

6 Research, Inventory, and Monitoring Needs

6.1 Introduction

OWM has supported a wide variety of watershed research, through access to its properties, directed management activities, and/or limited direct funding. While the research budget at OWM is not constant, the value of contiguous, undeveloped watershed properties generally behind secure gates or patrolled on a regular basis has attracted many researchers who bring their own funding. In addition, OWM watershed properties have provided fertile settings for a wide range of graduate theses. Although some of this research has primarily benefited the researcher, the vast majority has informed OWM managers and improved or supported watershed management practices.

Listed below is a variety of research, inventory, or monitoring needs in the general areas of forests and forestry, wildlife, and cultural resources. Most of these are identified as needs across the whole OWM watershed system while others are specific research needs for the Sudbury watersheds. These are listed in part to direct OWM's own efforts in the coming decade, but also as a specific reference for potential researchers who are looking for a project that would address a real need of the OWM.

6.2 Forest Research Needs

1. **Monitoring of Forest Management Activities:** OWM policy of “no measurable impact upon stream water quality from forest management activities” creates a need to establish a standard approach for measuring compliance. Streams should be monitored to assess any short-term water quality changes associated with active logging conducted on OWM lands. Monitoring should involve upstream and downstream and/or paired watershed sampling before planned operations, during active logging, and following the completion of the operations. Monitoring efforts should focus on storm event testing. Parameters should include pH, temperature, dissolved oxygen, turbidity, suspended solids, total particulates, total and fecal coliform, and nutrients. Based on this fieldwork, specific recommendations could be made outlining a low cost, statistically valid method of monitoring logging operations on a more wide-scale basis. Recommendations for adjustments in current Conservation Management Practices would be made, if necessary, based on this research.
2. **Analysis of Optimal Riparian Vegetation:** While the opportunity to shift species composition on the watersheds is limited by site, seed, overstory conditions, etc., it would be valuable to complete an investigative literature review and/or field study to determine the water quality benefits/detriments associated with each of the common tree/shrub species. While species selection for an entire watershed should be based primarily on site suitability and species stability, in areas directly adjacent to tributaries and reservoir shorelines, a species' direct impact on water quality may have a measurable benefit. One result of this work would be to generate a model of the ideal riparian forest for various sites. Models developed recently to quantify the buffering effects of riparian forest should be examined for applicability to the Sudbury watersheds and other OWM forests.
3. **Invasive Plant Species:** Many different invasive plant species are currently established on and adjacent to OWM properties on the Sudbury watersheds. Control of these species is important to the establishment of tree regeneration and the maintenance of native plant diversity. To begin to address this issue, a survey of invasive plant species on the watershed and the extent of their spread should be conducted and digitized, in part to establish an historical reference point for future distribution of these species. Once priorities have been established for control, further research needs to be conducted on the feasibility of mechanical controls and/or the relative benefits and threats associated with chemical or biological controls.

4. ***Evaluation of Sudbury Access Roads:*** Given that roads are a potential source of pollution and sedimentation on watershed lands, a systematic evaluation of the Sudbury road system would be valuable. This project would include a watershed-wide mapping of road conditions to identify trouble spots including testing for sediment transport during storm events. Part of this project would involve locating the most appropriate model for sizing culverts and utilizing GIS to routinely size culverts and design roads that will withstand 50-year storms. The results of this study would be useful in the decision making process when planning new road construction on newly acquired property as well as improving the current road network.
5. ***Analysis of Sudbury forest age structure:*** Section 2.4.1 describes the origin of most of the Sudbury forest as plantations dating to the years from 1907 to 1947. Since DWSP will be managing the forest for a balanced age structure, a careful analysis of the current distribution of age classes needs to be made. Similar work is ongoing at the Wachusett Reservoir, and will be extended to the Sudbury when that is complete. This will involve recording years of origin in a GIS layer table for all stands mapped on DWSP lands. Plantation ages can be determined from old records, while all other stands will need to be sampled in the field. All openings made as a result of silvicultural operations will also be included in this layer. Thus a complete picture of the age structure will be available for analysis and guidance of future silviculture. This work will be completed by DWSP foresters.

6.3 *Wildlife Research Needs*

Very little wildlife research or monitoring has been conducted on the Sudbury watersheds. Occasional monitoring of certain species has occurred, but limited resources and personnel have prevented extensive monitoring efforts. Much more work is needed. The following projects represent a few areas where technical data would assist in managing wildlife resources more effectively.

1. ***Biological Surveys and Inventories:*** In order to minimize or avoid negative impacts of land management activities on wildlife and critical habitats, all proposed activities are reviewed by the wildlife biologist. However, a single biologist is responsible for all watersheds within OWM and it would be impossible to physically inspect the hundreds of proposed acres. OWM must rely on records of known occurrences of critical habitat or species. Although new information is added as it becomes available, the database is far from complete. Biological surveys conducted by qualified persons can provide critical additional information that will aid OWM efforts to protect these resources during land management activities. For example, Cedar Swamp is listed as an Area of Critical Environmental Concern, yet there is little natural resource information about it. An in-depth biological survey of the area would prove useful. Gathered information should be incorporated into GIS data layers.
2. ***Routine Monitoring Activities:*** Routine monitoring programs for selective species will continue during this management period. These surveys include monitoring potential common loon nesting around the watershed, Canada goose breeding surveys, and occasional breeding bird surveys. Other surveys (permanent breeding bird surveys, locating rare and endangered species) may be conducted if resources and personnel are available.

6.4 Cultural Resources Research Needs

The principal research need for the continued protection of cultural resources within OWM properties on the Sudbury Reservoir watersheds is to inventory, accurately map, and digitize all known historic cultural sites. This inventory would be modeled after the multi-phased historic site inventory that was completed for the Quabbin Reservoir watershed in 1995-96. The Quabbin inventory was completed by graduate students and faculty of the Boston University Department of Archaeology in collaboration with the OWM staff archaeologist. The process involved integration of geographical and descriptive information from a variety of cartographic and historical resources, including historic OWM Real Estate Plans and a series of maps dating as far back as 1794. Information from these sources was used to complete a database and map record for several hundred sites. Many of these sites were subsequently field checked for current condition. Locational information was entered in OWM's GIS so that important sites can be identified when management activities are proposed for areas within OWM's properties. This process greatly enhances the ability of managers to protect historic cultural resources.

7 Public Involvement

7.1 *Public Input in Formulating Watershed Management Plans*

Public input represents an important part of OWM's management planning process. This input is provided in several ways, including through the Wachusett/Sudbury Watershed System Advisory Committee, local experts in resource management, and the general public. The goals of OWM's public input process are:

- To understand the broad range of public issues and concerns regarding forest and wildlife management at OWM's watersheds so that OWM can better integrate the concerns of the public into protection strategies for maintaining watershed integrity.
- To improve the understanding of the technical aspects of forest and wildlife management on OWM watersheds and to generate creative program ideas.
- To educate the public regarding the purposes and goals of OWM with regard to its watershed management program in order that the public will better understand the program chosen in managing the forest and wildlife resources at Sudbury.
- To gain support for the implementation of the watershed management program selected by OWM so that it may be implemented smoothly.

Throughout the public input process, OWM will stress that its primary legislative mandate is the delivery of sufficient quantities of pure water to present and future generations of water users of the system. This mandate is much narrower than that of most public land managing agencies. Therefore, it is important that the public understand that management alternatives that do not adequately support OWM's primary mandate will not be considered viable. While OWM considers secondary values of its watershed such as passive recreation, environmental research, natural areas, and wildlife management, these values will only be encouraged and enhanced where they do not impair the primary mandate of OWM. Occasional conflicts may arise between state and federal laws (e.g., rare and endangered species, wetlands, and historic sites) and prudent watershed management. These conflicts will be examined on a case by case basis to ensure that the requirements of laws protecting non-water supply resources are met while still protecting the water supply.

Chapter 372, Acts of 1984 states that the Division of Watershed Management shall prepare watershed management plans each five years that provide for forestry, water yield enhancement, and recreation. The legislation further states that these plans shall be prepared with the participation of the appropriate watershed advisory committee and a professional forester and that public hearings be held to discuss these watershed management plans. Two committees, the Quabbin Watershed Advisory Committee (there is now also a Ware River Advisory Committee) and the Watershed System Advisory Committee (for Wachusett and Sudbury), were also formed by this legislation, although the Watershed System Advisory Committee is not currently active (OWM is currently attempting to reactivate this committee by communicating with the represented towns). The Sudbury Watershed Advisory Committee is technically a standing sub-committee of the above Watershed Advisory Committee.

Due to the technical nature of this plan, input has been sought from appropriate watershed management, forest, and wildlife experts outside of OWM to improve the technical presentations in this plan. As this plan is modeled after the policies and recommendations contained in the MDC's 1995

Quabbin Land Management Plan, the public and technical review of that plan has assisted in the drafting of this document. For example, in completing the Quabbin Land Management Plan, the MDC held a one day discussion with hydrology and forest ecology experts from Harvard Forest, University of Massachusetts and S.U.N.Y College of Environmental Sciences and Forestry to consider the general approach OWM had taken with regard to forest watershed management in the Quabbin plan. The Quabbin plan was also reviewed in May, 1994 at a Watershed Workshop to which more than 60 representatives of various environmental organizations and interest groups were invited and again at two two-day conferences in the fall of 1996 and 1997 by the Quabbin Science and Technical Advisory Committee, composed of land management experts from the around the northeast.

After review of the draft Sudbury Land Plan by interested groups, OWM will make the plan available to the local community and will present the final draft of the plan at a public hearing. With the comments it receives, OWM will produce the final plan.

7.2 Regular Revisions to the Sudbury Land Management Plan

Watershed management is a developing science. In order to accommodate new findings in the field, and to adapt management policies based on local experience, OWM will revise and update this plan in five years. OWM will compile the revisions to the plan, together with a summary of the management which has occurred during this time and present this information to the Sudbury Watershed Advisory Committee. Local officials and the general public will also be invited to this review meeting. At the meeting, OWM will also outline planned watershed land management activities for the remaining five year period of the plan. At that time information gained from relevant ongoing OWM research, new professional literature, and comments from the general public can be incorporated into the remaining five year period.