COMMONWEALTH OF KENTUCKY

FIRST BIENNIAL REPORT

OF THE

Department of

GEOLOGY

and

FORESTRY



Willard Rouse Jillson, Director.

FRANKFORT, KY., 1919

COMMONWEALTH OF KENTUCKY

First Biennial Report

OF THE

DEPARTMENT of GEOLOGY AND FORESTRY

By J. E. BARTON



1919

JOHN EARLE BARTON, Commissioner and State Forester WILLARD ROUSE JILLSON, Deputy Commissioner and State Geologist

FRANKFORT, KY.

GOVERNING KENTUCKY STATUTES

Acts of General Assembly

CHAPTER 35

(p. 102)

AN ACT abolishing the office of State Forester and State Geologist and creating the office of Commissioner of Geology and Forestry, providing for a deputy and fixing salaries and extending the appropriation to the Kentucky Geological Survey so as to cover the work of same and that of the State Board of Forestry, repealing portion of sections 1905c, 2007a, and 2007b, Kentucky Statutes, Carroll's edition of 1915.

Be it enacted by the General Assembly of the Commonwealth of Kentucky:

- § 1. That there is hereby created the office of Commissioner of Geology and Forestry, who shall be a graduate in good standing of some standard school of geology, or a graduate in good standing of a standard school of forestry, and he may appoint, with the consent of the Governor, a deputy, who shall be a graduate in good standing of some standard school of geology or school of forestry. If the commissioner is a graduate in geology said deputy shall be a graduate in forestry, or vice versa. Said commissioner, together with said deputy, is hereby authorized to and shall discharge all the powers, duties and privileges that are now conferred upon the office of Geological Survey and the Board of Forestry.
- § 2. That said commissioner shall receive a salary of three thousand dollars, to be paid out of the state treasury of the Commonwealth of Kentucky, for his services, and his deputy shall receive a salary of twenty-five hundred dollars out of the state treasury for his services.
- § 3. Said commissioner and his deputy shall be appointed by the Governor, by and with the consent of the Senate, for two years, and from and after the expiration of this period

they shall be appointed for a term of four years; they shall reside in Franklin county, and shall maintain the office of said commissioner in the State Capitol, and they shall give their entire time to the duties of said office.

- § 4. Said commissioner and his deputy are hereby invested with the authority to and they shall discharge all the powers, duties and privileges now conferred by law on the State Geologist and the State Forester, and said offices are hereby abolished.
- § 5. Subsection 30 of section 1905c, Kentucky Statutes, Carroll's edition of 1915, providing an appropriation of fifteen thousand dollars for the use of the State Board of Forestry is hereby repealed.
- § 6. The appropriation provided in section 2007b, Kentucky Statutes, Carroll's edition of 1915, shall be used for the work of the State Board of Forestry as well as that of the Geological Survey.
- § 7. All laws and parts of laws in conflict herewith are hereby repealed.

Approved March 26, 1918.

REPORT

of the

COMMISSIONER OF GEOLOGY AND FORESTRY 1919

Introduction

The General Assembly of 1918 abolished the office of State Forester and State Geologist, also, the Board of Forestry and the Geological Advisory Board and created a Commissioner of Geology and Forestry and a Deputy Commissioner, thereby combining the two departments. The appropriation of \$15,000 heretofore available to the State Board of Forestry was also repealed by the same act (Acts of 1918, chap. 35, p. 102). In accordance with this act, J. E. Barton, formerly State Forester, was appointed Commissioner of Geology and Forestry on July 1, 1918, for a term of two years, and the consolidation and reorganization of the two departments was undertaken immediately. The offices previously used by the Geological Survey were occupied for the new Department of Geology and Forestry and these offices were enlarged by the addition of what had heretofore been used as a storeroom. The work of systematizing the office proceeded rapidly. A system of filing and indexing for correspondence was instituted, a survey of publications of the previous Geological Surveys was made. These were arranged for ready access in a storeroom and the work undertaken of distributing these publications to the largest public so that they might serve to develop the resources of the state. It was found upon investigation that several geological reports—four in all were awaiting publication in the hands of the printer, and had been in his hands for a long period. The early publication of these reports was arranged for and the last—the Coals and Structures of Magoffin County-has now appeared. February 1, 1919, Gov. A. O. Stanley appointed Prof. W. R. Jillson to the then vacant position of Deputy Commissioner and State Geologist. Mr. Jillson, at the time of his appointment, was Assistant Professor of Geology at the University of Kentucky, and had been engaged in consulting geological work in Kentucky and the adjoining states for several years.

FORESTRY DIVISION.

J. E. BARTON, State Forester.

GENERAL CONDITIONS.

The activities along forestry lines in Kentucky during the past year have continued about the same as heretofore, except that they have necessarily been sharply curtailed due to the small funds available. The same policy of education by addresses, studies, circulars and bulletins has been followed. The war recently ended brought out more sharply than anything else would have done the immense value of our forests to the economic life of the nation and the rapid depletion of these forests which is going forward—particularly in regard to the more valuable species. It showed the necessity of complete, well-defined and aggressive forest policies on the part of the states and of the nation as a whole and of new and drastic forest legislation. The life of many timber using industries within the state are seriously threatened by the decreasing timber supply and the constant drain on the forests.

KENTENIA STATE FOREST.

The greatest single step forward in forestry in Kentucky has but recently been consummated. It consists in the transfer to the state of 3,400 acres of land on Pine Mountain, in Harlan county, for the purpose of a State Forest by the Kentenia-Katron Corporation. The gift of this land to the state for the purposes of a State Forest is the biggest stimulus to the management of timber tracts under effective forestry principles that the movement in the state to this end has yet seen. The Kentenia-Katron Corporation has always taken a keen interest in the forestry problems of the state, and the concrete way in which they have shown this interest is worthy of their efforts heretofore in the same direction. The area has a mixed stand of hardwoods, common to the region, and includes some pines. The management of this tract on scientific ferestry priciples will serve as an excellent example of what can be accomplished under these conditions in the Southern Appalachian region. Active steps will be taken to put the area under effective administration at an early date. Immediate measures will be taken looking to the protection of the timber on the tract from fire and other destructive agencies

PUBLICATIONS

There have appeared two circulars recently. No. 7, "Maple Sugar and the Maple Sugar Industry," and No. 8, "The Regenerative Forests of Eastern Kentucky and Their Relation to the Coal Mining Industry." An address by the Commissioner on "The Relation of Forestry to the Economic Development of the State," delivered before the Kentucky Academy of Sciences, was published in the July issue of the Mineral and Forest Resources.

FOREST PROTECTION.

This past year has been a particularly fortunate one from the point of view of forest protection. A rainy spring and a rainy fall have had the effect of reducing the number of forest fires very noticeably. Only three fires have been reported during the fall of 1919. A marked change in attitude was evident in many sections in regard to carelessness with regard to setting forest fires for purposes of clearing and other reasons. Fires due to carelessness are noticeably on the decrease. The cooperative agreement with the Forest Service of the United States Department of Agriculture is still in force and \$4,000 was again allotted to Kentucky for purposes of fire protection in 1919. The pay of the federal patrolmen has been increased from \$2.00 to \$3.00 per day, due to economic pressure. The fire lookout station at the junction of Letcher, Knott and Pike counties has been maintained and also one in Clay county.

FOREST FIRES IN KENTUCKY.

As shown by statistics gathered in an average of 15 counties in the years 1914, 1915, 1916, 1917 and 1918 and for the spring of 1919.

(1) No. of Fires

1919	1918	1917	1916	1915	1914
76	55	105	133	207	132

(2) Causes of Fires.

1919	1918	1917	1916	1915	1914
Lightning		1			
Railroads 4	12	14	13	15	14
Lumbering 5	14	2	5	12	4
*Brushburning 39	14	54	46	88	23
Campers (Hunters)	16	7	21 .	30	26
Incendiary 8	1	3	8	7	8
Miscellaneous 4	1	3	6	9	7
Unknown 16	11	21	34	45	50
Total 76	55	105	133	207	132

(3) Area Burned Over

1919	1918	1917	1916	1915	1914
Forest Land9113	5865	12856	18653	50564	50921
Open Land 379	572	2530	978	2939	1632
Total 9492	6437	15386	19541	53503	52553

(4) Less By Forest Fires

Timber destroyed in thousand feet board measure (M. ft. B. M.)

Year	Amount	Value
1919	4243 M. ft. B. M	\$21,218
1918	239 "	2,592
1917	2089 "	8,357
1916	2616 "	13,751
1915	13160 "	12,477
1914	6909 "	26,669

Value	of	Value	of
Young Growth	Destroyed	Improvements	Destroyed
1919	\$17,813	1919	\$1,099
1918	5,627	1918	1,030
1917	22,136	1917	3,241
1916	38,489	1916	1,667
1915	88,601	1915	6,347
1914	111,655	1914	1,030
		(fences, barns,	outbuildings)

^{*}Brushburning includes mostly fires set to clear off new ground for planting and the burning of forest areas to make range for stock.

EXTENSION

The business of the State Forest nurseries was seriously interfered with by war conditions. Wages were high, labor was hard to get and the demand for forestry material had entirely ceased. At the conclusion of the war it was necessary to face radically different conditions and await the renewal of the demand for forestry nursery material. That has come about in slight measure as indicated by the fact that the sale of trees from the state nurseries for the fiscal year ending June 30, 1919, was \$45.35, whereas the net total of sales for the spring of 1917 was \$253.75. Indications, however, point to an extended demand for forestry planting material at an early date and wide scope. Recent developments have shown a desire on the part of timber land owners in Eastern Kentucky to plant up their waste and cut over areas to insure a future crop of timber for working their mines.

THE LOUISVILLE NURSERY.

(Occupies 25 acres adjacent to State Fair Grounds.)

The material at the Louisville Nursery has shown up better than ever before, in fact the care of the ground and the repeated and constant treatment thereof by various fertilizers (green crops and mineral) has begun to have a marked effect on the growth of the seedlings and transplants. The willow plantation has done especially well. The commercial exploitation of the rods from the plantation has presented technical difficulties which it is expected to obviate at the next cutting. About 60,000 rods will be available this winter. The size of the plantation has been considerably increased. It occupies now two acres.

THE FRANKFORT NURSERY

(Occupies 60 acres on the K. N. & I. I. property.)

This nursery received a decided back-set by the fact that the nurseryman went into the army and was away one year. Since his return in the spring of 1919, the nursery has been brought up to its former excellent state. It is proposed, however, to move the stock in this nursery to Louisville and consolidate the two, thereby decreasing the overhead expense of operation. It is estimated that the value of the stock in the two nurseries is close to \$15,000.

GEOLOGICAL DIVISION.

W. R. JILLSON, State Geologist.

GENERAL CONDITIONS.

It was evident early in 1918 that Kentucky was due for a large development of her natural resources, particularly her mineral resources. This was occasioned in large part by the war. An enormous demand for coal arose which made profitable the opening of new coal veins and their exploitation. An unprecedented number of requests for reports on the coals and coal regions of Kentucky was noticed from all parts of the United States. This development of the coal areas is shown in the increase in the number of tons mined in years 1916, 1917 and 1918, as follows:

1916	25,292,767
1917	26,000,000
1918	31.530.442

Oil and gas production received an extraordinary stimulation and the development of the oil fields of Kentucky since 1916 has been prodigious. Accurate figures on oil produced during the last two years in Kentucky follow:

1918 Total 4,308,898.03 Bbls, Value \$11,128,421.00 1919 Total 9,226,473.39 Bbls, Value \$24,459,017.36

Other minerals were early sought since the source of supplies from foreign countries was closed, and the United States was ransacked for clays, zine, lead, glass sand and a long list of other products. Kentucky stood forth as a treasure house of supplies heretofore largely unnoticed, and the development of the barite, phosphates, fluorspar, zine, lead, clays and other minerals of the state was feverishly pushed and their exploitation proceeded apace. The stimulus of these war activities has continued due to high prices, generally disturbed conditions of trade and commerce and other factors as well as the ordinary process of development. The Department of Geology and Forestry has made every effort to meet the demands of this unprecedented situation as far as the limited funds available per-

mitted. Reports on oil and gas, coal and other products were placed in the hands of the public as rapidly as they could be sent out.

REPORTS AND PUBLICATIONS.

Since the creation of the Department of Geology and Forestry, the following reports have appeared. The first four were already in the hands of the printer, but their publication had been unaccountably delayed.

Series IV.

- Vol. III, Part 3:—Coals of the North Fork of the Kentucky River in Perry County and parts of Breathitt and Knott.
- Vol. IV, Part 3:-Coals of Clay County, by Hodge and Russell.
- Vol. V, Part 1:—Coals of the Middle Fork of the Kentucky River in Leslie and Harlan counties, by Hodge.
- Vol. V, Part 2:--Coals and Structure of Magoffin County, by Browning and Russell.

Series V.

- Bull. I :—Oil and Gas Resources of Kentucky, by Willard R.
 Jillson. 646 pp. 1919.
- Bull. II :-Geology of Kentucky, by Arthur M. Miller. 422 pp. 1919.
- Bull. III :—Coals of Stinking Creek and Cumberland River in Knox County, Ky., by Willard R. Jillson and James M. Hodge. 103 pp. 1919.

These last three publications represent wholly the activities of the present Department of Geology and Forestry. In addition a quarterly publication has been established, called the "Mineral and Forest Resources of Kentucky," which has contained timely articles on the various forest and mineral activities of the state. This publication has met with popular approval and has received a wide circulation. The first number was an edition of 750 copies, which was promptly exhausted. The second edition of 1,500 copies, likewise exhausted within a very limited period. Twenty-five hundred copies were printed of the third number, all of which were practically called for by the mailing list made up of those personally requesting this publication.

Series V., Vol. I.

THE MINERAL AND FOREST RESOURCES OF KENTUCKY.

CONTENTS

No. I.

April, 1919.

(One Edition of 700 Copies, exhausted.)

- Sketch of the Development of the Oil and Gas Industry in Kentucky during the Past Century. (1819-1919.) By Williard Rouse Jillson.
- No. 2. The Used and Unused Natural Gas Fields of Eastern Kentucky and Their Relations to Present and Future Public Service Demands. By Willard Rouse Jillson.
- No. 3. A Bibliography of Kentucky Petroleum, Natural Gas, Asphalt, and Oil Shale. By Willard Rouse Jillson.

No. II.

July 1, 1919.

(One Edition of 1,500 copies, exhausted.)

- No. 1. Structural Deformation and its Relation to Proven Oil and Gas Accumulation in Eastern Kentucky. By Willard Rouse Jillson.
- No. 2. The Irvine Oil District. By Stuart St. Clair.
- No. 3. Relation of Private Forestry to the Economic Development of the State. By John E. Barton,
- No. 4. The Status of the Mauch Chunk in Southeastern Kentucky as a Producer of Petroleum and Natural Gas. By Willard Rouse Jillson.
- No. 5. Natural-Gas Gasoline in Kentucky in 1917. By John D. Northrup.
- No. 6. The Kendrick Shale—A New Calcareous Fossil Horizon in the Coal Measures of Eastern Kentucky. By Willard Rouse Jillson.
- No. 7. The Migration of the Headwaters Divide of Right Middle Creek, Floyd County, Kentucky. By Willard Rouse Jillson.
- No. 8. The Low Sulphur Coals of Kentucky. By Willard Rouse Jillson.
- No. 9. The Cumberland Falls Meteorite. By Arthur M. Miller.
- No. 10. The New Oil and Gas Pools of Allen County. By Willard Rouse Jillson.

No. III.

October 1, 1919.

(One Edition of 2,500 Copies.)

- No. 1. The Geology of Barren County, Kentucky. By Charles Butts.
- No. 2. The Oil and Gas Geology of Breathitt and Knott Counties. By Willard Rouse Jillson.
- No. 3. The Geology of Allen County. By Arthur McQuiston Miller.
- No. 4. The Paint Creek Uplift. By E. O. Rhodes.
- No. 5. The Amount of Standing Timber in Kentucky. By John E. Barton.
- No. 6. A Bibliography of the Coals of Kentucky. By Willard Rouse Jillson.
- No. 7. The Production of Coal in Kentucky. By Willard Rouse Jillson.
- No. 8. The Wier Sand—A Newly Recognized Oil Horizon in Eastern Kentucky. By Willard Rouse Jillson.
- No. 9. The Pay Oil Sands of Eastern Kentucky. By Willard Rouse Jillson.
- No. 10. The Oil and Gas Pools of Warren County, Kentucky. By Willard Rouse Jillson.

 The total number of pages in No. 1, No. 2, and No. 3 combined is 396; illustrated with many plates, diagrams, geographic and geologic maps.

An up-to-date list of avalable publications was also compiled and published.

TOPOGRAPHIC SURVEYS.

The sum of \$10,000 is available annually for topographic surveys in cooperation with the United States Geological Survey, which spends a like sum in Kentucky. In 1918 this sum was expended for a survey of the region in the vicinity of Camps Taylor and Knox—work urgently called for by the exigencies of the War Department. During the summer of 1919, this sum has been expended for a survey of the region of the state embracing Warren, Allen, Barren and adjoining counties, since detailed topographic work here was called for by the enormous oil activity in this section. The Camp Taylor, Hyden and Harlan Quadrangles have appeared within the year. There is urgent need of much more extended work along

lines of topographic surveys. Such surveys are demanded by the enormous increase in mineral development, good roads construction, and the demands of such engineering products as water power development, construction of pipe lines, railroads, etc. A good many of the older topographic surveys of the state are 30° surveys. These should be broken up in 15° surveys on a large scale. This is particularly true in some of the present most important oil and gas and coal fields. At the present time 45% of the area of Kentucky is covered by topographic surveys.

STUDIES.

There have been several important studies in progress during the last year, one of the most important of which is a continuation of the study of the Mississippian Formation in Kentucky by Chas. Butts. This study was begun in 1916 and the results published is a miscellaneous bulletin, "The Mississippian Formations in Western Kentucky," by Chas. Butts, together with an article, "The Formation of the Chester Series and Their Correlates Elsewhere," by E. O. Ulrich. The study was first made possible by a cooperative agreement between the U.S. Geological Survey and the Geological Survey of Kentucky, which was renewed by the Department of Geology and Forestry in 1919. Under the terms of this co-operative agreement one-half of the salary and expenses of Mr. Butts, a geologist of the U. S. Geological Survey, were to be paid by each party to the agreement and the results published jointly. As a result of this study, Mr. Butts completed the study of the Mississippian Formation in South-Central Kentucky in the field season of 1919 and also made a study of the areal geology of Barren County, particularly from an oil and gas standpoint.

A study of some of the fossil limestones of the Pottsville of Eastern Kentucky was made by W. C. Morse, during July and August, 1919. This study had as its object the breaking up of the coals of Eastern Kentucky and their ultimate complete correlation. The results of this study will appear early in 1920.

Another study covered the structural geology of Magoffin, Knott, Breathitt and Johnson, by I. B. Browning and W. R. Jillson, the results of which have in part already appeared.

The oil and gas resources of the state have been fully covered by a report, "The Oil and Gas Resources of Kentucky," by W. R. Jillson. This report is extremely timely, quite exhaustive and is in very great demand.

Another very timely study completed this summer was that of the surficial geology of Allen County, by Prof. A. M Miller, which has already appeared.

Other studies include the oil and gas pools and development of Warren County, by W. R. Jillson, and detailed studies of the Gainesville and Big Sinking Pools.

MISCELLANEOUS ACTIVITIES.

The demand for reports, maps and other publications of the Department has been enormous, and the handling of this material for mail and shipping has involved a large amount of labor and the expenditure of large amounts for postage. It has been the aim of the Department of Geology and Forestry to get such publications into the hands of the public with the least expense and delay.

Stream gauging stations have been maintained in Kentucky in cooperation with the Water Resource Branch of the U. S. Geological Survey at three points, as follows: Cumberland River, at Cumberland Falls; Green River, at Munfordville; the South Fork of the Cumberland River, at Nevelsville, and the Dix River, at Burgin. The salaries of the gage-readers were paid by the Department, while the instruments, etc., were furnished by the U. S. Geological Survey.

Thousands of letters have been answered requesting specific geological information where printed publications are not as yet available.

RECOMMENDATIONS.

(a) That the sum available for topographic mapping in cooperation with the U. S. Geological Survey be increased from \$10,000 to \$20,000 annually. This with the sum available from the U. S. Geological Survey will make available \$40,000 annually for such survey and permit extension of these surveys over areas in which such surveys are urgently needed. As heretofore stated 45% of the state of Kentucky has already

been covered by topographic surveys and it is estimated that the sum of \$776,000 will be necessary to finish completely the topographic sheets for the state. The cost of mapping and maintaining parties in the fields has increased with other activities and the sum of \$10,000 originally appropriated hardly serves to complete one-half the work it would have completed 10 years ago. The necessity of such surveys is shown by the following excerpt from a letter addressed by the Engineering Council to the President of the United States under date of July 1, 1919:

"Every industry, art and science, governmental or otherwise, which demands a knowledge of the lay of the land is depedent on suitable maps. The location of railways and highways; the planning of irrigation, drainage, and water supply projects; the prosecution of geological, soil and forest surveys; the development of water powers and the installation of electric power lines; the improvement and maintenance of inland water-ways and the location of reservoir sites for flood relief and water conservation—all require good maps. If none are available in any particular locality where such projects are developed special maps must be made with consequent increase of cost and loss of time, or the projects must be pursued with that uncertainty and likelihood of error which must always be present in the absence of maps."

(b) For general purposes the appropriation of the Department should be increased from \$15,000 to \$30,000. As heretofore stated, the cost of everything has advanced enormously. Salaries heretofore paid do not serve to secure to the state the services of trained and qualified geologists to pursue the various lies of inquiry, study and investigation required by the demand of the times. This Department is constanty forced by the present limited appropriations to confine its attention to few exceedingly urgent lines of inquiry and investigation and sometimes to depend on outside sources of information not wholly official or reliable. Funds should be available to secure and retain the services of at least two Assistant Geologists, whose entire time might be devoted to the work of the Department and to take advantage of the services during the summer season of geologists from institutions of learning then obtainable.

- (c) Funds for cooperative soil surveys with the Extension Division of the College of Agriculture of the University of Kentucky should also be available.
- (d) Funds for increased analyses of minerals and materials submitted to this office by citizens of the state should be provided. Preferably a small laboratory should be arranged in this Department for a small amount of such work or the services of one man's time at the Agricultural Experiment Station at Lexington, paid for by the Department.
- (e) Funds for the systematic arranging and cataloging of the library now in the possession of this office by an expert should be available. At the present time, the full usefulness of the technical geological and forestry libraries is by no means attained.
- (f) Funds for the systematic purchase of lands suitable for state forests should by all means be provided. Such lands can be made to grow valuable forests, can now be purchased at a relatively low price and can be made to produce crops which in the not so far distant future will be of immense economical benefit to the state besides producing a material revenue. Already many large coal mining companies in Eastern Kentucky are anticipating a decided timber shortage within a few years.
- (g) Funds for active cooperation with individuals, firms and corporations in reforesting waste and cut-over land should be provided, chiefly for the salary and expenses of a field man who may constantly be available for consultation on the ground with interested parties. Cooperation could be secured from the Federal Government if the state had funds available for this purpose.
- (h) Additional funds are urgently needed for the investigation of tree diseases and insect infectations. Already the presence of the chestnut blight in Western Virginia is a serious menace to Kentucky chestnut forests. The spread of the black locust borer is a problem which needs careful study, since this seriously affects the availability of the black locust for reforesting purposes. Other probems of like character demand attention and study.

DEPARTMENT OF GEOLOGY AND FORESTRY SUMMARY OF EXPENDITURES FOR FISCAL YEAR 1919.

OFFICE OF STATE GEOLOGIST

(1)	Salaries		
(1)		\$1:	05.00
	(Parala in the same in the sa		
		16 85	
		ру 56	
	Total		\$3443.67
(2)	Wages		
	(a) Oil Investigation	s	52.25
(3)	Traveling Expenses		
	(a) Misc. Executive	49	27.21
	(b) Oil Investigation	ns 82	24.08
			30.54
		· -	
	Total		1281.83
(4)	Transportation of Mater		
	(a) Misc. Executive		30.13
(6)	Communications		
	(a) Misc. Executive		285.47
(7)	Advertising, Printing an	d Binding	
	(a) Misc. Executive		46.15
(9)	Equipment—Field		
	(a) Investigations		30.00
	(b) Misc. Executive		2.80
	Total		82.80
(10)	Materials and Supplies		
	(a) Misc. Executive		65.33
(12)	Miscellaneous		
	(a) Misc. Executive	6	9.70
	(b) Chemical Analy	ses 6	1.00
	(c) Construction	28	6.00
	Total		416.70
	Grand Total	······································	\$5704.33

DETAILED EXPENDITURES

1918			
7/20	L. M. Sellier, et al	\$246.00	\$246.00
8/10	Adams Express Co.		247.38
8/10	Frankfort Home Tel. & Teleg. Co	2.50	249.88
8/24	Elizabeth Ratliff, et al	121.00	370.88
9/7	Frankfort Home Tel. & Teleg. Co	2.50	373.38
9/24	Elizabeth Ratliff, et al	121.00	494.38
10/7	Frankfort Home Tel. & TelegCo	2.50	496.88
10/7	Ky. Agri. Experiment Station	10.00	506.88
10/24	Elizabeth Ratliff, et al	116.00	622.88
10/25	Chas. H. Scott	75.00	697.88
11/6	Frankfort Home Tel. & Teleg. Co	2.50	700.38
11/6	Adams Express Co.	1.57	701.95
11/6	R. A. Brawner	3.10	705.05
11/6	C. H. Scott (expenses)	99.26	804.31
11/12	G. R. Hughes (stamps)	25.00	829.31
11/23	Elizabeth Ratliff, et al	191.00	1020.31
11/23	Harcourt & Co.	25.50	1045.81
12/2	C. H. Scott (expenses)	88.35	1134.16
12/6	R. A. Brawner	4.00	1138.16
12/6	Frankfort Home Tel. & Teleg. Co.	4.50	1142.66
12/6	Frank R. McGrath	71.00	1213.66
12/9	G. R. Hughes (stamps)	25.00	1238.66
12/17	Elizabeth Ratliff, et al	191.00	1429.66
/ 1.	Zinzabeth Rathir, (it dissination		
1919			
1/9	Metric Metal Works	80.00	1509.66
1/10	W. R. Jillson (expenses)	27.45	1537.11
1/10	W. R. Jillson	150.00	1697.11
1/10	R. A. Brawner	5.00	1692.11
1/10	Frankfort Home Tel. & Teleg	3.00	1695.11
1/10	C. H. Scott (expenses)	103.08	1798.19
1/10	Agri. Exp. Station	51.00	1849.19
1/24	Elizabeth Ratliff, et al	341.00	2190.19
1/31	G. G. Fetter & Co.	30.20	2220.39
2/3	Frankfort Home Tel. & Teleg. Co	2.50	2222.89
2/10	W. R. Jillson (expenses)	102.75	2325.64
2/10	Chas. H. Scott (expenses)	25.90	2351.54
2/20	Elizabeth Ratliff, et al	191.00	2542.54
2/26	Tom Morris	5.00	2547.54
3/1	G. R. Hughes (stamps)	50.00	2597.54
3/7	W. H. Averill's Sons	2.80	2600.34
3/7	C. H. Scott	39.98	2640.32
3/7	Capital Lbr & Mfg. Co	215.00	2855.32
3/7	Rupert Grocery Co	5.75	2861.07
3/7	Remington Typewriter Co	15.60	2876.67

3/7	A. M. Miller	500.00	3376.67
3/7	Frankfort Home Tel. & Teleg. Co	2.50	3379.17
3/14	W. R. Jillson	75.86	3455.03
3/22	Elizabeth Ratliff, et al	191.00	3646.03
4/9	W. R. Jillson (expenses)	131.71	3777.74
4/9	C. H. Scott (expenses)	63.09	3840.83
4/9	Cumberland Tel. & Teleg. Co	11.35	3852.18
4/9	Lexington Herald Co	7.80	3858.98
4/9	John R. Sower Hdwr. Co	4.20	3864.18
4/9	The R. R. Red Book	2.70	3866.88
4/9	W. H. Averill's Sons	4.80	3871.68
4/22	Elizabeth Ratliff, et al	377.67	4249.35
4/25	G. R. Hughes (stamps)	30.00	4279.35
4/30	State Journal Co	1.65	4281.00
5/7	W. H. Averill's Sons	8.50	4289.50
5/7	Adams Express	7.30	4296.80
5/7	Cumberland Tel. & Teleg. Co	21.80	4318.60
5/8	Iley B. Browning (expenses)	130.15	4448.75
5/8	W. R. Jillson (expenses)	133.72	4582.47
5/9	Stanley J. Wilson	26.50	4608.97
5/10	C. H. Scott (expenses)	31.33	4640.30
5/12	G. R. Hughes (stamps)	30.00	4670.30
5/13	Harcourt & Co.	13.50	4683.80
5/14	G. G. Fetter Co.	1.60	4685.40
5/21	Elizabeth Ratliff, et al	336.00	5021.40
6/3	Louisville Paper Co.	4.76	5026.16
6/4	State Journal Co.	5.50	5031.66
6/12	Iley B. Browning (expenses)	139.72	5171.38
6/12	Chas. Butts (expenses)	30.54	5201.92
6/12	W. R. Jillson (expenses)	130.45	5332.37
6/20	·Elizabeth Ratliff, et al	296.00	5628.37
6/25	Adams Express Co	6.83	5635.20
6/25	Keuffel & Esser Co.	2.10	5637.30
6/25	Cumberland Tel. & Teleg. Co	27.03	5664.33
6/25	G. R. Hughes (stamps) (Part)	40.00	5704.33

DEPARTMENT OF GEOLOGY AND FORESTRY SUMMARY OF EXPENDITURES FOR THE FISCAL YEAR 1919 J. E. BARTON, Commissioner

Cooperation with U. S. Geological Survey (Topographic Surveys)

Salaries	\$8228.47
Transportation of Persons	1725.00
Communication	9.00
Rent	37.50

Total \$9999.97

DETAILED EXPENDITURES

9/25	R. H. Runyan, et al	712.50	\$712.50
9/25	A. L. Ackers, et al		1418.50
9/25	W. R. Chenoweth		1506.00
9/25	Garland S. Higgs		1542.67
9/25	P. M. Burton		1583.00
9/25	Preston E. Trice		1627.00
9/25	Walter H. Schoewe, et al	688.33	2315.33
10/7	A. L. Ackers, et al		2939.33
10/7	J. M. Whitman, Jr.		3066.83
10/7	J. L. Lewis	225.00	3291.83
10/7	W. R. Chenoweth	87.50	3379.33
10/8	J. H. Tarpley	90.00	3469.33
10/8	F. E. Jones	25.00	3494.33
10/9	Mrs. Benj. P. Black	300.00	3794.33
10/9	Walter H. Schoewe, et al	687.00	4481.33
11/4	Browder & Hoskins	150.00	4631.33
11/4	Browder & Hoskins	245.00	4876.33
11/4	Dixie Highway Garage	150.00	2026.33
11/4	W. N. Hatfield	75.00	5101.33
11/6	A. L Akers, et al	543.33	5644.66
11/6	A. L. Akers, et al	703.66	6348.32
11/6	W. R. Chenoweth	89.50	6437.82
11/6	W. R. Chenoweth	87.50	6525.32
11/6	J. L. Lewis	227.00	6752.3?
11/8	R. H. Runyan, et al	1225.00	7977.32
11/8	Frank M. Schilling, et al	837.33	8814.65
11/8	Roy H. Bassett	57.00	8871.65
11/8	Robert Hoyle Haynes	49.67	8921.32
11/8	Henry Nevitt	57.00	8978.32
11/8	Mrs. Benj. P. Black	310.00	9288.32
12/2	Morris Brown	18.33	9306.65
12/2	Mrs. Benj. P. Black	120.00	9426.65
12/2	Dixie Highway Garage	50.00	9476.65
12/2	W. N. Hatfield	50.00	9526.65
12/9	Frank L. Whaley	151.00	9677.65
12/9	Frank L. Whaley	31.49	9709.14
1919			
1/10	F. E. Jones	12.50	9721.64
1/10	J. H. Tarpley	90.00	9811.64
1/10	Browder & Hoskins	95.00	9906.64
1/10	J. H. Tarpley	84.33	9990.97
6/25	G. R. Hughes (stamps) (Part)	9.00	9999.97
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DEPARTMENT OF GEOLOGY AND FORESTRY SUMMARY OF EXPENDITURES FOR FISCAL YEAR 1919 OFFICE OF STATE FORESTER

(1)	Salaries	*	
	(a) Fire Protection	\$3,000.00	
	(b) Nurseries	1,842.50	
	(c) Misc. Executive		
	Total		5690.00
(2)	Wages		
	(a) Fire Protection	1,287.40	
	(b) Nurseries	1,318.05	
	(c) Misc. Executive	32.50	
	Total	4	2637.95
(3)	Travel Expenses		
	(a) Fire Protection	217.80	
	(b) Misc. Executive	398.75	
	Total		616.55
(4)	Transportation of Materials		
	(a) Nursery	5.00	
	(b) Misc. Executive	11.50	
	Total		16.50
(6)	Communication		
	(a) Misc. Executive		120.39
(7)	Advertising, Printing and Binding		
	(a) Fire Protection	10.73	
	(b) Misc. Executive	32.28	
	Total		43.01
(8)	Equipment—Office		
	(a) Misc. Executive		16.00
(9)	Equipment—Field		
	(a) Nursery		2.50
(10)	Material and Supplies—Office		
	(a) Misc. Executive		4.37
(11)	Materials and Supplies—Field		
	(a) Nurseries		260.78
(12)	Miscellaneous .		
	(a) Nurseries	19.48	
	(b) Misc Executive	12.64	
	Total	Garage Contract	32.12
	Grand Total		\$9440.17

DEPARTMENT OF GEOLOGY AND FORESTRY

EXPENDITURES AT STATE NURSERIES

Louisville, Ky.

	Louisville, Ry.		
	(a) Labor	\$1323.28	
	(b) Freight, Hauling, etc	12.95	
	(c) Tools and Equipment	7.05	
	(d) Materials—Seed	52.45	
	(e) Materials—other than seed	184.68	
	(f) Repairs	15.10	
	(g) Miscellaneous	2.65	
	(h) Regular Salaries	900.00	
	Total		\$2498.16
	Frankfort, Kentucky		4-100,110
	(a) Regular Salaries		\$942.50
	(a) Regular Salaries		φ342.00
	DETAILED EXPENDITURES		
1918			
7/1	G. G. Fetter & Co.	\$16.84	\$16.84
7/1	John Crawford, et al	144.00	160.84
7/24	Elizabeth Ratliff, et al	422.50	583.34
8/10	Adams Express Co.	.79	584.13
8/10	Frankfort Home Tel. & Teleg. Co	2.50	586.63
8/10	Cumberland Tel, & Teleg. Co	8.20	594.83
8/10	Louisville Hay & Grain Co.	11.70	606.53
8/10	Wood, Stubbs & Co.	3.20	609.73
8/10	John L. Crawford	81.00	690.73
8/10	R. A. Brawner	1.00	691.73
8/10	J. E. Barton (expenses)	12.53	704.26
8/24	Elizabeth Ratliff, et al	475.00	1179.26
9/7	John Crawford, et al	141.00	1320.26
9/7	J. E. Barton (expenses)	57.61	1377.87
9/7	Frank Kavanaugh	2.00	1379.87
9/7	Cumberland Tel. & Teleg. Co	5.55	1385.42
9/7	Frankfort Home Tel. & Teleg. Co	2.50	1387.92
9/7	Louisville Hay & Grain Co	29.20	1417.12
9/24	Elizabeth Ratliff, et al	475.00	1892.12
10/2	State Journal Co.	20.88	1913.00
10/7	John Crawford, et al	132.50	2045.50
10/7	J. E. Barton (expenses)	26.14	2071.64
10/7	Cumberland Tel. & Teleg. Co	4.20	2075.84
10/7	Frankfort Home Tel. & Teleg. Co	2.50	2078.34
10/7	Henry Heick Hdwe. Co	.65	2078.99
10/7	Louisville Hay & Grain Co.	14.56	2093.55
10/7	G. R. Hughes (stamps)	50.00	2143.55

10/24	Elizabeth Ratliff, et al	475.00	2618.55
11/5	Louisville Hay & Grain Co.	12.25	2630.80
11/6	Frankfort Home Tel. & Teleg. Co	2.50	2633.30
11/6	Cumberland Tel. & Teleg. Co	9.57	2642.87
11/6	Mike Berg	2.65	2645.52
11/6	J. R. Buckman	104.00	2749.52
11/6	John Crawford, et al	254.40	3003.92
11/9	State Journal Co.	5.06	3008.98
11/12	J. E. Barton (expenses)	17.56	3026.54
11/23	Elizabeth Ratliff, et al	475.00	3501.54
12/2	Harry F. Price (expenses)	18.61	3520.15
12/2	Louisville Hay & Grain Co.	14.30	3534.45
12/5	Louis Oestreich	4.00	3538.45
12/6	Alberecht Sons Hdwe. Co.	1.35	3539.80
12/8	John Crawford, et al	395.00	3934.80
12/9	Cumberland Tel. & Teleg. Co.	6.95	3941.75
12/9	J. E. Barton (expenses)	15.84	3957.59
12/17	Elizabeth Ratliff, et al	475.00	4432.59
1919			
9/9 (Cumberland Tel. & Teleg. Co	4.89	4437.48
1/10	Louisville Hay & Grain Co.	28.06	4465.54
1/10	J. E. Barton (expenses)	82.79	4548.33
1/10	Ottie Hall	106.00	4654.33
1/10	S. K. Vaught	24.00	4678.33
1/10	John Crawford	57.00	4735.33
1/24	Elizabeth Ratliff, et al	475.00	5210.33
2/1	Samuel Glenn	18.50	5228.83
2/1	Carrico Bros.	27.00	5255.83
2/3	Clarence Palmer	10.00	5265.83
2/3	Albrecht Sons Hdwe. Co.	1.15	5266.98
2/3	Cumberland Tel. & Teleg. Co.	4.93	5271.91
2/4	Mike Berg	3.05	5274.96
2/7	Louisville Hay & Grain Co.	3.40	5278.36
2/10	J. E. Barton (expenses)	47.42	5325.78
2/10	John Crawford, et al	91.00	5416.78
2/20	Elizabeth Ratliff, et al	475.00	5891.78
3/7	John Crawford	72.00	5963.78
3/7	Cumberland Tel. & Teleg. Co.	6.60	5970.38
3/7	Wirth Bros.	1.85	5972.23
3/10	J. E. Barton (expenses)	94.16	6066.39
3/22	Elizabeth Ratliff, et al	475.00	6541.39
4/3	State Journal Co.	17.01	6558.46
4/9	Frankfort Home Tel. & Teleg. Co	3.00	6561.46
4/9	Louisville Hay & Grain Co.	11.40	6572.86
4/9	Louis Oestreich	4.00	6576.86
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4/9	Albrecht Sons Hdwe, Co	.65	6577.51
4/9	Mike Berg	.98	6578.49
4/9	Wirth Bros.	3.15	6581.64
4/9	John Crawford, et al	194.00	6775.64
4/10	J. E. Barton (expenses)	16.46	6792.10
4/22	Elizabeth Ratliff, et al	475.00	7267.10
5/6	Wirth Bros	1.60	7268.70
5/7	Frankfort Home Tel. & Teleg. Co	2.75	7271.45
5/7	Albrecht Sons Hdwe. Co	.65	7272.10
5/8	J. E. Barton (expenses)	108.16	7380.26
5/8	H. F. Price (expenses)	86.93	7467.19
5/8	John Crawford, et al	329.00	7796.19
5/8	C. H. Click, et al.	116.00	7912.19
5/9	Louisville Hay & Grain Co.	41,43	7953.62
5/21	Elizabeth Ratliff, et al	475.00	8428.62
5/12	J. E. Barton (expenses)	88.72	8517.34
6/12	John Crawford, et al	351.50	8868.84
6/12	Elizabeth Ratliff, et al	517.50	9386.34
6/25	Wood, Stubbs & Co	3.75	9390.09
6/25	Wirth Bros,	525.25	9395.34
6/25	Louisville Carriage & Taxi Co	5.00	9400.34
6/25	Frankfort Home Tel. & Teleg. Co	3.75	9404.09
6/25	Louisville Hay & Grain Co.	33.48	9437.57
6/25	Albrecht Sons Hdwe. Co	2.60	9440.17