

Paul B. Sears and the Ecological Society of America

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ABSTRACT. Paul B. Sears, perhaps more than any other person, epitomized American plant ecology. In a professional career spanning almost 7 decades, he made major contributions to vegetation mapping, paleoecology and Pleistocene history, vegetation studies, conservation, human ecology and our use of land; and particularly, the varied roles of scientists in modern society. He introduced his work in most of these subjects by presenting papers at the annual meetings of the Ecological Society of America (ESA). As a member or chair of numerous committees, Sears pushed the ESA to become involved in supporting the teaching of ecology in college curricula, conservation efforts, applied ecology, human ecology and outreach to government and the public. He also served the ESA as an editor, vice president and president. His influence is still felt in the ESA, although few realize where the ideas originated. Sears was named Eminent Ecologist by the ESA in 1965, a title as appropriate today as it was then.

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INTRODUCTION

After earning a Bachelor of Science degree at Ohio Wesleyan University in Delaware, Ohio, Paul B. Sears went to the University of Nebraska, a young school, but one that attracted a hero of early ecology, Charles Edwin Bessey who separated himself from the eastern botanical tradition by adopting a European, predominantly German, mode of teaching, where laboratories and field experience played a major role in training students (Cittadino 1980, 1990). Years before, Bessey had hand-carried the first microscope across the Mississippi (at a time before bridges) to Iowa State, then moved to Nebraska (Pool 1915). Bessey fostered the young discipline that was to become ecology through his "Botanical Seminar," (Bot Sem), whose early participants included Roscoe Pound and Frederic Clements (Stieber 1980). They produced *The Phytogeography of Nebraska* (Pound and Clements 1897), one of the foundations of American plant ecology. In contrast to university protocols today, Pound and Clements presented the results of this research jointly in partial fulfillment of the requirements for the Doctor of Philosophy degree.

At Nebraska, under the direction of Bessey, Sears embarked on a study of the cytological and developmental characteristics of the dandelion, *Taraxacum laevigatum* (Willd.) DC, group. After completing a Master of Arts degree at Nebraska in 1915 (Sears 1917), he went to The Ohio State University for a 4-year stint as an Instructor in Botany. He then matriculated at the University of Chicago for doctoral study under the direction of Henry Chandler Cowles, famed "physiographic ecologist." Through 1922, Sears continued to study the dandelion group for his doctorate and published two papers from his dissertation (Sears 1922a, 1922b). He then abandoned cytology in favor of ecology, conservation and societal issues, which dominated the remainder of his life through teaching positions at the University of Oklahoma, Oberlin College and Yale University and during his retirement years in New Mexico.

Sears was a major contributor to a variety of sciences, regions, aspects and organizations (Stuckey 1990). After a term as President of the Nebraska Academy of Science in 1925 (Moore 1985), Sears served the Ohio Academy of Science for over half a century. He was one of only two ecologists to lead the American Association for the Advancement of Science (in 1956; the other was Thomas Park in 1961) (Blair 1961), and was president of the American Society of Naturalists in 1959. In addition to his many other

activities, Sears, throughout his career, contributed significantly to The Ecological Society of America (ESA), as discussed below.

INVOLVEMENT IN THE ECOLOGICAL SOCIETY OF AMERICA

Sears joined the fledgling Ecological Society (founded in 1915) during his graduate student days at the University of Chicago. Cowles was president of the Society in 1918 and influenced many of his students to join. Dues at that time were \$1.00 a year. Over the next 40 years, Sears presented 22 papers at ESA meetings, arranged symposia, chaired sessions, held office, edited journals, served on over a dozen important committees and gave the ESA (and the science of plant ecology) the benefit of his wisdom, experience and vision.

Participation at Meetings

Sears presented his first ESA paper at the 1923 meeting at the University of Cincinnati with the American Association for the Advancement of Science (AAAS). At 2:00 PM on Monday, 31 December 1923, in Hanna Hall Annex, Sears presented a paper entitled, *A Map of the Virgin Forest of Ohio, with Notes on Plant Succession in the Erie Basin*, in a symposium on Ohio ecology (Sears 1924). One of the legacies that Paul Sears left to Ohio was a method of vegetation mapping (see Stuckey, this volume), which culminated in the beautiful map published by the Ohio Biological Survey (Gordon 1966).

In 1931, at the New Orleans AAAS meeting, Sears and Elsie Janson of The University of Michigan collaborated on a paper, *The Rate of Peat Accumulation in the Ohio - Michigan Area* (Sears and Janson 1931). They reported on a series of analyses originally generated by his interest in pollen analysis and its potential for paleoecological reconstructions of both climate and vegetation (see Shane, this volume).

Members at the annual ESA business meeting convened in Cabannis Hall in Richmond, Virginia on 29 December 1938, and in an action that was to have far-reaching effects, entertained, discussed and passed a motion by Sears to create a reserve of \$100 or more each year, as the treasury warranted (Park 1939). Disbursements from this reserve fund were to be made at the discretion of the Executive Committee of the Society. Although the amount was small, the concept was discussed for the next 15 years, until the official establishment of an ESA Endowment in 1954 (Dice and others 1955, Preston 1954, Test 1955). The early

¹Posthumously published.

stages were crucial and the Society now enjoys the income from a substantial endowment fund.

Also in 1938, the ESA established a Committee on Summer Symposia, with Sears as chair (Anonymous 1938, Sears 1939). Every year since its founding, the ESA had held summer meetings, usually with the AAAS or one of its geographic subdivisions. The meetings were field-oriented, with excursions or field trips. The ESA wished to formalize participation in the summer programs and did so through Sears' committee. The AAAS met in Milwaukee in June 1939, and Sears' report stressed the success of the symposium on land use, subsequently published in the *Journal of Forestry* (Anonymous 1939a, 1939b, 1940). Previous summer symposia had been arranged by William S. Cooper in Rochester in 1936 and by Howard DeForest for the Denver meetings in June 1937. By late 1938, the Summer Symposia Committee had been expanded (Sears 1939) with the addition of John Aikman, George Nichols, Albert Wright, R. E. Coker and Clarence Korstian, all of whom were or became president of the ESA.

Sears was a pioneer in the study of fossil pollen grains, often preserved in cold, acid peat bogs of the glaciated regions of North America. Throughout much of his early work, the thrust was to relate the pollen assemblages to one or more paleovegetation communities, as a means to infer past climates. At the December 1932 meeting at the Hotel Traymore in Atlantic City, Sears presented a paper, "Post-glacial climatic forest succession in the eastern United States," (Sears 1932) based on his work in Ohio and Michigan, as part of a symposium on forest succession arranged and chaired by George Elwood Nichols.

The next few years were instrumental in characterizing Sears as both an ardent conservationist and as a human ecologist. He was chair of botany at the University of Oklahoma at a time when a major drought affected the Great Plains. A great exodus took thousands of migrants to California. From this experience came his first book, *Deserts on the March* (Sears 1935a), whose title was derived in part from the ancient proverb, *Where man walks, deserts follow in his footsteps*. Sears was a trained ecologist and recognized that cycles, particularly drought cycles, were common in nature. But the economic crisis was partly due to mistreatment of the land by the resident population.

As a follow-up to his book, Sears presented *Ecological Notes on the Dust Bowl Area of the Southern Great Plains* at the 21st Annual Meeting of the ESA in the Municipal Auditorium in St. Louis, at 9:00 AM 2 January 1936 (Sears 1935b). These communications served to establish this Ohio ecologist as both an expert on land use and a sympathetic advocate of the neglected, the marginal and the downtrodden segments of society; in other words, an incipient "human ecologist."

The emerging interest in human ecology surfaced again in December 1937, with a paper on *Ecology and human culture forms* at the Indianapolis meeting (Sears 1937). Alfred E. Emerson chaired the session and Sears was listed as a Research Associate of the Teachers College of Columbia University. In his capacity as chair of the Summer Symposia Committee, Sears arranged for a session at the Ottawa meeting in the summer of 1938 on *The Influence of Fire on Forests, Wildlife and Public Welfare*, (Anonymous 1938a, 1938b), again tying the still adolescent science of ecology to the essential needs and rational desires of the human population. This general theme continued for the summer meetings of 1939 in Milwaukee (Anonymous 1939b), with the joint symposium with the Society of American Foresters on land use, including Aldo Leopold's seminal contribution, *A Biotic View of Land* (Sears

1939). During the Philadelphia meeting in December 1940, Sears and Charles C. Adams shared a role as "discussants" for a major symposium on human ecology (Anonymous 1940c, Sears 1940).

At the Dallas meetings of December 1941, which were held despite the declaration of war, Benjamin Carroll Tharp of the University of Texas organized a symposium on *Bio-Ecology*, (Anonymous 1941), apparently capitalizing on the volume published 2 years earlier (Clements and Shelford 1939). Sears, now at Oberlin College, published an abstract entitled, *Population, Resources and Culture Patterns in Ohio* (Sears 1941) in which he demonstrated how the forest and nonforest percentages of the state had been reversed by a 1,000-fold population increase, from roughly 6 square miles (3,840 acres) per person at the time of the American Revolution to about 4 acres per person in 1940. He recognized four phases in Ohio's history: 1) a primitive hunting economy before 1786, 2) a pioneer agriculture economy from 1786-1850, 3) an expanding industrial transition from 1850-1900, and 4) a neotechnical urban economy since about the turn of the 19th century (Sears 1941). Although neither the concepts nor the terms probably originated with Sears, his application to Ohio and the interrelationships with ecology were new.

A year later, Sears sent an abstract for the planned meeting in New York City in December 1942. The meetings were cancelled due to war mobilization efforts and a government request to curtail civilian travel. Nevertheless, Sears proposed "A useful empirical formula," in a "bioecology" session to be chaired by S. Charles Kendeigh. Resources (R), population (P) and culture (C) were related by the formula, $R/P = (f)C$, which Sears said was appreciated by civilization (Sears 1942).

Sears advocated the teaching of ecology, urging the ESA to play an active role in advocating that ecology courses be offered in college and university curricula, as well as building an ecological competence and conscience in the public schools. In June 1944, he was a discussion leader for a symposium on the *Teaching of Ecology*, jointly sponsored by the ESA and Section Q (Education) of the AAAS, held in Cleveland (Anonymous 1944a). Sears spoke on *The teaching of ecology in the biological sciences*. At the St. Louis meeting in March of 1946, the first held after the war, Sears chaired a conference on teaching, inviting individual course and curriculum descriptions from those who contributed to the symposium in Cleveland. Finally, at the Boston conclave in December 1946, Sears presented, *The Importance of Ecology in the Training of Engineers* (Sears 1946a), perhaps foreshadowing much of the controversy over conservation, natural resources and wild America that eventually led to the first Earth Day in April of 1970. Also in that year, Sears summarized his pollen studies at Itasca (Sears 1946b) and presented an analysis of sagebrush dynamics in Montana (Sears 1946c).

In March 1947, Sears participated in a symposium on *Bottom Sediments*, jointly sponsored with the American Society of Limnology and Oceanography. On 31 December 1947, with Ira T. Wilson of Heidelberg College presiding, Sears presented, *Forest Succession, Climate and Chronology of the Middle West*. Fossil pollen grains are indeed "bottom sediments," and Sears summarized some 20 years of work in paleoecology with this presentation, which was expanded further for publication (Sears 1948a). In 1948, a symposium on *Cooperation and Conflict Among Living Organisms* was organized through the joint efforts of the Botanical Society of America, the ESA, the Institute of Ethnic Affairs, the Institute of General Semantics, the National Indian Institute, The Ohio State University Personnel Research Board, the Society for the Advancement of Psychotherapy, the Society

for Applied Anthropology and the Sociometric Institute. The symposium was held in Washington, DC, September 11-13, 1949, and Sears presented *Conflict and Its Resolution in the Plant Realm* (Anonymous 1948c).

During the decade of the 1950s, Sears combined his continuing research thrusts in paleoecology with his interests in human ecology and applied ecology and his status as a past-president and "elder statesman" in the ESA. He presented nine papers, mostly in symposia, at ESA meetings, ranging from the empirical *New Evidence of Present Climatic Trend* (unpublished) based on pollen profile interpretation to the philosophical *The Place of Ecology Among the Sciences* (Sears 1960a). Additional contributions are in Sears (1950a, 1951, 1953, 1954 and 1957), several of which stimulated the large contingent of young postgraduate ecologists emerging then from the nation's graduate schools.

Service on ESA Committees

Sears functioned on 12 different ESA committees, during a period spanning more than three decades. Both published and unpublished records of these various committees tend to be uneven and incomplete. Consequently, it is difficult to trace all of the actions in a consistent way, as reports may not have been submitted or even written and important items may have been omitted. These items came to attention only after careful examination of later records that refer to earlier actions or activities.

Beginning in the early 1930s, Sears was appointed to the two major committees in the Society: The Committee for the Preservation of Natural Conditions and The Committee for the Study of Plant and Animal Communities (Shelford 1934, 1936; Anonymous 1937a). Both were instigated by Victor Shelford and aimed (at least initially) at finding ways to preserve natural areas for scientific study and social enjoyment (Crocker 1991). Sears apparently served until the late 1940s, but whether continuously is not known. He chaired the Committee for the Study of Plant and Animal Communities from 1946 to 1948 (Anonymous 1946, 1948b; Sears 1947, 1948). By 1949, both committees were disbanded, following the establishment, through the ESA, of the Ecologist's Union, which a few years later was incorporated as The Nature Conservancy. For the past 55 years, The Nature Conservancy has matured into a successful "land preserving" organization. Sears was certainly a part of the early ESA activities that first conceived and then established it (Dexter 1978).

Sears chaired the Committee on Summer Symposia from 1938 through 1940 (Anonymous 1940a, Sears 1939), apparently the only years in which either the concept or the committee functioned. The World War II reduction on domestic travel disrupted scientific meetings in a major way and, as a result, advance planning for summer symposia was no longer necessary. In addition, the ESA already was considering the appointment of a program chairman assisted by a committee to deal with all program matters, including the annual meeting and the summer field meetings with AAAS.

From the middle 1930s to the late 1940s, the ESA had a Committee on Applied Ecology and Sears served for 8 or 9 years, mostly as a member of the "executive group" (Aikma 1945, Anonymous 1937b). Apparently, much interest in applied aspects of ecological science was generated from a variety of sources. The great drought of 1930-1936 brought attention to problems of crop production and soil erosion. Forestry was becoming more scientific and dam building was an incipient boom industry. Congress created the Tennessee Valley Authority in 1933 and the first project, Norris Dam on the Clinch River, was completed in

1937. (Morgan 1971). The role of ecologists in military concerns was becoming a dominant discussion topic. Several symposia were held and many papers had an applied focus. This activity subsided through the 1950s and 1960s, only to resurface when several premature obituaries for Lake Erie were written, a massive oil spill devastated the Santa Barbara Channel and the Cuyahoga River burned more than once in downtown Cleveland. This triumvirate of human influenced problems spawned the first Earth Day in 1970, soon followed by an Applied Ecology Section in the ESA and in 1991, a third major journal, *Ecological Applications*. The legacy of the Committee on Applied Ecology was put to good use and Sears made important contributions to this legacy in its adolescent years.

Additionally, Sears served on the Membership Committee in 1949 and 1950 (Anonymous 1951), on the Endowment Committee in 1952 (Buell 1953), as Chairman of the Committee on Human Ecology in 1952 (Anonymous 1952) and as member through 1957, and on the Finance Committee, with Heinie Oosting and Frederick Test in 1954 (Anonymous 1954). He was also appointed to a Desert Laboratory Committee in 1940 (Anonymous 1940b), perhaps related to the attempt by the Carnegie Institution of Washington to divest itself of the facilities on Tumamoc Hill in Tucson, the laboratory that supported Forrest Shreve, T. D. Mallory, William A. Cannon, Daniel Trembley McDougall and many others since the turn of the century (McIntosh 1983, Bowers 1988). No further details have been located on this effort. Also in 1939, stemming from the grassland subcommittees of the Committee for the Preservation of Natural Conditions, including the Oklahoma Center, a Committee on Ecology of Grasslands was sponsored by the National Research Council with membership (including Sears) drawn heavily from the ESA (Coker 1940). In 1946, National Academy of Science President Alfred C. Redfield appointed Sears to a 3-year term on the Conservation Council (Dreyer 1946) and in 1951 and 1952, Sears served as the ESA's representative on the Natural Resources Council of America (Sears 1952).

Two other committee assignments are of note. Sears served on the Nominating Committee in 1945, 1946, 1949, 1953 and 1958, more than any other ecologist (Darrow and others 1948; Coker and others 1950, 1954). The committee was charged, with preparing a slate of officers each year, and by 1958, with the task of selecting an "Eminent Ecologist" from the ranks. The 1949 committee, chaired by Sears, nominated Emma Lucy Braun for President of the ESA (Coker and others 1950), and she became the first woman president in 1950. Perhaps Sears seized an opportunity both to elect a woman president and to honor a fellow Ohioan.

In March 1958, Sears asked the ESA establish a committee of the social applications of ecological science (Billings and others 1958). Sears' efforts in both human ecology and applied ecology stimulated this committee. In response, the ESA Council voted to create a Panel on Ecological Policy (Anonymous 1959b). In 1959, the National Science Foundation granted the ESA \$24,000 for an Ecology Study Committee and pledged to support its work for 3 years (Anonymous 1959). Sears was appointed chair (Olmsted and others 1962). Through 1964, that committee examined all aspects of ecological science and the role of the ESA in responding to national and global needs. The committee, including James Bonner, Stanley Cain, George Clarke, Arthur Hasler and Thomas Park, recommended more attention to human ecology and more involvement in ecological education (Olmsted and others 1962). In 1962, Sears suggested that the ESA offer to review the new materials being developed by BSCS, the Biological Sciences Curriculum

Study (Olmsted 1962). The American Institute of Biological Sciences accepted the offer and ecologists provided continuous involvement in the "Green Version" of high school biology texts. The committee also worked on an endowment for the Society and greatly expanded both the dollars and its focus. Public policy was a continuing theme (Sears and Cantlon 1963) and some of the results of the Ecology Study Committee deliberations are evident today in the Public Affairs Office of the ESA.

In the early 1970s, the ESA worked to establish The Institute of Ecology, ostensibly as an action arm for the science that would function in Washington D.C. and increase influence in governmental affairs related to ecology and the environment (Ecological Society of America and others 1970a, 1970b). By the early 1980s, that institute was officially disbanded (Doherty and Cooper 1990) and the staff of the ESA's Public Affairs Office absorbed some of its functions.

Service as Editor and Officer

When Sears was at the University of Oklahoma, he was appointed to a 3-year term on the Editorial Board of *Ecological Monographs* (Anonymous 1934, Nichols and others 1934), then a new journal only in its third volume and struggling to continue publishing during the Great Depression. A few years later, he served on the Editorial Board of *Ecology* (Botany) (Allee and others 1944, Anonymous 1944b). At that time, the ESA had fewer than 600 members, and dues were \$5.00 a year (Burgess 1977).

Sears served as vice president of the ESA both in 1943 (Weaver and others 1943) and in 1947 (Emerson and others 1943), the only person to hold this office twice. Following his second term as vice president, Sears was elected President of the Society in 1948 (Darrow and others 1948). As is true of many societies where turnover of officers is an annual event and election is mostly an honorary recognition, Sears' administration was relatively uneventful. The Society was trying to put its affairs in order following World War II, membership was starting to grow and millions of returning service members were clamoring for higher education under the GI Bill of Rights. During the late 1940s and early 1950s, many courses, curricula and graduate programs in ecology developed in American colleges and universities and the ESA had a major role in this revival (Burgess 1981).

Since the administration of Ellsworth Huntington, second president of the ESA in 1917, it became customary for the past (retiring) president to present an address to the membership at the annual meeting (Anonymous 1917, Huntington 1918). This tradition persists. In 1947, Aldo Leopold was the ESA president and was prepared to deliver his address at the Boston meetings. Unfortunately, he died of a heart attack while fighting a grass fire near his now famous "shack" (Anonymous 1948a) and it fell to Sears to read *The Land Ethic* (Anonymous 1949a), a philosophical essay that underpins the conservation and environmental movements.

The next year, Sears delivered *The Living Landscape* as his own presidential address (Anonymous 1949b, Sears 1950b), incorporating many of the concepts pioneered by Leopold and leading ultimately to the relatively new subdiscipline known as landscape ecology.

Honored by the ESA

Paul Bigelow Sears was named Eminent Ecologist by the ESA in 1965 (Anonymous 1965). This award is the ultimate recognition of Sears' decades of research, teaching, service to the ESA and leadership in science and its applications. In part, his citation read:

We salute and applaud you as teacher, writer, spokesman for biologists in general and for ecologists in particular; we appreciate you as statesman *par excellence*, especially for your long-time attention to the importance of improving our understanding of the mutual relationships between science and human affairs. We agree with you when you said, 'Failure to use science as a source of perspective in our present stage of culture degrades its function and may in time be disastrous.' We are especially impressed by these words of yours, 'As a touchstone to test the effectiveness of a scientific education, I would suggest the final ability to read and enjoy the landscape. While there is life there is hope, but only for the enlightened' (Anonymous 1965).

Other Contributions

Sears also contributed to ecological history and biography. Based his long association with The Ohio State University, Sears (1960) wrote a tribute to Edgar Nelson Transeau. In a seminal paper (Sears 1956), Sears discussed the working milieu of scientists in a still young discipline. Sears (1969) also discussed ecology in a small volume on botanical history in the United States, which was prepared for the XI International Botanical Congress at the University of Washington in Seattle in 1969.

Paul Bigelow Sears lived a life immersed in the science of ecology. Using the ESA as both a springboard and a primary vehicle, he conducted research, instructed at colleges and universities and accepted professional service, all with unending dedication to principles and ideas. Most of these ideas were broached, tested and nurtured through his ESA involvement, and to the benefit of ecological sciences. Before his death at the age of 99, Sears saw most of his efforts come to fruition. No more fitting honor could be bestowed.

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