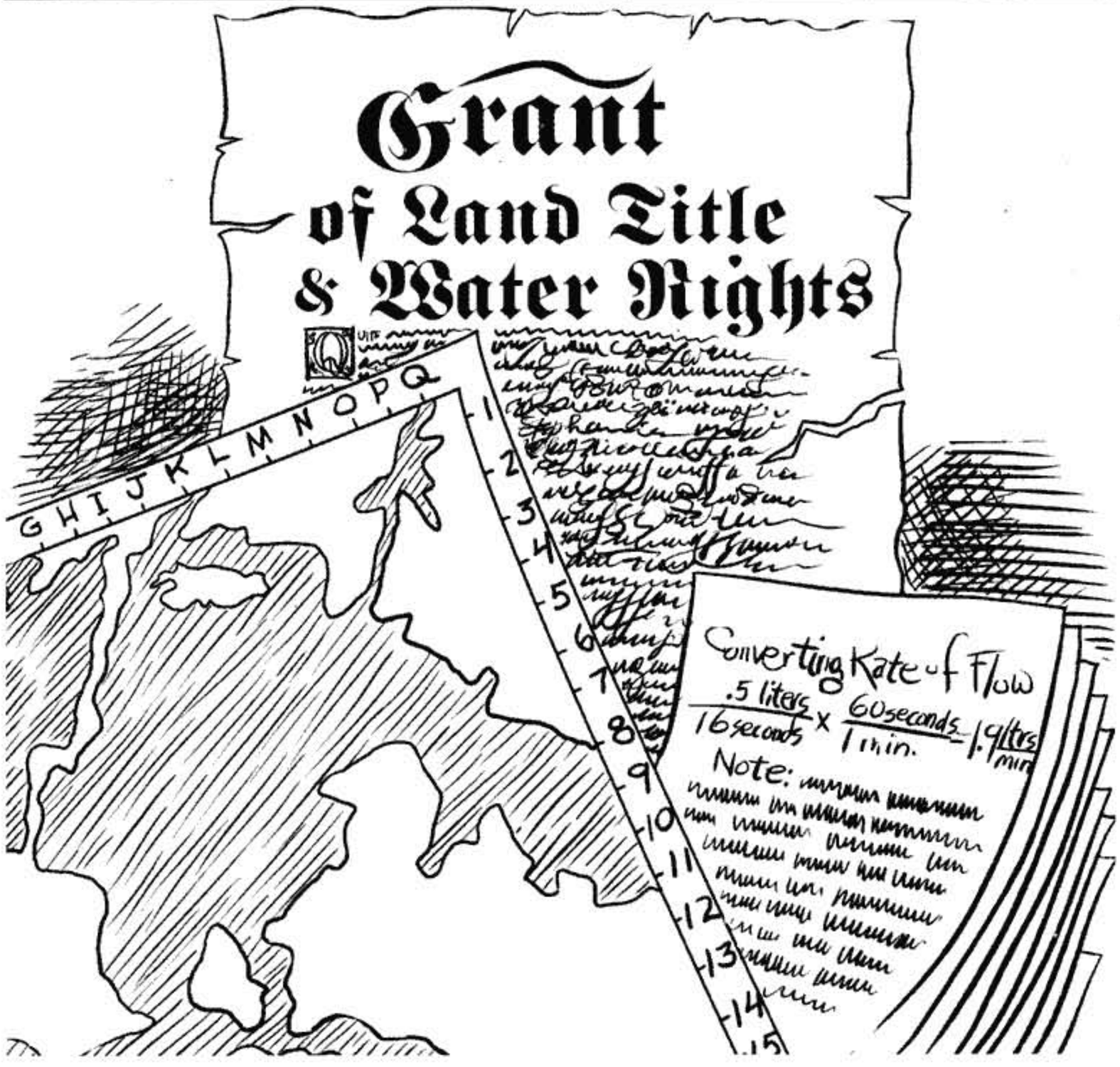
LESSON 4 BOSTON'S WATER HISTORY



LESSON 4 BOSTON'S WATER HISTORY

Water supply in Boston was a simple matter three hundred years ago, when no one had indoor plumbing and relatively few people lived in the colonial city. In the first activity, students will learn how Boston grew, not only in population but geographically. Filling tidal areas added land for houses and businesses, but it didn't increase the available fresh water. The creation of South Boston, the Back Bay and the South End eventually forced Boston to look inland for clean, fresh water. Using coordinates on a map, students will locate familiar landmarks to learn just how much Boston has grown.

Many Bostonians know vaguely that much of their water comes from a place called Quabbin Reservoir. Fewer know of the sacrifices made several generations ago to create this vast and precious resource. A second map activity honors the towns that were taken in the 1930s so that we could have a dependable water supply far into the future.

LESSON 4 BOSTON'S WATER HISTORY

ACTIVITY 4-1 WET HISTORY OF BOSTON

SUMMARY Students will learn about the growth of Boston since colonial times.

CONTENT AREAS history, social studies, math

GOAL to understand the growth of Metropolitan Boston and the corresponding planning and building required to meet its water needs

TIME one session, plus homework

MATERIALS two one-foot rulers or other straight edges for each student

ADVANCE PREPARATION

- Copy student pages and maps for each student.
- Collect necessary straight edges.

BACKGROUND INFORMATION

Boston began as a small settlement of colonists in the 1600s and has grown to be one of the world's major cities. In earlier days, the Shawmut Peninsula (original Boston) was isolated from most neighboring areas by rivers and tidal flats. Filling of tidal areas, building of dams and tide mills, construction of bridges and extension of roadways have changed Boston's geography dramatically. Today, the original footprint of Boston has been obscured by a greatly expanded metropolis.

The few wells, springs, and streams on the peninsula that supplied water to the early settlers eventually proved inadequate for the growing population. As people and animals crowded together, the water sources became polluted. In 1795, a wooden pipeline was constructed from Jamaica Pond, far from the city in those days, to supply plentiful, clean water to the growing city.

Filling the Back Bay, East and South Boston, and other areas greatly increased the land available for homes and businesses, but it didn't increase the available water. The inadequacy of the Jamaica Pond system was demonstrated by a large fire in 1825, and city officials struggled to devise a plan for Boston's water future. Finally, in 1848, water from Lake Cochituate in Natick was brought to Boston, setting the precedent of westward expansion for the water system.

In the late 1860s and early 1870s, Boston annexed a number of communities, such as Dorchester, Roxbury, Brighton and Charlestown. One incentive for these communities to join Boston was connection to its water system. Then, in 1895, the Metropolitan Water District was formed, inviting membership from any community within a ten mile radius of the State House. Wachusett Reservoir at the turn of the century and Quabbin Reservoir in the 1930s were built to meet the needs of the new, larger district; they comprise the water sources we depend upon today.

Notes about the maps: The original Boston Harbor shoreline was not as distinct as the map in this exercise suggests. Large areas were shallow water at high tide and mud flats at low tide. Some areas that appear as islands here may have been connected to the mainland at low tide. Even sections of the Shawmut Neck could be covered with water at high tides during storms.

Due to limitations of the grid system, some landmark locations may not be exact, but they will work well for the purposes of the activity

TEACHER PROCEDURE

1. Give each student (or pair of students) a copy of the student pages, including **Map One - Original Boston** and **Map Two - Water Resources.**

2. Read the procedure with them, to be sure they understand the use of coordinates on a map and to clarify that if a point lies between two letters, say C and D, we label it as CD. Similarly, 8.5 is half way between 8 and 9.

3. The activity itself can be done as classwork or homework. If students are doing it in class, circulate to be sure they understand the concept of coordinates.

4. As a follow-up when students have completed their work, you may show them an overhead transparency of **Original Boston With Current Shoreline**, or distribute copies of it. Discuss with students what large sections of today's city (Logan Airport, South Boston, Back Bay and the South End) were created by filling marshes and tidal areas.

5. Conclude the activity by asking the students to answer some reflection questions. These might include but not be limited to:

    a. What two or three things most surprised you in this activity?

    b. Why do you think we no longer use Jamaica Pond or Lake Cochituate for water supply?

    c. Why are fires important to the development of Boston's water supply?

    d. Why don't we use Boston Harbor as a water source?

ANSWERS TO STUDENT QUESTIONS

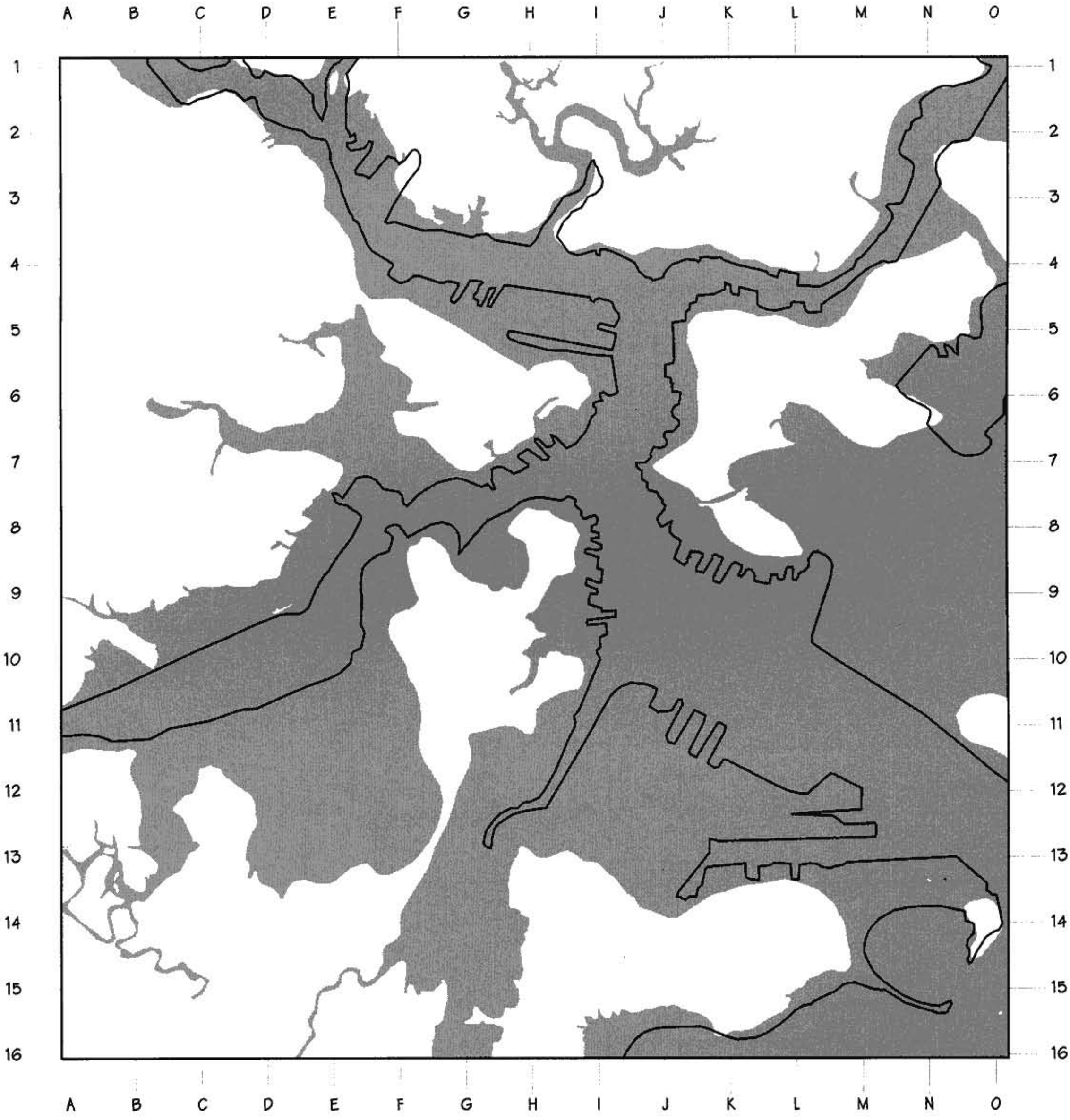
b. Too many people now live close by Jamaica Pond and Lake Cochituate, so the water is no longer as clean.

c. Firefighting requires large quantities of water in a short time. Inadequate sources are quickly depleted. At least once in Boston's history, Boston Harbor water was used to fight fires, but the salt water caused rapid corrosion of pipes, pumps and valves.

d. Boston Harbor contains salt water, not fresh water. Even if the harbor were as clean as possible, treating salt water to convert it to fresh water would be hugely expensive.

ACTIVITY 4-1 WET HISTORY OF BOSTON

ORIGINAL BOSTON WITH CURRENT SHORELINE



ACTIVITY 4-1 WET HISTORY OF BOSTON

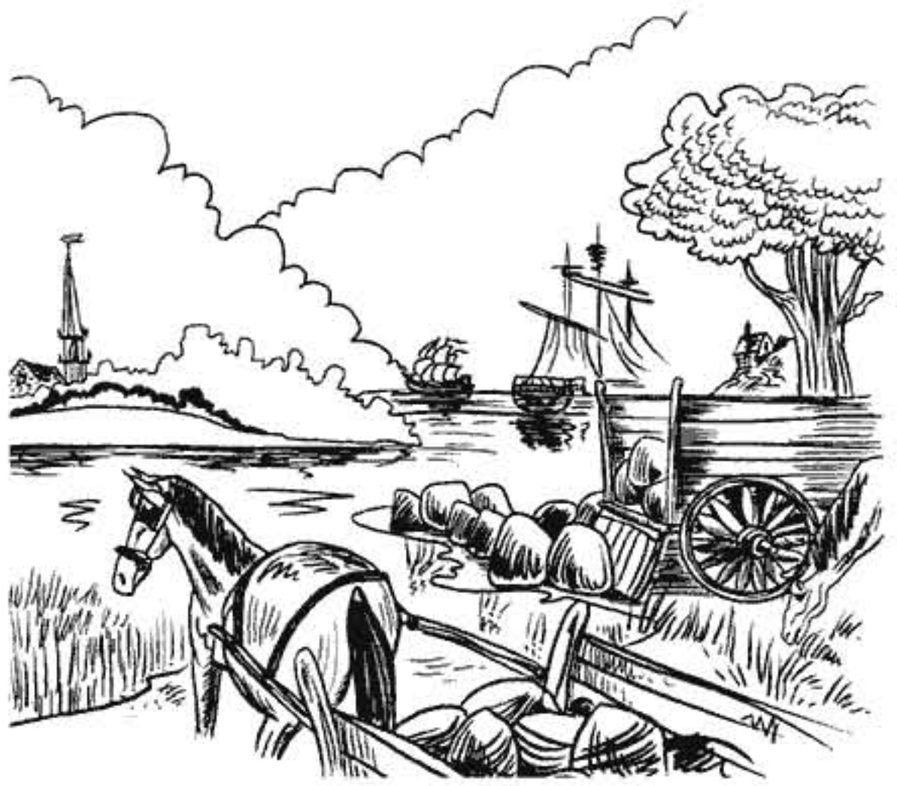
INTRODUCTION: THE STORY OF EARLY BOSTON

Boston, in Ben Franklin's boyhood, was a very different community from the city we know today. It was a peninsula of hills, fields, and marshy shores, very much a port and sea-faring place, inhabited by merchants, shopkeepers and shipbuilders. Yet as simple as it sounds, by 1743, when Franklin was 37 years old, Boston was the largest town in British North America, larger than Philadelphia or New York, with a population of 16,382.

The center of town was the present intersection of State and Washington Streets. To the east, State Street ran down to Long Wharf, the sea, and the rest of the world. The high ground to the north, which we call Beacon Hill, was mostly fields and a few poorer neighborhoods. To the south and west, a main road we now call Washington Street was Boston's only link to the mainland, running along a narrow neck of exposed land that connected to Roxbury. A fortified gate there protected the town by land; gun emplacements on the hilltops and in shoreline batteries controlled access by sea.

Residents of Dorchester and Cambridge did not visit Boston often, for travel by foot or horseback was time consuming at best and wet and muddy in stormy weather.
Jamaica Pond was far out in the country. The first bridge that linked Boston and the mainland was built to Charlestown in 1786. Boston was no longer quite so isolated.

The greatest geographical differences between Boston in 1776 and today are its shoreline and its lowered hills. Large areas we know as the central waterfront, South Cove, the South End, South Boston, East Boston and Back Bay were simply tidal flats -- that is, shallow water at high tide and marshy ground at low tide. Early ships unloaded by anchoring in the harbor and transferring cargo to lighter boats. Only when docks and wharves were extended to deeper water could ships unload directly onto land.



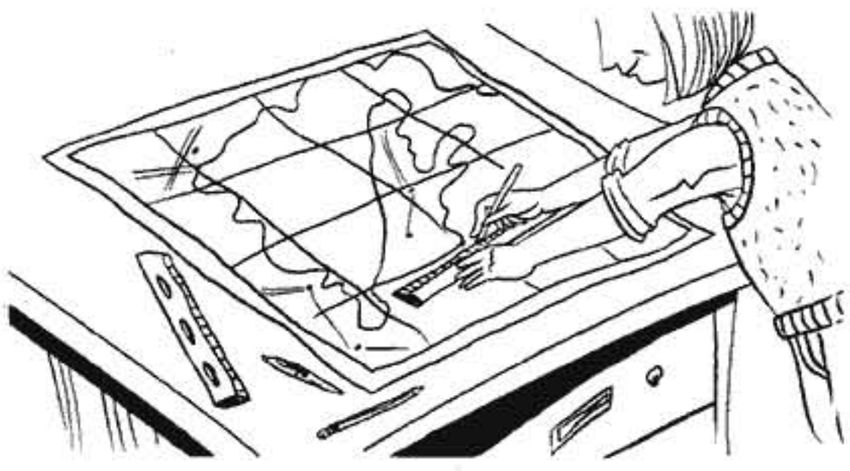
How did tidal flats become neighborhoods? Beginning around 1800, several of Boston's tall hills were cut down, and their gravel and soil were hauled to the shore and dumped there. This raised the ground high enough that new buildings would not flood at high tide. Beacon Hill was 60 feet taller than it is today, and two other hills on either side of it (the three together were called Trimountain) were cut down completely. Much of this work was done by hand, with only horses to help. Later, beginning in the 1850s, when most of the hills had been moved, gravel was dug by steam shovels in Needham and brought by railroad to fill the Back Bay and South End. The land for the neighborhoods from Washington Street to the Charles River on the northwest, and from Washington to the Fort Point Channel on the east, was all "created" by filling tidal flats.

Map One in this exercise will show you just how much Boston has changed. The white area is land; the gray is water.

PROCEDURE

A. Using small, neat lettering, label the following features of the 1775 Boston area. Example:

1. Castle Island O - 14



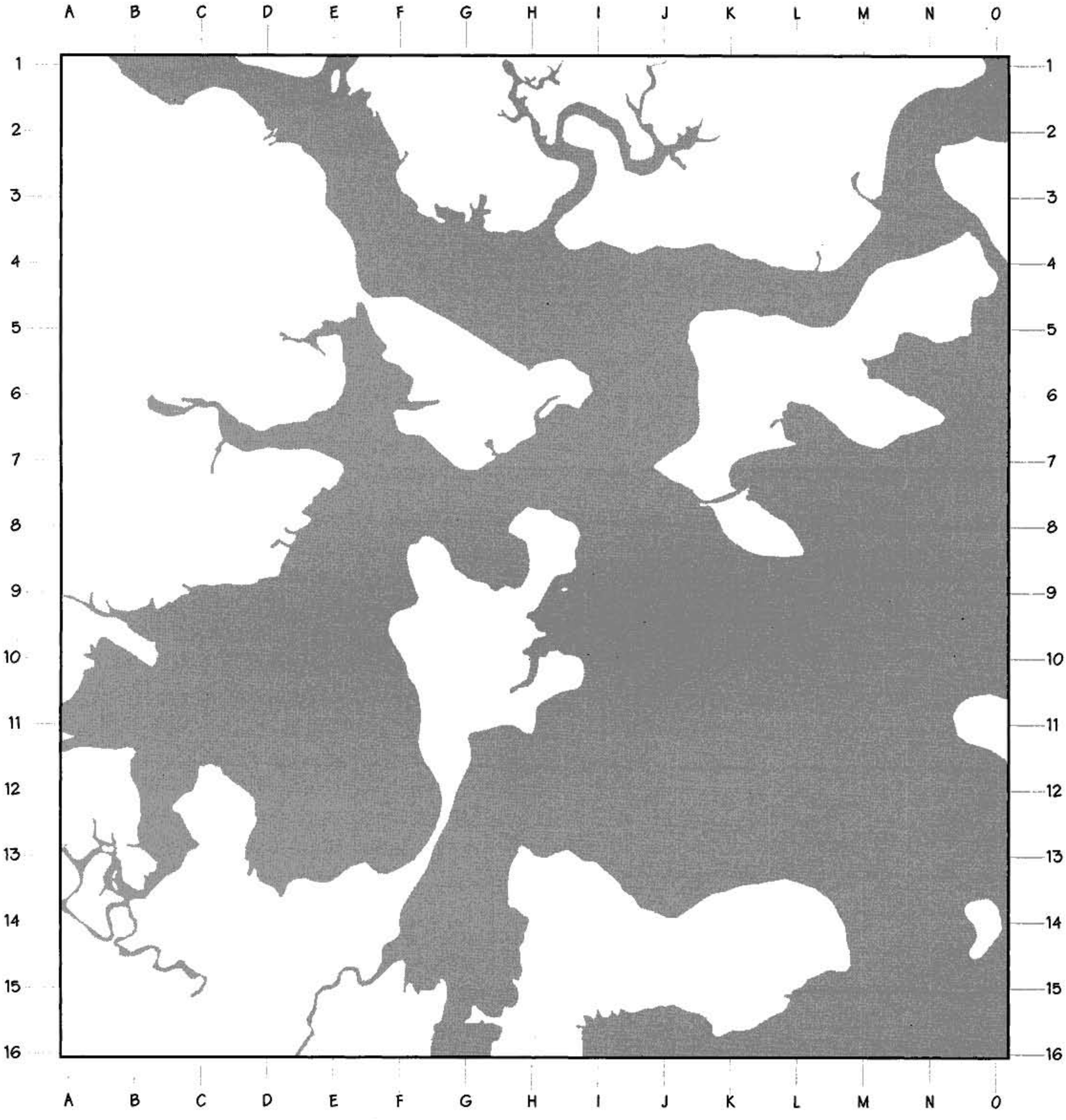
First line up one straight edge along the two "Os" at the top and bottom of the page. Then line up the other straight edge along the "14s" on the sides. The two lines cross on Castle Island.

Note: If a point is between two letters, say C and D, we will give its location as CD. If it is between 8 and 9, we will call that 8.5.

NAME _____

DATE _____

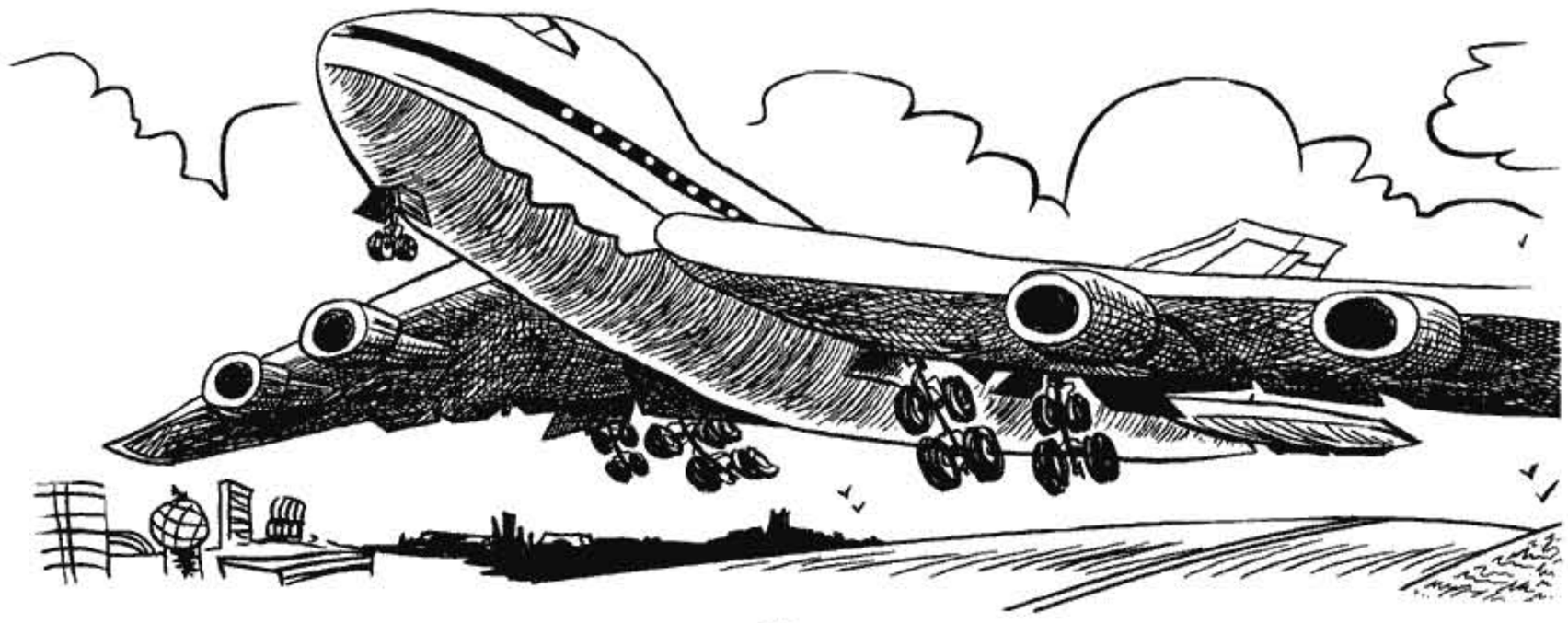
MAP ONE-ORIGINAL BOSTON



2. Charlestown	G- 6	7. Dorchester Heights	K - 15
3. Noddle's Island	L - 6	8. Charles River	A - 11
4. Shawmut Peninsula	G- 10	9. Muddy River	A - 13.5
5. Shawmut Neck	FG - 12 to FG - 13	10. Stony Brook	C - 15
6. Cambridge	B - 8	11. Governor's Island	O - 11

B. To understand Boston's growth, locate the following modern landmarks on your map. If there is too little room to write, simply put down an abbreviation or the number.

12. Fenway Park	B - 12	22. State House	G - 9.5
13. MIT	C - 9.5	23. New Federal Court House	IJ - 10.5
14. Museum of Science	E - 8	24. Old North Church	HI - 8
15. Central Sq., Camb.	A - 8	25. Boston City Hospital	E - 14.5
16. Symphony Hall	CD- 13	26. Museum of Fine Arts	B - 14
17. N. E. Aquarium	I - 9.5	27. Hatch Shell	EF - 10
18. Lechmere Station	E - 7	28. L Street Bath House	K - 15.5
19. Mass General Hospital	H - 7.5	29. Kendall Square	CD - 8.5
20. Commonwealth Pier	JK - 11	30. Bunker Hill Monument	GH - 6
21. Boston Public Library at Copley Square	E - 11.5	31. Southwest boundary of Logan Airport	L - 9.5 to O - 12



As the city grew, it needed more water. The few wells and springs soon proved inadequate, and the concentration of horses and outhouses gradually polluted the groundwater. People channeled roof drains into underground storage tanks called cisterns, but in a city of soot and sea gulls, roof water wasn't always the best quality, either.

In 1795, a group of investors formed the Jamaica Pond Aqueduct Company and constructed a wooden pipeline to bring the relatively untouched waters of Jamaica Pond to the growing town. (Jamaica Pond is just off the southwest corner of our map.) Residents could now fill their cisterns with much cleaner water, and those who began to pipe it into their houses no longer needed to go outside to fetch water.

A large fire in 1825 demonstrated the need for a larger water supply, and in 1848 water was brought all the way from Lake Cochituate in Natick. More and more people could now have indoor plumbing. In 1865, the Upper Mystic Lake, northwest of the city, was developed for water supply.

Another fire, the most significant in Boston's history, took place in November, 1872. A series of additional reservoirs were built soon after, concluding with the Sudbury Reservoir in the 1890s. Through these decades, Boston annexed the neighboring towns of Roxbury, Dorchester, Brighton and Charlestown, and the demand for water continued to grow.

In 1895, a new Metropolitan Water District was formed, open to any community within ten miles of the State House, or roughly the area within Route 128 today. Rivers in Central Massachusetts, the Nashua River at the turn of the century and the Swift River in the 1930s, were dammed to form Wachusett and Quabbin Reservoirs, the water sources we depend upon today. Wachusett and Quabbin are the only sources currently in use. All the sources that served Boston earlier in its history, from Jamaica Pond to Sudbury Reservoir, have been retired.

C. **Map Two** covers a portion of Massachusetts, but not Cape Cod or the Berkshire Mountains. It shows some of the major rivers in our area and the water sources that have served Metropolitan Boston over the years. Label those features as listed below. For each body that has served as water supply, include the date when it was developed.

Charles River Basin (inset) KL - 2.5

Jamaica Pond (inset) K - 4

Mystic Lakes (inset) J - 1

Lake Cochituate O - 8

Connecticut River C - 3 to B - 12

Merrimack River N - 3 to T - 1

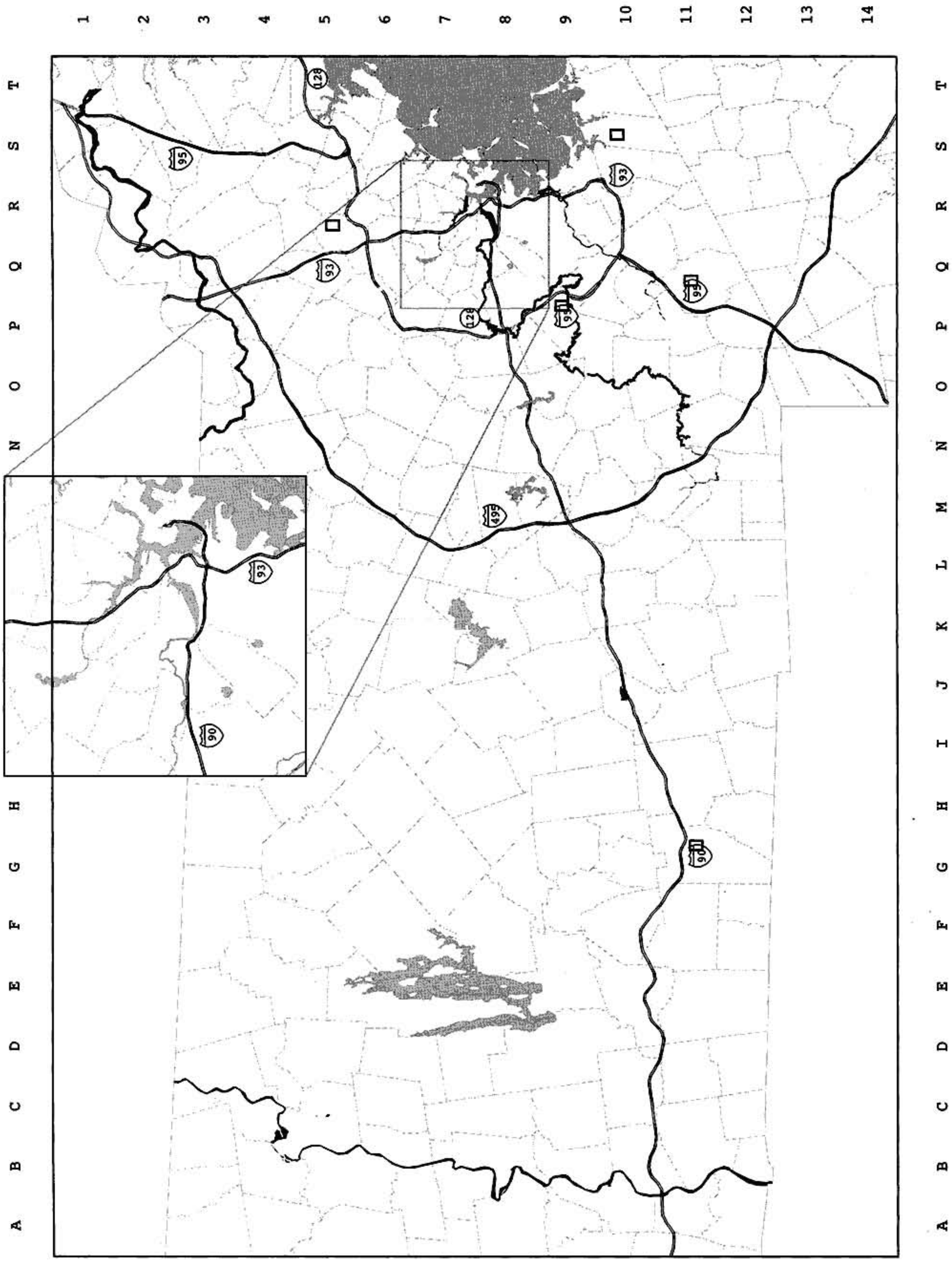
Neponset River P - 10.5 to RS - 9

Sudbury Reservoir M - 8

Wachusett Reservoir K - 7.5

Quabbin Reservoir E - 7

MAP TWO-WATER RESOURCES



LESSON 4 BOSTON'S WATER HISTORY

ACTIVITY 4-2 THE QUABBIN STORY

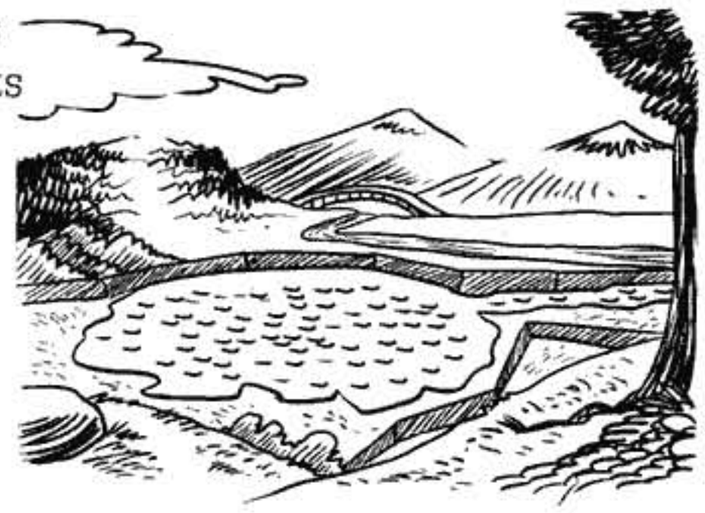
SUMMARY Students learn about the Quabbin Reservoir and its history in the Swift River Valley.

CONTENT AREAS history, social studies

GOAL to consider the sacrifices that made Quabbin Reservoir, our main water supply, possible

TIME one session

MATERIALS
- map of Quabbin Watershed and list of landmarks
- two straight edges per student or pair of students



ADVANCE PREPARATION

- Copy maps and student pages.
- Optional : Read "Letting Swift River Go" by Jane Yolen.

BACKGROUND INFORMATION

Many people know that Metropolitan Boston gets much of its drinking water from Quabbin Reservoir. Some remember vaguely that towns were flooded and property taken by eminent domain. Which towns were destroyed? Which of the towns were below the new water line, and which were just too close to the new reservoir? This activity should remind students of the sacrifices others have made for the health and well-being of future generations.

Source protection is one of the most important practices in water supply. Water that doesn't get polluted in the first place needs less treatment and can become better drinking water. Understanding this, planners persuaded the state to buy not only the land that would be flooded, but large areas above the water line, too.

Access to Quabbin is controlled and restricted. Students may have heard that while no one can swim at Quabbin, people can fish from boats in some places and that those boats have gasoline engines. This may seem contradictory to them. However, microorganisms introduced to the water by swimming might persist in the water long enough to enter the aqueduct. Gasoline, on the other hand, floats on water's surface and evaporates readily. The aqueduct intakes are far below the surface, and boats are allowed no closer than half a mile from those intakes.

TEACHER PROCEDURE

1. Hand out maps of the Quabbin watershed and the student instruction pages.
2. Be certain they understand that JK is a coordinate half way between J and K, and that a coordinate 5.5 is about halfway from 5 to 6. Do one or two sample locations with them, then assign the rest as classwork or homework.
3. Discuss the activity when they are done. What reactions did they have? Did it lead them to think differently about our reservoirs and the water they use each day?

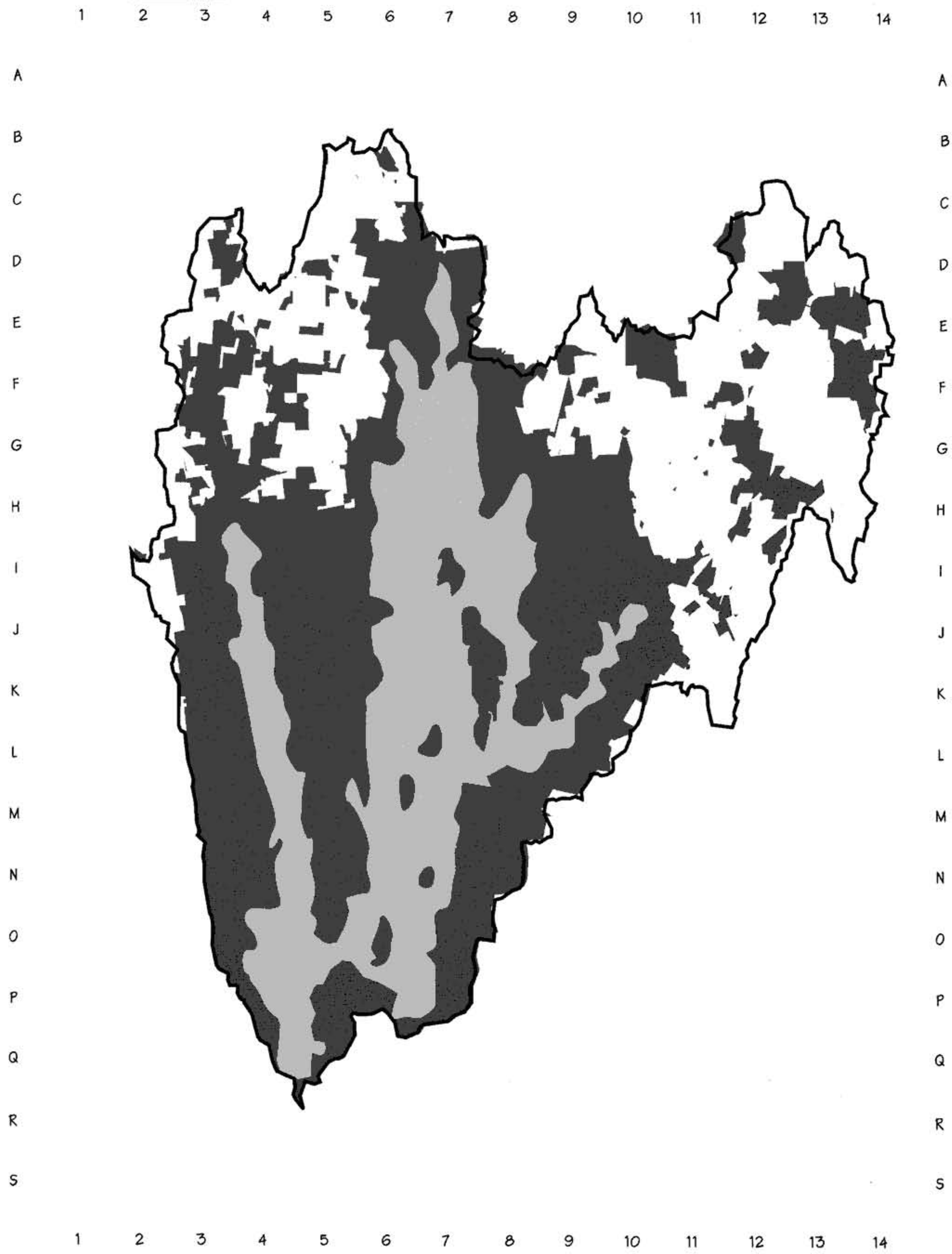
ACTIVITY 4-2 THE QUABBIN STORY

INTRODUCTION

Quabbin Reservoir was built in the 1930s to provide Metropolitan Boston with an ample supply of water. Before the construction, the Swift River Valley was home to several towns and villages, many farms, mills and other businesses, and a railroad that connected Springfield and Athol, Massachusetts. 2,500 people lived in the valley.

Damming the river and flooding the valley meant that everything had to go. All buildings were removed, trees were cut down, and the valley floor was generally cleared of anything that might contaminate the water. The state purchased all the land that would be flooded, plus a good deal of the land around the new reservoir. People had no choice but to sell. A law called "eminent domain" states that owners must sell their property when it stands in the way of a large project, like a highway or reservoir, that will be of benefit to a great many people.

QUABBIN WATERSHED



QUABBIN LANDMARKS

1.	Q - 5	Site of main Quabbin Spillway; elevation 530 feet above sea level
2.	L - 5	Town of Prescott; 1920 population: 236
3.	I - 10	Town of Dana; 1920 population: 599
4.	O - 6	Little Quabbin Hill; site of annual motorcycle hill climb; elevation 740 feet above sea level
5.	MN - 7	Town of Greenwich; 1920 population: 399
6.	N - 6	East Branch of Swift River joins Middle Branch of Swift River
7.	P - 4.5	West Branch of Swift joins Middle Branch
8.	H - 7.5	Village of North Dana (part of the Town of Dana)
9.	N - 6.5	Mount Lizzie
10.	R - 2	Belchertown, Massachusetts; 1990 population: 10,579
11.	S - 10	Ware, Massachusetts; 1990 population: 9,808
12.	QR - 4.5	Site of Winsor Dam, completed 1938
13.	A - 5	Town of Orange, Massachusetts; 1990 population: 7,312
14.	L - 6.5	Quabbin golf course
15.	LM - 7	Lake Quabbin; now the beginning of the aqueduct carrying water to the east
16.	JK - 7.5	Mount Zion
17.	A - 9	Town of Athol, Massachusetts; 1990 population: 11,451
18.	P - 5.5	Great Quabbin Hill; site of observation tower today; elevation: 1020 feet above sea level
19.	O - 5	Town of Enfield, largest town in the valley; 1920 population: 790
20.	I - 7	Mount L.

QUESTIONS AND CONCLUSIONS

1. Suppose you had lived in one of the valley towns. Your parents and grandparents were born there, too, and aunts and uncles had farms and businesses in the valley. How would you have reacted when the state told you that your town would be taken and everyone must move?

2. Quabbin is a beautiful wilderness area. Many have suggested that people be allowed to camp, canoe, or cross-country ski there. Why do you think the rules continue to prohibit such activity?