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Financial Risk Assessment of Triploid Oyster Aquaculture along the West Coast of Florida



Risks in Oyster Production

- Common risk events that affect oyster growth and survival:
 - Changing water parameters (temperature, salinity, etc.)
 - Disease and predation
 - Hurricanes or major storms
- Economic risk variables that directly affect a farmer's profitability:
 - Varying market prices
 - Changes in input costs
 - Policy adjustments

Economic Effects from Risk

- Environmental risk events may affect:
 - Labor time and costs for preparation
 - Repairs to production gear
 - Oyster mortality
- Economic risk events may affect:
 - Market prices
 - Operational costs
- Overall, we are interested in the effect of risk on profitability over a 5-year time period considering:
 - Major storms
 - High/low salinity events
 - Market price

Data Collection

- Distributed logbooks
 - Collected the amount of labor time spent working on 5,000 oysters
 - 10 growers total
- Interviewed 3 growers
 - Collected data that compared economic effects with environmental risk events
- NOAA Interactive Hurricane database
- FL Department of Agriculture and Consumer Services, Shellfish Harvest Area (SHA) monitoring stations
- Virginia Institute of Marine Sciences' historical market prices of culture oysters

Farm Budget Model

Production Assumptions (in the absence of risk)

- 5-year planning horizon
- Seed plantings increase each year
 - Year 1 – 10,000
 - Year 2 – 50,000
 - Year 3 – 150,000
 - Year 4 – 225,000
 - Year 5 – 250,000
- Planting seed size – 6mm
 - Transfer between 3 bag sizes each year
- 80% average survival per year
- 90% of oysters harvested each year

Farm Budget Model

Financial Assumptions

- Seed Costs \$25/1,000 oysters
- Average growing unit cost of \$33
 - Includes bags, floats, zip ties, ropes, pucks, longline clips, and preparation
- Boat/motor costs
 - \$32,000 amortized over 10 years at 7% interest
 - \$4,800 annual payments
- Part-time labor - \$12/hour
 - Years 1 to 3 - assume no labor costs
 - Year 4 – 95 paid hours
 - Year 5 – 105 paid hours
- Output of net returns to owner/operator

Growing Areas

- 4 areas considered:
 - Cedar Key, Levy County
 - Alligator Harbor, Franklin County
 - Oyster Bay, Wakulla County
 - Pensacola Bay, Escambia County
- We assume Cedar Key and Alligator Harbor farmers grow hard clams in addition to oysters
 - Utilize partial budgeting for boat/fuel costs and lease setup cost

Scenario 1 - Base

- Base case
- No environmental or market risk
- Normal risk occurs
 - Base level mortality
 - Labor time
 - Growing unit costs
- Allows for a comparison to other scenarios to determine effect from risk variable

Scenario 2 - Hurricanes

- Considers hurricane risk
 - Affects mortality, additional labor costs, and additional capital costs
 - Only considers Tropical Storms traveling NE, and Category 1 Hurricanes traveling N and NE
 - Varies among region
- No other environmental or market risks
- Probability that storm meets attributes:
 - Cedar Key: 19%
 - Alligator Harbor: 19%
 - Wakulla County: 16%
 - Pensacola Bay: 11%
- Probability that 2 storms strike:
 - Cedar Key: 2%
 - Alligator Harbor: 2%
 - Wakulla County: 4%
 - Pensacola Bay: 0%

Scenarios 3 & 4 – Salinity Events

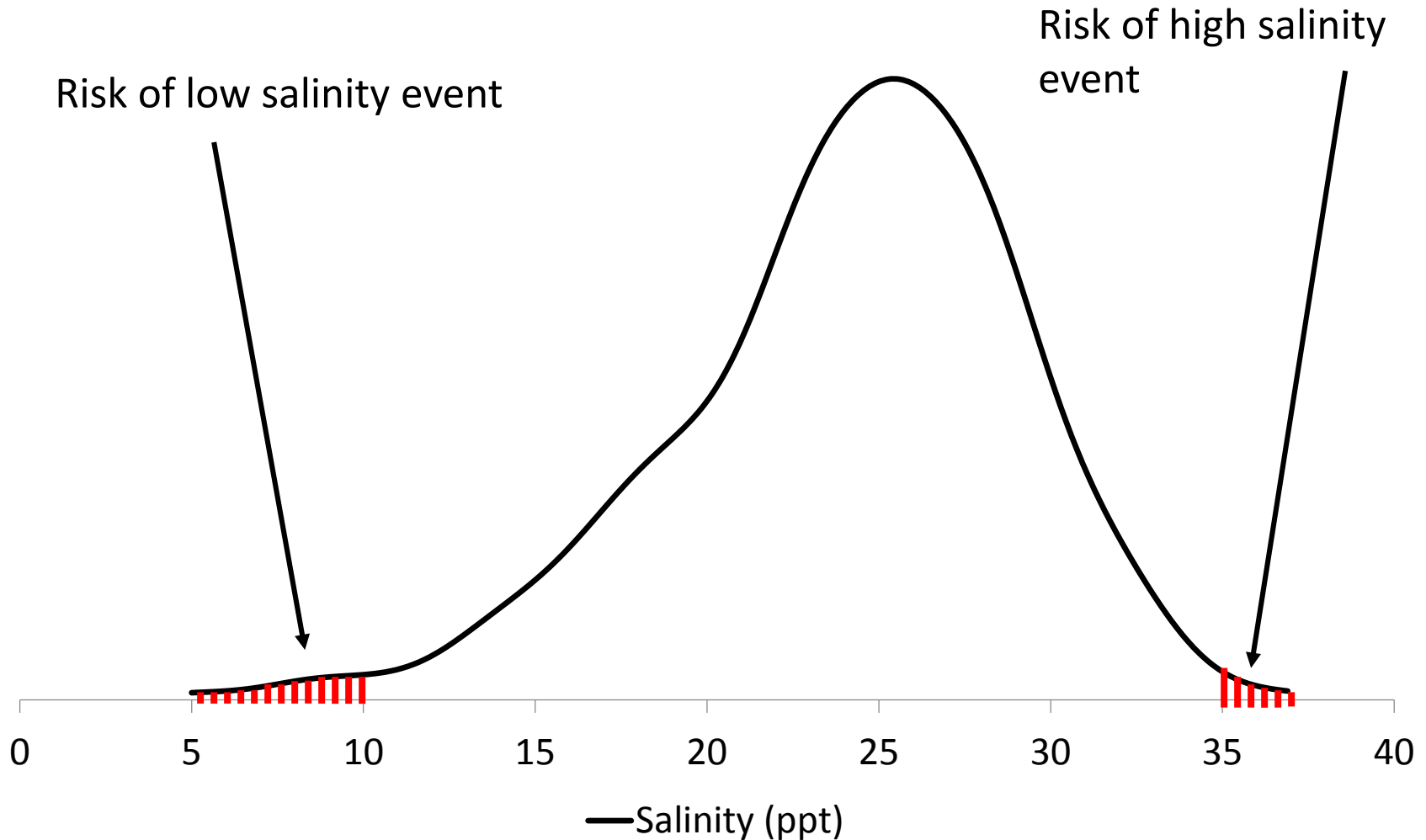
Scenario 3

- Low salinity event (≤ 10 ppt) for a sustained period
 - Affects mortality, additional labor cost, and additional capital cost
 - Varies among region
- No other environmental or market risks

Scenario 4

- High salinity event (≥ 35 ppt) for a sustained period
 - Affects mortality, additional labor cost, and additional capital cost
 - Varies among region
- No other environmental or market risks

Salinity Lease Area, Levy County



*Data from UF monitoring stations

Scenarios 3 & 4 – Salinity Events

Scenario 3

- Low salinity event (≤ 10 ppt) for a sustained period
- Cedar Key: <1%
- Alligator Harbor: 0%
- Wakulla County: 11%
- Pensacola Bay: 50%

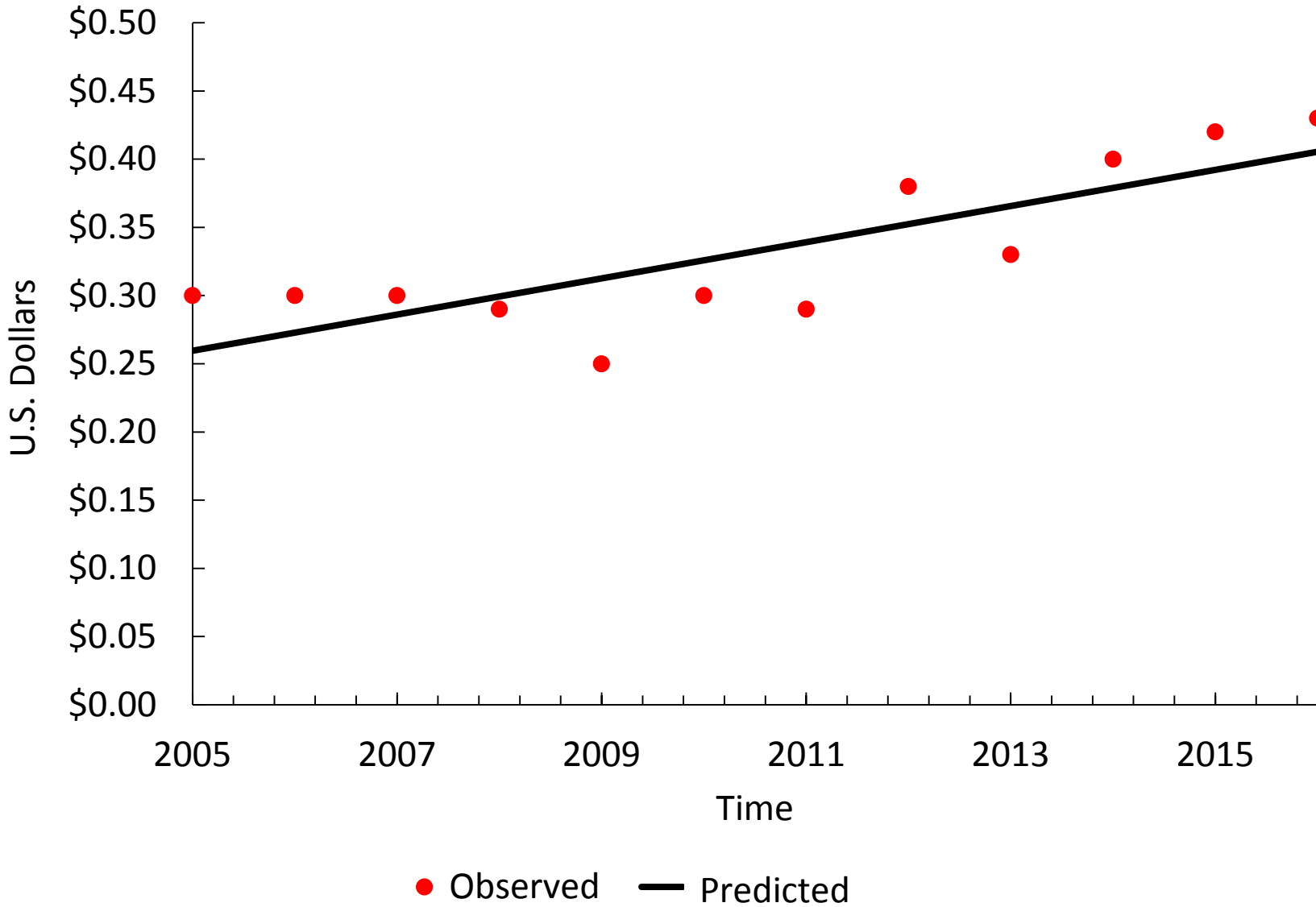
Scenario 4

- High salinity event (≥ 35 ppt) for a sustained period
- Cedar Key: <1%
- Alligator Harbor: 30%
- Wakulla County: <1%
- Pensacola Bay: 0%

Scenario 5 – Market Price

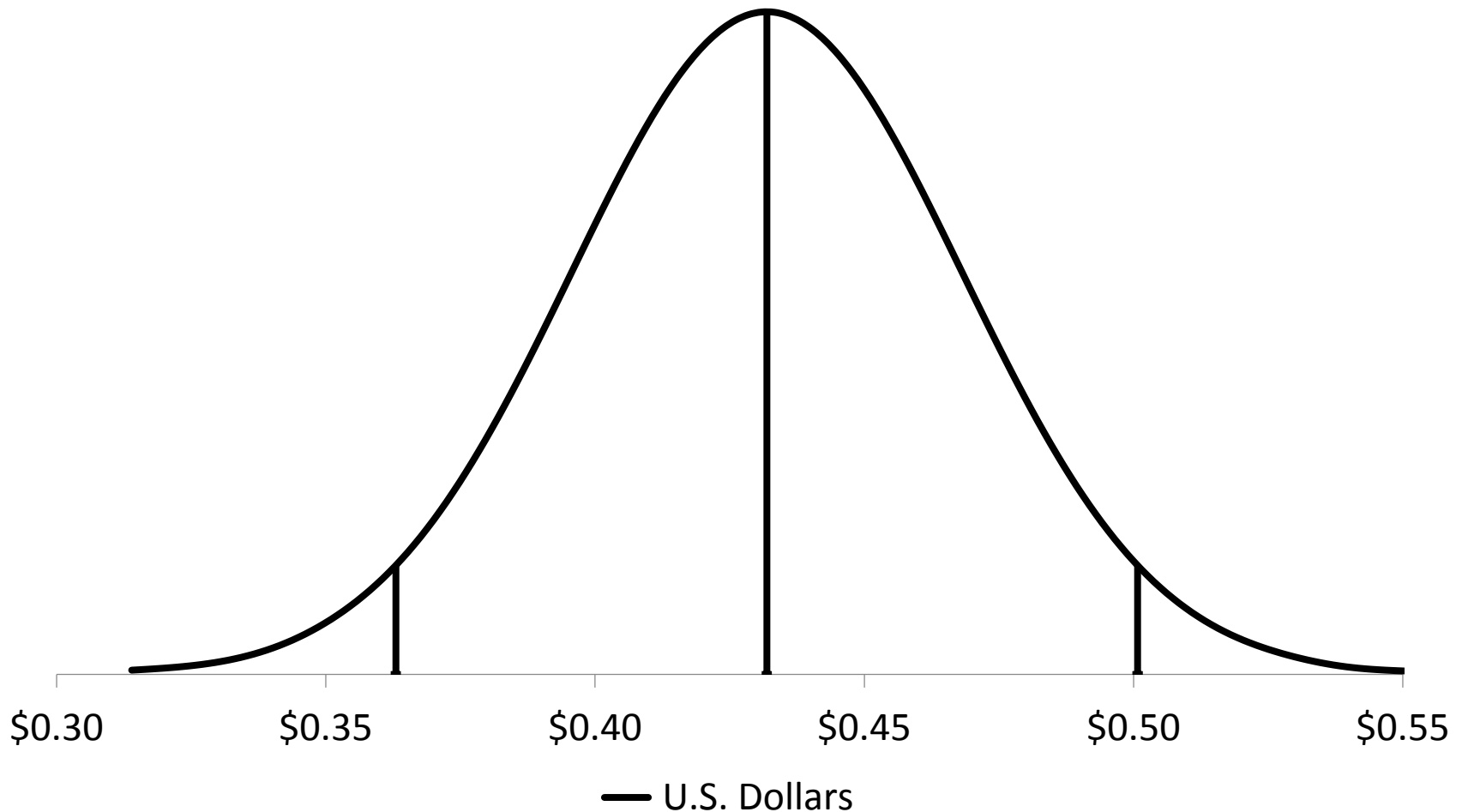
- Considers changes in market price
 - Average market price increases each year
 - Variance is considered each year
- No environmental risk occurs
- Average market price:
 - 2018: **\$0.43**
 - 2019: **\$0.45**
 - 2020: **\$0.46**
 - 2021: **\$0.47**
 - 2022: **\$0.49**

Observed and Predicted Values for Market Price



2018 Market Price

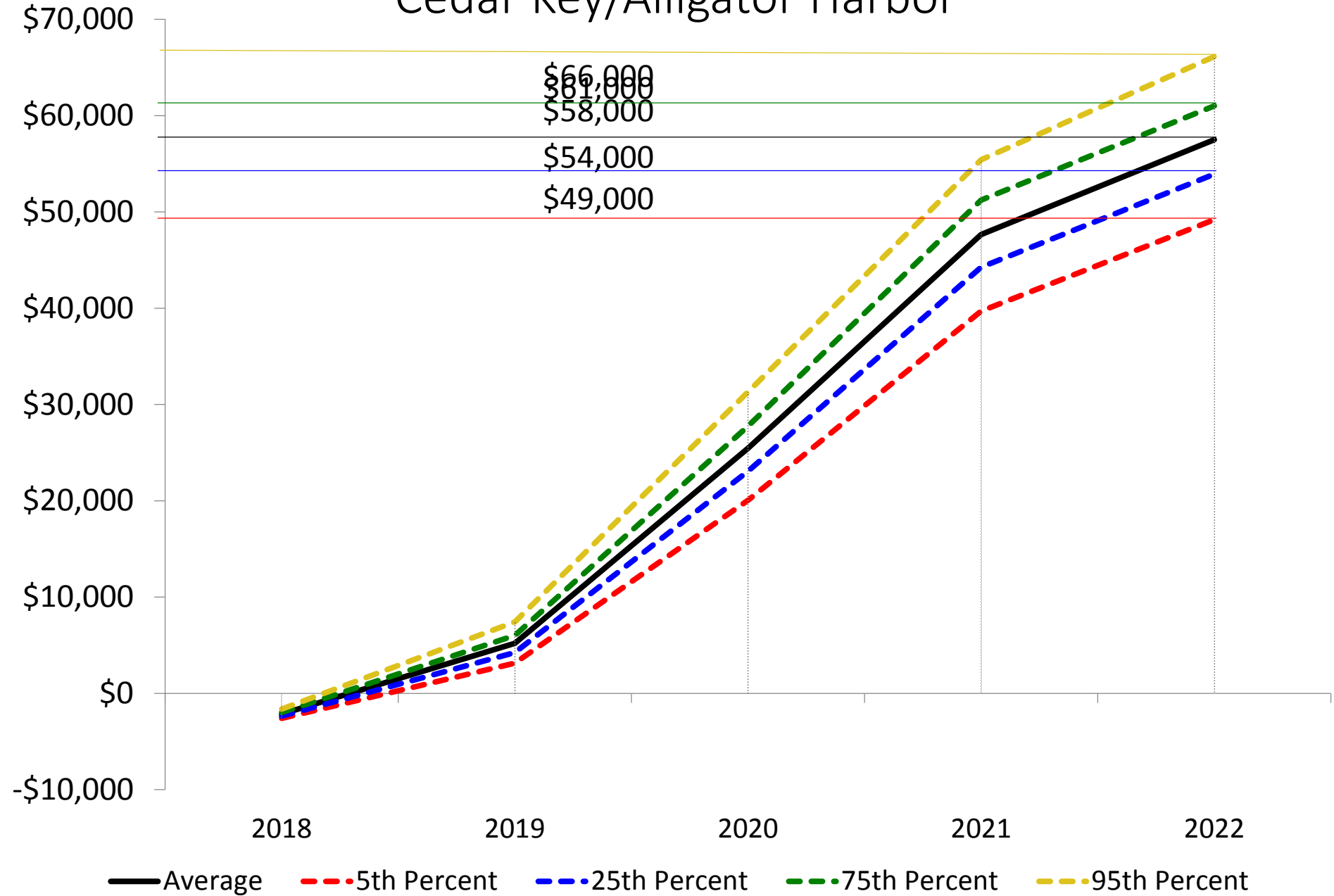
- Risk is depicted as the possibility of obtaining any market price in this distribution



Scenario 6

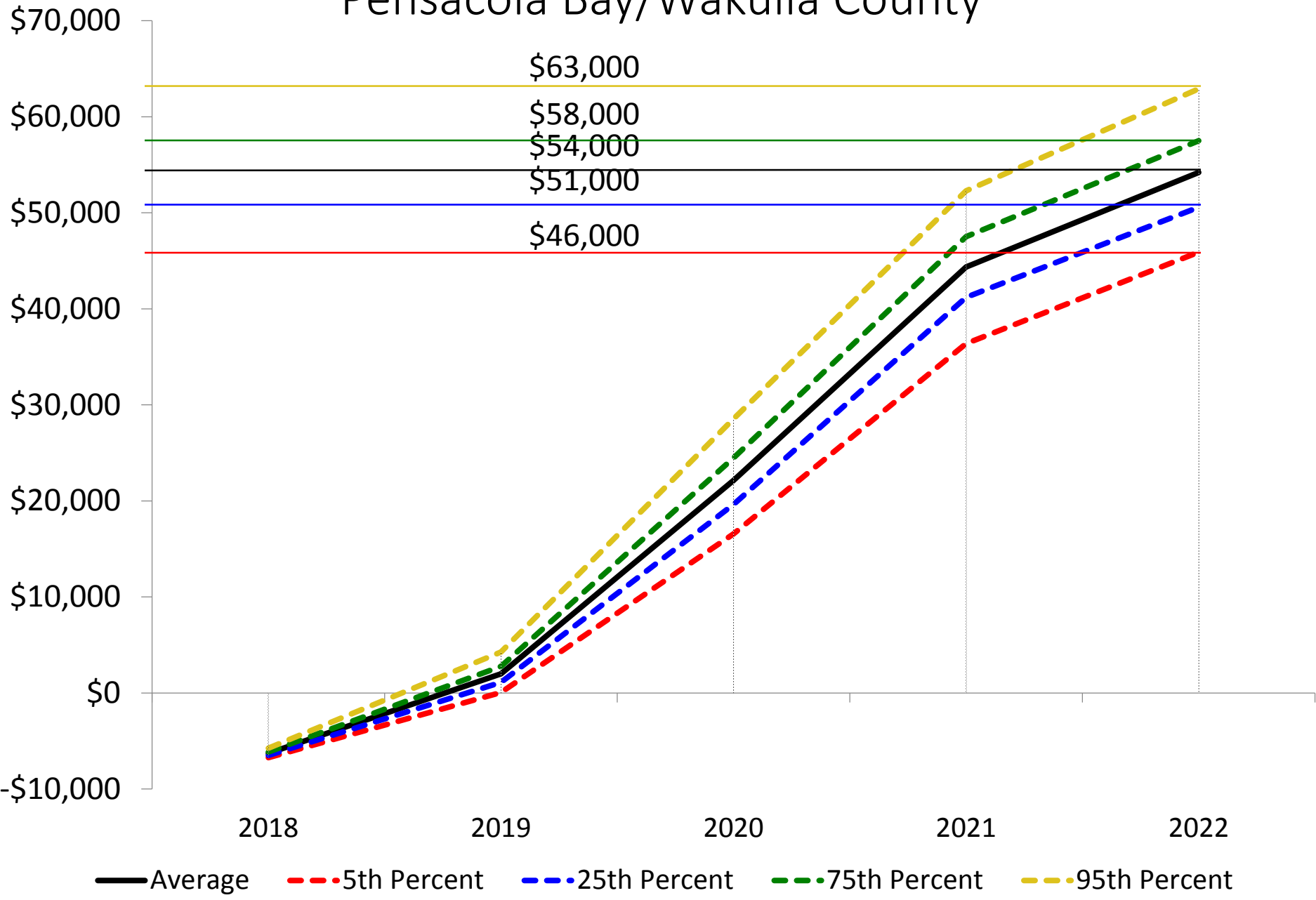
- Realistic case for an oyster farm in each region
- Considers risk events from all previous scenarios
 - Hurricane risk
 - Low salinity and high salinity events
 - Changes in market price
 - Normal production risk
- Simulation Methods
 - Simetar, an Excel Add-on, used for forecasting and modeling
 - Created various distributions for each variable that encompasses production risk
 - Simulated 1,000 iterations to determine potential distribution of profitability

Scenario 1 – Base Case Cedar Key/Alligator Harbor

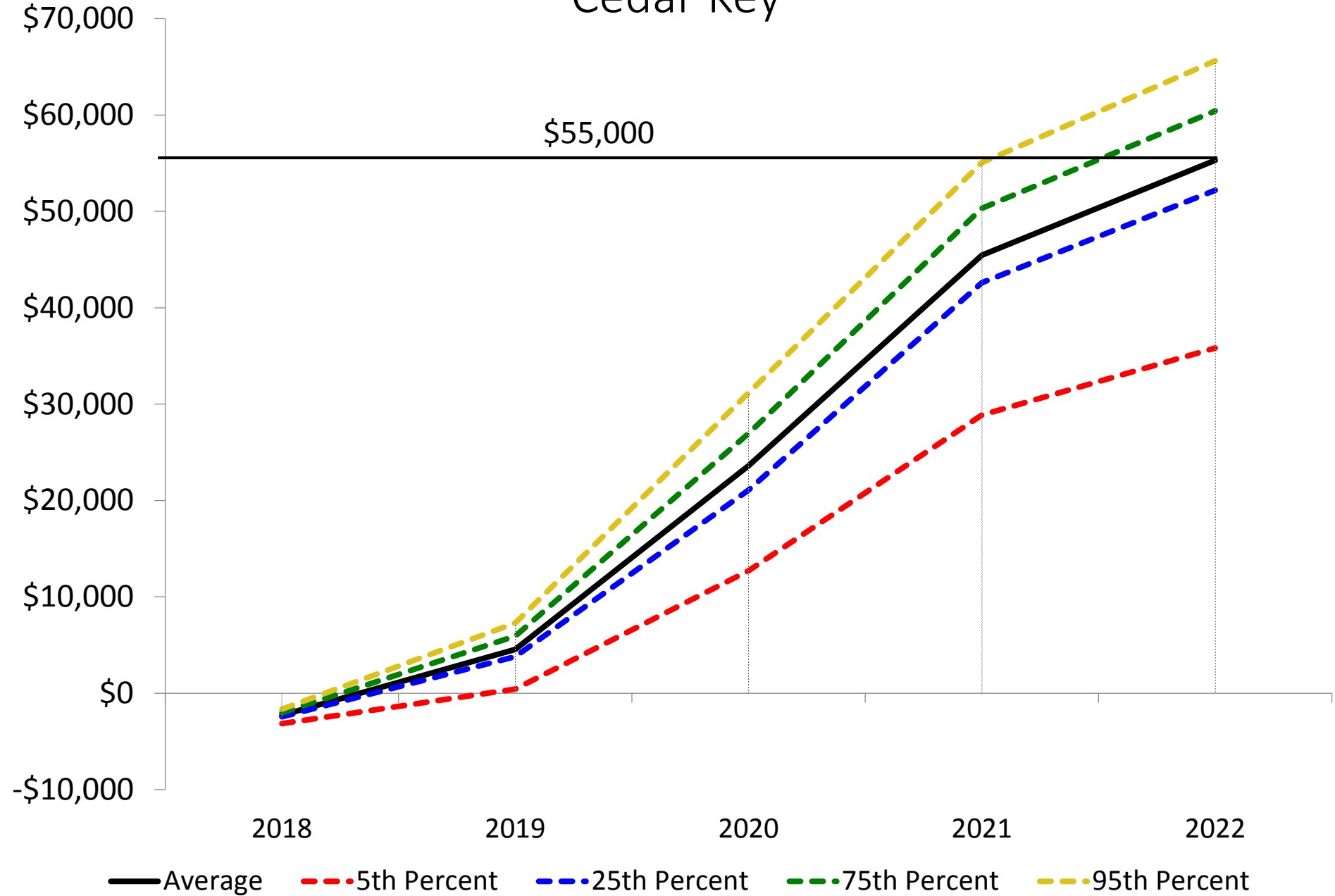


Scenario 1 – Base Case

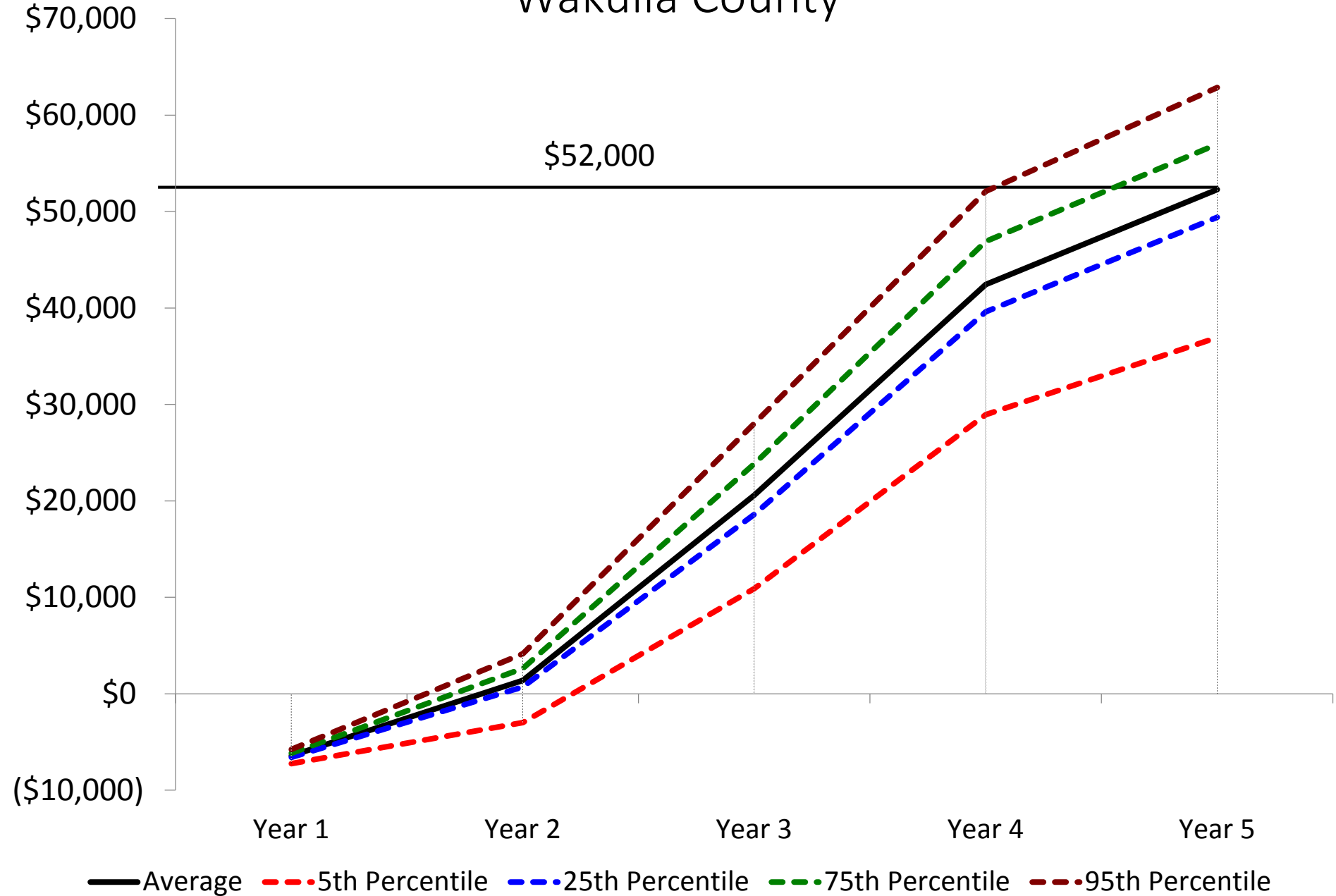
Pensacola Bay/Wakulla County



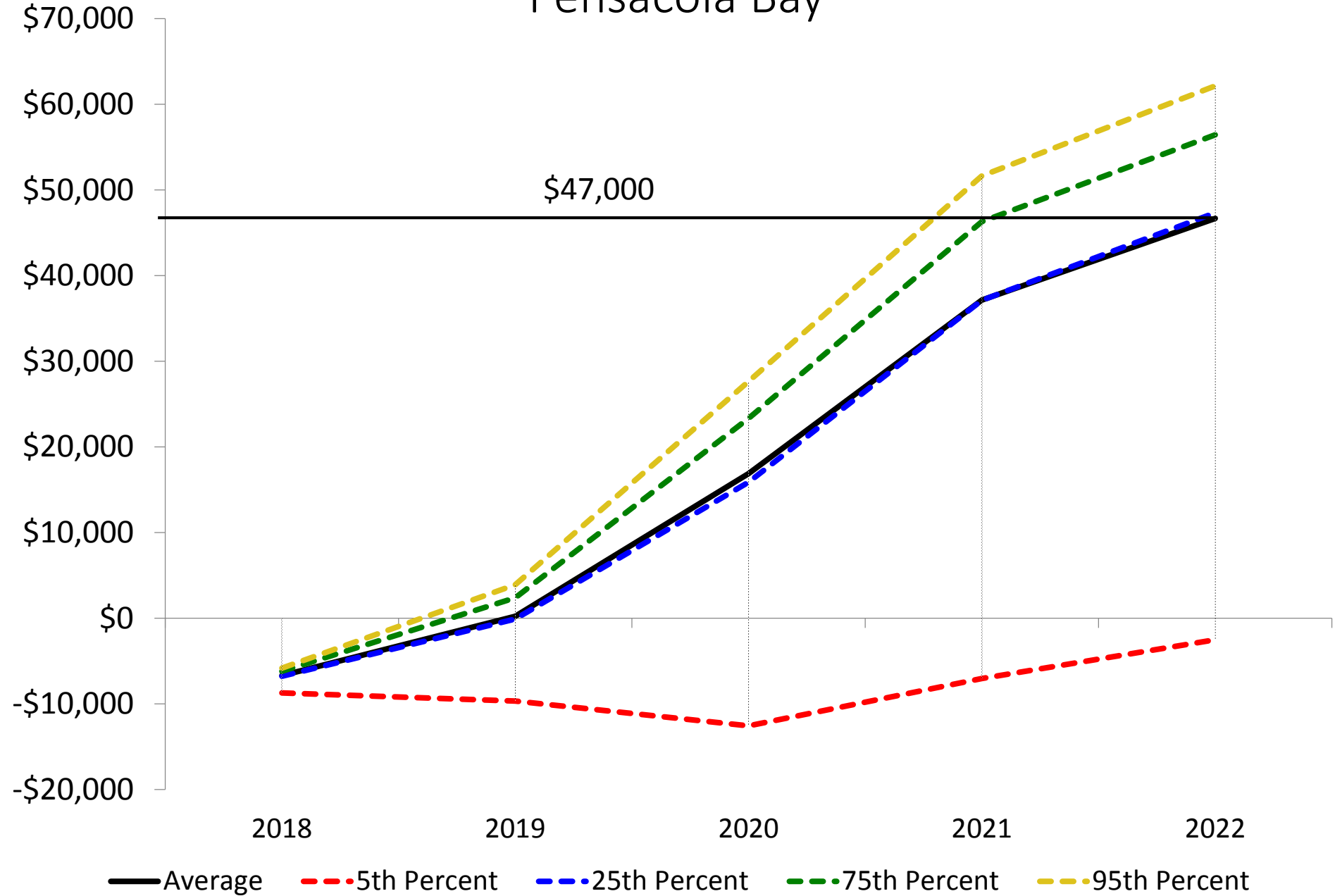
Scenario 2 – Hurricane Risk Cedar Key



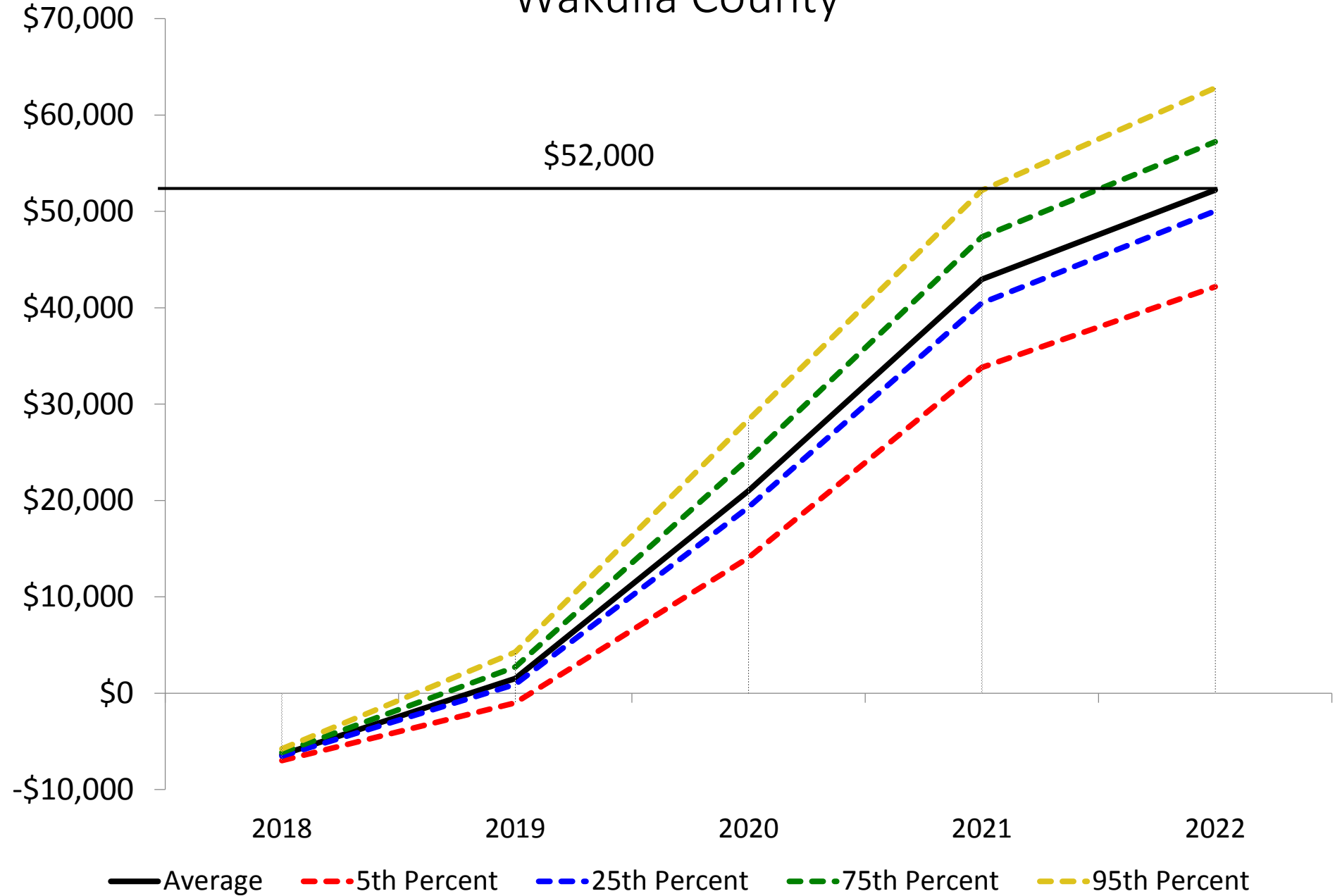
Scenario 2 – Hurricane Risk Wakulla County



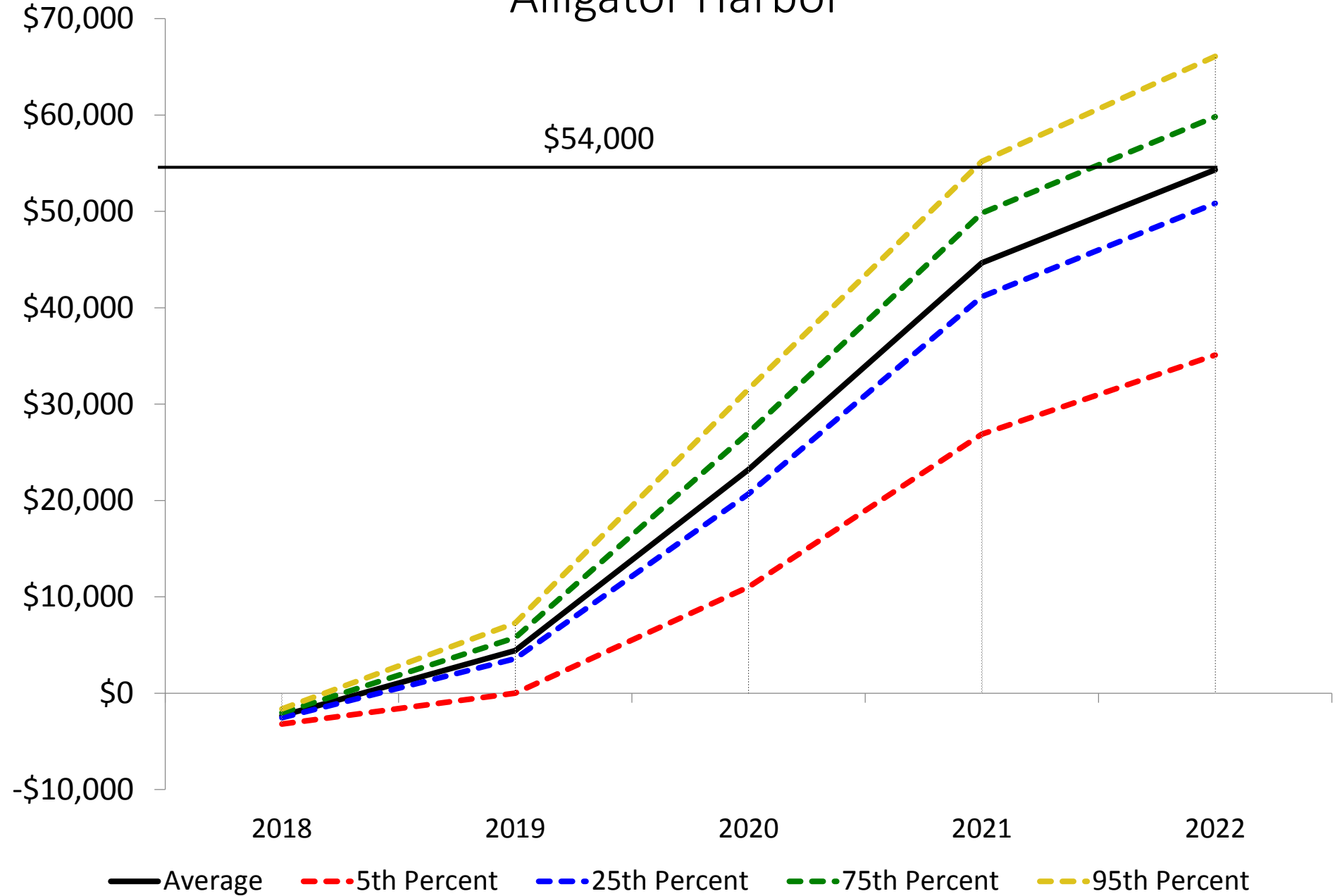
Scenario 3 – Low Salinity Risk Pensacola Bay



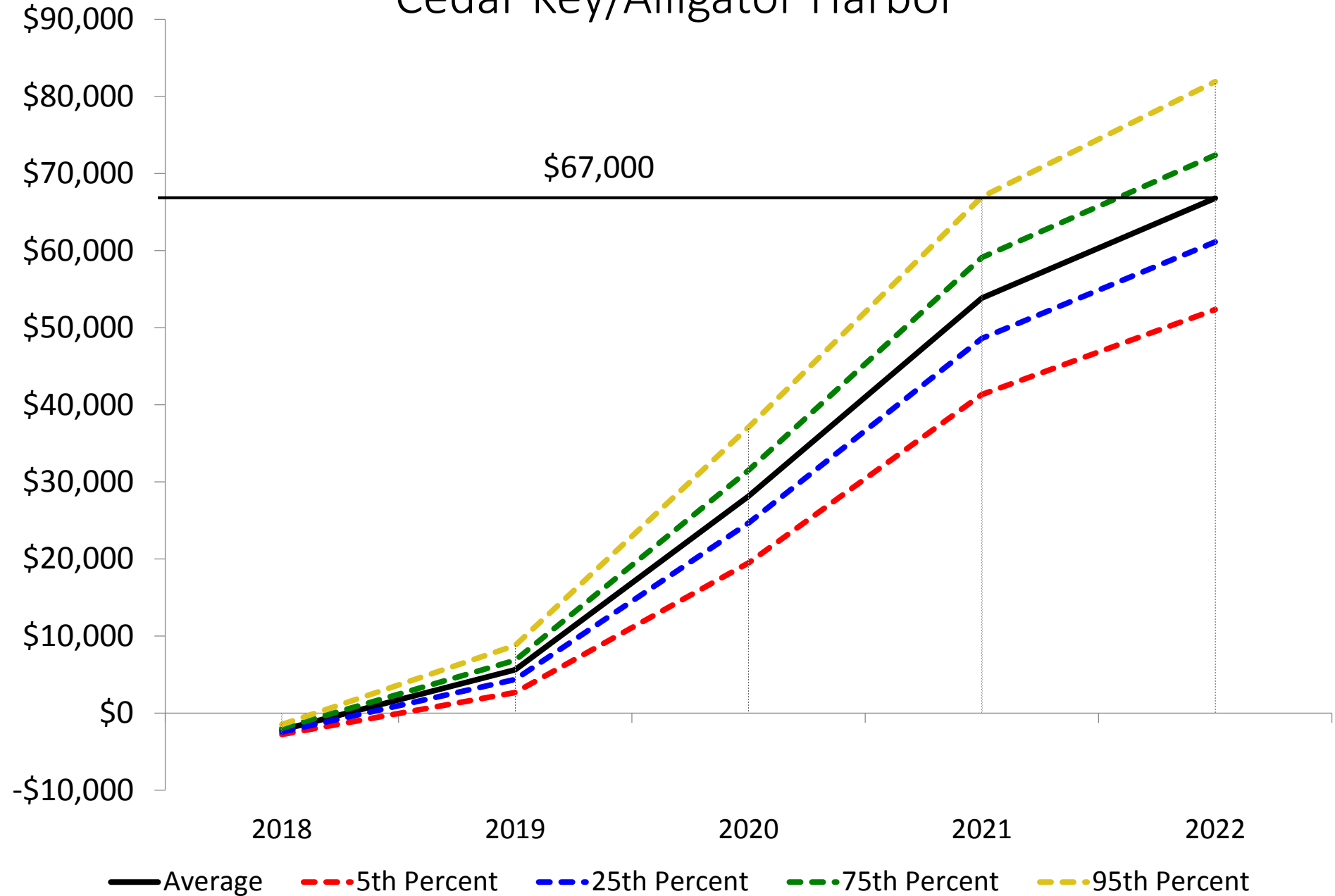
Scenario 3 – Low Salinity Risk Wakulla County



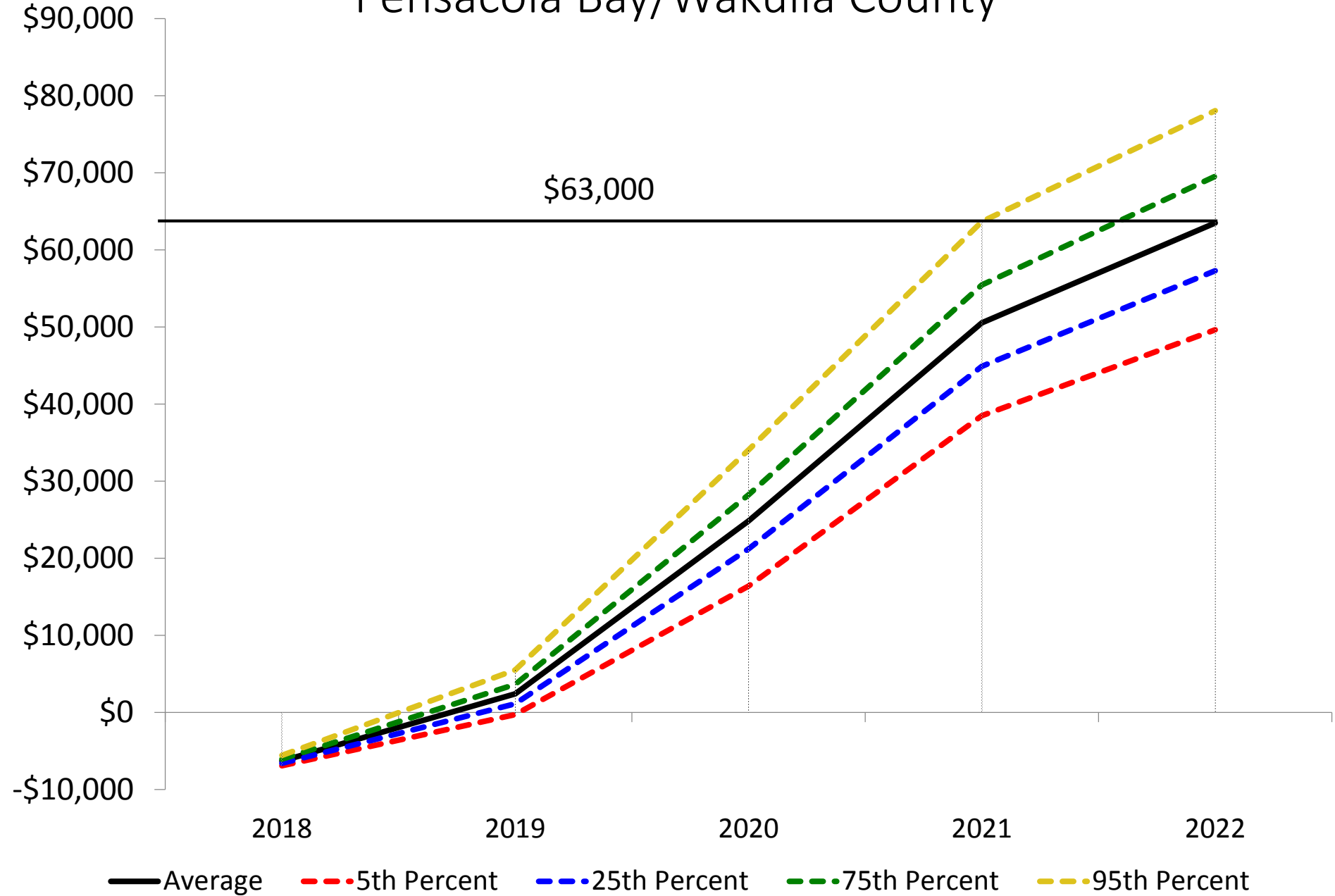
Scenario 4 – High Salinity Risk Alligator Harbor



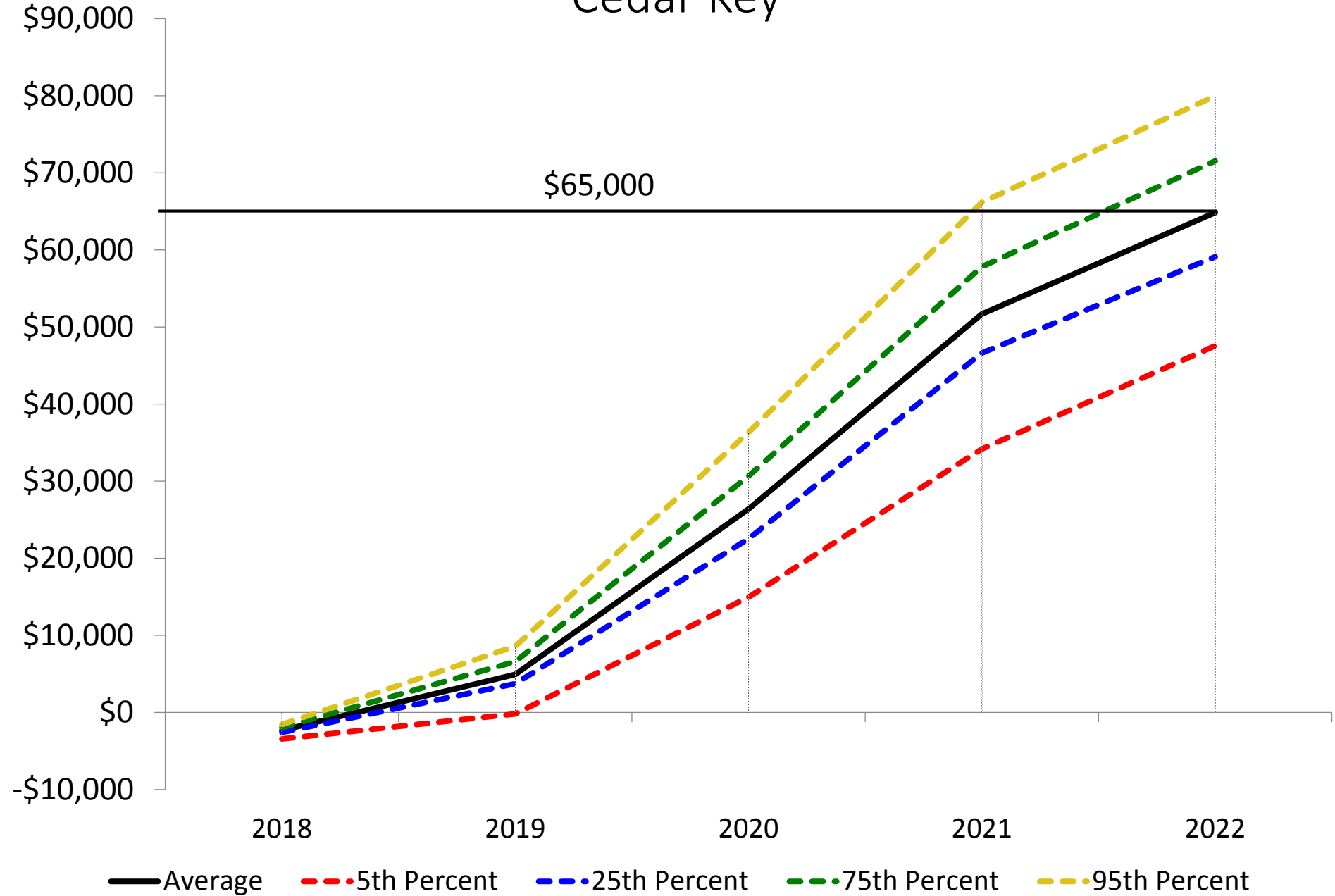
Scenario 5 – Market Price Risk Cedar Key/Alligator Harbor



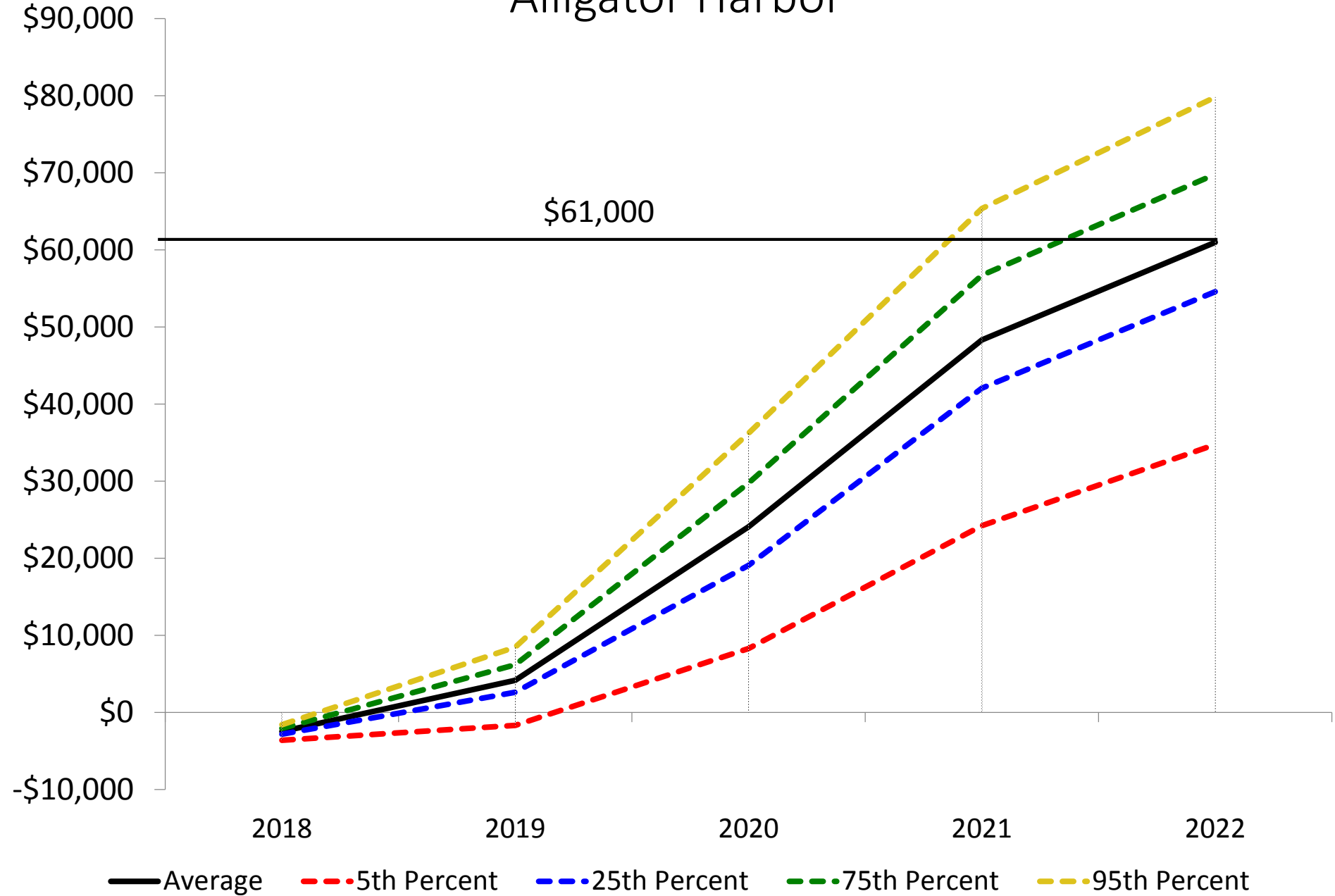
Scenario 5 – Market Price Risk Pensacola Bay/Wakulla County



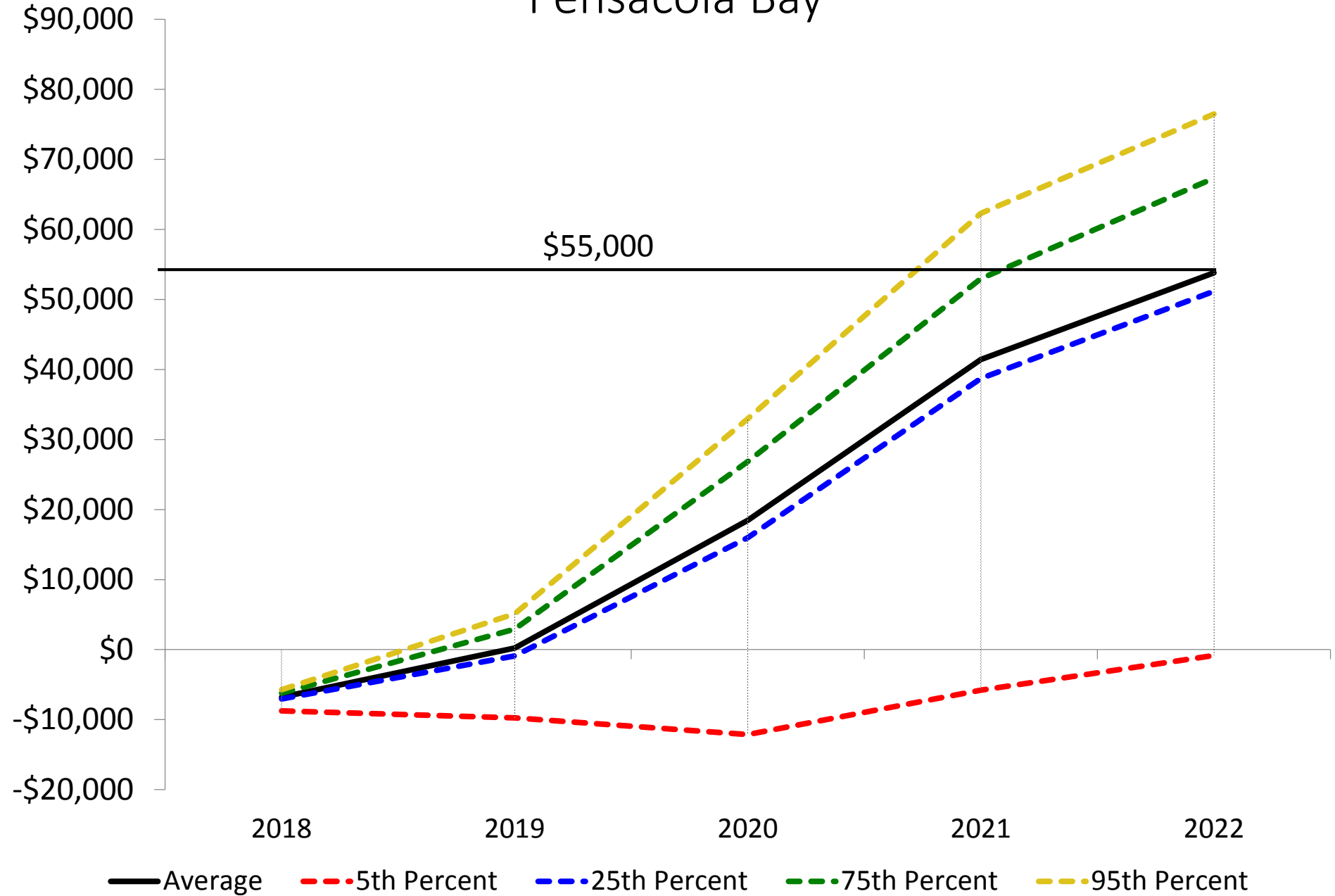
Scenario 6 – All Risk Cedar Key



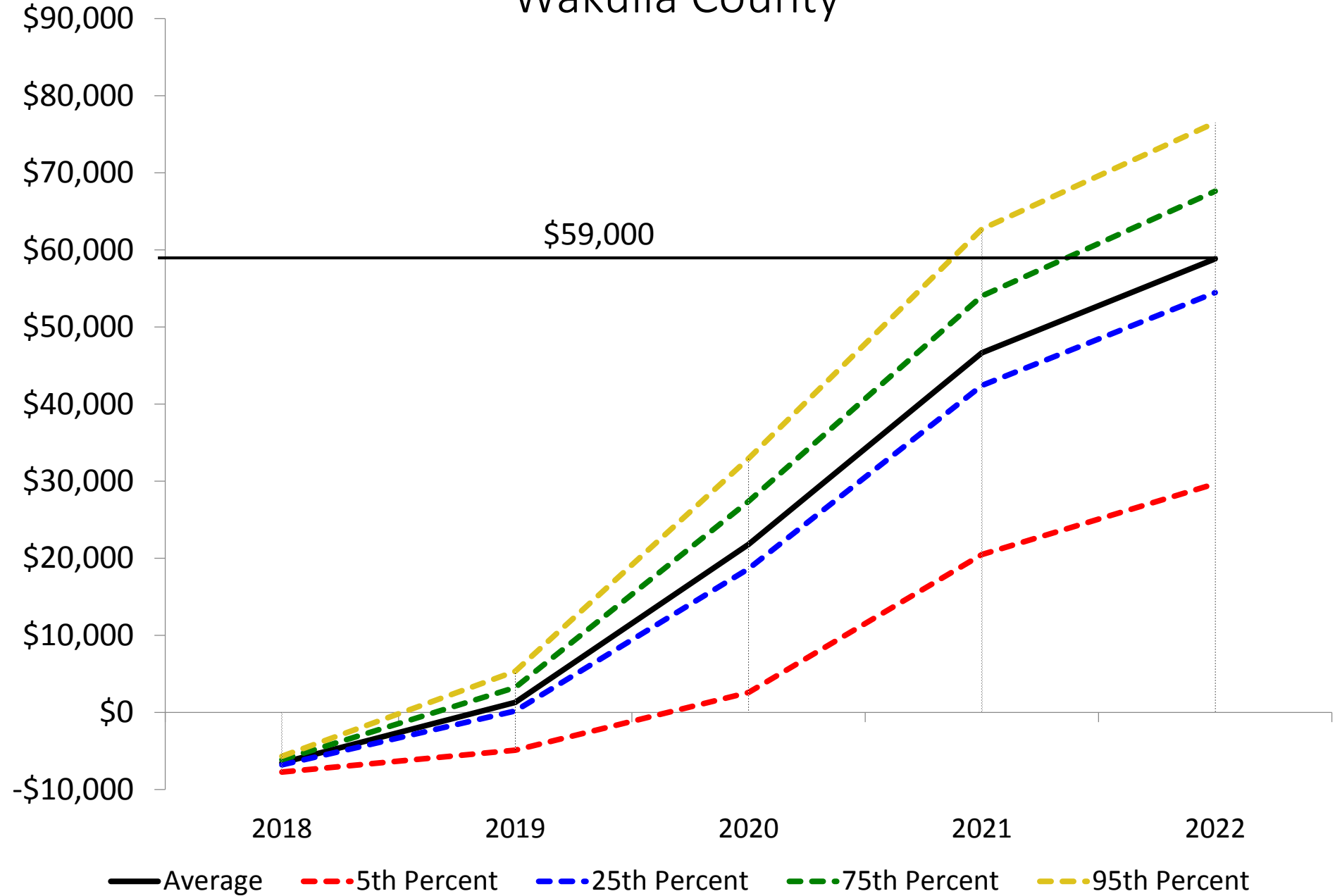
Scenario 6 – All Risk Alligator Harbor



Scenario 6 – All Risk Pensacola Bay



Scenario 6 – All Risk Wakulla County



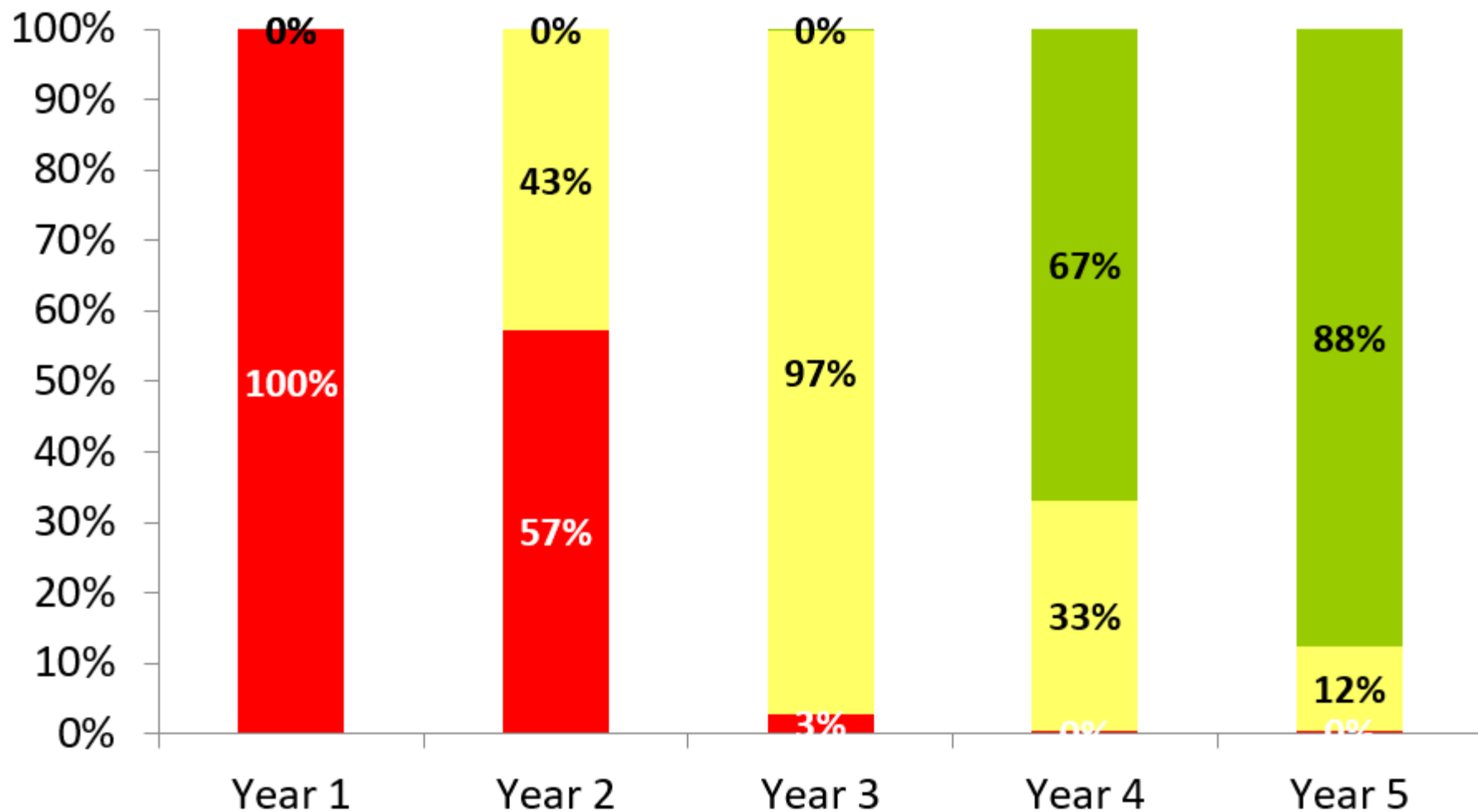
Conclusion

- Importance of various types of environmental risk varies among region based on probabilities of occurrence
- As more oysters are planted risk increases but, on average, profitability increases
- 94% chance of being profitable at the end of year 5 when considering all risk variables
- Tools are being developed to determine the probability of attaining a grower's stated profitability based on region and scenario
 - Stoplight Chart

Lower Cut-Off Value: **\$ 5,000** Upper Cut-Off Value: **\$ 45,000**

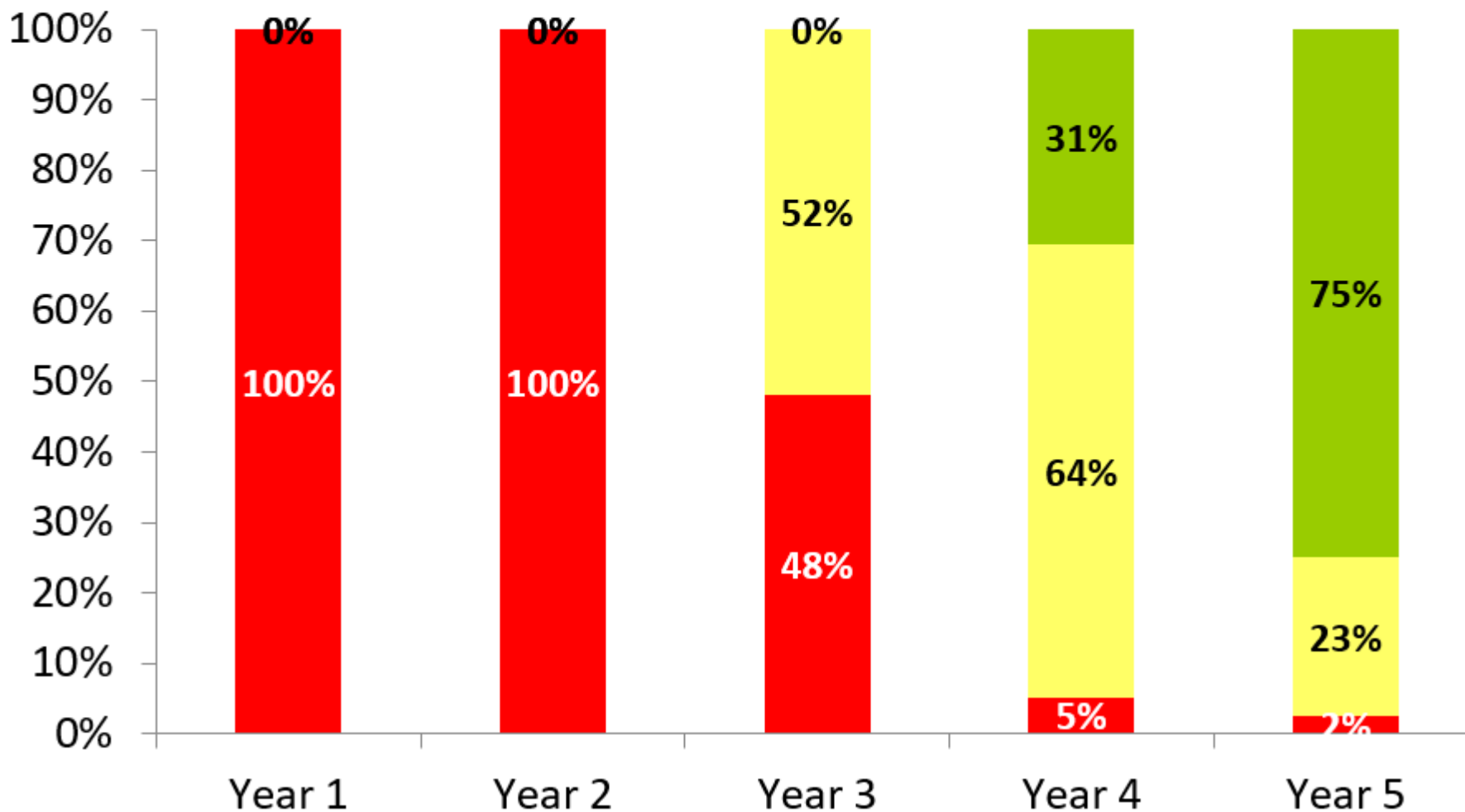
Year 1 Year 2 Year 3 Year 4 Year 5

Prob(Unfavorable)	100%	57%	3%	0%	0%
Prob(Cautionary)	0%	43%	97%	33%	12%
Prob(Favorable)	0%	0%	0%	67%	88%



Lower Cut-Off Value: **\$25,000** Upper Cut-Off Value: **\$ 55,000**

	Year 1	Year 2	Year 3	Year 4	Year 5
Prob(Unfavorable)	100%	100%	48%	5%	2%
Prob(Cautionary)	0%	0%	52%	64%	23%
Prob(Favorable)	0%	0%	0%	31%	75%



Questions?