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Beyond scents: fragrance industry partnerships for biodiversity conservation

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Abstract

Since the 1992 Convention on Biological Diversity at the Earth Summit in Rio de Janeiro, United Nations biodiversity agreements have evolved to provide greater specificity on benefit-sharing and conservation strategies. The Kunming-Montreal Global Biodiversity Framework additionally highlights new opportunities for businesses to support biodiversity conservation, reinforced by the creation of a landmark 'Cali Fund' at COP16 in Colombia. However, biodiversity continues to decline at an alarming rate. This paper explores how innovative partnerships between the fragrance industry, conservation NGOs (both global and local), and commercial brands can advance international plant conservation goals. By using the scents of threatened species and ecosystems as inspiration for novel products without destructive harvesting, companies can integrate conservation principles into product development, from sourcing to commercialization, while channeling a portion of proceeds back into conservation efforts. This approach directly connects industries to conservation and addresses a critical gap in plant science expertise within leadership roles in both conservation organizations and businesses. Greater engagement by conservation scientists with the fragrance industry is needed, offering a replicable model for corporate engagement that is sustainable, equitable, and impactful. To achieve these goals, bioprospecting must be reframed to address current environmental, market, and societal challenges.

Introduction

The Convention on Biological Diversity (CBD; UNEP, 1992), adopted at the 1992 Earth Summit, established global goals for biodiversity conservation, sustainable use, and equitable benefit sharing, later expanded by the Cartagena Protocol on Biosafety (UNEP, 2000) and the Nagoya Protocol on Access and Benefit Sharing (SCB, 2011). Twenty years later, at the 2012 World Conservation Congress, the International Union for the Conservation of Nature (IUCN) formalized a collaboration with the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), aiming to unify conservation efforts globally. Both IUCN and IPBES produce authoritative biodiversity assessments and incorporate local and Indigenous knowledge to strengthen policy and capacity building. Most recently, the 2022 Kunming-Montreal Global Biodiversity Framework (GBF; CBD, 2022) built on these initiatives, providing a comprehensive strategy to address the biodiversity crisis and reverse global biodiversity loss.

The GBF maps out four global biodiversity goals for 2050, three sets of targets for 2030, and 23 individual targets to achieve the 2050 goals (CBD, 2022). Two of the individual targets, T15 and T19,

are especially key to developing novel approaches to achieve philanthropic goals for plant conservation. Target 15 addresses the imperative for businesses, and in particular, large transnational companies, to commit to (1) rigorous monitoring, assessment, and reporting of their risks, impacts, and dependencies on biodiversity, (2) providing information to consumers about their impacts to promote sustainable consumption, and (3) accurate reporting on their compliance with access and benefit-sharing rules and regulations. Target 19 (c) calls for a substantial increase in funding for biodiversity strategies and action plans through an array of financing scenarios, including private investment and blended financing approaches (CBD, 2022).

By the time COP16, the United Nations' biodiversity summit, was convened in Cali, Colombia, in October 2024, it was clear that corporate interest in conservation and sustainable use of biodiversity was at an all-time high. This is evident from the steadily rising corporate attendance at these summits: at COP14 there were approximately 300 companies represented, at COP15 1,000, and at COP16 3,000 (numbers reported by Colombia's Minister of Environment, pers. comm.). In addition, several workshops and side events focusing on bioeconomy were held. Biodiverse countries like Brazil and Colombia are now strong advocates for the commercial use of biodiversity to generate essential resources for conservation efforts and land stewardship by Indigenous peoples and local communities. As a consequence, an agreement was reached stating that large companies using digital sequence information (DSI) from biodiversity (e.g., in the pharmaceutical, cosmetics, and nutraceutical industries) should contribute 1% of their profits, or 0.1% of their revenue, to the landmark Cali Fund. This fund is dedicated to fair and equitable benefit-sharing from the use of DSI to support the conservation and sustainable use of biodiversity, with a portion of the funds available to Indigenous peoples and local communities for these purposes (CBD, 2024).

Global agreements are not enough

Despite these concerted international efforts, biodiversity loss continues at an accelerating pace (Díaz et al., 2019; Ceballos et al., 2020; Cowie et al., 2022; Williams et al., 2022). The 2023 *State of the World's Plants and Fungi* report and its underlying studies highlighted that 45% of the world's flowering plants are estimated to be at risk of extinction (Antonelli et al., 2023; Bachman et al., 2024), while three out of four undescribed plant species are also likely to be under threat (Antonelli et al., 2023; Brown et al., 2023). Island biodiversity continues to be particularly vulnerable. Documented island plant extinctions lie at 67.8% of all known vascular plant extinctions (Fernández-Palacios et al., 2021). From a more optimistic standpoint, Langhammer et al. (2024) posit that two-thirds of global conservation efforts yield at least some positive results, particularly projects that target invasive species control, habitat loss reduction, and restoration. Notwithstanding, these global interventions have not been sufficient to reverse or even halt global biodiversity loss (Díaz et al., 2019). Clearly,

accelerated action and more innovative approaches are urgently needed to fully realize the goals of the GBF.

A major opportunity for enhanced impact lies in strengthening the second and third of the CBD's original objectives, i.e., focusing not only on conservation but also on the sustainable use of biodiversity and equitable sharing of benefits derived from genetic resources (Antonelli et al., 2020; Cowell et al., 2021). This can be achieved by promoting new, innovative mechanisms that link conservation efforts with socio-economic incentives, such as creating sustainable value chains for biodiversity-based products or leveraging emerging technologies like bioprospecting agreements that ensure Indigenous peoples and local communities benefit from the use of their genetic resources. Strengthening these goals requires more inclusive partnerships between the private sector, governments, and local stakeholders to ensure that conservation initiatives are not only ecologically effective but also socially and economically beneficial. By encouraging more equitable frameworks for benefit-sharing, we can incentivize communities to actively participate in biodiversity conservation while securing livelihoods.

There are critical questions about why, as a community of conservation scientists, we have not embraced the CBD's goals more positively, inclusively, and, crucially, more innovatively. Although the IPBES has made some strides toward achieving the 2050 GBF objectives —through position papers, grey literature, and a handful of joint publications —these efforts are not widely circulated and are poorly cited, which significantly limits their influence and impact.

Bioprospecting and biopiracy

Humans have long exploited plants for an extraordinary breadth of applications, ranging from fundamental (e.g., food, shelter, medicine) to cultural (e.g., Levis et al., 2017). Likewise, the commercial development of plant-derived products has yielded countless pharmaceuticals, perfumes, cosmetics, agro-chemicals and functional foods. While the human benefits of many of these products are undeniable, the exploration of biodiversity for commercialization, also termed bioprospecting, has fallen under increasing scrutiny (Neimark, 2017).

During the 1992 Earth Summit, bioprospecting gained new prominence and negative attention. The historical exploitation of biodiversity by high-income countries and unethical practices in the corporate sector prompted some nations to greatly restrict or even prohibit bioprospecting activities (Neimark & Tilghman, 2014; Moran et al., 2001). This complex history has been reviewed elsewhere (e.g., Moran et al., 2001), and the associated inequities are both well-known and irrefutable. The term "biopiracy" was coined to describe the situation where knowledge and biological resources of

Indigenous peoples and other traditional and local communities are appropriated for exclusive control by individuals or institutions. Biopiracy not only highlights global power imbalances, it also alludes to a disregard for the natural world; by the early 21st century it was raised as a critique of virtually any form of research or commercialization of plants and, to a lesser degree, animals (Neimark, 2017). Bourdy et al. (2017) provides a thorough overview of the *Quassia amara* (Simaroubaceae) biopiracy allegation, particularly in the context of patent claims for a bioactive compound that has shown potential in treating malaria and cancer. The study addresses the ethical, legal, and conservation implications of commercializing Indigenous knowledge and genetic resources, highlighting the ongoing debate on bioprospecting versus biopiracy. The discovery and commercialization of the broad-ranging therapeutic compounds of the rosy periwinkle (*Catharanthus roseus*) is another well-known biopiracy case study. Yet the ongoing debate over the fair distribution of royalties remains politically and scientifically contentious, with conflicting claims and counterclaims regarding benefit-sharing (Neimark, 2017).

McAfee (1999, 2012) cautioned against assigning monetary value to nature and its services, describing the trade of local biodiversity on international markets as “selling nature to save nature”. While the international commodification of natural capital is potentially fraught, outright dismissal is too cynical and unproductive to inspire the conservation actions called for by the CBD and the GBF. In today's world, transformative solutions are essential. Blanket criticisms of monetization risk stifling responsible efforts to meet the GBF's targets, such as sustainable wild harvesting (Target 5), the sustainable management and use of wild species (Target 9), and the integration of biodiversity values into business and financial policies (Target 15). Scaling up positive incentives for biodiversity conservation while simultaneously reforming harmful ones (Target 18), requires a more nuanced and constructive approach. Now, more than ever, we need pragmatic, solution-driven conservation strategies that align ecological and economic goals.

For-profit industry and plant conservation

Of critical relevance to for-profit industries that rely heavily, or exclusively, on plants is the GBF's explicit language emphasizing that:

> *[n]ature can be conserved, restored and used sustainably while other global societal goals are simultaneously met through urgent and concerted efforts fostering transformative change* (Kunming-Montreal Global Biodiversity Framework section A.2, paragraph 4, 2022).

Here we focus on the imperative for groundbreaking change in global commerce, as highlighted in the GBF in Targets 15 and 19. We call for new, dynamic models of partnership between industry,

conservation bodies, and research institutions, which we illustrate through a case study of botanical scents that benefit the profit-driven fragrance industry while channeling funds into on-the-ground conservation projects. This approach advocates for collaboration among scientists, conservationists, plant chemists, and commerce leaders to integrate plant conservation into product development and consumer education, going beyond supply chain concerns in the fragrance industry — a global multibillion dollar industry utterly dependent on plants.

That for-profit businesses must become part of the solution to the biodiversity crisis is well understood and explicitly identified throughout the GBF (e.g., Target 15), and emphatically re-emphasized at COP16 in late 2024. Corporations must reject "greenwashing" approaches and expand their focus beyond mandated, yet often poorly tracked and enforced, Environmental-Social-Governance (ESG) commitments, such as reducing greenhouse gas emissions, minimizing waste, and selecting sustainable supply chains. Instead, they must increasingly incorporate activities that directly support nature conservation and restoration into their core mission and business practices (UEBT, 2023).

Returning to the GBF, several of the global targets can and should be strengthened by establishing novel partnerships with global industries dependent on plant biodiversity. Very relevant to this discussion is Target 19:

> *Substantially and progressively increase the level of financial resources from all sources [...], to implement national biodiversity strategies and action plans, mobilizing at least $200 bn per year by 2030, including by:*
>
> > *...(c) Leveraging private finance, promoting blended finance, implementing strategies for raising new and additional resources, and encouraging the private sector to invest in biodiversity, including through impact funds and other instruments* (Kunming-Montreal Global Biodiversity Framework, Target 19, paragraph (c), 2022).

The fragrance industry provides a compelling example of how private-sector engagement can unlock significant conservation funding. Several businesses, including charitable foundations from major beauty brands (e.g., Aēsop Foundation, Fondation L'Oréal, Estée Lauder Charitable Foundations), as well as many much smaller companies, have already begun to engage in conservation partnerships. A recent example is the collaboration between Caswell-Massey, International Flavors and Fragrance, and Yellowstone National Park to create the "Yellowstone Collection" (https://www.caswellmassey.com/collections/yellowstone), a product line that raises funds for the Yellowstone Forever Institute. These partnerships are indicative of how industry can meet multiple

objectives while raising environmental awareness, and generating substantial funding for conservation. With the fragrance market projected to generate $60.13 billion in revenue in by 2024 and the majority of fragranced-product sales being non-luxury items (e.g., soaps, creams, and detergents) (Statistica, 2024), everyday purchases have the potential to profoundly contribute to environmental awareness and biodiversity conservation efforts on a global scale.

One concrete pathway to corporate engagement is through bridging mechanisms that directly connect for-profit industry to plant conservation initiatives, as exemplified by The Red List Project (TRLP; www.theredlistproject.org; see our disclosure of Conflicting Interests describing our close associations with TRLP), a US-based, non-governmental organization (NGO) dedicated to the conservation of imperiled plants and critical habitats. Through creation of partnerships within the commercial fragrance sector, TRLP is compelling this industry to provide direct and genuine support for plant conservation action. TRLP nucleates these collaborations around rare and threatened plants or habitats and their evocative scent profiles. These scents serve as inspiration for fragrances in commercial products which in turn generate proceeds in support of conservation action for the focal plant or site. This approach relies on synthetic scent reconstitution not extraction so drives novel ingredient creation without wild harvest or any collateral damage to the supporting ecosystem. This squarely addresses the heart of Target 15 and ensures that the use, harvesting, and trade of wild species is sustainable, safe and legal (CBD, 2022).

TRLP also engages with experts in plant conservation from the academic sphere, including research arms of botanic gardens and natural history museums to ensure the best possible scientific outcomes for the conservation projects. Past and present partners include the Natural History Museum of Jamaica, Federal University of Minas Gerais (Brazil), Montgomery Botanical Center (USA), and the University of Palermo (Italy), among others.

To date, TRLP's conservation work has focused on threatened species on the global IUCN Red List and/or national Red Lists in biodiversity hotspots (Myers et al., 2000; Mittermeier et al., 2004). Projects have been supported in the Caribbean, Mediterranean Basin, South Pacific, and South America through novel ingredient development and fragranced consumer products. Examples of TRLP's efforts include a project in Brazil, focused on the Atlantic Forest biodiversity hotspot, one of the most threatened biomes across the globe (Vancine et al., 2024). TRLP has partnered with an historic US fragrance manufacturer (Blocki; https://www.blocki.com/) for work on the fragrant *Alstroemeria caryophyllaea* Jacq. (Alstroemeriaceae) (Fig. 1a-b). The species is listed as 'Endangered' according to Centro Nacional de Conservação da Flora (http://www.cncflora.jbrj.gov.br/portal), which provides a continuously updated list of threatened plant species in the country. TRLP's in-country conservation partner is the Antonelli Foundations for Biodiversity Research and Conservation

(www.antonelli-foundations.org), a non-profit organization that promotes research, education, conservation, sustainable use of biodiversity and entrepreneurship. Elsewhere in South America, TRLP has partnered with a global fragrance and flavoring house (MANE; https://www.mane.com/) and a local nature reserve (Mashpi Reserve and Lodge; Mashpi Cloud Forest Reserve) to steward several imperiled *Magnolia* species endemic to the Ecuadorian Chocó (Fig. 1c-d). Furthermore, a recent collaboration between TRLP, an independent fragrance house, and an Italian university exemplifies how such partnerships can directly engage academia in educating visitors about plant conservation (Gianguzzi et al., 2022). Such initiatives showcase how industry-academia-NGO collaborations can serve as powerful models for marrying conservation with commercial success, fostering both biodiversity protection and sustainable business growth.

These collaborations demonstrate the fragrance industry's engagement in conservation and highlight the potential for scalable corporate involvement. Partnerships like TRLP not only fund plant conservation but also establish replicable models for other industries. While small initiatives may appear limited, they can act as pilots, testing approaches and providing insights for broader implementation. The cumulative impact of multiple small projects can drive larger-scale action, influencing corporate strategies and government policies to advance conservation efforts effectively. Building on TRLP's work, we propose several mechanisms (Fig. 2) that can further enhance corporate contributions to biodiversity conservation, particularly in sectors with plant-dependent supply chains.

One particularly effective mechanism is linking financial contributions directly to product development. Companies can embed conservation into their product development processes by using the scent profiles of threatened species as the starting point for developing novel fragrances or other consumer products without engaging in destructive wild harvesting. This approach not only capitalizes on biodiversity but also channels a portion of the proceeds back into conservation efforts, creating self-sustaining or partially sustained funding models that directly support habitat restoration and research. In this model, conservation is integrated with product development from the outset, rather than as an optics-driven afterthought. This means that product development is guided by a focus on threatened species, with conservation principles embedded at every stage – from concept through to market, including narrative, responsible sourcing, and best practices for commercialization.

Additionally, conservation partnerships can serve as powerful branding tools, allowing corporations to genuinely enhance their ESG credentials. TRLP's collaborations across scales—from boutique fragrance companies like Blocki to multinationals like MANE—exemplify how conservation partnerships can align with a company's identity, bridging commercial goals with tangible biodiversity outcomes. Furthermore, businesses can leverage existing frameworks such as the GBF, using

transparent biodiversity reporting to ensure that their contributions are measurable and impactful. Ultimately, consumer education is another critical output in this model, as businesses can engage and inform their consumers about the species and ecosystems they are helping to protect, thus driving demand for biodiversity-friendly products.

TRLP is now focused on developing partnerships that extend beyond financial donations and integrate commitments to supply chain transparency, investments in local communities, and sustainable sourcing practices that respect and adhere to the benefit-sharing principles outlined in the Nagoya Protocol. Specifically, companies are encouraged to support sustainable development by ensuring that the local communities, particularly those that are stewards of biodiversity-rich areas, directly benefit from corporate activities. This can be achieved through fair compensation for the use of genetic resources, investment in local conservation infrastructure, and capacity-building programs that empower these communities to manage and protect their natural resources. To ensure sustainable sourcing practices, companies can adopt traceability measures that monitor the ecological impact of ingredient harvesting, guarantee fair labor conditions, and reinforce local economies. By incorporating benefit-sharing into their business models, corporations not only contribute to biodiversity conservation but also foster socioeconomic resilience in regions where biodiversity is most at risk.

How to hold every party accountable

To ensure accountability in collaborative NGO and transnational business initiatives, clear and transparent frameworks must be established from the outset. Legally binding agreements between corporate partners, NGOs, and conservation bodies are a fundamental starting point. These agreements should explicitly outline commitments to biodiversity conservation, sustainable sourcing, and benefit-sharing, with enforceable clauses that ensure companies fulfill their obligations. Legal consequences for non-compliance create a formal mechanism for responsibility, encouraging adherence to agreed standards. Independent audits and third-party oversight are equally critical in reinforcing accountability. Neutral parties can conduct regular evaluations of ecological, social, and economic impacts, ensuring that resources are allocated effectively, supply chain transparency is maintained, and local communities benefit in accordance with the Nagoya Protocol. This multi-layered scrutiny ensures that all participants operate at the highest standards of accountability.

Transparency through public reporting further strengthens these frameworks. Disclosing biodiversity-related data allows stakeholders, including consumers and investors, to monitor progress and hold organizations accountable. Corporate disclosures must focus on biodiversity outcomes and be supported by robust regulatory frameworks to contribute to global conservation goals (Mair et al., 2024). However, the lack of standardization often leads to vague and incomplete disclosures, with

companies failing to detail how they measure their biodiversity impacts (Adler et al., 2017). To address these gaps, mandatory ESG reporting is necessary, ensuring both the quantity and quality of disclosures. High-quality information is vital for achieving meaningful environmental outcomes (Krueger et al., 2023), yet investors frequently highlight the insufficiency of current ESG disclosures for making informed decisions (Krueger et al., 2023). Standardized and accessible ESG reports would not only enhance transparency but also strengthen the credibility of conservation initiatives, solidifying the commitment to genuine biodiversity protection.

Accountability can also be enhanced through performance-based metrics. For corporations, these could involve tracking the sustainable sourcing of ingredients, the number of local jobs created, or the reduction of environmental impacts within their supply chains. NGOs, on the other hand, might measure success in terms of species recovery, habitat restoration, or community empowerment. These metrics should be continuously evaluated to ensure that the initiatives are meeting their objectives, and adjusted as necessary based on outcomes. Consumers, as crucial stakeholders, also have a role to play in ensuring accountability. By educating consumers about the conservation impact of their purchasing decisions, businesses can create a direct link between product choices and biodiversity conservation. Tools such as QR codes on packaging could provide real-time updates on conservation projects, fostering a deeper connection between consumers and the initiatives they support.

Finally, adaptive management practices are essential. Given the uncertainties inherent in such collaborative efforts, flexibility is key. All parties—corporations, NGOs, and local communities—should continuously assess progress, remain open to strategic adjustments, and incorporate feedback to improve the initiative's effectiveness.

By implementing these mechanisms—legally binding agreements, independent audits, transparent reporting, performance metrics, consumer engagement, and adaptive management—TRLP’s projects and similar initiatives can ensure that corporate engagement in conservation is both genuine and impactful. Holding each party accountable through these structured approaches will be crucial to the long-term success of conservation efforts.

Challenges and opportunities in measuring success

Measuring the success of collaborative NGO–transnational business initiatives accurately and responsibly will take time, and it may well prove that this model of corporate engagement with the fragrance industry is neither financially successful nor scalable as a global practice. Accurate measurements and accountable reporting will require transformational shifts in the way markets value nature to include (if not replace) the valuation of nature for its own sake (Deutz et al., 2020). Similar to the recently proposed framework for high-integrity biodiversity markets (Antonelli et al., 2024),

responsible metrics and reporting must avoid the pitfalls and slippery accounting that often characterize the reporting of sustainable development and carbon credit goals by transnational corporations (see Vorisek and Yu, 2020; Peacock 2023). Further, repeatable metrics are elusive within this domain precisely because fragranced-product initiatives cannot be approached as controlled experiments. Fragrances are highly personal and commercially short-lived (generally), but they can be highly lucrative. An important goal of TRLP's initiative, and any similar ones that may follow suit, includes education of the fragrance industry decision-makers and consumers about the importance of plants in our daily lives. In conjunction a powerful message emerges: that individual actions can contribute financially to conservation goals *and* bring meaning and positivity to everyone involved.

Bioprospecting as a critical step towards a global bioeconomy

Thirty years on from the Earth Summit, with many insights gained along the way, we argue that bioprospecting must be reframed to reflect contemporary ecological, economic, and social realities. Indeed there is increasing evidence that bioprospecting is shifting away from economies that rely heavily on the finite extraction of natural resources—timber, oil, minerals, and agricultural activities that demand large tracts of land—to "bioeconomies". These bioeconomies, guided by a set of high-level principles recently established under Brazil's G20 presidency (https://www.g20.org/en/news/g20-reaches-consensus-and-establishes-high-level-principles-on-bioeconomy), prioritize sustainable and inclusive uses of biodiversity, valuing ecosystems not for their extractive potential, but for their ability to contribute to long-term environmental resilience and human prosperity (Jaramillo et al., 2019).

The fragrance industry offers a promising case study at the intersection of science, conservation, for-profit business, and equitable benefit-sharing. This sector, historically dependent on nature for its most essential raw materials, is increasingly aware of the need for sustainable practices that protect biodiversity. We advocate for deeper, more integrated engagement between governments, industries, and conservation entities—engagement that goes beyond ethical supply chain management to embrace nature-first strategies. Such approaches should center community and Indigenous stakeholders as partners rather than beneficiaries, fostering collaborations that ensure shared prosperity. In line with the recommendations agreed upon at COP16 and mentioned above, financial returns from the production and commercialization of biodiversity-based products, like fragrances, should be channeled into biodiversity conservation, habitat restoration, and scientific research. This approach not only enables the corporate sector to enhance its positive environmental impact but also embeds conservation directly within the profit structure of the industry.

To make this vision a reality, conservation organizations, both global and local, must broaden their reach and expertise. Involvement from a range of disciplines—science, business, and law—will better equip these organizations to navigate complex corporate partnerships. Specifically, we call for more diverse advisory boards and scientific oversight committees, which should include experts who understand the nuances of conservation science, sustainable sourcing and ecological systems. Unfortunately, a review of these bodies reveals an alarming gap: the near complete absence of biodiversity scientists from key decision-making board rooms. We urge biodiversity scientists to become more proactive in shaping policies and programs, participating in discussions that extend beyond academia and into global biodiversity governance. There is a particular need for plant scientists to engage with industries like fragrance and beauty, where their expertise could directly influence the sourcing of raw materials and ensure sustainable practices. While learning the complexities of supply chains and product development may seem far removed from traditional botanical work, it is crucial for the conservation of threatened species and habitats. Plant scientists can help design strategies that prevent overexploitation, protect pristine ecosystems, and offer alternatives to the long-held extractive models that still dominate in many countries.

Plant diversity has supported the evolution and well-being of humans for millennia, and will undoubtedly continue to do so for generations to come. Through inclusive and innovative approaches, there is potential for responsible bioprospecting that helps us tackle some of our most pressing societal and environmental challenges, from biodiversity loss to climate change and food security (Antonelli et al., 2023). We urge all stakeholders to move beyond fear and mistrust and embark on a positive and mutually beneficial journey to ensure the responsible use of biodiversity while contributing to global conservation goals.

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Conflict of interest: All authors are linked to The Red List Project, a nonprofit organization that helps generate conservation funding through collaborations with consumer products industry partners, grounded upon scientific consensus and global biodiversity conservation concepts. They hold unpaid

roles as founder, executive director and principal scientist (PLF), project scientist (LFAP), scientific advisor (RJS), director of conservation science (VH), and project partner (AA).

Authors' Contribution:

Luiza F. A. de Paula: Conceptualization (lead); writing – original draft (equal); writing – review and editing (equal). Rhian J. Smith: Conceptualization (supporting); writing – original draft (supporting); writing – review and editing (supporting). Vanessa Handley: Conceptualization (supporting); writing – original draft (supporting); writing – review and editing (supporting). Alexandre Antonelli: Conceptualization (supporting); writing – original draft (equal); writing – review and editing (supporting). Peggy L. Fiedler: Conceptualization (lead); writing – original draft (equal); writing – review and editing (equal).

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595 **Figure subtitles**

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598 **Figure 1**. Examples of ecosystems and species studied by The Red List Project in Brazil and
599 Ecuador, respectively. A, B - The Brazilian Atlantic Forest landscape and the target fragrant
600 *Alstroemeria caryophyllaea* Jacq. (Alstroemeriaceae); C, D - The tropical montane forest within
601 Masphi Reserve, Ecuador, and the target fragrant *Magnolia mashpi* Á. J. Pérez, F. Arroyo & A.
602 Vázques (Magnoliaceae). Photographs: (a) by A. Antonelli, (b) by L. de Paula, (c) and (d) by V.
603 Handley.

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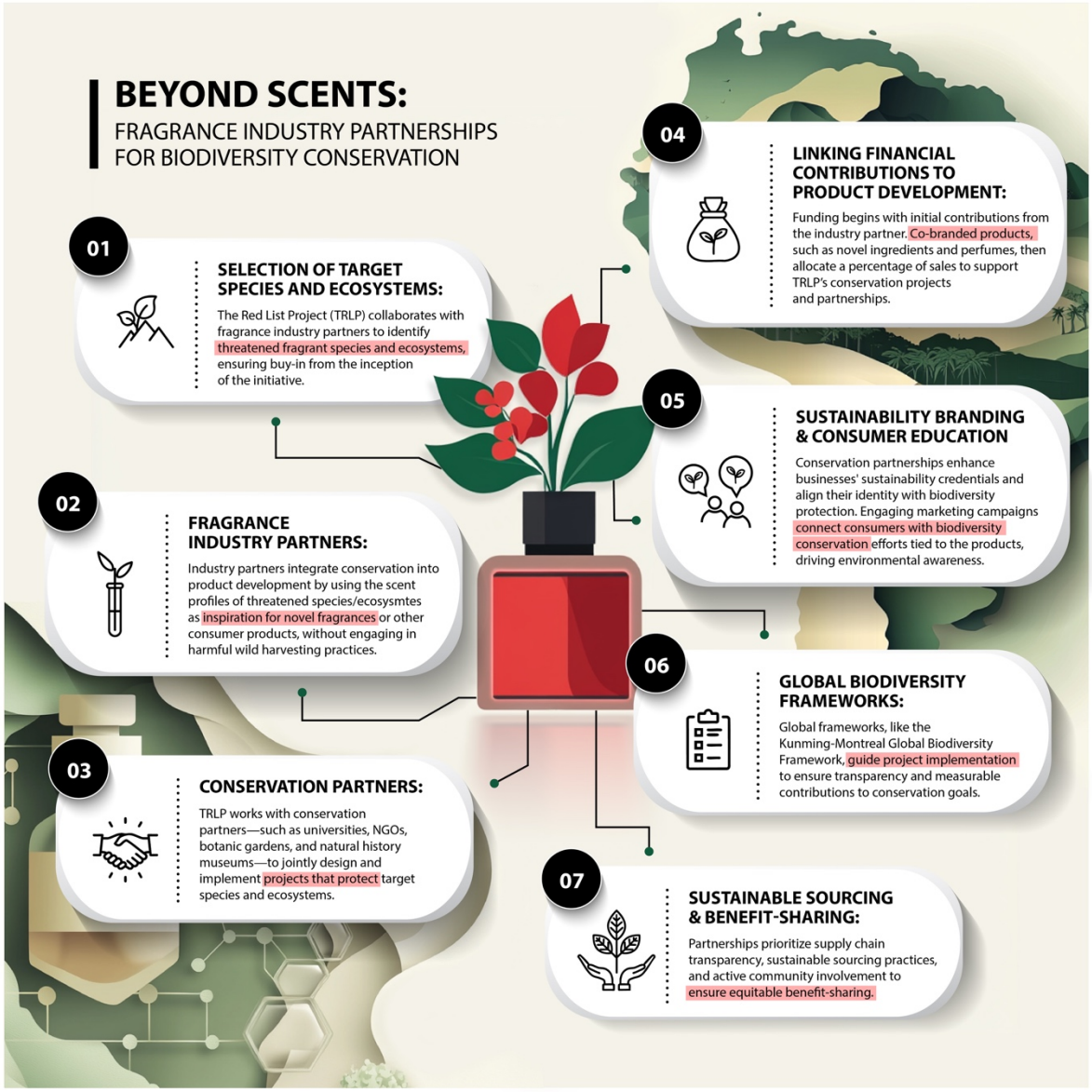

Figure 2. Mechanisms for integrating businesses into biodiversity conservation, using the fragrance industry as a case study.

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