APPENDIX 4
GLOSSARY OF TERMS AND REPORT PLATES

YAZOO BACKWATER AREA REFORMULATION

APPENDIX 4
GLOSSARY

This glossary contains standard and technical terms used throughout the Yazoo Backwater Area Reformulation Study Final Report, Final Supplemental Environmental Impact Statement, and its appendixes.

100-year flood - A term commonly used to refer to the 1 percent annual probability flood in any year. The 100-year flood is the flood that is equaled or exceeded once in 100 years on the average, but the term should not be taken literally as there is no guarantee that the 100-year flood will occur at all within the 100-year period or that it will not recur several times.

2-year flood – A term commonly used to refer to the 50 percent annual probability flood.

2-1/4 percent interest rate – The current Federal interest rate in effect at the time of the 1982 reevaluation report for the Yazoo Area pump project, Yazoo Backwater Area, Mississippi, as established by Headquarters, U.S. Army Corps of Engineers (HQUSACE) for that fiscal year (FY).

5-1/8 percent interest rate – The current Federal interest rate for FY 06, which was the current Federal discount rate in effect at the time of the latest Yazoo Backwater Area Reformulation evaluation, was established by the HQUSACE Directorate of Civil Works and published in Economic Guidance Memorandum (EGM) No. 06-01, Federal Interest Rates for Corps of Engineers Projects for FY 06. In accordance with Principles and Guidelines (Section 1.4.11) and Section 80 of Public Law (PL) 93-251, the current Federal discount rate for the project evaluation and formulation of Civil Works projects is set each FY and published in an EGM by the HQUSACE Directorate of Civil Works using interest rates from the U.S. Treasury Department.

"A" horizon - A mineral soil horizon at the soil surface or below an "O" horizon characterized by accumulation of humified organic matter intricately mixed with the mineral fraction.

Agricultural noncrop damages – Flood damages to farm property other than crops including damages to farm supplies, farm roads, drainage ditches (including V and W types), fences, irrigation systems, and landforming and leveling.

Annual flood - The highest annual peak discharge or stage.

Annual flood series - A list of annual flood peaks.

Antecedent conditions - Watershed conditions prevailing prior to an event normally used to characterize basin wetness (e.g., soil moisture).

Aquatic resources - All waters and water habitats including lakes, ponds, streams, rivers, and adjoining flood plain areas.

Area-capacity curve - A graph showing the relation between the surface area of the water in a reservoir/ponding area and the corresponding volume.

Attenuation – The reduction in the peak of a hydrograph resulting in a broader and flatter hydrograph.

Average annual costs – Gross investment costs amortized over the life of the project utilizing the current interest rate. Average annual costs are then combined with other miscellaneous annual costs (i.e., operation and maintenance costs, fish and wildlife costs, etc.) to obtain the total average annual costs used in comparison with the total average annual benefits to compute the benefit-cost ratio.

Average annual habitat units (AAHU) - The number of habitat units (HU) gained or lost as a result of a proposed action, divided by the number of years in the project life.

Backwater - Water backed up or retarded in its course as compared with its normal or natural condition of flow. Instream gaging, a rise in stage produced by a temporary obstruction such as ice or weeds, or by the flooding of the stream below. The difference between the observed stage and that indicated by the stage-discharge relation is reported as backwater.

Backwater effect - The rise in water surface elevation caused by some obstruction such as a narrow bridge opening, buildings, or fill material that limits the area through which the water must flow.

Bank - The margins of a channel. Banks are called right or left as viewed facing in the direction of the flow.

Base flood plain - The flood plain that would be inundated by a 100-year (1 percent probability) flood.

Basic hydrologic data - Includes inventories of features of land and water that vary only from place to place (topographic and geologic maps are examples) and records of processes that vary with both place and time. (Records of precipitation, streamflow, ground water, and quality-of-water analyses are examples.)

Borrow areas – Pits that are constructed by the removal of soil to be used in the construction of levees, roads, etc.

Buffer (area, zone, or habitat) - An intervening area or other form of barrier that separates wetlands or streams from developed or disturbed areas and reduces the impacts on the wetlands, streams, and other habitats that may result from human activities. The critical functions of a buffer (associated with an aquatic system) include shading, input of organic debris and coarse sediments, uptake of nutrients, stabilization of banks, interception of fine sediments, storm-flow attenuation during high-water events, protection from disturbance by humans and domestic animals, maintenance of wildlife habitat, and room for variation of aquatic system boundaries over time due to hydrologic or climate effects.

Basic hydrologic information - A broader term that includes surveys of the water resources of particular areas and a study of their physical and related economic processes, interrelations, and mechanisms.

Boundary condition – Known or hypothetical conditions at the limit of a problem that govern its solution. For example, when solving a routing problem for a given reach, an upstream boundary condition is necessary to determine condition at the downstream boundary.

Breeding success – The relative effectiveness of an individual in successfully mating, caring for, and raising young.

Calibration – Adjustments of model parameter values that produce the "best" fit to observed data.

Canopy-interception – Precipitation that falls on and is stored in the leaf or trunk of vegetation. The term can refer to either the process or a volume.

Carrying capacity - The maximum number of individuals of a given species that an area can support during the most unfavorable time of year (without causing deterioration of the site) or the maximum number of organisms that can be supported in a given area or habitat on a long-term basis; usually constrained by limiting factors such as water, nutrients, and habitat.

Channel - A natural stream or river or an artificial feature, such as a ditch or canal, that exhibits features of bed and bank and conveys water primarily unidirectional and downgradient.

Connecting channel (watercourse) - An open conduit, either naturally or artificially created, which periodically or continuously contains moving water or which forms a connecting link between two bodies of water. River, creek, run, branch, anabranch, and tributary are some of the terms used to describe natural channels. Natural channels may be single or braided. Canal and floodway are some of the terms used to describe artificial channels.

Channel storage - The volume of water in the channel or over the flood plain of the streams in a drainage basin or river reach.

Clean Water Act - The Federal law that establishes standards and procedures for limiting the discharge of fill and pollutants into waters of the United States.

Colluvium - A heterogeneous mixture of soil and parent material that has moved down a slope and settled at its base as a result of gravitational action.

Compensatory mitigation - The creation of an environmental resource to offset unavoidable adverse impacts.

Computation duration – The user-defined window used in hydrologic modeling.

Computation interval – The user-defined time step used by a hydrologic model for performing mathematical computations.

Computerized Agricultural Crop Flood Damage Assessment System (CACFDAS) – The computer program that is utilized to evaluate flood damages to crops. The program analyzes daily stage data which reflect varying flood events (when cleared cropland is being flooded) or multiple flood events (analysis of multiple flood events of cleared cropland is the same year on the same area). The program allows for specific crop replanting and/or crop substitution. The CACFDAS was developed to include various levels of management, planting dates, and yields for the principal crops of rice, cotton, soybeans, and corn.

Confluence – The point at which two streams converge.

Content to structure ratio – Content value, normally expressed as a percentage of structure value.

Contingency – An estimate of known uncertainties in estimating project costs whereby a factor (usually expressed as a percentage as a specific provision of money or time) is applied to account for any reservations about the cost basis or data.

Correlation - The process of establishing a relation between a variable and one or more related variables. Correlation is simple if there is only one independent variable; multiple, if there is more than one independent variable.

Cubic foot per second (cfs) – A unit of measure used to describe the amount of flow passing a given point in a stream channel. One cfs is equivalent to approximately 7.5 gallons per second.

Damage-frequency curve – The damage-frequency function is characterized as a curve in a graphic approximation of the frequency distribution of probability damage calculation points. The area under the curve for annual probability damage points is the average or expected annual damage.

Degree of protection – The level of protection afforded an area resulting from implementation of a flood reduction alternative, usually expressed as percentage reduction (i.e., if 1,000 acres floods under existing conditions and only 200 floods with implementation of a water resource alternative, the level of protection would be 80 percent (800 ÷ 1,000)).

Depressional storage - The volume of water contained in natural depressions in the land surface.

Depth-damage analysis – Depth-damage functions describe direct relationships between the depth of water in a structure and the amount of damage sustained. Depth-damage relationships, computed separately for structures and contents, reflect the water-surface elevation and its relationship to structure height. These are the primary variables in determining expected damage values.

Depth-damage curve – Percent damage based on depth of flooding.

Dewatering – The temporary drawdown of ground-water levels for construction purposes.

Direct impacts - Project impacts that result from the physical alteration of a site.

Direct runoff - The runoff entering stream channels promptly after rainfall or snowmelt. Superposed on base runoff, it forms the bulk of the hydrograph of a flood. See also surface runoff. The terms “base runoff” and “direct runoff” are time classifications of runoff. The terms “ground-water runoff” and “surface runoff” are classifications according to source.

Discharge - In its simplest concept, discharge is outflow; therefore, the use of this term is not restricted as to course or location, and it can be applied to describe the flow of water from a pipe or drainage basin. If the discharge occurs in some course or channel, it is correct to speak of the discharge of a canal or river. It is also correct to speak of the discharge of a canal or stream into a lake, stream, or ocean. The data in the reports of the U.S. Geological Survey (USGS) on surface water represent the total fluids measured. Thus, the terms “discharge,” “streamflow,” and “runoff” represent water with the solids dissolved in it and the sediment mixed with it. Of these terms, discharge is the most comprehensive. The discharge of drainage basins is distinguished as follows:

Yield - Total water runout or crop; includes runoff plus underflow.

Runoff - That part of water yield that appears in streams.

Streamflow - The actual flow in streams, whether or not subject to regulation, or underflow. Each of these terms can be reported in total volumes (such as acre-feet) or time rates (such as cfs or acre-feet per year). The differentiation between runoff as a volume and streamflow as a rate is not accepted.

Discharge rating curve - See stage discharge relation.

Distribution graph (distribution hydrograph) - A unit hydrograph of direct runoff modified to show the proportions of the volume of runoff that occur during successive equal units of time.

Diversion - The removal of water from a stream or other body of water into a canal, pipe, or other conduit.

Drainage area - The area of a stream at a specified location which is enclosed by a drainage divide.

Drainage basin - A part of the surface of the earth that is occupied by a drainage system which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Drainage divide - The rim of a drainage basin. (See Watershed.)

Duck-use-days (DUD) - The capacity of available forage per acre to meet the energy requirement of one duck for 1 day.

Duration curve - See flow-duration curve for one type.

Ecoregion - A relatively large unit of land or water characterized by a distinctive climate, ecological features, and plant and animal communities; area that is reasonably homogeneous with respect to climate, geography, and topography.

Evaluation species – Representative species used to evaluate project impacts.

Ecosystem – Dynamic and interrelating complex of plant and animal communities and their associated nonliving environment.

Engineering News Record (ENR) – The ENR Construction Cost Index, usually obtained from the Cost Engineer, is the major source utilized in updating benefit and construction cost values to the most current price levels. (Hegwood.)

EnviroFish – A hydraulic model coupled with land use and reproductive requirements of fish used to evaluate aquatic impacts.

Ephemeral - Streams in which flow is attributable only to surface water runoff in response to precipitation.

Escalation – The provision in a cost estimate for increases in the cost of equipment, material, labor, etc., due to continuing price changes over time (usually expressed as a percentage or ratio). Escalation factors are used to estimate the future cost of a project or bring historical costs to the present.

Evaporation - The process by which water is changed from the liquid or solid state into the vapor state. In hydrology, evaporation is vaporization that takes place at a temperature below the boiling point.

Evapotranspiration - Water withdrawn by evaporation from water surfaces and moist soil and plant transpiration.

Event-based model – Model that simulates some hydrologic response to a precipitation event. (See continuous model.)

Exceedance probability – Hydrologically, the probability that an event selected at random will exceed a specified magnitude.

Excess precipitation – The precipitation in excess of infiltration capacity, evaporation, transpiration, and other losses.

Existing flood damages – The potential average annual dollar damages to activities affected by flooding at the time of the study.

Falling limb – The portion of a hydrograph where runoff is decreasing.

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.

Fill material (Section 404) - Placement of material taken from a site and used to change the bottom features of waters of the United States (includes soil, rock, vegetative material, debris, or construction materials).

Fill material (construction) - Material utilized in construction features which can include soil, rock, vegetative material, debris, or construction materials.

Flood - An overflow or inundation that comes from a river or other body of water.

Flood peak - The highest value of the stage or discharge attained by a flood; thus, peak stage or peak discharge.

Flood plain - A strip of relatively smooth land bordering a stream, built of sediment carried by a 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. The lowland that borders a river, usually dry, but subject to flooding. That land outside of a stream channel described by the perimeter of the maximum probable flood.

Flood profile - A graph of the water surface elevation versus distance (typically measured in river miles).

Flood routing - The process of determining progressively the timing and shape of a flood wave at successive points along a river.

Flood stage - The stage at which overflow of the natural banks of a stream begins to cause damage in the reach in which the elevation is measured.

Floodway - A part of the flood plain, otherwise leveed, reserved for emergency diversion of water during floods. A part of the flood plain which, to facilitate the passage of floodwater, is kept clear of encumbrances.

Frequency flood event – Flood event associated with a specified probability of occurrence.

Fully funded costs – The total project first costs including escalation (i.e., inflation) over the life of the project.

Frequency – Number of times a specific event such as a flood occurs within a specified time interval.

Frequency method of annualization – The process of converting to a yearly basis. In water resources, planning, frequency, and probability distribution are utilized to convert losses at various flood magnitudes to an average annual equivalent or yearly basis.

Functional capacity index (FCI) - An index of the capacity of a wetland to perform a function relative to other wetlands from a regional wetland subclass in a reference domain. The FCIs are by definition scaled from 0.0 to 1.0. An index of 1.0 indicates that a wetland performs a function at the highest sustainable functional capacity, the level equivalent to a wetland under reference standard conditions in a reference domain. An index of 0.0 indicates the wetland does not perform the function at a measurable level and will not recover the capacity to perform the function through natural processes.

Functional capacity - The rate or magnitude at which a wetland ecosystem performs a function. Functional capacity is dictated by characteristics of the wetland ecosystem, the surrounding landscape, and the interaction between the two.

Future flood damages – The monetary damages to economic activities that would be projected to use the flood plain in the future in the absence of an improvement plan.

Gaging station - A specific site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.

Geomorphic - The shape of the land surface.

Gill nets – Fine mesh webbing used to entangle and capture fish.

Ground water - Water in the ground that is in the zone of saturation from which wells, springs, and ground-water runoff are supplied.

Ground-water runoff - That part of the runoff which has passed into the ground and has been discharged into a stream channel as spring or seepage water.

Gross (total) investment costs – The summation of total project first costs and interest during construction.

Guild - A group of species that use the same habitat in similar ways, and therefore tend to be similarly impacted or benefited by a particular habitat change.

General permit - A Section 404 permit for a specific class of activities with minimal individual and cumulative impact within a specified area issued by the Corps, authorizing the discharge of dredged or fill material into waters of the United States, including wetlands.

Habitat suitability index (HSI) - Unitless number ranging from 0 to 1, where 0 represents unsuitable habitat and 1 represents optimal habitat.

Habitat unit - A value derived from multiplying the HSI for an evaluation species by the size of the area for which the HSI was calculated.

HEC-FDA – A computer program developed by the Institute of Water Resources Planning which calculates economic stage-damage with risk and uncertainty; integrates stage-damage curves, stage-discharge curves, and the discharge-probability curves; and evaluates existing and proposed levees, channels, including project sizing and project reliability.

Highest sustainable functional capacity - The level of functional capacity achieved across the suite of functions by a wetland under reference standard conditions in a reference domain. This approach assumes that the highest sustainable functional capacity is achieved when a wetland ecosystem and the surrounding landscape are undisturbed. Marvin

Hydrogeomorphic model (HGM) - A wetland assessment methodology used to determine functions and potential project impacts.

Hydrogeomorphic wetland class - A method of categorizing wetlands based on their hydrologic and geomorphic characteristics. The five basic hydrogeomorphic classes of wetlands include riverine, depression, fringe, slope, and flat.

Hydrograph - A graph showing stage, flow, velocity, or other property of water with respect to time.

Hydraulic radius – The flow area divided by the wetted perimeter. The wetted perimeter does not include the free surface.

Hydrologic cycle - The circulation of water from the sea, through the atmosphere, to the land.

Hydrology - The science encompassing the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

Hyetograph - Graphical representation of rainfall intensity against time.

Hydrologic analysis – Methodology used to evaluate the drainage area of a particular stream, evaluating the precipitation, runoff, storage, and evaporation.

Hydrology – A science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

Hypoxic – Low dissolved oxygen levels that impair respiratory process of fish.

Ichthyoplankton – Drift or aggregation of larval fish that can be sampled using nets or traps.

Income assurance program – For this study, it was a lump sum payment which would be paid to farmers that equated to the crop insurance premium over the 50-year period of analysis.

Incubation - The time for eggs to develop and hatch.

Indicator - Observable characteristics that correspond to identifiable variable conditions in a specific habitat or the surrounding landscape.

Indirect impacts - Impacts resulting from a project that occur concurrently or at some time in the future away from the point of direct impact. For example, indirect impacts of a project on wildlife can result from an increase in the level of activity in adjacent, newly developed areas, even though the wetland is not physically altered by direct impacts. Marvin

Indirect measure - A qualitative measure of an assessment model variable that corresponds to an identifiable variable condition.

Individual permit - A Section 404 permit issued by the Corps for an individual project for which a specific review was conducted.

Infiltration - The flow of a fluid into a substance through pores or small openings.

Infiltration capacity - The maximum rate at which the soil, when in a given condition, can absorb falling rain or melting snow.

Infiltration index - An average rate of infiltration, in inches per hour, equal to the average rate of rainfall such that the volume of rainfall at greater rates equals the total direct runoff.

Inflection point –The point on a hydrograph separating the rising limb from the falling limb.

Initial condition – The conditions prevailing prior to an event. (Refer also to Antecedent conditions.)

Intensification – A change in cropping patterns which allows farmers the potential to change from a less profitable crop to a more profitable crop or an increase in the acreage planted.

Interest or discount rate – The discount rate is the interest rate used in plan formulation and evaluation for discounting future benefits and costs or otherwise converting benefits and costs to a common time basis.

Intermittent stream - Streams in which ground-water-maintained base flow occurs intermittently at different times of the year.

Interception - The process and the amount of rain stored on leaves and branches and eventually evaporated back to the air.

Isohyetal line (isohyet) - A line drawn on a map or chart joining points that receive the same amount of precipitation.

Jurisdictional wetland - Areas that meet the soil, vegetation, and hydrologic criteria described in the "Corps of Engineers 1987 Wetlands Delineation Manual."

Lag time – Defined as time from the beginning (or center of mass) of rainfall to peak (or center of mass) of runoff.

Levee – An embankment constructed to prevent flooding.

Levee district – Cooperative quasi-governmental organizations.

Light traps – Plexiglas traps with an internal light source (a chemical light stick on our case) used to attract and capture larval and juvenile fishes.

Loss (hydrologic) – The difference between the volume of rainfall and runoff. Losses include water absorbed by infiltration, water stored in surface depressions, and water intercepted by vegetation.

Meander - The winding of a stream channel.

Mesolarvae – Larval fish that have absorbed yolk sac and begun exogenous feeding, but have not expressed adult characteristics.

Metalarvae – Late-stage larval fish with fins beginning to differentiate and attaining adult characteristics.

Mitigation – The process of avoiding, minimizing, and compensating for adverse environmental effects.

Mitigation plan - A plan for replacing unavoidable adverse effects.

Model – A physical or mathematical representation of a process that can be used to predict outcomes.

Moisture - Water diffused into the atmosphere or the ground.

National Economic Development (NED) plan – The plan that maximizes the greatest excess benefits as compared to the costs.

National Geodetic Vertical Datum (NGVD) - A fixed reference adopted as a standard geodetic datum for elevation in the United States. For land-based vertical measurements, NGVD is usually given a value of 0.0, and all other points are measured according to their distance above or below.

Nationwide permit - General permit issued nationally for specific types of activities resulting in discharges of dredged or fill material into waters of the United States with minimal individual and cumulative impacts.

Nonstructural benefits - Benefits that accrue to the project as a result of the reforestation of cleared agricultural lands or the removal of property from the flood plain.

Nonstructural measures – Alternative methods of reducing flood damages without using physical construction features. Designed to reduce flood damages or enhance the value of the flood plain without significantly altering existing uses of the flood plain.

Nursery areas – Habitats used by larval or juvenile fish for feeding and protection from predators.

"O" horizon - A layer with more than 12 to 18 percent organic C (by weight; 50 percent by volume). Form of the organic material may be recognizable plant parts (Oi) such as leaves, needles, twigs, moss, etc.; partially decomposed plant debris (Oe); or totally decomposed organic material (Oa) such as muck.

Objective function – A mathematical expression that allows comparison between a calculated result and a specified goal. In HEC-HMS, the objective function correlates calculated discharge with observed discharge. The value of the objective function is the basis for calibrating model parameters.

Offsite mitigation - Mitigation that is done at a location physically separated from the site at which the original impacts occurred, possibly in another watershed.

Out-of-kind mitigation - Mitigation in which lost function capacity is replaced in a wetland of a different regional wetland subclass.

Overland flow - The flow of rainwater or snowmelt over the land surface toward stream channels. After it enters a stream, it becomes runoff.

Parameter – A variable in a general model whose value is adjusted to make the model specific to a given situation. A numerical measure of the properties of the real-world system.

Parameter estimation – The selection of a parameter value based on the results of analysis and/or engineering judgment. Analysis techniques include calibrations, regional analysis, estimating questions, and physically based methods. (Refer also to Calibration.)

Partial-duration flood series - A list of all flood peaks that exceed a chosen base stage or discharge regardless of the number of peaks occurring in a year. (Also called basic-stage flood series or floods above a base.)

Peak – The highest elevation reached by a flood wave. (Also referred to as the crest.)

Peak flow – The point of the hydrograph that has the highest flow.

Peakedness – Describes the rate of rise and fall of a hydrograph.

Percolation - The movement, under hydrostatic pressure, of water through the interstices of a rock or soil, except the movement through large openings such as caves.

Percolation, deep - In irrigation or farming practice, the amount of water that passes below the root zone of the crop or vegetation.

Perennial stream - Perennial streams are defined as streams in which base flow is maintained year round by ground water.

Period of analysis – Each alternative plan or set of project conditions is to be analyzed for a specific period of time. This period of analysis is the time required for implementation plus the lesser of (1) the period of time that any alternative plan would have significant beneficial or adverse effects or (2) a period not to exceed 100 years. Generally, Federal policy is to use a 50-year period of analysis.

Permanent water bodies – Any water body on the flood plain that maintains adequate water levels during the spawning and rearing season of fishes after a flood has receded.

Population – A group of individuals of the same species occupying an area small enough to permit interbreeding among all members of the group.

Prealternate molt – Molting is broadly defined as the routine shedding of hair (mammals), skin (reptiles), or feathers (birds). Alternate plumage (breeding or summer) in birds is acquired by a prealternate molt in the fall or summer. Usually a partial molt, replacing only body feathers, but not the wings and tail. Resulting alternate plumages are brighter and more colorful (in most species).

Precipitation - As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface. It is the common process by which atmospheric water becomes surface or subsurface water. The term "precipitation" is also commonly used to designate the quantity of water that is precipitated. (Precipitation includes rainfall, snow, hail, and sleet and is therefore a more general term than rainfall.)

Preloading – The temporary loading of a foundation site with suitable fill material to induce consolidation and settlement prior to construction.

Probable maximum flood - The largest flood for which there is any reasonable expectancy in this climatic era.

Project alternatives - Different ways in which a given project can be done. Alternatives may vary in terms of project location, design, method of construction, amount of fill required, and other ways.

Project target - The level of functioning identified for a restoration or creation project. Conditions specified for the functioning are used to judge whether a project reaches the target and is developing toward site capacity.

Protolarvae – Earliest developmental period of larval fish, usually with yolk sac.

Principles and standards/principles and guidelines – The "Principles and Standards for Planning of Water and Related Land Resources" is a Presidential policy statement issued in September 1973 which established a framework for improved planning for the use of water and related land resources based on the objectives of NED and Environmental Quality. The "Principles and Standards" were revised and issued as the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources for Implementation Studies."

Project life - The planning period used to evaluate the project. The Yazoo Backwater project life is 54 years (4 for construction, 50 for calculating project benefits).

Puddle ducks – A large, common group of North American waterfowl often referred to as dabbling ducks (Tribe Anatini); puddle ducks feed by tipping "tail-up" in shallow water (18 to 36 inches deep) to forage on aquatic plants, seeds, and invertebrates. They require no running start to take off, but spring directly into flight.

Rain - Liquid precipitation.

Rainfall - The quantity of water that falls as rain only. Not synonymous with precipitation.

Rainfall excess - The volume of rainfall available for direct runoff. It is equal to the total rainfall minus interception, depression storage, and absorption.

Rating curve – The relationship between stage and discharge.

Reach – A segment of a stream channel.

Recession curve - A hydrograph showing the decreasing rate of runoff following a period of rain or snowmelt. Since direct runoff and base runoff recede at different rates, separate curves, called "direct runoff recession curves" or "base runoff recession curves," are generally drawn. The term "depletion curve" in the sense of base runoff recession is not recommended.

Rearing – Early developmental stage of fish, commonly referred to as larvae, and occurs between the egg and juvenile life stage.

Recurrence interval (return period) - The average interval of time within which the given flood will be equaled or exceeded once.

Red flag features - Features of a wetland or the surrounding landscape to which special recognition or protection is assigned on the basis of objective criteria. The recognition or protection may occur at a Federal, state, regional, or local level and may be official or unofficial.

Reference domain - The geographic area from which reference wetlands are selected. A reference domain may or may not include the entire geographic area in which a regional wetland subclass occurs.

Reference standards - Conditions exhibited by a group of reference wetlands that correspond to the highest level of functional capacity (highest sustainable level of functioning) across the suite of functions performed by the regional wetland subclass. The highest level of functional capacity is assigned an index value of 1.0 by definition.

Reference wetlands - Wetland sites that encompass the variability of a regional wetland subclass in a reference domain. Reference wetlands are used to establish the range of conditions for construction and calibration of functional indices and establish reference standards.

Reforestation – Agricultural lands which have been planted with bottom-land hardwoods and are dominated by herbaceous vegetation.

Region - A geographic area that is relatively homogeneous with respect to large-scale factors such as climate and geology that may influence how wetlands function.

Regulation - The artificial manipulation of the flow of a stream.

Regional wetland subclass - Wetlands within a region that are similar based on hydrogeomorphic classification factors. There may be more than one regional wetland subclass identified within each hydrogeomorphic wetland class, depending on the diversity of wetlands in a region and the assessment objectives.

Reservoir - A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

Residual-mass curve - A graph of the cumulative departures from a given reference such as the arithmetic average, generally as ordinate, plotted against time or date, as abscissa.

Restoration - Actions taken which result in the reestablishment of aquatic site structure, processes, and functions in areas where the aquatic site has been altered, degraded, or destroyed.

Retention basin – Similar to detention basin, but water in storage is permanently obstructed from flowing downstream.

Rising limb – Portion of the hydrograph where runoff is increasing.

Risk and uncertainty – Risks are typically defined as outcomes that can be described in reasonable well-known probability distributions such as the probability of particular flood events. Uncertainty, characteristic of many aspects of water resources planning, results in potential outcomes that cannot be described in objectively known probability distributions.

Riparian habitat - The zone of hydrophytic vegetation growing along the banks of rivers, streams, and creeks.

Runoff - That part of the precipitation that appears in surface streams. It is the same as streamflow unaffected by artificial diversions, storage, or other works of man in or on the stream channels. Runoff may be classified as follows:

Classification as to speed of appearance after rainfall or snow melting:

Direct runoff
Base runoff

Classification as to source:

Surface runoff (See Overland flow)
Storm seepage
Ground-water runoff (See Stream, gaining)

Saturation zone – The portion of the soil profile where available water storage is completely filled. The boundary between the vadose zone and the saturation zone is called the water table. Note that under certain periods of infiltration, the uppermost layers of the soil profile can be saturated. (See vadose zone.)

SCS curve number – An empirically derived relationship between location, soil type, land use, antecedent moisture conditions, and runoff. An SCS curve number is used in many event-based models to establish the initial soil moisture condition and the infiltration characteristics.

Seasonally flooded – A flood pulse that connects the flood plain with the river, but occurs only on a seasonal basis, usually in the spring.

Section 404 permit - The permit issued by the Corps under Section 404 of the Clean Water Act for authorizing the discharge of dredged or fill material into waters of the United States, including wetlands; also known as Corps permit, fill permit, Department of the Army permit, DA permit, individual permit, Section 404 permit.

Section 404 (b)(1) guidelines - Substantive regulations promulgated at 40 CFR §230 in accordance with Section 404(b)(1) of the Clean Water Act that provides the standards for unacceptable adverse impacts on waters of the United States, including wetlands, used to determine whether a Section 404 permit should be issued. Generally, discharges of fill are allowed under the guidelines only if no other environmentally less damaging practicable alternative is available, no significant degradation of the waters, no adverse impacts to threatened and endangered species, and if appropriate and practicable steps have been taken to sequentially avoid, minimize, and mitigate adverse impacts on the aquatic ecosystem.

Seine – A net with small square mesh (e.g., 0.25 inch) attached to poles (brails) having a float line on top and a lead line on bottom.

Sensitivity analysis – Sensitivity analyses include such items as assumptions, predicted variables, estimated values, and parameter values which are critical to plan formulation and selection. Therefore, sensitivity analyses can provide a range of benefit levels representing data and assumptions of different confidence levels.

Site potential - The highest level of functioning possible, given local constraints of disturbance history, land use, or other factors. Site capacity may be equal to or less than levels of functioning established by reference standards for the reference domain, and it may be equal to or less than the functional capacity of a wetland ecosystem.

Soil column - A set of related soil horizons.

Soil horizon - A layer approximately parallel to the surface of the soil that is distinguishable from adjacent layers by a distinctive set of properties produced by soil forming processes.

Soil moisture (soil water) - Water diffused in the soil, the upper part of the zone of aeration from which water is discharged by the transpiration of plants or by soil evaporation. (See Field-moisture capacity and Field-moisture deficiency.)

Soil moisture accounting (SMA) – A modeling process that accounts for continuous fluxes to and from the soil profile. Models can be event-based or continuous. When using a continuous simulation, a soil moisture accounting method is used to account for changes in soil moistures between precipitation events.

Soil profile – A description of the uppermost layers of the ground down to bedrock. In a hydrologic context, the portion of the ground subject in infiltration, evaporation, and percolation events.

Spawning – Deposition of eggs which is often associated with nest construction and guarding behavior.

Stage - The height of a water surface above an established datum plane; also gage height.

Stage-area curve – Hydrologic stage-frequency curves reflect the relationship of state/elevation of flooding and the frequency of occurrence.

Stage-capacity curve - A graph showing the relation between the surface elevation of the water in a reservoir, usually plotted as ordinate, against the volume below that elevation, plotted as abscissa.

Stage-discharge curve (rating curve) - A graph showing the relation between the gage height, usually plotted as ordinate, and the amount of water flowing in a channel, expressed as volume per unit of time, plotted as abscissa.

Stage-discharge relation - The relation expressed by the stage-discharge curve.

Stage frequency curve - A graph showing the stage versus the associated probability of occurrence. Probability of occurrence can be shown as frequency (years) or percent probability (equaled or exceeded).

Stemflow - Rainfall or snowmelt led to the ground down the trunks or stems of plants.

Stratify – Arranged or split into an upper area or stratum and lower stratum. Stratification establishes a "breakpoint" or elevation which reflects that in the lower stratum, which is more flood-prone, farming operations differ from those of the upper stratum.

Stream - A general term for a body of flowing water. In hydrology, the term is generally applied to the water flowing in a natural channel as distinct from a canal. More generally, as in the term "stream gaging," it is applied to the water flowing in any channel, natural or artificial. Streams in natural channels may be classified as follows:

Relation to time.

Perennial - One which flows continuously.

Intermittent or seasonal - One which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas.

Ephemeral - One that flows only in direct response to precipitation and whose channel is at all times above the water table.

Relation to space.

Continuous - One that does not have interruptions in space.

Interrupted - One which contains alternating reaches that are either perennial, intermittent, or ephemeral.

Relation to ground water.

Gaining - A stream or reach of a stream that receives water from the zone of saturation.

Losing - A stream or reach of a stream that contributes water to the zone of saturation.

Insulated - A stream or reach of a stream that neither contributes water to the zone of saturation nor receives water from it. It is separated from the zones of saturation by an impermeable bed.

Perched - A perched stream is either a losing stream or an insulated stream that is separated from the underlying ground water by a zone of aeration.

Streamflow - The discharge that occurs in a natural channel. Although the term discharge can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than runoff, as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Stream gaging - The process and art of measuring the depths, areas, velocities, and rates of flow in natural or artificial channels.

Stream-gaging station - A gaging station where a record of discharge of a stream is obtained. Within USGS, this term is used only for those gaging stations where a continuous record of discharge is obtained.

Stream type - This refers to the Rosgen (1996) classification of streams, which is based on channel slope, sinuosity, entrenchment, width to depth ratios, and channel substrate.

Storage – (1) Water artificially impounded in surface or underground reservoirs for future use. The term "regulation" refers to the action of this storage in modifying streamflow. (See also Conservation storage, Total storage, Dead storage, and Usable storage) and (2) Water naturally detained in a drainage basin, such as ground water, channel storage, and depression storage. The term "drainage basin storage" or simply "basin storage" is sometimes used to refer collectively to the amount of water in natural storage in a drainage basin.

Storm - A disturbance of the ordinary average conditions of the atmosphere which, unless specifically qualified, may include any or all meteorological disturbances, such as wind, rain, snow, hail, or thunder.

Structure – The horizontal and vertical spatial arrangement, or configuration, of a habitat, community, or ecosystem includes biotic and abiotic diversity. It should be noted that the economic definition varies from this definition.

Structural benefits – Those benefits that accrue to the project as the result of the construction and operation of construction features (i.e., 14,000-cfs pump).

Structural measures - Structural measures are physical flood damage reduction measures to change various riverine conditions in order to reduce flood damages or enhance the value of the flood plain.

Sublimation – The process of transformation directly between a solid and a gas.

Surface runoff - That part of the runoff which travels over the soil surface to the nearest stream channel. It is also defined as that part of the runoff of a drainage basin that has not passed beneath the surface since precipitation. The term is misused when applied in the sense of direct runoff.

Surface water - Water on the surface of the earth.

Target year (TY) - A specific year for which habitat conditions for a species are measured or estimated.

Tension zone – In the context of HEC-HMS, the portion of the soil profile that will lose water only to evapotranspiration. This designation allows modeling water held in the interstices of the soil.

Thermocline – The vertical distance in water where there is a sharp decline in temperature and dissolved oxygen.

Through flow - The lateral movement of water in an unsaturated zone during and immediately after a precipitation event. The water from through flow seeps out at the base of slopes and then flows across the ground surface as return flow, ultimately reaching a stream or lake. (See Interflow for comparison.)

Time of concentration – The travel time from the hydraulically furthermost point in a watershed to the outlet. Also defined as the time from the end of rainfall excess to the inflection points on the recession curve.

Time to rise – The time from the start of rainfall excess to the peak of the hydrograph.

Time to peak – The time from the center of mass of the rainfall excess to the peak of the hydrograph. (Refer also to Lag time.)

Tolerant – Fish species that tolerate impaired water quality and habitat conditions.

Total project first costs – The costs for construction, real estate (i.e., lands and damages), relocations, planning engineering and design, and construction management (including contingencies) for each proposed alternative of improvement.

Transpiration - The quantity of water absorbed, transpired, and used directly in the building of plant tissue in a specified time. It does not include soil evaporation. The process by which water vapor escapes from the living plant, principally the leaves, and enters the atmosphere.

Tubers - Short, thickened, mostly underground stems that constitute the resting stage of certain seed plants. It is often an organ of food storage, reproduction, or both and bears minute-scale leaves, each with a bud that has the potential for developing into a new plant; a swollen, underground storage organ, modified from a root or rhizome, with buds where new shoots and roots develop after a dormant period.

Underflow - The downstream flow of water through the permeable deposits that underlie a stream and are more or less limited by rocks of low permeability.

Unwatering – The temporary removal of surface water for construction purposes.

Unit hydrograph - The hydrograph of direct runoff from a storm uniformly distributed over the drainage basin during a specified unit of time; the hydrograph is reduced in vertical scale to correspond to a volume of runoff of 1 inch from the drainage basin. The hydrograph of surface runoff (not including ground-water runoff) on a given basin due to an effective rainfall falling for a unit of time.

Urban flood damages – Urban flood damages are classified as physical damages or losses, income losses, and emergency costs incurred by a flood event in an urban area. These include damages to residential and nonresidential structures, losses to the contents in those structures, flood damages to automobiles, the costs associated with flood emergency operations, and the cost for administering the Flood Insurance Administration program.

Usable storage - The volume normally available for release from a reservoir below the stage of the maximum controllable level.

Vadose zone – The portion of the soil profile above the saturation zone.

Valley type - Valley type refers to the Rosgen (1996) classification of valleys, which is based on valley slope, width, and shape.

Value of wetland function - The relative importance of a wetland function to an individual or group.

Variable - An attribute or characteristic of a wetland ecosystem or the surrounding landscape that influences the capacity of the wetland to perform a function.

Variable condition - The condition of a variable as determined through quantitative or qualitative measure.

Variable index - A measure of how an assessment model variable in a wetland compares to the reference standards of a regional wetland subclass in a reference domain.

Waters of the United States - Water bodies that are regulated under Section 404 of the Clean Water Act. It is the broadest category of regulated water bodies and includes wetlands along with nonwetland habitats, such as streams, rivers, lakes, ponds, bays, and oceans.

Water year - In USGS reports dealing with surface-water supply, the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends, which includes 9 of the 12 months. Thus, the year ended September 30, 1959, is called the "1959 water year." With terms arranged in alphabetical order as they are in the previous section, it is difficult to find the definitions of related terms. For convenience in finding such terms, the following list is organized by major topics, with related terms grouped. The main headings are alphabetized, and the subheadings are arranged approximately in the order of their association with the main headings. The terms that are grouped with the subheadings are similarly arranged. All terms defined in this manual are included, and some may appear under more than one heading. Page numbers are given for ready reference to the definitions.

Watershed – The geographic area that naturally drains into a given watercourse such as a stream or river.

Wetland - Areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetland assessment model - A model that defines the relationship between ecosystem and landscape scale variables and functional capacity of a wetland. The model is developed and calibrated using reference wetlands.

Wetland assessment objective - Assessment objectives normally fall into one of three categories. These include documenting existing conditions, comparing different wetlands at the same point in time (e.g., alternatives analysis), and comparing the same wetland at different points in time (e.g., impact analysis or mitigation success).

Wetland assessment team (A-Team) - An interdisciplinary group of regional and local scientists responsible for classification of wetlands within a region, identification of reference wetlands, construction of assessment models, definition of reference standards, and calibration of assessment models.

Wetland assessment area (WAA) - The wetland area to which results of an assessment are applied.

Wetland banking - The process of creating a "bank" of created, enhanced, or restored wetland to serve at a future date as mitigation for project impacts.

Wetland creation - The process of creating a wetland in a location where a wetland did not previously exist. Wetland creation is typically done for mitigation.

Wetland ecosystems - In Section 404, ". . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas . . . ." (Corps Regulation 33, CFR §328.3, and EPA Regulation 40 CFR §230.3). In a more general sense, wetland ecosystems are three-dimensional segments of the natural world where the presence of water, at or near the surface, creates conditions leading to the development of redoxomorphic soil conditions, and the presence of a flora and fauna adapted to the permanently or periodically flooded or saturated conditions.

Wetland delineation - The process for determining the jurisdictional boundary of a wetland.

Wetland enhancement - The process of increasing the capacity of a wetland to perform one or more functions. Wetland enhancement can increase functional capacity to levels greater than the highest sustainable functional capacity achieved under reference standard conditions, but usually at the expense of sustainability or at a reduction of functional capacity of other functions. Wetland enhancement is typically done for mitigation.

Wetland functions - The normal activities or actions that occur in wetland ecosystems, or simply, the things that wetlands do. Wetland functions result directly from the characteristics of a wetland ecosystem and the surrounding landscape and their interaction.

Wetland functional assessment - The methodology used to determine the capacity of a wetland to perform a function.

Wetland model variable - A characteristic of the wetland ecosystem or surrounding landscape that influences the capacity of a wetland ecosystem to perform a function.

Wetland restoration - The process of restoring wetland function in a degraded wetland. Restoration is typically done as mitigation.

Wetland tract - The area of forested wetland that is contiguous and directly accessible to the WAA.

Wetland values - See Value of wetland functions.

With-project condition – The with-project condition is the most likely condition expected to exist in the future if a specific project is undertaken. There are as many with-project conditions as there are alternative projects.

Without-project condition – The without-project condition is the land use and related conditions expected to occur for existing improvements, laws, and policies. The without-project condition is the condition expected to prevail if no action is taken.

Yazoo Backwater economic base study area - The area that appropriately reflects the economic problems, needs, conditions, and opportunities indicative of the study area. In this document, the economic base area was determined to be Sharkey and Issaquena Counties.

Yazoo Backwater project area – The area known as the Yazoo area subbasin. This area encompasses approximately 930,000 acres.

Yazoo Backwater study area - The area directly affected by the construction of water resources improvement plans; also, the area encompassed by the 100-year frequency flood elevation delineation from existing/base or without-project conditions, encompassing approximately 630,000 acres.

Year class strength – The number or biomass of fish that have spawned and recruited into the population during any given year.

Yolk sac - Recently hatched larval fish with a yolk sac still attached.

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PLATES