

# Melding Modern and Conventional: Approaches Towards Developing Hawai'i's First Protection & Restoration Strategy for Wetlands

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<sup>1</sup>Hawai'i Coral Reef Initiative

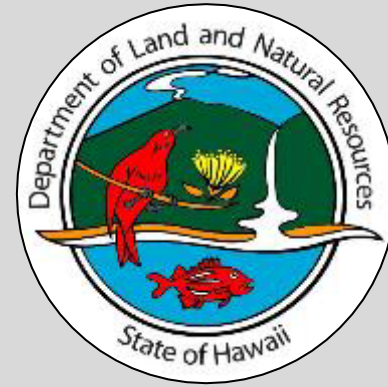
<sup>2</sup>Hawai'i Department of Land and Natural Resources, Division of Aquatic Resources



# Division of Aquatic Resources (DAR)

*Aquatic natural resources: Protection, Restoration and Management*

- Regulate commercial & recreational fishing
- Protected marine species
- Streams, estuaries, and coral reefs
- Marine reserves & managed areas
- Education & outreach



# Division of Forestry and Wildlife (DOFAW)

*Terrestrial Natural Resources: Protection, Restoration, and Management*

- Regulate hunting & outdoor recreation
- Plants, animals, and insects
- Forestry management
- Natural area reserves
- Education & outreach

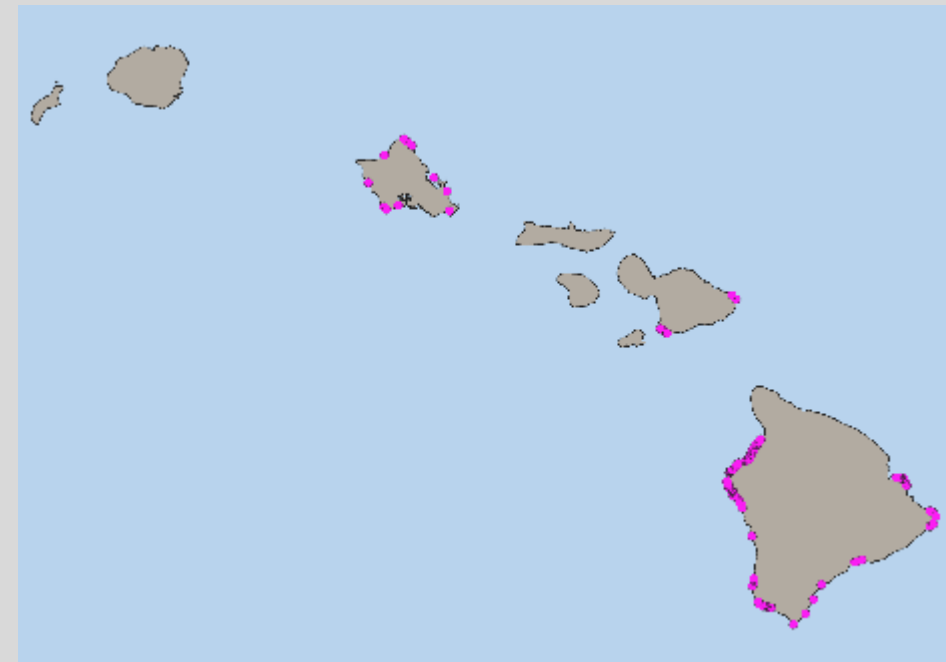


Brett Mossman



# Anchialine Pools in Hawai'i (DAR)

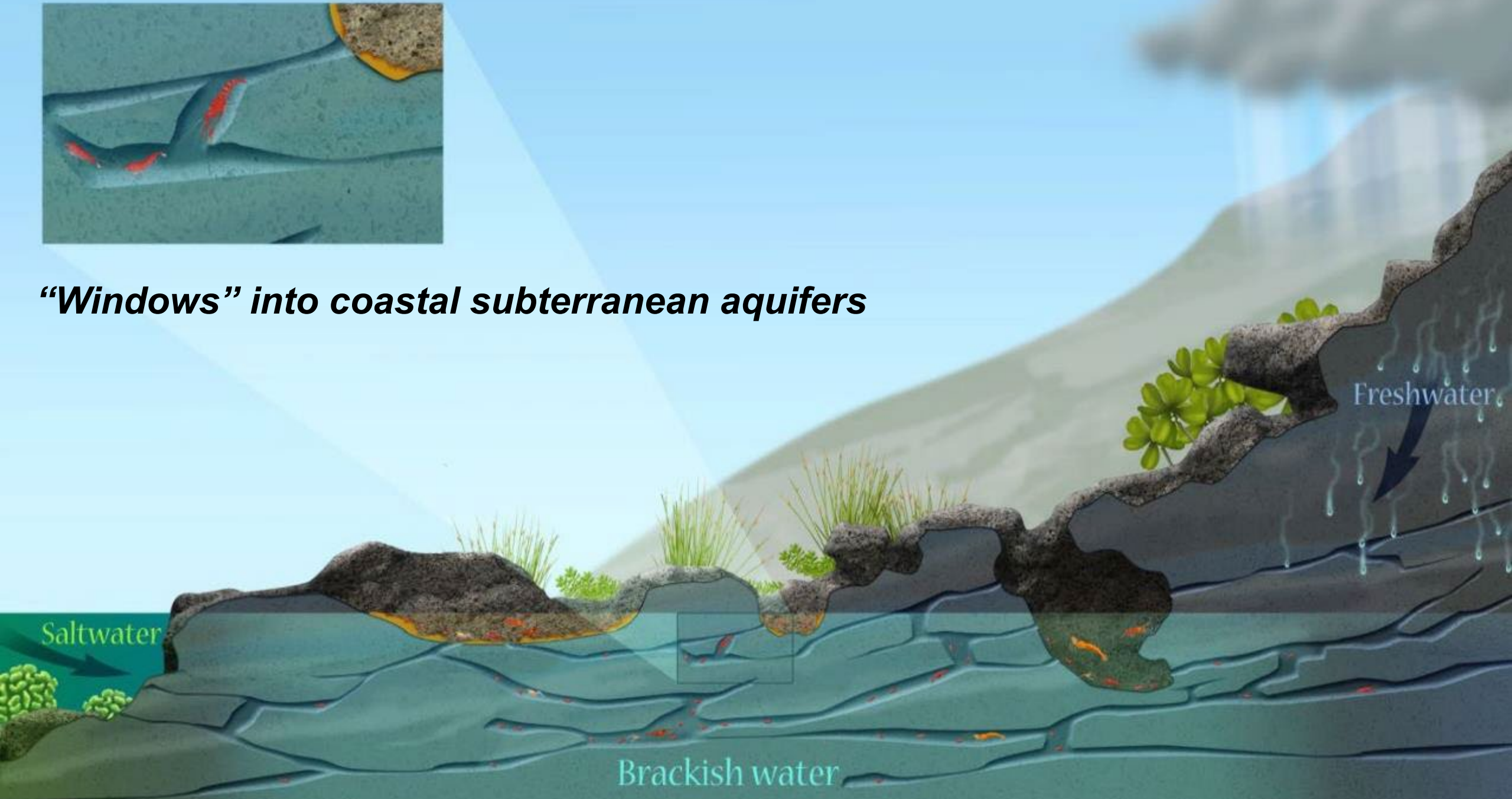
- Brackish ecosystems that do not have a surface connection to the ocean
  - Influenced by tides & groundwater
- Found globally, but concentrated in the Hawaiian Islands (~700 pools)
  - Majority located on the island of Hawai'i (~650 pools)
- Habitat for rare and endemic shrimp
  - Some limited to specific pools on Maui or Hawai'i Island
- Studied since the 1950's, but still much unknown
  - Biogeochemistry and shrimp ecology



Mike Yamamoto



***“Windows” into coastal subterranean aquifers***



# Marshes in Hawai'i (DOFAW)

Low-lying area seasonally or permanently saturated with water, dominated by herbaceous plants

- Historic and cultural importance
  - Food production, medicinal plants and mo'olelo
- Important habitat for birds
  - 60 species of migratory birds that winter in Hawai'i
  - 5 endemic water bird species
- Key component of watersheds
  - Store and gradually release water into aquifer
  - Filter sediments and absorb nutrients



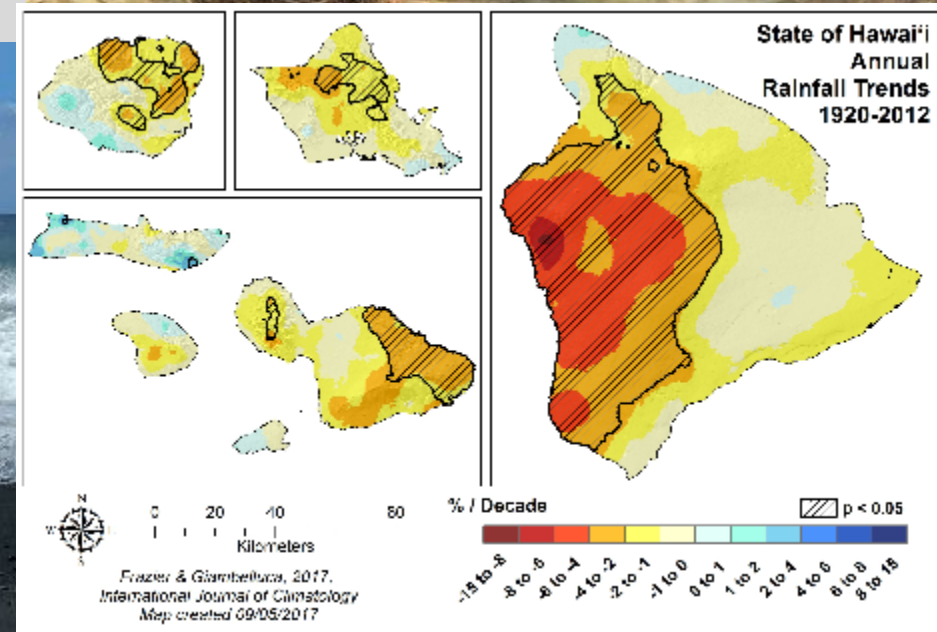
# Threats to Hawaiian Wetlands

## Current & increasing threats

- Invasive species
- Sea level rise
- Changes in weather patterns & precipitation
- Pollution & development



HHF Planners



# Wetland Management Needs

**Currently no guiding management plan/strategy for both ecosystems**

- How to manage for the future?
- What should a roadmap to success include? What needs to change?
- What should we be learning/doing now for the future?



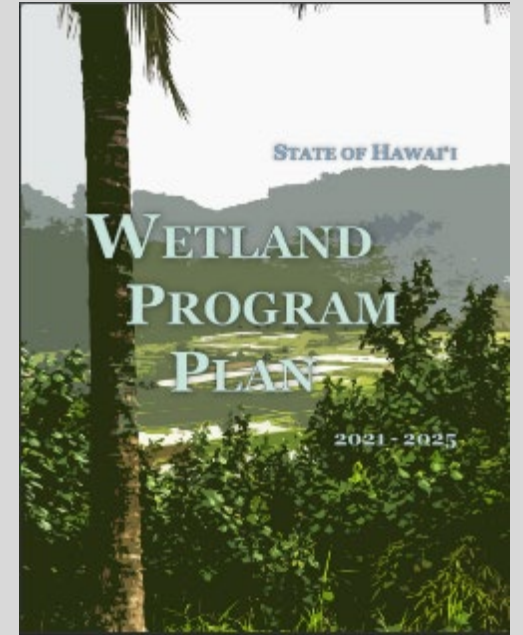


# The Hawai'i Wetlands Program Plan (HWPP)

- Result of discussions between DAR and DOFAW staff in 2020
- Guided by EPA Core Elements framework
- Wetlands of focus: **Anchialine pools, marshes**, estuaries, and coral reefs

## Identified the following needs:

- Guidelines (SOPs) for ecosystem monitoring and assessment
- Evaluate and adapt regulatory measures to support protection and restoration
- Establish water quality standards for wetlands of focus
- Increase awareness through education and outreach
- A statewide or site-specific anchialine pool management plan
- Develop a protection and restoration strategy for wetlands



# DLNR Wetland Protection & Restoration (P&R) Strategy

- Address the needs identified in HWPP
- Wetlands of focus: Anchialine pools & marshes
- Develop a P&R strategy for DLNR

## **Task 1: Convene a state advisory committee to prioritize wetland restoration activities**

- Organize advisory boards for anchialine pools & marshes
  - Management agencies & community members/groups
- Identify goals for P&R Strategy
- Develop objectives, activities, roles, and performance criteria

# DLNR Wetland Protection & Restoration (P&R) Strategy

**Task 1: Convene a state advisory committee to prioritize wetland restoration activities**

## **Advisory Board Meetings**

- Boards have met twice this year
- Good discussions and ideas for P&R Strategy
- Additional board members (i.e. hydrologist)

# DLNR Wetland Protection & Restoration (P&R) Strategy

## Task 2: Develop a monitoring and assessment strategy for anchialine pools

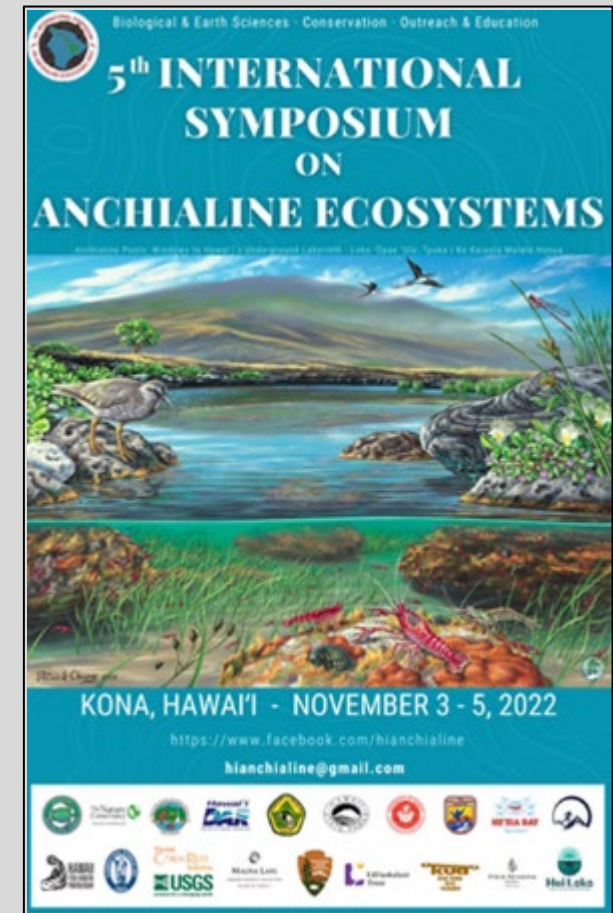
- Pilot studies to evaluate novel monitoring techniques
- Seek monitoring and assessment input from advisory boards
- Develop monitoring and assessment SOPs
- Draft DLNR's first anchialine management plan

# DLNR Wetland Protection & Restoration (P&R) Strategy

## Phase 2: Develop a monitoring and assessment strategy for anchialine pools

### 5<sup>th</sup> International Symposium on Anchialine Ecosystems (November 2022)

- Current research and restoration activities in Hawai'i
- Hosted workshops
  - Monitoring & assessment
  - Environmental DNA (eDNA)
- Input from workshops will shape P&R Strategy



# DLNR Wetland Protection & Restoration (P&R) Strategy

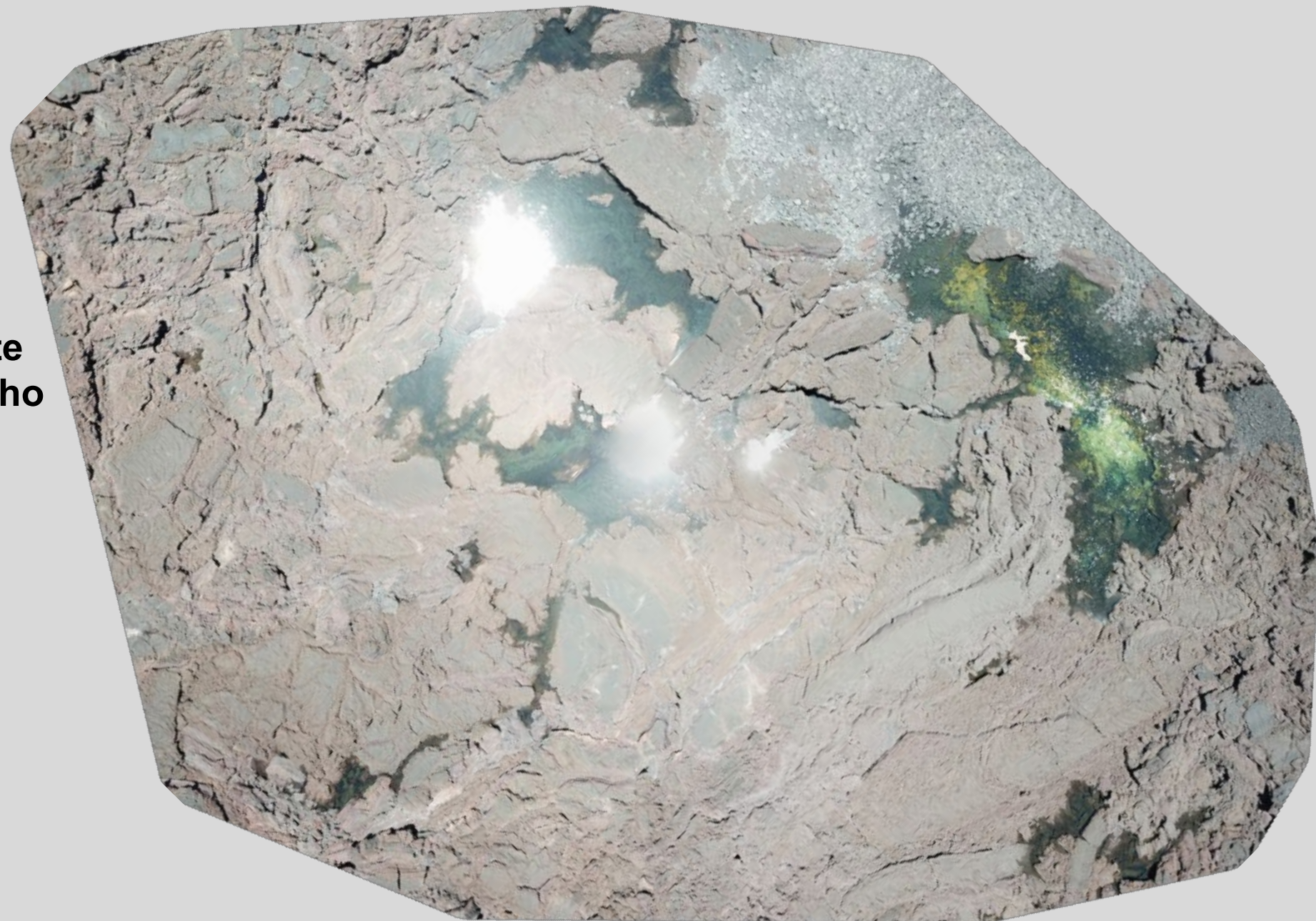
## Phase 2: Develop a monitoring and assessment strategy for anchialine pools

### 1<sup>st</sup> Pilot Study: Unmanned Aerial Vehicles (UAV)

- A more efficient way to locate pools?
  - Faster & easier than hiking
  - Provides aerial perspective
  - Images can be used to make structure from motion (sfm) models
- First trials in Summer 2022, more this year



**Newly pools in remote  
portion of 2018 Kapoho  
lava flow**



# DLNR Wetland Protection & Restoration (P&R) Strategy

## Phase 2: Develop a monitoring and assessment strategy for anchialine pools

### 2<sup>nd</sup> Pilot Study: Environmental DNA (eDNA)

- DNA analysis of filtered water samples
- Detect cryptic & rare species
- Improve species distribution (native & invasive)
- Smith-Root sampler backpack
- Potentially start this summer





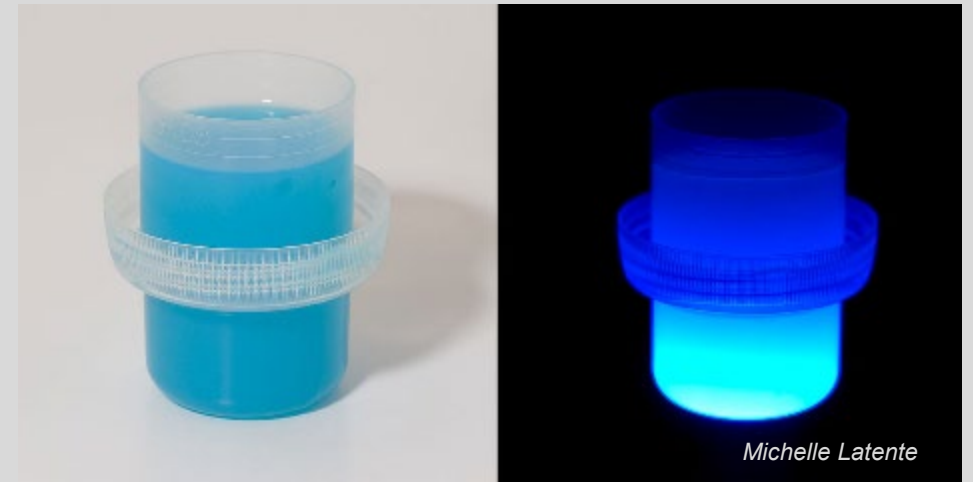
# DLNR Wetland Protection & Restoration (P&R) Strategy

## Phase 2: Develop a monitoring and assessment strategy for anchialine pools

### 3<sup>rd</sup> Pilot Study: Novel Water Quality Approaches

#### *Optical Brighteners*

- Fluorescent chemicals commonly found in laundry detergent
- Quick & simple way to detect anthropogenic pollution?
- Currently reviewing literature and developing methods



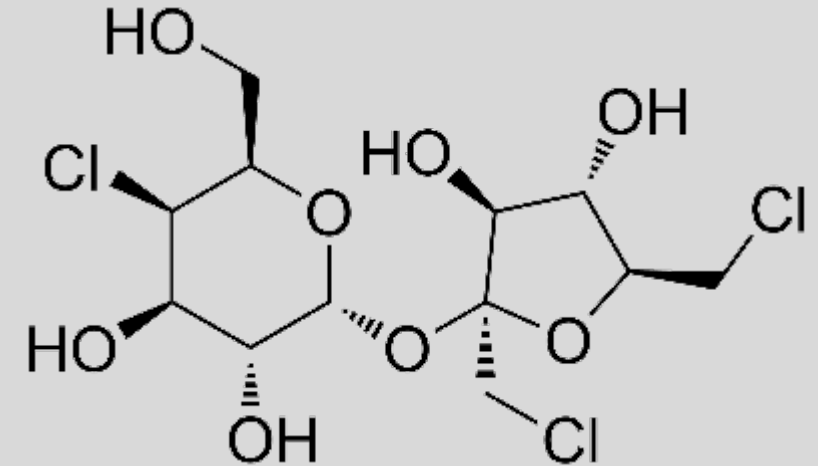
# DLNR Wetland Protection & Restoration (P&R) Strategy

## Phase 2: Develop a monitoring and assessment strategy for anchialine pools

### 3<sup>rd</sup> Pilot Study: Novel Water Quality Approaches

#### *Sucralose*

- Artificial sweetener found in many sugary foods
- Not metabolized by humans
  - Detected in wastewater effluent & coastal waters
  - Fairly resistant to degradation in the environment
- Currently reviewing literature and developing methods



# DLNR Wetland Protection & Restoration (P&R) Strategy

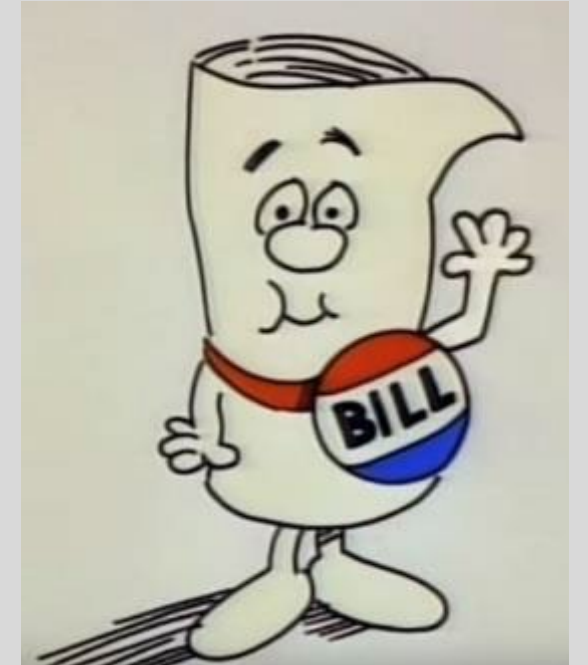
## **Phase 3: Identify regulatory jurisdiction & create, revise, and adopt policies and rules that improve the regulatory process**

- Clarify jurisdictional coverage between County, State, and Federal agencies
- Review permitting and consultation process for protection and restoration methods
- Identify regulatory gaps necessary for effective restoration and management
- Review and develop DLNR statutes, rules, and policies for wetlands

# DLNR Wetland Protection & Restoration (P&R) Strategy

**Phase 3: Identify regulatory jurisdiction & create, revise, and adopt policies and rules that improve the regulatory process**

- Hiring a legal fellow this year
- Working with attorney general on proposed anchialine pool rules
- Identifying current regulations & policies pertaining to wetlands



# How will a P&R Strategy benefit DLNR?

## Improve Restoration & Protection

- Communication & coordination among DLNR divisions
- Increase effectiveness of wetland restoration
- Engage communities through input and collaboration

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## Anchialine Pool Monitoring & Assessment

- Management plan specifically for anchialine pools
- Refine monitoring and assessment methods

# How will a P&R Strategy benefit DLNR?

## Improve Restoration & Protection

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- Increase effectiveness of wetland restoration
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## Anchialine Pool Monitoring & Assessment

- Management plan specifically for anchialine pools
- Refine monitoring and assessment methods

## Wetlands Regulation

- Evaluate current regulations
- Identify and address gaps in current regulations
- Streamline restoration and protection process for anchialine pools & marshes

# Mahalo!

## Any Questions?

