

Eliminating Barriers to Commercial Production of Sunray Venus Clams in Florida:

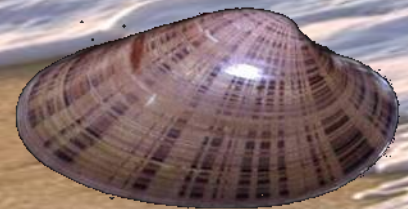
Characterization of Aqueous Soil Properties for Growout

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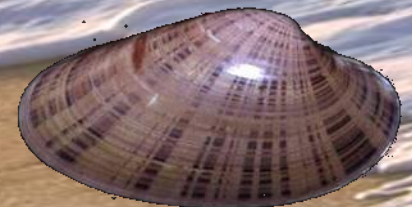
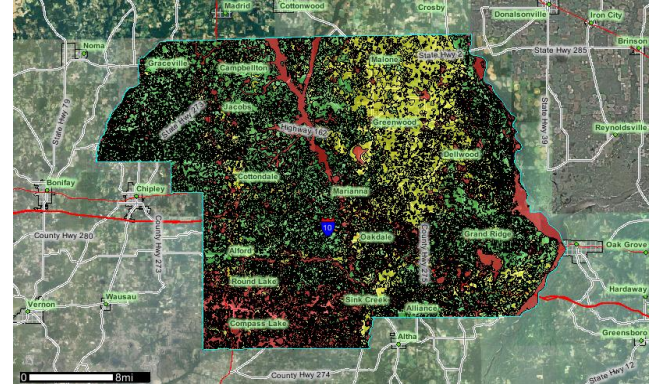
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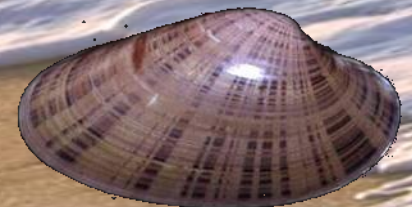
Rationale

- Sunray venus (*Macrocallista nimbosa*) spends most of its life cycle buried in sediments or subaqueous soils.
- A need for a soils-based approach similar to terrestrial agriculture.
 - Drives decision making regarding land-use for crop and site selection.
- Soils knowledge should aid:
 - Determining compatibility of existing shellfish culture leases and siting future leases



Project Objectives

- Investigate relationship between soil properties and sunray venus (SRV) growth
- Develop soils-based guidelines for selection of future SRV culture lease sites



1st Bucket Study: 2010-11

Objective

Investigate particle size and soil OM effect on SRV growth

Methods

Select three soils spanning a range of particle size and OM content:

Sand (natural habitat)	99% sand	0.5% OM
Muddy Sand (UF lease)	97% sand	1.3% OM
Mud (salt marsh)	80% sand	9.2% OM

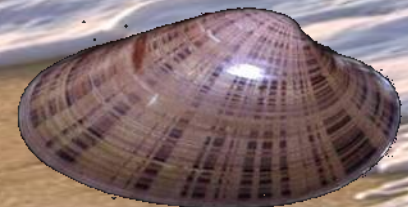
Sand



Muddy Sand



Mud



1st Bucket Study: 2010-11

Methods cont.

Soil:

- Fill 3-gallon buckets with soil: 3 types x 6 reps
- All 18 buckets planted at one lease to minimize env. factors (e.g. salinity and temp.)

Clams:

- Buckets stocked with 40 SRV (30 mm SL)
- Bucket tops covered with netting

Harvest:

- Harvested after 6-month period
- Production characteristics measured

Analysis:

- General linear model with Tukey's HSD post-hoc test

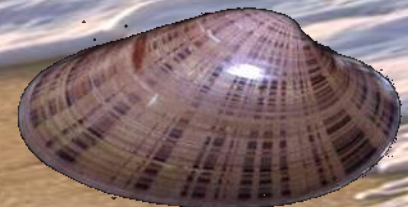
Sand



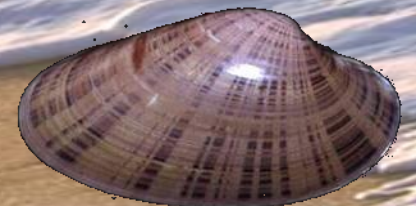
Muddy Sand



Mud



1st Bucket Study: 2010-11

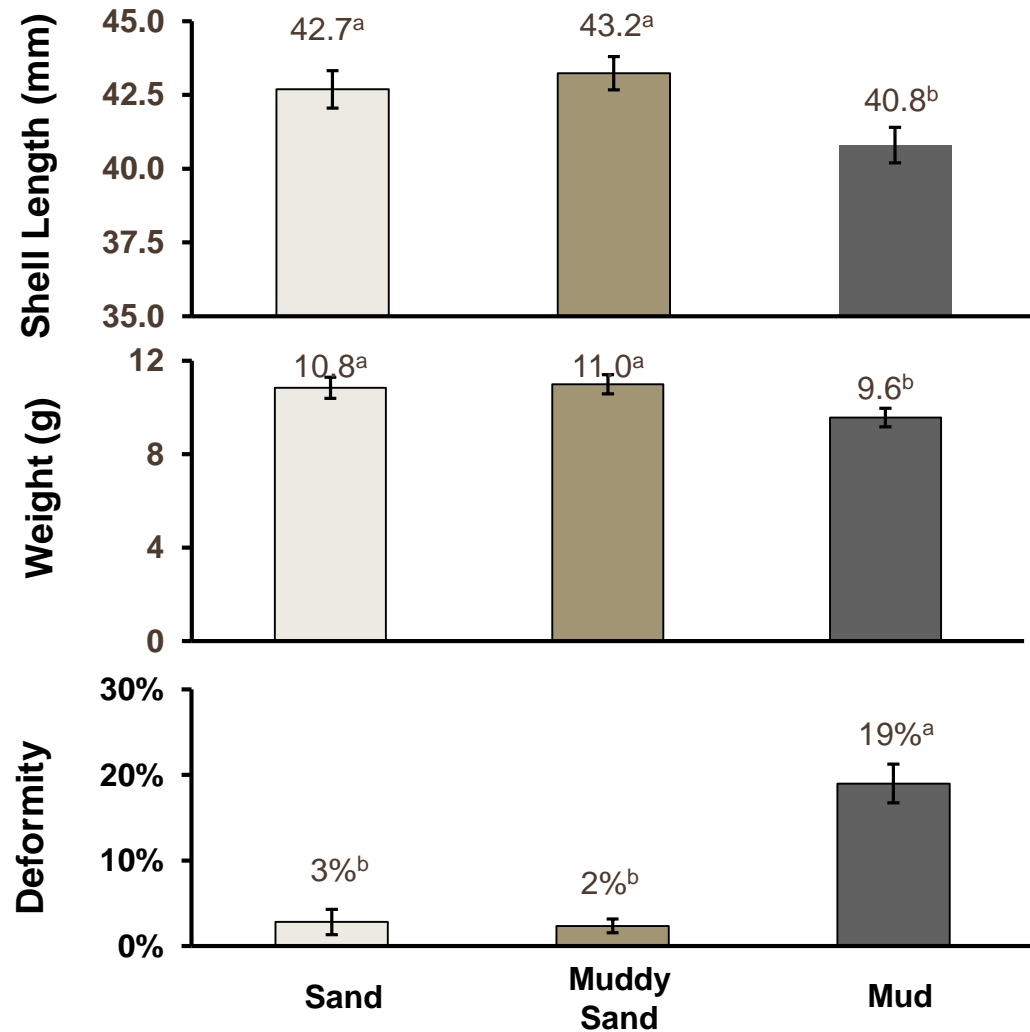


1st Bucket Study: 2010-11

Results

- All growth parameters similar between Sand and Muddy Sand
- Reduced weight and length in Mud
- 10x greater deformities in Mud
- Survival data acceptable:

Sand:	100%
Muddy Sand:	94%
Mud:	98%



1st Bucket Study: 2010-11

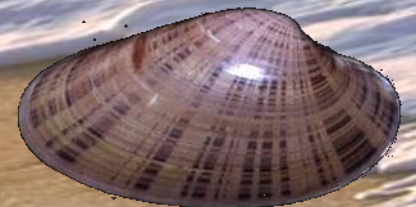
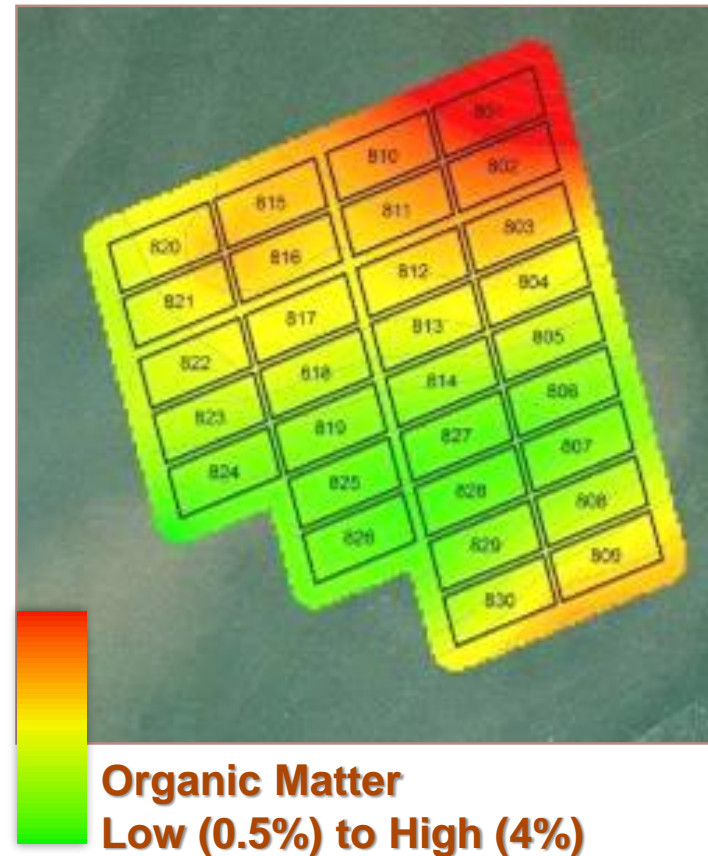
Results

- High OM, low sand may inhibit desired SRV growth

**Mud, 80% Sand –
low growth**



Dog Island HDLA Levy County Florida



2nd Bucket Study: 2011-12

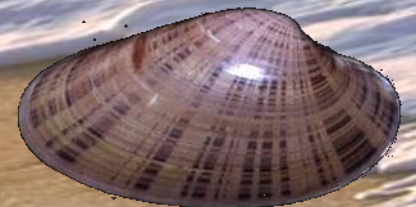
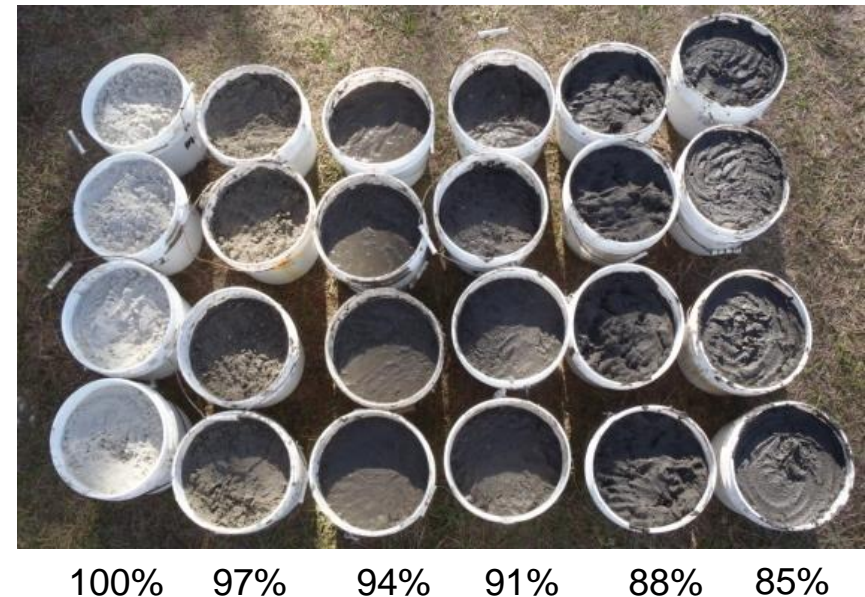
Objective

- Refine understanding of sand and OM affect on SRV growth

Methods

Soil:

- Repeat *in situ* bucket approach
- Sand and OM proportional, so engineer soils w/ controlled sand content
- Engineer six soils ranging from 85% - %100 sand
- Place each soil in four replicate 3 gal buckets



2nd Bucket Study: 2011-12

Methods cont.

Clams:

- Buckets stocked with 40 SRV (30 mm SL)
- Bucket tops covered with netting

Harvest:

- Harvested after 6-month period
- Production characteristics measured

Analysis:

- General linear model (GLM)
- Regression to elucidate trends that may not be significant using GLM

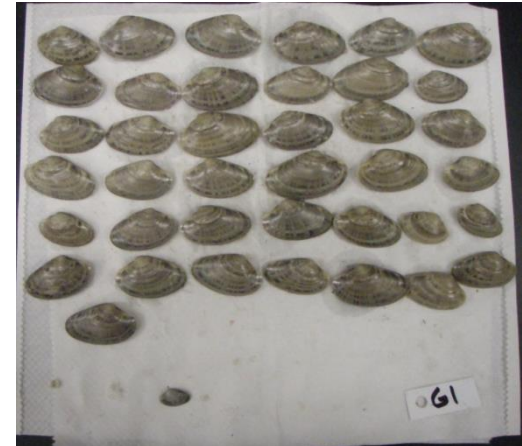


2nd Bucket Study: 2011-12

Results

- No significant differences between clam production characteristics among soil types when analyzed using a GLM
 - Shell width ranged 11.7-12.4 mm
 - Shell length ranged 34.8-36.8 mm
 - Total weight ranged 5.2-6.3 g
 - Survival ranged 82-95%
 - Deformities ranged 0-2.7%
- Interesting trends
 - Highest SW, SL, TW and survival were found in the 91% sand treatment
 - Lowest survival and highest rate of shell deformity were found in 85% sand treatment

91% sand



85% sand

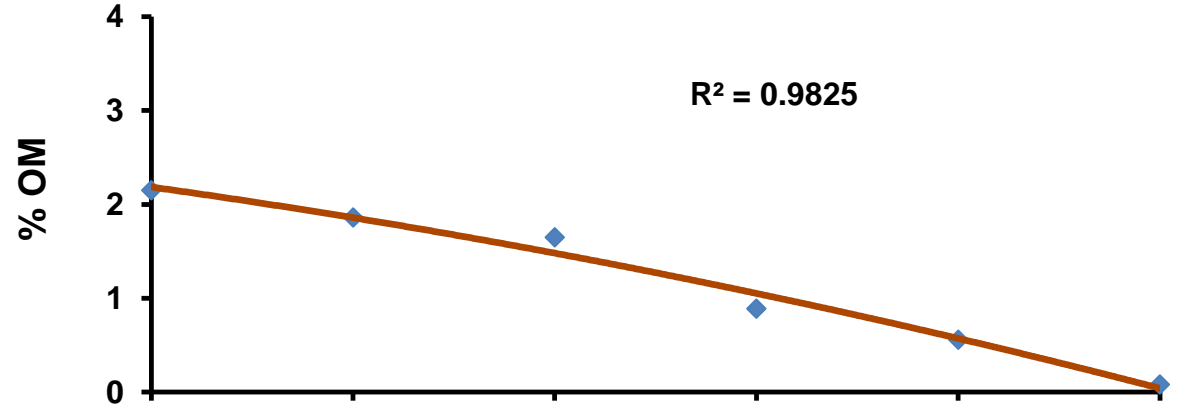


2nd Bucket Study: 2011-12 Regression Trends

Results

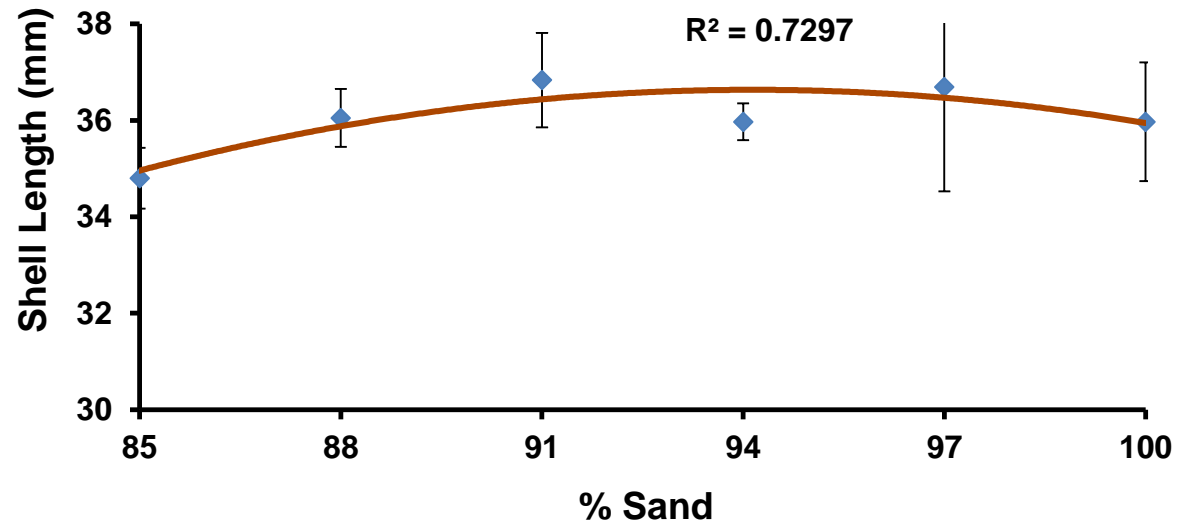
Soil:

- More sand = less OM



Clams:

- More sand = larger SRVs
- Although, a peak appears to occur near 94%

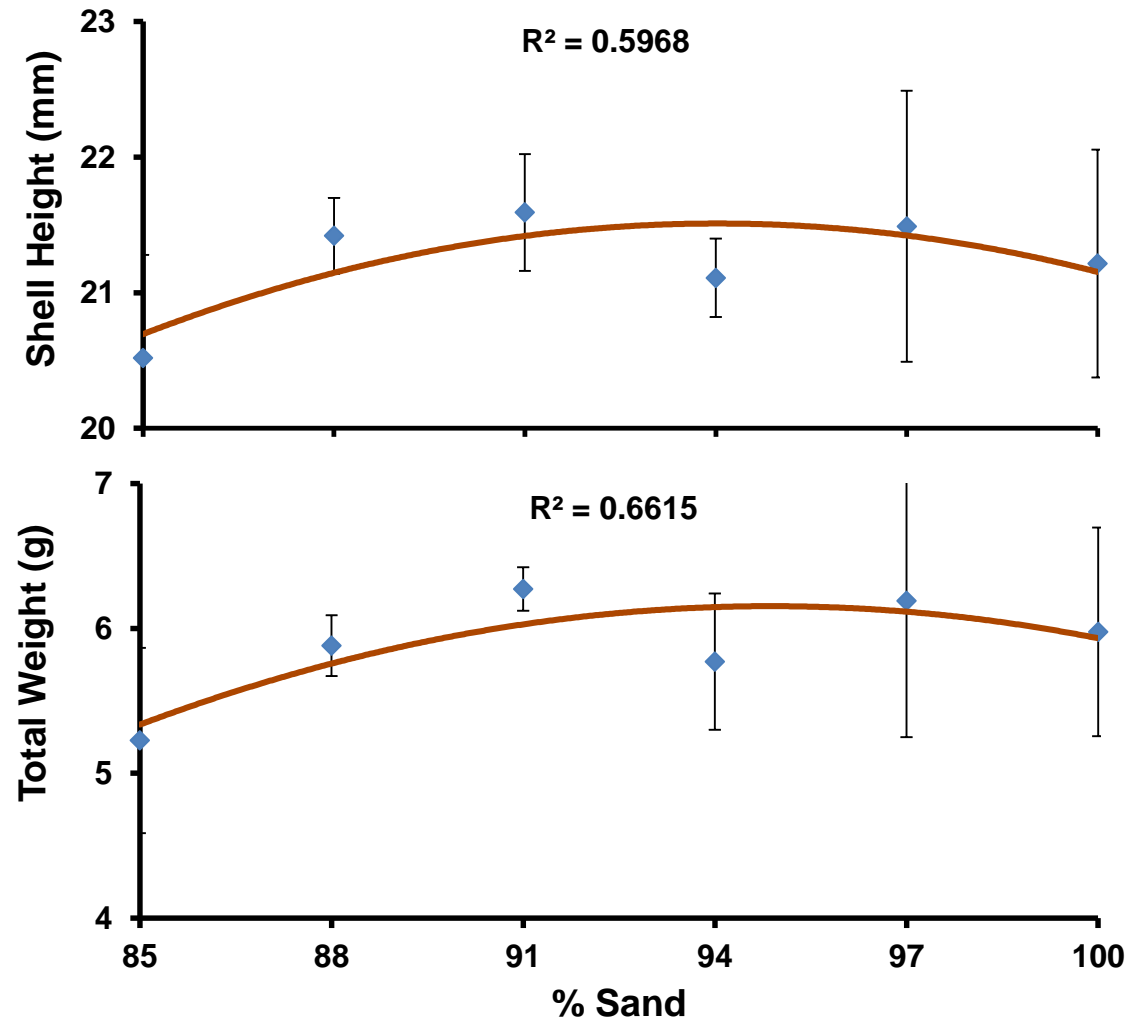


2nd Bucket Study: 2011-12 Regression Trends

Results

Clams:

- More sand = larger and heavier SRVs
- Although, a peak appears to occur near 94%

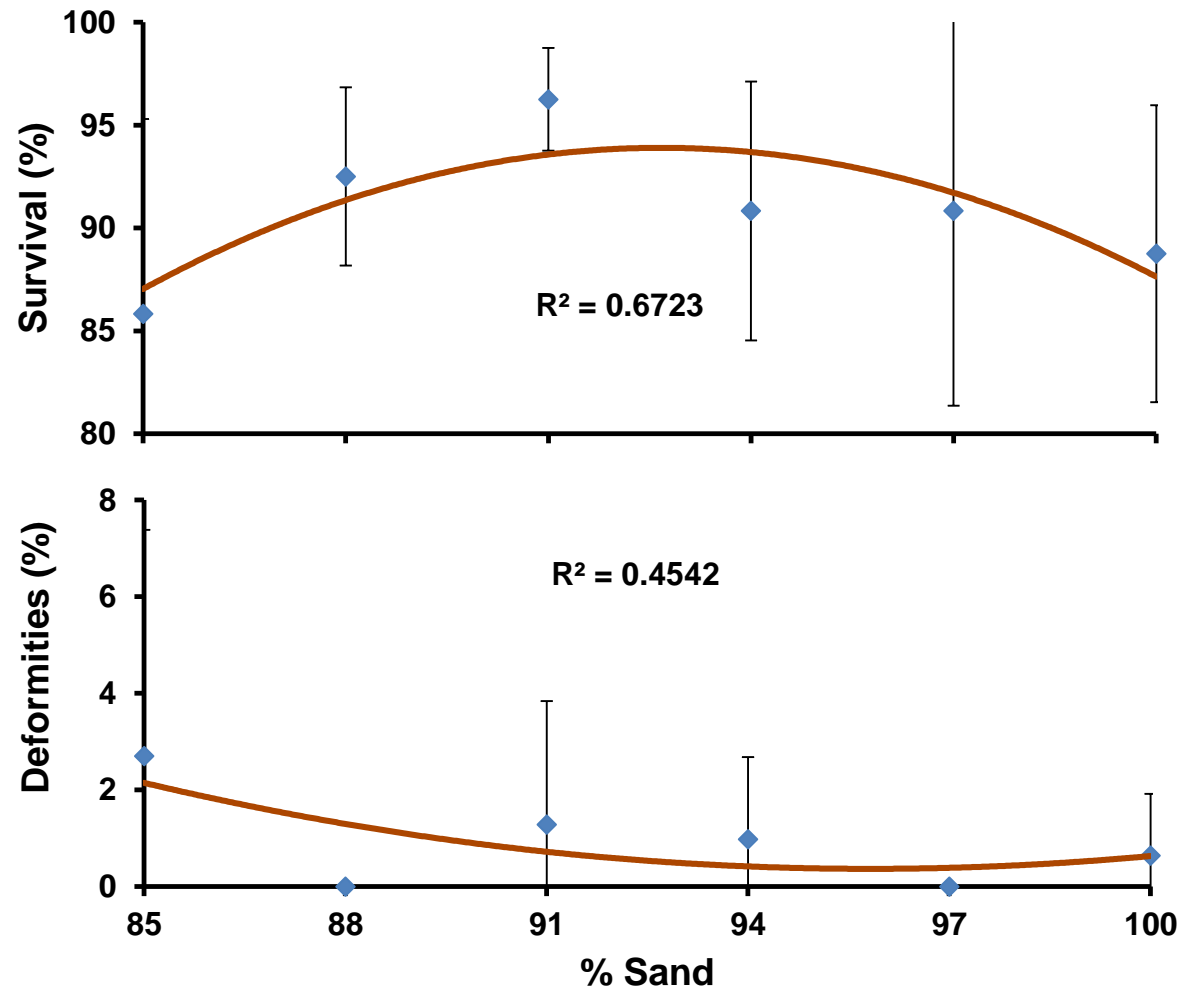


2nd Bucket Study: 2011-12 Regression Trends

Results

Clams:

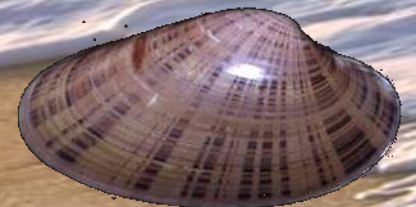
- More sand = higher survival and less deformities
- Although, a peak appears to occur near 94%



Conclusions

Investigate relationship between soil properties and SRV growth

- Soil OM and % sand are related metrics (use either)
- SRV grow larger in size and weight in sandier soils (lower OM)
- Above 85% sand (3% OM), SRV growth is desirable: size/weight are high, mortality is low, and deformities are minimal
- Loss on ignition could provide rapid assessment of soil properties critical for SRV growth



Soil Recommendations for SRV

Develop soils-based guidelines for selection of future SRV culture lease sites

- Sunray venus clams should be planted in the sandiest soil available.
- Both mesocosm studies suggest that soils above 85% sand (< 3% OM) are well suited to SRV cultivation, but optimal conditions seem to occur between 91-94% sand.

Mud



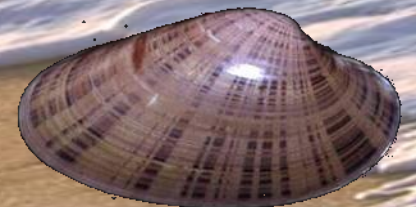
Marginal
80%

Muddy Sand



Better		Best		Better	
85%	88%	91%	94%	97%	100%

Sand



Questions?

