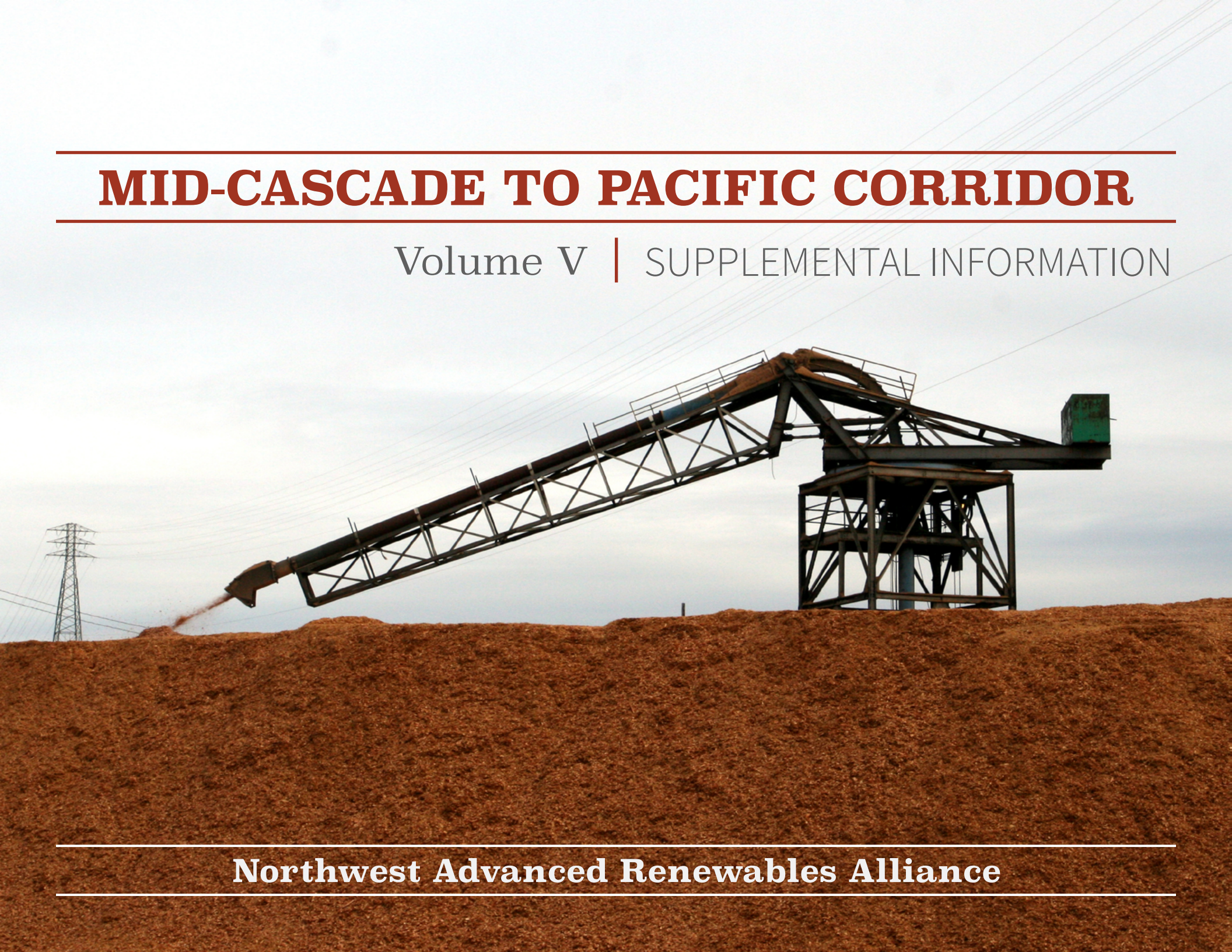
MID-CASCADE TO PACIFIC CORRIDOR

Volume V | SUPPLEMENTAL INFORMATION



Northwest Advanced Renewables Alliance

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ABBREVIATIONS

AFRI	Agriculture and Food Research Initiative program
AHB	Advanced Hardwood Biofuels Northwest
BDT	Bone Dry Tons
Brownfield	Abandoned or underutilized site with real or perceived contamination
CAPS	Coordinated Agricultural Projects
CAAM	Community Asset Assessment Model
C&D	Construction and Demolition Debris
CIA	Community Impact Analysis
CY	Cubic Yard
Greyfield	Vacant or underutilized site with no contamination
IDX	Integrated Design Experience
IO	Input-Output Analysis
LCA	Life Cycle Assessment
MRF	Material Recycling Facility
MSW	Municipal Solid Waste
N&E	New and emerging
NARA	Northwest Advanced Renewables Alliance
NIFA	USDA National Institute of Food and Agriculture
OSU	Oregon State University
RFA	Resource Flow Analysis
RWW	Recycled Wood Waste
SLA	Site Location Analysis
TEA	Techno-Economic Analysis
UI	University of Idaho
USFS	United States Forest Service
MC2P	Mid-Cascades to Pacific Corridor
WSU	Washington State University

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Northwest Advanced Renewables Alliance

Mid-Cascade to Pacific Corridor

5.1.0 IDX DESIGN STUDIO

In the Fall 2013/Spring 2014 academic year, the Integrated Design Experience (IDX) Studio, an interdisciplinary undergraduate and graduate design class and part of the Northwest Advanced Renewables Alliance (NARA) Education Team, studied the regional supply chain assets, the history of the wood products industry, the available inventory of forest residual biomass, and developed conceptual plans for locations that may be ideal for a future biomass-to-biojet manufacturing facility in the Mid-Cascade to Pacific (MC2P) region www.idexstudio.org.

A total of five former and current industrial operations in the MC2P were identified as having potential to become a biomass-to-biojet fuel operation.

Due to their proximity to the Pacific Coast and nearby waterways, such as the Columbia River and the Chehalis River, these sites may be more prone to natural hazards (e.g. flooding, severe storms, earthquakes, and tsunamis). Building upon the geographic data collected during IDX Studio, an IDX Graduate Student collected and reviewed the "All Hazard Mitigation Plans" for each of the three counties where a proposed biojet fuel operation was suggested by the IDX Studio. The natural hazard information is summarized in this Supplemental Student Work.

Table 5.1.1 Former and Current Industrial Operations in the MC2P with potential Biojet Fuel facilities

NAME	COUNTY	CITY	STATE
Weyerhaeuser Bay City Pulp and Packaging	Cowlitz	Aberdeen	WA
Sierra Pacific Industries, Aberdeen Division	Grays Harbor	Aberdeen	WA
Cosmo Specialty Fibers	Grays Harbor	Cosmopolis	WA
Kapstone (a/k/a Longview Fibre Company)	Cowlitz	Longview	WA
Former Bradley-Woodward Lumber Company	Clatsop	Bradwood	OR

In order to eliminate losses from the impacts of natural hazards, the Federal Emergency Management Agency (FEMA), recommends mitigation actions that can be taken.

There are six categories of hazard mitigation strategies, which are provided by FEMA:
1) Prevention (zoning, building codes, storm water regulations)
2) Property Protection (elevation, relocation, structural retrofits)
3) Public Education and Awareness (outreach projects, real estate disclosure)
4) Natural Resource Protection (sediment and erosion control, stream corridor restoration)
5) Emergency Services (warning systems, protection of critical facilities)
6) Structural Projects (dams, levees)

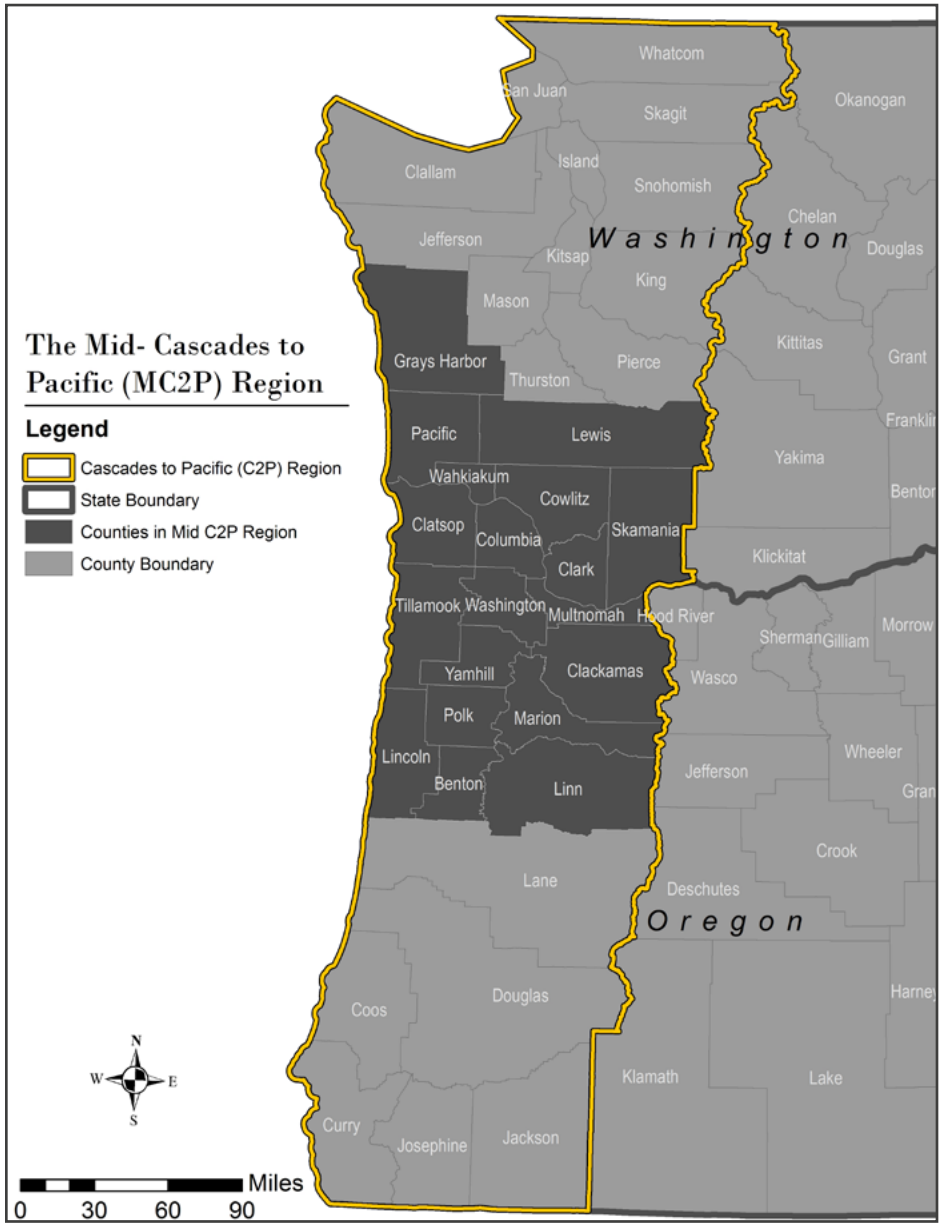

Figure 5.1.1. Map of the MC2P Region and Conceptual Design

Table 5.1.2 MC2P sites probability of experiencing multiple hazards based on FEMA definitions.

	SEVERE STORM	EARTHQUAKE	TSUNAMI
Weyerhaeuser-Baycity	▲	●	●
Cosmopolis	▲	●	●
Sierra Pacific Industries	▲	●	●
Kapstone/Longview Fiber	▲	▲	◆
Bradwood	◆	▲	◆
▲ =	HIGH Probability of hazard occurring		
● =	MEDIUM Probability of hazard occurring		
◆ =	LOW Probability of hazard occurring		

Table 5.1.2 summarizes the probabilities of multiple natural hazards and shows the likelihood of these hazards to impact the proposed biomass-to-biojet fuel sites, based on FEMA-approved hazard definitions and information reported in each of the county's All Hazard Mitigation Plans.

The probabilities are represented by three different shapes (triangle, circle, square), which indicate whether the hazard has a corresponding low, medium, or high probability of occurring. Following the visually illustrated table of hazard probability, a brief section describing the hazards in more detail with their overall probability of occurring. Each hazard has potential mitigation strategies more detail for each of the three counties in the MC2P, with its designated sites, that describes, which are listed in a comprehensive table following the county hazards section. Provided in this table are the potential mitigation strategies, with their estimated low and/or high cost and whether each strategy is long and/or short term. To conclude this analysis of hazard probabilities and mitigation strategies, a comprehensive list of barriers for implementing the mitigation actions is provided at the end of this section.

EARTHQUAKE: "the sudden release of stored energy. Most earthquakes occur along a fracture within earth, called a fault. The shaking caused by this sudden shift is often very small, but occasionally large earthquakes produce very strong ground shaking. It is this strong shaking and its consequences- ground failure, landslide, liquefaction- that damages buildings and structures and upsets the regional economy." (FEMA)

FLOOD: "general and temporary condition of partial or complete inundation of normally dry land areas from: 1. the overflow of inland or tidal waters. 2. the unusual and rapid accumulation or runoff or surface waters from any source or 3. mud flows or the collapse of shoreline land." (FEMA)

SEVERE STORM: "an atmospheric disturbance featuring sustained strong winds of 40 mph or greater and/or significant precipitation such as rain or snow that can pose risks to life or property and those that require the attention of authorities." (FEMA)

TSUNAMI: "train of waves typically generated during an earthquake by sudden displacement of the sea floor or lakebed. A tsunami can cause vast death and destruction. They are particularly dangerous close to their sources, where the first waves in the tsunami train can arrive within a few to tens of minutes of the shaking." (FEMA)

5.1.1 GRAYS HARBOR COUNTY, WA

SITES:

- Cosmopolis
- Sierra Pacific Industries
- Weyerhaeuser Bay City Mill

Grays Harbor County is vulnerable to four different hazards:
1) flood
2) earthquakes
3) severe storms
4) tsunamis.

Grays Harbor County is expected to experience a flood once every three years and these floods are becoming more prevalent due to climate change. There have been six Federal emergencies designed in this county, including the latest in 2009, which had all of the rivers in the county on flood watch.

According to the Washington State Hazard Mitigation Plan, Grays Harbor is also considered “most vulnerable and at risk” to earthquakes. There is a 40-50% chance of experiencing an earthquake with a magnitude of 5.0 in the next 50 years, with a 12-25% chance of a 7.0 magnitude earthquake within the same time period. Despite these percentages, Grays Harbor County has experienced an earthquake that has had a noticeable impact, in regards to damages, once every 35 years (Washington State Hazard Mitigation Plan). The county is most vulnerable to this damage because it is located within a “moderate” to “high” liquefaction zone and has a designated “D to E” geo-hazard site class.

Severe storms are another hazard that Grays Harbor County is susceptible to, there is a 170% chance of one damaging wind event per year, with winds 40 mph and greater. Furthermore, there is a 40% chance every two years for a severe storm bringing snowfall and freezing rain.

Tsunamis are hazards that are often not worried about due to their scare occurrences, however Grays Harbor has a 10-15% chance of one materializing over the next 50 years, which carries with it, a high tsunami inundation potential. If a tsunami were to hit Grays Harbor County, heavy long term damage would include the coastline subsiding six feet.

5.1.2 COWLITZ COUNTY, WA

SITE:

- Kapstone

Cowlitz County is vulnerable to three different hazards:
1) flood
2) earthquakes
3) severe storms:
    - high winds
    - heavy rain
    - heavy snow

The county, including the Kapstone site, is located in a 500-year floodplain and the nearby Columbia River is located in the 100-year floodplain. Due to the county’s location, it has a “high” probability of a flood occurrence, with a major flood prevailing every four years.

Cowlitz County is also vulnerable to earthquakes, with a probability of a damaging earthquake event being “high”. A destructive earthquake event occurs every 26 years. In 2001, an earthquake with a 6.8 magnitude hit the county, leaving behind property damage of 500 million dollars. Furthermore, in 1965, a 6.5 magnitude earthquake hit the area causing 12.5 million dollars in damages. Kapstone is located within this earthquake zone and the site has the potential to become more vulnerable due to its “moderate“ to “high” liquefaction base.

Severe storms are prevalent in this part of the state and Cowlitz County is susceptible to three types of these storms; High winds/windstorm, heavy rainstorms, and heavy snowstorms. There is a “high” probability of high winds/windstorm and the annual high wind occurrence rate is 175%. In the last 25 years, 18 Pacific Northwest Cyclones have impacted this region. Damaging heavy rainstorms have a 38% annual probability of occurrence, which means Cowlitz County has a “high” probability for damaging heavy rains to occur. Likewise, in the next 25 years there is a “high” probability for a heavy snow event in the county with a 50% chance of depths greater than four inches and an 11% chance of depths greater than one foot.

5.1.3 CLATSOP COUNTY, WA

SITE:
Former Bradley-Woodward Lumber site near Bradwood

Clatsop County is vulnerable to two different hazards:
1) flood
2) severe storms:
- high winds
- heavy rain
- heavy snow

The county, including the Bradwood Site has a “high” probability of flood occurrence, which means that one incident is likely to occur within a 10-35 year period. Furthermore, the county is located within the 100-year floodplain and the most recent flood event in this region occurred December 1-3, 2007, which had heavy flooding in all of Clatsop County.

Severe storms also have a “high” probability of occurring, especially with heavy rainfall and high winds. The most recent heavy rain events have occurred in 2001, 2003, 2004, 2006, 2007, which includes the aforementioned December flood event. The severe storm that prevailed December 1-3, 2007 brought hurricane force winds, rains, and mudslides. At least one major emergency or disaster as a result of a windstorm is likely to occur within a 10-35 year period, which means that Clatsop County is due for a damaging wind event in the near future.

5.1.4 BARRIERS FOR IMPLEMENTATION OF MITIGATION STRATEGIES

The All Hazard Mitigation Plans for Clatsop, Cowlitz and Grays Harbor identified several barriers that exist, which create challenges for implementing the recommend natural hazard mitigation strategies.

These are:
- Funding and cost source, can it be funded under existing programs or budgets? or does it need to come from an external source?
- Lack of external source
- Putting that funding into costly actions, which in the end, the hazard may not even occur. (lack of predictability)
- Unknown costs or too heavy of a cost (lack of concrete information)
- Unknown benefits (lack of concrete information)
- Costs vs. Benefits analysis
- No sponsor or lead agency
- Not priority
- Lack of regulations, the creation of hazard mitigation plan is Federally required, yet they lacked and without specific criterion.
- National Flood Insurance Program encourages development within these hazard areas.

Table 5.1.3 County Mitigation Strategies organized by implementation costs.

MITIGATION STRATEGY	LOW COST	HIGH COST	SHORT TERM	LONG TERM
Refer to external sources such as: - Comprehensive Plan - County Code - International Building Code - Stormwater Manual for Western Washington	X		X	X
Protect aquifers for community water supplies by constructing containment fields along rail lines and other transportation corridors		X		X
LiDAR flyovers to identify natural and converted areas capable of providing natural storage of floodwaters		X	X	
Restore wetlands that provide natural flood protection and reconnect off-channel habitat		X		X
Install flashing lights at beach approaches to identify escape points during dense fog conditions	X		X	
Beach setbacks to reduce threats from tsunamis and floods		X		X
Educational trainings for awareness	X		X	X
Relocate outside of hazard area		X		X
Build redundancy for critical functions and facilities	X	X	X	X
Clear stormwater drains and culverts	X		X	
Inspect roads to identify and remove danger trees that may block transportation routes for severe storms	X		X	
Tree planting projects	X		X	
Properly prune storm damaged trees	X		X	
Maintain and update 72 hour kits	X		X	
Develop an inventory of available generators and fuel distribution	X	X	X	X

5.1.5 REFERENCES

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