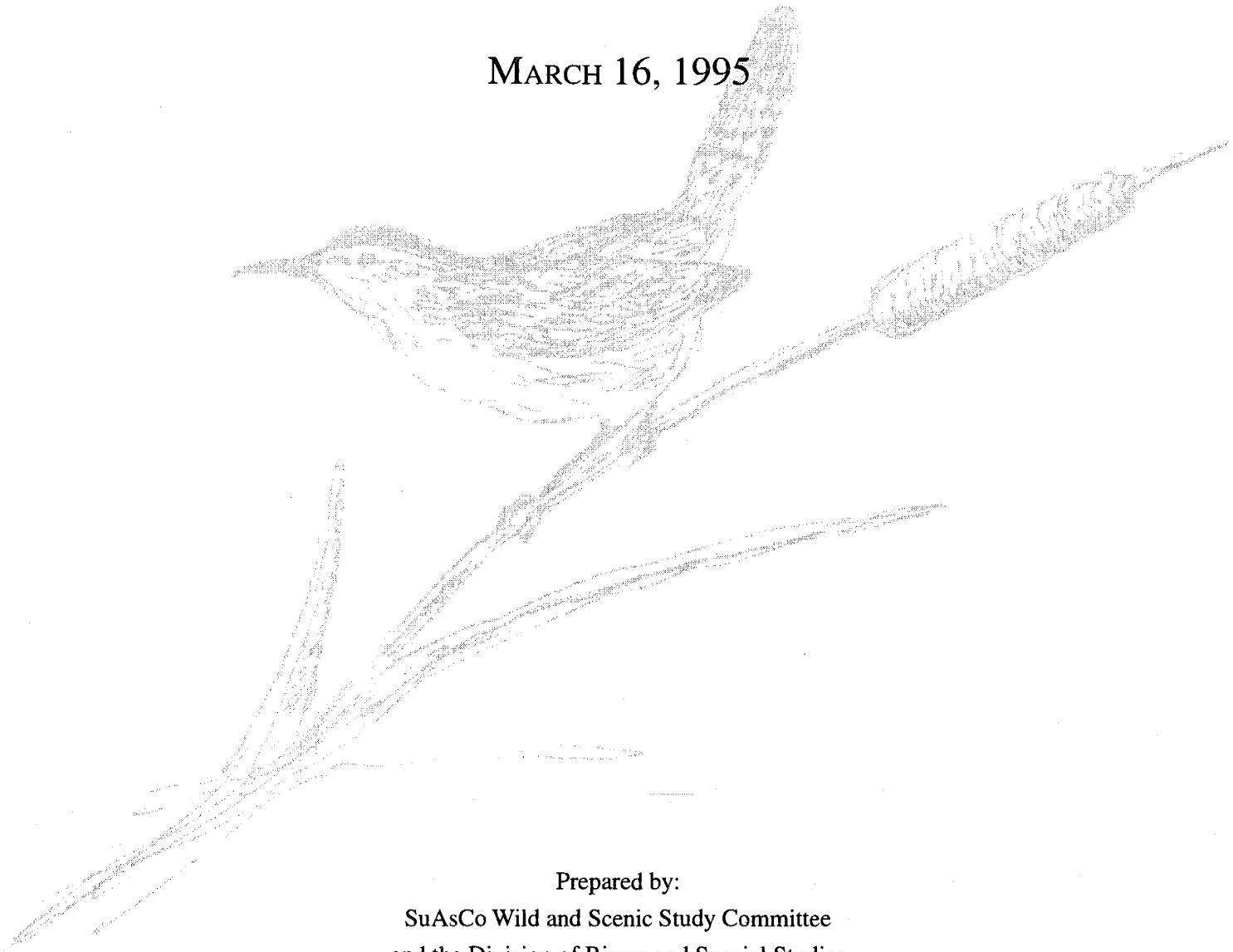
SUDBURY, ASSABET AND CONCORD WILD AND SCENIC RIVER STUDY

RIVER CONSERVATION PLAN

MARCH 16, 1995



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INTRODUCTION

The Sudbury, Assabet and Concord River Conservation Plan articulates a vision for the cooperative protection of resources along a 29-mile segment of these rivers in eastern Massachusetts. It also proposes complementary actions that might be taken upstream and downstream of this segment. The Plan was prepared as one component of the Sudbury, Assabet and Concord Wild and Scenic River Study, which was authorized by Congress in 1990 through P.L. 101-628.

The study has been conducted by the Sudbury, Assabet and Concord Wild and Scenic River Study Committee in cooperation with the National Park Service. This advisory group, created by Congress to represent major interests in the study area, includes members from the eight towns within the study area, the Commonwealth of Massachusetts, the Sudbury Valley Trustees, the Organization for the Assabet River, and the U.S. Fish and Wildlife Service. Funding and staff assistance were provided by the North Atlantic Regional Office of the National Park Service.

The Wild and Scenic Rivers Act (P.L. 90-452 as amended) does not require river management plans (as they are called in the Act) to be prepared until after a wild and scenic river study has been completed and the river designated. On some recent studies of rivers flowing through privately-owned lands in New England, however, management plans have been developed during the course of the study, with full participation by the advisory committee. This approach allows the residents of the study area, as well as state and federal policy-makers, to reach consensus on the proposed river conservation framework and protection standards before having to decide whether wild and scenic designation is an appropriate step. In addition, because this River Conservation Plan includes river protection measures that can be implemented regardless of whether the rivers are designated, preparation of the Plan during the study helps to ensure that the Study Committee's efforts will produce actual river protection results.

This Plan is the product of months of concerted effort by the Study Committee and other river study participants. Study Committee subcommittees, a technical advisory group, and interested individuals spent many hours defining river protection issues and developing consensus on management solutions. Inevitably there were differences of opinion. These were resolved through open dialogue, both within the Study Committee and between the Committee and affected interests in the study area. The quality of the Plan reflects this process, and the document has the support of all those who were involved in its preparation.

The Plan has five parts:

1. **River Protection Philosophy**

This section describes the basic philosophic approach taken during the Wild and Scenic river

study, which guided the Plan's development. It also describes how Wild and Scenic designation would affect the study rivers, and what the implications would be for the various interests involved in river management.

2. Administrative Framework

This section describes the organizational structure that is being proposed to oversee implementation of this Plan.

3. Resource Management

This section is the main body of the Plan. It is divided into three parts: land resources, water resources, and outstanding resources. For each resource type, the proposed resource protection standard is described; necessary actions to meet this standard are laid out; and specific provisions that will take effect if the rivers are designated as Wild and Scenic are identified.

4. Watershed Management

This section describes how resource management decisions for areas outside the Wild and Scenic study corridor but within the Sudbury, Assabet and Concord watershed affect the study area. It also identifies protective measures that would enhance protection of the Wild and Scenic river corridor if the rivers are designated.

5. Education and Outreach

This section identifies a number of activities that could be undertaken to increase public awareness of the rivers' values, and of beneficial resource management techniques.

The River Conservation Plan is directed to local governments, the Commonwealth of Massachusetts, federal agencies, public water and sewer utilities, river corridor residents, river users, and others who care about the future of the Sudbury, Assabet and Concord rivers. All of these interests will have to work together if the rivers are to be protected and the Plan's goals are to be achieved.

The Plan does not contain a prescription for every situation that could confront river managers. Instead, it provides a vision for the future of the rivers and a context for interpreting and acting on future events. The Plan creates a specific mechanism — the Sudbury, Assabet and Concord Rivers Stewardship Council (RSC) — to address future management issues.

I. RIVER PROTECTION PHILOSOPHY

GOALS

The Sudbury, Assabet and Concord Wild and Scenic River Study Committee has adopted the following goals for the future protection of the rivers:

1. Conserve and enhance the Sudbury, Assabet and Concord rivers' wildlife habitat, scenery, recreational resources, historic and archaeological resources, and literary values for the benefit of present and future generations.

2. Make decisions affecting the rivers and related resources in a coordinated, holistic way, in cooperation with local governments, private property owners, and state and federal agencies.

3. Create an adaptable administrative framework that can accommodate the needs of future decision-makers.

4. Promote education and awareness; identify and study trends that have occurred and others likely to occur.

STEWARDSHIP APPROACH

These goals give direction as to what the River Conservation Plan seeks to accomplish. The means by which these goals should be met — the "how" of this Plan — are described by the following river stewardship approach.

The approach has four basic elements:

1. Resource conservation should be fully integrated with traditional patterns of use, ownership, and jurisdiction.

2. River protection should be accomplished through cooperation among riparian landowners and all public and private organizations with an interest in the river.

3. Long-term resource protection should rely on existing programs and authorities rather than on new layers of bureaucracy.

4. Future management of river resources should be based on a cooperatively-developed plan that establishes resource protection standards and identifies key actions.

This river protection philosophy is built on the assumption that, for the most part, existing river protection mechanisms are adequate to protect river resources. If a resource value has been protected by existing management, and if existing management seems adequate to address issues that can reasonably be expected to appear in the future, then the existing mechanism should be left alone. If the existing mechanism could be improved or made more efficient by better coordination or enforcement, then this should be pursued. New or stricter regulations, or other actions, should be developed only if clearly needed.

In accordance with this philosophy, the Study Committee does not intend this River Conservation Plan to pre-empt existing rights or management responsibilities. Rather, the Plan should create a common vision for the future and provide a setting for the organization of the Stewardship Council and an environment in which those concerned about the rivers can focus their collective energies to make this vision a reality.

WILD AND SCENIC RIVER CONSIDERATIONS

Legislative Guidance

The Wild and Scenic Rivers Act (P.L. 90-542, as amended) provides the legal foundation and overall guidance for the National Wild and Scenic Rivers System. The basic concepts underlying this Act, and the elements relevant to the designation of the Sudbury, Assabet and Concord rivers, are described below.

Section 1(b) summarizes the intent of the Act:

> *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.*

Section 10(a) specifies how designated rivers should be managed:

> *Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting aesthetics, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area.*

Section 7(a) describes the specific protections provided to designated rivers:

> *The Federal Power Commission [*Federal Energy Regulatory Commission*] shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act . . . on or directly affecting any river which is designated . . . and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established. . . . No department or agency of the United States shall recommend authorization of any water resources project that would have a direct and adverse effect on the values for which such river was established . . .*

Relationship Between the River Conservation Plan and Designation

Section 3(d) of the Wild and Scenic Rivers Act requires that a comprehensive river management plan be prepared for each river designated into the national system "to provide for the protection of the river values." Furthermore, as described in Section 10(a) of the Act, management prescriptions are to be tailored to meet the specific needs of the river in question. The Study Committee intends this River Conservation Plan to satisfy the requirements of Section 3(d), should the rivers be designated into the system. Thus this Plan will constitute the official framework for the future management of the rivers. As described in the **Administrative Framework** section, the Plan will be subject to periodic review and updating by the Stewardship Council to be established if the rivers are designated.

Safeguards

The Plan includes the following specific provisions to safeguard the interests of landowners and others. These provisions are consistent with the direction provided by Congress in authorizing the Sudbury, Assabet and Concord Wild and Scenic River Study and are <u>not</u> subject to change through subsequent votes of the RSC.

1. There will be no acquisition of lands or interests in land by the federal government, through condemnation or otherwise, in order to implement Wild and Scenic River designation.

2. There will be no federal management of non-federal lands. Private lands along the river will continue to be managed by their respective owners in accordance with existing land use regulations. Non-federal public lands will continue to be managed by the agencies that own those lands. Federal lands, including lands within Great Meadows National Wildlife Refuge and Minute Man National Historical Park, will continue to be managed by their respective agencies in accordance with the management plans developed for this purpose.

3. The river area outside the boundaries of Minute Man National Historical Park will not become a national park and will not be subject to the federal regulations that govern units of the National Park System.

4. No new federal permits will be required solely as a result of designation.

National Park Service Role

As demonstrated in this Plan, designation will be achieved through a non-traditional approach, with the federal government acting as a partner in river management rather than as the primary manager. The National Park Service (NPS) will serve as the key federal representative in the overall implementation of the River Conservation Plan if the rivers are designated. The agency's principal role will be to represent the Secretary of the Interior in reviewing federal projects affecting the rivers and related resources, as required by Section 7(a) of the Act. Also, the NPS may provide ongoing technical assistance, staff support, and/or any funding that may be appropriated by Congress for management of the river. Any such NPS assistance will be coordinated with the stewardship council described in the **Administrative Framework** section of this plan, and, specifically, with the U.S. Fish and Wildlife Service with respect to Great Meadows National Wildlife Refuge. The **Resource Management** section provides additional details on the National Park Service's role under the heading **Wild and Scenic River Provisions**.

Geographic Area Proposed for Designation

The segments of the Sudbury, Assabet and Concord rivers proposed for designation are those described in the study authorization legislation, namely: the Sudbury River from the Danforth Street bridge in Framingham downstream to the confluence with the Assabet at Egg Rock; the Assabet River from a point 1000 feet downstream of the Damondale dam in West Concord to Egg Rock; and the Concord River from its origin at Egg Rock in Concord downstream to the Route 3 bridge in Billerica (see Figure 1).

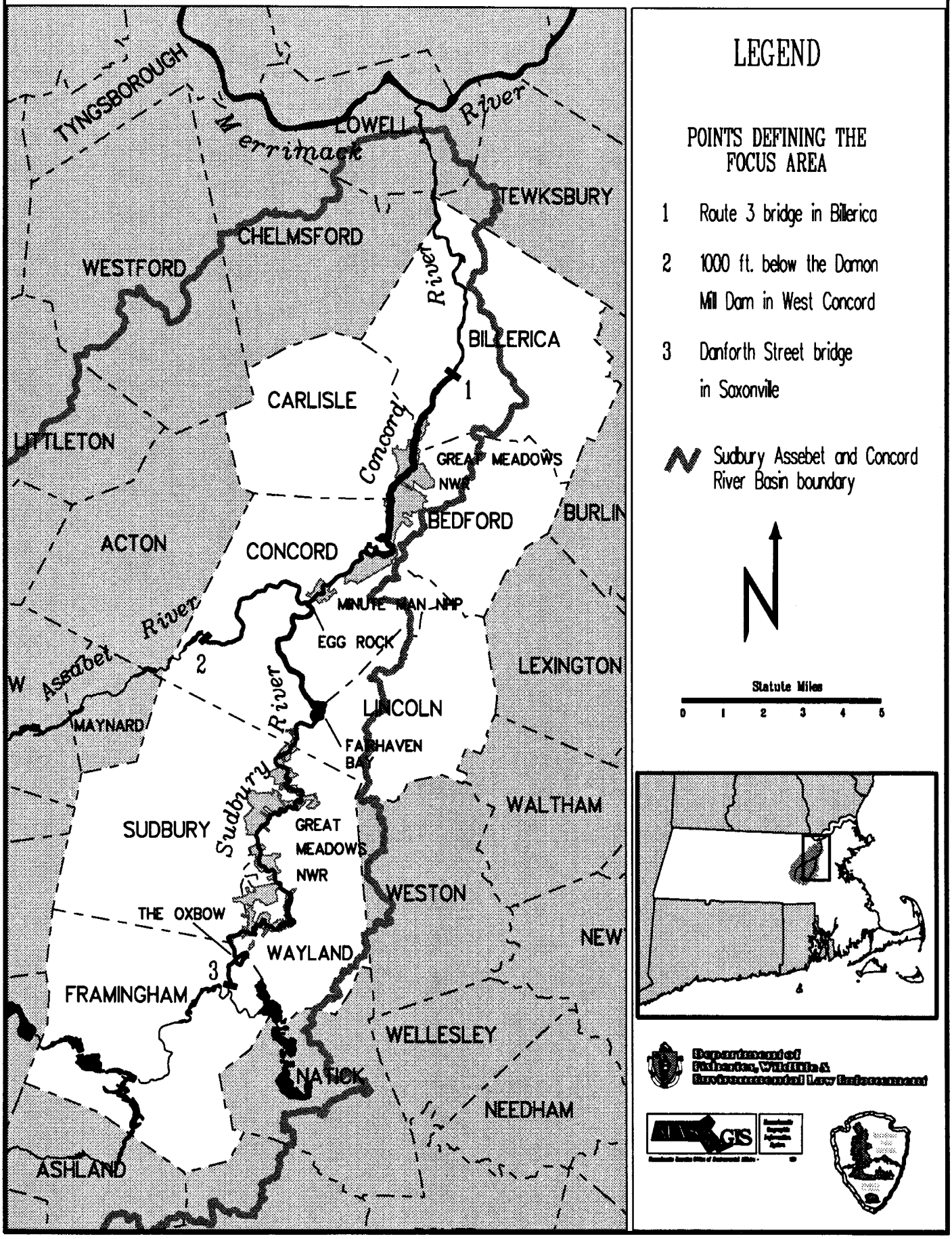
With respect to lateral boundaries, Section 4(d) of the Act specifies that the area included in a **study** should "generally comprise that area measured within one-quarter mile from the ordinary high water mark." However, there are no specific requirements regarding the minimum width of the river corridor following designation. The Study Committee has concluded that, on the Sudbury, Assabet and Concord rivers, where much of the corridor is in private ownership and where some issues — notably water quality — involve the entire watershed, defining a distinct lateral boundary would serve no useful purpose and, indeed, could be counter-productive.

Although a specific lateral boundary therefore is not established, the Plan focuses protection efforts on the river itself and the immediate riparian corridor. In keeping with the approach used in preparing the **Resource Management** section of this Plan, lands within the floodplain, immediately adjacent to the rivers' banks, or which are noteworthy in their scenic character, receive the greatest attention. For uplands outside of this area, the Plan identifies beneficial actions relating to water quality maintenance, public and private land management, and other issues.

Figure 1

SUASCO WILD & SCENIC RIVERS STUDY AREA

INCLUDING PORTIONS OF THE SUDBURY ASSABET & CONCORD RIVERS



II. ADMINISTRATIVE FRAMEWORK

OVERVIEW

This section describes a framework for the administration of the designated segments that will provide ongoing coordination and communication among the many interests involved in the Sudbury, Assabet and Concord river area.

Underlying this administrative framework is the principle that existing institutions and authorities must provide the foundation for the successful long-term protection of the Sudbury, Assabet and Concord rivers.

Landowners, riverfront communities, the Commonwealth, advocacy and user groups, and federal agencies all have active and indispensable roles in maintaining the values of the river system. These roles are described in the **Resource Management** section of this Plan. What is described in this **Administrative Framework** section is the manner in which the activities of those involved in the stewardship of the river and its corridor will be coordinated.

The administrative structure has two elements:

1. The establishment of a broadly representative committee — the Sudbury, Assabet and Concord River Stewardship Council — to link all those responsible for river management together on a long-term basis. This group will build upon the work and successes of the Sudbury, Assabet and Concord Study Committee in seeking increased cooperation among all river interests.

2. The use of agreements among the various parties in order to implement river conservation. These agreements will reinforce the current consensus to work cooperatively in implementing this Plan and in pursuing the long-term protection of the Sudbury, Assabet and Concord rivers.

SUDBURY, ASSABET AND CONCORD RIVER STEWARDSHIP COUNCIL

Purpose

The purpose of the Sudbury, Assabet and Concord River Stewardship Council (RSC) is to promote the long-term protection of the rivers by 1) bringing together on a regular basis various parties responsible for river management; (2) facilitating agreements and coordination among them; (3) providing a focus and a forum for all river interests to discuss and make recommendations regarding issues of concern; and (4) coordinating implementation of this River Conservation Plan.

A representative body such as the proposed RSC is necessary because of the complexities of managing the Sudbury, Assabet and Concord river system. Given the number of jurisdictions and interests involved, no one entity can assume sole responsibility or provide the necessary protection for the entire river corridor. Furthermore, management decisions by any one entity are likely to affect a number of other interests. The forum provided by the RSC will ensure communication among all parties and the representation of all viewpoints in making and implementing river stewardship decisions.

The achievements of the Study Committee are indicative of what can be accomplished through a participatory, cooperative effort. These achievements, including the collaborative development of this River Conservation Plan, are directly attributable to the cooperation that has evolved among its members. The RSC will continue that cooperative spirit.

Function

The RSC will have an advisory role; it will not have regulatory or land acquisition authority. The Council will provide advice to existing entities that have management or regulatory authority affecting the rivers, but it will not have the power to dictate the actions or decisions of any of those entities.

The RSC will not have additional authority for the following reasons: 1) a major emphasis throughout the Wild and Scenic study process has been to work within existing authorities to achieve effective protection of the river; 2) there is no need to create an additional layer of regulatory bureaucracy; 3) since federal land acquisition is not proposed to be used as a tool to protect the rivers, there is no need for the Council to be empowered to oversee an acquisition program; and 4) the RSC is intended to complement and support the roles and activities of existing interests, not to compete with them.

Responsibilities

The RSC will assume the following responsibilities:

Address river-related issues: The RSC will pursue the cooperative resolution of current issues affecting the Sudbury, Assabet and Concord rivers, as well as issues that may arise in the future. The Council will not have the authority to resolve any issue directly. Instead, it will provide a public forum for the discussion of issues, help raise awareness about issues of particular importance, and stimulate the appropriate authorities to take action.

Recreation management is an example of an issue that the RSC might well wish to address because it is of common concern to all eight towns, the U.S. Fish and Wildlife Service, and the state. This issue is described more fully in the section on **Protection of Outstanding Resources**.

Monitor activities that might affect the river: The RSC will evaluate specific proposals that could affect the designated segments, and provide comments as it deems necessary to the appropriate authorities. RSC review of a particular proposal could be initiated at the request of the public, or of local, state, or federal officials, or at the Council's own discretion. Examples of proposals that the RSC could choose to review and comment on include:

- changes to state programs or policies (e.g. statewide water quality standards, river basin plans)
- proposed zoning changes for lands along the rivers or their tributaries
- proposed development projects near the rivers
- applications for state permits (e.g. point source discharges, water withdrawals)

The RSC will also advise the NPS about the potential impacts of federally-funded or licensed projects that are subject to Section 7(a) review under the Wild and Scenic Rivers Act if the river segments are included in the National Wild and Scenic Rivers System. Examples include:

- applications for federal permits (e.g. Army Corps of Engineers Section 404 permits, Federal Energy Regulatory Commission certification for pipeline crossings)
- other federal or federally-funded projects having an impact on water resources (e.g. FAA approval for expanded operations at Hanscom Field)

As specified in the **Resource Management** section of this plan, the state will notify the RSC of certain state permit applications and other potential actions, and give the Council the opportunity to comment.[1] Upon being notified by the relevant federal agencies, the NPS will inform the Council of any proposed projects requiring federal permits or other assistance that would affect the segment. Town boards will be encouraged to communicate and cooperate with the RSC on matters related to the rivers (including notifying the Council of specific proposals), but it will be the Council's final responsibility to keep itself informed of proposals under local jurisdiction that it may wish to review and provide comments on. Individual Council members, particularly the town representatives, will play an important role in keeping the group abreast of local issues.

The monitoring efforts of the RSC will <u>not</u> pre-empt the monitoring and review functions of its member organizations.

Stimulate public involvement and education: The RSC will provide opportunities for the public to become aware of, and participate in, efforts to resolve issues that affect the rivers. As funding permits, this may be accomplished through publicized Council meetings, workshops, newsletters, surveys, mailings, or other techniques. The Council will also support the education and outreach activities of its members, and, when appropriate, initiate its own projects to educate the public about the rivers' special values, the challenges they face, and sensible conservation

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[1]The provision for notification of the RSC by certain state agencies may require statutory, executive, or other action at the state level. This issue is addressed at the end of the Overview to the **Resource Management** section of this Plan.

techniques.[2] In performing these activities, the RSC should reach out to a broad cross-section of the public, including recreational users, elected and appointed officials at all levels of government, agency staff, riverfront landowners, and other local residents.

Promote river enhancement initiatives: The RSC will support river enhancement projects initiated by its members or other groups, contingent on endorsement by the Council. Whenever necessary and appropriate, the Council will seek to coordinate the involvement of its members in enhancement efforts. The Council may also find opportunities to initiate its own cooperative enhancement efforts.

Examples of river enhancement projects that could merit RSC support and involvement include the frequent river cleanups that are sponsored by area advocacy and user groups. The RSC could augment past cleanup successes by stimulating coordinated action among its members.

Review and update the Sudbury, Assabet and Concord River Conservation Plan: Changes to this Plan undoubtedly will become necessary due to new issues, technological advances, or new statutes, regulations, and programs. In addition, actions identified in the **Resource Management** section of this Plan may be completed. Although the RSC will be responsible for reviewing the Plan on a regular basis and updating it as necessary, the primary focus of its energies and resources must be on implementation rather than the process of review.

If actions should occur that are inconsistent with this Plan's provisions for resource protection and management, the RSC will need to evaluate potential responses and incorporate into the Plan those it determines to be most appropriate.

It is recommended that the RSC conduct a thorough review of this River Conservation Plan every five years, although this schedule may be altered as appropriate. Changes to this Plan can only be made if they are approved by all members of the RSC eligible to vote. No changes to the provisions listed under **Safeguards**, above, will be permitted. In addition, the public will be given ample opportunity to participate in future revisions to the Plan.

Prepare periodic status reports: The RSC will prepare brief reports every 3-5 years on the status of protection of the segments and implementation of this Plan. These reports will serve two primary purposes:

1. To inform the general public, local officials, the Governor, the Great and General Court, and, if the segments are designated Wild and Scenic rivers, Congress and the Secretary of the Interior, about the condition of the rivers.

2. To publicize any pressing needs or issues requiring attention or assistance from the local, state and/or federal governments.

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[2] Specific projects that the RSC or its member organizations should consider are included in the section of this Plan on **Education and Outreach**.

Membership

Core membership: The following entities will constitute the core voting membership of the RSC. With the exception of the Commonwealth, each will have one representative and one alternate.

- Town of Framingham
- Town of Wayland
- Town of Sudbury
- Town of Lincoln
- Town of Concord
- Town of Bedford
- Town of Carlisle
- Town of Billerica
- Commonwealth of Massachusetts (two representatives and two alternates. It is recommended that a staff member from the DFWELE Riverways Program serve as one of the Commonwealth's representatives.)
- Sudbury Valley Trustees
- Organization for the Assabet River
- U.S. Fish and Wildlife Service
- National Park Service

Appointments: Representatives and alternates will be appointed as follows:

- Town representatives, by the respective Board of Selectmen
- Commonwealth representatives, by the Governor
- SVT representatives, by its Board of Directors
- OAR representatives, by its Board of Directors
- U.S. Fish and Wildlife Service, by the Regional Director
- National Park Service, by the Regional Director

While not a requirement, each riverfront town is encouraged to appoint a member of its Board of Selectmen as either its regular member or its alternate.

Criterion: To be eligible to serve on the RSC, members must endorse and support the goals, objectives, standards and stewardship philosophy of this Plan.

Additional members: Membership may be changed to include other interests based on the following provisions:

1) Other interested parties not already represented on the RSC (upstream or downstream towns,

river user groups, etc.) may be added to the Council if they request membership and are approved by a 2/3 majority of the existing members eligible to vote. The existing members shall decide on a case-by-case basis whether any new member shall be granted voting or non-voting status.

2) Representatives of any new member institutions will be appointed by the governing body of that institution.

All representatives shall serve for a maximum of two three-year terms. An incoming representative who replaces a member resigning before the end of his or her term shall be eligible to serve two complete three year terms. In this way, Council members' terms will become staggered, ensuring continuity.

While the regular members and alternates will be the official representatives of the respective organizations, staff from any organization having expertise relevant to the Council's activities will be encouraged to participate on an ongoing basis.

Procedures

Establishment: The RSC will be established after Congress concludes its deliberations on whether to designate the segments into the National Wild and Scenic Rivers System. It may hold its first meeting as soon as a quorum of members has been appointed.

Decision-making: Except for decisions concerning the content of this Plan, there must be a favorable 2/3 vote of those present and eligible to vote whenever a formal vote is requested by any member on any decision, recommendation or action. Permissible changes to the Plan (i.e. those that are not listed under **Safeguards** in Section I) are subject to the unanimous consent of all members eligible to vote. Other decisions, recommendations and actions will be by consensus.

While alternates will be encouraged to attend meetings and participate actively on the Council, each organization will be limited to one vote per representative on any matter requiring a formal decision by the Council.

Officers: The Council will have three officers: chair, vice-chair, and secretary/treasurer. The responsibilities of the officers will be established in the Council's bylaws. The chairperson will be elected by the Council from among its appointed town or state members.
Quorum: A majority of the members of the Council who are eligible to vote will constitute a quorum.

Bylaws: The Council will develop and enact bylaws for all other procedural issues.

Funding/Staff

To implement the responsibilities identified above in a meaningful way, in-kind assistance and funding will likely be required. Funds may be needed to 1) hire staff to coordinate the Council's activities; 2) undertake specific projects; and/or 3) cover costs related to general operations or specific responsibilities (office space and equipment, printing and distributing information, education and outreach, etc.).

If the segments are designated as national Wild and Scenic Rivers, Congressional appropriations will be sought to assist with the establishment and initiation of the RSC. Federal funds to support the Council will be pursued for a start-up period of 3-5 years.[3] Such funds will be part of the annual budget request to Congress by the National Park Service. If adequate funding is forthcoming, the NPS could 1) provide the necessary staff support for the RSC from its own personnel; or 2) transfer money directly to the RSC through a formal cooperative agreement. (Cooperative agreements are discussed later in this section.)

In addition to providing staff support and/or direct financial assistance to the RSC, the NPS may provide technical planning and river conservation assistance to the Council and its members if requested and if sufficient appropriations are available.

For long-term funding needs or for specific projects — such as those identified in the **Resource Management** section of this plan — the RSC may wish to pursue financial assistance and/or in-kind contributions (office space, equipment, etc.) from individuals, foundations, corporations, and government (federal, state, and/or local). In pursuing funding from any of these sources, the RSC will cooperate with its member organizations where appropriate. The RSC will avoid situations where its receipt of funds or in-kind contributions could create perceptions of conflict of interest.

If the segments are included in the National Wild and Scenic Rivers System, the NPS will provide assistance to the RSC in identifying potential sources of additional federal funding for specific river conservation projects. For instance, federal funding may be available through the Land and Water Conservation Fund, the National Park Service's "Challenge Cost-Share Program," or other similar sources.

MANAGEMENT AGREEMENTS

Stewardship Council Agreement

Among the RSC's first tasks will be to develop a written agreement to be adopted by its member institutions. This agreement will establish a cooperative commitment among the members to participate in long-term management of the river and to implement those parts of this Plan under

[3] The need for continued federal funding will be evaluated after this start-up period.

their jurisdiction or to which they have been assigned specific responsibility. If the segments are designated as national Wild and Scenic Rivers, the development of this agreement will be contingent upon the endorsement by the RSC's voting members of the provisions contained in the legislation designating the segment.

Inter-agency Consistency and Coordination

The success of this Plan will depend, in part, on state and federal agencies being consistent with the broad goals and specific provisions of the Plan when taking any actions that could affect the segment. It is strongly recommended that the DFWELE Riverways Program take the lead in pursuing options to achieve such consistency at the state level. Possible approaches include statutory action by the State Legislature, Executive Order by the Governor, and/or other less formal means.

If the rivers are designated as Wild and Scenic, the NPS will take the lead in ensuring consistency at the federal level through its authority under the Wild and Scenic Rivers Act.

Cooperative Agreements Between the RSC and the NPS

If the segments are included in the Wild and Scenic Rivers System, the NPS may enter into formal cooperative agreements with the RSC or any of its member organizations pursuant to Sec. 10(e) and/or Sec. 11(b)(1) of the Wild and Scenic Rivers Act. Such agreements could include provisions for limited financial or other assistance from the federal government to facilitate the protection and management of the Sudbury, Assabet and Concord rivers. Relevant passages from the Wild and Scenic Rivers Act follow.

> Section 10(e): *The Federal agency charged with the administration of any component of the national wild and scenic rivers system may enter into written cooperative agreements with the Governor of a State, the head of any State agency, or the appropriate official of a political subdivision of a State for State or local government participation in the administration of the component.*
>
> Section 11(b)(1): *The Secretary of the Interior .... shall assist, advise, and cooperate with States or their political subdivisions, landowners, private organizations, or individuals to plan, protect, and manage river resources. Such assistance, advice and cooperation may be through written agreements or otherwise .... Any agreement under this subsection may include provisions for limited financial or other assistance.*

III. RESOURCE MANAGEMENT

OVERVIEW

This section of the Plan describes a detailed program that will provide long-term protection for the Sudbury, Assabet and Concord rivers and their outstanding scenic, recreational, wildlife, historic, and literary values. The discussion is divided into three parts: Land Management, Water Resource Management, and Protection of Outstanding Resources. These are further subdivided into more specific categories, as indicated below.

Land Management:

Private Lands
Public Lands

Water Resource Management:

Water Quality
Water Quantity
Channel, Floodplain, and Wetland Protection

Protection of Outstanding Resources:

Recreation
Ecology
Historic, Archaeologic and Literary Resources
Scenic Resources

A fundamental tenet of the Plan — that the rivers' outstanding resources can only be protected through sound management of the land and water base on which they rely — is reflected in this format. The specific provisions described in **Land Management** and **Water Resource Management** establish the foundation necessary for long-term protection. Other considerations specific to each outstanding resource are described in **Protection of Outstanding Resources**.

For each category, the following are discussed:

Objectives establish a vision for future management. These objectives are intended to supplement the broad goals that were presented in the **River Protection Philosophy** section.

Standards establish the minimum criteria by which future management actions will be measured.

Action Program lays out specific strategies for achieving the objectives and ensuring the long-term protection of the river and its important values. The Action Program has three components:

Key Actions identify the most essential actions required for managing river resources according to the defined standards.

Supporting Activities identify other programs and actions currently in place that contribute to effective management.

Additional Opportunities include recommendations for further actions that, while not required, could enhance resource management and protection.

Wild and Scenic River Provisions include special conditions that will take effect if the rivers are designated as national Wild and Scenic Rivers, such as the requirements that the designated segments be maintained in their current free-flowing condition, and that federal Clean Water Act water quality standards be met. This section describes the role of the National Park Service as the federal stewardship partner, specific policies and standards that will be linked to designation, and any additional actions that will be required of other entities to implement the designation.

The reader should note that implementation of certain provisions contained in this River Conservation Plan may require statutory, executive, or other action at the state level. These provisions primarily relate to notification requirements for future implementation of state regulatory responsibilities affecting the segment.

RESOURCE MANAGEMENT: LAND RESOURCES

PRIVATE LANDS

OBJECTIVE:

To conserve the ecological integrity and scenic character of the Sudbury, Assabet and Concord river corridor through sensitive management of privately-owned shoreland and upland areas, without unduly restricting other uses of those lands.

STANDARDS:

Riparian Corridor: The rivers' riparian lands (banks, floodplain, bordering wetlands, and upland buffers) are the highest priority areas for protection. Based on the extensive analysis of land use patterns and existing land use controls that was conducted during the study, these critical areas were found to be adequately protected from land uses changes that could damage riparian resources. Thus the local zoning (including floodplain zoning) and state and local wetlands protection laws in place as of the effective date of this Plan constitute the minimum standard for riverfront protection on private lands.

Uplands: This Plan does not establish specific standards for the management of privately-owned upland areas beyond floodplains and wetlands buffers. Although activities in upland areas can affect river values, existing land ownership patterns, regulations, and topography provide the segments with strong protection from potential adverse effects of land use changes in upland areas. To complement that protection, land managers (i.e. private landowners and the local, state and federal agencies responsible for public lands) should seek to minimize impacts on water quality, streamflows, views to and from the river, and the scenic character of the river corridor.

ACTION PROGRAM

Key Actions

Landowner stewardship: *Private lands will remain private; landowners will continue as the primary stewards of lands along the segments.*

Longstanding traditions of resource stewardship along the Sudbury, Assabet and Concord rivers are largely responsible for the character and quality of the river corridor. This River Conservation Plan serves to reinforce those patterns and the traditional stewardship role of landowners.

Landowners can fulfill their stewardship responsibilities by taking an active interest in the rivers, by expanding their knowledge of land management practices that protect the rivers' scenic and ecological values, and by incorporating those practices into management of their lands. Voluntary opportunities available to landowners to enhance their short and long-term stewardship abilities include gaining knowledge of Best Management Practices in forest, wildlife habitat and vegetation management. Landowners can avail themselves of conservation restrictions and other land conservation techniques, including preferential property taxation programs (Chapter 61, 61A, and 61B programs). Other voluntary land management techniques directly related to reducing nonpoint source pollution are described under "Land Stewardship" in the **Water Quality** section of this plan.

Local land use management: *Riverfront towns will implement and enforce their existing land use regulations, including floodplain zoning, local wetlands bylaws, the state Wetlands Protection Act, Board of Health regulations, and other programs that provide protection to the rivers.*

Floodplain overlay zones in combination with state and local wetlands protection laws provide the backbone of protection for private lands located within the riparian corridor. These forms of protection are supplemented by town regulations relating to underlying zoning densities, subdivisions, building height limitations, and septic system siting requirements. Each riverfront town should emphasize conservation of river values when implementing these regulations. River protection will be enhanced by active consideration of the river in the enforcement of existing regulations and other land use programs in upland areas (beyond the 100-year floodplain and wetland buffer zones). Special emphasis should be given to tributaries to the Sudbury, Assabet and Concord rivers.

There are several other actions the towns could take to provide further protection for the river. These are described under ***Additional Opportunities*** at the end of this section.

Supporting Activities

Local land acquisition: *The eight study-area towns should continue to pursue the purchase of appropriate river-related lands from willing sellers.*

The Open Space plans prepared by the towns provide the policy framework for local land protection programs. In cooperation with private landowners and land trusts, and when funding permits, the towns should continue to implement these plans, and should place particular emphasis on the protection of areas that are already providing local recreational access to the rivers and related areas.

State land use regulations: *In implementing the state Wetlands Protection Act, managing land use on state-owned lands, and regulating activities such as utility lines that could affect riparian*

lands, the Commonwealth will to the greatest extent possible ensure that its policies and actions are consistent with this River Conservation Plan and with local floodplain and wetlands protection laws.

The Commonwealth has several programmatic responsibilities relevant to the Plan's land use standards, including:

- point-source discharge permitting under the Massachusetts Clean Waters Act (M.G.L. c. 21 §§ 26-53) and Sec. 402 of the federal Clean Water Act (P.L. 95-217);
- control of nonpoint source pollution pursuant to those same statutes;
- the public water supply wellhead protection program; state Wetlands Protection Act; Title 5, which controls the design and siting of sub-surface wastewater disposal facilities; regulatory control over the siting of hazardous waste, low-level radioactive waste storage, energy, and telecommunications facilities; and the regulation of underground storage tanks;
- road and bridge construction and maintenance;
- management of state-owned lands including the Pantry Brook fish and wildlife lands along the Sudbury River and the MCI-Concord site on the Assabet River.

While these programs clearly have a bearing on land use, they are also directly related to water quality and/or wetland protection. Additional discussion of these programs is included in the **Water Resource Management** section of this Plan.

State land acquisition: *The Commonwealth of Massachusetts should pursue the purchase of important river-related lands from willing sellers if parcels come on the market and if funding is available.*

Selective public purchase of critical lands or interests in land on a willing-seller basis is a valuable component of a diversified strategy to protect a river corridor.

The RSC should assist the state — particularly the DFWELE Division of Fisheries and Wildlife, which already owns significant wildlife habitat along Pantry Brook, a tributary to the Sudbury River — in looking for other opportunities for applying its habitat protection programs. Local representatives on the RSC can play a particularly valuable role in monitoring the availability of important parcels for potential acquisition by DFWELE.

Federal regulations: *The U.S. Army Corps of Engineers will continue to implement its permitting responsibilities under Section 404 of the Clean Water Act and Sections 9 and 10 of the Rivers and Harbors Act of 1899. All federal agencies will comply with Executive Orders 11988 and 11990, which require that alternatives be considered when federally-funded or permitted projects could have adverse impacts on floodplain and wetland resources.*

Sec. 404 requires a permit from the Corps for any project that would discharge dredged or fill material into the waters of the United States, including wetlands. This is the primary federally-

administered regulatory program that affects land use decisions along the rivers. The program is addressed in greater detail in the section of this Plan on **Water Resources Management - Channel, Floodplain, and Wetland Protection.** The Corps' responsibility for implementing the Rivers and Harbors Act of 1899, which controls the placement of dams and other impediments to navigation, is also discussed in that section.

Federal land acquisition: *The U.S. Fish and Wildlife Service should continue its program of willing-buyer, willing-seller land acquisition within the approved boundaries of Great Meadows National Wildlife Refuge.*

The protection afforded to the rivers by Great Meadows National Wildlife Refuge is one of the major factors that makes the study area suitable for Wild and Scenic designation. The refuge's land acquisition program will continue whether or not the rivers are designated; however, if the rivers are designated, the RSC should explore ways to support this program where appropriate.

Voluntary land conservation: *Local land trusts should pursue protection of important riverfront and watershed lands by assisting landowners with voluntary land conservation actions.*

Voluntary land conservation programs have proven to be highly effective in protecting important riverfront and watershed lands on rivers across the country. The elements common to successful programs have included: 1) identifying parcels of particular significance for the conservation of the river (for instance, those with undeveloped riverbanks, steep slopes, striking visual features, or habitat for rare species); and 2) actively encouraging landowners to protect those parcels by providing them with information and assistance regarding the full range of voluntary private land protection techniques (e.g. purchase, donations of fee title or conservation restrictions, deed restrictions, covenants, and transfers of development rights).

Along the Sudbury, Assabet, and Concord river corridor, the Sudbury Valley Trustees and several local land trusts have a long history of success in implementing this type of program. Their efforts should be supported, where appropriate, by the RSC. Such support could take the form of collaborative public education and outreach efforts, the development of model language to be used for new riverfront conservation restrictions, etc.

Additional Opportunities

Local land-use recommendations: *The Study Committee's River Conservation Subcommittee identified a number of recommendations for the study area towns that should be implemented in order to strengthen existing land-use requirements.*

The recommendations, which are summarized in Appendix A, were developed through an exhaustive analysis of existing local controls and ownership patterns, and represent the collective

wisdom of the Study Committee. When implemented, these recommendations will build upon the significant protections already in place, further decreasing the rivers' vulnerability to inappropriate land use changes.

The adoption of any new land use regulations or other local mechanisms will continue to be at the discretion of the towns.

Technical assistance to landowners: *Establish a program to provide resource management expertise to interested landowners.*

Stewardship of riverfront and watershed lands could be enhanced if landowners had access to professional advice about wildlife habitat enhancement techniques and the effects of fertilizers, pesticides, and vegetative cutting in the floodplain and riparian wetlands. Landowners may be unaware that such expertise exists, or they may be unable to afford the costs involved in obtaining it.

The RSC should evaluate opportunities for making resource management expertise more readily available by publicizing existing technical assistance programs and/or seeking funding to hire resource management professionals who could then provide their services to landowners at reduced cost or free of charge.

Local enforcement of regulations: *Improve the zoning, building code, Title 5, wetlands bylaw and conservation restriction enforcement capacity of the riverfront towns.*

The need for increased diligence in the enforcement of local bylaws and regulations, along with enforcement of the provisions of conservation restrictions held by the towns, has been identified as an issue related to the protection of riverfront areas. The towns' limited enforcement capabilities are often a result of tight local budgets. Riverfront towns, with possible assistance from the RSC and others, should pursue funding to enable them, either individually or collectively, to hire additional enforcement staff (e.g. river stewards) to focus specifically on river-related issues or to train existing staff.

Local planning: *Each riverfront town should emphasize conservation of the river in updates to its Open Space Plan, Master Plan, Comprehensive Plan, and other land use plans.*

All of the study area towns have prepared Open Space Plans in the past, largely in order to qualify for state reimbursement for acquisition funding. Due to a sharp decrease in the availability of such funds in the late 1980s, many towns' plans are out of date. In updating the plans, the town should focus specifically on the protection of the rivers and their tributaries. By updating their plans, the towns will also become eligible for newly-available state funds.

In preparing their Master Plans or Comprehensive Plans, the towns should be encouraged to consider the need to protect access, riparian habitat and scenery along the segments.

Open space requirements: *The riverfront towns should consider revising their local subdivision, PUD, and cluster development and other land use regulations to require that areas set aside as protected open space include riparian buffer areas.*

By specifically targeting lands along the Sudbury, Assabet and Concord rivers and their tributaries for such existing set-asides, this authority could be used to provide further protection for the rivers. In towns such as Billerica, which allow clustering only within designated areas of the town, consideration should be given to expanding such areas to include riparian lands.

Aquifer protection: *Towns along the segments should evaluate opportunities to increase the protection of water quality in the segments and their tributaries through implementation of aquifer protection programs.*

Towns are able to designate and protect aquifers that are recognized for their existing or potential use as a public water supply. For any such aquifer, the town involved may adopt land use, hazardous waste, underground storage tank, or other regulations, and assign the appropriate town board or commission (e.g. Planning Board, Board of Health, or Fire Department) the responsibility of enforcing those regulations. It may also buy the lands of concern. The towns of Wayland and Sudbury, for example, have aquifer and water resources protection overlay zoning districts, respectively. The other towns along the segment may wish to consider these forms of protection.

The Massachusetts DEP requires that in order to be approved for public water supply, all new wells must be protected under the state's wellhead protection program. Requirements include the ownership or control of lands within 400 feet of the wellhead, and land use restrictions (such as the prohibition of floor drains discharging to the ground) within the area known as the Zone II, or primary recharge area. While the primary intent of these programs is to protect public groundwater supplies, any concomitant protection of aquifers adjacent to the rivers or their tributaries would help to protect and enhance the water quality of the segments themselves, since groundwater provides the rivers' base flow.

Some surface water supplies in the state are also protected through overlay zoning along their shores and tributaries. While implementation of surface water protection zoning has not yet been suggested for the Sudbury, Assabet, and upper Concord rivers, which feed Billerica's water supply system, all of the measures listed in this Plan that serve to protect riparian resources have the added value of protecting the rivers' value as a source of drinking water.

Scenic road designation: *The riverfront towns should evaluate the potential to designate roads which cross or parallel the rivers as "scenic."*

Towns in Massachusetts are empowered to designate local roadways as scenic, which serves to protect stone walls and trees that are within the right of way from removal that could result in the loss of historic and scenic character. Scenic road designation could help avert detrimental changes in the layout of local roads near river crossings or in other areas visible from the rivers.

Watershed protection initiatives: *SVT and OAR, and, where appropriate, DFWELE, DEM, and MDC, should give special attention to protecting land along the undesignated sections of the Sudbury and Assabet rivers when setting priorities for their watershed-wide programs.*

The RSC's responsibilities for areas upstream of the study segments include working with town governments to strengthen local river protection mechanisms, and participating in the public review of specific development proposals that could affect the rivers. Technical assistance from the RSC could help upper watershed towns to implement the kinds of conservation restrictions, floodplain zoning bylaws, local wetlands bylaws, etc., that have contributed to the protection of the designated segments.

WILD AND SCENIC RIVER PROVISIONS

With the exception of pre-authorized, independent land acquisition programs at Great Meadows National Wildlife Refuge and Minute Man National Historical Park, national Wild and Scenic designation will not result in federal government acquisition of private lands or interests in land along the segments by condemnation or otherwise. Furthermore, designation will neither empower the federal government to regulate the use of non-federal lands, nor will it result in requirements for additional state or local land use regulations. Designation will not preclude use of federal funds through the Land and Water Conservation Fund or similar programs for state or local land acquisition.

PUBLIC LANDS

OBJECTIVE:

To conserve the ecological integrity and scenic character of the Sudbury, Assabet and Concord river corridor through sensitive management of publicly-owned riparian and upland areas, without unduly restricting other uses of those lands.

STANDARDS:

Riparian corridor: Public lands within the riparian corridor will be managed in a way that will maintain or enhance their natural appearance and function.

Uplands: Upland areas under public ownership within the segments' watershed will, to the extent reasonably possible, be managed in a way that takes into account and ensures protection of water quality and quantity, scenic views to and from the rivers, wildlife habitat, river-related historic and archaeological resources, and the natural character of the Sudbury, Assabet and Concord river corridor.

ACTION PROGRAM

Key Actions

Management practices: *The towns, U.S. Fish and Wildlife Service, National Park Service, DFWELE-DFW, and Mass. Dept. of Corrections will continue to manage their respective lands along the segments. Each public landowner will review its current policies and practices for consistency with the objective and standards stated above, and revise them if necessary.*

The substantial amount of public land along the segments is essential in maintaining the water quality, wildlife habitat, recreational access, historic and archaeological resources, and scenic character of the Sudbury, Assabet and Concord river corridor. Town-owned lands along the segments also provide limited but important public access to the rivers. This Plan actively supports a continuation of these diverse uses.

New infrastructure development within 100 feet of the rivers' banks should be limited to that necessary for public health, welfare, and safety. This includes infrastructure needed for wildlife habitat enhancement, such as minor water control structures, for emergency response, or to provide public access to the river. The need for any such infrastructure must be reviewed by the land managing agency or town board, and the infrastructure must be designed and constructed so as to minimize both short- and long-term impacts on the ecological functions and scenic qualities of the shorelands area.

Through its local, state, or federal government representatives, the RSC will be given the opportunity to participate in reviews of management plans and practices affecting the rivers, and the land management agencies will give the RSC's comments due consideration.

Land transfers: *Public lands held for conservation, recreation, or open space purposes will be kept in public ownership for such purposes.*

Because public conservation, recreation, and open space lands are vital to the protection of many resources within the Sudbury, Assabet and Concord river corridor, the rivers' character could be severely jeopardized if all or part of those lands were to be transferred into private ownership or otherwise opened to development. Neither the towns, the Commonwealth nor the federal government will divert to other uses any land along the riparian corridor held for conservation, recreation, or open space purposes.

Article 97 of the Massachusetts Constitution requires a 2/3 vote of the legislature before state-owned land currently used for conservation or passive recreation may be transferred into any other form of use, including a more intensive public use. For town-owned land, Article 97 requires a corresponding 2/3 town meeting vote as well.

Should a change in ownership or use of any other existing public lands along the rivers or their tributaries be considered, every reasonable effort should be made to retain and manage the land for conservation or recreational use, and/or to provide protective riparian buffers. If such land is to be transferred to private ownership, conservation easements or other legally-binding restrictions on development should be placed at the time of transfer on areas that are most critical for maintaining the rivers' water quality and quantity, ecological integrity, and scenic qualities.

WILD AND SCENIC RIVER PROVISIONS

There will be no additional requirements related to the management of public lands as a result of Wild and Scenic River designation.

RESOURCE MANAGEMENT: WATER RESOURCES

WATER QUALITY

OBJECTIVE:

To enhance and maintain the segments' water quality so as to protect their outstanding water quality dependent resources (ecology, recreation and scenery).

The segments' water quality will be improved to ensure year-round compliance with state and federal water pollution control laws. This will serve to reduce or eliminate the gradual loss of aquatic habitat quality and diversity through the conversion of open water and wetland areas to wetlands and uplands respectively, and through the displacement of native vegetation by non-native, pollution-tolerant species. It will also protect against the loss of open water areas and consequent reduction in the rivers' value for recreation and scenery.

STANDARDS:

Measures will be taken to reduce nitrogen and phosphorus loadings to levels that are within the rivers' assimilative capacity in order to reduce the rate of cultural eutrophication. This will serve to protect the segments' outstanding aquatic fish and wildlife habitat, recreation, and scenic values. To the extent possible, the discharge of additional mercury into the Sudbury and Concord river segments will be prevented in order to protect wildlife habitat and recreation (fishing and contact recreation).

Point source discharges:

- Point source discharges (including both existing and new discharges) shall comply with state and federal water pollution control statutes.
- For other new activities (e.g. storm water drains) that are regulated under Sec. 402 of the federal Clean Water Act (P.L. 95-217) and that would discharge directly into the segments, Best Management Practices appropriate for the reduction of sedimentation and associated nutrient loading will be required.
- To the extent possible, the release through discharge or downstream transport of additional mercury to the Sudbury and Concord river segments will be prevented.

Nonpoint source pollution: The riverfront towns and the state will seek to eliminate, avoid, or reduce nonpoint source pollution impacts on the segment. The 100-year floodplain plus uplands within 100 feet of the rivers' and their tributaries' ordinary high water mark will be the highest priority for attention. Within these areas, the principal mechanisms for controlling nonpoint

source pollution will be the preservation of natural vegetation, maximum setbacks of new roads and septic systems, and the implementation of Best Management Practices as outlined in the DEP "Megamanual." Special emphasis will be given to the implementation of those practices that reduce the discharge of sediment and associated phosphorus and nitrogen compounds to the rivers, tributaries, and groundwater.

ACTION PROGRAM:

Key Actions

Water pollution control statutes: *The U. S. Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (DEP) will continue to have primary responsibility for implementing federal and state water pollution control statutes.*

Two laws govern the protection of water quality in Massachusetts — the federal Clean Water Act (P.L. 95-217), and the Massachusetts Clean Water Act (M.G.L. c. 21 §§ 26-53). The DEP administers the state law while the EPA administers the federal law. DEP has four primary responsibilities that affect the Sudbury, Assabet and Concord rivers' water quality:

Establishment of statewide water quality standards: These standards designate water quality goals and designated uses for different classes of water bodies, and establish base level criteria that must be met to maintain the designated uses for each class. As required under 314 CMR 4.00, Massachusetts also designates certain water bodies under its anti-degradation policy as "high quality" or "outstanding resource" waters. The anti-degradation policy protects the existing uses of a waterbody, prevents waters that exceed minimum criteria from deteriorating, limits degradation of "outstanding" waters, and seeks improvement in degraded waters.

Project review and certification under Sec. 401 of the Clean Water Act: Sec. 401 requires that, with certain exceptions, any proposed discharge into the waters of the state must not violate state water quality standards. Certification is required before any necessary federal permits or licenses can be granted. This requirement makes Sec. 401 certification a strong tool for the state in protecting its interests.

Point source discharge permits: Sec. 402 of the Clean Water Act establishes a permit system — the "National Pollution Discharge Elimination System" (NPDES) — for all point source discharges, such as new or expanded discharges from sewage treatment plants and industrial facilities. Stormwater discharges also are regulated under Sec. 402. The DEP has established general permits for stormwater discharges associated with two types of activities: (1) construction projects that involve the disturbance of greater than five acres of land; and (2) industrial facilities, as defined by the Standard Industrial Classification (SIC) Codes. Applicants are covered by these general permits if they register with the DEP, but they must be able to demonstrate that they are in compliance with the general permit requirements. The permits require, among other things,

that the permittee develop a pollution prevention plan and monitor the discharge. The DEP cannot deny a registration; however, the agency can enforce the permit requirements if the permittee is found to be in violation.

Nonpoint source pollution control: The state and federal Clean Water Acts establish limited regulatory authority and encourage planning efforts for the reduction of nonpoint source pollution. The DEP's nonpoint source program is described in detail in the "Megamanual" which was sent to every Conservation Commission in the state in 1993.

The EPA oversees implementation of the federal Clean Water Act in Massachusetts, and maintains approval/veto authority over the state's water quality standards and permitting of specific projects, but not over Sec. 401 water quality certifications. Massachusetts' Surface Water Quality Standards are reviewed at least every three years, with participation from a public advisory committee. Following public hearings and approval by the state Water Resources Commission, the Standards are submitted to EPA for approval.

The Sudbury, Assabet and Concord rivers are currently classified Class B. The goal of this classification is to ensure the rivers' suitability for the protection and propagation of fish, wildlife, and other aquatic life and for recreation in and on the water. The Sudbury River is also designated as a "High Quality Water" from Saxonville Dam downstream to Wash Brook, with a designated use of aquatic life. The Assabet and Concord rivers are designated as warm water fisheries.

To achieve this Plan's standards for water quality protection, the DEP will need to take the following actions:

1. In its next triennial review of the Massachusetts Surface Water Quality Standards (anticipated in 1996), DEP shall consult with the RSC to designate uses for the rivers that are consistent with the rivers' water-dependent outstandingly remarkable resource values, i.e. ecology, recreation, and scenery.

2. In its approval of new point-source discharge permits or repermitting of existing discharges, DEP should actively promote the use of innovative approaches to reduce nutrient loads within the basin. For example, to ensure that new or increased phosphate discharges are within the rivers' assimilative capacity, point-source dischargers should be encouraged to seek ways of reducing non-point source discharges of this pollutant. This could be done through the sewering of communities where existing septic systems are located near wetlands or floodplains, or through the use of Best Management Practices in stormwater management.

3. In its implementation of the "Watershed Initiative" approach to water quality and quantity permitting (whereby the cumulative impacts of DEP permits throughout the river basin are considered in setting new or renewal permit conditions), DEP should consult with the RSC to promote the protection of the rivers' outstanding water-dependent resources.

Local land use management: *The riverfront towns will implement and enforce existing local land use regulations, including local wetlands protection bylaws and septic system siting requirements, and other programs that protect water quality. In implementing existing laws and in considering the need for revisions to such laws, the towns will specifically consider to what extent the laws can be used to reduce the discharge of sediment and phosphorus and nitrogen compounds to groundwater, the rivers, and their tributaries.*

Several local land use programs provide important protection for the Sudbury, Assabet and Concord rivers' water quality. In addition to local wetlands protection bylaws, the most significant regulations are those related to septic systems, floodplains, and subdivisions (including cluster development provisions). Some of these regulations and programs are discussed in greater detail under **Land Management**. As identified in the Water Resources Study conducted for the Study Committee, excessive nutrient discharges (particularly of nitrogen-containing compounds) to the rivers represent a significant threat to the protection and enhancement of the rivers' water quality. "Best Management Practices," which can reduce such excessive discharges, are summarized in the DEP "Megamanual" which has been sent to every town in the Commonwealth. All town boards having a role in local land use should familiarize themselves with the practices found in this manual, and should take every opportunity to implement appropriate land management practices. To the extent possible, the RSC should make a particular effort to ensure that adequate technical assistance is provided to the town agencies for this purpose.

While full implementation and enforcement of these mechanisms is most critical in those towns that directly abut the segments, water quality is also dependent upon sensitive land use management in the towns upstream of the segments and along their tributaries. The RSC should encourage these communities to implement and enforce their own land use regulations and programs in a way that will contribute to the protection and restoration of the segments' water quality.

Land stewardship: *Landowners, both private and public, will help maintain the segments' water quality through sensitive management of their lands.*

There are many land management techniques that landowners should consider using in order to protect the water quality of the river, its tributaries, and related aquifers. For example, landowners can maintain or re-establish vegetative buffers along the rivers and their tributaries; reduce or eliminate the use of fertilizers and pesticides on golf courses, lawns, and gardens; and leave low stumps and root structures in place if any vegetation is removed along the banks of the rivers or tributaries. Many of these practices are described in the DEP Megamanual on file with local Conservation Commissions. Owners of riparian lands immediately adjacent to and upstream of the segments can fulfill their stewardship responsibility by expanding their knowledge of these and other techniques, and by incorporating them into the management of their lands. The role of landowners is discussed in more detail under **Land Management — Key Actions.**

Federal regulation of stream alterations: *For any project that would affect water quality through the discharge of material into the segments or an adjacent wetland, the Army Corps of Engineers will implement its responsibilities under Sec. 404 of the Clean Water Act in a manner consistent with this Plan's water quality standards.*

This responsibility is described under **Channel, Floodplain, and Wetland Protection — Key Actions.**

Supporting Activities

Other state regulatory responsibilities: *The state should ensure consistency with this Plan in its implementation of other laws and regulations that could have a bearing on water quality in the segment.*

Relevant state programs include:

1. DEP's regulation of hazardous waste transportation and the Hazardous Waste Facility Site Safety Council's regulation of storage facilities.

2. The Department of Capital Planning and Operations' authority over the disposition of state-owned lands.

3. DEM's and DEP's responsibility for River Basin Planning and water withdrawal permitting. These planning and permitting programs have impacts on water quality because they affect the amount of flow, and thus the pollutant dilution factor, in the rivers.

In exercising these authorities, DEP, DEM, DCPO, and the Site Safety Council should ensure the full protection of the segments' wildlife habitat, recreation, historic, archeological, and scenic values from any potential adverse effects that could result from activities in the watershed of the segments. The RSC should be notified of, and given the opportunity to comment on, any action under either program that could affect the rivers.

Additional Opportunities

Upgrade designated uses: *Consider upgrading the designation of the Sudbury River to "high quality water" along the entire study segment.*

Below Wash Brook, the Sudbury's designated use is merely "aquatic life." The RSC should compile information on actual water quality conditions and uses (including uses based on the outstandingly remarkable resources that qualify the segment for Wild and Scenic River designation) in support of a request to upgrade the reach from Wash Brook to Egg Rock to "high quality water."

Water quality monitoring: *Initiate a volunteer/citizen-based water quality monitoring program.*

A water quality monitoring program conducted by local volunteers can be a cost-effective method for collecting important data on a continuing basis. This type of program also provides an excellent opportunity to increase community awareness of water quality issues, and to stimulate citizen participation in efforts to address difficult problems such as nonpoint source pollution. The Organization for the Assabet River has an ongoing program along the Assabet; this program could be expanded to include measurements of pollutants not currently being monitored and extended to the Sudbury and Concord rivers. The Water Watch Partnership at UMASS Amherst could also provide information and advice about initiating a monitoring program. Such programs can be integrated into the science curriculum in local schools, helping to ensure year-to-year continuity while providing students with a local opportunity for field research. Community service groups and river user groups also can be a good source of volunteers and resources.

Coordination for this type of program on the segments could be provided by the RSC or one or more of its members, including OAR, SVT, and the Commonwealth's Riverways Program. The latter could be actively involved in training local residents to perform shoreline surveys to help them implement the measures identified under ***Key Actions***. The DEP should be actively involved in any such effort in order to provide technical expertise and to ensure compatibility with existing water quality monitoring activities.

Education and outreach: *Pursue opportunities to educate landowners, developers, and local land use boards about the cause of nonpoint source pollution, its potential impacts on water quality and instream resources, and methods — such as the Best Management Practices described in the Megamanual — for reducing or eliminating it.*

This could be achieved through a variety of techniques, such as informational brochures, local workshops, and articles in local papers. This would be a good opportunity for a cooperative effort involving many of the groups represented on the RSC.

Demonstration projects: *Pursue opportunities to demonstrate the use of Best Management Practices and other measures in controlling nonpoint source pollution.*

Federal funding for pilot projects is available through grants from the EPA under Sections 319, 104b, and 604b of the Clean Water Act. Landowners and developers should take advantage of these funding incentives for projects that would require the use of Best Management Practices. The RSC should work through local planning boards and conservation commissions to notify permit applicants about the existence of these grant programs, and work with them to acquire this assistance.

In addition, towns should investigate the feasibility of using "betterments" (a form of targeted, limited duration property taxation) to fund needed upgrades for failing septic systems, leaking underground storage tanks, etc.

Biological monitoring: *Conduct additional studies of the segments' aquatic biota to establish baseline biological conditions, and initiate a long-term biological monitoring program to build on knowledge generated by the Water Resources Study.*

Some baseline information on the rivers' existing biological condition was collected during the course of the Wild and Scenic study under the Water Resources Study. Additional information, including data on macroinvertebrates (e.g. river-bottom insect larvae which serve as pollution indicators), would be useful in order to monitor the rivers' long-term health. Such a long-term monitoring program could provide important indications of change within the system, such as incremental water quality degradation from nonpoint source pollution. While DEP should play the lead role in any such efforts, it may be possible to incorporate long-term biological monitoring into the volunteer-based water quality monitoring program described above.

Control of road runoff: *Pursue opportunities for reducing potential pollution impacts resulting from various forms of road runoff.*

The towns and the Commonwealth maintain roads along the segments. Both should review their procedures for road maintenance to identify opportunities for reducing impacts on water quality. Maintenance activities that may be relevant include resurfacing, winter sanding and salting, the use of riverfront areas for snow disposal, and cleaning of storm drains. Also, road crews should be made aware of the significance of the river. This could be achieved by posting signs at bridge crossings or other appropriate locations, as is done for public water supply watersheds elsewhere in the state.

WILD AND SCENIC RIVER PROVISIONS

In accordance with the Wild and Scenic Rivers Act, designated segments must be managed so as to comply with the water quality requirements of the federal Clean Water Act. That statute and accompanying regulations set the standard for approval of federal projects and permits that could have a direct and adverse effect on the rivers' outstanding resources by degrading water quality. The following provisions and procedures will ensure compliance with Wild and Scenic and Clean Water Act requirements:

- *In consultation with the RSC, the NPS will review federal permit and grant applications that require approval under the Clean Water Act.* This review will be limited to projects that would discharge directly into the segments or their tributaries (including areas upstream of the segments), and will be based upon an evaluation of the project relative to the River Conservation Plan's objectives and standards. No project that would have a direct and adverse effect on the segments' outstanding wildlife habitat, recreation, or aesthetic values will be allowed. NPS review will be conducted in direct consultation with the DEP and, where appropriate, the EPA.

In order to fulfill this responsibility, the NPS will be notified of relevant permit and grant applications by DEP and EPA. The NPS will not require notification of individual registrations for stormwater and other general permits. However, the NPS will be notified of, and given the opportunity to review, any proposed changes to the criteria and standards for general permits.

- The DEP will notify the NPS of any proposed revisions to Massachusetts' water quality standards or any proposed projects requiring state certification under Sec. 401 of the Clean Water Act that are applicable to the segments. In either case, the NPS will be given the opportunity to comment.

- The RSC will be notified of, and given the opportunity to comment on, any of the following on or directly affecting the segments: 1) point source discharge permit applications under Sec. 402 of the Clean Water Act; 2) proposed projects requiring state certification under Sec. 401 of the Clean Water Act; and 3) proposed revisions to Massachusetts' water quality standards.

- The Army Corps of Engineers will notify the NPS of any applications for individual permits under Sec. 404 of the Clean Water Act that would affect the segments. The Corps and the NPS will develop a coordination/screening procedure for projects located near but not directly on the segments which would otherwise be authorized through the use of Programmatic General Permits.

- The RSC will periodically review the status of projects associated with the above permits and will summarize this information in its periodic updates to this Plan. By studying the outcome of such projects, the RSC and NPS will improve their effectiveness in the federal permit consultation process.

WATER QUANTITY

OBJECTIVE:

Protect the natural seasonal flows necessary to maintain the segments' existing water quality and to sustain their flow-dependent outstanding resources (wildlife habitat, recreation and scenery) while, to the extent possible without creating a direct and adverse effect on these resources, meeting compatible waste assimilation and water supply needs.

STANDARDS:

Existing flows: Flows within the Sudbury, Assabet and Concord rivers are influenced both by variations in precipitation and by human activities. The SuAsCo Water Resources Study[4] and accompanying hydrologic flow model provide the best information currently available about the relationship between the rivers' flows and their outstanding resources, and about the potential impacts of both natural and human-induced flow reductions. Examples of the latter include consumptive withdrawals of water (e.g. water pumped from wells within the basin and transferred through sewers to locations outside of the basin, or irrigation water lost to evaporation) and changes in land use that reduce the amount of natural storage of water in groundwater and wetlands. These human activities result in increased peak flows during the spring thaw and immediately following heavy rains, and reduced flows during dry spells. To the extent that human activities can be modified to protect the rivers' long-term health, this plan establishes the following standards:

Wildlife habitat: The areal extent and diversity of river-related wildlife habitat that existed under the baseline conditions reported in the 1994 Water Resources Study will be protected. In order to achieve this standard, the following specific conditions must be met:

Flow levels: Water levels sufficient to maintain the existing diverse wetland vegetation that provides breeding, feeding, and cover habitat for both resident native and migratory wildlife will be protected; along with flows necessary to ensure compliance with water quality standards and to protect the health of bottom-dwelling and instream fauna.

Flushing flows: To maintain habitat viability and streambed quality, naturally-occurring high seasonal flows adequate to maintain these features will be protected. Because the 1994 Water Resources Study did not address flushing flows, this aspect of the rivers' hydrology will be studied in detail before new withdrawals that would affect flushing flows (particularly "flood skimming" proposals) are pursued.

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[4] This study, which was conducted at the request of the Study Committee, is an important supplement to this River Conservation Plan. For further description, refer to ***Key Actions* – Use of the Water Resources Study** in the next section.

Recreational resources: The opportunities currently available for high quality recreation on the rivers will be maintained. In order to achieve this standard, the following specific conditions must be met:

Frequency of opportunity: The existing seasonal pattern of flows in the rivers (as observed during the Water Resources Study), which provides a variety of recreational experiences, will be protected from human-induced changes that would diminish either the frequency or variety of these experiences. Included are spring high water levels that allow access by canoe to the rivers' wide floodplain; flows that create whitewater conditions on the Assabet River; and water levels sufficient to maintain the rivers' navigability for both motorized and non-motorized boats.

Quality of opportunity: Flow alterations that would significantly impair the rivers' scenic values by reducing natural water levels or by creating offensive water quality conditions will not be permitted. Flow alterations that would damage populations of game fish are likewise not allowed.

Water quality: Flows sufficient to enable the segments to comply with Massachusetts' water quality standards will be protected.

Emergency uses: In a declared water supply emergency, public health and welfare will be given priority over instream needs. That is, the above water quantity standards would be suspended, if necessary, for the duration of the declared emergency.

ACTION PROGRAM:

Key Actions

Flow management: *The MDC/MWRA will continue to manage the reservoirs upstream of the Sudbury River segment in accordance with existing policies and the state minimum release law. Any changes in flow management that would alter flows or water levels within the segments must conform to the water quantity and quality standards described above.*

Under present conditions, flow management along the Sudbury and Concord rivers is specifically subject to Chapter 194 of the Acts of 1988, "An Act Relative to the Sudbury River," which requires that "reasonable instream flow" be maintained below the MDC/MWRA Sudbury Reservoir system. If any changes to this requirement are proposed, certain issues would need to be addressed to ensure conformance with the water quantity standards. The RSC will take an active role in efforts to resolve these and other flow-related issues.

Water supply planning: *Potential needs for additional water supply withdrawals from the Sudbury, Assabet and Concord rivers will be determined through the state's river basin planning process.*

In 1979, Massachusetts established a long-range, statewide river basin planning process when it promulgated the Water Resources Management Planning regulations (313 CMR 2.00). Recognizing that water supply planning is a dynamic process, the regulations require the review and revision of river basin plans on a regular basis.

With respect to the Sudbury, Assabet and Concord rivers, the current basin plan, entitled "Inventory and Analysis of Current and Projected Water Use" dated June 1989, will be updated effective June 1995. Further revisions to this basin plan should reflect both the knowledge gained from the Water Resources Study and the water quality and quantity standards of this River Conservation Plan.

In addition, the Massachusetts Water Resources Authority has prepared several planning documents during the past decade that address the potential need for withdrawals from the Sudbury River, through reactivation of Sudbury Reservoir and/or withdrawals from other sub-basins. These documents have been subject to review and comment by state agencies and the public, including reviews conducted in accordance with the Massachusetts Environmental Policy Act (M.G.L. Chapter 30 §§ 61-62H). Based on these various water supply plans, Sudbury Reservoir (along with Framingham Reservoir #3) remains the only approved source of emergency water supply for the MWRA system, which serves about 2 million people in the Boston Metropolitan area, including residents of the SuAsCo basin communities of Framingham, Bedford, Marlborough, Northborough and Southborough. Withdrawals from the reservoirs upstream of the Sudbury River segment may be made only after declaration of a water supply emergency by the Massachusetts DEP. None of the documents identify a current or definite future need for consumptive withdrawals from the river by the MWRA.

Future revisions to these documents should reflect both the knowledge gained from the Water Resources Study and the water quantity and quality standards of this River Conservation Plan.

Water conservation: *Pursue water conservation opportunities to reduce reliance on the Sudbury, Assabet and Concord rivers' surface and groundwater sources for present and future water supply.*

There are two primary areas on which attention should be focused:

1. Supporting water use efficiency planning as the most important element of DEM and MWRA river basin and long-range water supply plans.

2. Promoting water conservation and water use efficiency in study area towns.

Considerable energy and resources have been expended in both of these areas for many years — the MWRA has pursued both supply management and demand management throughout its system, and the Massachusetts Water Resources Commission has emphasized educational programs on water conservation throughout the Sudbury, Assabet and Concord rivers basin.

While these programs have been very successful, additional "grassroots" citizen and targeted industrial/institutional educational efforts could increase awareness of this important issue.

Implementation of recent state and federal water conservation mandates will help to achieve further reductions in demand. At the state level, the Water Management and Interbasin Transfer acts, along with MWRA member community water pricing regulations, have established a clear policy direction concerning the important role of water conservation in water management. In 1992, the Water Resources Commission formally adopted Water Conservation Standards to be used in water supply planning. Massachusetts also led the nation by revising its state plumbing code to require the use of low flow fixtures for all installations since 1989. At the federal level, the National Energy Policy Act (P.L. 102-486; Oct. 24, 1992) established new national plumbing efficiency standards.

Use of the Water Resources Study: *The Water Resources Study, along with this River Conservation Plan, will be used as a primary source of information in water management and planning.*

The Water Resources Study provides important information regarding the flows necessary to enhance and maintain water-dependent resources as well as the potential for compatibility between resource protection and additional water supply withdrawals.[5] The MWRA, DEM, DEP, and the Massachusetts Water Resources Commission should incorporate this information into any planning, management, or regulatory activities that involve water quantity issues within the segments.

Users of this information should keep in mind that the Water Resources Study is not an evaluation of specific withdrawal or diversion proposals, nor does it define specific management regimes for the Sudbury, Assabet and Concord rivers. Rather, it incorporates hypothetical levels of withdrawals and diversions, along with multi-year droughts, into an analysis of resulting river elevations. As with any scientific analysis, the study is based on a number of important assumptions, and these assumptions have related limitations that should be considered in any future management decisions.

Given those considerations, the Water Resources Study indicates that some additional use of Sudbury, Assabet and Concord river water for water supply could be compatible with protection of the river's instream resources and, therefore, with Wild and Scenic river designation. Based upon the assumptions utilized in the Water Resources Study, during dry years there appears to be sufficient water to provide for "likely" future in-basin water demand through the year 2010. Under severe drought conditions and higher levels of demand, the study suggested that a significant amount of river-dependent wildlife habitat and diversity could be lost due to reduced flow levels. This result points to the need for aggressive water conservation measures within the rivers' watershed, especially during drier-than-normal years.

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[5] This information is contained in the final report of the Water Resources Study and the "Summary: Sudbury, Assabet and Concord Rivers Water Resources Study" contained in Appendix B.

State regulation of water diversions: *Any new withdrawal, increase in existing withdrawal, or diversion of 100,000 gallons per day or more from the rivers will require approval from the DEP under the Massachusetts Water Management Act (Chapter 592, Acts of 1985 and 310 CMR 36.00). The transfer of water out of the Concord River basin, through either water transmission or sewer lines, is regulated under the Interbasin Transfer Act (Ch. 658, Acts 1983 and 313 CMR 4.00).*

The Water Management Act is intended to protect the state's water resources and to ensure that a basin's safe yield is maintained. Decisions under this law reflect the needs for public water supply, water quality, waste assimilation, flood management, water-based recreation, wildlife habitat, agriculture, and fish and wildlife.

The law requires a permit from the DEP for any new or increased withdrawal of surface or ground water greater than 100,000 gallons per day. In addition to evaluating the factors listed above, DEP considers whether the applicant has adequately addressed the following: thorough exploration of alternatives, including conservation; implementation of conservation measures; and initiation of public information programs on conservation techniques.

The Interbasin Transfer Act was established to encourage the maintenance of adequate flows within a given basin by requiring the implementation of conservation measures and use of alternative in-basin sources of supply before interbasin transfers are permitted. This law also requires that reasonable instream flows in the donor basin be maintained.

If new withdrawals that would affect the Sudbury, Assabet and Concord rivers are proposed, applicants will need to prepare and submit a plan that demonstrates the extent to which improvements in water use efficiency could be used to supply the needed water, and how the river's resources would be protected, as described above and in the Water Resources Study.

State water quality certification: *The DEP will continue to implement the water quality certification requirements of Sec. 401 of the Clean Water Act for any discharge into the segment requiring a permit from the Army Corps of Engineers and that could affect water quantity in the segment.*

This responsibility is described in the discussion of DEP's implementation of state and federal water pollution control statutes under **Water Quality — Key Actions.**

Federal regulation of stream alterations: *The Army Corps of Engineers will implement the permitting requirements of Sec. 404 of the Clean Water Act for any project affecting water quantity that would discharge dredged or fill material into the segment or an adjacent wetland.*

This responsibility is described under **Channel, Floodplain, and Wetland Protection — Key Actions.**

State regulation of water supply emergencies: *The DEP will maintain authority to declare a water supply emergency if conditions arise that necessitate such action.*

In 1989 the Massachusetts DEP promulgated a Drought Response Plan for the MWRA system. Under emergency conditions, including severe drought, transmission system failure, or supply contamination conditions, this plan requires use of water from Sudbury Reservoir and Framingham Reservoir # 3 to help supply the MWRA service area. In the case of a drought, the DEP administrative order requires the mixing of Sudbury River water with existing supplies during high spring runoff periods, once water levels at Quabbin drop to 50% of maximum.

DEP will notify the RSC if these drought emergency requirements are ever implemented.

Supporting Activities

Other state authorities: *The state should ensure consistency with this River Conservation Plan in its implementation of other laws, policies and regulations that could have a bearing on water quantity in the segment.*

Additional Opportunities

Study of flushing flows: *Conduct a study to identify the "flushing flows" needed to maintain the rivers' ecological integrity.*

Because of time and budget limitations, consideration of the rivers' flushing flow needs was not included in the Water Resources Study. A detailed empirical study would be desirable. If such a study is pursued, the RSC should participate in developing the scope of work and reviewing the results.

Implementation of local water use efficiency plans: *DEP will continue to monitor the implementation of local water conservation plans every five years.* The RSC will work with the towns, DEP, and DEM to ensure that appropriate water conservation measures are identified in the local water conservation plans registered water users must file with the state, and will assist the DEP in monitoring the implementation status of these plans. The RSC will also help local registered users develop and distribute educational materials that promote the use of voluntary conservation measures (e.g. reduced lawn and garden watering) during pre-drought conditions.

Reservoir management: *The MDC/MWRA should evaluate its reservoir and dam operations to ensure that periods of drawdown and refilling do not create adverse impacts on downstream water quality, wildlife habitat, or recreation, particularly during low-flow periods.*

WILD AND SCENIC RIVER PROVISIONS

- Community water and sewer departments within the SuAsCo basin should notify the RSC when they are preparing any relevant withdrawal permit application. This will enable the RSC to work with the community during the state permit review process.

- In consultation with the RSC, NPS will review any proposed project involving flow alteration and requiring federal assistance through permits, licenses, funding, or other action and that would be on or directly affecting the segments. This would apply to projects upstream or on tributaries, as well as those on the segments themselves. Such review will be based upon an evaluation of the project relative to the Plan's objectives and standards. No project that would have a direct and adverse effect on the segments' free-flowing character, water quality, or on their outstanding wildlife habitat, recreation, scenery, or historic and literary values, will be allowed.

- The DEP/WRC/DEM will notify the NPS and the RSC of any relevant withdrawal permit applications. Notification will also be provided of other proposals that could affect the segments' free-flowing character or water quantity and that require state certification under Sec. 401 of the Clean Water Act.

- The Army Corps of Engineers will notify the NPS of any applications for individual permits under Sec. 404 of the Clean Water Act that would affect the segments. The Corps and the NPS will develop a coordination/screening procedure for projects which are authorized under programmatic general permits.

CHANNEL, FLOODPLAIN, AND WETLAND PROTECTION

OBJECTIVE:

Maintain or enhance the natural condition of the river system, including its free-flowing character; the integrity of the stream channel, banks and floodplain; and the ecological functions of adjacent wetlands.

STANDARDS:

Dams: In order to maintain the segments' free-flowing character, no new dams, nor modifications to existing dams that would impair this character, will be allowed.

Wetlands: Alterations to riparian wetlands, including vegetative cutting, that adversely affect wildlife habitat, erosion control, recreation, or aesthetics, will only be permitted to the extent that they are allowed under applicable federal, state and local laws.

Other alterations: No other new man-made alterations to the rivers' channel or banks that would degrade their natural appearance and function will be allowed, unless such alterations are clearly in the interest of public health, safety, and welfare and no feasible and prudent alternative exists.

Improvements for recreational access, wildlife habitat enhancement, or wetlands restoration will not be precluded. However, the need for any such improvement should be clearly established, and its design and construction must minimize adverse impacts on the integrity and function of the river's channel, banks, floodplain, and adjacent wetlands.

ACTION PROGRAM:

Key Actions

Federal regulation of stream alterations: *The Army Corps of Engineers will implement Sec. 404 of the Clean Water Act, which requires federal approval for any project that would discharge dredged or fill material into a river or wetland; and Sections 9 and 10 of the Rivers and Harbors Act of 1899, which regulates the placement of new structures in navigable waters.*

Regulations governing the Army Corps of Engineers' Nationwide Permit Program (Federal Register, November 22, 1991) require individual rather than nationwide or general permits for all proposed projects covered by Section 404 of the Clean Water Act that are "in a component of the National Wild and Scenic Rivers System." In accordance with these regulations and the Wild and

Scenic Rivers Act, the Corps will, in its review of the individual permit applications that will be required along the segments, specifically consider comments from the NPS regarding consistency of the proposed projects with the standards set forth in this Plan. Such NPS comments will be developed through consultation with the RSC, and will thus include input from Conservation Commissions and other local experts.

However, it would not be appropriate for the NPS or the RSC to take an active role in **all** Section 404 permitting actions in the entire Concord River basin. The Corps and the NPS will work cooperatively to develop a coordination/screening procedure, including a procedure for requiring individual rather than nationwide or general permits, for projects that are outside the segments but that could adversely affect them.[6]

State water quality certification: *The DEP will continue to implement the water quality certification requirements of Sec. 401 of the Clean Water Act for any project affecting the segments' channel, banks, or adjacent wetlands that requires a Clean Water Act discharge permit.*

This responsibility is described in the discussion of DEP's implementation of state and federal water pollution control statutes under **Water Quality — *Key Actions.***

State Wetlands Protection Act: *The riverfront towns and DEP will implement and enforce the provisions of the Massachusetts Wetlands Protection Act.*

This law serves to protect the public interest in many of the natural functions that wetlands, water bodies and floodplains provide, including flood storage, storm damage protection, wildlife habitat, prevention of pollution, and fisheries protection. Such functions are preserved and promoted by limiting the human alteration of wetlands resource areas, including water bodies, banks, bordering vegetated wetlands, the 100-year floodplain, and vernal pools; and of lands immediately adjacent to these resource areas. In implementing this statute, the towns and DEP should make a particular effort to protect the outstanding river-related resources (e.g. wildlife habitat) that qualify the rivers for Wild and Scenic designation, keeping in mind that activities along tributaries may have an impact on resources downstream.

Local land use regulation: *The riverfront towns will implement and enforce existing land use regulations that protect the rivers' channel, banks, floodplain, and adjacent wetlands.*

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[6] Nationwide or general permits are only applicable for certain previously identified Sec. 404 projects involving limited amounts of filling or dredging. Larger projects, such as might result in impacts on flows, scenery or water quality within the segments even if the project is located far upstream or downstream of the segments, always require individual permits. Thus it should be possible to develop a geographic cutoff for the individual review of those projects located outside the segments that would otherwise be authorized under a nationwide or general permit, based on the proximity of these smaller projects to the resources of concern.

The natural appearance and function of the rivers' channel, banks, floodplain, and adjacent wetlands receive strong protection through several local land use regulations. The most important include local wetlands protection bylaws and local floodplain zoning. These existing local bylaws have been found to provide adequate protection for the segments and their related land-based resources, making the rivers suitable for Wild and Scenic designation. The local laws and regulations are discussed in greater detail under **Land Management.**

In implementing state and local wetlands protection laws, the riverfront towns will take actions to minimize the impacts of any unavoidable alterations on wildlife habitat, water quality, and, where appropriate, aesthetics and recreation. Such actions could include the use of best management construction practices and designs based on "soft" or green engineering approaches. To prevent further resource degradation, any new bridge abutments or other physical structures should be designed to minimize physical and aesthetic impacts and/or be located as far back from the river's banks as possible. Any necessary bank stabilization should be designed in a way that will maintain the natural character of the shoreline and, wherever possible, should be achieved using natural vegetation.

Supporting Activities

Other state regulatory responsibilities: *The state should ensure consistency with the provisions of this River Conservation Plan in its implementation of other laws, regulations and programs that relate to the protection of the rivers' channel, banks, floodplain, and adjacent wetlands.*

Massachusetts has several other programs and policies that potentially have a bearing on the physical character of the rivers. They include the following:

- Executive Order 149, which requires all state agencies, under the leadership and direction of the Water Resources Commission, to avoid the use of floodplains to the extent possible in constructing structures, roads, and other facilities.

- The state building code (780 CMR 2102), which regulates the design and construction of any structure within the floodplain through the local Building Inspector, or, for state-owned structures, through the State Building Inspector.

- The Massachusetts Environmental Policy Act (MEPA), which requires the pre-construction review of projects (including state-sponsored projects) that exceed certain thresholds with respect to wetland alteration.

- Dams and Reservoir Safety (M.G.L. Ch. 253, §§ 44-50), which authorizes the DEM to regulate the construction, repair, or alteration of dams, reservoirs, and similar structures.

The RSC should be notified of, and given the opportunity to comment on, any actions other than those of an emergency nature under these programs that could affect the rivers. In particular, the Massachusetts Highway Department should consult with the RSC early in the process of designing new or improved bridges and roads that could affect the segments' channel, floodplain, or wetlands. While state highway projects are exempt from regulation under state and local wetlands regulations, the federal funding or Sec. 404 permits that are usually associated with these projects will trigger NPS and RSC review under Section 7 of the Wild and Scenic Rivers Act. In the interest of efficiency, state highway engineers and planners are urged to consult with the RSC to ensure that all measures to avoid direct and adverse impacts on the segments' outstanding resources have been taken before proceeding with the final design of such projects.

Additional Opportunities

Floodplain protection: *Those riverfront towns that have not yet strengthened their local floodplain zoning to require more than minimal National Flood Insurance Program requirements should consider adopting stronger measures.*

Although all of the riverfront towns have floodplain zoning bylaws which comply with minimum flood insurance standards, several towns' bylaws are much stronger, virtually prohibiting new building or paving in the floodplain. The NFIP merely requires communities that wish to make their residents eligible for federally-subsidized flood insurance to require in turn that new construction within the floodplain is designed with all habitable areas above the 100-year flood level, and that associated utilities are "floodproofed." This can cause incremental increases in the extent of the 100-year floodplain, further increasing the likelihood of eventual catastrophic property losses. It also results in the loss of floodplain-related resources such as wildlife habitat and scenic values. Using information compiled during the Wild and Scenic study, the RSC should work with town governments to encourage the enactment of stronger floodplain zoning bylaws,[7] where necessary.

WILD AND SCENIC RIVER PROVISIONS

- In consultation with the RSC, NPS will review any proposed channel, bank, or wetland alteration that requires a federal permit, license, certification, or funding and that would directly affect the designated segments. This review will be based upon an evaluation of the project relative to the River Conservation Plan's objectives and standards. No project that would have a direct and adverse effect on the segments' free-flowing condition or its outstanding wildlife habitat, recreation, scenery, or historic and literary values will be allowed.

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[7] such as those in place in Carlisle, Sudbury and Wayland which virtually eliminate new construction, and, in the case of Carlisle, new paving within the 100-year floodplain.

- In accordance with the Wild and Scenic Rivers Act, no federal permits or licenses will be issued, nor federal funds spent, on new dams or modifications to existing dams that would destroy the free-flowing character of the river segments. The NPS and RSC will review any such proposed dams or modifications to existing dams in consultation with the appropriate federal agency in making this determination.

- No hydroelectric projects within or directly affecting resources within the segments will be allowed.

- The DEP will notify the NPS and the RSC of, and give each the opportunity to comment on, any proposed project requiring state certification under Sec. 401 of the Clean Water Act.

- The Army Corps of Engineers will notify the NPS of all applications for an individual permit under Sec. 404 of the Clean Water Act that would affect the segments. The Corps and NPS will develop a screening procedure that would require individual filings for projects outside the designated segments which would otherwise be authorized under nationwide or general permits, in order to ensure that no project that could have an impact on the segments' outstanding resources or free-flowing character fails to receive individual scrutiny by the NPS and RSC.

PROTECTION OF OUTSTANDING RESOURCES

This section of the Plan addresses the protection of the five outstanding resources (recreation, scenery, ecology, historical and archaeological resources, and literary values) that were found to make the river study segments eligible for Wild and Scenic designation. The primary geographic focus is on protecting these resources within the segments and adjacent lands. However, the Plan's action program also addresses activities outside the segments that could have a direct and adverse impact on outstanding resources within the segments

RECREATIONAL RESOURCES

OBJECTIVE:

Protect and enhance the Sudbury, Assabet and Concord rivers' outstanding recreational resources, as described in the Resource Assessment and Eligibility Report, the public Issues Identification Forums held during the study, and the Water Resources Study.

STANDARDS:

Recreational opportunities: Existing recreational opportunities will be maintained and enhanced. New forms of recreation, or the significant expansion of existing uses, will be encouraged only to the extent that this will not adversely affect existing recreation.

Impacts on land and water resources: All recreational activities and facilities will be managed in a way that will prevent degradation of the rivers' land and water resources, including their outstanding scenic, ecological, historical, and archaeological resources.

Access: Public lands will continue to be relied upon to provide access to the river. Any access through private lands will be at the discretion of the landowner.

ACTION PROGRAM:

Key Actions

Monitoring recreational use and promoting issue resolution: *The RSC will take the lead in monitoring river recreation, identifying persistent issues associated with recreational use, and promoting the cooperative resolution of those issues. This may include developing a comprehensive recreation management plan.*

During the course of the Wild and Scenic River Study, members of the public identified a number of existing issues that warrant attention, including:

- concerns expressed by owners of riparian lands (e.g. trespass, noise, vandalism, and lack of respect for their privacy)
- conflicts posed by competing or incompatible recreational uses
- noise and high wakes associated with speeding power boats and the illegal operation of jet skis
- parking and traffic problems
- litter problems on both private and public lands
- the health, safety, and welfare of river users
- the potential intensification of these and other issues if recreational use increases in the future.

The Resource Assessment and Eligibility Report, Study Committee meeting minutes, Issues Identification Forums, and Water Resources Study provide detailed information about existing recreational conditions along the segments, and the preferences of area residents and other users for the various forms of recreation provided by the rivers. In working to address these and other recreation issues, the RSC should build on the information collected during the study. Issue resolution may be promoted through the development of a comprehensive recreation management plan for the segment. Such a plan should be developed in cooperation with all interests that have a stake in recreational use of the river corridor.

Regulation of water-borne recreation: *The Massachusetts DFWELE and the towns will continue to regulate boating along the segments in accordance with their existing authorities. The U.S. Fish and Wildlife Service will continue to develop and implement water-borne recreation policies that are consistent with the refuge's primary wildlife protection mandate for those portions of the rivers that are subject to its jurisdiction.*

The Wild and Scenic study identified lack of awareness and enforcement of state and local boating regulations, including speed limits, as one of the principal causes of recreational conflicts on the rivers. To help remedy this, the towns and DFWELE should:

1. Coordinate efforts to publicize boating regulations, including existing local speed limits, and safe boating practices at major access points, marinas, etc.
2. Coordinate public outreach efforts in cooperation with user groups such as boating and fishing clubs.
3. Consider establishing a cooperatively-funded enforcement officer position to provide badly-needed boating safety patrol capability along the segments.
4. Consider whether to amend the state boating regulations to reduce speed limits within certain portions of the segments where the statewide 40 mph limit may result in adverse impacts on public safety or river resources.

Recreational management on public lands: *The U.S. Fish and Wildlife Service and National Park Service will continue to manage recreation within Great Meadows National Wildlife Refuge and Minute Man National Historical Park respectively. The riverfront towns will continue to manage recreation on their lands along the segment. Land managers should review current policies and practices relating to recreation management for consistency with the objective and standards stated above, and revise them if necessary.*

The extensive access from public lands, and the variety of recreational opportunities along the segments make the Sudbury, Assabet and Concord rivers one of the region's most important recreational resources. Any major revision to existing recreation management policies and practices for public lands along the segments should be made in consultation with the RSC.

Private organization initiatives: *River advocacy and recreation user groups will continue to play an important role in recreation management.*

The Sudbury, Assabet and Concord rivers' principal river advocacy and recreation user groups (including SVT; OAR; the Sudbury, Assabet and Concord Watershed Association; the Framingham Advocates for the Sudbury River; Concord Rod and Gun Club; and the Boston Chapter of the Appalachian Mountain Club) have dealt with recreational issues on the river for many years. Their continued cooperation in working with the RSC, riverfront towns, commercial boating facilities, and public agencies will be vital for effective recreation management in the future. These groups should focus attention on three primary activities:

1. Educating users about the rivers and about the potential environmental and social effects of various recreational activities.
2. Participating in efforts to resolve recreational conflicts and to balance competing uses.
3. Assisting in cooperative projects such as the development of appropriate access sites and river cleanups.

Supporting Activities

Local land use regulations and practices affecting recreation: *The riverfront towns will help to protect the rivers' outstanding recreation by enforcing existing land use requirements along the segments, and by maintaining existing recreational access points on town-owned lands.*

Town-enforced land use regulations, including floodplain zoning, state and local wetlands protection laws, and, in some towns, the enforcement of conservation restrictions held by the town, serve to protect the rivers' recreational values by protecting the fish and wildlife habitat and scenery valued by recreational users.

Support for recreational access provided by commercial canoe liveries and marinas: *The existing canoe livery and marina located along the segments are recognized as enhancing public access to the rivers through the provision of boat rental and storage facilities.*

In the absence of the existing commercial boating facilities along the rivers, enjoyment of the Sudbury, Assabet and Concord's outstanding recreational opportunities might be restricted to the relatively few private boat owners in the area. In accordance with the standards articulated above, commercial boating facilities are encouraged to continue to provide services to all potential members of the boating public, and through the provision of such services, to enhance public understanding and appreciation for the rivers' diverse resources.

Additional Opportunities

Acquisition of additional access points by towns: *The riverfront towns should seek out opportunities to acquire additional public access points along the segments through easements, municipal ownership, or transfer of use.*

Opportunities may exist for the towns to acquire appropriate recreational access points along the rivers (including lands that provide fishing, picnicking, or hiking access) through the acquisition of easements, intramunicipal transfers of use, and municipal ownership of abandoned roads, tax title lands, etc. Working through appropriate town boards such as Conservation Commissions and Recreation Departments, the towns should identify local access needs through the development of Open Space and Recreation Plans, and work cooperatively with willing private landowners and state agencies to implement the plans.

WILD AND SCENIC RIVER PROVISIONS

No additional requirements related to the management of recreational resources will result from Wild and Scenic River designation. The National Park Service and U.S. Fish and Wildlife Service will not expand the regulation of recreational uses or require permits for commercial recreational activities outside the areas where this authority already exists, i.e. within Minute Man National Historical Park and Great Meadows National Wildlife Refuge.

ECOLOGICAL RESOURCES

OBJECTIVE:

Protect and enhance the Sudbury, Assabet and Concord rivers' outstanding ecological resources.

STANDARDS:

Fish and wildlife habitat: The quantity, quality, and diversity of river-dependent fish and wildlife habitat, as documented by the Resource Assessment and Eligibility Report and the Water Resources Study, will be maintained and enhanced.

Sensitive species: Populations of sensitive species, including state-listed river-dependent rare and endangered species, will be protected and enhanced.

ACTION PROGRAM:

Key Actions

Wildlife management: *The U.S. Fish and Wildlife Service, Massachusetts DFWELE-DFW, town boards, and private conservation organizations will retain responsibility for management of fish and wildlife (including vegetation) within the areas that are under their respective jurisdictions.*

The U.S. Fish and Wildlife Service enhances and maintains fish and wildlife habitat within Great Meadows National Wildlife Refuge by maintaining existing dikes and water control structures, and, as necessary, constructing additional water control devices as part of its wetland restoration program. Water levels are manipulated within GMNWR impoundments for purposes such as but not limited to wildlife habitat improvement and nuisance exotic plant control. Other primary programs include managing muskrat populations at high levels to create vegetative eat-out openings in the floodplain marshes. These openings off the main river channel afford wading birds, waterfowl and shorebirds with feeding and loafing areas away from human disturbance created by motorboats, canoes and kayaks. Great Meadows' artificial wood duck nesting box program will continue to be expanded. Waterfowl hunting will remain closed until land acquisition within the refuge progresses to the extent that a refuge-operated, public waterfowl hunting program can be offered.

Any major changes to the U.S. Fish and Wildlife Service's existing management practices that are specific to the Sudbury, Assabet and Concord rivers will be consistent with the standards of this Plan, and will be made in consultation with the RSC.

The DFWELE Division of Fish and Wildlife's major fish and wildlife management activities

include: 1) habitat management and protection, 2) the regulation of fishing and hunting activities, 3) research, 4) environmental review, and 5) the stocking of fish.

Any major changes to the Division of Fish and Wildlife's existing management practices that are specific to the Sudbury, Assabet and Concord rivers should be consistent with the standards of this Plan, and should be made in consultation with the RSC.

Supporting Activities

Initiatives for habitat protection and enhancement: *The RSC should promote projects that support the restoration, protection and/or enhancement of aquatic wildlife habitat.*

Particular emphasis should be given to projects along the rivers and tributaries that would protect habitat diversity, enhance habitat for rare and endangered species, promote anadromous fish restoration, restore habitats having high wildlife value (such as deep marsh wetlands), retard the accelerated conversion of wetlands into dry land, and decrease the prevalence of low-value, invasive vegetation such as purple loosestrife and *Phragmites*.

Good examples of existing and potential projects include the following:

- The placement of Osprey nesting platforms along the Sudbury River by Lincoln's Conservation Commission.
- GMNWR's water chestnut eradication campaign.
- The RSC's potential efforts to work with private landowners to develop voluntary land management practices to protect rare, endangered and threatened species' habitat and other habitat critical to aquatic and riparian wildlife.

Additional Opportunities

Inventory of sensitive species: *Update the existing inventory of sensitive plant and animal species associated with the Sudbury, Assabet and Concord rivers.*

This effort could be pursued cooperatively by the RSC, the DFWELE Natural Heritage and Endangered Species Program, the U.S. Fish and Wildlife Service, educational institutions, local conservation commissions, and other appropriate organizations.

WILD AND SCENIC RIVER PROVISIONS

There will be no additional requirements for the management of fisheries and wildlife habitat, and there will be no National Park Service role in such management, as a result of Wild and Scenic River designation.

HISTORIC, ARCHAEOLOGICAL AND LITERARY RESOURCES

OBJECTIVE:

Protect and enhance the outstanding historic, archaeological and literary resources associated with the Sudbury, Assabet and Concord rivers.

STANDARDS:

Historic sites: The integrity of sites associated with the segments and listed on the National Register of Historic Places or Massachusetts's State Register of Historic Places will be maintained.

Archeological sites: The integrity of sites that are important in understanding and interpreting the activities of Native American and prehistoric cultures in the Sudbury, Assabet and Concord river corridor will be maintained.

Literary heritage: The integrity of sites associated with the rivers' literary heritage will be maintained, and opportunities will be sought to enhance the interpretation of this heritage for the public.

ACTION PROGRAM:

Key Actions

Historic preservation laws: *The Massachusetts Historical Commission, the National Park Service, and the Advisory Council on Historic Preservation will continue to exercise their respective authorities to protect historic sites under M.G.L. Chapter 9 §§ 26-82 and the National Historic Preservation Act (P.L. 89-665).*

Section 106 of the National Historic Preservation Act requires that a review be conducted before any federal action is taken that might affect a site listed on the National Register. Federal actions that trigger this review include construction, licensing and permitting, government loans, and similar activities. The purpose of the review is to determine if the site would be adversely affected and, if so, to identify ways to avoid or mitigate the adverse effect. The Act does not grant authority to stop a project in order to preserve a site; rather, it mandates that historic resources be "taken into account." States typically take the lead in evaluating the potential impacts of proposed projects on listed sites. The NPS provides technical assistance as needed, and retains the option of conducting its own review, as does the Advisory Council on Historic Preservation.

Several sites in the area have been recognized for their river-related historic significance. Structures on the National Register include the Four-arched Bridge over the Sudbury River and Barrett's Farm in Concord. In addition, the entirety of Minute Man National Historical Park in Concord is listed on the Register. Additional structures along the segments are listed on the State Register of Historic Places or have been included in local historic districts.

Existing authorities will be sufficient to protect these outstanding historic resources. Agencies responsible for oversight of these resources should be informed of the existence of this River Conservation Plan and encouraged to take it into account as they exercise their review and consultation responsibilities.

Protection and investigation of historic and archaeologic sites on public lands: *Public land managers will review their existing land management plans for compatibility with the protection of important historical and archaeological sites that are linked to the river, and will take additional actions if necessary to ensure the protection of those sites.*

The riverfront towns should consult with local historical societies and historic district commissions to ensure that all river-related historic sites on public lands, including sites not considered eligible for national or state recognition, are protected. The RSC will cooperate with the towns in such projects.

Further investigations of archaeological sites on public lands should be encouraged, but should be coordinated in advance with the land-managing agency to avoid conflicts with other resource management activities. All archeological activities should be overseen by recognized professional archaeologists using accepted field techniques.

Protection and interpretation of rivers' literary heritage: *Public land managers and private foundations will continue to protect sites along the rivers that are significant to the area's literary heritage, and will continue to provide appropriate interpretation of such sites for the public's benefit.*

The rivers' outstanding heritage in the history of the transcendentalist movement has been recognized in the preservation of many sites important to this movement, including Walden Pond and the Old Manse, protected and interpreted for the public by the Massachusetts DEM and the Trustees of Reservations respectively. The RSC should seek opportunities to work with these organizations and others such as the Thoreau Lyceum to ensure the continued protection of these sites, and to promote an awareness of this aspect of the rivers' history throughout the study area towns.

Supporting Activities

Interpretation of historic resources: *Local historical societies will continue to be both the primary source of information for the public on the region's historic resources, and the primary advocate for the protection of those resources.*

Local historical societies should evaluate opportunities for further research into the historical and literary relationship between the adjacent communities and the river. This connection would also be an appropriate theme for the RSC and the societies to emphasize in their public education efforts.

WILD AND SCENIC RIVER PROVISIONS

There will be no additional requirements related to the protection and management of historic resources as a result of Wild and Scenic River designation. National Park Service authority will be limited to that already established under the Historic Preservation Act.

SCENIC RESOURCES

OBJECTIVE:

Protect and enhance the outstanding scenic resources associated with the Sudbury, Assabet and Concord rivers.

STANDARDS:

Landscape protection: The distinctive and noteworthy landscapes associated with the segments will be protected from inappropriate land use changes.

Viewshed protection: Existing scenic views to and from the rivers will be protected from inappropriate land use changes.

Scenic bridges: The many distinctive bridges that span the segments will be protected and maintained.

ACTION PROGRAM:

Key Actions

Landscape stewardship: *Public landowners and land regulating agencies will continue to enforce existing land use policies that serve to protect important river-related landscapes, and the RSC will work with Conservation Commissions, Historic District Commissions, and land trusts to improve public awareness of landscape stewardship responsibilities.*

The continued enforcement of state and town wetlands laws, local zoning, and conservation restriction requirements will help to protect the distinctive and noteworthy landscapes along the segments, as identified in the Massachusetts DEM's 1979 statewide landscape inventory. Such landscapes are at least partially dependent on appropriate vegetative management practices, including the continued mowing of wet meadows, the mowing of hillsides overlooking Fairhaven Bay, and the preservation of a mature forest canopy in many locations along the rivers.

Bridge maintenance and repair: *The Massachusetts Highway Department and town DPWs and Road Commissions will give due regard to preserving the distinctive design and appropriate scale of bridges spanning the rivers when planning significant reconstruction and maintenance projects.*

Many of the bridges that span the segments add to the rivers' scenic value, both by providing visual access and because the bridges themselves have architectural interest. Designs include the iron truss bridge at Danforth Street (badly in need of restoration); the humpbacked Pelham Island Road bridge; the Four-arched stone bridge between Wayland and Sudbury; Sherman's bridge, recently rebuilt using timber; Lee's bridge between Lincoln and Concord; the Old North Bridge replica in Concord; and many others. While some of these bridges may require reconstruction in the future, efforts should be made to design replacement or repair structures that maintain the existing bridges' dimensions and architectural style to the extent possible. In reviewing federal permit and funding requests associated with such reconstruction projects, the RSC will work with the appropriate town and state agencies to conserve the bridges' scenic character.

Supporting Activities

Scenic inventory: *The RSC will pursue options to conduct a systematic inventory of river-related scenic resources.*

The protection of the rivers' scenic values would be enhanced if a scenic inventory were available for use by town planners. Such an inventory would also aid the RSC and NPS in making Section 7 determinations on federally-funded or assisted projects. However, no systematic assessment of scenic values has been conducted along the segments since the 1979 statewide inventory, which was not intended to focus on river-related scenery. The RSC should pursue funding for such an inventory, which could take the form of a "demonstration project" conducted cooperatively with local experts and interested private landowners. This would be particularly appropriate if the rivers are designated into the Wild and Scenic Rivers system.

WILD AND SCENIC RIVER PROVISIONS

There will be no additional requirements related to the protection of scenic resources as a result of Wild and Scenic River designation.

IV. WATERSHED MANAGEMENT

OVERVIEW

Protection of the study segments of the Sudbury, Assabet and Concord rivers cannot be considered in isolation from other portions of the river system. The previous section addressed the segments proposed for designation. This section focuses on portions of the watershed upstream of the study area, including the towns of Hopkinton, Ashland, Natick, Westborough, Southborough, Northborough, Marlborough, Berlin, Hudson, Bolton, Stow, Maynard, Acton, and Boxborough. It identifies actions that could be taken by these communities and others both to protect the upstream portions of the watershed and to support actions being proposed for the study segments. These are recommendations only, and their implementation is not required as part of the Sudbury, Assabet and Concord River Conservation Plan.

This section also suggests ways for towns downstream from the study segments to get involved in protecting the Concord River and its tributaries, from Rte. 3 to the confluence with the Merrimack River in Lowell.

MANAGEMENT RECOMMENDATIONS

Local Government Actions

Towns upstream from the designated segments, including those along their tributaries, should review the **Land Management** section of this Plan and pursue implementation of actions that they deem relevant and beneficial. Towns along the designated segments should also pursue protection along tributaries to the segments, as described in the **Resource Management** section. In particular, upstream towns should consider adopting or strengthening floodplain zoning, erosion and sedimentation controls, and wetlands protection bylaws.

Private Organization Initiatives

Local land trusts involved in this area also should focus efforts on the river, possibly in partnership with SVT and OAR.

In addition, SVT, OAR, the DEP, DFWELE-Riverways Adopt-A-Stream Program, and any other interested groups (such as the Hop Brook Protection Association) should consider a cooperative effort to initiate a volunteer water quality monitoring program, including shoreline surveys, for the entire watershed.

PARTICIPATION ON THE RIVER STEWARDSHIP COUNCIL

The Sudbury, Assabet and Concord Rivers Stewardship Council (RSC) should actively seek the participation of all of the towns within the Concord River basin, either through formal membership or informally through information exchange and cooperation on specific projects involving both upstream and downstream sections of the river. As discussed in the **Administrative Framework** section of this Plan, formal membership on the RSC would require a 2/3 vote of the existing members. Voting status would be determined by the Council.

Upstream or downstream towns also may wish to establish a working committee among themselves to address river-related issues that cross town lines, and to alert the RSC of conditions or issues that merit the Council's attention.

State and Federal Actions

State and federal agency decisions affecting flows and water quality in areas of the watershed outside the segments will be made in accordance with the **Water Resources Management** section of this Plan.

V. EDUCATION AND OUTREACH

OVERVIEW

Long-term protection of the Sudbury, Assabet and Concord rivers will depend upon a shared sense of responsibility and the enlightened stewardship of all who use and manage the river and its adjacent lands. Developing this unified spirit in an area with so many interests, issues, and jurisdictions will require a commitment to education and outreach.

Organizations with existing education and outreach programs will be encouraged to continue and expand their efforts. In addition, the RSC will help to organize cooperative efforts among its membership and with other organizations. The Council's objective will be to support and complement ongoing education and outreach activities, rather than to duplicate them.

POTENTIAL ACTIVITIES

Following are examples of education and outreach activities that should be considered. Many of these are discussed in greater detail elsewhere in this Plan.

- Developing a volunteer water quality monitoring program with students, local service organizations, organizations such as the Framingham Advocates for the Sudbury River and Hop Brook Protection Association, and other residents.

- Providing hands-on opportunities for the public to experience the river (e.g. through nature hikes and canoe trips) and to help improve it (e.g. by working on river clean-ups). Organizations such as GMNWR, SVT, OAR, and the Boston Chapter of the Appalachian Mountain Club have been quite successful in organizing such activities.

- Developing and distributing information about the special features of the Sudbury, Assabet and Concord rivers and how this Plan will provide for their long-term protection and management. This could be done through slide shows and videos, printed materials, and/or formation of a speakers bureau to give presentations to local service organizations, garden clubs, and similar groups.

- Providing information and assistance to landowners on techniques to enhance their stewardship of riverfront land. This could include: 1) identifying sources of information and expertise regarding the management of wildlife habitat and wetland vegetation; 2) organizing workshops and providing follow-up assistance on voluntary land protection techniques, such as conservation restrictions; and 3) providing information on the use of Best Management

Practices to control nonpoint source pollution, and on funding opportunities to implement demonstration projects using Best Management Practices.

- Developing a simple, understandable brochure for riverfront landowners that 1) summarizes the existing local, state, and federal regulations that may affect them and how those regulations are implemented; and 2) provides addresses and phone numbers of the appropriate offices or agencies at each level of government. Ideally, this brochure should be prepared in consultation and cooperation with the local planning boards and conservation commissions on a town-by-town basis to ensure accurate descriptions of each town's regulations.

- Developing information for landowners, developers, local land use boards, and others about the causes of nonpoint source pollution, its potential impacts on water quality and other instream resources, and methods for reducing or eliminating it.

- Establishing an awards program to recognize outstanding conservation achievements by individuals and groups in the Sudbury, Assabet and Concord river corridor.

- Promoting river-related activities in local schools, as well as with local service organizations and other groups.

- Establishing a clearinghouse of information on river protection techniques that have been used successfully in other areas.

- Developing an information and interpretive center at an appropriate location such as the historic Danforth St. bridge in Framingham as a focal point for visitors to the Sudbury, Assabet and Concord river corridor.

- Encourage the cooperation of school groups and adult advocacy groups such as the partnership between the Hop Brook Protection Association and school groups in Sudbury. These groups work together on shoreline surveys (visual surveys to discover sources of nonpoint source pollution, erosion and sedimentation, leaking or illegal pipes, areas of possible access and trails), water quality monitoring testing and advocacy. DEP requests the results of shoreline surveys to aid in its basin-wide permitting processes.

In addition, the DFWELE Riverways Adopt-A-Stream program is available to meet with and help in the formation of river protection groups, and will provide materials and hold workshops on shoreline surveys, land protection, water quality and quantity issues, and citizen action. Organizations such as the Massachusetts Water Watch Partnership, which works with community groups to design and implement water quality monitoring programs, may also be involved.

APPENDIX A

Sudbury, Assabet and Concord Wild and Scenic River Study Committee Recommendations For the Eight River Towns

(As approved at the 9/8/94 meeting of the SuAsCo Study Committee.)

Introduction

The Wild and Scenic River study process includes findings regarding a river's eligibility and suitability for designation. In order to be considered eligible, study rivers must be free-flowing and must have at least one noteworthy ("outstandingly remarkable") resource value, such as recreation, wildlife habitat, or scenery. In order for a river to be considered suitable for designation, these outstanding resources must be adequately protected. The *Resource Assessment and Eligibility Report* prepared by the National Park Service found that the 29-mile Sudbury, Assabet and Concord River study area has five outstanding resources, making the rivers eligible for designation. The question of whether these resources have adequate, long term protection was considered by the River Conservation Planning Subcommittee together with National Park Service, professional planning and conservation staff within the study area towns, and other interested participants. Study segments within each town were examined to determine whether the rivers and adjacent lands are adequately protected from inappropriate changes in land use that could degrade the outstanding resources. Among the factors considered were the existing land use zoning, physical features (such as floodplains and wetlands), and ownership patterns along the rivers. Based on this review, the Subcommittee and National Park Service found that the rivers and related resources are adequately protected from future changes that might harm them. However, as a result of information gathered during the study process, the Subcommittee developed a series of non-mandatory recommendations that, if implemented, would further strengthen the protection of the rivers' resources. These recommendations were adopted by the full Study Committee at its September 8th, 1994 meeting and discussed with appropriate town boards.

The recommendations are summarized below, and appear under ***Additional Opportunities*** in the **Resource Management - Private Lands** section of this Plan.

Study Committee Findings

The Sudbury, Assabet and Concord Wild and Scenic River Study Committee (referred to as the Study Committee) finds that the segments are suitable for designation; however, the Study Committee has both general recommendations for river protection, and for some segments the Study Committee has strong specific recommendations. In the areas where the

Study Committee has concerns, it hopes to work with the towns to improve protection for the rivers, their corridors and their resources.

General Recommendations

The *Water Resource Study: Sudbury, Assabet and Concord Rivers* (Goldman Environmental Consultants, Inc., Randolph, MA, April 21, 1994), commissioned by the Wild and Scenic River Study Committee, the National Park Service and the Massachusetts Department of Environmental Management found that the SuAsCo system

> ....is currently undergoing accelerated eutrophication, as evidenced by high phosphorus concentrations, extensive aquatic vegetation, sedimentation in the river system and high nutrient loadings.

The *Water Resource Study* recommended additional controls on both point source (wastewater treatment plants and industrial waste discharges) and nonpoint source (polluted runoff) discharges to the rivers.

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **strongly recommends that towns along the three rivers pass erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff (from sources such as leaking septic systems, parking lots, lawns, and driveways) from entering the river.** Vegetated riparian buffers are a highly effective means of improving the quality of runoff as it enters the rivers.

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadows' boundaries on a willing seller/willing buyer basis because refuge ownership offers the greatest protection for lands abutting the rivers, and consequently, for the rivers themselves. In addition, we encourage the towns to apply for Self-Help funds from the State's Division of Conservation Services and other sources to protect the river corridor.

Recommendations by Town

Framingham:

The study segment of the Sudbury River begins in Framingham at the Danforth St. Bridge and continues until the Sudbury border for a total of 3.3 miles of river frontage, including the oxbow, on both banks.

The Study Committee finds that the Framingham segment is suitable for designation and, in order to protect the resources of the river, **strongly recommends that:**

1. Because the Study Committee believes that maximum build-out of Sudbury Landing under existing zoning will severely impair the resources of the Sudbury River in an outstanding section of the river, **the Town actively pursue protection measures for Sudbury Landing.**

2. **The Town and New England Sand and Gravel work together to protect the river corridor through sensitive development and other means, and urges that the owner provide permanent protection of the Oxbow island.**

3. **The Town support Conservation Commission efforts to transfer the care and control of the riverfront portions of municipal land at the Edwards Cemetery and Cameron School to the Conservation Commission.**

4. In view of the Danforth Street Bridge's historic value and aesthetic appeal, **all possible means be pursued to restore the bridge for non-vehicular use.** This site is particularly appropriate for an interpretive site for describing the historic background of the Saxonville area, and if the Sudbury River is designated, the start of the designated section of the river.

5. **The Town negotiate to put a car-top boat launch on the Sudbury Landing site (or other site at the start of the proposed designated section) to allow residents and others the opportunity to canoe this important stretch of the river.**

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **recommends that Framingham pass erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Wherever possible, the Study Committee encourages the Town to apply for Self-Help funds from the State's Division of Conservation Services and other sources to protect the river corridor.

Wayland:

Wayland, with 14.7 miles of river frontage, has the second longest river stretch of the eight study area towns. The vast majority of Wayland's river frontage is well protected.

The Study Committee finds that the Wayland segment is suitable for designation, and in order to protect the resources of the river, **recommends that:**

1. The Town continue its impressive efforts to protect the Paine Estate;

2. The Town make every effort to preserve the archeological and scenic values of the Lord Parcel; and

3. The Town support efforts to repair the railings on the historic old Town Bridge on Route 27 so that public access may continue.

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **recommends that Wayland pass erosion and sedimentation control bylaws and stormwater regulations**. The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadow's boundaries on a willing seller-willing buyer basis because refuge ownership offers the greatest protection. In addition, we encourage the Town to apply for Self-Help funds from the State's Division of Conservation Services to protect the river corridor.

Sudbury:

There are 5.4 miles of Sudbury River frontage in Sudbury.

The Study Committee finds that the Sudbury segment is suitable for designation, and in order to protect the resources of the river, **urges that:**

1. Town, state, and federal agencies enforce existing regulations on the Macone land; and

2. The Town work to protect the important scenic values of Rice Hill on the former Quinn parcel.

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **recommends that Sudbury pass erosion and sedimentation control bylaws and stormwater regulations**. The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadow's boundaries on a willing seller-willing buyer basis because refuge ownership offers the greatest protection. In addition, we encourage the Town to apply for Self-Help funds from the State's Division of Conservation Services to protect the river corridor.

Lincoln:

The Sudbury River flows in Lincoln for 1.7 miles, forming the border between Lincoln and Concord. All but 440 feet of Lincoln's river frontage is protected through conservation ownership or conservation restrictions.

The Study Committee finds the Lincoln segment to be suitable for designation. It appreciates Lincoln's efforts to protect land and to offer recreational access along the river. In order to protect the resources of the river, **recommends that:**

> **1. The Town and the Lincoln Land Conservation Trust continue to monitor the conservation restrictions along the river and Fairhaven Bay to ensure that the owners follow the conditions of the conservation restrictions. In addition, landowners are encouraged to create vegetative buffers to protect the water quality of the river and habitat of the river and its corridor.**

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **recommends that Lincoln consider passing erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Concord:

All three study rivers flow through Concord. With 23.7 miles of frontage, Concord's river segments are the longest of the study area's eight towns. The Town of Concord, together with riverfront landowners and Great Meadows National Wildlife Refuge, has done a good job of protecting Concord's rivers.

The Study Committee finds that the Concord segments are suitable for designation, and in order to protect the rivers' resources, **recommends that:**

> 1. Because scenery along Fairhaven Bay is an important resource which needs to be protected (and some existing conservation restrictions do not address aesthetic issues), **there be continued monitoring of conservation restrictions and the encouragement of vegetative buffers along Fairhaven Bay.**
>
> 2. Because of the heights of buildings at the Deaconess facility and at Emerson Hospital and their impacts on the scenic qualities of the river, **conservation interests keep active lines of communication with the Deaconess and Emerson Hospital so they are kept aware of the importance of vegetated buffers along the river.**

3. Because of the impacts which can result from municipal maintenance facility uses along the river, **the Town continue its creative efforts to minimize impacts from the Keyes municipal lot on the river and to realize the potential of the site as an important recreational asset for the Sudbury River.**

4. **Future development of MCI-Concord be sensitive to views from the river. The Study Committee will convey its concerns to the appropriate state agency.**

5. **Ball's Hill be given a top priority for permanent protection because of its important scenic, geological and ecological values.**

To reduce the amount of polluted runoff contaminating the rivers with excess nutrients and sediments, the Study Committee **recommends that Concord pass erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the rivers.**

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadow's boundaries on a willing seller-willing buyer basis because refuge ownership offers the greatest protection. In addition, we encourage the Town to apply for Self-Help funds from the State's Division of Conservation Services to protect the river corridor.

Carlisle:

Carlisle has two miles of frontage along the left bank of the Concord River; of this only about 1600 feet is in unrestricted private ownership. Because of conservation ownership, strong local bylaws, conservation restrictions, and topography, the Carlisle segment of the Concord River is well protected.

The Study Committee finds the Carlisle segment is suitable for designation.

To reduce the amount of polluted runoff contaminating the river with excess nutrients and sediments, the Study Committee **recommends that Carlisle pass erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the rivers.**

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadow's boundaries on a willing seller-willing buyer basis because refuge ownership offers the greatest protection. In addition, we encourage the Town to apply for Self-Help funds from the State's Division of Conservation Services to protect the river corridor.

Bedford:

Bedford has just over three miles of frontage on the right bank of the Concord River. Of these 16,000 feet, all but 550 feet are part of the Great Meadows National Wildlife Refuge. Because of conservation ownership, strong local bylaws, and topography, the river segment is well protected.

The Study Committee finds that the Bedford segment is suitable for designation.

To reduce the amount of polluted runoff contaminating the river with excess nutrients and sediments, the Study Committee **recommends that Bedford pass erosion and sedimentation control bylaws and stormwater regulations.** The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Billerica:

Billerica has approximately 2.4 miles of frontage along the Concord River upstream of the Route 3 Bridge--the portion of the river under study.

The Study Committee finds that the Billerica segment is suitable for designation and strongly recommends that:

1. Because of the important scenic and habitat values of the steep slope on the left bank just upstream of the Route 3 bridge,

    a) **the Town continue its outstanding efforts to protect the former county-owned parcel which it has recently acquired, and that it seek ways to further protect the river by designating the parcel's river frontage as conservation land for open space and passive recreation purposes.**

    b) **the Town work to protect the river corridor on the Hazen parcel through acquisition in fee or through a conservation restriction, by allowing cluster development, or by using development setbacks.**

2. Because of the Study Committee's concern about the developed floodplain and resulting damage to water quality in the Concord River, **Billerica implement its proposal to establish a committee to protect the Concord River and its watershed. The Study Committee recommends that the watershed committee place on its agenda the protection and restoration of the floodplain, and consider abandoning the paper roads and retaining these easements for trails for non-motorized recreation.**

3. **The Town enforce existing regulations on property owners in the floodplain.**

4. **The Town find ways to stop or mitigate septage and polluted runoff from entering the Concord River from adjacent properties.**

To reduce the amount of polluted runoff contaminating the river with excess nutrients and sediments, the Study Committee **recommends that Billerica pass erosion and sedimentation control bylaws and stormwater regulations**. The Study Committee **supports education efforts to help landowners understand the importance of stewardship on their lands to prevent polluted runoff** (from leaking septic systems, lawns, parking lots and driveways) **from entering the river.**

Wherever possible, the Study Committee supports the continuing acquisition of land within Great Meadow's boundaries on a willing seller-willing buyer basis because refuge ownership offers the greatest protection. In addition, we encourage the Town to apply for Self-Help funds from the State's Division of Conservation Services to protect the river corridor.

APPENDIX B

SUMMARY

WATER RESOURCE STUDY
SUDBURY, ASSABET AND CONCORD RIVERS

This summary provides an overview of the Final Water Resource Study conducted in 1993 as part of the Sudbury, Assabet and Concord (SuAsCo) Wild and Scenic Rivers Study. It includes descriptions of the various methodologies used, the results obtained, and an analysis of what the results mean. A complete description can be found in the actual Final Water Resource Study report, as prepared by GEC Inc. of Randolph Massachusetts.

I. INTRODUCTION

Purpose

The purpose of the water resources study was to provide answers to the following questions:

- What is the relationship between the quantity and quality of water in the study rivers and flow-dependent resources such as wildlife habitat, recreation, and scenery?

- What impact would possible future increases in consumptive withdrawals of water from the rivers, along with reduced flows caused by naturally-occurring droughts, have on these flow-dependent resources?

- With respect to water quality problems caused by excessive nutrient loading, what is the relative contribution of these nutrients from point source discharges and non-point source runoff? What measures could be taken to reduce the loadings?

Answers to these questions are important to the long-term management of the river. In the immediate future, they will be used to help the SuAsCo Study Committee to formulate recommendations that will serve to protect and enhance the rivers' flow-dependent resources. Acceptance of such recommendations by study area towns and state agencies would indicate their support for the goals of Wild and Scenic designation, namely, the long-term protection of the rivers' outstanding resources.

When reading this summary or the actual Water Resources Study report, there are several important points to keep in mind:

- **The scope of the study was limited.** With limited time and limited funding, it was necessary to focus the study on the flow-dependent "outstandingly remarkable" resources which qualify the rivers for Wild and Scenic designation, i.e. wildlife habitat, recreation, and scenery. As a result, characteristics such as water quality, sediment chemistry, and flushing flows could not be investigated in detail. Such issues deserve attention and should be the subject of follow-up studies whether or not the rivers are designated.

- **The water resources study report is an information document rather than a decision-making document.** It provides important new information about the relationship between river flows and water-dependent resources. This "baseline" data about the current status of outstanding resources can be used to monitor the long-term health of the river system. Study report information will also be very useful in decisions concerning future water withdrawals and many other river management issues. But the report does not create a protection policy for the rivers -- it is up to the SuAsCo Study Committee, through its Management Plan, to develop policies to be used in such decisions.

- **The results of the water resources study are directly dependent on a number of assumptions and simplifications that had to be made in order to create models of the rivers' hydrology and ecology.** Changing any of these assumptions would alter the results. The major assumptions are presented in the "Purpose and Methods" sections of this summary and are analyzed in the "Discussion" section.

- **The water resources study is not intended to provide predictions of the rivers' instantaneous future flows throughout the study area.** The models used in the study predicted average monthly flows at key reference points, and these predicted flows are subject to fairly large margins of error. Field work for the study was conducted over a very short period during a particularly dry summer, and longer-term gauging records come from locations outside the study area. If new consumptive withdrawals are proposed in the future, more detailed site-specific studies would be needed to predict instantaneous low flow conditions (i.e. worst-case conditions for fish and other aquatic life) downstream of the withdrawal point.

Project Administration

The Water Resources Study was made possible through a cooperative effort among the major participants in the Wild and Scenic River Study, including the SuAsCo Study Committee and its ad hoc Technical Advisory Committee (TAC). The study's direct budget of $94,000 was funded by Congressional appropriations through the National Park Service ($84,000) and by the Massachusetts Water Resources Authority ($10,000). In addition, all of the interests involved in the study made substantial in-kind contributions of volunteer and staff time, and other resources.

The Massachusetts Department of Environmental Management (DEM) administered the project under a cooperative agreement with the NPS. DEM's prime consultant was Goldman Environmental Consultants (GEC), Inc. of Randolph, MA, which in turn contracted with two sub-consultants (Horsley & Witten, Inc. and a team from the University of Massachusetts at Amherst) for the hydrological and ecological portions of the study. A team of advisors, including the Water Resources Subcommittee of the SuAsCo Study Committee and outside experts who comprised the TAC, worked with DEM and the consultants to guide the study process. This team defined the scope of the study; reviewed the request for proposals; selected GEC to conduct the study; approved a work plan; resolved questions about the selection of study transects; defined hypothetical water use and wastewater discharge scenarios; and reviewed the draft study report. Without the support of the TAC, many of whom were volunteers or already over-worked agency and non-profit technical staff, the water resources study could not have been a success.

General Methodology

Following is an outline of the general methodology and approach used by the consultants:

- **Flows:** A hydrologic accounting (mass flow) model was developed and used to predict average monthly flows, elevations, and depths at several reference points, or nodes, within the study area. The model provided information both on current, or baseline, conditions, and on likely conditions under future drought and withdrawal scenarios. The predicted flows and elevations were then used to determine likely changes in wildlife habitat, recreational suitability, and scenic value under the future scenarios.

- **Wildlife Habitat:** Seven study plots along the rivers were surveyed to gather data on water levels, vegetation, macroinvertebrates, wildlife habitat, and fisheries. These plots were located along transects extending across the rivers' channel and floodplain from upland to upland. Data collected at the study plots were used to quantify the value of aquatic and wetlands fish and wildlife habitat, using "habitat suitability indices," for certain species selected by the study team. This approach measures the quantity of breeding and foraging habitat available to the species, and can be used to predict the impacts of long-term changes in water levels on species abundance and diversity.

- **Nutrient Loading:** Water quality was studied using a nutrient loading approach. The amount of nitrogen and phosphorus added to the rivers each year was calculated from wastewater treatment plant records and from information about loadings associated with various forms of land use within the study area. The effect of development and population growth within the watershed, producing increased treatment plant discharges and increased loadings from surface run-off, was then predicted. The nutrient loading information is relevant because excessive nutrients are the major cause of accelerated eutrophication, which in turn affects the rivers' ecology and recreational value.

- **Recreation:** Recreational suitability rankings ("unacceptable" through "optimal") were defined for various segments of the study rivers based on baseline water depths and interviews with both expert users and the general public. Using the water depths predicted by the flow model, changes in these qualitative suitability rankings were calculated for each future hydrological scenario. The recreational uses studied included canoeing, kayaking, sculling, angling, and motor boating.

- **Scenery:** A visual inventory of the rivers' scenic features was conducted using photography, and river user attitudes about scenery were compiled using written surveys.

II. HYDROLOGIC MODELING

Purpose and Methods

Model

In order to determine how changes in the amount of water flowing through the rivers might affect the flow-dependent resources of concern, it was necessary to develop a model that would

predict the rivers' response to a combination of drought and high water demand conditions. Specifically, we needed a model that would tell us what the surface elevation (or "stage") of the rivers would be during periods of low precipitation and high water use. Elevations were judged to be more important to the resources of concern than flows or velocities because the type of wetland vegetation that grows along these lake-like rivers is most affected by long term ($\geq$ five years) changes in water levels. Also, with the exception of boating on the Assabet River, the type of water-borne recreation prevalent in the study area is more dependent on suitable water depths than on flow rates. Thus the model used for this study went beyond flow estimates to predict stage values.

Information used to create the hydrologic model included eleven years' worth of readings at three gauges above and below the study area; stage and discharge readings taken during the study's six-month 1993 field season; and other miscellaneous measurements that had been made by individuals and state and federal agencies. The resulting "mass flow" model takes input in the form of discharge readings in cubic feet per second (i.e. the volume of water passing a point during a given time) and produces output in the form of predicted stage and discharge measurements at eight locations within the study area.

Scenarios

The model was used to predict changes in the rivers' hydrology based on hypothetical increases in water consumption in the year 2010 combined with five-year droughts of varying severity. Five years of decreased flows are the minimum required to cause changes in vegetation types within the rivers' wetlands. Each of the four scenarios combined increased water consumption -- either at new withdrawal points or from increased withdrawals at existing wells -- **and** either significant or severe droughts. Because of this combination, the modeled results do not distinguish between flow reductions due to human use and those caused by climatic conditions.

FUTURE HYDROLOGICAL SCENARIOS		
SCENARIO	5-YEAR CLIMATIC CONDITIONS	2010 A.D. WATER CONSUMPTION FACTORS
1	Significant Drought (2 drought years and 3 normal years)	Most probable in-basin increase in use.
2	ditto	Most probable in-basin use plus 40 MGD out-of-basin diversion from Sudbury River.
2A	ditto	Most probable in-basin use plus 8.2-16.4 MGD out-of-basin diversion from Sudbury Reservoir.
3	Severe Drought (3 drought years and 2 normal years)	High in-basin increase in use.

The future water use assumptions used in the four hypothetical scenarios ranged from "most probable" to "high demand," bracketing a range of potential conditions. Scenarios 1 and 3 assumed that increased withdrawals in the year 2010 from those portions of the rivers' watershed that contribute flow to the study area would be made from either existing wells or from likely

future locations, and that withdrawal amounts would be "most probable" or "high demand" respectively. Scenarios 2 and 2A assumed "most probable" 2010 water withdrawals, plus a 40 MGD (million gallons per day) diversion from the main stem of the Sudbury River and a lesser diversion from Sudbury Reservoir respectively. The Sudbury Reservoir diversion amounts of 16.4 MGD in normal years and 8.2 MGD in drought years were based on scenarios actually examined by the MDC in the mid-1980s[1]. This scenario (2A) was added to the final study report because it was felt to be more realistic than the 40 MGD direct diversion (Scenario 2) modeled in the draft report. While the engineering feasibility of a 40 MGD withdrawal was once studied by the MDC, such a diversion has never actually been proposed.

The five-year climatic conditions used ranged from a significant to a severe drought, based on combinations of dry and normal years. For Scenarios 1, 2, and 2A, a significant drought consisting of three normal years and two years within which the flow for every month is less than that actually recorded 75% of the time (i.e. the "75% exceedence value") was used. For Scenario 3, the combination was three drought years and two normal years, producing a severe drought. It is very important to note that the synthetic drought years used for the analysis, which assumed low river flows in all twelve months of the year, are highly unlikely events. They were used because the study team felt that the hydrologic and habitat models would only respond to these fairly sizable, long term reductions in flow.

Since most of the water withdrawn from the watershed returns to the rivers via sewage treatment plants or septic systems, the model assumed that 20% of the volume taken out would be "lost" due to evaporation and transpiration. This is a very conservative assumption, i.e. it under-estimates the return flow to the rivers, especially during the colder months.

The hydrologic model was tested for accuracy by running it using actual gauge measurements as input and comparing its predicted stage and discharge values to what was recorded in the field. The model was determined to be quite accurate in predicting stage and discharge under low flow conditions, and under higher flow conditions when such conditions persisted long enough to saturate the rivers' wetlands. However, because of the way the wetlands absorb and store water during the first days and weeks of increased runoff (so-called "rising stage" conditions), the model tends to overestimate stage and discharge during these periods. This idiosyncracy, which produces what hydrologists call a "hysteresis" in the curve on a flow versus discharge graph, should be kept in mind when the model is used in the future.

Results

Scenario 2 showed the greatest reduction in flows from baseline conditions. As noted above, the 40 MGD average out-of-basin diversion associated with this scenario has never been proposed. For normal years, the flows predicted under Scenarios 1 and 3 varied little from baseline conditions, indicating that growth in water use within the study area has a relatively small impact on river flows. The hypothetical drought conditions used in the model had a much greater

[1] The MDC-defined Sudbury Reservoir scenario includes the following withdrawal constraints: no withdrawals from June 15 through September 30th of each year, no withdrawals when water elevations at Sherman's Bridge downstream fall below a cut-off threshold, and a 1.5 MGD minimum release from the reservoir to the river at all times.

impact on flows. Scenario 2A, the hypothetical diversion based on the MDC's decade-old proposal, had a bigger impact on flows than Scenarios 1 and 3, but less than Scenario 2.

III. WILDLIFE HABITAT MODELING

Purpose and Methods

Model

In order to be able to predict what would happen to aquatic wildlife if river flows were reduced in the future, the consultants first needed to quantify the amount of existing habitat in the study area, and then to develop models that could predict changes in the amount of habitat caused by the reduced flows. The quantification technique they used is known as a "habitat evaluation procedure," or HEP, and relies on information about the physical and biological conditions found at field plots to generate a measure of how useful the area is to the species in question as breeding or foraging habitat. This measure is called the "habitat suitability index," or HSI.

Seven locations along the rivers were chosen for the study plots by study biologists in consultation with the U.S Fish and Wildlife Service. The plots were chosen to exemplify the full range of wetland types found within the study area, and thus the amount of wetlands of each type within the plots was not representative of the actual abundance of that type overall. At each transect, the study teams measured elevations and recorded the type of vegetation present. They also noted physical and biological habitat characteristics, such as water temperature and percent cover, for use in calculating the HSI values. Wetland vegetation zones were identified based on a standard classification system, and referenced to elevations along the transect.

Mean HSI values for each wetland type were calculated for two species of fish (chain pickerel and largemouth bass) and nine species of wildlife: bullfrog, snapping turtle, muskrat, mink, red-winged blackbird, black duck, wood duck, American bittern, and great blue heron. These particular species were chosen by the study team, in consultation with the TAC, as representative of the range of fish and wildlife present in the study area, and because they were species for which HSI curves had already been developed.

To quantify the total amount of habitat for each species within the entire wild and scenic study area, the mean HSI value for each species and wetland type was multiplied by the total number of acres of that wetland type within the study area. These acreages had been determined based on aerial photos taken for the Massachusetts DEP's Wetlands Conservancy Program. The habitat totals established the baseline value of the study area to the eleven fish and wildlife species under current conditions.

Scenario Analysis

Using the hydrologic model, it was possible for the biologists to predict changes in wetland vegetation types along the study transects resulting from the long-term changes in average monthly water elevations generated under three of the four scenarios. (The fourth scenario, 2A, was evaluated qualitatively for the final report as a result of comments on the draft report.)

New habitat totals for each of the eleven species were then calculated and compared to the baseline totals. The result was a prediction of the percent change -- gain or loss -- in each species' total habitat under three future scenarios.

Results

Small to moderate reductions in total wetland area were predicted under all four scenarios. However, some wetlands vegetation types (forested swamps and buttonbush shrub swamps) were predicted to increase, while other types, such as marsh and deep marsh, were disproportionately reduced. Because wetland types of less value to wildlife would tend to replace the more valuable marsh and deep marsh habitat under all the scenarios, the model predicted a decrease in habitat for most of the species. Overall habitat loss was greatest under Scenario 3, but many of the species modeled would suffer larger negative impacts under Scenario 2.

Habitat value increased for only two of the wildlife species modeled (black duck and wood duck) under any of the scenarios, and these increases were slight. In contrast, American bittern habitat decreased by about 60% under both Scenarios 2 and 3. While no state or federally-listed rare and endangered species were modeled, due to the fact that HSI curves have not yet been developed for these species, the consultants felt that habitat for several such species of concern (including the least bittern) would be reduced significantly due to loss of marshlands. In addition, they predicted that any reduction in current water levels would exacerbate problems caused by invasive species such as purple loosestrife, glossy buckthorn, water chestnut, and fanwort. These non-native plants reduce habitat values by crowding out native vegetation having greater forage or cover value, and in the case of water chestnut, also interfere with recreation.

IV. WATER QUALITY

Purpose and Methods

The study's budget and time constraints limited the scope of the water quality analysis to an examination of nutrient loading trends. Nutrients (i.e. compounds of phosphorus and nitrogen, coming from sewage and overland runoff) were chosen because of their role in causing "cultural eutrophication," or the accelerated evolution of the river system into wetlands and upland. Nutrient overloads, combined with sedimentation and elevated summer runoff temperatures caused by land development activities, also cause short-term problems for aquatic organisms by robbing the water of the dissolved oxygen these organisms need for respiration. While several toxic contaminants, including mercury and other heavy metals, also threaten water quality in the rivers, the study team felt that since these pollutants are currently being studied by the U.S. EPA under the well-funded Nyanza Superfund program, our study should focus on nutrients alone.

The study team decided to study the trend in nutrient loadings, i.e. the total amount of nutrients coming into the river system in pounds over time, rather than nutrient concentrations. This decision was made because the concentration of nutrients in the rivers is not merely affected by inputs from runoff and sewage, but also by additional factors which are difficult to quantify. For example, phosphorus binds readily to river sediments and wetland soils, so in order to calculate phosphorus concentrations within the water column, the rate of phosphorus exchange

between the water and soils and sediments would have to be known. This chemical pathway is very complex, with the rate varying depending on temperature and pH among other things.

Other water quality parameters, namely dissolved oxygen and temperature, were also studied qualitatively by the team, in order to assess the rivers' overall compliance with state and federal water quality standards.

Loading Calculations

Phosphorus and nitrogen compounds are used by aquatic plants in their growth. Too much of these nutrients cause "algal blooms," with rapid plant die-off and consequent crashes in the amount of dissolved oxygen in the water as the dead plants decay. The study team was interested in knowing how much of these nutrients is currently entering the rivers, and how much would be added by new development in the watershed. They based their calculations on loadings associated with the two major sources of phosphorus and nitrogen: "point sources" such as discharges from sewage treatment plants, and "non-point sources" such as overland runoff.

The consultants used data from 1985 to represent baseline nutrient loading conditions, because 1985 was the most recent year for which 19 categories of land use had been mapped using aerial photos. Values for the amount of nitrogen and phosphorus found in runoff from the various land use types were found in the scientific literature. These loading rates were multiplied by the acreage of each land use category within the entire portion of the rivers' watershed that contributes to the study segments. Loadings from point sources, calculated by multiplying the concentrations in the sewage treatment plants' 1985 permit reports by the volume of water discharged, were then added to the non-point source values to produce a total.

Scenarios

While the same target year (2010) was used for the nutrient loading projections as was used for the hydrologic scenarios, the water quality scenarios were based on changes in land use rather than droughts and increases in water withdrawals. The four scenarios analyzed were **A**, most likely future conditions (based on land use changes predicted by MAPC, the regional planning agency); **B**, likely future with additional point source controls, i.e. state-of-the-art nutrient removal at all area sewage treatment plants; **C**, likely future with additional non-point source controls, i.e. reasonably achievable structural, regulatory or management measures to reduce sedimentation and contamination of runoff; and **D**, likely future with both point and non-point source controls. It is important to note that implementation of the non-point source controls in all upstream communities (not just the eight study-area towns) would require the cooperation of town governments, state agencies, and landowners.

Results

The study team found that the rivers are currently overloaded with nutrients, in particular phosphorus. In most freshwater systems, phosphorus is the limiting nutrient, i.e. increases in nitrogen will have no effect on the rate of eutrophication because aquatic plants need both nutrients in order to grow and the existing ratio between the two nutrients causes the phosphorus to be used up first. In our rivers, however, there is so much phosphorus that nitrogen is the

limiting nutrient. This means that, at least until the phosphorus that is stored in the system (e.g. in sediments) is partially used up, it is more important to control nitrogen in order to limit eutrophication. Thanks to the state's new prohibition on detergents containing phosphate, however, the relative amount of phosphate entering the system is predicted to decrease in the future, which may eventually reverse this situation.

In modeling future loadings, the consultants found that under Scenario A (most likely 2010 loadings with no additional controls), both nitrogen and phosphorus loadings would increase significantly. Either additional point or non-point source controls were adequate to reduce future nitrogen loadings below current levels, and in combination (Scenario D) they reduced this nutrient by 34% over baseline. For phosphorus, however, non-point source controls alone are not adequate to reduce future loadings. Additional point-source controls would be necessary: under Scenario B, these controls alone would reduce loading by about 9%, while a combination of point and non-point source controls yields a 31% decrease. These results are consistent with what is known about the way these two nutrients travel through ground water. Phosphorus binds readily to sediment particles so relatively little of this nutrient discharged through septic system leaching fields or dissolved in runoff reaches the rivers, while nitrogen can travel great distances in groundwater and runoff.

The study team noted that while their approach compared future loadings to baseline loadings in order to determine the impact of future development on water quality, the baseline situation is already causing eutrophication problems.

V. RECREATION AND SCENERY

Purpose and Methods

In order to assess likely impacts on flow-related recreation due to potential changes in the rivers' flows, the consultants attempted to quantify the value of various portions of the study area for several types of recreation, and then, using the hydrologic model, to predict how these values might be affected by changing water levels. The study team relied both on random user surveys and on interviews with recreational experts who regularly use the rivers in order to assess the existing relationship between water quality, levels, and recreation. The product of this work was a set of baseline recreational suitability rankings for eight segments within the study area. Using the changing water levels predicted under the four hydrologic scenarios, the consultants then determined how the rankings would change.

Since water levels varied little during the course of the study in the summer of 1993, the consultants were unable to obtain empirical information about how recreational users viewed the relationship between flow conditions and recreation. Thus their analysis relied heavily on the opinions of a few expert users, along with their own assumptions about factors that make a river segment more or less suitable for a given form of recreation.

The recreational suitability rankings for the eight segments defined by the consultants were necessarily subjective. These rankings range from "unacceptable" to "optimal." "Unacceptable" rankings were generally given when there was either too little or too much flow in the rivers. Factors contributing to an "optimal" ranking for canoeing, the most popular form of recreation

on the study rivers, included unobstructed navigation (no low bridge clearances caused by high water levels); the opportunity to use high water levels to reach parts of the system not normally boatable; and safe flow velocities for novice boaters.

To provide a basis for comparison of segment-by-segment suitability rankings for each form of recreation under baseline and future scenario conditions, the consultants gave each ranking a numerical value. The values were then tabulated by adding the ranking for each recreational type and month, producing a sum for each segment that could be compared to sums under altered flow conditions.

In order to assess the relationship between water levels and scenic values, the consultants included questions about this issue in the written survey administered to river users during the course of the field season. Expert users were also interviewed on the subject.

Results

The consultants determined that, although some survey respondents preferred the appearance of the rivers with fully submerged banks, and the clearer water associated with higher flows, scenic and aesthetic values were not directly affected by changing water levels for a majority of users. The Study Committee notes, however, that there were significant aesthetic problems (clogged channels and foul smells caused by decaying vegetation) when the Sudbury Reservoir was last used to supply the metropolitan area in the 1960s.

Not surprisingly, the study team found that the shallower parts of the rivers (e.g. the upper Sudbury) are less suitable for water-borne recreation than other segments during mid-to-late summer, due to low flows. The drought years defined by the modeled scenarios exacerbated this condition (while making areas with spring bridge clearance problems more suitable), but increased water demand had less of an effect. The diversions associated with Scenarios 2 and 2A likewise had less of an impact than the low flows caused by drought, mainly because of the assumptions under these scenarios that no withdrawals would take place when the river was already below a critical stage level at Sherman's bridge.

Spring high water levels make parts of the Sudbury's floodplain accessible and thus optimal for canoeing and kayaking in the consultant's view. However, they felt that high flows in the Assabet make the river minimally acceptable or unacceptable due to turbulence. The Concord River, which changes less with fluctuating flow conditions, is never optimal according to the study team because even though the river is never too shallow for boating, or too high for bridge clearance, the opportunity to paddle up tributaries or elsewhere within the floodplain during periods of high flow is absent.

It is very important that all who use this report realize how subjective these suitability rankings are. Extreme caution must be used in relying on the "combined average monthly suitability" rankings to compare baseline and future scenario conditions. These combined rankings accord equal weight to August canoeing and November sculling, taking no account of the relative popularity of each recreational type or unequal use of the rivers at different times of year. For example, the model's combined suitability rankings might appear to favor a proposed withdrawal that would improve November sculling conditions at the expense of August canoeing. However,

was chosen as beyond the worst-case situation. Assumptions relevant to the study's investigation of water supply withdrawals included the following: that there would be constant withdrawals for in-basin water supply; that major new diversions would vary based on flows at Sherman's bridge and on seasonal constraints; and that there is no storage within the watershed that could be used to augment low flows.

Recommendations for Future Technical Studies

The assessment of the impacts of increased demand focused on low flows rather than altered hydrology during the spring freshet. The impacts on flushing flows of both current consumptive withdrawals and any diversion proposed in the future have not been examined. In order to determine how high flow events affect sediment dynamics, which in turn affects floodplain ecology, sediment chemistry, and navigability, state and federal agencies along with any coordinating entity which might be established pursuant to Wild and Scenic designation should work together to conduct additional studies of this issue.

In order to improve the relevance of the biological models, it would be helpful if habitat suitability indices could be developed for species of special concern to participants in the Wild and Scenic study, such as state-listed rare and endangered wildlife.

Conclusion

The water resources study is an unusual example of cooperation among many diverse interests to generate new, objective information on subjects which have been the focus of many past debates. The study would not have been successful without the substantial commitment made by all participants to work cooperatively.

The study provides important new information for decision-makers both on the flows needed to protect the study rivers' wildlife habitat, recreation, and scenic values, and on the compatibility between future growth and new withdrawals on the one hand and the protection of these values on the other. This information is essential to the development of a management plan for the river and the resolution of several river protection policy issues.

The reader should keep in mind that the hypothetical water use scenarios evaluated in the water resources study were defined for discussion purposes only, and do not reflect actual proposed withdrawals or conditions. If major new consumptive withdrawals (including either a single large withdrawal such as the reactivation of Sudbury Reservoir or multiple smaller withdrawals) are proposed in the future, the applicant would have to satisfy requirements for applicable state and federal permits. Such requirements would likely include site-specific studies of the proposed withdrawal's impacts on the rivers' resources.

the consultant's survey showed that canoeing is by far the most popular form of water-borne recreation on the study rivers.

In short, the recreational model used is very sensitive to the assumptions made about factors contributing to the relative suitability of the various segments. It assumes that lack of bridge clearance is an impediment to recreation along long reaches of the rivers that can be accessed without boating under bridges; that the more challenging flow conditions found along the 4.4 mile Assabet segment in some seasons are less preferable than the flatwater conditions available year round within the remaining 25 miles of the study area, even though not all users are novices; and that the Concord's less frequent flooding beyond its banks makes it less suitable than the Sudbury for canoeing. While the study provides useful descriptive information about the recreational and scenic values of the river, the tabulated suitability ranking information it contains should be viewed with caution.

VI. DISCUSSION

Study Limitations

A number of significant assumptions have been identified in this summary. As described above, the scope of the study was limited due to funding and timing constraints. It relied heavily on a modeling approach to predict future hydrological, ecological, water quality, and recreational conditions. Future users of these models must fully understand the assumptions upon which they are based. All users of the report's information should resist the urge to treat its numerical results as hard facts rather than indications of general trends.

Even with sufficient funding, only an intensive multi-year field investigation can yield detailed information about characteristics like hydrology and water quality, which vary significantly in time and space. It would be a mistake to rely on the "snap shot" of information about worst-case low flow events or water quality problems observed during this study, or as a result of previous single-day monitoring efforts, to predict the actual likelihood and duration of worst-case events in the future. In addition, the general results produced by the hydrological scenario models do not obviate the need for site specific investigations of the likely impacts of any significant new withdrawal, diversion or discharge in the future.

Modeling Approach

The hydrologic model was not sensitive enough to respond to minor, short term changes in flow conditions, so it was necessary to create scenarios which included major diversions and significant, multi-year droughts. The decision to select these scenarios for analysis should not be misinterpreted. Of the conditions used to construct the scenarios, only the "most probable" increased 2010 water demand is known to be a likely occurrence. Drought years consisting of twelve months in a row of flows that are on average exceeded 75% of the time are highly unlikely, and five year periods which include two or three such years are rarer still. The diversion amount and location under Scenario 2A were chosen because they had once been proposed for consideration, not because there is any certainty that this water will ever be needed, that such a diversion would make economic sense, or that it would be permitted by state regulatory agencies. Scenario 2 does not represent any diversion proposal past or present, but