Methodology

Ukrainian Innovation in a War of Attrition

Data Selection and Process

The CSIS Transnational Threats Project produced a map of Russian and Ukrainian force disposition in Ukraine as of February 10, 2023, by compiling, updating, and analyzing a data set of geolocated units and a line of contact through open-source research. The research team first compiled a data set of potential unit locations based on the existing work of several open-source researchers, including Project Owl (@projectowlosint) and Jomini of the West (@JominiW). The research team then searched social media platforms—including Twitter and Telegram—for each of these units. Units for which the last available sighting was before January 1, 2023, were removed from the data set, as were units for which multiple sources provided conflicting information. Additional units not originally contained in the data set that could be identified and geolocated since the beginning of 2023 were also added.

The resulting data set included only units for which there was a confirmed geolocation or multiple identifications from open sources with a history of reliable statements or purported access to primary source information in a particular area. Such sources included publications and information from governments, including those of Ukraine, Russia, and the United Kingdom; publications and social media posts from verified international journalists reporting on the conflict, including those affiliated with CNN and the *New York Times*; and social media accounts claiming to belong to open-source analysts and sources on the ground in Ukraine. CSIS researchers then reviewed instances of conflicting accounts, returning several units to the data set because one of the sources that generated the conflict was assessed to be significantly less reliable than others.

The remaining units were plotted and compared to information detailing recent military activity in Ukraine. Such information was derived from author interviews with multiple sources involved in fighting in Ukraine, as well as open-source event aggregators, including **Geoconfirmed**, **Live Universal Awareness Map**, and **Operational Map Ukraine**. CSIS researchers determined areas in which the existing set of confirmed units was insufficient to produce the observed military activity. Units

capable of producing such activity that had been previously excluded from the data set due to sourcing limitations were returned to the data set in low numbers.

The line of contact for the battlefield map was also created using open sources. The CSIS research team began by consulting several existing maps, including those produced by the **Institute for the Study of War and AEI's Critical Threats Project**, **Project Owl**, and **@War_Mapper**. CSIS researchers then identified locations where existing maps conflicted both with one another and with the CSIS plotting of units. In these locations, further research was conducted to find the most up-to-date position of the line of contact. This information was derived from similar sources as the unit locations, including publications and information from governments, including those of Ukraine, Russia, and the United Kingdom; publications and social media posts from verified international journalists reporting on the conflict, including those affiliated with Reuters, PBS Newshour, the *Wall Street Journal*, and the *New York Times*; and social media accounts claiming to belong to open-source analysts and sources on the ground in Ukraine. The representation of the line of contact between Ukrainian and Russian forces is not meant to denote de facto or de jure Russian control over Ukrainian territory.

Limitations

The information on this map—including unit types, sizes, locations, and the line of contact between Ukrainian and Russian forces—represent CSIS's best estimates. All locations are approximate. The fog of war is a reality both for warfighters and those researching conflicts. Accordingly, there are five key limitations to the methodology used to create the CSIS battlefield map.

One limitation is that reliance on open-source material creates two forms of selection bias. First, units not involved in combat—particularly those in rear areas away from the line of contact—are less likely to appear in open sources. This applies equally to Russian and Ukrainian units and means that the map generally does not capture units far from the line of contact, including those held in operational or strategic reserve. Second, Ukrainian units are more likely than Russian units to appear in open sources. The Ukrainian military has made concerted use of social media and other information platforms to promote its war efforts. For example, it is not uncommon for Ukrainian units to have Facebook pages where they post updates on their activity and even release battlefield footage, such as that from body cameras or drones. Citizens are also more likely to be in closer proximity to Ukrainian soldiers in friendly territory, allowing them to post images and videos of military activity. As a result, it is possible that a greater proportion of Ukrainian units was detected and mapped than of Russian units.

The second limitation in the methodology is that not all units are equally detectable. Armored formations, for example, leave a larger footprint than infantry formations of the same size. Likewise, infantry units dug in for prolonged periods in trenches are more easily detectable than infantry units engaged in house-to-house fighting in urban terrain. This reality severely limits the ability of researchers to identify

small formations and units intentionally maintaining a low profile. With a handful of exceptions, CSIS researchers did not attempt to map special forces units or formations below the size of a battalion.

The third limitation is that combat is ongoing and territorial control is fluid in several actively contested areas. Both sides are continuously trading small amounts of territory, and this constant flux means no assessment of the line of contact or a unit position is perfectly accurate at any given time. For example, a Russian offensive against Vuhledar appears to have intensified significantly in the days between when data was collected for the February 2023 Russian and Ukrainian force disposition map and its publication, and therefore the map likely understates the density of units in the area and may not represent the line of contact there as precisely as in other areas.

The fourth limitation is the difference between units on paper and their capabilities in reality. As units fight, their manpower and matériel is typically depleted. CSIS researchers did not assess the strength of individual units. As such, it is likely that various units are weaker than they appear on the map. The suitability of weapons platforms for different purposes or ambiguity in terminology exacerbates this issue. For example, a video or report of a Ukrainian artillery strike could indicate the presence of an artillery unit, mortar unit, or armored unit employing indirect fire. Likewise, the equipment a unit possesses may change over time and, therefore, units may be employing capabilities not indicated on the map.

The fifth limitation is that both Ukraine and Russia are incentivized to misrepresent the situation on the battlefield. The information domain has become a key battlespace during the war at both the strategic and operational levels. Both sides attempt to exaggerate their successes and downplay their failures in efforts to influence audiences at home and abroad. Both sides are also highly likely to attempt deception operations and enforce operational security to surprise the enemy. For that reason, information released by either government, as well as by supporters for either side, may be biased. CSIS researchers attempted to limit the impact of this bias by prioritizing sources that provided visual evidence whenever possible. When such evidence was unavailable, researchers required multiple other sources to place a unit or the line of contact in a particular area.

These five limitations are summarized in Table 1. Although these limitations are difficult to mitigate entirely, the CSIS research team has ensured that the Russian and Ukrainian force disposition map and accompanying analysis represent its best estimates based on available open-source information.

Table 1: Methodological Limitations

Limitation	Implications	Actions Taken
Selection bias: Units not involved in combat—particularly those in rear areas away from the line of contact—are less likely to appear in open sources.	The map captures few units far from the line of contact, including those held in operational or strategic reserve. This applies equally to Russian and Ukrainian units.	Researchers generally did not attempt to map units far from the line of contact.
Selection bias: Ukrainian units are more likely than Russian units to appear in open sources.	A higher proportion of Ukrainian units was likely detected and mapped than of Russian units.	Russian units in some areas were added to the map at a lower threshold of evidence. This was done in areas in which the existing force disposition or level of military activity indicated the presence of additional Russian units.
Small formations and units intentionally maintaining a low profile, such as special forces units, are unlikely to appear in open sources.	Formations and those maintaining a low profile are underrepresented on the map.	With a handful of exceptions, CSIS researchers did not attempt to map special forces units or formations below the size of a battalion.
Combat is ongoing and territorial control is fluid in several actively contested areas.	No assessment of the line of contact or a unit position is perfectly accurate at any given time.	All locations depicted on the map are approximate. Locations were last updated February 10, 2023.
Complete evidence of a unit's strength or capabilities is rare and difficult to assess. The equipment and capabilities of a unit may also change over time.	It is likely that various units are weaker than they appear on the map. New equipment or capabilities a unit possesses may not be indicated on the map.	Researchers did not attempt to assess unit strength or the difference between unit capabilities on paper and on the battlefield.
The Ukrainian and Russian governments (as well as supporters of either side) are incentivized to misrepresent the situation on the battlefield.	Biased information related to unit locations or territorial advances may lead to inaccuracies on the map.	Researchers prioritized sources that provided visual evidence whenever possible. When such evidence was unavailable, researchers required multiple other sources to place a unit or the line of contact in a particular area.