RMP Sample Archive Strategy

RMP ECWG Meeting
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Purpose of the RMP Specimen Bank

A repository for sample material that can be used to document and assess the quality of the SF Estuary through retrospective chemical analyses

1) Time trend analyses of chemical contaminants
2) Investigation of emerging contaminants
3) Future verification of analytical results if quality assurance issues arise

Storage at -20 °C

Advantages

- Less expensive
- Less maintenance
- Suitable for inorganics
- Suitable for persistent organics for at least 10-15 years?

Disadvantages

- Preservation of persistent organics for > 15 years uncertain
- Integrity of reactive, less persistent chemicals questionable
- Moisture migration, ice crystals, tissue desiccation (dry weight analysis only)
- Tissue sample color changes, bacterial action highly suspected (NIST)
- Changes in lipid content

Storage at ≤ -80 °C

Advantages

- 'Absolute' preservation of chemical integrity in long-term (?)
- No moisture migration, tissue color change

Disadvantages

- More expensive
- More maintenance

Current Archive Location

Schaeffer's Meat and Cold Storage, Oakland

- -18 °C
- Continuously monitors temperature electronically
- Keeps temperature log records
- No backup generator, but expected to hold temp for a few days during a power failure
- 'Short-term archive'

Marine Environmental Specimen Bank

- Hollings Marine Lab, NIST, Charleston, SC
- Liquid N2 vapor freezers (-150 °C)
- 'Long-term archive' (> 10 yrs)

- State of the art facilities, banking protocols, SOPs
- Computerized tracking systems, security systems, continuous electronic monitoring of storage conditions
- Classified air clean rooms for cleaning storage containers, processing banked samples

NIST Collaboration

What We Get Out of It

- Secure, long-term preservation of RMP samples (includes storage container cleaning, management, inventory, maintenance, etc)
- Chemical data (potentially)

What They Get Out of It

- $5,000-10,000/year
- RMP samples for NIST studies

$5,000-10,000/year

Sediment Samples

Table 1. Sediment samples collected for the RMP Specimen Bank

Samples	# of containers	Sediment per container (ml)	Container	Storage Purpose	Storage Temperature	Volume needed for each composite (ml)
Historic sites (n = 7 composites)	3	45-50	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	100
	2	200	250 ml PE jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	18-20	22 ml Teflon vial[c]	Long-term archive	LN2	
	5	4	5 ml PP cryovial[c]	Long-term archive	LN2	
Random sites (n = 40 composites in summer/dry season or 20 composites in winter/wet season)	3	45-50	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	75
	2	20-25	250 ml PE jar[b]	Time trends, CECs, QA/QC	-18 °C	

PE = polyethylene; PP = polypropylene; CECs = contaminants of emerging concern; QA/QC = quality assurance/quality control; LN2 = liquid nitrogen vapor

a = Pre-cleaned/PC class jars, Teflon-lined lid, supplied by ESS Vial (Oakland, CA)
b = Pre-cleaned by ?, linerless lid, supplied by Fisher Scientific
c = Pre-cleaned by NIST

- Smaller volume aliquots (all matrices)
- Long-term storage of historic site samples only

Bivalve Samples

Table 2. Bivalve samples collected for the RMP Specimen Bank

Samples	# of containers	Tissue mass per container (g wet wt)	Container	Storage Purpose	Storage Temperature	Mass needed for each composite (g wet wt)
All sites (n = 11 composites)	3	15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	135
	2	15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	15	22 ml Teflon vial[c]	Long-term archive	LN2	
	5	3	5 ml PP cryovial[c]	Long-term archive	LN2	

PE = polyethylene; PP = polypropylene; CECs = contaminants of emerging concern; QA/QC = quality assurance/quality control; LN2 = liquid nitrogen vapor

a = Pre-cleaned/PC class jars, Teflon-lined lid, supplied by ESS Vial (Oakland, CA)
b = Pre-cleaned by ?, linerless lid, supplied by Fisher Scientific
c = Pre-cleaned by NIST

- Long-term storage of samples from all sites

Sport Fish Samples

Table 3. Sport fish samples collected for the RMP Specimen Bank

Samples	# of containers	Tissue mass per container (g wet wt)	Container	Storage Purpose	Storage Temperature	Mass needed for each composite (g wet wt)
Baseline for all samples except white croaker, shiner surfperch, and northern anchovy	3	15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	120
	2	15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	15	22 ml Teflon vial[c]	Long-term archive	LN2	
White croaker	3	15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	135
	2	15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	15	22 ml Teflon vial[c]	Long-term archive	LN2	
	5	3	5 ml PP cryovial[c]	Long-term archive	LN2	
Shiner surfperch	4	15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	135
	2	15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	15	22 ml Teflon vial[c]	Long-term archive	LN2	
Northern anchovy (30-45g tissue)	1	10-15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	30-45
	1	10-15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	1	10-15	22 ml Teflon vial[c]	Long-term archive	LN2	
Northern anchovy (20-30g tissue)	1	10-15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	20-30
	1	10-15	22 ml Teflon vial[c]	Long-term archive	LN2	
Northern anchovy (10-20g tissue)	1	10-15	22 ml Teflon vial[c]	Long-term archive	LN2	10-20

- Sub-sample of all species in Teflon vial (long-term, all analytes except PFCs)
- Sub-sample for PFCs from white croaker only

Bird Egg Samples

Table 4. Bird Egg samples collected for the RMP Specimen Bank

Samples	# of containers	Tissue mass per container (g wet wt)	Container	Storage Purpose	Storage Temperature	Mass needed for each composite (g wet wt)
All sites (n = 9 composites)	4	15	60 ml glass jar[a]	Time trends, CECs, QA/QC	-18 °C	150
	2	15	30 ml PP jar[b]	Time trends, CECs, QA/QC	-18 °C	
	3	15	22 ml Teflon vial[c]	Long-term archive	LN2	
	5	3	5 ml PP cryovial[c]	Long-term archive	LN2	

PE = polyethylene; PP = polypropylene; CECs = contaminants of emerging concern; QA/QC = quality assurance/quality control; LN2 = liquid nitrogen vapor

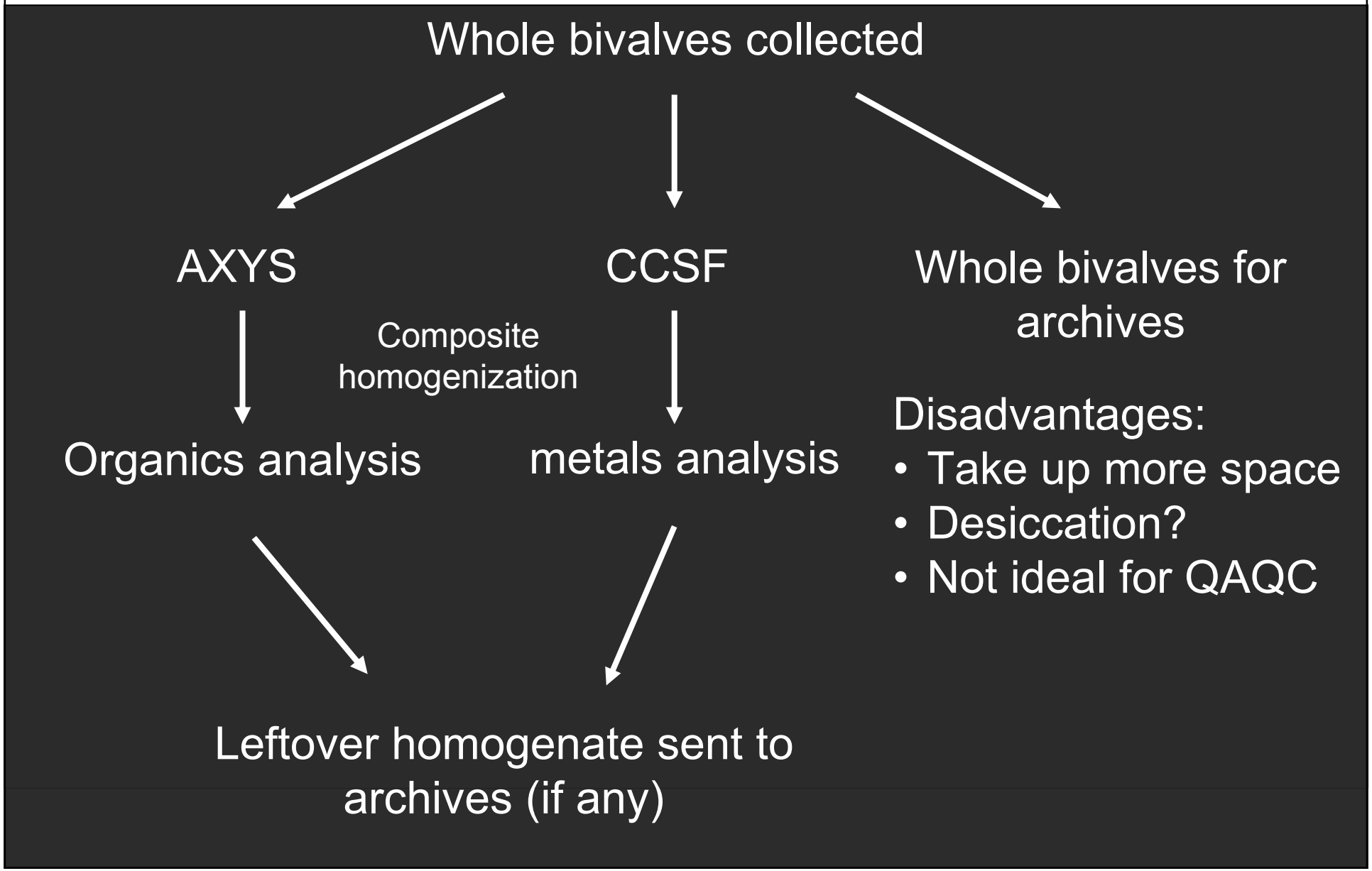
a = Pre-cleaned/PC class jars, Teflon-lined lid, supplied by ESS Vial (Oakland, CA)
b = Pre-cleaned by Moss Landing Marine Labs, linerless lid, supplied by Fisher Scientific
c = Pre-cleaned by NIST

- Long-term storage of samples from all sites

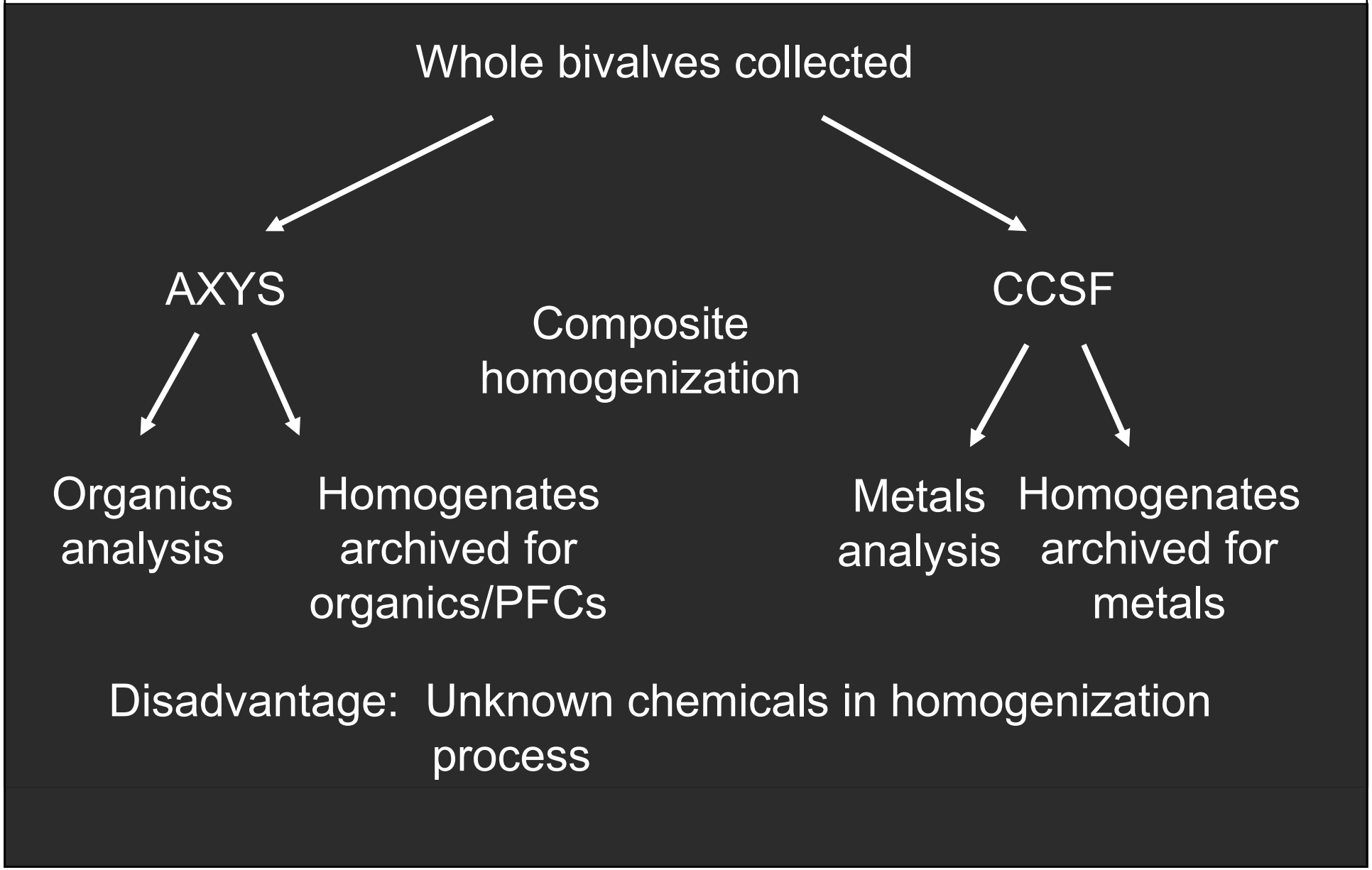
Hold Times

Samples	Hold Time
Short-term archive	15 years (beginning with samples added in 2010)
Long-term archive	40 yrs; after 40 yrs keep only those collected every 5 yrs
All Tissue	40 yrs; after 40 yrs keep sediment collected every 3rd year, tissue samples every 6th year
Extracts	1 year

Current Bivalve Archive Procedures



Potential Changes to Bivalve Procedures



Disadvantage: Unknown chemicals in homogenization process

Monitoring Chemical Degradation

NIST 1974b: fresh frozen mussel tissue (Mytilus edulis)

- 3 replicates analyzed every 4 years
- Coincides with biennial bivalve monitoring
- Same target analytes as analyzed in S&T monitoring
- Kept in storage (-20 and -150 °C) with other RMP samples

Why mussel SRM?

- Mussels frequently analyzed by RMP
- Collected from an urban estuary (Boston Harbor)
- NIST-certified PAHs, PCBs, OC pesticides
- NIST published reports: PBDEs, organotins, musks, MeHg

Monitoring Chemical Degradation

- 6 analyses of 3 SRM reps every 4 years (PAHs, PCBs, PBDEs, pest, metals, ?)
- 10g per replicate for each analysis * 3 replicate * 6 analyses = 200 g every 4 yrs

	Cost every 4 years	Total over 40 years
SRM	$3,200 (200g SRM)	$32,000
Analysis of 3 replicates ($500-600/run*6 chems)	$10,000	$100,000
Total	$13,200	$132,000
x 2 freezers (-18 and -150 C)	$26,400	$264,000

Estimated cost per year: ~$6,000
Long-term archive: ~$5,000-10,000/year
Short-term archive: ~$19,000/year

Issues to Address

1. Bivalve homogenization, storage of whole bivalves?
2. Procedure for monitoring chemical degradation
3. Others?