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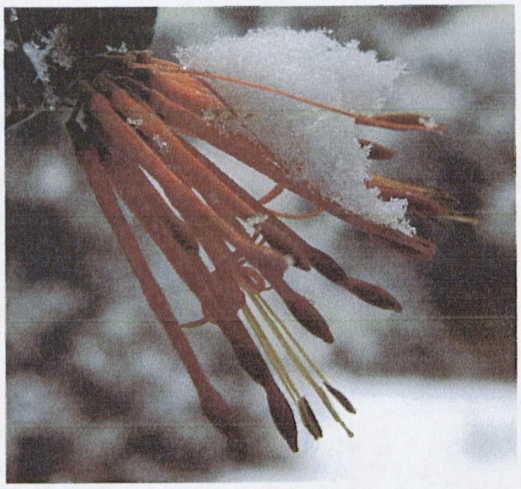
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COMMENTARIES

Responses of 73 Ecologists Important in Developing the Foundations of Ecology: Summary of a 1952–59 and 1972 Survey

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Abstract

Many of the early leading ecologists, especially Americans, were surveyed (primarily between 1952 and 1959) to learn what (1) initially inspired an ecological interest, (2) stimulated a major career direction in ecology, and (3) was one's major career accomplishment. Patterns of responses from 73 ecologists, primarily in their own words using their own typewriters, are summarized. Yale, Duke, Illinois, Michigan, Oxford, and Wisconsin are the most frequent primary institutions of respondents, who were initially not only concentrated in the U.S. Midwest, but also working in the Northeast, South, West, and abroad. The initial ecological stimulus of survey respondents was most reported as plants, between ages 9 and 11, and a parent. Victor Shelford, Henry Cowles, Edgar Transeau, and Stanley Cain were most mentioned as catalysts of a career direction. Also, the opportunity to teach or work in a new place, or reading a key publication(s), often inspired a career direction. The many early ecologists most frequently knew or interacted with H. Cowles, M. Buell, F. Clements, V. Shelford, S. Cain, and H. Oosting. The most frequent major accomplishments or contributions reported by a leading ecologist were analysis of the ecology, vegetation, or flora of a particular area; elucidated ecosystem, productivity, and nutrients; produced a book(s); furthered understanding of natural communities or vegetation; analyzed succession or vegetation dynamics; and established or ran an administrative unit or natural reserve. These survey response patterns are complemented by a wide range of specific responses by individuals. Selected unusual observations and experiences provide insight into the leading ecologists as people. A perspective provides key insights into the survey, the earliest phase of ecology and its later maturation, and environmental/social conditions affecting early ecologists and ecology.

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Key words: catalyst for career direction; early ecologists; ecology maturation phase; initial ecological inspiration; interaction among early ecologists; major career accomplishment; Murray F. Buell; pre-ecology ecologists; summary of early ecologists survey.

Ecologists respect, even revere, the pioneers and early leaders of our field, but we also wonder what their careers were like in another era and conditions past.

What inspired an ecology career? At what age? Did another ecologist stimulate a career direction or change? Or was an event or feature or experience the catalyst? Did the early ecologists know or interact with each other? What did they consider to be their major contribution to scholarship or society? What unusual experiences and observations would these early ecologists share with their successors?

A treasure chest of answers, based mainly on the ecologists' own words, is opened in the pages ahead.

Methods

Murray F. Buell, former Eminent Ecologist and President of the Ecological Society of America, organized a 1952–1959 survey of early ecologists. Murray knew many of the key people and stimulated discussion of their work in his Rutgers University Department of Botany classes. Graduate students wrote letters to the scholars selected to learn about their careers and contributions. After retirement, Murray briefly taught at the University of Georgia, where he continued the project in 1972 to include some newer leading ecologists.

Responses from 73 early ecologists, with good and bad typewriters, filled approximately 566 pages. After teaching at the Escuela Agricola Panamericana and the University of Wisconsin, I joined the Rutgers University botany department in 1966. A few months after Murray died in 1975, his widow, Dr. Helen Foote Buell, active in the department and nearby Hutcheson Memorial Forest, and a good friend, came to my office with the stack of survey responses. She said that Murray simply wanted me to have these. It is now time to make the unique information widely available for readers to learn and enjoy.

Thirty-one individuals who could be identified in the material (primarily graduate students) wrote dated invitation letters to the early ecologists. Twenty-three of the listed letter writers (following) were from Rutgers, with the remaining eight associated with the University of Georgia (and the 1972 survey); names are drawn from the letters and are not always complete. Dates of letters are included; a few 1960s dates presumably indicate continued correspondence. Many of the letter writers later had important careers in ecology.

Stephen Collins: 1952, 1954, and 1955. Mr. Muller: 1952. Bernard L. Patten, Jr.: 1953, 1957, 1958, and 1961. Jack McCormick: 1953, 1954, and 1955. Mr. Clark: 1954 and 1955. John W. Andresen: 1954, 1956, and 1957. Warren A. Wistendahl: 1954 and 1958. James Baird, Jr.: 1954. Ernest S. Hamilton: 1954 and 1955. William Laycock: 1955, 1956, and 1957. Mr. McDonough: 1955. Mademoiselle: 1956. Carl Monk: 1956. William E. Martin: 1956, 1957. George Van Vechten: 1957. Phil Pearson: 1957. John M. Bernard: 1958. Earl Rosenwinckel: 1958. Michael H. Levin: 1959. Donald N. Davidson: 1959, 1960, and 1962. Ralph E. Good: 1961 and 1964. L. F. Ohmann: 19??. H. Dill: 19?? Nancy G. W. Baker: 1972. Kermit Cromack: 1972. Pepe Martinez: 1972. Joy Lee: 1972. Frank Day: 1972. C. Ronnie Best: 1972. Mr. Embry: 1972. Peggy Spring: 1972.

The letters sent to early ecologists varied, but emphasized five areas. One ("What types of courses and practical experience should ecology graduate students have?") was seldom addressed, so it is omitted in the summary below. The second ("We welcome an autobiographical sketch, and a list of your key publications") provided a wealth of biographical insights introduced below. Almost all responses included a list of publications. Thus, three major response items are highlighted here.

1. How did you become interested in and start working in ecology or plant ecology?
2. What person, event, idea, or experience inspired or catalyzed a major ecological career direction?
3. What is/are your major contribution/s or accomplishment/s in ecology?

The early ecologists who responded were selected by Professor Buell, a leading 20th-century plant ecologist (and perhaps his students). None of these early ecologists are still living. The response from one additional ecologist (Harold A. Mooney, who happily continues his distinguished career today) was omitted from this survey summary based on human-subject research ethics. Other distinguished ecologists in this early period were not reflected in the survey, including Eugen Warming, Forrest Shreve, C. Hart Merriam, Charles E. Bessey, Andreas F. W. Schimper, John W. Harshberger, R. L. Lindeman, Ramon Margalef, Edward S. Deevey, Eugene P. Odum, and Robert H. MacArthur. Although no information is available to know whether these or others were invited to respond, no other responses appear in the collection. Nevertheless, the information, summaries, and conclusions following probably apply widely to the early period of ecology.

Results

The 73 ecologists were born between 1869 and 1929 (Table 1). Sixty-five were primarily located in the United States, one in Canada (Ezra H. Moss), and one in New Zealand (J. Roger Bray). Nicholas Polunin spent prolonged periods in both Canada and the United Kingdom. The remaining seven in Europe were Arthur G. Tansley, William B. Turrill, Alex S. Watt, Ronald Good, and Charles S. Elton in the U.K., and Josais Braun-Blanquet and Marcel-Henri Gaussen in France. The only woman included was E. Lucy Braun, the first woman president of the Ecological Society of America.

These distinguished ecologists were widely distributed, with the most frequent primary institutions being Yale University (5), Duke University (3), University of Illinois (3), University of Michigan (3), Oxford University (3), and University of Wisconsin (3).

The earliest of the ecologists were concentrated in the American Midwest (Table 1): Cowles 1869 (birth year), Fuller 1869, Clements 1874, Conard 1874, Transeau 1875, Shelford 1877, McDougall 1883, Cooper 1884, Weaver 1884, and Allee 1885. In the West, Rigg 1873, Woodbury 1886, Kittredge 1890, Clausen 1891, Went 1903, and Humphrey 1904 were among the earliest. In the Northeast were Adams 1873, Griggs 1881, Gleason 1882, Nichols 1882, and Wherry 1885. In the South, Harper 1878, Korstian 1889, Davis 1901, and Oosting 1903 were among the earliest ecologists.

The most recent distinguished ecologists included were mainly born in the 1920s (Table 1): Whittaker 1920, Heslop-Harrison (U.K.) 1920, Auerbach 1921, McMillan 1922, Bormann 1922, Becking 1922, Niering 1924, H. T. Odum 1924, Fraser 1925, Bray 1929, and Bliss 1929. Some of their major contributions also occurred after the survey.

Table 1. Ecologists, years of birth, primary institutions, and nature of responses.

Name	Year of birth	Primary institution	Nature of response(s)
Adams, Charles C.	1873	New York State Museum	6, 7
Aikman, J. M.	1893	Iowa State College	1
Allee, W. Clyde	1885	University of Chicago	3, 6
Auerbach, Stanley I.	1921	Oak Ridge National Laboratory	2
Becking, Rudolf W.	1922	Humboldt State College	1
Billings, W. Dwight	1910	Duke University	2
Bliss, Lawrence C.	1929	University of Washington	2, 5
Bormann, F. Herbert	1922	Yale University	2
Braun, E. Lucy	1889	University of Cincinnati	2
Braun-Blanquet, Josias	1884	Station Internationale Geobotanique et Climatique, Montpellier, France	1
Bray, J. Roger	1929	DSNZ, Palmerston, New Zealand	2
Cain, Stanley A.	1902	University of Tennessee	6
Clausen, Jens	1891	Carnegie Institution of Washington, Stanford	2
Clements, Frederick E.	1874	University of Michigan; Carnegie Institution of Washington	3, 6
Conard, Henry S.	1874	Grinnell College	2
Cooper, William S.	1884	University of Minnesota	2
Cottam, Grant	1918	University of Wisconsin	4, 5, 7
Cowles, Henry C.	1869	University of Chicago	1, 3
Curtis, John T.	1913	University of Wisconsin	2
Dansereau, Pierre	1911	University of Montreal, Canada	2
Daubenmire, Rexford F.	1909	Washington State University	4
Davis, John H., Jr.	1901	University of Florida	4
Dice, Lee R.	1887	University of Michigan	1, 6
Drew, William B.	1908	Michigan State University	1
Dyksterhuis, E. J.	1908	Range Management, Northern Great Plains States	1
Egler, Frank E.	1911	Aton Forest, Connecticut	2
Elton, Charles S.	1900	Oxford University, U.K.	2, 7
Evans, Francis C.	1914	University of Michigan	2
Fassett, Norman C.	1900	University of Wisconsin	6
Fraser, Donald A.	1925	Petawana Forest Experiment Station, Ontario, Canada	4
Fuller, George D.	1869	University of Chicago	4
Gates, Frank C.	1887	Kansas State University	6
Gaussen, Marcel-Henri	1891	University of Toulouse, France	2, 5
Gleason, Henry A.	1882	New York Botanical Garden	2, 6
Good, Ronald	1896	University of Hull, U.K.	2, 5

(Continues)

Table 1. (Continued)

Name	Year of birth	Primary institution	Nature of response(s)
Griggs, Robert, F.	1881	University of Pittsburg	2
Hansen, Henry P.	1907	Oregon State College, Corvallis	1
Hanson, Herbert C.	1890	Catholic University of America	2, 5
Harper, Roland M.	1878	Florida Geological Survey	2
Heslop-Harrison, J.	1920	University of Birmingham, U.K.	2, 5
Humphrey, Robert R.	1904	University of Arizona	2
Hutchinson, G. Evelyn	1903	Yale University	1, 7
Kendeigh, S. Charles	1904	University of Illinois	1
Kittredge, Joseph	1890	University of California, Berkeley	1, 6
Korstian, Clarence F.	1889	Duke University	1, 6
Lutz, Harold J.	1900	Yale University	1, 6, 7
McDougall, W. B.	1883	University of Illinois	2
McMillan, Calvin	1922	University of Texas	2
Moss, Ezra H.	1892	University of Alberta, Canada	4
Nichols, George E.	1882	Yale University	4
Niering, William A.	1924	Connecticut College	2
Odum, Howard Thomas	1924	University of Florida	4
Oosting, Henry J.	1903	Duke University	2
Penfound, William T.	1897	University of Oklahoma	2
Phillips, Edwin A.	1915	Pomona College	1, 5
Platt, Robert B.	1913	Emory University	2
Polunin, Nicholas	1909	Oxford University, U.K.; McGill University, Canada	1, 5
Potzger, John E.	1886	Butler University	2, 5, 6
Raup, Hugh M.	1901	Harvard University	2
Rice, Elroy L.	1917	University of Oklahoma	2
Rigg, George B.	1872	University of Washington	1
Sears, Paul B.	1891	Yale University	2
Shelford, Victor E.	1877	University of Illinois	1
Tansley, Arthur G.	1871	Oxford University, U.K.	2
Transeau, Edgar N.	1875	Ohio State University	1
Turrill, William B.	1890	Royal Botanic Gardens, Kew, U.K.	2
Watt, Alex S.	1892	Cambridge University, U.K.	2
Weaver, John E.	1884	University of Nebraska	1, 6, 7
Went, Frits W.	1903	California Institute of Technology; University of Nevada, Reno	1, 4, 5
Wherry, Edgar T.	1885	University of Pennsylvania	2
Whittaker, Robert H.	1920	Cornell University	2

(Continues)

Table 1. (Continued)

Name	Year of birth	Primary institution	Nature of response(s)
Wolfe, John N.	1910	Ohio State University	4
Woodbury, Angus M.	1886	University of Utah	2, 3

Notes. Types of responses are numbered. Almost all responses list key publications. Information was gathered from the literature (marked #3) if an ecologist was not living at survey time, and in a few other cases.

1. Contains information on people, ideas, or experiences that stimulated/inspired later work.
2. Considerable information on people, ideas, or experiences that stimulated/inspired later work.
3. Information apparently summarized by writer of the invitation letter.
4. Mainly or only a list of publications.
5. Faded copy, difficult to read in parts or unreadable.
6. Published biographical material also sent.
7. Includes one or more letters by other knowledgeable people about the ecologist.

Thirty respondents provided information about what initially inspired them to pursue an ecologically related career (Table 2). Of eight who indicated their age of initial stimulation, two said age 5, five said ages 9–11, and one mentioned high school. Of 13 ecologists providing information, seven said father or parents, three indicated sister, brother, or uncle, and two said teacher.

Fifty-one objects, features, or experiences were highlighted as key initial motivations for a possible ecologically related career (Table 2). Eleven ecologists mentioned plants, four of whom specified plant identification, two collecting and drying plants, and one pointing to native orchids. Nature was highlighted by eight ecologists. Birds or mammals were mentioned by five, animals by two, and insects by one respondent. Three highlighted habitats of organisms, and three said books. Each of the following was mentioned by one or two ecologists: farm, ranch, outdoors, wilderness life, exploring a swamp, agriculture/hunting/fishing/camping, chemistry, and a lecture on the Smokies.

Overall, while a few patterns are suggested as key stimulants of young people toward ecological careers, perhaps, the bigger message is the wide breadth of stimulants identified. These results are highlighted by, and refer to, future distinguished ecologists.

Thirty respondents also identified people who inspired them to pursue a major career direction (Table 3). Four cited Victor E. Shelford (University of Illinois), three pointed to Henry C. Cowles (University of Chicago), three to Edgar N. Transeau (Ohio State University), and three mentioned Stanley A. Cain (University of Tennessee) as key catalysts. Others mentioned by two ecologists as key stimulants were William S. Cooper, David D. Keck, William M. Hiesey, and W. Dwight Billings.

Clearly Shelford's influence in energizing the field of ecology was great, in addition to that of Cowles, Transeau, and Cain. Shelford, Cowles, Transeau, and Cooper were of the first generation of academic ecologists. Cain's influence was slightly later, and Billings (Duke University) was a more recent catalyst for ecology. Non-ecologists in cognate fields were also widely cited by respondents as stimulating an ecological career direction (Table 3).

Table 2. Initial stimulus or inspiration to pursue an ecological field.

Birth year	Name	Initial stimulus or inspiration
1871	Tansley	Young boy; collected and dried plants
1874	Conard	Father walked us in the Philadelphia suburb to find the first spring flowers and name the trees (mostly Latin names); at Westtown, a Quaker boarding school farther out, botanizing was greatly favored; using Darlington's flora we learned the habitats as well; the places where things grow were as natural as the names themselves.
1878	Harper	Age ~ 10; interested in nature; stimulated by Paul Bert's *Bert's Science*; later began collecting plants
1881	Griggs	Stimulated by high school teacher
1884	Cooper	Age 9; "sister gave me a pack of cards showing plants for a game like Authors, but I took the cards into a Detroit vacant lot to identify plants"
1885	Allee	An orphan, farm life, and one-room country school; "initially I taught in county schools; later became a Quaker"
1885	Wherry	Age 11; attended lectures on chemistry
1886	Potzger	Life in the wilderness
1887	Dice	As a boy; "on a ranch using my parents' good library"; learned the common plants, then birds, then mammals, then insects
1889	Braun	Parents encouraged observation of plants and animals
1890	Turrill	Age 5 or 6; collected and named local wild plants
1891	Clausen	Age 9; "farm-laborer uncle took me on hikes and taught me the plants"; early teens, read J. Eugen B. Warming's *Plantesamfund*; wrote a term paper on the botanical communities in a 2000-acre moor area; during high school, bought Darwin's *The Origin of Species* (in English)
1891	Sears	Grew up in atmosphere where living plants were important
1892	Watt	Brought up on a farm
1900	Elton	Age 9; oldest brother was a good field naturalist
1903	Hutchinson	Age 5; "father encouraged my native interest in natural history"
1903	Oosting	Small town atmosphere; agriculture, hunting, fishing, camping as part of normal existence
1904	Humphrey	Grew up among plants, and father and mother botanists
1904	Kendeigh	At very early age; became interested in birds, collected bird eggs, trapped muskrats and skunks
1910	Billings	Youth; sports, hiking, scouts, and exploring a local swamp; heard high school talk by Professor Stanley Cain about the Smoky Mountains; "promptly we took a trip there"
1911	Egler	"In middle of New York City, 5th grade teacher took us out looking for birds"
1913	Curtis	In high school; interested in native orchids
1915	Phillips	Nature study as camp counselor, in YMCA and 4H Camp
1920	Heslop-Harrison	Very early age; interested in the living kingdom; father was an ecology lecturer
1920	Whittaker	Zoologist father; grew up with nature

(Continues)

Table 2. (Continued)

Birth year	Name	Initial stimulus or inspiration
1921	Auerbach	Small boy; interested in the natural world, and how and why organisms were there
1922	McMillan	Growing up with greasewood-alkali flat in back, alpine mountain view in front; family picnics in oak, fir, and spruce-fir zones
1922	Bormann	Youth explored woods and fields; interested in nature and its esthetics
1924	Niering	Hunting with father; high school activities
1929	Bliss	As a small boy; loved the out-of-doors; wanted to be a medical doctor

Twenty-eight ecologists highlighted an event, feature, or experience that inspired a major career direction (Table 4). The opportunity to teach or work in a new place was highlighted eight times. Also, eight pinpointed reading a key publication(s) as catalytic. Five ecologists indicated travel to a distant place or ecosystem, and four pointed to interactions with a different group of people. Other ecologists mentioned a wide range of events and experiences as being especially influential in determining a career direction (Table 4).

The specific career stimulants mentioned by these early ecologists are yet more revealing. An interesting breadth of geography, institutions, people, ideas, and times emerges (Table 4). Three of the earliest-born ecologists (two in the United States and one in the United Kingdom) mention J. E. B. Warming's plant ecology book, *Plantesamfund* (Warming and Vahl 1909). The other readings mentioned are Gray's *Manual of Botany*; Collett's work; a book on Hudson's Bay Company cycles; Clements' writings; and the fire publications of Thornbur, Wooton, and Griffiths. Although a few types of stimulants mentioned predominate, clearly many specific events and experiences may jumpstart the career of a distinguished ecologist.

Did these leading early ecologists know or interact with each other? Who else seemed to be important in their interactions? Some indication is given by the names mentioned in the responses of 40 ecologists who mention one or more names (Table 5). Eight ecologists highlighted Cowles, eight Buell, six Clements, six Shelford, five Cain, and five Oosting. Cooper, Weaver, Gates, and Daubenmire were each mentioned by four ecologists.

Henry C. Cowles (University of Chicago), Frederick E. Clements (University of Michigan and Carnegie Institution of Washington), and Victor E. Shelford (University of Illinois) were in the first generation of pioneering American ecologists. The responses suggest that they, along with Cooper and Weaver, cast a long shadow, influencing many leading ecologists during the earliest and subsequent "middle" periods of ecology (Table 5). Then, Murray F. Buell (Rutgers University), Stanley A. Cain (University of Tennessee), Henry J. Oosting (Duke University), and Rexford F. Daubenmire (Washington State University) were apparently especially influential among leading ecologists in the middle (and later) period of ecology's development.

Interactions with 39 people not highlighted in the survey were mentioned by the 40 ecologists (Table 5). Forrest Shreve (Carnegie Institution, Tucson botanist) was mentioned by three ecologists, Charles E. Bessey (University of Nebraska botanist) twice, and John E. Cantlon (Michigan State University ecologist) twice. Other ecologists mentioned included John W. Harshberger, Ralph Buchsbaum, David E. Reichle, D. A. Crossley, B. C. Patten, G. W. Van Dyne, Eugene P. Odum, George M. Woodwell, and Gene E. Likens. Interactions with distinguished scholars in other fields were also indicated, including

Table 3. Persons who stimulated or inspired a major ecological career direction.

Birth year	Name	Person(s) stimulating or inspiring a major career direction
1872	Rigg	H. C. Cowles
1874	Conard	Henry Sherring Pratt; Duncan S. Johnson; G. D. Fuller
1878	Harper	Clarence Knowlton; Nathaniel Lord Britton
1881	Griggs	Roland Thaxter; O. F. Cook; Frederick V. Coville
1884	Cooper	C. A. Davis; E. N. Transeau; Forrest Shreve; Rollin D. Salisbury
1885	Allee	Frank R. Lillie; V. E. Shelford
1886	Potzger	S. A. Cain
1889	Braun	C. C. Adams; N. M. Fenneman; H. C. Cowles
1890	Hanson	F. E. Clements; J. E. Weaver; Dr. Poole
1891	Clausen	Mr. Thorgiles; Chresten Raunkiaer; Eug. Warming; Wilhelm Johannsen; Gote Turesson; Ojvind Winger; E. B. Babcock; H. M. Hall; David D. Keck; William M. Hiesey
1891	Sears	John H. Schaffner; H. C. Cowles
1893	Aikman	Claude J. Shirk
1897	Penfound	Frederick O. Grover
1901	Raup	Charles G. Shatzer; O. E. Jennings; E. N. Transeau; E. L. Braun; Merritt Lloyd Fernald; Kirk Bryan; R. T. Fisher; my wife
1903	Oosting	W. S. Cooper
1904	Humphrey	W. S. Cooper
1904	Kendeigh	Lynds Jones; Dr. Baldwin; V. E. Shelford
1908	Drew	G. E. Nichols
1908	Dyksterhuis	L. H. Pammel; John N. Martin
1910	Billings	S. A. Cain; H. J. Oosting; John Cantlon
1911	Dansereau	Louis-Marie Lalonds; B. P. G. Hochrentiner; J. Braun-Blanquet; P. B. Sears; H. S. Conard; S. A. Cain; G. Ledyard Stebbins; J. Clausen; David Keck; William Hiesey
1911	Egler	Dr. Meier
1913	Curtis	B. M. Duggar
1915	Phillips	Oran Stanley
1917	Rice	P. B. Sears; Charles E. Olmsted
1918	Cottam	J. T. Curtis; E. N. Transeau
1920	Whittaker	A.G. Vestal; V. E. Shelford
1921	Auerbach	V. E. Shelford; Orlando Park
1922	Bormann	R. F. Daubenmire; M. F. Buell; while climbing Mt. Washington, a German student arguing that water passing through soil would remove nutrients and fertilize elsewhere, then commenting, "If you measure the chemistry of that stream, you would know I'm right."; Gene Likens
1929	Bliss	W. D. Billings

Table 4. Idea/event/feature/experience that stimulated or inspired a major career direction.

Birth year	Name	Idea/event/feature/experience stimulating or inspiring a career
1869	Cowles	J. Eugen B. Warming's book, *Plantesamfund*
1871	Tansley	J. Eugen B. Warming's book, *Plantesamfund*
1872	Rigg	J. Eugen B. Warming's book
1881	Griggs	Joined Washington, D. C. luncheons of diverse disciplinary people who became noted
1883	McDougall	William Trelease invitation to teach plant ecology
1884	Cooper	"Mother gave me a copy of Gray's *Manual of Botany*, with a daunting "Key" at the beginning to overcome"; then began a herbarium; got interested in *Carex*; then grasses
1884	Weaver	Teach/research ecology, a new field, at Washington State College
1885	Allee	Opportunity to spend a winter at Barro Colorado Island; a series of family and medical calamities, including one that left him in a wheelchair; upon retirement, moving south to be Head of the University of Florida Biology Department, sparking another productive career
1885	Wherry	U.S. Department of Agriculture sent him to measure soil acidity for rare plants
1886	Potzger	Lutheran philosophy; the piano; noted Indianapolis sculptor; brother lent money
1886	Woodbury	Took an entomology course at local college
1889	Braun	Within a day's field trip of Cincinnati was enormous geological and vegetational diversity, plus the obvious dynamic processes of successions; the highly variable association-segregate "mixed mesophytic forest" of Kentucky's Cumberland Mountains
1890	Turrill	Knowing names and characters of local plants
1891	Clausen	In WWI was assigned to an Artillery Company, and had a microscope (on the command desk) to study hybridization of two nearby violet species, with 13 and 17 pairs of chromosomes, that produced moderately fertile offspring; early plant genetics; the highly varied and diversified California vegetation
1897	Penfound	Encountering the Oklahoma grasslands and forests
1900	Elton	Three summer expeditions to Spitsbergen; reading Collett's work and a book on Hudson's Bay Company cycles
1901	Raup	National Research Fellowship led to research collaboration with people in other fields
1903	Oosting	Paucity of North Carolina lakes resulted in forest ecology interest; writing *Plant Communities*
1904	Humphrey	Fire publications of Thornber, Wooton, and Griffiths
1908	Dyksterhuis	For an Iowa farmer, the "Hunt, Fish, Trap, Patrol, Be a Forest Ranger" ads common in popular magazines; Frederick E. Clement's writings
1911	Dansereau	"Broke away from my bourgeois environment and developed a social consciousness with sons of miners, laborers, farmers, etc."
1913	Curtis	During the war, an emergency rubber project in Haiti's tropical rainforest led to the continuum concept

(Continues)

Table 4. (Continued)

Birth year	Name	Idea/event/feature/experience stimulating or inspiring a career
1913	Platt	Taking a junior college position in Savanna, Georgia
1915	Phillips	Measured every forest in Michigan
1921	Auerbach	Oak Ridge National Laboratory had 30,000 acres of forest for research and many habitats under close control; also, technological support and equipment facilities without parallel in academic situations
1922	Bormann	Idea of root grafting between trees
1924	Niering	Resident at an Audubon Nature Sanctuary
1929	Bliss	Pre-doctoral summer in northern Alaska studying microenvironments and plant growth; alpine zones of Wyoming and Mt. Washington

David Fairchild, Frank R. Lillie, N. M. Fenneman, Warren Thornthwaite, M. L. Fernald, G. Ledyard Stebbins, Stephen Spurr, and Marston Bates.

Seldom does one see a list of major career contributions or accomplishments provided by a group of leading scholars themselves (Table 6). Forty-four leading ecologists briefly highlighted their major contributions or accomplishments, the most responses for any requested information in this survey summary. Ten ecologists mentioned an analysis of the ecology, vegetation, or flora of a particular area. Eight elucidated ecosystem, productivity, and nutrients. Seven produced a book(s). Seven furthered our understanding of natural communities or vegetation. Seven analyzed succession or vegetation dynamics. Seven established or ran an administrative unit or natural reserve, and six provided new insight into a plant population(s). Animal ecology and microenvironmental studies were each furthered by four leading ecologists.

The ecologists born in the late 19th century and those born in the early 20th century (Table 6), in effect, provide a comparison of the earliest and the following (middle) phases of ecology. Societal and environmental conditions differed. Also, the somewhat different subjects and accomplishments reflect the evolution of ecology as a field. Nevertheless, both the earlier and later groups of ecologists addressed a wide range of subjects that outlined the breadth of a still developing field.

While summarizing or grouping the career achievements seems informative, absorbing the individual cases is perhaps more interesting. Brief summaries, many from the ecologists' own words, reveal their primary career contributions and accomplishments (Table 6). Work related to vegetation seems overrepresented compared with today's field of ecology. Perhaps that is partly due to vegetation studies being especially prominent in the early phase of American ecology, and partly because the survey organizer, Murray Buell, mainly worked in this area. The ecologists' accomplishments highlight geographical and ecosystem differences.

Most of the ecologists were probably teachers and administrators for long or short periods. Yet for this survey, they considered their scientific research to be the major accomplishment(s) (Table 6). Only Weaver and Oosting highlighted teaching as a major accomplishment. Administering a unit was at least indirectly mentioned by Adams, Allee, Dice, Went, Dansereau, Egler, and Auerbach. Applying ecology to solve societal problems or build a better future is indirectly highlighted by four of the 44 leading ecologists, Adams, Dice, Platt, and Auerbach.

Table 5. Key ecology and other colleagues, whom an ecologist knew or interacted with.

Birth year	Name	Key colleagues known or interacted with
1869	Cowles	Tansley, Cooper, H. L. Shantz, Fuller, Nichols, Shelford, Cain
1871	Tansley	Cowles, Clements, several leading European botanists
1872	Rigg	Cowles
1873	Adams	Sears, Oosting, W. T. Taylor, Murray F. Buell
1874	Clements	Charles Bessey, Dr. Pound, Edith Clements, Weaver, Hanson, Shelford
1874	Conard	Fuller, A. J. Grout, Cain
1875	Transeau	Cowles
1881	Griggs	David Fairchild
1882	Gleason	Gates
1883	McDougall	Gleason, W. Trelease, Cowles, Clements
1884	Cooper	C. A. Davis, Transeau, Forrest Shreve, Cowles
1885	Allee	Shelford, Frank R. Lillie, Thomas Park, Ralph Buchsbaum, Orlando Park
1886	Potzger	Cain, Gates
1886	Woodbury	Cowles, John W. Harshberger, A. C. Kinsey
1887	Dice	Shelford, Adams, Dr. Grinnell, Dr. Ruthven, Clements, Forrest Shreve
1889	Braun	N. M. Fenneman, Cowles, Clements
1890	Hanson	Clements, Weaver
1891	Sears	Cowles, Warren Thornthwaite, Transeau, Charles Bessey, Dr. Crocker
1892	Watt	Tansley
1893	Aikman	Weaver
1897	Penfound	Weaver, Clements, Shelford
1900	Fassett	M. L. Fernald
1901	Davis	Murray F. Buell
1901	Raup	Transeau, Braun
1903	Oosting	Cooper
1904	Humphrey	Griggs, Cooper, Murray F. Buell, Daubenmire, Oosting, Forrest Shreve
1904	Kendeigh	Murray F. Buell, Shelford
1907	Hansen	Fassett
1908	Drew	Nichols, Gates
1910	Billings	Cain, Daubenmire, Potzger, Oosting, Drew, John Cantlon, Bliss, John Reed, Korstian
1911	Dansereau	Braun-Blanquet, Sears, Conard, Cain, G. Ledyard Stebbins, Clausen, Evans, Stephen Spurr, Marston Bates, Murray F. Buell, Egler, D. B. Lawrence, Billings, J. Tautis?
1911	Egler	Cooper, Murray F. Buell, Daubenmire, Nichols, Dr. Skottsberg
1913	Platt	Wherry
1914	Evans	Elton
1915	Phillips	Nichols, Gates, Braun-Blanquet, Louis Emberger
1918	Cottam	Curtis

(Continues)

Table 5. (Continued)

Birth year	Name	Key colleagues known or interacted with
1921	Auerbach	Shelford, David E. Reichle, D. A. Crossley, B. C. Patten, George W. VanDyne
1922	Bormann	Daubenmire, Murray F. Buell, Oosting, Platt, Eugene P. Odum, George M. Woodwell, Gene Likens
1924	Niering	Murray F. Buell
1929	Bliss	Oosting, Billings, John Cantlon, Bormann

The preceding six tables present information from all ecologists who addressed the question or topic posed. In the final Table 7, highlighting unusual observations or experiences of ecologists, I have selected 20 from the 566 survey pages written by the ecologists, our early leaders.

These 20 items help understand ecologists as people. They travel. They see more in the land than just nature. Find the academia route to be convoluted. Have a sense of humor, and enjoy amusement. Manage despite financial problems. Relish and thrive with endless adventures. Seldom get lost. Stay in reasonable shape. Live with professional conflicts. Are broadened and enriched by diversity (e.g., animals, plants, places, and experiences). Sometimes, make prescient or memorable observations. Do these features also apply to today's ecologists, from beginners to distinguished?

Perspective

Murray Buell and the ecology survey

Such an ecology survey fit well with Murray Buell, its organizer (Bormann and Pearson 1975). His career essentially began with Willliam S. Cooper at the University of Minnesota, one of the first distinguished American ecologists, and ended in 1975 as the rapidly growing field of ecology seemed to have just coalesced or "matured." After some early palynology work, his career focused on plants and vegetation. Over the years, he stimulated an enormous number of bright students into ecology, especially plant ecology, careers.

At Rutgers, he and the vertebrate ecologist Paul G. Pearson (also a President of the Ecological Society of America) taught a graduate course together and notably ran a long-standing Ecology Seminar Series. Many of the later ecologists in the survey were seminar speakers, who also enjoyed a field trip with Buell, graduate students, and others to the New Jersey Pine Barrens, Hutcheson Memorial Forest, or elsewhere. Most of the letter writers in the ecology survey took Murray's course(s), were regulars at the seminar series and participated in the field trips.

Having earlier studied or worked with several leading ecologists and ornithologists, I was a 1966–75 departmental colleague with Murray. He gradually passed on to me the joint graduate teaching, seminar series leadership, Hutcheson Memorial Forest directorship, and other opportunities. These continued effectively onward well after I moved on and Steward T. A. Pickett stepped forward in 1984 to play a leadership role.

Paul Pearson and I had both served many years on the Ecological Society of America Council and knew most of the organization's leaders. After Dr. Buell's death, we recommended creating a "Murray F. Buell

Table 6. Major career contributions or accomplishments.

Birth year	Name	Major contributions or accomplishments
1869	Cowles	Dune studies showing close relations between physiography and vegetation; succession in which equilibrium is never reached; a vegetation classification must be genetic and dynamic
1871	Tansley	*The British Isles and Their Vegetation*; led group starting the British Ecological Society and *Journal of Ecology*; helped launch the International Phytogeographical Excursions
1873	Adams	Geographical distribution of plants; established the Roosevelt Wildlife Preserve and biological station; general ecology and human ecology; dynamics of communities
1874	Clements	Climax is the response, expression, and indicator of a particular climate; as an organism, the formation arises, grows, matures, and dies; climax community of a succession terminates in the highest life form possible in that climate
1874	Conard	Plants of Iowa
1875	Transeau	Syntheses in a textbook of botany
1882	Gleason	Theory of the plant association; successional series continues, unless interrupted by environmental change or new species migrating in
1883	McDougall	Classification of symbiotic phenomena
1884	Braun-Blanquet	Theory, classification, and cartography of vegetational groupings; vegetation of high mountains; Mediterranean historical phytosociology and phytogeography; vegetation cover in relation to soil in the Montpellier (France) region
1884	Cooper	Fundamentals of vegetation change
1884	Weaver	Studies of root systems; prairie ecology; soil conservation; plant ecology text; 42 Ph.D. student theses
1885	Allee	Sustained contributions to the Woods Hole Marine Biological Laboratory; experimentally modified chemical, physical and social factors affecting an isopod in currents; animal aggregations, including the roles of pro-cooperation, and the deleterious effect of under-crowding, and unconscious need for fellow individuals in many animal species; research leading to *The Social Life of Animals*; contributions to the Society of Friends (Quakers); *Principles of Animal Ecology*
1885	Wherry	Role of hydrogen ion concentration for plants
1886	Potzger	Discovery of spruce and fir pollen in Texas; discovery of __?__ due to local glaciation all over southern Quebec; the pollen work in New Jersey
1887	Dice	Development of the research Institute of Human Ecology at the University of Michigan
1889	Braun	*Deciduous Forests of Eastern North America*
1890	Turrill	Plant life of the Balkan Peninsula; pioneering plant geography; linking taxonomy, cytology and ecology of plants
1891	Clausen	Introgressive hybridization; species distinguished by taxonomic characters controlled by genes that can be analyzed; transplant studies showing ecotypes in different environments; evolution of genetic barriers; stages in evolution of species; apomixis; genetic structure of ecological races; physiological role in the differentiation process
1892	Moss	*Flora of Alberta*

(Continues)

Table 6. (Continued)

Birth year	Name	Major contributions or accomplishments
1892	Watt	Forestry from an ecology perspective; pattern and process dynamics related to species' life histories
1893	Aikman	Measured growth responses of species and groups to microenvironments differing in space, time, and treatment
1900	Elton	Circulation of matter through food chains, based in part on lemming cycles; fluctuations in numbers are common in nature; pyramid of numbers; system of breaking down an ecosystem into recognizable discontinuities and centers of action in nature
1901	Raup	Mackenzie Basin studies
1902	Cain	*Foundations of Plant Geography*
1903	Hutchinson	Chemical evidence for hypolimnetic streaming and nutrient movements in small stratified lakes; survival growth curves indicated by lake sediments; new niche theory
1903	Oosting	Accomplishments of students who worked with me
1903	Went	Hormonal control of plant growth; the Phytotron
1904	Kendeigh	Developed methods and foundations for understanding the life history of birds
1907	Hansen	Tamarack bogs of the Wisconsin driftless area
1910	Billings	Relationships between vegetation types and desert microclimates evaluated using instrumentation
1911	Dansereau	Founded research unit, Service de Biogeographie, at the University of Montreal; neo-Schimperism coupled with biosystematics
1911	Egler	Ecological management of a small forest in Connecticut
1913	Curtis	Continuum concept; community classification—or ordination—in *Vegetation of Wisconsin*
1913	Platt	Ph.D. thesis on Eastern shale barrens; importance of microenvironmental work; radiation ecology using a cobalt source in the field
1914	Evans	Ecology of an old-field ecosystem, including dispersion of plants, nestlings of old-field sparrows, trophic structure and seasonality of grassland insects
1917	Rice	Role of chemical inhibitors in old-field succession; inhibition of nitrification by climax ecosystems
1920	Heslop-Harrison	Plant development physiology and breeding systems
1921	Auerbach	Giving ecology an increased recognition and respectability among the other science and engineering groups; ecology as an interdisciplinary science using different approaches and disciplines in the study of landscape systems; strengthening the professional organization to bring the input of ecologists as thinkers, planners and advisors to decision makers on the national scene
1922	Becking	Comparisons of phytosociology and ecology
1922	Bormann	Root grafting, so plants aren't individuals, but are literally linked together; small watershed as a delineated system with flows that measure nutrient budgets, a core concept for ecosystem ecology
1922	McMillan	*Xanthium*, and the genetics of photoperiodic responses

(Continues)

Table 6. (Continued)

Birth year	Name	Major contributions or accomplishments
1924	Niering	Sonoran Desert saguaro and vegetation work; *The Life of the Marsh*
1929	Bliss	Microenvironments and plant production in the Mt. Washington alpine zone; alpine and arctic photosynthesis/respiration, and producer energy flow relative to microenvironmental variation

Award" for the outstanding student presentation at the Annual Meeting, and the award was established in 1977 by the Ecological Society of America. Finally now, I feel humbled to honor Murray by summarizing the results of his survey, plus making the complete results available online, for ecologists and others interested.

Murray Buell's ecology survey of 1952–59 was done a half century after the generally recognized beginning of American ecology. Clearly at the beginning, the questions, studies, trends, and state of the science differed from those today and evolved over the fifty years. Ecologists of the later survey period were in mid-career, or even early career. Thus, their subsequent distinguished work does not appear in the survey. Although all of the ecologists surveyed were unique and remarkable people, it is hard not to notice two early ecologists, W. Clyde Allee, and Jens Clausen, as being unusual (Tables 2, 4, 6, 7). Imagine knowing them!

A bit of pre-ecology and ecology history

Most ecologists date the field of ecology to 1866 Germany and Ernest Haeckel, who studied marine medusae, plankton, biomass, and evolution, and made stunning drawings of the fauna (McIntosh 1985, Worster 1994, Forman 2016). He was the first to use the word "ecology" in print, which helped create his legacy. Karl Mobius published community and equilibrium studies of marine oyster beds in 1877. Then, in the 1890s in Europe, Eugen Warming, the "Zurich-Montpellier School," and Andreas F. W. Schimper published works on plant communities, vegetation classification, plant physiology, adaptation, and geography. By the 1890s in Europe, "...natural history and physiology combined and emerged quite suddenly as a recognized discipline of ecology" (McIntosh 1985). It combined biological oceanography, limnology, plant ecology, and animal ecology, and was taught in many European institutions. These scientists just pre-dated the work of ecologists in the survey (Table 1).

The earliest recognized North American ecologists, many included in the survey (Table 1), accelerated the development of this new science (McIntosh 1985, Kingsland 2005, Egerton 2015, Southgate 2019). In 1880–1887, Stephen A. Forbes published lake microcosm studies, and Charles E. Bessey grassland ecology research. In 1905–1916, Frederick E. Clements, Henry C. Cowles, and Willam S. Cooper followed with vegetation dynamics (succession) research, and Victor Shelford in 1913 with work on animal communities.

Did these early European and American ecologists "stand on the shoulders of giants"? Clearly, there were antecedents, such as Carolus von Linnaeus, Gilbert White, Alexander von Humboldt, Charles Darwin, and Henry David Thoreau, but were there scholars who could be considered as the "roots" that led more-or-less directly to ecology? For instance, natural or ecological succession was highlighted by Warming, Clements, Cowles, and Cooper, but in 1714, the eminent physician (and archaeologist), G. M. Lansisi, published a river-mouth coastal study south of Rome, in which he used the terms succession and primary plants in describing four vegetation stages apparently from

Table 7. Unusual observations and experiences of early ecologists.

Birth year	Name	Unusual observations and experiences
1873	Adams	Apparently, for a kind of feud between Dr. Adams and Dr. Pearse, Adams sent Pearse telegrams collect (paid by recipient rather than sender), and Pearse responded with telegrams 2 to 10 times longer, also sent collect.
1874	Conard	"In that Quaker community…nature study was the most favored outdoor sport, and the contemplation of nature was a form of worship."
1878	Harper	Received a list of his 490 publications.
1881	Griggs	"…I took my doctorate (in one year) at Harvard…" with my completed thesis accepted before my arrival.
1883	McDougall	"I used to have friendly quarrels with Clements but I endorsed his concept of a plant community as an individual organism…"
1883	McDougall	At retirement age, "I took an 18 mile day hike in the Chisos Mountains in Big Bend…"
1884	Braun-Blanquet	"I notice with regret that in the USA one does not seem yet to have understood the entire implications of such a system (highlighting vegetational groupings)… Phytosociology is a science of *synthesis*---much more so than ecology."
1885	Allee	"At Barro Colorado, I was one of the first to climb to the tree top canopy, and measure its environmental factors."
1886	Potzger	Grew up in a pioneer family living in a tiny community in the wilderness.
1887	Dice	Was only at the University of Chicago one year, had to work in western harvest fields to earn money, and the long trip (from Spokane) east was too expensive, U. Chicago tuition high, so I went to Stanford.
1891	Clausen	"I started physics under Niels Bohr."
1897	Penfound	"My sympathy goes out to all young plant ecologists who must obtain most of their support from federal agencies."
1903	Oosting	"Even now, I don't know where we are going. After…having no overall program, I've concluded it doesn't much matter! I doubt that forcing all activities here into a preconceived pattern could have been any more effective…"
1904	Humphrey	In remote Baja, the car broke down/wouldn't start, 2 days waiting, left wife with water in car, took quart of water and 2 cans of beer, walked out 40 miles (2 days), plus 12 miles on horseback with a Mexican herding cattle. At village restaurant, an American (who discovered my wife) drives up. "Dr. Humphrey, I presume?"
1911	Dansereau	"Registered at the Faculty of Law…how not to lecture and how not to study… coupled with my apparent lack of talent led to my withdrawal from an intended diplomatic career."
1911	Egler	Landing in France…with a handsome bronze medal, awarded first prize at the ship's masquerade for appearing as an overfilled woman's laundry bag.
1913	Curtis	"I have constantly been stimulated by the ideas of H. A. Gleason, whom I consider to be the most outstanding ecologist of all time. He was so far ahead of his time that we have not yet (1955) caught up to him."
1913	Platt	Gunnery officer (WWII) on the only one of 10 merchant ships that survived crossing the North Atlantic, but then became icebound north of Russia where we overwintered.

(Continues)

Table 7. (Continued)

Birth year	Name	Unusual observations and experiences
1922	Bormann	"I would like to see…the planning of a totally new city…based on ecological principles."
1924	Niering	Lived with on a remote Polynesian atoll among the native population, and sailed to the 33 islets on a breadfruit tree outrigger.

Ammophila/Agropyron to oak species, and outlined the mechanisms causing the dynamic process (Pignatti and Savoia 1989). In the mid-1700s, Linnaeus described bog succession. Then in 1860, Thoreau published the now classic essay, "The Succession of Forest Trees," including animal, wind, and plant mechanisms (Worster 1994, Lawrence Buell, 2021, *personal communication*). Furthermore, Thoreau's detailed studies of community structure, lake ecology, phenology, and more also pre-date mainstream ecology subjects. Thoreau read and was especially influenced by White, Linnaeus, Humboldt, Darwin, and the botanist-naturalist Peter Kalm. Are Thoreau and other such prescient people antecedents, roots, or ecologists? The survey summarized here starts with early leading ecologists, but were they really among the earliest?

Eugen Warming's 1895 ecology book, *Plantesamfund* (Warming and Vahl 1909), was used at the beginning of ecology in North America (Table 4). Otherwise, there is little indication in the survey responses that the mostly American ecologists corresponded with, or read, early European ecologists and their work (Tables 3, 5).

At the outset, the relatively tiny group of pioneering scientists (Table 1) emerged in a world where land and nature had been changing under human influence for millennia (McNeill 2000, Ponting 2007, Southgate 2019). Certainly, perceptive people over time had repeatedly addressed environmental problems with logical ecological solutions. The tiny group of early ecologists rapidly led to a larger group and its organization, including the establishment of the British Ecological Society in 1913 and the Ecological Society of America in 1915 (Egerton 2015). Within decades thereafter, the science matured, and today is of worldwide importance.

Ecology maturation phase

Many or all of the earliest ecologists worked in semi-natural areas or areas with a heavy human imprint (McIntosh 1985, Worster 1994). Envision early studies, for example, of marine animals around busy polluted harbors (Haeckel and Mobius), vegetation in densely populated and modified Denmark (Warming), plant communities around built areas (Zurich-Montpellier School), pasture vegetation (Bessey), and succession of crop fields in the Midwestern United States (Clements, Weaver). Analyses of relatively natural areas (e.g., Schimper, Tansley, Cowles, Cooper, and C. Hart Merriam) were gradually added to the mix, and, as ecology matured, supposed natural areas became predominant at least in North America. Today significant past and present human effects on ecosystems are universally recognized by ecologists.

The pioneering work of the early decades (Table 6) produced important threads and topics and themes that gradually developed and linked to form the core (and general boundaries) of ecology. The 1960s

"environmental crisis," plus adding newer important subjects, accelerated the maturation of ecology. During this process, population ecology and evolutionary ecology each noticeably matured, that is, developed a generally accepted body of principles. Ecosystem ecology, landscape ecology, conservation biology, and theoretical ecology emerged and seemed to mature. Soil ecology, urban ecology, road ecology, town ecology, global ecology, and other important sub-fields emerged. Thereafter, all these fields continued to open frontiers and expand.

Applied ecology was another important dimension of ecology's maturation. Over many decades, ecologists have sometimes applied their findings to solve environmental problems. Yet, from the 1960s onward, applied ecology grew rapidly and became a mainstream component of ecology. Also, accomplishing basic conceptual research that promises a short lag between theory and application, as in some landscape ecology and road ecology studies, has been a particularly valuable approach (Forman 1995, 2019). Adding applied ecology catapulted ecologists into consulting roles for society, helping solve environmental problems, even planning a better future.

Murray Buell, who did early work with William S. Cooper, knew the majority and perhaps the bulk of the 73 early ecologists surveyed (Table 1). Most of us today work in ecology as a mature recognized science. My studies and readings had introduced me to most of the ecologists surveyed. Yet, I only interacted with 16 of them, mostly in the younger cohort (briefly met Braun, Dansereau, Braun-Blanquet, Sears; knew Evans, Auerbach, Niering, H. T. Odum, Platt, Wherry; worked with or actively interacted with Oosting, Billings, MacArthur, Cottam, Whittaker, Bliss, plus Aaron Jack Sharp, Chandler S. Robbins, Olin Sewell Pettingill). Meeting or knowing such people makes them "giants" for me. As ecology moves beyond its maturation phase, now most of us know, and are inspired by, few of the early ecology giants. They have become revered figures of history.

Societal conditions affecting early ecology

As mentioned above, many of the earliest American ecologists worked in the Midwest (Table 1), which was largely agricultural with farmsteads, remnant woodlots and grasslands, dirt roads, and villages. Much of the West, in contrast, was emerging from pioneer days, but still relatively less-exploited or urbanized land, with Indigenous peoples often still prominent. The Northeast and South were largely a patchwork of woods, fields, dirt roads, farmsteads, and towns. All regions had scattered cities, where most major institutions are located. A few of the ecologists (e.g., John E. Potzger) grew up in wilderness and knew pioneer days (Table 7). These geographical patterns were particularly important to the early ecologists, because almost everyone lived close to, and was quite familiar with, the nearby woods, fields, or desert/grassland (Forman 1995, 2019, Southgate 2019).

World War I and World War II and the intervening Great Depression occurred during the period, and for some ecologists, the Indo-China War. Many ecologists served in a war (Tables 4, 7). Although this usually required distant travel, it seemed to have little effect on career research direction (Table 4). Overall, communication between European and American ecologists was rather limited during the period, and the field progressed in these areas (as well as in Australia, Latin America, China, and elsewhere) relatively independently. In contrast, today most ecologists bridge such divides by traveling widely to share ideas and new frontiers, and understand diverse landscapes and ecosystems (as an extreme, I lived on four continents, and gave >120 invited presentations in 27 countries). What would early ecologists have thought?

Overall, the conditions for research by early ecologists were both better and worse than they are today. Early ecologists generally knew nature well, had nearby convenient research areas, required few funds for travel, had few technology problems, spent little time on grant-proposal writing, and spent most time with nature, rather than being glued to a desk or computer. On the contrary, today's ecologists readily go considerable distances for research, have computers for rapid searches and data analyses, use huge libraries, frequently enjoy access to research funds, have many publication options, communicate widely with other ecologists and scholars, and know each other through frequent meetings and invited lectures. Which set of issues is better for ecologists, and for ecology?

Finally, the survey of early leading ecologists is quite amazing. This results from the period represented and the number of ecologists who responded. Perhaps, most important is that the material received is mainly in the ecologists' own words, typed on their own good and bad typewriters.

This summary mainly highlights patterns in responses by the group. However, the tables are also designed to provide at least a sliver of insight into an individual ecologist and his/her work. Following publication of this summary article, the entire ca. 566 pages of responses from the 73 ecologists are scheduled to be deposited in the Harvard University DASH Repository. Hopefully, by reading the responses themselves, the individual early ecologists will emerge as interesting, impressive, enjoyable people, who set the stage for ecology and us.

The survey provides a rare glimpse into our pioneering ecologists, and their early ecology.

Data Availability

The >500 pages of collected writings, upon which this summary is based, are to be deposited in the Harvard University DASH Repository.

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