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905013

SIMON HYDRO-SEARCH

SIMON HYDRO-SEARCH

350 Indiana Street
Suite 300
Golden, CO 80401

Telephone (303) 279-7982
(800) 544-5528
Facsimile (303) 279-7988

HBA

ADDENDUM NO. 2 TO THE MACHIAS GRAVEL PIT REMEDIAL INVESTIGATION REPORT SITE NUMBER 905013

3/11/92

March 11, 1992

Prepared for:

Motorola, Inc.
4000 Commercial Avenue
Northbrook, IL 60062

Prepared by:

Simon Hydro-Search
350 Indiana Street, Suite 300
Golden, Colorado 80401

426116032

SIMON Environmental

EXECUTIVE SUMMARY

Motorola, Inc. contracted Simon Hydro-Search to perform a Remedial Investigation/Feasibility Study (RI/FS) of the Machias Gravel Pit site (NYSDEC #905013). The site is located on Very Road, approximately two miles west of the Town of Machias, Cattaragus County, New York. The RI/FS resulted in the development and submittal of the following deliverables:

1) Machias Gravel Pit Remedial Investigation Report (Final: August, 1991).
2) Machias Gravel Pit Draft Feasibility Study (July, 1991).
3) Addendum No. 1 to the Machias Gravel Pit Remedial Investigation Report (January, 1992).

Comments from the New York State Department of Environmental Conservation (NYSDEC) on the draft of the Remedial Investigation Report were issued on July 12, 1991. As part of the RI review comments, the NYSDEC requested that Steps I and III of a Habitat Based Assessment (HBA) be performed for the site. This additional work was not part of the original RI/FS Work Plan approved by the NYSDEC.

Simon Hydro-Search contracted Environmental Science & Engineering, Inc. (ESE) of St. Louis, Missouri to perform Steps I and III of an HBA in accordance with NYSDEC requirements specified in "Habitat Based Assessment, Guidance Document for Conducing Environmental Risk Assessments at Hazardous Waste Sites" dated December 28, 1989.

The HBA was conducted by ESE during the period December 1991 through February 1992 with actual field work in support of the HBA being performed in January, 1992. The resulting report entitled "Machias Gravel Pit Habitat Evaluation and Ecological Risk Analysis", is provided in Attachment A of this addendum to the RI Report. The submittal of this document fulfills all NYSDEC requirements for completion of the Machias Gravel Pit RI/FS.

The purpose of this Executive Summary is to provide a brief overview of the scope of the HBA performed and the results of the assessment. The details are provided in the above referenced document in Attachment A.

Scope of Habitat Evaluation and Ecological Risk Analysis

The ultimate objectives of the study were to characterize the potentially impacted habitat types in the vicinity of the site and to describe the potential environmental risks associated with the Machias Gravel Pit site. The focus of the ecological risk analysis was the on-site habitat and the area of Ischua Creek.

The habitat evaluation provided in Attachment A includes a description of the existing ecology which may potentially be affected by constituents at the site. This description includes a discussion and illustration of the significant habitats, wetlands, regulated streams and other special natural resources within a 2-mile radius, and 9 miles downstream of the site. As part of this description, a resource characterization is included which identified fish and wildlife species that utilize the habitats at the site and an evaluation is performed regarding the general quality of the habitat in meeting the needs of the local species populations. The habitat evaluation also includes an identification of the hazard threshold at the site. The hazard threshold is defined as the available fish and wildlife related applicable or relevant and appropriate requirements (ARARs) and other to be considered (TBC) values. The estimated exposure point concentrations presented in the RI and Addendum No. 1 reports are compared to the available ARARs to determine if any constituents exceed the hazard threshold levels.

The ecological risk analysis used the information developed in the habitat evaluation to evaluate the potential risks that the constituents at the site pose to the identified fish and wildlife receptors. The ecological risk assessment includes four major components:

- Selection of target species and pathways;
- Exposure assessment;
- Toxicity assessment; and
- Risk characterization.

The ecological risk assessment includes an evaluation of those habitats and species of most concern, those exposure pathways likely to impact the selected resources, an evaluation of the likely toxic effects of the constituents of concern, and the characterization of the potential ecological risk associated with the site. This assessment also includes an evaluation of the potential for bioaccumulation and the potential threat to upper-level food chain consumers (both human and other wildlife). Impacts are discussed at the species and population levels and in relation to the reduction in use of habitats by fish, wildlife, and recreational users.

Conclusions - Habitat Evaluation

More than 10 National Heritage cover types were identified during this evaluation. Many of these consisted of habitats in varying stages of disturbance (cropland, old field, gravel pit, etc.) while others exhibited less disturbances (e.g., shallow marsh, shrub swamp).

Notably important resources of the project vicinity included the presence of State regulated wetlands, designated trout streams, and the presence of several unusual features. These included the tongue-tied minnow and an Inland Poor Fen that supports a population of *Carex schweinitzii*. The fen community is ranked as having a limited distribution (S3), whereas the above species are ranked as vulnerable (S2) (see Attachment A, Section 2.1.2, Table 2-2). Among these,the tongue-tied minnow is the nearest to the project site (0.2 mile), while the other resources are more distant (0.8 mile).

Conclusions - Ecological Risk Assessment

The focus of the ecological risk analysis was the on-site habitat (the gravel pit) and Ischua Creek. The ecological risk analysis identified several target species including fish, herpetofauna, soil organisms, plants, the eastern cottontail rabbit, and the red-tailed hawk. Based on the results of the habitat evaluation and the ecological risk assessment presented in this report, the following conclusions are forwarded in support of the overall RI performed for the Machias Gravel Pit site. Important exposure routes include direct uptake from soil or surface water, as well as consumption of plants and prey species (see Attachment A, Table 4-2). No potential aquatic toxicity is expected (see Attachment A, Table 4-5). Estimated surface water concentrations of 1,1,1-trichloroethane and trichloroethylene are below toxic levels of concern. In addition, no potential terrestrial toxicity is expected (see Attachment A, Section 4.4.2).

Measured soil concentrations of lead are below toxic levels of concern. Finally, ecological risks (i.e., ecological risks consider exposure as well as toxicity) to aquatic and terrestrial species are not expected. Concentrations of the constituents of concern do not exceed the available toxic effect levels.

ATTACHMENT A

MACHIAS GRAVEL PIT HABITAT EVALUATION AND ECOLOGICAL RISK ANALYSIS

MACHIAS GRAVEL PIT
HABITAT EVALUATION
AND
ECOLOGICAL RISK ANALYSIS

Prepared for:

SIMON HYDRO-SEARCH
Golden, Colorado

Prepared by:

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
St. Louis, Missouri

ESE No. 591-1017-0200

March 1992

ESE Environmental Science & Engineering, Inc.

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Environmental
Science &
Engineering, Inc.
A CILCORP Company

March 10, 1992
591-1017-0200

Mr. Richard Gnat
Simon Hydro-Search
350 Indiana, Suite 300
Golden, Colorado 80401

RE: Habitat Evaluation and Ecological Risk Analysis for Machias Gravel Pit Site/Motorola

Dear Mr. Gnat:

I am pleased to provide you with 10 copies of the Habitat Evaluation and Ecological Risk Analysis for the Machias Gravel Pit Site. This report was prepared for Motorola to describe the habitat and ecological resources in the vicinity of the Machias Gravel Pit. In addition, the report presents an ecological risk analysis of the constituents of concern associated with the site.

If you have any questions, please do not hesitate to contact me.

Sincerely,

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

James A. Kountzman

James A. Kountzman
Manager, Risk Assessment and Toxicology Department

cep/clb:ec51-s1/mgp

Enclosures

11665 Lilburn Park Road St. Louis, MO 63146-3535 Phone (314) 567-4600 Fax (314) 567-5030

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1.0 INTRODUCTION

Environmental Science & Engineering, Inc. (ESE) has been contracted by Simon Hydro-Search to conduct a habitat evaluation and ecological risk assessment for the Machias Gravel Pit Site in support of the overall remedial investigation (RI) performed by Simon Hydro-Search on behalf of Motorola, Inc. This report contains the results of the habitat evaluation and ecological risk assessment performed in response to comments received from the New York State Department of Environmental Conservation, dated July 12, 1991, and September 30, 1991.

The ultimate objectives of this report are to characterize the potentially impacted habitat types in the vicinity of the site, and to describe the potential environmental risks associated with the Machias Gravel Pit site. This habitat evaluation and ecological risk analysis are consistent with the New York State Department of Environmental Conservation Technical and Administrative Guidance Memorandum "Habitat Based Assessment: Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Sites" (NYSDEC, 1989). In addition, supplemental guidance for the preparation of this document was provided by USEPA (1989) Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual.

This report has been prepared based on the findings of the Remedial Investigation/Feasibility Study (RI/FS) of the Machias Gravel Pit site (NYSDEC #905013). The RI/FS resulted in the development and submittal of the following three deliverables:

- Machias Gravel Pit Remedial Investigation Report (August 1991),
- Machias Gravel Pit Draft Feasibility Study (July 1991), and
- Addendum No. 1 to the Machias Gravel Pit Remedial Investigation Report (January 23, 1992).

These documents were used as a source of baseline information concerning the site from which the habitat evaluation and ecological risk assessment was initiated.

1.1 SITE BACKGROUND

1.1 Site Location/Description

The Machias Gravel Pit site is located on Very Road approximately 2 miles west of the town of Machias, in Cattaragus County, New York (Figure 1-1). The site is approximately 20 acres in size and consists of an active gravel pit operation in the southern portion of the site and an inactive gravel pit area in the northern section.

1.1.2 Site History

The inactive gravel pit area to the north was reportedly used for the storage of approximately 600 drums of waste material from the former Motorola Plant in Arcade, New York, between March and September 1978. The drums were suspected of containing wastes such as epoxy resins, acids, flammable and nonflammable solvents, and cutting oils. The oils received at the site were reportedly spread on local roads for dust control by town personnel. The gravel pit was used as the transfer point to fill tank trucks prior to spraying the oil on rural roads. Based on background information approximately 300 drums were spilled directly on the ground surface. The remaining drums were allegedly stacked on the ground surface along the inactive gravel pit wall.

In 1986 and 1987 NYSDEC oversaw a drum removal and soil remediation project on the site. An attempt to clean contaminated soil was made by excavating a small portion of soil from directly beneath the drums and placing it on plastic. The soil was to be turned routinely to promote volatilization. However, it is unclear whether this soil was eventually removed from the site and properly disposed. Approximately 184 drums were removed by the town of Machias (the property owner) over the period from October, 1986 through May, 1988.

1.2 SUMMARY OF REMEDIAL INVESTIGATION

The Remedial Investigation (RI) performed by Motorola was designed to collect additional site information to characterize the potential source area(s); confirm or refute the presence of buried drums; delineate the horizontal and vertical extent of constituent migration; and to conduct a preliminary human health risk assessment. Based on the physical and chemical data generated during the RI, the following conclusions were made:

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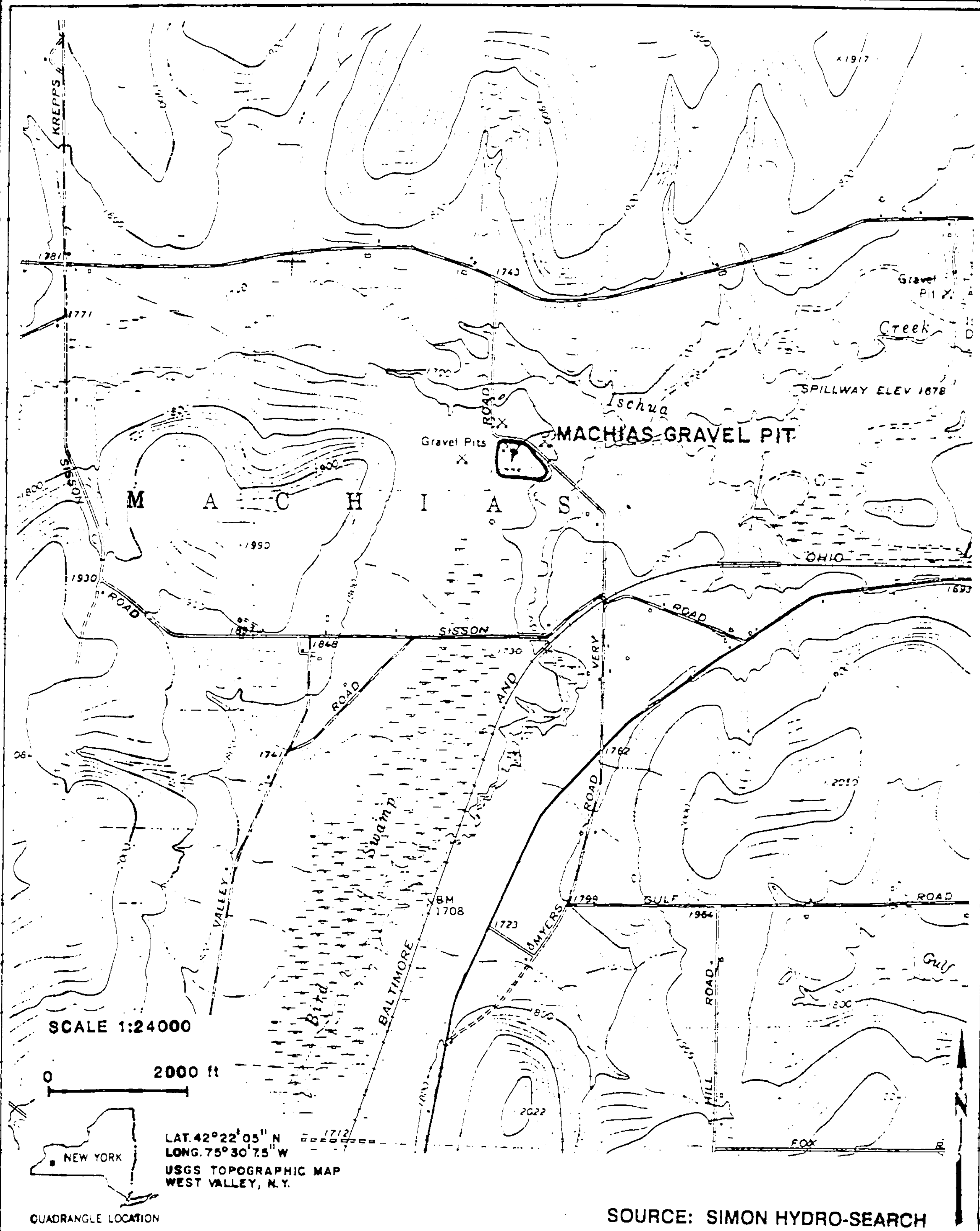

SOURCE: SIMON HYDRO-SEARCH

Figure 1-1
ECOLOGICAL RISK ASSESSMENT
LOCATION MAP

ESE Environmental Science & Engineering, Inc.
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- Based on results of the geophysical survey and subsequent test pit excavation/sampling, no drums were disposed within the suspect drum burial area.
- The primary source area of contamination is confirmed to be the inactive gravel pit. There is no evidence of past waste handling/storage activities in the former maintenance garage area.
- A slug of dissolved phase volatile organic compound (VOC) contamination is migrating via the groundwater system to the northeast, toward the cabin well approximately 450 feet north of the Cole residence. The primary constituents of concern are TCE and 1,1,1-TCA.
- The Cole residence does not appear to be within the migration pathway of the VOC contamination.
- The sporadic chloroform problem associated with the Cole residence well appears to be an isolated issue not related to past waste handling/storage activities at the Machias Gravel Pit site.
- There is no significant non-carcinogenic health threats to adults of children associated with 1,1,1-TCA in the groundwater.
- The total estimate of future carcinogenic risks associated with the groundwater pathway is 2.9×10^{-5}.
- There are no apparent significant health risks associated with the soil, surface water or air exposure pathways.

Upon review of the RI, the NYSDEC requested additional surface and subsurface soil samples be collected and analyzed for lead. In addition, Motorola proposed to install two additional monitoring wells and perform additional groundwater sampling to confirm or refute the analytical model predictions. As a result of these concerns, additional field work was performed in November, 1991. Based on results of these additional site characterization activities, the following conclusions were presented in the Addendum No. 1 report:

- Lead in soils impacts are limited to the inactive gravel pit area and are substantially lower than previous data suggested.

- The dissolved phase VOC plume has migrated slightly further downgradient than predicted by the initial analytical modeling performed as part of the RI report.
- More than one spill event may have occurred resulting in the noted TCE and 1,1,1-TCA distribution pattern.
- After several rounds of sampling, some biodegradation of TCE and 1,1,1-TCA has begun to occur as evidenced by the first set of detections of low levels of degradation products such as the dichloroethenes and dichloroethanes.
- Continued contaminant distribution patterns indicate that there is no contaminant migration toward Bird Swamp.
- The additional data corroborates previous findings that the low level chloroform detections in the Cole residential well are an isolated incident not related to past activities at the Machias Gravel Pit site.

1.3 SCOPE AND ORGANIZATION OF HABITAT EVALUATION AND ECOLOGICAL RISK ANALYSIS

As previously mentioned, the ultimate objectives of this report are to characterize the potentially impacted habitat types in the vicinity of the site and to describe the potential environmental risks associated with the Machias Gravel Pit site. The focus of the ecological risk analysis will be the on-site habitat and the area of Ischua Creek impacted by groundwater discharge.

The habitat evaluation includes a description of the existing ecology which may be affected by constituents at the site. This description includes a discussion and illustration of the significant habitats, wetlands, regulated streams and other special natural resources within a 2-mile radius of the site, and 9 miles downstream of the site. As part of this description, a resource characterization is included which identifies fish and wildlife species that would utilize the habitats at the site and evaluates the general quality of the habitat in meeting the needs of the local species populations. The habitat evaluation also includes an identification of the hazard threshold at the site. The hazard threshold is defined as the available fish and wildlife related applicable or relevant and appropriate requirements (ARARs) and other to be considered (TBC) values. The estimated exposure point concentrations presented in the RI and Addendum No. 1 reports are then compared to the available ARARs to determine if any constituents exceed the hazard threshold levels.

The ecological risk analysis uses the information developed in the habitat evaluation to evaluate the potential risk that the constituents at the site pose to the identified fish and wildlife receptors. The ecological risk assessment includes four major components:

- Selection of target species and pathways,
- Exposure assessment,
- Toxicity assessment, and
- Risk characterization.

The ecological risk assessment includes an evaluation of those habitats and species of most concern, those exposure pathways likely to impact the selected resources, an evaluation of the likely toxic affects of the constituents of concern, and the characterization of the potential ecological risk associated with the site. This assessment also includes an evaluation of the potential for bioaccumulation and the potential threat to upper-level food chain consumers (both human and other wildlife). Impacts are discussed at the species and population levels and in relation to the reduction in use of habitats by fish, wildlife, and recreational users.

2.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

An ecological investigation was conducted at the Machias Gravel Pit, and the surrounding area between January 22-23, 1992. The investigation integrated field reconnaissance with the support of an office review of supplementary materials and telephone interviews. The field visit included an office visit to the New York State Department of Environmental Conservation (DEC) in Olean, New York. A listing of agencies and organizations contacted is provided in Section 6.0.

The purpose of the ecological investigation was to:

- Identify cover types and habitats within a .5-mile radius of the gravel pit (i.e., the site area) to provide accurate description of the existing ecological resources, and to characterize associated vegetative and faunal species populations. (Due to the limitations in scope, quantitative characterization was not a component of the ecological study), and

- Identify any special ecological resources within a 2-mile radius, and 9 miles downstream of the gravel pit (i.e., the study area).

A site walkover was completed by two ESE biologists. Terrestrial habitat characterization was largely based upon the identification of predominant vegetation communities within given areas. Plant identification was primarily accomplished in the field, however selected specimens were collected for taxonomic scrutiny to assure accurate verification. The identification and characterization of the aquatic resources were the result of direct observations made during field collections. Physical and chemical characteristics were noted and recorded.

2.1 SITE ECOLOGY

The project area is located in rural Cattaragus County in the Cattaragus Highlands ecozone of the Appalachian Plateau. Topography of the area is variable. Small streams dissecting the project area are bordered by a variety of wetland communities typical of bottomlands. Areas at higher elevations are often cultivated, depending on slope.

The extent of successional communities in the project vicinity appears to reflect both agricultural abandonment and past logging activities. Abandoned pastures have developed into old field, wet meadow, and successional shrubland communities. Forested areas, cut in the past, have a relatively low diversity and are dominated by species whose seed is rapidly dispersed by wind (maple, birch, elm, aspen) or animals (hawthorn).

Aquatic communities of the project area are primarily represented by Ischua Creek and its tributaries. These streams are of relatively good quality with sand and gravel substrates supporting such species as brown trout, mottled sculpin, fantail darter, and rainbow darter.

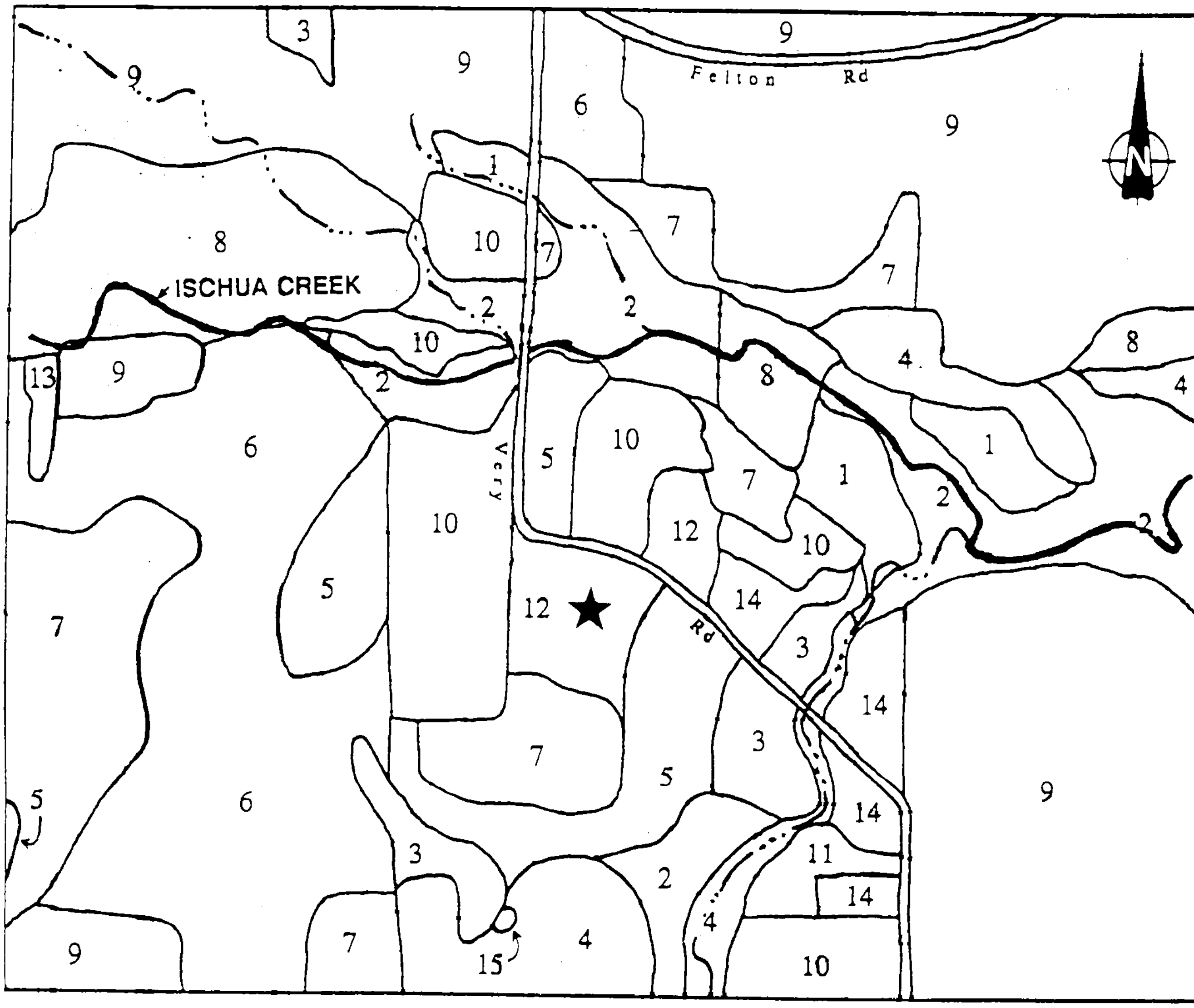
2.1.1 Cover Types

A total of 15 cover types were identified within a half-mile radius of the gravel pit (Figure 2-1, Table 2-1). Terrestrial habitats include shallow emergent marsh, shrub

Table 2-1. New York Natural Heritage Cover Types in the Vicinity of the Machias Gravel Pit

Code	Classification	Acres	Percent
1	Shallow Emergent Marsh	11.1	2.3
2	Shrub Swamp	43.3	8.8
3	Wet Meadow	12.3	2.5
4	Hemlock Hardwood Swamp	25.1	5.1
5	Successional Old Field	26.5	5.4
6	Successional Shrubland	66.1	13.4
7	Successional Northern Hardwoods	44.0	8.9
8	Spruce-Fir Plantation	36.5	7.4
9	Cropland-Field Crops	165.2	33.6
10	Cropland-Row Crops	36.2	7.3
11	Pasture Land	2.8	0.6
12	Gravel Mine	10.7	2.2
13	Pine Plantation	1.5	0.3
14	Mowed Lawn with Trees	10.5	2.1
15	Farm Pond	0.2	0.1
	TOTAL	492.0	100.0

Source: ESE, 1992.



New York Natural Heritage Cover Type Classification

1 Shallow Emergent Marsh
2 Shrub Swamp
3 Wet Meadow
4 Hemlock Hardwood Swamp
5 Successional Old Field
6 Successional Shrubland
7 Successional Northern Hardwoods
8 Spruce-Fir Plantation
9 Cropland - Field Crops
10 Cropland - Row Crops
11 Pasture Land
12 Gravel Mine
13 Pine Plantation
14 Mowed Lawn with Trees
15 Farm Pond
★ Project Location

300 0 300 600 900 FEET

Figure 2-1
MACHIAS GRAVEL PIT
ECOLOGICAL RISK ASSESSMENT
COVER - TYPE MAP

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swamp, wet meadow, hemlock hardwood swamp, successional old field, successional shrubland, successional northern hardwoods, spruce-fir plantation, cropland-field, cropland-row, pasture land, gravel pit, pine plantation, and mowed lawn with trees. Aquatic habitats within the study site include Ischua Creek and a small farm pond.

Local land use practices have largely determined the cover types found within the vicinity of the study area. The primary land use is agricultural, consequently, the predominant cover type is cropland. Field-cropped and row-cropped areas comprise 40.9 percent of the study area, totalling 201.4 acres. Early successional cover types (shrubland and old field) follow with 13.4 percent (66.1 acres) and 5.4 percent (26.5 acres), respectively. Less abundant cover types are pine plantation and farm pond, totalling 0.3 percent (1.5 acres) and 0.1 percent (0.2 acres), respectively. Photographs of representative habitat types found in the project vicinity are given in Appendix A.

2.1.2 Identification of Special Resources

An investigation was conducted to identify "special" resources within a two mile radius and up to nine miles downstream of the Machias Gravel Pit. Special resources are those natural resources identified by the Natural Heritage Program (NHP) as communities and/or species considered to be rare, protected, or otherwise significant. Significance is largely determined by New York State Rank ("S1-S5") and the Element Occurrence Rank ("A-F", "X" and "H").

The state ranking system reflects resource rarity within the state ("S1" being the most rare), while element occurrence ranking of a resource is based upon: quality, condition, viability, and defensibility ("A" defined as excellent). According to NHP, significant resources are those species or communities with state ranks of S1 and S2, regardless of element occurrence rank (EO), and those species or communities with an EO rank of A, regardless of S rank (Reschke, 1990).

The investigation identified three habitat types and six species as special resources, two species and two habitats of which are located upgradient of the gravel pit (Table 2-2). The upgradient special resources include the Kettlehole Bog and Inland Poor Fen located

Table 2-2. Resources Occurring on the Natural Heritage Inventory in the Vicinity of the Machias Gravel Pit

USGS Quadrangle	Resource	State Rank*	Element Occurrence Rank**	State Legal Status	Distance From Site (mi)	Upgradient (U) vs. Downgradient (D)
West Valley	Inland Poor Fen	S3	B	U	0.8	D
	Carex schweinitzii	S2	AB	R	0.8	D
	Exoglossum laurae	S2	E	U	0.2	D
Delevan	Kettlehole Bog	S2	CD	R	2.7	U
	Carex chordorrhiza	S2	CD	R	2.7	U
	Inland Poor Fen	S3	A	U	2.7	U
	Armoracia aquatica	S1,S3	H	R	2.8	U
	Epilobium ciliatum subsp. glandulosum	S4	H	R	2.6	D
Franklinville	Lampetra appendix	S3	E	U	4.7	D

* State Rank:
- S1 - Especially Vulnerable
- S2 - Very Vulnerable
- S3 - Limited Distribution
- S4 - Apparently Secure

Occurrence Rank:
- A - Excellent
- B - Good
- C - Marginal
- D - Poor
- E - Verified Extent, no EO rank
- H - Historical, no recent data

Legal Status:
- U - Unclassified
- R - Rare

Source: NYS Natural Herritage Inventory.
ESE, 1992.

on the Delevan USGS quadrangle. Of the most immediate importance are those special resources located closest to the gravel pit (i.e., the Inland Poor Fen located on the USGS West Valley quadrangle).

Tongue-tied minnow (*Exoglossum laurae*) was collected during field sampling from Ischua Creek .2 miles downgradient of the gravel pit. The current state rank and element occurrence rank are S2 and E, respectively. This suggests that the tongue-tied minnow is vulnerable although it is currently unprotected by the state.

Other special resources within one mile of the gravel pit include Inland Poor Fen and a sedge (*Carex schweinitzii*). Inland Poor Fens are unusual wetland communities having a limited distribution in the state. They are typically influenced by groundwater and have substrates of peat. The sedge, *Carex schweinitzii*, undoubtedly occurs within the fen. Both of these resources are located within the same location, .8 miles due east of the gravel pit.

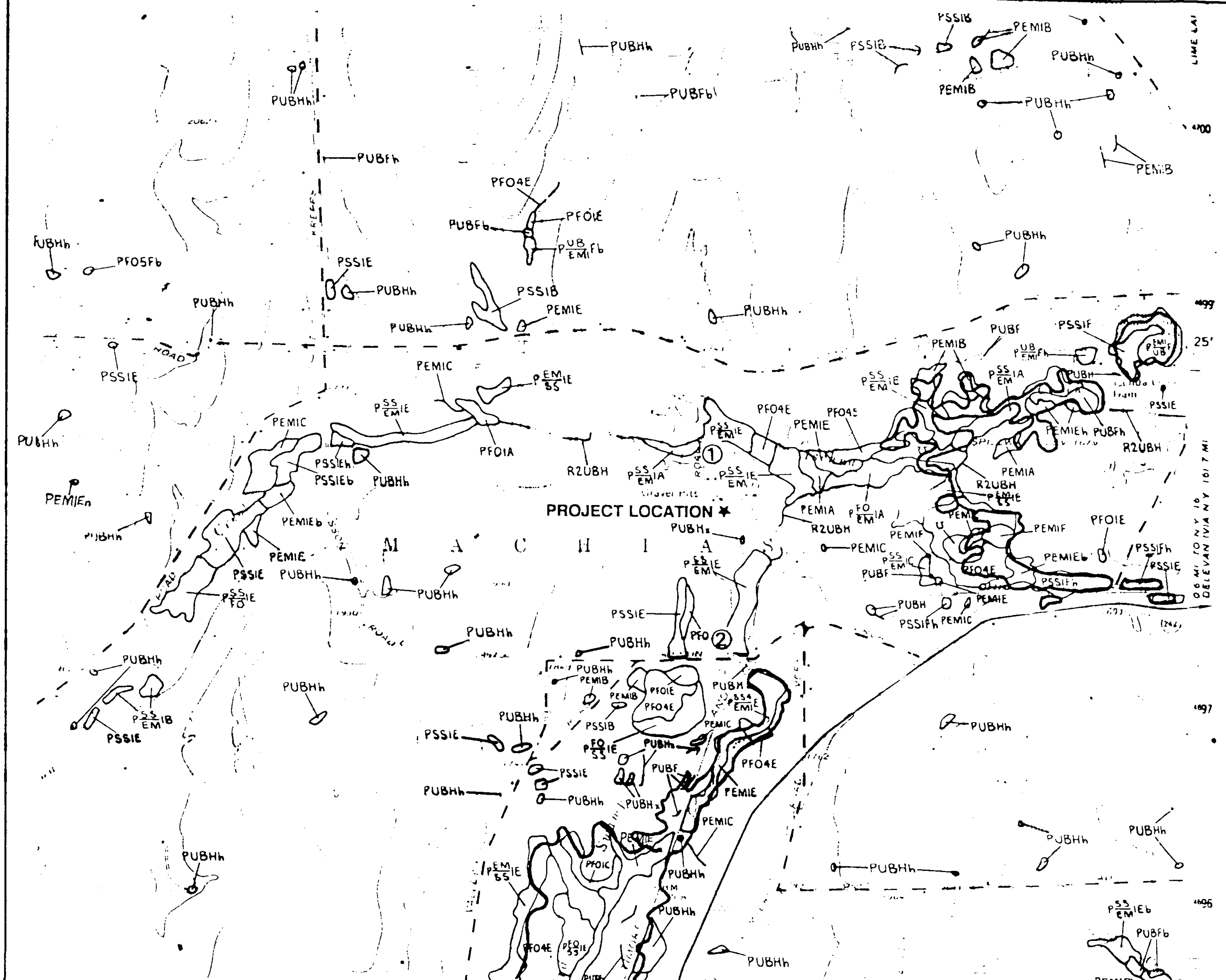
In addition to local "special" resources, there are also New York State-regulated wetlands within the study area. Those wetland systems determined by the State to be state regulatory wetlands are provided in Figures 2-2 and 2-3.

2.1.3 Habitat Description/Species Association

Cropland

The dominant habitat within the immediate study site is agricultural land. Consistent with local topography, fields are located on hilltops, hillsides, and down in lower, drier swale areas. In response to local undulating topographical conditions, there are no large contiguous tracts of cropland. The ultimate effect is increased local habitat variability, creating numerous smaller habitat tracts and "edge" habitats.

Two classes of cropland were observed. Field-cropped cropland totalled 165.2 acres, accounting for 33.6 percent of the total site area. Row-cropped cropland totalled 36.2 acres, comprising 7.3 percent of the total site area. At the time of investigation the fields had been most recently planted in hay, and the row-cropped fields had been most recently



LEGEND

L1UB	-Lacustrine Unconsolidated Bottom
PUB	-Palustrine Unconsolidated Bottom
PEM	-Palustrine Emergent
PFO	-Palustrine Forested
PSS -	Palustrine Scrub Shrub

WATER REGION MODIFIERS

B	-	Saturated
C	-	Seasonally Flooded
E	-	Seasonally Flooded/Saturated
F	-	Semi-permanently Flooded
H	-	Permanently Flooded

SPECIAL MODIFIERS

h	-	Diked/Impounded
x	-	Excavated
b	-	Beaver

①	-	Aquatic Sampling Location
▬	-	New York State Regulated Wetlands

Figure 2-2
MACHIAS GRAVEL PIT
ECOLOGICAL RISK ASSESSMENT WETLANDS
USGS WEST VALLEY QUAD

ESE Environmental Science & Engineering, Inc.

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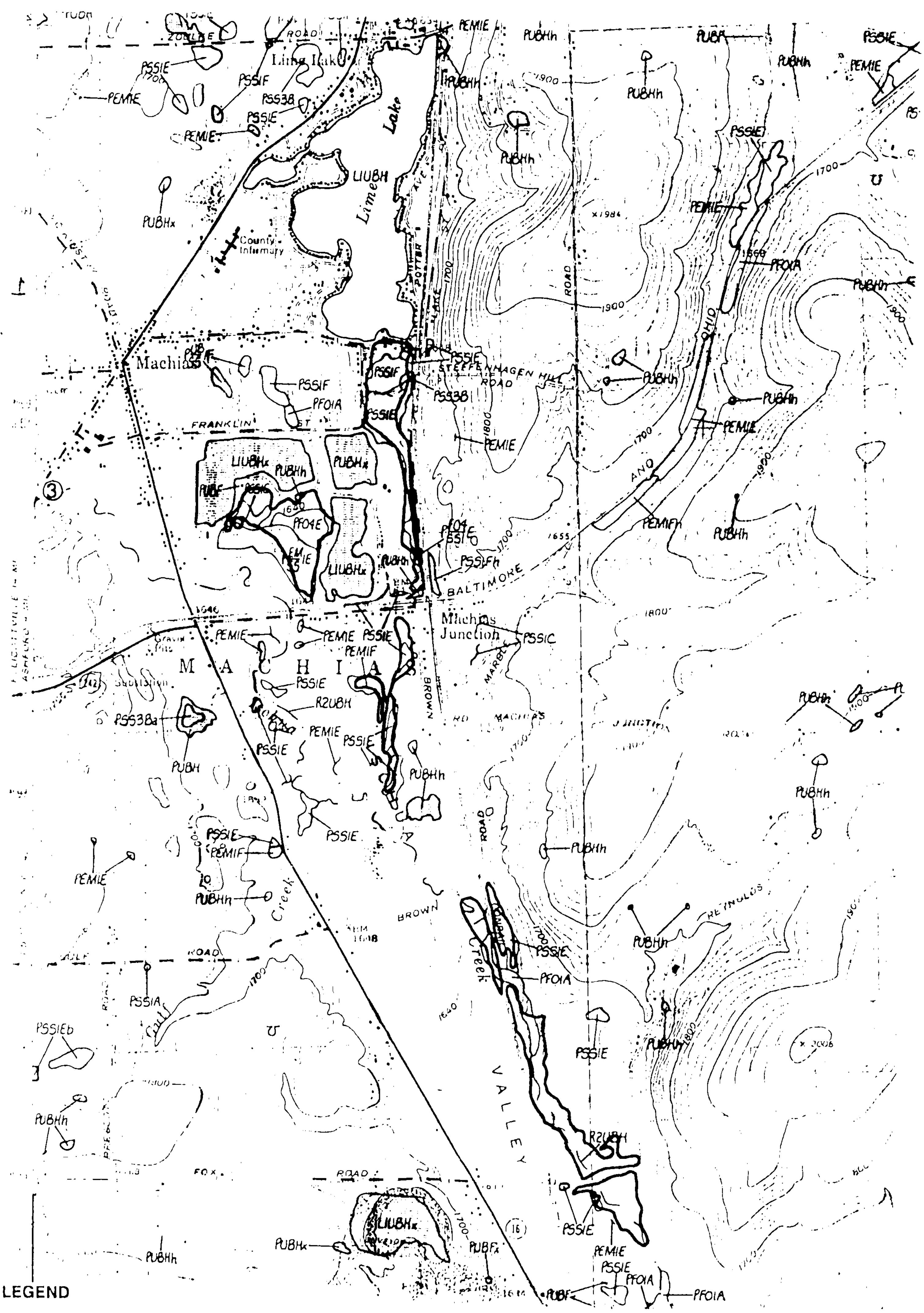

LEGEND

L1UB - Lacustrine Unconsolidated Bottom
PUB - Palustrine Unconsolidated Bottom
PEM - Palustrine Emergent
PFO - Palustrine Forested
PSS - Palustrine Scrub Shrub

SPECIAL MODIFIERS
h - Diked/Impounded
x - Excavated
b - Beaver

① - Aquatic Sampling Location
▬ - New York State Regulated Wetlands

WATER REGION MODIFIERS
B - Saturated
C - Seasonally Flooded
E - Seasonally Flooded/Saturated
F - Semi-permanently Flooded
H - Permanently Flooded

Figure 2-3
MACHIAS GRAVEL PIT
ECOLOGICAL RISK ASSESSMENT WETLANDS
USGS DELEVAN QUAD

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planted in corn. In response to the disturbed nature of cultivated areas, and the season in which observation occurred, relatively few volunteer vegetative species were recorded in these areas. Probable volunteer species include foxtail, dandelion, and clover.

Various faunal species are known to utilize cropland to forage, hunt, and use as resting areas. The presence of variable edge habitats adjacent to cropland areas probably influences local faunal diversity, occurrence, and species abundance.

Common bird species associated with cropland are the common crow, field sparrow, mourning dove, red-winged blackbird, common grackle, killdeer, eastern phoebe, and American kestrel (Table 2-3). Field observations included crow, red-tailed hawk, and cardinal.

Cropland is also used intermittently by mammal species including the eastern cottontail, white-footed mouse, meadow jumping mouse, gray fox, striped skunk, and white-tailed deer (Table 2-4). No direct field observations were made, however the tracks of deer and cottontail were identified.

Successional Communities

As previously discussed, post-settlement activities have played a predominant role in the distribution of current cover types. As a result of past activities (e.g., farming, logging, etc.) successional communities may be found in various seral stages including shrubland, old field, and northern hardwoods.

Shrubland

The second largest community type within the study site is successional shrubland. This community totals 66.1 acres, comprising 13.4 percent of the study area. There are two areas that represent the successional shrubland community. The larger tract is situated due west (upgradient) of the gravel pit, upslope from a cultivated field. This location receives groundwater seepage and overland runoff from surrounding upland areas. The sloping shrubland community is dominated by *Cornus stolonifera, Malus sp., Prunus serotina*, and occasional *Picea sp*. Within the western slope are several seep areas which have created

Table 2-3. Bird Species Potentially Occurring within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York (Page 1 of 3)

Common Name	Scientific Name	Habitat Association*
Great Blue Heron	*Ardea herodias*	Wt
Green Heron	*Butorides virescens*	Wt
Canada Goose	*Branta canadensis*	C,OF,Wt
Mallard	*Anas platyrhynchos*	C,Wt
Hooded Merganser	*Lophodytes cucullatus*	Wt
Ruffed Grouse**	*Bonasa umbellus*	C,OF,Wd
Ring-necked Pheasant	*Phasianus colchicus*	C,OF,Wd
Turkey Vulture	*Cathartes aura*	OF,P,Wd,Wt
Sarp-shinned Hawk	*Accipiter striatus*	OF,P,Wd,Wt
Copper's Hawk	*Accipiter cooperii*	OF,P,Wd,Wt
Northern Harrier	*Circus cyanues*	P,Wd,Wt
Red-tailed Hawk**	*Buteo jamaicensis*	C,OF,P,Wd,Wt
American Kestrel**	*Falco sparverius*	C,OF,P,Wd,Wt
Virginia Rail	*Rallus limicola*	C,OF,Wt
Sora	*Porzana carolina*	C,OF,Wt
Killdeer	*Charadrius vociferus*	C,OF,Wt
Mourning Dove	*Zenaidura macroura*	OF,Wd,Wd
Black-billed Cuckoo	*Coccyzus erythropthalmus*	OF,Wd,Wt
Barn Owl	*Tyto alba*	C,OF,P,Wd
Screech Owl	*Otus aso*	C,OF,P,Wd
Great Horned Owl	*Bubo virginianus*	C,OF,P,Wd
Barred Owl	*Strix varia*	C,OF,P,Wd
Ruby-throated Hummingbird	*Archilochus colubris*	OF,Wd
Belted Kingfisher	*Megaceryle alcyon*	Wt
Common Flicker	*Colaptes auratus*	Wd,Wt
Pileated Woodpecker	*Dryocopus pileatus*	Wd,Wt
Red-headed Woopecker	*Melanerpes erythrocephalus*	Wd,Wt
Hairy Woodpecker	*Dendrocopos villosus*	OF,Wd
Downy Woodpecker	*Dendrocopos pubescens*	OF,Wd

Table 2-3. Bird Species Potentially Occurring within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York (Page 2 of 3)

Common Name	Scientific Name	Habitat Association
Eastern Kingbird	*Tyrannus tyrannus*	C,OF,Wd,Wt
Great Crested Flycatcher	*Myiarchus crinitus*	Wd,Wt
Eastern Phoebe	*Sayuornis phoebe*	C,OF,Wd,Wt
Eastern Wood Pewee	*Contopus virens*	Wd,Wt
Alder Flycatcher	*Empidonax alnorum*	Wd,Wt
Horned Lark	*Eremophila alpestris*	OF,P
Barn Swallow	*Hirundo rustica*	C,OF,P,Wd,Wt
Tree Swallow	*Iridoprocne bicolor*	OF,P,Wt
Blue Jay	*Cyanocitta cristata*	OF,Wd
Common Crow**	*Corvus brachyrhynchos*	C,OF
Black-capped Chickadee	*Parus atricapillus*	Wd,Wt
White-breasted Nuthach	*Sitta carolinensis*	OF,Wd
House Wren	*Troglodytes aedon*	C,OF,Wd
Marsh Wren	*Cistothorus palustris*	C,OF,Wt
Brown Thrasher	*Toxostoma rufum*	OF
Gray Catbird	*Dumetella carolinensis*	OF
Blue-gray Gnatcatcher	*Polioptila caerulea*	Wd
American Robin	*Turdus migratorius*	C,Wd
Eastern Bluebird	*Sialia sialis*	C,OF,P
Veery	*Hylocichla fuscescens*	Wt
Wood Thrush	*Hulocichla mustelina*	Wd,Wt
Cedar Waxwing	*Bombycilla cedrorum*	Wd
Red-eyed Vireo	*Vireo olivaceus*	Wd,Wt
Warbling Vireo	*Vireo gilvus*	Wd
Black-throated Green Warbler	*Dendroica virens*	Wd
Chestnut-sided Warbler	*Dendroica pensylvanica*	OF,P
American Redstart	*Setophaga ruticlla*	Wd
Blue-winged Warbler	*Vermivora pinus*	OF,Wd,Wt
Yellow Warbler	*Dendroica petechia*	Wd,Wt

Table 2-3. Bird Species Potentially Occurring within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York (Page 3 of 3)

Common Name	*Scientific Name*	Habitat Association
Mourning Warbler	*Oporornis philadelphia*	OF
Common Yellowthroat	*Geothlypis trichas*	Wd,Wt
Redwinged Blackbird	*Agelaius phaeniceus*	C,OF,Wd,Wt
Common Grackle	*Quiscalus Quiscula*	C,OF,Wt
Bobolink	*Dolichonyx oryzivorus*	C,OF
Eastern Meadowlark	*Sturnella magna*	C,OF,Wt
Brown-headed Cowbird	*Molothrus ater*	C,OF,Wd
Scarlet Tanager	*Piranga olivacea*	Wd
Cardinal	*Cardinalis cardinalis*	OF,Wd
House Sparrow	*Passer domesticus*	C,OF
Indigo bunting	*Passerina cyanea*	OF,Wd
Purple Finch	*Carpodacus purpureus*	Wd
American Goldfinch	*Spinus tristis*	C,Wd,Wt
Savannah Sparrow	*Passerculus sandwichensis*	OF
Chipping Sparrow	*Spizella passerina*	C,Wd
Field Sparrow	*Spizella oysilla*	OF,P
Swamp Sparrow	*Melospiza georgiana*	Wt
Song Sparrow	*Melospiza melodia*	OF

* Habitats denoted by:
C - Cultivated Field (field and row cropped)
OF - Old Field (herbaceous, shrub)
P - Pasture
Wd - Woodland (hardwood, deciduous, mixed)
Wt - Wetland (shallow emergent marsh, shrub swamp, wet meadow)

** Species observed during field reconnaissance.

Source: ESE, 1992

Table 2-4. Mammal Species Potentially Occurring within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York (Page 1 of 2)

Common Name	Scientific Name	Habitat Association*
Opossum	*Didelphis marsupialis*	OF,Wd,Wt
Masked Shrew	*Sorex cinerus*	OF,P,Wd,Wt
Pygmy Shrew	*Microsorex hoyi*	OF,Wd
Short-tailed Shrew	*Blarina brevicauda*	OF,P,Wd
Star-nosed Mole	*Condylura cristata*	OF,Wd,Wt
Little Brown Bat	*Myotis lucifugus*	Wd
Big Brown Bat	*Eptesicus fuscus*	Wd
Red Bat	*Lasiurus borealis*	C,OF,Wd
Eastern Cottontail**	*Sylvilagus floridanus*	C,OF,Wd,Wt
Eastern Chipmunk	*Tamias striatus*	C,OF,Wd
Woodchuck	*Marmota monax*	OF,Wd
Gray Squirrel	*Sciurus carolinensis*	Wd
Red Squirrel	*Tamiasciurus hudsonicus*	Wd
Beaver**	*Castor canadensis*	Wd,Wt
Deer Mouse	*Peromyscus maniculatus*	Wd
White-footed Mouse	*Peromyscus leucopus*	OF,Wd
Meadow Vole	*Microtus pensylvanicus*	OF,P,Wt
Pine Vole	*Pitymys pinetorum*	Wd,Wt
Muskrat	*Ondatra zibethicus*	OF,P,Wt
Norway Rat	*Rattus norvegicus*	C,OF
House Mouse	*Mus musculus*	C,OF
Meadow Jumping Mouse	*Zapus hudsonius*	OF,P
Porcupine	*Erethizon dorsatum*	Wd
Coyote	*Canis latrans*	C,OF,P,Wd
Red Fox	*Vulpes fulva*	C,OF,P,Wd

Table 2-4. Mammal Species Potentially Occurring within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York (Page 2 of 2)

Common Name	Scientific Name	Habitat Association*
Gray Fox	*Urocyon cinereoargenteus*	C,OF,P,Wd,Wt
Raccoon	*Procyon lotor*	Wd,Wt
Long-tailed Weasel	*Mustela frenata*	C,OF,Wt
Mink	*Mustela vison*	Wd,Wt
Striped Skunk	*Mephitis mephitis*	C,OF,Wd
Bobcat	*Lynx rufus*	Wd
White-tailed Deer**	*Odocoileus virginianus*	C,OF,P,Wd,Wt

* Habitats denoted by:
- C – Cultivated Field (field and row cropped)
- OF – Old Field (herbaceous, shrub)
- P – Pasture
- Wd – Woodland (hardwood, deciduous, mixed)
- Wt – Wetland (shallow emergent marsh, shrub swamp, wet meadow)

** Species directly, or indirectly, observed during field reconnaissance.

Source: ESE, 1992

small fen areas characterized by *Sphagnum* sp. *Juncus* sp., *Carex* sp., and *Onoclea sp.* At the time of reconnaissance, snow melt and groundwater seepage from the adjacent upland area had contributed to very wet conditions. Other vegetative species include *Acer saccaharum, Crataegus* sp. and *Abies balsamea*.

The second successional shrubland community is located due north of the gravel pit. This area appears to have been cultivated at one time, or perhaps utilized as pasture land. The habitat at this location is sloping as well, but does not appear to receive the same degree and extent of runoff or seepage as the larger area. Shrubs account for roughly 30 to 35 percent of the cover within the community. The predominant shrubs are tall shrubs (>4 feet), however low shrub species (<4 feet) are also present. Dominant shrub species include *Cornus stolonifera, Prunus serotina*, and *Rhus glabra*. The predominant herbs include *Solidago* sp. *Aster* sp., *Juncus* sp. and *Scirpus* spp.

The successional shrubland community provides habitat for a variety of fauna. Numerous bird species and small mammals use this habitat for nesting, feeding/foraging, and cover. The larger habitat offers greater potential for faunal diversity due to larger areal coverage, the greater degree of intra-community diversity (e.g., fen-like seep areas, upland forested and lowland areas), and a variety of abutting habitats.

Bird species generally found to occur in shrubland communities include American robin, horned lark, and red-tailed hawk. A more complete list of bird species that may potentially occur within this habitat is provided in Table 2-3.

Mammals potentially occurring include a variety of rodent species including masked shrew, white-footed mouse, meadow jumping mouse, and eastern cottontail (Table 2-4). Herpetofauna potentially occurring include black rat snake, northern black racer, and wood turtle (Table 2-5).

<u>Old Field</u>

There are three separate areas identified as old field within the study site boundaries. The old field habitat totals 26.5 acres, comprising 5.4 percent of the total site area.

Table 2-5. Herpetofauna Potentially Occurring Within the Identified Habitats in the Vicinity of the Machias Gravel Pit, Cattaraugus County, New York

Common Name	Scientific Name	Habitat Association*
Spotted Salamander	*Ambystoma maculatum*	OF,Wd
Red-Spotted Salamander	*Notophthalmus viridescens*	Wt
N. Dusky Salamander	*Desmognathus fuscus*	Wt
Slimy Salamander	*Plethodon glutinosus*	Wt
Spring Salamander	*Gyrinophilus porphyriticus*	Wd,Wt
Red-Backed Salamander	*Plethodon cinereus*	Wd
Four-Toed Salamander	*Hemidactylum scutatum*	Wd,Wt
N. Two-Lined Salamander	*Eurycea bislineata*	Wd,Wt
Mud Puppy	*Necturus maculosus*	Wt
American Toad	*Bufo americanus*	OF,P,Wd,Wt
Northern Spring Peeper	*Hyla crucifer crucifer*	OF,Wd,Wt
Gray Treefrog	*Hyla versicolor*	Wd,Wt
Bullfrog	*Rana catesbeiana*	Wt
Green Frog	*Rana clamitans melanota*	Wt
Pickerel Frog	*Rana palustris*	Wd,Wt
Wood Frog	*Rana slyvatica*	Wd,Wt
Snapping Turtle	*Chelydra serpentina*	Wd,Wt
Wood Turtle	*Clemmys insculpta*	OF,P,Wd,Wt
Midland Painted Turtle	*Chrysemys picta*	Wt
N. Ringneck Snake	*Diadiphis punctatus*	Wd,Wt
Smooth Green Snake	*Opheodrys vernalis*	OF,P,Wd
N. Black Racer	*Coluber constrictor*	OF,P,Wd
Black Rat Snake	*Elaphe obsoleta*	C,OF,P,Wd
E. Milk Snake	*Lampropeltis triangulum*	C,OF,P,Wd,Wt
N. Ribbon Snake	*Thamnophis sauritus*	Wt
E. Garter Snake	*Thamnophis sirtalis*	C,OF,P,Wd,Wt
N. Brown Snake	*Storeria dekayi*	Wd,Wt
N. Red-bellied Snake	*Storeria occipitomaculata*	Wd
N. Water Snake	*Natrix sipedon*	Wt

Habitats denoted by:
- C - Cultivated Field (field and row cropped)
- OF - Old Field (herbaceous, shrub)
- P - Pasture
- Wd - Woodland (hardwood, deciduous, mixed)
- Wt - Wetland (emergent shallow marsh, shrub swamp, wet meadow)

Source: ESE, 1992

The old field habitat is generally an area that was previously cleared and subsequently utilized for agricultural purposes. Two of the old field sites are located adjacent to cropland. The third is situated just east of the gravel pit. Due to the relatively recent disturbance, vegetative growth is predominantly herbaceous. The common species in these habitats include *Solidago* spp., *Daucus carota, Aster* sp., *Scirpus* sp., *Onoclea sensibilis*, and *Rubus* sp. Shrub species also found in the old field habitat include *Cornus stolonifera, Rhus glabra*, and *Acer saccharum.*

Faunal species occurring in the old field habitat are similar to those found in the successional shrub habitat (see Tables 2-3 through 2-5).

Northern Hardwoods

Seven successional hardwood communities were identified within the site boundaries. The northern hardwoods habitat covers 44 acres, accounting for 8.9 percent of the total site area. In response to past clearing activities these upland sites are scattered, and vary with respect to size (see Figure 2-1).

Species composition is characterized by mixed hardwood forest tree species. Dominant overstory species include *Acer saccharum, Populus tremuloides*, and *Prunus serotina.* Understory species include *Populus tremuloides, Crataegus* sp., *Prunus serotina, Fraxinus americana*, and *Ulmus* sp. Overall vegetative growth is relatively young-aged. The northern hardwood habitat offers faunal species cover, movement corridors, nesting and breeding sites, food, and foraging area. Species occurrence and diversity is influenced by location within the landscape and the overall size of the tract.

Common bird species include harp-shinned hawk, screech owl, ruffed grouse (observed), hairy woodpecker, and chestnut-sided warbler. Other birds potentially occurring within this habitat are included in Table 2-3.

Mammal species typically associated with a forested hardwood community include opossum, little brown bat, fox, raccoon, bobcat, and white-tailed deer (see Table 2-4).

Wetland Communities

Four wetland community types were identified within the study site boundaries. The wetland communities include shallow emergent marsh, shrub swamp, wet meadow, and hemlock hardwood swamp. Each one of these habitat types is located within the proximity of the Ischua Creek floodplain. Wetland communities represent a transition in elevation and hydroperiod which, in turn, influences vegetative species composition (see Figure 2-1). The wetland communities total 91.8 acres, comprising approximately 18.6 percent of the site area.

Shallow Emergent Marsh

The shallow emergent marsh habitat is interspersed with shrub swamp habitat along the Ischua Creek floodplain. The emergent marsh habitat is subtly lower in elevation in the landscape in relation to the other identified wetland habitats. These areas normally have a longer hydroperiod in terms of frequency and duration; soils are normally saturated and seasonally to semi-permanently flooded.

The shallow emergent marsh habitat constitutes 11.1 acres, comprising 2.3 percent of the total study site area.

The predominance of herbaceous species characterizes vegetative composition in shallow emergent marsh habitat. Vegetative species include *Phalaris arundinacea, Leersia oryzoides, Carex* spp., *Scirpus* spp., *Juncus* spp., *Polygonum amphibium*, and occasionally *Typha latifolia*. Shrubby species include *Salix* spp., *Cornus stolonifera, C. amomum*, and *Alnus rugosa*.

Faunal occurrence is typically diverse within this wetland habitat, depending upon the structure of the habitat, local plant species composition, and the frequency and duration of flooding. Common bird species include mallard, Canada goose, hooded merganser, and swamp sparrow (see Table 2-3). Mammal species potentially occurring within the emergent marsh habitat include beaver, muskrat, mink, and long-tailed weasel (see Table 2-4). Those herpetofauna species potentially occurring include the four-toed salamander, bullfrog, and northern ribbon snake (see Table 2-5).

Shrub Swamp

Shrub swamp accounts for 43.3 acres, comprising 8.8 percent of the site area. As a result of the direct association with Ischua Creek, the shrub swamp acts as a transition zone between upland communities and shallow emergent wetland habitats. Flooding and saturation are typically seasonal. The tract of greatest size within the site area is located east by northeasterly of the gravel pit (Figure 2-1).

Vegetative cover is characteristically dominated by dense stands of shrubby growth. Shrub cover may range from 40 to 80 percent. Predominant species are commonly *Salix* spp., Alnus rugosa, Cornus stolonifera, and *Rosa palustris*. Potential herbaceous species include *Lysmachia* spp., *Eupatorium perfoliatum, Bidens* sp., and *Equisetum* spp.

Common faunal populations are similar to the emergent shallow marsh habitat, however, the increased prevalence of shrubby growth provides greater variability and dimension of ecologic structure, which may result in greater songbird diversity (see Tables 2-2 through 2-5).

Wet Meadow

Four separate areas were identified as wet meadow habitat within the site area. (see Figure 2-1). The wet meadow habitats are located along runoff drainage areas, and may also be influenced by groundwater seepage. Local topography and land use have characterized these habitats as transitional zones toward wetter habitats (e.g. shallow emergent marsh). Flooding and saturation are both seasonal and storm event related.

Wet meadow habitat covers 11.1 acres, which constitutes 2.3 percent of the site area.

Vegetative cover is typically herbaceous and commonly the predominant species are grasses and sedges. Potential species include *Carex spp, Juncus spp., Calamagrostis canadensis, Onoclea spp.*, and *Eupatorium spp.* Occasional shrub species may include *Cornus stolonifera, Rhus glabra*, and *Alnus rugosa*.

Bird and mammal species potentially occurring in the wet meadow habitat are similar to those species found in the shallow emergent marsh, shrub swamp, and successional old field habitats, depending on extent and frequency of saturation and position within the landscape (see Tables 2-3 through 2-5).

Hemlock Hardwood Swamp

Four areas were identified as hemlock hardwood swamp within the site area (see Figure 2-1). Each of these sites is associated with the Ischua Creek floodplain. The hemlock hardwood swamp is essentially a transition zone between upland communities and lowland wetland communities. The extent of coverage therefore has been determined by local hydroregimes and local land use practices. Degree of inundation and soil moisture regimes typically fluctuate dramatically with the change of seasons.

This habitat type totals 25.1 acres, comprising 5.1 percent of the total site area.

Vegetative cover was dominated by forest tree species. Common species were *Tsuga canadensis*, *Betula lenta*, and *Ostrya virginiana*. The predominant species in the site area was *T. canadensis* which created a dense overstory with 80 to 90 percent cover. Other species included *Fagus grandifolia*, *Rubus* sp., *Sambucus canadensis*, and *Vibunum* sp.

Faunal diversity may be relatively high within the hemlock hardwood swamp. The location of this habitat as a transitional habitat between upland and lowland habitat influences species presence and numbers. Common bird species potentially include barred owl, great crested flycatcher, tree swallow, and alder flycatcher (see Table 2-3). Mammal species include big brown bat, pine vole, beaver, woodchuck, gray fox, and white-tailed deer (see Table 2-4). Herpetofauna may include pickerel frog, wood turtle, American toad, and eastern milk snake (see Table 2-5). The tracks of white-tailed deer and eastern cottontail were observed. Indications of beaver presence (i.e., fallen trees with typical beaver signs) were also in evidence along Ischua Creek south of the gravel pit.

Forested Plantation

Forested plantation habitats account for 38 acres, comprising 7.6 percent of the site area. These stands are typically planted for a variety of reasons: cultivation and harvest of timber, soil erosion control, and windbreaks. Two forested plantation types were identified during field reconnaissance.

Spruce-Fir

Spruce-Fir habitat totalled 36.5 acres, comprising 7.3 percent of the site area. These areas are located in upland areas, and are scattered throughout the northern portion of the site area. Vegetative cover is not strictly monocultural, however only few species were identified. The predominant species included *Picea abies* and *Abies balsamea*. Herbaceous cover was not directly observed, but is believed to be characteristically sparse. *Veronica officinalis* is a common species cited by Reschke (1990).

Pine

Pine plantation totalled 1.5 acres, comprising 0.3 percent of the site area. This habitat exists in one location, to the west by northwest of the gravel pit. Similar to Spruce-Fir, this stand is typically of low vegetative diversity.

Minor Cover Types

The remaining terrestrial habitat types (pasture land, gravel mine, and mowed lawn with trees) are of relative limited distribution and biological importance within the site area. Generally these habitats offer little opportunity for biological diversity.

Pasture land and residential areas characteristically provide habitat to species such as the barn owl, killdeer, chimney swift, Norway rat, opossum, raccoon, and gray squirrel (see Tables 2-3 and 2-4). Pasture land totalled 2.8 acres, accounting for 0.6 percent of the site area, while mowed lawn with trees totalled 10.5 acres, comprising 2.1 percent of the site area.

The gravel pit typically provides little vegetative or faunal habitat value. The area was characteristically devoid of vegetative growth, except on the very fringes of the property lines. It is assumed that mammal and bird species occurrence is transient. The gravel pit totalled 10.7 acres and accounted for 2.2 percent of the site area.

Aquatic Habitats

Ischua Creek is part of the Olean Creek drainage basin and is located within the site area, flowing from west to east, and north to south. According to the New York State DEC, the stream is classified a Class "C" fresh surface water. Ischua Creek has also been further identified as a standard "CT" stream. Briefly, a Class C fresh surface water system is a water body suitable for fishing, fish propagation, and recreational activity. According to Colby Tucker (Division of Water, DEC, personal communication), the standard "CT" classified Ischua Creek as state-protected stream which is capable of being a trout supporting and/or trout spawning habitat.

Ischua Creek is a permanent, small to moderately sized meandering stream characterized by alternative pool, chute, and rifle habitats. Stream channel widths within the site area range from 5 to 35 feet. Stream depths are typically variable, ranging from 2 inches to 4 feet. The substrate consists predominantly of large rock, pebble, and coarse sand (Table 2-6). Snags and undercut banks occur frequently. Rooted aquatic macrophytes were observed near the stream bank in some locations.

Ischua Creek was sampled in three separate locations for existing faunal populations, and for two water quality parameters, dissolved oxygen and temperature. One of the sampling locations, Station 1, was located northwest of the gravel pit where Very Road crosses Ischua Creek (Figure 2-2). Other aquatic sampling locations were located upgradient (Station 2) and downgradient (Station 3) of the site (Figures 2-2 and 2-3, respectively). A .25-inch mesh seine was used to sample for fish and other fauna. The results of the seine hauls are provided in Table 2-7. Species included stoneroller, creek chub, fantail darter, and mottled sculpin, among others. Also collected was the tongue-tied minnow, which is a species currently assigned a New York state ranking of "S2". The latter occurrence ranking defines the tongue-tied minnow as a species that appears to be of few remaining individuals within the State of New York, and is currently "vulnerable to extirpation". Previous sampling by the DEC resulted in the collection of brown trout at this location.

Table 2-6. Water Quality and Stream Characteristics of Aquatic Sampling Locations in the Vicinity of Machias Gravel Pit

Station No.	D.O. (ppm)	Temperature (°C)	Habitat Characteristics
1	13.5	0.0	Substrate: Detritus with rubble, gravel, pebble and coarse sand Width: 15'-25' Depth: 2"-18"
2	12.0	0.0	Substrate: Gravel, pebble, and coarse sand Width: 5'-15' Depth: 4"-3.5'
3	12.75	0.0	Substrate: Rubble, pebble, and coarse sand Width: 30'-35' Depth: 9"-4'

Source: ESE, 1992.

Table 2-7. Species Collected During Seining Efforts at Three Locations along Ischua Creek in Machias, Cattaraugus County, New York

Sampling Locations	Common Name	Scientific Name	Number Collected
Station 1	Stoneroller	*Campostoma anomalum*	2
	Tongue-tied Minnow+	*Exoglossum laurae*	1
	Creek Chub	*Semotilus atromaculatus*	1
	Rainbow Darter	*Etheostoma caeruleum*	1
	Mottled Sculpin	*Cottus bairdi*	12
Station 2	Stoneroller	*Campostoma anomalum*	1
	Fantail Darter	*Etheostoma flabellarae*	2
	Mottled Sculpin	*Cottus bairdi*	2
	N. Two-lined Salamander	*Eurycea bislineata bislineata*	1
Station 3	Stoneroller	*Campostoma anomalum*	1
	Longnose Dace	*Rhinichthys cataractae*	4
	N. Hogsucker	*Hypentelium nigricans*	1
	Rainbow Darter	*Etheostoma caeruleum*	13
	Fantail Darter	*Etheostoma flabellarae*	10
	Mottled Sculpin	*Cottus bairdi*	1

+ Species currently given a New York State ranking of S2; which typically means there are few remaining individuals within the State and is "vulnerable to extirpation".

ESE, 1992

A YSI model 54A oxygen meter was employed to measure dissolved oxygen (DO) and water temperature at all three sampling locations (see Table 2-6). DO values were well above the State's water quality regulations requirement that DO not be less than 7.0 ppm. From a visual standpoint, water clarity was excellent.

Cover types adjacent to Ischua Creek typically included emergent shallow marsh, shrub swamp, and hemlock hardwood swamp.

Farm Pond

A small farm pond was identified south of the gravel pit located at the edge of wet meadow and hemlock hardwood swamp habitats. The pond covers approximately .2 acres and is located upgradient of the site.

The pond was frozen over and covered with snow at the time of field reconnaissance, however, it appeared to be largely an open water area with emergent growth along the banks. A small intermittent stream drained the pond to the east. The pond was not sampled.

2.2 RESOURCE CHARACTERIZATION

2.2.1 General Habitat Quality

The quality of the habitat in the vicinity of the Machias Gravel Pit was variably related to past and present land use patterns. As presented in Table 2-1, cultivated areas represent the greatest percentage of land use in the vicinity (>40 percent). Consequently, these areas are primarily limited to transient use by wildlife as feeding or resting areas.

Successional habitats, represented by old field, shrubland and successional northern hardwoods, also accounted for a large portion of the study area (>27 percent). As discussed in Section 2.1, these areas are characterized by a variety of grass, forb, shrub, and tree species that provide valuable habitat for nesting and feeding. While relatively little wildlife was observed during the site visit, these areas may be expected to support a moderate diversity of song birds, game birds, and small mammals that provide ample forage for a variety of predators (e.g., raptors, fox, etc.).

Wetland communities accounted for approximately 18 percent of the cover types in the project vicinity. The topographic position of these areas has created a seasonal or semi-permanent wet condition that has precluded other land uses. These areas offer valuable habitat for wildlife and are important in flood storage, sediment and erosion control, and water quality improvement. These areas are also known to support several unusual resources including two rare species (tongue-tied minnow and *Carex schweinitzii*) and an unusual plant community (Inland Poor Fen).

The remaining cover types within the project vicinity are disturbed communities represented by conifer plantations (pine, spruce-fir), gravel pits, pasture, and residential cover types. These habitats generally offer relatively poor habitat quality, resulting from low diversity of species and structure as well as a relatively frequent human presence.

Quality of the aquatic system (i.e., Ischua Creek) in the project area is relatively good. As was presented in Table 2-6, dissolved oxygen values were high at all three sampling locations. Substrates consisted of predominantly sands and gravels along with detrital material. The observed instream habitat characteristics common to most locations included the presence of snags, undercut stable banks, and the presence of numerous riffle/pool complexes. Habitat quality was also evidenced by the presence of fish such as tongue-tied minnow, brown trout and mottled sculpin in Ischua Creek.

2.2.2 Existing Environmental Stress

No evidence of environmental stress was observed during the site visit. However, two areas were noted to contain several dead hemlock trees (south of Ischua Creek and east of Very Road, and immediately north of Sisson Road west of Very Road). The distance from the site and the direction of groundwater flow precludes any conclusions to suggest that the mortality of the hemlock trees was associated with past waste storage practices at the site. Rather, it is likely that this effect may be more related to natural sources of mortality (e.g., disease).

3.0 HAZARD THRESHOLD IDENTIFICATION

3.1 FISH AND WILDLIFE RELATED APPLICABLE AND RELEVANT OR APPROPRIATE REQUIREMENTS (ARARs)

The National Contingency Plan (NCP), amended pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), established the process for determining appropriate remedial actions at those sites listed on the National Priorities List (NPL) (Superfund sites). Recent amendments to CERCLA by the Superfund Amendments and Reauthorization Act of 1986 (SARA) further define the process for determining appropriate remedial actions at Superfund sites and the degree of remediation to be achieved by these remedial actions.

Potential ARARs are to be used as a guide in evaluating the appropriate extent of site remediation, to aid in scoping and formulating remedial action alternatives, and to govern the implementability and reliability of the selected remedial action. The purpose of these requirements is to make CERCLA response actions consistent with other pertinent federal or state public health and environmental requirements.

To identify potential fish and wildlife related ARARs specific to the Machias Gravel Pit site, input from the Ecological Risk Assessment (ERA) is necessary. The ERA describes those pathways that may result in exposure, identifies potential receptors, characterizes the risk from exposure to chemicals at the site, characterizes the uncertainty associated with that risk, provides the appropriate context for assessing the magnitude of that risk, and defines those exposure pathways that may pose an endangerment to the environment. Using this information as a basis, potential ARARs are determined only for those exposure routes resulting in potential endangerments exceeding the criteria specified in the NCP. The site-specific risk management decision, (i.e., the decision concerning what level of risk is acceptable at this site) is made when a remedy is selected.

As the definition implies, potential ARARs identified for a site are those selected from federal and state environmental laws and standards that are applicable or relevant and appropriate to the site-specific remedial actions under consideration. In order to determine whether a regulatory requirement is a potential ARAR, one must divide the question into whether the requirement is "applicable" or "relevant and appropriate." Applicable requirements are defined in the NCP as those "promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site" (40 CFR 300.5). A requirement is applicable if there is a "one-to-one correspondence between the requirement and the circumstances at the site..." (53 FR 51437). SARA has broadened the definition of applicable to include state requirements. However, any state standard that precludes in-state land disposal is not applicable unless all of several conditions apply [SARA Sec. 121(d)(2)(C)]. Thus, a federal or state standard is applicable if it applies to the remedial action under consideration if the action were undertaken outside of the context of a CERCLA cleanup. For example, maximum contaminant levels (MCLs) are applicable to the quality of water supplied by a water supplier, but not to groundwater that is not developed as a water supply. Usually, there is little discretion involved in such determinations (53 FR 51437).

If the requirement is not applicable, best professional judgement must be used to determine whether the requirement is "relevant and appropriate." Relevant and appropriate requirements are less clearly defined than applicable requirements. The NCP defines relevant and appropriate as those "that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (40 CFR 300.5). Additionally, a requirement is relevant and appropriate if it addresses problems or situations that are generally pertinent to the conditions at the site (i.e., the requirement is relevant) and the requirement is well-suited to the particular site (i.e., the requirement is appropriate) (53 FR 51436, 51437). Relevant requirements are not potential ARARs unless their use is appropriate given the conditions at the site (50 FR 47912, 47918). Whether a requirement is appropriate depends upon the nature of the substances at the site, the site characteristics, the circumstances surrounding the release, and the ability of the action to address the release. The most important criteria used to assess whether a requirement is appropriate are whether the purpose for which the requirement was created is similar to the specific objectives of the CERCLA action and whether the actions or activities regulated by the requirement are similar to the remedial action contemplated at the CERCLA site (50 FR 51346).

Potential ARARs are classified as chemical-specific, location-specific, and action-specific. Another category of remediation goals is the "to be considered" (TBC) advisories and guidance. TBCs are non-promulgated advisories, guidance, or other criteria issued by federal and state governments that are not legally binding and do not have the status of potential ARARs. However, they may be useful in determining remediation goals for the further protection of human health and the environment.

A potential chemical-specific ARAR is a chemical-specific concentration limit set by either federal or state environmental laws for a given environmental medium. Examples for groundwater include MCLs and maximum contaminant level goals (MCLGs) established pursuant to the SDWA. Examples for surface water are ambient water quality criteria (AWQC) established pursuant to the CWA.

AWQCs established pursuant to Section 304 (a) of the CWA set numerical concentration limits for constituents in surface water. These criteria provide guidance on concentration of constituents acceptable to the U.S. Environmental Protection Agency (EPA) for the protection of aquatic life and are thus relevant and appropriate to surface water. AWQCs are not applicable to groundwater, but they may be determined to be relevant and appropriate as they are specifically identified in Section 121 of SARA.

AWQCs are promulgated to provide guidance on detrimental effects of pollutants "in any body of water, including groundwater" (33 U.S.C. Sec. 1314). Thus, AWQCs based on human consumption may be considered relevant and appropriate to the extent that the groundwater at the site is a potential source of drinking water and MCLs and non-zero MCLGs are available (55 FR 8755).

There are three types of AWQCs based on human exposure: (1) consumption of aquatic organisms, (2) consumption of aquatic organisms and drinking water, and (3) adjusted criteria based solely on exposure through consumption of drinking water. These later adjusted criteria are not promulgated but are more pertinent to groundwater than the other two since aquatic organisms do not exist in groundwater. However, to be relevant and appropriate, the AWQCs must reflect current scientific information (53 FR 51442). Thus, AWQCs may be relevant but not appropriate if its scientific basis is not current. Additionally, AWQCs are not appropriate if an MCL or non-zero MCLG exist for the constituent of concern (55 FR 8755).

The shallow groundwater at the site may discharge to surface water (Ischua Creek). Therefore, AWQCs for the protection of aquatic life may also be relevant and appropriate. The potential connection between the shallow groundwater and Ischua Creek results in the need to address the protection of aquatic life in identifying ARARs for the site.

New York Water Quality Standards are identified in Title 6, Parts 609 and 700-704 of the New York Codes, Rules and Regulations. Specific numeric water quality criteria have been established by the state to be protective of both aquatic life and human health and are applicable to the waters of the state. Surface waters in the vicinity of the site are designated Class C fresh surface water (fishing, fish preparation and recreational activities). Because these state standards are applicable, they are considered as potential ARARs for the Machias Gravel Pit site.

The chemical specific ARARs for surface water are presented in Table 3-1. 1,1,1-Trichloroethane and trichloroethylene are the only two site-related constituents expected to reach surface water.

Other fish and wildlife-related ARARs include:

6 NYCRR Part 193.3:	Establishes as a violation the damage or destruction of listed plant species by the application of herbicides or defoliants without the consent of the owner.
Title 7, Article 24	(Freshwater Wetlands Act) of the Environmental Conservation Law, (Regulated under 6 NYCRR Part 663): Regulates any form of pollution in to freshwater wetlands. Permit required.

Table 3-1. Fish and Wildlife Related ARARs for Constituents of Concern at the Machias Gravel Pit Site (µg/L)

	USEPA AWQC			NYSDEC	
	Freshwater Aquatic Life		Protection of Human Health	Class C	Class A
	Acute	Chronic	Fish and Water	Aquatic Life	Human Health
1,1,1-Trichloroethane	9,000 (L)	90 (E)	18,400	270 (C)	5
Trichloroethylene	45,000 (L)	21,900 (L)	2.7	11	3

L = Lowest observed effect level.
E = Estimated value based on acute level divided by a safety factor of 100.
C = Calculated guidance level based on New York Water Classifications and Quality Standards.

3.2 COMPARISON OF ESTIMATED EXPOSURE POINT CONCENTRATION WITH ARARs

The comparison of estimated exposure point concentration with ARARs for the Machias Gravel Pit site are presented in the Ecological Risk Analysis, Section 4.4.1.

4.0 IMPACT ANALYSIS (ECOLOGICAL RISK ASSESSMENT)

The evaluation of potential impacts on environmental receptors associated with the constituents of concern detected at the Machias Gravel Pit site includes an evaluation of site-specific constituent data, information on animal and plant species present, exposure data, and toxicological information about the potential effects of the constituents of concern on the indigenous biota.

The primary objective of this ecological risk assessment is to describe the potential environmental risks associated with the Machias Gravel Pit site. It is a specific objective of this assessment to evaluate the risk associated with exposure of individual species to the constituents of concern at the site. Adverse impacts on the environmental receptors will be characterized for each environmental media of concern (i.e., soil and surface water). Based on the requirements of the NYSDEC guidelines for the preparation of a habitat evaluation and impact analysis, this assessment will be semi-quantitative. When data are sufficient, environmental risks will be quantified. However, when information is inadequate to numerically characterize the anticipated impacts, a qualitative discussion will be provided.

An evaluation of the site constituent data has been presented previously in the RI and Addendum No. 1 reports and is not repeated here. Constituents detected in onsite soils include organic and inorganic chemicals, however, only chromium, lead, and nickel were identified in surface soil samples. Of these constituents, only lead was identified as a potential constituent of concern because some concentrations were found to exceed background. Constituents detected in groundwater also include organic and inorganic chemicals, however, only 1,1,1-trichloroethane and trichloroethylene were selected as constituents of concern because of their potential for migration and discharge to Ischua Creek, located to the north of the site.

The ecological setting of the Machias Gravel Pit site is described in detail in Section 2.0 of this report. The habitat types present at the site include both terrestrial and aquatic resources. Terrestrial habitats include cropland, old field, hardwood swamp, woodland, gravel mine, and wetland. Aquatic habitats include Ischua Creek and the downgradient wetland (Inland Poor Fen). A wide variety of plant and animal species are found in each habitat type. A detailed description of each habitat type and the plant and animal species known or suspected of being present is provided in Section 2.1.

4.1 SELECTION OF TARGET SPECIES AND PATHWAYS OF EXPOSURE

The following presents the target species and pathway selection for the site. It eliminates those pathways and exposure routes that are not of concern, based on the analysis of site characteristics, and provides a focus for those pathways and species critical to the ecological risk assessment.

Principal criteria for the selection of target species (States *et al.*, 1978) include:

- Species that are threatened, endangered, or of special concern;
- Species that are valuable for recreation purposes;
- Species that are important to the well being of either or both of the above groups;
- Species that are critical to the structure and function of the particular ecosystem in which they inhabit; and
- Species that serve as indicators of an important change in the ecosystem.

Other criteria for the selection of target species include:

- Species present in habitats onsite or immediately adjacent to the site; and
- Species that are residents and or transients in the identified impacted habitats.

Factors that have been considered in the exposure pathway selection process include:

- Location of the site;
- Local topography;
- Local land use;
- Surrounding terrestrial habitats;
- Surrounding aquatic habitats;

- Qualitative prediction of constituent migration; and
- Persistence and mobility of migrating constituents.

The following subsections provide a qualitative screening of the species and exposure pathways of concern at the Machias Gravel Pit site.

4.1.1 Terrestrial Species and Pathways

The terrestrial environmental receptors at the Machias Gravel Pit site include both plant and animal species that may come into contact with site constituents. There are no known local populations of endangered or threatened species in the area. However, a number of typical local species are known or suspected to be present. Among the terrestrial wildlife species listed in Section 2.1 that are expected to live in the onsite (gravel pit) habitat are:

Herpetofauna -	black rat snake
	eastern garter snake
Birds -	eastern phoebe
	blue jay
	common crow
	red-winged blackbird
	eastern meadowlark
	house sparrow
	savannah sparrow
Mammals -	eastern cottontail
	woodchuck

In addition to these resident species, several additional species may also be found on the site. Based on the habitat and species associations described in Section 2.1, the following species may live in adjacent habitats, and would be expected to occasionally be present on site:

Herpetofauna -	wood turtle
	smooth green snake
	northern black racer
	eastern milk snake
	northern red-bellied snake

Birds -	red-tailed hawk	eastern kingbird
	American kestrel	American robin
	Virginia rail	cardinal
	killdeer	indigo bunting
	mourning dove	chipping sparrow
	screech owl	field sparrow
	barred owl	song sparrow
Mammals -	opossum	coyote
	eastern chipmunk	red fox
	gray squirrel	gray fox
	red squirrel	raccoon
	white-footed mouse	striped skunk
	Norway rat	white-tailed deer

The plant species on which these animals depend for food are also important receptors to be considered. However, the disturbed areas of the site (gravel pit) consist of little or no persistent vegetation that would be impacted by the site constituent of concern for soils (i.e., lead). The predominant plant species present include various species of annual grasses and herbs, however, none are a particular benefit to the resident and transient species of wildlife.

Because of its recreational importance (i.e., the only game species in the vicinity of the site), the eastern cottontail rabbit (*Sylvilagus floridanus*) is selected as the indicator terrestrial species of concern. Because it is dependent on an adequate and available source of vegetation for both food and shelter, any adverse impacts on vegetation would also likely impact the eastern cottontail rabbit. Critical pathways and routes of exposure through which the eastern cottontail may be exposed to constituents of concern include:

- Ingestion of soil containing constituents of concern; and
- Ingestion of browse containing constituents of concern.

Other terrestrial wildlife of concern, such as the white-tailed deer, are mobile species, and may travel large distances in a single day. At the same time, wildlife are creatures of habit, often frequenting favorite locations within their home range. Most exposures affecting this or any other transient terrestrial wildlife species would be expected in areas that provide maximum food and shelter. The areas containing detectable concentrations of constituents of concern at the Machias Gravel Pit site are small compared to the range of white-tailed deer. In addition, the habitat quality of the source area is limited due to general unavailability of food and cover. This may reduce the attractiveness of the site and result in infrequent opportunities for exposure.

Bio-uptake of a constituent (in soil) is dependent upon a variety of factors. These factors are determined by the physical and chemical characteristics of the soil, and the physical and chemical characteristics of the constituent, and the physical, morphological, and chemical characteristics of the receptor. Additionally, an apparent integral factor of fate and bioavailability is constituent residence time or half-life. Constituents with longer residence times can cause significant accumulation within a particular site. Levin and Kimball (1984) found residence times inversely related to ecosystem recovery; a preliminary indication suggesting that longer residence times increases the probability for floral and faunal uptake. Residence times in terrestrial systems, in turn, are dependent upon the type of constituent, the tendency of the constituent to be adsorbed by organic material and clay minerals, soil, pH, temperature, aeration, and type of vegetative cover.

In general terms, constituent fate and transport is biologically and chemically mediated. Those processes that affect the behavior of constituents in soil are summarized in Table 4-1. A generalized illustration of constituent entry and movement within a terrestrial ecosystem is provided in Figure 4-1.

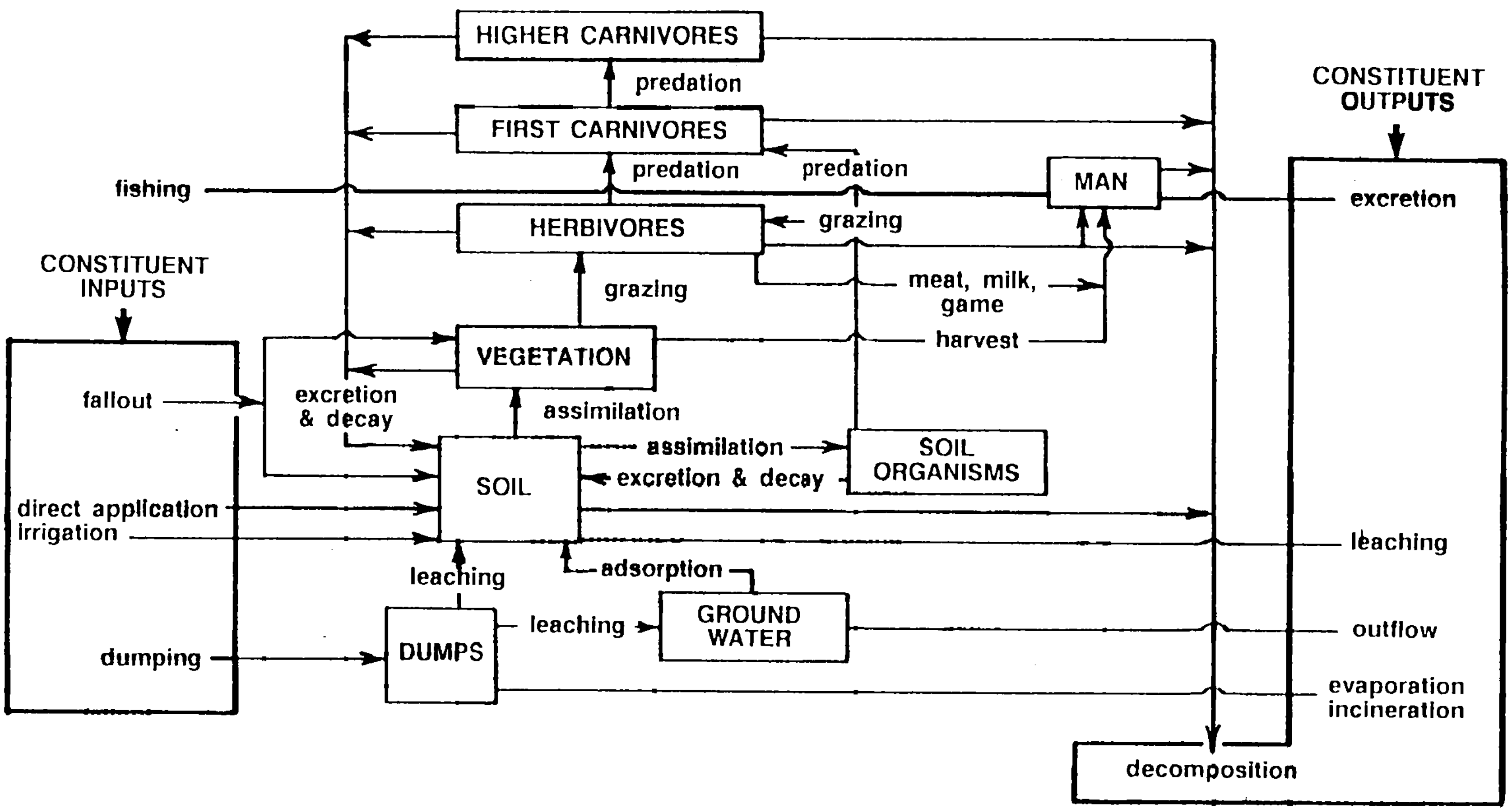
4.1.2 Aquatic/Wetland Species and Pathways

The biological features of Ischua Creek and its wetlands have been described previously in Section 2.0. The aquatic environmental receptors at the site include both plant and animal species that may come into contact with site constituents of concern in both surface water and sediment. The constituents of concern potentially impacting Ischua Creek and the downgradient wetlands include 1,1,1-trichloroethane, and trichloroethylene. These constituents have been identified in the groundwater plume migrating from the site;

Table 4-1. Processes Affecting the Behavior of Xenobiotics in Soil

Process	Primary Governing Factors Related to	
	Contaminants	Soil Environment
Hydrolysis	pK	pH
Volatilization	Vapor pressure	Temperature, porosity moisture
Oxidation/Reduction	Eo	Eh, aeration
Adsorption	Partition coefficient (Koc) solubility	Organic matter content (total carbon), clay type and amount, pKa of adsorbate
Leaching	Solubility, size (if a particle); adsorption (if sorbed to a particle)	Hydraulic conductivity, climate (moisture regime)
Physical Redistribution (pedoturbation, or soil mixing)		Primarily faunal activity (earthworms) influenced by structure, mineralogy, moisture, temperature
Chemical Transformation/ Biodegradation	Organic/inorganic nature, molecular structure, and composition	Microbial activity, temperature, aeration, pH, moisture, sunlight
Bioaccumulation	Octanol-water partition coefficient (Kow)	pKa of absorbate
Biomagnification	Bioaccumulation factor	Trophic levels/nutrient cycle

Source: Modified from Hicks and Van Voris, 1988.



SOURCE: MODIFIED FROM TINSLEY, 1979.

Figure 4-1
TYPICAL SOURCES, DISTRIBUTION, AND FATE OF CHEMICALS IN A TERRESTRIAL ECOSYSTEM

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however, they have not yet reached the receptors in Ischua Creek and the associated downgradient wetlands. Modeling results presented in the RI and FS reports predict that the leading edge of the plume may reach the creek within the next eight years. More recent sampling performed during additional field work, the results of which were presented in Addendum No. 1 to the RI report, suggest that the plume may be travelling faster than initially predicted. Therefore the leading edge of the plume may reach Ischua Creek sooner than anticipated, however, predicted maximum concentrations appear to still be valid.

There are no known local populations of endangered or threatened species in the area. However, a number of typical local species are known or suspected to be present. Among the aquatic life listed in Section 2.1 are various species of fish and herpetofauna, including:

Herptofauna -	red-spotted salamander	bullfrog
	northern dusky salamander	green frog
	slimy salamander	pickerel frog
	spring salamander	midland painted turtle
	four-toed salamander	northern ringneck snake
	northern two-lined salamander	northern ribbon snake
	mud puppy	northern brown snake
	American toad	northern water snake
	northern spring peeper	
Fish -	stoneroller	mottled sculpin
	tongue-tied minnow	fantail darter
	creek chub	longnose dace
	rainbow darter	northern hogsucker

Of these species, all of the fish and the northern two-lined salamander were actually observed during the habitat evaluation site visit. The tongue-tied minnow is considered to be a rare species within the State of New York, however it is currently unprotected.

In addition to these resident species, several additional species may also be found in the riparian habitat of Ischua Creek. Based on the habitat and species associations described in Section 2.1, the following list of species might live in adjacent habitats, but that would be expected to occasionally visit Ischua Creek or the associated downgradient wetlands.

Birds -	green heron	common grackle
	mallard	great crested flycatcher
	hooded merganser	eastern wood pewee
	Virginia rail	barn swallow
	sora	tree swallow
	black-billed cuckoo	black-capped chickadee
	belted kingfisher	marsh wren
	common flicker	veery
	pileated woodpecker	wood thrush
	red-headed woodpecker	red-eyed vireo
	blue-winged warbler	eastern meadowlark
	yellow warbler	American goldfinch
	common yellowthroat	swamp sparrow
	red-winged blackbird	
Mammals -	masked shrew	gray fox
	star-nosed mole	raccoon
	eastern cottontail	long-tailed weasel
	beaver	mink
	meadow vole	white-tailed deer
	muskrat	

In addition, although none were actually observed during the habitat evaluation site visit, brown trout would be expected to occur in the Ischua Creek watershed based on stream classification data supplied by the NYSDEC.

Each of the aquatic and terrestrial species potentially present are of concern because of their close interrelationship within the aquatic ecosystem. Because of the balance of the aquatic/wetland system, any adverse impacts on one species may impact many others in this ecosystem. As a result, the potential hazards associated with the constituents of concern in Ischua Creek, and associated wetlands will be evaluated for aquatic life as a whole.

The processes governing constituent fate in aquatic systems are similar to those presented for terrestrial systems (see Table 4-1). The processes of hydrolysis, volatization, oxidation/reduction, chemical transformation/biodegradation, bioaccumulation, and biomagnification are dependent in varying degrees on water chemistry. The water chemistry parameters of importance include pH, alkalinity, dissolved oxygen, temperature, and calcium carbonate concentration. These parameters determine the chemical speciation of constituent compounds, constituent reactions and their rates of reaction, and where the constituents are ultimately stored. A major determinant of contaminant fate and transport within aquatic systems in the physical nature of the system, whether the system is lentic (standing water) or lotic (flowing water), the velocity of flow, morphological configuration, physical and chemical characteristics of the sediments, and whether seasonal turnover occurs.

4.1.3 Avian Species and Pathways

A list of the known or suspected birds observed or expected to occur at the site is presented in Section 2.1 and in the previous discussion of terrestrial (site specific) and aquatic (Ischua Creek) species of concern. None of the species are known to be threatened or endangered within the vicinity of the site. Among the more important avian species are waterfowl (mallard, hooded merganser), predatory species (hawks, owls), numerous song birds (wrens, robins, vireos, warblers, sparrows), and other game species (mourning dove).

Because the potential exists for the bioaccumulation of constituents within a food-chain, a bird species is chosen to evaluate the exposure and risk associated with the consumption of food. A predatory species (i.e., red-tailed hawk) was selected as the species of concern for this route of exposure, because its diet is almost exclusively based on a variety of small rodents which may accumulate constituents of concern from the site.

In addition to the red-tailed hawk, the mallard was chosen as an indicator avian species to examine the potential impact to waterfowl using wetlands in the Ischua Creek watershed. The mallard is known to consume both plant and animal foods including the seeds, nuts and stems of marsh plants, and a few crustaceans and mollusks. Consequently, the critical route through which the mallard may be exposed includes consumption of aquatic life from surface waters potentially containing constituents of concern.

4.2 EXPOSURE ASSESSMENT

The analysis of exposure to wildlife is a complex process involving the use of numerous exposure assumptions for which the determination is often quite difficult. Potential exposure routes for the terrestrial, aquatic, and avian species at the site may include:

- Absorption/absorption of constituents by soil microfauna (e.g., nematodes, earthworms);
- Ingestion of constituents in soil by soil dwelling organisms (e.g., earthworm and non-soil dwelling organisms (e.g., birds ingesting soil as grit);
- Ingestion of constituents in surface water from stream and wetland areas;
- Adsorption via dermal exposure to constituents in soil by fossorial animals (e.g., mole, groundhog);
- Herbivore exposure resulting from ingestion of constituents in plant material (e.g., eastern cottontail);
- Predator exposure resulting from ingestion of affected prey species (e.g., insect, shrew, hawk);
- Exposure (adsorption/absorption ingestion) to constituents in early life stages of amphibians using aquatic and wetland locations for breeding;
- Absorption of constituents in solution through gills (e.g., fish, tadpole, crayfish);
- Dermal exposure as a result of contact with constituents in the sediment or in the aqueous phase (e.g., burrowing organisms, aquatic insects);
- Ingestion of constituents of concern in sediments and microfauna as a result of feeding activity (e.g., oligochaetes); and
- Ingestion of prey organisms containing constituents of concern (oligochaete, odoneate, fish, bird).

The transfer of constituents of concern along various trophic levels is facilitated by constituent uptake by predator species. For example, an earthworm may create a pathway of exposure to amphibians/reptiles, some mammals, and birds.

A summary of the ecological exposure scenarios including the habitat, target species, and exposure routes for the site is presented in Table 4-2.

4.3 TOXICITY ASSESSMENT

This section of the ecological risk assessment presents the available toxicity information for each constituent of concern on the selected target species. The toxicity assessment is based on a literature survey conducted of available aquatic and eco-toxicity data regarding the three constituents of concern (i.e., lead, 1,1,1-trichloroethane and trichloroethylene). Detailed quantitative toxicity data is not available in the literature reviewed for all constituents, species, and routes of exposure. When possible, toxicity values are reported for the target species (or closely related species); however, much of the information available is more qualitative. The results of this toxicity assessment are used in the risk characterization (Section 4.4) to evaluate the potential risks associated with the site.

While a wide range of pesticides, herbicides, VOCs, polycyclic aromatic hydrocarbons, and heavy metals have been shown to affect biological processes in controlled laboratory experiments, there is little data concerning the extent to which these constituents may affect the overall integrity of a functional ecosystem. This is especially true for organic constituents in general, and specifically VOCs. Conversely, there have been numerous studies conducted on the effects of heavy metals on terrestrial ecosystems. Past research most often has been associated with smelting operations (Beyer, 1988; Buchauer, 1973; Crecelius *et al.*, 1974) and roadways (Grue *et al.*, 1986; Quartes, 1974; Chow, 1970). Characteristically, therefore, focus has been on the effects that massive loadings of heavy metals have wrought over extended periods of bulk.

The bulk of past investigations on organic constituents have centered on establishing maximum allowable exposure levels of herbicides and pesticides based on human health hazards. Due to the high degree of variability of contaminant speciation and respective

Table 4-2. Ecological Exposure Scenarios for the Machias Gravel Pit Site

Habitat	Location	Target Species	Routes of Exposure
Aquatic	Ischua Creek	Fish, herpetofauna, invertebrates, plants	Uptake from surface water, sediment
	Wetlands	Fish, herpetofauna, invertebrates, plants	Uptake from surface water, sediment
		Mallard	Consumption from aquatic plants, ingestion of invertebrates
Terrestrial (gravel pit cropland old field hardwood swamp)	Machias Gravel Pit and adjacent habitat types	Soil organisms, plants	Uptake from soil
		Eastern Cottontail	Consumption of soil, browse
		Red-tailed hawk	Ingestion of prey species (small mammals)

Source: ESE, 1992.

reactions in the natural environment, human-based standards may not be applicable to protect the health of ecosystems. Available information concerning the pathways of bioavailability, fate, transport, and constituent levels that produce deleterious effects on both the ecosystem and individual organism are provided in the following subsections.

4.3.1 Terrestrial Species Toxicity (Lead Toxicity of Plants and Animals)

Information concerning the toxicity of the constituents of concern (lead) on soil organisms is limited, however, some qualitative data is available.

Examples of effects on soil organisms include:

- Inhibitor of soil decomposer activity and subsequent impacts on soil nutrient availability (Beyer and Anderson, 1985; Jordon and Lechevalier, 1975; Jackson *et al.*, 1978).
- Reduction in bacterial, fungal, and arthropod populations (Bisessar, 1982; Tyler, 1975; Jackson and Watson, 1977).
- Bioaccumulation of heavy metals in soil-dwelling organisms such as earthworms, woodlice, beetles, spiders, and nematodes (Beyer and Anderson, 1985; Hartenstein, Neuhouser, and Collier, 1980).
- Inhibition of extracellular enzymatic activity (Tyler, 1978; Jackson *et al.*, 1978).
- Interference of normal biochemical pathways by organic compounds (Jackson and Watson, 1977; Jackson *et al.*, 1978).
- Reduced soil organism survival, growth rate, sexual maturation, and species diversity (Bollag and Barabasz, 1979).
- Bioaccumulation of metals by predators (e.g., beetles, birds, mammals) and soil-dwelling organisms
- Increased leaching of nutrient metals such as potassium, magnesium, and manganese via cation exchange.
- Increased O_2 consumption due to metabolization of some organic constituents (at low levels).

Concentrations of lead as high as 12,800 mg/kg have been reported to cause reduced survival and reproduction in woodlice (Beyer and Anderson, 1985). This amount of lead is similar to the amounts reportedly associated with reductions in natural populations of decomposers such as fungi, earthworms, and arthropods. Herbivorous land snails have been reported to accumulate lead in the mid-gut gland when fed lettuce enriched with lead (1,000 mg/kg). Although lead was found to accumulate in the treated organisms when compared to the controls, no ill effects on growth, reproduction, or survival were reported (Dallinger and Wieser, 1984).

Research on the effects on plants has primarily focused on the large-scale massive loadings of heavy metals and on the effects of various chlorinated hydrocarbons (pesticides and herbicides). USEPA has established a PHYTOX database to act as a bibliographic reference for studies dealing with the phytotoxic effects of constituents. The primary concern has been on agricultural plants rather than on plant species associated with natural ecosystems.

Studies have shown that plants, agricultural and otherwise, do bioaccumulate heavy metals and some organic constituents. In addition to the contaminant-specific and environmental factors governing contaminant uptake in plants and the resulting effects of uptake, bio-uptake also appears to be species-specific. According to Chaney (1987), however, there has been no biochemical or physiological basis established to explain the differential uptake and distribution of constituents in plants.

The primary pathways of contaminant uptake in plants is: (1) through the root system (aqueous phase), and (2) via adsorption/absorption of foliage (vapor phase). Translocation of constituents to various parts of a plant have also been observed. Studies involving heavy metals have reported lead uptake by plants (Jackson *et al.*, 1978; Sadiq, 1985). A study of lead uptake by forest tree species documented differential translocation to various tree parts. The twigs of the tree concentrated the highest levels of lead followed by bark, root bark, root wood, foliage, and tree wood, respectively. The trees, however, contained levels of lead that were lower than the average concentration in the soil.

It has been suggested that aqueous uptake, or root uptake, of constituents is a function of transpiration. The greater the transpiration rate, the greater the uptake of soil water and constituent compounds by the roots (Thakre, 1973). This suggests that there is potential for bioaccumulation of constituents along the trophic food chain. However, according to Chaney (1985) a "soil-plant barrier" exists that would prevent contaminant movement up the trophic chain. Chaney cites various processes that limit levels of a contaminant in edible plant tissues to levels that are safe for ingestion by animals. The processes include:

- Insolubility of a contaminant in the soil; and
- Immobility of a contaminant in the roots preventing translocation to edible tissues.

According to Chaney, contaminant concentrations within the plant results in plant death at levels that are below those that would cause injury to herbivores, thus minimizing the potential for trophic transfer.

In general various aspects of contaminant-plant characteristics can be summarized as follows:

- The roots of plants have demonstrated the capability of extracting potentially phytotoxic constituents from surrounding soil; roots are not necessarily selective;
- Parameters of uptake in addition to those previously mentioned, (soil, pH, temperature, etc.) appear to be the degree of wetness in the soil; the rate at which constituents are introduced within a system, the type of plant species, and any behavioral differences of a contaminant that might exist between wet and dry phases;
- Aeration of soils is related to degree of bioavailability and consequent uptake of heavy metals and organic compounds. This is especially true for organic constituents--the greater the disturbance in the soil, the more likely that volatilization will occur;
- Heavy metal water-soluble salts appear to be the form of heavy metals that is the most toxic to plants; and
- Recorded effects of some heavy metals and organic compounds include: reduction of chlorophyll synthesis resulting in chlorosis, the inactivation of enzymes, stunting, malformation, and mortality.

A summary of some of the toxicological effects of lead on plants is presented in Table 4-3.

Plants readily accumulate lead from soils of low pH or low organic content. Lead seems to be tightly bound by most soils, and substantial amounts must accumulate in the soil before it affects the growth of higher plants (Boggess, 1977). The interactions of lead with other metals are complex and largely unknown. Lead inhibits plant growth, reduces photosynthesis, and reduces mitosis and water absorption. For two species of roadside weeds (*Cassia spp.*) pollen germination was reduced by 90 percent and seed germination was reduced by 87 percent at lead levels of about 500 mg/kg in soil (Krishmayya and Bedi, 1986). There is no evidence for biomagnification of lead in the food chain of vegetation, nor is there convincing evidence that any terrestrial vegetation is important in food chain biomagnification of lead (USEPA, 1980).

Controlled laboratory experiments have identified levels of toxicity and sublethal effects of lead on terrestrial wildlife. Recorded effects include increased susceptibility to disease, reduced antibody production, increased sensitivity to shock, as well as a variety of behavioral and physiological abnormalities.

Wildlife may become exposed to lead in a variety of ways including both primary and secondary pathways. Primary pathways include the active ingestion of lead in soil while grazing, absorption through the skin via dermal exposure, and the inhalation of airborne constituents. Secondary pathways include the ingestion of lead in plants, animals, and water.

A summary of some of the general toxicological effects of lead on terrestrial wildlife is presented in Table 4-3.

No data were available on the toxic or sublethal effects of lead to terrestrial herpetofauna under controlled conditions. Lead poisoning resulting from the ingestion of lead shotgun pellets has long been recognized as a cause of waterfowl deaths. Although no waterfowl species are expected to occur in the onsite gravel mine habitat, other bird species may be

Table 4-3. Effects of Lead on Terrestrial Species

Terrestrial Species	Availability for Uptake	Documented Effects
Plants	Yes-Root uptake: greater at low pH or low organic content. Foliar uptake.	Inhibition of photosynthesis, growth, and water uptake. Reduced transpiration. Reduced seed germination.
Wildlife	Yes-Undetermined potential for biomagnification. Bioaccummulation is possible. Direct ingestion.	Adverse effects to young. Adverse effects to central nervous system Adverse effects to gastro-intestinal tract Behavioral impairment Impairment of liver and thyroid function

Source: Eisler, 1988.

exposed by the ingestion of soil as a result of their search for food or grit. The lead present in onsite soils retained in the gizzard of bird species would be expected to become solubilized by a combination of the powerful muscular grinding action and the low pH of gizzard contents. The released lead could be available for absorption. Absorbed lead causes a variety of effects which may result in death, including damage to the nervous system, muscular paralysis, inhibition of heme synthesis and damage to the kidneys and liver. Signs of lead poisoning in birds have been extensively documented (Eisler, 1988) and include: loss of appetite, lethargy, weakness, emaciation, tremors, drooped wings, green liquid feces, as well as impaired locomotion, balance, and depth perception. Toxic and sublethal effects of lead on birds may be dependant on the species, age, sex, of the bird as well as the form and quantity of the lead ingested.

Birds of prey may ingest lead in the form of biologically incorporated lead from lead poisoned birds and small mammals. While this may contribute to the total lead burden of a carnivorous bird, it is unlikely in itself to cause clinical lead poisoning (Custer *et al,* 1985).

Little research has been conducted regarding the effects of lead on mammalian wildlife, however, some qualitative information is available. Signs of lead poisoning in mammals include: impairment of normal functions of the central nervous system, the gastrointestinal tract, and the muscular and hematopoietic systems. Non-fatal exposures may result in depression, anorexia, colic, disturbed sleep patterns, diarrhea, anemia, visual impairment, blindness, susceptibility to bacterial infections, excessive salivation, eye blinking, renal malfunctions, peripheral nerve diseases, reduced growth, reduced life span, abnormal social behavior, and learning impairment. Lead is known to cross the placenta and is passed in milk (Eisler, 1988).

4.3.2 Aquatic Species Toxicity

Ambient water quality criteria (AWQC) for the protection of freshwater aquatic life have been established that are protective of 95 percent of all aquatic species. Therefore, not only fish, but also aquatic invertebrates and plants are protected (EPA, 1986). While AWQC may not be available for every constituent of concern, lowest reported levels known to cause toxic effects are available in the literature. A summary of the aquatic toxicity data for the constituents of concern at the site is presented in Table 4-4.

The acute toxicity of 1,1,1-trichloroethane to aquatic species is rather low, with the lethal concentration (LC_{50}) for the most sensitive species tested (juvenile bluegills) being 40.0 mg/L (Buccafusco *et al*, 1981). The lowest observed effect level (LOEL) for an acute toxicity test is reported to be 9.0 mg/L (USEPA, 1980). Data on the chronic toxicity to aquatic organisms could not be found in the literature reviewed. 1,1,1-Trichloroethane is only slightly bioaccumulated with a steady-state bioconcentration factor of 9 (reported for the bluegill) with an elimination half-life of two days (USEPA, 1985). This suggests that the potential for bioconcentration of 1,1,1-trichloroethane is relatively low.

The New York State Department of Environmental Conservation has not established aquatic life standards for 1,1,1-trichloroethane, however, a guidance level (270 μg/L) may be calculated based on the LOEL (9.0 mg/L) modified by an application factor of 0.03. This guidance level was calculated for Class C surface water using the procedures for the derivation of a guidance level for the protection of fish propagation and survival (NY Codes, Rules and Regulations, Title 6, Part 702.10).

Data on the toxicity of trichloroethylene to aquatic organisms are limited. The available data for trichloroethylene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 45.0 mg/L and would occur at lower concentrations among species that are more sensitive than those tested (USEPA, 1980). Fathead minnows exposed to concentrations of 15.2 mg/L have been observed to demonstrate a loss of equilibrium (Verschueren, 1983). No specific information are available concerning the chronic toxicity of trichloroethylene to sensitive freshwater aquatic life, but the behavior of one species is adversely affected at concentrations as low as 21.9 mg/L. A fish bioaccumulation factor of 10.6 has been reported by the USEPA (1980), which suggests that the potential for bioconcentration is relatively low. The New York State Department of Environmental Conservation has established a guidance level of 11 μg/L to protect Class C surface waters (NYSDEC, 1992).

Table 4-4. Aquatic Toxicity Data (μg/L) for Constituents of Concern at Machias Gravel Pit Site

	USEPA AWQC Freshwater Aquatic Life		NYSDEC	
	Acute	Chronic	Aquatic Life (Class C Surface Water)	Human Health (Class A Surface Water
1,1,1-Trichloroethane	9,000 (L)	90 (E)	270 (C)	5
Trichloroethylene	45,000 (L)	21,900 (L)	11	3

L = Lowest observed effect level.

E = Estimated value based on acute level divided by a safety factor of 100.

C = Calculated guidance level based on New York Water Classifications and Quality Standards (New York Codes, Rules and Regulations Title 6, Part 702.10). Used lowest observed effect level modified by an application factor of 0.03.

Source: ESE, 1992.
NYSDEC, 1992.

4.4 RISK CHARACTERIZATION

This section integrates the exposure and toxicity assessment to evaluate the potential hazard or risk to the environmental receptors at the Machias Gravel Pit site. The discussions of risk which follow are generally qualitative except for the aquatic receptors. Risks to aquatic receptors are quantified by comparing the environmental data to the available AWQC. If the constituent concentration exceeds the AWQC or available toxicity value, then the potential for an adverse environmental impact is suggested.

The following is a discussion of the risks to aquatic life and terrestrial wildlife associated with the constituents of concern at the Machias Gravel Pit site. The risks discussed are specific to the previously presented exposure scenarios. The major uncertainties associated with this risk analysis are the lack of general environmental toxicity data for the constituents of concern. As a result, conservative assumptions that tend to overestimate the actual risks were made.

4.4.1 Risk to Aquatic Life

Risks to aquatic life were estimated by comparing measured or estimated surface water concentrations with the available AWQC for the protection of aquatic life from chronic exposure to the constituents of concern. Constituent concentrations that exceed the available aquatic toxicity values may pose a risk to aquatic life. The result of this comparison is presented in Table 4-5. In all cases, the estimated surface water concentrations are expected to be lower than the relevant aquatic toxicity data. The results of this comparison indicate that the constituents of concern are not expected to pose a risk to aquatic life. It should be noted that predicted maximum concentrations were based on conservative assumptions used in the analytical groundwater model for the site (refer to the RI and FS reports). The conservative assumptions provide a worst case maximum estimate of surface water concentrations at the point of groundwater discharge to Ischua Creek. Actual concentrations of the constituents of concern in Ischua Creek are expected to be lower than these maximum values.

Table 4-5. Comparison of Estimated Machias Gravel Pit Site Surface Water Quality with Available Aquatic Toxicity Data (μg/L)

Constituent	Estimated Surface Water Concentration [1]	Aquatic Toxicity Date USEPA (Chronic)	NYSDEC (Aquatic Life)
1,1,1-Trichloroethane	0.753	90(E) [18,400]	270(C) [5]
Trichloroethylene	1.02	21,900 (L) [2.7]	11 [3]

[1] Estimated surface water concentrations reported in the Machias Gravel Pit RI and FS reports.

E = Estimated value based on acute level divided by a safety factor of 100.
L = Lowest observed effect level.
[ ] = Value in brackets is water quality criteria for the protection of human health.
C = Calculated value based on NYSDEC guidance.

Source: ESE, 1992.

4.4.2 Risk to Terrestrial Life

Risk to terrestrial life was evaluated qualitatively based on the potential for exposure and the available information on the toxicity of lead. The toxicity data for wildlife is not nearly as complete as that for aquatic species. Following is a discussion of the potential risks for each target species selected.

Soil Organisms

Soil organisms (i.e., fungi, earthworms, arthropods) exposed to lead in soil at the Machias Gravel Pit are not expected to demonstrate adverse impacts. The concentration of lead in the soil (maximum lead of 101 mg/kg reported in Addendum No. 1 report) at the Machias Gravel Pit site is considerably lower than concentrations (12,800 mg/kg) associated with toxic effects on soil organisms (Beyer and Anderson, 1985).

Plants

As discussed previously, uptake of lead into plants may occur. Toxic effects of lead on plants have been reported as low as 500 mg/kg (Krishmayya and Bedi, 1986) which is about 5 times higher than that found at the site. Observations at the site, indicate that the existing vegetation is not stressed. Based on this information, adverse effects on plants due to lead are not expected at the Machias Gravel Pit site.

Wildlife

The selected target species (eastern cottontail rabbit and red-tailed hawk), exposed to lead in soil at the Machias Gravel Pit site are not expected to demonstrate adverse impacts. The potential for exposure to any of these species is low because the frequency of exposure is limited and the concentrations of lead at the points of exposure are not expected to result in adverse effects. Exposure to the selected species could occur through direct and indirect exposure pathways. Direct exposure pathways include dermal absorption and oral ingestion of soil. The most common indirect exposure pathway for these species would be the potential for lead uptake and translocation to edible parts of plants and subsequent food-chain transfer. Although lead has some potential for bioaccumulation, concentrations of lead at the site (101 mg/kg) are much lower than those known to be associated with toxic effects. The exposure and toxicity information combine to suggest that risks to terrestrial wildlife are not expected to be significant.

5.0 SUMMARY

5.1 HABITAT EVALUATION

The habitat evaluation for the Machias Gravel Pit site included an identification and characterization of significant habitats, wetlands, regulated streams, and other special natural resources within a 2-mile radius of the site and 9 miles downstream from the site. The evaluation was conducted by contacting numerous agencies and organizations, reviewing available mapping, aerial photography, and literature, and by performing field sampling and verification.

More than 10 National Heritage cover types were identified during this evaluation. Many of these consisted of habitats in varying stages of disturbance (cropland, old field, gravel pit, etc.) while others exhibited less disturbances (e.g., shallow marsh, shrub swamp).

Notably important resources of the project vicinity included the presence of State regulated wetlands, designated trout streams, and the presence of several unusual features. These included the presence of tongue-tied minnow, and an Inland Poor Fen that supports a population of *Carex schweinitzii*. The fen community is ranked as having a limited distribution (S3), whereas the above species are ranked as very vulnerable (S2). Among these the tongue-tied minnow is the nearest to the project site (0.2 mile), while the other resources are more distant (0.8 mile).

5.2 SUMMARY OF ECOLOGICAL RISK ASSESSMENT

The focus of the ecological risk analysis was the on-site habitat (the gravel pit) and Ischua Creek. The ecological risk analysis identified several target species including fish, herpetofauna, soil organisms, plants, the eastern cottontail rabbit, and the red-tailed hawk. Based on the results of the habitat evaluation and the ecological risk assessment presented in this report, the following conclusions are forwarded in support of the overall RI performed for the Machias Gravel Pit site. Important exposure routes include direct uptake from soil or surface water, as well as consumption of plants and prey species. No potential aquatic toxicity is expected. Estimated surface water concentrations of 1,1,1-trichloroethane and trichloroethylene are below toxic levels of concern. In addition, no potential terrestrial toxicity is expected. Measured soil concentrations of lead are below toxic levels of concern. Finally, ecologieal risks to aquatic and terrestrial species are not expected. Concentrations of the constituents of concern do not exceed the available toxic effect levels.

6.0 AGENCY AND ORGANIZATION CONTACTS

A number of agencies and organizations were contacted as part of the ecological site characterization. A listing of these agencies and the representatives contacted are presented in Table 6-1.

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Table 6-1. List of Agencies/Organizations Contacted

Agency/Organization	Representative
NY Department of Environmental Conservation	
Bureau of Environmental Protection	
Habitat Inventory Unit	Jerry Rasmussen, Larry Alber, Scott Crocoll
Endangered Species Unit	Larry Brown
Bureau of Fisheries (Region 9)	Paul McKeown
Forest Resource Management Bureau	Wayne Cooper
Bureau of Monitoring and Assessment	John Spagnoli, Tom Everetts
Divison of Water	Colby Tucker
U.S. Soil Conservation Service	Cattaraugus County
ASCS	Cattaraugus County
Cornell University Cooperative Extension Unit	Tom Leeback
Federation of NY State Bird Clubs, Inc.	Mary Sunderlin, Timothy Baird, Dr. Steve Eaton

Source: ESE: 1992.

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APPENDIX A

Photographs

1. View of main gravel pit.

2. View of successional northern hardwood swamp community immediately south of site.

3. View of hemlock hardwood south of site.

4. View of wet meadow within successional old field southwest of site.

5. View of successional old field and shrubland southwest of site.

6. View of successional shrubland west of site.

7. View of groundwater seep within successional shrubland on hill west of site.

8. View of successional old field (foreground) and cultivated field (background) west of site.

9. View of successional hardwood forest west of site.

10. View of shrub swamp along Ischua Creek east of Very Road.

11. View of shrub swamp northeast of site near spillway.

12. View of aquatic sampling Station 1 on Ischua Creek.

13. View of aquatic sampling Station 1 on Ischua Creek.

14. View of aquatic sampling Station 2 on tributary of Ischua Creek.

15. View of aquatic sampling Station 3 on Ischua Creek.