Aquatic weed management

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Ecosystem impacts

- Mats inhibit freshwater flow and gas exchange with air.
- Decomposition of mats:
  - Consumed by bacteria and fungi.
  - Oxygen consumed and depleted.

https://fishbio.com/breathing-under-water/

4

Ecosystem impacts

- Outcompetes native vegetation.
- Disrupt food chain and nutrient cycles.

5

Socio-economic impacts

- Clogs water ways.
  - Increases risk of flooding.
- Inhibits recreational water activities.
- Money and time for management.
- Health
  - Breeding ground for mosquitoes.

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Climate change will make it worse!

Higher temperatures = higher growth rate!

Photo: ©TRYFONOV - STOCK.ADOBE.COM

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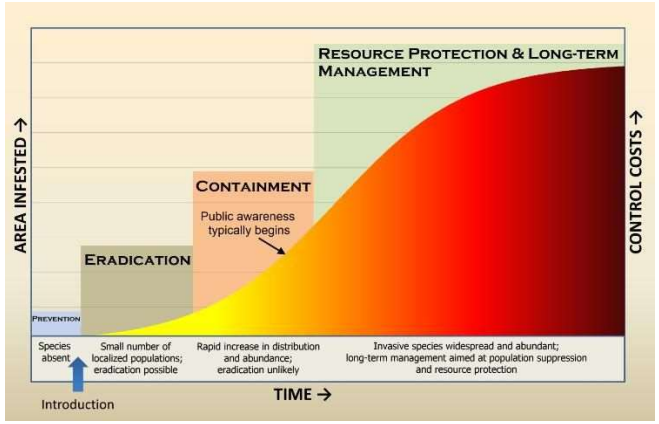

https://edis.ifas.ufl.edu/publication/UW392

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Minimize costs.

Minimize environmental damage.

Maximize effectivity.

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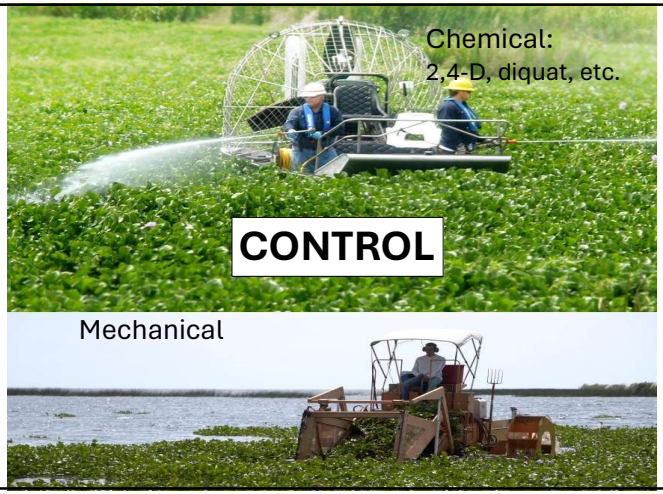

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Mechanical removal

- Can be selective (depending on technique).
- Some action better than no action.
- Immediate removal not contributing to detritus/sludge.

- Not always appropriate (access).
- Expensive.
- Disposal issues.
- Bycatch.
- Not effective in long term.
- Labor intensive.

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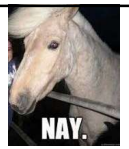
Chemical control



- Fast acting.
- Effective in short term.
- Used according to label reduces impacts on other organisms.
- Cheaper than mechanical.

- Requires frequent reapplication.
- Only effective in short term (regrowth).
- Can be expensive.
- Damaging to environment (nontarget impacts).
- Public outcry.

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Classical biological control

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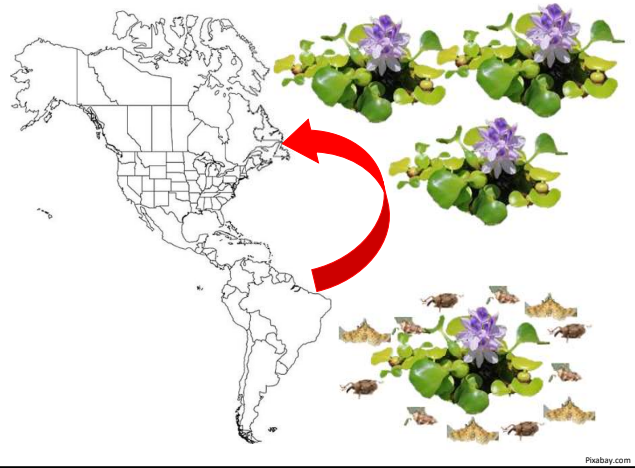

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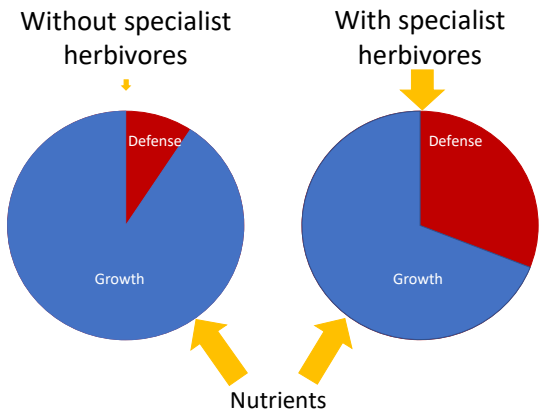

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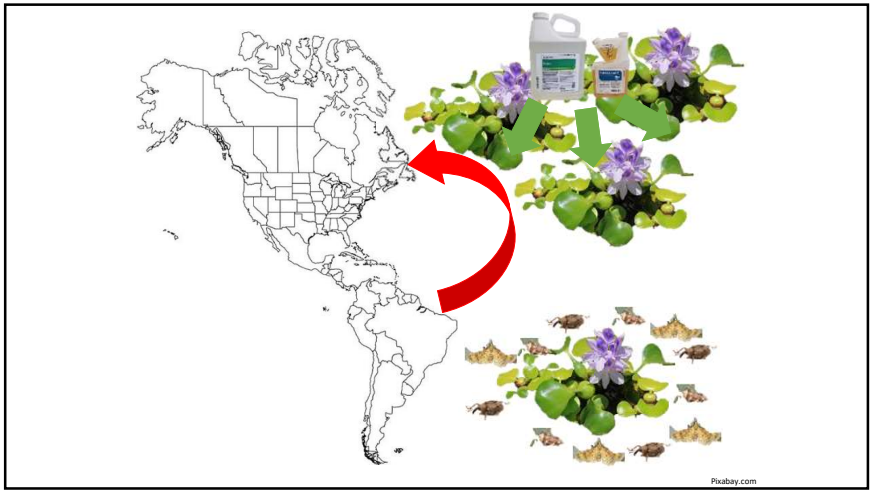

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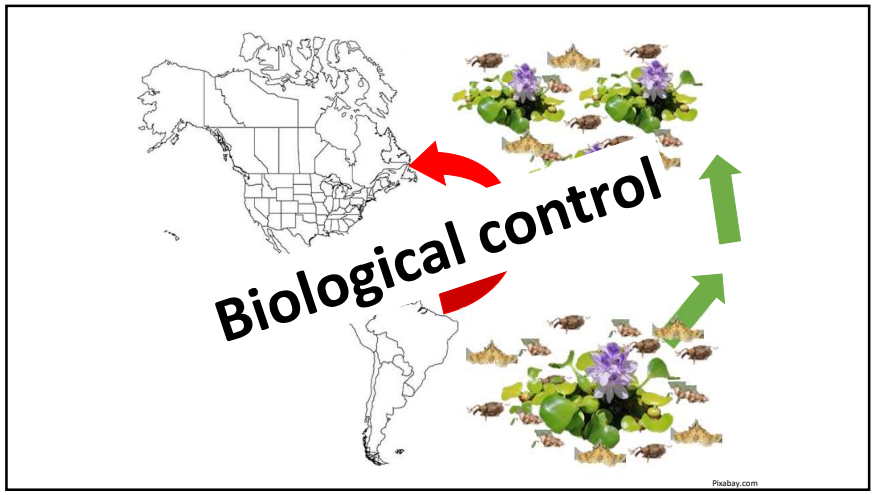

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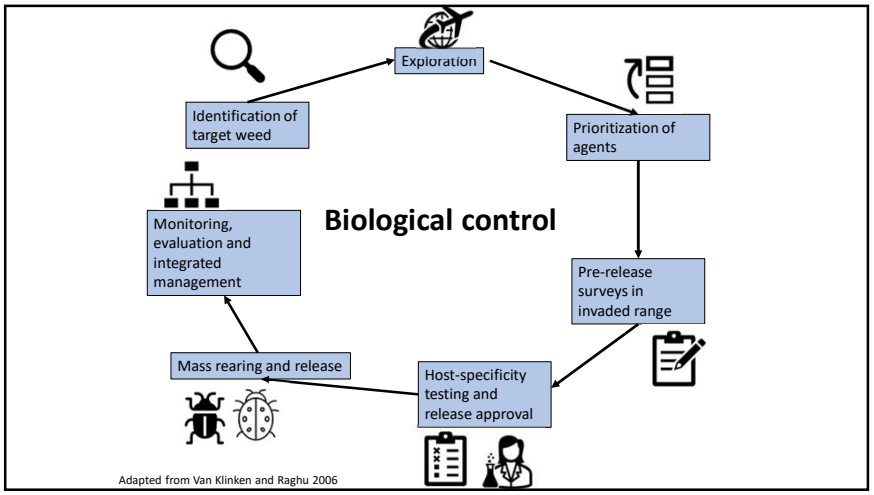

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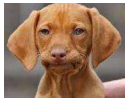
Biological control



- Environmentally friendly.
- Selective.
- Effective in the long term.
- May require less frequent introductions after establishment.
- Value of benefits outweigh financial costs.

- Takes time to research.
- Takes time for populations to establish and exert control (if they do).
- Dependent on insect densities.
- Multiple agents may be necessary for control.

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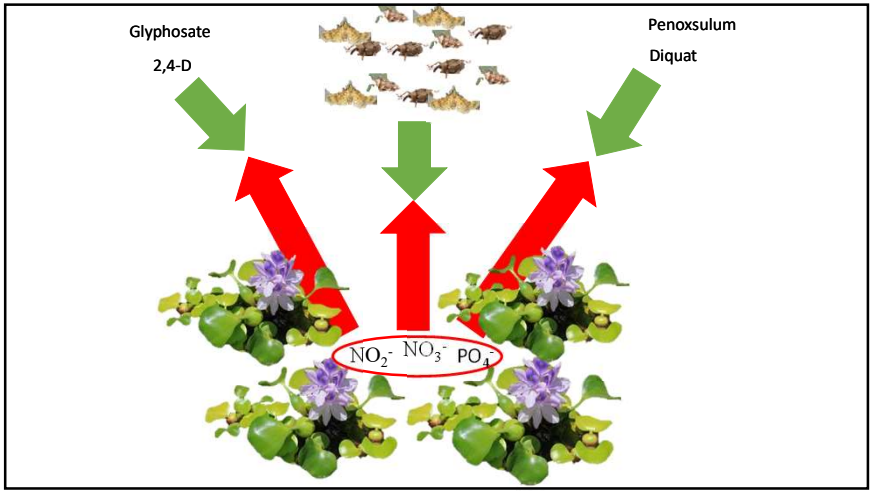

24

Integrated pest management (IPM)

- Halve rate of herbicide use.
- Reduce costs + environmental impacts.
- Combine advantages of both methods.
- Top-down pressure on WH from multiple angles.
- Ubiquitous already.

- Takes time to research.
- Techniques need to be optimized.
- Need to make sure methods are compatible (ensure correct techniques are used).
- Agents unavailable for new releases.

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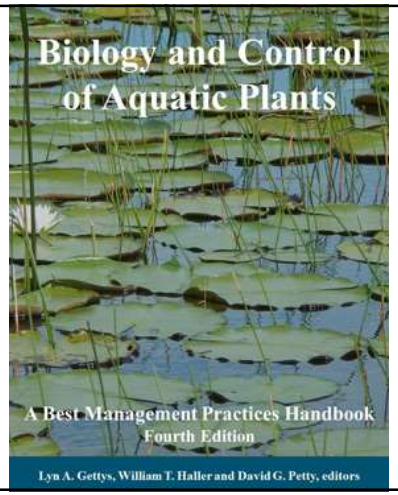

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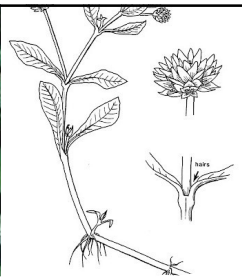

Alligatorweed
Alternanthera philoxeroides

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Control

- Triclopyr, Imazapyr, Bispyribac are effective, among others.
- Mechanical control ineffective, spread by fragmentation.
- Biological control highly successful.

28

Alligatorweed flea beetle (*Agasicles hygrophila*)

- Introduced in 1964 from South America.
- Complete control in southern FL to southern Texas.
- Not cold tolerant, die out in winter in central/northern Gulf states.
- Augmented releases by USACE.

29

30

Thrips (*Amynothrips andersoni*)

Released 1967, attacks terrestrial form, less successful.

Moth (*Arcola malloi*)
Released 1971, moderate control, important in upper Mississippi valley.

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Very effective biocontrol, world's first example of aquatic weed biocontrol success.

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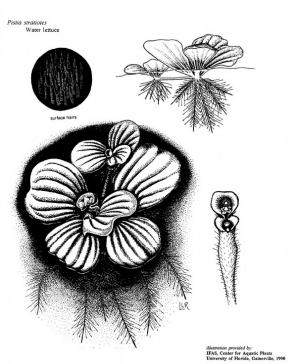
Waterlettuce (*Pistia stratiotes*)



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Control

- Diquat, carfentrazone = quick damage. Systemics like imazapyr and penoxsulam = slow but effective.
- Can be helpful in small waterbodies, less practical in larger systems. Disposal issues.
- Negligible effect on growth.

34

Waterlettuce leaf moth (*Spodoptera pectinicornis*)

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Waterlettuce weevil (*Neohydronomus affinis*)

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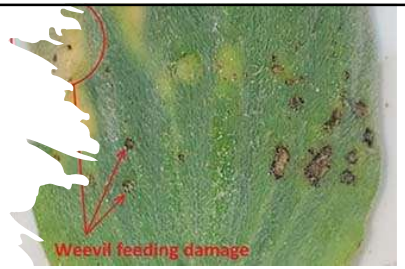
- Native to Argentina and Brazil.
- First introduced to US in 1987.
- Larvae bore into spongey tissue.
- Successful in SA, AUS, Louisiana.
- Populations fluctuate.



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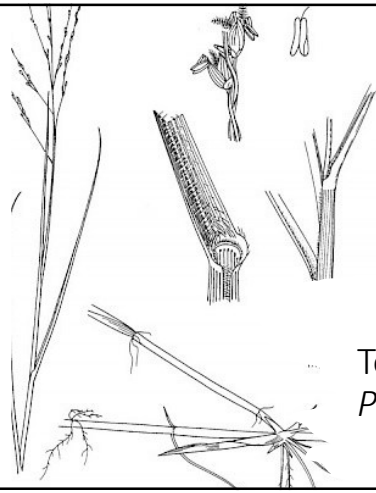

Torpedo grass
Panicum repens

38

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Control

Postemergence herbicides most common. Most effective = glyphosate, imazapyr.

Moderately effective. Digging, mowing, burning. Resprout from rhizomes.

Limited agents being studied. Palatable for cows, goats.

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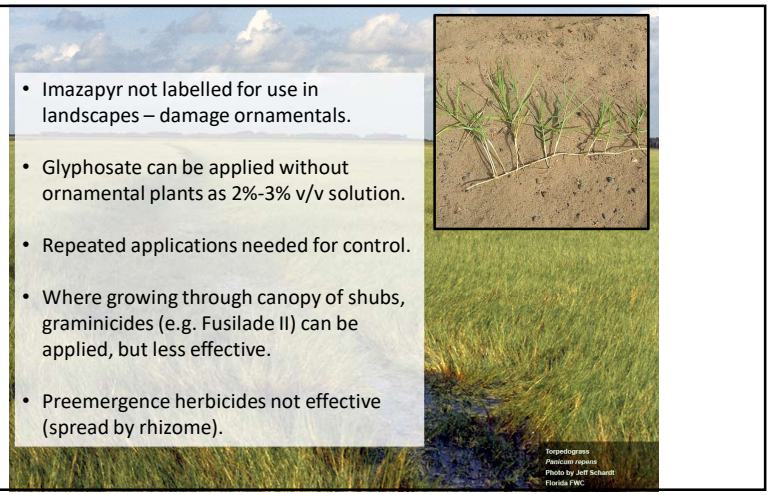

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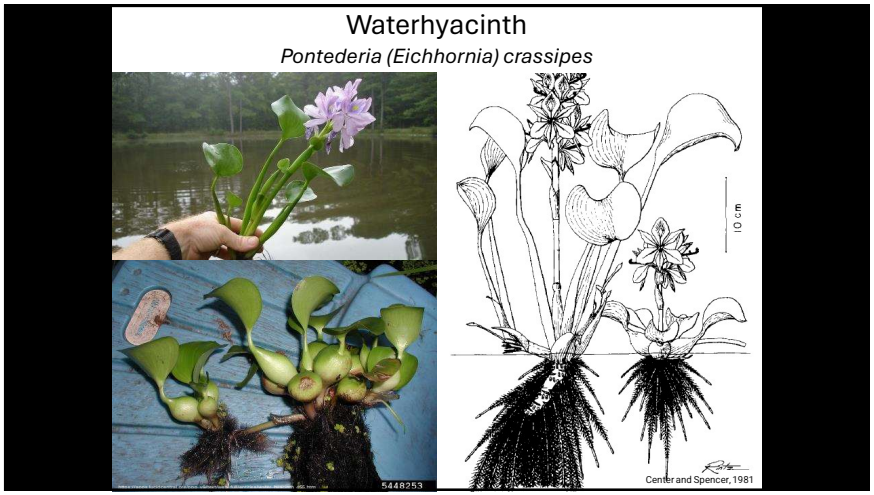

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Control

- 2,4,D-amine, penoxsulam, diquat, imazamox, etc.
- Mechanical harvesters can work, but short term and expensive.
- Weevils ubiquitous, effective but IPM needed.

43

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Neochetina eichhorniae (mottled water hyacinth weevil)

48

Neochetina eichhorniae (mottled water hyacinth weevil)

- Native to South America.
- Introduced to U.S. in 1972.
- Can result in 58.2% less biomass, 97% fewer flowers (Tipping et al. 2014).
- Plants more susceptible to infection, sinking, herbicides.

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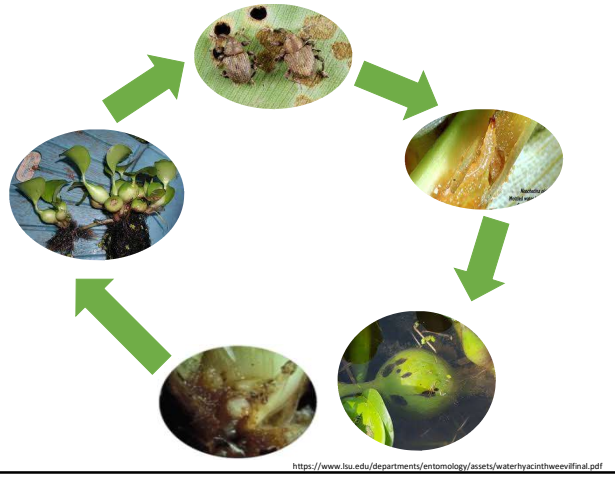

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Neochetina bruchi (chevroned water hyacinth weevil)

- Introduced to U.S. in 1974.
- Lower prevalence in Florida.

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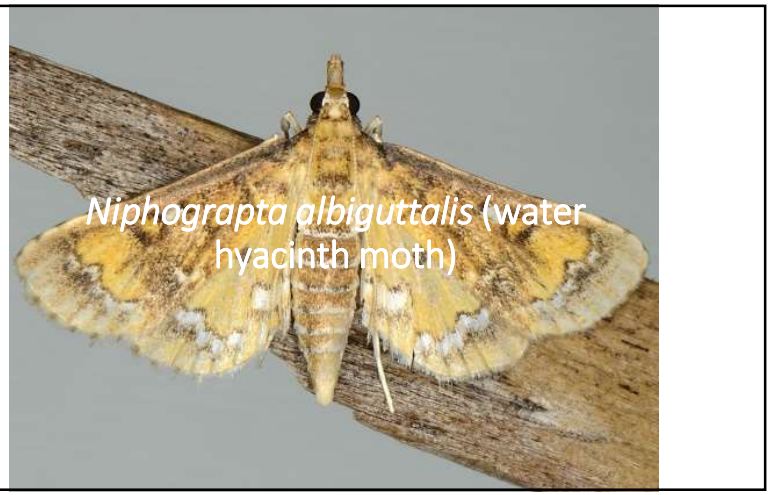

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Niphograpta albiguttalis (water hyacinth moth)

- Introduced from Argentina in 1977.
- Established throughout southern U.S.
- Larvae feed inside petioles.
- Provides patchy, temporary control.

Bugguide.net

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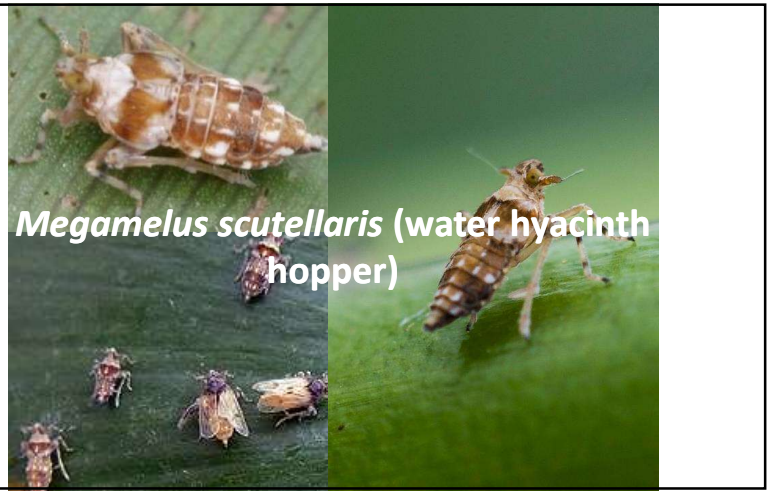

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Megamelus scutellaris (water hyacinth hopper)

- Released in 2010 – Florida, Mississippi, Louisiana, California.
- Two forms: with wings and without wings.

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Megamelus scutellaris (water hyacinth hopper)

- Released in 2010 – Florida, Mississippi, Louisiana, California.
- Two forms: with wings and without wings.
- Sap suckers – increase susceptibility to disease.
- Not abundant in Florida.

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Combined effect of biocontrol agents reduces WH biomass by 60%, seed production by 95%.

But it's not enough…

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Integrated management: because teamwork makes the dream work!

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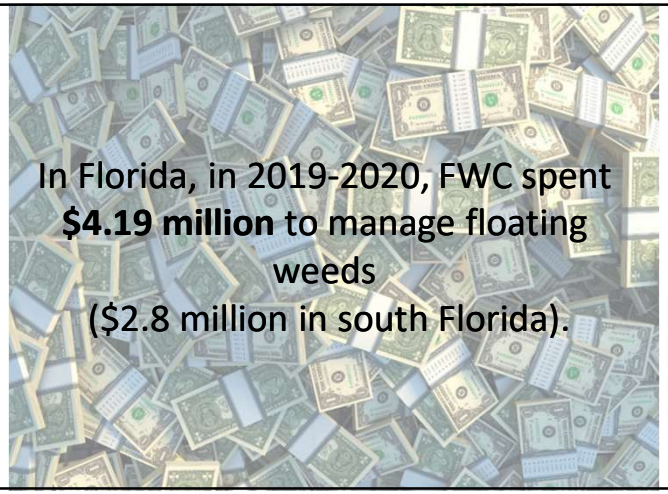

In Florida, in 2019-2020, FWC spent **$4.19 million** to manage floating weeds
($2.8 million in south Florida).

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- Operational rates of 2,4-D can be **reduced from 4qpa to 2qpa.**
- Herbicide usage can be **reduced with similar efficacy** when integrating with biocontrol**.**
- Important to leave refuges: 40-80% spray coverage equivalent to 100%.

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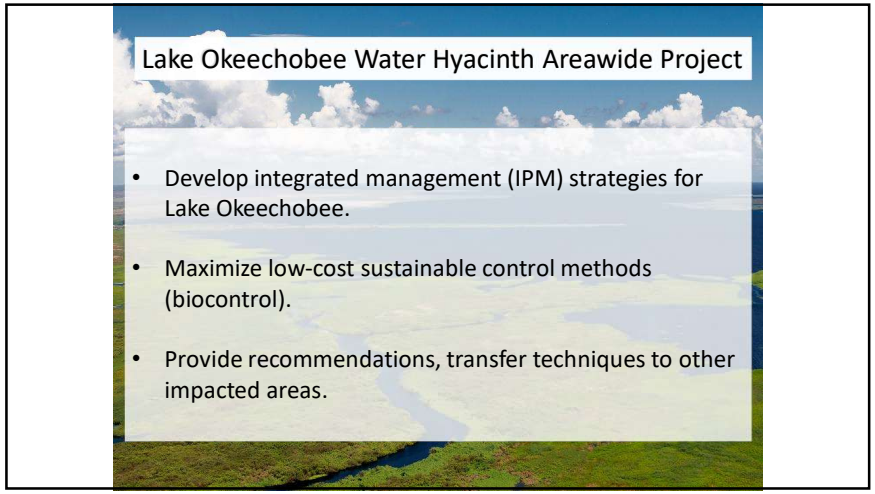

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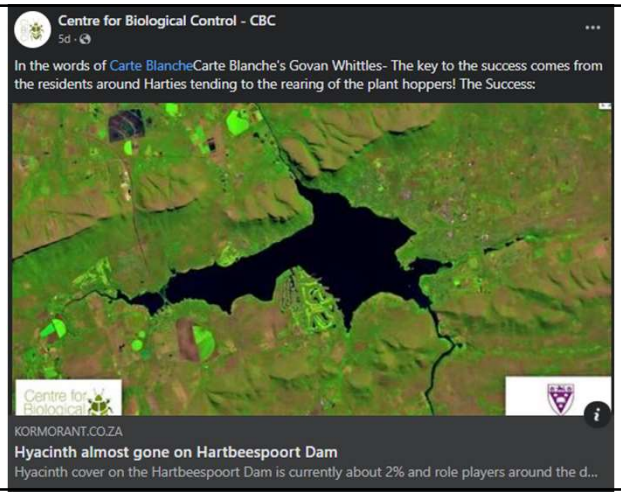
Centre for Biological Control - CBC
5d ·
In the words of Carte BlancheCarte Blanche's Govan Whittles- The key to the success comes from the residents around Harties tending to the rearing of the plant hoppers! The Success:
KORMORANT.CO.ZA
Hyacinth almost gone on Hartbeespoort Dam
Hyacinth cover on the Hartbeespoort Dam is currently about 2% and role players around the d...

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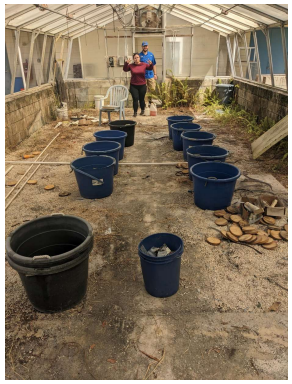

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Important: methods are unlikely to result in complete eradication but will exert maintenance control.

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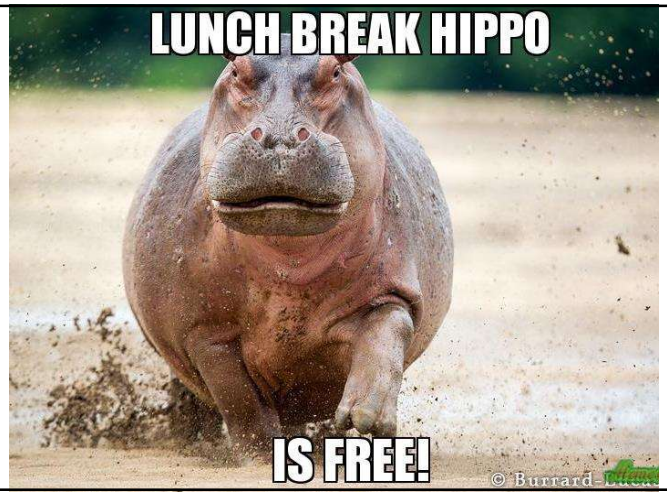
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74