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Growth Data from Sections of Acer saccharum

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The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana's vegetation in past decades. Authors were Butler faculty, current and former master's degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler's first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner , included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight. W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daubenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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GROWTH DATA FROM NINE SECTIONS OF ACER SACCHARUM FROM MONTGOMERY COUNTY, INDIANA

By CHESTER W. MILLER

Nine sections of *Acer saccharum* were cut in 1940, following logging operations on the Albert Smith farm 13 miles southwest of Crawfordsville and about 3 miles east of Alamo, Indiana. Rainfall data were secured from the U. S. Weather Bureau Station which is located at Crawfordsville approximately 13 miles northeast from the forest in which the trees grew. Unfortunately, the rainfall data are not complete from 1884 through 1910; consequently, no growth-rainfall correlation could be determined for those years. Rainfall behavior charts were prepared for the rainfall periods May-August, May-June, May-July, June-July and June-August (1).

Growth as shown by annual-ring width was measured along three radii of each section. Measurements were made under a 10X magnifier and to the nearest quarter millimeter. Growth behavior charts were prepared from the sums of the measurements of the three radii for each section individually. Fuller (2) used the averages of three radii in his work with oak in Illinois. In a previous paper (3) dealing with three deciduous species of trees from Brown County, Indiana, the sums of the measurements of four radii were used.

Tables are presented, showing the average yearly growth (in millimeters) for each of the nine sections of *Acer saccharum* and growth-rainfall trend coefficients (4) i.e., the percentage of agreement in sign of the year to year changes between rainfall and growth, for the different rainfall periods.

OBSERVATION

The average yearly radial growth of the 9 sections is shown in table I. It may be noted that the oldest section, 40A-12, gives growth data back to and including 1710. These total data are presented because they cover a longer period of time than has been reported in any previous Indiana studies.

Growth-rainfall trend coefficients for the different month combinations are shown in table II. *Acer saccharum* shows its highest trend coefficient in the present study for the rainfall period June-July. This indicates that annual radial growth in this area is more sensitive to rainfall changes during the early summer months. Friesner (1) found the highest trend coefficient for this species to occur during the rainfall period May-August. This was on sites with considerable relief and hence subject to excessive run-off.

SUMMARY AND CONCLUSIONS

1. Annular-ring growth data of *Acer saccharum* is given to and including the year 1710.

2. In the present study, the highest growth-rainfall trend coefficient is shown for the rainfall period June-July.

LITERATURE CITED

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3. MILLER, CHESTER W. The effect of precipitation on the annular-ring growth in three species of trees from Brown County, Indiana. Butler Univ. Bot. Stud. 9(17). 1950.
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TABLE I

Showing the average annual radial growth of nine sections of Acer saccharum

	Section Number								
Year	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1940	0.4mm	1.1mm	3.2mm	1.5mm	2.6mm	1.7mm	1.3mm	1.6mm	0.7mm
1939	0.4	1.4	2.0	1.7	3.7	2.0	1.4	2.6	1.2
1938	0.4	1.0	2.0	1.4	0.6	2.3	1.1	4.0	0.9
1937	0.3	0.6	3.6	1.1	3.1	1.3	0.6	2.6	1.2
1936	0.5	0.7	2.6	1.0	1.9	0.8	0.2	1.2	1.5
1935	0.6	1.3	1.3	2.0	1.6	1.2	1.0	1.7	1.9
1934	0.5	0.6	3.5	1.6	2.1	0.5	0.3	1.3	1.8
1933	0.8	0.4	3.0	1.4	0.8	1.1	0.9	1.7	1.0
1932	0.6	0.4	1.6	2.1	1.2	1.6	1.1	3.6	1.5
1931	0.4	0.8	1.3	1.1	3.1	0.6	0.6	2.8	1.9
1930	0.5	3.0	2.7	1.0	0.9	1.0	1.1	2.2	1.8
1929	0.6	4.8	2.6	1.0	2.1	1.6	1.6	3.3	0.6

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

Year	Section Number								
	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1928	0.8	2.8	2.4	1.5	2.6	2.1	3.0	3.4	1.2
1927	1.0	2.5	2.1	1.0	3.6	1.3	2.5	2.9	1.6
1926	1.0	3.3	2.2	1.0	2.1	1.1	1.5	2.7	1.9
1925	1.4	2.6	3.5	1.1	1.2	1.5	2.1	1.2	1.2
1924	0.6	2.9	3.1	1.0	0.8	1.7	2.1	1.4	0.7
1923	1.2	1.3	0.9	0.8	0.9	1.0	0.7	1.5	1.0
1922	0.9	4.1	2.1	0.6	0.3	1.0	0.4	2.0	1.2
1921	1.0	2.2	2.3	0.7	0.5	0.9	0.8	1.6	0.9
1920	1.4	2.9	1.3	0.6	1.6	1.1	0.8	1.5	0.6
1919	2.7	2.5	1.7	0.8	1.7	0.8	0.7	1.4	0.9
1918	1.8	1.5	1.7	0.5	1.4	1.1	0.6	2.1	1.2
1917	2.0	3.5	2.0	0.9	0.8	1.7	1.1	2.6	1.2
1916	2.3	3.0	2.1	1.1	0.9	2.1	1.6	1.8	1.1
1915	3.1	0.8	2.1	0.4	1.3	1.6	1.4	1.8	0.9
1914	1.5	1.7	2.6	0.7	1.7	0.7	0.4	2.8	1.6
1913	2.5	2.7	2.0	1.0	0.8	1.0	1.0	1.9	2.0
1912	4.6	2.4	1.5	1.1	1.4	1.6	1.0	3.2	2.1
1911	1.6	2.8	1.3	1.0	1.7	1.0	0.8	3.1	2.8
1910	4.3	3.0	1.7	1.2	1.0	1.3	1.1	3.3	2.9
1909	4.8	5.1	2.5	1.1	1.9	1.1	1.4	3.2	3.1
1908	3.8	4.7	2.1	1.5	2.1	1.9	1.4	1.2	1.8
1907	4.7	6.2	1.6	1.5	2.3	2.7	1.6	1.2	2.6
1906	4.1	6.6	2.1	1.5	2.3	2.5	1.7	2.1	3.5
1905	4.1	4.4	2.8	2.0	2.0	3.1	2.1	1.7	3.7
1904	4.3	4.5	2.6	1.9	2.3	2.8	2.1	2.2	3.6
1903	4.2	2.1	1.8	2.0	2.9	2.1	1.6	2.1	4.3
1902	4.5	2.5	0.5	1.6	2.6	3.1	1.6	1.4	4.5
1901	3.4	2.7	0.7	1.9	2.4	2.1	1.7	2.4	2.4
1900	4.4	2.3	0.5	1.6	2.5	2.1	1.3	2.5	2.6
1899	5.1	2.1	0.5	2.1	3.3	2.4	1.6	2.7	3.1
1898	4.8	2.3	0.5	3.2	2.7	2.2	1.1	2.5	3.7
1897	2.8	2.3	0.5	3.5	2.8	2.4	1.6	3.2	3.6
1896	5.1	2.1	0.7	4.6	2.7	3.6	1.2	1.7	4.0
1895	2.7	1.9	0.5	2.0	2.8	1.2	0.5	2.5	3.4
1894	3.8	0.8	0.2	2.6	1.3	2.4	0.8	2.2	2.1
1893	1.9	0.9	0.2	2.2	2.6	2.0	1.2	2.6	2.7
1892	2.8	0.7	0.2	4.5	1.7	2.8	1.0	1.9	3.9
1891	2.8	2.0	0.2	3.2	2.3	1.5	0.8	3.5	4.2
1890	2.1	2.2	0.5	4.8	2.0	1.1	1.4	7.8	4.3
1889	2.1	0.6	0.2	5.3	2.9	1.6	1.5	4.4	3.5
1888	2.1	1.5	0.5	3.6	4.2	1.2	0.5	4.4	2.6
1887	2.3	2.2	0.2	2.7	2.8	1.2	0.7	8.0	3.5

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

Year	Section Number								
	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1886	1.6	2.6	0.2	4.3	2.6	2.6	1.0	7.6	3.6
1885		1.4	0.5	4.0	3.5	2.4	1.2	9.0	2.3
1884		0.5	0.5	3.9	3.5	2.4	1.1	7.6	1.1
1883		0.6	0.5	3.2	4.4	2.2	0.8	5.5	1.2
1882		0.8	0.5	2.2	2.8	2.2	0.3	4.9	1.6
1881		0.9	0.5	1.6	1.6	2.3	0.4	6.5	2.2
1880		0.6	0.5	1.5	1.2	2.3	0.2	4.5	2.7
1879		1.2	0.2	1.1	2.3	1.2	0.8	6.2	0.7
1878		1.7	0.5	1.0	1.6	1.5	0.3	5.1	0.5
1877		1.7	0.2	1.5	2.1	3.1	0.3	6.4	0.7
1876		1.1	0.5	1.6	2.1	3.5	0.6	2.6	0.5
1875		1.4	0.2	1.6	2.2	1.5	0.6	2.2	0.5
1874		2.1	0.7	1.3	2.0	1.5	0.6	2.1	0.5
1873		0.6	0.2	2.1	1.4	0.6	0.8	2.4	0.5
1872		0.5	0.2	2.7	1.1	0.8	0.4	0.8	0.5
1871		0.6	0.7	5.1	1.1	0.6	0.6	0.9	1.3
1870		1.4	1.0	0.2	0.8	0.7	0.9	2.2	1.7
1869		1.0	1.0	0.2	0.9	1.0	0.4	0.6	2.8
1868		1.2	0.5	0.2	1.2	0.5	0.6	1.1	3.3
1867		1.3	0.2	0.2	0.0	0.5	0.7	1.1	5.1
1866		1.0	0.2	0.2	1.2	0.7	1.0	1.0	10.0*
1865		1.3	0.5	0.5	1.6	0.6	0.9	1.6	1.1
1864		2.7	0.5	0.7	1.1	0.8	0.6	2.1	0.6
1863		2.0	0.5	0.5	1.5	0.7	0.6	3.1	0.8
1862		2.3	0.7	1.0	2.2	0.8	0.7	4.6	0.5
1861		2.8	0.5	0.7	3.1	1.3	0.8	10.4*	0.5
1860			1.0	1.0	3.6		1.1	0.6	0.8
1859			1.3	0.5	5.0		0.6	0.5	0.5
1858			1.3	0.5	1.0		0.6	0.9	0.4
1857			1.2	0.7	0.4		0.8	0.9	0.4
1856			1.3	1.5	1.0		1.2	0.4	0.5
1855			1.2	1.0	0.5		0.9	0.9	0.9

* These measurements were for the first year following cessation of removal of sap for syrup-making, as evidenced by the "overgrowing" of spile-holes in these two sections. It is to be noted that these "excessive" year-ring widths climax long periods of small amounts of growth and that they are followed by much higher annual radial growth than occurred during the earlier years when, presumably, sap was being removed annually. It is probable that the other seven sections also have a sap-removal history though no spile holes were encountered when the sections were cut from the tops of stumps left by logging operations.

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

	Section Number								
Year	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1854			0.9	1.1	0.3		0.9	0.6	0.5
1853			1.0	0.5	0.5		0.7	0.8	0.1
1852			1.0	0.5	0.3		0.4	1.0	0.9
1851			1.5	0.5	0.6		0.8	0.8	1.6
1850			1.5	0.5	0.5		0.4	0.9	2.2
1849			1.9	0.5	0.7		0.6	1.0	1.0
1848			0.6	0.9	0.6		0.9	1.0	0.6
1847			2.1	0.8	0.6		0.7	0.9	1.1
1846			1.9	0.9	0.6		1.5	0.9	2.0
1845			1.8	1.8	0.6		0.9	0.6	1.8
1844			1.9	1.0	0.7		1.1	0.8	1.2
1843			1.6	0.8	0.6		1.1	0.9	2.0
1842			1.5	0.9	0.9		1.8	1.0	2.1
1841			1.6	0.8	0.9		1.0	0.9	1.9
1840			1.7	1.1	1.1		1.3	1.0	2.9
1839			2.5	0.7	1.0		1.9	0.8	3.5
1838			2.0	0.8	1.0		2.1	0.8	1.5
1837			1.6	1.0	1.4		2.2	1.2	1.1
1836			2.3	0.9	1.2		2.1	1.2	1.9
1835			1.8	1.7	1.0		2.1	0.8	1.4
1834			1.9	1.6	1.2		1.6	1.0	1.1
1833			1.1	1.1	1.3		1.3	0.9	0.6
1832			0.9	0.6	1.0		1.9	1.4	0.9
1831			1.1	0.9	0.8		2.2	1.4	1.6
1930			1.2	0.6	1.1		2.1	1.4	1.5
1829			1.1	0.9	1.0		2.0	0.6	2.3
1828			1.5	0.6	1.0		1.5	0.8	0.7
1827			1.6	0.7	0.5		1.9	1.1	1.3
1826			1.6	1.1	1.2		2.1	1.5	1.1
1825			2.1	1.0	1.0		2.4	1.8	1.3
1824			2.1	0.8	1.2		2.1	2.4	2.0
1823			1.5	0.8	1.1		2.8	1.4	2.4
1822			1.4	1.1	0.9		2.6	1.2	1.9
1821			1.5	1.0	0.6		2.5	2.1	2.2
1820			1.1	0.9	1.0		2.3	2.5	3.0
1819			1.4	1.4	1.0		2.7	1.8	2.5
1818			1.9	1.3	1.1		2.4	1.8	2.6
1817			0.7	1.4	1.6		1.9	2.5	2.8
1816			1.1	1.3	1.1		2.2	2.0	3.6
1815			1.6	1.2	0.8		2.3	2.2	3.6
1814			1.1	1.6	1.0		2.1	1.5	2.8
1813			1.7	1.6	1.9		1.9	1.0	0.9

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

Year	Section Number								
	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1812			1.4	1.5	1.4		2.9	1.4	0.7
1811			1.4	2.4	1.4		2.3	1.2	1.0
1810			1.5	2.6	1.6		1.7	1.5	1.5
1809			2.0	1.6	1.1		1.9	2.2	2.1
1808			1.7	1.6	1.1			1.2	1.6
1807			1.1	0.9	0.7			1.0	1.1
1806			1.2	1.3	1.1			1.2	2.2
1805			1.7	1.1	1.3			1.8	1.6
1804			1.3	1.3	1.2			1.5	1.1
1803			1.3	1.6	1.3			2.2	1.8
1802			1.7	1.0	1.4			2.0	1.6
1801			1.9	1.5	0.9			1.6	1.5
1800			1.8	1.0	1.0			1.5	1.6
1799			1.6	2.2	1.1			1.2	2.1
1798			1.6	2.5	1.3			1.6	1.6
1797			1.5	2.0	1.6			2.2	0.9
1796			1.2	1.7	1.1			2.5	2.2
1795			1.0	1.6	1.3			2.6	1.7
1794			1.5	2.0	1.3			1.9	2.1
1793			1.2	2.1	1.2			2.4	1.6
1792			2.1	1.8	0.6			1.6	2.3
1791			1.5	3.4	1.1			1.5	1.1
1790			2.0	1.6	1.5			1.9	0.8
1789			1.7	3.1	1.3			1.2	1.1
1788			2.3	3.5	1.7			1.0	1.3
1787			1.8	1.8	1.1			1.6	1.5
1786			2.1	2.0	1.7			1.5	1.9
1785			1.3	2.1	1.1			0.9	2.1
1784			1.5	1.1	1.1			0.9	
1783			1.1	2.1	1.6			1.0	
1782			2.1	1.6	1.2			1.7	
1781			1.6	1.5	1.1			0.7	
1780			1.9	1.9	1.2			1.2	
1779			1.7	1.6	1.4			0.9	
1778			1.9	1.6	1.1			1.5	
1777			2.1	1.7	1.0			1.0	
1776			2.1	1.1	1.4			1.5	
1775				1.5	1.4			1.6	
1774				1.6	1.0			0.7	
1773				1.8	1.3			1.5	
1772				1.0	0.8			1.2	
1771				1.6	1.1			1.0	

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

	Section Number								
Year	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1770				1.5	1.2			1.7	
1769				1.0	1.1			1.0	
1768				2.2	1.9			1.6	
1767				1.0	1.5			1.1	
1766				1.2	1.6			1.4	
1765				0.7	1.4			1.4	
1764				1.0	1.2			1.1	
1763				1.4	1.9			1.9	
1762				0.6	3.1			1.2	
1761				1.1	1.7			2.0	
1760				0.8	1.6			1.0	
1759				1.0	1.7			0.7	
1758				1.0	1.8			1.0	
1757				1.0	1.2			1.2	
1756				1.5	1.9			1.0	
1755				1.0	1.4			1.7	
1754				1.6	2.0			1.5	
1753				1.0	1.3			1.6	
1752				1.0	1.3			1.6	
1751				0.8	1.5			1.5	
1750				1.1	1.3			2.0	
1749				0.7	1.3			1.5	
1748				1.0	1.6			2.4	
1747				1.0	1.1			1.5	
1746				1.1	1.4			1.9	
1745				0.9	1.8			1.6	
1744				0.6	1.9			2.0	
1743				0.5	2.0			1.0	
1742				0.5	1.6			1.9	
1741				0.9	1.3			1.1	
1740				0.6	2.1			1.1	
1739				0.6	2.2			1.6	
1738				0.8	2.1			1.5	
1737				0.4	1.8			0.7	
1736				0.4	1.4			1.5	
1935				0.4	1.4			1.0	
1734				0.4	1.4			0.7	
1733				0.6	1.6			1.6	
1732				0.4	1.1			1.4	
1731				0.3	1.0			1.4	
1730				0.5	1.9			0.9	
1729				0.6	1.4			1.0	

TABLE I—(Continued)

Showing the average annual radial growth of nine sections of Acer saccharum

	Section Number								
Year	40A-2	40A-4	40A-5	40A-6	40A-7	40A-8	40A-9	40A-12	40A-13
1728				0.5	1.4			1.2	
1727				0.5	1.0			1.4	
1726				0.5	1.2			0.9	
1725				0.4				0.6	
1724				0.6				0.9	
1723				0.6				0.6	
1722				0.7				0.5	
1721				0.8				0.6	
1720				1.0				0.6	
1719				1.2				0.6	
1718				1.3				0.6	
1717				1.2				0.6	
1716				1.0				0.5	
1715								0.5	
1714								0.7	
1713								1.0	
1712								0.9	
1711								0.9	
1710								1.0	

TABLE II

Trend coefficients of *Acer saccharum* for each month-combination rainfall period

Month Combination		Trend Coefficient
June-July	(2 months)	63
June-August	(3 months)	60
May-August	(4 months)	57
May-July	(3 months)	57
May-June	(2 months)	51