WATERSHEDS AND HEALTHY REEFS:

Making the connection

Coral reefs are one of the world's most productive ecosystems, providing valuable resources including fisheries, coastal protection and tourism income. In order to survive, coral reefs need specific environmental conditions, such as low nutrient and sediment levels. These conditions can easily be altered by the content and quantity of water that flows through watersheds and into coral reef waters. Human activities, including deforestation, agriculture, coastal development and dam construction have altered the natural flow of watersheds, putting coral reefs at risk. In addition, pollutants, such as sewage and chemical fertilizers, make their way to reefs through watersheds, endangering not only coral reefs, but also human health. By effectively managing watersheds, we can protect both the health of coral reefs and the people who depend on them.

HOW IS WATERSHED POLLUTION THREATENING CORAL REEFS?

Land development alters natural water flows leading to erosion and greater amounts of fresh water, nutrients, and sediments reaching coral reefs. The three largest impacts on reefs from watersheds are agricultural industry inputs, sewage, and sedimentation:

- Ineffective management of agriculture, sewage, and land-use has created excessive loads of sediment and nutrients in the watershed.
- Land alterations, such as deforestation and large-scale agriculture have increased the overall amount of runoff received from the watershed and increased sediment and nutrients levels.
- Dam construction and extraction of water for agriculture have altered river and stream water flows to the ocean and changeed levels of sedimentation.

Recovery of coral reefs from pollution is dependent upon many factors such as the nature, intensity, and frequency of the disturbance, as well as the composition of reef species, the availability of species to reproduce, and other environmental variables needed for coral reproduction. Once the watershed is managed properly, it can take years to decades for a reef to recover.

WAYS TO EFFECTIVELY MANAGE WATERSHEDS AND PROTECT CORAL REEFS

Local Solutions Include:

1. **Dispose of sewage and storm water properly.** Build and maintain waste water treatment plants and ensure plants are not are overloaded, malfunctioning, or have outfalls that are incorrectly positioned.
2. **Establish Marine Protected Areas (MPAs).** Coral reef communities that are protected from multiple stresses are more likely to recover faster from any single disturbance.
3. **Promote more sustainable land-use practices.** Support the implementation of Integrated Coastal Zone Management (ICZM). ICZM is an approach to develop and implement environmentally, culturally, and economically sustainable uses of the coastal zone. For more information see ICRAN Issue Brief: Coral Reefs, Coastal Development, and Coastal Zone Management.

ICRI

CORAL
THE CORAL REEF ALLIANCE
www.coral.org • 1-888-CORAL REEF

ICRAN
International Coral Reef Action Network
www.icran.org

International Policies & Agreements Supporting Management of Watersheds and Reefs:
Policies listed below support the implementation of ICZM and watershed management.

- The Montreal Declaration on the Protection of Marine Environment from Land-based Activities
- The Convention on Biological Diversity
- Agenda 21, United Nations Conference on Environment and Development (UNCED): Earth Summit
- The Convention on Wetlands, otherwise known as the Ramsar Convention

International Policies & Agreements Supporting Management of Watersheds and Reefs:

- Cartagena Convention for the Protection and Development of the Marine Environment
- Jakarta mandate on the "Conservation and Sustainable Use of Marine and Coastal Biological Diversity"
- Barbados Programme of Action from the Global Conference on the Sustainable Development of Small Island Developing States
- The Protocol for Specially Protected Areas and Wildlife (SPAW)

EFFECTIVE WATERSHED MANAGEMENT AND INPUT REDUCTION:
BENEFITS TO REEFS AND PEOPLE

Inputs from watersheds into coral reef waters	Benefits to the reef by reducing input	Benefits to humans by reducing input
Agricultural Industry Inputs Water discharged from agricultural sites contains herbicides, fungicides, pesticides, and nutrient fertilizers. Nutrient levels and pesticide concentrations in watersheds can be greatly elevated from unmanaged agricultural wastewater. Nitrogen and phosphorus from fertilizers are the main nutrients deposited in waterways.	1. Reduces excess nutrients and prevents algae from growing over corals and blocking sunlight. 2. Decreases risk of toxic algal blooms. 3. Reduces threats from pesticides, herbicides, and fungicides that accumulate and weaken immune systems in corals and other reef animals and plants. 4. Protects biodiversity.	1. Reduces cancer risk from nitrates and pesticides, herbicides, and fungicides in contaminated drinking water. 2. Increases availability of other natural resources such as fresh water through sustainable agriculture practices.
Sewage Sewage is made up from solid and liquid human waste, which contains nutrients, bacteria and viruses. Sewage enters reef systems from rivers and outfall pipes (point source) as well as runoff and ground water (non-point source). Sewage discharged into waterways is often minimally or not treated.	1. Decreases diseases associated with contamination of marine life from synthetic hormones. 2. Decreases coral disease caused by fecal bacteria, such as White Band Disease. 3. Protects biodiversity. 4. Reduces water cloudiness, which improves coral feeding, reproduction, and overall health.	1. Decreases infectious diseases related to bathing and swimming in coastal waters contaminated with sewage discharge. 2. Decreases infectious diseases associated with the consumption of seafood harvested from coastal waters. 3. Improves quality of drinking water by reducing the presence of fecal coliform bacteria.

For more information contact:
The Coral Reef Alliance (CORAL) • info@coral.org • www.coral.org