# What Early 20th Century Nature Study Can Teach Us

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*Students are becoming more and more disconnected from nature, a phenomenon labeled "nature-deficit disorder" or "ecophobia." Some relate the problem to overly conceptual science curricula and argue for science programs to be based, in part, upon local natural history. Such a curriculum, called nature study, was developed at the beginning of the 20th century for similar reasons. Nature study developed in response to the industrialization of American society and became the foundation for science teaching in elementary schools. Nature study proponents believed nature could be studied locally to discover scientific truths, develop within children affection for nature, bring joy to children growing up in an industrialized world, and develop a sense of conservation. Early 20th century nature study educators provide arguments for the study of natural history that sound remarkably contemporary and provide pedagogical practices that can be scrutinized and adapted to the needs of today's classrooms.*

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Louv (2005) introduced the phrase "nature-deficit-disorder" to characterize the growing concern over children's isolation from nature. He suggested that not only is nature necessary for physical, emotional, and spiritual health, but that it also promotes environmental stewardship.

Those disconnected from nature are not likely to see the strong necessity of protecting it, even when they participate in environmental education efforts, whether formal or informal. Instead, Louv and others suggest that environmental stewardship is more likely to be fostered by some of the natural history educational practices common at the beginning of the 20th century.

Sobel (2008) is critical of environmental education for young children and even believes it may instead be instilling "ecophobia." Sobel (1996, 2008) argues for more developmentally appropriate environmental education practices that include an understanding of local natural history. His suggestion of "no environmental tragedies before fourth grade" (2008, p. 141) challenges the status quo of units on rainforests and recycling in the early grades.

Sobel suggests that if ecology or environmental education is about students' responsibilities to prevent impending doom, we may be provoking a form of dissociation. He worries that if children lack positive experiences with nature, they may begin to associate nature with fear. Further, he cites studies such as Wells and Leckies (2006) that indicate childhood experiences and interactions with nature (for example, hiking) rather than declarative knowledge about the environment are more positively associated with environmental behaviors in adults.

Louv (2005) quotes biologist Elaine Brooks who said that humans seldom value what they cannot name; Brooks goes on to paraphrase one of her students who said "giving a name to something is a way of knowing it" (Louv, p. 41). The root of Louv's and Sobel's arguments is that "if educators are to heal the broken bond between the young and the natural world, they and the rest of us must confront the unintended educational consequences of an overly abstract science education" (Louv, p. 134).

Our own anecdotal evidence suggests something else about the current environmental/ecological efforts in science education: Many of our students, who are college seniors, know more about the wildlife found in rainforests and the plains of Africa than they know about the wildlife in Illinois. When speaking about food chains, we are more likely to hear students recall lions and zebras than deer mice and Red-tailed Hawks.

It seems that education is distancing students from the natural world. Our students have little knowledge about endangered species in Illinois (some don't even know that there *are* endangered species in Illinois), but when

asked, they can easily name endangered species that are found in Africa.

It should not come as a surprise that Kellert (1985) found that 6-10 year olds were found to be the most exploitive, unfeeling, and uninformed of all children in their attitudes towards wildlife. However, in her study of Swiss children Lindeman-Matthies (2005) found that the more wild plants and animals children noticed and could name in the local environment, the more they appreciated these organisms.

We are not referring here to formal environmental education classes but rather to everyday elementary classrooms and general science classrooms in middle school and high school. While environmental education has not always been developmentally appropriate, organizing learning around nature study is appropriate to current ideas in environmental education.

The idea of nature study as the basis for the development of environmental awareness and concern is supported by contemporary environmental education research. Chawla (1998) characterized an individual's concern for the environment as being linked to early childhood experiences with nature. Chawla (1999) also found such childhood experiences consistent with Hungerford and Volk's (1990) model of determinants of responsible behavior—of which the major entry-level variable is "*environmental sensitivity*" (p. 24).

No longer do environmental educators assume that simply imparting knowledge to students will result in responsible environmental behaviors (Hungerford and Volk 1990, Chawla and Cushing 2007). It is contemporary studies such as these that have led to current recommendations about environmental education, such as those outlined in *Excellence in Environmental Education: Guidelines for Learning (K-12)* (NAAEE 2010). Among the key principles in the *Guidelines* is an understanding of the local environment at elementary, middle, and high school levels. But many teachers of science who have responsibility for teaching units on the environment are unaware of the importance of childhood experiences with nature.

Among the shared attributes of natural history education and environmental education is both have ecology as their theoretical base and frequently make use of ecological investigative procedures. Proponents of education in both subjects also see greater affinity for the natural world as a worthy goal in itself, a goal that contributes to increased environmental citizenship.

Perhaps the greatest difference between the two subjects is the emphasis on deductive reasoning found in environmental units in typical science texts, which would likely rely more on principles of ecology and the impact of human activity on those principles. In our view, natural history is more inductive with emphasis on observing and studying local nature for its own sake rather than being a means to an end. For instance, teachers might well offer lessons on defining ecosystems and the consequences of human impact on reducing the diversity of those systems.

The human-environment interface is of serious import and we agree that an informed citizenry is critical to wiser political policies and responsibility. It seems to us, however, that the deductive approach leads to abstraction along with individual feelings of futility.

The fact is there really isn't much that a ten-year-old can do about the dead zone in the Gulf of Mexico, especially if he or she hasn't even seen the Gulf and experienced first hand the sights, smells, and sounds of the coastal community. On the other hand, teaching natural history might be more likely to lead students to observe components of nature that exist in students' own neighborhoods, parks, and school grounds. Of course, this does nothing for the Gulf, but it does give students experience that leads to greater personalization with the natural world.

The ability to put a name with creatures that share our environment reinforces that relationship and, we submit, takes a step toward the informed citizen mentioned above. One of the early concerns in the teaching of nature study was teachers' difficulty in finding resources to teach nature (Comstock 1911/1986). Fortunately, we now have tools that make the identification task more approachable than ever before. The budding naturalist has access to an abundance of free, online resources for identifying virtually anything in one's local environs. These range from simple picture matching to the dichotomous keys of taxonomists that require facility with sophisticated vocabulary. An Internet search ("big black bird" for instance) coupled with a bit of logic leads to a likely identification. "Is the big black bird I saw in the school yard more likely to be a crow or a wild turkey?"

We argue that it makes sense to refocus content related to the environment to a more positive approach based in local nature study, or as we prefer, natural history. This is certainly not a new idea, since natural history education in elementary schools can trace its origins to the nature study movement of the late 19th century.

However, just because it is not a new idea does not mean it is not a plausible or important one.

**History of Nature Study**

Armitage (2009), in his examination of the nature study movement, highlights a central conflict of nature study that seems appropriate for discussion today: how to study nature "for the purposes of increasing the sum of human knowledge" and "to put the pupil in a sympathetic attitude toward nature." (p. 1).

Nature study advocates believed both were possible. Armitage argues that nature study actually began in the 1870's when noted Harvard University zoologist Louis Agassiz created the Anderson School of Natural History on Penikese Island, Massachusetts. While it is often credited with being the precursor to Woods Hole Oceanographic Institute and other laboratory field stations, Anderson was actually a field school for teachers—an indicator of Agassiz's commitment to teachers. He felt strongly about science pedagogy; that the teaching of natural history from "the direct observation of natural phenomenon rather than learning about the outdoors from textbooks" was crucial (p. 15).

Aggasiz could speak for many science educators today:

> Stanford University president David Starr Jordan, a former student of Agassiz's, recalled his professor protesting that "throughout the country the great body of teachers of science went on in the old mechanical way. . . The boys and girls still kept up the humdrum recitations from worthless text-books. They got their lessons from the book, recited from memory, and no more came into contact with Nature than they would if no animals or plants or rocks existed on this side of the planet Jupiter" (Armitage 2009, p. 16).

The nature study movement in the United States reached its zenith at the turn of the 19th century. Its adherents believed nature could be studied to discover scientific truths and to create within students affection for nature and an understanding of nature's ability to bring joy in an industrialized world (Armitage 2009). Further, nature study pedagogy stressed the importance of knowing "the nature encountered in students' day-to-day lives" and that such knowledge would result in concern for nature which would result in greater interest in conservation (Armitage 2009, p. 3).

Anna Botsford Comstock, who literally wrote the book on nature study, described the purpose of nature study as the need "to cultivate in children powers of accurate observation and to build up within them understanding" (1911/1986, p. 1). In *Handbook of Nature Study,* first published in 1911 and reprinted occasionally since then, Comstock anticipated issues that continue today. While we might argue today that Comstock sounds naïve, her concerns for students and teachers were genuine. She related her initial conversation with teachers about nature study resulted in teachers declaring "Oh, we have no time for it. Every moment is now full!" (p. 3)—a familiar refrain of many teachers today.

Comstock believed that if teachers would only fill their free time with out-of-door activities rather than more work, then teachers would not feel tension and fatigue from their job, thus demonstrating her belief that nature study was both a topic of study and a balm for the stresses of the day. Further, Comstock believed nature study was good for veteran teachers because learning something new helps stave off becoming "didactic" and "dogmatic" (p. 4). Engaging in nature study with children helps teachers avoid "the terrors of discipline, the eternal watching and eternal nagging to keep pupils quiet and at work" (p. 3) The same was true for students because

> much of the naughtiness in school is a result of the child's lack of interest in his work, augmented by the physical inaction that results from an attempt to sit quietly. The best teachers try to obviate both of these causes of misbehavior rather than punish naughtiness that results from them. Nature-study is an aid in both respects, since it keeps the child interested and also gives him something to do (Comstock 1911/1986, p. 4).

In *Handbook of Nature Study*, Comstock provided a teacher's guide to nature that included a section on the teaching of nature study and how it correlated to other subject areas as well as the importance and use of a field notebook. Other sections include study information on common eastern North American animals and plants. The text is nearly 900 pages!

In addition to Comstock, another voice of nature study was Liberty Hyde Bailey. Bailey, a prominent horticulturist and botanist, was a professor at Cornell University, but he made clear that nature study was not a subject of universities but a "movement of the common schools" (Bailey 1909, p. 3). Bailey said nature study "designates the movement originating in the common schools to open the pupil's mind by direct observation to a knowledge and love of the common things and experiences in the child's life and environment. It is a pedagogical term not a scientific term" (p. 4).

Bailey provided a history of the nature-study movement that began with Agassiz but reiterated the movement is a product of elementary schools, not universities. To Bailey the idea was not a new one; nature study is as old as Socrates and Aristotle and could be found in the work of Pestalozzi, Rousseau, and Froebel. He called nature study a response to "dry-as-dust science teaching" (Bailey 1909, p. 17).

Bailey asserts that nature study as discussed here began in 1884 and is a descendant of "object teaching"—where representative objects are used to teach children. Bailey believed that object teaching, which uses the senses rather than just memorizing, was an improvement to traditional methods but was still isolated and disconnected. That began to change when a follower of Agassiz, H.H. Straight, created an integrated curriculum based on "common things in the neighborhood" (p. 20) at the State Normal School at Oswego (NY). Bailey said this was where Agassiz met Pestalozzi.

Shortly thereafter, Straight left for Cook County Normal School where he worked to make elementary science an equal part of the school day with mathematics and grammar. By 1889, Cook County Normal School had sought to make elementary science not only sympathetic to nature but also foundational for high school studies. The Cook County Normal School elementary science plan, developed by Wilbur S. Jackman, rejected specialized study of inert forms in the classroom for study out of doors. Jackman published the elementary science plan in pamphlets called "Outlines in Elementary Science," which were later published in book form titled "Nature Study for Common Schools" (Bailey 1909, p. 23).

Similar movements were underway in Massachusetts and New York. Nature study, it was reiterated, "was not botany, entomology or geology, but plants, insects and fields" (p. 30). "Nature study is seeing what one looks at and drawing proper conclusions from what one sees, and thereby the learner comes into personal relation with the object" (p. 30). Nature study was progressive in that it relates schooling to living.

Nature study did later become part of Progressivism; proponents included popular progressives like John Dewey and Theodore Roosevelt. In fact, Dewey, who maintains a cult-like status among many educators, "warned that if nature is isolated from the child's world, 'the original open and free attitude of the mind to nature is destroyed; nature has been reduced to a mass of meaningless details' " (Armitage 2009, p. 24).

From the 1890's through World War I millions of students were involved in nature study. Armitage (2009) cites a 1915 study that "found that 14 states required elementary schools to teach nature study, and 23 states issued outlines for nature study instruction. A 1921 survey said '1905 to 1915 saw the incorporation of nature study outlined in the Course of Study of almost every state in the union'" (p. 4).

Several professional journals related to nature study were founded around the turn of the last century. One, *The Nature Study Review*, first published by the American Nature Study Society in 1905, was "devoted to all phases of nature-study in elementary schools." In its introduction the editors included in nature study

> the natural history of plants and animals (nature-study in its common and most limited sense), school-gardening and the closely allied elementary agriculture, elementary physical science, the physical side of geography, and physiology and hygiene with special reference to the human body" (Fairbanks et al. 1905, p. 1).

It was the belief of the editors that larger goals in education could be taught through the local environment, as this was common practice among biology programs at the university level. Further, as stated by editor Fairbanks, immersion in the local environment had it own benefits as children

> are shut away in too many instances from a free contact with nature; their needs are so provided for and dangers guarded against, that they grow up with undeveloped capacities and in almost total ignorance of the world of nature. How much more they would make of their surroundings, and how much more these surroundings would heighten their interest and zest in life if they were able to appreciate them in even a very simple way (Fairbanks et al. 1905, p. 6).

In addition to providing an "interest and zest in life," it was believed that nature study at the elementary level would lead easily to the scientific study of nature at the high school level while still instilling a love of nature.

Many believed that the technical study of plants and animals (i.e., structure, function, development, and classification) without any "acquaintance with a number of common animals and plants" would not lead to any meaningful learning. In an editorial, Hodge succinctly states that if done correctly "nature will be accorded its rightful place as a great source of nourishment in our educational life" (Fairbanks et al. 1905, p. 9). And, lest it be forgotten, an editorial by Bigelow reminds the

reader that nature study "is only a modern form of the old-time general natural history" which can prepare the learner to understand the generalizations and principles of modern science (Fairbanks et al. 1905, p. 16).

How far off were these early 20th century science educators from modern thinking on these issues? Do educators not now, using concepts from modern cognitive science, insist on the idea that learning is more robust if experiences precede explanations?

Scott (1900), in his book *Nature Study and the Child*, does not begin with a treatise on the definitions, aims, and principles of nature study methods but with a detailed outline of the study of a dandelion as a concrete example of nature study and the multiple ways one can approach the study of the dandelion. The table of contents hints at the level of detail in the outline, which includes the structure of the dandelion; comparing the dandelion to other plants; the study of the dandelion in relation to its physical environment; its adaptation to its environment; and its relation to society as a medicine, food, weed, and plaything—but first one goes outside to observe it and dig it up to observe its taproot. By doing this study of a dandelion, Scott believes students will learn information about the dandelion, gain an interest in the dandelion, become more observant, and develop language and writing skills when writing and speaking about the dandelion.

What did a nature study curriculum entail? Comstock (1911/1986) first advises the teacher that her handbook is intended to make the teacher familiar with the topic—the handbook is not intended to be read to, or by, children. Comstock also suggests if the teacher is not prepared for her lesson, "she should take up the questions with the pupils as a joint investigation, and be boon companion in discovering the story" (p. 23).

Comstock's handbook is divided into four parts: the teaching of nature study, animals, plants, and Earth and sky. Birds are the first topic of study in the animal section; here Comstock reminds the teacher that studying birds is more than naming birds and the real purpose is to know the "life habits of the bird" (p. 27). Comstock then outlines lessons on observing feathers, feathers as clothing, feathers as ornament, how birds fly, migration, eyes and ears, beaks, feet, songs, attracting birds, the value of birds, studying birds' nests in winter, and finally life histories of common birds. For example, Comstock suggests students keep a robin notebook to help comprehend the habits of this common bird about which children may know very little.

Comstock provides a list of questions teachers can use to help aid students in their observations. These questions are in a series to be revealed over the course of study at the appropriate time. The first series of questions relate to the arrival of robins (What date did you notice the first arrival of robins in the spring? Does the robin begin to sing as soon as it comes north?). The next series encourages the observation of the robin (What is the color of the beak? What is the color of the tail feathers?). Later series ask questions related to singing, nest building, eggs, young, and finally questions for observations over the summer break (p. 61-62).

Similarly, nature study journals are filled with observations, information, and lessons for teachers. Volume One of *Nature Study* (1901) included articles titled "Among the Artichokes," "Fern and Fern Allies," "Woodpecker Architecture," "How to Find the Constellations," "Incidents of Spider Life," and "The Study of Rocks" among others. "Among the Artichokes" (Burnham 1901), for example, highlights the insect fauna, and their interactions, discovered by the author and a young child near artichokes in a garden including jumping spiders, flies, bees, locusts, crickets, tree hoppers, aphids, and ants.

Of particular interest is a description of a course in nature study described in part by Jackman, who created one of the original elementary courses of study in science (noted above). The course of study includes both the content and pedagogical methods needed to teach nature study (Jackman et al. 1900). In addition to content knowledge and field work, Jackman et al. include painting, drawing, and writing and how they relate to observation; measurement; reading; study; recitation; criticism; and moral aspects of nature study as necessary for the teaching of nature study.

Bailey addressed the notion that children, and interestingly enough, non-science majors in college, should not be taught as the specialist is taught.

> I have a growing feeling that the nature-study method is not only a public-school process, but that it is equally needed in colleges and universities for all unspecialized students. The process applies, in fact, from kindergarten to college. From long experience I am convinced that much of our college physics, botany, zoology and chemistry is very poorly taught if we are to consider its effect on the student; and this effect is, of course, the end of teaching. A student may take college physics and yet have little conception of the common physical phenomena of life. He may study physiology and

> gain little real understanding of his bodily functions or of every-day sanitation. These subjects are likely to be taught with the special[ist] student in mind rather than the general student. The teacher is disposed to think of the necessity of developing a whole subject rather than give the student a rational and vivid conception of the material as it relates to him. I have been interested all my life in plants; but I should not care to have one of my pupils devote four or five class periods a week for a whole freshman year to the study of botany unless he were specially interested in botany. Much of the beginning teaching in the sciences in college and universities is undoubtedly very bad. It is no doubt accurate, and it may also be adapted to the few students who desire to specialize in the subject; but such students should be taken further in courses designed for them. Condensed general courses that give the college student a rational view of the subject, without many details and exceptions, are very much to be desired; and such courses should attempt to relate the student to his own experience in life (Bailey 1909, p. 8).

Scott makes very clear that elementary science cannot be taught in any manner similar to high school and college science:

> Our university or college friend or high-school friend, interested in education, enthusiastic in his specialty, would have us introduce, or has already introduced, into our schools such work as he carries on with his students, with very little modification or adaptation to children. The botanist would have our little folks begin with the plant cell as the unit of plant life and structure, or with the lower forms of plants, such as pond scum, and work up step by step to the complex organism which the child calls a bean plant. This seems to the botanist the simplest, easiest, and only logical method of procedure. The mineralogist would have the children begin with the chemical elements of which minerals are composed, and build up the minerals and rocks, because to him a mineral means nothing unless he knows its components. Both overlook the fact that what is logical and simple for them may be illogical and incomprehensible to the child, and what is complex for them may be simple to the child. Both forget the long process of education, much of it unconscious, by which they learned to analyze the common things about them, before they could even understand they were complex, much less resolve them into their components, or build them by a synthetic process from their components (Scott 1900, p. 93).

Nature study practices and scholarship continued through the turn of the last century into the war years. During this time, nature study influenced future leaders of the environmental movement. Aldo Leopold was influenced by the writings of Liberty Hyde Bailey in the development of his conservation ethic and ideas on education (Armitage 2009).

Rachel Carson was also influenced by the nature study movement. Carson's mother, Maria, like many educated women at the time, had an interest in natural history (another facet of the nature study movement) and was familiar with Comstock's *Handbook of Nature Study* as she assisted her older children with their nature-study related schoolwork. With her husband traveling and her other children older, Maria, a former schoolteacher, was later able to spend her days with young Rachel observing nature on their farm (Lear 1997). Armitage (2009) contends that Maria Carson urged Rachel into a writing career modeled by nature study writers Gene Stratton Porter and Mabel Osgood Wright. Rachel Carson would later incorporate many nature study ideas into her own writings about children's education.

**The Demise of Nature Study**

World War I was the beginning of the end for nature study. Armitage (2009) argues that proponents of nature study "understood the war as typifying the very traits of modern life against which nature lovers rebelled" (p. 196). This, argues Armitage, resulted in "the propensity for organized, ameliorative reform [to] yield to the corporate values of mass consumption and commercialized leisure that became the popular ethos of the 1920s" (p. 197). Further, the war changed the way the public perceived conservation—moving from a moral duty to conserve wildlife "to maximiz[ing] effectiveness of resource exploitation" (p. 197).

Armitage also contends that nature study was difficult to implement because of a lack of resources and training, especially in urban areas. Instead, teachers turned to books that sentimentalized nature and created the perception that nature study was "cute and fluffy" and, therefore, feminine at a time when there was a "postwar backlash against female teachers" (p. 201).

Nature study was also perceived as lacking in order and discipline at a time when efficiency and behaviorism were ascendant in education. In the end, Armitage believes "all of these factors combined to emphasize order and discipline instead of student-centered learning in the education of the postwar years" (p. 202). However, one lasting result of nature study was the

establishment of science in elementary schools, even if student-centered learning and nature study were not.

**Directions for the Future**

One could argue the central conflict of nature study (i.e., increasing knowledge of science versus the development of a sympathetic attitude towards nature) continues today in the conflict between science literacy standards that focus on career and economic success and failure "to teach aesthetics, reason, the importance of a sense of community, civics, morality, evaluation and compromise – the fundamental building blocks on which free and sustainable societies will be constructed" (Saylan and Blumstein 2011, p. 42). Therefore, the ideas and goals of nature study are not unrelated to contemporary thoughts about natural history (e.g., Louv 2005, Sobel 2008).

Kolan and Poleman (2009) discuss current natural history studies more as practice than a body of knowledge; a practice "that strives for depth as well as breadth and a commitment to deepen our sense of connection and belonging to this world" (p. 31). Kolan and Polemen use this idea of natural history as practice to craft an approach to educational design that includes an understanding of "our participatory place"—the flora, fauna, climate, culture, and physical features that make it unique. They consider an understanding of place as necessary to promote sustainability.

And it is not just the general public or biology generally that has ignored natural history. Stewart (2006) analyzed 10 years of discourse in the Australian Journal of Environmental Education and found no articles that discussed an environmental education pedagogy based upon the natural history of Australia. Science educators, ecologists, biologists, and environmental educators all seem to overemphasize general science concepts to the exclusion of natural history.

Can the past, as exemplified by nature study, provide direction for science education today? Are we capable of looking to the past to inform a science education for the future, in these times of standards, testing, and technology? The National Science Education Standards (National Research Council 1996) did not preclude the study of natural history in its life science standards nor did it promote natural history. One could argue that children's separation from nature has continued uninterrupted since their publication. Current drafts of the Next Generation Science Standards (www.nextgenscience.org) also don't prohibit natural history education, but their emphasis on college and career readiness and testing does not make it likely that teaching children local natural history will be a valued part of the science curriculum. The Framework for Assessing Environmental Literacy from the North American Association for Environmental Education (NAAEE 2011) does suggest local flora and fauna as a context for an assessment of environmental literacy but does not overtly mention teaching natural history. Providing a local context to assess environmental literacy may not help if students are as unfamiliar with their local flora and fauna as studies suggest. Nor does NAAEE mention natural history in its definition of environmental education (www.naaee.net/what-is-ee).

However, while many science standards do not explicitly mention teaching natural history, they also do not prevent it. Adherence to the Common Core Standards (CCSSO & NGA 2010) would not prohibit the study of local natural history, which includes nature journaling and use of informational texts. On the other hand, current actions such as No Child Left Indoors legislation are complementary to natural history education.

We know it is not an issue whether children will embrace the indoors and technology—they already have. The issue is whether children will choose to embrace nature in any fundamental way. Spend much time with school children in a garden, many of them complaining about "bugs!" while swatting flies and running from spiders, and it is clear some children already fear and loathe nature and are happy to retreat indoors to follow technological pursuits. As has been suggested, a science education filled with abstractions and declarative knowledge has not created a sense of environmental stewardship in our children. But, as Armitage concludes,

> research indicates that children who experience the outdoors become more caring, grounded adults. These ethics extend to the treatment of nature. Thus contemporary research, though not conclusive, seems to validate the nature study intuition that children need to experience nature in order to care for it and their fellows (p. 212).

If society wants children to appreciate the natural world and become stewards of the environment, then the environment cannot be an abstraction. It cannot be taught in specialized classes but must be embraced by all teachers at all levels. Standardized curricula and tests must make room for children to go outside, dig up dandelions, and observe robins. Many critics such as Louv and Sobel are leading the discussions about changing the way we teach children about the environment. Educators of the past such as Comstock

and Bailey provide arguments for the study of natural history that sound remarkably contemporary and provide pedagogical practices that can be scrutinized and adapted to the needs of today's teachers. Educators concerned with the environment and stewardship may do well to heed the call of our forbearers and look to natural history studies as a component of the general science curriculum.

Or, perhaps environmental education efforts could be focused around natural history.

Of course, natural history education cannot just dust off a one hundred-year-old curriculum. Stebbins (2012) argues there is much to value in the "direct observation of local plants and animals and their structure and manner of life" found in nature study. But nature study "lacked the unifying theme of evolution and was sometimes given to moralizing, excessive sentimentality, and interpretations based on the way humans think and behave (anthropomorphism)" (p. 10).

Instead, Stebbins recommends local natural history studies that "emphasize ecological principles and the inter-relationships of the organisms studied …involve students and teachers in actual studies of living things in their natural habitats near school or home…focus on learning the methods of science, emphasizing the 'discovery' (hands-on) approach over the 'telling' (lecture) approach [and]…give attention to human ecology – humanity's place in the web of life – including the ecological impacts of human actions and our attitudes towards nature" (p. 10). It is not enough to just study the dandelion but also its place in an ecosystem.

Science educators and scientists should assist teachers by working to ensure the inclusion of natural history education in the development of national, state, and local standards. Since many states are in the process of adopting Environmental Literacy Plans, perhaps those plans could be correlated to natural history goals advocated by environmental educators and organizations such as the Natural History Network. This would mean that local natural history studies would become overtly expected in school curricula.

Science educators and scientists should also work with local teachers to develop a natural history curriculum that makes use of local natural history contexts. While field trips to natural areas are ideal, test-based curricula and tight budgets (including insurance and transportation costs) mean science educators and scientists need to help teachers realize what can be accomplished in the schoolyard (Stebbins 2012).

Finally, science teacher educators, along with their science colleagues, need to develop experiences for pre-service elementary teachers that reconnect them with nature—as these young people are as often disconnected from nature as elementary students. In the elementary science methods courses that we teach, we have begun using nature journals and schoolyard walks to stimulate pre-service teachers to learn more about the wildlife on the other side of the classroom window. We've built plant presses to help them see the benefit of a school natural history museum. We've begun discussions with our biology colleagues to develop courses with a greater emphasis on natural history.

If young people (pre-service teachers and elementary students alike) do indeed need to experience nature in order to care for it, then action is needed on the part of science educators and scientists in service to schools. John Dewey understood this importance of educational experiences with nature when he wrote:

> No number of object-lessons, got up *as* object lessons for the sake of giving information, can afford even the shadow of a substitute for acquaintance with the plants and animals of the farm and garden acquired through actual living among them and caring for them (Dewey 1899/1980, p. 8).

**References**


Armitage, K.C. 2009. *The Nature Study Movement: The Forgotten Popularizer of America's Conservation Ethic*. University of Kansas Press.

Bailey, L.H. 1909. *The Nature Study Idea: An Interpretation of the New School-Movement to Put the Young into Relation and Sympathy with Nature* (3rd Ed.). MacMillan.

Burnham, E.J. 1901. Among the artichokes. *Nature Study* 1: 75-77.

Chawla, L.C. 1998. Significant life experiences revisited: A review of research on sources of environmental sensitivity. *The Journal of Environmental Education* 29(3): 11-21.

Chawla, L.C. 1999. Life paths into effective environmental action. *The Journal of Environmental Education* 31(1): 15-26.

Chawla, L.C., and D.F. Cushing. 2007. Education for strategic environmental behavior.

*Environmental Education Research* 13: 437-452.

Comstock, A.B. 1986. *Handbook of Nature Study*. Cornell University Press. Original work published 1911; the 1986 edition is reprinted from the 1939 edition, for which the editor's preface states is a reprinting of the original.

Council of Chief State School Science Officers (CCSSO) and the National Governors Association (NGA). 2010. *Common core state standards*. Retrieved from http://www.corestandards.org

Dewey, J. 1980. *The School and Society*. Southern Illinois University Press. Original work published 1899.

Fairbanks, H.W., C.F. Hodge, T.H. MacBride, F.L. Stevens, F.L., and M.A. Bigelow. 1905. Nature-study and natural science – a symposium. *The Nature Study Review* 1(1): 2-18.

Hungerford, H., and T. Volk. 1990. Changing learner behavior through environmental education. *Journal of Environmental Education* 21(3): 8-21.

Jackman, W.S., I.B. Meyers, and C.W. Carmen. 1900. Science department. *The Course of Study* 1(1): 32-33.

Kellert, S.R. 1985. Attitudes towards animals: Age-related development among children. *The Journal of Environmental Education* 16: 29-39.

Kolan, M., and W. Poleman W. 2009. Revitalizing natural history education by design. *The Journal of Natural History Education* 3: 30-40.

Lear, L.J. 1997. *Rachel Carson: Witness for Nature*. Houghton Mifflin Harcourt.

Lindeman-Matthies, P. 2005. 'Loveable' mammals and 'lifeless' plants: How children's interest in common local organisms can be enhanced through observation of nature. *International Journal of Science Education* 27: 655-677.

Louv, R.L. 2005. *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*. Algonquin.

National Research Council. 1996. *National Science Education Standards*. National Academy Press.

North American Association for Environmental Education (NAAEE). 2010. *Excellence in Environmental Education: Guidelines for Learning (K-12)*.

North American Association for Environmental Education (NAAEE). 2011. *Developing a framework for assessing environmental literacy*. Retrieved from http://www.naaee.net/framework

Saylen, C., and D.T. Blumstein. 2011. *The Failure of Environmental Education (and How We Can Fix It)*. University of California Press.

Scott, C.B. 1900. *Nature Study and the Child*. D.C. Heath

Sobel, D. 1996. *Beyond Ecophobia: Reclaiming the Heart in Nature Education.* Nature Literacy Monograph Series No. 1. The Orion Society.

Sobel, D. 2008. *Childhood and Nature: Design Principles for Educators*. Stenhouse Publishers.

Stebbins, R.C. 2012. *Connecting with Nature: A Naturalist's Perspective*. NSTA Press.

Stewart, A. 2006. Seeing the trees and the forest: Attending to Australian natural history as if it mattered. *Australian Journal of Environmental Education* 22: 85-97.

Wells, N.M., and K.S. Lekies. 2006. Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, Youth and Environments* 16(1): 1-24.