F

F [ℑ] (Self-purification Factor) — The self-purification factor is an indication of the ability of a stream to assimilate a waste discharge. It is defined as the ratio of the re-aeration (r) and the rate of deoxygenation (k), or ℑ = r/k, where ℑ is called the self-purification factor.

Face (of a Dam) — The external surface of a structure, such as the surface of an appurtenance or a dam.

Facilities Plans — Plans and studies related to the construction of water treatment works necessary to comply with the *Clean Water Act (CWA).* A facilities plan investigates needs and provides information on the cost effectiveness of alternatives, a recommended plan, an *Environmental Assessment (EA)* of the recommendation, and descriptions of the treatment works, costs, and a completion schedule.

Facultative Bacteria — Bacteria that can live under *Aerobic* or *Anaerobic* conditions.

Facultative Phreatophyte — Plants that utilize moisture from groundwater for a portion of their water requirements.

Fahrenheit (F) — (1) A unit of temperature. (2) Of or relating to a temperature scale that registers the freezing point of water as 32 F and the boiling point as 212 F at one atmosphere of pressure. See *Fahrenheit Temperature Scale*.

Fahrenheit Temperature Scale — A thermometric scale on which the freezing point of water is at 32 F (Fahrenheit) above the 0 (F) mark on the scale, and the boiling point of water is at 212 F. The Fahrenheit temperature scale was designed by German physicist Daniel Fahrenheit and is commonly used in the United States. Contrast with the *Centigrade Temperature Scale*, using degrees *Celsius* (C), in which 0 (C) marks the freezing point of water and 100 C indicates the boiling point of water (at sea level). The formula for converting a Fahrenheit temperature to Celsius is C =5/9 x (F – 32).

Failure — The collapse or slippage of a large mass of bank material into a stream.

Fairfield-Hardy Digester — (Water Quality) A machine that decomposes garbage, sewage sludge, industrial and other organic wastes by a controlled continuous *Aerobic-Thermophilic Process.*

Fallon National Wildlife Refuge (NWR) [Nevada] — One of the nine *National Wildlife Refuges (NWR)* located in the State of Nevada, the Fallon NWR was established in 1931 and encompasses approximately 17,900 acres (28 square miles) where the Carson River terminates in the Carson Sink and is situated within the northwest portion of the *Stillwater Wildlife Management Area* near the town of Fallon in Churchill County, Nevada. Due to typically limited and uncertain flows of the Carson River at its terminus, generally not enough water enters this refuge to maintain it as a viable wetland area. The Fallon NWR is currently managed by the *U.S. Fish and Wildlife Service (USFWS)* along with the *Stillwater National Wildlife Refuge* and is included as part of the Stillwater Wildlife Management Area. Also see *National Wildlife Refuge (NWR) System* and *National Wildlife Refuges (NWR) [Nevada]*.

Fall Overturn — A physical phenomenon that may take place in a body of water during early autumn. The sequence of events leading to fall overturn include:

[1] The cooling of surface waters;
[2] A density change in surface waters producing convection currents from top to bottom;
[3] The circulation of the total water volume by wind action; and
[4] Eventual vertical temperature equality.

The overturn results in a uniformity of the physical and chemical properties of the entire water body. Also referred to as *Fall Turnover*. Also see *Spring Overturn*.

Falling Limb — The portion of the *Hydrograph* trace immediately following the peak and reflecting the decreasing production of storm flow.

Fallow — (1) Allowing cropland, either tilled or untilled, to lie idle during the whole or greater portion of the growing season. (2) Land plowed and tilled and left unplanted.

Falls — A waterfall or other precipitous descent of water.

Fan — A generic term for constructional landforms that are built of more-or-less stratified alluvium and that occur on the piedmont slope, downslope from their source of alluvium.

Fan Apron — A component landform comprised of a sheet-like mantle of relatively young alluvium covering part of an older fan piedmont (and occasionally alluvial fan) surface. It somewhere buries a pedogenic soil which can be

traced to the edge of the fan apron where the soil emerges as the land surface, or relict soil. No buried soils shold occur within a fan-apron mantle, rather, they separate mantles.

Fan Collar — A component landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin of a major alluvial fan at a mountain front. The mantle somewhere buries a pedogenic soil that can be traced to the edge of the fan collar where it emerges as the land surface, or relict soil.

Fan-Head Trench — A relatively deep drainageway originating in a mountain valley and cut into the apex of, and commonly across an alluvial fan. It may empty into an interfan-valley drainage, debouch onto the fan piedmont, or cross the fan piedmont.

Fan Piedmont — The most extensive major landform of most piedmont slopes, formed by the lateral coalescence of mountain-front alluvial fans downslope into one generally smooth slope without the transverse undulations of the semi-conical alluvial fans and by accretion of fan aprons. Fan piedmonts commonly are complexes of many component landforms.

Fan Remnant — A generic term for component landforms that are the remaining parts of various older fan landforms that either have been dissected (erosional fan remnants) or partially buried (non-buried fan remnants). Erosional fan remnants must have a flattish summit of relict fan surface; non-buried fan remnants are all relict fan surfaces. Fan remnants may be specifically identified as fan-piedmont remnants, inset-fan remnants, etc.

Fan-Remnant Sideslope — A landform element comprised of the relatively young erosional slope around the sides of an erosional fan remnant. It is composed of should, backslope, and footslope slope components.

Fan Skirt — A major landform comprised of laterally coalescing, small alluvial fans that issue from gullies cut into, or are extensions of inset fans of the fan piedmont and that merge along their toeslopes with the basin floor. Fan skirts are smooth or only slightly dissected and ordinarily do not comprise component landforms.

Fanglomerate — Heterogeneous materials that were originally deposited in an *Alluvial Fan* but since deposition have been cemented into solid rock.

Fanlette — A very small, normally undissected alluvial fan, something less than a few tenths of a square mile in area that may occur below a gully, inset fan, or ravine in a variety of positions on the piedmont slope or within mountain valleys.

Farm Delivery Requirement — The *Crop Irrigation Requirement* plus farm losses due to evaporation, deep percolation, surface waste, and nonproductive consumption. The losses are measured by the *Farm Irrigation Efficiency*, which is the percent of farm-delivered water that remains in the root zone and is available for crop growth.

Farm Efficiency — The consumptive *Crop Irrigation Requirement (CIR)* divided by the farm water delivery.

Farm Headgate Delivery (Diversion) — That amount of water in acre feet (AF) delivered through a farm headgate.

Farm Irrigation Efficiency — An expression comparing the amount of water actually required for growing a crop to the amount of irrigation water that is diverted at the farm headgate. Expressed as a percentage on an annual basis.

Farm Pond — A water impoundment made by constructing a dam or embankment or by excavating a pit or "dug out".

Farm Surface Runoff (Tailwater) — A portion of the *Farm Headgate Delivery* that flows off the lower portion of the farm or field surface (drain ditch) flow. This is one loss component considered in *Farm Irrigation Efficiency*.

Farm Waste and Deep Percolation — The amount of irrigation water delivered to the crop area from a canal turnout or ground water pump that is not consumptively used on the crop area. Includes water moving through the root zone to the water table, water intercepted by drainage systems, and surface waste to natural or constructed drainage systems, and non-cropped areas.

Farmland, Prime — As defined in the *Farmland Protection Policy Act of 1981*: Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is available for these uses (urban areas are not included). It has the soil quality, growing season, and moisture supply needed for the economic production of sustained high yields of crops when treated and managed (including water management) according to acceptable farming methods. Prime farmland includes land that is being used currently to produce livestock and timber, but it excludes land committed to urban development or water storage.

Fata Morgana — See *Mirage*.

Fathom — (1) A unit of length equal to 6 feet (1.83 meters), used principally in the measurement and specification of marine depths. (2) To measure the depth of a body of water as with a *Lead Line*.

Faucet — A device for regulating the flow of a liquid from a reservoir such as a pipe or drum.

Fault — (Geology) A fracture in rock along which movement can be demonstrated. A fracture in the earth's crust forming a boundary between rock masses that have shifted. Faults may be classified as follows:

[1] ***Active Fault*** – A fault that has moved recently and which is likely to move again, usually defined as one

that has shown movement within the last 11,000 years and can be expected to move again within the next 100 years;

[2] ***Potentially Active Fault*** – A fault that moved within the Quaternary Period (i.e., within the last 2 million years) or a fault which, because it is judged to be capable of ground rupture or shaking, poses an unacceptable risk for a proposed project or structure;

[3] ***Historically Active Fault*** – A fault active within the last 200 years;

[4] ***Inactive Fault*** – A fault which has shown no evidence of movement in recent geologic time and no potential for movement in the relatively near future.

Fault Creep — A very slow movement along a fault which is unaccompanied by perceptible earthquakes.

Fault Escarpment — (Geology) A fracture or fracture zone along which there has been displacement of one side with respect to the other.

Fault-Line Scarp — A steep slope produced along an old fault line by differential weathering and erosion, rather than by fault movement.

Fault, Rupture — A break in the ground along the fault line during an earthquake.

Fault Sag Ponds — A small, enclosed depression along an active or recent fault. It is caused by differential movement between slices and blocks within the fault zone or by warping and tilting associated with differential displacement along the fault, and it forms the site of a sag pond.

Fault Scarp — A cliff formed by a fault, usually modified by erosion unless the fault is very recent.

Fault Trace — The intersection of a fault and the earth's surface as often revealed by dislocation of fences and roads and/or by ridges and furrows in the ground.

Fauna — (1) A term used to describe the animal species of a specific region or time. (2) All animal life associated with a given habitat, country, area, or period.

Feasibility Study (FS) — (1) A complete assessment of alternative courses of action to solve one or more problems, to meet needs, and to recommend the most practical course of action consistent with state and local planning objectives. (2) (Environmental) Analysis of the practicability of a proposal, e.g., a description and analysis of potential cleanup alternatives for a site such as one on the *National Priorities List (NPL)*. The feasibility study usually recommends selection of a cost-effective alternative. It usually starts as soon as the *Remedial Investigation (RI)* is underway; together, they are commonly referred to as the "RI/FS".

Fecal Bacteria — Any type of bacteria whose normal habitat is the colon of warm-blooded mammals, such as man. These organisms are usually divided into groups, such as *Fecal Coliform* or *Fecal Streptococci (Streptococcus)*.

Fecal Coliform Bacteria — A group of bacteria normally present in large numbers in the intestinal tracts of humans and other warm-blooded animals. Specifically, the group includes all of the rod-shaped bacteria that are non-sporeforming, *Gram-Negative*, lactose-fermenting in 24 hours at 44.5 C, and which can grow with or without oxygen. In the laboratory, they are defined as all organisms that produce produce blue colonies with specified time frames. The presence of this type of bacteria in water, beverages, or food is usually taken to indicate that the material is contaminated with solid human waste. Bacteria included in this classification represent a subgroup of the larger group termed *Coliform*. Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal Material — (Water Quality) Solid waste produced by humans and other animals and discharged from the gastrointestinal tract. Also referred to as feces or solid excrement, it is a component of domestic sewage and must be treated to avoid the transmission of fecal bacteria and other organisms or disease.

Fecal Streptococcal Bacteria — Bacteria found in the intestine of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria that are capable of growth in brain-heart broth. In the laboratory, they are defined as all organisms that produce red or pink colonies with 48 hours at 35 degrees centigrade plus or minus 1 degree centigrade on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample. Also see *Fecal Streptococcus*.

Fecal Streptococcus — A group of bacteria normally present in large numbers in the intestinal tracts of warm-blooded animals other than humans. By assessing the ratio of coliforms to streptococci in a water sample, a rough estimate can be made of the relative contribution of fecal contamination from the two mentioned possible sources.

Federal Emergency Management Agency (FEMA) — An independent agency of the federal government founded in 1979 and reporting to the President of the United States and headquartered in Washington D.C. FEMA's mission is to reduce loss of life and property and protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery. Primary support functions of FEMA include; (1) advising on building codes and flood plain management; (2) teaching people how to get through a disaster; (3) helping equip local and state emergency preparedness; (4)

coordinating the federal response to a disaster; (5) making disaster assistance available to states, communities, businesses and individuals; (6) training emergency managers; (7) supporting the nation's fire service; and (8) administering the national flood and crime insurance programs (*National Flood Insurance Program*). FEMA's operating directorates consist of: (1) Mitigation Directorate; (2) Information Technology Directorate; (3) Federal Insurance Administration (Program); (4) Operations Support Directorate; (5) Preparedness Directorate; (6) Response and Recovery Directorate; (7) United States Fire Administration; and (8) ten Regional Offices. FEMA's ten regions, Federal Regional Centers, and states included in each region are:

[1] Region I (Boston, Massachusetts) – Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont;
[2] Region II (New York, N.Y., Caribbean Division – San Juan, Puerto Rico) – New York, New Jersey, the Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands;
[3] Region III (Philadelphia, Pennsylvania) – District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, West Virginia;
[4] Region IV (Atlanta, Georgia) – Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee;
[5] Region V (Chicago, Illinois) – Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin;
[6] Region VI (Denton, Texas) – Arkansas, Louisiana, New Mexico, Oklahoma and Texas;
[7] Region VII (Kansas City, Missouri) – Iowa, Kansas, Missouri, Nebraska;
[8] Region VIII (Denver, Colorado) – Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming;
[9] Region IX (San Francisco, California) – Arizona, California, Hawaii and Nevada; and the Territory of American Samoa, the Territory of Guam, the Commonwealth of the Northern Mariana Islands, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau;
[10] Region X (Bothell, Washington) – Alaska, Idaho, Oregon and Washington.

Federal Insurance Administration (FIA) — A component of the *Federal Emergency Management Agency (FEMA)* directly responsible for administering the flood insurance aspects of the *National Flood Insurance Program (NFIP)*.

Federal Power Act — An act of Congress creating a federal licensing system administered by the *Federal Energy Regulatory Commission (FERC)* and requiring that a license be obtained for nonfederal hydroelectric projects proposing to use *Navigable* waters or federal lands. The act contains a clause modeled after a clause in the *Reclamation Act of 1902* which disclaims any intent to affect state water rights law. Subsequently, in a number of decisions dating back to the 1940s, the U.S. Supreme Court held that the provisions of both the Reclamation Act and the Federal Power Act preempted inconsistent provisions of state law. Decisions under both acts found that these clauses were merely "saving clauses" which required the United States to follow minimal state procedural laws or to pay just compensation where vested non-federal water rights are taken. Later the Supreme Court overturned a number of its earlier decisions and required that the *Bureau of Reclamation (USBR)* comply with conditions in state water rights permits unless those conditions conflict with "clear Congressional directives." However, no such reversal of the Federal Power Act's provisions followed and more recent decisions (*Sayles Hydro Association v. Maughan*, February 1993) reinforced this fact by holding that federal law has "occupied the field," preventing any state regulation of federally licensed power projects other than determining proprietary water rights. This precedent has far-reaching implications over states' rights to regulate water projects and stream flows within their borders. There have been instances where holders of Federal Power Act licenses have claimed preemption from state safety of dams requirements, minimum stream flow requirements, and state designation of wild and scenic streams. Also see *Equal Footing Doctrine (U.S. Constitution)* and *Public Trust Doctrine*.

Federal Reserved Water Rights — A category of federal water rights, created by federal law. These rights are created when the federal government withdraws land from the public domain to establish a federal reservation such as a national park, forest, or Indian reservation. By this action, the government is held to have reserved water rights sufficient for the primary purpose for which the land was withdrawn. Also see *Winters Rights (Decision)*, *Reservation Doctrine, Reserved Rights Doctrine, and Winters Doctrine*, and *Water Law [Federal]*.

Federal Water Pollution Control Act (Public Law 92–500) — More commonly referred to as the *Clean Water Act (CWA)*, constitutes the basic federal water pollution control statute for the United States. Originally based on the *Water Quality Act* of 1965 which began setting water quality standards. The 1966 amendments to this act increased federal government funding for sewage treatment plants. Additional 1972 amendments established a goal of zero toxic discharges and "fishable" and "swimmable" surface waters. Enforceable provisions of the CWA include technology-based effluent standards for point sources of pollution, a state-run control program for nonpoint pollution sources, a construction grants program to build or upgrade municipal sewage treatment plants, a regulatory system for spills of oil and other hazardous wastes, and a wetlands preservation program.

Feedlot — A confined area for the controlled feeding of animals. Tends to concentrate large amounts of animal waste that cannot be absorbed by the soil and, therefore, may be carried to nearby streams or lakes by rainfall runoff.

Feedwater — (Water Quality) Water input into a desalting or water treatment plant.

Feet Per Second (ft./sec.) — A measure of the velocity of moving water.

FEMA — See *Federal Emergency Management Agency (FEMA)*.

Fen — Low land covered wholly or partly with water; a *Moor* or *Marsh*. A type of *Wetland* that accumulates peat deposits. Fens are less acidic than *Bogs*, deriving most of their water from groundwater rich in calcium and magnesium. Also see *Calcareous Fens*.

Fermentation, Anaerobic — (Water Quality) The process in which carbohydrates are converted in the absence of oxygen to hydrocarbons (such as methane gas).

Ferrous Sulfate — A greenish crystalline compound, $FeSO_4 \cdot H_2O$, used as a pigment, fertilizer, and feed additive, in sewage and water treatment, and as a medicine in the treatment of iron deficiency. Also called *Copperas*.

Fertigation — The use of irrigation water as a vehicle for spreading fertilizer on the land.

Fertilizer — Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth. Various types of fertilizers include acid-forming, blended, bulk-blended, chemical, coated, conditioned, granular, liquid, non-granular, prilled, solution, straight, and suspension.

Fetch — (1) The distance traveled by waves in open water, from their point of origin to the point where they break. (2) The distance the wind blows over water or another homogeneous surface without appreciable change in direction.

Field — (1) A broad, level, open expanse of land; a meadow. (2) A cultivated expanse of land, especially one devoted to a particular crop. (3) A portion of land or a geologic formation containing a specified natural resource. (4) A wide, unbroken expanse, as of ice.

Field (Moisture) Capacity — The capacity of soil to hold water. It is measured by the soil scientist as the ratio of the weight of water retained by the soil to the weight of the dry soil.

Field Diversion — An interception channel near the contour to carry runoff to a waterway. Intervals vary with the precipitation, slope, and cropping.

Field-Moisture Capacity — The quantity of water which can be permanently retained in the soil in opposition to the downward pull of gravity.

Field-Moisture Deficiency — The quantity of water which would be required to restore the soil moisture to *Field-Moisture Capacity*.

Field Permeability — Permeability corresponding to the temperature which occurs under field conditions.

Field Sprinkler System — A system of closed conduits carrying irrigation water under pressure to orifices designed to distribute the water over a given area.

Filamentous Algae — Aggregations of one-celled plants that grow in long strings or mats in water and are either attached or free floating and tend to plug canals, weirs, and other structures, but also provide habitat of invertebrate animals.

Fill — (Geology) Any sediment deposited by any agent such as water so as to fill or partly fill a channel, valley, sink, or other depression.

Fill Material — Soil that is placed at a specified location to bring the ground surface up to a desired elevation or angle of slope.

Filling — Depositing dirt, mud or other materials into aquatic areas to create more dry land, usually for agricultural or commercial development purposes, and frequently with ruinous ecological consequences. Also see *Wetland Banking*, *Wetland "Clumping" (Aggregation)*, and *Wetland Mitigation*.

Filter — A device used to remove solids from a mixture or to separate materials. A porous material through which a liquid or gas is passed in order to separate the fluid from suspended particular matter. Suspended materials are frequently separated from water using filters.

Filter Bed — A layer of sand or gravel on the bottom of a reservoir or tank, used to filter water or sewage.

Filter Cake — (1) The solids or semisolids deposited on a filter as a fluid is moved through it. (2) The remaining solids or semisolids on a filter after the fluid in a material is extracted by a negative pressure.

Filter Fabric — A polypropylene textile used to keep soil separate from water. Comes in many different forms and is used for construction roads, lining ponds, and in many erosion control projects.

Filter Feeder — An aquatic animal, such as a clam, barnacle, or sponge, that feeds by filtering particulate organic material from water.

Filter Strip — A strip or area of vegetation used for removing sediment, organic matter, and other pollutants from runoff and waste water.

Filter Zone (of a Dam) — A band or zone of granular material that is incorporated into a dam and is graded (either naturally or by selection) so as to allow seepage to flow across or down the filter without causing the migration of material from zones adjacent to the filter zone.

Filterable — Of particles that are sufficiently small to allow their passage through filters capable of retaining most particles. For example, a filterable virus is one that will pass through a filter that will normally retain bacteria.

Filtrate — Liquid that has been passed through a filter.

Filtration — (1) The process in which suspended matter is removed from a liquid through a medium which is permeable to the liquid but not to the suspended material. (2) (Water Quality) A treatment process, under the control of qualified operators, for removing solid (particulate) matter from water by means of porous media such as sand or a man-made filter; often used to remove particles that contain *Pathogens*.

Final Clarifier — (Water Quality) A gravitational settling tank installed as part of some wastewater treatment plants and placed after the biological treatment step. The tank functions to remove suspended solids. Also referred to as *Secondary Clarifier*.

Finding of No Significant Impact (FONSI) — A document prepared by a federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require the preparation of an *Environmental Impact Statement (EIS)*. A FONSI is based on the results of an *Environmental Assessment (EA)*.

Finished Water — (Water Quality) Water that has completed a purification or treatment process; water that has passed through all the processes in a water treatment plant and is ready to be delivered to consumers. Contrast with *Raw Water*.

Firm Capacity — For public drinking water supplies, the system delivery capacity with the largest single water well or production unit out of service.

FIRM Map — Flood insurance rate map used to establish the insurance rates for structures under the *National Flood Insurance Program*.

Firm Yield — (1) The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower yields will occur in accordance with a predetermined schedule or probability. (2) The dependable annual water supply that could be available in all years, without exceeding specified shortages in agricultural deliveries during droughts. Sometimes referred to as *Dependable Yield*.

Firn (Firn Snow) — Old snow on the top of glaciers that has become granular and compact through temperature changes, forming the transition stage to glacial ice. Also referred to as *Neve*.

Firn Line — The highest level to which the fresh snow on a glacier's surface retreats during the melting season; the line separating the accumulation area from the ablation area.

First Draw — The water that comes out when the tap is first opened, likely to contain the highest level of lead contamination from plumbing fixtures and materials.

"First in Time, First in Right" — A phrase indicating that older water rights have priority over more recent rights if there is not enough water to satisfy all rights. See *(Prior) Appropriation Doctrine* and *Appropriative Water Rights*.

Firth — A narrow inlet or arm of the sea; an *Estuary*.

(United States) Fish and Wildlife Service (USFWS) — Part of the U.S. Department of the Interior, the early beginnings of the Fish and Wildlife Service go back to 1871 when the federal government established the Commissioner of Fisheries. In 1896, the Division of Biological Survey was established within the Department of Agriculture. In 1939, these functions were transferred to the Department of the Interior. Then in 1940, these functions were formally consolidated and redesignated as the Fish and Wildlife Service. Further reorganization came in 1956 when the Fish and Wildlife Act created the Bureau of Sport Fisheries and Wildlife. An amendment to this act in 1974 designated the Bureau as the U.S. Fish and Wildlife Service. Today the USFWS consists of a headquarters in Washington, D.C., eight regional offices, and over 700 field units and installations. Included are more than 470 National Wildlife Refuges, comprising more than 90 million acres, 57 fish and wildlife research laboratories and field units, 43 cooperative research units at universities across the country, nearly 135 national fish hatcheries and fishery assistance stations, and a nationwide network of law enforcement agents and biologists. The functions of the USFWS primarily includes the following:

[1] Acquires, protects and manages unique ecosystems necessary to sustain fish and wildlife, such as migratory birds and endangered species;

[2] As specified in the *Endangered Species Act (ESA)* (1973), as amended, and in conjunction with the *National Marine Fisheries Service (NMFS)*, determines critical habitat and develops recovery plans for protected endangered and threatened species of plants and animals;

[3] Operates fish hatcheries to support research, develop new techniques and fulfill the public demand for

recreational fishing;

[4] Operates wildlife refuges to provide, restore, and manage a national network of lands and waters sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available;

[5] Conducts fundamental research on fish, wildlife and their habitats to provide better management and produce healthier and more vigorous animals; also protects fish and wildlife from dislocation or destruction of their habitats;

[6] Renders financial and professional assistance to states, through federal aid programs, for the enhancement and restoration of fish and wildlife resources;

[7] Establishes and enforces regulations for the protection of migratory birds, marine mammals, fish and other non-endangered wildlife from illegal taking, transportation or sale within the United States or from foreign countries; and

[8] Communicates information essential for public awareness and understanding of the importance of fish and wildlife resources, and changes reflecting environmental degradation that ultimately will affect the welfare of human beings.

Also see *National Wildlife Refuge System*, *Endangered Species Act (ESA)*, *Endangered Species*, *Threaten Species*, and *National Oceanic and Atmospheric Administration (NOAA)*.

Fish Credit Water — Generally, water reserved in upstream reservoirs for release for downstream fisheries purposes. Often provisions will be made such that other forms of water credits, e.g., *Drought Reserve Water*, will convert to fish credit water if snowpack water content or runoff is deemed sufficient by a stipulated date.

Fishing Waters — Waters used for angling or for commercial fishing.

Fish Ladder — (1) A series of small pools arranged in an ascending fashion to allow the migration of fish upstream past construction obstacles, such as dams. (2) An inclined trough which carries water from above to below a dam so that fish can easily swim upstream. There are various types, some with baffles to reduce the velocity of the water and some consisting of a series of boxes with water spilling down from one box to the next. Also see *Fishway*.

Fishpond — A small body of water managed for fish.

Fish Screen — A porous barrier placed across the inlet our outlet of a pond to prevent the passage of fish.

Fishway — A passageway designed to enable fish to ascend a dam, cataract, or velocity barrier. Also referred to as a *Fish Ladder*.

Fissure — A surface of a fracture or crack in a rock along which there is a distinct separation.

Five-Hundred Year Flood (500-Year Flood) — The flood that a 0.2 percent chance of being equaled or exceeded in any year. Areas subject to the 500-year flood have a moderate to low risk of flooding. Includes flood Zones B, C, and X. One- to four-unit buildings in these zones are eligible for *Preferred Risk Policies*. A 500-year flood would be deeper than a 2100-year flood and would cover a greater area.

Fix a Sample — A sample is "fixed" in the field by adding chemicals that prevent water quality indicators of interest in the sample from changing before laboratory measurements are made.

Fixed Ground Water — Water held in saturated material within pore spaces so small that it is permanently attached to the walls, or moves so slowly that it is usually not available as a source of water for pumping.

Fjord, or Fiord — A long, narrow, deep inlet of the sea between steep slopes.

Flap Valve — See *Check Valve*.

Flash — To fill suddenly with water.

Flashboard — A temporary barrier, relatively low in height and usually constructed of wood, placed along the crest of the spillway of a dam to allow the water surface in the reservoir to be raised above spillway level in order to increase the storage capacity. It is designed to be readily removed, lowered or carried away by high flow or floods.

Flash Flood, also Flashflood — A sudden flood of great volume, usually caused by a heavy rain. Also, a flood that crests in a short length of time (hours or minutes) and is often characterized by high velocity flows. It is often the result of heavy rainfall in a localized area.

Flat — A level landform composed of *Unconsolidated Sediments* — usually mud or sand. Flats may be irregularly shaped or elongate and continuous with the shore, whereas bars are generally elongate, parallel to the shore, and separated from the shore by water.

Flatboat — A boat with a flat bottom and square ends used for transportation of bulky freight, especially used in shallow waters.

Flat-Water — Of or on a level or slow-moving watercourse.

Float — (1) To remain suspended within or on the surface of a fluid without sinking. To cause to remain suspended without sinking or falling. (2) To put into water; launch. (3) To flood (land), as for irrigation.

Floater — A *Wetland* plant that floats on the surface of the water.

Floating Dock — (1) A structure that can be submerged to permit the entry and docking of a ship and then raised to lift the ship from the water for repairs. Also referred to as a *Floating Drydock*. (2) A dock that is supported by metal pipes on which it can move up and down with the rise and fall of the water level.

Floating Plant — A non-anchored plant that floats freely in the water or on the surface; e.g., water hyacinth (*Eichhornia crassipes*) or common duckweed (*Lemna minor*).

Floating-Leaved Plant — A rooted, *Herbaceous Hydrophyte* with some leaves floating on the water surface; e.g., white water lily (*Nymphae odorata*), floating-leaved pondweed (*Potamogeton natans*). Plants such as yellow water lily (*Nuphar luteum*), which sometimes have leaves raised above the surface, are considered floating-leaved plants or emergents, depending on their growth habit at a particular site.

Floc — Generally, a very fine, fluffy mass formed by the aggregation of fine suspended particles, as in a precipitate. In terms of water quality, clumped solids or precipitates formed in sewage by biological or chemical activity.

Flocculate — To aggregate or clump together individual, tiny particles into small clumps or clusters.

Flocculation — (Water Quality) In water and wastewater treatment, the agglomeration or clustering of colloidal and finely divided suspended matter after coagulation by gentle stirring by either mechanical or hydraulic means such that they can be separated from water or sewage.

Floe — An ice flow. Also a segment that has separated from such an ice mass.

Floe Ice — Ice usually several feet thick, which has formed on the surface of a body of water and then has broken into pieces and is floating on the water's surface.

(The) Flood — (Biblical) The universal deluge recorded in the Old Testament as having occurred during the life of Noah.

Flood, or Flood Waters — (1) Temporary inundation of normally dry land areas from the overflow of inland or tidal waters, or from the unusual and rapid accumulation or runoff of surface waters from any source. The rise in water may be caused by excessive rainfall, snowmelt, natural stream blockages, wind storms over a lake or any combination of such conditions. (2) An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean. (3) As defined, in part, in the *Standard Flood Insurance Policy (SFIP)*: "A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters or from the unusual and rapid accumulation or runoff of surface waters from any source." (4) As defined under the *National Flood Insurance Program (NFIP)*, a partial or complete inundation of normally dry land areas from (a) the overland flow of a lake, river, stream, ditch, etc.; (b) the unusual and rapid accumulation or runoff of surface waters; and (c) mudflows or the sudden collapse of shoreline land.

Flood (FEMA) — A general and temporary condition of partial or complete inundation or normally dry land areas from: (1) overflow of inland or tidal waters; (2) the unusual and rapid accumulation or runoff of surface waters from any source; (3) mudslides (i.e., mudflows) which are proximately caused by flood, as defined above, and are akin to a river of liquid and flowing mud on the surface of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current; and (4) the collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding the cyclical levels which result in flood, as defined above.

Flood, 100-Year — A 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a 1 percent or greater chance of being equaled or exceeded in any given year. Areas below the 100-year flood level are termed *Special Flood Hazard Areas*. Areas between the 100-year and the 500-year flood boundaries are termed *Moderate Flood Hazard Areas*. The remaining areas are above the 500-year flood level and are termed *Minimal Flood Hazard Areas*.

Flood, Annual — The highest peak discharge in a water year.

Flood Abatement — See *Flood Control*.

Flood-Base Discharge — A value of high flow usually computed during the first 5 years of station operation that, on the average, is exceeded about three times per year.

Flood Boundary and Floodway Map (FBFM) — Official map of a community on which the Federal Emergency Management Agency (FEMA) or Federal Insurance Administration (FIA) have delineated the boundaries of the flood, mudslide and related erosion areas having special hazards have been designated as *Flood Zones* A, M, and E. Now superseded by the *Floodway Hazard Boundary Map (FHBM)*.

Flood Capacity — The flow carried by a stream or floodway at bankfull water level. Also, the storage capacity of the flood pool at a reservoir.

Flood Control (Storage) — The control of flood waters by the construction of flood storage reservoirs, flood water retaining structures, channel improvements, levees, bypass channels, other engineering works, or vegetative changes.

Flood Control Districts — A district organized to manage flooding hazards through land use controls and construction and maintenance of flood control structures.

Flood Control Pool — (1) Reservoir volume reserved for flood runoff and then evacuated as soon as possible to keep that volume in readiness for the next flood. (2) Reservoir volume above the active conservation and joint-use pool that is reserved for flood runoff and then released as soon as possible to keep that space available for the next flood.

Flood Control Storage — Storage above the active storage and joint-use storage that is reserved for flood releases.

Flood Crest — The maximum stage or elevation reached or expected to be reached by the waters of a flood at a given location.

Flood Damage — The direct and indirect economic loss caused by floods including damage by inundation, erosion, or sediment deposition. Indirect damages may also include emergency costs and business or financial losses. Evaluation may be based on the cost of replacing, repairing, or rehabilitating; or the comparative change in market or sales value; or on the change in income or production caused by flooding.

Flood Depth — Height of flood waters above the surface of the ground at a given point.

Flood Duration — (1) The length of time a stream is above flood stage or overflowing its banks. (2) The amount of time between the initial rise of flood, including freeboard, waters and their recession.

Flood Duration Curve — A cumulative frequency curve that shows the percentage of time that specified discharges are equaled or exceeded.

Flood Elevation — The height of flood waters above an *Elevation Datum Plane*.

Flood Fighting — Actions taken immediately before or during a flood to protect human life and to reduce flood damages such as evacuation, emergency sandbagging and diking, and provision of assistance to flood victims.

Flood Forecasting — The process of predicting the occurrence, magnitude and duration of an imminent flood through meteorological and hydrological observations and analysis. Flood forecasts are primarily the responsibility of the National Weather Service, *National Oceanic and Atmospheric Administration (NOAA)*, and are used to predict flood stages and times and indicate areas subject to flooding.

Flood Frequency — (1) Probability, expressed as a percentage, that a flood of a given size will be equaled or exceeded in any given year. (2) A statistical expression or measure of the average time period between floods equaling or exceeding a given magnitude. For example, a 100-year flood has a magnitude expected to be equaled or exceeded on the average of once every hundred years; such a flood has a one-percent chance of being equaled or exceeded in any given year. Similarly, the floods that have a 2-percent probability (1 in 50) and a 0.2-percent probability (1 in 500) of being equaled or exceeded in any year are referred to as the 50-year flood and the 500-year flood, respectively. The term is oftentimes used interchangeably with *Recurrence Interval*. Also see *Hundred–Year Flood, One-Percent Duration Flood, X–Year Flood*, and *X–Year Flood, Y–Duration Rain*.

Flood Frequency Curve — (1) A graph showing the average interval of time within which a flood of a given magnitude will be equaled or exceeded once. (2) A similar graph but plotted with the *Recurrence Intervals* of floods plotted instead.

Flood Fringe — The portion of the floodplain outside of the floodway but still subject to flooding. Sometimes referred to as *Floodway Fringe*.

Floodgate — (1) A gate used to control the flow of a body of water. Also referred to as a *Water Gate*. (2) Something that restrains a flood or an outpouring.

Flood Hazard Boundary Map (FHBM) — An official map of a community, issued or approved by the *Federal Emergency Management Agency (FEMA)* or Federal Insurance Administration (FIA), on which the boundaries of the floodplain and special flood hazard areas have been designated. This map is prepared according to the best flood data available at the time of its preparation, and is superseded by te *Flood Insurance Rate Map (FIRM)* after more detailed studies have been completed.

Flood Hazard Zones (Defined) — Zones on the *Flood Insurance Rate Map (FIRM)* in which the risk premium insurance rates have been established by a *Flood Insurance Study (FIS)*. The following flood hazard zone designations apply:

[1] ***Flood Zone V*** – Areas along coasts subject o inundation by the 100-year flood event with additional hazards associated with storm-induced waves. Mandatory flood insurance purchase requirements apply;

[2] ***Flood Zones EV and V1-V30*** – Areas along coasts subject to inundation by the 100-year flood event with additional hazards due to storm-induced velocity wave action. Mandatory flood insurance purchase requirements apply. (Zone VE is used on new and revised flood maps in place of Zones V1-V30.);

[3] ***Flood Zone A*** – Areas subject to inundation by the 100-year flood event. Mandatory flood insurance purchase requirements apply;

[4] ***Flood Zones AE and A1-30*** – Areas subject to inundation by the 100-year flood event determined by detailed methods. Mandatory flood insurance purchase requirements apply. (Zone AE is used on new and revised maps in place of Zones A1-A30.);

[5] ***Flood Zone AH*** – Areas subject to inundation by 100-year shallow flooding (usually areas of ponding) where average depths are between one and three feet. Mandatory flood insurance purchase requirements apply:

[6] ***Flood Zone AO*** – Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Mandatory flood insurance purchase requirements apply;

[7] ***Flood Zone A99*** – Areas subject to inundation by the 100-year flood event, but which will ultimately be protected upon completion of an under construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protective system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. Mandatory flood insurance purchase requirements apply;

[8] ***Flood Zones B, C and X*** – Areas identified in the community FIS as areas of moderate or minimal hazard from the principal source of flood in the area. However, buildings in these zones could be flooded by severe, concentrated rainfall coupled with inadequate local drainage systems. Local stormwater drainage systems are not normally considered in the community's FIS. The failure of a local drainage system creates areas of high flood risk within these rate zones. Flood insurance is available in participating communities but is not required by regulation in these zones. (Zone X is used on new and revised maps in place of Zones B and C.); and

[9] ***Flood Zone D*** – Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

Flooding — Temporary inundation of all or part of the floodplain along a well-defined channel or temporary localized inundation occurring when surface water runoff moves via surface flow, swales, channels, and sewers toward well-defined channels. Flooding is not necessarily synonymous with *Flooding Problem*.

Flooding Problem — The disruption to community affairs, damage to property and facilities, and the danger to human life and health that occurs when land use is incompatible with the hydrologic-hydraulic system.

Flood Insurance — A means of spreading the cost of flood losses. It enables property owners in communities participating in the *National Flood Insurance Program (NFIP)* to purchase insurance against loss resulting from floods.

Flood Insurance Rate Map (FIRM) — Official map on which the *Federal Emergency Management Agency (FEMA)* or Federal Insurance Administration (FIA) has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

Flood Insurance Rate Zone — A zone identified on a *Flood Insurance Rate Map (FIRM)* as subject to a specified degree of flood, mudslide (i.e., mudflow) or flood-related erosion hazards, to which a particular set of actuarial rates and floodplain management requirements apply.

Flood Insurance Study (FIS) — (1) A study, funded by the *Federal Emergency Management Agency (FEMA)* or Federal Insurance Administration (FIA), and carried out by any of a variety of agencies and consultants, to delineate the special flood hazard areas, base flood elevations, and *National Flood Insurance Program (NFIP)* actuarial insurance rate zones. The study is based on detailed site surveys and analysis of site-specific hydrologic characteristics and includes flood profiles, the *Flood Insurance Rate Map (FIRM)*, the *Flood Boundary and Floodway Map (FBFM)*, and the water surface elevation of the base flood. (2) A document containing the results of an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations, mudslides and erosion hazards.

Flood, Intermediate Regional — A flood having a one percent probability, or an average frequency of occurrence on the order of once in 100 years, although the flood may occur in any year. The intermediate regional flood is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the "general region of the watershed."

Flood Irrigation — The application of irrigation water where the entire surface of the soil is covered by a sheet of water, called *Controlled Flooding* when water is impounded or the flow directed by border dikes, ridges, or ditches.

Flood, Maximum Probable — The greatest flood that may be expected at a place, taking into account all pertinent factors of location, meteorology, hydrology, and terrain.

Flood Mitigation Assistance Program (FMA) — A grant program funded by the *Federal Emergency Management Agency (FEMA)* with the objective of providing funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the *National Flood Insurance Program (NFIP)*.

Flood of Record — The highest observed river stage or discharge at a given site during the period of record keeping. May not necessarily be the highest known stage.

Flood Peak — The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest, i.e., the maximum stage or elevation reached by the flood flow.

Flood Plain, also Floodplain — (1) (FEMA) Any normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually low land adjacent to a river, stream, watercourse, ocean or lake. (2) A strip of relatively smooth land bordering a stream, built of sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current. It is called a *Living Flood Plain* if it is overflowed in times of high water but a *Fossil Flood Plain* if it is beyond the reach of the highest flood. (3) The lowland that borders a stream or river, usually dry but subject to flooding. (4) The transversely level floor of the axial-stream drainageway of a semi-bolson or of a major desert stream valley that is occasionally or regularly alluviated by the stream overflowing its channel during flood. (5) The land adjacent to a channel at the elevation of the bankfull discharge, which is inundated on the average of about 2 out of 3 years. The floor of stream valleys, which can be inundated by small to very large floods. The one-in-100-year floodplain has a probability of 0.01 chance per year of being covered with water. (6) That land outside of a stream channel described by the perimeter of the *Maximum Probable Flood*. Also referred to as a *Flood-Prone Area*.

Floodplain Fringe — The portion of the flood plain outside the floodway which is covered by floodwaters during the 100–year recurrence interval flood. It is generally associated with shallow, standing or slowly moving water rather than deep, rapidly flowing water.

Floodplain Information Reports — Reports prepared to provide local governmental agencies with basic technical data to assist in planning for wise use and development of their flood plains.

Floodplain Management — (1) (FEMA) The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to flood control projects, floodplain land use regulations, floodproofing of buildings, and emergency preparedness plans. (2) Comprehensive flood damage prevention programs which require the integration of all alternative measures (structural and nonstructural) in investigation of flood problems and planning for wise use of the floodplain. Includes corrective and preventive measures for reducing flood damage and preserving and enhancing, where possible, natural resources in the floodplain, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations and ordinances, and open space plans.

Floodplain Management Measures — Refers to an overall community program of corrective and preventive measures for reducing future flood damage. The measures take a variety of forms and generally include zoning, subdivision, or building requirements and special-purpose floodplain ordinances. Also see *National Flood Insurance Program (NFIP)* and *Federal Emergency Management Agency (FEMA)*.

Floodplain Management Regulations — Any federal, state, or local government regulations and zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a grading permit and erosion control requirement) and other applications of regulatory power which control development in flood-prone areas specifically for the purpose of preventing and reducing flood loss and damage.

Floodplain of Aggradation — A flood plain formed by the building up of the valley floor by sedimentation.

Floodplain Playa — A component landform consisting of very low gradient, broad, barren, axial-stream channel segments in an inter-montane basin. It floods broadly and shallowly and is veneered with barren fine textured sediments that crusts. Commonly, a floodplain playa is segmented by transverse, narrow bands of vegetation, and it may alternate with ordinary, narrow or braided channel segments.

Floodplain Regulations — (FEMA) General term applied to the full range of codes, ordinances and other regulations relating to the use of land and construction within floodplain limits. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment laws and open area (space) regulations.

Flood Plane — The position occupied by the water surface of a stream during a particular flood. Also, loosely, the elevation of the water surface at various points along the stream during a particular flood. More commonly spelled *Floodplain*.

Flood Prevention — Methods or structural measures used to prevent floods.

Flood Probability — The statistical probability that a flood of a given size will be equaled or exceeded in a given period of time.

Flood Profile — (FEMA) A graph showing the relationship of water surface elevation to a specific location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Proofing (Floodproofing) — (1) Any combination of structural and nonstructural additions, changes, or adjustments to structures and properties subject to flooding primarily for the reduction or elimination of flood damage to real estate or improved property, water and sanitary facilities, structures and their contents. (2) Structural or nonstructural changes or adjustments included in the design, construction, or alternation of a building that reduce damage to the building and its contents from flooding and erosion. See *Dry Floodproofing* and *Wet Floodproofing*.

Flood Protection Elevation (FPE) — Elevation of the highest flood, including freeboard, that a retrofitting method is intended to protect against.

Flood-Related Erosion — The collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding.

Flood-Related Erosion Area — A land area adjoining the shore of a lake or other body of water, which due to the composition of the shoreline or bank and high water levels or wind-driven currents, is likely to suffer flood-related erosion damage. Also referred to as the *Flood-Related Erosion Prone Area*.

Flood-Related Erosion Area Management — The operation of an overall program of corrective and preventive measures for reducing flood-related erosion damage, including but not limited to emergency preparedness plans, flood-related erosion control works, and floodplain management regulations.

Flood Routing — The process of determining progressively downstream the timing and stage of a flood at successive points along a river. Also, the determination of the attenuating effect of storage on a flood passing through a valley, channel, or reservoir.

Flood Stage — (1) An elevation for the water level at high flows. (2) The elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Flood Stage Profile — A graph of flooding condition water surface elevation versus distance along a river or stream. The profile may correspond to an historic flood event or an event or a specified recurrence interval. The channel bottom, as well as bridges, culverts, and dams, are usually shown on the flood stage profile.

Flood, Standard Project (SPF) — A hypothetical flood that might result from the most severe combination of meteorological and hydrological conditions that are reasonably characteristic of the geographical region involved. The SPF is the usual basis for design of flood control structures.

Flood Tide, also Floodtide — The incoming or rising tide; the period between low water and the succeeding high water.

Floodwall — Flood barrier constructed of manmade materials, such as concrete or masonry.

Flood Warning — The issuance and dissemination of information about an imminent or current flood.

Floodwater — The water of a flood. Often used in the plural (Floodwaters).

Floodwater Detention Capacity — That part of the gross reservoir capacity which, at the time under consideration, is reserved for the temporary storage of floodwaters. It can vary from zero to the entire capacity (exclusive of dead storage) according to a predetermined schedule based upon such parameters as antecedent precipitation, reservoir inflow, potential snowmelt, or downstream channel capacities. Also referred to as *Flood-Control Capacity*.

Floodwater Retarding Structure — A structure providing for temporary storage of floodwater and for its controlled releases.

Floodwater Retention — The capacity of *Wetland* sediments and vegetation to hold excess pulses of water for subsequent discharge.

Flood Wave — A distinct rise in stage, culminating in a crest and followed by recession to lower stages.

Floodway — (1) The channel of a river or other watercourse and the adjacent land area that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. (2) A regulatory floodplain under the *National Flood Insurance Program (NFIP)* that includes the channel and that portion of the adjacent floodplain that is required to pass flood flows (normally the one-in-100-year flood) without increasing the water surface elevation more than a designated height (1 foot in most areas). (3) Portion

of the regulatory floodplain that must be kept free of development so that flood elevations will not increase beyond a set limit – a maximum of 1 foot under NFIP. The floodway usually consists of the stream channel and land along its sides. Also referred to as *Regulatory Floodway*.

Floodway Encroachment Lines — The lines marking the limits of *Floodways* on federal, state, and local floodplain maps.

Floodway Fringe — The area of the floodplain on either side of the *Regulatory Floodway* where encroachment may be permitted.

Floodway Hazard Boundary Map — See *Flood Hazard Boundary Map (FHBM)*.

Flood Zone — (1) The land bordering a stream which is subject to floods of about equal frequency; for example, a strip of the floodplain subject to flooding more often than once, but not as frequently as twice in a century (*100–Year Flood*). (2) (FEMA) Zones that begin with the letters V and A are in the *Special Flood Hazard Area (SFHA)*. Zones B, C, D, or X are within the floodplain but not in the SFHA and, therefore, are not considered to be areas requiring flood insurance for structures located in those areas.

Floor — A generic term for the nearly level, lower-part of an inter-montane basin (a bolson or semi-bolson) or a major desert stream valley.

Flora — (1) A term used to describe the entire plant species of a specified region or time. (2) The sum total of the kinds of plants in an area at one time. All plant life associated with a given habitat, country, area, or period. *Bacteria* are considered flora.

Floriston Rates [California and Nevada] — Currently represents the primary operational criteria of the Truckee River between its source (Lake Tahoe) and its terminus (Pyramid Lake). The rates originated in a 1915 decree (*Truckee River General Electric Decree*) in which the *U.S. Bureau of Reclamation (USBR)* gained an easement to operate the Lake Tahoe outlet dam in return for providing year-round flow rates for run-of-the-river users — hydropower and a pulp and paper mill. Along with the *Orr Ditch Decree* (1944) and the *Truckee River Agreement* (1935), which has been incorporated into the Orr Ditch Decree, these requirements govern the Truckee River flows. The Floriston rates essentially constitute a minimum instream flow in the river, as long as water is physically available in Lake Tahoe and Boca Reservoir to support the rates. Water may only be stored in Lake Tahoe and Boca Reservoir when rates are being met. The precise definition contained in the Truckee River Agreement is as follows:

[1] **Floriston Rates** means the rate of flow in the Truckee River at the head of the diversion penstock at Floriston, California (to be measured at the Iceland gage, but currently measured at the Farad gage) consisting of an average flow of 500 cubic feet of water per second each day during the period commencing March 1 and ending September 30 of any year, and an average flow of 400 cubic feet per second each day during the period commencing October 1 and ending the last day of the next following February of any year.

[2] **Reduced Floriston Rates** means rates of flow in the Truckee River, measured at the Iceland gage (currently the Farad gage), effective and in force during the period commencing November 1 and ending the next following March 31 of each year, determined as follows:

(a) 350 cubic feet per second whenever the elevation of the water surface of Lake Tahoe is below 6226.0 feet above sea level and not below 6225.25 feet above sea level; and

(b) 300 cubic feet per second whenever the water surface elevation of Lake Tahoe is below 6225.25 feet above sea level.

Also see *Truckee River Agreement [Nevada and California]*.

Flotage — See *Flotation*.

Flotation, also Floatation — (1) The act, process, or condition of floating, also called *Flotage*. (2) The process of separating different materials, especially minerals, by agitating a pulverized mixture of the materials with water, oil, and chemicals. Differential wetting of the suspended particles causes unwetted particles to be carried by air bubbles to the surface for collection.

Flow — (1) The movement of water. (2) The rate of water discharged from a source given in volume with respect to time.

Flowage — (1) The act of flowing or overflowing. (2) The state of being flooded; a body of water, such as a lake or reservoir, formed by usually deliberate flooding. (3) An outflow or overflow.

Flow Augmentation — The addition of water to a stream especially to meet instream flow needs.

Flow Boundaries — Anything which inhibits ground water flow, such as a ground water divide or an impermeable geologic unit.

Flow Duration Curve — A cumulative frequency curve that shows the percentage of time that specified discharges

are equaled or exceeded.

Flow Duration Percentiles — Values on a scale of 100 that indicate the percentage of time for which a flow is not exceeded. For example, the 90th percentile of river flow is greater than or equal to 90 percent of all recorded flow rates.

Flow Interval — The shortest period of time in days (typically) during which one-half (the *Half-Flow Interval*) or one-quarter (the *Quarter-Flow Interval*) of the annual runoff occurs.

Flowline (Streamline) — (1) The general path that a particle of water follows under laminar flow conditions. (2) The line indicating the direction followed by ground water toward points of discharge. Flow lines are perpendicular to *Equipotential Lines*.

Flow Meter — A device which allows for measurement of stream flow by measuring velocity in a given cross-sectional area.

(Ground Water) Flow Model — (1) A digital computer model that calculates a hydraulic head field for the modeling domain using numerical methods to arrive at an approximate solution to the differential equation of ground-water flow. (2) Any representation, typically using plastic or glass cross-sectional viewing boxes, with representative soil samples, depicting ground-water flows and frequently used for educational purposes.

Flow, Laminar — Flow of water in well-defined flow lines in which the viscous force is predominant; in channels it occurs at a *Reynolds Number* smaller than 500–2,000 and through porous media at Reynolds Number smaller than 1–10.

Flow, Modified — That streamflow which would have existed had the works of man in or on the stream channels and in the drainage basin been consistent throughout the period of record. Usually used with an adjective such as "present" or specific year to mean that the flow record was modified to represent the record that would have been obtained had the "present" conditions prevailed throughout the period of record. Modified flow is equal to *Virgin Flow* minus the amount of *Streamflow Depletion* occurring at the specified time.

Flow, Natural — The rate of water movement past a specified point on a natural stream from a drainage area which has not been affected by stream diversion, storage, import, export, return flow or change in consumptive use resulting from man's modification of land use. Natural flow rarely occurs in a developed country.

Flow, Net — A graphical representation of flow lines and *Equipotential Lines* for two-dimensional, steady-state ground-water flow.

Flow, Overland — The flow of rainwater or snowmelt over the land surface toward stream channels. Upon entering a stream, it becomes runoff.

Flow Path — The subsurface course a water molecule or solute would follow in a given ground-water velocity field.

Flow Rate — (1) The speed or rate at which water is taken from a water course or the speed at which it flows past a point, usually measured in gallons per hour or cubic feet per second (cfs). (2) The rate, expressed in gallons or liters-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Flow Resources versus Stock Resources — Flow resources are resources that are not permanently expendable under usual circumstances; they are resources which are replaced. They are commonly expressed in annual rates at which they are regenerated. Examples are fresh-water runoff and timber. Stock resources can be permanently expended and whose quantity is usually expressed in absolute amounts rather than in rates. Examples are coal and petroleum deposits.

Flow, Steady — A flow in which the magnitude and direction of the specific discharge are constant in time.

Flowstone — A layered deposit of calcium carbonate, $CaCO_3$, on rock where water has flowed or dripped, as on the walls of a cave. Also see *Tufa*.

Flow, Turbulent — A flow in which successive flow particles follow independent path lines, and head loss varies approximately with the square of the velocity. In stream channels it occurs at a *Reynolds Number* greater than 5,000.

Flow, Uniform — A characteristic of a flow system where specific discharge has the same magnitude and direction at any point.

Flow Velocity — (1) The volume of water flowing through a unit cross-sectional area of an aquifer. Also referred to as *Specific Discharge*. (2) Speed at which water moves during a flood. Velocities usually vary across the floodplain. They are usually greatest near the channel and lowest near the edges of the floodplain.

Flow, Virgin — That streamflow which would exist had man not modified conditions on or along the stream or in the drainage basin.

Flowing Well — An *Artesian Well* having sufficient head to discharge water above the land surface; a well where the *Piezometric Surface* lies above the ground surface..

Flowmeter — A gauge indicating the velocity of wastewater moving through a treatment plant or of any liquid moving through various industrial processes.

Flue Gas Scrubber — A type of equipment that removes fly ash and other objectionable materials from flue gas by the use of sprays, wet baffles, or other means that require water as the primary separation mechanism. Also referred to as *Flue Gas Washer*.

Fluid — Having particles which easily move and change their relative position without a separation of the mass, and which easily yield to pressure; capable of flowing; liquid or gaseous.

Fluidized — A mass of solid particles that is made to flow like a liquid by injection of water or gas is said to have been fluidized. In water treatment, a bed of filter media is fluidized by backwashing water through the filter.

Fluid Ounce — (Abbreviated fl oz, fl. oz.) (1) A unit of volume or capacity in the U.S. Customary System, used in liquid measure, equal to 29.57 milliliters (1.804 cubic inches). (2) A unit of volume or capacity in the British Imperial System, used in liquid and dry measure, equal to 28.41 milliliters (1.734 cubic inches).

Fluid Potential — The mechanical energy per unit mass of a fluid at any given point in space and time with respect to an arbitrary state and datum. Loss of fluid potential results as the fluid moves from a region of high potential to one of low potential and represents the loss of mechanical energy which is converted to heat by friction.

Flume — (1) A narrow gorge, usually with a stream flowing through it. (2) An open artificial channel or chute carrying a stream of water, as for furnishing power, conveying logs, or as a measuring device.

Fluoridate (Fluoridation) — To add a fluorine compound to a drinking water supply, for example, for the purpose of reducing tooth decay, particularly in children. Since 1962, the U.S. Public Health Service (PHS) has recommended an "optimal" fluoride concentration of 0.7 to 1.2 mg/l (milligrams per liter) to prevent dental caries and minimize mottling (fluorosis). In 1986, the *U.S. Environmental Protection Agency (EPA)* set the *Maximum Contaminant Level (MCL)* for fluoride at 4 mg/l.

Fluoride — A binary compound of *Fluorine* with another element; gaseous, solid, or dissolved compounds containing fluorine that result from industrial processes. Fluoride combines with tooth enamel to render it less soluble in acid environments and fluoride compounds are added to public water supplies to prevent tooth decay. Excessive amounts in food can lead to *Fluorosis*. Fluorine is a halogen with the chemical symbol F.

Fluorine — A pale-yellow, highly corrosive, poisonous, gaseous halogen element, the most electronegative and most reactive of all the elements, used in a wide variety of industrially important compounds. Fluorine is a halogen with the chemical symbol F.

Fluorosis — An abnormal condition caused by excessive intake of *Fluorine*, as from fluoridated drinking water, characterized chiefly by mottling of the teeth.

Flush — (1) To flow suddenly and abundantly, as from containment; flood. (2) To be emptied or cleaned by a rapid flow of water, as a toilet. (3) To open a cold-water tap to clear out all the water which may have been sitting for a long time in the pipes. In new homes, to flush a system means to send large volumes of water gushing through the unused pipes to remove loose particles of solder and flux. (4) To force large amounts of water through liquid to clean out piping or tubing, storage or process tanks.

Flushing Flows — Discharges, either natural or man-caused, of sufficient magnitude and duration to cause scouring and removal of fine sands from the streambed gravel to maintain intragravel permeability.

Flushing of Fish — The downstream movement of fish because of water velocity.

Flushless Toilet — A toilet that disposes of waste without using water, especially one that utilizes bacteria to break down waste matter.

Flushometer — A device for flushing toilets and urinals that utilizes pressure from the water supply system rather than the force of gravity to discharge water into the bowl, designed to use less water than conventional flush toilets.

Fluve — A linear depression, rill, gully, arroyo, canyon, valley, etc., of any size, along which flows at some time, a drainageway.

Fluvial — Of or pertaining to rivers and streams; growing or living in streams or ponds; produced by the action of a river, stream or flood flow, as in a fluvial plain.

Fluvial Geomorphology (Geomorphologist) — The science concerned specifically with the influences of water and rivers on the erosional cycle of land deposition and degradation over time. While hydrology concentrates on the description, measurement, and analysis of precipitation and the flow of water on the earth's surface and underground, fluvial geomorphology concentrates on understanding the processes that govern the influence of water on the landscape over time.

Fluvioglacial — Pertaining to streams flowing from glaciers or to the deposits made by such streams.

Flux — (1) A flowing or flow. (2) The flowing in of the tide. (3) The measure of the hydraulic rate of flow of water through a pressure osmosis membrane in gallons per square foot of membrane per day (GFD).

Flux Density — The rate of flow of any quantity, usually a form of energy, through a unit area of specified surface.

Foam — (1) A mass of bubbles of air or gas in a matrix of liquid film, especially an accumulation of fine, frothy bubbles formed in or on the surface of a liquid, as from agitation or fermentation. (2) The sea.

Fog — Condensed water vapor in cloud-like masses lying close to the ground.

Fog Drip — Water that is collected on the surface of vegetation and falls to the ground, as warm, moist air is advected over the vegetation.

Fold — (Geology) A bend or flexure in a layer or layers of rock.

Food Chain — A succession of organisms in an ecological community that constitutes a continuation of food energy from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member.

Footslope — The relatively gently sloping, slightly concave slope component of an erosional slope that is at the base of the backslope component. Synonymous with *Pediment*.

Forage — Food for livestock and wildlife, especially taken by browsing or grazing.

Forage Fish — Small fish which breed prolifically and serve as food for predatory fish.

Forb — (1) Any *Herbaceous* flowering plant, other than a grass; especially one growing under range conditions. (2) An herbaceous plant other than a *Graminoid*.

Force Mains — Pipes in which wastewater is transported under pressure; the system is used in some areas having small elevation changes with distance and therefore needing to augment the gravity flow.

Force Pump — A pump with a solid piston and valves used to raise a liquid or expel it under pressure.

Ford — (1) A shallow place in a body of water, such as a river, where one can cross by walking or riding on an animal or in a vehicle. (2) An at-grade stream crossing that uses the bottom of the channel in lieu of a bridged or culverted crossing.

Forebay — The water behind a dam. A reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water levels; also a storage basin for regulating water for percolation into ground water basins. Compare with *Afterbay*.

Forebay Reservoir — A reservoir used to regulate the flow of water to a hydroelectric plant; it may also serve other purposes such as recreation. Also see *Afterbay*.

Forecast (Forecasting) — (Statistics) A forecast is a quantitative estimate (or set of estimates) about the likelihood of future events based on past and current information. This "past and current information" is specifically embodied in the structure of the econometric model used to generate the forecasts. By extrapolating the model out beyond the period over which it was estimated, we can use the information contained in it to make forecasts about future events. It is useful to distinguish between two types of forecasting, *ex post* and *ex ante*. In an *ex post* forecasts all values of dependent and independent variables are known with certainty and therefore provides a means of evaluating a forecasting model. Specifically, in an *ex post* forecast, a model will be estimated using observations excluding those in the *ex post* period, and then comparisons of the forecasts will be made to these actual values. An *ex ante* forecast predicts values of the dependent variable beyond the estimation period using values for the explanatory variables which may or may not be known with certainty.

Forecast Horizon — (Statistics) The number of time periods to be forecasted; also, the time period in the future to which forecasts are to be made.

Foreshore — (1) The part of a shore that lies between high and low watermarks. (2) The part of a shore between the water and occupied or cultivated land.

Forest — In general, an area or biotic community dominated by trees of any size (usually, at least 10 percent of the area is covered by trees). If distinction is made to woodlands, forests are composed of taller, more closely-spaced trees.

Forest Health — A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency, while meeting current and future needs of people for desired levels of values, uses, products, and services.

Forest Hydrology — The study of hydrologic processes as influenced by forest and associated vegetation.

Forest Influences — The effects resulting from the presence of forest or brush upon climate, soil water, runoff, streamflow, floods, erosion, and soil productivity.

Forest Land — Land which is at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and power line clearing of any width.

(United States) Forest Service (USFS) — The largest and most diverse agency of the U.S. Department of Agriculture, the Forest Service provides leadership in the management, protection, and use of the nation's forests and

rangelands, which comprise almost two-thirds of the nation's federally owned lands. The creation of the Forest Service go back to 1891 when the President was authorized to establish Forest Reserves from forest and range lands in the *Public Domain*. In 1905 the responsibilities for the management and protection of these Forest Reserves was transferred from the Department of the Interior to the Department of Agriculture and the Forest Service was formally established. The Forest Reserves were then renamed National Forests. Today the Forest Services manages 156 National Forests, 19 National Grasslands, and 16 Land Utilization Projects that make up the National Forest System located in 44 states, Puerto Rico, and the Virgin Islands. Much of the nation's fresh water supply flows from National Forest System lands and insuring adequate yields of high quality water and continuing soil productivity are primary aims of the Forest Service's watershed management programs. The Forest Service manages more than 14 percent of the nation's 1.2 billion acres of forest range. This National Forest System (NFS) rangeland is managed to conserve the land and its vegetation while providing food for both domestic livestock and wildlife. The Forest Service manages fish and wildlife habitat on the National Forests and National Grasslands in cooperation with the individual states' fish and game departments. Of the 191 million acres of National Forests, 86.5 million acres are classified as commercial forests, available for, and capable of, producing crops of industrial wood. National Forest timber reserves are managed on a sustained-yield basis to produce a continuous supply of wood products to meet the nation's economic demands while maintaining the productive capacity of these lands. In 1924 the Forest Service pioneered the establishment of wilderness areas on National Forest lands. National Forest lands are a major source of mineral and energy supplies with regulatory and management responsibilities for mineral activities shared with the Department of the Interior, Bureau of Mines. The Forest Service, with one of the world's largest wildland firefighting forces, provides direct fire protection and control for National Forest System lands as well as cooperative fire control on several million additional acres. The Forest Service is responsible for the forest management aspects of the Watershed Protection and Flood Prevention Program administered by the *Natural Resources Conservation Service (NRCS)*. The Forest Service also participates in the forestry aspects of the River Basin Program, which guides and coordinates water and related land resource planning among several federal departments. The Forest Service operates an extensive forestry research program consisting of eight Forest and Range Experiment Stations, a Forest Products Laboratory, and 75 research labs located throughout the U.S., Puerto Rico, and the Pacific Trust Territories. The Forest Service is organized into nine (9) regions as listed below (regional headquarters are in parentheses):

[1] ***Eastern Region*** (Milwaukee, Wisconsin) – Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Ohio, Indiana, Michigan, Illinois, Missouri, Iowa, Wisconsin, Minnesota;

[2] ***Southern Region*** (Atlanta, Georgia) – Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas;

[3] ***Rocky Mountain Region*** (Denver, Colorado) – South Dakota, Nebraska, Kansas, Wyoming, Colorado;

[4] ***Northern Region*** (Missoula, Montana) – North Dakota, Montana, Idaho (northern part only), South Dakota (northwest corner only), Wyoming (northwest corner only);

[5] ***Intermountain Region*** (Ogden, Utah) – Nevada, Utah, Idaho (except northern portion), Wyoming (western portion only);

[6] ***Southwest Region*** (Albuquerque, New Mexico) – Arizona, New Mexico;

[7] ***Pacific Northwest Region*** (Portland, Oregon) – Washington, Oregon;

[8] ***Pacific Southwest Region*** (San Francisco, California) – California, Hawaii;

[9] ***Alaska Region*** (Juneau, Alaska) – Alaska.

Forfeited Water Right — A water right that is no longer valid because of five or more consecutive years of nonuse. Also see *Abandoned Water Right*.

Forfeiture (Water Right) — (1) The loss of a water right through nonuse for a specified period of time; can occur involuntarily. (2) The invalidation of a water right because of five or more consecutive years of nonuse. Compare to *Abandonment (Water Right)*.

Formation — (Geology) A body of rock or soil of considerable thickness that has characteristics making it distinguishable from adjacent geologic structures.

Fossil Water — Limited subterranean water deposits laid down in past ages but drawn on by modern man.

Foucault, Jean Bernard Léon (1819–1868) — A French physicist who estimated the speed of light and determined that it travels more slowly in water than in air (1850).

Foundation (of a Dam) — The natural material on which the dam structure is placed.

Founder — To sink below the water.

Fountain — (1) An artificially created jet or stream of water; a structure, often decorative, from which a jet or stream

of water issues. (2) A spring, especially the source of a stream. (3) A reservoir or chamber containing a supply of liquid that can be siphoned off as needed.

Fountainhead — (1) A spring that is the source or head of a stream. (2) The upper end of a confined-aquifer conduit, where it intersects the land surface.

Fracture — A general term for any break in rock, which includes cracks, joints, and faults.

Fractured Bedrock Aquifer — An aquifer composed of solid rock, but where most water flows through cracks and fractures in the rock instead of through pore spaces. Flow through fractured rock is typically relatively fast.

Fragile Area — Areas that, due to steepness, soil type, exposure, and cover, are especially subject to soil erosion and rapid deterioration. Also referred to as *Critical Area*.

Fragmentation (of Habitat) — (Ecology) (1) A process by which large, contiguous blocks of habitat are broken into smaller patches isolated from each other by a landscape matrix dissimilar to the original habitat. (2) Interruption of large expanses of one type of habitat or vegetation by man-made clearings. Generally used where roads or areas of cropland are cleared within forested areas, thereby breaking a large continuous area of forest into smaller parcels of forest.

Frazil (Frazil Ice) — A French-Canadian term for the fine spicular ice, derived from the French words for cinders which this variety of ice most resembles. When formed in slat water it is known as *Lolly Ice*. When first formed, frazil is colloidal and is not visible in the water.

Freeboard — (1) The vertical distance between a design maximum water level and the top of a structure such as a channel, dike, floodwall, dam, or other control surface. The freeboard is a safety factor intended to accommodate the possible effect of unpredictable obstructions, such as ice accumulation and debris blockage, that could increase stages above the design water surface. (2) (Nautical) The distance between the water line and the uppermost full deck of a ship. For dams, the terms “net freeboard”, “dry freeboard”, “flood freeboard”, or “residual freeboard” refer to the vertical distance between the estimated maximum water level and the top of a dam. “Gross freeboard” or “total freeboard” is the vertical distance between the maximum planned controlled retention water level and the top of a dam. (3) (FEMA) A factor of safety expressed in feet above a design flood level for flood protective or control works. Freeboard is intended to allow for all of the uncertainties in analysis, design and construction which cannot be fully or readily considered in an analytical fashion.

Free Flow — (Hydraulics) Flow through or over a structure not affected by submergence or backwater.

Free-Flowing — Flowing without artificial restrictions.

Free-Flowing Stream — A stream or a portion of a stream that is unmodified by the works of man or, if modified, still retains its natural scenic qualities and recreational opportunities.

Free-Flowing Weir — A weir that in use has the tailwater lower than the crest of the weir.

Free-Flowing Well — An *Artesian Well* in which the potentiometric surface is above the land surface. Also see *Potentiometric Surface*.

Free Ground Water — Water in interconnected pore spaces in the *Zone of Saturation* down to the first impervious barrier, moving under the control of the water table slope.

Free Liquids — (Water Quality) Liquids capable of migrating from waste and contaminating ground water. Hazardous waste containing free liquids may not be disposed of in landfills.

Free Moisture — Liquid that will drain freely from solid waste by the action of gravity only.

Free Water Surface (FWS) Constructed Wetland — A type of constructed wetland, a man-made marsh-like area used to treat wastewater. In this type of wetland, the effluent flows through various aquatic plants, with the water level exposed to the air. While this type of wetland is relatively easy to construct, it is not as effective as the *Subsurface Flow (SF) Constructed Wetland* with respect to associated odors, potential for insect breeding, and risk of public exposure and contact with the water in the system. Also see *Wetlands, Benefits*.

Freeze — (1) To pass from the liquid to the solid state by loss of heat. (2) To acquire a surface of coat of ice from cold.

Freezing — The change of a liquid into a solid as temperature decreases. For water, the freezing point is 32 F (Fahrenheit) or 0 C (Celsius).

Freezing Point — (1) The temperature at which a liquid of specified composition solidifies under a specified pressure. (2) The temperature at which the liquid and solid phases of a substance of specified composition are in equilibrium at atmospheric pressure.

Freezing Rain — Water that freezes upon reaching a surface, the temperature of which is below freezing.

French Drain — An underground passageway for water through the interstices among stones placed loosely in a trench.

Frequency Analysis — A statistical procedure involved in interpreting the past record of a hydrological event to occurrences of that event in the future (e.g., estimates of frequencies of floods, droughts, storage, rainfall, water

quality, etc.).

Frequency Curve — A graphical representation of the frequency of occurrence of specific events. Also referred to as *Frequency Distribution*.

Frequency Distribution — An arrangement of quantities pertaining to a single event, in order of magnitude and frequency of occurrence.

Fresh — (1) Not saline or salty. (2) Free from impurity or pollution.

Freshet — (1) A sudden overflow of a stream resulting from a heavy rain or a thaw. (2) A stream of fresh water that empties into a body of salt water.

Fresh-Salt Water Interface — The region where fresh water and salt water meet.

Freshwater (Fresh Water) — (1) Of, relating to, living in, or consisting of water that is not salty. (2) Water with salinity less than 0.5‰ (parts per thousand) dissolved salts. (3) Water that contains less than 1,000 milligrams per liter (mg/l) of dissolved solids; generally, more than 500 mg/l of dissolved solids is undesirable for drinking and many industrial uses. (4) (Nautical) Accustomed to sailing on inland waters only as a fresh water sailor. Also see *Sweet Water*.

Freshwater Marsh — (1) Open wetlands that occur along rivers and lakes, and in many other areas. Sedges, reeds, rushes, and grasses are the dominant plants in freshwater marshes. (2) A *Circumneutral Ecosystem* of more or less continuously water-logged soil dominated by emersed herbaceous plants, but without a surface accumulation of peat.

Freshwater Swamps — Forested or shrubby wetlands. *Pocosins* and heaths are two examples of freshwater swamps.

Fret — To gnaw or wear away; erode. To form (a passage or channel) by erosion. To disturb the surface of (water or a stream); agitate.

Friable — (1) Said of a rock or mineral that crumbles naturally or is easily broken, pulverized, or reduced to powder, such as a soft or poorly cemented sandstone. (2) Said of a soil consistency in which moist soil material crushes easily under gentle to moderate pressure (between thumb and forefinger) an coheres when pressed together.

Friction Head — Energy required to overcome friction due to fluid movement with respect to the walls of the conduit or containing medium.

Friction Losses — Total energy losses in the flow of water due to friction between the water and the walls of a conduit, channel, or porous medium, usually expressed in units of height.

Friction Slope — The energy loss per unit of length of open or closed conduit due to friction.

Friends of the Earth (FOE) — A conservation and environmental organization, founded in 1969, dedicated to preservation, restoration, and wise use of natural resources. The United States headquarters is located in Washington, D.C., with affiliates offices in 37 countries. Through the *Friends of the Earth Foundation*, the organization promotes public education and monitors enforcement of environmental policies.

Fringe Water — Water occurring in the *Capillary Fringe*.

Fringe Marsh — A saturated, poorly drained area, intermittently or permanently water covered, close to and along the edge of a land mass.

Front — (1) Land bordering a lake or river. (2) (Meteorology) A line of separation or interface between air masses of different temperatures or densities.

Frontage — Land adjacent to something, such as a body of water.

Frost — (1) Thin ice crystals in the shape of scales, needles, feathers or fans which are deposited by *Sublimation* at temperatures of 32 F (0 C) or lower. (2) A temperature low enough to cause freezing. (3) The process of freezing.

Frost Heave — Ruptured soil, rock, or pavement caused by the expansion of freezing water immediately beneath the surface.

Frost Line — The depth to which frost penetrates the earth.

Frost Pockets — A low area or depression at the base of a slope where frost collects.

Froth — A mass of bubbles in or on a liquid; foam.

Frozen — (1) Made into, covered with, or surrounded by ice. (2) Very cold.

Fuels — The organic materials that support ignition and spread of a fire (duff, litter, grass, weeds, forbs, brush, trees, snags, and logs).

Full Cost (USBR) — A water rate defined by Congress in the Reclamation Reform Act of 1982 intended to represent the federal government's actual cost in providing project water to irrigators. The full-cost rate for each project or district is calculated by amortizing the expenditures for construction properly allocable to irrigation facilities in service, including all operation and maintenance deficits funded, less payments, over such periods as may be required under federal reclamation law or applicable contract provisions. Interest on all charges accrues from October 12, 1982, on costs outstanding at that date or from the date incurred of costs arising subsequent to October

12, 1982. The term *Full-Cost Rate* means the full-cost charge plus actual operation, maintenance, and replacement costs.

Full-Cost Rate (USBR) — An annual rate as determined by the U.S. Secretary of the Interior that shall amortize construction expenditures that are properly allocable to irrigation facilities in service, including all operation and maintenance deficits funded, less payments, over such periods as may be required by reclamation law or applicable contract provisions, with interest on both accruing from October 12, 1982, on costs outstanding at that date, or from the date incurred in the cast of costs arising subsequent to October 12, 1982.

Fully Permanent Sprinkler System — An irrigation system usually composed of buried enclosed conduits carrying water under pressure to fixed orifices to distribute water over a given area.

Fumarole — A hole or orifice in a volcanic region, and usually in lava, from which issue gases and vapors at high temperature.

Functional Equivalent — A term used to describe the *U.S. Environmental Protection Agency's (EPA)* decision-making process and its relationship to the environmental review conducted under the *National Environmental Policy Act (NEPA)*. A review is considered functionally equivalent when it addresses the substantive components of a NEPA review.

Functional Relationship — (Statistics) A hypothetical relationship that describes the effect of one or more *Independent Variables* on a *Dependent Variable*, of the general form:

$$Y = f(X_1, X_2, \ldots, X_n)$$

where Y represents the dependent variable whose behavior is a function of, $f(\ )$, the values of the independent variables, $X_1, X_2, \ldots, X_n$. A fundamental assumption of a functional relationship is that changes in the independent variables, also referred to as the *Exogenous Variables*, prescribe or determine changes in the dependent, or *Endogenous Variable*, consequently leading to a flow of causation from the independent variables to the dependent variable. As such, a functional relationship is not exactly comparable to a mathematical equation in which variables may be moved from one side of the equation to the other without changing the validity of the equality. In a functional relationship by contrast, once the flow of causation has been prescribed (the *Specification*), the equation's (model's) structure is fixed.

Functionally Dependent Use — (FEMA) A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities and port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, and does not include long-term storage or related manufacturing facilities.

Fungi (Singular: Fungus) — Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms lacking in chlorophyll (i.e., are not photosynthetic) and which are usually non-mobile, filamentous, and multicellular. Some grow in soil, others attach themselves to decaying trees and other plants whence they obtain nutrients. Some are *Pathogens*, others stabilize sewage and digest composted waste.

Fungicide — A chemical material used to retard or prevent the growth of fungi.

Furrow — A long, narrow, shallow trench made in the ground by a plow for planting and irrigation.

Furrow Dams — Small earth ridges or rows used to impound water in furrows.

Furrow Irrigation — Spreading water by directing it into small channels across the field. Also referred to as *Corrugation Irrigation*.

Furrow Stream — The size of water flow released into the furrow; the size of the stream is adjusted to prevent erosion, limited in amount to the capacity of the furrow, and as needed for the intake rates of the soil involved.