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Ecosystem assessment and translating a groundskeeping framework into practice for promoting systemic change in higher education

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Many institutions include equity as a stated foundational value of their academic missions but often face significant challenges when initiating practices and policies that are aligned with this goal. We propose that institutions and biomedical research environments require innovative approaches to move systems toward equitable environments. The effective transformation of systems involves steps that include an assessment of the current environment; a clear delineation of institutional goals; commitment of resources, structures of accountability, and recognition and/or rewards; as well as identification of transformative or visionary leaders. In the assessment of current systems with regard to progress toward the establishment and cultivation of systems that promote equity, it is critical to identify and maintain effective current practices and to execute necessary changes by drawing on existing change theories or deploying innovative approaches to institutional transformation. The Groundskeeping theoretical framework aligns well with the goal of creating such systems in that it seeks to dismantle (1) notions of the *status quo*, (2) faulty notions of unbiased meritocracy, and (3) behaviors that create barriers preventing access and advancement. Instead, Groundskeeping creates permissive environments that advance systems toward sustained equitable outcomes. Here, we present an approach that uses the Groundskeeping framework as one possible means for approaching institutional change by initiating systems-level changes in academic and biomedical environments. We provide a step-by-step roadmap to initiate effective approaches that address structural challenges arising from behaviors perpetuating accepted norms, and we also discuss ways to build capacity among individuals as they assess their environments and foster change in their organizations. Finally, we highlight recent effective national approaches aligned with the Groundskeeping framework that work toward change in institutional environments. Ideally, such approaches could be applied in a variety of organizational settings and will translate across different environments to initiate systemic change.

KEYWORDS

diversity, equity, inclusion, higher education, institutional transformation, systemic change, systems, groundskeeping

1 Introduction

Many higher education institutions and biomedical entities have long espoused commitments to support a broad range of individuals from diverse backgrounds. Such commitments to increase representation and equity have been especially prevalent in efforts in science, technology, engineering, and mathematics (STEM) (National Academies of Sciences, Engineering, and Medicine, 2007, 2010, 2023). In the wake of the re-examination of structural racism and other forms of inequity in the United States following the murder of George Floyd in the summer of 2020, and legal advances such as the national recognition of marriage equality, a number of public and private educational institutions and biomedical research organizations pursued practices and policies to make their systems more equitable, including hiring and recruitment initiatives; establishing or expanding offices and executive leadership roles focused on diversity, equity, and inclusion; and revisiting reward practices to acknowledge academic and professional work supporting equity.

Many recent approaches attempted by institutions have focused on pursuing a cycle of education, awareness, and action. A significant number have focused primarily on increasing awareness of the longstanding histories of racism, sexism, genderism, xenophobia, and other forms of inequity in the U.S., with some going beyond increasing awareness to launching programs, practices, or policies to promote access and inclusion. The need for such efforts is well documented. For example, a number of studies have documented biases in hiring practices for women and underrepresented individuals (Moss-Racusin et al., 2012; Eaton et al., 2020; Friedmann and Efrat-Treister, 2023), as well as persistent biases in funding decisions that disadvantage scholars of color, with Black National Institutes of Health (NIH) applicants disproportionately less likely to be successful at obtaining funding (Ginther et al., 2011). Additional analyses demonstrated that Black and Asian women primary investigators (PIs) were disadvantaged compared to PIs from other demographic groups in successfully obtaining NIH funding, which is associated with successful advancement in academic and biomedical faculty careers (Ginther et al., 2016). While some of the disparities in NIH funding have been further explored (Hoppe et al., 2019; Lauer et al., 2021), the gaps in funding success by race/ethnicity and gender have persisted. More recently, similar racial disparities were reported for funding across all directorates of the National Science Foundation with white PIs being funded at higher rates than non-white PIs (Chen et al., 2022). Along these same lines, data demonstrate that limitations persist in the hiring processes for academic faculty (Wapman et al., 2022), resulting in prestige and affinity biases, and that underrepresented faculty face inequitable standards during the promotion and tenure process (Masters-Waage et al., 2024).

For entities focused heavily on increasing awareness about persistent biases and inequities in higher education, it is critical to heed the words of Professor Imani Perry that "awareness is not a virtue in and of itself, not without a moral imperative" (Perry, 2019, pp. 18–19). By not addressing the documented biases in hiring, funding success, and promotion and tenure, or the persistent gaps in achievement and success, the biomedical workforce will continue to face limits that prevent its highest potential (Yang

et al., 2022, Page, 2017). To implement such change in the system, practices and policies must expand beyond what author and change leader Deborah Rowland (2017) referred to as "layer[ing] change onto a system" (p. 154). In her work on organizational change, Rowland highlights the importance of addressing features and stakeholders in complex systems to promote lasting change, rather than simply layering change onto existing practices and norms. Rowland emphasizes the need to "work on the underlying system that produced the results, not [to] try and drive new results through keeping the current systems and routines intact" (Rowland, 2017, pp. 178–179). Thus, needed change to promote equity in STEM and higher education will require leaders to reimagine themselves as stewards who seek methods to disrupt widely accepted inequitable norms, not just adding diversity programs and initiatives to a system with documented disparities and persistent inequities (Ginther et al., 2011 and 2016, Wapman et al., 2022, Hoppe et al., 2019, Masters-Waage et al., 2024, Moss-Racusin et al., 2012; Eaton et al., 2020; Friedmann and Efrat-Treister, 2023, Chen et al., 2022). Such an approach necessitates interrogating embedded practices and policies that serve to maintain the *status quo* and allow inequities to persist.

Unfortunately, many of the changes in the most recent efforts targeted to address inequities related to race and gender in academia and the biomedical research enterprise have been tenuous at best and ill-effective at worst. While some efforts have led to some increases in representational diversity at multiple levels in higher education, long-standing disparities across race and gender persist as individuals progress along professional trajectories and into senior positions (Fry et al., 2021). Additionally, cycles of progress have shown ebbs and flows with periods of cluster hiring followed by attrition and failure to retain representational diversity, what Frière (1996) has deemed "a pattern of cyclical progress and cyclical regression" (p. 98). Indeed, as is common for documented cycles of progress and retrenchment related to equity progress in the United States (Anderson, 2016), an unraveling of commitments and investments to promote equity has already ensued and is being amplified with recent executive orders in the United States. Recognized reversions include the recent U.S. Supreme Court decision banning the use of affirmative action in college admissions and the associated overreach of institutions in dismantling scholarship, fellowship, and mentoring programs designed to support diversity, equity, and inclusion in institutions and business sectors (Camera, 2023; Kelderman, 2023; Maye, 2023; Montgomery, 2024; Valbrun, 2024; Wood, 2023). Additionally, recent presidential executive orders in the United States also seek to roll back progress related to race/ethnicity, gender, disabilities, and more (Blake, 2025). Thus, continued commitment and effort to address the persistent inequities and biases in STEM and higher education will require innovative, novel approaches that intervene in systems and lead to lasting, effective changes.

There are a number of organizational change frameworks described in the literature with relevance for systems-level change in higher education and STEM. Foster-Fishman et al. (2007) define systems change as "an intentional process designed to alter the *status quo* by shifting and realigning the form and function of a targeted system" (p. 197). Such work involves systems-level thinking to effectively support organizational change. In alignment with Rowland's caution about layering change onto status-quo systems, Foster-Fishman et al. (2007) recognize that "systems

change is an episodic and transformative change pursuit that is fundamentally about shifting the *status quo* by altering the elemental form and function of a system" (p. 201). In work that applies Edward Deming's principles on managing organizational transformation to higher education systems, Redmond et al. (2008) point to a number of factors for promoting change including identifying and breaking down or mitigating barriers to change, recognizing the importance of addressing transformation of individuals' actions and behaviors in systems and how that links to opportunities that evolve cultures to support needed change (p. 432–434). Foster-Fishman et al. (2007) point out that as "most systems contain a complex web of interdependent parts: leveraging change in one part will lead to the desired outcome only if concurrent shifts happen in the relational and compositional elements of the system" (p. 199). Thus, in approaching change, Foster-Fishman et al. (2007) highlight the importance of assessing current system function and the identification of existing levers that can lead to desired change (p. 200). At the same time, leaders and stakeholders need to also keep focus on resistance to change. In this regard, Meyer and Stensaker (2006) point out the problem when "managers consistently neglect or underestimate the adverse effects of implementing change" (p. 219) and acknowledge that this must be addressed to increase the capacity for change in organizations. According to Foster-Fishman et al. (2007), system features of importance include norms, resources, regulations, and operations. The policies and practices of higher education ecosystems sometimes codify norms, encompass regulations, and define operations, and thus are a target for change interventions. Furthermore, resources sometimes limit approaching or actively restrict possibilities for change. The commitment of resources generally requires leadership buy-in and stewardship, linking effective systems change to effective and impactful leadership, as highlighted by Meyer and Stensaker (2006) and by Montgomery (2020a) in the Groundskeeping framework.

Here, we provide an ecosystems-centered perspective that requires the initiation of an authentic and holistic assessment of the commitment and vision of institutions as they pursue equity. To truly understand the limits to the rate and persistence of change, we propose a process to begin such work based on a theory of growth-based change centered in groundskeeping (Montgomery, 2020a, 2021). The Groundskeeping approach supports outlining an ecosystems-based assessment process that assists individuals in identifying the practices, processes, and policies that need to be maintained and those that require evolution. In this framework, notions of *status quo*, faulty understandings of unbiased meritocracy, and gatekeeping behaviors are addressed head on to promote establishing permissive environments that advance systems toward sustained equitable outcomes. The Groundskeeping assessment process aligns with the strengths of some of the aforementioned organizational change frameworks. It serves as an accessible and practical means to support the establishment of systems of equitable resources and accountability that promote actions toward establishing and maintaining systemic change. This assessment process is designed to be used effectively across all environments and levels of the biomedical enterprise by leaders, faculty, researchers, professional development professionals, and others committed to initiating systemic change.

2 Ecosystem assessment: current state, opportunities, and challenges

One of the most significant challenges to sustained changes in environments, including academic settings and the biomedical research enterprise, is acknowledging the need for a commitment to change at the ecosystem level. In biological research, ecosystem frameworks focus on investigating or understanding organisms in the context of their dynamic, complex habitats (Loreau, 2010). Ecosystem-based analyses do not focus on individual organisms in isolation but center on a contextual-based understanding of organisms and the beings with whom they are in community and relationally interact. Thus, engaging in systemic change from an ecosytem framework considers circumstances from a systemic perspective to understand individual elements, relationships, and the contexts that result in challenges that need to be addressed to support individual and collective thriving (Flynn et al., 2011). Such ecosystem frameworks have been successfully used to explore the importance of the mentorship relationship by focusing not just on individual mentoring relationships but on the full system in which mentoring occurs to promote successful outcomes (Mondisa et al., 2021; Montgomery, 2017; National Academies of Sciences, Engineering, and Medicine, 2018), and align with other established change models for higher education (e.g., Meyer and Stensaker, 2006; Foster-Fishman et al., 2007; Redmond et al., 2008). Such frameworks should inspire similar approaches for moving beyond individual success models in other realms of work in the academy, and STEM in particular (Whittaker and Montgomery, 2022), including in promoting equity.

Without appropriately assessing or fully examining current environments that have long histories of maintaining inequity and the *status quo*, we will continue to experience incremental progress, stagnation, or worse yet experience current retrenchment toward inequity. To truly move beyond espoused commitments and incremental progress, organizations must be willing and able to truthfully assess the current state of their ecosystems. Then, they must address whether the lived experience assessed aligns with (or fails to align with) their stated institutional commitments and goals. Such assessments are critical to support system-level improvement or needed change.

2.1 Theoretical framing: gatekeeping (maintaining the status quo) compared to groundskeeping (promoting equitable change)

To adopt new frameworks, systems must be positioned and willing to move from maintaining the *status quo* to considering radically new approaches that dismantle historical norms, behaviors, and practices. They must also be committed to attempting bold and innovative approaches that are grounded in evidence and are adequately resourced and paired with systems of accountability. In addition, there must be a better understanding of *why* commitments have not successfully shifted behaviors and *how* to approach the work in contextually relevant ways.

A number of theories exist in the social science literature that explain the bases of organizational change, structural modification,

behavioral outcomes, and roles of change leaders (Bass et al., 2003; Dowd, 2007; Foster-Fishman et al., 2007; Howell and Avolio, 1993; Meyer and Stensaker, 2006; Montgomery and Whittaker, 2021; Redmond et al., 2008; Xenikou, 2017). The theory of Groundskeeping (Montgomery, 2020a) integrates these areas and captures the possibility of incorporating practices that will lead to more equitable systems and shift away from traditional gatekeeping. Common gatekeeping approaches center on "guarding who gains access and who advances based on conceptualizations and assumptions about who can function and thrive" (Montgomery, 2020a, p. 1). In contrast, the Groundskeeping theory states that academic systems need to evolve from traditional gatekeeping frameworks and practices to being advanced through groundskeeping, which is defined as "identifying [and replicating] unfettered paths, as well as working actively to open and clear paths with recognized barriers, roadblocks, and inequities that may prevent access and success by specific individuals or groups" (Montgomery, 2020a, p. 4).

Common gatekeeping practices focus on assessing the worthiness of individuals when deciding whether they will have access to opportunities—generally based on traditional metrics, such as grade point average, the prestige of degree-granting institutions, or the receipt of prestigious awards (Montgomery, 2020a). Gatekeeping can impact academic constituents across multiple levels—namely, students, faculty, and leaders (Figure 1, left). If deemed worthy based on gatekeeping metrics or traditional characteristics, individuals may gain access to "selective" environments. However, even when "granted" access in spite of gatekeeping practices, additional internal measures of metrics-based gatekeeping may occur within these environments, including student performance in "weed-out" courses (e.g., Gasiewski et al., 2012) or via faculty-associated processes, such as traditional tenure and promotion systems built on the acquisition of increasingly limited grant dollars and "publish or perish" frameworks (Montgomery, 2020a; Whittaker and Montgomery, 2022; Masters-Waage et al., 2024).

In contrast, Groundskeeping perspectives focus on more inclusive entry practices, such as the assessment of whether participants have the desire and cultivable abilities to contribute to ecosystems (Figure 1 right; Montgomery, 2020a). Groundskeeping-type approaches to leadership, in particular, have been described as having a "democratization effect" (Dowd, 2007, p. 415). In groundskeeping approaches based on growth-based engagement, mentors and leaders focus on cultivating growth and tending to the environment to support individual and collaborative contributions geared toward promoting collective success (Montgomery, 2020a; Whittaker and Montgomery, 2022). In these contexts, leaders focus on their roles as environmental stewards, supporting individuals in context and in service toward success, rather than on deficit-based frameworks focusing on "fixing" individuals (Montgomery, 2020b,c, 2023).

The Groundskeeping framework provides a clear roadmap to support the process of values alignment (Montgomery, 2020a). First, it guides the identification and disruption of gatekeeping behaviors that are oppositional to establishing and supporting equity. It also supports the modification or disruption of practices that continually enforce detrimental aspects of the *status quo*, such as biases in hiring and advancement of specific demographic groups in STEM and the biomedical enterprise (Chen et al., 2022;
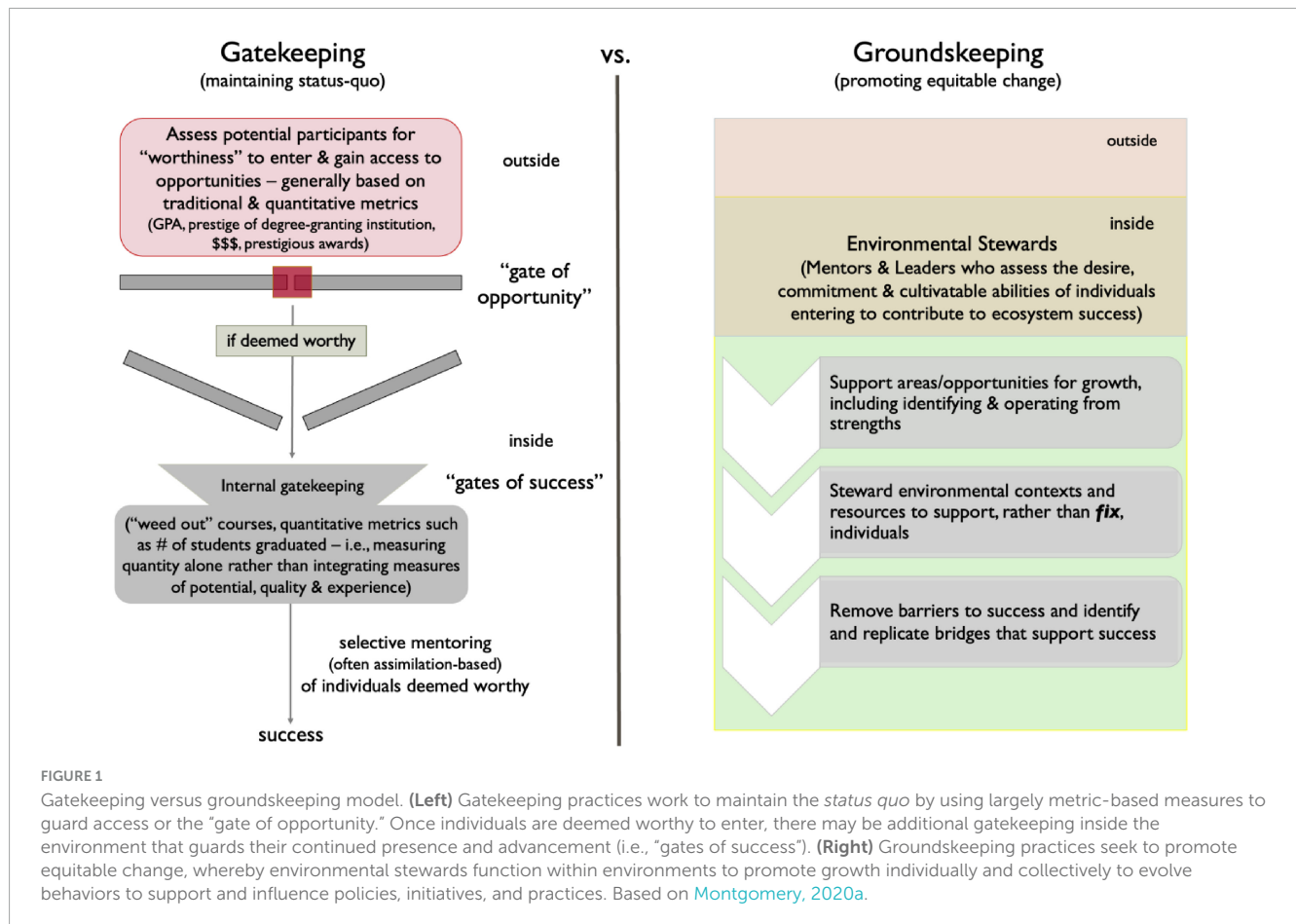
Eaton et al., 2020; Friedmann and Efrat-Treister, 2023; Ginther et al., 2011, 2016; Lauer et al., 2021; Moss-Racusin et al., 2012). The Groundskeeping framework requires an honest interrogation of why inequitable practices have been allowed to persist and helps shed light on how to motivate behaviors toward change instead of further entrenching current practices. Second, it allows those with positionality and power in the system to enact change. The framework supports the notion that focus should be placed on identifying and removing the barriers that make systems inequitable (Black et al., 2022; Byars-Winston et al., 2023; Mays et al., 2023; Montgomery, 2023; Montgomery and Whittaker, 2021; Pfund et al., 2022; Whittaker and Montgomery, 2022). Such capacity building comes through engagement in relevant education, but only to the extent that it accommodates and supports those who wish to engage in systemic change.

2.2 Applying the framework of Groundskeeping

When institutions seek systemic changes, leaders and stakeholders committing to breaking reliance on common gatekeeping practices is only the first step. They may also consider applying the Groundskeeping framework as they contemplate how to best move forward and evolve toward growth-based actions. Communities must move from an espoused commitment to a concrete method to determine where gatekeeping occurs in their environments and find specific means to pivot toward groundskeeping. Effective steps to promote this include the following: (1) assess the current state of an ecosystem and catalog prior approaches that have led to the current state; (2) based on the outcomes of this assessment, determine a summary diagnosis of steps that will contribute positively toward the stated communal vision and goals; (3) identify the steps that must be disrupted or replaced to support intended outcomes; (4) work individually and collectively as a community to draft specific points of revision of processes, practices, and policies to move toward the Groundskeeping-based pursuit of equity; and, (5) implement and assess revised approaches (Figure 2).

2.2.1 Assessment of the current ecosystem state

An effective assessment of the current state of an ecosystem requires engaging with and querying the commitments and practices of multiple stakeholders or stakeholder groups in an ecosystem, which impacts the current culture and the potential for needed change (Redmond et al., 2008, p. 434). An important place to start is to query key stakeholders about the goal(s) of a particular effort (e.g., an equity goal for the community). Initiating such an effort is benefitted by clarifying the boundaries of the goal(s) or problem(s) under assessment. As supported by Foster-Fishman et al. (2007), boundary setting is critical to the success of systems-level change initiatives. Additionally, gaining insights from leaders, faculty, staff, students, and other relevant members of the local ecosystem is critical in an academic context. Individuals must first determine whether there is a shared understanding of local and institutional goals. Next, individuals must gain insights into the methods that distinct stakeholder groups identify as being used to support the pursuit of organizational goals, as

FIGURE 1

Gatekeeping versus groundskeeping model. **(Left)** Gatekeeping practices work to maintain the *status quo* by using largely metric-based measures to guard access or the "gate of opportunity." Once individuals are deemed worthy to enter, there may be additional gatekeeping inside the environment that guards their continued presence and advancement (i.e., "gates of success"). **(Right)** Groundskeeping practices seek to promote equitable change, whereby environmental stewards function within environments to promote growth individually and collectively to evolve behaviors to support and influence policies, initiatives, and practices. Based on Montgomery, 2020a.

well as to determine whether key stakeholders have indicated that the methods being used are effective or not. This type of assessment can begin to reveal a number of factors that may contribute to progress, a lack thereof, or perceptions about intended progress. Where misalignments emerge in the understanding of the vision, identification of methods being used, or perceptions about the effectiveness of methods utilized, it becomes clear where impediments to progress in a community may emerge.

Important parts of assessing a current ecosystem are querying when and where data are used and understanding the different ways in which such data are informing practices and policies. Data can provide evidence of the current state of the system, reflect progress in the system, or identify issues and practices that prevent evolution in the system. Academic environments often use short-term data (e.g., the demographics of a single, current cohort of students, staff, or faculty) to demonstrate progress with long-term challenges, which may lead to misinterpretation or an over-extrapolation of cause vs. effect. Longitudinal data are more meaningful in determining whether effective disruptions of persistent challenges and gatekeeping practices have occurred. Thus, while a good recruiting year can yield data that demonstrate short-term promise, long-term data that document the overrepresentation of some groups and the underrepresentation of other groups, including persistent disparities in treatment or progress across gender, race, ethnicity, differences in ability, veteran status, etc. over years or decades provide evidence of the current presence of factors and practices that support inequity. Members of

the academy tend to lean into gathering and sharing data that represent short-term wins while frequently struggling to reconcile with longitudinal data that potentially point to long-term gatekeeping that results in persistent inequities. This is especially challenging when those gatekeeping practices reinforce the advancement and progress of some groups over others, as this may cause individuals to reconsider their own personal and professional achievements since those achievements were awarded in inequitable systems. No matter how promising a short-term initiative is, introducing such work in the absence of actively working to disrupt the factors that have maintained long-standing inequity makes it unlikely that existing ecosystems will transform into equitable environments. For example, if an institution has experienced a long-term, consistent gap in graduation rates among different demographic groups, a groundskeeping approach would ask what active conditions, policies, and practices have worked to maintain that gap. Thus, cataloging and assessing advising, mentoring, or other practices and policies associated with graduation should be conducted as a first step in understanding the persisting graduation gap (Figure 2, Step 1). Rarely in nature are such differences maintained with such consistent precision over long time periods without the active upkeep and maintenance of long-term practices or maintaining forces. An effective ecosystem assessment will identify those promising short-term interventions but will also query the ecosystem for long-term practices, policies, and cultural
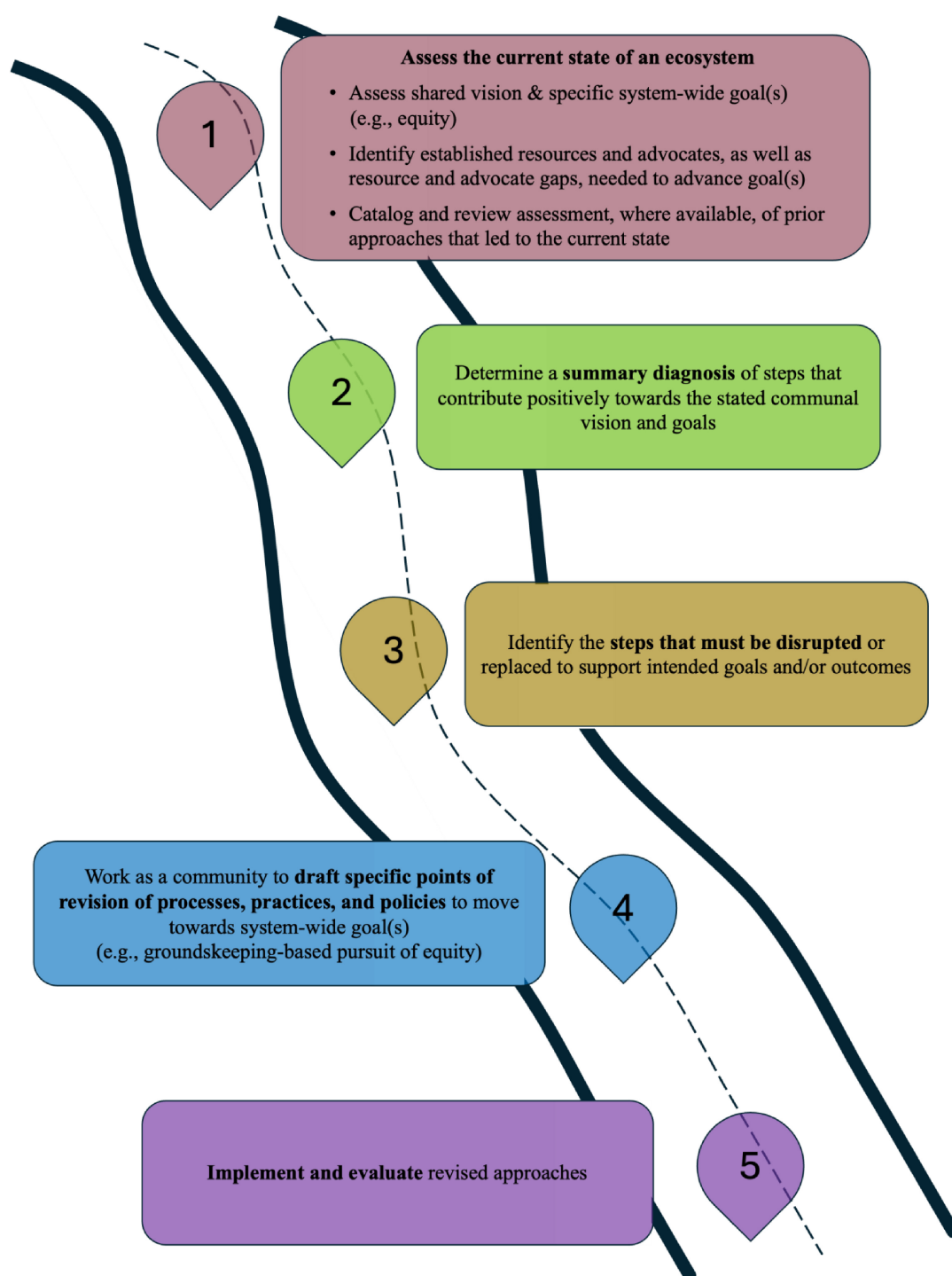
FIGURE 2
Roadmap to advance from gatekeeping practices that promote the *status quo* to groundskeeping practices that advance equity. This roadmap is based on the use of a concrete, practical method to identify where gatekeeping occurs in one's environment and to find specific means to pivot toward groundskeeping.

gatekeeping features that work to maintain the *status quo* and inequity.

2.2.2 Diagnosis of the current ecosystem

After completing an ecosystem assessment, a summary diagnosis is the next step in articulating central or commonly identified strengths, challenges, and opportunities for growth. Such a diagnosis identifies practices and policies with significant potential for sustaining the *status quo* or gatekeeping practices. These can be related to identified challenges, such as the association of standardized tests with racial or socioeconomic bias (Smith and Reeves, 2020), biases associated with race

System-wide policy and practice assessment to promote groundskeeping.

or gender in the assessment of job candidates (Eaton et al., 2020; Friedmann and Efrat-Treister, 2023; Moss-Racusin et al., 2012), or the association of education and prestige biases related to the limited number of institutions that train Ph.D. students who go on to tenure-track jobs (Wapman et al., 2022). Continuing to use metrics and prestige systems that maintain the *status quo* undermines stated institutional commitments to change.

Alternatively, some practices currently present in an ecosystem may be identified that have documented efficacy for promoting change and equity, such as the incorporation of culturally competent mentor training in the professional development of primary investigators in academic or biomedical research spaces (Pfund et al., 2022). This diagnosis may also allow for repurposing and innovative new uses of existing practices, which can be particularly critical in systems in which resources emerge as a rate-limiting step toward progress. Finally, this process may also identify important gaps whereby documented practices associated with groundskeeping have yet to be engaged or incorporated into practice in the ecosystem under review.

Such a summary diagnosis (i.e., Figure 2, Step 2) should yield a sorting of related practices and policies identified in an system-wide assessment of a particular area into several categories: (1) those that need to be protected and/or expanded; (2) areas that need to be assessed for efficacy; (3) some actions, practices, and policies that need to sunset, specifically to disrupt gatekeeping practices; and (4) gaps that need attention to support needed change. Once such an institution-specific assessment and summary diagnosis (categories summarized in Figure 3) are in place, a community can work to prioritize actions to promote desired change. It is critically important to identify the steps that must be targeted for change and replacement (i.e., Figure 2, Step 3), as well as to pay close attention to already established processes that must be

retained. This latter point has also been highlighted by Foster-Fishman et al. (2007) in their model of effective organizational change.

2.2.3 Draft revisions of processes, practices, and policies and evaluate implementation to promote change

Based on identified strengths, gatekeeping practices that need to be disrupted, or key gaps present in an ecosystem, stakeholders can establish a process and timeline for revising processes, practices, and policies (Figure 2, Step 4). This process and timeline will vary and have different requirements according to specific local contexts, but the outcome should ultimately move the system forward toward the desired changes identified in the diagnosis process described earlier. To incorporate rigor into the process and timeline, institutions should learn from their own data, learn from and incorporate examples from scholarly literature and frameworks, study successful approaches from other entities, and amplify the experiences of critical local stakeholders. As the communities work to implement identified, adapted, or innovative interventions to promote change, evaluating the implementation of revised approaches is a critical step in the roadmap toward organizational transformation (Figure 2, Step 5).

2.2.4 Groundskeeping in action: examples of national initiatives that reflect Groundskeeping principles

Although not the design framework for these efforts, several high-profile initiatives have emerged since 2020 that reflect Groundskeeping-style assessment processes. These efforts have sought to revamp inequitable practices and norms to promote systemic change. Importantly, they focused efforts on stewarding environmental contexts and used resources to change the academic ecosystem rather than focusing on fixing individuals. For example,

several national initiatives that emerged recently focus on the critical issue of faculty recruitment and seek to evolve hiring processes away from the ongoing practices which have documented biases embedded at each stage. Each initiative engages different approaches, which is consistent with the adaptable nature of the Groundskeeping assessment process.

At the time of writing this article, a number of national organizations supported programs that are consistent with Groundskeeping principles. The National Institutes of Health launched the Faculty Institutional Recruitment for Sustained Transformation (FIRST) program, which seeks to remedy the barrier of low demographic representation and inconsistent commitments for equitable practices by supporting cohort-based hiring of excellent faculty candidates committed to diversity and inclusive excellence.[1] The program also reduces the barrier of *status quo* mindsets by promoting innovation through requiring a thorough review of the departmental practices and environments. These changes in commonly adopted hiring practices will increase opportunities for all candidates to move through the process without accepting assimilation to inequitable practices, and will also require candidates to reflect on how they will further improve departmental culture in the coming years, leading to longitudinal changes (not only short-term impact). The Howard Hughes Medical Institute (HHMI) created the Freeman Hrabowski Scholars Program, which reduces the gatekeeping barrier of misalignment between the stated commitments and demonstrated actions of personal and institutional equity goals. The program mandates an initial screening of each candidate for their understanding and demonstrated track record to prioritize advancing equity in their faculty careers. Candidates only move to the advanced stage of scientific review after scoring exemplary marks in the first round of screening by national experts in equity scholarship and practitioner work. Finally, the Chan Zuckerberg Initiative's (CZI) Science Diversity Leadership Award reduces the gatekeeping barrier of misalignment between institutional incentive structures for advancement and promotion and stated equity goals. The program includes this work as a central criterion for an assessment of excellence and recognizes exceptional biomedical researchers with a record of promoting diversity, equity, and inclusion in their respective disciplines. CZI provides financial support for both scientific research careers and efforts to promote equity in faculty careers. Together, these and other faculty hiring programs have a significant opportunity to fundamentally shift demographic representation, promote equity-centered policies and practices, and increase demonstrated equity commitments in advancement and promotion criteria for faculty in STEM fields. By creating innovative practices to reduce gatekeeping, the entire system has benefitted through an opportunity to engage in scholarly excellence and innovation that may otherwise have been excluded due to gatekeeping practices. Removing these gates will have significant implications that extend far beyond the faculty and institutions that receive the awards; it will change who mentors future scholars, who is eligible to lead academic institutions, who is reflected in prestigious societies, and whose work receives influential grants and awards. The

impact of such a change cannot be understated—this type of fundamental shift will lead to longitudinal and impactful systemic change.

3 Discussion

The Groundskeeping framework provides a clear roadmap and strategy to assess the current state of systems, diagnose challenges, identify gaps in need of attention, and devise plans to start systems on the path toward systemic change (Figure 2). While this framework can serve as an effective means to develop a roadmap to move institutions and scientific organizations forward, it is important to start the groundskeeping process with a reflection on how systems have reached the point of challenge that requires focused attention. While a number of factors can contribute to inequity, the behaviors of individuals in a system and defaults to false notions of meritocracy can often create the most significant barriers to progress. Behaviors based on ignorance, manipulation, fear, abuse of power, complacency, or lack of motivation can all contribute to further retrenchment into the *status quo*. These behaviors must be honestly evaluated and addressed before true groundskeeping principles can move forward.

Accessibility is another point of consideration for groundskeeping strategies to have a longitudinal impact. While the three examples of faculty hiring initiatives described above align with the Groundskeeping framework and are exemplary points of national progress, it is important to note that those programs are highly selective and financially exclusive, thus reducing their accessibility by those who may wish to engage in the initiatives. Additionally, some of these programs are likely under threat for continued existence given shifting support for diversity and equity in the U.S. (Blake, 2025). Even when not under attack, resources are often among the most challenging "gates" to overcome when working to embody groundskeeping principles in many environments, and it is important to frequently assess the types of equity or inclusion sacrificed in some areas while working toward equity gains in other areas.

Finally, finding full alignment with Groundskeeping principles requires a willingness to identify inequities in an existing system or norm and to work to mitigate or disrupt them fully when creating a new, more equity-centered practice. Innovation lies at the heart of all systemic change work, and the Groundskeeping framework challenges the academy to reimagine ways in which institutions can progress to become environments in which all stakeholders can thrive. Innovation is hard work, and moving toward effective, longitudinally successful strategies often requires the extension of approaches beyond acquiring new knowledge and embodying equitable principles. Instead, individuals and systems seeking effective systemic change may need to expand their approach to a more collaborative, multi-faceted, cross-disciplinary practice that extends principles and frameworks into the space of actual intervention science implementation. We argue that this is a next impactful step for individuals and institutions on the journey toward systemic change.

Finally, the groundskeeping approach can support evolving structures that, importantly, define professional advancement and success in the careers of faculty, researchers, and leaders.

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1 https://commonfund.nih.gov/first

It can also lay the foundation for effective assessment to ensure sustained work and encourage long-term engagement in equity work. Given the impact of recent executive orders in the United States that have been deployed to roll back progress in equity, now more than ever, there will be a pressing need to continue to identify and commit to paths to pursue innovative, novel approaches for intervening in challenged systems that lead to lasting, effective change. Any institution or organization wishing to engage in systemic change will find an effective start with the Groundskeeping process.

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