

AEWA European Goose Management Platform



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Workshop for the Revision of Pink-footed Goose ISSMP *Modelling Harvest Capacity and Population Size*

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EGMP Data Center, Aarhus University

7-8 October 2024 Levanger, Norway



Goal

- Projection of future (12 years) population sizes under varying harvest rates for two potential population targets
- Intent is to inform discussion on target setting and harvest management, where no further management measures are implemented for population control

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Pink-footed goose IPM

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Posterior estimates of:
Natural mortality
Vulnerability of young to harvest
Effects of thaw days on RS

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Pink-footed goose IPM

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Stochastic Dynamic Programming
(SDP) Optimization Algorithm

Accounts for demographic and
environmental uncertainty on
population dynamics

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Pink-footed goose IPM

Posterior estimates of:
Natural mortality
Vulnerability of young to harvest
Effects of thaw days on RS

Stochastic Dynamic Programming (SDP) Optimization Algorithm

Accounts for demographic and environmental uncertainty on population dynamics

Allowable harvest for each possible population size and number of thaw days that might be observed in the future

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Population targets

- 60k – Existing target
- 80k – Similar to current spring population size of 78k

Harvest rates

- Unconstrained (any harvest necessary to control pop size)
- 17k – Maximum harvest achieved (1992-2023)
- 15k – Mean harvest (2016 – 2020)
- 10k – Mean harvest in past three years (2021 – 2023)

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Population Target: 60,000



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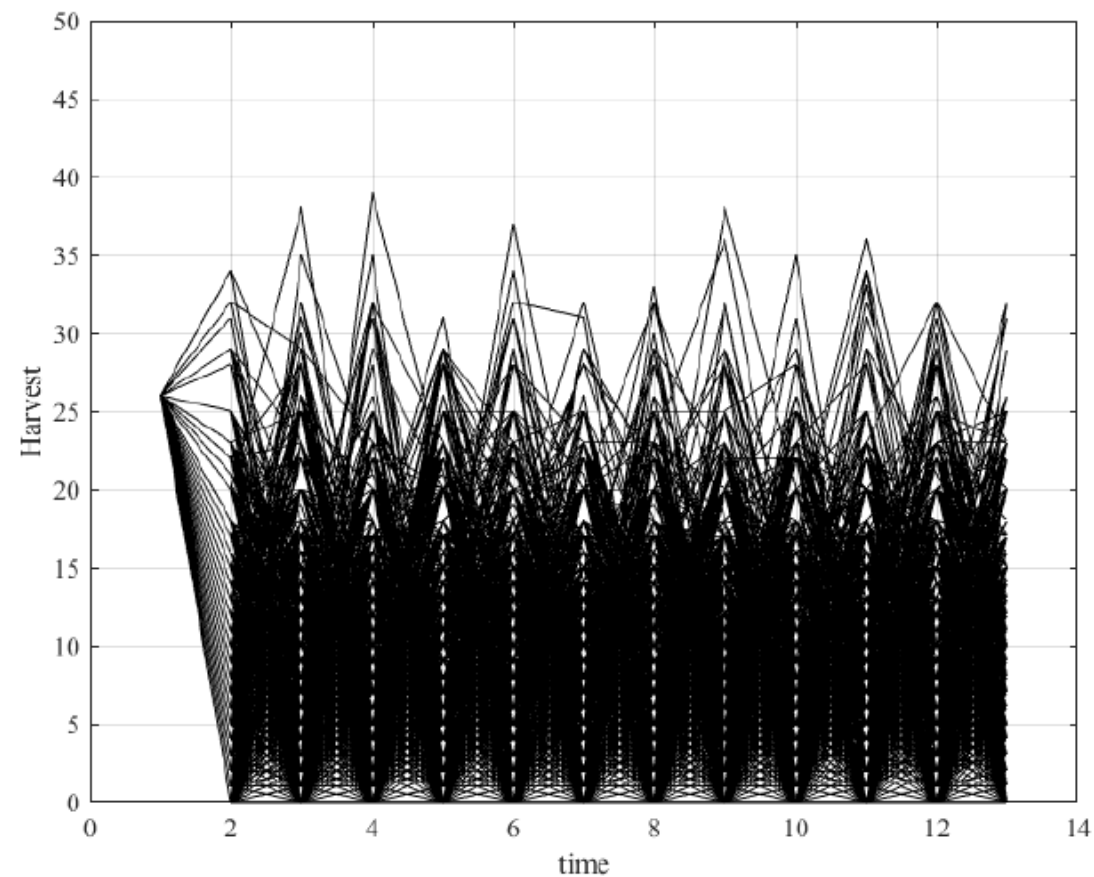
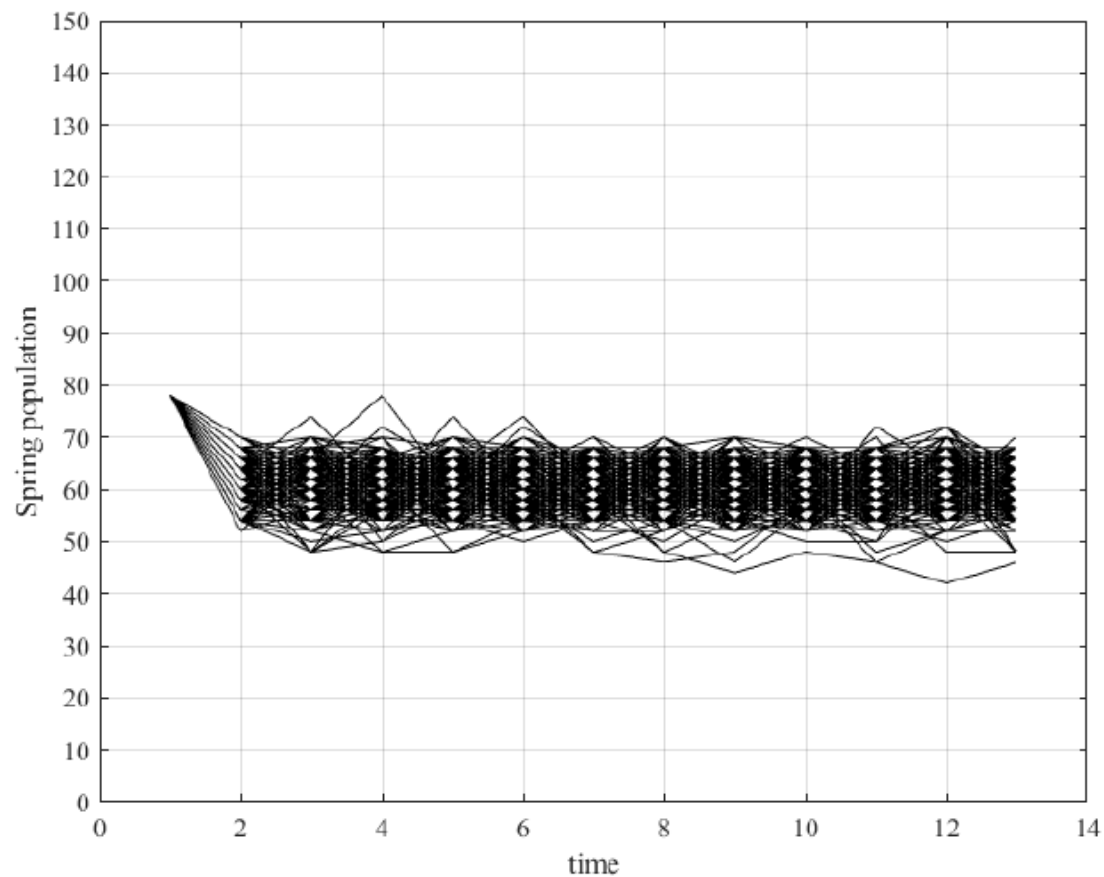
Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
50k	unconstrained	62.8k (5.5)	9.7k (7.8)	61.7k (3.4)	8.5k (6.4)

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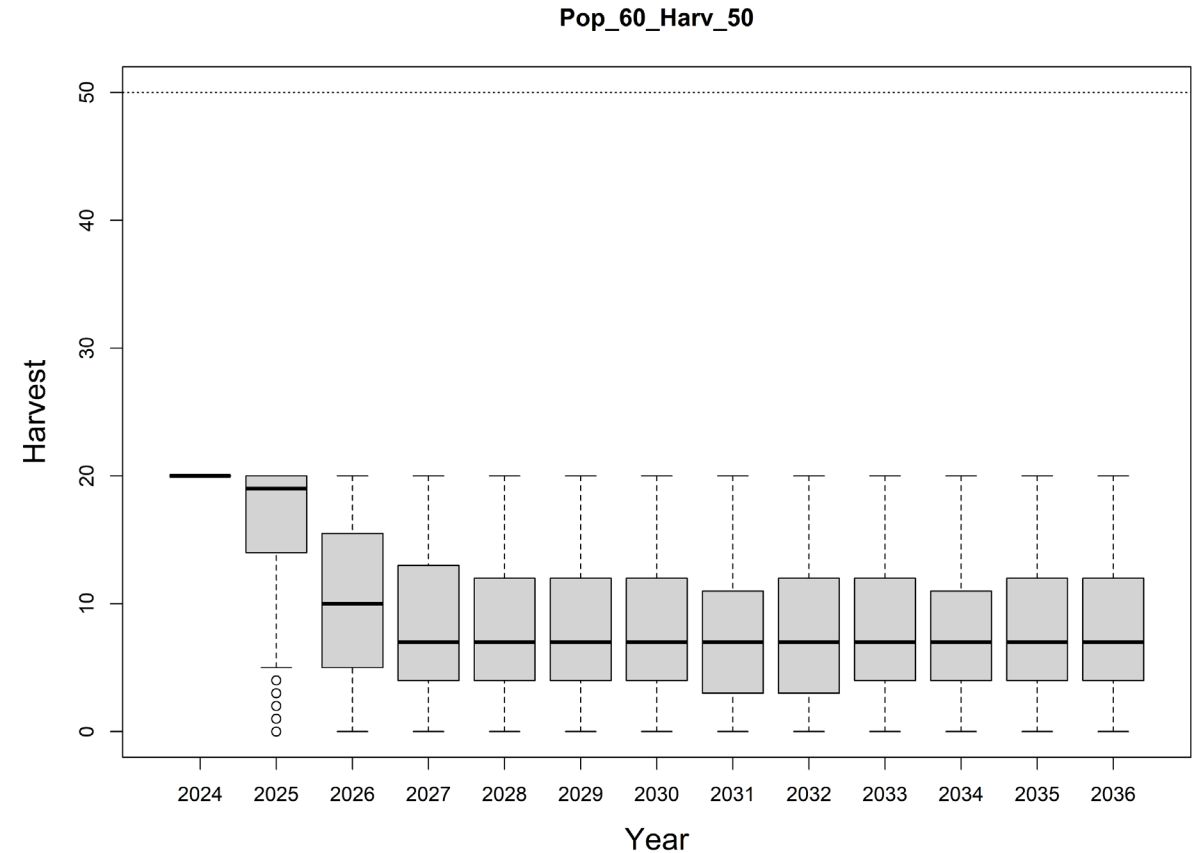
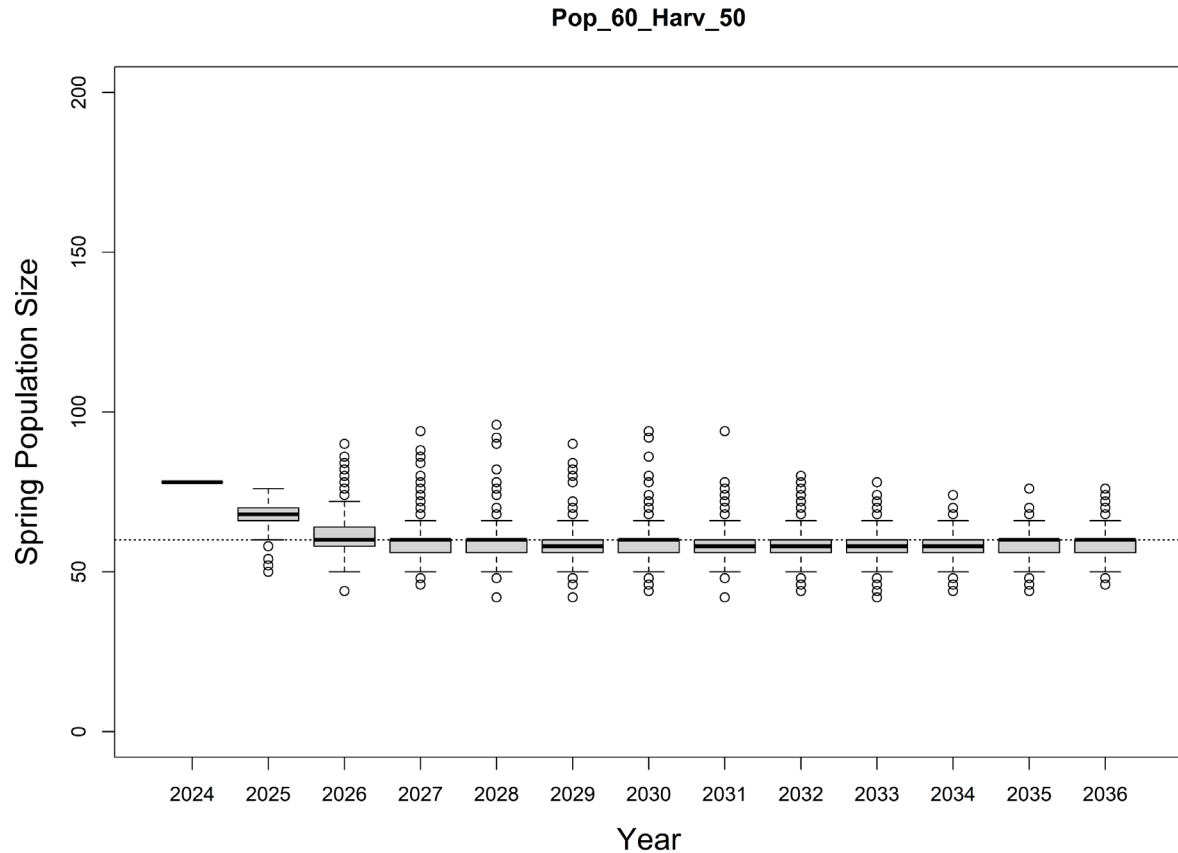
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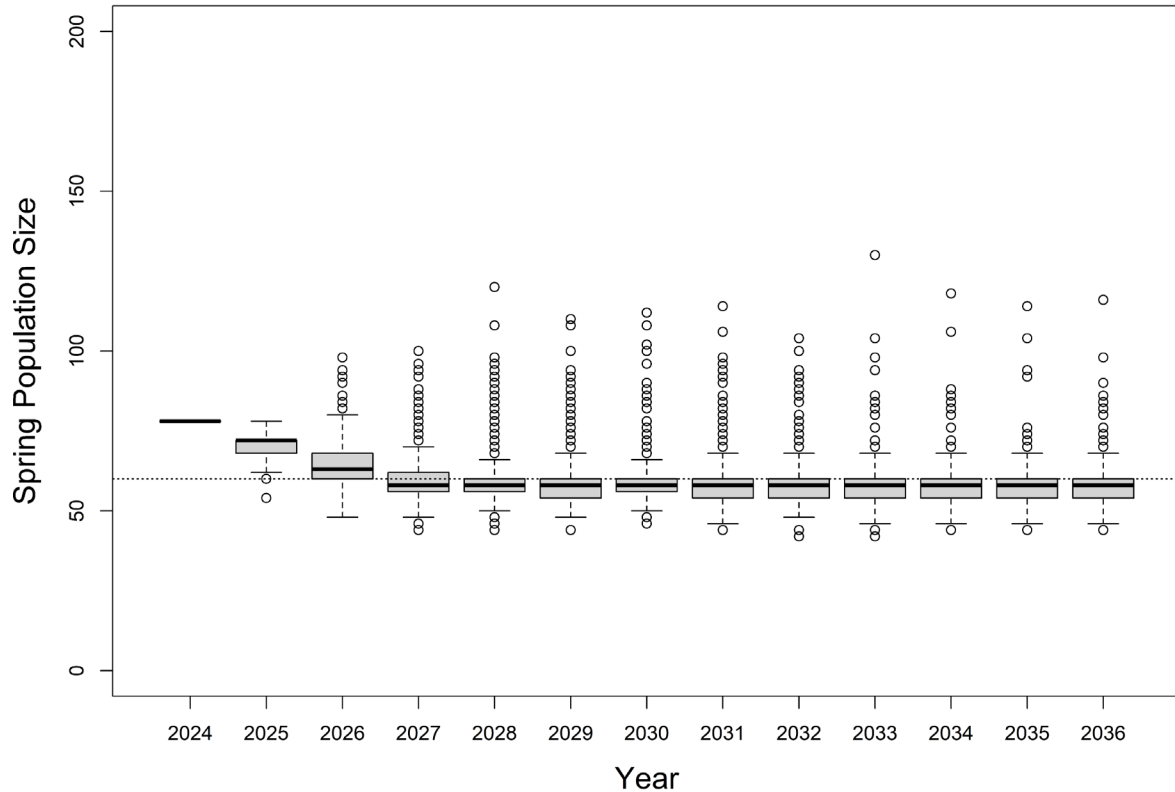
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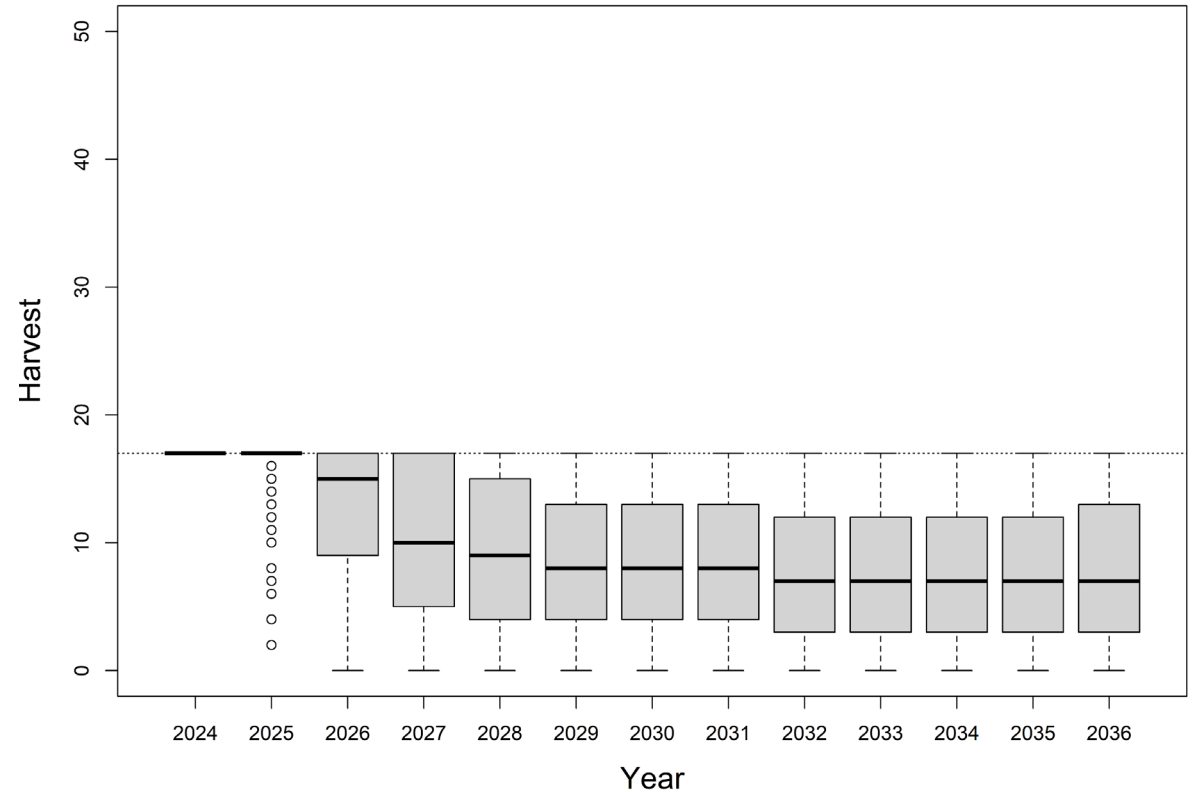
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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
17k	maximum 1992-2023	61.2k (8.3)	9.9k (6.0)	57.4k (4.9)	7.7k (5.7)

Pop_60_Harv_17



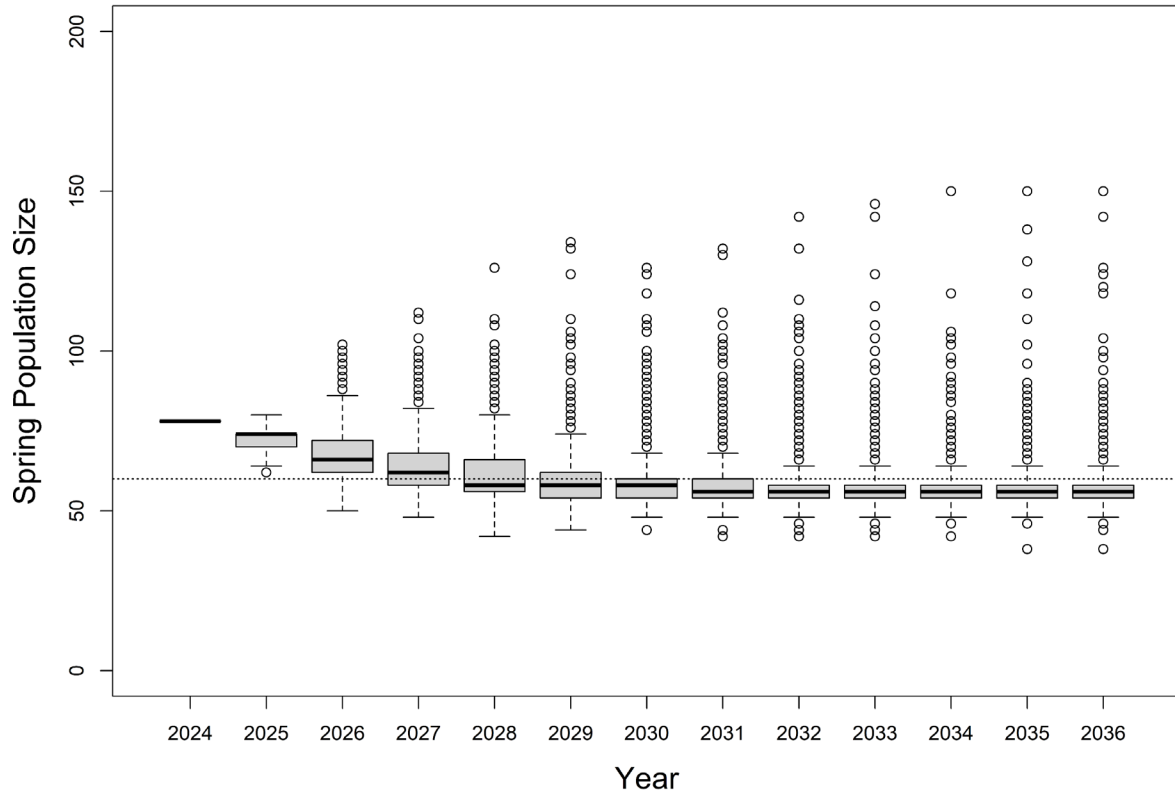
Pop_60_Harv_17



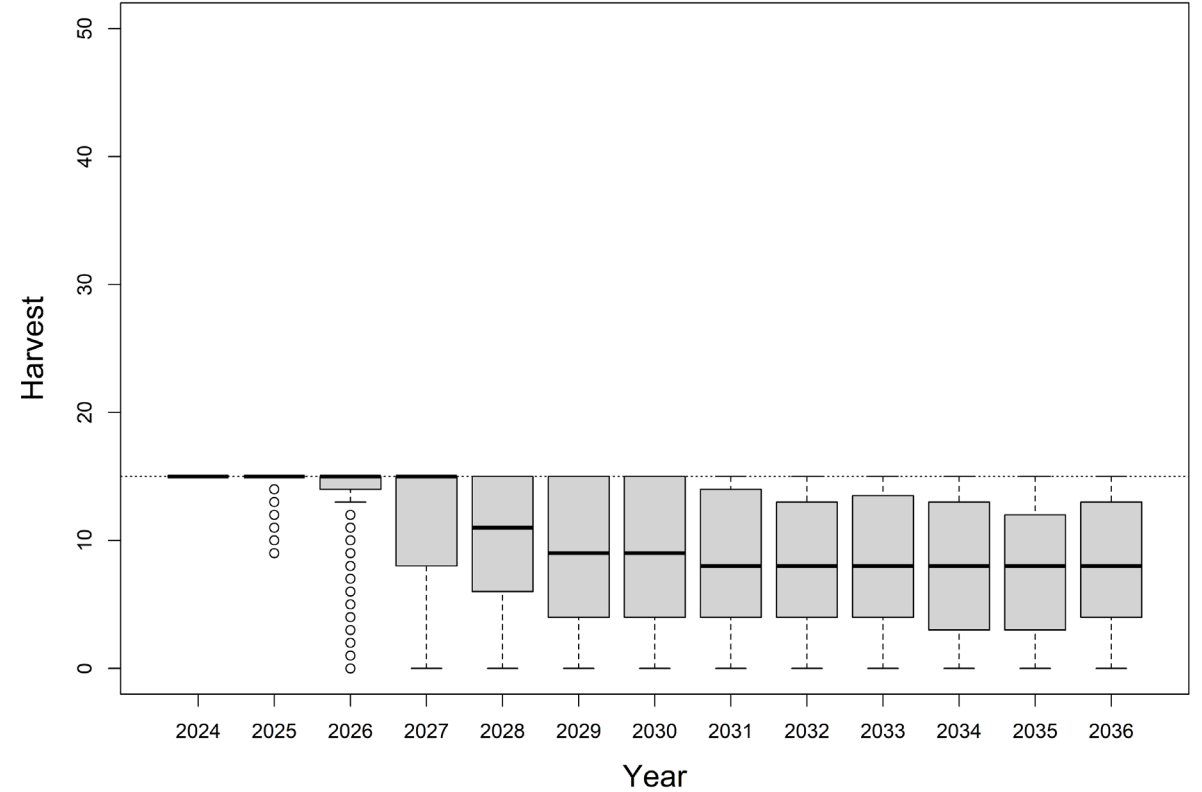
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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
15k	mean 2016-2020	62.4k (10.2)	10.0k (5.3)	57.6k (7.8)	8.1k (5.1)

Pop_60_Harv_15

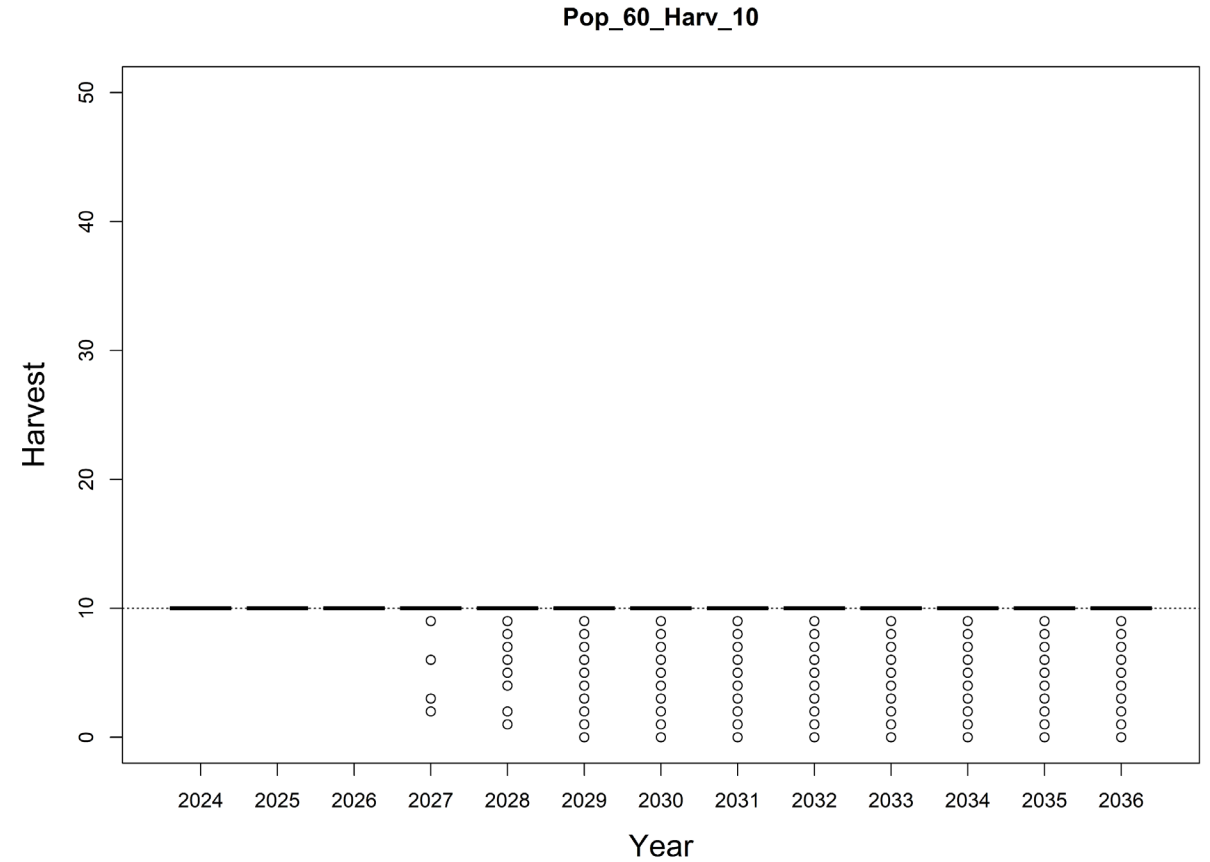
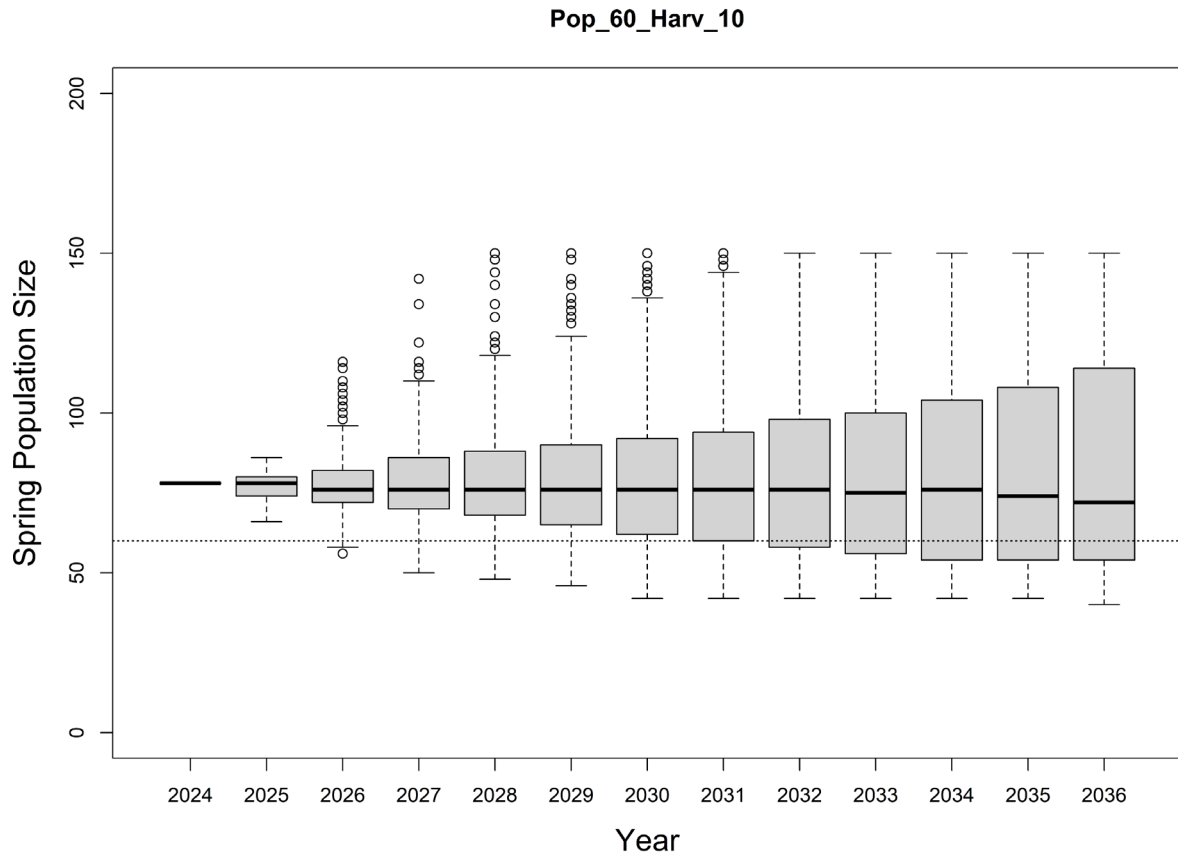


Pop_60_Harv_15



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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
10k	mean 2021-2023	80.1k (23.3)	9.5 (1.8)	84.9k (35.0)	8.8k (2.7)



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Population Target: 60,000

Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
50k	unconstrained	62.8k (5.5)	9.7k (7.8)	61.7k (3.4)	8.5k (6.4)
17k	maximum 1992-2023	61.2k (8.3)	9.9k (6.0)	57.4k (4.9)	7.7k (5.7)
15k	mean 2016-2020	62.4k (10.2)	10.0k (5.3)	57.6k (7.8)	8.1k (5.1)
10k	mean 2021-2023	80.1k (23.3)	9.5 (1.8)	84.9k (35.0)	8.8k (2.7)

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Population Target: 80,000



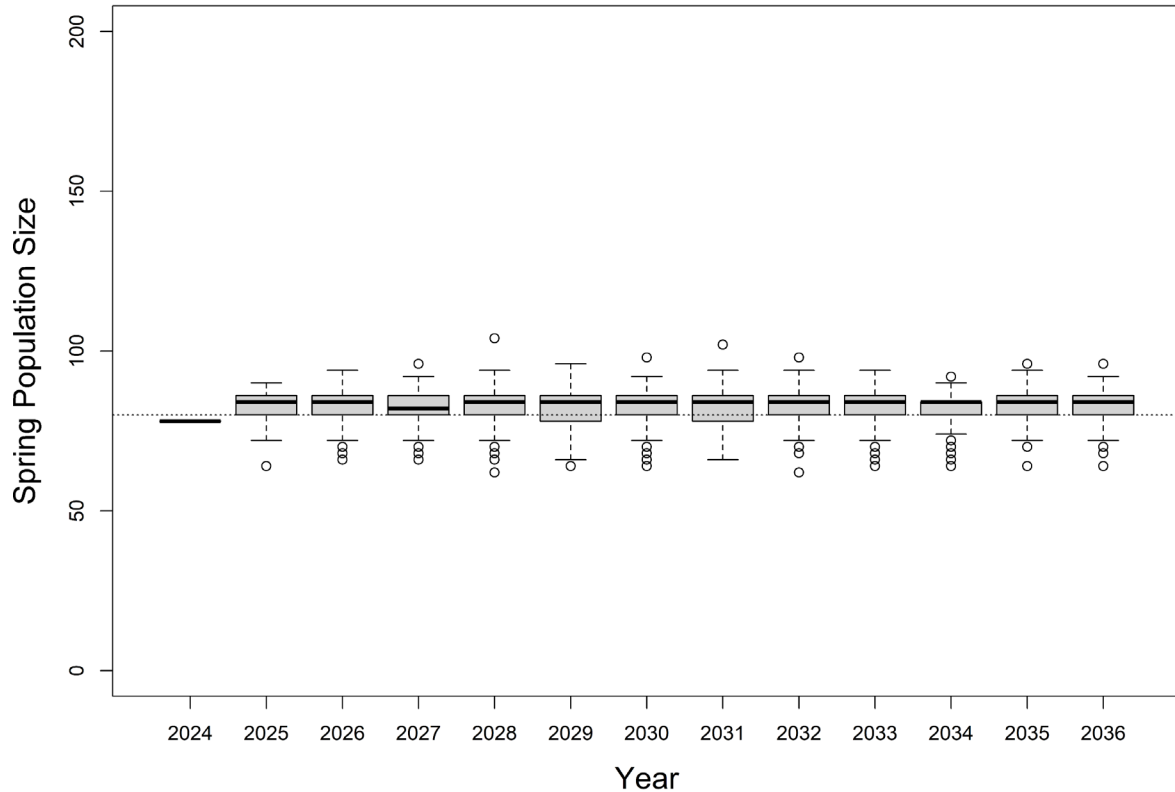
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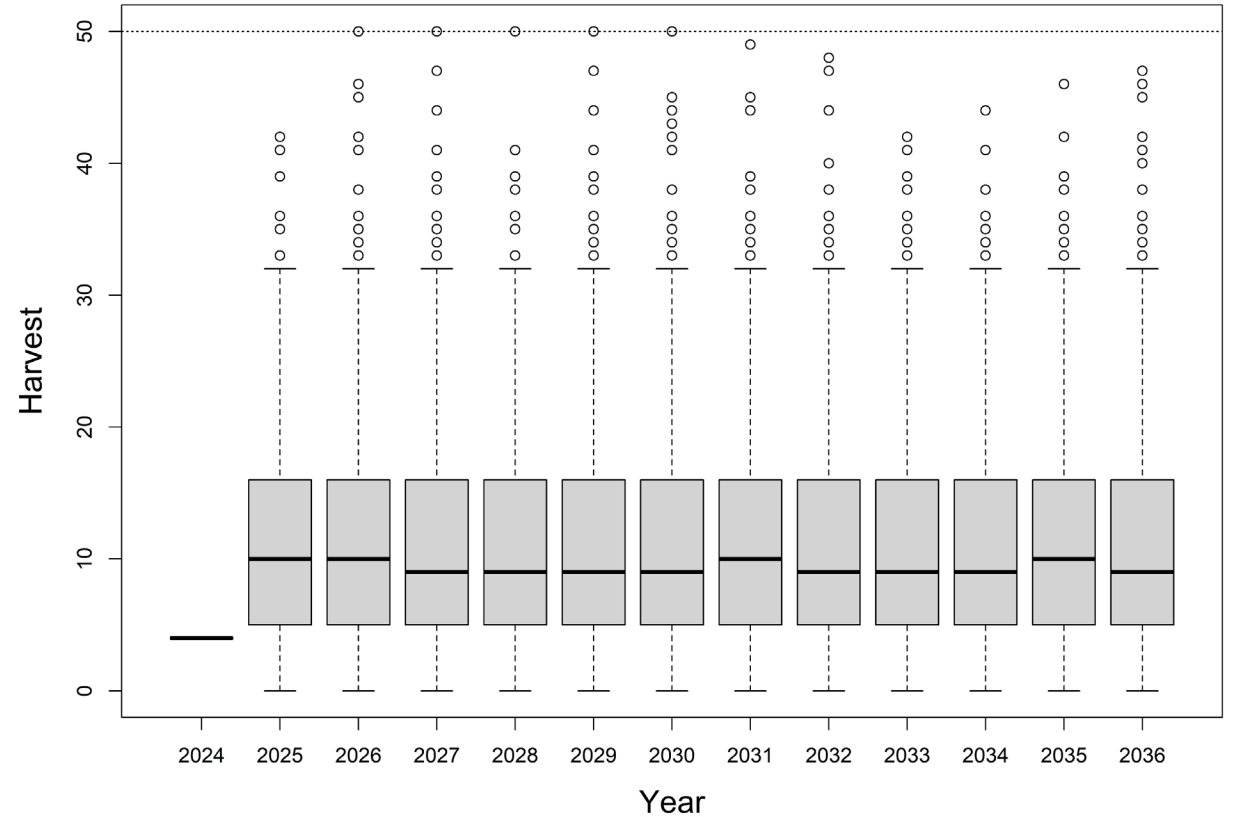
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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
50k	unconstrained	81.8k (4.5)	10.5k (8.5)	82.0k (4.6)	11.1k (8.9)

Pop_80_Harv_50



Pop_80_Harv_50

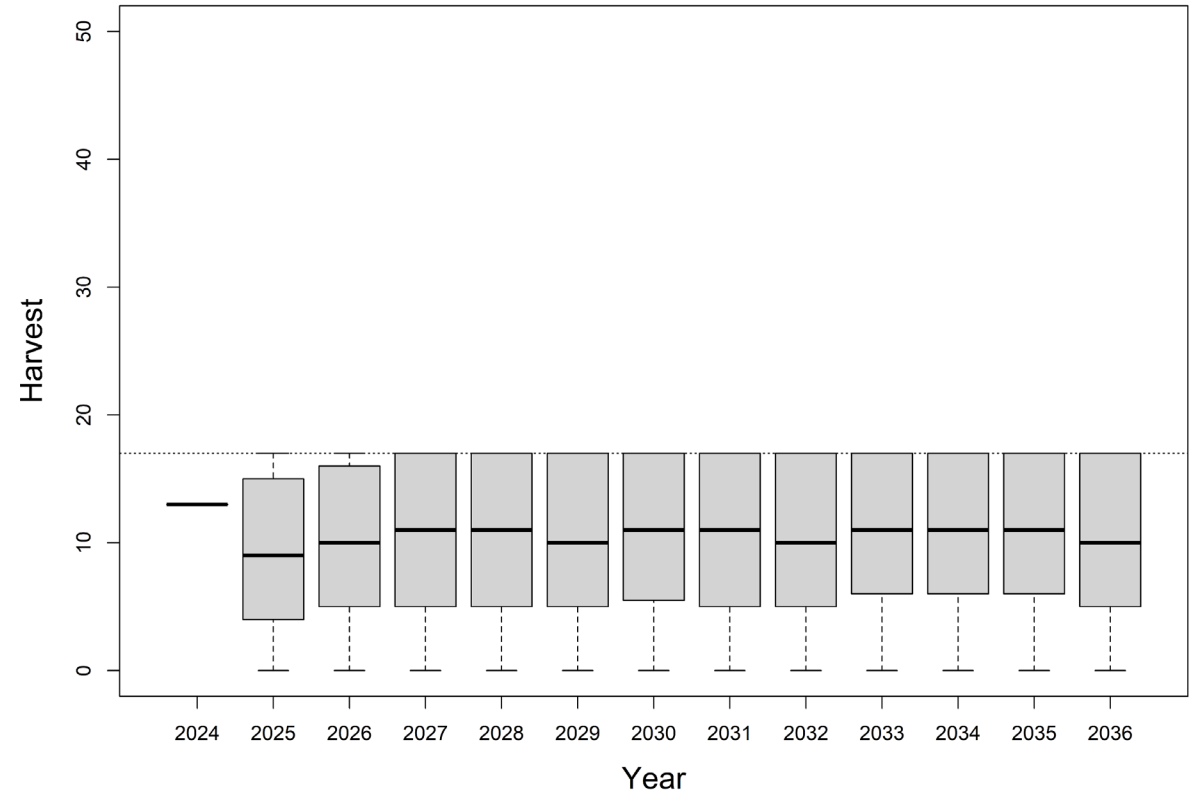
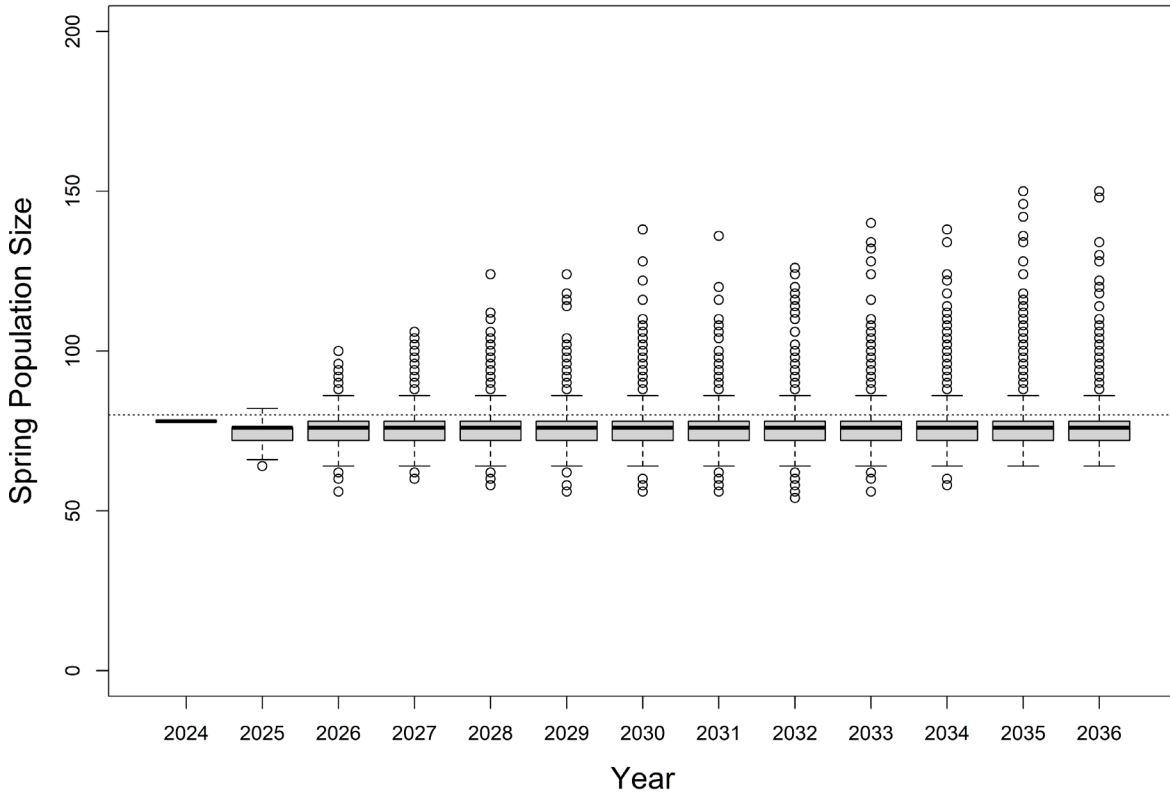


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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
17k	maximum 1992-2023	76.0k (6.8)	10.1k (5.8)	76.6k (8.6)	10.2k (6.1)

Pop_80_Harv_17

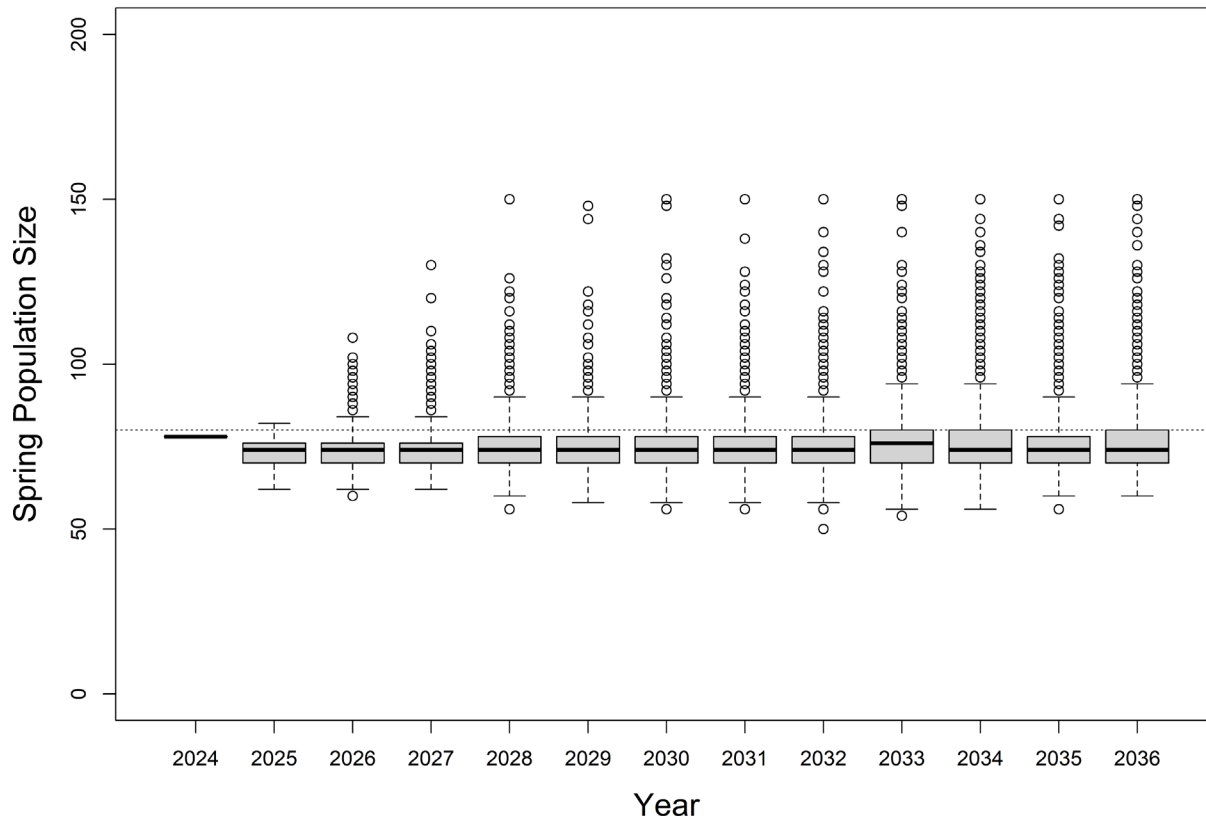
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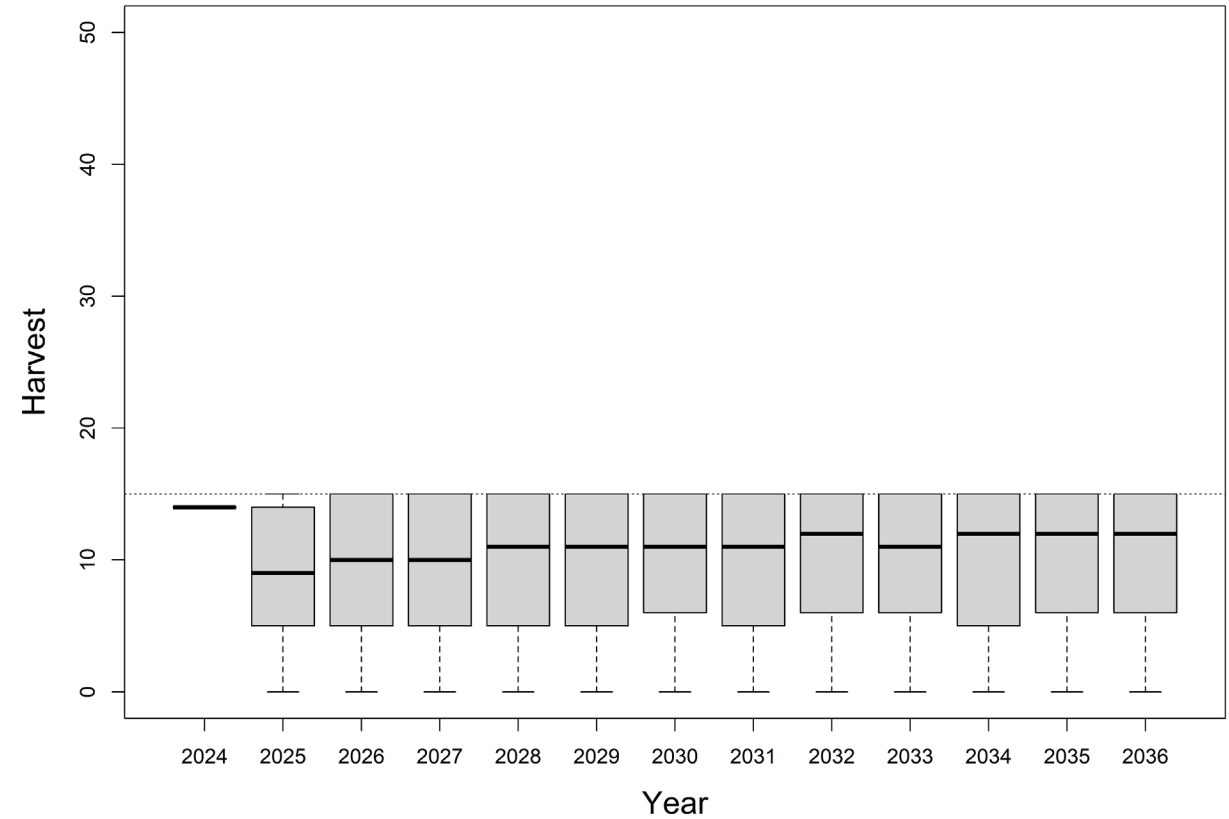
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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
15k	mean 2016-2020	76.4k (9.4)	10.2k (5.2)	78.0k (12.8)	10.1k (5.3)

Pop_80_Harv_15

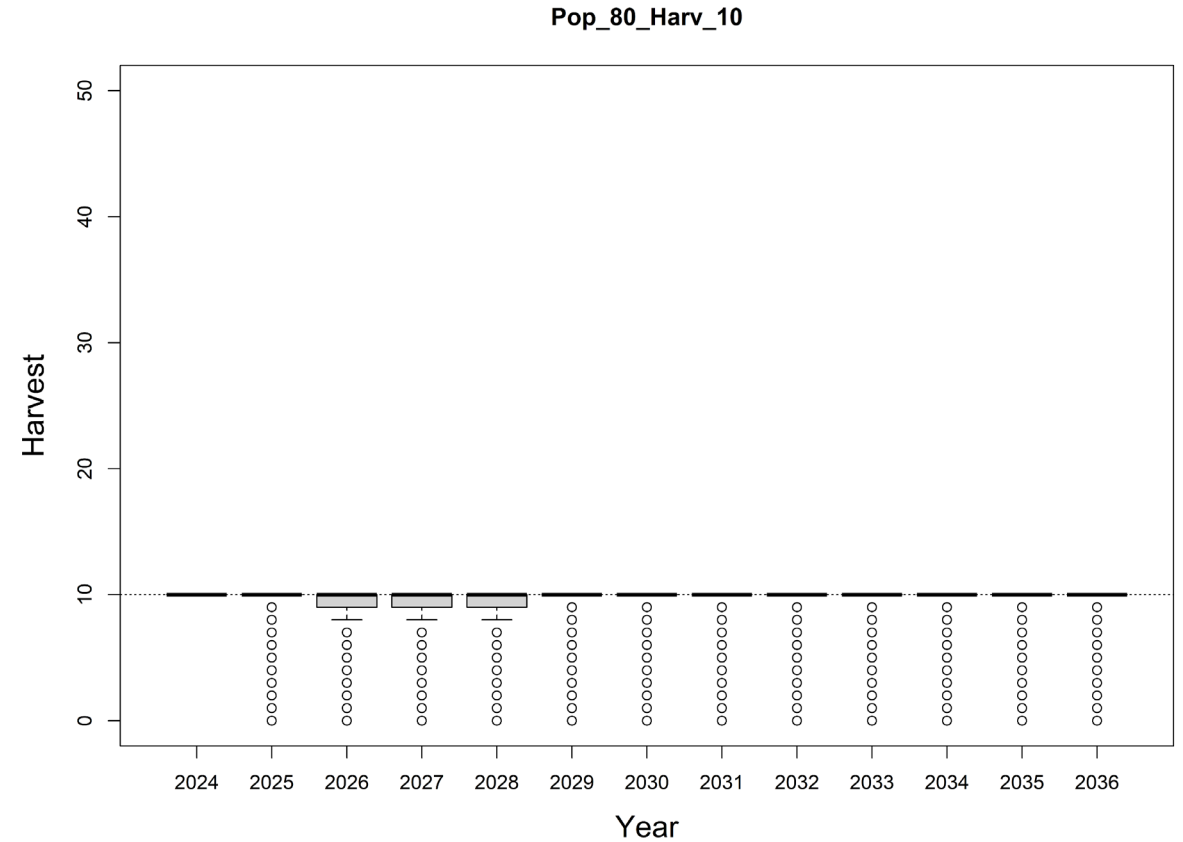
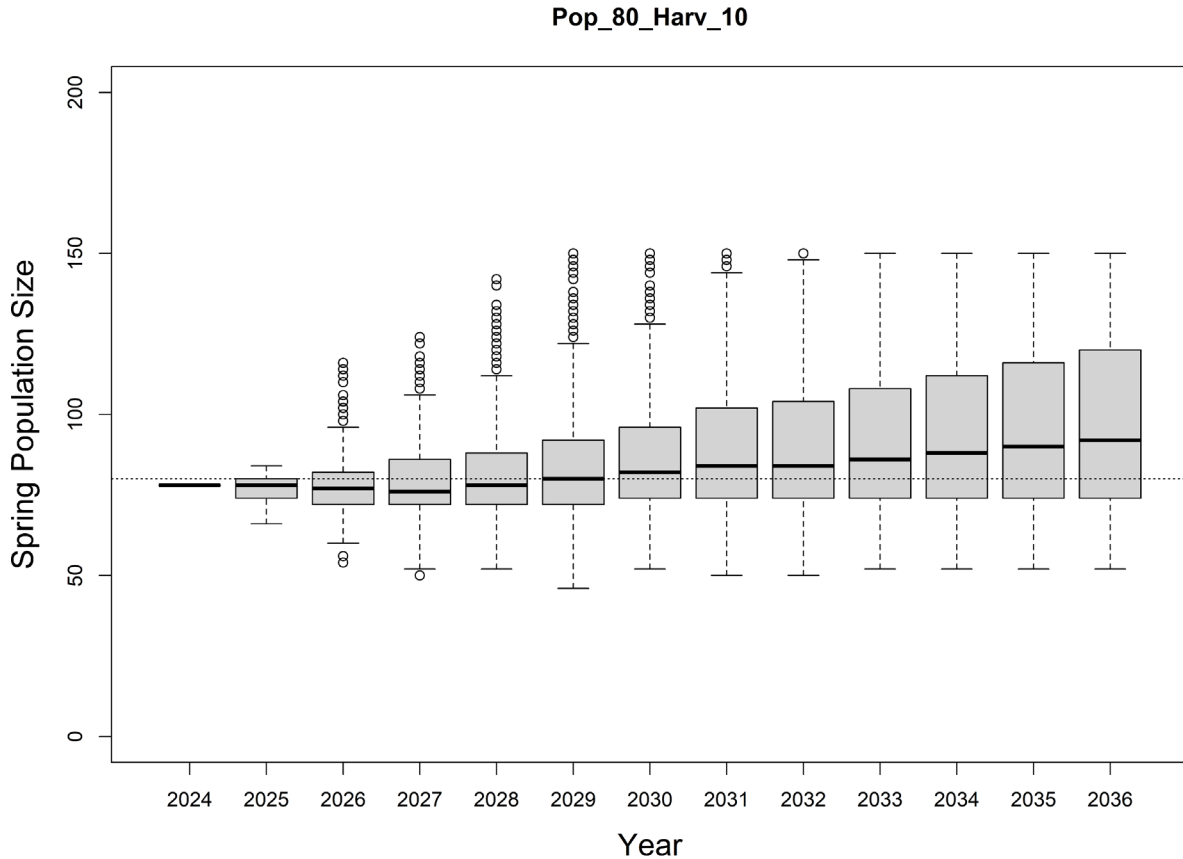


Pop_80_Harv_15



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Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
10k	mean 2021-2023	87.2k (21.0)	9.1k (2.3)	100.0k (28.7)	9.2k (2.1)



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Population Target: 80,000

Maximum attainable harvest	Source	Mean N (sd)	Mean H (sd)	Last N (sd)	Last H (sd)
50k	unconstrained	81.8k (4.5)	10.5k (8.5)	82.0k (4.6)	11.1k (8.9)
17k	maximum 1992-2023	76.0k (6.8)	10.1k (5.8)	76.6k (8.6)	10.2k (6.1)
15k	mean 2016-2020	76.4k (9.4)	10.2k (5.2)	78.0k (12.8)	10.1k (5.3)
10k	mean 2021-2023	87.2k (21.0)	9.1k (2.3)	100.0k (28.7)	9.2k (2.1)

Conclusions

- With unconstrained maximum harvest, optimal harvests can achieve a mean pop size close to the intended target after 12 years
- Variation in pop size increases and variation in annual harvest decreases as the capacity to exert harvest pressure declines. Constraining maximum harvest increases risk of failing to achieve target
- Max harvests of 15k and 17k results in pop slightly below target (pulses in population growth difficult to control with constrained max harvests)
- Max harvests of 10k could result in loss of control over population growth, regardless of target
- Target of 80k = more hunting opportunity (larger harvests) than 60k. However, higher harvests need to be maintained on a regular basis with higher targets (desired targets not reached if sufficient harvest not maintained)