Protecting the Homer Spit

A Local Effort for Coastal Resiliency

Written by: Landon Bunting, Nolan Bunting, Cody Bond, Jay-Mason Davis, and Galen Lyon

Contagious *Cyclopterus*

Coaches: Lauren Seaton and Leah Thon

Contact: lseaton@kpbsd.k12.ak.us, 235-4679

Homer High School
600 E. Fairview Ave.
Homer, AK 99603

"This paper was written as part of the Alaska Ocean Sciences Bowl high school competition. The conclusions in this report are solely those of the student authors."
Protecting the Homer Spit: A Local Effort for Coastal Resilience

Abstract:
“Vulnerability is our susceptibility to the harmful impacts of natural hazards” (FEMA, 2015). Understanding the complexity of this vulnerability is the basis for building resilience in a community. Our community contains an invaluable resource of the Homer Spit, a natural 4.5 mile long glacial spit extending into Kachemak Bay. The Homer Spit contributes to the community’s economic, social, and environmental value. Economically it is the business center of our tourism industry. Socially it holds much history of the town and contains the harbor. Environmentally, it is a key habitat for many marine species. Identifying the risk components on the spit can be daunting. There are businesses, industry, hazardous waste materials, water supplies, private and public property, and a fragile ecosystem that would all be seriously compromised in the event of a natural disaster. It is at most risk for a natural disaster such as a tsunami or earthquake but erosion and man-made disasters such as fire or the lack of containment of hazardous chemicals can also contribute to the area’s vulnerability. Our plan focuses on awareness of the communities involved, preparedness with physical kits as well as educating the public, and an evacuation procedure of Homer Spit in case of a tsunami.
The Homer Spit, see Figure 1, is a 4.5 mile stretch of gravel offering recreational, commercial, industrial, and residential use. It is a historical element in the town of Homer and attracts tourists from all over the world. This small area of land offers a source of social, environment, and economic opportunities that are diverse enough to accommodate the citizens of Homer and the visitors who come to experience it.

The Homer Spit has been occupied for many years and was one of the first settlements in Homer (Nasioti, 2014). The social contribution this land makes for the population around Homer has continually changed over the years. The beauty and centralized location of the spit draws people to explore and utilize the land. It is a destination for tourists and locals interested in bird watching, beach combing, dining, and shopping. Public art and culture are represented on the spit with the Pier One Theater, local sculptures, and public art displays. The Nick Duggan Fishing hole and the boat harbor allow fishermen to harvest fish for subsistence, commercial, and recreational use. The City of Homer has four zoning codes for the area including Marine Commercial, Marine Industrial, Open Space-Recreational, and Conservation (City of Homer, 2011). However, the city of Homer has 11 different land usages defined, see Table 1. The City of Homer has had several comprehensive plans to evaluate its use so that it continues to be a benefit to individuals and businesses in the community.
Table 1, “Land Use by Category” (City of Homer, 2011) *acreage includes tidal lands

This land area offers a variety of economic value to the community, Alaska, and the world. It is a center for the tourism industry with lodging, restaurants, and sources for retail. The port and harbor offers recreational based opportunities, supports the fishing industry, allows for a harbor for shipping of manufactured goods in and out of Alaska, and supports oil exploration and refinement in the Cook Inlet. The Deep Water Dock area is available for Coast Guard based operations, the State of Alaska Department of Transportation ferry system, and the cruise ship industry. There is fuel storage, manufacturing, and processing sites. Currently, the Homer Spit offers both economic and industrial development that, in turn, sustain year-round jobs for residents.

In addition, it has supported the local wildlife by offering protected habitat. Their presence encourages people to value the natural beauty and focus on environmental issues. It is a destination for many recreationists who enjoy what the environment has to offer including photography, water sports, wildlife viewing, and sport fishing. The Homer
spit supports camping in both private and public campgrounds for people to experience a closer look at nature. The beach and surrounding waters offer marine mammals, marine invertebrates, and vegetation to grow and live in their natural environment. Several locations, including the Mud Bay area and Mariner Lagoon on the Homer Spit, have been designated as critical habitat by the State of Alaska (Matz, 2012). The Mud Bay area and Mariner Lagoon are also considered part of the Western Shorebird Reserve Network (Matz, 2012). The protection of the environment is not only valuable for a healthy ecosystem, but is also critical to the value this area offers to the local economy in the form of tourism and fishing.

Like much of the coast of Alaska, it is in an active seismic area that is subject to tsunamis, earthquakes, landslides, volcanic eruptions, and erosion. The Army Corp of Engineers has intervened to maintain the integrity of the Homer Spit since the 1950s with new changes being made as technology advances (Chu, 1987). The use of the spit for commercial and recreational use is impacted by natural erosion and changes in the deposition of sediments. The biggest change was the recovery efforts following the 1964 earthquake (Gronewald, 1965) but continued modifications of the spit have been necessary to stabilize the area (Chu, 1987). Problems and solutions to both natural disasters and man-made modifications will continually change the landscape of the Homer Spit. Vigilant and continual efforts in these areas are vital to maintaining existence of the land mass but for the people who live and work in this area it is important that they be protected as well. This changing landscape is an area that leaves a segment of the population susceptible to disaster. Public awareness, preparedness and the execution of a plan to evacuate this area during a natural disaster is necessary.
The absence of an action plan will leave a community vulnerable and lessen the reliance of the Homer Spit and surrounding area.

**Risks**

The Kachemak Bay region, including the Homer Spit is constantly changing. Movement of the earth’s crust, seismic and volcanic activity is continually occurring in this region. There has been geological evidence of earthquakes in this area for thousands of years, one of which had a serious effect on the Homer Spit in 1964 (Waller and Stanley, 1966). This earthquake caused a submarine landslide that lowered the elevation of the Homer Spit (Waller and Stanley, 1966). Erosion and deposits of sediment are also contributing to the changes in the area and has been continually studied. Waves crash against the bluffs of Kachemak Bay and currents circling around the bay pick up sediment from areas like the Anchor River, nineteen miles from the Homer Spit (Google 2015). This sediment is transported, particularly during the large tides and winter winds that come from the north, and are then deposited onto the deep trench and underwater ridge that creates the Homer Spit. Nature’s force is continually shaping this area. We believe that tsunamis pose the greatest threat to the Homer Spit. The Homer Spit is very susceptible to a localized tsunami either from an earthquake or a landslide. The type of soil, silt loam, surrounding the bay is vulnerable to landslides (USGS 2015). A landslide from the surrounding shoreline as a result of a volcanic eruption of Mt. Saint Augustine or an earthquake could result in a landslide entering Kachemak Bay and causing a massive sea wave that would wash over the Homer Spit (Field, 2000). All of these factors leave this area very vulnerable and can result in devastation of the local economy, ecology and social aspects of the Homer region.
Potential Solutions

Beginning at the northern base end of the spit, the first concern is that the ecosystem including protected bird and marine mammal habitat will be impacted by factors. Sediment and deposits of material is changing the formation of the estuary (Erikson, 2000). Designated parking facilities, limiting vehicle traffic on the beach and controlled access is already being enforced (Armstrong, 2006). To limit erosion due to storms and tides, there has been an increased recognition that native plant species, like ryegrass, be maintained and enhanced (City of Homer, 2011). A seawall is one new innovation that may protect not only this area but also other vulnerable areas along the spit. The placement of rocks or seawall, help break up the waves and allow for a space for vegetation to grow and reduce erosion (Washington State University, 2015).

Continuing down the spit, buildings, marine industrial areas, boat harbor, residences and storage facilities appear. Currently there are no building codes for Homer Spit businesses (Venuti, 2015). These are particularly vulnerable to an earthquake or tsunami. Some of these buildings are placed on a boardwalk that is supported by pilings. They are wood pilings that are in constant state of degradation and disrepair. One solution would be to integrate stronger materials into the pilings such as concrete bases and surrounding the existing pilings with stronger materials. In the event of an earthquake or tsunami the stored materials and the buildings themselves can become projectiles, dislodge existing structures and in some cases deposit hazardous waste into the ecosystem. Developing building codes and zoning restrictions and having routine certified inspections would reduce this risk factor.

The road itself is also at risk. In the 1964 earthquake the entire spit dropped approximately six feet (Gronewald, 1965). The current asphalt of the road would not
likely sustain that damage. In the winter, with high tides and wind, the road is often closed due to debris and asphalt being eroded. Flood mapping is ongoing and new engineering techniques may be necessary to maintain the highway.

The entire Homer Spit is at risk for increased erosion and flooding due to climate change. The warming earth is causing sea levels to rise, increasing the severity of storms, and accelerating erosion of shorelines. The Homer Spit with its low elevation is particularly vulnerable. Federal, state and city governments are examining the impacts of climate change and making action plans (City of Homer, 2011).

Even with the best planning, engineering and designs, the Homer Spit is a very vulnerable area that would be difficult to protect in the event of a tsunami. It would be more important to have increased public awareness, evacuation plans and build community resiliency.

**Necessary Tools**

With current technology and previous historical evidence, we can determine areas affected by disasters such as tsunamis, flooding, erosion and earthquakes. In September of 2014 the U.S. Geological Survey released a document on what areas in the world would be affected by tsunamis near their location (USGS, 2014). In this theoretical scenario, the Homer Spit would be entirely immersed. Tools such as the Geographic Information Systems are advanced computers that are capable of analyzing any geographical model on the earth (Goodchild, 2010) including impact by localized events, including tsunamis and earthquakes. The Flood Inundation Mapping system used by the United States Geological Survey can indicate where flooding is most likely to occur. The Pedestrian Evacuation Analyst program demonstrates how long it would
take to for a person to evacuate an area. The Deep-ocean Assessment and Reporting of Tsunamis, see Figure 2, is a mooring system that is capable of detecting tsunamis and sending the data to a warning center. These tools along with historical data, can assist in the understanding of how a community can improve its understanding of an event and how to prepare and protect vulnerable areas and populations.

![Deep-Ocean Assessment and Reporting of Tsunamis](NOAA 2015)

**Figure 2 “Deep-Ocean Assessment and Reporting of Tsunamis” (NOAA 2015)**

**Action Plan**

Resilience planning can reduce vulnerability of the Homer Spit and one step in the building of community resilience is the implementation of practical applications that can be incorporated into community and individual preparedness. It is not possible to be protected from a disaster, but one way we can reduce our vulnerability and increase our resistance as a community is to empower individuals and organizations to be prepared. Our action plan will focus on a three-pronged approach: public awareness through identifying key groups of people who would be willing or mandated to participate in educational programs, preparedness with emergency kits, and evacuation plan for the Homer Spit area.

The first aspect of our plan is about public awareness. We need to involve select community members who can educate visitors or employees. These groups may
include hotel personnel, harbor employees, business managers, charter boat operators, and local and state government employees. Participation by these core groups could create an infrastructure necessary to building resiliency. However, their lack of education will interfere with the understanding and the adoption of emergency plans and can lead to resistance to any measures taken to insure public safety. This increases vulnerability of the community.

The public awareness component would be to distribute prepared educational materials that different populations within the community would modify to fit their sector of the public that come to the Homer Spit. For example, the material could be integrated into interactive kiosks located at tourist destinations. Signs with instruction on where to proceed in case of an emergency should be prevalent and in highly visible locations. To accommodate the international visitors, references to assist with interpretation and education could be developed on phone apps or translated into various languages. This could also include a change in city ordinances to mandate these brochures to be given to businesses, posted and distributed to patrons. This ordinance could require that posted directions for evacuation be included in every residential facility, tourist boat, public and private business and federal or city owned facilities. Required in this publication would be an element of awareness and steps to be prepared for emergency action. These materials should minimize the barriers to compliance and adoption of mitigation efforts, and overcome the variables of education, culture, individualism or lack of experience.

Aside from prepared material it is important to have an educational component that is interactive within this infrastructure. Programs in residential facilities and
businesses should be offered on an annual basis to orient new employees and refresh long-term employees on the “resilience planning cycle: prepare, protect, respond, recover and adapt” (FEMA, 2015) for this area. Safety training and the development of local response teams that could be identified, and then be prepared to educate and assist others should be included in this training module. A sign that would identify the business or individual who has agreed to take this level of responsibility could be incorporated to increase public awareness of options in an emergency. City ordinances that would require mandatory training should be developed to insure compliance.

Moving into the preparedness section of our action plan, individual businesses should be instructed to have an emergency kit available and supplies to protect businesses. A central emergency preparedness site, away from the more likely damaged areas should include emergency kits, fresh water supplies, communication and power sources. A community workforce for the management of these systems should be identified and periodically trained on risk factors associated with a disaster.

Evacuation of the Homer Spit is the third prong in our action plan. Aside from individual and public education, the current systems that are in place to increase the ease of evacuation need to be evaluated. It is important that this infrastructure for evacuation planning is well maintained and operational.

Public awareness in the action plan involves the current community broadcasting system for tsunami warning that is evaluated monthly by the City of Homer (NOAA). However, it may not be sufficient, and can lead to public misunderstanding or complacency. The signal comes from the United States Tsunami Warning Centers but is not designed to detect a localized tsunami that could be generated by a local
earthquake or landslide (NOAA). For example, the city of Cannon Beach, Oregon, changed their practice test signal to mooing cows along with the instructions for evacuation, reducing the complacency of ignoring the signal in the event of a real emergency (City of Cannon Beach). Homer could adopt a variation of this plan. A sufficient warning signal that would instruct people on evacuation is crucial to public safety.

In the event of an evacuation of the Homer Spit, is it important to consider some contributing factors that could impede the flow of traffic on and off the Homer Spit road. Vehicles on the spit would need to be directed so as not to cause traffic barriers for evacuation of the spit and community responders should be trained in this area as part of the action plan on awareness and preparedness. Homer Spit has only one, two-lane road. The traffic flow on and off the spit has to be organized and managed so that evacuation is more effective. Aside from emergency personnel who may be entering the road, the local transportation for evacuating people is from school bus facility located in Homer. Instruction on carpooling people should be incorporated into planning so as to reduce traffic as well.

If there is sufficient warning it is good practice to move a boat to a deeper part of the bay, thus reducing damage that would occur in unsecured or poorly secured boats in the harbor area. Boat owners coming onto the Homer Spit to secure or move fishing vessels can also cause traffic congestion. The trained personnel would need clear and precise instruction on evacuation as well as incorporating this into the educational materials that would be distributed.
Even though there are three separate components of this action plan, they are equally important and still are cooperative in the effort to create a more resilient community. Training the community, engaging citizens and getting collaboration across various businesses and community organizations can strengthen the resilience of the Homer Spit community.

**Evaluation of the Action Plan**

Our approach to evaluating our action plan would include a survey of the effectiveness of our educational outreach and drills on preparedness and evacuation. The survey would include a checklist that would be distributed to the same population that received the public awareness and preparedness material. The survey would contain questions requiring yes/no/true/false responses. These questions would directly relate to material covered in the distributed brochures, signs and pamphlets. Completed surveys would be collected at businesses, Homer Chamber of Commerce and sites throughout the city and Homer Spit area. Analyzing the responses in these surveys would give an indication to personnel involved in public awareness, preparedness or evacuation on the effectiveness of the educational material.

In addition, it is important to conduct drills with the people involved in the resiliency training. These drills would include a wider variety of community members including those identified as first responders in previous training programs, police, fire and EMS services and local government agencies and community volunteers, civic and faith based groups, non-profit organizations, cultural groups, students and educational groups. These drills could take place annually, preferably before the start of the tourist season. Drills would include reassessing the emergency locations of prepared
materials, signage, and replacing or modifying existing emergency kits and materials. A
drill on the evacuation of the Homer Spit including traffic control and evacuation of
people would be conducted during a set time frame. Evaluation of the compliance,
participation and ease of evacuation in terms of numbers of evacuated people in a given
time frame would be conducted after the drill sequence. Follow-up training on the
positive and negative aspects of this process would be implemented for the core
agencies or individuals involved in developing or modifying existing evacuation plans to
assure the increased effectiveness of the plan.

The three-pronged approach and determining its effectiveness does not account
for all the variables that can occur on the Homer Spit, however, it's implementation can
lead to community reliance and reduce the vulnerability of this important social,
economic and environmental area of Alaska.

References

and-drink-your-way-through-homer

Armstrong, M. 2006 “Police Remind ATVers Where It’s Okay To Ride On Beaches”.

Chu,Yen-His; Gravens,Mark B.; Smith, Jane M.;Gorman, Laurel T.; Chen, H.S. “
Coastal Engineering Research Center, Vicksburg, MS; September 1987.”Beach Erosion
Control Study, Homer Spit, Alaska”. http:
oai.dtic.mil/oai?verb=getRecord&metadataPrefix=html&identifier=ADA187016

City of Cannon Beach, Oregon “ Education and Outreach Case Study: City of Cannon
Beach, Oregon Unique Tsunami Warning;  

City of Homer, 2011. “Homer Spit Comprehensive Plan”, www.city of homer-
ak.gov/Planning/spit-comprehensive.
City of Homer. www.cityofhomer-ak.gov/planning/building codes.


NOAA (National Oceanic and Atmospheric Administration); www.tsunami.noaa.gov/warnings_forecasts.html)


