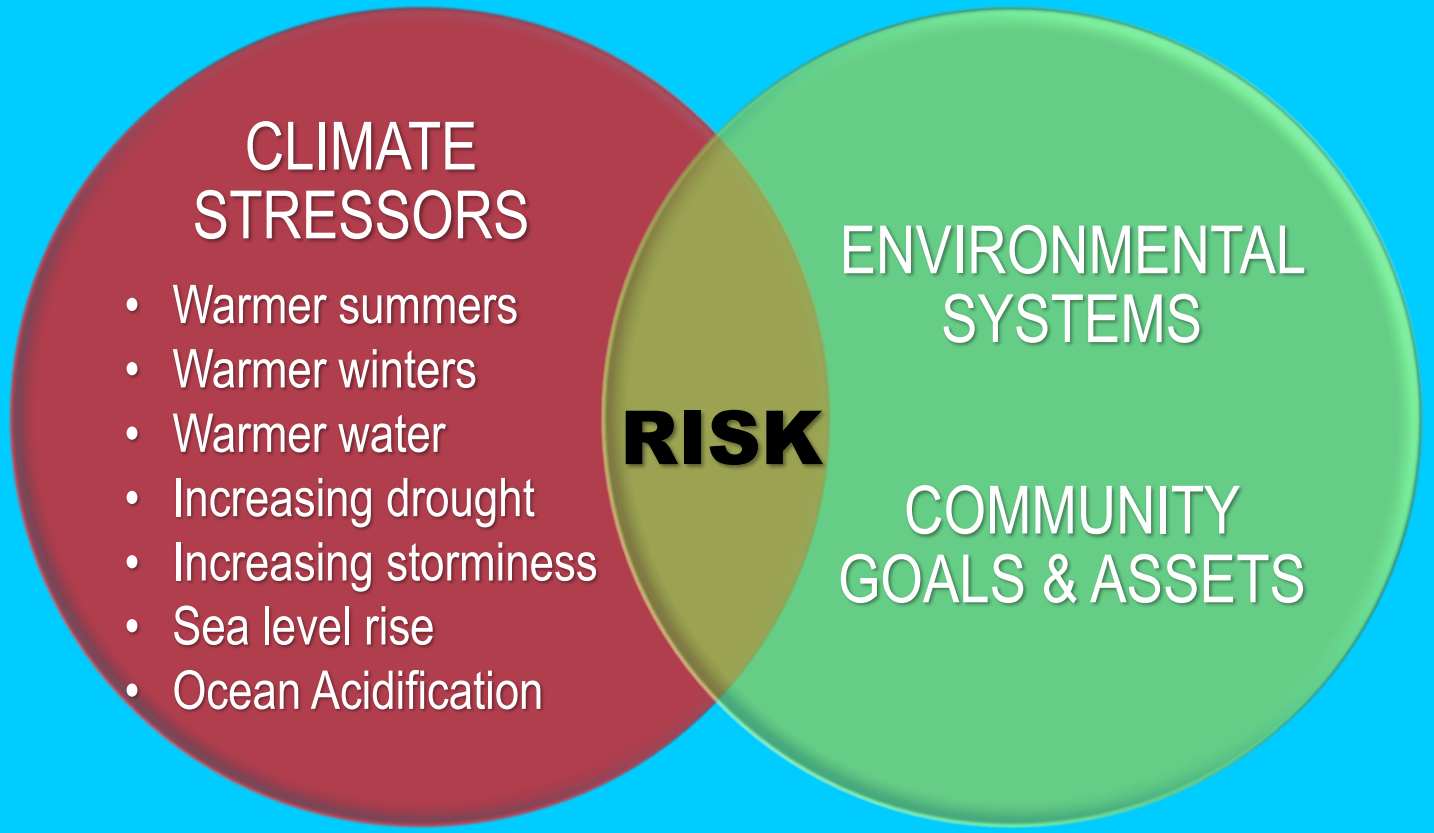
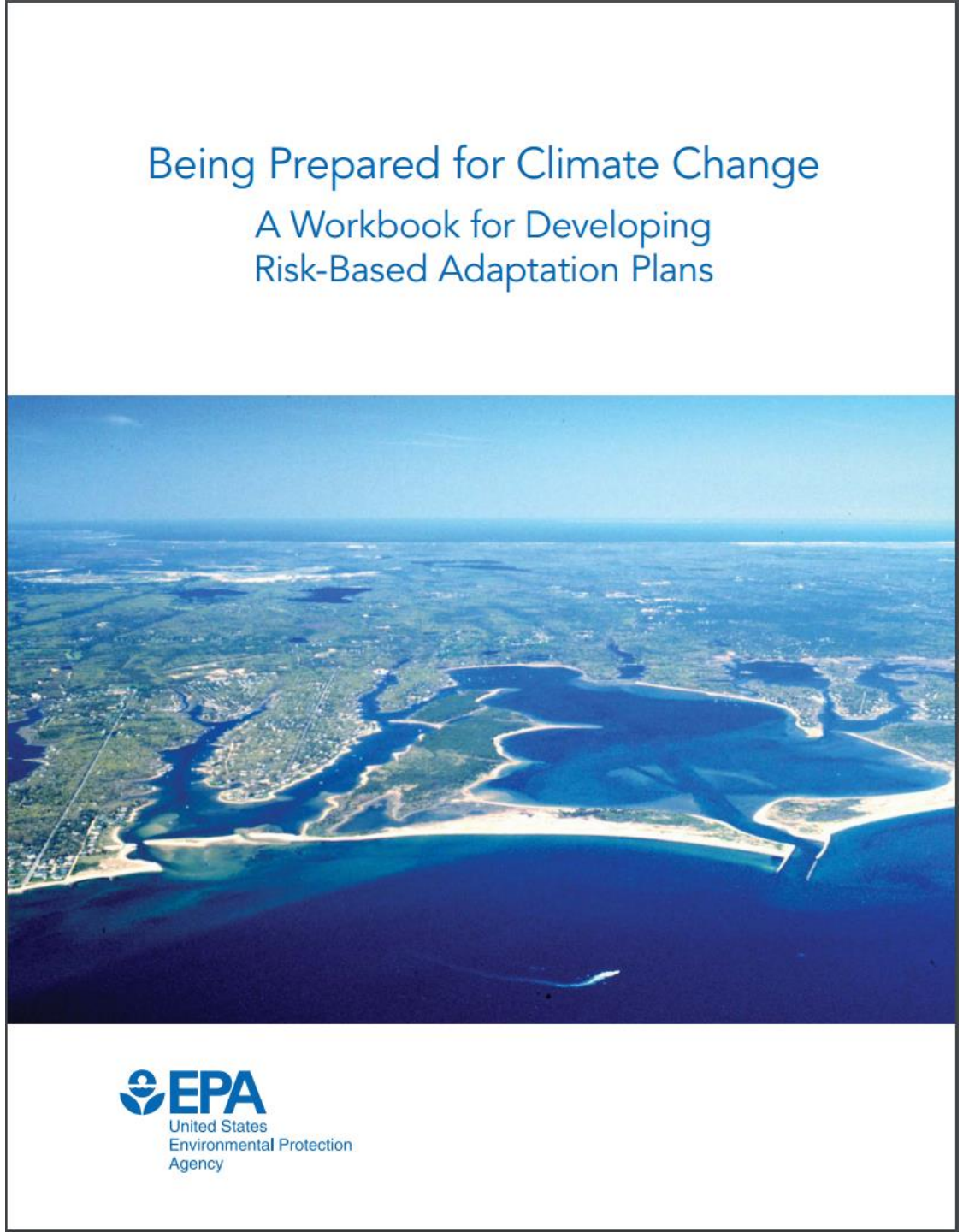

THURSTON
CLIMATE
ADAPTATION
PLAN
RISK
ASSESSMENT
Methodology

WHAT IS RISK?

Risk –

The potential for loss, damage, disruption, or other impacts created by the interaction of climate change stressors with environmental systems and community goals and assets



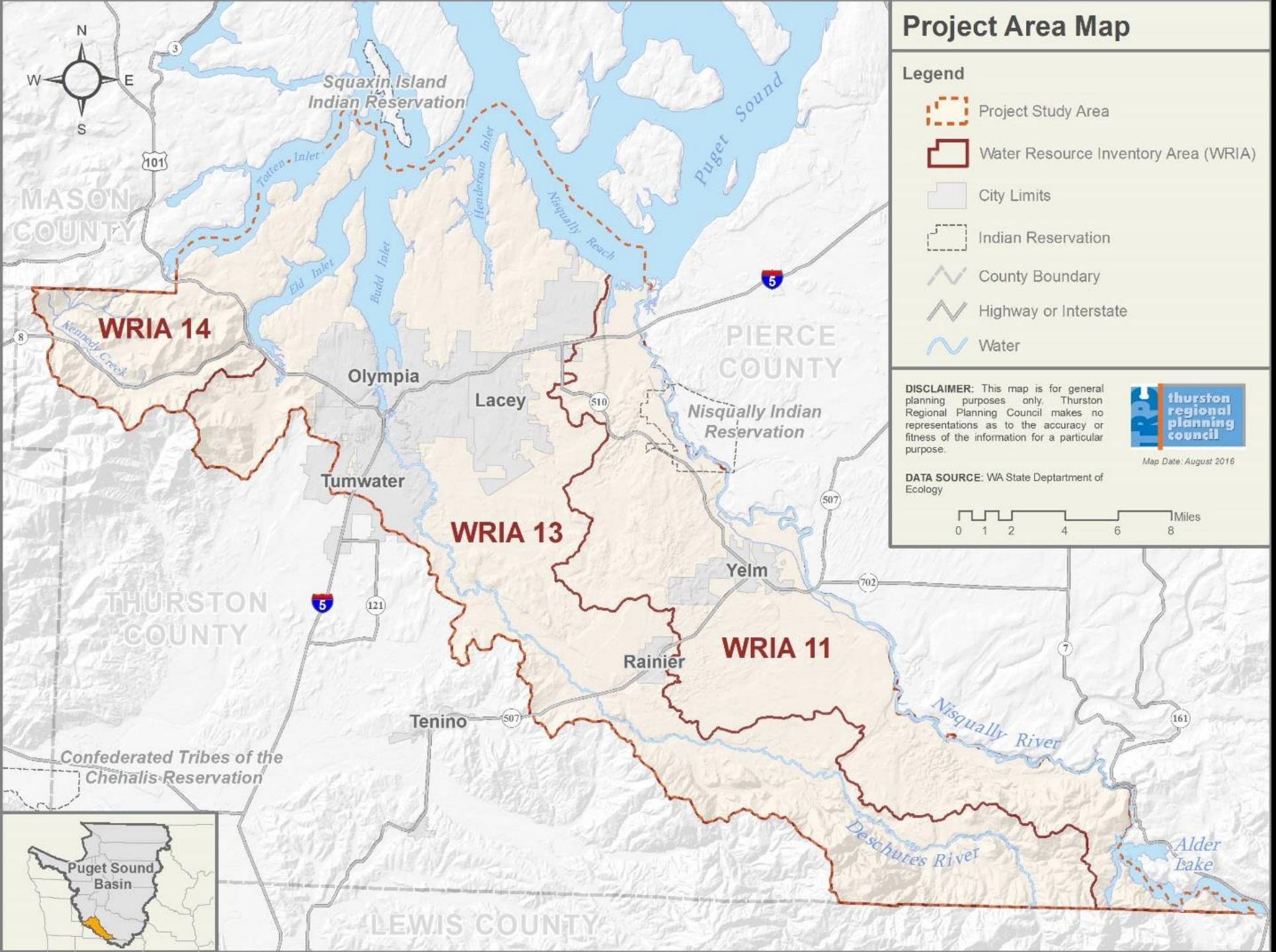


WHAT CAN WE DO?

RISK CAN BE MANAGED

Climate change risks and hazards can be effectively managed by identifying, analyzing, evaluating, and mitigating them

A ***Risk Assessment*** is a tool that informs the development of a ***Mitigation Strategy***



WATERSHED FOCUSED RISK ASSESSMENT

INFORMED BY

Science Summary
Vulnerability Assessment
other resources

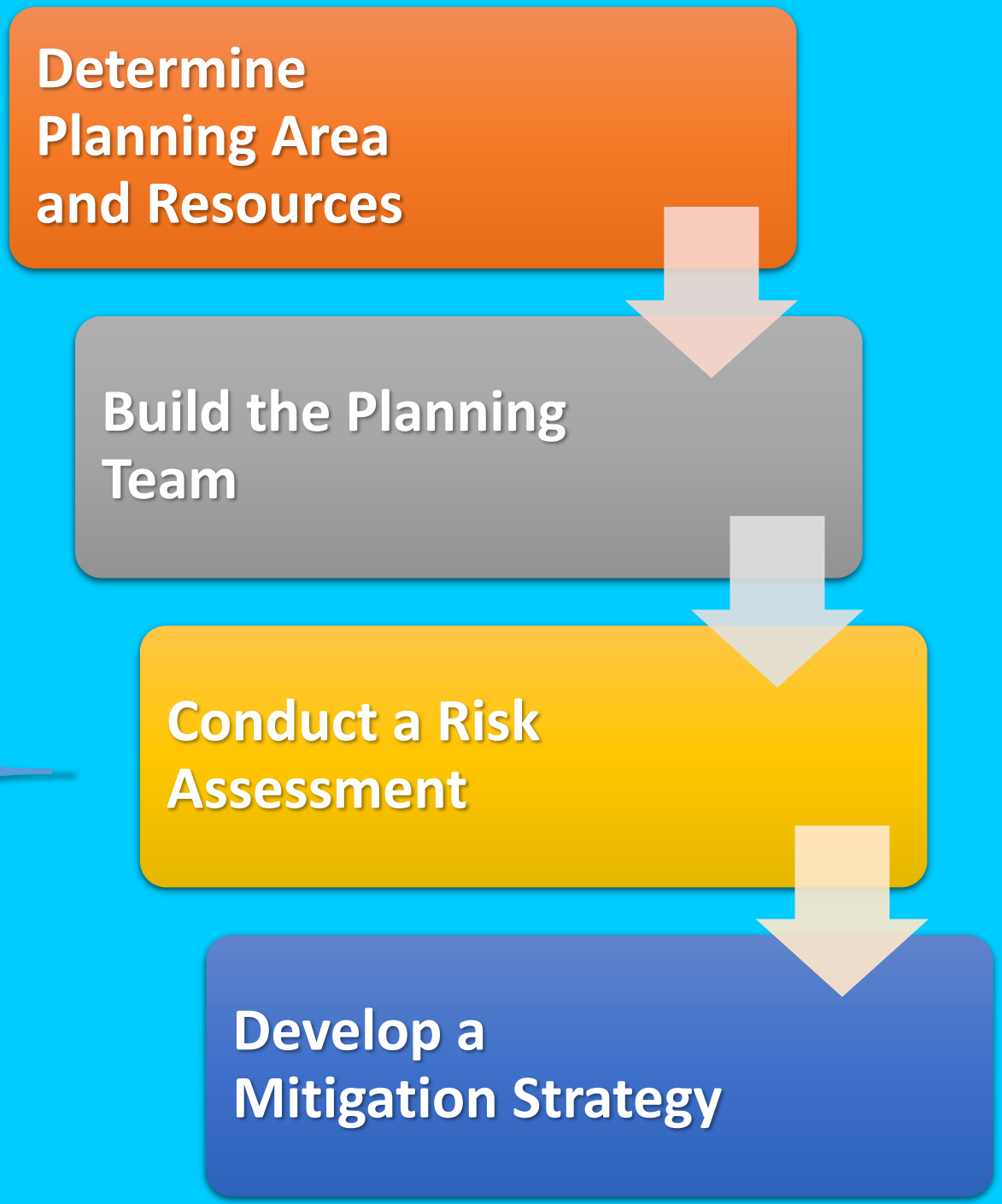
The Process

Risk Assessment

Overview

Conduct a Risk Assessment

1. Establish Community Context
2. Risk Identification
3. Risk Analysis
4. Risk Rating
5. Review Community Capabilities
6. Risk Prioritization



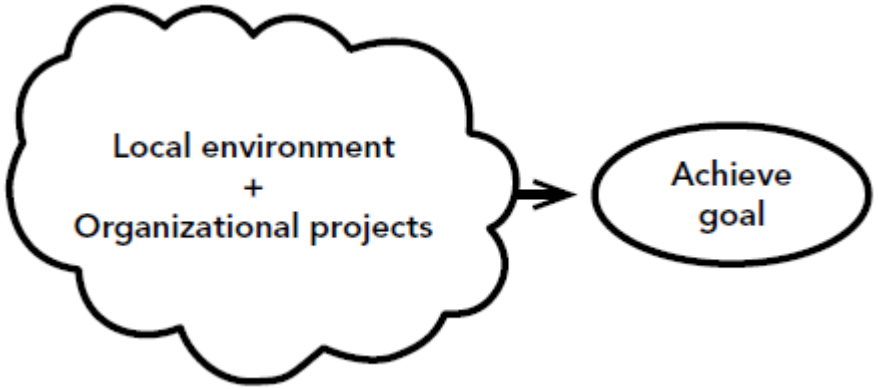
1. ESTABLISH COMMUNITY CONTEXT – GOAL IDENTIFICATION

- EPA's methodology: organizations' goals are fundamental unit for addressing risk
- Thurston Climate Adaptation Plan is a place-based planning process with diverse stakeholders
- Risk Assessment should include everything that affects goals and omit everything that has no effect on them
- *Sustainable Thurston goals* provides the baseline for the Risk Assessment
- Additional goals may be identified

2. RISK IDENTIFICATION

- Identify broad list of climate change risks that may adversely affect goal achievement
- Goals will be cross-tabulated with climate change stressors to identify risks

Business as usual…



Climate change stressor introduced to business as usual scenario…

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Climate Change Stressors

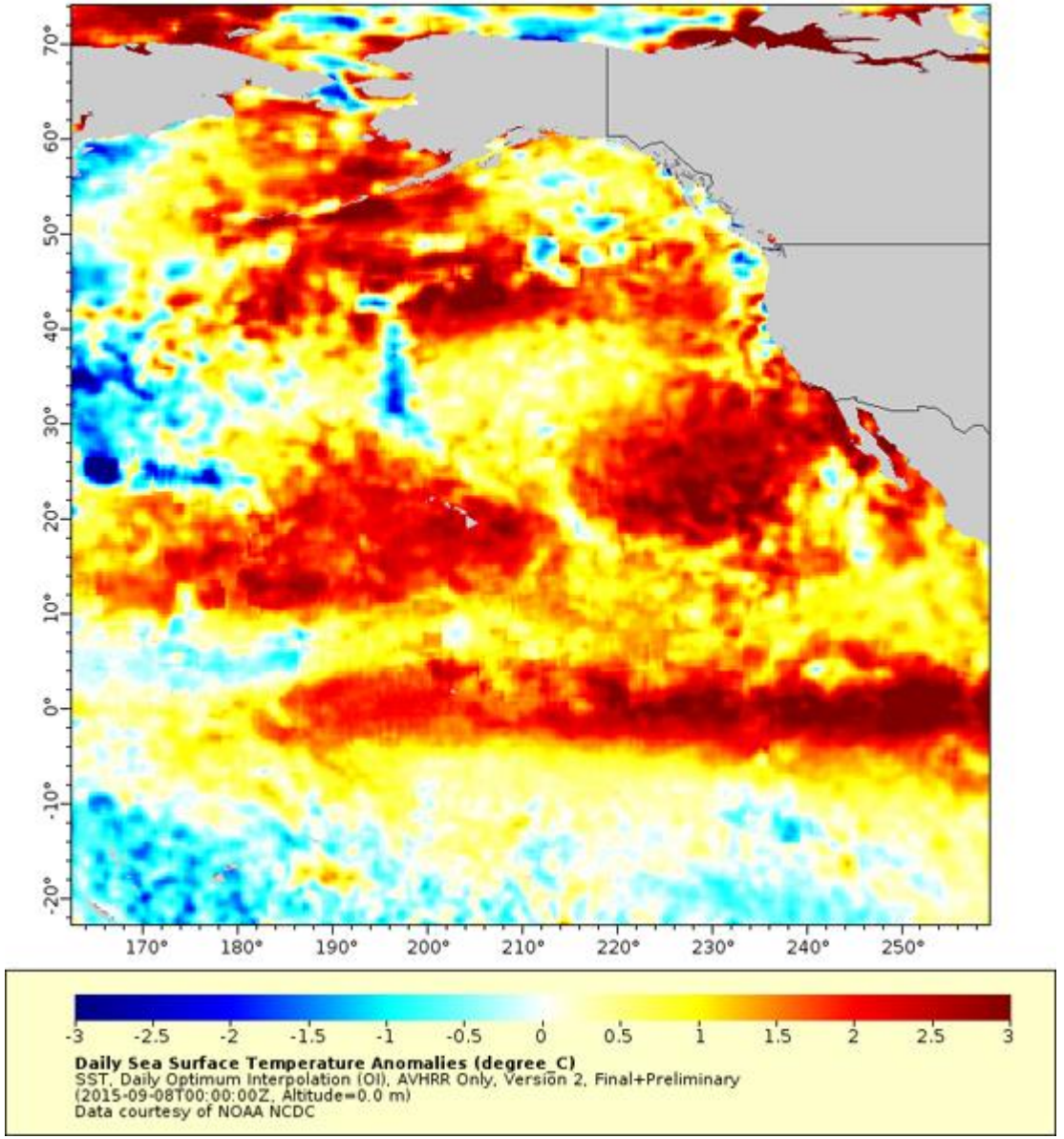
RISKS SORTED BY

1. Warmer Summers
2. Warmer Winters
3. Warmer Water
4. Increasing Drought
5. Increasing Storminess
6. Sea Level Rise
7. Ocean Acidification

STRESSOR, RISK, GOAL

Goal – Protect and improve water quality, including groundwater, rivers, streams, lakes and Puget Sound

Climate change stressor	Paths	Unrealized goal
Warmer water →	✓ Toxicity of pollutants may increase ✓ Water can hold less dissolved oxygen ✓ Greater algae growth may occur ✓ Parasites and bacteria have greater abundance, survival or transmission →	~~Maintain water quality~~



RISK IDENTIFICATION TABLE

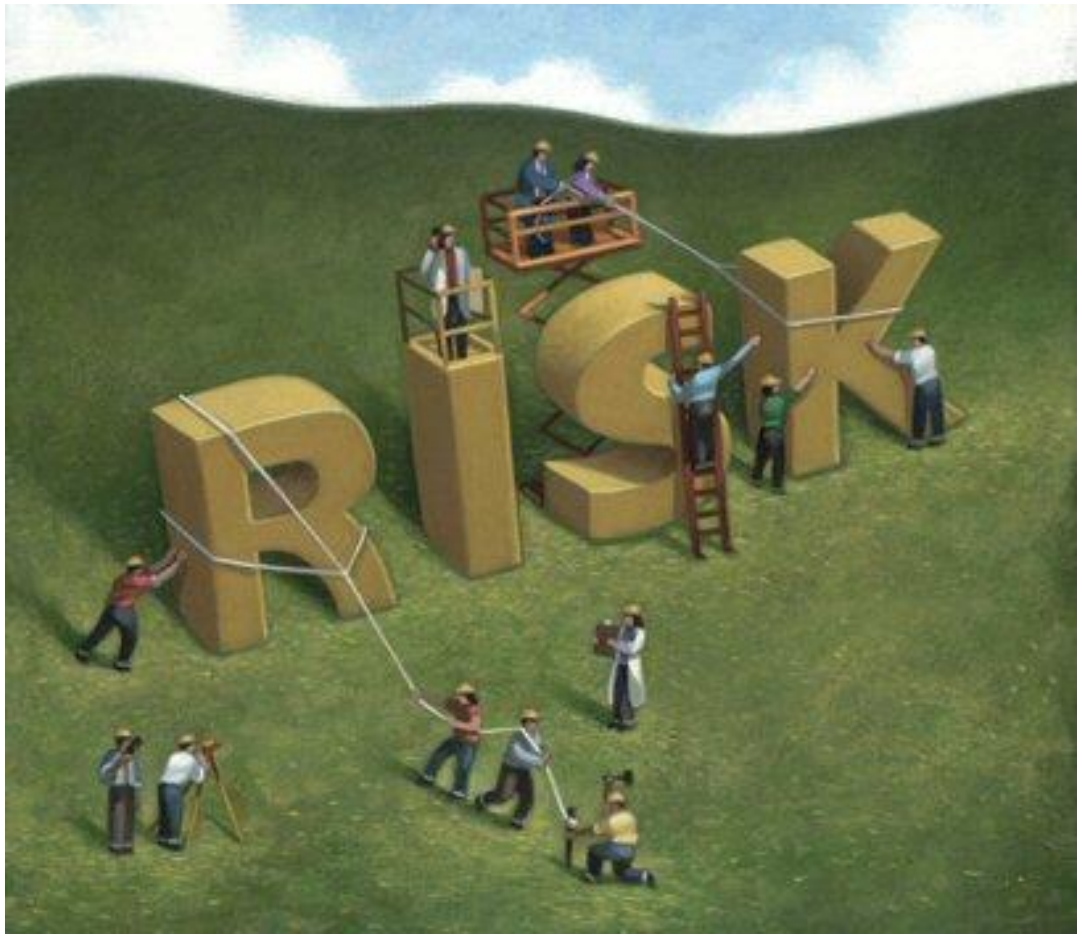
Plan Goals	Warmer Summer	Warmer Winter	Warmer Water	Increasing Drought	Increasing Storminess	Sea-Level Rise	Ocean Acidification
Goal 4: Protect and improve water quality, including groundwater, rivers, streams, lakes and Puget Sound	● Decreases precipitaton volume and raises water temperature of streams, lakes and Puget Sound, which degrades water quality and raises health risks (e.g., supports algal blooms) [Secs. 3.1 and 3.2, pgs. 32 and 45]. ● Decreases precipitation volume and groundwater recharge, which may raise pollutant concentrations in shallow wells [Sec. 3.4, pg. 51];		● Causes exceedences of temperature criteria for fish in some stream reaches [Sec. 3.1, pg. 38]; ● Increases the toxicity of algal blooms and harms human health [pg. XX]; ● May make it harder for local governments to comply with state water-quality TMDL standards [Sec. 3.1, pg. 43]	● Reduces aquifer recharge and may spur more groundwater pumping when surface water is scarce, which could make coastal groundwater more vulnerable to saltwater intrusion [Sec. 3.4, pg. 49] and, raise the cost of pumping well water from greater depths [Sec. 3.4, pg. 53].	● Increases the frequency and intensity of heaviest 24-hour rain events, which can increase volume of stormwater runoff [Sec. 2.3, pg. 27] and frequency and severity of floods [Sec. 6.2, pg. 79] and landslides [Sec. 6.2, pg. 81] that degrade water quality.	● Inundates former industrial sites, which may mobilize pollutants in the soil and degade water quality [Sec. 4.1, pg. 57]	● Increases in ocean pH and temperature, coupled with terrestrial pollution could support spread of bacteria (Vibro) in shellfish and threaten human health [Sec. 4.2, pg. 65];

3. RISK ANALYSIS

Process of understanding a risk

For each risk in the Risk Identification Table, analyze the:

- Source or cause of risk
- Likelihood (probability) of occurrence
- Consequence
- Spatial scale of impact
- Timing – when will it occur?
- Habitat type



HIGH LEVEL DETERMINATIONS USING QUALITATIVE SCALES

CONSEQUENCE

Low
life goes on
not as important
adjustments easily made

Medium

High
major disruption
goal difficult or impossible to attain

LIKELIHOOD

Low

Medium

High

SPATIAL EXTENT

Site
a few waterfront lots
bridge
sewage treatment plant

Place or Region
community
state forest

Extensive
major disruption
goal difficult or impossible to attain

HIGH LEVEL DETERMINATIONS USING QUALITATIVE SCALES

TIME HORIZON

More than 30 years

10-30 years

Already occurring (0-10 years)

HABITAT TYPE

Marine

Freshwater

Prairie

Forest

GOAL

Protect and improve water quality, including groundwater, rivers, streams, lakes and Puget Sound

STRESSOR – Warmer Water

RISK – Warmer Water increases the toxicity of algal blooms and harms human health

CONSEQUENCE - Medium

LIKELIHOOD – High

SPATIAL EXTENT – Regional

TIME HORIZON – Already occurring

4. RISK RATING

Process of reaching consensus on the assessment of risks

Involves developing and reviewing consequence/probability matrices

- Each risk is mapped to a cell based on its low to high consequence and likelihood developed in the risk analysis
- Staff develops first iteration
- Stakeholders provide input and confirm ratings
- Informs which risks will be the focus of the action plan

CONSEQUENCE/ PROBABILITY MATRIX

A VISUALIZATION TOOL

Green Risks | Yellow Risks | Red Risks

The C/P matrix should become an agreed-on categorization of all foreseeable climate-change-related risks based on their likelihood of occurrence and consequence to the goals.

Likelihood (probability) of occurrence	Low	Medium	High
High	1. Warmer water may stress immobile biota 2. Warmer water may lead to changes in drinking water treatment processes n. _____	1. Warmer water may hold less dissolved oxygen 2. Sea level rise may cause bulkheads, sea walls and revetments to become more widely adopted n. _____	1. Shoreline erosion from sea level rise may lead to loss of beaches, wetlands and salt marshes 2. Combined sewer overflows may increase from more intense precipitation n. _____
Medium	1. Increased wildfires from warmer summers may lead to soil erosion 2. Warmer winters may lead species that once migrated through to stop and stay n. _____	1. Parasites and bacteria may have greater abundance, survival or transmission due to warmer water 2. Warmer summers may drive greater water demand n. _____	1. More frequent drought may diminish freshwater flow in streams 2. More intense precipitation may cause more flooding n. _____
Low	1. Warmer water may lead open seasons and fish to be misaligned 2. Warmer winters may lead to more freeze/thaw cycles that impact water infrastructure n. _____	1. Warmer water may lead jellyfish to be more common 2. Ocean acidification may cause the recreational shellfish harvest to be lost n. _____	1. Contaminated sites may flood from sea level rise 2. Warmer water may promote invasive species n. _____
	Low	Medium	High
	Consequence of impact		

5. REVIEW COMMUNITY CAPABILITIES

Prepatory for developing the action plan

In this step, examine community abilities, resources, opportunities, and constraints to address risks

- Consider assets and liabilities of all partners
- What opportunities exist to remove barriers – are they feasible?
- What is the community/institutional support to invest efforts in addressing risks?
- Consider partners across the community

OPPORTUNITIES/BARRIERS

Environmental

Planning and Regulatory

Administrative and Technical

Human Resources

Economic and Financial

Education and Outreach

Political Leadership

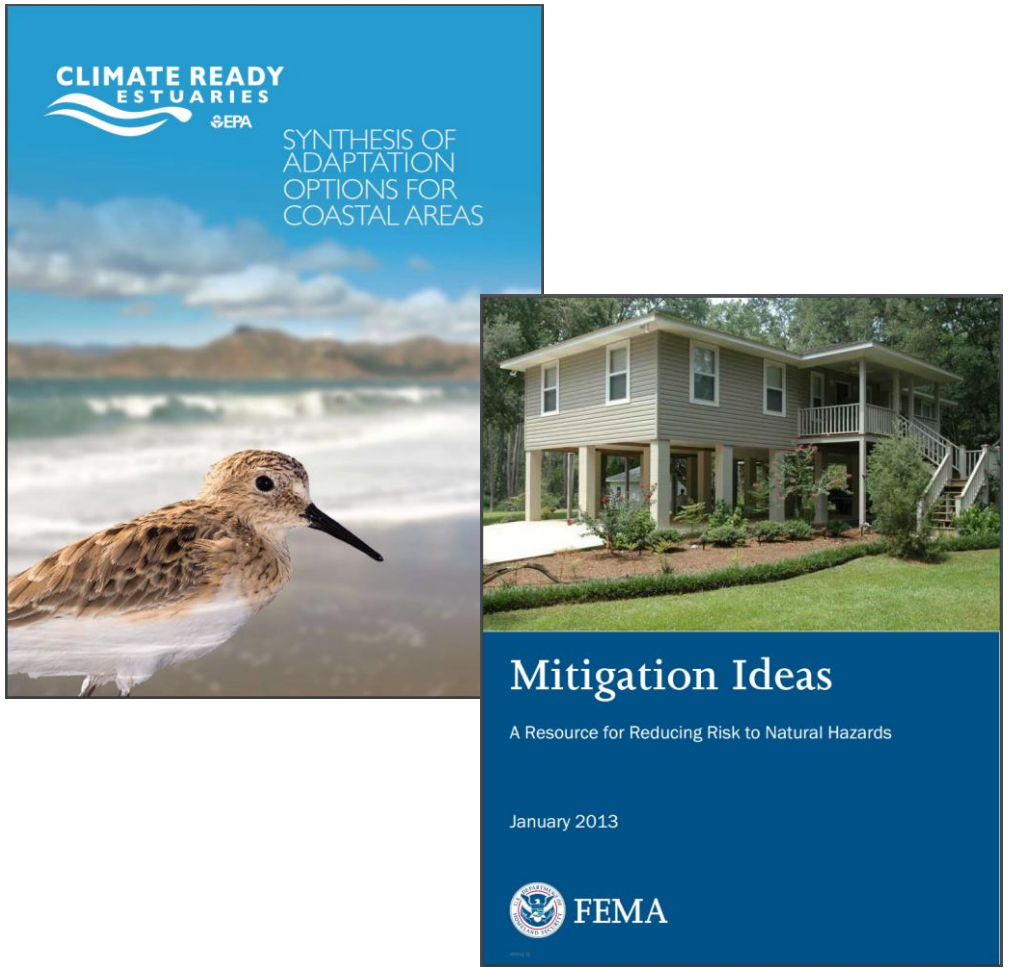
Social/Cultural

6. RISK PRIORITIZATION

Process to identify which risks will be the primary focus of the plan

Begin to research and understand range of potential mitigation actions for each risk

- Not all risks can be addressed
- Investigating feasible mitigation options can be resource intensive
- Limited resources should be allocated to highest priority risks



HOW RISKS ARE APPROACHED DETERMINES WHERE ADAPTAION ACTIONS ARE FOCUSED GOING FORWARD

MITIGATE

ACCEPT

TRANSFER

AVOID

MITIGATE

Mitigating a risk involves taking actions to reduce the likelihood and/or consequence of the threat to your goals.

Involves a commitment of organizational/community resources to address the risk, or lead the effort to address the risk.

TRANSFER

Transferring delegates responsibility of addressing a risk to another organization.

Other organizations need to affirm their commitment to mitigating the risk; otherwise the risk will still exist.

What you cannot transfer and do not want to accept or avoid, you must mitigate yourself.

ACCEPT

Accepting a risk means that your organization will continue with business as usual and run the risk, dealing with the impact if/when it does occur.

If you don't make a choice to use any other approach, then by default you have elected to accept a risk. You are running the risk.

The farther out a risk is on the time horizon, the better the accept approach becomes.

- **Green Risks in the C/P Matrix are good candidates for the accept approach.**
- **Yellow Risks that are decades away are candidates for acceptance.**
- **Red Risks are bad candidates for acceptance.**

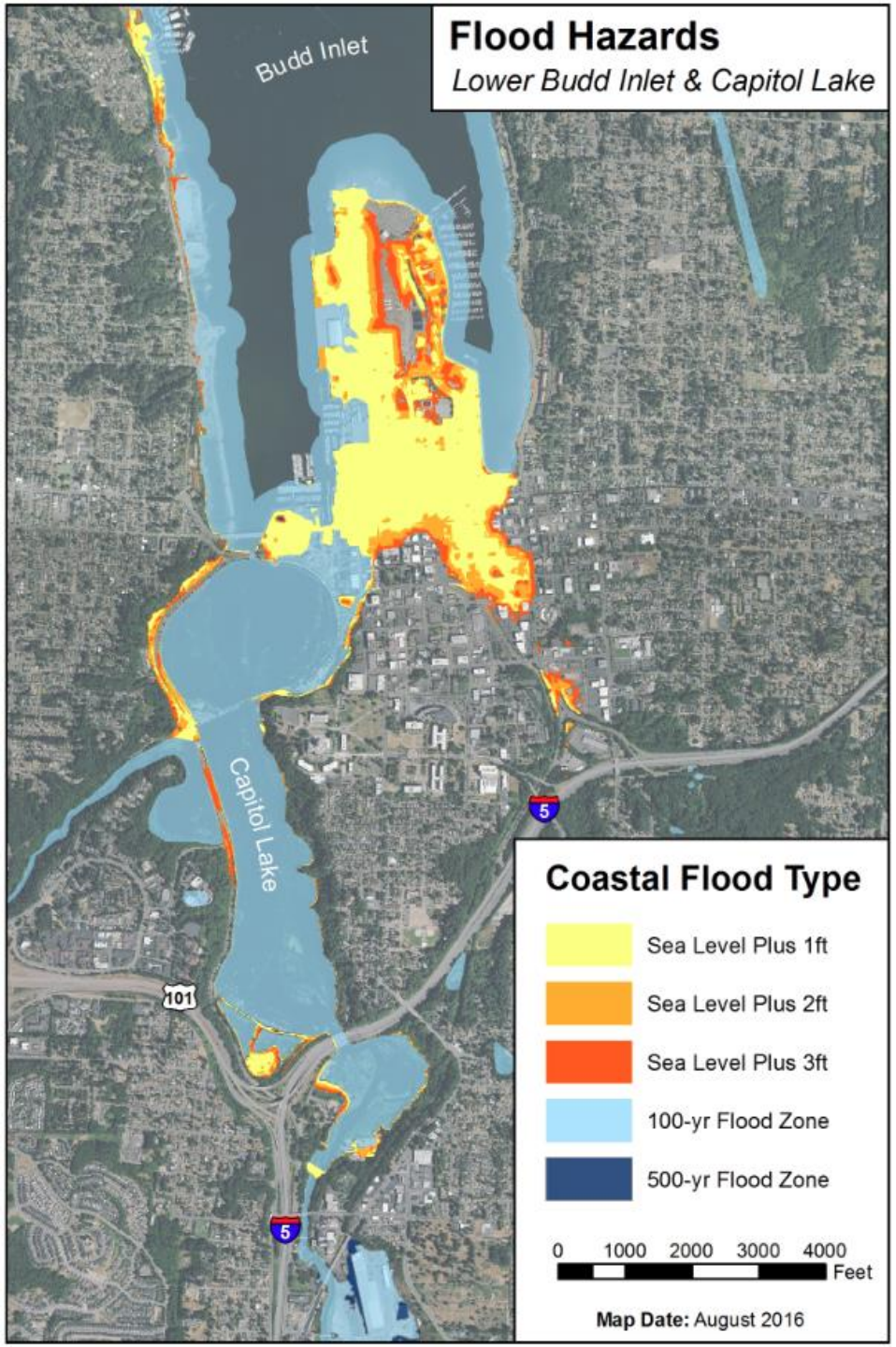
AVOID

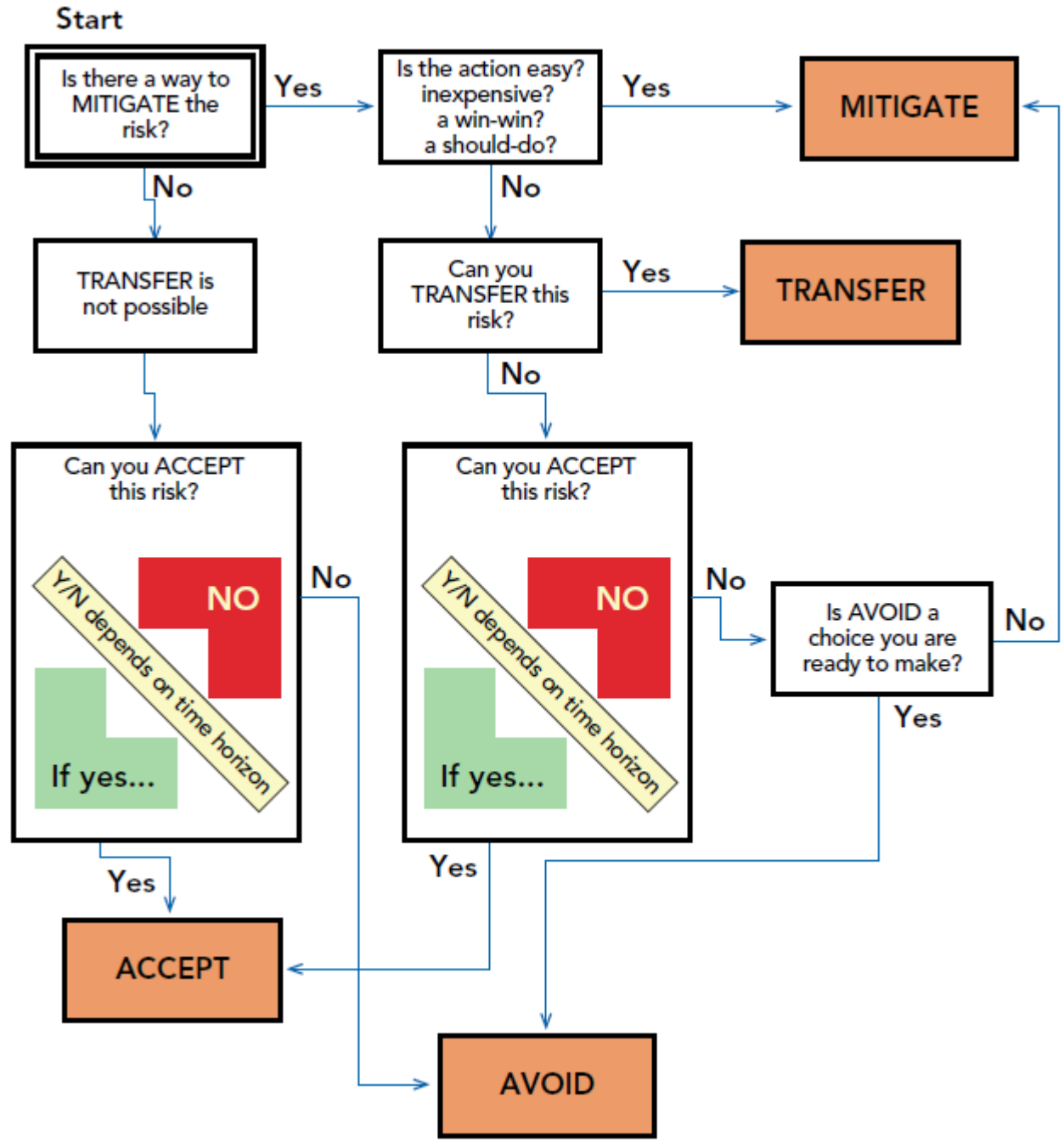
Avoiding a risk requires a shift in an organization's operations or goals so that you are no longer exposed to that risk.

Avoiding a risk may be a radical move for an organization: you will be pulling back from work that you thought was important, but it will free up resources to focus on other priorities.

Reserve this approach for risks that will not be mitigated (by you or others) and where accepting the risk is a bad proposition.

Key decision makers should approve this change in course.


Flood Hazards
Lower Budd Inlet & Capitol Lake
Budd Inlet
Capitol Lake
101
5
5
Coastal Flood Type
Sea Level Plus 1ft
Sea Level Plus 2ft
Sea Level Plus 3ft
100-yr Flood Zone
500-yr Flood Zone
0 1000 2000 3000 4000
Feet
Map Date: August 2016


Start
Is there a way to MITIGATE the risk?
Yes
Is the action easy? inexpensive? a win-win? a should-do?
Yes
MITIGATE
No
No
TRANSFER is not possible
Can you TRANSFER this risk?
Yes
TRANSFER
No
Can you ACCEPT this risk?
Y/N depends on time horizon
NO
If yes...
No
Can you ACCEPT this risk?
Y/N depends on time horizon
NO
If yes...
No
Is AVOID a choice you are ready to make?
No
Yes
Yes
Yes
ACCEPT
AVOID

TRANSFER ACCEPT AVOID

Risks that are not actively mitigated will be documented. They should be periodically reviewed and evaluated as new information becomes available or conditions change.

A different risk management approach such as mitigation may be warranted as community capabilities or priorities change.

PRIORITY RISKS FOR MITIGATION

NEXT STEPS

IDENTIFY ADAPTATION ACTIONS

Look at the risks selected for mitigation and consider a plausible range of actions that could be effective at reducing their consequence or likelihood

SELECT ADAPTATION ACTIONS

Screen potential actions to determine their feasibility and select those that are best suited to reducing the risks and meeting the community's goals

PREPARING AND IMPLEMENTING AN ACTION PLAN