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RE: **Plastic Marine Debris: Challenges and Future Actions**
Briefing Paper for Meeting of June 10, 2005

Recent studies have revealed the problem of plastic in the ocean to be more pervasive and insidious than previously imagined, with implications for the marine food web.

Why focus on plastic?

The qualities that make its use so widespread – durability, light weight, low cost – also have caused it to become by far the most serious marine debris problem. Estimates are that from 60-80% (and 90-95% in some areas)[i] of marine debris is plastic, as is 90% of all floating debris.[ii]

U.S. resin production soared from 6 billion pounds per year in 1960 to 108 billion pounds in 2000[iii], and only a small percentage (5%) get recycled.[iv] The abundance of plastic disposable goods combined with improper disposal has led to the proliferation of plastic in places it doesn't belong. And because plastic is durable and lightweight, it is easily carried by wind and currents and can circulate continuously in the open sea, where it is mistaken for food by birds and fishes. Over time plastic photodegrades – breaks down into progressively smaller pieces – but it never fully biodegrades. Broken, degraded plastic pieces outweigh surface zooplankton in the central North Pacific by a factor of six to one, i.e., six pounds of plastic for every single pound of zooplankton.[v] It is a global phenomenon affecting all oceans and shorelines.[vi] Even the beaches of uninhabited islands in the middle of the Pacific are littered with plastic debris, as are the waters and shores of remote Antarctica. Plastic affects the entire body of the ocean: it floats on the surface, is present throughout the water column, and settles in bottom sediments.

Impacts of Plastic Marine Debris

Plastic marine litter poses a growing threat to marine life and its biological diversity. One of the ways this threat manifests is by causing damage and death to marine wildlife, including endangered or protected species. Marine litter harms a significant number of marine species – 267 worldwide by one estimate.[vii] Given the quantities of small plastic pieces floating in the ocean, the potential for ingestion is enormous. For example, 90% of Laysian Albatross chicks surveyed had plastic in their stomachs – a significant source of mortality.[viii] The continued survival of endangered sea turtles is also threatened by ingestion of plastic; studies have found as many as 75% with plastic debris in their digestive tracks.[ix] Entanglement is another serious problem. Scientists have estimated that 100,000 marine mammals are killed by entanglement in plastic each year in the

North Pacific.[x] Population declines for a variety of marine mammals have been attributed to plastic entanglement.[xi]

A 2001 study found that plastic resin pellets absorb toxic chemicals such as PCBs and DDE at up to one million times background levels, becoming a potential source of toxins to the marine organisms that ingest them.[xii] Since plastics are ingested by filter-feeding organisms at the base of marine food chains, this finding may have repercussions throughout the marine food web, including implications for human health. Plastic litter is also known to transport invasive species.[xiii]

In addition to environmental and health impacts, plastic marine litter has great economic costs. For commercial and recreational fisherman, floating debris is a hazard that can damage boat propellers and clog seawater intakes. In a survey of fisherman in Oregon, 58% had experienced vessel problems due to plastic marine debris.[xiv] Since tourism is such a large part of California's coastal economy, coastal cities and counties spend millions of dollars per year cleaning debris off beaches. Beaches and shorelines that are littered with debris may result in lost tourism dollars for the surrounding communities.

Sources of Marine Debris

Marine debris originates from both land-based and ocean-based sources. Land-based sources include littering, storm water runoff, coastal municipal landfills, transport of garbage, open trash collection containers, industrial facilities, and beach-goers. Ocean-based sources include commercial and recreational fishing, overboard disposal of passenger and commercial shipboard waste, and cargo containers falling off ships in high seas. The majority of marine debris appears to come from land-based sources (approximately 80%).[xv]

Plastic Debris: Rivers to Sea Project

The Coastal Commission is working in partnership with the Algalita Marine Reseach Foundation on a two-year effort funded by the State Water Board to assess plastic debris loading and sources of plastic and trash in the Los Angeles and San Gabriel Rivers. The project involves working with plastic manufacturers and municipalities to develop best management practices, and bringing together stakeholders to develop a California Action Plan to reduce land-based sources of marine debris. The Plastic Debris: Rivers to Sea conference, to be held September 7-9, 2005 in Redondo Beach will involve scientists, government officials, industry and environmental activists. The conference is cosponsored by the Heinz Center.

Public Education Efforts

Education is one of the keys to solving the marine debris problem. Examples include the International Coastal Cleanup, for which the Coastal Commission coordinates California Coastal Cleanup Day, and the year round Adopt-A-Beach Program. These and other public education efforts should be expanded.

The State Water Resources Control Board's Erase the Waste campaign is designed to reduce storm water pollution, including plastic debris and other trash, in Los Angeles County. The two-year, $5 million campaign began in August 2003, and encourages residents to be part of the "pollution solution" by adopting simple, everyday actions.

Regulatory Approaches

The Los Angeles Regional Water Quality Control Board developed Total Maximum Daily Loads (TMDLs) for trash in three watersheds; these TMDLs, however, only address the larger pieces of plastic that are easily recognizable as trash (>5mm), and not the small plastic pieces and resin pellets. The State Water Board placed Orange County beaches on its 2002 monitoring list to evaluate the presence of trash there.

The majority of land-based sources of plastic debris are located in urban areas, which are regulated under storm water permits issued by the Water Boards. State Water Board staff is currently evaluating language in storm water permits and in the California Ocean Plan in order to propose improvements to further limit plastic wastes discharges.

Recommendation for the Future

The public education and regulatory approaches described above are important steps in the right direction, but are inadequate to address the scope of the problem. It has been almost 20 years since a statewide effort produced the California Marine Debris Action Plan. It is time for a renewed, systematic, coordinated effort to look at the various mechanisms through which debris ends up in the ocean, to identify key players, to devise solutions appropriate for each source, and then to follow-up with implementation. The action planning component of the Plastic Debris: Rivers to Sea project is a first step, but that project is nearing the end of its funding. The Ocean Protection Council should support the next step – building upon this coordinated planning and implementation effort to ensure that California maintains a leadership role in addressing this important environmental problem.

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[ii] Derriak, J.G.B. 2002. The pollution of the marine environment by plastic debris: a review, Marine Pollution Bulletin 44, 843.

[iii] The Resin Review 2000 Edition, American Plastics Council, Washington, D.C. 2001

[iv] U.S.E.P.A. Municipal Solid Waste Generation in the U.S.: 2001 Facts and Figures. EPA 530-S-03-011,7.

[v] C. J. Moore, *et al*, 2001. A Comparison of Plastic and Plankton in the North Pacific Central Gyre, Marine Pollution Bulletin, 42, 1297-1300.

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[xii] Mato, Y. *et al*, 2001. Plastic Resin Pellets as a Transport Medium for Toxic Chemicals in the Marine Environment. Environ. Sc. Technol. 35, 318-324.

[xiii] Derraik, 2002

[xiv] Recht, F. 1988. Dealing with Annex V – A Reference Guide for Ports. US Dept. of Commerce, Wa. DC

[xv] U.S. Dept. of Commerce and U. S. Navy (1999). *Turning to the Sea: America's Ocean Future*, p. 56.