**US EPA Ecosystem Services Research Program (ESRP)**

**Standard Lexicon. December 15, 2009**

A set of defined terms for consistent use in the Ecosystem Services Research Program. The Lexicon currently is divided into three tables, with an additional references and sources section. Table 1 provides core ESRP terms with their preferred definitions. Table 2 includes a much broader listing of terms useful to the ESRP, and includes the core terms. Table 3 is a set of modeling terminology supplied by Denis White. Table entries contain cross references (indicated in bolded blue) hot linked to other terms in the tables.

A manuscript based on Table 1 is in preparation for submission to Ecological Economics in May 2011. The citation will be: Munns, W.R., Jr., A.W. Rea, M.J. Mazzotta, L. Wainger and K. Saterson. “Toward a standard lexicon for ecosystem services.”

**Table 1. Core ESRP Terms & Their Preferred Definitions**

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| **adverse ecological effect** | A change that is considered undesirable because it alters **d** (in the general sense) structural or functional characteristics of **s** or their components. An evaluation of adversity might consider the type, intensity, and scale of the effect as well as the potential for . (modified from: U.S. EPA 1998) |
| **assessment endpoint** | As used in , an explicit expression of the environmental value [i.e., something important to **s** and/or **s**] that is to be protected, operationally defined by an and its attributes. For example, salmon populations are valued ecological entities, and age class structure is one of their important attributes. Together, “salmon population age class structure” forms an assessment endpoint. An assessment endpoint involving an and its quality or quantity is called an “ecosystem service assessment endpoint.” (adopted from: U.S. EPA 1998; also see Munns et al. 2009) |
| **baseline** | A against which changes or trends are judged, often a set of conditions that exist at a particular point in time. (source: U.S. EPA 2008) |
| **benefit** | In the ESRP, shorthand notation for . |
| **benefit-cost analysis**  **(also, cost-benefit analysis)** | A formal quantitative and sometimes qualitative evaluation of the **s** to be derived from a decision or action compared to the **s** incurred by implementing that decision or action. Benefits and costs may include both **s** and **s**. Also see . |
| **benefit indicator** | A non-monetary measure based on economic theory and empirical evidence of that indicates a relative magnitude of value for **s**. |
| **benefit transfer** | Techniques to estimate **s** of based on previously conducted studies. Benefit transfer is conducted by either taking average values of existing studies or by using a transfer function to transfer values from primary studies (study sites) to new locations (policy sites). A transfer function is often developed through meta-analysis, which is a statistical (usually regression) technique to model differences in values among primary valuation studies. A transfer function allows values to be transferred from study sites to policy sites based on a set of independent variables that capture the degree of similarity between the study sites and policy sites. (source: Wainger & Mazzotta 2009) |
| **best management practice (BMP)** | A practice or combination of practices designed to maintain productivity while reducing and . (adapted from: CRS 2005) |
| **biophysical** | (adj) Pertaining to the biological, chemical and physical attributes of an or environment. |
| **“Boyd” endpoint** | ESRP-internal jargon synonymous with . |
| **bundled services** | A set of services that are joint products (**ed** outcomes of ecosystem functions and processes) of an . In the context of **s**, applies to co-products, where a public good (e.g., **bio**) is provided along with a marketed service (e.g., ). Also see . (adapted from Kroeger 2006) |
| **commodity** | Generally, a physical substance, such as food, grain or metal, that is interchangeable with another product of the same type, and which investors buy or sell. The of the commodity is subject to and . |
| **complementary goods and services** | Inputs (usually built infrastructure or location characteristics) that allow a good or service to be used by complementing the ecological condition. For example, complementary goods and services that allow the presence of fishable fish to become an opportunity for recreational fishing will include aspects of site accessibility, such as road access, available parking and the presence of a fishing pier, all of which make fishing at the site possible and enhance enjoyment of the activity. |
| **conceptual model** | In the ESRP, a written description, visual representation and/or electronically-linked description of known, suspected or predicted relationships among causes and effects. Conceptual models can be used to link any or all components in the causal chain between a management action and an outcome that matters to people (human actions, **s**, entities, **s** and ). (generalized from: U.S. EPA 1998) |
| **cost effectiveness** | Generally, the of a service compared to the **s** it produces, typically expressed as a ratio (for example, $/kg nitrogen removed from a waste stream). |
| **credit** | A single unit of trading that quantifies the provision (or right of use) of a regulated or non-regulated , and that defines the changes in ecosystem condition that are equivalent to a unit of a service. (adapted from: Willamette Partnership) |
| **decision maker** | Individual(s) or groups of people responsible for making choices or determining policy that impacts the functions, processes, and condition of ecological systems. Decisions may be local, regional or national in scale. (modified from: ESRP Decision Support Theme) |
| **decision making process** | One of any social and mental processes leading to the selection of a course of action among several management options or alternatives. Also see and . (modified from: ESRP Decision Support Theme) |
| **decision/management alternative** | An alternative policy or management option for action or inaction to accomplish a specific goal or objective. Synonymous with . (derived from: ESRP Decision Support Theme) |
| **decision support framework** | An organizing structure to inform the . (modified from: ESRP Decision Support Theme) |
| **decision support system** | An interactive computer-based system to aid **s** in identifying and solving problems, and making decisions. These systems may use data from observations, output from statistical or dynamic models, and rules based on expert knowledge. (source: ESRP Modeling Theme) |
| **decision support tools** | Software, analysis methods, models, data sets, maps, etc. available to inform the . (modified from: ESRP Decision Support Theme) |
| **demand** | Generally, the amount of a particular good or service that a consumer or group of consumers will want to purchase at a given . Demand for a good or service is determined by many different factors other than price, such as the price of and . Along with , demand is one of the two key determinants of the market price. |
| **discounting** | A widely used economic procedure that weights, through application of a , past and future **s** or **s** such that they are comparable to present benefits and costs. Discounting reflects a sense that a benefit received today is considered more valuable than one received in the future. Discounting often is used in Natural Resource Damage Assessment (NRDA) to scale projects or to establish appropriate monetary compensation for ecological services lost as a result of chemical releases or spills. Also see and . (derived from NOAA 1999; also see Munns et al. 2009) |
| **Driving Force, Pressure, State, Impact, Response**  **(DPSIR)** | The conceptual framework for describing the interactions between and the environment adopted by the European Environment Agency (EEA). An extension of the Pressure-State-Response (PSR) model developed by the Organization for Economic Cooperation and Development (OECD), the DPSIR framework considers **s**, **s**, **s**, **s** and **s**, and their linkages. (derived from: EEA-ETDS) |
| **ecological benefit** | The contribution to of . In the ESRP, the term applies specifically to net improvements in social welfare that result from changes in the quantity or quality of ecosystem goods and services attributable to or environmental decisions. Synonymous with (as used in the ESRP), , and “ecosystem-derived benefits” as used in Wainger & Boyd (2009). (modified from: U.S. EPA 2006) |
| **ecological benefits assessment** | A formal evaluation of the expected changes in resulting from policies and environmental decisions via changes in **es**; **s** are quantified in and monetary terms when possible, or described qualitatively when quantification is not possible. (modified from: U.S. EPA 2006) |
| **ecological economics** | The field of research and analysis that aims to address the interdependence and co-evolution of human economies and natural **s** over time and space. Compare with . |
| **ecological endpoint** | A feature, quantity or quality that requires little further translation to make clear its relevance to (i.e., “public-friendly” **s**). Ecological endpoints are the ecological inputs that, along with inputs and by people, produce **s**. For the ESRP, synonymous with . For example, a population of watchable birds is an ecological endpoint, that when combined with complementary inputs such as transportation infrastructure and demand by birders, produce the ecosystem service of recreational bird watching. (adapted from: Boyd 2007, Boyd & Banzhaf 2007, Wainger & Boyd 2009, Wainger & Mazzotta 2009) |
| **ecological production function**  **(EPF)** | A description of the type, quantity and interactions of **s** required to generate outputs of functional **s**. For a simple example, the characteristics of a coastal (flooding regimes, salinity, nutrient concentrations, plant species abundance, prey and predator abundances, etc.) can influence the abundance of a population of watchable wading shorebirds (the ecological endpoint). The outputs of ecological production functions, when combined with and by humans, produce . Also see . (adapted from: Wainger & Boyd 2009, Wainger & Mazzotta 2009). |
| **ecological risk assessment** | A formal evaluation of the likelihood that **s** may occur or are occurring as a result of exposure to one or more **s**. (source: U.S. EPA 1998) |
| **ecosystem goods and services** | Outputs of ecological functions or processes that directly (“” sensu Boyd & Banzhaff 2007) or indirectly (“”) contribute to or have the potential to do so in the future. Some outputs may be bought and sold, but most are not **ed**. Often abbreviated as **s**. (modified from: U.S. EPA 2006) |
| **ecosystem service** | Shorthand notation for . |
| **ecosystem service market** | Any of the full spectrum of regulatory (e.g., ) and voluntary mitigation **s**, such as , habitat/**ing**, water quality trading, environmental water transactions and carbon markets. (source: Willamette Partnership) |
| **ecosystem service production function**  **(ESPF)** | A description of the relationship between quality-adjusted **s** and the provision of . This term differs from because it includes both the functions and the non-ecological assessments that are needed to demonstrate a service. ESPFs evaluate four things: 1) how ecological endpoints combine with complementary (non-ecological) inputs to generate goods and services; 2) whether the quality of ecological endpoints is sufficient to generate the service; 3) whether required (trails, roads, homes) are available; and 4) whether exists for the service by location. For example, a quantitative or qualitative description of how a population of watchable birds (the ecological endpoint), when combined with complementary inputs such as transportation infrastructure and demand by birders, produces the ecosystem service of recreational bird watching, is an ecosystem service production function. Also see . (source: Wainger & Mazzotta 2009, with input from J. Boyd) |
| **end user** | The person or group that uses data, information, tools, methods, models or systems developed by the ESRP. Under certain circumstances, can be synonymous with and . |
| **environmental economics** | A subfield of economics that undertakes theoretical or empirical studies of the economic effects of national or local environmental . Particular issues addressed include the **s** and **s** of alternative environmental policies to deal with air pollution, water quality, toxic substances, solid waste and global warming. Compare with (adapted from: National Bureau of Economic Research) |
| **externality** | A consequence of an economic activity that is experienced by unrelated third parties. An externality can be either positive (such as a scenic view) or negative (such as pollution). |
| **human well-being** | Broadly, the condition of humans and , defined in terms of the basic material needs for a good life, freedom and choice, health, wealth, social relations and personal security. In economics, the term is often used interchangeably with [although the definition provided here is broader than the standard economic definition]. (derived from MEA) |
| **joint production of ecosystem services** | The simultaneous production of several distinct **s** through land management practices or other policies (including no intervention). Also see . (derived from: Kline et al. 2009) |
| **management choice** | The that is chosen or selected as a result of a . (modified from: ESRP Decision Support Theme) |
| **marginal change** | A proportionally very small addition or subtraction to the total quantity or quality of some variable, such as an or . The **s** and **s** of any good or service are determined “at the margin,” meaning that the cost and benefit of adding one more unit (the “marginal unit”) is used to evaluate efficiency. |
| **monetization** | in monetary (dollar, if in the US or Canada) terms. Also referred to as “economic valuation” or “monetary valuation.” (source: U.S. EPA 2006) |
| **natural capital** | An extension of the economic concept of capital (manufactured means of production) to . Natural capital is thus the stock of natural **s** that yields a flow of valuable ecosystem goods or services into the future. Also see . |
| **nonuse value** | The people hold for a service that they do not directly use. [Sometimes referred to as “passive use value.”] Early literature in environmental economics split nonuse value into three components: , and . Nonuse values are theoretically distinct from **s**, although the boundary between use and nonuse values is often fuzzy. |
| **offset**  **(also, offset credit)** | A used to compensate for the unavoidable impacts on the environment. Used by companies, governments or other entities in **s** to comply with regulatory caps. Offset credits are often called **s**. Also see . (adapted from: Willamette Partnership) |
| **payments for ecosystem services** | The variety of arrangements through which the beneficiaries of **s** pay back the providers/protectors of those services. Payments encompass the full spectrum of options including, but not limited to, government programs, **ing** programs and/or tax programs. (source: Willamette Partnership) |
| **policy** | Generally, any statement of approach, philosophy, goal or decision. For ESRP purposes, the output of a federal or local governmental legislative authority, such as standard, regulation, decision or . |
| **reactive nitrogen (Nr)** | All biologically, chemically, and radiatively active nitrogen compounds in the atmosphere and biosphere. It includes forms of nitrogen, such as ammonia (NH3) and ammonium (NH4+), nitric oxide (NO), nitrogen dioxide (NO2), nitric acid (HNO3), nitrous oxide (N2O), and nitrate (NO3-), and organic compounds such as urea, amines, proteins and nucleic acids. (source: Galloway et al. 2003). |
| **restoration** | The reconstitution of a pre-existing ecological condition, or range of conditions. |
| **risk** | The likelihood that **s** or human health effects may occur or are occurring as a result of exposure to one or more **s**. (derived from: U.S. EPA 1998) |
| **risk management** | The process of deciding whether and how to manage **s**. Risk management requires consideration of legal, economic and behavioral factors, as well as ecological, human health and welfare effects of each . Management may involve regulatory and non-regulatory responses. (source: CRS 2005) |
| **risk-benefit analysis** | A formal comparison of the short- and long-term **s** to the overall societal **s** of an activity, chemical use or technology. When risks and benefits are expressed in monetary terms, this is effectively a . (adapted from: CRS 2005) |
| **scenario** | As used in the ESRP, a set of driving conditions that will cause ecological and potentially change. Driving conditions can include the continuation of existing trends (“business-as-usual”), extrinsic changes (e.g., a change in the rate of population growth, a change in the rate of sea level rise) or the introduction of hypothetical policies. (derived from: FML Team) |
| **social** | Relating to human and its members. |
| **social benefit** | Synonymous with . |
| **social welfare** | , measured at some aggregate level (U.S. EPA 2006). In the typical economic context, the sum of individual benefit measures within a utilitarian benefit-cost framework, where individual welfare is often measured by a person’s . |
| **society** | A group of people having a distinctive cultural and economic organization, as well as the manner or condition in which they live together for their mutual benefit. By extension, society denotes the people of a region or country, sometimes even the world, taken as a whole. |
| **stakeholder** | An individual, group or organization with an interest in, or potentially impacted by, the of a or . (modified from: ESRP Decision Support Theme) |
| **stressor-response function**  **(also, stressor-response model)**  **(also, stressor-response relationship)** | An empirical or model-based description of the relationship between the strength, magnitude or other quantity of a and some characteristic of an ecological system. Typically, a stressor-response function is used to describe expected changes in the response of an ecological system to changes in the stressor. |
| **substitutability** | The degree to which two or more goods (or services) can be substituted for one another. |
| **supply** | Generally, the total amount of a good or service available for purchase (or use for ). Along with , supply is one of the two key determinants of . |
| **sustainable development** | Development which meets the needs of the present without compromising the ability of future generations to meet their own needs. (source: United Nations 1987) |
| **threshold** | An abrupt change in ecological, social or economic systems in space or time, often not easily reversed (and sometimes never reversible) and often with persistent consequences. Synonymous with . |
| **tipping point** | Synonymous with . |
| **total economic value**  **(TEV)** | The sum of all relevant and **s** for of a change in a given (i.e., the full social benefits). This is distinct from the "total value" of an ecosystem, which is the of the entire system (e.g., the value of the loss of an entire ), but instead is the value of a to that ecosystem. |
| **tradeoff** | Generally, an exchange of one thing in return for another, especially relinquishment of one benefit or advantage for another. In the ESRP, gained or lost as the result of a . |
| **uncertainty** | A limit to knowledge where it is impossible to describe an existing state or future outcome exactly. Uncertainty has three primary components: 1) (also called “heterogeneity” or “stochasticity”), a component of all biological systems, which represents actual differences in the value of a parameter or attribute among units in a (statistical) population; 2) , which represents a lack of knowledge about the true value of a parameter that can result from inadequate or imperfect measurement; and 3) , which results from the use of the wrong methods, models or data in analysis activities. (derived from: Munns 2002) |
| **use value** | The of a good or service derived from its direct or indirect use (as opposed to ). |
| **utility** | The satisfaction of wants and needs obtained from the use or consumption of goods and services (including “passive” uses). Synonymous in the aggregate with . |
| **valuation** | Generally, the process of estimating the worth, merit or desirability of something. Specifically with respect to **s**, the of those benefits. (adapted from: U.S. EPA 2006) |
| **value** | Generally, the worth, merit or desirability of something. It can be expressed quantitatively (for example, in monetary terms) or qualitatively. Specifically with respect to **s**, a quantitative or qualitative description of those benefits. |
| **wetland** | An area of predominantly hydric soils that can support a prevalence of water-loving plants, known as “hydrophilic vegetation.” Transitional between terrestrial and aquatic systems are wetlands typified by a water table at or near the surface, or the land is covered by shallow water at least part of the year. Types of wetlands are distinguished by water patterns (the frequency and length of flooding) and location in relation to upland areas and water bodies. Wetlands perform many functions including wildlife and fish , storage and conveyance of flood waters, sediment and pollution control, and recreation. (source: CRS 2005) |

**Table 2. General Ecological & Economic Terms** (including Core ESRP Terms, denoted by \*)

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| **$A** |  |
| **accuracy** | From inferential statistics, how well an estimate matches the true value of the particular parameter or quantity being estimated (e.g., population abundance), typically quantified using some measure of bias. Compare with . |
| **acreage conservation reserve** | The acreage diverted from production under the acreage reduction program authorized by USDA prior to 1996. (source: CRS 2005) |
| **acreage diversion program** | Historically, programs included provisions to reduce commodity supplies by diverting acreage to non-crop uses. Examples include paid  diversion, unpaid diversion, set-aside and acreage reduction programs. The 1996 Farm Bill (P.L. 104-127) eliminated authority for the USDA to implement annual acreage reduction programs. The pays farmers for the long-term conversion of fragile to conserving uses and is not considered to be an acreage diversion program. (source: CRS 2005) |
| **adaptive management** | An approach to management that involves monitoring the **s** of an activity, project or decision, and on the basis of the monitoring results, making changes that improve the way the activity, project or issue is managed. (modified from: NSWG Department of Environment, Climate Change and Water) |
| **additionality** | In **s**, the concept that calls for credited improvements to represent an overall increase in, or avoided reduction of, **s**, relative to those services that would have existed without creating the **s**. (source: Willamette Partnership) |
| **adverse ecological effect\*** | A change that is considered undesirable because it alters **d** (in the general sense) structural or functional characteristics of **s** or their components. An evaluation of adversity might consider the type, intensity, and scale of the effect as well as the potential for . (modified from: U.S. EPA 1998) |
| **agricultural pollution** | Wastes, emissions and **s** arising from farming activities, including: runoff and leaching of pesticides and fertilizers; pesticide drift and volatilization; and dust from cultivation; and improper disposal of animal manure and carcasses. Some agricultural is , meaning that it is derived from a single discharge point, such as a pipe. Large feedlots are an example of point sources, and they require permits under the Clean Water Act (P.L. 92-500, 33 U.S.C. 1251-1387). However, much of the pollution from agriculture is , meaning that it derives from dispersed origins (e.g., blowing dust or nutrients leaching from fields). (source: CRS 2005) |
| **air pollution** | Contamination of the atmosphere by substances that, directly or indirectly, adversely affect human health and (including effects on **s**). Air pollution results from human activities, including both (e.g., from smokestacks) and (area sources, e.g., as dust blown from streets or fields, leaky pipes, etc.), and from natural sources (including sea spray, volcanic emissions and pollen). (modified from: CRS 2005) |
| **allotment** | In conjunction with commodity support programs, acreage allotments and marketing quotas historically served to limit a farm’s output or volume marketed. For federal lands grazing, an allotment is an area designated and managed for grazing of livestock. (source: CRS 2005) |
| **alternative fuels** | According to the Department of Energy (DOE), substantially nonpetroleum sources of energy. As defined by the Energy Policy Act of 1993, DOE currently recognizes the following as alternative fuels: mixtures containing 85% or more by volume of alcohol fuel, including methanol and denatured ethanol; natural gas (compressed or liquefied); liquefied petroleum gas (propane); hydrogen; coal-derived liquid fuels; fuels derived from biological materials; electricity (including electricity from solar energy); and 100% (B100). **R**enewable**s** are a subset of alternative fuels. (source: CRS 2005) |
| **analytical hierarchy process** | A decision-informing method for placing decision criteria into a hierarchy, assessing the relative importance of these criteria, comparing **s** for each criterion, and determining an overall ranking of the alternatives. (source: ESRP Modeling Theme) |
| **animal feeding operation** | Facilities in which animals are kept and raised in confined situations. Clean Water Act regulations define **s** as those confining livestock or poultry for 45 days or more in a 12-month period in a facility that has no vegetative ground cover. When large enough, these facilities are designated as **s** (CAFOs) and they become subject to regulatory requirements to prevent . (source: CRS 2005) |
| **aquifer** | An underground geological formation, or group of formations, containing usable amounts of groundwater that can supply wells or springs for domestic, industrial and irrigation uses. (source: CRS 2005) |
| **assessment endpoint\*** | As used in , an explicit expression of the environmental value [i.e., something important to **s** and/or **s**] that is to be protected, operationally defined by an and its attributes. For example, salmon populations are valued ecological entities, and age class structure is one of their important attributes. Together, “salmon population age class structure” forms an assessment endpoint. An assessment endpoint involving an and its quality or quantity is called an “ecosystem service assessment endpoint.” (adopted from: U.S. EPA 1998; also see Munns et al. 2009) |
| **assimilative capacity** | The ability of an to cleanse itself and its capacity to receive waste waters or toxic materials without **s**. (modified from: CRS 2005) |
| **attainment area** | As defined in the Clean Air Act (42 U.S.C. 7401 et seq.), an area considered to have air quality as good as or better than the National Ambient Air Quality Standards. (source: CRS 2005) |
| **auction** | Generally, a process of buying and selling goods or services by offering them up for bid, taking bids, and then selling the item to the highest bidder. In economic theory, an auction may refer to any mechanism or set of rules for exchange. |
| **$B** |  |
| **barter** | A form of in which goods having comparable values are exchanged under a single contract, within a specified period of time, and without any exchange of money taking place. (source: CRS 2005) |
| **baseline\*** | A against which changes or trends are judged; often a set of conditions that exist at a particular point in time. (source: U.S. EPA 2008) |
| **Bayesian belief network**  **(also, Bayesian network)**  **(BBN)** | A graphical network for modeling probabilistic interrelationships between events. Events are represented by nodes in the network and causative relationships are represented by directed arrows between the nodes. A BBN is especially useful when individual nodes of the network will be updated with evidence. For example, a BBN could represent the probabilistic relationships between diseases and symptoms. Given symptoms, the network can be used to compute the probabilities of the presence of various diseases. Decision and utility nodes can be added to a BBN to represent and solve a decision problem following maximum expected value criterion (this is called an influence diagram). (source: ESRP Decision Support Theme) |
| **benefit\*** | In the ESRP, shorthand notation for . |
| **benefit-cost analysis\***  **(also, cost-benefit analysis)** | A formal quantitative and sometimes qualitative evaluation of the **s** to be derived from a decision or action compared to the **s** incurred by implementing that decision or action. Benefits and costs may include both **s** and **s**. Also see . |
| **benefit function** | A description of the relationship between changes in an and gains or losses in . (source: Wainger & Mazzotta 2009) |
| **benefit indicator\*** | A non-monetary measure based on economic theory and empirical evidence of that indicates a relative magnitude of value for **s**. |
| **benefit transfer\*** | Techniques to estimate **s** of based on previously conducted studies. Benefit transfer is conducted by either taking average values of existing studies or by using a transfer function to transfer values from primary studies (study sites) to new locations (policy sites). A transfer function is often developed through meta-analysis, which is a statistical (usually regression) technique to model differences in values among primary valuation studies. A transfer function allows values to be transferred from study sites to policy sites based on a set of independent variables that capture the degree of similarity between the study sites and policy sites. (source: Wainger & Mazzotta 2009) |
| **bequest value** | A (increase in individual or welfare) that stems from knowing that a good or service is available for others to use now and in the future. |
| **best management practice\* (BMP)** | A practice or combination of practices designed to maintain productivity while reducing and . (adapted from: CRS 2005) |
| **biodiesel** | An alternative , produced from vegetable oils or animal fats through a refinery process called transesterification. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. (adapted from: CRS 2005) |
| **bio****diversity**  **(also, biological diversity)** | In general, the variety and variation among plants, animals and microorganisms, and among their **s**. Typically considered at three levels: ecosystem diversity, species diversity and genetic diversity. |
| **bioenergy** | Electricity, motor fuels (e.g., ethanol, ) or other energy products  produced from biomass. (source: CRS 2005) |
| **biofuels** | Fuels made from biomass, which, in the United States, largely include corn-based ethanol (blended into gasoline and called gasohol) and soybean-based biodiesel. Biofuels are a subset of **s**, which are a subset of . (source: CRS 2005) |
| **biological integrity** | The ability of an to support and maintain a balanced, adaptive community of organisms having a species composition, and functional organization comparable to that of similar, undisturbed ecosystems within a region. |
| **biophysical\*** | (adj) Pertaining to the biological, chemical and physical attributes of an or environment. |
| **“Boyd” endpoint\*** | ESRP-internal jargon synonymous with . |
| **Brownfield site** | Real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant. (source: Brownfields Revitalization and Environmental Restoration Act of 2001 (Title II of P.L. 107-118)) |
| **bundled services\*** | A set of services that are joint products (**ed** outcomes of ecosystem functions and processes) of an . In the context of **s**, applies to co-products, where a public good (e.g., **bio**) is provided along with a marketed service (e.g., ). Also see . (adapted from Kroeger 2006) |
| **buffer strip** | A narrow area of permanent vegetation, often planted along the edge or the  contour of a field, usually to slow the flow of water or the velocity of wind, in order to trap sediment and other materials (nutrients, pesticides and certain pathogens) before they leave agricultural areas and become pollutants. Types of buffers include **s**, field borders, grassed waterways, field windbreaks, shelterbelts, contour grass strips and **s**. Synonymous with . (source: CRS 2005) |
| **built infrastructure**  **(also, gray infrastructure)** | Human engineered and constructed structures and systems that may function to substitute for or partially replace **s**, such as stormwater systems, levees, etc. Also see . |
| **$C** |  |
| **cap-and-trade system** | A system that seeks a specific environmental result; trading allowances to release (e.g., greenhouse gasses) is an option to minimize the cost of achieving the emission reductions specified in the regulatory cap on emissions. In the cap-and-trade approach, allowances for future emissions are sold or granted to existing sources. (source: U.S. EPA 2001) |
| **carbon sequestration** | Retention of carbon through physical, chemical or biological processes that prevent or delay its emission to the atmosphere as carbon dioxide by holding it in a . Carbon sequestration might help mitigate climate change by reducing the amount of carbon dioxide in the atmosphere. (source: CRS 2005) |
| **carbon sink** | A feature, process or activity that absorbs, or takes up, released carbon from another part of the carbon cycle. The four types of sinks, within which carbon behaves in a systematic manner, are the atmosphere, the terrestrial biosphere (including agricultural, forest and freshwater systems), oceans and sediments (including fossil fuels). (source: CRS 2005) |
| **channelization** | Modification of watercourses by straightening, widening or deepening them. Channelization can interfere with waste , disturb fish and wildlife **s** and aggravate flooding in other areas. (source: CRS 2005) |
| **co-benefit** | An additional from an action that is undertaken to achieve a particular purpose, and that is not directly related to that purpose. (source: NSWG Department of Environment, Climate Change and Water) |
| **commodity\*** | Generally, a physical substance, such as food, grain or metal, that is interchangeable with another product of the same type, and which investors buy or sell. The of the commodity is subject to and . |
| **commodity exchange** | An organization operating under a set of bylaws aimed at promoting in one or more commodities by providing services and rules for the conduct of trade. Commodity exchanges may deal in cash and/or futures contracts. (source: CRS 2005) |
| **complementary goods and services\*** | Inputs (usually built infrastructure or location characteristics) that allow a good or service to be used by complementing the ecological condition. For example, complementary goods and services that allow the presence of fishable fish to become an opportunity for recreational fishing will include aspects of site accessibility, such as road access, available parking and the presence of a fishing pier, all of which make fishing at the site possible and enhance enjoyment of the activity. |
| **compliance market** | An established for purchasing and selling **credits**. |
| **concentrated animal feeding operation**  **(CAFO)** | Generally, a facility within which large numbers of farm animals are confined, fed and raised, such as dairy and beef cattle feedlots, hog production facilities and closed poultry houses. EPA has developed a specific regulatory definition of CAFO for the purposes of enforcing the Clean Water Act (P.L. 92-500, 33 U.S.C. 1251-1387). The CWA requires individual places that are potential sources of water to obtain permits that specify the allowable levels of effluent from each of these places. The regulations define **s** as those confining livestock or poultry for 45 days or more in a 12-month period in a facility that has no vegetative ground cover. Such places are further considered concentrated and therefore required to have an EPA permit, if they exceed a size threshold or meet other criteria specified in the EPA regulations. (source: CRS 2005) |
| **conceptual model\*** | In the ESRP, a written description, visual representation and/or electronically-linked description of known, suspected or predicted relationships among causes and effects. Conceptual models can be used to link any or all components in the causal chain between a management action and an outcome that matters to people (human actions, **s**, entities, **s** and ). (generalized from: U.S. EPA 1998) |
| **conjunctive use** | The practice of storing surface water in a groundwater basin in wet years and withdrawing it from the basin in dry years. (source: CRS 2005) |
| **conservation** | The management of natural resources to provide maximum **s** over  a sustained period of time. (source: CRS 2005) |
| **conservation bank** | Synonymous with . |
| **conservation buffer** | Synonymous with . |
| **conservation easement** | The acquisition of rights and interest to a property to protect identified or resource values, using a reserved interest deed. Conservation easements can range from permanent to a multi-year period. Also see . (source: CRS 2005) |
| **conservation plan** | A combination of land uses and farming practices to protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Also see . (source: CRS 2005) |
| **conservation practice** | Any technique or measure used to protect soil and water resources for which standards and specifications for installation, operation or maintenance have been developed. Practices can be structural or land management. (source: CRS 2005) |
| **Conservation Reserve Program**  **(CRP)** | A program created in the Food Security Act of 1985 (P.L. 99-198) to retire from production up to 45 million acres of highly erodible and environmentally sensitive farmland. Landowners who sign contracts agree to keep retired lands in approved conserving uses for 10-15 years. In exchange, the landowner receives an annual rental payment, cost-share payments to establish permanent vegetative cover, and technical assistance. (source: CRS 2005) |
| **conservation tillage** | Any tillage and planting system that leaves at least 30% of the soil surface covered by residue after planting. Conservation tillage maintains a ground cover with less soil disturbance than traditional cultivation, thereby reducing soil loss and energy use while maintaining crop yields and quality. Conservation tillage techniques include minimum tillage, mulch tillage, ridge tillage and . (source: CRS 2005) |
| **consumptive water use** | Water removed from available supplies without return to a water resources system (e.g., water used in manufacturing, agriculture and food preparation that is not returned to a stream, river or water treatment plant). (source: CRS 2005) |
| **contingent valuation** | A class of economic methods used to generate data and estimate , usually from household surveys, when real **s** do not supply reliable data about demands for certain types of goods or services. (source: Durlauf & Blume 2008) |
| **contract** | A written or oral agreement spelling out the parties’ understanding of how a is to be produced and/or marketed, possibly including specifications for quantity, quality and . (source: CRS 2005) |
| **converted wetland** | Under the USDA , **s** that were drained or altered to improve agricultural production after December 23, 1985, the date the swampbuster program was enacted. Lands converted before December 23, 1985 are called **s**, and alterations to these lands are subject to less stringent requirements. On lands with this designation, no drainage maintenance and no additional drainage are allowed. (source: CRS 2005) |
| **cost** | In economics, the total money, time and resources associated with a purchase or activity. Also see . |
| **cost effectiveness\*** | Generally, the of a service compared to the **s** it produces, typically expressed as a ratio (for example, $/kg nitrogen removed from a waste stream). |
| **countertrade** | A transaction of goods and services without the exchange of money. Forms of countertrade include , buy-back or compensation, counter-purchase, offset requirements, swap or triangular trade. (source: CRS 2005) |
| **credit\*** | A single unit of trading that quantifies the provision (or right of use) of a regulated or non-regulated , and that defines the changes in ecosystem condition that are equivalent to a unit of a service. (adapted from: Willamette Partnership) |
| **credit system** | An open-market system that does not establish a fixed ceiling on total emissions. Total emissions can increase if new sources of pollution enter the and as existing sources increase production. In uncapped systems (see ), **s** are earned for controlling beyond a specified in one’s permit. (modified from: U.S. EPA 2001) |
| **critical load** | A quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements or processes of an do not occur according to present knowledge. (derived from: Nilsson & Grennfelt 1988) |
| **criterion** | The value of a physical, chemical or biological parameter selected through , regulatory or decision trigger for management intervention or action. |
| **cover crop** | A close-growing crop, planted primarily as a rotation between regularly planted crops, or between trees and vines in orchards and vineyards, to protect soil from and improve it between periods of regular crops. (source: CRS 2005) |
| **cropland** | Land used primarily for the production of row crops, close-growing crops, and fruit and nut crops. It includes cultivated and noncultivated acreage, but not land enrolled in the . (source: CRS 2005) |
| **critical habitat** | An area essential to the of a listed species, although the area need not actually be occupied by the species at the time it is designated. Critical habitat must be designated for all threatened and endangered species under the U.S. Endangered Species Act (with certain specified exceptions). (source: U.S. Endangered Species Act (P.L. 93-205)) |
| **cultural services** | A category of “ecosystem services” as described by the *Millennium Ecosystem Assessment*. Cultural services are the nonmaterial “benefits” people obtain from **s** through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including: cultural diversity; spiritual and religious values; knowledge systems (traditional and formal); educational values; aesthetic values; social relations; sense of place; cultural heritage values; and recreation and ecotourism. In the lexicon of the ESRP, many of the elements in the MEA category (e.g., spiritual and religious values) could be considered **s** that are best defined specifically in terms of beneficiaries’ ethical or cultural **s**, while the benefits derived from others (e.g., certain aspects of recreation and ecotourism) might be **d** in more generic terms. Also see the other MEA categories of , and . (source: MEA 2005) |
| **$D** |  |
| **dead zone** | Generally, an area of an aquatic resource (ocean, , lake, reservoir or river) where there is insufficient oxygen to support aerobic organisms such as fish and shellfish. Specifically, an area of depleted oxygen in the Gulf of Mexico off the mouth of the Mississippi River covering about 6,000 square miles. Also see . |
| **decision landscape** | A for capturing the physical, legal and institutional environment in which a particular is made. It includes identification of **s**, **s** of interest and stakeholder of outcomes, as well as the key participants involved in making the decision (**s**, **s** and **s**), the information they use to inform the decision and its associated , and the they use to evaluate outcomes. (source: ESRP Decision Support Theme) |
| **decision maker\*** | Individual(s) or groups of people responsible for making choices or determining that impacts the functions, processes, and condition of ecological systems. Decisions may be local, regional or national in scale. (modified from: ESRP Decision Support Theme) |
| **decision making process\*** | One of any social and mental processes leading to the selection of a course of action among several or management options or alternatives. Also see and . (modified from: ESRP Decision Support Theme) |
| **decision/management alternative\*** | An alternative or management option for action or inaction to accomplish a specific goal or objective. Synonymous with . (derived from: ESRP Decision Support Theme) |
| **decision/management option** | Synonymous with . |
| **decision point** | A key step in the at which a choice is made. (modified from: ESRP Decision Support Theme) |
| **decision support framework\*** | An organizing structure to inform the . (modified from: ESRP Decision Support Theme) |
| **decision support system\*** | An interactive computer-based system to aid **s** in identifying and solving problems, and making decisions. These systems may use data from observations, output from statistical or dynamic models, and rules based on expert knowledge. (source: ESRP Modeling Theme) |
| **decision support tools\*** | Software, analysis methods, models, data sets, maps, etc. available to inform the . (modified from: ESRP Decision Support Theme) |
| **deliberation** | Any formal or informal process for communicating, raising and collectively considering issues; one in which people confer, ponder, exchange views, consider evidence, reflect on matters of mutual interest, negotiate and attempt to persuade others. (source: ESRP Decision Support Theme) |
| **demand\*** | Generally, the amount of a particular good or service that a consumer or group of consumers will want to purchase at a given . Demand for a good or service is determined by many different factors other than price, such as the price of and . Along with , demand is one of the two key determinants of the market price. |
| **designated use (of water)** | Water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act (P.L. 92-500, as amended; 33 U.S.C. 1251-1387). Uses can include cold water fisheries, public water  supply, irrigation, etc. |
| **desired future condition** | An expression of the future state of based on ecological, social and economic considerations. |
| **development easement** | A legal agreement by which a landowner surrenders (in whole or in part) the right to develop a designated parcel of property. Some local and state governments have programs to acquire development easements from private landowners to prevent conversion of farmland to other uses. Also see . (source: CRS 2005) |
| **direct payments** | Generally, payments (usually in cash but sometimes in certificates) made directly to producers in conjunction with participation in commodity support programs, conservation programs and disaster assistance programs. (source: CRS 2005) |
| **discharge** | In water resources, the flow of surface water in a stream or canal, or the outflow of ground water from a flowing artesian well, ditch, or spring. In environmental protection, the term is used synonymously with effluent or emission as a term of release. |
| **discounting\*** | A widely used economic procedure that weights, through application of a , past and future **s** or **s** such that they are comparable to present benefits and costs. Discounting reflects a sense that a benefit received today is considered more valuable than one received in the future. Discounting often is used in Natural Resource Damage Assessment (NRDA) to scale projects or to establish appropriate monetary compensation for ecological services lost as a result of chemical releases or spills. Also see and . (derived from NOAA 1999; also see Munns et al. 2009) |
| **discount rate** | The rate at which a (or as a whole) is willing to trade off present for future benefits. Also see . |
| **drainage basin** | The area of land that drains water, sediment and dissolved materials to a common outlet or conveyance at some point along a stream channel. (source: CRS 2005) |
| **Driving Force, Pressure, State, Impact, Response\***  **(****DPSIR)** | The conceptual framework for describing the interactions between and the environment adopted by the European Environment Agency (EEA). An extension of the Pressure-State-Response (PSR) model developed by the Organization for Economic Cooperation and Development (OECD), the DPSIR framework considers **s**, **s**, **s**, **s** and **s**, and their linkages. (derived from: EEA-ETDS) |
| **driving force** | In the conceptual framework, the social, demographic and economic developments in societies and the corresponding changes in life styles, overall levels of consumption and production patterns. Primary driving forces are technical and societal forces that motivate human activities (population growth, social structure, cultural attitudes, individual needs). Primary driving forces provoke changes in the overall levels of production and consumption. Through changes in production and consumption, the driving forces exert **s** on the environment. They induce developments in secondary driving forces, which are human activities triggering **s** and **s** (e.g. land use changes, urban expansion, industry and agricultural developments). Driving forces can originate and/or act globally, regionally or locally. (adapted from: EEA-ETDS, Maxim et al. 2009) |
| **pressure** | In the conceptual framework, anthropogenic factors (e.g., the release of substances, physical and biological agents and other potential **s**; changes in the use of resources; changes in the use of land) that induce environmental change (**s**). The pressures exerted by are transported and transformed in a variety of natural processes to manifest themselves in changes in environmental conditions (**s)**. Usually these changes are unwanted and are seen as negative (damage, degradation, etc.). Pressures depend on the kind, level and technology involved in source activities, which can vary across geographic regions and spatial scales. Also see and . (adapted from: EEA-ETDS, Maxim et al. 2009) |
| **state** | In the conceptual framework, the condition of environmental components and systems in terms of variables (e.g., the quantity and quality of physical phenomena such as temperature; biological phenomena such as fish stocks; and chemical phenomena such as atmospheric CO2concentrations) in a certain area. Included are the abiotic conditions of soil, air, and water, as well as biotic conditions (e.g., **bio**) at /, species/community and genetic levels. (adapted from: Gabrielsen & Bosch 2003, EEA 2007, EEA-ETDS) |
| **impact** | In the conceptual framework, changes in environmental functions, affecting (negatively) social, economic and environmental dimensions, as caused by changes in . (derived from: Maxim & Spangenberg 2009) |
| **response** | In the conceptual framework, actions taken by groups (and individuals) in and government to prevent, compensate, ameliorate or adapt to changes in the of the environment. Responses may seek to control **s** or **s** (prevention, ), to maintain or restore the state of the environment, to help adapt to **s** or even to deliberate “do nothing” strategies, as chosen through **es** at a variety of scales. Some societal responses may be regarded as driving forces, since they aim at redirecting prevailing trends in consumption and production patterns. (derived from: EEA-ETDS, Maxim et al. 2009) |
| **$E** |  |
| **easement** | The acquisition from a landowner of rights and interest to a portion of the property for some purpose, usually in return for a payment or some other benefit. Easements can be permanent, or temporary for some specified period of time. (adapted from: CRS 2005) |
| **ecological benefit\*** | The contribution to of . In the ESRP, the term applies specifically to net improvements in social welfare that result from changes in the quantity or quality of ecosystem goods and services attributable to or environmental decisions. Synonymous with (as used in the ESRP), , and “ecosystem-derived benefits” as used in Wainger & Boyd (2009). (modified from: U.S. EPA 2006) |
| **ecological benefits assessment\*** | A formal evaluation of the expected changes in resulting from policies and environmental decisions via changes in **es**; **s** are quantified in and monetary terms when possible, or described qualitatively when quantification is not possible. (modified from: U.S. EPA 2006) |
| **ecological economics\*** | The field of research and analysis that aims to address the interdependence and co-evolution of human economies and natural **s** over time and space. Compare with . |
| **ecological entity** | A general term referring to readily observable characteristics of natural systems, including a species, a group of species, an function or characteristic or a specific . For example, a “salmon population” could be an ecological entity. In , an ecological entity is one component of an . (modified from: U.S. EPA 2006) |
| **ecological endpoint\*** | A feature, quantity or quality that requires little further translation to make clear its relevance to (i.e., “public-friendly” **s**). Ecological endpoints are the ecological inputs that, along with inputs and by people, produce **s**. For the ESRP, synonymous with . For example, a population of watchable birds is an ecological endpoint, that when combined with complementary inputs such as transportation infrastructure and demand by birders, produce the ecosystem service of recreational bird watching. (adapted from: Boyd 2007, Boyd & Banzhaf 2007, Wainger & Boyd 2009, Wainger & Mazzotta 2009) |
| **ecological process** | A characteristic physical, chemical and/or biological activity that influences the flow, storage and/or transformation of materials and energy within and through **s**, such as the uptake of nitrogen from soil by vegetation. (modified from: U.S. EPA 2006) |
| **ecological production function\***  **(EPF)** | A description of the type, quantity and interactions of **s** required to generate outputs of functional **s**. For a simple example, the characteristics of a coastal (flooding regimes, salinity, nutrient concentrations, plant species abundance, prey and predator abundances, etc.) can influence the abundance of a population of watchable wading shorebirds (the ecological endpoint). The outputs of ecological production functions, when combined with and by humans, produce . Also see . (adapted from: Wainger & Boyd 2009, Wainger & Mazzotta 2009). |
| **ecological response function\***  **(ERF)** | A term coined early in development of the ESRP Willamette Ecosystem Services Project to be a description of the response of an to various forcing variables. Due to vagueness in its definition, this term is no longer in favor in the ESRP. See and as preferred terms. |
| **ecological risk assessment\*** | A formal evaluation of the likelihood that **s** may occur or are occurring as a result of exposure to one or more **s**. (source: U.S. EPA 1998) |
| **ecological tradeoff function**  **(ETF)** | A term coined early in development of the ESRP Willamette Ecosystem Services Project with unclear definition. Due to vagueness in its definition, this term is no longer in favor in the ESRP. |
| **econometrics** | The combination of economic theory with statistics to analyze and test economic relationships. Theoretical econometrics considers questions about the statistical properties of estimators and tests, while applied econometrics is concerned with the application of econometric methods to assess economic theories and test empirical hypotheses. |
| **economic demand function** | The relationship between the quantity of a good or service **ed** and of the good or service, described at either the individual or aggregate (market) level. The quantity demanded also can depend on characteristics of the good (quality and distinctiveness), characteristics of the individual (preferences), prices of substitute and , and income. |
| **ecosystem** | The biotic community (including humans) and abiotic environment within a specified location in space and time. (modified from: U.S. EPA 1998) |
| **ecosystem goods and services\*** | Outputs of ecological functions or processes that directly (“” sensu Boyd & Banzhaff 2007) or indirectly (“”) contribute to or have the potential to do so in the future. Some outputs may be bought and sold, but most are not **ed**. Often abbreviated as **s**. (modified from: U.S. EPA 2006) |
| **ecosystem service\*** | Shorthand notation for . |
| **ecosystem service market\*** | Any of the full spectrum of regulatory (e.g., ) and voluntary mitigation **s**, such as , habitat/**ing**, water quality trading, environmental water transactions and carbon markets. (source: Willamette Partnership) |
| **ecosystem service production function\***  **(ESPF)** | A description of the relationship between quality-adjusted **s** and the provision of . This term differs from because it includes both the functions and the non-ecological assessments that are needed to demonstrate a service. ESPFs evaluate four things: 1) how ecological endpoints combine with complementary (non-ecological) inputs to generate goods and services; 2) whether the quality of ecological endpoints is sufficient to generate the service; 3) whether required (trails, roads, homes) are available; and 4) whether exists for the service by location. For example, a quantitative or qualitative description of how a population of watchable birds (the ecological endpoint), when combined with complementary inputs such as transportation infrastructure and demand by birders, produces the ecosystem service of recreational bird watching, is an ecosystem service production function. Also see . (source: Wainger & Mazzotta 2009, with input from J. Boyd) |
| **effluent** | Waste, usually liquid, released or **d** to the environment. Generally the term refers to discharges of sewage or contaminated waste waters into surface waters. (adapted from CRS 2005) |
| **emergy** | The available energy of one kind previously used-up directly and indirectly to make a product or service. Emergy is expressed in its own unit, the emjoule, which connotes the energy of equivalent quality (e.g., solar emjoules) used in the past to make a product or service (e.g., a ), as compared with the energy (J) content of the product or service. (source: D.E. Campbell) |
| **emergy accounting** | Shorthand notation for . |
| **end user\*** | The person or group that uses data, information, tools, methods, models or systems developed by the ESRP. Under certain circumstances, can be synonymous with and . |
| **environmental accounting using emergy** | The application of the standard methods of accounting using as the measure of . In this approach, an income statement and balance sheet are created for a system. When fully documented, the balance sheet contains a with environmental, economic, and social liabilities and assets documented with the same set of accounting books. (source: D.E. Campbell) |
| **environmental benefits index** | An index that has been used by the USDA Farm Service Agency (FSA) since 1990 to rank farmers’ requests to enroll land into the during each general sign-up period. As currently structured, the index assigns points for cost to the government and 6 other factors; 1) wildlife benefits; 2) water quality benefits; 3) on-farm erosion control; 4) enduring benefits; 5) air quality benefits; and 6) whether the land in a state or national priority area. Bids only are accepted if they exceed a threshold level that is determined after the total of the **s** that each bid would provide are compared. Also see . (source: CRS 2005) |
| **environmental economics\*** | A subfield of economics that undertakes theoretical or empirical studies of the economic effects of national or local environmental . Particular issues addressed include the **s** and **s** of alternative environmental policies to deal with , water quality, toxic substances, solid waste and global warming. Compare with (adapted from: National Bureau of Economic Research) |
| **environmental equity** | Equal protection from environmental hazards for individuals, groups or communities regardless of race, age, ethnicity or economic status. This applies to the development, implementation and enforcement of environmental laws, regulations and policies, and implies that no population of people should be forced to shoulder a disproportionate share of adverse impacts of pollution. Synonymous with . (source: CRS 2005) |
| **environmental indicator** | A numerical value derived from actual measurements of a pressure, state or ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment. (source: U.S. EPA 2008) |
| **environmental justice** | Synonymous with . |
| **erosion** | The wearing away of the land surface. Unconsolidated materials, such as soil, erode more rapidly than consolidated materials, such as rock. Rates of erosion vary widely across the landscape, depending on numerous physical factors. (source: CRS 2005) |
| **error** | A component of , which results from the use of the wrong methods, models or data in analysis activities. Error can be corrected or minimized by rigorous attention to assessment quality. Also see and . (derived from: Munns 2002) |
| **estuary** | Regions of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes and lagoons. These brackish water **s** shelter and feed marine life, birds, and wildlife, but also are sites where commerce and industry are concentrated. |
| **eutrophication** | The process by which a body of water acquires a high concentration of plant nutrients, especially nitrates or phosphates. This nutrient enrichment promotes algae growth that, when it dies, can lead to the depletion of dissolved oxygen, killing fish and other aquatic organisms. (source: CRS 2005) |
| **existence value** | A (increase in individual or “welfare”) that stems from simply knowing that a good or service exists, despite having no expected direct interaction with that good or service. |
| **external variable** | A factor (such as climate change or market ) that affects the that is beyond the control of **s** and which provides the basis for uncertainty analysis (see ). Also referred to as an “exogenous variable.” |
| **externality\*** | A consequence of an economic activity that is experienced by unrelated third parties. An externality can be either positive (such as a scenic view) or negative (such as pollution). |
| **$F** |  |
| **farmed wetlands** | Under the USDA , **s** that were partially drained or altered to improve crop production before swampbuster was enacted on December 23, 1985. Farmed wetlands have undergone less alteration than , and are therefore subject to more stringent rules about further change. Farmed wetlands may be farmed as they were before the 1985 date, and the drainage that was in place before that date can be maintained, but no additional drainage is allowed. (source: CRS 2005) |
| **filter strip** | A type of that is an area of vegetation, generally narrow and long, that slows the rate of runoff, allowing sediments, organic matter and other pollutants that are being conveyed by the water to be removed by settling out. Filter strips reduce and the accompanying stream , and can be a . (source: CRS 2005) |
| **final ecosystem service** | Components of nature, directly enjoyed, consumed, or used to yield . Also see . (source: Boyd & Banzhaf 2007) |
| **forecast** | (v) To describe the **s**, trends or expected future behavior of a system, typically through the use of models. (n) A description of the **s**, trends or expected future behavior of a system. Also see and . |
| **forest health** | Forest condition, characterized by attributes (e.g., insect and disease infestations, wildfires and related tree mortality) and **s** of future problems (e.g., too many small-diameter trees due to overstocking, excessive biomass, an unnatural combination of tree species in mixed stands). |
| **forest plan** | Land and resource management plans for units of the National Forest System under the Forest and Rangeland Renewable Resources Planning Act (P.L. 93-378) and the National Forest Management Act (P.L. 94-588). (source: CRS 2005) |
| **free market** | An economic system in which the forces of and determine **s** and allocate available supplies, without government intervention. (source: CRS 2005) |
| **fungibility** | The characteristic of interchangeability. (source: CRS 2005) |
| **furrow irrigation** | An irrigation system of small, shallow channels guide water across the surface of a leveled field. Crops are typically grown on a ridge or raised bed between the furrows. This is the major irrigation system that is based on gravity flow. (source: CRS 2005) |
| **future value** | The of a or calculated for a specified date in the future. A is used to translate into the future. Empirical evidence suggests that people value a benefit received today as being more valuable than one received in the future. (derived from NOAA 1999) |
| **$G** |  |
| **green payments** | In agriculture, payments made to producers as compensation for **s** that accrue as a result of or in conjunction with their farming activities. (source: CRS 2005) |
| **green GDP** | An index of economic growth with the environmental consequences of that growth factored in. |
| **green infrastructure** | Generally, a concept that highlights the importance of the natural environment in decisions about land use planning, with emphasis on the life support functions provided by interconnectivity of natural **s** that supports long term sustainability. EPA has extended the concept to apply to the management of stormwater runoff at the local level through the use of natural systems, or engineered systems that mimic natural systems, to treat polluted runoff. This use of the term to refer to urban green (BMPs), although not central to the larger concept, does contribute to the over health of natural ecosystems. Also see . |
| **$H** |  |
| **habitat suitability index**  **(HSI)** | A wildlife habitat suitability model providing information for evaluating impacts on biota resulting from water or land use changes. (source: CRS 2005) |
| **habitat** | The place where a population (e.g., human, other animal, plant, microorganism) lives, characterized by physical features, dominant plants and other attributes. |
| **hedonic pricing** | A method used to estimate economic **s** for **s** that directly affect **s**. It is most commonly applied to variations in housing prices that reflect the value of local environmental attributes. |
| **hypoxic zone** | An area of aquatic resource (ocean, , lake, reservoir or river) where there is insufficient oxygen to support aerobic organisms such as fish and shellfish. Oxygen depletion can be caused by an excessive amount of nutrients that are washed downstream from inland sources. |
| **human well-being\*** | Broadly, the condition of humans and , defined in terms of the basic material needs for a good life, freedom and choice, health, wealth, social relations and personal security. In economics, the term is often used interchangeably with [although the definition provided here is broader than the standard economic definition]. (derived from MEA) |
| **$I** |  |
| **ignorance** | A component of which represents a lack of knowledge about the true value of a parameter that can result from inadequate or imperfect measurement. Ignorance can be reduced with the collection of additional data and information. Also see and . (derived from: Munns 2002) |
| **incentive** | As applied to pollution control, an instrument that uses financial means to motivate polluters to reduce the **s** posed by their facilities, processes or products. Incentives provide monetary and near-monetary rewards for polluting less and impose costs of various types for polluting more, thus supplying the necessary motivation to polluters. Specifically for the ESRP, an instrument that uses financial means to motivate individuals and groups to preserve and enhance the **s** and **es** that produce . (modified from: U.S. EPA 2001) |
| **index** | A single number, mathematically derived by combining two or more variables, that is intended to simplify complex information. (source: U.S. EPA 2008) |
| **information** | A collection of data from which conclusions may be drawn. (source: ESRP Decision Support Theme) |
| **information collector** | A scientist or research organization that collects data and information. (source: ESRP Decision Support Theme) |
| **intermediate ecosystem service** | Components of nature that are not directly enjoyed, consumed or used to yield , but which are important for the production of **s**. |
| **intrinsic value** | The underlying, essential, inherent that the environment and life forms have in their own right, and which is not derived from the human use they can or cannot be put to. |
| **involuntary program** | A system in which transactions between buyers and sellers are mandated by government taxes, laws and regulations. Contrast with . |
| **$J** |  |
| **joint production of ecosystem services\*** | The simultaneous production of several distinct **s** through land management practices or other policies (including no intervention). Also see . (derived from: Kline et al. 2009) |
| **$L** |  |
| **land trust** | A private nonprofit organization exempted from federal taxes, if it conforms  to Section 501 (c)(3) of the federal tax code, that may receive donations of money, property or development rights, and may use its assets to purchase property or development rights, typically through **s**. (source: CRS 2005) |
| **land use plan** | A coordinated collection of data, programs and activities related to existing and potential uses of land and resources within a defined area. Commonly associated with local units of government trying to anticipate and organize uses of space so as to meet defined goals. For producers, are a type of land use plan. (source: CRS 2005) |
| **leakage** | A situation within which the actions of an individual or group to reduce pollution loads creates perverse **s** for others to increase loads. For example, leakage can occur when a parcel of land or set aside for preservation results in a different parcel of land being cleared instead. Leakage can result in net degradation of environmental quality. |
| **$M** |  |
| **management choice\*** | The that is chosen or selected as a result of a . (modified from: ESRP Decision Support Theme) |
| **marginal** | The difference made by one extra unit of something. |
| **marginal change\*** | A proportionally very small addition or subtraction to the total quantity or quality of some variable, such as an or . The **s** and **s** of any good or service are determined “at the margin,” meaning that the cost and benefit of adding one more unit (the “marginal unit”) is used to evaluate efficiency. |
| **marginal cost** | Generally, the change in total that arises when the quantity produced changes by one unit. |
| **marginal demand** | Generally, the change in consumer for a product or service in response to a specific change in its . |
| **marginal utility** | The additional derived from consumption of an additional unit of a good or service. The of an additional unit of a good or service. |
| **market** | The organized exchange of goods, services or resources between buyers and sellers. |
| **market value** | The (often in monetary terms) of a good or service as determined by **s**. |
| **measurement** | The quantified value of an entity or its attributes. |
| **method of assessment** | A systematic way of evaluating or estimating the nature, quality, ability, extent or significance of an . (source: ESRP Decision Support Theme) |
| **metric** | A standard unit of , such as “meter” or “foot” for length. |
| **mitigation** | Generally, a reduction in impacts. While used generically to refer to actions taken to reduce impacts, a more precise term is offset, if the objective is no net loss as in regulatory programs that call for mitigation or offset of impacts. (source: Willamette Partnership) |
| **mitigation bank** | An area of land conserved or restored to provide additional **s** that is drawn on to compensate for adverse environmental impacts elsewhere. Synonymous with . (source: Willamette Partnership) |
| **mitigation credit** | Synonymous with . |
| **model** | A physical, mathematical or logical representation of a system of entities, phenomena or processes; an abstracted view of a complex reality. Also see . (modified from: ESRP Decision Support Theme) |
| **monetization\*** | in monetary (dollar, if in the US or Canada) terms. Also referred to as “economic valuation” or “monetary valuation.” (source: U.S. EPA 2006) |
| **$N** |  |
| **natural capital\*** | An extension of the economic concept of capital (manufactured means of production) to . Natural capital is thus the stock of natural **s** that yields a flow of valuable ecosystem goods or services into the future. Also see . |
| **natural feature** | A readily observable characteristic of natural systems such as type of vegetation and arrangement of land use. (source: Wainger & Boyd 2009) |
| **natural infrastructure** | Natural systems that provide the basis/framework for human activity. Also see . |
| **network** | An interconnected system of people (also see ) or things. |
| **no-till farming** | A method of planting crops that involves no seed bed preparation other than opening the soil to place individual seeds in holes or small slits. Usually no cultivation during crop production, although chemical weed control is normally used. No-till farming is a form of . (derived from: CRS 2005) |
| **nonmarket goods and services** | that are not defined, provided and priced by conventional **s**. |
| **nonmarket value** | recognized by people but not usually expressed in **s** because the thing either is not currently, or cannot be, trad**ed** in **s.** |
| **nonpoint source pollution** | Pollutants that are not **d** or emitted from a specific point source, such as a pipe or smokestack. Nonpoint water pollutants are often carried from dispersed, diverse sources into water channels by rain-induced runoff. Runoff from streets, open pit and strip mines, and agricultural fields are prominent examples. Nonpoint source (often called fugitive emissions) include small dispersed sources (e.g., fireplace smoke, and uncontained emissions, like dust blown from fields and unpaved roads). Also see . (source: CRS 2005) |
| **nonrenewable resource** | A resource that does not naturally replenish itself within time limits that permit sustained yield (e.g., minerals and hydrocarbons, such as phosphate rock, limestone, petroleum). Nonrenewable resources are sometimes called “stock resources” because of their fixed . Some resources, such as soil and water, can be treated as either nonrenewable or depending on circumstances. (source: CRS 2005) |
| **nonuse value\*** | The people hold for a service that they do not directly use. [Sometimes referred to as “passive use value.”] Early literature in environmental economics split nonuse value into three components: , and . Nonuse values are theoretically distinct from **s**, although the boundary between use and nonuse values is often fuzzy. |
| **nutrient management plan** | A farm developed by the Natural Resources Conservation Service (NRCS) for a landowner that describes how nutrients will be stored, used, and disposed of to minimize environmental problems such as water . In animal agriculture, managing nutrients can often be accomplished through manure management. (source: CRS 2005) |
| **nutrient pollution** | Contamination by excessive inputs of nutrients. A primary cause of  of surface waters, in which excess nutrients, usually nitrogen or phosphorus, stimulate algal growth. Sources of nutrient pollution include runoff from fields and pastures, **s** from septic tanks and feedlots, and emissions from combustion. (source: CRS 2005) |
| **$O** |  |
| **offset\***  **(also, offset credit)** | A used to compensate for the unavoidable impacts on the environment. Used by companies, governments or other entities in **s** to comply with regulatory caps. Offset credits are often called **s**. Also see . (adapted from: Willamette Partnership) |
| **opportunity cost** | The  of something in terms of an opportunity forgone (and the **s** which could be received from that opportunity), or the most valuable forgone alternative (i.e., the second best alternative). |
| **option value** | The potential of a good or service for future (direct or indirect) use. |
| **outcome** | The result, impact or consequence of making and acting on a decision. (source: ESRP Decision Support Theme) |
| **overdrafting** | Removing more groundwater from an aquifer than is naturally replenished, which can result in a dropping water table, increased pumping costs, land subsidence (which reduces the future recharge capacity), saltwater intrusion, reduced stream flows in interconnected ground- and surface-water systems and exhaustion of groundwater reserves. (source: CRS 2005) |
| **$P** |  |
| **partner** | Generally, a person or group that is united or associated with another in an activity or a sphere of common interest. |
| **payments for ecosystem services\*** | The variety of arrangements through which the beneficiaries of **s** pay back the providers/protectors of those services. Payments encompass the full spectrum of options including, but not limited to, government programs, **ing** programs and/or tax programs. (source: Willamette Partnership) |
| **performance-based standard** | A criterion that defines a particular objective or outcome to be achieved without prescribing the specific methods to be used to achieve the objective. A performance-based standard describes and provides measures for the attributes of success to the extent practicable. The measures may be qualitative, quantitative, or a combination of the two. For example, “quantification of an within 10% accuracy,” without specification of the quantification methods to be used, could be a performance-based standard. |
| **point source pollution** | Pollutants that are **d** or emitted from discrete point sources, such as pipes and smokestacks. Both the Clean Water Act (P.L. 92-500; 33, U.S.C.  1251-1387) and the Clean Air Act (42 U.S.C. 7401 et seq.) focus control requirements on point sources and both require permits for major sources of discharges from point sources. See also . |
| **policy\*** | Generally, any statement of approach, philosophy, goal or decision. For ESRP purposes, the output of a federal or local governmental legislative authority, such as standard, regulation, decision or . |
| **pollution** | Alteration of the environment, as through the introduction of hazardous or detrimental substances, heat, noise or other **s** whose nature, location or quantity produces **s** or human health effects. |
| **precision** | From inferential statistics, the amount of variation among multiple estimates made of a particular parameter or quantity, usually expressed using some measure of scatter. Compare with . |
| **prediction** | A statement or claim that a particular event will occur in the future in more certain terms than a . See also . |
| **prescribed burning** | The practice of intentionally setting fires within identified areas under specified conditions to reduce fuels and produce other **s** with less than from wildfires. (source: CRS 2005) |
| **present value** | The of future or past **s** or **s** in the present time period. A is used to translate past and into present value terms. (derived from NOAA 1999) |
| **press disturbance** | An environmental impact driven by constantly increasing pressures on atmospheric and ecological systems, such as atmospheric CO2 change that occurs slowly in ecological time (decades to centuries) relative to a of pre-industrial concentrations. Also see . (source: Bender et al. 1984) |
| **price** | , usually expressed in monetary terms. |
| **price elasticity** | In economics, the degree to which a change for an item results from a unit change () in (called “supply elasticity” or “price elasticity of supply”) or a unit change in (called “demand elasticity” or “price elasticity of demand”). If the percentage change in quantity is more than the percentage change in price, the good is “price elastic”; if it is less, the good is “price inelastic.” |
| **prior converted wetland** | Under the USDA , these are **s** that were converted to before swampbuster was enacted on December 23, 1985, and meet wetland criteria for saturated soils or water-loving plants. Under swampbuster, there are no restrictions on either drainage maintenance or additional drainage on prior converted wetland. (source: CRS 2005) |
| **projection** | A of **s**, trends or expected future behavior of a system if all things were held constant other than the variable(s) of interest. In the ESRP, analyses of **s** provide projections of the future state of in response to selection amongst **s**. Also see and . |
| **provisioning services** | A category of “ecosystem services” as described by the *Millennium Ecosystem Assessment*. Provisioning services are the products (ecosystem goods) obtained from **s**, including: food; fiber; fuel; genetic resources; biochemicals, natural medicines, and pharmaceuticals; ornamental resources; and fresh water. In the lexicon of the ESRP and when quantified appropriately, elements in the MEA provisioning services category could be considered **s**. When combined with and by humans, they could produce . Also see the other MEA categories of , , and . (source: MEA 2005) |
| **public lands** | As defined in the Federal Land Policy and Management Act (P.L. 94-579), any land and interest in land outside of Alaska owned by the United States and administered by the Bureau of Land Management. In common usage, public lands can refer to all federal land no matter what agency has responsibility for its management or may refer even to state- and local municipality-owned lands. (source: CRS 2005) |
| **pulse disturbance** | An environmental event that occur once or at periodic intervals, such as fire and extreme climatic events. Also see . (source: Bender et al. 1984) |
| **$Q** |  |
| **quantification** | The expression of entities or their attributes, **s** or **s** in numerical units (**s**). (modified from: U.S. EPA 2006) |
| **$R** |  |
| **reactive nitrogen (Nr)\*** | All biologically, chemically, and radiatively active nitrogen compounds in the atmosphere and biosphere. It includes forms of nitrogen, such as ammonia (NH3) and ammonium (NH4+), nitric oxide (NO), nitrogen dioxide (NO2), nitric acid (HNO3), nitrous oxide (N2O), and nitrate (NO3-), and organic compounds such as urea, amines, proteins and nucleic acids. (source: Galloway et al. 2003). |
| **reclamation** | The process of rehabilitating disturbed lands, or converting unproductive lands to productive uses. This term is also used for the process of recycling or reusing water or reestablishing lands disturbed during mining. Also see . (source: CRS 2005) |
| **recovery** | The rate and extent of return of a population, community or to some aspect(s) of its previous condition. Also see , and . (modified from: U.S. EPA 1998) |
| **reference condition** | A set of selected measurements or conditions of an unimpaired or minimally impaired characteristic of an ecosystem type in a region. Also see . |
| **regulating services** | A category of “ecosystem services” as described by the *Millennium Ecosystem Assessment*. Regulating services are the “benefits” obtained from the regulation of ecosystem processes, including: air quality regulation; climate regulation; water regulation; erosion regulation; water purification and waste treatment; disease regulation; pest regulation; pollination; and natural hazard regulation. In the lexicon of the ESRP, elements in the MEA regulating services category could be considered **es** that can produce **s**, which when combined with and by humans, could produce . Also see the other MEA categories of , and . (source: MEA 2005) |
| **renewable fuel** | Broadly, a fuel made from replenishing feedstocks (such as biomass, sunlight, wind, water and waste products) in contrast to exhaustible  () feedstocks (such as petroleum and coal). Renewable fuels are a subset of . (source: CRS 2005) |
| **renewable resource** | A natural resource, sometimes called a “flow resource,” that replenishes itself within time limits that permit sustained use (e.g., timber, livestock forage, wildlife and fish), in contrast to a . (source: CRS 2005) |
| **resilience** | The rate or time of of an ecological system to an original state (or some defined description of that state) following cessation of a specified level of impact. Also see and . |
| **resistance** | The opposition of an ecological system to change as a result of exposure to a . Also see , and . |
| **restoration\*** | The reconstitution of a pre-existing ecological condition, or range of conditions. |
| **revealed preference** | The use of the of expenditure to “reveal” the preference of a consumer or group of consumers for the bundle of goods they purchase. |
| **reverse auction** | A type of in which the role of the buyer and seller are reversed, with the primary objective to drive purchase **s** downward. |
| **riparian** | Pertaining to or situated on or along the bank of a stream or other body of water. Often referenced in the context of cattle grazing and protection of streams for fish and wildlife , and water quality purposes. (source: CRS 2005) |
| **riparian buffer** | A strip of vegetation along the bank of a body of water which slows the rate of flow of runoff from adjoining uplands, causing sediment and other materials to fall out onto the land before the runoff enters and pollutes the body of water. Also see and . (source: CRS 2005) |
| **riparian rights** | The entitlement of a land owner to certain uses of water on or bordering the property, including the right to prevent diversion or misuse of upstream waters (generally a matter of state law). (source: CRS 2005) |
| **risk\*** | The likelihood that **s** or human health effects may occur or are occurring as a result of exposure to one or more **s**. (derived from: U.S. EPA 1998) |
| **risk management\*** | The process of deciding whether and how to manage **s**. Risk management requires consideration of legal, economic and behavioral factors, as well as ecological, human health and welfare effects of each . Management may involve regulatory and non-regulatory responses. (source: CRS 2005) |
| **risk-benefit analysis\*** | A formal comparison of the short- and long-term **s** to the overall societal **s** of an activity, chemical use or technology. When risks and benefits are expressed in monetary terms, this is effectively a . (adapted from: CRS 2005) |
| **rural area** | According to the U.S. Bureau of the Census, areas that comprise open country and settlements with fewer than 2,500 residents. Territory outside of urbanized areas is designated rural and can have population densities as high as 999 per square mile or as low as 1 person per square mile. Rural areas consist of all territory outside of Census Bureau defined **s** and urban clusters. (source: CRS 2005) |
| **$S** |  |
| **scarcity** | Insufficiency of amount or . |
| **scenario\*** | As used in the ESRP, a set of driving conditions that will cause ecological and potentially change. Driving conditions can include the continuation of existing trends (“business-as-usual”), extrinsic changes (e.g., a change in the rate of population growth, a change in the rate of sea level rise) or the introduction of hypothetical policies. (derived from: FML Team) |
| **set-aside program** | A program (not used since the late 1970s) under which farmers were required to set aside a certain percentage of their total planted acreage and devote this land to approved uses (such as grasses, legumes and small grain which is not allowed to mature) to be eligible for nonrecourse loans and deficiency payments. (source: CRS 2005) |
| **smart growth** | Generally, public policies that selectively use financial and other public **s** to influence the density and pattern of new development. The goal  of Smart Growth is to encourage development in specified areas (typically where infrastructure, such as roads, schools and public utilities, are already in place) and discourage (not prohibit) it in other areas. (source: CRS 2005) |
| **social\*** | Relating to human and its members. |
| **social benefit\*** | Synonymous with . |
| **social network** | In the ESRP, a for representing the people involved in a and the relationships between them, such as who has authority to make decisions and with whom they work or interact. Social relationships typically are depicted in terms of nodes (individuals within **s**) and ties (relationships between the individuals). (source: ESRP Decision Support Theme) |
| **social welfare\*** | , measured at some aggregate level (U.S. EPA 2006). In the typical economic context, the sum of individual benefit measures within a utilitarian benefit-cost framework, where individual welfare is often measured by a person’s . |
| **social welfare function** | A function that establishes criteria under which efficiency and equity outcomes are transformed into a single metric, making them directly comparable. A potential output of such a function is a ranking of **s** that have different aggregate levels and distributions of net **s**. A social welfare function can provide empirical evidence that a yielding higher net benefits, but a less equitable distribution of wealth, is better or worse than a less efficient alternative with more egalitarian distributional consequences. (source: U.S. EPA 2001) |
| **society\*** | A group of people having a distinctive cultural and economic organization, as well as the manner or condition in which they live together for their mutual benefit. By extension, society denotes the people of a region or country, sometimes even the world, taken as a whole. |
| **soil conservation district** | A legal subdivision of state government, with a locally elected governing body, responsible for developing and carrying out a program of soil and water within a geographic boundary, usually coinciding with county lines. The nearly 3,000 districts in the United States have varying names (soil conservation districts, soil and water conservation districts, natural resources districts, resource districts, resource conservation districts). (source: CRS 2005) |
| **stakeholder\*** | An individual, group or organization with an interest in, or potentially impacted by, the of a or . (modified from: ESRP Decision Support Theme) |
| **stakeholder perception** | A **’s** knowledge or beliefs about an issue. (source: ESRP Decision Support Theme) |
| **strength or magnitude of the relationship (between variables)** | The degree of association or causality between two variables (i.e., between decisions and **s**). (source: ESRP Decision Support Theme) |
| **stacking credits** | The creation of different types in the same geographic area. It allows landowners to market multiple **s** at a single site, including those with and without specific geographic delineation. (source: Willamette Partnership) |
| **stacking services** | Payments for multiple **s** provided by a given land area wherein the land owner is paid separately for different services, sometimes from different programs. Stacking often allows land owners to maximize income from . Also see and . (adapted from Kroeger 2006) |
| **stressor** | A by-product of human activity that can impact entities, their attributes or **es** adversely (see ), including past activities that leave **s** in a degraded condition. (modified from: U.S. EPA 2006) |
| **stressor-response function\***  **(also, stressor-response model)**  **(also, stressor-response relationship)** | An empirical or model-based description of the relationship between the strength, magnitude or other quantity of a and some characteristic of an ecological system. Typically, a stressor-response function is used to describe expected changes in the response of an ecological system to changes in the stressor. |
| **subsidy** | A direct or indirect payment or other benefit granted by a government for the production or distribution (including export) of a good or to supplement other services. Generally, subsidies are thought to be production and trade distorting, resulting in an inefficient use of resources. (source: CRS 2005) |
| **substitutability\*** | The degree to which two or more goods (or services) can be substituted for one another. |
| **subsistence farming** | A low-income farming operation in which the operator is producing primarily for the family’s needs rather than for sale. (source: CRS 2005) |
| **supply\*** | Generally, the total amount of a good or service available for purchase (or use for ). Along with , supply is one of the two key determinants of . |
| **supporting services** | A category of “ecosystem services” as described by the *Millennium Ecosystem Assessment*. Supporting services are those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. (Some services, like erosion regulation, can be categorized as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people.) Examples of supporting services include: soil formation; photosynthesis; primary production; nutrient cycling; and water cycling. In the lexicon of the ESRP, elements in the MEA supporting services category could be considered **es** that can produce **s**, which when combined with and by humans, could produce . Also see the other MEA categories of , and . (source: MEA 2005) |
| **surface runoff** | Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major cause of and transporter of . (source: CRS 2005) |
| **surplus** | In economic production, the amount by which available supplies are greater than the quantity that will bring producers an adequate income. A surplus may be due to production outrunning , a decline in consumption, or a general decline in consumer income or buying power. (source: CRS 2005) |
| **sustainable development\*** | Development which meets the needs of the present without compromising the ability of future generations to meet their own needs. (source: United Nations 1987) |
| **sustainable agriculture** | A systematic approach to farming intended to reduce , enhance natural resource and financial sustainability, and improve efficiency. Overall, alternative agriculture emphasizes management practices that take advantage of natural processes (such as nutrient cycles, nitrogen fixation and pest-predator relationships), to improve the match between cropping patterns and agronomic practices on the one hand and the productive potential and physical characteristics of the land on the other. (source: CRS 2005) |
| **sustainable forest management** | The use of silvicultural practices that ensure that the desired goals of forest management (outputs, uses, desired conditions, etc.) can continue to be achieved in perpetuity. (source: CRS 2005) |
| **sustained yield** | An output of **s** that does not impair the productivity of the resource; it implies a balance between harvesting and incremental growth or  replenishment. (source: CRS 2005) |
| **swampbuster program** | A provision of the Food Security Act of 1985 (P.L. 99-198) that discourages the conversion of **s** to use. Producers converting a wetland area to cropland lose eligibility for several federal farm program benefits. (source: CRS 2005) |
| **$T** |  |
| **target load** | The amount of pollutant or physical condition that will not result in a water quality violation. |
| **threshold\*** | An abrupt change in ecological, social or economic systems in space or time, often not easily reversed (and sometimes never reversible) and often with persistent consequences. Synonymous with . |
| **tipping point\*** | Synonymous with . |
| **total economic value\***  **(TEV)** | The sum of all relevant and **s** for of a change in a given (i.e., the full social benefits). This is distinct from the "total value" of an ecosystem, which is the of the entire system (e.g., the value of the loss of an entire ), but instead is the value of a to that ecosystem. |
| **tradeoff\*** | Generally, an exchange of one thing in return for another, especially relinquishment of one benefit or advantage for another. In the ESRP, gained or lost as the result of a . |
| **trading** | The voluntary exchange of goods, services or both. |
| **tragedy of the commons** | A situation that arises when it is difficult and costly to exclude potential users from common-pool, or open access, resources that yield finite flows of **s**, as a result of which those resources will be exhausted by rational, -maximizing individuals rather than conserved for the benefit of all. (source: Durlauf & Blume 2008) |
| **triple bottom line** | An accounting system that considers more than the traditional financial bottom line, such that in addition to financial outcomes, an organization’s performance is measured against its social and environmental impacts and responsibilities. (modified from: NSWG Department of Environment, Climate Change and Water) |
| **$U** |  |
| **uncertainty\*** | A limit to knowledge where it is impossible to describe an existing state or future outcome exactly. Uncertainty has three primary components: 1) (also called “heterogeneity” or “stochasticity”), a component of all biological systems, which represents actual differences in the value of a parameter or attribute among units in a (statistical) population; 2) , which represents a lack of knowledge about the true value of a parameter that can result from inadequate or imperfect measurement; and 3) , which results from the use of the wrong methods, models or data in analysis activities. (derived from: Munns 2002) |
| **urban area** | As defined by the U.S. Census Bureau, an area with more than 1.5 people per acre. |
| **use value\*** | The of a good or service derived from its direct or indirect use (as opposed to ). |
| **utility\*** | The satisfaction of wants and needs obtained from the use or consumption of goods and services (including “passive” uses). Synonymous in the aggregate with . |
| **$V** |  |
| **valuation\*** | Generally, the process of estimating the worth, merit or desirability of something. Specifically with respect to **s**, the of those benefits. (adapted from: U.S. EPA 2006) |
| **value\*** | Generally, the worth, merit or desirability of something. It can be expressed quantitatively (for example, in monetary terms) or qualitatively. Specifically with respect to **s**, a quantitative or qualitative description of those benefits. |
| **value system** | For the ESRP, the set of cultural and moral **s** (in the general sense) held by a person or a group. |
| **variability** | A component of , which represents actual differences in the value of a parameter or attribute among units in a (statistical) population. Variability is a component of all biological systems, and cannot be reduced by taking additional measurements of a parameter, although it can be quantified. Also called “heterogeneity” or “stochasticity.” Also see and . (derived from: Munns 2002) |
| **voluntary program** | A system in which buyers and sellers freely and willingly engage in transactions. Transactions are made in such a way that both the buyer and the seller are better off after the transaction then before it occurred. Contrast with . |
| **vulnerability** | Susceptibility to injury or attack. Also see , and . |
| **$W** |  |
| **water banking** | The practice of foregoing water deliveries during certain periods, and banking either the right to use the foregone water in the future, or saving it for someone else to use in exchange for a fee or delivery in kind. Usually used where there is significant storage capacity to facilitate such transfers of water. Water banking is typically regulated and managed at the state level. (source: CRS 2005) |
| **watershed** | The total land area, regardless of size, above a given point on a waterway that contributes runoff water to the flow at that point. It is a major subdivision of a . (source: CRS 2005) |
| **wellhead protection area** | A surface and subsurface land area regulated to prevent contamination of a well or well-field supplying a public water system. (source: CRS 2005) |
| **wetland\*** | An area of predominantly hydric soils that can support a prevalence of water-loving plants, known as “hydrophilic vegetation.” Transitional between terrestrial and aquatic systems are wetlands typified by a water table at or near the surface, or the land is covered by shallow water at least part of the year. Types of wetlands are distinguished by water patterns (the frequency and length of flooding) and location in relation to upland areas and water bodies. Wetlands perform many functions including wildlife and fish , storage and conveyance of flood waters, sediment and pollution control, and recreation. (source: CRS 2005) |
| **wetland mitigation banking** | A system used to offset destruction of **s** that are regulated under section 404 of the US Clean Water Act (33 U.S.C. 1344) or state wetland law. A bank is established by creating or restoring a wetland. After the bank is in place, any entity who would modify or destroy a wetland and is required by the CWA section 404 regulatory program to mitigate that action can meet their obligation by buying **s** in the . The purchase of credits offsets the costs associated with establishing the bank, and if the bank is a private enterprise, can be used to generate a profit. (source: CRS 2005) |
| **wilderness** | An area of pristine federally-owned where the impact of humans is largely unnoticeable, and which is managed to minimize any impacts. Federal land managed as wilderness often has been designated by Congress as a unit in the Wilderness Preservation System. (source: CRS 2005) |
| **wildland-urban interface**  **(WUI)** | Lands within and adjacent to (usually within ½ mile from) communities that abut or are surrounded by wildlands potentially subject to wildfires. (source: CRS 2005; also see Bruins et al. 2009) |
| **wildlife corridor** | A relatively narrow passage between two larger areas that provide for wildlife. Corridors can range from lengthy passages for large animals that roam over broad territories (e.g., grizzly bears), to relatively short passages (e.g., between ponds for amphibians). As development, and especially highways, have become barriers to wildlife movement, corridors that avoid or bypass these barriers have become increasingly important to maintaining animal populations. (source: CRS 2005) |
| **willingness to accept** | The amount of money (or other goods) that a person must be paid in order to accept the loss of something else. |
| **willingness to pay** | The amount of money (or other goods) that a person is willing to give up to get something else. |
| **$Z** |  |
| **zoonotic disease** | A disease that under natural conditions is communicable from animals to humans. Lyme disease, tuberculosis and rabies are examples of zoonotic diseases. |

**Table 3. Modeling Supplement** (supplied by Denis White)

|  |  |
| --- | --- |
| **declarative modeling** | A method for specifying models in which the system being modeling is described by declarative statements or in a visual modeling environment. Contrast with . |
| **differential/difference equation modeling** | Differential or difference equations arise in many areas of science and technology whenever a deterministic relationship involving some continuously changing quantities (modeled by functions) and their rates of change (expressed as derivatives) is known or postulated. |
| **dynamic modeling** | Modeling where changes take place in time. |
| **individual/agent/actor-based modeling** | Models that consist of dynamically interacting rule-based agents. These agents are intelligent and purposeful, and situated in space and time. Agents’ interactions can result in equilibrium states or emergent patterns. |
| **normative modeling** | Modeling with explicit goal functions, as in optimization. |
| **object-oriented modeling**  **(OOP)** | A method for specifying models that conforms to the object-oriented paradigm in software engineering. Object-oriented programming may be seen as a collection of cooperating objects, as opposed to a traditional view in which a program may be seen as a list of instructions to the computer. In OOP, each object is capable of receiving messages, processing data, and sending messages to other objects. Each object can be viewed as an independent little machine with a distinct role or responsibility. |
| **optimization modeling** | A modeling approach in which the purpose is to find a best or optimal solution, given some constraints. With quantitative data, the methods of operations research such as linear programming are usually used. |
| **procedural modeling** | A method for specifying models in which the system being modeled is described by a set of instructions for the sequence of actions between objects in the model. Contrast with . |
| **simulation modeling** | A type of dynamic modeling in which the behavior of a system of interacting components is observed over time. |
| **spatial modeling** | Modeling in which spatial units are explicitly included. Modeling with geographic information systems (GIS) is by definition spatial modeling. |
| **stochastic modeling** | Modeling in which there is randomness in some aspect of the model. |
| **system dynamics modeling** | An approach to understanding the behavior of complex systems over time using stocks and flows of substances, and feedback loops and time delays that affect the behavior of the entire system. |

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