

WHAT WE KNOW ABOUT THE "GARBAGE PATCHES"



Andrea Neal, PhD

PACIFIC OCEAN "GARBAGE PATCHES"

"Garbage patches" – Inaccurate nickname given to open ocean areas where marine debris concentrates.

What's in a name? - The name "garbage patch" is a misnomer. There is no island of trash forming in the middle of the ocean nor a blanket of trash that can be seen with satellite or aerial photographs. This is likely because much of the debris found here is small bits of floating plastic not easily seen from a boat.

Eastern garbage patch - Concentrations of marine debris have been noted in an area midway between Hawai'i and California known as the North Pacific Subtropical High or the "eastern garbage patch." The High is not a stationary area, but one that rotates, moves, and changes.

Western garbage patch - Another area of marine debris concentration is located off the coast of Japan, and researchers believe it to be a small recirculation gyre (ocean feature made up of currents that spiral around a central point) likely created by winds and ocean eddies.

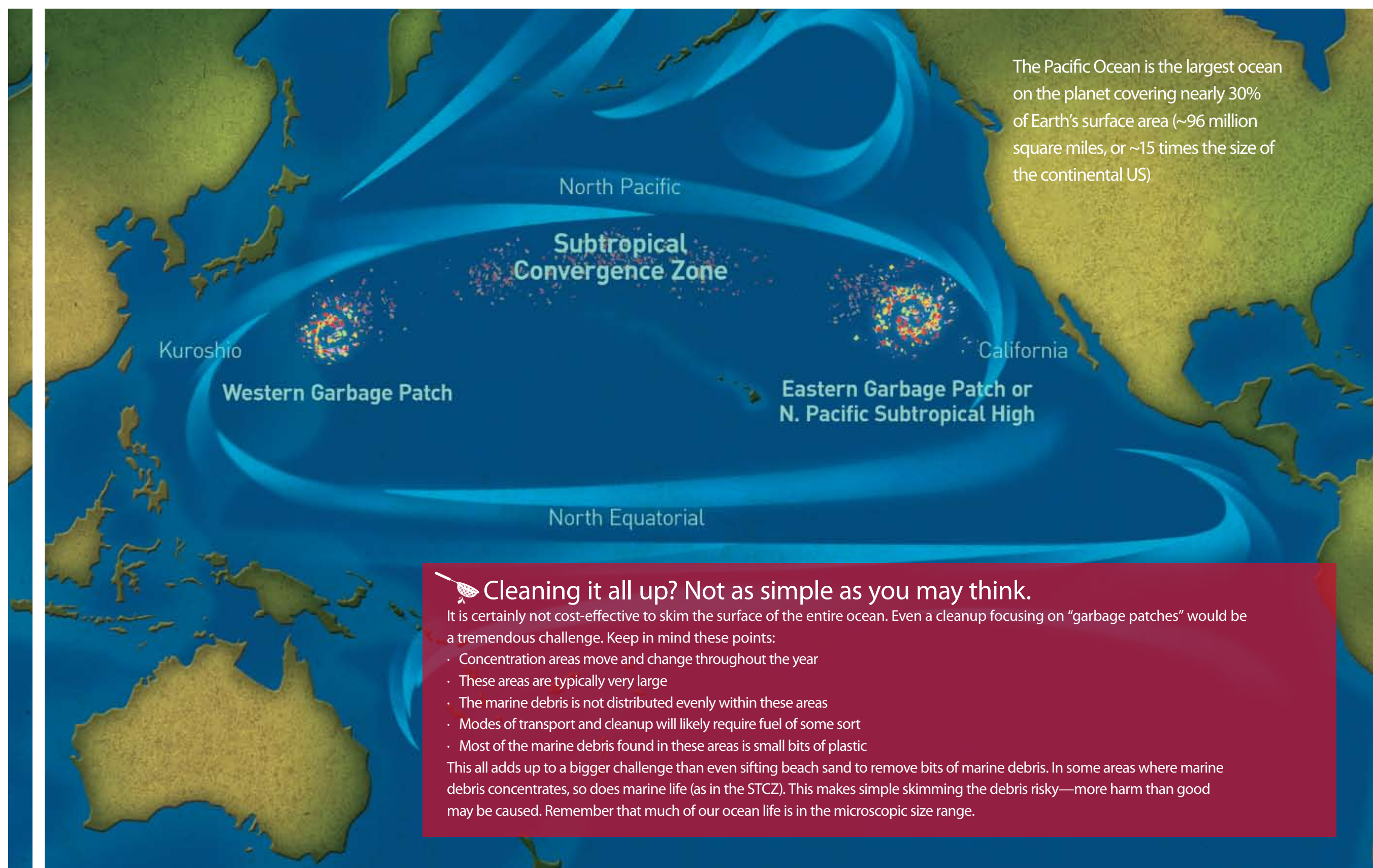
OTHER AREAS? OTHER OCEANS?

The "patches" are not the only open ocean areas where marine debris is concentrated. Another important area is the North Pacific is the Subtropical Convergence Zone (STCZ). This area, located north of the Hawaiian archipelago, has a high abundance of marine life, is a known area of marine debris concentration, and is one of the mechanisms for accumulation of debris in the Hawaiian Islands (Pichel et al., 2007).

Oceanographic features similar to the North Pacific Subtropical High and STCZ exist in other oceans of the world. Little research to date has been conducted on marine debris in these areas. Because of this no one can say for sure how large these areas are, especially since they move and change, sometimes daily, and no accurate estimate exists of how much debris is out there.

Regardless of the exact size, mass, and location of these areas of concentration, man-made litter and debris do not belong in our oceans or waterways.

For more information & details please visit www.MarineDebris.noaa.gov/info/patch.html



Cleaning it all up? Not as simple as you may think.

It is certainly not cost-effective to skim the surface of the entire ocean. Even a cleanup focusing on "garbage patches" would be a tremendous challenge. Keep in mind these points:

- Concentration areas move and change throughout the year
- These areas are typically very large
- The marine debris is not distributed evenly within these areas
- Modes of transport and cleanup will likely require fuel of some sort
- Most of the marine debris found in these areas is small bits of plastic

This all adds up to a bigger challenge than even sifting beach sand to remove bits of marine debris. In some areas where marine debris concentrates, so does marine life (as in the STCZ). This makes simple skimming the debris risky—more harm than good may be caused. Remember that much of our ocean life is in the microscopic size range.

"GARBAGE PATCH" RECIPE

- Floatable marine debris from land- and ocean-based sources (e.g., tiny pieces of plastic)
- Ocean and atmospheric conditions suitable for the concentration of marine debris (e.g., waters rotating—large or small area, fast or slow rotation—in a cyclone-like fashion)



Andrea Neal, PhD

Debris collected in a trawl of nearly seven miles of ocean surface in the N. Pacific. The volume of water that passed through the trawl net was ~1.5 times the volume of water in an olympic-sized swimming pool.

WHAT CAN I DO?

- Be responsible for all of your trash on land and on the water. Dispose of items properly.
- Get involved! Participate in local cleanups in your area.
- Remember that the land and sea, no matter where you are, are connected.



- Reduce the amount of waste you produce.
- Reuse items whenever possible. Choose reusable items over disposable ones.
- Recycle as much as possible. Bags, bottles and caps, cans, cell phones, ink cartridges, and many other items can be recycled.

MAIN INGREDIENT = PLASTIC DEBRIS

Why such a common ingredient? Likely because of the abundance of plastics and the fact that some common types of plastic float.

Do plastics degrade in the ocean? In general, yes*; however there are many things to note. A few points to consider (Singh and Sharma, 2008):

- There are MANY types of plastic, and thus many different chemical compositions
- Degradation rates depend on chemical composition, molecular weight, additives, environmental conditions, etc.

Based on research to date, most commonly used plastics do not ever fully "go away"*** but rather break down into smaller and smaller pieces (A. Andrady, pers. comm.). Also keep in mind that many of the bio-based and truly biodegradable plastics break down in a compost pile or landfill, but not necessarily in the ocean.

* Degradation here is defined as a process leading to deterioration of the physical properties of a plastic polymer (Bovey and Winslow, 1979).
 ** Here, "go away" refers to a process called mineralization, or the full conversion of all breakdown products into carbon dioxide, water, and small inorganic molecules (Andrady, 2003).

For more information & details please visit www.MarineDebris.noaa.gov/info/plastic.html

For more information please visit www.MarineDebris.noaa.gov

References
 Andrady, Anthony. 2003. Plastics and the Environment. New Jersey: John Wiley & Sons, Inc.
 Andrady, Anthony. 2009. Personal communication. Research Triangle Institute (RTI) International.
 Bovey, F. and F. Winslow. 1979. Macromolecules – an introduction to polymer science. London: Academic Press. pp. 423-430.

Pichel, W. J., Churnside, T., Venetris, D., Foley, K., Friedman, R., Baskand, J., Nicol, D., Zheng, and P. Clemente-Colon. 2007. Marine debris collects within the North Pacific Subtropical Convergence Zone. Marine Pollution Bulletin 54: 1207-1211.
 Singh, B. and N. Sharma. 2008. Mechanistic implications of plastic degradation. Polymer Degradation and Stability 93: 561-584.

