at a point three-fourths of a mile north of the actual front of Ferry Lake.

The surveys executed by Williamson Jones, D. S., in 1837, Terrell and Warren, D. S., in 1838, The United States and Texas Boundary Commission, in 1841, George W. Morse, D. S., in 1846, Robert Boyd, D. S., in 1854, and J. P. Parsons, D. S., in 1871, were all reasonably correct.

Upland Areas Omitted from Original Surveys.

Not until consideration is given to the relation of the original meander line in Secs. 3, 4, 9, 10, 12, 13, 24, 25, 27, 32

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and 36, to the mean high water elevation of Ferry Lake during the raft period, does any question arise as to the correctness of the surveys executed by A. W. Warren, D. S., in 1839, and B. B. Bristol, D. S., in 1871. The areas erroneously omitted from the original surveys in the aforementioned sections range from quantities of minor importance to quantities of major importance. The meander line in Sec. 3 indicates an "averaging" of the water front, but in Sec. 10 the meander line does not conform to the water front nor does it appear to agree with any rule or reason or principle or topographical feature of any kind or description.

The areas of upland omitted from the surveys in Secs. 3, 4, 9, 10, 12, 13, 15, 16, 23, 24, 25, 27, 32 and 36, are in no way unlike the adjacent areas included in the original surveys. The ecologist and the geologist have each prepared a special report covering the character of the land included in the areas of unsurveyed upland.

The character of the forest growth on the unsurveyed parcels of upland is indicated, in part, on portions of Sheets Nos. 1 to 6, incl., considering all above the red line contour. The topographical character of these areas is shown on Sheet No. 7, which also gives the quantities of unsurveyed upland in each section. These parcels of upland were in place in the years 1812, 1839 and 1871, and were then as now exactly of the same character as the areas included within the approved township plats.

Submerged Areas Cmitted from Original Surveys.

All areas in T. 20 N., R. 16 W., below the contour 173.09 feet above mean gulf level, were submerged at the mean high water elevation of Ferry Lake during the raft period. This condition obtained in the year 1812, when Louisiana was admitted into the Union, and in the year 1839, when the township was originally subdivided, and thereafter continued during the period of influence of the raft. Since the end of the raft influence there has been a gradual reappearance of the lake bottom until at the present time the area submerged at the average high water elevation of Ferry Lake is bounded by the contour 167 feet above mean gulf level.

It is precaricus to estimate the date when, disregarding the influence of the dam, the entire area which was forested prior to the year 1777, would probably reappear. Such an estimate is best based upon the headward trenching of the rapids in Twelve Mile Bayou, an accurate measure of which in twenty years time has already been shown. An equal rate of effective progress would result in draining Ferry Lake in about twelve years time. Should the cutting become confined to the limits of the submerged banks of the old channel of Cypress Bayou only soft material would be encountered and the rate of cutting would then be greatly accelerated.

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On the other hand the actual cutting will continue to be greater than the effective cutting. The rapids will continue to remove much material below a grade line necessary to drain Ferry Lake, and the unit of measure applied must provide for the quantity of material which will be removed below such a grade line. If the same linear headward progress of the rapids continues as during the period from 1891 to 1911 about thirty years time will be required to drain Ferry Lake, but the chances are now much better that the old bayou channel will be encountered, and thus hasten the headward progress. The best estimate lies somewhere between twelve and thirty years, with a period of twenty five years as a fairly safe prediction.

Upon return to pre-raft drainage conditions the channels of Cypress and James Bayous will be restored to their former normal function.

The above conditions are best shown upon Sheet No. 7. In several places the reestablished meander line is shown to cross short stretches of areas below the 173.09 foot contour, this is not unusual in respect to the crossing of tributary outlets, or the crossing of sharp curves of embayments. A notable exception is found in Sec. 24 where one long meander course was found to be located almost wholly below the mean high water elevation of the raft period. Upon Sheet No. 7 are shown the quantities of the submerged areas, in each section, omitted from the original surveys

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and situated below the mean high water elevation of Ferry Lake in 1812 and 1839.

I am not attempting to submit any additional facts bearing upon the navigation over the submerged areas during the raft period. The submerged channels of Cypress and James Bayous were then of a character to permit navigation. The actual <u>depths of</u> <u>water</u> over every part of Ferry and Clear Lakes and James Bayou in T. 20 N., R. 16 W., is readily obtainable from Sheet No. 7, and the one remaining factor to modify the navigability of these waters in this township in the year 1812 was the condition of the <u>drowned forest</u>. This factor has been fully discussed in the ecological report.

Reestablished Meander Line.

The meander line of Ferry and Clear Lakes and James Bayou in T. 20 N., R. 16 W., has been reestablished in accordance with the calls of the original field notes; each angle point has been permanently monumented with an iron post, with cap suitably marked, and witnessed by bearing trees.

Preliminary to the reestablishment of the original meander line a retracement was made of the old meanders in each section based upon the courses and distances returned in the original field notes. The retracement developed the amount and character of the "closing error" (inaccuracy) of the original meander line. The errors in latitude (north or south) and departure (east or west)

were distributed along each meander course in proportion to their lengths, in accordance with surveying rules, resulting in the adjusted reestablished meander line recorded in our field notes whereby the several angle points were fixed for position. The closing errors were not large in any case, and in many were quite small.

An evident clerical error in the record of Warren's meander line in Sec. 25 was observed in the field, so patent in character that very little difficulty was experienced in detecting the error and in making an excellent adjustment. No similar adjustment could be made in any other section where the meander courses departed from the lake front.

On pages 55. to 58, incl., of Book "C" of the field notes, will be found a complete statement of the conditions presented in relation to Warren's meander line in Sec. 25 and the manner of the adjustment. Sheet No. 10 has been prepared on a large scale in order to graphically represent every condition encountered. This map shows that portion of the Mooringsport Townsite located in Sec. 25 and the topography of the land. A protracted position of the meander line is shown based upon the erroneous field notes, and the relation of the whole to the adjusted meander line as reestablished in the position in which I believe that Warren actually ran his meander line is clearly brought out.

The reestablished meander line in all the sections is shown

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on Sheets Nos. 7 and 9.

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Pidgeon's Survey.

Pursuant to office instructions dated January 13, 1911, Mr. Charles M. Pidgeon, U. S. Surveyor, executed a survey of certain parcels of land omitted from the original surveys in T. 20 N., R. 16 W. Mr. Pidgeon commenced his field work on February 13, 1911, and completed the same on March 4, 1911. His retracements and surveys were limited to sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 15, 16 and 24. A plat and field notes were duly submitted with a report, but the approval of his survey was suspended in Departmental letter dated September 3, 1913. The reexamination and surveys in T. 20 N., R. 16 W., provided for in my instructions dated September 27, 1913, were directed in the same Departmental letter.

It develops that Mr. Pidgeon was successful in the identification of his starting point, which was the 1 section corner between sections 13 and 18 on the east boundary of the township. Here Mr. Pidgeon found an original bearing tree marked by A. W. Warren, D. S., in 1839. Thereafter Mr. Pidgeon was less successful and in fact he failed elsewhere to identify a single original His reestablishments were found to be out of position corner. and it became my duty to destroy his corners, as stated in my field notes.

At the 2 section corner between sections 10 and 11 both of Warren's original bearing trees were standing. The top of the tree in section 11 had been blown down, but the marks on the stump

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were plain. These I cut off and the block is herewith submitted as an exhibit, the purpose of which is to show that the differences in the findings of Mr. Pidgeon and myself are of fact rather than opinion. Except in this one instance I avoided in any way mutilating the evidence on the ground by which the early surveys were elsewhere identified, and even here the stump may again be readily identified by relation to the other bearing tree.

Extension Surveys.

It is clear in Departmental letter dated September 3, 1913, that I was not required to establish any lines beyond the limits of the surveys shown on the original approved township plats.

The requirements of my instructions have been carried out as faithfully as possible, and the various reports, maps, photographs, etc., are submitted with the belief that the facts in this case have been fully developed and comprehensively presented to the end that the proper legal principles may be applied and a decision reached as to what is the limit of the public lands. Such additional surveys as may be required may be executed hereafter by an extension of the section lines of the original surveys which are now identified and permanently recovered.

Very respectfully,

arthur 20. Fidder Supervisor of Surveys.

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SUMMARY REPORT Frank Leverett

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Summary Statement concerning the Geological and Drainage features of Ferry Lake and

Vicinity.

By

Frank Leverett, Geologist, U. S. Geological Survey. With an appended account of the Freeman-Custis Expedition of 1806. Summary Statement concerning the Geological and Drainage features of Ferry Lake and 5

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Vicinity.

by Frank Leverett, Geologist, U. S. Geological Survey.

The area tributary to Ferry Lake embraces about 2,850 square miles, with an average reinfall of approximately fortyfive inches. It is largely embraced in hillside slopes in which there is a high percentage of run-off and the surface formations are largely of clayey or slowly pervious material. Judging from the neighboring drainage basin of Sulphur River, which contains no lake, but whose bottom lands are inundated after heavy rains, there is likely to have been frequent inundation of the district now occupied by Ferry Lake before a raft formed on Red River, as well as during and since the raft occupancy of that river channel. It would, however, have been of the nature of a transitory inundation and not continuous ponding such as occurred after the raft formed on Red River. Now that the raft has disappeared, the lake is maintained by a barrier of sediment which was built across its eastern end by floods discharging down Red River. It will persist until this barrier has been cut through by the headward recession of the channel of Twelvemile Bayou. It would then be drained as in the pre-raft stage if there were no dam constructed to prevent its drainage.

The best defined shore markings are those formed at the highest level reached by the lake, th ough washed by the lake for much less than half the year. Between this highest level and the lowest level of the lake, the shore markings are being worked over by the rising and falling stages of the water, and rendered vague and indefinite. There is, however, a slight change in the angle of the slope along parts of the shore, at about 173 feet, which seems to mark the mean high water stage, but it seldom presents a definite scarp or definite bar. The highest shore markings are at about 180 feet along the base of a scarp found at exposed situations around the borders of the lake. At the ends of these scarps there are also low sandy bars extending out into the recesses and doubling back into them to some extent, to follow the contours of the shore. These contain part of the material which has been removed to form the scarps, but the finer part of the material has been carried out and lodged in the midst of the lake.

The channeling produced by tributaries, and the deltas formed at the mouths of tributaries, are in accord with the low water level of the lake or but slightly above it. They extend down about to the 165 foot contour. The low water stage of the lake was controlled by the level of the outlet. The bed of Soda Lake is now about 163 feet, and has hot been materially lowered in the forty years since the removal of the raft. Its eastern side appears to have been materially encroached upon by deposits

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brought in by bayous from Red River during the raft stage. This encroachment apparently extended beyond the old bayou which carried the waters of the Cypress Drainage basin into Red River, for soundings have failed to revel the presence of the old bayou channel within, area now embraced in Soda Lake. As a result of the deposition of this material, on the eastern side of Soda Lake area, the lowest part of the old lake bed would be filled up; so that near the close of the raft stage the low water level of the lake may have been somewhat higher than prior to this deposition. It was only in periods of extreme drouth, however, during the raft stage, that Soda Lake was brought down to a level of 163 feet. The deltas and the channeling of tributaries on the borders of Ferry Lake seem to indicate that the low water level was not far from 165 feet. The lake thus had a range of 15 to 17 feet between the high flood stages and the stages of lowest water. This is nearly three times as much variation as is commonly found along the shores of the Great Lakes.

In connection with the present investigation Mr. Arthur D. Kidder, of the General Land Office, has made a contour map of the bed of the portion of Ferry Lake falling in T. 20 N., R. 16 W., which is the area in litigation. This map shows definite stream channels traversing each of the arms of the lake to their junction, and then continuing as a single line towards the outlet, or eastern end of the lake. The map also shows the course of

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some of the small tributaries for some distance out from the shore. The channels, however, of these tributaries, are often completely filled with the sediment of Ferry Lake and the main channels are also partly filled. Near the easterm end of the township and limits of Mr. Kidder's survey, the filling becomes almost complete and continues so eastward to the vicinity of the dam. The filling at this end of the lake is due to sediment brought in from the flood waters of Red River during the raft stage, for reports by the Army Engineers indicate that upon emerging from Stumpy Bayou at the south end of Clear Lake, the flood waters moved into the eastern end of Ferry Lake, as well as down the Red River Valley, and deposited the red silt carried by the waters of Red River. In the vicinity of the railroad bridge by Mooringsport, the bayou is filled for a short distance in such manner as to indicate that the material came from the building of the embankment, which extends nearly across Ferry Lake. Mr. Kidder's map does not show this embankment, but shows the obliteration of the old bayou near the line of the embankment.

Soundings across the channel of the old bayou in Ferry Lake in which the present writer participated, brough out clearly a feature not so distinctly shown on the map, that is very significant as to the agent of erosion. It was found that in the bends of the channel the outer curves have much steeper banks than the inner curves, there being on the inner curves

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a gradual slope into the channel such as commonly characterizes meandering streams. Deposition or lodgment of material takes place where the current is slow around the inner curves, while erosion of the channel takes place along the course of the swiftly moving currents around the outer curves.

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The map brings to light an abandoned oxbow channel, as well as the meandering stream course which was in operation at the time ponding set in. Features of this sort are of much significance in proving that the stream is not a short lived one. The neighboring part of Red River valley has been covered by maps of different dates, beginning as far back as 1806, and by comparison of these maps the amount of shifting of the stream and development of oxbows and cut-off channels which has taken place in about a hundred years may be ascertained. Sections of these maps are presented in connection with the discussion of the Freeman expedition of 1806, and they serve to show that the development of meanders and cut-offs in the course of a century has not been so great but that one can easily recognize on the ground, the courses of a hundred years back. Yet the material on Red River is a loose-textured fine sandy loam, which erodes very rapidly. It is strikingly in contrast with the compact clay in which the bayou channels submerged beneath Ferry Lake have been cut. The amount of meandering and drainage change shown in the development and cutting off of this oxbow

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curve in Ferry Lake, seems likely therefore, to involve a period of several centuries. It falls in well with other lines of evidence, both geological and ecological, in showing that the stream and forest stage existed for many centuries in this area now covered by Ferry Lake.

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That this stream and forest stage persisted to within a comparatively recent date, is commonly recognized from the fact that remnants of the forests still persist all over the lake bed, (See photos by Mr. Janes) a feature which is very convincing to all classes of persons. The evidence on the geological side is equally convincing, but may not be so easily appreciated. The geological evidence consists of the slight amount of deposition of sedimant in the bed and in the bayous of the lake. Over a large part of the lake bed the sediment is found to be only a few inches, seldom six, inches in depth. In the main bayou channels the filling has been insufficient to more than half fill the channels. Soundings indicate that the bed of the channel in the eastern end of the lake is 148-150 feet above mean gulf level, and that it is covered ordinarily by about five feet of soft sediment deposited since the ponding of waters began. In the tributary channels the soft sediment is found to be usually but two to three feet. These fine sediments were derived largely from the cutting of the exposed points on the shores as the material brought in from the drainage basin above the lake would be deposited mainly at the head of the lake.

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A small amount of sediment was brought in by the flood waters from Red River, but as noted above, this was chiefly deposited in the part below Mooringsport, and was sufficient to completely obliterate the channel in the eastern end of the lake.

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Another line of geological evidence indicative of the relatively short period involved in this ponded condition, is found in the fragmentary development of shore line features. It is only in exposed situations where points project out into the valley, and waters have considerable depth near the shore, that scarps or cut banks are conspicuous. Along much of the shore it is difficult to find any topographic evidence as to the limits of the lake. In these exposed situations the dirt has been removed from among the roots of forest trees, around which or against which the waves have been breaking. Measurements as to the amount of material removed, have been made in a large number of places by Mr. L. L. Janes, the ecologist on this investigation, from whose report the data may be secured.

In certain places the work of this modern lake falls along the base of bluffs which were in existence prior to the ponding of the waters and which rise somewhat abruptly nearly to the level of the bordering uplands. Such bluffs are especially noticeable in the vicinity of Mooringsport, and are easily distinguished from the low scarps formed by the modern lake. Their development dates from a period estimated to be some thousands of years in the past, hence they have no bearing on the questions at issue. They antedate the period of stream and forest occupancy of the Ferry Lake area.

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Data as to the time when the influence of the great raft on Red River began to be felt in the Ferry Lake district are contained in two documents, quotations from which on this matter are given in collateral reports herewith submitted. The Freeman-Custis Expedition of 1806 passed around the great raft and returned to Red River at the mouth of Willow Chute in Lat.32°40' which is about the latitude of the outlet of Ferry Lake (32°43'). Their report notes the existence of a large lake west of their point of return to Red River which can be no other than Soda Lake with its affluent Ferry Lake. The height of the banks of Red River above water at their point of return is stated to be 10 to 12 feet. They also noted in the neighboring swamps marks of a stage of water ten feet higher than at the time of their exploration. In order to determine with some precision the water levels of that time and compare them with Ferry Lake, a careful survey was made under the direction of Mr. Kidder and the present writer, and a topographic map prepared of the region near the point of return to Red River. The data is mean gulf level or the same as that used in the maps of the Ferry Lake district. By reference to the topographic map it will be been that the banks are now 184 to 185 feet above the gulf level. It has been estimated, however, by the U. S. Army Engineers that during the occupancy of a given section of Red River by the raft its banks and natural leves would be raised 3 to 5 feet, the banks may therefor have been only 180 to 182 feet at the time of the 1806 expe-

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dition in which case the water level being 10 to 12 feet below the banks was about 170 feet at the time of their return and the extreme high water mark of that region 180 feet, is the same as the highest shore markings of the Ferry Lake. This stream is reported to have been "rising with a gentle current", it seems unlikely therefore to have been above the mean high water stage and may have been a little below it, the month of June being near the close of the wet season.

The water is reported to have had a depth of 34 feet, deduct ing this from 170 foot water surface gives 136 feet as the level of the river bed. This is about 12 feet lower than the bed of Cypress Bayou at the east end of Ferry Lake and serves to show that prior to the silting up of this part of Red River valley through raft influence there was sufficient fall toward the Red River to give Cypress Bayou complete drainage.

The position of the head of the raft in 1806 was not determined by the Freeman - Custis expedition but is determinable within a very close range by data furnished in a letter written by Dr. Joseph Paxton, in 1828, in response to an inquiry of the Hon. A. H. Sevier, delegate to congress from Arkansas, for data concerning the great raft (Sem. Doc. 78, 20th Congress, 2nd Session, 1829, 18 pages). This letter is discussed more fully in one of the collateral statements submitted herewith. It states that twelve years previous, in 1816, the head of the raft was just below and in sight of Bee Bayou, it seems to be the Benoists Bayou of the Land Office Plats, which leaves the river about 10 miles

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down the stream from Willow Chute. The growth of the raft is stated to have been about one mile per year in that interval and also in the interval of 35 years from 1793 to 1828 its position in 1793 having been noted by Mr. Wallace who was living in that vicinity. From this statement we infer that in 1812, when Louisana was admitted to statehood, the head of the raft was about four miles below Benoists Bayou which was several miles by course of stream above the point where Twelvemile Bayou or Soda Bayou, which is likely to have been the outlet of the Ferry Lake district, enters Red River. The raft according to Dr. Paxton's letter would have passed the mouth of Twelvemile Bayou prior to 1806, the date of the Freeman - Custis expedition, it would have passed the mouth of Cross Bayou just above Shreveport as early as 1800. It was probably close to Shreveport in 1793. The ponding of waters in Cross and Twelvemile Bayou is likely to have begun as far back as the time when Bayou Pierre, which leaves the river on the lower side just below Shreveport, was closed by the raft. On the basis of Dr. Paxton's letter it may therefore he stated that the obstruction of Cypress Bayou drainage and the beginning of Ferry Lake, was in the latter part of the 18th century. By 1812 it is likely because of the extension of the raft below the mouth of Twelvemile Bayou to have reached nearly its full height.

The only later change which is liable to have caused the increased height of flooding in Ferry Lake is the deflection of the Red River drainage from farther up the valley to the bayous and lakes to the west bluff of the river and east of Ferry Lake.

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This took place when the head of the Benoists Bayou and Willow Chute became obstructed by the raft. From D. Paxton's letter it appears that the Benoists Bayou was blocked about 1816 and that Willow Chute was blocked prior to 1828. The rise shown produced on Ferry Lake, is likely, however, to have been a few inches at most, its amount may be determinable from ecologic data but can scarcely be determined from geologic evidence.

As indicated in the collateral report on improvements in Red River navigation, there were no accumulations of raft in the portion of Red River below the mouth of Twelvemile Eaycu after its removal by Shreve. The reopening of the outlet may, therefore be said to date from that time. At high stages of the water, however, there was a lake-like condition between Soda Lake and Cross Lake, and through Cross Bayou to Red River, but in the lower stages the lakesdisappeared and all of the flow was through Twelvemile Bayou. The head of this bayou was gradually extended back into the bed of Soda Lake, by a receding rapids. The position of the head of the bayou has been carefully fixed in maps by the Army Engineers at different dates, so that by a comparison of these maps the rate of headward recession can easily be ascertained. Mr. Kidder has in this way made a comparison of the recession in the twenty years between 1891 and 1911, the results of which are given in the accompaning map and profile section. It appears from this comparison that the recession

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will require but about twenty-five years longer to reach the passes that connect Ferry Lake with Soda Lake. Had no dam been built at the east endof Ferry Lake, it would have been but a few years longer until the recession of this channel would have extended far enough westward to have connected with the bayou channel in Ferry Lake, and thus have ended this ponded condition of the waters of Cypress Bayou.

Attention was directed to the topographic and geologic rethe lations of the meander line of the Warren survey to_A limits reached by the waters of Ferry Lake. There are certain areas of upland shown by Mr. Kidder's map which are outside the limits of Warren's meander line and yet which show no evidence whatever of having been covered by the waters of the lake. They are not due in any case to accretion or shifting of material subsequent to Warren's survey but are in geologic character similar to the adjacent uplands within the limits of the Warren survey and should have been included within his survey. There are also large areas lying between the extreme high water and the mean high water levels of the lake which should have been included in his survey, since they were submerged only a small portion of the year and are similar geologically to lands bordering on and included within the major portion of Warren's meander line.

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B. - The Freeman and Custia mpedition up Red River in 1805. 5

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The results of this expedition have been discussed in a valuable document of 65 pages, describing the surface features and conditions for navigation along Red River in 1806, or six years before the admission of Sculsians to Statchood. The document bears no date, and was written in the third person, but declares on its title page that it is "An account of the Red River in Louisiana, drawn up from the returns of Messra. Freeman and Custis to the Ear Office of the United States, who explored the same in the year 1806". An examination in the Adjutant General's office at Tashington, P.C. on June 10, 1914, failed to bring to light the original manuscript or journals; but references to their receipt at the ar Department and to insidents of the expedition were found. They consist of letters and inclosures from William 'unbar, Ratchez, Missiesi pi, 25 follows:

"March 18, 1806. Advising of the arrival of Thomas Freeman, and relating to the proposed expedition up Red.

"June 24, 1806. Transmitting communications from the party exploring Hed Hiver."

"August 12, 1806. Relativ: to the exploring party up Red River. Inclosing extracts of letters from Lieut. Humphrey and Dr. Sibley."

"Sept. 5, 1806. Relative to the exploring party. Inclosing Mr. Freeman's and Mr. Custis' communications." "Hov. 11, 1806. Inclosing the continuance of Mr. Thos. Freeman's journal."

There is on file in the office of the Chief of Engineers, U. S. Army, a map showing the line of traverse of this expedition,

protracted by Micholas King from the courses and distances given in Mr. Thomas Freeman's journal of the survey of Red River in Louisiana from Matchitoches to the Coashatay village made in dated 1806, June, 1806. A smaller scale map, also on file in the office of the Chief of Engineers, U. S. Army, was reduced by Nicholas Zing from the protracted courses of this exploring party, and gives its entire course from the Spanish Camp, where it was not by the Spanish troops, down the valley to where Red River enters the Mississippi. Mr. Zidder has examined these maps and carefully tested the latitude entries on them, and found them remarkably accurate. The portion of the map opposite Ferry Lake and above the point where the expedition returned to Red River above the raft, is strikingly similar to the course of the same section of the river shown in the Land Office plats made thirty to thirty-five years later, Gertain parts of the river taken from these two cources are here introduced side by side, for purposes of comparison

Inasmuch as this description of the country traversed by the Freeman - Custis expedition bears evidence of scientific accuracy, and shows a condition practically contemporary with the admission of Louisiana to Statehood, and also throws light upon the relations of the river and the great raft to conditions at that time in Ferry Lake, a complete copy of the document from the starting point up to the return of the expedition to that river above the great raft, is here presented.

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Of The

RED RIVER,

In

LOUISIANA,

Drawn Up

From The Returns

OF MESSES. FREELIAN & CUSTIS,

To The

WAR OFFICE

Of The

UNITED STATES, WHO EXPLORED THE SAME,

In The Year 1806."

U. S. Geological Survey Library.

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Of

THE RED RIVER, ETC.

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THE party employed to explore the Red River, at leaving Fort Adams, consisted of Mr. Thomas Freeman, Surveyor, who was furnished with the requisite instruments, for determining geographical positions, by astronomical observations; Dr. Peter Custis, whose attention was directed to botany, and natural history; Captain Sparks, and Lieutenant Humphreys, two non-commissioned officers, seventeen privato soldiers, and a black servant.

They left Fort Adams, on the Mississippi, on the afternoon of the 19th of April, in two flat bottomed barges and a periogue, taking with them such stores and other articles, as it was probable they might want, in the course of the expedition, calculating, however, on the receiving of a supply at Natchitoches, for the presecution of the survey, beyond that port.

The only mode of travelling, which the nature of the country admits of, while it furnishes the means of making the survey of the river sufficiently accurate for geographical purposes, precludes attention to topography, and the general face of the country, which is important, and furnishes the widest field for observation.

In ascending a navigable river, whose banks are generally elevated considerably above the surface of the water, the remarks of the surveyor will be confined to the width, depth, and course it pursues; and its rise during periods of inundation; the quality of the water, the vegetation on the banks in the immediate vicinity of the river; as woll as the animals and fish, which art or accident may bring within his reach; together with the mineralogical and geological facts, which the abrasion of the water furnish, confine the naturalist and chemist within very narrow bounds.

On entering the Red River it was the wish of the party to have ascertained the longitude and latitude of its mouth, hy celestial observation; but the spot where they camped, and the unfavorable weather, prevented this circumstance from taking place: other observers had determined it to be in 31 deg. 1 min. 15 sec. N. L. and 91 deg. 47 min. 45 sec. west from Greenwich.

On the 3rd of May, they had ascended Red River, as far as the mouth of Black river, a distance of 26 miles: Red river is nearly half a mile wide at its mouth, which width it preserves for about a mile, when it contracts to about one fourth of a mile; whence to Black river, the width varies from 350 to 300 yards: the depth of the river at its confluence with the

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Mississippi is 84 feet; and where it receives the water of Black river, 42 feet. A mile from the mouth of the river, its banks were 14 feet above the surface of the water, at the time the party passed up: in ascending the river, these were observed to rise, and when they had reached the mouth of Black river, they were found to be 25 feet above the surface of the water. The face of the land is nearly level to the distance of a mile from the banks of the river, where the ground becomes swampy. At a small distance from land, olevating the surface nearly as high as the water rises in the periodical floods, which the marks left on the trees denote to be from 25 to 28 feet higher than at this time: the soil on each have been formed by the deposition of the soil, and earthy particles brought by the water in the periodical inundations, to which this

The water of Red River is of a reddish brown, or chocolate color, caused by the particles of an argillaceous marle suspended therein, and of which the banks in many places above the Black River, appear to be almost wholly composed. For two or three miles, this river is beautifully bordered with willow trees, which extend back from its margin nearly half a mile to the second rise in the land or bank, about six feet higher than that which borders the river. The trees on this second bank or plane are var-ous. the most abundant; this is a species of Juglans, which bears the The Pecan is much admired Illinois nut. In its habits the Pecan is so very different from the Juglans Alba, as not to be mistaken for it, by the most careless observer, yet the only difference which can be pointed cut is in the leaf: both have pinnate leaves; the Alba has an odd leaflet sessile, the Pecan the odd leaflet potiolate. Juglans petiolata would be an appropriate name for this species. The cotton tree, which of late has excited so much attention, is found here: although considered a populus, and by some termed the lombardy poplar, there is no other resemblance than the leaf. The other trees are oaks, (Quercus rubra, alba and phellos,) Per-simmon (Diosphyros Virginiana,) Hagberry (Prunus padus) Sycamore, or the American plane tree (Plantanus Occidentalis) and Cratogus After passing three miles up the river, no trees but the Willow and Pecan are seen from it, until approaching the Black river, where the Cyprus (Cupressus disticha) is noticed. can is covored with Misleto. The Pe-

The bank of Black river on the right side is high, the soil very rich and light, and occasionally flooded; and besides all the trees above enumerated, except the sycamore and Cotton trees, which disappear shortly after entering the river, it produces the Red Gum (Liquid amber styraciflua) of a very large size, and the Red wood (Lyder axylon mite.) Almost immediately after passing Black river, which enters at right angles, and is here the most beautiful of the two, the width of the Red river is contracted to about 120.

At the Avoyell's sentlement, about 35 miles higher than Black river, the Plantanus Occidentalis, and Cotton trees begin to make their spearance, with the Cornus Corices and Cypress: the Pecan and Fersimmon are most abundant, the first of which usually grows to the height of 100 fest. Nino miles above the settlement is a beautiful bluff, nearly a mile in length, and fifty feet in height, formed of a reddish yollow sindy slay: here is first seen the Querous Migra or Black Oak, the Myrica Carifora, or Candle berry bush, and Maple (Lear Ponnsylvanicum.) Six miles above this bluff, a stratum of large trees and leaves, thirty feet below the surface f of the ground, and covered by 10 or 12 foet of hard marle or clay, Sylvestrie, Dogwood (Cornus Florida,)Sassafras Laurus Sassafras,) Chestnut Oak (Quercus Esculus,) Holly (LIox aquifolium,) Hickory (Juglans abla,) Spics wood (Laurus Benzoin,) and Buckeye (Esculus parviflora of Walter,) make their appearance at this place; the Benzoin boing the only undergrowth to be found for a considerableextent. A shrub is found in great abundance every where along the river, growing to the height of from 10 to 20 fast, bearing a drupe resembling the Olive, but not so large, which, when ripe, is of a reddish purple color. The season of its flowering being passed, the species could not be ascertained, but Dr. Custis supposes it to be the Elceagus of Linnoe us. The putamon is of a woody fibrous texture, easily separated by the fingers; the Peduncles are ram-eous, and sub-apposite, each bearing from 10 to 15 frupes, the leaves eliptic. The Great Rapids, or the falls. are in lat. 31 deg: 20 min. 19 sec. N. and longitude - deg. - min. - sec. West from Greenwich. The rapids, or falls, are occasioned by a stratum of indurated clay, which crosses the river, in two places, about three fourths of a mile apart. The river is here about 300 yards. At the lower fall the current is very rapid, for about 100 yards, in 50 of which there is a fall of 10 feet, when the river is low: at the time the exploring party passed it, the fall was five feet, four feet of which was a perpendicular pitch. The second fall is in every respect similar to the first; with a very swift water for 100 rods above the fall. Although the clay which forms

yards, which breadth it preserves, with little variation, for about 72 miles, to the rapids. Its dopth at this season varies from 18 to 20 feet; and it flows generally at the rate of from two to and sometimes on both, are bold and steep; the land level, very rich and subject to be overflowed during the annual inundation. The upper stratum of all the land here is the red argillaceous in places, to a depth of 5 or 6 feet below the surface. The banks season, and the land generally declines from the water at this fourth of a mile to Cypress swamps. The few bluffs, or spots of which approach the river, are cultivated.

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the obstruction at the rapids, when exposed to the sun and air acquires an hardness approaching to that of stone, yet under the wa water it is easily cut, and a safe and easy channel might be opened through the falls, at a very moderate expense. Twenty men, in little more than as many days, with mattocks only, would be sufficient to effect this object, and render the navigation safe and easy at all seasons.

The banks of the river here are high; the land very rich, somewhat broken and well adapted to the growth of cotton, and not subject to be overflowed. Most of the Red river lands are either of a clayey or marley soil, apparently not desirable for cultivation; the fact however is otherwise: they are found to be more productive than the best Mississippi lands, and the cotton raised on them always commands a higher price than that of the Mississippi. At the foot of the falls and on the left bank of the river, is Rapide Court House; and its vicinity is a considerable settlement. Here the Chequapin (Fagus pumila) grows to a very large size; some of them 30 feet high, and seven in diameter. The Myrica Cerifera is very abundant.

Above the falls, the width of the river varies from 120 to 200 yards. The banks generally 30 feet above the water at this season, and the depth of water 18 feet. Steep as the river banks are, cloathed with vegetation, chiefly grass and small willows.

Twenty-three miles higher up the river than the falls, on a bluff about 50 feet higher than the surface of the water, is an Indian village, called the Appalaches, on the right side of the river as you ascend. These Indians appear to be rapidly advancing towards civilization; they pessess horses, cattle and hogs; dress better than Indians generally do, and seem to derive a considerable portion of their support from the cultivation of the earth. They migrated from the Appalaches river, on the frontiers of Georgia, when the white settlers approached their towns.

A few miles above this village, on the left hand, there is a sand stone rock, which project into the river - its cohesion is too slight to render it fit for building with. Two miles higher, a tribe of Pasquegoula Indians reside on both banks of the river; they are a peaceable, friendly, and industrious people; here the Tooth Ache tree (Zabthoxylum Clava Hercules) is first met with, and a little higher the Frickly Ash (Zonthoxylon fraxifolium.)

vides Almost, immediately, above, these Indian, villages, Ead Eiver dithe whole width of the river, retains the name of Red Fiver, but is impassable, on account of the rafts of timber which are lodged in it. It separates from the other branch of the river, called Old river or Cane river, four or five miles above Natchitoches, forming an Island of nearly sixty miles in length, and not more than five miles wide. The inhabitants generally name it La Riviere de petits bon Dieux, from the circumstance of a priest, who in ascend-

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ing the river was upset at this place, and lost his images. banks of these rivers are high and bold, presenting settlements The occasionally on both sides. On this part of the river there is an abundance of sand stone, fit for all the purposes of building and masonry. Twenty-four miles above the hunction of the Petits Bon Dieux with the old river, or as it is sometimes called, Crane river (from the Arundo donax with which its banks abound) another branch falls in from the left hand or south side, which left the principal stream immediately below Natchitoches; it forms an island 32 miles long, and 4 miles wide. The branch which here falls in on the left hand, takes, or rather continues the name of Crane river, and is the largest of the two, being 100 yards wide; but in consequence of the rafts and impediments which it contains, the other is used in navigation. It is the middle branch of three, and generally known by the name of Little river. The banks of the river are here 25 feet above the present surface of the water. their junction there is a depth of 36 feet; a small distance above this, Little river is 70 yards wide and 24 feet deep, and continues thence, from 40 to 50 yards wide, and 18 feet deep up to Natchi-toches. The banks of Little river are in many places low, not more than eight feet high, but the water does not flow over them; the current in the river is very rapid. The timber is like what has been before described, with the addition of the Ash and Elm (Fraxinus, and Ulmus Americana,) which are most abundant. The Pecan: continues in plenty, one of which near the mouth of Little river was measured, and found to be 19 feet in circumference, at the height of five feet from the ground. From the confluence of Little River with Crane river, to Natchitoches, the land on both banks is generally cultivated, particularly the left bank, which presents a series of small plantations, each having one field in front, and extending back, from 80 to 100 perches to the Cypress Swamps. The inhabitants live in small cottages on the hanks and near the river.

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On the left hand or south bank of the river, 32 miles above the junction of Little and Cane rivers, stands the town and fort of Natchitoches. It is on a handsome plain 16 feet higher than the present surface of the water; distanct 184 miles and 266 perches from the Mississippi, by the meanders of Red river, as measured in boats, by time, and the rate of ascending. Its latitude is 31 deg. 45 min. 45 sec. North, and longitude - deg. - min. - sec. West of the meridian of Greenwich.

The party left Natchitoches on the second of June, having made all the necessary arrangements for the prosecutuion of their voyage.

From the town of Natchitoches to where the Northern Branch, or La Riviere de petits bon Dieux runs out, the Red River varies in

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width from 150 to 200 yards, and is from 30 to 40 feet feet deep; the banks were about 15 feet higher than the water. occur on both sides of the river. About nine and half miles Plantations from Natchitoches, the Bayou runs out from the south side of the river, which enters it again at the bluff above the town. this Bayou, and where a bluff seventy feet inheight approaches from the south, there is a ferry across Red River. The river above this bluff is contracted to 70 yards in width; passing through first rate land, elevated from 15 to 20 feet, above the surface of the water at the time the exploring party passed up. White Gum, Cotton Wood, very large Pecan, Ash, Hickory, Mulberry, and Locust. About three miles from the ferry, a large Bayou (150 yards wide) runs in from the South West, and forms the principal communication with the bayous, branches, lakes and ponds, which lie on the south side of Red river, and pass the settlement of Bayou The depth of the water in the river here, varies from 25 to 30 feet. The annual in undations rise nearly to the top of the bank, and in some places pass nearly a foot over it. below the first raft, there is a bluff on the north bank of the Five miles river, 30 feet high. Above this bluff, high cane appears on the south bank, and frequently on both sides of the river. raft is not more than 40 yards through. It consists of the trunks of large trees, lying in all directions, and damming up the river for its whole width, from the bottom, to about three feet higher than the surface of the water. The wood lie so compact, that aushes, weeds and grass cover the surface of the raft. camped on the evening of the seventh at the highest white settle-The party enment; which is a small plantation on the north side of the river, 45 miles above Natchitoches. Two miles below the settlement, and on the same side, there is a bluff, 40 feet high, and 100 yards in The Cotton Wood tree grows to a great size in this neighborhood; one standing in a cornfield, was found to be five feet in diameter and 141 and an half feet high.

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Next morning they came to the second raft, which crosses the river here 100 feet in width, and extends for 200 yards along its course. This raft rises nearly three feet above the water, and is covered with bushes and weeds: the trees of which it is composed are Cotton Wood, Cypress, Red Cedar, etc. and they lie so close that the men could walk over it in any direction. With great exertions they opened a passage for the boats, through this raft on one side, by floating the large trees down the river.

Here they were overtaken by Talapoon, a guide and interpreter, hired at Natchitoches, to gozas far as the Panis nation; he had a interpreter, mule and a package of goods, for the purchase of horses at the Panis nation, to prosecute the expedition upon, when the river ceased to be navigable.

Intelligence which he brought of the marching of the Spanish troops from Macogdoches, determined the party to halt at a small Indian village, a few miles higher up the river, and there wait for the arrival of the U. States agent, who was expected. Dr. S.

ibley .

and the gentleman from Nacogdoches, who had witnessed the marching of the Spanish troops, reached the party about noon: after having communicated this information, which was the occasion of their visit, they parted again about 2 o'clock P. M. the exploring party up the river, and Dr. Sibley on his return to Natchitoches.

The river here seldom exceeds 70 yards in width, is 32 feet deep, and in time of flood rises from 15 to 20 feet above the present surface, flowing over the banks, which are only from 4 to 12 feet above it. The timber continues the same as below, with Cane on one, or both banks all the way. The rough rust of the Mississippi is also frequently met with. The trees are so covered with vines and creeping plants, as to present an impermeable mass of vegetation, while the low banks of the river are edged with willows.

In this flat country bayous are not with communicating with the river, almost as frequently conducting the waters out of, as bringing an accession to the principal stream.

On the evening of the ninth they arrived at the third raft, like the two former, composed of the trunks of trees, brought down by the floods, and lodged on sand bars; forming an almost impenetrable mass, which extends from the bottom of the river, totwo or three fest above the surface of the water, a thickness of 30 or 40 feet. This raft extends up the river nearly 300 yards. Many of these logs were of Red Cedar, from 1 to 3 feet in diameter, and 60 feet in length. With much difficulty a passage was effected through this; as the vacancy, occasioned by the removal of any part of the logs, was soon filled by others. The labor incident to the forma-tion of a passage, through these small rafts, is so great, that the navigation of this part of the river is never attempted: for it would require to be repeated every time a passage was attempted.

The country is intersected with swamps, lakes, and bayous, communicating with and running into each other, for perhaps 6 or 8 miles on each side of the river. The current of the river is very gentle, seldom exceeding the rate of three fourths of a mile in the hour.

On the morning of the 11th they reached a place, where a branch of the river; or bayou ran rapidly in from the north. Being informed by.M. Touline (a French gentleman born in the Caddo nation, and who now accompanied the party of that nation, to render his good offices) that it was absolutely impracticable to pass the great raft in boats of any kind; as neither red nor white men had attempted it for 50 years before, and, that this was the only communica-tion, through which the passage could be effected; they here left the river, and entered the bayou. This bayou is by the Indians called Datche, (which in their language, signifies a gap eaten by a bear in a log, from the circumstance of the first Indian who pass-ed this way, seeing a bear gnawing a log in this place.) The cur-rent in the bayou is very rapid, it being the discharge for the water which runs out above the great raft; indeed appearances seem to promise, that this will in time be the principal channel of the

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river, as no hops can be entertained of the great raft ever being removed.

After passing up this baycu, about five miles against a current, running at the rapid rate of three miles an hour, they entered a lake called by the Indians Big Broth, from the vast quantity of froth which collects in, and floats along it, during the time of high water. A few miles above the entrance into the lake, they stopped in a beautiful cove, where M. Touline has numerous herds, kept by herdsmen. There they waited a day or two, for a rise in the water, which they observed was taking place, that they might the more easily make their way through the bayous and swamps above.

Almost immediately on entering the lake, there is a beautiful high bluff on the east side; along which side there is a series of elevated ridges, with a wavy surface. On the margin of the lake there is a growth of Willows and low bushy Cypress, for about 80 yards, beyond which the land is of good quality, rises to the height of forty feet, and is cloathed with white and Black Oak, Hickory, and Dogwood. The left or west side of the lake is low, and covered with large Cypress trees and bushes for about two miles. This beautiful lake is said to extend seventy miles, in a northerly direction, and is about two miles wide, agreeably variegated. The water was from tootto six feet deep, when the party were on it, but vastiges of the flood were ten feet higher. H. Touline procured them an Indian as a guide through the intricacies of the lakes and bayous, by which the water forces its passages, from where it leaves the Red River above the great raft.

From the west side of the Big Broth Lake, they passed through a very rapid bayou of 100 yards wide, and one mile long, with large timber on its banks, into Swan Lake, whichaut its entrance is 500 yards wide. This is a very handsome lake, about one mile wide, to the eastern shore of which the upland approaches as you ascend. At the upper end of this lake, they had to enter and pursue their course through several small and very rapid bayous, in which it was. necessary to make use of the trees and bushes growing on their margins, to aid the progress of the boats. When boats descend through these short, crocked and rapid passages, they are obliged to stay their motion by means of ropes. The bed of the river at the great raft, was supposed to be seven miles from hence, in a southerly direction. Their course now lay through bayous of various widths, in which the water was from 4 to 12 feet deep; and at this time 10 feet lower than in the season of the great inundation.

Pursuing their course through a boyou, on the evening of the 16th they arrived at a point where it touched the high land. Here they stopped for the purpose of making astronomical observations, particularly of the Solar Eclipse, which took place during the morning after. The observations then taken determined their posis. tion to be in Lat. 32 deg. 26 min. 53 sec. N. and Long. - deg. min. - sec. W. from the Meridian of Greenwich.

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The passage up the bayou had been dangerous, from the frequency of dead trees, ready to fall on receiving the least shock. The high land, which occasionally approached the bayou on the eastern side, was elevated 40 or 50 feet above the surface of the water; it had a wavy surface, of good soil, covered with Black Oak and Hickory. They stopped on the evening of the 17th, at a point of high land, which approaches the bayou, where it leaves the lake. This high land they called Point Return, from the circumstance of their having been obliged to come to it again, after their first unsuccessful attempt to discover a passage, out of the lake of which it forms the eastern margin. This lake is full of dead trees, very rotten and standing close together. passage from it, they sent the Indian guide forward by land, to the Coashutta village, not more than 20 miles, for a better pilot, and awaited his arrival at Point Return. The Indian came again on the 21st, and said he had seen the chief at the village, who had given him some directions, and would be with them himself on the day fol-They did not wait but pushed on, through bushes in a kind of bayou within the lake, and at last got through the lake, and entered a bayou, by which they entered a handsome prairie; the surface of the land was four feet higher than the water in the bayou; the soil rich; the grass high and luxuriant. There was a border near the bayou of trees, thinly scattered, consisting of oaks, some of which were very large.

On leaving this prairie, the passed through a bayou, varying in width from 50 to 100 yards, with rotten Cypress and Ash trees standing in it so thick, as to very much impede the progress of the boats; whilst the falling trees rendered it dangerous to run against any of them. The underwood, which grew in this water course, was so large and thick as to pre vent the view from extending much beyond the length of the boats in advance.

On the morning of the 24th, they entered a beautiful lake, near a mile in longth, and about 500 yards wide, margined by beautiful willows, over the tops of which appear lofty trees in every The ease with which the boats glided over the smooth surface of the water, was a pleasing contrast to the laborious passages they had previously made through the bayous. Out of this lake they passed into a Cypress swamp, over which the water was from 3.to.5 feet in depth; the trees were large and stood very This was followed by a swamp covered with Willow bushes growing very close, and through which it was almost impossible to The certainty of being within a very small distance of the river, gave a vigor to their exertions which ' carried them through the swamps by evening, when they reached the entrance of a small bayou. Here they had the first certainty . of effecting their passage to the river above the great raft, without having to abandon their boats, or else be obliged to haul them over the land. After removing such impediments as existed in this bayou, consisting of small rafts of trees, they by a passage of about half a mile through it, reached the river above the raft, to

A circuitous passage of upwards of 98 miles had been thus forced through lakes, bayous, and almost impenetrable swamps, in fourteen days; contrary to the expectation of all those persons who had hitherto any knowledge of the impediments to be encountered and overcome. For it is to be observed, that the idea of effecting this passage with such boats as the party had, was quite laughed at in Natchitoches.

On entering the river, they found a beautiful stream of 230 yards wide, 34 feet deep, and running with a gentle current; its banks are from 10 to 12 feet, bordered by lofty trees, of the Cotton Wood, Oak and Red Cedar. On the right of the river, ascending, at at the distance of from 50 to 100 yards, the land rises to the height of 50 feet above the banks, and is covered with Oaks, Hickory, Ash, and some Pine. On the left it is level and very rich; a large prairie extending for several miles below the places where the party ontered the river, and as far above. Beyond this prairio there is a large lake, on the west of which, and nearly 30 miles from Red River, lie the principal village of the Caddos. cending the river to the Coashutta village, which is upwards of 19 When asmiles from where they entered it, they met a cance with two men in it approaching them: one of them proved to be Talapoon, the interpreter and guide, who had been sent round from Natchitoches, with a message to the Caddoo chief, requesting him to meet the party at the Coashutta village; the other was an Indian, whom the chief had sent to deliver a message from him to M. Touline. was to inform him, that about 300 Spanish dragoons, with 4 or 500 horses and mules were encamped a few miles back of the Caddo village. He did not know from the officers, what their intentions were; but believed it was to meet the American party on the river. officer, who commanded the Spanish troops, had given the chief his hand, and asked if he loved the Americans. His answer was evasive --"he "loved all men; if the Spaniards came to fight "they must not spill blood on his land, as it "was the command of his forefathers, that "white blood should not be spilled on their "land". The officer left him without giving any answer, and did not return ...

After delivering this message, the Indian said the Caddo chief requested N. Touline to go to him immediately on their arrival at the Coashutta village, as he wished very much to see him: but if M. Touline could not go to the Caddo village, the chief would meet him at the Coashutta's, and expected the Spanish officer would wish to accompany him.

The man was dispatched immediately, with a request that the Caddo chief should met M. Touline along, at the Coashutta village.

They visited the chief of the Coashutta village, who resides a few miles below it, and has a large corn field. He appears comfortably fixed. About sun-set on the 26th of June, they arrived at the village. It stands on the north side, on a handsome bluff, about 30 feet high, composed of sand stone rock, and washed by the river. This little village has been built within two or three years,

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and consists of 6 or 8 families of stragglers from the lower Creek nation, near the Mobile.

Was the obstruction of the river occasioned by the great raft, removed, and the navigation made safe and easy; this country would become as desirable as any portion of the earth. The soil is a rich clayey loam, which, judging from a field the Coashutta's have in corn, will yield from 50 to 60 bushels per acre. Cotton might be cultivated here to very great advantage."

MAIN REPORT Frank Leverett

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Lake District.

Ceologist, U. S. Geological Survey.

Explanatory Statement.

The accompanying report embraces a brief summary of the leading results of the investigations made in February to April, 1914, in the vicinity of Ferry Lake, in Caddo Parish, Louisiana. designated, Summary statement concerning the Geological and Drainage Features of Ferry Lake and Vicinity. With this are included several collateral reports based in part upon field investigations and in part upon library work, which it is thought will have value for reference, and which contain the material on which the summary statement is based.

The report is also illustrated and made much more intelligible by certain maps which have been prepared by Mr. Arthur D. Midder, Supervisor of Surveys, of the General Land Office. Summary Statement concerning the Geological and Drainage features of Ferry (Caddo) Lake

and Vicinity.

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Frank Leverett, Geologist, U. S. Geological Survey.

The lake which forms the subject of this investigation is on some maps called Caddo, but is generally known as Ferry Lake. It is situated partly in northwestern Louisiana, but extends into the edge of Texas nearly to the village of Jefferson. It receives the drainage of Sypress Bayou, which has a watershed of about 2,850 square mills, largely of well drained hillside slopes. The rainfall is high, being about 45 inches, and the percentage of run-off is high, because of the favorable conditions for drainage and the clayey condition of the surface formations which absorb a very small part of the rainfall. Judging from the neighboring drainage basin of Sulphur River, which contains no lake, but whose bottom lands are inundated after heavy rains, there is likely to have been frequent inundation of the district now occupied by Ferry Lake before a raft formed on Red River, as well as during and since the raft occupancy of that river channel. It would, however, have been of the nature of a transitory inundation and not continuous ponding such as occurred after the raft formed on Red River. Now that the raft has disappeared, the lake is maintained by a barrier of sediment which was built across its eastern end by floods discharging down Red River. It will persist until this barrier has been cut through by the headward recession of the channel of Twelvemile Bayou. It would then be drained as in the pre-raft stage if there were no dam constructed to prevent its drainage.

The best defined shore markings are those formed at the highest level reached by the lake, though washed by the lake for much less than half the year. Between this highest level and the lowest level of the lake, the shore markings are being worked over by the rising and falling stages of the water, and rendered vague and indefinite. There is, however, a slight change in the angle of the slope along parts of the shore, at about 773 feet, which seems to mark the mean high water stage, but it seldom presents a definite scarp or definite bar. The highest shore markings are at about 180 feet along the base of a scarp found at exposed situations around the borders of the lake. At the ends of these scarps there are also low sandy bars extending out into the recesses and doubling back into them to some extent, to icllow the contours of the shore. These contain part of the material which has been removed to form the scarps, but the finer part of the material has been carried out and lodged in the midst of the lake.

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The channeling produced by tributaries, and the deltas formed at the mouths of tributaries, are in accord with the low water level of the lake or but slightly above it. They extend down about to the 165 foot contour. The low water stage of the lake was controlled by the level of the outlet. The bed of Soda Lake is now about 163 feet, and has not been materially lowered in the forty years since the removal of the raft. Its eastern side appears to have been materially encroached upon by deposits

brought in by bayous from Red River during the raft stage. This encroachment apparently extended beyond the old bayou which carried the waters of the Cypress drainage basin into Red River, for soundings have failed to reveal the presence of the old beyou channel within the area now embraced in Soda Lake. As a result of the deposition of this material, on the eastern side of Soda Lake area, the lowest part of the old lake bed would be filled up; so that near the close of the raft stage the low water level of the lake may have been somewhat higher than prior to this deposition. It was only in periods of extreme drouth, however, during the raft stage, that Sode Lake was brought down to a level of 163 feet. The deltas and the channeling of tributarics on the borders of Ferry Lake seem to indicate that the low water level was not far from 165 feet. The lake thus had a range of 15 to 17 feet between the high flood stages and the stages of lowest water. This is nearly three times as much variation as is commonly found along the shores of the Great Lakes.

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In connection with the present investigation Hr. Arthur D. Kidder, of the General Land Office, has made a contour map of the bed of the portion of Ferry Lake falling in T. 20 H., R. 16 W., which is the area in litigation. This map shows definite stream channels traversing each of the arms of the lake to their junction, and then continuing as a single line toward the outlet, or eastern end of the lake. The map also shows the course of

some of the small tributaries for some distance out from the shore. The channels, however, of these tributaries, are often completely filled with the sediments of Ferry Lake and the main channels are also partly filled. Near the eastern end of the township, and limits of Mr. Kidder's survey, the filling becomes almost complete and continues so eastward to the vicinity of the dam. The filling at this end of the lake is due to sediment brought in from the flood waters of Red River during the laft stage, for reports by the Army Engineers indicate that upon emerging from Stumpy Bayou at the south end of Clear Lake, the flocd waters moved into the eastern end of Ferry Lake, as well as down the Red River Valley, and deposited the red silt carried by the waters of Red River. In the vicinity of the railroad bridge by Mooringsport, the bayou is filled for a short distance in such manner as to indicate that the material came from the building of the embaniment, which extends nearly across Ferry Lake. Mr. Zidder's map does not show this embankment, but shows the obliteration of the old bayou near the line of the embankment.

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Soundings across the channel of the old bayou in Ferry Lake in which the present writer participated, brought out clearly a feature not so distinctly shown on the map, that is very significant as to the agent of erosion. It was found that in the bends of the channel the outer curves have much steeper banks than the inner curves, there being on the inner curves

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a gradual slope into the channel such as commonly characterizes meandering streams. Deposition or lodgment of material takes place where the current is slow around the inner curves, while along moving currents around the outer curves.

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The map brings to light an abandoned oxbow channel, as well as the meandering stream course which was in operation at the time ponding set in. Features of this sort are of much significance in proving that the stream is not a short lived one. The neighboring part of Red River valley has been covered by maps of different dates, beginning as far back as 1806, and by comparison of these maps the amount of shifting of the stream and development of oxbows and cut-off channels which has taken place in about a hundred years may be ascertained. Sections of these maps are presented in connection with the discussion of the Freeman expedition of 1806, and they serve to show that the development of meanders and cut-offs in the course of a century has not been so great but that one can easily recognize on the ground, the courses of a hundred years back. Net the material on Hed River is a loose-textured fine sandy loam, which erodes very rapidly. It is strikingly in contrast with the compact clay in which the buyou channels submerged beneath Ferry Lake have been cut. The amount of meandering and drainage change shown in the development and cutting off of this oxbow

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curve in Ferry Lake, seems likely therefore, to involve a period of several conturies. It fills in well with other lines of evidence, both geological and ecological, in showing that the stream-and-forest stages existed for many centuries in this area now covered by Ferry Lake.

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That this stream-and-forest stage persisted to within a comparatively recent date, is commonly recognized from the fact that rownants of the forest still persist all over the lake bed, (see photos by Er. Janes) a feature which is very convincing to all classes of persons. The evidence on the geological side is equally convincing, but may not be so easily recognized and appreciated. The geological evidence consists of the slight amount of deposition of sediment on the bod and in the bayous of the lake. Over a large part of the lake bed the sediment is found to be only a few inches, seldom sim inches, in depth. In the main bayou channels the filling has been insufficient to more than half fill the channels. Soundings indicate that the bed of the channel in the eastern end of the lake is 148-150 feet above mean sulf level, and that it is covered ordinarily by about five feet of soft sediment deposited since the ponding of waters began. In the tributary channels the solt sediment is found to be usually but two to three feet. These fine sediments were derived largely from the cutting of the exposed points on the shores as the material brought in from the drainage basin above the lake would be deposited mainly at the head of the lake. A

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small amount of sedi: ent was brought in by the flood waters from Red Hiver, but as noted above, this wirk's chiefly deposited in the part below Mooringsport, and was sufficient to completely obliterate the channel in the eastern end of the lake.

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Another line of geological evidence indicative of the relatively short period involved in this ponded condition, is found in the fragmentary development of shore line features. It is only in exposed situations where points project out into the valley, and waters have considerable depth near the shore, that scarps or cut banks are conspicuous. Along much of the shore it is difficult to find any topographic evidence as to the limits of the lake. In these exposed situations the dirt has been removed from among the roots of forest trees, around which or against which the waves have been breaking. measurements as to the amount of material removed, have been made in a large number of laces by Mr. L. L. Janes, the coologist on this investigation, from whose report the data may be secured.

In certain places the work of this modern lake falls along the base of bluffs which were in existence prior to the ponding of the waters and which rise somewhat abruptly, to the level of the bordering uplands. Such bluffs are especially noticeable in the vicinity of Mooringsport, and are easily disti: guished from the low scarps formed by the modern lake. Their development dates from a period estimated to be some thousands of years in the past, hence they have no bearing on the questions at issue. They ancedate the period of stream and forest occupancy of the Ferry Lake area.

Data as to the time when the influ nce of the great raft on Red River began to be felt in the Ferry Lake district are contained in two documents, quotations from which on this matter are given in collateral reports herewith submitted. The Freeman - through bayous on the east side of the river Custis Expedition of 1806 passed around the great raft and returned to Red River at the .head of Willow Chute in Lat. 32°40' which is about the latitude of the outlet of Ferry Lake (32°43'). Their report notes the existence of a large lake west of their point of return to Red River which can be no other than Soda Lake with its affluent Ferry Lake. The height of the banks of Red River above water level at their point of return is stated to be 10 to 12 feet. They also noted in the neighboring swamps marks of a stage . cf water ten feet higher than at the time of their ex-· ploration. In order to determine with some precision the water levels of that time and compare them with Ferry Lake, a careful survey was made urder the direction of Mr. Kidder and the present writer, and a topographic map prepared of the region near the point of return to Red River. The data is mean gulf level or the same as that used in the maps of the Ferry Lake district. By reference to the topographic map it will be seen that the banks are now lot to 185 feet above the gulf level.. It has been estimated, however, by the U.S. Army Engineers that during the occupancy of a given section of Red River by the raft its banks and natural levers would be raised 3 to 5 feet; the banks may therefor have been only 180 to 182 feet at the time of the 1806 expe-

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dition jin which case the water level being 10 to 12 feet below the banks was about 170 feet at the time of their return and the extreme high water mark of that region 180 feet, if the same as the highest shore markings of Ferry Lake. This stream is reported to have been " runing with a gentle current"; it seems unlikely therefore to have been above the mean high water stage and may have been a little below it, the month of June being near the close of the wet season.

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The mater is reported to have had a depth of 34 feet. Meducting this from 170-foot water surface gives 136 feet as the level of the river bed. This is about 12 feet lower than the bed of Cypress Eayou at the east end of Ferry Lake and serves to show that prior to the silting up of this part of Red River valley through raft influence there was sufficient fall toward the Red River to give Cypress Bayou complete drainage.

The position of the head of the raft in 1806 was not determined by the Freeman - Custis expedition but is determinable within a very close range by data furnished in a letter written by Dr. Joseph Paxton, in 1828, in response to an inquiry of the Hon. A. H. Sevier, delegate to congress from Arkansas, for data concerning the great raft (Sen. Doc. 78, 20th Congress, 2nd Session, 1829, 15 pages). This letter is discussed more fully in one of the collateral statements submitted herewith. It states that twelve years previous, in 1816, the head of the raft was just below and in sight of Eee Bayou. This seems to be the Benoists Bayou of the Land Office Flats, which leaves the river about ten miles

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down the stream from Willow Chute. The growth of the raft is stated to have been about one mile per year in that interval and also in the interval of 35 years from 1793 to 1628, its position in 1793 having been noted by Mr. Wallace, who was living in that vicinity.

From these statements we conclude that in 1312, when Louisiana was admitted to statehood, the head of the raft was about four miles below lenoists Bayou, that is about 14 miles by course of stream above the point where Twelvemile Bayou or Soda Bayou, the outlet of the Ferry Lake district, enters Red River. The raft, according to Dr. Paxton's letter, would have passed the mouth of Twelvemile Bayou about 1800 and the mouth of Cross Bayou just above Shreveport, six years earlier. This takes back to the time of Mr. Wallace's observations in 1793. The ponding of waters in Cross and Twelvemile Bayou would have begun as far back as the time When Bayou Pierre, which leaves the river on the west side just below Shreveport, was closed by the raft. On the basis of Dr. Paxton's letter it may therefore be stated that the obstruction of Cypress Eayou drainage and the beginning of Ferry Lake, must have begun by 1790. By 1812 it is likely, because of the extension of the raft beyond the mouth of Twelvemile Bayou, to have reached hearly its full height.

The only later change which is liable to have caused increased height of flooding in Ferry Lake is the deflection of the Red River drainage from farther up the valley to the bayous and lakes along the west bluff of the river and east end of Ferry Lake.

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This took place when the head of the Benoists Bayou and Willow Chute became obstructed by the raft. From Dx Paxton's letter it appears that the Benoists Bayou was blocked about 1816 and that Willow Chute was blocked prior to 1828. The rise shown produced on Ferry Lake, is likely, however, to have been a few inches at most; its amount may be determinable from ecologic data but can scarcely be determined from geologic evidence.

As indicated in the collateral report on improvements in Red River navigation, there were no accumulations of raft in the portion of Red Eiver below the mouth of Twelvemile Bayou after its removal by Shreve. The reopening of the outlet may, therefore, be said to date from that time. At high stages of the water, however, there was a lake-like condition between Soda Lake and Cross Lake, and through Cross Bayou to Red River, but in the lower stages the lakes disappeared and all of the flow was through Twelvemile Bayou. The head of this bayou was gradually extended back into the bed of Soda Lake, by a receding rapids. The position of the head of the bayou has been carefully fixed in maps by the Army Engineers at different dates, so that by a comparison of these maps the rate of headward recession can easily be ascertained. Mr. Kidder has in this way made a comparison of the recession in the twenty years between 1891 and 1911, the results of which are given in the accompaning map and profile section. It appears from this comparison that the recession **will** require but about twenty-five years longer to reach the passes that connect Forry Lake with Soda Lake. Had no dam been built at the east end of Ferry Lake, nor the international a few years international the recession of this channel would have extended for enough westward to increase connected with the bayou channel in Ferry Lake, and thus there ended this ponded condition of the waters of Cypress Bayou.

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Attention was directed to the topographic and geologic relations of the meander line of the Warren survey to the limits reached by the waters of Ferry Lake. There are certain areas of upland shown by Mr. Kidder's map which are cutside the limits of Warren's meander line and yet which show no evidence whatever of having been covered by the waters of the lake. They are not due in any case to accretion or shifting of material subsequent to Warren's survey but are in geologic character similar to the adjacent uplands within the limits of the Warren survey and should have been included within his survey. There are also large areas lying between the extreme high water and the mean high water levels of the lake which should have been included in his survey, since they were submerged only a small portion of the year and are similar geologically to lands bordering on and included within the major portion of Warren's meander line.

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Drainage Conditions of Cypress Bayou and

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Ferry Lake.

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The area of the drainage basin of Cypress Bayou was determined from measurements made on Robert T. Hill's topographic map of Texas, and the soil map of the U.S. Bureau of Soils in Caddo Parish, Louisiana, and is found to embrace an area of about 2,650 square miles, which discharges through Ferry Lake to Red River across the bed of Soda Lake and thence down Twelvemile Layou. The portion occupied by Ferry Lake has a bed with very slight fall, which in the periods of high rainfall was likely to have become more than bank full and to have inundated the adjacent bottom lands prior to the development of the raft on Red River, but after the development of the rait, this transitory periodic inundation gave place to a permanent ponding because of the high water conditions prevailing along Red River in the vicinity of the raft, and also because of sediment deposited by Red River floods, which built a barrier at the eastern end of the lake and thus produced a basin over the rim of which the water now discharges across the bed of Soda Lake to Twelvemile Bayou.

This drainage system is subject to very wide range in the amount of run-off. In dry seasons, as determined by recent observations, reported in Document 236, 63rd Congress, 1st session.

15. dmg- 17 fo the low water flow at the head of Ferry Lake may be reduced to only five cubic feet per second. The evaporation from the surface of Ferry Lake in the dry seasons may equal the rate of inflow from Cypress Dayou, there being approximately fifty square miles of water surface exposed. The following statement in House Document 680, 61st Congress, 2nd session, page 3, sets forth the conditions of outflow from Ferry Lake in seasons of great drought:

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"The drought so general in Texas this year so affected Cypress Bayou as to give an exceedingly low water level, the stage being lower than it has been for many years. The stage has been so low that in several places shoals have extended clear across Soda Lake near its head, cutting off the flow, but water has reached the channel farther cown, presumably from seepage through the shoals and the adjacent marshes, which in higher water are part of the upper portion of Soda Lake."

At high water stages there is a rise of fully ten feet in Ferry Lake independent of the backwater influence from Red river. During the progress of this investigation in April, 1914, the lake level rose to 174.2 feet, or to a height of nearly ten feet above the crest of the dam which is under construction below Mooringsport. The current at that time was estimated to be at least two miles per hour, and the width or the stream at the east end of ferry Lake about one-half mile. If therefore, the water had a depth of nine feet at the dam, the discharge was in the neighborhood of 50,000 cubic feet per second, or 10,000 times the low water charge. In the absonce of current meter measurements, no more definite data are available.

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The Shore Features of Ferry Lake.

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At the highest stages reached by the lake, which are about 180 feet above mean gulf level, there were formed during the raft period, definite scarps or cut banks at exposed situations, where points project out into the lake, or where the lake had considerable depth of water close to the shore. These banks are known to be the product of a lake and not of a stream, from the fact that they encroach upon the projecting points and produce asloping terrace in the part of the shore from which material is removed, that is easily distinguished by those familiar with lake shores, as the product of wave action and not of zarrent action. Ead a stream been flowing plong the edge of Ferry Lake at the level at which these banks occur, it would have swung around the projecting points and produced considerable deposition in passing them, instead or mains directly across them. The tendency of the stream work would be to increase the sinuosities of the borders of the valley, whereas the offect of the lake is to render the shore line less sinuous.

At the Ends of the cut bank there are often extensions of low sundy bars which double back into the recesses and follow the contours of the shore, and which contain a considerable part of the material which has been removed in forming the cut banks.

This highest set of shore markings was occupied by the lake only at times of extreme high water, which embraced byt a small portion of each year. In years of moderate rainfall, the lake

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may not have risen to it, yet its markings are the most definite found along the border of the lake. The mean high water level, which marks a much more prolonged stage of occupancy by the lake, and is about 173 feet, is less definite than the extreme high water mark because its shore markings are worked over by the rising and falling stages of the water. ...s a rule it is marked only by a slight change in the angle of the slope, there being a more rapid descent toward the lake clow it than there is in the part of the beach immediately back of it. The water held this level for so large a part of the year that it had a very pronounced effect upon the forest which was growing along the shore, as is indicated by the report of the ecologist, and is very evident to the layman as well.

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During the low water level of the lake the tributaries of rerry Lake extended down past the shores marking the mean high water, and deposited more or less delta material at a level nearly in accord with the lowest level of the lake. The altitude of the lake at its lowest stage was controlled by the level of the bed of sode Lake, which is about 163 feet, and which has not been materially lowered in the forty years since the removal of the raft. It may have been raised slightly during the raft stage by deposition of material along the eastern side of the Soda Lake. basin, which was brought in by bayous from Red River. This encroachment apparently extended beyond the old bayou which carried the waters of the Cypress drainage basin into Ked River, and which probably occupied the lowest ground in that district.

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Development and Destruction of the Lakes of Red River Valley.

The manner in which rafts have ponded water along Red River and in the lower courses of its tributaries, has been ably discussed by A. C. 7eatch, in Professional Paper 46, U. S. Geological Jurvey, pages 60-62. Maps based upon Land Office plats accompany his discussion, which show conditions in the district opposite Ferry Lake when the land surveys were made in 1838-39, at which time Soda Lake received large accessions of Red River water from along and above the raft. Along Side of the map showing the conditions of the raft stage, appears one made as a result of his own surveys, which shows the shrunken Soda Lake of the post-raft period, when but little drainage outside that irom cypress Eayou leads into Soda Lake.

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A similar change is shown to have affected Bodcau Lake, on the east side of Red River Valley, directly opposite Soda Lake. A still more significant set of maps, based in part on Land Office plats, and in parts on his own surveys in 1902, set forth conditions before the raft had reached its fullest influence, and during the time of fullest influence and then after the raft influence had disappeared. From these maps it may be seen that Poston Lake was developed by raft influence, and then completely drained by raft removal, in the period between the land office surveys of 1832-8 and Teatch's survey in 1902.

It is also clearly shown by Veatch that the explanation

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which originated with William Darby in 1816, and had been incorporated in certain modern standard text books, that these lakes are the result of excessive silt deposition in the normal régime of hed River, is erroneous. He notes (1) that the lakes along Red Eiver Valley did not extend above the limit of raft influence, though the valley above is quite as mature, and should under the conditions assumed, be subject to a similar amount or degree of sedimentation; (2) that the uppermost of the lakes are known to have been formed by the raft; (3) that since the removal of the raft, all the lakes have materially decreased, and in some cases are completely drained; (4) that Red River itself, when the raft was removed, began a rapid lowering of its bea, which is still in progress. He assumes, and the assumption seems fully warranted, that had there been no raft on Red River, there would have been no such lake as Ferry Lake and its companion lakes in this part of Red River Valley.

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Veatch also calls attention to the fallacy of another explanation suggested by Sir Charles Lyell, and recently restated by Prof. D. M. Shepard, that these lakes along Red River Valley are occupying sunk lands affected by earthquake action. The distribution and topographic relations of all of the lakes along Red River Calley fit in with earlier formed drainage features, and are not connected with any sinking or displacement of the areas so fur as has yet been observed. He makes the significant remark that it would be a most singular earthquake or series of

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earthquakes which would produce lakes having this peculiar regularity in reference to drainage features, and without any accompanying evidence of faulting. The sunk land explanation evidently was advanced as a mere assumption unsupported by any positive evidence that earthquakes had affected this region.

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In the case of Ferry Lake, the bed of the bayou is found to have an altitude that fits in naturally with that of the bed of Hed River. Had there been no sediment deposited where Soda Lake now stands as the result of the floods during the raft stage, Cypress Bayou would have had a fall of from 12 to 20 feet in its course across the Red River bottoms, to the main channel of the river.

There are in the reports of the U. 3. Army Engineers, and of the early expeditions, numerous descriptions setting forth the manner in which the headward growth of the raft would block certain beyous that had been carrying the overflow from Red kiver, and cause the waters to rise to the level of the beyous farther up stream, and thus flood land which would otherwise have remained dry. In similar manner it is shown that below the raft, as its foot receded or as it was artificially removed, the main channel of the river became occupied by a more effective drainage line, which caused its deepening, and drew into it the waters of the bordering lakes and swamps.

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Time Required to Drain Ferry Lake.

The best means for determining the time required for Twelvemile Dayou to work back to Ferry Lake is furnished by making a comparison of the recession which has occurred between successive surveys along Twelvemile Bayou. Such surveys were made in 1891 and 1911. From these Mr. Kidder has prepared a map in profile section. There remain about 11,000 feet between the head of the rapids and Little Willow Pass, at the upper end of Soda Lake. Should the headward recession continue at the present rate, the pass will be reached in about 25 years. But inasmuch as the amount of fall will decrease as the rapids recede, the time is liable to be somewhat longer than was required for a section of the same length in the district below the present head of the rapids. Were no dam present at the east end of Ferry Lake, only a few years would be required for the development of a channel from the head of the passes far enough westward to make connection with the bayou warm channel in Ferry Lake, and thus end the ponded condition of the waters of Cypress Bayou.

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Oritical Points Affecting Mavigation.

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Until the latter part of the eighteenth century the head of the raft appears to have been in the part of the valloy below Shreveport, where the river is flowing for a long distance in the midst of its valley, and has chains of bayous and lakes on each side of the main channel. But when in the latter part of the eighteenth century the head of the raft approached the site of Shreveport, the main channel was flowing against, bluff on the west side of the valley. Water could then scape from the portion of the valley above the raft, only through the bayous on the east side of the river. It was for this reason that the early expeditions up Red River made use of the lakes and bayous on the east side oi the main channel, for the bluff at Shreveport would prevent their getting by the raft on the west side.

It appears from a letter written by Dr. Paxton in 1828, that by that year the raft had advanced up the valley to Hurricane Bluffs, where the main channel strikes the east bluff of the river. This blockade seems to have stopped navigation along the east side c. the river, and led to the opening of a channel by Col. Sewell, near Shreveport, which would afford a passage by the rait on the west side of the valley, into the bayous above Shreveport. The removal of the raft by Shreve, had reached shreveport in 1835 and thus cleared out a passage for boats

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so that they passed from the main channel into the system of bayous and lakes on the west side of the valley, and returned to Red River through Red Bayou, a little north of the latitude of Ferry Lake.

About 1859 the head of the raft had closed the head of Red Bayou, so that from that time down to 1873, when the raft was finally removed, navigation was maintained with great difficulty in the district north from the head of Red Bayou. The Rate of Growth of the Raft, and Causes for Variation.

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An examination of the reports of the U.S. Army Engineers serves to show that the head of the raft was not at all uniform . in its rate of advance. In fact there were times when it was forced some little distance down the valley beyond positions which had previously held. There were other times when it extended headwards as much as five miles in a single year. It thus appears that the statements and estimates concerning the growth of the raft, need qualification and some understanding of the particular conditions. It was found that when the raft had reached Lurricane Bluffs the flooding of the bayous above that point was sufficient to divert a considerable amount of the aft material into them, so that for the period between 1828 to 1837 the raft made a headward advance of only three miles. The diversion of raft material into the bayous, however, could be hept up for only a short time, as they became speedily clogged and thus ceased to divert the material.

The manner in which the freshets caue on would determine to a large degree, the amount of rait material and what is perhaps of more importance, the force of the currents which were transporting it. . ith exceptionally strong currents, the material would not be lodged at points where lodgment might take place under a weak current. The supply of trees seems also to have varied greatly from time to time, and thus have greatly affected the rate of growth.

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Rate of Disappearance of the Raft.

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Statements have been made by some of the writers on the Red River ruft, that its foot ix recoding at about the same rute that the head was advancing. Such statements should, of course; be interpreted only in a most general way, for there is no particular relation between the rate of headward growth and the rate of breaking up of the raft, each being dependent upon its cwn set of conditions. The question as to how long a raft cun withstand decay and maintain its position at a given point, falls naturally to the ecologist, and is discussed by Er. Janes.

Removal of the Raft.

Surveys looking to the removal of the raft appear to have been begun in 1828, when Lieut. A. H. Bowman visited the region. The operation of removing the raft was begun by Henry M. Shreve in 1833, and completed in 1838. Shreve's operations in 1833-35 were entirely below Shreveport, in a district so remote from the Ferry Lake area as to have had only slight influence upon its drainage conditions.

On March 19, 1835, operations were begun on the first raft above doates Sluff, near the present site of Shraveport. By the 13th of April the raft had been removed as far up as the mouth of Soda Bayou, now known as Twelvemile Dayou, 15 miles above the

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canal opened by Sewell. Shreve makes the following remarks concerning the magivation at that date; (Senate Document 24th Congress, 1st session, Vol. 1, pp. 172-3, 1835):

"Through this bayou the boats pass that transport goods, produce, etc., to and from the country above the raft. It is only navigable for keel boats at the highest stage of water. The distance from its junction with the river through Sode Lake and Black Eayou into the river above the raft, is estimated at 48 miles. About two-thirds of the water of Red River flows down through those bayous and lakes, being forced out of the river at the head of the raft by the back water formed by the masses of timber crowded into the channel. The remaining portion of water that passes down the old bed of the river, through the rait from its head, twelve miles down to the Willot chute, a bayou through which at least one half of the water that runs down to it escapes from the old bed if the river, and does not return to it again until it passes the raft, and falls in at the mouth of Loggy bayou. Seven miles lower down Williams's and Benware's bayou run out of the river and carry off all of the water from the old bed of the river, leaving twelve miles from Benware's (Benoit's) Bayou to the mouth of Soda Bayou without current. There is not a sufficient circulation to maintain the color of the water in the river, which was as clear as lake water. In this distance of 12 miles, the raft was found to be much heavier than any part of that removed below, since the timber had been drifted into this part of the river, and forced its waters through the passes on either side of the river, as above described. A deposit of mud had accumulated to such extent as to cover a large portion of the timber, on which the willow and cottonwood had sprung up and taken root on the logs of which the raft was composed. Many trees were found growing in that manner, as large as eighteen inches in diameter. To remove this description of raft required much more labor than any before met with. The greatest delay, however, was for want of current in the river to float the raft off after it had been loosened from its bed. To remedy that great evil, I was compelled to throw works across the mouths of Benware's and Williams's Bayous and the Willow chute. Those passes were so far stopped as to create a current through the river below them sufficient to move the timber down after it was loosened from the raft."

The removal of the raft in 1835 extended to within three miles *Focult*] of Bonware's Bayou, at which time there remained 23 miles of raft unremoved. In the following year 21 miles were removed, at which time the raft had so increased that there were nine miles remaining.

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This had increased to about 15 miles in 1837, in which year 122 miles were removed, leaving only 440 yards at the close of work, May 25, 1837. The raft was completely removed by May 1 of 1838, but was again blocked in July of that year, by a raft 2,300 yards long. This raft was removed in February, 1839. In July 1840 the raft again collected four miles below the original head, and was opened by citizens of Arkanses, but again became closed within a few weeks. It seems, however, to have been again removed by 1842 (see Senate Document 1, 27th Congress, 3rd session, p. 284). The raft reformed in the summer of 1842, and reached a length of four miles by October, 1843 (Senate Document 1, 28th Congress, 2nd session, p. 279-282.). The expense of maintaining the channel had by that time been shown to be so great that preparations appropriations for the removal of the raft were discontinued.

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In the Army Engineers report for 1873, page 664, it is stated that Col. Fuller in 1856 opened the raft from the head of Dooley's bayou to its upper end. Subsequent to this the raft appears to have accumulated only in the portion of the river above Carolinn Bluffs. By 1871 it had extended to within four miles of the arkansas line, or a distance of 35 to 40 miles including short intervals of clear river. This new raft was completely removed **rive**in it. 1872-1873 and the river has been prevented since that date from accumulating new rafts. The sediments which had accumulated during the raft stage are being rapidly removed, and there is also a <u>uffeceptible</u> increase in the width of the narrow parts which had been filled by cediment along the raft.

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Observations by Lieut. Col. Stephen H. Long.

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In 1341 Lieut. Col. Stephen E. Long made an examination of the portion of Red River Valley which had been affected by the raft, and presented a report of 22 pages, forming Senate Document 64, 27th Congress, 1st session, 1841. He gave attention to the distribution of the water through bayous, and to the range between high water and low water, which throws considerable light upon the conditions which prevailed in connection with the old raft. The range from high water to low water at the head of the raft was found to be only five feet, and this is said to be the ordinary Benoist's range as far down the valley as (Benoit's) Bayou, 16 miles below Hurricane bluff. He estimated that about half of the flow of Red River was diverted into bayous on its west side, Red, New, Dooley's and Cheftels, which ran west into Caddo or Soda Lake. The last named is about midway of the new raft, the other three above its head. Ton miles below the raft is the head of Willow Chute, and ten miles farther Benoist's (Benoit's) Bayou, which diverted about half of the remaining flow of Red River eastward into Bodcau Lake. This left a sluggish current 1; miles an hour or less for 10 miles below Benoist's (Benoit's) Bayou, to the point where Soda Bayou enters Red River from the west. Soda Bayou and Cross Bayou, which enters Red River six miles farther down, brought back the part of the Red River flow which had been abstracted near the head of the raft, thus giving the river a three-fourths volume flow below the mouth of Cross Bayou, at Shreveport.

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The water which was diverted through Willow Chute and Benoit Bayou returned to Red River at Loggy Bayou, where Shreve found the foot of the raft in 1833.

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These descriptions by Lieut. Col. Long, serve to explain why navigation during the interval between the removal of the raft by Shreve and the removal of the new raft in 1872-3, followed the bayous and lakes along the west bluff of Red River. Documents bearing upon the conditions at the

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time Louisiane became a State. John A. - Dr. Sibley's Report.

In the message from the President of the United States, in 1806, there is communicated the report of discoveries made on the Missouri, Red Eiver, and Washita, by Captains Lewis and Clark, Doctor Sibley, and Mr. Dunbar. The report by Dr. Sibley pertains to Red River and the country adjacent, and is addressed to General Henry Dearborn, Secretary of War. It is based upon his personal knowledge, from the mouth of the stream to about 70 or 80 miles above Natchitoches, a distance by the course of the river of about 400 miles. Above that point his information was derived from others, principally from Mr. Francis Grappe, his assistant and Indian interpreter, who was familiar with the river for a distance of 500 miles above Natchitoches.

In the month of March, 1803, Dr. Sibley ascended Red River from its mouth to Natchitoches, in an open boat, and his report presents notes upon the vegetation, soil, and inhabitation of the district traversed. It also discusses the great raft on Red River, the foot of which was reached at the village of Campti. He appears, however, to have no personal knowledge of the raft farther up the valley, and his statements concerning it have not the weight that can be given to his discussion of the region below, which he personally traversed. He seems to have underestimated the cifficulties of navigation past the raft, which are brought out by Freeman's exploration in 1806, discussed below. His statements concerning the raft are as follows; on pages 101-102:

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"The upper end of this settlement (Campti) is the last on the main branch of Red River, which, straight by land, does not exceed 25 miles above Natchitoches. At the upper house the great raft or jam with timber begins; this raft choaks the main channel for upwards of 100 miles, by the course of the river; not one entire jam from the beginning to the end of it, but only at the points, with places of several leagues that are clear. The river is very crooked, and the low grounds are wide and rich, and I am informed, no part of Red River will afford better plantation than along its banks by this raft, which is represented as being so important as to render the country above it of little value for settlements; this opinion is founded entirely upon incorrect information. The first or lowest part of the raft is at a bend or point in the river, just below the upper plantation, at which, on the right side, a large bayau, or division of the river, called Bayau Channo comes in, which is free of any obstructions, and the greater part of the year boats of any size may ascend it, into Lake Bistino, through which, to its communication with the lake, is only about three miles; the lake is about 60 miles long, and lays nearly parallel with the river, from the upper end of which it communicates again with the river, by a bayau called Daichet, about 40 miles above the upper end of the raft; from the lake to the river, through Bayau Duichet, is called 9 miles: there is always in this bayap sufficient water for any boat to pass; from thence upwards, Red River is free of all obstructions to the mountains. By Lake Bistino, and these two bayaus, an island is formed, about 70 miles long, and 3 or 4 wide, capable of aifording settlements inferior to none on the river. From the above account, you will perceive, that the only difficulty in opening a boat passage by this raft, through the lake, which is much shorter than by the course of the river, and avoid the current, and indeed, was the river unobstructed, would always be preferred, is this small jam of timber at the point, just below the Bayau Channo, as it is called."

The remarks concerning Bayou Daichet show that Sibley must have referred to a different bayou from the Bayou Daichet through which Freeman's expedition passed from the river into Lake Bistineau, for that expedition entered the southern end of the lake. The statements concerning the position of the head of the raft seem also to be far irom correct.

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E. - The Freeman and Custis Expedition up Red River in 1806.

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The results of this expedition have been discussed in a valuable document of 63 pages, describing the surface features and conditions for navigation along Red River in 1806, or six years before the admission of Louisiana to Statehood. The document bears no date, and was written in the third person, but declares on its title page that it is "An account of the Red River in Louisiana, drawn up from the returns of Messrs. Freeman and Custis to the War Office of the United States, who explored the same in the year 1806". An examination in the Adjutant General's office at Washington, D.C. on June 10, 1914, failed to bring to light the original menuscript or journals; but references to their receipt at the War Department and to incidents of the expedition were found. They consist of letters and inclosures iron William Lunbar, Matchez, Mississippi, as follows:

"March 18, 1806. Advising of the arrival of Thomas Freeman, and relating to the proposed expedition up Red River."

"June 24, 1806. Transmitting communications from the party exploring hed River."

"August 12, 1806. Relative to the exploring party up Red River. Inclosing extracts of letters from Lieut. Eumphrey and Dr. Sibley."

"Sept. 6, 1806. Relative to the exploring party. Inclosing Mr. Freeman's and Mr. Custis' communications." "Nov. 11, 1806. Inclosing the continuance of Mr. Thos. Freeman's journal."

There is on file in the office of the Chief of Engineers, U. J. Army, a map showing the line of traverse of this expedition,

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protracted by Nicholas King from the courses and distances given in Mr. Thomas Freeman's journal of the survey of Red River in Louisiana from Eatchitoches to the Coashetay village, made in June, 1306. A smaller scale map, also on file in the office of the Chief of Engineers, U. S. Army, was reduced by Bicholas King from the protracted courses of this exploring party, and gives its entire course from the Spanish Camp, where it was met by the Spanish troops, down the valley to where Red River enters the Missichippi. Mr. Midder has examined these maps and carefully tested the latitude entries on them, and found them remarkably accurate. The portion of the map opposite Ferry Lake and above the point where the expedition returned to Red River above the raft, is strikingly similar to the course of the same section of the river shown in the Land Office plats made thirty to thirty-five years later, Certain parts of the river taken from these two Sources are here introduced side by side, for purposes of comparison

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Inasmuch as this description of the country traversed by the Freeman - Custis expedition bears evidence of scientific accuracy, and shows a condition practically contemporary with the admission of Louisiana to Statehood, and also throws light upon the relations of the river and the great raft to conditions at that time in Ferry Lake, a complete copy of the document from the starting point up to the return of the expedition to that river above the great raft, is here presented.

"AN ACCOUNT

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Of The

RED RIVER,

In

LOUISIANA,

Drawn Up

From The Returns

OF MESSRS. FREEMAN & CUSTIS,

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To The

WAR OFFICE

Of The

UNITED STATES, WHO EXPLORED THE SAME,

In The Year 1806."

Copied From Book Nc. 4865, U. S. Geological Survey Library.

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ACCOUNT

Of

THE RED RIVER, ETC.

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THE party employed to explore the Red River, at leaving Fort Adams, consisted of Mr. Thomas Freeman, Surveyor, who was furnished with the requisite instruments, for determining geographical positions, by astronomical observations; Dr. Peter Custis, whose attention was directed to belany, and natural history; Gaptuin Sparks, and Lieutenant Humphreys, two non-commissioned officers, seventeen private soldiers, and a black servant.

They left Fort Adams, on the Mississippi, on the afternoon of the 19th of April, in two flat bottomed barges and a periogue, taking with them such stores and other articles, as it was probable they might want, in the course of the expedition, calculating, however, on the receiving of a supply at Natchitoches, for the prosecution of the survey, beyond that port.

The only mode of travelling, which the nature of the country admits of, while it furnishes the means of making the survey of the river sufficiently accurate for geographical purposes, precludes attention to topography, and the general face of the country, which is important, and furnishes the widest field for observation.

In ascending a navigable river, whose banks are generally elevated considerably above the surface of the water, the remarks of the surveyor will be confined to the width, depth, and course it pursues; and its rise during periods of inundation; the quality of the water, the vegetation on the banks in the immediate vicinity of the river; as well as the animals and fish, which art or accident may bring within his reach; together with the mineralogical and geological facts, which the abrasion of the water furnish, confine the naturalist and chemist within very narrow bounds.

On entering the Red River it was the wish of the party to have accortained the longitude and latitude of its mouth, by colostial observation; but the apot where they Bamped, and the unfavorable weather, prevented this circumstance from taking place: other observers had determined it to be in 31 deg. 1 min. 15 sec. N. L. and 91 deg. 47 min. 45 sec. west from Greenwich.

On the 3rd of May, they had ascended Red River, as far as the mouth of Black river, a distance of 26 miles: Red river is nearly half a mile wide at its mouth, which width it preserves for about a mile, when it contracts to about one fourth of a mile; whence to Black river. the width varies from 350 to 300 yards: the depth of the river at its confluence with the Mississippi is 84 feet; and where it receives the water of Black river, 42 feet. A mile from the mouth of the river, its banks were 14 feet above the surface of the water, at the time the party passed up: in ascending the river, these were observed to rise, and when they had reached the mouth of Black river, they were found land is nearly level to the surface of the water. The face of the river, where the ground becomes swampy. At a small distance from the margin of the river, there is a second bank or rise in the land, elevating the surface nearly as high as the water rises in the periodical floods, which the marks left on the trees denote to side of the river has the appearance of being rich, and seems tc have been formed by the deposition of the soil, and earthy particles river is subject.

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The water of Red River is of a reddish brown, or chocolate color, caused by the particles of an argillaceous marle suspended therein, and of which the hanks in many places above the Black River, appear to be almost wholly composed. For two or three miles, this river is beautifully bordered with willow trees, which extend back from its margin nearly half a mile to the second rise in the land or bank, about six feet higher than that which borders the river. The trees on this second bank or plane are various. The Pecan is the most abundant; this is a species of Juglans, which bears the much admired Illinois nut. In its habits the Pecan is so very dif.erent from the Juglans Alba, as not to be mistaken for it, by the most careless observer, yet the only difference which can be pointed out is in the leaf: both have pinnate leaves; the Alba has an odd leaflet sescile, the Pecan the odd leaflet petiolate. Juglans petiolata would be an appropriate name for this species. The cotton tree, which of late has excited so much attention, is found here: although considered a populus, and by some termed the lombardy poplar, there is no other resemblance than the leaf. The other trees are oaks, (Cuercus rubra, alba and phellos,) Per-simmon (Diosphyros Virginiana,) Hagberry (Prunus padus) Sycamore, or the American plane tree (Plantanus Occidentalis) and Cratogus After passing three miles up the river, no trees but the Willow and Pecan are seen from it, until approaching the Black river, where the Cyprus (Cupressus disticha) is noticed. can is covered with Misleto. The Pe-

The bank of Black river on the right side is high, the soil very rich and light, and occasionally flooded; and besides all the trees above enumerated, except the sycamore and Cotton trees, which disappear shortly after entering the river, it produces the Red Gum (Liquid amber styraciflua) of a very large size, and the Ironriver, which enters at right angles, and is here the most beautiful of the two, the width of the Red river is contracted to about 120 yards, which breadth it preserves, with little variation, for about 72 miles, to the rapids. Its depth at this season varies from 18 to 20 feet; and it flows generally at the rate of from two to three miles an hour. The banks, on either one side or the other, and sometimes on both, are bold and steep; the land level, very rich and subject to be overflowed during the annual inundation. The upper stratum of all the land here is the red argillaceous in places, to a depth of 5 or 6 feet below the surface. The banks of the river are from 18 to 25 feet higher than the water at this season, and the land generally declines from them, for about one ground higher than the waters flow in the season of inundation,

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At the Avoyell's settlement, about 35 miles higher than Black river, the Plantanus Occidentalis, and Cotton trees begin to make their appearance, with the Cornus Sericea and Cypress: the Pecan and Persimmon are most abundant, the first of which usually grows to the height of 100 feet. Nine miles above the settlement is a beautiful bluff, nearly a mile in length, and fifty feet in height, formed of a reddish yellow sandy clay: here is first seen the Quercus Nigra or Black Oak, the Myrica Cerifera, or Candle berry bush, and Maple (Acer Pennsylvanicum.) Six miles above this bluff, a stratum of large trees and leaves, thirty feet below the surface of the ground, and covered by 10 or 12 feet of hard marle or clay, was exposed to view in the bank of the river. Sylvertris, Dogwood (Cornus Florida,)Sassafras Laurus Sassafras,) Chestnut Oak (Quercus Esculus,) Holly (Ilex aquifolium,) Hickory (Juglans abla,) Spice wood (Laurus Benzcin,) and Buckeye (Esculus parviflora of Walter,) make their appearance at this place; the Benzoin being the only undergrowth to be found for a considerable extent. A shrub is found in great abundance every where along the river, growing to the height of from 10 to 20 feet, bearing a drupe resembling the Olive, but not so large, which, when ripe, is of a reddish purple color. The season of its flowering being passed, the species could not be ascertained, but Dr. Custis supposes it to be the Eloeagus of Linnoeus. The putamen is of a woody fibrous texture, casily separated by the fingers; the Peduncles are rameous, and sub-apposite, each bearing from 10 to 15 drupes, the leaves eliptic. The Great Rapids, or the falls. are in lat. 31 deg. 20 min. 19 sec. N. and longitude - deg. - min. - sec. West from Greenwich. The rapids, or falls, are occasioned by a stratum of indurated clay, which crosses the river, in two places, about three fourths of a mile apart. The river is here about 300 yards wide. At the lower fall the current is very rapid, for about 100 yards, in 50 of which there is a fall of 10 feet, when the river is low: at the time the exploring party passed it, the fall was five feet, four feet of which was a perpendicular pitch. The second fall is in every respect similar to the first; with a very swift water for 100 rods above the fall. Although the clay which forms

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the distruction at the rapids, when exposed to the sun and air acquires an hardness approaching to that of stone, yet under the wa water it is easily cut, and a safe and easy channel might be opened through the falls, at a very moderate expense. Twenty men, in little more than as many days, with mattocks only, would be sufficient to effect this object, and render the navigation safe and easy at all seasons.

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The banks of the river here are high; the land very rich, somewhat broken and well adapted to the growth of cotton, and not subject to be overflowed. Most of the Red river lands are either of a clayey or marley soil, apparently not desirable for cultivation; the fact however is otherwise: they are found to be more productive than the best Mississippi lands, and the cotton raised on them always commands a higher price than that of the Mississippi. At the foot of the falls and on the left bank of the river, is Rapide Court House; and its vicinity is a considerable settlement. Here the Chequapin (Fagus pumila) grows to a very large size: some of them 30 feet high, and seven in diameter. The Myrica Cerifera

Above the falls, the width of the river varies from 120 to 200 yards. The banks generally 30 feet above the water at this season, and the depth of water 18 feet. Steep as the river banks are, cloathed with vegetation, chiefly grass and small willows.

Twenty-three miles higher up the river than the falls, on a bluff about 50 feet higher than the surface of the water, is an Indian village, called the Appalaches, on the right side of the river as you ascend. These Indians appear to be rapidly advancing towards civilization; they possess horses, cattle and hogs; dress better than Indians generally do, and seem to derive a considerable portion of their support from the cultivation of the earch. They migrated from the Appalaches river, on the frontiers of Georgia, when the white settlers approached their towns.

A few miles above this village, on the left hand, there is a sand stone rock, which project into the river - its cohesion is too slight to render it fit for building with. Two miles higher, a tribe of Pasquegoula Indians reside on both banks of the river; they are a peaceable, friendly, and industrious people; here the Tooth Ache tree (Zabthoxylum Clava Hercules) is first met with, and a little higher the Prickly Ash (Zonthoxylon fraxifolium.)

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Almost immediately above these Indian villages, Red River divides into two branches; that to the right is about one third of the whole width of the river, retains the name of Red river, but is impassable, on account of the rafts of timber which are lodged in it. It separates from the other branch of the river, called Old river or Cane river, four or five miles above Natchitoches, forming an Island of nearly sixty miles in length, and not more than five miles wide. The inhabitants generally name it La Riviere de petits bon Dieux, from the circumstance of a priest, who in ascend-

ing the river was upset at this place, and lost his images. The banks of these rivers are high and bold, presenting settlements occasionally on both sides. On this part of the river there is an abundance of sand stone, fit for all the purposes of building and masonry. Twenty-four miles above the hunction of the Petits Bon Dieux withthe Old river, or as it is sometimes called, Crane river (from the Arundo donax with which its banks abound) another branch falls in from the left hand or south side, which left the principal stream immediately below Natchitoches; it forms an island 32 miles long, and 4 miles wide. The branch which here falls in on the left hand, takes, or rather continues the name of Crane river, and is the largest of the two, being 100 yards wide; but in consequence of the rafts and impediments which it contains, the other is used in navigation. It is the middle branch of three, and generally known by the name of Little river. The banks of the river are here 25 feet above the present surface of the water. their junction there is a depth of 36 feet; a small distance above this, little river is 70 yards wide and 24 feet deep, and continues thence, from 40 to 50 yards wide, and 18 feet deep up to Matchi-toches. The banks of Little river are in many places low, not more At than eight feet high, but the water does not flow over them; the current in the river is very rapid. The timber is like what has been before described, with the addition of the Ash and Elm (Fraxinus, and Ulmus Americana,) which are most abundant. The Pecan continues in plenty, one of which near the mouth of Little river was measured, and found to be 19 feet in circumference, at the height of five feet from the ground. From the confluence of Little River with Crane river, to Natchitoches, the land on both banks is generally cultivated, particularly the left bank, which presents a series of small plantations, each having one field in front, and extending back,, from 80 to 100 perches to the Cypress Swamps. The inhabitants live in small cottages on the hanks and near the river.

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On the left hand or south bank of the river, 32 miles above the junction of Little and Cane rivers, stands the town and fort of Natchitoches. It is on a handsome plain 16 feet higher than the present surface of the water; distant 184 miles and 266 perches from the Mississippi, by the meanders of Red river, as measured in boats, by time, and the rate of ascending. Its latitude is 31 deg. 45 min. 45 sec. North, and longitude - deg. - min. - sec. West of the meridian of Greenwich.

The party left Natchitoches on the second of June, having made all the necessary arrangements for the prosecutuion of their voyage.

From the town of Natchitoches to where the Northern Branch, or La Riviere de petits bon Dieux runs out, the Red River varies in

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width from 150 to 200 yards, and is from 30 to 40 feet feet deep; the banks were about 15 feet higher than the water. Plantations occur on both sides of the river. About nine and half miles from Eatchitcches, the Bayou runs out from the south side of the river, which enters it again at the bluff above the town. Above this Bayou, and where a bluff seventy feet in height approaches from the south, there is a ferry across Red River. The river above this bluff is contracted to 70 yards in width; passing through first rate land, elevated from 15 to 20 feet, above the surface of the water at the time the excloring party passed up. The timber is White Gum, Cotton Wood, very large Pecan, Ash, Hickory, Mulberry, and Locust. About three miles from the ferry, a large Bayou (150 yards wide) runs in from the South West, and forms the principal communication with the bayous, branches, lakes and ponds, which lie on the south side of Red river, and pass the settlement of Bayou Pierre. The depth of the water in the river here, varies from 25 to 30 feet The annual inundations rise nearly to the top of the bank, and in some places pass nearly a foot over it. Five miles below the first raft, there is a bluff on the north bank of the river, 30 fect high. Above this bluff, high cane appears on the south bank, and frequently on both sides of the river. The first raft is not more than 40 yards through. It consists of the trunks of large trees, lying in all directions, and damming up the river for its whole width, from the bottom, to about three feet higher than the surface of the water. The wood lie so compact, that hushes, weeds and grass cover the surface of the raft. The party encamped on the evening of the seventh at the highest white settlement; which is a small plantation on the north side of the river, 45 miles above Natchitoches. Two miles below the settlement, and on the same side, there is a bluff, 40 feet high, and 100 yards in length. The Cotton Wood tree grows to a great size in this neighborhood; one standing in a cornfield, was found to be five feet in diameter and 141 and an half feet high.

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Next morning they came to the second raft, which crosses the river here 100 feet in width, and extends for 200 yards along its course. This raft rises nearly three feet above the water, and is are Cotton Wood, Cypress, Red Cedar, etc. and they lie so close that the men could walk over it in any direction. With great exertions by floating the large trees down the river.

Here they were overtaken by Talapoon, a guide and interpreter, hired at Natchitoches, to go as far as the Panis nation; he had a mule and a package of goods, for the purchase of horses at the Panis nation, to prosecute the expedition upon, when the river ceased to be navigable.

Intelligence which he brought of the marching of the Spanish troops from Nacogdoches, determined the party to halt at a small Indian village, a few miles higher up the river, and there wait for the arrival of the U. States agent, who was expected. Dr. Sibley

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and the gentleman from Nacogdoches, who had witnessed the marching of the Spanish troops, reached the party about noon: after having communicated this information, which was the occasion of their visit, they parted again about 2 o'clock P. M. the exploring party up the river, and Dr. Sibley on his return to Natchitoches.

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The river here celdom exceeds 70 yards in width, is 52 feet deep, and in time of flood rises from 15 to 20 feet above the present surface, flowing over the banks, which are only from 4 to 12 feet above it. The timber continues the same as below, with Cane on one, or both banks all the way. The rough rust of the Mississippi is also frequently met with. The trees are so covered with vines and creeping plants, as to present an impermeable mass of vegetation, while the low banks of the river are edged with willows.

In this flat country bayous are met with communicating with the river, almost as frequently conducting the waters out of, as bringing an accession to the principal stream.

On the evening of the ninth they arrived at the third raft, like the two former, composed of the trunks of trees, brought down by the floods, and lodged on sand bars; forming an almost impenetrable mass, which extends from the bottom of the river, totwo or three feet above the surface of the water, a thickness of 30 or 40 feet. This raft extends up the river nearly 300 yards. Many of these logs were of Red Cedar, from 1 to 3 feet in diameter, and 60 feet in length. With much difficulty a passage was effected through this; as the vacancy, occasioned by the removal of any part of the logs, was soon filled by others. The labor incident to the formation of a passage, through these small rafts, is so great, that the navigation of this part of the river is never attempted: for it would require to be repeated every time a passage was attempted.

The country is intersected with swamps, lakes, and bayous, communicating with and running into each other, for perhaps 6 or 8 miles on each side of the river. The current of the river is very gentle, seldom exceeding the rate of three fourths of a mile in the hour.

On the morning of the 11th they reached a place, where a branch of the river, or bayou ran rapidly in from the north. Being informed by M. Touline (a French gentleman born in the Caddo nation, and who now accompanied the party of that nation, to render his good offices) that it was absolutely impracticable to pass the great tad it for 50 years before, and, that this was the only communication, through which the passage could be effected; they here left the river, and entered the bayou. This bayou is by the Indians a bear in a log, from the circumstance of the first Indian who passrent in the bayou is very rapid, it being the discharge for the water which runs out above the great raft; indeed appearances seem to promise, that this will in time be the principal channel of the

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After passing up this bayou, about five miles against a current, running at the rapid rate of three miles an hour, they entered a lake called by the Indians Big Broth, from the vast quantity of froth which collects in, and floats along it, during the time of high water. A few miles above the entrance into the lake, they stopped in a beautiful cove, where M. Touline has numerous herds, kept by herdsmen. There they waited a day or two, for a rise in the water, which they observed was taking place, that they might the more easily make their way through the bayous and swamps above.

Almost immediately on entering the lake, there is a beautiful high bluff on the east side; along which side there is a series of elevated ridges, with a wavy surface. On the margin of the lake there is a growth of Willows and low bushy Cypress, for about 80 yards, beyond which the land is of good quality, rises to the height of forty feet, and is cloathed with White and Black Oak, Hickory, and Dogwood. The left or west side of the lake is low, and covered with large Cypress trees and bushes for about two miles. This beautiful lake is said to extend seventy miles, in a northerly direction, and is about two miles wide, agreeably variegated. The water was from two to six feet deep, when the partywere on it, but them an Indian as a guide through the intricacies of the lakes and bayous, by which the water forces its passages, from where it leaves the Red River above the great raft.

From the west side of the Big Broth Lake, they passed through a very rapid bayou of 100 yards wide, and one mile long, with large timber on its banks, into Swan Lake, which at its entrance is 500 yards wide. This is a very handsome lake, about one mile wide, to the eastern shore of which the upland approaches as you ascend. At the upper end of this lake, they had to enter and pursue their course through several small and very rapid bayous, in which it was gins, to aid the progress of the trees and bushes growing on their marthese short, crocked and rapid passages, they are obliged to stay their motion by means of ropes. The bed of the river at the great direction. Their course now lay through bayous of various widths, in which the water was from 4 to 12 feet deep; and at this time 10 feet lower than in the season of the great inundation.

Pursuing their course through a bayou, on the evening of the loth they arrived at a point where it touched the high land. Here they stopped for the purpose of making astronomical observations, particularly of the Solar Eclipse, which took place during the morning after. The observations then taken determined their position to be in Lat. 32 deg. 26 min. 53 sec. N. and Long. - deg. min. - sec. W. from the Meridian of Greenwich.

49- dang-46 The passage up the bayou had been dangerous, from the freouency of deld trees, ready to fall on receiving the least shock. The high land, which occasionally approached the bayou on the east-18 ern side, was elevated 40 or 50 feet above the surface of the water; it had a wavy surface, of good soil, covered with Black Oak and Hickory. They stopped on the evening of the 17th, at a point of high land, which approaches the bayou, where it leaves the lake.

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This high land they called Point Return, from the circumstance of their having been obliged to come to it again, after their first unsuccessful attempt to discover a passage, out of the lake of which it forms the eastern margin. This lake is full of dead trees, very rotten and standing close together. Discovering no passage from it, they sent the Indian guide forward by land, to the Coashutta village, not more than 20 miles, for a better pilot, and awaited his arrival at Point Return. The Indian came again on the 21st, and said he had seen the chief at the village, who had given him some directions, and would be with them himself on the day following. They did not wait but pushed on, through bushes in a kind of bay u within the lake, and at last got through the lake, and entered a bayou, by which they entered a handsome prairie; the surface of the land was four feet higher than the water in the bayou; the soil rich; the grass high and luxuriant. There was a border near the bayou of trees, thinly scattered, consisting of oaks, some of which were very large.

On leaving this prairie, they passed through a bayou, varying in midth from 50 to 100 yards, with rotten Cypress and Ash trees standing in it so thick, as to very much impede the progress of the boats; whilst the falling trees rendered it dangerous to run against any of them. The underwood, which grew in this water course, was so large and thick as to pre vent the view from extending much beyond the length of the boats in advance.

On the morning of the 24th, they entered a beautiful lake, near a mile in length, and about 500 yards wide, margined by beautiful willows, over the tops of which appear lofty trees in every The case with which the boats glided over the smooth surface of the water, was a pleasing contrast to the laborious passages they had previously made through the bayous. lake they passed into a Cypress swamp, over which the water was Out of this from 3 to 5 feet in depth; the trees were large and stood very This was followed by a swamp covered with Willow bushes growing very close, and through which it was almost impossible to propel the boats. The certainty of being within a very small distance of the river, gave a vigor to their exertions which carried them through the swamps by evening, when they reached the entrance of a small bayou. Here they had the first certainty of effecting their passage to the river above the great raft, without having to abandon their boats, or else be obliged to haul them over the land. After removing such impediments as existed in this bayou, consisting of small rafts of trees, they by a passage of about half a mile through it, reached the river above the raft, to the great jcy of the party.

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A circuitous passage of upwards of 98 miles had been thus forced through lakes, bayous, and almost impenetrable swamps, in fourteen days; contrary to the expectation of all those persons who had hitherto any knowledge of the impediments to be encountered and overcome. For it is to be observed, that the idea of effecting this passage with such boats as the party had, was quite laughed at in Natchitoches.

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On entering the river, they found a beautiful stream of 230 yards wide, 34 feet deep, and running with a gentle current; its banks are from 10 to 12 feet, bordered by lofty trees, of the Cotton Wood, Oak and Red Cedar. On the right of the river, ascending, at at the distance of from 50 to 100 yards, the land rises to the height of 50 feet above the banks, and is covered with Oaks, Hickory, Ash, and some Pine. On the left it is level and very rich; a large prairie extending for several miles below the places where the party entered the river, and as far above. Beyond this prairie there is a large lake, on the west of which, and nearly 30 miles from Red River, lie the principal village of the Caddos. When ascending the river to the Coashutta village, which is upwards of 19 miles from where they entered it, they met a canoe with two men in it approaching them: one of them proved to be Talapoon, the interpreter and guide, who had been sent round from Natchitoches, with a message to the Caddoo chief, requesting him to meet the party at the Coashutta village; the other was an Indian, whom the chief had sent to deliver a message from him to M. Touline. This message was to inform him, that about 300 Spanish dragoons, with 4 or 500 horses and mules were encamped a few miles back of the Caddo village. He did not know from the officers, what their intentions were; but believed it was to meet the American party on the river. officer, who commanded the Spanish troops, had given the chief his hand, and asked if he loved the Americans. His answer was evasive--"he "loved all men; if the Spaniards came to fight "they must not spill blood or his land, as it "was the command of his forefathers, that "white blood should not be spilled on their "land". officer left him without giving any answer, and did not return.

After delivering this message, the Indian said the Caddo chief requested M. Touline to go to him immediately on their arrival at the Coashutta village, as he wished very much to see him: but if M. Touline could not go to the Caddo village, the chief would meet him at the Coashutta's, and expected the Spanish officer would wish to accompany him.

The man was dispatched immediately, with a request that the Caddo chief should met M. Touline alone, at the Coashutta village.

They visited the chief of the Coashutta village, who resides a few miles below it, and has a large corn field. He appears comfortably fixed. About sun-set on the 26th of June, they arrived at the village. It stands on the north side, on a handsome bluff, about 30 feet high, composed of sand stone rock, and washed by the river. This little village has been built within two or three years,

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and consists of six or eight families of stragglers from the lower Creek nation, near the Mobile.

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Was the obstruction of the river occasioned by the great raft, removed, and the navigation made safe and easy, this country would become as desirable as any portion of the earth. The soil, is a rich clayey loam, which, judging from a field the coaschutta's have in corn, will yield from 50 to 60 bushels per acre. Cotton might be cultivated here to very great advantage."

This account of the difficulties encountered in making a passage by boat up this great river and around the raft, it will be noted, represents conditions at the time so close to that of the admission of Louisiana to statehood as to be practically contemporary. There is no reason to think that material changes affecting the navigability of this waterway or of its tributeries, occurred in the six years that intervened between the date of this expedition and 1312, the date of Louisiana's admission. It shows not only the extent and condition of the existing raft, but notes certain features which have resulted from the former presence of the raft farther down the valley, such as the rapids near Alexandria and the abandoned raft-filled section of the river above that point (page 10). In the passage around the great raft, the notes concerning the state of the timber indicate that the flooding must have occurred some years previously; otherwise the trees **xaxia** which were killed as a result of the flooding, would not have reached so advanced a state of decay as to be easily overturned or broken down. The notes concerning the stage of water ten feet above that prevailing at the time of the expedition, are also of great significance, since the altitude reached has proved to correspond exactly to that of the highest

shore markings on Ferry Lake, as brought out by the surveys under the direction of Mr. Kidder.

The map which is submitted herewith, when **Kanaraskad** compared with the Land Office plats of the same district, leaves no room to doubt that the Freeman expedition returned to Red River at the head of Willow Chute. The description in the quotation given above is also sufficiently definite to enable one to locate the place of entry beyond question. The reference to high land rising to 50 fect above the river bank at 50 to 100 yards east of the stream (see page 20) evidently applies to Hurricane Bluffs. This is the first bluff of that height touched by Red River in the district above the outlet of Lake Bistineau, where the expedition turned away from the river to pass around the raft, and its presence would have forced a return to the river. The large lake west of the prairie opposite their point of entry, can be no other than Soda Lake, of which Ferry Lake is an affluent. It is significant also that it was recognized to be a large lake, even though the water stage at the time was about ten feet below previous high water stage.

By reference to the topographic map, it will be seen that the banks at the head of Willow Chute are now 184-165 feet above gulf level. It has been estimated, however, by the U. S. Army Engineers, that during the occupancy of a given section of Red River by the raft, its banks and natural levees would be raised three to five feet; the banks may therefore have been only 180-182 feet at the time of the 1806 expedition. In that case the water

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level being 10 to 12 feet below the banks, was about 170 feet . above gulf level at the time of their return to the river, and the extreme high water level of that region 180 feet, or the same as the highest shore markings on Ferry Lake. This stream is reported to have been "running with a gentle current"; it seems unlikely therefore, to have been above the mean high water stage, and may have been a little below it, the month of June being near the close of the wet season.

The water is reported to have had a depth of 34 feet. Deducting this from the 170 foot water surface, gives 136 feet as the level of the river bed. This is about 12 feet lower than the bed of Cypress Bayou, at the east end of Ferry Lake, and serves to show that prior to the silting up of this part of Red River Valley, through raft influence, there was sufficient fall toward Red River to have given Cypress Bayou complete drainage.

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C. - Major Amos Stoddard's Report.

Under the treaty of Cession, Major Amos Stoddard took possession of Louisiana in the month of March, 1804. Between that date and 1812 he gathered material for a volume of 488 pages, entitled "Sketches, Historical and Descriptive, of Louisiana", published at Philadelphia by Mathew Carey. It covers a large part of the interior of the United States, and only a few pages are devoted to the district along Red River. Major Stoddard ascended Red River in February, 1809, far enough to gain information concerning the great raft, which he briefly discusses as follows; on pages 189-90:

"At the distance of about one hundred and thirty miles above Natchitoches, commences what is called the great raft. The distance from the lower to the upper end of it is estimated at forty-five or fifty miles. This obstruction is similar to the one places: so that (Atcharaleya); and is broken and unconnected in many extent, a good navigation exists: Yet, as the channel is frequently of trees, firmly bound together by the alluvious substances precipitated from above by the current, no boat can possibly ascend the river. The passage, however, is found round this raft by means in some places it is difficult to navigate, and the distance is on Red River than along this raft."

Major Stoddard reported the presence of a faft of wood in the northern end of the Atchafalaya, which obstructed navigation for 20 miles, being 10 or 12 log jams. He stated that these rafts rise and fall with the water, and are therefore justly termed floating bridges. He stated further that many of them are covered with willow trees up to ten inches in diameter, showing that the raft was maintained for a term of years.

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D. - William Darby's Geographical Description of the State of Louisiana.

Darby's Geographical description of the State of Louisiana was printed for the author by John Melish, of Fhiladelphia, in 1816, to accompany a map of Louisiana which he had prepared. The volume and map are both in the library of the U. S. Geological Survey.

(pages 65-6) Darby states definitely that the raft at the head of the in 1770, Atchafalaya was formed 38 years prior to the preparation of his map in 1808. The length of the raft is given as upwards of twenty miles, but the raft itself would aggregate only ten miles, with the different sections all combined.

Concerning the development of lakes on the borders of the Red in the vicinity of the Great Raft River Valley, Darby presented the idea that **ikers** they are a result of the development of natural levees along the main stream, and he attributes little or no influence to the presence of the raft in the river. He appears to have overlooked the fact that the lakes were developed no farther up the Red River valley than the raft had an influence, although the conditions for their development along the low bottom lands next to the bluffs are the same in the district above the raft as along its borders. He also appears not to have recognized that the bed of Red River is sufficiently low where unaffected by raft influence, to draw off all the water from the bottem lands at low water stages.

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The beds of the lakes are stated by Darby to be much lower than the channel of the river (page 56). Yet he states on the same page that they return the water into the river when the lowering of the river begins to take place. As already noted in the discussion of the Freeman expedition, the bed of Red River opposite Ferry Lake was found to be several feet lower than the bed of the bayou dhannel in that lake. Hecent surveys of Red River in the district above Shreveport show that now that the river has had time to clear out the sediment which accumulated around the raft, the bed is considerably lower than the lowest points in the beds of the neighboring lakes. It is only the sediment that has been built during the raft stage across the outlets of certain lakes that prevents their complete drain-ge into that river.

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E. - Dr. Joseph Paxton's report on the raft of Red River.

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In a letter to the Hon. A. H. Sevier, delegate to Congress from the Territory of Arkansas, Dr. Joseph Baxton presented a report of 18 pages published as Senate Document 78, 20th Congress, 2nd session, 1829, the date of the letter being August 1, 1828. The letter discusses the slopes of the country and probable changes in the lower course of Red River, but deals mainly with the condition of the raft. The raft is thought to have started at the place where Red River meets the back waters of the Mississippi, and to have become extended headwards at a rate proportioned to the quantity of drift wood brought down the river. The rate of headward extension is found to have been about one mile per year for the 35 years from 1793 to 1828. In the latter year it had reached the base of Hurricane Bluffs, immediately west of Benton. Assuming the same rate of headward growth for the entire district over which the raft had extended, its date of beginning would have been about 300 years previous to 1823. The validity of this assumption, however, is not well established, and the Assatise period covered by raft formation may prove to be either markedly more or less than three centurios.

Dr. Paxton calls attention to the fact that the head of the raft had in 1825 arrived at a point where the river washes the left bluff (page 11), and notes that navigation on the east side of the river can no longer be continued, and also that it is very uncertain

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whether a passage can be obtained for navigation on the west side, in which case navigation will be complete stopped.

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These observations by Dr. Paxton enable us to fix with considerable definitness, the position of the head of the raft at the time Louisiana became a state, the position being 20 miles by stream above the mouth of Cross Bayou at Shreveport, and about four miles below an outlet called Bee Bayou, which seems to correspond to Benoit Bayou of some of the Louisiana maps. It would have reached Shreveport by 1793 and have blocked westward outflow below there a few years earlier. The following are statements made by Dr. Paxton on this and other matters, pages 4-5:

"It is a fact well known in this part of the country, that when the first keel boat ascended Red River through [past] the raft, its head was then immediately below and in sight of a well known outlet called Ree Bayou. At this time; twelve years since, the head of the raft was twelve miles above suid point, and has continued to progress every intermediate season since, at about the same rate. This boat was conducted by Major Moss, who is known to you.

"A Mr. Wallace, whose veracity no one doubts, who has resided many years in the vicinity of the raft, and is well acquainted with it, states, and is willing to testify that thirty-five years ago the head of the raft was nearly opposite the middle or Rodcau Lake, then a beautiful prairie. At this time, this point was computed to be thirty-five miles below its present head.

"The appearance of the state of decay of timber in this lake, and others near the head of the raft, compared to that in those below, also prices their more recent formation, and the consequent progress of the rait. The rait, as it ascends, chokes up and stops the mouth of the bayous, as they descend from the hills, forming lakes in their valleys, gradually enlarging as the raft approaches, killing the timber in them as the water rises, first in the middle where the surface is lower, and subsequently near the margin, where, in this lake and others near the head of the raft, the timber still retains small limbs, in a partial state of decay; proving the relative ly recent iormation, compared to that in those below, even far below the present site of the raft, when, as in Lake Noir there is scarcely a vestige of it remaining. The state of decay of timber in all of them, being always advanced in proportion to, and is an index of their distance below the present head of the raft, leaving no room for Boubt as to the mode, time, and cause, of their formation. I know of but one bayou that is in this respect an exception; but it adds proof, if proof were wanted, that the above is the true cause of the formation. Sibley's Creek runs into Red

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River from a bluff called Grandechor; it has no lake in its mouth. The cause is evident; its channel lies above the level of the river.

"It is also known that the raft is ascending from the following circumstances. The time is yet within the memory of some of the oldest inhabitants in and near Matchitoches, when the lower end of the raft was still below that place; and the then Governor ordercd out the troops in command, to break down and cause to float off, all the part then below. This circumstance wonderfully accords with, and supports the above data. Some of the French families here are celebrated for longevity; and the lower end of the raft is some 60 or 70 miles above. It involves also the evident and of the raft is decaying off, at the same rate it is accumulating above.

"After the raft had commenced, it continued to accumulate, and extend itself up the river at the above mate about the term of eighty years, or until it had occupied a space of about eighty miles; at which time it began, and still continues to decay off: and the fact of its occupying only that space now, after having existed such a length of time, **TAUXEXPRESENTERS AND A PRESENT STREET STREET.**

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"This phenomena is easily accounted for - In its first formation, the raft was composed of a variety of species of timber, a large propertion of which was already in a far advanced state of decay. Cther kinds, as the willow and cottonwood, are known to be very susteptible of collapsing, particularly when exposed in such a situation as this. The consequence is, that immediately that in some twelve or fifteen years, there is scarcely any other timber left than the most durable, as the cedar, bois de ark, and were once; and, in about eighty years, even these skeletons of what they remains, unsupported by the timber chat formerly composed so freshets.

"From the above facts and deductions, we probably arrive nearly at the time of its origin from the Rappeyons to its present site. The space over which it is supposed, at the above rate, to have progressed is, by the bends of the valley, about 300 miles; consequently fixes nearly the time of its existence."

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Samples from the Bed of Ferry Lake.

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The set of samples were taken along the line running from the north shore opposite Rocky Point, directly across the lake to Rocky Point, which have been submitted for mechanical and microscopic analysis, to Mr. Marcus Goldman, of the U. S. Ceological Survey, whose report is herewith appended. They serve the purpose of indicating the fineness of the sediment and the appendices serve to show the thickness of the sediment which has accumulated in the submerged bayou and plain bordering it. There is also included, mechanical analysis of the soil samples made by the U. S. Department of Agriculture.

55. drug - 57 Report on the Mechanical and Microscopic Analysis of Samples Of the Bottom Deposits of Ferry Leke, Louisiane.

The samples from their general appearance could be divided into two types, one the red clays from the eastern side, the other the gray from the western side. The red clays extended from the east bank of the ease across the submorged bayou or channel, while the the west of this submorged bayou gray sediments appeared, to judge from the samples, rather abruptly.

The problem presented, was to see whether any internal character could be found in these sediments to show that these two types were derived from different sources, the belief being that the red sediments might have been brought in from the Red river in periods of flood, while the gray might be the local sediments of the lake brought in from the west.

Mechanical Analysis.

The mechanical analysis was courteously made by the Bureau of Soils of the U. S. Department of Agriculture according to their usual method. Six typical samples were selected from the thirteen samples collected; the results are given in the accompanying table, page 8 . As was anticipated from the appearance of the samples so much of the material was in the finest sizes that but, little can be learned from the proportion of different sizes present. Comparison with the analysis of Red River sediments given by Willard , proved useless because, in his analysis the two finest sizes, silt and clay, which predominate in the sediments of Ferry Leke were not separated. If these two portions are surmed in the analysis of Ferry Lake samples they form in most cases much over 90% of the sample corresponding

1. Willard, J.H. Improvement of certain rivers and waterways in Louisians, Texas, otc. An. Rept. Chf. of Eng. U.S. Army, 1895, pt 3, pp. 1872-1877.

56. 61-0 dmg-58 to the finest samples given in Willard's table and thus giving too little differentiation to afford a basis of comparison. This lack of differentiation is accentuated by the fact that there is, in the samples from Ferry Lake, practically no minoral matter coarser than0.1 mm. (the finest sand) the figures that appear in the tables for these coarser sizes, representing carbonaceous matter (plant fragments) which cannot be considered with the sedimentary minoral matter.

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However, the content organic matter is itself significant, for it is almost completely absent in the sands of Samples 6 and 8, scarce in those of sample 4, but the sole or predominant constituent in those of Samples 17, 23, and 24, from the west of the submerged bayou. Thus, the grey samples are rich in carbonacecus ratter, the red poor. That the differences in color are due to this fact alone is quite possible, and since Mr. Loverett's observations show that the bottom to the gest of the submerged bayou is shallow and supports abundant aquatic plant life, while the bottom to the east of the submerged bayou is deeper and poct in growing plants, it is quite possible that the difference in color is due to the local conditions in the region of sedimentation and not to any previous condition of the sedimentary material brought in.

One other fact is worth noting. In the three complex of red sediment (4,6, and 8), the silt portion is more abundant than the clay, while in the gray sediments (17, 23 and 24) the clay is more abundant than the silt. Since the colloidal meterial which may be regarded as true clay is in the portion called clay, though much that is merely very fine sand is also included, it seemed that in the content of colloidal matter there may be a real difference between the rod and gray samples , the gray being characterized by more of this colloidal matter. In the absence of similar information in Willards tables, forever, this difference cannot be used to correlate the red sediments with those of the

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Red River; moreover, this difference may again be due to difference in content since requirementation of organic matter, when present, tends to go partly into the colloidal state and thus might increase the amount of the portion called clay, not only by appearing in that portion itself but, also by carrying into that portion mineral matter which otherwise might appear as silt.

Microscopic Ezamination.

Since the sand portions were so very scant in most of the samples, the two extreme samples, 4 and 24, which being nearer shore were coarser, were taken as representative of the two types.

Following is a list of grains of heavy minerals (S.G. > 2.73) recognized: Sample No. 4:

Zircon, magnetite, apatite, kyanite, calcito, muscovite, dieopside, epidote, tournaline, opal, rutile, cerusite, biotite, chlorite, carbonaceous matter, pyrite nodules, limonitic grains.

Sermie No. 24:

Zircon, magnetite, staurolite, kyanite, epidote, rutile, tourmaline, carbonaceous matter, pyrite nodules.

Here again we have a well indicated difference in the two sediments. These differences do not appear in the more emumoration of the minerals, but also in their relativo abundance.

Peculiar to No. 4, however, is above all apatite, peculiar to No. 24 staurolite, and these two minerals typify the difference between the two sediments, for No.24 is characterized by the predominance of minerals belonging more to the metamorphic rocks, kyanite and rutile, both being more prominent than in No. 4, while biotite is scarce and miscovite and chlorite wore not found at all in No. 24. On the other hand the mice, both miscovite and biotite, are rolatively abundant in No. 4. However, in both samples

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magnetite and zircon are overwhelmingly predominant, zircon especially in No. 4. There is thus a recognizable difference in the mineral composition of the two samples.

The portions of light minerals (S. G. < 2.73) separated showed the differonce in color observed in the original samples from which they were separated, those of No. 4 being reddish, those of No. 24 grey. Under the microscope this difference of color, as anticipated, was found to be due to staining, respectively with ferruginous and with carbonacecus matter.

Summary and Conclusion .

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Red Seciment, Eastern Side

- 1. Carbonaceous matter scarce.
- 2. Silt portion greater than clay.
- 3. Quartz and felsper grains show a ferruginous stain.
- 4. Characterized by; apatite, and micas.
- 5. Varieties of minorals more mumerous and mixed in character.

Grey Sediment, West Side.

Carbonaceous matter abundant.

Clay portion greater than silt.

Querts and felsper grains show a carbonaceous stain.

Characterized by: staurclite.

Varioties of minerals less numerous and more of the motamorphic rock type.

In the absence of knowledge of detailed character of Red River sediments and of other possible sources of the material examined, it is not possible to determine the derivation of these two types of sediments.

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June 15-1914

Associate Geologist.

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Appendix No. I

Following is Mr. Leverett's description of the soundings taken by him and of the method of collecting samples:

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"The line of sounding was very close to the line shown on Sheet 6 of the 1890-91 maps that run W-SW from near south end of Stormy Point toward north end of Rocky Point, and is about 1 mile long. I made 40 soundings at somewhat regular intervals and took samples whomever they seemed of interest. A small gas pipe with 1/2 inch inside diameter was fastemed to the sounding rod. Enough material stayed in the pipe when we bauled it up to give a small sample,. The smallness of some samples I am sending is due to the scanty amount that came up in the pipe."

1. Letter to an alden, ann arboy mich. april 29-1714, 1/2.

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Appendix II

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List of Soundings made by Mr. Leverett in Ferry Leke, La.

	lo. Depth	No.	Depth
1	9.8'	21	14.41
2	2 10.91	22	14.6 1
3	11.21	23	14.61
4	13.3 (hard bottom at 16!)	24	15.01
5	14.61	25	14.7 1
6	15.3' (hard bottom at 19.7)	26	14.71
7	17.35(hard at 201)	27	14.51
8	19.4' (hard at 25.7')	28	14.51
9	15.51	29	14.51
10	15.5 1	30	14.4 1
11	14.8'	31	14.3 '
12	14.81	32	14.31
13	14.8'	33	14.21
14	14.9 1	34	14.21
15	14.8	35	14 1
16	14.8'	36	13.91
17	14.8 '	37	13.51
18	14.61	38	13.5'
19	14.8'	39	11.21
20	14.51	40	9.71
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1. Letter from the Keverett to the Alden and theor, anich, april 29-1914, f3

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List of Bottom Samples Collected by

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Mr. Frank Loverett

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Ferry Leke.

110.	Date	Depth	Description	Location	
4	April 6	160.9-158.2	Red Clay		
6.;		158.9-154.5	; n a	Ferry Lake	
7		156.9-154.2	п п	Sucmerged bayou in Ferry Lake	
8	п	154.8-148.5	и п		
10		158.7-158.5	Blue clay cylinds	West how's of he	
12	п	150 4 150 0		Lake.	
		109.4-108.9	Blue clay with vegetation	West of submerged channel	
13	11	159. 4- 158 , 9	Red Clay	West of submerged channel in	
14	π	159.3-158.6	u	West of submerged channel in	
17		159.4-158.4	п. п	Ferry Leke	
19		159.4-158.9	" "Vegata	west, submerged bayou, Ferry Lake	
21	н	159.8-159.3	tion at bottom	west, submarged channel " "	
23		159.6-159.1	Yellowish blue	West, submerged bayon, " "	
34	"	159.2-158.7	Blue Olay with regetation.	West of ubmerged bayou in	

					100				
Dept. of Agri. Seri: No. of Analysis.	Lurorettic semplo n	Fine Gravel. 2 to 1 m	Course sand, 1 to 0.5 mm	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1nm.	Very fine sand, 0.1 to 0.05 mm	Silt, 0.05 to 0.005 mm	Glay, 0.005 to 0 mm	
26950	4	0.0	0.0	0.2	0.7				
26951	6	· 0	.0	.1	0.7	8.9	53.3	36.5	
269 <i>E</i> 2	8	.0	.0	.0	.1	4	51.4	48.3	
20000							01.1	40.5	
69953	17	.0	.1	.3	.8	.8	40.5	59 4	
26954	17 28	0. 0.	.1 .3	.3 .7	.8 8.6	.8	40.5	58.4 67.5	

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Mechanical Analysis of Soil Samples from Ferry Lake. by the United States Department of Agriculture.

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Liap of the bed of Ferry Lake.

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Attention is here directed to the contour map of the bed of Ferry Lake, which was prepared by Mr. Kidder. A discussion of certain significant features disclosed by this map, appears on pages 4-8 of the Summary Statement which appears in the early part of the present report. The ecological data obtained from the bed of the lake are discussed by Mr. Janes. They seem to accord with, and strengthen the **wriderse** geological evidence as to the long continued existence of the stream-and-forest stage, whose close was at a time closely in accord with the statements made by the early explorers, Paxton, Freeman, and Sibley, concerning the conditions at about the time Louisiana became a State. They give a measure of precision that can scarcely be obtained by geological evidence, and should therefore be given corresponding weight.

