

US EPA ARCHIVE DOCUMENT

DRAFT BASELINE ECOLOGICAL RISK ASSESSMENT UPDATE

Centredale Manor Restoration Project

December 2004

www.epa.gov/ne/superfund/sites/centredale

The U.S. Environmental Protection Agency (EPA) and Rhode Island Department of Environmental Management (RIDEM) continue to work with the town of North Providence, the potentially responsible parties, and the Woonasquatucket River Management Action Committee to address contamination at the Centredale Manor Restoration Project located along the Woonasquatucket River in North Providence, Rhode Island.

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Local Information Repositories

North Providence Library
Johnston Library

Or visit the Centredale Manor Restoration
Project Web site:

www.epa.gov/ne/superfund/sites/centredale

If you have comments, please send them to
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EPA Releases Draft Baseline Ecological Risk Assessment for Centredale Manor Project

Since 2001, EPA has conducted several studies to assess the contamination in and along the Woonasquatucket River from Route 44 downstream to Dyerville Pond. These studies are being used to assess the potential risks to public health and the environment and will form the basis for any future cleanup activities at the site. This update summarizes the findings of the draft baseline ecological risk assessment (BERA), which evaluates the potential chemical risks to wildlife and other ecological species that depend upon the aquatic resources and adjoining wetlands of the Woonasquatucket River.

The draft BERA estimates the potential risks to wildlife (e.g., birds, fish, and mammals) that may be exposed to chemicals (contaminants) through consumption of contaminated prey, drinking water, and, to a lesser extent, surface soil or sediment. The draft BERA also estimates the potential risks to other ecological species (e.g., plants, invertebrates, and fish) that may be exposed to site contaminants through direct contact with and ingestion of surface water and sediment or floodplain soil. Potential ecological receptors studied include the following:

- Aquatic and floodplain plants
- Benthic invertebrates (aquatic larval life stage of some flying adult insects)
- Amphibians
- Fish
- Birds
- Mammals



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The risk assessment provides the community and decision makers with an understanding of the potential ecological risks, now or in the future, posed by contamination from the site in the absence of any cleanup.

What is an Ecological Risk Assessment?

To determine what the potential current and future ecological risks are, the risk assessment answers the following questions:

1 Are toxic contaminants present where plants and animals are located? (Problem Formulation)

The draft BERA identified the plants and animals located along the Woonasquattuck River. Samples of floodplain soil, river sediment, surface water, and animals (e.g., fish, birds) were collected to determine what contaminants are present in environmental media of the Woonasquattuck River near the Centredale Manor site. The draft BERA also developed a Conceptual Site Model (CSM) that shows how the animals may be directly or indirectly exposed to contamination from the Centredale Manor Restoration Project.

2 What animals are exposed? How often? To what degree? (Exposure Assessment)

Animals are exposed to contaminants through breathing (inhalation); eating, drinking, or preening (ingestion); or by skin contact (direct dermal contact). How specific animals may come into contact with chemicals and how often (e.g., the number of fish a river otter eats from the river) are determined in the Exposure Assessment. The most important exposure for many animals in the Woonasquattuck River is through their diet. A range of likely exposures was developed for representative species, based on where they live and what they eat, to estimate the amount and types of contaminants they ingest over time.

Representative species from various levels in the food chain were evaluated to estimate potential ecological risks. The level in the food chain for a species is based on what it eats and what eats it. Wildlife species can be exposed to high concentrations of persistent chemicals like dioxin because it bioaccumulates in the food chain (concentrations increase at each level).

3 How toxic are the chemicals? (Effects Assessment)

EPA used information from studies conducted in the Woonasquattuck River, and from studies conducted elsewhere, to assess the potential for contaminants to cause harm to different species. Studies conducted at

RISK ASSESSMENT

1 Problem Formulation

2 Exposure Assessment

3 Effects Assessment

4 Risk Characterization

CLEANUP DECISION

the site provided data about toxic effects that were specific to the Woonasquattuck River. Studies included a multi-year tree swallow population study, laboratory fish embryo and invertebrate toxicity tests, aquatic community biological assessments, and a two-year census of amphibians.

4 Are there potential ecological risks? (Risk Characterization)

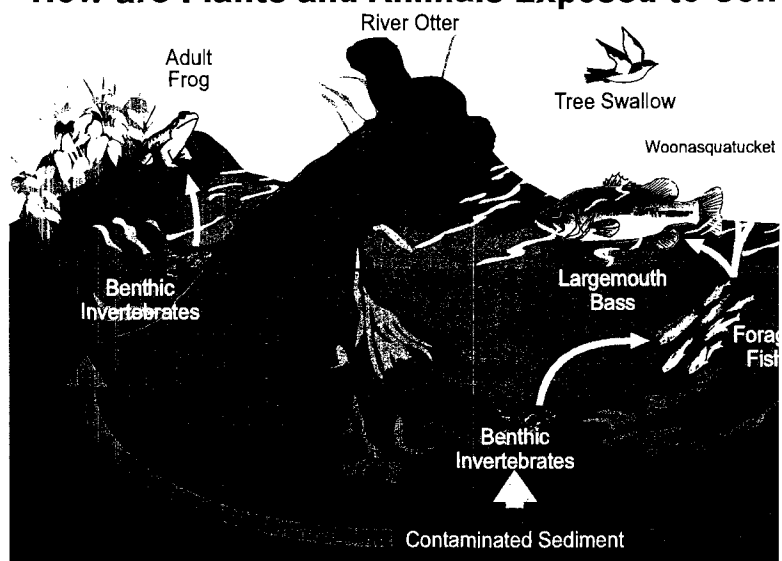
The Risk Characterization describes the types and magnitude of potential risk from contaminants for different animals. However, because of the many different interactions in a complex ecosystem like the Woonasquattuck River, there are some uncertainties that must be considered when determining potential ecological risk. These uncertainties are evaluated using statistical methods, and the potential risk for different animals is expressed in terms about how certain that risk is.

How are Wildlife Exposed to Contaminants at the Centredale Manor Restoration Project Site?

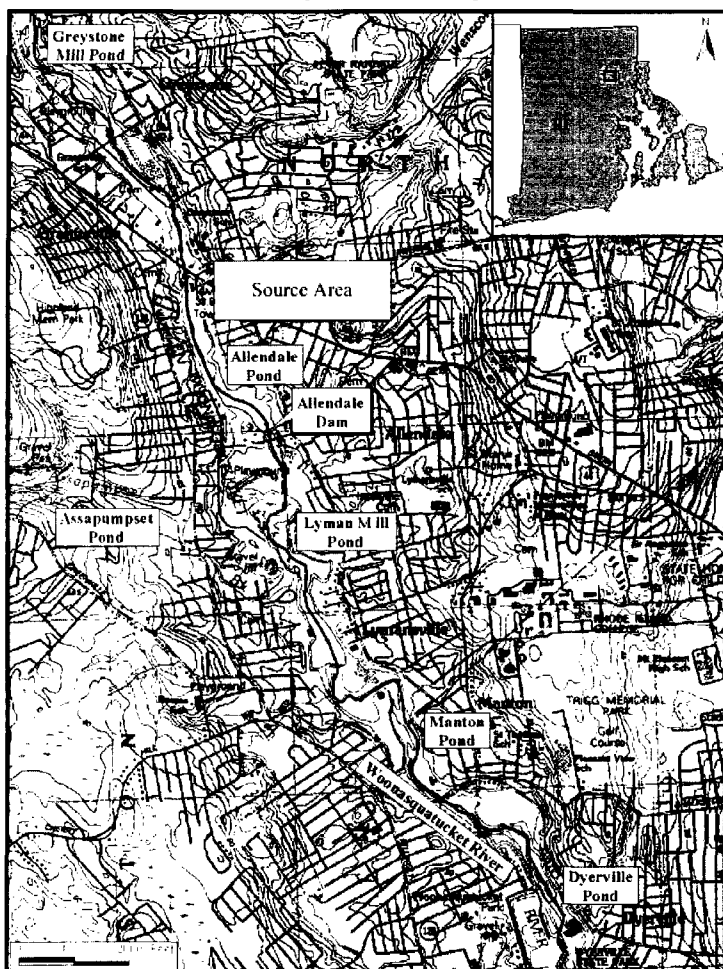
Benthic invertebrates, such as insects and earthworms, form the base for the food chain in the river. Benthic invertebrates that live on and in the river sediment can be exposed to contaminants through direct contact with contaminated surface water, sediment, and floodplain soil. Animals that live along the river, including fish, amphibians (e.g., frogs), birds, and mammals (e.g., raccoons), can be exposed to contaminants through direct contact with contaminated floodplain soil, sediment, and surface water. Animals living along the river also can be indirectly exposed to contaminants by drinking contaminated water and/or consuming contaminated prey (e.g., insects, fish).

For example, benthic invertebrates (insects) are directly contaminated by living in the sediments. Tree swallows are contaminated when they consume flying insects that emerge off of bottom sediments in the river.

How are Plants and Animals Exposed to Contaminants?



Map of the Study Area



Centredale Manor Restoration Project, the Woonasquatucket River, and its associated waterbodies, including Greystone Mill Pond (background area) and Assumpset Pond (reference area) and Allendale, Lyman Mill, Manton, and Dyerville Ponds located adjacent to and downstream of the source area, Centredale Manor Restoration Project.

Highlights of the Draft Baseline Ecological Risk Assessment

Although the BERA is still in draft form, EPA's preliminary findings indicate that overall, animals and other ecological receptors living in and along the Woonasquatucket River may be at substantial risk of harm due to direct contact and indirect food chain exposure to site-related contaminants.

Key findings of the draft BERA, which evaluates potential risks to ecological receptors from exposure to site contaminants, include the following:

- Benthic (aquatic) invertebrate communities that reside in depositional (e.g., silty sediment) areas appear to be at substantial risk of harm. In contrast, benthic macroinvertebrate communities in free-flowing areas (particularly near the source) and soil invertebrates that reside within the Woonasquatucket River floodplain do not appear to be at substantial risk of harm.
- Fish, bird, and mammal populations may be at substantial risk of harm due to exposure to site-related contaminants in sediment.
- Bird and mammal populations that consume contaminated fish also may be at risk because chemicals present in the contaminated fish can bioaccumulate in their bodies, potentially resulting in adverse reproductive effects.
- Chemicals that appear to be the largest contributors to risk for fish-eating animals include dioxins, polychlorinated biphenyls (coplanar PCBs and Aroclor-1254), 4,4'-DDE, and methylmercury.

- Dioxins and coplanar PCBs appear to be the primary contributors to risks for insect-eating animals. For example, elevated dioxin concentrations were associated with a reduction in tree swallow egg hatching success on the river.

Overall, preliminary findings from the draft BERA indicate that contaminated sediments appear to be associated with the largest risks at the site. The sediment contaminants are a particular concern because they are persistent, bioaccumulate, are toxic at the concentrations measured, and transfer up the food chain as animals consume contaminated prey.

Chemicals of Concern

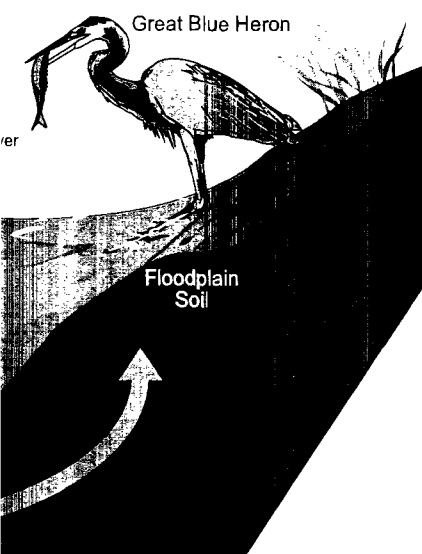
Dioxin is a general term describing a group of hundreds of chemicals that are highly persistent in the environment. Dioxins are formed as unintentional by-products of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing, and pulp and paper bleaching. The most toxic of these compounds is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. TCDD is believed to cause cancer and is considered a serious public health threat.

PCBs (polychlorinated biphenyls) are mixtures of up to 209 individual chlorinated compounds. There are no known natural sources of PCBs. Many commercial PCB mixtures are known by the trade name **Aroclor** and were used as coolants and lubricants in electrical equipment. The manufacture of PCBs was stopped in the United States in 1977.

4,4' DDE is a breakdown product of the pesticide DDT. DDE adheres strongly to soil and can build up in plants and the fatty tissues of animals. Use of DDT was banned in the U.S. in 1972.

Methylmercury is one of the most toxic and bioaccumulative forms of mercury. Methylmercury is formed by bacterial action on inorganic mercury in sediments. The main sources of mercury to the environment are air emissions from power generation and other industrial and waste disposal activities. Methylmercury is a neurotoxin and will bioaccumulate in tissue.

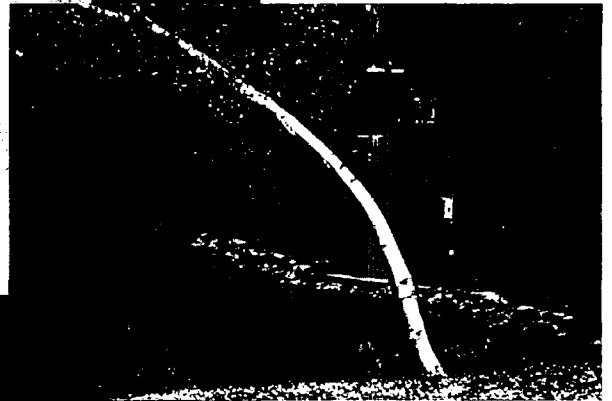
Contaminants?



RISK ASSESSMENT CLEANUP DECISION NEXT STEPS

The Draft Baseline Ecological Risk Assessment is one in a series of reports being prepared for the Centredale Manor Restoration Project. This report, combined with the Draft Baseline Human Health Risk Assessment (issued September 2004), characterizes the potential risks posed to people and the environment by contamination at the site. In addition to assessing the potential risks from contamination at the site, EPA is conducting environmental studies to assess the sources and nature and extent of contamination in the river. Following the completion of these studies, EPA will begin evaluating options for cleaning up the river. The public will have an opportunity to learn more about and comment on these various cleanup options before EPA makes a final decision about how to proceed.

Copies of the Draft Baseline Ecological Risk Assessment Report are available for public review at the public libraries in North Providence and Johnston.



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