

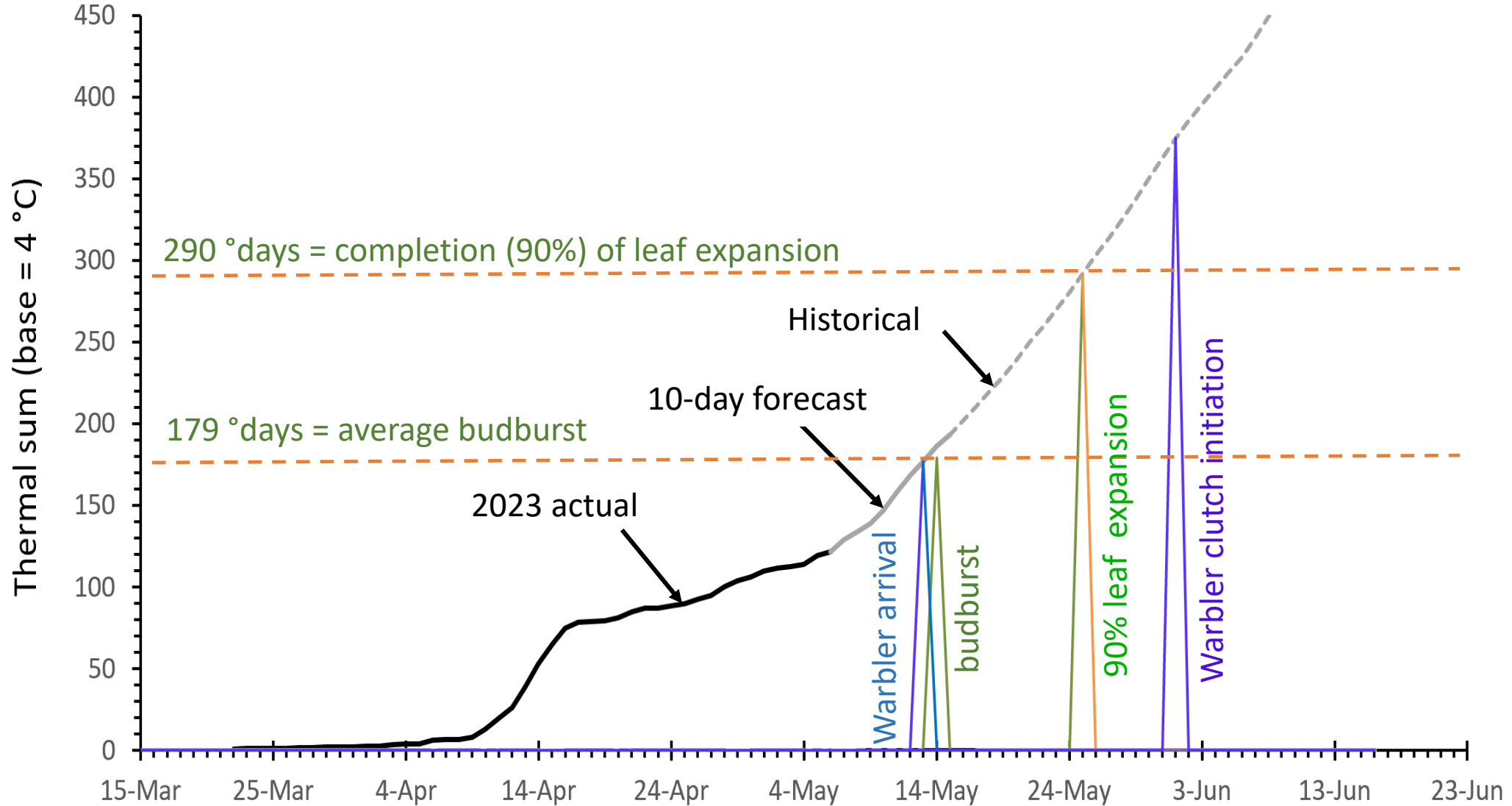
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 7 May 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

14 May and 25 May.

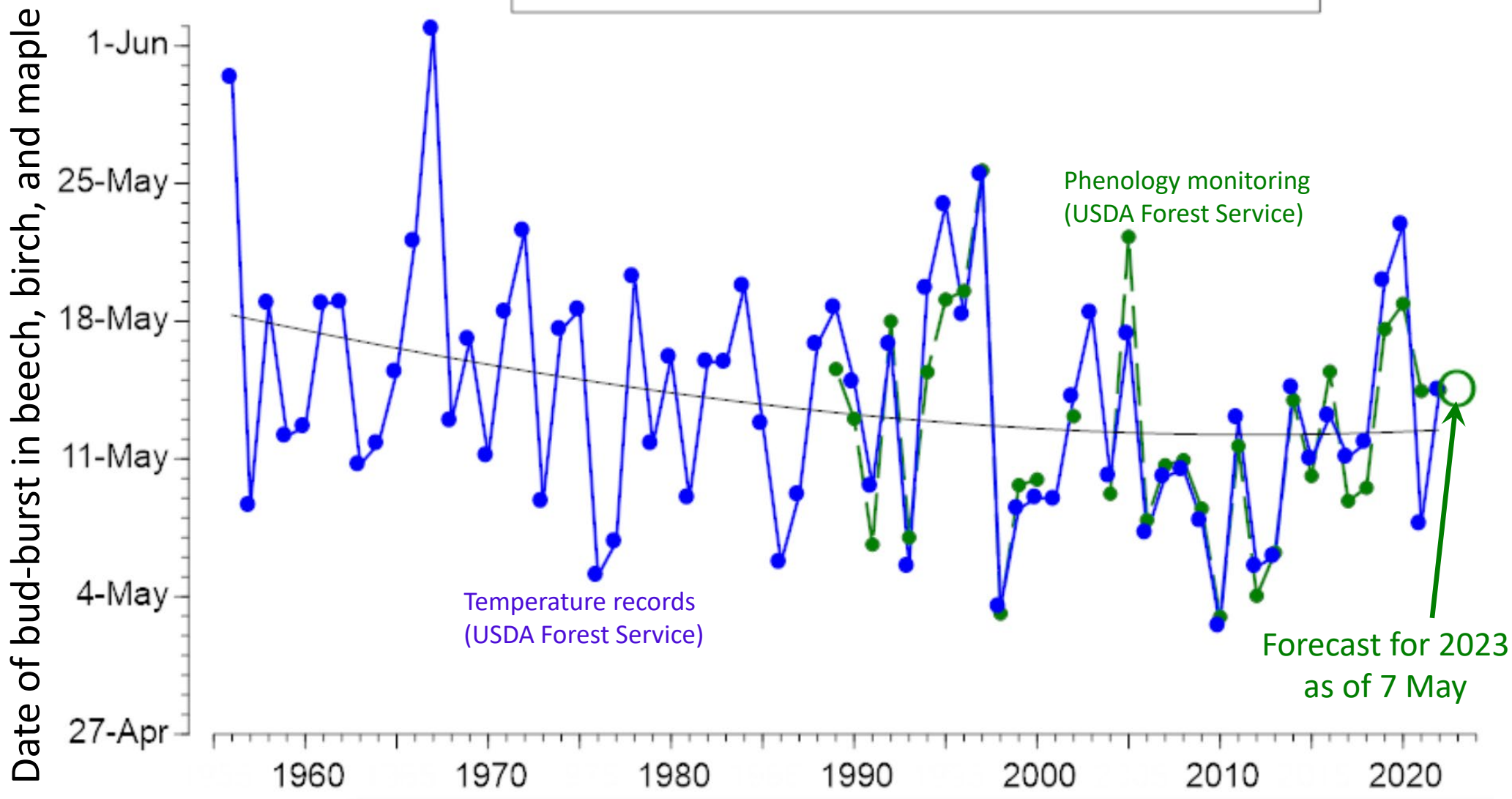
Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

13 May and 1 June.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.



As of 7 May 2023, the forecast date of leafout is 14 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.

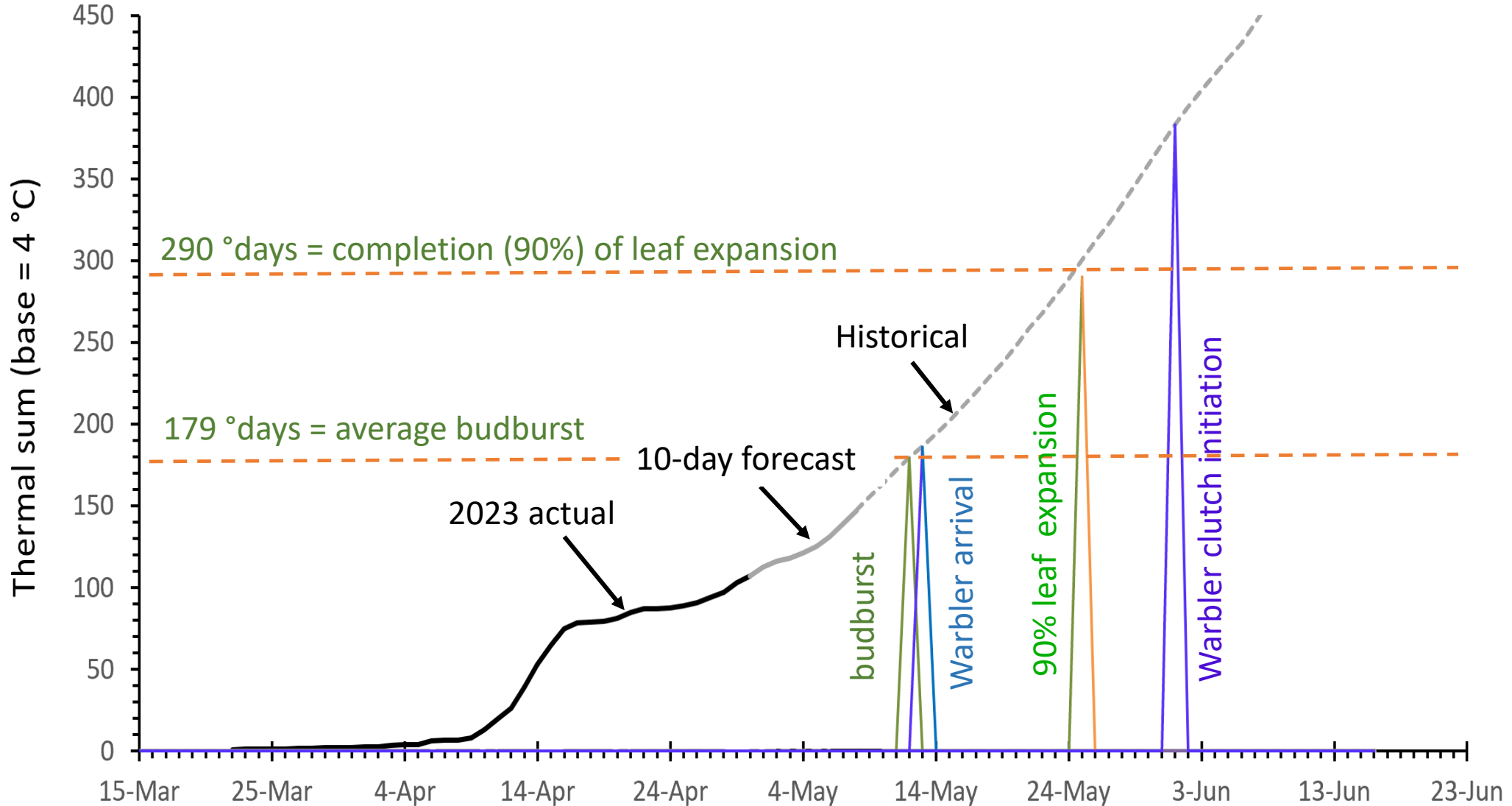
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 30 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

12 May and 25 May.

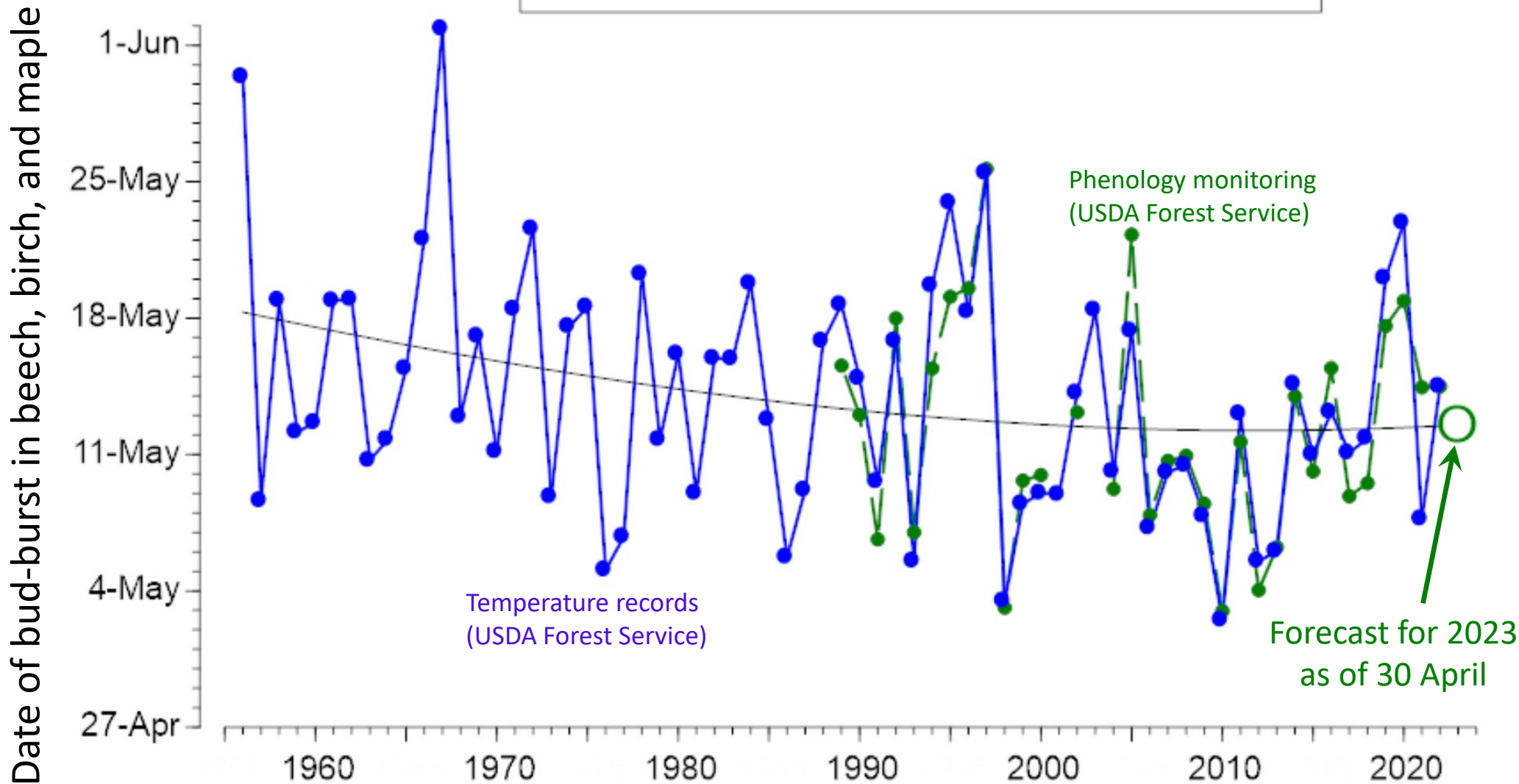
Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

13 May and 1 June.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.



[As of 30 April 2023](#), the forecast date of leafout is 12 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.

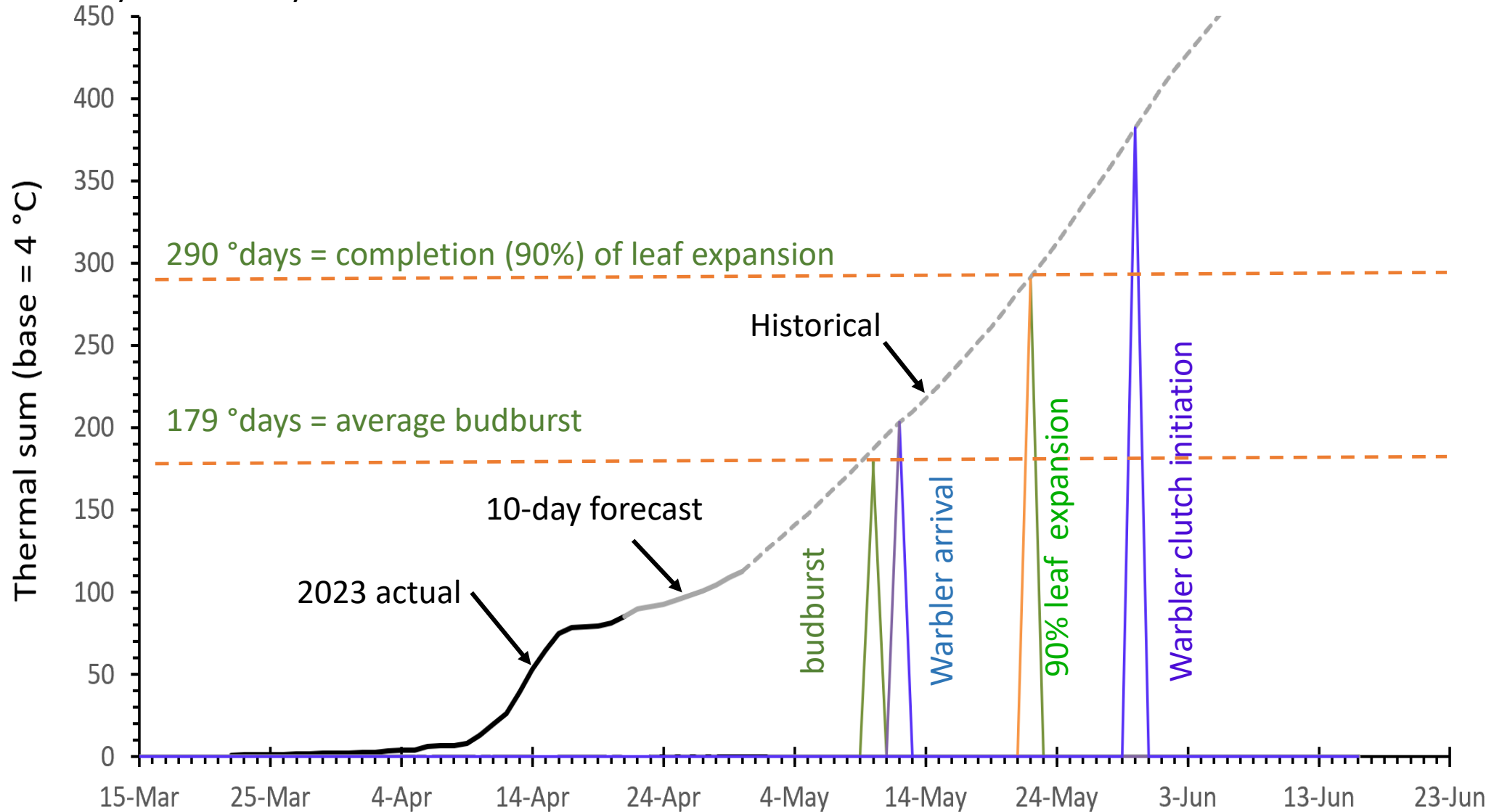
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 22 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

10 May and 22 May.

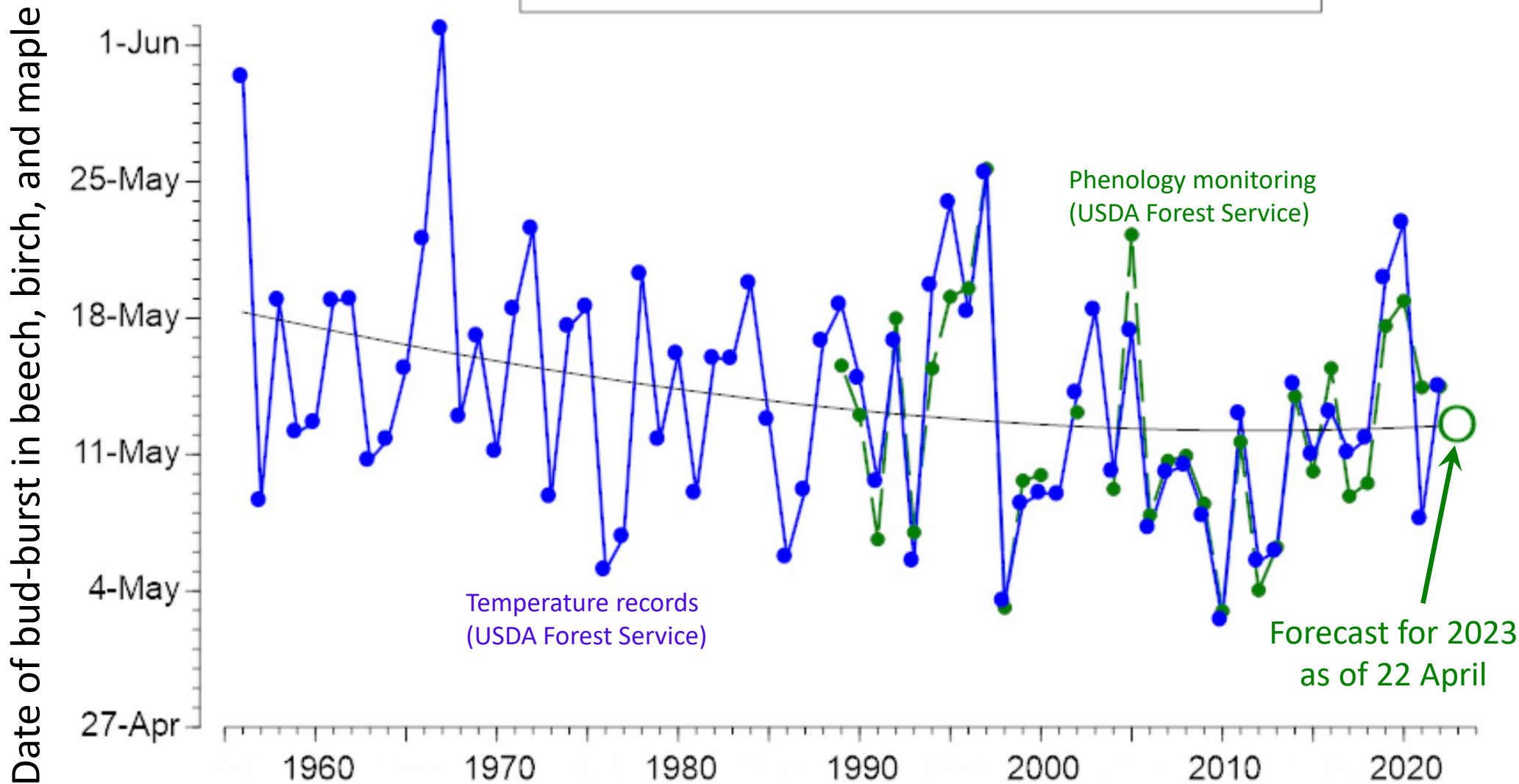
Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

12 May and 30 May.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.



[As of 22 April 2023](#), the forecast date of leafout is 10 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.



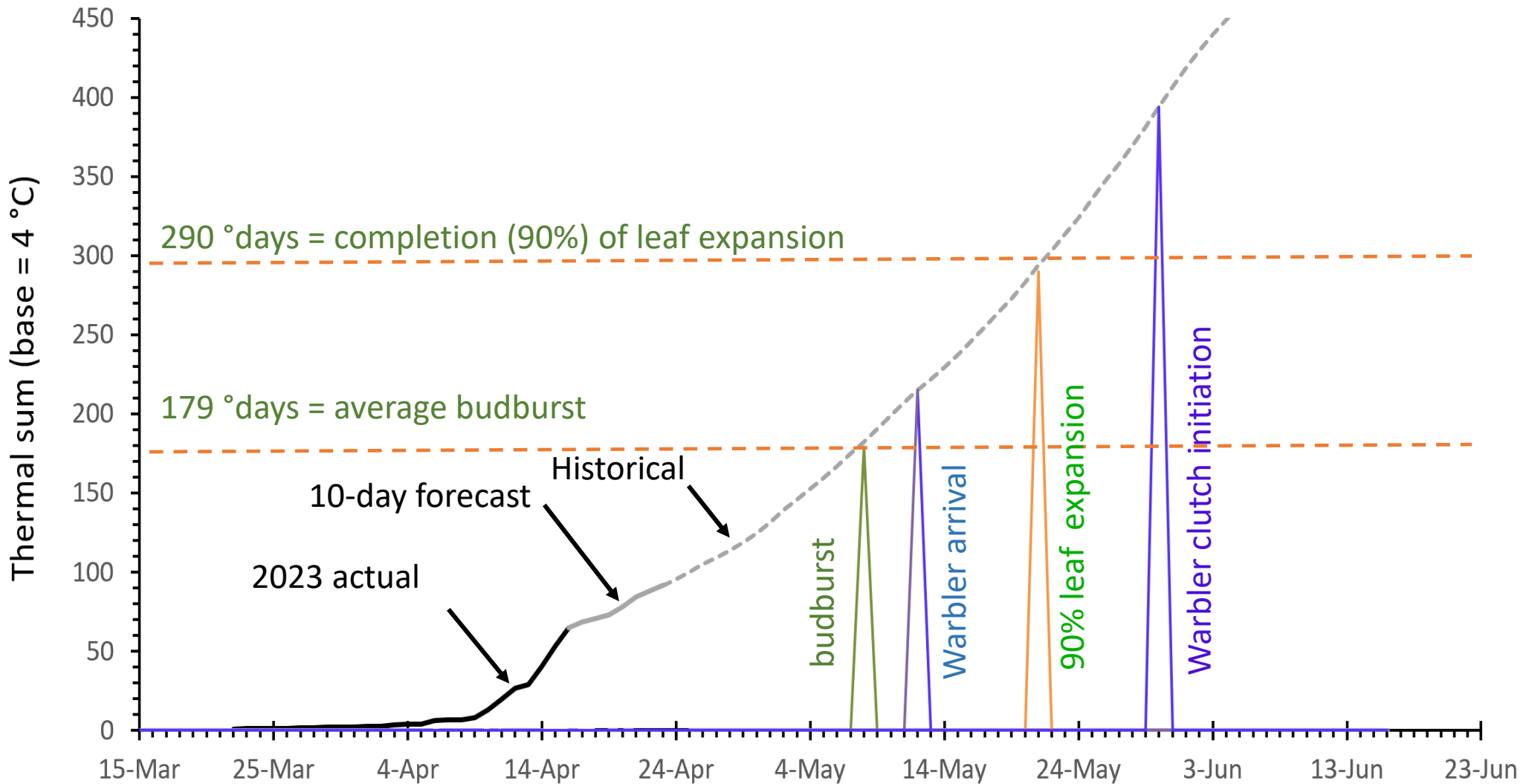
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 16 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

8 May and 21 May.

Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

12 May and 30 May.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.

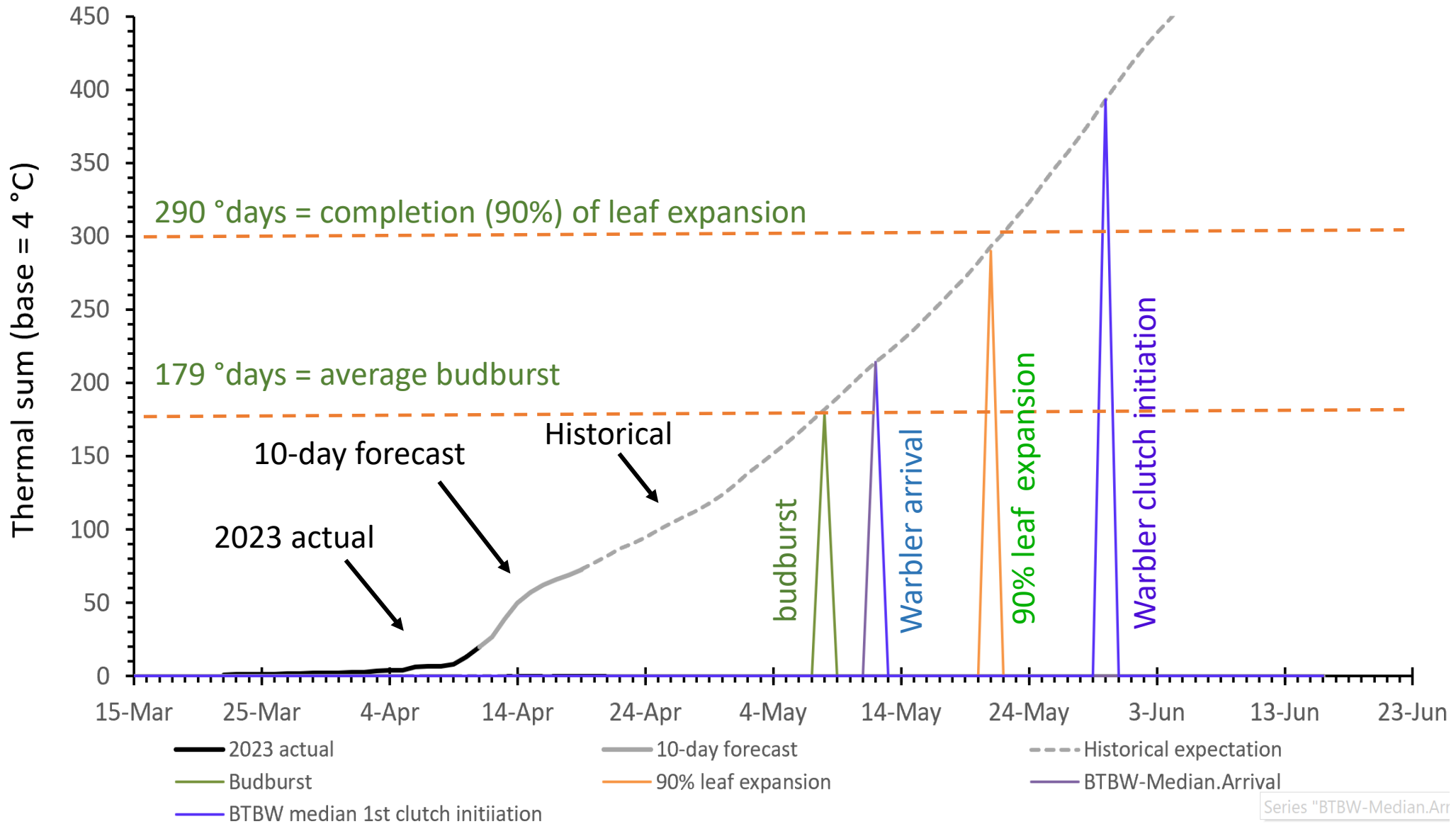
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 12 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

8 May and 21 May.

Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

12 May and 30 May.

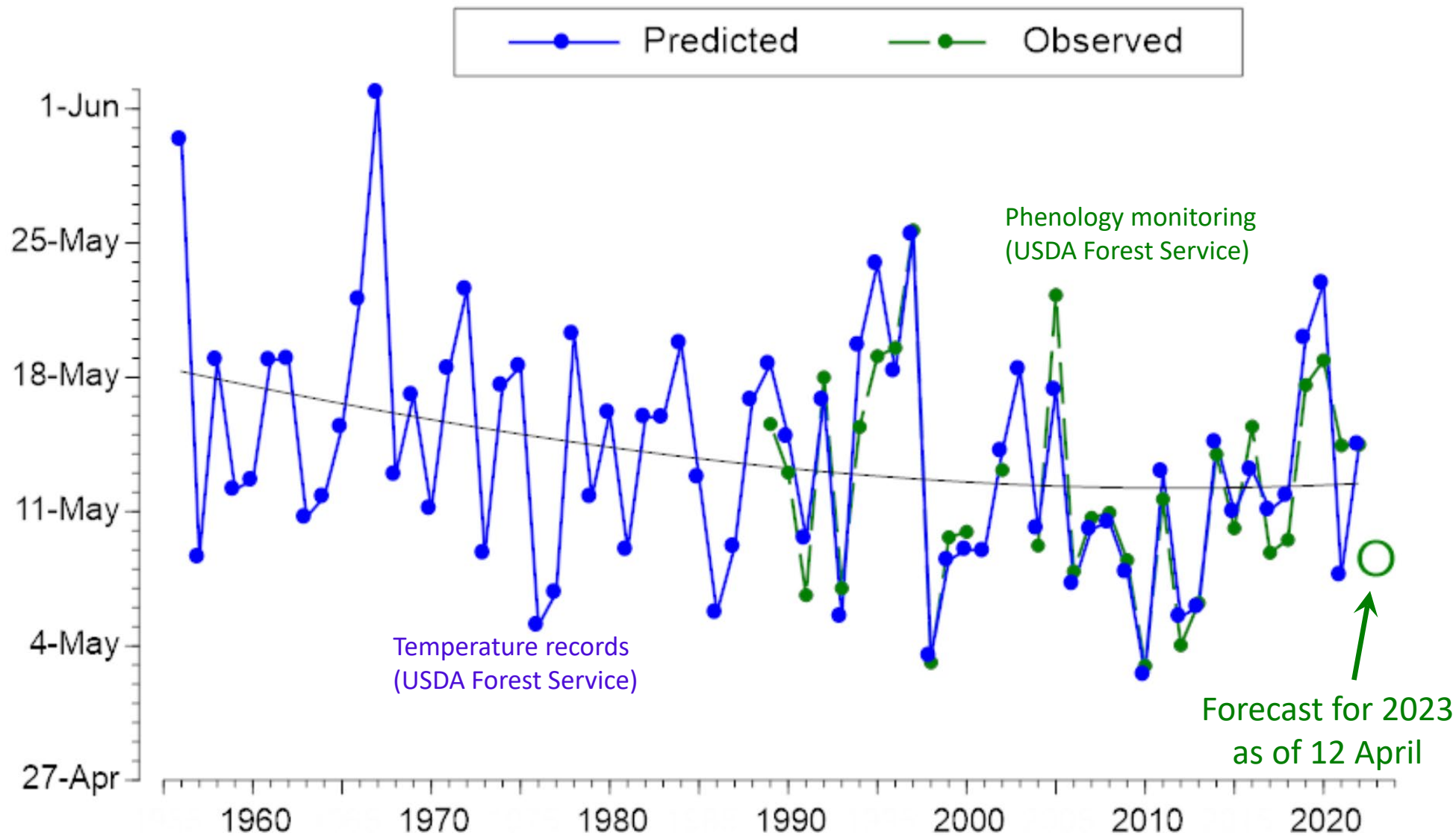


Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.



Date of bud-burst in beech, birch, and maple



[As of 12 April 2023](#), the forecast date of leafout is 8 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.

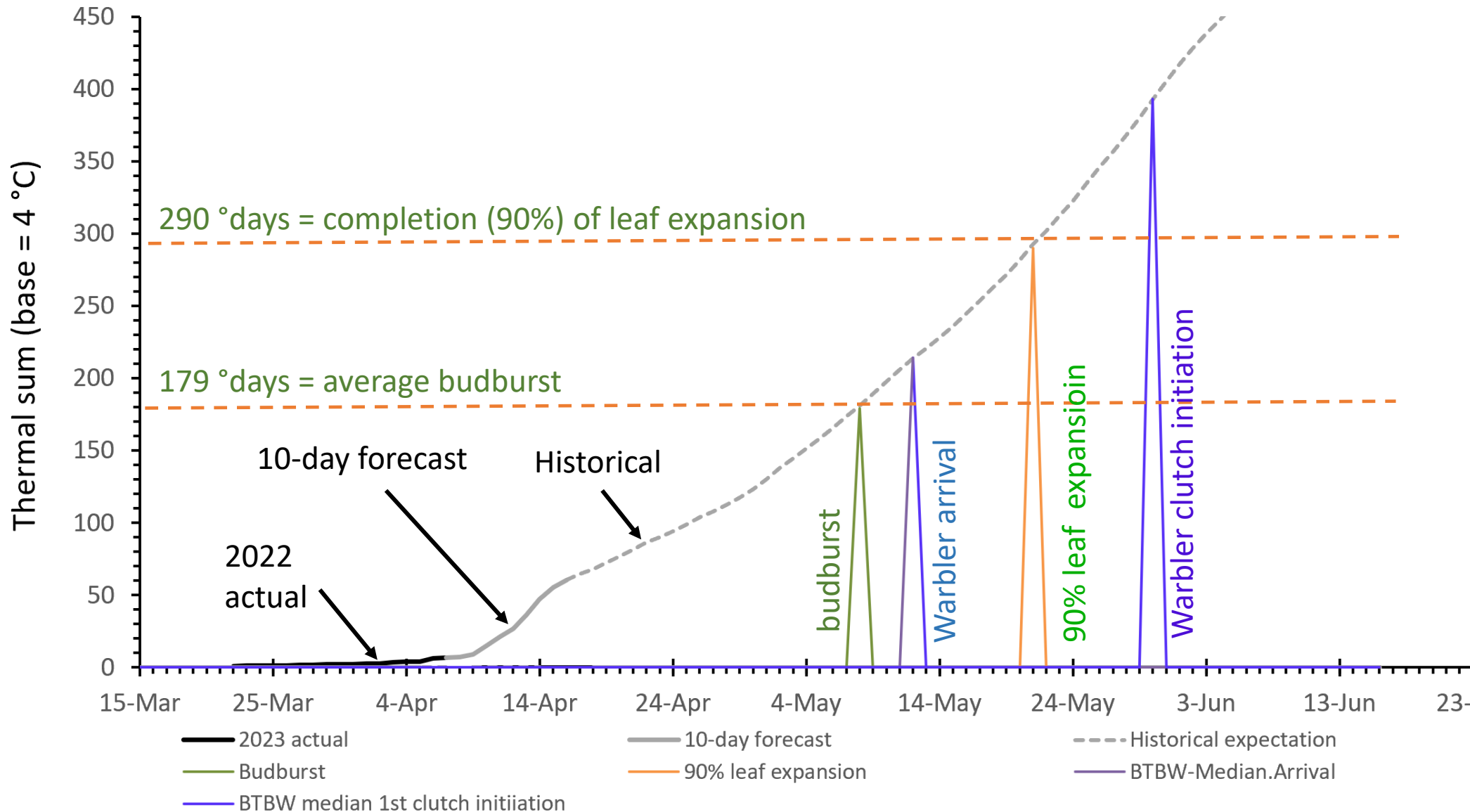
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 8 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

8 May and 21 May.

Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

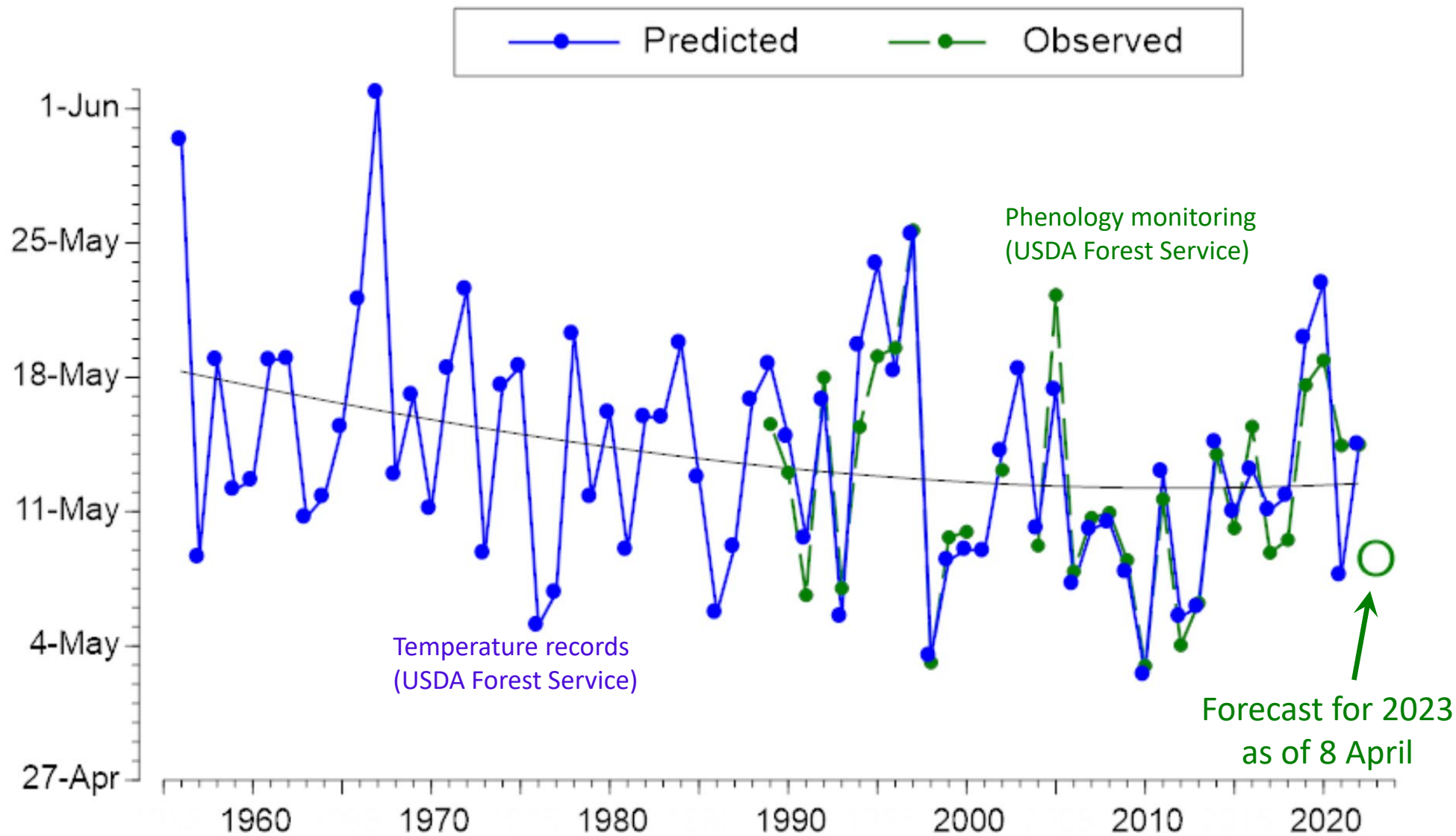
12 May and 30 May.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.

Date of bud-burst in beech, birch, and maple



[As of 8 April 2023](#), the forecast date of leafout is 8 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.

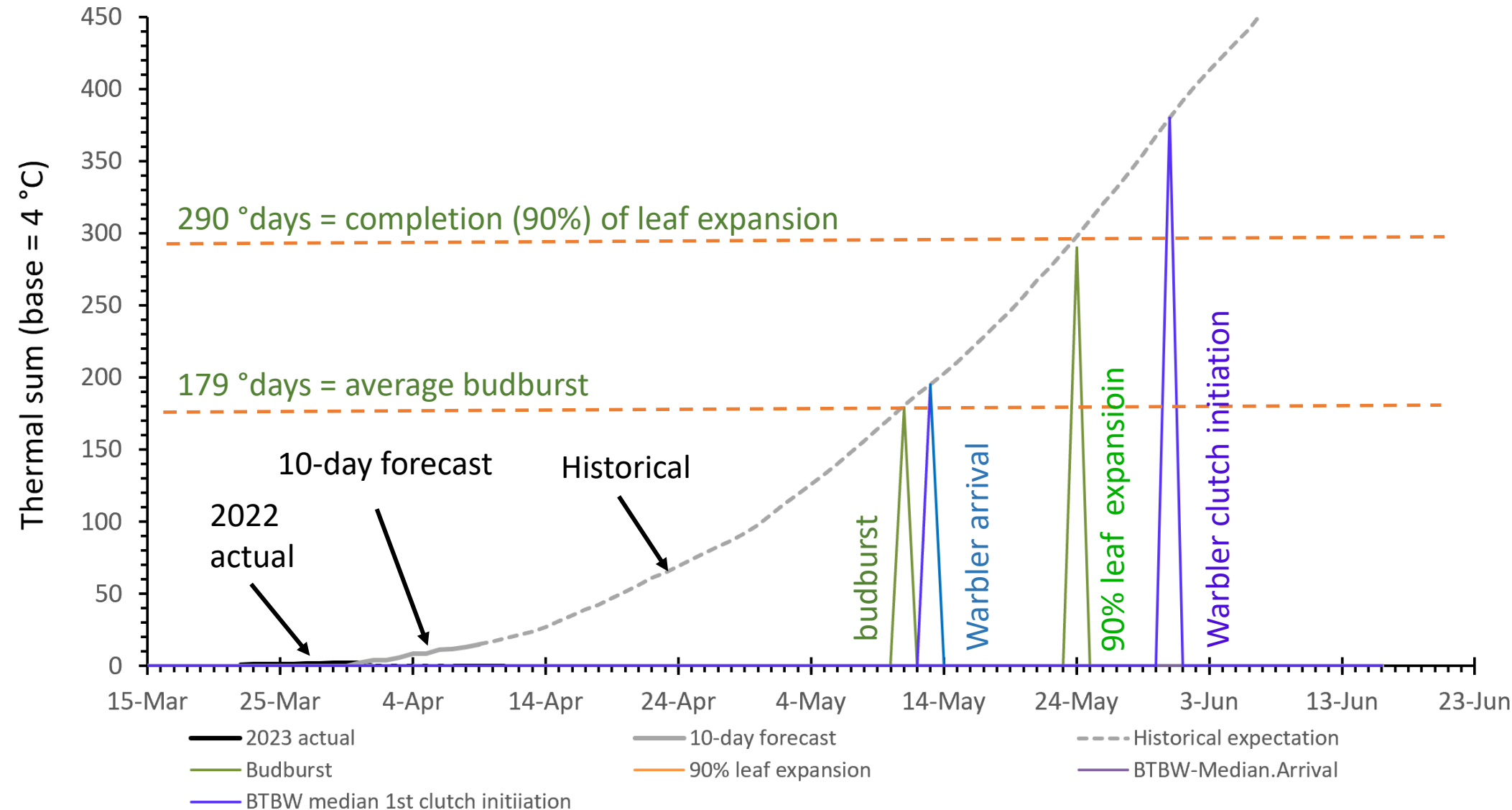
Estimated leaf-out phenology for mid-elevation Bird Plot in 2023 based on thermal sums.

[As of 1 April 2023](#), predicted dates for budburst and 90% completion of leaf expansion are:

11 May and 24 May.

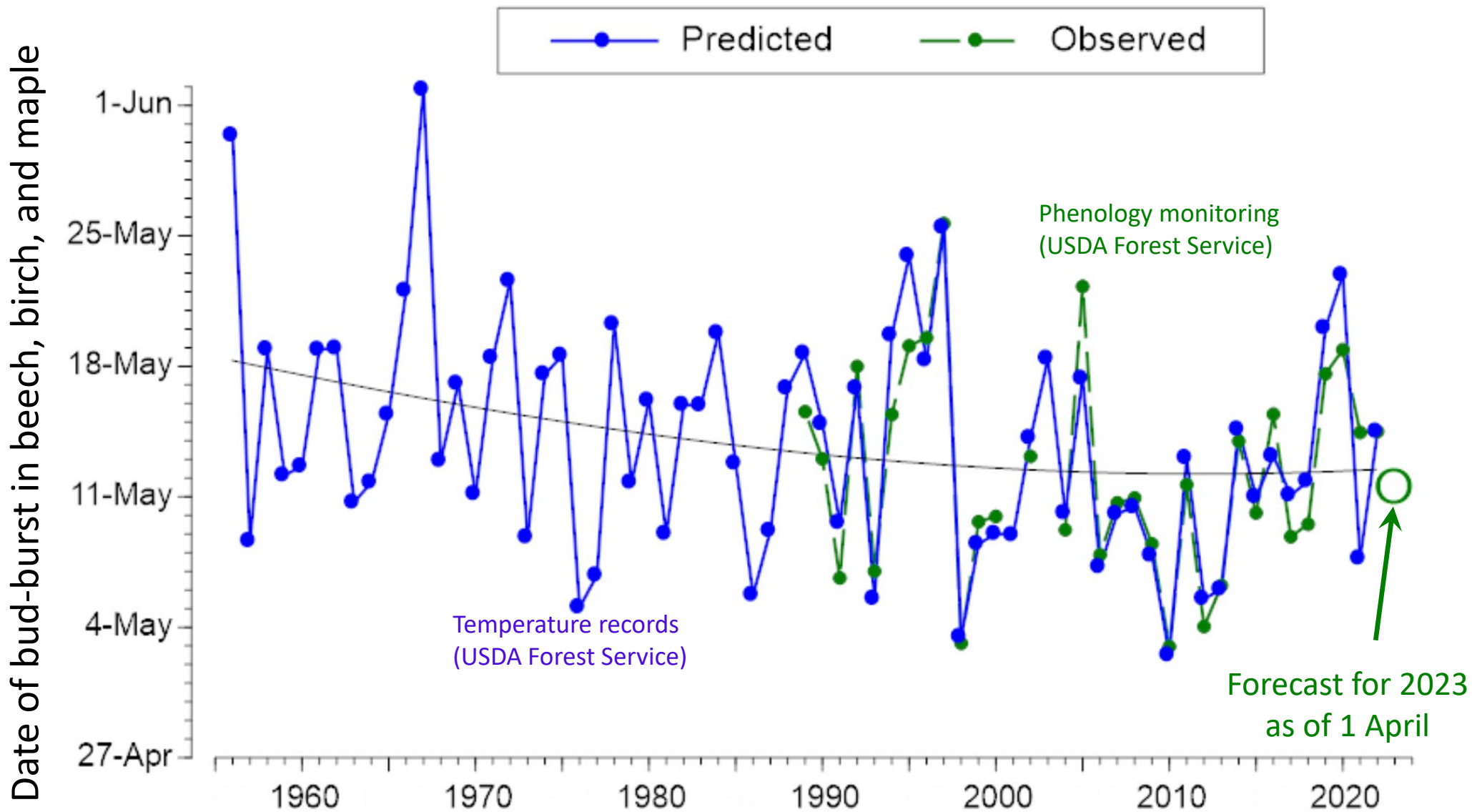
Predicted median dates of arrival and 1<sup>st</sup> clutch initiation by Black-throated Blue Warblers are:

13 May and 31 May.



Real-time temperature records from USDA Forest Service station at Watershed 1.

Phenological models adapted from Lany et al. 2016 using long term data of USDA Forest Service.



[As of 1 April 2023](#), the forecast date of leafout is 11 May for mid-elevation bird plots at Hubbard Brook.

Phenology measurements by Northern Research Station, USDA Forest Service.

Leaf phenology model adapted from Nina Lany et al. 2016, *Oikos*.

Analyses by Matt Ayres et al., Dartmouth College.

## References

USDA Forest Service, Northern Research Station. 2021. Hubbard Brook Experimental Forest: Routine Seasonal Phenology Measurements, 1989 - present ver 12. Environmental Data Initiative.

<https://doi.org/10.6073/pasta/f2c18a955c24eadaec1fa0d915a7b527>

USDA Forest Service, Northern Research Station. 2021. Hubbard Brook Experimental Forest: Daily Temperature Record, 1955 - present ver 10. Environmental Data Initiative.

<https://doi.org/10.6073/pasta/3afab60d54d5f2fcb1112e71f4be2106>

Lany, Nina K., Matthew P. Ayres, Erik E. Stange, T. Scott Sillett, Nicholas L. Rodenhouse, & Richard T. Holmes. 2016. Breeding timed to maximize reproductive success for a migratory songbird: the importance of phenological asynchrony. *Oikos* 125: 656-666.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/oik.02412>