Public Perceptions of the Removal of the Homestead Woolen Mills Dam, Swanzey, NH

STUDIES in NEW ENGLAND GEOGRAPHY

Keene State College
Public Perceptions of the Removal of the Homestead Woolen Mills Dam, Swanzey, New Hampshire

Abstract
Dam removal has become an important issue in many New England communities. An increasing number of dams have been removed because they no longer serve the purpose for which they were constructed. This study focuses on the Homestead Woolen Mills Dam located on the Ashuelot River in Swanzey, New Hampshire. This dam has been on the removal list since 1997, yet no action has been taken. Much of the delay is a result of time spent to inform the town’s residents which in turn has created a debate over whether or not to remove the dam. Town residents were surveyed to ascertain public opinion on the proposed removal and any effect it may have on the community. Results indicate that approximately half of the respondents supported the dam’s removal. However, several indicated that they did not have enough knowledge to make an informed decision. When questioned about financing, approximately one third of those surveyed were willing to have the town contribute funds toward dam removal. Majorities found the Thompson Covered Bridge to be a significant resource in the community but were unclear about the impact of removal on the bridge. Key words: dam removal, environmental impact, historic landmark, public perception

Introduction
Rivers are one of the most dramatically modified elements of the world’s natural environment (Pohl 2004). Dams are the cause of many of these modifications. Over the past 200 years, approximately two million dams in the United States have been constructed to provide water for irrigation and hydropower, enhance inland water transportation systems, and mitigate flooding (Biahs, David, and Graf 2002).

Of the 76,000 inventoried dams that are registered across the United States some 600 have been removed (American Rivers 2005). The vast majority of these removals have taken place during the last two decades. However, dam razing faces challenges from citizens who feel removal is too costly or even value these obsolete structures as historic landmarks (Babbitt 2002). Most of the dam deconstruction occurring at this time involves facilities that are no longer serving a purpose. Babbitt (2002), former Secretary of the Interior, states the need for adequate written policy based on science and consensus to decommission dams.
By the year 2020, it is estimated that approximately 85 percent of dams in the United States will be candidates for dismantling. No policy is in place to address this issue. While all dams are not good candidates for removal, an increasing number are considered to be unsafe and obsolete thus suitable for dismantling. Therefore, regulations are necessary to address dam analysis and evaluation for removal (Wade 1999; Aspen Institute 2002; International Rivers Network 2006).

Decision making regarding dam removal should be logical and unique to each site, taking into account the safety issues and any ecological and environmental conditions and impacts (Aspen Institute 2002). Societal concerns and the effects of dam destruction on the community need to be addressed as well as any economic effects the razing may produce (Aspen Institute 2002). While the vast majority of states across the nation have not established a formal protocol for making decisions regarding dam removal, New Hampshire has. This protocol was developed in the late 1990s and early 2000s as the state began to realize the need for state and local government guidance when addressing unsafe dams, structures and/or those that had negatively impacted riverine ecosystems.

Pros and Cons of Dam Removal

A number of positive and negative impacts of dam removal have been identified (Table 1). These are site dependent but Table 1 provides a generalized list of potential impacts. Rivers provide a great deal of recreational opportunities. It is a common misperception that dam razing reduces these opportunities, but one study in Wisconsin demonstrated that society is more likely to use the river and surrounding lands for recreational purposes after dam dismantling (Wisconsin Department of Natural Resources).
Resources 2006). Removal of an obsolete failing structure addresses serious safety concerns and reduces owner liability (Biahs, David, and Graf 2002).

<table>
<thead>
<tr>
<th>Benefits associated with dam removal</th>
<th>Negative impacts associated with dam removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational purposes</td>
<td>Visual appearance</td>
</tr>
<tr>
<td>Natural flowing river</td>
<td>Effect on aquatic habitat</td>
</tr>
<tr>
<td>Increased fish migration</td>
<td>Effect on plant life</td>
</tr>
<tr>
<td>Removal of an obsolete structure</td>
<td>Effect on surrounding habitat</td>
</tr>
<tr>
<td>More aesthetically pleasing landscape</td>
<td>Effect on the river bed</td>
</tr>
<tr>
<td>Enhanced wildlife passage</td>
<td></td>
</tr>
<tr>
<td>Increased safety</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Aspen Institute 2002; Vanasse Hangen Brustlin, Inc. 2004; Disincentives to Dam Removal in Massachusetts 2006; International Rivers Network 2006.

Dams create a barrier for migratory fish, some of which are threatened or endangered. Dam removal can vastly improve populations of fish species by opening spawning grounds and facilitating migratory movement. As a result, fish migration and fisheries will have the potential to naturally increase over time or may be enhanced through a dam removal (Hart and Poff 2002). Returning a river to its natural flowing state improves sediment transport and habitats over time and leads to a more aesthetically pleasing landscape. Draining the impoundment behind the dam, however, does cause short-term negative impacts such as an aesthetically unpleasant mudflat area above the new water level. Human mitigation can quickly return the mudflat to a natural, pre-dam state once the dam has been removed and even a natural vegetative succession typically removes this visual scar within three years (Hart and Poff 2002). Returning the river to its natural flowing state will enhance plant and wildlife habitat and improve wildlife passage.

Research has established that dam dismantling is often a more cost effective option compared to other measures since repair, replacement, or retrofitting typically
costs three to five times more than removal (Babbitt 2002). Dismantling a dam can still be costly, thus state policies are necessary to define financial responsibility and resources for dam removal. Financial assistance programs need to be in place to expedite the dismantling process (Aspen Institute 2002). While the owner is ultimately responsible for securing finances, many private owners are unable to fully fund a removal. Additionally, in the case of small, obsolete dams, ownership is unknown and removal requires government involvement and funding (Sarakinos and Johnson 2002).

Aesthetic value is a primary concern for many residents of a community debating or facing dam removal (Sarakinos and Johnson 2002). Further, Sarakinos and Johnson (2002) note that if the public perceives that dam dismantling will cause a negative impact on the landscape, they are less likely to support razing than if they visualize a positive landscape outcome. Another concern is the perceived potential for flooding even when a dam provides no flood control (Sarakinos and Johnson 2002). Members of the community may also perceive that removal of a dam will cause the river to dry up and disappear (2002). Societal misconceptions like this may cause the public to view this outcome as permanent leading to a decline in property value and an increase in insects and disease. Draining an impoundment increases the amount of land adjacent to the river, and questions arise concerning ownership and responsibility of the drained land. The loss of water-based recreation opportunities is another common concern. Research indicates that most residents of a community perceive that removal of a dam will decrease the availability of recreational opportunities. Sarakinos and Johnson’s study, however, found an increase in recreational use following a dam removal (2002).
The Homestead Woolen Mills Dam

Removing a dam in New Hampshire is a four-step process beginning with information gathering on the dam under consideration, and the filing of application materials to the New Hampshire Department of Environmental Services (NHDES) River Restoration Coordinator. The second step is to research, design, and plan the project, taking into consideration such key issues as the size of the project, site survey, historical resources mitigation, public information meetings, and approval from the US Army Corps of Engineers. This is followed by extensive data collection and permit applications. Finally, the NHDES has 75 days to review the application, during which time additional public meetings may be required. Upon submission, the NHDES Dam Bureau, Wetlands Bureau, and US Army Corps of Engineers will provide written approval if the project is pennitable (DES 2003).

The Homestead Woolen Mills Dam (HWMD), situated on the Ashuelot River in the southwest corner of New Hampshire was one of the first dams considered for removal under the state’s new protocol (Figures 1 and 2). The dam is located in Cheshire County in the Town of Swanzey immediately downstream from the historic Thompson Covered Bridge (TCB). The engineering firm of Vanasse Hangen Brustlin, Inc. (VHB) describes the facility as a non-gated timber crib structure that has been obsolete since 1985 when the Homestead Woolen Mill was closed (2005a). This privately owned dam is believed to have been originally built in the 1860’s and replaced in 1910 (VHB 2005a). The 12’ high, 167’ long dam stored approximately 50 acre-feet of water until it was partially breeched during the last decade. It was originally constructed to provide water to the mill, its apparent predecessors, the West Swanzey Manufacturing Company, and the box
mill on the east side of the river. The dam is currently a failed structure that is a serious safety hazard due to the deterioration of the timber cribbing and concrete spillway. Since 1997 after a state routine safety inspection, it has been listed by the New Hampshire Dam Bureau as requiring repair or removal. In this inspection, the NH Dam Bureau found the dam to be deficient in several areas. At that time, the private owner filed for a permit to remove the aging structure. State officials advised that removal would be acceptable and would also promote fish habitat and river restoration (VHB 2005a). Due to the current safety concerns identified by the Dam Bureau of DES, failing to act would be unacceptable. Despite the owner’s formal petition for removal and state officials’ support, stumbling blocks persisted and the process was stalled due to a number of questions regarding the removal’s impact on the environment and surrounding landscape (VHB 2005a).

One of the critical questions involved the potential removal impact on the stability of the neighboring historic Thompson Covered Bridge. The bridge, built in 1832, spans the Ashuelot River impoundment, just upstream from the HWMD and is also listed on the National Register of Historic Places (DES 2006). The bridge is 136'10” long with clear spans of 64’ and 63’6”, an overall width of 25’6” and a roadway width of 16’7’ (Marshall 1994). It was feared that the removal of the dam downstream would result in greater riverbed scour upstream, thus negatively impacting the structural integrity of the historic bridge. Other concerns surfaced over the loss of water-based recreation and over the drop in water levels in private wells along the dam’s impoundment area.
An advisory group was created to address concerns expressed by the public and the New Hampshire Division of Historical Resources. To fully address the expressed questions and concerns, the NHDES contracted a private consulting firm to develop a dam removal Feasibility Study. This study was developed to ensure that all concerned parties be provided with the facts required to make an informed decision about the fate of the dam (VHB 2005a). A final Feasibility Study was completed in 2005; however, there is currently a paucity of information on the dam itself. The Feasibility Study documents the disintegrating condition of the structure and proposes that it be removed.

While there is a rapidly growing body of research on some aspects of dam removal, there are few studies that present data on the social perspective. Because removing a dam nestled in a community (Figure 3) can have significant impacts on the citizens, gathering information from members of the community would provide crucial feedback as well as valuable background knowledge (Aspen Institute 2002). This study examines public perception of dam removal in a community engaged in debating the fate of a local dam.
Informing the Public on a Course of Action

The 1997 New Hampshire Dam Safety Inspection was the first step in what would become a long process to determine the fate of the Homestead Woolen Mills Dam. In 1998, the owner resolved to finalize plans to see the dam removed. The first public meeting to take public comment on the proposed removal was held in June, 2000 at the Swanzey Town Hall. At that time, a number of serious concerns were raised that could not be resolved, such as how the town will make a decision regarding the dam, what the alternatives are to removal, what impact it would have on the Thompson Covered Bridge, how it would affect private wells along the reservoir area, and how much it would cost the town (VHB 2005b). The spring of 2002 saw the expiration of the owner’s removal request. The New Hampshire Department of Transportation (NHDOT) completed an engineering study on the Thompson Covered Bridge in 2002; it revealed the center pier of the bridge was vulnerable to scour because the foundation is shallow and set on materials susceptible to erosion. The TCB center pier should be addressed with or without dam removal because it requires long-term stabilization (VHB 2005c).
NHDOT recommended that if the dam was repaired, the bridge’s center pier should be repaired within ten years; however, if the dam is removed, the ideal situation would entail repairs to the TCB prior to removal (VHB 2005c).

A pre-bid site overview of the dam by several prospective consulting firms was completed on October 15, 2003; Vanasse Hangen Brustlin, Inc. of Bedford, New Hampshire was subsequently contracted to complete a feasibility study addressing issues surrounding the HWMD. With a firm in place, a public information meeting was held on May 27, 2004, at which time it was announced that a comprehensive study had to be undertaken on the HWMD. “The Feasibility Study was commissioned by the New Hampshire DES in cooperation with the National Oceanic and Atmospheric Administration, the Town of Swanzey, the US Fish and Wildlife Service, and the NH Fish and Game Department” (VHB 2004, 2).

A press release from the DES announced that three objectives for the HWMD were: 1) attaining dam safety, whether through dam removal or dam repair, 2) ensuring the stability and historic integrity of the 172 year-old TCB, Homestead Woolen Mills, and the village of West Swanzey, and 3) restoring fish movement upstream (DES 2004).

During a closed meeting on May 27, 2004, a number of alternatives were outlined. Alternative A was to take no action. This was not an acceptable option because of the condition and safety concerns surrounding the dam (Figure 4). Alternatives B1 and B2 include repair of the dam and several options surrounding
fish passage (VHB 2005b). Alternative B3, suggested by the townspeople, would see the
dam used for hydropower. Alternative C involves the construction of a rock ramp, which
would retain the water at an artificially-raised level with the possibility of having it
extend downstream 200’ or more to provide an appropriate slope for fish passage.
Alternative D would be full dam removal, which would involve “removing the structure
in a controlled manner, and would result in water levels decreasing to natural depths in
the current impoundment” (VHB 2005b, 4). At the time of the meeting, much emphasis
was placed on alternatives to dam removal and the safety of the TCB (VHB 2005b).
Also discussed was the cost of the HWMD removal which was estimated to be
approximately $200,000 (VHB 2005b).

The draft Feasibility Study, completed in March, 2005, outlined all alternative
options and offered recommendations. A meeting of the DES Homestead Dam Advisory
Group was held on May 9, 2005 to discuss the report and to field questions and
comments on the draft. A public information meeting was held on June 8, 2005 to
discuss the options outlined in the report. At the meeting, an overview of the draft Feasibility Study was used to provide information to the attendees. Issues related to dam removal or replacement were discussed, and information was provided concerning “the historical nature of the project area and the process under Section 106 of the National Historic Preservation Action” (VHB 2005, 1). Public comment was also taken to gather feedback on the desired future course of action as well as lingering concerns. Some of the concerns voiced included how sediment would be addressed, impacts on the stability of the center pier of the TCB, the current risk and consequence of dam failure, the value of the bridge to the community, the mill pond, the historic nature of the area, and the educational value of the dam and its surroundings (VHB 2005c).

In a general election during the fall of 2005, the residents of the Town of Swanzey voted against taking ownership, and thereby responsibility, of the dam, alleviating some concern of financial burden on taxpayers (VHB 2005c). On September 26, 2006, a meeting was held with the dam owner, multiple project partners, and the New Hampshire DES to discuss the most recent design proposal submitted by Vanasse Hangen Brustlin, Inc. (Loiselle 2006). The proposal included removal of the HWMD and the placement of three rock veins downstream of the TCB (Loiselle 2006). The goal of all parties involved is to have the dam removed by the end of 2007; however, no specific date or timeline has been established.

The DES will continue to coordinate with the Town of Swanzey and consider the stability of the TCB. The optimal circumstances would have the bridge and dam addressed at the same time. However, currently funds are not available for repairing the bridge (Loiselle 2006).
Methodology

This study examines local residents’ opinions regarding the proposed removal of the Homestead Woolen Mills Dam, as well as its perceived impacts on the Thompson Covered Bridge. The public frequently expresses concerns about dam removal and its impact on the river and surrounding land. Of these concerns, the loss of a historic dam is often disheartening to some community members (Sarakinos and Johnson 2002), while in Swanzey the concern may be less over the dam itself and more over the potential damage to or loss of the TCB (VHB 2005c). The first hypothesis, the public does not support removal of the Homestead Woolen Mills Dam because of potential impacts on the Thompson Covered Bridge, focuses on the public’s concern over damage to the bridge as a direct result of removing the HWMD. It was hypothesized that the public perceives removal of the dam as a potential cause of considerable damage to the bridge and therefore should not be removed. The TCB is thought to be an important landmark in the community while the HWMD is held in less regard.

Research has demonstrated that economic issues are often the most important factors in the decision to dismantle a dam (Sarakinos and Johnson 2002). The estimated cost to remove the HWMD is $201,719. Removal was the least expensive option provided in the Feasibility Study (VHB 2005a). The second hypothesis, the public perceives the removal of the Homestead Woolen Mills Dam as an economic hardship on the town, addresses the economic concerns of the community. Although it is typically the responsibility of the owner to bear the cost of dam removal, this is not always practical since removal costs can be high (Aspen Institute 2002). It was hypothesized that the residents of Swanzey expect the town will have to bear some of the cost of dismantling
the dam, leading to a tax increase. As a result of this hypothesized perception, many taxpayers may be reluctant to support removal.

Social perspectives impact the opinions of a community pertaining to pros and cons of dam demolition (Sarakinos and Johnson 2002). The third hypothesis, *a majority of respondents do not support removal of the Homestead Woolen Mills Dam because they are uninformed about the pros and cons of dam removal*, addresses the lack of knowledge surrounding costs and benefits of dam razing. Society typically perceives dam dismantling to have more negative than positive impacts on the community (Aspen Institute 2002). Although the town and state have made efforts to enlighten the citizens about dam removal issues, it was thought that many would not support the dam being torn down because they are not fully informed.

To test the hypotheses, a public survey was employed. The purpose of the survey was to gather opinions and perceptions of the local residents in the community in which the dam is situated. Face-to-face intercept interviews were conducted with 101 residents. The survey (Appendix A) consisted of 11 open-ended or direct response questions relating to the HWMD, the TCB, public perceptions and knowledge of pros and cons of dam removal, and socioeconomic information. The instrument opened with a question related to the TCB and any significance it may have in the community, followed by another that focused on the direct impact that removal may have on the bridge. Both questions offered the opportunity for personal comments. Five questions concerning socioeconomic information were included at the end of the survey to validate the sample’s representativeness.
Results

To determine whether the public views the historic Thompson Covered Bridge as a key component in the removal decision, Swanzey residents were asked two questions specifically about the bridge. The first inquired whether they felt the bridge had any special significance to the community, and the second asked whether they felt that removal of the dam would have an impact on the structure.

The vast majority (85.1 percent) of residents who were sampled were clear in their responses that the bridge has a special significance in their community. As seen in Table 2, the largest percentage of respondents (41.4) stated that the bridge is a historic site, while 22.4 percent felt that the bridge was an important landmark in the community, “especially in a small New England town such as Swanzey,” as stated by one survey participant. Other responses for the significance of the bridge included the aesthetic value that it added to the character of the town, the tourism that the bridge brings to the area, and the fact that it is still used to travel across the river. Whether the public feels that the bridge is important for the more historical aspects, or its utilitarian function, this bridge is an important part of Swanzey’s atmosphere.

<table>
<thead>
<tr>
<th>What significance does the Thompson Covered Bridge have in your community?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic Site</td>
<td>48</td>
<td>41.4</td>
</tr>
<tr>
<td>Landmark/Tradition</td>
<td>26</td>
<td>22.4</td>
</tr>
<tr>
<td>Aesthetic/Character/Tourism</td>
<td>29</td>
<td>25.0</td>
</tr>
<tr>
<td>Travel</td>
<td>8</td>
<td>6.9</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>Total</td>
<td>116*</td>
<td>100</td>
</tr>
</tbody>
</table>

*Multiple responses were accepted.
Analysis further determined that there is no significant difference between those who feel that the bridge is an important aspect of the community and whether they do or do not support removal of the HWMD. It was thought that if the public is aware of any potential positive or negative impacts that removing the dam may have on the TCB, and they feel the bridge is important, they would not want to remove a dam unless preventative measures were taken to secure the bridge. Of the 24 who support removing the dam, 23 respondents (95.8 percent) also find the bridge to be important to the community (Table 3). There is nearly the same percentage of people who do not want the dam removed (88.9 percent) and who find the bridge significant to the community. However, a large percentage of those surveyed remain unclear about the link between dam removal and the TCB.

Table 3  Relationship between responses of supporting dam removal and the significance of the Thompson Covered Bridge

| Does the Thompson Covered Bridge have any special significance in your community? | Do you support removal of the Homestead Woolen Mills Dam? |
|---|---|---|---|
|  | Yes | N | %  | No | N | %  | Unsure | N | % |
| Yes | 23 | 95.8 | 24 | 88.9 | 40 | 80.0 |
| No | 1 | 4.2 | 1 | 3.7 | 8 | 16.0 |
| Unsure | 0 | 0.0 | 2 | 7.4 | 2 | 4.0 |
| Total | 24 | 100 | 27 | 100 | 50 | 100 |

If the Thompson Covered Bridge is an integral part of the Swanzey community, it is hypothesized that people may feel that removing the dam would negatively impact the bridge and therefore the public may not support removal. Respondents were asked if removal of the dam would impact the bridge. Approximately 44 percent of the respondents stated they were unsure whether the bridge would be impacted (Table 4).
Nearly 32 percent stated they felt removal of the dam would not have any impact on the bridge compared to the 23.8 percent who stated there would be a potential impact.

When examining those not in support of removing the dam, 88.9 percent felt that the TCB had special significance in the community, as noted in Table 2. Yet, of those not supportive of removal, only 44.4 percent felt that dismantling would have an impact on the TCB (Table 5). This may indicate that those who do not want the dam removed may not be basing their decision on their concern about any perceived negative impact to the covered bridge.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Response of the potential impact of dam removal on the Thompson Covered Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would removal of the Homestead Woolen Mills Dam have an impact on the Thompson Covered Bridge?</td>
<td>N</td>
</tr>
<tr>
<td>Yes</td>
<td>24</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
</tr>
<tr>
<td>Unsure</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
</tr>
</tbody>
</table>

A chi-square analysis (Table 5) indicates that there is a statistical difference in people's response of whether or not dam removal would impact the bridge, regardless of their support for removal. Of the 24 respondents who support removal, only 25 percent feel that the bridge will be impacted. Because nearly one-half of the sample population (50) was unsure if they support removal, there is insufficient information at this point to determine the validity of the hypothesis.
Table 5  Chi-Square analysis of response to remove the dam and the impact on the Thompson Covered Bridge

<table>
<thead>
<tr>
<th>Would removal of the Homestead Woolen Mill Dam have an impact on the Thompson Covered Bridge?</th>
<th>Do you support removal of the Homestead Woolen Mills Dam?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>11</td>
</tr>
<tr>
<td>Unsure</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
</tr>
</tbody>
</table>

$X^2 = 16.64$  Sig. at .05  N = 101

Financial responsibility for large town projects is generally a concern in smaller communities. The second hypothesis addresses whether or not the public perceives the removal of the dam to be an economic hardship on the town. Of the 101 individuals surveyed, 62 percent agreed that financial responsibility for removal should be shared, 24 percent did not favor this financing approach and 14 percent stated that they did not have enough information to form an opinion (Figure 5). Of the 62 percent who agreed responsibility should be shared, nearly 51 percent were in favor of the town assuming a portion of the costs for removal. Of these respondents who supported a town contribution, the majority, 62.5 percent, approved an amount ranging from $1 to $50,000, the upper end of which which represents approximately one-fourth of the total cost for removal. Nearly 28 percent of the respondents who support a town contribution were in favor of the town contributing between $50,001 and $200,000. Of the 24 percent who do not support cost sharing, the majority (79 percent) declared that removal expenses should be the complete responsibility of the dam’s owner.
When attempting to determine whether the sample population was informed about the issues related to the removal of the HWMD, it was hypothesized that the sample would not support removal because they were not aware of the positive and negative impacts of dam removal. In order to measure the respondents’ level of awareness regarding potential impacts, they were asked to state any benefits or negative impacts that they were aware of associated with dam removal. Initially, it was thought that the uninformed would not support removal, simply because they felt they were not fully aware of the important issues. One would sense that the respondents who did not support removing the HWMD would not perceive any benefits associated with dam removal, but would be aware of negative impacts. As was expected, the majority (81.5 percent) of the people who do not support removing the HWMD did not perceive any benefits. Only 51.9 percent of the respondents not in support of the proposed dam removal stated that they were aware of any negative impacts (Table 6).
<table>
<thead>
<tr>
<th>Respondents who do not support removal of the Homestead Woolen Mills Dam</th>
<th>N</th>
<th>%</th>
<th>Respondents who do not support removal of the Homestead Woolen Mills Dam</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you aware of benefits associated with dam removal?</td>
<td>27</td>
<td>100</td>
<td>Are you aware of negative impacts associated with dam removal?</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>7.4</td>
<td>Yes</td>
<td>14</td>
<td>51.9</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
<td>81.5</td>
<td>No</td>
<td>7</td>
<td>25.9</td>
</tr>
<tr>
<td>Unsure</td>
<td>3</td>
<td>11.1</td>
<td>Unsure</td>
<td>6</td>
<td>22.2</td>
</tr>
</tbody>
</table>

Of those who support removal, it was believed that they would perceive benefits associated with dam removal and would not perceive negative impacts. In other words, respondents in favor of dam removal would feel that positive impacts are many while negative impacts are few. Table 7 presents that only 50.0 percent of those who support removal perceived benefits, while 20.8 percent were aware of negative impacts. Both of these values comprise at least one-half of the group in support of dam removal. It was initially speculated that a larger majority of that group would be aware of the benefits of dam removal.

<table>
<thead>
<tr>
<th>Respondents who do support removal of the Homestead Woolen Mills Dam</th>
<th>N</th>
<th>%</th>
<th>Respondents who do support removal of the Homestead Woolen Mills Dam</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you aware of benefits associated with dam removal?</td>
<td>23</td>
<td>100</td>
<td>Are you aware of negative impacts associated with dam removal?</td>
<td>24</td>
<td>100</td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>50.0</td>
<td>Yes</td>
<td>4</td>
<td>16.6</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>29.2</td>
<td>No</td>
<td>19</td>
<td>79.2</td>
</tr>
<tr>
<td>Unsure</td>
<td>4</td>
<td>16.7</td>
<td>Unsure</td>
<td>1</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Nearly one-half of residents surveyed were unsure whether they supported the removal of the HWMD (Table 8). Of these respondents, 20 percent perceived some benefits associated with dam removal. A slightly greater percentage (22), stated that they perceived negative impacts associated with this removal.
Table 8  Awareness of benefits and negative impacts of those who are unsure about dam removal

<table>
<thead>
<tr>
<th>Respondents who are unsure about supporting removal of the Homestead Woolen Mills Dam</th>
<th>Are you aware of benefits associated with dam removal?</th>
<th>Are you aware of negative impacts associated with dam removal?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Are you aware of benefits associated with dam removal?</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Yes</td>
<td>10</td>
<td>20.0</td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>48.0</td>
</tr>
<tr>
<td>Unsure</td>
<td>16</td>
<td>32.0</td>
</tr>
</tbody>
</table>

Since a high number of survey respondents stated they were unsure about removing the HWMD, their reasons were more carefully examined. Nearly 30 percent of the sample who were unsure about removal stated that they did not have enough information to form a concrete opinion. Of the individuals who were unsure about removal, 62 percent did not provide an explanation for their indecisiveness. This leads to the question of whether the citizens of Swanzey are actually informed about this controversy and what their opinions would be if they indeed had key information concerning beneficial as well as negative impacts of the removal of the Homestead Woolen Mills Dam. Although public fora were held to discuss the HWMD and some media coverage followed, it appears that a majority of residents remain uninformed. Only four survey respondents attended at least one public forum.

Those who felt they had a solid understanding of the impacts of removal were asked to articulate specific benefits and/or negative impacts. Participants provided a variety of responses, categorized in Table 9. According to our sample, fish migration is perceived to be the main benefit to dismantling a dam. The top four perceived negative impacts comprise more than half of the responses. Flooding, damage to the bridge, wildlife and habitat loss, and loss of the impoundment behind the dam were the greatest concerns of the survey respondents.
Table 9 Benefits and negative impacts of dam removal perceived by survey respondents

<table>
<thead>
<tr>
<th>Benefits</th>
<th>N</th>
<th>%</th>
<th>Negative Impacts</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish Migration</td>
<td>16</td>
<td>42.1</td>
<td>Flooding</td>
<td>7</td>
<td>17.1</td>
</tr>
<tr>
<td>Environment</td>
<td>6</td>
<td>15.8</td>
<td>Damage to Bridge</td>
<td>6</td>
<td>14.6</td>
</tr>
<tr>
<td>Safety</td>
<td>5</td>
<td>13.2</td>
<td>Wildlife/Habitat Loss</td>
<td>5</td>
<td>12.2</td>
</tr>
<tr>
<td>Natural/Deeper Channel</td>
<td>3</td>
<td>7.9</td>
<td>Remove Impoundment</td>
<td>5</td>
<td>12.2</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>3</td>
<td>7.9</td>
<td>Septic/Well Problems</td>
<td>4</td>
<td>9.8</td>
</tr>
<tr>
<td>Recreation</td>
<td>3</td>
<td>7.9</td>
<td>Erosion</td>
<td>4</td>
<td>9.8</td>
</tr>
<tr>
<td>Economic Cost</td>
<td>1</td>
<td>2.6</td>
<td>Economic Cost</td>
<td>4</td>
<td>9.8</td>
</tr>
<tr>
<td>Obsolete Structure</td>
<td>1</td>
<td>2.6</td>
<td>Impact Fishing</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aesthetic</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Loss of Recreation</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Safety</td>
<td>1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Total 38 100  Total 41 100

As seen in Table 10, a chi-square analysis determines that there is a significant difference in individuals’ responses of whether or not they support removal and their awareness of the benefits and negative impacts of dam deconstruction. Of the respondents who do not support dam removal, 81.5 percent are not aware of any associated benefits (Part A), while only 25.9 percent are not aware of any negative impacts (Part B). According to our hypothesis, it was anticipated that a greater percentage of respondents would be unaware of the negative impacts.

Research indicates that educational level plays an important role in individual decision making processes (American Rivers 2006). To examine this, we tested whether or not a respondent’s level of education impacted support for removal. The average respondent in this survey had attained some level of college education. The distribution, as shown in Table 11, is weighted toward higher levels of education than the Swanzey population in general. Of those who are in support of removing the dam, 54.1 percent
Table 10 Chi-square analysis of response to remove the dam and awareness of benefits and negative impacts of dam removal

<table>
<thead>
<tr>
<th>A)</th>
<th>Do you perceive any benefits associated with dam removal?</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Yes</td>
<td>12 52.2</td>
<td>2</td>
<td>7.4</td>
<td>10</td>
</tr>
<tr>
<td>No</td>
<td>7 30.4</td>
<td>22</td>
<td>81.5</td>
<td>24</td>
</tr>
<tr>
<td>Unsure</td>
<td>4 17.4</td>
<td>3</td>
<td>11.1</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>23 100</td>
<td>27</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

$X^2 = 21.35$ Sig. at .05 N = 100

<table>
<thead>
<tr>
<th>B)</th>
<th>Are you aware of any negative impacts associated with dam removal?</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Yes</td>
<td>4 16.7</td>
<td>14</td>
<td>51.9</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>19 79.2</td>
<td>7</td>
<td>25.9</td>
<td>28</td>
</tr>
<tr>
<td>Unsure</td>
<td>1 4.1</td>
<td>6</td>
<td>22.2</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>24 100</td>
<td>27</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

$X^2 = 17.18$ Sig. at .05 N = 101

have earned a college or postgraduate degree. For those in opposition, the education level was more dispersed. When tested, no significant relationship was found between education and support for dismantling the dam. As can be seen in Figure 6, the town has a high percentage of individuals with a high school diploma or equivalency, while our sample’s largest population had earned a college degree.
Table 11 The relationship between response to removal of the dam and the level of education attained

<table>
<thead>
<tr>
<th>Highest level of education obtained</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
<th>Unsure</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some High School</td>
<td>1</td>
<td>4.2</td>
<td>1</td>
<td>4.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>High School Diploma/GED</td>
<td>6</td>
<td>25.0</td>
<td>9</td>
<td>33.0</td>
<td>14</td>
<td>28.0</td>
</tr>
<tr>
<td>Some College</td>
<td>4</td>
<td>16.7</td>
<td>4</td>
<td>15.0</td>
<td>15</td>
<td>30.0</td>
</tr>
<tr>
<td>College Degree</td>
<td>10</td>
<td>41.6</td>
<td>7</td>
<td>26.0</td>
<td>13</td>
<td>26.0</td>
</tr>
<tr>
<td>Post Graduate Degree</td>
<td>3</td>
<td>12.5</td>
<td>5</td>
<td>18.0</td>
<td>6</td>
<td>12.0</td>
</tr>
<tr>
<td>Did not answer</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>4.0</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>100</td>
<td>27</td>
<td>100</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Also examined was the relationship between the number of years respondents had lived in Swanzey and whether or not they support removal. The average residency for our sample was 20.6 years. As seen in Table 12, the average residency for supporters of dam removal is 30.3 years, while those who are unsure and do not support removal are approximately 17 years.

Figure 6 Education levels of survey respondents and total population
Table 12  Number of years respondents have lived in Swanzey and their response to support for removal of the dam

<table>
<thead>
<tr>
<th>Do you support removal of the Homestead Woolen Mills Dam?</th>
<th>N</th>
<th>Average years of residency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>24</td>
<td>30.3</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>17.2</td>
</tr>
<tr>
<td>Unsure</td>
<td>50</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Statistical testing indicates that the longer respondents have lived in Swanzey, the more likely they are to be in favor of removing the dam (Table 13). These residents may be more aware of the current state of deterioration and realize that the dam no longer serves its original function to supply water to the Homestead Woolen Mill.

Table 13  Significant values of ANOVA and T-Test analysis of response to removal of the dam

<table>
<thead>
<tr>
<th>Do you support removal of the Homestead Woolen Mills Dam?</th>
<th>Obtained significance value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA</td>
<td>0.007</td>
</tr>
<tr>
<td>T-Test</td>
<td></td>
</tr>
<tr>
<td>Yes &amp; No</td>
<td>0.01</td>
</tr>
<tr>
<td>No &amp; Unsure</td>
<td>0.848</td>
</tr>
<tr>
<td>Yes &amp; Unsure</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Limitations of the Study

As in many research studies, challenges surface around survey questions. Two survey questions were determined to be unclear to some respondents (Questions 3 and 6A: see Appendix A). When asked why they did or did not support removal of the HWMD, some respondents referred to their earlier statements regarding positive and negative impacts of dam removal. When rating the potential impacts, many respondents only rated the top two or three reasons out of the five positive and seven negative impacts.
offered, while others rated all categories as equal. Many respondents that provided their own suggestions for impacts only provided one. This limits analysis because it is not a completely accurate representation of the respondents' opinions.

Question #3 asked if financial responsibility should be shared. Commonly, respondents wanted to know by whom, which was answered in the next part of the question using a checklist of funding sources. In some instances, respondents replied that financial responsibility should be shared, but then stated later that only the owner should be financially responsible.

Concepts regarding ecology, aesthetics, recreation, and vested interests, as they pertain to public perception, were excluded from the analysis as we focused on information issues. Societal perceptions of these other aspects of dam removal may be significant and should be considered in future studies.

Survey participation presents another limitation. A number of prospective respondents declined to take part in the HWMD survey. Survey location and times may also present bias in the socioeconomic factors, thereby affecting results. Additionally, not all respondents were willing to answer all socioeconomic questions. For example, twenty percent refused to provide information about total household income.

Conclusions

The Homestead Woolen Mills Dam is in disrepair and in need of removal. Although it has been considered for removal since 1997, it has yet to be dismantled. While many factors affect the removal process, the public can play a significant role in the decision to remove a dam. Several perceptions may influence societal concerns.
Residents in the Town of Swanzey explicitly acknowledge the significance of the Thompson Covered Bridge in their community. We originally assumed that concern over this historic bridge would affect people’s opinions regarding the proposed dam removal. However, in this study, respondents who perceived the bridge as an important community resource were no more or less supportive of the dam’s removal than respondents who were less certain about the bridge’s importance. The study did, however, determine that there is significant association between support for dam removal and perceived impacts on the bridge. Those respondents who perceived a correlation between demolishing the dam and damage to the bridge structure were less likely to support removal of the dam.

Economic factors impact societal concerns about the dam. While the dam’s owner is financially responsible for meeting safety standards through repair, replacement, or dismantling, the majority of respondents stated that financial responsibility for dam removal should be shared. Of the respondents in support of cost sharing, 52 percent were in favor of the town allocating funds toward removal. A majority supported a contribution of up to $50,000, which is almost one-quarter of the estimated cost for removal. Of the respondents who felt that financial responsibility should not be shared, the majority stated that the owner should be solely responsible.

Public knowledge plays an important role in forming opinions about dam deconstruction. Many residents of Swanzey have limited knowledge on the structural state of the HWMD. The townspeople have limited knowledge of how the dam can be removed, the costs of dismantling, and the condition of the river after removal. A chi-square analysis determined that there is a significant association between support for and perceived benefits of dam removal. Similarly, a chi-square analysis determined that there
is a significant association between support for and perceived negative impacts of dam removal. Fifty of the respondents replied that they were unsure if they support removal; 30 percent of these participants declared that they did not have enough information about the impacts of dam removal to form an opinion. This is despite the two public fora and numerous town selectmen meetings that were held to educate the public about the issues surrounding the dam.

Education plays an important role in the decision making process. The majority of respondents in favor of razing the HWMD had obtained a college degree. The distribution level of education in the sample surveyed was not significantly different from the population of Swanzey. The responses are, however, slightly skewed toward a higher level of education.

There is a relationship between the length of residency and support for dismantling the HWMD. Testing determined that the sample population that supports dam removal has lived in Swanzey significantly longer than those who do not support removal or are unsure. Further research is needed to study these relationships.

This study indicates that respondents who have lived in the community the longest, who have attained higher education, and perceive some beneficial or negative impacts of dam removal, are most likely to form an opinion about dam removal.

While this study only examined the historical importance of the Thompson Covered Bridge, the economic concerns, and the level of awareness of Swanzey residents regarding potential impacts, further research could be undertaken on other aspects influencing the public’s support to remove the Homestead Woolen Mills Dam. These aspects may include the aesthetic values of the surrounding land, recreational use of the
Further research could also evaluate the attempt to inform the public about the issues surrounding the removal of this dam. Although meetings were held to inform the public about the dam, the removal process, and the historic bridge as well as allow concerns to be voiced, it is unclear as to how many citizens actually participated and the efficacy of the sessions. While we originally thought that the public was knowledgeable about these issues, nearly one-half of our sample noted uncertainty in their responses to numerous survey questions. It appears that while an attempt was made to involve the public on this matter, these attempts did not prove to be productive in terms of public awareness, and may have lengthened the process to remove the Homestead Woolen Mills Dam.
Bibliography


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APPENDIX A

The Homestead Woolen Mills Dam is a privately owned timber dam on the Ashuelot River in Swanzey, situated just downstream from the Thompson Covered Bridge. The aging dam structure is in disrepair. A feasibility study has been completed to demonstrate the options surrounding the fate of the dam. The purpose of this survey is to sample public opinion about removal of the Homestead Woolen Mills Dam.

All personal information will be kept strictly confidential.

1. Does the Thompson Covered Bridge have any special significance in your community?
   - [ ] Yes
   - [ ] No
   - [ ] Unsure

   If YES, what is that significance?
   __________________________
   __________________________
   __________________________
   __________________________

2. Would removal of the Homestead Woolen Mills Dam have an impact on the Thompson Covered Bridge?
   - [ ] Yes
   - [ ] No
   - [ ] Unsure

   If YES, what kind of impact?
   __________________________
   __________________________
   __________________________
   __________________________

   An engineering study completed in 2004 estimates that removal of the Homestead Woolen Mills Dam will cost approximately $200,000.00.

3. Should financial responsibility for removal of the Homestead Woolen Mills Dam be shared?
   - [ ] Yes
   - [ ] No
   - [ ] Unsure
If YES, who do you think should be financially responsible for removal? Is it the:

- Owner
- State
- Other - please specify
- Town
- Federal

If TOWN, what dollar amount would you support for the town’s contribution? Is it:

- None
- $1 to $50,000
- $50,001 to $100,000
- $100,001 to $150,000
- $150,001 to $200,000

4. Do you perceive any benefits associated with dam removal?

- Yes
- No
- Unsure

If YES, please list some.

____________________
____________________
____________________

Of the benefits just listed, could you please rate them in order of importance? (1 being very important and the highest number being the least important.)

If NO, go to question 5.

If UNSURE, here is a list of benefits associated with dam removal. Which do you consider the most important? Please rate them as 1 being more important and 7 being less important.

- Recreational purposes
- Natural flowing river
- Increased fish migration
- Removal of an obsolete structure
- More aesthetically pleasing landscape
- Enhanced wildlife passage
- Increased safety
4A. How did you learn about the potential benefits of dam removal? Check all that apply.

☐ Public meetings If YES, How many did you attend? 
☐ Article or publication
☐ Word of mouth
☐ Televised newscast
☐ Radio broadcast
☐ Other - please specify

5. Are you aware of any negative impacts associated with dam removal?

☐ Yes
☐ No
☐ Unsure

If YES, please list some.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Of the benefits just listed, could you please rate them in order of importance? (1 being very important and the highest number being the least important.)

If NO, go to question 6.

If UNSURE, here is a list of negative impacts associated with dam removal. Which do you consider the most important? Please rate them as 1 being more important and 5 being less important.

☐ Visual Appearance
☐ Effect on aquatic habitat
☐ Effect on plant life
☐ Effect on surrounding habitat
☐ Effect on the river bed

5A. How did you learn about the potential negative impacts of dam removal? Check all that apply.

☐ Public meetings If YES, how many did you attend? 
☐ Article or publication
☐ Word of mouth
☐ Televised newscast
☐ Radio broadcast
☐ Other - please specify
6. Do you support removal of the Homestead Woolen Mills Dam?
   - Yes
   - No
   - Unsure

6A. Please explain why or why not.

7. How long have you lived in Swanzey? _______ years

8. In which of the following age ranges do you fall? Are you:
   - Under 30
   - 31 to 45
   - 46 to 60
   - Over 60

9. What is your total annual household income range? Is it:
   - less than $10,000
   - $10,000 to $34,999
   - $35,000 to $74,999
   - $75,000 to $149,999
   - $150,000 and up

10. What is the highest level of education you have obtained? Is it:
    - Some high school
    - High school diploma or GED
    - Some College
    - College degree
    - Postgraduate degree

Gender:
   - Male
   - Female

Thank you for taking the time to participate in our survey.