**Delta Characteristics**

1. Tidal habitat
2. The Delta, especially the Wester Delta has fronts or a boundary between two distinct water masses. Front can create abrupt changes to WQ constituents, mostly due to differential advection that can be on the order of meters.

**How Does it Work**

1. Linear interpolation- steps through the spatial distributions in time, every 15 minutes. It smears gradients between stations.
2. The CT improves spatial resolution to develop more accurate estimates (definition of the gradients) of the spatial variation by assuming pure advection and by correcting estimates using data assimilation from adjacent stations.

*\*\*\*Show smeared vs. advection*

1. Goal: To create a spatial representation of constituent values at the end of a flood or ebb tide through advection of data at nearby sites.

**What do we Show with the model**

1. Describe how close turbidity is to the facilities
2. Maximum position of turbidity every day and stringing those results together so they can see movement of turbidity field without seeing the tides moving back and forth. i.e. “It looks like slack after flood, turbidity is moving toward the facilities.
3. At the entire scale of the Delta, the constant point in tide does a very nice job of showing big picture of entire system and what is going on. Time for space thing pretty cool.
4. Most people cannot produce this structure by looking at time series at each site.

**Use Cases**

Salinity Intrusion

Turbidity Transport

Bloom Tracking: North Delta Flow Action

Sac Regional Upgrade

**February 6-14, 2019 (33:25)**

Turbidity created by the influence of the SJR. Look only at VCU and if red you might think there could be a salvage event coming toward CCF. But look at Frank’s Tract and the OMR loop. Turbidity bridge not bridged.

Another

Preventing turbidity in the pumps: Turbidity is coming down, gets into franks tract, velocities are low and turbidity settles. It is fluffy. The next big storm come in and if they start pumping they will exceed the regulatory requirements. You will see 12 NTU not from river born turbidity but from Franks tract. And you can see it in the simulation because Franks will light up like a Christmas tree and then be gone.

**Water in the Mokelumne**

Contains all of the turbidity that enters the central Delta. It comes when they close the cross channel which is when will get the big turbidity spikes. It all come in through Georgiana slough. Because the water does what we show, is that most turbidity comes through False river. Most people imagine that turbidity comes through the mokulumne, then through OSJ and into Franks tract—DSM2 will concur. But no that is not it how its works so we can educate. Salmon do the same thing, more than likely end up coming in from False River-georgiana-mokelumne. If you are trying manage the system but have the wrong conceptual model, you will not do a good job. Documented by radio tagged salmon

**Nozzle- Better Management of Franks Tract**

Smelt push through Franks and get eaten by bass

**Snap shot 2/23/2009 or 3/11/2017**

Turbidity out of Mokelumne, big gradient north to south

**Blocked turbidity bridges --Avoid collapse of turbidity bridge—large outflow event**

Watch out for wind

**Main Management Discussions:**

From a management perspective we don’t really care about the tidal timescale movements- we care about the effect of exports and river flows, these are manifest as the slow mode.

We are interested in how WQ fields evolve at weekly to monthly timescales in response to net flows and dispersion.

Being more precise about the timing of turbidity field

**Alternative approach to traditional boat collection. DWR boat collected transects are used by Delta Smelt Working Group**

1. In the Central Delta it is really hard to get things right.
2. Spring tide can move particles, delta smelt, turbidity around approximately 4.5 miles.
3. Transects are tidally aliased spatial maps.
4. Transects are expensive and can put people at risk.
5. Transects take the day to complete and conditions are constantly moving. By the time the collection is complete many things have changed.
6. Better snapshot of what is happening.

**Salinity**

Focusing on salinity, EC is a conservative constituent the concentration does not change with the movement of the tides unlike chlorophyll (grow, bugs that eat them).

State board funded new sensors in Suisun Bay: X2, nutrients, Turbidity Max.

The length that a particle can go during a spring tide in Suisun Bay is the length of the Bay

Suisun bay 2cm slope

**Suspended Sediment**

It is NOT a conservative

**The Future**

1. Significant expansion in data collection
2. Expand model out the Benicia
3. Junction rules and grid refinements: ARC is 1-D model
   1. Receiving channel computes concentration based on discharge weighted dilution (ratios to determine concentration leaving two channel). If we know concentration from red channel and green channel we can estimate the grey channel.
   2. There is not lateral mixing really so it is better to modify the grid (split it up) so that the water that exits a channel and stays in its channel- they are different water masses. The water masses has different habitats. They have different water quality signatures. E.g. in Yolo bypass had 7 lanes and eventually mixes out at river bends etc. Take a while for the water masses to mix out.
4. Look at different habitats in really wide channels because they are exchanging with different parts of the system. The Mokelumne is mostly exchanging with the northern side of SJJ. Franks Tract when it exits through False River it is mostly exchanging with the southern side of SJJ. Understanding this should affect sampling. App for understanding where in the channels to identify where the tidal excursion is and where to sample in those dendritic channels. So every time you come out you are sampling in the right habitat.
5. By species:
   1. Salmon Team: First flush and where turbidity is going as a possible tracer for where salmon may be going.

**Lenny Pitch**

Data Assimilation

Want to remove the tides. Tides to them are noise. But that removes the main signals from the best data. CPT give you average.

From regulatory perspective they don't care about tides. We know this so we are trying to get rid of it

All of these wigglies at all of these sites are what we are working with but with all of these techniques we can show you what that looks like in space or on an average basis. We get all of the time series signals from a bunch of places and combing in a way that you can see this graphic that make it really easy to see what is going.

Need an example of a split channel before we meet with Lenny. One use case – because it goes beyond the spatial distribution to showing how the system really works.

Add an example of drifter data.

Need to set up for some super users. Salmon monitoring teams can run their scenarios. Record it.

More sophisticated show and tell. Train faster if not looking at it by themselves.

December 24, 2016 show this for Lenny see visualization and minute 54Min in meeting

Bloom tracking experiments do not have the tools to look at it effectively.

See something interesting in the color maps and then you plot the time series, go back and look at the underlying data. Make the computations of how different they are.

Show weird stuff , like particles coming out of 3 mile slough, Mokelumne, flow splits out of the Sac.

Ex: How the guys designing the intake because the current turn around. Don’t pump if there is poop.

Create videos of the basics and add commentary- 2 min for a weekly discussion. Stop it at a place and tell a story about what people do normally know.

e.g. Do basic here is where turbidity was last week and here is where we are today. Winds are XXX. Call out a couple of things. Generate a few and then add experts over season to date, etc. Tight version of what you see at conference. Why does it matter. Kae a tool to make a narrative on the state of the system. Give an example of what that would look like. Put together an example briefing.

e.g. Salmon entering OMR

**December 2016 -Jan 2017**

This is the end goal. Now let us show you what we are doing. This is the tidally averaged turbidity field moving on an ebb out of the system. Now this is what we had to do to make it look like this

Set up in different tabs at different years. Get a good sense of one year to the next.

**The Straw (2-Gates) 1:06**

**Freshwater Pool:** The straw block off all side channels, isolate middle river

**Questions:**

1. In the visualization how can we do a better job of show time (other than a huge time step graphic). For example, in some of the use cases we watch turbidity in the system and 6 or 7 days go by quite quickly. This would also beg to question if reading time series graphs is still appropriate because things are moving slowly?

**To Do:**

Reach GIS

Fix the CT rollovers to be easier to read

DSM2 will make all franks tract pink or interpolates everything to Franks tract. But we adjust the grid (expert system context) for more realistic expression that what you can get in DSM2.

Need all historical drifter data.

Script to grab model- publish URL

If a station was not active, we should color it differently from a station that is not working at the moment. Attributes differences.

Gauges:

OMR: Takes into account pumping minus the SJR