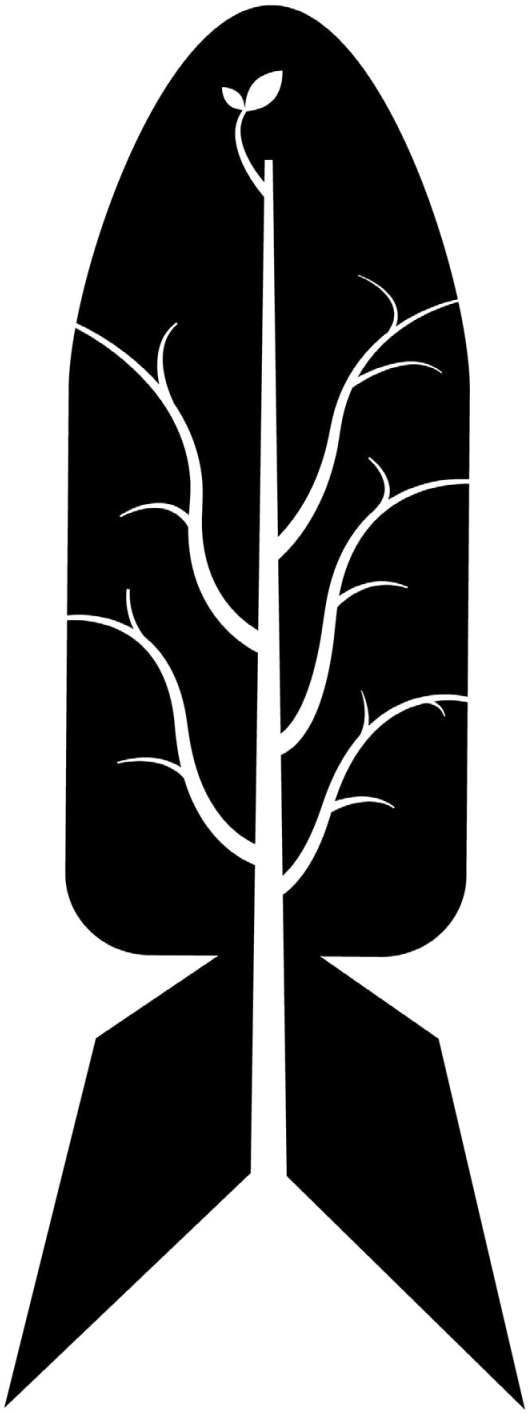


UWEC

Ukraine War Environmental Consequences Work Group

Issue #24

2024 UWEC work group

Dear Friends!

We are continuing our work on analyzing the environmental consequences of the war in Ukraine. Apart from working on articles, we also take active part in conferences, work groups, and webinars devoted to this topic. In late August, our experts **Eugene Simonov** *and* **Oleksiy Vasyliuk** *gave a presentation at the 14th European Conference on Ecological Restoration in Tartu, Estonia. Meanwhile, UWEC editor* **Alexei Ovchinnikov** *joined representatives from the Ukrainian initiative Razom We Stand at the 14th iteration of the Tbilisi International Conference, devoted to European security and organized by the Green European Foundation, to talk about the environmental consequences of the war in Ukraine.*

Eugene Simonov also attended the 46th session of the World Heritage Committee (UNESCO), which this year took place in India. Against the backdrop of global political polarization caused by the Russian invasion, it is becoming harder to protect the Earth's cultural and natural heritage, with attempts to find solutions to issues frequently getting bogged down in political debates. Are such huge international institutions as UNESCO capable of continuing to protect our common heritage and to what extent are they adapting to the conditions of global polarization? Read more in this article:

- **Ukraine's UNESCO sites at risk as war goes on**

Mechanisms for nature conservation were also discussed at a conference in Ukraine in early July. The main topics were the collection of data in order to open an international court case on ecocide and the consequences of the emptying of the Kakhovka Reservoir following the destruction of the dam by Russian forces. As experts note, natural restoration of nature in Ukraine may make it possible to achieve climate neutrality goals and make a significant contribution to the formation of a "green future" that is not only Ukrainian, but also European as a whole. Read about how data on the environmental consequences of the war in Ukraine is collected, how international organizations participate in analysis, and what results they have received to date in our traditional review:

- **Environmental Consequences of the War in Ukraine: July 2024 Review**

International organizations are continuing to provide significant assistance and support in collecting data on the environmental consequences of the war. The Czech organization Arnika is currently carrying out research in Ukraine with the aim of obtaining data on the damage done by the flooding that followed the destruction of the Kakhovka dam. Unfortunately, it is difficult to obtain samples for laboratory analysis in Ukraine at the moment, since the war goes on and many of the most polluted areas are located along the frontline. The lower reaches of the Dnipro River, which were hit particularly hard by the floodwaters from the Kakhovka Reservoir, are no exception.

Our article looks at the data collection methods used by Arnika representatives in collaboration with Ukrainian scientists and what conclusions they came to as a result of the analysis.

• **Pollution from the bed of the Kakhovka Reservoir could affect water quality in local settlements**

The issue of ensuring a green recovery for Ukraine is a priority for UWEC. While we are confident that the war will eventually end, it is vital that the country's recovery be sustainable and ecological. Otherwise the consequences for nature will be even more catastrophic. Forests are one of the ecosystems that have suffered most from the war, since they are used for engineering and camouflage purposes by both sides, and military operations often lead to fires. You can read about the impact the war has had on forest ecosystems and what measures are required for their active post-war recovery in our article by **Viktoria Hubareva** *and* **Stanislav Viter**.

• **Reforestation in Ukraine: during and after wartime**

Our work group is one of few, if not the only one, which also tries to carry out analysis of the environmental consequences of the war in the occupied territories. We have already written about the consequences of the construction of the Crimean Bridge for the local environment and about the negative impact of the militarization of the peninsula. In a new article we look at how the occupation has affected **Crimea's nature conservation areas**. *The conclusions our authors reach after analyzing satellite images are not exactly comforting. The unique Yalta Reserve has diminished in size since the occupation began, and new buildings and infrastructure have appeared within its boundaries. We also have information indicating that if occupation of Crimea continues, there are plans to remove conservation status from even larger protected areas. Read more in our article by Viktoria Hubareva and Oleksiy Vasyliuk:*

• **Sleight of land: How Russian authorities in occupied Crimea are using legal trickery to develop protected areas**

You can find more analysis and news about the environmental consequences of Russia's full-scale invasion of Ukraine on our website, as well as on Twitter (X), Facebook and on Telegram.

We wish you strength and peace!
Alexej Ovchinnikov
Editor, UWEC Work Group

Ukraine's **UNESCO World Heritage sites** at risk as war goes on

Eugene Simonov

New Delhi, India played host to the 46th session of the UNESCO World Heritage Committee on July 21–31, and our expert Eugene Simonov was there to report on proceedings for UWEC.

In a sense, this year's event dispelled rumors and fears that the World Heritage summit would become yet another victim of global geopolitical rifts, as seemed likely two years ago when the 45th session in Kazan, Russia was postponed following Russia's full-scale invasion of Ukraine. As a result, the committee struggled to cope with a doubled workload at last year's summit in Saudi Arabia.

- **Read about the 45th Session: UNESCO condemns construction of border fences**

Ukrainian Deputy Minister of Culture (and former Vice Mayor of Odesa) Anastasia Bondar: "We defended our right to call the war a war and to call the aggressor to account." Source: UNESCO

The Ukrainian question

The 46th session was relatively constructive and accomplished all its tasks without any particular hiccups or scandals. Nonetheless, the behavior of the respective committee members – the UNESCO World Heritage Committee is made up of 21 countries, each delegated the right to make decisions for a period of four years – was strongly influenced by their own political sympathies and antipathies.

Naturally, the ongoing Russian aggression in Ukraine and the far-reaching consequences of the conflict could not but affect the course of the meetings and the various decisions taken. Last year, Russia's term as a committee member expired and Ukraine stepped into the vacancy.

The first days of the session were marked by tension as those in attendance awaited the report on three Ukrainian sites included on the World Heritage in Danger list due to military threats. While Kyiv's St. Sophia Cathedral and Lviv's historic center were awarded UNESCO World Heritage status in the last century, the last of the three sites – the historical center of Odesa – was urgently inscribed directly to the World Heritage in Danger list at an extraordinary session of UNESCO in January 2023 – a move that drew vehement criticism from Russia.

All three sites are under UNESCO's priority control, and considerable funds have been allocated for their preservation, but the UNESCO mission has not yet been able to visit the sites due to the high degree of danger from

shelling. "In the second half of 2023, the Russian Federation launched five large-scale missile and drone strikes on the historic center of Odesa, damaging about 100 cultural heritage sites both within the heritage site and in its buffer zone," notes the World Heritage Center's report after Odesa was included in the list.

Amendments to the draft decisions come down to the question of whether to name the aggressor or limit themselves to impersonal pronouns, regarding some "nameless dark forces" that, in the committee's opinion, should "refrain from damaging Ukraine's heritage sites." Russia's allies on the committee insisted on removing any mention of the aggressor country from all three decisions, while Ukraine demanded that the decisions clearly indicate that it is Russia that must refrain from damaging both specific monuments and Ukraine's cultural heritage as a whole.

The committee members demanded a secret vote, which resulted in wording that clearly explained which aggressor country is asked to refrain from causing direct and indirect damage to Ukraine's cultural heritage, which the Ukrainian Foreign Ministry saw as a major diplomatic victory. Unfortunately, the decision does not mention natural heritage.

Meanwhile, Russia continues to appropriate Ukraine's natural heritage in the occupied territories, particularly the Askania-Nova Reserve, which is on the World Heritage "Tentative list."

In an interview with Kedr-Media the head of the Department of Protected Areas of the Ministry of Natural Resources of Russia, Irina Makanova, reported that: "A draft decree on the creation of the Pfalz-Fein Askania-Nova Nature Reserve has been submitted to the government of the Russian Federation for consideration. The planned area is about 33,500 hectares. The reserve is being created in the Kherson region to preserve natural complexes in the Black Sea steppe region, including virgin steppes with diverse flora and fauna…"

The fact that the reserve has already existed successfully for more than 100 years is of no interest to Makanova, who urgently needs to report on a national project titled "Ecology", the aim of which is the creation of 24 protected areas in five years. Askania-Nova merely happens to be a convenient 24th site with which to complete the report.

- **Read more: Fires in Askania-Nova: Consequences of military occupation of a reserve**

Russia's precious lake again under threat

The decisions to name Russia as damage-inflicting aggressor should rightfully be cheered. They could, however, open a Pandora's box for UNESCO, allowing any country involved in any conflict to use the decisions of the

The draft resolution on Lake Baikal was submitted for discussion in the last hour of work on July 25. Source: UWEC Work Group

convention to apply pressure to enemies. And there are enough conflicts between the 196 country-signatories to the World Heritage Convention to fill three annual Committee sessions with bickering.

Meanwhile, it is becoming increasingly difficult to effectively carry out monitoring of the preservation of heritage sites. The World Heritage Committee is making more and more decisions: every year its members enthusiastically add a dozen or so sites to the heritage list, often ignoring the recommendations of UNESCO advisers to delay adding sites to the list until mechanisms for their protection have been finalized.

As a result, the number of problems identified in the course of monitoring sites already accepted on the list is also naturally growing, as are accordingly the number of conflicts that the Committee also must resolve when considering reports on the protection of sites. The Committee is now in a position in which even if it meets for three weeks, it will not have enough time to discuss each report.

At this session in India, decisions on more than 100 sites were therefore proposed to be adopted without face-to-face discussion – for the umpteenth time in a row – simply in the form prepared by the UNESCO World Heritage Center, whose experts have (deservedly) great authority.

Russia's long-suffering Lake Baikal, which is reviewed in almost every session, was once again included in the list of decisions to be adopted without discussion. The key thesis was to prevent amendments to the country's "Law

on the Protection of Lake Baikal," that could potentially open the way to the massive development of tourist sites in natural areas along the lake's shores. It is worth recalling here that Putin recently approved a domestic tourism development project titled Five Seas and Lake Baikal, the aim of which is to increase vacation opportunities for Russians, who have lost access to a significant number of foreign resorts since the beginning of the war.

- **Read more: Lake Baikal at War**

The UNESCO World Heritage Committee would have rubber-stamped this proposed decision without discussion if Russian agencies had played by the rules and followed the procedures prescribed by the UNESCO Convention. But a month and a half before the UNESCO Committee meeting, the Russian Ministry of Natural Resources and the Environment issued a draft government resolution on expanding the permissible range of fluctuations in the level of Lake Baikal from one to two-and-a-half meters.

> Limiting fluctuations in the water level is the most important part of the legislation adopted after Lake Baikal was included in the World Heritage List. It is intended to protect the lake, which is also a reservoir for the Irkutsk hydropower plant (HPP), from excessive exploitation by HPPs and from being used as a flood-control reservoir. Since the level of Lake Baikal has already been raised a meter above its natural level after construction of the hydroelectric dam, further raising it will lead to active erosion of the lake's shores and destruction of shoreline ecosystems, as well as soil washout, resulting in increased eutrophication (an increase in nutrient enrichment leading to a growth in algal blooms and other organisms that reduces the water's oxygen content, threatening aquatic fauna).

It was thought that the Russian government would adopt a new resolution in August 2024. In a discussion with the resolution's opponents, the Ministry of Natural Resources and the Environment said that since the Heritage Committee's draft resolution does not directly state that Russia should not make such a dangerous decision (to alter water levels) without it first being reviewed by UNESCO bodies, the Russian government has the right to adopt any legislation it likes, whenever it likes. In fact, the Guidelines of the Convention state the opposite, but not everyone in the Ministry read them, just as they refused to take into account that at least six previous decisions issued by the Committee since 2016 clearly warned Russia against weakening the rules for

managing the water resources of Lake Baikal.

Therefore, the representatives of environmental NGOs who arrived in New Delhi strongly recommended that members of the UNESCO World Heritage Committee discuss the problem of Lake Baikal in person at the summit in order to add some "magic" words to the text of the resolution warning the Russian Federation against taking any ill-considered steps to change the existing procedure for regulating the lake's water level until the International Union for Conservation of Nature (IUCN) has reviewed and approved the proposed changes.

All delegations listened to the arguments presented by NGO representatives and gave understanding nods, but since everything related to Russia is perceived as "geopolitical friction" they refused to raise this issue. Up until the last hour of the meeting to review monitoring reports on the preservation of sites, there was no guarantee that Baikal would in fact be discussed.

The Belgian delegation miraculously raised the issue for discussion at the very last moment and the amendments were adopted. Now the Russian Ministry of Natural Resources and the Environment will be unable to claim that it was not warned about the inadmissibility of issuing such regulations without UNESCO approval. Russia will also have to submit its next report on the preservation of Baikal to UNESCO in six months, rather than in one-and-a-half to two years, as previously planned. And in 2026, a new UNESCO and IUCN monitoring mission will go to Baikal "to assess the site's compliance with the conditions for inclusion on the List of World Heritage in Danger."

It remains to be hoped that UNESCO's tough and clear resolution on Baikal will be heard in Russia and that they will not change laws and statutory instruments without discussion with the International Union for Conservation of Nature. In any case, the State Duma session that ended on 31 July did not approve thoroughly pernicious amendments to the "Law on the Protection of Lake Baikal" for a second reading. Which is a good sign.

Białowieża Forest standoff

A new resolution on the transboundary Białowieża Forest was adopted without discussion in New Delhi. The Committee "expresses its utmost concern regarding the conclusions of the 2024 joint World Heritage Centre/ IUCN Reactive Monitoring mission that the establishment of the border barrier, associated infrastructure and border security operations in the part of the property in Poland, is exacerbating the impacts of the existing barrier in Belarus…, and that the succession of border barrier infrastructure is blocking the majority of wildlife movements and has resulted in

Belarusian Deputy Minister of Natural Resources Alexander Korbut: "We ask to restore cooperation on Białowieża Forest, at least at the level of permanent consultations on technical issues." Source: UNESCO

a loss of ecological connectivity, which threatens the integrity of the property and its biodiversity values, and … could result in the property meeting the conditions for inscription on the List of World Heritage in Danger in the near future unless decisive urgent actions are taken".

After the decision, Belarus took the floor and again bitterly complained about Poland's construction of an "anti-migration" fence. The Polish delegation also didn't mince words either, again accusing Belarus of maintaining a similar fence on its side since the Soviet era, preventing the migration of animals. Ultimately, neither party said anything cogent about their readiness to implement UNESCO's recommendations.

- **Read more:** **Can the Iron Curtain Be Green? Europe's nature is being divided by fences and fortifications**

Energy boom in the Wadden Sea

The consequences of the war in Ukraine are also being felt in many other heritage sites. They can be seen today, for example, in the Wadden Sea, a series of tidal shallows off the coast of the Netherlands, Germany, and Denmark. A unique marine ecosystem situated on global bird migration routes, these shallows suffer both from rising sea levels due to climate change and from subsidence due to gas and oil pumping.

Poland's Permanent Representative to UNESCO H.E. Mariusz Lewicki: "The lack of ecological connectivity is exacerbated by the modernisation of the fence in Belarus and can only be restored in cooperation with the State Party of Belarus, including the need to address illegal human migration affecting the property." Source: UNESCO

While agreements to quickly phase out hydrocarbon production in areas adjacent to the UNESCO heritage site were reached by 2021, the war in Ukraine and the reduction in Russian carbon fuel imports have caused an energy crisis that has not only placed a question mark over these agreements, but also seriously accelerated the development of wind power in the same area (in accordance with the REpowerEU program).

Vast offshore and onshore wind farms now straddle the perimeter of the heritage site, posing a threat to migrating birds, while numerous undersea cables to link energy generation to consumers could cross the seabed in all directions. The three countries are working with UNESCO on a strategic environmental assessment and overall management plan to mitigate the impact of the region's energy boom, a process fueled by war and geopolitical divisions.

- **Read more:** **Does REPowerEU Reinforce or Contradict the Green Deal?**

A question of ethics

The war in Ukraine continues to have a significant impact on World Heritage sites and complicates the work of UNESCO bodies as a whole. Every day and every hour, this war confronts those who have devoted their careers to the protection of Europe's heritage with difficult moral dilemmas.

The Kenozero National Park in northern Russia. Source: K. Kokoshkin, UN

Russia's Kenozero National Park, which was accepted into the World Heritage List at the last session, is a good example of this ethical conundrum. Certainly deserving of World Heritage status, Kenozero is a valuable cultural and natural site created by enthusiasts in northern Russia and it is now better protected from the vicissitudes of fate.

Nevertheless many participants in the session queried whether it is acceptable to accept new sites onto the UNESCO World Heritage List from a country that is itself destroying heritage sites in a neighboring country? The question remains an open one. •

Translated by Alastair Gill

Main illustration source: EPA-ELTA

Environmental Consequences of the War in Ukraine: July 2024 Review

Alexei Ovchinnikov

Each month, the UWEC editorial team shares highlights of recent media coverage and analysis of the Ukraine war's environmental consequences with our readers. As always, we welcome reader feedback, which you can give by commenting on the website, emailing us (editor@uwecworkgroup.info), or contacting us via social networks.

Mechanism to protect nature in wartime

On 1-3 July, a summer school on the topic of environmental protection in wartime took place in Lviv Oblast. Participants considered both the direct and indirect impacts of war on Ukraine's environment, including increased difficulties in environmental protection in areas not directly affected by military action. One example is the ongoing struggle to preserve the Svydovets mountain range, an area that remains threatened by proposed construction of a tourist complex. Summer school participants also discussed plans to build wind power plants in the Borzhava

Polonyna area in the Carpathian Mountains and a part of Europe's Emerald Network.

Professor of Kherson University and Corresponding Member of the National Academy of Sciences of Ukraine Oleksandr Khodosovtsev spoke about the work of Kamyanska Sich National Park during the war. The scientist noted that this protected area's ecosystems were significantly damaged as a result of military action, shelling, and the resulting fires. Many rare plants growing in Kamyanska Sich now face extinction. EPL legal adviser Anatoliy Pavelko described for participants the war's consequences for forests, primarily focusing on the issue of forest fires and their negative impact on forest ecosystems. As the expert noted, it is only possible to assess the consequences of Russia's full-scale military invasion on Ukraine's forests if a unified monitoring system is established and local community (hromada) representatives are actively involved in monitoring. It is also important to develop remote monitoring of areas currently under occupation.

Event participants also discussed the war's consequences for aquatic ecosystems, primarily as a result of the destruction of waterwork infrastructure. In addition to monitoring the consequences for large waterworks on the Dnipro River, the basin of which changed dramatically after the dam at Kakhovka hydropower plant was sabotaged, smaller rivers, where flow changes and the impacts resulting from destruction of waterworks have occurred, must also be monitored. The Irpin River located in Kyiv's suburbs is a good example. Ukraine used explosives to destroy the river's dam at the beginning of the full-scale invasion in order to halt Russia's offensive on the capital.

- **Read more: Plans to rebuild Ukraine shaped by solutions for Irpin**

Important topics, such as ecocide and Ukraine's "green" restoration, were also discussed at the summer school. EPL's legal adviser Solomiya Baran noted the current wording in Article 441 of Ukraine's Criminal Code – "Ecocide" – needs revision in order to facilitate prosecution of crimes against nature, including military crimes. EPL has previously developed seven criteria that can be used to determine whether or not a crime can be recognized as ecocide. The organization continues to work on developing a "gold standard" to simplify investigation of ecocide cases, including at the international level.

- **Read more: On the path to international recognition of ecocide**

The agenda also included approaches to evaluating environmental impacts during military activity and in the

Destruction of storage facilities and plant infrastructure as a result of shelling by Russian troops. Source: CEOBS

context of the country's restoration. Experts noted that restoration that fails to meet a "green standard" can lead to more catastrophic consequences than the initial destruction that occurred during active military operations.

Anna Kuzemko, senior researcher at the Institute of Botany of the National Academy of Sciences of Ukraine noted: "On the one hand, Ukraine professes support for the European Green Deal, while on the other hand, its wildlife is being mercilessly destroyed, as if we are not the masters of our land. The most resonant environmental issues being raised today are the questions of reconstruction of the Kakhovka dam and reservoir versus restoration of Velyky Luh (Great Meadow), development of a resort at Svydovets versus preservation of alpine ecosystems unique to Ukraine, flooding the granite-steppe landscape in the Buh River watershed with waters from Aleksandrivske Reservoir, preserving Gard Island (home to unique historical artifacts from the Cossack era), and many others. All of these issues are tricky challenges for our government and civil society. We must decide how to move—forward, towards European values, or back, to the Soviet colonial past. I believe that the right choice will be made when it comes to the environment!"

Environmental consequences of the attack on Kremenchuk Oil Refinery: joint research

Together with Ukrainian Archive, the international Conflict and Environment Observatory (CEOBS) published the first part of their joint investigation on the environmental consequences of attacks on Kremenchuk Oil Refinery in April – May 2022.

The plant is located on the banks of the Dnipro River in the northern part of the city of Kremenchuk in Poltava Oblast. It was built in 1961, and by 2008 was producing 30% of Ukraine's fuel supply and there were plans afoot to modernize it in order to comply with European standards. Despite that, the plant was operating at only 25% of its capacity as of 2016.

On 2 April 2022, the plant was shelled by Russian troops, destroying at least 16 oil storage facilities, four biogas storage facilities, and an oil pipeline. The plant's infrastructure, from the power plant to roads and administrative buildings, also suffered significant damage.

That shelling caused significant damage to the region's environment as well. First and foremost, air, soil, and groundwater were polluted. Fire caused by the shelling resulted in a significant release of greenhouse gases.

The study also noted that the primary negative environmental impact was caused by a large smoke plume. Although no precise analysis of the plume's composition exists, comparison of this disaster with similar ones where measurements could be made allows researchers to anticipate high levels of fine particulate matter (PM), nitrogen oxides (NOx), nitrous acid (HONO), carbon monoxide (CO), sulfur dioxide (SO2), and volatile organic compounds such as formaldehyde and potentially dioxins, furans, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). OSINT analysis suggests that the plumes were particularly black, indicating high levels of particulate matter and carbon monoxide, which are very harmful to human health and the climate.

Damage to the substation also suggests a high probability of the presence of biphenyl (diphenyl) polychlorinate, one of the most toxic pollutants, entering the area's soil and water. In the event of fire, these pollutants could also break down further into the more toxic chemicals dibenzofuran and dibenzodioxin.

All of these factors led to an environmental disaster, the consequences of which were extremely negative not only for the residents of Kremenchug and nearby settlements, but also for local ecosystems that already suffer due to their proximity to these industrial facilities. At the same time, this area contains, for example, the regional landscape park Kremenchutski Plavni and Shyroka Balka Landscape Reserve. Lisovi Ozera Landscape Reserve is

located a little further downstream along the Dnipro River. The plume from the plant could also lead to pollution of regional protected areas Keleberdyansky and Dovhorukovsky reserves.

This above is a single complex example of the catastrophic environmental consequences of Russia's military invasion of Ukraine. More examples are tracked using an interactive map developed by CEOBS experts.

> Documenting and investigating the environmental consequences of war is not only important for obtaining reparations. As CEOBS experts note, crimes against nature resulting from military conflicts are still not internationally considered in the proper fora and they remain unpunished. That said, after the war in Vietnam, the issue of ecocide and environmental protection began to be considered in international law. Perhaps the war in Ukraine will finally lead to crimes against the environment being properly considered and punishments for those who committed them.

Ukraine's "green" recovery enables the nation to reduce negative climate consequences of the full-scale invasion

Ministry of Environmental Protection and Natural Resources of Ukraine wrote in its 17 July Ecozagroza newsletter of an online meeting that was held with representatives of international organizations dedicated to discussing the Do No Significant Harm (DNSH) principle within the framework of Ukraine's potential recovery. The meeting was attended by representatives of non-governmental organizations, as well as the governments of Ukraine, Croatia, and Austria.

As Deputy Minister of Environment and Natural Resources of Ukraine Serhiy Vlasenko noted at that meeting, the DNSH principle "aims to ensure that all our actions and projects implemented within the framework of climate policy avoid negative impacts on the environment, biodiversity, and human health. This approach is critically important in current conditions, when Ukraine is going through difficult times due to the Russian war." Government representatives also emphasized that compliance with European Union requirements and further development of climate policy measures is an important condition for Ukraine's accession to the EU.

During the meeting Deputy Minister of Environment and Natural Resources of Ukraine Serhiy Vlasenko noted that the DNSH principle "aims to ensure that all our actions and projects implemented within the framework of climate policy do not have a negative impact on the environment, biodiversity and human

health. This is critically important in current conditions, when Ukraine is going through difficult times due to the Russian war." Government representatives also emphasized that compliance with the requirements and further development of climate policy measures is an important condition for Ukraine's accession to the European Union.

The climate impacts of Russia's full-scale war remain at the initial analysis stage. EPL noted several key aspects in a recent climate report: greenhouse gas emissions from fires accompanied by the destruction of important climate ecosystems (such as forests); CO2 emissions from military equipment; pollution of water resources through the destruction of industrial facilities; destruction of renewable energy infrastructure that leads to increased use of electricity and heat generation produced using fossil fuels.

However, even greater greenhouse gas emissions can be expected during Ukraine's post-war reconstruction, when new infrastructure is built and energy independence is developed. It is important that the reconstruction phase is, at a minimum, based on the Do No Significant Harm principle that has been supported by government representatives. This means developing a just transition and focusing on a more sustainable energy system. Local communities and non-governmental organizations should play an important role in this process. They are already doing this work today, as the war goes on. For example, Ukrainian organization Ecoaction continues to work with community activists, to implement projects for a just transition in coal-mining regions that suffered significantly as a result of the invasion (especially in the Donetsk and Luhansk regions).

The shared work of NGOs and communities will lead Ukraine to a "green" and fair future, and ensure that the country's restoration is environmentally-friendly. •

Translated by Jennifer Castner

Main illustration source: Suspilne

Pollution from the bed of the Kakhovka Reservoir **could affect water quality in local settlements**

Viktoria Hubareva

Analysis of sediments on the bed of the former Kakhovka Reservoir carried out by the Czech NGO Arnika has revealed the presence of heavy metals.

One of the most eye-catching and well-documented examples of the environmental damage caused by Russia in Ukraine was the destruction of the dam at Kakhovka Hydropower Plant in June 2023. This terrorist act by Russian Armed Forces led to mass flooding covering an area of 612 square kilometers (554.6 sq. km in Kherson region and 57.8 sq. km in Mykolaiv region), encompassing a vast area of natural zones in the Dnipro River delta,

as well as settlements, ports, factories, and agricultural areas. The surging water finally destroyed the damaged dam and in the course of two weeks the reservoir completely disappeared, leaving 1,870 square kilometers of dry bed and small enclosed bodies of water. Now empty, the natural relief that existed before the reservoir was built became visible: the restoration of the Dnipro's natural channel, a network of river branches that is now surrounded on all sides by a willow forest that is growing twice as fast as anywhere else in the world.

- **Read more: One year after the terrorist attack at Kakhovka Hydropower Plant: 1B trees instead of desert and willow forests unique to the continent**

One of the serious concerns associated with the Kakhovka Reservoir's disappearance is pollution of bottom sediments by industrial and domestic wastewater.

The large industrial centers of Zaporizhzhia and Nikopol sit right on the banks of the reservoir, on either side of the city of Marhanets, with the cities of Dnipro and Kamianske a little further upstream. For more than 50 years, the industrial enterprises based in these cities have made the area one of the main centers of environmental pollution in Ukraine. This pollution can even be tracked online in satellite photographs. It is no surprise that an enormous stagnant water body, with large volumes of stationary water and a large quantity of accumulated silt deposits has become the site of a large-scale accumulation of pollutants from hazard classes I-III in the region. Around 80% of the surface of the reservoir bed was covered by a layer of silt up to 92 cm thick (17.6 cm on average). Given the size of the reservoir, these figures indicate a fairly large volume: 0.6 cubic kilometers, or 1/30 of the volume of the reservoir.

The situation began to change as the reservoir drained after the dam was sabotaged. The exposed bed of the reservoir guided the water flow into deeper areas, and subsequently, into the river channel — the most active water movement to occur in the former Kakhovka Reservoir for 69 years. As a result of the current, polluted silt and sediments – a significant portion of the contaminated silt, along with heavy metals and other waste – rose into the water column and followed it downstream, polluting the flood zone and the Black Sea downstream.

This led to a completely new situation in which no one knew how many pollutants remained at the bottom of the former reservoir or how safe it was.

In the first weeks after the water escaped from the reservoir, there was no indication that natural vegetation would fill the empty space so quickly, with many experts warning of the threat

The bed of the Kakhovka Reservoir, fall 2023. Source: Majda Slámová, Arnika

of "toxic dust storms." But such fears proved to be unfounded. And although the contaminated substrate is now overgrown with young forest and the threat of hazardous substances spreading as a result of storms is now significantly reduced, it is crucial to understand how dangerous this substrate remains. Without such an understanding, it will be impossible to make decisions about the future of this area.

The Arnika study

In 2023, after the last traces of water had vanished from the former reservoir, opening up access to the now dried-out bed, Czech specialists collected a series of samples of bottom sediments from the Dnipro River in Zaporizhia, as well as Kherson further downstream. The samples were found to contain heavy metals, insecticides, organochlorine pesticides, and other harmful substances.

Marcela Chernokhova, coordinator of the Clean Air for Ukraine project, explained to UWEC how the research was carried out, what danger is posed by the substances found in the bottom sediments and what needs to be done to avoid harmful public health consequences.

> Clean Air for Ukraine is a long-term international program conducted by the Czech public organization Arnika in cooperation with its Ukrainian partners.

"When we visited Zaporizhia for the first time after the Kakhovka disaster, the emotions

were pretty strong and sharp. We took samples from the bottom of the former reservoir and saw a vast, boundless empty space. Words like "lunar landscape" and "apocalypse" describe what we remembered quite well. On the other hand, literally a few months later, when we visited the same place, there were already thickets of young willow there. Nature is already winning," says Chernokhova.

In Zaporizhzhia and downstream in the Kakhovka Reservoir, Arnika specialists collected five samples of bottom sediments from the Dnipro River and two samples of soil from shell craters. Another sample of sediments from the Dnipro, which flooded the city in the aftermath of the disaster, was collected in Kherson.

Given the limited resources and difficulties in accessing some areas, the main objective of this study was to determine the level of risk and provide initial data for further discussions on the future of the Kakhovka dam and plans to eliminate the consequences of this disaster. A more detailed and comprehensive analysis would require a much larger number of samples to be taken, including taking measurements in areas that are currently inaccessible.

The list of dangerous substances detected in the collected samples is impressive: heavy metals, polycyclic aromatic hydrocarbons, non-polar extracted compounds, C10-C40 hydrocarbons, cyanides, polychlorinated biphenyls, hexachlorobenzene, pentachlorobenzene, hexachlorobutadiene, organochlorine compounds, polychlorinated naphthalenes poly- and perfluoroalkyl substances.

The pollution is the result of many years of industrial activity upstream from the reservoir. According to Chernokhova, the amount of pollutants exceeds the permissible limit.

"A total of ten samples were collected from the bottom of the reservoir, with four samples exceeding the maximum permissible concentrations for polyaromatic hydrocarbons. Two samples were found to have particularly high concentrations of petroleum hydrocarbons, one was found to have a high concentration of PCBs [polychlorobenzenes], and one was found to have a high concentration of DDT [dichloro-diphenyl-trichloroethane, a substance used as an insecticide and banned from use back in the 1990s], meaning it has remained in the sediments at the bottom of the reservoir since then. Some samples were found to have elevated levels of heavy metals, including mercury and arsenic, which can get into the food chain or the lungs," Chernokhova notes.

The expert also added that she and her team plan to continue studying the situation. This June she visited Zaporizhzhia once again and collected samples following the shelling of the Dnipro Hydropower Plant. Arnika is assuming that the sediments will be contaminated with petroleum substances.

> The damage inflicted on the structures of the Dnipro hydropower plant led to an increased discharge of water from the Dnipro Reservoir, located upstream from the former Kakhovka Reservoir. Media reported that the Dnipro had been polluted with oil products after the Dnipro hydropower plant was damaged in the spring of 2024. During this period, water levels were much higher than normal and it spilled across the former reservoir, watering young trees. Unfortunately, the former reservoir was also polluted with oil products, which covered an enormous area of water with a thin film.

- **Read more:** **About the new Russian missile attack on the Dnipro HPP in the morning of March 22, 2024**

How to make the dry bed of Kakhovka reservoir safe

The exposed bed of the reservoir is a huge land resource for communities, and the people living nearby hope to use it for grazing livestock, growing vegetables, installing solar panels, recreation, and other purposes. Given the results of the analyses, such scenarios seem unrealistic. However, the authors of the study have not yet definitively concluded that these areas are unfit for use: more samples need to be taken from more places before any suitable conclusion can be made.

Only when the final results are known will it be possible to start talking about reclamation of these areas, cleaning and restoring them.

According to Chernokhova, the reservoir's land can be used to mitigate the effects of climate change, conduct educational activities, and preserve rare species, as well as for many other useful and sustainable solutions.

"Some areas can become wetlands, while others will become home to organisms that need support and protection. The empty reservoir can be used for recreational activities, including hiking, birdwatching, and other outdoor pursuits. We recommend encouraging sustainable farming near the reservoir, in view of the fact that the same water source is no longer available. This will help restore groundwater supplies," she explains.

For now, however, there are more urgent concerns, she argues. For example, local communities need to be informed about potential dangers, including contamination of drinking water. The introduction of water quality monitoring is recommended to solve these problems. For drinking water, this may involve installing temporary purification systems.

A report published as part of the project also contains recommendations for polluted land reclamation.

Chernokhova sees the most realistic scenario for such restoration, given

the scale of pollution impacts and scarcity of resources, is to carry out phytomelioration (practices aimed at improving soil productivity and potential via the cultivation of selected crop species) of the most contaminated areas, which could threaten drinking water sources. However, one of the problems with phytomelioration is that while it can help remove heavy metals and persistent organic pollutants from the soil, the pollutants can still remain in plants.

Priority should be given to contaminated areas that threaten drinking water supplies. Given the limited resources available, it may be necessary to develop and implement cost-effective and locally viable remediation methods that are adapted to the types of contamination and environmental conditions downstream of the Kakhovka dam and reservoir.

UWEC Work Group expert Oleksiy Vasyliuk believes that the transfer of contaminated bottom sediments will have a big influence on future restoration plans for the whole area that suffered from the Kakhovka sabotage.

"Pollutants that were previously resting at the bottom of the reservoir now affect the environment over a much larger area. As soon as the water level in Kherson began to fall, contaminated silt created areas of very thick layers of sediment in the flood zone. It is not yet clear whether future use will be possible for a territory so polluted with heavy metals and other chemicals. It's especially bad that the flood zone, where the silt settled, which until recently was safe for life, will be the most polluted," says Vasyliuk.

He adds that the situation is no better in the marine environment of the Black Sea, where pollutants have settled on the bottom:

"Now heavy metals and other substances will accumulate in plankton and filter feeders (for example, in mussels, clams, sponges, and other marine organisms). This way, resilient pollutants enter the food pyramid and will eventually accumulate in the end-consumers of seafood: large predatory fish species, dolphins — and, of course, humans, which is alarming news."

For now, however, the presence of Russian troops on the opposite bank of the Dnipro makes it impossible to carry out any activities on the land formerly occupied by the Kakhovka Reservoir, either within the zone hit by catastrophic flooding or in the Black Sea. The only method currently available is water quality monitoring. •

Translated by Alastair Gill

Main image: Marcela Chernokhova (Arnica, Czech Republic) at the bottom of the drained Kakhovsky reservoir near Zaporizhzhia Source: Clean Air for Ukraine

Reforestation in Ukraine: during and after wartime

Stanislav Viter, Viktoria Hubareva

The area of forest destroyed by fire resulting from combat activity in Ukraine is constantly increasing. In this article, we explore the future of Ukraine's forests, the possibility of natural restoration processes, and the government's actions to restore these lost resources.

Note: This piece uses forest destruction data provided by the Ukrainian State Forestry Agency (USFA) in response to an official request. This data was not collected nationwide, but only in areas where it was possible to conduct detailed field surveys. An article previously published by UWEC Work Group provided other data on forest fire damage that significantly exceeds official state data. Both options have the right to exist, given that they were collected using different methods. The article's authors expect that as territories in Ukraine are de-occupied, the figure provided by the USFA will increase.

According to USFA, almost 900 hectares (ha) of forest have been completely destroyed to the point of growth cessation since the beginning

of the full-scale invasion of Ukraine. According to UWEC Work Group's preliminary estimates, 104,000 ha of forests have been damaged (including surface fires that do not cause complete destruction of forest stands). Is it possible to restore these forests and what is the state doing about it?

Forests are affected by military tactics during war. They are easily destroyed and difficult to restore, and consequently suffer more harm than other types of ecosystems. According to information provided by USFA, Ukraine has already lost forests valued at $60 billion USD.

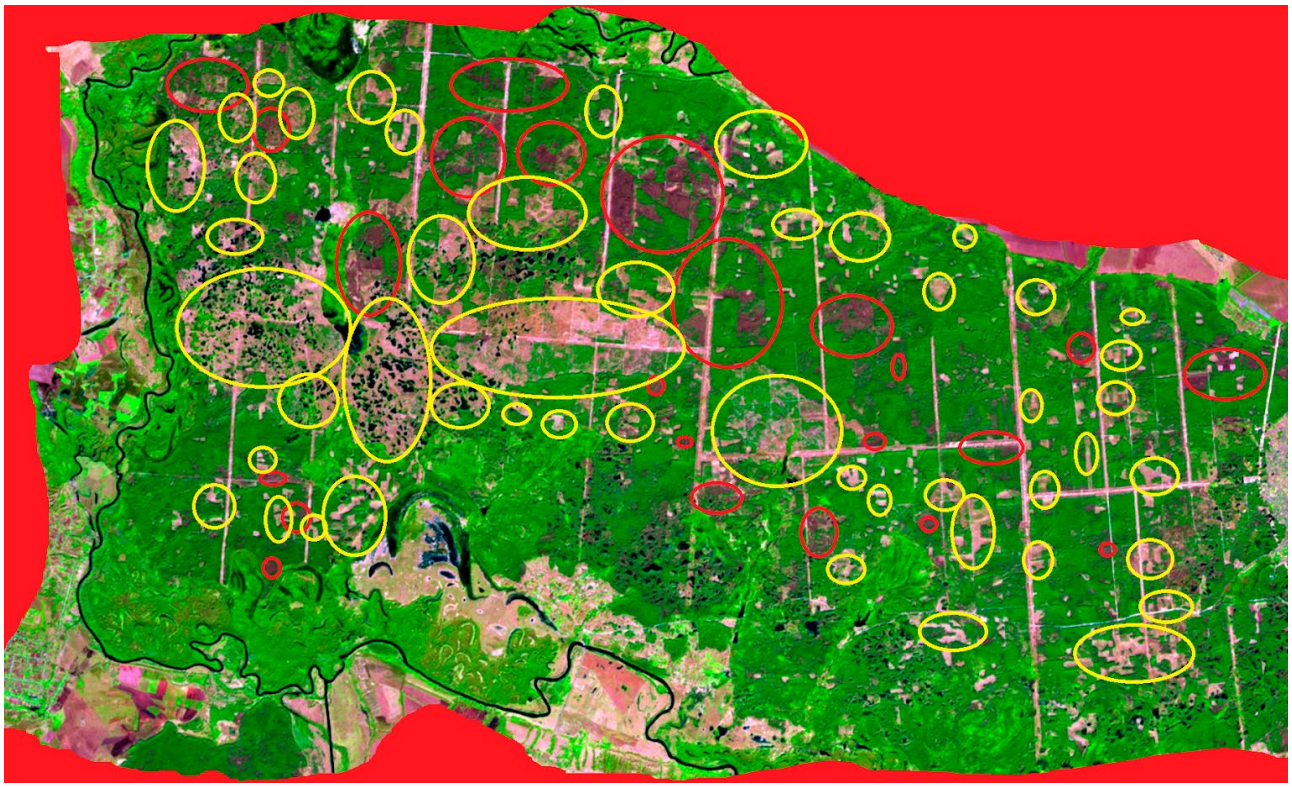
Forests have been used in wars across all eras of human existence. Firstly, the forest itself is a convenient natural shelter for armies, helping to enable the "surprise factor". Secondly, forest resources (game, wild fruits, timber) have helped people to survive in many wars and, ultimately, to restore the local economy as quickly as possible.

Russia's war against Ukraine is no exception. During the full-scale invasion, enemy targeting of Ukraine's largest cities caused the most **damage to near-urban forests**. Forested areas around Kharkiv and Kyiv, as well as in the Siversky Donets and Oskil river valleys in Kharkiv, Luhansk, and Donetsk oblasts all burned, located as they were along the Ukrainian Armed Forces' main lines of defense. Forests in the Dnipro River valley on the approaches to the city of Kherson suffered no less. In essence, these forests today play a role similar to that played by abatis defenses along the southern borders of the Russian Empire and Ukraine, where forests defended against raiding by steppe nomads.

Forests that stretch densely along natural barriers such as rivers are excellent terrain elements for camouflaging equipment, cover for defense forces, and constructing defensive fortifications. The trees themselves become additional protection from enemy bullets and shrapnel.

The enemy also uses forests to get as close as possible to the positions of Ukrainian defenders. As a result, forested areas become the site of particularly protracted combat, ultimately leading to the destruction of most natural and relatively natural forests along the entire line of contact.

> According to USFA data provided to UWEC Work Group, as of June 2024, 708,900 ha of forests were directly affected by the war, of which 893.9 ha are considered completely destroyed, and the total damage to forests is valued at 2.457 million hryvnia ($59,580 in USD). The agency also noted that this figure may fluctuate, because widespread landmines render accurate calculations impossible.



Izyum Forestry Enterprise and the planned Izyumskoye Lake National Nature Park (including Izyumskoye, Peschanskoye, Petrovskoye, Zavgorodnevskoye and Pridonetskoye Forestry Enterprises). Satellite image, 12 April 2024. Light rectangles and rounded yellow areas experienced peacetime deforestation. Dark purple spots outlined in red are recent fires that occurred during the invasion.

Fighting destroyed almost 900 ha of forest to the point of growth cessation. That said, the figure seems small when compared to forests destroyed in peacetime.

UWEC Work Group calculated (see the processed satellite imagery below) that at least 3,600 ha burned and were then felled after a fire in the Izyum Forestry Enterprise alone between 1990 and 2020. Given long-term experience with forest restoration in this area, as well as the fact that during the full-scale invasion it again became an epicenter for forest conflagrations, the Izyum Forestry Enterprise can be a model for research and restoration planning.

Despite replanting burned areas in the 1990s over the course of almost two decades, there are still large sandy wastelands there without a single tree. The heat, dry sandy soil, and absence of water and nutrients make any attempt to reestablish forest extremely difficult.

What happens in forests destroyed by fighting?

As yet unpublished scientific research provides an ambiguous picture of what is happening in the organic world of forest ecosystems that includes plants, fungi, and animals.

For example, satellite imagery of the Izyumsky forest shows that relatively young coniferous reforested stands are primarily affected. Such areas possess lower biological diversity. In most cases, current forestry management regulations call for clear-cutting Scots pine stands at the age of 60 to 100 years, depending on the condition of standing timber. Such forests are the most common forest type in Ukraine's eastern frontline regions.

At the same time, such forest stands are the most effective for establishing military positions, as pines, unlike deciduous trees, have green crowns year-round. Young and middle-aged pine stands grow much more densely than old-growth – usually sparse pine forests with numerous clearings. In old pine forests with rich biodiversity, there is no advantage for either the occupiers or the Ukrainian Armed Forces to set up positions that are readily visible thanks to reconnaissance drones.

> The tactical advantages or disadvantages of certain forest types have shifted the destructive impacts of the war to relatively young forests that are less biologically diverse. Forest managers prefer to harvest timber in older forest areas, resulting in the focused destruction of areas with the greatest biodiversity. For example, while peacetime incidents of destruction of nests used by white-tailed eagles (two cases) and imperial eagles (three nests) were documented in this area, not a single nesting site used by these species was destroyed in Izyum due to military actions.

A unique situation occurred in the Luhansk-area Serebryansky Forestry Enterprise, where the frontline moved continuously through the forest, gradually engulfing all types of forest stands, both young and old. But such a devastating impact is limited to a relatively small area on the immediate line of contact.

What are the barriers to forest regeneration?

Before restoration of any natural areas can occur, they must first be demined – the safety of forestry workers is critical. It should be noted that forests are third "in line" for demining after populated areas and agricultural lands.

According to Professor **Valentina Meshkova**, head of the forest protection laboratory at the G. M. Vysotsky Ukrainian Research Institute of Forestry and Agroforestry, demining is one of the biggest problems in post-war forest restoration.

"In Germany, there are still places waiting since the end of World War II to be cleared of mines. So in Ukraine, this process could last for decades…," Professor

Valentina Meshkova explained during an interview with UWEC Work Group. She recently took part in the German-Ukrainian Dialogue (APD) on land issues to study fieldwork experience in clearing territories of explosive objects and the prospects for using this experience in Ukraine.

Meshkova hopes for natural regeneration of forests when areas remain inaccessible for forestry over the long term, as is happening in the Chornobyl zone.

"*Of course, without tending, forests will not have the composition and productivity that the forest industry desires, but they will perform ecological functions, even if they are represented by so-called 'low-value' species,*" Meshkova believes.

Deadwood will not hurt such forests either. Some foresters note that such wood should be removed, but she commented that areas where trees have been completely burned are not pest hosts. On the contrary, rare species may develop there:

"*The presence of dead fuel (primarily dead wood) is not dangerous. If a tree is dead (missing its crown), but the wood retains moisture, rare species can develop. Some of them are associated with fungi involved in wood decomposition or other groups of organisms.*"

It is premature to discuss the possibility of large-scale forest restoration in these areas, primarily because of the dense concentration of mines. War-affected forests are not dangerous hotbeds of "pests", and in some cases, on the contrary, they can be a refuge for rare flora and fauna.

Can warfare positively impact forests?

In some cases, war has even had a positive impact on the biodiversity of frontline forests, in the form of following transformations:

1. Destruction of artificially created same-year forests consisting of single-species stands. Usually such forests are dense stands of Scots pine (Pinus sylvestris) which lack rich biodiversity and are more connected to old sparse forest areas. For example, some rare plants, such as meadow pasqueflower (Pulsatilla pratensis) and open pasqueflower (Pulsatilla patens), as well as feather grass (Stipa capillata) and sand feather grass (Stipa borysthenica) prefer sparse pine forests, glades, and clearings. The same can be said about a rare snake species – common smooth snake (Coronella austriaca). A very rare and majestic bird of prey, the imperial eagle (Aquila heliaca) prefers to nest in the remains of old pine forests scattered in open sandy steppe lands, clearings, and burnt-out areas. The replacement

of sparse forests with open sands containing dense pine stands led, in particular, to the disappearance of a rare bird species on the Sivirsky Donets and Oskil rivers – the Eurasian stone curlew (Burhinus oedicnemus).

2. Mines render it almost impossible to conduct intensive forestry in pine forests in the valley of the lower Dnipro, Sivirsky Donets and Oskil rivers. As a result, insects and other terrestrial invertebrates, birds, small mammals, mushrooms, and plants will remain free of anthropogenic pressure for a time. Mines do not threaten, but rather, are an ongoing factor that will, at least for a time, ensure the preservation of their habitats, places that have survived many years of "peaceful forestry" and military operations. At the same time, large animals, especially elk, suffer greatly from mines and may even be wiped out locally.
3. Raise awareness of forest conservation challenges. Awful images of forests burned and mutilated by explosions attract attention not only to the need for restoring damaged forests, but also to the need for a caring attitude toward surviving forests and their comprehensive protection in the peaceful future of Ukraine.

In sum, a somewhat strange situation has arisen: some areas of frontline forests have burned to ashes, while others, on the contrary, are increasingly reminiscent of protected areas.

Why can't today's forest regeneration in Ukraine be called "useful"?

Despite the possibility of natural forest regeneration out of ashes and the dense minefields in many areas, artificial forest restoration (afforestation) has already begun.

According to data provided to UWEC by USFA, 61.7 ha of war-damaged forests were restored in 2023, and 66.2 ha in the first half of 2024.

The problem is that afforestation is taking place not only where forests existed prior to the war, but also where forests have never before existed. State authorities are encouraging the creation of new forests of "billions of trees" in every possible way, including as a way of contributing to afforestation and counteracting global warming. It has also been envisioned as compensation for war-time losses of forest cover since the war began in 2022. These efforts are specifically aimed at creating new forests on non-forested lands, some of which had no history of woody vegetation coverage in the historical period.

According to USFA, 10,900 ha of new forests were created in 2021-2023.

To a large extent, these areas are new, previously unforested areas. And for the most part, these are, unfortunately, not former quarries, terrakon slag heaps or degraded farmland, but steppe balki ravines, that is, valuable natural open landscapes and territories, of which so few remain among Europe's spectrum of natural biotopes. It is in these refuges where one-third of all rare species of animals and plants in Ukraine are preserved. So the creation of forests where there were none before harms nature, rather than helps.

Oleksiy Vasyliuk, director of the NGO Ukrainian Nature Conservation Group notes: *"It's logical to use tree replanted stands as a reclamation strategy for slag heaps, quarries, and other industrial sites, as well as for the restoration of forests destroyed by war or clear cut."* Degraded agricultural lands that have lost fertile soils can also be used to create new forest areas. While soil conditions generally allow planting certain types of trees, in some places it is impossible to create viable stands of Scots pine. For example, planting in fairly dense and organically rich agricultural lands is unsuitable, because this pine is specifically adapted to growing in sandy soils. On fertile soils, pines sicken and die.

Valentina Meshkova confirms this thesis: *"Forests on former agricultural lands often grow normally for up to 30 years, and then they become vulnerable to pathogens, particularly pathogens that cause root rot (pine fungus). One reason for the rapid spread of diseases is thought to be the presence of a soil layer compacted by many years of plowing at a single depth. Tree roots cannot break through this layer, and weakened trees are infected by pathogens. Arable soil layers enriched with organic matter can also create an environment favorable for the development of pathogenic fungi. Even though these soils are more suited to the growth of deciduous trees and bushes, pine is mainly planted on such lands,"* the professor notes.

At the same time, Valentina Meshkova believes that forests for economic use should be planted on reclaimed lands. This will prevent soil erosion processes, and trees will perform environmental services and create favorable conditions for the growth of other species of plants, animals, and fungi. From an aesthetic point of view, says Meshkova, such areas will look better.

Experts fundamentally oppose the creation of new forests in steppe areas: *"First of all, we note that in Europe, steppes are the landscape most damaged by human activity. Currently our continent contains less than 10% of the steppes found here 200 years ago. In such conditions, even common steppe species of plants and animals have lost most of their habitat and must be recognized as rare,"* says Oleksiy Vasyliuk.

One of the "iron-clad" arguments made by supporters of "steppe afforestation" or the creation of forests in place of steppes is the ability of forests

to effectively accumulate carbon (in the form of carbon dioxide as a product of photosynthesis) and deposit it in wood – an excellent mechanism for reducing the concentration of atmospheric carbon. However, Vasyliuk argues that for forest-based carbon in arid steppe climate conditions, especially against the backdrop of global warming, depositing carbon in the form of timber is an extremely unprofitable investment: *"Trees grow and deposit carbon, mainly in the form of hardwood. But climate aridity and high summer temperatures are more and more extreme every year. And then one fine day a forest fire breaks out in a steppe-land stand, and all the carbon that was deposited in that wood over the course of many years returns to the atmosphere in a matter of hours.… Moreover, it immediately takes the 'convenient form' of the greenhouse gas CO2,"* says Oleksiy.

According to Vasyliuk, some war-damaged territories and degraded farmland in the steppe zone should not be converted into forest, but rather should be used to recreate steppe areas. That is, rewilding methods should be used, returning damaged territories to their natural state, while restoring the rarest steppe vegetation in Europe to high levels of biodiversity. Experts believe that this would be a good alternative to "steppe afforestation".

And again, restoration of steppe vegetation is more practical as a means of counteracting global warming in natural steppe zone conditions. As Vasyliuk noted, each natural zone possesses its own characteristic vegetation that serves as the best repository for carbon. In steppes, herbaceous plants deposit carbon mainly in the form of humus and underground parts of plants (roots, tubers, bulbs, rhizomes). Research has shown that during steppe fires neither underground plant parts nor humus burn, and therefore most of the carbon deposited over the years will not return to the atmosphere.

For their part, government forestry institutions are very actively promoting the concept of afforestation of all open (non-forest) territories. And the reasons for such unanimity among "foresters" is obvious: state budget financing of existing and potential forestry program funding. According to the USFA, in 2021, 43,565,600 hryvnias (approximately one million US dollars) were allocated for the creation of new forests and the restoration of previously cut down and war-destroyed forests, in 2022 – 25,770,200 hryvnias, in 2023 – 76,045,000, and in 2024 – 163,400,00 hryvnias. That is, financing of the creation of new forests in Ukraine is gaining momentum. Naturally, agencies involved in such projects are very interested in promoting new forest creation, given processes that last many years, as can their budget financing.

In any case, the new forest creation has absolutely nothing to do with the war's consequences and the forests damaged during the fighting. In other words, forests were damaged in one place, and there are proposals to "restore" them in another, more convenient place, where funds allocated for restoration can be used. Unfortunately, such an approach not only destroys valuable steppe areas, but also does not help solve the problems facing forests, which really did suffer colossal damage during the war.

What future awaits forests in post-war Ukraine?

First of all, we note that any natural ecosystem has a "safety margin" and quite a few natural mechanisms for self-restoration, as long as humans do not foolishly interfere with this complex process. The war certainly caused great damage to many forests in eastern and some southern parts of Ukraine. But hope for the natural regeneration of forests remains, even if man cannot directly do it himself.

Russian aggression has indeed led to the loss of a number of forest areas, areas partially destroyed by fires, explosions, and unplanned logging without subsequent reforestation. But the scale of these losses in terms of biodiversity impacts is significantly smaller than those resulting from logging and various fires in peacetime. At the same time, an opportunity for natural restoration of forests remains, something that is especially important in conditions where large areas of damaged forest stands and natural forests are inaccessible for human restoration due to the presence of densely laid land mines.

When it comes to human-led forest regeneration, a differentiated approach will need to be created. In many areas of dry sands, for example in the Oleshkovsky Sands and in places in forests in Izyum, it will not be possible to restore the burnt-out tree stands, and it is more rational to allow the sandy steppe to restore itself with small groves of birch, aspen, and alder in damp lower reaches and ravines.

The war has made the problem of natural reforestation and new forest creation – afforestation – more urgent. Unfortunately, the impossibility of quickly eliminating the consequences of Russian aggression in Ukraine's forests has shifted the emphasis on damaged forest restoration to the creation of new forest areas, and new forests are often planted where afforestation is strictly prohibited, for example, on valuable steppe habitat in Ukraine's last remaining steppes. At the same time, scientists suggest tactical changes and afforestation of reclaimed lands (in slag heaps, quarries), as well as some areas of degraded agricultural land where appropriate soil conditions are present.

Finally, it is high time to work toward the creation of new natural protected

areas and to expand the protected areas network in both remaining old forests and in the last remaining steppe areas.•

Translated by Jennifer Castner

Main image: A forest area near the village of Oskil (Krasny Oskil), Izyumsky District. The photo shows the scale of forest destruction and the relatively young pine stands that were damaged. Old pine forests survived despite flames raging nearby.

Credit: Stanislav Viter

Sleight of land: How Russian authorities in occupied Crimea are using legal trickery to develop protected areas

Oleksiy Vasyliuk and Viktoria Hubareva

The self-proclaimed government of occupied Crimea is cynically lopping off chunks of the Yalta Mountain Forest Nature Reserve in order to build lucrative residential and tourist infrastructure.

Russian military aggression against Ukraine dates back to 2014, when Moscow annexed the Crimean Peninsula and subsequently fomented an armed conflict in the Donetsk and Luhansk regions. Russia's actions against Ukraine are a crude violation of the UN Charter and a number of principles established in international law: in particular, the non-use of force and the threat of force, the inviolability of state borders and the territorial integrity of states, and the fulfillment of international obligations.

View from Mount Ai-Petri, part of the Yalta Mountain Forest Nature Reserve. Source: Victoria Kuznetsova.

Under Russian occupation, the protected status of several territories belonging to Crimea's nature reserve fund (NRF) has either been annulled or downgraded through decisions by the occupying authorities. This has presented an opportunity to utilize protected land for projects that are at odds with the conservation of nature, with some areas already having been cleared of vegetation. In addition, the nature reserves have been subordinated to the so-called Republican Forestry Management Committee", as a result of which scientific work has ceased to be a guiding principle in the operation of Ukraine's reserves.

Under the new legislation introduced on the occupied peninsula by the self-proclaimed Russian authorities, all existing nature reserves were to be brought under the jurisdiction of the Russian Ministry of Natural Resources. Anonymous sources have told the UWEC Work Group that the self-proclaimed authorities planned to appropriate and develop land belonging to the reserve (primarily along the coastline in the south of Crimea) on a large scale from the outset. It turned out, however, that not only could reserves not simply be abolished, but control over them had to be transferred to the federal government. The Russian legislation came as a surprise to collaborationist officials, who were already planning to develop the area but were forced to submit to the new

Rare species of orchid found in the Yalta Mountain Forest Nature Reserve. From left to right and top to bottom: 1. Himantoglossum caprinum, 2-3. Horned Orchid (Ophrys oestrifera), 4. Lady's Slipper (Cypripedium calceolus). Sources: dinasafina; sapsan; svetlana-bogdanovich; vyacheslavluzanov

conditions. Over time, the self-proclaimed authorities of Crimea nevertheless found an opportunity to carve up the reserves in their own way, as will become apparent later in this article. The **Yalta Mountain Forest Nature Reserve** can be used as a case study of the consequences of this activity

Why is the Yalta reserve such a distinctive and valuable conservation area?

Situated in the southwest of Crimea, the Yalta Mountain Forest Nature Reserve occupies an area of 14,523 hectares. It was established back in Soviet times, in 1973 – around 50 years ago. Its territory extends west to east for **49 km along the Black Sea, from Foros to Gurzuf**, surrounding the city of Yalta and its suburbs. The majority of Crimea's most spectacular landscapes can be seen in this reserve. In fact, almost all the wilderness areas along Crimea's southern coast are part of the Yalta Mountain Forest Nature Reserve. For more than half a century, the reserve has effectively protected Crimea's southern coastline from development, preserving the status quo of this territory as a "resort alongside a nature reserve."

Of course, the nature conservation value of the reserve far outweighs its role as a resort. The Yalta reserve's vegetation spans four altitudinal zones and includes forests containing Greek juniper (Juniperus excelsa) and Atlantic pistachio (Pistacia mutica), which are listed in the Red Book of Ukraine and are not only unique "pearls" of Crimea, but also the oldest trees in Ukraine. The oldest of the junipers and pistachios found here are up to 2,000 years old.

The country's largest forests of Crimean pine (Pinus nigra ssp. pallasiana) are also located here. In total, the reserve is home to no fewer than 1,364 species of vascular plants, 183 species of moss, 154 species of lichens and 1,733 species of fungi – some of the highest respective numbers among all Ukrainian reserves. It is far harder to estimate the number of animal species. However, with the help of the Biodiversity Viewer tool, 128 species listed in the Red Book of Ukraine can be counted in the reserve. Many of them are endemic species, that is, they are found only in the Yalta reserve and nowhere else in the world.

Butchering the Yalta reserve: a plot years in the making

Returning to the challenges facing the reserve, the plans to develop it seem to have been gestating over a very long period and scandals relating to the issue arose from time to time throughout the period of Ukraine's independence.

In 2018 part of Crimea's protected areas were brought under the federal jurisdiction of the Russian Federation, including the Yalta Mountain Forest

Nature Reserve. Later, on March 10, 2020 together with five other protected areas, the Yalta reserve was transferred to the jurisdiction of the Zapovedny Krym FGBU (Crimean Reserve Federal State Budgetary Institution) – a specially created body under the auspices of the Ministry of Natural Resources of the Russian Federation. **Krymsky National Park** was transferred to the jurisdiction of the Russian Presidential Property Management Department, and the Karadag Nature Reserve came under the jurisdiction of the Russian Ministry of Education and Science.

> However, in this document the stated size of the Yalta Mountain Forest Nature Reserve was already diminished. It had been reduced from 14,523 to 14,459 hectares, that is, it was now 64 hectares smaller than before. Following this, information about recreational services appeared on the reserve's website, and even a detailed map of routes that could be uploaded to a GPS navigator or smartphone.

Overlaying a map of the current borders of the reserve with the full Ukrainian borders allows us to see precisely where carve-outs were made.

One of the most striking examples of development on land reallocated from the reserve by the occupying authorities is the Lastochkino Gnezdo residential complex near Haspra. Building work began on the complex in 2014–2015. The developer's website actively advertises the complex as being located close to Swallow's Nest, a Neo-Gothic chateau on a clifftop overlooking the sea, and "surrounded on all sides by juniper groves." This is unsurprising, since it has been built in the very location where junipers grew in the reserve.

That said, there have always been buildings within the Yalta Mountain Forest Nature Reserve, including those built for recreational purposes. However, the sectors of the reserve that were reallocated or sold for future construction were not located in the vicinity of older developments – they were tracts of wild land.

The speed with which the new territories around Yalta are being developed can be seen by comparing satellite photographs from different years. The scale of new construction since the Russian occupation began is clearly visible on the western outskirts of the city.

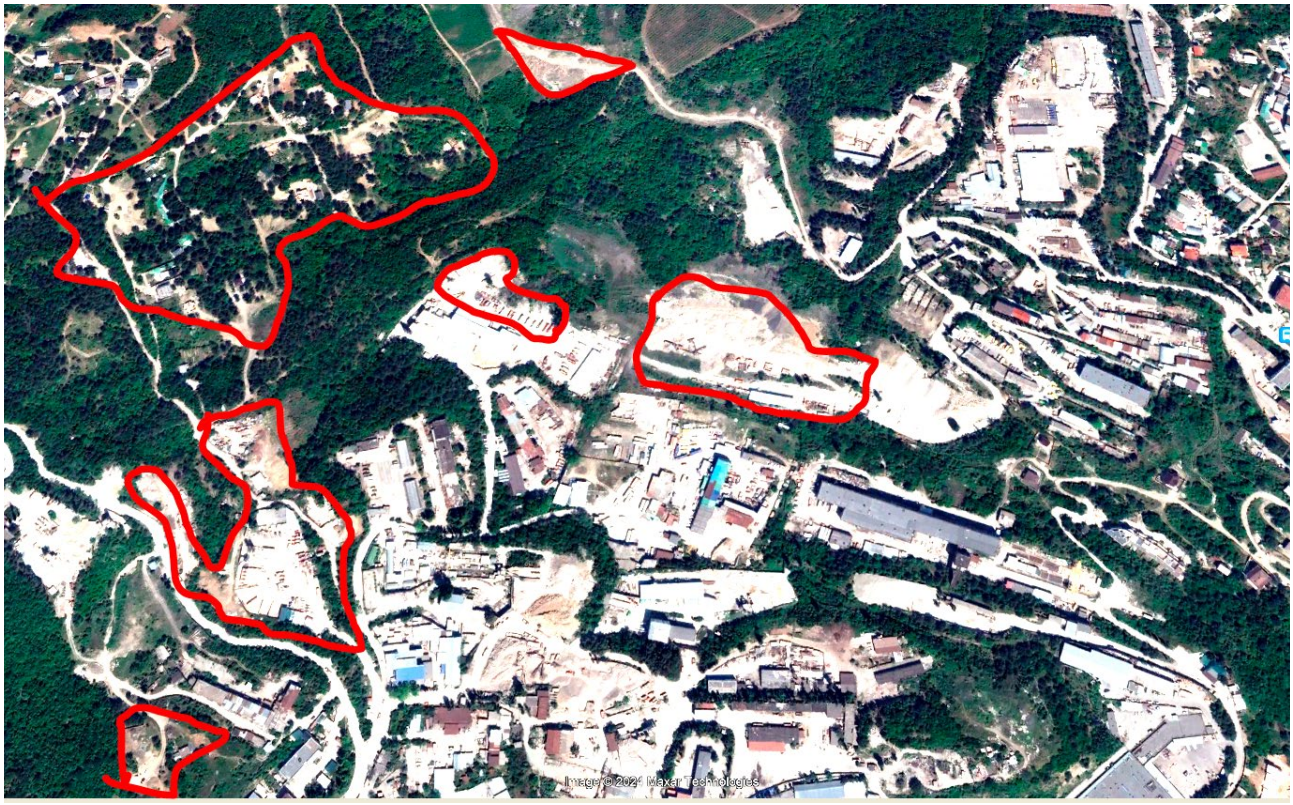
It is interesting to note that immediately prior to the events leading to the annexation of Crimea in 2014, then-president of Ukraine Viktor Yanukovich planned, together with Sergei Aksyonov (who subsequently became head of the occupation government in Crimea), to remove 700 hectares of the most attractive land from the reserve. No development had been allowed on land

Satellite images taken in 2013 (a) and 2024 (b) showing the northern outskirts of the settlement of Olyva. Source: Google Earth
Satellite images taken in 2013 (a) and 2024 (b) show how a section of the reserve has been converted into a parking lot for the Mriya Resort & Spa complex. Source: Google Earth

belonging to nature reserves in the years following Ukraine's independence, so it was not easy to organize such a scam. Crimean officials had been laying the ground for the move for at least 7-10 years.

It was during this period that environmentalists became aware of Aksyonov, whose name they came to associate with attempts to develop parts of the Mountain Forest Nature Reserve. The plan was to "expand" the reserve through the signing of a corresponding presidential decree, but in reality this meant adding land of no interest to developers while simultaneously seizing 700 hectares on the southern coast for development. Prior to 2010, it was impossible to issue such a decree, since Viktor Yushchenko was in power. The most active of all Ukrainian presidents when it came to supporting

The recently built Lastochkino Gnezdo residential complex (top center) is located inside the official boundaries of the Yalta reserve (marked in yellow) but outside the new borders established by the occupation authorities (marked in red). Source: Satellite images analyzed by the UWEC Work Group



Land plots developed between 2014 and 2024 on the western outskirts of Yalta. Source: Satellite images analyzed by the UWEC Work Group

Areas of land removed from the Yalta Mountain Forest Reserve, showing the official Ukrainian boundaries (marked in green) and the new borders established by the occupation authorities (marked in yellow). Source: Satellite images analyzed by the UWEC Work Group

protected areas, Yushchenko created the largest number of Ukrainian national parks in history, and took important steps to strengthen their protection. But as soon as Viktor Yanukovych became president, a draft decree on changing the borders of the Yalta Reserve was immediately drawn up. In the end, it was not possible to implement these plans, because Yanukovych ended up on the losing side during the Revolution of Dignity in 2014 and was stripped of his office after fleeing to Russia.

Nonetheless, the nefarious plans to seize land from the reserve came to fruition following the annexation of Crimea, in the immediate aftermath of the Revolution of Dignity.

According to the official data, the park has been reduced in size by only 64 hectares, although we wrote above that the plan was to remove 700. This is indeed the case. It appears that the land appropriation scheme is yet to be fully realized. While the map above, published on the official website of the reserve by the occupation administration, ostensibly shows the reserve to be just 64 hectares smaller than the "original boundaries," in reality depicts an area that is at least 700 hectares smaller. A comparison of the reserve's "Ukrainian" and "occupation" borders quickly makes everything clear. So we can expect subsequent rulings that will see the Yalta Mountain Forest Nature Reserve shrink even further.

The practice of stripping land from the nature reserve fund is in contradiction of Ukrainian state policy, and, at a time

when there are global demands for the preservation of remaining nature areas, appears to be nothing short of barbarism. Of course, such steps are linked to the desire of the occupation administration to make use of those territories which have potential for the tourism and hospitality industry. Development is of course an extremely profitable activity, though of no benefit when it comes to the conservation of biodiversity.

Once Crimea returns to Ukrainian control, it will be impossible to return the land stolen from the Yalta reserve to its previous status, since it will already be destroyed. However, it will be possible to take other measures: firstly, to bring those involved in the appropriation and development of the reserve's territory to justice; secondly, to prevent development plans not yet implemented from being put into effect; and thirdly, to expand the reserve into adjacent territory in the mountains. Such actions would serve as some kind of compensation and contribute to the conservation of those species that remain within the reserve. •

Translated by Alastair Gill

Main image: View of the coastal settlements of Sanatorny and Foros from the Yalta Mountain Forest Nature Reserve. Source: Roman Pankov

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