PEI Oyster Growth Trial

2021 Report

Technical Report # 273

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Introduction

Prince Edward Island (PEI) is Canada's smallest province but it has a large contribution to Canada's economy. The Oyster industry is significant for PEI, producing world famous oysters, and valued over $12M in 2020. Due to the on-going Covid-19 pandemic, there was a decrease of approximately 1,400 tonnes in landings in 2020 compared to 2019, which contributed to a $5M decrease in production value. As this industry has grown and developed, interest in new technologies and innovations has also increased. In recent years, the adoption of off-bottom growing practices has become popular with many Island growers. This practice involves growing the oysters in floating bags or cages either on the surface or below the surface of the water, keeping them off the bottom. The bags or cages are also able to be flipped to expose to air and sun periodically for a short period (often 24 hours), removing most fouling and leading to cleaner cages and product. It has proven to be an effective growing method, resulting in oysters reaching market size at a quicker rate than when grown on the bottom[1].

Initially, PEI was primarily leased for growing oysters on the bottom. As interest grew in off-bottom growing techniques, leases changed and many growers purchased new leases or requested to change their existing bottom lease to an off-bottom (OB/Surface) lease (Figure 1 provides a view of the increased acreage assigned to off-bottom oyster aquaculture over more than a decade.). With these changes, many growers raised concerns about food availability in an area as the industry developed and wanted to ensure growth would not see a significant decline. The Foxley River growing area was an area that was seeing significant adoption of these new off-bottom growing techniques, and as a result, the Department of Fisheries and Communities (DFC) began a study to gather information on the growth rates within these areas. Four locations within Foxley River and three other areas (Percival, Bideford and Savage Harbour) were selected for the trial to provide growth data for comparison within various regions.

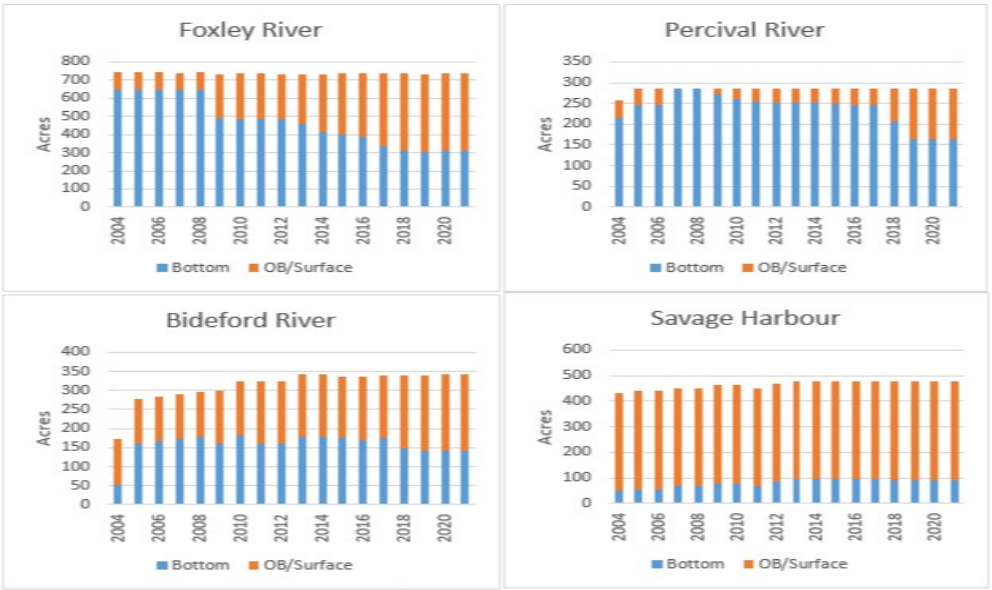


Figure 1: Oyster lease area by location and type

[1] S. Bastien-Daigle, M. Hardy and G. Robichaud (2007), Habitat Management Qualitative Risk Assessment: Water Column Oyster Aquaculture in New Brunswick. Canadian Technical Report of Fisheries and Aquatic Sciences 2728

Figure 1 demonstrates the steady transition of off-bottom oyster culture in Foxley River beginning in 2009 to current. It is interesting to note that there are now over 100 off-bottom leases in this river system; 10 times as many as in 2004. Comparing the oyster growth of Foxley River to these other regions which have not seen as significant of change in leasing structure aimed to provide insight into the impacts of increased surface oyster culture to overall oyster growth for production.

Methods

In May of 2021, the trial began again for the nineth season. Oysters were available from previous years, maintained in the departmental cages over winter. The seed and 1st year oysters from 2020 were used to fulfill the requirement for 1st and 2nd year oysters for the 2021 trial. In 2020 Covid-19 added a few new limitations and as a result, the oyster seed was purchased from a different seed source than in the past number of years. In 2021, seed was purchased from the same source as previous years, compared to 2020, which helps maintaining consistent seed stock year over year when comparing data from year to year.

Prior to the beginning of the trial, oysters from all areas were returned to the Aquaculture laboratory. Keeping each year class separate (1st year and 2nd year), any mortalities were removed and then mixed to ensure that the trial was not impacted by previous locations or overwintering practices. Afterwards, approximately 300 seed oysters, 160 1st years, and 125 2nd years were measured for length and width using a digital caliper with USB connection, which reduces manual recording errors as it directly records the measurements within Microsoft Excel. This provided the baseline starting size for the 2021 trial. The seed oysters were then measured to 3 litres and added to individually tagged bags (3 litres of oysters per bag). The 1st and 2nd years were counted and added to tagged bags (150/bag for 1st years, 125/bag for 2nd years). Each bag was also weighed and recorded. The tags placed on the bags were color coded and numbered to differentiate the bags and identify year class. Further, a HOBO temperature logger was used at each location, tracking water temperature every hour throughout the trial.

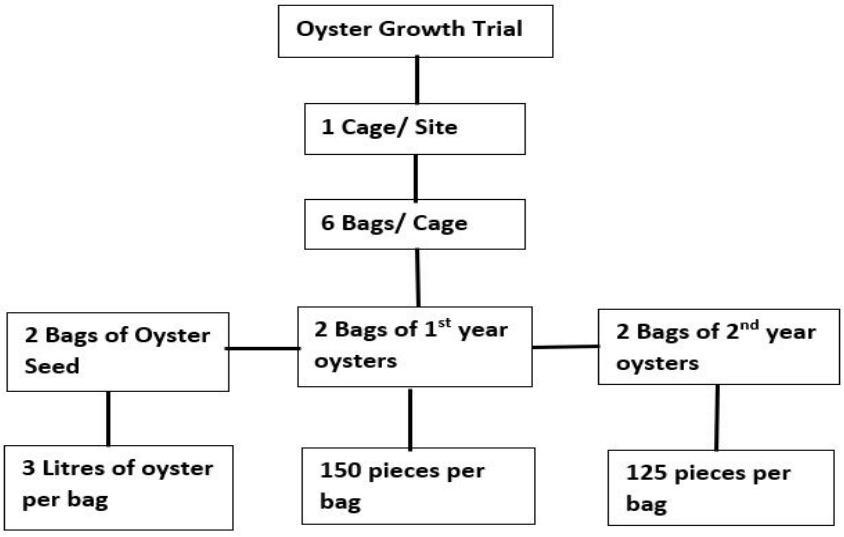


Figure 2: Breakdown of Site setup

The bags of seed were lime dipped to ensure no transfer of organisms between river systems. The bags of seed were then randomly assigned to each location with two bags going to each location to be housed in the 6 bag cages, along with the 4 bags from previous year classes. The seven selected locations were four locations in Foxley River (Figure 3) and one each in Percival River (Figure 4), Bideford River (Figure 5) and Savage Harbour (Figure 6).

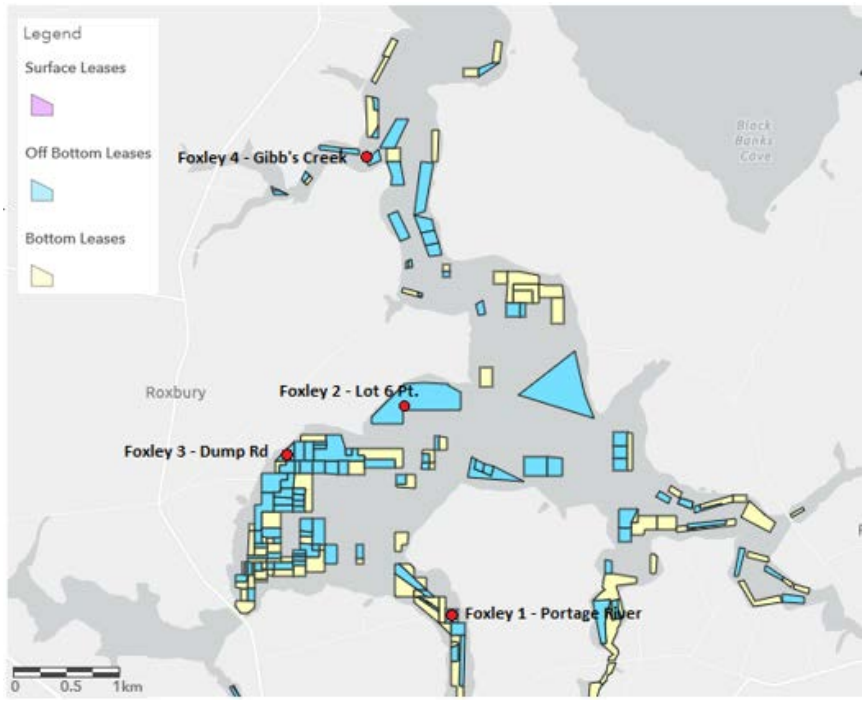


Figure 3: Foxley River growth sites

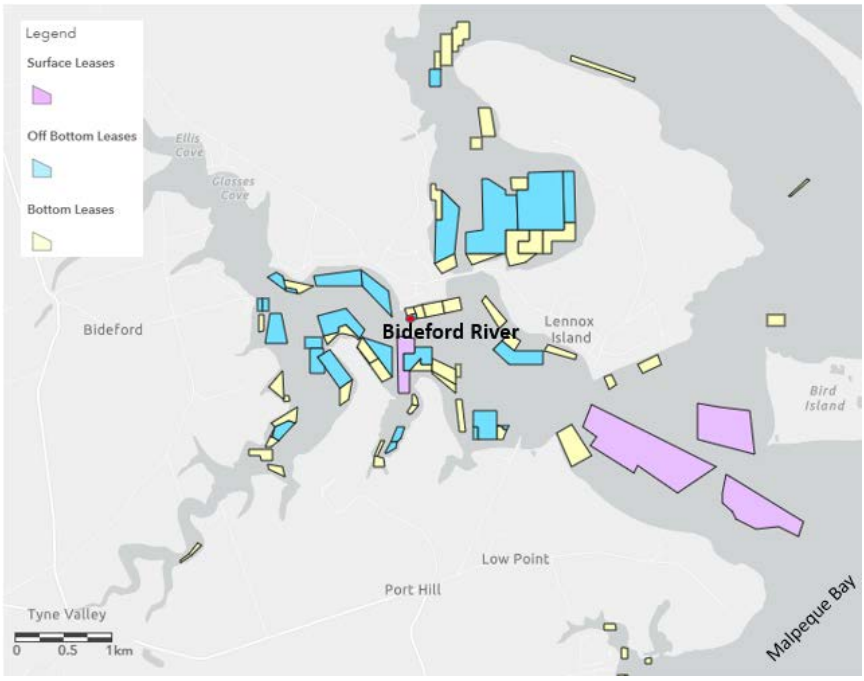


Figure 4: Bideford River growth site

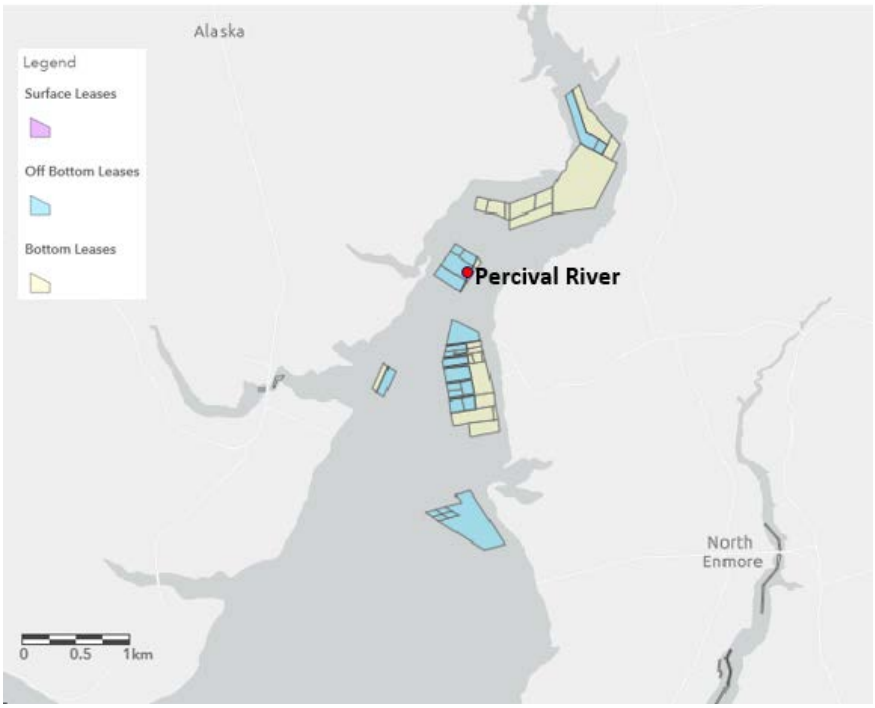


Figure 5: Percival River growth site

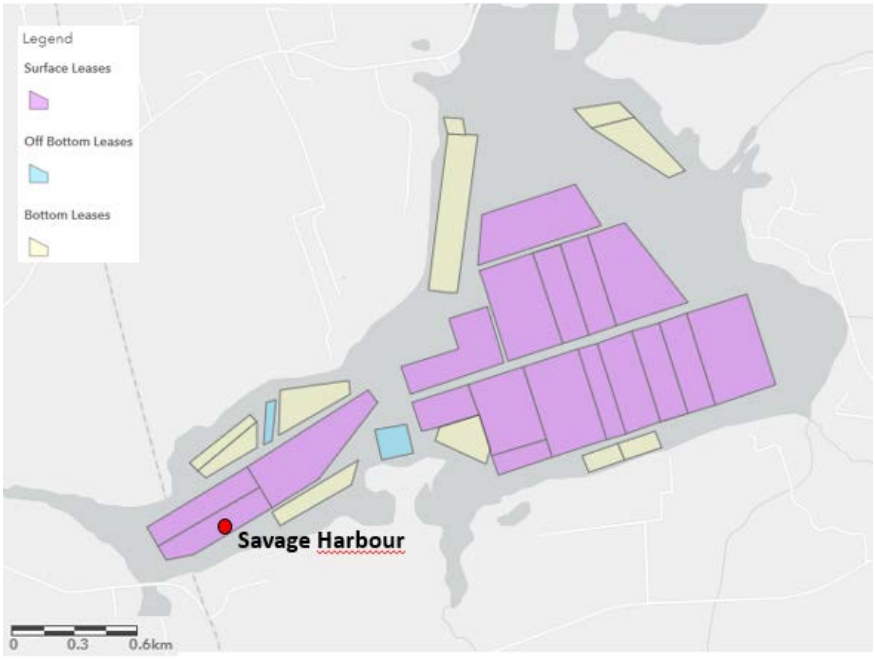


Figure 6: Savage Harbour growth site

As Foxley River was initially the area of interest and had four sites, the other three areas were selected in different river systems to provide a better understanding of the growth potential and act as a reference site to the Foxley River system. Percival provided a site which was on the Northumberland Strait side of PEI, Savage Harbour is much further East, and Bideford was another fairly developed river system with

off-bottom being used, thus providing better variability in the conditions. Figure 7 provides a view of these locations across PEI.

Figure 7: Growth locations across PEI

Throughout the growing season, the cages were flipped every two weeks and exposed to air drying for approximately 24 hours, before returning to the growing position. This was following standard industry practices for effective management of fouling on oyster cages.

Midway through the trial each year, the oysters had grown substantially, and as a result, the bags of seed needed to be thinned out. In late August, the bags of seed at each site were removed from the water, randomly divided, 3 liters were measured and returned to their original bag. The extra oysters were removed from the site, donated to the lease holder or bagged and held for future trials.

At the end of the trial in the fall, oysters from all year classes were retrieved from the cages and again measured. Oysters from each bag were randomly divided and approximately 50 per bag were measured, providing a sample of 100 oysters per age class per location. The 2-year oysters were given to the lease holder and the remaining oysters were either returned to the water or held in other bags for future trials. The lease holders sank the DFC cages for winter when sinking their own cages.

Results

Growth data has been collected since 2013 in 7 locations and has provided insight into growth activity in these areas. As expected, the seed oysters demonstrated the most growth each year, followed by the first years and then second years. Figure 8 provides a view of the growth of the seven locations included in the 2021 results. Figure 8 shows that Bideford has the lowest growth in 1st and 2nd year oysters. One factor that could be considered for the low growth rate in these age classes is that there was a recorded mortality

event on June 28th that showed a mortality of 35%, 8% and 5% for seed, 1st and 2nd year respectively. This event potentially may have affected the oyster growth rates; it may have slowed oyster growth, and the loss of oysters contributed to a lower number of oysters to measure at the end of season.

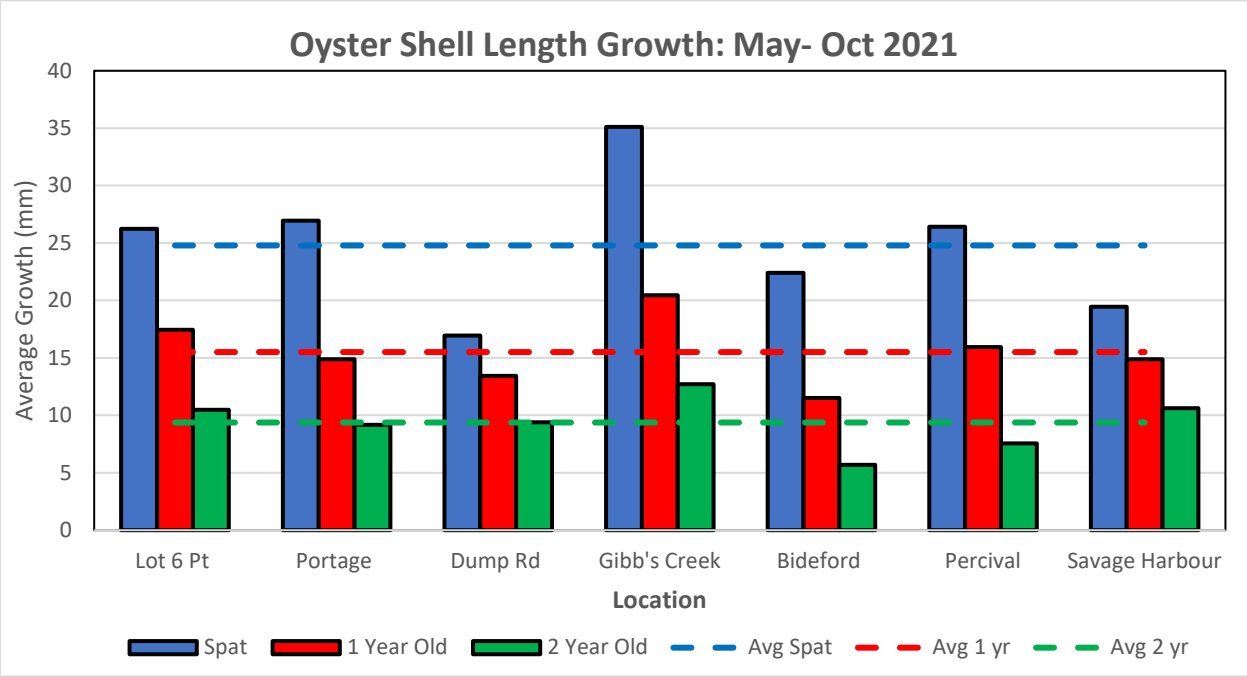


Figure 8: Oyster Growth May-Oct 2021

Not only is location a variable which appears to impact growth, but year to year results show variability. Annual and seasonal variability is expected as environmental conditions vary greatly from year to year. Figure 9, 10 and 11 demonstrate the annual growth in each location year over year based on year class. It is interesting to note the variation. For example, for the seed oysters, 2017 demonstrated the highest growth in all locations. However, the first years in 2017 fell in the middle of the pack and the 2nd years demonstrated the lowest year of growth. No results were recorded for the Portage site for all year classes in 2018 due to a long drying period that caused high mortalities. Results from the 2021 growth trial appears to follow the historical norm, basically falling in the middle of the pack. In 2021, Gibb's Creek continues its strong annual growth, it had the highest growth in all year classes. It has shown this strong growth over the past nine years, in 2021 it was the strongest year to date for seed and the second highest growth to date for 1st year oysters.

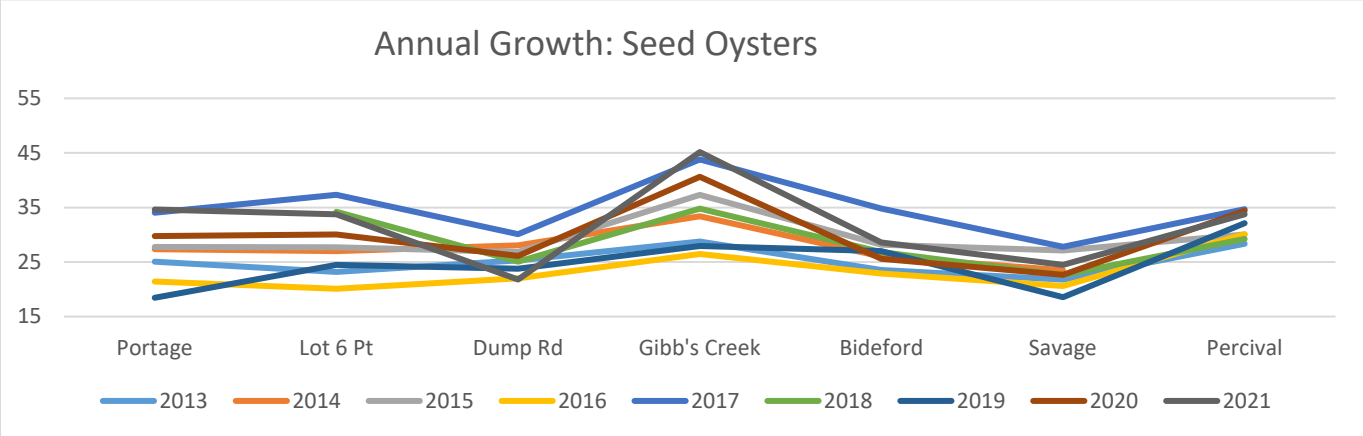


Figure 9: Annual Growth: Seed Oysters

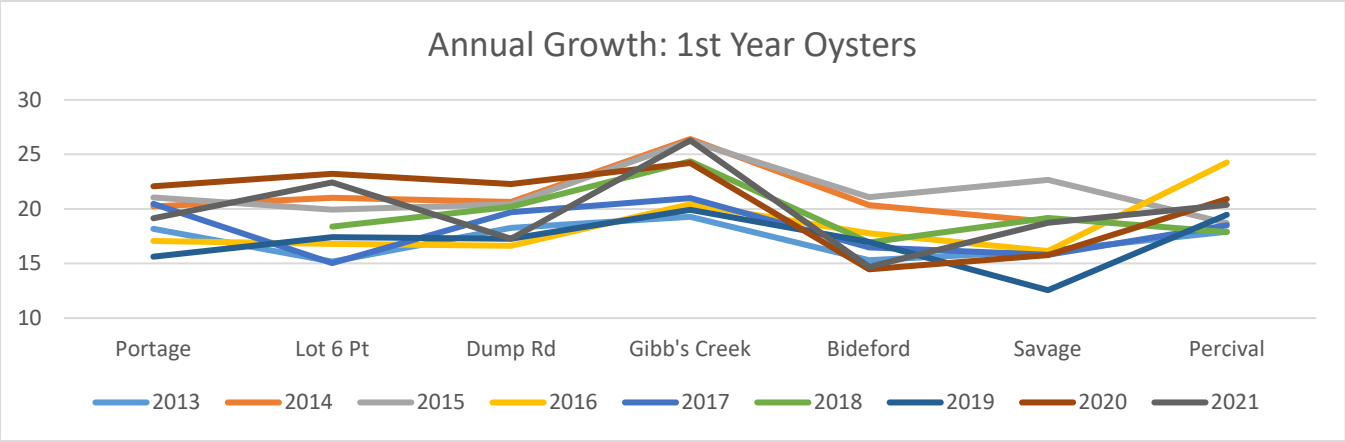


Figure 10: Annual Growth: 1st Year Oysters

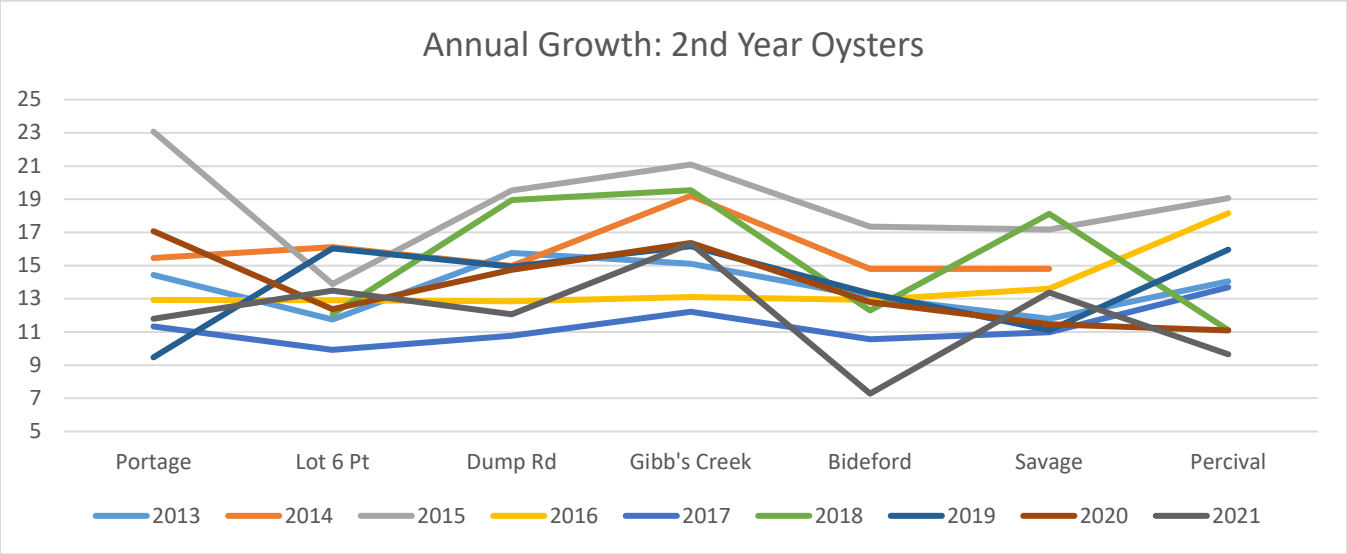
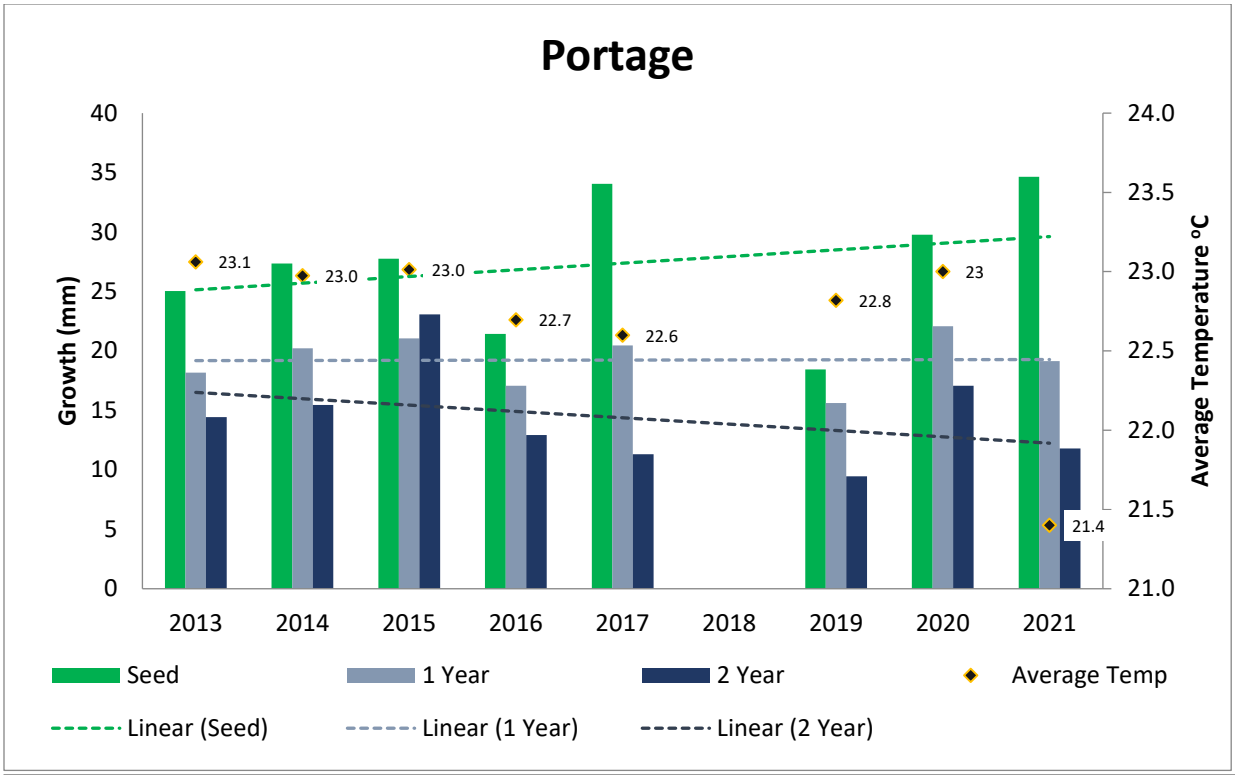
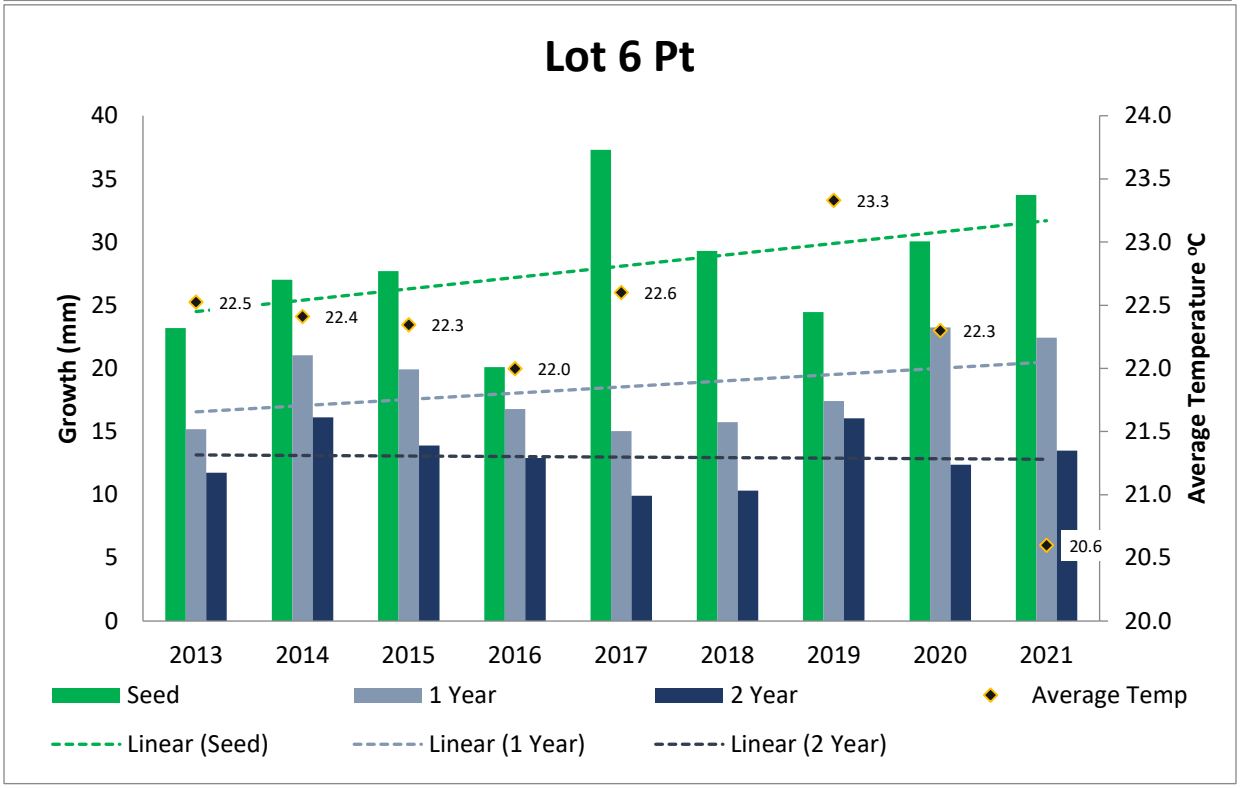
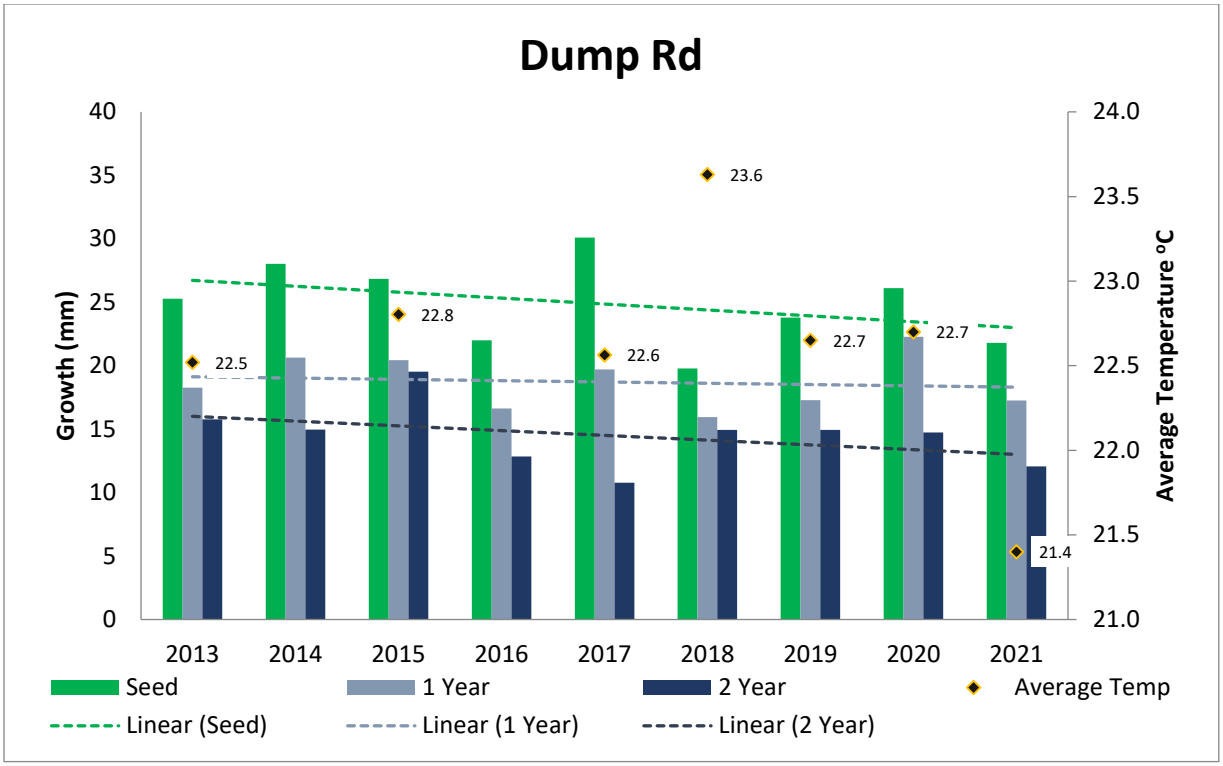


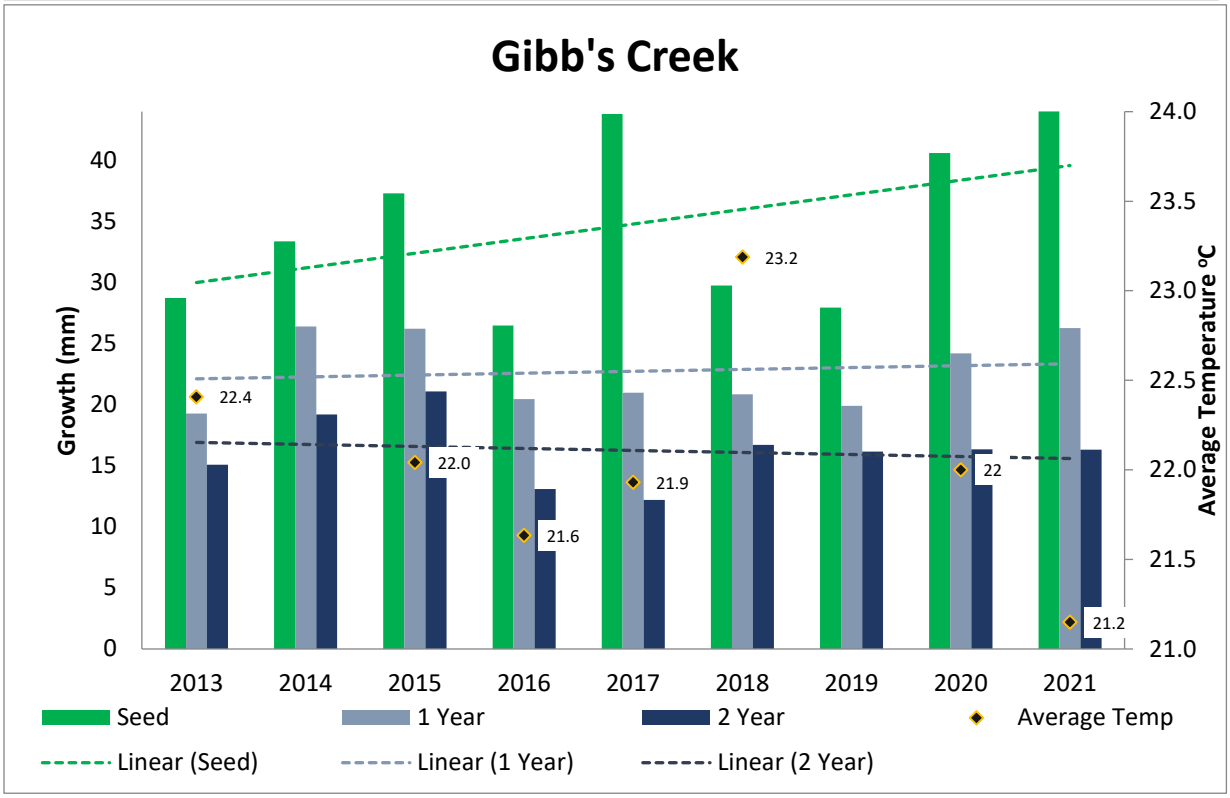
Figure 11: Annual Growth: 2nd Year Oysters

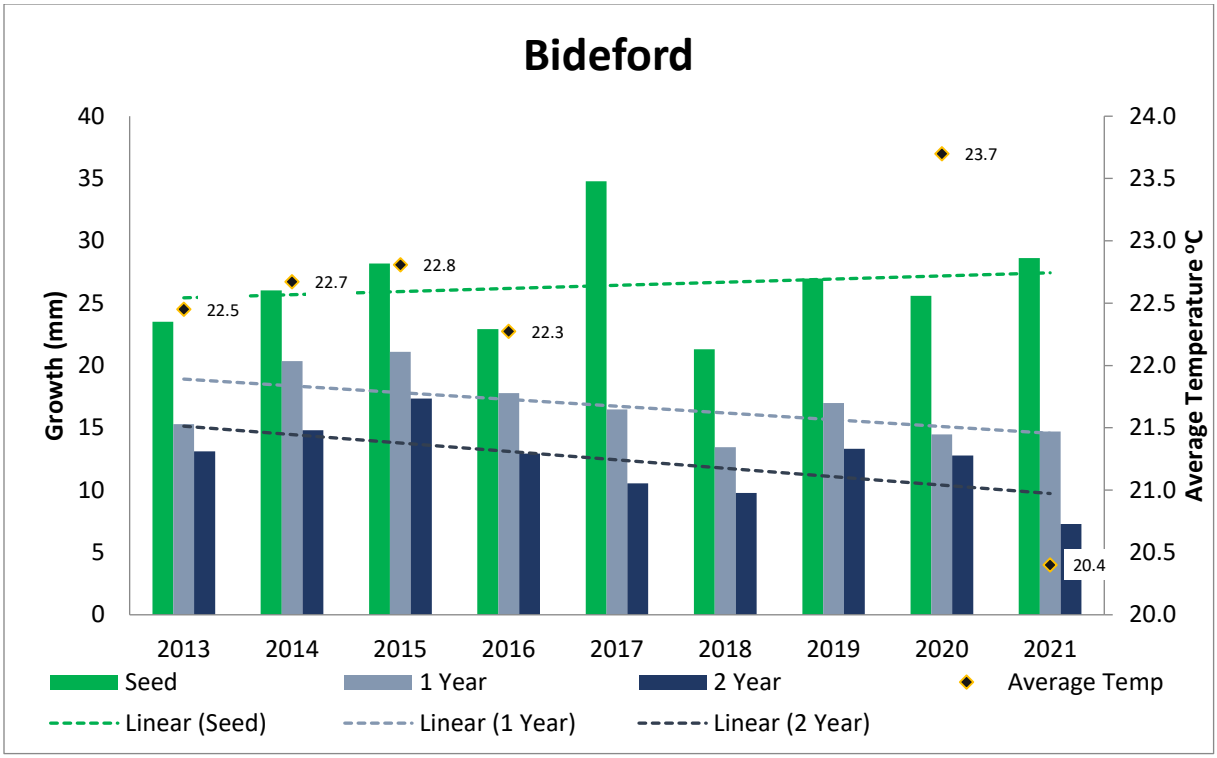
Regarding temperature data, an effort was made to collect temperature data at each location throughout the trials. Unfortunately, this proved more problematic than expected. The HOBO temperature tracker is a small device which was attached to the line near the cage. Due to its size and the extended period in the water, several devices were not able to be located for retrieval. Further, the battery source often failed, and as a result, data was sporadic and often ended mid-season. To address these discrepancies, the average temperature for July and August were used to simply graph with the growth data, to understand any visible trends. Due to lack of data, no definitive conclusions could be made regarding temperature. Figure 12 provides a snapshot of growth in each location year over year, with trend lines and temperature included.

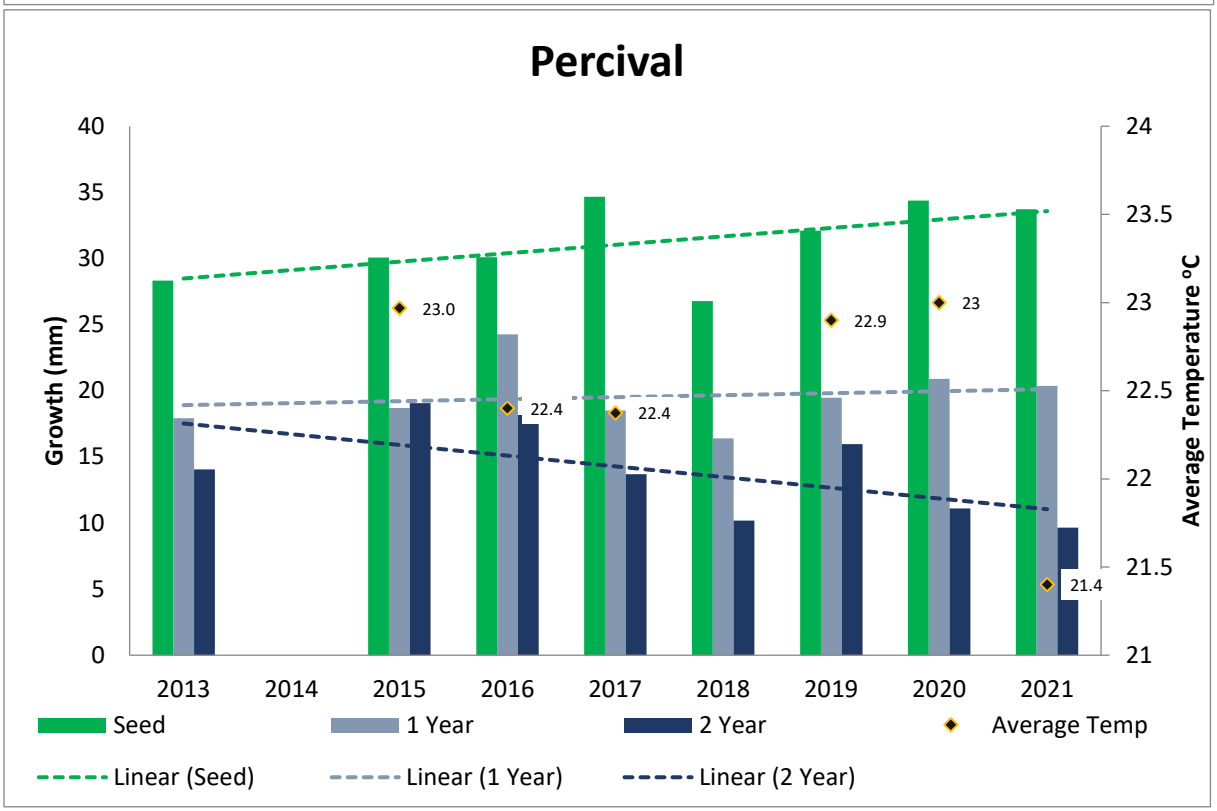

Portage
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24.0
23.5
23.0
22.5
22.0
21.5
21.0
23.1
23.0
23.0
22.7
22.6
22.8
23
21.4
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)


Lot 6 Pt
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24.0
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
22.5
22.4
22.3
22.0
22.6
23.3
22.3
20.6
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)


Dump Rd
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24.0
23.5
23.0
22.5
22.0
21.5
21.0
22.5
22.8
23.6
22.6
22.7
22.7
21.4
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)


Gibb's Creek
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24.0
23.5
23.0
22.5
22.0
21.5
21.0
22.4
22.0
21.6
21.9
23.2
22
21.2
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)


Bideford
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24.0
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
22.5
22.7
22.8
22.3
23.7
20.4
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)


Percival
Growth (mm)
Average Temperature °C
40
35
30
25
20
15
10
5
0
24
23.5
23
22.5
22
21.5
21
23.0
22.4
22.4
22.9
23
21.4
2013
2014
2015
2016
2017
2018
2019
2020
2021
Seed
1 Year
2 Year
Average Temp
Linear (Seed)
Linear (1 Year)
Linear (2 Year)

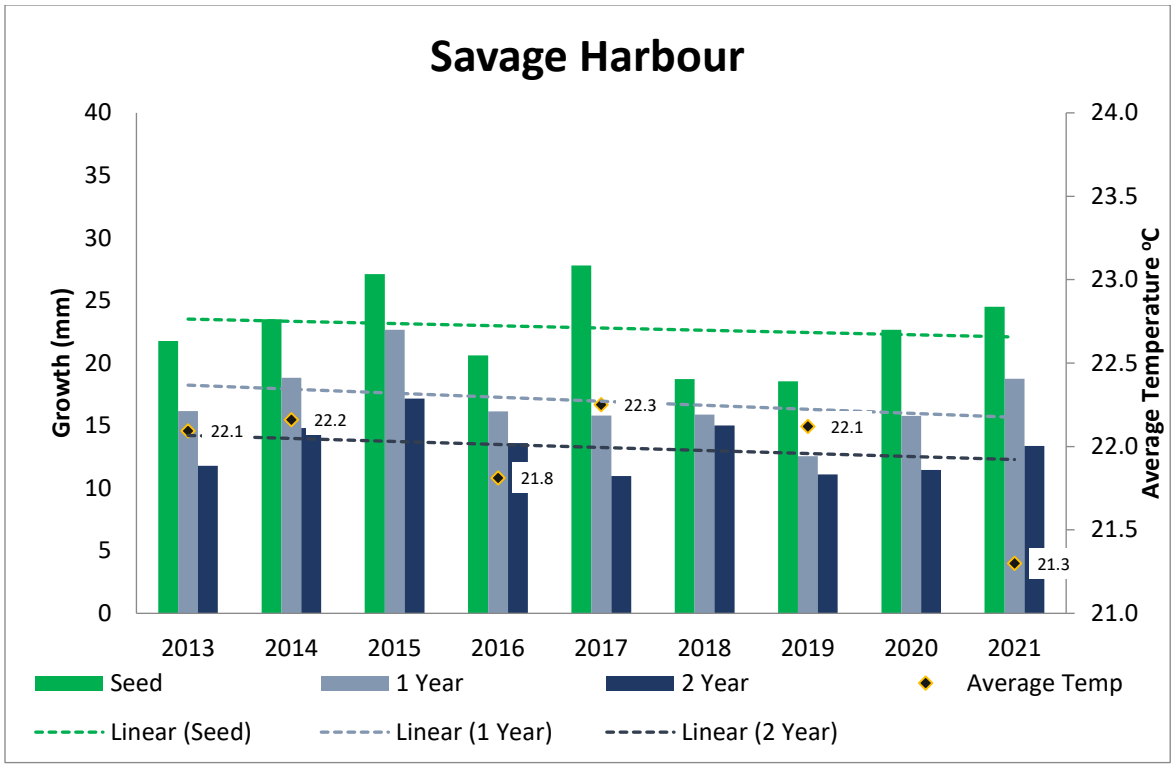


Figure 12: Annual Growth and Temperature by location

Discussion

The growth trial began in 2013 in an effort to understand if increased surface oyster growth production would negatively impact the existing growth in the Foxley River. As a result, four locations were selected within Foxley River to understand if growth declined as acreage of off-bottom leases increased. The three other locations: Savage Harbour, Bideford, and Percival provided comparative data.

The year over year results provide insight into the trends for oyster growth. It is important to note that the expectation is not for oyster growth to trend upward year over year. The growth capability of oysters is finite to a point and would be unrealistic to expect continual improvement in growth. It is more realistic to assume that the oysters would continue to grow at their normal rate for the area and as such, would demonstrate a relatively flat trend line. As there have been other research efforts in the Foxley River system over the last decade, the goal of the study is to provide yearly oyster growth data for purposes of following growth trends. This had been identified by industry as useful information and was also seen to support and enhance other research efforts being conducted in the system.

Overall, there is not an extreme trending decline in growth for any of the areas. Trend lines varied but were relatively flat. All areas continue to show relatively regular growth year over year.

Looking at the summer months (July and August), average temperatures did not vary by more than a little over a degree year over year or from location to location. In examining historical data, on average for July and August, the lowest temperature observed was 20.4°C and the highest temperature observed was at 23.7°C, both coming from Bideford. As a result, the temperature at each location was quite consistent, and therefore, it is unclear if there is any significant correlation with the variation in growth.

Growth can be impacted by many variables year over year. The quality of the seed and the overwintering practices can be a factor. Salinity, temperature, rainfall, food availability and other water parameters will impact growth. High winds or extreme weather events can change the growth and even may tumble the oysters to remove some growth, depending on the timing of these events. As PEI is in a winter climate, the time of year when ice enters the river system may also have an impact as it can reduce the amount of days oysters can grow every year. The length of winter can impact the health and condition of oysters in the spring as well. As a result, it is expected to observe variation in growth year over year, as is seen in this study. From the beginning, industry was interested in ensuring that growth rates remain suitable to maintain the profitability of their operations. The intention of this study is to provide additional information to industry and help evaluate and assess the development of this industry. The current observations, as well as feedback from industry growers, appears to indicate that growth rates are suitable for farm and business management.