

Study Plan
For
Mink Injury Determination

Investigation of Mink Abundance and Density Relative to
Polychlorinated Biphenyl Contamination within the
Hudson River Drainage

Hudson River Natural Resource Damage Assessment

HUDSON RIVER NATURAL RESOURCE TRUSTEES

State of New York
U.S. Department of Commerce
U.S. Department of the Interior

DRAFT FOR PUBLIC REVIEW AND COMMENT

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Executive Summary

Natural resources of the Hudson River have been contaminated through past and ongoing discharges of polychlorinated biphenyls (PCBs). The Hudson River Natural Resource Trustees – New York State, the U.S. Department of Commerce, and the U.S. Department of the Interior – are conducting a natural resource damage assessment (NRDA) to assess and restore those natural resources injured by PCBs.

Many species of mammals rely on the Hudson River, including its floodplain, for habitat, food, and as a breeding ground. Mammals that depend on the river for food and habitat include otter, muskrat, raccoon, beaver, and mink. The Hudson River NRDA Plan identified mink and otter health as an area of biological injury investigation. Mink are the subject of this draft Study Plan for an injury determination effort as part of the Hudson River NRDA

Based on the results of preliminary investigations conducted by the Trustees, including the mink and otter work conducted in the upper Hudson River drainage during the 1998-1999 and 1999-2000 trapping seasons, input from a panel of mammal experts, review of the existing mink and otter toxicology literature, and considering factors such as the life history of mink, preliminary results of the mink PCB-feeding study, and goals of the NRDA, the Trustees have determined that it is appropriate to conduct further investigations focused on mink to be initiated in the year 2012.

Pursuant to the Hudson River NRDA Plan, the Trustees have developed this Draft Study Plan for a mink injury determination effort. The objective of the proposed study is to estimate abundance and density of mink in areas within the Upper Hudson River drainage where elevated levels of PCBs have been found, and to compare that estimate of mink abundance and density to that in a reference river. The Trustees propose to assess the following potential injury to mink: reduced abundance and density in areas contaminated by elevated levels of PCBs.

In the future the Trustees may propose additional work to supplement this effort.

In accordance with the Hudson River NRDA Plan, the Trustees are issuing this Draft Study Plan for public review and comment. Comments should be submitted by April 18, 2012 to:

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1.0 Background

Past and continuing discharges of polychlorinated biphenyls (PCBs) have contaminated the natural resources of the Hudson River. The Hudson River Natural Resource Trustees – New York State, the U.S. Department of Commerce, and the U.S. Department of the Interior – are conducting a natural resource damage assessment (NRDA) to assess and restore those natural resources injured by PCBs (Hudson River Natural Resource Trustees 2002).

Many species of mammals rely on the Hudson River, including its floodplain, for habitat, food, and as a breeding ground. Mammals that depend on the river for food and habitat include otter, muskrat, raccoon, beaver, and mink. The Hudson River NRDA Plan identified mink and otter health as an area of biological injury investigation. Mink are the subject of this Draft Study Plan for an injury determination effort as part of the Hudson River NRDA.

Injury means a measurable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource resulting either directly or indirectly from exposure to release of a hazardous substance, such as PCBs, or exposure to a product of reactions resulting from the release of a hazardous substance. An injury to a biological resource, such as mink, has resulted from the release of a hazardous substance, such as PCBs, if the concentration of the substance is sufficient to cause the biological resource or its offspring to have undergone at least one of the following adverse changes in viability: death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations.

Mink are small carnivorous mammals that are associated with aquatic habitats of all kinds including rivers, lakes, and wetlands (USEPA 1993). They are opportunistic hunters, feeding on any animal material they can find and kill (Linscombe et al. 1982). Mink appear to select prey primarily based on its availability (Gilbert and Nancekivell 1982) and vulnerability (Eagle and Whitman 1987). The mink diet includes other small mammals such as mice, rats, rabbits and muskrats, aquatic prey including frogs, fish, and crayfish, and terrestrial prey including birds, reptiles such as snakes, insects, and other invertebrates. Mink are exposed to PCBs directly through their diet. Mink are also exposed to PCB-contaminated water and soil or sediments as they build dens and forage for food.

The Trustee agencies have assessed PCB concentrations in mink from the Hudson River. PCB concentrations in liver (normalized for the amount of fat, or lipids, in each sample) range from 0.13 ppm to 139 ppm in mink (NYSDEC 2001, 2002). PCB concentrations in liver on a wet weight basis range from 0.0082 to 3.34 ppm in Hudson River mink (NYSDEC 2001, 2002).

Analysis of mink collected from 1998 to 2000 for hepatic PCB burdens as Aroclors indicated concentrations were elevated for animals collected from the main channel of river sections contaminated with PCBs or tributaries entering those sections. Maximum PCB levels in mink exceeded criteria for reproductive impairment and criteria for potential health impairment (Leonards *et al.* 1994; Smit *et al.* 1996). Approximately half the mink collected during 1998-2002 within 6 km of the main-stem of the Hudson River had elevated levels of PCBs in their livers; mink with elevated levels of PCBs in their livers were not recovered beyond 5 km from the main-stem Hudson River. In addition to elevated contaminant burdens, a lower take of mink relative to trapping effort was evident for trap sites located within 6 km of PCB-contaminated

sections of the Hudson River between Hudson Falls and Troy compared to sites at least one home range from the river or upstream of Hudson Falls (Mayack and Loukmas 2001).

Those preliminary investigations of mink exposure to PCBs were undertaken to assist the Trustees in determining the extent to which mink in the Hudson River are contaminated with PCBs, to determine if additional pathway and injury assessment studies focused on mink should be conducted as part of the Hudson River NRDA, and for potential use in the design of future studies to assess the health of Hudson River mink.

In January 2002, the Trustees assembled an expert panel to review the exposure and effects information compiled by the NYSDEC for mink and otter, and to provide guidance to the Trustees on appropriate next steps for determining whether PCBs are causing adverse biological effects in Hudson River mammals, particularly mink and otter. The Hudson River NRDA Plan noted that the Trustees planned to build upon the existing mink and otter studies, potentially conducting further studies to determine PCB effects in mink and otter from the Hudson River.

The Trustees are engaged in two such studies. The first study is a laboratory study; the second study is this proposed field study.

Regarding the laboratory study, in 2006, the Trustees initiated a mink-PCB feeding study (Hudson River Natural Resource Trustees, 2006) as part of the mink injury determination. The results of that study are currently undergoing peer review. Pursuant to the Hudson River NRDA Plan, the results of that study will be released to the public after peer review is complete. Regarding the field study, on August, 2, 2010, the Trustees released a draft study plan entitled, “Investigation of Mink Occupancy Relative to Polychlorinated Biphenyl Contamination within the Hudson River Drainage” (Hudson River Natural Resource Trustees, 2010). Following peer and public review of that plan, the Trustees determined that revisions to that plan were appropriate, resulting in the current draft study plan being released for further peer and public review.

2.0 Introduction

Based on the results of preliminary investigations conducted by the Trustees, including the mink and otter work (Mayack and Loukmas 2001; NYSDEC 2001, 2002), input from a panel of mammal experts, review of the existing mink and otter toxicology literature, and considering factors such as the life history of mink, preliminary results of the mink PCB-feeding study (Hudson River Natural Resource Trustees, 2006), and goals of the NRDA, the Trustees have determined that it is appropriate to conduct further investigations on mink to be initiated in the year 2012.

Pursuant to the Hudson River NRDA Plan, the Trustees have developed this Draft Study Plan for a mink injury determination effort. This Draft Study Plan focuses on a further investigation of the apparent decrease in abundance of mink in PCB-contaminated areas of the Hudson River (Mayack and Loukmas 2001). PCB-contaminated areas of the Hudson River may be functioning as “sinks” for mink.

In accordance with the Hudson River NRDA Plan, the Trustees are issuing this Draft Study Plan for public review and comment. The Trustees are interested in receiving feedback on this Draft

Study Plan. To facilitate this process, the Trustees are asking the public and the party or parties responsible for the contamination to review this Draft Study Plan and provide feedback on the proposed approach. Comments should be submitted by April 18, 2012. These comments will help the Trustees plan and conduct an assessment that is scientifically valid and cost effective and that incorporates a broad array of perspectives.

To that end, the Trustees request that you carefully consider this Draft Study Plan and provide any comments you may have to:

CONTACT FOR PUBLIC COMMENTS

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Pursuant to the Hudson River NRDA plan, peer review of a draft work plan for this study is in progress. A Final Study Plan will be released to the public when those reviews are complete. A Responsiveness Summary responding to public comments on this Draft Study Plan will also be released. After the study is completed, the results will be peer reviewed and released to the public.

When ready, that information will be available on the following Trustee websites:

- <http://www.fws.gov/contaminants/restorationplans/HudsonRiver/index.html>;
- <http://www.dec.ny.gov/lands/25609.html>; and,
- <http://www.darrp.noaa.gov/northeast/udson/>.

3.0 Purpose and Objective

The purpose of this work is to inform the Trustees regarding injury to mink and to guide their future efforts to identify pathways and specific injuries to mink from PCBs, as defined in regulations written by the U.S. Department of the Interior (Title 43 of the Code of Federal Regulations Part 11, Natural Resource Damage Assessment). This work will also be used to help determine whether future studies will be performed, and if so, to help in their design.

This Draft Study Plan describes a field study designed to assess the abundance and density of mink in areas of the Hudson River drainage contaminated with PCBs (within 5 km of the main stem) as compared with areas with no documented or minimal contamination (within 5 km of the main stem of the Mohawk River, a reference river). The study will be conducted in the Upper Hudson River drainage (between Fort Edward and 50 km south of Fort Edward). The Mohawk River drainage (between Herkimer and 50 km east of Herkimer) will serve as a reference river, and will be evaluated similarly (sampling within 5 km of the main stem).

The objective of the study is to estimate abundance and density of mink in areas within the Upper Hudson River drainage where elevated levels of PCBs have been found, and to compare that estimate of mink abundance and density to that in a reference river. The Trustees propose to

assess the following potential injury to mink: reduced abundance and density in areas contaminated by elevated levels of PCBs.

To investigate mink abundance and density, the Trustees propose a spatial mark-recapture study based on two sources of data: mink scat samples and mink hair samples. Scats obtained from mink using dogs specialized in mink-scat search will be analyzed for DNA. The Trustees will also design a pilot study to evaluate hair-snare collection devices as a means to collect mink hair samples, providing an additional source of DNA material. The Trustees' goal is to use those techniques to obtain individual identification of mink to estimate mink abundance and density using spatial capture-recapture (SCR) models.

4.0 Methods

4.1 Mark-Recapture Study

4.1.1 Introduction

The use of non-invasive genetic methods by genotyping hair, feather, feces, or sloughed skin represents an alternative to traditional marking methods, and is very useful in conjunction with mark-recapture methods to estimate population size (Bellemain et al. 2005, Boulanger et al. 2004a, Boulanger et al. 2004b, Creel et al. 2003, Eggert et al. 2003, Mills et al. 2000, Mowat and Paetkau 2002, Prugh et al. 2005, Taberlet et al. 1999, Wilson et al. 2003). These methods have been used for species including brown and black bears (Woods et al. 1999, Mowat and Strobeck 2000), cougars (Sawaya et al. 2010), tigers (Mondol et al. 2009), and marmots (Goossens et al. 1998).

Among the non-invasive hair sampling approaches, the hair-snare method has been used to study elusive species (Depue and Ben-David 2007, Gardner et al. 2010, Mowat and Paetkau 2002, Raphael 1994) and has great potential because it is a low-cost alternative to direct capture and intensive tracking (i.e., radiocollar) methods. To further assess that potential, a pilot study of a mink hair snare collection device will be conducted.

Using scat detection dogs to collect mink scats can significantly increase the number of scats collected, and has been used effectively on black bears, fishers, and bobcats (Harrison 2006, Homan et al. 2001, Long et al. 2006, Reed et al. 2011, Smith et al. 2001). Maximizing fecal-sample collection is of major importance because typically only 30-60% of fecal samples lead to species identification (Rozhnov et al. 2008, Harrington et al. 2010) and probably fewer will yield individual identification. The sampling design for both scat and hair collection will include repeated sampling of sites to maximize the spatial recapture rate.

The unique genetic profile of each individual identified through the non-invasive sampling techniques is then used to build capture histories, which will be used in spatial mark-recapture models to estimate abundance and density.

4.1.2 Study Design

The proposed study is designed to assess the abundance and density of mink in areas of the Hudson River drainage contaminated with PCBs (within 5 km of the main stem) as compared to

areas with no or minimal contamination (within 5 km of the main stem of the Mohawk River, a reference river). The study will be conducted in the upper Hudson River drainage (between Fort Edward and 50 km south of Fort Edward) and in the Mohawk River drainage (between Herkimer and 50 km east of Herkimer).

Collected hair and scat will be used to identify individuals based on genetic analyses. Site selection will follow protocols identified to represent suitable mink habitat. Site selection for the scat study will consider both habitat suitability for mink as well as accessibility for the scat-detection dog/handler team. Work will occur only at locations for which landowner permission is obtained in advance.

Scat detection will be conducted at stream-road intersections (i.e., 100m on either side of the intersection, on both sides of the stream) on tributary streams entering the main stem of both the Hudson and Mohawk Rivers. Initial limited data-gathering and scat-detection activities will occur in 2012, while a larger number of scat-detection sites will be visited on three occasions during summer 2013.

For the hair-snare pilot study, 2012 activities will include the testing of devices at a limited number of sites. Two hair-snare devices will be deployed at each selected site (which will also be subject to scat collection). Once deployed, hair snares will be visited weekly until the end of the summer field season. Sites for both hair snares and scat detection dogs will be within 5 km of the main stem of the Hudson and Mohawk Rivers. This work may be revised in 2013 based on initial results from 2012.

Mink abundance estimates in the Hudson and Mohawk River drainages will be obtained using SCR analysis. Given the nature of the target species and the study design/data requirements, the SCR approach was chosen over conventional mark-recapture techniques. SCR models produce not only abundance estimates, but also density estimates because animal movement and location are modeled and allow the direct estimation of the area effectively covered by the search area.

4.1.2.1 Study Sites

4.1.2.1.1 Site Selection for Scat Detection and Collection

Mink are indigenous to North America and occupy a variety of riparian, lake shore, wetland, and coastal habitats throughout the non-arid portions of the continent (Dunstone 1993). A modified version of the Habitat Suitability Index (HSI) developed by Allen (1984) will be used to identify high-scoring habitats likely to support mink. High-scoring sites where permission for survey is granted by the owners will be evaluated for dog/handler team accessibility.

The numbers of potential stream-road intersections within the Hudson and Mohawk study areas are 682 and 754, respectively. Sites will be ranked using a modification of the HSI, and landowner permissions will be sought for the highest ranked sites, with the objective of identifying 144 sites in each watershed for study implementation. For 2013, those 144 highest ranked sites in both rivers will be selected and sampled according to their suitability for the detection dogs. For 2012, sampling and collection will be conducted at a more limited number of sites.

4.1.2.1.2 Hair Snare Devices

Hair snares will be based on a design selected during a field trial using farm-raised mink in a captive facility. The field trial suggested that the most efficient device is made of a corrugated plastic shield folded into a triangle using 5 bolts and wing nuts. Hair will be collected using 2 gun brushes (of 0.45 caliber) mounted inside the device. A sardine will be placed in the middle of the device using an alligator clip. Winkler's Brown Beauty mink gland lure (Sterling Fur Company) will be placed in a hardware cloth pocket (6 x 6 cm) and placed adjacent to the hair snare device.

4.1.2.1.3 Monitoring Visitation

Hair-snares

In the 2012 pilot study, hair snares will be visited every 7 days in the order they were installed in the field. Gun brushes with hair will be unscrewed from the device and the gun brush will be placed in a microtube (i.e., falcon tube) by technicians wearing a new pair of surgical gloves for every gun brush handled.

In the field, we will record the uniquely numbered device, the gun brush number, GPS location of device, collection date, sample number, and the collectors initials will be recorded if hair is present and/or if animal signs are present around the device (even in the event of no hair present on the gun brushes). Any unusual observations will be reported (e.g., devices missing, devices moved or destroyed, etc.) and photos will be taken to document these observations, (e.g., animal signs around the devices, how hair was caught in the gun brushes, etc.). Gun brushes with hairs will be removed and a thorough search of the inside of the device will ensure that no hair is adhered to the side walls of the device. Any hair snares containing hair must be clean after hair collection. Hair snares will be visually inspected for hair that may be adhered to the side walls, and if present, will be rinsed in the adjacent stream.

Scat collection

In 2012, one scat detection team will collect scat samples from a more limited number of study sites in the Hudson and Mohawk watersheds. In 2013, two scat detection teams will survey all selected study sites. To minimize any potential influence of differential search performance between the teams, each team will alternate between the two study areas. Each of the 144 sites will be visited approximately every 18 days in each watershed.

In the field, GPS location, sample number, collection date, collection time, and collector's initials will be recorded for all mink scats found by the dog. Any unusual observation will be reported, and photos will be taken to document each fecal sample found. Scats will be placed in 10x16 cm waxless paper bags, with one scat stored in each bag. Field technicians will wear a new pair of gloves to collect each sample. After scat is collected, scats in paper bags will be placed in a warm, dry place and allowed to dry for 1-4 days. Scats will be kept out of direct sunlight. After drying, scats will be stored in falcon tube vials filled with 96% ethanol. Each vial will have an outside label identifying collection information as well as a duplicate label on the inside of the tube.

4.2 Sample and Data Analysis

Mink scat and hair samples will be genetically analyzed using approved protocols.

Databases of capture histories of each animal at each trap and each sampling occasion and available covariates will be prepared for data from the hair-snare and scat experiments. Those data will be used in SCR analyses to estimate mink abundance and density in the Hudson and Mohawk River drainages.

As this investigation entails injury assessment, the Trustees are performing a peer review of the proposed investigation. A draft work plan, prepared by the PIs, is undergoing peer review and changes may be made as a result of the peer review process. The Trustees are seeking public review and comment on this document as part of the public review of this draft Study Plan, in accordance with the Hudson River NRDA Plan.

In the future the Trustees may propose additional work to supplement this effort.

5.0 Quality Assurance/Quality Control

This study is being conducted in accordance with the Quality Assurance Management Plan for the Trustees' Hudson River NRDA (Hudson River Natural Resources Trustees, 2002).

As noted in the Trustees' Responsiveness Summary for the NRDA Plan (Hudson River Natural Resource Trustees, 2003), for each data collection effort that is part of the Hudson River NRDA and is identified in the NRDA Plan, the Trustees will develop a project-specific QA Plan which may be an independent document or may be incorporated into the project Study Plan. Such a QA Plan, in combination with the information on QA management described in the NRDA Plan (Hudson River Natural Resource Trustees, 2002), will ensure that the requirements listed in the National Contingency Plan and applicable EPA guidance for quality control and quality assurance plans are met. The Final Study Plan for the investigation will include a project-specific QA Plan.

Strict Chain of Custody procedures will be used throughout the study.

6.0 Special Provisions

Permits will be required from the National Park Service to conduct a portion of the field study on National Park Service land. Permission will be required to enter private lands or lands under the jurisdiction of State agencies or authorities other than New York State Department of Environmental Conservation to conduct a portion of the field study on those lands.

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