PIC

Bringing Value to the Swine Industry

David Casey

Introduction

- Masters project - Nebraska
  - Analyzed 10 generations of selection on ovulation rate and embryonic survival
  - Sow nutrition trial
- PhD project – Iowa State
  - Jack and I started the RFI selection experiment
  - FIRE feeder data editing and analysis
- Rodger was focused on research that brought value to the swine industry

Optimum Boar Life –

Economic tool used to assist in the decision of when to cull a boar from a stud

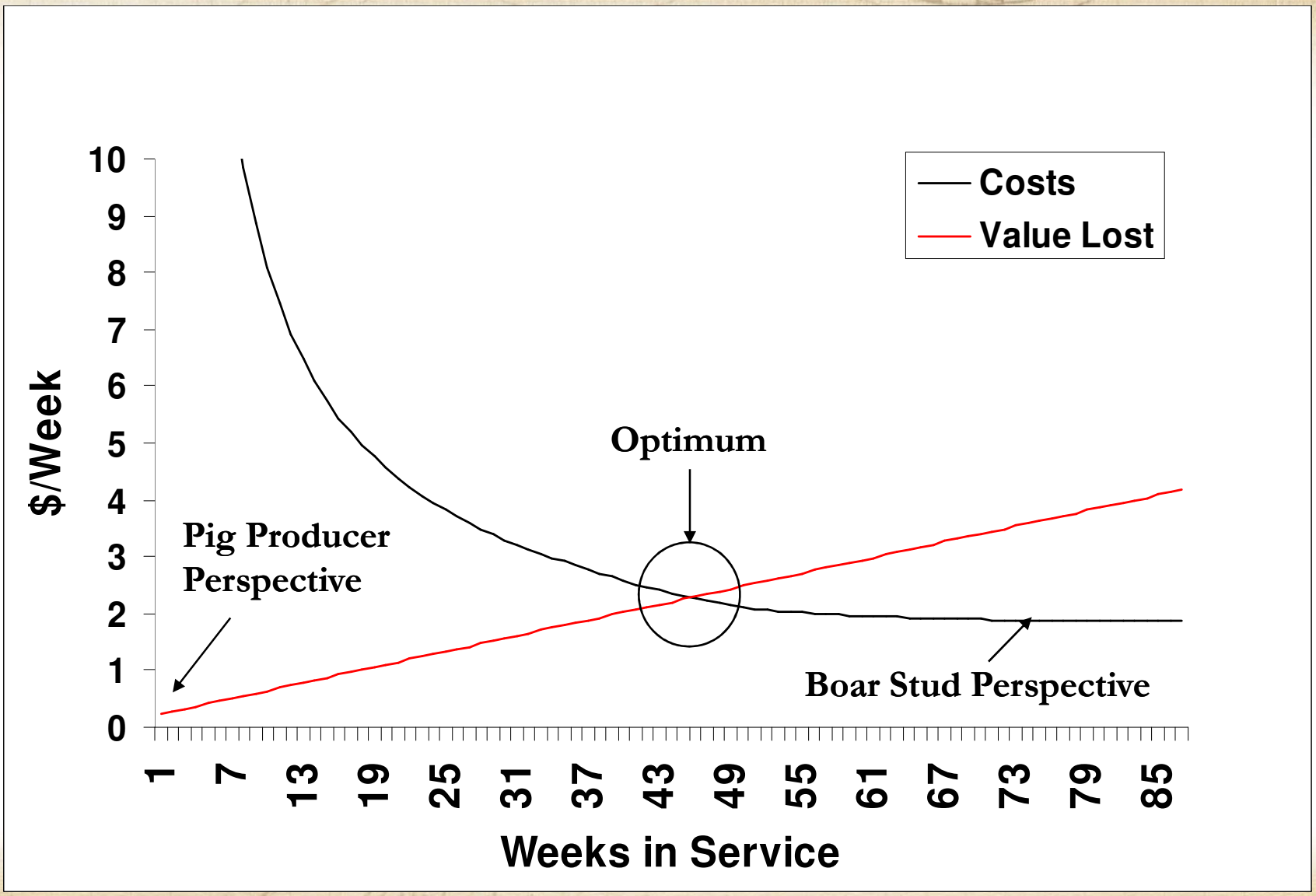
Optimum Boar Life – OBL

- What is the optimum length of time a boar should be in a boar stud
  - Depends on the perspective
    - Semen Customer
      - Best indexing boar – highest value - YOUNG boars
    - Boar Stud
      - Recoup their costs
        - » Large volume of quality semen - OLD boars
  - How do we balance the two?

Outline

- Optimum Boar Life – GTC Model
  - Semen is purchased from GTC
  - Summer internship project – Justin Fix
- Optimum Boar Life – Integrated Model
  - Semen is owned
  - Justin Fix & Dr. Zering
- Implementation successes
- Future Work – Joe Cassady

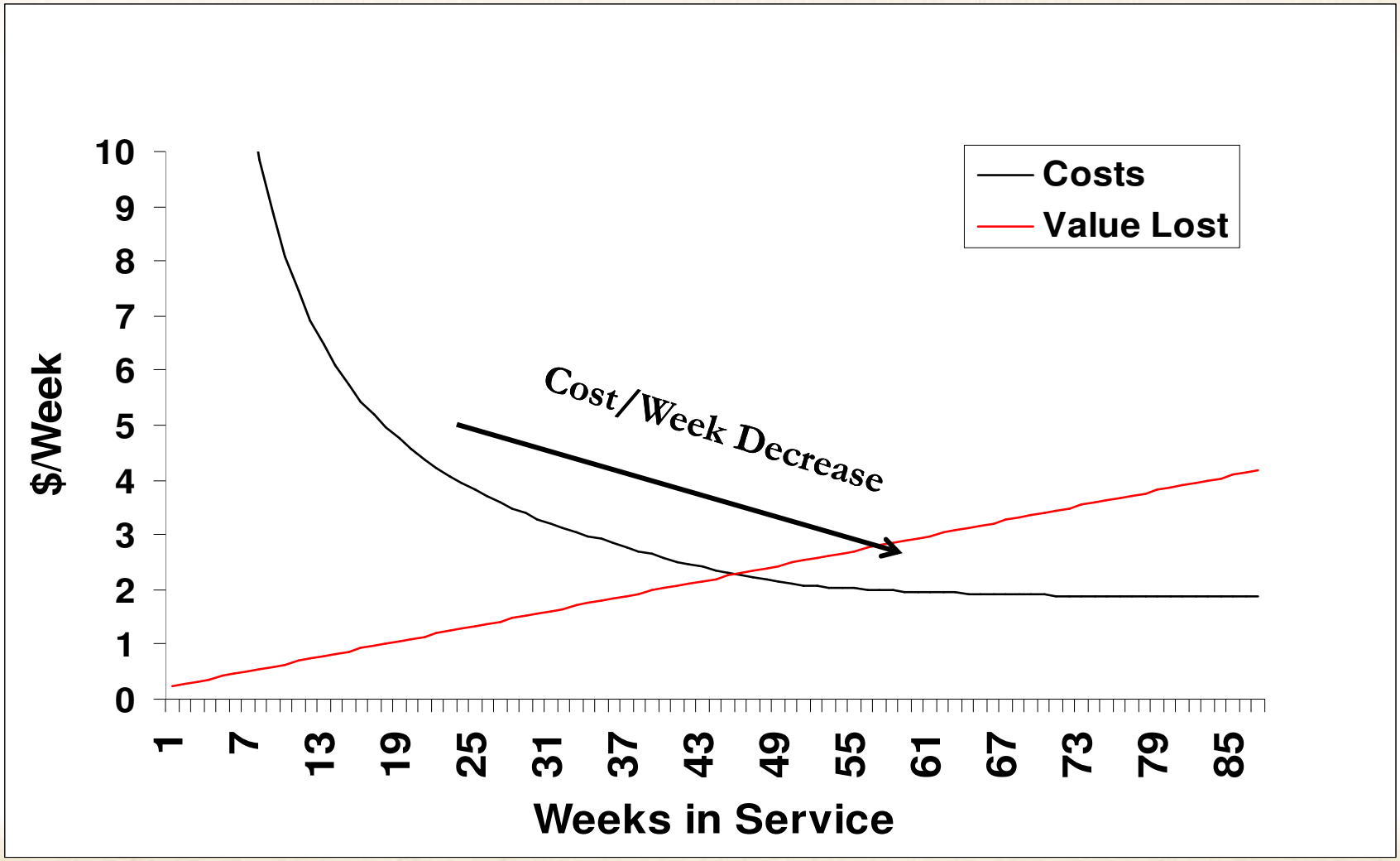
OBL - GTC Model



Boar Stud Costs/Wk

- **Boar stud costs are a function of:**
  - **Cost of goods / boar**
    - **Salvage value of boar**
    - **Death loss**
  - **Isolation cost / boar**
  - **Production cost / boar space / week**
  - **Collection labor / collection**
  - **Post collection (lab costs) / dose**
  - **Royalty cost**

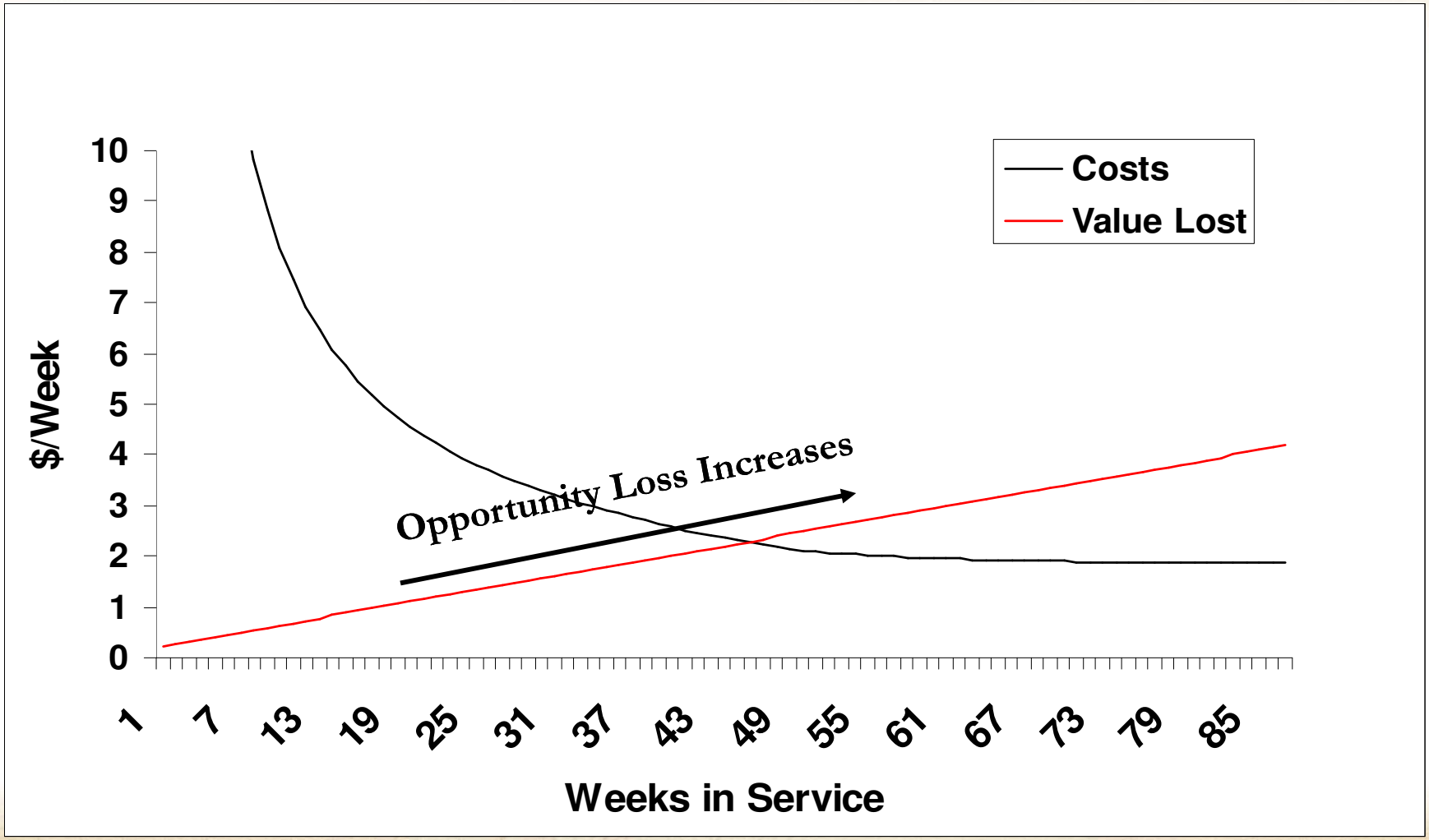
Boar Stud Costs



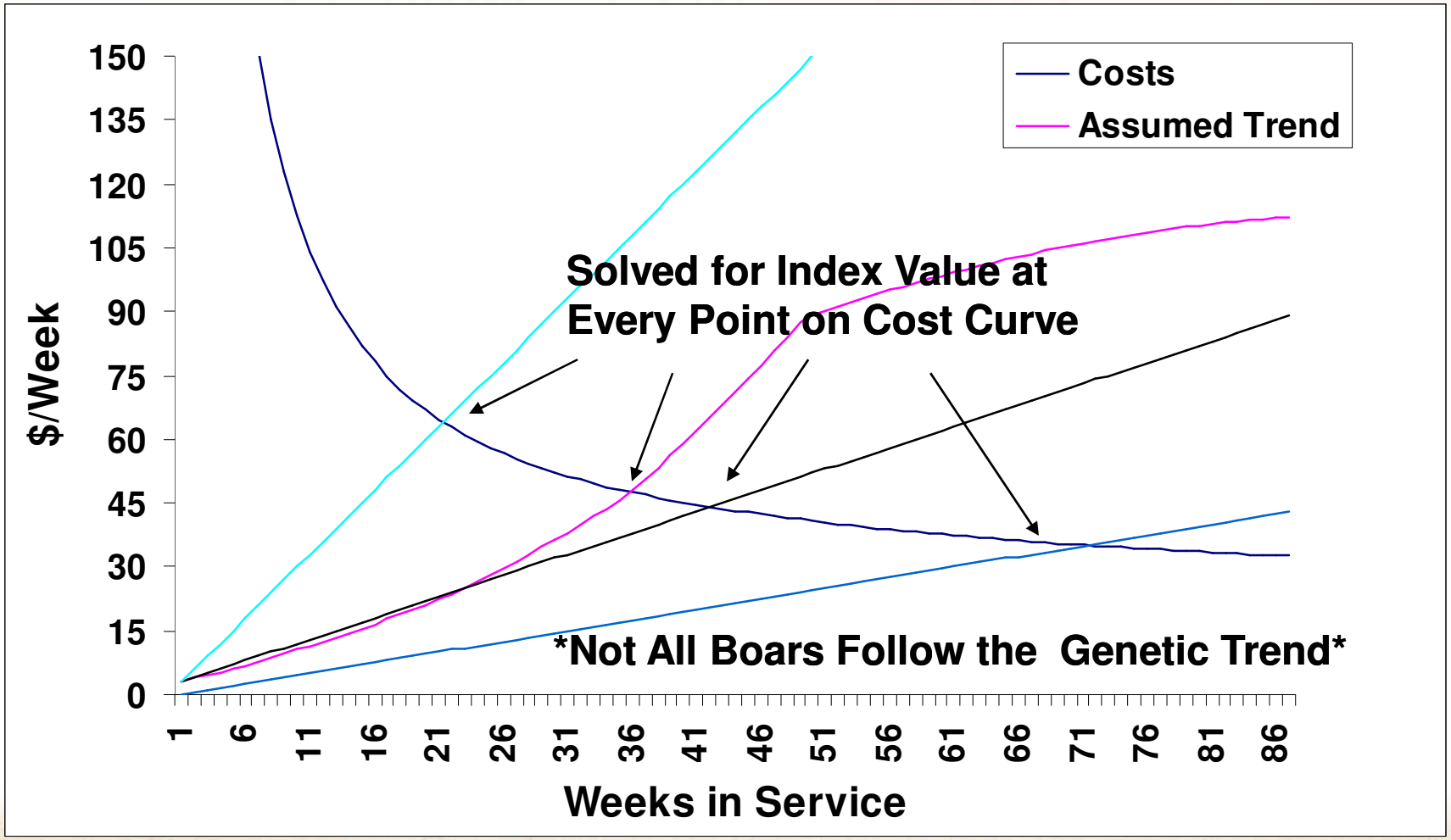
Opportunity Loss /Wk

- Opportunity loss is a function of:
  - Difference in index points between a given boar and a potential replacement
  - Value of an index point for a marketed pig
  - Pigs marketed per dose
  - Doses produced per week
    - Depends on semen production curve and collection schedule
    - Average line curves were calculated

Opportunity Loss



Optimum Index for Culling



Optimum Index for Culling

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Boar Stud

Culling Recommendations for
August 10, 2011

Cull as soon as possible!

Please cull as availability allows

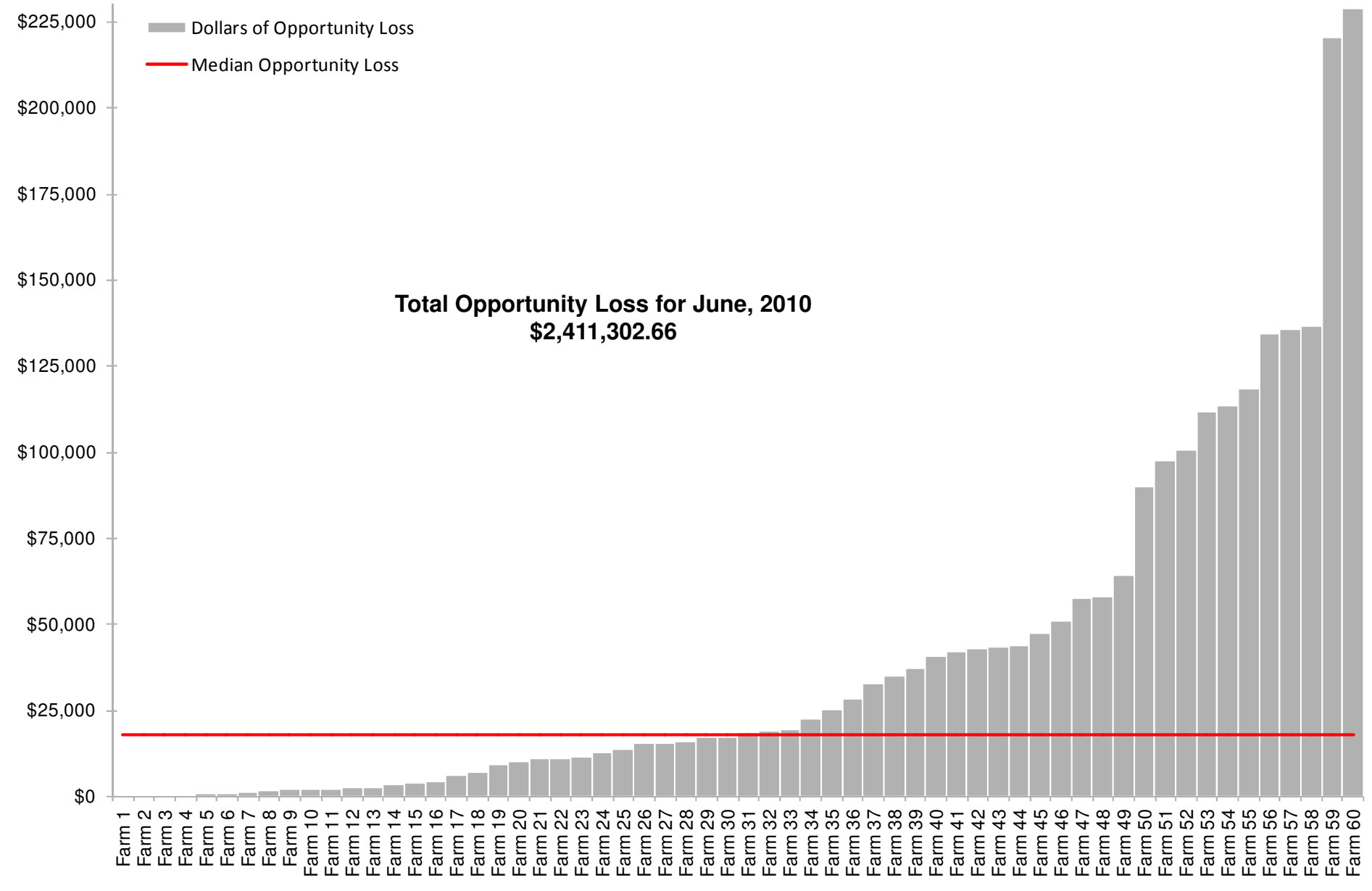
Mortality high risk

Scrotal or Umbil. hernia high risk

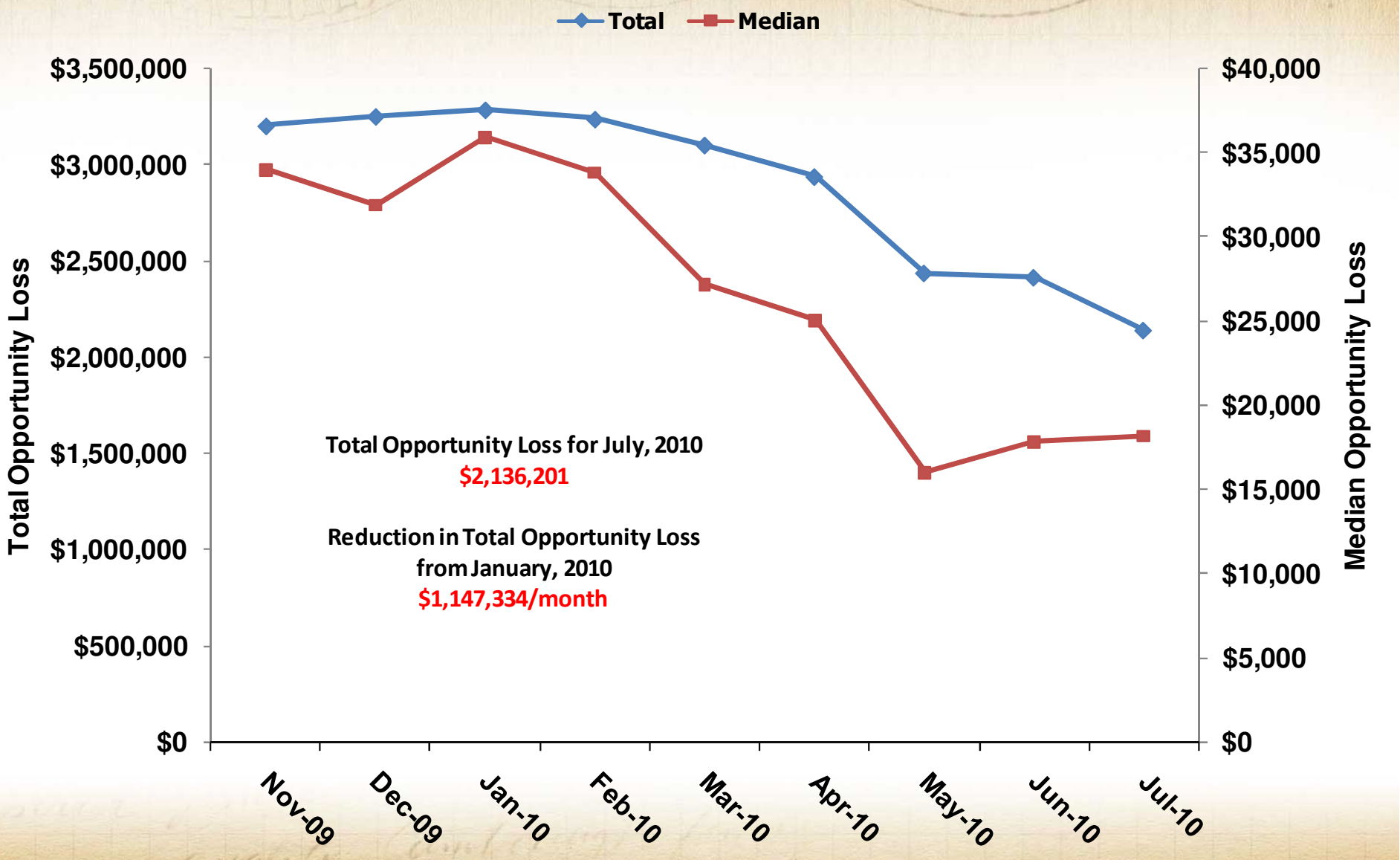
$48,640 **Total Opportunity Loss**

Breed	Boar Stud ID	Delivery Date	Age	Index	Cull	Cull Rank	Opportunity Loss per Month
280							
280	309787	11/16/10	481	80	Index Cull	1	$932
280	Z5871	11/03/08	1184	82	Index Cull	2	$863
280	309334	10/05/10	507	83	Index Cull	3	$828
280	309163	10/05/10	515	87	Index Cull	4	$690
280	308651	08/24/10	550	88	Index Cull	5	$656
280	308999	08/24/10	530	88	Index Cull	5	$656
280	308209	07/13/10	583	89	Index Cull	7	$621
280	308653	08/24/10	550	89	Index Cull	7	$621
280	309244	10/05/10	512	89	Index Cull	7	$621
280	306804	04/13/10	686	90		1	
280	307623	06/03/10	629	92		2	

Total Opportunity Loss per Month for Sire Lines in Each North American Stud



Total Opportunity Loss per Month for all NA boar studs



OBL - Integrated Model

- **What is the optimum length of time a boar should be in a boar stud if semen is owned?**
  - **When a boar maximizes profit for the system**
  - **Again, need to balance between**
    - **Increased semen production from older boars**
    - **Increased index value from younger boars**

OBL - Integrated Model

- **OBL - Integrated Model**
  - **Developed by Dr. J. Fix (Ph.D. student) & Dr. K. Zering (Economics Professor) – NC State Univ.**
  - **Asset Replacement Theory** Perrin (1972), Chavas et al. (1985)
    - **Used by industries to decide when to replace equipment (assets)**
  - **Maximizes future profits based on the NPV (net present value) of future profits**

OBL - Integrated Model

- What is NPV?
  - Adjusting future profits back to today's dollar
    - A dollar today is worth more than a dollar tomorrow
    - Discount rate
      - Adjusting for inflation
- OBL - Integrated Model maximizes the NPV of future profits
  - Revenues – Costs

OBL - Integrated Model

- Boar stud revenue is a function of:
  - Value of a boar's index
    - No. doses produced in 1 week * Difference in index points between a given boar and the group average * Value of an index point for a dose of semen
  - Value of a dose of semen
    - No. doses produced in 1 week * Value of an "Average" dose of semen
      - Value of a dose – Amount paid if dose was purchased
      - Boar stud viewed as a profit center not cost center

OBL - Integrated Model

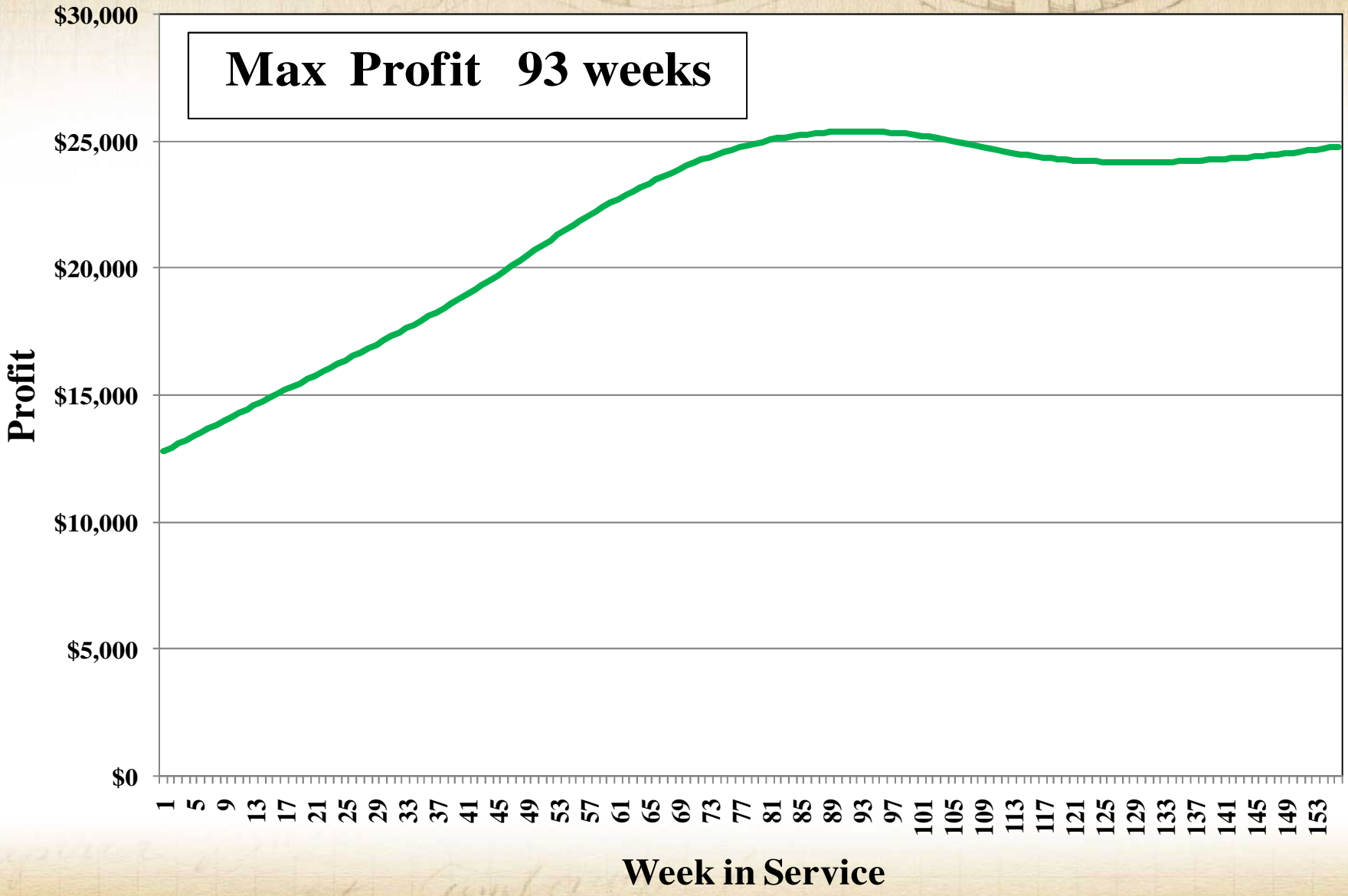
- **Boar stud costs are a function of:**
  - **Cost of purchasing boar**
  - **Isolation cost / boar**
  - **Production cost / boar space / week**
  - **Collection labor / collection**
  - **Post collection (lab costs) / dose**
  - **Royalty cost**
  - **Semen production curve**
    - **Collections**
    - **Doses**

OBL - Integrated Model

- **Revenue and costs are calculated each week over a time horizon based on semen and collection curves**
  - **Values are discounted back to first week of prod.**

- **Estimate NPV for potential culling every week**
  - **Cull the boar week 1**
    - **Replace with a new boar (avg. index at placement)**
  - **Cull the boar week 2**
    - **Replace with a new boar (avg. index at placement)**
  - **Continue through end of the time horizon**
    - **1 week increment**

Profit Curve to Determine When to Replace a Boar



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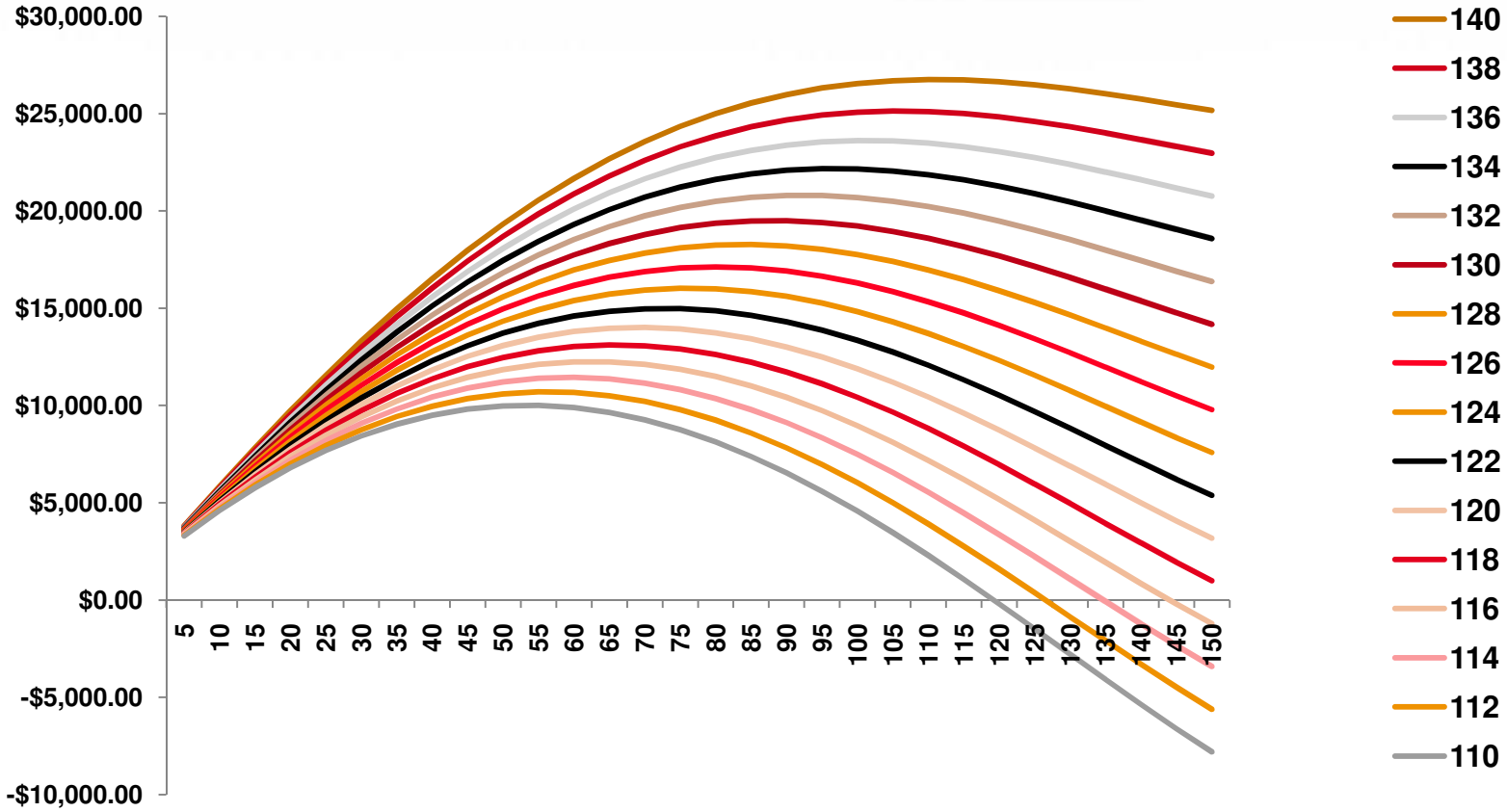
  - Cull the boar week 2
    - Replace with a new boar (avg. index at placement)
  - Continue through end of the time horizon
    - 1 week increment

- **Cull week with the highest NPV is the best week to cull the boar**
  - **When culling the boar maximizes profit**

OBL - Integrated Model

- **Culling decision based on economics NOT genetics alone – genetics part of economics but it is not the only driver**

NPV by Cull Week for Beginning Index Values



OBL - Integrated Model

- Culling decision based on economics NOT genetics alone – genetics part of economics but it is not the only driver

- **Boar should be culled when he reaches his max profit NOT based on index**

- **May cull an older, higher indexing boar and keep a younger, lower indexing boar to recoup costs and get more doses**

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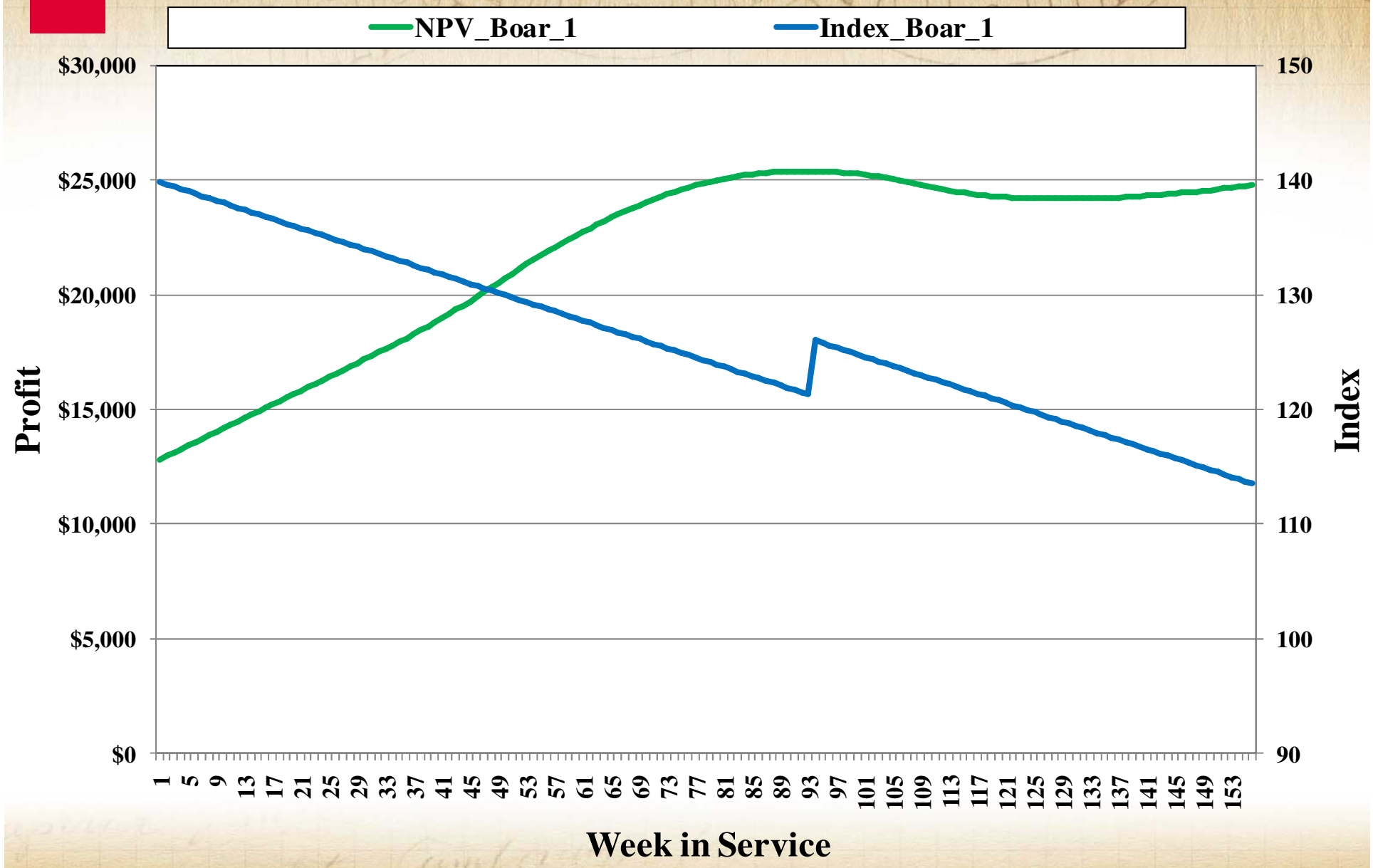

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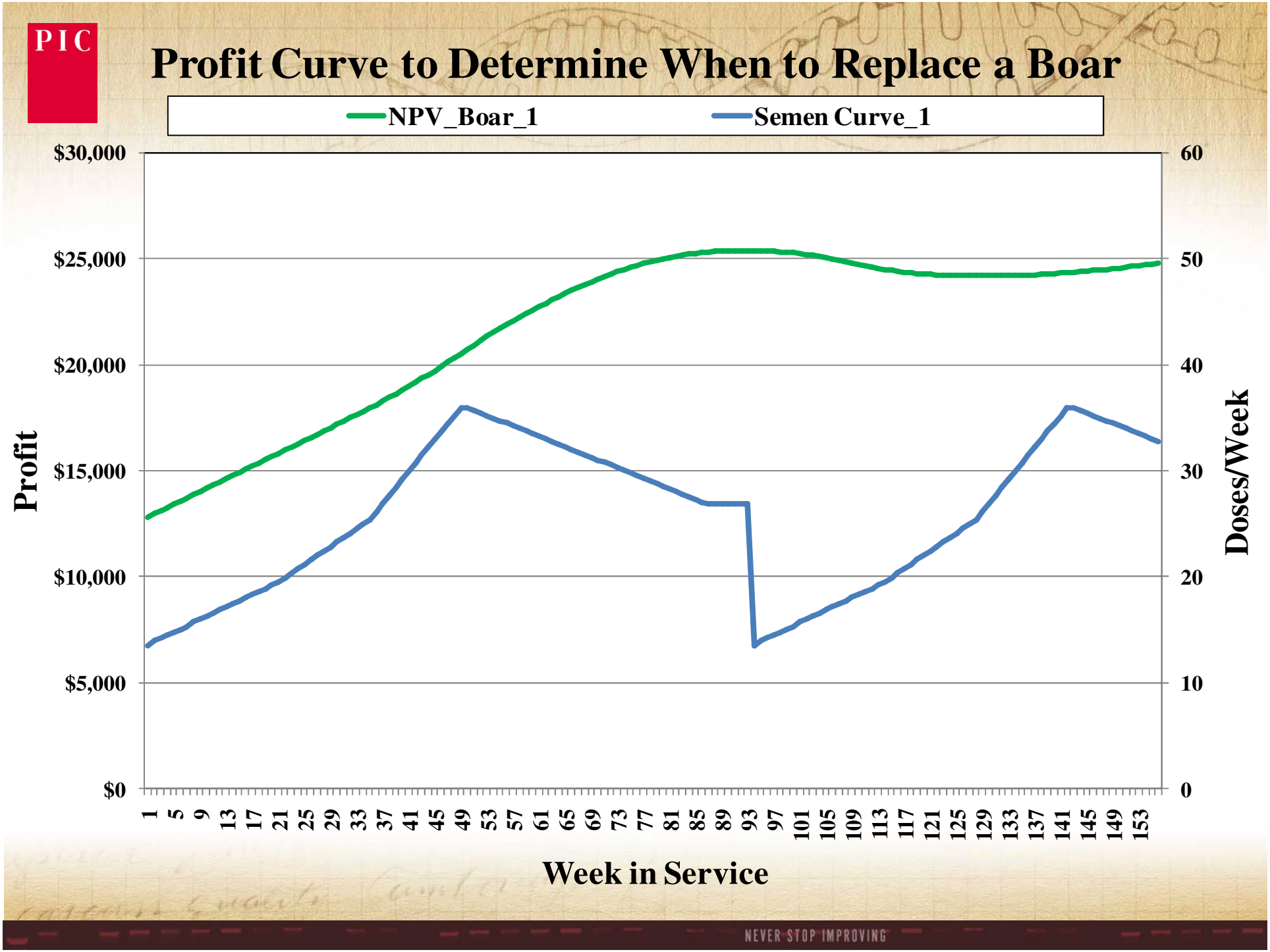

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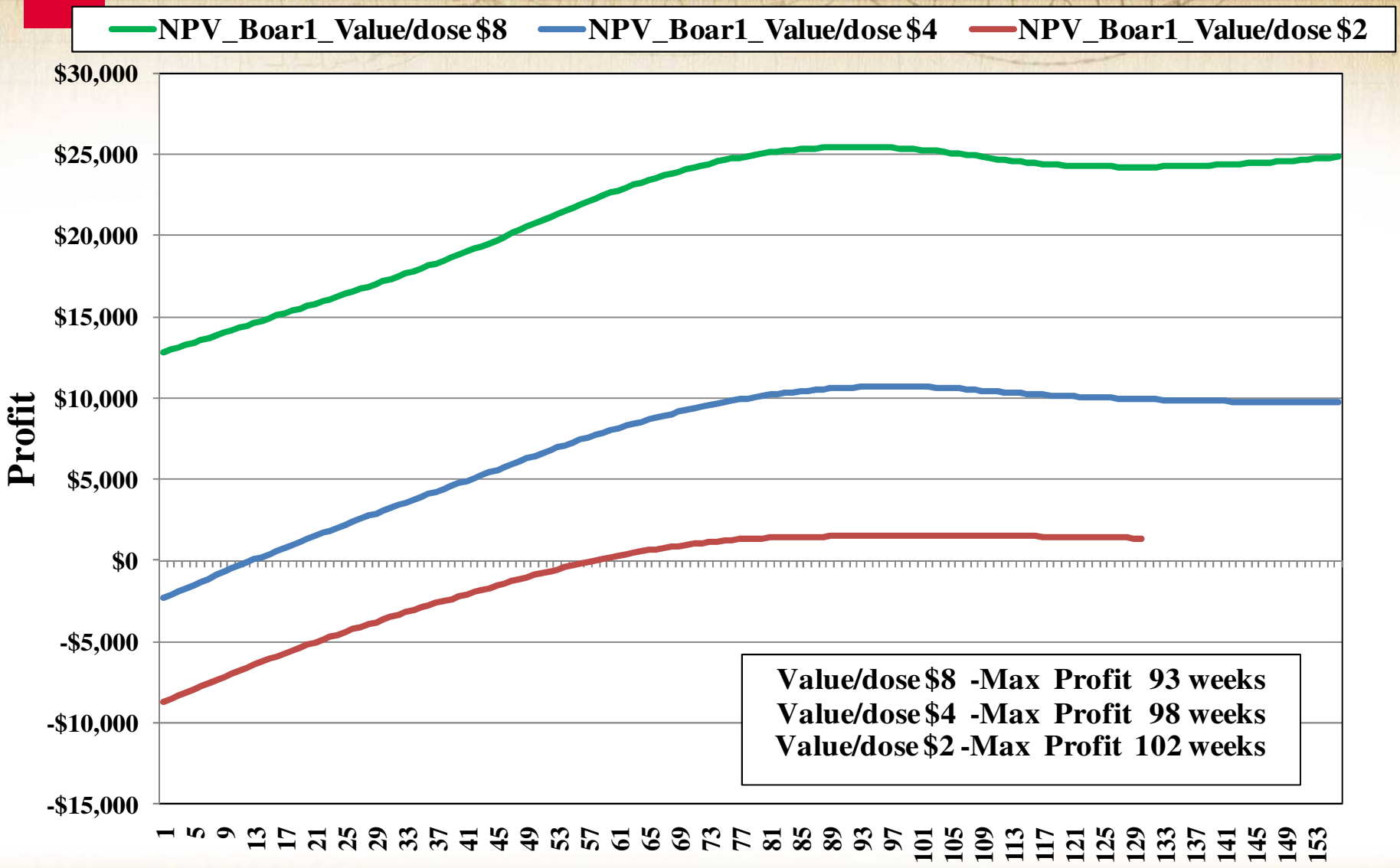

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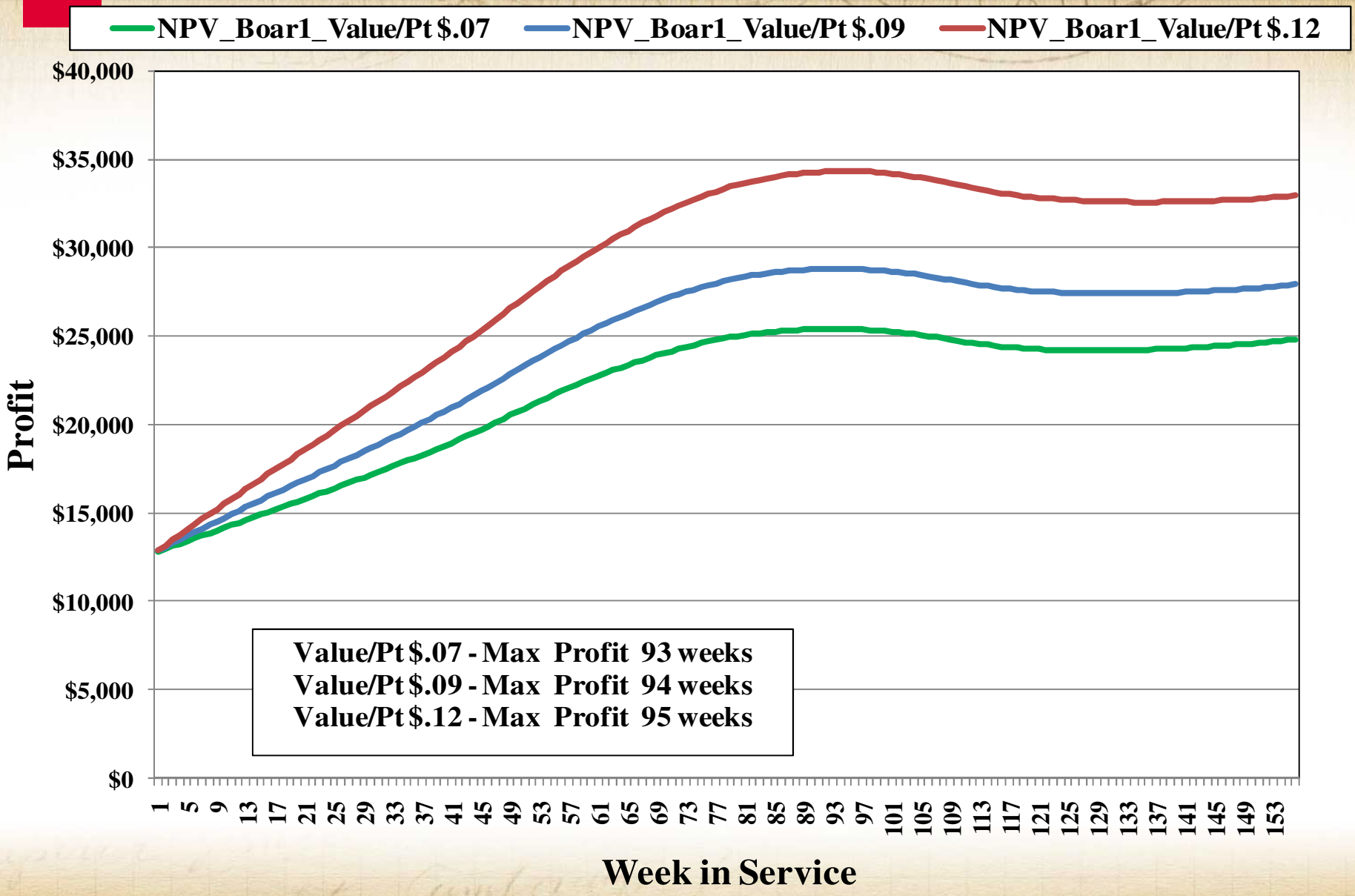
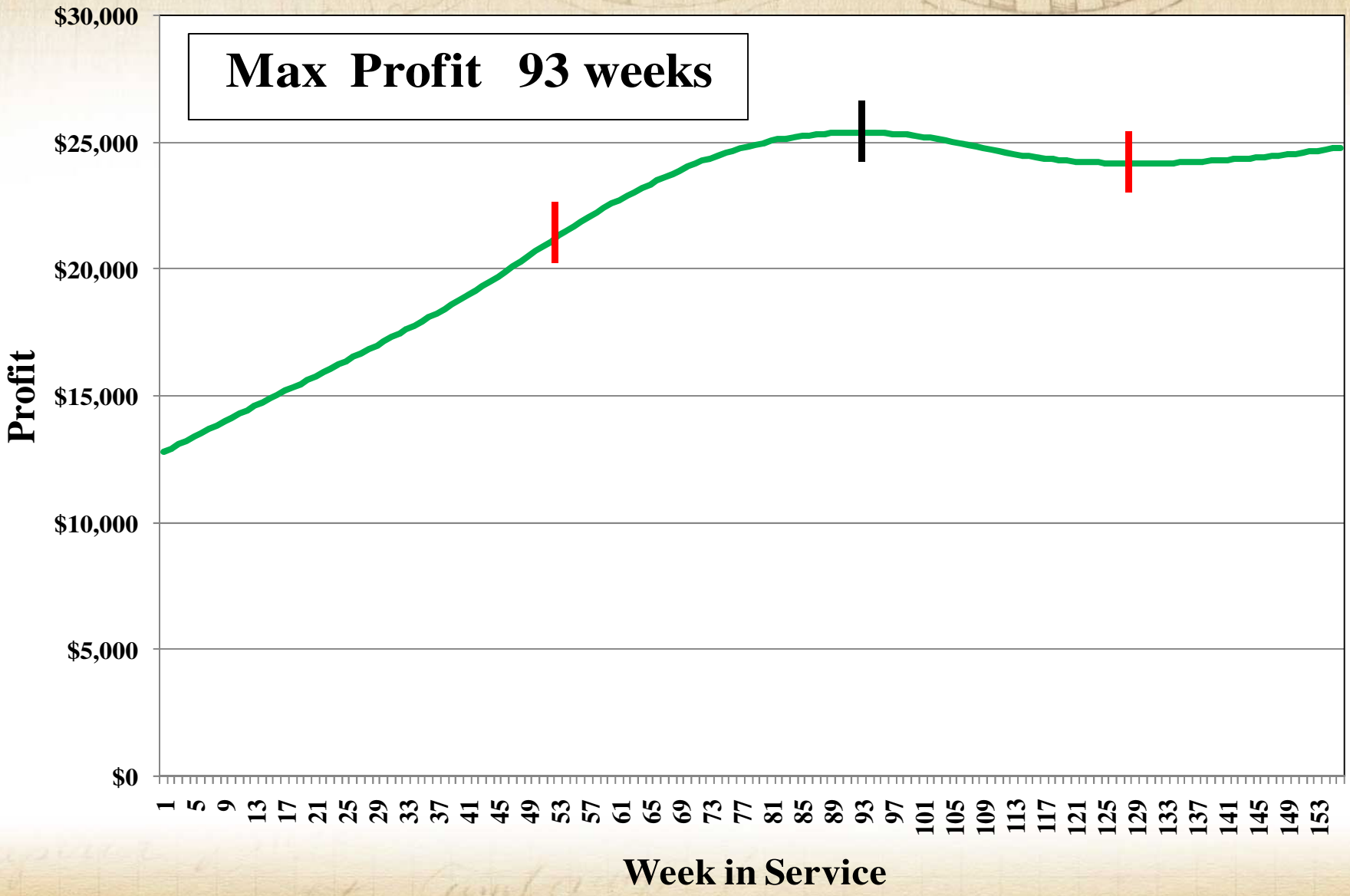


Profit Curve to Determine When to Replace a Boar



PIC

Farm - Stud

Culling Recommendations for
September 14, 2010

Cull as soon as possible!
Please cull as availability allows
Mortality high risk
Scrotal or Umbil. hernia high risk
Future Cull

$73,141 **Total Lost Profit**

Breed	Boar Stud ID	Delivery Date	Age	Cull	Cull Rank	Weeks from Max Profit	Difference from Max Profit
				380			
380	3711	06/20/08	997	Survival & Index Cull	1	38	$2,529
380	3181	07/28/08	1055	Survival & Index Cull	2	28	$1,649
380	3894	06/20/08	987	Index Cull	1	73	$9,674
380	Y3818	06/03/08	989	Index Cull	2	61	$6,053
380	X2917	07/28/08	1083	Index Cull	3	46	$3,830
380	A4237	09/04/08	953	Index Cull	4	43	$3,385
380	3240	07/28/08	1039	Index Cull	5	41	$3,092
380	3667	06/20/08	1009	Index Cull	6	35	$2,224
380	3737	06/20/08	989	Index Cull	6	35	$2,224
380	4008	06/20/08	974	Index Cull	6	35	$2,224
380	2663	03/09/07	1547	Index Cull	9	45	$2,218
380	2410	03/06/09	747	Index Cull	10	34	$2,181
380	D2387	03/06/09	748	Index Cull	10	34	$2,181

PIC

Farm - Stud

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Please cull as availability allows
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Future Cull

$73,141 **Total Lost Profit**

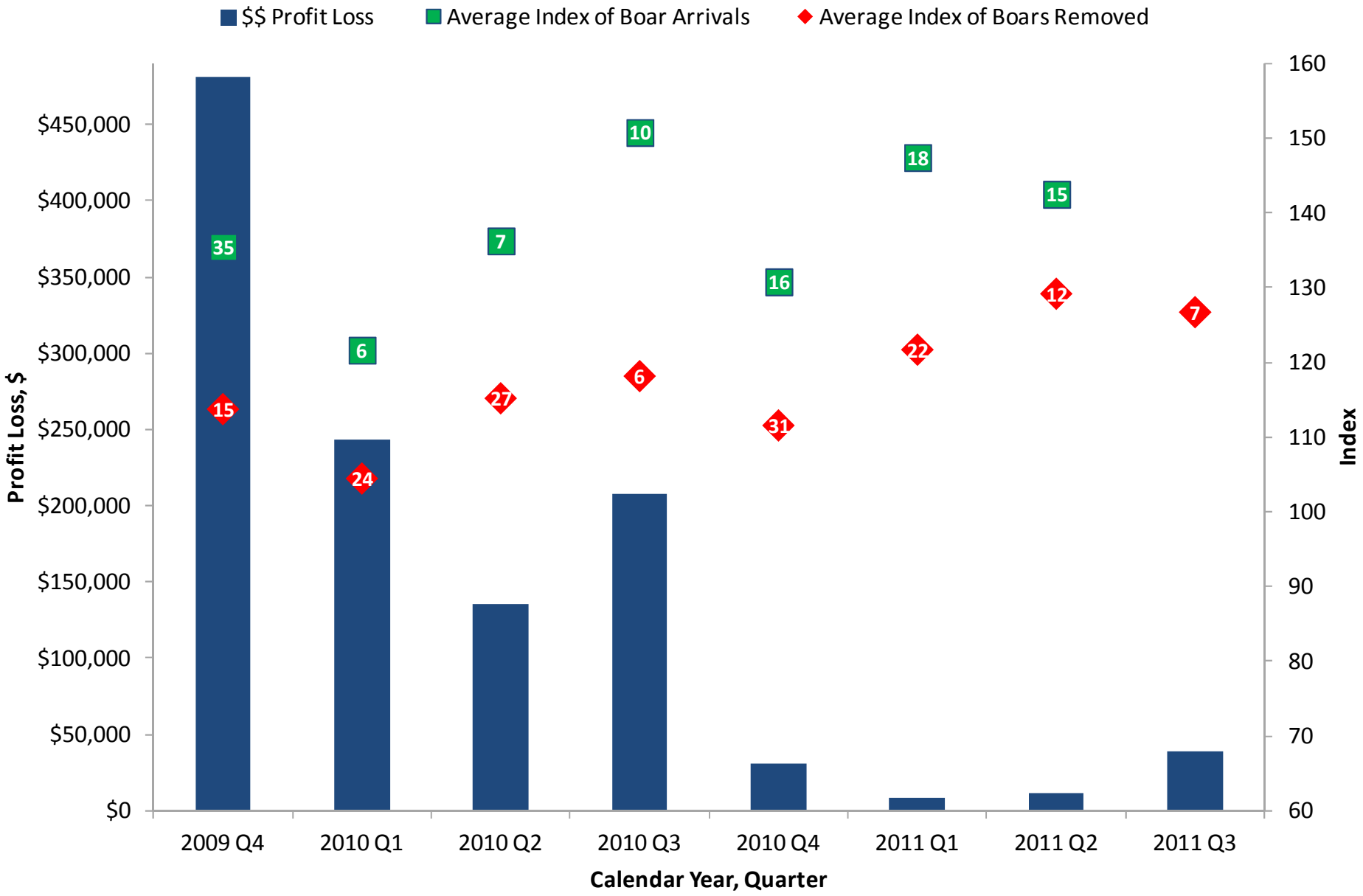
Breed	Boar Stud ID	Delivery Date	Age	Cull	Cull Rank	Weeks from Max Profit	Difference from Max Profit
				380			
380	3070	12/28/09	559		102	-53	$5,713
380	3075	12/28/09	561		102	-53	$5,713
380	1767	07/06/09	810		104	-53	$5,803
380	1939	07/06/09	790		104	-53	$5,803
380	0553	08/30/10	291		106	-55	$5,975
380	0576	08/30/10	292		106	-55	$5,975
380	0973	08/30/10	262		106	-55	$5,975
380	2423	03/06/09	726		109	-58	$6,036
380	H3479	03/05/10	444		110	-58	$6,106
380	3102	12/28/09	536		111	-55	$6,165
380	0954	08/30/10	267		112	-58	$6,400
380	3274	03/05/10	478		113	-59	$6,597
380	0614	08/30/10	289		114	-60	$6,844
380	0622	08/30/10	288		114	-60	$6,844

OBL - Integrated Model

Estimated Replacement Rates for the next year				
Line	Replacement Rate		No. Boars past Maximum	Cumulative Loss
380	88.3%	(incl. 45% for non-index cull)	44	$63,515

PIC

Trend in Total Profit Loss and the Average Index for B337 Boar Arrivals and Boars Removed by Calendar Quarter



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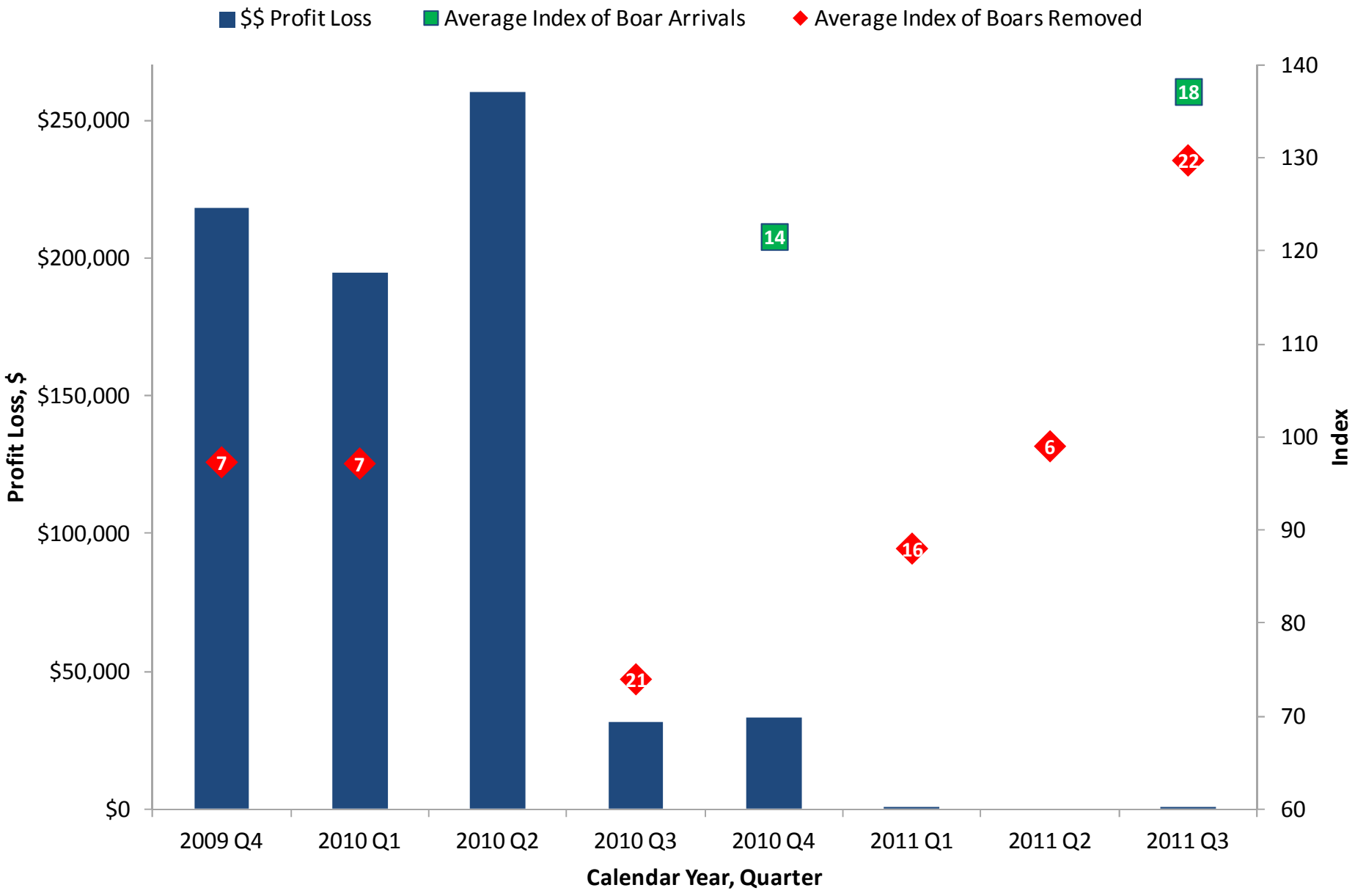
Trend in Total Profit Loss and the Average Index for B380 Boar Arrivals and Boars Removed by Calendar Quarter



PIC

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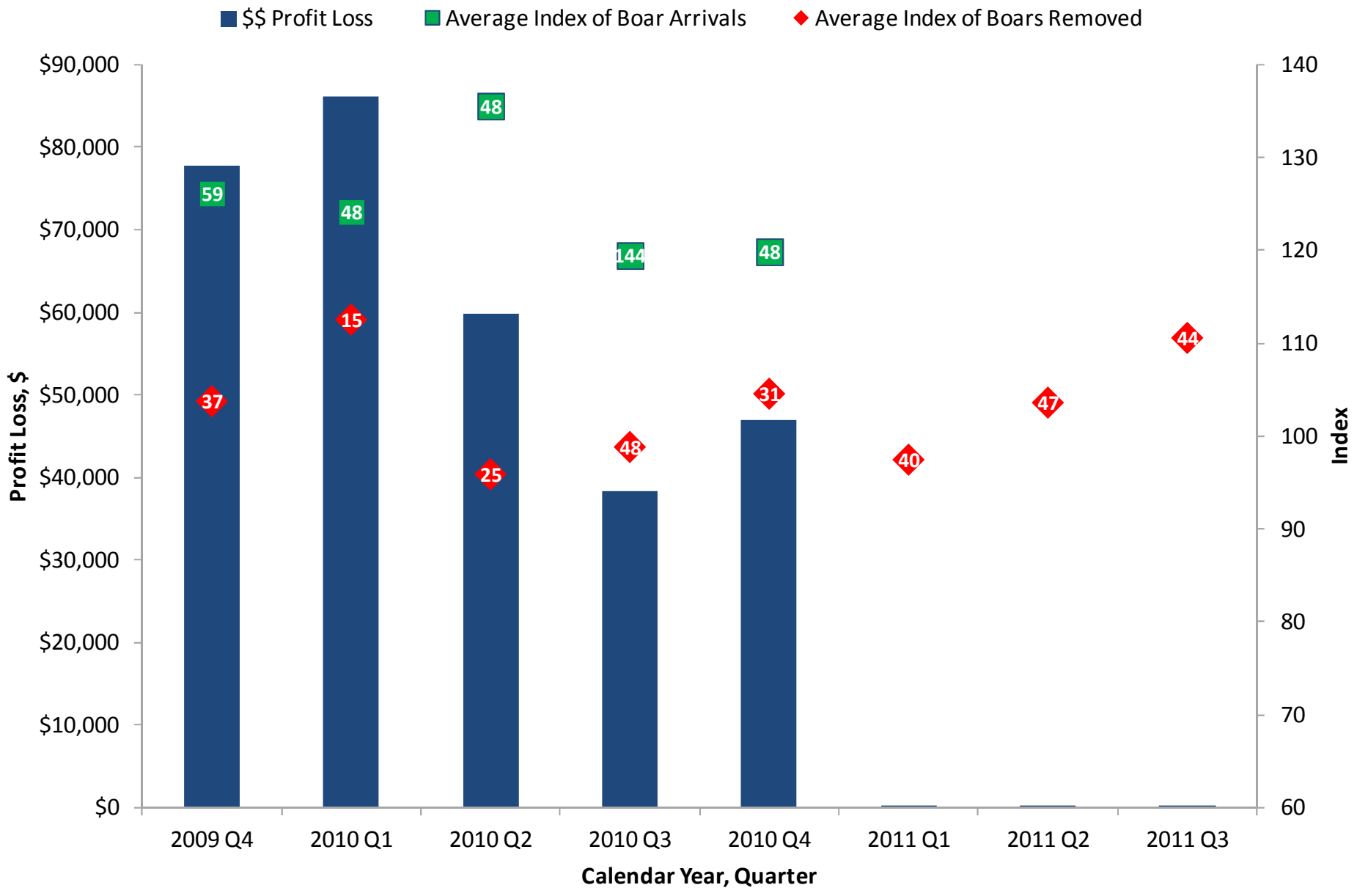

PIC

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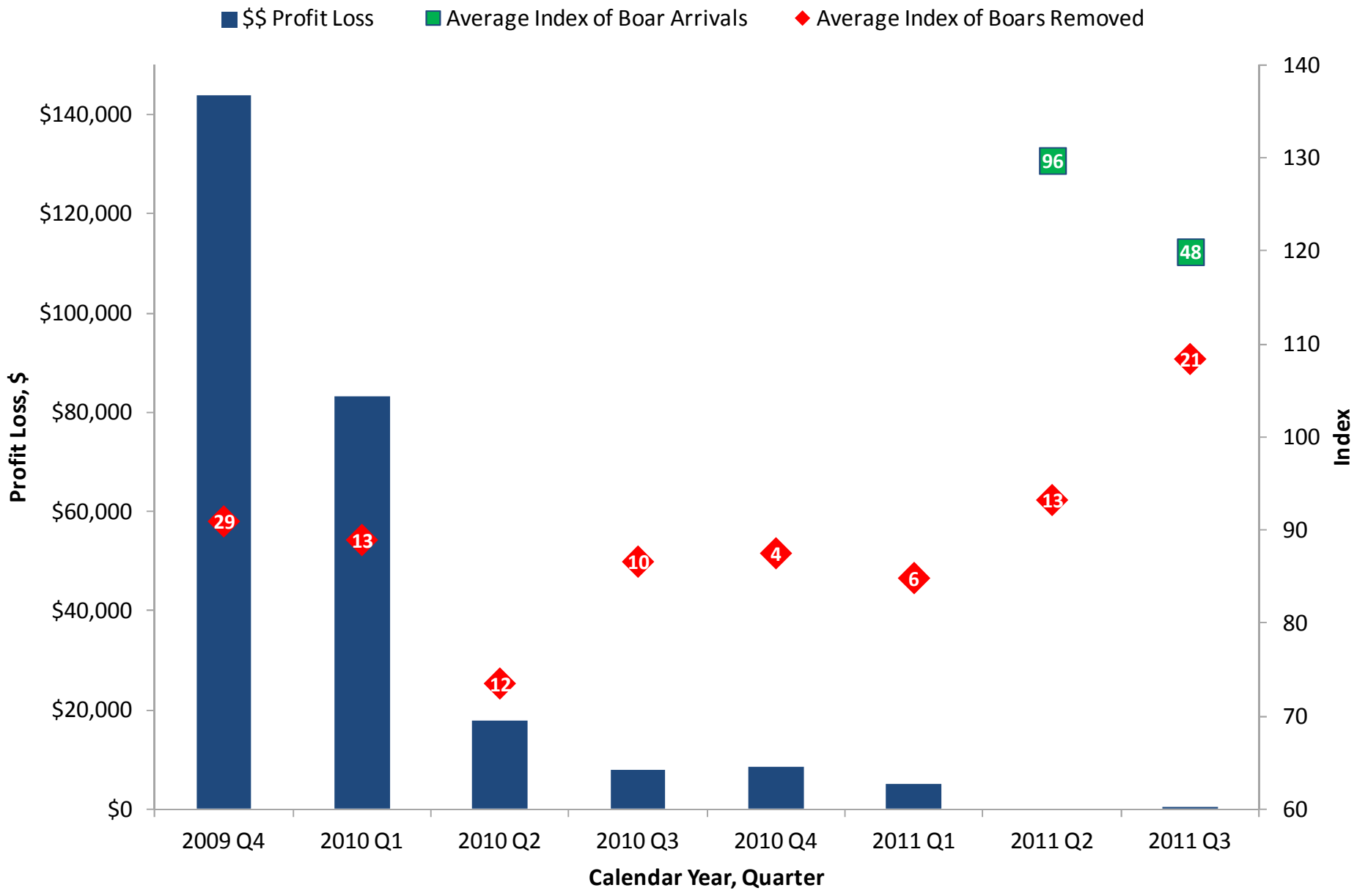
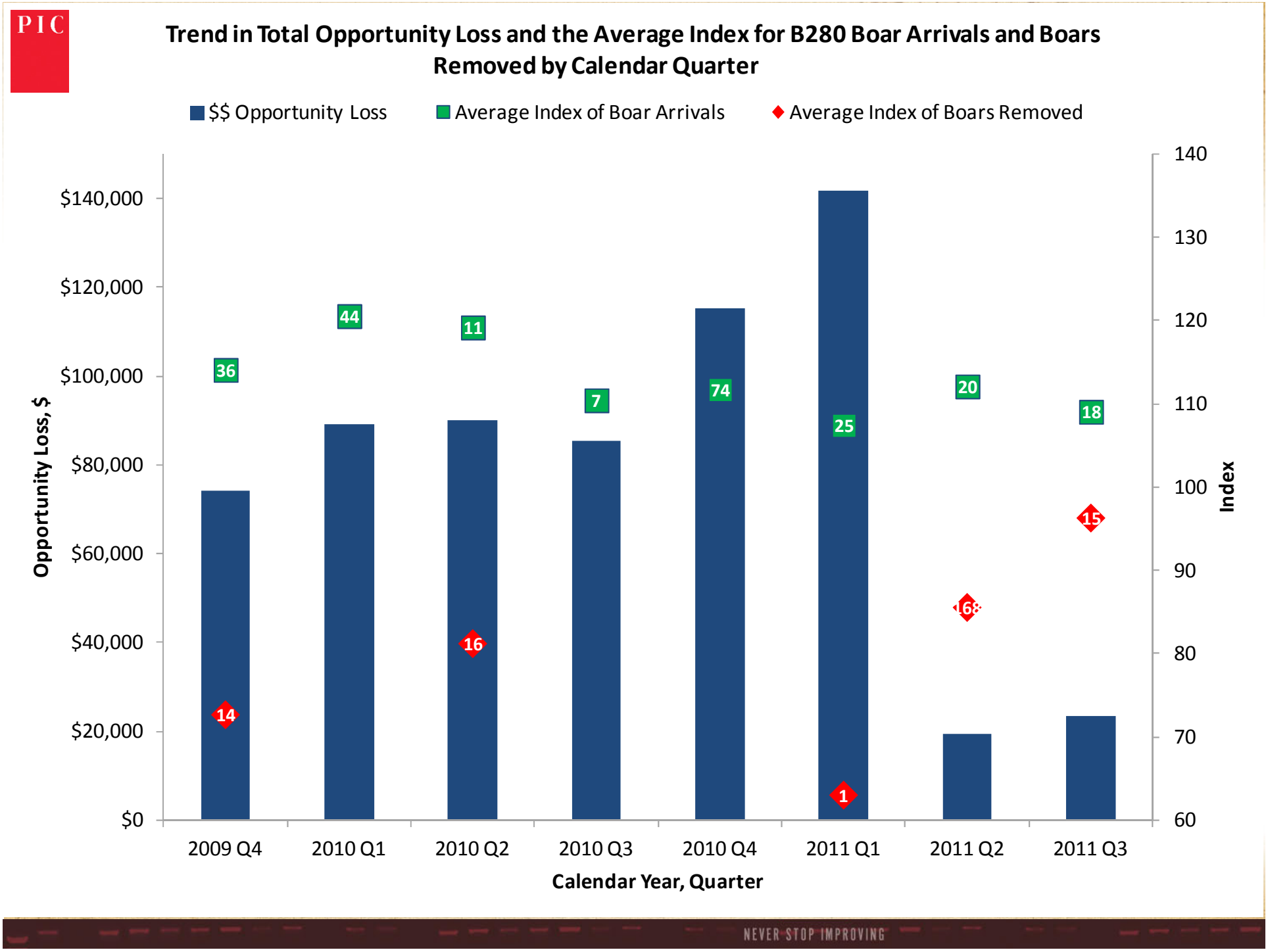
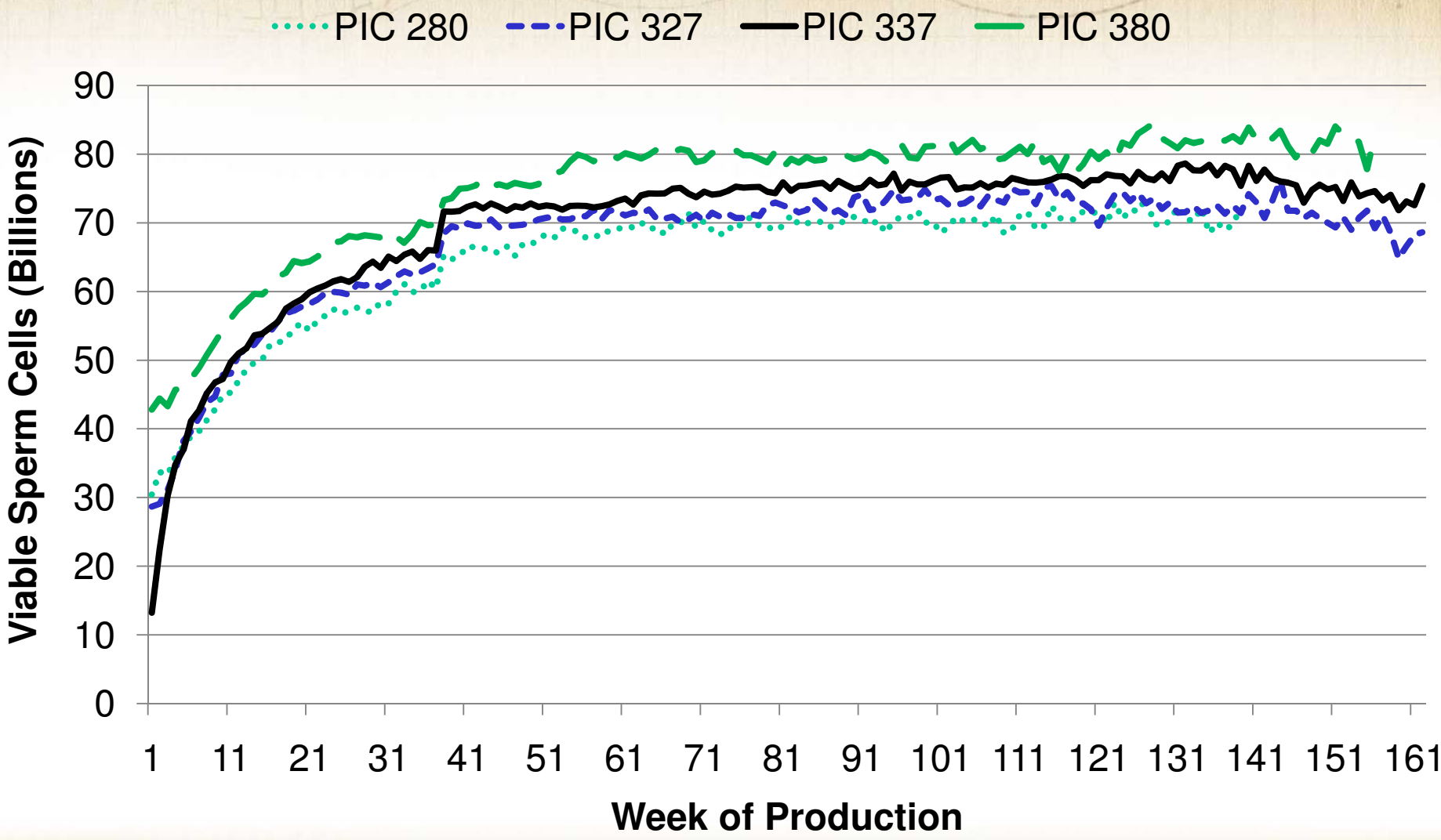



PIC
Trend in Total Opportunity Loss and the Average Index for B280 Boar Arrivals and Boars Removed by Calendar Quarter
$$ Opportunity Loss
Average Index of Boar Arrivals
Average Index of Boars Removed
Opportunity Loss, $
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
Index
140
130
120
110
100
90
80
70
60
36
44
11
7
74
25
20
18
14
16
68
1
15
2009 Q4
2010 Q1
2010 Q2
2010 Q3
2010 Q4
2011 Q1
2011 Q2
2011 Q3
Calendar Year, Quarter
NEVER STOP IMPROVING

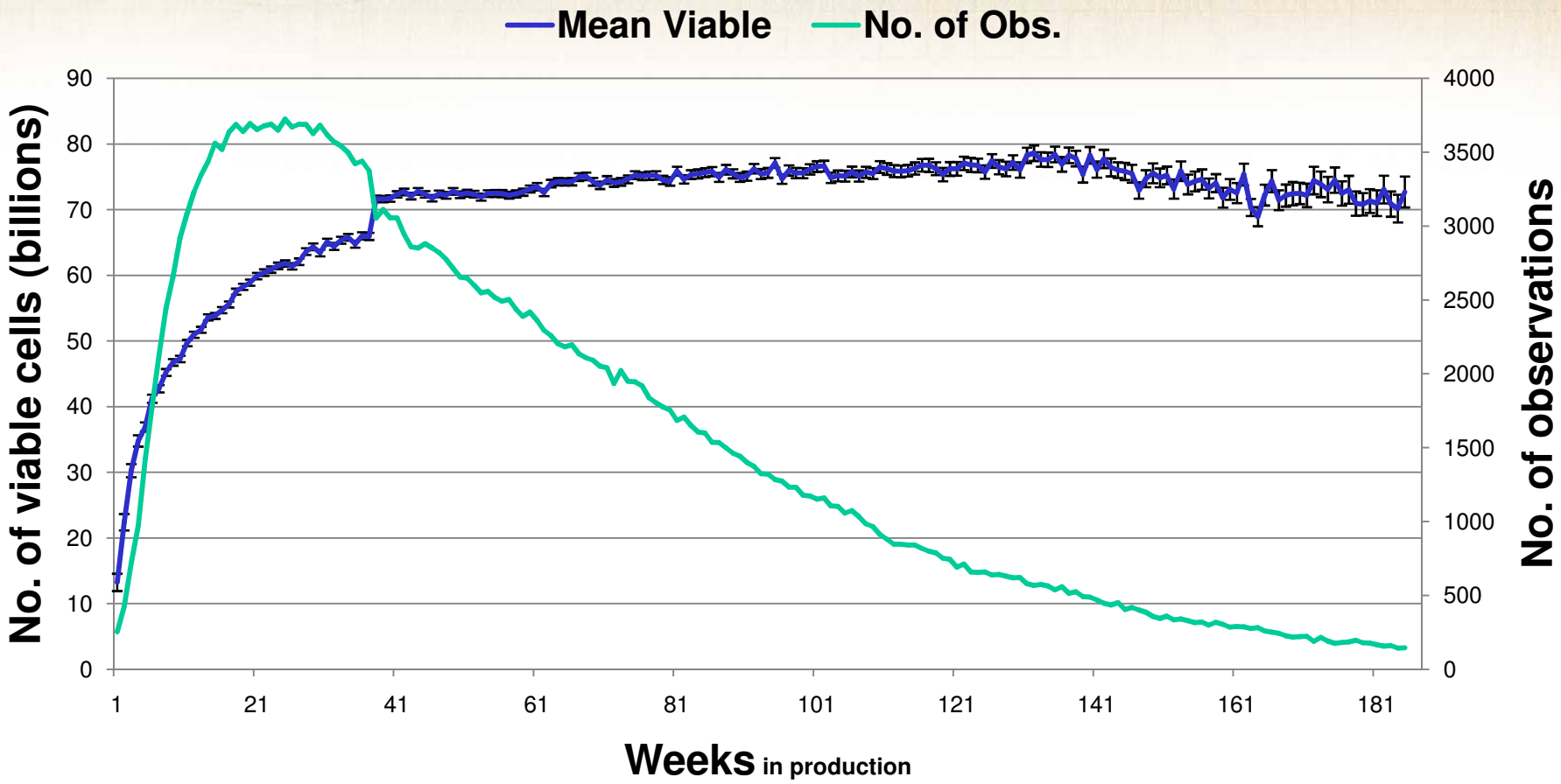
Future Work

- Improved estimates of semen curves
- Apply OBL - Integrated Model to dam lines
- Effect of using average semen curve by line versus individual boar semen production

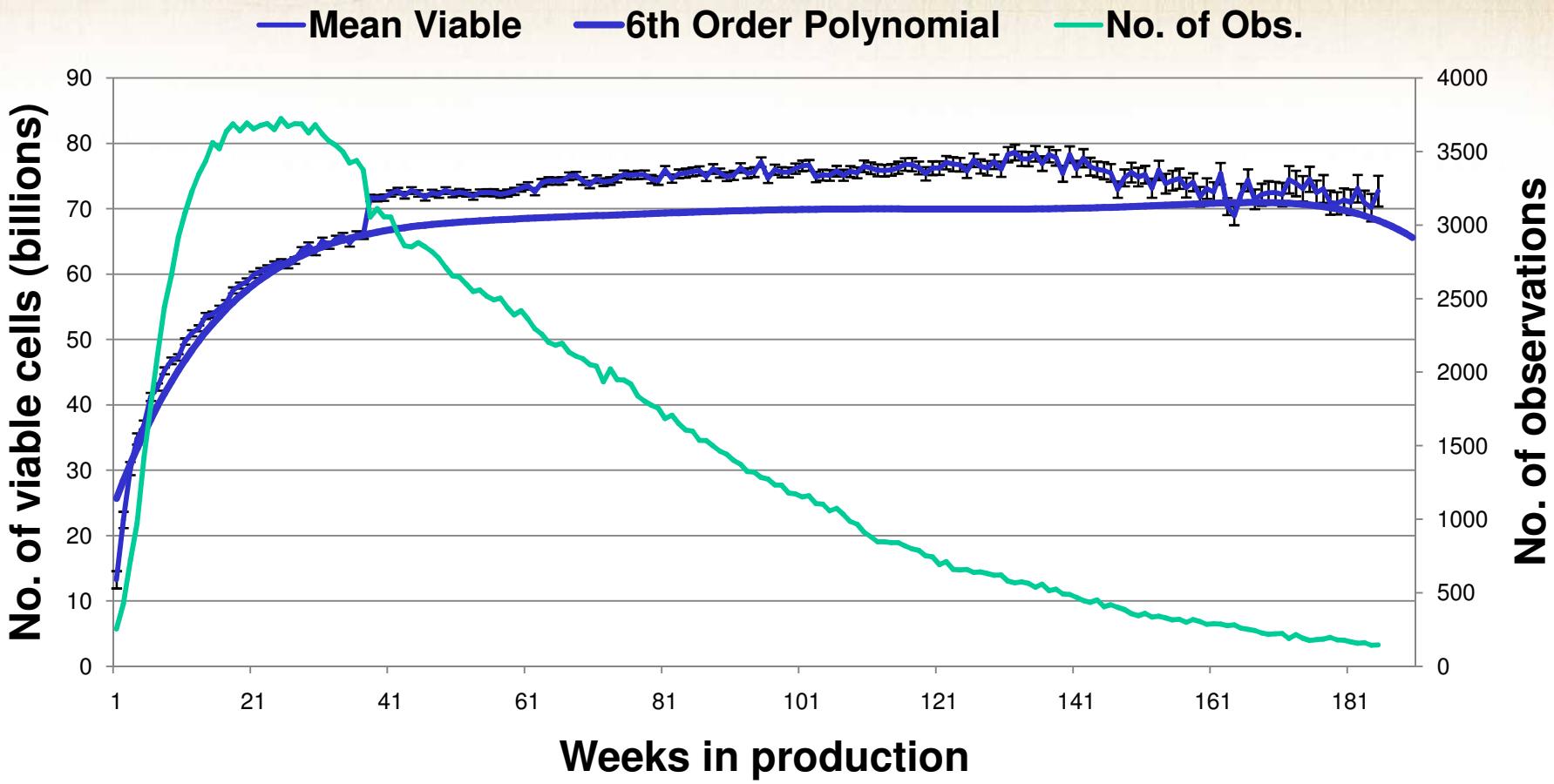
Variation Among Lines



PIC 337 Boars



PIC 337 Boars



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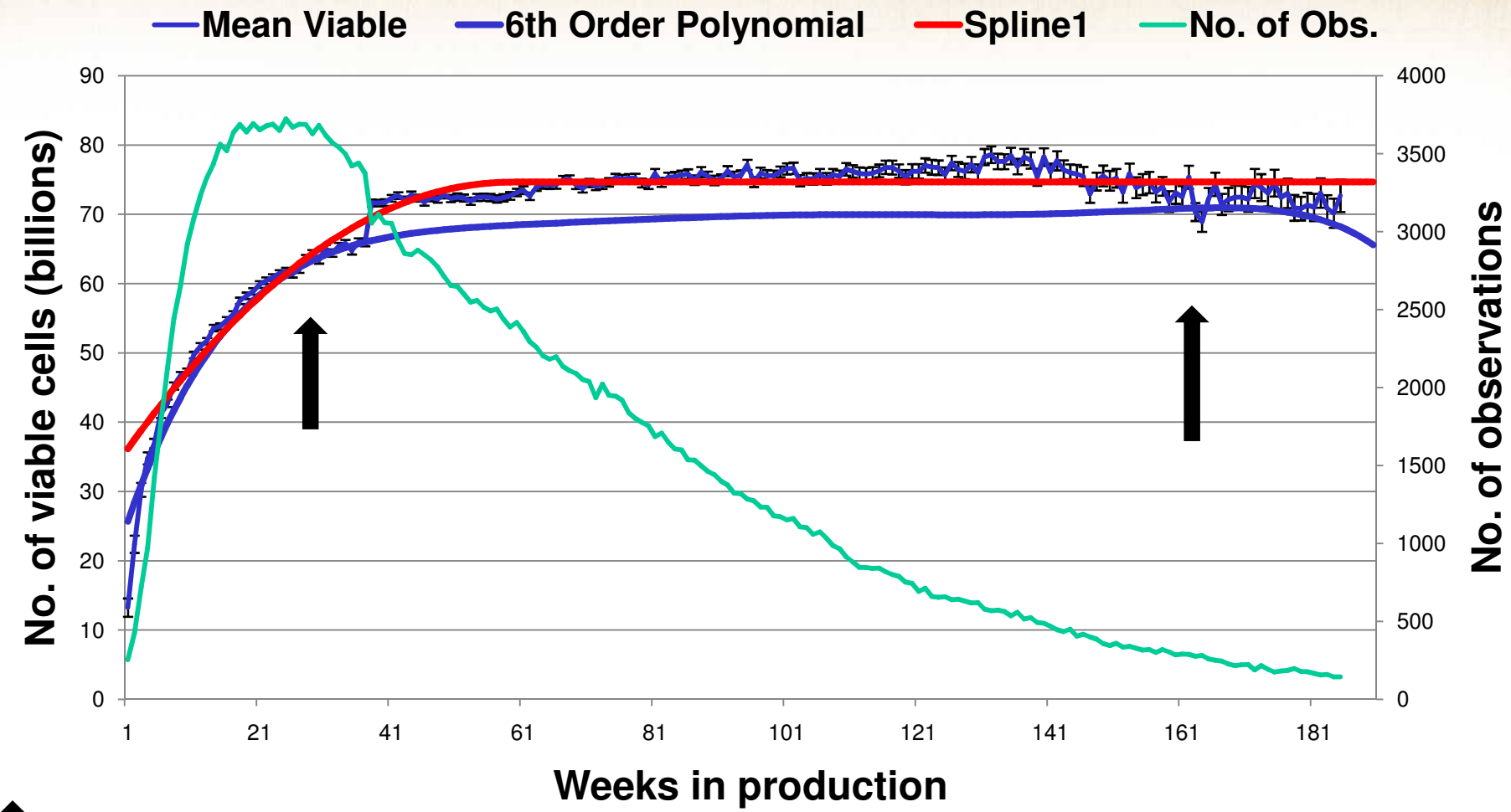
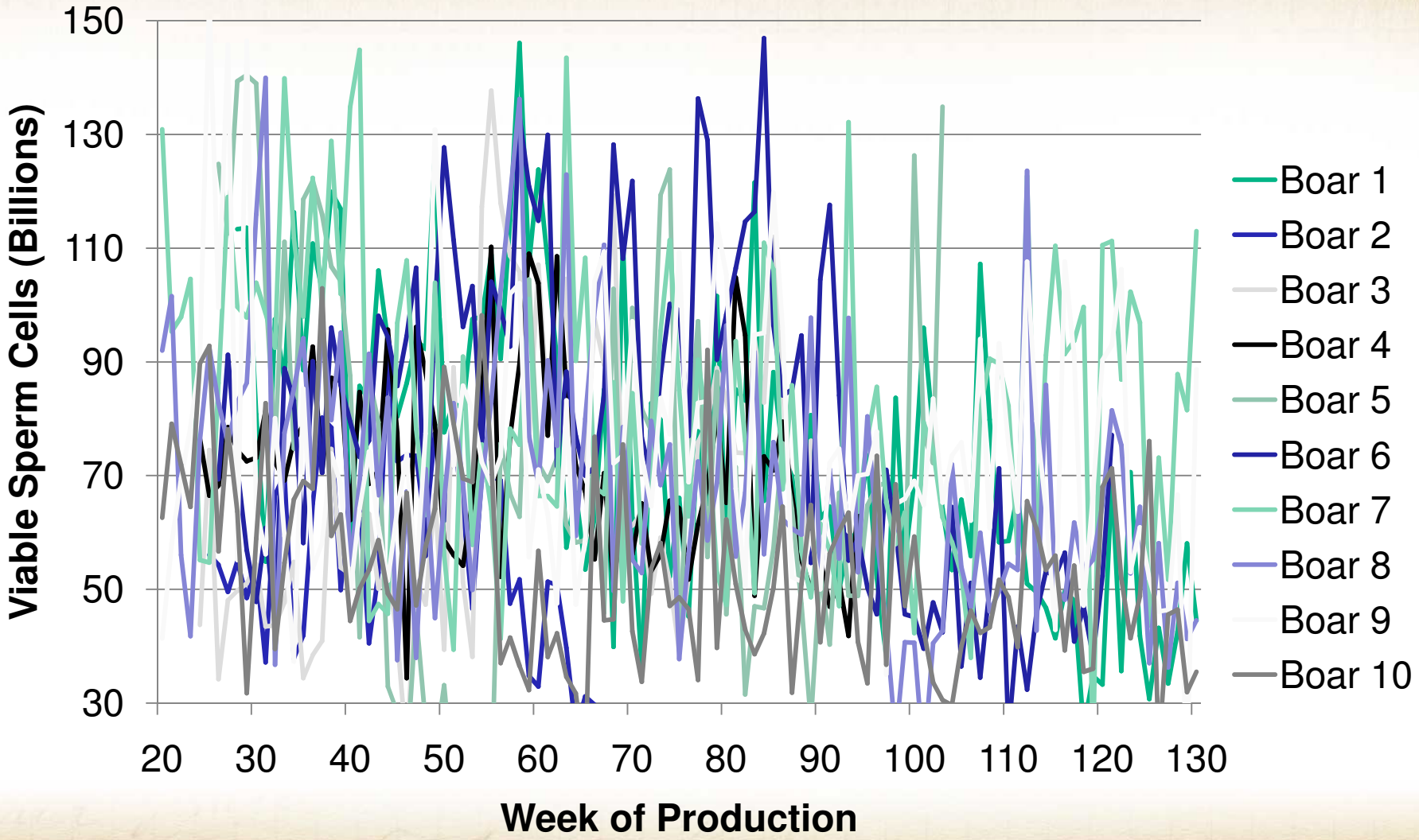


Indicates the location of knots in the spline analysis

10 Boars from PIC 327



3 Boars from PIC 327