



Land use changes in Portugal threaten farmland birds such as the little bustard (*Tetrax tetrax*).



LETTERS

Edited by Jennifer Sills

Portugal's farmland bird crisis requires action

The outlook for farmland bird conservation in Portugal is dire. The great bustard (*Otis tarda*), little bustard (*Tetrax tetrax*), and Montagu's harrier (*Circus pygargus*)—three priority species under the European Union's Birds Directive (1)—have declined by 50 to 80% over the past 10 years (2–4). One-third of common agricultural birds are also decreasing (5). Portugal must take action to reverse these trends.

Reductions in farmland bird populations are mostly attributable to a nationwide shift from arable land to specialized livestock production (mainly beef) and permanent crops (e.g., olive groves). The transition began in 2003 when Portugal stopped subsidizing cereal production but maintained subsidies for livestock within the context of the European Union's Common Agricultural Policy reform (6). In addition to the direct loss of open habitat, this change has resulted in the abandonment of extensive rotational crop farming—a matrix of cereals, legumes, and fallow land. The reduction of landscape diversity and vegetation complexity depleted the birds' food supplies (mainly vegetation and invertebrates) and breeding cover (which was previously more plentiful given the taller crops and lack of overgrazing). To fulfill cattle dietary needs, livestock production also involves growing fodder crops, which are cut earlier in the season than cereal

crops, destroying nests and harming both chicks and adult birds (2, 7).

Between 1999 and 2008, Portugal integrated key bird conservation sites located in farmland areas into the Natura 2000 protected network. The country also introduced specific voluntary agri-environmental measures designed to maintain or enhance key species' conservation status, along with financial incentives to encourage implementation. However, measures intended to enhance habitats containing cereal crops (8, 9) are less effective as grazing systems expand and intensify (6). Meanwhile, recommended measures to protect nests cannot compete financially with current agricultural practices (6), resulting in minimal adherence among farmers.

By failing to reverse the decline of priority species and manage Natura 2000, Portugal is in clear noncompliance with the European Union's Birds Directive (10). The country must incentivize farmers to reinstate appropriate habitats for farmland birds by widely implementing agri-environmental measures. This action can only be achieved through close collaboration between the Ministries of Environment and Agriculture and effective engagement with stakeholders. To judge the program's success, monitoring frameworks should be put in place to oversee agri-environmental measures and conservation initiatives, determine the degree to which farmers are implementing them, gauge their efficacy, and facilitate prompt adjustments. Only a joint effort by those responsible for agriculture and those responsible for conservation can reverse the precipitous decline of farmland birds in Portugal.

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10.1126/science.adn1390

Good governance can save China's mine ecosystems

In China, there are an estimated 99,000 abandoned mines, about 11,700 of which are metal mines (1). The abandoned mines threaten ecosystems and pose health hazards to people and animals (2, 3). Unclear goals and expensive pollution mitigation challenges impede ecological restoration efforts. Stakeholders must ensure that all environmental activities are coordinated to maximize restoration efficiency.

China has taken steps to restore ecosystems around abandoned mines. In 2018, the Chinese government created the Department of Territorial Space Ecological Restoration, which includes areas with abandoned mines in its purview. The Overall Plan for Major Projects for the Protection and Restoration of National Important Ecosystems (2021–2035) (4) designates mine ecological restoration as a key task (5). However, these measures are

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inadequate because they fail to account for the pollution that mining leaves in its wake or the costs required to remediate it (6, 7).

Mining activities leave behind complex soil and water environments. Organic and inorganic pollutants are found in solid waste, abandoned land, groundwater, surface water, and other interconnected systems (7, 8). Although some encouraging advances have been made in cultivating plants that sequester metals (9), much work remains to be done to improve the effectiveness of contaminant removal in some areas.

Removing the pollutants triggered by metal mines is expensive. In many cases, the companies that built the mines have left, leaving the burden of environmental remediation to the local government. To minimize the investment required, stakeholders tend to look for rapid and efficient strategies, such as repurposing abandoned land for production instead of restoring ecological spaces (10). These solutions allow investors to quickly recover the upfront financial deficit and generate profits, but the land might remain contaminated (11).

Effective ecological restoration would simultaneously address environmental pollution, but such efforts are hindered by fragmented governance. Government departments and private enterprises are working toward disparate goals, such as geological environmental protection, pollution control, soil erosion prevention, and biodiversity conservation. Because there is no mechanism to coordinate systematic restoration goals, these varied efforts can undermine efficient collaboration.

At the 2023 National Conference on Ecological and Environmental Protection in Beijing, attendees discussed the importance of synergistic governance and high-level protection (5). China should take immediate action to streamline ecological restoration and pollution mitigation efforts in areas with abandoned mines. Stakeholders must ensure that all environmental activities are coordinated to maximize restoration efficiency.

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10.1126/science.adn2422

Nature protection must precede restoration

Globally, billions of dollars are spent to restore terrestrial, freshwater, and marine systems (1). In addition to governmental financing and nongovernmental organizations, transnational companies invest substantial funds in nature restoration to position themselves as leaders in offsetting their environmental impact (2). However, the overall success of restoration often falls below expectations (3) because the human pressures that led to ecosystem degradation have not been addressed. Legal protection of ecosystems can reduce harmful human activities (4), but restoration plans often move forward without corresponding protections in place. Strict legal protection should always accompany restoration efforts.

The European Union provides one example of restoration plans that lack associated protective measures. In November 2023, Europe provisionally agreed to a new nature restoration law, pledging to restore habitats and species comprising at least 20% of land and sea by 2030 and all ecosystems requiring restoration by 2050 (5). Although multiple strategies and directives highlight the importance of strict protection of ecosystems, implementation by EU member states remains limited (6). In Denmark, for instance, nutrient runoff drives eutrophication and hypoxia in marine systems (7), and the country is developing widespread

marine restoration programs. However, reduction of nutrient quantities remains limited and does not meet EU directives (7). As a result, the legislation will likely struggle to protect both natural and restored marine ecosystems.

Australia, where intensified land use frequently conflicts with ecosystem protection (8), suffers from similarly short-sighted decisions. The country has implemented innovative restoration methods, but in 2020, the government agreed to not intervene with the development of 69 coal mining projects or 45 gas mining projects (9). Together with the ongoing expansion of land clearing (10), these actions put immense pressure on terrestrial, freshwater, and marine habitats, undermining any restoration plans.

Ecosystem restoration is undeniably beneficial—restoring 15% of lands globally could prevent 60% of expected species extinctions (11). However, strict protection of natural and restored ecosystems should be prioritized. Recovery after restoration is lengthy and complex (3), and rates of global habitat destruction, fragmentation, and exploitation largely surpass habitat restoration and protection (12). The development of an environmentally sustainable economy will likely take decades. Unless strict legal protection is enforced now, more ecosystems will likely be lost than restoration can revitalize.

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10.1126/science.adn0543



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Science **383** (6679), . DOI: 10.1126/science.adn0543

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