



AN ABSTRACT OF THE THESIS OF

Denise E. Elston for the degree of Master of Science in Water Resources Policy and Management presented on June 9, 2009.

Title: Characterizing Community Impacts of Small Dam Removal: A Case Study of the Brownsville Dam

Abstract approved:

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Denise H. Lach

Emerging river policy has launched small dam removal as a viable option to meet the ecological and social demands for river restoration. As small dam removals gain precedence as a policy tool in river restoration projects there exists a glaring gap in the social considerations, in particular how small dam removals may affect existing community conditions. In order to determine the community impacts that may result, a case study of the Brownsville Dam Removal, in Brownsville Oregon was investigated to address two questions: 1) how has the Brownsville Dam removal affected the social and economic conditions of the community and 2) what indicators can be used to characterize and monitor the impacts. Twenty-nine semi-structured interviews were conducted with four community affiliations: 1) Canal Company members; 2) Calapooia Watershed Council members; 3) City Officials; and 4) community residents. A participatory social impact assessment (SIA) approach was used to validate existing and/or emergent impacts and indicators. The semi-structured interviews assisted in the development of a matrix of impacts and indicators specific to small dam removal. The local impacts and indicators were operationalized and measured.

Findings suggest that the social and economic impacts when distributed across the community are minimal in this case of small dam removal. Because local data availability is limited, it was determined that the traditional social impact assessment framework can be vastly improved through the engagement of the community. This research further suggests that when collaboration is extended beyond a unidirectional flow of information (which is often the case in a traditional SIA), issues and concerns are open to deliberation in a non-threatening arena. The Calapooia Watershed Council served as the forum through which the residents of Brownsville were able to enhance their participation in decision making. This also contributed to a learning process that in the end furthered the community's understanding of the dynamic physical changes to the Calapooia River as well as their capacity to solve complex decisions. The case also demonstrated that collective learning is a reflective process of adjustment to the changing circumstances in which the community came to perceive, interpret, and act upon their interest.

With a growing number of collaborative partnerships of watershed based management, distinguishable by their decentralized, participatory engagement of stakeholders, it may be likely that these place-based mechanisms will become the nexus to the successful coordination of small dam removal deliberation in the future.

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Denise E. Elston, Author

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Dedicated to Kaitelyn McDonald.  
You are my number one fan.  
Without you, I wouldn't be here.  
You will always be my inspiration.

## CHAPTER 1: INTRODUCTION

*Men may dam it and say that they have made a lake, but it will still be a river. It will keep its nature and bide its time, like a caged animal alert for the slightest opening. In Time, it will have its way; the dam, like the ancient cliffs, will be carried away piecemeal in the currents.*

*-Wendell Berry*

Humans have long sought ways to capture, store, and redirect water resources to reduce their vulnerability to unpredictable rainfall and irregular river flows (Gleick, 2000). Over time, this has led to the perspective that environmental resources were to be exploited for economic development and thus seen as a service to society. As a result, U.S. waterways have been channelized and modified to provide water for municipal use, irrigation, industry and other utilities. By the end of the 1800's the creation of federal agencies such as the Army Corps of Engineers and the Bureau of Reclamation supported this new ethic and the installation of dams and canals became major features of the environmental, economic, and social landscapes. And as modern society experienced growing populations, greater reliance on the development of physical infrastructure to meet the growing demand of water supply took precedence and in the last 40-50 years most of the U.S. river systems have been engineered to some degree.

Until the late 1960's the emphasis remained on using natural resources to meet human-centered needs but changed drastically when the American public and national policy makers became concerned with environmental quality (Heinz Report, 2002). The rise and increasing influence of the post 1970's environmental movement has led to the empowerment of new ideas pertaining to environmental management and restoration. The environmental movement of this time raised awareness that urbanization,



industrialization, and overuse of our river systems had caused severe degradation. And although there was little understanding of downstream consequences, the emergence of national policies placed emphasis on the preservation and restoration of environmental quality and improvement of the quality of river environments (Heinz Report, 2002). It is the consequences of these past environmental, economic, and political activities that have shaped new efforts to move beyond management of rivers and instead focus on the protection and restoration of natural systems (Gleick, 2000; Pohl, 2003; Woosley *et al.*, 2007).

### **Dam Removal as an Emerging Policy**

There is no denying that dams have made a significant contribution to human development and have provided innumerable societal benefits; yet, over time they have also extracted a high environmental cost (Gleick, 2000; Orr *et al.*, 2004). Some authors suggest that the existence and operation of dams has “already had greater hydrologic and ecological impacts on American rivers than any changes that might reasonably be expected from global climate change in the near future” (Doyle *et al.*, 2003: 453). It is now recognized that the benefits associated with dam construction are counterbalanced by external costs to taxpayers and funding agencies in addition to their effects on the natural environment (Doyle *et al.*, 2003).

The ecological consequences associated with the construction of dams have been found to contribute to the loss of free flowing rivers, natural riparian systems, and biodiversity (Gleick, 2000; Hart *et al.*, 2002). Along with the recognition that dams contribute to

fragmented and interrupted riverine systems it has also become apparent that dams hinder the passage of anadromous fish species and other wildlife. Uninterrupted aquatic and riparian corridors provide habitat and migratory pathways for these fish and other species. The concept of dismantling dams is not new to river managers or engineers and in recent years there has been an increased emphasis on incorporating dam removal into watershed restoration plans (Doyle *et al.*, 2003; Hart *et al.*, 2002). This can reduce the costs and duration of these projects and provide unprecedented opportunities for restoration of riverine ecosystems blocked by dams (Hart *et al.*, 2002). Increased understanding of the deleterious environmental impacts resulting from dams has further motivated removals to address the restoration processes of riverine systems (Bednarek, 2001; Pohl, 2002; Woosley *et al.*, 2007).

Other factors aside from the growing concerns for the ecological and environmental disturbances of dams are safety and economic burdens. The magnitude of safety concerns is dependant on the size of the structure, thus large dams have a greater potential than small dams to be responsible for significant losses whether human, property, or environmental. For small dams that no longer serve a functional purpose, safety concerns can translate into economic issues and burdens. It often proves cheaper to remove an aging dam than to invest in the necessary maintenance, repairs, and environmental controls. For these smaller dams, it is often the case that the cost for repair or rebuilding is high, typically ranging from hundreds of thousands to millions of dollars. The high cost of maintaining these old dams, especially obsolete ones, is forcing dam owners (often municipalities) to look for alternative solutions (Born *et al.*, 1998; Johnson and Graber,

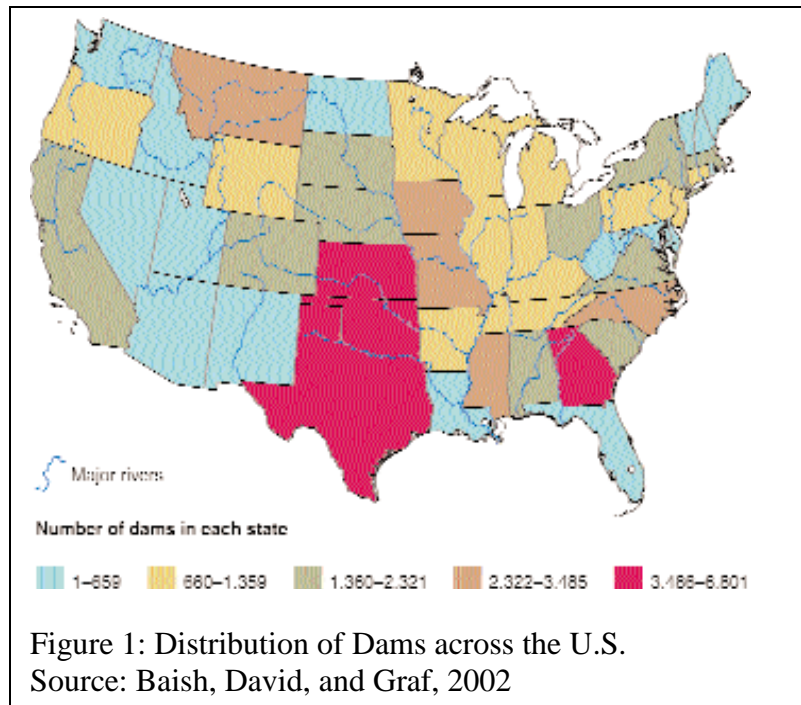
2002). In some cases, the cost of dam repair has been documented to be as much as five times the cost of removal and that state and federal grants are more readily available for dam removal than for dam repair (Sarakinos and Johnson, 2000)

As dam removal initiatives become more main-stream in American water policy, society is faced with a fundamental challenge to the status quo of traditional development practices. This is reflected in dam policy, first from the development and management of river systems to the restoration and protection of these same systems. Such forces have prompted a reassessment of policy priorities and as a result there have been a number of policy changes to recreate more natural ecosystems and conserve natural and cultural resources (Lowry, 2003). Support for this movement of river restoration through dam removal is evident; for example, since 1999 more than 185 dams have been removed or breached across the country. When used as an indicator, decommissioning and removal has surpassed the rate of dam construction in the U.S. (World Commission of Dams, 2000). Coupled with a change in values and attitudes toward the natural environment and the markedly contrasting needs and services originally provided by small dams, dam removal has emerged as an environmental management issue (Doyle *et al.*, 2003).

### **Significance of Research**

The U.S. Army Corps of Engineers National Inventory of Dams (NID) identifies over 79,000 dams that are at least six feet in height and impound at least fifty acre-feet of water. The Federal Emergency Management Agency (FEMA, 2008) estimates there are 80,300 dams and other measures that find there are 5,459 large dams in the nation,

defined as any dam 15 meters or more in height, Figure 1 (Baish, David, and Graf, 2002; McCool, 2005). In Oregon, there are 1,570 dams that are at least 10 feet in height or that impound at least 15 acre-feet of water (OWEB, 2008). While there are challenges to defining what constitutes a large dam, the challenge remains



more so for dams that fall outside the parameters describing large dams. There is no single inventory that catalogs all the dams in the U.S., therefore no one knows the exact number. For example, the National Research Council (2005) estimates there are approximately 2.5 million smaller dams scattered throughout the United States. In addition to dams, there are countless other forms of water development structures including levees, channels, and pipelines that alter natural river systems. One study estimated that these structures block over a half a million miles of what was once free flowing rivers (Shuman, 1995). While another study by the National Parks Service estimated that there are more than 3.25 million miles of modified U.S. stream channels (NRC, 1982). The result of these modifications has left less than 2% of America's streams undeveloped. Most of these structures were constructed in the early 20<sup>th</sup> century to provide multiple services such as flood protection, irrigation, hydroelectric power, and water supply (Pohl, 2002). However, we have come to recognize that these structures are

meeting their life expectancies and have come to or will no longer serve their original utility. Across the United States it is estimated that more than 85% of dams will approach the end of their operational life by 2020 (Pejchar and Warner, 2001; McCool, 2005). As dams age it must be decided how to manage these structures. These decisions will be based on social values and the beneficial costs of the dam's operation in comparison to rebuilding or removal.

### **Social Impact Assessment**

A social impact assessment (SIA) is a process of assessing or predicting the social consequences that are likely to follow the implementation of a specific policy or project development. In most instances, the SIA is designed to be a predictive tool used to measure social and cultural change to human populations, in essence looking at any alteration in the ways people live, work, play, relate, or organize as members of society (IOCGP, 2003). In the past, the assessment of social impacts was subsumed by assessors in the more obvious Environmental Impact Assessment (EIA) and is frequently collapsed into a socio-economic impact assessment which gleans economic measures as a means to evaluate social and economic change (Lockie, 2001). While there is an acknowledgment of its importance, SIA has yet to be sufficiently integrated into the institutionalized decision and policy making process. It is the juxtaposition of social change and policy that has motivated this research. On the one hand, we are faced with a new era of river management where policy and decision makers will need to make decisions based on the growing environmental awareness of their constituents as argued above. On the other hand, a social impact assessment has seldom accompanied the decision supporting any

dam removal and has been absent from the decisions about small dam removals thus far. The Brownsville case study allows an opportunity to explore the social impacts of a small dam removal and offers a first look at how dam removal and social considerations can be integrated.

## **Background**

The Calapooia River supports a diversity of fish including native populations of winter steelhead, pacific lamprey, spring Chinook, and cutthroat trout (ODFW, 2005). Currently, winter steelhead (*Oncorhynchus mykiss*) and spring Chinook (*Oncorhynchus Tshawytscha*) are considered ‘threatened’ under the federal Endangered Species Act (ESA). Because the Calapooia Watershed is home to two species listed as ‘threatened’ under the federal ESA, NOAA’s National Marine Fisheries Service (NMFS) is the responsible agency for recovery planning for salmon and steelhead. It is their responsibility to mitigate the impact of dams on migratory fish. NOAA Fisheries has been involved in improving fish passage at main stem dams, major coastal river systems, and numerous other stream blockages, i.e. culverts.

Over the course of five years, the Brownsville community experienced a lengthy and involved decision-making process concerning the fate of the Brownsville Dam. Since the dam removal in 2007, the community has had time to experience community life without the dam. This study is an investigation from the community’s perspective post-dam removal (*expo facto*) and is directed specifically at how the community views any social change as a result of dam removal. The Brownsville Dam removal project represents one

of what will be a growing number of small dam removal projects funded by federal and state agencies to address fish habitat, social values, safety concerns, and economic burdens.

### *Area Setting*

The Calapooia Watershed is located in the Willamette River Valley in Western Oregon (Figure 2).

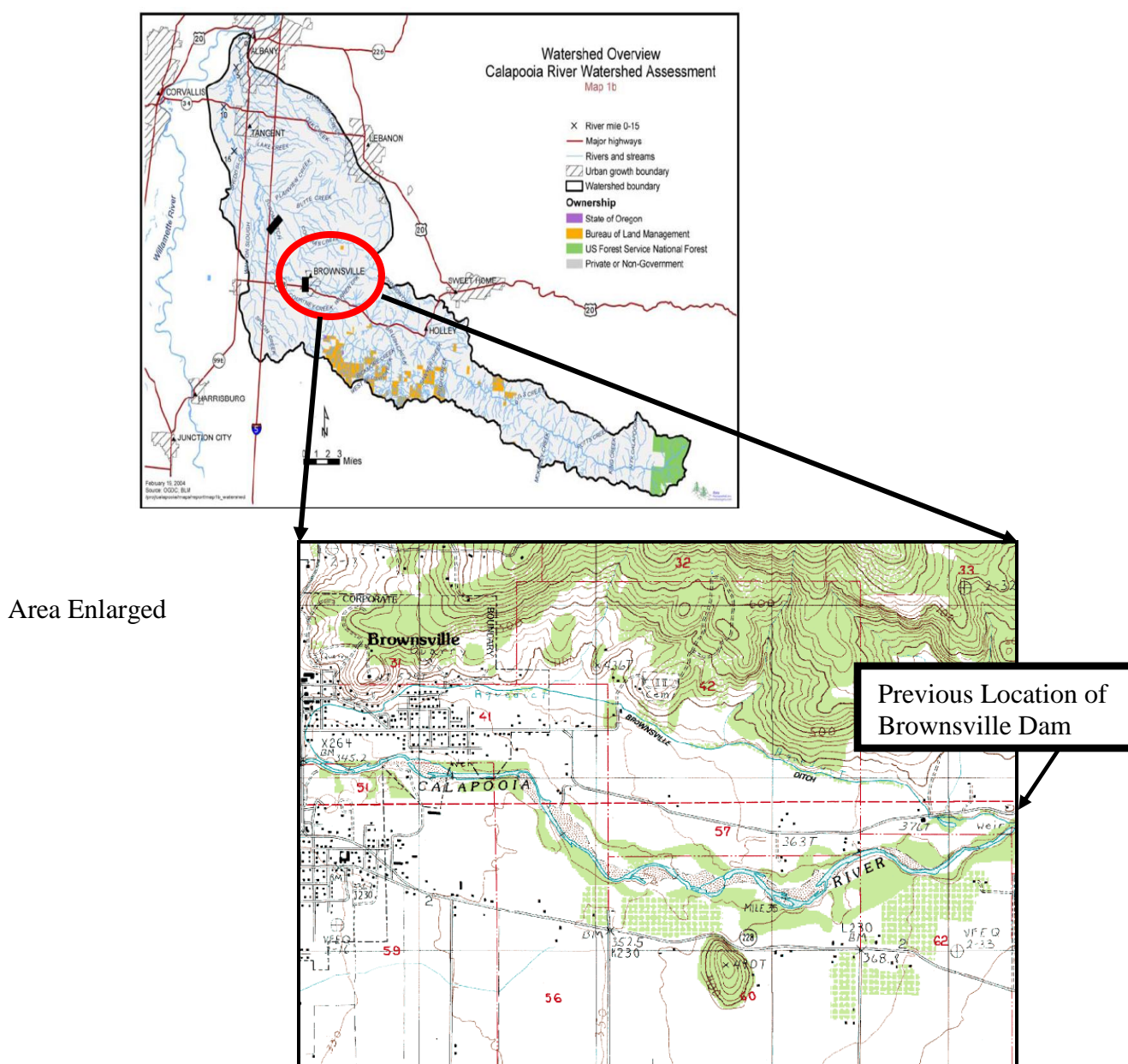


Figure 2: Area Map: Calapooia River Watershed and Brownsville, OR  
Source: Calapooia Watershed Assessment, 2004

The watershed encompasses a total area of 231,800 acres; of that, 94% is under private ownership (Calapooia Watershed Assessment, 2004). The Calapooia River runs 72 miles from its headwaters at Tidbits Mountain in the Cascades to the mouth at Bryant and Monteith Park in Albany (Calapooia Watershed Council, 2006). The Brownsville Dam was located on the Calapooia River near the center of the watershed.

Originally constructed as a wooded crib dam in the late 1800's

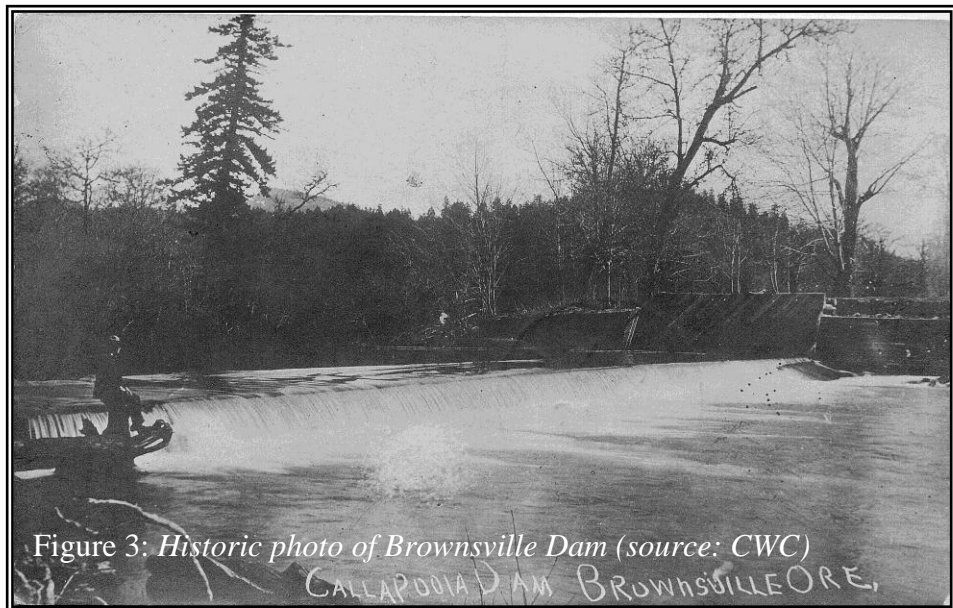


Figure 3: *Historic photo of Brownsville Dam (source: CWC)*

(Figure 3) the dam powered the timber, flour and woolen mills located in Brownsville (Figure 7 below). A hand dug ditch was used to divert water through a three mile canal, bringing water to the mills to assist in their operation. After a fire consumed and destroyed the mills in the 1940's, the milling industry was no longer a viable economic resource for the community. Shortly after the mills closed the dam was destroyed during a flood event. In 1967-68 the dam was re-built as a concrete structure with federal funds available from the Community Beautification Act passed under the Johnson administration. However, when the dam was rebuilt it no longer served a compelling need or purpose as it was not being used for flood control, commerce, or community water supply. Its sole purpose was to divert water back into the three mile Brownsville



canal with the primary function serving as an aesthetic value for the City of Brownsville. Currently, the city of Brownsville holds a 1992 water right for 2.23 cubic feet per second (cfs), which is used by several irrigators and has aesthetic values for the City of Brownsville (Calapooia Watershed Council, 2004).

## **Purpose of Study**

### ***Research Problem***

This research focuses on determining the social and economic impacts associated with small dam removal. More specifically this research is a first attempt at incorporating the often neglected social and economic component of dam removals into a larger assessment of impacts. This study is the culmination of a two-year effort to measure the effects of the Brownsville Dam removal in the framework design of traditional Social Impact Assessments (SIA) with the supplementary goal of incorporating citizen values into the assessment.

The research involved in this study is designed to address two questions: 1) how has the Brownsville dam removal affected the social and economic conditions of the community and 2) what indicators can be used to characterize and monitor the impacts. In order to answer these questions, the study has five main objectives:

1. Characterize the social and economic impacts associated with the removal of the Brownsville Dam.
2. Determine the validity of impact variables and their associated indicators most likely used to measure a social impact assessment.

3. Modify existing and/or develop new measurable/operational indicators applicable to small dam removal.
4. Formulate a methodological protocol (i.e. indicators and procedures) that can be applied to other small dam removals.
5. Lessen the gap in the literature as related to the social impacts of small dam removal.

Motivation for this study is due to the fact that there is a lack of available information addressing the societal impacts involving small dam removal. A growing national interest in dam removal has resulted from the recognition of ecological and geomorphologic effects of dams (Doyle *et al.*, 2000; Gregory *et al.*, 2002; Bednarek, 2001; and others), safety concerns of aging dams (Pohl, 2002), and the need to relicense hydropower dams (FERC, 2009; American Rivers, 2000). The literature regarding dam removal is extensive regarding the physical and biological impacts that occur as a result to the fragmentation of riverine systems. However, there are very few studies that consider societal issues with the same rigor. The studies that have been done only further demonstrate the need to examine the social impacts of a community surrounding dam removal.

## CHAPTER 2: LITERATURE REVIEW

*The public is now learning that we have paid a steadily accumulating price for these projects [dams] in the form of fish spawning runs destroyed, downstream rivers altered by changes in temperature, unnatural nutrient loads and seasonal flows, wedges of sediment piling up behind structures, and delta wetlands degraded by lack of fresh water and nutrients, and saltwater intrusion. Rivers are always on the move and their inhabitants know no boundaries; salmon and shad do not read maps, only streams.*

*-U.S. Secretary Bruce Babbitt*

The following review is used to address the multiple facets of this research. It is designed to explore the underlying premise of the social impact assessment and more specifically how this translates to small dam removal. First, the framework in which this research approach is formatted is described, looking specifically at the literature on social impact assessments and more specifically at the different approaches used in this study: technical and participatory. This is followed by a review of how a political shift in river management is leading to studies of dam removal or decommissioning but have lag behind in incorporating societal considerations and dam removal concurrently. Finally, the literature involving deliberative democracy is examined as a framework used to explain the processes which occurred in Brownsville and the debate surrounding the dam removal and how new methods of governance are contributing to collaborative decision making forums, watershed councils specifically.

### **The Social Impact**

The social impact assessment (SIA) process started in the early 1970's in good faith as a genuine process that attempted to identify and manage the (negative) social consequences of development (Burdge, 2003; Vanclay, 2006). It came in response to new environmental legislation, namely the National Environmental Policy Act (NEPA), which

requires Federal agencies to consider the impacts of major Federal actions and their potential to significantly affect the human environment. The agencies must first prepare an environmental assessment (EA) or environmental impact assessment (EIA), which integrates the natural and social sciences in its decision making (Freudenburg, 1986; IOCGP, 2003). Freudenburg (1986) pointed out that these integrated approaches were virtually impossible to find in some of the early Environmental Impact Assessments. In the past two decades, there has been a greater recognition by federal agencies and decision makers that social consequences of projects, programs and policies must be better understood (IOCGP, 2003). In response to this need, a group of social scientists formed the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment (IOCGP), with the purpose of outlining a set of guidelines and principles that will assist agencies and private interests in fulfilling their obligations under NEPA. The U.S. IOCGP (2003: 231) defines social impacts as:

the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society. The term also includes cultural impacts to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society.

The SIA was originally seen as being the *ex-ante* (in advance) prediction of the negative (social) impacts of a planned intervention within a regulatory framework (Burdge, 2003; IOCGP, 2003; Lockie, 2001). Burdge and Vanclay (1995) suggest an asocietal mentality is one of the reasons responsible for focusing investigations on measurable impacts

and/or politically convenient indicators such as population change, job creation/loss, or changes in services provided. Lockie (2001: 278) points out shortcomings of the SIA as, “one of the most frequently identified reasons for the marginalization of SIA is the technocratic rationality that dominates natural resource decision making and assessment” and notes it is inadequate to deal with competing interests, values, and aspirations that characterize complex social situations. Vanclay (2005: 2) also considered the original understanding of SIA as “inherently limiting in that it presumed an adversarial regulatory system” stating there is no role for the management, mitigation, and monitoring of impacts, or for the contribution of community members and other stakeholders in the design of the project or in decision-making. If the goal of a social impact assessment is “to help individuals and communities as well as government and private sector organizations understand and better anticipate the possible social consequences for human populations and communities of planned and unplanned social change resulting from proposed policies, plans, and projects” (Burdge, 2003: 85), it is important to point out the crude characterization of making unforeseen predictions of the related impact. And when a SIA is not conducive to engaging communities it can not achieve the best outcomes for the community. Challenges remain due to the lack of theoretical explanations for the *ex-ante* predictions and also because there is not consensus on the social indicators for which data are collected on a community basis (Burdge, 2003).

### ***Social Indictors***

Social measures influence public policy and in the 1960's the term ‘social indicators’ became commonplace (Force and Machlis, 1997). Measures such as unemployment rates, crime rates, life expectancy, and other related social conditions (Cobb and Rixford 1998;

Bauer, 1966), as well as perceptual measures such as subjective well-being and quality of life were used to define social impacts (Land, 2001). Generally, social indicators tend to be statistics and other measures that enable assessment of the social trends and the human dimensions of program or policy impacts (Bauer 1966; Bright *et al.*, 2003; Cole *et al.*, 1998). Ideally, social indicators should be “available to be collected over time and can be derived from available data sources...” (Force and Machlis, 1997: 369).

Practitioners wishing to use social indicators as a neat and tidy way to isolate small community changes are generally limited by data availability, validity, level of analysis, and causality which links macro-level and micro-level phenomena (Jackson *et al.*, 2004). In addition, published data are often limited by definitive boundaries used when collecting data. For example, data about employment and scholastic performance are frequently based on county or political jurisdictions and not necessarily representative of the population of interest which may be located in a small part of the jurisdiction or even across jurisdictional boundaries (Jackson *et al.*, 2004).

While practitioners and policy makers have identified a range of indicators that can be used to identify areas of likely problems, these are generally focused on the negative or weak aspects of a community (e.g. divorce and death). In addition, community characteristics and their systems are dynamic and made up of many interrelated processes, and therefore, social changes are particularly difficult to capture through a collection of facts or statistics (Force and Machlis, 1997). Other problems encountered with the identification of social indicators include much of the available secondary data

sources are collected for reasons unconnected to the environment and difficult to apply to a SIA (Morton and Padgitt, 2005; Jackson *et al.*, 2004).

Vanclay (2002) acknowledges that a few attempts have been made by social scientists to develop a list of specific social impacts and fewer still to provide the operational definitions of their variables. Although there are existing lists of social impact indicators (i.e. what to measure) Vanclay (2002) finds they are inadequate and contradictory. He implies that existing lists of social impact indicators may underestimate the impacts as experienced by affected communities and a list of social impact indicators “is not intended to be complete...and in fact no list is ever complete” (Vanclay, 2002: 200). He further argues that lists tend to limit the range of impacts as the impacts are substantially different in reference and context, subsequently resulting in the exclusion of certain impacts because they did not appear at a certain time or place.

The social science literature is abundant with articles addressing social impacts, social assessments, and social indicators (e.g. Burdge, 2003; Burdge 1998; Vanclay, 2002; Becker *et al.*, 2004; Lockie, 2001) but very few look at the relationship with water resources (Morton and Padgitt, 2005; Harris et al, 2003; Heinz Report, 2000; Andrews *et al.*, 1981) or even more specifically, dam removal (Born *et al.*, 1998). Burdge (2003) claims that compared to the biophysical component, social impact assessments and indicators have not been widely adopted in environmental and natural resource decision-making.

### **Participatory Application of Social Impact Assessment**

The SIA is constrained by the requirements of national legislation (Freudenburg, 1986; Lockie, 2001) and biases were recognized early in SIA applications. Linked to the environmental impact assessment (EIA), it was part of a regulatory process and was limited by bureaucratic restrictions and political interference, as well as by the limitations of the consultants who undertook SIA. To ensure the presence of a social component in an EIA statement, SIA was changed to socio-economic indicators, and as a result many U.S. Federal agencies adopted the term ‘socio-economic’ impacts. In practice, the social part was not done and socio-economic became an economic impact assessment, with a concentration on demographic changes and jurisdictional multipliers (Burdge and Vanclay, 1996). The goal for a SIA must be to separate further the social from socio-economic impact assessment, and to enhance the legitimacy of purely social concerns. Freudenburg (1986: 464) describes the debate in which divergent views appear between the “technical and political” approach to SIA and the “research and participatory” approaches. This argument still continues today as social scientists are restricted by technical and quantifiable impacts used in political decision making and the inability to incorporate the perspectives and interests of the affected community (Burdge, 2003; Burdge and Vanclay, 1996; Lockie, 2001).

One of the limitations imposed by a traditional social impact assessment is agreement on the methods for identifying impacts (Lockie, 2001). It has been found that many social impact assessments underestimate the impacts that a community has experienced (Vanclay, 2002). Lockie (2001) observed that causal processes are generally not



straightforward but rather deal with dynamic and often contested meanings associated with attitudes, beliefs, and values attributed to the proposed changes. Social assessment researchers and authors recognize that the traditional vulnerability and predictive-based approaches to social assessment are limited because of their inability to fully capture, understand, and control all possible changes and threats that may confront a community. Because social reality is dynamic and constantly changing, it is impossible to predict all potential outcomes (Kelly, 2000; Walker *et al.*, 2002), making it difficult to catalogue all dimensions of social impacts (Vanclay, 2002; Lockie, 2001; IOCGP, 2003).

To better capture the community response to dam removal it may be important to consider a wider range of social knowledge and thus reflect a participatory view that uses the knowledge and experience of individuals most affected by the proposed changes as the basis for projecting impacts (Becker *et al.*, 2004; Stolp *et al.*, 2002). As Born *et al.* (1998) found in a Wisconsin study of fourteen dam removals, in half of the examined cases, stakeholders felt that their concerns were not considered seriously and that there was intentional bias of the involved outsiders and/or non-local parties toward dam removal. Doyle *et al.* (2000) suggest that differences in environmental views and values from the various groups involved often result in considerable discrepancies that are rarely identified or addressed appropriately.

### ***Integrating the technical and participatory approaches to SIA***

Becker *et al.* (2004) compare independent applications of technical and participatory approaches and examined the benefits of using one application over another. It was found

that when these methods are used together, it provides a more holistic view, where the strengths of one approach are used to address the deficiencies of the other (Becker *et al.*, 2004). It allows for both a consideration of impacts from the local community members, a qualitative approach, as well as the analysis of quantitative indicators. Ideally it allows the community to be interactive in the decision-making process and participate in identifying potential impacts. While Sarakinos and Johnson (Heinz Report, 2002) suggest that community members may feel a sense of powerlessness when faced with the decision of dam removal, Becker *et al.* (2003) find that a participatory SIA seeks to empower individuals by giving them the opportunity to express their attitudes, beliefs, and values toward the proposed action. Becker *et al.* (2003) also find that it is more likely that an assessment lacking locally-defined indicators will miss the community-level impacts. In the end it should be noted that neither the affected community nor the SIA specialists will have all the answers or be able to identify all the impacts. This places a greater emphasis on the need for all stakeholders to work cooperatively through the impact assessment and planning process (Lockie, 2001).

This emphasis on linked participatory and analytical approaches is well developed within the SIA literature (Becker *et al.*, 2003; Harris *et al.*, 2003; Lockie, 2001). However, very little specification of the methods or techniques to capture citizens' values has been developed. The International Committee's *Guidelines and Principles for Social Impact Assessment* and others (Stolp *et al.*, 2002) have endorsed a general procedure but acknowledge its incompleteness on the predicate that the social environment is different than the biophysical environment because it reacts to change. They claim that the social

environment is better able to adapt to changing circumstances if it is a participant in the planning process (Burdge, 2001; IOCGP, 2003; Stolp *et al.*, 2002).

### **Dam Removal: The New Trend in River Restoration**

Until recently, government policy in the United States has largely treated rivers as utilitarian workhorses and a means for economic development (Lowry, 2005). Early water resource development efforts modified rivers with new infrastructure including dams, reservoirs, and levees, to manage flows, prevent flooding, and provide water for hydroelectric power, irrigation, or municipal uses (Lowry, 2005; McCool, 2005). This infrastructure has fragmented riverine systems, impairing the ecological, biological, and physical systems of once natural streams (Poff & Hart, 2002; Bednarek, 2001; Gregory *et al.*, 2002; and others).

Recognizing that the current data on dam removal was fragmented and incomplete Pohl (2002) offers the first analysis of U.S. dam removal rationales and assesses the primary reasons for removing American dams. The results of the study found ecological and environmental reasons as primary motives for removals even before federal regulations such as the ESA, and is expected to increase as the outcome of scientific, social, and environmental policy changes occur (Pohl, 2002).

Safety and economic reasons are more recent rationales and it is suspected that this trend will continue due to the natural consequence of aging structures and advanced technology. Pohl (2002) also finds that the geographic variation in removal rationale typically reflect the presence of programs that support or fund removals. Improved scientific understanding of resulting environmental impacts is driving federal, state and

local agencies to become more actively involved in dismantling dams in efforts to restore fisheries or ecosystems often to remain in compliance with federal statutes, mandates and regulation (e.g. Endangered Species Act (ESA); Clean Water Act (CWA); and Federal Energy Relicensing Commission (FERC)).

### ***A New Era in River Management***

Over the past four decades, American river policy has taken a different view of river management. Challenges posed by past environmental, economic, and political impacts have shaped efforts to move towards integrating management of rivers with the protection and restoration of natural systems (Pohl, 2002). Ultimately, this has required federal, state and local agencies to formulate new management policies designed to assist and evaluate alternative options in restoration efforts. One such example of this can be seen with a new federal program, NOAA's Open Rivers Initiative (NOAA ORI), with goals to "help communities restore habitat for migratory fish, foster sustainable fish populations, improve watershed health, engender community safety and health while contributing to economic revitalization of riverfront communities" (NOAA, 2005). This goal is being implemented through the removal of dams and other existing barriers (e.g. culverts) in streams and rivers. The NOAA ORI helps communities by providing funding and technical assistance for restoration efforts and contributes to improving and maintaining the long-term health of these aquatic resources. NOAA ORI's framework not only looks at the technical feasibility of these projects but is looking at community factors such as community participation and community enhancement.

NOAA's Open Rivers Initiative has made its way onto the political agenda by way of incremental policy change associated with river restoration. As federal policies begin to address issues such as fish passage and fish barriers, dam removal has gained federal policy status in programs such as NOAA's Fisheries Habitat Restoration.

### ***Is it Policy Reversal?***

In response to the threats identified to river systems mentioned in Chapter 1, e.g. aging infrastructure, safety, and the role of the ESA, dam removal entered the political mainstream in the 1990's as an increasingly acceptable method to restore rivers (Bender, 1997 cited in Pohl, 2002). This movement paralleled an increase in public awareness of the deleterious environmental impacts dams have on riverine systems. This in turn has placed a greater impetus of action on policy makers regarding the value of river restoration in recent decades (Graf, 1993 cited in Pohl, 2002).

Lowry (2005) questions that pattern of political behavior that changed dam policy from development to regulation and in some cases to removal. He suggests traditional dam building which once was the dominant management policy has changed to the restoring rivers back to their natural systems through dam removal, generating what he calls a policy reversal. Kingdon implies that a wide range of influences converge to create opportunities and significant departures from the policy status quo. He refers to this "window of opportunity" as a possibility to generate policy change (Kingdon, 1984 cited in Birkland, 2005: 225). Doyle and Harbor (2003) also suggest that policy change is happening with dam policies, wherein technical or environmental problems, politics, and policy alternatives merge together and discussions of problems and solutions coincide

with a receptive political environment. Although dam removal has gained momentum over the past three decades, this policy window can close at any time if there are changes in the political or social environment or perhaps emerging scientific evidence which proves removal not to be the best alternative. Relatively little research is available for policymakers and what is available often refers to dam removals that have not looked at the social and economic component.

### ***Dam Removal and Societal Considerations***

One of the major challenges in defining social impacts associated with dam removal is that very little research including social-economic considerations exists. The literature that *is* available states the need to address the social-economic considerations of dam removal. One of the pivotal studies performed thus far has been the Wisconsin study by Born *et al.* (1998). Although often cited by fellow researchers (Doyle *et al.*, 2003; Johnson and Graber, 2002), this study does not define the impacts of small dam removal in a societal context. Born *et al.* (1998) does conclude that as dam removal is increasingly being considered as a means for ecosystems restoration by dam owners, local communities, interest groups, and natural resource and regulatory agencies across the country (Born *et al.*, 1998; Johnson and Graber, 2002), socioeconomic considerations will have to be studied in more detail. Schmidt *et al.* (1998) suggest that effective environmental restoration, in addition to being based on sound science, must be based on a clear definition of the value of riverine resources to society. While the scientific foundation for dam removal is far from well documented, it is much more commonly explored than the societal values of dam removal.

Johnson and Graber (2002) suggest that the decision concerning the removal of obsolete small dams can pit the values and concerns of communities against those of non-local environmentalists, scientists, and government agencies. Communities can be strongly opposed to dam removal, especially in cases where the removal is perceived as a threat from an entity outside of the local community due to value differences in the decision making process that is introduced and advocated by these “outsiders” (Born *et al.*, 1998; Heinz Report, 2002; Johnson and Graber, 2002; Sarakinos and Johnson, 2002: 42). These outside groups are usually identified as federal and state agency groups and conservation organizations, which usually get involved when the dam poses a safety concern, economic burden, or environmental harm (Johnson and Graber, 2002; Pohl, 2003). Johnson and Graber (2002) further acknowledge that decisions affecting the future of larger dams are often made in a court of law while decisions affecting smaller dams are made through the “court of public opinion” (Johnson & Graber, 2002: 731). Thus, local residents can greatly influence the decision of removing small dams (Orr *et al.*, 2004). Johnson and Graber (2002) reference Born *et al.* (1998) suggesting that decisions concerning dam removals are often made with inaccurate information and often in emotionally-charged and divisive atmospheres. One of the more common arguments for keeping a dam concerns the affinity that people develop for their local environment (Johnson and Graber, 2002). Residents who grew up in a community surrounding the reservoir may experience a sense of loss at the prospect of having something taken away that has always been a prominent feature of the local landscape.

Furthermore, aesthetics and property values are two different although complementary concerns of communities who are involved in dam removals. While difficult to quantify in a traditional cost-benefit analysis, which often drives dam removal, aesthetic value is one of the more consistent reasons voiced by local stakeholders in opposition to dam removal (Heinz Report, 2000). Often riparian landowners and businesses have purchased land or developed businesses based on the reservoir and thus rely on high water levels for aesthetics, recreation, or other uses. Hence, property value can change dramatically, either positively or negatively, as a result of dam removal. Lewis, Bohlen, and Wilson (2008) conclude from their study of hedonic property values for multiple dam removal sites in Maine that opposition to dam removal is especially common from property owners along impoundments, who may have purchased homes or invested in boats, docks, and other recreational facilities in expectation of the presence of an impoundment.

### **Deliberative Democracy: The New Trend in Governance**

The general emphasis of deliberative democracy theory is not on the outcomes of deliberation but instead on the deliberation process itself. Rather than focus on how public participation can improve decision-making, deliberative democracy theory functions with a logic that frames public participation as an opportunity for public debate, personal reflection, and informed public opinion (Miller, 1992). The areas for application of deliberative theory for the purposes of this study will be connecting deliberative theory to the dam removal community in ways that have 1) encouraged the decentralization of decision-making to the local community and 2) deliberation processes foster relationships



to look beyond self-interest and more toward collective and ecological well-being in the community (Dryzek, 1987).

Although largely untapped by the natural resource literature (Schusler *et al.*, 2003), the idea around public debate and public opinion formation appear highly relevant within the natural resource management context where issues are often highly complex and deeply contested (Parkins and Mitchell, 2003). Schusler *et al.* (2003) examine what works in deliberative processes and why and how deliberative processes foster learning among participants in the Lake Ontario Islands Wildlife Management Area (LOIWMA) in New York. Their study found that deliberation and the processes associated with it (communication, collective choice mechanisms, increased understanding, etc.) provide one mechanism through which social learning can occur. They define social learning as “learning that occurs when people engage with one another, sharing diverse perspectives and experiences to develop a common framework of understanding and basis for joint action” (p. 311). Furthermore, Webler *et al.* (1995: 4456) make an important observation that social learning consists of two components. It has a cognitive side when it refers to learning new knowledge, such as new facts about the environment or learning about other stakeholders’ positions. It also has a normative dimension where a group of people learn to act and make decisions collectively.

Deliberation enables social learning with individuals and/or groups. It can offer a forum that encourages participants to view issues, relevant facts, problems and opportunities, areas of agreement and disagreement while contributing to the identification of a common purpose (Schusler *et al.*, 2003). Schusler *et al.* (2003) concluded that social

learning is essential but not sufficient alone for collaboration to develop. Social learning is one form of community capacity as defined by Kusel (1996: 369) as “the collective ability of residents in a community to respond to external and internal stresses; to create and take advantage of opportunities.” Community capacity comes from the residents themselves, and it is explicitly tied to action (Smith and Gilden, 2002) to mobilize capital resources for communal rather than individual benefit (Mendis-Millard and Reed, 2006). Appropriate structures and processes are needed to sustain learning and enable joint action. Developing appropriate local institutions for further collaboration, such as watershed councils, requires leadership and commitment in terms of human and financial resources.

According to Miller (1992), the role of deliberation is not to establish universal standards of right and wrong, or to embark on a process of discovery to find the one correct answer to a dispute or problem, but to arrive at decisions that participants believe fair and reasonable.

### ***Governance: Watershed Councils***

Like many deliberative processes, watershed councils have evolved in response to the public’s dissatisfaction with federal agency attempts to implement and develop a public involvement process to assess environmental and social impacts required after the passage of NEPA in 1970. Modern day watershed councils are another demonstration of a power shift away from the centralized top-down management of natural resources toward more community-level involvement. Watershed councils offer more than the traditional two-way transfer of information, they allow a multi-directional flow of

information and interaction between agency and stakeholder, as well as action and power that is distributed throughout the decision making arena (Innes and Booher, 2004). One distinguishing characteristic of watershed councils is the emphasis on partner efforts that focus on the protection and management of natural resources in a decentralized and shared manner (Genskow and Born, 2006). They encourage individuals and communities to take a greater role in stewardship of their natural resources. Watershed councils may also become a community forum that allows citizens an opportunity to spend months or years in meetings or allows citizens to participate in a dialog that best represents their individual needs or interests.

This 'new' approach can be found in a broader decentralization movement that focuses on more local level participation that encourages citizen deliberation as an important aspect in democratic decision-making (Griffen, 1999; Daniels and Walker, 1996; Miller, 1992). Concepts similar to localized resource management can be found under the names of collaborative resource management (Moore and Koontz, 2003), place-based natural resource management (Hibbard and Madsen, 2003), and grass-root ecosystem resource management (Weber, 2000).

In Oregon, the substantive potential of watershed councils has been recognized; currently there are 88 active watershed councils (OWEB, 2009). The Oregon legislature passed House Bill 3441 in 1995, which provided guidance in establishing watershed councils but made it clear that formation of a council is a local government decision not needing state approval (OWEB, 2009). According to state law, it is the policy of the state of Oregon

that: 1) voluntary programs initiated at the local level to protect and enhance the quality and stability of watersheds are a high priority of the state; 2) state agencies are encouraged to cooperate with local watershed protection and enhancement efforts and to coordinate their activities with one another and with local, regional, tribal, and federal governments, as well as private landowners; and 3) state agencies are encouraged to foster local watershed planning, protection, and enhancement efforts before initiating action within a watershed (Hibbard and Lurie, 2005).

### *Summary*

There has been a change in environmental management over the past several decades, towards a focus on integrating economic development and the restoration and protection of natural resources. This is reflected in the increasing interest and desire to remove aging dams to restore free-flowing rivers. While there is very little existing research about the social and economic impacts of such dam removals, there is a large body of research describing the need to combine technical with participatory approaches for assessing perceived impacts. The integration of approaches is also echoed by increasing demand for venues in which community members can make local decisions about the place they live. We know that communities change as they learn and deliberate together. It is in this context of changes in policy and practice that the study described in this thesis was conducted.

## CHAPTER 3: METHODOLOGY

*The [dam removal] movement is on its way. It's no longer dependent on the policies of federal agencies. It's rooted in communities all over the country*  
*-U.S. Secretary Bruce Babbitt*

This chapter describes the social impact assessment approach and the methods used to collect data for investigating the social impacts associated with a small dam removal. This research draws on a case study in Brownsville, Oregon identifying relevant impacts and indicators and proposing a methodological protocol that can be applied to other small dam removals.

### **Approach and Methods**

A case study is characterized as a type of research in which data are gathered directly from individuals or the social and communal groups in their natural environment for the purposes of studying interactions, attitudes, and characteristics (Leedy and Ormrod, 2001). Case studies are the preferred strategy when “how” and “why” questions are posed, when the investigator has little control over the events, and when the focus is on a contemporary phenomenon within a real life context (Yin, 2003: 1). The case study approach was used in this research to focus on the dynamics within a single community in order to examine and characterize the unexplored social and economic attributes that have largely been ignored in dam removal processes across the U.S.

### ***The Social Assessment Methodology***

According to Burdge (2003), case studies can provide important inputs for impact prediction and mitigation. The social impact assessment is a methodology used to measure the change in the social conditions of a proposed policy or project actions. For

this research, the identification of impacts utilized a participatory SIA approach such that those who were affected by the policy or project action would have a role in identifying the scope and magnitude of local impacts. Borrowing from research on local community change (Force and Machlis, 1997), natural resource dependent communities (Jackson *et al.*, 2004), watershed management (Morton and Padgitt, 2005; Harris *et al.*, 2003), and social impact/social change in general (Becker *et al.*, 2004; Branch *et al.*, 1984; IOCGP, 2003; Kelly and Steed, 2004; Vanclay, 2002), a matrix describing the categories of impact types (e.g. economic, quality of life) and potential indicators of those impacts was developed to help define impacts and indicators specific to the Brownsville Dam removal (Table 1 below).

To understand how the Brownsville Dam removal affected the social and economic conditions of the Brownsville community and what indicators can be used to characterize and monitor the associated impacts multiple methods were used: participant observation, document analysis, and semi-structured interviews.

### ***Participant Observation***

Participant observation provided the study with observational and inductive information on the interactions between Calapooia Watershed Council members, community members, and various other attendants who participate or were present at monthly Watershed Council meetings. The literature supports participatory research because it enables the researcher and the participants to equally engage in action-driven research. It gives a first-hand account of the situation under investigation, and when combined with

interviews and document analysis, allows for a holistic interpretation of the phenomenon being studied (Merriam, 1988). Participant observation is an important tool to guide the researcher's relationship with the community and to ultimately learn more about the community (Bernard, 2006).

Monthly Calapooia Watershed Council meetings were attended from November 2007 to February 2009. During these meetings, notes were taken when information regarding the Brownsville Dam removal was exchanged between council members and anyone in attendance. After attending several meetings, I believe my presence was no longer an anomaly and people of the community and the council began brief interactions with me and showed curiosity in the research being conducted. This opportunity was used to build rapport with the community members. This created additional opportunity to have informal conversations and engage in ad hoc exchanges with those in attendance, either community members or council members. Over the course of seventeen months, several brief project updates were presented at the monthly meetings and two detailed study purpose and progress reports were presented at the Watershed Council's annual open house event for each year this study was conducted.

### ***Document Review***

Document analysis is one form of secondary information used in this research. The investigation of secondary sources provided an opportunity to learn about what was occurring in the community prior to my involvement. It was used to assemble opinions, attitudes, and descriptions of situations in the community that have developed or

dissolved as a result of the dam removal. Document review also assisted in establishing a generalized baseline of the community pre-dam removal. Document analysis for this research includes:

- Historical Analysis: archived materials from newspapers and photographs from 1856 to present
- Newspapers: local and regional news sources, the Gazette times (Corvallis, OR), Register Herald (Eugene, OR), Albany Democrat Herald (Albany, OR), and Brownville Times (Brownsville, OR)
- Meeting minutes: City Council meetings, the Calapooia Watershed Council meetings, and Canal Company meetings
- Government documents: federal and state policy action literature

### ***Semi-Structured Interviews***

Non-probability sampling method was used to select the sample population for this study. The community informants were purposively selected on the assumption that active and involved residents with diverse roles would be the most informed and knowledgeable about their community and more likely to identify associated impacts following small dam removal. Snowball sampling is a widely used method of purposive sampling in which participants are asked to identify other community members they felt should be interviewed. This was done at the end of each interview. This process was repeated until no new names were offered, reaching a point in which case the sampling frame had become saturated (Bernard, 2006).



Twenty-nine interviews were conducted between September 2008 and February 2009, speaking with a total of thirty-one informants (two interviews had two participants). Of the twenty-nine interviews conducted, twenty-four were in-person and five were over the phone. If meeting in-person, the location was selected by the participant. The interviews lasted from 40 minutes to 2.5 hours; the average time being 1 hour and 15 minutes. An interview script was prepared consisting of a set of questions (see Appendix A) to guide the interaction between the researcher and participant. Probe questions were used when necessary to gather more information from the participant or to help clarify their answers. Interview notes were taken during the interview and then transcribed into a searchable document using Microsoft Word. Following transcription, interviews were coded using WEFT-QDA a software program for text documents. To minimize researcher biases (e.g. data interpretation, understanding, or perspective) that might limit objectivity due to particular human interaction inherent in the interview situation answers were repeated back to the participant and asked for clarification when necessary.

Four different categories of respondents were identified: the Calapooia Watershed Council affiliates (CWC), Canal Company members, City officials, and community members not currently associated with the CWC or the Canal Company:

1. Calapooia Watershed Council (6) – members who are current or past representatives.
2. Canal Company members (14) – community members who live along the mill race. These community members are associated with the Canal Company because of their residence, not by official membership.

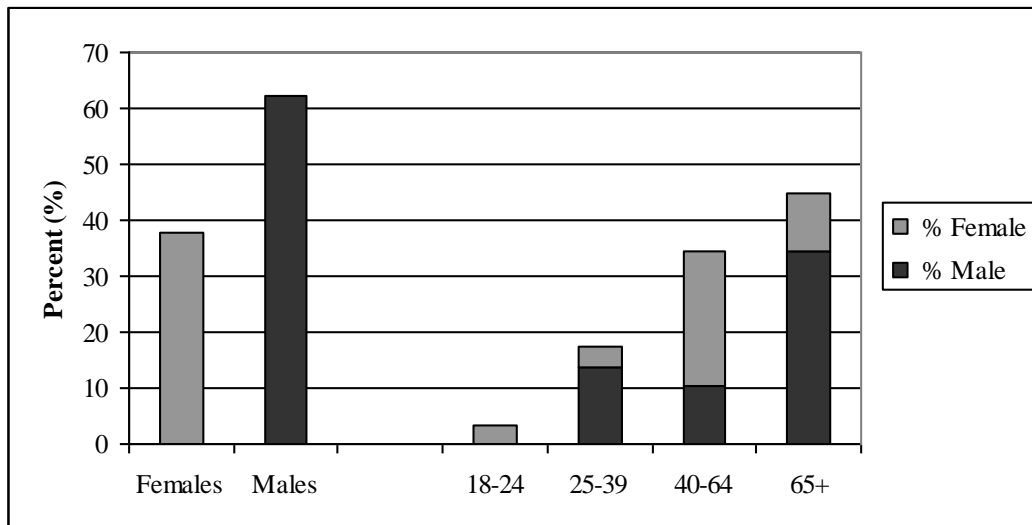
3. City Officials (3) – community members who work for the City of Brownsville and/or are on the city council.
4. Community members (8) – residents of Brownsville not currently associated with above mentioned categories.

A limitation to this categorization is an over-lap in institutional affiliation, such that three City Officials are also associated with the Canal Company. For analysis, one was grouped as City Official and the other two as Canal Company members. This was determined by the affiliation most used to frame their answers to the interview questions. For example, when asked what they see as perceived gains or losses (of dam removal) to the community, the respondent answered either as a Canal Company member or City Official, but not both. All other community affiliations are exclusive and independent of each other.

### **Participant Demographics**

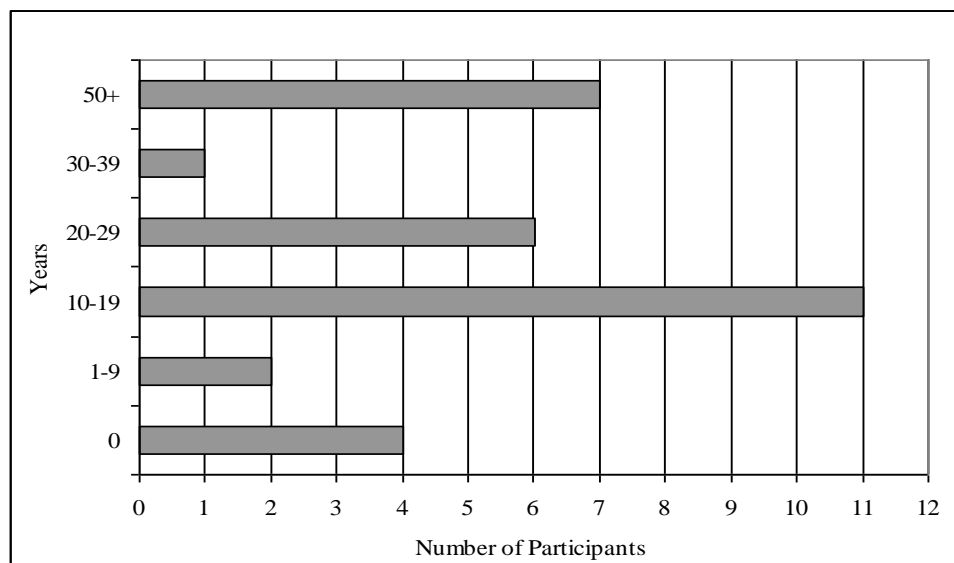
Representation in a community group or organization is affected by an individual's social networks, goals and needs (Griffin, 1999; Larson and Lach, 2008). The participants for this research were asked to provide general demographic information in order to better understand their responses relative to identifying community impacts. Variables include, age, time lived in Brownsville, proximity to the Calapooia River, and current or past membership of the Watershed Council.

### *Participant Description*



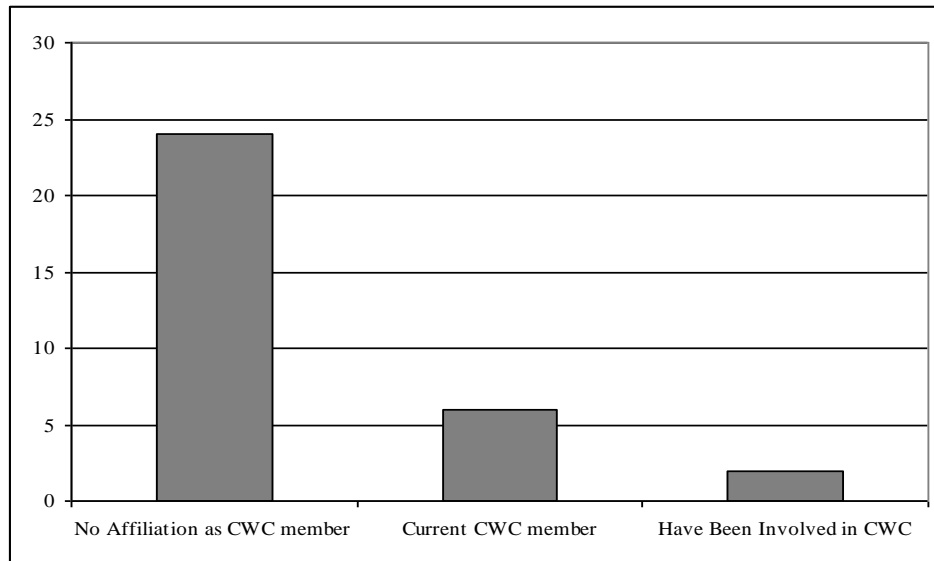
*Figure 4: Gender and Age Distribution of Participants*

Older males were the most frequently interviewed respondents (Figure 4) and very few newcomers to Brownsville were interviewed (Figure 5). This reflects the membership of the Watershed Council, Canal Company, and City Official. Short timers were purposively selected to ensure that the age seniority of respondents was not solely responsible for observed perceptions and experiences.



*Figure 5: Participants Length of Residency in Brownsville, OR*

Finally, while the Calapooia Watershed Council hosted the dam removal discussion, most respondents were not current or past members (although most all had attending meetings (Figure 6).



*Figure 6: Participants Affiliation with the Calapooia Watershed Council*

### ***Data Entry and Analysis***

The hand recorded notes from interviews were transcribed and analyzed using qualitative analysis techniques, looking for patterns of similarities and differences and categorized accordingly in WEFT-QDA. The categories were determined from the established social impact assessment literature and data were sorted using these categories as *a priori* codes. The process involved a minimum of two coding steps: 1) open-coding (Strauss and Corbin, 1990 in Bryman and Burgess, 1994), which is the process of examining, comparing, and conceptualizing the data; and 2) axial coding (Strauss and Corbin, 1990 in Bryman and Burgess, 1994), which makes connections between the categories, thus

analyzing emergent codes in comparison with one another to uncover general themes and areas of associated impacts and other community responses to the removal.

The interviews were conducted to validate the existing impacts and indicators as well as identify any new emergent impacts and indicators specific to small dam removal. After each interview, each participant's *identified impacts* were transferred onto the *a priori* matrix template, noting when the participant validated the existing indicators or identified an emergent indicator (Table 3 below). No new categories of impacts were identified by respondents during the interview process.

Analysis was used to contribute to the formulation of a SIA matrix specific to small dam removal as existing literature in small dam removal is negligible. The matrix framework is an attempt to display 1) the existing impacts identified in SIA literature, in general; 2) locally identified impacts; and 3) potential ways to measure selected impacts. Any *local* impacts will be generalized and operationalized using available local data in the sense that the impact will be measure specific to Brownsville (Table 4 below).

### ***Operationalizing the Social Indicators***

The next step in this process was to assign a measurable index for the selected indicators. Social indicators tend to be a collection of facts or statistics that are an integrated set of numerical values used to calculate the indicator. Social indicators are largely developed from existing data sources and dependent on accessibility to secondary information such as Census data (Force and Machlis, 1997). In a small town with limited sources of data and resources to collect information, the information may not be available at levels or

periods useful for the analysis (Jackson, *et al.*, 2004). This data-poor scenario is likely to be the case in many small dam removal projects.

The selection of indicators and how the indicators were measured for this study were based on several criteria: 1) extensive review of the literature; 2) relevant to small dam removal; 3) easy to understand (transparent); 4) readily collectable; and 5) identified by community members (Force and Machilis, 1997).

## **CHAPTER 4: ANALYSIS AND EVALUATION**

This chapter is presented in three sections. The first section identifies key themes found from the qualitative interviews describing perceived individual and community impacts from the participants' perspective. The next section distills these key themes in a social impact matrix where impacts and indicators identified from the first section are categorized. The final section presents the operationalization of the critical impacts and indicators for the Brownsville Dam removal.

### **Themes from Stakeholder Knowledge and Local Expertise**

#### ***Fish in the Calapooia?***

In 2003, the Calapooia Watershed Council (CWC) issued the Calapooia River Watershed Assessment (CRWA) to aid in identifying opportunities and priorities across all land uses for voluntary watershed restoration projects and education (CRWA, 2004). The CRWA listed specific activities for the Council to pursue, including the removal of the Brownsville Dam and was determined a high priority activity in order to provide access to upstream fish habitat. The Council took this as an opportunity to not only improve fish passage, but also to reduce an increasingly unwieldy financial burden for the Canal Company. According to one Calapooia Watershed Council member:

The most significant goal was to improve fish passage on the Calapooia River. The objective was to fix the fish passage problem and at the same time solve a significant problem for the Canal Company by way of

providing help and support for a local community group that did not have the skills or ability to do it themselves.

Respondents unanimously described the dam removal debate as centered on the threatened anadromous fish in the Calapooia River. The fish issue is complex, however, and respondents often hold inconsistent and even contradictory views about the dam. For example, some respondents expressed a sincere desire to restore ecosystem processes and an equally strong conviction that the dam's fish ladder had been inaccurately characterized as limiting access to habitat. The belief that fish could get past the dam was a common sentiment among Canal Company members as described by one member: "The debate was always about fish and fish passage and this angered a lot of the locals because the dam had been there for over 100 years and fish could get by the dam." Others were convinced that dam removal would not restore fish populations or increase access to habitat for a somewhat different reason as described by one life-long resident:

The dam removal is not going to improve the fish populations. The steelhead populations have been increasing with the dam still in place but the Chinook are doomed. Years ago an old mill owner would catch the fish on the apron and then sell the fish to the people. This damaged this population. [I] feel that the characteristics of climate are shifting, creating lower summer flows, it does not really matter how much water you get in the winter if there is no water in the summer.



While some community members were not convinced that dam removal would help return fish to the Calapooia River, most reported a belief that the removal has been very beneficial to the health of the river and improvement to fish passage has been made. As a city official said, “We are helping the fish. I was appalled by the environmental loss the dam has caused. It is an important moral issue about habitat and restoration.”

Increases in fish populations, however, are not linked solely to dam removal. Other factors to consider on the Calapooia River are historical and changing land uses that may diminish the quality of habitat accessed through the dam removal. A City official describes how upstream, “There is more harvesting of timber and that has created more sediment flows moving downstream filling the pools that once existed, making them shallower and not good fish habitat.” While most community and Watershed Council members see dam removal as improving access to fish habitat there is still some confusion about what the long term impacts for the fish population will be. However, as one fish biologist acknowledged, “While dam removal cannot be causally associated with increased populations of fish, it certainly can’t hurt.”

### ***Costs and Benefits: Operational Costs, Safety, and Recreation***

Costs of dam maintenance and repair can be high, especially for deteriorating federal and non-federal dams (Born et al, 1998). The normative argument for the Brownsville dam removal was recognition by state agencies and respondents of the safety threats posed by the deteriorating condition of the dam. This recognition, however, was tempered by respondents’ concerns about future costs associated with the need for electric pumps to keep water in the millrace. A city official expressed these shared concerns:

We are in a time of diminishing energy and increased costs. Removing the dam has increased the city's electricity cost to operate a pump that will keep water in the millrace four months a year.

The Calapooia Watershed Council attempted to secure funding to offset the pump operation costs for ten years, but changes in state and federal granting agencies "left the city to pay \$20,000 it did not have" (City official).

The new pump system was not only recognized as a long-term cost to the community but also an area of great uncertainty as no one knows yet just what the costs will be. A city official captures the general sentiment of the majority of respondents about the uncertainty and confusion about future costs associated with the dam removal:

The cost to operate the pumps will cost at least \$3500 a year. This analysis is based on current electrical rates, approximating costs at \$1800 to \$2200 per year. There are a lot of uncertainties involved with this process. If the city has to hire a crew to take out the pumps every year or install them, additional costs will accrue. Hiring personnel to take care of what the federal and state agencies started creates a larger burden on small communities in the future.

The pumps are scheduled to begin regular operation in June 2009. Until then, the question of “who pays?” and “how much will it cost?” is open to considerable debate and discussion among community members.

While replacing the passive run-of-the-river dam with a system that requires electricity was an area of concern for some respondents, the most frequently identified cost related concern was for the replacement services to the recreational opportunities the dam provided the community. It is recognized that concerns about changing recreation are common in communities where dam removal is proposed (Born *et al.* 1998). In Brownsville, the small reservoir created after the dam flashboards were installed was the community swimming hole. Seventeen respondents described a sense of community loss as expressed by one life-long resident, “[We] lost our recreation spot; one of the only summertime activities for the town youth was to go to the dam and swim.” This sentiment was echoed by the study’s youngest respondent:

[A negative impact is] losing the recreation resource. Maybe because of my age group, but you either went swimming at the dam or you went really far away. If we did not swim at the dam, we would have to go to Foster Dam in Sweet Home or go out toward Crawfordsville to a place called Swiss Cheese.

Although respondents generally expressed disappointment about the loss of this recreation site, there also appeared to be a sigh of relief from many of the same community members:

Yeah, the swimming hole is gone, but really it was dangerous...there was a huge hole in the dam and what if someone got stuck in there? It gave some adults the creeps just thinking about the safety hazards.

It was widely recognized by respondents that the Brownsville Dam was deteriorating and posed a safety hazard. It also was recognized by many respondents that the dam had already failed in previous years which had scoured a hole under the structure. This also raised concerns for some community members that the people using the swimming hole, especially children, could get serious injured. What differed among respondents was what approach to take to address the safety issues. Watershed Council members argue that, along with fish passage, safety was a primary impetus for removal; one member suggests, "Someone was going to get hurt and sue the Canal Company. The Canal Company carried liability insurance but I feel that this became more of an issue for their organization." In general, safety issues were less salient for Canal Company respondents than concerns about future costs, however, and when safety was raised it was framed somewhat differently as one Canal Company member describes, "The dam did need some repair work but it would keep operating for quite some time before they needed to be addressed."

Not all costs associated with the dam removal were perceived negatively. Many respondents identified the alleviation or elimination of potential lawsuits related to fish passage or safety, reduced need for liability insurance, and reduced maintenance costs as positive outcomes. Other respondents suggested opportunities for increased tourism and new recreation opportunities for the community such as improved fly-fishing opportunities and canoeing.

Respondents also reported that environmental impacts can be highly intangible and difficult to monetize yet still highly valuable to the community. One community member, for example, asked, “The aesthetics of moving water. How do you measure this value?” Anecdotal evidence from other communities suggests that in some cases dam removal can serve as a catalyst for community revitalization and can improve aesthetics, both of which can bring more people to the community (Heinz Center, 2002). Brownsville residents and Watershed Council members thought that having water in the millrace and a free-flowing river might have some economic potential:

The millrace no longer has utilitarian value, which this could be just as important to the tourist as well as the community. For example, when people come to visit Brownsville and they see an empty ditch they just keep driving. But if they come and see flowing water out here in the park, they may stop and get out and enjoy the town more. (Community resident)

As Adams (2000) suggests, the debate about the social impact of dams revolves around whether the positive economic benefits outweigh the costs. The community of

Brownsville is not reliant on the Calapooia River for industrial or commercial purposes nor are the livelihoods of residents tied to utilization of the river. In this case, while positive economic benefits through increased tourism or reduced liability costs and costs associated with the pumping are still unknown, no respondent identified either large costs or benefits associated with the dam removal.

### ***Institutional objectives***

The Calapooia River is home to two fish species listed as “threatened” under the federal ESA; winter steelhead (*Oncorhynchus mykiss*) and spring Chinook (*Oncorhynchus tshawytscha*). The Calapooia Basin has also been identified by the State of Oregon as one of 27 conservation opportunity areas in the Willamette ecoregion (ODFW, 2005). State and federal agency objectives and regulatory regimes all operate in the background as a local community decides to remove a dam. In Brownsville, many of the factors perceived as leading to dam removal appeared to be external political forces, causing some concern among respondents.

Watershed Council members took the position that resources were available to meet the goals identified in the Calapooia River Watershed Assessment, improve fish passage, and address financial concerns of the Canal Company. One Watershed Council member described this commitment:

The main debate centered on looking at fish passage in both the regulatory frame and for ecological reasons. The Canal Company was dealing with liability issues; legal liability concerning two issues; 1) safety and 2) fish passage by some means. Whether it would have been a citizen lawsuit or

other means, this was a concern. No one had money. The million dollars it cost to remove the dam – no one on the Canal Company has the ability to afford that much money.

While the Watershed Council believed they were addressing multiple concerns that addressed both local and non-local goals, Canal Company respondents reported that they felt “outsiders” were making decisions for the community. Many felt that the decision to remove the dam was a foregone conclusion regardless of any preferred alternative of dam repair. Some non-Canal Company respondents also expressed concern about the decision process even though they agreed with the decision to remove the dam:

I understand the agencies have goals and objectives, but it is critical to fulfill commitments that have been made to communities. They cannot come into a community and make these changes and walk away from it with a “screw you” attitude once they have reached agency goals and/or objectives. Long-term obligations will be required by local governments and the community [i.e., financial obligations] which accrues increased cost to the city either through a tax or other. Often these “additional” unexpected costs are unachievable by the city.

As local communities assume increased responsibility for the management of watersheds in Oregon and elsewhere, the outcome of decision making is likely to reflect the importance of traditional practices through which these communities have shaped their surrounding landscape (Rhoads et al, 1999). Potentially, institutional goals and objectives

set out by federal and state agencies can create challenges for small communities that struggle to overcome financial shortfalls to meet new institutional requirements. In Brownsville, there are disparate views between the agencies and the local residents as to what defines “success” of the dam removal. While some respondents agree with the agencies’ objectives and support the process, others wonder if these agencies had considered what the local impacts would be in order to meet these objectives.

***(In)Accessible Information?***

*The information was accessible to those who lived in town; if you did not get the newspaper, or hang out at the local coffee shops, the information was less available to those folks. (Community member)*

Open channels of communication and opportunities for civic engagement are widely recognized to contribute to greater involvement in local issues (Marquart-Pyatt and Petrzela, 2008). Respondents were asked to describe the effectiveness of communication channels and if this information was informative relative to the dam removal issues.

Many respondents agreed that the information was accessible and available, either through announcements in the local paper, one-on-one visits by the Watershed Council members, or as one community member suggests, “ There was a lot of gossip was going on [or goes on] so a lot of information I was getting was hearsay.” The overall sentiment by a majority of the respondents hailed the Watershed Council’s efforts to remain engaged with the community and transparent through the removal process:



The information was available to the community. There were public meetings in which the council would pass out handouts. These were available to everyone who came to the meetings. [ I ] do not remember getting anything in the mail or mass mailings about the removal but there was still a good bit of literature out there, the [Corvallis Gazette] Times and Albany Herald...everything was put in the paper every time there was a meeting or there was something to report. (Community member)

Yet, a somewhat different picture emerges from the Canal Company members, many of whom claim they do not subscribe to the local newspaper or go to the Watershed Council meetings. As one Canal Company member found, “If you were lucky enough to know about the meeting, maybe a neighbor because they read it in the paper or saw it posted on the board in town...then I would have gone to more of them [meetings].” The Watershed Council members agree that they could have done more, claiming there are always opportunities to improve lines of communication, one member suggests the responsibility can go both ways:

Communication goes both ways. People want two doves to deliver the velvet sealed message, so people want or claim to be communication victims but the information was out there.

As expected, respondents who demonstrated some form of engagement with the Watershed Council activities, such as attending meetings or volunteering prior to the dam

removal, reported having the available resources of information while those who were not involved felt information and communication was lacking. Also, the level of uncertainty of the dam removal outcome was greater for respondents who claimed the information was unavailable than those with available information

### ***The Evil Doers***

*There was talk that the Canal Company was going to be sued by two environmental groups. The groups were unnamed and were known as the “evil doers.” (Canal Company member)*

Value differences are especially pointed in dam removal because the removal option is most often introduced and advocated by non-local parties (Doyle *et al.*, 2000). This leads to concerns about access to information, fairness, and institutional arrangements (Born *et al.*, 1998). Canal Company members were particularly skeptical of those with outside affiliations, who became known as “the fish people.” These outside organizations appeared threatening to the Canal Company because they were viewed as the force behind the dam removal through legal channels or forced governmental authority. Most Canal Company members felt the regulatory and legal process was used as leverage, and some assert the sentiment expressed by several members, “They used the scare tactic by telling the members of the Canal Company that they were going to be sued...The members that make up the Canal Company are old and were scared into the removal.” The belief that these outsider groups were forcing the community to make decisions that carry long term impacts was mostly identified by Canal Company members, but also

shared by some community respondents. One Canal Company member describes these outside groups as:

The people who made these decisions do not live in Brownsville. The people who make decisions for communities need to be more involved within the community itself because once *they* leave, it is the people of the community who must face the consequences, and the decision makers are not the ones affected. They get to walk away.

As a whole, the Canal Company members remain resentful that other alternatives were not fully explored to address the issues concerning the dam. Even some supporters of the removal express remorse:

We should have explored more options to see if there was some way it could have been funded for co-generation, meaning look for ways to have fish ladder and produce electricity. Solve the fish problem without taking the dam out. (Canal Company member)

And while the majority of Canal Company respondents express concerns about “the fish people” or “the evil doers,” other community groups focused their concern on the fish passage barrier and the potential safety liability of the dam to the community and the burdens it placed on the Canal Company. These respondents agreed that the outside organizations were meeting agency objectives and taking appropriate measures to achieve these objectives. Although the Watershed Council was not perceived as an outside organization, they were viewed as determined to meet particular goals and objectives. As

a community member said, “If Oregon Department of Fish and Wildlife (ODFW) was looking into it, it was probably something that needed to happen.”

### *Something Lost...*

*[The dam removal means] the loss of a loved treasure, like an institution that has been a part of the community for such a long time. (Watershed Council Member)*

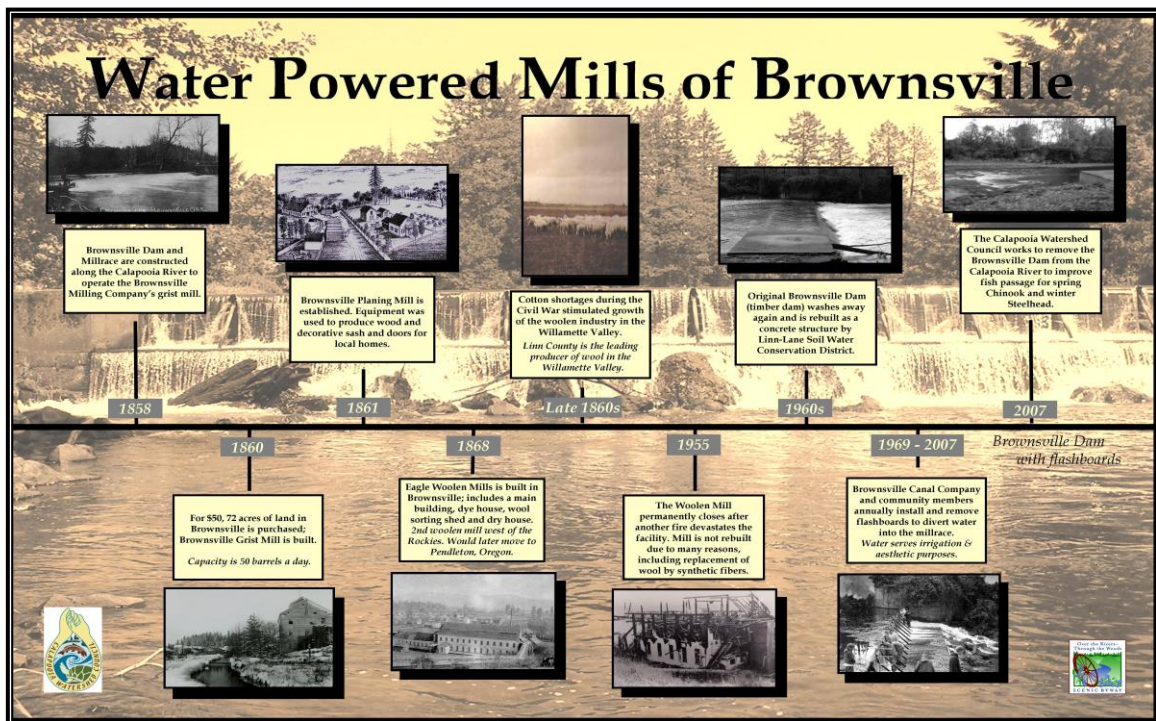


Figure 7: Historic Time Line: The mills of Brownsville. This is on display near the museum in downtown Brownsville and serves as a tribute of the dam for the community: photo CWC

The decision to remove a feature that has been strongly associated with community identity for decades is controversial and difficult (Born *et al.*, 1998). The literature points out that one of the more common arguments for keeping a dam concerns the affinity that people develop for their local environment (Johnson and Graber, 2002). For some residents where the dam has always been apart of the community character and has been

a prominent feature of the local landscape, a sense of loss and sadness may be experienced. This was true for Brownsville, as one of the most salient issues among all community groups was that the dam removal took something valuable away from the community. This was expressed in two slightly different, but interdependent ideas. The first was a loss of community identity and the second was a loss of a historic structure that contributed to the sense of Brownsville as a community.

*Community Identity: Sense of Place*

A sense of community and attachment to place are associated with the symbolic interaction which occurs through the use of the physical environment (Brower, 1980 in Lev-Wiesel, 2003). Community identity, as used in this paper, is described as the folklore or mythology of community culture and value related to their relationship with the dam. This connection was found to be strong for Brownsville residents and many felt the dam removal affected the community's well-being. This concept is best captured by a city official's statement:

[The most significant impact affecting the community] is a loss of community memory. This is important because it is what shapes the community. We [city of Brownsville] have the oldest event happening in Oregon, Pioneer Picnic, happening since 1888. The community develops a folklore that is kept alive through generations and we do not have that anymore [referring to the dam]. It is a small town emotional folklore concept; the dam meant something to the people.

Many respondents expressed sentimental associations toward the dam site location based on their experiences and they reported a selective nostalgia based on two key features: 1) the swimming hole and 2) flashboard installation and removal (described in more detail below).

#### *Historic uniqueness*

*Historically, the ditch is almost as old as the town; it was a hand dug ditch that served as a great economic component to community. The river and the ditch add life to this town and it preserves the community way of life with tremendous historical importance. (Community member)*

The dam removal was seen by many as removing a historic center piece of the community's character. The unique character that lies behind the idea of having an old wooden dam in Brownsville stirred some emotion as a community member explained, "We lost a piece of nostalgia, a memory that will no longer exist; [we have the memory] but not the dam itself. We can look at an old photo but we can not bring our grandkids down to show them because it is not there." The old wood dam which was rebuilt as a concrete structure in the 1960's after it washed away in a flood event has not diminished the historic appeal it had for the community. This was also apparent to the Watershed Council members as well. The Council hosted a special event specifically to honor the significance of the dam in the community and placed commemorative plaques in Brownsville for its permanent recognition (Figure 7). As one council member described:

It was very healing for the community to have an acknowledgement ceremony recognizing the importance of the dam to the community. It was an opportunity to publicly mourn the loss, which enhances the community's ability to move on. This openness was the real healing moment for the community.

However, not all respondents agree that the dam removal is a loss to the community. For the community members who live in close proximity to the dam site, the removal delivers a sense of satisfaction because it eliminates disturbances from social gatherings and trespassing. Several community members hail the removal because it has “eliminated people of questionable character out at the dam site...” Another community member further extends that claim:

The users were about 10% families and the rest were drug addicts and alcoholics. They used the area because there was not policing out this far. They know this and come out here to be out of sight. [The] police in the area have a large area to cover and that the dam site is out of sight out of mind.

Even Canal Company members who were opposed to the dam removal agree with the above sentiment. However, this applies only to those who own property near the dam site.

It can be viewed that even as people mourn the loss of an historic structure or the connection to *sense of place* (Brownsville), some recognize the modern reality and benefits of dam removal.

### ***Community cohesion***

There is a collective sentiment among respondents that the dam brought the community together. The two events that were most commonly identified to contribute to this perception of community cohesiveness are the bi-annual flashboard event and gatherings at the swim hole.

### ***Flashboards***

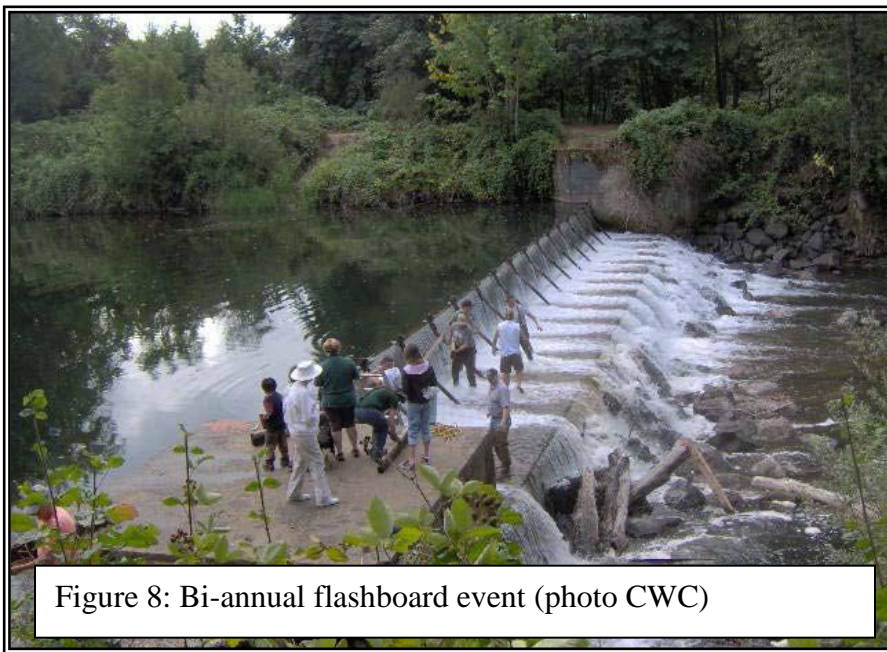


Figure 8: Bi-annual flashboard event (photo CWC)

For most of the respondents, loss of the bi-annual event to install and remove the dam's flashboards (Figure 8) was a significant impact on the community and

themselves. The Canal Company members in particular have a long standing history with the dam and the diversion ditch along which they live. This group has been primarily responsible for putting in and removing the flashboards every year, even though this was an



event in which the community at large could participate. A City Council member who is also a Canal Company member portrays the overall sentiment the event carried with the community:

Putting the dam flashboards in and out built community cohesiveness.

Even though it was only a small group and I barely even knew them that well, I miss it. I enjoyed getting together and the company. Even when I did not feel like getting in the water on “that” day I would go because of the connection and company.

Unfortunately, the people who have been involved in this event are aging as a group, and their ability and capacity to maintain the dam was decreasing. Several respondents question what the Canal Company’s presence in the community might look like in the future. A Watershed Council member suggests that, “In some ways the Canal Company is a failing organization and in regard to the dam removal, the Watershed Council was willing to help obtain funding and do the bulk of the work. It got to a point that only three people were actually doing anything for the Canal Company.” And when the Canal Company’s existence was questioned in a City Council meeting, a City Council member stated that, “The Canal Company will stay in existence as long as they are responsible for maintaining the mill race.” Many Canal Company members believe that since the dam is gone, they should not be held responsible or liable for the maintenance of the mill race or any other factor relating to the dam (e.g. pump operation cost). Canal Company members frequently identified the importance of the mill race for the city because it serves as the city storm-water drainage and many suggest:

The system is valuable to the City because they essentially have a storm drainage system that they do not have to maintain. If the canal did not exist or was filled in they would have to design their own system and that would cost them.

The majority of respondents agree that the dam offered the community an experience uniquely their own. Some community members choose to participate in other volunteer opportunities with the Watershed Council now that the dam has been removed. There are many others, and especially Canal Company members, who feel the dam removal contributes to a significant loss of community spirit and generations of community traditions that can never be replaced.

### *Recreation*

The Brownsville Dam site served both as a functional use for the community members who used it as a swimming location and had an emotional-symbolic meaning for the majority of the respondents. The dam site was an area for community gatherings as well as providing recreational opportunities for the locals and surrounding area residents. Many interviewees mourn the loss of the community swimming hole as discussed previously, but there are other participants who suggest that the dam removal has opened up new recreational opportunities on the river. One community member who expressed sadness about losing the swimming hole quickly followed up by noting the possibilities for new recreational activities, “There is a potential opportunity for

better recreation, like boating and rafting down the river; we would have to get out of our boats at the dam site and go around, now we won't have to do that anymore.”

Participants agree that the loss of the dam site took away one of the only places to access the river that was not on private property or too far away. Watershed Council members suggest that the community has Pioneer Park, a local park in Brownsville that also has access to the river, but there was unanimous agreement among the users of the dam's swimming hole that it was preferred over the other options in spite of its deteriorating condition.

### *Summary*

Interviews with Brownsville community members suggest that while most had a sense that access to fish habitat could be improved through the dam removal, there would also be social and cultural losses as well as ongoing costs to keep water in the millrace. For the most part these losses were nostalgic in nature and not perceived as either catastrophic or especially beneficial to individuals or the community as a whole. Economic costs may accrue to the city at some point in the future, but most respondents (except for city officials and Canal Company members) do not perceive this to be a major problem. In general, the removal of the small dam in Brownsville did not result in either large measurable benefits or costs to community members or individuals. The perceptions and experiences revealed through the interviews were used to characterize the social impacts of small dam removal and this process is described more fully in the next section.

### **A Three Step Process to Frame the Identified Social Impacts**

The process of identifying the social impacts for the Brownsville Dam removal was done in three stages. First, a review of the social impact assessment literature (Branch, 1981; Burdge, 1995; Vanclay 2002; IOCGPS, 2003; Becker et al, 2004) identified relevant impacts and impact variables for small dam removal and a preliminary matrix was developed (Table 1). After the interviews were conducted, the matrix was revised to identify both validated and emergent impact variables, as defined by participants (Table 3). The final stage was distilling the critical impacts and impact variables into operational indicators. In other words, taking (when possible) the most frequently identified and emergent indicators and operationalizing them as measureable variables (Table 4).

The results in this section are descriptive and have been determined by axial coding using the participatory approach of the social impact assessment. The strength of this approach is that it allows the affected community to provide input into the decision of what indicators and measures of social effects are most relevant to the dam removal.

#### ***Stage 1: Matrix of Potential Social Impacts and Indicators for Small Dam Removal***

Table 1 describes the potential social impacts and indicators identified in the existing literature. Table 2 provides a description of each impact category. This *a priori* matrix was created to serve as the foundational framework for characterizing social impact indicators for the Brownsville Dam removal.

		Potential			Impacts		
		Health and Social Well-Being Impacts	Quality of the Living Environment (Livability) Impacts	Economic Impacts and Material Well-Being Impacts	Cultural Impacts	Family and Community Impacts	Institutional, Legal, Political, and Equity Impacts
Indicators		Uncertainty –being unsure of the effects or meaning of dam removal	Leisure and recreational activities and opportunities	Standard/Cost of living	Cultural integrity-degree to which local culture is respected and likely to persist	Changes in social networks	Participation in decision-making
		Feeling about the removal that may result in formation of interest groups	Perceived and actual quality of the living environment	Property values-real estate sales	Experience of being culturally marginalized-exclusion of certain groups	Changes in demographic structure of the community	Changes in land ownership, tenure, or legal rights
		Annoyance –experiences due to disruption of life	Aesthetic qualities	Replacement costs of environmental services	Loss of cultural or natural heritage- areas of recreational value	Community identification and connection-sense of belonging, attachment to place	Impact equity-distribution of social and economic impacts across the community
Potential		Dissatisfaction –due to failure of removal to deliver promised benefits	Perception of personal safety, hazard exposure, and fear of crime	Occupational status and type of employment-temporary local jobs generated by the project	Change in cultural traditions	Perceived and actual community cohesion	Access to and utilization of legal procedures and advice throughout project
		(Location for) delinquent behavior		Access to public goods/services		Social differentiation and inequality-creation of perceived or actual differences between groups  Changes in social tension-conflict within the community	

Table 1: Potential Social Impacts and Indicators for Small Dam Removal

***Stage 2: Matrix of Validated and Emergent Social Impacts and Indicators for Brownsville Dam Removal***

As described in the previous section, interview respondents (n=31) were asked to identify impacts to themselves and the community. Responses were translated onto the *a priori* matrix; if the indicator variable was already listed it was noted and if it was not, it was placed into an impact category that closely represented the participant's meaning (Table 3).

The conceptualization of social impacts for this study are divided into six categories, as defined by the literature and validated by participants. No additional impact categories were described by the respondents. The impact columns are populated with indicators as characterized by the respondents. Some indicators have overlapping associations with the different categories of impacts. For example, **recreation** can be regarded as a *livability impact*, *economic impact*, *cultural impact*, and *family/community impact*. For simplification, indicators that were found to overlap with multiple "impact" categories were coded and categorized according to the author's interpretation of the participants meaning.

To assist with the identification of impacts and indicators found in this case study, a unidirectional matrix of impacts and indicators can be found in the Appendix. This matrix offers the same impact and indicator categories as seen in Table 3 yet the perception of a gain or loss, as determined by the participants, has been removed.

Table 2: Definition of Impact Categories

<b>Impact</b>	<b>Description</b>
<b><i>Health and Social Well Being</i></b>	Health and Social Well-Being impacts apply to individuals and to the society in which they live. The indicators were coded according to the participants' reference to health as defined by Vanclay (1999: 3) as "a complete state of mental, physical and social well-being, not merely the absence of disease or infirmity"
<b><i>Quality of the Living Environment: Livability</i></b>	Livability impacts were determined by participants' reference to the "livability" of their neighborhood, workplace, or personal environment (Vanclay, 2002: 203). This macroconcept encompasses both a perceptual dimension and an actual dimension meaning; the physical changes as well as the participant's feelings about their physical and psychological surrounds were categorized here.
<b><i>Economic and Material Well being:</i></b>	Economic and material well-being impacts are related to the "wealth and prosperity of individuals and the community as a whole" (Vanclay, 2002: 204). This was determined by the participants' reference of the potential (either actual or perceived) economic change for themselves or the community. The literature finds that small dam removals are frequently approved to relieve the economic burden of deteriorating structures (Johnson and Graber, 2002).
<b><i>Cultural</i></b>	Cultural impacts include the impacts or associated changes on the culture or cultures of the affected area or community. In some instances this may "relate to specific individuals or cultural groups where loss of a language, cultural heritage or traditions is compromised as a result of the project/policy" (Vanclay, 2002: 205). Cultural impacts as a change in community culture, or the loss of a specific event that was distinctively correlated to the Brownsville dam were categorized here.
<b><i>Family and Community</i></b>	Family and community impacts relate to the "family, social networks or the community in general" (Vanclay, 2002: 206). When participants referred to changes or disruption in their usual social interaction patterns, both individually and/or collectively, these were coded as an impact to existing social networks and were categorized under family and community impacts. Participants' responses that referred to the multiple facets of "community" were coded here.
<b><i>Institutional, Legal, Political, and Equity</i></b>	Institutional, legal, political, and equitable impacts encompass a broad array of impacts that can affect different components within a community. Local communities are shown to be dynamic and internally differentiated, and the environmental priorities of social actors positioned differently in power relations can be highly variable. These factors point to the importance of diverse institutions operating at multiple-scale levels which can influence who has access to and control over what resources (Leach <i>et al.</i> , 1999). Participants' responses referring to any aspect of agency objectives, legal processes, political affiliation or equitable impact distribution in any capacity were coded and categorized here.

**Bold font** indicates indicators of impacts validated by respondent; the *italic font* indicates emergent indicators (i.e. not represented in *a priori* matrix). The shaded boxes represent the impact indicators most frequently mentioned by respondents

Health and Social Well-Being Impacts	Quality of the Living Environment (Livability) Impacts	Economic Impacts and Material Well-Being Impacts	Cultural Impacts	Family and Community Impacts	Institutional, Legal, Political, and Equity Impacts
<b>Uncertainty –being unsure of the effects or meaning of dam removal</b>	<b>Change in leisure and recreational activities and opportunities</b>	<b>Change in property values/real estate sales</b>	<b>Cultural integrity-degree to which local culture is respected and likely to persist</b>	<b>Changes in social tension-conflict within the community</b>	<b>Participation in decision-making</b>
<i>Hazard to Public Safety</i>	Perceived/ actual quality of the living environment	Replacement costs of environmental services	Loss of cultural or natural heritage-areas of recreational value	Strength of social networks	Fulfilled legal or regulatory obligation of administrative order
<b>Annoyance – experiences due to disruption of life</b>	Perception of personal safety, hazard exposure, and fear of crime	Maintenance cost alleviated/eliminated/ <i>Created a financial obligation to operate pumps</i>		<i>Lack of participatory involvement</i>	<i>Meeting State and Federal agency objectives</i>
<b>(Location for) delinquent behavior/</b> <i>Elimination of location for delinquent behavior</i>	<i>Shared vision for the watershed</i>	Access to public goods & services/ Changes in the cost of recreation shift	Change in cultural traditions	Community identification; Sense of belonging; attachment to place: loss of community identification	<i>Conflicting agency agendas</i>
<b>Dissatisfaction – due to failure of removal to deliver promised benefits</b>	<i>Fire Control</i>	Liability risks eliminated <i>Liability Risk Created</i>	Historic structure-place of interest	Perceived and actual community cohesion	Formation of special interest groups as a result of institutional priority to certain groups
<i>Sense of Identity/ Place</i>	<i>Habitat Restoration</i>	<i>Changes to tourism industry</i>			<i>Lack of participatory involvement</i>
<b>Aesthetic qualities</b>	<b>Aesthetic qualities</b>	<i>Litigation</i>	<b>Aesthetic/Spiritual qualities</b>	<i>Community Safety</i>	
		<i>Local employment opportunity</i>			

Table 3: SIA Matrix of Validated and Emergent Impacts and Indicator: Brownsville Dam



### ***Stage 3: Identifying and Operationalizing Indicators Specific to the Brownsville Dam Removal***

The final step in this process was to identify specific local indicators for each impact category. Local indicators were selected from the potential set described in Table 3 based on perceived relevance of small dam removal and importance to the community, as identified by the respondents. In addition to the ability to operationalize the indicator as some characteristic that can be easily measured (see Table 4). This process is described in the next section.

Table 4: Critical Social and Economic Impacts Considered by Participants

<b>Impact</b>	<b>Local Indicators</b>
Health and Well-Being	1. Uncertainty
	2. Hazard to Public Safety: Flow, Erosion, Recreation, Infrastructure
Quality of the Living Environment	3. Habitat Restoration
	4. Health of the River
Economic	5. Cost of Removal
	6. Replacement Cost of environmental services
	7. Access to public goods and services
	8. Change in Property Values/ land use
Cultural	9. Change in Cultural Traditions
Family and Community	10. Community Identification
	11. Social tension and conflict within the community
Institutional, Legal, Political, and Equity	12. Participate in Decision-Making
	13. Meeting Agency Objectives
	14. Equitable Distribution of Impacts

### **Operationalizing Impacts and Indicators for the Brownsville Dam Removal**

In order to assess any social impact, it is necessary to operationalize the selected indicators in ways that can be measured. For most community projects, where resources for initial and ongoing monitoring are limited, it is critical that measurements be relatively easy and inexpensive. The use of existing data sources whenever possible is highly recommended (Force and Machlis, 1997; Jackson *et al.* 2004). As described above fourteen locally specified indicators of social impact were identified (Table 4) through the in-depth interviews with Brownsville community members. Operationalization of indicators was based on several criteria: 1) relevance to dam removal; 2) ease of understanding and interpretation (i.e., transparency); 3) data availability; and 4) salience to community (i.e., frequently identified by community members as important). This section describes the operationalization for each of these indicators.

### ***Operationalizing and Measuring Health and Social Well Being Indicators***

Critical indicators for impacts to health and well being in the Brownsville case are related to 1) a lack of information (or uncertainty) about the dam removal as well as 2) the creation of hazards to personal property and individuals.

While there are many possible ways for people to learn about dam removal, we are limited in this after-the-fact analysis to identify existing records of meetings and meeting announcements. The first indicator was operationalized as the frequency of announcements in the local newspaper (*The Brownsville Times*) which referenced “Watershed Council meetings,” announcements referring to the “Brownsville Dam removal,” and other community opportunities to obtain information such as “City

Council meetings” and “Canal Company meetings.” Regional newspapers including the *Albany Democratic Herald*, *Corvallis Gazette Time*, and *Eugene Register Guard* were also examined using similar criteria to identify articles that referenced the Brownsville Dam removal.

Table 5: Public Comments and Announcements: References to the Brownsville Dam Removal

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Albany Democratic Herald	0	0	0	0	2	2	4	0	0
Corvallis Gazette Times	0	0	0	0	0	1	1	0	0
Eugene Register Guard	0	0	0	0	0	1	2	0	0
Brownsville Times	-	7	2	15	21	27	25	15	3

Public meeting announcements (Table 5) in the local Brownsville paper were made frequently during the years 2003-2007, while the dam removal was being discussed. Papers in surrounding towns published far fewer notices or stories about the dam removal process. The bolded black vertical line represents the year the Brownsville Dam was removed to indicate any change pre and post removal.

The second Health and Social Well-being indicator was operationalized as concerns about hazards in the Calapooia River (pre- and post-dam removal) as 1) displayed in the editorials and letters to the editor, and 2) police and hospital reports in the local newspaper (*The Brownsville Times*). In this small town, police coverage came from the County Sheriff’s office and local police records were not available, so the police reports in the paper were used, although it is not clear how comprehensive these published reports are. Also, there is no local hospital so residents may use one of several in neighboring towns. Reports in the local paper about hospitalizations are subject to the

same limitations as those for police reports. An analysis of the local newspaper from the period between 2001-2008 looked for public comments and/or reports about river hazards using the key words, “Calapooia River,” “Brownsville Dam,” “disturbance,” “vandalism,” and “HWY 228” (the closest major road to the dam). As described in Table 6, there are very few editorials related to the hazards of or disturbances at the dam and relatively no change in the level of police and hospital reports.

Table 6: Frequency counts of Published Information in the *Brownsville Times*:

Year	2001	2002	2003	2004	2005	2006	2007	2008
Published Police reports	6	3	5	5	6	4	5	4
Published Hospital reports	0	0	0	0	0	0	0	0
Editorials and Public Comments on Hazards created from dam removal	0	0	0	0	0	0	1	0

### ***Operationalizing and Measuring Economic Indicators***

Four indicators were selected and operationalized to measure economic impacts: 1) cost of dam removal was operationalized as total project expense including budget shortfalls and is described in Table 7; 2) replacement cost of one environmental services was operationalized as projected costs of pump system and is described in Table 8; 3) access to public goods and services was operationalized as approximated replacement costs for displaced services including swimming, fishing, and picnic opportunities in surrounding parks and is described in Table 9; and 4) change in property values is measured through existing U.S. Census data and property tax lot information and is described in Table 10. The Calapooia Watershed Council has tracked the total project expense (Table 7),

including an assessment of budget shortfalls. This type of information is important to record and track over the life of the project, especially as more dams are slated for removal and could use a range of estimates for projected costs of different types of dams.

Table 7. Dam Removal Cost: Data from Calapooia Watershed Council Documents 2007

**Budget Breakdown by Project Phase**

Brownsville Dam Removal and Irrigation Diversion Restoration **UPDATED 12/03/07**

<b>FINAL BUDGET – PHASE 1</b>	<b>PHASE 1 – Dam Removal</b>		<b>PHASE 1:Total Costs</b>
Expense Category	<b>ORI</b>	<b>OWEB</b>	
<b>Pre-implementation Costs</b>			
<b>SUB-TOTALS (Pre-imp)</b>	<b>\$ 20,000.00</b>	<b>\$ 6,741.73</b>	<b>\$ 26,741.73</b>
<b>SUB-TOTALS (Watershed Council)</b>	<b>\$ 8,520.00</b>	<b>\$ 21,019.00</b>	<b>\$ 29,539.00</b>
<b>SUB-TOTALS (CES)</b>	<b>\$ 111,481.00</b>	<b>\$ 163,772.00</b>	<b>\$ 275,253.00</b>
<b>Monitoring</b>			
<b>SUB-TOTALS TOTAL</b>	<b>\$ 212,656.00</b>	<b>\$ 191,532.73</b>	<b>\$ 404,188.73</b>
<b>TOTALS (Phase 1)</b>	<b>\$ 233,922.00</b>	<b>\$ 210,686.00</b>	<b>\$ 444,608.00</b>
<b>DRAFT BUDGET PHASE 2</b>	<b>PHASE 2 – Canal Diversion Restoration</b>		<b>PHASE 2:Total Costs</b>
Expense Category	<b>ORI</b>	<b>OWEB</b>	
<b>SUB-TOTAL (Watershed Council)</b>		<b>\$ 3,500.00</b>	<b>\$ 3,500.00</b>
<b>SUB-TOTAL (CES)</b>		<b>\$ 360,201.00</b>	<b>\$ 360,201.00</b>
<b>Monitoring</b>			
<b>SUB-TOTALS TOTAL</b>	<b>\$ 91,310.00</b>	<b>\$ 363,701.00</b>	<b>\$ 455,011.00</b>
Electricity Costs 10 year agreement		<b>\$ 12,000</b>	<b>\$ 12,000</b>
<b>TOTALS (Phase 2)</b>	<b>\$ 100,441.00</b>	<b>\$ 412,071.10</b>	<b>\$ 512,512.10</b>
<b>DRAFT BUDGET PHASE 3</b>	<b>PHASE 3- Iowa Vane Installation</b>		<b>PHASE 3:Total Costs</b>
Expense Category	<b>ORI</b>	<b>OWEB</b>	
<b>SUB-TOTAL (Watershed Council)</b>		<b>\$ 7,877.00</b>	<b>\$ 7,877.00</b>
<b>SUB-TOTAL (CES)</b>		<b>\$ 66,126.00</b>	<b>\$ 66,126.00</b>
<b>Monitoring</b>			
<b>SUB-TOTALS TOTAL</b>	<b>\$ 95,163.00</b>	<b>\$ 74,003.00</b>	<b>\$ 169,166.00</b>
<b>TOTALS (Phase 3)</b>	<b>\$ 104,679.30</b>	<b>\$ 82,203.30</b>	<b>\$ 186,882.60</b>
<b>– Additional project funding needed</b>			
TOTAL Project Construction Costs Phase 2 only (not including monitoring for Phase 2)			<b>\$ 412,071.10</b>
TOTAL Available Funding for Constructing Phase 2 (not including monitoring for Phase 2)			<b>\$ 373,190.00</b>
<b>Budget Shortfall for installing Phase 2</b>			<b>\$ 38,881.10</b>
TOTAL Project Construction Costs (not including monitoring for Phase 3)			<b>\$ 82,203.30</b>
<b>Budget Shortfall for installing Phase 3</b>			<b>\$ 82,203.30</b>
<b>TOTAL BUDGET SHORTFALL PHASES 2 and 3</b>			<b>\$ 121,084.40</b>

In addition, information about ongoing costs, (in this case the estimated annual costs for the power and maintenance of the pumps required to keep water in the millrace), it will be important for future comparisons. Ongoing costs are estimated (Table 8) to be approximately \$2800 per year (CWC, 2007).

Table 8: Brownsville Dam Removal Projected Pump Operation Cost (Calapooia Watershed Council)

<b>Assumptions:</b> 10 hp pump will be run 24/7 for 4 months of the year					
Electricity cost =	\$0.06	per kW-hr			
Rate for skilled workers =	\$40.00	per hour			
Pumps will be rebuilt once each at year 10 during 20 year life at cost of \$1000 each					
Annual rate of inflation =	5.00%				
<b>Power Cost</b>	Power (kW)	Run time per year (days)	(hrs)	Energy (kW-hrs)	Energy Cost per year (\$)
Submersible pump power	8.8774	120	2880	25566.912	\$1,534.01
	Full Days/season	Hrs/ Week required	Total time/yr. (hrs)	Maintenance/ cost/yr. (\$)	
<b>Maintenance Cost</b>	required	required			
Submersible pumps	2	1	32	\$1,280.00	
<b>Annual Power + Maintenance Costs</b>					
Submersible pumps	<b>\$2,814</b>				

There are multiple parks with a variety of services within 40 miles of Brownsville (Table 9). The closest park is about 4.5 miles away, however, and certainly not as convenient a fishing or swimming hole as the former dam site, especially for young people without transportation or for families out for a walk on a summer evening. While it is relatively easy to calculate replacement costs as fuel to drive to another park, this probably does not fully capture the time and energy also required to travel to a more distant site.

Table 9. Surrounding Recreation: Alternative Use Area Replacement Costs. Source: Linn County Parks and Recreation

Name	Location	Distance from Brownsville (miles)	Amenities	Overnight	Cost for Services	Fuel Cost* (\$)
McKercher Park	HWY 228	4.5	Swimming, Picnic Area, Fishing	N	N	0.80
Larwood Wayside	Scio, OR	37.7	Swimming, Fishing, Hiking	N	N	6.61
Lewis Creek	Foster Reservoir, Sweet Home OR	23.7	Swimming, Fishing, Hiking, Picnic area	N	N	4.15
McClun Wayside	Holley, OR	11.5	Picnic Area, Fishing, some swimming	N	N	2.01
Waterloo County Park	Waterloo, OR	16.2	Swimming, Fishing, Picnic area, Hiking	Y	Y	2.84
Whitcomb Creek County Park	Sweet Home, OR	33.4	Boat Ramp, Hiking, Picnic area, Swimming, Fishing	Y	Y	5.85

\*Assumptions: The travel cost for replacement services was based on vehicle that gets at least 25mpg and current gas price of \$2.19 per gallon; Fuel price represents round trip approximation

In general, property values are relatively easy data to collect and are often an expected economic indicator in impact assessments, it is difficult in this case to correlate any direct

impact of the dam removal with changes in housing values. For example, while U.S. Census data suggest that there was an 8% depreciation in Brownsville homes in 2009 as shown (Table 10), the decline was most likely associated with the national economic slump in 2008-2009. It is also difficult to collect this data easily for the few houses along the millrace that may have some locality bonus associated with river-front property although this may be possible to determine by the Canal Company and/or Watershed Council if they are interested in maintaining their own records.

Table 10: Brownsville Population and Housing Data: 1990-2009

Year	1990	2000	2005	2009
<b>Total Population</b>	1,281	1,449	1,530	1,620
<b>Housing</b>				
Total Housing Units	508	579	N/A	N/A
Home Ownership Rate	73.60%	76.64%	N/A	71.50%
Housing Vacancy Rate	5.32%	7.60%	N/A	7.42%
Percent of Houses for use Seasonally or Recreationally	3.7	0	N/A	N/A
Median Home Value	45,100	117,800	N/A	164,270
Renter population	N/A	N/A	N/A	21.59%
Average Property Tax Rate	N/A	\$10.85	\$11.85	\$9.71
Home Appreciation	N/A	N/A	N/A	-8.40%

### *Operationalizing and Measuring Cultural Indicators*

One indicator was identified to measure cultural impacts. Change in cultural traditions was operationalized as the number of events that offer opportunities for the community to come together around a river specific activity (Table 11). While respondents expressed concern that community events related to the dam, especially the bi-annual flashboard efforts, would disappear with the dam removal, the Watershed Council offers volunteer and community opportunities specific to river function and health. The Watershed Council provides multiple types of community and volunteer activities as described in



Table 11, through current projects including efforts to remove invasive species such as Japanese knotweed, Himalayan blackberry, English ivy, and false brome. These efforts are often followed by a volunteer native species re-planting event (CWC, 2009). To date, no one tracks the number (or identity) of volunteers for activities and the data are estimates provided by Calapooia Watershed Volunteer Coordinators. One Watershed Council member also suggested that:

The council does provide/offer opportunities for the community to take part in working outside for the river but we found that the people invested in the dam flashboards are not the same people invested in the river today. It is a different constituent of Brownsville that volunteer with the river now.

Table 11: Opportunities for Participating in River-Related Community Activities

<b>Volunteer Event</b>	<b>Time of Year and Number of Opportunities</b>	<b>Number of Volunteers (approximate)</b>
Native Planting	2-3 events in Fall	15
Native Planning	1-3 events in Spring	15
Weed Removal	Several days in Early Summer	10
Brownsville Pioneer and Kirk Park Weed Control	Fall and Spring	22
Albany Ivy Riverside Events	Fall and Spring	10

No baseline of participants in the flashboard events exist to compare the number of participants, but it is possible to begin tracking the number and types of community volunteer activities that are available to Brownsville residents. This may serve as an opportunity to replace the cultural tradition that was associated with the bi-annual flashboard event.

### ***Operationalizing and Measuring Family and Community Indicators***

Dam removal means not only a change in the characteristics of a river but also possible changes in the human community. Impacts to family and community in Brownsville are measured as 1) community identification as related to river specific events, operationalized as the number of events unique to Brownsville and the Calapooia River and/or dam site and 2) change in social tensions or conflict within the community, operationalized as the frequency of concerns or conflicting views about the dam removal project as displayed in letters to the editor and editorials of the local newspaper (*The Brownsville Times*) and the minutes of the Watershed Council.

The Pioneer Picnic Day, the oldest community gathering in Oregon, is the only event that prominently features the river that runs through Brownsville. This community event is free and open to the public, and no record of visitors during this period has been recorded. As a surrogate for this activity, the number of overnight guests staying at two of three Bed and Breakfasts in Brownsville was used to track the influx of visitors during the event days between 2005-2008. In an informal correspondence with the owner and manager of two Bed and Breakfasts, they believe that no change in over night guests in Brownsville occurred as a result of the dam removal. Collection of this data is quite intrusive and it may be more beneficial for the community to begin tracking or estimating the number of visitors to the community for Pioneer Picnic Day and other community celebrations.

Published stories or announcements in the local newspaper and in Watershed Council meeting minutes were examined to identify the frequency of “concerns,” “dissatisfactions,” and/or “hostility” to the dam removal project as mentioned publically over the period between 2001-2008. The frequency of comments in the newspaper and council meeting minutes (Table 12) suggest that community members were not publicly raising concerns or expressing hostility for or against the dam removal. A comparison between meeting minutes and published newspaper comments suggest that more people with concerns went to the public meetings than published an editorial in the *Brownsville Times*. Again, the bolded black vertical line in the following tables represents the year the Brownsville Dam was removed to indicate any change pre and post removal.

Table 12: Frequency of Published Comments in Newspaper and Meeting Minutes 2001-2008

Year	2001	2002	2003	2004	2005	2006	2007	2008
Editorials and/or Public Comments	0	0	0	1	0	0	2	0
Meeting Minutes				1	1	3	4	3

### ***Operationalizing and Measuring Institutional, Legal, Political, and Equity Indicators***

Three indicators are proposed to measure institutional impacts: 1) participation in decision making operationalized as opportunities to participate in Watershed Council meetings, City Council meetings, Canal Company meetings, and any other public forums available during the period of 2001-2008; 2) meeting agency objectives operationalized as the extent to which agency mission statements were met by the dam removal project; and 3) equitable distribution of impacts operationalized as respondents’ perceived impact to their affiliated group.

Notices for opportunities to participate in Watershed Council meetings, City council meetings, and Canal Company meetings were tracked through notices in *The Brownsville Times* (Table 13). More than 700 community members subscribe to this local paper, although some respondents report that they don't read the paper. However, in this small community, the paper is the only consistent location for meeting notification and was used to collect data on this indicator.

Table 13: Announcements of Public Meetings 2001-2008

Year	2001	2002	2003	2004	2005	2006	2007	2008
Announcement of public meetings: Watershed Council, City Council, Canal Company	7	15	17	15	22	31	34	29

A review of institutional objectives was evaluated for the eight organizations most involved in the dam removal process or its outcomes. The listed agencies were identified by the Calapooia Watershed documentation of required regulatory processes and agencies addressing dam removal. These agencies include NOAA's Open Rivers Initiative (ORI), Oregon Watershed Enhancement Board (OWEB), Oregon Department of Fish and Wildlife (ODRW), Calapooia Watershed Council (CWC), Oregon Department of Environmental Quality (ODEQ), and Oregon Water Resources Department (OWRD), State Historic Preservation Office (SHPO), Canal Company (CC), and City of Brownsville (CoB). Their relevant missions are described in Table 14. The dam removal at Brownsville met multiple objectives for many different organizations (Table 15). Primary organizational missions that were met were related to the dam removal itself

(i.e., funding) as well as those related to protecting and enhancing habitat of threatened and endangered fish species.

Table 14: Agency defined Goals, Objectives, and/or Missions for Federal, State and Local Agencies

Agency	Objective; Goals; and/or Mission Statement
NOAA ORI	To provide funding and technical expertise for community driven small dam and barrier removals. Responsible for the regulatory monitoring of endangered species through federal laws such as Endangered Species Act (ESA)
OWEB	Programs that support Oregon's efforts to restore salmon runs, improve water quality, and strengthen ecosystems that are critical to healthy watersheds, ex Oregon Plan for Salmon and Watersheds. Responsible for federal laws such as Endangered Species Act (ESA)
ODFW	Maintain healthy fish populations by maintaining and restoring functioning habitats, ex. Oregon Comprehensive Wildlife Strategy, Responsible for federal laws such as Endangered Species Act (ESA)
ODEQ	Department of State Lands, Protecting Oregon's resources...to ensure a legacy for Oregonians and their schools through sound stewardship of lands and waterways
CWC	Mission providing opportunities for membership to cooperate in promoting and sustaining the health of the watershed
CoB	Prideful of its historic, small-town presentation. Brownsville hosts the oldest community event in Oregon: Pioneer Picnic Days and features a 26-acre park surrounded by the Calapooia River. The city has a 2.3 cfs water right for water through the mill race.
WRD	Dam Safety: to protect downstream communities or property from dam failures, and reviews the plans and specifications for any dam 10 or more feet in height and storing more than 9.2 acre feet of water
SHPO	To manage and administer programs for the protection of the state's historic and cultural resources. When these resources disappear, communities not only can lose the tangible and educational assets that contribute directly to Oregon's heritage, opportunities for local economic development can also be lost.
CC	Owned and operated the dam, responsible for maintenance and repairs. Several Canal Company members have water rights along the mill race.

Table 15: Meeting Agency Objective: Defined as Goals or Objectives for Federal, State, and Local Agencies

	Endangered Species Act (ESA)	Enhance fish access to spawning habitat	Cultural Resource Evaluation	Sediment Evaluation Framework	Maintain Water Rights*	Funding for Dam Removal
National Oceanic and Atmospheric Administration Open River's Initiative (NOAA ORI)	X	X				X
Oregon Watershed Enhancement Board (OWEB)	X	X				X
Oregon Department of Fish and Wildlife (ODFW)	X	X				X
Oregon Department of Environmental Quality (ODEQ)	X			X		X
Calapooia Watershed Council (CWC)		X				X
City of Brownsville (CoB)					X	X
Water Resources Department (WRD)	X				X	
State Historic Preservation Office (SHPO)			X			
Canal Company (CC)					X	

Finally, the equitable distribution of impacts was measured using a method developed by Coplin and O'Leary (1982) to assess the saliency or importance of each indicator to various stakeholders. In this case, an ordinal scale from one to three was used, with one meaning the issue is less important and three the issue is very important. The frequency of positive and negative perceptions on each of the potential impacts (the 14 indicators) was noted for each of the four different groups described above: the Calapooia Watershed Council, the Canal Company, City officials, and community residents. If less than one-

third of the members of a group described any positive or negative impact of an indicator, importance of that indicator for the group was scored as a one. If 33-66% of group members reported a negative or positive impact of an indicator, it was scored as having a two. And, if more than 66% of group members reported a positive or negative impact it was scored a three. As described in Table 16, the sum of the scores for each group was tabulated. While qualitative in nature, this strategy does highlight the impacts considered most salient to each group of respondents and makes it easier to compare differences in perceived impacts across groups. For example, it is apparent that members of the Canal Company may feel that they have the highest potential impacts (both positive and negative) of the four groups. This reflects one reality that their properties are the most affected by changes in the river, although each of the other groups feels some great saliency on specific impacts. For most respondents, the impacts, saliency, and distribution of social impacts from the dam removal suggest only minimal effects across the community; even those impacts related to economic costs associated with the removal of the dam and the ongoing costs to operate the pumps aren't overwhelming to most respondents. (If everyone in town paid their share of the estimated \$2800 per year to operate the pumps, it would come to about \$1.85 per person.)

Table 16:  
Distribution of Impacts on the Four Community Institutions in Brownsville

Indicator		Calapooia Watershed Council	Canal Company	City of Brownsville	Community Residents	Salience
	Uncertainty	1	3	2	1	
	Hazard to Public Safety: Flow, Erosion, Recreation, Infrastructure	1	1	2	2	
	Habitat Restoration	3	1	1	2	
	Health of the River	3	2	2	2	
	Cost of Removal	1	2	1	1	
	Replacement Cost of environmental services	1	3	3	1	
	Access to public goods and services	1	2	2	3	
	Change in Property Values/ land use	1	3	1	1	
	Change in Cultural Traditions	1	3	2	2	
	Community Identification	1	3	2	2	
	Social tension and conflict within the community	2	2	1	1	
	Participate in Decision- Making	1	3	1	2	
	Meeting Agency Objectives	3	1	2	2	
Total		<b>20</b>	<b>29</b>	<b>22</b>	<b>22</b>	



## *Operationalizing and Measuring Quality of the Living Environment (Livability)*

### *Indicators*

The indicators for Livability Impacts are the result of participants concerns of restoring the river ecosystem health and fish populations to the Calapooia River. Although changes to the fish populations can not be linked to dam removal alone other measures are used to determine changes in fish habitat, such as bars and riffle response, grain size (stream bed substrate) and, open stream miles, as a result of dam removal. The following data is from concurrent dam removal research looking at the physical characteristics of stream changes as a result of small dam removals.

Figure 9 represent the  $D_{50}$  in bars and riffles of the response reach (DS) and reference reach (US) before and after dam removal. US data points represent a composite of four samples.

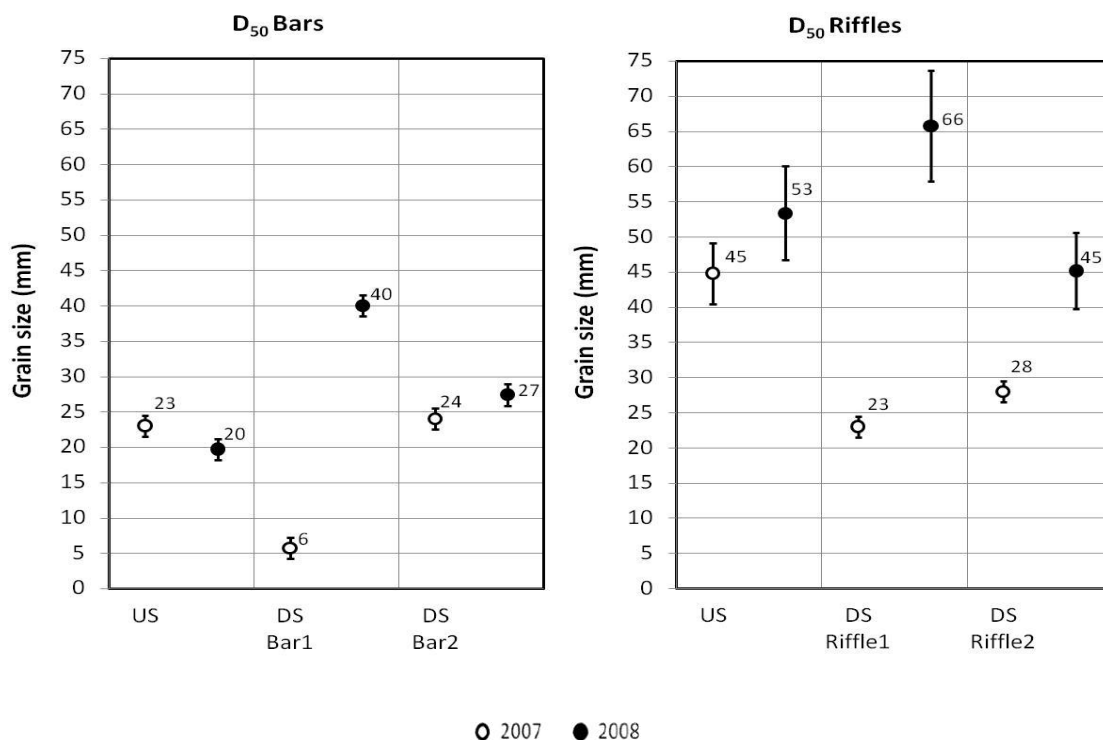


Figure 9:  $D_{50}$  in Bars and Riffles: pre and post dam removal

Before the dam was removed, mean median grain size ( $D_{50}$ ) in the response reach was  $26\pm 2\text{mm}$  in riffles and  $15\pm 2\text{mm}$  in bars (Figure 9). One year after dam removal, mean  $D_{50}$  had increased to  $55\pm 10\text{mm}$  in riffles and  $34\pm 2\text{mm}$  in bars. In the upstream reference reach, corresponding changes to  $D_{50}$  in riffles and bars were within the range of measurement error. Changes to bed material composition observed in the response reach were consistent with the hypothesis that surface grain sizes would increase to approach  $59\text{mm}$ . Figure 10 is representation of the percent fines in bars and riffles of the response reach (DS) and reference reach (US) before and after dam removal. US data points represent a composite of four samples.

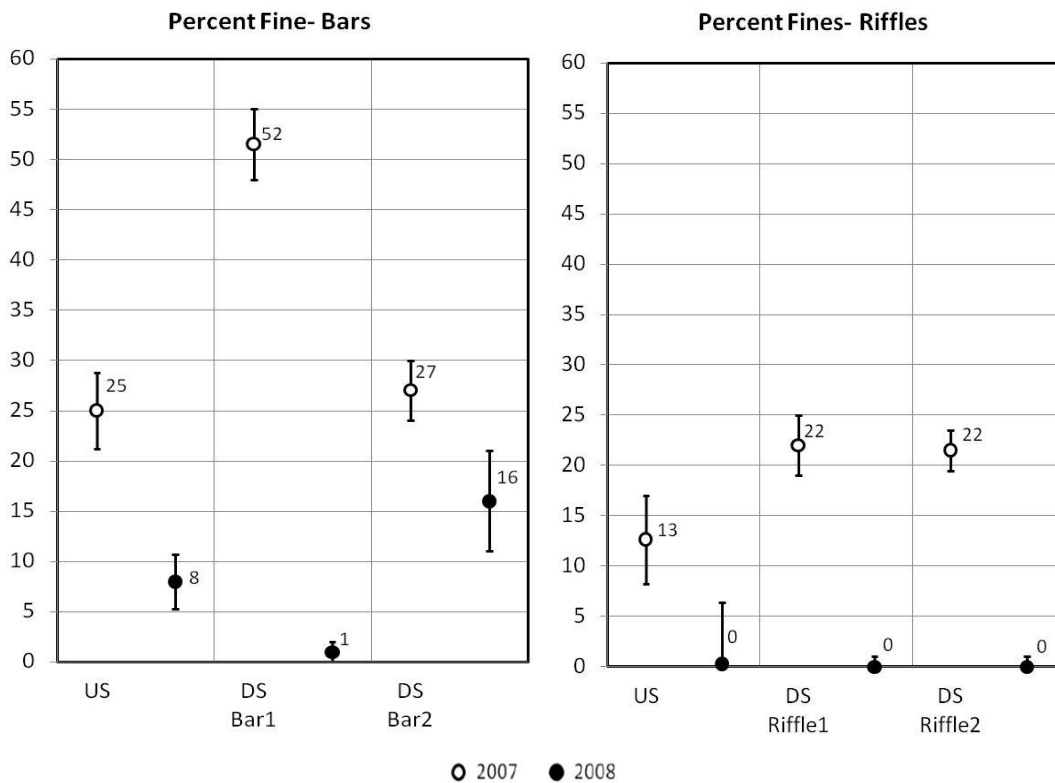


Figure 10: Percent fines in Bars and Riffles: pre and post dam removal

Before the dam was removed, mean percentages of material finer than  $4\text{mm}$  (percent fines) in the response reach was  $22\pm 4\%$  in riffles and  $39\pm 5\%$  in bars (Figure 10). One

year after dam removal, mean percent fines had decreased to  $0\pm0\%$  in riffles and  $9\pm5\%$  in bars of the response reach. In the upstream reference reach, percent fines in riffles and bars also decreased beyond the range of measurement error. The pre-removal mean percent fines in riffles of  $13\pm4\%$  decreased to  $0.5\pm6\%$  in the post removal year, and the pre-removal mean percent fines in bars of  $25\pm4\%$  decreased to  $8\pm3\%$  in the post removal year. As hypothesized, percentages of fine materials in sediments of the response reach did not increase after dam removal, rather a decrease in fine material was observed. However, observations from the reference reach indicate that another factor beyond the dam removal may have contributed to the decrease in fine material.

Figure 11 is a representation of the changes in substrate size class composition by percent in the response reach (DS) and reference reach (US) before and after dam removal.

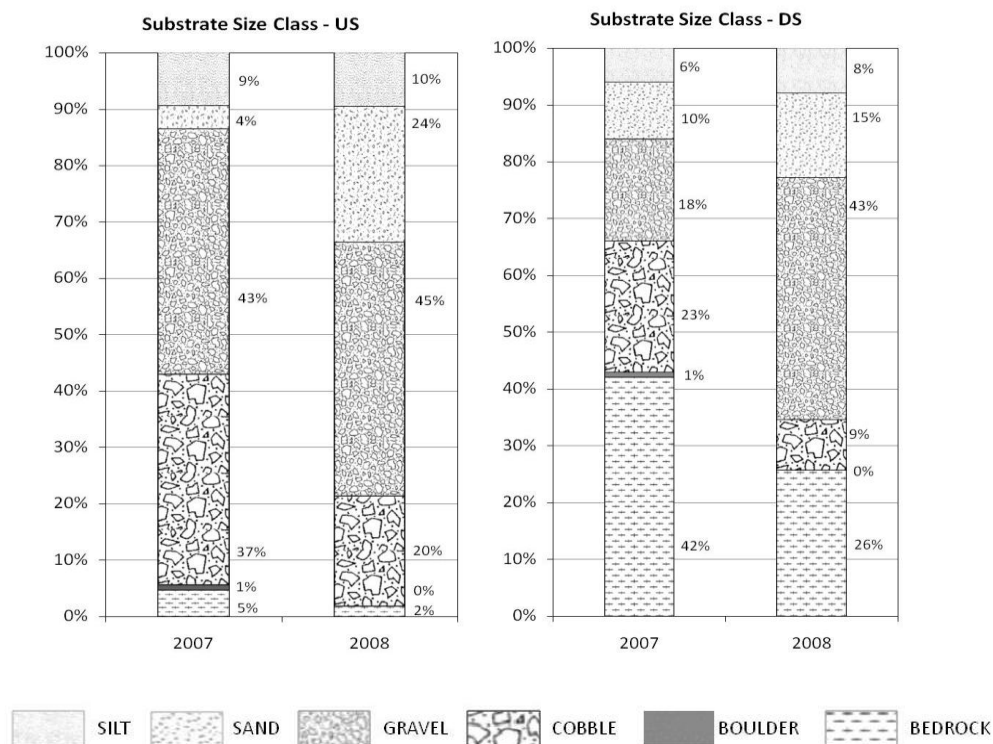


Figure 11: Substrate Size Class Composition by Percent: pre and post dam removal

Based on the ODFW Aquatic Habitat surveys,  $42 \pm 13$  % of the sampled response reach was dominated by clay hardpan prior to removal, whereas  $26 \pm 8\%$  was composed of hardpan after removal (Figure 11). As indicated by the corresponding shift from  $18 \pm 6\%$  to  $43 \pm 14\%$  gravel, coarse sediment that was released with the dam removal deposited along the hardpan in the response reach. In the upstream reference reach, no appreciable changes to percentages of hardpan or gravel were observed, however, percentages of sand and cobble changed considerably. The results are consistent with the hypothesis that the bed surface would become dominated by gravel within a year of removal; however, the high degree of error associated with the ODFW methodology of substrate characterization should be considered.

Figure 12 is a demonstration of how channel units changed in the response reach (DS) and reference reach (US) before and after dam removal. Prior to dam removal, the response reach displayed a relatively simple morphology as compared to the upstream reference reach. Devoid of depositional features and pools, a majority of the response channel was characterized by glide channel units (Figure 12). One year after dam removal, the number of channel units in the response reach had increased from three to five, representing creation of a new riffle and pools. This geomorphic response was consistent with the hypothesis that the number of channel units would increase within five years of removal.

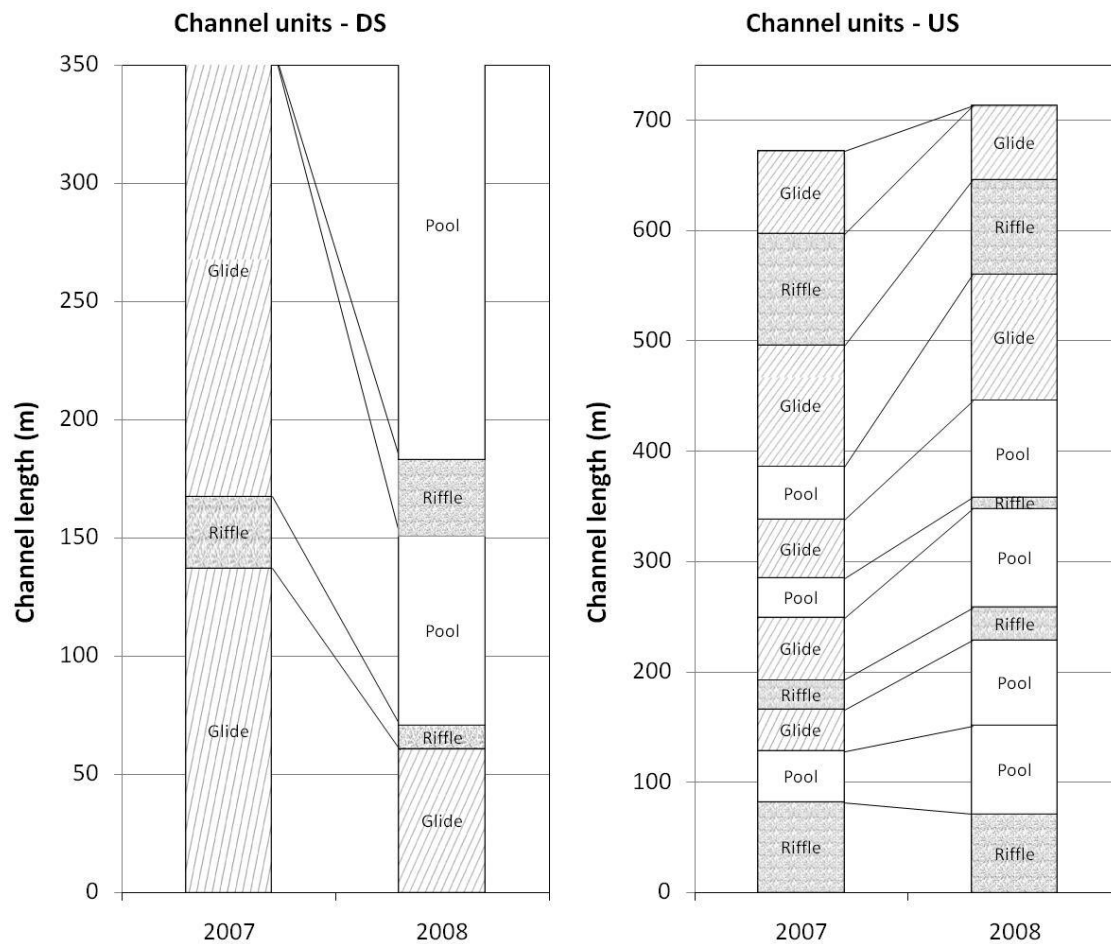


Figure 12: Response of Channel Units: pre and post dam removal

One of the over-all project goals of the Brownsville Dam removal was to open access to fish spawning habitat. According to Oregon Watershed Enhancement Board (OWEB), the removal of the dam will improve access and fish passage to over 28 miles of winter steelhead and spring Chinook salmon spawning beds and rearing habitat found on the mainstem and in the tributaries of the Calapooia River.

It is important to mention that while dam removal in and of itself will not increase fish populations other factors of the removal can contribute to habitat improvements and watershed health.

### **Measuring the Intangibles**

Impact studies have shown that the values people hold about water are to a large extent intangible, that is they cannot be seen, touched or directly measured (Loomis, 2000). Many respondents of Brownsville identified intangible impacts including community identity and folklore, nostalgia and aesthetics, spiritual connectedness, and a community loss. While an attempt was made to operationalize and measure some of these impacts, they posed particular difficulties. Small towns like Brownsville often do not have a reservoir of existing data or community institutions that provide specific services that can be tracked over time. They share social services with larger jurisdictions (county or bigger towns) which makes it difficult to track community specific impacts.

As described above, most social indicators have been based on objective, quantifiable measures rather than on individual's lived experience and perceptions of their environment. While researchers criticize the normative approach that reduces the "quality of life into mere numbers" (Miles, 1975: 12 in Carley, 1981), there is still not a consensus on ways to measure the subjective aspects of reality (Carley, 1981). Concepts such as place attachment and identification with place are very difficult to quantify and easily discounted in the formal decision process and yet, like in Brownsville, they may be

the most important factors in determining project success and probable acceptance by local populations (Burdge 1994).

## CHAPTER 5: DISCUSSION

### **Community Change**

Under ideal circumstances, the social impact assessment is designed to estimate the effects of a proposed action or policy on the social organization of the community and on the well being of the people over the long and short term (Branch *et al.*, 1984). This section will summarize how the four groups, Canal Company members, City Officials, Watershed Council members, and non-affiliated community members, view the dam removal process and how each group identifies with the changes in the community as a result.

### ***Canal Company***

As discussed in Chapter 4, the decision to remove a dam can be particularly difficult for residents who have always known the dam to be a part of the community landscape (Johnson and Graber, 2002; Born *et al.*, 1998). The interviews suggest that the Brownsville Dam was a defining attribute for the Canal Company. They saw it as an integral part of the place they call home. Members of this group were most likely to describe the dam removal as a loss, not just to their group but to community culture and traditions. For most of the Canal Company members, there is an expression of sadness and remorse over the loss of the dam. They describe the dam removal as unnecessary, suggesting they were threatened by outside groups and considered the decision making process unfair. Several Canal Company members sought legal council in an attempt to retain the dam but were unsuccessful. There are, however, a few Canal Company



members who perceived the dam removal positively (or less negatively), and continue to attend watershed council meetings to learn more about proposed river restoration efforts. The ability of this community institution to adapt to the dam removal will depend on the group's capacity to sustain monetary support to pay for the pump operation and its liability insurance policy. Deliberation between the City of Brownsville and the Canal Company regarding who will be responsible for pump cost is pending. Canal Company members expressed skepticism as to what the organization's new responsibilities will be in order to meet the changes that have occurred as a result of the dam removal.

### *City Officials*

The dam removal was regarded by most city officials as a regulatory process that will place additional costs onto the community members. The dam removal was not viewed as either strongly positive or negative by this group. City officials suggest that the community will need to decide if water in the mill race is worth the additional costs. There is an overall understanding that maintaining the millrace is important for the city because the canal serves as a storm water drainage system. The focus for the city officials is coping with potential cost and benefits to the community constituents, specifically the Canal Company members. Some City Officials assert the dam removal will be viewed as an opportunity to reduce conflict in future decision making because the dam removal provided the community with this opportunity to come together and make a complex decision. At the same time, they equally express concern over what the long-term impact of the dam removal will mean for their community residents. Some City Officials suggest that small communities may not have the ability to adapt to some of the

changes they face, leaving the community of Brownsville to struggle for financial resources.

### ***Community Members***

All community members experienced some emotional loss associated with the dam removal but most acknowledged the benefits to be gained over time and have appeared to be adapted to community life without the dam. Several community members praise the dam removal as a positive effort, concluding it was a successful resolution to a complex and divisive situation. Many agreed that the dam presented a safety hazard to the community and was a barrier to fish passage. These respondents felt that the community would gain on multiple grounds: economically, recreationally, and environmentally. Even though a majority of community members regard the dam removal positively, there is still a sense of uncertainty as to what the dam removal will mean for Brownsville. Some community members are looking forward to the changes in the perceived recreation and tourism opportunities and the benefits that will be associated with these for the community of Brownsville. Others suggest the only change will be an increased cost to the taxpayers as also expressed by City officials.

For the community members, their ability to adapt to community life without the dam will depend on the value they place on having water the millrace. If the community decides that water in the millrace is a means to retain its community identity, as discussed in Chapter 4, then they will decide it is worth any additional cost to them (e.g. taxes or pump operation costs).

### ***Watershed Council Members***

The dam removal was viewed by Watershed Council members as a positive outcome serving multiple interests in the community: 1) an opportunity to help the Canal Company with little effort from Canal Company members; 2) improving fish passage as required by federal and state regulations; 3) addressing dam safety issues; and 4) statewide recognition for the community for having the capacity to undertake such a complex project. The Watershed Council as an organization would continue regardless of the dam's removal. To some degree, the success of the dam removal has demonstrated to the community the Watershed Council's commitment to continue working on watershed health. Most Watershed Council members acknowledge that there are community members who remain unconvinced that the Watershed Council can improve watershed health or increase access to fish habitat. Despite these perceptions, some Watershed Council members acknowledge the possibilities the Watershed Council offers the community. Not only their dedication to watershed health but also serving as a forum where collective dialogue and open discussion encourage community participation and decision making when necessary.

The interviews suggest the four community groups identify with the gains and losses of the dam removal differently for themselves and the community. The respondents who negatively viewed the dam removal were more likely to resist the dam removal and were less likely to participate in the decision-making process. These respondents searched for alternatives in order to keep or maintain the structure. They believe the process had an unfortunate outcome and remain resentful. For many of these respondents this will be

until water is returned to the mill race yet a few will never accept the dam's removal. The respondents who positively evaluated the removal were more likely to be involved with both past and current Watershed Council activities.

Overall, interviews revealed that all respondents had some emotional reaction to the removal. Most expressed sadness over the loss to the community but there are a few that are looking forward to the new potential opportunities the dam removal will bring to Brownsville.

### **Something lost, Something gained...Something Learned!**

One significant notion of community-based natural resource management is its effort to broaden participation in community-level problem solving efforts (Lasker and Weiss, 2003). In Oregon, watershed councils were conceived to 1) represent the community's interest and help build trust both within the community and between communities and governmental agencies (Clark, 2004), and 2) to encourage voluntary efforts by the citizens at local levels. This is in contrast to traditional public involvement forums that try to inform, educate, and convey technical information with little input from the local public (Wondolleck, 1988). Under traditional public involvement, the degree of public understanding of the decisions and policies made are not of particular concern and not used as a means for promoting social learning or civic discourse among diverse community groups (Daniels and Walker, 1996). It is often implied in these traditional processes that the decision makers and resource professionals are the experts or are in a position to make appropriate choice decisions necessary to implement a policy or project.

Unfortunately this philosophy demonstrates a unidirectional flow of information and assumes the public is the only group that has something to learn.

Schusler *et al.* (2003) find that deliberative processes including, public meetings can contribute to an increased understanding of the issue. It also allows collective understanding when arriving at substantive decisions. When assessing the opportunity to participate in decision making, interviewed respondents were aware of the dam removal. Many of the community members said they were aware of the process but were not active participants or attendants at the watershed council meetings or other public forums in Brownsville. For the Canal Company members, some admit they attended watershed council meetings in the beginning stopped attending once the decision was made to remove the dam. Collective decision making strategies require investments from all parties. Deliberative processes contribute to the process but can only be successful if people participate. As a result, social learning can only contribute to building collaborative relationships and enhancing awareness if people are willing to engage.

When respondents were asked describe the things that were present (or absent) in the dam removal process that helped or hindered their understanding, many referred to dam removal as a catalyst that increased learning and community relationships. They described people coming together to share different view points and make compromises on the things they share and value collectively. Several of the Canal Company members who viewed the dam removal most negatively, agree that people now know who will or will not be involved in the decision making that affects the community. One common

sentiment was the dam removal process helped build a new level of community capacity through a deliberative learning process. As a city official described the opportunity:

When you have change, it helps define the character of the people, it helps establish and formulate community identity. When you are working with people and hearing different view points, people start working together, discussing issues in the community, and try to solve problems based on a greater set of information. Change essentially helps build infrastructure of the community from the bottom-up approach

In Brownsville, the forum that encouraged social learning and invited public deliberation processes was the Watershed Council meetings. Many of the respondents' comments on the process and outcome of the dam removal reflect the idea of a learning process and its valuable contribution in gaining public acceptance. This was also viewed as an opportunity for the community institutions to identify areas of diverse perspectives and shared concerns. Although the removal of the dam was not the initial option, over time it steadily became the option that would best satisfy regulatory obligations, alleviate liability and litigation concerns of the responsible institution, and lead the community to acknowledge their capacity to solve a complex and contentious issue.

### **Can Deliberative Democracy be a link in the Social Impact Assessment?**

One of the most enduring debates among social impact assessment scholars concerns whether the social impact assessment should primarily be about predicting and/or

measuring the impacts of intervention with certainty and precision (the technical approach) or whether it should be about providing a mechanism to facilitate public involvement and empowerment in decision making (a participatory approach) (Lockie, 2001). However, some researchers regard the two aspects of the social impact assessment as inseparable (Becker, 2004; Lockie, 2001). If predictive techniques inform democratic debate by identifying *a priori* a range of potential impacts, as determined in Chapter 2, perhaps deliberative democracy can extend participatory techniques in two broad ways by:

- Extending the scope of information that is made available to inform policy decisions. This includes local knowledge about social conditions, processes, and potential impacts; subjective and cultural impacts relating to the ways in which people understand their social and natural environment; and the attitudes and perceptions that are likely to shape participants' responses and adaptations to proposed change (e.g. Fischer, 2000).
  
- Provide specific mechanisms to involve different groups in the decision-making process to encourage mutual understanding between participants and enable social learning where individuals and groups are exposed to other's understanding of issues, relevant facts, problems and opportunities, areas of agreement and disagreement, and values (e.g. Schusler, 2003).

Existing studies and reports acknowledge limitations in the traditional social impact assessment (Burdge, 1996; Becker *et al.*, 2003; Harris *et al.*, 2003; Lockie, 2001; Vanclay, 2002). When used in conjunction with a participatory approach, some of these shortfalls are addressed. The capacity of democratic institutions to solve problems leading to an acceptable outcome depends on the knowledge and involvement of citizens in a community decision-making process that encourages systemic thought and broad-based action. Without deliberative processes or the forums that encourage deliberative debate, we revert to simply using a technical process that limits the input from the impacted group of citizens. Through utilizing the strengths of deliberation, decisions may be based as much on participants' assessments of appropriate procedures or norms as on their assessment of empirical facts (Miller, 1992). Through communicating, learning, and action, effective participatory mechanisms may innovate dialogue and improve citizen understandings to ongoing social change (Daniels and Walker, 1996).



## **CHAPTER 6: CONCLUSIONS, LIMITATIONS, AND DIRECTION FOR FUTURE RESEARCH**

This thesis contributes a methodological framework for SIA of small dam removals, utilizing community-level involvement and expertise to determine the local impacts of community change. This research addresses two fundamental limitations in current dam removal literature. First, the absence of social considerations in dam removal studies (Born *et al.*, 1998; Doyle, 2002; The Heinz Center, 2002). Second, the research validates the application of a participatory SIA approach to identify local social impacts and indicators specific to small dam removal.

### **SIA: Advancing Social Impact Assessment in the Dam Removal Process**

Building upon the literature and the evidence of a shift in water policy, this study represents an attempt to document some of the complex social dimensions that have been neglected thus far in dam removal research and to apply the SIA framework to assist in decision-making. The traditional, SIA rationale uses quantitative statistical measures and expert observations to evaluate social change (Burdge and Vanclay, 1996; Daniels and Walker, 1996; Fischer, 2001; Lockie, 2003). More recent SIA's have come to look more closely at the values, beliefs, and attitudes of those affected by integrating qualitative and quantitative data to provide a more holistic perspective than was previously considered. This SIA approach is seen to expand the use of community-based decision making (Harris *et al.*, 2003). Although gaining in popularity, there has yet been an agreement on the methodological framework for its application by the SIA experts (Burdge, 1996; Becker *et al.*, 2003; Harris *et al.*, 2003; Lockie, 2001; Vanclay, 2002).

This thesis contributes to the literature emphasizing the role of SIA in facilitating public participation. In addition, it also emphasizes how a deliberative process contributes to the active engagement of those involved or affected by the proposed change. In order for a social impact assessment to effectively assist in understanding and promoting a community's capacity to adapt to change, it is crucial that every step of this process is conducted in partnership between the community and the agency that is implementing the change (Daniels and Walkers, 1996).

The traditional SIA framework can be vastly improved when the involvement of impacted communities extends beyond the contribution of data, as was demonstrated in the case study of the Brownsville Dam removal. In the end, a new scientific procedure or type of impact assessment was not introduced in this study, but an expansion of the traditional assessment procedures. Building on existing literature and extending the process of the SIA, this approach included those who are most impacted by the dam removal, the local community.

## **Key Findings**

This preliminary research suggests that there are a range of linked issues likely to influence whether there is an ability to reach agreement in any particular case of proposed dam removal projects. This study identifies several key considerations:

*Local decision making, community involvement and acceptable participatory approaches are vital for the successful implementation of dam removal processes*

- Communication within the community and between members of the Watershed Council and Canal Company and their constituents came up as key issues that affected the decision-making process. The Brownsville case demonstrates the extent to which agreement can be achieved through the facilitation of collaboration and the support of the local community residents. There was consistent agreement among the community members that the Watershed Council sustained widespread involvement throughout the project, making themselves transparent and providing accessible information.
- There was a general sense that members of the community and particularly the Canal Company members struggled to assimilate the complex technical, economic, and scientific information about the dam removal. In order for this information to be available to the community, the agency or organization implementing the project or policy should use multiple means to disseminate complex technical data to the community (Doyle *et al.*, 2000).

*Complex decision-making requires sufficient time and dedication*

- The considerable time taken to resolve intense interest- and value-based differences is another feature of this case. Respondents were interested in the technical and scientific information about the physical, environmental, and social aspects during the decision-making processes. Their understanding of the issues surround dam removal emerged as a particularly important aspect that influenced the progress of decision-making.
- The majority of respondents emphasized the importance of time (Smith *et al.*, 2000) in order to reach consensus on complex issues affecting individuals and the community.

*The community is best suited to identify local impacts and indicators*

- Although generalized indicators may provide a preliminary framework to assess SIA, each community faces unique circumstances. Selected indicators should reflect localized conditions.
- Participation from local community members through group negotiation, collaboration and cooperation may best capture citizen's values and the importance they place on their living environment (Becker *et al.*, 2003; Harris *et al.*, 2003)

*Social learning can serve as an impetus for present and future community decision making*

- Despite conflict and limitations that occurred in the public involvement processes, the Watershed Council is referenced as offering a significant social learning environment which helped frame the issues, analyze alternatives, and debate choices in the context of broad public deliberation (Daniels and Walker, 1996). The particular reference of social learning by respondents supports deliberative decision making processes and encourages its use in future dam removal settings.
- Social learning in this case should be seen against the backdrop of significant changes to the policy and institutional context of the changing practice of dam removal research (Doyle *et al.*, 2003).

*Data availability and collection can be challenging as information resources in small towns is limited*

- Availability of information in small towns can represent obstacles in analysis of impacts. Planning departments in the governance of these small towns often does not exist. Further, small communities are often limited by available resources for monitoring changes over time. If small towns are expected to collect data to monitor impacts as a result of small dam removal they will need assistance and support from someone (agency) to gather available data.

## Research Limitations

Several limitations to this research should be acknowledged:

- The absence of baseline data: Baseline conditions are the existing conditions and past trends associated with the social and economic environment where a project, policy or program will be implemented. Without this social and economic context, changes in the level or even the type of changes caused by the project or policy and its significance are difficult to assess and/or track. The lack of baseline data is not uncommon in small communities like Brownsville. In addition, available data that can be used is often found at the county or regional level of analysis and can limit the researcher's ability to localize resultant changes (Jackson *et al.*, 2004; McLain *et al.*, 2007).
- The *ex-post facto* analysis allowed participants to identify community impacts as a result of dam removal. However, it may be possible that by simply introducing the notion that community impacts are likely to result from dam removal, this research may have artificially generated a response by the participants. It was difficult to assess if the impacts would have been realized if participants were not asked to identify the perceived impacts.
- Not all learning leads to collaboration: While the underlying assumption is that deliberative processes will encourage collective decision making and foster learning experiences, it is important to recognize the limitations of the deliberative process. Not all learning is positive (Schusler *et al.*, 2003) and not all deliberative forums enable participants to extend equal engagement with each other. The Watershed Council has retained many of the participants involved in the original dam removal, though some stakeholders remain more involved than others.

### **Future Research**

A fundamental shortfall in current small dam removal literature is the lack of a rigorous effort to incorporate societal concerns in the decision-making process. Small dam removals are likely to become the new standard to address both social and environmental issues that have resulted from the dam building era of the early 20<sup>th</sup> century (Orr *et al.*, 2004). The importance of analyzing community change as a function of small dam removal must continue to be considered.

Community case studies appear to be the most appropriate strategy for defining policy effects at the community level. This case study demonstrates the ability to isolate the impacts at the local level than examining county or regional data, (i.e. Census data) that may or may not indicate localized change

### **Final Thoughts**

It is only within the last few decades that dam removal has become a viable option to address the deleterious consequences of the dam building era. As small dam removal makes its way up the political agenda, policy and decision makers will have to consider the effects on the social and human environment and not only on the physical and biological impacts. The SIA is designed as a policy tool to predict “in advance” the consequences of a policy project, or proposal. As we move away from the traditional SIA approach there is an opportunity to actively engage those most likely to be impacted. The SIA process can be enhanced through deliberative forums such as watershed councils that are established in communities facing the decision to remove a dam. Having an

established organization, such as the watershed council can help foster the necessary relationships that over time may result in an agreement that best meets community needs.

When the conditions for authentic dialogue are met, genuine learning takes place; trust and social capital can be built; the quality, understanding and acceptance of information can be increased; jointly developed objectives and solutions can emerge and innovative approaches to seemingly intractable problems can be developed (Innes & Booher, 1999).

For some of Brownsville's residents and its local institutions, the dam's removal will have laid the foundation for collaboration in future decision making through the practice of deliberation, social learning and cooperation.



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## **APPENDIX A:**

### **Interview questions**



Were you aware the dam was to be removed? Y or N

When did you become aware? (was there an incident that brought this to your attention?)

Who were the key players in the debate and what were their positions?

What were the main events that characterized the debate?

What did your involvement in the dam removal process look like?

How did you engage the community in the dam removal proposal?

How accessible was this information to the community members?

Do you see any positive or negative impacts to the dam removal? (Grid)

Can you tell me what the positive impacts look like?

Can you tell me what the negative impacts look like?

What do you think the community gained or lost with the dam removal?

What do you see as the most significant issue (affecting the community) as far as the dam removal is concerned?

If you had to do this over again, what would you do differently?

What suggestions do you have if this comes up again (what are things that were present or absent that would help another community facing a similar situation)

Who else do you think I should talk to about this?

Demographic Questions:

1) How long have you lived, (do you live) in Brownsville?

2) How close to the Calapooia River do you live/ own property?

3) Are you or have been a Watershed Council member?

For how long? What years?

4) Gender: \_\_\_\_Male: \_\_\_\_Female

**APPENDIX B: Unidirectional Matrix of Impacts and Indicators**  
 SIA Matrix of Impacts and Indicators found from the Brownsville Dam Removal 2008

<b>Health and Social Well-Being Impacts</b>	<b>Quality of the Living Environment (Livability) Impacts</b>	<b>Economic Impacts and Material Well-Being Impacts</b>	<b>Cultural Impacts</b>	<b>Family and Community Impacts</b>	<b>Institutional, Legal, Political, and Equity Impacts</b>
Uncertainty -being unsure of the effects or meaning of dam removal	Change in leisure and recreational activities and opportunities	Change in property values/real estate sales	Cultural integrity-degree to which local culture is respected and likely to persist	Changes in social tension-conflict within the community	Opportunities for citizen participation in decision making
Hazard to Public Safety; flow, recreation, erosion, infrastructure	Perceived and actual quality of the living environment	Change in the costs of environmental services	Change to cultural or natural heritage-areas of recreational value	Strength of social networks	Fulfilled legal and/or regulatory obligation of administrative order
Annoyance - experiences due to disruption of life	Perception of personal safety, hazard exposure, and fear of crime	Change in perceived/actual financial obligation of operational costs		Opportunities for participatory involvement	Meeting State and Federal agency objectives
Change to the location for delinquent behavior	Shared vision for the watershed	Access to public goods & services; changes to recreation costs	Change in cultural traditions	Community identification; Sense of belonging; attachment to place: loss of community identification	Conflicting agency agendas
Dissatisfaction -due to failure of removal to deliver promised benefits	Habitat Restoration	Change to liability risks	Changes in historic structure or place of interest	Perceived and actual community cohesion	Formation of special interest groups as a result of institutional priority of certain groups
	Fire Control	Maintenance cost		Perceived and actual community safety	
Aesthetic qualities	Aesthetic qualities	Changes to tourism industry	Aesthetic/Spiritual qualities	Aesthetic qualities	
		Perceived and actual Litigation potential			
		Local employment opportunity			

SIA Matrix of Impacts and Indicators found from the Brownsville Dam Removal 2008

