MARINE TOURISM BEST MANAGEMENT PRACTICES

A PRACTICAL GUIDE FOR PUGET SOUND

PEOPLE FOR PUGET SOUND

Sound Tourism — Sound Environment

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MARINE TOURISM BEST MANAGEMENT PRACTICES

I. What Are Environmental Best Management Practices (BMPs)?

Environmental Best Management Practices (BMPs) are those practices selected by a systematic process and judged as good, exemplary or successfully demonstrated to reduce negative impacts on the environment.

"Best" is a contextual term. Those practices adopted by your tourism business will depend on what stage of development you are in, as well as your executive commitment. This commitment presumes a willingness to strive for a level of performance that exceeds basic regulatory compliance requirements or common standards of practice *(Catalogue of Exemplary Practices in Adventure Travel and Ecotourism,* www.canadatourism.com*)*.

The marine tourism BMPs apply to the following marine tourism subsectors:

1. Kayaking
2. Diving
3. Pleasure tour vessels
4. Whale watching operations
5. Cruise Ships
6. Marinas
7. Charter Fishing

II. Why Adopt BMPs?

The Services of Nature: Puget Sound is a system contained within a system — called Earth. This system is the foundation of our entire economy. Our local habitats, similar to your home, provide "ecological services," to all of us, many of which cannot be replaced by technology. Even if they could be replaced by technology, it would involve economic costs society would be unwilling or unable to bear.

These ecological or ecosystem services include:

- Purification of air and water
- Mitigation of floods and drought (through wetlands and other vegetation and soils)
- Detoxification and decomposition of waste
- Generation and renewal of soil and soil fertility
- Pollination of crops and natural vegetation
- Control of potential agricultural pests
- Dispersal of seeds and translocation of nutrients
- Maintenance of biodiversity
- Protection from the Sun's ultraviolet rays

- Partial stabilization of climate
- Moderation of temperature extremes and the force of wind and waves
- Supports diverse human culture
- Provides aesthetic beauty

(Daily, G, ed. 1997. *Nature's services: Societal dependence on natural ecosystems.* Washington, D.C.: Island Press)

Poorly managed tourism activities can seriously degrade Puget Sound's near shore environment, which is the very resource that provides the tourism industry with revenue, aesthetic values and is the place we call home.

Efficiency and Community Integration

As a corollary, BMP adoption will reduce your operating expenses, provide meaningful public relations opportunities and signal your positive value system to staff, customers and the community which makes your business viable. You can think of your business as having an implicit partnership with the Puget Sound ecosystem, including the people whose survival depends on its healthy functioning.

III. Organizing Principles

The BMPs embody two components: *Operating Procedures* and *Purchasing Strategies.*

(A) Operating Procedures include:

1. Office Management
2. Building and Site Design, including Hazardous Waste Management
3. Landscaping and Organics Management
4. Energy Use
5. Water Use
6. Vessel Management (engine/fuel choice, cleaning, repair and maintenance; oil spill prevention; bilge management)
7. Effluent and Discharge Management
8. Interactions with Wildlife

Site Design or How You Design and Maintain Your Property (Stormwater)

What is the Issue? Impervious surfaces such as concrete and asphalt interrupt the natural flow of rain and snow (part of the *hydrologic cycle)*, causing pollutants to flow directly, untreated, to Puget Sound.

Why do I care? The oils, heavy metals and chemicals that flow off the land impair aquatic ecosystems, can make swimmers sick, close shellfish and other fisheries and exacerbate flooding. Loss of sport and commercial fish stocks have tremendous

economic and social ramifications. Stormwater infrastructure is also expensive to build and maintain.

The practices:

- Reduce the amount of impervious surfaces on your lot
- Wash vehicles at a commercial car wash
- Remove all or part of your lawn and replace with native plants
- Disconnect downspouts from your building from the storm drain system and direct runoff to landscaped areas ("disconnectivity")
- If you are on a septic system, maintain your system
- Reduce or eliminate chemical fertilizers, pesticides and herbicides
- Use Low Impact Development (LID) techniques, such as:

    1. Bioretention cells (surface runoff is directed into shallow landscaped Depressions)
    2. Amending soils with compost
    3. Pervious (porous) substrates
    4. Grass or gravel pavers or paving blocks for parking areas and alleyways
    5. Rainbarrels to collect roof runoff

See the Puget Sound Action Team's website and look for LID case studies, technical manuals and other related materials: www.psat.wa.gov/Programs/LID.htm and 800-54-SOUND.

(B) Environmentally Preferable Purchasing (EPP) Strategies

Environmentally Preferable Purchasing is a method for incorporating environmental specifications into your purchasing system. EPP means products or services that have a lesser effect on human health and the environment when compared with competing products, while meeting effectiveness and cost considerations.

Tourism businesses, as non-manufacturing businesses, have the opportunity and power through EPP to:

- Reduce negative impacts on the environment
- Reduce operating expenses
- Consolidate product purchases
- Reduce risk of injury to staff and guests
- Reduce liability

As you review these BMPs, think about how you can purchase (using bid specifications), products that:

- Are made with less energy
- Made with less materials (but deliver the same service, like cleaning)
- Are made with recycled materials
- Use renewable resources (not fossil fuels)
- Have extended durability and reuse potential
- Contains no toxics or less toxic chemicals

For examples of how to establish an environmentally preferable purchasing program, visit the Pacific Northwest Pollution Prevention Resource Center (PPRC) at www.pprc.org or call them at (206) 352-2050. You can also join a listserve devoted to this topic at www.nerc.org/eppnet.html or (802) 254-3636.

IV. ORGANIZATION OF REPORT

The report is organized according to each marine tourism sector. It begins with a profile of a Puget Sound tourism business that has adopted environmental practices. Extended practices to illustrate the highest level of best management practices, with accompanying resource information, is incorporated into each section as well as at the end of the document.

V. BEST MANAGEMENT PRACTICES FOR MARINE TOURISM COMPANIES

KAYAKING: Alki Kayak Tours

Company Profile: Alki Kayak Tours is devoted to guided sea kayaking adventures in West Seattle while maintaining and enhancing essential ecological processes, biological diversity, and the water quality of Elliott Bay.

From Alki Kayak Tours website:

Commitment to Puget Sound

Alki Kayak Tours is committed to the conservation and preservation of the Puget Sound as a working marine ecosystem that supports the industries of Seattle as well as the spawning salmon headed up the Duwamish River. Our guides provide an additional set of eyes on the Sound looking over its well-being for preventable ecological harm. We utilize best management practices and focus on leaving the smallest possible ecological footprint when operating tours. The tours are a forum where the Puget Sound community and tourists alike can discuss and learn about the history and ecosystems of the Sound. AKT offers meaningful commentary with a goal of having every paddler will leave with a greater understanding and appreciation for our unique corner of the world.

Alki Kayak Tours operate within a minimal ecological footprint, and provide guests with exciting and educational adventures. Sustainable practices will lend to the longevity of the aesthetics of the touring locations as well as provide a model for others in the local tourism industry.

1. Waste Management Program

Alki Kayak Tours uses the following guidelines:

- Provide regular waste disposal station for guests that include clearly labeled recycling for all suitable materials.
- Business operations incorporate recycled products into the consumption stream whenever possible.
- Business operations recycle all suitable materials as an every day practice.
- Minimize production of solid waste materials whenever possible.
- Store any hazardous materials in labeled containers in a contained area and use until completely gone. Dispose of hazardous materials and associated containers per manufacturer's instructions as well as federal, state, and local regulations.

2. Water Conservation Program

Alki Kayak Tours will minimize unnecessary water usage by implementing the following actions with regards to water consumption:

- Maintain water using equipment in good condition.
- Repair water leaks promptly.
- Cover and re-use water for equipment fresh rinse as opposed to refilling the rinse tank daily.
- Wash vehicles at facilities which reclaims water back into the washing system.
- Rinse kayaks over a grassy area to provide runoff for vegetation. Use as little water as necessary when rinsing kayaks.

3. Procurement Program

Alki Kayak Tours utilizes its procurement process to minimize associated waste. The following guidelines direct materials and supplies purchasing:

- Purchase items locally when at all possible to minimize unnecessary packaging and shipping wastes.
- Minimize the use of hazardous materials by researching contents of products.
- Utilize non-hazardous materials for business operations when at all possible. Store any hazardous materials in labeled containers in a contained area and use until completely gone. Dispose of hazardous materials and associated containers per manufacturer's instructions as well as federal, state, and local regulations.
- Purchase recycled or re-usable materials when they are available for business consumables.

4. Energy Savings Program

Alki Kayak Tours uses the following guidelines to minimize energy use associated with operations:

- Encourage ridesharing and use of public transit and the Elliott Bay water taxi for accessing the tours.
- Minimize vehicle trips, rideshare among Alki Kayak Tours associates.
- Utilize and acquire efficient appliances and office machines for associated business necessities.

5. Wildlife Interaction Program (courtesy of the *Watchable Wildlife Marine Viewing Working Group*):

Alki Kayak Tours will follow the mandates of the *Marine Mammal Protection Act* as well as the guidelines of the following Watchable Wildlife Program:

"The following marine wildlife viewing guidelines are intended to help you enjoy watching marine wildlife without causing them harm or placing personal safety at risk. Please note that these are general guidelines and that the types of wildlife, local habitat conditions, and numbers of people present in an area may require local restrictions or closures to protect the wildlife. Always follow local and species-specific guidelines and regulations when available, and respect the rights of landowners and other wildlife viewers on your travels.

1. **Learn before you go**. Read about the wildlife, viewing sites and local regulations to get the most from your wildlife viewing experience. Many species live only in specific habitats such as estuaries, coral reefs, sand dunes or the open ocean. Seasonal and daily cycles also influence when and where an animal may be located. Research on the internet, buy regional viewing guidebooks, talk with local residents and hire local guides to increase your chances of seeing marine wildlife.

2. **Keep your distance**. Use binoculars, spotting scopes and cameras with zoom lenses to get a closer look. Marine wildlife may be very sensitive to human disturbance, and if cornered, they can harm the viewer or leave the area. If wildlife approaches you, stay calm and slowly back away or place boat engines in neutral. When closer encounters occur, do not make sudden moves or obstruct the travel path of the animals - let them have the unhindered "right of way."

3. **Hands off.** Never touch, handle or ride marine wildlife. Touching wildlife, or attempting to do so, can injure the animal, put you at risk and may also be illegal for certain species. The slimy coating on fish and many marine invertebrates protects the animal from infection and is easily rubbed off with a hand, glove or foot. Avoid using gloves when diving or snorkeling to minimize the temptation to touch. Remember, wild animals may bite, body slam or even pull you underwater if startled or threatened.

4. **Do not feed or attract marine wildlife**. Feeding or attempting to attract wildlife with food, decoys, sound or light disrupts normal feeding cycles, may cause sickness or death from unnatural or contaminated food items, and habituates animals to people. Habituated animals are vulnerable to vessel strikes or vandalism, and can be dangerous to people.

5. **Never chase or harass wildlife**. Following a wild animal that is trying to escape is dangerous. Never completely surround the animal, trap an animal between a vessel and shore, block its escape route, or come between mother and young. When viewing from a boat, operate at slow speed, move parallel to the swimming animals, and avoid approaching head-on or from behind, and separating individuals from a group. If you are operating a non-motorized vessel, emit periodic noise to make wildlife aware of your presence and avoid surprise.

6. **Stay away from wildlife that appears.** Some marine animals such as seals, leave the water or are exposed at low tide as part of their natural life cycle — there may be nothing wrong with them. Young animals that appear to be orphaned may actually be under the watchful eye of a nearby parent. An animal that is sick or injured is already vulnerable and may be more likely to bite. If you think an animal is in trouble, contact the local authorities for advice.

7. **Wildlife and pets don't mix**. Wild animals can injure and spread diseases to pets, and in turn, pets can harm and disturb wildlife. For example, wild animals recognize dogs as predators and quickly flee when they see or smell dogs. If you are traveling with a pet, always keep them on a leash and away from areas frequented by marine wildlife.

8. **Lend a hand with trash removal.** Human garbage is one of the greatest threats to marine wildlife. Carry a trash bag with you and pick up litter found along the shore and in the water. Plastic bags, floating debris and monofilament line pose the greatest risk to wildlife.

9. **Help others to become responsible wildlife watchers and tour operators.** Speak up if you notice other viewers or tour operators behaving in a way that disturbs the wildlife or other viewers, or impacts sensitive habitats. Be friendly, respectful and discrete when approaching others. When operating a boat, lead by example and reduce your speed in areas frequented by marine wildlife, anchor properly and encourage others to do the same. Violations of the law should be reported to local authorities."

[Produced by the ***Watchable Wildlife Marine Viewing Working Group***, made up of representatives from the National Park Service; NOAA Fisheries, Office of Protected Resources; NOAA National Marine Sanctuaries; The International Ecotourism Society; U. S. Fish and Wildlife Service; Whale and Dolphin Conservation Society; Wildlife Conservation Society; and Watchable Wildlife, Inc.]

DIVING: The Scuba Schools Group

Company Profile: Craig Gillespie can barely contain his enthusiasm for his company's commitment to marine conservation and professionalism. In 1972, he took diving lessons and volunteered two days later, securing his life long commitment to the ocean and the world of diving. As the director of The Scuba Schools Group, he manages operations in Seattle/Tacoma, Portland, and San Francisco and manages a business part time in Japan. The schools certify divers through the Professional association of Diving Instructors, or PADI.

Non-Profit Partnership: The Scuba Schools Group partners with the Ka'ua Foundation, a non-profit marine research and educational film programming institute based in Maui. This partnership focuses on certification classes that encompass a wide range of diving techniques that increase the diver's awareness of the environment around them. Scuba Schools teaches divers associated with Ka'ua who are collecting water quality samples and related marine research.

The foundation's mission is to bring awareness through responsible educational training, educational film programming and documentaries.

1. **Waste Management**:The company recycles paper, glass, metals and plastic and uses recyclable materials whenever possible.

2. **Procurement:** Scuba Schools utilizes non-hazardous biodegradable materials for business operations when possible. They store any hazardous materials in labeled containers in a contained area and are used until completely finished in their entirety. Hazardous materials and associated containers are disposed of in accordance with manufacturer's instructions as well as federal, state, and local regulations.
   They purchase recycled or recyclable materials when they are available for business consumables.

3. **Energy Management:**
   Scuba Schools encourages car pooling from the training facilities to the dive sites and use energy efficient machines and appliances if all facilities

4. **Training and Equipment:** Damage to marine environments is most often encountered when the diver loses buoyancy and touches animals, plants or bottom surfaces. Scuba Schools teaches buoyancy control in open water classes during the first dive, students fine tune weight and buoyancy. Buoyancy is controlled through deep breathing, adjusting vest air and additional training with the buoyancy control device (BCD). Students practice the fin pivot to obtain neutral buoyancy, as well as changing their depth just by varying their breathing. From this the diver learns the key to buoyancy control, the BCD is used to make the course adjustments, and breathing is used to fine-tune buoyancy to perfection.

5. Naturalist Education and Training: Scuba Schools offers the following emphasis regarding the marine environment:

Underwater Naturalist Specialty Course

This course is designed to be an introduction to the underwater aquatic environment and to help the student diver develop safe and responsible interaction with aquatic life. It is an introduction to aquatic life including an overview of responsible human interactions with aquatic life.

The following topics are included in the program:
1. Planning, organization, procedures, techniques, problems and hazards of diving in different aquatic environments.
2. Basic overview of major aquatic life groupings (kingdoms and phyla).
3. Factual information that dispels myths of potentially dangerous aquatic life.
4. Overview of basic aquatic life interactions and associations.
5. Responsible human interactions with aquatic life.
6. Diving technique used to help preserve bottom dwelling aquatic life and minimize aquatic life disturbance.

Fish Identifcation Specialty Course

This course is designed to introduce divers to the most common families and species of fish found in temperate and tropical waters. Divers learn basic fish identifcation and scienti.c surveying techniques. Through an overview of Project AWARE and other preservation and research efforts, such as the REEF Fish Survey Project, divers also learn the importance of personal involvement in aquatic environment conservation.

This course covers the knowledge and techniques for identifying fish common to the local area. The course will cover the following topics:

1. The Scuba Schools philosophy about protecting worldwide aquatic ecosystems.
2. Fish family groupings and common characteristics of fish species found in the local area.
3. Fish surveying techniques and strategies for collecting valid data.
4. The planning, organization, and procedures for identifying fish families and species while diving.

Coral Reef Conservation Specialty Course

The Coral Reef Conservation Specialty course teaches divers, snorkelers and nondivers about the vital role coral reefs play in the marine environment and how these ecosystems are currently threatened. The course familiarizes participants with the current state of the world's coral reefs and explains how individuals can help protect the living reef from further decline.

This course covers information about coral reef distribution, diversity, formation and ecology. It also reveals factors that threaten reefs and discusses conservation measures to protect these living resources.

Coral Reef Conservation Specialty course, includes the following:
1. An introduction to The Scuba Schools philospohy of reef conservation.
2. The importance of coral reefs to marine ecosystems and coastal areas.
3. Coral reef and reef inhabitant biology, association and competition.
4. The status of the world's coral reefs and detrimental land-based and ocean based activities that put reefs in peril.
5. Suggestions and information about actions that may help to protect reefs, including responsible diving and snorkeling practices.

PLEASURE TOUR VESSELS: Argosy Cruises

Company Profile: Argosy Cruises is a local, family-owned business that has graced Puget Sound's waters since 1950. Captain Lynn Campbell originally founded the company as the Spring Street Water Taxi in 1949. Argosy has a well-known commitment to environmental management and education and has grown to a fleet of 9 vessels ranging in size from 36 to 180 feet. Argosy's "value proposition" is to celebrate the breathtaking beauty of the Pacific NW. With this, the company recognizes corresponding natural resource stewardship opportunities and responsibilities.

Management Policies: Argosy has an enviable Captain Training & Vessel Qualification program which helps set the stage for good environmental management. It begins with developing leadership qualities and attitude, and provides an intensive orientation for vessel safety and systems, boat handling, and vessel navigation. New staff do basic and shadow training for the initial trial period, including the ability to locate and illustrate parts of their vessels.

The *Vessel Systems Knowledge* section addresses oil, changing fuel filters, bleeding the injector pump, bleeding injectors, the bilge system and pumping sewage.

1. **Waste Management Program**

Recycling: Argosy has an in-office paper recycling program which includes ideas for paper waste reduction. On board, paper, cardboard and glass are collected which are then recycled at the Seattle piers where Argosy operates. This takes a considerable commitment and challenge because it requires coordination between three private landlords and issues associated with container design and longevity. Metal recycling containers are preferred.

Phase-out of Polystrene: Polystyrene foam cups have been phased out by the company. These cups are made from expanded polystryrene, or EPS, which, when broken down into pellets is eaten by sea life and kills them. Ingestion of EPS pellets

causes starvation because marine life such as otters, sea lions, and harbor seals sense they have eaten when they have not.

Food Donations: Leftover food from *The Royal Argosy* is donated to Second Harvest, a national program that distributes food to hunger programs. In 2002, over 28 million pounds of food was distributed to people in need in Washington State. This is a notable trend. Nationally an estimated 96 billion pounds of edible food is discarded as garbage each year. Washington ranks 2nd in the nation for hunger, only rivaled by Oregon, and ranks 10th for food insecurity (meaning families do not have regular access to food or must make difficult trade off decisions such as paying for utilities or prescription medicines rather than food.) Contact Food Lifeline to see how you can help: (206) 545-6600 and www.foodlifeline.org

Plastics: Plastics are never discharged into water. This complies with international restrictions under the Marine Pollution Convention of the International Maritime Organization, or MARPOL, Annex V.

United States Coastguard Regulations: Title 33 Code of Federal Regulations (CFR) Part 151.57, requires all oceangoing vessels 40 feet or more in length used in commerce or equipped with a galley and berthing to have a written waste management plan.

2. Energy Management and Air Pollution:

Argosy's fleet will start purchasing electronic engines by 2007. These engines save about 10% in fuel and are virtually smokeless, thereby reducing particulate pollution. The company is considering using ultra-low diesel fuel which is provided by Rainier Petroleum (www.rainierpetroleum.com and (206) 623-3480, with terminals in Ferndale and Tacoma).

The issue: Marine diesel engines create emissions of several dangerous substances. Higher levels of sulphur in diesel fuel create sulfur dioxide (SO^2) and toxic air pollutants which leads to ozone, a human health problem aggravating respiratory conditions such as asthma and emphysema, in addition to impairing visibility and leading to acid rain. In addition, diesel exhaust contains fine particulates. These particles are so fine that several thousand of them could fit in the period at the end of this sentence. Fine particulate cannot be expunged through coughing and like SO^2 aggravates respiratory conditions and leads to premature deaths.

Emerging Technologies and Fuels:

Reductions in energy and emissions can be accomplished through:

1. Electronic management/Injection equipment such as electronic controlled jerk pumps, electronic controlled unit injectors and Common rail systems (*Southwest Research Institute; www.swri.org)*
2. Fuel composition: Low and ultra-low sulphur fuels, SO^2 reduction and alternative fuel mixes.
3. Exhaust After treatment: Particulate Matter traps, oxidation catalysts and selective catalytic reduction.

Alternatives to Conventional Number 2 Diesel Fuel:

The five most common alternatives to conventional number 2 diesel fuel include:

1. Ultra-low Sulfur Diesel fuel (ULSD)
2. Biodiesel (B20)
3. Number 1 diesel fuel
4. Compressed Natural Gas
5. Propane

There is critical mass in the Puget Sound Georgia Basin to reduce diesel emissions, including a pilot by the Washington State Ferries, Clean School Bus Program, West Coast Diesel Emissions Reduction Collaborative, and the Georgia Basin Puget Sound Airshed Characterization Study. Washington State Ferry's *Clean Fuel Initiatives* aligns with the Governor's Executive Order which requires Washington State agencies to develop and implement sustainability plans (Executive Order 02-03).

(*See* www.wsdot.wa.gov/ferries/pdf/CleanAir.pdf; www.northwestcollaborative.org; www.pscleanair.org; www.cleanairfleets.org/altfuels.html and www.pyr.ec.gc.ca/airshed/).

1. Ultra-Low Sulfur Diesel: Ultra-low sulfur diesel fuel has had the sulfur content reduced from approximately 500 parts per million (ppm) to 13 ppm sulfur. ULSD was formulated to meet the Environmental Protection Agency's 2007 emissions standards (see below for the federal phase in requirements).

Benefits: Using USLD fuel without particulate filters or oxidation catalysts could provide up to 13% reduction in particulate matter (PM), a 13% reduction in hydrocarbons (HC), a 6% reduction in carbon monoxide (CO) and a 3% reduction of nitrogen oxide (NO_x). When USLD is used *with* particulate filters or oxidation catalysts, the reductions are impressive, including up to 80% reduction in PM, 90% in HC, 90% in CO and up to 20% in NO_x.

Drawbacks: Drawbacks include cost, availability, and cold flow properties. You should check with Washington State Ferries, the Puget Sound Clean Air Agency and other research partners to assess at what percentage ULSD will work for your engine.

2. Biodiesel (B20): The most common form of biodiesel is derived from soybean oil, and the most common form is B20 which is 20% biodiesel blended with 80% conventional diesel. This blend can work in most engines without modification to the engine.

Benefits: Benefits include enhanced lubricity (and enhanced engine life of heavy-duty engines), fuel system cleaning properties (by acting as a solvent), and environmental benefits. B20 reduces PM by 10%, HC by 21%, CO by 11% and NO_x by 2% (EPA's draft report *Comprehensive Analysis of Biodiesel Impacts in Exhaust Emissions, October 2002).* In addition, wheat farmers in Eastern Washington like to plant mustard as a cover crop which is a great source for biodiesel.

Drawbacks: Potential drawbacks are cold flow properties since the cold filter plugging point of B20 is approximately 7 degrees warmer than with conventional diesel. Another potential drawback is fuel economy as conventional biodiesel has more energy content than B20. Finally, B20 will have a shorter shelf life and should be used within six months of purchase (*National Biodiesel Board* at 800-841-5849).

3. Number 1 Diesel Fuel: Number 1 diesel fuel is an alternative to conventional diesel fuel. This fuel has lower sulfur than conventional diesel and, therefore, provides some emissions benefits. In addition to lower sulfur, the fuel has better cold flow properties than conventional diesel, making it a good alternative for cold weather operations.

Some potential drawbacks of number 1 diesel fuel include reduced lubricity, which can be addressed with additives, and reduced fuel economy. More research is pending regarding this fuel. Please visit the Clean Air Fleets web site at www.cleanairfleets.org for developing information.

(This section was written by the Clean Air Fleets program in Denver, CO: www.cleanairfleets.org).

EPA Emission Standards for Marine Engines: The Near Future

In May 2004, as part of the Clean Air Nonroad Diesel Rule, the Environmental Protection Agency (EPA) finalized new requirements for non-road diesel fuel that will decrease the allowable levels of sulfur in fuel used in marine vessels by 99%. The threshold levels for emissions are different for engines under 37 kW versus all other marine diesel engines.

The engines used in marine tourism in Puget Sound, except the cruise lines, are considered Category 1 Commercial and Category 2 marine diesel engines.

Emission reductions of hydrocarbons (HC), nitrogen oxide (NO_x), particulate matter (PM) and carbon monoxide (CO) are addressed with the most stringent requirements phased in by 2007.

The limits are set according to displacement (liter/cylinder). Please see EPA's Office of Transportation and Air Quality site at www.epa.gov/otaq/marine.htm and search for the *Overview of EPA's Emission Standards for Marine Engines,* which is the first document under the *Miscellaneous Documents* category at the end of the page. EPA420-F-04-031.

4. **Oil Spill Prevention and Bilge Care:**

Argosy trains its captains and crew in both oil spill prevention and bilge management in its training course.

Oil Spill Prevention:

The company took fuel fills and moved them back to the aft deck from the side of their vessels and installed catch basins.

They train their staff to:

(1) Place a bucket or plastic cup under the fuel drain line to catch the fuel while bleeding the injector bleeding valve;
(2) Use clean oil absorbent pads in the bilge anytime oil is found in the bilge;
(3) Remove oil saturated pads;
(4) Pump the bilge or use absorbent pads to remove oil; and
(5) Never use detergents or soaps to disperse oil

Additional **bilge measures:**

- Regularly check fittings, fluid lines, engine seals and gaskets
- Use suction oil changers or oil pumps that attach to a drill head
- Turn off automatic bilge pumps and use them only when there is water in the bilge
- Use a manual override switch for bilge pumps
- Use hydrocarbon sensitive bilge pumps which shut off automatically when they sense oil

Additional **fuel spill prevention measures**:

- Install automatic back pressure shut-offs on all fuel nozzles
- Do not remove the holding clips from the nozzle
- Do not allow fuel nozzles to be blocked in an open position
- Use vent cups to capture fuel "burps" out the air vents
- For fueling docks, use above ground piping that is double-walled and use a solenoid valve at the point where the above ground and below ground pipes meet

(from The Department of Ecology's *Resource Manual for Pollution Prevention in Marinas.* May 1988, publication #9811. (360) 407-7472, or www.ecy.wa.gov)

WHALE WATCHING: Mosquito Fleet

Company Profile: Mosquito Fleet is named after Puget Sound's historic "Mosquito Fleet," which consisted of thousands of steamships that steamed from port to port around the sound from the 1850s to the 1930s. They were so numerous that people said they resembled a "swarm of mosquitoes." The heyday of the Mosquito Fleet ended in the 1930s when competition with rail and road transportation put the fleet out of business.

Mosquito Fleet's goal is to "provide an exciting, memorable, educational, and safe whale watching experience that shows guests the beauty of Orca whales, Puget Sound marine life, and the San Juan Islands." The company is the winner of the People For Puget Sound Business of the Year for educational programs for school groups and at-risk youth, and is recommended by The Seattle Aquarium.

1. Naturalist Training: One of the calling cards of Mosquito Fleet has been their excellent naturalist training. Many staff have attended a 3-day training sponsored by The Whale Museum in Friday Harbor, and the Marine Mammal Research Group in Victoria, B.C., since 1994. The objective of Marine Naturalist Training is to provide a learning experience that allows graduates to be qualified regionally as professional or volunteer naturalists. The course is endorsed by the Washington/B.C.-based Whale Watching Operators Association Northwest as naturalist certification (see www.whale-museum.org/education/library/whalewatch/wwlinks.html).

The Issue: Resident Orca Killer Whales, better known as pods J, K & L, have experienced serious declines in the last 10 years. "The best available scientific consensus suggests that it is the decline of salmon and toxic pollution and the ripple effects of the captures 30 years ago that are combining to negatively impact the whales. Added stress due to boat interactions is a factor, currently being researched by shore observations conducted by Orca Conservancy and others, but to date the results of this and other studies of boat/whale interactions are mixed.

Orca researchers at the National Marine Fisheries Service in Seattle generally agreed that dwindling supplies of salmon as a food source, compounded by PCB contamination, are the primary cause of the 17 percent decline in the Southern residents from 1995-99. When the whales are hungry, the toxins that have accumulated in their blubber are released into the blood where they can disrupt endocrine systems, leading to immune deficiencies and reproductive problems among other potential impacts.

In addition, the removal by capture of most of the Southern residents born between about 1961 and 1971 has taken a 10 year age cohort of females almost entirely out of the community. Those females would now be in their reproductive years, and their absence has contributed to the scarcity of newborns in recent years" (from Howard Garrett, The Orca Conservancy. *Reprinted from* www.whale-museum.org).

2. Whale watching Guidelines: Mosquito Fleet belongs to the Whale Watch Operators Association-Northwest, which is an international industry organization representing commercial whale watchers operating in the Pacific Northwest water of Juan de Fuca, Haro and Georgia Straits (see www.nwwhalewatchers.org/guidelines). These best practices guidelines are intended to conserve all marine species, but with an emphasis on the resident Killer whales in J, K and L pods.

You can check to see whether prospective companies belong to the Association through their *Look Before you Book* Program, which you can get from the WhaleWatch Operators Association Northwest.

The whale watching operator guidelines are organized around five major principles:

(1) Speed
(2) Vicinity
(3) Interactions with Wildlife
(4) Other boats
(5) Time Limitations

Access the full guidelines at www.nwwhalewatchers.org/guidelines.html or by calling the Whale Museum at (360) 378-4710. The longer guidelines have been condensed into ***Be Whale Wise,*** a one-page pamphlet this is widely distributed.

1. Be cautious and courteous: Approach areas of known or suspected marine mammal activity with extreme caution. Look in all directions before planning your approach or departure.

2. Slow down: Reduce speed to less than 7 knots when within 400 metres/ yards of the nearest whale. Avoid abrupt course changes.

3. Avoid approaching closer than 100 metres/yards to any whale.

4. If your vessel is unexpectedly within 100 metres/yards of a whale, stop immediately and allow the whales to pass.

5. Avoid approaching whales from the front or from behind. Always approach and depart whales from the side, moving in a direction parallel to the direction of the whales.

6. Keep clear of the whales' path. Avoid positioning your vessel within the 400 metre/yard areas in the path of the whales.

7. Stay on the offshore side of the whales when they are traveling close to shore. Remain at least 200 metres/yards offshore at all times.

8. Limit your viewing time to a recommended maximum of 30 minutes. This will minimize the cumulative impact of many vessels and give consideration to other viewers.

9. Do not swim with or feed the whales.

Whale Harassment

Marine mammals are protected under the Marine Mammal Protection Act of 1972. Human activities in the vicinity of marine mammals can result in a variety of impacts ranging from no observable change in behavior to actual physical harm. Examples of behavior by disturbed or harassed animals can include (but are not limited to):

* a rapid change in direction or speed;
* escape tactics such as prolonged diving, underwater course changes, or underwater exhalation;
* evasive swimming patterns such as rapid swimming at the surface;
* attempts by a female whale to shield a calf from a vessel or a human observer by tail swishing or other protective movements.

Report incidents of harassment of whales or other marine mammals using the following 24-hour hotlines: US: (800) 853-1964. Canada: (800) 465-4336.

Courtesy of the Whale Museum Web Site

CRUISE SHIPS: Holland America

Company Profile: Holland America was founded in 1873 as the Netherlands-America Steamship Company (NASM), a shipping and passenger line. Because it was headquartered in Rotterdam and provided service to the Americas, it became known as Holland America Line.

Though transportation and shipping were the primary sources of revenue, in 1895 the company offered its first vacation cruise; its second leisure cruise, from New York to the Holy Land, was in 1910. Finally, in 1971, Holland America suspended its transatlantic passenger trade and, in 1973, the company sold its cargo shipping division. Cruise vacations became the line's full time focus.

In 1989, Holland America Line Inc. became a wholly owned subsidiary of Carnival Corporation & plc., the largest cruise company in the world. Holland America is headquartered in Seattle. (www.hollandamerica.com).

International Regulations: Cruise ships are regulated under the International Convention for the Prevention of Pollution from Ships, or MARPOL, in addition to the Safety of Life At Sea Convention (SOLAS), and International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW). In the United States, various federal statutes apply as well.

Ocean Conservation and Tourism Alliance (OCTA): OCTA is a 2003 partnership between the International Council of Cruise Lines (www.iccl.org) and Conservation International's Center for Environmental Leadership in Business, or CELB (www.celb.org).

The Ocean Conservation and Tourism Alliance sets up four initial priority areas including: (1) **Best Practices for Wastewater Management:** improved shipboard technology, specifically accelerating and adopting Advanced Wastewater Purification (AWP) systems; (2) **Establishing Destination Partnerships:** working with local governments and communities to maintain high-quality travel experiences by protecting the natural and cultural assets of cruise destinations; (3) **Promoting Environmental Education:** raising guest and crew awareness of and support for critical conservation issues; and (4)
Promoting Vendor Environmental Education: lessening the environmental impacts of suppliers.

1. 2004 Memorandum of Understanding:

A Memorandum of Understanding (MOU) was signed on April 20, 2004 by the Northwest Cruise Ship Association (of which Holland is a member), the Port of Seattle, and the Washington State Department of Ecology.

The provisions of the MOU, a voluntary agreement, cover Washington State waters, international waters in the Straits of Juan de Fuca and close what were considered "donut holes" (in between the San Juan Islands, Port Townsend and Victoria).

Advanced Wastewater Treatment Systems: Notably, the MOU requires use of advanced wastewater treatment systems (AWTS) certified by the Coast Guard before waste water can be discharged into Washington State waters. The MOU requires that these systems include ultra-violet light polishing, various monitoring equipment, and storage tanks. UV light polishing kills any bacteria left over after the advanced wastewater treatment system cleans the waste to a level that exceeds any shore based system in Puget Sound.

Vessel Inspections: The Department of Ecology is allowed to conduct vessel inspections to ensure operation of the AWTS, something that is not required under federal law.

Effluent discharge: Sludge, the remains of treated sewage, cannot be discharged within 12 nautical miles of shore and "areas to be avoided" of the Olympic Coast National Marine Sanctuary. Discharge of untreated and treated graywater (from

showers, kitchens or galley etc.) and blackwater (toilets and medical facility water) are completely prohibited. Under current federal law, graywater is not addressed. Sludge and oil water are from the bilgewater system.

After graywater and blackwater is treated by an AWTS approved by the Coast Guard, the effluent can then be discharged anywhere. Effluent discharges are permitted at ports, provided the ships have immediate shutdown capability, continuous turbidity monitoring and UV disinfection. Untreated graywater is not allowed to be discharged anywhere under the MOU. The Port of Seattle has no legal authority to regulate discharges at Port (the Coast Guard supersedes even the State). That is another reason why this agreement goes beyond anything the Port could do in policy or contracts.

Sampling Requirements: In addition to addressing these discharges, the MOU requires monthly effluent sampling by the cruise ships and copies of sample results are given to Alaska (where the most stringent rules apply to cruise ship operations). The ships docking in Seattle are the same ships that are giving samples in Alaska. The Coast Guard and the State of Alaska receive the results. These samples are then tested by an independent firm and reviewed by the Coast
Guard and the Alaska State Department of Conservation and open for public Review (see www.ecy.wa.gov/programs/wq for more details about the MOU).

3. **Waste Management:** Holland America belongs to the International Council of Cruise Lines, or ICCL (www.iccl.org) which has adopted standards for waste management (ICCL E-01-01; 2001, revision 2). ICCL member lines have agreed to incorporate environmental performance into Safety Management Systems and MARPOL mandated Waste Management Manuals.

Holland America has agreed to follow these principles:

1. ***Photo processing waste:*** The company uses a contractor which processes used photo chemicals in a silver recovery unit. These are sent ashore to a disposal facility;

2. ***Dry-Cleaning Waste and Contaminated Materials:*** Dry cleaning wastes, which contain perchloroethylene or PERC, are treated as Hazardous Waste under the *Resource Conservation and Recovery Act (RCRA)* and handled through on-shore hazardous material waste handlers;

3. ***Print Shop Waste Fluids:*** All print shop wastes are considered hazardous and disposed of locally on-shore;

4. ***Photo copying and Laser Printer Cartridges:*** All laser printer cartridges are recycled in Vancouver or Victoria. ICCL policies encourage use of inks, toners and printing/copying cartridges that contain non-hazardous chemical components;

5. ***Unused and outdated Pharmaceuticals:*** Unused pharmaceuticals are returned to the supplier for disposal;

6. ***Fluorescent and Mercury Vapor Lamp Bulbs:*** Fluorescent bulbs are processed aboard in an approved device and the various components recycled~ glass, phosphor and mercury. A small number of odd shaped bulbs are sent ashore whole for recycling.

7. ***Batteries:*** Discarded batteries are isolated from garbage and recycled on-shore. Intact wet-cell batteries are sent back to the supplier. Dry-cell batteries are manifested to a licensed firm for recycling;

8. ***Bilge and Oily Water Residue:*** Bilge and oily water residues are discharged so the oil content of the discharged effluent is less than 15 ppm and will not leave a visible sheen on the surface of the water. No discharge is allowed in certain areas pursuant to Washington's MOU. Holland vessels have an oil record book (MARPOL Regulation 9(b) and US Coast Guard regulations at 33 CFR 151) which has to be completed each time: (a) there is ballasting or cleaning of fuel oil tanks; (b) discharge of dirty ballast or cleaning water from the fuel oil tanks above; (c) disposal of oily residues and (d) discharge of bilge water that accumulated in machinery spaces;

9. ***Waste Reduction and Recycling:*** Holland has a waste reduction program that requires bulk purchases with minimum packaging. When the packaging is removed, heavy items such as wooden pallets are sent ashore for recycling and the paper is sent to their on-board incinerators. Holland recycles glass, aluminum, ferrous metals, and paper in Victoria, BC or Vancouver, BC.

10. ***Water Conservation and Reclamation:*** Each vessel uses it waste heat to operate seawater evaporators to make fresh water. Holland also has a vacuum sewer system which limits flush water to 1 quart. On several more advanced vessels, they reuse some of their treated waste water for technical purposes.

11. ***Incinerator Ash:*** Reduce the production of incinerator ash by…and test the ash at least once quarterly in the first year of operation to establish a baseline and then every year after that. Testing includes a number of heavy metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. Batteries will be removed from the incinerator waste stream;

12. ***Graywater and Blackwater:*** Please see the MOU section above;

13. ***Advanced Wastewater Purification Systems:*** Holland has Advanced Wastewater Purification Systems on nine of its ships. It is currently using in its

Alaska routes a Shipboard Reverse Osmosis Desalination System, or SROD. Reverse osmosis is a pressure driven membrane separation process that separates dissolved and suspended substances from water. Benefits include lower maintenance costs, ease and reliability of operation, and energy efficiency (see www.zenon.com);

14***. Education and Training Materials:*** The ship's crew receives training regarding shipboard safety and environmental procedures. These are required under the *International Convention on Standards of Training Certification and Watchkeeping,* and includes training on the proper operation of shipboard machinery, and knowledge of, and ability to assure compliance with the environmental protection requirements of MARPOL and SOLAS. Holland also has a lecturer who speaks about Alaska, including geomorphology and while in Glacier Bay, brings several National Park Rangers on-board for a full day's worth of lectures and commentary.

4. **Engine Design and Air Pollution:** Holland uses residual fuel with a sulfur content of less than 2%. The range for vessels fueled in Seattle and Vancouver, BC is 1.2% to 1.9%.

   Technology Options: A highly innovative engine has been developed by the Finnish company Warsila (see www.wartsila.com). This engine combines Common Rail Fuel Injection, Direct Water Injection and Selective Catalytic Reduction. Common rail technology on 4-stroke engines consists of fuel pumps, which feed pressurized oil to accumulators connected to electronically controlled fuel injectors in two cylinders. The accumulators are connected with piping called the *common rail* and timing of fuel pumping is not connected with the timing of injection. Accordingly, the engine eliminates visible smoke, and minimizes carbon monoxide, sulfur and nitrogen oxides.

5. **Port of Seattle BMPs:** The Port of Seattle developed best management practices for all the cruise lines docking at Seattle Pier 66 and Terminal 30 as a condition of its use of the Port.

1. Sewage Management and Gray Water:

- The discharge of untreated or treated sewage from vessels moored at Port facilities is prohibited. *Sewage* is defined as "black water and/or sludge, from toilets, urinals and medical/dental sinks."
- No discharge of gray water when moored at Port facilities
- Reduce generation of gray water discharge from sinks, laundry, showers and vessel rinse-down
- Vessel cleaning soaps cannot contain chlorine or petroleum distillates
- Gray water discharges displaying turbidity, oil sheen or discoloration to the receiving water violates the State's water quality standards (RCW 90.48.080; *prohibits discharge of polluting substances into water*)

2. **Bilge Water Management:**

    - Bilge water shall not be discharged
    - Prevent oil contamination of bilge water: (a) do not drain oil into the bilge; (b) use containment troughs underneath the engine to capture drips or spills; (c) use oil absorbent pads, socks or pillows to soak up oil and fuel; (d) fix leaks as they occur; (e) inspect fuel lines and hoses for chaffing, wear and general deterioration; (g) clean bilge areas after engine maintenance
    - Keep engines tuned and minimize engine cleaners and detergents
    - Dispose of oil soaked absorbents when liquids are fully absorbed

3. **Ballast Water Management:**

    - Pre-arrival ballast exchange is required prior to discharge into Washington waters
    - Perform open sea exchange in 2,000 meters or more and if not possible, 50 nautical miles offshore
    - The state of Washington requires at least 24 hours prior to entering Washington water, using the approved U.S.Coast Guard Ballast Reporting form (forms submitted to waballast@aol.com or faxed to (206) 443-8025). If not discharging, the form should be filled out "not discharging" in the *history* part of Section 1.

4. **Used Oil:**

    - Used oil must be removed by a used oil service provider

5. **Hazardous Chemicals, Cleaners and Wastes Management:**

    - Cover and contain hazardous or flammable chemical materials on the vessel, gas cylinders and batteries and do not store at Terminal 30 or Pier 66
    - Used oil, antifreeze, paints, solvents, varnishes, gas cylinders, preservatives and batteries must be disposed through a hazardous waste disposal contractor
    - Clear and contain any debris, trash, sanding dust, paint chips, slag etc from work areas immediately after any maintenance or repair activity and dispose of properly

6. **Spill Prevention and Response:**

    - Sufficient absorbent materials and spill containment instruments to confine a spill should be carried aboard the vessel

- When a spill occurs, stop the spill or leakage source and contain the spill
- For reporting: Terminal Management; USCG National Response Center at (800) 424-8802 and the Department of Ecology at 1-800-OILS-911 or 800-258-5990

7. Vessel Repair, Painting and Pier Storage:

- Painting, scraping and refinishing vessel in water is limited to *minor touch ups* (defined by Ecology, is limited to the *vessel's superstructure, deck and hull above the waterline and is 25% of less of the vessel's hull surface above the waterline over a period of 12 months)*. Touchups are confined to cosmetic purposes and extensive repair work and bottom cleaning must occur in a commercial, permitted boat or shipyard
- Minor painting, scraping and refinishing must be contained and all debris collected. Tarp the area to prevent release of sanding debris or paint to the marine environment
- Containers for paint are limited to 5-gallons in size and must not contain more than 1-gallon of paint
- Use containment such as pails or drip pans for minor painting, paint mixing and tool cleaning conducted outside
- Vessel work from portable floats or on the uplands is prohibited. Use fixed platforms (pier apron) with appropriate plastic or tarpaulin barriers as work surfaces and for containment when work is performed on the vessel
- Clean and sweep regularly to remove debris
- Spray painting and blasting are prohibited
- Outside painting and sanding activities during weather conditions that render containment ineffective is prohibited
- Paint burning or use of spray guns is prohibited
- Engines and equipment may be removed from the vessel and sent for repairs. Engine repair and maintenance within engineering spaces is permitted
- Boat repair and equipment supplies are not allowed on piers
- Clean water under pressure may be used to remove salt from the outside of the vessel (but in accordance with RCW 90.48)
- Terminal 30 is permitted for Level I and Level II hot work (welding, cutting, grinding). Special permits can be obtained from the Seattle Fire Department for hot work at Pier 66

8. Air Quality:

- Homeport diesel-powered and turbine vessels at Terminal 30 must use a fuel with a maximum 0.05% by weight sulfur content. Copies of documentation will be made available upon request by the Puget Sound Clean Air Agency and Port of Seattle
- All vessels are required to comply with Section 9.03 of the Puget Sound Clean Air Agency regulations, which prohibits air emissions greater than 20% opacity for more than 3 minutes in any 1 hour
- Use on on-board incinerators while at Port of Seattle facilities is prohibited

MARINAS: Elliott Bay Marina

Company Profile: Elliott Bay Marina, with1,200 boat slips ranging from 32 to 63 feet, opened in 1991. This stunning facility represents a 12-year rigorous site planning process. The marina works with the *Envirostars* program (Hazardous Waste Management Program in King County) to develop annual environmental goals and several of its staff act as mentors for other marinas in the region.

Elliott Bay Marina's advertising makes the connection between their business objectives and stewardship of Puget Sound. "*Our ultimate goal is to provide unequaled customer satisfaction, amenities, and facilities while actually enhancing the environment. During the planning and construction phases, our key focus was on creating an environment in which marine life would flourish. We designed our docks to use the more expensive, but cleaner, concrete pilings to facilitate marine growth. The 1,300 acres of cobblestone added to the shoreline acts as a lunch counter to feed small salmon. We have already experienced an explosion of marine growth and have earned numerous awards.*"

Each tenant receives a booklet that ends with Elliott Bay Marina's Clean Environment Statement, which reads, in part: *"Protecting our waters, marine life, fish and waterfowl from boat and marina pollutants is a major goal of this marina. Every boater and every employee needs to work together to keep our marina and environment clean."*

1. Site Design and Planning:

Habitat and Water Assessment*:*

- The marina conducted a 5-year habitat testing program as well as an interim marina life monitoring report
- *Wide openings* between the rock groin-type breakwaters, docks and beach give easy access to migrating juvenile salmon leaving Puget Sound, while providing good water circulation and tidal changes inside the marina basin

- *A man-made 1,500-foot long sandy beach* along the marina's shoreline replaces habitat lost when intertidal areas were filled for the parking lot
- *The floating marina moorage (docks)* were built of concrete floats and anchoring piles. Concrete is a long-lasting surface which quickly attracts and supports extensive growth of fouling life, including seaweeds, barnacles and mussels
- *The rock breakwater* has become an extensive artificial reef and its 2,700-foot length yields a surface area 80 times longer than the original ground it covered. It is a vast growing area for underwater plants, including bull and smaller kelp (which are prime fish nurseries)
- East of the marina, a *7.5 acre rock beach was created,* as well as a ½ acre beach on the west side, in previously unvegetated sites. Both serve as "migration" beaches covered with marine growth/food for marine fish and young salmon

(From EPA's Office of Water; Pollution Prevention Pays case studies. www.p2pays.org/ref/04/03708/text/ch10.html)

1. Hazardous Waste Management:

Elliott Bay Marina has a hazardous waste procedures manual which sets forth how to prevent and manage hazardous waste. Most marinas are exempt from Washington State's Dangerous Waste regulations (Chapter 173-303 Washington Administrative Code, or *WAC)*, but are likely small quantity generators which are managed as a moderate risk waste generator (MRW).

Moderate risk wastes are regulated by local government, either through the adoption of a county ordinance or local moderate risk waste plan (see *Resource Manual for Pollution Prevention in Marinas, May 1998, Publication #9811.* Washington State Department of Ecology, Water Quality Program. (360) 407-6000 or www.ecy.wa.gov/programs/wq. This document will be referred to as "*P2 Marinas* in following sections).

Commonly Generated Boater Hazardous Waste: Products commonly used by boaters that may contain hazardous waste include:

- Paints
- Varnishes
- Paint thinners and solvents (many can be recycled)
- Antifreeze (which can be recycled)
- Gasoline
- Batteries (lead-acid must be recycled)

- Engine cleaners
- Wood preservatives and other pesticides
- Sealants, adhesives and epoxies
- Cleaning products

Elliott Bay's Hazardous Waste Procedures Manual makes clear that handling hazardous waste "simply makes good environmental sense." The marina promptly picks up each boater's waste and disposes it in the hazardous waste facility.

Their hazardous waste management practices:

- Pick up client's hazardous waste
- No commingling or mixing of wastes, including used oil
- The Hazardous Waste depot is surrounded by a gate or enclosure and is located behind a bermed area. It is well ventilated and roofed
- Materials are separated into clearly marked containers, such as bilge water, used oil, oily rags, gasoline, paints and varnishes and antifreeze
- Emergency Preparedness Manual describes in detail the procedures for all safety, environmental, spill and emergency circumstances

Additional Practices:

- Store materials on a bermed concrete slab
- Raise waste containers off the floor with pallets
- Pallets should be spaced to permit periodic inspection of the container's integrity
- Segregate incompatible wastes
- Encourage of use of less-toxic products (see *Resources* section)

Best Management Practices for Used Oil

(Department of Ecology Publication #02-04-006, revised April 2005)

Used oil is defined at Chapter 70.951 RCW and means, in part, *lubricating fluids that have been removed from an engine crankcase, transmission, gearbox, hydraulic device or… machinery powered by an internal combustion engine.* If the used oil meets the state's definition of used oil, is managed as used oil and will be recycled, the marina does not have to test the used oil for hazardous constituents.

Elliott Bay Marina picks up boater's used oil and has it commercially recycled. They never mix used oil with other substances and store it in clearly marked containers.

- Specify the used oil recycling requirements in moorage agreements
- Post signs that clearly identify oils acceptable for recycling
- Have tenants puncture and drain oil filters overnight. Recycle them for their metal content (Elliott Bay has their staff prepare the filters)
- Test for chloride contamination on a regular basis with commercially available screening tests

(see *P2 Marinas*)

1. **Bilge Water and Fueling Management:** (*see* Pleasure Tour Vessel section)

- Provide notice that discharge of contaminated bilge is illegal
- Make information available on bilge pumpout services
- Make supplies and equipment accessible for removing oil and fuel from bilge water
- Dispose of oil soaked absorbents as household hazardous waste if possible
- Do not use detergents or bilge cleaners
- Do not drain oil into bilge
- Fit a tray underneath the engine to collect drips and drops
- Fix all fuel and oil leaks in a timely fashion
- Advise boaters to turn off automatic bilge pumps and use them only when there is water in the bilge

4. Sewage Management: Elliott Bay Marina was the first marina to put in slip side pump out (staff pump out the customer's boats).

- Boaters must have marine sanitation devices. Boaters should know which are the proper treatment chemicals. When possible, use chemical additives that do NOT contain formaldehyde, formalin, phenol derivatives, ammonia compounds, alcohol bases or chlorine bleach

5. Fuel Dock Operation and Maintenance: The fuel dock at Elliott Bay Marina is separately owned and managed by Elliott Bay Fuel Dock. They sell biodiesel (B100 formulation) to boaters.

- Locate and design fuel stations so spills can be contained
- Make absorbent pads and instructions for use readily available

- Do not soap spills
- Install automatic back-pressure shutoffs on all fuel nozzles
- Never leave fuel nozzles unattended and do not allow fuel nozzles to be blocked in an open position
- Ask boaters not to "top off" fuel tanks
- Use vent cups to capture "fuel burps" from air vents
- Provide information about vent whistles and fuel/air separators
- Request that boaters install fuel/air separators on their fuel tank vents or consider requiring it in your tenant lease agreement
- Clear the fuel nozzle of residual fuel prior to transferring back to the pump
- Do not allow self service on a gravity feed fueling system. Automatic shut off nozzles may not work on these types of systems

The issue: Gasoline contains a wide range of polluting constituents. Hydrocarbons, described below, are products derived from crude oil and are toxic to humans and some species. They float on the water's surface and smother marine larvae that need to breathe at the surface. In their gaseous state, they contribute to ground level ozone that is a major component of smog, which in turn causes asthma and cancer in humans (*See Environmental Handbook for Towed Water Sports:* www.iwsf.com/EnvironmentalHandbook/iwsfecappend.htm).

Advances in Technology: Similar to marine diesel engines, the EPA's non-road initiative will require changes in outboard gasoline fuel engines and emissions. There are three primary technologies to help achieve cleaner boating:

1. Direct Injection for two-stroke engines
2. Catalytic converters
3. High performance four-stroke technology for outboard motors

(see P2 Marinas)

6. **Oil Spill Prevention:** Elliott Bay Marina has oil spill procedures in both staff manuals and their emergency preparedness manual.

- Spills are reported immediately to supervisors and promptly cleaned up using water (where appropriate) or oil absorbing rags. ***State and Federal law requires the US Coast Guard and the Department of Ecology to be notified of all spills.***
- In the event of a major oil spill inside the hazardous materials area, plug the drain hole located under the access gate with the designated plug

- The marina has Emergency Spill Kits
- Locate the source of the leak and attempt to stop it at its source
- Use the hand pump and pump liquids into the 5-gallon buckets inside the hazardous material center. If there is an empty 55-gallon drum outside the containment area, use it as well
- Once all of these are full, prepare to use the oil sorb sweeps inside the Oil Spill Response Kit to further contain the spill

Spill Response Plans: Components of a spill recovery plan should include:

1. *WHO*: Identify who is responsible for spill notification, response and follow up
    - Coast Guard National Response Center: 1 (800) 424-8802
    - Department of Ecology: 1 (800) OILS-911
2. *WHAT*: Determine what types and quantities of oil spill response equipment is necessary for a spill event and the actions needed to mitigate the impacts and recover spilled materials
3. *WHEN:* Define when the different types of response actions need to be implemented and when additional assistance is to be called in
4. *WHERE:* Specify where the spill response equipment and notification telephone numbers are located within the marina
5. *HOW:* Explain how the equipment should be used and disposed of.

The issue: Oil contains many constituent parts but among the most problematic are *polycyclic aromatic hydrocarbons*, or PAHs. Crude oil consists of thousands of different chemicals, including PAHs. Many PAHs are known cancer-causing agents because they interact directly with DNA ("carcinogens") and were among the first substances to be associated with cancer profiled in European coal tar workers in the late 1800s. PAHs can adversely affect survival, growth, metabolism, reproduction, immune function, and photosynthesis. PAHs also tend to accumulate in sediment where they pose short term (acute) hazard to bottom dwelling (benthic) organisms that are the basis of the aquatic food chain (www.sfei.org).

PAHs also result from carbon-based combustion, woodburning and internal combustion engines.

According to the National Marine Fisheries Service, Alaska Fisheries Science Center, the long term effects of PAHs on Prince William Sound after the 1989 Valdez spill were quite surprising. When Pacific herring eggs were exposed to Alaska North Slope crude oil at a

concentration as low as 0.7 parts per billion (ppb), the result was malformations, genetic damage, mortality, decreased size and inhibited swimming in smolts. With pink salmon, similar effects were noted at concentration levels of 1.0 ppb. Present water-quality standards in Alaska allow for total PAH concentrations of up to 15 ppb.

(Source: Jeffrey W. Short, Research Chemist, National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratory, 11305 Glacier Highway, Juneau, AK 99801-8626. Tel: (907) 789-6065. Fax: (907) 789 6094. E-Mail: jeff.short@noaa.gov)

Oil and Wildlife

Seabird Effects

Oil affects seabirds several ways. First, oil destroys the protective layer of feathers and insulating down of the bird which provides an energy reserve and insulation. Once this protective layer is destroyed, the bird will die from hypothermia (freezing). Second, oil can clog a bird's feathers making it impossible to fly. Third, the bird may lose it buoyancy (ability to float) and drown. Fourth, in cleaning themselves, the birds may inhale or ingest oil. Because the constituents in oil are quite toxic, the bird can contract pneumonia, congested lungs, intestinal and lung hemorrhage, or liver and kidney damage.

Finally, the oil may impair the bird's ability to reproduce as the oil from feathers of a bird laying on eggs may pass through the pores of the eggshells and kill embryos or lead to genetic malformations (see effects of oil pollution on marine wildlife by the UNEP Global Marine Oil Pollution Information Gateway at oils.gpa.unep.org/facts/wildlife.htm).

Marine Mammal Effects

Sensitivity to oil exposure varies but effects include hypothermia, organ dysfunction, congested lungs, damaged airways, interstitial emphysema (from inhalation of oil droplets and vapor), gastrointestinal ulceration and hemorrhaging, eye and skin lesions and decreased body mass. Sea otters are particularly susceptible to oil spills because of the amount of time they spend floating on the sea surface. Their fur is their only barrier against the cold and enables them to float where they break open shellfish to eat. Inhalation of toxic constituents from oil can also damage their lungs, cause ulcers and result in liver and kidney damage (From the spring 2005 issue of *Sound & Sustainable,* pugetsound.org/pdf/newsletters/tourism_2005_02.pdf).

7. **Solid Waste Management:** Elliott Bay Marina has a waste reduction and recycling policy. Recycling is provided to all boaters for paper, plastic, glass, aluminum and used oil. See the resources section below for information on waste reduction and purchasing strategies.

8. Boat Maintenance and Cleaning:

Elliott Bay Marina only permits minor boat maintenance at boat slips in accordance with Department of Ecology regulations for painting, scraping and refinishing vessel in water. These activities are limited to *minor touch ups* which means the *vessel's superstructure, deck and hull above the waterline and is 25% of less of the vessel's hull surface above the waterline over a period of 12 month.* Touchups are confined to cosmetic purposes and extensive repair work and bottom cleaning must occur in a commercial, permitted boat or shipyard.

Cleaning:

- Rinse your boat off after each use with fresh water
- Try to use non-commercial products where possible. Avoid products that contain phosphates, chlorinated compounds, petroleum distillates, phenols and formaldehyde. Note that biodegradable soaps are *not necessarily* non-toxic and there is a good deal of misleading advertising:

Bleach: Borax or hydrogen peroxide

Detergent: Your own elbow grease

Scouring Powder: Baking soda

Window cleaner: One cup vinegar with 1 quart warm water- squeegee or use newspaper

Copper cleaner: Lemon or lime juice with salt and water

Fiberglass stain remover: Baking soda paste

Aluminum: Cream of tartar and water

- Scrape and sand on-shore: Cover the area between the boat and the dock with visquine (plastic sheet) or a tarp to catch debris. Reverse the boat in the slip to work on the other side. Reuse visquine or tarp after cleaning and allowing it to dry.
- Use sanding equipment with a dust containment bag. Sweep or vacuum all residual sanding dust and put it in the trash.
- Plug scuppers to contain dust and debris.

Painting: Marine paints have a long history of adverse environmental effects. Biological "fouling" is caused by organisms (called phyla) such as tunicates, tube worms, barnacles, algaes and slimes. They increase drag, resulting in added fuel consumption and can cause major structural damage to a vessel's hull. Earlier anti-fouling paints used tributylin, or TBT, which is now prohibited under federal

and international treaties. TBT led to structural deformities in oysters and other mollusks at very low levels (*Ship Shape. Document 99-16.* Washington State Department of Ecology. www.ecy.wa.gov/programs/wq. To order a copy call (360) 407-7472).

Most anti-fouling paints are either conventional or soluble.

(1) Conventionals use diffusion as the mechanism to release the copper biocide. These paints can have copper concentrations as high as 75 % but lose their effectiveness when the boat is pulled out of the water for prolonged periods of time. Epoxies cure by oxidation and the coating is difficult to remove when depleted. Vinyl paints cure by solvent evaporation but lose effectiveness when the boat is stored out the water for prolonged periods.

BMPs:

- Mix paints thoroughly before using
- Only apply to clean hulls
- Do not thin paints with solvents or water
- Use high quality roller
- Never add anything to antifouling paints other than small amounts of suitable paint thinners consistent with the manufacturer's recommendations
- Apply an extra coat at the waterline and in areas of high turbulence such as the bow, rudder, leading edge of the keel, stabilizers, trim tabs and cavitation areas

(2) Soluble paints: The paint binder or matrix itself gradually dissolves exposing the new layers of the active biocide ingredient. They include *sloughing paints*, which are designed for use on slow boats with displacement hulls. *Ablative paints* erode at a controlled rate and multiple coats are necessary for the best performance.

(3) Metallic Paints: This family of paints uses copper as the biocide. The draft standard test method for copper release rates is 40 ug/square cm/day.

(4) Non-toxic Paints: These paints are made with Teflon, silicone and other proprietary materials. They work by relying on a super slick or fibrous finish that inhibits attachment by fouling agents. They also lead to greater fuel efficiency.

Examples of Non-toxic Paints:

- Interlux produces a silicone-based paint called *Veridian*. It is expensive but translates into fuel savings of 10-20% (908/686-1300)

- Sound Specialty Coatings produces a permanent bottom coating called *Aquaplay M.* It is reported to have a service life of 10 years and is guaranteed for five years (206/517-2611)
- *Seal Coat* produces a two-part coating system, with the first being an epoxy-based barrier coat and the second a layer of synthetic fibers that are sprayed on. It is guaranteed for a minimum of 3- years (206/633-3308)

Prohibition of In-Water Hull Cleaning:

In April 1999, the Washington State Department of Ecology and the Washington State Department of Natural Resources issued a prohibition against in-water hull cleaning of vessels painted with sloughing or ablative paints, as well as those painted with tin-based compounds. The legal threshold for copper concentrations in marine waters is 5 ppb and samples taken in several Puget Sound marinas indicated concentrations from 590-648 ppb (see *Surface Water Quality Standards. WAC Chapter 173-201).*

Please contact the Department of Ecology's Water Quality program for a copy of this directive (360-407-6000).

CHARTER FISHING: Fish Finders Private Charters

Company Profile: Fish Finders Private Charters: Carl Nyman moved to Seattle when he was just 3 years old. His passion for fish began with a trip with his grandfather in San Diego where he was startled by the diversity in the water. Fourteen years and many licenses later, Carl started Fish Finders Private Charters in 1995.

"*I began this Seattle Washington Charter fishing operation… with the interest of providing personal, fulfilling and productive fishing trips catering to small groups, families and individuals looking for that quality Salmon fishing experience without spending too much time and money.*" He is keenly aware of the impacts of our urbanized population on Puget Sound, describing wastewater flows into the Sound during heavy rains, fueling spills from other vessels and incidental encounters with non-harvested salmon. Fish Finders has forged an interesting relationship with the University of Washington by taking students and researchers on *Fishwitch,* his 28 foot Uniflight Salty Dog, to explore the realities of charter fishing in Puget Sound.

1. **Waste Management:** Fish Finders cuts filament lines on board, disposes of garbage onshore and recycles any paper, plastic or glass used on board.
2. **Spill Prevention and Bilge Care**: The bilge is routinely cleaned and oil absorbent pads are kept on board in case a leak develops. Please refer to the pleasure boating section for additional BMPs.
3. **Energy Management and Air Pollution:** The company has a High Thrust Yamaha inboard engine and Carl frequently tunes up the engine and changes engine oil. Fish Finders also uses Biosoy in its hydraulic systems (www.nautamatic.com/gold/prices%20access.htm).

Changes in Federal Regulation: EPA is phasing in standards for outboard and personal watercraft exhaust between 1998 and 2006. Please see www.epa.gov/otaq/marinesi.htm (734) 214-4311 for further detail. There are currently no federal standards for gasoline sterndrive and inboard engines but EPA intends to develop emission standards for these engines. To evaluate more protective emission standards, please see California's standards (CA. Air Resources Board) at www.arb.ca.gov/msprog.offroad/recmarine/documents/inboard-staff-report.pdf.

4. **Oil Spill Prevention:** Fish Finders has oil absorbent pads in the event a leak develops and the company monitors the quality of bilge water regularly.

Additional Measures:

- Let machinery components and fluids cool and relieve pressure from all closed fluid systems
- Remove oil, debris and clutter from the immediate work area during repair
- Provide sufficient lighting to inspect all lines and connections
- Ventilate your work space well and extinguish or remove all ignition sources from the work area
- Secure all lines and hoses and protect them from chafing, abrasion or accidental damage which can cause leaks. Hydraulic lines running along open decks or ladders are particularly vulnerable to damage
- Disable automatic bilge pumps during repairs to prevent accidental overboard discharge of oil-contaminated bilge water
- Know your valves- post a schematic of all fuel and oil systems. Label or color-code fluid lines and valves
- Log oil changes, including type and length of service and refer to manufacturer's specifications to determine when your engine needs fresh oil
- Inspect hoses and other fluid service lines for excessive wear, cracking, swelling, brittleness, stretching, porosity or other signs of deterioration
- Check all oil seals, gaskets and connections for leaks and drips. Tighten connecting flanges, fittings and oil pan covers to specified torque values. Replace worn or brittle gaskets

(*Keeping Small Oil Spills From Becoming Large Problems.*
Washington Sea Grant, Marine Advisory Services. (206) 543-6600.
wsg.washington.edu/outreach/mas/mas.html)

5. **Cleaning and Maintenance:** Fish Finders uses Pettit Yacht Copper containing 25% cuprous oxide and Arm and Hammer laundry detergent and alcohol and wax for cleaning. Please see the *Marina* BMPs for further options.

Additional Resources:

- Puget Sound Action Team: www.psat.wa.gov or 800-54-SOUND (See LID section for techniques, suppliers and Puget Sound case studies)
- Washington State Department of Ecology: www.ecy.wa.gov/programs/wq/stormwater or (360) 407-6444
- Seattle Public Utilities and Natural Drainage Systems: www.seattle.gov/util/About_SPU or (206) 684-3000. You can find plant, architectural drawings and other information about the Street Edge Alternative (SEA) project in the Broadview neighborhood in Seattle
- NW Native Plant Society: www.wnps.org/nurserylist.html and (206) 527-3210 or (888) 288-8022

I. Waste Reduction and Management:

(a) Paper Use Reduction. Our consumption of paper is driving the destruction of forests all over the world, including ancient forests. Intact forest habitat, particularly ancient old-growth forests, provides unparalleled air cleansing and filtering. The Pacific NW is home to one of the last intact old growth forest ecosystems in the world.

These forest ecosystems;

- regulate climate throughout the world, including production of oxygen, soil stabilization and health

- provides medicine and habitat for both people and an incredibly diverse array of species and;

- prevents erosion. Erosion- which occurs when forest habitats are severely impaired or destroyed — causes flooding, ruins fish habitat, increases temperature, and displaces people and cause disease. When paper is made, hundreds of chemicals are used, including elemental chlorine.

Chlorine use and production produces dioxins and organochlorines, both of which are persistent in the environment and taken up in the food chain. The harbor seals in the Puget Sound Georgia Basin have very high levels of both dioxins and furans, as well as polychlorinated biphenyls, or PCBs (see ecy.wa.gov/biblio/0201002.html for the entire indicator report). Stay tuned for the fall 2005 Puget Sound Georgia Basin Ecosystem Indicators report on EPA Region 10's web site.

Re-think when and how you use paper:

- (1) Be more efficient with the paper you do use by copying **double sided** (2) Reduce font size (3) Use more print to cover a printed page to reduce dead white space (4) Copy books 2 pages per side (5) Use unused paper as scrap and for notepads (6) Always reuse packaging and other paper products (6) Reduce junk mail now
- When you do buy paper, make sure it has at least 30-40% **post-consumer** content
- Even better, specify non-tree papers made from agricultural fibers
- Don't print everything off your computer
- Speak with your staff instead of writing memos or notes, if possible
- Don't use paper that is bleached with chlorine- contact the Chlorine Free Products Association and specify totally chlorine free (TCF) papers
- When buying wood products or paper, ask for Forest Stewardship Council (FSC) certified products
- Bring a canvas bag with you to shop- don't ask for paper bags

(b) Reduce Waste:

The issue: Inefficiency is expensive, both in terms of labor, liability, storage, transportation and operating costs. In the tourism business, you are essentially providing services and in many cases, you can deliver the same or better service- even with tangible products- by rethinking how you buy.

I. **Reduce Packaging:** Ask your suppliers to take back packaging; talk to them about returnable, reusable packaging; don't use packaging at all if you can; go naked and use minimal retail display packaging

II. **Buy in bulk or concentrate**

III. **Durable, reusable and warranted products:** Is the product a one-time use only gig? (bad idea and bad value) Make sure the product has many lives, is under extended warranty, has replacement parts (so that if one part malfunctions, you don't have to discard the entire product). How many batteries have you thrown out? Use rechargeable ones!

IV. **Reuse items:** Consult the Industrial Materials Exchange (IMEX- see below) to see what items are up for sale/give away that you might have purchased new.

V. **Don't buy it at all:** Though old habits that die hard, we tend to use things we really don't need such as straws, doilies, and paper napkins. Don't assume things about your customers- why not ask them what they think, or conversely, just make the change and then tell your customers why you made the change. Talk to your suppliers about how to reduce the amount of packaging and other embellishments that accompany your inventory- remember, it becomes your problem, not theirs!

VI. **Substitute something new:** If you decide to remove some embellishment, add something new like a spring flower.

VII. **Extend life:** Use things wisely such as paper; respect where it has come from and what was sacrificed to bring it to your door.

VIII. **Think about the associated costs of any material you bring in:** Incorporated into product price; shipping and transportation weight; additional taxes and freight charges; staff time to break down packaging; storage; pass through charges in rent; life of product (one second or 3 years?); repairability; toxicity; staff time in general.

(b) Buy Recycled

Manufacturing with recycled content products means we mine a little less mineral ore, use less virgin timber and save energy, water and chemicals. That's because not all the feedstocks, or the materials that go into making the product, are 100% new, having to be extracted in very intensive and polluting processes.

Products made with post-consumer content use much less energy and water than those made with 100% new feedstocks. Take an aluminum can for instance. One pound of primary (virgin- from the ground) aluminum (comes from bauxite ore) requires ***30,000*** **BTUs** to produce (*British Thermal Units* — an expression of energy — or the amount of heat required to raise 1 pound of water 1 degree Fahrenheit). One pound of **recycled** aluminum only requires ***700*** **BTUs.** With this 29,300 BTU savings- just by using one pound of recycled aluminum — you could power a 100-watt bulb for over 3 days. And that's just one pound.

Other benefits include water saved, which means more water for fish migration, irrigation for food, and to create the ubiquitous energy we use like mad.

Ask for the highest possible post-consumer recycled content, such as 40-100%. Contrary to popular belief, recycled products are of superior quality, represent an added value because they are part of a more efficient manufacturing process, and in many cases do not pose a price premium.

Definitions:

Recycled: Means that the product contains some percentage of non-virgin (newly extracted) materials, and can include the byproducts of the manufacturing process. In the case of paper, this is excess paper called "mill broke." Remember the fact that a product has some recycled content just means that the manufacturer was smart enough to use some of its off-spec materials to make the product. It doesn't signify good will, an environmental program or anything else except some common sense.

Post-consumer recycled content: This means that the product — paper, plastic bags, composite plastic lumber, and pails — contains material that was already collected from a commercial or residential recycling system. So, it means that some percentage- 10% up to 100%- has already been used in commerce (like your morning newspaper), and then returned to make a new product. This is smart given that 94% of all

manufacturing inputs are wasted and never returned to a new product. **Look for and ask for** the **percentage of post-consumer content** (look on the label or ask).

Recyclable: This means that the product- a newspaper, the cookie box, a plastic container, or yogurt container, can be recycled where you live or work.

II. Water Efficiency/Conservation

The issue: Water, like all natural resources, is limited. Only a fraction of 1% of all the earth's water is available for human use and rain is not drinking water *per se.*

- Only 0.5% of the earth's water is available for human use
- We each use about 78 gallons/day
- Water is amazing: it can break boulders the size of cars, has more dimensions that any other substance, allows nutrients to pass through organ membranes in our bodies and sustains everything that is alive
- We are 70% water
- The Cedar and Tolt watersheds provide Seattle and its surrounding areas, (over 1 million people), with 150 million gallons of water each day
- Water is part of a continuous, ancient flow from sky to land, back to sky again. This means that there is no such thing as "new" water
- Water is a shared resource: it is needed to irrigate farms and landscaping, wildlife habitat and consumption, cleaning and cooking at home, industrial sources and of course, salmon need it to get from point A to point B
- Water Conservation is like having a savings account: if you are water wise now, there will be water left in the future without threat of shortages or mandatory controls

ACTIONS:

- Join the Saving Water Partnership: www.savingwater.org
- Install a 1.6 gallon/per/flush toilet — they can use up to 3 times less than a standard toilet and are the best/easiest way to be water smart
- Buy a high-efficiency washing machine (see resources below and get at $100 rebate from SPU)
- Repair leaks right away
- Install faucet aerators
- Turn off the water while you are brushing your teeth or shaving
- Wash only full loads of laundry and dishes
- Wash your car at a car wash and not at home
- Use drought resistant landscaping
- When you water your lawn, water deeply about once a week; for planting beds, use soaker hoses and not sprinklers
- If you have an ice machine, make sure it's air cooled — a water cooled ice machine can use up to 300 gallons of water to produce only 100 gallons of water
- If you operate a restaurant, don't serve water unless requested and ask your servers not to fill glasses right before the customer is about to leave

Resources:

- Department of Ecology Hotline for recycling and hazardous waste: 1-800-RECYCLE
- Home and garden hints for Healthy Streams and Salmon: www.metrokc.gov/exec/esa/hometips.htm
- Puget Sound Action Team: www.psat.wa.gov (800) 54-SOUND
- Seattle Public Utilities Resource Conservation Program: www.ci.seattle.wa.us/util/Directory/Conservation_Index/index.asp (206) 684-SAVE;
- Financial incentives for businesses for water saving technologies: www.ci.seattle.wa.us/util/Services/Water/For_Commercial_Customers/WATERCONS
- Urban Creeks Legacy Volunteer Program: (206) 684-7655 (covers Longfellow, Pipers, Taylor and Thornton Creeks)
- US Geological Survey: ga.water.usgs.gov/edu/w

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