
9 GLOSSARY

Acoustics: The scientific study of sound, especially of its generation, transmission, and reception.

Acoustically mediated bubble growth: A suggested cause of injury to marine mammals related to gas accumulation in the bloodstream. Under the **acoustically mediated bubble growth** hypothesis, stable gas bubbles could be destabilized by high-level sound exposures such that bubble growth occurs through static diffusion of gas out of the tissues. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness (see related concept of “rectified diffusion”).

Ambient noise: The typical or persistent environmental background noise present in the ocean.

Anthropogenic noise: Noise related to, or produced by, human activities.

Antisubmarine warfare (ASW): Naval operations conducted against submarines, their supporting forces, and operating bases.

Asymmetry: Asymmetry/asymmetric has many definitions and is used to describe many things, from weapons systems and tactics, through strategy and worldviews, to comprehension of what is sanctioned by morality or international law. **Asymmetric threats** are commonly viewed as having the potential to produce widespread civilian casualties or considerable environmental damage.

Attenuation: A decrease in level over time or space or distance.

Baleen: The filtering plates that hang from the upper jaw of a baleen whale.

Bathymetry: The measurement of water depth at various places in a body of water; the information derived from such measurements.

Benthic: Referring to the bottom-dwelling community of organisms that creep, crawl, burrow, or attach themselves to either the sea bottom or such structures as ships, buoys, and wharf pilings (e.g., crabs, clams, worms, etc.).

Bight: A long, gradual bend or recess in the coastline that forms a large, open bay.

Biologically important activities/behaviors: Those activities or behaviors essential to the continued existence of a species, such as migration, breeding/calving, or feeding.

Brumate: A specific term for when reptiles “hibernate” or go into a dormant state by burying themselves in sand or sediment during cold periods or during cold winters.

Cetacean: Of or belonging to the order Cetacea, which includes aquatic mammals with anterior flippers, no posterior limbs, and a dorsal fin, such as whales, dolphins, and porpoises.

Continental shelf: A shallow submarine plain of varying width forming a border to a continent and typically ending in a steep slope to the oceanic abyss.

Decibel (dB): A unit used to express the relative difference in power, usually between acoustic or electrical signals, equal to ten times the common logarithm of the ratio of the two levels.

Decompression sickness: a condition caused by release of gas bubbles in tissue upon rapid ascent from a compressed atmosphere and resulting exposure to rapidly lowered air pressure

Demersal: Living at or near the bottom of a waterbody, but having the capacity for active swimming.

Endangered species: Defined in 16 USC 1532 as any species that is in danger of extinction throughout all or a significant portion of its range. Federally endangered species are listed in 50 CFR 17.11 and 17.12.

Energy flux density level (EL): A measure of the sound energy flow per unit area expressed in decibels. EL is stated in dB re $1 \mu\text{Pa}^2\text{-s}$ for underwater sound and dB re $(20 \mu\text{Pa})^2\text{-s}$ for airborne sound.

Epifauna: Organisms living on the surface of the sediment/sea bed.

Essential fish habitat (EFH): Those waters and substrate that are defined within Fishery Management Plans for federally-managed fish species as necessary to fish for spawning, breeding, feeding, or growth to maturity.

Fishing hotspot: An area of concentrated fishing.

Frequency: Description of the rate of disturbance, or vibration, measured in cycles per second. Cycles per second are usually referred to as the unit of measure of Hertz (Hz). In acoustics, frequency is characterized in general terms as low, mid, or high. The Navy categorizes these as follows:

- **Low frequency (LF)** sound is below 1,000 Hz.
- **Mid frequency (MF)** sound is between 1 and 10 kHz (kilohertz).
- **High frequency (HF)** sound is above 10 kHz.

Harassment: Intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

Harassment zones: The volumes of ocean in which Level A or B harassment (defined below) are predicted to occur.

- **Level A harassment zone:** Extends from the source out to the distance and exposure at which the slightest amount of injury is predicted to occur. The acoustic exposure that produces the slightest degree of injury is therefore the threshold value defining the outermost limit of the Level A harassment zone.
- **Level B harassment zone:** Begins just beyond the point of slightest injury and extends outward from that point. It includes all animals that may potentially experience Level B harassment. Physiological effects extend beyond the range of slightest injury to a point where slight temporary distortion of the most sensitive tissue occurs, but without destruction or loss of that tissue. The animals predicted to be in this zone experience Level B harassment by virtue of temporary impairment of sensory function (altered physiological function) that can disrupt behavior.

Hydrography: The characteristic features (e.g., flow, depth) of bodies of water.

Infauna: Animals living within the sediment.

Irreversible and irretrievable resources: Those resources that are consumed during the construction and implementation of a project and that cannot be reused. Because their reuse is impossible, they are considered irreversibly and irretrievably committed to the development of the proposed project. These resources would include expendable materials necessary for construction, as well as fuels and other forms of energy that are utilized during project implementation.

Isobath: A line on a chart or map connecting points of equal depths; bathymetric contour.

Letter of authorization (LOA): The Marine Mammal Protection Act provides for a “small take authorization” (i.e., letter of authorization) for maritime activities, provided the National Marine Fisheries Service finds that the takings would be of small numbers (i.e., taking would have a negligible impact on that species or stock), would have no more than a negligible impact on those marine mammal species not listed as depleted, and would not have an unmitigable adverse impact on subsistence harvests of these species.

Level A harassment: Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. **Injury** is identified as the destruction or loss of biological tissue. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue.

Level B harassment: Level B harassment includes all actions that disturb or are likely to disturb a marine mammal or marine mammal stock in the wild through the disruption of natural behavioral patterns. Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects have the potential to cause Level B harassment.

Live/hard bottom habitat: Scattered irregularly over the continental shelf, live/hard bottom habitat is comprised of zones of highly concentrated invertebrate and algal growth, in association with marked deviations in topographical relief, that support substantial fish assemblages. Live/hard bottom habitat is considered essential fish habitat.

Masking: The obscuring of sounds of interest by interfering sounds, generally at similar frequencies.

Mysticete: Any of several whales of the suborder Mysticeti having symmetrical skulls, paired blowholes, and plates of whalebone (baleen plates) instead of teeth. Mysticetes are filter-feeding whales, also referred to as baleen whales.

Notice of intent (NOI): A written notice published in the *Federal Register* that announces the intent to prepare an EIS. Also provides information about a proposed federal action, alternatives, the scoping process, and points of contact within the lead federal agency regarding the EIS.

Odontocete: Any of the toothed whales (without baleen plates) of the suborder Odontoceti having a single blowhole and asymmetrical skull, such as orcas, dolphins, and porpoises.

Onset permanent threshold shift (PTS): PTS (defined below) is non-recoverable and, by definition, must result from the destruction of tissues within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the wording of the Marine Mammal Protection Act. In this OEIS/EIS, the smallest amount of PTS (**onset-PTS**) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset-PTS is used to define the outer limit of the Level A harassment zone.

Onset temporary threshold shift (TTS): TTS (defined below) is recoverable and is considered to result from the temporary, non-injurious distortion of hearing-related tissues. In this OEIS/EIS, the smallest measurable amount of TTS (**onset-TTS**) is taken as the best indicator for slight temporary sensory impairment. Because it is considered non-injurious, the acoustic exposure associated with onset-TTS is used to define the outer limit of the portion of the Level B harassment zone attributable to physiological effects. This follows from the concept that hearing loss potentially affects an animal's ability to react normally to the sounds around it. Therefore, the potential for TTS qualifies as a Level B harassment that is mediated by physiological effects upon the auditory system.

Pelagic: Living in the water column. Plants and animals that are free-floating and drift passively, or animals that are strong swimmers.

Permanent threshold shift (PTS): Very high sound levels may rupture the eardrum or damage the small bones in the middle ear. Lower-level exposures may cause permanent or temporary hearing loss, which is called a noise-induced threshold shift, or simply a **threshold shift (TS)**. A TS may be permanent, called a **permanent threshold shift (PTS)**, or temporary, called a **temporary threshold shift (TTS)**.

Physiological effect: Defined in the OEIS/EIS as a variation in an animal's physiology that results from an anthropogenic acoustic exposure and exceeds the normal daily variation in physiological function.

Pinniped: Any of a suborder (Pinnipedia) of aquatic carnivorous mammals such as a seal or walrus with all four limbs modified into flippers.

Received level (RL): The level of sound that arrives at the receiver, or listening device (hydrophone). The received level is the source level minus the transmission losses from the sound traveling through the water.

Record of decision (ROD): In regard to an EIS, the notice published in the *Federal Register* that contains the lead agency's decision, and identifies both the alternatives and the mitigation measures to be used.

Rectified diffusion: A potential cause of injury to marine mammals related to gas bubble accumulation in the bloodstream. **Rectified diffusion** is the process of increasing the size of a gas bubble by exposing it to a sound field. Repetitive diving by marine mammals can cause the blood and other tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure. If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness (see related "**acoustically mediated bubble growth**").

Resonance: A suggested cause of injury in marine mammals is air cavity resonance due to sonar exposure. **Resonance** is a phenomenon that exists when an object is vibrated at a frequency near its natural frequency of vibration – the particular frequency at which the object vibrates most readily. The size and geometry of an air cavity determine the frequency at which the cavity will resonate. Displacement of the cavity boundaries during resonance has been suggested as a cause of injury. Large displacements have the potential to tear tissues that surround the air space (for example, lung tissue).

Sargassum habitat: Pelagic brown algae *Sargassum natans* and *S. fluitans* form a dynamic structural habitat within the warm waters of the western North Atlantic. Pelagic *Sargassum* is considered essential fish habitat because it provides protection, feeding opportunity, and is used as a spawning substrate to a variety of fish species.

Scoping: Early consultation with federal and state agencies and interested parties to identify possible alternatives and the significant issues to be addressed in the EIS.

Sirenian: Any of an order (Sirenia) of aquatic herbivorous mammals including the manatee, dugong, and Steller's sea cow.

Sonar: An acronym for SOund Navigation and Ranging. It includes any system that uses underwater sound, or acoustics, for observations and communications. There are two broad types of sonar:

- **Passive sonar** detects the sound created by an object (source) in the water. This is a one-way transmission of sound waves traveling through the water from the source to the receiver.
- **Active sonar** detects objects by creating a sound pulse, or ping, that transmits through the water and reflects off the target, returning in the form of an echo. This is a two-way transmission (source to reflector to receiver).

Sound exposure level (SEL): The total acoustic energy of a noise, it is calculated as the summation of energy over time.

Sound pressure level (SPL): A measure of the root-mean square, or "effective," sound pressure in decibels. SPL is expressed in dB re 1 μ Pa for underwater sound and dB re 20 μ Pa for airborne sound.

Source level (SL): The sound transmitted into the water by a sound source, such as an active sonar ping.

Spatial: Pertaining to space, or pertaining to distance such as spatial variation (variation over distance).

Submarine acoustic signature: The sound a submarine generates under water.

Substrate: The base on which an organism lives.

SURTASS LFA sonar: Long-range, all-weather low frequency sonar system composed of both active and passive components. SURTASS (Surveillance Towed Array Sensor System) is the passive component. LFA (Low Frequency Active) is the active component.

Temporal: Of or relating to time.

Temporary threshold shift (TTS): Very high sound levels may rupture the eardrum or damage the small bones in the middle ear. Lower-level exposures may cause permanent or temporary hearing loss, which is called a noise-induced threshold shift, or simply a **threshold shift (TS)**. A TS may be permanent, called a **permanent threshold shift (PTS)**, or temporary, called a **temporary threshold shift (TTS)**.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are listed in 50 CFR 17.12.

Transmission loss (TL): Energy losses that occur as the pressure wave, or sound, travels through the water. The associated wavefront diminishes due to the spreading of the sound over an increasingly larger volume and the absorption of some of the energy by seawater.

Uncontrolled Airspace: Airspace of defined dimensions in which no air traffic control services to either instrument flight rules or visual flight rules aircraft will be provided, other than possible traffic advisories when the air traffic control workload permits and radio communications can be established.

U.S. Territorial Waters: Sea areas within 12 nautical miles of the U.S. continental and island shoreline.

Volatile Organic Compound (VOC): One of a group of chemicals that react in the atmosphere with nitrogen oxides in the presence of heat and sunlight to form ozone; it does not include methane and other compounds determined by the U.S. Environmental Protection Agency to have negligible photochemical reactivity. Examples of volatile organic compounds include gasoline fumes and oil-based paints.

Warning Area: A designated airspace in which flights are not restricted but avoidance is advised during published times of use.

Wetlands: Lands or areas that either contain much soil moisture or are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include such areas as bogs, marshes, mud and tidal flats, sloughs, river overflows, seeps, springs, or swamps.

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