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The Sona Lithic Mounds: Field Measurements and Preliminary Interpretation of Anomalous Stone Structures in Transylvania, Romania

Sam Osmanagich*

Founder and Principal Investigator, Archaeological Park: Bosnian Pyramid of the Sun Foundation, Ravne bb, 71300 Visoko, Bosnia-Herzegovina

***Corresponding Author:** Sam Osmanagich, Founder and Principal Investigator, Archaeological Park: Bosnian Pyramid of the Sun Foundation, Ravne bb, 71300 Visoko, Bosnia-Herzegovina.

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Abstract

The Šona Lithic Mounds, located near Făgăraș in Transylvania, Romania, represent a group of eight anomalous elevations arranged in two regular west–east rows of four. Previous Romanian descriptions have classified them as earthen "pyramids" or tumuli composed primarily of mud and clay, with estimated heights of up to 30 m. However, those statements lack any empirical field data or structural investigation. This study presents the first in situ field measurements and scientific observations conducted in October 2025 by the author.

Using topographic surveying, ionization, and electromagnetic measurements, combined with direct access into tunnel cavities created by illicit excavation in 2013, the mounds were confirmed to consist of compact lithic material rather than loose sediment or anthropogenic fill. Their geometry is irregular, yet the spatial organization is clearly intentional—aligned west–east, corresponding with the solar axis (sunrise–sunset). Morphometric analyses based on half- ellipsoid modeling reveal consistent circumferences between 150–166 m for six of the eight mounds (±5 %), suggesting deliberate proportional control despite naturalistic external forms.

Environmental readings indicated normal background radiation (0.12–0.15 μSv/h), moderate magnetic and electric field strengths, and positive–negative air ion balance typical for unpolluted rural sites. No anomalous energies were detected. The Šona mounds therefore present a paradox:

lithic structures displaying ordered placement and proportional similarity, yet lacking signs of shaping or tool-based modification. Further research involving LIDAR, GPR, and excavation is recommended to determine their origin, internal architecture, and potential relation to the wider European tumulus tradition.

Keywords: Šona Lithic Mounds, Transylvania, Lithic Structures, Tumulus Morphology, Geomorphology, Field Measurements, Ionization, Electromagnetic Survey, European Mound Tradition, Anomalous Formations

Introduction

The site of Šona, located near Făgăraș in central Romania, contains eight prominent mounds distributed in two parallel rows oriented along an almost perfect west–east axis. These features—commonly known in local sources as the "Piramidele de la Șona"—have long been the subject of popular speculation but have never undergone scientific investigation or measurement.

Romanian literature and online publications typically describe them as earthen pyramids or tumuli formed from clay and soil deposits, allegedly rising to heights of about 30 meters [1, 2]. However, these statements are unsupported by field data, and no peer-reviewed geophysical or geological surveys have been published to date.

The absence of quantitative documentation has resulted in persistent misconceptions regarding the Šona mounds' morphology, composition, and possible origin. The current study represents the first empirical field survey conducted at the site, performed by the author in October 2025, combining morphometric measurements, environmental instrumentation, and in situ observations inside existing tunnels. The primary objective was to determine the geometrical parameters, material composition, and spatial organization of the structures, while evaluating the validity of the prevailing assumptions in Romanian and European literature.

Earlier research on tumuli and megalithic mounds across Europe demonstrates considerable variability in form and construction materials—from earth-filled burial barrows in Britain and Scandinavia to megalithic lithic tumuli in the Balkans and Anatolia [3-5]. The Šona complex exhibits certain parallels to these structures, particularly in its alignment and proportional regularity, yet differs sharply in its internal lithic composition and lack of visible anthropogenic masonry or stratigraphy. Its appearance and orientation suggest intentional placement, while its composition implies a non-anthropogenic lithic formation, creating an interpretive anomaly within the regional archaeological landscape.

The present paper therefore aims to:

- Document the first quantitative dataset for all eight Šona mounds, including length, width, height, circumference, and estimated volume;
- Present results from ionization, electromagnetic, and radiometric measurements conducted on-site.

- Compare the Šona lithic structures with established European mound typologies; and
- Discuss the implications of these findings for understanding the formation, possible intentionality, and classification of these anomalous geomorphological-archaeological features.

Materials and Methods

Site Description

The Šona Lithic Mounds are located on the southern slopes of the Transylvanian Plateau, near the village of Șona, approximately 10 km west of Făgăraș, Romania. The site consists of eight elongated lithic elevations arranged in two parallel rows oriented along the west–east axis, corresponding to the solar alignment between sunrise and sunset (Figure 1). Each row comprises four mounds (Figures 2–4), separated by relatively flat terrain. Vegetation is primarily grass and low brush, with no evidence of modern agricultural modification.

Field Campaign and Measurements

Field investigations were conducted in October 2025 under stable autumn weather conditions. The campaign represented the first systematic documentation of the site using direct measurements and physical instrumentation. The mounds were numbered from No. 1 (westernmost) to No. 8 (easternmost) (Figure 14). Topographic data were obtained through manual surveying using a Stanley Powerwinder 60 m (34-775) steel tape and a Silva professional compass for azimuthal reference. Each mound's length (L), width (W), and height (H) were recorded, and circumference (C) was measured or derived from surface perimeter traverses. The resulting dataset was used to compute volumes assuming a half-ellipsoid geometric model (Section 3).

Subsurface Access and Lithic Verification

Two narrow tunnels—one first dug by looters in 2013, extending ~15 m horizontally into Mound No. 2, and a second descending shaft from 2019, ~14 m deep—were examined for direct material observation (Figure 5). Both tunnels revealed compact, lithic structure, contradicting earlier reports describing the mounds as clay or earthen deposits [1,2]. The interior exhibited homogeneous stone material, lacking brick, tile, or mortar layers, as shown in Figures 6 and 7. The tunnel walls are massive and unstratified, indicating lithic cohesion rather than sedimentary lamination.

Instrumentation and Environmental Measurements

A suite of precision instruments was employed to record environmental parameters (Figure 9):

- **Air Ion Counter** (Alpha Lab Inc., USA, Model 19): 1000 ions/cm³ total concentration, with negative air ions (NAI) ranging 600–1000 ions/cm³ and positive air ions (PAI) 400– 800 ions/cm³. These values correspond to healthy rural background levels (6), roughly five

times cleaner than urban environments, with a favorable NAI > PAI ratio.

- **Electrosmog Meter** (Cornet Microsystem Inc., ED88T Plus, USA): 100 MHz–8 GHz, LG Gauss sensor, readings 0.0005–0.0030 MHz range, indicating negligible EM pollution.
- **Trifield EMF Meter** (Model TF2, USA): magnetic 0.1–0.2 mG, electric 0 V/m, RF 0 mV/m²—baseline background.
- **Radiation Dosimeter** (MKS-05 IP20 Terra-P, Ecotest CE, USA): gamma dose 0.12–0.15 μSv/h, consistent with global natural background [7].
- **ExTech EMF 450 Multifield Meter** (USA): 0.21 mG magnetic field, 1.0 V/m electric field, 0 RF strength.

All readings confirmed the absence of geophysical anomalies and electromagnetic irregularities.

Data Processing and Visualization

Dimensional data were compiled into a comparative table (Figure 11), integrating field measurements and derived volumes based on the half-ellipsoid formula:

V=23πabcV = \frac{2}{3}\pi a b cV=32πabc

where a and b are semi-axes of length and width, and c represents height. A one-meter surface layer was assumed to consist of soil and clay, with the remainder representing lithic material. A $\rho \approx 2.4$ t/m³ average rock density was used for mass estimation. Correlations between mound height and volume are illustrated in Figure 12, while proportional consistency of circumferences is summarized in Figure 14.

Results

Morphometry of the Šona Lithic Mounds

The eight Šona mounds exhibit elongated, half-ellipsoidal geometry rather than conical or pyramidal forms (Figures 2–4). Their alignment follows a strict west–east orientation, with the long axes nearly parallel to one another.

Measured dimensions are summarized in Figure 11, while a schematic overview of the mound geometry and relative positions is shown in Figure 14.

The mounds range from 6 m (No. 6) to 19 m (No. 2) in height and 120–166 m in circumference. Despite visible irregularities in outline, six of the eight mounds (Nos. 1–5 and 8) fall within ±5

% of a mean circumference of 158 m, suggesting an underlying proportional planning principle not expected of purely natural features.

The combined site area of the two rows spans approximately 250 m × 160 m.. The uniform azimuth support a hypothesis of deliberate placement or modification, contrasting with surrounding natural terrain, which displays random erosional topography [8].

Lithic Composition and Internal Structure

Field access through the robber tunnels in Mound No. 2 (Figures 5–7) confirmed that the structures are composed of solid lithic material—compact, dense, and without evidence of man-made brick or mortar. The internal surface shows fractured stone rather than cohesive sediment, demonstrating that these are not clay mounds as repeatedly described in regional sources [1, 2].

Preliminary visual examination suggests the rock may be silicified sandstone or andesitic lithic breccia, both abundant in Transylvanian subsurface formations [9]. The rock mass lacks visible stratification, displaying a monolithic texture consistent with mechanically coherent lithified blocks, likely covered by approximately one meter of topsoil and weathered clay.

Volumetric and Mass Calculations

Volumes were computed using the half-ellipsoid formula V=23πabcV = \frac{2}{3}\pi a b cV=32πabc where aaa, bbb, and ccc represent semi-axes of length, width, and height respectively. Calculated values ranged between 1,000 m³ (No. 6) and 15,000 m³ (No. 5) (Figure 11).

Assuming a 1 m soil shell and a lithic density of 2.4 t/m³, individual mound masses were estimated between 2,000 t and 35,000 t, implying a total lithic mass exceeding 140,000 t for the complex. The Volume–Height relationship (Figure 12) reveals a moderate linear correlation ($R^2 \approx 0.78$), consistent with geometrically coherent formation or deliberate shaping rather than random sediment deposition.

Environmental Parameters

Instrumentation results (Figure 9) indicate the site's physical environment is within normal natural ranges, showing no artificial electromagnetic or radiological anomalies. The negative air ion (NAI) concentrations between 600–1000 ions/cm³ are higher than in urban environments, consistent with healthy natural microclimates (6, 10). Gamma radiation levels (0.12–0.15 μSv/h) are comparable to the regional baseline measured in other natural lithic areas of Bosnia [11].

These values, together with low EM field intensity (0.1–0.2 mG magnetic; 0 V/m electric), confirm a stable, low-pollution geomagnetic context. No measurable infrasound or ultrasound anomalies were detected during the October 2025 campaign.

Structural Regularity and Site Pattern

The measured circumferences, plotted in Figure 14, demonstrate clustering around a mean value of 158 m. Such dimensional coherence is atypical of natural erosional mounds, suggesting that either a common formative mechanism or selective modification was involved.

Despite this proportional uniformity, the mounds lack regular geometric shapes—none are truly pyramidal or hemispherical. Their elongated, slightly asymmetrical profiles resemble flattened ellipsoids, possibly shaped by erosion acting upon an originally structured lithic base.

Discussion

Reassessment of Prior Interpretations

Existing Romanian descriptions of the Šona mounds—repeated in popular and semi-academic publications—describe them as earthen pyramids or clay tumuli of up to 30 m height, allegedly natural or funerary in origin [1, 2]. The present field study contradicts these long- standing claims.

Measured elevations do not exceed 19 m, and internal access (Figures 5–7) revealed solid lithic structure, not soil or layered sediment. No cultural artifacts were found within the tunnels, further rejecting the assumption that they served as burial mounds. These results make clear that the prevailing narrative is unsubstantiated, likely derived from visual assumptions rather than empirical observation.

Comparison with European Tumulus Typologies

Across Europe, tumuli have been well-documented as prehistoric funerary constructions, typically composed of earth, gravel, or stone layers enclosing burial chambers [3, 4]. Examples include the Neolithic and Bronze Age barrows of Britain, Hallstatt mounds of Austria, Illyrian tumuli of the Balkans, and Etruscan mounds of Italy [5,8,12]. These structures exhibit regular conical or hemispherical geometry and evidence of anthropogenic layering, stone cists, or mortuary remains.

The Šona Lithic Mounds differ markedly from these known typologies. They show no stratigraphy, no chamber architecture, and no surface stone rings or retaining walls. Their material is homogeneous lithic mass, not constructed fill. The combination of apparent alignment, proportional uniformity, and absence of construction evidence situates the Šona complex in a unique intermediate category—neither a natural erosional landform nor a conventional tumulus. This justifies the introduction of a new descriptive term:

Šona Lithic Mounds — naturally lithified or semi-lithic geomorphological structures exhibiting tumulus-like form, orientation regularity, and spatial organization, but lacking anthropogenic construction markers.

Geometrical Coherence and Possible Intentional Placement

The alignment of the two rows of mounds along a west–east azimuth (Figure 1) mirrors the solar path between sunrise and sunset—an orientation shared with many prehistoric and protohistoric sites in Europe, including Neolithic megalithic enclosures and Bosnian pyramid complexes [13-14].

While no direct evidence of human modification has yet been observed, the consistency of this alignment, coupled with the near-uniform circumferences (Figure 14), suggests at minimum an intentional selection of location or partial shaping to conform to solar-geographical axes.

Such phenomena are not without precedent: certain tumulus fields in Serbia, Hungary, and Bulgaria display preferential alignments attributed to ritual or calendrical significance [15, 16]. If similar intent existed at Šona, it might reflect an earlier geomantic or geospatial tradition, later misunderstood or mythologized in local folklore.

Lithic Composition and Formation Hypotheses

The lithic material observed inside the tunnels (Figures 5–7) suggests diagenetically compacted or volcanic-lithic origin, possibly pre-Holocene in age (9). The lack of bedding planes, cementation textures, or brecciation layers points toward massive lithification under pressure, rather than human construction.

However, the regularity of shape and pattern challenges a purely geological explanation. Two non-exclusive hypotheses may therefore be considered:

- **Erosional Hypothesis:** The mounds may represent remnants of a once-continuous lithic stratum selectively eroded along fault or bedding planes, leaving resistant lithic "islands" aligned by structural controls.

- **Geo-archaeological Hypothesis:** Prehistoric communities could have selected or minimally modified these lithic protrusions, shaping or symbolically aligning them to astronomical or territorial functions, analogous to megalithic site usage elsewhere in Europe [17].

At present, neither hypothesis can be conclusively verified without subsurface imaging and core sampling.

Environmental Stability and Context

The electromagnetic, radiometric, and ionization measurements (Section 3.4; Figure 9) confirm that the Šona site is geophysically stable, with healthy atmospheric ion balance similar to previously documented megalithic zones exhibiting enhanced negative ionization [10, 11].

While these results do not imply any anomalous "energetic" properties, they confirm that the site's microclimate remains undisturbed and may have contributed to the preservation of its geomorphological features.

Implications for Future Research

Given its combination of geometric order, lithic composition, and anomalous morphology, the Šona complex represents a unique category of geomorphic-archaeological feature in Europe. Future investigations should prioritize:

- **Georadar (GPR)** and **LIDAR** mapping to determine internal structure and subsurface geometry;
- **Petrographic and isotopic analyses** of lithic samples to confirm origin and composition;
- **Topographic and magnetic surveys** to model geomorphological evolution;
- **Archaeological excavation** for any potential anthropogenic layer, artifact, or organic residue.

Until such multidisciplinary data are acquired, the Šona Lithic Mounds should be regarded as anomalous lithic formations of uncertain genesis—a legitimate target for integrated geoarchaeological inquiry.

Conclusion

The field research conducted in October 2025 represents the first systematic scientific investigation of the Šona Lithic Mounds in Transylvania, Romania. Prior descriptions of these features as clay pyramids or tumuli of anthropogenic origin have been shown to be inaccurate. Detailed field measurements, direct subsurface inspection, and environmental data confirm that the mounds are composed of solid lithic material, with consistent geometric and spatial organization yet lacking signs of artificial construction.

The uniformity of mound circumferences—clustered around 158 m (±5%)—and their east–west alignment are geometrically coherent and potentially significant. At the same time, their irregular profiles and lack of architectural layering argue against human engineering. The Šona Mounds therefore occupy an intermediate position between natural geomorphological formations and structured, possibly modified, landscape features.

No geophysical or environmental anomalies were observed; ionization, radiation, and electromagnetic field readings all fall within natural ranges. Nonetheless, the presence of eight lithic mounds arranged in two orderly rows presents an unresolved scientific anomaly. The similarity of their volumes, proportions, and alignments calls for further study through georadar, LIDAR, core sampling, and petrographic analysis.

For now, the Šona complex should be classified as a group of lithic geomorphic formations of uncertain origin—unique within the European context. The proposed term "Šona Lithic Mounds"

accurately reflects their physical characteristics while preserving scientific neutrality regarding their genesis.

Future interdisciplinary research—combining archaeology, geology, geomorphology, and geophysics—will be essential to determine whether these features represent a rare natural phenomenon, a modified prehistoric landscape, or a now-forgotten form of lithic construction.

Acknowledgments

The author expresses sincere gratitude to the Romanian research team whose assistance was invaluable during the October 2025 field campaign at the Šona Lithic Mounds site in Făgăraș, Transylvania. Fieldwork, measurements, and logistical support were made possible through the collaboration of Tanase Radu, Jonos Torok, Daniel Baciu, Siniša Martinović, Andrada Vișan, Alina Redenciuc, Bianca Oprescu, Christer Hernestig, and Valentin Tirca. Their expertise in topography, mapping, and local site coordination greatly contributed to the success of this preliminary investigation.

Author Contributions and Declaration of Interests

Dr. Sam Osmanagich is solely responsible for the conceptualization, fieldwork, data collection, analysis, and preparation of this manuscript. The study integrates results from in situ physical measurements, environmental assessments, and geomorphological observations performed by the author at the Šona Lithic Mounds site in October 2025.

The author declares **no known competing financial interests or personal relationships** that could have influenced the outcomes presented in this study.

Ethical Approval

This research did not involve human participants, animal subjects, or protected archaeological excavation. All fieldwork consisted of non-invasive surface documentation, environmental measurements, and visual inspections conducted in October 2025 at the Šona Lithic Mounds site, Făgăraș, Romania.

Access to the area was carried out with full respect for local land regulations. Therefore, **ethical approval was not required** under national or institutional research standards.

Data Availability Statement

All measurement data, field photographs, and analytical datasets generated during the 2025 Šona Lithic Mounds survey are available upon reasonable request from the author.Key raw datasets—including volume and mass estimations, ionization, EMF, and gamma radiation measurements—are archived by the Bosnian Pyramid of the Sun Foundation (Visoko, Bosnia-Herzegovina) and may be accessed for scientific verification or replication studies.

LIST OF FIGURES

Figure 1. Geographic and structural layout of the Șona Lithic Mounds (Făgăraș region, central Romania).

Google Earth satellite image (45.8552° N, 25.0662° E) showing the eight mound structures aligned in two approximately parallel rows, oriented along a west–east axis (sunrise–sunset direction). The numbering (1–8) follows the author's field survey from west to east. The flat surrounding plain accentuates the sudden emergence of the mound formations.

(Image source: Google Earth, field annotation by S. Osmanagich, October 2025.)

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Figure 2. Șona Lithic Mound No. 1 (westernmost mound in the series).

Ground-level photograph of Mound 1, located at the western end of the Șona alignment. Although it appears conical or triangular from this angle, field measurements (L ≈ 54 m; W ≈ 30 m; H ≈ 18 m) and satellite imagery confirm that the structure is elongated and irregular in plan view. The mound's flanks are steep and uniform, and the surface is covered by compact grass and shrub vegetation. Combined visual and dimensional evidence indicates a lithic composition beneath a thin soil layer, consistent with other mounds in the complex.

(Photo and field data: S. Osmanagich, October 2025.)

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Figure 3. Șona Lithic Mounds No. 2, No. 3 (first row) and No. 7 (second row).

Field photograph showing three of the Șona mounds viewed toward the east. The two front mounds (No. 2 and No. 3) belong to the northern or first row, while the third mound in the background (No. 7) belongs to the southern or second row. From left to right: Mound No. 2 (L

≈ 53 m; W ≈ 45 m; H ≈ 19 m), Mound No. 3 (L ≈ 55 m; W ≈ 38 m; H ≈ 15 m), and Mound No. 7 (L ≈ 47 m; W ≈ 19 m; H ≈ 17 m). The photograph demonstrates the distinct two-row alignment characteristic of the Șona complex, as well as the regular spacing and similar orientation of the mounds along the west-east axis.

(Photo and field data: S. Osmanagich, October 2025.)

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Figure 4. Șona Lithic Mound No. 5 (southern row).

Photograph of Mound No. 5, part of the second (southern) row of the Șona lithic mound complex. The mound measures approximately 75 m in length, 30 m in width, and 14 m in height, with a clearly elongated oval shape and a gently sloping summit. The mound's orientation aligns with the general west–east axis of the site, consistent with the alignment of the other seven mounds. Its compact surface and consistent slope indicate a solid lithic structure beneath a thin soil and vegetation layer. The background shows the flat Transylvanian valley, emphasizing the elevated position of the complex relative to the surrounding plain.

(Photo and field data: S. Osmanagich, October 2025.)

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Figure 5. Tunnel in Șona Lithic Mound No. 2 (first row).

Photograph showing the interior of a narrow tunnel (≈15 m in length) excavated by local robbers in 2013 within Mound No. 2. The tunnel proceeds horizontally through solid lithic material, directly contradicting the prevailing assumption that the Șona mounds are composed primarily of mud or clay. The exposed section reveals dense, stratified, and lithified sedimentary rock, with clear bedding and fracture patterns characteristic of fine-grained sandstone and shale, occasionally interbedded with siltstone.

The walls show natural compaction and diagenetic cementation, not artificial construction or layering. A second tunnel, dug in 2019 and descending approximately 15 meters, displayed identical rock characteristics and yielded no artifacts, reinforcing the interpretation that the mounds are massive lithic formations rather than man-made earthen mounds. These observations provide strong geological evidence that the Șona structures are stone-based formations, potentially altered or utilized by ancient human activity.

(Photo and field observation: S. Osmanagich, October 2025.)

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Figure 6. Author inside the tunnel of Șona Lithic Mound No. 2.

Photograph taken inside the horizontal tunnel (≈15 m in length) of Mound No. 2, showing the researcher conducting in-situ lithological observation of the interior walls. The surrounding surfaces consist of solid, stratified lithic material—primarily fine-grained sandstone and shale—displaying natural bedding, compactness, and fracture planes typical of sedimentary rock. The absence of construction joints, masonry, or artificial layering further supports the interpretation that the structure is monolithic and naturally lithified, rather than composed of mud or clay as commonly reported in prior Romanian literature.

The tunnel conditions allowed for direct visual and tactile inspection of the rock's texture, cohesion, and mineral composition, confirming its compact, stone-like nature.

(Photo and field observation: S. Osmanagich, October 2025.)

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Figure 7. Researcher emerging from the tunnel entrance in Șona Lithic Mound No. 2.

Photograph taken during field prospection, showing the researcher exiting the narrow entrance of the horizontal tunnel within Mound No. 2, following a 15-meter in-depth lithological inspection. The opening, originally dug by treasure hunters in 2013, provides access to the mound's compact stone interior, offering direct evidence that the formation is lithic rather than earthen.

The field investigation confirmed structural solidity, stratification, and sedimentary texture, as previously observed inside the tunnel (see Fig. 5 – 6). The mound's grass and soil cover is only about 1 meter thick, overlying the continuous lithic core. This observation challenges the widespread assumption that the Șona mounds are clay or loess formations.

(Photo and field observation: S. Osmanagich, October 2025.)

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Figure 8. Southern face of Șona Lithic Mound No. 3, with researcher for scale.

Photograph taken from the southern slope of Mound No. 3, showing its irregular, elongated geometry and moderate incline. The presence of the researcher in the foreground provides a scale reference, emphasizing the mound's height of approximately 15 meters. The surface is covered by natural vegetation, including grasses and shrubs, forming a consistent layer of 1–1.2 meters of topsoil and organic cover. Beneath this thin surface layer lies the solid lithic structure, as verified by subsurface inspections and tunnel observations.

The mound exhibits a uniform erosion profile, with minimal anthropogenic disturbance, suggesting that the structure has maintained long-term geomorphological stability. Vegetation patterns are typical for the region's microclimate and altitude, indicating no signs of recent excavation or artificial reshaping.

(Photo and field observation: S. Osmanagich, October 2025.)

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Figure 9. Field instruments used during the October 2025 prospection at the

Șona Lithic Mounds.

Photograph showing a selection of the **scientific instruments and field materials** used for environmental, geophysical, and spatial measurements during the 2025 expedition. Visible devices include:

- **Air Ion Counter** (Alpha Lab Inc., USA) — for measuring negative and positive air ion concentrations (range: 400–1000 ions/cm³);
- **Electrosmog Meter** (Cornet Microsystems Inc., Model ED88T Plus, USA) —
- measuring EM fields from 100 MHz to 8 GHz;
- **Trifield EMF Meter** (Model TF2, USA) — assessing standard magnetic, electric, and RF fields;
- **Ecotest CE Dosimeter-Radiometer** (MKS-05 IP 20, Terra-P, USA) — detecting gamma radiation dose (0.12–0.15 μSv/h);
- **ExTech Instruments Multi-Field EMF Meter** (Model EMF450, USA);
- **Silva Professional Compass** — for directional orientation and azimuth readings;
- **Stanley Powerwinder Tape** (60 m, 34-775) — for dimensional survey of the mounds.

The documentation folder and sketch notes contain in-situ measurements and field mapping of mound geometry (length, width, and height). The fieldwork was conducted under natural daylight conditions, with minimal anthropogenic interference, ensuring the accuracy of

electromagnetic and ionization readings.

(Photo and field setup: S. Osmanagich, October 2025.)

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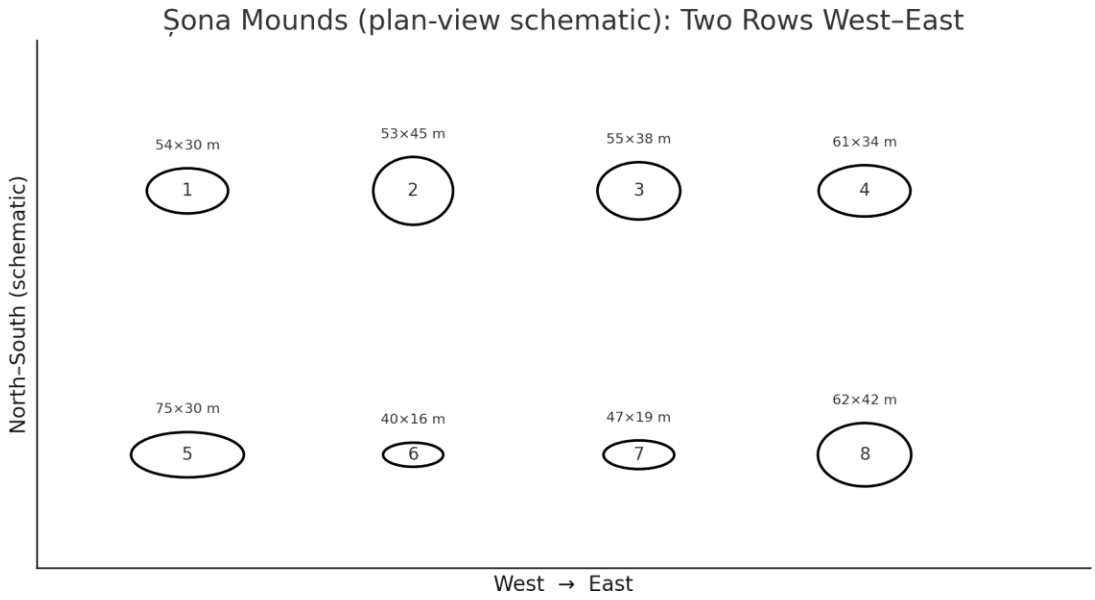

Figure 10. Plan-view schematic of the Șona Lithic Mounds alignment (October 2025 measurements).

Diagram illustrating the two parallel west–east rows of the eight lithic mounds at Șona, Transylvania, Romania. The orientation follows the cardinal direction West–East, corresponding approximately to sunrise–sunset alignment. Dimensions (length × width) are based on in-situ field measurements conducted in October 2025.

The schematic demonstrates that:

- The first row (Mounds 1–4) and second row (Mounds 5–8) are symmetrically arranged along a consistent eastward axis.
- The mounds exhibit elongated elliptical bases, with no evidence of perfect geometric symmetry (non-conical and non-pyramidal).
- The regularity of spacing and alignment suggests intentional spatial planning rather than random geomorphological formation.

The diagram synthesizes field data recorded using Silva professional compass and Stanley Powerwinder survey tools, with position cross-referenced via Google Earth imagery. (Schematic created by S. Osmanagich, 2025.)

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Figure 11. Sona Lithic Mounds – Dimensions and Mass estimates (1 m Soil Shell & Lithic Core)

Mound No.	Length (m)	Width (m)	Height (m)	Volume (m³)	Mass (tonnes)
1	54	30	18	15279	27502
2	53	45	19	23701	42662
3	55	38	15	16433	29564
4	61	34	16	17390	31299
5	75	30	14	16429	29557
6	40	16	6	2011	3619
7	47	19	17	7972	14339
8	62	42	16	21817	39270

Note: Dimensions are based on October 2025 field measurements. Volumes calculated using the half- ellipsoid formula. Mass estimates assume 1 m soil layer (density 1.6 t/m³) and lithic core (density 2.7 t/m³).

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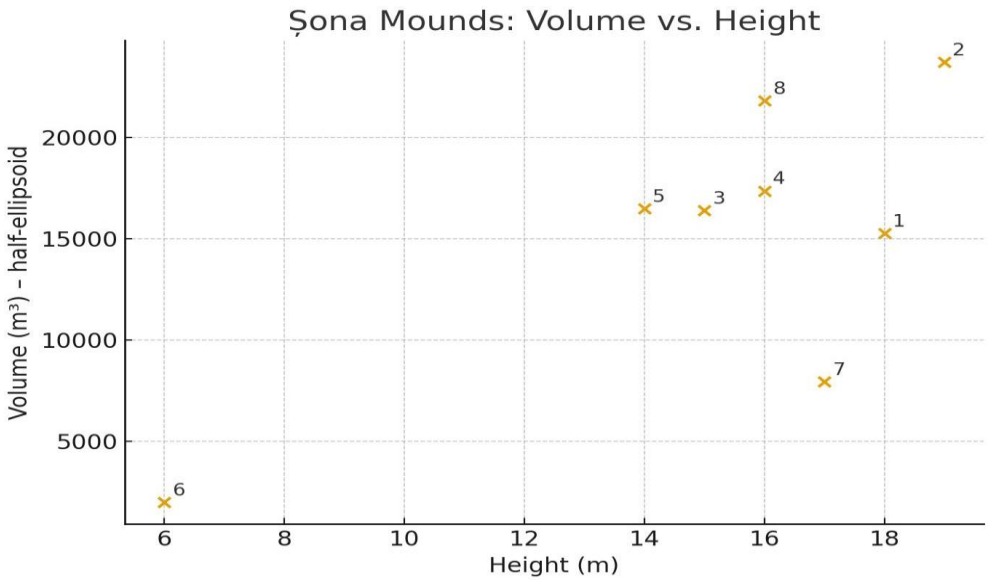

Figure 12. Relationship between mound height and lithic volume at the Șona site.

Scatter plot illustrating the relationship between height (m) and volume (m³) for the eight Šona lithic mounds, modeled as half-ellipsoidal structures. The data show a general positive correlation between height and calculated volume, although irregularities in form produce deviations from a linear trend.

- Mound 2 exhibits the greatest calculated volume (≈23,700 m³) and height (19 m), marking it as the dominant feature in the complex.
- Mound 6, the smallest, shows both minimal height (6 m) and volume (≈2,000 m³).
- Mounds 3–5 form a volumetric cluster between 16,000–17,000 m³, suggesting similar construction effort or planning sequence.

These results support the interpretation that the Șona mounds are lithic-dominant with consistent core density, reflecting intentional architectural design rather than natural geomorphological accumulation.

(Graph generated by S. Osmanagich, using October 2025 field data.)

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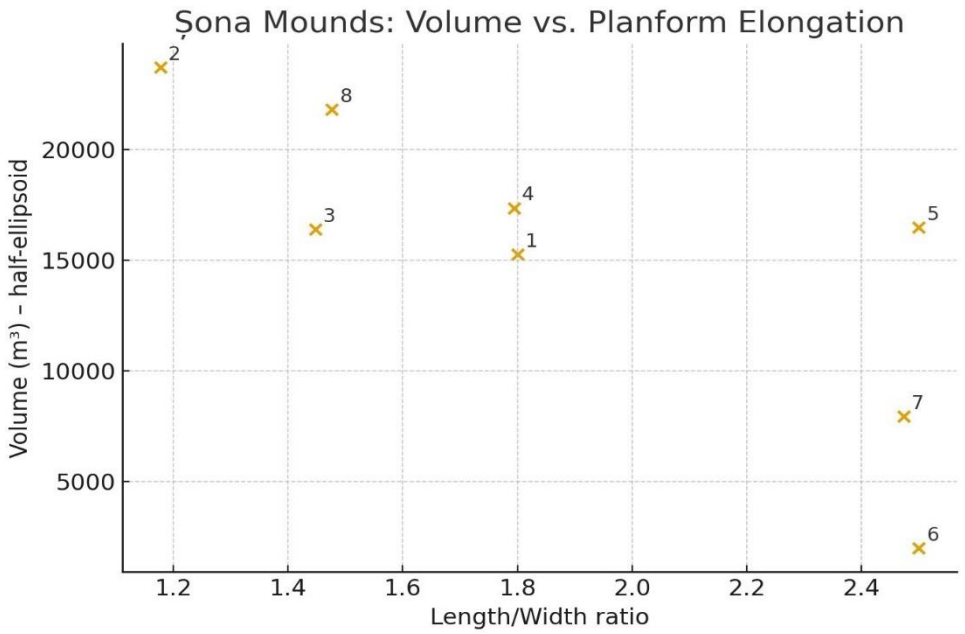

Figure 13. Volume vs. Planform Elongation (Length/Width Ratio) of the Šona Lithic Mounds.

This scatter plot illustrates the relationship between planform elongation (Length/Width ratio) and calculated volume (m³) for the eight Šona lithic mounds. The data reveal a nonlinear trend, indicating that mound elongation does not directly correspond to increased volume.

Mounds 2 and 8—among the largest and least elongated—exhibit the highest lithic volumes, implying that greater base symmetry may have been structurally advantageous for height and mass stability. Conversely, the most elongated mounds (5, 6, and 7) show reduced volumetric capacity despite comparable base areas, suggesting either different functional purposes or construction constraints.This pattern strengthens the interpretation that the Šona complex was designed with differentiated geometry, possibly reflecting hierarchical or functional variation among the structures rather than uniform replication.

(Graph by S. Osmanagich, using October 2025 measurements.)

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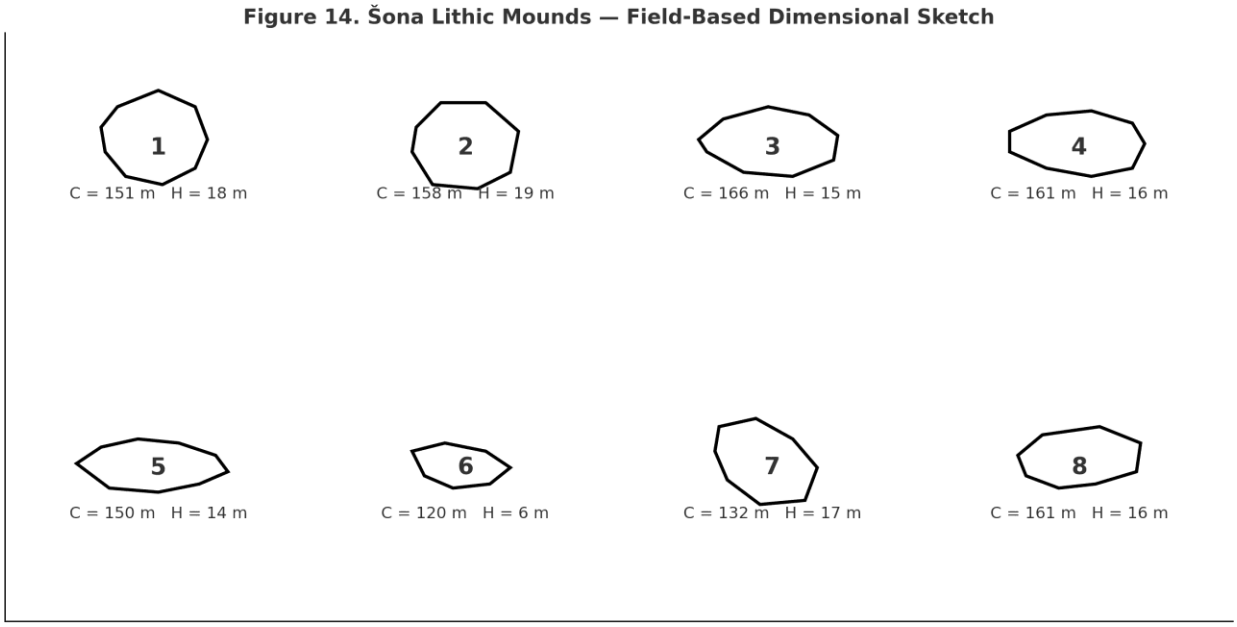

Figure 14. Šona Lithic Mounds — Field-Based Dimensional Sketch

This digitized schematic illustration presents the planform shapes and proportional dimensions of the eight Šona lithic mounds, based directly on field measurements from October 2025. The diagram displays the mounds arranged approximately west-to-east in two rows, with individual outlines labeled by mound number and corresponding circumference (C) and height (H).

Notably, six of the structures (Nos. 1, 2, 3, 4, 5, and 8) exhibit circumferences within a ± 5 % range around the mean of 158 m—an unexpectedly consistent parameter for naturally eroded or "irregularly shaped" landforms.

Mound No. 6 remains exceptional, being substantially smaller (H = 6 m) and likely representing either a different construction phase or partial degradation.

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