Trout study 2005 draft data summary by John MacMillan and Tara Crandlemere

Regional and provincial data have indicated that trout populations could benefit from additional protection through the use of Special Management Areas. On a provincial level the annual catch of brook trout has ranged from 800,000 to 2.2 million and has decreased by about sixty percent over the past 25 years. Difficulty arises when attempting to assess the importance of each factor behind the trend in annual trout catch. The decline has corresponded with habitat changes, a drop in license sales, and new regulations designed to reduce the harvest. Regionally, previous studies and many anglers have indicated that changes in trout populations have occurred and overfishing has taken place.

There is little doubt that overfishing and habitat loss have resulted in changes to the trout fishery

The goal of Special Management Areas are to protect stocks from overfishing as well as increase the number of fish caught by anglers.

The Woodens River Special Management Area represents the only Nova Scotia watershed, including all lakes, that is under a catch and release regulations.

The Tangier Grand Lake Wilderness Area is under general regulations that include a daily bag limit of five trout with no gear restriction.

Two lakes in the Woodens River watershed (Croucher and Long) and two lakes in the Tangier Grand Lake Wilderness Area (Fourth and Blue Woods) were selected for assessment through the Recreational Fishing Advisory Committee Process.

The purpose of the 2005 trout study was to assess the status of the four trout populations and environmental factors that may influence trout production in the four study lakes. The data were compared with other recent studies conducted in the Cape Breton highlands and mainland Nova Scotia, as well as compared to historical studies.

Angling and netting were used to catch, measure and mark trout from the four lakes. Scale samples were collected from trout to assess age, length, and growth.

The data in this report should be regarded as preliminary and may change with further analysis.

Data collected during the 2005 survey was used to describe:

Growth rates	Population size
Population density	Lake habitat suitability
Population age structure	Competitors in the lake

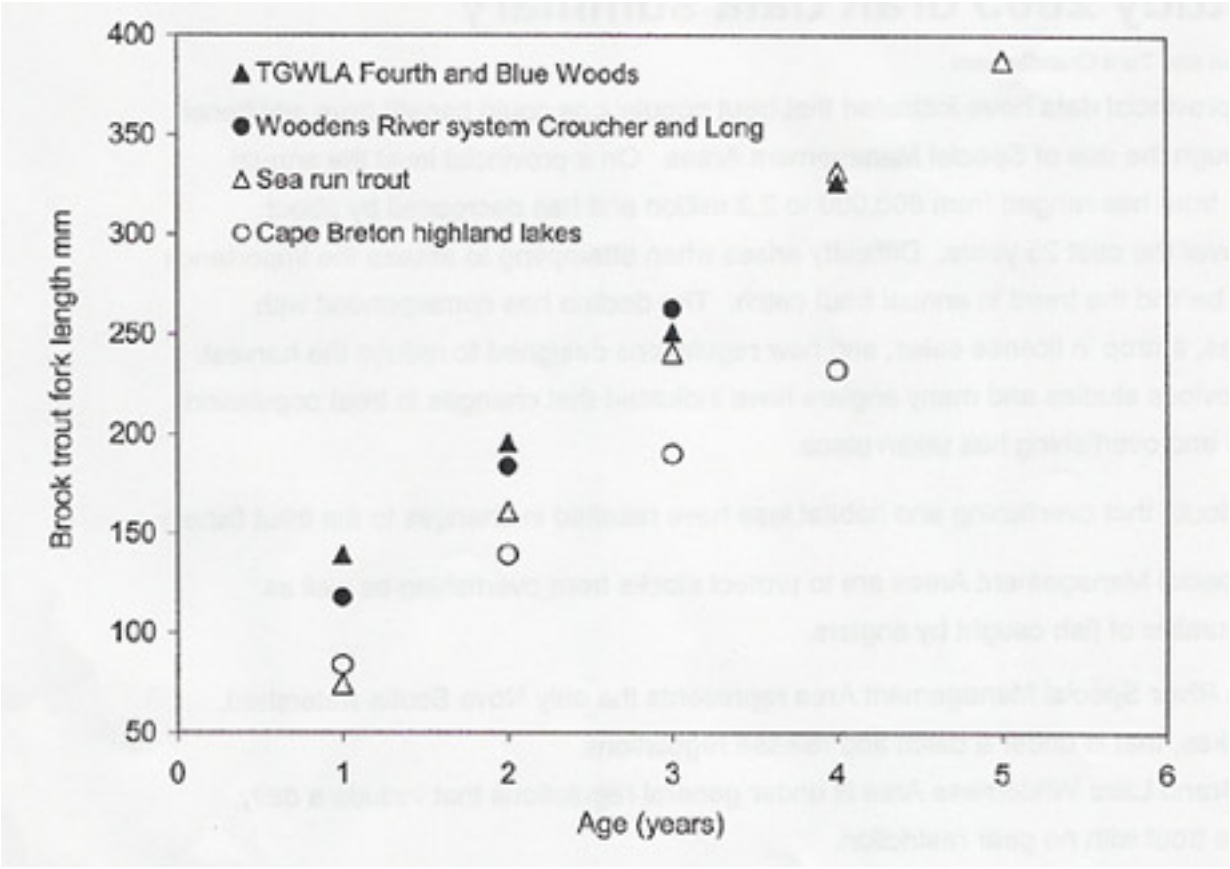

Figure 1. Mean length at age of brook trout in Nova Scotia.

Table 1. Back-calculated length at age in mm of brook trout sampled from different sites

Lake	one year	two year	three year	four year	fifth year
Fourth Lake	104	173	244	349	
Blue Woods Lake	174	218	257	303	
Long Lake	126	189	261		
Croucher Lake	109	179	264		
Big Indian Lake	108	179	255		
East Taylor Bay	76	154	238		
Cape Breton Highlands	84	139	190	232	
Northumberland Strait rivers sea run	86	162	241	336	402
Middle River Cape Breton sea run	63	160	240	327	373
Halifax / Guysborough lakes	102	176	235	269	
Average	103	173	243	303	388

Growth is variable depending on region and life history
Growth is fast in mainland lakes compared to highland lakes
Sea run fish grow fast once they leave freshwater
Very few brook trout reach the age of four and five years
Fast growth indicates that food supply is not limiting to some populations

Table 2. Mean catch per trap night of brook trout and competitors of brook trout in sixteen lakes in Halifax County and the Cape Breton

Year	Region	Lake	Competing species	Mean number of trout Caught per trap night
2002	Halifax County	East Taylor Bay	2	0.48
		Rocky	3	0.02
		Alma	3	0.07
		Southwest	5	0.21
2005		Long	3	0.04
		Blue Woods	3	0.37
		Fourth L	2	0.25
		Croucher	3	0.14
Average				0.20
2003	Cape Breton	Larken	1	1.8
		Moose	1	5.4
		Timber	1	1.5
		Bonnie	1	0.9
		Round	1	3.3
		Tara Pond	1	6.5
		MacDonalds Pond	1	2.5
		Bell	1	0.21
Average				2.76

*competitor species include white perch, yellow perch, American eel, white suckers, and

brown bullhead.
Brook trout are poor competitors and tend to be at low population density in areas where competition is strong.
Highest catch rates (i.e., population density index) are found in Cape Breton highland populations with few competitors.

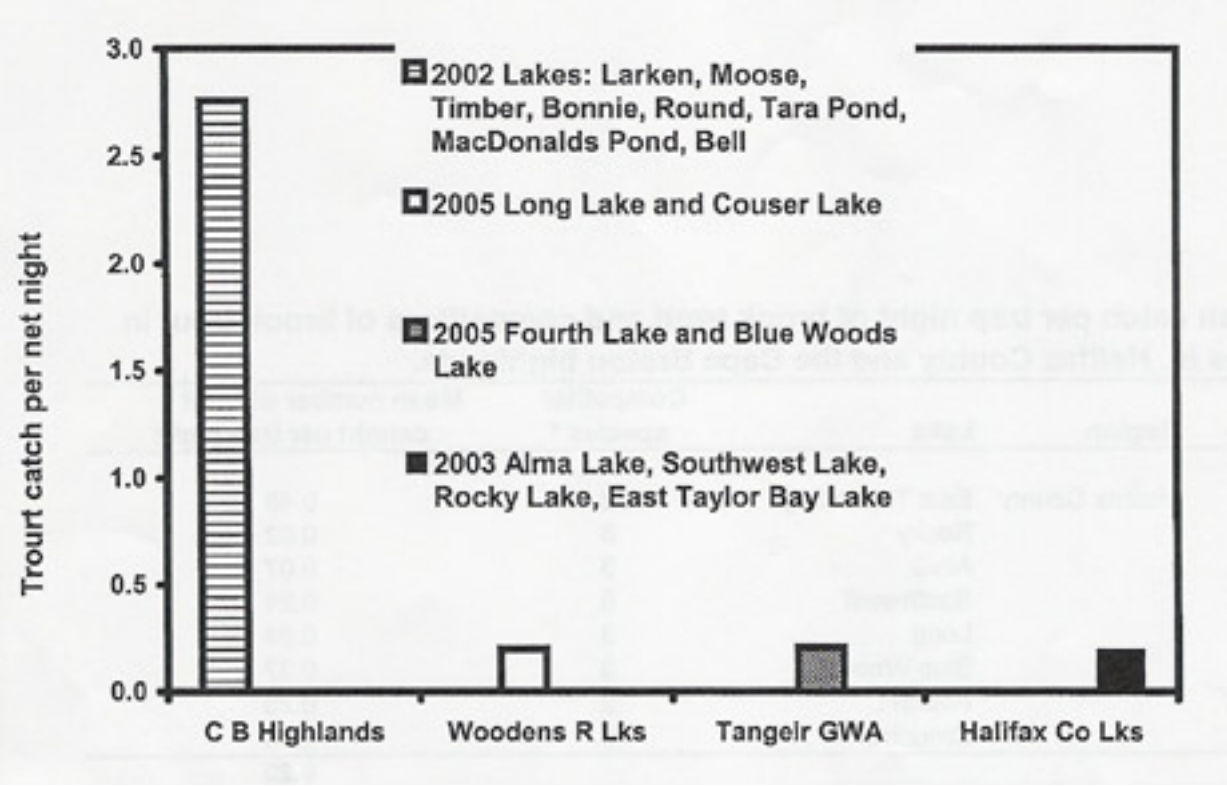

Figure 2. Mean trout catch per net night in the Cape Breton highlands compared to mainland populations

Catch of trout per net night is used as an index of population density (level of crowding).
Population density in much lower in mainland populations compared to the Cape Breton highlands.
Slow growth in Cape Breton highlands seems to be related to population density.
Factors that may influence density include water quality, competition and overfishing.
Populations at low density are potentially more sensitive to being overfished compared to trout populations at high density.

Table 3. Profiles of dissolved oxygen and temperature at depth in summer.

East Taylor Bay Halifax County

Depth	Temperature	Dissolved oxygen	
m	°C	mg/l	% saturation
0	22	7.5	85
1	22	7.5	85
2	22	7.4	84
3	22	6.8	76
4	22	6.6	74
5	22	4.0	45
6	15	5.8	57
7	13	5.8	55
8	12	5.6	52
9	10	5.4	47
10	10	4.6	40
11	8	3.6	30
12	8	2.8	23
13	8	2.5	21

pH = 5.1

Blue Woods Lake Tangier Grand Wilderness Area

Depth	Temperature	Dissolved oxygen	
m	°C	mg/l	% saturation
0	25	8.5	102
1	25	8.2	98
2	22	7.8	89
3	16	4.9	49
4	12	4.7	43
5	10	4.6	40
6	9	3.1	27
7	9	2.2	19
8	9	1.4	12

pH = 5.7

Fourth Lake Tangier Grand Wilderness Area

Depth	Temperature	Dissolved oxygen	
m	°C	mg/l	% saturation
0	25	7.0	83
1	25	7.0	83
2	24	6.5	76
3	21	5.7	64
4	14	4.8	45
5	10	1.8	15
6	9	1.4	12
7	9	2.8	24

pH = 5.8

Long Lake Woodens River

Depth	Temperature	Dissolved oxygen	
m	°C	mg/l	% saturation
0	25	7.0	83
1	25	7.0	83
2	23	6.5	75
3	22	5.7	65
4	22	4.8	54
5	17	1.8	18
6	12	1.4	13
7	11	1.1	10
8	10	0.9	8

pH = 5.7

Croucher Lake Woodens River

Depth	Temperature	Dissolved oxygen	
m	°C	mg/l	% saturation
0	23	8.5	99
1	23	8.5	99
1.5	22	7.9	89
2	21	7.2	80
2.5	21	5.6	62
3	20	1.9	21

pH = 5.7

Brook trout require cool well oxygenated (>50% saturation) water to survive.

The depth of stratification is variable and ranged from 2m to 6m
Dark coloured water lakes can have a shallow depth of stratification
Suitable summer habitat in many lakes could be reduced to groundwater seeps/springs and a thin layer in lakes between anoxic (low oxygen) cool water and warm (>20C) surface water.

Table 4. Brook trout population size in ten lakes in Nova Scotia

County	Lake	Size ha	Trout (Kg / ha)	Number of trout per ha	FL cm mean	Weight mean grams	Population estimate mean	*Competitors	pH	Reference
Halifax	Croucher	10	2.5	17	23	145	172	Eel, YP, WS	5.4	2005 trout study
	Blue Woods	25	0.7	4	24	170	102	Eel, YP, WS	5.7	2005 trout study
	Fourth	10	2.7	21	22	125	212	Eel, Bul	5.8	2005 trout study
	Long	50	n/a	n/a	24	168	n/a	Eel, YP, WS	5.5	2005 trout study
	Big Indian	106	2.3	22	22	130	2346	Eel	5.5	Alexander & Merrill, 1976
Victoria	Ingonish	32	3.7	39	20	93	1262	Eel	-	McNeil, 1996
Yarmouth	L Jesse	18	0.4	2	28	276	29	WS,YP, Eel, Bul	5.9	Smith, 1938
Digby	Boarsback	23	0.1	1	20	87	23	WS,YP, Eel, Bul	4.4	Smith, 1938
	Tedford	21	0	0	0	0	0	WP, YP, Eel, Bul	5.7	Smith, 1938

*competitor species include white perch, yellow perch, American eel, white suckers, and brown bullhead.

Trout production is low in many Nova Scotia lakes and few previous studies have taken place to assess trout population size in Nova Scotia

The highest trout biomass (3.7 kilograms per hectare) was from Ingonish Lake in the Cape Breton highlands

The smallest mean length of trout (20 cm) were found in Ingonish Lake indicating a higher level of crowding

The lowest trout biomass (0 - 0.4 kilograms per hectare) was located in Southwest Nova Scotia lakes inhabited by four competing species

Trout represented 2% and 0.6% of the total fish production in Lake Jesse and Boarsback Lake in Southwest Nova Scotia

Table 5. Mean salmonid population densities from 100 electrofished stream sites in 2002-05 in Nova Scotia.

Thermal category average summer water temperature	Num of Sites	Trout kg per ha	Density Trout per ha	Percentage of site with competitors	Depth mn m	pH
Cool <16.5°C	35	61	5538	43%	0.20	7.1
Inter 16.5 - 19°C	29	15	1446	62%	0.20	6.8
Warm >19°C	36	2	176	89%	0.20	6.3

Trout populations in streams is highly related to water temperature

Warm streams were occupied by more fish species considered to be competitors of trout

Trout biomass in kilograms per hectare is much greater in cool streams compared to lakes

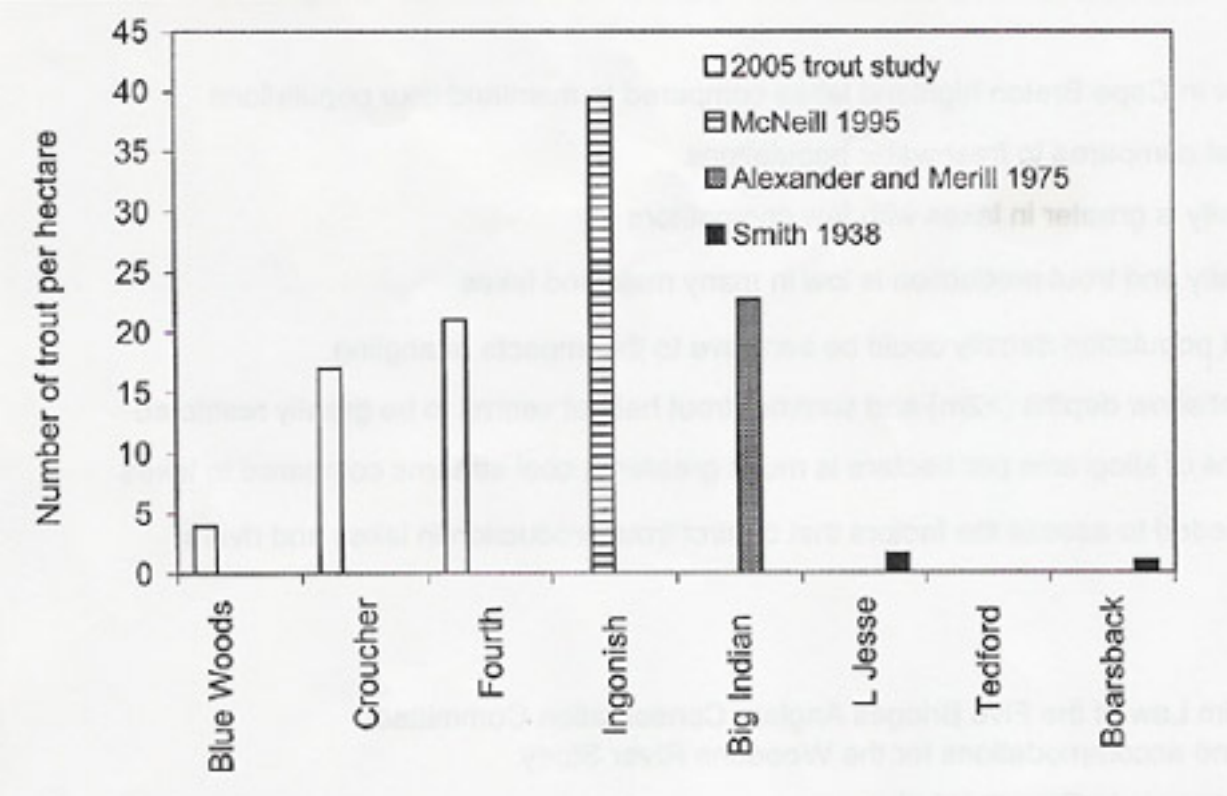

Figure 3. Population estimates (number of trout per hectare) from eight lakes in Nova Scotia.

Population estimates indicate that trout production is variable and less in mainland Nova Scotia compared to Cape Breton (Ingonish Lake).
More cool water habitat and fewer numbers of competitor species are present in Cape Breton highland streams and lakes.
Trout production is less in Digby and Yarmouth (L Jesse, Tedford, and Boarsback).
According to Smith (1938), Lake Jesse and Tedford lake were good sites to angle in years prior to 1938. White speculated that overfishing reduced predation by trout on yellow perch and enabled the populations of yellow perch to dominate habitat.
Alexander and Merrill (1976) concluded that trout production is low in Nova Scotia and suggested that overfishing has occurred and resulted in more available habitat for competitors of trout.
Habitat disturbance and warming trends can benefit populations of warm water species that include white and yellow perch, white sucker, and bullhead.
Croucher and Big Indian Lakes were under Special Management at the time of sampling.

Conclusions

Growth of trout is slow in Cape Breton highland lakes compared to mainland lake populations
Sea run trout grow fast compared to freshwater populations
Trout population density is greater in lakes with few competitors
Trout population density and trout production is low in many mainland lakes
Lakes with small trout population density could be sensitive to the impacts of angling
Lakes can stratify at shallow depths (>2m) and summer trout habitat seems to be greatly restricted
Trout biomass in terms of kilograms per hectare is much greater in cool streams compared to lakes
Additional study is needed to assess the factors that control trout production in lakes and rivers in Nova Scotia

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