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Publisher: Routledge

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Journal of Geography

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rjog20>

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Published online: 07 Feb 2008.

To cite this article: John E. Smith (1914) Geographic Control of Transportation in the Southeast, Journal of Geography, 12:9, 301-307, DOI: [10.1080/00221341408983630](https://doi.org/10.1080/00221341408983630)

To link to this article: <http://dx.doi.org/10.1080/00221341408983630>

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THE JOURNAL OF GEOGRAPHY

VOLUME XII

MAY, 1914

NUMBER 9

GEOGRAPHIC CONTROL OF TRANSPORTATION IN THE SOUTHEAST

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University of North Carolina, Chapel Hill

THE area here included in the term Southeast extends from the Appalachian Mountains to the Atlantic Ocean and from the Potomac River to the Floridan Province whose boundary is approximately a line from Montgomery, Ala., to Savannah, Ga. This term is sometimes used to include the Eastern Gulf States. This area has a maximum width of nearly 300 miles and is about 700 miles in length. It is the principal avenue of land transportation between the large area in the warm temperate and sub-tropical climates of the Southern Coastal Plains producing enormous quantities of raw materials, and the excellent harbors and great centers of manufacture and distribution on Chesapeake waters and northward. It has become this thoroughfare largely because it is directly in line between these factors of production and distribution, but this location has been partially determined by the influence of the Southern Coastal Plains producing enormous quantities of raw materials of the great mountain barrier on its western border.

PHYSIOGRAPHY

As a whole this mountain region is a belt of ridges bounding the Great Valley. East of this barrier there are two large and distinct physiographic provinces each long and narrow and in general parallel to the mountains and to the coast.

The Piedmont Plateau or "Upper Country", a maturely dissected peneplain, has an elevation of 1200 feet or more where it meets the mountains on the west and slopes somewhat uniformly to its eastern margin where the altitude varies from 300 to 500 feet. Underlying this belt is the Basement Complex consisting chiefly of igneous and metamorphic rocks. A larger proportion of rough topography along the eastern margin of this plateau than elsewhere in it, with the elevation of this margin above the Coastal Plain, helps to make it a distinct province of transportation. The width of the Piedmont at the south, nearly 150 miles, and its elevation there, 1000 feet or more, decrease with varying uniformity northward to the Potomac where it is a narrow strip at tidewater.

Stretching eastward to the ocean from an elevation of 200 to 400 feet along the margin of the Piedmont lies the Atlantic Coastal Plain. The rocks of this plain are of sedimentary origin and the "Fall Line" is formed by the

meeting of these physiographic provinces. In North Carolina, however, the rocks of the Basement Complex outcrop in the streams and valleys twenty to forty miles east of this line and Raleigh is thirty miles west of the rapids. The Coastal Plain is naturally divided into three parts.*

The western one is in part an area of Triassic sandstone and shale. This is the fall line region and is known as the Pine Barren, also as the "Sandhill Section."† It is thirty to forty miles wide and varies from 200 to 400 feet in elevation.

The Upper Pine Belt is the middle subdivision of the Coastal Plain and is 100 to 300 feet in elevation.‡ Its topography is much like that of the Pine Barren but is less rugged.

The eastern part of the Coastal Plain is low and very level, much of it being less than thirty feet above the sea and it rarely exceeds sixty except toward its western border where it grades insensibly into the Upper Pine Belt at an elevation of nearly 100 feet. This is the Lower Pine Belt.**

The relief of these provinces varies directly as the elevation. The swamps and pocosons of the Lower Pine Belt are due to insufficient relief for drainage. As the distance increases westward across these belts, the elevation increases, the surface becomes more rugged, and the topography advances through the stages of youth to those of maturity in a region of slight relief and to a typical mature region of greater relief in the Piedmont; here the new base level is being cut by lateral planation, in numerous places 200 feet below the remaining surface of the upland peneplain (See Columbia and Gaffney, S. C., and Charlotte, N. C., quadrangles, U. S. Geological Survey).

The Mountain Region comprises the highest land in the United States east of the Mississippi River with Mt. Mitchell (6711 ft.) as the culminating point, and numerous others a mile or more above sea level. The mountain passes—water gaps and wind gaps—are 500 to 1500 feet higher in North Carolina than those used by the railways in Virginia and northward.

TRANSPORTATION LINES

Each of these natural provinces is the location of a system of north-south transportation. The Southern Railway traverses the Piedmont Belt. Its shorter branches are in the Piedmont but some of the longer ones extend into the Great Valley and westward. On the Coastal Plain it reaches Norfolk and Savannah and extends southward into Florida.

The Seaboard Air Line is the fall line road and the line direct to the State capitals. It extends southward from Petersburg, Va., and parallels the Piedmont road about 60 to 70 miles east of it in the Pine Barrens. Its

*Emerson, F. V., *Geographical Influences in American Slavery*, Bul. Am. Geog. Soc., Feb., 1911.

†Glenn, L. C., *Geography of South Carolina*, Supplement in Natural School Geography, Redway and Hinman.

‡See the following topographic sheets, U. S. G. S.: Rocky Mount, Kenly, Four Oaks.

**See Newbern, Chocowinity, and Beckford quadrangles, U. S. G. S.

shorter branches are in a region of topography like that of the main line but it reaches Atlanta and Birmingham via a line from Wilmington, N. C., part of which is on the Coastal Plain and part in the Piedmont. From Columbia, S. C., the main line extends into Florida on the Coastal Plain.

Traversing the Upper Pine Belt, the Atlantic Coast Line Railway parallels the fall line road about twenty miles east of it.

Map Showing Topographical Adjustment of Railway Systems in the Southeast.

The rapid agricultural and industrial development in the Southeast has given rise to a relatively new road—the Norfolk Southern Railway. This line extends from Norfolk to Beaufort, N. C., on the Lower Coastal Plain.

In the Great Valley there are a few lines of minor importance whose chief service is to transport coal to the larger roads. The Carolina, Clinchfield, and Ohio is one of these. It is now building to Charleston, S. C. The Virginian Railway is a coal road to Norfolk. In Virginia where the Piedmont is narrow and the Great Valley broad and fertile, the Norfolk and Western operates a line along the latter to northern connections.

EAST-WEST LINES

In each of the states of this area there are cross roads to the principal harbors that are not reached by the main lines and each north-south system enters two or more of these ports. On these harbors are Savannah, Charleston, Wilmington, Richmond, Norfolk and Newport News. Wilmington, N. C., recently became distinguished by shipping to England the largest cargo of cotton that ever left an American port. It consisted of 20,324 bales valued at \$1,525,000. Wilmington is reached by five lines owned by two of the north-south systems. Attention is now being directed toward Cape Lookout where the Government is preparing to construct an enormous breakwater to improve the natural harbor with its depth of forty feet. The Norfolk Southern is now building to this point and will transport coal received from connecting lines at Charlotte to the new deep-water harbor. The Norfolk and Western has a right of way and will build an extension from Durham, N. C., to Cape Lookout. It will bring coal for the Panama trade via Lynchburg, Va., to a deep water harbor at a point safely south of Cape Hatteras and its many dangers to navigation.

Clustered about the harbor at Hampton Roads are half a dozen cities whose existence depends primarily on the receipt and transfer of commodities both foreign and domestic. Among these are Hampton, Newport News, Portsmouth, and Norfolk. Their total population equals that of Richmond, located on tidewater but eighty miles inland. The Government maintains a deep water channel to the Navy Yard at Portsmouth. "All roads lead to Norfolk."

The efficiency of the mountains on the west as barriers is shown by the fact that it is three to five hours shorter from most points in North Carolina to Kansas City, Mo., via Atlanta and the Frisco's Jacksonville Flyer through Birmingham, Memphis, and Springfield, Mo., than by any route across the mountains via Louisville and St. Louis. A train in operation to Memphis via Asheville, N. C., was recently discontinued because of the easier and quicker route through the Gulf States.*

In Virginia and northward the economic necessity for east-west transportation is sufficiently great to justify the expense of constructing important trunk lines across the Appalachian barrier, and numerous roads follow the lines of least resistance along picturesque streams and through tunnels or via water gaps and wind gaps from the fertile valley of the Ohio to the level of the sea. Among these are the Chesapeake and Ohio Railway, and the Norfolk and Western.

TOPOGRAPHIC CONTROL

"Geological structure, and resulting geographic conditions, have determined the direction of our system of internal improvements, from the days

*Prof. Collier Cobb, "Geographic Factors in the Making of Atlanta," an address before the A. A. A. S., reported in the *Atlanta Constitution*, Jan. 1, 1914.

of waterways and plank roads down to the present. The united will of the people has been unable to give us a State system of railroads. Our old North Carolina Railroad from the mountains to the sea has been turned aside by the strike of the rocks, the geological structure of the country, to build up other states and other ports than ours.**

The early roads built in the Carolinas to meet local requirements have been absorbed by the north-south systems. Those located chiefly on the Coastal Plain became the property of the larger lines traversing the provinces of the Coastal Plain, and the roads lying chiefly in the Piedmont were taken over by the *Piedmont Line*. In some instances those parts of the old roads built in the Piedmont were bought by the Southern Railway and those parts built on the Coastal Plain were absorbed by the trunk lines that traverse the lower provinces.

OPERATING COST PER MILE OF ROAD*

Road		Maintenance of way and structures	Maintenance of equipment	Traffic expenses	Transportation expenses	General expenses	Total
Piedmont Belt, South- ern Ry.....	July, '12 to Mch., 1913, inclusive	\$975	\$1210	\$219	\$2513	\$213	\$5130
Fall Line, Seaboard A. L. Ry.....		790	822	186	2156	168	4122
Upper Coastal Plain, A. C. L.....		781	891	103	2059	150	3984
Lower Coastal Plain, N-S.		547	588	78	1398	245	2856
Piedmont Line, South- ern Ry.	Dec. 1912	108	134	24	293	26	585
Fall Line Road, S. A. L. Ry.	July	103	136	23	265	22	549
Upper Coastal Plain Line	Dec.	93	94	21	251	20	479
Lower Coastal Plain Line	July	90	83	21	210	17	421
	Dec.	85	97	12	241	17	452
	July	83	104	9	211	16	423
	Dec.	62	64	8	160	28	322
	July	59	61	10	164	25	319

The influence of topography on the cost of operating these railways is shown in the above table, the upper half of which gives the aggregate expense per mile from July, 1912 to March, 1913 inclusive, and the remaining part shows seasonal differences per mile.

**Prof. Collier Cobb, "Geographical Influences in the Development of North Carolina," Address, reported in *The News and Observer* (Raleigh), July 2, 1896.

*"Bulletin of Revenues and Expenses of Steam Roads in the United States," Interstate Commerce Commission.

A comparison of the expenses in the column of totals for each group shows that they vary directly as the elevation and consequently as the relief of the provinces traversed by the respective roads. An inspection of the figures in the other columns of cost per mile shows the same relation to topography with but two exceptions in the group of aggregates and only six among the items of monthly expense. All exceptions in the column of General Expenses are due to the shorter mileage of the Norfolk Southern line. The same general relation exists among the total costs (right of way, constructing, etc.) per mile of these roads to 1911 inclusive, which are as follows: Southern Railway (Piedmont), \$57,986; Seaboard Air Line (Fall Line, Pine Barrens), \$51,045; Atlantic Coast Line (Upper Pine Belt), \$34,411; Norfolk Southern (Lower Pine Belt), \$31,633.‡

INFLUENCE OF CLIMATE

The total expense per mile in each province as given in the table is larger in December than in July showing a seasonal difference. The expenditure per mile during July increases with the elevation and relief and the cost of operation for December is also adjusted to the topography of the respective provinces. The figures given under the individual items of expense reveal the fact that, in fifteen comparisons among these details, there are but four exceptions to this adjustment for July and only two for December. The differences between the total expense for December and July for the four physiographic provinces in their order from the sea, are \$3, \$29, \$58, and \$36. In this we see the seasonal variation of a littoral climate contrasted with that of a plateau climate with some degree of gradation between the two.

The effect of climate on the expense per mile as the season advances is well illustrated by the following monthly totals for the Seaboard Air Line Railway in 1912: Aug. \$415; Sept., \$422; Oct., \$456; Nov., \$471; Dec., \$479.* The corresponding data for the other lines in this area show a similar adjustment to seasonal change.

SUMMARY AND CONCLUSIONS

The railway systems of the Southeast are in topographic adjustment, each physiographic province being traversed by one system. The expenditures of the respective roads vary directly as the elevation and relief of the provinces traversed.

The Southern Railway is a plateau line, chiefly in the Piedmont. It has branches in the Cumberland Plateau and some in the adjacent mountain region which tends to increase the expenses per mile.

*Data from bulletins of Interstate Commerce Commission.

‡Data from report of North Carolina Corporation Commission for 1911.

The Atlantic Coast Line Railway has a larger proportion of its mileage in the Lower Pine Belt than has the Seaboard Air Line Railway. This tends to reduce the expenditures of the Coast Line slightly more than those of the Seaboard.

The same factors that cause the railroads to parallel the mountains in the Southeast, force railway systems to cross the Appalachian barrier in Virginia and northward.

New roads are building or preparing to build to every deep water harbor south of Cape Hatteras to supply coal for the Panama trade.

The expenditures of a railway system conform to the season of the year. The difference between the influence of an equable climate and that of an upland continental one, with intermediate gradations, is expressed by monetary values in the expenditures of steam roads among the natural physiographic provinces of the Southeast.

TEACHERS OF GEOGRAPHY

THE teacher of geography in American normal schools is expected to be a versatile person. According to information compiled by the United States Bureau of Education, the teacher of this subject generally has it assigned to him as one of a number of different subjects. In only 26 out of 233 public normal schools is there a teacher who teaches geography and nothing else.

In two public normal schools the geography teacher handles ten other subjects. Eight other subjects besides geography are taught by the same teacher in three normal schools, and seven in the case of four others. Many of the schools allot five and six subjects with geography to the same teacher. In private normals similar versatility is required; geography frequently occurs as one of seven or eight subjects in charge of one teacher.

Generally the subjects are more or less closely related, but sometimes they embrace several widely divergent fields. Geography and history form a frequent and natural combination, as do geography and nature study. Geography and drawing are sometimes combined. On the other hand, music is added to these combinations with the effect of broadening the requirement considerably.

There are many other groupings of subjects resorted to by the normal schools for obvious reasons of economy. In a western normal school of excellent standing one teacher has the following program: Geography, chemistry, agriculture, photography, nature study, geology, grammar, and school architecture.