Agency: Commerce, Community and Economic Development

Grants to Named Recipients (AS 37.05.316)

Grant Recipient: Alutiiq Pride Shellfish Hatchery **Federal Tax ID:** 92-0126412

Project Title: **Project Type:** Remodel, Reconstruction and Upgrades

Alutiiq Pride Shellfish Hatchery - Shellfish Hatchery Facilities Upgrades

State Funding Requested: $460,000 **House District:** Kenai Areawide (33-35)
Future Funding May Be Requested

Brief Project Description:

Improve hatchery's algae production and increase energy efficiency, and install a marine water heat pump to reduce energy costs. Provide the hatchery with adequate operating funds.

Funding Plan:

Total Project Cost:	$723,000
Funding Already Secured:	($263,000)
FY2013 State Funding Request:	($460,000)
Project Deficit:	$0

Funding Details:

Alutiiq Pride Shellfish Hatchery received $150,000 in capoital grants for each of the following fiscal years: fy2011

Detailed Project Description and Justification:

When the state built Alutiiq Pride Shellfish Hatchery (APSH) in 1996 the facility was considered state of the art. Technology has changed dramatically over the past 15 years and some critical systems are obsolete and contribute to high energy costs.

The hatchery has redesigned many of its systems in recent years in an attempt to minimize operation costs focused on recycling heated seawater. By utilizing pumps and basic filtration technology the hatchery can reuse the heated water multiple times.

Unfortunately, many of the hatchery‟s systems are now obsolete, mainly the boilers and heat recovery systems. The hatchery needs to replace its oil-fired burners with propane boilers which are more efficient and should cost significantly less to operate. The hatchery has also installed electric heaters in some of its reservoirs. The use of electric hot water heaters enables the staff to dial in more precise temperatures and minimize the wasting of water as it is heated up.

Despite the best efforts at conservation of heat, minimizing flows and reusing as much as possible the hatchery has been able to maintain stable electric and fuel costs. The monthly cost during peak production time for electric and fuel can exceed $9,000.

There are two primary areas that need upgrading at the APSH to improve hatchery feasibility and performance. The following is a brief description of these areas.

Contact Name: Heather Beggs
Contact Number: 465-2028

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$460,000 Approved

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There is currently only 5,000 liters of algae available per day to feed bivalve larvae or seed. This is only enough algae to support 2 million 3 mm oyster seed in a four-month season. The hatchery needs to scale up its algae system to a commercial size operation to be feasible which may be an oyster seed production of 10 million 3 mm in a four-month season. This will require the
production of 25,000 liters of algae per day during the production season or five times what is presently available.

There are two ways to increase the algae production in a hatchery.
1) Increase the algae volume per day by changing the system and volume or number of tanks available to feed.
2) Increase the density of the algae for the final stage of culture by changing the system and or culture protocols. For example changing the amount of inoculum or lighting type and intensity of this final stage.

The algae system will have to be reviewed to ascertain the best approach for increasing the amount of algae available to feed. The cost of the review and upgrade is projected at $75,000.

One of the largest operating costs in a hatchery is the energy required to heat seawater for larvae or seed culture. There are very efficient systems now available to recover waste heat from hatcheries and add heat to systems with significantly reduced operating costs.

The hatchery currently spends about $7,000 per month on energy for the hatchery. There is a heat recovery system in place at the hatchery but it is not engineered or operated properly with the end result that there is little or no significant heat recovery. An efficient heat recovery system should be able to recover over 80% of waste heat generated and therefore reduce the energy operating costs significantly. Titanium plate heat exchangers for heat recovery coupled with heat pumps for added heat should to be considered.

A review of the current energy system and hatchery process flows is required followed by an engineered system. The cost of the review and the upgrade is projected at $85,000.

The Alutiiq Pride Shellfish Hatchery has operated for the past 15 years with no ongoing funding, and has done a good job in recent years of attracting research projects to supplement revenue from seed sales and state grants. But, the financial instability has taken its toll.
One recent example came last spring when the hatchery‟s cash flow hit a low point and couldn‟t pay its fuel bill. As a result, the boilers went down and an entire crop of geoduck spat was lost.
In response to budget shortfalls the hatchery is now staffed with only two fulltime employees. Maintenance and seasonal workers are hired as contractors as needed. The hatchery really needs a shellfish biologist on staff who can focus exclusively on raising shellfish and algae, but the uncertain cash flow prevents APSH from being able to bring on another employee.

The Alaskan Shellfish Growers Association (ASGA) has been discussing with ADF&G the potential of tapping a department biologist for six months a year for the next three years to increase hatchery production of oyster and geoduck spat. The request is under consideration.

APSH appears to be on track to securing up to $80,000 a year from the Bureau of Indian Affairs tribal hatchery maintenance fund, and it has two major enhancement research projects underway (king crab and sea cucumbers). In addition, production of geoduck spat is increasing and seed sales income should increase. However, it is clear the hatchery will need funding

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support as it responds to the oyster spat shortages.

APSH is planning to raise 5 million oyster spat for the 2012 growing season from eyed larvae purchased from outside hatcheries. This request is for $150,000 to cover FY 2013 operating expenses and $150,000 for the following year.
ASGA and other industry members will work with the hatchery over the next two years to develop a business plan that will lead to seed sales and research projects that cover operating costs by 2015.

ASGA will establish an advisory group to work with APSH in setting goals for the Seward hatchery. The advisory group will include representatives of shellfish farmers, dive harvesters and the Marine advisory program.

In addition to discussing annual production goals of various species, the advisory group will review progress of the hatchery in improving algae production, reducing energy costs and making other improvements in hatchery performance. The advisory group also will help the hatchery staff update its business plan and develop a report outlining the path to financial independence to the legislature by January 31, 2014.

Project Timeline:

Project start: July 1, 2012.
Project completion: June 30, 2014.

Entity Responsible for the Ongoing Operation and Maintenance of this Project:

Alutiiq Pride Shellfish Hatchery

Grant Recipient Contact Information:

Name:	Jeff Hetrick
Title:	hatchery director
Address:	101 Railroad Avenue Seward, Alaska 99664
Phone Number:	(907)362-2378
Email:	jjh@seward.net

Has this project been through a public review process at the local level and is it a community priority? ☐ Yes ☒ No

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Strategies to improve Alaska production of shellfish seed

A report to the Alaska State Legislature
by the Alaskan Shellfish Growers Association
January 2012

Introduction

Availability of oyster seed or "spat" to Alaska growers has been a recurring problem for at least the past two decades. In 2011 the problem was magnified both by the increased demand for oyster spat, and the most significant spat shortage in West Coast hatcheries. Surveys of Alaska oyster nursery operators and growers reveal farmers were able to obtain only 40 percent of their spat orders.

The shortages have not been limited to Alaska. Growers in British Columbia have also suffered significant shortfalls of oyster seed, and some Washington oyster farms also were unable to obtain their full orders.

The outlook for 2012 does not look promising. This report is designed to respond to the direction of the Alaska State Legislature to prepare a report on the status of seed supplies to Alaska shellfish growers and recommend strategies for improving in-state production of oyster and geoduck seed.

This report focuses upon oyster spat, but improvements at the Alutiiq Pride Shellfish Hatchery recommended in this report would benefit geoduck farmers as well.

This report was prepared by the Alaskan Shellfish Growers Association with assistance from Jim Donaldson, a leading West Coast expert on shellfish hatcheries, and Tom Henderson, mariculture manager, OceansAlaska.

Background

After struggling for years, Alaska's shellfish farming industry has been experiencing a rapid increase in production over the past several years. Much of the recent growth can be attributed to investments by Southeast Alaska Native corporations, interest from tribal governments and to an industry-university-community effort to promote shellfish farming as an economic development

Oyster spat purchases

Year	Spat Purchases
2007	4,741,551
2008	7,455,000
2009	10,918,550
2010	10,428,300
*2011	4,100,000

Source (2007-2010): ADF&G

*Estimate (ASGA)

strategy.

The table at right reflects both the recent growth in oyster farming and the severity of the 2011 seed shortage. Our surveys of oyster nursery operators, cooperatives and individual farmers found 2011 demand at roughly 10 million seed oysters or "spat," or nearly the same as 2009-2010. The result is that growers were short at least 6,000,000 oyster spat, which will have a significant impact upon future earnings.

The impact of the shortfalls will be exacerbated by the late delivery of the spat nursery operators were able to secure. Roughly half of the spat was obtained in August and September, or toward the end of the growing season, ensuring it won't be large enough to grow out on farms until at least half of the 2012 growing season (April-October) has passed.

Since it takes at least five years for a crop of 3-5 mm spat to work its way through a nursery and oyster farm, the economic losses won't be immediately apparent. But, they will be significant, as the table below suggests.

Economic Impacts of 2011 Oyster Spat Shortages	
Nursery Operations	
Number of spat shortfall	6,000,000
Survival to 15-20 mm	75%
Survivors (millions)	4,500,000
Value/1,000 spat	$35
Loss	$157,500
Farms	
Spat deficit	4,500,000
Survival to marketable oysters	80%
Marketable oysters	3,600,000
Dozens of marketable oysters	300,000
Farmgate value/dozen	$5
Loss to growers	$1,500,000
Total	**$1,657,500**

How many farmers were unable to obtain oyster spat is unclear, but there were some. Missing a seasonal planting of a new crop means the farmer loses a year

of sales revenue that would be spread across two growing seasons (April-October). Unlike a terrestrial farm that can shut down when a crop can't be planted, oyster farmers must continue full operations tending up to the 4-5 different year classes, or crops, in the water.

What is clear is that most farms received less than half of the spat needed to provide adequate revenues to support the small rural businesses. The seed shortages have sent shock waves through the industry and have set back aggressive development schedules of the many new farms and two farmers cooperatives fighting for survival.

The industry has endured seed shortages in the past, but investment dollars have increased significantly and the projected losses will be greater. The timing couldn't have been worse as we forecast significantly higher demand over the next decade. Surveys of growers, Native corporations, tribal governments and nursery operators suggest oyster spat demand could double over the next five years to 20 million.

Farmed Shellfish Production of U.S. Pacific Coast

(2008 and 2009 Data, Sales in millions of dollars)

Oysters	Clams	Mussels	Geoduck	Seed Sales	Totals
Washington					
58	**20**	**3.1**	**20**	**7**	**$107,562,500**
California					
12	**.83**	**.945**		**2.3**	**$16,436,326**
Oregon					
2.2				**.75**	**$3,003,135**
Alaska					
.441	**.25**	**.006**		**.126**	**$599,232**
Totals					
73	**20**	**4**	**20**	**10**	**$117,425,193**

For the past 30 years, Alaska oyster farmers have purchased all their spat from nurseries located in Washington and California. Securing enough seed was

always a challenge. There were periodic interruptions in seed supply occurring in roughly five year intervals.

These interruptions were caused by a variety of factors, but they can largely be attributed to Alaska's small stature in the West Coast oyster seed market. Statewide demand from about two dozen growers was less than what Washington State farmers regard as a "small" oyster farm. When problems arose it was easy to cut a small market like Alaska, particularly when the state's importation rules were regarded as stringent.

The supply picture improved dramatically as oyster nursery operations developed in each of the state's primary growing areas (Southeast, Prince William Sound and Kachemak Bay). In recent years, these nurseries obtained small spat (4-6 mm) from a single source: Coast Seafoods hatchery in Kona, Hawaii.

An unexpected decision by Coast to suspend sales of single seed oyster spat caught the nursery operations off-guard in 2011 and triggered the seed shortages.

West Coast Oyster Seed Supplies; Future Prospects for Alaska

Historically, natural sets of oysters supplied a significant portion of the seed demand on the West Coast of the U.S. Natural sets have, for several decades, decreased, and in most cases been completely eliminated as a possible seed source for oyster farmers. This, coupled with the success at captive rearing of oysters in hatcheries, has resulted in oyster hatcheries playing an increasingly important role.

There are four major oyster hatcheries on the West Coast, Coast Seafoods, Taylor Shellfish, Whiskey Creek and the Lummi Tribal Hatchery. Recently, unpredictable water quality at Whiskey Creek, Taylor Shellfish and the Coast Seafoods Kona hatchery has lead to supply shortfalls of seed. A significant reduction in production at one hatchery may affect the supply of spat on the entire West Coast. Oyster seed shortages have been attributed to a number of causes. Since seed production is driven by larvae production it is important to look at the reasons for the larvae production failures as well as seed production failures.

Climate change appears to be a major factor at the Whiskey Creek Hatchery because it is located in an area of coastal upwelling. This upwelled, acidified water is likely affecting carbonate chemistry of seawater at this location. Carbonate chemistry of seawater has recently been found to have an important influence on oyster larvae performance. Climate change may also be a factor in the recent bacteria problems at this same hatchery.

Climate change is affecting the quality of water available at Whiskey Creek in some years by decreasing the pH (acidifying the water) and influencing the water in other ways that are conducive to bacterial growth. The influence of climate change at this hatchery will vary from year to year but it is expected to continue to be an important factor in the diminished supplies of oyster seed on the West Coast of North America.

There are Alaska regulatory issues that allow for import only from certain hatcheries. This reduces the potential supply to only Coast Seafoods and Taylor Shellfish. When one of these hatcheries has a supply problem, it has a significant effect on Alaska oyster farmers.

Both Taylor Shellfish and Coast Seafoods are large, vertically integrated companies that will take care of their own needs before offering oyster seed for sale to others. Coast Seafoods has now been sold to Pacific Seafood, creating even more uncertainty regarding larvae and seed sales.

Oyster farms on the West Coast are expanding their growing areas to meet the increased demand for west coast oysters. This is increasing the demand for seed from all sources, therefore putting additional pressure on hatchery supplies.

The oyster seed that is imported may not be the best seed for growing in Alaska. The Molluscan Broodstock Program at Oregon State University has developed a generalist oyster stock that does well in all environments from Washington to California. Alaska Sea Grant Program has reported that these generalist stocks have not fared as well as some other stocks when grown in Alaska. It is apparent, therefore, that Alaska needs to develop its own genetic stock in order to have control over its own oyster seed supply and, additionally, its own broodstock that can be developed for its unique growing areas.

B.C. growers rely upon importing foreign oyster spat

British Columbia's oyster industry closely resembled Alaska's until the 1980s when the federal, provincial and local governments combined forces to promote aquaculture as an economic development tool.

The industry expanded very quickly with the government support and today growth is limited by a freeze on new sites for shellfish farms on the southern coast. Shellfish farming activity in northern B.C. has been limited primarily to "First Nation" development efforts with scallops.

British Columbia in 2007 had a demand of 1,000 million oyster larvae and 170 million single seed oysters. Roughly half of the demand was actually met. In the report entitled "Hatchery Feasibility Study" from the Centre for Shellfish Research (CSR) at Vancouver Island University, several weaknesses and constraints in the industry were identified. Chief among these were: 1) reliance on foreign sources of shellfish seed, and 2) lack of seed production capacity and security.

The BC Shellfish Growers Association has described the industry as "being about one-sixth the size of the industry in Washington State and smaller than just the mussel industry in Prince Edward Island." Officially, industry is considered just too small to support a large scale shellfish hatchery.

A CSR report entitled "Feasibility of a Shared Shellfish Hatchery for the BC Shellfish Aquaculture Industry" cites two reasons BC cannot support a hatchery: 1) "Supply from competitors in Hawaii which has a broader season so can provide a great amount of seed to meet that early season demand that would be difficult to provide locally…;" and 2) …There exists "potential conflict and competition with current BC and Washington hatcheries."

Speaking privately, many small growers acknowledge the lack of hatcheries is in great part due to the largest growers having access to their own seed and objecting to a government funded provincial based hatchery. Some growers say larger companies are trying to squeeze out competition by withholding seed.

Whatever the reasons, many B.C. growers are not getting the seed they need to maintain their flow of product. Here's what one B.C. oyster grower said in a recent email asking about seed supplies:

"Don't even mention spat," he said. "Our target is 5 million seed a year, but this year we can get nothing. Not a good situation. I think I'm going to lay off most of my crew in the spring… Not a good time for seed!!"

Current sources of oyster seed in BC are primarily two facilities; Taylor Shellfish, with hatcheries in Washington, California, with setting facilities in Hawaii; and the Guernsey Sea Farms, a UK hatchery off the coast of France.

Island Scallops on Vancouver Island also does some setting of larvae imported from Washington State. In past years, Coast Seafoods has also been an important source of spat. In 2011, production problems severely limited Coast's seed production, which hurt BC growers as it did Alaska growers.

Alaska's shellfish seed production assets

Despite its small size, Alaska has a surprising number of assets that are working to produce shellfish seed, including a large shellfish hatchery, remote setting facilities and shellfish nurseries in each of the state's production regions: Southeast, Prince William Sound and Kachemak Bay.

Hatcheries have the capability of conditioning and spawning adult shellfish, culturing larvae through the transformation into tiny shellfish, and producing spat for shellfish farming or wild stock enhancement programs. Hatcheries also must produce algae to feed the shellfish.

Shellfish hatcheries generally have high overhead costs and rarely run in the black. The two companies that produce most of the West Coast's oyster spat are very large and have extensive investments in the shellfish business stretching from B.C. to Mexico, jumping over to the Hawaiian Islands. These hatcheries supply smaller operations with seed to help offset operating costs.

Remote setting facilities are more compact operations that begin at the eyed-larvae stage, which are purchased from hatcheries certified by ADF&G. Remote setting facilities generally operate only a few months a year to produce spat large enough to transfer to a nursery. These operations must be very energy efficient, but even the best operations are unlikely to cover operating costs unless they are attached to an efficient nursery system.

Alaska shellfish nurseries are all based upon the concept of providing small oyster spat with a large amount of food produced by Mother Nature. These floating upwelling systems (FLUPSY) simply enhance the flow of nutrient rich

marine water through bins of densely packed oyster spat. Large paddlewheels creating the upwelling effect are very energy efficient and there can be a profit margin in well-managed FLUPSYs.

Alutiiq Pride Shellfish Hatchery

Alaska's only shellfish hatchery, Alutiiq Pride Shellfish Hatchery in Seward, was built by the State of Alaska in 1996 with proceeds from criminal liability penalties resulting from the ***Exxon Valdez*** oil spill. The primary rationale for the hatchery was to help restore subsistence shellfish resources damaged by the spill, with the added mission of producing seed for aquatic farming and restoration projects in other areas. Part of the hatchery complex was to be dedicated to independent shellfish research projects.

The state later withdrew funding for the hatchery and transferred ownership to the City of Seward. The Qutecak Native Corporation initially operated the hatchery under contract and later stepped back in favor of the Chugach Regional Resources Commission.

Alaska's aquatic farmers are restricted to growing Pacific oysters and indigenous species of shellfish and aquatic plants, and the Seward hatchery is the only permitted source of seed for indigenous species. The Seward hatchery has been successful in rearing seed from wild stocks of geoducks, littleneck clams, cockles, rock scallops, razor clams and sea cucumbers.

The challenge of raising oyster spat in an Alaska hatchery is much greater than it is with the indigenous cold water shellfish. Alutiiq Pride must warm incoming marine water from 40^0 to 70^0 F. to condition the oysters and inducing spawning, and the larvae and oyster spat require the water to be heated. The result has been that the cost of producing oyster spat in Seward is much higher than it is at facilities located in warmer areas which have access to lower energy costs. Since oyster spat can be imported, nurseries and growers turned to lower-cost producers, such as Coast's Kona hatchery.

The hatchery's role in producing geoducks and other indigenous species and success as a research facility makes it invaluable to farmers and other coastal residents. The hatchery facility is very large for the size of the industry and is

expensive to operate, although the staff has done an admirable job at reducing energy consumption and other operating costs.

Upgrades to the hatchery's algae systems and waste heat recovery systems are necessary if Alutiiq Pride is to play a major role in Alaska production of oyster spat.

Remote-setting facilities

Two facilities designed to produce small oyster spat suitable for nursery culture are currently under development and a third of these "seed-setting" facilities is in the process of resuming operation. All three plan on setting seed during 2012.

OceansAlaska is constructing a five million oyster spat seed-setting facility at its new mariculture research facility in Ketchikan. Here's how the organization describes the project:

"OceansAlaska (OA) is a non-profit marine research organization based in Ketchikan, Alaska. The mission of OA is to support mariculture through research, training and education. Recently (October 25, 2011), OceansAlaska sponsored a shellfish industry forum to set objectives for the organization. The first objective identified was "develop an oyster and geoduck seed production facility". To this end, OA is proposing a capital expenditure in excess of $300,000 to outfit a recently completed research facility to serve as a shellfish setting lab, addressing the short term needs of shellfish growers.

"The proposed shellfish setting facility has a goal of producing 5 million oyster spat and 500,000 geoduck spat. A second goal is to collect data on operating costs, relating primarily to energy and manpower. A third goal of the facility is to train the mariculture manager and other employees to operate the setting facility and algae production lab. Ultimately, the trainees will become the trainers. This facility should operate not more than two years. The ultimate goal is to make the data and training available to another organization to build a 'stand alone' hatchery.

"The major problem with hatchery operation, in Alaska or elsewhere, is cost. Operators acknowledge the low profitability of hatchery operations. This of course in the real reason why there are no private hatcheries in Alaska and BC. Preliminary figures for the OceansAlaska setting facility show a substantial loss

on the production of 5 million oyster seed. The cost of seed is tied in to the cost of feed, algae production, which requires large inputs of energy for heating water. The goal of OceansAlaska is to produce 5 mm seed which can be transferred to a nursery operator before it is purchased by growers. The larger the seed, the more feed is required, and the greater is the cost.

"One way to show profit from a hatchery is to first place the seed in a floating nursery, known as a FLUPSY. A floating nursery can take small (4-5mm) seed from a hatchery, and produce 20-25 mm seed with a much greater sales value. The post-FLUPSY value would be enough to cover the nursery operating cost and the hatchery operating cost, perhaps resulting in a small profit. The only other option for an in-state hatchery to be economical is for FLUPSY operators to buy the seed at a price high enough to guarantee a profit to the hatchery. This would require selfless discipline from operators who may have the option in some years be to buy cheaper seed from Outside hatcheries."

The second seed setting facility is currently under development by the Kachemak Shellfish Mariculture Association at the farmer cooperative's facility on the Homer Spit. Phase One of KSMA's project is to set 1 million seed at a facility designed by shellfish hatchery expert Jim Donalson. Here's how KSMA describes its project:

"A long term goal of this initiative is to be able to produce seed from the best oyster seed stock in Alaska, thus assuring long term success of our oyster aquaculture industry in the state.

"KSMA will be responsible for the design, construction and operation of the trial facility and Alutiiq Pride will be a participant in the facility and KSMA will help in preparing the report to the senate.

"Phase 1 SOA FY-2012

The primary objectives of the project will be to:

1) Develop a design for a small scale independent hatchery for production of seed in Alaska
2) Construct the hatchery within budget and on time
3) Populate the hatchery with eyed larvae in time to produce oysters seed for the nurseries for the 2012 season
4) Determine the financial feasibility of small scale independent hatcheries in Alaska

5) Received a $90,000 startup grant from the Alaska Legislature in FY-2012, see below "Grant"

"A report outlining the results of the study, measures used to define success of the effort or lack thereof, the basis for design of the facility, and conclusions of the potential viability of a hatchery like this one will be submitted the Senate Finance Committee, with a copy to the City of Seward, by February 1, 2012.

"KSMA owned equipment inventory, facilities and personnel;

- Processing facility on Homer spit with salt water well with capacity for project
- 1ea. 1.5 Million seed Flupsy and a 4 Million seed Flupsy
- Biologist on staff

"Progress in FY-2012:

- Secured industry professional to design a hatchery for KSMA
- Developed a hatchery plan
- Located and transported purchased and shared equipment to hatchery
- Trained staff in hatchery design and shellfish production/development
- Ordered new equipment; note delays for material on ordered due to purchase ordering with grantee
- In June 2010 a production concept paper and demonstration project results will be issued after first seed setting.
- Secure financial support for phase 2 of project
- Prove demonstration project, refine the design and increase production to 1M oysters

"Phase 2
Scale project to 2M

"Phase 3
Scale project to 5M"

Nurseries

Alaska has developed sufficient nursery capacity to meet current demand for oyster spat, and the potential to ramp up to meet a doubling of current demand. There currently are operating FLUPSYs in Naukati, Kake and Kachemak Bay,

each of which has a 4-million seed capacity. In addition, there are two other smaller FLUPSYs in Prince William Sound, and larger capacity units that have been decommissioned but are potentially usable.

Haa Ani, a subsidiary of Sealaska Corporation, owns the 4-million seed FLUPSY operated by Pearl of Alaska near Kake, and has developed plans to build a larger FLUPSY (8-million seed) for operation in Southeast. Sealaska recently delayed construction of the FLUPSY because of the current difficulties in obtaining seed.

Once the new, larger capacity FLUPSY is operating Alaska should have adequate nursery capacity to meet a projected doubling of seed demand by 2020.

ASGA Recommendations to Improve Alaska Production of Shellfish Spat

1. Alutiiq Pride Shellfish Hatchery System Upgrades $160,000

When the state built Alutiiq Pride Shellfish Hatchery in 1996 the facility was considered state of the art. Technology has changed dramatically over the past 15 years and some critical systems are obsolete and contribute to high energy costs.

The hatchery has redesigned many of its systems in recent years in an attempt to minimize operation costs focused on recycling heated seawater. By utilizing pumps and basic filtration technology the hatchery can reuse the heated water multiple times.

Unfortunately, many of the hatchery's systems are now obsolete, mainly the boilers and heat recovery systems. The hatchery needs to replace its oil-fired burners with propane boilers which are more efficient and should cost significantly less to operate. The hatchery has also installed electric heaters in some of its reservoirs. The use of electric hot water heaters enables the staff to dial in more precise temperatures and minimize the wasting of water as it is heated up.

Despite the best efforts at conservation of heat, minimizing flows and reusing as much as possible the hatchery has been able to maintain stable electric and fuel costs. The monthly cost during peak production time for electric and fuel can exceed $9,000.

There are two primary areas that need upgrading at the APSH to improve hatchery feasibility and performance. The following is a brief description of these areas.

Algae production

There is currently only 5,000 liters of algae available per day to feed bivalve larvae or seed. This is only enough algae to support 2 million 3 mm oyster seed in a four-month season. The hatchery needs to scale up its algae system to a commercial size operation to be feasible which may be an oyster seed production of 10 million 3 mm in a four-month season. This will require the

production of 25,000 liters of algae per day during the production season or five times what is presently available.

There are two ways to increase the algae production in a hatchery.

1) Increase the algae volume per day by changing the system and volume or number of tanks available to feed.
2) Increase the density of the algae for the final stage of culture by changing the system and or culture protocols. For example changing the amount of inoculum or lighting type and intensity of this final stage.

The algae system will have to be reviewed to ascertain the best approach for increasing the amount of algae available to feed. The cost of the review and upgrade is projected at $75,000.

Energy Efficiency

One of the largest operating costs in a hatchery is the energy required to heat seawater for larvae or seed culture. There are very efficient systems now available to recover waste heat from hatcheries and add heat to systems with significantly reduced operating costs.

The hatchery currently spends about $7,000 per month on energy for the hatchery. There is a heat recovery system in place at the hatchery but it is not engineered or operated properly with the end result that there is little or no significant heat recovery. An efficient heat recovery system should be able to recover over 80% of waste heat generated and therefore reduce the energy operating costs significantly. Titanium plate heat exchangers for heat recovery coupled with heat pumps for added heat should to be considered.

Here is a comparison of the cost of heating water for oysters spat in a 10 million spat facility (these figures are based upon Ketchikan electricity costs):

Cost of Heating by Energy Source

Heat Source	Btu/Mo	Btu/Season	5 mo Energy Cost
Oil	576,500,000	2,882,500,000	$90,078
Electric- resistance heating	576,500,000	2,882,500,000	$84,481
Heat pump	146,888,000	807,840,000	$23,700

Unit Cost of Energy, Jan 2012

Source	Btu Values	unit cost	cost/btu
1 Kw elec	3412	0.1	2.93083E-05
1 gal D1	136000	4.25	0.00003125
1 gal Pro	91000	2.85	3.13187E-05

A review of the current energy system and hatchery process flows is required followed by an engineered system. The cost of the review and the upgrade is projected at $85,000.

2. Technical assistance grants $170,000

The Alaska shellfish farming industry needs to tap expert advice to develop effective strategies for improving in-state production of oyster and geoduck spat and it needs to do this quickly and efficiently.

The guidance is necessary to design effective and efficient methods of increasing in-state shellfish seed production including guidance from experts in shellfish aquaculture and energy efficiency in designing and planning operations and preparing funding proposals. Unfortunately, nimbleness and speed not is characteristic of state government, as recent conversations with DCCED reveal.

DCCED officials say it takes at least takes eight months to promulgate regulations to implement a new small grant program. Then, the agency must issue a "Request For Proposals" to even entertain suggestions of how the grants should be spent. While this may be a great way for agencies to expend state funds, it would not work for the private sector, as it would make funds available for plans affecting the 2014 growing season, at the very earliest.

The Alaskan Shellfish Growers Association (ASGA) can move much more quickly, while providing a public process parallel to a state agency vehicle. ASGA estimates that $150,000 in small-scale technical assistance grants for

purposes of upgrading Alaska's shellfish spat production over a two-year period could be available for application and award by late 2012.

ASGA will work with DCCED to develop grant award guidelines parallel to what the agency would provide, but without the red tape even a one-time special grant might entail if administered by a state agency. ASGA will develop the grant award guidelines, subject to approval by the DCCED commissioner, and will establish a grant review committee chaired by Ray RaLonde, aquaculture specialist with the Alaska Sea Grant Marine Advisory Program, with additional representation by DCCED, ASGA, and a fourth member selected by the other three members.

The grants review committee will establish an annual description of the scope of the grants and publish annual public notices for Request for Proposals. The primary thrust of the RFPs will be to industry, but public notice also will be communicated through electronic releases to Alaska coastal media outlets and other online resources.

Recommendations for grant awards will be made by the grant review committee, and committee recommendations, grant applications and summaries of grant activities will be maintained by ASGA, At the end of the two-year grant project, ASGA will submit a report summarizing grant activities and results to the president of the Alaska State Senate. ASGA also will submit annual reports of grant activities to the commissioner of DCCED and the chairman of the Alaska State Senate Finance Committee.

Technology assistance grants	
Grants	150,000
Project Management Fees	5,000
Administration	15,000
Total	170,000

ASGA will administer the grants program for a 10 percent of the grant amount, plus $5,000 in fees for developing the grant guidelines, handling outreach to the industry and public, reporting, and coordinating project activities.

3. Operating funds for Seward hatchery $300,000

The Alutiiq Pride Shellfish Hatchery has operated for the past 15 years with no ongoing funding, and has done a good job in recent years of attracting research projects to supplement revenue from seed sales and state grants. But, the financial instability has taken its toll.

One recent example came last spring when the hatchery's cash flow hit a low point and couldn't pay its fuel bill. As a result, the boilers went down and an entire crop of geoduck spat was lost.

In response to budget shortfalls the hatchery is now staffed with only two fulltime employees. Maintenance and seasonal workers are hired as contractors as needed. The hatchery really needs a shellfish biologist on staff who can focus exclusively on raising shellfish and algae, but the uncertain cash flow prevents APSH from being able to bring on another employee.

ASGA has been discussing with ADF&G the potential of tapping a department biologist for six months a year for the next three years to increase hatchery production of oyster and geoduck spat. The request is under consideration.

APSH appears to be on track to securing up to $80,000 a year from the Bureau of Indian Affairs tribal hatchery maintenance fund, and it has two major enhancement research projects underway (king crab and sea cucumbers). In addition, production of geoduck spat is increasing and seed sales income should increase. However, it is clear the hatchery will need funding support as it responds to the oyster spat shortages.

APSH is planning to raise 5 million oyster spat for the 2012 growing season from eyed larvae purchased from outside hatcheries. This request is for $150,000 to cover FY 2013 operating expenses and $150,000 for the following year.

ASGA and other industry members will work with the hatchery over the next two years to develop a business plan that will lead to seed sales and research projects that cover operating costs by 2015.

ASGA will establish an advisory group to work with Alutiiq Pride Shellfish Hatchery in setting goals for the Seward hatchery. The advisory group will include representatives of shellfish farmers, dive harvesters and the Marine advisory program.

In addition to discussing annual production goals of various species, the advisory group will review progress of the hatchery in improving algae production, reducing energy costs and making other improvements in hatchery performance. The advisory group also will help the hatchery staff update its business plan and develop a report outlining the path to financial independence to the legislature by January 31, 2014.

4. Support for remote setting facilities $164,000

Small-scale remote setting facilities can be an important element of responding to the oyster seed production, but much needs to be learned from the two projects now preparing for 2012 growing season. Both projects have been designed by shellfish hatchery experts and employ energy efficient systems, and both are committed to sharing results with the rest of the industry.

OceansAlaska's 5-million spat project is fully funded and is meeting its development goals. KSMA's homer facility also is on track for operating during 2012, but the project needs some financial help to complete its initial goal of testing the feasibility of setting 1 million spat. Depending upon the success of phase 1, KSMA hopes to ramp up production to five million spar per season.

KSMA needs another $164,400 to complete phase 1. Here's a budget breakdown provided by KSMA. (KSMA's full report to the legislature and more detailed budget information is attached.)

KSMA Budget for Completion of Phase 1

2011 Over run	$	62,000.00
2012-2013 Projection	$	75,000.00
Sub Total	$	137,000.00
Reporting and industry support	$	27,400.00
	$	164,400.00

Strategies to improve Alaska production of shellfish seed

A report to the Alaska State Legislature
by the Alaskan Shellfish Growers Association
January 2012

Introduction

Availability of oyster seed or "spat" to Alaska growers has been a recurring problem for at least the past two decades. In 2011 the problem was magnified both by the increased demand for oyster spat, and the most significant spat shortage in West Coast hatcheries. Surveys of Alaska oyster nursery operators and growers reveal farmers were able to obtain only 40 percent of their spat orders.

The shortages have not been limited to Alaska. Growers in British Columbia have also suffered significant shortfalls of oyster seed, and some Washington oyster farms also were unable to obtain their full orders.

The outlook for 2012 does not look promising. This report is designed to respond to the direction of the Alaska State Legislature to prepare a report on the status of seed supplies to Alaska shellfish growers and recommend strategies for improving in-state production of oyster and geoduck seed.

This report focuses upon oyster spat, but improvements at the Alutiiq Pride Shellfish Hatchery recommended in this report would benefit geoduck farmers as well.

This report was prepared by the Alaskan Shellfish Growers Association with assistance from Jim Donaldson, a leading West Coast expert on shellfish hatcheries, and Tom Henderson, mariculture manager, OceansAlaska.

Background

After struggling for years, Alaska's shellfish farming industry has been experiencing a rapid increase in production over the past several years. Much of the recent growth can be attributed to investments by Southeast Alaska Native corporations, interest from tribal governments and to an industry-university-community effort to promote shellfish farming as an economic development

Oyster spat purchases

Year	Spat Purchases
2007	4,741,551
2008	7,455,000
2009	10,918,550
2010	10,428,300
*2011	4,100,000

Source (2007-2010): ADF&G

*Estimate (ASGA)

strategy.

The table at right reflects both the recent growth in oyster farming and the severity of the 2011 seed shortage. Our surveys of oyster nursery operators, cooperatives and individual farmers found 2011 demand at roughly 10 million seed oysters or "spat," or nearly the same as 2009-2010. The result is that growers were short at least 6,000,000 oyster spat, which will have a significant impact upon future earnings.

The impact of the shortfalls will be exacerbated by the late delivery of the spat nursery operators were able to secure. Roughly half of the spat was obtained in August and September, or toward the end of the growing season, ensuring it won't be large enough to grow out on farms until at least half of the 2012 growing season (April-October) has passed.

Since it takes at least five years for a crop of 3-5 mm spat to work its way through a nursery and oyster farm, the economic losses won't be immediately apparent. But, they will be significant, as the table below suggests.

Economic Impacts of 2011 Oyster Spat Shortages	
Nursery Operations	
Number of spat shortfall	6,000,000
Survival to 15-20 mm	75%
Survivors (millions)	4,500,000
Value/1,000 spat	$35
Loss	$157,500
Farms	
Spat deficit	4,500,000
Survival to marketable oysters	80%
Marketable oysters	3,600,000
Dozens of marketable oysters	300,000
Farmgate value/dozen	$5
Loss to growers	$1,500,000
Total	**$1,657,500**

How many farmers were unable to obtain oyster spat is unclear, but there were some. Missing a seasonal planting of a new crop means the farmer loses a year

of sales revenue that would be spread across two growing seasons (April-October). Unlike a terrestrial farm that can shut down when a crop can't be planted, oyster farmers must continue full operations tending up to the 4-5 different year classes, or crops, in the water.

What is clear is that most farms received less than half of the spat needed to provide adequate revenues to support the small rural businesses. The seed shortages have sent shock waves through the industry and have set back aggressive development schedules of the many new farms and two farmers cooperatives fighting for survival.

The industry has endured seed shortages in the past, but investment dollars have increased significantly and the projected losses will be greater. The timing couldn't have been worse as we forecast significantly higher demand over the next decade. Surveys of growers, Native corporations, tribal governments and nursery operators suggest oyster spat demand could double over the next five years to 20 million.

Farmed Shellfish Production of U.S. Pacific Coast

(2008 and 2009 Data, Sales in millions of dollars)

Oysters	Clams	Mussels	Geoduck	Seed Sales	Totals
Washington					
58	**20**	**3.1**	**20**	**7**	**$107,562,500**
California					
12	**.83**	**.945**		**2.3**	**$16,436,326**
Oregon					
2.2				**.75**	**$3,003,135**
Alaska					
.441	**.25**	**.006**		**.126**	**$599,232**
Totals					
73	**20**	**4**	**20**	**10**	**$117,425,193**

For the past 30 years, Alaska oyster farmers have purchased all their spat from nurseries located in Washington and California. Securing enough seed was

always a challenge. There were periodic interruptions in seed supply occurring in roughly five year intervals.

These interruptions were caused by a variety of factors, but they can largely be attributed to Alaska's small stature in the West Coast oyster seed market. Statewide demand from about two dozen growers was less than what Washington State farmers regard as a "small" oyster farm. When problems arose it was easy to cut a small market like Alaska, particularly when the state's importation rules were regarded as stringent.

The supply picture improved dramatically as oyster nursery operations developed in each of the state's primary growing areas (Southeast, Prince William Sound and Kachemak Bay). In recent years, these nurseries obtained small spat (4-6 mm) from a single source: Coast Seafoods hatchery in Kona, Hawaii.

An unexpected decision by Coast to suspend sales of single seed oyster spat caught the nursery operations off-guard in 2011 and triggered the seed shortages.

West Coast Oyster Seed Supplies; Future Prospects for Alaska

Historically, natural sets of oysters supplied a significant portion of the seed demand on the West Coast of the U.S. Natural sets have, for several decades, decreased, and in most cases been completely eliminated as a possible seed source for oyster farmers. This, coupled with the success at captive rearing of oysters in hatcheries, has resulted in oyster hatcheries playing an increasingly important role.

There are four major oyster hatcheries on the West Coast, Coast Seafoods, Taylor Shellfish, Whiskey Creek and the Lummi Tribal Hatchery. Recently, unpredictable water quality at Whiskey Creek, Taylor Shellfish and the Coast Seafoods Kona hatchery has lead to supply shortfalls of seed. A significant reduction in production at one hatchery may affect the supply of spat on the entire West Coast. Oyster seed shortages have been attributed to a number of causes. Since seed production is driven by larvae production it is important to look at the reasons for the larvae production failures as well as seed production failures.

Climate change appears to be a major factor at the Whiskey Creek Hatchery because it is located in an area of coastal upwelling. This upwelled, acidified water is likely affecting carbonate chemistry of seawater at this location. Carbonate chemistry of seawater has recently been found to have an important influence on oyster larvae performance. Climate change may also be a factor in the recent bacteria problems at this same hatchery.

Climate change is affecting the quality of water available at Whiskey Creek in some years by decreasing the pH (acidifying the water) and influencing the water in other ways that are conducive to bacterial growth. The influence of climate change at this hatchery will vary from year to year but it is expected to continue to be an important factor in the diminished supplies of oyster seed on the West Coast of North America.

There are Alaska regulatory issues that allow for import only from certain hatcheries. This reduces the potential supply to only Coast Seafoods and Taylor Shellfish. When one of these hatcheries has a supply problem, it has a significant effect on Alaska oyster farmers.

Both Taylor Shellfish and Coast Seafoods are large, vertically integrated companies that will take care of their own needs before offering oyster seed for sale to others. Coast Seafoods has now been sold to Pacific Seafood, creating even more uncertainty regarding larvae and seed sales.

Oyster farms on the West Coast are expanding their growing areas to meet the increased demand for west coast oysters. This is increasing the demand for seed from all sources, therefore putting additional pressure on hatchery supplies.

The oyster seed that is imported may not be the best seed for growing in Alaska. The Molluscan Broodstock Program at Oregon State University has developed a generalist oyster stock that does well in all environments from Washington to California. Alaska Sea Grant Program has reported that these generalist stocks have not fared as well as some other stocks when grown in Alaska. It is apparent, therefore, that Alaska needs to develop its own genetic stock in order to have control over its own oyster seed supply and, additionally, its own broodstock that can be developed for its unique growing areas.

B.C. growers rely upon importing foreign oyster spat

British Columbia's oyster industry closely resembled Alaska's until the 1980s when the federal, provincial and local governments combined forces to promote aquaculture as an economic development tool.

The industry expanded very quickly with the government support and today growth is limited by a freeze on new sites for shellfish farms on the southern coast. Shellfish farming activity in northern B.C. has been limited primarily to "First Nation" development efforts with scallops.

British Columbia in 2007 had a demand of 1,000 million oyster larvae and 170 million single seed oysters. Roughly half of the demand was actually met. In the report entitled "Hatchery Feasibility Study" from the Centre for Shellfish Research (CSR) at Vancouver Island University, several weaknesses and constraints in the industry were identified. Chief among these were: 1) reliance on foreign sources of shellfish seed, and 2) lack of seed production capacity and security.

The BC Shellfish Growers Association has described the industry as "being about one-sixth the size of the industry in Washington State and smaller than just the mussel industry in Prince Edward Island." Officially, industry is considered just too small to support a large scale shellfish hatchery.

A CSR report entitled "Feasibility of a Shared Shellfish Hatchery for the BC Shellfish Aquaculture Industry" cites two reasons BC cannot support a hatchery: 1) "Supply from competitors in Hawaii which has a broader season so can provide a great amount of seed to meet that early season demand that would be difficult to provide locally…;" and 2) …There exists "potential conflict and competition with current BC and Washington hatcheries."

Speaking privately, many small growers acknowledge the lack of hatcheries is in great part due to the largest growers having access to their own seed and objecting to a government funded provincial based hatchery. Some growers say larger companies are trying to squeeze out competition by withholding seed.

Whatever the reasons, many B.C. growers are not getting the seed they need to maintain their flow of product. Here's what one B.C. oyster grower said in a recent email asking about seed supplies:

"Don't even mention spat," he said. "Our target is 5 million seed a year, but this year we can get nothing. Not a good situation. I think I'm going to lay off most of my crew in the spring… Not a good time for seed!!"

Current sources of oyster seed in BC are primarily two facilities; Taylor Shellfish, with hatcheries in Washington, California, with setting facilities in Hawaii; and the Guernsey Sea Farms, a UK hatchery off the coast of France.

Island Scallops on Vancouver Island also does some setting of larvae imported from Washington State. In past years, Coast Seafoods has also been an important source of spat. In 2011, production problems severely limited Coast's seed production, which hurt BC growers as it did Alaska growers.

Alaska's shellfish seed production assets

Despite its small size, Alaska has a surprising number of assets that are working to produce shellfish seed, including a large shellfish hatchery, remote setting facilities and shellfish nurseries in each of the state's production regions: Southeast, Prince William Sound and Kachemak Bay.

Hatcheries have the capability of conditioning and spawning adult shellfish, culturing larvae through the transformation into tiny shellfish, and producing spat for shellfish farming or wild stock enhancement programs. Hatcheries also must produce algae to feed the shellfish.

Shellfish hatcheries generally have high overhead costs and rarely run in the black. The two companies that produce most of the West Coast's oyster spat are very large and have extensive investments in the shellfish business stretching from B.C. to Mexico, jumping over to the Hawaiian Islands. These hatcheries supply smaller operations with seed to help offset operating costs.

Remote setting facilities are more compact operations that begin at the eyed-larvae stage, which are purchased from hatcheries certified by ADF&G. Remote setting facilities generally operate only a few months a year to produce spat large enough to transfer to a nursery. These operations must be very energy efficient, but even the best operations are unlikely to cover operating costs unless they are attached to an efficient nursery system.

Alaska shellfish nurseries are all based upon the concept of providing small oyster spat with a large amount of food produced by Mother Nature. These floating upwelling systems (FLUPSY) simply enhance the flow of nutrient rich

marine water through bins of densely packed oyster spat. Large paddlewheels creating the upwelling effect are very energy efficient and there can be a profit margin in well-managed FLUPSYs.

Alutiiq Pride Shellfish Hatchery

Alaska's only shellfish hatchery, Alutiiq Pride Shellfish Hatchery in Seward, was built by the State of Alaska in 1996 with proceeds from criminal liability penalties resulting from the ***Exxon Valdez*** oil spill. The primary rationale for the hatchery was to help restore subsistence shellfish resources damaged by the spill, with the added mission of producing seed for aquatic farming and restoration projects in other areas. Part of the hatchery complex was to be dedicated to independent shellfish research projects.

The state later withdrew funding for the hatchery and transferred ownership to the City of Seward. The Qutecak Native Corporation initially operated the hatchery under contract and later stepped back in favor of the Chugach Regional Resources Commission.

Alaska's aquatic farmers are restricted to growing Pacific oysters and indigenous species of shellfish and aquatic plants, and the Seward hatchery is the only permitted source of seed for indigenous species. The Seward hatchery has been successful in rearing seed from wild stocks of geoducks, littleneck clams, cockles, rock scallops, razor clams and sea cucumbers.

The challenge of raising oyster spat in an Alaska hatchery is much greater than it is with the indigenous cold water shellfish. Alutiiq Pride must warm incoming marine water from 40^0 to 70^0 F. to condition the oysters and inducing spawning, and the larvae and oyster spat require the water to be heated. The result has been that the cost of producing oyster spat in Seward is much higher than it is at facilities located in warmer areas which have access to lower energy costs. Since oyster spat can be imported, nurseries and growers turned to lower-cost producers, such as Coast's Kona hatchery.

The hatchery's role in producing geoducks and other indigenous species and success as a research facility makes it invaluable to farmers and other coastal residents. The hatchery facility is very large for the size of the industry and is

expensive to operate, although the staff has done an admirable job at reducing energy consumption and other operating costs.

Upgrades to the hatchery's algae systems and waste heat recovery systems are necessary if Alutiiq Pride is to play a major role in Alaska production of oyster spat.

Remote-setting facilities

Two facilities designed to produce small oyster spat suitable for nursery culture are currently under development and a third of these "seed-setting" facilities is in the process of resuming operation. All three plan on setting seed during 2012.

OceansAlaska is constructing a five million oyster spat seed-setting facility at its new mariculture research facility in Ketchikan. Here's how the organization describes the project:

"OceansAlaska (OA) is a non-profit marine research organization based in Ketchikan, Alaska. The mission of OA is to support mariculture through research, training and education. Recently (October 25, 2011), OceansAlaska sponsored a shellfish industry forum to set objectives for the organization. The first objective identified was "develop an oyster and geoduck seed production facility". To this end, OA is proposing a capital expenditure in excess of $300,000 to outfit a recently completed research facility to serve as a shellfish setting lab, addressing the short term needs of shellfish growers.

"The proposed shellfish setting facility has a goal of producing 5 million oyster spat and 500,000 geoduck spat. A second goal is to collect data on operating costs, relating primarily to energy and manpower. A third goal of the facility is to train the mariculture manager and other employees to operate the setting facility and algae production lab. Ultimately, the trainees will become the trainers. This facility should operate not more than two years. The ultimate goal is to make the data and training available to another organization to build a 'stand alone' hatchery.

"The major problem with hatchery operation, in Alaska or elsewhere, is cost. Operators acknowledge the low profitability of hatchery operations. This of course in the real reason why there are no private hatcheries in Alaska and BC. Preliminary figures for the OceansAlaska setting facility show a substantial loss

on the production of 5 million oyster seed. The cost of seed is tied in to the cost of feed, algae production, which requires large inputs of energy for heating water. The goal of OceansAlaska is to produce 5 mm seed which can be transferred to a nursery operator before it is purchased by growers. The larger the seed, the more feed is required, and the greater is the cost.

"One way to show profit from a hatchery is to first place the seed in a floating nursery, known as a FLUPSY. A floating nursery can take small (4-5mm) seed from a hatchery, and produce 20-25 mm seed with a much greater sales value. The post-FLUPSY value would be enough to cover the nursery operating cost and the hatchery operating cost, perhaps resulting in a small profit. The only other option for an in-state hatchery to be economical is for FLUPSY operators to buy the seed at a price high enough to guarantee a profit to the hatchery. This would require selfless discipline from operators who may have the option in some years be to buy cheaper seed from Outside hatcheries."

The second seed setting facility is currently under development by the Kachemak Shellfish Mariculture Association at the farmer cooperative's facility on the Homer Spit. Phase One of KSMA's project is to set 1 million seed at a facility designed by shellfish hatchery expert Jim Donalson. Here's how KSMA describes its project:

"A long term goal of this initiative is to be able to produce seed from the best oyster seed stock in Alaska, thus assuring long term success of our oyster aquaculture industry in the state.

"KSMA will be responsible for the design, construction and operation of the trial facility and Alutiiq Pride will be a participant in the facility and KSMA will help in preparing the report to the senate.

"Phase 1 SOA FY-2012

The primary objectives of the project will be to:

1) Develop a design for a small scale independent hatchery for production of seed in Alaska
2) Construct the hatchery within budget and on time
3) Populate the hatchery with eyed larvae in time to produce oysters seed for the nurseries for the 2012 season
4) Determine the financial feasibility of small scale independent hatcheries in Alaska

5) Received a $90,000 startup grant from the Alaska Legislature in FY-2012, see below "Grant"

"A report outlining the results of the study, measures used to define success of the effort or lack thereof, the basis for design of the facility, and conclusions of the potential viability of a hatchery like this one will be submitted the Senate Finance Committee, with a copy to the City of Seward, by February 1, 2012.

"KSMA owned equipment inventory, facilities and personnel;

- Processing facility on Homer spit with salt water well with capacity for project
- 1ea. 1.5 Million seed Flupsy and a 4 Million seed Flupsy
- Biologist on staff

"Progress in FY-2012:

- Secured industry professional to design a hatchery for KSMA
- Developed a hatchery plan
- Located and transported purchased and shared equipment to hatchery
- Trained staff in hatchery design and shellfish production/development
- Ordered new equipment; note delays for material on ordered due to purchase ordering with grantee
- In June 2010 a production concept paper and demonstration project results will be issued after first seed setting.
- Secure financial support for phase 2 of project
- Prove demonstration project, refine the design and increase production to 1M oysters

"Phase 2
Scale project to 2M

"Phase 3
Scale project to 5M"

Nurseries

Alaska has developed sufficient nursery capacity to meet current demand for oyster spat, and the potential to ramp up to meet a doubling of current demand. There currently are operating FLUPSYs in Naukati, Kake and Kachemak Bay,

each of which has a 4-million seed capacity. In addition, there are two other smaller FLUPSYs in Prince William Sound, and larger capacity units that have been decommissioned but are potentially usable.

Haa Ani, a subsidiary of Sealaska Corporation, owns the 4-million seed FLUPSY operated by Pearl of Alaska near Kake, and has developed plans to build a larger FLUPSY (8-million seed) for operation in Southeast. Sealaska recently delayed construction of the FLUPSY because of the current difficulties in obtaining seed.

Once the new, larger capacity FLUPSY is operating Alaska should have adequate nursery capacity to meet a projected doubling of seed demand by 2020.

ASGA Recommendations to Improve Alaska Production of Shellfish Spat

1. Alutiiq Pride Shellfish Hatchery System Upgrades $160,000

When the state built Alutiiq Pride Shellfish Hatchery in 1996 the facility was considered state of the art. Technology has changed dramatically over the past 15 years and some critical systems are obsolete and contribute to high energy costs.

The hatchery has redesigned many of its systems in recent years in an attempt to minimize operation costs focused on recycling heated seawater. By utilizing pumps and basic filtration technology the hatchery can reuse the heated water multiple times.

Unfortunately, many of the hatchery's systems are now obsolete, mainly the boilers and heat recovery systems. The hatchery needs to replace its oil-fired burners with propane boilers which are more efficient and should cost significantly less to operate. The hatchery has also installed electric heaters in some of its reservoirs. The use of electric hot water heaters enables the staff to dial in more precise temperatures and minimize the wasting of water as it is heated up.

Despite the best efforts at conservation of heat, minimizing flows and reusing as much as possible the hatchery has been able to maintain stable electric and fuel costs. The monthly cost during peak production time for electric and fuel can exceed $9,000.

There are two primary areas that need upgrading at the APSH to improve hatchery feasibility and performance. The following is a brief description of these areas.

Algae production

There is currently only 5,000 liters of algae available per day to feed bivalve larvae or seed. This is only enough algae to support 2 million 3 mm oyster seed in a four-month season. The hatchery needs to scale up its algae system to a commercial size operation to be feasible which may be an oyster seed production of 10 million 3 mm in a four-month season. This will require the

production of 25,000 liters of algae per day during the production season or five times what is presently available.

There are two ways to increase the algae production in a hatchery.

1) Increase the algae volume per day by changing the system and volume or number of tanks available to feed.
2) Increase the density of the algae for the final stage of culture by changing the system and or culture protocols. For example changing the amount of inoculum or lighting type and intensity of this final stage.

The algae system will have to be reviewed to ascertain the best approach for increasing the amount of algae available to feed. The cost of the review and upgrade is projected at $75,000.

Energy Efficiency

One of the largest operating costs in a hatchery is the energy required to heat seawater for larvae or seed culture. There are very efficient systems now available to recover waste heat from hatcheries and add heat to systems with significantly reduced operating costs.

The hatchery currently spends about $7,000 per month on energy for the hatchery. There is a heat recovery system in place at the hatchery but it is not engineered or operated properly with the end result that there is little or no significant heat recovery. An efficient heat recovery system should be able to recover over 80% of waste heat generated and therefore reduce the energy operating costs significantly. Titanium plate heat exchangers for heat recovery coupled with heat pumps for added heat should to be considered.

Here is a comparison of the cost of heating water for oysters spat in a 10 million spat facility (these figures are based upon Ketchikan electricity costs):

Cost of Heating by Energy Source

Heat Source	Btu/Mo	Btu/Season	5 mo Energy Cost
Oil	576,500,000	2,882,500,000	$90,078
Electric- resistance heating	576,500,000	2,882,500,000	$84,481
Heat pump	146,888,000	807,840,000	$23,700

Unit Cost of Energy, Jan 2012

Source	Btu Values	unit cost	cost/btu
1 Kw elec	3412	0.1	2.93083E-05
1 gal D1	136000	4.25	0.00003125
1 gal Pro	91000	2.85	3.13187E-05

A review of the current energy system and hatchery process flows is required followed by an engineered system. The cost of the review and the upgrade is projected at $85,000.

2. Technical assistance grants $170,000

The Alaska shellfish farming industry needs to tap expert advice to develop effective strategies for improving in-state production of oyster and geoduck spat and it needs to do this quickly and efficiently.

The guidance is necessary to design effective and efficient methods of increasing in-state shellfish seed production including guidance from experts in shellfish aquaculture and energy efficiency in designing and planning operations and preparing funding proposals. Unfortunately, nimbleness and speed not is characteristic of state government, as recent conversations with DCCED reveal.

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ASGA will work with DCCED to develop grant award guidelines parallel to what the agency would provide, but without the red tape even a one-time special grant might entail if administered by a state agency. ASGA will develop the grant award guidelines, subject to approval by the DCCED commissioner, and will establish a grant review committee chaired by Ray RaLonde, aquaculture specialist with the Alaska Sea Grant Marine Advisory Program, with additional representation by DCCED, ASGA, and a fourth member selected by the other three members.

The grants review committee will establish an annual description of the scope of the grants and publish annual public notices for Request for Proposals. The primary thrust of the RFPs will be to industry, but public notice also will be communicated through electronic releases to Alaska coastal media outlets and other online resources.

Recommendations for grant awards will be made by the grant review committee, and committee recommendations, grant applications and summaries of grant activities will be maintained by ASGA, At the end of the two-year grant project, ASGA will submit a report summarizing grant activities and results to the president of the Alaska State Senate. ASGA also will submit annual reports of grant activities to the commissioner of DCCED and the chairman of the Alaska State Senate Finance Committee.

Technology assistance grants	
Grants	150,000
Project Management Fees	5,000
Administration	15,000
Total	170,000

ASGA will administer the grants program for a 10 percent of the grant amount, plus $5,000 in fees for developing the grant guidelines, handling outreach to the industry and public, reporting, and coordinating project activities.

3. Operating funds for Seward hatchery $300,000

The Alutiiq Pride Shellfish Hatchery has operated for the past 15 years with no ongoing funding, and has done a good job in recent years of attracting research projects to supplement revenue from seed sales and state grants. But, the financial instability has taken its toll.

One recent example came last spring when the hatchery's cash flow hit a low point and couldn't pay its fuel bill. As a result, the boilers went down and an entire crop of geoduck spat was lost.

In response to budget shortfalls the hatchery is now staffed with only two fulltime employees. Maintenance and seasonal workers are hired as contractors as needed. The hatchery really needs a shellfish biologist on staff who can focus exclusively on raising shellfish and algae, but the uncertain cash flow prevents APSH from being able to bring on another employee.

ASGA has been discussing with ADF&G the potential of tapping a department biologist for six months a year for the next three years to increase hatchery production of oyster and geoduck spat. The request is under consideration.

APSH appears to be on track to securing up to $80,000 a year from the Bureau of Indian Affairs tribal hatchery maintenance fund, and it has two major enhancement research projects underway (king crab and sea cucumbers). In addition, production of geoduck spat is increasing and seed sales income should increase. However, it is clear the hatchery will need funding support as it responds to the oyster spat shortages.

APSH is planning to raise 5 million oyster spat for the 2012 growing season from eyed larvae purchased from outside hatcheries. This request is for $150,000 to cover FY 2013 operating expenses and $150,000 for the following year.

ASGA and other industry members will work with the hatchery over the next two years to develop a business plan that will lead to seed sales and research projects that cover operating costs by 2015.

ASGA will establish an advisory group to work with Alutiiq Pride Shellfish Hatchery in setting goals for the Seward hatchery. The advisory group will include representatives of shellfish farmers, dive harvesters and the Marine advisory program.

In addition to discussing annual production goals of various species, the advisory group will review progress of the hatchery in improving algae production, reducing energy costs and making other improvements in hatchery performance. The advisory group also will help the hatchery staff update its business plan and develop a report outlining the path to financial independence to the legislature by January 31, 2014.

4. Support for remote setting facilities $164,000

Small-scale remote setting facilities can be an important element of responding to the oyster seed production, but much needs to be learned from the two projects now preparing for 2012 growing season. Both projects have been designed by shellfish hatchery experts and employ energy efficient systems, and both are committed to sharing results with the rest of the industry.

OceansAlaska's 5-million spat project is fully funded and is meeting its development goals. KSMA's homer facility also is on track for operating during 2012, but the project needs some financial help to complete its initial goal of testing the feasibility of setting 1 million spat. Depending upon the success of phase 1, KSMA hopes to ramp up production to five million spar per season.

KSMA needs another $164,400 to complete phase 1. Here's a budget breakdown provided by KSMA. (KSMA's full report to the legislature and more detailed budget information is attached.)

KSMA Budget for Completion of Phase 1

2011 Over run	$	62,000.00
2012-2013 Projection	$	75,000.00
Sub Total	$	137,000.00
Reporting and industry support	$	27,400.00
	$	164,400.00

Shellfish initiative addresses 6 million oyster spat shortfall

Alaska's oyster farmers were able to secure only 40% of the seed or "spat" needed during 2011. The Alaskan Shellfish Growers Association (ASGA) estimates the spat shortfalls will cost the industry more than $1.6 million. The shortages were caused by a combination of factors, including ocean acidification in Oregon and Washington, a virus in a key Hawaiian hatchery and Alaska's small stature in the West Coast farmed shellfish industry.

Oyster spat purchases

Year	Spat Purchases
2007	4,741,551
2008	7,455,000
2009	10,918,550
2010	10,428,300
*2011	4,100,000

Source (2007-2010): ADF&G
*Estimate (ASGA)

ASGA recently submitted a report to the Alaska State Senate Finance Committee that provides a more in-depth overview. The report and recommendations on how to improve in-state production of shellfish spat were developed with the help of one of the best known shellfish hatchery experts on the West Coast and OceansAlaska. Here's a summary of the recommendations:

Upgrades to the Alutiiq Pride Shellfish Hatchery: $160,000.

The hatchery's algae production system currently can produce only one-fifth of the food necessary to feed the 10 million oyster spat currently needed by Alaska oyster farmers, and its production costs are high because of antiquated equipment. The hatchery currently spends up to $9,000 a month on energy costs during peak production periods. These can be significantly reduced with the installation of a marine water heat exchange pump system similar to those in use at NOAA's Lena Point lab and the SeaLife Center in Seward.

Maintenance and operating costs of APSH: $300,000

The state built the hatchery in 1996 with criminal liability funds recovered from the *Exxon Valdez* oil spill as a tool in helping rehabilitate subsistence resources damaged by the disaster. The hatchery has operated for the past 15 years as a private non-profit enterprise, but it has had no stable funding. These funds spread over a two-year period would provide stable enough funding for APSH to hire a much-needed shellfish biologist.

Technology grants for expert advice: $170,000

The Alaska shellfish farming industry needs to tap expert advice to develop effective strategies for improving in-state production of oyster and geoduck spat and it needs to do this quickly and efficiently. The guidance is necessary to design effective and efficient methods of increasing in-state shellfish seed production. Unfortunately, it would take about a year before the state could issue even one-time grants. ASGA will work with the state to develop an acceptable method of distributing small grants to the most deserving applicants.

Support for small scale seed production: $164,000

A smaller scale effort to increase Alaska oyster spat production has been initiated by the Kachemak Shellfish Mariculture Association which is building a "remote setting" facility on the Homer Spit. The project will allow KSMA to produce 1 million spat on the Homer Spit. KSMA plans to ramp up the facility to produce 5 million spat.

A model mussel farm for Alaska

The Alaska Mussel Technology Transfer Project is designed to demonstrate the economic and technical feasibility of large scale mussel farming in Alaska as a method of revitalizing the economy of coastal Alaska. The project will result in the construction, deployment and operation of four 40' x 40' mussel rafts capable of producing $560,000 in annual gross sales within two years. Eventually, the Halibut Cove mussel farm will have an annual production 1.2 million pounds of high quality mussels worth $2,000,000 and will employ ten local residents.

Alaska Shellfish Farms (ASF) is a family owned and operated shellfish farm in Halibut Cove, Kachemak Bay. Owners Greg and Weatherly Bates have aquaculture degrees and have worked on and managed several shellfish farms in both Maine and Alaska. The Bates will construct and operate the prototype mussel project and will work with the Alaskan Shellfish Growers Association (ASGA) and Alaska Sea Grant Marine Advisory Program (MAP) to collect and analyze environmental and financial data from the project. Project outreach will be aggressive and will focus upon getting results out to the public through workshops, development of a manual for new mussel farmers and education of students interested in making a sustainable living from the sea.

Global mussel production has increased dramatically over the past two decades, increasing from 346,000 tons in 1991 to 446,000 tons in 2002, according to the FAO. Meanwhile, production in Alaska actually decreased to a paltry 1,573 pounds in 2010, according to data compiled by ADF&G. This project is designed to demonstrate Alaska's tremendous potential as a mussel producer. Kachemak Bay mussels compare favorably with the best blue mussels produced on the East Coast and Canadian Maritimes, and are a far superior quality product than any mussel produced on the West Coast. The technologies the Bates' are implementing are proven, and will allow for a production of a species prolific to our waters

Mussels will be grown suspended on lines hung from a raft, surrounded by a predator net. The mussel rafts will be built with a steel I-beam frame able to withstand wave action, ice. The rafts will be held in place by four 1-ton plow anchors, two on each end, each anchor with 300' of 1'' chain held to raft. Mussel seed will be collected from wild sets.

Mussel processing equipment is necessary for production of any volume of product because of the large amounts of labor harvesting and processing would require if done by hand. Mussel processing equipment obtained directly from successful industries will accelerate the development of an Alaskan mussel industry.

Alaska Mussel Technology Transfer

Item	Cost
Raft Materials	120000
Predator Net	56000
Moorings	118000
Mussel Processing Line	92000
Culture Equipment/materials	46400
Outreach	30000
Administration	23120
TOTAL	**485520**

One of the biggest challenges will be protecting the mussel crop from predators, particularly sea otters and sea ducks. ASF will completely enclose their farm with a specially designed predator net that will keep the voracious predators at bay. Predator nets are commonly used to protect mussels from sea duck predation in most places where rafts are used, the predator net technology is a direct transfer from other industries.

ASGA will work with ASF to develop a marketing plan that will focus upon building in-state demand, while using the "Alaska seafood brand" to obtain premium prices in upscale U.S. markets. ASGA and MAP also will use information generated from the project to develop model business plans and a manual for Alaska mussel farmers and investors. ASGA, MAP and ASF also will collaborate on mussel farming workshops.

Kachemak Shellfish Mariculture Association
3851 Homer Spit Road, Homer, Alaska 99603 (907)-235-1935 AlaskaOyster.org

Need

- Alaskan oyster farmers suffer for an inconsistence quality and supply of oyster seed.
- National and International shellfish industry seed security concerns must be addressed to insure sustainability of the shellfish production in Alaska.
- Alaskan oyster farmers have identified several issues leading to the need a cooperative owned and operated shellfish hatchery in Homer Alaska.
    - Current seed sources is from out of state Washington, Oregon and Hawaii .
    - Diversifying the seed source, more than one hatchery supporting shellfish
    - Ocean Acidification, a natural threat in many areas around the world.
- Develop a plan for an industry driven hatchery in Kachemak Bay (vs. research driven)

Natural and biological

In Japan the Miyagi Prefecture used to export seed oysters to the U.S. West Coast. However when French oyster farmers experienced a decade of oyster die-off from 1970 due to disease, it turned to Japan for Pacific oysters. In response the oyster industry of Washington State, with help from Washington State University, developed its own spatted production. France soon also became independent of Japanese seed production. Miyagi Prefecture supplied 70 percent of Japan's seed oysters before suffering extensive tsunami damage in 2011. Today, other prefectures are now scrambling to secure juvenile oysters. This is one example as to having more than one source of seed for and in Alaska.

Ocean Acidification;

In the U.S. in 2007, Whiskey Creek Shellfish Hatchery in Netarts Bay, Oregon, first drew attention to the issue of seed security and ocean acidification. With high mortality in their juvenile oysters the hatchery staff thought it was due to bacteria or other pathogen. Finding nothing, they turned to ocean acidification issue and the pH levels of the water. With this they have identified this as the cause and are working on a remedy as ocean acidification is not going away. It is suspected that acidic water, with a low pH, is responsible for a significant decline in oyster larvae production at West Coast shellfish hatcheries. It's also likely responsible for the lack of natural oyster recruitment in the Willapa Bay region, as spawning events have not naturally occurred there in the past six years.
Several seed suppliers in 2011 identified that this is the reason that they could not supply the necessary seed for Alaska.

Grantee history and partnership

Kachemak Shellfish Mariculture Association (KSMA) - Agricultural 501c5 tax exempt nonprofit

In 1989 the State of Alaska passed legislation permitting the farming of approved shellfish species in coastal waters. By 1993 approximately ten oyster farms were established in Kachemak Bay. The farmers soon realized that shellfish farming also involved educating the community, working for clean water practices along with the production and marketing of shellfish. Thus, the farmers joined together in 1994 and formed, Kachemak Shellfish Mariculture Association. KSMA commits itself to supporting mariculture throughout in Alaska,

educating the public and supporting water quality practices. The organization has evolved into a strong voice for Alaska's shellfish industry and its programs have matured beyond their origination as the needs of the industry have changed. KSMA is an active voice and a leader in research and production of shellfish and mariculture. Today KSMA is on the front line of the oyster seed security, as its only motivation in this issue is to support the sustainable production of oysters in Kachemak Bay through quality oyster seed availability for Alaskan growers.

In 2005 KSMA received an EDA grant to develop cooperative multiuse facility to promote the mariculture industry to the State and region. Today this facility is used by KSGC to market shellfish and related seafood products to Homer and beyond. It leases out unutilized portions to offset operation costs and is where the hatchery is co-located saving overall costs.

Kachemak Shellfish Growers Cooperative (KSGC) – Members cooperative

As shellfish have been farmed commercially in Kachemak Bay for more than 20 years, the farms and farmers are recognized as stewards of the bay and of their sustainable industry. With shellfish production playing a vital role in the environment, culture, and economy of Kachemak Bay, KSGC was formed as a for profit organization representing shellfish farmers in production and product marketing. Additionally KSMA is a leader in research, production, promotion and education of shellfish and mariculture statewide.

We invite you to learn more about our extraordinary shellfish and the people who grow them. Many KSMA and KSGC members are also members in the State shellfish organization; Alaska Shellfish Growers Association (ASGC) and the Pacific Shellfish Growers Association. We also support the efforts of Kachemak Bay Research Reserve and the UA-Alaska Sea Grant, Marine Advisory Program's.

Project

Develop a reliable and quality, industry driven seed source supporting oyster growers in Kachemak Bay and throughout Alaska with genetics for cold water through a brood stock program.

Kachemak Shellfish Mariculture Association (KSMA) is seeking to develop a reliable, industry driven oyster seed source for Alaska which will serve as a foundation supporting the developing oyster industry. A secure, dependable seed supply for oyster farmers is the first step in ensuring consistent reliable oyster production year after year, this is a key element ensure growth of the industry.

The goal of this project is to build capacity within the state of Alaska to ensure a consistent and dependable seed source and eventually from Alaska brood stock oysters. To do this, KSMA is proposing to construct and operate a demonstration scale regional oyster seed production facility, with capacity to produce approximately 1.5 million seed, at KSMA's existing shellfish processing facility in Homer, Alaska.

Trial Oyster Seed Production Facility Proposal

A long term goal of this initiative is to be able to produce seed from the best oyster seed stock in Alaska, thus assuring long term success of our oyster aquaculture industry in the state.

KSMA will be responsible for the design, construction and operation of the trial facility and Alutiiq Pride will be a participant in the facility and KSMA will help in preparing the report to the senate.

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Phase 1 SOA FY-2012

The primary objectives of the project will be to:

1) Develop a design for a small scale independent hatchery for production of seed in Alaska
2) Construct the hatchery within budget and on time
3) Populate the hatchery with eyed larvae in time to produce oysters seed for the nurseries for the 2012 season
4) Determine the financial feasibility of small scale independent hatcheries in Alaska
5) Received a $90,000 startup grant from the Alaska Legislature in FY-2012, see below "Grant"

A report outlining the results of the study, measures used to define success of the effort or lack thereof, the basis for design of the facility, and conclusions of the potential viability of a hatchery like this one will be submitted the Senate Finance Committee, with a copy to the City of Seward, by February 1, 2012.

KSMA owned equipment inventory, facilities and personnel;

- Processing facility on Homer spit with salt water well with capacity for project
- 1ea. 1.5 Million seed Flupsy and a 4 Million seed Flupsy
- Biologist on staff

Progress in FY-2012:

- Secured industry professional to design a hatchery for KSMA
- Developed a hatchery plan
- Located and transported purchased and shared equipment to hatchery
- Trained staff in hatchery design and shellfish production/development
- Ordered new equipment; note delays for material on ordered due to purchase ordering with grantee
- In June 2010 a production concept paper and demonstration project results will be issued after first seed setting.
- Secure financial support for phase 2 of project
- Prove demonstration project, refine the design and increase production to 1M oysters

Phase 2

Scale project to 2M

Phase 3

Scale project to 5M

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Grant

2011 Legislature TPS Report 52180v1
Agency: Commerce, Community and Economic Development
Grants to Named Recipients (AS 37.05.316)
Grant Recipient: Seward Federal Tax ID: 92-6000086
Project Title: Project Type: Remodel, Reconstruction and Upgrades
Seward - Alutiq Pride Shellfish Hatchery Upgrade
State Funding Requested: $250,000 Approved House District: 35 / R
Future Funding May Be Requested
Brief Project Description:
Upgrading the Alutiq Pride Shellfish Hatchery and Expanding Shellfish Aquaculture in Alaska.

In addition to tackling some of the maintenance issues at the Alutiiq Pride Shellfish Hatchery, $100,000 will be spent in conjunction with the Alaska Shellfish Growers Association and the Kachemak Shellfish Mariculture Association (KSMA) on developing reliable oyster seed. The project will induce analyzing the feasibility of developing a regional oyster seed production facility at KMSA's facility on the Homer Spit. The Alutiiq Pride Shellfish Hatchery will deliver a report on the results of the trail facility in Homer and Oyster Seed Security in Alaska to the Senate Finance Committee by February 1, 2012.

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Borrowed Equipment

Needs to be returned in July!	
3 Algae tanks	$5,500.00
2 Nursery Tanks	$4,200.00
Microscope	$600.00
PH meter	$300.00
Misc. Lab equipment	$1,500.00
Refractometer	$200.00
Refrigerator	$300.00
Total	$12,600.00

2011 Cost over runs

	budget	cost	Cost Over Run
Electric	$ 8,000.00	$ 23,000.00	$ (15,000.00)
Labor	$ 16,000.00	$ 25,000.00	$ (9,000.00)
Well Upgrades	$ -	$ 14,000.00	$ (14,000.00)
Filtration System	$ -	$ 6,000.00	$ (6,000.00)
Larvae, Chemistyr	$ -	$ 5,400.00	$ (5,400.00)
Replace Borrowed Equipment	$ -	$12,600.00	$ (12,600.00)
		Total 2011 cost over run	**$ (62,000.00)**

KSMA Hatchery

2012-2013 Season Cost Projections

Labor	$	35,000.00
Power	$	24,000.00
New Technology and misc.	$	16,000.00
	$	75,000.00

Combine Over run and Phase 2

2011 Over run	$	62,000.00
2012-2013 Projection	$	75,000.00
Sub Total	$	137,000.00
Reporting and industry support	$	27,400.00
	$	164,400.00

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