

Biting Godzilla

How shellfish producers, scientists, and coastal states
are ganging up on ocean acidification

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Photo: Moremarin.com

Ocean acidification



**Cause for
panic?...**

...or old school resource management?



Influential Witnesses



L-R: Bill Dewey (Taylor), WA Gov. Christine Gregoire, Jane Lubchenco (NOAA)

Five response strategies

- **Improve understanding of problem & options**
 - Research and monitoring not just “academic.” Key: Know your enemy, know your tools
- **Mitigation (pollution reduction) TOP PRIORITY: CO2**
 - Also deep reductions in emissions & nutrient wastes are possible, often profitable.
 - Mitigating acidification in seawater more speculative.
- **Adaptation (defense)**
 - Shellfish industry now relies on monitoring of chemistry & larval performance in hatcheries: controlled environment.
 - Strong ROI demonstrated for now. How long will this work? Can it work in open water?
 - Adaptation methods outside hatcheries largely untested.
- **Remediation (restoration)**
 - Phytoremediation and shell restoration show promise, but need further field testing.
- **Leadership (build awareness of problem, options for response)**
 - Gov. Gregoire’s response.

Research & Monitoring

Know what you're up against



MITIGATION through incentives, cooperation

Tulalip biodigester helps farmers win by reducing pollution

- Dairy manure digesters can reduce CO₂e emissions, nutrient wastes.
- Tulalip's project has enfranchised farmers in habitat efforts.
- One dairy farm family has saved \$250k on waste hauling, earns extra \$ from power.



States take the lead: \$6m+ in AK WA

Even while Congress has stalled, states and federal agencies are making progress

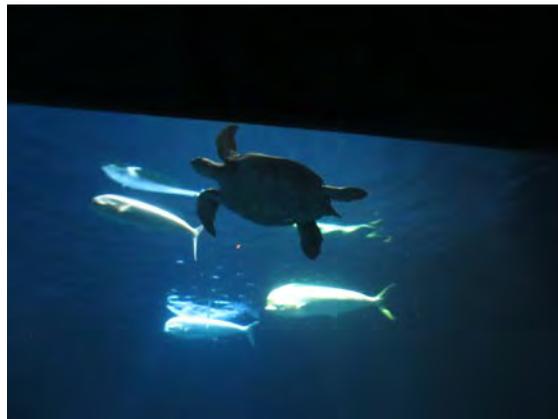


Tulalip Tribe helped launch Washington panel, reduce pollution(Terry Williams, left)

Helped industry win \$2.7 million state funding for Alaska OA Research at UAF (Clem Tillion, right).



California has tasked a science advisory panel to prepare advice on how to tackle OA.



For Alaska villages, **“Get us off carbon, wherever it is possible.”**
— Clem Tillion (R), retired 9-term Alaska state legislator, fisherman, rural community advocate.

Leadership

It starts with outreach, education

Volunteer shell restoration, remediation, monitoring projects provide some avenues



ADAPTATION



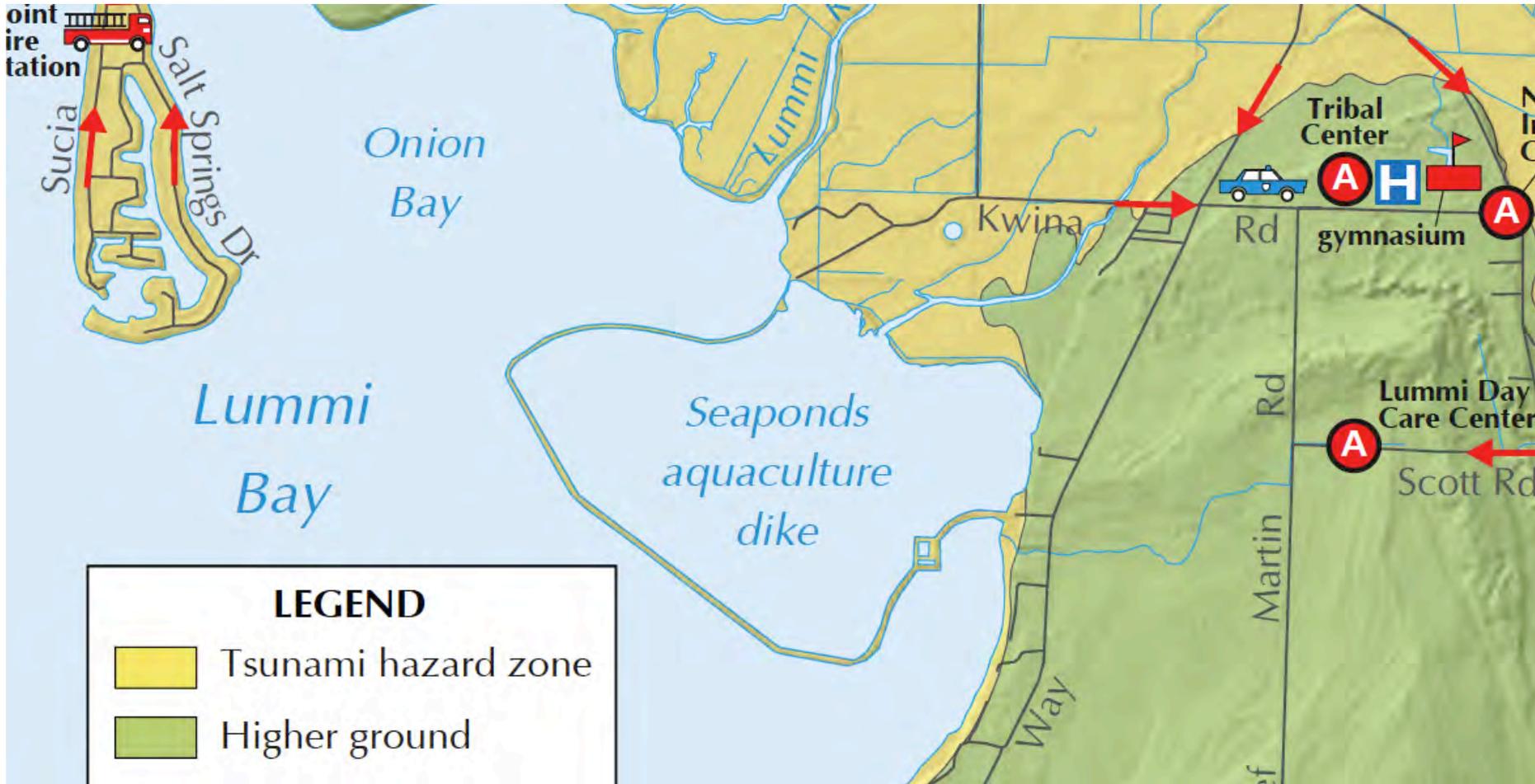
Hatcheries

Control of most vulnerable life-stage enabled them to defend larvae < 120 microns.

ADAPTATION

Manage acidification refuges

Diked tideflats and lowlands?



REMEDIATION



Seagrass, some macroalgae may “sweeten” water locally.