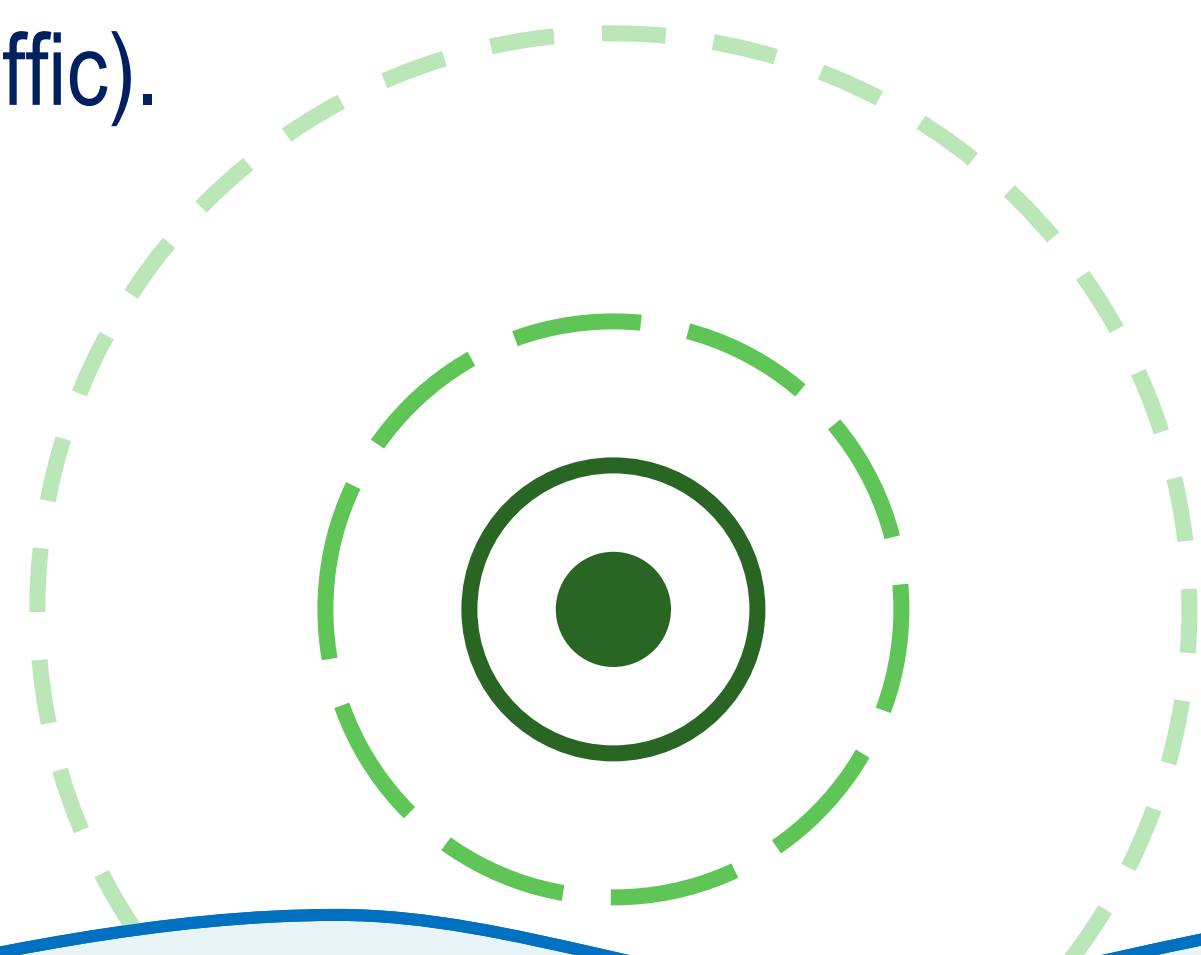


## BASICS OF UNDERWATER SOUND

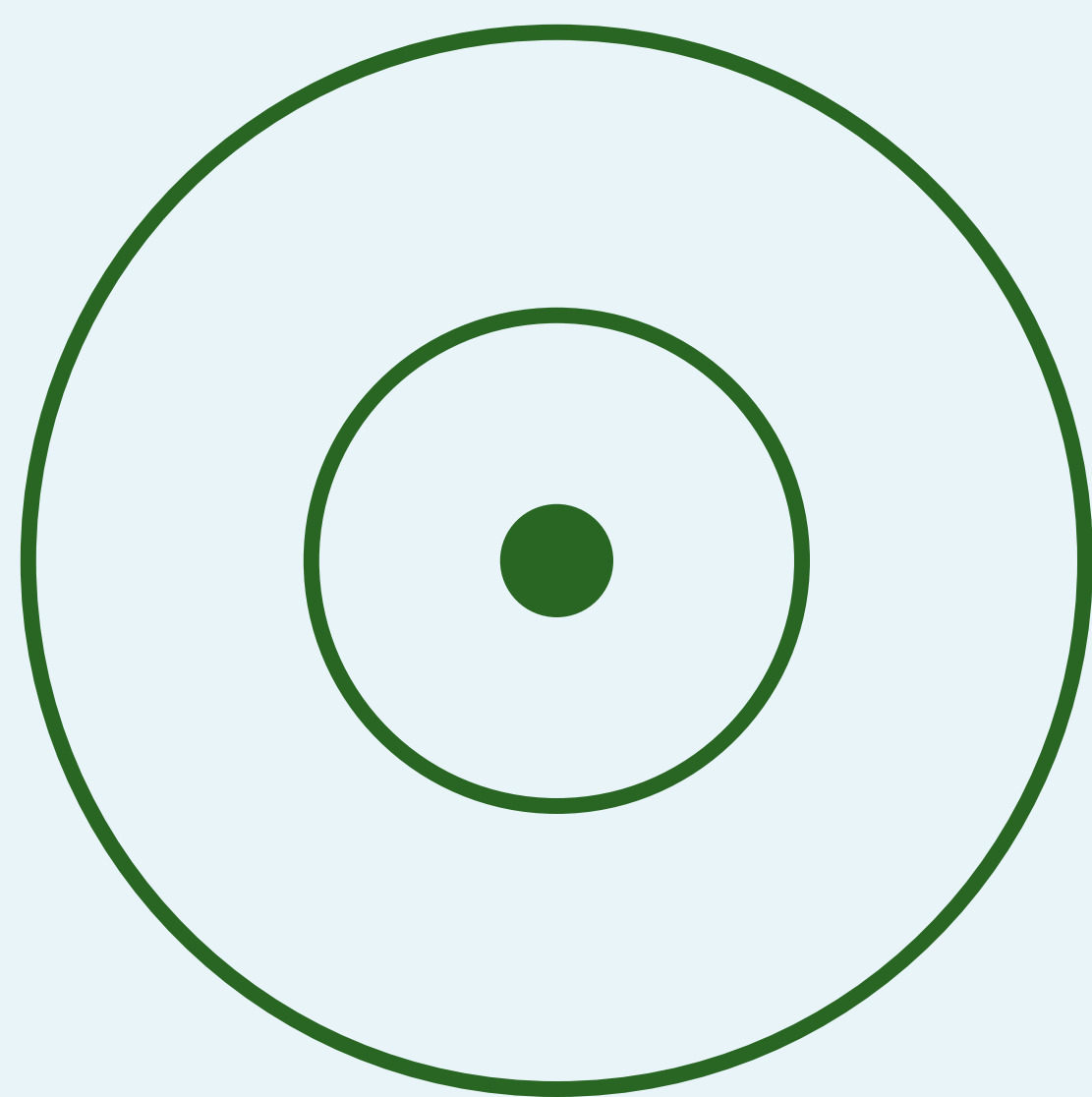


The marine and freshwater soundscape is comprised of natural biological sounds (e.g., sounds made by animals), natural physical sounds (e.g., weather and waves), and human-made sounds (e.g., vessel traffic).

In air, sounds are typically characterized by their loudness (intensity) and pitch (frequency). The physical differences between air and water result in the same sound having different intensity, pitch, and speed in water compared to in air. Sound travels much farther in seawater than in air; low-frequency sounds can travel hundreds of kilometers in seawater. Sound also generally travels over four times faster in seawater compared to in air.



**Speed of Sound in Air:** 340 meters per second (m/s)  
(760 miles per hour [mph])



**Speed of Sound in Seawater:** 1,500 m/s (3,500 mph)

**Sound intensity** is measured in decibels (dB) which are scaled using different reference pressures in air and water; therefore, decibels reported for sounds in air are different than underwater decibels. Decibel values of underwater sounds represent lower levels of intensity than the same decibel values of sound in air.

NOS activities could potentially contribute to the growing ambient sound levels of the ocean environment. Given the great differences between how a single sound is received and processed by different animals (receptors of sound), NOS determined that the impact of underwater sounds would be best assessed at the receptor level under each biological resource analyzed.