ORIGINAL

FPL Energy

FPL Energy Maine, 150 Main Street, Lewiston, ME 04240
207-795-1342

December 28, 2007

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: INDIAN POND PROJECT (FERC No. 2142), INDIAN POND SETTLEMENT AGREEMENT AND LICENSE ARTICLE 401 COMPLIANCE: SMALLMOUTH BASS INVASION ASSESSMENT REPORT

Dear Ms. Bose,

Please find attached the Upper Kennebec and Dead River Tributaries Smallmouth Bass Investigations Report for the Indian Pond Project, completed as part of compliance work for the Indian Pond Settlement Agreement and License Article 401 of the new FERC license.

In an order issued July 18, 2007, FERC indicated that by December 31, 2007, FPL Energy should file with FERC a report with results of the Smallmouth Bass investigations. A draft of this report was submitted to the Indian Pond Project Fisheries Committee Members for review and comment on November 21, 2007. The Committee is made up of representatives from Maine Department of Inland Fisheries and Wildlife (MDIFW), the United States Fish and Wildlife Service (USFWS), Trout Unlimited (TU), Maine Trout (MT), and the Forks Chamber of Commerce (FCC). MDIFW, MT, and USFWS provided comments which are attached. TU and FCC didn't provide any comments.

The attached report has been revised to incorporate these comments, as applicable. MT commented on the frequency and intensity of sampling performed as part of this study. Regarding this comment, the sampling protocol used in this study was previously established in consultation with MDIFW. FPL Energy believes that the frequency and intensity of sampling done during this study adequately met the goals and objectives of this study. FPL Energy will further discuss the MT comment at the next Fisheries Committee meeting in 2008.

Please feel free to contact Bob Richter at 207-877-8386, Ext 10, if you have any questions.

Sincerely,

Christopher L. Allen
General Manager, Maine Generation

Attachments

692 Cathance Road
Topsham, ME 04086
December 13, 2007

Dear Dana,

The study of bass in the tributaries of the Kennebec and Dead rivers at The Forks does not seem to me to make a very convincing statement. I feel strongly that a one run sample does not give much credence to the results. There were two streams, Spencer and Enchanted, where no trout were found but it is known that trout can be found there. In Spencer Stream no bass were found but the report states that they know bass are there. This alone should indicate the need for more sampling. I would like to see sampling done in different parts of the streams as was done on Pleasant Pond Stream. After this first sampling the number of streams sampled could be cut down and those that have the greatest impact on trout in the river sampled further.

It seems to me that in order to get accurate information, stream temperatures should be taken several different times during the summer months, rather than only in a span of a few days. Forrest Bonney's study on Cold STream indicates a maximum monthly average temperature of 23 C over a one month period, well within the preferred bass range. I would like to see sampling in Cold Stream closer to the Kennebec River where trout spawning was evident. and done below and above the accepted barrier. For me the map does not clearly indicate where some of the sampling took place. Tomhegan Brook samples seem to have been taken at the mouth where it comes into Cold Stream which might make them Cold Stream trout. I am also not sure where the sampling was done at The Gut--upstream or at the pool where the Gut run empties. I remember this being close to a four foot drop, but it has been a number of years since I have been there.

I have limited knowledge of sampling methods and I am sure there are many difficulties encountered in a study such as this that I am not aware of. Thank you for giving me the opportunity to comment.

Sincerely,

Jim Lentz

Valleau, Dana (Augusta,ME-US)

From: Fred_Seavey@fws.gov
Sent: Monday, December 24, 2007 11:30 AM
To: robert_richter@fpl.com
Cc: Valleau, Dana (Augusta,ME-US); forrest.bonney@maine.gov; steve.timpano@maine.gov
Subject: Indian Pond Project (FERC No. 2142) - Review of Draft Investigations Relating to Smallmouth Bass

The U.S. Fish and Wildlife Service has reviewed the November 20, 2007 draft report on smallmouth bass presence and potential bass barriers on tributaries of the Indian Pond Project impoundment. We concur with the findings in the report and have no additional comments. Thank you for the opportunity to review the draft report.

/s/ Frederic G. Seavey

==========
Fred Seavey
U.S. Fish & Wildlife Service
Fish & Wildlife Biologist
1168 Main Street
Old Town, Maine 04468
v: (207) 827-5938 ext. 16
f: (207) 827-6099
==========

CERTIFICATE OF SERVICE

Indian Pond Project, FERC No. 2142

I, Robert C. Richter III, Senior Environmental Specialist for FPL Energy, hereby certify that copies of the foregoing documents have been filed with the following parties of record on December 28, 2007:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Mr. Forrest Bonney
ME. Department of Inland Fisheries and Wildlife
689 Farmington Road
Strong, ME. 04983

Mr. Fred Seavey
U.S. Fish and Wildlife Service
1168 Main Street
Old Town, ME 04468-2023

Mr. Steve Timpano
ME Dept of Inland Fisheries and Wildlife
41 State House Station
Augusta, ME 04333

Mr. Jeff Reardon
Trout Unlimited
Maine Council
8 Crosby Street
Augusta, ME 04330

Mr. Joe Christopher
Forks Chamber of Commerce
Three Rivers Whitewater
P.O. Box 10
West Forks, ME 04985

Mr. Jim Lentz
ME Trout
692 Cathance Road
Topsham, ME 04086

Mr. Craig Denis
Trout Unlimited
38 Daggett Hill Rd.
Athens, ME. 04912

Robert C. Richter III

12-28-07
Date

an FPL Group company

Upper Kennebec and Dead River Tributaries Smallmouth Bass Investigations

Indian Pond Project
FERC Project No. 2142

Submitted to:

FPL Energy Maine Hydro LLC
150 Main Street
Lewiston, ME 04240
Phone: 207-795-1342

Submitted by:

TRC Engineering, LLC
249 Western Avenue
Augusta, ME 04330
Phone: 207-621-7000

December 28, 2007

TABLE OF CONTENTS

1.0 INTRODUCTION

The Indian Pond Project (Project, FERC No. 2142) is located northwestern Maine, in the upper portion of the Kennebec River Basin approximately 30 miles from the Canadian Border, and approximately 152 miles above the river mouth. The Project's hydroelectric facility, Harris Dam, is located at the headwaters of the Kennebec River, in Chase Stream Township, in Somerset County, Maine.

The license for the Indian Pond Project was issued on January 14, 2004. In part, this license enforces the conditions of the Indian Pond Settlement Agreement, dated July 25, 2001. Section 3.3.3 of this agreement mandates fisheries enhancements for the Indian Pond Project. Under Section 3.3.7, the licensee is to develop, in consultation with the Fisheries Committee, a study plan for construction of a series of habitat restoration projects. Draft study plans were distributed to members of the Fisheries Committee on October 6, 2006. Written comments were supplied by the U.S. Fish and Wildlife Service (FWS) committee member in a letter dated February 16, 2007. In addition to other comments, the FWS noted that Maine Department of Inland Fisheries and Wildlife (MDIFW) raised the issue of invasive smallmouth bass presence in the monitored streams.

The FWS and MDIFW requested that this issue be investigated as part of the process to enhance and restore coldwater fisheries. The FWS and MDIFW recommended a study plan to: review the existing information and describe potentials for bass invasions into project waters; conduct surveys to determine the presence of bass in waters for which bass presence is not known; define the passage criteria for bass at barriers; and locate and measure barriers in area streams not known to harbor bass. The licensee contracted the services of TRC Engineering to perform these investigations in 2007. This report documents the results of these investigations.

1.1 *Study Area*

The study area for this investigation includes: tributaries to the Upper Kennebec River between Harris Dam and the Wyman Lake impoundment (approximately 19 miles downstream from Harris Dam); and tributaries to the Dead River between Grand Falls and the Dead River's confluence with the Kennebec River. This confluence occurs approximately 12 miles below the Harris Dam, where the Dead River enters the Kennebec from the west.

While numerous tributaries exist along the Upper Kennebec and Dead Rivers within the study area, 15 were selected for the purpose of this investigation during scoping of the proposed study based upon feasibility ratings presented in Desktop Review for Fisheries Enhancement at the Indian Pond Project (Desktop Review: E/PRO 2005). Ten of these are tributaries to the Kennebec; these include Chase Stream, Dead Stream, Carry Brook, Fish Pond Stream, Cold Stream, Tomhegan Brook, Kelly Brook, Holly Brook, Moose Pond Stream, and Pleasant Pond Stream. Five of the tributaries inspected flow into the Dead River; these include Spencer Stream, Alder Pond Stream, Enchanted Stream, Salmon Stream, and Durgin Brook.

A map of the study area, which also identifies the 15 selected tributaries, is provided in Figure 1.

1.0 INTRODUCTION

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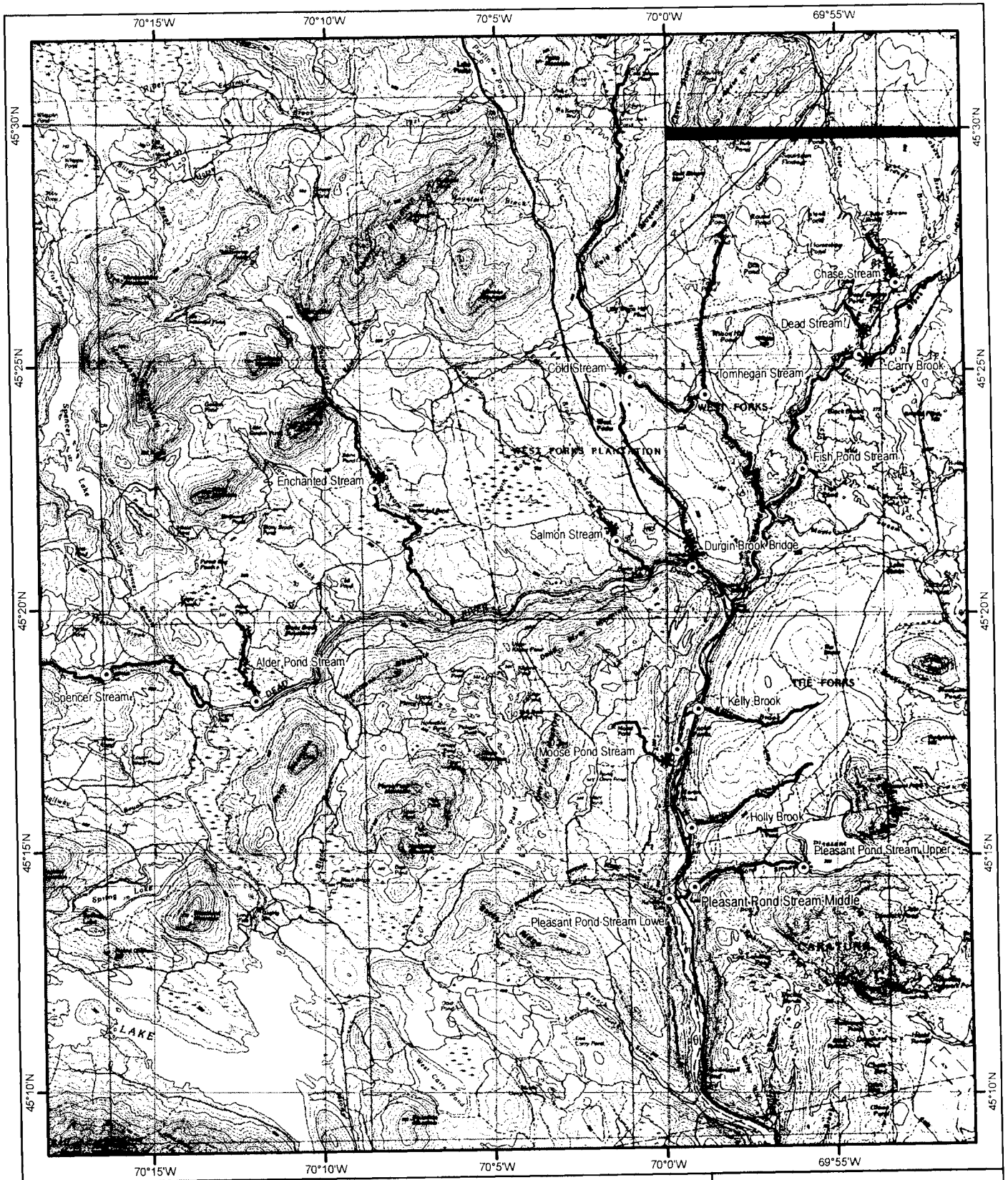


1.2 *Previous Research*

Several studies have been undertaken within the study area in recent years; many of these occurred as part of Project relicensing. One pivotal study involved intensive telemetry based tracking of radio-tagged salmonids in the Upper Kennebec River, the Dead River, and their tributaries in 1999 and 2000 (E/PRO 2000).

In 2005, the licensee contracted TRC to perform a Desktop Review for Fisheries Enhancement at the Indian Pond Project (E/PRO 2005). This review ascertained valuable information regarding potential restoration sites through extensive historical, literary and anecdotal research, with the goal of determining feasibility of brook trout habitat restoration/enhancement in these tributaries. Information collected and summarized in the report included construction access, suitability of stream water temperatures for salmonids, presence of bass, presence of barriers to bass, upstream access from river main stems, stream order, stream length, and drainage area. This Desktop Review has been a key information source for the current project.

2.0 METHODS

Four tasks were undertaken in order to fulfill the objectives of this investigation; these include reviewing existing information (including agency consultation), defining passage criteria for smallmouth bass at natural and man-made barriers, locating and measuring existing natural barriers in streams that are not known to have smallmouth bass, and conducting surveys to determine if smallmouth bass are present. The methods germane to each of these tasks are described, below.

2.1 *Review of Existing Information*

Numerous sources were consulted during the literature review phase of this investigation. Resources included (but were not limited to) Habitat Suitability Information (HSI) for Smallmouth Bass (Edwards et al. 1983), Indian Pond salmonid telemetry studies conducted during Project relicensing (E/PRO 2000), and the Desktop Review (E/PRO 2005). An internet-based literature search for topics related to smallmouth bass invasion, passage criteria, and other relevant topics was also performed.

TRC biologists also met with Forrest Bonney, Regional Fisheries Biologist for the Maine Department of Inland Fisheries and Wildlife (MDIFW) on August 21, 2007 (See meeting memo in Appendix 1). Dave Boucher, another Regional Fisheries Biologist for the MDIFW, was also consulted via telephone.

2.2 *Defining Passage Criteria for Smallmouth Bass*

This task was performed as part of the review of existing information and agency consultation.

2.3 *Locating and Measuring Existing Natural Barriers*

For this task, two general categories of streams were identified: those with known barriers and those with no known barrier. These were identified through review of the Desktop Review, personal communication with FPLE biologists, personal communication with local residents, or personal knowledge of the field personnel. For streams with known barriers, field personnel visited the known barriers and collected location data with a hand-held GPS. The height of barrier were measured with a tape when possible, otherwise, visual estimates were made. For streams where the presence of a barrier was not known, the stream channels were walked by field personnel from downstream to upstream. Streams were walked upstream until a barrier was identified, to the first road crossing, or to a point determined to be sufficient by the best professional judgment of the field personnel.

2.4 *Surveys to Determine Presence of Smallmouth Bass*

Smallmouth bass presence surveys were conducted by one run with a backpack electrofishing unit below the lower most barrier found. Where no barrier was found, surveys were conducted relatively close to the main stem of the river. MDIFW survey protocol for Level 3 Assessment was utilized, however, one-run samples were performed at the request of Forrest Bonney (rather than three-run sampling as prescribed by the standard protocol). Per this protocol, sample areas were at least 500 square yards wherever possible. MDIFW data forms were filled out at each sampling location. Water chemistry samples including temperature, dissolved oxygen (DO), conductivity, alkalinity, and pH were also collected at each stream.

3.0 RESULTS

3.1 *Consultation and Literature Review*

Agency consultation and literature review ascertained critical information relative to the following topics:

- known distribution of smallmouth bass in the study area;
- known movements of radio tagged fish in the study area;
- presence of known barriers to upstream fish movement; and
- appropriate standards for assessing potential barriers to fish passage (ie. vertical height).

Each of these items is discussed in detail, below.

3.1.1 Distribution of Smallmouth Bass in the Study Area

Smallmouth bass are known to occur in the main stem of the Kennebec River throughout the study area. Bass are also known to inhabit the main stem of the Dead River from the confluence with the Kennebec River in the West Forks upstream to Grand Falls, which is a barrier to upstream fish passage. These fish are also well established in waters upstream of Harris Station, including Indian Pond, the East Outlet, West Outlet, Long Pond, Moosehead Lake, and Prong Pond.

Smallmouth bass have been documented in Moxie Pond and Moxie Stream, which flows into the Kennebec River. They have also been documented in Little Spencer Stream, a tributary to Spencer Stream which flows into the Dead River just below Grand Falls. As such, smallmouth bass likely occur in the lower reaches Spencer Stream; however, bass have not been documented in Spencer Stream to date.

3.1.2 Known Movements of Radio-Tagged Fish in the Study Area

Extensive radio-telemetry studies were performed during the recent relicensing of the Indian Pond Project. These studies, which focused on salmonids (primarily brook trout), documented widespread fish movement throughout the study area (E/PRO 2000). Radio tagged salmonids were observed to move within the main stem of the Kennebec River from Wyman Lake to Harris Dam and into its tributaries, particularly Cold Stream and Pleasant Pond Stream. Fish tagged below the confluence of the Kennebec and Dead Rivers were observed to move upstream from the Kennebec into the Dead River. Movement within the Dead River watershed extended to Grand Falls along the main stem, and into Spencer Stream. These studies demonstrate the interconnected nature of this watershed and provide some insight on the potential for smallmouth bass to exhibit similar freedom of movement.

3.1.3 Previously Documented Barriers

Several potential barriers on tributaries within the study area were informally documented during relicensing studies and the Desktop Review (E/PRO 2005). Tributaries with known barriers include Chase Stream, Dead Stream, Carry Brook, and Durgin Brook. However, due to the informal and/or anecdotal identification of these formations, accurate locations and detailed physical characteristics were not always clearly described. Nonetheless, these sources served to provide some focus for this investigation.

Several potential barriers on Cold Stream were also documented during a biological survey of Cold Stream, performed during the summer of 2004 by MDIFW (Bonney 2005). This assessment was conducted to quantify brook trout habitat, habitat conditions, and help formulate recommendations for regulations that would protect the wild brook trout fishery found in the stream. The stream was surveyed on foot, and locations of habitat changes and physical characteristics such as potential barriers were located with GPS.

3.1.4 Standards for Assessing Potential Barriers to Fish Passage

Despite an exhaustive literature search, little applicable data was found which defines passage criteria for smallmouth bass. However, the MDIFW regional biologists who were consulted as part of this investigation have extensive recent experience germane to this subject. For example, MDIFW has been intimately involved with ongoing studies in the Rapid River watershed, where smallmouth bass have recently become established and threaten a wild brook trout fishery of national significance.

Based on this experience, the MDIFW is currently applying a standard of four vertical feet to define a barrier sufficient to preclude upstream smallmouth bass movement. This standard is similar to what is considered a barrier to upstream brook trout movement. MDIFW has conducted investigations above and below such barriers since institution of this standard, and have repeatedly supported the 4-foot-vertical-drop guideline (personal communication with Dave Boucher, MDIFW). This is not, however, an absolute as various factors can affect the functional height of a barrier. For example, seasonal variations in flow and tailwater elevation during high flow events may render some obstructions temporarily passable. Such variables must be considered on a case by case basis.

3.2 *Field Surveys*

Field surveys were performed between August 27 and August 29, 2007. Maps of each stream with survey location and barrier location (if any) are provided in Appendix 2. Photos of each stream and barrier are provided with the description. Physical attributes of each of the stream sampled, including a species list of fish found, are summarized in Table 1. Water chemistry for each stream can be found in Table 2. Number and size class information for brook trout sampled during stream surveys is presented, by stream, in Table 3. Summaries of observations obtained at each stream are provided below; these

are presented in order of occurrence upstream-to-downstream for each main stem river. A synthesized discussion of findings is provided in Section 4.0.

Table 1: Physical Attributes of Surveyed Streams

Stream Name	Stream Order	Natural Barrier (waterfall) (Y/N)	Man Made Barrier (Y/N)	Barrier Location (Lat./Long.)	Barrier Vertical Drop (ft.)	Fish Species Present
Chase Stream	2	Yes	No	N45°26.784 W69°53.217	25'	BKT, BND
Dead Stream	3	Yes	No	N45°25.780 W69°54.107	12'	BKT
Carry Brook	2	Yes	No	N45°25.298 W69°54.281	20'	BKT, BND
Fish Pond Stream	2	No	No	N/A	N/A	BKT
Cold Stream	4	Yes	No	N45°25.003 W70°01.308	6'	BKT, BND
Tomhegan Stream	3	No	No	N/A	N/A	BKT
Kelly Brook	1	No	No	N/A	N/A	BKT, SCU, BND
Holly Brook	1	No	No	N/A	N/A	BKT, SCU
Moose Pond Stream	2	Yes	No	N45°17.158 W69°59.740	16'	CRC, BAK, BKT, SCU, BND
Pleasant Pond Stream						
Upper	2	No	Yes (dam)	N45°14.709 W69°55.931	4' (dam)	BKT, BND
Middle	3	No	No	N/A	N/A	BKT, RBT, SCU, BND, WHS
Lower	3	No	No	N/A	N/A	BKT, RBT, FAF, SCU, BND, FSD, CRC, WHS, COS, SMB
Spencer Stream	5	No	No	N/A	N/A	CRC, COS, BND
Alder Pond Stream	1	No	No	N/A	N/A	BKT, CRC
Enchanted Stream	4	Yes	No	N45°22.561 W70°08.473	5'	CRC, BND, COS, WHS
Salmon Stream	3	Yes	No	N45°21.495 W70.01.438	6'	BKT, BND, CRC
Durgin Brook	2	No	Yes (culvert)	N45°20.986 W69°59.204	5.5' (culvert)	BKT, SCU

Fish Species Key: BKT = Brook Trout, FSD = Finescale Dace, BND = Black Nosed Dace, CRC = Creek Chub, SCU = Sculpin, COS = Common Shiner, WHS = White Sucker BAK = Banded Killifish, RBT = Rainbow Trout, FAF = Fall Fish, SMB = Small Mouth Bass

Table 2: Water Chemistry

Stream Name	Temp (°C)	DO (mg/l)	DO percent saturation	Alkalinity (mg/L)	pH	Conduc-tivity
Chase Stream	18.8	8.68	93%	14	7.5	38
Dead Stream	16.6	9.13	93%	14	7.5	37
Carry Brook	15	9.24	91%	11	7.1	33
Fish Pond Stream	14.9	9.31	92%	36	7.6	68
Fish Pond Stream- Duplicate	14.9	9.31	92%	35	7.7	70
Cold Stream	16	9.64	97%	7	7	36
Tomhegan Stream	16.4	9.8	100%	20	7.5	46
Kelly Brook	15.4	10.09	100%	16	7.2	42
Kelly Brook- Duplicate	15.4	10.09	100%	16	7.2	41
Holly Brook	14.1	10.05	97%	29	7.6	67
Moose Pond Stream	15.1	10.3	102%	29	7.5	60
Pleasant Pond Stream	17	9.34	96%	18	7.5	48
Middle	17	9.34	96%	18	7.5	48
Lower	17	9.34	96%	18	7.5	48
Spencer Stream	18.9	8.44	90%	14	7.4	38
Alder Pond Stream	20.6	7.7	85%	17	7.3	42
Alder Pond Stream- Duplicate	20.6	7.7	85%	17	7.3	42
Enchanted Stream	16	9.5	96%	12	7.4	33
Salmon Stream	17.6	9.73	101%	14	7.5	43
Durgin Brook	13.1	10.2	96%	20	7.4	150
Durgin Brook- Duplicate	13.1	10.2	96%	18	7.3	150

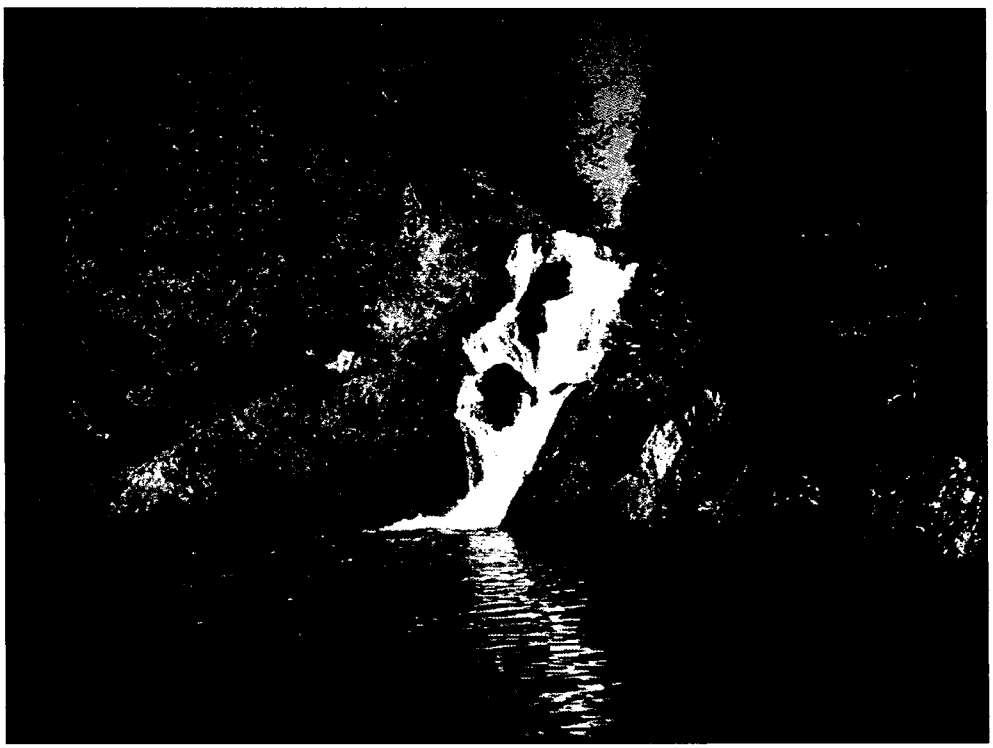
Table 3: Brook Trout Number and Size Class Data

Stream Name	Total # Captured	Young-of-the-year	Age 1+	Age 2+
Chase Stream	1		1	
Dead Stream	1			1
Carry Brook	1		1	
Fish Pond Stream	7	6	1	
Cold Stream	5	3	2	
Tomhegan Stream	15	11	2	2
Kelly Brook	29	8	20	1
Holly Brook	26	12	13	1
Moose Pond Stream	31	27	5	
Pleasant Pond Stream-Upper	6	6		
Pleasant Pond Stream-Middle	7	2	3	2
Pleasant Pond Stream-Lower	1	1		
Spencer Stream- Gut	0			
Alder Pond Stream	6	5		1
Enchanted Stream	0			
Salmon Stream	7			7
Durgin Brook	21	8	6	7

3.2.5 Kennebec River Tributaries

Chase Stream

Chase Stream is a tributary to the Kennebec River, in Moxie Gore Township. A sheer waterfall barrier of approximately 25 feet was found one quarter of a mile upstream from the confluence with the Kennebec River. The area sampled was 0.16 mile (900 feet) upstream from the confluence with the Kennebec River and consisted of approximately 500 square yards of the stream. Stream substrate consisted of cobble and gravel; habitat consisted of pool and riffle. Within the surveyed area two species of fish, brook trout and black nosed dace, were found in small numbers. No smallmouth bass were found. Please refer to Table 1 for Chase Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.



Chase Stream Falls

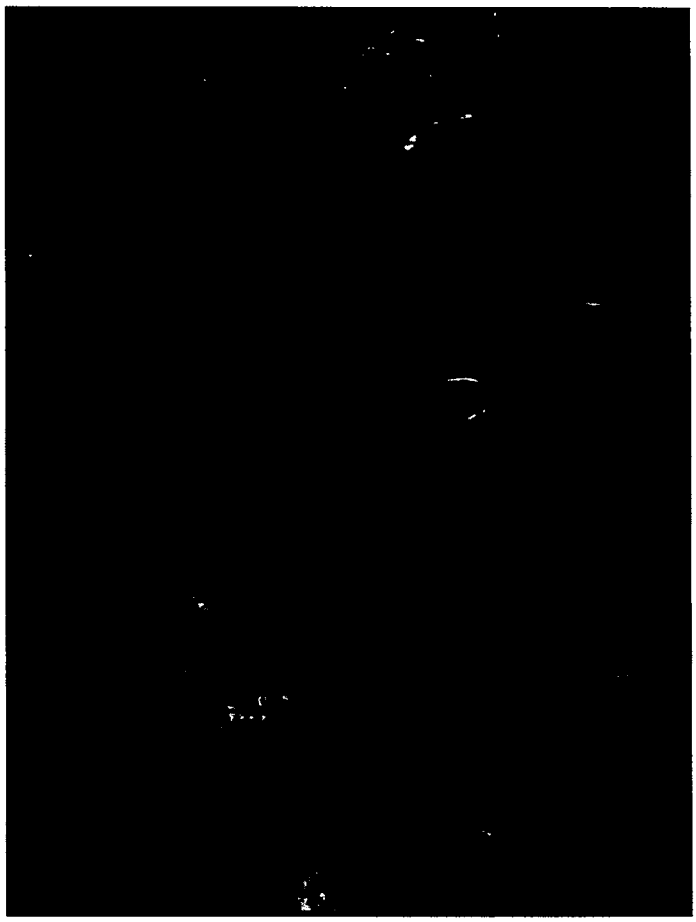
Dead Stream

Dead Stream is a tributary to the Kennebec River, in Moxie Gore Township. A sheer waterfall barrier, approximately 12 feet high is located approximately 50 feet upstream from the confluence with the Kennebec River. The area sampled consisted of roughly 500 square feet of stream, which included the entirety of the stream area found below the falls. Stream substrate consisted of cobble and gravel; habitat consisted of pool and riffle. Within the surveyed area one individual fish, a brook trout, was found. No smallmouth bass were found. Please refer to Table 1 for Dead Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.

Dead Stream Falls

Carry Brook

Carry Brook is a tributary to the Kennebec River, in Moxie Gore Township. A multiple ledge drop barrier of about 20 feet in height is found about 150 feet upstream of the confluence with the Kennebec. All of this area was sampled and consisted of approximately 1500 square feet of stream. Stream substrate consisted of cobble and gravel, and the habitat was primarily riffle. Within the surveyed area two species of fish, brook trout and black nosed dace, were found in very small numbers. No smallmouth bass were found. Please refer to Table 1 for Carry Brook's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this brook is provided below; a map is provided in Appendix 2.



Carry Brook

Fish Pond Stream

Fish Pond Stream is a tributary to the Kennebec River, in Moxie Gore Township. Although the stream gradient is high, no barrier to upstream fish movement was found. The area sampled consisted of approximately 500 square yards of stream, starting just above the confluence with the Kennebec River and extending upstream. The majority of stream substrate consisted of boulder and cobble. Habitat consisted of pools and riffles. Within the surveyed area, only small numbers of brook trout were found. No smallmouth bass were found. Please refer to Table 1 for Fish Pond Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.

Fish Pond Stream

Cold Stream

Cold Stream is a tributary to the Kennebec River, in West Forks Plantation. Several potential barriers to upstream movement of fish were found in a reach of the stream 2.89

to 2.95 miles upstream from the confluence with the main stem of the Kennebec River during the biological survey conducted by MDIFW in 2004 (Bonney 2005). The potential barrier in this area was made up of 3 step falls, with a total drop of approximately 35 feet (See photo below). Electrofishing performed during 2004 downstream of this barrier, 1.9 miles upstream of the confluence with the Kennebec River, found brook trout, black nosed dace, and slimy sculpin. No smallmouth bass were observed. Several other barriers are noted in the biological survey report between 2.95 miles and 6 miles upstream of Cold Stream's confluence with the Kennebec River. The efficacy of these barriers is questionable, however, since a radio-tagged brook trout had moved from the Kennebec River to approximately 6 miles up Cold Stream during July and August 2000 (E/PRO 2000). During the stream surveys undertaken in 2007, a 6-foot waterfall barrier was found 6.3 miles upstream from the confluence with the Kennebec River. During 2007, the area sampled was approximately 6 miles upstream from the confluence with the Kennebec River and consisted of approximately 500 square yards of stream. Stream substrate consisted of cobble and gravel; habitat consisted of pool and riffle. Within the surveyed area, two fish species were found in small numbers: brook trout and black nosed dace. No smallmouth bass were found. Please refer to Table 1 for Cold Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. Photographs of this stream are provided below; a map is provided in Appendix 2.

Cold Stream potential barriers at 2.89 miles upstream from Kennebec River

Cold Stream barrier at 6.3 miles upstream from Kennebec River

Tomhegan Stream

Tomhegan Stream is a tributary to Cold Stream in the Kennebec River watershed; it is located in Lower Enchanted Township. This stream was surveyed from the confluence with Cold Stream up to the first road crossing. No barrier to upstream fish movement was found. The area sampled was located at the confluence of Tomhegan Stream and Cold Stream, approximately 3.7 miles upstream from the confluence of Cold Stream with the Kennebec River; it consisted of approximately 500 square yards of stream. Stream substrate consisted of cobble and gravel; habitat consisted of riffle and run. Within the surveyed area one species of fish, brook trout, was found. No smallmouth bass were found. Please refer to Table 1 for Tomhegan Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. Photographs of this stream are provided below; a map is provided in Appendix 2.

Tomhegan Stream Photo # 1

Tomhegan Stream Photo # 2

Kelly Brook

Kelly Brook is a tributary to the Kennebec River, located in The Forks. A formation of large boulders which constituted a 4-foot vertical drop was found 0.4 mile upstream from the brook's confluence with the Kennebec River. The overall vertical magnitude of this drop is likely reduced during high flows, and may not constitute a barrier to upstream fish movement under such conditions. Furthermore, this formation was comprised of loose boulder material that is subject to movement over time; therefore, it cannot be considered a permanent barrier.

The area sampled for this brook consisted of approximately 500 square yards of stream just below the described boulder formation (e.g. this drop defined the upstream limit of sampling). Stream substrate consisted of boulder and cobble; habitat consisted of riffle, run, and pool. Within the surveyed area three species of fish, brook trout, slimy sculpin, and black nosed dace, were found. No smallmouth bass were found. Please refer to Table 1 for Kelly Brook's physical attributes, Table 2 for water chemistry, and Table 3 for

brook trout numbers captured. A photograph of this brook is provided below, a map is provided in Appendix 2.

Kelly Brook

Holly Brook

Holly Brook is a tributary to the Kennebec River, located in The Forks. A formation of large boulders which constituted a 3.5-foot vertical drop was found 0.4 mile upstream from the brook's confluence with the Kennebec River. The overall vertical magnitude of this drop is likely reduced during high flows, and may not constitute a barrier to upstream fish movement under such conditions. Furthermore, this formation was comprised of loose boulder material that is subject to movement over time; therefore, it cannot be considered a permanent barrier.

The area sampled for this brook consisted of approximately 500 square yards of stream just below the described boulder formation (e.g. this drop defined the upstream limit of sampling). Stream substrate consisted of boulder and cobble; habitat sampled consisted of riffle, run, and pool. Within the surveyed area two species of fish, brook trout and

slimy sculpin, were found. No smallmouth bass were found. Please refer to Table 1 for Holly Brook's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this brook is provided below; a map is provided in Appendix 2.

Holly Brook

Moose Pond Stream

Moose Pond Stream is located in Bowtown Township. A 16 foot waterfall barrier was found approximately 0.1 of a mile upstream from the confluence with the Kennebec River. The area sampled consisted of approximately 500 square yards of stream, beginning at the confluence with the Kennebec River and extending upstream. Stream substrate consisted of cobble and gravel; habitat consisted of riffle, run, and pool. Within the surveyed area five species of fish, brook trout, creek chub, banded killifish, slimy sculpin, and black nosed dace were found. Brook trout was the most abundant fish species. No smallmouth bass were found. Please refer to Table 1 for Moose Pond Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout

numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.

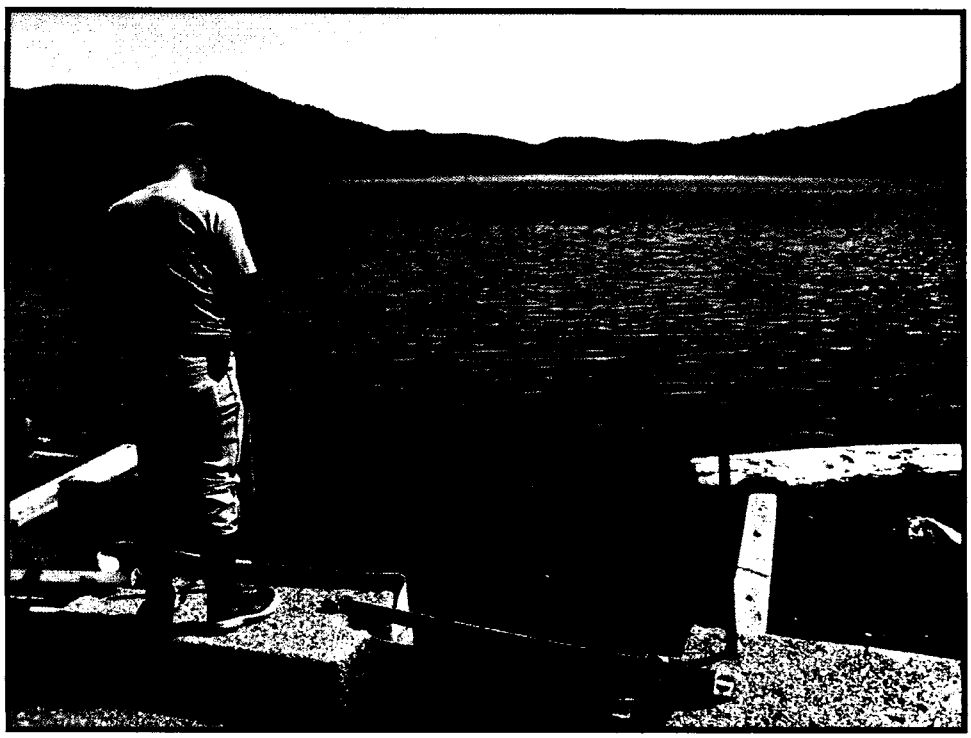
Moose Pond Stream Falls

Pleasant Pond Stream: Upper, Middle, & Lower

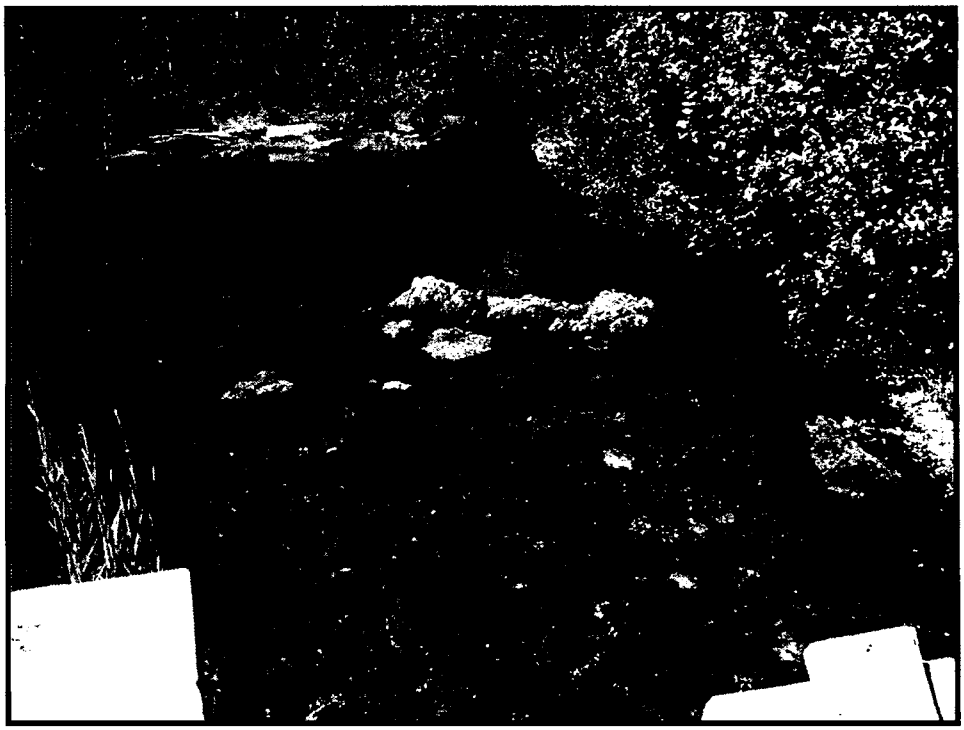
Pleasant Pond Stream is located in Caratunk Township. No barrier was found on this stream except for the outlet dam at Pleasant Pond, a 4-foot, man-made dam found approximately 3.8 miles upstream from the confluence with the Kennebec River. Since a smallmouth bass was captured at the lowermost sampling site, additional sites were surveyed between the lowermost site and the outlet dam to determine if bass are distributed throughout the stream. Please refer to Table 1 for Pleasant Pond Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured.

At the uppermost site, just below the outlet dam, the area sampled consisted of approximately 500 square yards of stream with the base of the dam defining the upper

limit of the sample area. Stream substrate consisted of sand, cobble, and gravel; habitat consisted of run. Within the surveyed area, two species of fish, brook trout and black nosed dace, were found in small numbers. No smallmouth bass were found. Photographs of this stream, including the dam, are provided below; a map is provided in Appendix 2.



Pleasant Pond, Outlet Dam



Pleasant Pond Stream, Below Outlet Dam

Area sampled in middle reach of Pleasant Pond Stream was located approximately 0.8 mile upstream of the confluence with the Kennebec River and consisted of approximately 500 square yards of stream. Stream substrate consisted of boulder and cobble; habitat consisted of run and riffle. Within the surveyed area, five species of fish were found in small numbers; species included brook trout, rainbow trout, black nosed dace, white sucker, and slimy sculpin. No smallmouth bass were found. A photograph of this part of the stream is provided below; a map is provided in Appendix 2.

Pleasant Pond Stream, Middle Reach

The sampling area for the lower reach of Pleasant Pond Stream was located just under 0.1 mile upstream from the confluence with the Kennebec River and consisted of approximately 500 square yards of stream. Stream substrate consisted of cobble; habitat consisted of riffle and run. Within the surveyed area, ten species of fish were identified. These included rainbow trout, brook trout, fallfish, black nosed dace, finescale dace, creek chub, white sucker, common shiner, slimy sculpin and smallmouth bass. Smallmouth bass were represented by a single young-of-the-year individual. A photograph of this part of the stream is provided below; a map is provided in Appendix 2.

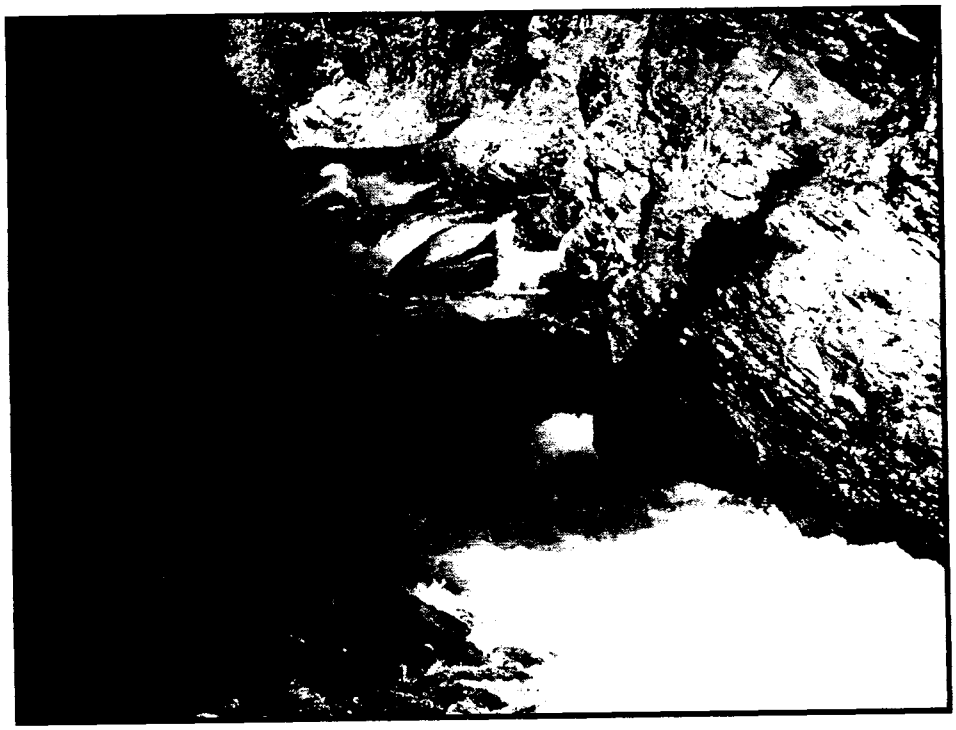
Pleasant Pond Stream, Lower Reach

3.2.6 Dead River Tributaries

Spencer Stream

Spencer Stream is a tributary to the Dead River, in T3 R5 BKP WKR Township. Though there were several drops observed, none were single vertical drops greater than 4 feet. No definitive barrier to upstream fish movement was found. This stream was surveyed to the upper end of the area known as Spencer Gut. Road access to this area is highlighted on the map, found in Appendix 2. The area sampled was near the downstream end of this area, approximately 3.4 miles upstream from the confluence with the Dead River, and consisted of approximately 500 square yards of stream. Stream substrate consisted of boulder and cobble; habitat consisted of pool and riffle. Within the surveyed area, three fish species were found in small numbers; these included creek chub, common shiner, and black nosed dace. No smallmouth bass were found. Please refer to Table 1 for Spencer Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook

trout numbers captured. A photograph of this stream at Spencer Gut is provided below; a map is provided in Appendix 2.



Spencer Gut

Alder Pond Stream

Alder Pond Stream is a tributary to the Dead River, located in Lower Enchanted Township. This stream was surveyed up to the first road crossing. No barrier to upstream fish movement was found. The area sampled was located approximately 0.1 mile upstream from the confluence with the Dead River and consisted of approximately 500 square yards of stream and. Stream substrate consisted of sand, cobble, and gravel; habitat consisted of run and riffle. This is a low gradient stream. Within the surveyed area two species of fish, brook trout and creek chub, were found in small numbers. No smallmouth bass were found. Please refer to Table 1 for Alder Pond Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.

Alder Pond Stream

Enchanted Stream

Enchanted Stream is a tributary to the Dead River, located in Lower Enchanted Township. A 5 foot waterfall barrier, known locally as Pea Boy Falls, exists approximately 5.3 miles upstream from the confluence with the Dead River. Access to this site is highlighted on the map of the stream, provided in Appendix 2. The area sampled consisted roughly of 500 square yards of stream with the upstream limit defined by the waterfall. Stream substrate consisted of cobble; habitat sampled consisted of riffle, run, and pool. Within the surveyed area, four species of fish were found in small numbers; these included black nosed dace, creek chub, common shiner, and white sucker. No smallmouth bass were found. Please refer to Table 1 for Enchanted Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. A photograph of this stream is provided below; a map is provided in Appendix 2.

Pea Boy (Enchanted Stream) Falls

Salmon Stream

Salmon Stream is a tributary to the Dead River, located in West Forks Plantation. A 6 foot waterfall barrier exists approximately 1.3 miles upstream from the confluence with the Dead River. Access to this site is highlighted on the map of this stream, provided in Appendix 2. The area sampled consisted of roughly 500 square yards of stream, with the upstream limit of sampling defined by the falls. Stream substrate consisted of boulder and gravel; habitat consisted of riffle and run. Within the surveyed area, three species of fish, including brook trout, black nosed dace, and creek chub, were found in small numbers. No smallmouth bass were found. Please refer to Table 1 for Salmon Stream's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. Photographs of the barrier and the stream are provided below; a map is provided in Appendix 2.

Salmon Stream Falls

Salmon Stream

Durgin Brook

Durgin Brook is a tributary to the Dead River, located in West Forks Plantation. Two man-made barriers were identified during field surveys of this stream. Both of these consisted of road crossings with associated culverts. The Dead River Road crosses the brook approximately 0.1 mile upstream from the confluence with the Dead River, and Route 201 crosses approximately 0.3 mile upstream from the confluence with the Dead River. Maine Road-Stream Crossing Survey Field Forms were completed for both of these sites (see Appendix 3). Both road crossings constitute barriers to upstream fish movement, though the Dead River Road culvert is likely only a barrier at low flows.

Furthermore, a snowmobile bridge that appears to be no longer functional was also observed just above the confluence with the Dead River. The remains of this bridge are currently laying on the stream bed. This material may constitute a barrier to upstream fish movement, and may also create erosion in the stream channel.

The area sampled for Durgin Brook consisted of roughly 500 square yards of stream located between the confluence with the Dead River and the Dead River Road crossing. Stream substrate consisted of cobble and gravel; habitat consisted of riffle, run, and pool. Within the surveyed area, two species of fish were found: brook trout and slimy sculpin. No smallmouth bass were found. Please refer to Table 1 for Durgin Brook's physical attributes, Table 2 for water chemistry, and Table 3 for brook trout numbers captured. Photographs of the culverts on this brook are provided below; a map is provided in Appendix 2.

Durgin Brook, River Road Culvert

Durgin Brook, Route 201 Culvert

4.0 DISCUSSION

4.1 *Existing Barriers*

Barriers to upstream fish movement were found on 8 streams: Chase Stream, Carry Brook, Cold Stream, Dead Stream, Durgin Brook, Moose Pond Stream, Salmon Stream and Enchanted Stream. All of these barriers were greater than 4 feet tall, and were vertical ledge drops, with the exception of the barrier at Durgin Brook, which is a large culvert under Route 201.

Seven of the streams surveyed did not have any barriers which met the 4-foot vertical height standard, with the exception of Kelly Brook, which has a 4-foot barrier made up of boulders that do not likely form a barrier at all flows and may be disrupted in the near future. These include Tomhegan Stream, Spencer Stream, Pleasant Pond Stream, Kelly Brook, Holly Brook, Fish Pond Stream, and Alder Pond Stream.

4.2 *Stream Habitat and Suitability for Smallmouth Bass*

Optimum stream habitat for smallmouth bass is characterized by cool, clear, mid-order streams (fourth order or higher) that are greater than 10.5 meters wide, have abundant shade and cover, deep pools, moderate current, and gravel and rubble substrate (Edwards, et al. 1983). Ideal smallmouth bass streams should also have relatively low gradients, alternating pools and riffle habitat, with the pools deeper than 1.2 meters (Edwards, et al. 1983). Twelve of the fifteen streams that were surveyed do not possess these habitat characteristics, and most are small first, second, or third order streams. However, Spencer Stream, Enchanted Stream, and Cold Stream, are mid-order streams that are greater than 10.5 meters wide. These three streams also have sections with relatively low gradients, and some pool areas that are deep. Therefore, these three streams have the most potential to be suitable smallmouth bass habitat and support populations of smallmouth bass. Both Enchanted and Cold Stream, however, have adequate barriers to prevent upstream movement of bass throughout their watersheds, so bass movement is

restricted to below these barriers. Additionally, surveys conducted for this study did not find any bass in these streams.

Edwards et al. (1983) also states that temperatures may be the most important single factor limiting distribution of smallmouth bass. This is true for both adult and juvenile bass, with preferred temperatures for adult bass ranging from 21-27° C and juveniles preferring temperatures between 28 to 31°C. Stream temperatures for the streams in this study area likely reach these temperature ranges for only short period in the middle to end of the summer. During the surveys performed for this study, stream flows were low, and water temperatures should have been near their summer maximum levels. The highest stream temperatures observed during these surveys was 20.1 °C in Alder Pond Stream. Continuous temperature monitoring was performed at three sites as part of the biological assessment of Cold Stream (Bonney 2005). In Cold Stream, hourly water temperatures were highest in July and August, 2004, when they averaged 17.2°C at the lower (mile 1.4) and upper (mile 12.7) temperature recording sites, and 16.1°C at the middle (mile 10) site. The maximum average monthly reading was 23°C, which was recorded at the lower site. To give additional context to the range of water temperatures observed in Cold Stream, maximum water temperatures exceeded the preference for brook trout, which is 20°C, for 14 days at the lower site, 3 days at the middle site, and 3 days at the upper site.

These factors indicate that habitat in most of these streams is not ideal for smallmouth bass. Field surveys performed for this study further confirm this conclusion since smallmouth bass, though well established in the main stems of the Kennebec and Dead Rivers, were not found in fourteen of the fifteen streams, and have not become well established in any of these tributaries.

4.3 *Fish Species Assemblage and Presence of Smallmouth Bass*

Brook trout were the most prevalent fish found over the course of this investigation. This species was represented in samples from all streams with the exception of Spencer Stream and Enchanted Stream. The highest numbers of brook trout were found in Moose

Pond Stream, Kelly Brook, Holly Brook, and Durgin Brook. Most of these brook trout were juvenile fish in the young-of-the-year or in the 1+ age class.

The only smallmouth bass observed was located at the lowermost site sampled on Pleasant Pond Stream, less than one tenth of a mile upstream from the confluence with the Kennebec River. This individual was identified as a young-of-the-year age class.

5.0 CONCLUSION

Only one smallmouth bass was found during electrofishing surveys of fifteen tributaries to the upper Kennebec and lower Dead Rivers. That fish was a young-of-the-year bass, and was found less than one tenth of a mile from the Kennebec River. These survey results indicate that smallmouth bass have not become well established in any of these tributaries, even though three of the streams, Spencer Stream, Enchanted Stream, and Cold Stream appear to have potentially suitable habitat.

Of these fifteen streams, eight have upstream barriers that will preclude the movement of smallmouth bass into upstream areas. Of the remaining seven, six are small, and do not possess suitable habitat for establishment of bass populations in the streams. One of these, Spencer Stream, does have potentially suitable habitat for smallmouth bass. There are also many waters in it's headwaters in King and Bartlett Township that may offer suitable habitat for smallmouth bass colonization. These waters include Little King Lake and Baker Pond. A tributary to Spencer Stream, Little Spencer Stream, has a documented, well established smallmouth bass population. The dam at the outlet of Spencer Lake, the headwater of Little Spencer Stream, was recently rebuilt to the four-foot barrier standard to prevent smallmouth bass colonization of Spencer Lake and upstream waters. Due to the large size of the main branch of the Spencer Stream watershed and relative inaccessibility, there appears to be limited opportunity to establish a barrier on Spencer Stream. One area that has potential access for enhancement of an existing drop is found at the top of the area known as Spencer Gut. Road access does not extend to this site, however, a good gravel road passes within approximately 800 feet.

Steep ledge walls, approximately 35 feet high from the top of the bank to the stream surface, severely limit access to the stream, and it is unlikely enhancement at this site would be possible.

The large proportion of juvenile (young-of-the-year and age 1+) brook trout found in many of the surveyed streams are an indication of the potential value these streams have as nursery habitat for brook trout in this watershed. As found in previous studies in this area, it is apparent that tributaries to the Kennebec and Dead Rivers and their interconnected nature are an important component of the brook trout fishery currently found in these rivers. In order to maintain the nursery value of these streams, it is not advisable to install barriers to upstream movement that would exclude brook trout and other salmonids seeking cold water refuge or spawning and nursery habitat on streams that appear to support these functions that do not currently have a barrier. These include Fish Pond Stream, Tomhegan Stream, Kelly Brook, Holly Brook, Pleasant Pond Stream, and Alder Pond Stream.

One site surveyed presents potential enhancement and deserves additional assessment. The suggested area for additional assessment is the Pleasant Pond Dam. Pleasant Pond Dam should be assessed for long term stability/integrity as a barrier to upstream fish movement. A baseline assessment and then regular periodic assessments should be performed to ensure that bass do not have a chance to get established in Pleasant Pond.

6.0 REFERENCES

Bonney, Forrest R. 2005. Fishery interim summary report series No. 05-01: biological survey of Cold Stream. Maine Department of Inland Fisheries and Wildlife, Fisheries and Hatcheries Division, Augusta, Maine. November 2005.

Edwards, E. A., G. Gebhart, and O.E. Maughan. 1983. Habitat suitability information: Smallmouth bass. U.S. Depart. Int., Fish Wildl. Serv. FWS/OBS-82/10.36. 47 pp.

E/PRO Engineering and Environmental Consulting, LLC. 2000. Assessment of salmonid fisheries in the upper Kennebec/Lower Dead River watershed, Maine for the Indian Pond relicensing, FERC No. 2142. Submitted to Robert Richter, FPL Energy Maine Hydro, LLC, 100 Middle Street, Portland, Maine 04101. November 2000.

E/PRO Engineering and Environmental Consulting, LLC. 2005. Desktop review for fisheries enhancement at the Indian Pond Project, FERC No. 2142. Submitted to Robert Richter, FPL Energy Maine Hydro, LLC, 150 Main Street, Lewiston, Maine 04240. October 2005.

APPENDIX 1
Meeting Memo
August 21, 2007

TRC

249 Western Avenue
Augusta, ME 04330

207.621.7000 PHONE
207.621.7001 FAX

www.TRCsolutions.com

Subject: Review Tasks for Indian Pond SMB work **Date:** August 21, 2007

From: Dana Valleau **Ext.:** 621-7093

To: Robert Richter, FPL; Forrest Bonney, IFW; Indian Pond Fisheries Committee

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On Thursday August 9, 2007, I met with Forrest Bonney, MDIFW Region D Regional Fisheries Biologist and member of the Indian Pond Fisheries Committee. The primary purpose of this meeting was to discuss the scope of work for the investigations relating to smallmouth bass in tributaries to the Kennebec and Dead Rivers. I want to be sure to collect all the information that Forrest and Fisheries Committee are interested in for this project.

First we discussed our literature search for information to help assess the risk of smallmouth bass invasion and defining passage criteria for smallmouth bass at natural and man-made barriers (Task 1 and 2 in the TRC proposed scope of work). To date, our literature review has not been helpful in resolving these two issues in a definitive way. We do know, and Forrest acknowledged, that Dave Boucher, the Assistant Regional Biologist, has been considering a 4 foot vertical drop as an upstream barrier to smallmouth bass. Forrest agreed to ask Merry Gallagher, MDIFW Bangor office, if she has any information from recent literature work regarding smallmouth bass introductions. TRC will follow up with Dave Boucher for any additional information/literature he can provide.

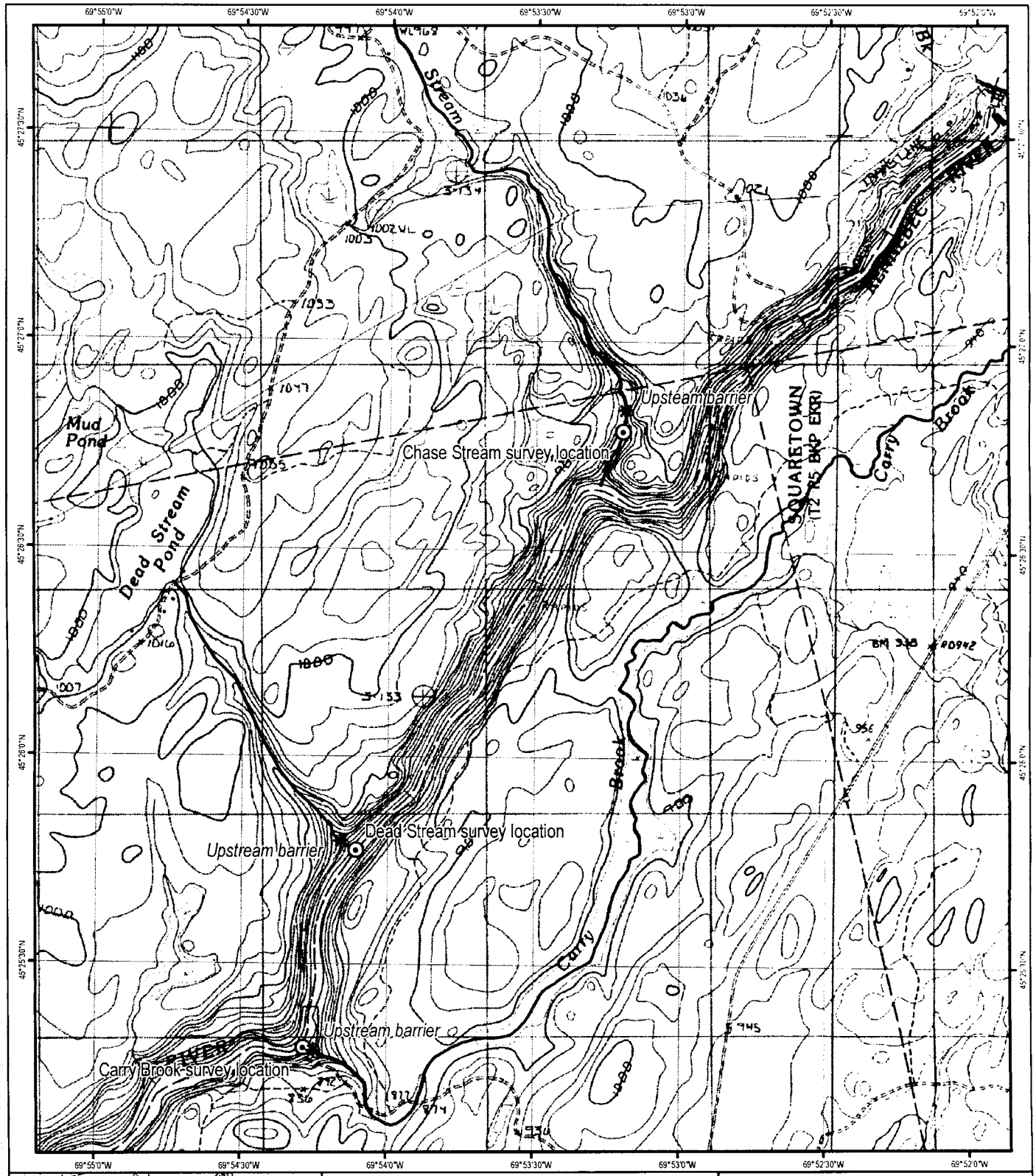
Based on existing information from our previous work in the area related to the Indian Pond Relicensing and the *Desktop Review for Fisheries Enhancement at the Indian Pond Project* (EPRO 2005), we do know where there are barriers on several of the streams, so we know which streams have a low risk of smallmouth bass invasion from the main stem of the rivers. I posed the question if we could narrow the list of streams in the assessment based on these known barriers. Forrest would like information collected for all of these streams, including photos, location coordinates, and measurements of the barriers. He would also like us to document potential barriers that may or may not be upstream passage barriers to smallmouth bass, but may be good locations to improve their effectiveness as a barrier. Forrest shared a culvert assessment manual and data sheet that we will also use to document conditions of road crossing of the streams.

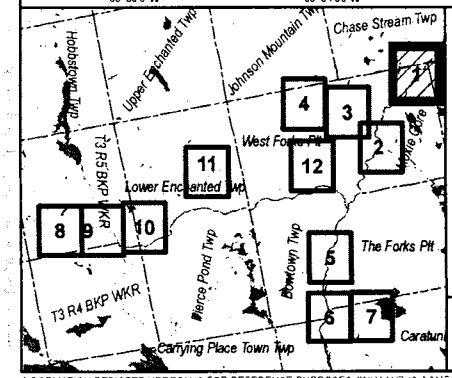
Forrest did say that we should keep in mind that the primary goal of this work is to look for streams that could benefit from restoration work. In order for the restoration work to have the most benefit to native salmonid fisheries (i.e., brook trout fisheries) the restoration work should only be done in areas that do not currently have bass, and the goal of this part of the effort is to identify such areas and if possible, identify if it is necessary or practical to prevent bass from getting established in those areas. Forrest said that practicality is important to keep in mind as well, and a foremost consideration should be accessibility for restoration work. Streams or tributaries of streams without good road access will not need to be surveyed because it is impractical to perform habitat restoration on these waters. At this point, in his mind, none of the streams can be removed from the assessment unless it was not practical to do future work in the stream. I said I would spend some time considering if the list could be narrowed based upon his thoughts. From the 15 streams that are currently being considered (Chase Stream, Dead Stream, Carry Brook, Fish Pond Stream, Tomhegan Stream, Cold Stream, Kelly Brook, Holly Brook, Pleasant Pond Stream, Moose Pond Stream, Spencer Stream, Alder Pond Stream, Enchanted Stream, Salmon Stream, and Durgin Brook), I don't believe any can be eliminated from the survey list because they all have good road access to at least one area along them.

Forrest also provided the Department's electro-fishing protocol, which includes water quality and habitat characterization parameters. In summary, the sampling will entail one run with a backpack electro-fishing unit. No blocking seines will be required for this type of sampling. Basic water quality parameters will also be collected (pH, DO, temperature, alkalinity, conductivity). Fish lengths and weights will be recorded, with a sample size of up to 30 individuals per species. Based on the protocol, he would also like us to sample a minimum of 500 square feet of stream, which is greater than what we proposed. This should not increase the time required to sample significantly as most of the time involved with this one-run sampling effort is spent on accessing the sites.

The field work is scheduled to start August 28, and additional literature research and consultation with MDIFW biologists will continue in the interim regarding upstream passage criteria.

APPENDIX 2
Maps





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

1,000 Feet

Chase Stream
Dead Stream, & Carry Brook
Figure 1

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
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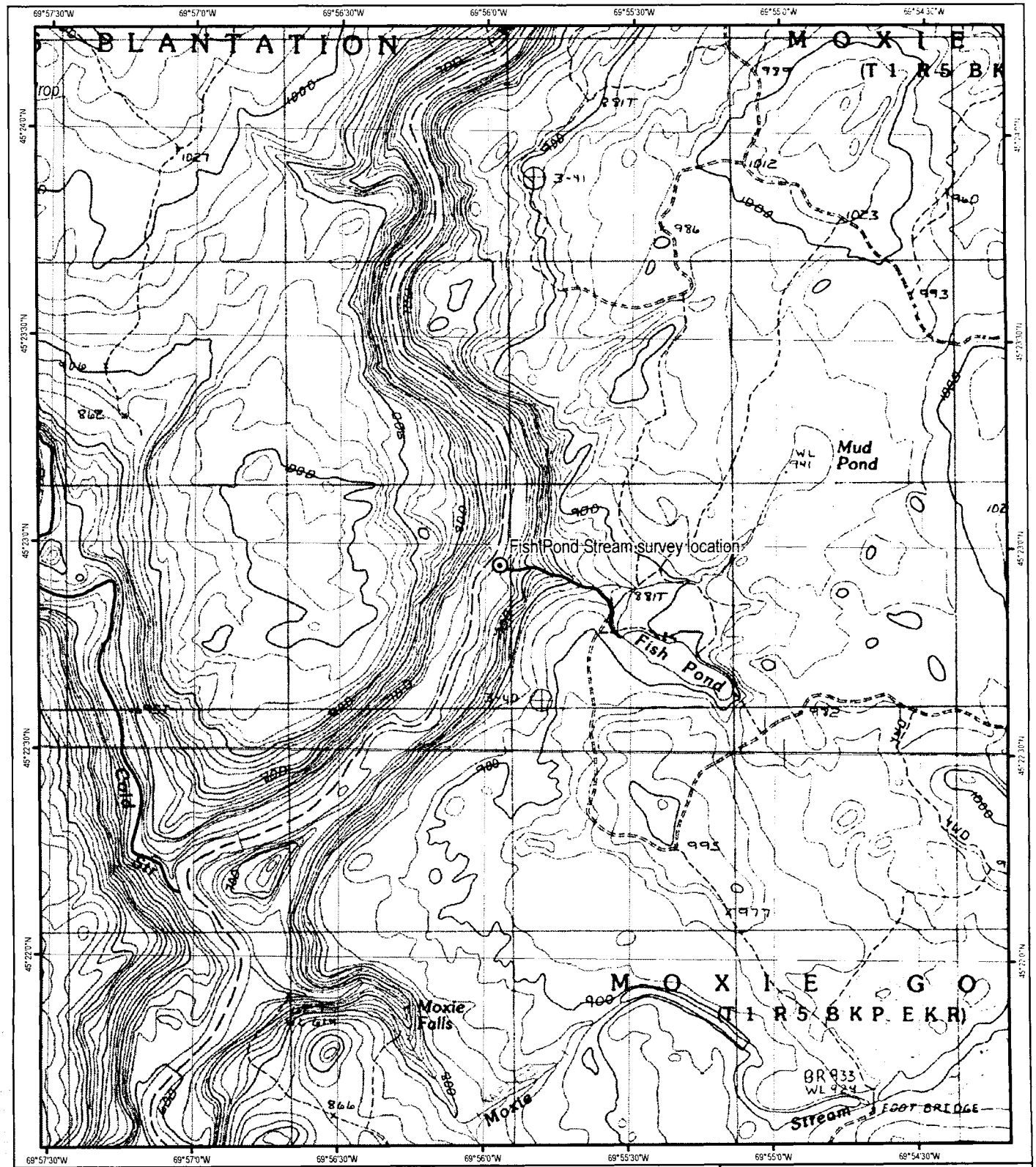

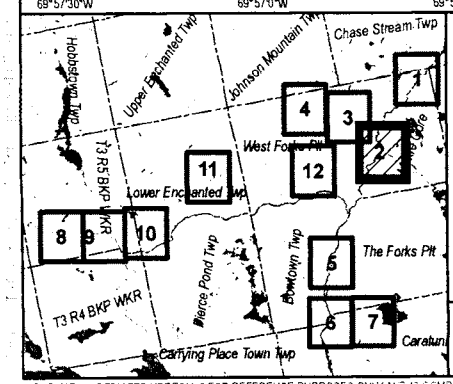

Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

1,000 Feet

Fish Pond Stream

Figure 2

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

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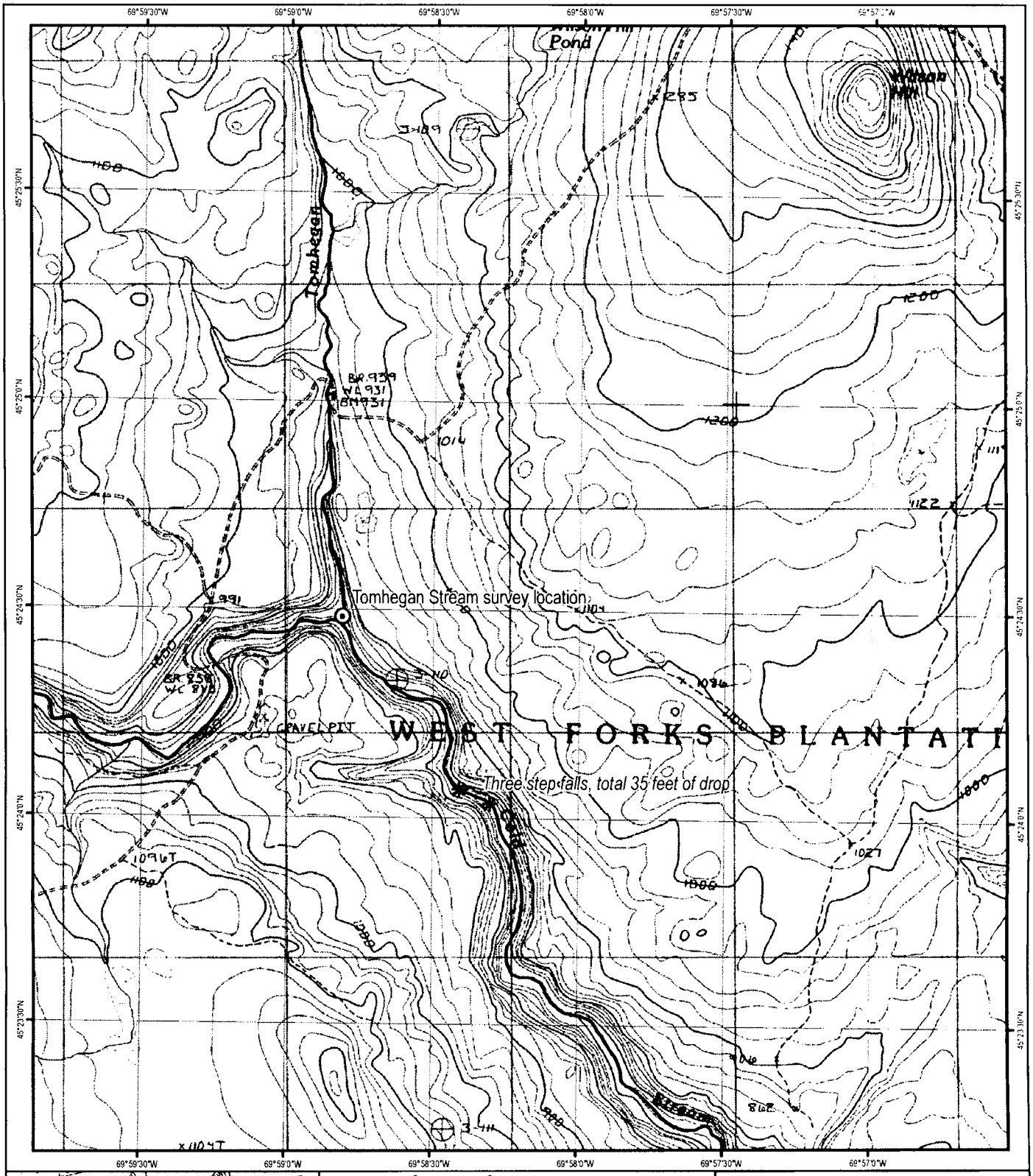

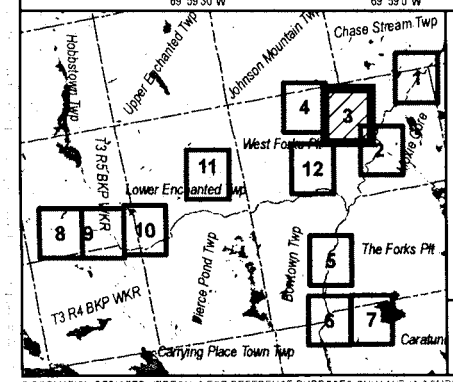

Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

1,000 Feet

Tomhegan Stream and Cold Steam

Figure 3

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

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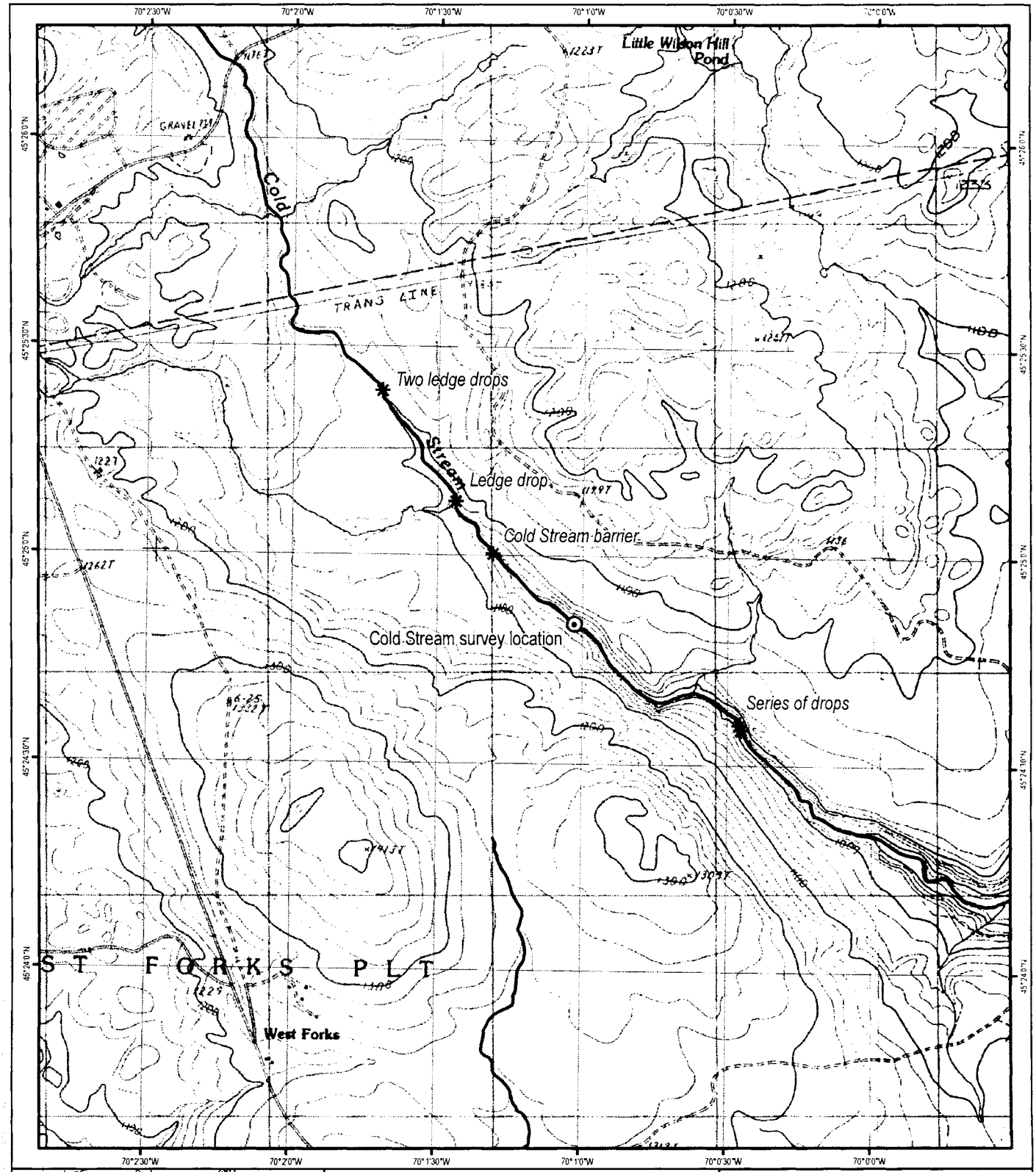

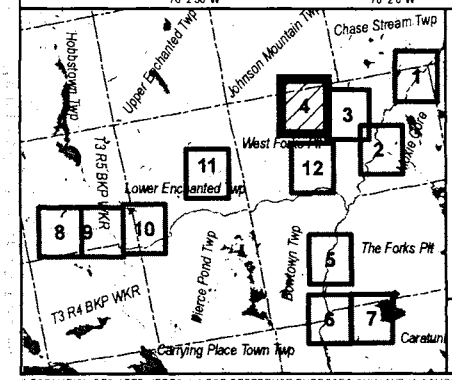

Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

1,000 Feet

Cold Stream

Figure 4

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

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Augusta, ME 04330
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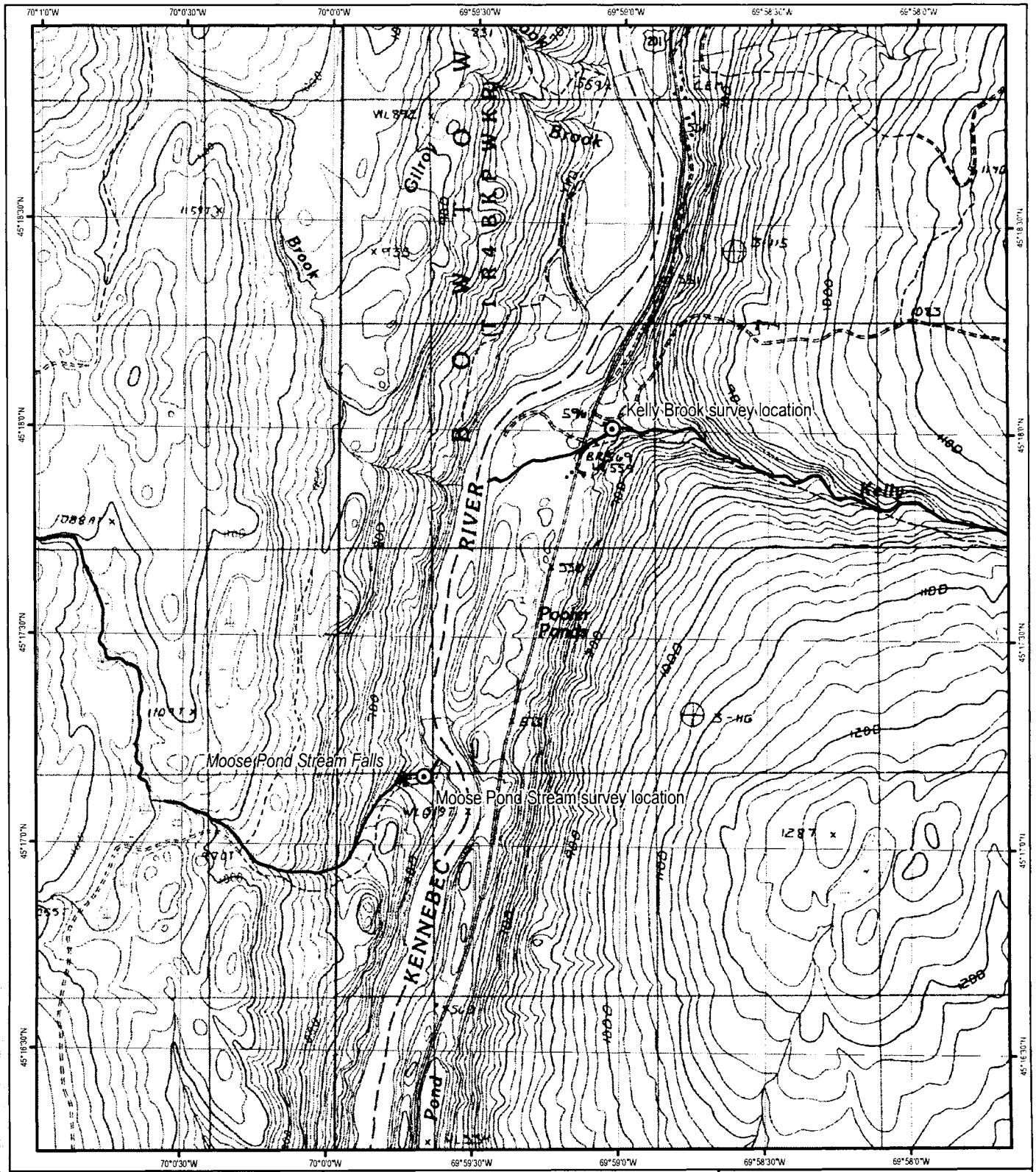

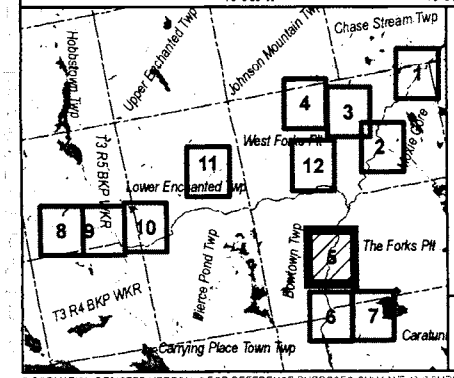

Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

1,000 Feet

Kelly Brook and Moose Pond Stream

Figure 5

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

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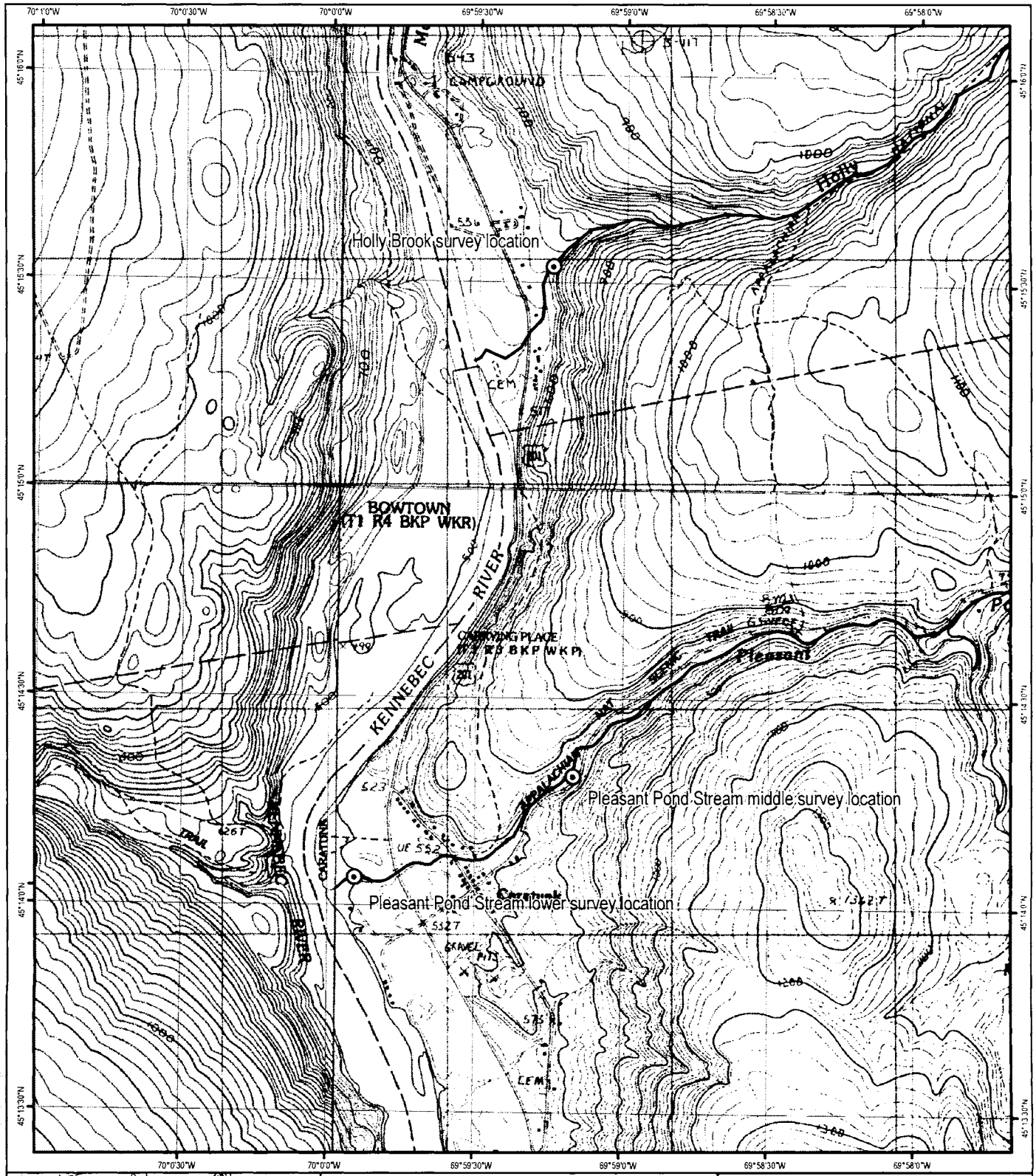
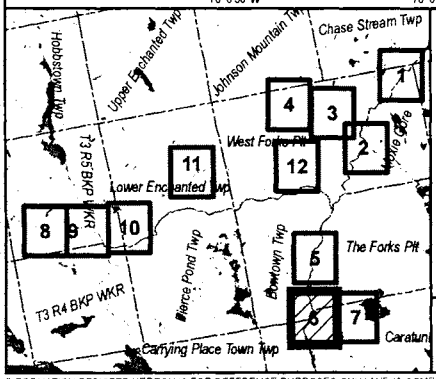
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

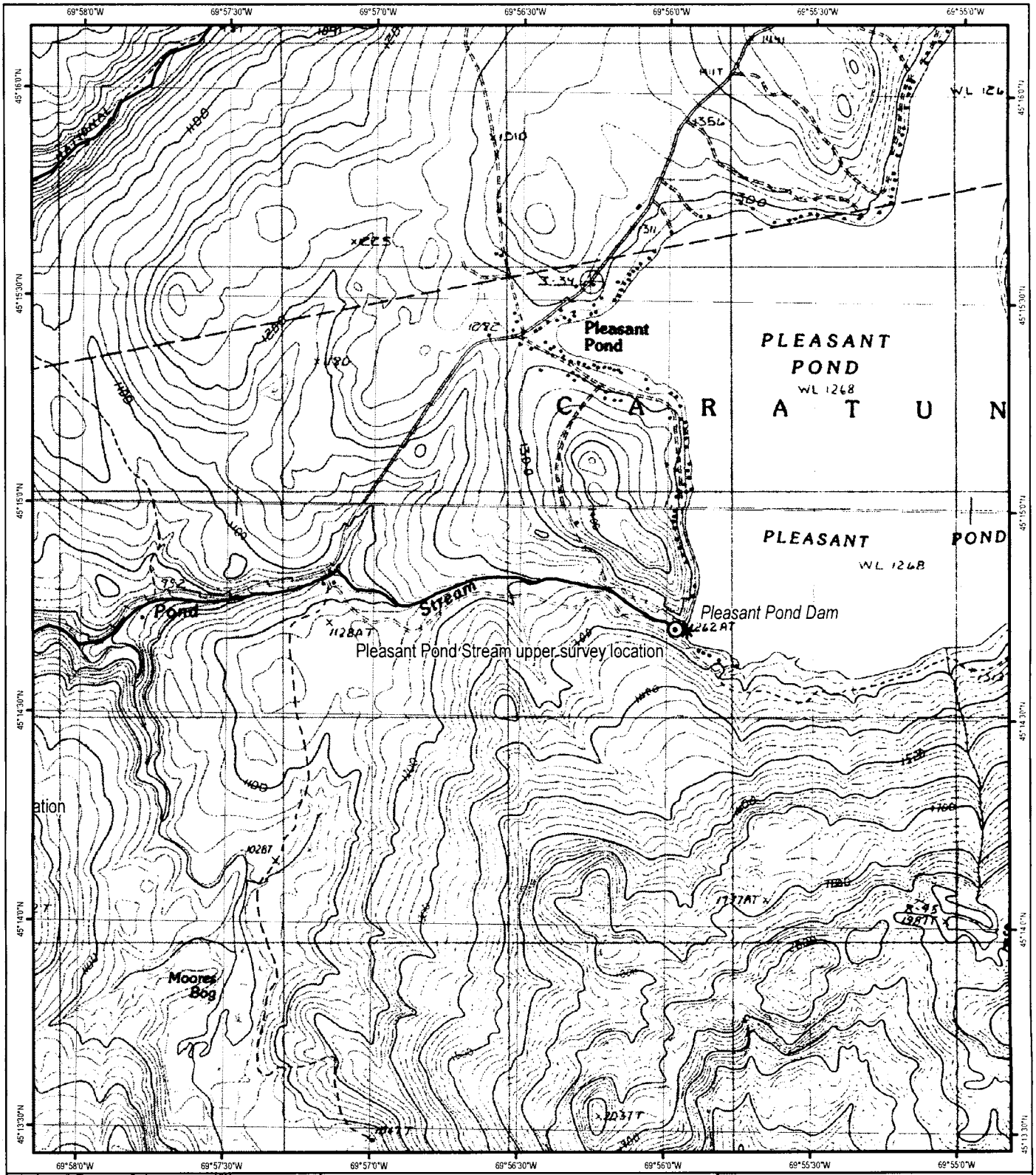
1,000 Feet

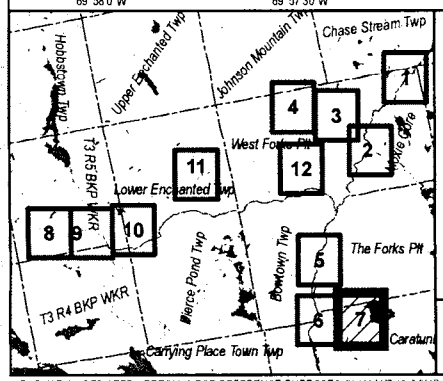
Holly Brook and Pleasant Pond Stream

Figure 6

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

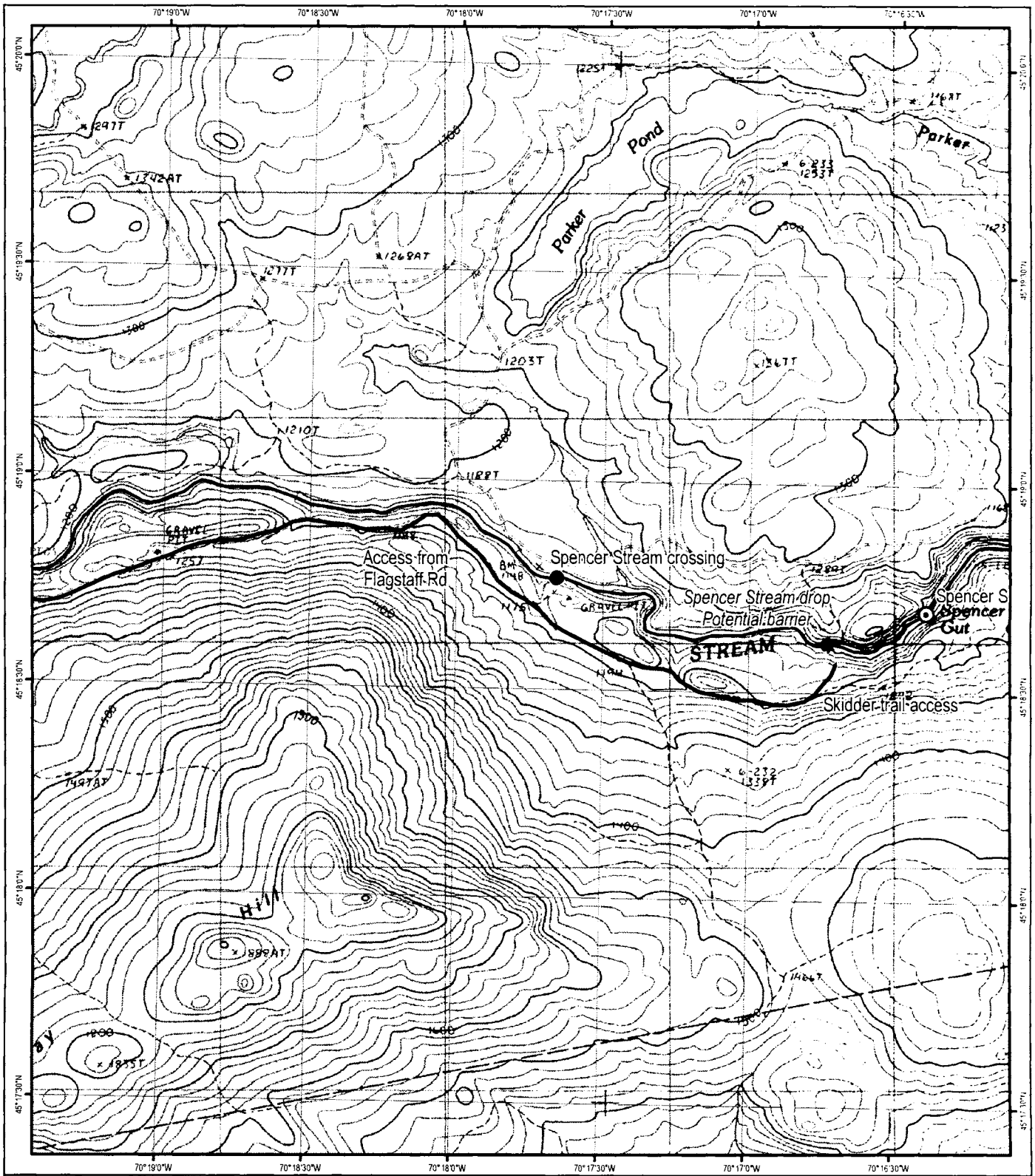
1,000 Feet

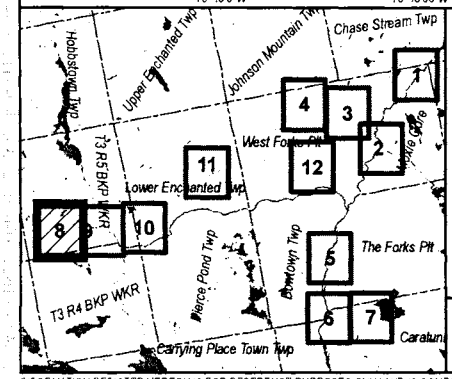
Pleasant Pond Stream

Figure 7

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

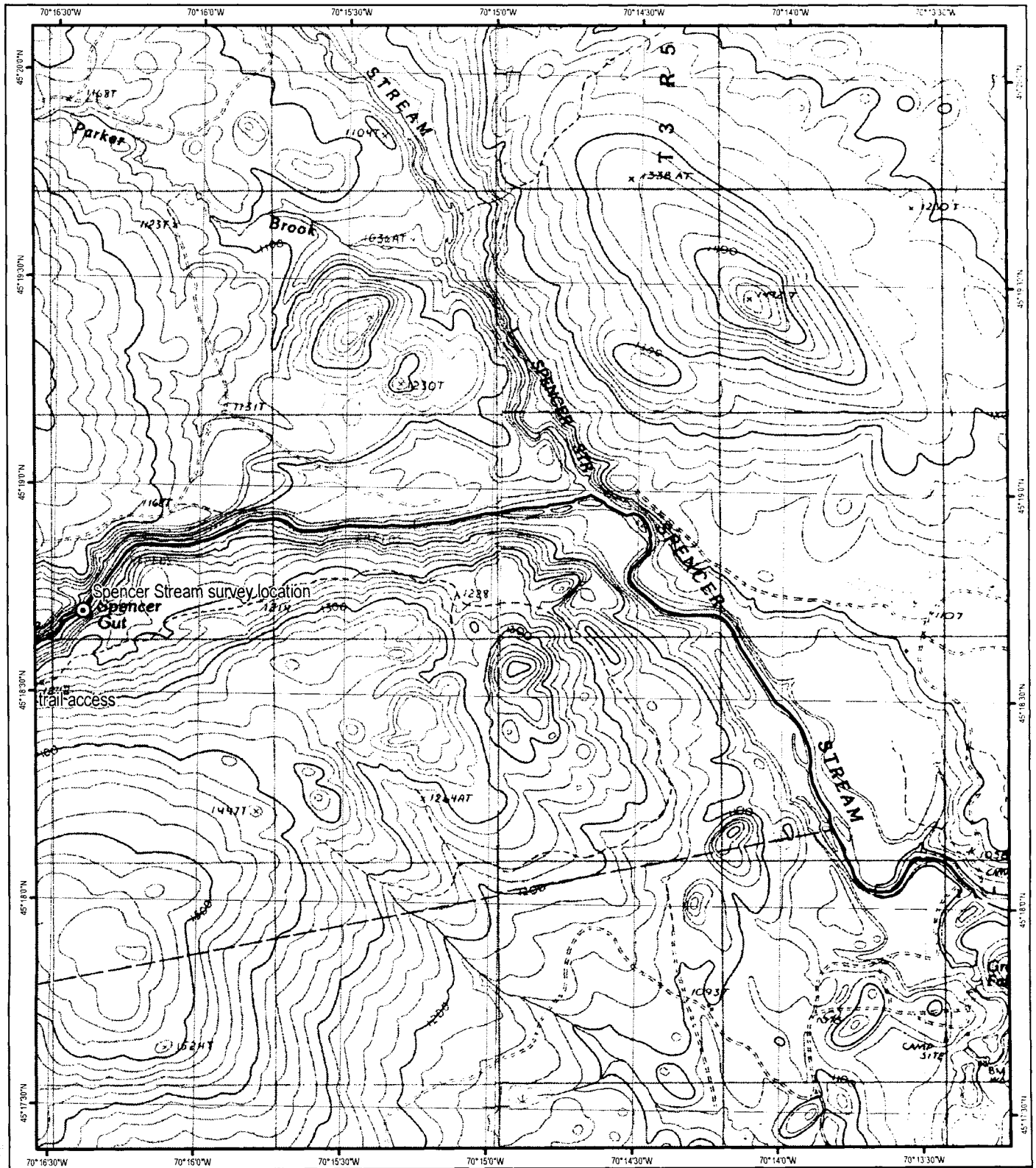
1,000 Feet

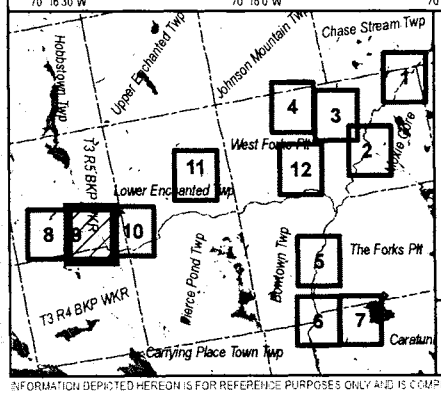
Spencer Stream

Figure 8

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

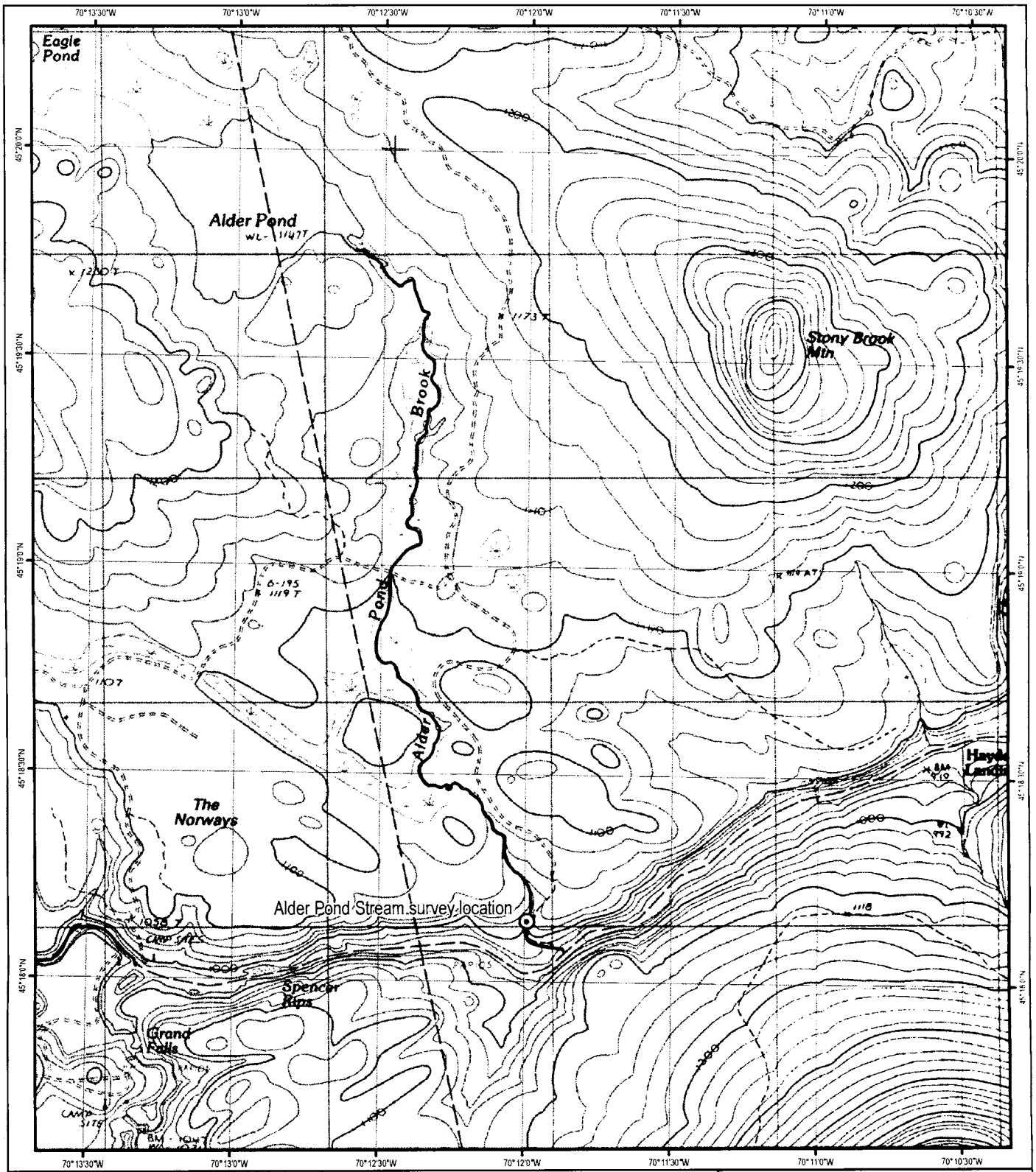
1,000 Feet

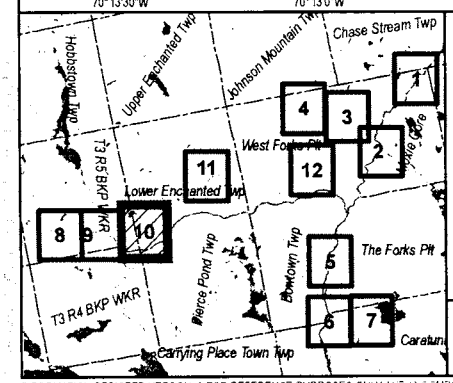
Spencer Stream

Figure 9

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

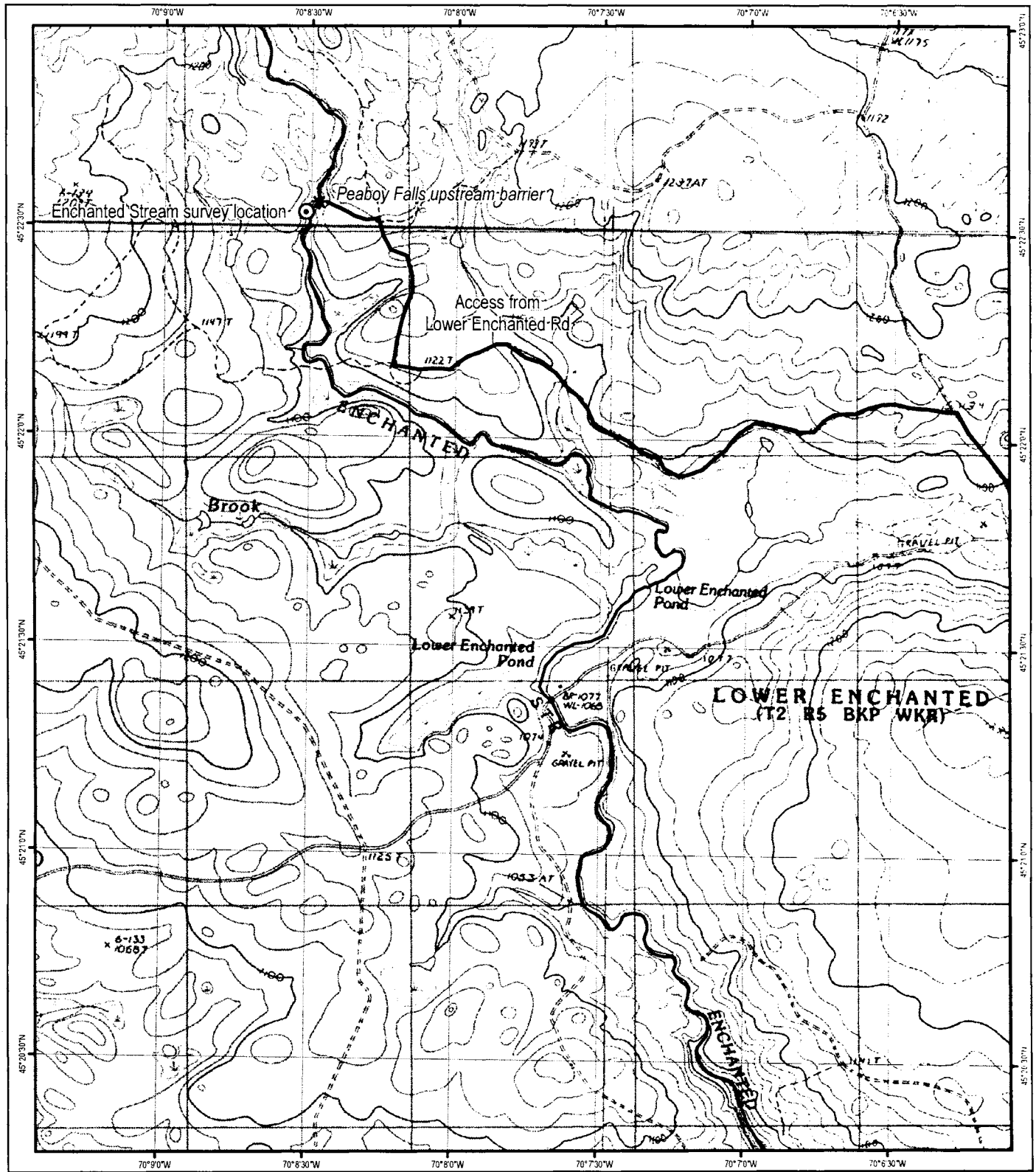
1,000 Feet

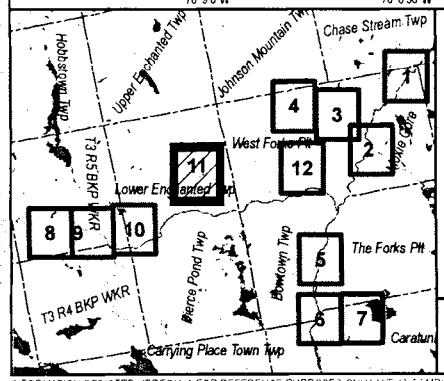
Alder Pond Stream

Figure 10

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC





Legend

- Survey Location
- Upstream Barrier
- Stream crossing
- Surveyed Tributary
- Access

True North

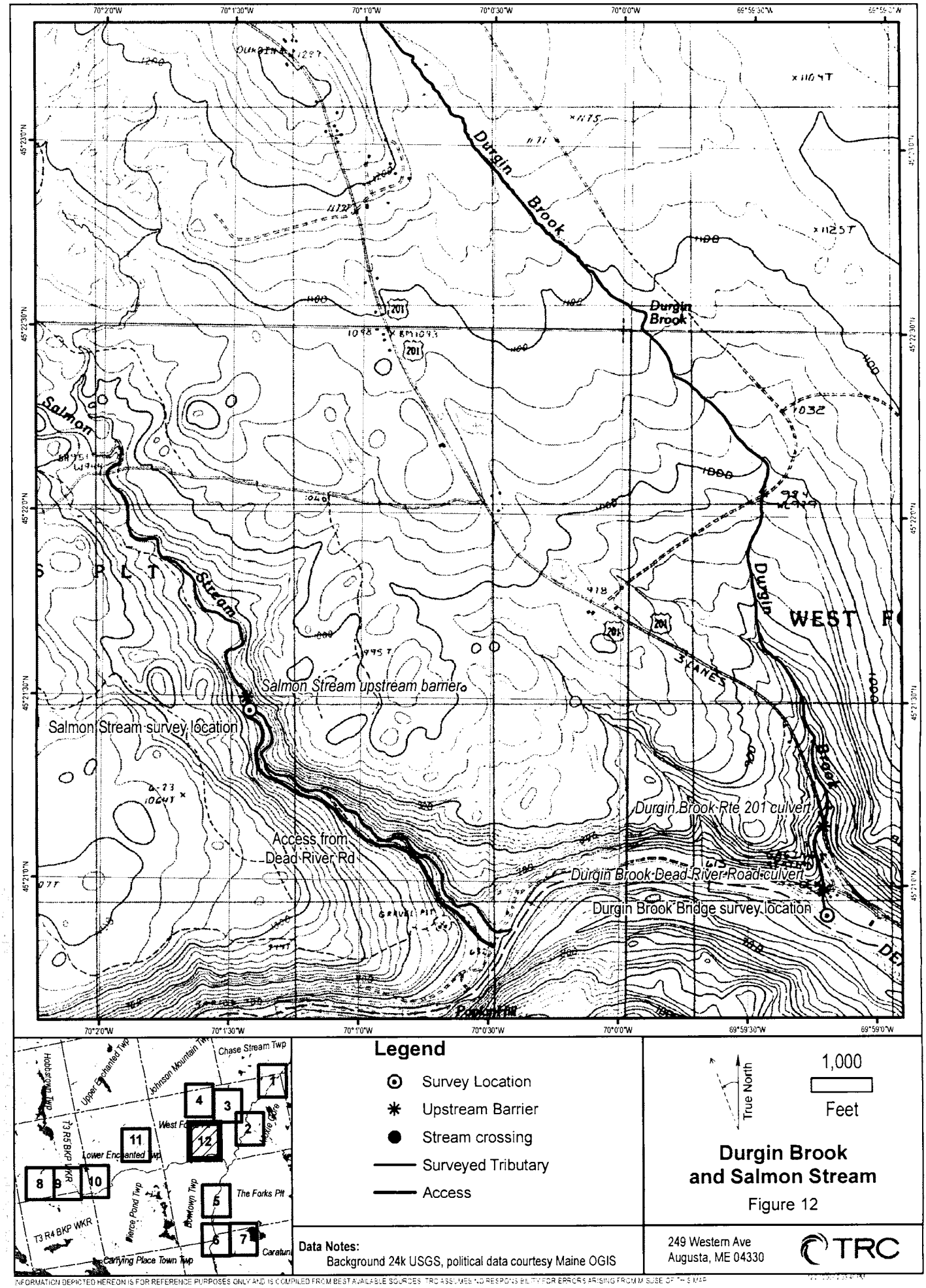
1,000 Feet

Enchanted Stream

Figure 11

Data Notes:
Background 24k USGS, political data courtesy Maine OGIS

249 Western Ave
Augusta, ME 04330
TRC



APPENDIX 3
Road-Stream Crossing
Survey Forms

ROAD - STREAM CROSSING SURVEY

Date 8-29-07 (mm/dd/yy) Time ___:___ Sequence #_____ | Site ID

Observer (s) DV, KM Organization FPLE

Stream Durgin Brook Tributary to Dead River Town Moxie Gore

Road Dead River Road Type ☐ Paved ☒ Unpaved ☐ Railroad ☐ Trail ☐ Driveway

GPS Coordinates [WGS84 UTM Zone 19N Meters] 0 4 2 2 7 0 5 East 5 0 2 2 2 8 0 North

DeLorme Atlas Map # ____ Grid Reference _____ Location Description just past Magic Falls Rafting Co.

Photo IDs Inlet #243, 242 Outlet #241, 240, 239 Other _____

US from Inlet #244 DS from Outlet # 245 High Flow ☐ Yes ☒ No

RR Approach #247 RL Approach #246 No Flow ☐ Yes ☒ No

Basic Structure Type ☐ Bridge ☒ Culvert ☐ Multiple Culverts # ____ ☐ Ford ☐ Removed Structure

Material ☒ Metal ☐ Concrete ☐ Plastic ☐ Wood ☐ Stone ☐ Other _____

Specific Structure Type (see reverse): ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Ford

Channel Width 13 ft/m ☒ Bankfull Width (*Preferred*) ☒ Wetted Width 9ft ☒ Measured ☐ Estimated

Inlet Condition ☒ At Stream Grade ☐ Inlet Drop ☐ Perched

☒ Flow Constriction ☐ Deformed ☐ Beaver Fencing

☐ Blocked (Circle One) 25% 50% 75% 100% Inlet Water Depth 1.5" ~~ft/m~~

Upstream Substrate

☐ Bedrock ☒ Boulder ☒ Cobble ☐ Gravel

☐ Sand ☐ Clay ☐ Organic ☐ Unknown

A) Inlet Span 7.5 ft/m B) Inlet Clearance 5.5 ft/m C) Inlet Wetted Width 4 ft/m

Outlet Condition ☐ At Stream Grade ☒ Perched ☐ Cascade

Outlet Water Depth 2" ~~ft/m~~ Outlet Drop 7" ~~ft/m~~

Tailwater Scour Pool ☒ Large ☐ Small ☐ None

Downstream Substrate

☐ Bedrock ☒ Boulder ☒ Cobble ☐ Gravel

☐ Sand ☐ Clay ☐ Organic ☐ Unknown

Tailwater Pool Depth ☒ < 3 ft / 1 m ☐ > 3 ft / 1 m Tailwater Armoring ☒ Extensive ☐ Not Extensive ☐ None

A) Outlet Span 7.5 ft/m B) Outlet Clearance 5.5 ft/m C) Outlet Wetted Width 2 ft/m

D) Crossing Structure Length 20 ft/m E) Abutment Height 5.5 ft/m Sliplined Culvert ☐ Yes ☒ No

Crossing Substrate ☒ None ☐ Comparable ☐ Contrasting ☐ Unknown ▶ Continuous ☐ Yes ☐ No ☐ Unknown

Internal Structures ☒ None ☐ Baffles / Weirs ☐ Bridge Piers ☐ Other _____ Corrugations ☒ Yes ☐ No

Water Depth Matches Stream ☐ Yes/Comparable ☒ No Water Velocity Matches Stream ☐ Yes/Comparable ☒ No

Slope Compared to Channel Slope ☐ Higher ☒ Lower ☐ Same Alignment ☒ Flow-Aligned ☐ Skewed

Significant Sediment Source Upstream ☐ Road / Ditches ☐ Embankment ☐ Stream Banks ☒ None

Downstream ☐ Road / Ditches ☐ Embankment ☐ Stream Banks ☒ None

Wildlife Barriers ☒ None ☐ High Traffic Volume ☐ Steep Embankments ☐ Retaining Walls ☐ Jersey Barriers ☐ Fencing

Comments: low flow barrier to upstream movement of fish

Units ☒ Feet ☐ Meters

ROAD - STREAM CROSSING SURVEY

Date 8-29-07 (mm/dd/yy) Time 18:30 Sequence # _____ | Site ID

Observer (s) DV KM Organization FPLE

Stream Durgin Brook Tributary to Dead River Town _____

Road Rte 201 Type ☒ Paved ☐ Unpaved ☐ Railroad ☐ Trail ☐ Driveway

GPS Coordinates [WGS84 UTM Zone 19N Meters] 0 4 2 2 7 0 2 East 5 0 2 2 6 0 2 North

DeLorme Atlas Map # ____ Grid Reference _____ Location Description _____

Photo IDs Inlet #293 Outlet #292 Other _____

US from Inlet #294 DS from Outlet #291 High Flow ☐ Yes ☒ No

RR Approach #290 RL Approach #289 No Flow ☐ Yes ☒ No

Basic Structure Type ☐ Bridge ☒ Culvert ☐ Multiple Culverts # ____ ☐ Ford ☐ Removed Structure

Material ☒ Metal ☒ Concrete ☐ Plastic ☐ Wood ☐ Stone ☐ Other _____

Specific Structure Type (see reverse): ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ Ford

Channel Width 18 ft/m ☒ Bankfull Width (*Preferred*) ☒ Wetted Width 12' ☒ Measured ☐ Estimated

Inlet Condition ☒ At Stream Grade ☐ Inlet Drop ☐ Perched

☒ Flow Constriction ☐ Deformed ☐ Beaver Fencing

☐ Blocked (Circle One) 25% 50% 75% 100% Inlet Water Depth 1.5" ft/m

Upstream Substrate: ☐ Bedrock ☒ Boulder ☒ Cobble ☒ Gravel ☐ Sand ☐ Clay ☐ Organic ☐ Unknown

A) Inlet Span 11 ft/m B) Inlet Clearance 12 ft/m C) Inlet Wetted Width 1.5 ft/m

Outlet Condition ☐ At Stream Grade ☒ Perched ☒ Cascade

Outlet Water Depth 2" ft/m Outlet Drop 5.5 ft/m

Tailwater Scour Pool ☒ Large ☐ Small ☐ None

Downstream Substrate: ☐ Bedrock ☒ Boulder ☐ Cobble ☐ Gravel ☐ Sand ☐ Clay ☐ Organic ☐ Unknown

Tailwater Pool Depth ☐ < 3 ft / 1 m ☒ > 3 ft / 1 m Tailwater Armoring ☒ Extensive ☐ Not Extensive ☐ None

A) Outlet Span 11 ft/m B) Outlet Clearance 12 ft/m C) Outlet Wetted Width 3 ft/m

D) Crossing Structure Length 114 ft/m E) Abutment Height 15 ft/m | Sliplined Culvert ☐ Yes ☐ No

Crossing Substrate ☐ None ☐ Comparable ☐ Contrasting ☐ Unknown | ▶ Continuous ☐ Yes ☐ No ☐ Unknown

Internal Structures ☒ None ☐ Baffles / Weirs ☐ Bridge Piers ☐ Other _____ | Corrugations ☐ Yes ☒ No

Water Depth Matches Stream ☐ Yes/Comparable ☒ No | Water Velocity Matches Stream ☐ Yes/Comparable ☒ No

Slope Compared to Channel Slope ☐ Higher ☒ Lower ☐ Same | Alignment ☒ Flow-Aligned ☐ Skewed

Significant Sediment Source Upstream ☐ Road / Ditches ☐ Embankment ☐ Stream Banks ☒ None

Downstream ☐ Road / Ditches ☐ Embankment ☐ Stream Banks ☒ None

Wildlife Barriers ☐ None ☐ High Traffic Volume ☒ Steep Embankments ☐ Retaining Walls ☐ Jersey Barriers ☐ Fencing

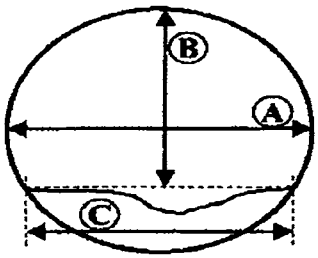
Comments: concrete lined; steeper at upstream end; complete barrier to upstream movement of fish

Units: ☒ Feet ☐ Meters

Structure Type & Dimensions

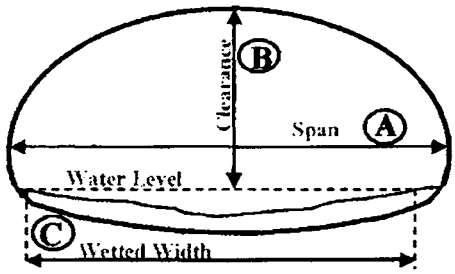
1) Select the Specific Structure Type from the diagrams below and check its number on the front of this form, and
2) Record on the front of this form in the approriate blanks dimensions A, B, and C as shown in the diagrams, as well the total Crossing Structure Length (D) for all. Record abutment height (E) only for Type 7 Structures.

1



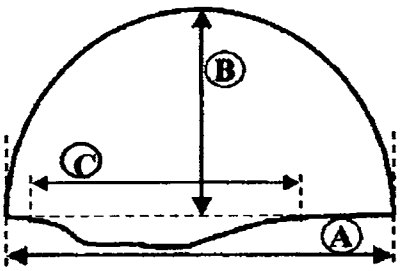
Round Culvert

2



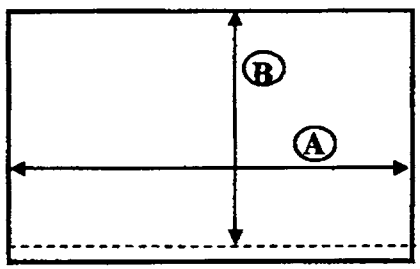
Pipe Arch Culvert

3



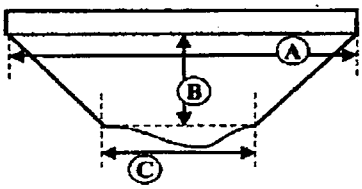
Open Bottom Arch

4



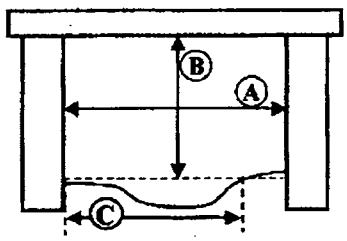
Box Culvert

5



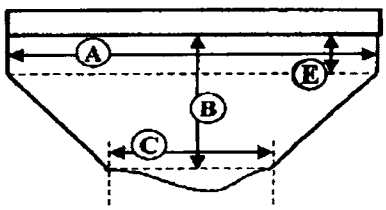
Bridge with Side Slopes

6



Bridge with Abutments
OR
Bottomless Box Culvert

7



Bridge with Abutments and Side Slopes