From:	Joseph_Rizzi
To:	CWC Water Storage Investment Program
Subject:	2 to 12 Trillion Gallons of Fresh water available for CA
Date:	Wednesday, February 10, 2016 2:50:15 PM
Attachments:	Benicia Salinity Control Louvers.doc Fish Filter vs ZeeWeed.doc
Importance:	High

Both Aqueduct in California can be transporting to their MAX while helping the environment and fish at the same time.

Please request that a **New study on controlling the Salt water intrusion at the Benicia location, with a Safety lock installed for deep water ship passage by bridges, and keeping one section never controlled (always open) for the environment and using Louvers that will always leak and never shut out 100% of the water like a barrier or gate would.** There have been studies in the past for Dam's, Barriers or locks, but this should be about narrowing the channel and controlling SALT water.

Our water shortage in CA is due to a lack of inventive ideas and the lack understanding of what water we have and wasting mixing with seawater.

1. Add a SAFETY shipping lock to ensure safe travel of ships under the 3 bridges between Benicia and Martinez. The lock would be in the shipping channel which is the deepest part of the channel and allows for the most salt water intrusion into the Delta. The addition would help the Fish and environment because it would make the Delta more fresh water marsh, which supports more life.
2. Add Louvers between (all but one of) the newer eastern bridge supports, which will allow CA to export 10 MAF in a drought year and 46 MAF in a wet year while still allowing FREE passage from small boats and fish all year round through the one support that does not have any louver or lock. Per CA Water Department 1.3 MAF of water is needed to naturally keep the salt water to the west naturally; like narrowing of a river or channel.
3. ZeeWeed or similar type of Filter should be REQUIRED for all water extracted into the Aqueducts! If you were to make it a law that all extractions of water over 0.5 MAF require ultra filtration to keep life in the bodies of water health and happy.

Please see the 2 attachments what go into more details.

Please help add more water to the federal and Sate aqueducts in a responsible way to help the endangered fish and environment at the same time.

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Benicia Salinity Control Louvers

Add 2+ Trillion Gallons for CA

By Joseph Rizzi 707-208-4508 Joseph_Rizzi@sbcglobal.net

Saltinity Control Louvers is the best and least costly way to add trillions of gallons of FRESH water for the environment and for export and an ideal way to meet the ***Co-Equal Goals*** as required by law. Studied before as a dam, which I agree is a bad option for the environment, but not studied for Salinity control leaving a section always open for the environment. Can be installed in months for millions (not billions) and adds 7 to 46 MAF available for export based on drought or wet year.

Comment: **New study is needed on controlling the Salt water intrusion at the Benicia location, with a Safety lock installed for deep water ship passage by bridges, and keeping one section never controlled (always open) for the environment and using Louvers that will always leak and never shut out 100% of the water like a barrier or gate would.** In a DWR dam study in 1931 it stated that 1.3 MAF is needed to naturally hold back the salt water intrusion and we should put in a requirement that minimum flow be set at 2 MAF for the fish and environment.

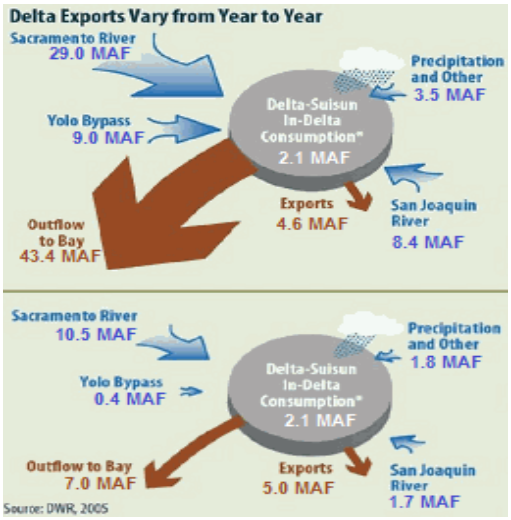
Pros and Cons:

- **Costs –** Benicia Salinity Control Louvers would cost hundreds of millions to add more that 2 trillion gallons of fresh water by adding the louvers at the base of the new Benicia bridge. Whereas 15 Billion is needed for the considered proposed "Water Fix" which is not going to add any additional water as proposed. I would recommend the export intakes be moved to Sherman Island instead of the current location and ZeeWeed type filter be used, which would add cost to the overall project, but not require for study.
- **Water Quantity** - 2 trillion gallons or in other words the exports can increase to 10 million acre feet exported in dry years (like 2014) if "Salinity Control Louvers" are added to Benicia bridge or that area to slow (not stop) the seawater incursion. Water fix is not suppose to supply any more water than today, but the public is skeptical since each tunnel can carry more than 15 million acre feet a year or a total of **30 MAF** instead of the current 5 MAF being exported south.
- **Ship Lock needed NOW! –** Safety is needed for all 3 of the bridges now, per my conversations with tug boat captains. Adding a Lock system for these ships should be installed in the shipping channel regardless of this salinity study requested for the safety of the ships, bridges and the environment. Blocking off this deep portion of the channel with a lock system will slow the salinity incursion into the Delta all by itself. The one section under the newer Benicia Bridge should be blocked off with a shipping lock. The lock would be closed at one side or the other at all times, unless water flows volumes are high enough to need the lock open to avoid flooding in Delta.
- **Brackish Salt Water –** Salt in the Delta is harmful to much of the eco system and water exports. It is easy to add saltwater back to areas in the Delta that environmentalist want or feel is needed for fish like the Delta Smelt by simply adding a pipeline from the bay to any and all points in Suisun Bay and Delta areas the salt water is desired in the quantities wanted. CA can take control of the SALT instead of letting it spoil the Delta.
- **Location –** After careful consideration of many locations Benicia's new bridge offers a good structure to easily add the Louvers on to with little stress to the bridge and the area's water depth is relatively shallow. Carquinez bridge area is way too deep and there are not existing supports in between land. Antioch Bridge area would require 2 Louver structures and you have 2 shipping channels to deal with as well as making difficult to manage water flow without causing issues with the Delta flows. Benicia's location is ideal because there is a large volume of water between the Salinity control point and the Delta's Sherman Island.
- **Dams added Water –** Salt is a major reason for letting out fresh water from the northern dams, to hold back the salt intrusion and to channel the fresh water naturally in stream from the Sacramento area to the Tracy pump area. With the Salinity Louvers to hold back the Sea Salt intrusion instead of added quantity of fresh water will allow CA to hold more fresh water storage in it's existing dams for later use.

Benicia Salinity Control Louvers

- **Co-Equal Goals** – Ships will have easier passage, small boats and fish will have an always open passage between fresh and salt water areas, Delta will have less to no salt incursion, environment will have Salty areas added to those areas needing more salt in the Delta area pied in, Double or more the water quantity available for export in dry and wet years, more water stored in Dams to the north to extend water supply, Colder water for fish, more life in Delta because fresh water marshes support more life than Brackish marshes, helps endangered fish, helps farmers in Delta, adds ability to have more crops in south which will add employment, clean air, add food and much more.
- **Louvers –** Not (Dam, Gate or barriers). Louvers 2 to 4 feet wide with each individually controlled to be horizontal to allow for water free flow or vertical to block most of water flow. Closing the lower louvers stops more of the salt incursion which is heavier than the fresh water that is lighter. Having the louvers computer controlled and connected to sensors in the Delta the measure Salinity and water level. This allows for the louvers to be opened to keep the flow and control the salt all year long. The lower louvers can be opened and directed downward to clean out the sediment too.
- **Min. Water for Delta –** DWR studied Dams across the straights in 1931 which failed on environmental concerns due to fish migration issues and not clearing out sediment and effluence from the Delta. Per this DWR study in 1931 1.3 MAF is needed to naturally keep the salt water out of the Delta and in the Bay, which I would recommend being rounded up to 2 MAF as required for the environment to keep the Delta healthy.

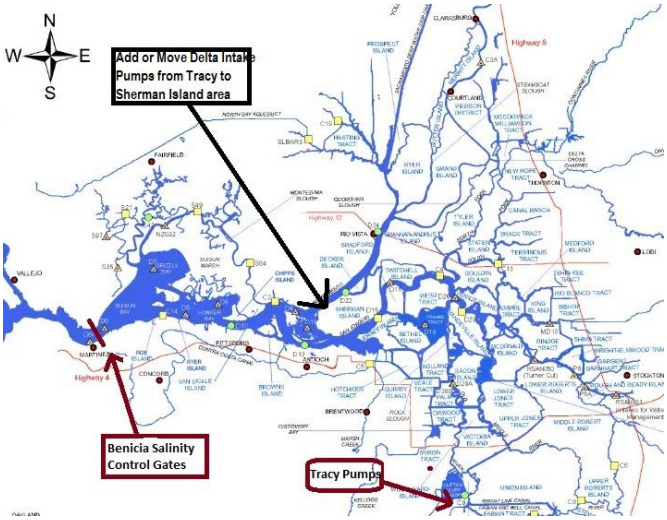
Type of Year	Available	Max. Export	Min. To Bay and Sea
Dry Year	12MAF	10MAF	2MAF
Wet Year	48MAF	46MAF	2MAF



http://tinyurl.com/l3npwmg
This is a view of the water flows in and out of the Delta area.

This also shows how much FRESH water can be exported if we can control the Salt intrusion into the Delta area.

This also shows that the location of intakes is bad for the Delta because the San Joanquin river does not have the volume to export all the water wanted in Summer, without reversing the Delta flows.



http://tinyurl.com/ktkv6hj

Benicia is the ideal location to Control Salinity, and it is clearly shown in the picture to the right that there is a great amount of water between the control point to the new proposed intake at Sherman Island.

Support the Co-Equal goals of people and Delta: → http://tinyurl.com/kno3ugg Added sales of water would be allowed without harming the Delta environment, which would allow for more faming in the Central and Southern California areas. More farming is more jobs and more food for people and wildlife. Freshwater marshes are one of the most productive ecosystems on earth.

Tracy Aqueduct Pumps intake: The intakes need to be moved or added to in order to not reverse the flows of the Delta. Why? Per the DWR Delta Exports chart on the other side, the San Joaquin river has 1.7 to 8.4 MAF of flow which is what the Tracy pumps pull from, so to max out the aqueducts at 10 MAF a better source for the intake is needed, which the closest (keeping in mind the co-equal goals) is Sherman Island, just outside the sensitive Delta ecosystem area.
*Per a study done by Dr. Pyke's (WDIC) Western Delta Intake Concept (**www.FixCAWater.com**) the intake pumps should be moved to Sherman Island to naturally control over pumping of the fresh water. This allows the extra water, that would normally just mix with the bay, to be exported south with no adverse environmental impacts.*

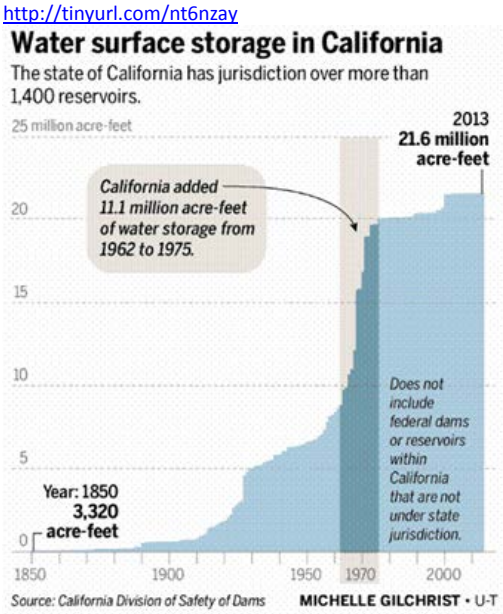
Running the pipeline(s) near the Rail line and Freeway would allow for a nearly straight route from Tracy pumps to Sherman Island which is significantly less expensive because it is only 20 miles instead of 37 miles.

$3 million to put in Temporary partial dam by AquaDam to limit water in about 1 months time for 2015, while the more permanent Louvers can be designed and installed at the foot of the new Benicia bridge.

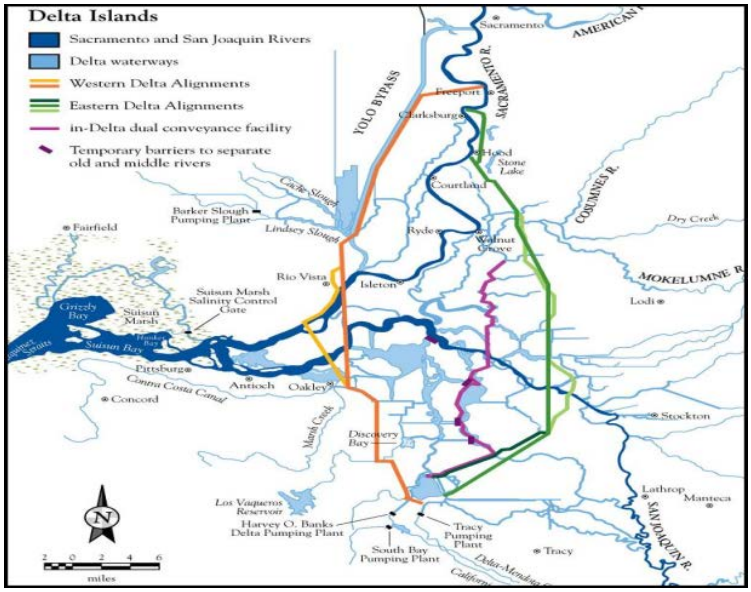
Resources/Reference links:

1931 DWR study of Barriers in the bay. (pg. 39 states 1.3 MAF needed to hold back salt waters naturally without locks. → http://tinyurl.com/punsotf
NOAA Water charts of Benicia area for water depths → http://tinyurl.com/q5fthlt
7 MAF = 2.28 trillion gallons, Export via Aqueducts contracted at 5 MAF with **max capacity of 9.46 MAF**
DWR Suisun Marsh Salinity Control Louvers report → http://tinyurl.com/q6ogcrz
95 square miles of water storage in the Delta estimated → http://tinyurl.com/najvwnn
Marsh Types →EPA http://tinyurl.com/napw6hg Wiki http://tinyurl.com/pjoyz28
Flow CalcTool for tunnel flows. → http://tinyurl.com/cw63n4x 30 Ft Dia. pipe for 20 miles 100 Ft drop = 7.8 MAF

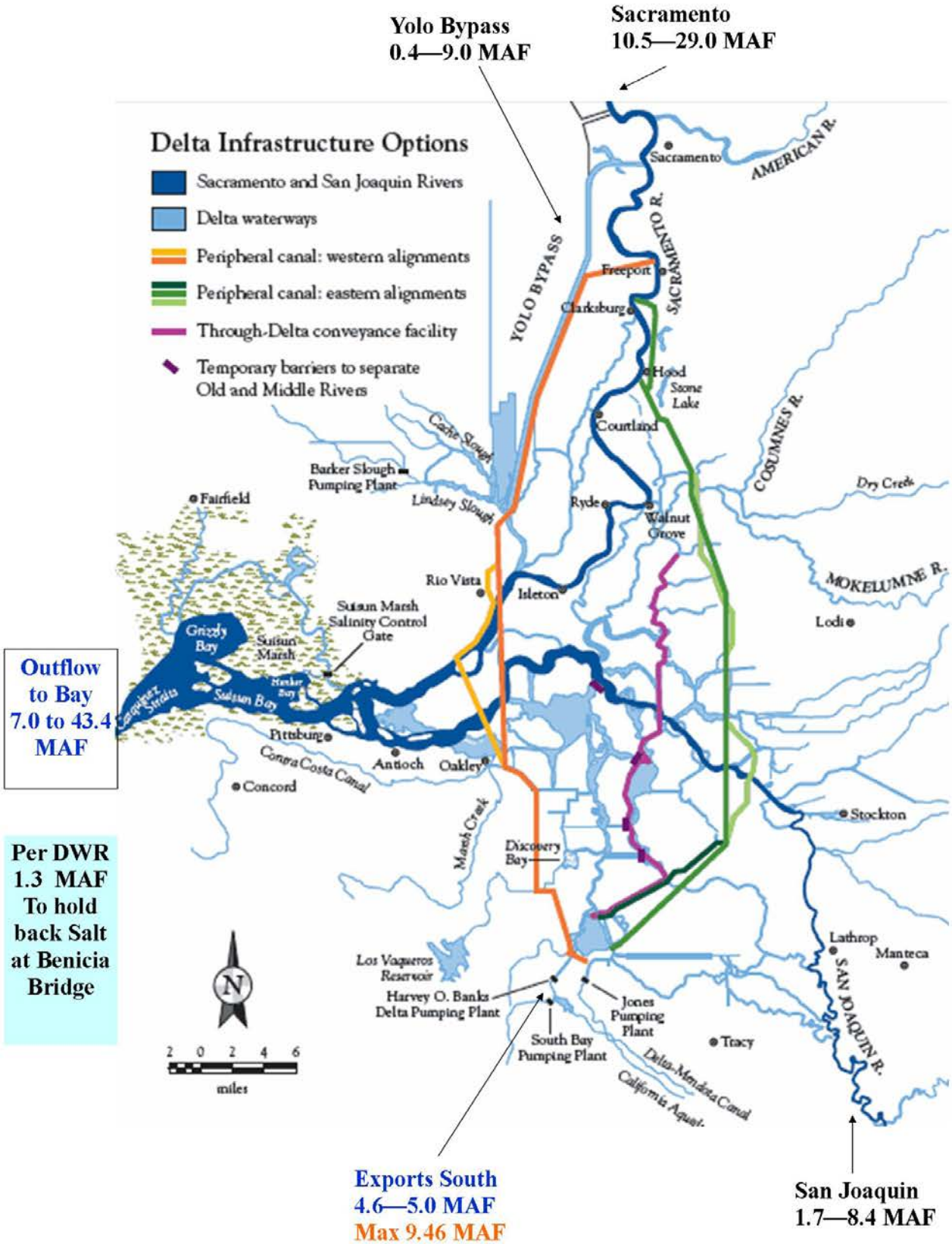
http://tinyurl.com/nt6nzay



http://tinyurl.com/c7on6p - Alternate Tunnel Routes



Benicia Salinity Control Gates



Fish Filter or ZeeWeed

Best available technology?

By Joseph Rizzi 707-208-4508 Joseph_Rizzi@sbcglobal.net

ZeeWeed (Ultra Filtration) is an example of the "Best Available Technology (BAT)" for the environment and for the project of exporting large quantities of clean water. Co-Equal Goals as required by law.

Comment: **Why is Ultra Filtration not being considered instead of the very poor "Sate of the Art" fish screens for the exporting of water?** If costs, then we now know the cost of the environmental health, but a documented study should be done, so we know a better cost estimate for the cost of our environment verses the cost of water for export.

I will use the term ZeeWeed as an example of Ultra Filtration in this document, but there are many manufactures of Ultra Filtration Membranes. I am retired and do not sell ZeeWeed, but I do love the product and what it does.

Pros and Cons:

- **Costs –** ZeeWeed 500 is modular and can be installed at one site to extract all the water needed without settling ponds. One or more troughs can be created to allow the water to flow in and around the open water hollow fiber ZeeWeed membranes to extract only the water (not the nutrients, fish food and other environmental features that make up the surrounding water). Higher upfront cost for ZeeWeed Hollow Fibers, but less infrastructure costs makes ZeeWeed a less costly choice. Fish Screens proposed requires large settling pond, pumps for mixing and the ponds have to be regularly maintained, so it will have a higher cost of construction with 3 to 5 sites proposed and maintenance of screens, ponds and pumps.
- **Pre-Screens** - ZeeWeed would require a pre-screen like the great fish screens that are being looked at, but I would recommend something more like the screens that we all use for windows and patio doors, just enough to keep out larger fish. It can be installed in a zig-zag motion like a car's oil or air filter if the rate of flow through the screen material is needed and modular like 5 foot sections that can be easily taken out and replaced as needed. Proposed Fish screens do not need prescreens, but should be made modular for maintenance purposes and installed in a zig-zag patter to reduce the speed of water flow through the screens.
- **Environment –** ZeeWeed causes **Zero** harm to the environment and is actually helpful because it will concentrates the fish food at a location for the fish to thrive without harming any aquatic life. Fish Screens **KILL** aquatic life and the setup with the settling ponds takes the nutrients and other small life in the water food chain.
- **Food Chain –** ZeeWeed does not kill fish or any part of the Aquatic food chain, whereas Fish Screens and settling ponds kill parts of the food chain and removes it from the water ways and the Delta.
- **Energy –** ZeeWeed can run using Nature to power it (which would be Zero energy) but then you would have to lift the clean water, which would be better to lift the water in a water tower to get better flow to it's destination since the trace pumps and all sites considered are at about the same elevation and the higher pressure means smaller pipes are need, leading to lower project costs. ZeeWeed need AIR bubbles and reverse flow to quickly and easily clean the hollow fibers. Fish screens need Zero energy, but there is power needed for settling ponds and pumps. Good analyst should crunch the numbers and get the comparison, so we all know the true facts in the comparison.
- **Endangered Spices –** ZeeWeed cannot kill any because the pores are too small and not enough pressure to trap fish or any organism. Whereas Fish Screens can, have and will continue to killed endangered Spices so long at they are being used directly and indirectly.

ZeeWeed 500 Features

- Highest solids tolerance of any hollow-fiber membrane
- Works through virtually any raw water quality change or upset
- Outside-in flow path provides a more robust system
- **Fully automated** for simplified design and operation
- Outstanding technology for virtually all wastewater treatment applications - from greenfield plants to retrofits to water reclamation projects

ZeeWeed* 500D Module

Immersed Hollow-Fiber Ultrafiltration Technology

Module Type	WW	DW
Application	Membrane Bioreactor	All Other Applications
Nominal Membrane Surface Area	340 ft² (31.6 m²)	340 ft² (31.6 m²) 440 ft² (40.9 m²)
Module Dimensions		
Height	2,198 mm (86.4")	
Width	844 mm (33.2")	
Depth	49 mm (1.9")	
Module Weight		
Max. Shipping Weight (crated)	26 kg (58 lb)	28 kg (62 lb)
Lifting Weight (varies with solids accumulation)	26 – 74 kg (58 -163 lb)	30 - 74 kg (66 -163 lb)
Membrane Properties		
Material	PVDF	
Nominal Pore Size	0.04 micron	
Surface Properties	Non-Ionic & Hydrophilic	
Fiber Diameter	1.9 mm OD / 0.8 mm ID	
Flow Path	Outside-In	
Operating Specifications		
TMP Range	- 55 to 55 kPa (- 8 to 8 psi)	-90 to 90 kPa (-13 to 13 psi)
Max. Operating Temperature	40°C (104°F)	
Operating pH Range	5.0 – 9.5	
Cleaning Specifications		
Max. Cleaning Temperature	40°C (104°F)	
Cleaning pH Range	2.0 – 10.5	
Max. Cl_2 Concentration	1,000 ppm	

a product of ecomagination

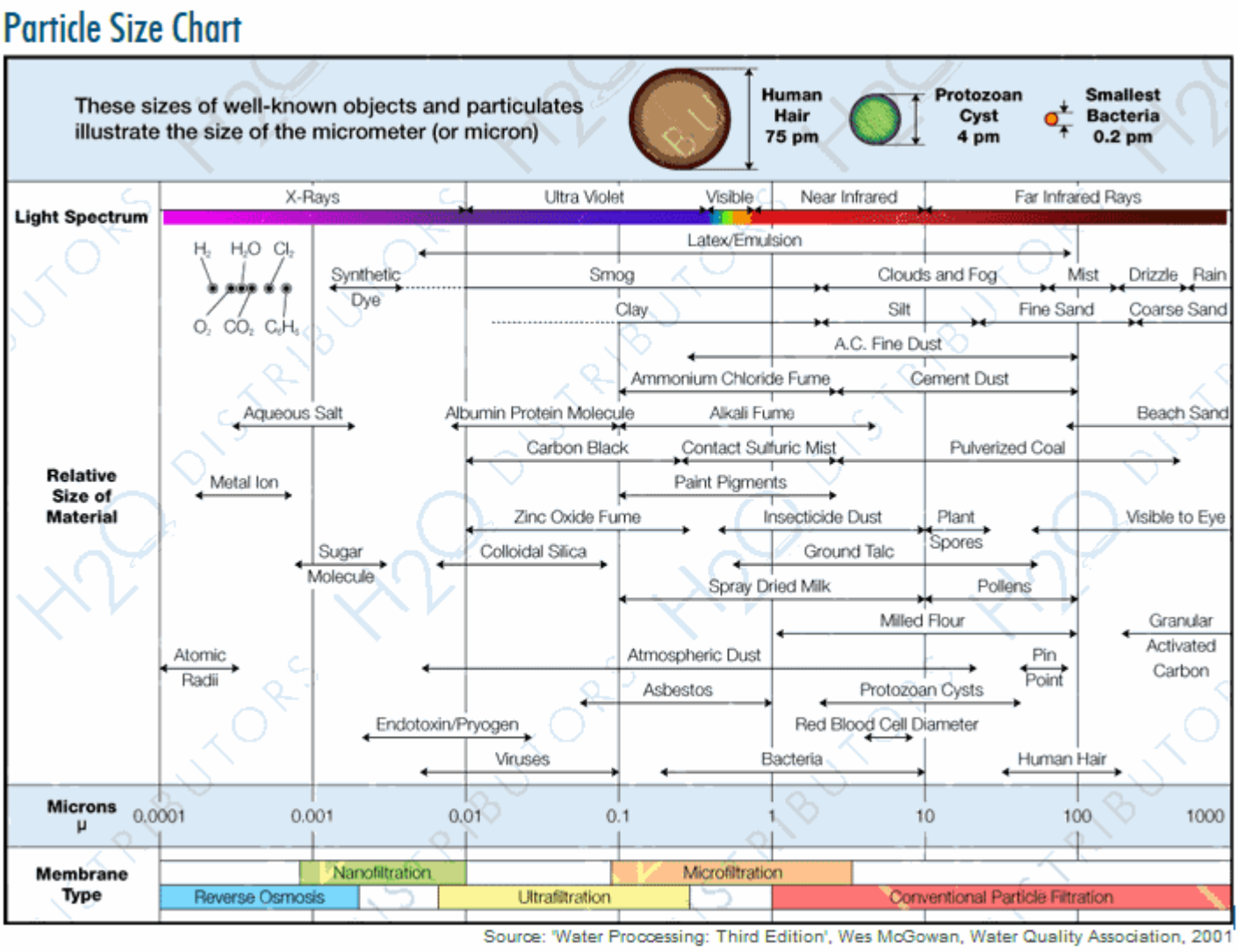
Fish Filter or ZeeWeed

Where does the so called "State of the Art" Fish screens fall on the following chart?

Look where ZeeWeed is on the chart – You can find it on the bottom of the chart marked in YELLOW showing that all items above maybe filtered out and everything to the right cannot make it through the pores.

Keep in mind that the cleaner the water is that is extracted the better quality of water that it is delivered, as well as keeping the environment that the water is taken from healthier.

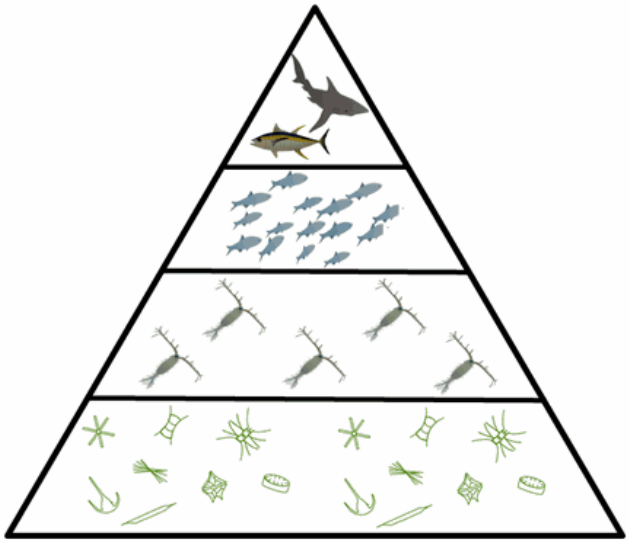
CO-Equal GOALS ← is what is required by law, but it makes since too.



https://www.h2odistributors.com/chart-particle-sizes.asp ← Link to WEB page for above chart.

Fish Filter or ZeeWeed

Food WEB ➔ http://teachoceanscience.net/teaching_resources/education_modules/aquatic_food_webs/learn/



What should be screened out, just endangered fish (like Delta Smelt) or also the smaller organisms that the fish and other smaller forms of life feed on? Check out the WEB link for more information on the WEB of life.

NOAA Education ➔ http://www.education.noaa.gov/Marine_Life/Aquatic_Food_Webs.html

Per NOAA's Web site: Big fish eat little fish; that's how the food cycle works. Of course, there's more to it than that. A whirlwind spiral up an aquatic food chain goes like this: Phytoplankton feed the zooplankton that feed the small fish and crustaceans that feed the larger fish that feed the even bigger fish that feed us.

Links from NOAA, for those wanting more details:

- Interactive Chesapeake Bay Food Web
- Phytoplankton: The Base of the Food Web
- Phytoplankton
- Plankton: Why are they Important?
- A Food Web Mystery
- The Game of Life
- Estuary Food Pyramid