



# Understanding Acoustic Effects On Marine Mammals

## Science for Assessing Acoustic Effects

The US Navy is a world leader in marine mammal research, supporting research by many of the country's top marine and acoustic scientists. Not only does this Navy-funded research further the state of science regarding marine mammals, it also assists in understanding and reducing the potential effects of our actions on marine mammals. The Navy is steadfastly committed to environmental compliance and incorporates protective measures into training and daily operations to minimize potential effects on the environment.

## Regulations to Protect Marine Mammals

The Endangered Species Act (ESA) requires that all federal agencies, in consultation with the responsible federal wildlife agency, ensure that proposed actions, such as projects like the Undersea Warfare Training Range (USWTR), are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of their critical habitat.

If an agency's proposed action may affect an ESA-listed species or its critical habitat, the agency must initiate consultation with the responsible wildlife agency. For ESA-listed marine mammals that may be affected by operations on the USWTR, the National Marine Fisheries Service (NMFS) is the responsible agency.

Under the Marine Mammal Protection Act (MMPA), it is illegal, with limited exceptions, to "take" marine mammals in waters or on lands under US jurisdiction. The act further regulates "takes" of marine mammals in the global commons (i.e., the high seas) by vessels or persons under US jurisdiction. Under the MMPA, "take" means to harm, harass, hunt, capture, or attempt to harm, harass, hunt, or

capture any marine mammal. The ESA defines the terms "harm" and "harass" as follows:

- *Harm* is defined as "an act which actually kills or injures fish or wildlife."
- *Harass* is defined as "an 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, including breeding, feeding or sheltering."

For military readiness activities such as the proposed use of the USWTR, the relevant definition of "harassment" under the MMPA is any act that:

- "Injures or has significant potential to injure a marine mammal or marine mammal stock in the wild" (called *Level A harassment*), or
- "Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered" (called *Level B harassment*).

NMFS may authorize the incidental take of marine mammals if it will have a negligible impact on the species or stock.

## Determining Effects from USWTR Sonar Use

Potential effects to marine mammals from sonar use at the USWTR are categorized either as injuries (or potential injuries) or as behavioral disruptions. The definition of injury due to sonar is the onset of a permanent threshold shift (PTS), which is the smallest detectable amount of permanent hearing loss that occurs after sound exposure. The behavioral disruption is defined in two ways; as a change in behavior and as the onset of a temporary threshold shift

(TTS), which is a temporary reduction in hearing sensitivity. The latter effect is considered because a reduction in hearing sensitivity may impede an animal's ability to respond to biologically important sounds.

As sound energy dissipates with increased distance from a source, there is a decreasing risk of effect (and severity thereof) further from the source.

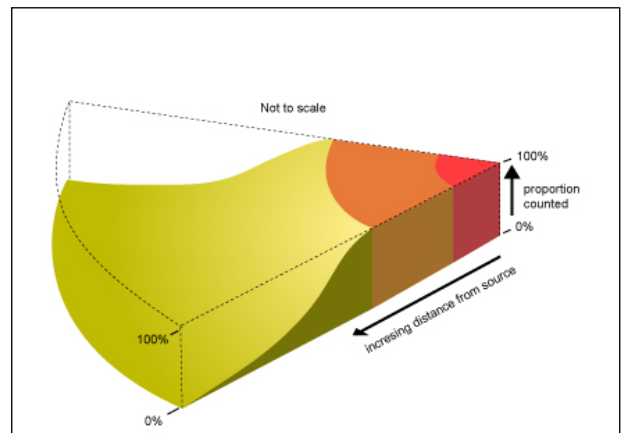
The figure on the right summarizes the framework used in the DEIS to categorize effects of sound on marine mammals associated with training with mid-frequency sonars at the proposed USWTR. This framework associates the level of sound a marine mammal might be exposed to (higher sound levels occur closer to the source) with levels of potential effects, using regulatory definitions from the MMPA. MMPA Level A and Level B zones are equated to the ESA harm and harassment zones, respectively, for the purposes of modeling marine mammal acoustic exposures.

### Factors That Influence Potential Effects of Sonar on Marine Mammals

Characteristics of the sound itself, how close the animal is to it, and how long it lasts (duration) are three factors that influence the effect of sonar on marine mammals.

### How Acoustic Effects from Sonar Were Modeled for the USWTR

The acoustic effect analysis is based on the best science available to estimate potential effects to marine mammals. The acoustic effects model used information about how sonar will be used on the USWTR along with site specific information about the seafloor, wind speeds, and marine mammal populations found at each alternative site. This information was used to calculate estimates of the number of individuals of each marine mammal species that would be exposed to sound levels that meet the Level A and Level B harassment criteria. Results were calculated on a per scenario basis and exposures were summed to annual totals.



General Relationships Between PTS, TTS, and Risk Function Harassment Zones

**PTS (Permanent Threshold Shift) -** Marine mammals predicted to receive a sound exposure at 215 dB of received energy or greater are assumed to experience PTS and are counted as Level A harassments.

**TTS (Temporary Threshold Shift)-** Marine mammals predicted to receive a sound exposure greater than or equal to 195 dB but less than 215 dB are assumed to experience TTS and are counted as Level B harassments.

**Behavioral Disturbance (without TTS) –** Marine mammals predicted to receive a sound exposure greater than or equal to 120 dB but less than 195 dB may experience behavioral disturbance at levels below that which may cause TTS. The probability of harassment is determined by comparing the maximum energy received to a 'risk' function. Marine mammals encountering such disturbance are counted as Level B harassments.

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