Section A: Executive Summary

PURPOSE

The first Bear Creek Watershed Management Plan was completed in July of 2000 by the Conservation Resource Alliance (CRA), Bear Creek Watershed Council (BCWC), and other project partners. The continued success of cooperative planning and management efforts and the growing concerns over potential impairments to Bear Lake led residents in the area to seek resources for the development of a comprehensive watershed management plan that would update the Bear Creek Watershed Management Plan and expand the scope of the original plan to include the entire watershed, including Bear Lake. The purpose of this Greater Bear Watershed Management Plan is to guide and inform the integration of future activities in the watershed to protect and enhance the valuable natural resources essential to the quality of life and economic well-being of residents of the area. Through the development of a consensus plan, the stakeholders have established the basis for seeking additional funding from private and public sources which will be required to implement the goals and objectives.

PRIOR SUCCESSES

The two primary objectives of the 2000 Bear Creek Watershed Management Plan were to address impairments to the coldwater (trout and salmon) fishery and wildlife in Bear Creek and major tributaries. In the years that followed, groups within the watershed achieved many of the specific goals established in that plan including extensive work to inventory and repair moderately and severely eroded stream bank erosion and road crossing sites along Bear Creek and its tributaries.

While groups such as the CRA and BCWC continued restoration efforts along Bear Creek and tributaries, others focused on Bear Lake. The Bear Lake Property Owners Association (BLPOA) has been involved with volunteer-driven water quality monitoring through the Michigan Clean Water Corps since the 1970s. This sampling has provided annual Secchi disk transparencies, and periodic data on dissolved oxygen, temperature, total phosphorus and chlorophyll *a*. More recently the BLPOA, the Village of Bear Lake, Pleasanton Township, and Bear Lake Township have agreed to support a plan by the District Health Department #10 to sample Bear Lake for E. *coli*, which is an indicator of pathogens that can be harmful to humans. The sampling began in 2013 and is expected to provide valuable information regarding water quality of the lake. New groups also formed that support watershed management activities including the Bear Lake Watershed Alliance, which continues to take an increasingly active role in coordinating watershed activities pertaining to Bear Lake. Additionally, the Bear Lake Improvement Board was established in 2007 as a result of a community-driven process to better manage lake resources and control Eurasian milfoil. In 2008 the board treated approximately 330 acres of Bear Lake for milfoil and since then milfoil has been controlled to significantly lower levels.

HISTORICAL PERSPECTIVE

The Greater Bear Watershed has undergone significant changes from the time European settlement occurred in the mid-1800s. Prior to the 1836 Treaty of Washington that ceded the land to the United States, the Native American tribes occupying the area relied upon the hunting, fishing, and other low-impact uses of local natural resources (and to a certain extent these uses continue) to sustain settlements concentrated adjacent to lakes and waterways in the watershed. However, soon after statehood, the large virgin pine forests attracted investors to the area and the subsequent clear cutting and related construction of roads, rail, and processing facilities significantly changed the land cover of the area and altered the character of the watershed streams. By the beginning of the 20th century, the extensive pine forests in the watershed had been largely removed and significant physical changes in Bear Creek and major tributaries

occurred. These included increased erosion and stream sedimentation due to the removal of streamside vegetation, use of log rollaways at streamside staging areas, and other bank clearing and widening to accommodate logs transported downriver to the Manistee River. These logs were destined for sawmills located primarily around Manistee Lake which had direct access to Lake Michigan shipping facilities.

The removal of streamside cover, stream widening, and sedimentation increased stream temperatures and reduced available habitat for sensitive aquatic species. Arctic grayling (Michigan grayling) were once abundant and thrived in the Bear Creek watershed streams, but as in other locations, Grayling never recovered following the clear cutting of the pine forest and were extirpated from the Bear Creek Watershed and throughout Michigan's Lower Peninsula by the early 1900s.

As hope for preserving the grayling in Michigan's Lower Peninsula faded, the state began intensive stocking of more resilient brook trout in former Grayling streams throughout the northern Lower Peninsula in the 1880s. Steelhead (rainbow trout) from California were introduced into Michigan's major rivers in the late 1800s, and annual runs of steelhead from Lake Michigan were well established in the Manistee River by the early 1900s and no doubt spawned in Bear Creek. Michigan Fish Commission Biennial Reports indicate that brook trout were planted in Bear Creek as early as 1889 and that steelhead were planted in Bear Creek as early as 1897. Brown trout were introduced from Europe to Michigan in 1883, but apparently were not stocked directly into the Bear Creek watershed until sometime after 1900.

A portion of the land cleared during the removal of both pine and later hardwoods was converted to agricultural use, although a significant portion of the pine forests in the watershed reverted to public ownership and remains as state or national forests today. Evergreen and deciduous forests and woody wetlands now make up more than 55 percent of the land cover in the watershed with 12 percent in cultivated crops and less than 1 percent in highly developed urbanized areas. Most of the urbanized area of the watershed is closely associated with either Bear Lake or Bear Creek. The first platted subdivision adjacent to Bear Lake occurred in 1874, a year after a tramway was constructed that allowed logs harvested from the area around the lake to be transported to a port on Lake Michigan outside of the watershed.

Bear Lake fishing and other water recreation opportunities encouraged many to build residences on the lake in the early 20th century, and as roads were developed summer cottages and retirement homes were built on the shore of the lake. Similarly, as access to the watershed improved, fishing camps and lodges and eventually permanent homes and cottages were established on Bear Creek. A significant portion of the main stream of Bear Creek remains in private ownership. Most properties along the shores of Bear Lake are now developed for use as public access sites and local parks, summer cottages, and permanent homes for residents who work in the area as well as retirees. The remaining undeveloped property around the lake is less suitable for development due to the lack of access and/or the presence of wetlands.

Following the initial logging operations, the focus of the economy throughout the watershed turned to agriculture and later tourism. Throughout the 1900s the watershed provided a major attraction to those seeking outdoor recreation and subsistence opportunities available on Bear Lake, Bear Creek, and the public lands in state and federal forests. In the 1970s, extensive hydrocarbon development for the extraction of oil and natural gas on public and private lands occurred in the watershed. More recently, development of new technologies for the extraction of natural gas has heightened interest in additional well drilling and natural gas production in the watershed. Despite these transitions in the regional economy, local residents are concerned that the current lack of employment opportunities in the watershed and the population trend of increasing numbers of retirees are not in the long-term economic interests of the area and that more attention needs to be focused on creating well-paying jobs that will encourage younger residents to stay in the area.

The introduction of coho salmon in Bear Creek in 1966 and the later introduction of Chinook salmon in the Manistee watershed resulted in a renewed interest in fishing in Bear Creek. While Bear Creek was selected as one of the first streams to receive plants of coho in the state because of its high quality, stable coldwater supply, and favorable spawning habitat accessible to Lake Michigan in order to support a new Lake Michigan sportfishery, the salmon fishery that eventually developed in Bear Creek itself has become a major attraction to wading fishermen. The combination of high-quality fishing for brook and brown trout, as well as steelhead and coho and Chinook salmon, makes Bear Creek one of only a handful of rivers throughout the world, nearly all located in Michigan, where anglers can catch these five, highly prized, naturally reproduced gamefish in a wadeable stream.

Public access to the portion of Bear Creek most attractive to fishermen has created conflict because a significant portion of Bear Creek most desirable for fishing is in private ownership. Private landowners along Bear Creek have expressed frustration over transgressions by some fishermen that interfere with their enjoyment of their riparian cottages and homes located close to the river's edge. The state's acquisition of properties for additional public access to the river has met with considerable local opposition from those property owners who fear additional anglers will begin to use the river and further limit their enjoyment of their property. Resolution of this conflict between the public's right to use Bear Creek and the rights of private owners to enjoy their property is essential to assuring long-term protection and reasonable, sustainable use of this world class trout and salmon fishery by both landowners and the angling public.

VISION

The vision of the Greater Bear Watershed Management Plan, developed by the stakeholders in the watershed, is to help build a consensus for action by individuals, private organizations, and governmental partners that will achieve common objectives through cooperative, coordinated efforts that support sustainable use and development of the water resources of the watershed, encourage closely related wise land use practices, and preserve historical and cultural amenities that make the area an attractive place to live, work, and recreate for present and future generations.

STAKEHOLDER INVOLVEMENT

The Greater Bear Watershed Management Plan was initiated by community interests seeking resources to better understand and address concerns related to the sustainability of Bear Lake, Bear Creek, and tributary streams. On behalf of these community interests, and with the encouragement of the Michigan Department of Environmental Quality, the Manistee Community Foundation applied for and was awarded a planning grant through the state-administered, U.S. Environmental Protection Agency's Section 319 Non-Point Source Program in 2011. Soon after the grant award the Community Foundation, with the assistance of the Manistee County Alliance for Economic Success (which together had completed a successful watershed planning effort on the Portage Lake Watershed two years earlier), formed a Bear Lake/Bear Creek committee composed of local stakeholder organizations and governmental partners. Once Public Sector Consultants, Inc. of Lansing, Michigan was selected as the technical consultant, the Greater Bear Watershed Management Plan (GBWMP) Steering Committee was formed. This committee met regularly to guide the development of the plan, establish a technical committee, develop and distribute public information about the planning process, conduct public information meetings in the watershed, and initiate a survey of watershed residents.

The GBWMP Steering Committee met 14 times during the plan development process between 2011 and 2013. The committee meetings were publicized and open to the public. In addition, the committee chaired a series of public meetings at the beginning and end of the planning period to gather public input and comments on the scope of the plan, and to allow public review and comment on the draft plan and draft

goals and objectives. Four public meetings were held in 2011 and 2012 at various locations in the watershed; and at one of the committee meetings a group of about 25 students from the Bear Lake School District attended and were engaged in discussions about the plan and their potential role.

Subsequent to the meeting with students, a plan was implemented to involve the schools in encouraging residents to participate in the survey of watershed households. Sixty-six percent of the responses were collected from a Web-based survey instrument and 34 percent were submitted as hard copies from distributed paper surveys. The survey results were used primarily to guide the development of public information and education objectives contained in the plan, identify the most frequent water-related recreational activities, and to compare various survey results to the responses received at public meetings on priorities and concerns.

DESCRIPTION OF THE WATERSHED

The Greater Bear Watershed is located in the northwest portion of Michigan's Lower Peninsula primarily in Manistee County with a very small portion of the land area extending into Wexford County in the east and Benzie County to the north, encompassing in total 204 square miles (130,800 acres) of land. The watershed encompasses all or portions of 13 townships, three incorporated villages (Kaleva, Bear Lake, and Copemish), the unincorporated community of Brethren, and lands of interest to the Little River Band of Ottawa Indians (LRBOI). The watershed includes a small portion of the Huron Manistee National Forest in the downstream area close to the confluence of Bear Creek with the Manistee River that subsequently flows into Lake Michigan. The downstream portion of Bear Creek within the Manistee National Forest is designated as a National Scenic River. There are over 32 square miles of state forest properties within the watershed concentrated in the northern headwater areas of Bear Creek. The soils of the watershed are predominantly permeable sandy loams that limit runoff except during heavy storms and sudden snow melts. The highest elevation in the watershed is 1,172 feet above sea level and it reaches its lowest point of 562 feet near the confluence of Bear Creek with the Manistee River.

There are 12 named tributaries to Bear Creek and 12 named natural and impounded lakes in the watershed. Most of these are small with the exception of Bear Lake, which is 1,744 acres and whose single outlet, Little Bear Creek, is a tributary to Bear Creek. The primary water source for Bear Lake, Bear Creek, and its tributaries is groundwater that seeps through the permeable sand and gravel surface glacial materials deposited over 10,000 years ago. The glacial deposits range from 200 feet to over 1,000 feet in depth above the bedrock shale formations. This year-round source of relatively shallow groundwater to the watershed is unique to Michigan's northern Lower Peninsula and is responsible for the exceptional coldwater fisheries habitat in Bear Creek and tributaries. In Bear Lake, the groundwater influence provides temperatures that support popular coolwater species such as walleye, northern pike, and smallmouth bass despite the relatively shallow average depth of the lake. Protection of this uncontaminated, cool groundwater resource is of primary concern to the residents of the area both as the primary source of drinking and irrigation water and its importance in supporting the fisheries in both Bear Lake and Bear Creek and tributaries.

The Greater Bear Watershed supports a number of plant and animal species listed by the state as endangered (1), threatened (3), or of special concern (8). In addition, the watershed is now home to a number of invasive aquatic and terrestrial plant and animal species that threaten native species, and in the case of Eurasian milfoil in Bear Lake, require control measures to prevent impairments to existing human uses.

The current land uses in the watershed include approximately 30 percent deciduous forest, 15 percent woody wetlands, 15 percent grassland/herbaceous cover, 12 percent cultivated crops, 10 percent evergreen forest, with the remaining 18 percent a mix of land cover types and open water. High-intensity development makes up less than 1 percent of the total land cover in the watershed. Comparison of

historical, pre-settlement (1860) land cover with current land cover maps indicates a significant loss of wetlands within the watershed over the past 125 years. Despite significant changes in the shoreline resulting from the construction of permanent and vacation homes, businesses, and transportation corridors, Bear Lake provides high-quality recreation opportunities for swimming, wading, boating, and related water sports, and a popular fishery for a range of species including an assortment of panfish, small and largemouth bass, northern pike, walleye, and a variety of other species.

Demographic information specific to the Greater Bear Watershed is difficult to determine from the U.S. Census information since the census data blocks do not correspond to the watershed boundaries. The census data based on ZIP Codes that most closely correspond to the Greater Bear Watershed boundaries indicate that, from 2000–2010, there was a 5.3 percent increase in the population, a 24.8 percent increase in those aged 65 and older, and an 8.8 percent increase in the number of households. Mean household income was not available for the Greater Bear Watershed using the ZIP Code comparison method, but for Manistee County as a whole mean family income, adjusted for inflation, decreased by 7 percent.

LOCAL PROGRAMS, PROJECTS, AND PLANNING

Planning and zoning documents for nine jurisdictions within the watershed (Arcadia, Bear Lake, Brown, Cleon, Dickson, Maple Grove, Marilla, Onekema, and Pleasanton townships) were reviewed to assess the effectiveness of each in helping to further watershed plan goals and objectives. These jurisdictions were selected because they encompass Bear Lake and the main stem of Bear Creek and most tributaries. These areas also encompass the majority of the population of the watershed. Some municipalities were not included in this review because of the limited geographic extent of the watershed extending into those jurisdictions. Other municipalities were not included in the review because no zoning ordinances were on file with the Manistee County Planning Department.

The Village of Bear Lake has not adopted zoning to control land use, but has passed ordinances that include controls on the use of land within a prescribed area encompassing municipal groundwater supplies. The Village of Kaleva similarly does not have zoning regulations on file with the county planning office, but has adopted ordinances to protect the groundwater sources of its public water supply.

EXISTING WATERSHED CONDITIONS

The current condition of Bear Lake, Bear Creek, tributary watercourses, and other waterbodies within the Greater Bear Watershed are assessed in this section. What is known about the condition of the surface water of the Greater Bear Watershed has been compiled from data and information contained in numerous studies and reports as well as from the files of, or direct communications with local, state, and federal agencies; tribal officials; and nonprofit organizations working in the watershed. Local residents have also provided information that was helpful in assessing the current condition of the surface water and groundwater.

Given the large area of the watershed and the varied natural landscapes and human land uses, the existing conditions are best described in terms of the subwatersheds developed through the plan process. The subwatersheds were identified based on public or private land ownership, population centers, hydrology, and other factors.

Bear Lake

The **Bear Lake Subwatershed** encompasses the surface area and related groundwater that drains toward Bear Lake. Bear Lake discharges to its only outlet, Little Bear Creek, which is a tributary to Bear Creek. The current and historical status of Bear Lake was assessed using information from a variety of sources. The analysis of prior studies includes an assessment of the health of the fishery; known invasive species;

and biological and chemical indicators of water quality. Overall, Bear Lake is considered to have high environmental quality and is considered one of the better coolwater fishing lakes in Michigan's northwestern Lower Peninsula.

Bear Creek Subwatersheds

The main stream of Bear Creek is approximately 28 miles long from its headwater area in the northeast portion of the watershed to its confluence with the Manistee River. It has many miles of named and unnamed tributaries as well as significant groundwater inputs as it flows generally in a southerly direction. It is the largest tributary to the Manistee River downstream of Tippy Dam, which is located in the southeast portion of Manistee County about 5 to 10 miles outside the Greater Bear Watershed.

The existing habitat, substrate, water quality, temperature, and flow data on Bear Creek and its tributaries come from a variety of agencies, each of which had specific objectives when conducting its sampling. However, a collective analysis of the data and descriptions from these past studies identifies key attributes that should be routinely monitored in the future and critical information gaps that need to be filled. Based upon the existing information described in the studies and other data sources, a long-term monitoring plan was developed.

The **Headwaters Subwatershed** encompasses Little Bear Creek and several other tributaries including First, Second, and Third creeks and Dutchman Creek. There is extensive state forest land ownership in this subwatershed. Bear Creek and its tributaries have a low gradient with considerable wetlands adjacent to the river in the Headwaters Subwatershed. Fishing is limited to the regular trout season from the last Saturday in April through September. The dividing line between the Headwaters Subwatershed and the Middle Subwatershed is 13 Mile Road, which is the upper stream limit of the portion of Bear Creek that is open to year-round fishing. Lemon Creek enters Bear Creek at 13 Mile Road and is the last downstream tributary of the Headwaters Subwatershed. Available information indicates that water quality in the Headwaters Subwatershed meets or exceeds Michigan Water Quality Standards (WQS) for coldwater (trout) streams.

The **Middle Subwatershed** on Bear Creek itself (between 13 Mile Road and Coates Highway) begins just downstream of the point where Lemon Creek joins Bear Creek. Halls Creek is the first named tributary feeding into Bear Creek in the Middle Subwatershed, followed downstream by Horseshoe, Beaver, Little Beaver, Cedar, Podunk, and Boswell creeks as well as a number of unnamed, smaller tributary streams, nearly all of which are classified trout streams. The relatively high gradient streams in this subwatershed, including Bear Creek itself, provide spawning for steelhead and salmon in exposed gravel areas and offer the best year-round fishing. Bear Creek and tributaries in this subwatershed are difficult to access due to the fact that the vast majority of riparian land is privately owned. Available monitoring data indicate that water quality was determined adequate for a coldwater stream; the glide/pool habitat was rated good (slightly impaired), and the macroinvertebrate populations were determined to be acceptable.

The **Lower Subwatershed** begins at Coates Highway and extends to the point where Bear Creek discharges to the Manistee River. This lower end of the watershed has a low gradient and the stream bottom is dominated by sand and silt with minimal amounts of exposed gravel. Wetlands are common along riparian state and federal forest lands which are extensive in this subwatershed. In general, reports indicate that water chemistry measured in this reach of the Lower Subwatershed is of good quality with the exception of possible sediment issues. Information shows in some areas there is a lack of woody debris and deep pools but overall the fish community in the subwatershed is highly diverse with representatives of coldwater, coolwater, and warmwater species observed.

DESIGNATED AND PROTECTED USES, THREATS, SOURCES, AND CAUSES

Bear Creek and its tributaries are protected under the WQS as coldwater streams. Current information indicates the WQS for coldwater streams are being met in the Greater Bear Watershed with the exception of three parameters for which there is insufficient information to determine compliance. Further testing is required to determine whether or not minimum dissolved oxygen concentrations, maximum *E. coli* (bacteria), and temperature standards are being met in some specific areas where samples in previous years suggest possible non-compliance. Bear Lake is protected under the WQS as a warmwater lake and further information is also needed on the *E. coli* bacteria levels and dissolved oxygen during the summer period to determine if all standards are being met. The most likely present and future threats to the Greater Bear Watershed surface waters are as follows:

- Human pathogens threats from:
  - pathogens coming from failed on-site wastewater treatment systems (OWTS), uncontrolled runoff from farm-raised animals, household pets, and waterfowl
- Ecosystem health threats from:
  - nutrient loadings (specifically phosphorus) due to waste discharges from OWTS, home and farm fertilizers applications on riparian lands, and storm water discharges
  - habitat degradation related to wetland disturbances, lakeshore and streamside alterations, expanded presence of aquatic and wetland invasive species (such as Eurasian milfoil, zebra and quagga mussels, purple loosestrife, and phragmites), and sedimentation from eroding banks, road crossings, and stormwater runoff
- Hazardous materials threats from:
  - contaminated fish due to air deposition of toxic, bioaccumulative heavy metals (such as mercury) and persistent organic compounds (such as polychlorinated biphenlys)
  - spills of toxic materials from transportation accidents, and household and business use, storage and handling of hazardous materials
  - contaminated runoff from cropland, and orchard and tree farms (such as pesticides, herbicides, and other agricultural chemicals)
  - industrial spills (manufacturing and production waste from hydrocarbon development)

Because groundwater is the dominant source of the water for the lakes and streams in the Greater Bear Watershed as well as the primary source of water for household use and irrigation, the residents of the area identified present and potential threats to groundwater as follows:

- Groundwater threats from:
  - excessive withdrawals related to expanded industrial uses or expanded agricultural irrigation
  - contamination associated with accidental releases of hazardous materials onto the ground
  - major changes in land use that would increase surface water runoff, decrease infiltration, and increase water temperatures of lakes and streams
  - contamination from historical disposal sites, former commercial operations, and agricultural chemical applications

Residents of the watershed identified other issues that they feel affect either the current uses of the water resource or impair the sustainability of the economic well-being and quality of life that attracts many to reside and recreate in the area. These additional threats include the following:

- Increasing land use conflicts
  - between anglers and riparian owners of private land along portions of Bear Creek
  - placement of energy facilities impacting attractive, natural viewscapes

- Declining local businesses and related employment opportunities
  - out-migration of youth in the watershed and increasing population of retirees
  - reduced local services and retail stores
  - reduced local tax base
- Abandoned homes, businesses, and other properties
  - expanded number of blighted properties detracting from the aesthetics of the area
- Uniformity of local planning, zoning, and enforcement
  - reduced protection of valuable natural, cultural, and historical features
  - uncoordinated local economic development planning

CRITICAL AND PRIORITY AREAS OF CONCERN

Critical and priority areas of concern within the Greater Bear Watershed, along with the known or suspected pollutant or threat, were identified to help develop goals and objectives and to guide future monitoring, planning, and management efforts. Critical areas represent those where restoration may be necessary; priority areas represent those where protection is important. The areas described are either the sources of pollutants identified or those areas most susceptible to activities that could degrade water quality or valuable aquatic habitats.

The critical areas identified are:

- Riparian lake and stream properties where all streamside vegetation has been removed, hardened bank/shore erosion devices have been installed
- Private agricultural lands adjacent to and within 300 feet of Bear Lake, Bear Creek, and tributaries
- Active stream bank erosion sites in Bear Creek and tributaries related to historical logging practices and recreational access on public and private lands
- Road stream crossings along Bear Creek and tributaries
- Locations where the lack of streamside shade and in-stream cover limits trout and salmon abundance
- OWTS located at permanent residences, vacation homes, and businesses adjacent to Bear Lake
- OWTS located at permanent residences, vacation homes, and businesses adjacent to Bear Creek and tributaries

The priority areas identified are:

- Existing undeveloped wetlands adjacent to Bear Lake, Bear Creek, and tributaries
- Properties of conservation significance identified through Grand Traverse Regional Land Conservancy (GTRLC) prioritization process

GOALS AND OBJECTIVES

There are eight major goals for the Greater Bear Watershed and a series of recommended objectives and actions for each of the goals. Five goals follow the categories established in the report used to identify existing or potential threats to legally protected uses of the surface water and groundwater resources within the watershed. The sixth goal is not directly related to water quality, but reflects the concerns expressed during the public meetings on the lack of youth employment opportunities, the increasing percentage of the population in the watershed over 65, the value of scenic vistas, and the growing evidence of abandoned and blighted properties. The seventh and eighth goals relate to plan implementation and evaluation.

The eight major goals for the Greater Bear Watershed are:

- **Pathogens Affecting Humans—**Minimize presence of organisms that impair swimming, wading, fishing, boating, water skiing and other full or partial body contact water recreation activities. Objectives and actions identified to reach this goal include decreasing sources of and monitoring for human pathogens.
- **Ecosystem Health—**Protect and restore essential physical habitat, and maintain compliance with water quality standards designed to protect fish, wildlife, and other aquatic organisms. Objectives and actions identified to reach this goal include reducing and preventing nutrients and pollutants from entering Bear Lake, Bear Creek, and tributaries as well as protecting and enhancing critical habitat for aquatic species.
- **Hazardous Materials—**Prevent future and reduce current impacts on people (fish consumption advisories) and the environment. Objectives and actions identified to reach this goal include efforts to educate watershed residents, businesses, and visitors and to develop contingency plans to respond appropriately in the event of a spill.
- **Invasive Species—**Control abundance and further distribution of exotic species injurious to protected human uses (swimming, boating, fishing, etc.) and native plants and animals. Objectives and actions identified to reach this goal include efforts to limit the expanse of existing invasive species and prevent the introduction of new invasive species.
- **Groundwater—**Protect quality and quantity of domestic and agricultural water supplies and the source of cool, clean water to surface lakes and streams. Objectives and actions identified to reach this goal include protection of drinking water supplies and monitoring to ensure that withdrawals do not create an adverse resource impact.
- **Joint Planning and Development—**Coordinated local economic and land use planning to preserve and optimize local assets and expand sustainable economic development and related employment. Objectives and actions in this category include efforts to strengthen natural resource–based tourism and collaborative planning efforts.
- **Sustainable Implementation of Greater Bear Watershed Plan—**Formation of Greater Bear Watershed Management Plan Steering Committee and identification of leadership responsibilities. Objectives and actions in this category include the formation of an implementation team to ensure that plan recommendations and goals are achieved.
- **Evaluation and Revision of Management Plan Progress—**Periodic assessment of progress in implementing actions and in meeting objectives, and targets for plan revisions and updates. Objectives and actions in this category include periodic assessment of progress toward plan goals and implementing adjustments as necessary.

INFORMATION AND EDUCATION

An information and education (IE) plan, based on stakeholder input from public forums, public survey, steering committee members, and relevant reports and information about environmental quality of watershed resources, was developed to advance attainment of watershed goals and objectives. This plan will help increase awareness and understanding about how actions on the land within the Greater Bear Watershed can impact water quality. The purpose of the strategy is to establish and promote education programs that support effective implementation of watershed planning goals, objectives, and actions.

Since the Greater Bear Watershed Management Plan Coordinating Committee is a relatively new group, the strategy focuses on building organizational capacity in the short term by implementing general IE tasks identified in Exhibit 92. The www.bearwaters.org website will become a central repository for educational and informational materials. In the beginning, efforts will focus on compiling existing materials identified in IE tasks and adding them to the website, and developing a contact list for distributing materials in 2013. Following this effort the Implementation Team will target educational

efforts on two individual plan goals in each year of plan implementation. This approach recognizes the importance of IE actions relating to each goal and the limited resources (staff/volunteer time and materials) to implement watershed tasks. The Implementation Team's focus on two goals each year (goals 1-6) will be repeated on a triennial cycle commencing in 2014.

MONITORING AND EVALUATION

Implementation of watershed plan goals and objectives will require routine monitoring of watershed resources at Bear Lake, Bear Creek, and tributaries. Monitoring is a fundamental component of this plan to ensure that current conditions that support designated and other desired uses are sustained. The proposed monitoring plan will fill information gaps to determine whether or not water quality standards are being met and further establish baseline levels for future comparisons.

The purpose of the monitoring plan is to identify changes in environmental quality before significant impairments occur such that management actions can be implemented to prevent or minimize risk to watershed resources. The monitoring plan focuses on three priorities of the watershed plan: human pathogens and public health, aquatic ecosystem health, and water quality (surface water and groundwater).

Evaluation of monitoring activities will also be necessary to determine the progress and effectiveness of proposed activities. A measure of success will be that all water quality standards continue to be met and designated and desired uses are protected. Successful establishment of the institutional structure of the Greater Bear Watershed Committee is critical to assure implementation of plan recommendations. Organizations represented on the committee need to continue to meet on a regular basis to assure that staff and volunteers of the respective organizations can manage the elements in the monitoring plan and evaluate the results.

The estimated cost of implementing all recommended actions to achieve watershed plan goals and objectives, as well as the information and education actions to achieve watershed plan goals, ranges from a low estimate of $7,654,000 to a high of $9,236,000 over the 10-year horizon of the plan.