

THE ENCYCLOPEDIA OF ENVIRONMENTAL STUDIES



WILLIAM ASHWORTH

THE ENCYCLOPEDIA OF ENVIRONMENTAL STUDIES

William Ashworth

The Encyclopedia of Environmental Studies

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**THE
ENCYCLOPEDIA OF
ENVIRONMENTAL
STUDIES**

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INTRODUCTION

I wrote this book out of frustration.

As an environmental activist, perusing environmental impact statements and other technical documents and reports produced by federal agencies, I have often run across terms that are defined poorly—or not at all—by the agencies' writers, forcing me either to do a long search through a shelfful of textbooks, glossaries, and specialized dictionaries, or to read on with my understanding limited (and perhaps badly skewed) by a wild stab at the meaning from context. As an environmental author, striving for accuracy and clarity in my own work, I have often had to restructure sentences or whole paragraphs because I wasn't sure of the connotation of a particular term and could not confirm its meaning—or sometimes even its existence—in any of the standard sources. And as a librarian, working the reference desk of a small public library, I have been brought up short again and again in attempts to help patrons define and understand the environmental terms they run across in their own reading. The problem is not just that there is no single source for these terms. Often it is that there is no source at all.

This book goes a long way toward filling the longstanding need for a single reference work aimed at those who must work with—and try to understand—environmental language from many disciplines. In it you will find definitions of those scientific terms from chemistry, biology, ecology, geology, and physics that are commonly encountered in environmental literature. You will find the specialized language used by federal agencies dealing with the environment, and explana-

tions of some of the important laws these agencies are governed by. You will find terms used by foresters, environmental engineers, meteorologists, epidemiologists, and other technical workers who apply the work of environmental scientists and agency bureaucrats to actual field conditions. And you will find a fair amount of slang—the terms you are likely to hear bandied about among the agency personnel, the field-workers, the scientists, and the environmental activists when they gather at the end of the day, often together, to unwind over a pitcher of beer.

The book is not complete—to be complete it would have to be approximately the size of the Taj Mahal—but it is comprehensive. It is catholic. And it is as accurate as multiple-source checking and close perusal by an editorial board composed of dedicated experts can make it.

The list of terms defined contains as broad and representative a range as possible of the technical terms used in the fields of environmental science, environmental management, and environmental law. This is of obvious use to the layman striving to understand the professionals in these fields, but it should also be of considerable use to the professionals themselves. After all, the geologist doesn't necessarily know the language of forestry, nor the forester that of the sanitary engineer, nor the sanitary engineer that of the wildlife biologist—and none of them is likely to be able to figure out the lawyer. With this book at hand, there is at least an even chance that professionals like these, who deal with the environment from a multitude of different approaches,

will be able to talk to one another. Perhaps they will even begin to understand each other.

Special emphasis can probably be found in these pages on terms from water pollution control, forestry, and government. That is because these are the fields within the broad range of environmental studies that happen to be of the most personal interest to me, and I have not been able to free myself entirely of the bias that this induces. I have, however, made an effort to be as inclusive as possible. Words have been chosen for inclusion as I came across them in my own reading, or as they have appeared in glossaries in environmental impact statements, environmental textbooks, and other sources, or as they have been suggested to me by professionals in the various fields.

In order to be as accurate as possible, no word has been included unless I was able to find a definition for it in at least two separate sources.

It is impossible to begin to list the many people who made significant contributions to this work, but that doesn't stop me from trying. Foremost in this regard are the members of the Editorial Board—Rod Badger, Zane Smith, Buck Parker, and, especially, Ed Fritz—whose dedication to the book has been almost as great as my own. Without them I could not possibly have completed the job, and I owe them much more gratitude than I can possibly express. Beyond these I can single out only a few others. Tom Ward checked the entries on permaculture and alternative agriculture and some of those on forestry and biology. Bob Harvey went through all of the chemistry terms, prescreening them for Rod Badger during a time when Rod was bedridden by a back injury and could not work to full capacity. Ron Waitt provided a valuable sounding board for Forest Service terminology. Liz Frenkel shared her expertise as an environmental lobbyist *par excellence*, and Larry Chitwood helped with geology entries. Rob Winthrop, who is working on a project similar to this one in the field of anthropology, provided a considerable

amount of moral support over more than one bottle of cheap California burgundy. Finally, I should mention the major contribution of my wife, Melody, whose expertise as a biologist and medical technician helped me dig myself out of numerous pitfalls that might otherwise have derailed the project entirely, and whose unflagging support—along with that of my daughters Jenny, Sara, and Billie Sue—often kept me going when nothing else could possibly have forced me back to the reference books and the word processor.

USING THIS ENCYCLOPEDIA

All terms defined appear alphabetically in a single listing. There has been no attempt to separate them by discipline, as such a separation appeared to run counter to the book's goal of ease of access to unfamiliar terms (if you don't know what a word means, chances are very good you won't know which discipline it is commonly used in either). Main headings are printed in boldface, with subheadings in italics. Cross-references (there are many) appear in small caps.

The cross-references themselves deserve a special word. There are three types. *See xxx* indicates that the term you are referred from is a *synonym* for the entry you are being referred to; *see under xxx* means that the term you are being referred from is defined *as part of* the entry you are referred to, but is not actually synonymous with it. Finally, *see also xxx* tells you merely that *further information* about the topic covered by the entry you are referred from may be found in the entry you are referred to.

If the word you seek does not appear as a heading, *check the index*. A term that does not appear at first glance to be covered at all may have been defined as part of another entry, and though many of these have been covered by cross-references interspersed in the main text, not all of them have. A good index is an indispensable tool. Use it.

**THE
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2 absolute age

tific facts, abortion will undoubtedly remain a controversial issue.

Methods. There are two principal means used to induce abortion. The older of the two methods, *dilatation and curettage* (d&c), involves dilating (stretching) the cervix (the neck of the womb), reaching through with a small blade, and scraping the womb clean. The second method, *suctioning*, was pioneered in Japan in the late 1950s. It involves inserting a small tube through the cervix into the womb and using a vacuum pump to suck out the contents. Suction in particular is a safe and effective technique, with life-threatening complications developing in only 5 of 1,000 cases (as opposed to 23 of 1,000 cases in full-term childbirth). It cannot be used beyond the 14th week of pregnancy, however.

Legal status. Therapeutic abortion (abortion to save the life of the mother or to terminate a pregnancy caused by incest or rape) is legal in most countries of the world. In addition, some countries (Japan, Sweden, Poland, the Soviet Union) have legalized abortion-on-demand as a means of limiting family size and controlling overpopulation. In the United States, therapeutic abortion was legalized in Colorado in 1967 and in Hawaii and New York in 1970. On December 22, 1973, in a case known as *Roe vs. Wade*, the United States Supreme Court ruled 7 to 2 that the government (federal or state) may not unduly limit a woman's right to abortion during the first six months of pregnancy. Since that time all states have permitted therapeutic abortion, and most have also legalized some forms of abortion-on-demand. Persistent efforts by antiabortion forces to promote a Constitutional amendment forbidding abortion have not to this time been successful.

absolute age in geology, the actual amount of time that has passed since a geologic event took place, as determined by radiocarbon dating, potassium-argon dating, *DENDROCHRONOLOGY* or some other means of measuring the passage of real time. See also *GEOLOGIC TIME*; *absolute geologic time*.

absolute humidity the weight of water vapor present in a given volume of air, usually expressed in grams/cubic meter. Knowledge of absolute humidity is of limited use because the volume of an *AIR MASS* changes with changes in temperature and atmospheric pressure, altering the absolute humidity without any change in the actual moisture content. Compare *RELATIVE HUMIDITY*. See also *HUMIDITY*.

absolute pressure in engineering, the actual pressure applied by a gas or a liquid to the inside walls of a containment vessel, ignoring whatever counter pressures may be applied to the outside walls by the *ATMOSPHERE* or by another surrounding gas or fluid. Compare *GAUGE PRESSURE*.

absolute temperature the *TEMPERATURE* of a body measured in relationship to the temperature known as *absolute zero*, where all molecular motion ceases. It is measured in degrees Kelvin (K), which are the same size as degrees Celcius (C) but for which "zero" corresponds to absolute zero rather than to the freezing point of water. Absolute zero has been calculated to lie at -273.16°C (-459.69°F); thus, the freezing point of water has an absolute temperature of 273.16°K .

absorption in chemistry, a process in which a liquid or gas is held within a solid without changing the chemical properties of either of the two substances involved. Absorbed molecules penetrate into the intermolecular spaces beneath the absorbing solid's surface. Compare *ADSORPTION*; *SOLUTION*.

abyssal plain in geology and oceanography, the relatively level portion of the deep-ocean floor, beginning at the foot of the continental rise (see under *CONTINENTAL SHELF*) and extending outward toward the center of the ocean. It was once thought that the abyssal plain extended in a nearly featureless expanse from one continental rise to the next, but this view is now known to be in error. See *MIDOCEAN RIDGE*; *SEAMOUNT*; *GUYOT*.

accretion (1) in law, the slow, imperceptible deposition or erosion of soil by a river over time, as contrasted to *avulsion*, which is the rapid, perceptible deposition or erosion of land by a river that changes course as a result of a flood or similar catastrophic event. The distinction is critical for determining the ownership of land: lands added by accretion belong to the owner of the parcel they are accreted to, while lands added by avulsion remain the property of the original landowner. See also *RELICION*.

(2) in geology, a *SEDIMENTARY ROCK* structure that has been built up from a small nucleus by the adherence of a layer or layers of particles around it.

(3) in geology, the process by which land is build up through the deposit of stream sediments in a *DELTA* or alluvial plain (see *ALLUVIUM*).

ACE

See *ALLOWABLE CUT EFFECT*.

ACEC

See *AREA OF CRITICAL ENVIRONMENTAL CONCERN*.

acetone a colorless, highly mobile fluid, chemical formula $\text{C}_3\text{H}_6\text{O}$ (also written CH_3COCH_3 or $(\text{CH}_3)_2\text{CO}$), obtained from the fermentation of corn or from the oxidation of propane or other petroleum gases. Acetone is the simplest member of the class of compounds known as *ketones* and is thus chemically related to the *ALDEHYDES*. It is an excellent solvent for fats, oils, plastics,

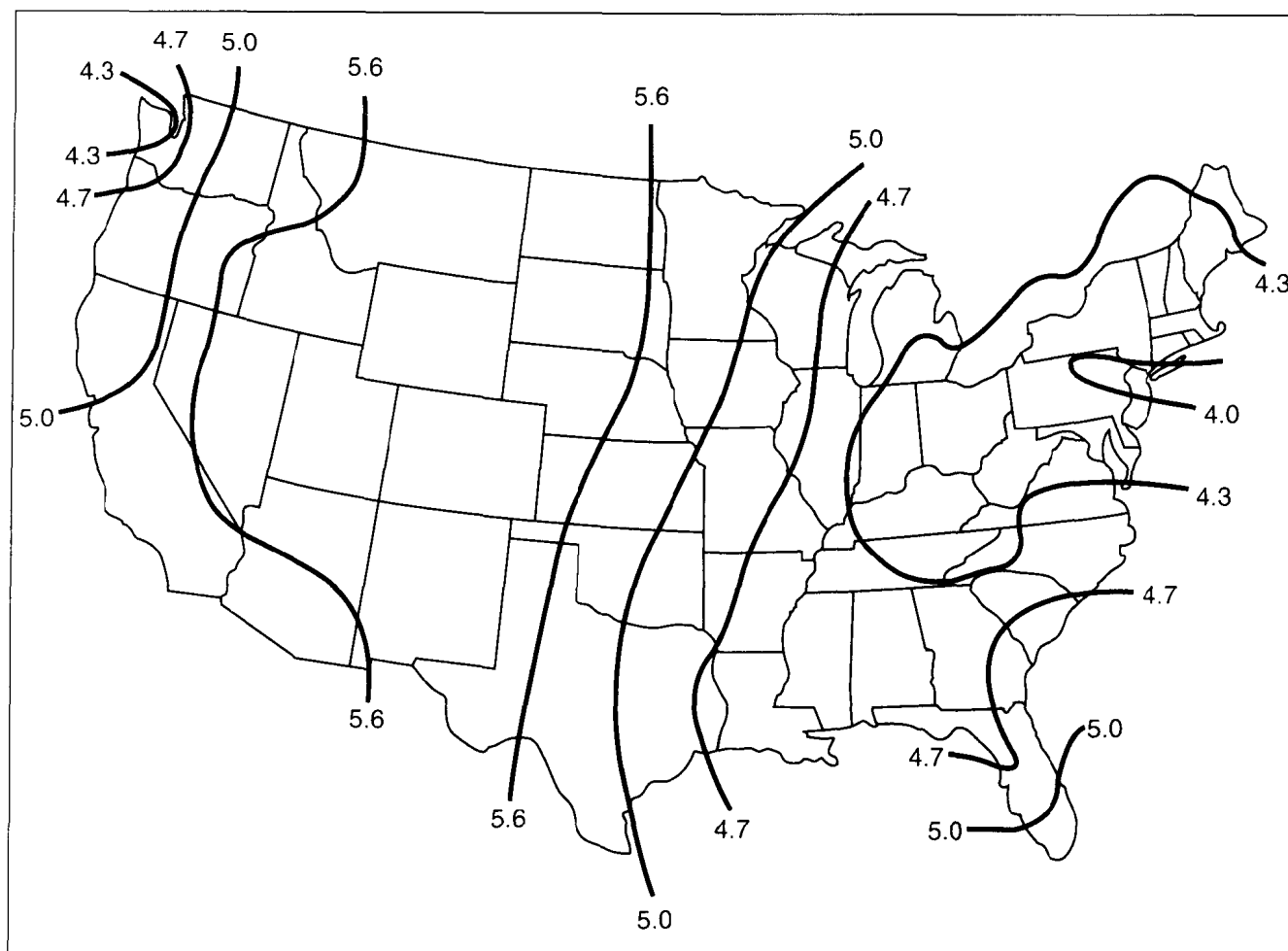


Fig. 1 Rainfall Acidity

paints, and numerous other compounds, and is sold commercially as fingernail-polish remover and as a solvent for the so-called "super glues." It is only moderately toxic (LD_{50} [rats, orally]: 10.7 ml/kg) and is not known to be carcinogenic (see CARCINOGEN), but is classed as a hazardous substance due to its extremely high VOLATILITY and low FLASH POINT (-20°C).

acid in chemistry, originally, any compound that dissociates upon contact with water, forming hydronium ions (H_3O^+ ; see DISSOCIATION; ION); often defined more broadly today as a *proton donor*, that is, any chemical substance that gives up protons when combining with other substances. Since the qualities we think of as "acidic" do not normally show up until the acid is dissolved in water and the dissociation (or proton donation) takes place, most people undoubtedly think of acids as liquids, though many of them are actually solids, and a few are gases, at room temperature. Acid solutions have a pH of less than 7; they have a sour taste, are moderately to strongly corrosive, and conduct electricity. All of these characteristics depend directly upon the presence of the H_3O^+ ions: the more completely a

substance dissociates (the more H_3O^+ ions a solution of it contains) the more strongly it will show acidic properties. Acids combine with BASES and METALS to form SALTS.

acid extractable organic compound in ENVIRONMENTAL PROTECTION AGENCY terminology, an ORGANIC COMPOUND that may be separated from wastewater by applying acid to the wastewater. The most hazardous of this group of compounds from an environmental standpoint are the PHENOLS. (Note that most chemists use this term to refer to organic compounds that can be separated *into* water, rather than *out of* water, by acids. Under this more common terminology, phenols are *base extractable* rather than *acid extractable*.) Compare BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUND.

acid rain rainfall with a lower pH than normal. Since snow, hail, and sleet can also be acidic, the term *acid precipitation* is probably preferable, though it is seldom used in the popular press. Acid rain is the best-known form of AERIAL DEPOSITION; it is found worldwide but is a particular problem in Scandinavia, central Europe, eastern Canada, and the northeastern United States.

4 acoustic emissions

Causes of acid rain. Normal rainfall is moderately acidic, with a pH of roughly 5.6 (7 is neutral). This acidity results from the dissolving of CARBON DIOXIDE (CO_2) out of the atmosphere by individual raindrops as they fall to earth. The dissolved carbon dioxide turns the water in the raindrops to weak carbonic acid (H_2CO_3). Chemicals released into the air from volcanoes and other natural sources may also contribute to temporary upswings in rainfall acidity. However, the most significant sources of acid rain are manmade emissions, primarily from the burning of FOSSIL FUELS. The combustion temperatures of these fuels are high enough to cause some of the nitrogen and oxygen molecules in the surrounding air to combine, forming NITROGEN OXIDES (NO_x). These compounds escape into the atmosphere, where they enter into a series of chemical reactions that convert them to nitric acid (HNO_3). Impurities in the fuel may also combine with oxygen to form acid-making compounds. The most important of these is sulfur, a common constituent of coal (less common in petroleum), which forms SULFUR OXIDES (SO_x). Some of these compounds, when acted on by atmospheric chemistry, yield sulfuric acid (H_2SO_4). Together, sulfur oxide and nitrogen oxide emissions can profoundly effect the pH of precipitation in areas downwind from an emitting source. The lowest known reading to date, during a rainstorm in Wheeling, West Virginia, in 1980, was pH 1.5—about 10,000 times as acidic as normal rainfall.

Effects of acid rain. The effects of acid rain vary greatly with the type of environment the rain falls upon. Regions of thick soils and basic (alkaline) rock types such as limestone may show little or no effects, while regions of thin soils and acidic rock types such as granite may be significantly altered. This alteration includes, but is not limited to, increases in the acidity of lakes and streams, leading to fish and invertebrate reproductive failure; decreases in the growth rate of vegetation, including commercial crops and timber; intensified soil erosion; and increases in the rate at which minerals and HEAVY METALS are leached from soil, rocks, and pipelines, resulting in depleted soils and increased health hazards for those using the mineralized water.

Historic background. Acid rain was first noted in Scandinavia, where it was being monitored and studied as early as 1952. Between 1960 and 1980, this monitoring showed average rainfall acidity increasing by roughly 200-fold. Similar results were demonstrated by North American monitoring programs begun in the late 1960s by Cornell University scientists in the Adirondack Mountains of New York and by scientists from the University of Toronto in the La Cloche Mountains of northern Ontario. By 1981 these studies had found approximately 180 lakes in the Adirondacks and 140 in Ontario that were devoid of life due to low pH levels brought about by acid rain. Public concern over these findings led to demands that industrial emissions of

SO_x and NO_x be curbed by law. However, due to the impossibility of tracing these diffuse airborne pollutants to precise sources, legislation to accomplish this equitably has proved difficult to write, and the issue of emissions control remains controversial. (See also AIR POLLUTION; TOXIC PRECIPITATION; SCRUBBER.)

acoustic emissions internal sounds generated by a structural material when placed under stress. Acoustic emissions are a forewarning of structural failure; hence, equipment designed to detect them is an important tool for preventing hazardous materials spills caused by ruptured tanks or pipelines.

acquired lands lands purchased by the federal government from private sources for management as part of a NATIONAL PARK, NATIONAL FOREST, or similar public holding. Compare PUBLIC DOMAIN.

acre-foot the amount of water required to cover one acre of land to a depth of one foot. The term is used primarily as a measure of reservoir capacity. One acre-foot is equal to 43,560 cubic feet (325,851 gallons).

acre-yield the amount of water obtainable from one acre of an AQUIFER; also, the amount of anything obtainable from one acre of the land that produces it.

activated carbon or activated charcoal a form of powdered or granulated CARBON from which most impurities have been removed by treatment with heat and steam. It readily absorbs large quantities of a great variety of substances, principally HYDROCARBONS, and is therefore extremely useful for removing organic pollutants from water and air (see ABSORPTION). Most activated carbon is prepared commercially from coconut husks, peach and apricot pits, and other woody BYPRODUCTS of food production.

activated sludge a common form of secondary sewage treatment (see SECONDARY TREATMENT), utilizing AEROBIC BACTERIA in a pond or tank that is kept oxygenated either by mechanical mixing or by pumping compressed air through it, both of which agitate or "activate" the WASTEWATER. The bacteria feed on each other and on other organic matter present in the wastewater, forming clumps of a frothy, sticky, gelatinous substance known as *floc*, or *zoogloal* ("living glue") masses. More than 60 SPECIES of bacteria have been found in a single sample of *floc*; however, the principal species is *Zoogloea ramigera*, which forms multibranched colonies whose sticky, fingerlike protruberances interlock with each other, firmly enmeshing most other microbial life in the water. The *floc* is separated from the wastewater through the use of a SETTLING BASIN. A small part of it is used to inoculate the wastewater coming into the activated sludge pond

with fresh colonies of *Z. ramigera*, while the remainder is disposed of. The clarified wastewater, its BIOCHEMICAL OXYGEN DEMAND reduced by 60% to 95%, is either dumped directly into the RECEIVING WATERS or retained for further purification (see TERTIARY TREATMENT).

active solar design any type of SOLAR ENERGY installation requiring pumps, fans, or other mechanical means to transfer heat from the collector to the point of use. Compare PASSIVE SOLAR DESIGN.

acute toxicity the ability of a toxic substance to cause death of or serious damage to living ORGANISMS within a short time after their exposure to it. A "short time" is usually defined for this purpose as 96 hours. Compare CHRONIC TOXICITY.

Adams, Ansel American photographer, author, and environmentalist. Born in San Francisco, California, on February 20, 1902, Adams had little formal schooling, being educated partly by his father and largely by his own insatiable curiosity. His first career was as a concert pianist, until he realized at about the age of 28 that what he called "making pictures" (never "taking pictures") was more important to him than his music. Although he continued to play the piano for pleasure to the end of his life, he gave no more concerts after 1930. In 1932 he gave his first important one-man show, at San Francisco's de Young Museum. Four years after that, he became the first young photographer since 1917 to be given a one-man show at Alfred Stieglitz's influential An American Place gallery in New York City. His photographs, primarily of the scenic grandeur of the American west, quickly became known for their clarity of vision and their intense attention to detail, qualities clearly shown in his most famous photograph, *Moonrise, Hernandez, New Mexico* (1941). Called strongly by an urge to protect the world's scenery as well as to capture it on film, Adams became a director of the *Sierra Club* in 1934, a post he held until 1970. His book *This is the American Earth* (1960: text by Nancy Newhall) was the progenitor of Sierra Club Books' Exhibit Format Series. An author and lecturer as well as a photographer, Adams published some 30 books and taught numerous seminars and courses in photography in Yosemite National Park and around the country. He received the Sierra Club's John Muir Award in 1963 and the Conservation Service Award of the U.S. Department of the Interior in 1968. A definitive biography, *The Eloquent Light* (Nancy Newhall), was published by Sierra Club Books in 1964. He died in Carmel, California on April 22, 1984.

adaptation in ecology, an alteration in the behavior and/or physical characteristics of an ORGANISM OR SPECIES that enables it to adjust to permanent changes in its

ENVIRONMENT or to fit into a different NICHE than it has historically occupied.

adequate treatment in sanitary engineering, a term used for a sewage treatment facility that includes at least SECONDARY TREATMENT and provides maximum EFFLUENT concentrations of 30 mg/L SUSPENDED SOLIDS, 30 mg/L BOD (see BIOCHEMICAL OXYGEN DEMAND), and 1.0 mg/L total phosphorus (see PHOSPHORUS: *phosphorus as a pollutant*).

adhesion, of a fluid

See WETTING ABILITY.

adiabatic rate in meteorology, the measure of ADIABATIC TEMPERATURE CHANGE caused by the motion of an AIR MASS upward or downward through the ATMOSPHERE. In dry air, the adiabatic rate is about 3°C (5.5°F) for every 1,000 feet of elevation change. Compare LAPSE RATE.

adiabatic temperature change in meteorology, the heating or cooling of an AIR MASS due to changes in volume rather than changes in energy content. Generally, the cause of an adiabatic temperature change is the movement of the air mass to a higher or lower elevation. As it moves to a higher elevation, the pressure on it decreases, causing its volume to expand and its temperature to lower; moving to a lower elevation reverses the process. See also ADIABATIC RATE.

Adirondack Mountain Club (ADK) hiking and outdoor club founded in 1922 to promote outings and conservation activities in mountain areas, especially the Adirondack Mountains of the State of New York. The ADK maintains portions of various trail systems in the northeastern mountains and operates a pair of lodges; it also has an extensive publications program. Membership (1988): 11,000. Address: 174 Glen Street, Glens Falls, NY 12801. Phone: (518) 793-7737.

administrative trail term used historically by both the BUREAU OF LAND MANAGEMENT and the FOREST SERVICE to designate a trail used primarily to help manage a piece of land and only secondarily (if at all) as a route for recreationists. Administrative trails were built to somewhat lower standards of grade and tread width than other types of trail. Most have now been replaced by roads.

adsorption in chemistry, a process in which a liquid or gas adheres to the outside of a solid without penetrating it. The adhering film is normally only one molecule thick. Compare ABSORPTION.

advanced treatment

See TERTIARY TREATMENT.

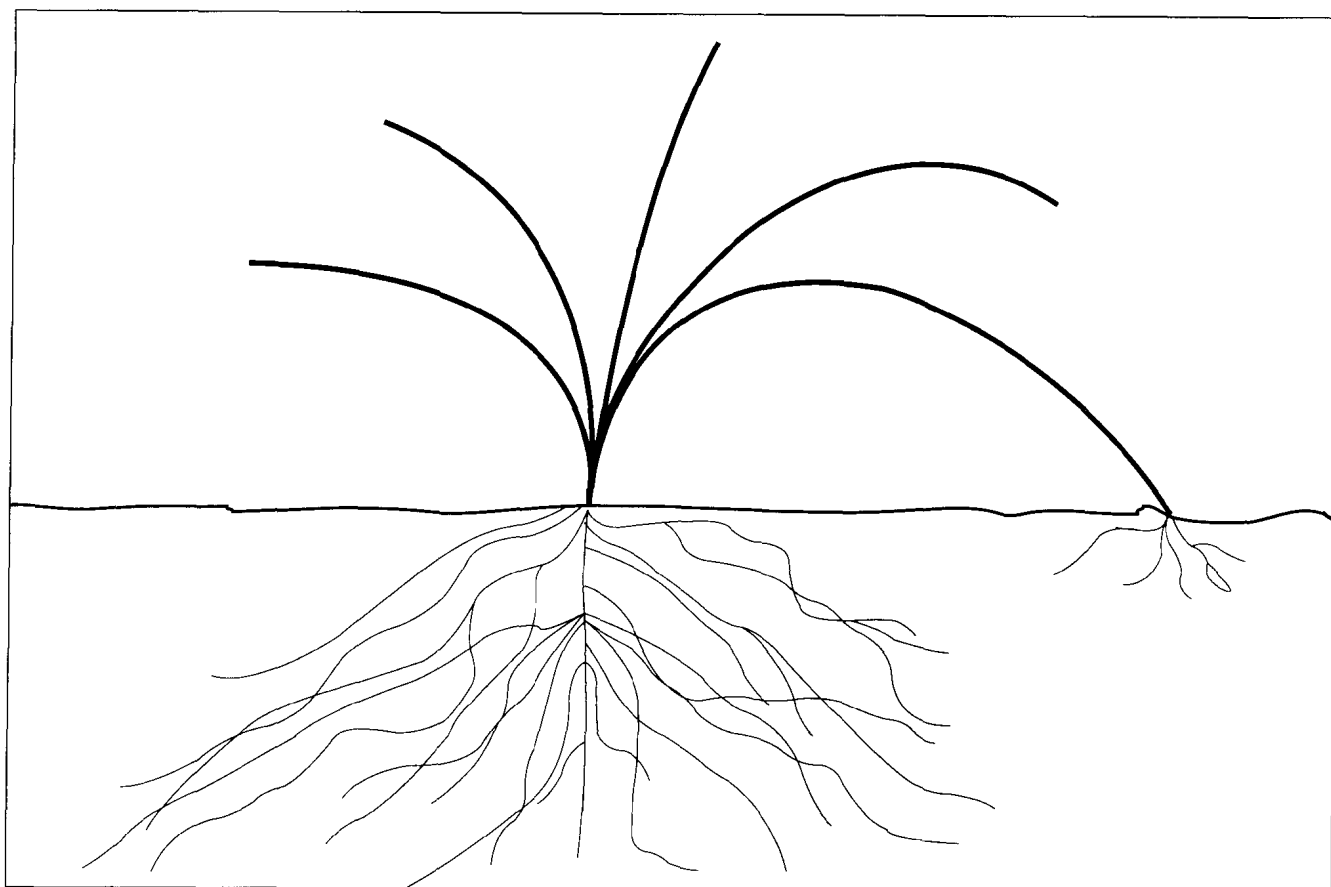


Fig. 2 Adventitious Roots

advection fog

See under FOG.

adventitious growth in botany, the development of any type of plant tissue in a region of the plant where it is not normally found. A tree branch that bends down and touches the ground, for example, may put out roots (*adventitious roots*) at the point of contact. The ability to produce adventitious growth increases a plant's ability to survive severe damage.

AE

See ANIMAL EQUIVALENT.

aeolian deposit in geology, soil or sand moved to its current location by wind. Aeolian deposits are particularly important features of the landscape in areas of little vegetation such as deserts (see DESERT BIOME) and LITTORAL ZONES. See also LOESS; DUNE.

aeration the process of passing air through water, sewage, or some other liquid. Aeration kills ANAEROBIC BACTERIA by exposing them to oxygen; encourages the OXIDATION of POLLUTANTS and growth of aerobic ORGANISMS that remove BIOCHEMICAL OXYGEN DEMAND from the water; and carries off small particles in the SURFACE

TENSION surrounding the air bubbles. It is performed either by piping air through a screen or other form of diffuser into the bottom of a tank of the liquid to be aerated and allowing it to bubble to the surface, or by mechanically agitating the liquid to a froth. Spraying may also be used as a form of aeration; in this case the liquid passes through the air rather than vice versa. Natural aeration occurs in the waterfalls and rapids of swiftly moving streams (see WHITE WATER).

aerial deposition deposition on the land surface or in the water of pollutants that have arrived through the air. Airborne contaminants are usually carried to earth in the rain, though in still air they may simply settle out. See ACID RAIN; TOXIC PRECIPITATION; DRY DEPOSITION.

aerial logging any system of logging in which the YARDING of the logs is done through the air. Aerial logging requires fewer roads and avoids the soil compaction and UNDERSTORY damage that results from dragging logs along the ground, and is thus preferable to ground yarding from an environmental standpoint, although it is usually considerably more expensive. The logs may be lifted directly by cable-guided balloons (*balloon logging*) or by helicopters. The most common technique,

however, is to use an elevated cable called a *skyline* (See SKYLINE LEAD).

aerobic bacteria any species of bacteria (see BACTERIUM) that requires oxygen to live. Compare ANAEROBIC BACTERIA.

aerobic stabilizer in sanitary engineering, any device used to remove BIOCHEMICAL OXYGEN DEMAND (BOD) from SEWAGE or other wastes through the use of AEROBIC BACTERIA. The most common aerobic stabilization devices are the TRICKLING FILTER and the ACTIVATED SLUDGE tank, either of which is capable of removing 85%–95% of the BOD in a waste stream in as little as two hours. Aerobic stabilizers are considered to be a form of secondary sewage treatment (see SECONDARY TREATMENT).

aerosols droplets of liquid small enough to be suspended in a gaseous medium (usually air). Aerosols can be a particularly dangerous form for POLLUTANTS to take because they can be breathed into the lungs, where they can both damage sensitive lung tissue and be absorbed directly into the bloodstream without the protection afforded by the digestive system. In air pollution control terminology they are sometimes considered to be a form of PARTICULATE (see AIR POLLUTION: *types of pollutants*). Note that “aerosol spray” cans are named for the fine mist of droplets they produce, not for the means of propelling the contents from the can. See also COLLOID; SUSPENSION.

aestivation

See ESTIVATION.

age class in ecology or forestry, a geographically related group of individuals of the same species and of roughly the same age. See also EVEN-AGED STAND; AGE DISTRIBUTION; COHORT; SURVIVORSHIP.

age distribution the total number of individuals in each AGE CLASS of a POPULATION at a specific instant in time. It is usually represented as a curve on a graph, with the horizontal (x) axis representing ages and the vertical (y) axis representing numbers of individuals. Compare SURVIVORSHIP.

Agency for Toxic Substances and Disease Registry

(ATSDR) federal agency responsible for coordinating efforts to control or reduce human health problems caused by toxic substances accidentally released into the environment. ATSDR's principal mission is to maintain listings, in as complete and accurate a form as possible, of hazardous substances, their health effects, and the locations within the United States where accidents involving them have caused significant health

hazards. The agency also coordinates (and to a certain extent, instigates) scientific studies of the relationships between toxic substances and human health, and acts as a support center for federal and state programs designed to respond to emergencies involving hazardous-substance spills. Established on April 19, 1983 by order of the Secretary of Health and Human Services, as directed by Section 104(i) of the COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT of 1980, ATSDR is a part of the PUBLIC HEALTH SERVICE of the Department of Health and Human Services (see HEALTH AND HUMAN SERVICES, DEPARTMENT OF).

age of recruitment in population biology, the age at which sexual maturity arrives; that is, the age at which an individual animal is “recruited” into the adult population.

aggregate in geology or engineering, gravel, sand, or broken rock quarried for use in making concrete.

aggregation in population biology, a collection (usually temporary) of many individuals of the same species at a single geographic location. An aggregation differs from a herd, flock, etc. by being circumstantial rather than structured. It has little or no social organization and is brought together by environmental forces rather than by any urge of the animals involved to seek their own kind. Examples of aggregations include moths drawn to a light, salmon gathering in the headwaters of rivers to spawn, and birds collecting in one spot before beginning their seasonal migration.

aggressive mimicry in behavioral ecology, a form of MIMICRY in which the mimicking species is a PREDATOR imitating another species or an object in the environment in order to deceive its prey into coming close enough to be caught.

aggressive resemblance

See under CRYPTIC COLORATION.

agribusiness or corporate farming practicing agriculture for business profit rather than for the sustenance of a single family. Agribusiness farms are normally much larger than family farms (average acreage, all U.S. farms, 437; agribusiness farms, 2,345), and are held by corporate ownership. They are more likely to practice large-scale MONOCULTURE than are family farmers, and are heavier users of agricultural chemicals (see FERTILIZER; HERBICIDES; PESTICIDES) and of farm machinery rather than hand labor. For these reasons, agribusiness holdings are usually a major source of NONPOINT POLLUTION, and are highly dependent upon FOSSIL FUELS. In the western United States, agribusiness is also associated with large scale-land modification (see IRRIGATION; RECLAMA-

8 Agricultural Research Service (ARS)

TION). There are approximately 51,000 corporate farms in the United States, mostly west of the 100th meridian.

Agricultural Research Service (ARS) branch of the United States Department of Agriculture responsible for overseeing and administering research projects relating to all aspects of agriculture. ARS research projects include (but are not limited to) animal and plant protection and production; the use, protection and improvement of soil, water, and air; commodities distribution and storage; and human nutrition. Most of these activities are carried out jointly with state, county, and local agencies through the Extension Service—a separate agency within the Department of Agriculture—and through other, similar partnership agreements. ARS activities take place in 147 sites spread throughout the world and are organized into four administrative regions. Budget (1985 est.) \$485,804,000; (1986 est.) \$477,835,000. See AGRICULTURE, DEPARTMENT OF.

Agricultural Stabilization and Conservation Service (ASCS) a branch of the United States Department of Agriculture (USDA), created June 5, 1961 and made responsible for the administration of commodity, land-use, and resource-conservation programs. Among the resource-related programs operated by ASCS are the AGRICULTURE CONSERVATION PROGRAM, the Forestry Incentive Program, the Water Bank Program, and the Experimental Rural Clean Water Program. ASCS cooperates closely with the Extension Service—an independent USDA agency—with county and state Extension Agents acting as ex-officio members of the ASCS governing committees on their respective levels. Address: Agricultural Stabilization and Conservation Service, PO Box 2415, Washington, DC 20013. See also AGRICULTURE, DEPARTMENT OF.

Agriculture Conservation Program (ACP) Federal grant program to encourage farmers to undertake conservation and environmental protection measures by underwriting up to 75% of the costs of these measures. First authorized in 1953 (as the National Agricultural Conservation Program), the program has been under the jurisdiction of the AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE since 1961. Funding (1985): \$197 million; (1986 est.): \$133 million. See also AGRICULTURE, DEPARTMENT OF.

Agriculture, Department of United States government agency charged with overseeing all federal programs relating to food and fiber production and distribution, including livestock, vegetables, grains, cotton, forest products, and the conservation of agricultural soil and water. It is the third largest federal agency in terms of work force (after Defense and Health and Human Services) and the second largest in terms of amount of land

managed (after Interior). A part of the EXECUTIVE BRANCH of the federal government, the department is headed by a cabinet-level officer (the secretary of agriculture) assisted by a deputy secretary and overseeing seven assistant secretaries, two undersecretaries, and four officers, each of whom is in charge of a major branch of the agency. The most important of these branches from an environmental standpoint is that headed by the assistant secretary for natural resources and the environment, which includes the FOREST SERVICE and the SOIL CONSERVATION SERVICE. Others with environmentally related programs include the assistant secretary for science and education (AGRICULTURAL RESEARCH SERVICE, COOPERATIVE STATE RESEARCH SERVICE, Extension Service, National Agricultural Library), the undersecretary for international affairs and commodity programs (AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE), the assistant secretary for marketing and inspection services (ANIMAL AND PLANT HEALTH INSPECTION SERVICE, FEDERAL GRAIN INSPECTION SERVICE, FOOD SAFETY AND INSPECTION SERVICE, and the assistant secretary for administration (Board of Contract Appeals).

History. The set of programs that eventually became the Department of Agriculture was begun about 1836 as a branch of the Office of the Commissioner of Patents (then a part of the State Department). It was charged with distributing seed and commodities to farmers. The agricultural programs moved to the Interior Department with the Patent Office in 1849, became a separate branch of Interior in 1862, and were elevated to cabinet status by act of Congress on February 9, 1889. Since then the department has undergone numerous changes, consolidations, and reorganizations. Among the most important of these are the Transfer Act of 1905, which added the Forest Service to the department; the Soil Conservation Act of 1935, which created the Soil Conservation Service; and the President's Reorganization Plan 1 of 1939, which transferred agricultural surplus programs from the Department of Commerce to the Department of Agriculture. Many food production functions were transferred to a War Foods Administration within the War Department during World War II, but were returned to the Department of Agriculture after the war. Employees (1982): 121,175. Land ownership: 193 million acres, mostly in the National Forest System (see FOREST SERVICE).

air

See ATMOSPHERE.

air current in meteorology, a wind caused by some environmental factor that is unrelated to a storm. Unlike storm winds, air currents are usually steady and predictable from day to day. See ATMOSPHERE: *dynamics of the atmosphere*.