PRELIMINARY STUDY OF THE LAMPREY RIVER WATERSHED

HENRY VALENTINE
JOHN C. WALKER
GARY W. SEARS
EUGENE R. CLARK, III

RESOURCE ECONOMICS 508
PROFESSORS WEEKS
AND JANSEN

Introduction

An appropriate introduction to this report should start with a synopsis of the goals this group set forth to accomplish, and justification of those goals.

As members of a course in Community Development, we wished to involve ourselves in the actual applied practices of community research. To accomplish this we attempted to set forth goals which would aid us in our learning processes, and yet be of value to the group we were working with. The Lamprey River Watershed Association is a newly-established group which we felt would be in need of some of the basic information we have gathered. This report in no way is intended to be completely comprehensive. It is a foundation which we hope the newly-formed watershed can use to launch themselves into further appropriate action. The facts presented in this report are stock inventory of the 14 towns within the watershed, and provide basic relative information which may be of use to the Lamprey River Watershed Association. In choosing areas to research we looked for those variables which would have the most dramatic impact on this area in the near and distant future. These areas of concern include: Population, Education, Community Facilities, and Housing.

As a preface to the facts which appear on the following pages, it would be in order to give some general information as to what the Lamprey River Watershed includes. The area the watershed spreads over in these 14 towns covers 142,000 acres in size. The average yearly rainfall is 43 inches with a 50 precent run-off of 21 inches. The principal storage of the watershed area is Mendums

Pond in Barrington and Pawtuckaway Pond in Nottingham. Running through these towns are 32 miles of streams having safe yields of 1 to 10 million gallons per day. The principal river is the Lamprey, which is formed by the confluence of several small streams that rise in the southeast corner of Northwood, flow southerly into Raymond, then easterly to Epping, and finally northeast to Newmarket where it empties into Great Bay. Other rivers which flow into the Lamprey include the North River, the Little River, and the Piscassic River. At the lower end of the river is a tidal range rising 6.8 feet. The gaging station on the Lamprey River is 4.6 miles upstream from its mouth.

The current condition of the waters in the watershed is good with only a few miles of streams in B-2 or lower condition. The N.H. State Legislature has claimed waters in the watershed to be B-1 with only the following exceptions: the Piscassic River, Foletts Brook, and all of their tributaries which are class A. These waters supply the municipal water system of Newmarket.

Hopefully this introduction has set the stage for what will be found in the remainder of this report.

As students enrolled in a course of applied Community Development, we hope to help these communities of the Lamprey Watershed Association achieve their goals, and at the same time we are striving to help ourselves learn and become more knowledgeable in the area of community processes. Hopefully with this project we have succeeded in meeting both goals.

A fitting quotation taken from the booklet, "The Theory and Practice of Community Development" by Donald Littrell, evokes the

image we wish to project with this report:

> The community development worker strives to motivate people to look at their environment to see how it might be enhanced or improved. He encourages the people to analyze their situation and to set goals. By helping people to establish a community development process in an area, a process of human development is started.

Population

When making an analysis such as this report is attempting to do, population figures are probably the most important of all to help make predictions about the future. Population logically deals with people, and people are our prime concern in the watershed. After all, people will help solve problems.

Population can be broken down into four particular categories, those deemed important to the watershed: 1) Population Growth, 2) Population Projections, 3) Age Distribution, and 4) Population Density and Land Area.

1. Population Growth

Below are the figures for past population within each town in the watershed. Also shown are the percent changes between decades. Finally, a comparison of past population between the Watershed Region, the two counties the watershed is in, and post population for the State of New Hampshire.

For these figures, the percent change is the important category. These changes by decade gives some ideas from what has been happening in the past, and can possibly give some ideas about what will happen in the future.

Population Growth 1940-1970

	1940 Census Population	1950 Census Population	1960 Census Population	1970 Census Population	1940-1950 % Change	1950-1960 % Change	1960-1970 % Change
Barrington	780	1,052	1,036	1,865	34.9	-1.5	80.0
Brentwood	720	819	1,072	1,468	13.8	30.9	37.0
Candia	965	1,243	1,490	1,997	28.8	19.9	34.0
Deerfield	749	706	714	1,178	-5.8	1.1	64.9
Durham	1,533	4,770	5,504	8,869	311.2	15.4	61.1
Epping	1,618	1,796	2,006	2,356	11.0	11.7	17.4
Exeter	5,398	5,664	7,243	8,892	4.9	27.9	22.7
Fremont	634	698	783	993	10.1	12.2	26.8
Lee	481	575	931	1,481	19.5	61.9	59.1
Newfields	417	469	737	843	12.5	57.1	14.4
Newmarket	2,640	2,709	3,153	3,361	2.6	16.4	6.6
Norhtwood	873	966	1,034	1,526	10.7	7.0	47.6
Nottingham	463	566	623	952	20.9	10.1	52.8
Raymond	1,340	1,428	1,867	3,003	6.6	30.7	60.8
Watershed Region	18,616	23,461	28,193	38,784	26.0	20.2	37.5
Rockingham	58,142	70,059	99,029	138,951	20.5	41.4	40.3
Strafford	43,553	51,567	59,799	70,431	18.4	16.0	17.8
State	491,524	533,242	606,256	737,681	8.5	13.7	21.7

2. Population Projections

Projections into the future concerning population by each town in the watershed are given below. These numbers can be used to help make plans for the future. Since these figures are estimates, they cannot be considered exact. Since they do form some guidelines for planning, they are important.

Population Projections

Town	1980	1990	2000	2010	2020
Barrington	3,300	7,000	14,000	25,000	40,000
Brentwood	2,300	3,700	5,600	8,200	13,000
Candia	5,200	5,200	9,400	18,000	35,000
Deerfield	1,800	3,600	7,000	13,000	22,000
Durham	14,000	20,000	25,000	29,000	31,000
Epping	3,700	5,400	8,200	13,000	22,000
Exeter	8,500	9,200	10,000	10,500	11,000
Fremont	1,500	2,500	4,800	10,500	22,000
Lee	2,200	4,000	6,000	8,000	9,800
Newfields	800	900	1,000	1,300	1,800
Newmarket	3,800	4,300	5,200	6,400	8,400
Northwood	1,900	2,300	3,000	4,100	6,800
Nottingham	1,400	2,500	4,500	8,800	17,000
Raymond	4,300	6,600	10,000	15,500	24,000

3. Age Distribution

A breakdown of the population in regards to age of individuals is given below for each town in the watershed. These figures are important in that they will help give some ideas to types of needs for the communities in the future. Each type of age bracket has desires and needs, and these must be taken into account.

Age Distribution

Town	Under 18	18-64	65 and over	% under 18 years	% over 65 years	Median age in years
Barrington	707	1,017	141	37.9	7.6	25.6
Brentwood	462	717	289	31.5	19.7	33.5
Candia	803	1,032	162	39.9	8.1	26.6
Deerfield	436	584	158	37.0	12.9	29.1
Durham	1,452	7,122	295	16.4	3.3	21.1
Epping	882	1,279	195	37.4	8.3	26.8
Exeter	3,105	4,685	1,102	34.9	12.4	29.8
Fremont	371	500	122	35.6	12.3	29.6
Lee	483	890	108	32.6	7.3	24.6
Newfields	371	418	54	43.3	6.4	23.8
Newmarket	1,109	1,898	354	33.0	10.5	27.4
Northwood	570	773	183	37.4	12.0	27.5
Nottingham	336	528	88	35.3	9.2	26.8
Raymond	1,129	1,561	313	37.6	10.4	27.2

4. Population Density and Land Area

The relationship between land and water area per square mile, and total population gives some meaning to how each town breaks down in relation to density. These are given for each town in the watershed. Also shown is a comparison between the watershed region and the two counties the watershed is in.

This again will give some idea for needs for the future.

Land Area and Population Density

Town	Inland Water Area in Square Miles	Land Area in Square Miles	Total Population 1970	Population Density Persons/sq.mi.
Barrington	2.0	47.1	1,865	36.6
Brentwood	-	16.8	1,468	87.4
Candia	0.3	29.9	1,997	66.8
Deerfield	1.0	50.9	1,178	23.1
Durham	2.2	23.3	8,869	380.6
Epping	-	26.2	2,356	89.9
Exeter	-	19.5	8,892	409.8
Fremont	*	17.2	993	57.7
Lee	0.1	20.3	1,481	73.0
Newfields	0.2	7.1	843	118.7
Newmarket	1.5	12.3	3,361	273.3
Northwood	1.8	27.9	1,526	54.7
Nottingham	2.1	46.0	952	20.7
Raymond	0.4	28.9	3,003	103.9
Region	11.6	373.4	38,784	103.9
Rockingham	27.1	690.8	138,951	201.1
Strafford	12.9	376.9	70,431	187.3

Housing

Housing is another category that has importance to the watershed. Types, conditions, and total numbers all have relevance to problems in the watershed towns. Whether these towns are capable of handling the possible growth in the future can and must be considered. Housing and population figures together will help answer the questions and give predictions concerning the future for the watershed and towns within the watershed.

Housing is broken down into three considerations: 1) type of housing, 2) numbers of houses, and 3) comparisons between counties and State.

1. Types of Housing

Included in the following chart is a breakdown of types of housing according to towns in the watershed. Within each type are considerations of plumbing and size of structure, which hopefully can give some indications of overall conditions of the housing involved.

Also included is a comparison between the two counties the watershed is in, and the State of New Hampshire. These will help give some insight as to how the two counties compare with the State.

Selected Housing Information - 1970

Year Round Housing Units

	total housing units	total	lack/ plumb.	one unit structure	Owner Occupied: total	Owner Occupied: lack/ plumb.	Owner Occupied: median # rooms	Owner Occupied: median value in $	Renter Occupied: total	Renter Occupied: lack/ plumb.	Renter Occupied: median # rooms	Renter Occupied: med. contract rent in $	1.01 or more persons per rm: total	1.01 or more persons per rm: lack/ plumb.
Barrington	1013	608	75	454	466	42	5.3	13,300	86	9	4.3	124	50	38
Brentwood	401	381	45	323	329	41	5.7	12,500	39	1	4.3	63	33	28
Candia	605	598	56	544	510	32	5.9	14,500	40	3	4.4	84	45	39
Deerfield	634	372	62	328	300	38	5.8	13,200	37	8	4.2	55	30	19
Durham	1560	1534	93	909	806	8	6.9	28,400	663	73	3.6	114	95	74
Epping	868	738	91	531	543	51	5.4	10,900	141	28	4.3	57	67	54
Exeter	3097	3081	163	1700	1998	38	5.6	17,300	946	84	4.1	81	134	126
Fremont	403	327	108	270	244	90	5.6	12,100	46	18	4.3	67	45	25
Lee	537	481	19	282	340	17	5.3	15,400	136	1	3.6	113	59	52
Newfields	232	231	12	200	176	8	6.4	13,100	45	4	5.1	72	17	17
Newmarket	1171	1163	61	534	655	22	5.9	14,400	442	24	4.3	69	63	60
Northwood	1140	516	62	415	388	41	5.7	14,500	73	9	4.6	83	37	28
Nottingham	665	336	45	297	257	38	5.8	13,900	43	7	5.1	92	24	20
Raymond	1193	995	107	638	760	41	5.0	13,300	154	12	4.2	84	77	58
Watershed Region							5.7	14,800			4.3	83		
Rockingham County							5.6	18,100			4.2	99		
Strafford County							5.7	14,600			4.1	77		
State							5.7	16,500			4.2	80		

2. Number of Houses.

In this category are a number of considerations. The total numbers are given for 1960 and 1970, and the change between the two. Also included are comparisons between total population by towns and population in households by towns. Finally there are figures for average number of persons per household and median family income.

These considerations, in accordance with other charts, help piece together the picture of where growth is within the watershed, and what the future holds.

Population in Households

	Number Households 1960	Number Households 1970	% Change in Households 1960-70	Total Pop. 1970	Pop. in Households	Ave. # Persons/ Household	Median Family Income 1969
Barrington	289	552	91.0	1,865	1,865	3.38	9,821
Brentwood	255	368	44.3	1,468	1,230	3.34	9,268
Candia	406	550	35.5	1,997	1,979	3.60	9,519
Deerfield	210	337	60.5	1,178	1,148	3.41	10,196
Durham	958	1,469	53.3	8,869	4,454	3.03	13,077
Epping	571	684	19.8	2,356	2,322	3.39	8,718
Exeter	2,288	2,944	28.7	8,892	8,854	3.01	9,460
Fremont	227	290	27.8	993	966	3.33	9,315
Lee	283	476	68.2	1,481	1,481	3.11	8,857
Newfields	193	221	14.5	843	843	3.81	10,694
Newmarket	986	1,097	11.3	3,361	3,317	3.02	8,714
Northwood	325	461	41.8	1,526	1,524	3.31	8,690
Nottingham	192	300	56.3	952	936	3.12	8,105
Raymond	536	914	70.5	3,003	2,986	3.27	8,599
Watershed Region							9,502
Rockingham County							10,084
Strafford County							9,400
State							9,698

Community Facilities

Needed in a study of this type is an inventory of existing facilities located in the towns within the watershed area. These will be helpful in the respect that the information will give some ideas of what is needed for the future. It will be an aid and information area for future planning.

Within this category of Community Facilities are three considerations: 1) Basic Community Facilities, 2) Water Bodies and Recreational Uses, and 3) Administrative Community Facilities.

1. Basic Community Facilities

In this category are included the core facilities within each town in the watershed. Gas, Electricity, Water, Sewer, Refuse Disposal, and Fire Department are the headings involved. These areas help to show where the community stands at the present, and how well these towns are prepared for the future. Water, Sewerage, and Refuse Disposal have the most meaning to the watershed in that these can directly affect the water bodies in the watershed area. This category is given by each town in the watershed.

Basic Community Facilities

Brentwood

Gas	No franchised utility
Electricity	Public Service Co. of N.H., Private, 100% population served
Water	No public system
Sewer	No public facility
Refuse Disposal	Kingston town dump may be used by Brentwood residents
Fire Department	Local department with $8,000 of equipment

Candia

Deerfield

Gas	No franchised utility
Electricity	Public Service Co. of N.H.
Water	Private wells - often put in by owners
Sewer	Private septic tanks - often put in by owners
Refuse Disposal	Dump at Fair Grounds looking for land for a landfill
Fire Department	Volunteer with an association owning the equipment

Durham

Gas	No franchised utility
Electricity	N.H. Electric Cooperative; Public Service Co. of N.H. 100% served
Water	Durham Water Dept; Private, 85.3% of population served
Sewer	Public facilities, serves 450 homes
Refuse Disposal	Municipal collection weekly
Fire Department	7 full-time men and 30-36 volunteers

Epping

Gas	No franchised utility
Electricity	N.H. Electric Co-op, Inc., Private, 100% population served
Water	Epping Water Department, Public, 32.4% population served
Sewer	Public facility
Refuse Disposal	By arrangement
Fire Department	Department in town, $20,000 land and buildings, $24,395 equipment

Basic Community Facilities (Cont'd)

Exeter

Gas	Northern Utilities Inc.
Electricity	Exeter and Hampton Electric Co.
Water	Municipal
Sewer	Municipal
Refuse Disposal	Municipal
Fire Department	Municipal

Fremont

Gas	No franchised utility
Electricity	Public Service Co. of N.H., Private, 100% served
Water	No public supply
Sewer	No public system
Refuse Disposal	Town dump - no public collection
Fire Department	Volunteer Dept., $8,900 land and equipment, $24,000 equip.

Lee

Gas	No franchised utility
Electricity	N.H. Electric Co-op, Private; Public Service Co. of N.H.
Water	No public supply
Sewer	No public system
Refuse Disposal	Town dump, no public collection
Fire Department	Volunteer system - $13,000 land, buildings, and equipment

Newfields

Gas	No franchised utility
Electricity	Public Service Co. of N.H., Private, 100% population served
Water	Newfield's Water Dept., Public - 52.6% population served
Sewer	No public facility
Refuse Disposal	By private arrangements
Fire Department	Local Dept., $8,428 land and buildings, $6,046 equipment

Newmarket

Gas	No franchised utility
Electricity	Public Service Co. of N.H.
Water	Newmarket Water Works, Public, 85% population served
Sewer	No public system
Refuse Disposal	Public collection weekly
Fire Department	Local Dept. $15,000 property, $10,200 equipment

Bacis Community Facilities (Cont'd)

Northwood

Gas	No franchised utility (Hopkins bottle gas)
Electricity	Public Service Co. of N.H.
Water	Private (wells)
Sewer	Private (septic tanks)
Refuse Disposal	Private - every man for himself
Fire Department	Volunteer, with equipment town owned

Nottingham

Gas	No franchised utility
Electricity	Public Service Co. of N.H.
Water	Private (wells)
Sewer	Private (septic tanks)
Refuse Disposal	By private arrangements (bring your own) central dump
Fire Department	Volunteer, equipment owned by town

Raymond

Gas	No franchised utility
Electricity	Public Service Co. of N.H. or R.E.A.
Water	Center of town for ½ mile in all directions is town water or public and the rest is private (wells)
Sewer	All private (septic tanks)
Refuse Disposal	Every man for himself
Fire Department	Volunteer, equipment owned by town, full-time fire chief.

Barrington

Gas	No franchised utility
Electricity	Public Service Co. of NH
Water	Private (wells)
Sewer	Septic tanks
Refuse Disposal	You take your own
Fire Department	Volunteer, Department or association owns equipment

2. Water Bodies and Recreational Uses

Included under this heading is a listing of water bodies in the watershed area. There is also a listing of recreational uses in the watershed. These two listings are of major importance to the watershed. Since recreation is such an integral part of the State of New Hampshire, these take on new meanings. The numbers of potential users could be staggering.

Given under Recreational Uses are present organized activities, showing what is used, and how much is used. This is important in evaluating future needs.

Water Bodies in Lamprey River Watershed

Name of Water Body	Town	Acres
Mendums Pond	Barrington	253
Loon Pond	Fremont	11
Piscassic Ice Pond	Newfields	10
Kenison Pond	Nottingham	15
Marston Pond	Nottingham	19
North River Pond	Nottingham	80
Pawtuckaway Pond	Nottingham	800
Quincy Pond	Nottingham	28
Dead Pond	Raymond	11
Governors Lake	Raymond	52
Lamprey River Pond	Raymond	46
Onway Lake	Raymond	193

Recreational Uses in Watershed

Water Body	Town	Name of Estate	No. Shores	Total Acres	Rec. Use	Land Use	Shore Length (ft)	Shore Length Used	Capacity
Lamprey River	Durham	Highland House (Hotel)	1	200	5	5	1,000	all	20
Lamprey River	Lee	Ferndale Acres (Camping Area)	1	60	60	60	3,000	all	100
Onway Lake	Raymond	Se-Sa-Ma-Ca	1	700	250	250	1,000	all	
		1. Organized B&C Camp							
		2. Horseback Riding							
		3. Swimming							
Onway Lake	Raymond	Shir Ray (Camping Area)	1	80	20	20	1,500	200	
		1.Camp & Trailer I and F							42
		2.Swimming							
		3.Fishing & Boating							

3. Administrative Community Facilities

Of necessary importance to a watershed is the degree of administrative or political assistance that is available in each town in the watershed. Below is a chart giving listings for Planning Boards and ordinances and codes within each town.

These listings have direct relationships with the watershed. They can, depending upon powers, help decide what course of action will be taken in any given area of the watershed. Of course, cooperation between towns is essential for the watershed, and these are areas for mutual discussion by the towns in the watershed.

Administrative Community Facilities

LAMPREY RIVER PROJECT

Towns	Planning board	Zoning ordinance	Building code	Land subdivision	Housing code
1) Barrington	1970	----	1972	----	----
2) Brentwood	1960	1962	1952	1964	1964
3) Candia	1956	1960	1960	1969	----
4) Deerfield	1967	1970	1961	1967	----
5) Durham	1942	1935	1952	1950	----
6) Epping	1952	1958	1955	1971	----
7) Exeter	1965	1966	1972	1971	----
8) Fremont	1957	1947	1957	1957	1957
9) Lee	1956	1966	1956	1962	----
10) Newfields	1945	1952	1955	1957	----
11) Newmarket	1959	1972	----	1963	----
12) Northwood	1961	1968	----	----	----
13) Nottingham	1957	1960	1957	1970	----
14) Raymond	1957	1970	----	----	----

Education

This category is one that has relevance to the watershed area in an indirect manner. Total numbers of students for each town, when used with population projections, can help give some idea of future needs for school facilities.

This indirectly affects the watershed in that land along water bodies in the watershed is often a prime site of development when spacious areas are needed. This is not to say that this will happen, but to have thought of the possiblility is enough.

Education

Town	Elementary	Jr. High	High	Total	Ave. Education Level of Town
Barrington	318	-	-	318	11.3
Brentwood	202	-	-	202	12.3
Candia	409	-	-	409	12.3
Deerfield	254	-	-	254	12.0
Durham	547	193	313	1,053	17.5
Epping	368	104	158	630	11.0
Exeter	1,199	672	1,043	2,914	12.4
Fremont	162	-	-	162	11.4
Lee	175	48	76	299	12.7
Newfields	111	-	-	111	12.1
Newmarket	486	-	205	691	12.0
Northwood	319	-	147*	466*	12.4

* Includes Public Academies

Recommendations

We do not attempt in this section of the report to list all paths of action or recommendations which would be appropriate and of value to the Lamprey River Watershed Association. We as students endeavor to learn and aid in the community planning process. We do not presume and will not attempt to fill the role of professionals in this area of study. The recommendations which follow are ones which we make in an effort to aid this newly-formed group, and setting a format of things to look toward in the future.

The first recommendation we wish to make is that of involving groups in any of the future functions performed by the association. The involvement of community planning boards, conservation commissions and agencies, and service groups will help the people of these towns understand why the watershed is so important to them. Aesthetic values, scientific study, wildlife protection, recreational assets, and water supply are just some of the varying and important uses of the watershed area.

The second recommendation which may be of help would be a culture inventory of the 14 towns in the Watershed Association. A windshield survey of each individual town would show the specific locations ofhouses, businesses, and other facilities. This inventory would show explicitly all facilities located on or near the watershed, and would be of continuing value as a reference.

A third course of action could include a survey of local soil conditions, specifically of wetland areas. The importance of this would be to locate the areas subject to flooding and to observe the effect on buildings and possibly septic limitations.

As a final recommendation we propose that the newly-formed Lamprey River Watershed Association study other watersheds and their associations. By studying other watershed associations a clear concept of their role in the community can be developed. This action would also show what other associations are doing to improve their areas and what courses of action can be taken to make the most effective impact upon their respective communities.

References

U. S. Census Reports; 1970 Census Count

Wilson, John A., Regional Planning: New Hampshire-Maine Part 2, University of New Hampshire, Durham, New Hampshire, May, 1969

New Hampshire State Planning Project, Land-Water-Recreation, Concord, New Hampshire, August, 1964

New Hampshire State Department of Education, Division of Administration. Concord, Fall Enrollments in New Hampshire Public Schools and Approved Public Academies September 1972, Concord, New Hampshire, September 1972

Littrell, Donald, The Theory and Practice of Community Development, Extension Division University of Missouri-Columbia