

**APPENDIX E**

**BIOLOGICAL DATA COLLECTION REPORTS - DILLON CONSULTING**

**Biological Data Collection  
Fall 2000, Spring, Summer,  
Fall 2001**

**Flintstone Rock Site (Final Report)**

*October 2001*

*Our File: 00-8392-0200*

**Issued to  
MGI Limited**

*Submitted by:*

**Dillon Consulting Limited**

October 24, 2001

MGI LIMITED  
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Dartmouth, Nova Scotia  
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ATTENTION: Mr. Peter Oram

***Biological Data Collection Fall 2000, Spring, Summer, Fall 2001 - Flintstone Rock Site - Final***

We are pleased to provide this final copy of our biological data collection report. If you have any questions, please contact the undersigned.

Yours truly,

DILLON CONSULTING LIMITED

Karen L. March, M.Sc.  
Project Manager

KLM:keb  
Our File: 00-8392-0200

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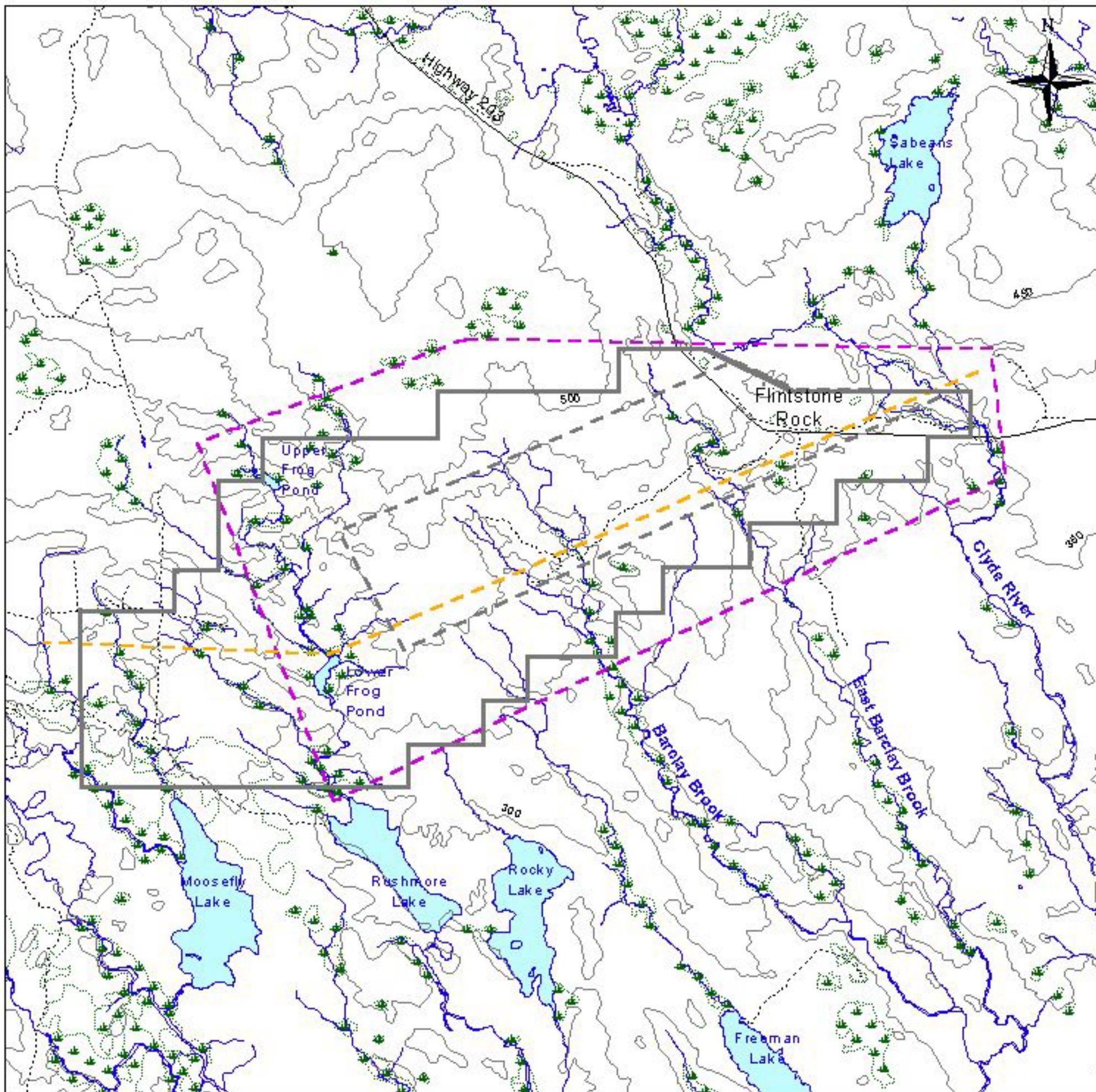
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## **1.0 Introduction**

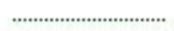
The Flintstone Rock area is currently being investigated by Black Bull Resources Inc. (Black Bull) to determine potential for quartz and kaolin resource development and is referred to as the White Rock Mine. As a component of environmental baseline data collection at the Yarmouth Claim Block, biology field investigations were undertaken in the fall of 2000 and spring, summer and fall of 2001. Work was conducted for MGI Limited (MGI) who are managing all permitting related matters associated with the White Rock Mine. Investigations undertaken included:

- a baseline assessment of fish habitat and fish species in East Barclay Brook, Barclay Brook and tributaries identified at 1:10 000 scale within the study area;
- an assessment of fish habitat in Lower and Upper Frog Ponds;
- an assessment of fish habitat at the Clyde River, at an upstream and generally downstream location, and a determination of fisheries from existing information;
- herpetile and breeding bird surveys as well as incidental wildlife observations; and
- an initial evaluation of potential for species at risk for the study area based on existing information and targeted field surveys, including botany surveys.

The location of the study area features that are the focus of this work is provided on Figure 1. Figure 2 illustrates aquatic habitat features, Figure 3 illustrates terrestrial habitat features and Figure 4 outlines wetlands. Site photographs are provided in Appendix A.



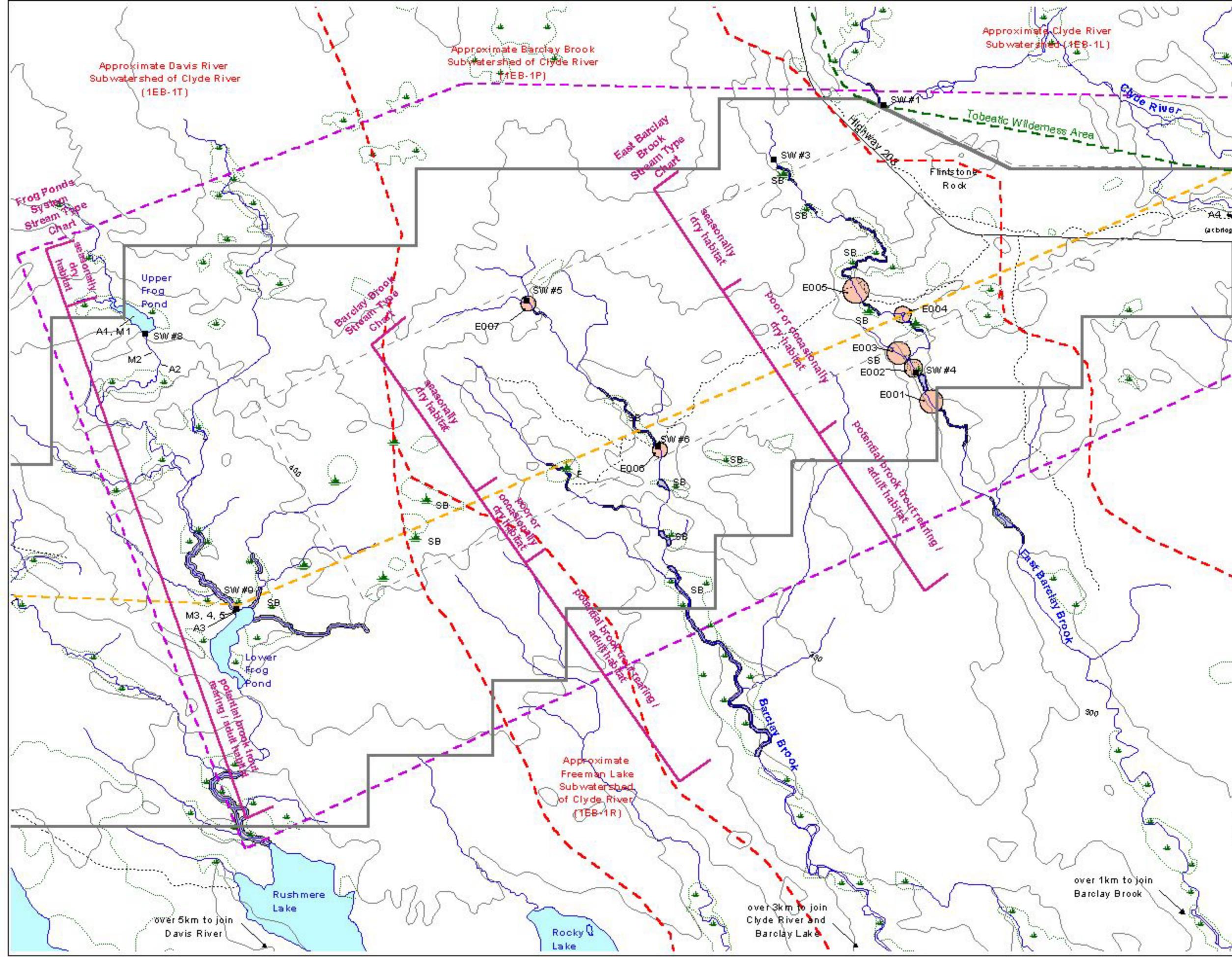
### LEGEND

-  Wetland
-  Approximate Study Area
-  Claim Block Area
-  Proposed Mining Lease Area
-  Road
-  Trail
-  Cutline (approx. centerline)
-  Watercourse
-  Wetland / Tree Line

Elevation Contour Interval 50ft

500 0 500 1000 Meters  
Scale 1:50 000

	Map Title	Figure No.
	Study Area	1
Date	Project	Project No.
Oct. 2001	Flintstone Rock Biology	00-8392



### LEGEND

- Road
- Trail
- Claim Block Area
- Proposed Mining Lease Area
- Outline (approx. centerline)
- Study Area
- Subwatershed (approx. boundary)
- Shrub Bog
- Fen
- Wetland
- Surface Water Sample Site
- Wetland / Tree Line
- Watercourse - riffle, run or flat
- Watercourse - stillwater
- E# - Electrofishing Site
- M# - Minnow Trap Site
- A# - Angling Survey



0 200 400 600 800 1000 Meters

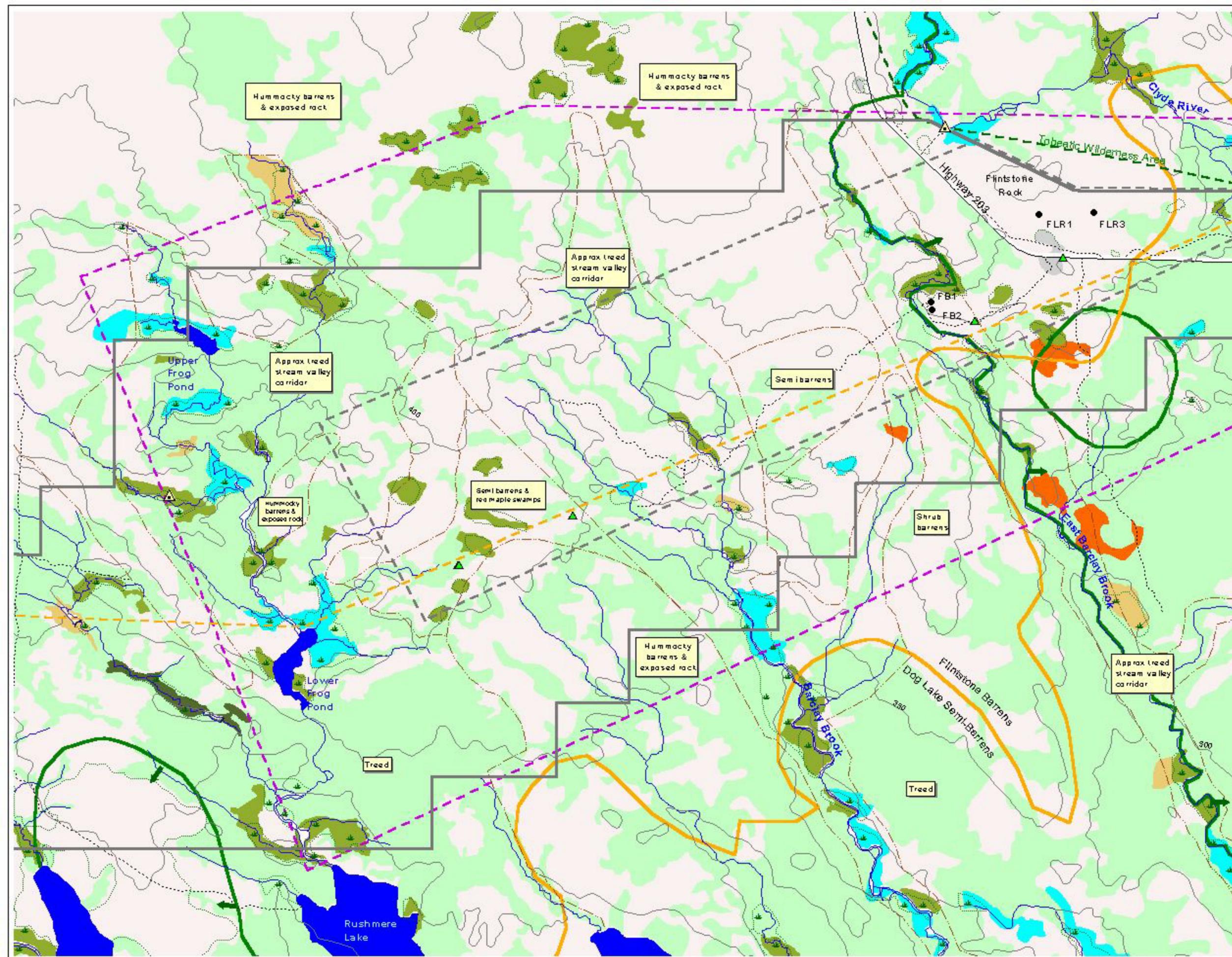
Elevation Contour Interval 50ft Scale 1:20 000

	Map Title	Figure No.
	Aquatic Habitat	2
Date	Project	Project No.
Oct. 2001	Flintstone Rock Biology	00-8392

over 5km to join Davis River

over 3km to join Clyde River and Barclay Lake

over 1km to join Barclay Brook



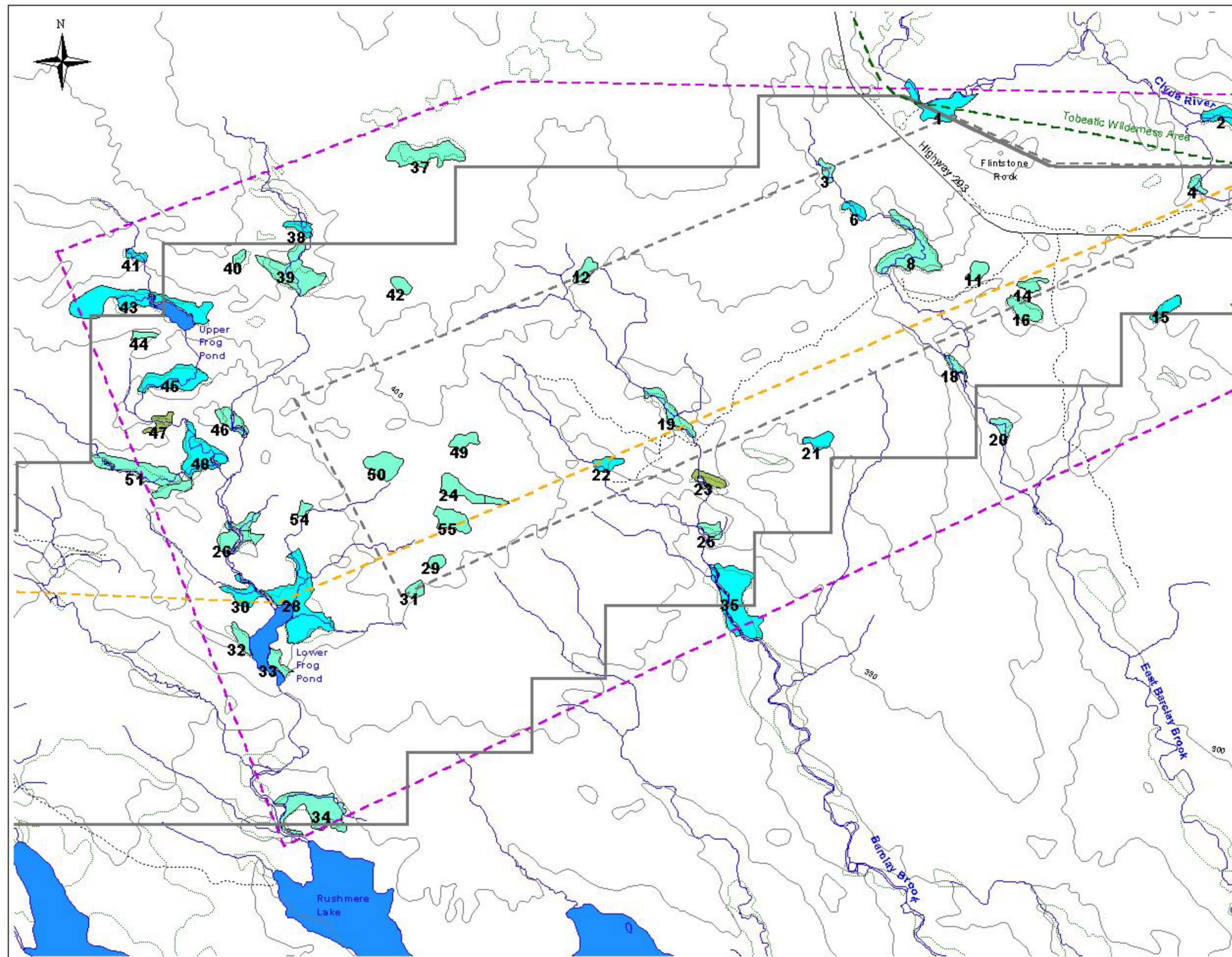
### LEGEND

- Road
- Trail
- Claim Block Area
- Proposed Mining Lease Area
- Outline (approx. centerline)
- Study Area
- Wetland
- Wetland / Tree Line
- Watercourse
- General Wetlands
- Beaver Flowage
- Open Bog
- Treed Bog
- Forested
- Barren
- Gravel Pit
- Mature Forest - 75yrs +
- Pellet Group Inventory Site
- NSDNR Plant Survey Sites (FB & FLR#)
- Approx. Location of at risk plants
- Significant Wildlife Habitat (NSDNR)
- Approximate boundary between Dog Lake Semi-Barrens and Flintstone Barrens
- Generalized terrestrial habitat based on aerial photography (1988) and limited field observations

**NOTE: Barren Vegetation:**  
 Mixed Huckleberry - Lambkill shrubs & Lichen - Bearberry - Broom Crowberry on more exposed rock

0 200 400 600 800 1000 Meters  
 Elevation Contour Interval 50ft Scale 1:20 000

	Map Title	Figure No.
	Terrestrial Habitat	3
Date	Project	Project No.
Oct. 2001	Flintstone Rock Biology	00-8392



Wetlands within Study Area

wetland#	Area	wetland#	Area
1	32502.500	32	8948.250
2	20480.500	33	8563.000
3	6017.125	34	48471.750
4	5628.625	35	47800.500
5	11632.500	36	10558.500
6	7258.125	37	37992.250
7	17951.750	38	7704.375
8	48800.250	39	43394.375
9	13584.375	40	4251.500
10	3484.000	41	4859.750
11	8765.125	42	7369.875
12	9200.750	43	63655.500
13	6298.000	44	4271.875
14	7530.625	45	33815.375
15	10365.375	46	12512.875
16	16432.500	47	9201.375
17	7005.375	48	36245.500
18	6048.000	49	10070.625
19	17863.250	50	20981.125
20	7857.000	51	46028.250
21	9466.750	54	4272.875
22	9249.125		
23	10221.375		
24	21727.125		
25	7860.000		
26	16959.000		
28	66870.750		
29	5895.750		
30	16476.125		
31	6806.750		

Area in Square Metres  
Note: 1 hectare = 10,000m<sup>2</sup>

- General Wetland
- Open Bog
- Treed Bog
- Claim Block Area
- Proposed Mining Lease Area
- Study Area
- Cut Line



Elevation Contour Interval 50ft Scale 1:20 000

	Map Title	Figure No.
	Wetlands	4
Date	Project	Project No.
Oct. 2001	Flintstone Rock Biology	00-8392

## **2.0 Aquatic Biological Data**

### **2.1 Aquatic Fish and Fish Habitat Surveys**

Fish habitat examined in the fall of 2000 and spring/summer 2001 included East Barclay Brook, Barclay Brook and the Clyde River as well as Upper and Lower Frog Ponds. Habitat assessments were conducted using standard DFO parameters. Electrofishing was conducted in East Barclay and Barclay Brooks (fall 2000). Water levels were generally unsuitable for electrofishing in the Clyde River and Frog Ponds at all survey times. Supplemental angling and minnow trap surveys were also conducted. Habitat and fish survey sites, habitat features, watershed boundaries and surface water sampling sites (collected by MGI and reported separately) are located on Figure 2. Habitat survey details are provided in Appendix B and electrofishing data in Appendix C. Peter Winchester (DFO Southern Nova Scotia Area Habitat Coordinator) was present during the assessment of portions of East Barclay Brook, the Clyde River and the Frog Ponds (fall 2000 and June and August 2001). Reg Sweeney (Habitat Management Branch) and Richard Dollimont (Fisheries Officer) were also present for a survey of the Frog Ponds (June 2001).

Fall surveys in September and October 2000 were conducted in moderate flow conditions. Surveys conducted in early June 2001, were during high flow conditions and surveys in late August 2001 were during low flow conditions.

### **2.2 Aquatic Setting**

The Flintstone Rock Claim Block area is located within the headwaters of the Clyde River watershed. Surface water from the site drains south-southeast. No drainage is toward the Tusket River watershed. A small eastern portion of the Claim Block and study area is within the main Clyde River watershed. Site activity is generally not proposed for this main Clyde River watershed. The majority of the eastern portion of the claim is within the Barclay and East Barclay Brooks subwatershed. A small wedge of the central portion of the claim drains to the Freeman and Silver Lakes subwatershed of the Clyde River, while the majority of the western portion of the claim (including Upper and Lower Frog Ponds) drains to the Davis River subwatershed of the Clyde River.

Many shallow irregular lakes are scattered throughout the larger Clyde River watershed, particularly in the upper reaches. Most of these lakes are upgradient of work proposed for the site. Water is typically acidic, reflecting the poor buffering capacity of shallow soils, granitic till and granitic bedrock. Swales,

swamps and bogs are also prevalent and contribute organic matter and often a dark colour to surface waters.

The Clyde River is one of the many southwestern Nova Scotia rivers affected by acid precipitation and poor natural buffering. Although the Clyde was naturally acidic and had low productivity, historically populations of Atlantic salmon were sustained (Farmer *et al.* 1980). Since the 1950's the pH in the Clyde has declined below 5 units, which is generally unsuitable for natural salmon production. Recent angling catches of over 50 salmon (grilse and salmon) (DFO *Atlantic Salmon Sport Catch Statistics 1996-98*) have occurred in downstream reaches due to release of put-and-take hatchery raised smolts. These fish are not expected to enter higher reaches due to the low pH. The main Clyde River provides good brook trout habitat in many areas throughout its length, however, production is limited by low pH. A spring sea-run of brook trout and salmon habitat also occur in the lower reaches. Brook trout habitat in the vicinity of Flintstone Rock depends to some extent on the pH of the local tributaries. The main branch of the Clyde River upstream of the lakes (Barclay and Long Lake) is reported to be less productive than areas along the Davis River and Clam Lake Branches (pers. comm. P. Winchester). Gaspereau and smelt are not known to travel up as far as the Flintstone Rock area. Eels, yellow perch and minnows occur throughout the system.

The Clyde River Committee (CRC) has an interest in protection of the watershed. The Committee has been involved in river enhancement projects, typically in the lower portion of the river (including liming efforts and construction of a fishway at Sutherlands Mill). Dillon understands that Black Bull and the CRC have had meetings to discuss common goals.

## **2.3 Clyde River Habitat Survey**

The Clyde River originates in Clyde Lake over 5 km upstream of the claim area and drains to the Atlantic Ocean over 50 km downstream at Port Clyde. Habitat within this river was examined upstream of the study area at SW1 (surface water sampling site) and in the downstream reaches of the study area at the Route 203 crossing during high and low flows. Sampling site SW1 is upstream of the proposed extraction area and outside of the proposed lease area. Much of the Clyde River is too deep to electrofish due to large size (even during periods of low flow) and beaver dammed stillwaters. An angling survey in August 2001 at sites SW1 and SW2 captured no fish. Low water levels and beaver obstructions throughout the Clyde River system likely contributed to limited fish presence at this time.

Upstream of the SW1 site, a shrub bog stillwater occurs (Photo 1). The stillwater areas are generally 8-15 m wide with a mud dominated bottom and open cover. Downstream of the SW1 site, a boulder garden run occurred in the fall of 2000 (Photo 2). However, by August 2001, numerous beaver dams were

established in this area and stillwater habitat occurred throughout. The beaver dams partially restrict fish passage. During the low flow period, depth maintained by the dams was only 20 - 50 cm less than during fall high flows (Photo 53). The stillwater extends for over 500 m downstream. Bottom substrate is dominated by mud with boulders, mixed with cobble, gravel and sand. Shoreline vegetation is represented by more conifers on the east bank and shrub on the west banks.

The Clyde River at the Highway 203 crossing, which is situated just outside of the claim block, is predominately a stillwater extending from the bridge over 500 m upstream of the road (Photo 3) and over 200 m downstream of the road (Photo 4). Conditions during low flow were similar to high flow due to beaver damming (Photo 54). Approximately 20 m downstream of the road, an old bridge footing and beaver blockage create a riffle and the pool downstream is reported to provide spring brook trout habitat. In the summer of 2001 a beaver dam was noted at the end of the stillwater that creating a partial obstruction to passage (Photo 55). Bottom substrate is dominated by mud with boulders, mixed with cobble, gravel and sand. Shoreline vegetation is dominated by shrubs. Downstream of the stillwater, a braid occurs in the stream and the stream narrows and steepens for approximately 150 m prior to entering another stillwater. The steeper area is expected to provide spring rearing areas and potentially spawning areas for brook trout. Bottom substrate consists of boulder, rock and cobble, with gravel and sand (Photo 56). Bank vegetation includes deciduous trees, shrubs and herbaceous cover.

Surface water chemistry (MGI on-going data collection reported separately) at SW1 and SW2 (downstream of Highway 203) is typical of the area. Water is characterized by low pH (4.1-4.8 units except during April 2000), high iron (exceeding Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guidelines - CCME FWAL occasionally at SW1), high aluminum (exceeding FWAL guidelines), generally low nutrients and high colour. The pH at SW1 is generally slightly higher than at SW2. Other occasional exceedances include a slight copper FWAL exceedance SW2 on one occasion, slight lead exceedances at SW1 and SW2, a slight cadmium exceedance and a slight zinc exceedance at SW2. This low pH, low nutrient water reduces brook trout production, however, brook trout in the area are known to be adapted to low pH and the habitat is suitable for adults and juvenile rearing. Potential for spawning habitat may be present if higher pH groundwater seeps/springs or inflows occur.

## **2.4 East Barclay Brook Habitat and Fish Survey**

East Barclay Brook originates in the Flintstone Rock area, near the northern edge of the study area. The brook travels approximately 2 km across the study area and joins Barclay Brook over 2.5 km downstream of the southern edge of the study area. Another 1.5 km downstream, Barclay Brook joins the Clyde River at Barclay Lake.

The portion of East Barclay Brook within the study area is high within the watershed and has a small contributing area. Generally much of this section of the watercourse has low flow and supports limited fish habitat. Habitat in the upstream reaches (examined in August 2001) is seasonally dry except in the stillwaters and even these have too little flow to support salmonids in the summer (Photos 57 and 58).

In the central study area and downstream under moderate to high flow conditions, the watercourse was generally under 2 m wide with less than 25 cm depth. Stream character is predominantly riffle, however, numerous stillwater shrub wetland areas occur. Photos 5 through 16 show habitat features as noted in the October 2000 habitat assessment. Photo 51 shows flow in June 2001 and Photo 59 flow in August 2001. Coarse sand is a dominant substrate type except in the stillwaters where mud tends to occur. The stillwater areas and approaches may support brook trout during higher flow periods. However, good brook trout habitat was not observed upstream of the pond (near surface water sampling station SW4).

The small tributary entering East Barclay Brook in the vicinity of the SW4 station has limited fish habitat. This tributary is very small (less than 1.5 m wide in November) and generally steep with numerous small debris blockages and root obstructions (Photo 17).

Spot electrofishing conducted along approximately one kilometer of East Barclay Brook from the stillwater above the ATV trail to the pond near the southern border resulted in the capture of no fish (Figure 2, E002-005). Brook trout were captured within the pond and numerous brook trout were captured approximately 100 m downstream of the pond (Figure 2, E001). The area downstream of the pond has good potential for spawning and rearing habitat.

Surface water chemistry (MGI on-going data collection reported separately) at SW3 and SW4 is typical of the area. Water is characterized by low pH (4.1-5.0 units upstream and 4.1-5.3 units downstream), high aluminum (exceeding FWAL guidelines), generally low nutrients and high colour. Occasional slight FWAL exceedances were noted for copper, iron and lead. The pH, particularly in downstream reaches, is slightly higher than the main Clyde River, improving potential for brook trout production.

## **2.5 Barclay Brook Habitat and Fish Survey**

The main Barclay Brook originates over 1 km to the west of East Barclay Brook, also near the northern edge of the study area. This brook and a small tributary travel approximately 2 km across the study area and join near the southern study boundary. Over 5 km downstream of the southern study boundary, Barclay Brook joins with East Barclay Brook. An additional 1.5 km downstream, Barclay Brook joins the Clyde River at Barclay Lake.

Within the study area, Barclay Brook is similar to East Barclay Brook. Photos 18 through 26 illustrate habitat features as noted in the October 2000 habitat assessment in the vicinity of the ATV trail. Photos 60 to 68 show conditions in August 2001 generally downstream of the 2000 habitat assessment. Flows appear to be slightly higher in Barclay Brook than East Barclay, reflecting a larger contributing watershed. A large stillwater shrub wetland occurs just upstream of the ATV trail. The watercourse upstream of this wetland is generally less than 1 m wide with limited fish habitat and low flows (Photos 69 and 18 and 19). Within the stillwater area, the watercourse is often over 5 m wide and 1 m deep and has some potential for seasonal brook trout use, however, access to this area may be limited by the approximately 150 m steep riffle section from the wetland downstream to a small pond. The watercourse in the riffle section was generally 3-5 m wide with less than 25 cm depth during the October (moderate to high flow period) survey. Photos 22, 52 and 60 show October, July and August flows at the ATV trail. Boulder and rock were the dominant substrate type with sections of sand and gravel. Mud dominated the stillwater/pond bottoms. The stillwater and pond areas and approaches may support brook trout during higher flow periods, however access from downstream habitat is difficult. Fish were not observed at the time of the survey.

Downstream of the small pond (approximately 120 m downstream of the ATV trail), the habitat is similar; typically steep boulders until a large wetland pond (SB on Figure 2, approximately 200 m downstream of ATV trail). Several beaver dams at the outlet limit fish passage during low flow. The next 200 m downstream (to the next wetland pond), is also characterized by steep slopes, boulder/rock/cobble substrate and low summer flows.

A tributary to Barclay Brook joins the main Barclay Brook at this second pond. This tributary originates less than 1 km upstream of the cutline. Upstream of the cutline, the watercourse is very small (less than 1.5 m bankfull width) and flows through moss covered rocks within a fairly steep channel, providing limited fish habitat (Photo 27). Downstream of the cutline the tributary watercourse enters a fen stillwater approximately 100 m long (Photo 28). A small fish (probably a brook trout) was observed at the upstream end of the fen. This downstream portion supports fish habitat at least during higher flow seasons. This tributary was also examined downstream of the fen where the bankfull width is 1-2 m and depth is up to 35 cm in small pools. Gradient is moderate and riffle substrate dominates (Photo 50). Habitat in this area is expected to be limited by low summer flows and depth, although refuge habitat is available in the upstream fen.

Spot electrofishing conducted along approximately 30 m section in the upstream portion of the main Barclay Brook watershed (Figure 2, E007 near station SW5) captured no fish. Spot electrofishing along Barclay Brook within the 200 m section between the large wetland and the pond downstream of the ATV trail (Figure 2, E006) captured an eel and several frogs.

Surface water chemistry (MGI on-going data collection reported separately) at SW5 and SW6 for summer 2000 is typical of the area. Water is characterized by low pH (4.3-4.4 units), high aluminum (exceeding FWAL guidelines), generally low nutrients and high colour. Slight FWAL exceedances occurred for lead (as well as one anomalous higher value). The low pH, low nutrient water combined with low flows limits brook trout production.

## **2.6 Upper Frog Pond and connection to Lower Frog Pond**

Upper Frog Pond is a small pond within 1 km of the headwaters of the Davis River tributary and approximately 2 km upstream of Lower Frog Pond (Photo 45). The Davis River joins the Clyde River over 15 km downstream of the study area.

The watercourse entering Upper Frog Pond is very small and portions (excluding stillwaters) are expected to be intermittent during low flow. Upper Frog Pond is approximately 300 m long by 100 m wide and generally less than 1.5 m deep (during moderate June flow levels). Small shrub bog areas occur in the inlet area and in the eastern corner of the pond. The remaining shoreline is dominated by granitic boulders with minor amounts of sedges and rushes between boulders and shrub back from the pond edge. Boulders extend throughout the pond bottom, however mud deposits and associated lily areas occur in the central portion of the pond. A June angling survey (2 surveys of 45 minutes each) and minnow trap sets (2.5 hours) captured no fish. However, log books from the cabin located approximately 700 m to the east of the pond indicated over a dozen brook trout had been captured in May. A surface water sample taken at the pond outlet (SW8) has similar characteristics to the Barclay Brooks water. The pH is low (4.9 units), aluminum concentrations exceed freshwater aquatic life (FWAL) guidelines, colour is high and nutrient levels are low.

The outlet tributary to the pond was also examined. This watercourse is generally 1-4 m wide and 0.1-0.3 m deep. For approximately 200 m downstream of the pond the dominant stream character is riffle, although short run/flats areas are also present (Photo 46). Forest cover consists of mixed woods (spruce, fir, maple). Moss and sparse ferns occur along the watercourse banks. The dominant bottom substrate varies from boulder in steeper areas to granite gravel in less steep areas. A minnow trap set within a run area (approximately 2 hours) captured no fish. A cabin occurs near the watercourse in this area. There is evidence of beaver throughout the area.

Approximately 200 m downstream of the pond a large stillwater and surrounding shrub bog (with a small blue-joint meadow at the entrance) occurs (Photo 47). At this location, a small (approximately 12 cm) brook trout was captured in an angling survey. The stillwater is generally 2-4 m wide, 0.5-0.8 m deep, has

an organic bottom and extends for over 300 m downstream. The remaining section downstream to Lower Frog Pond is dominated by shrub bordered stillwaters (approximately 1.3 km of the remaining 1.7 km).

A small tributary to the connector between Upper and Lower Frog Pond was also crossed within a stillwater area (Photo 48). The cabin noted above as occurring east of Upper Frog Pond is located on the east side of this tributary. This area has potential for brook trout habitat, although passage may be limited at times of low flow. A minnow trap survey in this watercourse (3 hours) captured no fish.

Brook trout use the Upper Frog Pond area during times of moderate to high water levels. During low water levels it is expected that fish seek refuge in the stillwaters or even Lower Frog Pond. Areas with spawning habitat occurs downstream of Upper Frog Pond within the deeper riffle areas and potentially in the stillwaters and ponds if higher pH seeps occur. The slightly higher pH in Upper Frog Pond may contribute to habitat quality in the pond and immediately downstream. Fish passage upstream of Upper Frog Pond is limited during all but high flow. Low summer flows may restrict passage in the non-stillwater areas throughout the watershed. This Upper Frog Pond area appears to support a moderate level of spring fishing effort (as well as fall hunting).

## **2.7 Lower Frog Pond Habitat Survey**

Lower Frog Pond is located within the southwestern portion of the study area. The pond flows into the Davis River and eventually the Clyde River, over 15 km downstream of the southern claim boundary. The pond is generally 100 m wide by 500 m long within a shrub wetland. Photos 29 through 35 and 49 illustrate Lower Frog Pond Habitat features. Stillwater areas extend upstream and downstream. Unless extensive obstructions or poor water quality occur, the pond and stillwaters are expected to support brook trout and minnows. A June angling survey (20 minutes) and minnow trap survey (3 traps, 1 hour) captured no fish. It is reported (pers. comm., P. Tufts) that the fishing within this pond is better than in the smaller, seasonally shallow Upper Frog Pond. Surface water chemistry at SW9 and Frog Pond sites (MGI on-going data collection reported separately) was again similar to the other watercourses in the area. The pH varies from 4.3 to 4.7 units, aluminium exceeds FWAL guidelines and colour is high. A very slight lead FWAL exceedance occurred in one sample.

## **3.0 Terrestrial Biological Data**

### **3.1 Flora and Fauna Surveys**

Botany surveys were conducted in the late fall of 2000 and summer of 2001. Surveys included a centerline transect walk and targeted surveys to representative habitat types present on site. Fauna surveys were conducted in the summer of 2000 as noted below.

Figure 3 illustrates terrestrial features. Appendices D and E provide field reports.

### **3.2 Terrestrial Setting and Flora**

The study area is predominantly in the Flintstone Barrens ecoregion area. A small portion of the eastern study area is within the Dog Lake Semi-Barrens. The Tobeatic Wilderness Area (TWA) is located in the eastern corner of the study area. The Wilderness Area is protected as representative of Western Granite Plain and Roseway Glacial Drift Landscape. Ecosystem features include glacial features, barrens and semi-barrens, moose and bear habitat, large wetlands, old forest and coastal plains elements and a headwater of several major rivers and large wilderness area. The Shelburne Barren Site of Ecological Significance (SES) has been provisionally redefined based on NSDNR/NSDOEL (Protected Areas Division) field investigations and Integrated Resource Management review (MacKinnon 1998) and is located approximately 1 km south of the study area along Barclay and East Barclay Brooks and the Clyde River. This SES is a candidate for designation as a nature reserve. The Indian Fields Provincial Park Reserve is also located in this general area, over 2 km south of the study area.

The Flintstone Barrens is an area of hummocky undulating terrain with low granitic bedrock controlled hills and ridges. Intervening low areas have bogs, swales, fens, streams and imperfectly drained flats. Erratic boulders are abundant and soils dominated by sand with gravel/cobble/boulder (MacKinnon 1998). The barrens are characterized by vegetation suited to the thin granitic soil, areas of exposed granite bedrock, forest fires, leaching due to low fertility and establishment of heath vegetation (Davis and Browne 1997). Heath vegetation such as huckleberries and lambkill dominate the upland barrens having a patchy distribution. Along the hummock tops, open areas of exposed bedrock barrens are dominated by lichen-bearberry-broom crowberry associations. As fires tend to be controlled, some of the barrens areas are slowly developing forest cover resulting in semi-barrens habitat. Semi-barrens habitats tend to be a mix of huckleberry-lambkill and white pine-black spruce-intolerant hardwoods trees. Forest vegetation, dominated by red maple, occurs in drainage swales (stream valley corridors and red maple or alder

cinnamon fern-sphagnum swamps). Wet areas have black spruce and tamarack in addition to red maple. Small ericaceous shrub wetlands are prevalent throughout the area. One small fen was observed along a Barclay Brook tributary.

The Dog Lake Semi-barrens, along the southern portion of East Barclay Brook and the Clyde River, is an undulating plain with a shallow iron pan and imperfectly drained soil (MacKinnon 1998). Vegetation is a typically a mix of black spruce and ericaceous shrub semi-barren.

The majority of the forest cover within the study area is within the 30 to 60 year age class (NSDNR 2001). Four small stands within the 75-85 year age class are located to the south of the lease area (Figure 3).

The botany field survey reports (November 2000 and summer 2001) detail plants found in each of the generalized habitats identified and note significant plants found (Appendix D). Photos 36 through 44 illustrate the various habitats. Additional botany surveys were conducted to further assess potential for rare species (Section 4). Further descriptions of floral elements in the general area are found in Hagreen (1999) and MacKinnon (1998).

### **3.3 General Fauna**

Barrens and semi-barrens are typically unproductive for wildlife habitat, with the exception of some small mammals and moose. Semi-aquatic wildlife are expected to include beaver, otter, muskrat and waterfowl (Davis and Browne 1997). Waterfowl production is generally low due to low fertility of wetlands and watercourses.

Fauna observed during the field surveys is typical of the habitats encountered. Snowshoe hare and bobcat appeared to be fairly abundant. The berry production within the barrens area shrubs also likely supports a good black bear and fox population. Appendix E lists the fauna observed.

### **3.4 Migratory Birds**

A breeding bird survey was conducted at the study area on June 10, 2001 between 3 am and 12 pm. The survey consisted of a series of listening posts at a variety of habitat types extending along the center of the study area and along Highway 203. The survey concentrated on the barrens area and associated shrub bogs, and on the Barclay Brook treed corridors. However, one listening post was established at the forested area to the west of Barclay Brook, and surveys along Highway 203 were extended to the Clyde

River. Appendix E identifies the bird species observed in the 2001 survey as well as those listed as occurring within the Breeding Bird Atlas survey blocks (Erskine 1992) encompassed by the site and their nesting habitat. Additional species noted in an earlier survey (Hagreen 1999) including additional habitat types within the larger Shelburne Barrens area are also noted.

Over 50 bird species were observed during the June 2001 survey. A variety of birds were present reflecting the dominant habitats; shrub bogs and forest edge. Diversity was moderate within the forest edge habitat within the semi-barrens areas where a mix of shrub hardwood trees and conifers have established. Diversity was poorer within the barrens areas and higher within the forested area to the west of Barclay Brook. Dominant species within the shrub bog areas included; Swamp Sparrow, Common Yellowthroat and thrushes. Dark-eyed Juncos, a variety of warblers and chickadees dominated the semi-barrens areas. Few birds were noted within the open barrens (lichen-bearberry-broom crowberry areas).

Several raptor species were observed. With the exception of the Northern Harrier, the hawk and owl species are most likely only using the barrens and semi-barrens areas for feeding habitat. The treed area surrounding the Frog Ponds has higher potential to support raptor nests, although few large trees are present.

A Whip-poor-will may have been heard in the roadside pit area east of East Barclay Brook. This area has potentially suitable habitat, however, the bird did not repeat its call and was not confirmed. Whip-poor-will are a scarce species in the Maritimes with very few nests known in the region. It is likely that the scarcity is due to the Maritimes being at the northern limit of the breeding range (Erskine 1992).

At risk bird species are discussed in Section 4.

### **3.5 Reptiles and Amphibians**

A reptile and amphibian survey was conducted at the study area on July 23, 2001. Appendix E provides field notes from this survey and lists the herpetile species observed on this and field surveys completed previously. Species were typical of the habitats encountered. The barrens area primarily supports garter snakes. Frogs (green and pickerel) were observed in the brooks and ponds. Upper Frog Pond appears to have an excellent green frog population.

At risk herpetile species are discussed Section 4.

### 3.6 Wetlands

Wetlands within the study area are noted on Figure 4. Several wetlands were visited during the botany and wildlife surveys and the field results are provided in Appendices D and E. The majority of wetlands within the study area are shrub wetland habitats dominated by heath vegetation. Diversity in these wetlands is low. Two at risk species found during field surveys in wetlands were possibly a bladderwort (*Utricularia subulata*) at the Lower Frog Pond wetland and *Bartonia* in a wetland downstream of the lease area (No. 23). Wetlands identified as significant (NSDNR 1982) include No. 43 (over 5 ha, Golet score 74.5) and the complex around Lower Frog Pond (21 ha, Golet score 74.5). The Golet score is an indicator of wetland value to wildlife, however, it is primarily based on air photo interpretation with limited ground truthing and likely underestimates value. Wetlands with lower scores may still provide wildlife habitat and important wetland functions such as groundwater recharge, nutrient cycling, flood control and sediment retention for example. All wetlands mapped are considered to be potentially valuable habitat. Several key wetlands in the general vicinity of the project are summarized in Table 1 and illustrated through air photos in Appendix F. These wetlands include No. 6 (0.7ha) and No. 8 (4.8ha) on the East Barclay Brook and No. 19 (1.7ha) and No. 22 (0.9ha) on the Barclay Brook as well as No. 11 (0.8ha) located approximately 200m southwest of Route 203. Wetlands Nos. 6 and 22 are classified as open bogs by the NSDNR forestry database, while wetlands Nos. 8, 11 and 19 are classified as general wetlands. Field surveys have identified wetland No. 22 as a fen and wetlands Nos. 6, 8, 11, and 19 as shrub wetlands.

**Table 1 Summary of Wetlands Potentially within the Vicinity of Active Portions of the Lease Area**

Data	Wetland No.6	Wetland No.8	Wetland No.11	Wetland No.19	Wetland No.22
Size	0.7 ha	4.9 ha	0.9 ha	1.8 ha	0.9 ha
General description	<ul style="list-style-type: none"> <li>➤ Streamside open wetland and shrub bog</li> </ul>	<ul style="list-style-type: none"> <li>➤ Streamside shrub fen/bog</li> <li>➤ Characterized in Appendix 4; Sept. 3 and 5 field report</li> </ul>	<ul style="list-style-type: none"> <li>➤ Upland shrub bog</li> <li>➤ Characterized in Appendix 4; Sept. 3 and 5 field report</li> </ul>	<ul style="list-style-type: none"> <li>➤ Streamside shrub fen/bog</li> <li>➤ Characterized in Appendix 4; Sept. 3 and 5 field report</li> </ul>	<ul style="list-style-type: none"> <li>➤ Streamside fen</li> <li>➤ Characterized in Appendix 4; Sept. 3 and 5 and Nov. field reports</li> </ul>
Wildlife habitat potential	Expected to be typical of wetlands in the area based on shrub and open bog habitat present	<ul style="list-style-type: none"> <li>➤ Wildlife expected to used the area occasionally include beaver, muskrat, white-tailed deer and snowshoe hare as well as a variety of small rodents and their predators</li> <li>➤ Streamside shrub and wooded ravine habitat birds noted in June survey (Appendix 5), particularly Swamp Sparrow and Least Flycatcher</li> <li>➤ Herpetiles typical of the area noted in July survey (Appendix 5), particularly green frog and spring peepers</li> </ul>	<ul style="list-style-type: none"> <li>➤ Wildlife expected to used the area occasionally include white-tailed deer, snowshoe hare as well as a variety of small rodents and their predators</li> <li>➤ Upland shrub birds noted in June survey (Appendix 5), particularly Swamp Sparrow and Palm Warbler</li> <li>➤ Herpetiles typical of the upland area noted in July survey (Appendix 5), particularly American toad and garter snake</li> </ul>	<ul style="list-style-type: none"> <li>➤ Wildlife expected to used the area includes beaver, muskrat, white-tailed deer and snowshoe hare as well as a variety of small rodents and their predators</li> <li>➤ Streamside shrub habitat birds noted in June survey (Appendix 5), particularly Common Yellowthroat and Swamp Sparrow</li> <li>➤ Herpetiles typical of the streamside wetland area noted in July survey (Appendix 5), particularly green frog and spring peepers</li> </ul>	<ul style="list-style-type: none"> <li>➤ Wildlife expected to used the area includes beaver, muskrat, white-tailed deer and snowshoe hare as well as a variety of small rodents and their predators</li> </ul>
Potential for rare and endangered species	<ul style="list-style-type: none"> <li>➤ Plant survey required</li> <li>➤ Rare birds or herpetiles not expected based on generalized July survey (Appendix 5)</li> <li>➤ Rare animals not expected (Section 4.2); Limited potential for critical moose habitat given small size</li> </ul>	<ul style="list-style-type: none"> <li>➤ No rare plant species observed (Appendix 4; Sept. 3 and 5 field report)</li> <li>➤ No rare birds or herpetiles observed or expected (Appendix 5)</li> <li>➤ Rare animals not expected (Section 4.2); Limited potential for critical moose habitat given small size</li> </ul>	<ul style="list-style-type: none"> <li>➤ No rare plant species observed (Appendix 4; Sept. 3 and 5 field report)</li> <li>➤ No rare birds or herpetiles observed or expected (Appendix 5)</li> <li>➤ Rare animals not expected (Section 4.2); Limited potential for critical moose habitat given small size</li> </ul>	<ul style="list-style-type: none"> <li>➤ No rare plant species observed (Appendix 4; Sept. 3 and 5 field report)</li> <li>➤ No rare birds or herpetiles observed or expected (Appendix 5)</li> <li>➤ Rare animals not expected (Section 4.2); Limited potential for critical moose habitat given small size</li> </ul>	<ul style="list-style-type: none"> <li>➤ No rare plant species observed (Appendix 4; Sept. 3 and 5 field report)</li> <li>➤ No rare birds or herpetiles observed or expected (Appendix 5)</li> <li>➤ Rare animals not expected (Section 4.2); Limited potential for critical moose habitat given small size</li> </ul>

Data	Wetland No.6	Wetland No.8	Wetland No.11	Wetland No.19	Wetland No.22
Groundwater recharge potential	As a streamside wetland is expected to be a shallow groundwater discharge zone	As a streamside wetland is expected to be a shallow groundwater discharge zone	Minor shallow groundwater recharge contribution given small size	As a streamside wetland is expected to be a shallow groundwater discharge zone	As a streamside wetland is expected to be a shallow groundwater discharge zone
Role in Surface flow regulation	Provides some storm water storage capacity for East Barclay Brook tributary	Provides storm storm water storage for headwaters of East Barclay Brook	Minor given small size and upland nature	Provides some storm water storage for Barclay Brook	Provides some storm water storage for Barclay Brook tributary
Agricultural use	None at present; unlikely potential for crops as shrub dominated; limited potential for blueberry (small size); moderate to high potential for cranberry bog with extensive development	None at present; unlikely crop potential as leatherleaf shrub dominated; moderate potential for blueberry; moderate to high potential for cranberry bog with extensive development	None at present; unlikely crop potential as leatherleaf shrub dominated; limited potential for blueberry (small size); moderate to high potential for cranberry bog with extensive development	None at present; unlikely crop potential as leatherleaf shrub dominated; limited potential for blueberry (remote and predominantly streamside); moderate to high potential for cranberry bog with extensive development	None at present; low crop potential given remote location; limited potential for blueberry (small size, remote and fen vegetation); moderate to high potential for cranberry bog with extensive development
Role in water treatment	Provides some runoff filtration and contributes wetland organic acids	Provides some runoff filtration and contributes wetland organic acids	Provides some runoff filtration and contributes wetland organic acids	Provides some runoff filtration and contributes wetland organic acids	Provides some runoff filtration and contributes wetland organic acids
Peat development potential	Limited potential; small size, shrub development reduces economic potential	Limited potential; small-moderate size, shrub development reduces economic potential	Limited; small size, shrub development reduces economic potential	Limited potential; small size, shrub development reduces economic potential	Limited potential; small size reduces economic potential
Other issues/concerns	Intermittent fish habitat	Poor fish habitat Larger size	Existing disturbance from ATV trail	Poor fish habitat	Poor fish habitat
Summary	Low potential for unique habitat or rare species. Resource use not anticipated	No unique habitat, rare species or resource uses anticipated	No unique habitat, rare species or resource uses anticipated	No unique habitat, rare species or resource uses anticipated	No unique habitat, rare species or resource uses anticipated
Appendix 1 photo #		5	40	20, 21	28, 41, 42

## 4.0 Species at Risk

Several ecologically significant features and species at risk are known to occur south of the study area and in the general area of south-central Nova Scotia as reported in the *Re-evaluation of the Shelburne Barrens as a Site of Ecological Significance* (Nova Scotia Department of Environment and Labour, MacKinnon 1998) and the Nova Scotia Museum (NSM) screening (Appendix G). Potential for species at risk is evaluated based on known distributions and habitats of at risk species and comparison with habitat potential in the study area. In addition, directed field surveys were conducted to further assess rare plants, herpetiles and birds.

### 4.1 Plant Species

The Nova Scotia Museum has records of several at risk plant species for the general area which, depending on the habitats present, have potential to occur in the Flintstone Rock area. As well, at risk plant species are identified for the adjacent Shelburne Barrens Site of Ecological Significance (MacKinnon 1998). Many of these at risk species are coastal plains plants which are unique as they occur in southwest Nova Scotia at the northern most edge of their range and may not occur elsewhere in Canada. At risk plants have been previously identified on the cobble-boulder shoreline and beach areas along Auger Lake, approximately 6 km south of the study area along the Clyde River upstream of the Barclay Brooks sub-watershed include: swamp loosestrife (*Decodon verticillatus*), meadow-beauty (*Rhexia virginica*), a bladderwort (*Utricularia subulata*) and a grass (*Panicum longifolium*). A bladderwort (*Utricularia gibba*) was found on a mucky exposed gravel-cobble shoreline on West Horseshoe Lake, over 5 km south of the study area and upstream of both the main Clyde River and the Barclay Brooks sub-watershed.

Based on the NSM and NSDOEL (Protected Area Division) records, as well as Pronych and Wilson (1993), Acadia University Herbarium records and 2000 and 2001 field surveys, a list of potential at risk plant species and their habitats is compiled (Table 2). Potential for rare plants at the site is based on field investigations of habitats and species present.

**Table 2 Potential at Risk Plant Species in the General Vicinity of the Study Area<sup>1,2,3,4</sup>**

Species	At Risk Status <sup>6</sup>	Common Name - Habitat <sup>2</sup>	Flowering Period <sup>7</sup>	Potential in Study Area <sup>4</sup>
<i>Alnus serrulata</i> <sup>1</sup>	Canadian Priority 5 NSDNR Red	Alder sp. - predominantly lake edges; also old pastures, swamps, swales	February to May; but distinguished by leaves throughout	Not observed during field surveys; low potential near Upper and Lower Frog Ponds

Species	At Risk Status <sup>6</sup>	Common Name - Habitat <sup>2</sup>	Flowering Period <sup>7</sup>	Potential in Study Area <sup>4</sup>
			growing season	
<i>Aster undulatus</i>	Canadian Priority 4	Aster sp. - Dry open woods, thickets, barrens, river slopes	August and September	Not observed during field surveys; low potential throughout
<i>Bartonia virginica</i> <sup>1,4</sup>	Canadian Priority 4 NSDNR Yellow	Bartonia - Lakeshores, peat bogs, dry sandy Corema barrens, burned barrens, openings in dry thickets	July to September	Present - observed during field surveys
<i>Carex atlantica ssp. capillacea</i> <sup>2</sup>	Canadian Priority 2	Sedge sp. - Swamps, bogs and peaty barrens, dry gravel road shoulder, bogs, swamps, small pools, boggy swales and thickets, hummocky pastures	May to early August	Not observed during field surveys; low potential throughout
<i>Cephalanthus occidentalis</i> <sup>2</sup>	NSDNR Red	Buttonbush - Shorelines, swale, rocky lake shores	July 15 to August 15	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Clethra alnifolia</i> <sup>2</sup>	COSEWIC Special Concern Canadian Priority 2 NSDNR Red	Sweet pepperbush - Shorelines of lakes, swamps, damp thickets, sandy woods	Late September to October	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Coreopsis rosea</i> <sup>2</sup>	COSEWIC Endangered Canadian Priority 1 NSDNR Red	Pink coreopsis - sandy/cobbly/gravelly/peaty shorelines, wet shores	Late July to August	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Decodon verticillatus</i> <sup>2,3</sup>	Provincial	Water-willow - quaking shores, peaty lake margins, sphagnum	July and August	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Desmodium canadense</i>	Provincial	Canada tick-trefoil - rich open woods, sandy beach, river banks	Late July	Not observed during field surveys; low potential throughout
<i>Eleocharis flavescens</i> <sup>2</sup>	Provincial	Capitate spikerush - Peaty bogs, wet sandy shores/swales	June to October	Not observed during field surveys; low potential throughout
<i>Eupatorium dubium</i> <sup>2</sup>	Canadian Priority 4	Eupatorium sp. - Rocky lakeshores, swamps and damp thickets, upper border of cobble beaches, swales	August and September	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Euthamia galetorum</i> <sup>2</sup>	Canadian Priority 4 NSDNR Yellow	Goldenrod sp. - Sloping sand/cobble beach, shorelines, sandy/peaty/gravelly beaches	August and September	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Euthamia tenuifolia</i> <sup>2</sup>	Provincial	Goldenrod sp. - dry sandy soils and beaches, sandy pockets in cobble, upper edge of cobble beach, peaty/cobbly/gravelly sandy beaches of large lakes	August and September	Not observed during field surveys; low potential throughout

Species	At Risk Status <sup>6</sup>	Common Name - Habitat <sup>2</sup>	Flowering Period <sup>7</sup>	Potential in Study Area <sup>4</sup>
<i>Galium obtusum</i> <sup>1</sup>	Provincial	Bedstraw sp. - low lying ground, along streams, boggy/seepy swales, wet thickets	July and August	Not observed during field surveys; low potential throughout;
<i>Goodyera repens</i>	Provincial	Creeping rattlesnake plantain - under confers	July to August	Not observed during field surveys; low potential throughout
<i>Listera australis</i> <sup>4</sup>	Canadian Priority 2	Southern twayblade - shaded sphagnum moss of bogs or damp woods	June	Present - observed during field surveys
<i>Myriophyllum farwellii</i>	Provincial	Water-milfoil sp. - ponds and slow moving streams, muddy shores, muddy coves in river channel overflow	June to September	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Panicum rigidulum (longifolium)</i> <sup>2,3</sup>	Canadian Priority 3	Grass sp. - Peaty/sandy shores, wet peaty/gravelly lake margins	July on	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Platanthera flava flava</i> <sup>2</sup>	Canadian Priority 3 NSDNR Yellow	Tubercled orchid - Peaty/cobbly upper beaches, gently sloping sand/cobble beaches, edge of lake, flood plain, bog, swamp, meadow	May to August	Not observed during field surveys low potential near Upper and Lower Frog Ponds
<i>Rhexia virginica</i> <sup>2,3</sup>	Canadian Priority 3 NSDNR Red	Meadow-beauty - Upper/lake beaches, gravel/rocky substrates, mucky soil near water edge, cobbly lake, shallow peaty margin	July and August	Not observed during field surveys; low potential near Upper and Lower Frog Ponds
<i>Sabatia kennedyana</i> <sup>2</sup>	COSEWIC Threatened Canadian Priority 1 NSDNR Red	Plymouth gentian - peaty/sandy shore, cobbly beach, boggy savannah, shallow lake, mid beach gravel	August	Not observed during field surveys low; potential near Upper and Lower Frog Ponds
<i>Spiranthes casei</i> <sup>2,4</sup>	provincial	Case's ladies-tresses - Dry sandy roadside, sandy soil, pits, open barrens	September	Observed on gravel bank/ditch between Route 203 and western sample pit during Sept. field survey
<i>Spiranthes ochroleuca</i> <sup>1,4</sup>	Canadian Priority 3	Yellow ladies-tresses - dry sand barrens, uplands, roadsides, fields	September to October	Observed on gravel bank/ditch between Route 203 and western sample pit during Sept. field survey
<i>Symplocarpus foetidus</i> <sup>1</sup>	provincial	Skunk cabbage - springy swale, open bog, mossy sphagnum woods, wet thicket, bogs, pastures	May - Leaves recognizable after flowering	Not observed during field surveys; low potential throughout
<i>Utricularia gibba</i> <sup>1,3</sup>	provincial	Bladderwort sp. - aquatic, river lagoon, bog pool, shallow mucky pool	Late June to September	Not observed during field surveys; low potential near Upper and Lower Frog Ponds

Species	At Risk Status <sup>6</sup>	Common Name - Habitat <sup>2</sup>	Flowering Period <sup>7</sup>	Potential in Study Area <sup>4</sup>
<i>Utricularia subulata</i> <sup>3,4</sup>	Canadian Priority 4	Bladderwort sp. - Moist sand beach, peaty areas, mucky marshes, cobbly moss embankment, lake margin mud	Late April to September	Potentially observed at Lower Frog Pond during Sept. field survey
<i>Woodwardia areolata</i> <sup>2</sup>	Canadian Priority 4 NSDNR Yellow	Dwarf chain fern - along streams, woods by lake, cobble beach, swamp, wet woods, bog, shores	July to October (spores) Identifiable by leaf/frond	Not observed during field surveys; low potential stream side
<p><u>Notes</u></p> <ol style="list-style-type: none"> <li>1. Pronych and Wilson 1993. <i>Atlas of Rare Vascular Plants in Nova Scotia</i>, NSM. - included within the 10 km square which encompasses the study area.</li> <li>2. Pronych and Wilson 1993, NSM. - included within adjacent 10 km squares to the study area.</li> <li>3. MacKinnon 1998.</li> <li>4. Field Survey - surveys conducted on Nov. 11, 2000; July 7, 2001, and July 23, 2001; September 3 and 5, 2001; and September 16, 2001.</li> <li>5. NSDNR Status of Wildlife Process, 2000.</li> <li>6. Canadian Priority 1 (extremely rare) to 4 (widespread but long term concern). COSEWIC Committee on the Status of Endangered Wildlife in Canada May 2001. Endangered - facing imminent extirpation/extinction, Threatened - likely to become Endangered, Special Concern - of concern due to characteristics making it sensitive to human activities or natural events. In addition to being nationally designated, COSEWIC species are also protected under the Nova Scotia Endangered Species Act. NSDNR Natural Resources Status of Wildlife Process Red- at risk of immediate extirpation/extinction, Yellow - sensitive, but not immediately at risk of extirpation/extinction. provincial - included in Pronych and Wilson 1993.</li> <li>7. Zinck, M. 1998. <i>Roland's Flora of Nova Scotia</i>. Nimbus Publishing and NSM.</li> </ol>				

An initial botany field survey was undertaken to assess potential for at risk plant species in the fall of 2000. This field survey targeted typical habitats present as well as habitats with potential for rare plant species. Habitats types were identified from air photographs. Habitats surveyed included the general barrens and semi-barrens areas, wetlands and watercourses. As well, Lower Frog Pond was investigated to determine potential for coastal plains species. Lower Frog Pond occurs within an extensive ericaceous shrub bog/barrens area. No extensive shorelines with peat development were noted, reducing potential for several coastal plains species. Upper Frog Pond was determined in a subsequent field survey to have similar habitat to Lower Frog Pond and thus similarly low habitat potential for many coastal plains species. However, as the initial botany survey was conducted late in the year and water levels were high, a follow-up assessments were recommended and completed for July and late August/September of 2001.

The July 17, 2001 botany survey generally confirmed the habitat types identified previously. Two plant species listed within the provincial rare plant atlas (Pronych and Wilson 1993) and two coastal plains plants were identified. An additional survey was conducted July 23, 2001 to further delineate the nationally rare species. Early September surveys were also conducted to identify late flowering plants and further assess potential for rare species as previously recommended. A coastal plains grass species was observed in wetland No. 11 and rare bladderwort species (*Utricularia subulata*) was possibly observed at

Lower Frog Pond. As well, a follow-up survey confirmed the presence of at risk ladies'-tresses (*Spiranthes* sp.) located adjacent to Highway 203 in the western ditch. Field summaries are provided in Appendix D. The at risk plants identified and their locations are outlined below (as well as on Figure 3).

- *Bartonia* (*Bartonia virginica*) – This plant is listed as Canadian Priority 4 (nationally widespread but long term concern) with a Yellow NSDNR at risk status (sensitive, but not at risk of immediate extinction/extirpation) and is relatively common in southwestern Nova Scotia. The plants were found primarily in the barrens area prior to East Barclay Brook in wetter peaty areas which had been opened up from shrub cover by ATV traffic. An additional site was noted in similar habitat between the Barclay Brooks/Lower Frog Pond in the vicinity of the twayblade site noted below.
- Southern twayblade (*Listera australis*) – The Southern twayblade is listed as nationally imperilled (Canadian Priority 2) although globally apparently secure (G4). Very few records of this plant exist in Nova Scotia (records in Inverness, a bog in Kings County and recently in the Halifax area). The twayblade was found in red maple/sphagnum/ cinnamon fern swales west of Barclay Brook. The plant was found initially in two swales sparsely distributed (17 plants at eastern site and 6 plants in the more westerly swale). A more extensive survey was conducted of red maple swales in this area but the majority of plants were located within the area originally found.
- Case's ladies'-tresses (*Spiranthes casei*) - This plant is considered rare in Nova Scotia by Maher *et al.* and is restricted to the southwestern portion of the province. There are two varieties in the provinces, var. *novascotiae* and var. *casei*, of which var. *novascotiae*, the more common variety, was found near the western sample pit. *S. casei* inhabits acid, sandy soils, roadsides and open barrens and flowers late in the season during August and September. One plant of this species was found along the Highway 203 ditch adjacent to the pit area.
- Yellow ladies'-tresses (*Spiranthes ochroleuca*) - Several specimens of this plant (15-20 plants) nationally were found along with *S. casei* in the road ditch area between the western sample pit and Highway 203. It is considered imperilled by Argus and Pryer (1990) due to its rarity. The plant thrives in dry, sandy barrens in southwestern Nova Scotia as well as along rivers, roadsides and open fields. Its provincial distribution ranges from southwestern Nova Scotia to Hants County. It has only recently been identified by taxonomists as a distinct species and was thought to be a variety of *S. ceruna*.

As well, several coastal plains species listed by NSDNR as sensitive (Coastal Plains Evaluations 2000) were noted; a fern in the maple swale area (*Thelypteris simulata*), a coastal plains grass (*Panicum spretum*) in wetland No. 11, *Hudsonia* (*Hudsonia ericoides*) along the ATV trail within 500 m of

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Highway 203 and another *Bartonia* species (*Bartonia paniculata*) downstream of the lease area on a Barclay Brook wetland (No. 23).

## 4.2 Animal Species

Table 3 lists national Committee on the Status of Endangered Wildlife in Canada (COSEWIC May 2001) and provincial at risk animal species with some potential to occur in the general area based on known distributions and habitat in the area.

**Table 3 Potential at Risk Animal Species in the General Vicinity of the Site**

Species	Name	At Risk Status	Habitat	Potential in Study Area
<i>Asio otus</i>	Long-eared Owl	NSDNR Yellow	Woodlands, forage in open areas; known breeding south of study area	Observed foraging south of study area; low potential for nesting in study area
<i>Alces alces</i>	Moose - mainland population	NSDNR Red	Forest and wet areas near lakes and swamps	Moderate habitat potential, population known for general area
<i>Coregonus huntsmani</i>	Atlantic whitefish	COSEWIC Endangered	Tusket River watershed	Not known for the study area or downstream watershed; no habitat potential
<i>Emydoidea blandingi</i>	Blandings turtle	COSEWIC Threatened NSDNR Red	Disjunct population confined to central, southwestern Nova Scotia (northern Kejimikujik National Park), fens bordering lakes and streams	Not known within 10 km of the study area; habitat not observed in field surveys; no habitat potential
<i>Gavia immer</i>	Common Loon	NSDNR Yellow	Lakeshores	Nests within the general area, but not evident on the Frog Ponds; low to no habitat potential in study area outside Frog Ponds
<i>Lasionycteris noctivagans</i>	Silver-haired bat	NSDNR Yellow	Hibernating caves, old mines, Kejimikujik Park	Caves and shafts not evident, low to no habitat potential
<i>Lasiurus borealis borealis</i>	Red bat	NSDNR Yellow	Solitary bat with few NS records	Low to no habitat potential
<i>Lasiurus cinereus</i>	Hoary bat	NSDNR Yellow	Solitary bat with few NS records, distribution currently unknown	Low to no habitat potential option

Species	Name	At Risk Status	Habitat	Potential in Study Area
<i>Martes americana</i>	American Marten	June 2001 protected under N.S. Endangered Species Act, NSDNR Red	Mature softwood forests, reintroduced into southwestern NS (Kejimikujik status "data deficient")	Low habitat potential
<i>Martes pennanti</i>	Fisher	NSDNR Yellow	Mature softwood forest, historically reintroduced into western mainland (including Tobeatic area in 60's - ranch stock)	Low to no habitat potential
<i>Myotis lucifugus</i>	Little brown bat	NSDNR Yellow	Hibernates in caves, old mines, contacts between evaporates and sandstones	Low to no habitat potential
<i>Myotis keeni</i>	Northern long-eared bat	NSDNR Yellow	Hibernates in caves, old mines, contacts between evaporates and sandstones	Low to no habitat potential
<i>Pipistrellus subflavus subflavus</i>	Eastern pipistrelle	NSDNR Yellow	Hibernates in caves, old mines,	Low to no habitat potential
<i>Salmo salar</i>	Atlantic salmon	NSM identified	Downstream in Clyde watershed	Habitat not observed during preliminary field survey; low habitat potential
<i>Thamnophis sauritus septentrionalis</i>	Northern ribbon snake	NSDNR Yellow	Disjunct population in central, southwestern Nova Scotia, centered in Queens County. In or near stillwaters, bogs and ponds	Habitat potential identified at Lower Frog Pond; no potential for rest of study area
<i>Margaritifera margaritifera</i>	Eastern river pearl mussel	NSDNR Yellow	Small-medium sized rivers	Low potential in aquatic habitats
<i>Incisalia lanoraineensis</i>	Bog Elfin	NSDNR Red	Black spruce bogs of western Nova Scotia	Low habitat potential
<i>Danaus plexippus</i>	Monarch	NSDNR Yellow COSEWIC Special Concern	Migrates through Nova Scotia	No potential for destruction of critical wintering habitat
<i>Polygonia gracilis</i>	Hoary Comma	NSDNR Yellow	Mainland Nova Scotia, larvae feed on currents and <i>Rhododendron</i> spp.	Moderate to low habitat potential
<i>Other Invertebrates</i>	In addition to butterflies, there are thirteen species of dragonflies and damselflies listed by NSDNR as Red or Yellow status. These species inhabit aquatic and surrounding environments. There is potential habitat within the study area for any of these species. However, although they are generally not known for the study area little data is available on their distribution.			
Nova Scotia Department of Natural Resources 2000. <i>Status of Wildlife in Nova Scotia</i> Erskine, A.J. 1992. <i>Atlas of Breeding Birds of the Maritime Provinces</i>				

None of the COSEWIC, May 2001 or provincially listed animal species are known directly for the study area, although moose are likely and, as noted below, others have potential to occur based on habitats and known distributions.

A Long-eared Owl was heard feeding in the vicinity of the site (towards the Upper/Lower Frog Pond area), but is unlikely to nest within the study area. This owl forages over a wide area. Appendix I provides NSDNR guidelines for raptors. Loons are expected to use the larger lakes to the south of the study area, but were not observed in the Upper or Lower Frog Ponds.

A mainland population of moose is also known to occur in the general area. The Tobeatic Wilderness Area is known to support a good population density of moose. The moose population is expected to be less dense through the study area, however numbers are undetermined (pers. comm., 2001. P. MacDonald, NSDNR Regional Biologist). The areas mapped by NSDNR as significant wildlife habitat (Figure 3) show locations where there is more evidence of moose activity (tracks or scat), but do not necessarily indicate a distinct population.

According to Dennis Brannen (pers. comm., 2001. Acadia University Centre for Wildlife and Conservation Biology), pellet group inventories of transects in the general study area have been consistent since 1983, indicating little change in moose activity over the last 17 years. Brannen indicates that two regions within the study area provide moose with suitable habitat for feeding, calving, and for shelter during the summer months; one to the west and one to the east of the proposed mine lease (Appendix H). Both of these zones are situated outside of the proposed mining lease area. According to telemetry research over three years, individual moose are not moving far from established ranges and that those moose within the regions noted above are not moving far beyond those areas.

American marten are known to inhabit the Province in a remnant population in the Cape Breton Highlands and a population reintroduced to Kejimikujik National Park. Marten prefer mature forests with large trees (preferably pine) for denning. There are no such mature stands within the lease area, small patches of mature white pines exist on the west side of Rocky Lake over 2 km south of the proposed lease area and along the East Barclay Brook 50 m - 500 m south of the proposed lease area (Figure 3). The animals released in Kejimikujik were known to have a dispersal range of over 50 km from their release point. The home range for marten ranges from about 2.5 to 4 km<sup>2</sup>. Marten are known to utilize mixed forest and edge habitat during the summer and if present, could forage within the study area.

Fishers similarly, inhabit mature softwood areas, but may also use mixed woods and cutovers and if present, could forage within the study area.

The herpetile survey identified potential habitat for the Northern Ribbon Snake at the Lower Frog Pond, but further surveys would be required at the pond to confirm the presence of this snake. Habitat for the blanding's turtle was not observed. The barrens area and mixed wood forest including Barclay Brook and East Barclay Brook and tributaries are not expected to provide habitat for at risk herpetile species. The area does not provide known bat hibernicular habitat and caves are not expected on-site, although large

erratics and trees may provide some roosting areas for feeding bats. At risk invertebrates were not observed, however, dedicated surveys were not undertaken.

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**Appendix A**  
**Site Photographs**

# Flintstone Rock Photos Oct., Nov. 2000



1. Clyde River, u/s SW1



2. Clyde River, d/s SW1



3. Clyde River, u/s HWY203



4. Clyde River, d/s HWY203



5. East Barclay Brook,  
~50m u/s ATV trail



6. East Barclay Brook,  
~30m u/s ATV trail



7. East Barclay Brook, at ATV trail



8. East Barclay Brook,  
~100m d/s ATV trail



9. East Barclay Brook,  
~150m d/s ATV trail



10. East Barclay Brook,  
~250m d/s ATV trail



11. East Barclay Brook,  
u/s SW4 pond



12. East Barclay Brook,  
SW4 pond



13. East Barclay Brook,  
d/s SW4 pond



14. East Barclay Brook,  
~50m d/s SW4 pond

u/s upstream  
d/s downstream

# Flintstone Rock Photos Oct., Nov. 2000



15. East Barclay Brook,  
~80m d/s SW4 pond



16. East Barclay Brook,  
~120m d/s SW4 pond



17. Trib. To East Barclay Brook,  
u/s SW4 pond



18. Barclay Brook,  
~1.2 km u/s ATV trail



19. Barclay Brook,  
~1.1 km u/s ATV trail



20. Barclay Brook,  
~150m u/s ATV trail



21. Barclay Brook,  
~25m u/s ATV trail



22. Barclay Brook,  
u/s ATV trail



23. Barclay Brook,  
~20m d/s ATV trail



24. Barclay Brook,  
~40m d/s ATV trail



25. Barclay Brook,  
~50m d/s ATV trail



26. Barclay Brook,  
~100m d/s ATV trail



27. Trib. To Barclay Brook  
u/s outline

u/s upstream  
d/s downstream



28. Trib. To Barclay Brook  
d/s outline



29. Trib. To Lower Frog Pond

# Flintstone Rock Photos Oct., Nov. 2000



30. Trib. To Lower Frog Pond



31.& 32. Lower Frog Pond



33. Inlet. To Lower Frog Pond



34. Inlet To Lower Frog Pond



35. Lower Frog Pond



36. Huckleberry-lambkill barren



37. Lichen-bearberry-broomcrowberry barren



38. Treed stream valley corridor



39. Shrub wetland, west of HWY 203



40. Shrub wetland, west of Barclay Brook



41. Fen along Barclay Brook Trib.



42. Fen along Barclay Brook Trib.



43. Red maple swamp, west of Barclay Brook



44. Forested area, west of Barclay Brook

# Flintstone Rock Photos June, July 2001



45. Upper Frog Pond



46. Outlet tributary to Upper Frog Pond



47. Stillwater downstream of Upper Frog Pond



48. Tributary to connector to Lower Frog Pond



49. Lower Frog Pond, June 2001



50. Barclay Brook tributary, d/s of fen



51. East Barclay Brook, u/s ATV trail



52. Barclay Brook, u/s ATV trail

# Flintstone Rock Photos August 2001



53. Clyde River; d/s Sw1 Site



54. Clyde River d/s of Rte 203



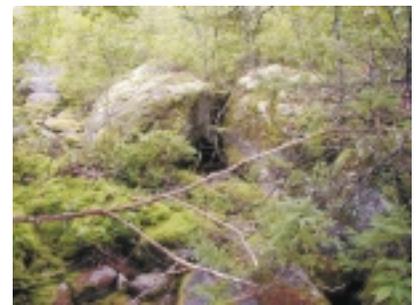
55. Clyde River; beaver dam  
~200 m d/s of Rte 203



56. Clyde River,  
~ 250 m d/s Rte 203



57. East Barclay Brook, d/s Sw3,  
~750 m u/s ATV trail, Shrub wetland



58. East Barclay Brook, ~ SW3  
~850 m u/s ATV trail



59. East Barclay Brook,  
u/s of ATV trail



60. Barclay Brook,  
u/s ATV trail



61. Barclay Brook,  
~140m d/s ATV trail

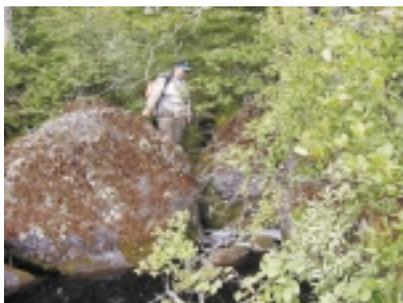
# Flintstone Rock Photos August 2001



62. Barclay Brook,  
~160m d/s ATV trail



63. Barclay Brook,  
~180m d/s ATV trail



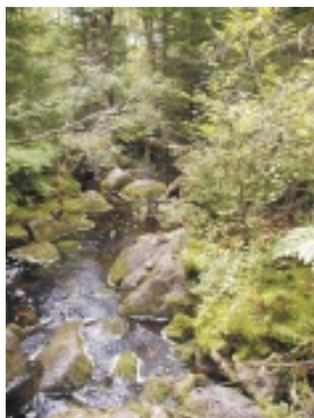
64. Barclay Brook,  
~180m d/s ATV trail



65. Barclay Brook,  
~200m d/s ATV trail



66. Barclay Brook,  
~300m d/s ATV trail



67. Barclay Brook,  
~350m d/s ATV trail



68. Barclay Brook,  
~450m d/s ATV trail



69. Barclay Brook,  
~350m u/s ATV trail

**Appendix B**  
**Fish Habitat Survey Sheets**

**Nova Scotia Stream Data Sheet**

**Stream Name:** Barclay Brook  
**Personnel:** KLM, DMV  
**Start Point:** as noted (going upstream)  
**End Point:** as noted

**Stream No.:** 1  
**Date:** as noted  
**Stream Order:** 1 to 3  
**NTS Coordinates:** (A) 4879900N, 5413010E  
 (B) 4880750N, 5412300E

Unit #	Unit Type	Stream Type	Chainage at Unit End (m)	Unit Length (m)	Average Width BF (m)	Avg. Depth Wet Width (m)	Substrate %										Site %							Stream Banks										Pool Criteria			Pool Tail Criteria				Comments
							Bedrock	Boulders	Rock	Cobbles	Gravel	Sand	Fines	Embeddness	Riffle	Run	Flat	Pool	Undercut Bank (%)	Overhanging Vegetation (%)	Large Woody Debris (m)	Shade (%)	Vegetation (%)					Erosion (%)					Depth (m)	Cover (%)	Stream (%)	Embeddness	Median Substrate Size	Fines (%)	Length (m)	Turbulence (%)	
																							Bare Ground	Moss	Grass	Shrubs	Coniferous Trees	Deciduous Trees	Stable	Bare Stable	Eroded										
Start : ~600 m downstream of ATV trail (8/29/01)																																									
1	p		100	100	20	1	10					90	H			100	10	20	15				80	10	10	90	5	5	1	15	70	H	r	70	100	5	Shrub bog wetland pond; confluence with tributary				
2	r		210	110	4	0.2	40	50	10			M	100			5	5	10	40	5	55	10		10	10	70	20	10									5	steep, ~5%			
3	p		215	5	4	0.5	40	30	10	10	5	M			100	5	10	40	5	40	10		15	10	70	20	10	0.5	40	80	M	r	5	5	5						
4	r,r,u		237	22	4	0.15	30	60	10			M	90	10		5	10	1	30	10	60	5	10	5	10	70	20	10													
5	r		262	25	2	0.15	20	70	10			M	90	10		5	10	5	40	5	50	5	10	15	15	80	15	5													
6	r		281	19	5	0.15	60	35	5			M	90	10		10	5		55	20	60		15	5	70	25	5														
7	r,r,u		308	27	3	0.25	50	30	20			M	40	10	50	5	5		45	35	45		10	5	5	50	45	5													
8			325	17	3	0.3	25	20	10	35	10	M		100		5	5	3	30	35	10		20	5	30	70	20	10													
9			328	3	4	0.3	10	5	60	30		M	10	90		5	5	10	30	30	10	10	10	5	30	70	20	10													
10			428	100	25	1	10					90	H			100	5	20	15			20	60	10	10	90	5	5	1	15	70	H	f	70	100		1 full beaver dam and secondary obstructions				
11			445	17	2	0.15	80	15	5			M	100			5	5		25	25	25		50		70	25	5														
12			459	14	4	0.6	60	10	10	5	10	M		100		5	15	45	10			30	10	5	20	75	5	0.6	15	70	M	b	5	14		pool below 1 m drop over boulder					
13			468	9	3	0.15	75	20		5		M	90	10		5	10		45	25	20		30	5	20	70	30														
14			490	22	3.5	0.15	10	35	10	40		M	80	20		5	5		35	20	10		70		70	30															
15			508	18	4	0.25	30	5	5	55	5	M	80	20		5	1	25	20	10			70		70	30															
(A) From 120 m downstream of trail to the stillwater 25m upstream (10/26/00)																																									
1	p		20	20	12	1	20	10				70	H			100	20	20	15	25	25	25	25	70	25	5	1	15	70	H	r,s	g,t	70	20	5	large pond in woods					
2	r,r,u	p	33	13	5	0.2	60	15	15	5	5	L	33	33		33	15	20	50	25		30	30	15	90	5	5	<1	20	15	M	b,r,s	15	2	5						
3	r,r,u		40	7	6	0.25	55	20		20	5	M	60	30		10	10	35	60	50			50	80	20			1	25	5	M	e,s	5	2	5						
4	r		50	10	5	0.3	75	20				L	100			0	15	20	25	25	25	25	75	25																	
5	r		58	8	4	0.2	38	25		32	5	L		90		10	5	30	50	25		25	25	25	85	15		0.4	30	30	M	r,b	g	10	3	5					
6	r		84	26	5	0.2	80	20				L	100			0	20	20	30	35	15	20	90	5	5																
7	r,r,u		98	14	6	0.3	35	35	25	5		M	50	50		10	20	20	25	25	25	25	90	10																	
8	r		138	40	6.5	0.2	25	25	30	15	5	M	5	15	80		5	35	20	50	50		90	10																	
9	r		145	7	5	0.2	40	40	10	10		M	90			10	10	25	30			100		90	5	5	<1	20	10	M	s,g	10	0.5	5							
10	s		500+	300+	7	0.25	15	5	5	5	20	50	H		80	20		30	25	25			100		90	5	5														
Approximately 300m upstream of the ATV trail at inlet to stillwater (8/29/01)																																									
1	r		300+	300+	2.3	0.1	30	35	35			M	60	40		5	10		35	40	20		30	10	80	15	5														
(B) Approximately 1km upstream of the trail (10/26/00)																																									
1	r,r,u	p	35	35	1	0.2	80				10	L	40	40		20	20	20	15	20	30	30	20	95		5	<1	5	5	L	s,g	15	1	5							

L:\PROJECTS\IDRAFT\008392\habitat1.xls\Barclay Bk

p=pond  
 r=riffle  
 ru=run  
 p=pool  
 f=flat  
 s=still water

H=high  
 M=moderate  
 L=low

r=rock  
 s=sand  
 g=gravel  
 f=fine  
 b=boulder



**Appendix C**  
**Fishing Data**

<b>Appendix C</b>		
<b>Electrofishing Spot Checks/Angling Summary</b>		
<b>Flintstone Rock Study Area</b>		
<b>Location</b>	<b>Captures</b>	<b>Fishing Data</b>
<b>October 26, November 10, 2000</b>		
E001	East Barclay Brook <ul style="list-style-type: none"> <li>▪ brook trout (four approximately 20 cm forklength and one observed similar size)</li> </ul>	length fished 50 m x 3 m; 300 machine sec.; volt. 300
Angling East Barclay Pond (DFO)	East Barclay Brook <ul style="list-style-type: none"> <li>▪ brook trout (~27 cm forklength)</li> </ul>	angled 10 minutes
E002	East Barclay Brook <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	length fished 50 m x 2 m; 300 machine sec.; volt. 300
E003	East Barclay Tributary <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	length fished 20 m x 1 m; 50 machine sec.; volt.400
E004	East Barclay Brook <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	length fished 25 m x 2-3 m; 60 machine sec.; volt.300
E005	East Barclay Brook <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	length fished 75 m x 2-3 m; 150 machine sec; volt.300
E006	Barclay Brook <ul style="list-style-type: none"> <li>▪ American eel (approximate forklength 35 cm)</li> <li>▪ 2 green frogs</li> </ul>	length fished 125 m x 2-3 m; 300 machine sec; volt.300
E007	Barclay Brook <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	length fished 30 m x 1-2 m; 60 machine sec.; volt.300
<b>June, August 2001</b>		
M1 and M2	Upper Frog Pond <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	2.5 hours
M3	Outlet to Upper Frog Pond <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	2.5 hours
M4 and 5	Lower Frog Pond (inlet area) <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	3 traps, 1 house
A1 (DFO)	Upper Frog Pond <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	angled approximately 2 x 45 minutes
A2 (DFO)	Upper Frog Pond Outlet Tributary <ul style="list-style-type: none"> <li>▪ brook trout (~ 15 cm)</li> </ul>	angled approximately 5 minutes
A3 (DFO)	Lower Frog Pond <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	angled approximately 20 minutes
A4 (DFO)	Clyde River (downstream Route 203) <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	angled approximately 45 minutes
A5 (DFO)	Clyde River (~SW1) <ul style="list-style-type: none"> <li>▪ no captures</li> </ul>	angled approximately 20 minutes

**Appendix D**  
**Plant Survey Reports**

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## Preliminary Plant and Habitat Survey of Proposed Quartz/Kaolin Mine Site

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Location: Flintstone Rock Area - White Rock Mine, Yarmouth County, Nova Scotia  
Date of Survey: November 11, 2000  
Botanist: Ruth E. Newell, B.Sc. (Hons.), M.Sc.

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### Introduction:

This survey is preliminary in nature. By November, many plant species become dormant in preparation for the winter season. The above ground parts of some herbaceous, perennial plants have died back to ground level. Annuals have simply died and will regenerate from seed in the spring. Most graminoid species have dropped their seeds rendering identification very difficult. For these reasons, further surveys will need to be conducted at more appropriate times in the year in order to obtain a more complete listing of species present in the area slated for development.

Botanical nomenclature used in this report follows Roland's Flora of Nova Scotia (Zinck, 1998).

### Results:

The Shelburne Barrens are listed as a "Site of Significance" by the Nova Scotia Department of the Environment. This area has significant ecological features as well as significant plant species (Department of the Environment Report, 1998).

No rare plant species were observed during this preliminary survey. However, due to the lateness of the survey (as discussed above), it was not possible to get a detailed listing of plant species present on the proposed mine site. The purpose of this particular survey was to identify where possible species of interest occur and to determine the various habitats present on site so that field efforts next spring/summer could be more efficiently focussed on habitats with higher potential for rare species.

The various habitats observed during the survey and a brief listing of species found in each are provided below.

#### *Huckleberry-Lambkill Barren:*

A predominant element of the landscape in the Shelburne Barrens is the Huckleberry-lambkill barren. This habitat is composed primarily of shrubs (1 m in height or greater) with a sprinkling of small trees and scattered boulders. The predominant shrubs are *Gaylussacia baccata* (Huckleberry) and *Kalmia angustifolia* (Lambkill). Other shrub species occurring in this habitat include *Ilex glabra* (Inkberry), *Aronia prunifolia* (Chokeberry), *Viburnum nudum* (Wild Raisin) and *Hamamelis virginiana* (Witchhazel).

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Herbaceous species are limited in this particular habitat. A stand of *Pinus banksiana* (Jack Pine) was observed near the test kaolin pit.

*Lichen-Bearberry-Broom Crowberry Barren:*

Interspersed throughout the huckleberry-lambkill barrens, is a second type of barren. This is the Lichen-Bearberry-Broom Crowberry Barren. Predominant species are *Arctostaphylos uva-ursi* (Bearberry), *Corema conradii* (Broom Crowberry) and lichen species, in particular *Cladonia* spp.. Bearberry and Broom Crowberry are low, woody shrubs. A variety of herbaceous species including a number of grasses also occur in this particular habitat.

*Treed Brook and Stream Valleys (e.g. East Barclay Brook):*

These are small, rocky, treed brook valleys with *Acer rubrum* (Red Maple) being one of the main tree species present. A variety of shrubs, herbaceous flowering species and ferns are also present.

*Species observed in this habitat include the following:*

*Abies balsamea* (Balsam Fir)

*Chamaedaphne calyculata* (Leatherleaf)

*Coptis trifolia* (Goldthread)

*Cornus canadensis* (Bunchberry)

*Dennstaedtia punctilobula* (Hay-scented Fern)

*Epigaea repens* (Mayflower)

*Gaultheria procumbens* (Teaberry)

*Hamamelis virginiana* (Witchhazel)

*Osmunda cinnamomea* (Cinnamon Fern)

*Picea* sp. (spruce)

*Pinus strobus* (White Pine)

*Rhododendron canadense* (Rhodora)

*Solidago* spp. (Goldenrod species)

*Thelypteris* sp. (fern)

*Trientalis borealis* (Star Flower)

*Viburnum cassinoides* (Wild Raisin)

*Lichens*

*Mosses*

*Shrub Bogs:*

Shrub bogs are fairly common in the Shelburne Barrens. These bogs are dominated by shrub species that form a rather uniform covering over the wetland. *Species observed in this habitat type during this survey include the following:*

*Alnus incana* (Speckled Alder)  
*Aronia sp.* (Chokeberry)  
*Calamagrostis canadensis* (Blue-joint)  
*Carex spp.* (sedges)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Gaylussacia baccata* (Huckleberry)  
*Ilex glabra* (Inkberry)  
*Kalmia angustifolia* (Lambkill, Sheep Laurel)  
*Kalmia polifolia* (Bog Laurel)  
*Myrica gale* (Sweet Gale)  
*Rhododendron canadense* (Rhodora)  
*Solidago uliginosa* (Bog Goldenrod)  
*Sphagnum spp.* (Sphagnum Moss)  
*Spiraea alba* (Meadowsweet)  
*Viburnum nudum* (Wild Raisin, Witherod)

*Fens:*

Fens appear to be less common than bogs in the survey area. A number of *Carex* species were observed in this wetland type. Due to the lateness of the season, however, we were unable to identify these to species with any degree of certainty. One fen was examined in the vicinity of the east boundary of the property. *Species observed include the following:*

*Alnus incana* (Speckled Alder)  
*Calamagrostis sp.* (Blue-joint)  
*Carex spp.* (sedge species)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Drosera sp.* (Sundew)  
*Eriophorum sp.* (Cottongrass)  
*Ilex glabra* (Inkberry)  
*Kalmia angustifolia* (Lambkill, Sheep Laurel)  
*Lycopodiella inundata* (Bog Clubmoss)

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*Osmunda cinnamomea* (Cinnamon Fern)  
*Picea mariana* (Black Spruce)  
*Pteridium aquilinum* (Bracken)  
*Sphagnum spp.* (Sphagnum Moss)  
*Triadenum fraseri* (Marsh St. John's-wort)  
*Vaccinium macrocarpon* (Large Cranberry)

*Red Maple Swamps:*

A number of treed bogs/swamps were observed during the survey. The predominant tree species present in most cases was *Acer rubrum* (Red Maple). *Picea mariana* (Black Spruce) was also present to a lesser extent. Extensive stands of Cinnamon Fern (*Osmunda cinnamomea*) were observed in some of these woods.

*The species observed in this habitat during this survey are listed below:*

*Acer rubrum* (Red Maple)  
*Carex trisperma* (sedge)  
*Coptis trifolia* (Goldthread)  
*Ilex glabra* (Inkberry)  
*Ilex verticillata* (Canada Holly)  
*Kalmia angustifolia* (Lambkill, Sheep Laurel)  
*Ledum groenlandicum* (Labrador-tea)  
*Mitchella repens* (Partridge-berry)  
*Myrica gale* (Sweet Gale)  
*Osmunda cinnamomea* (Cinammon Fern)  
*Picea mariana* (Black Spruce)  
*Sarracenia purpurea* (Pitcher Plant)  
*Solidago elliotii* (Goldenrod)  
*Sphagnum spp.* (Sphagnum Moss)  
*Viburnum nudum* (Wild Raisin, Witherod)

*Pond and Pond (Riparian) Edges:*

Lower Frog Pond is a small pond located in the southern section of the study area. The edges of this pond vary from rock/boulder to peat. The vegetation types found along the pond edge vary from shrub to sedge.

*Species found along the pond edge as well as aquatic vegetation occurring in the pond near the shoreline are as follows:*

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*Eriocaulon aquaticum* (Pipewort)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Rhododendron canadense* (Rhodora)  
*Kalmia angustifolia* (Lambkill, Sheep Laurel)  
*Osmunda cinnamomea* (Cinnamon Fern)  
*Triadenum fraseri* (Marsh St.John's-wort)  
*Juncus effusus* (Soft Rush)  
*Lysimachia terrestris* (Swamp Candle)  
*Juncus canadensis* (rush)  
*Utricularia geminiscapa* (Bladderwort)  
*Carex bullata* (sedge)  
*Scirpus subterminalis* (bulrush)  
*Nuphar variegata* (Cow-lily)  
*Carex sp.* (sedge)  
*Sphagnum spp.* (Sphagnum Moss)

References Cited:

MacKinnon, D. 1998. Re-evaluation of the Shelburne Barrens as a Site of Ecological Significance. Nova Scotia Department of the Environment (formerly NSDNR), Protected Areas Division.

Zinck, Marian. 1998 Roland's Flora of Nova Scotia. Nova Scotia Museum and Nimbus Publishing, Halifax, N.S.

## Field Report

*Site:* Flintstone Rock, White Rock Mine, Yarmouth Co., Nova Scotia  
*Date of survey:* July 7, 2001  
*Botanist:* Ruth E. Newell

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The purpose of this fieldwork was to supplement a previous botanical survey conducted late in the growing season of the previous year (Nov. 11, 2000) at this site.

The following habitat types were examined on July 7<sup>th</sup>, 2001: Huckleberry-Lambkill barren, Lichen-Bearberry-Broom Crowberry barren, treed brook valley (East Barclay Brook), and Red Maple swamp. **Additional** plant species observed for these habitats that were not reported for the November 11<sup>th</sup>, 2000 field survey due to the lateness of the season, are listed below.

### *Huckleberry-Lambkill Barren*

*Bartonia virginica* (*Bartonia*)\*  
*Platanthera blephariglottis* (White Fringed Orchid)  
*Pteridium aquilinum* (Bracken Fern)  
*Spiranthes lacera* (Northern Slender Ladies'-tresses)

### *Lichen-Bearberry-Broom Crowberry Barren*

*Danthonia spicata* (Poverty Grass)  
*Hudsonia ericoides* (*Hudsonia*)\*\*  
*Melampyrum lineare* (Cow-wheat)  
*Panicum lanuginosum* (Panic Grass)

### *East Barclay Brook (treed brook valley)*

*Cypripedium acaule* (Pink Lady's-slipper)  
*Medeola virginiana* (Indian Cucumber Root)

### *Red Maple Swamp*

*Gaylussacia baccata* (Huckleberry)  
*Listera australis* (Southern Twayblade)\*\*\*  
*Smilacina trifolia* (Three-leaved False Solomon's-seal)  
*Thelypteris simulata* (Massachusetts Fern)\*\*  
*Trientalis borealis* (Star-flower)

\**Bartonia virginica* is listed in Argus & Pryer (1990) and Pronych & Wilson (1993), as rare in Nova Scotia. GPS co-ordinates and other information about the population at Flintstone Rock are given in a July 16<sup>th</sup>, 2001 e-mail to Karen March.

\*\**Hudsonia ericoides* and *Thelypteris simulata* are part of the Atlantic Coastal Plain Flora and are ranked as yellow species by the Atlantic Coastal Plain Flora Recovery Team (<http://conservation.acadiau.ca/coastalplainflora/>) and adopted by NSDNR. Yellow species are species known to be, or believed to be, particularly sensitive to human activities or natural events. At Flintstone Rock, *Thelypteris simulata* was located in a Red Maple swamp in the vicinity of tin marker 3L0-29+75E. *Hudsonia ericoides* is sparsely distributed to uncommon in Lichen-Bearberry-Broom Crowberry habitat at Flintstone Rock. This species tends to occur in disturbed edges of this habitat.

\*\*\**Listera australis* is ranked as nationally imperilled because of rarity by Argus & Pryer (1990). Locations and a habitat description for this species at Flintstone Rock are given in a July 16<sup>th</sup>, 2001 e-mail to Karen March.

*References Cited:*

- Argus, G. W. and K. M. Pryer. 1990. Rare Vascular Plants of Canada. Ottawa: Canadian Museum of Nature. 199 pp. + maps.
- Pronych, G. and A. A. Wilson. 1993. Rare Vascular Plants of Nova Scotia. Halifax: Nova Scotia Museum. 2 vols. 331 pp.

From: Ruth Newell <ruth.newell@acadiau.ca>  
To: "Karen March" <kmarch@dillon.ca>  
Date: 7/16/01 12:33pm  
Subject: Flintstone Rock

Karen:

The first *Listera australis* plants we found were located between these two tin markers: 0+036+00E and 035+50E in the vicinity of the centerline cut. The habitat was fairly open, red maple swamp; *Listera* plants were sparsely distributed; they were growing in sphagnum moss beds in association with *Osmunda cinnamomea*, *Ilex verticillata*, *Gaylussacia baccata* and *Picea mariana*. 17 stems were located during this survey. The entire red maple swamp was not searched however and a more thorough survey may reveal more plants at this particular location.

More *Listera australis* plants were located in a second red maple swamp. The first plant we saw was immediately adjacent to tin marker 3L0-29+75E. A total of 6 plants were found in this red maple stand. Again, the area surveyed was limited and a more extensive survey may yield more plants. Here, *Listera australis* was growing with *Ledum groenlandicum*, *Gaylussacia baccata*, *Trientalis borealis* and *Viburnum cassinoides* in sphagnum moss under red maple.

All *Listera* plants except one, were in fruit. The one exception had neither flowers nor fruit, just the bare stalk of the inflorescence.

The GPS reading for the population of *Bartonia virginica* that we found is: 20T 0294225, 4852038 NAD 83. These were along the edge of the main trail and in the middle of an ATV trail adjacent to the main trail. Approximately 30 plants were observed at this one site. The *Bartonia* was growing with *Pteridium aquilinum*, *Kalmia angustifolia*, *Gaylussacia baccata* and *Aronia* sp.

Ruth

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**A Report on the Flintstone Rocks Field Trip Monday July 25/2001**  
**Heather Stewart**

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The scope of this trip was to check for presence/absence of additional populations of southern twayblade (*Listera australis*). This species has a Grank of G4 and an NS rank of S1. The best season to inventory this plant is June to early July (early to full flower) so the population is definitely not at its best in terms of getting accurate population estimates. The plants are located in an east –west trending series of red maple (*Acer rubrum*)swales. The understory shrub component is made up of False Holly (*Nemopanthus mucronata*) and Witherod (*Viburnum cassinoides*). The orchid is most often located in the shade of cinnamon fern (*Osmunda cinnamomea*), the dominant ground cover is a moist layer of sphagnum moss. Associated herbaceous species include *Vaccinium* sp.(blueberry), gold thread (*Coptis trifolia*), pitcher plant (*Sarracenia purpurea*) and scattered three leaved Solomon’s seal (*Smilacina trifolia*).

In surveying the area for additional the other east–west trending swales adjacent to the ones where the plants were additionally identified were visited. This included swales on the north and south side of the baseline. The swales were located at the marker 36 and marker 30 along the baseline. At marker 30 a fern filled swale continued on the north side of the baseline this was the head of the inflow to the Frog Pond (small pond). This had the right overstorey components but lacked the shrub component. It turned out to be increasingly wetter on the north side. On the south side, there were several more plants located approximately 15 meters from the trail. Continuing along this swale in a northwest direction the swale followed a stream and the area was very wet. No plants were found here. At the first location at marker 36 along the baseline the plants were scattered throughout the swale and south of the baseline scattered plants were found but none were located beyond 20 meters from the baseline. The swale was trending along the stream leading into Rocky Lake. This area may have more plants earlier in the season but the lack of plants may be due to the lateness of the season. North of the baseline the swale seemed to become too densely shrubby.

Uncorrected locations of main locations from Garmin GPS were

- 1/     **N 44° 03.182**  
       **W 065° 35.829 @ 13:02:36**
- 2/     **N 44° 03.011**  
       **W065° 36.240 @ 14:49:31**
- 3/     **N 44° 03.027**  
       **W 065° 36.236 @15:03:09**

# Flintstone Rocks Early Fall Wetland Assessment

Date of Survey: Sept.3 and 5/01  
Location: White Rock Mine, Yarmouth County, Nova Scotia  
Botanist: Heather Stewart, B.Sc., M.Sc.

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Purpose: An earlier spring site visit by Ruth Newell indicated that this study site might be a candidate area to watch for late flowering species such as rare coastal plain species and species of the Orchidaceae. The late summer is also a better time to check for wetland species as they have a tendency to flower later than most terrestrial species.

The area targeted in this survey, are wetlands immediately adjacent to the baseline and to the north of the baseline or the ATV trail.

The Botanical Nomenclature used in this report follows Roland's Flora of Nova Scotia (Zinck, 1998).

In two allotted days, wetlands from those immediately adjacent to the pit site to the wetlands on the edge of the frog pond were surveyed.

## ***Wetland 11***

The first small wetland closest to the pit area is immediately adjacent to the ATV trail and north of it between markers 62 - 64 is a very small shrub bog with signs of disturbance digging and garbage. This compact shrub bog is fairly close to highway 203 and there is indications that it is slightly more disturbed and drier with some lichens along the edge. There is no associated water channel through this bog. On scattered hummocks, there are *Viburnum nudum* (Witherod), *Rhododendron canadense* (Rhodora) and *Aronia arbutifolia* (Red Chokeberry). Dominant shrub species throughout the bog is *Chamaedaphne calyculata* (Leatherleaf) making a low dense cover over a drier Sphagnum lichen sp. substrate. There are scattered graminoids such as *Eriophorum virginicum* (Tawny Cotton-grass), and *Carex stricta* (Sedge). Where disturbance has opened the shrub layer there is a small patch of surface water and open peat. In the water *Utricularia geminiscapa* (Bladderwort) is mixed with green algae. Along the edge of this pool, *Carex trisperma* (Three-seeded Sedge) as well as *Panicum spretum*, *Carex cumulata*, *Drosera rotundifolia*, *Juncus effusus* and *Scirpus cyperinus* are scattered. Along the disturbed end of the bog at the edge there are stalks of tall *Plantanthera* (56 cm tall) (Northern Bog orchid) species.

## Species list:

*Alnus incana* (Speckled Alder)  
*Amelanchier bartramiana* (Mountain Serviceberry)  
*Andromeda glaucophylla* (Bog-rosemary)  
*Aronia arbutifolia* (Red Chokeberry)  
*Calamagrostis canadensis* (Canada Bluejoint)  
*Carex cumulata* (Sedge)  
*Carex stricta* (Sedge)

*Carex trisperma* (Three-seeded sedge)  
*Chamaedaphne calyculata* (Leatherleaf)

*Drosera rotundifolia* (Round-leaved Sundew)  
*Eriophorum virginicum* (Tawny Cotton-grass)  
*Gaylussacia baccata* (Huckleberry)  
*Ilex glabra* (Inkberry)  
*Juncus effusus* (Soft Rush)  
*Kalmia angustifolia* (Lambkill)  
*Kalmia polifolia* (Bog Laurel)  
*Lysymachia terrestris* (Swamp Candle)  
*Myrica gale* (Sweet gale)  
*Onoclea sensibilis* (Sensitive Fern)  
*Osmunda cinnamomea* (Cinnamon Fern)  
*Panicum spretum*  
*Platanthera sp.* (Northern Bog orchid)  
*Pteridium aquilinum* (Bracken Fern)  
*Rhododendron canadense* (Rhodora)  
*Rubus hispidus* (Dewberry)  
*Solidago uliginosa* (Bog Goldenrod)  
*Sphagnum sp.* (Sphagnum moss)  
*Utricularia geminiscapa* (Bladderwort)  
*Viburnum nudum* (Witherod)

***Site A (Along East Barclay Brook ~ 100 m downstream ATV trail)***

At the marker 60 + 25, a very small shrub bog is located at the base of a very steep slope from the barren top to open water (approx. 20-30 meters across). The steep slopes go from open barren through dry shrub slope of *Amelanchier bartramiana* (Mountain Serviceberry) *Rhododendron canadense* (Rhodora), *Gaylussacia baccata* (Huckleberry), and scattered *Prunus virginiana* (Chokecherry) with occasional *Osmunda cinnamomea* (Cinnamon Fern) down to water's edge. A dense ring of *Chamaedaphne calyculata* (Leatherleaf) surrounds the pond. Most of the edge on the north east side is made up of large shrub covered boulders. At the disturbed edge of this pond in the peaty mud *Calamagrostis canadensis* (Canada Bluejoint) is scattered as well as *Carex bullata* (Sedge) and *Drosera intermedia* (Narrow-leaved Sundew). In the water, floating mats of Sphagnum were observed as well as one leaf from *Nuphar variegata* (Cow-lily).

Species list:

*Alnus incana* (Speckled Alder)  
*Amelanchier bartramiana* (Mountain Serviceberry)  
*Aronia arbutifolia* (Red Chokeberry)  
*Calamagrostis canadensis* (Canada Bluejoint)  
*Carex cumulata* (Sedge)  
*Carex trisperma* (Three-seeded sedge)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Drosera intermedia* (Narrow-leaved Sundew)

*Gaylussacia baccata* (Huckleberry)  
*Ilex glabra* (Inkberry)  
*Lysymachia terrestris* (Swamp Candle)  
*Myrica gale* (Sweet gale)  
*Nuphar variegata* (Cow-lily)  
*Osmunda cinnamomea* (Cinnamon Fern)  
*Rhododendron canadense* (Rhodora)  
*Rubus hispidus* (Dewberry)  
*Smilicina trifolia* (Three-leaved False Solomon's seal)  
*Solidago uliginosa* (Bog Goldenrod)  
*Sphagnum sp.* (Sphagnum moss)  
*Utricularia geminiscapa* (Bladderwort)  
*Viburnum nudum* (Witherod)

### **Wetland 8**

At line 58 just north 50 m where the ATV trail crosses the streambed, the stream winds through a shrub fen. There is some evidence of disturbance immediately above the trail where ATV's have crossed the stream bed. This has opened the bank of the stream and in this disturbed edge *Juncus effusus* (Soft Rush) scattered *Calamagrostis canadensis* (Canada Bluejoint) and *Carex bullata* (Sedge) grew in the rocky peaty substrate. In the water a mix of *Utricularia geminiscapa* (Bladderwort) and Sphagnum floated. Elsewhere along the channel there is a dense coverage of *Chamaedaphne calyculata* (Leatherleaf) inhibiting most herbaceous growth along the bank. Throughout the shrub fen, Leatherleaf dominates with other scattered species including *Myrica gale* (Sweet gale), *Rhododendron canadense* (Rhodora) *Kalmia angustifolia* (Lambkill), and *Viburnum nudum* (Witherod). Scattered throughout the fen is the leaf blades of *Carex stricta* (Sedge).

### Species list:

*Alnus incana* (Speckled Alder)  
*Amelanchier bartramiana* (Mountain Serviceberry)  
*Aronia arbutifolia* (Red Chokeberry)  
*Calamagrostis canadensis* (Canada Bluejoint)  
*Carex bullata* (Sedge)  
*Carex stricta* (Sedge)  
*Carex trisperma* (Three-seeded sedge)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Drosera rotundifolia* (Round-leaved Sundew)  
*Eriophorum virginicum* (Tawny Cotton-grass)  
*Gaylussacia baccata* (Huckleberry)  
*Ilex glabra* (Inkberry)  
*Juncus effusus* (Soft Rush)  
*Kalmia angustifolia* (Lambkill)  
*Myrica gale* (Sweet gale)  
*Rhododendron canadense* (Rhodora)  
*Rubus hispidus* (Dewberry)

*Solidago uliginosa* (Bog Goldenrod)  
*Sphagnum girgensohnii* (Sphagnum moss)  
*Utricularia geminiscapa* (Bladderwort)  
*Vaccinium oxycoccus* (Small Cranberry)  
*Viburnum nudum* (Witherod)

### **Wetland 19**

Wetland at marker # 44 bridge crossing is adjacent to the ATV trail north of the Tie-in rock with flagging tape. This wetland is a shrub fen with a narrow channel running through it. The sides are sloped leading into the fen and across the fen, a transect of unmarked posts mark a straight line. This shrub fen is similar to the previous fen and has less diversity. The sphagnum moss substrate floats along the edge of the channel and *Chamaedaphne calyculata* (Leatherleaf) dominates the shrub component right up to the waters edge. No aquatic vegetation is evident floating in the water. This has no hummock formation and appears to be the most homogeneous shrub fen encountered. *Carex stricta* is scattered throughout.

#### Species list:

*Amelanchier bartramiana* (Mountain Serviceberry)  
*Aronia arbutifolia* (Red Chokeberry)  
*Carex stricta* (Sedge)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Gaylussacia baccata* (Huckleberry)  
*Kalmia angustifolia* (Lambkill)  
*Myrica gale* (Sweet gale)  
*Pteridium aquilinum* (Bracken Fern) along the edge  
*Rhododendron canadense* (Rhodora)  
*Rubus hispidus* (Dewberry)  
*Sphagnum sp.* (Sphagnum moss)  
*Viburnum nudum* (Witherod)

### **Wetland 23**

At the baseline marker # 39 just above the bridge crossing, another small shrub fen parallels the stream-channel. The component species are the same as previous fens but the substrate is a quaking Sphagnum base and there appears to be more nutrient movement through the fen. There are scattered *Carex stricta* (sedge) and *Eriophorum virginicum* (Tawny Cotton-grass). On the surface of the Sphagnum, *Vaccinium oxycoccus* (Small Cranberry) and *Drosera rotundifolia* (Round-leaved Sundew) are part of the herbaceous undergrowth. The only difference between this and the previous fen is the presence of *Alnus incana* (Alder) at the upstream end as the stream channel narrows and the slopes are steep into the channel. The shrub component changes to Alder with some *Acer rubrum* (Red maple).

### **Wetland 28,30**

The last wetland surveyed is the one around the Lower Frog Pond at baseline marker 20 - 22. This shrub fen has no evidence of disturbance other than the cut baseline and ATV trails are not visible. This fen has two sources of inflow and runs linearly along these as well as around the pond. The dominant shrub component is *Chamaedaphne calyculata* (Leatherleaf), *Gaylussacia baccata* (Huckleberry), *Myrica gale* (Sweet gale) and *Rhododendron canadense* (Rhodora), *Kalmia angustifolia* (Lambkill) and *Ledum groelandicum* (Labrador-tea). There are some scattered rocks along the lake edge and in the west inflow channel as well as along the south shore *Calamagrostis canadensis* (Bluejoint) grows in shallow water where shrubs have not colonized up to the water line. *Utricularia sp.* (Bladderwort) grows along the shallow edge of the shoreline but is not in flower at the time of survey. There is some reason to believe that *Utricularia subulata* is also located in this pond as a small section of stem pulled out of the water had a few cleistogamous flowers but no extensive sections were found at the time of survey. In the shallow water there is also, *Eriocaulon aquaticum* (Pipewort), *Subularia aquatica* (Awlwort) and *Nuphar variegata* (Cow-lily). *Triadenum virginicum* (Marsh St. John's-wort), *Drosera intermedia* (Narrow-leaved Sundew) was collected from the shoreline as well as *Carex bullata* (Sedge), *Lysimachia terrestris* (Swamp Candle) and *Juncus canadensis* (Canada Rush). *Carex stricta* (Sedge) is scattered throughout the fen and several dried stalks of *Platanthera* were found. These were most likely from *Platanthera clavellata* (Northern Club-spur). Along the baseline leading into the fen there are scattered *Alnus viridis* (Downy Alder), *Ilex glabra* (Inkberry) *Aronia arbutifolia* (Red Chokeberry), and *Viburnum nudum* (Witherod)

#### Species list:

*Alnus viridis* (Downy Alder)  
*Andromeda glaucophylla* (Bog-rosemary)  
*Aronia arbutifolia* (Red Chokeberry)  
*Calamagrostis canadensis* (Canada Bluejoint)  
*Carex bullata* (Sedge)  
*Carex stricta* (Sedge)  
*Chamaedaphne calyculata* (Leatherleaf)  
*Drosera intermedia* (Narrow-leaved Sundew)  
*Eriocaulon aquaticum* (Pipewort)  
*Eriophorum virginicum* (Tawny Cotton-grass)  
*Gaylussacia baccata* (Huckleberry)  
*Ilex glabra* (Inkberry)  
*Juncus canadensis* (Soft Rush)  
*Kalmia angustifolia* (Lambkill)  
*Kalmia polifolia* (Bog Laurel)  
*Lysimachia terrestris* (Swamp Candle)  
*Myrica gale* (Sweet gale)  
*Nuphar variegata* (Cow-lily)  
*Osmunda cinnamomea* (Cinnamon Fern)  
*Platanthera clavellata* (Northern Club-spur)  
*Rhododendron canadense* (Rhodora)

*Rubus hispidus* (Dewberry)  
*Solidago uliginosa* (Bog Goldenrod)  
*Sphagnum sp.* (Sphagnum moss)  
*Subularia aquatica* (Awlwort)  
*Triadenum virginicum* (Marsh St. John's-wort)  
*Utricularia geminiscapa* (Bladderwort)  
*Utricularia subulata* (Bladderwort)  
*Viburnum nudum* (Witherod)

Rare species:

The only rare species encountered was the *Utricularia subulata* encountered at Lower Frog Pond. The section found was too small to be conclusive. No sample was collected at this time but this pond should be periodically be monitored for this species.

In addition, the gravel bank above the test pit is being checked by an orchid expert to determine whether the *Spiranthes* species present are *Spiranthes casei* and *Spiranthes ochreoleuca*. *Spiranthes casei* is considered rare in Nova Scotia by Maher et al.(1978), *Spiranthes ochreoleuca* is considered nationally imperiled by Argus and Pryer(1990).

The following are the uncorrected coordinates for the field work done on Sunday concerning the location of *Spiranthes* species. (Sept 16/01 between 12:00 and 1:00) 3D uncorrected NAD 83 North American 1) *Spiranthes ochroleuca* and *S.lacera* general location. N4882358.600m E 294695.796m Alt. 102.362m

2) *Spiranthes ochroleuca* N 4882355.792m E 294695.447m Alt. 100.792m 3) *Spiranthes casei novascotiae* N 488358.637m E 294706.416m Alt 102.460m 4) *Spiranthes cernua* N 4882357.044m E 294703.862m Alt 102.360m All *Spiranthes* are localized between ditch edge and the top of ditch slope within a span of 20m.

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**Appendix E**  
**Fauna Field Survey Reports**

**Wildlife Observations - Fall 2000, Summer 2001**

<b>Animal</b>	<b>Species</b>	<b>Observation</b>
<b>Herpetiles</b>		
Eastern American toad	<i>Bufo americanus americanus</i>	1-in barrens area adjacent trail 1-Barclay Brook d/s ATV trail
Northern spring peeper	<i>Pseudocaris crucifer crucifer</i>	Heard during bird survey in Barclay Brooks area
Green frog	<i>Rana clamitans melanota</i>	Numerous in all watercourses
Pickerel frog	<i>Rana palustris</i>	1 - East Barclay Brook
Garter snake	<i>Thamnophis sirtalis palludula</i>	Several - barrens area and wooded area west of Barclay Brook
Green snake	<i>Liochlorophis vernalis borealis</i>	1 - heath adjacent Lower Frog Pond
<b>Mammals</b>		
Snowshoe hare	<i>Lepus americanus</i>	Scat observed throughout 1 - in barrens area
Eastern chipmunk	<i>Tamias striatus</i>	Several in wooded area west of Barclay Brook
Red squirrel	<i>Tamiasciurus hudsonicus</i>	Wooded areas throughout
Beaver	<i>Castor Canadensis</i>	Tree cuttings in Upper Frog Pond area Dams along East Barclay Brook
Red-backed vole	<i>Clethrionomys gapperi</i>	1 - in shrub adjacent Lower Frog Pond
Muskrat	<i>Ondatra zibethicus</i>	Probable cuttings in East Barclay Brook bog area
Common porcupine	<i>Erethizon dorsatum</i>	Bark removal in semi-barrens
Eastern coyote	<i>Canis latrans</i>	Scat throughout
Red fox	<i>Vulpes vulpes</i>	Scat throughout
American black bear	<i>Ursus americanus</i>	Probable scat in wooded area west of Barclay Brook
Bobcat	<i>Lynx rufus</i>	Scat throughout
White-tailed deer	<i>Odocoileus virginianus</i>	Scat throughout

Note: Birds are listed separately

## Breeding Birds Known for the Flintstone Rock General Area and Field Survey Observations

MBCA <sup>1</sup>	Bird	Species	Known Breeding Within 10 km	Nesting Habitat (nesting season for wetland species)	Occurrence During Breeding Survey (June 10, 2001)	At Risk Status
Y	Common Loon	<i>Gavia immer</i>	possible	lake shorelines		NSDNR Yellow
Y	Great Blue Heron	<i>Ardea herodias</i>	possible	colonies, in trees		
Y	American Black Duck	<i>Anas rubripes</i>	probable	ground near water/wetland (April-July)		
Y	Common Merganser	<i>Mergus merganser</i>	probable	hollow trees, cliffs or low branches near water		
	Osprey	<i>Pandion haliaetus</i>		nest tree, near water	1 FO	
	Northern Harrier	<i>Circus cyaneus</i>	possible	open areas	sparse	
	Sharp-shinned Hawk	<i>Accipiter striatus</i>		typically spruce trees	sparse	
	Ruffed Grouse	<i>Bonasa umbellus</i>	known	coniferous forest		
Y	Common Snipe	<i>Gallinago gallinago</i>	possible	ground, sedge clumps		
Y	American Woodcock	<i>Scolopax minor</i>		dense broad leaf forests and swamps (early Apr-June)	sparse 1 heard in gravel pit area	
	Great Horned Owl	<i>Bubo virginianus</i>		use large hawk or crow nest	1 feeding on road kill at Clyde River	
	Barred Owl	<i>Strix varia</i>	probable	cavity trees, nest boxes		
	Long-eared Owl	<i>Asio otus</i>		woodlands	1 heard toward Lower Frog Pond, likely feeding	NSDNR Yellow
	Northern Saw-whet Owl	<i>Aegolius acadicus</i>	probable	cavity nester - woodpecker holes	2 heard in western portion of site	
Y	Common Nighthawk	<i>Chordeiles minor</i>	possible	open ground, cutovers, buildings		
Y	Whip-poor-will	<i>Caprimulgus vociferus</i>		hardwood forests	not confirmed	
Y	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	possible	nest in hardwoods		
Y	Downey Woodpecker	<i>Picoides pubescens</i>	possible	cavity snags	sparse	
Y	Hairy Woodpecker	<i>Picoides villosus</i>	possible	cavities	sparse	
Y	Northern Flicker	<i>Colaptes auratus</i>	possible	cavities	common	
Y	Olive-sided Flycatcher	<i>Contopus borealis</i>	probable	forest edge	common	
Y	Eastern Wood-Pewee	<i>Conotopus virens</i>	probable	open forest		
Y	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	probable	ground in conifer moss		

## Breeding Birds Known for the Flintstone Rock General Area and Field Survey Observations

MBCA <sup>1</sup>	Bird	Species	Known Breeding Within 10 km	Nesting Habitat (nesting season for wetland species)	Occurrence During Breeding Survey (June 10, 2001)	At Risk Status
Y	Alder Flycatcher	<i>Empidonax alnorum</i>	probable	low in shrubbery (early June-Aug)	common	
Y	Least Flycatcher	<i>Empidonax minimus</i>		broad-leafed woods	common	
Y	Eastern Phoebe	<i>Sayornis phoebe</i>		near water, hardwoods, often nest on bridges, banks	1 at road (flew toward Clyde River)	
Y	Tree Swallow	<i>Tachycineta bicolor</i>	possible	cavities, nest boxes	common observed feeding	
Y	Bank Swallow	<i>Riparia riparia</i>		banks and cliffs	sparse feeding near road	
Y	Barn Swallow	<i>Hirundo rustica</i>		buildings, caves, cliffs	2	
	Gray Jay	<i>Perisoreus canadensis</i>	known	mature conifers	sparse	
	Blue Jay	<i>Cyanocitta cristata</i>	known	trees	sparse	
	American Crow	<i>Corvus brachyrhynchos</i>	possible	trees		
	Common Raven	<i>Corvus corax</i>		trees, cliffs, old buildings	sparse	
Y	Black-capped Chickadee	<i>Parus atricapillus</i>	known	nest cavities in rotted tree stumps	common	
Y	Boreal Chickadee	<i>Parus hudsonicus</i>		nest cavities in rotted tree stumps	common	
Y	Red-breasted Nuthatch	<i>Sitta canadensis</i>	possible	excavated from dead trees		
Y	White-breasted Nuthatch	<i>Sitta carolinensis</i>	known	cavity nester, broad-leafed trees		
Y	Golden-crowned Kinglet	<i>Regulus satrapa</i>	known	coniferous forest	common	
Y	Ruby-crowned Kinglet	<i>Regulus calendula</i>	known	conifers	common	
Y	Veery	<i>Catharus fuscescens</i>	possible	ground		
Y	Swainson's Thrush	<i>Catharus ustulatus</i>	possible	tree	abundant	
Y	Hermit Thrush	<i>Catharus guttatus</i>	known	ground	abundant	
Y	American Robin	<i>Turdus migratorius</i>	known	everywhere (mid Apr-Aug)	common	
Y	Cedar Waxwing	<i>Bombycilla cedrorum</i>	probable	open woods	sparse	
	European Starling	<i>Sturnus vulgaris</i>		enclosed		
Y	Solitary Vireo (Blue-headed)	<i>Vireo solitarius</i>	known	forest	common	
Y	Red-eyed Vireo	<i>Vireo olivaceus</i>	probable	forest	sparse	
Y	Nashville Warbler	<i>Vermivora ruficapilla</i>	possible	open woods/shrubs	sparse	

## Breeding Birds Known for the Flintstone Rock General Area and Field Survey Observations

MBCA <sup>1</sup>	Bird	Species	Known Breeding Within 10 km	Nesting Habitat (nesting season for wetland species)	Occurrence During Breeding Survey (June 10, 2001)	At Risk Status
Y	Northern Parula Warbler	<i>Parula americana</i>	probable	bearded lichen in conifer	sparse	
Y	Yellow Warbler	<i>Dendroica petechia</i>		shrubs, especially near streams (mid May-Aug)	sparse	
Y	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	known	low shrubs, raspberries (end May-Aug)	common	
Y	Magnolia Warbler	<i>Dendroica magnolia</i>	known	conifers	abundant	
Y	Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	known	broad-leaved woodlands	sparse	
Y	Yellow-rumped Warbler (Myrtle)	<i>Dendroica coronata</i>	known	forest with conifers	common	
Y	Black-throated Green Warbler	<i>Dendroica virens</i>	probable	mixed or coniferous forest	common	
Y	Blackburnian Warbler	<i>Dendroica fusca</i>	probable	conifers		
Y	Palm Warbler	<i>Dendroica palmarum</i>	known	shrub bogs (mid May-Aug)	abundant	
Y	Bay-breasted Warbler	<i>Dendroica castanea</i>	possible	conifers		
Y	Black-and-white Warbler	<i>Mniotilta varia</i>	probable	ground among tree roots	common	
Y	American Redstart	<i>Setophaga ruticilla</i>	known	small trees	common	
Y	Ovenbird	<i>Seiurus aurocapillus</i>		ground	1	
Y	Common Yellowthroat	<i>Geothlypis trichas</i>	known	brushy areas (mid May-Aug)	extremely abundant	
Y	Canada Warbler	<i>Wilsonia canadensis</i>		mature to mid aged forest	sparse	
Y	Savannah Sparrow	<i>Passerculus sandwichensis</i>	probable	grass, sedge		
Y	Song Sparrow	<i>Melospiza melodia</i>	known	shrubs (May-Aug)	sparse	
Y	Swamp Sparrow	<i>Melospiza georgiana</i>	known	wetlands with tall shrubby vegetation	very abundant	
Y	White-throated Sparrow	<i>Zonotrichia albicollis</i>	probable	ground at forest edge (mid May-Aug)	abundant	
Y	Dark-eyed Junco	<i>Junco hyemalis</i>	known	forest edge (early May-Aug)	very abundant	
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>		marshes with cattail and shrub (May-Aug)		
	Rusty Blackbird	<i>Euphagus carolinus</i>	known	wetlands (May-July)		

## Breeding Birds Known for the Flintstone Rock General Area and Field Survey Observations

MBCA <sup>1</sup>	Bird	Species	Known Breeding Within 10 km	Nesting Habitat (nesting season for wetland species)	Occurrence During Breeding Survey (June 10, 2001)	At Risk Status
	Common Grackle	<i>Quiscalus quiscula</i>		trees, bushes, buildings in open areas		
Y	Purple Finch	<i>Carpodacus purpureus</i>	possible	conifers	common (FO)	
Y	Red Crossbill	<i>Loxia curvirostra</i>	possible	conifers	sparse (FO)	
Y	White-winged Crossbill	<i>Loxia leucoptera</i>		conifers	2 feeding near road	
Y	Pine Siskin	<i>Carduelis pinus</i>		conifers	1 (FO)	
Y	American Goldfinch	<i>Carduelis tristis</i>	possible	open		
Additional Birds Observed in June 18 1998 Survey; 7 habitats in Shelburne Barrens (Hagreen 1999)						
Y	Ring-necked Duck	<i>Aythya collaris</i>		marsh, clumps of sedge, sweetgale or leatherleaf		
	Spruce Grouse	<i>Dendragapus canadensis</i>		ground, spruce forest		
Y	Spotted Sandpiper	<i>Actitis macularia</i>		ground in open areas		
Y	Grey Catbird	<i>Dumetella carolinensis</i>		shrubby, typically in broad leaved area		
Y	Blackpoll Warbler	<i>Dendroica striata</i>		spruce forests, coastal or elevated areas		
Y	Chipping Sparrow	<i>Spizella passerina</i>		edges and open woodlands		

<sup>1</sup> protected under Migratory Birds Convention Act

Legend (Estimated Numbers for Study Area):

Sparse 1-10  
 Common 10 - 100  
 Abundant 100-500  
 Very Abundant over 500  
 Extremely Abundant over 1000  
 FO Fly over

June 10, 2001 Survey Conducted by Fulton Lavender

Source of Breeding Data: *Atlas of Breeding Birds of the Maritime Provinces*, Erskine, A. 1992. Nimbus Publishing and NSM

Source for Additional Bird Data: *Survey of the Shelburne Barrens Candidate Nature Reserve and the Environmental Impacts of Kaolinite Mining*, Hagreen, L. 1999. Dalhousie University

## FIELD NOTES

Date: 23 July 2001

Locality: Lower Frog Pond, Yarmouth County, Nova Scotia:  
Clyde River Watershed (1EB-1T);  
Nova Scotia Map Book Reference SE2.

Observer: John Gilhen and Karen March (Heather Stewart investigating rare plants).

Time: Leave Prospect Bay, 0730 hours  
Highway gravel pit entrance, 1100 hours  
East Barclay Brook, 1130 hours  
Barclay Brook, 1210 hours  
Lower Frog Pond, 1400 to 1530 hours  
Return to gravel pit, 1630 hours  
Return to Prospect Bay, 2045 hours.

Weather: Very warm and humid, air temperature approximately 30° C by 1300 hours, but with gentle cool breeze; hazy sun in morning to bright cloudless sky by 1300 hours changing to light, high wind-swept clouds during afternoon.

Habitat: Lower Frog Pond is shallow at its northeastern side, with sphagnum mats on the surface. There is an extensive wetland along its northeastern side which, in very general terms, consists of mostly of sphagnum and heath with small open areas of sphagnum, grasses and sedges. There is a slow, firm bottomed, sphagnacious stream, or inflow here.

Species: We stopped for a short time at East Barclay Brook and Barclay Brook, and observed Green Frog, *Rana clamitans melanota*, and Pickerel Frog, *Rana palustris*, at both streams. One adult female Green Frog at East Barclay Brook was very dark, almost black on the back, with dark spots on a white chin.

The habitat at Lower Frog Pond is excellent for amphibians, and we observed four Green Frogs and tadpoles at the mouth of the stream. This area would be potential habitat for the Northern Ribbon Snake, *Thamnophis sauritus septentrionalis*.

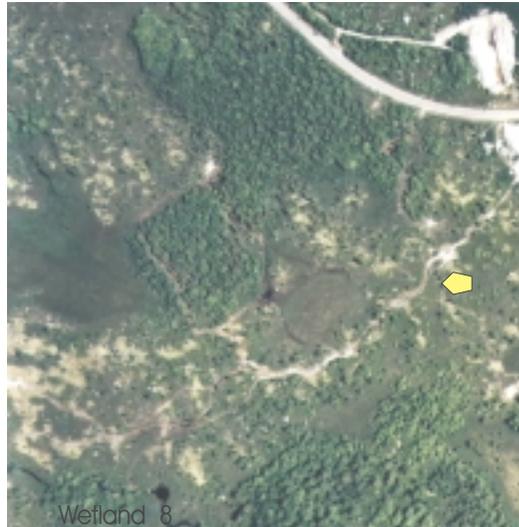
We did not see any snakes but there is habitat throughout the ATV trail which is habitat for the Maritime Garter Snake, *Thamnophis sirtalis pallidula*, and a favorite prey item the Eastern American Toad, *Bufo a. americanus*.

**Appendix F**  
**Wetland Airphotos**

# Flintstone Rock Wetlands



Wetland 6



Wetland 8



Wetland 11



Wetland 19



Wetland 22



NSDNR Air Photographs June, July 2000

**Appendix G**  
**Nova Scotia Museum Screening**



NOV 8 2000

Nova Scotia Museum  
Heritage Resource Services

## Memorandum

File No. F:\2000-01\28000-55 Environmental Screenings\00-10-12 Yarmouth County\Response.wpd

TO: Peter Oram  
MGI Limited

FROM: Robert Ogilvie  
Nova Scotia Museum

RE: Environmental Screening 00-10-12  
Yarmouth County

DATE: November 2, 2000

Staff of the Nova Scotia Museum have reviewed the documents related to the above screening request.

With respect to cultural resources, there are two recorded archaeological sites in the study area (BaDi-1 and BaDi-2), both on the Roseway River system. They were reported to the Nova Scotia Museum by an Archaeological Survey of Canada in 1973. We have no record of revisitation to these sites. We also have had unconfirmed anecdotal reports of more recent artifact finds in the Indian Fields area (BaDi-1).

It is highly likely that additional pre and post-contact First Nations archaeological sites are located within the study area, particularly with the extensive drainage for the Roseway and Clyde rivers. An historical background study will determine the potential for Euro-Canadian archaeological resources.

W.r.t. natural heritage components of interest, staff make the following observations.

The following plant species-at-risk are known from within the identified area of interest:

*Alnus serrulata*  
*Bartonia virginica*  
*Galium obtusum*  
*Spiranthes ochroleuca*  
*Symplocarpus foetidus*  
*Utricularia gibba* (aquatic)

The following plant species-at-risk are known from adjacent squares. Those marked with asterisks should be highlighted as they have national recognition as being 'at risk'. Two asterisks signify those species with provincial legal protection:

Mr. Peter Oram

November 2, 2000

Page 2

*Carex atlantica* ssp. *capillacea* \* Canadian Priority of 2  
*Cephalanthus occidentalis*  
*Clethra alnifolia* \*\*  
*Coreopsis rosea* \*\*  
*Decodon verticillatus*  
*Eleocharis flavescens*  
*Eupatorium dubium*  
*Euthamia galetorum*  
*E. tenuifolia*  
*Panicum rigidulum* \* Canadian Priority of 3  
*Platanthera flava*, var. *flava* \*  
*Rhexia virginica* \*  
*Sabatia kennedyana* \* Canadian Priority of 1  
*Spiranthes casei*  
*Woodwardia areolata* \*

Many of these species belong to the coastal plain floral element and are at the northernmost station of their range in Yarmouth County. As many are not found elsewhere in Canada, their presence or absence should be ascertained during timely field inventories, i.e. when they are in flower or fruit.

Of this list, many are associated only with wetlands or lake shores. The nature of the undertaken was not provided so at this point we cannot give a narrower list of plant species. This list is based almost solely on geographical area. Those species known to be found only in brackish or estuarine conditions have been excluded.

It should also be noted that in the vicinity of Flintstone Rock, there are several regions of seeded Pitch Pine (*Pinus rigida*), from an aerial spray program (DLF, 1960s). This species has naturalized in the barrens, but is not native this far north.

Depending on which watersheds are to be affected, there are two significant fish species of concern. The first is in the Tusket drainage, that is the Atlantic Whitefish (*Coregonus huntsmani*), which is COSEWIC-listed as endangered. There have been no recent records for the system, so the species may be seriously-imperiled in the watershed. Alternatively, the Clyde Drainage supports a fragile population of Atlantic Salmon (*Salmo salar*).

Although there are no records for the specific site, the site is within 25 km of the only Provincial records for both Blandings Turdes (*Emydoidea blandingii*) - COSEWIC-listed as threatened and the Northern Ribbon Snake (*Thamnophis sauritis*) - Provincially listed. We would recommend before development took place that the potential areas of impact be surveyed for these two species.

There are no records of breeding birds of note in the study area although we observe that the area was only reviewed in a cursory manner for the Maritime Breeding Bird Atlas.

NOV 08 '00 03:54PM MGI LTD DART

Mr. Peter Oram  
November 2, 2000  
Page 3

The Museum has no records of significant paleontological resources within the development area.

I have attached an invoice for the staff time spent reviewing museum records and compiling this response.

If you have any questions, please contact Robert Ogilvie at 424-6475.

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**Appendix H**  
**Moose Data**

September 27, 2001

Scott McMillan  
Environmental Scientist/Planner  
Dillon Consulting Ltd.

Dear Mr. McMillan,

This letter is in response to your request for information, on moose in the southwest portion of the Tobeatic, in your September 26, 2001 e-mail to me. The information that follows is a result of work that I am doing in the Tobeatic for my master's thesis. I have attached a map that outlines your approximate study area and includes areas that I have marked which I believe would hold the most potential for moose in the area. Much of my discussion will be based on the components of this map.

On the map, I have plotted the positions of a number of pellet group inventory (PGI) transects that are located in the area. These transects are surveyed each year, in the spring, with the number of moose and white-tailed deer pellet groups being recorded. This information is used to assess relative changes in density, however it is not an absolute density estimate. The information is used to look at trends only. Pellets found on these transects can also be used to indicate winter habitat use as well.

The PGI transect that is located on the western boundary of your study area, has more or less been consistent with moose pellet groups along it since PGI surveys were started in 1983 (range 0-10 pellet groups). In particular, since 1997 there have been pellet groups recorded along the transect each year (range 2-10). A second transect located 500m east of your eastern boundary has consistently shown no pellet groups since 1990, except in 1999 when 1 pellet group was found. Two other transects located north of your northern boundary were established in 2000 as part of an attempt to more intensely survey the Tobeatic to get a better idea of the moose population density. There were no pellet groups recorded along these two transect when surveyed in 2000. However a transect located approx. 3 km north of the Flintstone Rock area has been more or less consistent showing moose pellet groups since 1983 (range 0-5). In addition to the PGI transects, as you can see from the map, there is also a moose aerial survey unit that encompasses part of the northeastern portion of your study area. This unit was surveyed during the winter of 2000 with no moose being recorded in the unit.

As I mentioned before, the transect on the western boundary has consistently had pellet groups recorded along it since 1997. In looking at the habitat characteristics of the area that I have sectioned out on the western portion of your study area, this area provides many of the habitat requirement for moose. This area consists of predominately softwood stands with hardwood stands mixed in. Barrens make up the remaining area. Hardwoods and the barrens would provide moose with feeding areas and the softwood stands would provide shade and cooler temperatures during warm summer days. During summer months, moose with their summer coats start showing signs of heat stress when air temperatures go above 14°C. As well, during the late winter periods with warmer days, moose begin to exhibit heat stress when temperatures start going above -5°C. Softwood stands provide areas for moose to reduce their heat stress. As well in this area, there are

number of wetlands and lakes. Potential suitable areas for calving. The eastern portion that I sectioned out has many of the same habitat characteristics and therefore would serve as potential moose habitat as well.

As part of my research of moose in the Tobeatic, telemetry collars were placed on a number of moose. Having tracked these individuals for approx. 3 years, we have noticed that these moose do not move long distances. There is very little or no movement from their established home ranges. Therefore I would suggest that moose using the western portion of your study area are not moving very far.

In addition to looking at population estimates, my research involves developing a habitat use model based on pellet group data and telemetry data from the Tobeatic. This I hope will provide some insight into the habitat components that moose are using in this region. My goal is to then look at the greater southwest NS area and mainland NS to determine the availability of such habitat. This portion of my analysis is ongoing and at this point I am not in a position to say anything more about specific habitat use. Perhaps once I am finished analyzing the habitat data, we could discuss this issue again.

As you are well aware, mainland moose have been flagged as a "Red Species" by DNR. This designation means, at risk of extinction. Although small numbers of moose exist throughout mainland NS, it is believed that the moose of the Tobeatic represents one of the last pockets of indigenous moose on mainland NS. There are many factors that have led to the decrease in mainland moose, but it is thought that habitat fragmentation is one of the more important ones.

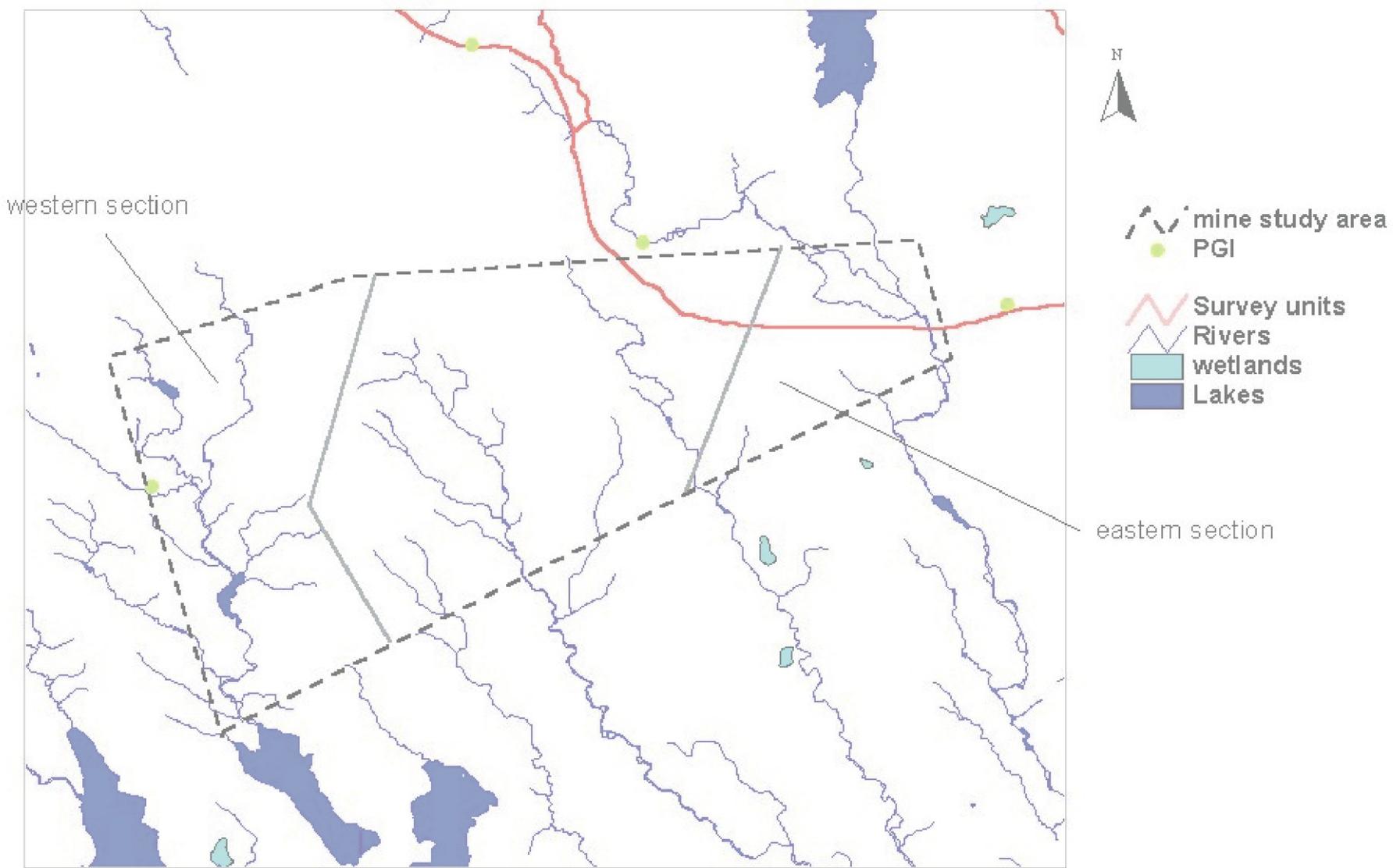
As you can appreciate, I cannot give you an exact estimate of moose numbers in your area. What I can say is that in the entire Tobeatic region, moose densities are below 1 moose/km<sup>2</sup>. Specifically in your area, you might be looking at 6 moose. It's really hard to say. As you can pick out of the PGI data that I presented, the number of moose are not great. As I pointed out earlier, the habitat on the western side of the study area is what I would consider somewhat decent moose habitat. Keep in mind that moose are threatened and are at what some would consider a critical juncture. What we need to do is retain as many of the habitat components that we can, to ensure that moose have the basic building blocks to begin a recovery.

Thank you for giving me an opportunity to provide input. If you would like to discuss this issue further, or at some juncture in the future would like to see my final analysis, please contact me.

Sincerely,

Dennis Brannen  
Acadia Centre for Wildlife  
and Conservation Biology  
Acadia University

# Review of Moose Presence and Habitat in the Southwestern Portion of the Tobeatic



**Appendix I**  
**NSDNR Raptor Guidelines**

## Suggested Guidelines for the Management of Woodland Hawks

### Introduction

Forest-dwelling hawks in Nova Scotia inhabit a variety of forest habitats and therefore the extent to which hawks depend upon on a forest stand varies with the forest cover and the type of forest management. Hawks that require mature or older growth forests are affected by any forest practices which tend to replace extensive older forest stands with those having shorter rotation periods. Goshawks for example breed in older, mixed forests which if clear cut and placed in short rotation cycles, will no longer be available as habitat for this species. On the other hand, sharp-shinned hawks will breed in younger-aged forests particularly those with some open areas and so these birds would benefit from short forest rotations. Both young and older forests therefore must be available to allow the survival of populations of both these and other forest-dwelling hawks. Adult breeding hawks tend to return to the same nesting area where they successfully bred and produced young in the previous year. For this reason, protection of a known breeding site is of prime importance.

These guidelines are based on information from Nova Scotia raptor nest record cards in the Maritime Nest Record Scheme (CWS), Habitat Management Guidelines for Ontario's Forest Nesting Accipiters, Buteos and Eagles prepared by Ross James, 1984, and Silviculture Practices and Raptor Habitat Associations in the Northeast by Brad Nelson and Kimberly Titus, 1988.

### Species and Habitat Requirements of Woodland Hawks in Nova Scotia

For the purposes of these guidelines, the woodland hawks include northern goshawk, sharp-shinned hawk, broad-winged hawk and red-tailed hawk. Falcons such as the merlin and kestrel are considered more open-country birds although both may be found nesting in small islands of trees in remote forest areas or along forest edges. Both the merlin and kestrel hunt over open ground, as does the red-tailed hawk, rather than within the forest proper.

#### Northern Goshawk

The goshawk inhabits extensive stands of mature or old growth hardwoods, mixed or softwood trees where understory vegetation exists and crown closure is about 50 to 60%. Nests are built in the main crotches or against the trunk on large branches well below the tops of large, preferably, hardwood trees. Often the nest tree is near a stream or lake. The nesting territory, that is the area which is actively defended, and sometimes aggressively so, is seldom less than 12 ha (30 ac) of large old trees. Distances between nesting pairs is not likely to be less than 1 km. The hunting territory of a pair of goshawks may be from 10 to 20 sq km

### Sharp-shinned Hawk

Sharp-shinned Hawks nest in dense (70 to 80% or more canopy closure) even-aged, young stands of softwoods, often not far from water. They will hunt in hardwoods and mixed woods as well as near open areas. Their favoured hunting areas are along forest edges where they depend upon quick, dashing flights to surprise and seize small birds. Their nests are built near the tops of thickly-branching conifers between 6 to 10 m (20 to 35 feet). Sharp-shinned nesting territories extend out to 100 meters around the nest or approximately 4 ha, but they will forage over an area of up to 1.2 km (3/4 mile). Nesting pairs would not likely be closer than 1 km.

### Broad-winged Hawk

Broad-winged hawks breed in dense, extensive forested tracts usually of hardwoods but sometimes, mixed hardwood and softwood forests but less often in softwood forests. Both nearly mature and mature, more open forests with predominately yellow birch and aspen rather than maple are preferred. Broad-winged hawk nests are often built near forest edges or water, in the main crotches of hardwood trees, particularly birch trees, about 7 to 12 m high (25 to 40 feet). Hunting territories may cover about 2.5 sq.km (1 sq. mi.). Prey items range from large insects, snakes, and frogs to squirrels and chipmunks which they hunt most often in forest openings, along stream and forest edges and sometimes within the forest under the canopy.

### Red-tailed Hawk

These hawks often breed in small woodlots or in scattered clumps of forest trees next to fairly large open areas which provide them with suitable hunting grounds. Nest sites are generally in mixed or hardwoods with a relatively open canopy and therefore higher shrub density. Nests are most often in birch trees but also in spruce, pine and maple, and are generally high in the tree, up to 75 feet or more. Home range size is highly variable depending upon prey availability (mainly rodents) and may be from 1.3 sq. km to 24 sq.km.

### General Guidelines

It should be noted that these general guidelines are intended for large forested areas where management for a wide variety of forest conditions may provide habitat features suitable for most of these raptors. Nonetheless, do not expect that all species will be present at all times throughout all stages of forest management.

1. Clearcutting probably has the greatest immediate impact on softwood forests clear cut in blocks over

2. Selection cutting of small patches or thinning of a few trees in hardwoods is a preferred treatment particularly for wetter areas.
  3. Encourage reforestation of blocks of low-lying lands with hardwoods.
  4. If possible, leave at least 3 to 8% of any large managed area uncut.
  5. Try to maintain a large undisturbed forest tract in the centre of any large managed area.
  6. Avoid cutting forest cover in special management zones. Leave forest cover on steep banks along rivers, streams, and around lakes, bogs and marshes.
  7. Natural regeneration which could allow a variety of uneven-aged species throughout forest succession should be encouraged.
  8. Keep road construction to a minimum and avoid constructing roads closely parallel to riparian corridors.
- Species-specific Guidelines.

Since no one prescription will adequately serve to improve forest habitats for meeting both nesting and foraging requirements of all woodland raptors, the following must be considered as suggested guidelines only for the desired species of hawk.

Table 1. Potential effects of silviculture treatments on four species of woodland raptors.<sup>1</sup>

Treatment	Northern Goshawk			Sharp-shinned Hawk			Broad-winged Hawk			Red-tailed Hawk		
	NS	HR	PA	NS	HR	PA	NS	HR	PA	NS	HR	PA
Selection	-	+	+	-	+	+	-	o	+	o	+	+
Clear-cut	-	o	+	-	+	+	-	o	+	-	+	+
Shelterwood (first cut)	-	+	u	-	o	o	-	o	o	-	o	+
Thinning	-	+	+	-	o	o	-	o	o	-	o	+
No cut	+	+	+	+	-	-	+	o	-	+	-	-

<sup>1</sup> from Nelson and Titus.

+ = positive effects, - = negative effects, o = no change, u = not known.

#### Northern Goshawk

1. To reduce the possibility of the birds abandoning the nesting area, prohibit any disturbances within 200 m of a nest site from mid-March through to mid-July.
2. If possible, leave at least 8 ha (20 acres) around the nest uncut.
3. If nest sites are unknown in preferred habitats (mature mixed woods of hemlock, birch, maple with high canopy closure) leave at least 8 to 10 ha. areas of mature trees for potential nest sites no closer than 1 to 2 km.

#### Sharp-shinned Hawk

1. To reduce the possibility of the birds abandoning the nesting area, prohibit any disturbances within 150 m of a nest site from 1st of May to the end of the first week of August.
2. Leave at least 1.6 ha (4 ac) of forest cover uncut around the nest site. This area can be left as clumps around cavity trees.
3. Where nest sites are unknown, but it is desired to manage an area for these hawks, leave uncut, a 4 ha (10 acres) stand of 20 to 40 year old spruce trees preferably near small forest openings, bogs, marshes or other edge situations.
4. Note that in Table 1, selection (patch) cutting provides some possible benefits to sharp-shinned hawks by opening up areas for hunting.
5. Small clear cuts (0.4ha) which produce patches of early successional vegetation as well as increasing edge, also may improve habitats for sharp-shinned hawks.

#### Broad-winged Hawk

1. To reduce the possibility of the birds abandoning the nesting area, prohibit any disturbances within 200 m of a nest site from the 1st of May through to the end of July.
2. If possible, leave at least a 8 ha (20 ac) area uncut around the nest site.
3. As these birds require relatively extensive stands of mixed forests with a large hardwood component, where possible, leave

Red-tailed Hawk

1. To reduce the possibility of the birds abandoning the nesting area, prohibit any disturbances within 150 m of a nest site from 1st of April to the end of the first week in July.

2. Leave at least 1.6 ha (4 ac.) of forest cover uncut around the nest site.

3. Shelterwood cuts and thinnings that reduce relative stand density to 60%, for example a first cut in the shelterwood sequence, or a thinning, may favour red-tailed hawks.

4. If a stand is to be managed for these birds, plan for 200-400 overstory trees/ha. with not more than 40% of the trees with 20 + cm dbh.

5. Clearcuts, which are detrimental to the nest-site, may be beneficial to these birds as hunting grounds.

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