

# Adaptive Management Working Group Meeting 9 February 2021

Platte River Recovery  
Implementation Program



*Colleen Childers*

# Whooping Cranes – Potential BIG QUESTIONS

- Q1: What are the conditions that influence whether a WC will stop or flyover the CPR?
- Q2: Can we use water to make UOCW for WC use?
  - a) Can we use SDHF (Fall) to maintain UOCW?  
Does anyone still want to test SDHF? If so, need to pose the specific question.
  - b) Can we use germination suppression flows (Spring/Summer) to maintain UOCW?
- Q3: What are the conditions that influence length of stay on the CPR?
- Q4: Are WC that stop on the CPR more fit?

# Whooping Cranes – Potential BIG QUESTIONS

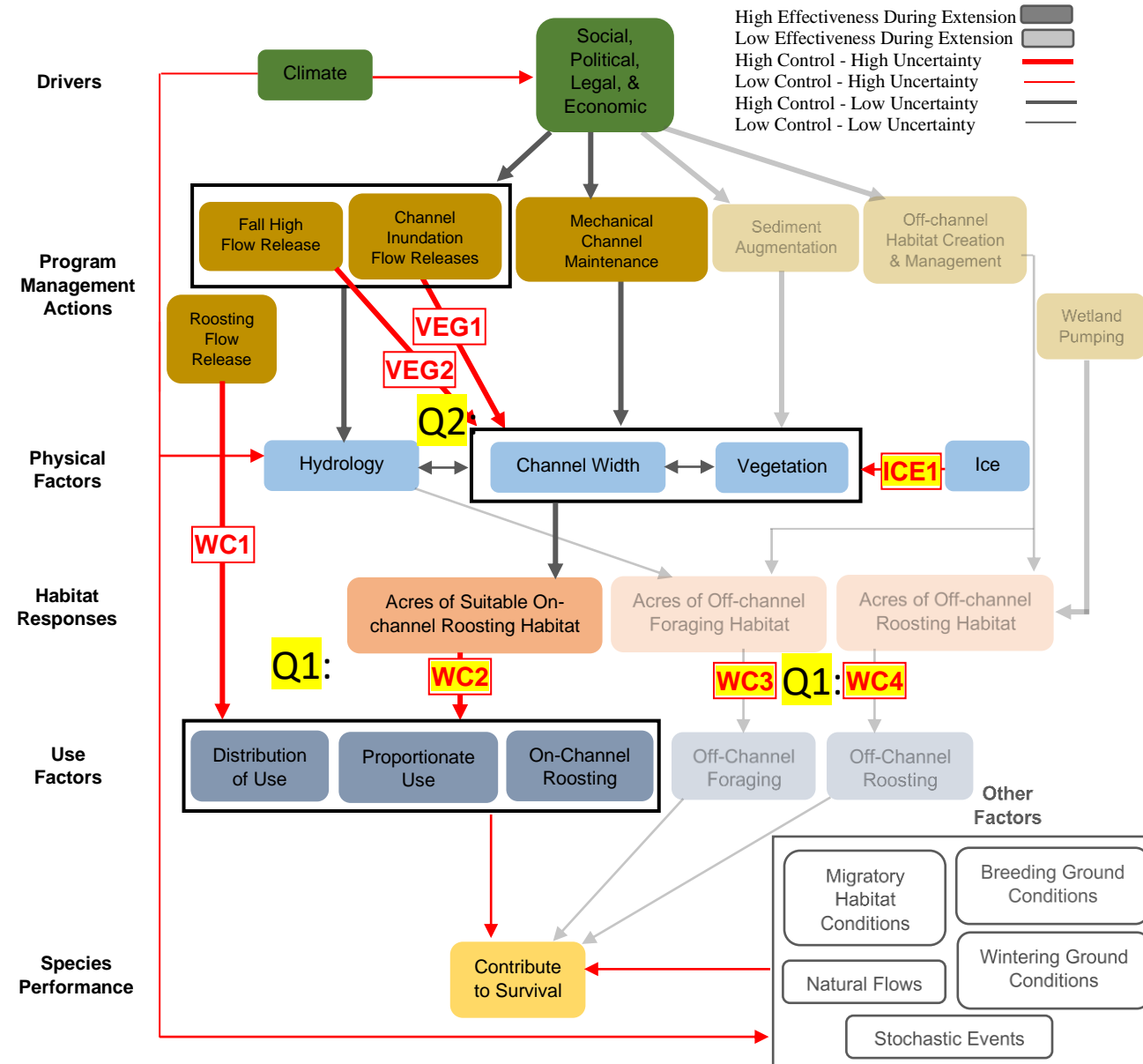
## Q1) Water during WC Migration

1) WHOOPING CRANES: Factors Influencing Stopovers vs. Flyovers	Meeting Objective: Formulating hypotheses to address Big Questions.		
<p>What are the conditions that influence whether a WC will stop or flyover the AHR?</p> <p>What hypotheses to test?</p> <p>What are the mechanisms in support of each hypothesis?</p> <p>How to test these hypotheses?</p> <p>How important is this in terms of influence on WC use?</p> <p>How likely is it that we can reduce uncertainty around this question?</p> <p>Are there direct links to PRRIP management?</p> <p>What information from the EDO will help formulate hypotheses and develop management options for testing hypotheses?</p>	1:20 PM	<a href="#">Hypotheses Formulation Worksheets</a>	

## Q2) Water for channel width creation/maintenance for WC

2) WHOOPING CRANES: Can we use water to maintain unobstructed channel width (UOCW) for WC use?	Meeting Objective: Formulating hypotheses to address Big Questions.		
<p>Can we use water to maintain unobstructed channel width (UOCW) for WC use? Short duration high flows? Germination suppression flows?</p> <p>What hypotheses to test?</p> <p>What are the mechanisms in support of each hypothesis?</p> <p>How to test these hypotheses?</p> <p>How important is this in terms of influence on WC use?</p> <p>How likely is it that we can reduce uncertainty around this question?</p> <p>Are there direct links to PRRIP management?</p> <p>What information from the EDO will help formulate hypotheses and develop management options for testing hypotheses?</p>	3:10 PM	<a href="#">Hypotheses Formulation Worksheets</a>	

**Figure 2.** Whooping Crane Conceptual Ecological Model



# Whooping Cranes – Potential BIG QUESTIONS

- **Q1: What are the conditions that influence whether a WC will stop or flyover the CPR?**
  - What do we already know?
  - What else could be important?
  - What hypotheses to test?
  - How to test these hypotheses?
  - What information from the EDO will help formulate hypotheses and develop management options for testing hypotheses?
  - How likely is it that we can reduce uncertainty around these Big Questions?
  - Will answering these Big Questions influence our management?

**Hypothesis:** Introduce your hypothesis, independent and dependent variables on each axis.

What data support this hypothesis? What are the mechanisms that connect independent variables to the response you predict?

Dependent

Define this variable.  
What range of responses are expected?  
How will they be measured?

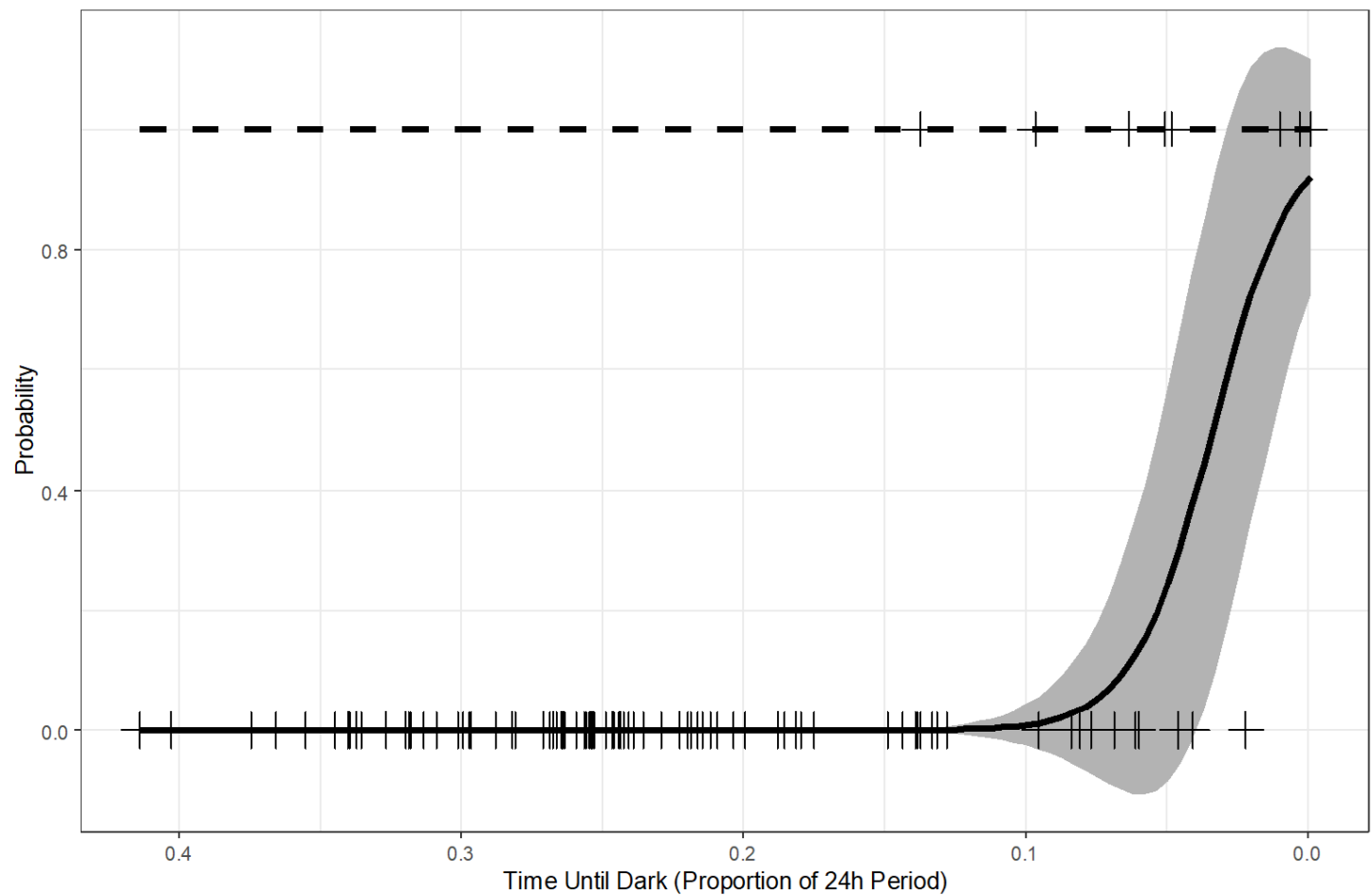
Define this variable.  
What range of conditions will be tested?  
Over what period of time?  
Over what spatial scale?  
How will they be created for testing?

Independent

**Description/Link to Program Management:**

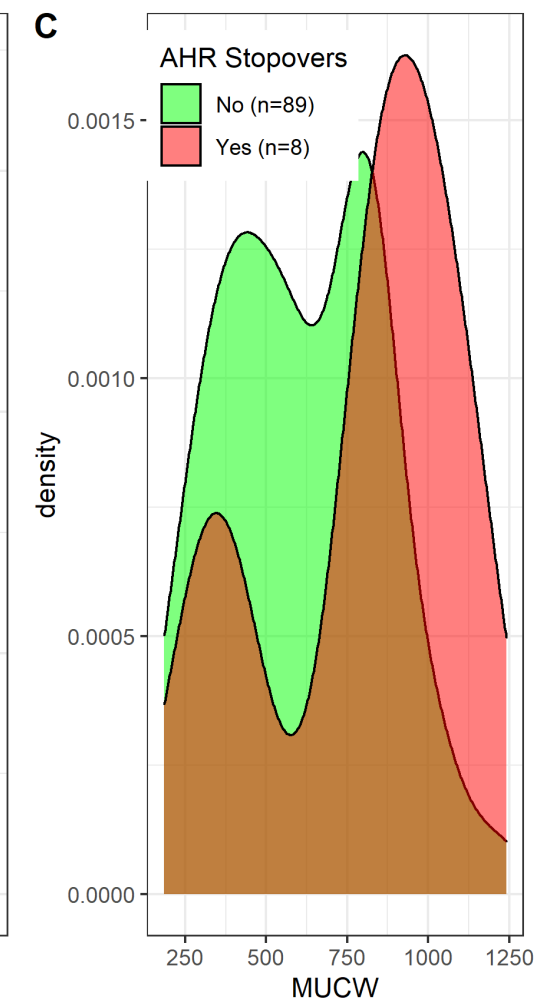
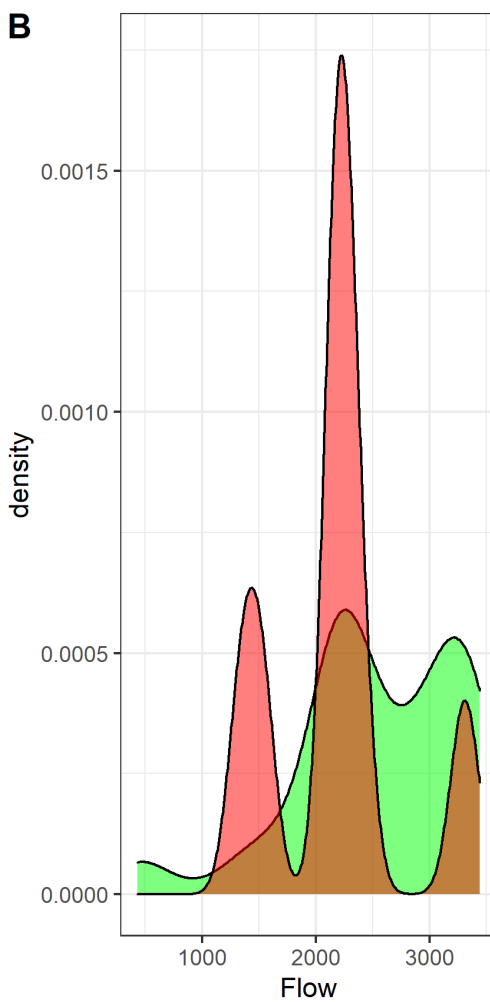
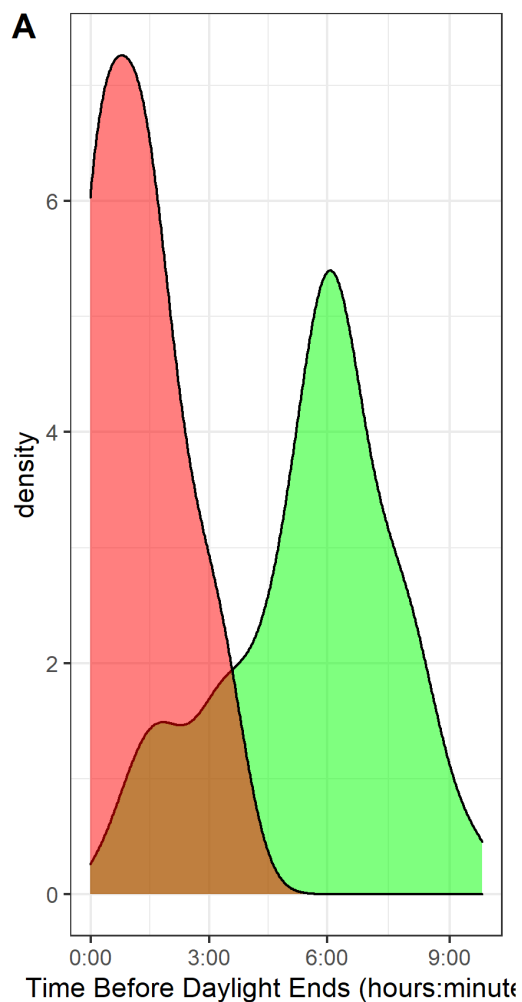
How is this hypothesis linked to Program management?

**Hypothesis:** Stopover probability along the AHR increases as it gets closer to dark.  
Stopovers along the AHR occur with greater probability 3 hours or less before dark (30 min after sunset).



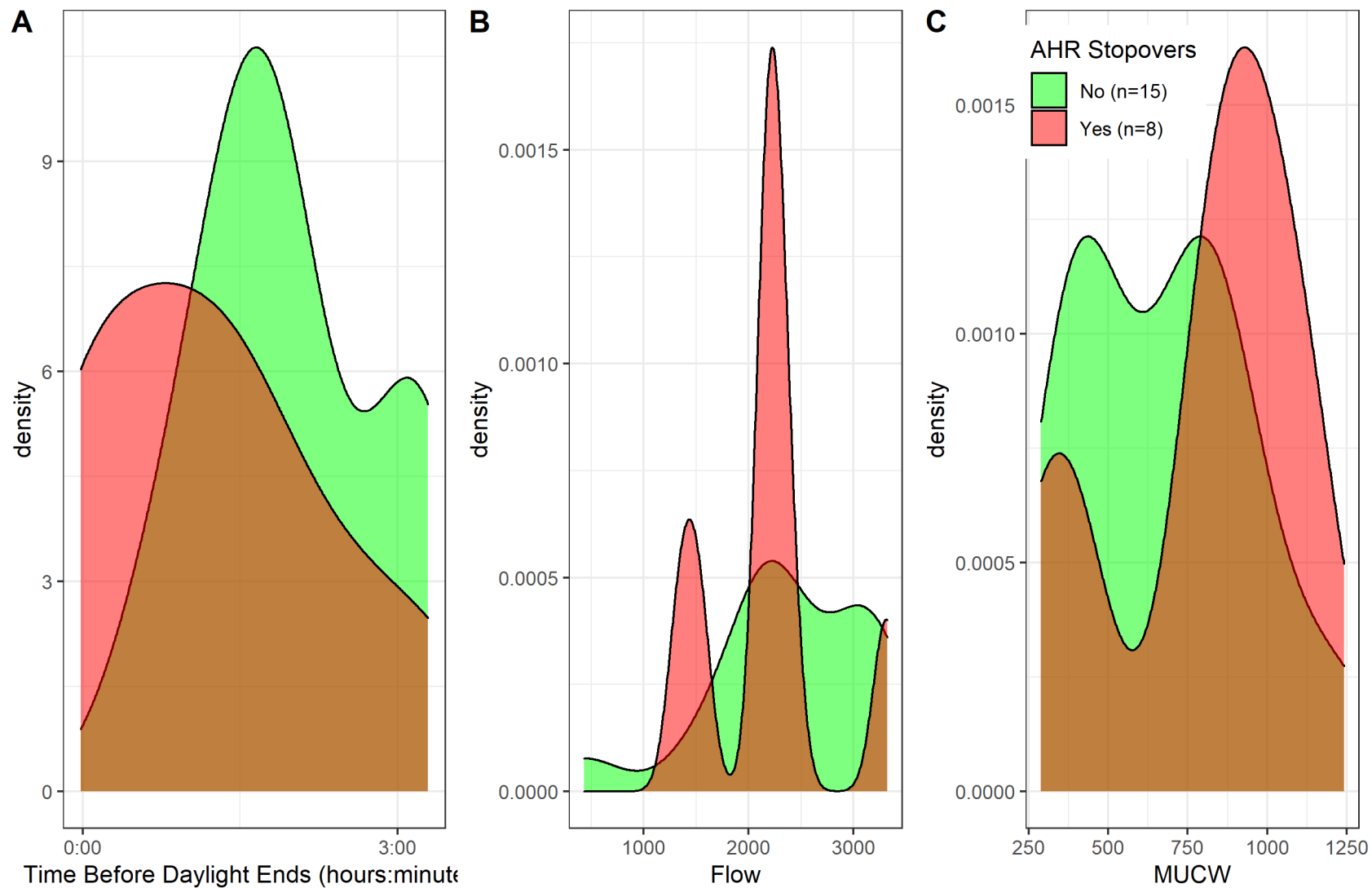
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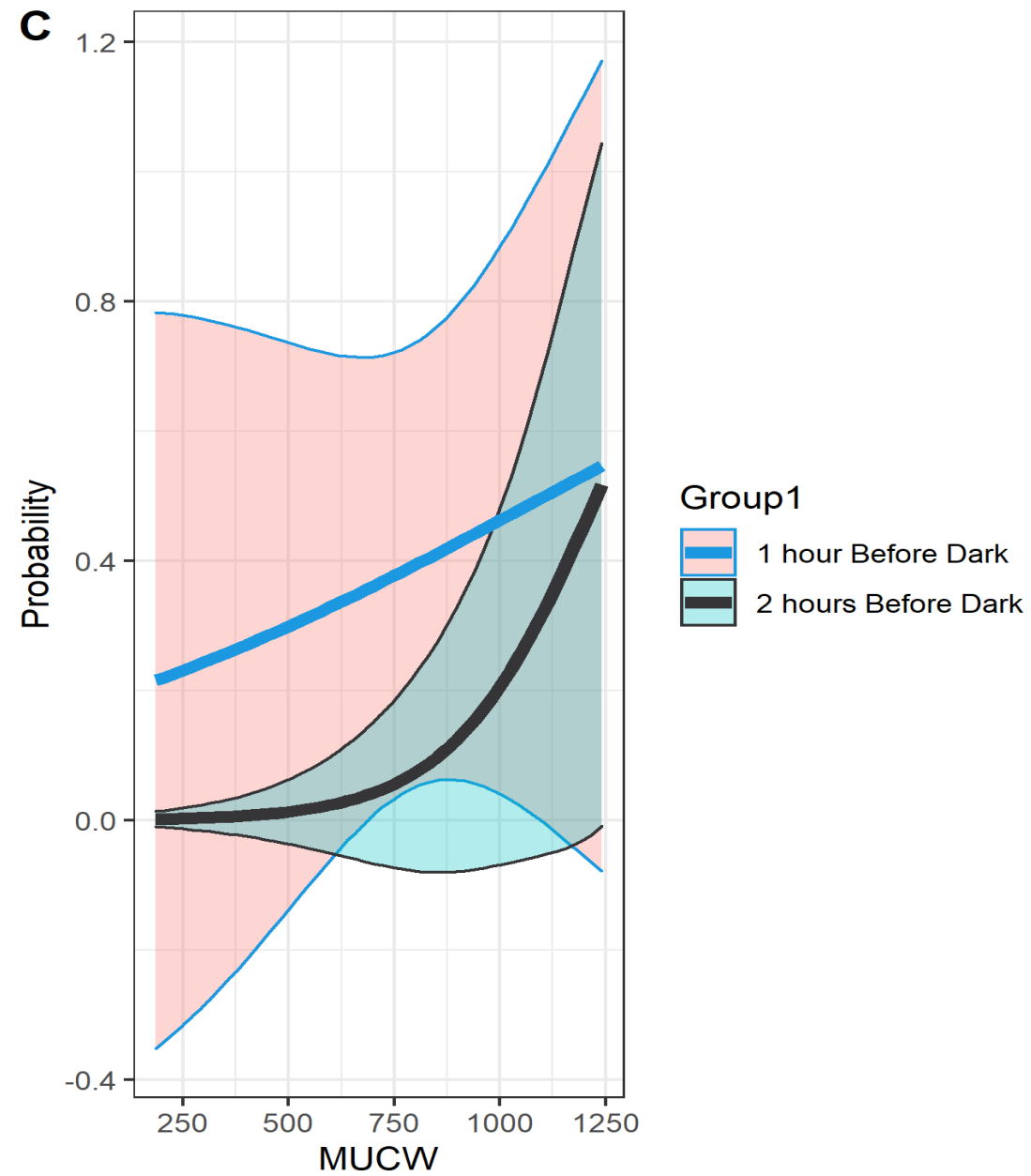
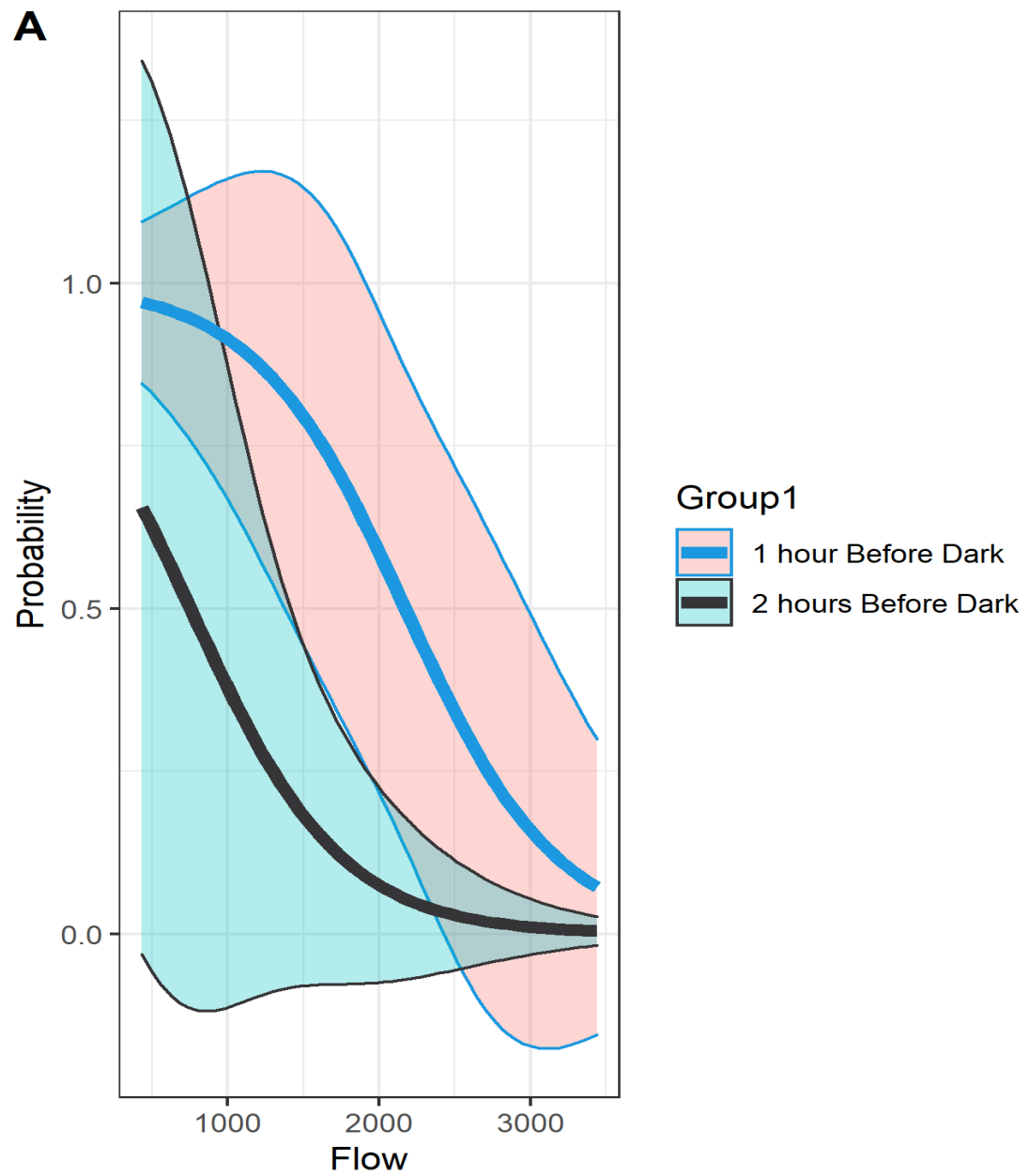
a) No links to Program Management discernable.



Model Rank	Variables	AUC	Pseudo R2
1	Time of Day * MUCW	0.96	0.58
2	Time of Day * MUCW + Flow	0.96	0.64
3	Time of Day	0.95	0.49
4	Time of Day + Flow	0.95	0.51
5	MUCW	0.7	0.07
6	Flow	0.67	0.03

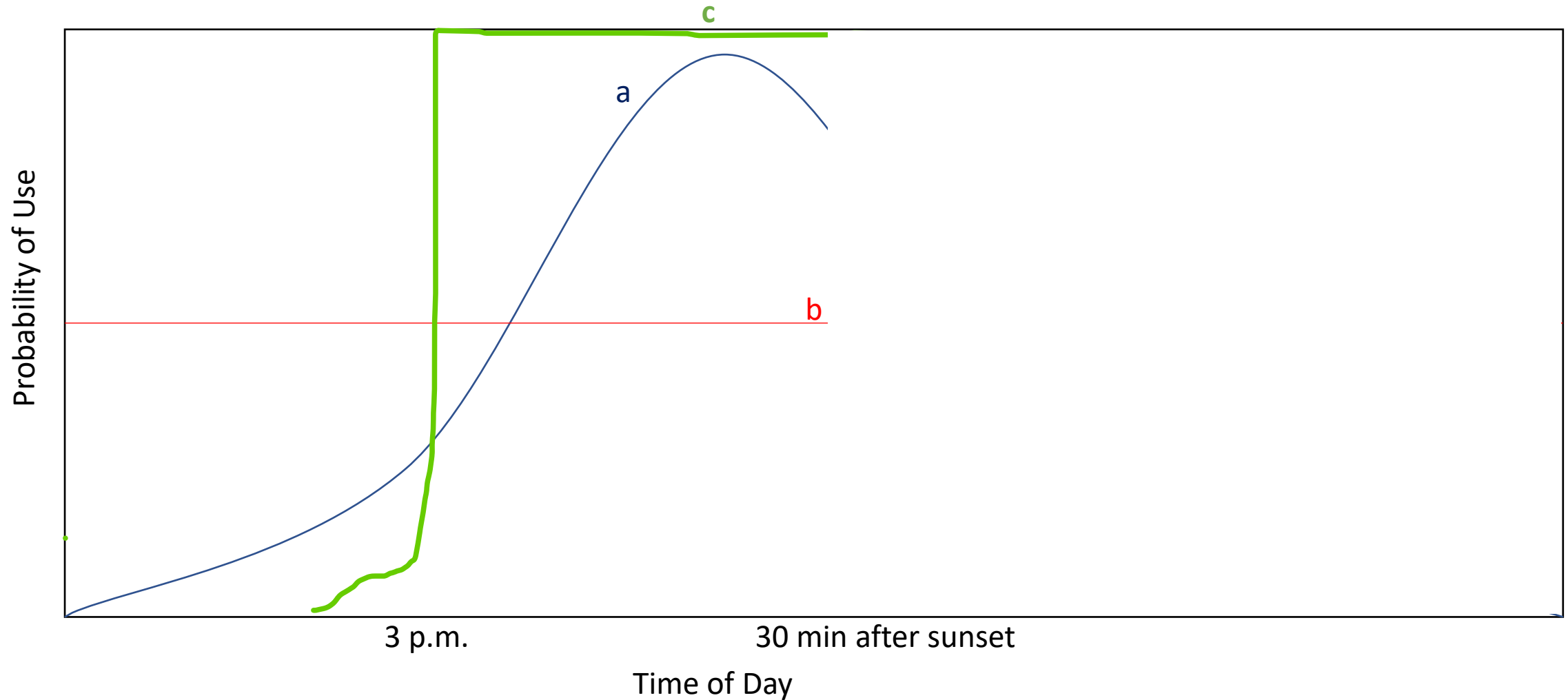
# Stopovers vs. Flyovers 3 Hours Before Dark





**Hypothesis:** Stopover probability increases as it gets closer to dark.

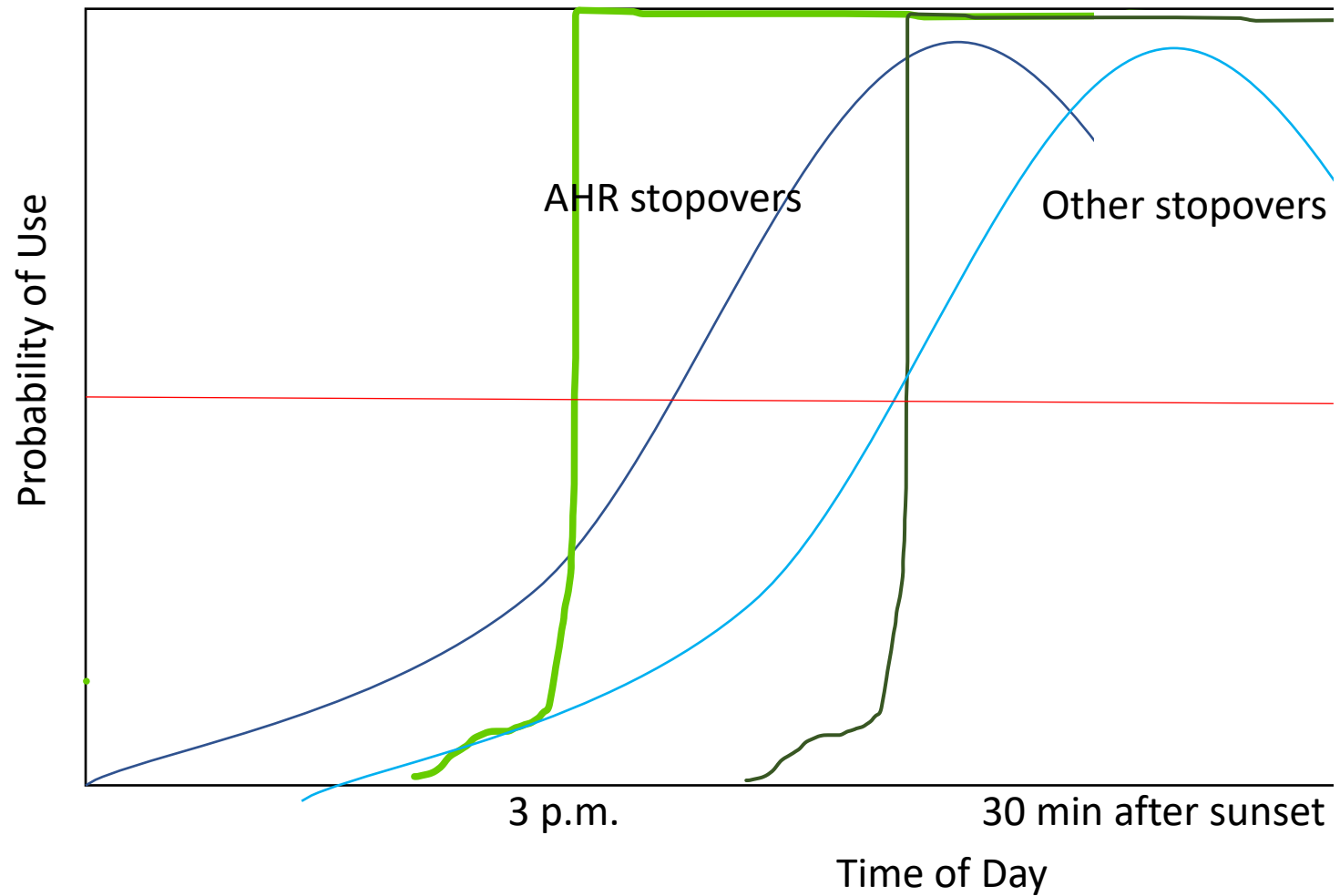
Stopovers along the AHR occur with greater probability 3 hours or less before dark (30 min after sunset).



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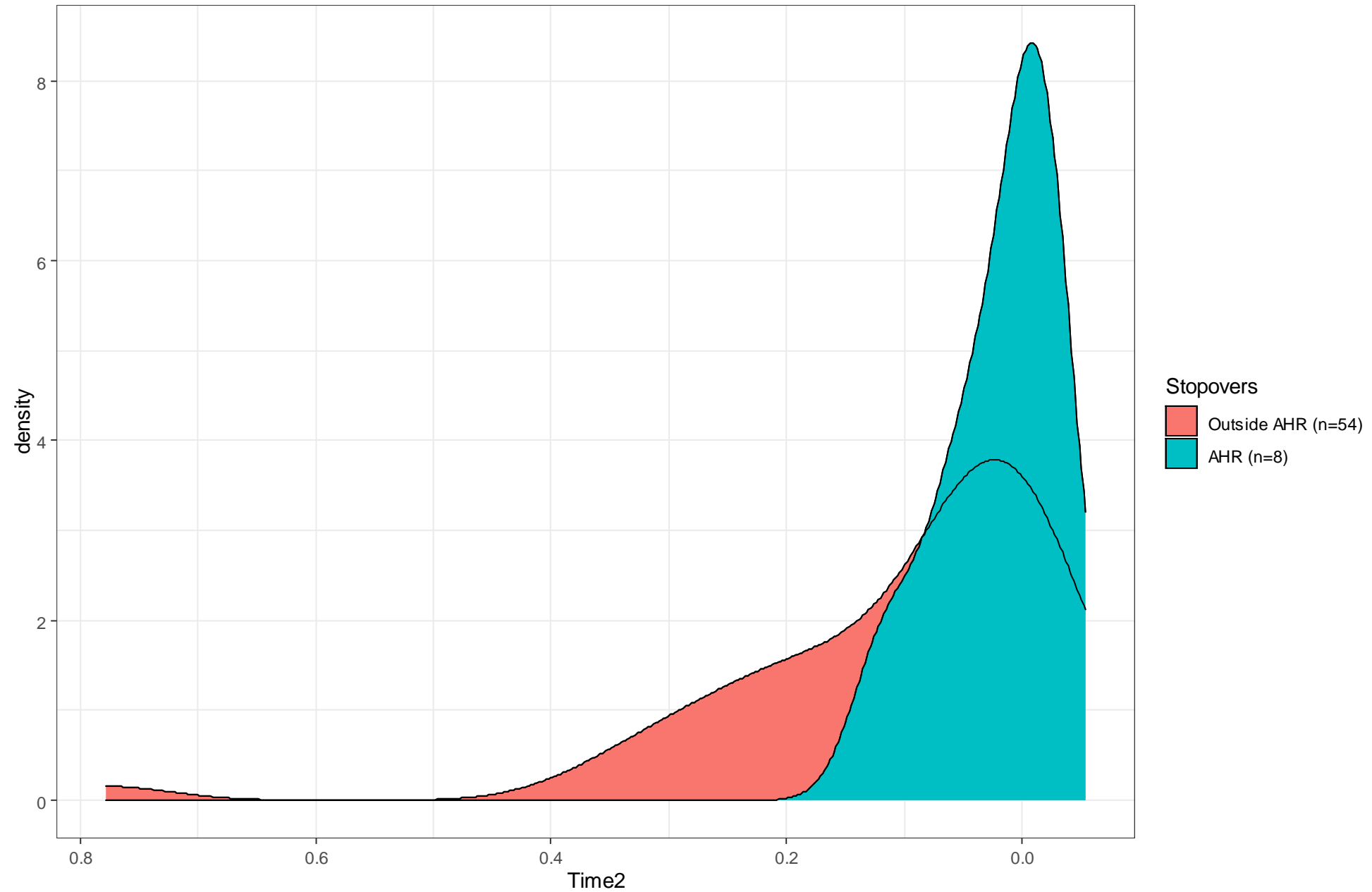
**Hypothesis:** Whooping cranes stop earlier along the AHR than they do at other stopover locations.



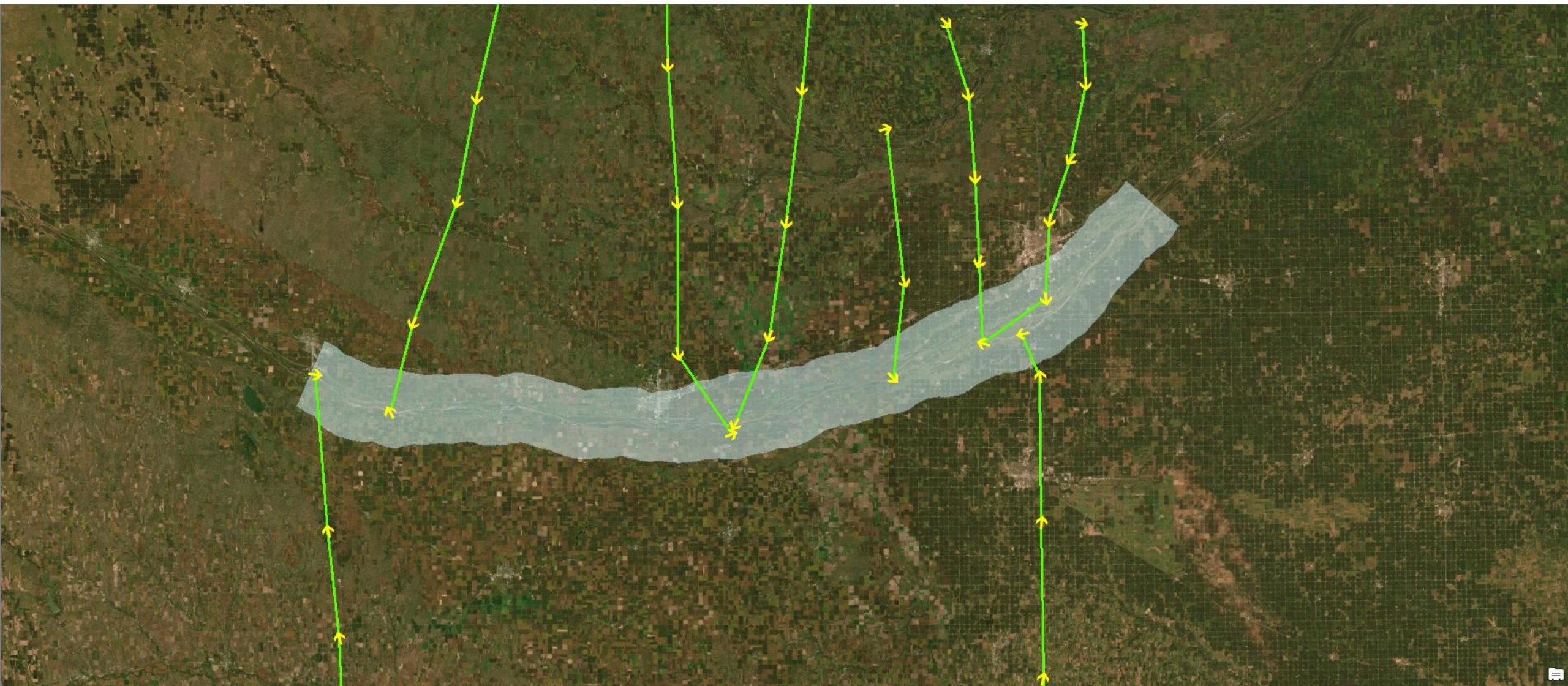
**Description/Link to Program Management:**

a) Earlier stops demonstrate selection for AHR habitat.

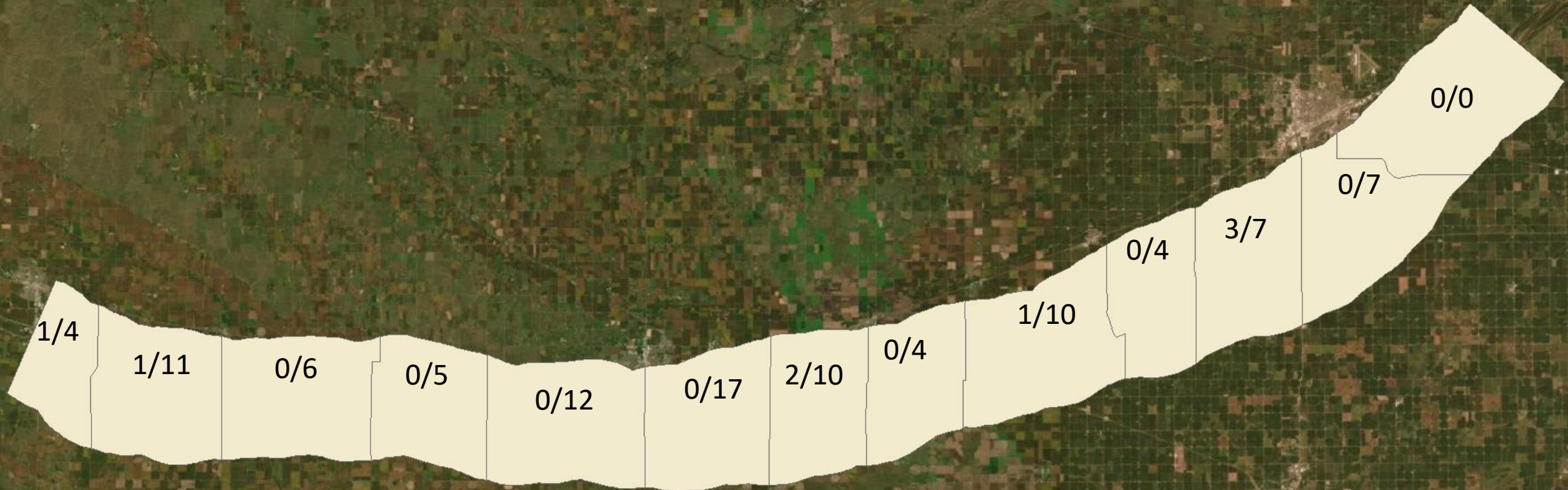
# Stopover Timing



# AHR stopover flight paths

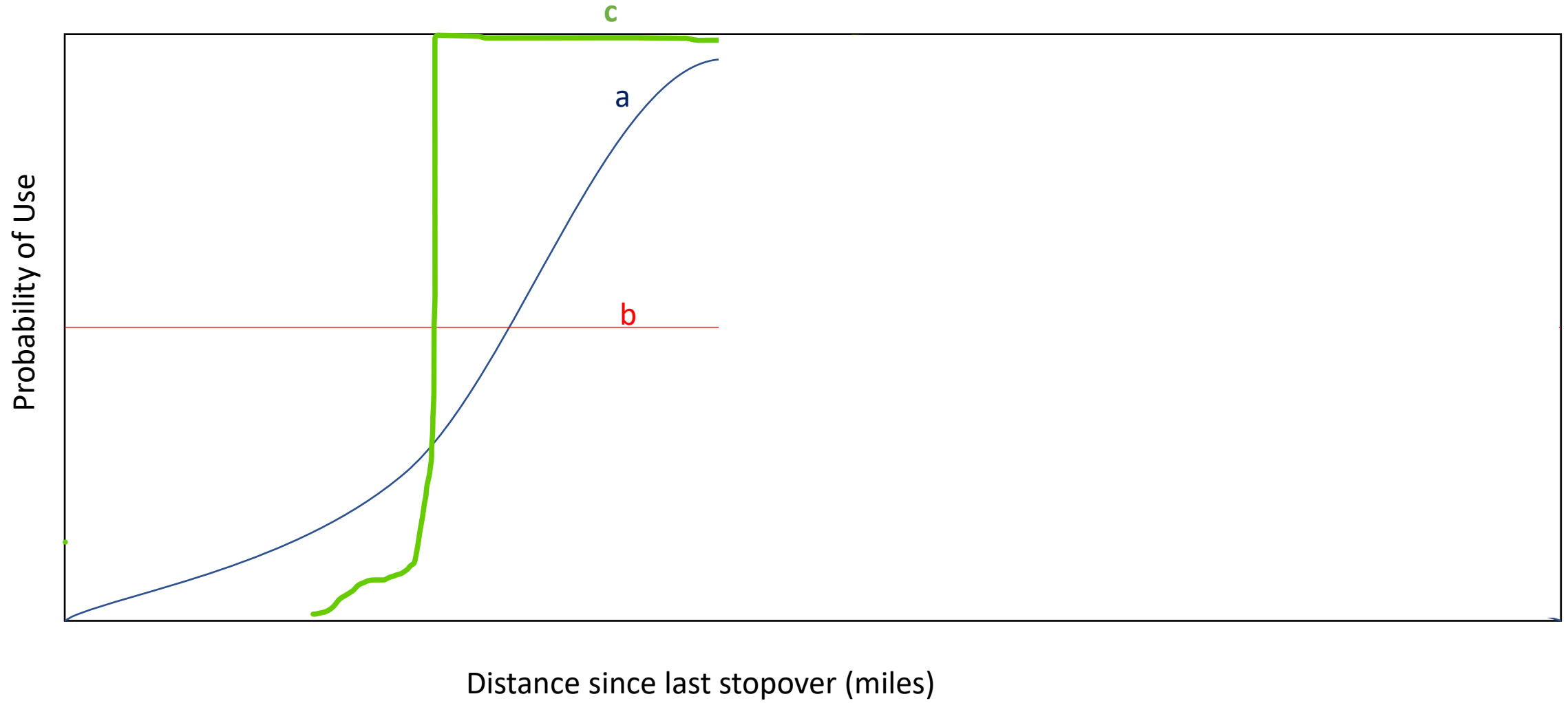


# Stopovers/flyovers by bridge segment



Stopovers/(Flyovers and Stopovers)

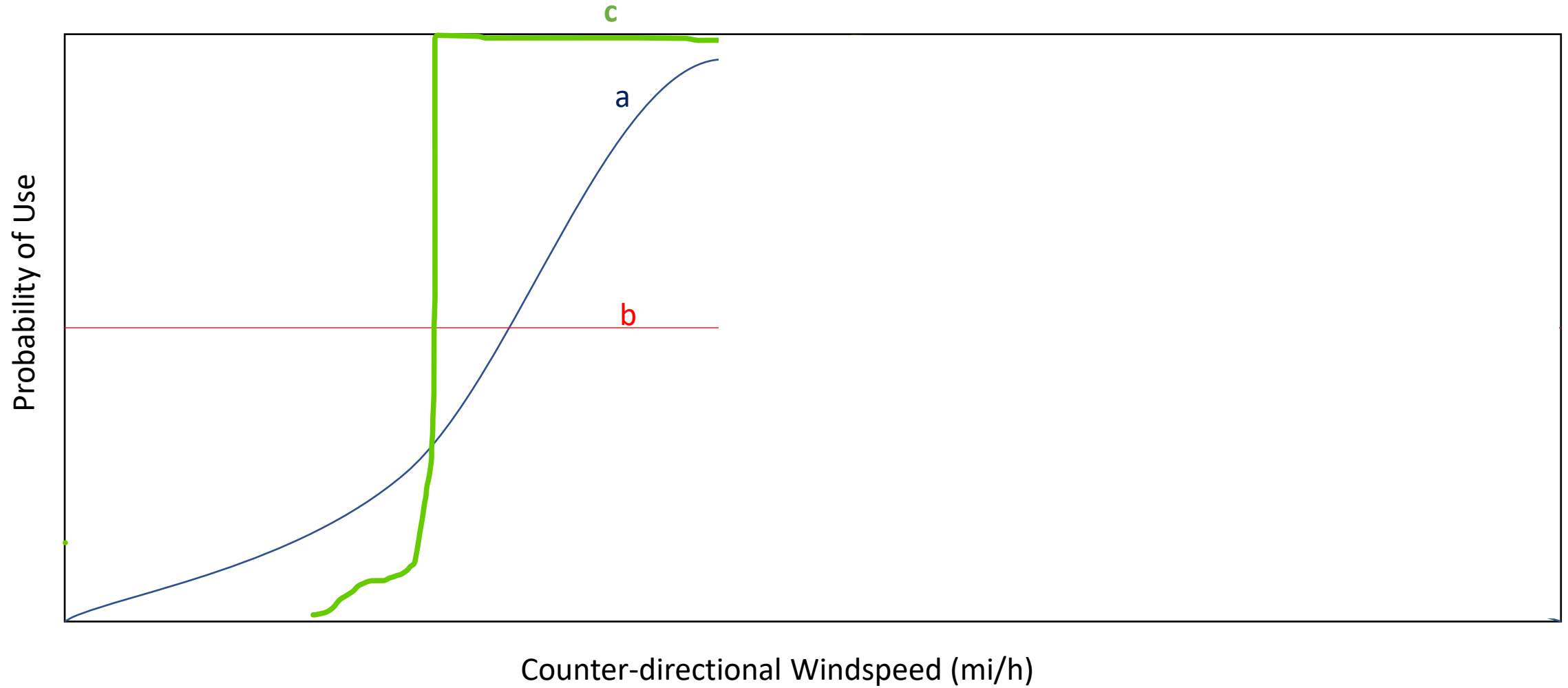
**Hypothesis:** Stopover probability increases as distance traveled since last stopover increases.



**Description/Link to Program Management:**

a) No links to Program Management discernable.

**Hypothesis:** Stopover probability increases as counter-directional windspeeds increase.



**Description/Link to Program Management:**

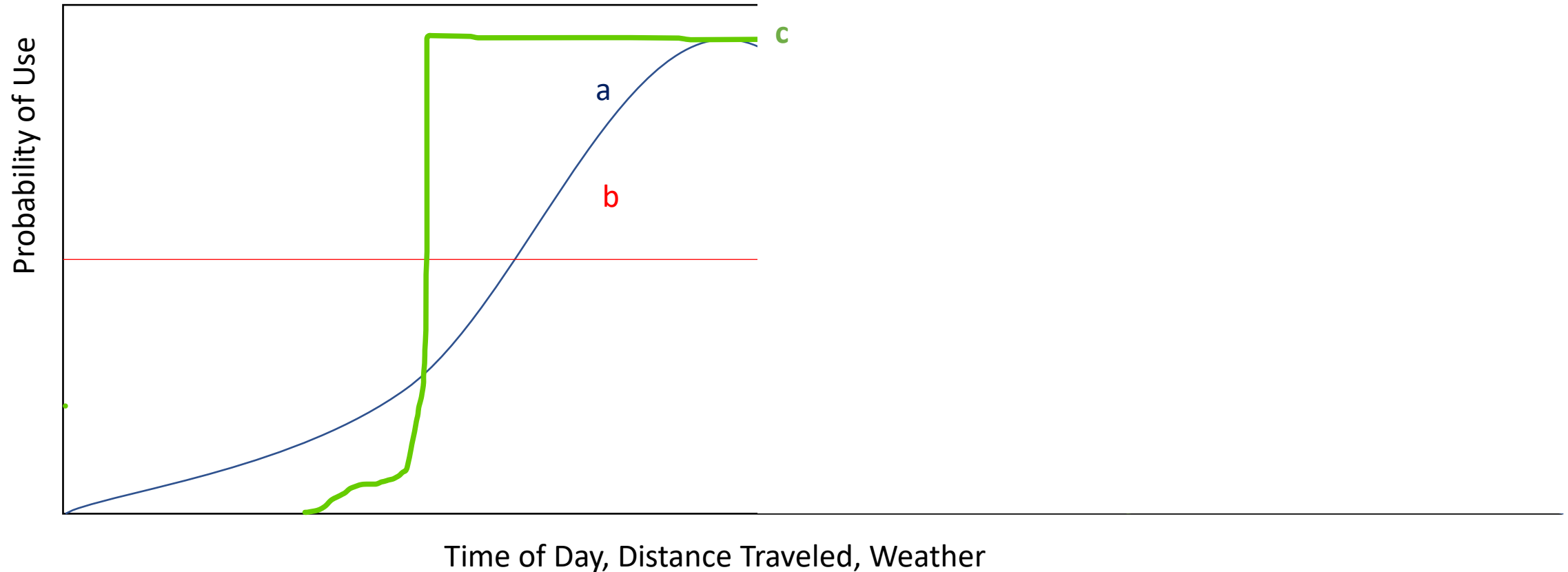
a) No links to Program Management discernable.

**QUESTION: How important are factors the Program can manage?** If Time of Day, distance since last stop, and weather account for 92% of the probability of stopovers (extrinsic to habitat, probably all interact to determine where and when WC encounter the AHR), how much do flow, UOCW, landcover (intrinsic to habitat) contribute?

**Can we get to effect size of those things the Program can control?**

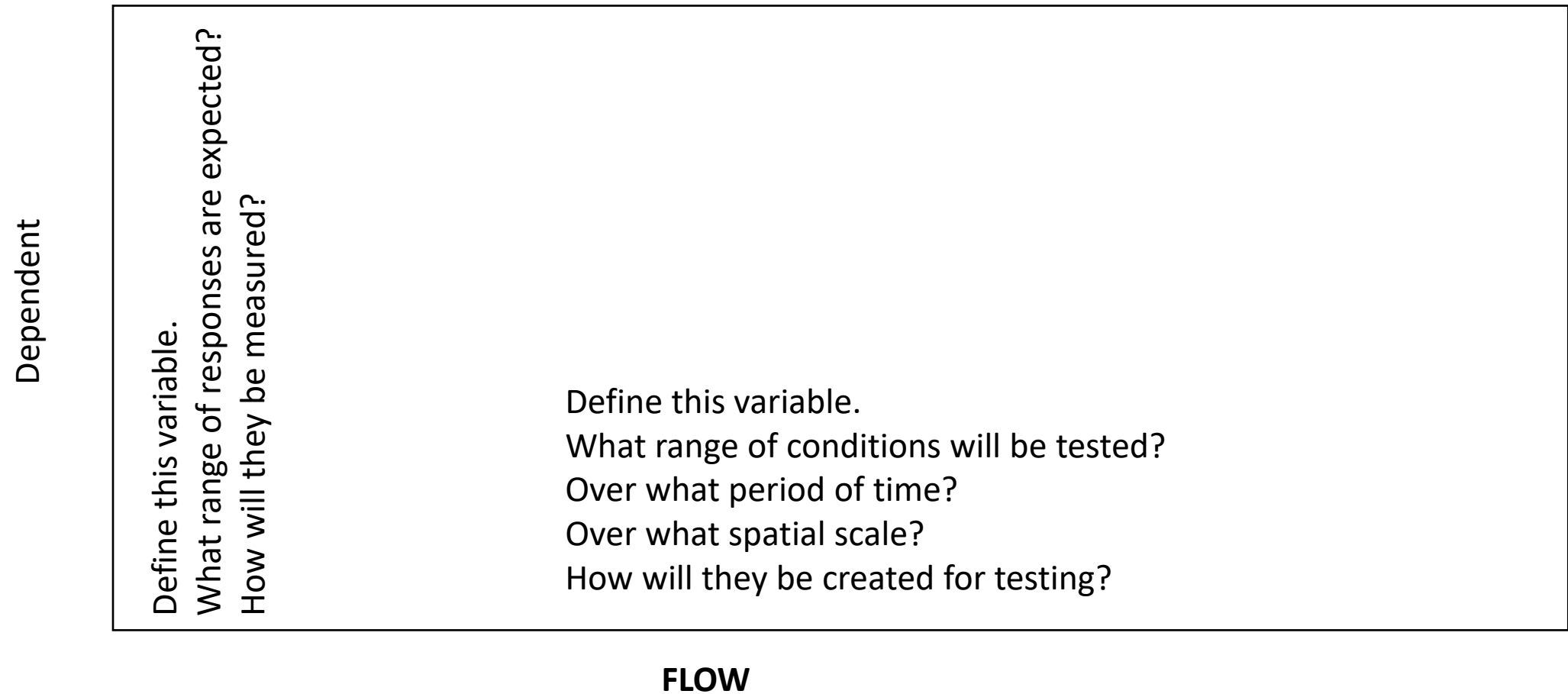
**Do we need to address this?**

**How can we address this with the dataset we have?**



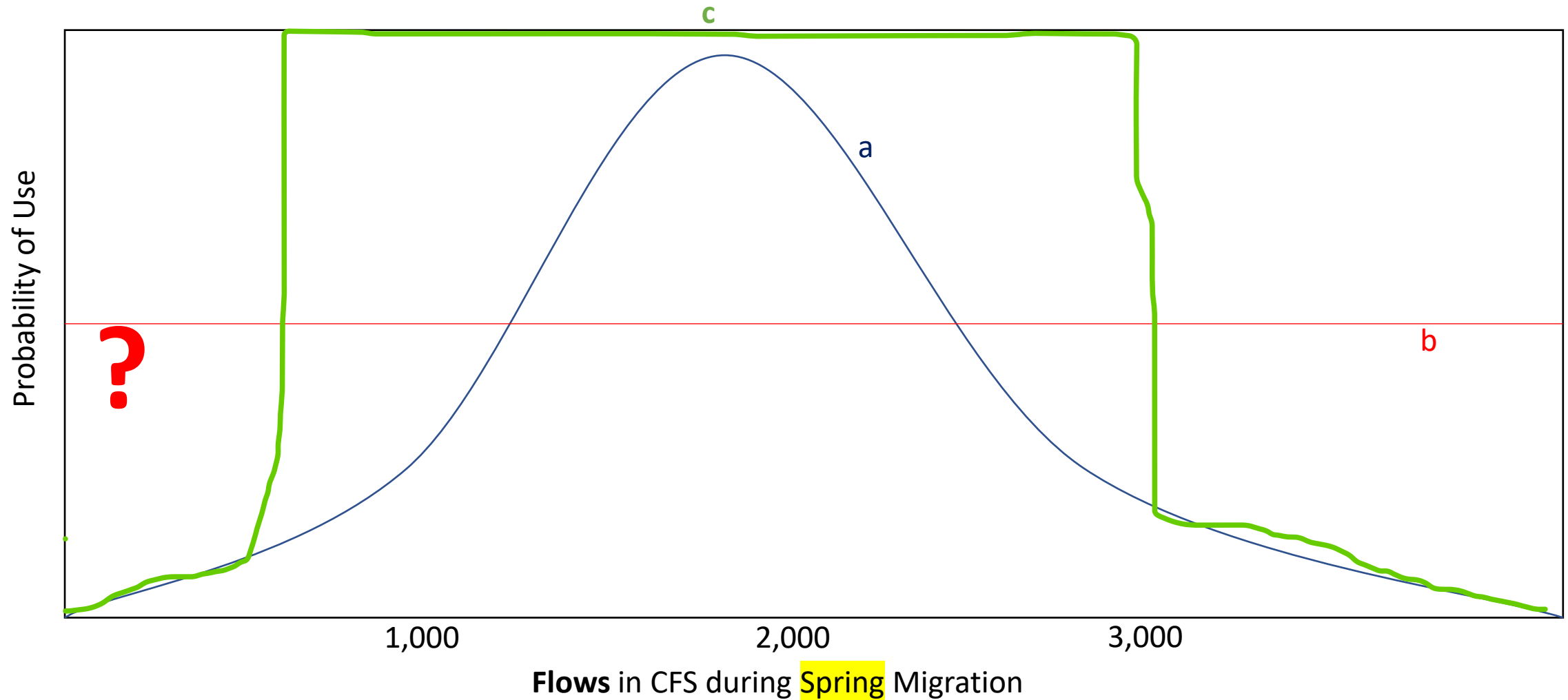
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What data support this hypothesis? What are the mechanisms that connect independent variables to the response you predict?



**Description/Link to Program Management:**  
How is this hypothesis linked to Program management?

**Hypothesis:** Flows have a ~quadratic relationship to stopover probability.

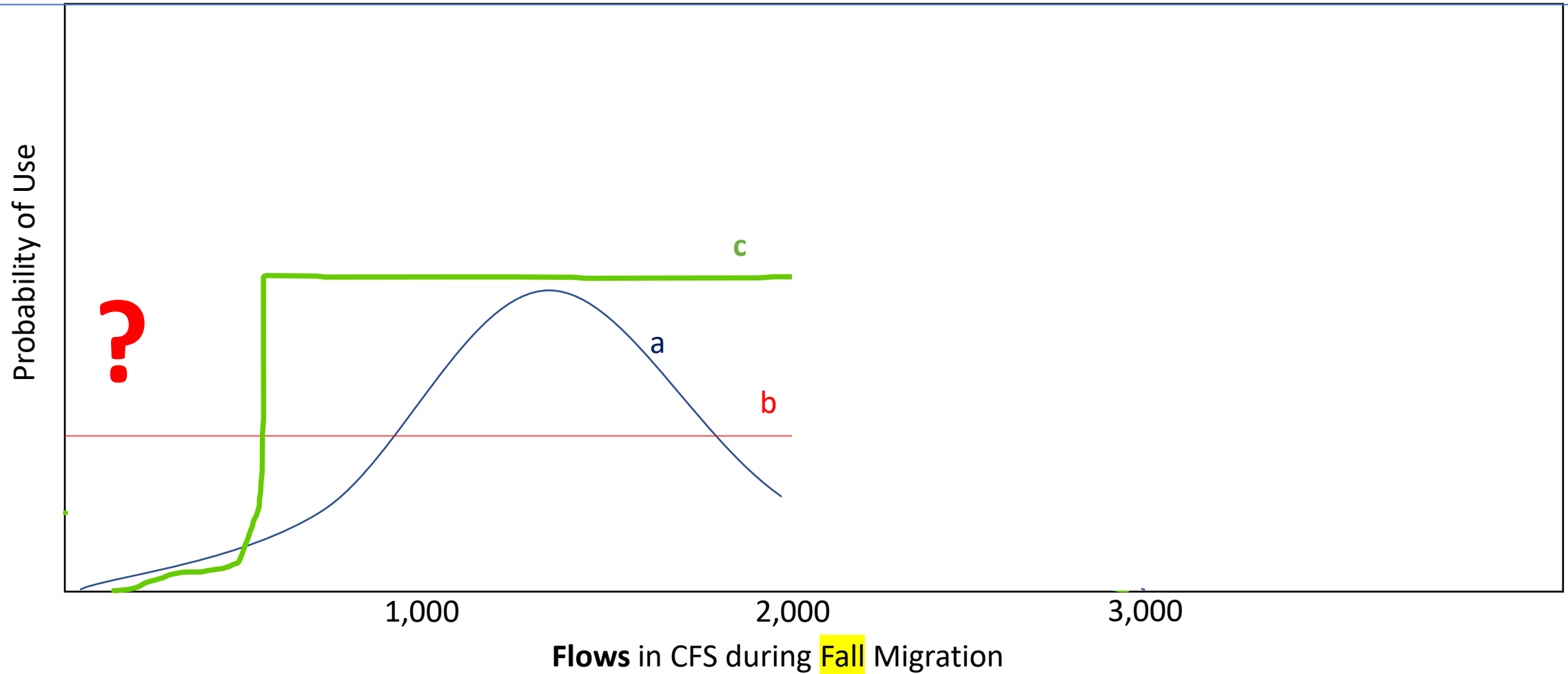


**Description/Link to Program Management:**

- a) Low (e.g., <1,000 cfs) and high flows (e.g., >3,500 cfs) limit Whooping Crane stopovers (e.g., probability maximized at ~1,800-2,000 cfs).
- b) No relationship exists between flows and the probability of Whooping Crane stopover.

**Hypothesis:** Flows have a ~quadratic relationship to stopover probability.

Do we expect differences in Spring vs. Fall Migration due to available water? Due to inherent differences in the individuals that stop each season? Due to inherent differences in the motivation for stopping each season?



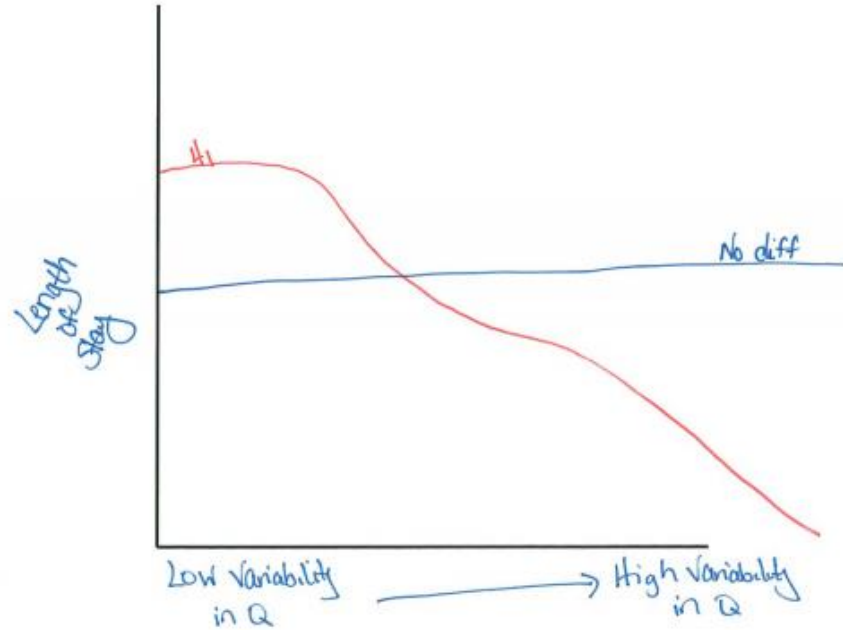
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### Hypothesis and Alternative Hypotheses

H<sub>0</sub>: No difference between low/high daily/weekly flow rates + length of stay  
H<sub>1</sub>: Diff. in the variability of flow rates influences stay length

### X-Y Graph



Is there enough **variability in flows** encountered by WC over the years/seasons as they intersect with the Platte to detect selection for this variable?

### Description/Link to Program Management

If flow ~~variability~~ variability has an impact, may want to release H<sub>2</sub>O.

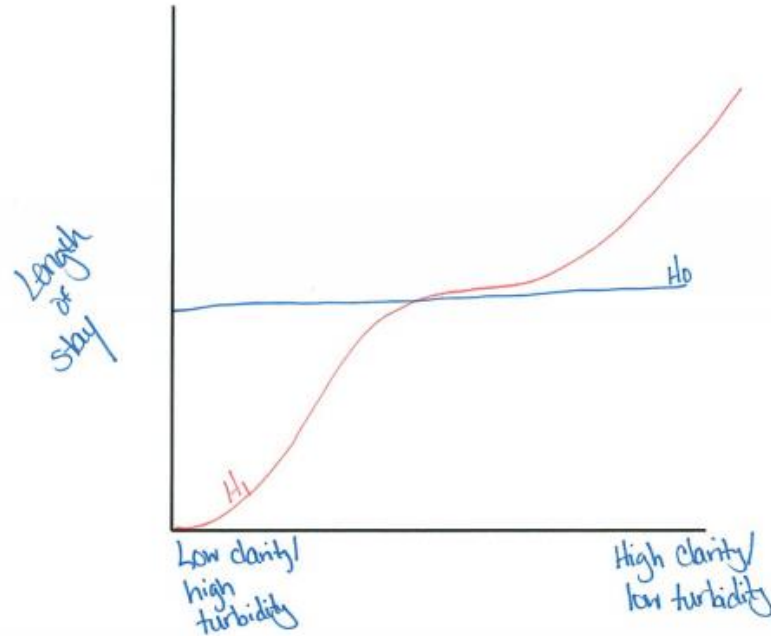
Do hourly/daily flow rates vary much during spring/fall whooping crane season to even consider this?

# Turbidity

## Hypothesis and Alternative Hypotheses

$H_0$ :  $H_2O$  clarity/turbidity has no correlation/impact on whooping crane length of stay  
 $H_1$ :  $H_2O$  clarity/turbidity is correlated to whooping crane stay length

## X-Y Graph

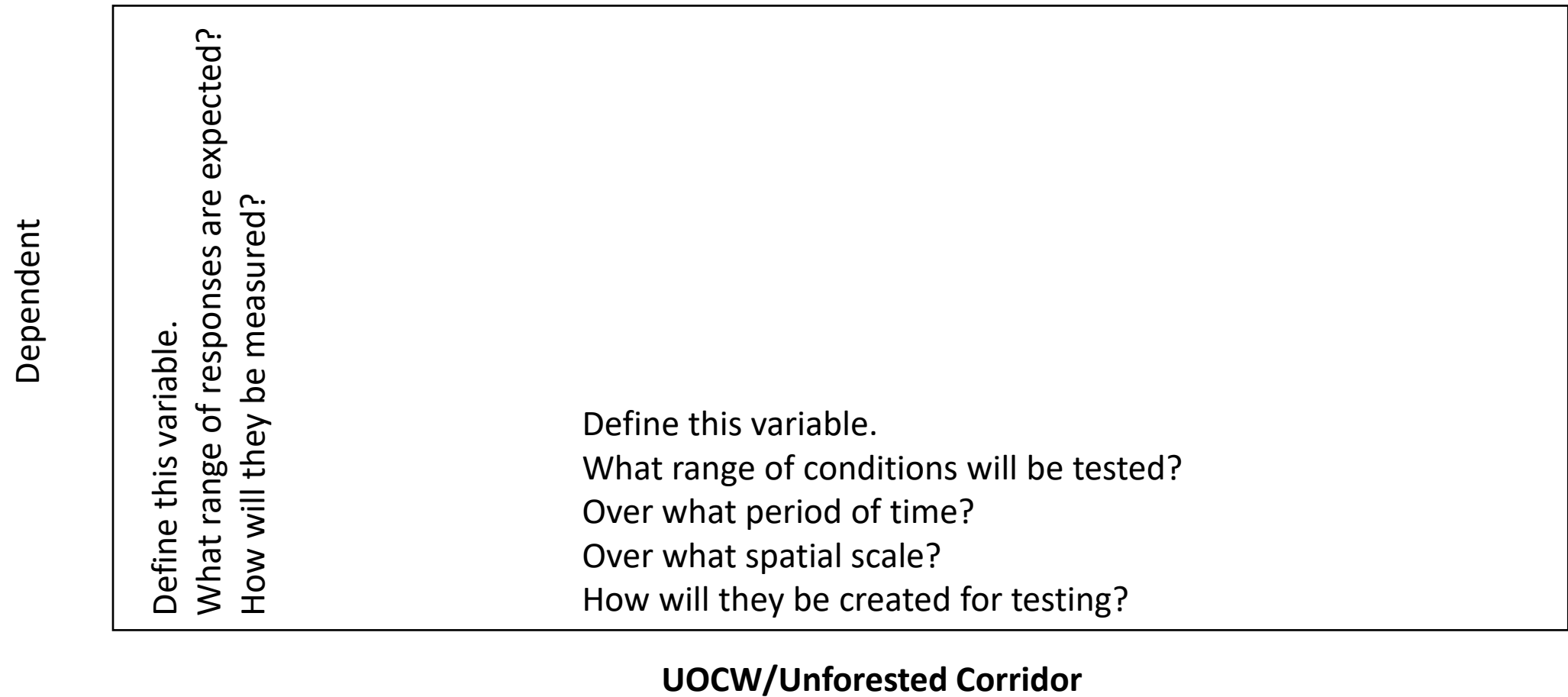


## Description/Link to Program Management

Good to know if determining factor is out of our control

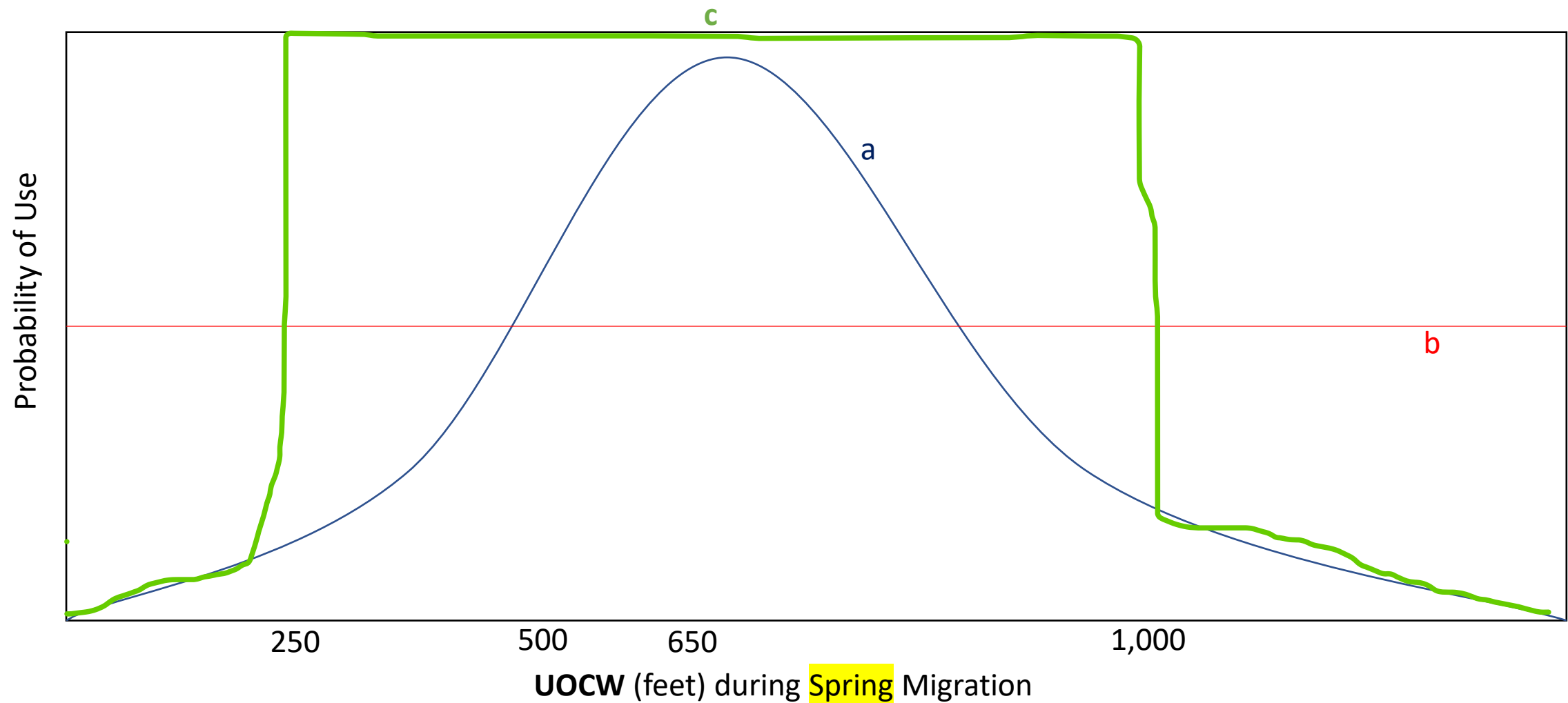
- 1) Is turbidity in the Platte so tightly correlated to Q that this is irrelevant?
- 2) During the spring/fall seasons does turbidity vary so little that this is irrelevant?

**Hypothesis:** Introduce your hypothesis, independent and dependent variables on each axis.  
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**Description/Link to Program Management:**  
How is this hypothesis linked to Program management?

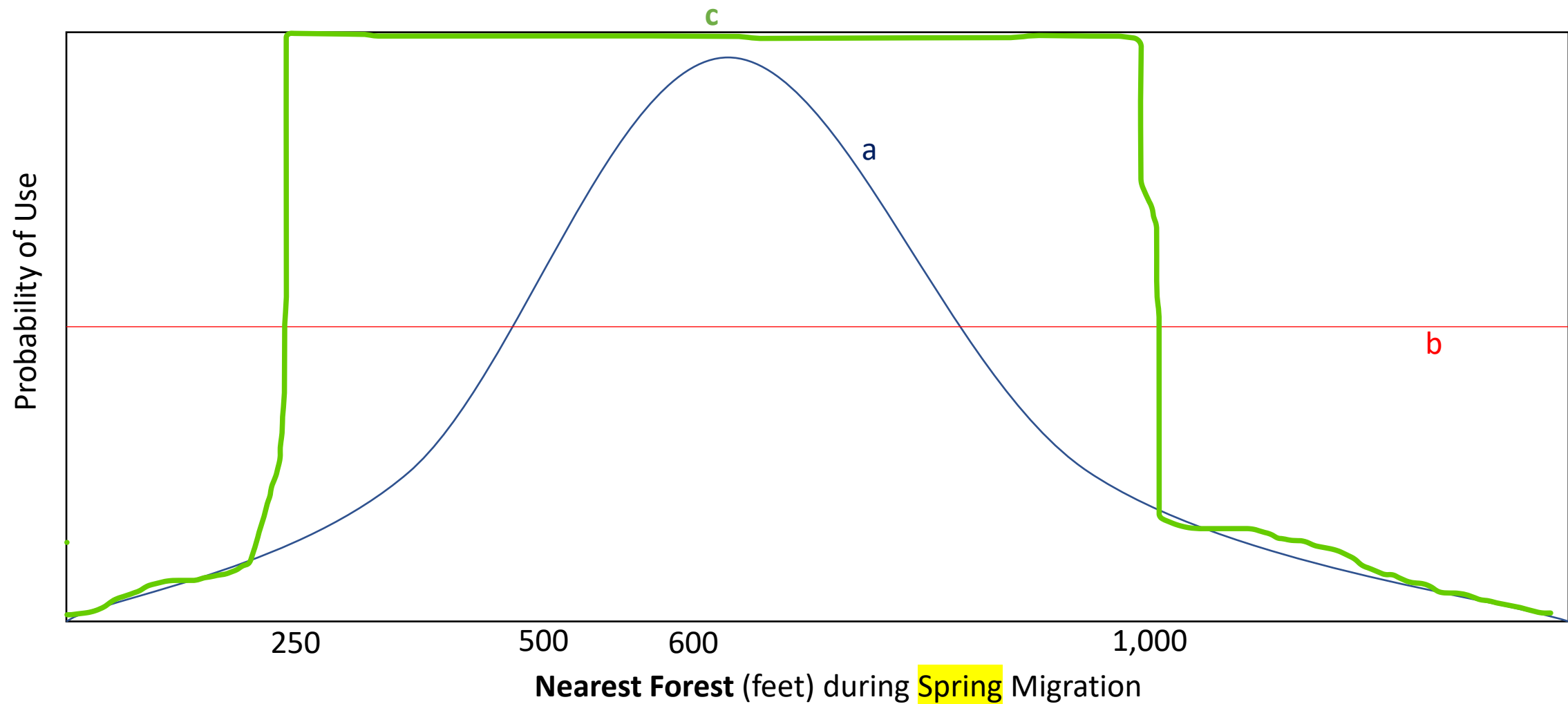
**Hypothesis:** UOCW have a ~quadratic relationship to stopover probability.



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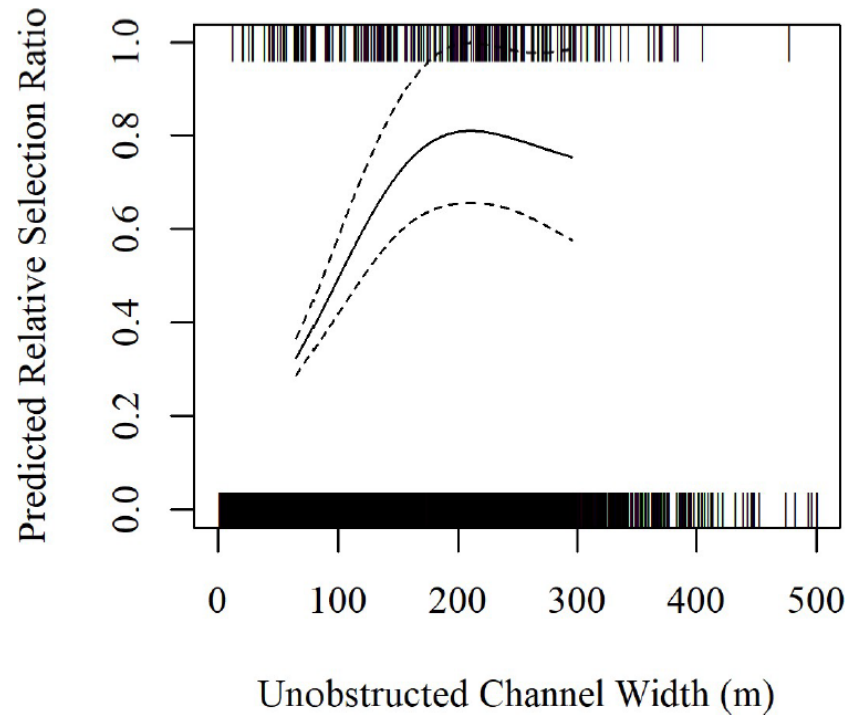
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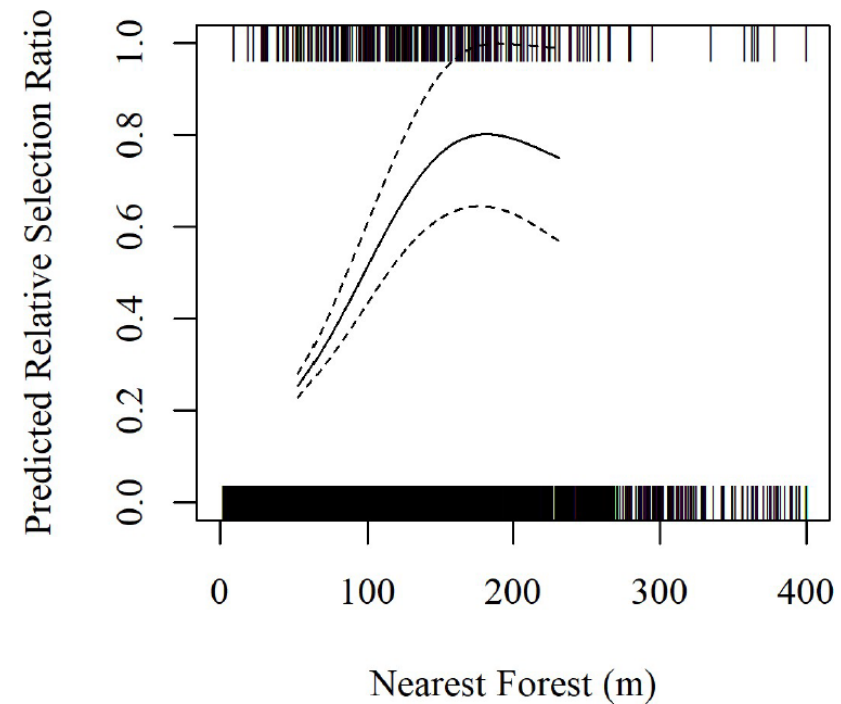
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**Fig 4. Predicted, relative selection ratio of unobstructed channel width (UOCW) based on all systematically collected whooping crane (n = 235).** Tick marks indicate actual data (use points are presented at y = 1 and available points are presented at y = 0). Data is displayed from the 10<sup>th</sup> to the 90<sup>th</sup> percentile of use locations with 90% confidence intervals.

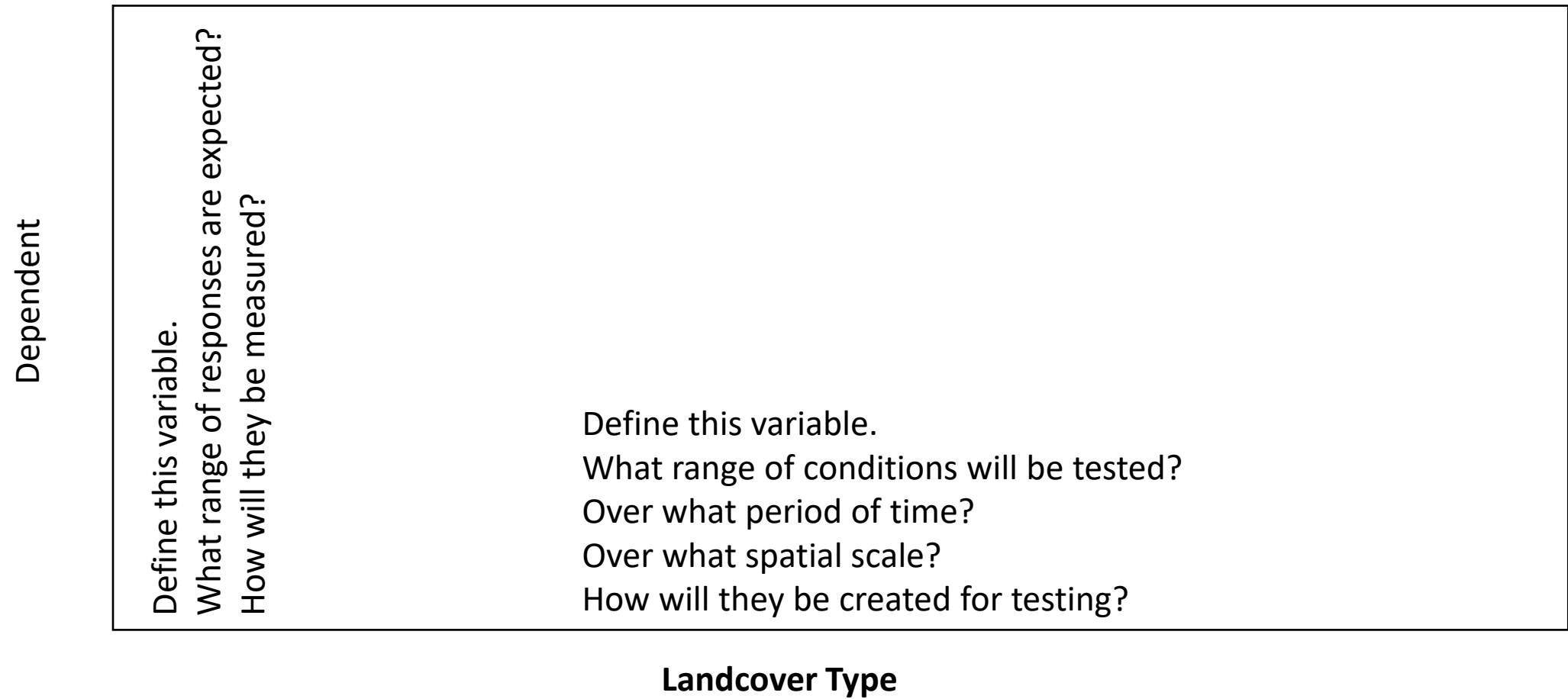
<https://doi.org/10.1371/journal.pone.0209612.g004>



**Fig 5. Predicted, relative selection ratio of nearest forest (NF) based on all systematically collected whooping crane roost locations (n = 235).** Tick marks indicate actual data (use points are presented at y = 1 and available points are presented at y = 0). Data is displayed from the 10<sup>th</sup> to the 90<sup>th</sup> percentile of use locations with 90% confidence intervals.

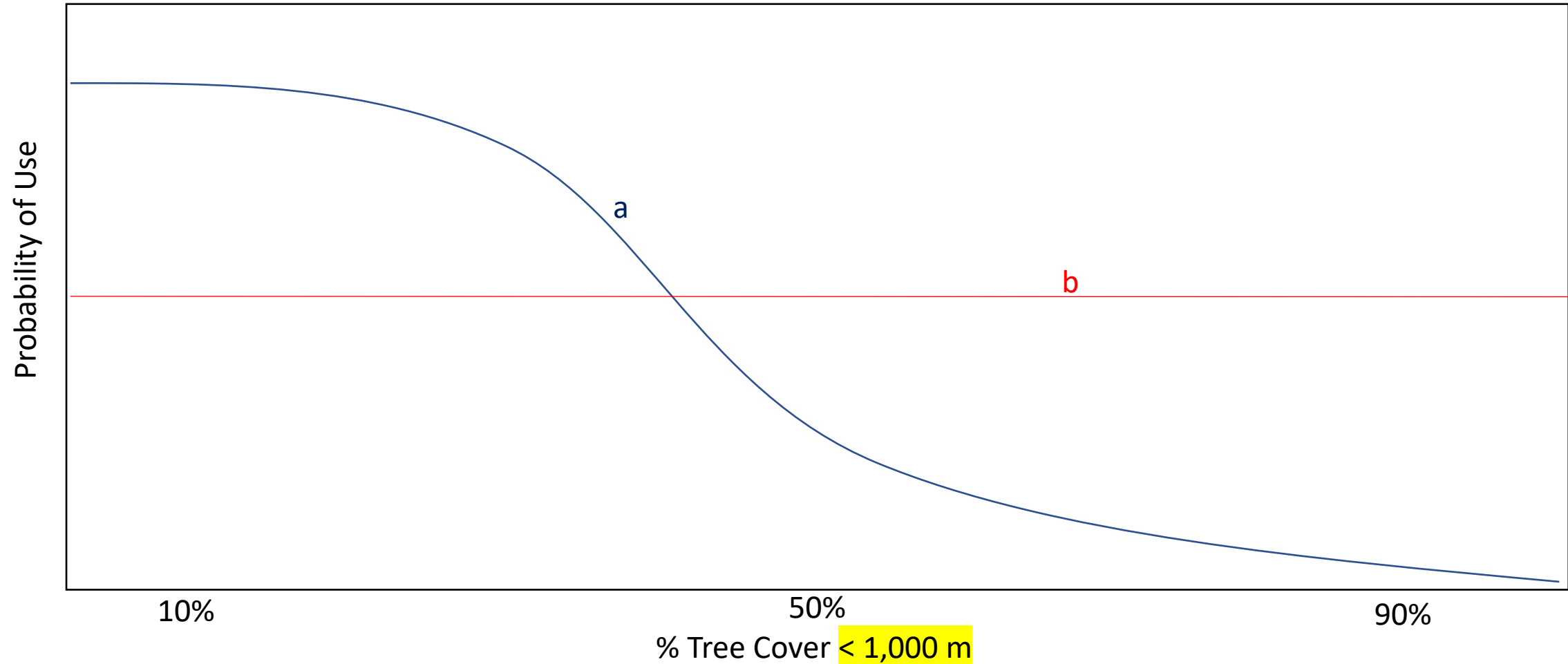
<https://doi.org/10.1371/journal.pone.0209612.g005>

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How is this hypothesis linked to Program management?

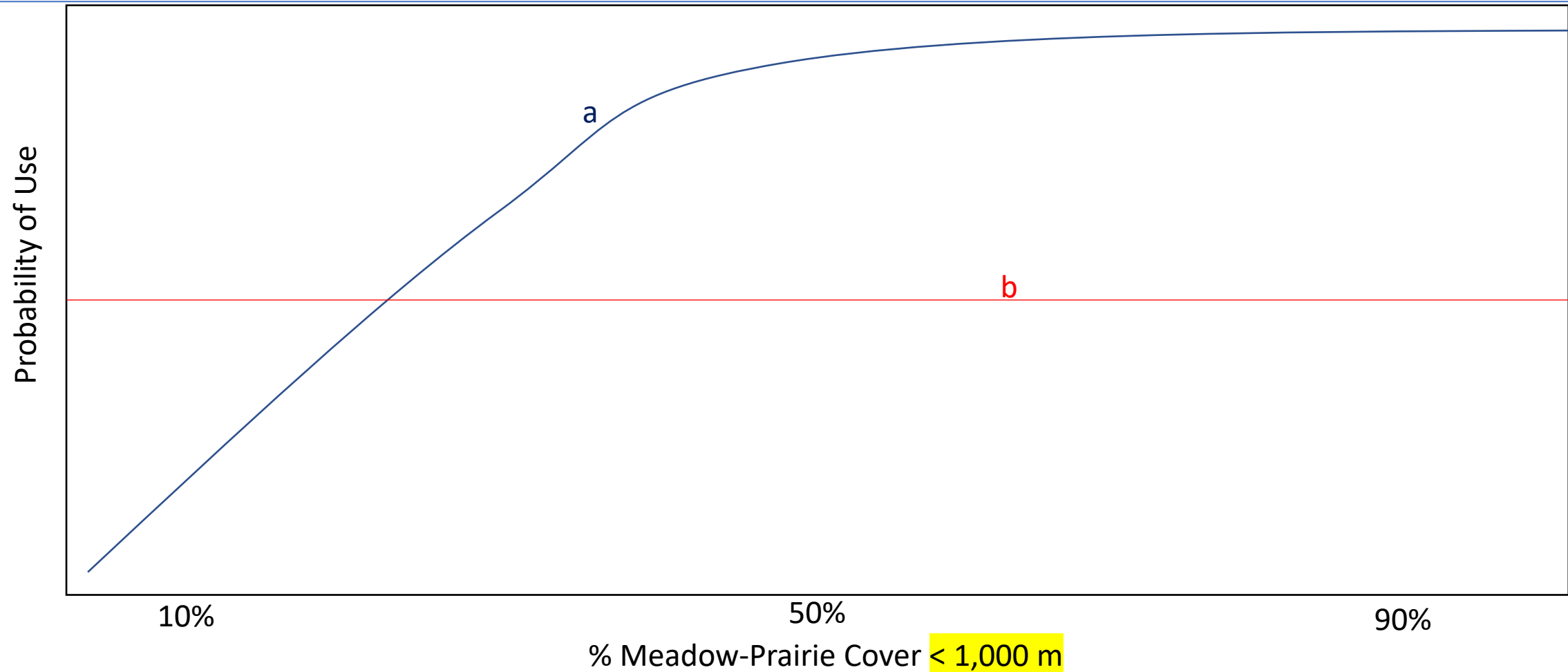
**Hypotheses:** The probability of Whooping Crane stopover decreases with the proportion of tree cover within 1,000 m (3280 feet) of the riverbanks where an individual or Whooping Crane group crosses the Platte River.



**Description/Link to Program Management:**

- a) Whooping Crane's are less likely to stop where woodland and forest (i.e., "tree cover") are relatively expansive adjacent to the river.
- b) There is no relationship between the abundance tree cover adjacent to the Platte River and the probability of a Whooping Crane stopover.

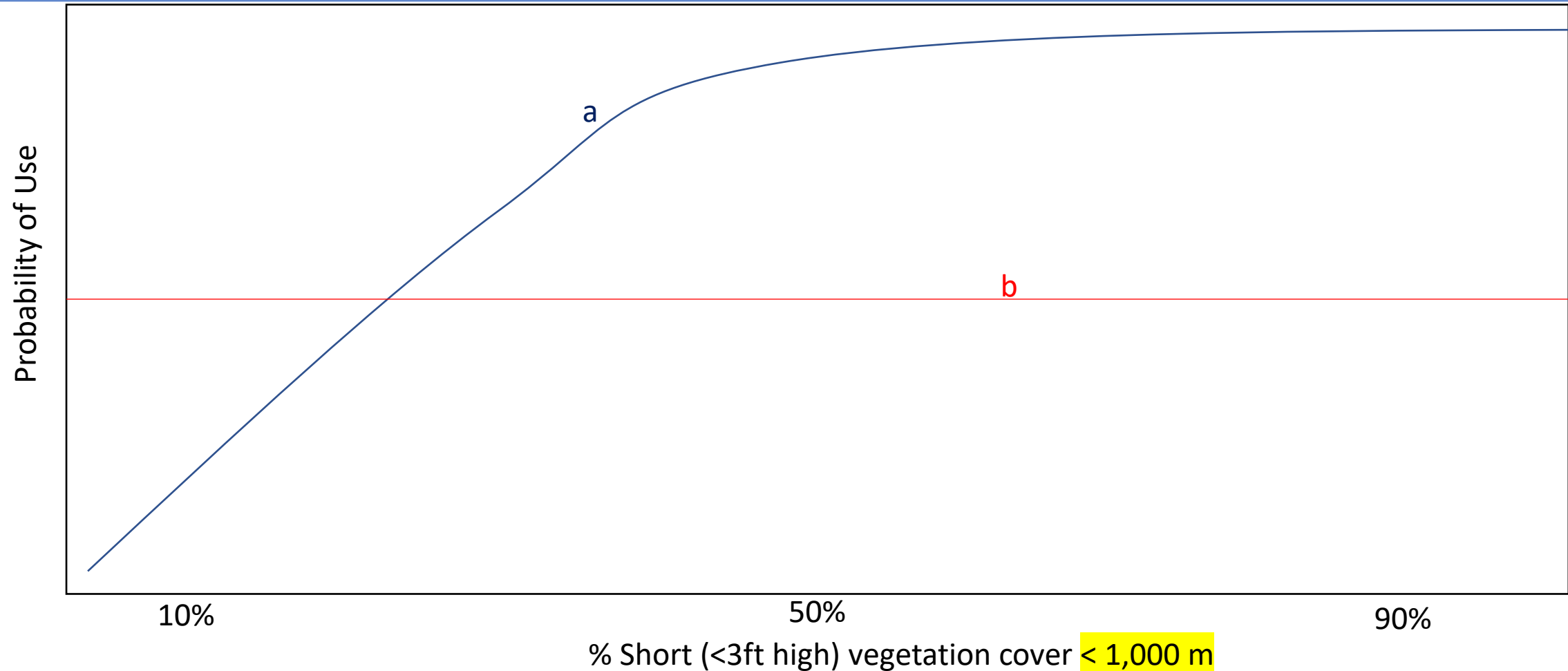
**Hypotheses:** The probability of Whooping Crane stopover increases with the proportion of meadow-prairie landcover within a 1,000 m buffer of the riverbanks where a Whooping Crane group/individual crosses the Platte River.



**Description/Link to Program Management:**

- a) Whooping Crane’s are more likely to stop where native grassland and wetland habitats (i.e., “meadow-prairie landcover”) are relatively expansive adjacent to the river.
- b) There is no relationship between the abundance of meadow-prairie landcover adjacent to the Platte River and the probability of a Whooping Crane stopover.

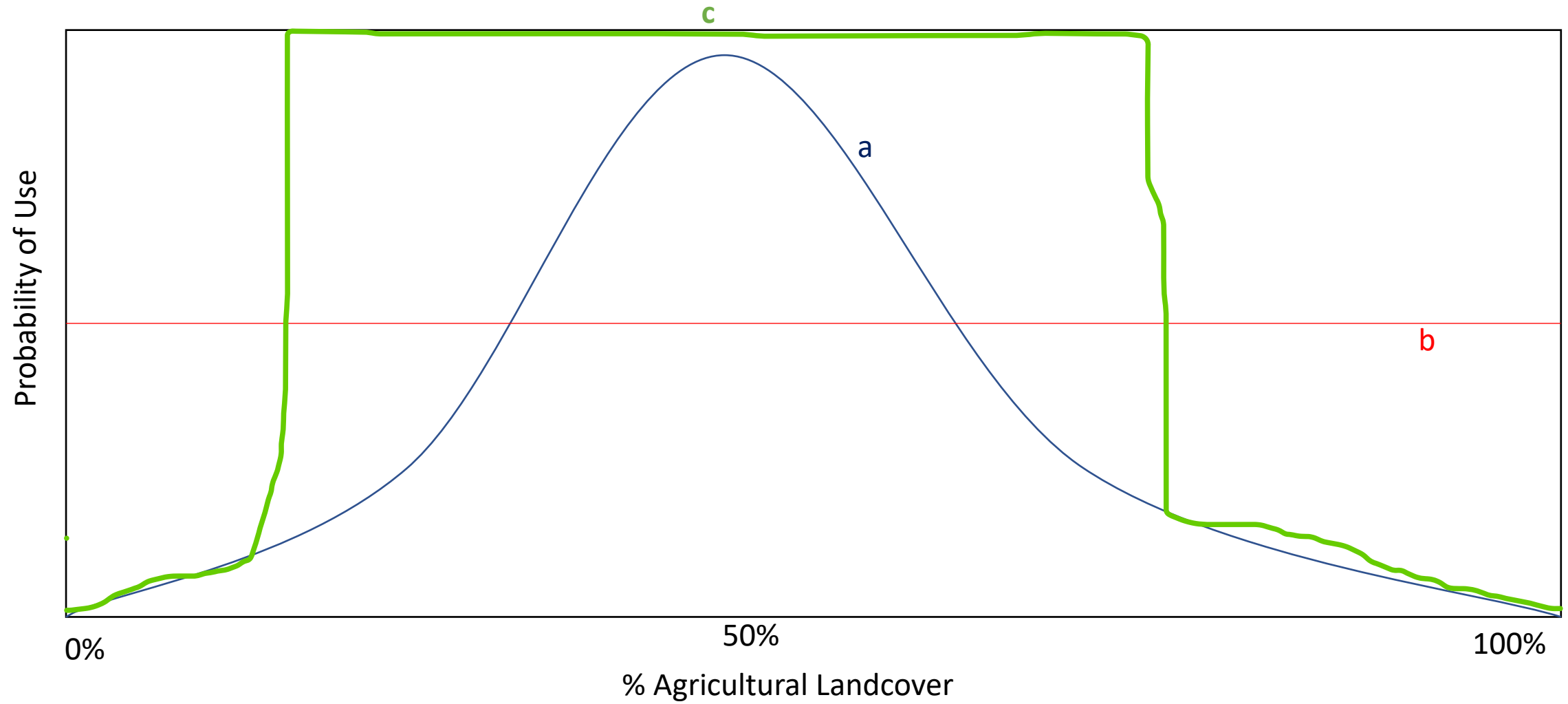
**Hypotheses:** The probability of Whooping Crane stopover increases with the proportion of short vegetation (<3 ft high) landcover within a 1,000 m buffer of the riverbanks where a Whooping Crane group/individual crosses the Platte River.



**Description/Link to Program Management:**

- a) Whooping Crane’s are more likely to stop where landcover of short vegetation <3 ft high is relatively expansive adjacent to the river.
- b) There is no relationship between the proportion of short vegetation <3 ft high adjacent to the Platte River and the probability of a Whooping Crane stopover.

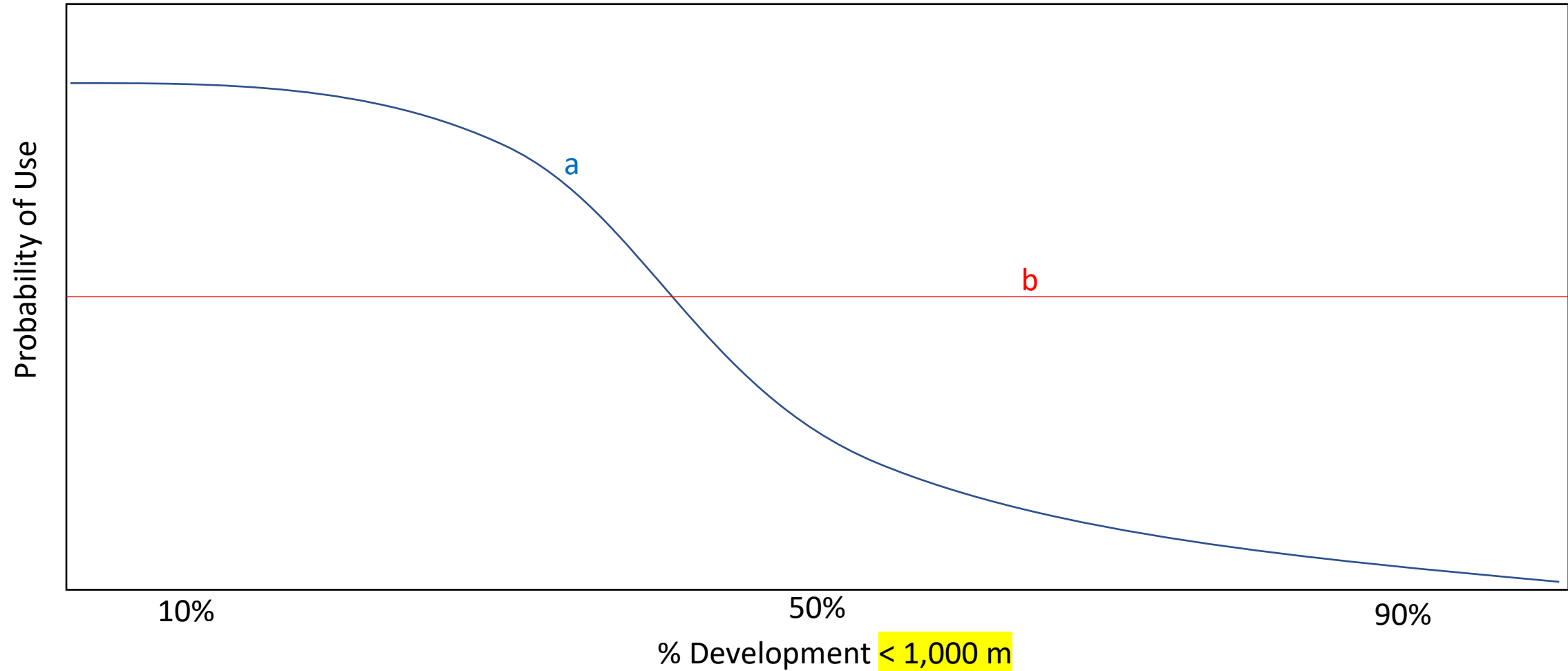
**Hypothesis: Hypotheses:** The probability of Whooping Crane stopover is lower with extremely low and extremely high proportions of agricultural landcover within a 1,000 m buffer of the riverbanks where a Whooping Crane group/individual crosses the Platte River.



**Description/Link to Program Management:**

- a) Low (e.g., <15%) and high (e.g., >85%) proportions of agricultural landcover limit Whooping Crane stopovers.
- b) No relationship exists between proportion of agricultural landcover and the probability of Whooping Crane stopover.

**Hypotheses:** The probability of Whooping Crane stopover decreases with the proportion of development (e.g., paved roads, buildings, etc.) within a 1,000 m buffer of the riverbanks where an individual Whooping Crane or group crosses the Platte River.



**Description/Link to Program Management:**

- a) Whooping Crane's are less likely to stop where development is relatively abundant adjacent to the river.
- b) There is no relationship between the abundance of human development adjacent to the Platte River and the probability of a Whooping Crane stopover.

# Why do they stop?

How important is it for us to know about patterns of WC habitat use outside the AHR?

Are there opportunities for stopovers that meet selection criteria prior to reaching the Platte and after 3 p.m.? This may tell us more about probability of Platte stopovers.

- Wetlands
- Grassland/meadow landcover or short veg
- Agricultural fields
- UOCW  $\geq 650$  feet
- Nearest forest  $\geq 600$  feet
- Unforested corridor  $\geq 1000$  feet
- Undeveloped

If habitat becomes less available throughout the migratory corridor, will the Platte become more important?

- Does an increase in proportional use reflect success on the Platte or less choice along the corridor?

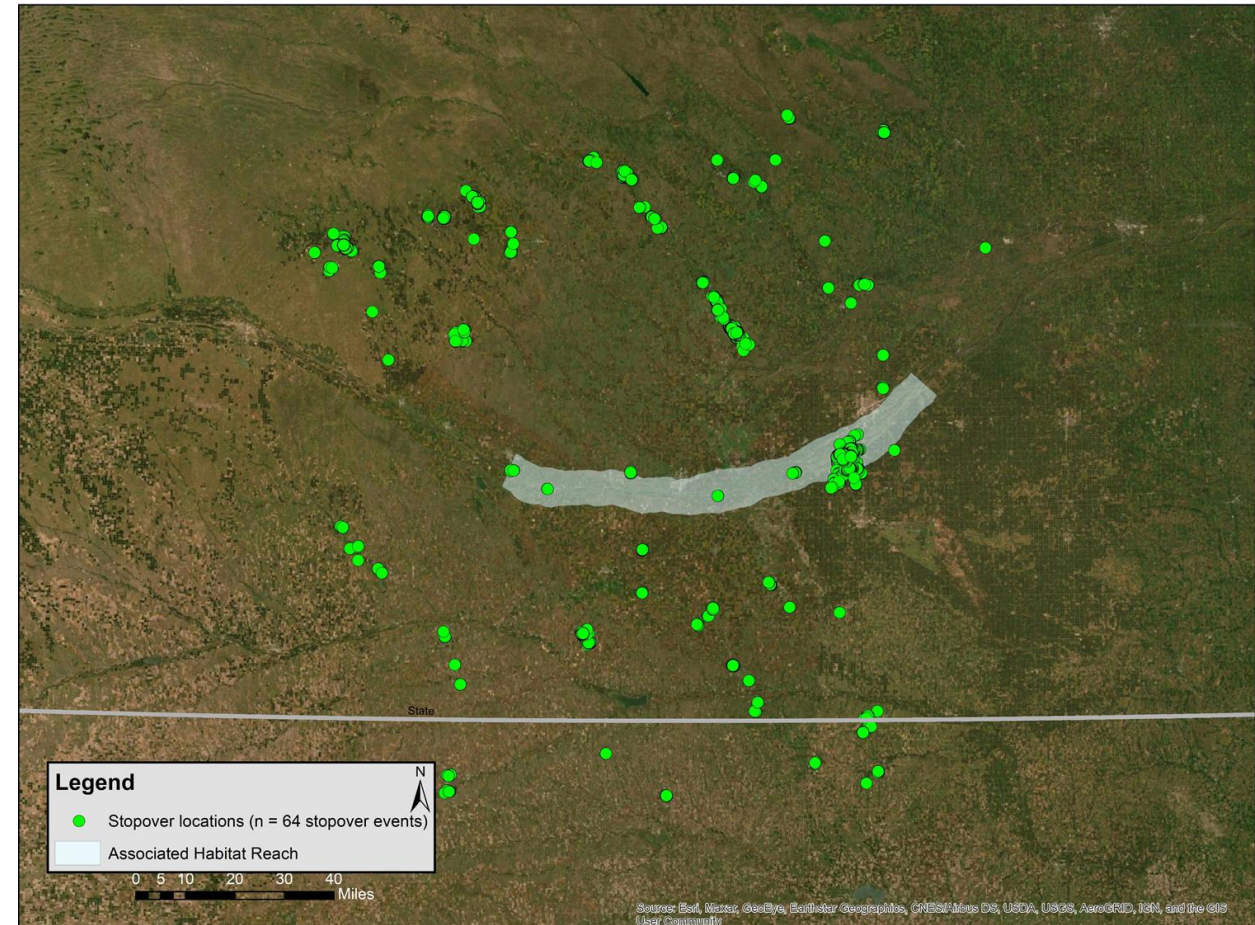
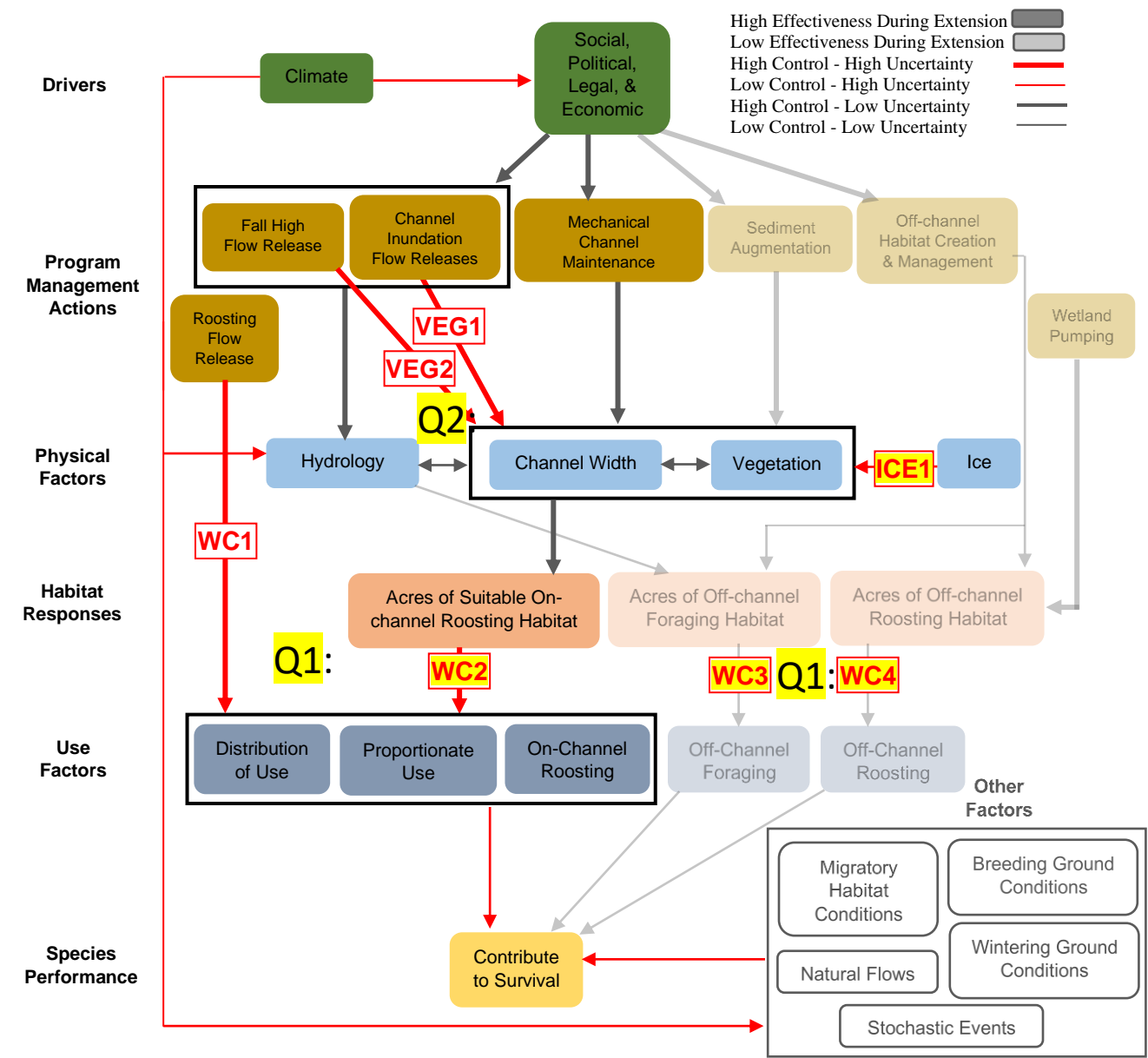


Figure 2. Whooping Crane Conceptual Ecological Model



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  - a) Can we use SDHF (Fall) to maintain UOCW?  
Does anyone still want to test SDHF? If so, need to pose the specific question.
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- Q3: What are the conditions that influence length of stay on the CPR?
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# Whooping Cranes – Potential BIG QUESTIONS

## Q1) Water during WC Migration

1) WHOOPING CRANES: Factors Influencing Stopovers vs. Flyovers	Meeting Objective: Formulating hypotheses to address Big Questions.		
<p>What are the conditions that influence whether a WC will stop or flyover the AHR?</p> <p>What hypotheses to test?</p> <p>What are the mechanisms in support of each hypothesis?</p> <p>How to test these hypotheses?</p> <p>How important is this in terms of influence on WC use?</p> <p>How likely is it that we can reduce uncertainty around this question?</p> <p>Are there direct links to PRRIP management?</p> <p>What information from the EDO will help formulate hypotheses and develop management options for testing hypotheses?</p>	1:20 PM	<a href="#">Hypotheses</a> <a href="#">Formulation</a> <a href="#">Worksheets</a>	

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# Whooping Cranes – Potential BIG QUESTIONS

- Q2: Can we use water to make UOCW for WC use?

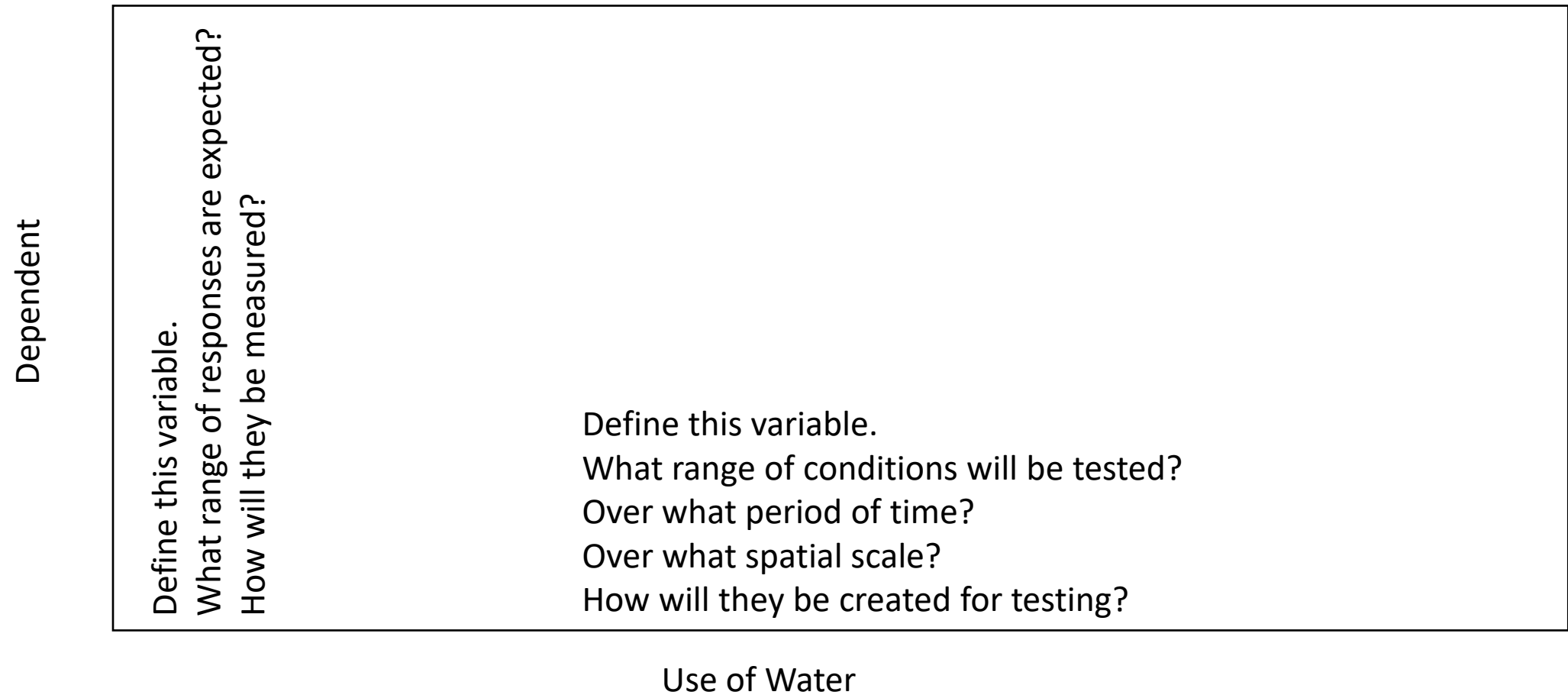
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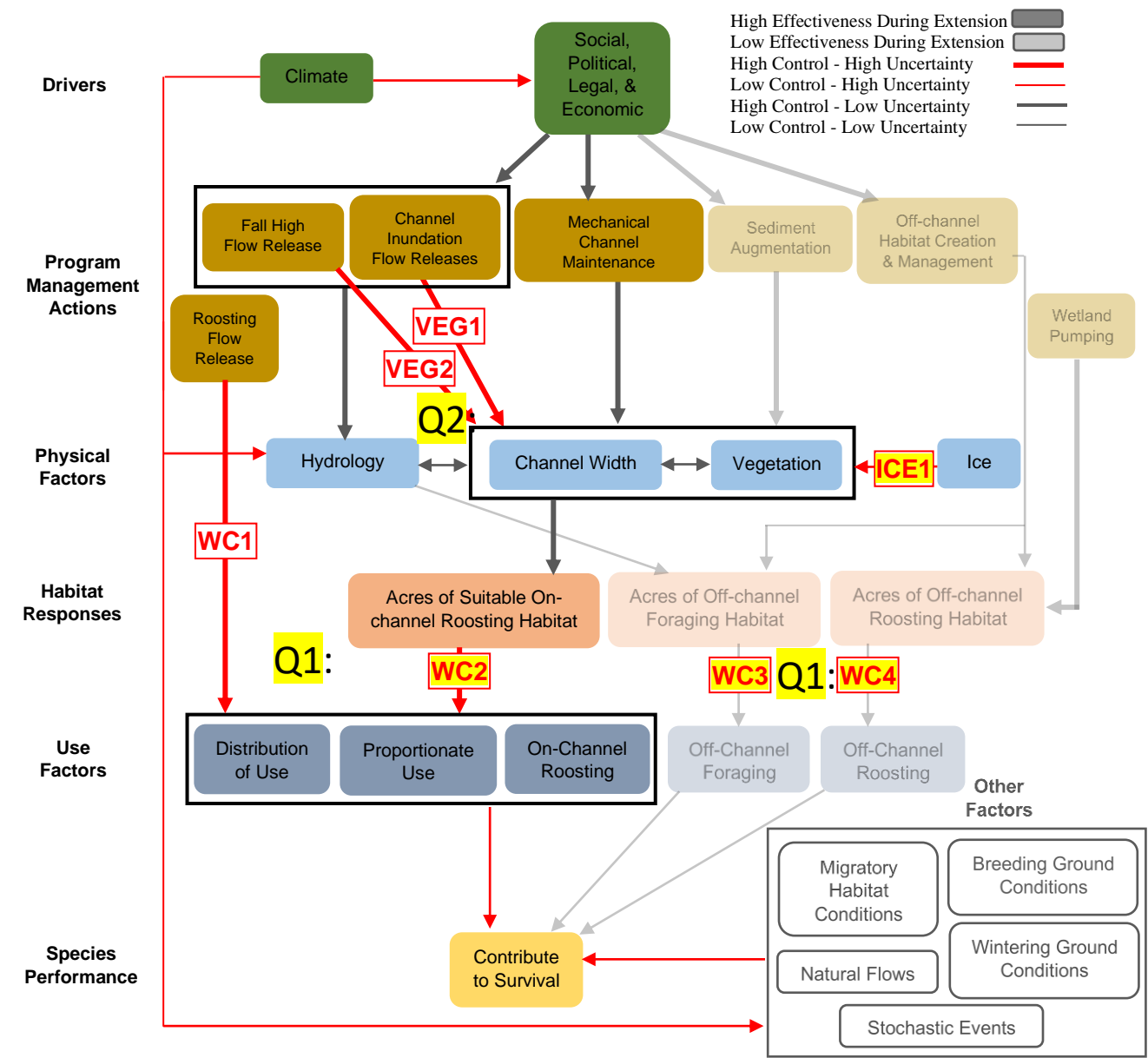
- What do we already know?
- What else could be important?
- What hypotheses to test?
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- Will answering these Big Questions influence our management?

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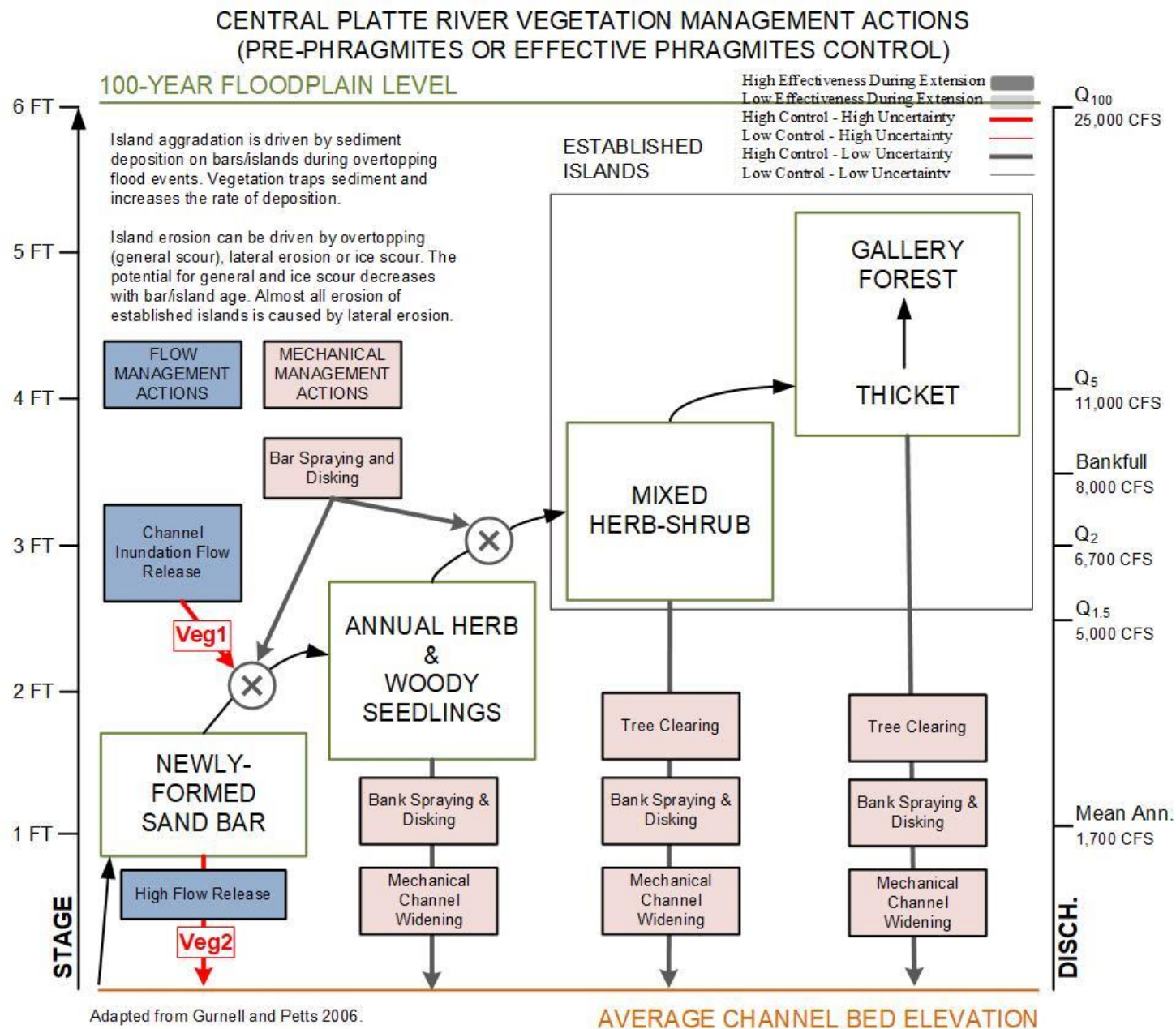


**Description/Link to Program Management:**  
How is this hypothesis linked to Program management?

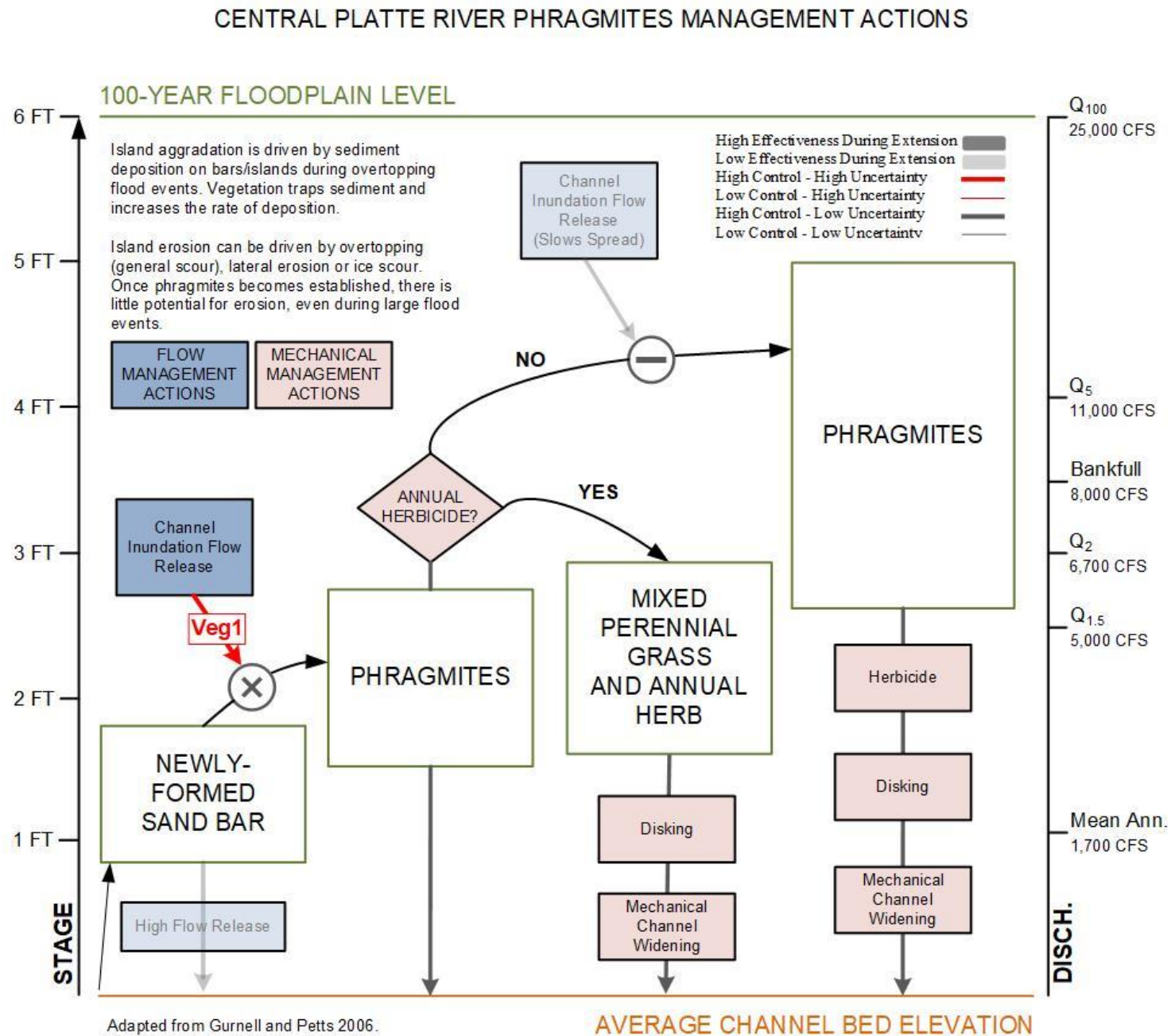
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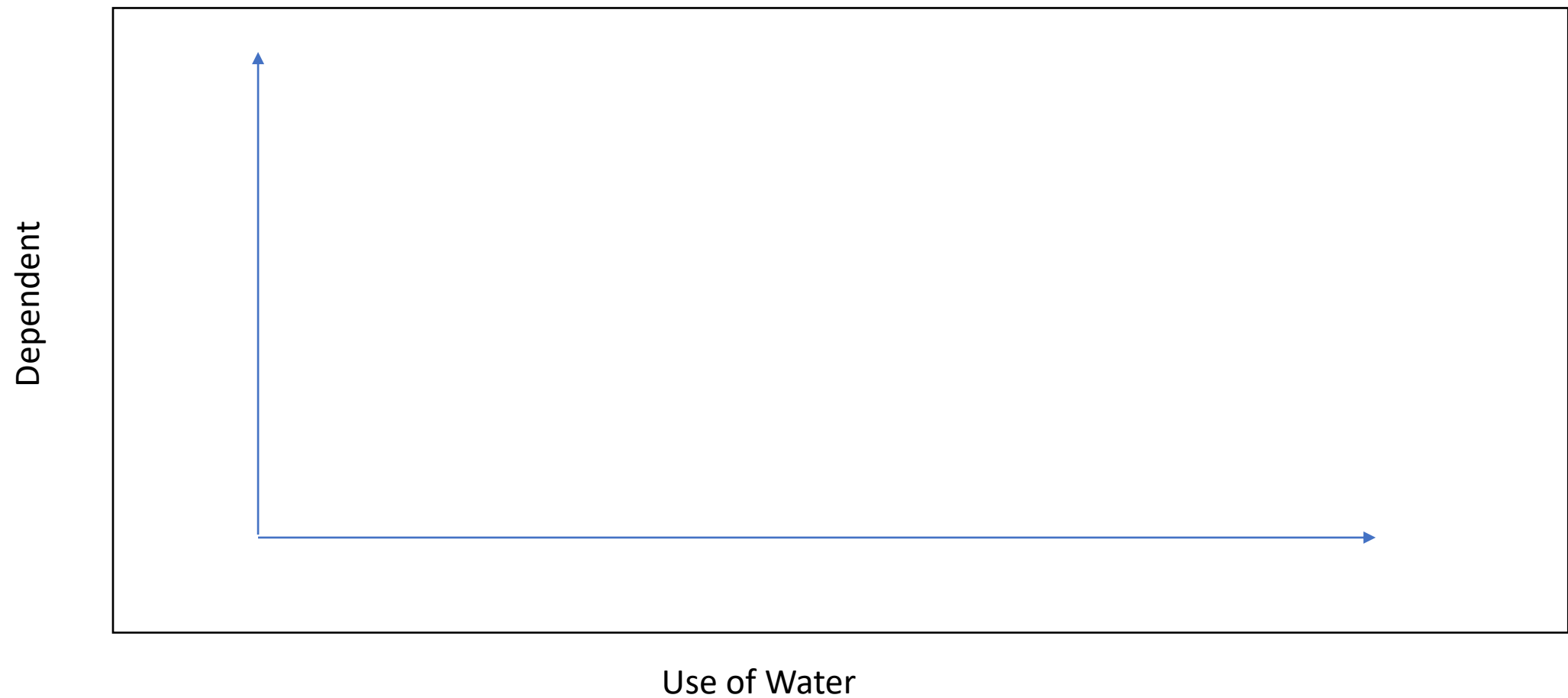
**Figure 3.** Annual and Perennial Vegetation Establishment Conceptual Ecological Model.



**Figure 4.** Phragmites Conceptual Ecological Model.



**Hypothesis:**



**Description/Link to Program Management:**

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# Meeting Review and Wrap-Up

- Meeting Feedback
- Action Items
  - Continued hypotheses formulation
  - What do you need from the EDO?
- Agenda suggestions for next meeting
- Upcoming Meetings:
  - AMP Reporting Session Feb 16<sup>th</sup>, 9-4 CDT
  - AMWG Meeting Feb 23<sup>rd</sup>, 1-5 PM CDT

