# SYNTHESIS OF AQUATIC VEGETATION SUBJECT MATTER EXPERT FEEDBACK TO IMPROVE RESTORATION STRATEGIES



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EMRRP Webinar Series

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U.S. ARMY

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# NEED RESEARCH FOR LARGE-SCALE AER

- Work unit (FY25-FY28) addresses 2 SoNs:
  - 2109 – Aquatic plant restoration threshold identification
  - 2112 – River and reservoir aquatic plant restoration and establishment

- Need to identify biotic and abiotic thresholds that should be overcome to scale-up aquatic vegetation establishment efforts

| Objectives | Approach | Status |
|---|---|---|
| Identify factors that limit scaling-up aquatic plant establishment efforts | Literature Review (complete) | In internal review (expected Sept 2026) |
| | SME Workshop | Complete |
| Evaluate methods experimentally | Mesocosm and field experiments | In progress (2026-2027) |
| Demonstrate successful methods | Demonstration workshop and technical guidance | Planned (2027-2028) |

# SME FEEDBACK INFORMS EXPERIMENTAL WORK

- Subject Matter Expert Workshop with focus on:
  - River and reservoir aquatic vegetation restoration successes and failures
  - Established and innovative restoration techniques
  - Opportunities to scale up for large (system) applications

- Organized workshop into lectures (USACE/ERDC experience) and breakout sessions (SME discussions)

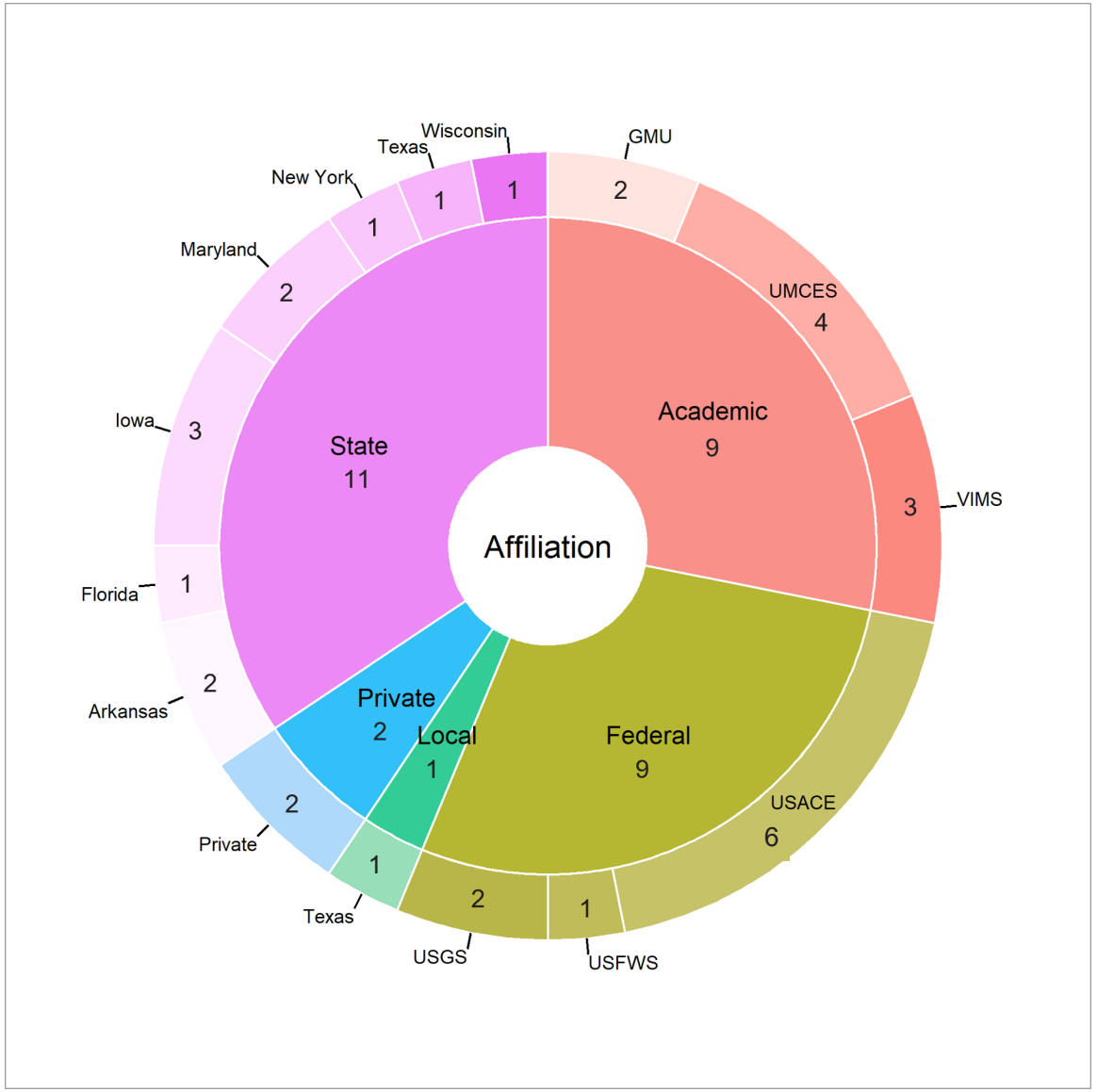
| | |
|---|---|
| Lecture 1 | "Aquatic vegetation restoration in rivers and reservoirs: Challenges, current techniques, and lessons learned" |
| Lecture 2 | "The impact of herbivory on SAV restoration success" (*SR in review*) |
| Lecture 3 | "Limits to restoring native aquatic vegetation: Expectations vs reality" |
| **Breakout 1** | **"Identifying key issues perceived by experts"** |
| Lecture 4 | "Established and innovative aquatic vegetation restoration techniques" |
| **Breakout 2** | **"Solutions to restoration challenges"** |
| Lecture 5 | "Opportunities to scale-up for large (system) applications" |
| **Breakout 3** | **"Prioritizing restoration solutions"** |

# GOVERNMENT AND ACADEMIC SMES

- 32 SMEs (not including ERDC facilitators) participated across 2-half-day workshops
  - Reached out to past partners/collaborators, authors of aquatic vegetation restoration studies

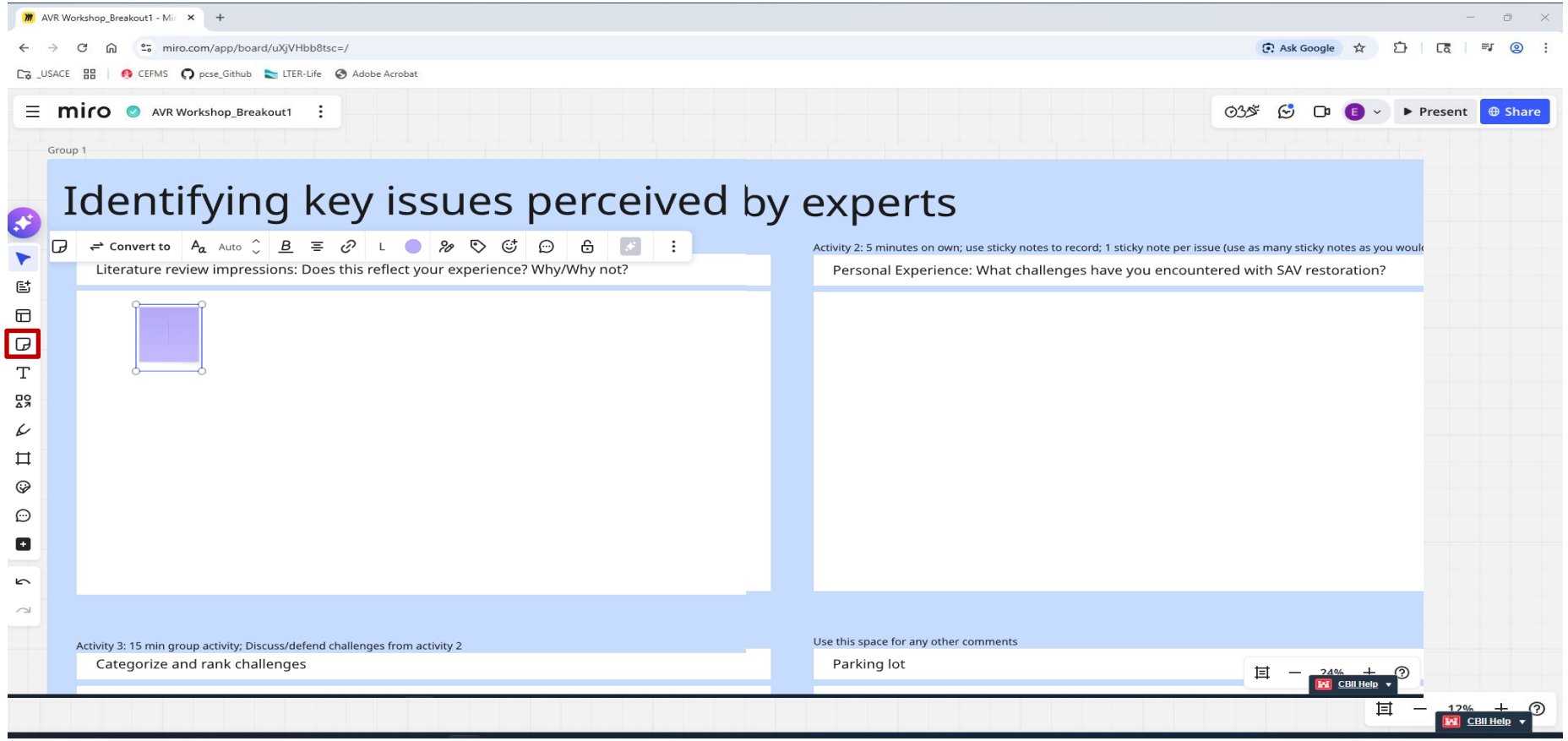
  - 7 different state (DNR) agencies (mostly from Mississippi River Watershed)
  - 3 academic institutions (all from Chesapeake Bay watershed)
  - 3 Federal Agencies
  - 2 from private consulting firms
  - 1 local government

*Main goal for SMEs was information gathering, learn from other practitioners, improve restoration efforts

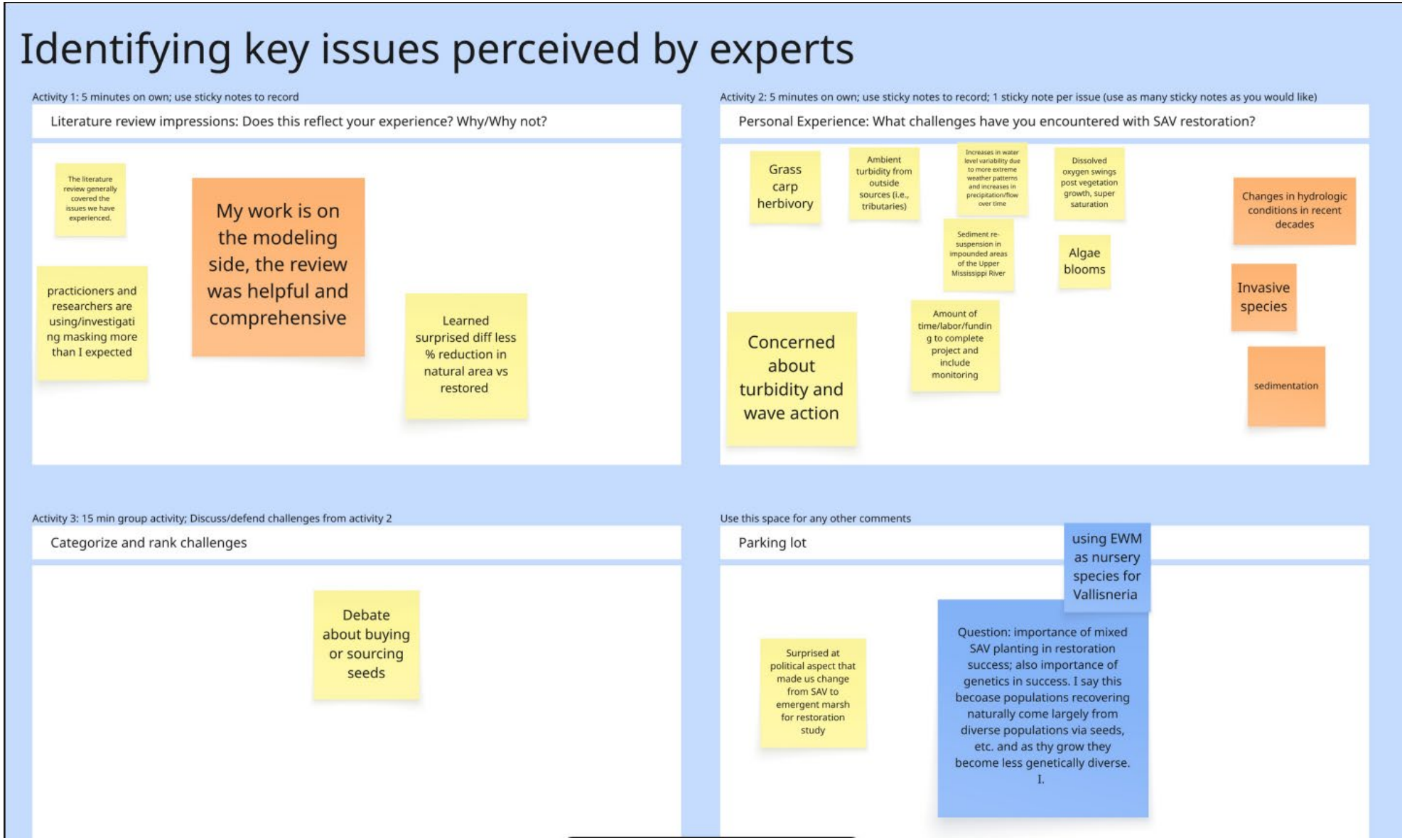


# VIRTUAL BREAKOUT SESSIONS IN MIRO

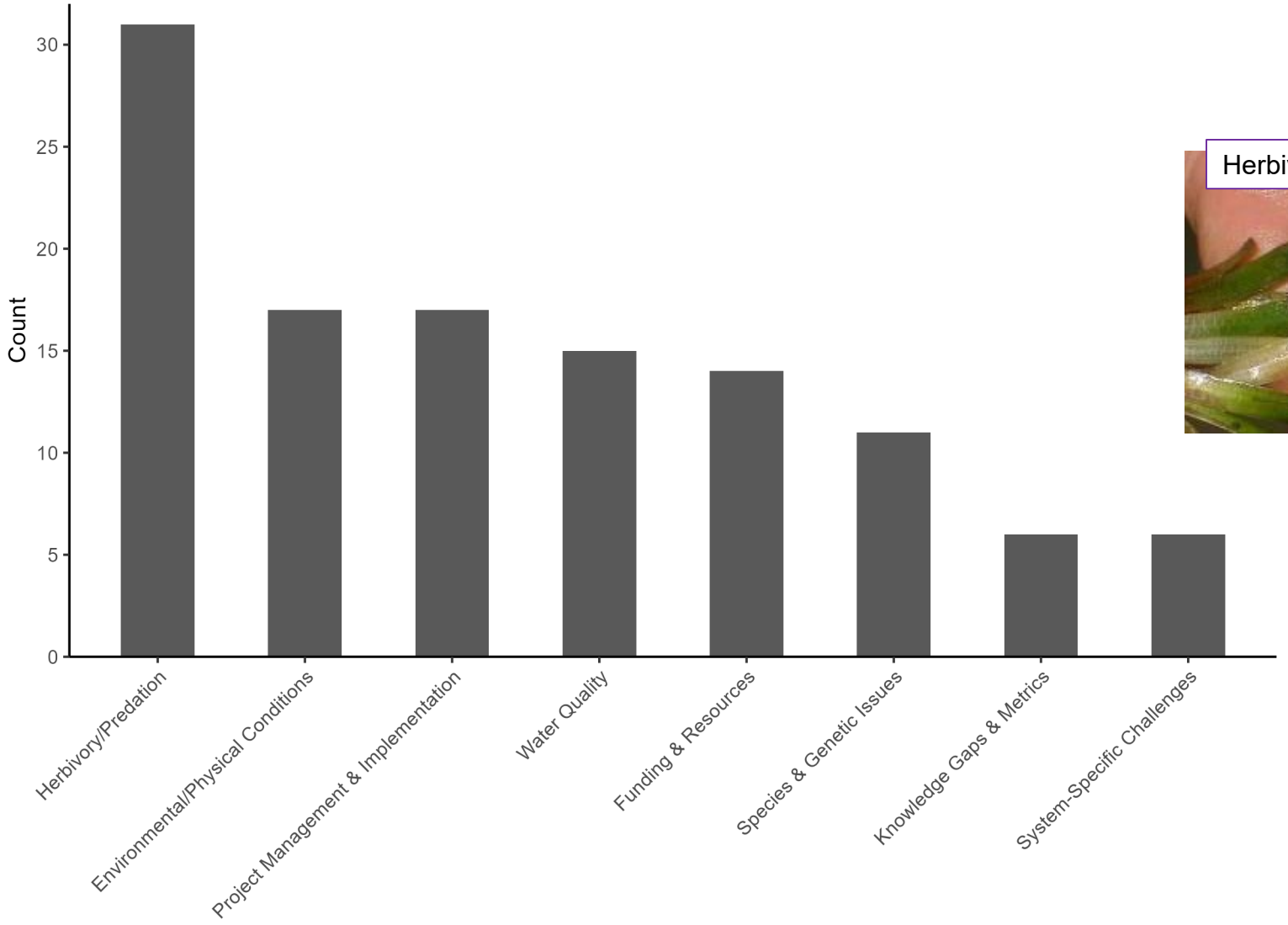
- Assigned participants into 4 breakout groups (led by ERDC facilitator)
- Used Miro Board to facilitate discussion/interaction
  - Encouraged SMEs to use “sticky notes” to add comments/ideas on Miro board



# BREAKOUT 1: AER CHALLENGES



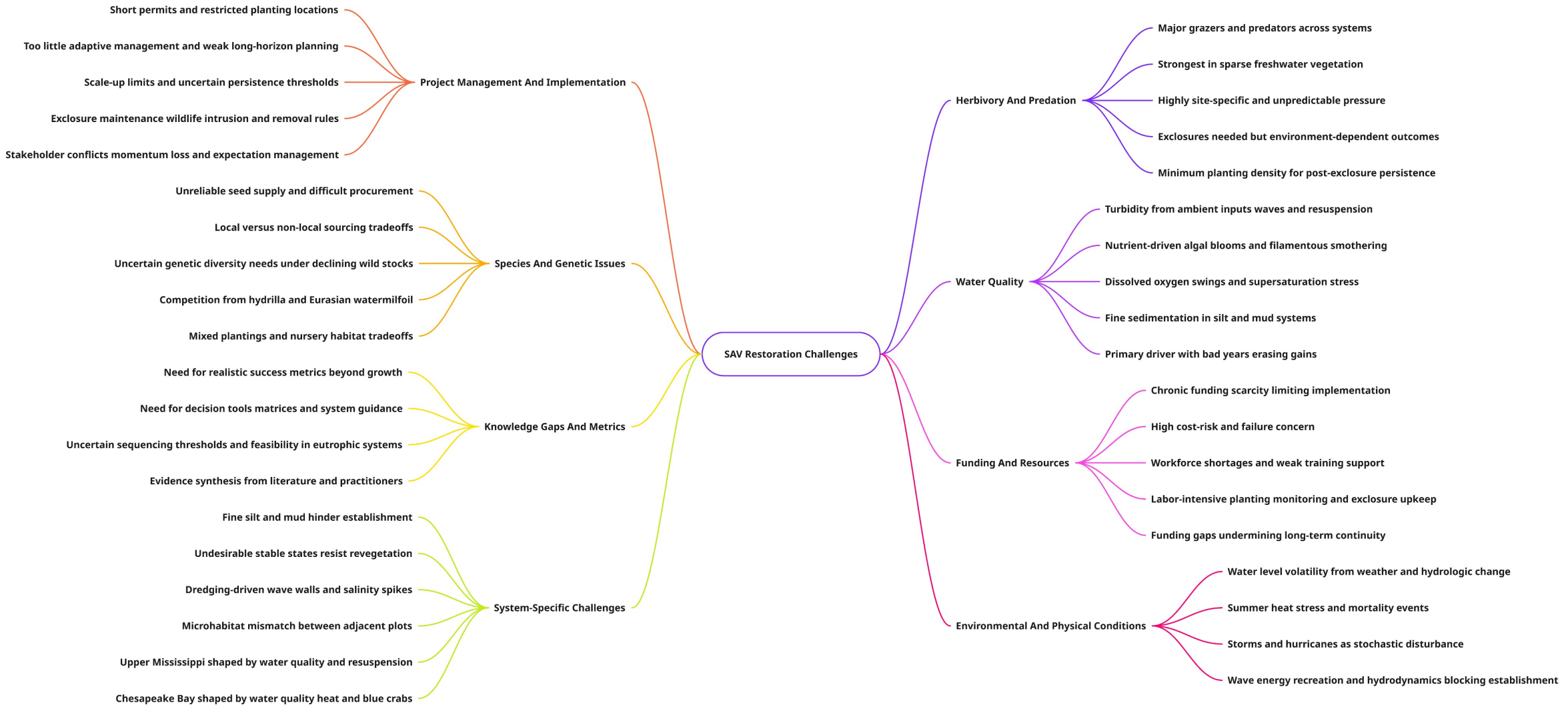
# TOP CHALLENGES: HERBIVORY, VARIABLE ENVIRONMENTAL CONDITIONS






Herbivory damage on *Vallisneria neotropicalis*

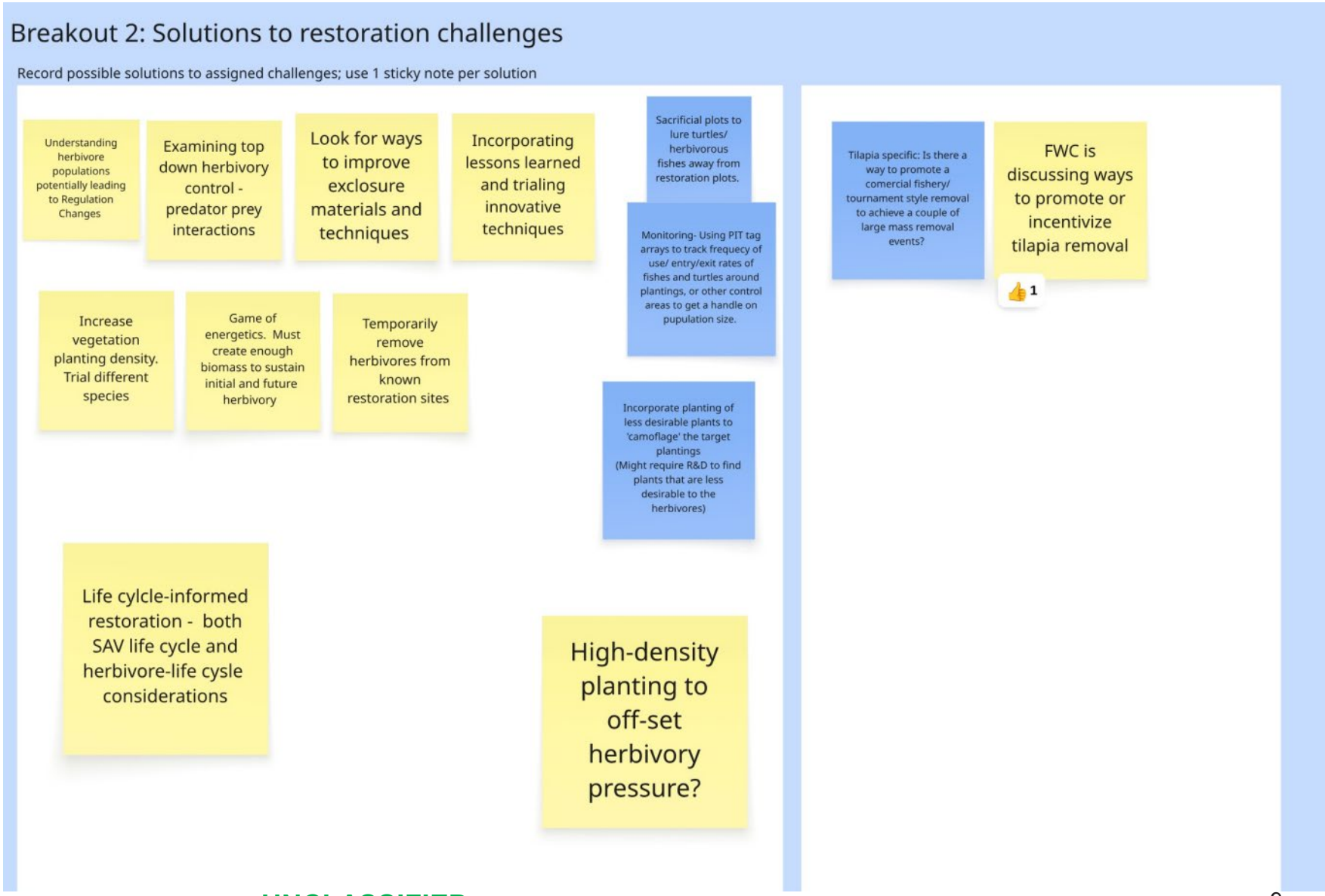
# TOP CHALLENGES: HERBIVORY, VARIABLE ENVIRONMENTAL CONDITIONS



# BREAKOUTS 2 AND 3: SOLUTIONS AND PRIORITIES

- Assigned each group restoration challenge:
  - Herbivory

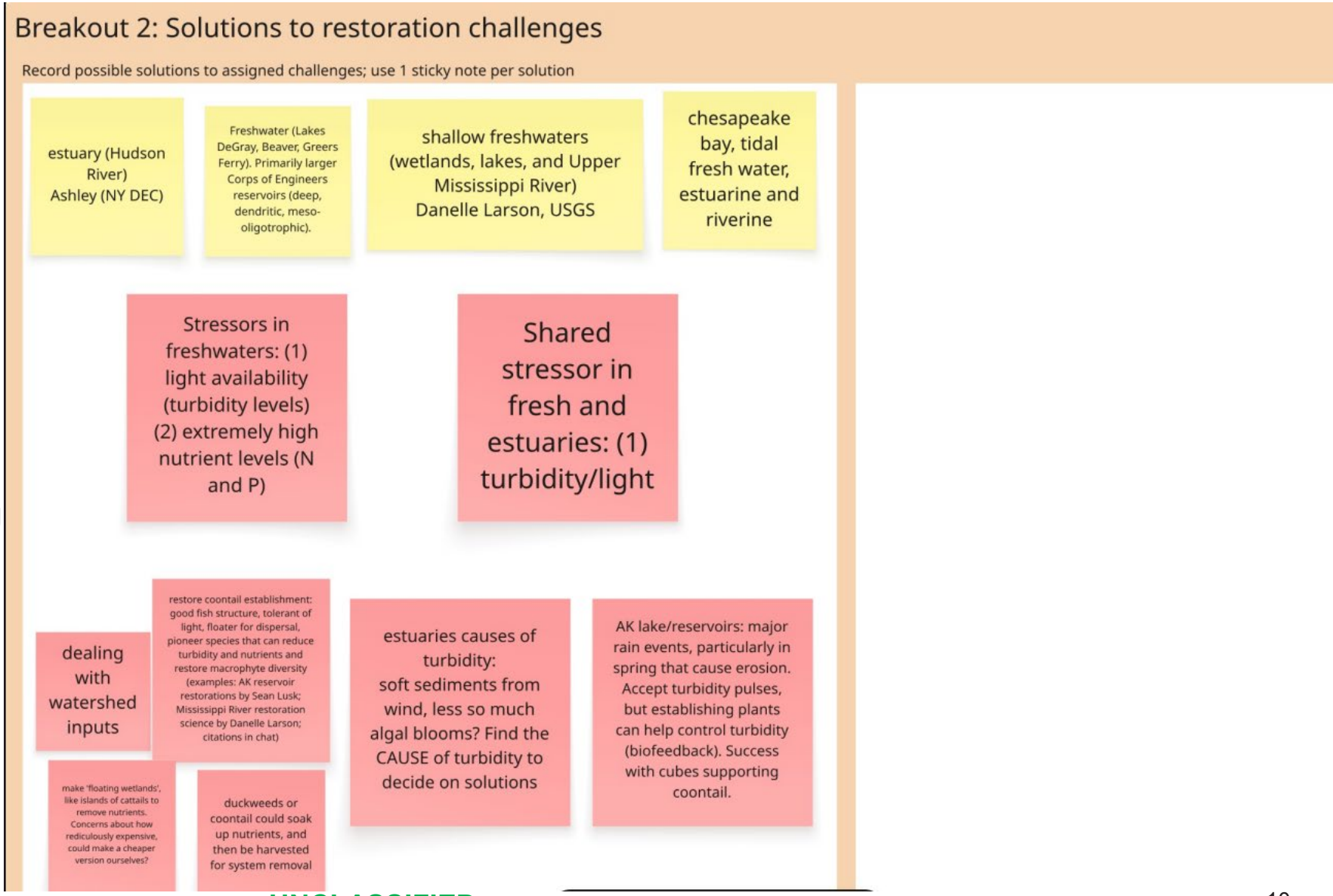
- Actionable strategies
  - Herbivore management
    - Direct removal
    - Sacrificial plots
    - Top-down control
    - Exclosures
  - Monitoring and research
    - Track herbivores using PIT tags
  - Planting strategies
    - Increased density
    - Different species
    - Timing planting w/ herbivore life cycle



# BREAKOUTS 2 AND 3: SOLUTIONS AND PRIORITIES

- Assigned each group restoration challenge:
  - Water quality

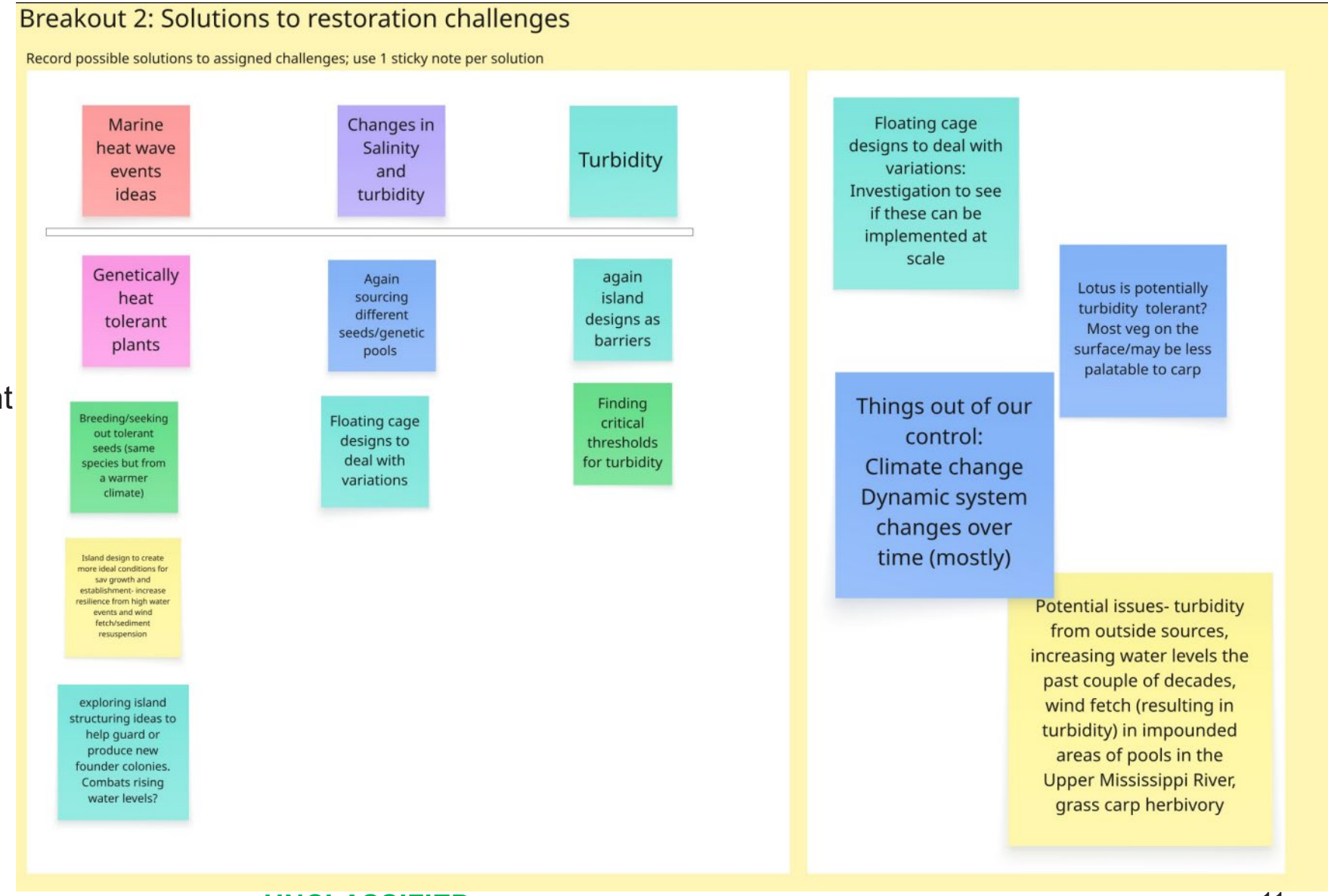
- Actionable Solutions
  - Coontail as pioneer
    - Low-light tolerant
    - Reduces turbidity/nutrients
    - Encourage dispersal
    - Good fish structure
  - Watershed scale management
    - Turbidity
      - Control before planting
      - Recognize sources
      - Plant-sedimentation feedbacks
    - Nutrients
      - Floating wetlands



# BREAKOUTS 2 AND 3: SOLUTIONS AND PRIORITIES

- Assigned each group restoration challenge:
  - Environmental variability

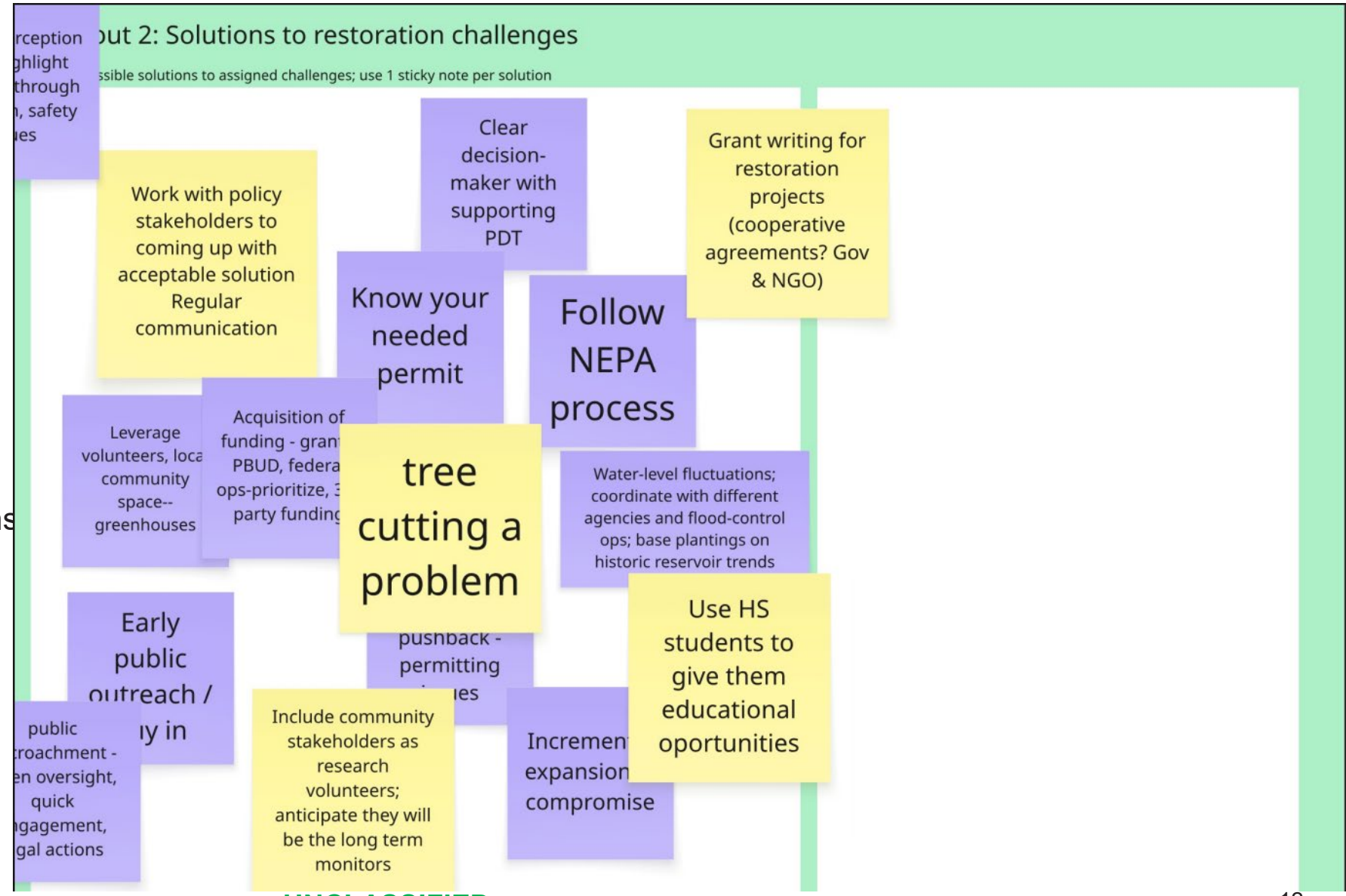
- Actionable solutions
  - Turbidity management
  - Control water level and wave action
    - Islands to increase resilience/SAV establishment
  - Alternative species testing
  - Heat tolerance strategies
    - Heat tolerant plants
    - Source seeds from warmer climates
    - Source seeds from different genetic pools
  - Salinity adaptation
    - Sourcing seeds
    - Floating cages
    - Island designs as physical barriers



# BREAKOUTS 2 AND 3: SOLUTIONS AND PRIORITIES

- Assigned each group restoration challenge:
  - Project management and implementation

- Actionable solutions
  - Funding and resources
    - Write grants, cooperative agreements, PBUD
    - Leverage volunteers and community resources
  - Interagency coordination
    - Ex. Flood control operations
  - Public engagement
    - Stakeholders
    - Outreach and education
  - Permitting
    - Identify necessary permits
    - Follow NEPA
    - Anticipate stakeholder pushback



# COLLABORATION AND METHOD TESTING

- Subject Matter Expert Workshop outcomes:
  - SME consensus that herbivory is a problem and that interactions are at play
  - Collaboration – site visits and faunal surveys
    - Texas, Iowa, Florida – What species; what size class, when are they causing damage?
      - Document/inventory of common species (herbivores and grazers) identified by COE/state agencies at all sites
      - Combination of survey techniques for fish and turtles
      - Diet assessments – DNA barcoding for tilapia in Florida

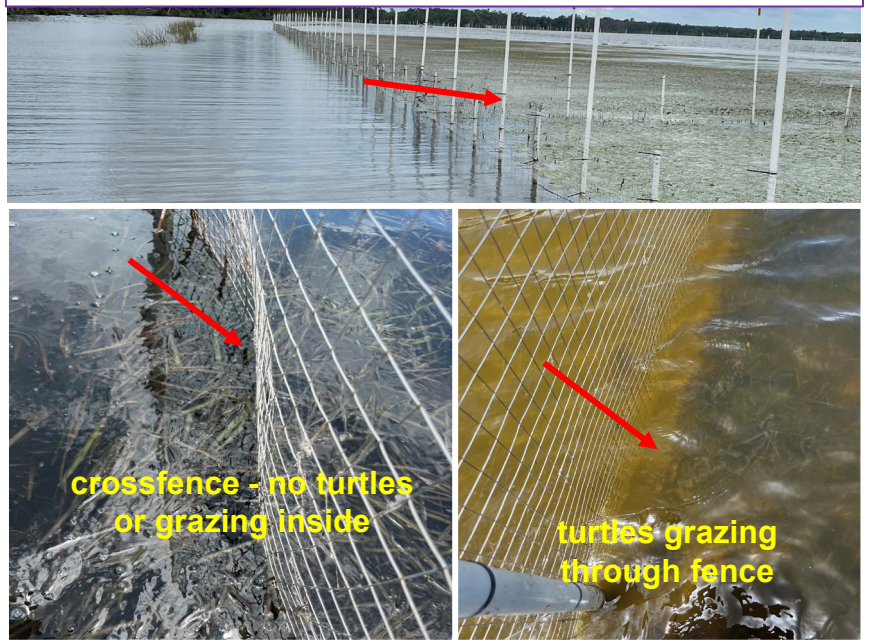
*1. Lewisville Lake, TX*
*Underwater cameras, nets & traps*



*2. Huron Island, IA*
*Fykenets, gill nets, turtle traps*




*3. Lake George, FL*
*Tilapia diet assessments (DNA barcoding)*
*Collaborating with Univ. FL on learning more about turtle diets and population densities*



# COLLABORATION AND METHOD TESTING

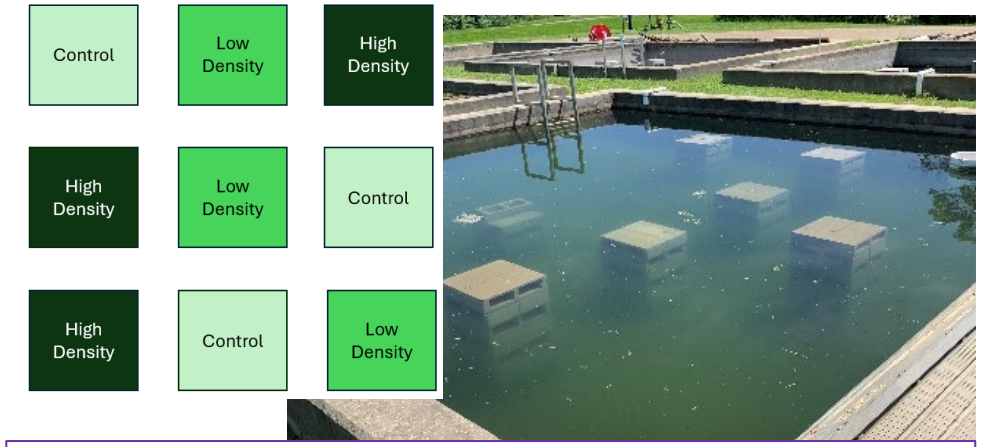
- Inform mesocosm experiments: we need to know more about herbivory impacts & interactions
  - Turbidity important to include in mesocosm study
  - *Vallisneria spp.* and *Ceratophyllum demersum* identified as important SAV to be included in mesocosm study

1. Testing turbidity (water quality) & crayfish density (herbivory) on aquatic plant growth
   a) Small-scale greenhouse, multifactor, short-term experiment (4 weeks)

2. Testing turbidity (water quality/clarity) & desiccation (drought) on aquatic plant growth
   a) Small-scale outdoor, multifactor, long-term experiment (2 growing seasons & post-winter recovery)

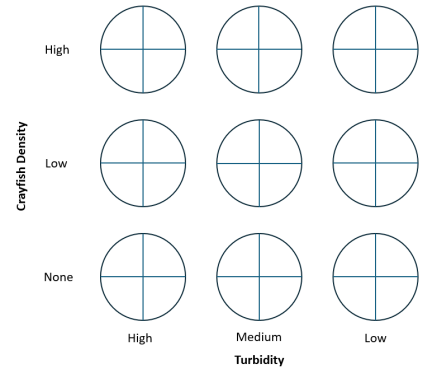
3. Testing turtle density (herbivory) on aquatic plant growth
   a) Intermediate scale outdoor – ponds, short-term experiment (12 weeks)






*Intermediate pond design* – determine impact of Red-Eared Slider (*Trachemys scripta elegans*) *density* on aquatic plant growth




*Small-scale 500 L mesocosm design* – analyze interaction effects of *crayfish* and *turbidity* on aquatic plant growth (4 species) in a multifactor split plot design

# NEXT STEPS

- Subject Matter Expert Workshop outcomes:

  - Inform field study experiments (FY27-FY28):
    - Objective – conduct small-scale removal/addition split-plot experiments in TX, IA, and FL
      - Use combinations of assumed impactful species within each region
        - » Semi-aquatic turtles, grass carp, common carp
        - » …additional taxa as identified by literature review/workshop
          - E.g. Tilapia identified by FWC/UFL as potentially problematic in impacting SAV
      - Evaluate different planting strategies and planting densities to test initial establishment
        - » Several discussed by SMEs during workshop
          - E.g. mask with less palatable species
          - E.g. test different planting densities x herbivore densities

  - Field-based demonstration workshop (FY28):
    - Based on…
      - Literature review
      - SME Workshop
      - Mesocosm and field studies findings



SAV: *Ceratophyllum demersum* as the nurse for *Vallisneria* sp. & *Potamogeton* sp.

Select for plant traits:
Exploit "*selective grazing*" and "*chemical defence*" of plant x herbivore
Exploit "*associational defence*" of plant x plant

# CONNECT WITH US


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*Aquatic Plant Restoration - Huron Island Complex HREP, Pool 18 - UMRRP*



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