

Tomahawk Lake Association's

Hydraulic Conveyor System

(Diver Assisted Suction Harvesting)



Thank you for attending the D.A.S.H.)diver assisted suction harvesting presentation at the Wisconsin Lakes Partnership Convention in Stevens Point. I have included within this power point presentation the basics or what this technology is all about. It hopefully gives you an idea of it's potential for your application.

If you need clarification for any of the information that I have provided in the presentation, feel free to email me at your convenience:

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“Weeding the Littoral Garden”

What is a D.A.S.H. system?

An automated system that removes, filters and bags Harvested EWM (AIS) after it has been hand harvested from the lakebed. (D.A.S.H. utilizing two people)

Increases the efficiency of the hand harvesting process ten fold.

Where it works best:

- At new sites where EWM (or other AIS) is just becoming established.
- In and around docks & boat houses, where other control methods don't work well.
- In high traffic areas where plants are routinely chopped up by boat propellers.

**Eurasian Water Milfoil Grows From The Shoreline
Out To Approximately 20 Feet In Water Depth.**

Hand pulling is efficient to 3 feet +/-.

3 feet to 20 feet – Control options are:

1. Un-assisted Hand Pulling – free/scuba divers
2. Diver Assisted Hand Pulling – D.A.S.H.
3. Chemical Herbicide Treatment
4. Mowing
5. Bio-Controls

Critical Element is Good Monitoring - Discovery

- Regular and consistent Searching methods are vital!
 - Beginning and end of season monitoring surveys
 - When possible use same teams for consistency – Divide & Conquer!
 - Search patterns need to be outlined in a “protocol”
 - Methods need to be standardized but amendable
 - Tools that can be used:
 - Aqua scopes – larger diameter works better
 - Underwater camera – ice fishing TV
 - Rakes on ropes
 - GPS data collection – Tied to mapping
 - Mapping infestations helps you look next time.

1. Un-assisted Hand Pulling: Free Divers

Divers pull plants as normal hand pulling method. Totally selective. Harvest success as good as divers. Diver collects as much plant material as possible and stuffs it into underwater bag or swims loose plant material to surface. Typical Problem areas:

Some loose plant material is lost due to fragmentation. Diver must swim upward to deposit plant material, and down to return to pulling. Detritus cloud forces divers to wait for cloud to dissipate before returning to pulling. Entire procedure reduces actual plant pulling to 20% +/- of divers time or less. If divers are free diving (as opposed to scuba diving) divers water depth is greatly reduced, and diver can stay down only as long as he can hold his or her breath.

2. Assisted Hand Pulling:

- Some or all of diver activities other than actual plant pulling are eliminated, which greatly increases efficiency.
- Totally selective.

Scuba

Divers can stay down long periods

D.A.S.H.

Divers can stay down indefinitely.

Fragmentation is largely eliminated.

Detritus cloud is removed with plants.

plants removed, filtered and bagged automatically.

3. Chemical Herbicide “Spot” Applications:

- a. Chemical applications efficient for large scale plant removal.
- b. Not particularly selective – negative effects on other plants.
- c. Long term effects on plant and animal life not well understood.
- d. Small treatments are expensive on a cost/acre basis

Diver Assisted Suction Harvesting Advantages

- A non-chemical alternative. No long term residue
- 100% control of process. No unwanted consequences.
- Totally selective in nature. Only removes plants chosen.
- Completely removes plants, roots and all.
- Virtually no disturbance of lake bed.

More Advantages:

- Divers work at harvesting instead of bagging and transporting to work barge.
- Divers don't have to wait for "cloud to clear."
- Virtually no fragment loss.
- Divers spend up to 1.50 hours on bottom JUST PICKING!

The Cons:

- The Cost to build, maintain and operate.
- Depends upon quality of divers work.
- Hand removal is relatively slow process.

T.L.A.'s HCS Design Elements:

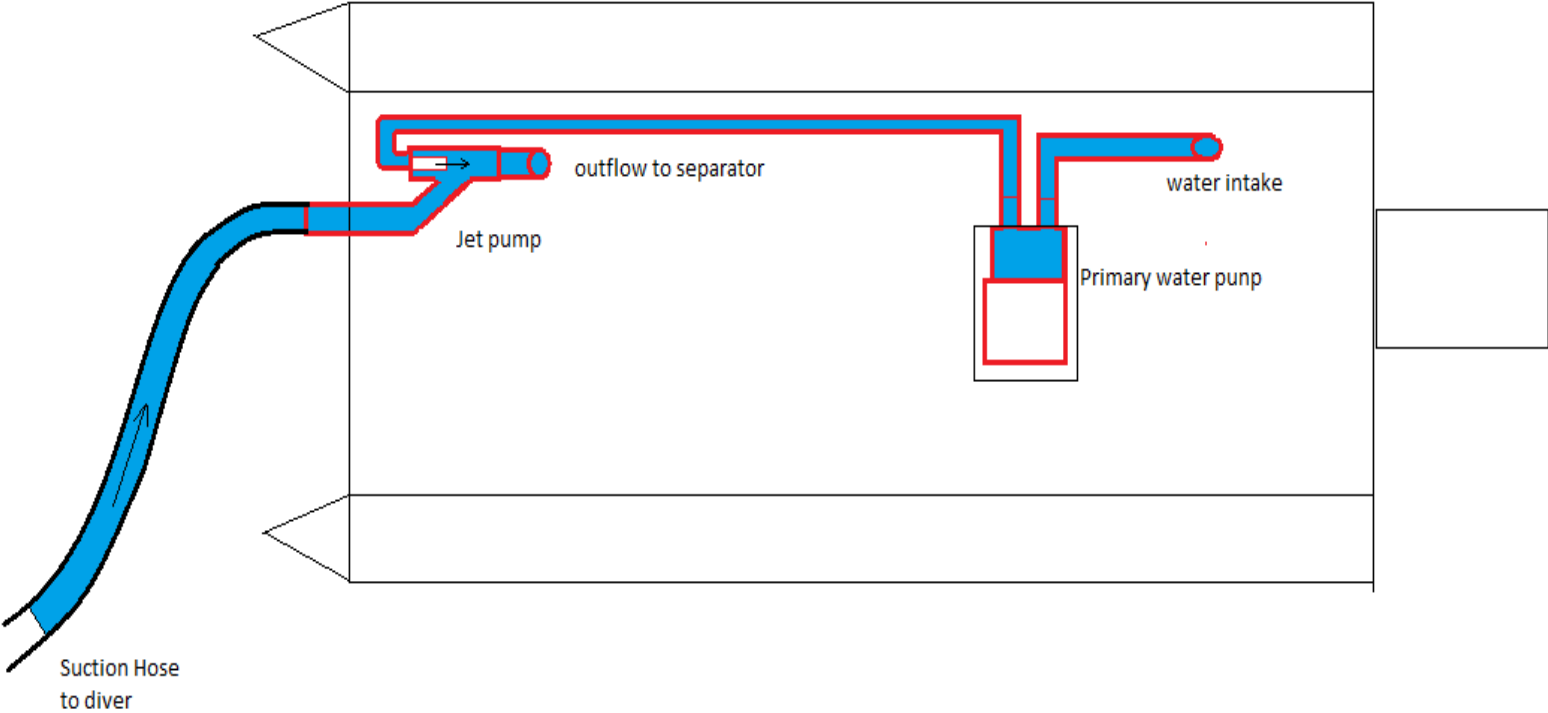
HCS incorporates several mechanical elements:

- A floating chassis – forms the base
- A “jet pump” water suction system – syphon technology
- A three tiered separation system
- A diver air supply system - Hookah

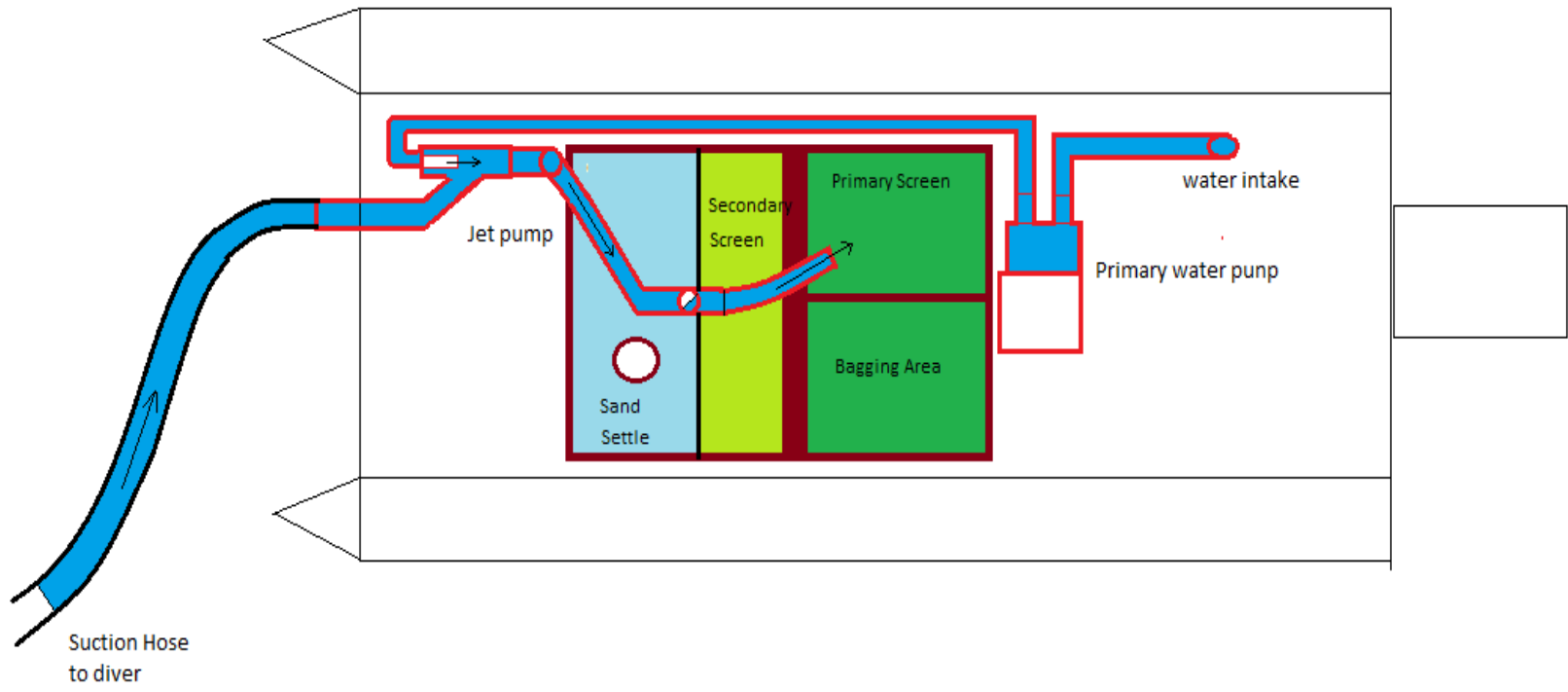
HCS Chassis - 28' Tri-Tune on 23" Tubes



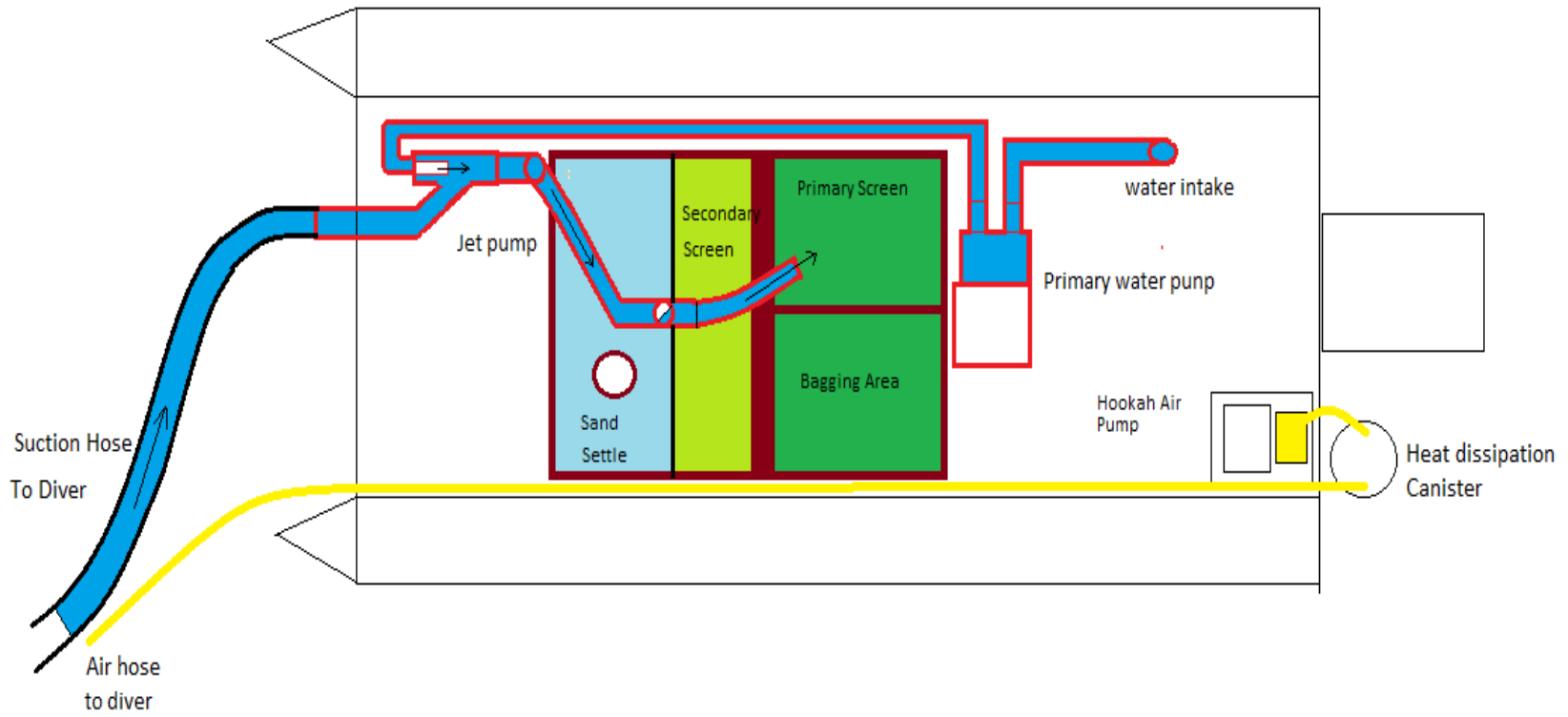
Water/ Suction System



Water / Separator System



Water / Separator / Air Supply System





What about Divers?

We require experienced divers who:

1. Have advanced diving certificates
2. Have extensive diving background (many commercial)
3. Are working on or have Natural Resources or Biology Degrees
4. Have good recommendations
5. Provide their own cold water wetsuit

We recruit UW schools of Natural Resources

We retain experienced divers

We reward good performance with year end bonus

Results: Lots of variables, remarkably consistent!

What effects “the harvest”?

1. Length of the season.
2. Number & size of sites.
3. Density of plants.
4. Down time” due to:

Weather: extreme cold, electrical storms.

Equipment failure & repair.

Diver lost time & school start up.

Divers Simply “Weed & Feed”!

- Suction nozzle faces surface
- Divers “feed” EWM foliage to suction vortex
- When foliage is inside nozzle, divers follow stems
Down to root ball and “pop it out” of lake bed substrate.
- Root ball & entire plant are removed (sucked) up
and out of lake, into separator system on board barge.
- Detritus “Cloud” is also is sucked up and out
- Diver continues on picking without stopping to
catch, bag, and bring EWM to surface

Harvest Results - 2009 - 2015 (7 years)

	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
Number of sites harvested	88	101	89	81	106	149	114
Seasonal drained weight	18,725	18,301	22,507	17,699	20,311	20,679	24,765
Estimated Surface Area (sq.ft.)	28,435	21,555	24,243	30,401	34,250	62,090	65,225
Target Plant Percent	89.1%	91.9%	92.7%	91.7%	93.6%	93.19%	93.19%

What does it cost to build & operate an HCS?

<u>Estimated Capitol Outlay</u>	<u>New</u>	<u>Used</u>
Chassis (with motor)	\$19,000	\$3,000
Water pump & plumb.	\$950	\$600
Filtration system	\$800	\$800
Diver air supply system	\$3,375	\$3,375
Diver equipment	<u>\$1,000</u>	<u>\$1,000</u>
Total Estimate	\$25,125	\$8,775

Estimated seasonal operating expenses:

Estimated Labor cost:

1 diver: \$22.00/hr X 38 hours / week	\$836
X13 weeks (June/July/August)	\$10,868
X 2 divers (total seasonal expense)	\$21,736
Insurance: (workmans comp, liability, Marine)	\$8,000
Harvesting expense (bags, permits etc.)	\$1,500
Fuel	\$1000
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Total estimated seasonal operating expenses:	\$30,836

Potential offsets:

- AIS control grants*
 - Wisconsin Environmental Board Water Grants
 - State General Environmental Grants
 - Private grant programs
 - County funding grants
 - Township/cities funding grants*
 - Chamber of Commerce grants
 - Private donations*
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- *TLA has obtained funding in these ways

Who can afford it?

- Large lake associations
- Multi-lake committees & partnerships
- Lake districts
- Partnerships between Lake groups, local governments and industry
- All it takes is an individual or group to “champion” it.
- Private commercial contractors are available

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