Assessing Aquatic Plant Invasiveness to Facilitate Management in the Sacramento-San Joaquin Delta

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Background/Legislative History

- Department of Parks and Recreation's Division of Boating and Waterways (DBW) is the lead agency for managing invasive aquatic plants in Sacramento-San Joaquin Delta, its tributaries, and Suisun Marsh.
- Prior to 2014, the authority to treat aquatic plant species required legislation for each individual species.
- Prior to 2015, species authorized for treatment by DBW included only:
  - Brazilian waterweed (*Egeria densa*)
  - Water hyacinth (*Eichhornia crassipes*)
  - South American spongeplant (*Limnobium laevigatum*)
- AB 763 (2013) established Harbors and Navigation Code section 64.5 (HNC 64.5)
  - Shifted the species authority-granting process from legislation to an interagency, bilateral determination process.
  - Process culminates in a risk assessment determination by Department of Fish and Wildlife (CDFW).

New Process for Treatment Authority

- To determine which plant species should be given highest priority for management, DBW must regularly consult with:
  - U.S. Department of Agriculture
  - U.S. Fish and Wildlife Service
  - National Oceanic and Atmospheric Administration
  - University of California
  - Other members of the scientific and research communities
  - Other state agencies with authority over the control of invasive aquatic plants
- After consultation, if DBW identifies an aquatic plant species that may be invasive and need to be controlled or eradicated, DBW requests CDFW conduct a risk assessment.
- CDFW conducts risk assessment in consultation with:
  - Department of Food and Agriculture
  - Department of Water Resources
  - State Water Resources Control Board
  - Department of Pesticide Regulation
  - Office of Environmental Health Hazard Assessment
  - Other appropriate local, state, and federal agencies
- CDFW's assessment must determine whether the species:
  - Is invasive, and
  - Presents a threat to the environment, economy, or human health.
- The assessment must specify whether the species has been determined to be an "**invasive aquatic plant**."

Section-specific Definition of "Invasive Aquatic Plant"

For the purposes of HNC 64.5, an invasive aquatic plant is defined as "an aquatic plant or algae species, including its seeds, fragments, and other biological materials capable of propagating that species, whose proliferation or dominant colonization of an area causes or is likely to cause economic or environmental harm or harm to human health."

Note there is no inclusion of species origin or non-native status.

Assessment Tool and Considerations

- Per HNC 64.5, considerations to be included in CDFW's assessment include impacts to:
  - Waterway navigability
  - Recreational uses of waterways
  - Health and stability of fisheries
  - Birds' access to waterways and nesting, roosting, and foraging areas
  - Water quality
  - Native plants
  - Water storage facilities and pumping operations
  - [Increased] flood risk
- CDFW utilizes the U.S. Aquatic Weed Risk Assessment tool (Gordon et al. 2012)
  - Modified from New Zealand Aquatic WRA (Champion and Clayton 2001)
  - Maximizes accuracy for aquatic plants
  - 38 questions; quantitative scoring system
  - Threshold score of 39 maximized overall accuracy of tool at 91%:
    - ≤ 39 = minor- and non-invaders
    - >39 = major invaders

U.S. Aquatic Weed Risk Assessment Questions

Ecology
- **Temperature tolerance (0-3)**
- **Range of habitat (1-3)**
- **Water/substrate type tolerance (1-2)**
- **Water clarity tolerance (0-1)**
- **Salinity tolerance (0-1)**
- **pH tolerance (0-1)**
- **Water level fluctuation tolerance (0-3)**

Competitive Ability
- **Lotic habitat tolerance (0-3)**
- **Lentic habitat tolerance (0-3)**
- **Other wetland habitat tolerance (0-3)**
- **Establishment into existing vegetation (-5,-3,0)**
- **Establishment into disturbed vegetation (0,1,5)**
- **Competition between growth forms (0,1,2)**

Dispersal Modes
- **Dispersal outside catchment – natural agents (0,1,3,5)**
- **Dispersal outside catchment by accidental human activity (1,2,3)**
- **Dispersal outside catchment by deliberate introduction (0-1)**
- **Effective spread within waterbody/catchment (0-1)**

Reproductive Capacity/Mode
- **Generation time (1,2,3)**
- **Seeding ability – quantity (0-3)**

Reproductive Capacity/Mode Cont'
- **Seeding ability – viability/persistence (0-2)**
- **Vegetative reproduction (0,1,3,5)**

Potential for Impacts
- **Physical – water use, recreation (0,2)**
- **Physical – access (0-2)**
- **Physical – water flow, power generation (0-2)**
- **Physical – irrigation, flood control (0-2)**
- **Aesthetic – visual, olfactory (0-2)**
- **Reduces biodiversity (0,1,3,5)**
- **Reduces water quality (0,1,3)**
- **Negatively affects physical processes (0,2)**
- **Human health impairment (0-2)**
- **Weed of agriculture – crops, livestock, aquaculture (0-1)**

Resistance to Management
- **Ease of management implementation (0-2)**
- **Recognition of management problem (0-1)**
- **Scope of control methods (0,1,2)**
- **Control method suitability (0-1)**
- **Effectiveness of control (0,1,2)**
- **Duration of control (0,1,2)**

History of Invasion Elsewhere
- **Problem in other countries (0,1,3,4,5)**

Species Assessments

- To date, DBW has requested assessment of 6 species:
  - Curlyleaf pondweed (*Potamogeton crispus*)
    - Score = 66; determined invasive
  - Eurasian watermilfoil (*Myriophyllum spicatum*)
    - Score = 76; determined invasive
  - Uruguay waterprimrose (*Ludwigia hexapetala*)
    - Score = 76; determined invasive
  - Coontail (*Ceratophyllum demersum*; **native to CA**)
    - Score = 58; determined an "invasive aquatic plant"*
  - Carolina fanwort (*Cabomba caroliniana*; CA noxious weed)
    - Assessment pending review; tentative score = 75
  - Floating pennywort (*Hydrocotyle ranunculoides*; **native to CA**)
    - Assessment pending

*Native species determined to meet the criteria for an "invasive aquatic plant" are not considered or categorized as invasive outside of the HNC 64.5 definition.

References

- Champion, P.D., and J.S. Clayton. 2001. A weed risk assessment model for aquatic weeds in New Zealand. In R.H. Groves, F.D. Panetta, and J.G. Virtue, eds. Weed risk assessment. Victoria: CSIRO Publishing.
- Gordon, D.R., C.A. Gantz, C.L. Jerde, W.L. Chadderton, R.P. Keller, and P.D. Champion. 2012. Weed risk assessment for aquatic plants: modification of a New Zealand system for the United States. PLoS ONE 7(7):e40031.