

# MARINA FLUSHING

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## Applicability

*The Marina Flushing section primarily applies to new or expanding marinas. Marina flushing is typically addressed through the permitting process in Indiana.*

## Background

The water quality and biological health of marinas partially depend on how well water circulates and is flushed within the marina. Marina siting and design affect water circulation and flushing characteristics within its basin. In tidal waters, marina flushing is primarily driven by rising and falling tides. In non-tidal waters, such as the Great Lakes, wind drives water circulation. Circulation and flushing can be influenced by the basin's configuration and orientation to



prevailing winds. Flushing may also be impacted by the water level of the lake. In rivers, water moves through the marina continuously if sited and designed properly. A marina located on a lake with many basins or a marina situated inland on a river can lead to decreased water circulation and flushing. This decrease in water circulation can lead to pollutants and debris concentrating in poorly flushed corners or in secluded areas protected from wind. The water may become stagnant with offensive odors. Biological activity may decrease and the area may become devoid of aquatic life. Inadequate flushing may also lead to the buildup of sediment within the marina, leading to increased cost for dredging.

The final design of a marina should represent a compromise of marina capacity, services, and access, while minimizing environmental impacts, dredging requirements, protective structures, and other site development costs. Marina siting and design should be done to ensure that marinas and their associated structures do not cause direct or indirect adverse water quality impacts or endanger wildlife and habitat both during and following marina construction.

Many factors influence the long-term impact a marina will have on water quality within the immediate vicinity of the marina and the adjacent waterway. Initial marina site selection is the most important factor. Selection of a site that has favorable hydro-geographic characteristics and requires the least amount of modification can reduce potential impacts.

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## Existing Federal and State Laws

As part of the permitting process, the Indiana Department of Environmental Management reviews potential water quality impacts for newly proposed or expanding marinas through the 401 Water Quality Certification Program. The Indiana Department of Natural Resources also reviews the potential impacts of newly proposed or expanding marinas through the Navigable Waterways Act (IC 14-29-1), the Sand and Gravel Permits Act (IC 14-29-3), and the Construction of Channels Act (IC 14-29-4). The U.S. Army Corps of Engineers utilize Section 10 of the River and Harbor Act of 1899 and Section 404 (permit application process) of the Clean Water Act to determine the impacts of proposed marinas.



## Best Management Practices

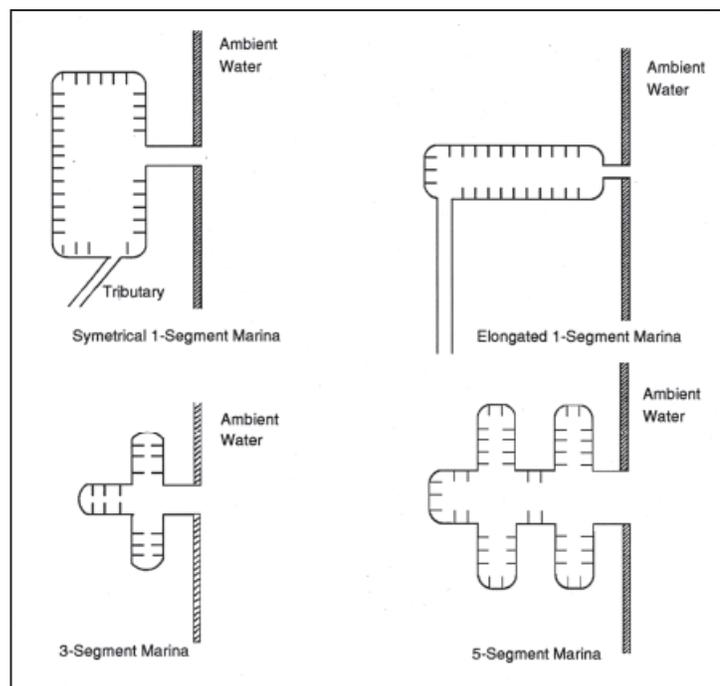
The U.S. Environmental Protection Agency has provided several best management practices that can be applied successfully to promote marina flushing. The following best management practices are described for illustrative purposes and to provide guidance for marinas that are in the planning stage or for those marinas that will be expanding.

- Site and design new marinas so that the bottom of the marina and the entrance channel are not deeper than adjacent navigable water, unless it can be demonstrated that the bottom will support a natural population of benthic organisms, those organisms that live in, on, or near the bottom of aquatic environments. Flushing rates in marinas can be maximized by proper design of the entrance channel and basins. For example, marina basin and channel depths should be designed to increase gradually toward open water to promote flushing. Otherwise, isolated deep holes may be created where water can stagnate and sediment can build up.
- Design new marinas with as few segments as possible to promote circulation within the basin. Flushing efficiency for a marina is inversely proportional to the number of segments. For example, a one-segment marina will not flush as well as a marina in open

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water; a two-segment marina will not flush as well as a one-segment marina, and so forth (see figure below). Curved corners instead of a boxed design can lessen the risk of stagnant corner water or excess sediment buildup. Marina configurations that promote flushing exhibit, in general, higher levels of dissolved oxygen than those with restrictions, improper entrance channel design, bends, and square corners.

- Consider other design alternatives in poorly flushed water bodies (e.g., open marina basin over semi-enclosed design; wave attenuators over a fixed structure) to enhance flushing.
- Design and locate entrance channels to promote flushing. Entrance channel alignment should follow the natural channel alignment as closely as possible to increase flushing. Marina flushing rates are enhanced by wind action when entrance channels are aligned parallel to the direction of prevailing winds because wind-generated currents can mix basin water and facilitate circulation between the basin and the adjacent waterway.
- Establish two openings, where appropriate, at opposite ends of the marina to promote flow-through currents.
- Utilize mechanical aerators to improve water circulation and water quality where the marina basin and entrance channel cannot be configured in a manner to promote adequate flushing. Designate areas that are and are not suitable for marina development (i.e., provide advance identification of water bodies that do and do not experience flushing adequate for marina development).



Example marina designs (Source: U.S. EPA, 2001)

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# WATER QUALITY ASSESSMENT

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## Applicability

*The Water Quality Assessment section primarily applies to new or expanding marinas and coincides with the Marina Flushing section. Water quality assessment is typically addressed through the permitting process in Indiana. However, this section does provide marina designers and developers some guidance on marina siting and design impacts on water quality.*

## Background

As stated in the Marina Flushing section, water circulation and marina flushing play important roles in the distribution and concentration of potential pollutants in a marina basin. Improperly designed marinas and day-to-day marina operations can potentially lead to poor water quality. Poor water quality in turn can have a negative impact on fish and wildlife within the marina basin or channel. However, remember that poor water quality in a marina may not solely be a result of operations in the marina itself. Marinas can be impacted by other land use activities within the watershed. The watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. Impacts such as storm water run-off from other areas, fertilizer use upstream or pollutants brought from marina flushing activities may all lead to decreased water quality.

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices being implemented in a marina. The concentration of dissolved oxygen in water is a good indicator of the health of the marina. This number indicates whether there is enough oxygen for fish and other aquatic life. A low dissolved oxygen concentration number may suggest that there is too much decaying matter, or possibly that oil or other substances on the water's surface is preventing an exchange of gases. The transparency of the water can also be a good indicator of water quality in the marina. Erosion, run-off, algal blooms, and resuspended bottom sediment can reduce transparency. Transparency can be measured with simple, inexpensive equipment such as a transparency tube (see photo on the next page) or Secchi disk.



A marina employee uses a Secchi disk to measure how deep she can see into the water.

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Pathogenic organisms can present a public health concern. Pathogens such as *E. coli* and enterococci are contained in human and animal fecal waste. Testing should be done to see if the water is safe to be used recreationally for swimming or skiing and to determine the condition of a proposed marina development site.

## Existing Federal and State Laws

As part of the permitting process, the Indiana Department of Environmental Management reviews potential water quality impacts for newly proposed or expanding marinas through the 401 Water Quality Certification Program. The Indiana Department of Natural Resources (IDNR) also reviews the potential impacts of newly proposed or expanding marinas through the Navigable Waterways Act (IC 14-29-1), the Lake Preservation Act (IC 14-26-2), the Sand and Gravel Permits Act (IC 14-29-3), and the Construction of Channels Act (IC 14-29-4). The U.S. Army Corps of Engineers (USACE) utilizes Section 10 of the River and Harbor Act of 1899 and Section 404 (permit application process) of the Clean Water Act to make a water quality assessment. However, existing marinas may also wish to participate in some form of volunteer water quality monitoring.



A transparency tube is used to assess water quality.

Visual inspections are an easy way for marina operators to perform water quality monitoring. The clarity of the water, volume of aquatic plants, abundance of aquatic wildlife and fish, presence of sheens on the water or debris accumulation can be used to judge the health of the water. These types of inspections can be easily done by educating marina staff on what to look for. Staff can do visual inspections during the course of their daily activities at little or no cost to the marina.



Marinas can utilize their clients and local community groups or universities to assist in water quality assessment. College students may be interested in participating in projects involving marinas. The data they gather can be shared. Volunteers may help gather and analyze water samples, record ecosystem activities, catalog and collect beach debris and restore degraded habitat.

Hoosier Riverwatch is a state-sponsored water quality monitoring initiative. The purpose is to increase public awareness of

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water quality issues and concerns by training volunteers to monitor stream water quality. More information can be found on the Web at [www.IN.gov/dnr/nrec/3046.htm](http://www.IN.gov/dnr/nrec/3046.htm).

The U.S. Environmental Protection Agency's Office of Wetlands, Oceans, and Watersheds offers training and assistance in starting up monitoring programs. A volunteer program description can be found on the Web at [www.epa.gov/owow/monitoring/volunteer](http://www.epa.gov/owow/monitoring/volunteer).

## Best Management Practices

U.S. EPA has provided several best management practices that can be applied successfully to monitor water quality. The following best management practices are described for illustrative purposes and to provide guidance for marinas that are in the planning stage or for those marinas that are looking to expand.

- Use a water quality monitoring methodology to measure water quality conditions. The first step in a marina water quality assessment should be the evaluation and the characterization of existing water quality conditions. Baseline data for the water body on which the marina is proposed might be available from IDNR, IDEM, or a federal agency such as the U.S. Geological Survey, U.S. EPA or USACE. The second step is to set design standards in terms of water quality. In most states, the water quality is graded based on dissolved oxygen content, and a standard exists for the 24-hour average concentration and an instantaneous minimum concentration. A state's water quality standard for dissolved oxygen during the critical season may be used to set limits of acceptability for good water quality.
- Use a water quality modeling methodology to predict post-construction water quality conditions. Numerical models can be a more economical alternative to collecting water quality data in the field. However, all models require some field data for proper calibration. (Check to see if baseline data already exists.) Numerical models can also be used to evaluate different alternative designs to maximize flushing of pollutants.
- Perform preconstruction inspection and assessment. A preconstruction inspection and assessment may be affordable in place of detailed water quality monitoring or modeling for marinas with 10 to 49 slips. An expert knowledgeable in water quality and hydrodynamics may assess potential impacts using available information and site inspection.
- Water quality sampling, monitoring, and modeling are not necessary in many cases to gather information about the health of a marina's waters. Visual inspections of aquatic plant abundance and appearance in and around the marina, use of the marina and surroundings by ducks and geese, the appearance of bottom sediments, the general clarity of the water near docks, and the abundance of fish can provide the information necessary to judge the health of the water. These types of inspections can be done during the course of daily operations by any member of the marina staff at minimal cost to the marina (see

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volunteer monitoring best management practice below). Done every year, these visual inspections can show what the “normal” conditions are within and adjacent to the marina. When changes are noted, limited water quality sampling can be done to determine what might account for them if a local or state environmental management authority hasn’t already done this.

- Establish a volunteer monitoring program at the marina. Marinas can help involve their clientele and local community in water quality issues and environmental protection by beginning a volunteer monitoring program. Volunteer monitors build awareness of pollution problems, become trained in pollution prevention, help clean up problem sites, and increase the amount of water quality information available.

# HABITAT ASSESSMENT

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## Applicability

*This section primarily applies to new or expanding marinas where site changes may affect important near-shore or riverine habitats. Habitat assessment is typically addressed through the permitting process in Indiana. However, this section does provide marina designers and developers some guidance on marina siting and design impacts on aquatic habitats.*

## Background

Construction of new marinas or expanding marinas can have an adverse impact on aquatic habitats. For example, Lake Michigan and its tributaries support a wide variety of fish and wildlife that depend on near-shore or riverine habitats to successfully maintain their populations. Many of the sport-fish that are so dearly prized on Lake Michigan (yellow perch, smallmouth bass, trout and salmon to name a few) use shoreline habitat for spawning, nurseries, feeding and cover throughout the year. Endangered species such as the Blanding's turtle, swamp rabbit, trumpeter swan, piping plover, hellbender and mudpuppy have historically been known to inhabit Lake Michigan and the nearby waterways.



The Blanding's turtle is an endangered species in Indiana (Source: IDNR).

When marinas are designed with consideration of habitat in mind, they can be an asset instead of a detriment to the ecosystem. They can allow for quiet, sheltered waters. A marina can assist in replacing natural habitat that allows for feeding and spawning. Pollution prevention measures taken by the marina will help maintain or even improve water and habitat quality leading to a more aesthetically pleasing marina.

## Existing Federal and State Laws

As part of the permitting process, the Indiana Department of Environmental Management reviews potential water quality impacts for newly proposed or expanding marinas through the 401 Water Quality Certification Program. The Indiana Department of Natural Resources also reviews the potential impacts of newly proposed or expanding marinas through the Navigable Waterways Act (IC 14-29-1), the Lake Preservation Act (IC 14-26-2), the Sand and Gravel Permits

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Act (IC 14-29-3), and the Construction of Channels Act (IC 14-29-4). The U.S. Army Corps of Engineers utilize Section 10 of the River and Harbor Act of 1899 and Section 404 (permit application process) of the Clean Water Act to determine the impacts of proposed marinas. The U.S. Fish and Wildlife Service reviews proposed marinas for potential impacts to fish and wildlife habitat and endangered species present at or near the proposed project site under the Endangered Species Act and the Fish and Wildlife Conservation Act.

## Best Management Practices

U.S. EPA has provided several best management practices that can be applied successfully to protect valuable near-shore and riverine habitats during marina siting and design. The following best management practices are described for illustrative purposes and to provide guidance to developers that are in the planning stage or for those marinas that will be expanding.

- Conduct habitat surveys to characterize the potential marina project site. Critical or unique habitats need to be identified. Disruption of behavior such as spawning and feeding need to be considered. The risk of infiltration of exotic species from boating activities or removal of vegetation is important to consider. Once the data is assembled, it becomes possible to identify environmental risks associated with development of the site. Through site-design modifications, preservation of critical or unique habitat, and biological/chemical/physical monitoring, it is possible to minimize the direct and indirect impacts associated with a specific waterfront development.
- Redevelop coastal waterfront sites that have been previously disturbed, such as brownfields (sites that have been used by industry), expand existing marinas, or consider alternative sites to minimize potential environmental impacts.

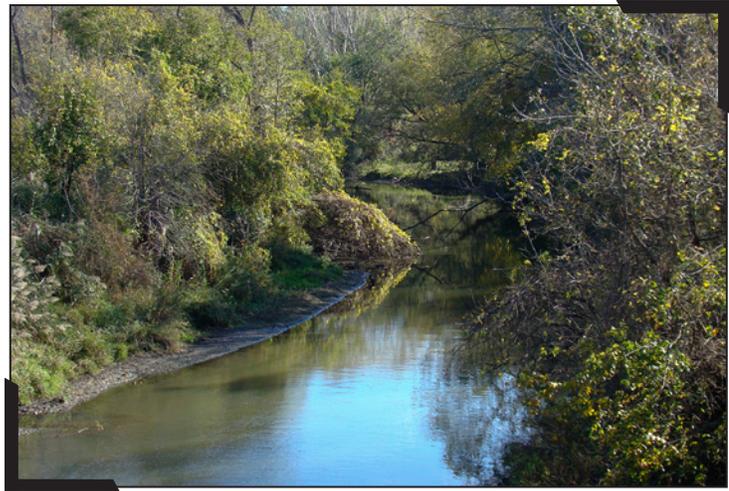


The Hammond Marina located on Indiana's Lake Michigan shoreline was built in 1991 on a former Brownfield site. The shoreline consisted of steel slag. The 54-acre complex was carved out of the steel mill slag and the shoreline was created from dredged sand, which created a mile-long sandy beach (Source: Hammond Marina).

# HABITAT ASSESSMENT

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- Assess historic habitat function (e.g., spawning area, nursery area, migration pathway) considering seasonal use by fish or other animals and use this information when designing the marina to minimize indirect impacts.
- Minimize disturbance to indigenous vegetation in riparian areas. Riparian areas are narrow areas along the banks of rivers, streams, lakes, ponds, reservoirs, and wetlands. They may have vegetation, or may just be sandy or rocky. These riparian areas help filter pollutants from the water and offer a high biodiversity and biomass due to the nutrients that absorb from the run-off water that passes through them.
- Create new habitats or expand habitats in the marina basin. The addition of rock or the planting of native plant species on the shoreline can create new areas for feeding and spawning.



This riparian corridor is along Trail Creek in LaPorte County (Photo by Alan Walus, Sanitary District of Michigan City).



Dry stack storage promotes pollution prevention.

- Consider building in dry stack storage that enables boaters to store their boats on land. This practice promotes pollution prevention by decreasing the possibility of anti-fouling paint flaking or leaching into the water and the chance of oil/gasoline leaking into the water. Dry stack storage also allows for more public access to waterways, increases rental units and results in less weathering and maintenance for boats.

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# SHORELINE STABILIZATION

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## Applicability

*This section primarily applies to new or expanding marinas where site changes may result in shoreline erosion. However, this section may also apply to existing marinas where shoreline erosion may be occurring.*

## Background

Shoreline and streambank erosion is a natural process. However, erosion can be accelerated by a variety of land use disturbances. Induced erosion often occurs where the shoreline has been disturbed by removing natural vegetation or where the current has been altered. When this happens, erosion can be a major contributor of nonpoint source pollution. Excess sediment delivery to a waterway can result in decreased water clarity, nuisance algal blooms and plant growth, and smothering of fish habitat. Excess sediment loads also can lead to increased maintenance dredging to allow boats enough draught to access the waterway.



Vegetation, beaches, and preservation of natural shorelines, where feasible, can be the most effective means of shoreline stabilization.

By design, marinas are often fairly calm, nonerosive environments. However erosion still may occur due to poorly designed structures or from boat activity (wakes and prop wash) within the marina basin. In severe cases, shoreline erosion can result in sediment deposition within the marina, requiring maintenance dredging. Stabilizing eroding shorelines can protect marina shorelines and reduce the need or frequency of maintenance dredging (U.S. EPA, 2001).

## Existing Federal and State Laws

Shoreline stabilization is often addressed in the permitting process for newly proposed or expanding marinas. Permits may also be required by existing marinas that are looking to address erosion occurring within the marina basin. Installation of erosion control measures typically requires a permit from the U.S. Army Corps of Engineers pursuant to the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, a Section 401 Water Quality Certification from the Indiana Department of Environmental Management, and a permit under the Navigable Waterways Act from the Indiana Department of Natural Resources. Additionally, the upland disposal of dredged material requires sampling and analysis to determine whether the sediment is a solid waste requiring off-site disposal in a landfill.

# SHORELINE STABILIZATION

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## Best Management Practices

U.S. EPA has provided several best management practices that can be applied successfully to protect shorelines and stream-banks from erosion. The following best management practices are described for illustrative purposes and to provide guidance for marinas that are in the planning stage, for marinas that will be expanding, or for marinas wanting to correct current erosion problems.



A bulkhead holds the shoreline together at Millenium Park, Michigan City.

- Use vegetative plantings, wetlands, beaches, and natural shorelines where space allows. Vegetative planting is a relatively low cost option. It can add a natural look to the marina and may assist in keeping invasive species at bay. The preservation or restoration of natural wetlands can help protect shorelines and dissipate wave energy. Both the planting of vegetation and preservation of wetlands provide habitat and may assist in filtering pollutants to improve water quality.
- Where shorelines need structural stabilization and where space and use allows, a riprap revetment is preferable to a solid vertical bulkhead. Riprap is an economical way to help stabilize embankments. Riprap can help decrease the energy of waves because of its irregular design.
- Vertical bulkheads made from concrete, treated timbers, steel, aluminum, or vinyl can be used to stabilize an embankment. These should only be used in areas where reflected waves will not endanger shorelines or habitats and where space is limited. Vertical bulkheads are more expensive and are not a good option for areas where waves or surges occur in the marina basin.
- At boat ramps, retain natural shoreline features to the extent feasible and protect disturbed areas from erosion. The construction and run-off water from the ramp can cause erosion and can increase maintenance costs. By leaving the natural shoreline, invasive species are less likely to take over and the marina has a more aesthetically pleasing look.

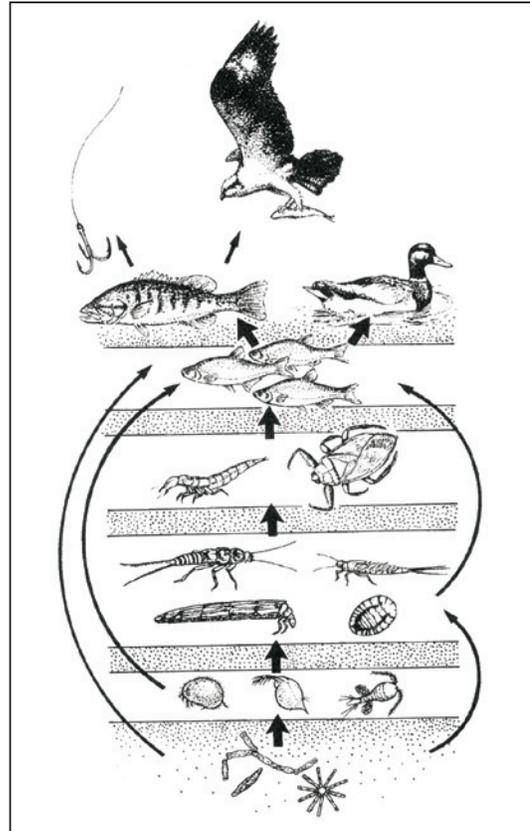
# STORM WATER RUN-OFF

## Applicability

*This section applies to new, expanding, or existing marinas.*

## Background

Storm water run-off from paved parking areas, maintenance buildings, hull maintenance areas, and other impermeable surfaces or structures can be a significant contributor of nonpoint source pollutants. Some of the common pollutants potentially found in marina storm water run-off include oils, grease, fuel, solvents, sandings and paint chips, copper and other heavy metals. If untreated, these pollutants can concentrate in the marina basin, leading to poor water quality. Metals and oils can settle along the bottom where they can be consumed by a number of organisms. Eventually, these contaminants can be passed up the food chain in concentrated levels in a process known as bioaccumulation. Excessive use of fertilizers can cause nutrients to leach into the water. This can result in excessive aquatic plant growth and a decline in water quality. Pet waste leaching into the water can also supply an excess of nutrients and also allow pathogens to get into the water. Additionally, some of these pollutants can create visually unappealing surface films that can adhere to boat hulls or result in noxious smells.



Aquatic food web (Source: Cornell University Cooperative Extension)

## Existing Federal and State Laws

Storm water is regulated under a number of programs within Indiana at the federal, state, and local level. The National Pollutant Discharge Elimination System (NPDES) program has been established to control pollutant discharges to the nation's waters. In Indiana, this program is administered by the Indiana Department of Environmental Management. In 2003, IDEM revised its general NPDES rules to bring its programs into compliance with Phase II of the U.S. Environmental Protection Agency's regulations. Phase II of the industrial storm water program requires a general NPDES permit for the point source discharge of storm water exposed to industrial activity (327 IAC 15-6 or Rule 6). Under Rule 6, there are 32 regulated Standard Industrial Classification (SIC) Codes, which include SIC Codes 4493 (marinas) and 3732 (boatyards and boat builders that repair, clean, and/or fuel boats).

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Facilities that are “primarily engaged” in operating marinas are classified as SIC Code 4493 (marinas). These facilities rent boat slips, store boats, and generally perform a range of other marine services including boat cleaning and incidental boat repair. For those facilities that are classified as SIC Code 4493 that are involved in vehicle (boat) maintenance activities (including vehicle rehabilitations, mechanical repairs, painting, fueling, and lubrication) or equipment cleaning operations, those portions of the facility are considered to be associated with



Vegetated areas can function as a buffer, filtering out pollutants between impervious surfaces and the marina basin.

industrial activity and are covered under the NPDES storm water regulations. Facilities classified as SIC Code 4493 that are not themselves involved in equipment cleaning or vehicle maintenance activities but allow patrons to work on their boat either in-water or out of the water would also be covered under the storm water permit regulations. Marine facilities that are “primarily engaged” in the retail sale of fuel and lubricating oils are best classified as SIC Code 5541 (marine service stations). These facilities are not covered by the NPDES storm water regulations.

If you, as a marina owner/operator, have a question relating to your status under the storm water regulations found in 327 IAC 15-6, you should contact IDEM at (800) 451-6027 or speak with a representative from IDEM’s confidential Compliance and Technical Assistance Program at (800) 988-7901.

Under Phase II, storm water discharges associated with construction and/or land-disturbing activities that disturb one acre or more of land will require an NPDES permit (327 IAC 15-5). Additionally, IDEM established rule 327 IAC 15-13, which regulates municipal separate storm sewer systems (MS4s). MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. A regulated conveyance system includes roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels and conduits. Marinas owned by an MS4 community could be subject to both requirements of the industrial storm water permit and MS4 permit. The marina should develop the storm water pollution prevention plan for all of the marina’s activities while referencing the presence of such a document under the community’s MS4 storm water quality management plan. Questions pertaining to these rules should be addressed to the MS4-Rule 13 coordinator in the Wetlands and Storm Water Section within IDEM’s Office of Water Quality at (800) 451-6027, Ext. 4-1601.

# STORM WATER RUN-OFF

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## Best Management Practices

Following is a list of recommended best management practices provided by U.S. EPA (2001) that can be used by marinas to reduce pollutants associated with storm water run-off.

- Perform boat repair and maintenance inside work buildings as much as possible. This will protect the work area from wind and rain. It allows for easier cleanup and localized contamination.
- If work buildings cannot be utilized, perform sand blasting and sanding within enclosed spray booths or tarps. This will help eliminate the spread of residue from the sandblasting activities. Work should only be allowed on clear, nonwindy days. The dust and residue should be cleaned away daily.
- Provide clearly designated hull and boat maintenance areas. These areas should be located well away from the water's edge. The area should be well marked and posted with a list of rules. Work should not be allowed outside of the work area. Tarping the area under the boat should be a recommended practice. The work area should be protected from wind and enclosed if possible.
- Design hull maintenance areas to minimize contaminated run-off. Hull maintenance should be done over impervious surfaces such as a concrete pad. If a pad is not feasible, temporary ground cover such as tarps can be effective. The areas should be cleaned at least daily and should only be swept or vacuumed. The blowing of dust and debris should be prohibited.
- Use or provide sanders equipped with vacuums to remove paint from hulls. By vacuuming the paint dust and debris as work is performed, the chance of contamination is lessened. There is less cleanup work and fewer respirable particles for the person performing the work. To insure the vacuum sanders are used, yard rules should be posted and a vacuum sander should be available for rent. Marina staff should be trained in the operation of the sander.



Dustless vacuum sanders are one of the best ways to control paint dust before it can become a pollutant (Source: Jay Tanski, New York Sea Grant).

# STORM WATER RUN-OFF

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- Establish a list of “yard rules” which boaters and contractors must follow when performing debris-producing boat maintenance. Allowing do-it-yourself boat repair work could result in an increase in marina liability costs. Marinas are increasingly requiring that only trained technicians with an understanding of state-approved environmental management practices be used.
- Clean hull maintenance areas regularly and dispose of collected material properly. Areas should be cleaned after work is performed or at a minimum of once daily. All trash, visible paint chips and other debris should be collected before they can be washed or blown away. Any collected waste should be stored under cover and in a secure container to reduce the possibility of it coming into contact with storm water. The area should be swept or vacuumed. Dust and debris should never be blown or rinsed off the pad as this could lead to the same contamination that you are trying to prevent.

- Capture and filter pollutants out of run-off waters with permeable tarps, screens or filter cloths. Tarps should be readily available and placed under cradles or stands before the boat is dry docked. If exposure to wind and/or rain is not an issue, regular plastic tarps can be used. These can be easily swept and cleaned off. If the work area could be exposed to adverse weather, fabric tarps are a better option. These tarps will hold onto the debris better. The area should



Perform boat repairs on an impervious surface over reusable permeable tarps, screens or filter cloth (Source: Jay Tanski, New York Sea Grant).

be swept daily. The dust and debris should never be blown off the tarp. When disposing of the sweepings and tarpaulins, you must first determine if your waste is hazardous. Hazardous waste cannot be placed in the marina’s regular trash. Information on how to determine if the waste is hazardous is available in Appendix D, Complying With the Hazardous Waste Rules, on pages 105-110.

- Sweep or vacuum around hull maintenance areas, roads, and parking lots regularly. This will help prevent pollutants from reaching the basin or other areas of the marina. Personal and commercial vehicles and foot traffic can carry sand and dirt to the parking lots. Debris blowing in from the street or tossed out as litter from careless people can end up on the pavement. Storm water will carry the dirt and debris to the marina basin or to

# STORM WATER RUN-OFF

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inlet drains that lead to the body of water. If you employ any sort of filtering devices in your catch basins or inlet drain, regular sweeping or vacuuming of the parking lots will lead to reduced cost by requiring less change outs. A clean parking lot is also more pleasing to look at.

- Plant or maintain vegetated areas between impervious surfaces (e.g., parking lots, roads, etc.) and the marina basin. Vegetated areas can function as a buffer, filtering out pollutants between impervious surfaces and the marina basin. When possible, use native plants in these vegetated areas.
- Use lawn fertilizers sparingly and follow manufacturers' application instructions to prevent nutrient run-off.
- Construct new or restore wetland areas where feasible and practical. This depends on space and cost. Wetlands are extremely efficient at removing pollutants from water.
- Use porous pavement where feasible. There are two types of porous pavement—porous asphalt and pervious concrete. Porous asphalt is an aggregate that is held together with binding material but with enough void space to allow water to permeate it. Pervious concrete is a mixture of Portland cement, aggregate, admixtures and water. It is mixed in such a way that there are interconnected voids for the passage of water. The pervious concrete should be placed on top of a filter layer, stone reservoir and a filter fabric. Porous pavement helps to recharge ground water and provides excellent pollutant removal (up to 80 percent of sediment, trace metals and organic material).
- Install oil/grit separators and/or vertical media filters to capture pollutants in run-off. These separators or filters are useful where oil or other petroleum products could be spilled. They are also good for areas where there is a large load of sand deposited with the storm water run-off. Oil/grit separators, if maintained properly, should have a life span of 50 years. Vertical media filters are usually used in parking lots and can help remove sediments, nutrients, metals, petroleum products and solid matter such as trash. This type of filter media can be adapted to fit the needs of the user.



This rain garden installed in Porter County captures and treats run-off from the parking lot (Source: Indiana Lake Michigan Coastal Program).

# STORM WATER RUN-OFF

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- Use catch basins where storm water enters the marina in large pulses. Catch basins allow the sediment that comes with the storm water to settle to the bottom of the catch basin, which is usually two to four feet below the outfall pipe. These catch basins and traps will require periodic cleaning and proper disposal of the sediment. Catch basins have a life span expectancy of 50 years.
- Add filters to storm drains that are located near designated work areas. Different filters can be installed to remove different materials. These filters are usually designed to be disposable and, while less expensive than an oil/grit separator, will require more maintenance and frequent replacement.
- Place absorbents in drain inlets. These disposable products will help remove any oils or greases from entering the drain pipe. Catch basins are only designed to remove sediment. You should use absorbents around the storm drain inlets if you utilize catch basins. These pads will need to be cleaned or replaced regularly.

# FUELING STATIONS

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## Applicability

*This section applies to new, expanding, or existing marinas that provide fueling services.*

## Background

Fuel spills, even small ones, can have an impact on marina operations. Under federal law, it is illegal to discharge oil or fuel into the water in any amount, even if it only creates a sheen. It only takes one pint of fuel to pollute up to one acre of water with a sheen. It is also illegal to add any dispersal agents, emulsifiers or coagulants to spills.

Beside potential violations, oil/fuel spills can cost you money in marina repairs. Petroleum will deteriorate the white polystyrene used in floats and docks. Fuel and oil can discolor boat hulls, woodwork and paint. There is also an issue of the potential fire risk due to the flammability of gasoline.

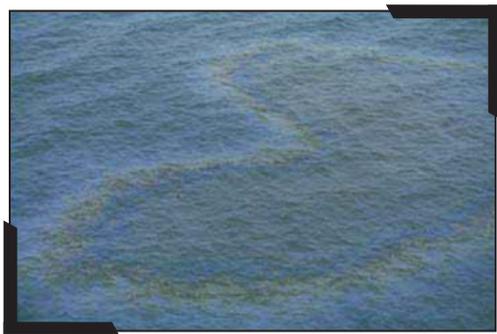
Fuel and oil spills also are detrimental to the environment. The components of gasoline contain carcinogens. These carcinogens are toxic to aquatic life and can upset fish and aquatic wildlife reproduction. While these compounds exist as a sheen on top of the water, some of the toxic chemicals may evaporate and pollute the air. Over time, heavier toxins sink to the bottom. Bottom dwellers may ingest the toxins. The toxins that have been ingested by these bottom dwellers will be passed up the food chain, ultimately ending up in game fish.

According to the U.S. Environmental Protection Agency (2001), most fuel dock spills result from overfilling boat fuel tanks or while transferring the fuel nozzle from the boat back to the fuel



This fueling station is at the Hammond Marina.

dock. These spills are usually small and can be minimized by taking some precautionary steps. Another potential source of fuel leaks comes from damaged pipes and hoses leading from the fuel storage tank(s). These leaks can result from boat collisions with the fueling dock or during severe storms. Petroleum-based fuels are lighter than water and float on the water's surface. This property allows for their capture if petroleum containment equipment is used in a timely manner.



# FUELING STATIONS

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## Existing Federal and State Laws

Any marina that has the capacity to store greater than an aggregate of 1,320 gallons of petroleum above ground, including any container of 55 gallons or more; or more than 42,000 gallons underground that is not subject to the underground storage tank rules found in Title 40, Parts 280 and 281, of the Code of Federal Regulations (40 CFR Parts 280 and 281), and has a reasonable expectation of an oil discharge into or upon navigable waters of the U.S. or adjoining shorelines is required to have a spill prevention, control, and countermeasure (SPCC) plan. This federal regulation (40 CFR Part 112) requires that a facility that meets the criteria described above comply with the SPCC rule by preventing oil spills and developing and implementing an SPCC plan. Though not all marinas are required to have such a plan in place, having some form of response plan in place is a good idea.

Underground storage tanks must be constructed and installed according to U.S. EPA-inspired standards detailed in 329 IAC 9 by the authority of IC 13-23. Corrective action plans for cleanup of spills must be submitted to the Indiana Department of Environmental Management. Also, both 329 IAC 9 and 327 IAC 2-6.1 require reporting, containment of, and response to fueling station spills.

The Division of Fire and Building Safety within the Indiana Department of Homeland Security regulates marine fueling facilities under Chapter 22 of the 2008 Indiana Fire Code and more specifically Section 2210 (675 IAC-22-2.4), the Indiana Building Code (675 IAC 13) and the Indiana Mechanical Code (675 IAC 18). Such operations shall include both public accessible and private operations. They address construction of the facilities; storage and handling of associated liquids; dispensing of fuels; fire prevention and protection methods; and, venting of tanks.

IDEM's Office of Air Quality permits and regulates gasoline dispensing facilities under 326 IAC 8-4-4. Facilities must comply with the Stage I vapor recovery system requirements as detailed in section (b) of that rule. Section (c) details special requirements for facilities in Lake, Porter, Clark and Floyd Counties that dispense an average monthly volume of more than ten thousand (10,000) gallons of gasoline per month or that are not an independent small business marketer of gasoline or that are an independent small business marketer which dispenses an average monthly volume of more than fifty thousand (50,000) gallons of gasoline per month.

Gasoline dispensing facilities may be subject to IDEM's air permitting requirements due to potential emissions from the storage and pumping of fuel. Subject facilities may elect to obtain a permit or to comply with IDEM's Permit by Rule for gasoline dispensing operations found in 326 IAC 2-11.

Facilities with a storage tank capacity equal to or less than ten thousand five hundred (10,500) gallons and dispensing less than or equal to one thousand three hundred (1,300) gallons per day of either gasoline or diesel are exempt from the permitting requirements pursuant to 326 IAC 2-1.1-3(e).

# FUELING STATIONS

## Best Management Practices

U.S. EPA recommends these best management practices for marina fueling stations.

- Use automatic shutoffs on fuel lines and at hose nozzles to reduce fuel loss.
- Remove older fuel nozzle triggers that hold the nozzle open without being held.
- Install personal watercraft floats at fuel docks to help drivers refuel without spilling.
- Require boaters to fuel all vessels at a designated fueling station or upland location away from water.



A boater and marina staff person practice spill prevention by using an absorbent cloth to prevent fuel from dripping.



Source: BoatU.S. Foundation

- Regularly inspect, maintain, and replace fuel hoses, pipes, and storage tanks.
- Train fuel dock staff in spill prevention, containment, and cleanup procedures.
- Install signs on the fuel dock that explain proper fueling, spill prevention, and spill reporting procedures and contact numbers. The BoatU.S. Foundation has developed a number of materials designed specifically for marinas and fuel docks to educate dock staff and customers about clean fueling. The information is free and available at [www.boatus.com/foundation](http://www.boatus.com/foundation).
- Locate and design fueling stations so spills can be easily contained and cleaned up.

# FUELING STATIONS

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Have a fire extinguisher readily available near fuel docks along with spill containment equipment.

- Write and implement a fuel spill recovery plan.
- Have spill containment equipment readily available and clearly marked. The locker or cabinet should contain:
  - Absorbent pads;
  - Absorbent booms (for small and large releases);
  - Empty sandbags;
  - Sewer pipe plugs;
  - Dry absorbent;
  - Spark-resistant square end shovels;
  - Spark-resistant pry bar;
  - Curtain boom;
  - Drain covers;
  - Fire extinguishers; and
  - A copy of the spill contingency plan.

If there is a spill, call IDEM's 24-hour emergency response hotline at (888) 233-7745 and the National Response Center at (800) 424-8802.

## For More Information

**Appendix E** – (pages 111-114)  
Spill Prevention, Control and Countermeasure Plans

**Appendix F** – (pages 115-123)  
Emergency Preparedness and Spill Response (includes Emergency Response Phone Directory)

# SEWAGE FACILITIES

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## Applicability

*This section applies to new, expanding, or existing marinas.*

## Background

As mentioned earlier in this guidebook, pollutants tend to concentrate within marina basins due to their sheltered environment. Of particular concern is the illegal discharge of untreated sewage from boats. The nutrients found in sewage can result in excessive plant and algal blooms within the marina basin. In severe cases, the decomposition of raw sewage within the marina basin may result in fish kills.

As the sewage is broken down by bacteria, the bacteria consume oxygen that is dissolved in the water column. This is the same oxygen that fish require. Additionally, raw sewage contains disease-causing bacteria and viruses which are a threat to swimmers and others coming into direct contact with the water. Every year there are a number of beach closures along Indiana's Lake Michigan beachfront due to elevated *E. coli* levels (an indicator of sewage contamination).



Wahala Beach in Lake County

While the potential volume of sewage that could be released from boats is relatively small as compared with sewer overflows, the concentration of the sewage is much higher. There is no dilution of the sewage with water from bathing, dishwashing, or clothes washing. Marine heads use little or no water.

## Existing Federal and State Laws

A marina located on the state's navigable waters and its public freshwater lakes must provide a pumpout that is in good order and is readily accessible to marina patrons unless the marina obtains an exemption from the Indiana Department of Natural Resources (IDNR) Division of Law Enforcement. IDNR may issue an exemption based on whether a marina is designed to service exclusively boats that are not required or likely to be equipped with a marine sanitation device or if the marina has entered into a binding agreement with another marina or similar facility to provide pumpout services. This exemption is valid for five (5) years at which point the marina must reapply for the exemption. If a marina is interested in obtaining an exemption it should contact IDNR at (317) 232-4011 for more information. To install and manage a pumpout station the marina must obtain either:

1. Permission from the local publicly owned treatment works (POTW) to connect to an existing sanitary sewer line owned/operated by the POTW;

# SEWAGE FACILITIES

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2. Approval from the Indiana Department of Environmental Management (IDEM) to construct a new sanitary sewer line and permission from the local POTW to connect the new sanitary sewer line to the POTW;
3. Approval from IDEM to construct a new sanitary sewer line and a wastewater treatment plant (in which case both construction permits and possibly an NPDES permit would be needed, depending on what would be done with the treated water from the wastewater treatment plant);



A boater uses a pumpout station at the Washington Park Marina.

4. A permit from the Indiana State Department of Health under 410 IAC 6-10 for the construction of a commercial on-site wastewater disposal facility;
5. A contract with a septic waste hauler and off-site disposal facility to manage the sewage; or
6. An alternative written approval for wastewater disposal from an authorized governmental agency (312 IAC 6-4-3) (312 IAC 11-4-1).

The Clean Vessel Act, which is administered by the U.S. Fish and Wildlife Service, makes grant dollars available to private and public marinas for the installation and restoration of boat sewage pumpout stations and portable toilet dump stations. IDEM has been awarded a grant from the U.S. Fish and Wildlife Service to implement the Clean Vessel Act Pumpout Program. Pumpout stations are used to dispose of highly concentrated human waste collected aboard boats. Under this program, marinas are reimbursed up to 75 percent of pumpout construction costs.



# SEWAGE FACILITIES

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## Best Management Practices

U.S. EPA recommends the following best management practices for sewage facility management and maintenance.

- Install pumpout facilities and dump stations that meet the marina's needs. There are three types of onshore sewage collection systems—fixed point, portable/mobile and dedicated slipside systems.
  1. Fixed point systems are stationary systems. The boat that needs service can move to the pumpout station. A hose is connected to the sanitation device fitting and a pump or vacuum system moves the waste material into an onshore holding device or into the sewer system. A fixed point system should be centrally located and have free and easy access for boats to maneuver.
  2. Portable systems are good for smaller, more difficult-to-maneuver marinas. They may or may not have a holding tank attached to them. Since these systems are portable, they can be pushed to the boat needing service instead of having the boat come to the dedicated pumpout station. Some boaters find this more convenient. The mobile systems are able to move about the marina. An empty mobile station is easier to maneuver than a full one. You must consider returning the mobile system to an area where it can be pumped out and whether it is feasible to move when full. These systems also require more hands-on cleaning activities.
  3. Dedicated slip side systems provide continuous wastewater collection at select slips within the marina. These are good systems if enough slips can be dedicated to their use. These systems have a direct connection to the boat and a below-dock gravity drained sewer system. It utilizes a vacuum-type pumpout system.



Portable toilet dump station

# SEWAGE FACILITIES

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- Along with these three sewage collection systems, a dump station should be available for boaters who have portable toilets. Dump stations can be considered a satisfactory disposal facility and may be fundable with funds from the Clean Vessel Act.



Washington Park Marina in Michigan City provides dockside pumpout services.

- Provide pumpout service at convenient times and at reasonable costs. Having the pumpout station open at the same times as the fueling station allows for patrons to fuel and dump during the same trip. Have extra staff available before and after weekends to meet your patrons' needs. Consider discounts to patrons who fuel at your dock, or incorporate it into the slip fees.
- Keep pumpout stations clean and easily accessible. While offering free or inexpensive pumpouts are likely to attract customers, having pumpouts that look dirty, are full of clutter and are difficult to use are a sure deterrent. Keep the equipment clean and free of debris. Post instructions near the station and offer training on its operation.
- Consider having marina staff do pumpouts. This service is appreciated by patrons and, if added to free pumpouts, would attract many customers to your slips.
- Provide portable dump stations near small slips and launch ramps. Most smaller boats (less than 26 feet in length) do not have marine sanitation devices on board. Many marinas allow transient boaters to launch from their ramps. Many of these transient boats do not have marine sanitation devices. These boaters utilize portable units that can be carried on shore for dumping into toilets. To further encourage boaters to properly dispose of their waste, dump stations should be kept clean and located in an area that is convenient to the ramp area. Public launch ramps should offer a dump station where feasible.
- Federal law prohibits the discharge of untreated waters into all territorial waters and inland waters of the nation. These areas are considered no discharge zones. On Indiana's boundaries of Lake Michigan and its navigable tributaries in the Indiana Lake Michigan Coastal Area Type I and II marine sanitation devices may lawfully be used. For additional information regarding waterways on which Type I and II marine sanitation

# SEWAGE FACILITIES

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devices may lawfully be used, see [www.IN.gov/legislative/register/20070214-IR-312070082NRA.xml.pdf](http://www.IN.gov/legislative/register/20070214-IR-312070082NRA.xml.pdf). The marina can seek designation as a no discharge area if certain conditions are met and the marina works with the state to petition U.S. EPA. To be considered for a no discharge zone classification the marina must meet one of three criteria:

1. There must be adequate restroom facilities for patrons and convenient and low/no cost pump-out services for both marina slip holders and transient boaters;
2. There are drinking water intakes nearby; or
3. The waters around the marina warrant greater environmental protection.



This bath house and public restroom is located at Washington Park Marina.

For more information on the designation process please read U.S. EPA document EPA-842-B-94-004, *Protecting Coastal Waters from Vessel and Marina Discharges*. This document is available from U.S. EPA's publication website at [www.epa.gov/nscep/index.html](http://www.epa.gov/nscep/index.html).



This dog walk area has educational signage, pet waste collection bags, a garbage can and even a fire hydrant!

# SEWAGE FACILITIES

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Resident waterfowl droppings can contribute to high levels of bacteria and viruses in the receiving waterbody.

- Provide convenient and clean public restrooms. Most boaters would prefer to use clean, well-lit restrooms than the portable unit located on the boat. If the restrooms are easy to access by boat and boaters, the potential for overboard discharge of untreated sewage is lessened.
- Establish practices to control pet waste problems. Provide a special area away from the shoreline for pets to be taken for walks. Install fenced dog parks to allow patrons to exercise their dogs or put in park benches to encourage the owner to use the space. The area should be grassy and away from storm drains. Offer a supply of cleanup bags and a refuse container with a lid on it. Educate your patrons on the issues with pet waste and ask them to clean up after their pet.
- Avoid feeding wild birds, including ducks, geese and/or seagulls, in the marina. This encourages birds to flock to the marina and become long-term residents. The birds' waste can contaminate water and create a mess on boats and walkways.