

CHAPTER 7. HEALTH AND CULTURE

Climate change is being linked to increases in the geographic range and incidence of certain infectious and non-infectious diseases, new problems in sanitation and solid waste management, and contaminant exposures in Alaska. Current programs are insufficient to identify and control these changes. To protect the health of humans and animals, both domestic and wildlife, from the effects of climate change in Alaska, existing programs and activities need to be augmented to address these emerging concerns to develop new methods for surveillance and reporting of human and animal diseases. Box 7-1 summarizes the mission statement for the sector.

Box 7-1 Health and Culture Mission Statement

Improve adaptive capacity to maintain human health and healthy ways of life, reduce current and likely future increases in disease due to a changing climate, and prevent the destruction of gravesites, archaeological sites, and historic sites due to accelerated coastal and river erosion.

Overview of Health and Culture Recommendations		
	Recommendation Name	Level of Support
HC-1	Infectious Disease and Surveillance Control	Unanimous
HC-2	Community Health Impact Evaluation	Supermajority*
HC-3	Sanitation Infrastructure and Practices	Unanimous
HC-4	Archeological Sites and Gravesites	Unanimous

*Supermajority reflects one objection. One AAG member objected to creation of a system because it would add an unnecessary layer of oversight. Additional costs in time and resources should be estimated and compared to that which is presently directed to assist communities in adapting their public health and water and sanitation infrastructure to warming.

Impacts and Vulnerabilities

Climate change poses risks to the health of all Alaskans, but particularly those living in rural communities with limited public health and health care capacity. Climate change also poses risks to cultural traditions and traditional ways of life.

Problem and Significance:

Health: Climate change poses real health risks (Ebi et al. 2008). Climate change is projected to increase the frequency and intensity of heatwaves and other extreme weather events (floods and droughts), change the geographic range and incidence of climate-sensitive vector-, food-, and waterborne diseases, and increase

diseases associated with air pollution and aeroallergens. Climate change is often not the sole cause of increases in the burden of climate-sensitive health outcomes, but interacts with other public health stresses. The increasing extent and rate of climate change means it is expected to be a major health issue for decades to come (Confalonieri et al. 2007).

There are indications that vector-borne and enteric diseases in Alaska may be changing their geographic range as a consequence of climate change, with adverse consequences for human health (McLaughlin 2008). Climate is a primary determinant of whether a particular location has the environmental conditions suitable for the transmission of several vectorborne diseases. A change in temperature may hinder or enhance vector and parasite development and survival, thus lengthening or shortening the season during which vectors and parasites survive. Small changes in temperature or precipitation may cause previously inhospitable altitudes or ecosystems to become conducive to disease transmission (or cause currently hospitable conditions to become inhospitable). Examples of human diseases that have already been or might soon be linked to climate change in Alaska include botulism, echinococcosis, giardiasis, paralytic shellfish poisoning, rabies, tick-borne encephalitis, venomous insect events, and West Nile virus infection. West Nile virus is of particular concern because it is spreading across Canada and is now one degree south of Juneau (McLaughlin 2008). Examples of animal diseases that have already been or might soon be linked to climate change in Alaska include leptospirosis; parasitic infestations in caribou, muskoxen and moose; toxoplasmosis in sea otters; tularemia; and winter tick infestation in moose (Gerlach 2008).

An example of the type of response that would be expected with climate change is a retrospective review of three independent patient databases in Alaska that reported a statistically significant trend in patients seeking care for insect reactions over fourteen years (Demain et al. 2009). In Fairbanks, there was a four-fold increase in patients in 2006 compared to 1992-2005. In Anchorage, there was a three -fold increase in patients between 1999 - 2002 and 2003- 2007. A review of the Alaska Medicaid database from 1999 to 2006 also showed statistically significant increases in medical claims for insect reactions in five of six regions, with the largest percentage increases occurring in the most northern areas. Since 1950, average annual and winter temperatures in Alaska increased 3.4°F and 6.3°F, respectively. Average winter temperatures increased at least 6°F in regions reporting a significant increase in bite or sting events; warmer temperatures may have been a contributing factor.

Increasing numbers of cases of food- and waterborne disease also are of concern to Alaskans. Most of these pathogens are enteric and transmitted by the fecal-oral route, and many are sensitive to ambient temperature. Control of these pathogens requires not just effective water treatment and food production and handling, but also sanitation and solid waste management. Enteric diseases of concern include *salmonella*, *campylobacter* and *cryptosporidium*. While the outcome of many gastrointestinal diseases is mild and self-limiting, they can be fatal or significantly decrease fitness in vulnerable populations, including young children, the immuno-compromised, and the elderly. Children ages 1-4 and older adults (>80 years) each constitute more than 25% of hospitalizations involving gastroenteritis, but older adults are 85% of the associated deaths (Gangarosa et al. 1992). Climate may affect food- and waterborne pathogens directly by influencing their growth, survival, persistence, transmission, or virulence in ways that could increase the number of cases with increasing ambient temperature (Fleury et al. 2006; Naumova et al. 2006).

Vibrio parahaemolyticus, the leading cause of seafood-associated gastroenteritis in the US, is typically associated with the consumption of raw oysters gathered from warm-water estuaries. In 2004, an outbreak occurred in Alaska where the consumption of raw oysters was the only significant predictor of illness; the

attack rate among people who consumed oysters was 29% (McLaughlin et al. 2005). All oysters associated with the outbreak were harvested when mean daily water temperatures exceeded 15.0°C (the theorized threshold for the risk of *V. parahaemolyticus* illness from the consumption of raw oysters). Between 1997 and 2004, mean water temperatures in July and August at the implicated oyster farm increased 0.21°C per year; 2004 was the only year during which mean daily temperatures did not drop below 15.0°C. The outbreak extended by 1000 km the northernmost documented source of oysters that caused illness due to *V. parahaemolyticus*. Rising temperatures of ocean water appear to have contributed to one of the largest outbreaks of *V. parahaemolyticus* in the US.

Culture: Marine and terrestrial ecosystems are changing substantially with complex feedbacks that alter habitat and the mix of fish, marine mammals, terrestrial mammals, and vegetation. Sea ice, the prime habitat of walrus and seals and the hunting grounds for many coastal villagers, is forming later and at differing rates in the winter and breaking up earlier in the spring. This combined with the overall dramatic rate of sea ice loss is impacting the people with loss of traditional knowledge and extended periods without access to traditional foods (Huntington and Fox 2005). Similar ecosystem and resource impacts are affecting native cultures throughout the state, challenging their subsistence way of life and posing significant cultural challenges. Subsistence hunters in these areas must now travel increasingly large distances to hunt marine mammals, such as bearded, spotted, ringed, and ribbon seals, whose reproduction and survival rates are known to fluctuate with climate changes (Ferguson et al. 2005; Stirling 2005). This hunting occurs in unsafe, frigid waters in boats for which gasoline costs more than \$9/gallon (ADCRA 2009), a high price to pay in communities whose per capita income is one third that of urban Anchorage. Rural villagers also confront population shifts, declines, and loss of quality in other subsistence species, including fish, moose, caribou, wild berries, and other native plants.

Many aspects of the traditional and subsistence way of life are now more difficult, more dangerous, and more expensive. The cost of store bought foods, heating oil, and other daily living expenses interact with climate-related challenges to create circumstances that make survival in rural villages increasingly difficult. More than one in five individuals is below the poverty threshold, three times that of their urban counterparts (Callaway and Smith 2008). Stresses to traditional practices – including a way of life tied to being on the land and providing for one's community – is combining with rising cost of rural living to raise the potential of serious social impacts. Other outcomes can be subtler. For example, Alex Whiting from Northwest Alaska notes that the youth and elderly depend on strong ice in fall to ice fish for saffron cod and smelt. Late freeze up and a concomitant shorter ice-fishing season lessens the opportunity for elders to pass on traditional knowledge and ethical values (Whiting 2002).

Beyond the social and cultural impacts of climate change, many villages are now facing erosion, flooding, engulfment, and disappearance of their community infrastructure. Shismaref, a community of 150 households on the northern Bering Sea, faces relocation at a cost of \$93 - \$179 million dollars (USACE 2004). A recent GAO report (GAO 2004) found 213 predominantly Native villages, historically situated along rivers and coasts, at risk, with potential relocation costs of \$34 billion. Several existing communities have begun the relocation process and others are seriously evaluating the risk to their communities and may follow suit in the near future. Beyond the communities themselves, many culturally important sites are currently at risk from erosion as well, including archaeological sites and gravesites.

Need for action: The coordinated delivery of services to rural communities supports many Health and Culture objectives. Currently an array of state, federal, and regional entities are responsible for delivering

services to rural Alaskan villages, but specific program policies and regulatory constraints cause conflicting directives, resulting in bottlenecks in the ability to achieve a coordinated delivery of vital services and outcomes that will enable villages and traditional culture to adapt to climate change. Chapter 8, "Common Themes," includes a recommendation that addresses the need for community assistance, which is more far reaching than simply health and culture but also includes natural systems, public infrastructure, and other needs.

Agencies within the state currently tasked with the responsibility for surveillance and control for human and animal diseases include the Alaska Department of Health and Social Services, the Alaska Department of Environmental Conservation (ADEC), the Alaska Native Health Consortium (ANTHC), and the Alaska Department of Fish and Game (ADF&G). Although programs and activities are in place, there is evidence that they are insufficient to address the additional health risks of climate change.

Actions taken to mitigate greenhouse gas emissions or to adapt to the current and projected impacts of climate change can benefit or harm human health. Without prior evaluation, adaptation and mitigation policies and programs might cause morbidity and mortality that would have been prevented, often by simple and inexpensive adjustments to the implementation plan.

Increases in global temperatures have led to new and exacerbated existing problems in sanitation and solid waste management that are anticipated to negatively impact the health of communities. Further, facility and program performance design is based on historical environmental factors. However, these design factors are shifting due to climate change. Current community sanitation policies are insufficient to address these risks and need to be modified. Not identifying and implementing effective and efficient modifications to sanitation and solid waste management will lead to additional cases of waterborne, vector-borne, and hygienic diseases, as well as environmental toxic exposure to humans and wildlife.

Alaska's gravesites, archaeological sites, and historic sites are becoming increasingly exposed and impacted through anthropogenic and natural processes, including global climate change. Coastal sites are particularly vulnerable. The sea level rise projected to occur over the next few decades will alter the shape of coastline and speed erosion, submerging or destroying many graves and cultural sites. Inland, warming temperatures have led to the melting of ice fields thousands of years old, exposing organic artifacts such as arrows to the elements. Warming temperatures are also causing lake and stream levels to become higher or lower than normal, exposing or inundating sites. In some areas, the onslaught of the bark beetle has had an effect on sites and structures.

Challenges:

Sufficient evidence exists that implementation of additional surveillance and monitoring for climate-sensitive infectious diseases will provide significant benefits in detecting cases of disease early enough to take action to reduce additional cases of disease. This information is critical for determining targeted public health control needs. Implementing additional surveillance is highly feasible as no new legislative authority is needed and the basic governmental structure already exists for implementation with minimal cost in terms of capital infrastructure and personnel services support.

Implementing an option to assess adaptation and mitigation options recommended by all sectors would require at least authorizing regulations. Existing personnel in the Department of Public Health could probably meet the professional needs, but part-time support staff would be needed. It is anticipated that the number of

mitigation and adaptation options selected by the State will not be large enough at any one time to make additional full-time professional staff a requirement.

Addressing climate change-related risks to sanitation and solid waste management will require augmentation of existing programs. Implementation of these changes will require increased human and material resources, including methods and tools, within existing programs, as well as new and augmented partnerships with the public and private sectors. Additionally, these recommendations will require an update of existing environmental data sets (temperature and climate projections) in order that facilities can be constructed and/or renovated to meet future changed environmental conditions.

There is scientific support for a relationship between global climate change and the environmental changes that are causing the destruction of gravesites, archaeological sites, and historic sites. Collection of baseline data and monitoring efforts are required to identify, assess, and prioritize threatened sites, and develop plans for mitigating these threats. Examples of cemeteries and cultural sites that have been wholly or partially destroyed by changing weather patterns are widespread throughout Alaska. Programs within the state have the authorities, infrastructure, and expertise to coordinate identification, assessment and mitigation of adverse effects to these resources, but do not have adequate staff or funding to perform the duties.

Health and Culture Adaptation Strategy

The four adaptation options recommended for the Health and Culture sector address issues where current climate variability and change have increased risks of adverse health and culture outcomes, with increasing impacts expected over the short- and long-term. Failure to implement the recommended modifications to

Box 7-2. Overview of Health and Culture Recommendations

HC-1: Augment surveillance and control programs for vector-, water-, and foodborne diseases

Augment surveillance and control programs for vector-, water-, and foodborne diseases likely to become greater threats because of climate change. Develop educational programs for the public, health care providers, environmental staff, and others on approaches to reduce emerging disease threats.

HC-2 Community Health Impact Evaluations

Develop a tiered approach to evaluate recommended adaptation and mitigation options to determine whether they could result in adverse health impacts and, if so, to recommend approaches to reduce these risks.

HC-3: Assess Sanitation and Infrastructure Risks from Climate Change

Assess sanitation infrastructure and practices at risk from flooding, thawing permafrost, and other risks, or that is otherwise subject to changed conditions that significantly reduce performance in environmental health protection. Consider modification, rebuilding, or relocation of sanitation infrastructure to protect human and environmental health.

HC-4: Assess, Protect, and Develop Plans for Archaeological Sites and Gravesites

In cooperation with appropriate local, regional, and statewide entities, assess archaeological sites and gravesites at risk from accelerated coastal and river erosion; convene archaeologists, anthropologists, Alaska Native elders, and others to discuss how best to address and prioritize sites at risk; and develop a plan for the protection or recovery of important at-risk sites. Assist in identifying and opening new gravesites; convene a respectful discussion about gravesites and explore best practices; provide assistance for the relocation of existing at-risk gravesites.

current programs and activities is expected to increase disease burdens. Climate change also is adversely affecting Alaska’s culture and history through observed and projected increase in the destruction of gravesites, archaeological sites, and historic sites due to accelerated coastal and river erosion. Box 7=2 summarizes the recommendations for Health and Culture.

Implementation of the recommendations would not only decrease vulnerability now, but would also build the capacity to increase future resilience to climate change. The recommendations would establish processes and data collection programs to support future actions to address additional climate change-related risks. The human and financial resources required for implementation would be significantly less than the benefits that would accrue; the overall resources needs are modest.

Research will be a critical part of these recommendations, as described further in Box 7-3. The recommendations are also intended to build on existing public and private sector programs and activities as described in Box 7-4. Both these boxes appear at the end of this chapter.

Option (number)	Short option name	Type of option										Implementation				
		Coordination				Data collection (research, monitoring, Regulatory / programmatic change or addition	Assessment, evaluation, or planning	Capacity building , education, outreach	Direct or indirect financial assistance (e.g., tax incentives)	Capital improvements	Requires new /insitutions / government agency	Requires new staffing	Requires funding	Requires new legislative authority	Lead role for state government	
HC-1	Infectious Disease Surveillance and Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HC-2	Community Health Impact Evaluation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HC-3	Sanitation Infrastructure and Practices	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HC-4	Archeological Sites and Gravesites	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Description of Health and Culture Recommendations

This section describes the options recommended for the health and culture sector.

HC-1 Augment Surveillance and Control Programs

Augment surveillance and control programs for vector-, water-, and foodborne diseases likely to become greater threats because of climate change. Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of public health

practice. Improving surveillance will allow more robust tracking and identification of trends in order to expeditiously and effectively respond to and control emerging public health threats. Surveillance and control are necessary because they are the mechanisms by which public health practitioners prevent, prepare for, and respond to disease threats.

The state of Alaska agencies currently tasked with the responsibility for surveillance and control for human and animal diseases are the Alaska Department of Health and Social Services, the Alaska Department of Environmental Conservation, and the Alaska Department of Fish and Game. The recommendations presented in this option will require augmentation of existing surveillance and control efforts performed by programs within these agencies. Implementation of the option recommendations will require increased human and material resources, including methods and tools within existing programs, as well as new and augmented partnerships with the public and private sectors, including memoranda of understanding to collect the necessary data.

The targets of the option include:

- Improve surveillance for vectors and vectorborne diseases in vectors;
- Expand and improve Department of Health and Social Services' (DHSS) hospital discharge and emergency room databases to improve detection of climate change-related diseases;
- Improve health care provider education around infectious disease reporting;
- Create a reporting system for sanitation/wastewater integrity disruptions within DEC;
- Improve interagency notification of drinking water and wastewater violations between Municipality of Anchorage (MOA), DHSS, DEC; and
- Provide surveillance and control program updates to stakeholders through a variety of means.

HC-2 Evaluate Recommended Adaptation and Mitigation Options

Evaluate recommended adaptation and mitigation options to determine whether they could result in adverse health impacts. Actions taken to mitigate greenhouse gas emissions or to adapt to the current and projected impacts of climate change in a wide variety of sectors also may benefit or harm human health. These auxiliary health effects are generally unintended, and can range from none to highly significant. At present, there is no established mechanism for a brief, structured, and rapid professional evaluation of a proposed mitigation or adaptation measure to identify potential adverse or positive influences on health. This option would create such a mechanism to identify where health effects were unlikely, minor, few, or more significant. Such an evaluation would facilitate the design and implementation of necessary additional measures, including monitoring, to maximize benefits and to reduce potential likely and significant adverse effects. This option proposes a Community Health Impact Evaluation (CHIE) initiative to rapidly and efficiently screen proposed mitigation and adaptation activities to determine whether there may be associated health benefits or harms and to identify additional actions to maximize the benefits and reduce potential adverse impacts.

The CHIE would require a Project Review Committee (PRC) with primary responsibility for examination and evaluation of each mitigation and adaptation measure recommended for implementation. To optimize efficiency and ensure rapid response, the PRC would have a core team that includes the State Department of Public Health, representatives from relevant State agencies, and public health professionals from other

organizations. Implementing this option would not require the hiring of new professional staff, but would need part-time staff support.

The Project Review Committee would follow these steps:

- The State agency responsible for the mitigation or adaptation measure would develop a tiered approach to determine which actions merit further analysis. The potential impacts associated with the actions under consideration will be the determining factor which dictates the level of review: Mini, Desktop, or Full.
- If further evaluation is warranted, a request would go to the PRC chair for an evaluation, along with a full description of the measure.
- The PRC Chair would convene the core PRC members, with at least one representative from the responsible State agency. The proposed measure would be reviewed by the PRC to determine the possible need for an in-depth review. A detailed evaluation would be recommended if (1) multiple likely mechanisms for adverse health effects were identified, (2) one mechanism was identified with a high likelihood of adverse effect, or (3) the initial evaluation suggested that there was likely to be a public perception of possible adverse effects.
- If the PRC evaluation concluded that there was a negligible likelihood for any adverse health effect, a report from the PRC would be issued to the responsible State agency.
- If the PRC decided an in-depth evaluation was advisable, an appropriate group of additional consultants, agency personnel, and citizen members would be convened, and a process followed to ascertain the possible pathways or mechanisms of potential adverse effects or benefits; identify all aspects of effect mechanisms, positive and adverse, and suggests measures to mitigate adverse effects and maximize benefits; align measures designed to minimize adverse impacts, and measures designed to maximize benefits, with outcome monitoring indicators to create the most efficient monitoring strategy; and submit a final report within 4-6 working weeks.

HC-3 Assess Sanitation and Infrastructure Practices

Assess sanitation infrastructure and practices at risk from climate-related impacts. Sanitation and solid waste management are intended to prevent the outbreak of waterborne, vector-borne, and hygienic diseases, limit environmental toxic exposure to humans and wildlife, and improve quality-of-life. Facility and program performance design is based on historical environmental factors. Increases in global temperatures have led to new and exacerbated existing problems in sanitation and solid waste management that are anticipated to negatively impact the health of communities. This option is intended to adapt program and facility design so that public health continues to be adequately addressed in the face of current and anticipated environmental changes. Current rural sanitation policies are insufficient to address these changes, and need to be modified. The objective of this option is to protect the health of humans and wildlife from the effect of climate change in Alaska by improving the capacity of the rural sanitation and solid waste management systems to respond to and/or control anticipated new and exacerbated disease and toxic exposures. The goal is to prevent or at least ameliorate acute and chronic health problems in the population.

There is a growing scientific consensus that climate change has affected the distribution, including incidence and geographic range, of infectious and non-infectious diseases that sanitation systems are intended to minimize. Additionally, changes in water quality, such as acidification and temperature that can affect human

and wildlife toxic exposures are occurring in Alaska. Changes in drinking water supply (both quality and quantity) and location may occur with the changing hydrology regime. Permafrost, utilized in some cases as a waste liner for sewage lagoons and solid waste facilities, and riverbanks that support treatment cells and infrastructure are eroding. Additionally, permafrost laden soils, in some cases, serve as structural elements in the foundation of water storage tanks, buildings that are part of the community sanitation infrastructure and/or earthen berms that may contain fresh water for drinking or coral effluent from a sewage collection system. These phenomena are a concern as rural sanitation differs from urban and semi-rural facilities.

The agencies currently tasked with the responsibility for rural sanitation and solid waste management include the Alaska Department of Environmental Conservation, the Alaska Native Tribal Health Consortium, Regional Tribal Health Organizations, local Environmental Programs, US Department of Agriculture, and U.S. Environmental Protection Agency. Alaska DHSS, ADF&G, U.S. Fish and Wildlife are indirectly involved in identification and control for human and aquatic life negative health outcomes that may emanate from inadequate system performance.

The recommendations presented in this option will require augmentation of existing sanitation and waste management or human and aquatic life health efforts performed by programs within these agencies. Implementation of the option recommendations will require increased human and material resources, including methods and tools, within existing programs, as well as new and augmented partnerships with the public and private sectors. Additionally, these recommendations will require an update of existing environmental data sets (temperature and climate projections) in order that facilities can be constructed and/or renovated to meet future changed environmental conditions.

A number of these recommendations, while focused on health-related concerns, also overlap with public infrastructure.

Targets include:

- Provide a portion of distressed community Operation & Maintenance (O&M) costs in order to adequately protect system investment, via annuity or other mechanism. Non-traditional approaches such as the Alaska Rural Utilities Collaborative may be considered for more wide spread utilization.
- Collaborate with statewide sanitation and environmental health entities currently conducting infrastructure inspections to design inspection/evaluation protocols addressing severity, nature, and timing of climate change impacts.
- Review existing Class III solid waste management guidelines (for rural and remote, non-hub communities) to adapt the regulations, recommendations, and community outreach to anticipate continued climate change impacts. For example:
- Review the State of Alaska Capital Improvement Project (CIP) list for solid waste projects and priority classifications in relation to substantial and relevant climate change issues
- Make available financial resources or incentives for development of more efficient and lower-cost systems, (e.g. Alaska-based manufacturing of road mats, modular treatment systems)
- Establish a Memorandum of Understanding (MOU) between agencies related to responsibilities.
- Assure to the extent possible that existing sanitation facilities are protected against system failure due to climatic events such as flooding, wind, erosion, permafrost melt, etc.

- Plans and designs for new sanitation facilities account for potential future climate changes that could damage or destroy these facilities

HC-4 Assess Archeological Sites at Risk from Accelerated Coastal and River Erosion

The State should convene archaeologists, anthropologists, Alaska Native elders, and others to discuss how best to address and prioritize cemetery, archaeological, and historic sites at risk, and develop a plan for the protection or recovery of important at-risk sites. This process should include a statewide assessment of the gravesites most at risk; assist in identifying and opening new gravesites; convene a respectful discussion about gravesites and explore best practices; provide assistance for the relocation of existing at-risk gravesites. The objective of this option is to identify, assess, prioritize, and mitigate adverse effects of climate change on gravesites, archaeological sites, and historic sites through the development of dedicated program areas within existing state authorities. This will provide for the coordination of efforts to identify, assess, prioritize, and develop mitigation plans to address the effects of climate change, and will enable the State to rapidly respond to threats as necessary.

This option addresses the observed and projected increase in the destruction of gravesites, archaeological sites, and historic sites due to the effects of global climate change. Programs within the state have the authorities, infrastructure, and expertise to coordinate identification, assessment and mitigation of adverse effects to these resources, but do not have adequate staff or funding to perform the duties. Appropriate responses to these challenges require augmentation to existing infrastructure.

The state agency tasked with preservation and protection of archaeological and historical sites on state lands, including tidelands and submerged lands, is the Office of History and Archaeology (OHA). Housed within the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation, OHA carries out the policy of the state to “preserve and protect the historic, prehistoric, and archeological resources of Alaska from loss, desecration, and destruction so that the scientific, historic, and cultural heritage embodied in these resources may pass undiminished to future generations...” (AS 41.35.10). OHA also fulfills the responsibilities of the State Historic Preservation Office, a federally funded program that carries out the mandates of the National Historic Preservation Act of 1966 (*16 U.S.C. 470*) for a wide range of historic preservation activities, including maintenance of the official restricted-access statewide inventory of archaeological and historic sites. With regard to gravesites and human remains, OHA has provided forensic anthropology consultation to the State Medical Examiner under reimbursable services agreements since 1988. In 2004, OHA initiated a Memorandum of Understanding with the State Medical Examiner and Alaska State Troopers that provides interagency guidance on the discovery and treatment of human remains.

Targets include:

- Establish a new program area within OHA, with a dedicated archaeologist / anthropologist position and funding for travel and equipment to coordinate and facilitate cemetery issues. Duties would include coordination of studies to assess the effects of climate change and providing technical advice. Modeled somewhat after a successful program in Wisconsin, the proposed “Alaska Burial Sites Preservation Program” would coordinate closely with the Alaska State Troopers, the Alaska State Medical Examiners Office, tribes, and other stakeholders. The position should be supplemented as necessary to carry out specific program activities through the use of paid college interns or non-permanent state positions. The position would serve as OHA liaison with law enforcement agencies, the State Medical Examiner’s Office, and the Bureau of Vital Statistics (for burial transit permits and disinterment / re-interment

permits). The position would also facilitate communication with tribal representatives on matters involving human remains.

- Establish a new program area within OHA, with a dedicated archaeologist position and funding for travel and equipment, to coordinate and facilitate studies for addressing the effects of climate change on Alaska's archaeological and historic sites.
- Pursue funding to create a benefit for private landowners who actively protect listed cemeteries / gravesites and archaeological or historical sites on their land.

Box 7-3. A Sampling of Relevant Current Activities and Entities

The examples presented below are not intended to be exhaustive, but rather to illustrate ongoing and proposed initiatives and activities.

Center for Climate and Health (CCH), Alaska Native Tribal Health Consortium (ANTHC)

The CCH combines engineering, environmental health, and community health expertise to provide the Alaska Tribal Health System with a comprehensive approach to local climate challenges. <http://antch.org/chs/ces/climate>

A number of programs within State agencies presently offer services which provide expertise or have the potential to further engage in collaborative efforts to carry out the options recommended by the AAG. Some of these include:

- Environmental Public Health Program, DHSS
- Infectious Disease Program, DHSS
- Office of the State Veterinarian Program, DEC
- Drinking Water Program, DEC
- Wastewater Program, DEC
- Solid Waste Program, DEC
- Wildlife Conservation Program, DF&G

Box 7-4. Health and Culture Recommended Research Needs

The Research Needs Work Group identified research necessary to both assist implementing the recommendations and to help the state of Alaska better understand the impacts of climate change on its health and culture.

- HC/RN-2.1 Assess impacts and socio-economic effects of decline and migratory shifts of major subsistence species and vegetation.
- HC/RN-2.2 Standardize ADF&G Harvest Surveys.
- HC/RN-4.1 Evaluate current monitoring and surveillance programs to ensure effectiveness in detection and control of new pathogens or contaminants from source water.
- HC/RN-4.2 Assess sanitation and solid waste disposal infrastructure and practices impacted by climate change.
- HC/RN-4.3 Estimate the impact from potential release of methane hydrates in the Arctic.
- HC/RN-4.4 Study the potential increase in bioavailability of transboundary pollutants.
- HC/RN-4.5 Study the interaction of increased UV exposure on humans, animals and vegetation in conjunction with projected climate changes.
- HC/RN-5.1 1. Assess archaeological sites most at risk and develop a protection or recovery plan . 2. Complete a statewide assessment of, and response to, gravesites most at risk.

For additional information on each recommendation, and for a broader set of identified needs, see Research Needs Work Group (2009).. The numbering system above refers to the last two subsection numbers in the appropriate chapter in the report.