

An underwater photograph showing a diver in a dark, murky lake environment. The diver is positioned on the left side of the frame, illuminated by a bright, circular light source. They are using a suction harvesting device, which is a long, flexible tube connected to a pump. The device is being used to harvest aquatic vegetation, which is visible as a dense thicket of green plants on the right side of the frame. The water is dark and turbid, with some light rays visible. The overall scene is dimly lit, with the primary light source being the diver's light.

Welcome

Diver Assisted Suction Harvesting
Wisconsin Lakes Convention

March 30, 2016

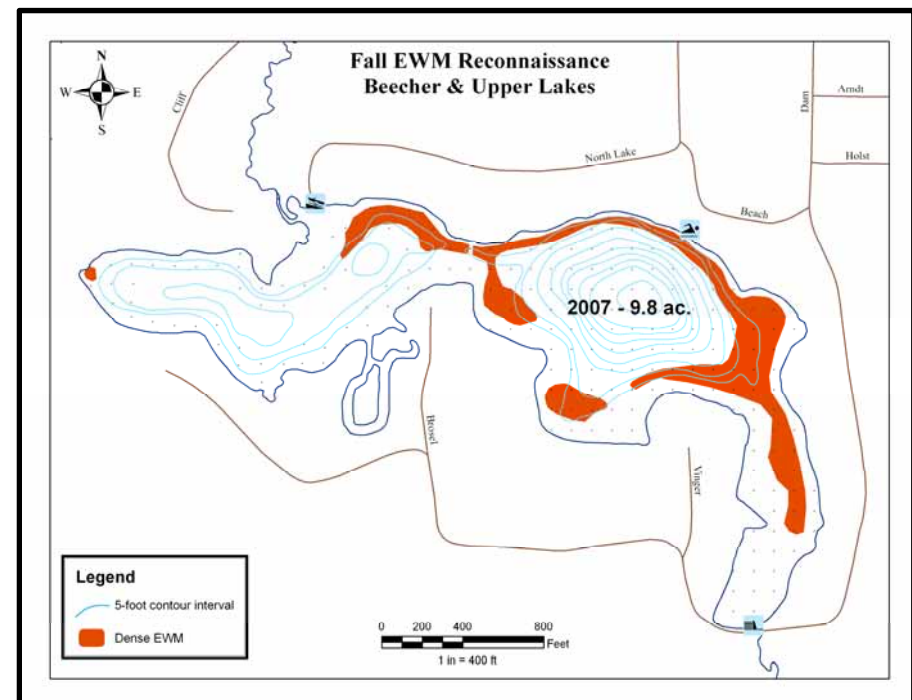
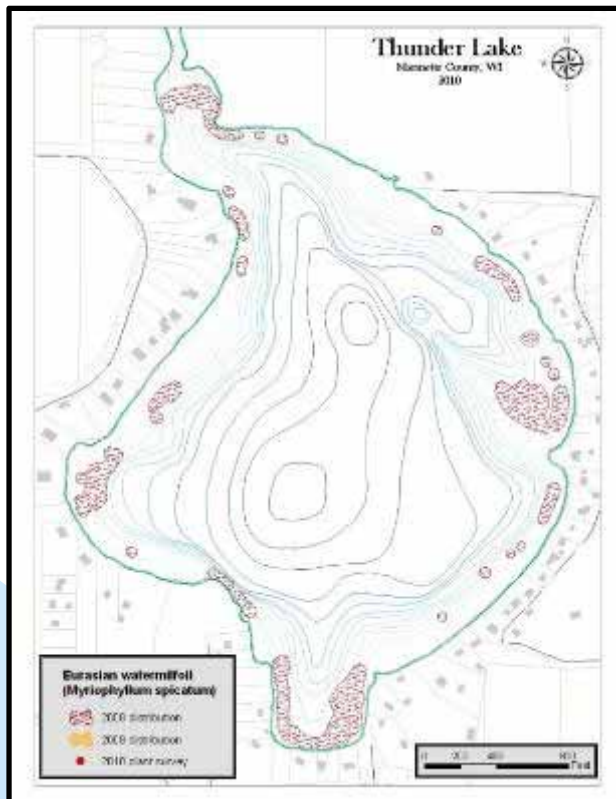
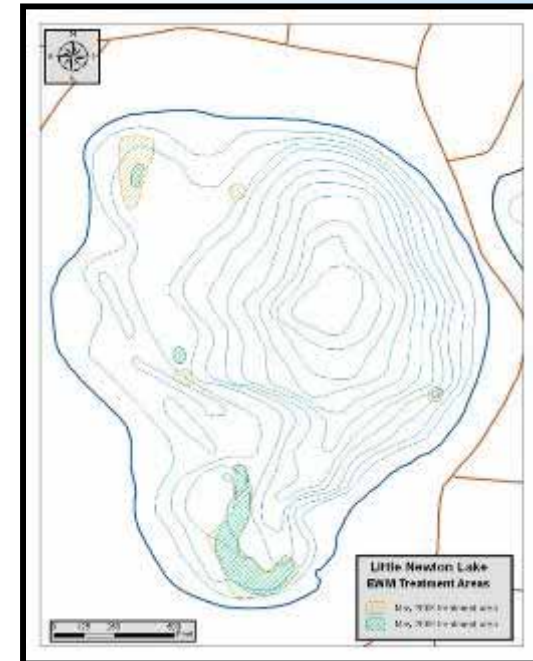
Brief History

2007 - Discovered EWM in Beecher Lake (72 ac) and Little Newton Lake (60 ac)

- AIS grants on both lakes to develop management plans and control EWM

2009 - Manage existing EWM population in Thunder Lake (135 ac)

- Lake Management Planning Grant



Chemical Control

- Effectiveness has varied
- Controversial
- Not applicable for low density populations



Manual Harvesting

- Difficult in deep water
- Difficult with very large plants
- Labor intensive

2012 AIS Control Grant

- Provide funds for construction of a Hydraulic Harvester
- Cost of Boat/motor/trailer was not grant eligible
- Equipment (pumps, hoses, dive gear) is grant eligible
- County match includes boat and lots of time

APM Rules and Permitting

- DASH should be part of a comprehensive APM plan.
- Permitted under NR109 - Manual and Mechanical Aquatic Plant Control
- As practiced, suction Harvesting is not considered dredging:
 - Plants are removed by hand
 - Sediment removal is incidental to plant harvesting (sediment attached to roots)

State of Wisconsin
Department of Natural Resources
RD 900769, Madison, WI 53707-2694

Mechanical / Manual Aquatic Plant Control Application
Form 2008-113 (11/2004) Page 1 of 4

Notice: Information recorded on this form is required to permit mechanical and/or manual aquatic plant control. Application fee: page 1130. (WV State: The Department of Natural Resources has approved and submitted to the State of Wisconsin. Available information is provided for program administration only. It is available to regulators under Wisconsin's Open Records Law (see 19.31 - 19.39, Wis. Stats.)

FOR DNR USE ONLY	
Date Received	Date Issued
File Number	Case File
By DNR	Year

Section I: Applicant Data

Plant Association Name: **Manitowish County LWCC**

Applicant Name: **1920 Hall Avenue**

City: **Manitowish**

State: **WI** ZIP Code: **54143-1717**

Telephone Number: **715-732-7528** E-Mail Address: **edunnevey@manitowishcounty.gov**

Individual and organization (e.g., Lake District, Lake Association, Property Owners Association, County Supervisor, etc.) of Registrant operating permit. Attach additional sheets if necessary.

Name	Address	Phone	E-mail Address
a. THE Lakes Association	Lizmy Engobes	715-757-2431	lengobes@twilb.luc.net
b. Newton Lakes Association	Dave Klein	715-757-3626	daveklein4@gmail.com
c. Boochee Lake District	Nancy McKenney	920-570-2196	roomdnancy@aol.com

Has a Lake Management Plan been provided to the DNR? Yes No

Is Year date approval of most current copy: Yes No (Jan 2010-Oct 2011)

Location of Applicant's Office: **LWCC Office - 1920 Hall Ave.**

Does the proposed permit involve work with the approved plan? Yes No

IF NO, explain. Attach additional sheets if necessary.

Is this area within or adjacent to a Special Area designated by the Wisconsin Department of Natural Resources? Yes No Don't Know If Yes, list area:

Section II: Location of Aquatic Plant Removal and Disposal

Waterbody of proposed plant removal: **Lake Superior Area (name)** County: **Manitowish**

Thunder, Little Newton, Secor, **202.0 combined**

Name of Plan (if sub-permitted): _____ Telephone Number: _____

Street Address: _____ City, State and ZIP: _____

Name of the Plant Control Site (if applicable)	Section	Length	Width	Depth	Area	County
Dunsmuir Control Site	SW	28	21	5	297	Manitowish
HAWEK (dunsmuir) Control Site	SW	30	22	5	330	Manitowish

Area(s) Proposed for Plant Removal (from table in permit cover letter for final permit phase). Please see attached sample drawing for grid size.

1. Length from shore _____ ft. x Shoreline or area width _____ ft. = Estimated Average Area Sq. Feet _____ ft.²

2. Length from shore _____ ft. x Shoreline or area width _____ ft. = Estimated Average Area Sq. Feet _____ ft.²

3. Length from shore _____ ft. x Shoreline or area width _____ ft. = Estimated Average Area Sq. Feet _____ ft.²

4. Offshore Control Site Length _____ ft. x Shoreline or area width _____ ft. = Estimated Average Area Sq. Feet _____ ft.²

5. Offshore Control Site Length _____ ft. x Shoreline or area width _____ ft. = Estimated Average Area Sq. Feet _____ ft.²

TOTAL ESTIMATED AVERAGE AREA: **SEE ATTACHED MAPS**

Building a Hydraulic Harvester

The Marinette Co. experience



Don't reinvent the wheel!

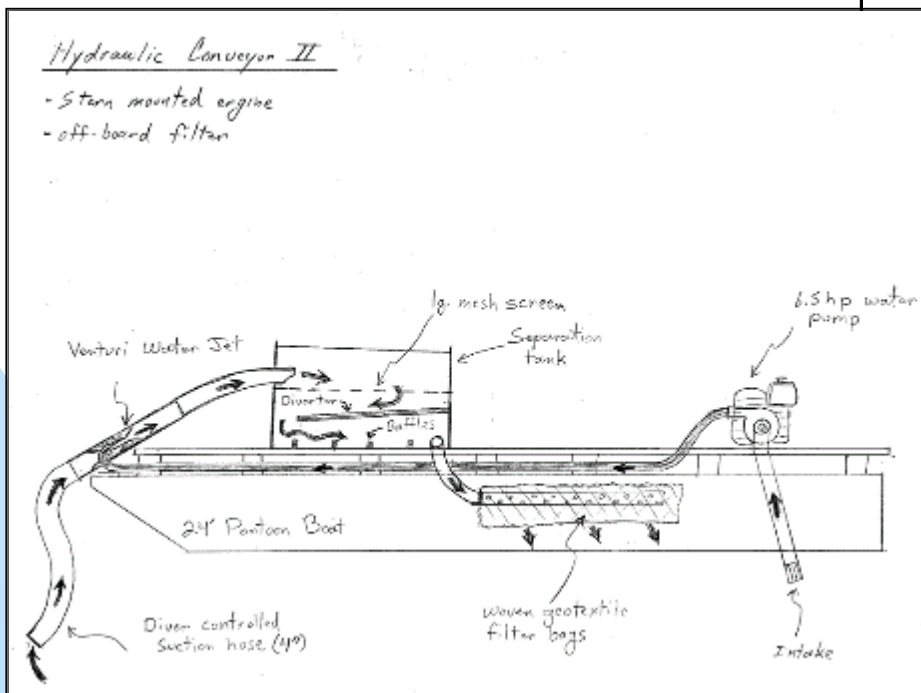
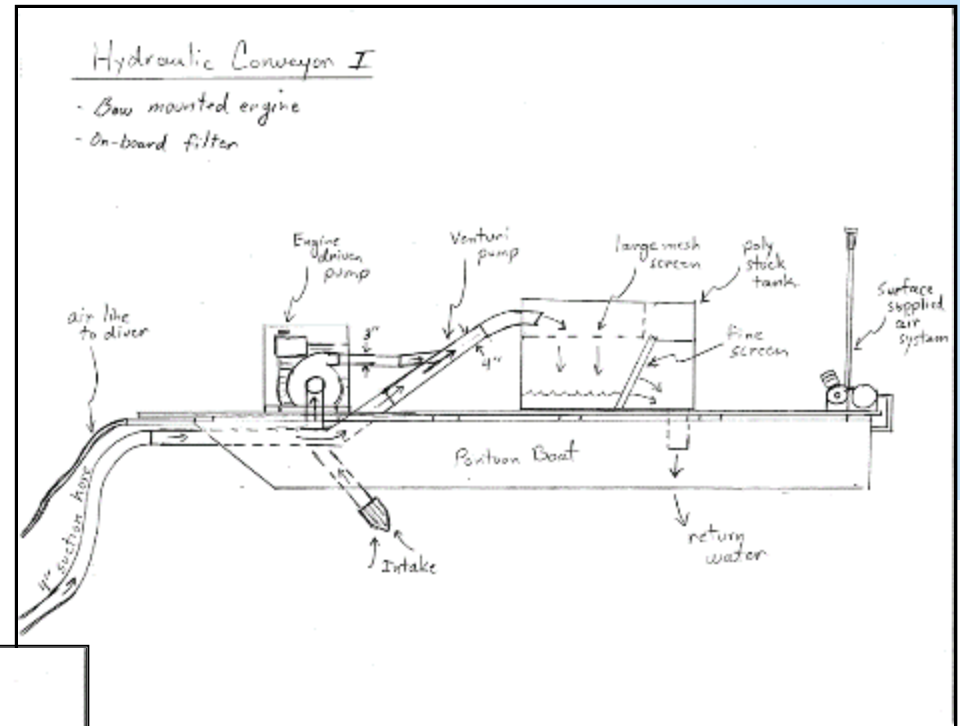


Lake Tomahawk suction harvester



Design Goals:

- Increased hydraulic efficiency
- More compact plant separation device
- Better return-water filtration



- Use an engineered venturi
- Fewer tight radius bends
- Increase filter area
- Filter return water off the boat

The "Guts" of a hydraulic harvester:



Water jet (venturi)



Engine-driven high pressure water pump

Suction is created by passing high pressure water through the water jet

Our working platform started life as a 24-foot
Sun Tracker Party Barge



American Marine & Motorsports in Shawano

Ask to see the pontoon boat graveyard



Pumps and Equipment

- 389 cc Honda (11.7 hp)
- HP 500 pump
- Integrated air compressor
- Twin 2" discharge hoses
- Twin leg water jet
- 4" suction hose (smooth interior)
- 4" swivel tip
- Lots of clamps and fittings





The pump and compressor are housed in a cabinet to the rear of the boat

Hoses are routed under the deck on top of the pontoons



The water jet is mounted on a sliding board that can be raised for trailering



The return water filtration system starts with a 175-gallon stock tank with a couple of toilet flanges in the bottom



Plants are deposited on a ¼-inch wire mesh screen



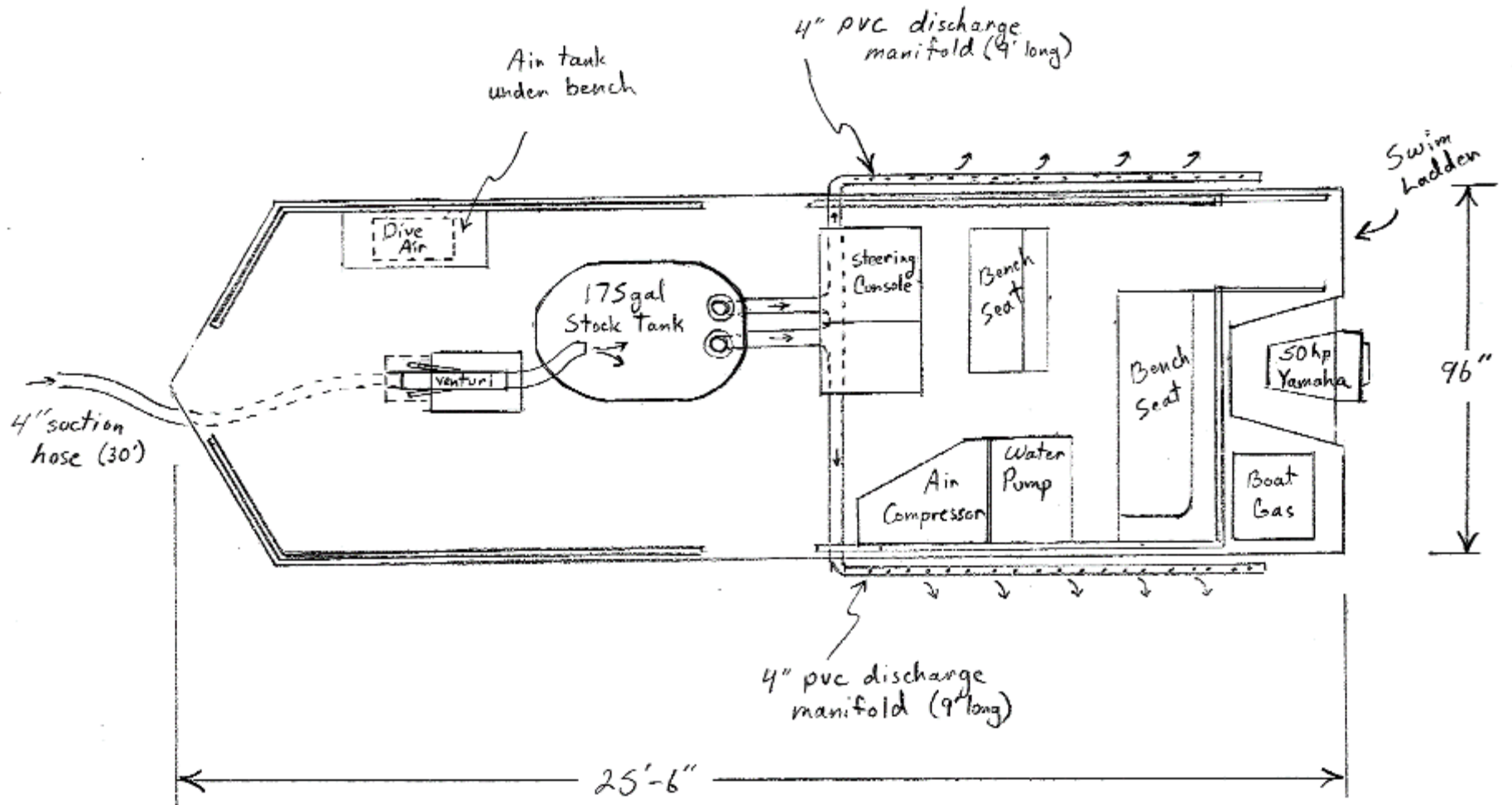
Water drains through 4" pvc pipes and fittings



Return-water manifolds on each side of the boat are made from perforated sewer pipes covered with custom-made mesh bags

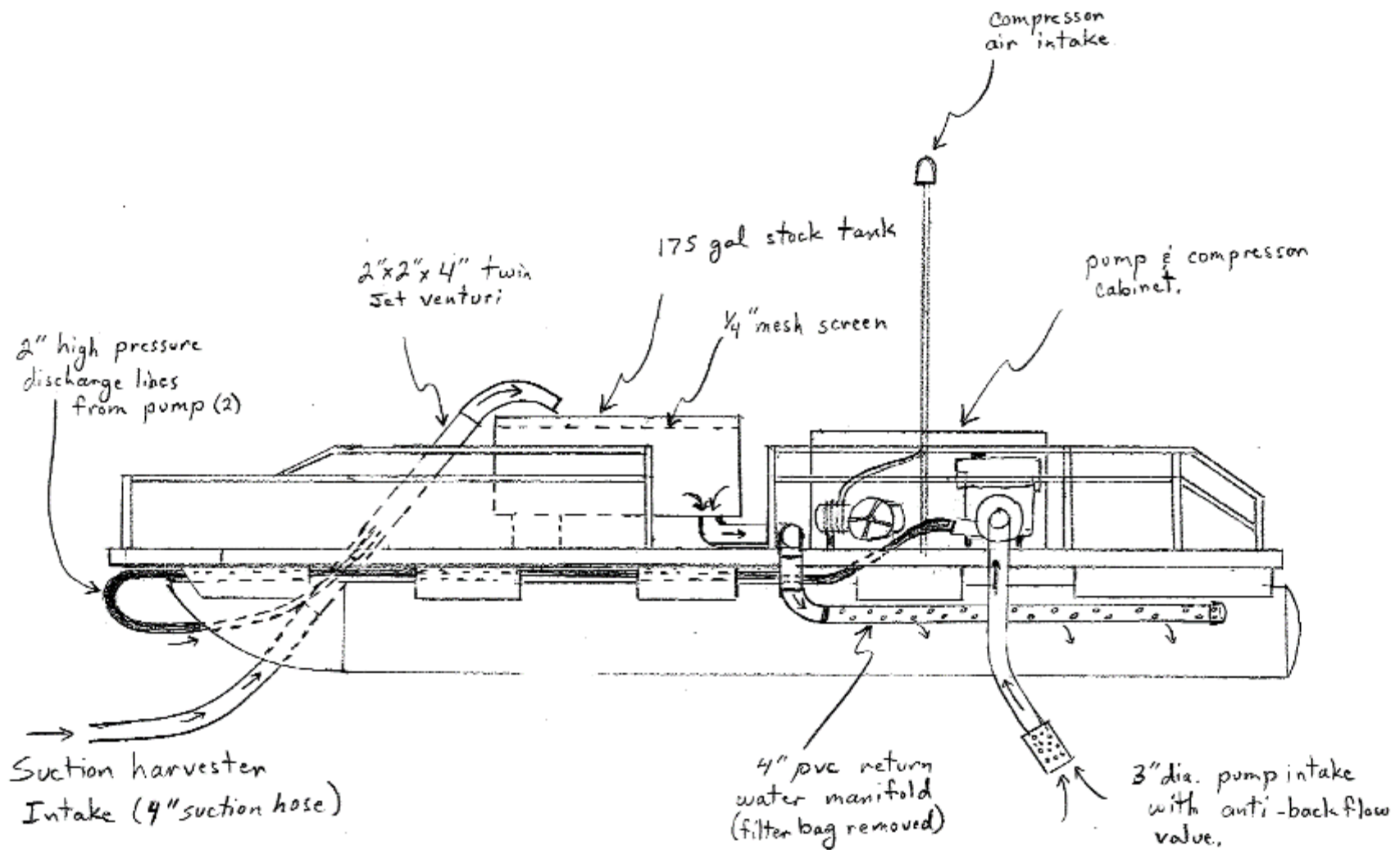
Hydraulic Harvester
Plan view scale - 1"=3'

Marinette Co. LWCD
3/15



Hydraulic Harvester
Side view scale - 1"=3'

Maninette Co. LWCD
3/15



Costs

➤ Boat (used), Motor (used) and Trailer (new)	\$8,222.00
➤ Hydraulic Gold Dredge Package <ul style="list-style-type: none">• 389cc Honda gas driven pump• 4" 2x2 power jet (venturi)• Integrated surface supply compressor• Accumulator tank and fittings• Hoses and fittings	\$4,924.00
➤ 150 gallon stock tank, PVC pipe & fittings	\$340.00
➤ Mesh filter bags (min. order of 6 bags)	\$230.00
➤ Miscellaneous supplies, fittings & hardware	<u>\$1,500.00</u>
	\$15,216.00

What we have learned from this build:

- Get a big boat - the space fills up fast
- Our system has plenty of power
- Quick connectors for the hoses are a must

Any questions about the design and construction process?



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Surface Supplied Air

Recreational (hookah)

- Small compressor - air hose -second stage regulator

Commercial

- Compressor & accumulator tank - umbilical (air/tether/communications) - full face mask or helmet



- (+) You won't run out
- (-) Unless the compressor quits
- (+) Tethered to the boat
- (-) Tethered to the boat

SCUBA

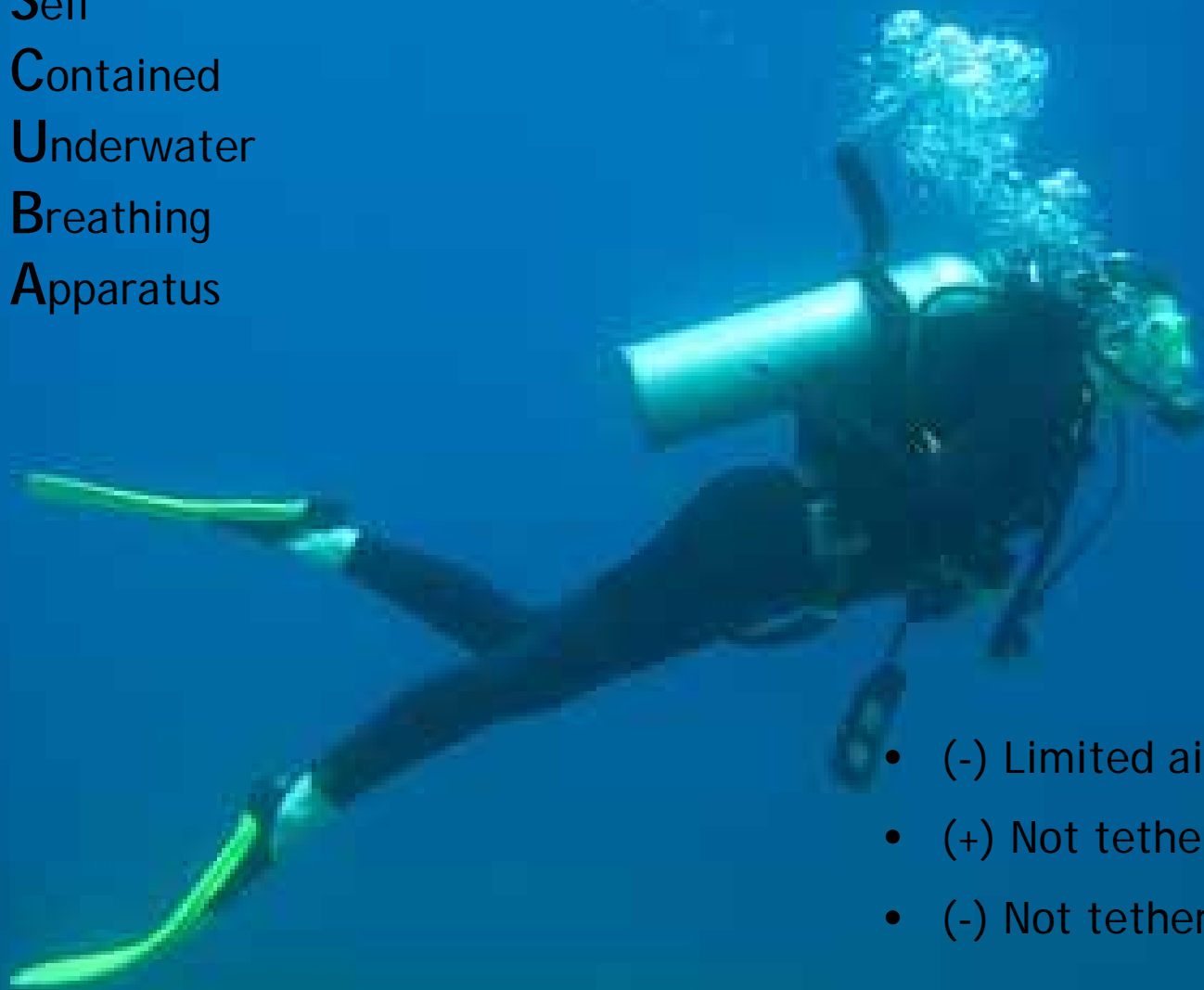
Self

Contained

Underwater

Breathing

Apparatus



- (-) Limited air supply
- (+) Not tethered to the boat
- (-) Not tethered to the boat

OSHA requirements for commercial diving

- I am not a lawyer or OSHA inspector
- Solo diver must be tethered to the boat
- Primary air supply (surface)
- Backup air supply (tank)
- Communication link
 - Requires a full face mask or helmet
- Diving Safe Practices Manual



Marinette County Air System

- Air compressor
 - Integrated with water pump
 - (+) Less expensive than a stand along engine and compressor
 - (-) Water pump must be primed and running to get air



- Accumulator tank
 - Provides a few minutes of air after the compressor stops
- Scuba tank
 - Backup air supply
 - Air supply for buoyancy control

Wireless Communication

- Face mask with built in microphone
- Underwater receiver
- Top-side receiver with headphones

Use your local dive shop!



More Dive Gear

- Dry/wet suit
- Buoyancy control vest
- Backup air tank
- Fins
- Weights
- First stage, gauges & hoses
- Air selector switch



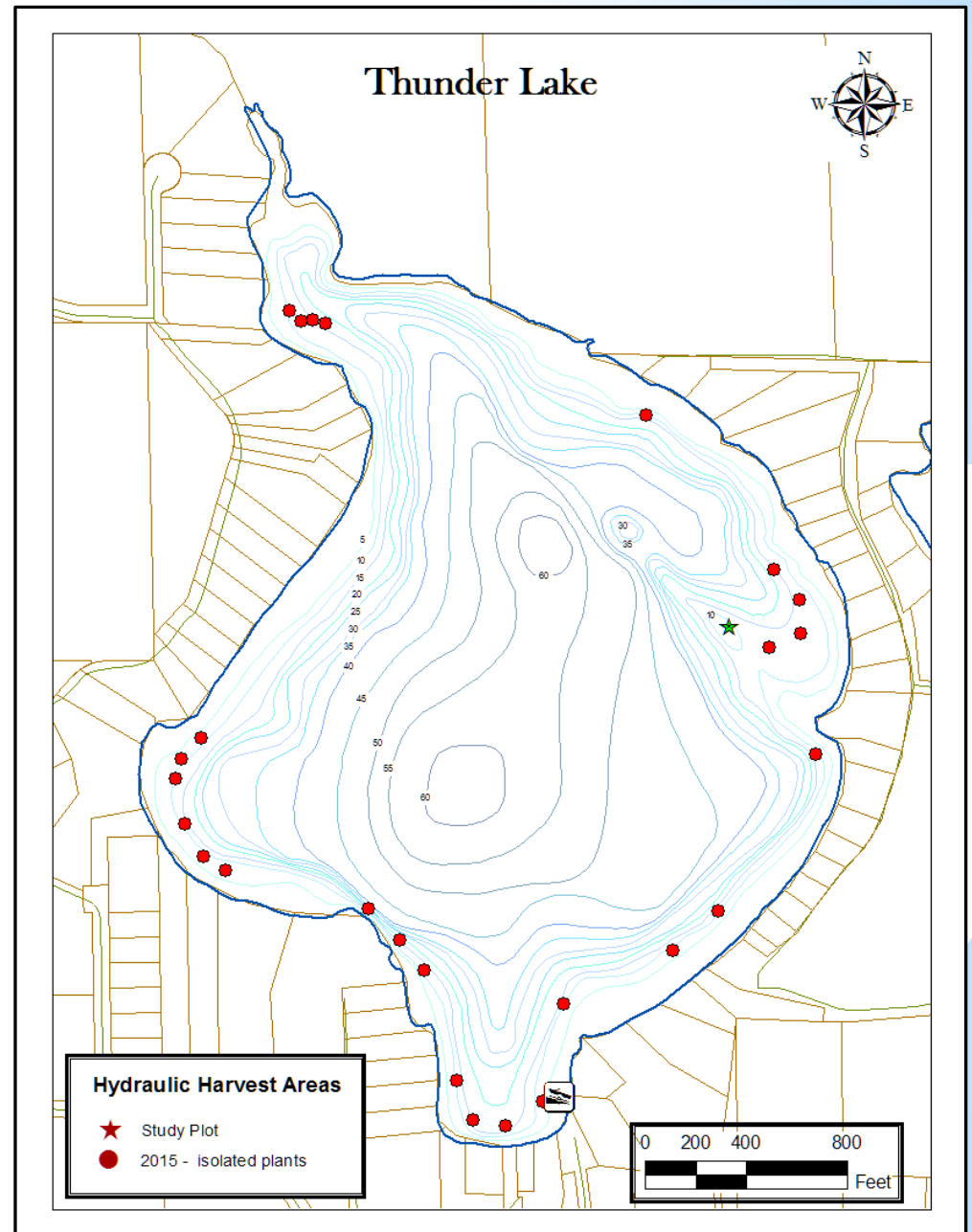
Costs

➤ Dry suits (2)	\$2,150.00
➤ Guardian OTS full face mask <ul style="list-style-type: none">• Wireless communication system• Surface communication unit	\$2,500.00
➤ Buoyancy control vest	\$250.00
➤ Personal dive equipment <ul style="list-style-type: none">• Masks, snorkels, hoods, gloves, etc.	\$600.00
➤ 50 cu ft air tanks (2)	\$260.00
➤ Regulator and gauges	\$275.00
➤ Isolator valve (air supply selector switch)	\$320.00
➤ Misc. hoses and fittings	<u>\$250.00</u>
	\$6,605.00

Work Planning

Start with EWM reconnaissance
(GPS EWM areas for harvesting)

At the start of the day mark
individual plants or small stands
with buoys



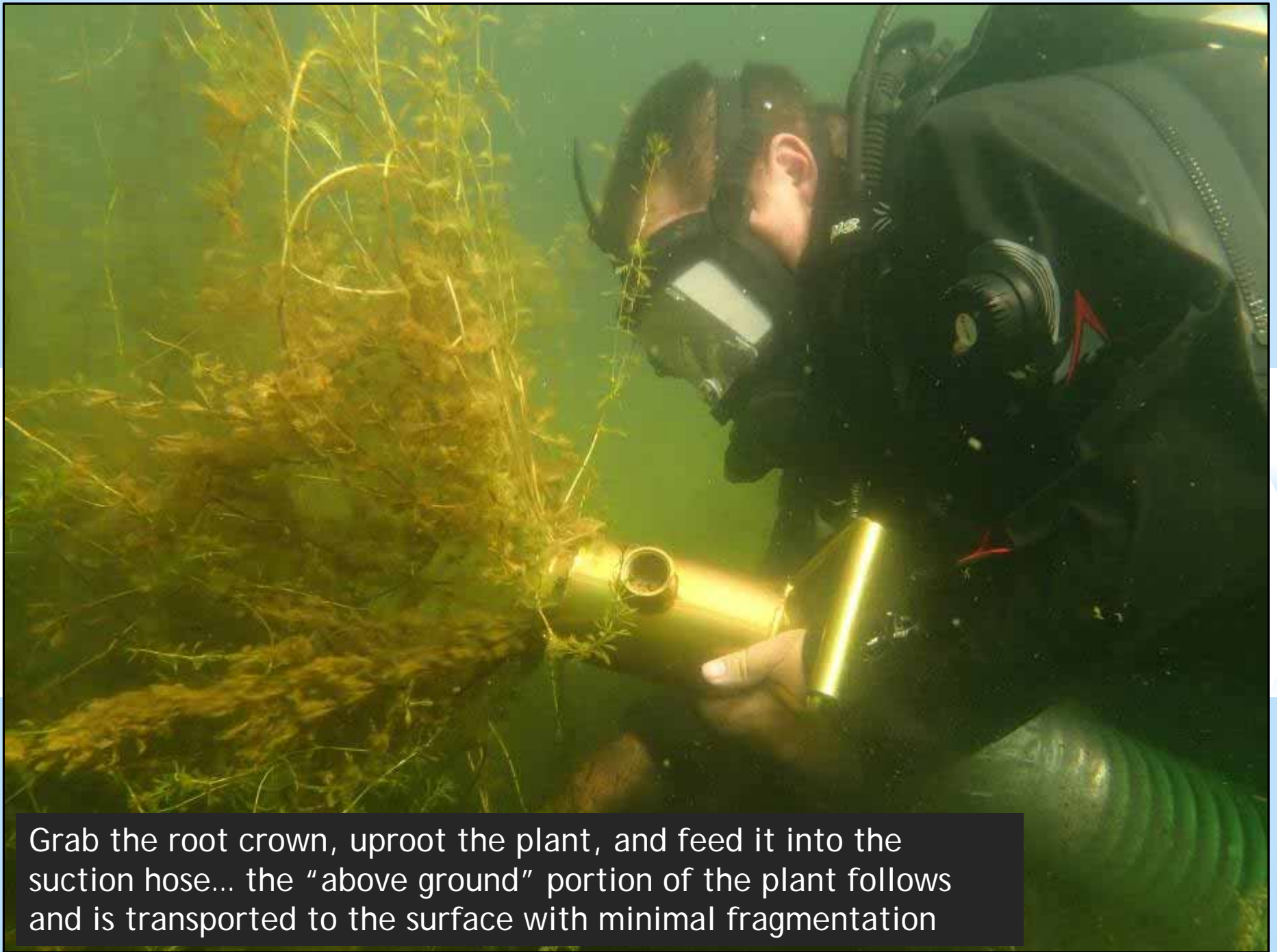
Operating Procedures

- Suit Up
 - Don the wet/dry suit
- Prime the pump
 - You don't want to sit around in full gear if there are pump problems
- Gear Up
 - Don BC and mask
 - Hook up and test air supply
- Connect the suction hoses
- Get to work



Staff on the boat assists the diver, monitors equipment, and bags aquatic plants.





Grab the root crown, uproot the plant, and feed it into the suction hose... the "above ground" portion of the plant follows and is transported to the surface with minimal fragmentation

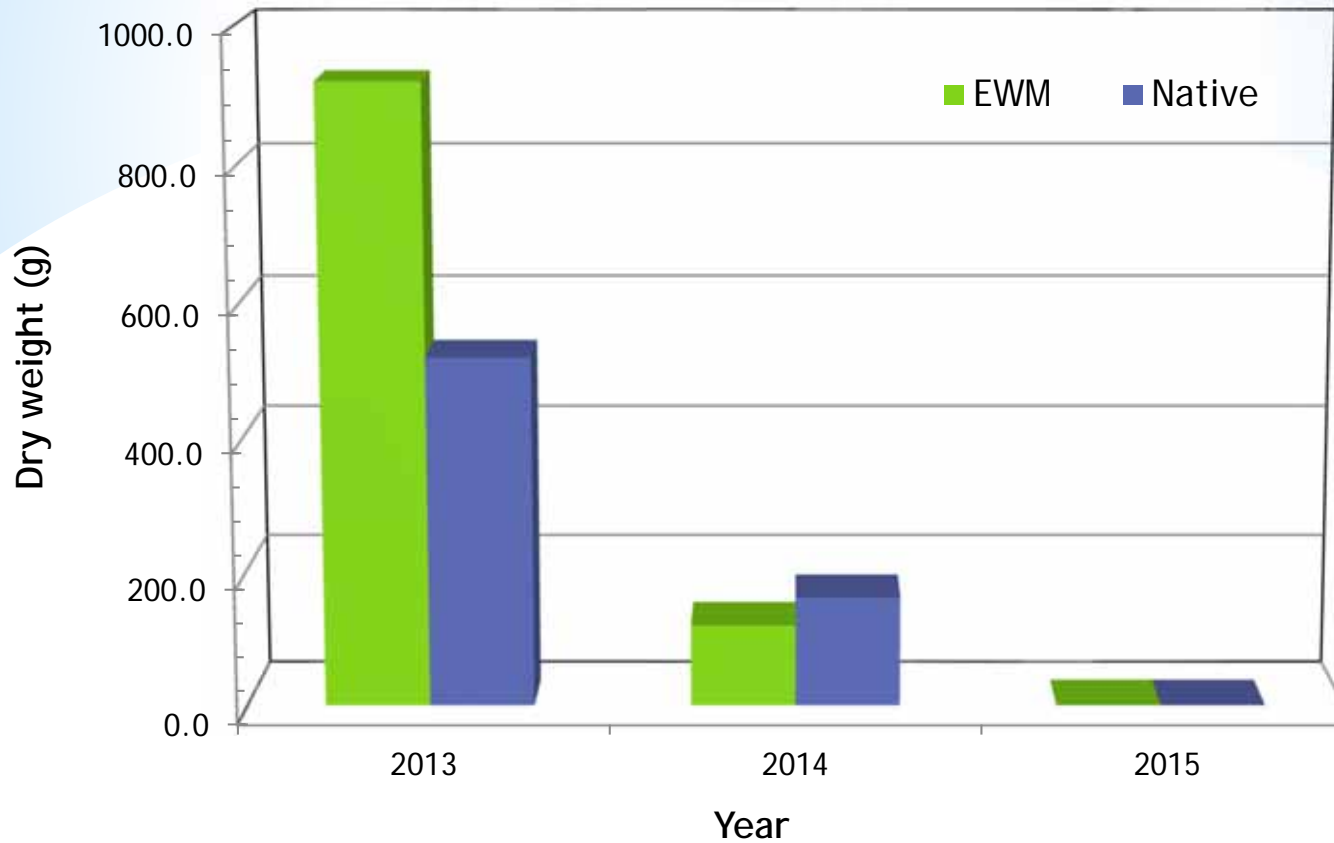


Feed the plant in first then follow the stems down to the root crown with your hand and rip it out

This one's not coming back!



DASH Test Plot Results



* Test plot is 225 ft² square (15ft x15ft) located in 10 feet of water
All EWM harvested, air dried, and weighed



Factors Effecting Harvest Efficiency

- Sediment type
- Depth
- Time of year
- Age of plants
- Associated plant community
- EWM density

Lessons Learned

- Shakedown Cruise
 - Pump Priming
 - Filtration
 - Hoses fittings and flotation
 - Things Break
- Operations
 - Positioning/Moving the boat
 - Dealing with wind
 - Live-boating
 - Diver buoyancy control



An aerial photograph of a large body of water, possibly a reservoir or a large lake. The water is dark green and brown, with a large, bright orange and white structure in the center. The structure appears to be a large, rectangular object, possibly a dam or a large building. The water is surrounded by a light blue border. The word "Questions?" is overlaid in the center of the image.

Questions?