

# 1. LAND LOT TASK: Animal Feeding Operation (AFO)

**Description:** This land lot contains an AFO, which is an agriculture operation where animals are kept and raised in confined situations. Animals are confined and fed for a total of 45 days or more in any 12-month period.

**Type of Water Pollution Source:** *Point Source (PS)*

AFOs are regulated under a permitting program run by a state's natural resource agency. If the AFO is in compliance with its permit, then its water pollution is prevented or minimized. If it does not follow the permit, it is in noncompliance and causes water pollution.

**Possible Water Pollutants:** Manure from animals (contains nitrogen, phosphorus) can be a nutrient/fertilizer but when excessive amounts enter a waterway it becomes a water pollutant. This causes excessive algae growth which results in fish kills and other problems. **See the link below for a more thorough definition and other AFO related pollutants.**

**Karst Feature:** This land lot has a **sinkhole** which carries surface water runoff underground which can potentially reach groundwater. It also has a well for the operation, which could be susceptible to groundwater pollution.

## Task Steps (Underlined Statements)

In this simulation activity, this AFO is NOT in compliance with its permit. Therefore, the pollutants listed above are entering the waterways on the land lot. Using a **green marker make several large bold green arrows pointing into the streams and into the sinkhole**. The arrow is green to represent the excessive nutrients from the manure that are entering the waterway and traveling downstream and into the groundwater. The arrows represent point source water pollution. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Animal Feeding Operations \(AFOs\) | US EPA](#)

## 2. LAND LOT TASK: Crop Agriculture

**Description:** This land lot produces a large crop for human or animal consumption.

**Type of Water Pollution Sources:** *Nonpoint Water Pollution (NPS)*

Crop agriculture is considered “normal” agricultural activity and is exempt from regulation under the Clean Water Act (CWA). Therefore, it is not regulated by a state resource agency.

**Possible Water Pollutants:** Water runoff from the field could contain soils from erosion. When eroded soil enters waterways it becomes sediment pollution. Sediment pollution is a major cause of nonpoint water pollution and agriculture is the biggest source. Sediment interferes with aquatic life in numerous ways. Also, excessive fertilizers, herbicides, pesticides, insecticides, and fungicides could become water pollutants if used and/or disposed of improperly. These chemicals can be harmful to aquatic life, wildlife, beneficial insects (such as bees) and humans, especially if used or disposed of improperly.

**Karst Feature:** This land lot has a **losing stream**. This means the stream water goes underground and returns to the surface elsewhere. As a result, polluted water runoff could possibly pollute groundwater. There is a well on the lot for irrigation of the crops and it could be susceptible to groundwater pollution.

### Task Steps (Underlined Statements)

In this simulation activity, the farmers growing this agricultural crop are using **Best Management Practices** to prevent water pollution. This means that various methods are taken to reduce soil erosion. In addition, the land lot has a buffer zone of trees and other vegetation around the losing stream to slow runoff and absorb nutrients from runoff. **Take a green marker and surround all waterways in the land lot (like a glove) to represent a buffer zone.** Also, all instructions are followed carefully if agriculture chemicals are used and disposed of. **Write BMPs on the land lot in a blue marker.** BMPs represent that the land lot is using Best Management Practices to prevent water pollution. The blue color represents the water the methods are protecting. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Protecting Water Quality from Agricultural Runoff \(epa.gov\)](http://epa.gov)

### 3. LAND LOT TASK: Crop Agriculture

**Description:** This land lot produces a large crop for human or animal consumption.

**Type of Water Pollution Sources:** *Nonpoint Water Pollution (NPS)*

Crop agriculture is considered “normal” agricultural activity and is exempt from regulation under the Clean Water Act (CWA). Therefore, it is not regulated by a state resource agency.

**Possible Water Pollutants:** Water runoff from the field could contain soils from erosion. When eroded soil enters waterways it becomes sediment pollution. Sediment pollution is a major cause of nonpoint water pollution and agriculture is the biggest source. Sediment interferes with aquatic life in numerous ways. Also, excessive fertilizers, herbicides, pesticides, insecticides, and fungicides could become water pollutants if used and/or disposed of improperly. These chemicals can be harmful to aquatic life, wildlife, beneficial insects (such as bees) and humans, especially if used or disposed of improperly.

**Karst Features:** This land lot has a **sinkhole**, which if not carefully managed could allow polluted water runoff to enter the groundwater.

#### **Task Steps (Underlined Statements)**

In this simulation activity, these farmers are NOT using methods to reduce soil erosion. Soil is entering the waterway becoming sediment pollution. **Using a brown marker, places .5 cm brown dots to represent soil erosion into the waterway.** Instructions are not consistently followed when agriculture chemicals are used and disposed of. **Using a purple marker, place .5 cm purple dots on the land lot to represent runoff of excessive chemicals listed above. Using a green marker make .5 cm dots for fertilizer causing excessive nutrient water pollution.** **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Protecting Water Quality from Agricultural Runoff \(epa.gov\)](http://epa.gov)

## 4. LAND LOT TASK: Mining Operation

**Description:** This land lot has valuable minerals that are being mined. The operation processes the mineral ore at the mine.

**Type of Water Pollution Source:** *Point Source Water Pollution (PS)*

Mining operations are a point source for industrial wastewater pollution and are regulated by a state's resource agency. If the mine is in compliance with its permit, then water pollution is prevented or minimized. If it does not follow the permit, it is in noncompliance and causes water pollution.

**Possible Water Pollutants:** The wastewater contains harmful chemicals. This wastewater is kept in tailing ponds so it does not enter the waterways. The mineral and chemical substances vary according to the type of mine.

**Karst Features:** This land lot has a **losing stream**. Water in the stream enters underground and resurfaces elsewhere. Therefore, it may come into contact with groundwater. The site has a well for processing the mineral ore which could be susceptible to groundwater pollution.

### **Task Steps (Underlined Statements)**

In this simulation activity, the mining operation is in compliance. Therefore, it is taking all necessary steps in its permit to prevent and minimize point source water pollution.

**Take a blue marker and surround all waterways (like a glove) on the land lot.** The blue outline represents that the operation is following all processes in the permit to protect the waterways and groundwater. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

*Note: Mining operations can also be a source of nonpoint water pollution such as acid drainage.*

[Industrial Wastewater | US EPA](#)

## 5. LAND LOT TASK: Forest Logging

**Description:** This land lot is forested and being harvested for timber.

**Type of Water Pollution Source:** *Nonpoint Water Pollution Source (NPS)*

Logging on private forest land is not regulated. Forestry on public land requires procedures to reduce and prevent potential water pollution.

**Possible Water Pollutants:** Eroded soils from logging operations become sediment water pollution when they enter a waterway, especially on slopes and stream banks. Skid trails and forest roads not properly maintained cause erosion. Large clear-cut areas increase chances for erosion. Logged areas not planted with ground cover are exposed to erosion. Sediment pollution is the major cause of nonpoint water pollution. Sediment interferes with aquatic life in numerous ways. Equipment oils left behind or dumped also pollute runoff and threaten aquatic life.

**Karst Features:** This land lot has a **losing stream** and **sinkhole**. Both karst features take surface water runoff into the ground.

### Task Steps (Underlined Statements)

In this simulation activity, this logging operation is NOT using methods to prevent and reduce nonpoint water pollution runoff. Therefore, eroded soils are entering the waterway and creating sediment water pollution. **Take a brown marker and place .5 cm dots on the land lot.** The brown dots represent eroded sediments entering the waterway from runoff. **Take a black marker and add some .5 cm dots but not nearly as many as the brown dots.** The black dots represent equipment oils and lubricants left on the site which run off into waterways as well. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Missouri Forest Management Guidelines | Missouri Department of Conservation \(mo.gov\)](https://www.mo.gov/conservation/forest-management-guidelines)

## 6. LAND LOT TASK: Forest Logging

**Description:** This land lot is forested and being harvested for timber.

**Type of Water Pollution Source:** *Nonpoint Water Pollution Source (NPS)*

Logging on private forest land is not regulated. Forestry on public land requires procedures to reduce and prevent potential water pollution.

**Possible Water Pollutants:** Eroded soils from logging operations become sediment water pollution when they enter a waterway especially on slopes and stream banks. Skid trails and forest roads not properly maintained cause erosion. Large clear-cut areas increase chances for erosion. Logged areas not planted with ground cover are exposed to erosion. Sediment pollution is the major cause of nonpoint water pollution. Sediment interferes with aquatic life in numerous ways. Equipment oils left behind or dumped also pollute runoff and threaten aquatic life.

**Karst Features:** This land lot has a **spring** along the waterway.

### **Task Steps (Underlined Statements)**

In this simulation activity, this logging operation is using Best Management Practices to prevent and reduce nonpoint water pollution runoff (sediments). This means that various methods are taken to reduce soil erosion. In addition, the land lot has a buffer zone of trees and other vegetation around the stream to slow runoff. **Take a green marker and surround all waterways in the land lot (like a glove) to represent buffer zone. With a blue marker write BMPs on the land lot.** This label represents that the land lot is using methods to reduce and prevent soil erosion. The blue color represents the waterways (streams and spring) the methods are protecting. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Missouri Forest Management Guidelines | Missouri Department of Conservation \(mo.gov\)](https://www.mo.gov/conservation/forest-management-guidelines)

## 7. LAND LOT TASK: Industrial Site

**Description:** This land lot has an industrial site that is processing raw materials for manufacturing and is producing wastewater.

**Type of Water Pollution Source:** *Point Source (PS)*

Industrial sites that produce wastewater are regulated under a permitting program run by a state's natural resource agency. If the industrial operation is in compliance, water pollution is prevented or minimized. If it does not follow the permit, it is in noncompliance and causes water pollution.

**Possible Water Pollutants:** Fifty different categories exist for industrial water pollution based on types of water pollutants (see provided link). For the purposes of this simulation, the pollutants will be considered toxic. Toxic substances are harmful to humans, plants and wildlife. In addition, any industrial site of five acres or larger is also regulated for stormwater runoff. Stormwater runoff is considered a point source pollution when leaving a site.

**Karst Feature:** This land lot has a **losing stream** which carries surface water runoff underground, which can potentially reach groundwater. It also has a well for the operation, which could be susceptible to groundwater pollution.

### **Task Steps (Underlined Statements)**

In this simulation activity, this industrial site is NOT in compliance with its permit. Therefore, the pollutants listed above are entering the waterways on the land lot. Using a **red marker make several large bold red arrows pointing into the waterway**. The arrow's red color represents the industrial water pollution, such as heated water or toxins that are entering the waterway and traveling downstream and into the groundwater. The arrows represent point source water pollution. **Using a gray marker make one large bold arrow pointing into the waterway**. The gray arrow represents stormwater runoff not in compliance with the stormwater permit for the site. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Learn about Effluent Guidelines | US EPA](#)

## 8. LAND LOT TASK: Protected Forest

**Description:** This land lot contains a forest that is being managed for the protection of wildlife and native plant species. A healthy forest, in turn, captures and filters drinking water for communities.

**Type of Water Pollution Source:** *Nonpoint source pollution (NPS)*

**Possible Water Pollutants:** Surface water runoff with wildlife excrement and possibly eroded soils from disturbances (accesses roads or hiking trails) could be nonpoint pollutants from a forest. Rural dumping in the area is also a possible nonpoint source of water pollution.

**Karst Feature:** This land lot has a **cave**. The cave is protected by the forest and therefore, is potentially preserved. Threats to the cave could be human caused events such as vandals harming the cave or illegal dumping in the area.

### **Task Steps (Underlined Statements)**

In this simulation activity, this natural area is being managed to protect the ecosystem. Native plants cover the landscape so wildlife and fish flourish. The streams are protected with a natural vegetative buffer zone. **Take a green marker and surround all waterways in the land lot (like a glove) to represent a buffer zone and include a green buffer around the cave. With a blue marker write BMPs on the land lot.** This label represents that the land lot is using methods to reduce and prevent soil erosion along any roads or trails. The blue color represents the streams and spring being protected. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Water Facts | US Forest Service \(usda.gov\)](#)



## 9. LAND LOT TASK: Cattle Ranch

**Description:** On this land lot, cattle are raised for food production.

**Type of Water Pollution Sources:** *Nonpoint Water Pollution (NPS)*

With the exception of Animal Feeding Operations (AFO), most “normal” agricultural activity is exempt from regulation under the Clean Water Act (CWA).

**Possible Water Pollutants:** Water runoff from the ranch may contain eroded soils from along hillsides and stream banks where cattle travel. Overgrazing can also cause soils to erode. When eroded soil enter waterways it becomes sediment pollution. Sediment pollution is a major cause of nonpoint source water pollution. Excessive sediments in waterways interferes with aquatic life in numerous ways. Cattle manure contains nitrogen and phosphorus that are also carried to waterways in runoff. Excessive nutrients become water pollution when algae blooms become extreme and deplete dissolved oxygen in water. Depleted oxygen stress aquatic life and can cause fish kills.

**Karst Features:** This land lot has a **losing stream** and **sinkhole**, which if not carefully managed could allow polluted water runoff to enter the groundwater.

### **Task Steps (Underlined Statements)**

In this simulation activity, cattle ranchers are NOT using methods to reduce soil erosion. Overgrazing and stream bank erosion is occurring. Soil is entering the waterway, becoming sediment pollution. **Using a brown marker, make .5 cm brown dots to represent excessive soil erosion into the waterway.** The area has excessive nutrient runoff from manure due to unlimited access to waterways on the ranch. **Using a green marker, place .5 cm green dots on the land lot.** The green dots represent excessive nutrients. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Protecting Water Quality from Agricultural Runoff \(epa.gov\)](http://epa.gov)

## 10. LAND LOT TASK: Cattle Ranch

**Description:** On this land lot, cattle are raised for food production.

**Type of Water Pollution Sources:** *Nonpoint Water Pollution (NPS)*

With the exception of Animal Feeding Operations (AFO) most “normal” agricultural activity is exempt from regulation under the Clean Water Act.

**Possible Water Pollutants:** Water runoff from the ranch may contain eroded soils from along hillsides and stream banks where cattle travel. Overgrazing can also cause soils to erode. When eroded soil enter waterways it becomes sediment pollution. Sediment pollution is the major cause of nonpoint water pollution. Sediment interferes with aquatic life in numerous ways. Cattle manure contains nitrogen and phosphorus that are also carried to waterways in runoff. Excessive nutrients become water pollution when algae blooms become extreme and deplete dissolved oxygen in water. Depleted oxygen stress aquatic life and can cause fish kills.

**Karst Features:** This land lot has a **spring** fed by groundwater and a well. The well could get contaminated by manure if not managed properly.

### **Task Steps (Underlined Statements)**

In this simulation activity, the cattle ranchers are using Best Management Practices to prevent water pollution. This means that overgrazing is avoided so there is less erosion. Cattle don't have unlimited access to waterways, so they're not causing excessive erosion or nutrient pollution. In addition, the land lot has a buffer zone of trees and other vegetation around the waterways to slow runoff and absorb some of the nutrient's runoff. **Take a green marker and surround all waterways in the land lot (like a glove) to represent this buffer zone. Write BMPs on the land lot in a blue marker.** This label represents that the land lot is using Best Management Practices to prevent water pollution. The blue color represents the water the methods are protecting. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Protecting Water Quality from Agricultural Runoff \(epa.gov\)](http://epa.gov)

## 11. LAND LOT TASK: Rural Area (Same as #17)

**Description:** The residents in this low density populated area are responsible for their own domestic water source and wastewater disposal. Some have private wells. A few are on rural water district systems and others haul water from town. Residents discharge their wastewater from toilets, showers, appliances and sinks into septic tanks, lagoons and outhouses. Some have rural trash services and others buy city trash bags. Others pile up debris, fill nearby sinkholes or use illegal dump sites. Some burn part or all of their trash. Some use a recycling center. Like urban residents, rural residents may use assorted yard and garden chemicals as well as household hazardous products for various purposes. Household hazardous substances can be dangerous because they are either toxic, flammable, corrosive, or reactive.

**Type of Water Pollution Source:** *Nonpoint Source Water Pollution (NPS)*

**Possible Water Pollutants:** Excessive nutrients and assorted household chemicals can enter nearby streams and groundwater if septic systems and lagoons are not functioning properly. Chemicals and metals can enter waterways from illegal dumping. Improper use and disposal of home, garden and yard products can contribute to polluted water runoff. Excessive sediments from eroded areas and nutrients from fertilizer overuse enter waterways and harm aquatic life in numerous ways.

**Karst Feature:** This land lot has a **sinkhole** and a **cave** that collect runoff.

### Task Steps (Underlined Statements)

In this simulation activity, the rural residents are NOT using Best Management Practices to prevent and reduce water pollution runoff. They are not maintaining their wastewater systems so excessive nutrients and chemicals enter waterways. Some of their trash including household hazardous wastes ends up in sinkholes and illegal dumps. The areas along streams are eroded due to the lack of trees and vegetation. On this land lot use the designated colors for the various nonpoint source water pollutants in the runoff. **Using a green marker make .5cm dots for excessive nutrients. Using a brown marker make .5cm dots for excessive sediments. Using a red marker make .5cm dots for household hazardous wastes. Using a black marker make a few .5cm dots for dumped oil and grease. Using a purple marker, make .5cm dots for NOT following instructions on use and disposal of pesticides, herbicides, insecticides and fungicides. Using a yellow marker make a few .5cm dots for litter. Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Household Hazardous Waste \(HHW\) | US EPA](#)  
[How to Care for Your Septic System | US EPA](#)  
[Residential Sewage Lagoon Systems: A Homeowner's Guide to Installation and Maintenance | MU Extension \(missouri.edu\)](#)

## 12. LAND LOT TASK: Rural Area

**Description:** The residents in this low density populated area are responsible for their own domestic water source and wastewater disposal. Some have private wells. A few are on rural water district systems and others haul water from town. Residents discharge their wastewater from toilets, showers, appliances and sinks into septic tanks, lagoons and outhouses. Some have rural trash services and others buy city trash bags. Others pile up debris, fill nearby sinkholes or use illegal dump sites. Some burn part or all of their trash. Some use a recycling center. Like urban residents, rural residents may use assorted yard and garden chemicals as well as household hazardous products for various purposes. Household hazardous substances can be dangerous because they are either toxic, flammable, corrosive, or reactive.

**Type of Water Pollution Source:** *Nonpoint Source Water Pollution (NPS)*

**Possible Water Pollutants:** Excessive nutrients and assorted household chemicals can enter nearby streams and groundwater if septic systems and lagoons are not functioning properly. Chemicals and metals can enter waterways from illegal dumping. Improper use and disposal of home, garden and yard products can contribute to polluted water runoff. Excessive sediments from eroded areas and nutrients from fertilizer overuse enter waterways and harm aquatic life in numerous ways.

**Karst Feature:** This land lot has a **sinkhole** that collects runoff which enters the **cave**.

### Task Steps (Underlined Statements)

In this simulation activity, the rural residents on this land lot are following Best Management Practices. They are properly maintaining their wastewater systems. They are taking trash to appropriate facilities and following instructions for disposal of all chemical products. They keep the areas along streams in trees and vegetation. **Take a green marker and surround all waterways in the land lot (like a glove) to represent buffer zone. Include a green buffer surrounding the sinkhole and cave. With a blue marker write BMPs on the land lot.** This label represents that the land lot is using Best Management Practices to prevent water pollution. The blue color represents the waterways the methods are protecting. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Household Hazardous Waste \(HHW\) | US EPA](#)  
[How to Care for Your Septic System | US EPA Residential Sewage Lagoon Systems: A Homeowner's Guide to Installation and Maintenance | MU Extension \(missouri.edu\)](#)

## 13. LAND LOT TASK: Suburban Area

**Description:** A suburban area consists primarily of residential homes that are not densely compacted, but it is located near a densely packed urban area. The homes utilize municipal water, sewage and trash services.

**Type of Water Pollution Source:** *Nonpoint Source (NPS) & Point Source (PS)*

The homes and facilities in suburban areas are connected to a municipal wastewater, which itself is a point source. The stormwater runoff that picks up assorted pollutants from yards, streets and roofs is nonpoint source water pollution. This is because it is difficult to pinpoint polluted runoff from specific locations. This runoff is collected and transported in a municipal stormwater system. This system consists of above and below ground conduits that eventually discharges the runoff into a waterbody or holding areas. Stormwater discharge of this kind is considered point source water pollution but carries nonpoint water pollution.

**Possible Water Pollutants:** Runoff from driveways, streets, and parking lots can include auto fluids and oil, grease, road salts and sands for snow and ice melts. Runoff from yards and gardens can include fertilizers, pet wastes, pesticides, herbicides as well as hazardous wastes if they are improperly used and disposed of. Exposed soils in parks and yards can be eroded and run off. Construction sites that do properly prevent soil erosion add to sediment water pollution. Such sites larger than an acre are required to have a stormwater discharge permit.

**Karst Feature:** This suburban area has a **losing stream** and **sinkhole** that collect runoff. It has a well too.

### Task Steps (Underlined Statements)

In this simulation activity, the suburban residents are NOT using methods to decrease nonpoint water pollution from runoff. Pollutants listed above are entering the stormwater system and being discharged into a waterway or basin. **Using a black marker, make .5cm dots for runoff from streets and parking lots.** This represents auto fluids, road sands, and salts. **Using a green marker make .5cm dots for excessive nutrients.** This results from the misuse of fertilizers and pet waste left to runoff. **Using purple and red markers, make .5cm dots for the misuse of herbicides, pesticides, pesticides, and fungicides. Make red .5cm dots for household hazardous wastes that are used improperly. Using a brown marker make some .5cm brown dots from eroded soils from parks, yards and construction sites. Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Nonpoint Source: Urban Areas | US EPA](#)  
[Stormwater Discharges from Construction Activities | US EPA](#)

## 14. LAND LOT TASK: Suburban Area

**Description:** A suburban area consists primarily of residential homes that are not densely compacted, but it is located near a densely packed urban area. The homes utilize municipal water, sewage and trash services.

**Type of Water Pollution Source:** *Nonpoint Source (NPS) & Point Source (PS)*

The homes and facilities in suburban areas are connected to a municipal wastewater system, which itself is a point source. The stormwater runoff that picks up assorted pollutants from yards, streets and roofs is nonpoint source water pollution. This is because it is difficult to pinpoint polluted runoff from specific locations. This runoff is collected and transported in a municipal stormwater system. This system consists of above and below ground conduits that eventually discharges the runoff into a waterbody or holding areas. Stormwater discharge of this kind is considered point source water pollution but carries nonpoint water pollution.

**Possible Water Pollutants:** Runoff from streets and parking lots can include auto fluids as well as road salts and sands that are used to melt snow and ice on roads. Runoff from yards and gardens can include fertilizers, pet wastes, pesticides, herbicides as well as hazardous wastes if they are improperly used and disposed of. Exposed soil in parks and yards can be eroded and transported in runoff. Construction sites that do not properly prevent soil erosion add to sediment water pollution. Such sites larger than an acre are required to have a stormwater discharge permit.

**Karst Feature:** This suburban area has a **spring** that brings groundwater to the surface.

### **Task Steps (Underlined Statements)**

In this simulation activity, suburban residents are using Best Management Practices to decrease nonpoint water pollution from runoff. Therefore, pollutants are prevented or reduced from entering the stormwater system and being discharged into a waterway or basin. **Using a green marker surround all the waterways in the land lot (like a glove) to represent a buffer zone.** This buffer consisting of trees and vegetation will slow and absorb some of the stormwater runoff and decrease bank erosion. Residents are following instructions on the use and disposal of yard, garden, automotive and household hazardous products. **Write BMPs on the land lot in a blue marker.** This label represents that the residents are using Best Management Practices to prevent water pollution. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Nonpoint Source: Urban Areas | US EPA](#)  
[Stormwater Discharges from Construction Activities | US EPA](#)

## 15. LAND LOT TASK: Commercial Area

**Description:** A commercial area consists primarily of businesses that sell goods and services. The areas have parking lots, streets and loading docks. There are stores, hospitals, assorted office buildings, gas stations, car washes, restaurants, civic centers, theaters, colleges and hotels. Green spaces such as parks and small lawns are scattered about. Construction sites pop up as new facilities emerge and older ones get demolished or remodeled.

**Type of Water Pollution Source:** *Nonpoint Source (NPS) & Point Source (PS)*  
The varied facilities in commercial areas are connected to a municipal wastewater system which itself is a point source. The stormwater runoff that picks up assorted pollutants from parking lots, streets and roofs is nonpoint source water pollution. This is because it is difficult to pinpoint polluted runoff from specific locations. This runoff is collected and transported in a municipal stormwater system. This system consists of above and below ground conduits that eventually discharges the runoff into a waterbody or holding areas. Stormwater discharge this kind is considered point source water pollution even though it transports nonpoint water pollution.

**Possible Water Pollutants:** Runoff from streets and parking lots can include auto fluids as well as road salts and sands that are used to melt snow and ice on roads. Construction sites that do not properly prevent soil erosion add to sediments to runoff. Commercial areas can generate large amounts of litter. Runoff carries litter with plastics that eventually become microplastics that harm aquatic life downstream and to the ocean. Runoff from all these sources is considerable since the cement and asphalt are impermeable (can't soak in water).

**Karst Feature:** This commercial area has a **sinkhole** that can funnel runoff underground. There is a well that taps into the groundwater.

### Task Steps (Underlined Statements)

In this simulation activity, the commercial area users are NOT using methods to decrease nonpoint water pollution from runoff. Pollutants listed above are entering the stormwater system and being discharged into a waterway. **Using a black marker, make .5 cm dots for runoff from streets and parking lots.** This represents auto fluids, road sands, and salts. **Using a brown marker make some .5cm brown dots from eroded construction sites.** The brown dots represent sediment pollution. **Using a yellow marker make .5 cm dots for litter that enters the stormwater system.** The yellow represents all the assorted litter that ends up on the ground either carelessly or inadvertently especially in parking lots and roads. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[No More Trash! | Missouri Department of Transportation \(modot.org\)](#)  
[National Menu of Best Management Practices \(BMPs\) for Stormwater | US EPA](#)



## 16. LAND LOT TASK: Commercial Area

**Description:** A commercial area consists primarily of businesses that sell goods and services. The areas have parking lots, streets and loading docks. There are stores, hospitals, assorted office buildings, gas stations, car washes, restaurants, civic centers, theaters, colleges and hotels. Green spaces such as parks and small lawns are scattered about. Construction sites pop up as new facilities emerge and older ones get demolished or remodeled.

**Type of Water Pollution Source:** *Nonpoint Source (NPS) & Point Source (PS)*  
The varied facilities in commercial areas are connected to a municipal wastewater system which itself is a point source. The stormwater runoff that picks up assorted pollutants from parking lots, streets and roofs is nonpoint source water pollution. This is because it is difficult to pinpoint polluted runoff from specific locations. This runoff is collected and transported in a municipal stormwater system. This system consists of above and below ground conduits that eventually discharges the runoff into a waterbody or holding areas. Stormwater discharge this kind is considered point source water pollution even though it transports nonpoint water pollution.

**Possible Water Pollutants:** Runoff from streets and parking lots can include auto fluids as well as road salts and sands that are used to melt snow and ice on roads. Construction sites that do not properly prevent soil erosion add to sediments to runoff. Commercial areas can generate large amounts of litter. Runoff carries litter with plastics that eventually become microplastics that harm aquatic life downstream and to the ocean. Runoff from all these sources is considerable since the cement and asphalt are impermeable (can't soak in water).

**Karst Feature:** This suburban area has a **losing stream** that can funnel runoff underground.

### **Task Steps (Underlined Statements)**

In this simulation activity, the commercial area users are doing Best Management Practices to reduce and prevent nonpoint water pollution. Pollutants are prevented or reduced from entering the stormwater system and being discharged into a waterway. **Using a green marker surround all waterways in the land lot (like a glove) to represents a buffer zone.** This buffer consisting of trees and vegetation will slow and absorb some of the stormwater runoff. Users of the commercial area put litter in trash cans and keep vehicles maintained. City road crews are using sand and salts wisely to keep roads safe and minimize excess use. **Write BMPs on the land lot in a blue marker.** This label represents that the residents are using Best Management Practices to prevent water pollution. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

Microplastics Info: [factsheet31.pdf \(mostreamteam.org\)](#)  
[No More Trash! | Missouri Department of Transportation \(modot.org\)](#)  
[National Menu of Best Management Practices \(BMPs\) for Stormwater | US EPA](#)



## 17. LAND LOT TASK: Rural Area (same as #11)

**Description:** The residents in this low density populated area are responsible for their own domestic water source and wastewater disposal. Some have private wells. A few are on rural water district systems and others haul water from town. Residents discharge their wastewater from toilets, showers, appliances and sinks into septic tanks, lagoons and outhouses. Some have rural trash services and others buy city trash bags. Others pile up debris, fill nearby sinkholes or use illegal dump sites. Some burn part or all of their trash. Some use a recycling center. Like urban residents, rural residents may use assorted yard and garden chemicals as well as household hazardous products for various purposes. Household hazardous substances can be dangerous because they are either toxic, flammable, corrosive, or reactive.

**Type of Water Pollution Source:** *Nonpoint Source Water Pollution (NPS)*

**Possible Water Pollutants:** Excessive nutrients and assorted household chemicals can enter nearby streams and groundwater if septic systems and lagoons are not functioning properly. Chemicals and metals can enter waterways from illegal dumping. Improper use and disposal of home, garden and yard products can contribute to polluted water runoff. Excessive sediments from eroded areas and nutrients from fertilizer overuse enter waterways and harm aquatic life in numerous ways.

**Karst Feature:** This land lot has a **sinkhole** and a **losing stream** can collect runoff, and private wells.

### **Task Steps (Underlined Statements)**

In this simulation activity, the rural residents are NOT using Best Management Practices to prevent and reduce water pollution runoff. They are not maintaining their wastewater systems, so excessive nutrients and chemicals enter waterways. Their trash, including household hazardous wastes, ends up in sinkholes and illegal dumps. The areas along streams are eroded due to the lack of trees and vegetation. On the land lot use the designated colors for the various nonpoint source water pollutants in the runoff. **Using a green marker make .5cm dots for excessive nutrients. Using a brown marker make .5cm dots for excessive sediments. Using a red marker make .5cm dots for household hazardous wastes. Using a black marker make a few .5 cm dots for dumped oil and grease. Using a purple marker, make .5 cm dots for NOT following instructions on pesticides, herbicides, insecticides and fungicides. Make a few .5cm yellow dots for litter. Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Household Hazardous Waste \(HHW\) | US EPA](#)

[How to Care for Your Septic System | US EPA](#)  
[Residential Sewage Lagoon Systems: A Homeowner's Guide to Installation and Maintenance | MU Extension \(missouri.edu\)](#)

## 18. LAND LOT TASK: Wastewater Treatment Plant (WWTP)

**Description:** A wastewater treatment plant is a facility that treats raw sewage wastewater from homes and other locations and then discharges the treated water into a waterway. WWTP operations also apply or provide biosolids (treated sludge) for horticulture use. Municipal facilities are owned and operated by incorporated towns and cities. Residents and businesses are connected to the facility and pay for the service through bonds and fees.

**Type of Water Pollution Sources:** *Point Source Water Pollution (PS)*

Since a WWTP treats raw sewage (human wastes) it is regulated by a state's resource agency. Operators are trained and certified since sewage carries pathogens and bacteria that are dangerous to human and aquatic life. Just like animal manure, nutrients from human wastes can cause algae blooms in water bodies and cause major fish kills downstream from discharge locations. Many WWTPs are a combined system and also treat stormwater. This can be problematic during high rainfalls.

**Possible Water Pollutants:** All substances and products that enter toilets, sinks, and washing machines connected to a municipal system are carried to a WWTP. This includes human wastes that carry disease pathogens, bacteria, viruses and nutrients. Other pollutants include toxins from pipe metals, assorted pharmaceuticals that are excreted and flushed, cleaning products, and hair products. Hair, feminine products, baby wipes and disinfectant wipes are especially problematic for pumps at WWTPs. Stormwater systems connected to WWTPs have nonpoint runoff pollution as well.

**Karst Feature:** This land lot has a **losing stream** so runoff and discharges travel underground.

### Task Steps (Underlined Statements)

In this simulation activity, the WWTP is in compliance with regulations. Therefore, the discharge from the WWTP is free of harmful disease pathogens and as well as excessive nutrients. In addition, biosolids are stabilized and can be safely applied as a fertilizer, with stipulations. **Take a blue marker and surround all waterways (like a glove) on the land lot.** The blue outline represents that the operation is following all processes in the permit to protect the waterways and groundwater. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

Fact Sheet about USA Systems: [Wastewater Treatment CSS04-14.pdf \(umich.edu\)](#)  
[EPA Administrator Regan Announces Comprehensive National Strategy to Confront PFAS Pollution | US EPA](#)

## 19. LAND LOT TASK: Electric Power Production

**Description:** The electrical power production facility on this land lot is one of the three types (either coal, natural gas or nuclear power) that generate electricity using large amounts of water for cooling purposes. The water is taken from rivers and lakes. The water will be discharge back into them after cooling unless it has a self-contained recycling system.

**Type of Water Pollution Source:** *Point Source Water Pollution (PS)*

Facilities that intake and/or release water for cooling are a point source of water pollution. This is because aquatic organisms can be killed and injured by heat, physical stress, chemicals and intake screens. If heated water, a by-product of electrical generation, is discharged to the waterway at above acceptable water temperatures, then the oxygen level in the water is reduced, which can lead to stress or death for some aquatic organisms. In addition, there are various other toxic pollutants that may be released into waterways. The pollutants that bioaccumulate move up the food chain can harm humans and aquatic life. **See the link below for more detail.**

**Possible Water Pollutants:** Permit regulations exist for water temperature levels before discharging, and for screen size before intaking water. Water temperature above the required levels is called thermal pollution. At electrical power production facilities that burn coal, the coal ash is stored in ash ponds. Such ponds that are not properly constructed, lined and maintained allow toxic pollutants to enter both surface and groundwater.

**Karst Feature:** None

### Task Steps (Underlined Statements)

In the simulation for this activity, the electrical power production plant is NOT in compliance. Heated water is discharged to the waterway at temperatures higher than acceptable levels, putting aquatic organisms at risk. **Using a red marker, make a large bold red arrow pointing into the river on the land lot.** The red represents the thermal pollution and the arrow represents point source water pollution. **Using a purple marker, make a large bold arrow for the toxins that are being released into the waterway. Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Steam Electric Power Generating Effluent Guidelines | US EPA](#)  
[About the U.S. Electricity System and its Impact on the Environment | US EPA](#)

## 20. LAND LOT TASK: Protected Forest (same as #8)

**Description:** This land lot contains a forest that is being managed for the protection of wildlife and native plant species. A healthy forest, in turn, captures and filters drinking water for communities.

**Type of Water Pollution Source:** *Nonpoint source pollution (NPS)*

**Possible Water Pollutants:** Surface water runoff with wildlife excrement and possibly eroded soils from disturbances (accesses roads or hiking trails) could be nonpoint pollutants from a forest. Rural dumping in the area is also a possible nonpoint source of water pollution.

**Karst Feature:** This land lot has a **cave**. The cave is surrounded by a protected by the forest and therefore, is potentially preserved. Threats to the cave could be human caused events such as vandals harming the cave or illegal dumping in the area.

### **Task Steps (Underlined Statements)**

In this simulation activity, this natural area is being managed to protect the ecosystem. Native plants cover the landscape so wildlife and fish flourish. The streams are protected with a natural vegetative buffer zone. **Take a green marker and surround all waterways in the land lot (like a glove) to represent a buffer zone. Surround the cave with a green buffer as well. With a blue marker write BMPs on the land lot.** This label represents that the land lot is using methods to reduce and prevent soil erosion along any roads or trails. The blue color represents the streams and spring being protected. **Be prepared to describe information on this sheet after the class puts the land lots together into a watershed map.**

[Water Facts | US Forest Service \(usda.gov\)](#)