# FORAGING WINDOWS OF WATERBIRDS IN THE FLOOD PULSE

## PROZORI HRANJENJA PTICA MOČVARICA U POPLAVNOM PULSU

### A SATELLITE-BASED THEORETICAL FRAMEWORK



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## 1 INTRODUCTION

As floodwaters recede, prey may become concentrated in shrinking shallow-water areas. This creates a brief foraging window: a period when suitable water depth and accessible prey coincide. Bird foraging guilds use different depths, so maximum inundated area need not provide maximum food availability.

**AIM:** **Link water recession, food availability for waterbird guilds and the ability of satellites to capture foraging windows.**

## 2 MATERIALS AND METHODS

### FROM SATELLITE IMAGE TO HABITAT CAPACITY

- Foraging window = the period when birds have access to both suitable shallow water and enough food.

**1 · WATER EXTENT AND DEPTH**

Satellite water maps (Sentinel-1, Sentinel-2, Landsat) are combined with water-level records to estimate how much floodplain area falls within each water-depth range over time.

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**2 · AREA ACCESSIBLE TO WATERBIRDS**

Dabbling ducks, shorebirds, herons and storks forage at different water depths. Their depth ranges are matched to the floodplain maps to estimate accessible area for each guild over time.

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**3 · PREY AND HABITAT CAPACITY**

As water recedes, prey may become concentrated, but can also be lost through drying and predation. Estimated food intake is compared with birds' daily energy needs to express capacity in bird-days.

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**4 · CAN SATELLITES CAPTURE THE WINDOW?**

The estimated duration of each foraging window is compared with satellite revisit intervals and cloud cover. This indicates the risk of missing a short-lived event.

**Figure 1.** Proposed theoretical workflow; not yet validated with field observations.

## 3 RESULTS: THEORETICAL PREDICTIONS

### RECESSION RATE

- Habitat capacity is predicted to peak at an intermediate recession rate. Both slower and faster recession may provide less foraging benefit.

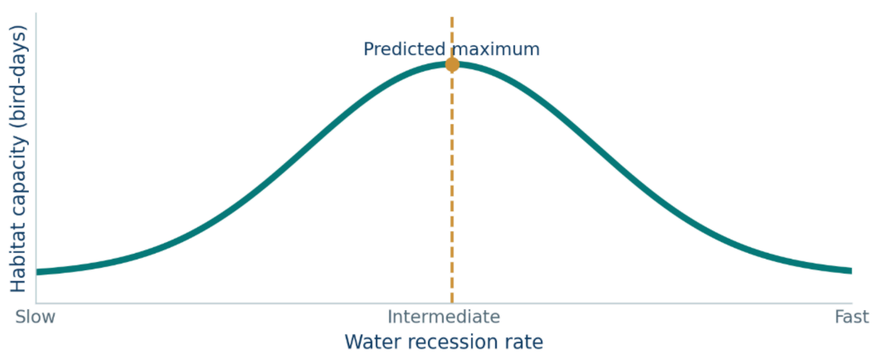



**Figure 2.** Conceptual relationship between water recession rate and habitat capacity, with a predicted maximum at an intermediate rate.

### SEQUENCE OF WINDOWS

- As water becomes shallower, accessible area changes for each foraging guild. Their predicted windows follow one another over time.

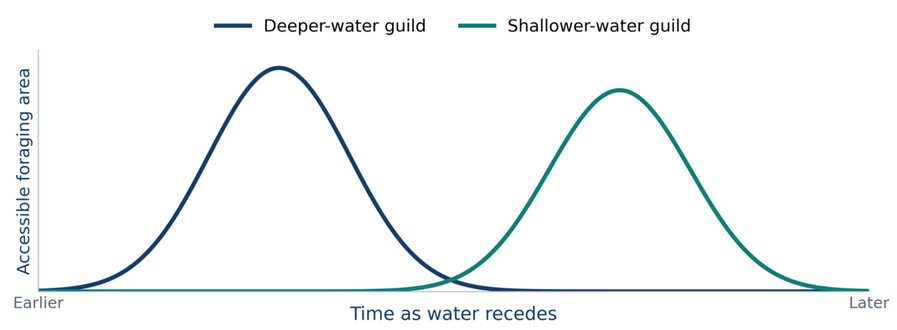



**Figure 3.** Predicted sequence of foraging windows for bird guilds using deeper and shallower water as flooding recedes.

### TIMING AND DETECTION

- Benefits to breeding birds depend on overlap with chick rearing. Optical imagery may miss a short window between cloud-free observations. Radar reduces this risk, except beneath forest canopy.

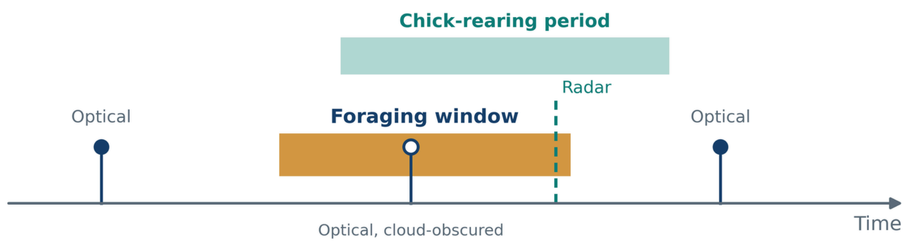



**Figure 4.** Conceptual timeline showing overlap with chick rearing and how clouds or satellite timing may cause a short foraging window to be missed.

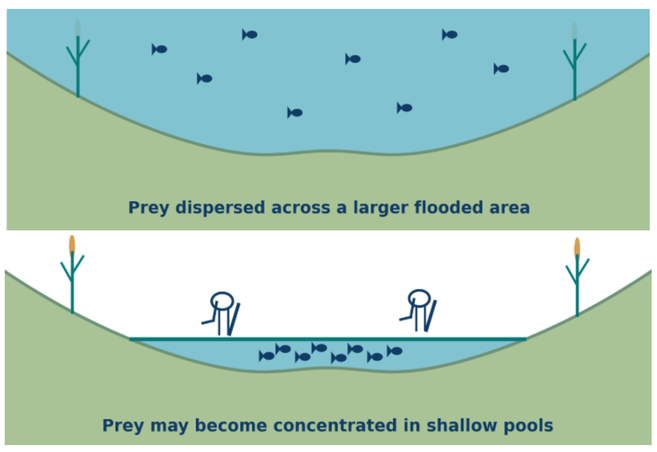



**Figure 5.** When suitable shallow water and prey coincide, a short foraging window may occur.

## 4 CONCLUSION

The foraging value of a flood depends on the timing and duration of shallow water and on prey accessibility. A large flood may therefore not benefit breeding birds if the foraging window does not coincide with chick rearing. The framework generates testable hypotheses for Kopački rit, but validation requires satellite imagery, water-level records and bird census data.

## 5 REFERENCES

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