The Importance of Oceans

Of all the great discoveries about the ocean, the two most significant may be, first, that all life on Earth—including our own—is dependent on the ocean; and second, that the ocean does not have an infinite capacity to absorb the wastes we allow to flow into it; so we are fully recover from the millions of tons of wildlife that we extract from it. We as a society have the capacity to alter the nature of the ocean and thus affect the basic resources that make Earth hospitable for life. This knowledge alone is reason enough to ensure that our children become ocean literate.

The ocean contains 97 percent of Earth's water and yields vapor to the atmosphere that eventually returns as fresh water in the form of precipitation. The living ocean carries the sun's heat and, weather, stabilizes temperatures, governs planetary chemistry, comprises more than 97 percent of all water in the accessible liquid water—the oceans. The ocean is the biochemical weather station—and generates more than 70 percent of the atmospheric oxygen. Estimates of the number of species and species of animals in the ocean suggest a much richer and more diverse caudaceus of life than had previously been supposed. An estimated 10 to 50 million species are yet to be found in the ocean. In contrast, all known land and aquatic organisms together total only about 15 to 20 million species.

"The oceans belong to everyone. Teachers are the greatest natural resource we have on planet Earth; they are the ones who will ultimately save our oceans."

GIL GROSVENOR
Chairman, National Geographic Society
Our Precious Oceans

Liking oceanography with geography—the study of the oceans with the study of the Earth—is a key step on the path to ‘ocean literacy’. Indeed, the synergy between the two disciplines invites science and social-studies teachers to enrich and cross-promote one another’s core curriculum. As science teachers learn to present ocean processes and life forms within a geographic context, their counterparts discover why an understanding of the life, physical, and earth sciences can form such a strong thread in the social fabric.

The ultimate goal of this cross-pollination of ideas is a fairly simple one: to help students comprehend how and why all life on Earth arises—from and remains dependent on our precious oceans.

About this brochure

In 1994, a broad sampling of educators, parents, and other concerned citizens got together to identify the critical subject matter skills, and perspectives that all kids in the United States should master to achieve a high level of geographic literacy. These 18 voluntary standards for geography education are organized into six “essential elements: 1. the world in spatial terms; 2. places and regions; 3. physical systems; 4. human systems; 5. environment and society; 6. uses of geography.

The Scope and Sequence Chart inside was developed using the national geographic standards and essential elements as the basis to identify and organize key ocean concepts. These concepts are introduced at various stepping stones in a child’s voyage of discovery, from kindergarten to 12th grade. If you are a teacher, a parent, or a curriculum writer, you can use this tool to monitor and encourage a student’s progress throughout that learning journey.

It may take time for textbooks, curricula, and standard testing regimes to catch up with the needs of a swiftly changing world and impart a sense of the ocean’s significance to all people. Through your immediate impact on the next generation of the planet’s caretakers, you have unique opportunities to shape the future of the ocean—right now.
### Oceans Scope and Sequence

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#### 1. THE WORLD IN SPATIAL TERMS

**Oceanography studies the relationships between life, places, and environments by mapping information about them into a spatial context.**

- **Location of nearby bodies of water and watersheds** (e.g., ponds, lakes, streams, rivers, etc.)
- **Location of significant rivers, estuaries, and watersheds** (e.g., Amazon, Ganges, Colorado, Mississippi, Nile)
- **Location of major world oceans, seas, gulfs, bays, and gulfs** (e.g., Arctic, Baltic, Mediterranean, Red Sea, Gulf of Mexico)
- **Oceans as three-dimensional habitats** (e.g., water depth, volume)
- **Distribution of water** (e.g., more than 70% of the Earth's surface, ocean basin terminology)

#### 2. PLACES AND REGIONS

**Oceans and other bodies of water have physical and biotic characteristics which are used to define habitats and regions.**

- **Characteristics of ocean habitats** (e.g., coastal, estuarine, shelf, slope, abyssal, polar)
- **Characteristics of oceans and ocean ecosystems and habitats** (e.g., salinity, dissolved oxygen, temperature, nutrients)
- **Concepts of regions as applied to oceans** (e.g., watersheds, continental shelves)

#### 3. PHYSICAL SYSTEMS

**Physical processes shape the ocean and all Earth systems to create, sustain, and modify ecosystems.**

- **The oceanographic cycle** (e.g., ocean transport, circulation, evaporation, precipitation)
- **Ocean influence on weather and climate** (e.g., changes in oceanic circulation, sea surface temperature)
- **Ocean floor features and processes** (e.g., plate tectonics, volcanic activity, continental margins, oceanic ridges, abyssal plains)
- **Earth/Sun and Earth/Moon relationships** (e.g., seasons, global weather patterns, tides, water cycles)
- **The biological ocean** (e.g., food webs, carbon cycle, biodiversity, biogeochemical cycles)

#### 4. HUMAN SYSTEMS

**Oceans and humans are interconnected (politically, economically, culturally, spatially, and temporally).**

- **Introduction to marine resources** (e.g., fishing, aquaculture, ocean energy, coastal development)
- **Human influences on the ocean** (e.g., climate change, pollution, biodiversity loss)
- **Impact of ocean processes on the location and outcome of historic events** (e.g., tsunamis, storms, hurricanes)
- **Ocean themes in literature, art, and music** (e.g., environmental, social, historical)

#### 5. ENVIRONMENT AND SOCIETY

**The ocean and other bodies of water are modified by human activities, largely as a consequence of the ways in which human societies value and use Earth's natural resources, and human activities are also influenced by the ocean's physical and chemical processes.**

- **Changes in ocean/land area distribution over time** (e.g., ice sheet change, island formation)
- **Influence of oceanography on past events** (e.g., climatological, archeological)
- **Impact of ocean processes on the location and outcome of historic events** (e.g., tsunamis, storms, hurricanes)

#### USES OF GEOGRAPHY

**Knowledge of oceanography enables people to understand the relationships between life, places, and environments over time—that is, of Earth as it was, is, and might be.**

- **Use of spatial representations and technology** (e.g., digital mapping and Global Positioning System (GPS))
- **Location and patterns of ocean characteristics** (e.g., currents, tides, seafloor topography)
- **Use of other ocean measurement technology** (e.g., underwater acoustics, measurement tools)
- **Analysis of regional ocean issues and problems** (e.g., overfishing, coastal erosion, marine biodiversity)
- **The role of oceans in human development** (e.g., economic, social, cultural)
- **Human impacts on the ocean** (e.g., pollution, coastal development, climate change)
- **Ocean themes in literature, art, and music** (e.g., environmental, social, historical)

Note: This table is based on the Ocean Literacy Curriculum Framework (2013). The curriculum is designed to help educators teach ocean science in a way that is relevant, engaging, and practical. The framework is intended to be flexible and adaptable to meet the needs of different educators and learners. It emphasizes the interconnectedness of the ocean and its ecosystems with human societies and cultures, and highlights the importance of understanding ocean processes and their impacts on the environment and human well-being. The curriculum is available for download from the National Ocean Service (NOS) website.