

Research Article

Current Distribution of the Turkestan White Stork (*Ciconia ciconia asiatica*) in Kazakhstan

Vassiliy Fedorenko  and Yuliya Zima 

Laboratory of Ornithology and Herpetology, Institute of Zoology of the Ministry of Science and Higher Education of the Republic of Kazakhstan, Al-Farabi Avenue 93, Almaty 050060, Kazakhstan

Correspondence should be addressed to Vassiliy Fedorenko; arthey@mail.ru

Received 30 October 2023; Revised 2 March 2024; Accepted 8 March 2024; Published 22 March 2024

Academic Editor: Edson Gandiwa

Copyright © 2024 Vassiliy Fedorenko and Yuliya Zima. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Over the last 100 years, the range of the White Stork *Ciconia ciconia asiatica* (Linnaeus, 1758) in Kazakhstan has greatly diminished; it has entirely disappeared in its former eastern and northern ranges, while the number of nesting sites has decreased in the remaining part of its habitat. The most recent specialized studies on the distribution of the White Stork here were conducted in the 1980s. Subsequently, ornithologists were only aware of isolated nests, and in the last 15 years, up until recently, in Kazakhstan, there was only one known active nest in the Zhambyl region. To clarify the current distribution of the White Stork in Kazakhstan, we conducted field research during the breeding season in places of its former distribution in the Zhambyl and Turkestan Regions. Nest surveys were conducted by visual observations using binoculars and a camera with a telephoto lens. During the expedition, 43 inhabited nests of the White Stork were found; information about another 4 nests was obtained from data survey and social networks. Analysis of satellite images allowed us to identify 12 nests located on power line pylons in the southern regions of the republic, specifically in the Keles, Zhetisay, and Maktaaral districts. In total, 59 White Stork nests were found in Kazakhstan. In addition, satellite images revealed more than 120 power line pylons with White Stork nests in the territory of Uzbekistan in close proximity to the Kazakhstan border. All literary and electronic sources available to the authors have been meticulously reviewed. By synthesizing these data, two maps were created: one delineating all recorded White Stork nesting sites across Kazakhstan and its neighboring territories, and the other illustrating the known contemporary and historical ranges of the White Stork in Kazakhstan. A cadastral survey accompanies new nest discoveries of the White Stork. Based on the newly acquired data, we conclude that the White Stork population in Kazakhstan is currently on the rise.

1. Introduction

The White Stork *Ciconia ciconia* (Linnaeus, 1758) inhabits in Europe, North and West Africa, Transcaucasia, and Western and Central Asia. Throughout its entire range, two subspecies are distinguished: the nominotypical *C. c. ciconia* (Linnaeus, 1758) and Turkestan *C. c. asiatica* Severtzov, 1873. The nominotypical subspecies inhabits in Europe, Africa, Transcaucasia, and Western Asia, and the Turkestan subspecies lives in the territory of Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan, and, possibly, in the far west of China [1–4]. In Kazakhstan, the Turkestan subspecies of the White Stork is listed in the Red Book of the Republic [5].

The range of the Turkestan White Stork is isolated from the range of the nominotypical subspecies and occupies a much smaller area. Most of its range is in Uzbekistan, according to publications of the last decade, and approximately 1200 nests have been recorded here [6–8].

In Kazakhstan, the Turkestan White Stork nests in the south of the republic, where it reaches the northern edge of its range. Over the last 100 years, its range has decreased here significantly both to the west and to the south, and until recently, there has been a trend of decreasing numbers [5].

In 1930s, the White Stork in Kazakhstan was distributed to the east till the vicinity of Almaty, where it nested in the lower reaches of the Kaskelen, Talgar, Issyk, and Turgen rivers [9, 10]. Before this period, there was also a colony of

storks near the border of Kazakhstan, near the Bishkek city on the Sukuluk river in Kyrgyzstan [10], which apparently disappeared in 1932 [11]. In the Zhambyl region, White Stork nests were found in 1922 in the lower reaches of the Talas River, near Usharal village [12], and in the Turkestan Region, its former distribution was indicated along the Arys and Keles rivers, in the Sairam and Mankent villages, as well as along the Syr Darya River, up to the Turkestan city [9]. Later, in 1987–1988, no nesting storks were observed along the Syr Darya River [13]. In general, from 1936 to 1982, Kazakh ornithologists were not aware of any inhabited White Stork nests [14]. Therefore, in 1982–1987, targeted research was conducted to find their nests, along with surveys of the residents, and subsequent verification of the data obtained. The collected materials showed that over the previous 50 years, the White Stork disappeared from many villages of the Turkestan Region, and in 1987, 19 active nests were reliably recorded here. In the Zhambyl region during this period, only 6 inhabited nests were identified [14], with most northern were found in the lower reaches of the Talas River, near the settlements of Usharal, Oiyk (Uyuk), and Bestam (60 let Oktyabrya) villages [15].

Later, no special monitoring activities were conducted, and active White Stork nests between 1990s and 2000s were known only from the Zhambyl region, around the Taskol and Bilikol lakes, to the west and north-west of Taraz city [16–20], as well as near the Aspara village, northeast of the Merke village [16, 21]. Last 15 years, until recently, only one nest was known in Kazakhstan, near the Aspara village in the Zhambyl region, where members of the website *kz.birds.watch* (formerly *birds.kz*) photographed a nesting pair almost every year. Only in 2022, several new nests were discovered near the Tegistik [22] and Akzhar [23] villages.

Thus, the most eastern reliable current habitat of the White Stork in Kazakhstan has been the Aspara village so far, and the most northern point that has been found recently near the Tegistik village in the Zhambyl region. In the Turkestan region, the last recorded nests date back to the 80s of the last century. This situation, on the one hand, is the consequence of the lack of specialized research and, on the other, apparently, the low population of the White Stork in Kazakhstan (previously published sources indicate 15–30 pairs [8]).

2. Materials and Methods

Locating the White Stork nests were made during an expedition to the Zhambyl and Turkestan regions, from April 7 to April 16, 2023. Nest surveys were conducted by visual observations using binoculars and a camera with a telephoto lens, as well as a survey of residents, followed by verification of these data. The research route is illustrated in Figure 1. The total length of the route was 2550 km.

Additionally, data from respondents (or data from social networks) and information about White Stork nests obtained through the analysis of satellite imagery are also provided. Satellite images were analyzed using Google Earth Pro version 7.3.6.9345 from different years.

The map for plotting the nest locations and range boundaries was created using QGIS (Quantum GIS) version 2.18.2. It was based on raster elevation data obtained from the Consortium for Spatial Information (CGIAR-CSI) dataset (<https://srtm.csi.cgiar.org>), Normalized Difference Vegetation Index NDVI maps from the SPOT-VEGETATION satellite (S10 NDVI collection) provided by the VITO research organization (<https://www.vito-eodata.be>), and vector maps of water bodies from the Digital Chart of the World for different countries, available on the Diva-GIS website (<https://www.diva-gis.org>).

The map provides the cadaster of new White Stork nest findings in Kazakhstan. It also displays all the previously known White Stork nest locations in Kazakhstan and the adjacent territory, gathered through the analysis of literary sources. All previously published nest locations in Kazakhstan are included on the map [9, 10, 13–21, 24–31], and for Uzbekistan and Kyrgyzstan, the points were taken solely from contemporary sources and new findings made by satellite imagery [5–7, 32, 33].

3. Results

During the expedition, we found 43 White Stork nests (Figure 1, points 1–43). Of these, the storks for 27 nests were incubating the clutch (the birds were sitting on the nests), while some nests were still under construction (the birds were standing on or near the nest).

A colleague, M. Kulemin, reported about one active nest (Figure 1, points 44, 45) near the Syr Darya River floodplain (Turkestan region).

Information about three active nests in the Zhambyl region was found by social networks (Figure 1, points 45–47): N. Myshbaeva recorded a video of an active stork nest in the meadows in the vicinity of the Zhylybulak village southeast of Biylikol Lake, in personal correspondence she mentioned that this nest is not the only one in that area; another two were captured on video and photos, one in the vicinity of the Chaidana village and the other in the Akermen village.

We identified a colony of six White Stork nests (Figure 1, points 48–52), located on power line pylons through satellite imagery analysis near the Shtabkanal village, in the Keles District, in the south of the Turkestan region, on the border of the republic. Additionally, several more nests were found further south based on satellite imagery: 2 nests in the Zhetisay District (Figure 1, points 53–54) and 5 nests in the Maktaaral District (Figure 1, points 55–59). Figures 2(a) and 2(b) show satellite images of one of these nests taken on different dates, and for comparison, satellite images of two nests (Figures 2(c)–2(f)) of varying quality were discovered visually during the expedition.

In addition to the abovementioned nests near the Shtabkanal village, colonial settlements were also observed near the Tegistik village (Figure 1, points 7–10) in Zhambyl region and near the Kaplanbek village (Figure 1, points 21–33) in the Turkestan Region. In these areas, a total of 4 nests and 12 nests were found, respectively, situated on adjacent power line pylons or within visible proximity.

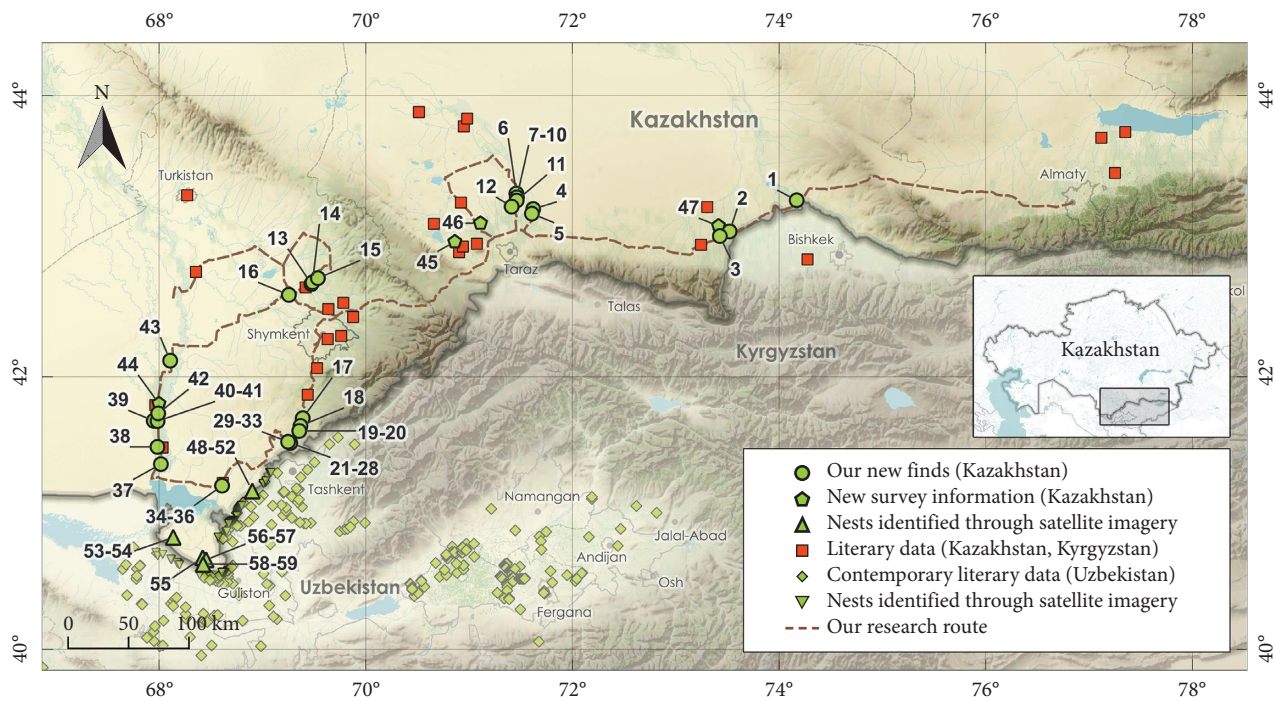


FIGURE 1: Finding points of White Stork nests in Kazakhstan and the adjacent territory.

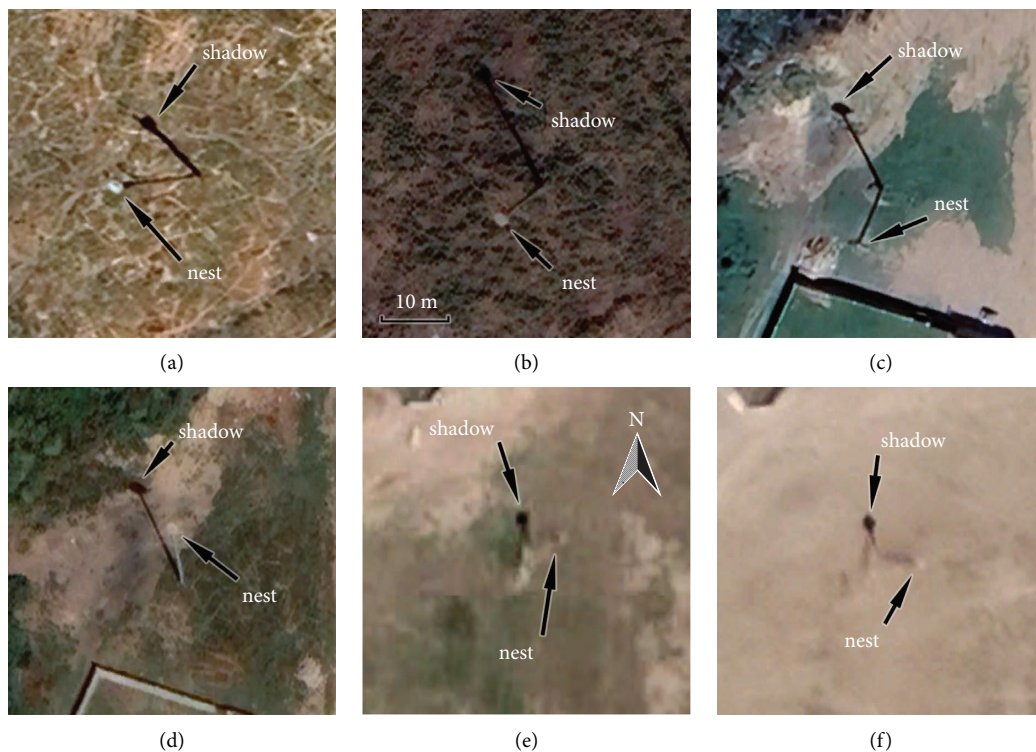


FIGURE 2: An example of an image of White Stork nests on power line pylons, on Google Earth satellite imagery: (a) -nest "49," 1.06.2023; (b) -nest "49," 6.09.2022; (c) -nest "22," 1.06.2023; (d) -nest "22," 1.06.2023; (e) -nest "12," 7.05.2021; (f) -nest "12," 9.08.2017.

All nests, except for two, were located on old utility poles or active power line pylons of various types (wooden, reinforced concrete, and metallic) (Figure 3). Two nests were

on trees: one nest in the Akzhar village on a broken dry tree trunk and another nest near the Zhylybulak village on a living tree (*Elaeagnus* sp.).

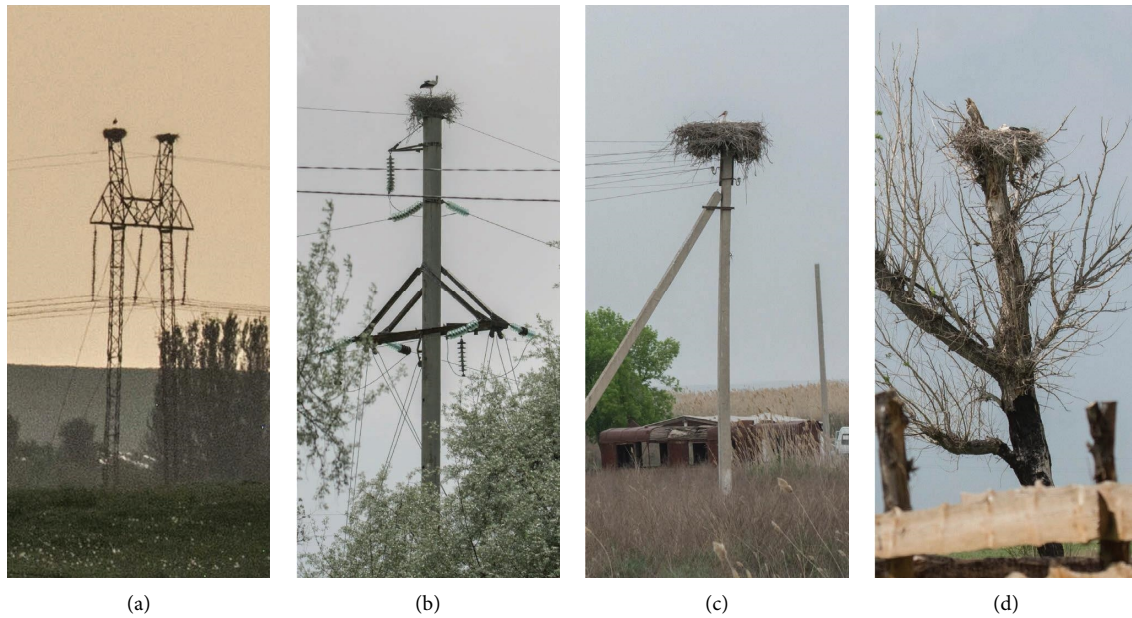


FIGURE 3: White Stork nests on different types of supports: (a) -two nests near the Kaplanbek village on an intermediate portal metal pylon; (b) -nest in the Temirlan village (Temirlanovka) on an anchor-corner reinforced concrete pylon; (c) -nest in the Uzynata village (Komsomolsky) on a corner intermediate reinforced concrete pylon; (d) -nest in the Akzhar village (Zhambyl) on a dry tree trunk.

In addition to the territory of Kazakhstan, over 120 power line pylons with White Stork nests were identified through satellite imagery for the territory of Uzbekistan, in the immediate vicinity of the Kazakhstan-Uzbekistan border. Many of these power line pylons hosted more than one nest. The locations of the pylons are shown in Figure 1 without representation.

By consolidating all these data, as well as information about past findings of White Stork nests from available literary sources, a map was constructed to display the known current and historical ranges of the White Stork in Kazakhstan (Figure 4).

3.1. Cadaster to Figure 1

(1) *Zhambyl Region*. 1: Chu River, vicinity of Blagoveshchenka village (N 43.26°, E 74.17°), 07.04.2023; 2: Aspara River, vicinity of Akermen village (N 43.04°, E 73.52°), 07.04.2023; 3: Makhandy River, vicinity of Akermen village (N 43.01°, E 73.42°), 07.04.2023; 4: Talas River, Akzhar village (Zhambyl) (N 43.20°, E 71.62°), 16.04.2023; 5: Talas River, vicinity of Akzhar village (Zhambyl) (N 43.16°, E 71.60°), 16.04.2023; 6: Talas River, vicinity of Tegistik village (N 43.31°, E 71.46°), 16.04.2023; 7-10: Talas River, vicinity of Tegistik village (N 43.28°, E 71.46°), 16.04.2023; 11: Talas River, vicinity of Tegistik village (N 43.26°, E 71.46°), 16.04.2023; 12: Shalkes River, vicinity of Kenes village (N 43.22°, E 71.41°), 16.04.2023.

(2) *Turkestan Region*. 13: Boralday River, vicinity of Sot-skogam village (N 42.67°, E 69.47°), 08.04.2023; 14: Boralday River, Sot-skogam village (N 42.68°, E 69.48°), 08.04.2023; 15: Boralday River, Boralday village (N 42.71°, E 69.54°), 08.04.2023; 16: Boralday River, Temirlan village

(Temirlanovka) (N 42.59°, E 69.26°), 15.04.2023; 17: Keles River, Savankhana village (N 41.70°, E 69.39°), 12.04.2023; 18: Keles River, Kyzylkia village (Novostroyka) (N 41.64°, E 69.37°), 12.04.2023; 19-20: Keles River, Akzhar village (Stepnoe) (N 41.61°, E 69.36°), 12.04.2023; 21-28: Keles River, Kaplanbek village (Gorny) (N 41.52°, E 69.27°), 12.04.2023; 29-33: Keles River, vicinity of Kaplanbek village (Gorny) (N 41.53°, E 69.25°), 12.04.2023; 34-36: Kurukkeles River, vicinity of Birlik village (N 41.21°, E 68.61°), 14.04.2023; 37: Syr Darya River, vicinity of Kosseyit village (Voskhod) (N 41.37°, E 68.02°), 14.04.2023; 38: Syr Darya River, vicinity of Koksu village (N 41.49°, E 67.98°), 14.04.2023; 39: Syr Darya River, vicinity of Uzynata village (Komsomolskiy) (N 41.68°, E 67.95°), 14.04.2023; 40-41: Syr Darya River, Uzynata village (Komsomolskiy) (N 41.68°, E 67.98°), 14.04.2023; 42: Syr Darya River, vicinity of Tselinnoye village (Kazakhstan) (N 41.73°, E 67.99°), 14.04.2023; 43: Syr Darya River, vicinity of Bayyrkum village (Bayirkum) (N 42.12°, E 68.11°), 14.04.2023.

(3) *Survey Data and Social Media Data. Turkestan region*: 44: Syr Darya River, Kazakhstan village (N 41.80°, E 67.99°), 05.2023 [M. Kulemin, pers. comm.]; *Zhambyl region*: 45: Biylkol Lake, vicinity of Zhylybulak village (N 42.96°, E 70.86°), 07.06.2023 [N. Myshbaeva, pers. comm., [34]; 46: Ashchibulak River, vicinity of Chaydana (Shaydana) village (N 43.10°, E 71.10°), 04.2023 [35]; 47: Aspara River, vicinity of Akermen village (N 43.08°, E 73.41°), 13.07.2018 [36].

(4) *Data from Satellite Imagery. Turkestan region*: 48-52: North Tashkent Canal, Shtabkanal village (N 41.16°, E 68.90°), 01.06.2023 [Airbus 2023, Google Earth]; 53-54: west of Zhily-su (Mineralnye vody) village (N 40.83°, E 68.14°), 08.09.2022 [Maxar Technologies 2023, Google Earth]; 55: north of Baybota village (otdel imeni Kirova)

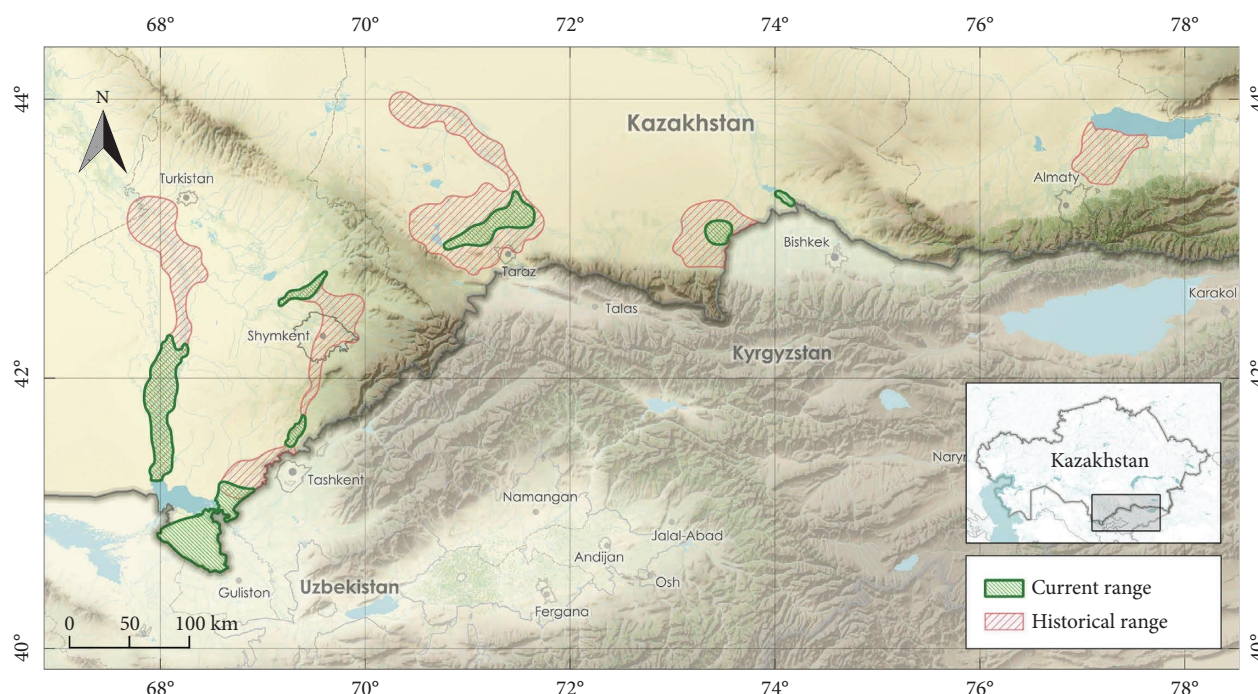


FIGURE 4: The current and historical range of the White Stork in Kazakhstan.

(N 40.68°, E 68.42°), 27.06.2023 [Airbus 2023, Google Earth]; 56-57: north of Baybota village (otdel imeni Kirova) (N 40.66°, E 68.45°), 27.06.2023 [Airbus 2023, Google Earth]; 58-59: vicinity of Baybota village (otdel imeni Kirova) (N 40.63°, E 68.43°), 27.06.2023 [Airbus 2023, Google Earth].

4. Discussion

It is believed that decline in the population of the Turkestan White Stork in the last century was influenced by anthropogenic factors, including reduction of rice cultivation areas [9], swamps drainage, direct shooting of birds, and urban expansion [4]. However, there is an opinion that climate conditions played the main role [1]. This is supported by the fact that the subsequent increase in the White Stork global population began at approximately the same time [1], and by the fact that the stork increase in Uzbekistan, where the core population of the Turkestan White Stork lives, recently continues without obvious positive changes in the region's anthropogenic impact [4, 5, 37].

In Kazakhstan, despite the absence of specific studies, some facts also indicate that the White Storks increased. For instance, we discovered nests in 2023 in the Syr Darya River valley near the Tselinnoye and Koksuy villages which were absent in 1987-1988 [13]. Individual nests of the current colonial settlement in the Kaplanbek village can only be identified in satellite images after 2013. Near the Tegistik village, we found 4 nests nearby and 1 nest slightly to the south, though only one nest was recorded in 2022 [22]. In the upper reaches of the Chu River, nesting sites were not previously known, but the nest we

found is located not far from the main highway and is quite noticeable.

In late May 2021, a group of 4 White Storks was documented by R. Bigonneau at Sinakkol Lake, southeast of the Turkestan city [38]. While these could have been young nonbreeding individuals, the past nesting records of White Storks, 30 km to the north in the Turkestan city [9], and 30 km southwest in the Shaulder village [17], increase the likelihood that White Storks are currently nesting in this area.

White Storks use nests for many years; in Europe, there are even nests known to remain occupied for over 100 years [1]. It is also known that the shortage of tall trees is one of the factors limiting the number of this species. The absence of tall trees forces birds to colonize anthropogenic structures, primarily power line pylons, which pose a dual threat for them: firstly, some of the nests are thrown from the pylons by power company employees (residents told us about such incidents) due to operational issues, and secondly, the birds die from electrocution on the lines. The safest places for the birds are power line pylons of 35 kV or higher, as the conductors on these pylons are spaced at distances of 2.5 meters and located below the load-bearing metal structures. To prevent birds from electrocution, power lines should be equipped with special bird protection devices (BPD). Installing nesting platforms both active power line pylons (if the design of the pylons allows the platform to be placed at a distance from the conductive elements and not expose the latter to the impact of droppings) and on standalone poles would reduce the number of accidents caused by birds (and their nests) and provide storks with

reliable and safe nesting sites, thereby increasing their nesting success and numbers.

Our research route did not cover all the areas where the White Stork was previously known to nest, let alone potential new territories where it could theoretically nest. After our expedition, the number of nests discovered through satellite imagery indicates how incomplete our data are and suggests that the contemporary range of the White Stork in Kazakhstan is broader.

5. Conclusions

The data obtained during stork and nest survey significantly enhance our understanding of the White Stork current distribution in Kazakhstan. Analysis of all available data leads us to conclude that there is currently an increase in the population of this species in Kazakhstan. However, its contemporary range has significantly decreased compared to the early 20th century.

The results obtained through the analysis of satellite imagery demonstrate that this tool is quite effective for locating White Stork nests on power line pylons, provided that high-resolution images are available.

The new information about White Stork nests enables specific nest monitoring and the development of conservation measures for this species within the republic.

Data Availability

All new information is included in the article.

Ethical Approval

The work was carried out within the framework of a state program and in accordance with the current laws of the Republic of Kazakhstan. All field observations were conducted remotely, without any direct interaction with the birds, and did not impact the breeding of White Storks.

Disclosure

The funders had no role in study's design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

We express our gratitude to M. Kulemin and N. Myshbaeva for providing information on the discovered stork nests, including details of their locations and the circumstances of the meetings. We are also thankful to G. Nazarbek and A. Eszhanov for their information regarding stork nests in the vicinity of Shardara city, which enabled us to adjust the route of our expedition and led to the discovery of several White Stork nests. Special thanks are extended to Zh. Ibragimova for her assistance with English language editing. This research was

supported financially by the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan and carried out within the framework of the Targeted Financing Program IRN BR18574058 (2022–2024) on the topic “Development of the Red Book of Animals of Kazakhstan and an Electronic Database on Rare and Endangered Animals.”

References

- [1] V. N. Grishchenko and Y. D. Galchyonkov, “White stork *Ciconia ciconia* (Linnaeus, 1758),” in *Pticy Rossii I Sprodel'nyh Regionov: Pelikanoobraznye, Aistooobraznye, Flamingoobraznye*, pp. 384–416, Association of Scientific Publications KMK, Moscow, 2011.
- [2] J. A. Hancock, J. A. Kushlan, and M. P. Kahl, “White stork *Ciconia ciconia* (Linnaeus),” in *Storks, Ibises and Spoonbills of the World*, pp. 97–102, Academic Press, Cambridge, MA, USA, 1992.
- [3] J. MacKinnon and K. Phillipps, *A Field Guide to the Birds of China*, Oxford University Press, New York, NY, USA, 2000.
- [4] A. K. Sagitov, “Order Ciconiiformes,” in *Pticy Uzbekistana*, vol. 1, pp. 29–54, Fan, Tashkent, Uzbekistan, 1987.
- [5] S. L. Sklyarenko, “Turkistan White Stork,” in *The Red Data Book of the Republic of Kazakhstan, 4th, revised and updated ed., vol. 1: Animals. Part 1: Vertebrates*, pp. 96–97, DPS, Almaty, Kazakhstan, 2010.
- [6] M. A. Gritsyna, E. A. Bykova, R. I. Ibragimov et al., “Results of surveys and analysis of nesting habitats of the Turkistan white stork *Ciconia ciconia asiatica* in the Fergana Oblast (Uzbekistan),” *Russian Journal of Ornithology*, vol. 31, no. 2201, pp. 2795–2808, 2022.
- [7] R. D. Kashkarov, A. A. Atakhodzhaev, V. O. Sudarev, L. E. Belyalova, S. E. Fundukchiev, and Z. M. Gadaev, “Current state of the population of the Turkistan white stork *Ciconia ciconia asiatica* in Uzbekistan,” in *Materialy Respublikanskoj nauchno-prakticheskoy konferencii ‘Sovremennyye problemy’ sokhraneniya redkikh, ischezayushchikh i malozuchennykh zhivotnykh Uzbekistana*, Tashkent, pp. 98–104, 2016.
- [8] Birds of Uzbekistan, “All records of the species-white stork *Ciconia ciconia* (Linnaeus, 1758),” 2023, https://birds.uz/map?species_id=27.
- [9] I. A. Dolgushin, “White stork-*Ciconia ciconia* L.,” in *Birds of Kazakhstan*, vol. 1, pp. 185–187, Izdatelstvo Akademii nauk Kazahskoj SSR, Almaty, Kazakhstan, 1960.
- [10] V. N. Shnitnikov, *Birds of Semirechye*, Izdatelstvo Akademii nauk SSSR, Moscow-Leningrad, 1949.
- [11] A. I. Yanushevich, P. S. Tyurin, I. D. Yakovleva, A. Kydyraliev, and N. I. Semenova, *Birds of Kyrgyzstan*, vol. 1, Izdatelstvo Akademii nauk Kirgizskoj SSR, Frunze, Kyrgyzstan, 1959.
- [12] D. N. Kashkarov, “Ecological profile of the region of lakes: Biylu-Kul, Akkul and Ashchi-Kul of Aulie-Ata district,” *Trudy Sredneaziatskogo gosudarstvennogo universiteta*, vol. 2, pp. 1–54, 1928.
- [13] B. M. Gubin and S. L. Sklyarenko, “Birds of Eastern edge of Kyzylkum Desert,” *Ornithological News of Kazakhstan and Middle Asia*, vol. 3, pp. 84–134, 2014.
- [14] S. L. Sklyarenko and A. P. Kovshar, “On the preparation of the cadastre of the white stork in Kazakhstan,” in *Vsesoyuznoe soveshchanie po probleme kadastra i ucheta zhivotnoy mira*, Ufa, vol. 3, pp. 217–219, 1989, 1989.

- [15] A. P. Kovshar and V. G. Kolbintsev, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, p. 52, 1991.
- [16] O. V. Belyalov, "White stork *Ciconia ciconia*," *Kazakhstan Ornithological Bulletin*, vol. 2005, p. 157, 2006.
- [17] B. M. Gubin, *The Birds of the Deserts of Kazakhstan*, vol. 3, Publishing house «SprintR», Almaty, 2020.
- [18] B. M. Gubin and F. F. Karpov, "Data on breeding birds of Bijlikul lake (Southern Kazakhstan)," *Russian Journal of Ornithology*, vol. 8, no. 75, pp. 3–13, 1999.
- [19] V. G. Kolbintsev, *Birds of the Wetlands of the Lesser Karatau Foothills (Southern Kazakhstan)*, Selevinia, vol. 2003, pp. 98–108, 2004.
- [20] V. G. Kolbintsev and E. M. Belousov, "Finding a nest of white storks in the south of Kazakhstan," *Kazakhstan Ornithological Bulletin*, vol. 2006, p. 138, 2007.
- [21] V. G. Kolbintsev, "White stork nesting in the Merken region," *Kazakhstan Ornithological Bulletin*, vol. 2007, p. 124, 2008.
- [22] M. Nukusbekov, "White stork *Ciconia ciconia* (Linnaeus, 1758)," *Birds of Kazakhstan*, 2022, <https://perma.cc/P3V9-XSX9>.
- [23] N. Sagaliyev, "White stork *Ciconia ciconia* (Linnaeus, 1758)," *Birds of Kazakhstan*, 2022, <https://perma.cc/LC2T-FBES>.
- [24] V. A. Belyalov, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, p. 51, 1991.
- [25] E. S. Chalikova, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, p. 51, 1991.
- [26] S. N. Erokhov, "Some birdwatching in the lower reaches of the Assa River," *Kazakhstan Ornithological Bulletin*, vol. 2003, p. 100, 2004.
- [27] B. M. Gubin, *The Birds of the Deserts of Kazakhstan*, vol. 1, LLP Kolor, Almaty, 2015.
- [28] V. G. Kolbintsev, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, pp. 51–52, 1991.
- [29] Y. Livinsky, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, p. 51, 1991.
- [30] R. G. Pfeffer, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, p. 52, 1991.
- [31] S. L. Sklyarenko and V. A. Morozov, "Brief report on *Ciconia ciconia*," in *Rare species of birds and animals of Kazakhstan*, Gilim, Alma-Ata, pp. 50–51, 1991.
- [32] O. V. Belyalov, V. A. Fedorenko, and S. V. Kulagin, "The results of ornithological trip to Kyrgyzstan in summer 2015," *Selevinia*, vol. 2015, pp. 149–155, 2016.
- [33] A. P. Kovshar, M. Lange, and V. I. Toropova, "Ornithological research in Inner, Central and Southern Tien Shan and in adjacent ranges of Alay mountain system in Kyrgyzstan," *Selevinia*, vol. 2004, pp. 65–96, 2005.
- [34] N. Myshbaeva, "White stork nest," *Instagram*, 2023, <https://perma.cc/3B9F-W3RE>.
- [35] Z. Qaz, "White stork nest," *Instagram*, 2023, <https://perma.cc/Q2N9-7ZTK>.
- [36] E. Alimkulov, "White stork nest," *Instagram*, 2018, <https://perma.cc/X7WT-KVQL>.
- [37] E. Shernazarov, "Distribution and numbers of *Ciconia c. asiatica* in Central Asia," in *Proceedings international symposium on the White Stork*, pp. 331–334, Hamburg, Germany, September 1996.
- [38] R. Bigonneau, "Asian white stork," *iNaturalist*, 2021, <https://perma.cc/3ZCX-V7DS>.