Pamet River Greenway Management Plan

1986

TRURO CONSERVATION TRUST

PAMET RIVER GREENWAY MANAGEMENT PLAN

DECEMBER 1986

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Cover Illustration: Photograph of Painting of Pamet River by Edward Hopper, 1937; Courtesy of Doll & Richards Gallery, New York

PAMET RIVER GREENWAY PROJECT
1984-1987

ABSTRACT

In 1978 the Commonwealth of Massachusetts classified forty rivers in the state as Scenic Rivers. These rivers are considered important due to their history, scenic beauty, recreational opportunities and water quality. Paemt River and Mashpee River were the only rivers selected as Scenic Rivers on Cape Cod. The Pamet River is a four-mile long river wholly within the Town of Truro, Massachusetts.

In 1984 the Truro Conservation Trust was awarded a $10,000 planning grant from the Massachusetts Department of Environmental Management to produce a comprehensive management plan for Pamet River. This Greenway Plan is designed to protect the unique features and quality of the Pamet (including Little Pamet River, Eagles Neck Creek and Pamet Harbor) and to promote proper recreational use of the river.

The Truro Conservation Trust formed a Greenway Committee, composed of town officials, Trust directors, and concerned residents to formulate the plan. The Greenway Plan will retain town control over management of the river. Town approval of the plan is necessary to implement Greenway recommendations.

The Greenway Plan was released in draft form in 1986. It was circulated for public and professional review and comments were incorporated in the final plan, which was released in March 1987.

ACKNOWLEDGEMENTS

Many people and agencies generously contributed to the making of the Greenway Project. Some gave extra effort to make it a good one. They include Susann Chaplin, Charles Martin, Bill Longgood, Graham Giese, Bill Worthington, Brenda Boleyn, Dana Pazolt, John Portnoy, Barbara Samora, Bob Prescott, Oscar Doane, Bob Bednarek, Jack Clarke, John Mendes, George Heufelder, Bill Davis, B.J. Allen, Scott Horsley, Barbara Meade, and Theda Leonard. The Greenway Committee gave time, work and enthusiasm. The Trustees gave vision, guidance and patience.

This plan is dedicated to the people of Truro. They love their town and cherish their Pamet River.

mhr
12/86

PAMET RIVER GREENWAY MANAGEMENT PLAN
Truro Conservation Trust
and
Pamet River Greenway Committee

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1) To protect the water quality, including adjacent ground water, of the Pamet River system

2) To preserve scenic views and the integrity of the Pamet Valley as an historic coastal village

3) To enhance appropriate recreational opportunities in the area, and

4) To maintain primary regulatory control over the river at the municipal level, while protecting qualities of the river that led to its Scenic Rivers classification by the Commonwealth of Massachusetts.

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b) To conduct related studies of the river to acquire baseline data, historical context and detailed examination of specific river problems

c) To manage the river as an interconnected ecological system in order to ensure that solutions to one problem will not exacerbate any other problem

d) To coordinate existing research and management efforts

e) To provide community officials with appropriate land management tools to protect the Pamet

f) To conduct a public educational program to emphasize the importance of the Pamet and the need to protect its resources.

II.A - PAMET RIVER GREENWAY MANAGEMENT PLANNING PROCESS (p. 38)

1) Formation of the Pamet River Greenway Committee
2) Meetings with town boards and the National Park Service
3) Coordination of water studies (IEP, MRI, DEQE, County)
4) New studies (Center for Coastal Studies, Barnstable County Health Department, Woods Hole Sea Grant Program)
5) Public Education ("Celebrate the Pamet" summer program, "Our Pamet" art show, opinion survey, news articles)
6) Development of Pamet River Greenway Management Plan

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II.B.1 - Land Ownership (p. 45)

1) The town should acquire significant "owners unknown" wetlands in the Pamet through tax title foreclosures, as provided in MGL c. 60. These wetlands should be managed by the Conservation Commission. Con Com

2) All town-owned lands not used for active recreation or

other non-conservation uses should be transferred to the control of the Conservation Commission.

3) The National Park Service should give priority to the purchase of two undeveloped parcels of land in the Pamet within its jurisdiction under the NPS "Land Protection Plan", 1985.

4) Title research should be conducted to determine the true ownership of alleged public landings on the Pamet:

a) Old County Road over Wilders Dike
b) Snows Landing (south end of Meetinghouse Road)
c) Bridge Road (north and south ends)

II.B.2 - Land Use (p. 56)

1) The General Business District at Pamet River should be re-zoned to Special Business to allow village shops and services, not manufacturing.

2) The laundromat should be licensed under the Massachusetts Ground Water Discharge Permit Program, if allowed to re-open.

3) A minimum lot size of 60,000 square feet for residential construction within the Pamet Valley should be adopted to protect water quality.

4) The town should oppose any future widening of Route 6 by the state in the Pamet Valley based on water quality and scenic issues.

II.B.3 - Water Quality (p. 58)
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1) The Truro Water Quality Advisory Committee should attempt to coordinate the monitoring studies and arrange an exchange of information.

2) DEQE should initate an intensive shellfish resurvey as soon as possible to identify sources of contamination. Truro town officials and Pamet residents should cooperate fully with DEQE in the resurvey.

3) DEQE should provide the Truro Board of Health with results of its regular monitoring program.

4) The Barnstable County Health Department should computerize all existing water quality data on the Pamet. Future monitoring should use previously established sampling locations.

5) The Division of Water Pollution Control should initiate more regular sampling of the the Pamet.

6) Water samples should be tested from Little Pamet River and Eagles Neck Creek in future studies.

II.B.3.c - Septic Systems (p. 63)

1) The Truro Board of Health should investigate why 14 septic systems identified in this plan are pumped out with unusual frequency. Failing systems should be upgraded immediately. (Board began this investigation in 1986 as a result of this plan.)

2) The Board of Health should review its septage coupon log annually to discover other septic pump-out anomalies.

3) Town building regulations should require septic system upgrading when new additions are proposed on existing structures. (Adopted by the Board of Health in April 1986 as a

result of this plan.)

4) The Board of Health and Water Quality Advisory Committee should enhance public education on proper septic system maintenance. Systems with potential for failure should be pumped annually.

5) Setbacks for septic leaching facilities should be increased from 50 to 100 feet from wetlands and from 100 to 200 feet from wells in the upgradient direction.

II.B.3.d - Underground Fuel Tanks (p. 68)

1) The Board of Health should ask the Barnstable County Health Department to computerize the town's underground fuel tank records to facilitate monitoring and removal.

2) Testing on 24 residential underground tanks within the vicinity should be initiated with priority given to older tanks in close proximity to the Pamet.

3) Tanks with discontinued use should be removed, as currently enforced by the Board of Health.

4) No new commercial underground fuel tanks should be installed within the river recharge area except to replace old tanks. (In July 1986 the Board of Health adopted a health regulation to prohibit the installation of underground home heating oil tanks throughout the town.)

5) Hydrocarbon testing of the soil and water near Wilders Dike should continue to determine the extent of oil contamination there.

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1) Drainage from Route 6 should not be discharged directly into the river as at present. Leaching catch basins and overland surface flow should be encouraged as an alternative.

2) The stormwater outfall pipe at the Meetinghouse Road landing should be removed and redesigned. Drainage at the Pamet Harbor parking lot should be improved during the upgrading of the boat ramp to prevent runoff from entering the harbor directly.

3) Oil traps and a maintenance program should be installed in existing catch basins.

4) Outfall pipes should be tested by county or state agencies to determine their pollutant load.

5) Catch basins should be cleaned annually.

6) Proper land management, discouraging the use of pesticides and chemical fertilizers should be employed on hill sides sloping into the river.

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1) Road salting should be reduced to a 4:1 mix of sand to salt and to 150 pounds per lane-mile.

2) The Board of Health should investigate causes of elevated sodium and nitrates in identified wells. The Water Quality Advisory Committee should coordinate a well testing program with Barnstable County.

3) Land use recommendations in this plan should be adopted to protect existing private water supplies.

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1) The results of the upper Pamet eutrophication study should be examined by the National Park Service and Truro Conservation Commission. Reducing existing nutrient inputs should be considered.

2) A analysis of the effects of removing various dikes and other obstructions to tidal flow in the Pamet should include a study of the potential benefit such a move might have on eutrophication.

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1) The National Park Service should be encouraged to cooperate in the proposed town study of the landfill.

2) The Town should continue to support SEMASS, the waste-to-energy plant proposed for Rochester, Mass. (The Town Meeting voted in 1985 to participate in this project.)

3) The septage lagoons should be fenced or otherwise secured at the landfill.

4) The lagoons should be upgraded to accept the increased volume of septic system pumping recommended in this plan. The town should continue to participate in the design of a regional treatment plant with Wellfleet and Provincetown.

II.B.3.i - Agriculture (p. 79)

1) The Town should acknowledge the beneficial role played by agriculture in preserving the rural character of the town. Innovative zoning and tax assessing practices should be instituted to encourage the continued existence of farms in Truro.

2) The operators of existing or potential farms should investigate the benefits of the Agriculture Preservation Restriction Program. The Truro Conservation Trust could provide technical assistance about the program.

3) Proper waste management plans should be developed for farms near the Pamet with the assistance of the U.S. Soil Conservation Service.

II.B.3.j - Erosion and Sedimentation (p. 80)

1) A six-mile per hour speed limit should be enforced throughout the river.

2) A study should be performed to investigate the feasibility and advisability of re-introduing tidal flow to certain sections of the freshwater Pamet as a means of increasing water flow and reducing sedimentation.

3) Drywells should be installed on homes near the river to prevent erosion of steep slopes.

4) Unvegetated hillsides should be stabilized with plantings of indigenous species with the assistance of the U.S. Soil Conservation Service.

5) Bulkhead and seawalls should be discouraged for erosion control when they interrupt wetland transition zones and act as visual intrusions. The bulkhead at the Truro Post Office, however, should be repaired due to its proximity to the stream.

6) A 50-foot construction setback from wetlands, including coastal banks, should be established to prevent erosion.

7) See also the recommendations in the "Pamet Harbor" section.

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1) The Town and the National Park Service should continue to monitor acid levels in the Pamet to uncover any trends in increasing acidity.

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1) The town, the National Park Service and the Truro Conservation Trust should be encouraged to conduct studies on the effects of re-introducing tidal flow to certain segments of the Pamet. (In 1986 the Woods Hole Oceanographic Institution and the Trust Conservation Trust initiated a hydraulic modelling study of the Pamet as the first step to predict physical changes.)

2) Similar tidal flow studies on the Herring River in Wellfleet should be consulted.

3) The Conservation Commission, Cape Cod Mosquito Control Project and the National Park Service should develop an integrated pest management plan for the Pamet to reduce Mosquito Control's reliance on ditching.

4) A full Environmental Impact Report should be prepared in the event that the state decides to widen Route 6 through the Pamet Valley. The Report should analyze options to increase water flow under the highway either by construction of a bridge or larger culvert.

II.B.5 - Pamet Harbor (p. 94)

1) A dredging/beach nourishment project should be conducted on a experimental basis to determine the feasibility of a regular dredging program in the Harbor. Priority should be given to maintaining the existing licensed channel from the boat ramp to the Bay and depositing the sdredge spoils on the eroded foreshore of Gull Island north of the jetties. A channel depth of four feet at low water would be consistent with the goal of the Pamet serving as a small-boat, recreational harbor. The best available measures to protect shellfish should be incorporated in any dredging proposal.

2) The Board of Selectmen should request an amended order from the Wetlands Restriction Program to permit dredging of the previously-licensed channel. (In 1986 the Selectmen made this request.)

3) The existing dredged mooring basin should not be enlarged. Innovative mooring practices should instead be encouraged.

4) Dredging outside of the licensed channel should not be permitted. Boating should be regarded as tidal-dependent outside the channel limits.

5) The Town should attempt to participate in a coordinated, regional dredging project to derive cost savings, if dredging is proposed.

6) The Pamet Harbor Committee should be expanded to include representation of beach and shellfish interests to address thier concerns in establishing a long-term harbor management plan.

The Harbor Committee should recognize the effects of upriver activities on harbor management.

7) If channel maintenance proceeds, mooring fees should be increased to at least $50 per year to offset town investments in the harbor.

8) The boat ramp should be upgraded and widened to alleviate traffic congestion at the parking lot.

9) A considerable percentage of local harbor fees should be reserved annually in a harbor maintenance fund by town meeting to fund dredging and related studies and improvements.

10) The Conservation Commission and Harbormaster should cooperate in identifying private docks, floats, walkways and other structures in or near the river that are suspected of not being licensed under state waterways and wetlands regulations. Compliance should be sought or removal ordered.

II.B.6 - Shellfish Management (p. 106)

1) Protection of water quality should be considered the top shellfish management priority. See "Water Quality" section of this plan.

2) A shellfish management plan should be developed.

3) A Shellfish Advisory Committee should be established to prepare the shellfish management plan.

4) The present ban on commercial shellfishing and summer shellfishing should remain in effect to conserve the stock.

5) Non-resident permit fees should be increased to $25 per year.

6) The town should enhance its propagation efforts.

7) Catch limits for oysters and mussels should be considered as a conservation measure.

8) Annual catch report data should be refined.

9) Enforcement should be visible and information signs should be kept up to date.

10) The shellfish management plan should consider the feasibility and advisability of a private aquaculture program to enhance seed production.

11) Any harbor dredging should include best available measures to prevent shellfish disturbance.

II.B.7 - Scenic Values (p. 120)

1) An Open Space Residential Development zoning bylaw should be adopted (cluster zoning of single family homes) to allow important natural areas to be preserved while accommodating development. Pre-design input from all relevant town boards is crucial to protect the right open space.

2) The Truro Historical Commission should investigate the need for several limited historic districts in the Pamet Valley.

II.B.8 - Recreation (p. 129)

1)The old railroad dike from Corn Hill parking lot south to the harbor, now owned by the town, should be developed with limited improvements for use as a nature observation path to encourage walkers. (In 1986 the Truro Boy Scout Troop began work on this project with Conservation Commission and Selectmen approval.)

2) The Conservation Commission and the Massachusetts Audubon Society should be encouraged to protect tern nesting areas on the foreshores of the barrier beaches at the mouth of the Pamet.

3) Until the town can provide better beach patrol, off-road vehicles (ORV) should not be permitted north of Fisher Beach and south of Corn Hill between Memorial Day and Labor Day. ORVs should be completely prohibited from operating along the marsh edges throughout the Pamet.

4) The National Park Service should be encouraged to revitalize the Pamet Cranberry Bog educational exhibit on North Pamet Road. The Cape Cod Cranberry Growers Association should be asked to help in this regard.

5) The Selectmen and Town Counsel should investigate the legal responsibilities concerning the continued use of the Depot Road Beach (Grandmothers Beach) in close proximity to the boat anchorage.

6) A boardwalk should be installed from the parking lot to Corn Hill Beach for improved access by the disabled.

I. INTRODUCTION

The Pamet River still has a chance to survive. Up until now, the Pamet in Truro, Massachusetts has escaped relatively unscathed from the pressures for development that have dramatically altered most of Cape Cod in the last twenty years. That protection stems partly from the Cape Cod National Seashore, which envelops some of the river system, and partly from Truro's own inaccessibility to the bulk of summer tourism.

But the beauty of the Pamet is primarily safeguarded by the affection the townspeople themselves hold for the river. The Truro Conservation Trust, sponsors of the management plan presented here, has made the Pamet its top target area for protection in the town. Many property owners have maintained with care the historic integrity of their homes and land. Truro has been called "what's left of Cape Cod" and, if true, the Pamet Valley is at the core of that statement.

Yet threats to the Pamet's survival are mounting. Each month another new house is being built in the watershed. More of the existing dwellings are being converted from seasonal to year-round occupancy. Large lots, once taken for granted as open space, are being subdivided for development because of financial pressures. Recent tests have revealed a potential shellfish contamination problem. Better travel and increased leisure will attract more people to live more continuously in Truro. Not all of the Pamet's troubles are derived from humans, but crowding will worsen existing problems.

Because the Pamet is still intact as a scenic and

recreational resource, the time to act is now to ensure its continued vitality. Planning won't stop development. Development won't wait for planning. But planning and local action can guide growth in the Pamet to acknowledge its special features and help to keep them that way.

I.A PURPOSE

The Pamet River system is a natural resource of local, regional and national importance. Its chief values are rooted in its historical, geological, recreational and scenic features. The significance of these features demands that the Pamet area receive adequate protection so that their value is enhanced or at least maintained.

I.A.1 Goals

The four primary goals of the Pamet River Greenway Project are as follows:

1) To protect the water quality, including adjacent ground water, of the river system

2) To preserve scenic views and the integrity of the Pamet as an historic coastal village

3) To enhance appropriate recreational opportunities in the area, and

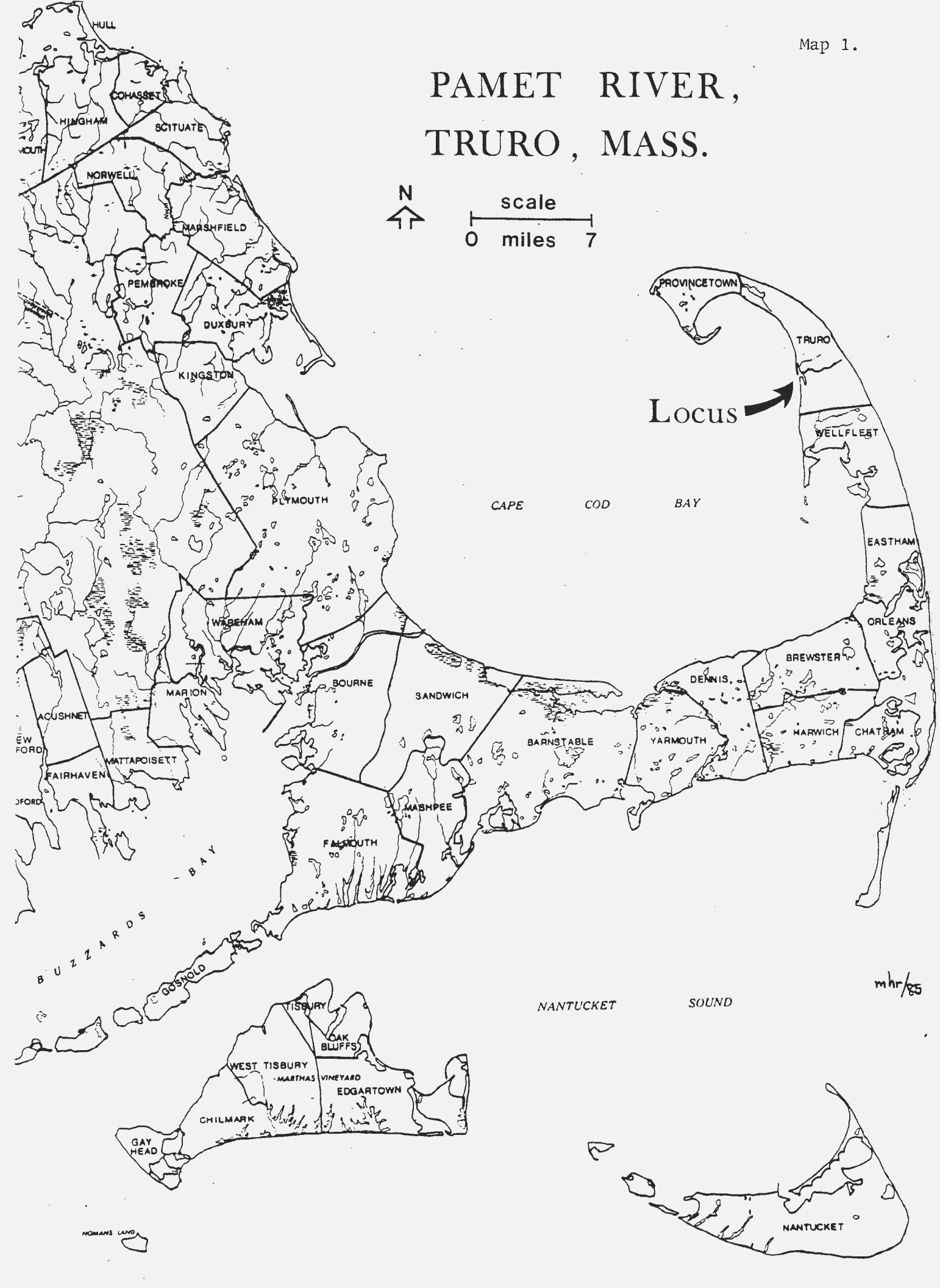
4) To maintain primary regulatory control over the river at the municipal level, while protecting qualities of the river that led to its Scenic Rivers classification by the Commonwealth of Massachusetts.

I.A.2 Objectives

To realize these goals, the following objectives were set:

Map 1.

PAMET RIVER, TRURO, MASS.



a) To develop a comprehensive management plan, likely to be supported by the community at large, for the entire river system with recommended strategies to protect identified values

b) To conduct related studies of the river to acquire baseline data, historical context and detailed examination of specific river problems

c) To manage the river as an interconnected ecological system in order to ensure that solutions to one problem will not exacerbate any other problem

d) To coordinate efforts of many separate public and private agencies studying or managing individual aspects or locales of the river

e) To provide community officials with appropriate land management tools and justification for their use in order to protect the Pamet

f) To conduct a public educational program to emphasize the importance of the Pamet and the need to protect its resources.

This report presents the conclusions and recommendations of the three-year Pamet River Greenway Project (1984-86). This management plan is intended for use as a blueprint, not a bible, of river protection strategies. Time may alter the strategies to meet possible new threats, but the goals should remain unchanged.

I.B IMPORTANCE OF THE RIVER

The Pamet River system is significant for many reasons and it is important to different groups for different characteristics. Some features, however, make the Pamet unquestionably unique and historically important.

I.B.1 Unique Features

Local Uniqueness

- Pamet River is the only navigable tidal inlet in the town and the only boat launching and mooring facilities.
- The Pamet contains the major shellfish beds of the town except for sea clams found offshore.
- The first settlement in Truro was located in the Pamet Valley.
- The only remaining salt marshes in Truro are in the Pamet River system.
- The Pamet Valley is the only glacial furrow with significant surface water in town.
- What is believed to be Truro's oldest house (c. 1760) is located on North Pamet Road.[1]

Regional Uniqueness

- The last commercial farm on Lower Cape Cod is on the Little Pamet.
- The Pamet River is the only river estuary north of Wellfleet.
- The Pamet is the widest (0.5 mile) and deepest (50 ft.) valley on the lower Cape.[2]
- The Pamet River divides two major Lower Cape aquifer

lenses (Pamet lens and Chequesset lens).

- Erosion of the Ballston Beach dune and the influx of ocean water into Pamet River would make most of Truro and Provincetown an island.

- Pamet River is one of only two Cape Cod rivers included in the state Scenic Rivers program.

- Pamet Harbor is one of only seven harbors in Cape Cod Bay navigable by sizable boats (Plymouth Bay, Barnstable Harbor, Sesuit Harbor, Rock Harbor, Wellfleet and Provincetown Harbors.)

State Uniqueness

- The Pamet Valley hosts several rare and threatened plant species identified by state naturalists, including the known limit of Prickly pear cactus and Bushy rockrose.

- The Pamet River is one of only 46 rivers classified as Scenic Rivers in Massachusetts. It was the state's second priority for protection, behind only the North River in the Marshfield area.

- The only salt water boat ramp on the Lower Cape authorized by the state Public Access Board is in Pamet Harbor.

National Uniqueness

- The Pamet Valley was explored by the Mayflower Pilgrims and settlement was seriously considered. Their first contact with Indian artifacts occurred at Corn Hill.

- The Valley is considered to be the geological archetype of a pamet, a valley or furrow carved in outwash drift by glacial meltwater.

- The American whaling industry originated in the Pamet.

I.B.2 Recognition

The significance of these features has been recognized in actions and policies by the following jurisdictions:

Town Recognition

1) In 1969 Truro's first Master Plan considered the Pamet as the town's critical planning area.

2) In 1977 the Truro Coastal Zone Management Advisory Committee declared the Pamet River as the top coastal priority in town.

3) In 1984 the town's Open Space Plan listed protection of the Pamet River system as the top priority for action.

Regional Recognition

1) In 1963 a Cape Cod Master Plan noted that the Pamet had "unusual attractiveness" and "one of the most beautiful views on the Cape."

State Recognition

1) In 1975 the Pamet and other Truro shore areas became the first wetlands in the state to be protected by deed restrictions under the Coastal Wetlands Restriction Act (MGL c. 130, s. 105).

2) In 1977 the state Coastal Zone Management Program recognized the river's "unique productivity and geological significance" and its value as a recreational harbor.

3) In 1978 the state adopted Pamet River as a Scenic River (MGL c. 21, s. 17B). The Pamet was the second river in the program to receive implementation attention.

4) In 1984 the state awarded a $ 10,000 planning grant to the Truro Conservation Trust to develop a Pamet River Greenway Plan.

Federal Recognition

1) In 1961 the upper Pamet was protected by inclusion in the Cape Cod National Seashore. The Pamet Cranberry Bog is the only interpretive trail of this important Cape Cod industry in the Seashore or anywhere on Cape Cod.

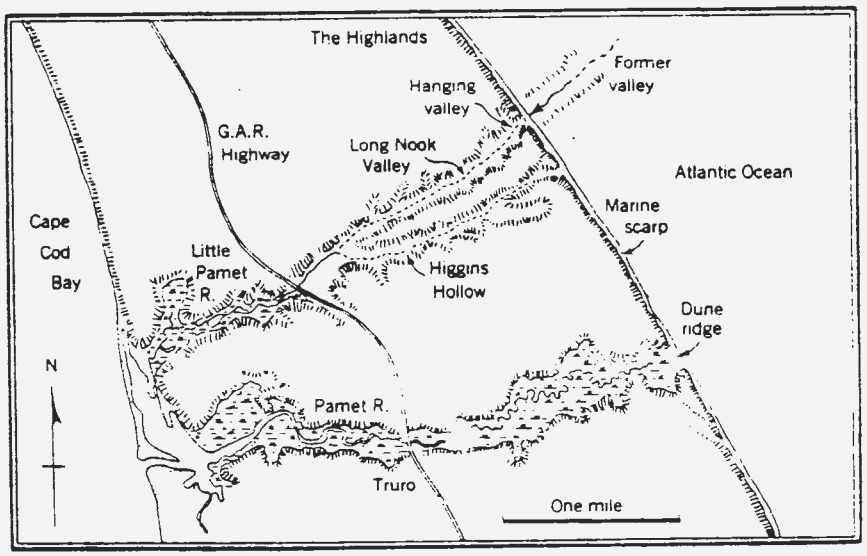
2) In 1984 the National Park Service became an active participant in the Pamet River Greenway planning process. The Service continues to support studies of the Pamet's ecology.

I.C DESCRIPTION OF THE RIVER

I.C.1 Physical Description

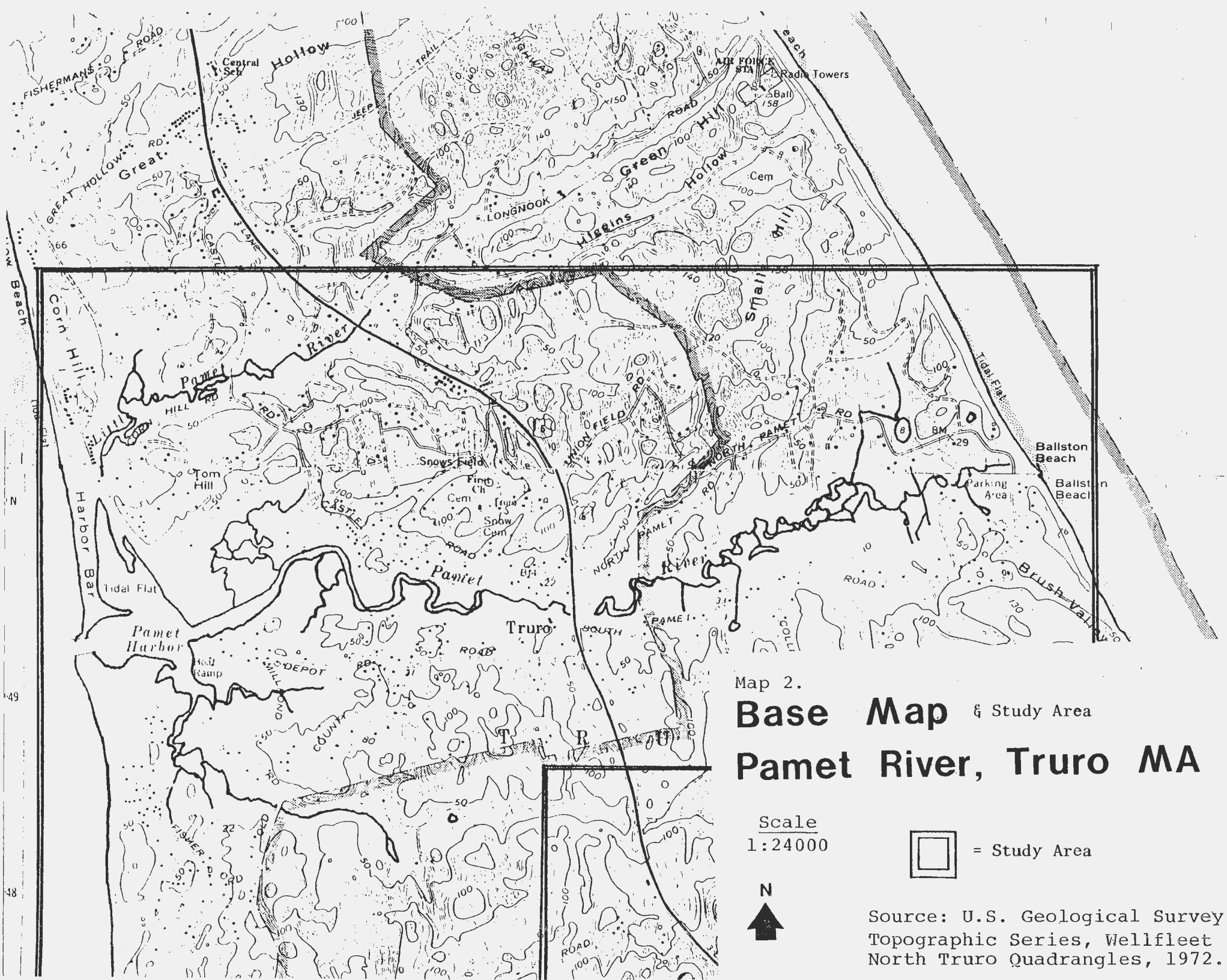
The Pamet River system is composed of three stream branches that meet before discharging into Cape Cod Bay in the Town of Truro, Massachusetts. The main stem, or Pamet River proper, meanders west four miles from head to mouth in Pamet Valley. Its two small tributaries, Little Pamet River to the north and Eagles Neck Creek to the south, flow about one and a half miles each before joining the Pamet at right angles to its mouth.

Figure 1. Physiography of the Pamet River System, Truro.



Source: Arthur Strahler, A Geologist's View of Cape Cod, 1966, p. 66.

Pamet River begins 100 yards from the ocean as a freshwater stream and flows towards the bay. Despite erosion of the Atlantic coastline, the ocean has never permanently breached this seemingly inadequate barrier at its source. The river becomes tidal west of the Route 6A dike, and was probably tidal for as much as three-quarters of its length before that dike was



Map 2.

Base Map & Study Area
Pamet River, Truro MA

Scale
1:24000

= Study Area

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Source: U.S. Geological Survey, Topographic Series, Wellfleet & North Truro Quadrangles, 1972.

built.[3]

Actually, the Pamet is not a river at all in the true sense of the term. It is an ancient valley carved by glacial meltwater coursing through an outwash plain. A rising sea level inundated these valleys and made them tidal streams. Man-made obstructions have reduced tidal sections so that half of the system is now a fresh water environment. Despite local theories about gushing springs at the headwater source of the Pamet, the fact is that fresh water in the river is derived solely from groundwater discharge and stormwater runoff.

A single barrier beach dune ridge at Ballston Beach separates the head of the main stem from the Atlantic Ocean to the east. This dune has been overwashed in storms, most recently in 1978 and January 1987, although it has never been completely breached. However, left to natural processes, including an accelerated rate of sea level rise, it is conceivable that the Pamet River could become another cross-Cape canal, leaving Provincetown and most of Truro an island.[4]

Dikes and ditches have divided the Pamet River system into 16 different areas, each one having its own hydrology and habitat. (See Map 15.) This compartmentalization has produced an artificial diversity of wetland types, including open water, salt marsh, cattail marsh, shrub swamp and bog. Its psychological impact, however, has been to deny the integrity of the Pamet as a unified system. The challenge to persuade the public of the need for integrated resource management has been made more difficult by this perception of a fragmented river.

Currents in the tidal sections of the river flow strong due to a 9-foot tidal range in Cape Cod Bay. (Spring tides, known locally as high course tides, rise and fall 12 feet.) Most of the tidal river lies as exposed flats at low tide. Water quality is generally good due to this flushing. Dominant visual features of the tidal Pamet include: broad salt marshes pockmarked by countless tidal pools, pans and twisting creeks; steep-sloped, bearberry-covered hills descending directly into marsh; the old railroad dike elevated above the marsh; and the harbor.

The fresh water river segments, in the main stem, Eagles Neck Creek and Little Pamet are denied tidal exchange due to tide gates or one-way clapper valves at various dikes. (See "Ditching and Diking" under River Management.) The stream beds are shallow and mucky due to low-flow velocities and water quality is variable. Shrubs encroach into the upper Pamet from the banks and macrophytes (pondweed, water lilies) clog the streams from beneath. The stream alternately narrows, then widens into a series of lagoons near its head. The dominant features of the upper Pamet are its broad valley floor and shrubby vegetation because the river itself is mostly obscured except from the air or by canoe.

Little Pamet is dominated visually by a cattail swamp, the steep pine-covered slopes of its valley, the Perry Farm and Corn Hill downstream. Eagles Neck/Bangs Creek consists of circular areas of wetlands in transition from salt marsh to shrub swamp, Mill Pond Road, and a network of mosquito ditches.

The harbor consists of a mooring basin for 100 boats, a

large bathing beach at Corn Hill, and a smaller one at the harbor. Stone jetties mark the navigation channel through the barrier beach on the bay side. (See "Pamet Harbor" chapter.)

For a complete overview of the geology and vegetation of the Pamet, see the report of The Center for Coastal Studies, (1985) in the bibliography.

I.C.2 Description of the Study Area

For the purpose of the Greenway Plan, a study area was established to coincide roughly with the recharge area of the Pamet River and its tributaries (See Maps 2 and 12.) This area was selected to acknowledge the important relationship between ground water quality and river water quality. The recharge area is larger than the surface watershed of the river system and represents all land area through which precipitation can be expected to migrate through the ground to discharge into the river.

Many of the potential sources of contamination, including septic systems, underground fuel tanks and the town landfill, are sited on this recharge area. A large scale planning map was prepared by the Greenway Committee to locate these contamination sources on individual lots (See Appendix G.) The sources were then transferred onto the standard U.S. Geological Survey maps found throughout the plan to provide a more manageeable size to use. The study area is expanded or reduced for certain issues depending on the need to illustrate specific topics. In general, however, the study area also corresponds to Truro Assessors' Atlas Sheets 45-54 (1986).

I.D HISTORY

I.D.1 Pilgrim Explorations and Indian Villages

The Pamet Valley contains a story of national importance, part of which is imagined below:

*****

William Bradford stamped his boots in the crusty snow, partly from the cold, but mostly from impatience. The men seemed always to take too much time in gathering their equipment out of the shallop. He had been the first to disembark onto the beach and now he had to wait for the others. The sun was already declining past its meridian and the day would soon get even colder. There was much to be explored before camp and the question burned: would this be their New World home?

Looking around, Bradford estimated favorable odds. The diverging rivers ran strong and true beside him, passing a great volume of seawater through the beach from the bay. On his right, the greater river looked goodly enough for ships to harbour with a fair wind and full tide; certain its depth could hold the Mayflower if need be. Empty shells on the beach told Bradford an anticipated wealth of shelled fish lay beneath the banks of these salt rivers. They would determine this truth when the ebb returned.

Bradford surveyed the nearby hills. They were good English hills, comfortable, protective of the rivers and the supposed inhabitants--the savages. The hills stood as unblinking sentinels, as if wondering what Bradford and his men were about in the quiet valley below. The hill on the left stored the corn

cache the explorers had requisitioned during their first discovery, a find which brought joy to the women with the ship at Cape Cod. The hill now before Bradford on the right, with snow-shaded oaks ascending its brow, could be easily pallisaded against savages and would command the harbour and bay. It troubled Bradford only that the slope looked too steep; it rose straight out of the riverbank. But he hoped to find easier access on the hill's southern slope around the bend. Would that his men would hasten their business here!

He could hear them assembling behind him.

"'Tis a bleak looking place," said one.

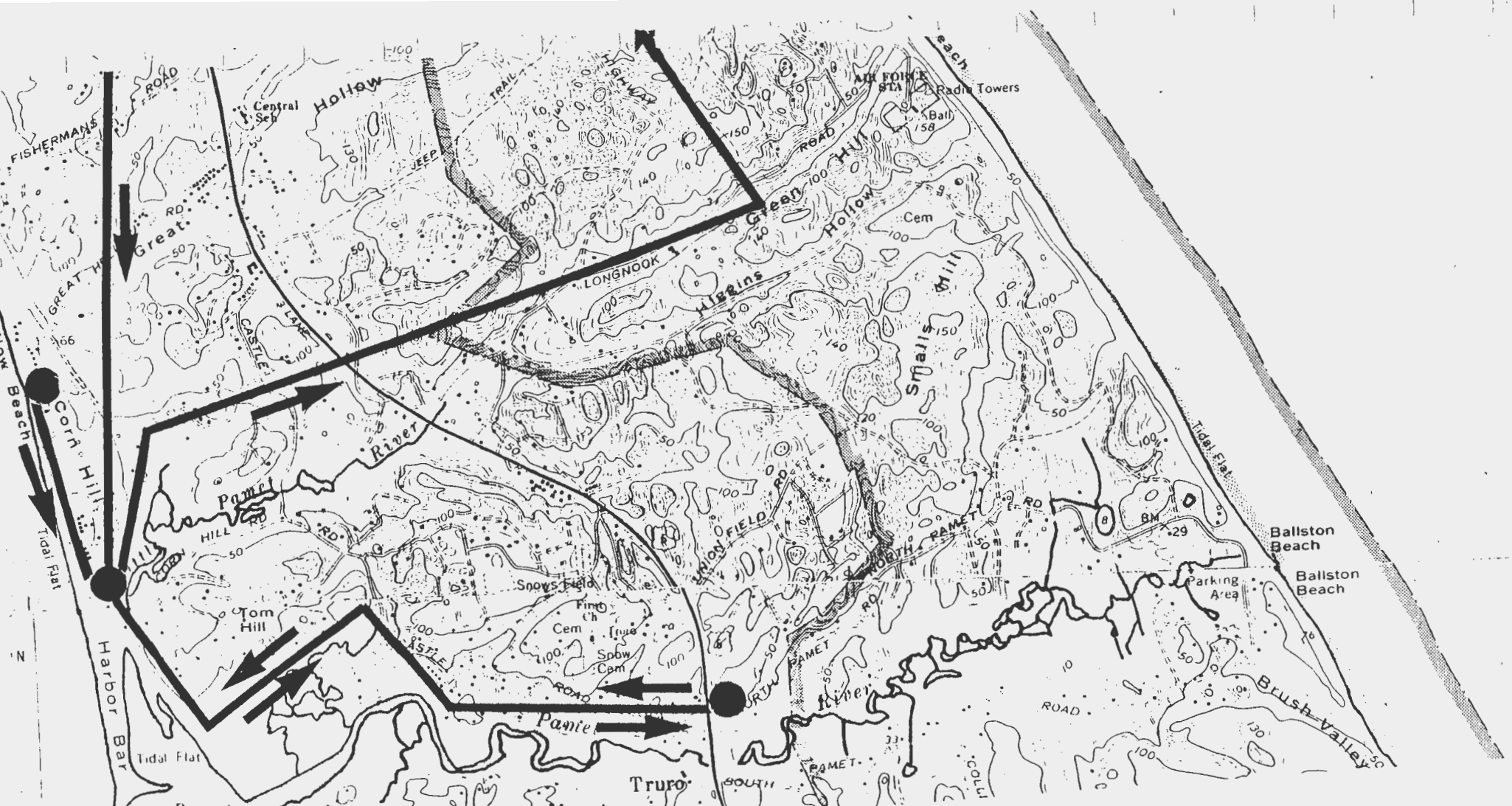
"Indeed, John, and a cold harbour too," answered a mate.

"Then Cold Harbour it shall be," said a third.

But in Bradford's mind it was a Gold Harbor for his band. Here God's fish were in the sea, His fowl were in the air and His beasts were surely in the woods. And the hills were farther from enemies and closer to God. The winter had come early in this new land and their situation was perilous. This place offered many advantages. And it was found.

How long could they spend looking for better? All that was needed was here: harbour, fish, cornfields, marshes, hills, timber, fowl, game. Only sweet water springs were left to find. If that discovery was made here, then he could end his men's grumblings and persuade them to adopt this site for settlement.

They were at last assembled. He addressed them, "Friends, the benefits God has granted this place seem plentiful. Let us remind ourselves as we march that we must soon settle a place or



Map 3.

Pilgrim Explorations -1620
Pamet River, Truro MA

SECOND DISCOVERY

After the Mayflower's shallop deposited Pilgrims at Corn Hill, the explored Pamet as a settlement site

Source: Shebnah Rich, 1893, Truro ;

perish, for the winter is come. Captain Jones, we will strike up onto these hills along the north side of the great river--"

"Cold Harbour," said a voice in the rear.

"--along Cold Harbour then," said Bradford, quietly irritated, "Can you follow in the shallop?"

"Aye, keeping an eye on the tide," replied Jones, "May your tramping be prosperous, and kill me a goodly goose for dinner."

"God willing," said others.

Bradford checked the sun again and stepped boldly up the beach, leading the white men into the portals of Pamet.

****

Captain Jones did get his goose for dinner that night in November 1620, but that and some more corn was all the Pilgrims retrieved from the Pamet Valley during their Second Discovery. During the next two days, Bradford and his men never found the freshwater stream they preferred over pond water for their potable supply. This disappointment, coupled with the steep topography and tricky harbor of the Valley, forced the band to seek their settlement elsewhere and Plymouth was found on the next Discovery. But the record shows that Cold Harbor or Pamet River was given serious consideration as the Pilgrims' home.[5] Ironically, these same issues of harbor, development and water supply figure prominently in 1986 as a comprehensive management plan for the Pamet is developed.

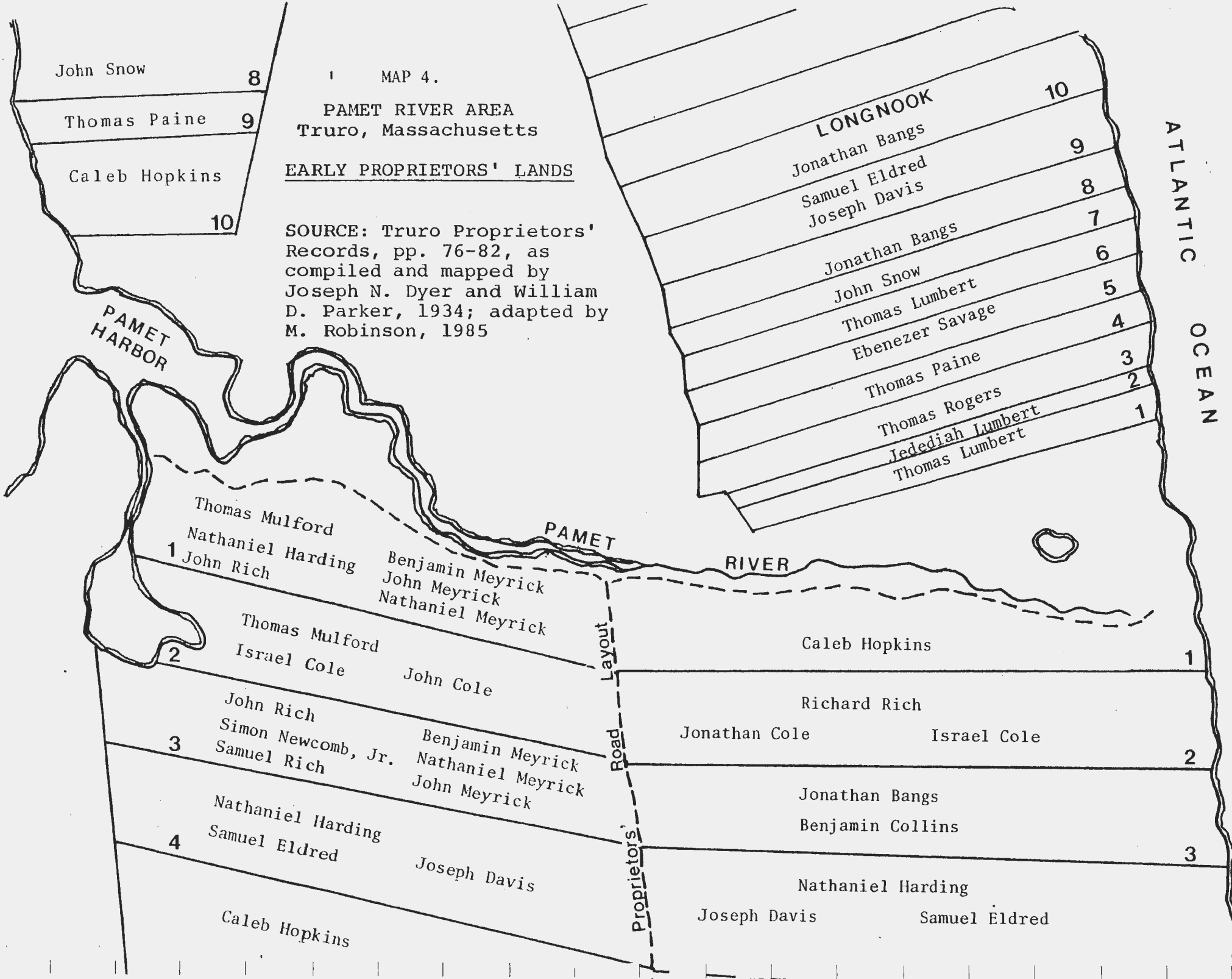
The Pilgrims had a fleeting glimpse of Indians dodging into the woods near Corn Hill, indicating their occupation of the area. In addition to the famous corn cache buried on that hill,

numerous shell heaps and artifacts have been found near Little Pamet and Fisher Beach, attesting to Indian presence near the river.[6] Although the lack of flat land may have prevented the establishment of large Indian villages,[7] it is inconceivable that they could have ignored such a rich estuary as the Pamet. Truro historian Shebnah Rich noted in 1884 that Squopenik, or the land between Little Pamet and Pamet River, was a favorite Indian settlement due to convenient access to both streams.** In any event, the local tribe of the Pawmets or Payomets is now remembered in the river's name.

I.D.2 <u>The Eighteenth Century</u>

Specific information is limited as to the role of the Pamet River during the eventual settlement of Outer Cape Cod by European immigrants in the 1700s. Early proprietors, including the original ancestors of the Hopkins, Snow and Rich families, which are still extant in the Pamet area, laid out land plots in long strips running east-west along the river. (See Map 4.) As in most villages at the time, farming was the primary occupation, while fishing served as an important supplement for diet and trade.

Features of the Pamet benefited both enterprises. The broad salt marsh of the river was an obvious attraction, not only for fish and shellfish, but for marsh grass as fodder for livestock. The marshes, known as meadows at the time, were initially held in common by the proprietors as pasture on which to graze their cattle. Direct grazing was banned by town ordinance as early as 1730 to prevent erosion and burial of the marsh by wind-blown sand[8], but salt hay was still harvested by hand in late summer.


MAP 4.
PAMET RIVER AREA
Truro, Massachusetts
EARLY PROPRIETORS' LANDS
SOURCE: Truro Proprietors' Records, pp. 76-82, as compiled and mapped by Joseph N. Dyer and William D. Parker, 1934; adapted by M. Robinson, 1985
John Snow 8
Thomas Paine 9
Caleb Hopkins 10
LONGNOOK
Jonathan Bangs 10
Samuel Eldred
Joseph Davis 9
Jonathan Bangs 8
John Snow 7
Thomas Lumbert 6
Ebenezer Savage 5
Thomas Paine 4
Thomas Rogers 3
Jedediah Lumbert 2
Thomas Lumbert 1
ATLANTIC OCEAN
PAMET HARBOR
PAMET RIVER
Thomas Mulford
Nathaniel Harding
John Rich 1
Benjamin Meyrick
John Meyrick
Nathaniel Meyrick
Thomas Mulford
Israel Cole 2
John Cole
John Rich
Simon Newcomb, Jr.
Samuel Rich 3
Benjamin Meyrick
Nathaniel Meyrick
John Meyrick
Nathaniel Harding
Samuel Eldred 4
Joseph Davis
Caleb Hopkins
Layout
Proprietors' Road
Caleb Hopkins 1
Richard Rich
Jonathan Cole
Israel Cole 2
Jonathan Bangs
Benjamin Collins 3
Nathaniel Harding
Joseph Davis
Samuel Eldred

The salt hay was dried and as late as 1900 was still the only winter fodder available for livestock.

Early farmers planted corn, wheat, rye and vegetables.[9] Fruit orchards, apples and pears, grew in the sheltered hollows. But soil erosion became very troublesome, and crop yields declined throughout the eighteenth century. By 1800 farmers were looking to crops such as asparagus to grow in the thinning soil. It seems likely that some of this lost topsoil may have washed down the side slopes of the Pamet Valley into the river, exacerbating continual shoaling problems in the harbor.

At the same time, however, home gardens were enriched with seaweed as fertilizer and loam borrowed from the freshwater swamps at the heads of the creeks. Gardens were also planted directly in these swamps. The construction of dikes to prevent tidal intrusion enabled conversion of more areas of salt marsh into these arable freshwater swamps.[10] Often, these "dikes" were nothing more than a fence-like pile of brush used to raise the elevation of the marsh by trapping sediment.[11] This "reclamation" of marsh into swamp gardens continued into the twentieth century.[12] (The effects of diking are discussed in depth in "Ditching and Diking" under River Management.)

Pamet Harbor provided the settlers with a safe, protected anchorage despite navigation problems due to a tortuous channel, to shoaling and to the great tidal range which left most of the harbor as mud flats at low tide. Jonathan Paine built the first authorized wharf on the north side of the harbor in 1754.[13] From this and, presumably, other small wharves an active shore

fishery soon arose in Cape Cod Bay. Cod, haddock, flounder and bass were early favorites. Shebnah Rich records that mackerel were first and best pursued commercially by Truro men.[14]

Handlining from dories in the Bay and handseining the sidecreeks in the marsh were the principal modes of fishing in the eighteenth century. (In the late-1800s trapfishing by means of netted weirs pole-driven into the Bay became more popular.)[15] Shellfish were dug initially as bait and fodder, though clams provided an easy food source for residents when times were hard.[16] By 1800 fishing had supplanted farming as the call to answer for Truro youth.[17]

The Pamet sent out many whaling crews in the 1700s; in fact, the Lower Cape dominated this occupation until Nantucket overtook it about 1750.[13] Drift whales, usually blackfish, were first exploited, then whalers fished coastal waters in boats averaging forty feet in length.[19] When scarcity made it necessary to hunt whales in distant waters, Truro men led the first whaling trip to the Falkland Islands[20] Try works or facilities to render whale blubber into oil for the nearshore and drift whales were located at the then-mouth of the river.[21] Charles W. Snow ran a blackfish try works near Town Hall into the twentieth century.[22] At least one of the whaling ships, the Lydia and Sophia, was built of Truro oak at a Pamet Harbor shipyard before 1800.[23]

Sometime in the 1700s,[24] Thomas Paine built a tidal grist mill on a creek leading to a salt marsh on the Pamet. This mill, whose only evidence now is the name given to the area known as Mill Pond, was one of several that Paine and his sons

built around the Cape.[25] Tidal mills offered the distinct advantage of regularly-scheduled use due to reliable tides rather than the unpredictable breezes needed to fuel windmills. Several residents have proposed re-establishing Paine's mill as an historical exhibit. There are no tidal mills on the Cape, although many popular windmills and stream mills attract visitors.

It is unlikely Paine's mill affected the flow of Mill Creek. Indeed, rather than impeding the current, the mill relied on that current for its operation. (The mill would have had an undershot wheel, probably geared to be used at both flooding and ebbing tides.) It is likely, however, that a small dike was placed across the pond's entrance to channel water through the mill. This dike or dam was mentioned in a petition by the mill owners in 1847 to the legislature seeking a permanent license for the obstruction, possibly due to complaints.[26]

Transportation around the Pamet in the 1700s relied on the river, but was also hindered by it. Numerous sidecreeks allowed penetration of the marsh by small boats and scows. A marsh trail along the upland edge of the river laid out by the original proprietors allowed east-west travel. (See Map 4.) There were apparently two small footbridges established across the river at the present Bridge Road and Wilders Dike locations.[27] Horsecart access between the north and south shores of the Pamet, however, were restricted to long end-around journeys at Ballston Beach or across the tidal flats at low

tide.

Head o' Pamet referred to the eastern north-south link behind what is now the Ballston Beach dune. This historic route was originally part of Truro's first road, laid out in 1703 as the Drift Highway and incorporated in 1715's Cape-wide King's Highway designation. Washovers of the dune protecting the road were recorded in 1896, 1937[28] and during the Great Storm of 1978. Owing to this most recent storm inundation, the road has been closed to through-traffic since 1980. Another impromptu route linking north and south may have lay over the exposed flats of Cape Cod Bay, with horses or oxen fording the shallow water at low tides.[29]

The Pamet Valley at the end of the eighteenth century sheltered several hundred hard-working souls.[30] It held a fairly stable population of fishermen, farmers and tradesmen with a fair sprinkling of Truro aristocracy--sea captains and whaling masters. The river figured prominently in the residents' subsistence, but its commercial potential had not yet been exploited. The beginning and end of the glory years of the Pamet lay waiting for the next century.

I.D.3 Nineteenth Century

Until the 19th century, the Pamet River remained largely intact in its natural state. The harbor was not a natural deep-water harbor, but it yielded a rich bounty of resources and could accommodate small-scale coastal trade. A maritime economy emerged despite the river, not because of it.

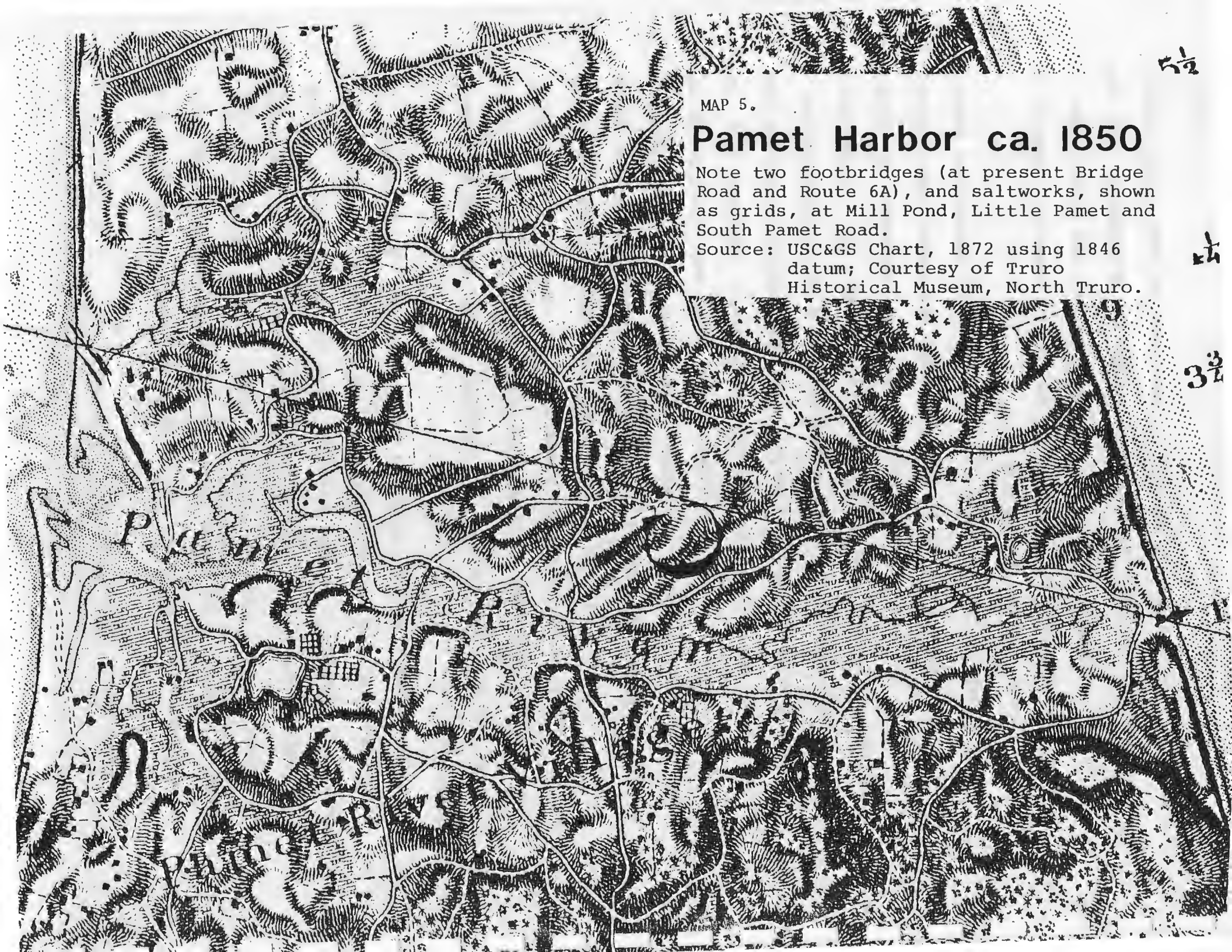
Like most of coastal New England, the Pamet experienced economic recession due to the War of 1812 and the associated

trade wars leading up to it. Truro whaling was particularly weakened by that war and never regained its prominence of the previous century, dying out completely after the Civil War.[31] All other components of the Pamet economy, however, boomed in the interval between those two wars.

The population of Truro, centered mostly around the Pamet, nearly doubled from 1820 to 1850.[32] What attracted this influx? Fishing. In 1837 there were 63 fishing vessels in Truro hauling primarily cod and mackerel. Over 500 hands were fishing, more than one-quarter of the town's entire population.

Union Wharf, the first major pier, was built in 1830 on the south side of the harbor where the present parking lot is located. A year later, another large wharf was constructed on the opposite shore. Serving these wharves were shipyards, sheds for mackerel packing, sail lofts, supply stores and flake yards (for drying cod). Regularly scheduled packet service began after 1812, ferrying goods and mail to and from Boston. The pinky Comet was the first recorded Truro packet in 1820, though the most famous one, the Postboy, began service ten years later.[33]

The other major industry at Pamet was salt-making, a thriving business around Cape Cod in the first half of the 1800's. Windmills pumped seawater from the river into a series of evaporation vats. The salt residue was sold as a meat and fish preservative and for medicinal uses, i.e., Glauber's, and Epsom's salts. At least 39 saltworks lined the banks of the Pamet and Little Pamet at its zenith in 1832.[34] (See Map 5.)



MAP 5.

Pamet Harbor ca. 1850

Note two footbridges (at present Bridge Road and Route 6A), and saltworks, shown as grids, at Mill Pond, Little Pamet and South Pamet Road.

Source: USC&GS Chart, 1872 using 1846 datum; Courtesy of Truro Historical Museum, North Truro.

With perhaps a little exaggeration, Historian Rich said:[35]

> All along the shores and banks of Pamet, its arms and coves and points were well-covered [with salt works], and every breezy summit was crowned with a picturesque windmill.

Truro thereafter declined with the rest of the saltmaking industry when salt mines were opened out West and abroad. The last Pamet saltworks ceased in 1870.

Table 1. Truro Saltmaking Industry in the 1800s.[36]

Year	Saltworks	Bushels
1837	39	17,490
1845	25	11,515
1855	15	5,078

An industry about which not much is known is the Little Pamet ice business. As in many parts of New England, ice blocks were carved out of ponds and fresh water lagoons, stored in sheds insulated with sawdust and hay, and either used for cooling throughout the summer or for export. The ice industry continued into this century at Little Pamet.[37]

In 1847 and 1848 four more wharves were built to host the large fishing fleet. A year later, Pamet Harbor Lighthouse began service on the north bank of the river at the foot of Toms Hill, its expense justified by the Pamet's busy commercial activity. Historian Rich relates, "At this time the indications were that ere many years wharves would line all the eligible points both sides of the harbor."[38] Pamet River seemed to stand on the brink of commercial greatness.

It never happened. The Pamet couldn't even hold onto what commerce it had. The economy of the last half of the century fell apart as quickly as it had soared in the first half. Town

population plummeted from its 1850 peak of 2000 to a low of 600 people in 1930, which was approximately the 1750 population of Truro.[39]

Reasons for the decline have often been cited: shoaling of the harbor, storms, the Civil War, fish stock depletion and lack of economic diversity.[40] More important was the townspeople's apparent reaction to the decline. Their attitude towards the river seems to have changed. Nineteenth-century residents tried to manipulated the river to accommodate an expanding economy, rather than re-shape the economy to accommodate the river. Giese maintains that "the demands of 19th century industry exceeded the scale of the estuary's resources."[41] If deeper-draft vessels were needed for profitable mackerel fishing, then the Pamet should be deepened instead of turning to other stocks or new enterprises, according to this apparent philosophy.

A vicious cycle ensued. The more that man tried to change the Pamet to suit his needs, the more the Pamet changed to thwart his designs. Frustration mounted; the villagers hacked away at the river. The marshes came to be viewed as wasteland, not the source of harvest as they once were. In keeping with the Industrial Revolution attitude towards natural features, engineering replaced equanimity. The story of the Pamet is the story of America.

The biggest trend in the Pamet in the 1800s was shutting the river into compartments through dike-building. In 1840 the first bridges wide enough to carry carts were built over the Pamet and Little Pamet. Wilders Bridge became solid-fill Wilders Dike across the Pamet in 1869.[42] This alteration

established Truro Center at either end of the Dike as the new hub of commercial activity, supplanting the stores at the decaying harbor. (See Figure 2.) Still other dikes were built for Old County Road and Castle Road and in 1872 for the iron road of the Old Colony Railroad.

The fact that the people of Pamet not only accepted but welcomed the railroad, despite obstructing the harbor, illustrates the end of the river's authority to shape the local economy. The Pamet no longer controlled the life of the village, but was controlled by it.

Figure 2. Truro Center, Old County Road over Wilders Dike, ca. 1900, (Courtesy of Truro Historical Society)

I.D.4 The Twentieth Century

The advent of the railroad was not entirely malign. Trap-fishing out in Cape Cod Bay was stimulated because the daily runs of the train opened a new market for fresh fish in Boston.[43] In addition, the trains inaugurated the summer tourist economy that persists to this day in Truro. As early as

1826, the Holsbery area on the south side of the Pamet hosted one of the first religious summer camp meetings on Cape Cod, at which off-Cape visitors came seeking spiritual rejuvenation under the sway of charismatic evangelists.[44]

But the first true summer cottage colonies were established at the turn of the twentieth century at Ballston Beach and Corn Hill. The railroad brought middle-class families from Boston and New York to stay by the sea for the summer. Some of the larger private homes rented rooms to summer visitors as well.

After World War II, summer guests built their own houses along the river, first as vacation homes and eventually for retirement use. This process accelerated after completion of the time-saving new Route 6 (Mid-Cape Highway) in 1953, although Truro so far has been spared the highway business sprawl that has strangled other parts of Cape Cod.

Numerous attempts were made to improve navigation in the harbor throughout this century, though most were successful only briefly due to repeated shoaling. (See "Pamet Harbor" section of this Plan.) Shellfish were depleted by commercial harvesting during the Depression and World War II. But, most significantly, the Pamet had evolved into its current stage as a recreational resource. Now Pamet River is primarily for boating, recreational shellfishing, swimming and watching sunsets.

The change in river use from subsistence to commercial exploitation to pleasure was a long one, but it has engendered a renewed sense of love for the Pamet by its users. It is no

coincidence that an inordinate number of Pamet dwellers now are artists and writers and others concerned that the environmental abuse of the river be stopped and reversed.

Perhaps a paradigm of Pamet history is found in the Mill Pond experience. As previously noted, a tidal mill was built in the 1700s on the banks of the creek leading into the pond. The grist mill did not seek to change river dynamics, but simply to benefit from one of its natural features--a powerful, steady tidal current.

In 1847 the mill owners sought legislative permission to dam Mill Pond, plausibly to enhance mill productivity by boosting the tidal capacity artificially. The manipulation must not have worked, may even have backfired, because by 1860 the mill was gone.[45] In its stead, the Pond was filled and cranberries were grown for at least thirty years. The Pond was estranged from the River; it had been made into a separate compartment.

Today even the bog is gone and the Pond is a shrub swamp with no commercial purpose. It is a pleasant landscape in its own right, but it is impossible to intuit its history and importance without the help of research. Mill Pond is lost from the life of the Pamet; we must not lose the Pamet from the life of Truro.

I.E FLORA AND FAUNA

The Pamet River Valley hosts a great diversity of plants and wildlife due to its variety of habitats, including tidal flats, dunes, salt marsh, shrub swamp, heathland and woodland. Only species of special interest will be noted here.

Shorebirds include a breeding population of Least Terns (Sterna antillarum) and Piping Plovers (Charadrius melodus) on Gull Island and Fisher Beach, the barrier beaches protecting Pamet Harbor. The Massachusetts Natural Heritage Program lists the Least Tern as a species of Special Concern and the Piping Plover is listed as Threatened by both the state and federal government.[46] Both terns and plovers are sensitive to disturbance by humans. The Massachusetts Audubon Society has documented disruption of the bird colonies on Gull Island by unregulated off-road vehicle travel and recommends management changes.[47]

Table 2. Least Tern Breeding Pairs[48]
Gull Island, Pamet Harbor

Year	Pairs
1976	12
1977	20
1982	42
1983	30
1984	17
1985	0

Shorebirds more commonly found in the Pamet are green herons, great blue herons, kingfishers, marsh hawks, snowy egrets, laughing gulls, black ducks, buffleheads, scoters and yellowlegs. Ospreys frequently migrate through the area and are

observed fishing in the marsh. This omen encouraged the Greenway Committee to cooperate with the Massachusetts Division of Fisheries and Wildlife's Osprey Recovery Project to erect a nesting pole in the Pamet in April 1986 to attract resident ospreys.

Pheasant, bobwhite quail, woodcock and other gamebirds are found near the Pamet. Rabbits, muskrats, raccoons, skunks and fox are still plentiful. Deer find the open woods attractive as habitat and the plentiful bearberry fruit is important to their diet. Although there have been no recent sightings, throughout the late-1970s there was repeated talk of a giant cat loose on the Truro heath. Bumper stickers urged citizens to "Save the Pamet Puma!" and even The Boston Globe came to investigate.

Tidal sections of the Pamet support most Cape Cod Bay estuarine species (Acadian bioregion), particularly winter and summer flounder, bluefish, menhaden, eels and the now-occasional striped bass. The eel population has thrived in the numerous winding creeks of the river since commercial trapping declined in this century.

In the fresh water Head O' Pamet (generally, east of Route 6), fish life is much different. The Pamet is not an active anadromous fish run, such as for alewives, due to poor flow, obstacles (clapper valves at dikes), and the lack of a pond at the headwaters. Nevertheless, brackish fish species spawn in the upper Pamet, such as yellow perch, white perch, smallmouth bass, bluegills and tesselated darters. Pumpkinseed sunfish make numerous spawning depressions throughout the streambed.

Snapping turtles grow large but lethargic in the Head O' Pamet and black snakes are also found, particularly near South Pamet Road.

State fisheries officials have stocked the upper Pamet with salter brook trout and sea-run brown trout in the tidal Pamet. The brook trout have begun natural spawning in a small pool connected to the river by a mosquito ditch running under South Pamet Road.[49] The brown trout are reported to exhibit a good growth rate and sizable returns from the bay back to the river each year.[50] No trout stocking of Little Pamet has been conducted nor has its fish stocks been surveyed, though it is anticipated that sunfish and perch predominate.

The Massachusetts Natural Heritage Program has identified rare vegetation in the Pamet as well. These plants inhabit the sandplains environment near the river. Prickly Pear cactus (Opuntia humifusa), the only widespread cactus in the East, is of Special Concern in Massachusetts and found only on the Outer Cape and Nantucket. The Pamet Valley individuals represent almost the northern limit of the Prickly Pear's range. It is primarily found on the upland slopes closest to the river. Adders-tongue Fern (Ophioglossum vulgatum), a threatened species in Massachusetts, has historically been found in seasonally wet habitats along the Pamet. Watercress, an interesting if not rare pond plant, is found at several locations in the freshwater Pamet.

In 1984 the state-designated rare plant Bushy Rockrose (Helianthemum dumosum) was located at two sites in the Pamet study area.[51] Again, these sites were sandplains and represent

the known northern limit of this Rockrose. A rare groundcover shrub Broom Crowberry (Corema conradii) is found along sections of Old County Road south of the river and near Little Pamet and on North Pamet Road.

Bearberry, (Arctostaphylos uva-ursi) a more common groundcover, could be called the characteristic upland vegetation of the Pamet. Covering whole hillsides in a dark green mat, bearberry, known to the residents as "hog cranberry", is a food source for birds and game and an aesthetic pleasure. Historian Rich noted in 1884:[52]

> The better name [for Bearberry] is mountain berry. With its battledoor, evergreen leaves and bright crimson berries, it sometimes covers the ground for rods with a thick shining carpet beautiful to behold. It creeps into the graveyards, spreading the low mounds with a matchless twining and interweaving attractive at all seasons.

But Bearberry's most useful feature is its erosion control capability. The steep sandy slopes of the Pamet Valley would wash into the river in many places without the anchoring Bearberry. Although Bearberry is locally common throughout the Northeast, nowhere on Cape Cod does it grow so extensively as on the hills of Truro.

The vegetative history of the Pamet is ably examined in a report done for the Truro Conservation Trust by the Center for Coastal Studies in 1985.[53]

Bearberry (courtesy of U.S. Soil Conservation Service)

II PROPOSED MANAGEMENT PLAN

II.A RIVER MANAGEMENT - HISTORICAL PERSPECTIVE

II.A.1 Previous Management Efforts

> 'Dr. L. Thomas Hopkins, a native of Truro and a nationally known educator, recalled a conversation with Dr. Herbert B. Howard in 1905. "Dr. Howard," he said, "was Director of Massachusetts General Hospital in those days, and he owned a cottage in Truro on the bluff at the head of Pamet in the Ballston Beach area. We were sitting on the porch of his cottage overlooking the ocean, the Pamet River Valley, and the highlands. He remarked that some day all of this area should be taken over and preserved by the State or Federal government to prevent private development.'
> -- from Francis Burling, The Birth of the Cape Cod National Seashore, 1974.

Management actions affecting the Pamet River date back to 1730 when Truro Town Meeting eliminated direct cattle grazing of the salt marsh to prevent erosion.[54] Other decisions were similarly oriented towards individual problems, such as navigation, drainage, etc., with little thought given to integrated resource management for the Pamet.

About 1961 Town Meeting established a Pamet Harbor Committee to assess boating and recreational needs near the river mouth. (See "Pamet Harbor" section of this Plan.) At the same time, the Cape Cod National Seashore was authorized, bringing most of the Pamet upstream of Route 6 under federal jurisdiction. Still, each group was concerned only with its respective end of the river.

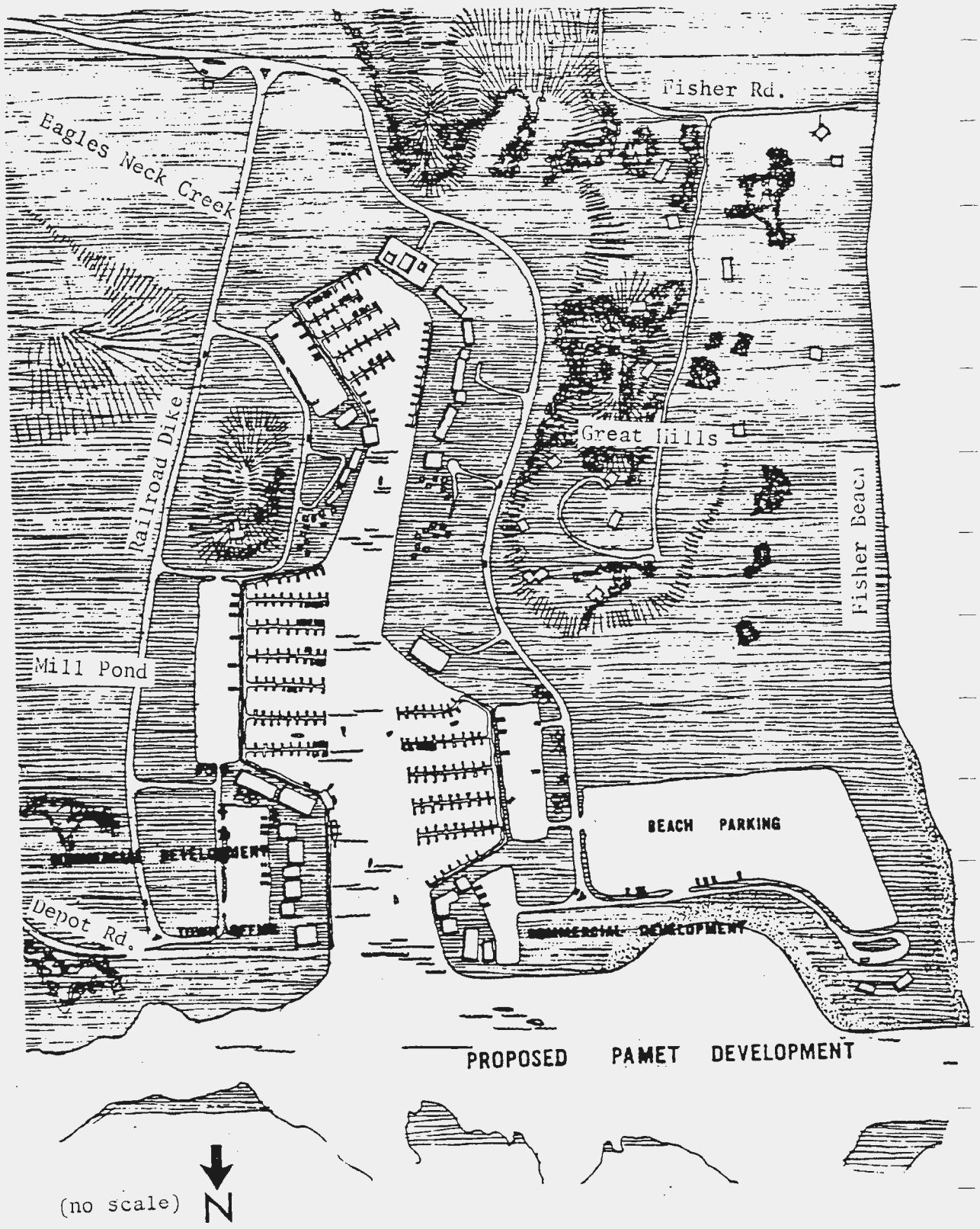
In 1963 the Commonwealth commissioned private consultants to produce a regional master plan for Cape Cod.[55] The planners acknowledged that the "unusual attractiveness" of the Pamet Valley "depends upon both halves functioning as one."[56] They

recommended elimination of commercial development near the highway crossing. They favored scattered residential dwellings as the preferred land use to preserve the Valley, although they approved of boating improvements.

In 1969 the Truro Planning Board hired a Boston consulting firm to design the first master plan for the town.[57] Among other strategies, the firm recommended: that residential zoning near the Pamet be increased to one-acre minimum lot size; that clustered housing should be encouraged to protect open space and that the Eagles Neck marshes be dredged to create a large marina complex at the harbor. A new town center was also proposed for the end of Depot Road to provide Truro with a "focus" for community life. (See Figure 3.) These planning studies had little local support and both were quietly shelved. Despite their failed recommendations, these reports represented the first attempts to design a cohesive land strategy for the Pamet area.

About this time, environmentalists began to recognize the need to manage rivers and natural resources in general as systems, not segments. This thinking, among other things, led to the creation of the Massachusetts Coastal Zone Management Program (CZM) and the Scenic Rivers Program in the 1970s. CZM relied on local citizens' concerns and needs to produce a coastal resources plan for the Massachusetts shoreline in 1977.[58] The Truro CZM Advisory Committee persuaded CZM that Pamet River was the top coastal concern in the town, though there seemed to be equal sentiment that what was needed was more preservation AND more recreational development.

Figure 3. Proposed Commercial Marina Development, Pamet Harbor, Truro MA. (In 1969, as part of a Master Plan for the Town of Truro, a Boston consulting firm proposed that salt marsh should be extensively dredged in Pamet Harbor to create a large commercial marina. Stores and offices would also be centered around the harbor.)



Source: Community Planning Services, "Truro Comprehensive Plan Summary-1969," Boston MA, p. 7.

II.A.2 The Scenic Rivers Program

Although the goals of preservation and development appear to be at odds, they actually reflect the need for balance between the two activities. The Commonwealth noted this balance again in 1978 when it classified* the Pamet as a Recreational Natural Landscape under the Scenic Rivers Program.[59] The Pamet was one of only two Cape Cod rivers (along with the Mashpee River) among the 46 rivers included in the program statewide. The Pamet and Mashpee Rivers were also recommended as the number two priority for protection, behind only the South Shore's North River, among the 46 rivers.[60]

From 1978 until 1980 the state explored various means of imposing a protective order regulating land uses near the Pamet, a power granted the Scenic Rivers Program by the state legislature. While a sizable component of Truro residents supported regulations to protect the river, another more vocal group of citizens believed that existing zoning and wetlands laws were sufficient to protect the river's water quality and scenic value. Adoption of town-enforced development controls in the River Valley failed at 1980 Town Meeting due to the still-raging controversy.

The Scenic Rivers Program developed an incentive program called the Greenway Project to encourage local initiative to protect the state's rivers. The Greenway Project funds local organizations to develop not only protective measures for a

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* (Under the Scenic Rivers Program, a river is classified if it meets program criteria; it becomes a designated Scenic River when a management plan or protective order is approved.)

river, but also a comprehensive management plan to accommodate a wide range of uses, including recreation, in the river.

II.A.3 The Pamet River Greenway Project

In 1984, with the support of the Truro Board of Selectmen, the Truro Conservation Trust, a private non-profit land trust, was awarded a $ 10,000 planning grant from the Massachusetts Department of Environmental Management to design a Greenway management plan to protect the water quality and scenic beauty and enhance recreation in the Pamet River system. An Oversight Committee, composed of town officials, Trust members, a representative of the Cape Cod National Seashore and concerned citizens, was formed to direct the project. The Trust's Executive Director served as Project Manager. The Committee's purpose was to develop a Greenway plan that would be supported by the community. The state's goal--protection of the river--would be met, while the town's aim--local control of the resource--would be maintained.

Among the activities of the Committee were the following:

1) Monthly or semi-monthly Committee meetings over a period of one year (August 1984-August 1985) to discuss needs of the river and Greenway development

2) Coordination with the Cape Cod National Seashore to develop compatible goals for the entire river system

3) Meetings with town boards, including Selectmen, Planning Board, Conservation Commisssion, Harbor Committee, Historical Commission and Water Study Committee to seek planning input and report findings

4) Cooperation with outside agencies studying or

managing aspects of the system:

a) IEP, Inc. - ground water consultants to Planning Board

b) MRI, Inc. - water quality consultants to Cape Cod National Seashore on the upper Pamet's conditions

c) Mass. Department of Environmental Quality Engineering - state agency monitoring quality of shellfishing waters in the river

d) Cape Cod Mosquito Control Proect - county agency involved in drainage controls and pest management in Pamet wetlands.

5) Initiation of new studies or management projects in the Pamet:

a) The Center for Coastal Studies in Provincetown-- developed an overview of historical changes in the river system, including vegetation, land use and flow regime resulting from human occupation

b) Barnstable County Health Department - analyzed water quality of the tidal Pamet, specifically for shellfishing

c) Massachusetts Division of Fisheries and Wildlife - established osprey nesting poles in the river.

d) Woods Hole Oceanographic Institution - Sea Grant Program to study tidal hydraulics and shellfish dispersal in the Pamet

6) Development of an active public participation program in the Summer of 1985 to increase the visibility of the Greenway Committee and focus public attention on the importance of the river. (See Appendix A.) Also, designed and distributed opinion survey to Truro taxpayers and tabulated over 500 responses in a computer. (See Appendix B.)

7) Production of this Greenway Plan with recommendations to preserve water quality, scenic beauty and to improve recreation.

II RIVER MANAGEMENT - INVENTORY AND RECOMMENDATIONS

II.B.1 LAND OWNERSHIP

II.B.1.a Analysis

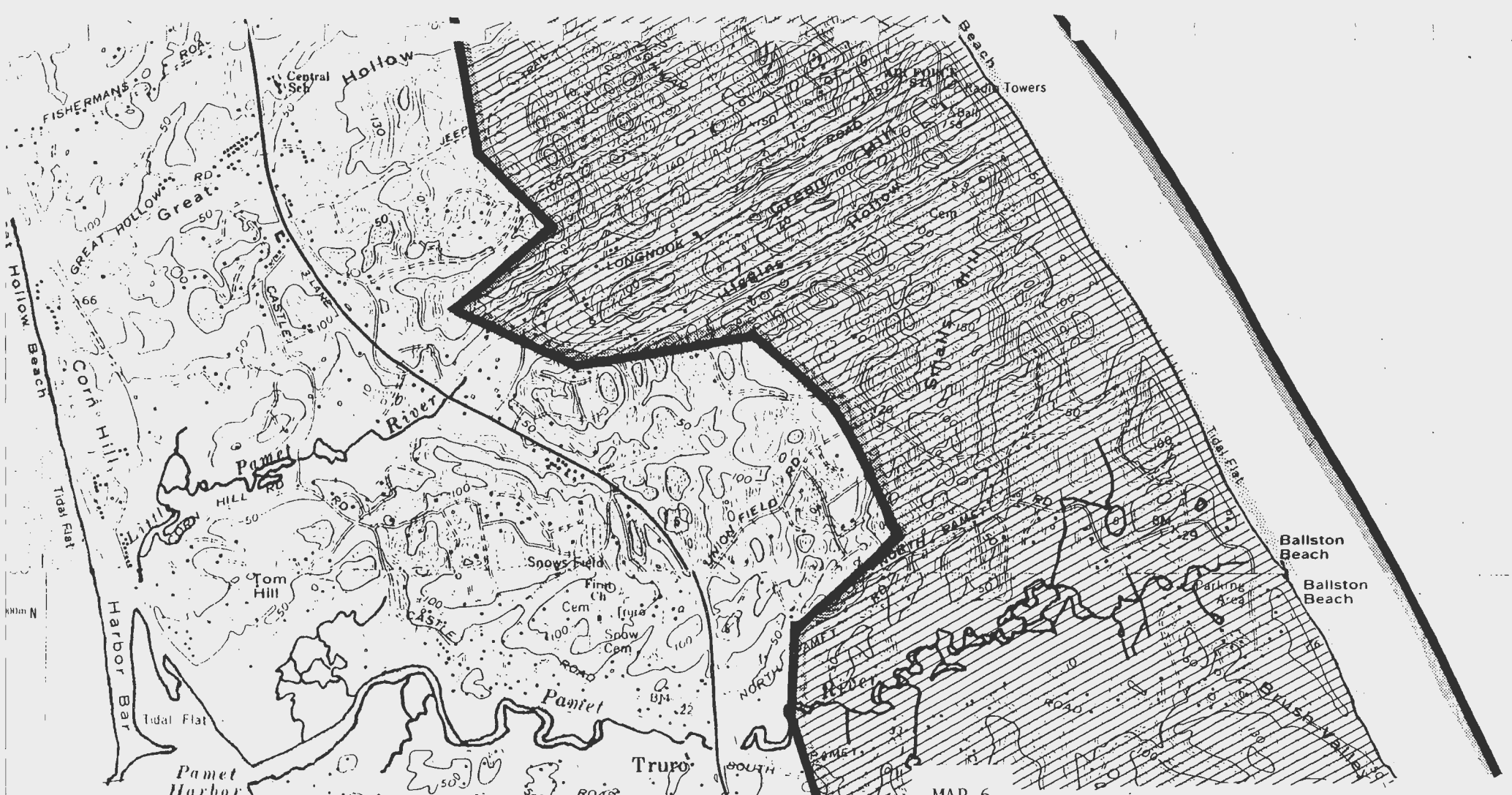
The single largest landowner in the Pamet River system is the U.S. Department of Interior's National Park Service (NPS), which manages the Cape Cod National Seashore established in 1961. The NPS owns most of the freshwater upper Pamet east of Route 6 and much of the contiguous upland, although there are numerous "improved" or developed properties owned by private individuals within the Seashore's jurisdictional boundary. Federal control is also extensive around Longnook (Little Pamet watershed) and Bangs Creek (east of Old County Road.) All of the saltwater Pamet and most dikes and culverts are outside National Seashore boundaries. (See Map 6.)

Another significant landholder is the Town of Truro. The town owns approximately 45 acres of upland (including beach as defined by the Board of Assessors) and 50 acres of wetlands (mostly salt marsh) along the river. These holdings are used for conservation and recreation. (See Table 3.)

Table 3. Town-owned Conservation/Recreation Land in Pamet Valley

Map	Lot	Upland Acreage	Wetland Acreage
45	50	29.18	0.00
49	1	5.00	1.61
49	16	12.25	1.47
49	17	3.24	1.95
49	18	0.91	0.79
49	33	0.00	1.34
49	34	0.00	4.13
50	9	0.00	0.01
50	18	0.91	3.97
50	210	0.00	21.18
50	211	0.00	9.27
51	12	1.07	0.52
54	5	0.00	3.49
	Totals	44.56	49.73

Source: Town of Truro, Assessors' Atlas, 1986.



MAP 6.

Cape Cod National Seashore
Pamet River, Truro MA

Scale
1" = 2000'

KEY

Boundary of Cape Cod National Seashore

Jurisdictional Area of National Seashore

N

Source: Public Law 87-126

MAP 10. **URBAN LAND, 1980**

Pamet River System, Truro MA

N

SCALE: 1:25 000

SOURCE: adapted from Wm. MacConnell et al, "Land Use Update for Cape Cod and the Islands, Map Down Maps," University of Massachusetts, Amherst, 1983.

MAP 7.

River Ownership
Pamet River, Truro MA

KEY

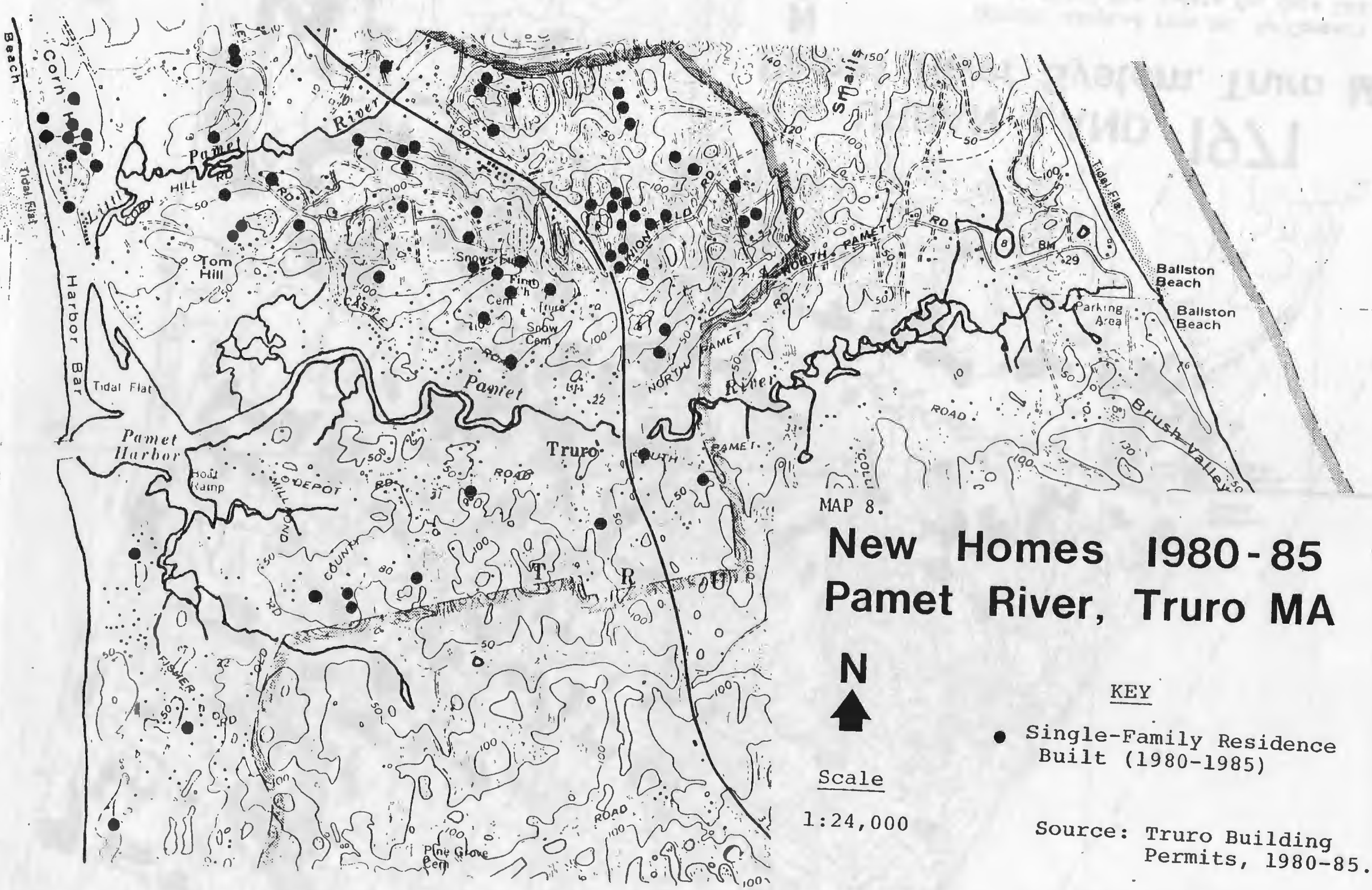
Scale
1"=1000'

Property Boundary

TOWN-OWNED LAND

TRURO CONSERVATION TRUST PROPERTIES

Source: Truro Assessors' Records,



MAP 8.

New Homes 1980-85 Pamet River, Truro MA

pond for a mill in the 1700s. Because the mill was a corporate venture, interests in the company appeared as land wedges in the pond.[64]

II.B.1.b Land Ownership Recommendations:

1) The town should initiate proceedings to acquire significant "owners unknown" wetlands in the Pamet through tax title foreclosures, as provided in MGL c.60. All lands acquired by these means should be transferred to the management authority of the Conservation Commission.

2) All town-owned lands not used for active or beach recreation or other non-conservation uses should be transferred to the control of the Conservation Commission.

3) The National Park Service should give priority to the purchase of two undeveloped parcels of lands in the Pamet within its jurisdiction under the NPS Land Protection Plan of 1985.

4) A title search should be conducted to determine the true nature of ownership of the following sites:

a) Old County Road over Wilders Dike (old Route 6)--town, county or state? ownership of culvert?

b) south end of Meetinghouse Road (Snows Landing)--is this a public way to water? public rights in a common landing cannot be discontinued or extinguished (Commonwealth v. Tucker, 2 Pick. 47).

c) south end of Bridge Road and a way between Pamet River and Holsbery Square on Depot Road (former footbridge location)--was this a public way? are public rights still valid?

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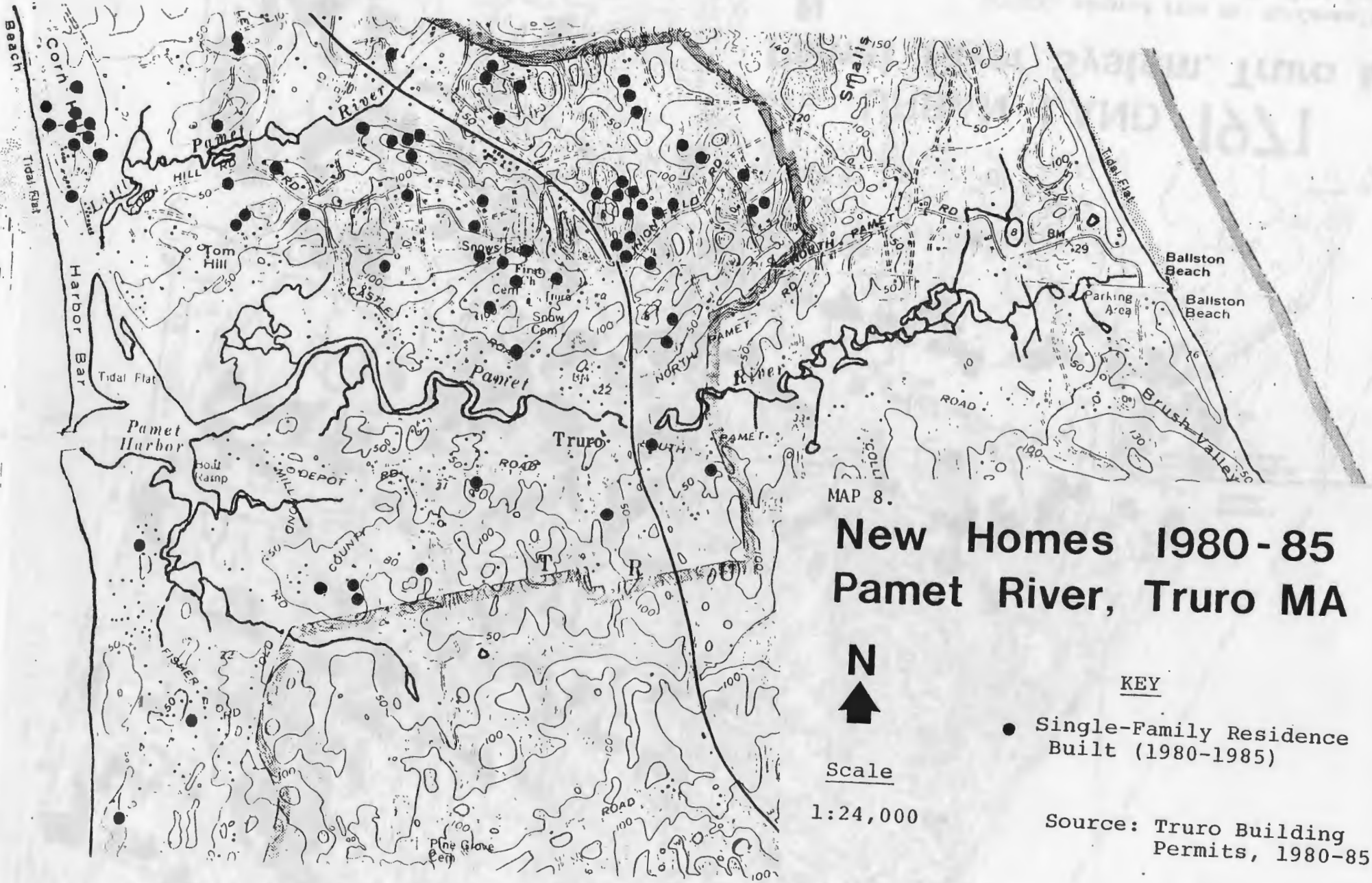

MAP 8.

New Homes 1980-85
Pamet River, Truro MA

N

Scale

1:24,000

KEY

- Single-Family Residence Built (1980-1985)

Source: Truro Building Permits, 1980-85.

MAP 7.

River Ownership
Pamet River, Truro MA

KEY

Scale
1"=1000'

Property Boundary

TOWN-OWNED LAND

TRURO CONSERVATION TRUST PROPERTIES

N

Source: Truro Assessors' Records,

MAP 10. **URBAN LAND, 1980**

Pamet River System, Truro MA

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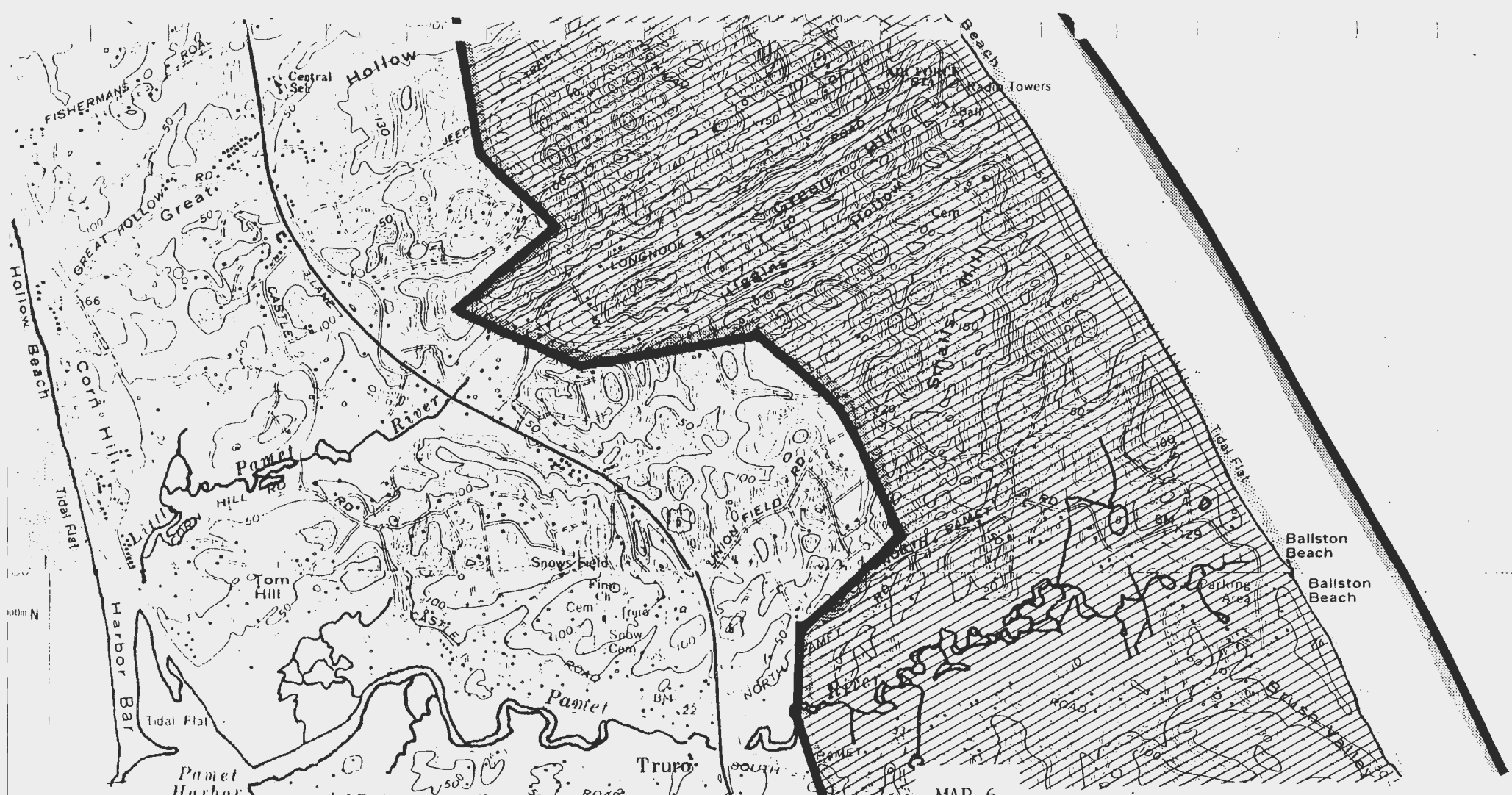
SCALE: 1:25 000

SOURCE: adapted from Wm. MacConnell et al, "Land Use Update for Cape Cod and the Islands, Map Down Maps," University of Massachusetts, Amherst, 1983.



MAP 6.

Cape Cod National Seashore
Pamet River, Truro MA

Scale

1" = 2000'

KEY

Boundary of Cape Cod National Seashore

Jurisdictional Area of National Seashore

N

Source: Public Law 87-126

A smattering of other land uses are located in the Pamet, including commercial, municipal and agricultural activities. A General Business zone envelops the river at its Route 6 and Wilders Dike crossings. Existing uses at this location include a post office, two restaurants, real estate offices, a seasonal grocery, antique shop, liquor store, library and seasonal laundromat. Other permitted uses include motels, automotive service and "inoffensive" manufacturing. This General Business district is one of only three small ones in the town.

Also within the Pamet area are the town hall, police and fire stations, highway barn, two churches, four cemeteries, a seasonal art center and the town landfill--the latter within the Cape Cod National Seashore. Only the fire station is situated directly on the riverbank. Route 6 between Pamet River and Little Pamet is zoned for residential use, but some non-conforming uses exist, such as a cottage colony, one gas station and a nursery. A site on North Pamet Road houses a youth hostel in the summer and an environmental education program for schoolchildren through the winter.

One commercial farm operates on the Little Pamet. A six-acre family farm on South Pamet Road also has livestock. Several other homes have minor numbers of stock animals. (See "Agriculture" under the Water Quality section of this Plan.)

In summary, Pamet land uses have been generally conducive to maintaining the scenic beauty and water quality of the river system. There is no obtrusive activity, such as industrial plants, or large-scale buildings, such as hotels, to mar the

rural character of the river. Housing patterns are not typically dense and the seasonal nature of the population reduces expected traffic, noise and pollution through much of the year. Truro Center (near Wilders Dike) offers the minimum amount of essential services to maintain village life around the Pamet, but is not a commercial center on a scale to disrupt river features at present. The land use qualities that reinforced the Pamet's designation as a state Scenic River in 1978 still exist.

There are several emerging phenomena, however, that could threaten these qualities. First, development pressures in the Pamet, while lower than other areas of Cape Cod, are magnified due to the relatively undeveloped landscape, topography and traditional low-density housing patterns found in the area. Houses on open Pamet hillsides clearly obtrude more than construction in wooded hollows. Second, as noted above, more houses are being occupied year-round, thereby increasing the feeling of "crowdedness" for longer portions of the year, while new construction creates spatial "crowdedness".

Third, the halt of new housing construction within the Cape Cod National Seashore (67% of the town falls within the Seashore) has accelerated development pressure in that half of the Pamet area outside federal jurisdiction. Fourth, the potential future of the Pamet's General Business zone is unknown; uses far less benign than existing ones may be proposed and approved. Finally, expansion plans contemplated for Route 6 by the Commonwealth may not only have harmful impacts on the Scenic River itself, but also by increasing the ease of

transportation may accelerate the other trends and problems noted above.

II.B.2.c Non-Zoning Land Use Controls

In addition to zoning standards, several other regulatory measures affect development near the Pamet. None of these rules are specific to the Pamet; they apply townwide.

The Board of Health administers septic disposal requirements through enforcement of Title V of the State Sanitary code. Title V establishes minimum standards, such as a 50-foot setback for leaching fields from wetlands, although Truro could adopt stricter regulations to ensure protection of valuable river resources.

The Conservation Commission regulates development within 100 feet of wetlands under the state Wetlands Protection Act (MGL c. 131, s.40). There is no setback from wetlands required in the state act, so development can be proposed right up to the edge of marshes, banks or the river itself. Again, the Conservation Commission can establish a local wetlands protection by-law to provide supplementary protection to natural resources. Due to technical flaws, two attempts to adopt such a by-law were unsuccessful in recent years.

The state Wetlands Restriction Program (MGL c. 130, s. 105 and c. 131, s.40A) places deed restrictions preventing permanent construction on certain wetland properties, particularly salt marshes in Truro. Truro was the first town in the Commonwealth to have its wetlands restricted when the program began in 1975. This program, however, does not address development immediately

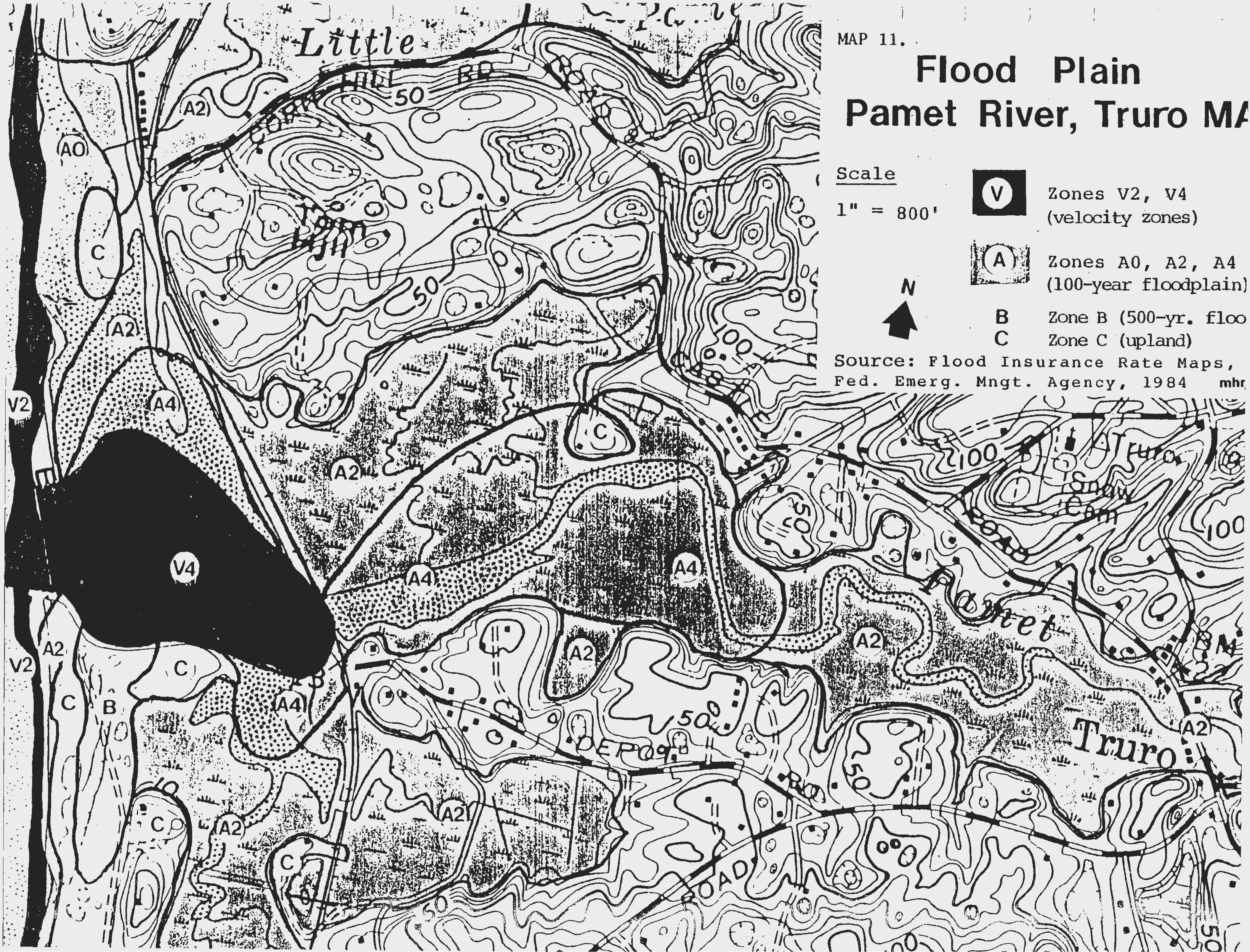
adjacent to wetlands.

Truro's zoning by-law incorporated a section (I.E) on floodplain development in 1978. While certain performance standards must be met for new buildings in the floodplain (ground floor elevated above the 100-year flood height) or in high hazard areas (pilings required for houses in dunes), these rules do not prevent development in low-lying areas. (See Map 11.)

In 1985 the U.S. Department of Interior proposed including all wetlands of the Pamet River system in its implementaion of the Coastal Barrier Resources Act. The intent of this legislation was to protect undeveloped barrier beaches and related coastal features, such as salt marshes, by prohibiting federal expenditures that might encourage development of these hazardous areas. Federal subsidies for roads, flood insurance, sewers, etc. would not be granted in these areas. Truro Selectmen petitioned to have the Route 6 crossing of the Pamet River deleted from the designation, in order to ensure that future utilities could cross with the highway. This program does not prevent development of the Pamet; it simply removes financial participation by the federal government.

The town has no standards regulating the aesthetics of structures, other than junk removal and height restrictions. Nor does the town have any procedure to prevent the demolition of an historic house other than Building Inspector approval, except within the National Seashore. No scenic roads by-law protects trees. No erosion control measures exist.

To conclude, local development controls are rarely more



MAP 11.
Flood Plain
Pamet River, Truro MA

stringent than state-mandated minimum requirements. And although the Pamet River has been consistently identified as a crucial natural resource, no additional protection has been afforded the Pamet area to reflect that concern. Town regulations presently treat the Pamet just like any other part of Truro.

Although it may appear to the casual observer that adequate controls already are available to protect the Pamet, that perception fails upon closer inspection. Besides minimal standards, development review authority is fragmented among different agencies, such as the Boards of Health, Planning, and Appeals; Conservation Commission; and the Building Inspector. Due to small or non-existent staff for these boards, coordination and enforcement is diffcult at best. Clearly, measures are presently insufficient to implement protection of the water quality, scenic beauty and recreational features of the Pamet that led to Scenic River classification. In order for the town to forestall state takeover of development regulations in the Pamet, the town must ensure that the state's needs are met through local measures.

II.B.2.d LAND USE RECOMMENDATIONS

1) The town should re-zone the existing General Business district at Truro Center to a new zone for Special Business. Existing uses that would become non-conforming uses could remain in operation under a grandfather clause. Uses permitted by right would be limited to single-family homes. Uses allowed by Special Permit would be limited to retail businesses,

professional offices, home occupations, restaurants and parks and playgrounds. (See, also, IEP, Inc., "Water Resources Protection Plan for the Town of Truro," December 1985.)

2) The laundromat and other large wastewater dischargers should not be allowed to expand their volume of discharge. The laundromat should be licensed under the Massachusetts Ground Water Discharge Permit Program. (During the Summer of 1986 the laundromat failed to open and is presumed permanently closed, pending sale of the property.)

3) The town should adopt a minimum lot size of 60,000 square feet for new subdivisions within the Pamet Valley based on water quality.

4) The town should oppose any future widening of Route 6 by the state in the Pamet area due to water quality and scenic issues. (See "Ditching and Diking" section.)

5) Recommendations regarding protection of aesthetics contained in the "Scenic Values" section of this report should be followed.

II.B.3 WATER QUALITY

II.B.3.a Introduction

One of the major goals of the Greenway Project is to protect existing water quality in the Pamet system from possible contamination and to correct identified problems. But the greatest threats to the river's quality do not come from use of the river. Because fresh water enters the river through runoff and ground water discharge, land use near the river is the primary concern when pollution sources are examined. Map 12 delineates the wide land area through which ground water migrates towards the Pamet system. Ground water will also transport most contaminants it encounters in its path, such as oil, nitrates and chemicals.

Water quality of the Pamet is generally good, although several problem areas have been detected. The state Division of Water Pollution Control has classified the waters SA (tidal portions) and B (fresh water segments),[68] meaning the highest standards for purity must be maintained. In addition, the Pamet is listed by the state as an Anti-degradation Stream because there is presently no point source discharge of pollutants (i.e., sewer outfalls pipes, factory wastes) and the state would be reluctant to permit proposed ones.

Features of the Pamet which tend to protect water quality include the following: a relatively low-density residential land use; strong flushing rates due to a large tidal range in the salt water Pamet; broad salt marshes and freshwater wetlands capable of treating certain wastes, such as nitrates and metals;

River Recharge Area Pamet River, Truro MA

MAP 12.

Scale: 1:24000

N

Ground water within the shaded area on map flows towards and eventually discharges into the Pamet River. Underground contaminants (oil, nitrates, etc.) will also migrate to river within this area.

Source: IEP, Inc. for Truro Planning Board, 1985

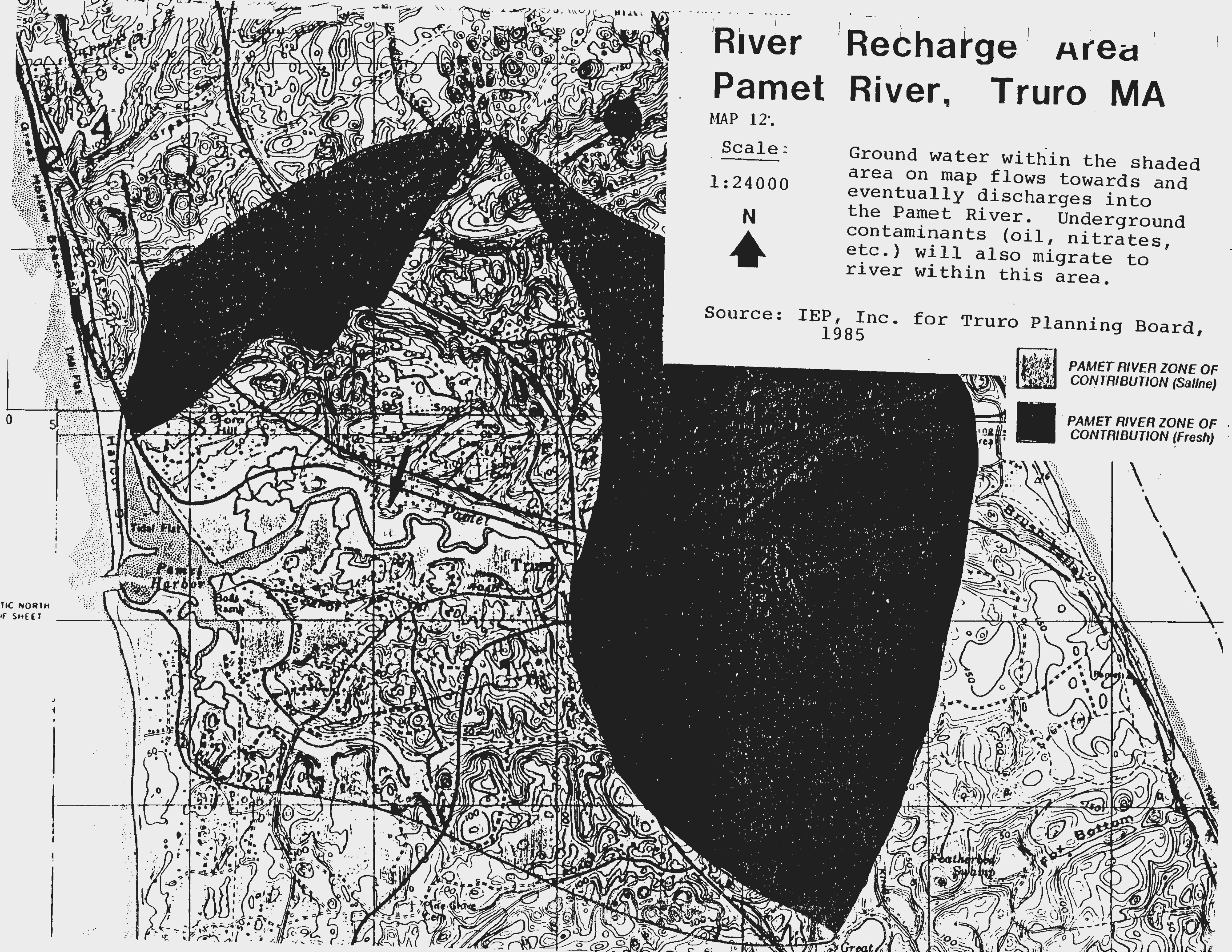


TABLE 5. PAMET RIVER WATER QUALITY

The Massachusetts Division of Water Pollution Control tested the water quality at three Pamet River locations on September 1, 1976 as part of its Cape Cod Drainage Basin Water Quality Survey. The Division has not repeated its sampling since that time for the Pamet River.

Station #	SS79-1	SS79-2	SS79-3	COMMENTS
Location	Pamet Harbor	Wilders Dike Castle Road	fresh Pamet N. Pamet Rd.	
Date	1 Sept 1976	1 Sept 1976	1 Sept 1976	
Time	1100	1110	1120	low tide
Temperature of water	68°	66°	66°	
Dissolved Oxygen	8.5	7.1	7.9	all good
Depth Sampled	Surface	Surface	Surface	
BOD_5	--	--	--	
pH	7.7	6.9	6.7	good
Total Alkalinity	82	11	10	
Suspended Solids	2.0	4.0	5.0	
Color	15	45	45	
Chlorides	11,750	300	240	#1 = tidal
Ammonia-N	0.02	0.01	0.02	
Nitrate-N	0.0	0.0	0.0	
Total Phosphorus	0.05	0.06	0.08	
Total Coliform	<10	160	300	#2 = high
Fecal Coliform	5	50	30	#2 = high
Turbidity	1	3	3	
Specific Conductivity	30,000	1,000	890	
Sulfate	1,700	36	39	
Calcium	250	10	100	
Magnesium	1,050	18	20	
Total Solids	23,230	580	940	

Source: Massachusetts Division of Water Pollution Control, Cape Cod Drainage Water Quality and Wastewater Discharge Survey, 1977.

the preferred siting of homes on hilltops, promoting sewage filtration through adequate depth to ground water; and, a predominately seasonal occupancy of dwellings.

Factors tending to degrade water quality are as follows: extensive diking which has impaired streamflow and flushing in upper segments of the system; houses built at elevations too low for maximum septic system effectiveness; the relative old age of most homes, suggesting the presence of outmoded cesspools instead of septic systems that meet Title V requirements; steep hills transporting land runoff directly into the river; and mounting development pressures in the river recharge area. An examination with recommendations for each water quality issue follows.

II.B.3.b Water Quality Monitoring Studies

Four different water studies affecting the Pamet have recently been conducted:

- Marine Research, Inc., a Falmouth consulting firm, examined the extent of eutrophication and salt water intrusion into the upper Pamet within the Cape Cod National Seashore under a contract from the National Park Service (NPS Contract Number CX1600-4-0045). Three river sampling stations and 12 ground water wells were tested for a wide range of chemicals, metals and physical parameters in 1984 and 1985. No bacteriological assessment was made.

- The Barnstable County Health and Environmental Services Department monitored the tidal Pamet to complement Marine Research's work. At the request of the Pamet River

Greenway Committee, the County study measured many of the same parameters, but also included bacteriological sampling in order to assess water quality for shellfishing.

- The Massachusetts Department of Environmental Quality Engineering (DEQE) has also sporadically sampled shellfishing water quality, (see Table 10 in Shellfish Management chapter). Only bacteriological tests have been performed. In 1984-85 a sampling survey of the river revealed high coliform counts near Wilders Dike. In November 1986 DEQE for the first time closed the river for two months due to high bacteria levels.

- IEP, Inc., a Barnstable consulting firm under contract to the Truro Planning Board, prepared a townwide Water Resources Protection Strategy in 1985. Although its primary focus was ground water assessment, IEP collaborated with the Greenway Project to incorporate ground water protection with river management.

MONITORING STUDIES RECOMMENDATIONS:

1) The Truro Water Quality Advisory Committee should attempt to coordinate the monitoring studies and arrange an exchange of information.

2) DEQE should initiate an intensive shellfish resurvey as soon as possible, using the results of the aforementioned studies to identify problems.

3) DEQE should regularly release its routine bacteriological sampling results to the town's Board of Health so the town can stay informed of trends in declining water quality in certain areas and correct problems. Presently, DEQE

waits until it deems a shellfishing closure necessary before alerting town officials.

4) Barnstable County should computerize all existing water quality data on the Pamet and serve as a repository for future sampling information. Future monitoring should attempt to use previous sampling locations to facilitate comparisons.

5) Truro town officials and Pamet residents should cooperate fully with DEQE in providing information to identify pollution sources, such as septic system data, road drainage patterns, etc.

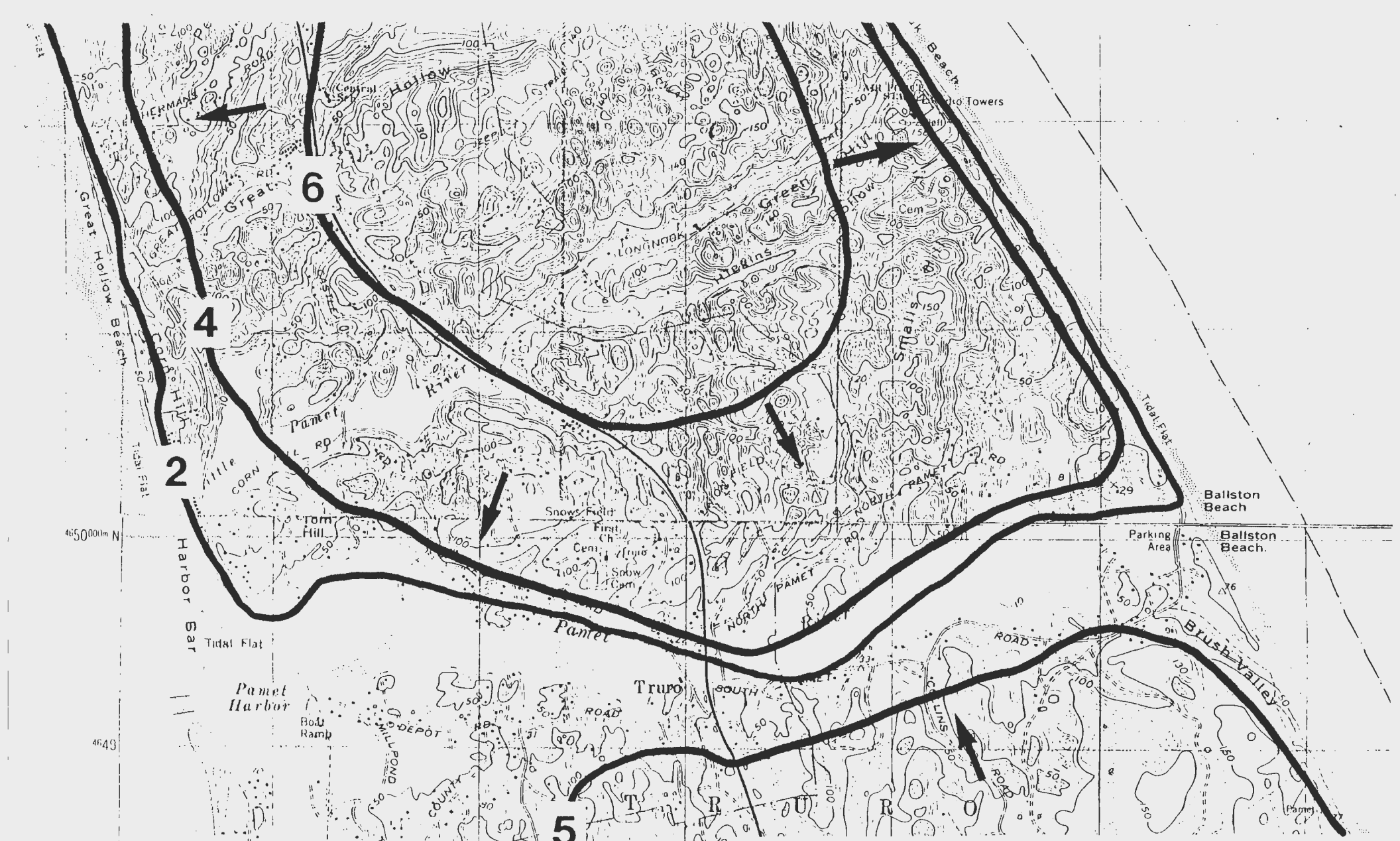
6) The Division of Water Pollution Control should initiate more regular sampling of the Pamet based on the significance of the river.

7) Water samples should be tested from the Little Pamet and Eagles Neck Creek in future studies.

II.B.3.c Septic Systems

There is no public sewer system in Truro. All homes and businesses are served by on-site septic systems. According to a survey commissioned by the Greenway Committee, Truro taxpayers (73%) believe that malfunctioning septic systems are the greatest threat to Pamet River's future. (See Appendix B.) Indeed, wastewater leaching from faulty septic systems can carry bacteria directly into ground water with consequent discharge in to the river. Even efficient septic systems cannot always remove viruses, nitrates, oils and household chemicals flowing through them.

Reasons that septic systems could potentially fail near the



MAP 13. WATER TABLE ELEVATIONS

PAMET RIVER SYSTEM, TRURO MA

Source: Cape Cod Planning and Economic Development Commission after U.S. Geological Survey,

—6— Ground Water Contour; Altitude of Ground Water in feet above Mean Sea Level

Pamet include the following:

1) The prevalence of older homes near the Pamet due to its history as a long-settled area. Older homes are more likely to use cesspools rather than Title V (state environmental code) septic designs required after 1977.

2) Older systems may have been installed at a low elevation without adequate depth to water table to allow soil filtration of wastes.

3) Systems may lack regular maintenance. Under Title V, systems should be pumped out annually even though a problem may not be detected (Section 6.16, Title V).

4) Older systems may have been installed in poorly drained soil, such as underlying clay or peat deposits.

5) Periods of elevated water table, such as during rainy springs, may prevent proper filtration of wastewater. Also, coastal flooding may inundate low-lying septic systems.

6) An increasing rate of year-round occupancy throughout the town means that more outmoded systems, previously effective when used seasonally, may not be able to handle year-round demand.

Septic systems were suspected as a source of pollution in the Pamet River in the 208 Water Quality Management Plan in 1978.[69] No field testing or other substantiation, however, was performed.

The Greenway Committee conducted its own septic system survey in 1985 based on septage haulers' reports of their pump-out locations to the Truro Board of Health. An examination of

TABLE 6. Suspected Septic System Problems Due to Frequent Pump-outs

Assessors' Number Sheet	Lot	Location	Pump-out Dates	Comments
* 50	155	Truro Center, Wilders Dike	numerous	Laundry; 44,850 gals./ summer removed by law
* 54	89	off Old County Rd. abuts Bangs Creek	4/80, 7/80, 5/82, 4/84	low-density development abuts swamp
50	202	off Holsbery Rd.	7/80, 9/81, 6/82, 9/82	low-density development
50	99	Depot Road near Holsbery Square	9/79, 7/81, 7/81, 8/81, 7/84	older home?
* 50	70	Meetinghouse Rd. near Snows Lndg.	10/79, 10/80, 8/82, 9/82, 8/83, 10/83, 5/84, 6/84, 8/84	tiny lot; suspected problem on adjacent lot floodplain
* 50	63	Meetinghouse Rd. near Snows Lndg.	5/80, 6/80, 4/82, 8/82	small lot; suspected problem on adjacent lot,
50	131	Castle Road near Truro Center	7/80, 12/82, 9/83	
46	267	Town Hall Road	11/81, 7/82, 7/82	
45	43	Corn Hill	9/84, 9/84, 10/84	sloping lot?
46	144	Longnook Lane	5/81, 10/82, 12/82, 6/83, 10/83, 1/85	
46	159	Atwood Road	8/80, 9/80, 8/81, 6/84	high nitrates in nearby well
47	54	Grouse Run East Pamet Hills	5/84 (repaired) 8/84, 1/85	newer home
48	13	South Pamet Rd. Brush Hollow	8/81, 8/82, 5/84	large lot; older home
48	--	North Pamet Rd. School/Youth Hostel	8/80, 4/83, 4/83, 7/83, 8/84, 11/84	

* = priority for investigation due to proximity to river

Source: Truro Board of Health, Septage Coupon Log, 1979-1984. Analysis by Pamet River Greenway Committee, 1985.

these records for the past six years (1979-84) revealed 14 sites in the Pamet study area that appear to require septic system pump-outs with unusual frequency.[70] (See Table 6).

Further investigation is needed to determine whether these data reflect failing systems or simply preventive maintenance by conscientious owners. Indeed, it may be that systems not pumped at all in the last five years are those introducing contaminants to ground water, their owners neglecting maintenance because no surface breakout is evident.

One special system deserves mention. The Pamet Laundry on Old County Road at Wilders Dike has pumped its system at least twice each summer, conforming to Board of Health requirements for its operation. Up until the early-1970's, a discharge pipe led directly into the river from the laundromat, but state water sampling revealed very high bacteria counts and forced termination of this point source discharge. In 1986 the Laundry did not receive a permit to open.

SEPTIC SYSTEM RECOMMENDATIONS:

1) The Truro Board of Health should investigate the 14 sites noted herein to learn the reasons for their frequent septic system pumpouts. Systems found to be failing should be upgraded immediately to prevent a continued threat to water quality, not only in Pamet River, but also in domestic wells.

2) The Board of Health should review its septage coupon log annually to note septic systems within the Pamet study area that are pumped with unusual frequency. Results should be compared with the Greenway tabulation provided in Table 6.

3) Town building regulations should require applicants to

provide a description of their present subsurface disposal system with any request for a building permit. If the system does not conform with Title V, (as is typical with most older systems), the Board of Health should require an upgraded system to be part of the building permit issuance. Conservation Commission approval of the plan to upgrade may also be required. (In April 1986 the Board of Health adopted this practice as a health regulation.)

4) The Board of Health should initiate public education as t the proper use and maintenance of septic sytems. Furthermore, it should require annual pump-out of septage for the following systems:

a) where system components (cesspool, septic tank, or leaching facility) do not meet Title V setback requirements from watercourses (sec. II, para. 3.7);

b) where systems do not maintain a four-foot separation from ground water elevations;

c) or, any other systems deemed to be threats to water quality of the Pamet River system, including ground water.

5) The Board of Health should increase the construction setback for leaching facilties to wetlands and domestic wells from the state minimum of 50 and 100 feet, respectively, to 100 and 200 feet in the upgradient direction.

II.B.3.d Underground Fuel Tanks

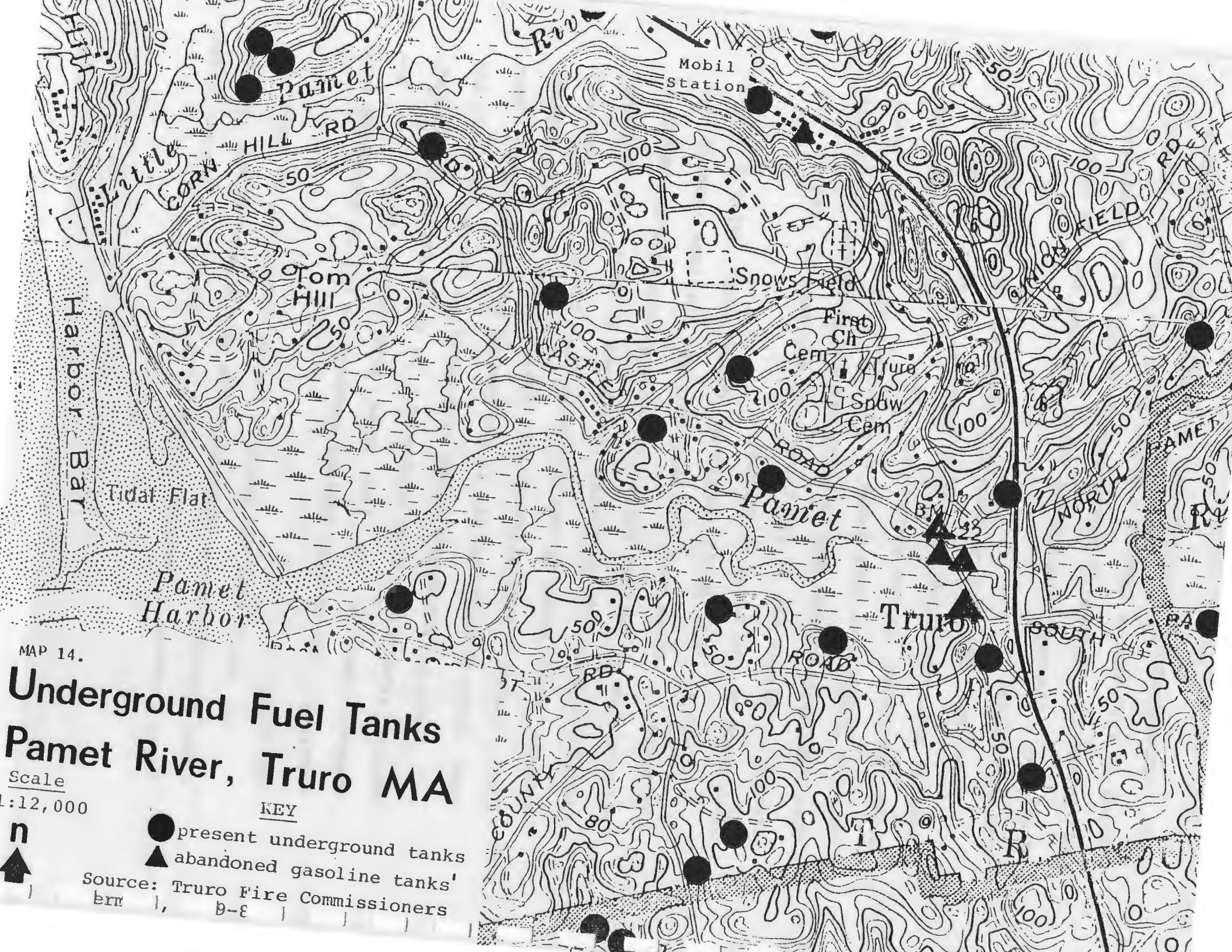
The Massachusetts Department of Environmental Quality Engineering claims that unmonitored underground fuel tanks are one of the greatest threats to water quality in the state.

Truro, unfortunately, contributed to public awareness of this problem in 1977 when a tank at a North Truro gas station leaked and forced the closure of Provincetown's South Hollow municipal wellfield. Cleanup efforts are still underway and the cost is over $3 million.

Only one gas station currently operates in the Pamet's recharge area--the Citgo station on Route 6. A Mobil station on Route 6 closed in the summer of 1986. Large commercial gasoline tanks have been found to be more susceptible to leaks than residential tanks due to size, use and pressure. The Mobil station replaced all of its tanks with new ones in 1985 at the insistence of the Board of Health.

Truro's Oil Spill Response Coordinator reports that, historically, there were at least four gas stations located near Wilders Dike at various times. These stations were abandoned as traffic bypassed Truro Center (old Route 6) when the Mid-Cape Highway (new Route 6) was opened in the 1950s. In February 1985, during installation of new utility poles in Truro Center, work crews encountered oil in the ground by excavation. Town and state pollution officials were notified about the spill and several site visits were conducted. It could not be determined, however, whether the leak came from one of these old gas stations. It is also unclear whether the oil is migrating into the river.

In March 1985 the Board of Health identified at least nine sites townwide where abandoned tanks were suspected and ordered their removal. Owners of two of the four Truro Center sites



MAP 14.

Underground Fuel Tanks
Pamet River, Truro MA

Scale
1:12,000

KEY

● present underground tanks

▲ abandoned gasoline tanks'

Source: Truro Fire Commissioners

complied.

Underground fuel tanks are also used for storing home heating oil at residences. The Greenway Committee has identified over 50 such tanks in the Pamet area after reviewing Truro Fire Department oil burner work permits for the years 1967-84. (See Map 14.) These tanks hold from 200 to 1000 gallons of #2 fuel oil.

Under town health regulations, underground tanks over fifteen years old must be tested by the owner to ensure they are not leaking. (Steel tanks rust and corrode in damp soil.) As is the case in most Cape towns that have adopted this regulation, however, Truro has concentrated its tank-testing enforcement efforts on commercial tanks, such as gas stations, due to lack of staff and funds. In July 1986, the Board of Health adopted a health regulation prohibiting the installation of new underground tanks to store heating fuel.

UNDERGROUND FUEL TANK RECOMMENDATIONS:

1) The Board of Health should ask the Barnstable County Health Department to computerize the town's underground fuel tank records, including homeowner tanks, to facilitate monitoring of old tanks and the required testing program.

2) The Board of Health should begin enforcement of residential undergound tank-testing with priority based on age and size of tanks and proximity to the Pamet River system.

3) The Board of Health should continue its enforcement of the removal of discontinued tanks near the Pamet.

4) No new commercial underground fuel tanks should be installed within the Pamet River recharge area except to replace

existing commercial tanks and in conformance with state Department of Public Safety regulations.

6) The Board of Health should request hydrocarbon testing by the state Division of Water Pollution Control and the Barnstable County Health Department in river waters and soil near Wilders Dike to determine the extent of oil contamination in the vicinity of suspected abandoned tanks.

II.B.3.e Stormwater Runoff

Surface runoff carries pollutants directly into the Pamet during rainstorms and snow melting periods. These contaminants can range from oils, metals and organic wastes to litter, chemicals and salts. Unfortunately, rivers have traditionally been used as receiving waters for stormwater runoff to prevent flooding of land areas or motorist inconvenience. Several pipes discharging road runoff from catch basins are located at Meetinghouse Road, South Pamet Road and Wilders Dike.

In fact, most of the runoff from Route 6 between Edgewood Farm and Unionfield Road (a segment 2/3-mile long) collects in highway catch basins for discharge into the river at the Pamet Roads exit ramp. Truro does not appear to suffer from another problem associated catch basins, which is that it is not unusual to find some residential septic systems illegally tied into these drainage devices.[71]

Stormwater runoff is a major source of bacterial pollution to shellfish beds around Cape Cod.[72] Elevated bacterial counts found in river samples near Wilders Dike by the Barnstable County Health Department and the state Department of

Environmental Quality Engineering may be related to the significant runoff inputs there.

STORMWATER RUNOFF RECOMMENDATIONS:

1) In connection with any proposed widening of Route 6, the Massachusetts Department of Public Works should be urged to eliminate catch basin outfall pipes and paved waterways leading directly into surface waters of the Pamet. Collected stormwater could instead be shunted into leaching catch basins or, at a minimum, pipes could discharge overland near the river rather than directly into the river itself to allow some soil filtration of pollutants.

2) The Meetinghouse Road outfall pipe at Snows Landing should be immediately replaced, not only due to its pollutant input, but also because of the erosive action of the discharge. A leaching catch basin should be installed in its stead. Leaching catch basins should also be installed at the Pamet Harbor parking lot due to its proximity to shellfish beds and swimmers and to eliminate the present discharge which flows directly into the river over the beach or boat ramp. This upgrading could be completed as part of the boat ramp improvements proposed by the state Public Access Board.

3) Existing closed-drainage systems (catch basins leading to outfall pipes) should be retrofitted with T-type oil separator outlets. Oil absorbent pillows should be placed in the basin and removed at six-month intervals.

4) The Board of Health should arrange to have the effluent discharged from drainage pipes tested by county or state

officials to determine the severity of any contamination discharge and its contribution to total pollution in the Pamet.

5) Catch basins should be cleaned annually to remove sump sediment. The resulting waste should be contained in a secure landfill.

6) The Board of Health and Conservation Commission should discourage the use of chemical pesticides and lawn fertilizers on hills sloping into Pamet wetlands to prevent transport of these pollutants during storms.

II.B.3.f Ground Water Quality

Over 60 water samples from private wells have been tested near the Pamet by the Barnstable County Health Department in the last five years. Most samples have indicated good quality water with the exception of some areas with high iron (not a health problem) and thirteen samples which exceed state and federal guidelines for sodium (salt) of 20 parts per million (ppm). Some of these high readings could be explained by proximity of the wells to tidal water, while others may be threatened by proximity to road salt. The town's salt storage shed at the Highway Department barn was enclosed in 1984 to prevent salt leaching off the stockpile.

Route 6 is heavily salted by the state Department of Public Works during snowstorms to prevent accidents, although a reduced-salting experiment by MDPW in Eastham in 1986 may lead to a change in this policy. Sodium is a major ground water problem because, unlike most other contaminants, such as metals and bacteria which can be removed through soil filtration or

soil adsorption, salts readily dissolve into ground water and can only be diluted, not removed.

In general, it is a better practice to shunt salt-laden runoff into tidal waters to reduce the risk of contaminating fresh water streams, ponds or ground water. However, road salt also contains significant additives, such as sodium ferrocyanide, which can release toxic cyanide into any receiving water.[73]

Nitrates, a potential carcinogen, are present in ground water near the Pamet, but do not seem elevated relative to other parts of the town or Cape Cod. Of 60 private wells tested for nitrates from 1980-84 only two homes registered nitrate concentrations greater than five ppm (5 ppm is the recommended county planning guideline; state health limit is 10 ppm). A 7.8 ppm reading was recorded on Higgins Hollow Road near a neighbor's suspected septic system problem. A 5.95 ppm reading was recorded on Depot Road near a small livestock pasture. The remaining nitrate levels are described in Table 7.

TABLE 7. Pamet Area Ground Water Nitrate Levels (1980-84)[74]

Wells	Nitrates (parts per million)
47	less than 1
7	1.0 - 1.9
4	2.0 - 4.9
2	5.0 -10.0
0	over 10
Total 60	----

A complete analysis of ground water quality is contained in IEP,Inc.'s "Water Resources Protection Plan for the Town of Truro," December 1985.

GROUND WATER QUALITY RECOMMENDATIONS:

1) To prevent sodium contamination of drinking water, road salting of town and state roads by their respective maintenance personnel should be reduced to a level commensurate with motorist safety, not motorist convenience. A 4:1 mix of sand to salt and a reduction in the application to no more than 150 pounds per lane-mile is recommended.

2) The Board of Health should investigate possible causes of elevated sodium and nitrates in private wells. Homeowners should be encouraged to take corrective action once sources of contamination have been confirmed. A coordinated testing program of home wells should be arranged with the Barnstable County Health Department.

3) Land use recommendations cited elsewhere in this report should be examined to protect existing private water supplies.

II.B.3.g Eutrophication

Eutrophication refers to the natural process which causes a buildup of vegetation in a water body. Chemical factors, such as an increase in nutrients, and physical factors, such as decreased water flow, are chief causes of eutrophication. While it is a natural process, eutrophication can be artificially accelerated by man-made alterations and a flowing river can be rapidly transformed into a stagnant swamp. The stream bed and banks become choked with excessive vegetation. Oxygen levels decline due to decomposition of organic matter so that fish and other wildlife may be killed.

The transformation of portions of Pamet River into shrub

swamps has resulted from artificial eutrophication. The diking of many river segments not only changed salt marshes to freshwater wetlands, but also caused reductions in stream flow. Sediment and nutrients are no longer flushed from these river stretches, such as Little Pamet, upper Pamet and Mill Pond.

Presently, Pondweed (Potemegia) and Water lilies clog much of the channel of the freshwater Pamet and dense stands of Sweet gale, Highbush blueberry and other swamp bushes crowd the river, making even canoe passage difficult. Ditching the freshwater Pamet for mosquito control has tended to dry the wetland. Encroachment of upland trees and shrubs, the last stage of eutrophication as drier soil conditions begin to persist in the swamp, has already been noted in the upper Pamet.[75]

The National Park Service is presently conducting a study to determine the extent and possible causes of eutrophication in the upper Pamet.[76] It is hoped that any man-made nutrient sources will also be identified.

EUTROPHICATION RECOMMENDATIONS:

1) The conclusions drawn by the eutrophication study of the upper Pamet and similar work being conducted in Wellfleet's Herring River should be assessed by the town Conservation Commission and the National Park Service to determine if the eutrophication process is man-made and therefore can be slowed or reversed. Reducing existing nutrient inputs, such as sewage, fertilizers and detergents, should be considered.

2) A cost-benefit analysis made on the removal of dikes and other obstacles to tidal penetration (see chapter on "Ditching and Diking") should include the ameliorating effect such a move

might have on eutrophication. Water flow should be enhanced by conversion to a tidal environment.

II.B.3.h Truro Sanitary Landfill

The sole municipal landfill for the town of Truro is situated on Route 6 about 3500 feet south of the Pamet River. The landfill includes a small unfenced septage lagoon which is used by local septage haulers. Both facilities are located within the Pamet River recharge area and any leachate (the plume of contaminants associated with these wastes) might migrate with local ground water flow direction and discharge into the river near the Route 6 crossing.

At Truro Town Meeting in April 1986, $25,000 was appropriated for a geohydrological monitoring study of the landfill. It is hoped that this study, when completed, will determine the environmental impact of the landfill on ground water quality in the vicinty.

LANDFILL RECOMMENDATIONS:

1) The National Park Service should be encouraged to cooperate in the proposed town study of the landfill so that the most efficient, environmentally-sound landfill can be operated.

2) The town should continue to support transfer of solid waste to a waste-to-energy plant planned for Rochester, Massachusetts, as a means of reducing the landfill's potential for polluting local natural resources.

3) The town's septage lagoons should be fenced or otherwise secured to prevent unauthorized entry and health problems.

4) The septage lagoons should be upgraded to accommodate an increased volume of septic system pumping, as recommended elsewhere in this plan to protect Pamet water quality.

II.B.3.i Agriculture

The last sizable working farm on Lower Cape Cod is situated in the Pamet area. Perry's Farm on Little Pamet River is all that remains of the once-thriving agricultural economy upon which Truro was founded. Located at the base of historic Corn Hill, Perry's Farm raises corn and other produce on about ten acres of the 70-acre farm. A small dairy herd and 1500 chickens are also maintained by the family-run operation.

About half of the farm's acreage consists of Little Pamet freshwater marsh. Cattle are grazed on lowland at the edge of the marsh. Until drainage was improved after the 1978 Blizzard, this lowland experienced periodic flooding.[77] The Massachusetts Division of Water Pollution Control identified the farm as a potential source of pollution in the Pamet in a 1976 report.[78] (One cow will produce an average of 351 pounds of nutrients, i.e., nitrogen, phosphorus, potassium, each year.)[79] Other small numbers of livestock, including sheep, cows, and horses are kept at homes on South Pamet and Hatch Roads. Domesticated ducks and geese are kept at Wilders Dike.

Each of these areas could be considered as sources of contaminants, particularly bacteria and nutrients, if animal waste is not managed correctly. It is difficult, however, to gauge the relative severity of these contaminant inputs. One home on Depot Road near a livestock area is experiencing

elevated nitrates in its well water, though the correlation is only suspected, not proved.

What is known is that retention of existing agriculture is crucial to the heritage of Truro. Farms in Truro are a link with its past, a source of visual enjoyment for its present and a continuing source of food for its future. Perry's Farm may be partly responsible for the scenic beauty that led to the Pamet's Scenic River classification. Part of Perry's Farm has already been sold for residential housing.

AGRICULTURE RECOMMENDATIONS:

1) The Town of Truro should acknowledge the beneficial role played by agriculture in preserving the rural character of the town. Innovative zoning and tax assessing practices, such as M.G.L. c. 61A, Farmland Assessment Act, should be instituted to encourage the continued existence of farms in Truro.

2) The operators of existing or potential farms should investigate the benefits of the Agricultural Preservation Restriction Act (Chapter 780 of 1977) of the Massachusetts General Laws. The Truro Conservation Trust could provide technical assistance to operators interested in the program.

3) Farm operators and other livestock managers should be encouraged to develop proper waste management procedures which will reduce potential water quality risks associated with runoff and leachate. Assistance could be sought from the U.S. Soil Conservation Service in West Barnstable.

II.B.3.j Erosion and Sedimentation

There is now little direct erosion along the river itself.

Streambanks are generally composed of salt marsh peat, which is relatively resistant to erosion and consequent sedimentation of the river. Occasional slumping of salt marsh banks is a natural process due to tidal currents, but it can be accelerated by man-made factors, such as boat wakes. Fresh water portions of Pamet streambanks are generally lined with Cattails, Sweet gale and other soil-anchoring vegetation, and low-flow conditions also prevent erosion.

Major erosion problems in the study area occur at the harbor, particularly on Gull Island, (see "Pamet Harbor" section of this plan) and along the bluff of the Great Beach in the Ballston area at the head of the river. Stabilization of the Ballston Beach dune has been encouraged by planting vegetation and by limiting automotive and foot traffic. Other eroded areas include individual hillsides bereft of groundcover (especially Bearberry) along South Pamet, Depot, and Mill Pond Roads. These areas have been revegetating naturally, however, and seem to be under control.

Sedimentation, in the form of shoaling, is a major problem in the harbor and between the jetties at the river mouth. Pronounced flood and ebb tidal deltas have formed at the jetties. (See "Pamet Harbor".) Lack of sediment transport in the freshwater segments of the Pamet system is a problem due to the absence of any appreciable currents. Stagnant water currents prevent soil, leaves and other debris from exiting the stream naturally.

EROSION AND SEDIMENTATION RECOMMENDATIONS:

1) Motorboats should be forced to obey a "six mile per hour, no wake" speed limit throughout the tidal portion of the river to prevent disturbance of the streambanks and to promote safety. If necessary, a few signs should be erected at the harbor to that effect.

2) Measures to reduce man-made sedimentation in the freshwater Pamet by increasing water flow should be explored through further studies of such options as re-introducing tidal exchange, narrowing stream channels, or redesigning the culverts, particularly under Route 6. The studies should include the chemical and biological effects of these physical changes.

3) Drywells for roof runoff on new homes in the Pamet area should be required by the Conservation Commission or Building Inspector on any hilly or steeply-graded lots. The desirability of drywells on existing structures should be assessed by the Building Inspector before issuing permits for any alterations or renovations.

4) Unvegetated hillsides near the river with the potential for serious erosion should be stabilized by plantings of indigenous species. Assistance from the U.S. Soil Conservation Service could be sought. In no case should branches, tires or other debris be used to try to stabilize bare slopes.

5) The use of bulkheads or seawalls to maintain slopes should be discouraged when they interrupt valuable wetland transition zones and act as visual intrusions. The bulkhead at the Truro Center Post Office, however, should be repaired due to

proximity of the structure to the stream.

6) The Planning Board should modify its Subdivision Regulations to include a 50-foot construction setback from wetlands, including coastal banks, for dwellings and other permanent structures in order to control erosion.

7) Other recommendations are contained in the "Pamet Harbor" section.

II.B.3.k Acidification

The impacts of acid rain can be magnified on Cape Cod due to a naturally occuring acidic soil and absence of sources of alkalinity, such as limestone, to act as a buffer. Current water quality monitoring of the Pamet River system cannot reveal any major decline in pH (increase in acidity) due to lack of historical data. The average pH values range from 6.0 to 7.2 for the freshwater main stem of the Pamet depending on the season,[80] but this range is less threatening to aquatic life than the under-5.0 pH values found in many ponds on Cape Cod.

At the same time, however, acid monitoring should be continued in the Pamet for several reasons. First, the state has introduced trout in the Pamet. Although not a native species to the Pamet, these acid-sensitive trout are a recreational resource that merits attention. Second, the ability of acidic waters to mobilize (dissolve) heavy metals (toxic contaminants) into the river should be recognized.

ACIDIFICATION RECOMMENDATIONS:

1) The Town of Truro and the National Park Service should be encouraged to support continued monitoring of acid levels in the

Pamet to uncover any trends in increasing acidity with reference to existing baseline information. Both should also encourage further studies of possible corrective measures in other water bodies, such as the current experimental liming of Great Pond in South Truro by the Massachusetts Division of Fisheries and Wildlife and the Massachusetts Audubon Society.

II.B.3.1 Boats

Boats are not suspected as a major source of bacterial contamination in Pamet Harbor. Most boats are small, recreational craft for day use only. Owing to the small size and limited depth of the Harbor, transient boats are a rare sight and there are no live aboard vessels. A portable rest station is installed each summer by the boat ramp for use by boaters. A permanent sewage pump-out facility for boats at the Harbor is not recommended at this time because of cost ineffectiveness and disposal problems.

Boats may contribute other contaminants to the Harbor, such as petroleum resulting from improper combustion and toxic compounds, including metals and TBT, or tributylin, leaching from boat bottom anti-fouling paint. However, the seasonal use, small number of boats and lack of fueling facilities in the Harbor reduce the potential magnitude of this pollution problem. Should an expanded marina be proposed for Pamet Harbor, these sources of contamination associated with boats should be re-examined.

II.B.4 DITCHING AND DIKING: Control Structures in the Pamet

The major human impact on the Pamet River has been the extensive alteration of the system by physical means: diking, clearing, ditching and filling. Although these processes have been substantially halted (except for mosquito control) in the last twenty years due to wetlands protection laws and increased environmental sensitivity in general, the long-term effects of previous alterations are profound and are still being felt. Most of the other management issues discussed in this report, including water quality, recreation, wildlife and historical importance, are directly influenced by these physical changes.

II.B.4.a Drainage Ditches

When the first ditches were dug and dikes built in the Pamet is unknown. As elsewhere on the Cape, perhaps the first ditches were laid to delimit boundaries as the salt marsh became privately owned. Other ditches were undoubtedly dug for boat transportation; that is, for skiff landings at the edge of the marsh. (See, for example, Snows Landing at Meetinghouse Road.) Some wetlands may have been dredged to create small open water lagoons for commercial production of water lilies for shipment to Boston.[81] Open water at the head of Bangs Creek may have resulted from the removal of Sphagnum or peat moss for agricultural use or trade.[82] Dredging also became the primary means of harbor improvement in this century. (See "Pamet Harbor".)

The major reason for ditching, however, was to improve drainage in the system. Truro town meeting reportedly voted

annually to authorize stream clearing in the upper Pamet to control silting and vegetation.[83] Flood protection, by draining excess stormwater runoff, was another motivation.

II.B.4.b Cape Cod Mosquito Control Project

Drainage was also the aim of the Cape Cod Mosquito Control Project, which was established in 1930 to reduce salt marsh mosquito (Aedes sollicitans) populations and other insects that terrorized residents and threatened the Cape's tourist industry. To drain the impoundments created behind dikes and other areas where mosquitos breed, the Project installed a ditching network that now totals 1,000 miles on Cape Cod, including the Pamet.[84]

Up until the mid-1960s, Mosquito Control took a ditching tractor down the main stem of the upper Pamet, though the overgrown character of the streambanks today precludes this maintenance. Maintenance is now limited to hand-spraying major mosquito breeding spots with BTI, a biological agent, and "Arosurf", a larvaecide oil, and keeping ditches clear of brush and debris.

II.B.4.c Dikes

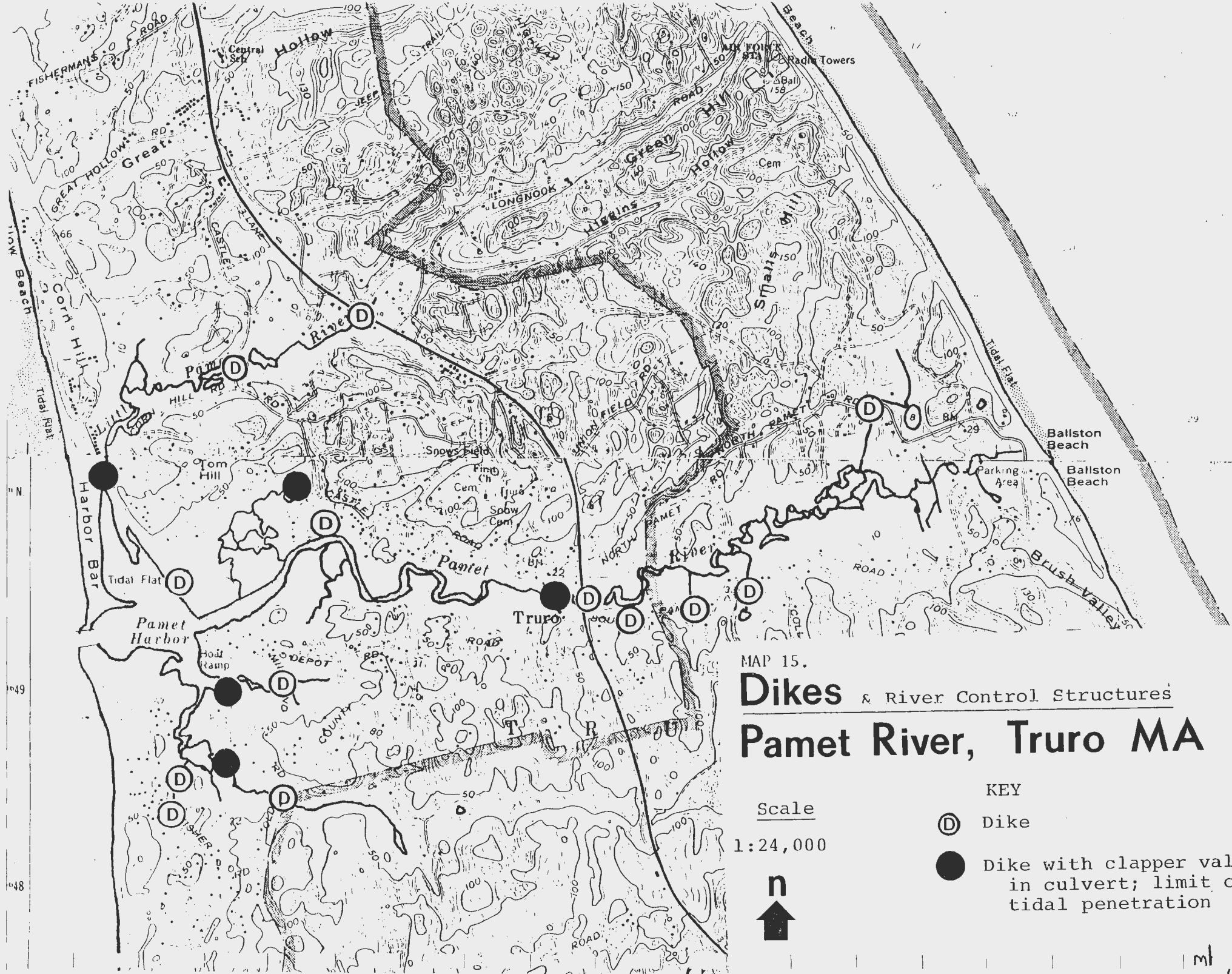
Mosquito Control did not construct any dikes in the Pamet; the agency simply took over responsibility for draining wetlands behind the many dikes that had previously been constructed in the system for other purposes. Dikes had been built to carry roadbeds (including the railroad in 1870 and Wilders Dike in 1869) across the river. Wooden bridges required more maintenance than solid fill dikes.

Dikes were also built to convert wetlands to agricultural

use, such as the Mill Pond and Head O'Pamet cranberry bogs. One dike at Cat Island is known to help prevent saltwater intrusion in nearby domestic wells.[85] In most cases, culverts placed under the dikes allowed only one-way drainage.

Figure 4. Wilders Dike, Truro, looking north. (From Agnes Edwards, Cape Cod New and Old, Boston, 1918, p. 141.)

A tide gate or clapper valve prevented tidal penetration upstream of the control structure. Giese and Mello (1985) estimate that 50-60% of the Pamet's historical salt marsh has been converted to freshwater wetlands, including all of the Little Pamet, due to these obstructions. (See Map 15.) A 1924 report by the U.S. Department of Agriculture claims that Wellfleet's Herring River and the Pamet were the largest areas of diked or "reclaimed" tidal marsh in southeastern Massachusetts.[86]



MAP 15.

Dikes & River Control Structures

Pamet River, Truro MA

II.B.4.d Effects of Alterations

More important than the reasons for the Pamet's ditching and diking are the consequences of this manipulation. The intended benefits of the dikes either never materialized or are obsolete. The railroad is gone. Commercial agriculture is no longer viable, and the cranberry bogs are abandoned. Dikes carrying roads have made townwide transportation more convenient, but bridges or larger culverts could accomplish the same purpose. Mosquito Control officials report that dike-hampered drainage now hinders their work.[87]

The only benefit remaining from the dikes is one not contemplated during their construction: the artificial creation of habitat diversity in the Pamet by enlarging freshwater marsh and swamp environments. Because this conversion, however, produced a corresponding decrease in marine habitats and, actually, a loss in overall wetlands as upland vegetation invades the margins, this change is not benign. Indeed, the water quality of the freshwater wetlands created by ditching and diking is also suspect.

The environmental harm caused by diking and ditching is not obsolete. It persists and worsens with each year. To summarize their effects as noted throughout this report and in others:

- Water Quality - less stream flow, more sedimentation, less oxygen, less pollutant export (reduced flushing), more sensitivity to acidity, more mobilization of toxic metals and sulfides in sediment;

- Harbor Management - smaller tidal prism, lower current velocities, more shoaling, less pollutant transport;

- Wildlife - reduction of shellfish habitat, effects of deteriorating water quality on fish, obstructions to fish passage, eutrophication;

- Vegetation - loss of wetlands due to upland tree and shrub encroachment on drying soil, eutrophication reducing diversity of plant species, loss of salt marsh, nature's most productive habitat;

- Recreation - limited opportunity for boating, less visual enjoyment of river due to obstructions and overgrown vegetation, more pollution for swimming and shellfishing;

- History - impoundments mean less integrity for Pamet as a complete system;

- Mosquito Control - more maintenance required in freshwater systems.

II.B.4.e Restoration of Natural Flow

These factors and others have not gone unnoticed by Truro citizens concerned that dikes and ditches have impaired the special qualities of the Pamet. There is widespread support for the general concept of reintroducing tidal flow to certain sections of the river system, particularly the main stem, by removing dikes, replacing them with bridges, enlarging culverts or at least removing tide gates. Most people recognize that there are possibly adverse ramifications which could be associated with "opening the dikes", such as the prospect of increased flooding, saltwater intrusion of wells, and destruction of vegetation, but they feel the concept is worth pursuing in order to restore the Pamet's environmental integrity with increased tidal flow. (See Appendix B.)

A poll commissioned by the Pamet River Greenway Committee in 1985 found that only 13% of the respondents (63 opponents out of a sample size of 523 Truro taxpayers) "would not support dike-opening under any circumstances."[88] The National Park Service, whose jurisdiction over the upper Pamet would be significantly affected by tidal flow, has not stated publicly

whether it would support or oppose such a re-opening, because it believes that further studies are necessary. In general, however, the NPS is committed to preserving naturally functioning ecosystems within its domain. By its continued support of studies examining the impact of a re-opening, the NPS has demonstrated a willingness to consider the option.[89]

One such study would predict the extent of tidal penetration into the upper Pamet based on hydrological modelling.[90] In order to assess the wide range of changes that might occur if tidal flow were permitted, researchers must first determine the volume of water involved and what land areas would be affected. (See Appendix D.)

Would salt marsh recolonize all the way to Head O'Pamet if the tide was allowed to flow naturally up the river? It seems unlikely, although salt marsh was once extensive in much of this area. The following historical accounts --albeit anecdotal-- confirm this extent:

- 1794: "As it [Pamet] extends inland it divides into three branches, on which are bodies of salt marsh, called Great, Hopkins [Little Pamet] and Eagles Neck [creeks]..." [91]

- 1801: "There is on it [Little Pamet] a body of salt marsh. The depth, when the tide is in, is five feet," and, "Pamet River, extending almost entirely across the township, being separated from the ocean only by a narrow beach. On its banks is a body of salt marsh." [92]

- 1802: "There [Pamet Valley] is a wide opening and leads immediately over a beach [Ballston] to a salt marsh at the head of the Pamet River...the Pamet river running from east to west through a body of salt marsh." [93]

- 1890: "The eastern shore of town [Truro] is fringed with salt marsh, and these extend far up on the sides of the

rivers and coves that exist on that coast of the town."[94]

But by this century, the changes were already being observed:

- 1909: "The tide waters [once] flowed in and out of the Longnook meadows and in every nook, corner and cove of the Pamet meadows,..."[95]

- 1914: "Gaze westward [from Ballston Beach]...How refreshing its [Pamet's] banks, green with a green which only Truro cattail and marsh vegetation can create."[96]

II.B.4.f Ditching and Diking Recommendations:

1) The town, National Park Service and the Truro Conservation Trust should be encouraged to conduct studies on the effects of re-introducing tidal flow to certain segments of the Pamet. The relevant recommendations included in the 1985 Center for Coastal Studies report should be followed with priority given to detailed modelling to predict the volume and areal extent of tidal penetration. The river segments which should receive priority for studying the effects of re-opening dikes are the main stem east of Wilders Dike and Route 6, Mill Creek/Mill Pond, and Eagles Neck Creek/Bangs Creek. The Cape Cod Mosquito Control Project, state Fish and Wildlife officials and other groups should participate in these studies to ensure their concerns are met. (In 1986 the Woods Hole Oceanographic Institution received funding from the Truro Conservation Trust and the Sea Grant Program to conduct a hydraulic modelling study of the Pamet as the first step to predict physical changes that might occur if certain dikes were removed.)

2) Information gathered from similar tidal flow studies by

the National Park Service concerning the Herring River in Wellfleet should be consulted for comparison purposes and general effects.

3) The Cape Cod Mosquito Control Project should be urged not ~~not~~ to construct new drainage ditches in the Pamet area in order to minimize impacts on wetland soils. Mosquito Control should be asked formally to support a re-introduction of tidal flow if it believes that such a reversion would aid the agency's mission. The town Conservation Commission, Mosquito Control and the National Park Service should be asked to meet to develop an integrated pest management plan for the Pamet, which considers wetlands ecology, water quality, and mosquito control.

4) In the event that the Massachusetts Department of Public Works begins design work to widen Route 6 and its embankments through Pamet Valley, the town of Truro should insist that a full Environmental Impact Report be prepared on the project. Such a report should examine, among other concerns, the possibility of constructing a bridge or, at a minimum, a larger culvert, with or without a tide gate, in place of the existing four-foot wide culvert under Route 6. Based on the Pamet's classification as a state Scenic River, the Executive Office of Environmental Affairs should be asked to intercede on behalf of the town to require that the state DPW compile such an impact study under the Massachusetts Environmental Policy Act.

II.B.5 PAMET HARBOR

> Here (on the Outer Cape) the land is in greater flux than the water, and at Truro the harbour has been practically swallowed up by sand, in spite of great sums to keep it open.
>
> -- Hildegarde Hawthorne, Old Seaport Towns of New England, 1916.

The story of Pamet Harbor has been recounted in the "History" section of this plan. In the early 1800s, the harbor was the foundation of a vibrant maritime economy in Truro. Today the harbor is an important recreational asset to the town, though its value for even that use is diminishing due to boating problems, shellfish concerns and erosion of beach areas.

II.B.5.a Description of the Harbor

The harbor may be described as that area of the Pamet River system west of the railroad dike. It now includes the boat ramp and parking lot at Depot Road, the mooring basin, channel, inlet jetties, town beaches, major shellfish beds and the Pamet Harbor Yacht Club. In this confined area, uses as varied as boating, swimming, fishing, off-road vehicle travel, shellfishing, housing and tern nesting compete for space.

With such demand, conflicts inevitably arise. Coordinated management, however, can accommodate most of these uses. In this section, options to improve navigation and control shoaling and erosion will be discussed, while other uses are explored in the "Recreation" section of this plan.

II.B.5.b Boating Use

Presently, public boating facilities include a 15-foot wide, single-lane concrete boat launching ramp at the foot of Depot Road. The ramp, built by the state in 1958, is operated by the

town, which collects fees from users. Town maintenance includes using a tractor to clear sand buildup from the ramp periodically. The ramp is heavily used during the summer and allows launching at almost all tides. The Pamet Harbor Committee, an advisory board of local boaters, proposes to double the width and resurface the ramp in 1987 using state funds.

A triangular-shaped parking lot with 125 spaces serves the ramp and mooring basin. This lot is bordered with stone riprap, but strong wave attack during northwest winds causes continual deterioration of this structure. No fee or sticker is currently charged for parking. The size of this parking area presently seems sufficient to meet existing summer demand. Drainage from the parking lot discharges directly into the waters of the harbor over the boat ramp and stone riprap. Stormwater runoff has been identified as a major source of bacterial contamination and hydrocarbons in shellfish.

The mooring basin lies perpendicular to the boat ramp. Last dredged in 1968 to a size of 400'x200' and a depth of 4 feet at low water, this anchorage has shoaled in recent years. Owing to a lack of space, an innovative system of anchored floats that moor two boats each has been instituted. This system reduces the area needed for traditional swing moorings, accommodating more boats. This float system seems particularly well-suited to the small boats of the Pamet.

Demand for mooring space increases yearly. (See Table 8.) In 1976, 86 boats were moored in the basin, while 115 were

anchored in 1984.[97] Between 30% - 40% of these moorings are used by year-round residents.

Table 8. Pamet Harbor Boat Use and Income (1978 - 1984).

BOATS \ YEAR	1978	1979	1980	1981	1982	1983	1984
Daily Ramp	822	819	678	706	545	443	466
Weekly Ramp	10	6	41	41	31	37	30
Seasonal Ramp	24	23	39	40	40	82	69
Seasonal Mooring	90	90	102	109	109	93	115
Temporary Mooring	0	4	1	1	1	1	5
Total Boats	946	942	861	907	726	656	685
Total Income	$ 4,567	4,566	6,019	6,288	7,970	8,055	8,375
Mooring Fee	$ 25	25	25	25	30	30	30
Weekly Ramp Fee	$ 10	10	10	10	15	15	15
Daily Ramp Fee	$ 2	2	3	3	5	5	5

Source: Harbormaster's Report, Truro Annual Reports, 1978-84.

Further expansion of the boat basin by dredging seems unlikely. Salt marsh, protected against dredging by M.G.L. c.130, s.105, surrounds the basin to the south and west. Major shellfish beds and the main channel exist north of the basin, while private residences are located east of the basin. The only place additional mooring space could be dug would be the existing de facto, but unauthorized, public beach fronting the parking lot. An extensive and costly bulkhead and floating dock/slip system would be required to maintain boats in this area.

The surge of private dock construction and dredging that presently affects other Cape Cod harbors has not yet been felt in the Pamet. The Pamet Harbor Yacht Club maintains a small boat dock for seasonal use. A few boats are moored at Snows Landing, Dickerson's and Great Hills, but most other shoreowners prefer to beach their small boats when not in use.

II.B.5.c Dredging and Maintenance

"To dredge or not to dredge" has been the primary question in Pamet Harbor management throughout this century. Some of the arguments, pro and con, can be summarized as follows:

"Periodic maintenance dredging of the Pamet entrance channel should be considered a regular operating cost of the town, just as roads are repaired when required."

"Dredging is a waste of money because the inlet will immediately shoal again."

"The harbor has great economic potential for the town if boating could be increased by dredging. Commercial fishing might also be attracted, providing sorely needed jobs for our young people."

"The harbor is too small and environmentally sensitive to accommodate increased boating or commercial use. Increases in vehicle traffic on Depot Road approaching the harbor would be intolerable."

"Dredging the harbor would benefit not only boaters. It could be used to control erosion on Gull Island and provide better water circulation for shellfish."

"The last time the harbor was dredged, shellfish stocks declined and swimming waters were muddied."

Each one of these arguments is valid. But what action is in the best interests of the Pamet and Truro as a whole? Does dredging benefit only a few hundred boaters or would it enhance a recreational amenity that attracts tourists and summer residents who are still the staple of Truro's economy? Would dredging kill shellfish or improve their habitat? A recent historical context is given in Table 9.

Table 9. Pamet Harbor Improvements in the Twentieth Century.

YEAR	ACTIVITY	CONSEQUENCES
1919	Beach cut 225' wide and 13' deep. Stone jetties installed (140' long north jetty and 300' long south jetty). Peat dike built making two separate inlets with mouths	Decreased tidal prism, shoaling at both inlets

	at Corn Hill and present location.	
1920	Peat dike supplemented by boulders.	
1920-1950	Closure of Corn Hill mouth by shoaling. Breakdown of dike separating boat basin from river due to erosion and vandalism.	Jettied channel becomes deeper due to increased flow through one mouth
1951	Channel widened to 300'; north jetty extended to 300' long.	Shoaling in channel due to widening. Greater accretion on south jetty, greater erosion on north jetty
1958	Boat ramp built.	Increased use by small recreational craft
1965-1966	Channel dredged 60' wide and 4' deep. Mooring basin 400' x 150' dug.	Shoaling of channel continues despite dredging. Accretion and erosion continues. Shellfish stocks dwindle.
1966-1968	Channel between jetties shoals from 5-6' deep to 1-2' deep.	
1968	Channel dredged 60' wide and and 4-6' deep. Mooring basin enlarged to 600' x 200'. Dredge spoil placed on Gull Island.	Shoaling, accretion and erosion continue. Shellfish decline.
1969	Railroad trestle removed and stone riprap built around edge of parking lot.	Reduced scouring of this area due to decreased water velocity.
1973-1980	Various town proposals to dredge 6,000 or 7,000 or 20,000 cubic yards from channel and Fisher Beach never succeeded. (Costs ranged from $50,000 to $150,000).	Continued shoaling and erosion. North jetty is detached from dune at high tide due to erosion.

Sediment transport sudies (Giese, 1980; Fitzgerald and Levin, 1981) have identified several phenomena affecting the harbor:

1) Net longshore transport of sand is from south to north along Cape Cod Bay in the Pamet area. The ability of the south jetty to trap sand is now exhausted by accretion (buildup of sand.) Spillover of sand past the south jetty clogs the entrance channel and wave action combined with flood currents

have driven bars into the inlet.

2) The jetty width is large relative to the tidal prism (volume of water) in the Pamet, resulting in reduced velocity of tidal flow at that location and, thus, further shoaling.

3) The tidal prism has been reduced due to construction of dikes and other flow control structures throughout the river. Less volume means less tidal velocity overall in the system.

4) Erosion of Gull Island, particularly at the breach near the north jetty, will continue due to the interruption of sand transport by the presence of the south jetty and natural migration of the river mouth to the north. (See Figure 5.)

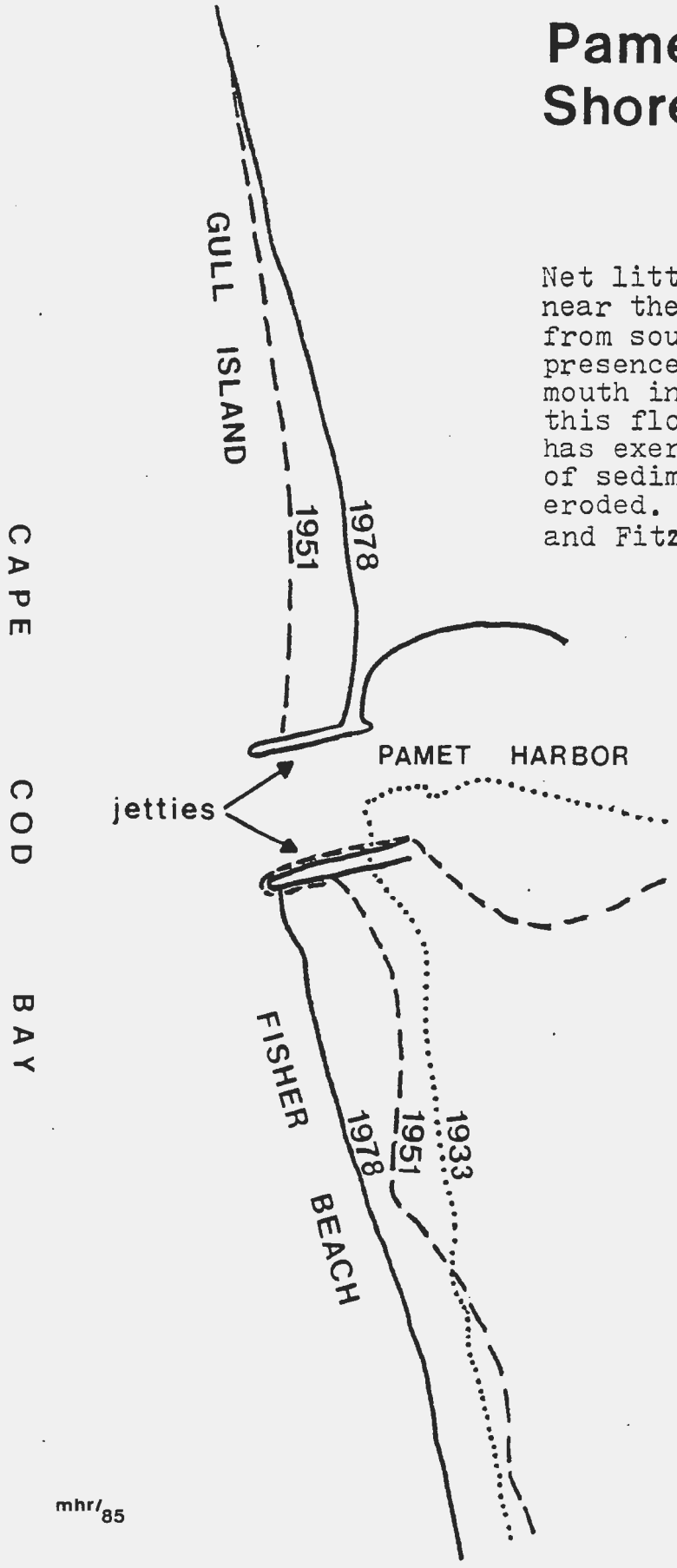
Considering these physical forces and the results of previous dredging attempts in the Pamet, it seems apparent that any benefits derived from maintenance dredging will be short-lived. This conclusion does not mean that dredging is not in the best interests of the town. Rather, it argues that dredging must be viewed as only one element--an important one--of long-term navigation management that considers issues of erosion, shoaling, tidal prism and jetty engineering. Channel dredging may be a practical solution for the immediate needs of the harbor while more comprehensive solutions are devised for other more persistent problems.

Although it has often been used as an informal "hurricane hole" by boats from Provincetown, Pamet Harbor is not a federal Harbor of Refuge,[98] so it is not eligible for federal maintenance of the channel. Still, the Pamet represents the only anchorage between Wellfleet and Provincetown and has

FIGURE 5.

Pamet Harbor – TRURO, MA
Shoreline Changes

Net littoral drift of beach sediment near the mouth of Pamet River is from south to north. Due to the presence of stone jetties at the mouth in this century, interrupting this flow of sand, Fisher Beach has exerienced accretion (build-up) of sediment, while Gull Island has eroded. (See, also, Giese, 1980 and Fitzgerald/Levin, 1981.)



SOURCE: Massachusetts Coastal Zone Management Office, "Massachusetts Shoreline Change Project," 1985. (Map 0013)

provided safety for small boats caught in Cape Cod Bay squalls. It is--and can continue to be--an appropriate small-boat harbor. While a few part-time commercial lobster boats presently moor in the harbor, development into a large commercial fishing port does not seem warranted based on poor site potential, changing hydrographic features, lack of adequate road access, and the current uncertain future of the Cape fishing industry itself, such as insurance, financing problems and stock depletion.

A poll commissioned by the Pamet River Greenway Committee in 1985 surveyed Truro taxpayer attitudes towards harbor improvements. (See Appendix B.) A majority of all respondents favored dredging as a means to improve navigation and higher boat fees to help fund it. More significantly, taxpayers who are also town meeting voters support boating improvements by an even greater margin, indicating that voters would appropriate funds to maintain the harbor, presumably as a share of state funding for such work. In addition, a town meeting vote in 1985 resolved that town officials should improve the harbor.

The environmental concerns of dredging are real and must be addressed before any work is done. State shellfish officials cite Pamet dredging in 1966 and 1968 as a major cause of resultant shellfish depletion due to silting, habitat destruction and increased loss of larvae by tidal flushing.[99]

It must be acknowledged, though, that dredging in the mid-1960s was not subject to today's strict environmental review, work protocols and shellfish transplanting requirements. Stabilization of dredge spoil by plantings of vegetation has also advanced since that time. It is anticipated that the

channel's clean sand would be compatible with disposal on eroded areas of nearby Gull Island as a beach nourishment project. Silts and muck, however, are expected to be found in the boat basin and may present a more difficult disposal problem.

The goal for Pamet Harbor should be to maintain, not expand, its present use as a small-boat harbor, primarily used for recreation, but with some part-time commercial fishing boats. The town should acknowledge that periodic dredging is a necessary maintenance cost to protect that recreational resource. At the same time, boaters must realize that Truro's financial budget is currently too small to support development of a major marina in the Pamet. Boaters must also recognize that any harbor with a nine-foot tide ranging over a sandy bottom is always likely to experience some navigation problems. It must also be recognized that Depot Road, the main approach road to the harbor, is narrow and winding and long and inappropriate to handle significant increases in boat trailer traffic.

II.B.5.d <u>Pamet Harbor Recommendations:</u>

1) A dredging/beach nourishment program should be conducted on an experimental basis to determine the feasibility and advisability of establishing a regular dredging program in the Harbor. Priority should be given to maintaining the channel from the boat ramp to outside of the jetties and transfering sand from the Fisher Beach jetty to the eroded foreshore of Gull Island, as recommended in the Center for Coastal Studies' 1980 "Shoaling and Erosion Study of Pamet Harbor." If funds are

limited, the boat basin should receive lower priority for dredging based on environmental concerns of sediment disturbance and disposal. A maintained channel of four feet deep at low water should be considered consistent with the goal of the Pamet serving as a small-boat harbor. The best available measures to protect shellfish should be incorporated in any dredging proposal.

2) The Board of Selectmen should request an amended order under M.G.L. c. 130, s. 105 (Wetlands Restriction Program) from the Commissioner of Wetlands and Waterways in the Department of Environmental Quality Engineering. The amendment would allow maintenance dredging in the previously-licensed channel. No dredging is allowed under any conditions under the present order. (In 1986 the Selectmen made this request.)

3) Expansion of the existing dredged boat basin/mooring area beyond its previous licensed limits should not be permitted. Innovative mooring practices, such as the present mooring float system, should be considered as an alternative if more anchorage supply is needed. Mooring of boats north of the channel should be discouraged due to effects of grounding on the shellfish beds. In no case should existing salt marsh be disturbed to accommodate moorings.

4) No dredging should be permitted east of the railroad dike or south of the Yacht Club for any reason except existing maintenance of mosquito control ditches. There are no public launching facilities in these areas that need dredging for navigation. Private dredging should be prohibited based on marsh disturbance, shellfish concerns and traditional lack of

access to a deep water channel in these areas. All boating outside of the maintained channel should be viewed as tidal-dependent and reflected in town policy and decision-making.

5) If dredging is propsed the town should work with neighboring towns and the Commonwealth to establish a regional, coordinated dredging program in order to promote cost savings for each project.

6) The Pamet Harbor Committee should be expanded to include representatives of shellfish and beach interests and neighboring property owners to address their concerns in establishing a long-term harbor management plan. The Harbor Committee should also recognize the importance of events upriver (silting, pollution, traffic, dikes) and the impacts these can have on harbor management.

7) If channel maintenance proceeds, mooring fees should be increased to at least $50/year to help offset town expenditures.

8) A considerable percentage of local harbor fees should be reserved annually by town meeting for a dredging account. This account will reduce the amount needed to be appropriated when dredging occurs and will show town commitment to a harbor maintenance program.

9) The Conservation Commission and Harbormaster should cooperate in identifying private docks, floats, walkways and other structures in or near the river that are suspected of not being licensed under state waterways and wetlands regulations. Compliance should be sought or removal ordered of these

unpermitted public nuisances.

10) The boat ramp at the harbor should be upgraded and widened to alleviate traffic problems at the parking lot. The parking lot should incorporate leaching catch basins to prevent the present practice of stormwater runoff discharging directly into the Harbor.

II.B.6 SHELLFISH MANAGEMENT

In November 1986 the Massachusetts Department of Environmental Quality Engineering (DEQE) for the first time temporarily closed (under authority from M.G.L. c.130, s.74A) the Pamet River to the harvesting of shellfish because of bacterial contamination. DEQE acted based on water quality tests that revealed high coliform counts throughout tidal portions of the Pamet. (See Table 10.) DEQE re-opened the Pamet in January 1987 when bacteria levels subsided. This closure had followed one initated by the town Board of Health in December 1985 that lasted until February 1986. Town action eliminating sources of pollution will determine whether shellfishing--a traditional activity in Truro--can remain open or will continue to experience closures due to contamination.

II.B.6.a Historical Resource

In 1794 the Pamet was considered good shellfish grounds. "The shores and marshes afford large and small clams, quahaugs, razor shells, periwinkles, muscles and cockles," wrote one visitor.[100] High dietary status was not reserved for shellfish at that time as it is today. Fodder, fertilizer and bait were the primary uses of shellfish. Clams were a food supplement, not a staple.

By the 1880s, shellfish became more popular with diners. The advent of tourism made "New England shore dinners", consisting of fish, clams, oysters or littlenecks, a favorite meal.[101] The extension of rail service to Truro in the 1870s opened quicker access to outside markets, which encouraged

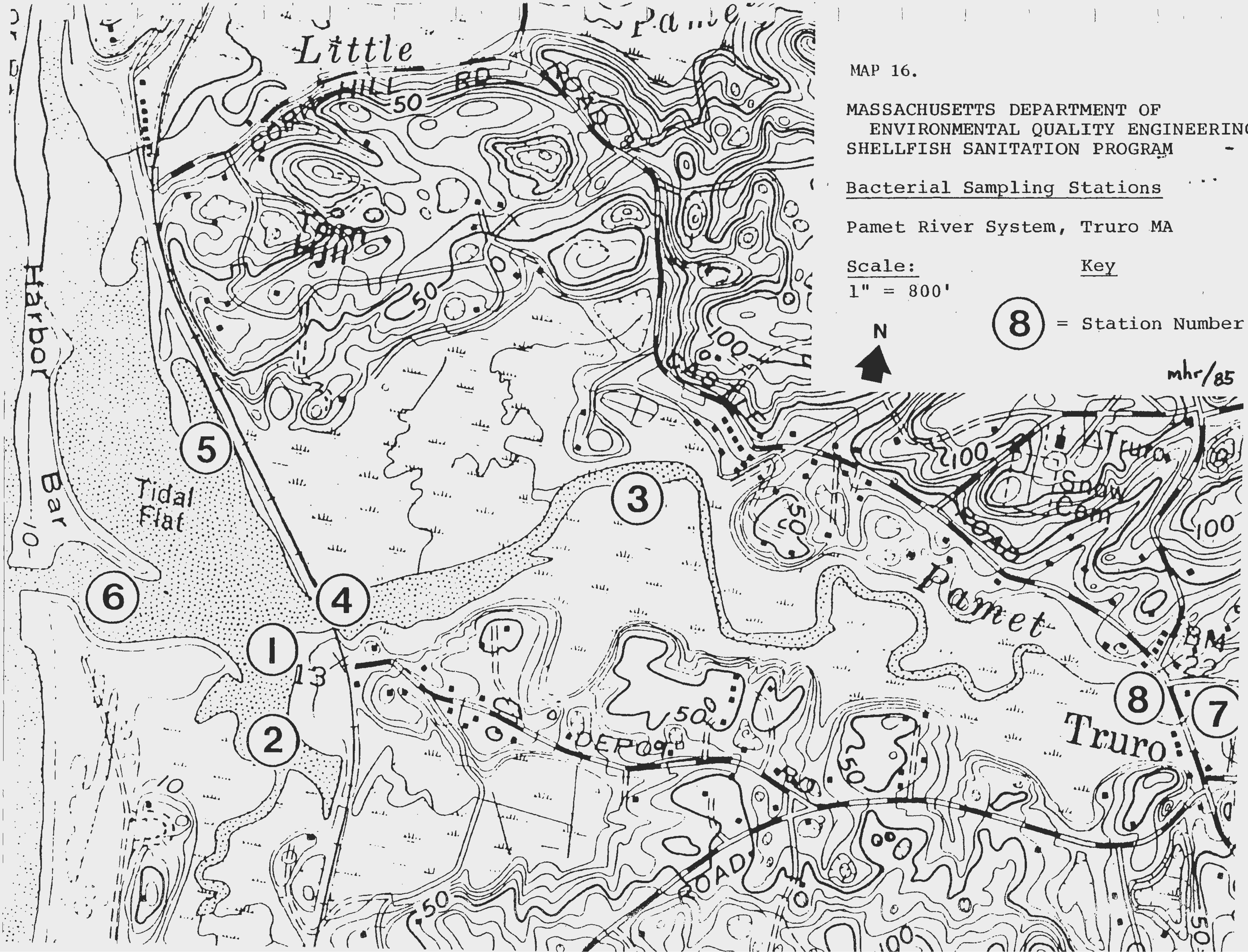

MAP 16.
MASSACHUSETTS DEPARTMENT OF
ENVIRONMENTAL QUALITY ENGINEERING
SHELLFISH SANITATION PROGRAM
Bacterial Sampling Stations
Pamet River System, Truro MA
Scale:
1" = 800'
Key
8 = Station Number
N
mhr/85
Little
CORN HILL RD
ROAD
Harbor
Bar
Tidal Flat
Pamet
Truro
DEPOT RD
ROAD
Snow Cem
BM 22
1
2
3
4
5
6
7
8

TABLE 10. COLIFORM BACTERIA COUNTS, 1971-86

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING - SOUTHEAST REGION
SHELLFISH SANITATION PROGRAM

TOWN: Truro
AREA: Pamet River
DEQE NO. : 45 /CCB7

Coliform
Total - 7
Fecal -

Station \ Date	27 Jul 71	6 July 82	7 July 82	5 Oct 82	14 Jul 83	
1 Pamet Harbor at boat ramp	36 Total 36 Fecal					
2 Mouth of Eagles Neck Creek at Pamet Harbor						
3 Pamet River at Cat Island		7.8 Total 7.8 Fecal		7.8 Total 7.8 Fecal	220 Total 33 Fecal	
4 Pamet River at old railroad crossing		<2 Total <2 Fecal	2 Total 2 Fecal	7.8 Total 4.5 Fecal	<2 Total <2 Fecal	
5 Pamet Harbor at Toms Hill			<2 Total			
6 Mouth of Pamet Harbor at jetties		4.5 Total 2 Fecal	<2 Total			
7 Pamet River between Route 6 and Old County Rd.	430 Total 36 Fecal					
8 Pamet River south of Wilders Dike	2,400,000 Total 150,000 Fecal	>1600 Total 1600 Fecal		240 Total 79 Fecal		

TABLE 10. (continued)
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING - SOUTHEAST REGION
SHELLFISH SANITATION PROGRAM

TOWN: Truro
AREA: Pamet River
DEQE NO. : 45 / CCB7

Coliform Limit
Total - 70
Fecal - 14

Station \ Date	26 Jan 85	13 Aug 85	18 Nov 85	17 Dec 85	7 Jan 86	21 Jan 86	5 March8
1 Pamet Harbor at boat ramp	7.3 Total <3 Fecal	23 Total 3.6 Fecal	>2400 Total 540 Fecal	540 Total 23 Fecal	17 Total <1.8 Fecal	79 Total 7.8 Fecal	<1.7 Fecal
2 Mouth of Eagles Neck Creek at Pamet Harbor	3.6 Total <3 Fecal	150 Total 43 Fecal		540 Total 23 Fecal	13 Total 4.5 Fecal	130 Total <1.8 Fecal	<1.7 Fecal
3 Pamet River at Cat Island	15 Total <3 Fecal	240 Total 240 Fecal	>2400 Total 1600 Fecal	350 Total 11 Fecal	21 Total 1.8 Fecal	350 Total 2.0 Fecal	<1.7 Fecal
4 Pamet River at old railroad crossing	3.6 Total 3.6 Fecal	3.6 Total <3 Fecal	920 Total 540 Fecal	540 Total 23 Fecal	2.0 Total <1.8 Fecal	22 Total <1.8 Fecal	ND Fecal
5 Pamet Harbor at Toms Hill	460 Total <3 Fecal	23 Total <3 Fecal	1600 Total 540 Fecal	33 Total 4.5 Fecal	<1.8 Total <1.8 Fecal	27 Total <1.8 Fecal	<1.7 Fecal
6 Mouth of Pamet Harbor at jetties		7.3 Total <3 Fecal		170 Total 23 Fecal	23 Total <1.8 Fecal	6.8 Total <1.8 Fecal	<1.7 Fecal
7 Pamet River between Route 6 and Old County Road	23 Total 9.1 Fecal		1600 Total 920 Fecal	70 Total 4.5 Fecal	920 Total 4.5 Fecal	2400 Total 240 Fecal	3.6 Fecal
8 Pamet River south of Wilders Dike	3.9 Total 3.6 Fecal	1100 Total 240 Fecal	>2400 Total 1600 Fecal	350 Total 33 Fecal	1600 Total 23 Fecal	2400 Total 33 Fecal	<1.7 Feca

commercial clam-digging in the Pamet, a particular boon since most economic enterprises in Truro had shut down. Sea clams were still used as bait and blue mussels were abundant in the marshes, though never preferred as food.[102]

II.B.6.b Present Management

Today, shellfishing in the Pamet is limited to recreational use. Town permits are issued for family consumption only; there are no commercial permits and no private aquacultural grants. As a further conservation measure, beds have been opened only during winter months since the mid-1960s. Although the Pamet had "long been considered one of the best soft-shell clam areas on Cape Cod" throughout this century,[103] in the past 25 years the stock's population has been erratic. From 1960-65 clams were generally plentiful and quahogs adequate. But from 1966 until 1979 stocks dwindled. For many of those years the season never opened due to a scarcity of adult clams.

Table 11. Total Shellfish Harvest, Pamet River, Truro(1978-84)

Category \ Year	1978	1979	1980	1981*	1982	1983	1984
Resident Permits	444	468	435	303	174	181	204
Non-Resident Permits	85	93	95	87	50	52	56
Senior Citizen Permits	58	98	83	128	NA	95	121
TOTAL PERMITS	587	659	613	518	224+	338	381
Species (10-qt. buckets)							
Quahogs & Soft-Shells	436	894	700	576	643	805	870
Oysters			104	144	284	312	320
Blue Mussels				282	264	106	115
Worms (pints)	230	250	195	173	169	96	90
Scallops	91						

*(In 1981, permit fees were raised from $2 to $15 for residents and from $5 to $1- for non- residents.)

SOURCE: "Annual Reports," Town of Truro MA, 1978 to 1984. Report of the Shellfish Warden.

Factors blamed for the shrinking shellfish population included channel dredging in 1966 and 1968; strong currents transporting seed offshore; smothering of shellfish by shifting sands; and, overfishing. Since 1979 all shellfish stocks have experienced a resurgence and 1985 was considered an abundant year, making the recent temporary closure especially frustrating. (Sea clams, a major though recently depleted stock in Truro, are found outside the harbor and will not be discussed here.)

Truro shellfishing is managed by a part-time, salaried ($3,800 per year) shellfish warden and an unpaid deputy. Truro usually has the smallest local budget for shellfish management in Barnstable County, which is consistent with the town's limited population and minor shellfish acreage. Like other towns, however, Truro is reimbursed approximately 25 per cent of its annual expenditure under the Massachusetts Shellfish Assistance Program (MGL c. 130, s. 20A) begun in 1974. In the last three fiscal years (FY 84-86) Truro received a total of $3,322 from this source. (This fund, though, is expected to change to a grant program for towns with active shellfish management programs.)

Despite this reimbursement, all Cape towns, including Truro, operate their shellfish programs at a loss. Most towns, however, have decided that the intangible rewards of shellfishing as part of the Cape's natural heritage, and as a tourism stimulant, outweigh the fiscal deficit. (See Table 12.)

Table 12. Fiscal Year 1984 Shellfish Budget, Town of Truro.

Expenditures

Shellfish Warden Salary	$3,800
Expenses	265
Total	$4,065

Revenue

Resident Permits	$ 965
Non-resident Permits	850
State Reimbursement	910
Total	$2,725

Total Expenditures	$ 4,065
Total Revenues	2,725
(Deficit)	$ 1,340

Management practices in the Pamet to protect and enhance shellfish have been limited. The summer closure is the major conservation tool in addition to catch limits. In 1976 the town funded a $1,100 study to examine propagation options.[104] This study made several determinations:

1) Sufficient food and good environmental conditions exist for shellfish growth;

2) A good natural set of quahogs and oysters occurred;

3) Transplanting seed quahogs would be successful, particularly behind Gull Island; soft shell clams and mussels did not transplant well; and,

4) Natural predators were not abundant enough to be a problem.

A 1981 research project examined the feasibility of oyster propagation in the Pamet.[105] This study concluded the following:

a) The Pamet possesses good sediment, salinity, pH, and food needed for oyster propagation;

b) The main drawback is the large tidal range, which leaves extensive tidal flats exposed to stresses of heat and cold and flushes larvae out of the harbor with strong currents, discouraging setting;

c) Predators and pollution were not a problem for production; and,

d) Dredging the harbor would disrupt major shellfish beds.

Oyster production has noticeably increased since 1980 in the Pamet, rising from 104 to 320 buckets (Bucket = 10 quarts). In 1976 the shellfish warden transplanted six bushels of oysters from the Pilgrim Lake outlet pipe in North Truro to the Pamet and in 1977 cultch (empty scallop shells) was spread near the railroad bed to collect spat. One hundred bushels of seed quahogs were bought and transplanted to Pamet Harbor in 1978 and 1979.

Bay scallops rarely enter the Pamet in harvestable sizes and quantities. Razor clams are still found in the harbor, but not in their former abundance.

Respondents to the Pamet River Greenway Project's 1985 opinion survey overwhelmingly support (329 to 44) a more aggressive shellfish propagation program. A continued ban on summer shellfishing is supported by almost a two to one margin (242 to 131). (See Appendix B.)

Numbers of permit holders have successively dwindled since 1960 despite increases in Truro's year-round and summer populations. (See Table 13.)

Table 13. Total Truro Shellfish Permits Issued.

Year	Permits	Permit Fees: Residents	Non-residents
1960	947	$ 1	$ 2
1965	757	1	2
1970	800	2	15
1975	674	2	15
1980	613	2	15
1985	371	5	15

Reasons for the sharp decline are speculative, but might include the following:

1) Summer shellfishing ban by 1970 eliminated summer residents from shellfishing;

2) Stock depletion between 1965 and 1980 discouraged clamming;

3) Increase in permit fees from $1 to $5 for residents and from $2 to $15 for non-residents (senior citizens--no fee) between 1960 and 1985; and,

4) Commercial dragging for sea clams in Cape Cod Bay, which has been allowed by the state from 1981 to the present despite town objections, has curtailed Truro's most important fishery.

5) The 1985 figure may reflect shellfishers' reluctance to buy permits during the town closure due to contamination.

If concern about health risks due to pollution grows, then the numbers of shellfishers may continue to decline in Truro.

II.B.6.c Water Quality

Sources of pollution have been discussed in the Water Quality section of this Plan. It should be recognized that the Pamet may not be more contaminated today than in past years; the fact that bacteria counts were relatively high in 1985 may be a

consequence of the present frequency and altered methodology of the state's water sampling program.

Land uses have not significantly changed near the river in the last twenty years. Housing density has not yet reached a critical level near the Pamet. No sickness or health problems associated with Pamet shellfish have been recorded. The Massachusetts Division of Marine Fisheries recorded an incidence of "red tide" in the harbor in September 1972, but it is not a recurring problem.[106] In summary, the recent alarm over bacterial contamination in the Pamet, while not unjustified in the short run, need not lead to a long-term abandonment of the shellfishery. What the limited amount of information suggests is that pollution in the Pamet is a serious potential problem, but not a constant threat to human health.

Of the eight river stations sampled by the Massachusetts Department of Environmental Quality Engineering (DEQE) in the Pamet, only station 8 (near Wilders Dike) could be considered to have poor quality water. High bacteria counts there are not surprising, considering several factors:

a) Limited tidal flushing relative to other parts of the river;

b) The backup of water (and pollutants) against the dike during a flood tide due to the clapper valve barrier;

c) Influx of road drainage (Route 6, Old County and Pamet Roads) at this location with several outfall pipes discharging catch basin stormwater directly into the river;

d) Unknown capacity, design and effectiveness of the

septic system serving the "Pamet Mall" and post office; (This area is filled salt marsh with suspected poor filtration capabilities.) and,

e) Resident pet waterfowl behind the Trifles and Treasures shop.

Other potential sources of pollution in this area include a small farm on South Pamet Road, wildlife in the freshwater Pamet, and failing septic systems in the vicinity.

Fortunately, both water quality and shellfish stocks increase downstream of this area. In 1984 DEQE contemplated a temporary closure under MGL c. 130, s. 74A of shellfishing from Wilders Dike to Snows Landing at Meetinghouse Road, but deferred due to lack of shellfishing in that stretch and to await further testing.[107] Pamet Harbor itself (west of the railroad bed), where most shellfishing occurs, had never recorded high bacteria counts until the November 1985 DEQE test. It seems likely that its proximity to the open Bay and strong tidal currents will continue to keep the harbor itself free of persistent pollution.

II.B.6.d <u>Shellfish Management Recommendations:</u>

1) Water quality should be considered the top shellfish management priority because, unless the fishery remains open to harvesting, all other shellfish plans become irrelevant. Specific recommendations are contained in the "Water Quality" section of this Plan.

2) A shellfish management plan, including stock enhancement, regulatory review and water quality monitoring, should be developed in order to unify town action and to remain eligible for state shellfish assistance funds.

3) A Shellfish Advisory Committee should be established to advise the Shellfish Warden, Board of Health and Conservation Commission on relevant matters and to assist in the preparation of a shellfish management plan.

4) The present ban on commercial shellfishing and summer shellfishing should remain in effect as a stock conservation measure, but should be evaluated from time to time for its effectiveness.

5) The non-resident permit fees should be increased to $25 per year in keeping shellfish fees in other towns. (The state allows up to a 5:1 ratio between the cost of non-resident and resident fees for shellfishing.)

6) In keeping with residents' wishes, the town should continue to upgrade its propagation efforts to maintain the present abundance of all stocks. Specifically, propagation should include the following:

a) Oyster cultch spread in the harbor;
b) Spat collection through the use of staked netting;
c) Purchase of quahog seed when available; and
d) Examination of the feasibility of transplanting oysters from the Pilgrim Lake pipe again.

7) Investigate the need for reduced catch limits for oysters and mussels in order to enhance populations of those stocks.

8) Refine the annual town catch report data by asking permit applicants to quantify their catch for the preceeding year.

9) Maintain a visible enforcement presence and keep information signs legible and up to date.

10) Investigate the feasibility of using the Little Pamet drainage channel for private aquaculture, such as quahog rafts, in order to provide side benefits to natural stock recruitment.

11) Ensure that any harbor dredging is conducted with the best available measures to protect nearby shellfish from burial, siltation and other disruption. Require that dredging proposals include pre-dredging assessment of shellfish impacts and post-dredging monitoring of changes.

II.B.7 SCENIC VALUES

II.B.7.a Recognition

Pamet River is a Scenic River, acknowledged as one of the most beautiful in the state. This status has been recognized through the actions of various groups:

Regional Importance

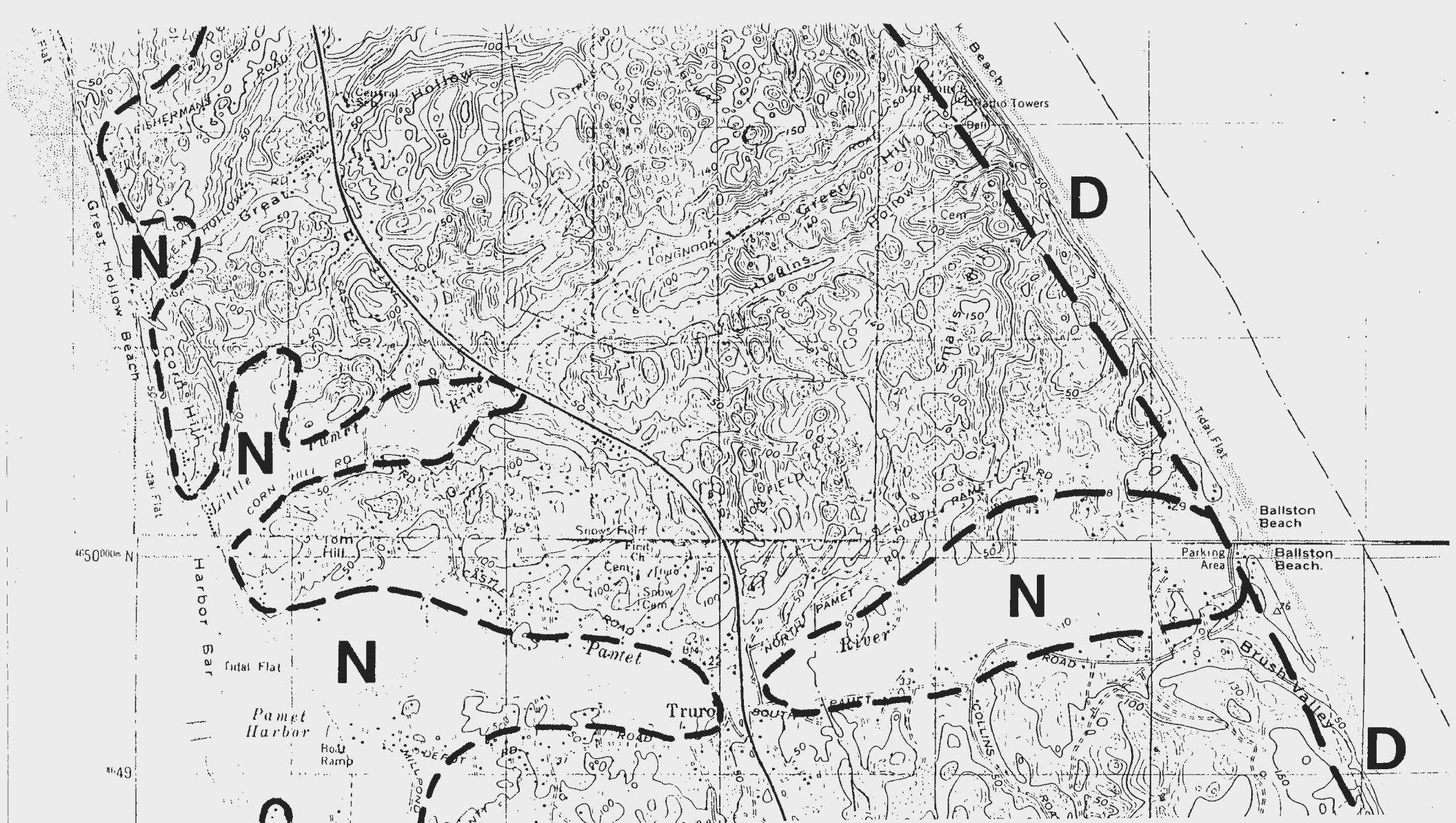
- A 1963 regional study of Cape Cod declared, "The Route 6 bridge (sic) over the Pamet offers one of the most beautiful views on the Cape."[108]

State Importance

- In 1978 the Massachusetts Department of Environmental Management (DEM) classified the Pamet as a Scenic River under MGL c.21, s.17b.
- In 1981 DEM listed the Pamet area, including Little Pamet, as a "Noteworthy Landscape," part of only 5% of the state's acreage so classified. In addition, the Great Beach on the Backside of Truro was part of only 4% of the state listed as a "Distinctive Landscape," the highest visual category. (See Map 17.)

National Importance

- Nationally-known artist Edward Hopper, among others, painted many scenes around the Pamet during his summer residence in South Truro from 1935-65. (See Figure 6.)
- In 1961 the Cape Cod National Seashore incorporated the eastern half of the Pamet River within its jurisdiction.



MAP 17. **SCENIC LANDSCAPE**

Pamet River System, Truro MA

SCALE: 1:25000

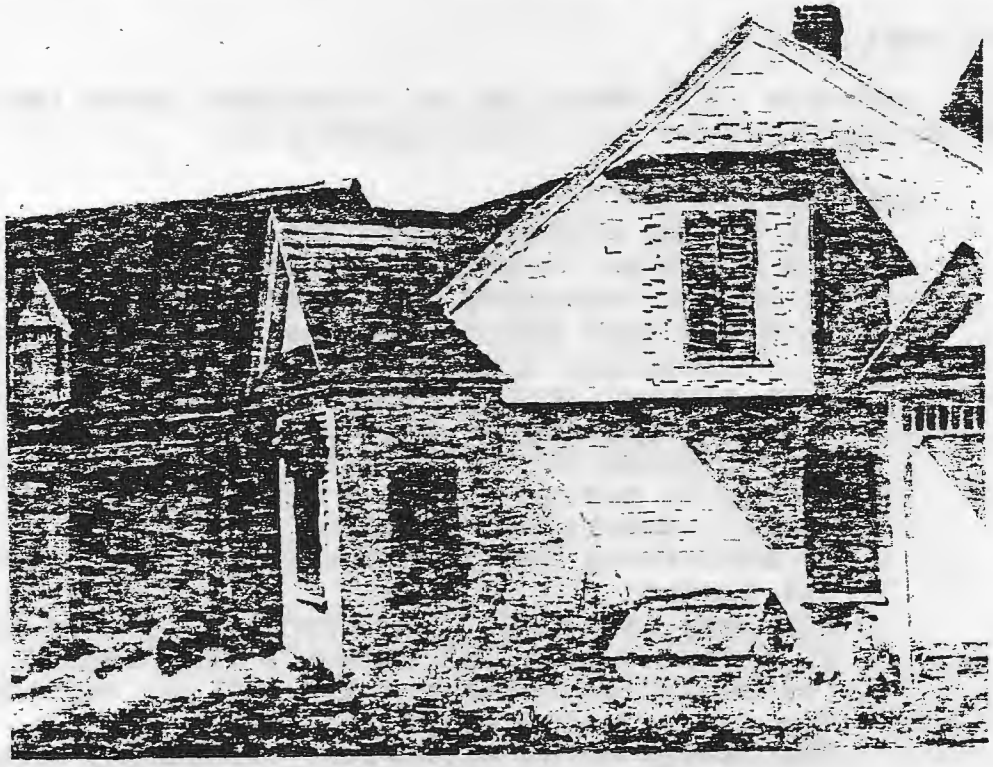
N

D = DISTINCTIVE Landscape (Areas containing the highest visual quality in Mass.; 4% of state is Distinctive

N = NOTEWORTHY Landscape (Areas of important visual quality; 5% of state is considered Noteworthy)

SOURCE: Massachusetts Landscape Inventory, Massachusetts

Figure 6. Painting, Edward Hopper, "House on Pamet River," 1934. (Courtesy Truro Historical Society)



Local Importance

The most important--and passionate--acknowledgement of the Pamet's beauty comes from Truro residents themselves. Their attitudes were reflected in a 1985 survey conducted by the Pamet River Greenway Committee. (See Appendix B.) Asked which activities they engaged in around the Pamet, the top four responses could be called "visual recreation": 1)driving by to see the harbor, 2) walking, 3) sunset viewing and 4) birdwatching. "Loss of scenic beauty" was also ranked fourth out the ten greatest threats to the river.

Most significantly, however, the final question in the survey was an open-ended one asking respondents to describe what they enjoyed most about the Pamet. Although answers ranged from historical importance to boating to economic potential, the

overwhelming response cited the natural, scenic beauty of the area (258 of 608 responses). A sampling of those comments follows:

Question 22. "What do you like most about the Pamet? Why is it important to you? (See Appendix B.)

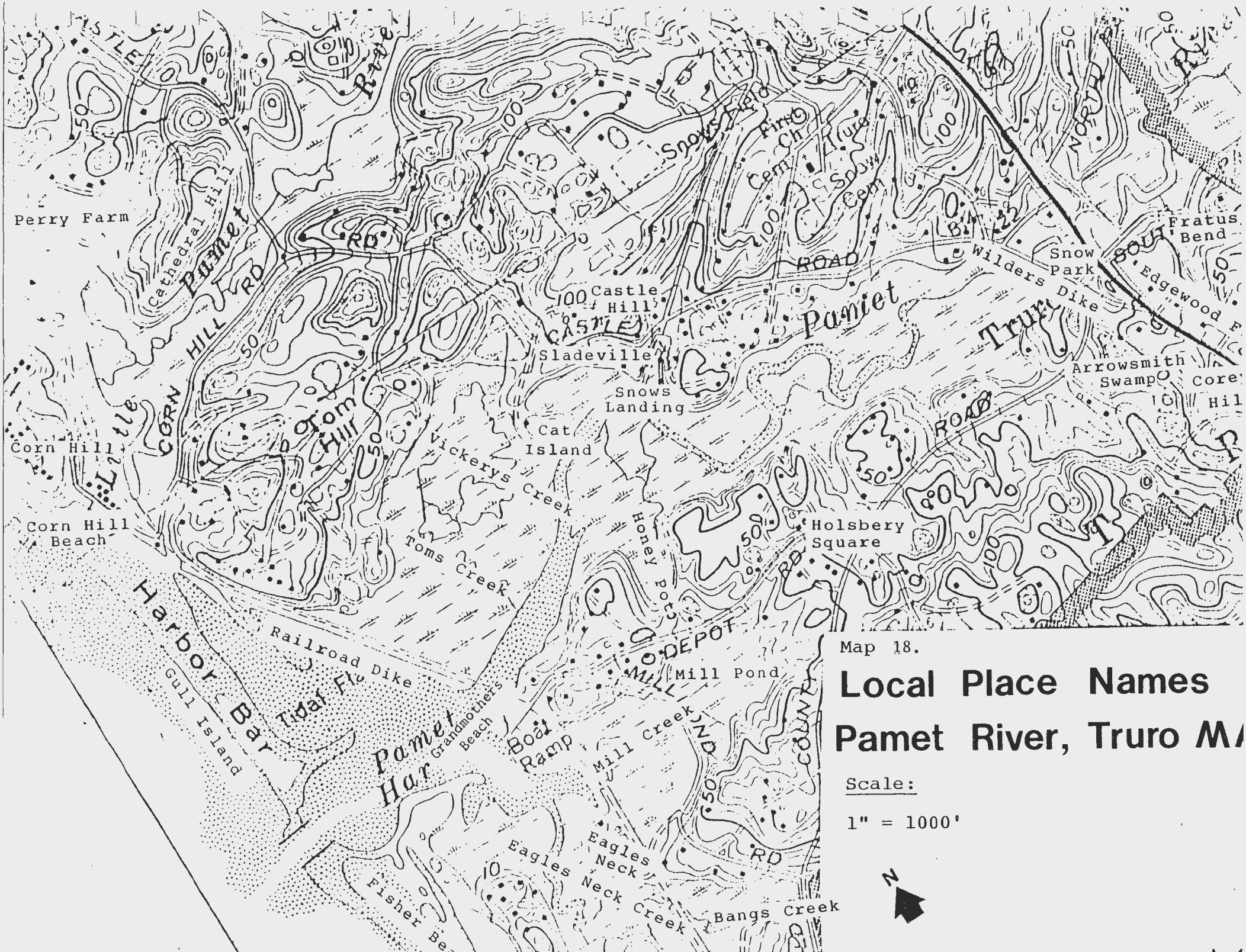
Answers:

The beauty of the valley and marshes.
Its old-time, traditional look.
It is ever-changing, yet always itself.
It's the most beautiful, restful and satisfying landscape I know.
Just sitting at the harbor, talking to friends and looking at the boats and sunset.
Just looking at the peaceful valley and rivers.
The quiet beauty of it, a scenic treasure.
Beauty, quiet, seclusion.
It represents Truro's peaceful, scenic appeal.
The sunsets!
The last stronghold of natural beauty on Cape Cod.
It offers a sense of serenity when needed.
Its beauty and wildness and endless variety.
The most appealing part of Truro.
The beauty of an exquisite, realtively unspoiled river as it meets the sea.

What these and many similar comments evoke is the true character of the Pamet's beauty. It is not a riverscape full of raging torrents, rugged cliffs, booming waterfalls and dramatic overlooks. Rather, the Pamet's beauty is based on a shared intimacy. The Pamet is a small gem of many facets, a secret treasure of the townspeople. This intimacy is reflected in the wealth of place names that residents have applied to every little creek, marsh and bend in the road. Examples are shown in Map 18.

II.B.7.b Scenic Components

Analyzing components of beauty, like dissecting a poem, often destroys the whole while looking for the parts. But what makes the Pamet scenic? A ventured guess might include the



Map 18.

Local Place Names

Pamet River, Truro MA

Scale:

1" = 1000'

unique blend of topography, landscape, architecture and village design of the area. Steep, rounded hills descending directly into the broad, flat salt marsh attracts the eye by its distinctive juxtaposition. Bearberry and other low, dense groundcovers help reveal the shape of most of the glacially-moulded hills, though pitch pines disguise the contours of others. Edward Hopper particularly liked to paint the contrast of blonde-colored field grass growing beneath a dark-shaded stand of pines. Variety is also added to the scene by the changing seasons and the great tide. The perigean tides of autumn flood the marsh to make an open-water bay, while the drastic ebbs leave one wondering if the sea will ever return.

The built environment--the human landscape--has generally enhanced the scenic qualities of the Pamet, at least until recently. With the exception of a few large subdivisions, including Great Hills at Fisher Beach and Corn Hill, most residences within view of the river are older ones that consist of traditional Cape styles. In his travels around Truro in the mid-1800s, Thoreau found:

> Generally, the old-fashioned and unpainted houses on the Cape looked more comfortable as well as picturesque than the modern and more pretentious ones, which were less in harmony with the scenery, and seemed less firmly planted.[109]

Although Thoreau's "modern" homes are our antique ones, his comments still hold today.

Living in a narrow, confined land, Cape Codders have always been concerned with proper scale. Their houses blessed the landscape, did not seek to dominate it. Even those houses built

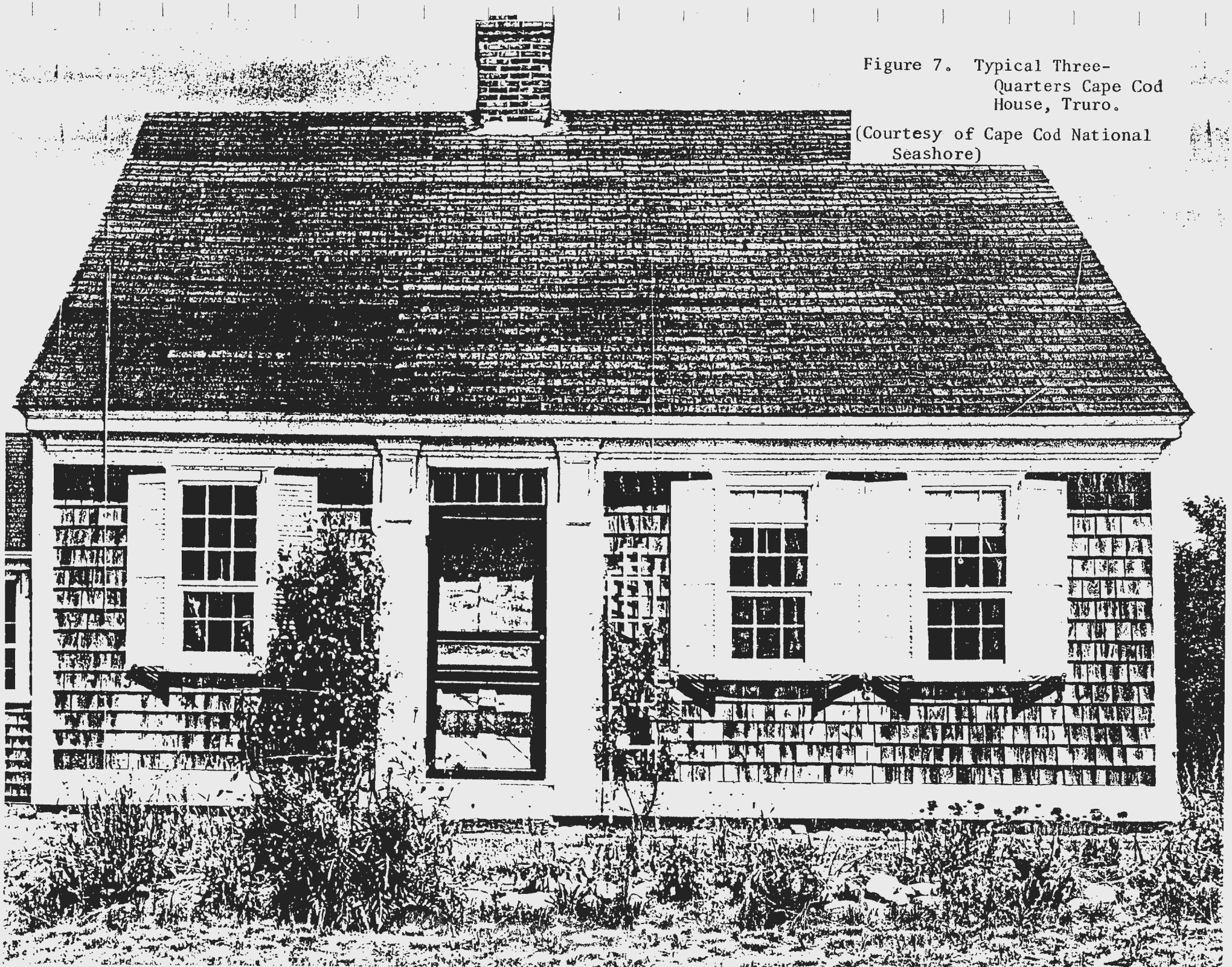


Figure 7. Typical Three-Quarters Cape Cod House, Truro.

(Courtesy of Cape Cod National Seashore)

on top of hills were small and simple and acted as keystones, balancing and drawing the lines of the hill together, rather than squashing the hill form with homes of ponderous bulk or intricate design.

Again, until recently, the organization of the village around the Pamet functioned as an unplanned "cluster development". Homes were constructed in pockets or along major roads like Depot, Castle and Pamet Roads with wide expanses of farmland between these settlements. Many homes were oriented so that they faced the river, indicating the importance of the river for transportation access; new homes turn their backs on the river to face the roads. (Most houses are designed to be more aesthetically pleasing from the front than the rear.) Recent construction is filling up the open areas with grid subdivisions. Also, housing sprawl becomes visually intrusive on the sparsely wooded hills or heaths in the area.

Without judging the relative aesthetics of traditional versus contemporary house designs, one fact is clear: regardless of density, the Pamet's integrity as an historic Cape Cod fishing village may be visually threatened by modern designs and accessory uses, such as satellite dishes, swimming pools and concrete retaining walls.

If, as is suspected, the old "quaint" homes of the Pamet enhance, rather than detract from the area's natural scenery, and if the historical integrity of Pamet River is important to the townspeople of Truro, then steps must be taken to ensure that that integrity is maintained. Some simple guidelines,

palatable to the community and easily enforced, should be developed to ensure that the Pamet's seaside charm is preserved for future residents.

II.B.7.c Scenic Values Recommendations:

1) The Truro Planning Board should adopt an Open Space Residential Development zoning by-law (cluster development) as proposed by IEP, Inc. in its 1985 report to the Planning Board entitled, "Water Resources Protection Plan." It should be provided, however, that the applicant will design a subdivision to protect features of the property deemed important by the Planning Board, Conservation Commission and Board of Health, including wetlands, groundwater quality, wildlife habitats and important public viewsheds. The purpose of this pre-design input from town boards would be to ensure that the right open space is protected in each subdivision, not simply any convenient acreage.

2) The Truro Historical Commission should investigate the feasibility of several limited Historic Districts in the Pamet area following completion of the historic house inventory currently underway.

II.B.8 RECREATION

The recreational value of Pamet River is based on water, scenery and natural resources. There is volume and variety to each. And, as stated in the "History" section of this plan, the significance of the Pamet to Truro's economy at present is rooted in its use for recreation.

II.B.8.a Recreation Uses

As the Pamet River Opinion Poll (Appendix B) makes clear, many people engage in many different activities in the Pamet. The top three uses are passive, non-consumptive activities: "driving by to see the harbor," "walking," and "sunset viewing". These types of use rely on maintaining the Pamet's scenic beauty for full enjoyment. Among poll respondents who felt that additional public access was needed in the Pamet, pedestrian access figured prominently. Most people mentioned trails, boardwalks, paths and overlooks as desired facilities.

A 1969 plan proposed using the railroad right-of-way as "a walkway through the marshes to a fisherman's landing."[110] The Greenway Committee endorses this proposal on the town-owned railroad dike stretching from the Corn Hill parking lot south to the river, ending at the previous trestle location. A panoramic view of the harbor and marsh is offered by this walk, plenty of parking is available at Corn Hill and needed improvements consist only of minor brushcutting and filling small, eroded holes in the dike to make it passable. This dike is not particularly important as a tidal barrier as other dikes in the

system are, (personal communication, Dr. Graham Giese). Maintaining it for recreational use is not inconsistent with the general Greenway objective of removing major tidal obstructions. A sign at the Corn Hill trail could inform walkers that this dike is public property and encourage its use. (In December 1986 the Truro Boy Scout Troop, with town permission, erected a simple sign indicating a walk was available.)

Birdwatching is another popular passive activity in the Pamet area. The variety of habitats make it attractive to many species, including shorebirds, ducks, raptors and songbirds. In April 1986 the Truro Conservation Trust cooperated with the Massachusetts Division of Fisheries and Wildlife Osprey Recovery Project to erect a 20-foot high pole in the Honey Pot salt marsh (see Map 18 for Honey Pot location) to promote nesting by migrating ospreys. Nesting did not occur the first season, but eventual success is likely, given the availablity of food supply for this dramatic "fish hawk."

People who fish enjoy the Pamet too. Most fishing is done from shore, not boats. Surfcasting for bluefish from Gull Island, Fisher Beach and Ballston Beach is most popular. Summer flounder and an occasional striped bass are also reeled in. Some fishing for bluegills and brown trout occurs upstream. Shellfishing is conducted primarily in the harbor on the flats north of the ramp.

Berrypicking occurs in season. Lowbush blueberry is common on the hills and the Snows' aborted Highbush blueberry orchard in the Bangs Creek Swamp still produces. Bayberries are sometimes collected for scenting candles and soap. The location

of Beach plums is coveted knowledge.

Another consumptive activity--hunting--is chiefly carried out during the autumn/winter duck season. Most shooting is done from the barrier beaches towards the bay, though duck blinds can be found scattered from Corn Hill to Wilders Dike. Deer and rabbit are also pursued. A deer stand on a utility pole in the middle of the freshwater Pamet indicates some hunting occurs right in the swamp upriver. The Highland Fish and Game Club represents local sportsmen.

Transportation-related active recreation, that is, fun through motion, consists of swimming, boating, canoeing, off-road driving and even hangliding. The bluffs overlooking the Bay have strong updrafts from the prevailing westerly winds. In 1929 Ralph Barnaby was the first American to receive an international soaring certificate for a flight off Corn Hill lasting fifteen minutes. (National Soaring Museum)

Three beaches of vastly different size and character are used for public swimming. Parking stickers are needed at all town beaches: $5 for an annual resident sticker, and $35 for an annual non-resident sticker. Ballston Beach is a town-managed beach within the Cape Cod National Seashore. Parking is limited and handicapped access is a difficult long climb over loose sand to the beach. But the beach itself can never be considered crowded if one is willing and able to walk. The water is the coldest of the three beaches, but the surf is gentle when the wind is offshore, as is frequent throughout the summer.

Corn Hill Beach has adequate parking and lots of beach

space to the south to prevent crowding. The water is warmed as it flows over the sun-baked flats and most swimming is done at high tide. A $1 daily parking fee is available.

Grandmother's Beach, next to the boat ramp, is so-called because its calm, warm water is preferred for small children and easy access is enjoyed by the elderly. Although it is on town-owned land (old dredge spoils), it is not a bathing beach authorized by town officials. The Truro Neighborhood Association, a civic group, maintains the bouyed line bounding the swim area, which is without water at low tide. The rope was installed because the beach's proximity to the boat ramp and channel caused safety concerns. The great popularity of this beach has made town oficials reluctant to close it.[111]

Water quality at all beaches is good for swimming, but one health problem exists. Schistosomiasis, or "swimmer's itch", is reported to be troublesome for some bathers.[112] The itch occurs when blood fluke larvae associated with waterfowl droppings attempt to enter human skin. Although the skin is too tough to be penetrated by the larvae, the skin can become irritated and inflamed for several days. The condition is most prevalent at low tide and can affect both swimmers and shellfishermen in contact with the water. Better tidal exchange in the river might reduce the phenomenon.

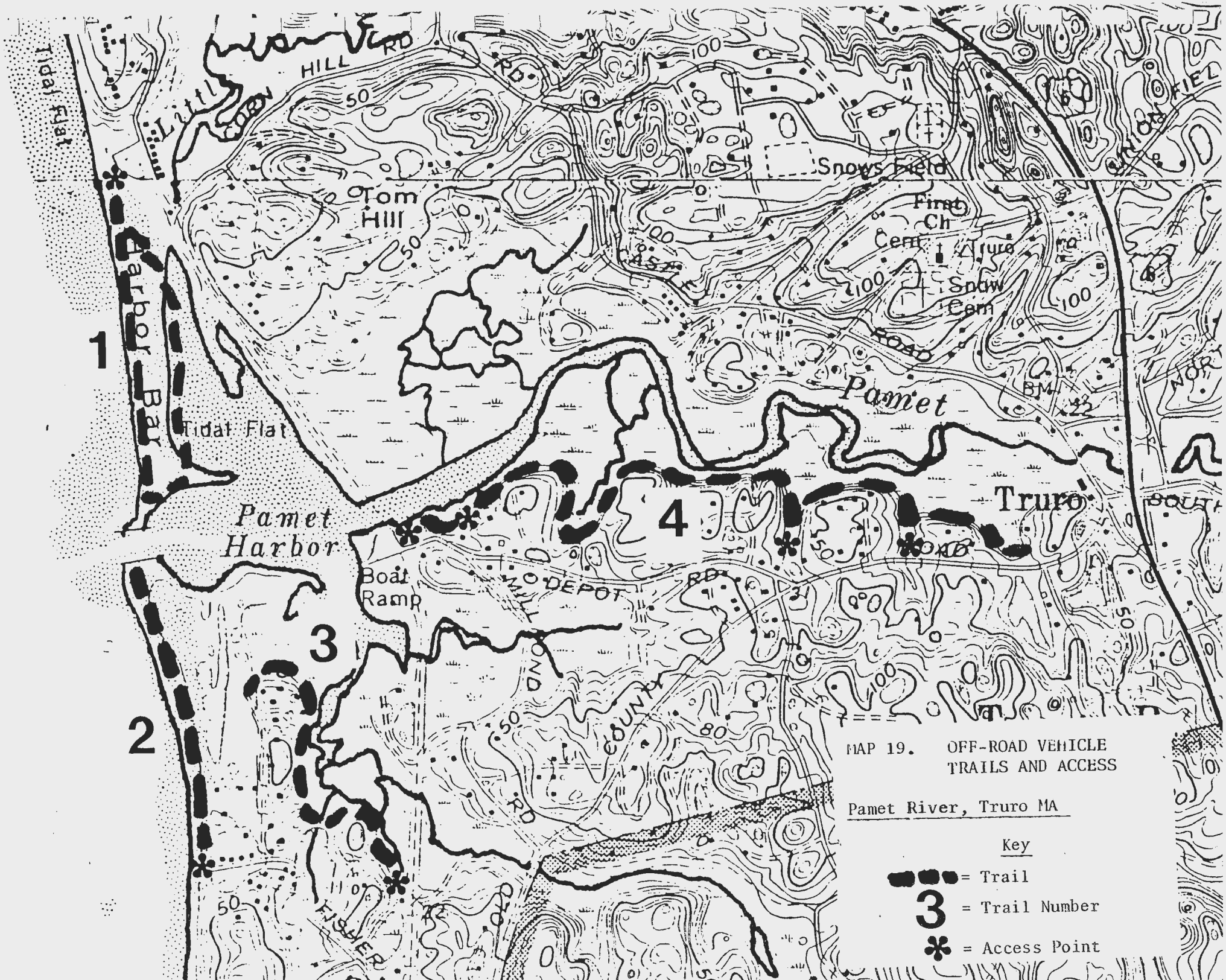
Boating--sail and power--is discussed in the "Pamet Harbor" section of this plan. Canoeing, however, is another popular form of navigation. The two Canoe Days sponsored by the Greenway Committee in 1985 were well-attended events. With a brief portage from Wilders Dike across Route 6, the entire

length of the Pamet River can be canoed. Clearing the stream of Sweet gale near Head O'Pamet would make paddling easier and canoeing is best at mid to high tide at the mouth. But a canoe rental business on the Pamet might have great potential for an entrepreneur.

Special mention should be made of the use of off-road vehicles (ORVs) in the Pamet area. Although an operating permit is required from the Police Department, few other local control measures exist for ORV use in the town. (In 1985, however, the National Park Service prohibited the use of ORVs from November to April along most of the National Seashore, including Ballston Beach.)

Four separate ORV trails exist near the lower Pamet. (See Map 19.) Trails #1 and #2 are used throughout the year for surfishing access along the barrier beaches, although the trails are each only one-half mile long. The Truro Conservation Commission has erected a barrier to prevent ORV use in the dunes at the end of Great Hills Road. The Massachusetts Audubon Society has documented disturbance of tern nesting areas on Gull Island by ORVs during the summer.[113]

ORV Trails #3 and #4 run along the edge of the salt marsh. They are ostensibly used for shellfishing access, although this access seems founded on convenience more than necessity. Joyriding is also known to occur on these trails. The Greenway Committee has documented destruction of salt marsh vegetation and erosion due to use of ORVs in these areas. The vehicles are also trespassing private property to use these trails and gain


Tidal Flat
Little Hill Rd
Tom Hill
Snows Field
First Ch Cem
Snow Cem
Pamet Road
Pamet
Truro
Barber Bar
Tidal Flat
Pamet Harbor
Boat Ramp
Mill Pond Rd
County Rd
Fisher Rd
1
2
3
4
MAP 19. OFF-ROAD VEHICLE TRAILS AND ACCESS
Pamet River, Truro MA
Key
= Trail
3 = Trail Number
= Access Point

access to them.

II.B.8.b RECREATION RECOMMENDATIONS:

1) The old railroad dike from the Corn Hill parking lot south the the harbor, now owned by the town, should be developed with limited improvements for use as a nature observation path to encourage walkers. (In 1986 the Truro Boy Scout Troop began work on this project with approval from the Conservation Commission and the Selectmen.)

2) The Conservation Commission and the Massachusetts Audubon Society should be encouraged to protect tern nesting areas on the foreshores of the barrier beaches at the mouth of the Pamet (Gull Island and Fisher Beach).

3) Until the town can provide better beach patrol, off-road vehicles (ORVs) should not be permitted north of Fisher Beach and south of Corn Hill between Memorial Day and Labor Day. ORVs should be completely prohibited from operating along the marsh edges throughout the Pamet except for use by emergency vehicles.

4) The National Park Service should be encouraged to revitalize the Pamet Pamet Cranberry Bog educational exhibit on North Pamet Road. The Cape Cod Cranberry Growers Association should be asked to help in this regard.

5) The Selectmen and Town Counsel should investigate the legal responsibilities concerning the continued use of the Depot Road Beach (Grandmothers Beach) due to its close proximity to the boat anchorage.

6) A boardwalk should be installed from the parking lot to Corn Hill Beach for improved access by the disabled.

CONCLUSION

The Pamet River Greenway Plan has tried to describe the many facets, both natural and human, of the river's resources. The need for integrated management for all of these resources should be clear. Many of the river's problems stem from a history of fragmentation--physical, political and perceptual. Dikes caused physical fragmentation, chopping off segments of the river. Politically, the Cape Cod National Seashore divided the Pamet in half. Perceptually, people have only begun to think of the river as a complete system in which actions in one part affect all other parts. This plan has tried to show the connections between shellfish, septic systems, swimming, siltation and scenery. If some of the chapters seem to overlap, good.

The strategy to achieve this integrated management does not depend on grand tactics. No super-agency or all-inclusive Pamet River Authority is needed at this time. No complex, sweeping new bylaws or regulations are proposed. The plan purposely relies on better use of existing protection tools. Better enforcement of current regulations will help. Better coordination among town boards is needed. The cooperation of state, county and federal agencies with interests in the Pamet should continue even though the plan is printed.

The problems of the Pamet are not severe. Water quality is generally good. The Valley's serenity is relatively intact. Public access for recreation is sufficient. In the 1980s President Reagan has made famous the axiom, "If it ain't broke,

don't fix it." Some people in Truro would echo that about the Pamet, "If it ain't ruined, why protect it?" The answer, borne out in many fields of human endeavor, is that protection is always easier than restoration. What is an ounce of prevention worth?

The Pamet River Greenway Plan is at an end, but it is not done. It never will be, so long as people care about the river.

ENDNOTES

CHAPTER I.B - IMPORTANCE OF THE RIVER

1. Ernest Allen Connally, "The Cape Cod House: an Introductory Study," in "Journal of the Society of Architectural Historians," May 1960. (In 1986 this house was owned by Margaret Lloyd.)

2. J.J. Fisher, "Pamet River," in Stephen Leatherman, (ed.), "Environmental Geologic Guide to Cape Cod National Seashore," University of Massachusetts - Amherst, 1979, p. 13.

CHAPTER I.C - DESCRIPTION OF THE RIVER

3. Graham Giese, Mark Mello, The Center for Coastal Studies, "A Brief History of the Pamet River System with Recommendations for Environmental Studies and Accompanied by Two Maps: A Report to the Truro Conservation Trust and the National Park Service," June 1985, p. 11.

4. Richard F. Delaney, Director, Massachusetts Coastal Zone Management Office, quoted in The Boston Globe, 2~~1 January~~ June 1985, p. 17 See also Note 28, p. 228.

CHAPTER I.D - HISTORY

5. Shebnah Rich, "Truro--Cape Cod: or, Land Marks and Sea Marks," Boston, 1884, p. 73.

6. U.S. National Park Service, "Master Plan of the Cape Cod National Seashore," Boston, 1964, "Archaeological Resources Map."

7. Stephen P. Leatherman, "Prehistoric Morphology and Marsh Development of Pamet River Valley and Nauset Marsh," The Environmental Institute, University of Massachusetts-Amhesrt, 1981,.p. 8.

8. Op cit. Note 5, p. 230.

9. Massachusetts Historical Society, "Collection", Vol. III, 1794, published 1810, Boston, p. 198.

10. Op. cit. Note 3, p. 15.

11. ?, "A Guide for Shipwrecked Seamen on the Coast of Cape Cod," 1802. (Collected in National Park Service files, Wellfleet MA.)

12. Personal Communication, Oscar Doane, Superintendent, Cape Cod Mosquito Control Project, March 1985.

13. Simeon L. Deyo, "History of Barnstable County, Mass.," New York City, 1890, p. 928.

14. Op. cit. Note 5, p. 427.

15. Anthony Marshall, "Truro, Cape Cod, As I Knew It," New York, 1974, p. 168.

16. William Cronan, "Changes in the Land," Globe Pequot Press, 1984, p. 46.

17. Op. cit. Note 9.

18. William Robinson, "Coastal New England: Its Life and Past," New York, 1984, p. 73.

19. Mr. Dan Sanders, "Letter to Mark Robinson," 5 February 1985, Truro Conservation Trust files.

20. Henry C. Kittredge, "Cape Cod: Its People and Their History," Boston, 1968, p. 6.

21. Op. cit. Note 19.

22. Op. cit. Note 15, p. 184.

23. Op. cit. Note 13, p. 927.

24. Accounts differ on the construction date of the tidal mill. Although Deyo places it "in the latter part of the eighteenth century," (Op. cit. Note 13, p. 928), an 1847 petiton to the state legislature, asking for continued authorizzation of the mill, refers to the mill dam being built "something over one hundred years ago," (Thomas Kane, "My Pamet," in "The Cape Codder," newspaper, March 21, 1974, p. 22.)

25. "Two-way tide mills lost to past," Cape Cod Times newspaper, July 21, 1978.

26. "The Cape Codder" newspaper, March 21, 1974, p. 22:

"To the Honorable Senate and House of Representatives in General Court Assembled: We, the undersigned inhabitants of the Town of Truro...repectfully represent to your honorable body that we are at present owners of a certain grist mill situated in Truro, the dam of which has been built (as nearly as can be ascertained) something over one hundred years ago, over a smalll cove of salt meadow by the means of about twelve acres which is usually dry about half-tide in common tides. Whether there was a creek into said cove is unknown. We therefore pray your honorable Body to pass a law making it a legal dam or causeway in the manner it has heretofore been. We further represent that there is not other grist mill propelled by water within twenty miles of the one named by us, nor any suitable place for one. If this mill cannot be legalized it must be abandoned to the lossof its owners and

great inconvenience of the inhabitants of the town...Dated at Truro January 22, 1847 Allen Hinckley and others."

27. See Map 5. See, also, F. Freeman, "The History of Cape Cod: Annals of the Thirteen Towns of Barnstable County," Boston, 1858, p. 75, footnote 2 (mention of a "lower bridge").

28. Josef Berger, "Cape Cod Pilot," Boston, 1937, p. 229.

29. Op. cit. Note 27 (Freeman), p. 538.

30. Op. cit. Note 3, Figure 2.

31. Mellen C.M. Hatch, "The Log of Provincetown and Truro on Cape Cod," Boston, 1939, p. 63.

32. Op. cit. Note 30.

33. Op. cit. Note 31, p. 44.

34. Op. cit. Note 5, p. 461.

35. Idem.

36. Op. cit. Note 13, p. 145.

37. Op. cit. Note 15, p. 30.

38. Op. cit. Note 5, p. 441.

39. Op. cit. Note 3, p. 16.

40. Ibid., p. 15.

41. Ibid., p. 16.

42. Idem.

43. Op. cit. Note 15, chapter 18.

44. Op. cit. Note 5, p. 327.

45. Op. cit. Note 13, p. 928.

CHAPTER I.E - FLORA AND FAUNA

46. Joanne Michaud, Massachusetts Natural Heritage Program,"Letter to Mark Robinson," 3 February 1986, (See Appendix F.)

47. Peter Trull, Massachusetts Audubon Society, "Letter to Mark Robinson," 6 February 1985.

48. Idem. Data for 1984 is from Brad Blodget, Massachusetts Division of Fisherieis and Wildlife. Data for 1985 is from Robert Prescott, Massachusetts Audubon Society.

49. Personal communication, Joseph Bergin, Massachusetts Division of Fisheries and Wildlife, 2 January 1985.

50. Idem.

51. Richard LeBlond, Center for Coastal Studies, "Letter to Charles Davidson, Truro Conservation Commission," 20 April 1985.

52. Op. cit. Note 5, p. 464.

53. Op. cit. Note 3.

CHAPTER II.A - RIVER MANAGEMENT - HISTORICAL PERSPECTIVE

II.A.1 - Previous Management Efforts

54. Op. cit. Note 3, p. 14.

55. Blair Associates, Inc., "Cape Cod 1980: A Sector of the Massachusetts State Plan," Providence RI, 1963, p. 79.

56. Ibid., p. 79.

57. Community Planning Services, "Truro (MA) Comprehensive Plan - 1969," Boston MA.

58. Massachusetts Coastal Zone Management Office, "Massachusetts Coastal Zone Management Plan, Atlas of Resources," 1978, Boston MA

II.A.3 - The Scenic Rivers Program

59. Massachusetts Department of Environmental Management, "Description of the Scenic Rivers Program," 1984, Boston MA.

60. "The Cape Codder," (Orleans MA), newspaper, 1 December 1978, p. 6.

CHAPTER II.B - RIVER MANAGEMENT - INVENTORY & RECOMMENDATIONS

II.B.1 - Land Ownership

61. Truro Conservation Trust files, County Road, North Truro MA. In the event of the dissolution of the Trust, all properties would be transferred to a similar conservation organization, such as the Massachusetts Audubon Society.

62. Pamet Harbor Committee, Town of Truro, Minutes, 1978.

63. Personal communication, Oscar Doane, Superintendent, Cape Cod Mosquito Control Project, Hyannis MA, March 1985.

64. William Worthington, "Remarks about the Mill Pond," Truro Conservation Trust files, March 1986.

II.B.2 - Land Use

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66. Truro Conservation Trust, "An Analysis of the Fiscal Impact of Subdivision Development of the Cronin Property, North Truro MA," 1985, Truro MA.

67. Pamet River Greenway Committee analysis. See also Appendix G.

CHAPTER II.B.3 - WATER QUALITY RECOMMENDATIONS

II.B.3.a - Introduction

68. Personal communication, Warren Kimball, Massachusetts Division of Water Pollution Control, 31 October 1985. See also, Massachusetts Department of Environmental Quality Engineering and Division of Fisheries and Wildlife, "Massachusetts Stream Classification Program," July 1982:

Pamet System = Cape Cod Coastal Drainage Area 96
Pamet River = Code #61725
Little Pamet River = Code #61750

69. Cape Cod Planning and Economic Development Commission, "Draft 208 Areawide Water Quality Management Plan," 1978, Barnstable MA, Chapter 7, p. 41.

70. Pamet River Greenway Committee analysis of Truro Board of Health Septage Coupon Log, May 1979 to January 1985.

71. Personal communication, John Mendes, Massachusetts Department of Environmental Quality Engineering, March 1985.

72. George Heufelder, Barnstable County Health and Environmental Department, "Bacteriological Quality of Shellfish Harvesting Areas in Barnstable County, Mass., 1984", Barnstable MA, p. 4. See also, Heufelder, "Preliminary Data Report on the Lower Portion of the Pamet River," 1985.

73. Mark H. Robinson, Metropolitan Area Planning Council, "Runoff and Recharge: Improving Ground Water Quality Through Alternative Drainage Designs," Boston, 1983, p. 9.

74. Pamet River Greenway Committee analysis of Barnstable County Health and Environmental Department files, 1984.

75. Op. cit. Note 3, p. 20.

76. Marine Research Inc., "Progress Report: Pamet River Study," Falmouth MA, July 1985.

77. Truro Board of Selectmen, "Letter to Wendy Franklin, Mass. Coastal Zone Management," 4 May 1978, Cape Cod Planning and Economic Development Commission files.

78. Massachusetts Division of Water Pollution Control, "Cape Cod Water Quality Management Plan," 1976, Westboro MA, p. 23.

79. Nashua River Watershed Association, "Squannacook River Protection Plan," Fitchburg MA, 1984, p. 8.

80. Op. cit. Note 76.

CHAPTER II.B.4 - DITCHING AND DIKING

81. Op. cit. Note 12.

82. Op. cit. Note 3, p. 25.

83. Op. cit. Note 12.

84. John Portnoy, Michael Soukup, National Park Service, "From Salt Marsh to Forest: The Outer Cape's Wetlands," in "The Cape Naturalist," Brewster MA, 1982, p. 33.

85. Personal communication, Evelyn Young, Cat Island property owner, 1985.

86. W.J. Latimer et al, U.S. Department of Agriculture, "Soil Survey of Norfolk, Bristol, and Barnstable Counties, Massachusetts," Washington DC, 1924.

87. Op. cit. Note 12.

88. Pamet River Greenway Committee, "Pamet River Opinion Survey," 1985. See Appendix B, Question 17.

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90. David G. Aubrey, Graham Giese, Woods Hole Oceanographic Institution, "Quantitative modeling of effects of tide gates on circulation and sedimentation in a coastal lagoon," (proposal to Sea Grant Program), Octoer 1985.

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94. Op. cit. Note 13, p. 926.

95. John B. Dyer, "Truro on the Cape," in "Cape Cod Magazine," December 1921, p. 7.

96. Osborne Ball, "Ballston Beach," (high school graduation speech), Truro, 1914. (Collection of the Truro Historical Society.)

CHAPTER II.B.5 - PAMET HARBOR

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98. Personal communication, Public Information Officer, Army Corps of Engineers, Waltham MA, 3 February 1986.

99. Personal communication, J. Michael Hickey, Massachusetts Division of Marine Fisheries, 4 September 1985.

CHAPTER II.B.6 - SHELLFISH MANAGEMENT

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CHAPTER II.B.7 - SCENIC VALUES

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CHAPTER II.B.8 - RECREATION

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111. "The Provincetown Advocate," newspaper, 9 August 1984, p. 31

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APPENDICES

APPENDIX A

"Celebrate the Pamet": Schedule of Public Events, 1985

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APPENDIX A

Pamet River Greenway Committee
Truro Conservation Trust

CELEBRATE THE PAMET

SCHEDULE OF EVENTS

The Pamet River Greenway Committee of the Truro Conservation Trust is sponsoring a series of special events celebrating the importance of the Pamet River to the history and future of Truro. This program is intended to highlight the need to protect the Pamet's water quality, scenic beauty and recreational opportunities. All events are open to the public and free of charge unless stated. Please contact the Truro Conservation Trust for further information (487-0167).

July 15
Monday
9:30 am
Fishnet Bldg.
N. Truro

CHANGES TO THE PAMET RIVER SYSTEM - 1620 to 1980
Mr. Mark Mello, Biologist with the Provincetown Center for Coastal Studies, will present the Center's findings on the geological and physical changes to the Pamet River since colonization. This presentation will be offered during the regular meeting of the Greenway Committee.

July 20
Saturday
11 am
Pamet Harbor
(Rain date-
July 21)

PAMET RIVER CANOE DAY - I
Join naturalist guides and other canoeists for an exploration of the tidal stretch of the Pamet River. A trip upriver in the morning and downstream in the afternoon will be timed to benefit from favorable tidal currents. Meet at the harbor parking lot (end of Depot Rd.) at 11 am for trip to Wilders Dike (Post Office) or 2:30 pm for the return trip or enjoy both. Lunch will be held on the town park across from the Post Office. Bring your own canoe or call the Trust to reserve a canoe (487-0167).

July 24
Wednesday
10 am
Corn Hill
Parking lot

PAMET HARBOR WALK
Dr. Charles S. Davidson, Chairman of the Truro Conservation Commission, will lead a walk from Corn Hill Beach to the mouth of Pamet Harbor. This dynamic area includes salt marsh, dunes, beach, the railroad dike and the ancient Pamet inlet. Shoaling and erosion problems will be addressed. (A town beach sticker or $ 1.00 parking fee is required to park at Corn Hill Beach.)

July 25
Thursday
8:30 pm
Race Point
Visitor Center
Provincetown

PAMET RIVER HISTORY AND GREENWAY PROJECT
Mark H. Robinson, Executive Director of the Truro Conservation Trust, will provide a slide presentation discussing the importance of the Pamet River to Truro and current attempts to protect the river. This Evening Program is co-sponsored by the Cape Cod National Seashore.

July 29
Monday
9:30 am
Fishnet Bldg.
N. Truro

PRESENTATION OF GREENWAY OPINION SURVEY RESULTS

In May 1985 the Pamet River Greenway Committee solicited opinions from Truro residents and summer visitors on use of the river as a recreational resource, perceived threats to the river and the need to protect the river's resources. At this regular meeting of the Greenway Committee, the results of the poll and their implications will be discussed.

August 12
Monday
9:30 am
Fishnet Bldg.
N. Truro

PUBLIC FORUM ON THE FUTURE OF PAMET RIVER

An open forum will be held during the regular meeting of the Pamet River Greenway Committee for members of the public to voice their concerns about the river. Among topics to be discussed: Should the harbor be dredged? Should culverts be opened to tidal flow? Are controls on development sufficient to prevent pollution of the river?

August 17
Saturday
11 am
Pamet Harbor
(Rain date-
August 18)

PAMET RIVER CANOE DAY - II

Same schedule as July 20 Canoe Day. Please call Truro Conservation Trust (487-0167) to reserve a canoe or bring your own.

August 20
Tuesday
8 am
Corn Hill
Parking lot

PAMET RIVER BIRD WALK

Robert Prescott, Director of the Wellfleet Bay Wildlife Sanctuary, will lead a bird walk on Gull Island (south of Corn Hill) enjoying shorebirds and their habitat. The tern nesting areas of Gull Island will also be discussed. (A town beach sticker or $ 1.00 parking fee is required to park at Corn Hill Beach.) This activity is co-sponsored by the Massachusetts Audubon Society.

August 21
Wednesday
7:30 pm
Congregational
Church, Truro

PAMET RIVER GREENWAY PROJECT

Mark H. Robinson, Executive Director of the Truro Conservation Trust, will provide a slide presentation of the Pamet River and discuss the Greenway Plan to protect the river.

August 22
Thursday
4 pm
Pamet Harbor
Yacht Club

TRURO CONSERVATION TRUST ANNUAL MEETING

The Honorable Paul V. Doane, State Senator for Cape Cod and the Islands, will be the featured speaker at the Summer Meeting of the Trust's membership. Senator Doane will discuss the Barnstable County Land Bank Bill, which he is sponsoring in the General Court.

August 23 Friday 4:30-7:30 pm Highland House N. Truro

OPENING OF PAMET RIVER ART SHOW

Free wine and cheese reception opening an Art Show celebrating Pamet River, featuring works by local artists. Recent paintings by artists from the Castle Hill Center for the Arts and children from the Truro Summer Recreation Program will be exhibited alongside historical paintings and photographs from private collections. This exhibit is co-sponsored by the Truro Historical Society.

August 25 -30 10 am - 5 pm Highland House N. Truro

PAMET RIVER ART SHOW

The Art Show will continue all week during the regular operating hours of the Truro Historical Society's Highland House Museum. (Admission fee for the Museum and Art Show is $ 1.00.)

PAMET RIVER GREENWAY PROJECT

In 1978 the Commonwealth of Massachusetts classified forty rivers in the state as Scenic Rivers. These rivers are considered important due to their history, scenic beauty, recreational opportunities and water quality. Pamet River and Mashpee River were the only rivers selected as Scenic Rivers on Cape Cod.

In 1984 the Truro Conservation Trust was awarded a $ 10,000 grant from the Massachusetts Department of Environmental Management to produce a comprehensive management plan for Pamet River. This Greenway Plan is designed to protect the unique features and quality of the Pamet (including Little Pamet, Eagles Neck Creek and Pamet Harbor) and promote proper recreational use of the river. The Truro Conservation Trust has formed a Greenway Committee, composed of town officials, Trust members and concerned residents, to formulate the plan. The Greenway Plan will retain town control over management of the river.

The Truro Conservation Trust is cooperating with other groups to develop the Greenway Project. The Cape Cod National Seashore is conducting studies to determine the effects of eutrophication and salt water intrusion in the upper Pamet (east of Route 6). The Provincetown Center for Coastal Studies has completed a report commissioned by the Trust, presenting an overview of the physical changes to the Pamet River Valley since colonization in the 1600's. Water quality studies are being performed by the county and state. An opinion survey has been mailed to every Truro taxpayer soliciting their concerns about the river and almost 600 responses have been received. The Pamet River Greenway Committee will incorporate the findings of these studies in developing a management plan for the river. Town approval of the plan will be necessary to implement Greenway recommendations.

The Greenway Committee meets Monday mornings (9:30 am) twice a month at the Fishnet Building in North Truro Center. Please join us. Call the Truro Conservation Trust (487-0167) for more information.

III. Initial Question: How far upstream will tidal flow extend if dikes are removed? If tidal penetration is insignificant, then it may not be worth the cost of removing dikes.

A. Historical data (How far upstream did tide reach before obstructions?)
1) PCCS study
2) Cape Cod Mosquito Control Project data
3) Marsh corings?
4) Personal observation of previous salt marsh extent

B. Mathematical/Engineering Formula
1) Channel geometry
a) low gradient encourages tide
b) twists and turns hamper tide
c) natural bottleneck at mid-river?
2) Freshwater discharge - low volume in Pamet may encourage tide
3) Tidal range - 9 to 10 feet in Pamet may encourage tide
4) Height of freshwater swamp in upper Pamet

IV. Consequences of Conversion

A. Hydrological Effects
1) Ground water and surface water interrelated
2) Tide will cause division of aquifer now connected through upper Pamet (see ground water contour map).
3) Strong tidal flow may result in greater mixing of transition zone. (Less dense fresh ground water floats above salt ground water.) Possible upward migration of salt lense.
4) Water wells may become contaminated by salt water intrusion.
a) Sodium levels in wells near Pamet are now generally low (see map).
b) Two-percent seawater mixed with fresh ground water can exceed federal limit for total dissolved solids in drinking water.
c) Very slow process for salt-contaminated aquifer to cleanse itself; possible abandonment of wells.
d) Problem could be exacerbated by new home construction in area. (More wells=More pumping of groundwater=Less ground water discharge to river=Less stream flow in river=Additional tidal penetration.)
e) Did older homes in area have problems with salt in wells before dikes built?
f) Well Protection Measures - all very costly.
i) move wells inland - impractical on small lots
ii) municipal water supply to serve homes
iii) construct hydraulic barriers with wells
iv) create subsurface barrier walls with clay, plastic
v) continuous monitoring of intrusion

B. Chemical Effects
1) Increase in salinity and conductivity
2) Decrease in acidity due to buffering effects of salt water
3) Greater flushing of pollutants
4) Corrosion by salt of engineering structures (steel bridges, etc.)
5) Application of road salt no longer a problem to marine receiving water

E. Recreation Effects

1) Increased opportunity for canoeing entire Pamet due to removal of overhanging shrubs, root-clogged channels in upper Pamet; canoe under bridges rather than portage across dikes.

2) Other navigation effects - see Physical Effects.

3) Swimming, shellfishing enhanced due to greater flushing of pollutants.

4) Public trust doctrine in tidelands would be expanded geographically, although already public access in lands of National Seashore.

F. Aesthetic Effects

1) Dead trunks of salt-killed trees will remain for years unless removed; denuded areas of marsh may arise and not regrow.

2) Visual appreciation of Pamet Valley will be enhanced; river less fragmented into segments by dikes.

G. Historical Effects

1) River restored to natural state known to Indians, Pilgrim explorers and early European settlers.

2) Geologists regain integrity of archetypal pamet.

H. Economic Effects

1) Cost of dike(s) removal; who pays?
2) Cost of bridge(s) construction; who pays?
3) Flood insurance
4) Liability for salt-contaminated wells
5) More acreage available for commercially-valuable fish and shellfish
6) Less maintenance costs by Mosquito Control
7) Increased recreational use of river by vacationers, i.e., tourist dollars spent in town.
8) Canoe rental business opportunity?

I. Other effects

1) more

2) much more

31 twists through the meadows, below...;..white perch were plentiful in this river at the time. To the north we see a few more farms and more grazing cattle. Along the far edges of the meadows, several large plots of swamp land have been plowed, but have not been planted as yet...We see very few homes in this area.

Reaching Castle Road again, we turn left, heading now toward the State Road (old Route 6). We cross the dike over the meadows, which was sometimes called "Phil Ryder's" dike.

45 (Railroad work crews) would be employed at such things as replacing piling and timbers on the (RR) bridge as well as renewing planking on the bridge's pedestrian walk, guard rail repairs and so forth.

52 (Washouts of RR track): In late Dec 1909, there occurred a very "high course" tide, accompanied by rain and wind. The Pamet River waters rose higher and higher against the banks of the railroad...at "Ned Pearson's Crossing."...the waters of the river breached the roadway and washed the roadbed away for a distance of several hundred feet, then flooded the meadows as far east as the dike which today crosses...at Mill Pond Rd. ...A thorough investigation...of the railroad's right-of-way was made and it was found that in each case not enough "rip-rap" of rock was on the lower part of the railroad banks. This situtation was remedied and the railroad experienced no further trouble from this source.

120 Occasionally, on a warm summer's afternoon a group of us boys, including my brothers, would stop at the well (on Depot Rd.) on our way home from an afternoon of swimming at "Roger's Landing" on the Pamet, which was located at the first bend of the river from what is now "Sladesville" and going toward "uptown".

123 ...much fish and shellfish was eaten in those days since they were easy to come by. Fish would often be obtained free dusring the fishing season for the asking...from the fishermen...Some people were able to obtain eels from the Pamet River by spearing...

132 From early spring until late autumn, some people engaged in fishing, but to be truthful, I do not recall that there was much freshwater fishing done in Truro's various ponds or in the Little Pamet or the upper reaches of the Pamet River in those days, except perhaps by outsiders. (Most people preferred saltwater fishing.)

144 All farm gardens, both large and small, were usually fertilized with barnyard manure, which was sometimes composted with sea weed or cordgrass (Spartina alterniflora) which was obtained along the shores of the Pamet River. Cord grass, a tall reed-like grass, grows along the banks of the Pamet River proper and along the banks of some of the smaller streams which feed into the Pamet River. As it dies, it gradually becomes detached from where it grows and is cast ashore where it gradually dries.

Swamp or meadow gardens were usually planted late in the spring, after the land had dried out sufficiently. They were usually prodigious producers of various kinds of vegetables....(swamp gardens often ravaged by woodchucks).

145 Another large dealer in milk in the town was Alexander A. Francis, whose combination dirt and dairy farm, was located in Longnook, just off of present Route 6 and west of Longnook Valley Road, just above the meadows of the Little Pamet.

United States Department of the Interior

NATIONAL PARK SERVICE

CAPE COD NATIONAL SEASHORE
SOUTH WELLFLEET, MASSACHUSETTS 02663

IN REPLY REFER TO:

April 14, 1986

Mr. Mark Robinson
Greenway Project Manager
Truro Conservation Trust
P.O. Box 327
Truro, MA. 02652

Dear Mark:

Thank you for allowing us to review the Draft Pamet River Greenway Management Plan. It is obvious that you have put a lot of effort into the plan which is generally well thought out and clearly stated. In addition to the comments we have already discussed at length, Ken Shea, Mike Whatley, and Frank Ackerman offer the following:

The Pamet Cranberry Bog trail is not only the Seashore's only trail interpreting the cranberry industry, it is the only facility of any kind dealing with this subject anywhere in the county.

The Historical American Building Survey (HABS),(the joint NPS, Library of Commerce, American Institute of Architects project) found some 60 houses that warranted documentation. Half of them are within the Greenway area. Since this field work was conducted in the 1950's - 60's it perhaps should be mentioned in "Recognition" if not in Sec. M (p 14, 15, and 18). As I suggested to you earlier, Mike Whatley can provide you with additional information on the HABS.

Regarding your statements on the Pamet Cranberry Bog:

> The log house, in Ken's opinion, is worthy of use as an exhibit structure. However, it was nominated to the register of historic places but was not found to be significant (due to its condition), although it is a HABS structure. The condition of the structure is, unfortunately, very poor and due to current funding constraints is unlikely to change. If an alternate source of funding could be located perhaps it could still be preserved and maybe utilized in the same manner as Old Harbor Station is now utilized.

I hope our comments have been helpful. We look forward to reviewing the final management plan.

I have enclosed a copy of the cover page for the Barrier Islands Newsletter which provides an update on the Coastal Barrier Resource Act. Also, if you would like copies of the enlarged USGS topographic maps, we have received the diazo paper (I left a message on your answering machine earlier). Good luck with the plan.

Sincerely,

/Barbara A. Samora

Barbara A. Samora
Resource Management Specialist

The Commonwealth of Massachusetts
State Reclamation Board

CAPE COD MOSQUITO CONTROL PROJECT

CAPE COD CIVIC BUILDING
149 FALMOUTH RD.
HYANNIS, MASS. 02601
TELEPHONE (617) 775-1510
775-1668

OSCAR W. DOANE, JR.
SUPERINTENDENT

JOHN W. DOANE
ASSISTANT SUPERINTENDENT

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SECRETARY-TREASURER

March 13, 1986

Mark H. Robinson
Executive Director
Truro Conservation Trust
County Road
Box 327
North Truro, Massachusetts 02652

Dear Mark:

John and I have gone over the Management Plan as you suggested. I am enclosing the original which you sent us with a few changes written in and some x'ing out of existing statements. For an example, mosquito control has not built dykes to convert salt water to fresh water outlets. The matter of hand labor cleaning ditches versus machinery apparently is not understood by some of your associates as well as it should be.

The mechanical means we use for this work is specialized equipment, very low ground pressure, and in many instances can travel across the marshes where men cannot walk. A request that all work be done by hand in this day and age is practically saying that we don't want mosquito control work in this area for the simle reason that we are all aware of the man power shortage in work such as ours.

Your thoughts about the intrusion of salt water, the lessening of tide gates, are all appropriate and we are in agreement with them. The one other matter is that there are many species of mosquitoes in Pamet River, and one particular maintenance program will not free the area of mosquitoes.

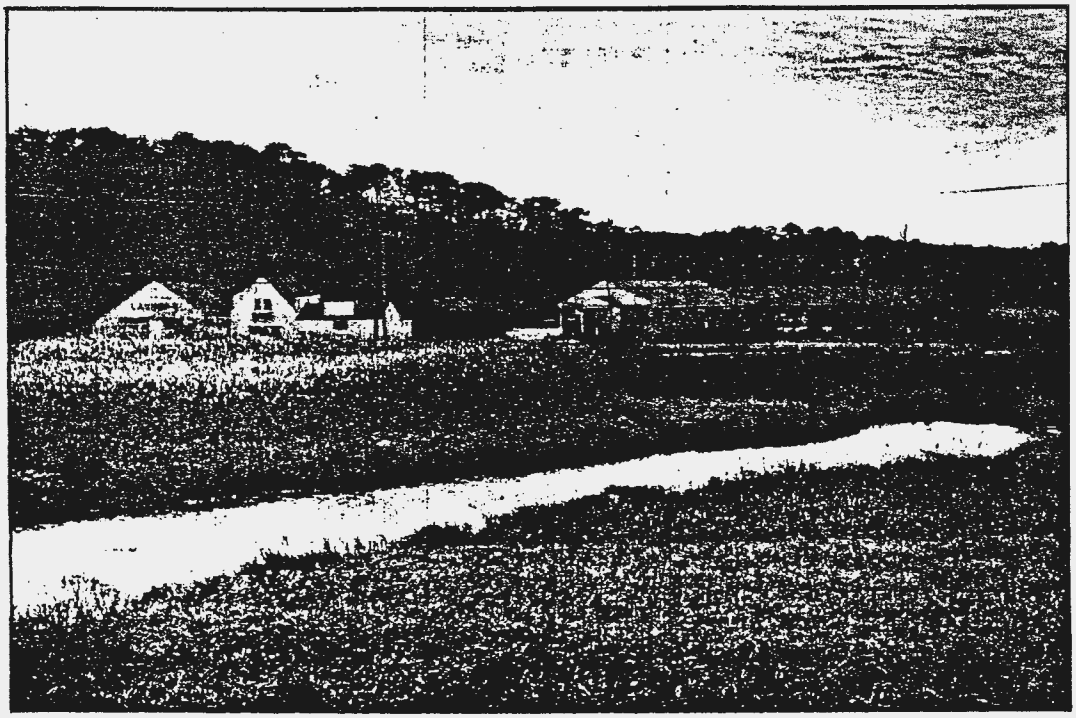
We will be available for whatever we can do to help you and your committee to maintain Pamet as a beautiful natural area. Your presentation before the group at Truro Town Hall was very well done. I would like to be present if more of these meetings are arranged.

Sincerely,

Oscar W. Doane, Jr.
Oscar W. Doane, Jr.
Superintendent

Tuesday, December 31, 1985
The Cape Codder

Probe Of Pamet River Pollution Started By Selectmen In Truro



The Pamet Mall In Truro Center. TCC/COHEN

By Bruce Cohen

An investigation into septic systems and other possible sources polluting the Pamet River—including a laundromat in the center of town—has been launched by the Truro selectmen.

The river was closed to shellfishing by the selectmen earlier this month because of high coliform counts (an indication of bacteria levels) found by the state's Department of Environmental Quality Engineering (DEQE). The state tests eight areas of the river.

"Just exactly who's doing what I don't know, though I do intend to find out," said Truro Selectman and Board of Health chairman Mark Peters. There are some "grossly inadequate" septic systems along the river, Mr Peters added.

Although the levels from the DEQE's last test, taken December 18, were "way down" from the previous test, taken a month earlier, they are still in some cases higher than acceptable limits. The DEQE will test the river again in January and, if the levels remain higher than the limits, may enforce a shellfishing ban that would supersede the selectmen's closure.

The possiblity of a DEQE-enforced closing, which would start as a temporary ban but lead to a stricter ban if high levels persisted, has caught the attention of town officials. Once the DEQE imposes a strict closing, it can take years to get a shellfish bed reopened.

"You address these things one step at a time," Mr Peters said recently. "And that's exactly what we're doing now. We are pursuing it." The Conservation Commission voted unanimously two weeks ago to urge the selectmen to investigate pollution sources contaminating the river.

Coastal geologist Mark Robinson, director of the Truro Conservation Trust, is also studying the river as part of a $10,000 Greenway grant awarded the Trust last year. Mr Robinson's management study, which he said is 85 per cent complete, contains sections on shellfish management and water quality. He dropped those sections off in the Selectmen's Office a few weeks ago.

Several Possible Sources

Failing septic systems, storm water runoff from roads, boats and other marina activity and waterfowl are thought to be the most common sources of pollution. For now, however, the selectmen are concentrating on the septic systems along the river's banks.

The selectmen plan to review septic system pumping records of property owners on the banks of the Pamet. "If we see pumping done every month, then we know we have a failing system," Selectman Bruce Tarvers explained. Mr Peters added he will "start on that immediately."

The subject of several complaints from Truro residents is the system owned by Joseph Schoonejongen, which discharges washwater from his laundromat at the Pamet Mall in Truro center. The selectmen are investigating whether Mr Schoonejongen's system is legal.

In a letter written December 17, the DEQE's Boston office wrote, "please be advised tht we have no record of any permits being issued to the facility by DEQE. As far as we know, the laundry has no approval for its waste system, nor has it made application for a groundwater discharge permit"—both of which must be issued before the laundromat can reopen next spring.

"It certainly doesn't meet any of the recent criteria for laundromats," Mr Tarvers said recently, "but it's always been treated as pre-regulation"—in other words, grandfathered as a preexisting use.

Friday morning, the selectmen reviewed the laundromat's three-inch-thick file that dates back to the early 1970s. The file contains a few past attempts by Truro Boards of Health to force the laundromat to close. Some of those efforts ended up in court, with Mr Schoonejongen the apparent victor. For that reason, the selectmen have asked town counsel to instruct them on how to proceed.

"That's some file," Mr Tarvers said. "This has been going on forever."

Mr Peters added, "Believe me, there's no vendetta involved in this situation." Whether Mr Schoonejongen's system is causing any pollution at all is "open to a great deal of debate," he said. Given the history of the laundromat, the selectmen said they were shocked the DEQE has no record of its septic system. □

M. H. Robinson
21 February 1985

OPENING PAMET: Possible Changes due to Re-Introduction of Tidal Flow to Pamet River System

I. Introduction

The Pamet River system has been changed drastically by human interference. Dikes, fill and culverts for roads and construction have altered the river's flow patterns, tidal prism, salinity and upstream vegetation. The Provincetown Center for Coastal Studies is preparing a report to document how and when these changes occurred. The PCCS study will not make recommendations on whether further alteration is desired, but there seems to be wide support in Truro for a conversion of the Pamet system back to a more natural state by removing man-made obstructions to the river's tidal flow.

The purpose of this discussion paper is to try to identify the range of consequences that must be considered if the Pamet Greenway Committee--and the town in general--wishes to pursue the opening of the dikes and the alteration of the Pamet. While this discussion may be premature--in anticipation of the PCCS study--it is important for the Committee to begin to think about what promises to be a long, long process.

II. General Points to Consider

A. Major changes to an ecosystem require in-depth study before local, state and federal regulatory agencies will approve the project.

B. Truro can use the re-opening of Wellfleet's Herring River dike to tidal flow as a parallel situation. Specific studies will have to conducted on the Pamet, but we can use the Herring River experience as a precedent, procedurally and environmentally.

C. Support from the National Park Service is vital because most of the upper Pamet (east of Route 6) falls under Cape Cod National Seashore jurisdiction and that area will be most affected.

D. The major opposition to a re-opening of the Pamet will likely come from two sources:

1) Landowners abutting the river concerned that tidal flow will flood their homes, septic tanks, and/or wells.
2) Local officials and taxpayers <u>if</u> town money must contribute significantly to effect the change.

E. Changes in the river's environment will be short-term and long-term. Also, changes will take place downstream as well as upstream with increased tidal flow.

F. The Pamet has many different obstructions and, in some areas, dikes in succession (Route 6 and Wilders Dike). Removing one dike without removing its partner may not yield the intended result.

Massachusetts Natural Heritage Program

February 3, 1986

Mark Robinson
Executive Director
Truro Conservation Trust
Box 327
North Truro, MA 02652

RE: Pamet River Management Plan

Dear Mr. Robinson,

Thank you for contacting the Massachusetts Natural Heritage Program regarding the Pamet River Management Plan. Our staff has reviewed the draft section on Flora and Fauna; overall, it looks fine, but we'd like to make a few comments.

I am enclosing the draft pages with minor corrections. Scott Melvin, the Program Zoologist, has suggested omitting the two sentences on the "Pamet Puma", since this is an unsubstantiated record.

I am also enclosing definitions of the terms Endangered, Threatened, and Special Concern. As you can see, the term "rare" is very general, and encompasses all three categories. I have listed the State Ranks of the plants and animals mentioned below, and suggest that you incorporate these more specific classifications into the final plan:

Species	State Rank
Charadrius melodus	Threatened*
Sterna antillarum	Special Concern
Opuntia humifusa	Special Concern
Ophioglossum vulgatum	Threatened
Helianthemum dumosum	Special Concern
Corema conradii	Special concern

*Also recently listed by the Federal Government (USFWS) as Threatened.

Please note that only breeding locations of rare animals are considered occurrences by the MNHP; a casual sighting of an over-wintering or migrating bird would not be counted in our inventory. Therefore, although the other rare birds which you have mentioned (Great Blue Heron, Marsh Hawk, Osprey, Laughing Gull) may have been seen on the Pamet, we are not aware of any confirmed breeding records.

Also, the Least Tern and the Piping Plover were not observed breeding at the Pamet River mouth in 1985.

I hope youwill contact me or Henry Woolsey if we can be of further assistance.

Sincerely,

Joanne Michaud

Joanne Michaud
Environmental Reviewer

JM/jm
Encl.

148 (Edgewood Farm) off Route 6, just south of the present P.O...operated by Manuel Corey...raised excellent peaches. He also raised excellent strawberries on a plot of ground at Fratus Bend on the river bank of South Pamet Road, just east of the present highway overpass...

173 Cranberry bogs: @ Head o' Pamet North: large, well-kept
Mill Pond: small
five at Fisher Beach off Fisher Rd: quite small

178 Muskrats were trapped at many places in the meadows which bordered the upper Pamet River and the meadows in the Mill Pond area and at South Truro, (in late autumn and winter.)

246 I recall a swamp fire near the upper Pamet River just east of Fratus Bend off South Pamet Road, which smouldered for several weeks, due to the large amount of peat which was afire there.

(See also Chapter 18, "River, Bay and Ocean Fishing.")

TRURO, CAPE COD, AS I KNEW IT, by Anthny L. Marshall, Vantage Press, NY, 1974.

Pamet River References

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3 Pamet Harbor in those days presented quite a different appearance than it does today. At the eastern end of the present day parking lot at the harbor and close to the main line of the railroad, there was a railroad siding of some length-- long enough to hold several railroad cars! A little beyond the land sloped sharply to the river. Looking due west and then south west, from this point, one would see only marshland which terminated in a continuous ridge of sand dunes, coming up from the left and then extending to the mouth of the Pamet River, at Corn Hill. Much of this marshland was later filled in with sand which had been dredged up from the new channel bottom.

The present day boat basin simply formed a south branch of the Pamet River. It has been said that the official name of this branch was "Eagles Nest Creek" but in my day, it had always been called "Jim Brown's Creek." Over to the left, of the present day boat basin and near the water's edge, on a far knoll, was "Jim Brown's" boat house.

10 Some of the cart roads would lead to such places as hay meadows, to wood lots, to farm gardens and/or to the shores of the Pamet River for the transporting of small boats, commercial eel fishing or for salt meadow haying.

11 One could also go from present-day Holsbery Road to old Route 6, via Dangerfield Road. What today is known as Holsbery Road was actually the south extension of Bridge Road, with the Pamet River separating the two sections of Bridge Road. This was many years before the time of my story (c. 1910)....Over the south section of Bridge Road,...People from a wide area of South Truro would drive over this road, and crossing over Depot Road at what today is known as Holsbery Square, they would continue on over what is now a private way and they would shortly arrive at a little cove on the south bank of the Pamet River. There, they would tether their horses and then they would proceed on foot over a foot bridge which crossed the meadows at that point, arriving at the far side at the foot of the north section of Bridge Road. They would then make their purchases from the local butcher and/or grocery cart which was awaiting them....This bridge obviated the necessity for these people making the long circuituous route up South and North Pamet Roads in order to reach the other side of the Pamet River. To this day (1974), some of the old bridge pilings remain in the meadow, showing one the approximate route of this bridge!

22 At this point, a dirt road goes over to Eagles Neck, which is the small neck of land jutting out into the Pamet, just south of the present Pamet Yacht Club...Skirting the meadow, we at last cross the very dike which once held back the original "Mill Pond" Here, the old grist mill operated many years ago, before the advent of the railroad in 1872.

30 ...the "Little Pamet," once known as "Hopkins' Creek." It was originally a branch of the Pamet River, but it is now a fresh water river.

As we follow along this small, twisting river, we can see one of the town's ice houses on the far side of the river. Here, each winter, when there is ice of sufficient thickness, many tons of it are harvested and stacked away in the ice house and carefully covered over with hay to dealy the melting of the ice. The inner walls of these old time ice houses were filled with sawdust between the studding...Ice was used for packing fish...

31 (from Corn Hill) the view of Pamet Harbor, the Truro Hills and the bay is superb! We also get an excellent view of the Little Pamet as it turns and

C. Physical Effects

1) Flooding Risks
   a) need to know elevations of existing homes; aren't most older homes high up on slopes?
   b) National Flood Insurance Maps would have to be changed to include more property in Pamet floodplain.

2) Potential for increased speed of river currents
   a) Greater scouring of silt in present low-flow areas of Pamet
   b) Reduction in shoaling at harbor mouth
   c) Navigation concerns - can small vessels, particularly sailboats and canoes, handle additional tidal velocity?
   d) Increased erosion potential of marsh banks, perhaps resulting in more bulkheads or retaining walls by homeowners

D. Biological Effects

1) Salt marsh is more productive in biomass than fresh swamp and saltwater species (e.g., shellfish) tend to be more economically valuable, but it is difficult to make a value judgement on which environment is intrinsically "better". Does this area of Truro need a freshwater swamp for greater diversity of wildlife?

2) Vegetation
   a) Probable change from cattail and Phragmites (reed) and shrubs to Spartina salt marsh if marsh elevation conducive; how long will changeover take?
   b) Salt will kill trees and shrubs which now encroach on river and are turning river into impassable swamp.
   c) No rare or endangered species of plants have been identified to date in the upper Pamet by the state's Natural Heritage Program but further examination would be needed.

3) Fish and Wildlife
   a) The most important fish species of recreational value now inhabiting the upper Pamet are brook trout and a few brown trout. These should not be affected by increased salinity because they are sea-run trout. Trout appreciate increased flow, oxygenation.
   b) Other fish found in upper Pamet, including yellow perch, pumpkinseed sunfish, tesselated darters, may be affected (Source: Joe Bergin, Mass. Div. of Fish and Wildlife).
   c) Wood ducks? Muskrats? etc.
   d) Detailed survey of fauna needed.

4) Mosquito Control
   a) Cape Cod Mosquito Control Project supports opening dikes because salt marsh is easier to manipulate for mosquito control (tide, not rain and poor drainage, becomes the main variable), alleviating the need for pesticide application
   b) Salt marsh-breeding mosquitos are not quite as virulent as freshwater species.