When Locking In Biodiversity Locks Up Land*

GOLNAZ BAHRAMI†
Penn State University

MATTHEW GUSTAFSON‡
Penn State University

EVA STEINER§
Penn State University

December 2025

Abstract

We provide new evidence on how U.S. biodiversity protections affect land markets using a comprehensive, nationwide parcel-level panel of protection exposure, land values, and land use. Parcels at future protected-area borders show no preexisting differences or trends. After protection, newly protected parcels near borders experience roughly 50% declines in value relative to comparable unprotected parcels, driven almost entirely by losses on protected parcels rather than gains on unprotected ones. These effects are concentrated where development option values are highest and dissipate quickly with distance. Protections also substantially reduce development rates. The results underscore nuanced conservation-development trade-offs.

KEYWORDS: Biodiversity conservation, land values, land development.
JEL CLASSIFICATION: G1, Q24, R1, R3.

---

*We thank Nathaniel Baum-Snow, Justin Benefield, Daniel Brent, Jason Chen, Ben Collier, Eyal Frank, Andra Ghent, John Griffin, Nadini Gupta, Ankit Kalda, Seohee Kim, Adam Kolasinski, Stefan Lewellen, Jiacui Li, Tanner Regan, Shikhar Singla, Boris Vallée, Karen Vanden, Douglas Wrenn, William Xiong, as well as seminar and conference participants at Auburn University, Indiana University, ITAM, Lehigh University, Norges Bank, Pennsylvania State University (EEEPI and Finance), Texas A&M University, the University of Nevada Reno, the University of Texas, the University of Utah, the Federal Reserve Bank of San Francisco 2025 Virtual Seminar on Climate Economics, the 2025 CMU-Pitt-PSU Finance Conference, the 2025 European Finance Association Conference, the 2025 Hoyt Academic Fellows Session, the 2025 AREUEA National Conference, the UT Dallas Fall Finance Conference 2025, and the Georgetown-Clark Symposium on Global Real Assets 2025 for their helpful comments. We thank Mason Croft (USGS) for excellent help with the PAD-US data. All errors are ours.

†Department of Finance, Penn State Smeal College of Business. Email: gxb5298@psu.edu.
‡Department of Finance, Penn State Smeal College of Business. Email: mtg15@psu.edu.
§Department of Risk Management, Penn State Smeal College of Business. Email: ems6770@psu.edu.

1 Introduction

Biodiversity protection is one of the defining policy challenges of the twenty-first century. Responding to scientific calls for stronger conservation (Cardinale et al., 2012; Jaureguiberry et al., 2022), governments are expanding protected areas to meet ambitious biodiversity targets.[1] In the United States, biodiversity protections that limit how land can be used and developed now cover roughly 8% of the $23 trillion land market by area, potentially constraining billions of dollars in private land value and reshaping local development. While established theories describing land value as a function of the development option predict large effects on land markets (Titman, 1985; Capozza and Helsley, 1989), international evidence and studies on U.S. critical-habitat designations only find minimal effects (Joppa and Pfaff, 2009; Grupp et al., 2023; Frank et al., 2025). This tension between theory and evidence reveals a gap in our understanding of how biodiversity protections affect land markets.

To address this gap, we provide the first systematic evidence on how biodiversity protections that impose limits on the conversion of natural land cover through development affect land value and land use. We construct a nationwide, parcel-level panel that links all major biodiversity conservation designations in the U.S. to proprietary data on parcel-level valuations and development activity. Our empirical design exploits spatial and temporal discontinuities around the formation of new protected areas, comparing changes in land value and development for parcels just inside these areas with nearby parcels just outside, which remain unprotected but share similar geography and local economic fundamentals. This comparison isolates the impact of conservation restrictions on private land markets, net of broader environmental and economic trends.

Different from prior work, we study a nationally consistent, systematic classification of land use restrictions in place. Specifically, we evaluate land market impacts across the universe of biodiversity protections recorded in the U.S. Geological Survey's Protected Areas Database, the official national inventory of all areas where development is legally restricted to conserve biodiversity. Since 2010, more than 15,000 new protected areas have been established in the U.S., roughly two-thirds of which are permanent conservation easements—voluntary, legally binding agreements that restrict the use of conservation-relevant private land (i.e., old growth forest, filtering wetlands, etc.) in perpetuity to maintain biodiversity. We link these protections to parcel-level data on land values from Corelogic and satellite-based land cover from the National Land Cover Database. Our primary dataset con-

---

[1] See the Kunming–Montreal Global Biodiversity Framework, signed by more than 190 countries in 2022.

tains over 340,000 parcel–year observations within 500M of 3,700 newly formed easement-protected areas, representing biodiversity-relevant land in every major region across the U.S.

This integrated dataset allows us to observe land values and land use both before and after protection, providing insight into how biodiversity conservation affects private land markets at the parcel level. Importantly, its panel structure enables us to test for preexisting discontinuities between ultimately protected and unprotected parcels along the borders of to-be protected areas. Consistent with the identifying assumptions of our spatial boundary design, we find little evidence of such discontinuities. Conditional on being undeveloped, parcels just inside and outside the border of future protected areas exhibit similar levels and trends in land value and land cover prior to protection.

We show that biodiversity protections significantly affect land values at the borders of newly formed easement-protected areas. On average, parcels just inside these borders are worth about 50% less than nearby unprotected parcels within five years of protection. The magnitude of this effect resembles that of a two-standard deviation increase in the land use restriction index of Turner et al. (2014). Our results are consistent with biodiversity protections imposing binding restrictions on development that reduce the value of the land development option, coupled with (expectations of) incomplete enforcement or protected parcels retaining residual value aside from development.

The magnitude of the estimated value differential varies with local development intensity and protected area characteristics. We find the largest differences of roughly 70–75% in locations in the top quartile of preexisting development, but much smaller differences elsewhere. Differences are also larger near smaller protected areas, where development pressures are typically greater, although this factor does not drive the concentration of effects in highly developed locations. Importantly, we find little evidence that the value impact relates to the presence of multi-parcel owners, critical habitat designations, or the level of local property taxes. These heterogeneous patterns align with the hypothesis that observed value differences at protected area borders reflect forgone development potential rather than factors such as mechanical post-easement tax adjustments.

To understand the source of these relative value differences, we next examine how land values evolve inside and outside newly protected areas. *Ex ante*, such differences could arise either from declines in the values of protected parcels or from spillovers to nearby unprotected parcels, which could have either positive or negative value impacts. We use the spatial dimension of our design to estimate potential external effects on unprotected parcels near protected area borders, following Turner et al. (2014). Our full-sample estimations fail to indicate significant spillovers as estimated external effects rarely exceed 10% and are generally statistically indistinguishable from zero. Although this result could be due to either insignificant or heterogeneous impacts of biodiversity protections on neighboring parcels, the former is more likely as our partition on preexisting development reveals minimal external effects along the entire distribution of surrounding development opportunities. Moreover, when we separately track land values inside and outside protected area borders over time, unprotected parcels show no systematic changes in value around the time of protection. Instead, the value dynamics of protected parcels closely mirror the evolution of the overall value differential, suggesting that post-formation declines in the values of protected parcels drive the observed border effects.

We then assess how these value differences vary with distance from protected area borders. Narrow-bandwidth analyses reveal that the roughly 50% difference in value between protected and unprotected parcels persists up to about 100M inside protected areas but dissipates beyond that range, even in highly developed locations. This steep decay coincides with lower pre-formation values of protected parcels far from the border and suggests that the economic impact of biodiversity protections is highly localized, with most protected acreage in the U.S. situated in areas with relatively low development pressure. Our results align with international evidence that conservation efforts often target land with limited development potential (Joppa and Pfaff, 2009; Grupp et al., 2023).

Next, we examine whether similar value patterns appear for long-standing protected areas. Unlike the majority of recently established areas, which are created through conservation easements, most long-standing areas are formed using other mechanisms, allowing us to assess whether our findings generalize across time and conservation mechanisms. Using a cross-sectional design analogous to that in Turner et al. (2014), we find that parcels at protected area borders formed at least five years before our main sample period exhibit value differences comparable to those in our primary analysis, whether the protected area was formed via conservation easements or not. Although pre-formation land values are unavailable for this older sample, we find no evidence of discontinuities in land cover or parcel density around borders, supporting the validity of the comparison. Transaction-level data confirm that these results are not driven by local assessment practices, suggesting that the economic effects of biodiversity protections extend across time and institutional settings.

Finally, we study how protected areas influence land development itself. While our results link value effects to forgone development options, the time horizon of these impacts remains an open question. In our data, less than 10% of parcels near newly formed protected areas were developed prior to protection, suggesting limited short-term conversion potential. Nonetheless, biodiversity protections prove highly effective at preventing development in both the short and long run, particularly in areas with greater preexisting development pressure. Within five years of protection, roughly 3% of nearby unprotected parcels are developed, whereas none of the protected parcels are. Over longer horizons, the pattern persists: between 2001 and 2021, the rate of new development is much lower inside than outside protected area borders, especially around protected areas formed since 1965. These results underscore the enduring effectiveness of biodiversity protections whereby their influence in limiting land conversion persists for decades after designation. These findings suggest that land use restrictions can deliver significant conservation benefits as the conversion of natural land cover through development has been identified as a key driver of the rapid global loss in biodiversity (see, e.g., Cardinale et al., 2012; Jaureguiberry et al., 2022)

Summary and Contributions. Our results provide novel insight into how biodiversity protections shape local land markets. Conservation designations sharply reduce the relative value of protected land, particularly where development pressure is high. These effects are highly localized, but persist over long horizons. The evidence indicates that biodiversity protections affect land values primarily through restrictions on development rights rather than through indirect spillovers or appraisal artifacts. These patterns highlight the central role of land use constraints in the economic costs of conservation and provide a quantification of those costs across space, time, and institutional settings. By linking parcel-level land values to protected area formation, our analysis provides the first systematic evidence on the magnitude, drivers, and persistence of these costs, which constitute key parameters for evaluating the efficiency and design of biodiversity conservation policy.

Theoretical models of conservation require estimates of the costs of regulatory interventions to inform optimal policy design. Weitzman (1993) states that “if we knew the relative costs of specific projects, we would be well on our way to having an operational framework for selecting the most effective diversity-improving investment strategy.” Weitzman (1998) formalizes this intuition in the Noah’s Ark framework, while Giglio et al. (2024) model the macroeconomic trade-offs between biodiversity conservation and production, but lack empirically-derived cost inputs. Our evidence that biodiversity protections limit development and reduce land values provides some of these missing inputs. Our results highlight how policy trade-offs are most acute along protected area borders, where the marginal economic costs and potential marginal environmental benefits of conservation are highest.

Our study also responds to recent calls for research in biodiversity finance such as Karolyi and Tobin-de la Puente (2023) and Giglio et al. (2025). Prior work shows that biodiversity and related regulatory risks affect firms’ activity and are increasingly reflected in asset prices across equity, debt, property, labor, as well as natural-resource markets (e.g., Bošković and Nøstbakken, 2017; Ferris and

Frank, 2021; Giglio et al., 2023; Xin et al., 2023; Chen et al., 2024; Coqueret et al., 2024; Garel et al., 2024; Xiong, 2024; Akbari et al., 2025; Sacher and Singla, 2025). We extend this work by studying the most directly affected but largely unexplored asset class—the land market—where biodiversity protections alter the value of the underlying productive resource itself. Our findings constitute novel evidence that biodiversity-related regulation is a first-order financial factor in the U.S. land market.

Our findings also complement prior research on the economic impacts of environmental and land use regulations showing that both environmental risks and regulatory constraints shape real estate values (Chay and Greenstone, 2005; Turner et al., 2014; Bernstein et al., 2019; Baldauf et al., 2020; Addoum et al., 2024). Our study isolates the direct impact of development prohibitions for the protection of biodiversity, contrasting them with critical-habitat designations that impose informational or procedural requirements but rarely bar development outright. Prior studies of critical-habitat designations yield mixed evidence, with List et al. (2006) and Auffhammer et al. (2020) finding modest negative effects and Mamun et al. (2024) and Frank et al. (2025) finding none. The biodiversity protections we study cover a larger share of U.S. land and generate stronger market responses. The stark contrast between our findings and prior work on critical habitat designations reveals previously unmeasured heterogeneity in the impact of different conservation policies, reflecting the stringency and expected permanence of the protected area regulations we examine.

Finally, our evidence has direct implications for the design of conservation policy and approaches to biodiversity finance. First, the existence of a significant "biodiversity-protection discount" linked to lower development rates indicates that land use restrictions for conservation in the U.S. bind on the margin. This result is of critical importance for policy design, as regulations that do not influence land use or value would be ineffective for conservation (Grupp et al., 2023; Reynaert et al., 2024; Blume and Vallee, 2025; Zhou and Almond, 2025). Second, the fact that value effects are confined to parcels near protected area borders suggests that modest boundary adjustments could substantially reduce economic costs while perhaps preserving ecological integrity. Finally, our findings contribute to global assessments of conservation costs (e.g., Deutz et al., 2020) and inform ongoing efforts to mobilize private capital for biodiversity protection, as emphasized by Flammer et al. (2023). In sum, our analysis helps bridge the gap between theory and measurement in the economics of biodiversity protection, providing critical inputs for both policymakers and investors.

2 Data

Our empirical analyses require land parcel-level data on biodiversity protections, land values, and land cover. In this section, we introduce the sources from which we obtain each data type, outline the construction of our main estimation samples, and provide descriptive statistics on these samples.

2.1 Data Sources

Biodiversity Protections We use parcel-level data on biodiversity protections from the U.S. Geological Survey's Protected Areas Database (PAD-US), the official national inventory of protected areas legally or effectively designated for the permanent preservation of biodiversity. Specifically, we rely on PAD-US version 4.0, which provides state-level shapefiles delineating the spatial boundaries and institutional characteristics of all protected areas in the United States as of 2024.

Protected areas in the U.S. can be classified based on the mechanism of protection, with the two most frequent protection mechanisms being fee (45% of records) and easement (53% of records). A fee simple interest is the most common way in which land is owned. As a protection mechanism, fee typically relates to publicly owned land that is placed under legal biodiversity protections by or on behalf of the public land owner (e.g., federal, state, or local governments).[2] By contrast, a conservation easement creates a permanent, voluntary, legally enforceable agreement between a private land owner and a government agency or qualified conservation organization to protect biodiversity-relevant land.[3] Notably, data from the National Conservation Easement Database (NCED) indicate that the vast majority of conservation easements whose purpose is known are created for environmental protections. In sum, land ownership status strongly predicts the type of biodiversity protection mechanism, with 72% of easements but only 5% of fee protections occurring on private land.[4]

---

[2] The legal basis for placing public land under biodiversity protections rests on Congress's constitutional authority under the Property Clause (Article IV §3(2)) to pass laws empowering agencies to protect biodiversity on federal lands, implemented through statutes (e.g., the National Park Service Act of 1916), complemented by executive powers (e.g., Biden's "30×30" initiative to conserve 30% of U.S. lands and waters by 2030) and agency regulations (e.g., agencies like the National Park Service implement conservation rules through land management plans). For land owned by state and local governments, authority comes from state constitutions and statutes that empower state legislatures, agencies, and local governments to manage land.

[3] Under common law, easements are typically tied to a dominant estate (e.g., the owner of a dominant parcel has a right of way to cross a neighboring servient parcel). Conservation easements benefit the public without a dominant estate. To enable such "easements in gross", U.S. states have passed Conservation Easement Enabling Acts, mostly modeled on the Uniform Conservation Easement Act (UCEA, 1981) drafted by the Uniform Law Commission. These statutes recognize conservation easements as valid, perpetual property interests, enforceable by "qualified holders" (usually government agencies managing land or land trusts).

[4] Protection mechanism and ownership status are not perfectly aligned as easements can protect public land, entities like conservation organizations can own land outright, and there are blended arrangements.

Conservation easements have become increasingly popular for protecting privately owned land since their codification in the 1980s. Their popularity is partly driven by federal tax law recognizing a "qualified conservation contribution" as a charitable donation eligible for an income tax deduction.[5] To qualify, the donation must be a perpetual conservation restriction (i.e., conservation easement), donated to a qualified organization (e.g., federal, state, or local government agency, or a 501(c)(3) non-profit organization like a land trust), with a specific conservation purpose (e.g., preservation of land, habitat, or open space). While the federal income tax deduction and lower property tax assessments can offset some of the value loss from conservation easements, the direct financial consequences of adopting them are typically negative. Instead, drivers for private owners to donate land include a sense of place, environmental ethics, and legacy motives (see, e.g., Kemink et al., 2021).

To establish a protected area (easement or fee), the managing agency, such as a federal, state, or local government agency, or a land trust, defines the legal and management framework governing the area's conservation objectives. This information is reported to the USGS and incorporated into the PAD-US. Based on the reported management intent and level of legal protection, the USGS assigns each protected area a GAP status code, as defined by the Gap Analysis Project (GAP). Code 1, the strictest level of biodiversity protection, refers to areas permanently protected from the conversion of natural land cover and managed to maintain a primarily natural state in which natural disturbance processes (e.g., fires, floods, insect outbreaks) are allowed to occur. Code 2 closely resembles Code 1 but allows only limited management interventions (e.g., fire suppression or mitigation of insect outbreaks). Code 3 designates lands where extractive uses (e.g., logging, mining, agriculture) or intensive recreation are permitted, and biodiversity conservation is not the primary management objective. Code 4 includes areas with no known protection against land cover conversion, typically managed for other purposes such as recreation or defense.

In sum, protected areas with GAP status codes 1 and 2 are permanently barred from development to preserve biodiversity (allowing up to 5% of the area to have preexisting or necessary development like roads, dams, or utility corridors). These areas account for 2% (code 1) and 16% (code 2) of protected area records in the PAD-US. Figure 1 shows that these protections combined cover approximately 8% of U.S. land area, broadly consistent with global averages (Jenkins et al., 2015).

[Insert Figure 1 about here.]

---

[5] A "qualified conservation contribution" is defined in Internal Revenue Code §170(h), added in 1980. Internal Revenue Code §2031(c) provides exclusion from the taxable estate for land subject to a qualified conservation easement. Many states and localities also reduce property taxes for land under conservation easements.

Land Values We obtain information on land values from Corelogic's Historical Property dataset, a near-universal, parcel-level database compiled from local tax rolls, for the 2010–2024 period. In this dataset, we focus on the variable calculated land value, which represents Corelogic's estimate of parcels' fair market value (FMV), defined as "the price at which a property would change hands between a willing buyer and seller, neither under compulsion and both with reasonable knowledge of relevant facts" (Treas. Reg. §20.2031-1(b)). Corelogic derives approximately 60% of these estimates from tax assessments, 5% from appraisal records, and 35% from recent comparable transactions.[6] The FMV-based measure we employ should capture the economic impact of biodiversity protections because FMV depends on the property's highest and best use (HBU, see e.g., the Uniform Standards of Professional Appraisal Practice, USPAP). Tax assessors and appraisers are generally required to assess land at current FMV, while transaction prices represent revealed market outcomes.[7]

The financial benefits that can accompany the formation of conservation easements typically do not affect a parcel's FMV. Instead, they reflect the extent to which the private land owner or public taxpayers bear the cost of conservation. The federal income tax deduction available for qualifying conservation easements itself does not affect FMV, but represents a side payment to compensate land owners for the loss in FMV caused by the easement. Specifically, federal income tax incentives under Internal Revenue Code §170(h) are available to the original land owner (donor) in the form of a one-time deduction (with a carry-forward option), equal to the difference in the fair market value of the donated land before versus after development rights are relinquished through a conservation easement.[8] Reductions in the assessed values used to compute property taxes do not affect FMV either, but are a consequence of the loss in FMV from adopting the easement. It is possible for FMV to be affected by easement adoption through some jurisdictions offering reductions in property tax rates that remain in place even when ownership changes. However, as we show in Section 4, these effects are economically small and do not constitute a primary driver of our results.

---

[6] Although we often observe the type of input used to inform the calculated value in the Corelogic dataset (e.g., assessed, appraised, or market value), we rely on the calculated value measure because it is more consistently populated than any of these individual inputs.

[7] While each value source will generally approach an estimate of FMV, there may be subtle differences between these value sources regarding the incorporation of biodiversity protections. Tax assessments are mass appraisals by government assessors, often using models, ratios, and statutory rules, so the effect of such protections may be muted. Unlike assessments, appraisals are single-property opinions of value by professional appraisers under USPAP standards, designed to more fully capture effects like those of biodiversity protections. Finally, transaction prices reflect market outcomes, but are only directly available for the small percentage of properties that sell and may include transactions that are not strictly arm's-length.

[8] There is also the potential for federal estate tax exclusions under Internal Revenue Code §2031(c), which apply at the time of death of the donor and do not not carry over to future owners of the encumbered land.

Land Characteristics The Corelogic Historical Property dataset also contains parcel-level characteristics, notably, unique identifiers (denoted as CLIP), size (in acres), exact address, a set of coordinates for the centroid of each parcel, and point-in-time indicators for property type codes. Corelogic updates parcel characteristics based on available county-level tax rolls at regular, usually annual, intervals. We observe these characteristics over the 2010–2024 period. We focus on parcels whose property type codes indicate that they are classified as vacant land in 2010. We carry forward their historical characteristics until a more recent update becomes available. We thus obtain a parcel-by-year panel dataset of land values and characteristics over the 2010–2024 period.

We merge this panel dataset with the PAD-US protected area dataset based on parcel-level coordinates. For each parcel, we define an indicator that takes the value of one if the coordinates are located within the boundaries of a protected area. For parcels inside protected areas, we record the GAP status code of the area containing the parcel. We then compute the distance from each set of parcel-level coordinates to the nearest protected area border. For parcels in a protected area with GAP status code 1 or 2, this variable measures the distance to the nearest border of the protected area containing the parcel. For all other parcels, this variable measures the distance to the nearest border of a protected area with GAP status code 1 or 2 in the same state. For parcels in a protected area with GAP status code 1 or 2 (all other parcels), we further merge in key characteristics of the area containing the parcel (of the nearest protected area with GAP status code 1 or 2). The merged dataset allows us to determine whether a given parcel from the Corelogic panel dataset is located in a protected area with GAP status code 1 or 2. It also allows us to observe the characteristics of the area containing the parcel (the nearest protected area with GAP status code 1 or 2, respectively).

Land Cover Finally, we source land cover data from the USGS National Land Cover Database (NLCD). This database includes classifications such as developed land, planted vegetation, forests, wetlands, and water bodies. The NLCD is updated periodically, and we obtain all available historical versions (i.e., from 2001, 2004, 2006, 2008, 2011, 2013, 2016, 2019, and 2021). We merge the NLCD land cover data with the Corelogic parcel-by-year panel dataset based on parcel-level coordinates. We also merge the NLCD land cover data with the full PAD-US protected area data (including protected areas in whose proximity we do not observe Corelogic parcels). Specifically, we create a 0.25-acre grid in a 100M bandwidth around all protected area borders in the PAD-US and determine the coordinates for the centroid of each grid cell. We then look up the land cover classification for each of these centroids in the NLCD in every available version of the NLCD.

2.2 Sample Construction

We focus our initial analyses on land surrounding easement areas, established since 2010, classified as GAP status code 1 or 2 (where development is barred to protect biodiversity). Focusing on easement areas allows us to observe land values more consistently, as easements are usually formed on private land, which is included in county-level tax rolls and thus more likely to appear in Corelogic (unlike public land). Focusing on areas formed since 2010 allows us to observe pre-formation land values, characteristics, and land cover, given the historical coverage of Corelogic and the NLCD.

According to the PAD-US, 16,350 new protected areas with GAP status code 1 or 2 have been created in the U.S. since 2010. We focus on those where we observe the protection mechanism, land ownership, and land cover, leaving 15,060 areas. Restricting these areas to easements leaves 11,041. Using Corelogic's parcel-level coordinates, we are able to locate parcels inside or within 10KM outside the borders of virtually all of these easements. However, we are most interested in analyzing parcels in close proximity to protected area borders to ensure greater comparability in terms of geography and local economic fundamentals. Thus, we construct two samples of parcels located within 500M of these protected area borders, a full panel with limited selection criteria and a smaller balanced panel that ensures consistent parcel-level observations before and after protected area formation. To reduce mis-classification in protection status, we drop the less than 4% of parcels within 31.8M of the border as well as the 1% of parcels that switch protection status over time.[9]

Full Panel Our full Corelogic vacant land panel retains all observations from ten years before to five years after easement area formation. As we show in Panel A of Table A.1, this panel contains parcels within 500M of the borders of 3,764 easement areas, meaning that we observe land in the vicinity of 34% of easement-based (23% of all protected areas) established since 2010.

The full Corelogic vacant land panel may contain easement areas that only have observations for parcels on one side of the border. For instance, in many areas we only observe unprotected parcels. These areas will help estimate the value impact of biodiversity protections on unprotected parcels, but will not contribute to the corresponding effect on protected parcels. In addition, the full panel may contain protected areas for which we only observe data either before or after protected area formation, but not both. Again, this will enhance statistical power for identifying the evolution of parcel value pre- and post-formation, but only under the assumption that the these value dynamics are homogeneous across protected areas. In sum, the full panel does not guarantee that we observe

---

[9] The closest the centroid of a square 1-acre parcel can be to the border without crossing it is 31.8M.

exactly the same protected and unprotected parcels before and after area formation. Specifically, 795 areas contribute both protected and unprotected parcels and pre- and post-formation observations.

Balanced Panel To ensure that the characteristics of the full panel do not drive our estimates, we also construct a balanced panel focusing on easement areas where we observe vacant/undeveloped land as of five years pre-formation and where we observe protected and unprotected parcels at least five years post-formation. While the balanced panel is smaller than the full panel, its construction ensures that the same parcels contribute to the sample over time (see Panel B of Table A.1).

We apply the following additional sample selection criteria to the balanced panel. We drop observations with missing values in key variables, fix protection status and distance to the border as of five years prior to easement area formation (to reduce mis-classification due to geo-coding errors in Corelogic), and drop parcels with changes in size or value that could indicate re-parceling. The resulting balanced panel covers land around the borders of 174 easement areas (see Panel C of Table A.1).

2.3 Descriptive Statistics

Table 1 presents descriptive statistics on all protected areas in the U.S. formed since 2010 with GAP status code 1 or 2 by protection mechanism. The statistics in column 1 indicate that 73% of these areas are formed through easements, 67% are formed on private land, and 89% carry GAP status code 2. These areas are most commonly formed on land classified as planted (30%), forest (35%), and water/wetlands (25%). Column 2 presents descriptive statistics on easement areas formed since 2010. The average easement area covers 95 acres, is created in 2014, established on private land (90%), and carries GAP status code 2 (91%). The statistics in column 3 indicate that, by comparison, the average non-easement area is slightly larger, created in 2015, established on public land, and more likely to carry GAP status code 1. Notably, the statistics reported in Table 1 highlight the importance of conservation easements to establish biodiversity protections on private land since 2010.

[Insert Table 1 about here.]

Table 2 presents descriptive statistics on the parcels in our main estimation samples over the 2010–2024 period. The statistics reported indicate that the average parcel in the full panel (column 1) is more valuable, smaller, located in/nearest to a larger protected area than in the balanced panel (column 2). The average parcels in both panels are located at a similar distance to the nearest protected area border. The average parcel in the full (balanced) panel is located in/nearest to a protected area with one protected parcel and 100 unprotected parcels (three protected and 15 unprotected parcels). Figure B.1 depicts the distribution of parcels by U.S. state, highlighting the similarity in coverage between the two samples. Critically, the statistics reported in Table 2 show that the full and balanced panels have similar clustering of parcels in terms of distance to the border.

[Insert Table 2 about here.]

Table A.2 presents additional descriptive statistics on the parcels in our final regression samples, which allow us to compare the characteristics of the protected areas in each of our test samples with those in the full sample of post-2010 protected areas described in Table 1. The typical protected area in the full (balanced) panels were formed in 2016 (2019), slightly later than the easement areas in Table 1. The parcels in our regression samples are also more likely to be around protected areas with more surrounding development, which is not surprising given that we require a protected parcel to be such that its centroid lies within 500M of the protected area border. Finally, about 65% of the protected areas we study are in metropolitan areas.

Given our focus on the land-value effects of biodiversity protections, Figure 2 presents binned averages of vacant-land values (in $'000 per acre) by distance to protected-area borders, comparing two years before to two years after formation in the balanced Corelogic panel. The figure shows: (i) values are similar at the border pre-formation, (ii) values deep inside protected areas are well below border values both before and after formation, (iii) protected parcels at the border become markedly less valuable post-formation, while the values of unprotected parcels at the border change little. These patterns motivate our border-based, before-versus-after empirical design introduced next.

[Insert Figure 2 about here.]

3 Identification Strategy

Identifying the effects of biodiversity protections on land values is challenging because protections are not randomly assigned. As illustrated in Figure 2, parcels inside protected areas may differ from those outside in land value, land cover, or other characteristics. A regression discontinuity design (RD, Imbens and Lemieux, 2008) with distance to the border as the running variable provides a local comparison that helps address such concerns. The key identifying assumption is that, absent protections, expected land values vary smoothly with distance to the border, so any discontinuity observed at the border can be attributed to the protections. However, this assumption is questionable for conservation easements, since the placement of the easement border itself may be correlated with unobserved drivers of value.

In light of this, we exploit the panel structure of our dataset and adopt an empirical approach that retains the local comparison of land values at protected area borders and combines it with the comparison of land values before versus after protections are established. The spatial component of this approach allows us to focus on parcels at protected area borders, where protected and unprotected parcels are more comparable. The temporal component allows us to include parcel-level fixed effects that absorb any preexisting discontinuities in the values of to-be protected and unprotected parcels prior to protections being adopted. The key identifying assumption is that any preexisting difference in land values at protected area borders would remain constant over time absent the protections. If this assumption holds, we can plausibly estimate the causal effect of biodiversity protections on the relative values of protected and unprotected parcels at these borders.

3.1 Diagnostic Tests

We assess the plausibility of the key identifying assumption behind our empirical design as follows. First, we examine whether easement borders coincide with preexisting discontinuities in land cover or land values. These tests are analogous to the balance checks between to-be-protected and unprotected parcels in a spatial RD design. Second, we exploit the panel structure of our data to evaluate the evidence for any pre-protection trends in the differences between the values of to-be-protected parcels and unprotected parcels at the border, analogous to pre-trend tests in a standard difference-in-differences (DiD) design.

Balance Tests We first examine preexisting land cover around the borders of easement areas formed since 2010 with GAP status codes 1 or 2, as described in column 2 of Table 1. We measure land cover by creating a 0.25-acre grid in a 100M bandwidth around these borders. For each grid point, we look up land cover by coordinates in the NLCD as of four to six years prior to easement adoption. We then estimate regressions of the following form:

$$Land\ Cover_i^j = \alpha_j + \tau Protected_i + \sum_{k=1}^{3} \Big(\beta_k Distance_i^k + \gamma_k Protected_i \times Distance_i^k\Big) + \epsilon_i \qquad (1)$$

where $\textit{Land Cover}_i^j$ is an indicator that takes the value of one if the land cover at grid point i in or near protected area j is of a given type (i.e., developed, planted, etc.). α_j are protected area fixed effects. $\textit{Protected}_i$ is an indicator that takes the value of one if grid point i is located inside protected area j. $\textit{Distance}_i$ is the distance between grid point i and the border of protected area j. We include polynomial terms of $\textit{Distance}_i$ up to order $k = 3$ as well as their interactions with protection status in the estimation of Eq. (1). ϵ_i is the residual. Standard errors are clustered by protected area. Table 3 presents the results.

[Insert Table 3 about here.]

The estimates in columns 1 and 2 of Table 3 indicate that land inside easement areas is significantly less likely to be developed or planted prior to easement adoption. Next, we restrict our estimation sample to land that is undisturbed by development or planting. The resulting estimates are insignificant and numerically very close to zero in samples of over five million observations (columns 3 through 6). In sum, the evidence presented in Table 3 suggests that, conditional on land still being undisturbed, there are no preexisting discontinuities in land cover at easement area borders.

For the second part of our balance tests, we examine preexisting land values around the borders of easement areas formed since 2010 with GAP status codes 1 or 2. Specifically, we estimate a version of Eq. (1) with $k = 1$ and a 500M bandwidth, using observed parcel-level land values as outcomes, three and five years prior to easement adoption. Table 4 presents the results.

[Insert Table 4 about here.]

The estimates reported across all columns indicate no significant discontinuities in preexisting land values at easement area borders. Note that the coefficient estimates on *Distance* (*Protected # Distance*) are significant in columns 1 and 2 (columns 2 through 4), indicating that preexisting land values can vary with distance to the border. In sum, the results of our balance tests suggest no discontinuities in land cover or land values at easement area borders prior to easement adoption, conditional on land still being undisturbed. At the same time, they highlight the importance of estimating the effects of interest at (or in close proximity to) the border as the value of protected (unprotected) parcels drops (rises) quickly with distance to protected area borders.

Pre-Trends in Border Discontinuities We focus our tests for potential pre-trends in border discontinuities on the balanced Corelogic vacant land panel, which is constructed so that the same parcels contribute to the sample observations over time. We again estimate a version of Eq. (1) with $k = 1$ and using the full 500M bandwidth of the balanced panel to avoid overfitting. We separately estimate this version of Eq. (1) in each of the five years leading up to easement adoption, using parcel-level land values and land cover indicators as outcomes. We present the results from these estimations visually, summarized in Figures 3 and 4.

[Insert Figure 3 and Figure 4 about here.]

The patterns depicted in Figure 3 indicate no significant discontinuities in land values, and no trends in these (insignificant) discontinuities over the five years leading up to easement adoption. The patterns depicted in Figure 4 show no significant discontinuities in land cover, or trends in any such discontinuities, in the five years prior to easement adoption, either.

In sum, the results from the diagnostic tests reported here fail to show that conservation easement borders are formed at preexisting discontinuities in land values or land cover. Our tests also reveal no signs of significant pre-protection trends in these (insignificant) discontinuities. Thus, the evidence presented here supports the key identifying assumption behind our empirical design, such that we can plausibly recover the causal impact of conservation easements on the relative values of protected versus unprotected parcels at the border.

SUTVA Pushing the interpretation of our estimates to capture the effect of biodiversity protections on protected parcels relies on the Stable Unit Treatment Value Assumption (SUTVA). This assumption is violated if protections have external effects on unprotected parcels nearby. We cannot *ex-ante* rule out such external effects, but our empirical design allows to characterize the extent to which protections affect unprotected parcels. Specifically, accounting for a parcel's distance to the border allows us to estimate how the values of unprotected parcels change with distance to the border. In addition, we can decompose our estimates to trace the values of protected and nearby unprotected parcels separately over time. Thus, although our empirical framework most directly estimates the effect of biodiversity protections on the relative values of protected versus unprotected parcels at protected area borders, we can also provide descriptive evidence on the extent to which any emerging value differential is driven by protected versus unprotected parcels (see Section 4.3).

3.2 Estimating Equation

We employ a Poisson pseudo-maximum likelihood model, which both allows for high-dimensional fixed effects and accounts for the skewness in the distribution of land values (see Figure B.2 and Cohn et al., 2022). Our primary regression specification takes the following form:

$$\begin{aligned} Value/Acre^{j}_{i,t} = \alpha_i + \gamma_{j,t} + \beta_1 Protected_i \times Post_{j,t} + \beta_2 Post_{j,t} \times Distance_i + \\ \beta_3 Protected_i \times Post_{j,t} \times Distance_i + \epsilon_{i,t} \end{aligned} \tag{2}$$

where $Value/Acre^{j}_{i,t}$ is the calculated value per acre of parcel i located in or near protected area j in year t. α_i are parcel fixed effects to account for time-invariant parcel characteristics, such as terrain or soil quality. $\gamma_{j,t}$ are protected area-by-year fixed effects to ensure that we compare land values between protected and unprotected parcels around the same border, and that already-protected parcels do not serve as counterfactuals for later-protected parcels (see, e.g., Goodman-Bacon, 2021; Borusyak et al., 2024). $Protected_i$ is an indicator that takes the value of one if parcel i is located inside a protected area. $Post_{j,t}$ is an indicator that takes the value of one starting when the protected area j is formed. $Distance_i$ is the distance from parcel i's centroid to the border of the nearest protected area j. α_i absorbs the main effects of $Protected_i$ and $Distance_i$. $\gamma_{j,t}$ absorbs the main effect of $Post_{j,t}$. $\epsilon_{i,t}$ is the residual. Standard errors are clustered by protected area. In this specification, β_1 captures the local value effects of biodiversity protections at the border, while β_2 and β_3 account for post-protection changes in the slope of land values with respect to distance to the border.

Note that $Distance_i$ is measured between the parcel's centroid and the nearest protected-area border. Because distance is defined from the centroid rather than the parcel boundary, it implicitly captures a combination of parcel size and location, where larger parcels with centroids farther from the border are treated as more interior. This approach provides a more stable and comparable measure of proximity across parcels of different shapes and sizes, avoiding sensitivity to parcel boundaries that have irregular shapes or are far removed from the typical acreage in the parcel.

4 Biodiversity Protections and Land Values

Table 5 presents output from estimating Eq. (2) in our main estimation samples over the 2010–2024 period. Columns 1 and 2 (columns 3 and 4) show the results from estimating this equation in the full (balanced) Corelogic vacant land panel. Odd (even) columns present results from restricting the estimation to parcels located in a 500M (200M) bandwidth around protected area borders.

[Insert Table 5 about here.]

The estimates reported across all columns of Table 5 indicate that protected parcels become significantly less valuable relative to nearby unprotected parcels after protected area formation. To assess the economic magnitude of these effects in the Poisson pseudo-ML model, we need to compute $e^{(\text{coef.})} - 1$. This conversion indicates that protected parcels are 50% to 58% less valuable relative to unprotected parcels immediately on the other side of the protected area border in the post-formation period (compared to the pre-formation period). This magnitude is similar to that of a two-standard deviation increase in the land use restriction index analyzed in Turner et al. (2014), which aggregates restrictions such as permit waiting times, growth restrictions, and minimum lot size requirements.

These results represent the first large-scale evidence that recent biodiversity protections in the U.S. have significant value effects. Although intuitive and consistent with models such as Titman (1985) that describe land value as a function of the development option, the magnitude of our estimates is novel in the context of other large-scale studies on the land value impacts of different environmental protections. Our estimates are large relative to several studies documenting minor value effects of biodiversity protections across the globe and for the U.S.'s Endangered Species Act (Joppa and Pfaff, 2009; Grupp et al., 2023; Frank et al., 2025). Yet, our estimates may appear small in the context of models that attribute land value exclusively to the development option (Titman, 1985). The approximate 50% relative value effect we estimate likely reflects protected parcels having some residual value for allowable uses (such as agriculture, forestry, recreation, and ecosystem services) or expectations regarding incomplete easement enforcement in some future states.

The coefficient estimates on the term *Post # Distance* reported in Table 5 suggest that biodiversity protections have limited effects on the values of nearby unprotected parcels. The largest coefficient estimate on the *Post # Distance* interaction of 0.590 in column 2, multiplied by the entire 0.2KM bandwidth, suggests a 13% value increase for a unprotected parcel at the far end of this bandwidth compared to one at the border. However, the corresponding coefficients in columns 1, 3, and 4 are numerically negative and statistically insignificant. The relatively small effect of biodiversity protections on nearby unprotected parcels is consistent with the small external effects documented in Turner et al. (2014) in response to variation in a more general land use restriction index.

The positive and marginally significant coefficient estimates on the term *Protected # Post # Distance* suggest that the decline in protected land values after protected area formation is mitigated for parcels with centroids deeper inside protected areas. Since some protected areas, especially smaller ones, contain a single protected parcel (see Figure B.3), treated parcels' centroids may be far from the border either because the parcel is large or because the parcel is not adjacent to the protected area border. In either case, our estimates are consistent with the finding that protected parcels whose centroids are located further from the border exhibit significant preexisting value differences compared to those closer to the border (see also Table 4). More broadly, our results are consistent with international evidence indicating that biodiversity protections often occur on land that is not under threat of development (Joppa and Pfaff, 2009; Grupp et al., 2023).

In Table A.3 we present several robustness tests to coroborate our inferences based on the specification in column 1 of Table 5, but unreported analyses produce similar results using columns 2 through 4. First, we document similar results after excluding parcels that share ownership with another parcel with opposite protection status. This ensures that our findings are not driven by land owners strategically choosing to place a conservation easement on one parcel they own to shore up the value of a nearby parcel they also own. Second, we show that our findings are similar dropping parcels over five acres in size. This makes it unlikely that partially protected parcels meaningfully contribute to our estimates. Further, we document a lack of sensitivity of our findings to the extent of county-level property taxes. This mitigates the possibility that a meaningful fraction of the estimated value differential reflects differences in future local property tax bills. Finally, we show that our inferences remain unchanged when dropping protected areas that have also been designated as critical habitats under the Endangered Species Act (see Figure B.4 for the spatial distribution of protected areas and federally designated critical habitats across the U.S.). The small effect this additional restriction has on the size of our estimation sample (329,235 observations in column 5 of Table A.3 versus 337,547 observations in our baseline estimates reported in column 1 of Table 5) underscore that we are focusing on a larger set of protected areas whose regulatory restrictions have direct effects on the market value of vacant land. In sum, our findings are most consistent with biodiversity protections causing a value differential such that properties just inside protected area borders become less valuable relative to unprotected parcels just outside these borders.

4.1 The Role of Development Opportunities

Leveraging the geographic dispersion of parcels in our estimation samples, we investigate how the value effects of biodiversity protection, that is, policies that constrain new development and operate through development rights, a central determinant of vacant land values (see, e.g., Titman, 1985), vary with the intensity of surrounding development. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is in (below) the top quartile of the sample distribution, although unreported results split at the median of preexisting development support equivalent inferences. Given that we limit the full and balanced Corelogic panels to parcels that are vacant prior to protected area formation, our location type classification captures the degree to which nearby land owners have already exercised their development option and should thus represent a reasonable proxy for the portion of the land value that derives from development opportunities. Table 6 presents the results from re-estimating Eq. (2) by location type.

[Insert Table 6 about here.]

The estimates reported indicate that the value effects of biodiversity protections are concentrated in high-development areas. The coefficients in columns 1 and 3 indicate a value differential of approximately 70% to 75% for parcels surrounding areas in the top quartile of preexisting development. Elsewhere, we find either a much smaller value effect that is about 25% of the magnitude observed in high-development areas (column 2) or an even smaller, statistically insignificant, positive effect of biodiversity protections on land values (column 4). Thus, the value differential caused by biodiversity protections seems to be concentrated in areas where the development option is most valuable.

The estimates in Table 6 also indicate that the effect of biodiversity protections on unprotected parcels remains economically small and/or statistically insignificant across high- and low-development locations. This inference is most prevalent using the full sample estimates in columns 1 and 2. For instance, the larger estimate of -0.146 in column 2 indicates that, following protected area formation, the value of an unprotected parcel at the protected area border rises by approximately 7% relative to that of an unprotected parcel 500M away. In the smaller balanced sample, we find a somewhat larger 20% relative rise in unprotected parcels in close proximity to the border of highly developed areas. Overall, however, the results in Table 6 suggest that the small magnitude of the external effects observed in our full sample is not primarily a product of heterogeneity by location type. Rather, our findings imply that biodiversity protections have minimal effects on unprotected parcels relative to their effects on protected parcels.

An important consideration when interpreting the results in Table 6 is that protected areas tend to be smaller in high-development locations (see Figure B.5). To assess the joint role of these factors in driving the value effects of biodiversity protections, we re-estimate Eq. (2) by location type and protected area size, measured in 40-acre increments. We focus these analyses on the full Corelogic vacant land panel, where we observe a larger number of protected areas of varying sizes than in the balanced panel. Figure 5 presents the results from these analyses.

[Insert Figure 5 about here.]

The estimates depicted indicate that the value effects of biodiversity protections are concentrated in high-development locations, even after partitioning the sample by protected area size. Notably, we estimate a larger value effect in high-development locations across most protected area size bins. However, we also estimate that the magnitude of the value effects of biodiversity protections varies with protected area size. To wit, the estimated value effect for protected areas between 80-120 acres in size in high-development locations is broadly in line with our baseline results, but much larger for protected areas less than 40 acres in size in high-development locations. In contrast, we find no significant value effect around the largest protected areas, even those in high-development locations.

Our results provide novel evidence on the local land value effects of biodiversity protections that can only be discerned from the large scale and geographic dispersion of our data. Our findings suggest that these protections are economically relevant and, consistent with seminal models of land values, their impact is concentrated in locations where development opportunities are most valuable.

4.2 Effects on Land Values Over Time

As discussed in Section 3, our empirical approach enables us to test whether biodiversity protections affect land values, as it captures the change in relative values of protected versus unprotected parcels at protected area borders before versus after these areas are formed. Since the diagnostic tests discussed in Section 3.1 show no evidence of significant preexisting border discontinuities in levels or of significant pre-trends in the relative values of protected and unprotected parcels, this change is likely caused by the formation of protected areas. However, the value effect derived from our empirical design captures a sample-weighted average across all land value observations pre- and post-protection. Here, we document how the estimated value differential evolves over time.

We begin by exploring the evolution of the value effects of biodiversity protections over time by estimating Eq. (2) across several sub-samples from our balanced panel. Each sub-sample contains observations from five years prior to protected area formation and from one additional period. This additional period contains, in turn, observations from four years before to five years after protected area formation. From each of these two-period estimations, we collect the coefficients on *Protected # Post*. Thus, each coefficient estimate represents the marginal change in land values of protected relative to unprotected parcels at protected area borders in a given year relative to five years prior to protected area formation. We present these coefficients in Figure 6.

[Insert Figure 6 about here.]

Consistent with our earlier findings, the coefficient estimates summarized in Figure 6 show little variation in the relative land values of protected and unprotected parcels prior to protected area formation. A change in the value differential between protected and unprotected parcels begins to emerge one year post-formation and becomes statistically significant in the following year. Our estimates then stabilize at a level similar to our baseline estimates reported in Table 5. The slight delay in the value impact is likely driven by our measure of calculated land values, which rely on a combination of tax assessments, appraisals, and market transactions (see Section 2.1). These results corroborate the assumption of parallel pre-trends for protected and unprotected parcels and shed light on the timing with which land values adjust to biodiversity protections.

Building on the evidence for the important role of development opportunities in driving the value effects of biodiversity protections (see Section 4.1), we partition the estimation sample for our dynamic analyses by location type. Figure 7 presents the results.

[Insert Figure 7 about here.]

The patterns for high-development locations depicted in this figure (shown in blue) closely resemble those from the full-sample estimates in Figure 6. This finding is consistent with our previous results suggesting that the value effects of biodiversity protections are concentrated in high-development locations. Reassuringly, the coefficient estimates summarized in Figure 7 show no significant evidence of any pre-trends in border discontinuities in high-development or low-development locations, strengthening the credibility of the estimated value effects of biodiversity protections in these locations. Also consistent with our previous results, the patterns depicted in Figure 7 indicate that there are no significant value effects of biodiversity protections in low-development locations (shown in orange). In addition, these analyses clarify that there is no evidence of any significant value impact in low-development locations that might emerge several years after protected area formation.

4.3 Effects on Protected vs. Unprotected Parcels

In this section, we discuss and provide evidence on the extent to which the difference in values that emerges between protected and unprotected parcels at protected area borders when these areas are formed corresponds to biodiversity protections reducing the values of protected parcels. While we cannot rule out that part of the value impact is due to protections affecting the values of unprotected parcels at the border, our empirical design allows us to estimate such external effects.

Several pieces of evidence suggest that the effect of biodiversity protections on nearby unprotected parcels is small relative to the post-formation value differential between protected and unprotected parcels. First, recall that Tables 5 and 6 suggest relatively small value changes between unprotected parcels in immediate proximity to the border and those up to 500M away. This makes it unlikely that variation in the values of unprotected parcels at the border drive the majority of the estimated value effects as all unprotected parcels within 500M of protected area borders would need to appreciate by over 25% to explain even half of the estimated effects.

We further assess how much of the estimated value effects of biodiversity protections is driven by variation in the values of protected versus unprotected parcels by replicating the estimations of Eq. (2) behind Figure 6, but replacing the area-by-year fixed effects with simple area fixed effects. This adjustment allows us to recover the coefficients on *Protected # Post* and *Post*, the latter of which captures the change in values of unprotected parcels over time. Thus, the coefficient estimates on *Protected # Post* (*Post*, respectively) trace the marginal changes in land values for protected (unprotected) parcels over time relative to protected area formation, as summarized in Figure 8.

[Insert Figure 8 about here.]

The figure shows that only protected parcels, depicted in blue, exhibit significant variation in land values following protected area formation. Not surprisingly, this variation closely resembles that of the overall value differential between protected and unprotected parcels presented in Figure 6. In contrast, we find little variation in the values of unprotected parcels, depicted in orange, with only weak evidence of minor increases four and five years post-formation. However, this long-term adjustment in unprotected land values is less than 20% of the magnitude of the variation in protected land values and is statistically insignificant. Taken together, the evidence strongly suggests that declines in the values of newly protected parcels drive the observed value differential between protected and unprotected parcels following the formation of biodiversity-protected areas.

5 Scope of the Estimated Value Effects

Our baseline analysis draws on the full and balanced Corelogic samples of parcels located within 500M of conservation easements established since 2010. This border-based design facilitates causal identification by allowing us to test for the absence of pre-trends in pre-formation value gaps, to rely on the consistent Corelogic coverage of private land values, and to exploit the smaller average footprint of recent easements, which enhances local comparability and enables conditioning on distance to the boundary to isolate border effects from interior differences. We next examine the extent to which the estimated effects generalize beyond the immediate borders of recent easements.

5.1 Non-Border Easement Parcels

To study how our estimates of the value effects of biodiversity protections generalize to non-border parcels, we replicate our main analyses using a regression specification in which we no longer account for a parcel's distance to the border. Specifically, we estimate regressions of the following form:

$$Value/Acre^{j}_{i,t} = \alpha_i + \gamma_{j,t} + \beta_1 Protected_i \times Post_{j,t} + \epsilon_{i,t} \tag{3}$$

where all variables and notation are as in Eq. (2). The coefficient β_1 in Eq. (3) does not capture the value effect at protected area borders, but rather reflects the average value effect across the sample parcels located along the entire estimation bandwidth. We estimate Eq. (3) in the balanced Corelogic vacant land panel. However, since this specification does not rely on parcels right at protected area borders to identify the effect of biodiversity protections, we relax the sample restriction of dropping parcels within 31.8M of these borders, although results are similar maintaining this restriction.

We first focus our estimations of Eq. (3) on a narrow 100M bandwidth around protected area borders to see if the at-the-border effects we have documented thus far extend to average effects within 100M of the protected area border. We then conduct similar analyses using only parcels further from the protected area border. Table 7 presents the results.

[Insert Table 7 about here.]

The estimates in column 1 indicate highly significant value effects of biodiversity protections within 100M of protected area borders resembling those from our baseline specification (see Table 5). Thus, our narrow bandwidth estimates that drop the covariates for a parcel's distance to the border and relax the sample restriction to parcels beyond 31.8M of the border yield similarly sized estimates regarding the effect of biodiversity protections on land value.

We further delve into this narrow bandwidth DiD-style analysis by separately illustrating the trend in protected and unprotected parcel value in the years around protected area formation. Specifically, we replicate the exercise behind Figure 8 by replacing the area-by-year fixed effects in Eq. (3) with simple area fixed effects. We then estimate this specification in several sub-samples from the balanced Corelogic vacant land panel (including parcels within 31.8M of protected area borders). Each estimation contains observations from three years prior to protected area formation and one additional period. This additional period contains, in turn, observations from two years before to three years after protected area formation. Again, the adjustment to Eq. (3) allows us to recover the coefficients on *Protected # Post* and *Post* separately. Each coefficient estimate thus represents the change in land values of protected (respectively, unprotected) parcels in a given year relative to three years prior to protected area formation. We summarize these coefficients in Figure 9.

[Insert Figure 9 about here.]

The patterns depicted indicate that there are no significant trends or differences in the values of protected versus unprotected parcels within 100M of protected area borders in the three years before protected area formation. As in Figure 8, the values of protected parcels begin to decline in the first year following protected area formation and decline further in years two and three post-formation.

Figure 9 also shows that the values of unprotected parcels within 100M of protected area borders exhibit a slight increase in values, which first emerges in year one post-formation and remains stable in years two and three. The direction and small magnitude of this effect is consistent with the illustration in Figure 8 and the generally negative *Post # Distance* in Tables 5 and 6. All of these results raise the possibility that the unprotected parcels right next to the border rise slightly in value after protected area formation. However, in all cases the increase is small relative to the concurrent declines in the values of protected parcels. Thus, while there are likely some external effects of biodiversity protections on nearby unprotected parcels, the small magnitude of such external effects relative to the larger declines in the values of protected parcels indicates that the majority of the value effects of biodiversity protections we estimate is driven by the effects of protections on protected parcels.

In column 2 of Table 7, we turn to estimating the effect of biodiversity protection on the value of parcels more than 100M from the protected area border. For this analysis, we drop parcels within 100M and estimate Eq. (3) on parcels that are between 100M and 500M from the protected area border. The insignificant estimates reported in column 2 offer no evidence of significant value effects of biodiversity protections on parcels more than 100M from protected area borders. Coupling this null result with our evidence suggesting that parcels more than 100M inside protected areas have substantially lower value even before protected area formation (see e.g., Figure 2 and the positive *Protected # Post # Distance* in Tables 5 and 6) highlights that biodiversity protections tend to occur on less developable land, as shown in international contexts (Joppa and Pfaff, 2009; Grupp et al., 2023).

In columns 3 and 4 (5 and 6) we replicate columns 1 and 2 after restricting the sample to high-development (low-development) locations. As in Table 6, we find that the value effects of biodiversity protections concentrate in high-development locations. The negligible effect of biodiversity protections on parcels located beyond 100M from protected area borders persist across both sub-samples.

In sum, the evidence in Table 7 indicates that the value impacts is concentrated within 100M inside the border of protected areas in the top quartile of surrounding development. The coefficient of -1.007 in column 4 further indicates that, within this sub-group, the value of protected and unprotected parcels shifts by approximately 64%, with the vast majority of this shift being via a reduction in the value of protected parcels. We find that there are approximately 15,625 (33,287) protected (unprotected) acres within 100M of post-2010 easements, with the unprotected acreage having a value of $96,165 per acre prior to the area's formation. Applying a 60% discount to this value suggests that the marginal 100M protected by post-2010 easements have reduced land value by approximately $902 million. For most of our sample period the highest marginal federal tax bracket was just under 40% suggesting that federal taxpayers paid approximately $360 million for these protections.

5.2 Long-Standing Protected Areas

Our analyses thus far focus on the land value effects of conservation easements established since 2010. This focus allows us to observe pre-formation land values, characteristics, and land cover, given the historical coverage of Corelogic and the NLCD. At the same time, this approach limits our inferences to these recent easement areas. Prior studies on the effects of land use restrictions, such as Turner et al. (2014), employ a static RD design. Several pieces of empirical evidence suggest such a cross-sectional approach is also informative in our setting. First, we see no discontinuity in preexisting land cover at protected area borders (see Table 3). Second, protected and unprotected land values are similar in levels and in trends over time before protected area formation in the cases for which we observe pre-formation data (see Figure 6). Motivated by these observations, we assess the degree to which our key inferences hold in a cross-sectional setting by estimating regressions of the following form:

$$Value/Acre^{a}_{i,t} = \gamma_{a,t} + \beta_1 Protected_i + \beta_2 Distance_i + \beta_3 Protected_i \times Distance_i + \epsilon_{i,t} \tag{4}$$

where all variables and notation are as in Eq. (2). We estimate Eq. (4) in the full Corelogic vacant land panel, restricted to observations occurring after protected area formation. The coefficient of interest, β_1, thus captures the difference in land values at protected area borders. Since we cannot include parcel-level fixed effects to account for time-invariant parcel characteristics like we do in Eq. (2), we estimate alternative versions of Eq. (4) including parcel size in acres and an interaction term between protection status and parcel size. Table A.4 presents the results of estimating this equation on the post-2010 easements sample we have used thus far in our analysis. Across all columns, the coefficient estimates reported corroborate the inferences from our baseline results shown in Table 5.

We leverage the similarity between our baseline results and the cross-sectional results presented here to expand our analyses beyond the easement areas formed since 2010. Since the estimation of Eq. (4) does not require observations of pre-formation land values, we can implement this cross-sectional approach in a much larger set of Corelogic parcels and protected areas. Such an expanded sample allows us to study the long-run effects of biodiversity protections on land values stemming from different types of protected areas (easements and non-easements).

In the following set of tests, we focus on all Corelogic parcels classified as vacant land as of 2010 that are located within a 500M bandwidth around easement and non-easement area borders formed in or before 2005. For each of these parcels, we compute the average land value per acre over the subsequent five years (that is, over the 2010–2014 period). We apply minimal additional selection criteria to this cross-section. We only drop parcels within 31.8M of the borders, those with missing acres, and those smaller than 0.25 acres. We then estimate a version of Eq. (4) with protected area fixed effects and covariates for parcel size (in acres) in this expanded sample of vacant land, split by protection mechanism (easement versus non-easement areas). Table 8 presents the results.

[Insert Table 8 about here.]

The estimates reported indicate a significant value effect consistent with our main inferences. Specifically, the coefficient estimates on the *Protected* indicator imply negative value effects of 54% to 64% in the expanded sample of easement areas (see columns 1 and 2). (Recall that we need to compute $e^{(\text{coef.})} - 1$ to assess the economic magnitude of the estimated effects in the Poisson pseudo-ML model.) These estimates are broadly in line with those from our baseline estimations in the full panel (see columns 1 and 2 of Table 5). The similarity between the expanded sample estimates in columns 1 and 2 of Table 8 and our baseline estimates in Table 5 suggests that the adjustment of land values to biodiversity protection easements that occurs within five years of protected area formation—the time horizon captured in our baseline estimations—already reflects the full extent of the value effect emerging over the long term, as shown here.

The estimates reported in columns 3 and 4 indicate that the value effects of biodiversity protections estimated at the borders of non-easement areas are similar to those estimated at the borders of the easement areas that we focus on for most of our study. Specifically, the estimates in the expanded sample of non-easement areas imply value effects of 45% to 46%. In sum, the results in Table 8 indicate that our inferences extend to a larger sample of protected areas formed under different mechanisms (easements and non-easements) and remain valid in the long term, as well.

5.3 Transacted Parcels

Our baseline results rely on calculated land values, which Corelogic derives from a combination of assessments, appraisals, and transactions. The use of calculated values mitigates the possibility that any value effects we estimate are driven by differences in liquidity between land inside and outside of protected area borders. Indeed, the potential biases created from relying on transactions alone may be large and hard to quantify, as most protected areas in our sample see no vacant land transactions in a 500M bandwidth between two and five years pre-formation. Nonetheless, it is possible that calculated values do not fully reflect actual market prices. To address this issue, we replicate our analyses in a sample of vacant land transactions obtained from Corelogic's Owner Transfer dataset.

The Owner Transfer dataset contains transaction-level records on completion dates, transaction prices, as well as key parcel characteristics. We extract transactions of vacant land completed between 2010 and 2024. We drop pending records, retain only arms-length transactions, and focus on those recorded in regular deeds (i.e., not foreclosures or quit claims). We also drop parcels that sold multiple times in the same year to avoid observations associated with land flipping, transactions with missing acres, and parcels smaller than 0.25 acres. After merging the Corelogic transactions dataset with the PAD-US data following analogous procedures to those outlined in Section 2, we focus on transactions of parcels located within 500M of protected area borders that were formed at some point prior to the observed transaction (again, dropping parcels located within 31.8M of protected area borders to avoid mis-classification). We then estimate regressions of the following form:

$$\begin{aligned} Price/Acre^{a}_{i,t} = \gamma_a + \beta_1 Protected_i + \beta_2 Distance_i + \beta_3 Protected_i \times Distance_i \\ + \beta_4 Protected_i \times Acres_i + \beta_5 Acres_i + \epsilon_{i,t} \end{aligned} \tag{5}$$

where all variables and notation are as in Eq. (2), except $Price/Acre^{a}_{i,t}$ is the price per acre of parcel i located in or near the border of protected area a at time t, γ_a are protected area fixed effects, and $Acres_i$ is the size of a parcel. We estimate Eq. (5) in the sample of Corelogic vacant land transactions described above, split by protection mechanism (easement versus non-easement areas). Table 9 presents the results. Converting the estimates reported in this table to their economic magnitudes indicates that the value effects of biodiversity protections estimated from transactions around easement (non-easement) areas range from approximately 30% to 70%, qualitatively consistent with our main results. Our findings indicate that the value effects of biodiversity protections are also reflected in transaction prices for vacant land.

[Insert Table 9 about here.]

6 Biodiversity Protections and Land Development

The evidence presented thus far indicates that there are significant value effects of biodiversity protections on parcels at the border of the average biodiversity-protected area in the U.S. In addition, this value effect is linked to the extent of preexisting development, corroborating the intuition that vacant land values are driven in large part by the present value of the option to develop the land. Yet, the horizon over which biodiversity protections impact development is unclear. For one, the average newly-protected parcel may face little near-term development pressure. Indeed, Table 1 shows that few parcels in recently established protected areas are developed. Moreover, biodiversity protections often have little effect on observed development (Joppa and Pfaff, 2009; Grupp et al., 2023). Conservation efforts are also frequently implemented over many decades (Pimm et al., 2014; Tsioumani, 2020). In this case, the value effects of biodiversity protections we document could be driven by a combination of reduced long-term development opportunities and very low long-term discount rates (see, e.g., Giglio et al., 2015), rather than near-term development opportunities.

To shore up the interpretation of our findings, we test whether biodiversity protections affect development outcomes directly. First, we study the impact on near-term development following protected area formation. Then, we study the evolution of development (i.e., the change in development between 2001 and 2021) around long-standing protected areas (i.e., areas established before 2001).

6.1 Short-Run Development Impact

For our analysis on the short-run development impact of biodiversity protections, we focus on parcels in our full and balanced Corelogic panels that are vacant as of five years prior to protected area formation and that we can still observe at least in the year after protected area formation. (Note that this restriction only affects the composition of the full Corelogic panel, as a stricter version of this selection rule already applies to the balanced panel.) For each of the remaining parcels, we determine development outcomes based on the NLCD land cover data. We use the resulting cross-sectional datasets to estimate regressions of the following form:

$$Developed_i^j = \alpha_j + \beta_1 Protected_i + \beta_2 Distance_i + \beta_3 Protected_i \times Distance_i + \epsilon_i \tag{6}$$

where all variables and notation are as in Eq. (4), except $Developed_i^j$ is an indicator that takes the value of one if the land cover of parcel i near the border of protected area j is classified as developed or planted within five years of protected area formation. This indicator captures the change in development from the pre- to post-formation period since we require parcels to be undeveloped pre-formation. A negative sign on β_1 indicates that biodiversity protections reduce development.

Before reporting the results from estimating Eq. (6), we present simple descriptive statistics for high-development areas, where the value effects of biodiversity protections are concentrated (see Section 4.1). Within these areas, we observe five-year post-formation outcomes for 118 (respectively, 279) parcels from the balanced sample in a 200M (500M) bandwidth around protected area borders. By construction, all of these parcels are vacant five years prior to protected area formation. We find that around 2.5% (3.5%) of these parcels are developed post-formation, but none of them are in the protected category. These statistics suggest that (1) biodiversity protections appear to predict less development, and (2) development rates around newly formed protected areas are fairly modest at less than 1% per year, even after conditioning on areas with high rates of preexisting development.

Table 10 presents the results from estimating Eq. (6) in the cross-sections extracted from the full and balanced Corelogic panels as outlined above. We note up-front that the estimation results are similar across these two samples. Specifically, the estimates in columns 1 and 3 (2 and 4, respectively) are obtained from regressions focused on high-development (low-development) areas. The results in columns 1 and 3 indicate that biodiversity protections curtail observed development in high-development areas (although the coefficient estimate in column 3 is statistically insignificant). The economic magnitude of these effects is approximately 6 percentage points, which is higher than the average observed development rate post-formation. This estimate likely overstates the true effect due to the small sample and the lack of any observed development among protected parcels. By contrast, we find no evidence of biodiversity protections reducing development outcomes in areas with low preexisting development rates (columns 2 and 4). In sum, the evidence presented in Table 10 points to biodiversity protections exerting a negative impact on near-term development activity in precisely the locations that drive the value effects of biodiversity protections we document.

[Insert Table 10 about here.]

6.2 Long-Run Development Impact

We next examine the long-run effects of biodiversity protections on development. We focus these analyses on the cross-section of land within 500M around the borders of protected areas established before 2001. An observation refers to a cell in a 500M×500M grid around these borders. We examine development in these cells over the 2001–2021 period based on NLCD land cover classifications at the cell centroids. For context, the NLCD data indicate that 5% of cells outside protected area borders are classified as developed in 2001, as compared to 2% of cells inside. Planted land cover is more common, with 15% of unprotected cells and 16% of protected cells classified as planted in 2001.

To examine long-run development patterns, we replicate the estimation from Eq. (6) in the cross-section of land described above. The dependent variable is Δ *Developed*, which takes the value of 100 if land cover at a cell centroid is classified as developed in 2021 but not in 2001. This variable takes the value of -100 if land cover at a cell centroid is classified as not developed in 2021 but as developed in 2001. It takes the value of zero if there is no change in land cover classification as developed between 2001 and 2021. Alternatively, the dependent variable is Δ *Planted*, defined analogously to Δ *Developed* but for land cover classified as planted. Thus, the coefficient on the indicator *Protected* in Eq. (6) captures the percentage point change in the probability of development or planting over the 20-year period from 2001 to 2021. Table 11 presents the results.

[Insert Table 11 about here.]

Across all columns of Table 11 we see that biodiversity protections predict lower development and planting around protected area borders in recent decades. The estimate of approximately -0.31

in column 1 indicates that 0.31 percentage points less development occurs, which is almost exactly the mean of the dependent variable. We also find a negative effect of biodiversity protections on planting (column 2). Finally, the coefficient estimates in columns 3 through 6 indicate that the full-sample results for developed land cover in columns 1 and 2 generally persist using either the easement and non-easement sub-sample, while we find weaker effects for planted land cover in each of these sub-samples individually. In sum, the results presented in Table 11 indicate that long-standing biodiversity protections effectively curtail development between 2001 and 2021.

To better understand the dynamic impact of biodiversity protections on long-run development, we partition the regression from column 1 of Table 11 based on the year of protected area formation. Figure 10 presents the coefficient estimates on the *Protected* variable from this series of regressions.

[Insert Figure 10 about here.]

Figure 10 shows that the effect of biodiversity protections on 2001–2021 development is consistent across protected areas formed any time since 1966. The point estimates corresponding to areas formed after 1998, between 1988 and 1998, between 1977 and 1987, and between 1966 and 1976 are all very similar to each other and generally slightly larger than the full sample estimate of -0.312 in column 1 of Table 11. In contrast, the development impact is only about half as large for protected areas formed prior to 1966. Thus, longstanding biodiversity-protected areas have a continued impact on development over the past several decades, in some cases more than 40 years after their formation.

In our final set of tests, we examine whether the long-run development impact of of biodiversity protections is related to the extent of surrounding development, as we found to be the case with respect to short-run development. To do this, we replicate the estimations reported in Table 11 based on whether the protected area is in the top quartile of the sample distribution for surrounding development as of our first NLCD observation in 2001. Table 12 presents the results.

[Insert Table 12 about here.]

Comparing Panels A and B of Table 12 shows that the development impact of biodiversity protections is three to four times as large in high-development locations, while the effect on planted land is larger in low-development locations. These findings highlight that the land use effects of biodiversity protections are context-dependent. Our previous results show that the value impact of these protections is concentrated in locations with higher preexisting development. This evidence, combined with the results in Table 12, presents nuanced trade-offs for policy makers, as biodiversity protections in areas with less preexisting development appear to have a limited impact on land value, while at the same time reducing the proportion of planted land in the decades after protected area formation.

7 Conclusion

Biodiversity loss is a defining environmental challenge, yet its market consequences remain incompletely measured. We provide the first nationwide evidence on how biodiversity protections affect U.S. land markets using parcel-level values and the timing of protected area formation. Along protected area borders, vacant land values fall by roughly 50% on average following protection. The effects are concentrated within about 100M of the boundary and largest where development opportunities are most valuable. We find little corresponding change for nearby unprotected parcels, consistent with limited spatial spillovers and a sharp, localized capitalization of protections.

These results imply that biodiversity protections constrain development at the margin and thus plausibly deliver conservation benefits. At the same time, the narrow spatial reach of the capitalization we document suggests that the economic costs of conservation are highly concentrated on owners immediately adjacent to new boundaries. This concentration creates scope for policy design whereby careful boundary placement could preserve ecological benefits while minimizing efficiency losses. Our evidence also indicates that most protected land is located where development value is low (given the estimated interior gradient, combined with the fact that interior acreage accounts for the majority of protected-land area) consistent with conservation occurring where opportunity costs are modest.

More broadly, our estimates offer inputs to biodiversity finance by quantifying how conservation is capitalized into land values at fine spatial scales. These estimates can inform the pricing of conservation instruments (e.g., easements, habitat credits) and the incidence of conservation policy. At the same time, our identification is deliberately local: we primarily estimate border-level effects in a balanced panel of parcels near recent protections, corroborated by results from a full panel, post-protection transaction records, and samples of vacant land around long-standing protected areas. A full welfare analysis would integrate the benefits of biodiversity, incorporate any dynamic re-optimization of development, and allow for supply-side effects on unregulated land further away. Future work linking our local border estimates to ecosystem benefit measures and to general equilibrium land and housing market outcomes would help close this gap.

References

Addoum, Jawad, Piet Eichholtz, Eva Steiner, and Erkan Yönder, 2024, Climate Change and Commercial Real Estate: Evidence from Hurricane Sandy, *Real Estate Economics* 52, 687–713.

Akbari, Amir, Lilian Ng, Man Duy Pham, and Jing Yu, 2025, The Real Effects of Protecting Biodiversity, *Review of Finance* Forthcoming.

Auffhammer, Maximilian, Maya Duru, Edward Rubin, and David Sunding, 2020, The Economic Impact of Critical-Habitat Designation: Evidence from Vacant-Land Transactions, *Land Economics* 96, 188–206.

Baldauf, Markus, Lorenzo Garlappi, and Constantine Yannelis, 2020, Does Climate Change Affect Real Estate Prices? Only If You Believe In It, *Review of Financial Studies* 33, 1256–1295.

Bernstein, Asaf, Matthew Gustafson, and Ryan Lewis, 2019, Disaster on the Horizon: The Price Effect of Sea-Level Rise, *Journal of Financial Economics* 134, 253–272.

Blume, James, and Boris Vallee, 2025, Can Environmental Markets Solve the Biodiversity Crisis?, Working Paper 5239357, SSRN.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, 2024, Revisiting Event-Study Designs: Robust and Efficient Estimation, *Review of Economic Studies* 91, 3253–3285.

Bošković, Branko, and Linda Nøstbakken, 2017, The Cost of Endangered Species Protection: Evidence from Auctions for Natural Resources, *Journal of Environmental Economics and Management* 81, 174–192.

Capozza, Dennis, and Robert Helsley, 1989, The Fundamentals of Land Prices and Urban Growth, *Journal of Urban Economics* 26, 295–306.

Cardinale, Bradley, Emmett Duffy, Andrew Gonzalez, David Hooper, Charles Perrings, Patrick Venail, Anita Narwani, Georgina M. Mace, David Tilman, David A. Wardle, Ann P. Kinzig, Gretchen C. Daily, Michel Loreau, James B. Grace, Anne Larigauderie, Diane S. Srivastava, and Shahid Naeem, 2012, Biodiversity Loss and Its Impact on Humanity, *Nature* 486, 59–67.

Chay, Kenneth, and Michael Greenstone, 2005, Does Air Quality Matter? Evidence from the Housing Market, *Journal of Political Economy* 113, 376–424.

Chen, Fukang, Minhao Chen, Lin William Cong, Haoyu Gao, and Jacopo Ponticelli, 2024, Pricing the Priceless: The Financial Cost of Biodiversity Conservation, Working Paper 32743, National Bureau of Economic Research.

Cohn, Jonathan, Zack Liu, and Malcolm Wardlaw, 2022, Count (and Count-Like) Data in Finance, *Journal of Financial Economics* 146, 529–551.

Coqueret, Guillaume, Thomas Giroux, and Olivier David Zerbib, 2024, The Biodiversity Premium, Working Paper 4489550, SSRN.

Deutz, Andrew, Geoffrey Heal, Rose Niu, Eric Swanson, Terry Townshend, Zhu Li, Alejandro Delmar, Alqayam Meghji, Suresh Tobin-de la Sethi, and John Puente, 2020, Financing Nature: Closing the Global Biodiversity Financing Gap, Research Report, The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability.

Ferris, Ann, and Eyal Frank, 2021, Labor Market Impacts of Land Protection: The Northern Spotted Owl, *Journal of Environmental Economics and Management* 109, 102480.

Flammer, Caroline, Thomas Giroux, and Geoffrey Heal, 2023, Biodiversity Finance, Working Paper 31022, National Bureau of Economic Research.

Frank, Eyal, Maximilian Auffhammer, David McLaughlin, Elisheba Spiller, and David Sunding, 2025, The Cost of Species Protection: The Land Market Impacts of the Endangered Species Act, Working Paper 33352, National Bureau of Economic Research.

Garel, Alexandre, Arthur Romec, Zacharias Sautner, and Alexander Wagner, 2024, Do Investors Care About Biodiversity?, *Review of Finance* 28, 1151–1186.

Giglio, Stefano, Theresa Kuchler, Johannes Stroebel, and Olivier Wang, 2024, The Economics of Biodiversity Loss, Working Paper 32678, National Bureau of Economic Research.

Giglio, Stefano, Theresa Kuchler, Johannes Stroebel, and Olivier Wang, 2025, Nature and Biodiversity Loss: A Research Agenda for Financial Economics, Working Paper 34286, National Bureau of Economic Research.

Giglio, Stefano, Theresa Kuchler, Johannes Stroebel, and Xuran Zeng, 2023, Biodiversity Risk, Working Paper 31137, National Bureau of Economic Research.

Giglio, Stefano, Matteo Maggiori, and Johannes Stroebel, 2015, Very Long-Run Discount Rates, *Quarterly Journal of Economics* 130, 1–54.

Goodman-Bacon, Andrew, 2021, Difference-in-Differences with Variation in Treatment Timing, *Journal of Econometrics* 225, 254–277.

Grupp, Tristan, Prakash Mishra, Mathias Reynaert, and Arthur van Benthem, 2023, An Evaluation of Protected Area Policies in the European Union, Working Paper 31934, National Bureau of Economic Research.

Imbens, Guido, and Thomas Lemieux, 2008, Regression Discontinuity Designs: A Guide to Practice, *Journal of Econometrics* 142, 615–635.

Jaureguiberry, Pedro, Nicolas Titeux, Martin Wiemers, Diana Bowler, Luca Coscieme, Abigail Golden, Carlos Guerra, Ute Jacob, Yasuo Takahashi, Josef Settele, Sandra Díaz, Zsolt Molnár, and Andy Purvis, 2022, The Direct Drivers of Recent Global Anthropogenic Biodiversity Loss, *Science Advances* 8, eabm9982.

Jenkins, Clinton, Kyle Van Houtan, Stuart Pimm, and Joseph Sexton, 2015, US Protected Lands Mismatch Biodiversity Priorities, *Proceedings of the National Academy of Sciences* 112, 5081–5086.

Joppa, Lucas, and Alexander Pfaff, 2009, High and Far: Biases in the Location of Protected Areas, *PLoS ONE* 4, e8273.

Karolyi, Andrew, and John Tobin-de la Puente, 2023, Biodiversity Finance: A Call for Research into Financing Nature, *Financial Management* 52, 231–251.

Kemink, Kaylan, Vanessa Adams, Robert Pressey, and Johann Walker, 2021, A Synthesis of Knowledge about Motives for Participation in Perpetual Conservation Easements, *Conservation Science and Practice* 3, e323.

List, John, Michael Margolis, and Daniel Osgood, 2006, Is the Endangered Species Act Endangering Species?, Working Paper 12777, National Bureau of Economic Research.

Mamun, Saleh, Erik Nelson, and Christoph Nolte, 2024, Estimating the Impact of Critical-Habitat Designation on the Values of Developed and Undeveloped Parcels, *Land Economics* 100, 148–175.

Pimm, Stuart, Clinton Jenkins, Robin Abell, Thomas Brooks, John Gittleman, Lucas Joppa, Peter Raven, Callum Roberts, and Joseph Sexton, 2014, The Biodiversity of Species and Their Rates of Extinction, Distribution, and Protection, *Science* 344, 987–987.

Reynaert, Mathias, Eduardo Souza-Rodrigues, and Arthur van Benthem, 2024, The Environmental Impacts of Protected Area Policy, *Regional Science and Urban Economics* 107, 103968.

Sacher, Maxwell, and Shikhar Singla, 2025, Impact of Biodiversity Regulatory Risk on House Prices, Working Paper 5241282, SSRN.

Titman, Sheridan, 1985, Urban Land Prices Under Uncertainty, *American Economic Review* 75, 505–514.

Tsioumani, Elsa, 2020, Convention on Biological Diversity: A Review of the Post-2020 Global Biodiversity Framework Working Group Negotiations, *Environmental Policy and Law* 50, 55–59.

Turner, Matthew, Andrew Haughwout, and Wilbert van der Klaauw, 2014, Land Use Regulation and Welfare, *Econometrica* 82, 1341–1403.

Weitzman, Martin, 1993, What to Preserve? An Application of Diversity Theory to Crane Conservation, *Quarterly Journal of Economics* 108, 157–183.

Weitzman, Martin, 1998, The Noah's Ark Problem, *Econometrica* 66, 1279–1298.

Xin, Wei, Lewis Grant, Ben Groom, and Chendi Zhang, 2023, Biodiversity Confusion: The Impact of ESG Biodiversity Ratings on Asset Prices, Working Paper 4540722, SSRN.

Xiong, William, 2024, The World Market Price of Biodiversity Risk, Working Paper, Binghamton University.

Zhou, Zoey Yiyuan, and Douglas Almond, 2025, Biodiversity Co-Benefits in Carbon Markets? Evidence from Voluntary Offset Projects, Working Paper, European Finance Association Conference.

Figure 1. Protected Areas in the U.S.

This figure depicts the spatial distribution of biodiversity-protected areas in the contiguous U.S. Dark green shading indicates areas with permanent biodiversity protections in place (those with GAP status codes 1 and 2). The data used to produce this figure are from the USGS.

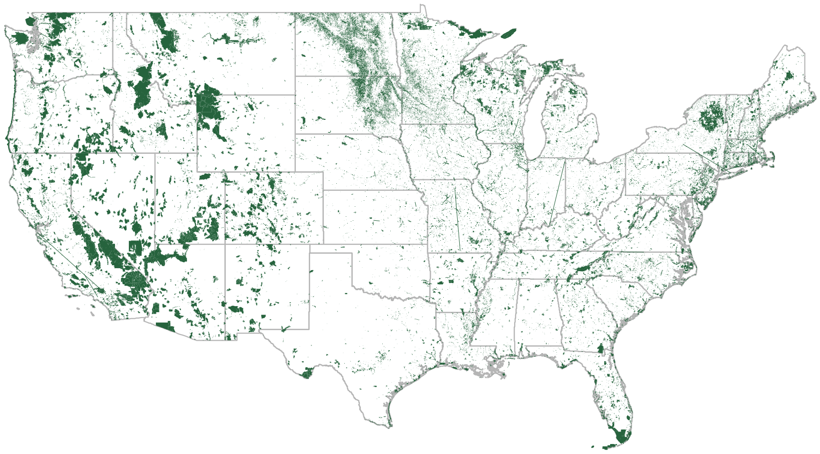


Figure 2. Land Values Around Protected Area Borders

This figure depicts binned averages of vacant land values around protected area borders two years before versus two years after protected area formation by distance to the border in the balanced Corelogic vacant land panel. Land values are shown in $’000 per acre. Distance to the border is shown in KM. Average land values are computed in 100M bins around protected area borders. The data used to produce this figure are from Corelogic and the USGS.

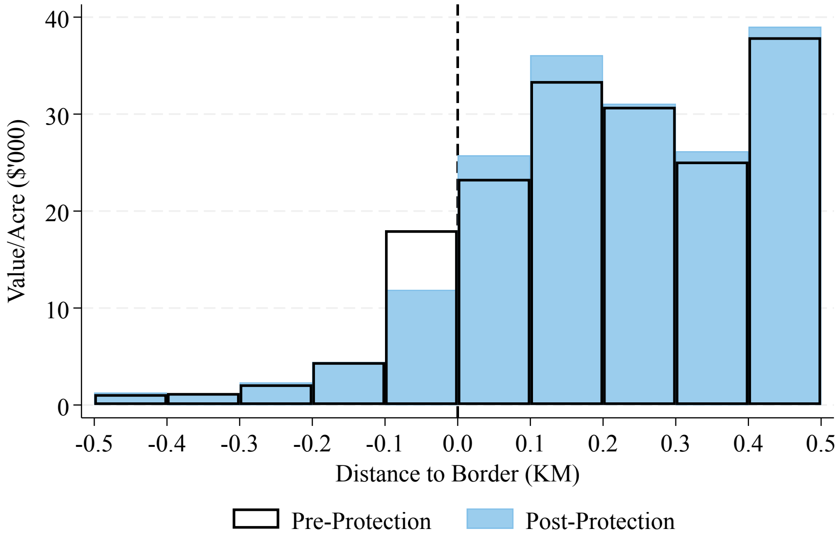


Figure 3. Land Values Prior to Protected Area Formation

This figure depicts the results from estimating Eq. (1) in the balanced panel of vacant land in each of the five years leading up to protected area formation. The dependent variable is the value per acre of vacant land in $'000. The markers indicate coefficient estimates on the *Protected* indicator. The capped bars indicate 90% confidence intervals. The data used to produce this figure are from Corelogic and the USGS.

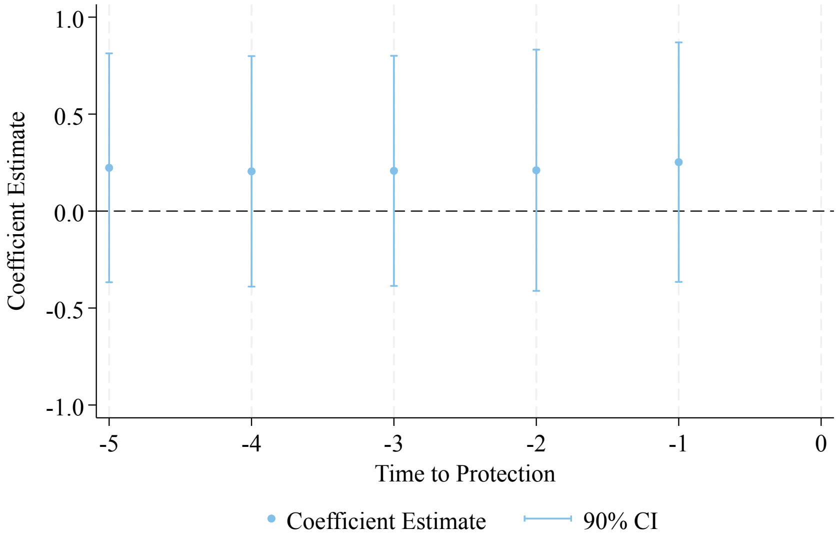
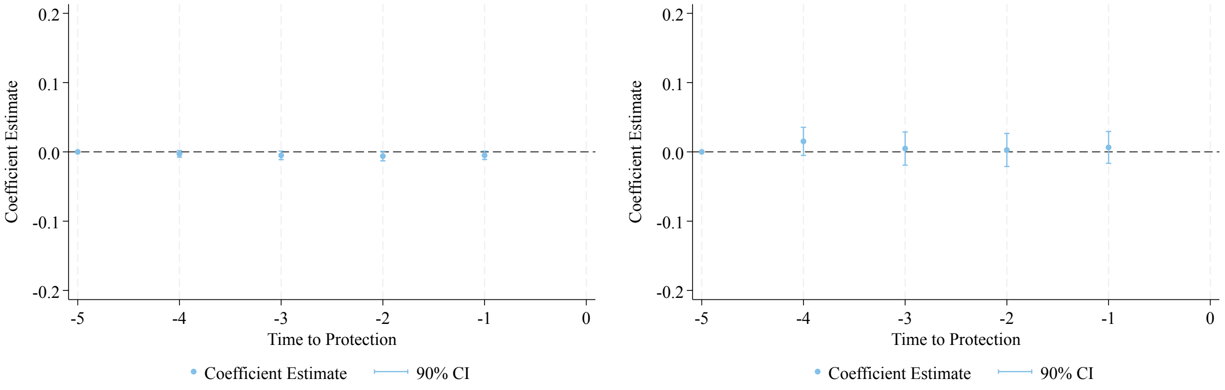


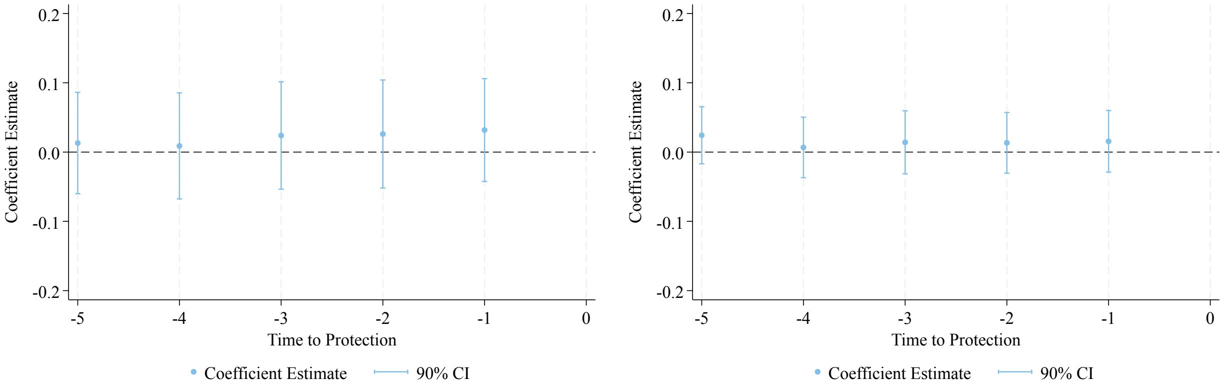
Figure 4. Land Cover Prior to Protected Area Formation

This figure depicts the results from estimating Eq. (1) in the balanced panel of vacant land in each of the five years leading up to protected area formation. The dependent variable in Panel A is *Developed*, an indicator that takes the value of one if land cover in the location of a parcel is classified as developed in the National Land Cover Database (NLCD). In the estimations summarized in each of the subsequent panels, the dependent variables are *Planted*, *Forest*, *Herb*, *Shrub*, and *Water/Wetlands*, respectively, which capture the NLCD classification of the land cover in the location of a parcel as planted (i.e., used for agriculture), forest, herbaceous, shrub land, and water/wetlands. Across all panels, the markers indicate coefficient estimates on the *Protected* indicator. The capped bars indicate 90% confidence intervals. The data used to produce this figure are from Corelogic, the NLCD, and the USGS.



(A) Developed

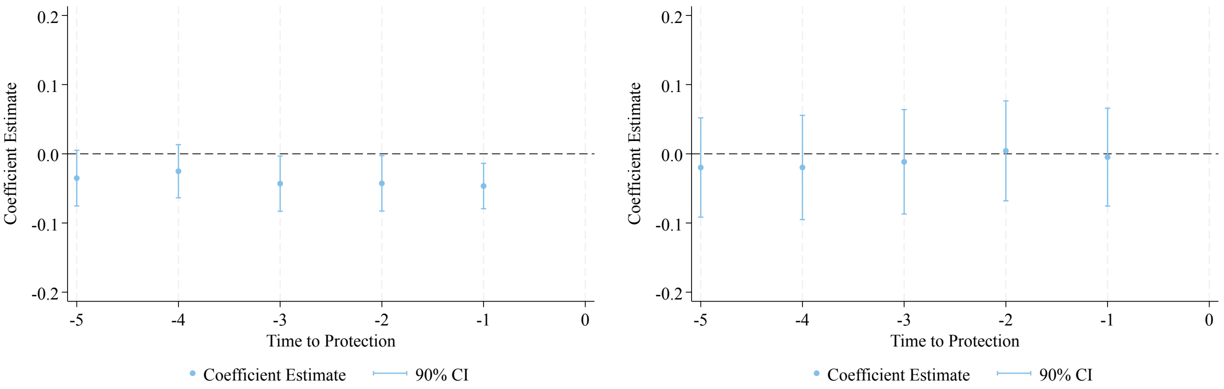
(B) Planted



(C) Forest

(D) Herb

Figure 4. Land Cover Prior to Protected Area Formation (Ctd.)



(E) Shrub Land

(F) Water/Wetlands

Figure 5. Land Value Effects by Protected Area Size and Development

This figure depicts the value effects of biodiversity protections derived from estimating Eq. (2) in the full Corelogic vacant land panel by protected area size. *Protected Area Size (Acres)* denotes protected area size bins in 40-acre increments. The blue circles (respectively, orange diamonds) indicate the coefficient estimates on the interaction term *Protected # Post* in the high-development (low-development) sub-sample. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is in the top quartile (below the top quartile) of the sample distribution. We measure the extent of preexisting development using the available historical versions of the NLCD land cover data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic, the NLCD, and the USGS.

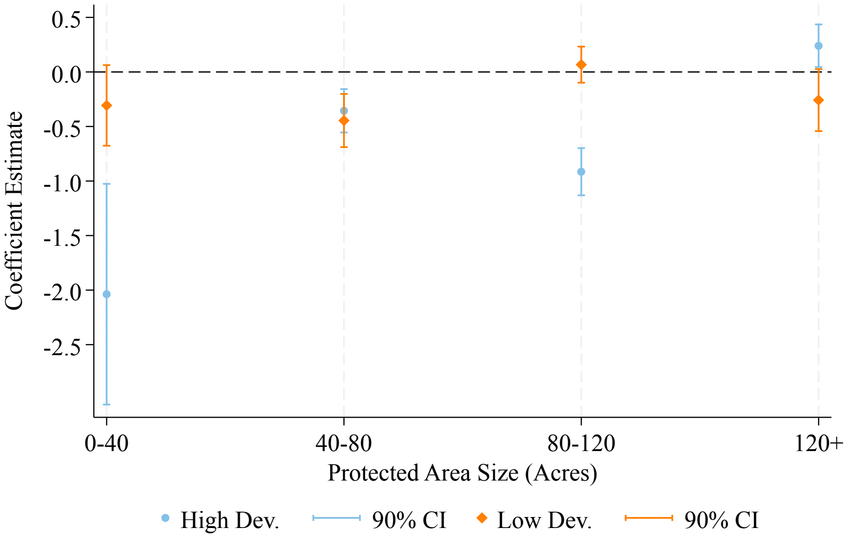


Figure 6. Land Value Effects over Time

This figure depicts the value effects of biodiversity protections derived from estimating Eq. (2) in the balanced Corelogic vacant land panel over time. *Time to Protection* represents the difference between the observation year and the year when the nearest protected area border is established. The circles indicate the coefficient estimates on the interaction term *Protected # Post* from an estimation containing observations from five years prior to protected area formation and one additional period. This additional period contains, in turn, observations from four years before to five years after protected area formation. Thus, each coefficient estimate represents the marginal change in land values of protected relative to unprotected parcels at protected area borders in a given year relative to five years prior to protected area formation. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic and the USGS.

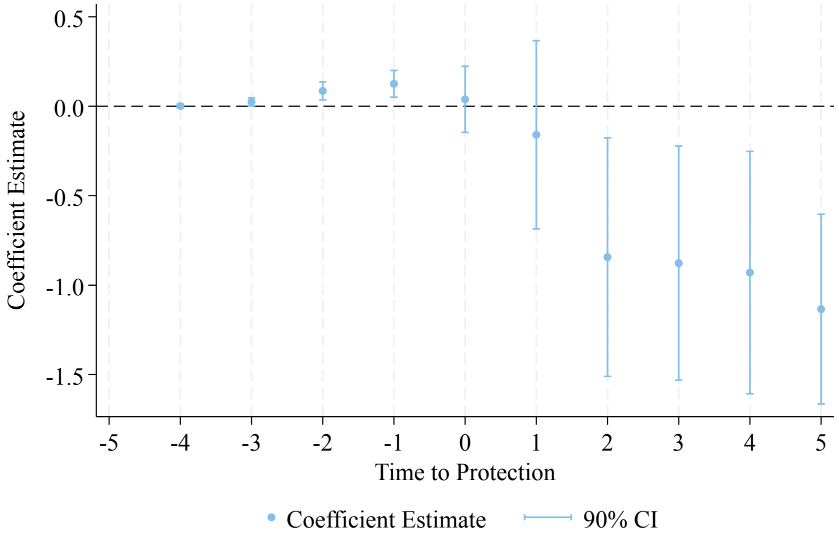


Figure 7. Land Value Effects over Time by Location Type

This figure depicts the value effects of biodiversity protections derived from estimating Eq. (2) in the balanced Corelogic vacant land panel over time by location type. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is above (below) the sample median. We measure the extent of preexisting development using NLCD land cover data. *Time to Protection* represents the difference between the observation year and the year when the nearest protected area border is established. The blue circles (respectively, orange diamonds) indicate the coefficient estimates on the interaction term *Protected # Post* from an estimation containing observations from five years prior to protected area formation and one additional period in high-development (low-development) locations. This additional period contains, in turn, observations from four years before to five years after protected area formation. Thus, each coefficient estimate represents the marginal change in land values of protected relative to unprotected parcels at protected area borders in a given year relative to five years prior to protected area formation. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic, the NLCD, and the USGS.

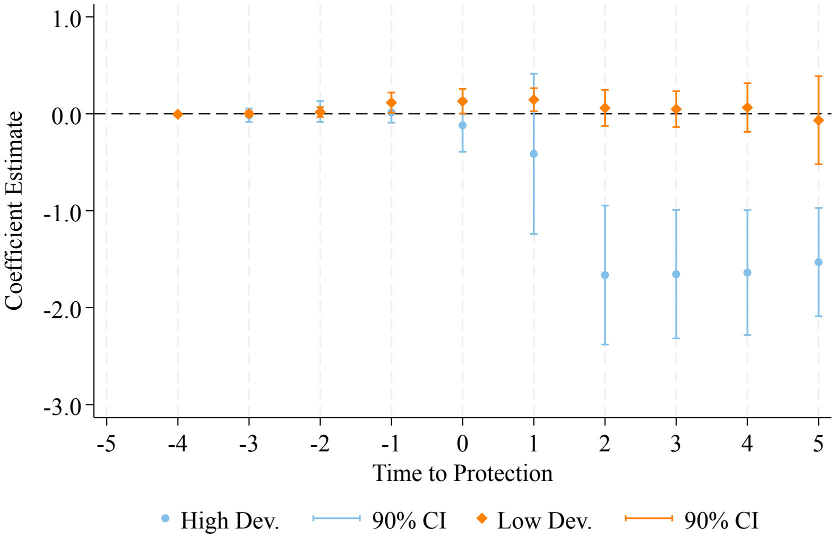


Figure 8. Land Value Effects over Time by Protection Status

This figure depicts the value effects of biodiversity protections derived from estimating an alternative version of Eq. (2), replacing the area-by-year fixed effects with simple area fixed effects, in the balanced Corelogic vacant land panel. *Time to Protection* represents the difference between the observation year and the year when the nearest protected area border is established. The blue circles (respectively, orange diamonds) represent the coefficient estimates on the interaction term *Protected # Post* (on the term *Post*) from an estimation containing observations from five years prior to protected area formation and one additional period. This additional period contains, in turn, observations from four years before to five years after protected area formation. Thus, each coefficient estimate represents the marginal change in land values of protected (respectively, unprotected) parcels at protected area borders in a given year relative to five years prior to protected area formation. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic and the USGS.

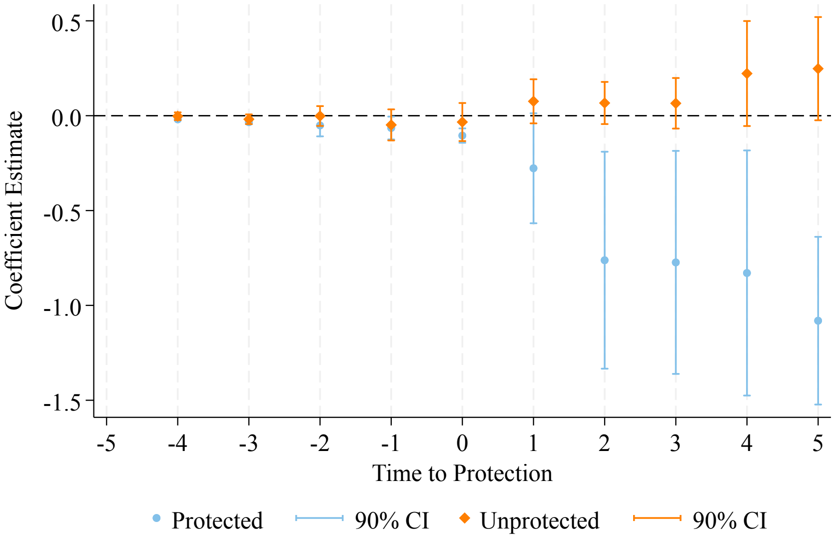


Figure 9. Land Value Effects over Time from Difference-in-Differences Style Analyses

This figure depicts the value effects of biodiversity protections derived from estimating an alternative version of Eq. (3), replacing the area-by-year fixed effects with simple area fixed effects, in the balanced Corelogic vacant land panel, including parcels within 31.8M of protected area borders. *Time to Protection* represents the difference between the observation year and the year when the nearest protected area border is established. The blue circles (respectively, orange diamonds) represent the coefficient estimates on the interaction term *Protected # Post* (on the term *Post*) from an estimation containing observations from three years prior to protected area formation and one additional period. This additional period contains, in turn, observations from two years before to three years after protected area formation. Thus, each coefficient estimate represents the marginal change in land values of protected (respectively, unprotected) parcels in a given year relative to three years prior to protected area formation. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic and the USGS.

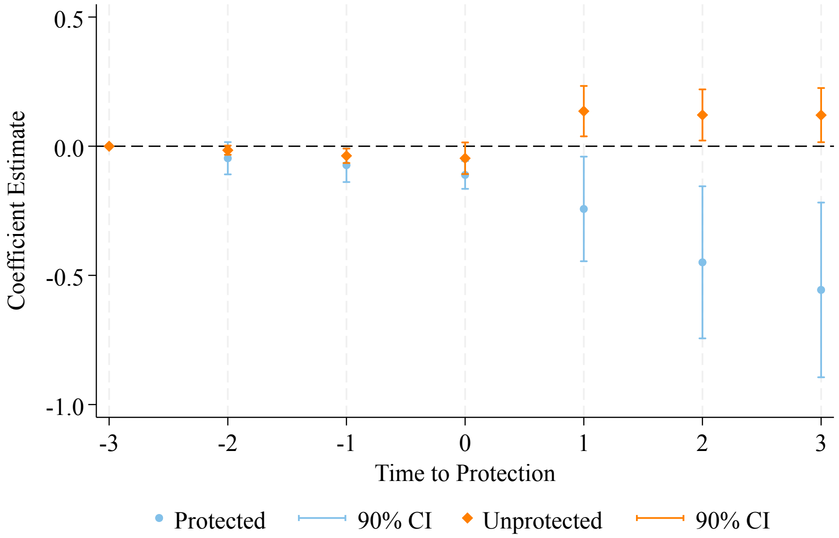


Figure 10. Development Effects by Protected Area Formation Year

This figure depicts the long-run development effects of biodiversity protections derived from estimating Eq. (6) by protected area formation year in the sample behind the results reported in column 1 of Table 11. *Protected Area Formation Year* denotes the year of protected area formation in ten-year increments. The blue circles indicate the coefficient estimates on the term *Protected*. The capped bars indicate 90% confidence intervals around the coefficient estimates. The data used to produce this figure are from Corelogic, the NLCD, and the USGS.

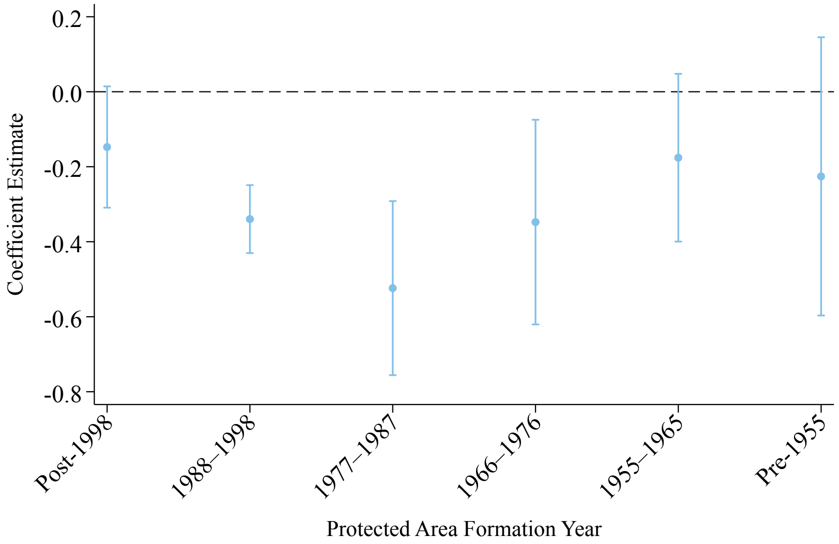


Table 1. Descriptive Statistics Protected Areas

This table presents descriptive statistics on the protected areas in the U.S. formed since 2010 with GAP status code 1 or 2. Column 1 presents descriptive statistics on all of these protected areas. Column 2 (respectively, column 3) presents descriptive statistics on the sub-set of protected areas formed through easements (non-easements). *Area Size* is protected area size in acres. *Year Established* is the year in which the protected area was formed. *Easement* is an indicator that takes the value of one if the protected area is formed through an easement. *Private* is an indicator that takes the value of one if the land in the protected area is privately owned. *GAP Status 1* (*GAP Status 2*) is an indicator that takes the value of one if the protected area is classified as GAP status code 1 (respectively, 2). Protected area characteristics are from the PAD-US. *Developed* is an indicator that takes the value of one if preexisting land cover in the protected area is classified as developed. Correspondingly, *Planted*, *Forest*, *Herb*, *Shrub*, and *Water/Wetlands* capture the classification of the preexisting land cover in the protected area as planted, forest, herbaceous, shrub land, and water/wetlands. We measure preexisting land cover using the available historical versions of the NLCD data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders.

	(1) All		(2) Easements		(3) Non-Easements	
	Mean	Median	Mean	Median	Mean	Median
Area Size	95.65	46.00	94.77	48.00	98.07	40.00
Year Established	2014	2014	2014	2013	2015	2015
Easement	0.73	1.00	1.00	1.00	0.00	0.00
Private	0.67	1.00	0.90	1.00	0.02	0.00
GAP Status 1	0.11	0.00	0.09	0.00	0.17	0.00
GAP Status 2	0.89	1.00	0.91	1.00	0.83	1.00
Developed	0.05	0.00	0.04	0.00	0.07	0.02
Planted	0.30	0.09	0.37	0.29	0.09	0.00
Forest	0.35	0.17	0.28	0.07	0.54	0.62
Herb	0.03	0.00	0.04	0.00	0.02	0.00
Shrub	0.02	0.00	0.02	0.00	0.03	0.00
Water/Wetlands	0.25	0.11	0.26	0.13	0.23	0.05
Observations	15,060		11,041		4,019	

Table 2. Descriptive Statistics Sample Parcels

This table presents descriptive statistics on the parcels in our main estimation samples over the 2010–2024 period. Column 1 (respectively, column 2) presents descriptive statistics on the full (balanced) Corelogic vacant land panel. *Value/Acre* is the calculated value per acre of vacant land in $'000. *Parcel Size* is the size of the parcel in acres. *Area Size* is the size of the closest protected area in acres. *Distance* is the distance of a parcel to the closest protected area border in meters. *No. Protected* (respectively, *No. Unprotected*) is the number of protected (unprotected) parcels around the border of the closest protected area. For protected parcels, the closest protected area is the one containing the parcel. For unprotected parcels, this term refers to the closest surrounding protected area with GAP status 1 or 2 in the same state.

	(1) Full Panel			(2) Balanced Panel		
	Mean	Median	SD	Mean	Median	SD
Value/Acre	46.88	6.73	115.13	29.71	4.84	64.73
Parcel Size	17.63	1.08	278.81	35.81	5.02	101.23
Area Size	887.86	75.00	2544.06	613.35	124.00	1391.43
Distance	282.20	288.84	134.15	242.95	230.74	140.04
No. Protected	0.99	0.00	2.60	2.59	1.00	2.93
No. Unprotected	101.86	24.00	241.80	14.96	12.00	12.86
Observations	343,999			16,105		

Table 3. Land Cover Prior to Protected Area Formation

This table presents output from estimating Eq. (1). The estimation sample is the cross-section of land observed prior to protected area formation. Each observation refers to a cell in a 0.25-acre grid within 100M around (future) protected area borders. The dependent variable in column 1 is *Developed*, an indicator that takes the value of one if the land cover for a cell, measured at its centroid, is classified as developed in the National Land Cover Database (NLCD). The dependent variables in columns 2 to 6 are *Planted*, *Forest*, *Herb*, *Shrub*, and *Water/Wet*, respectively, which capture the NLCD classification of the land cover for a cell centroid as planted, forest, herbaceous, shrub land, and water/wetlands. *Protected* is an indicator that takes the value of one for cells whose centroids are located where a protected area with GAP status 1 or 2 is later formed. *Distance* is the distance from a cell centroid to the nearest protected area border in KM. For protected cells, this variable measures the distance from the cell centroid to the nearest border of the protected area containing the cell. For unprotected cells, this variable measures the distance from the cell centroid to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. Time to Protection indicates that the estimations are limited to land cover observations from four to six years prior to protected area formation, based on the available historical versions of the NLCD. Excluded indicates which types of land cover are dropped from the estimation (if any). The mean of the dependent variable is reported in decimal form. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Developed	(2) Planted	(3) Forest	(4) Herb	(5) Shrub	(6) Water/Wet
Protected	-0.029***	-0.006***	-0.001	0.000	0.000	0.002
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Distance	-0.002***	0.001***	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Protected # *Distance*	-0.004***	0.001***	-0.000***	0.000	-0.000*	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.1 KM	0.1 KM	0.1 KM	0.1 KM	0.1 KM	0.1 KM
Distance Covariates	Cubic	Cubic	Cubic	Cubic	Cubic	Cubic
Time to Protection	4-6 Yrs. Pre.	4-6 Yrs. Pre.	4-6 Yrs. Pre.	4-6 Yrs. Pre.	4-6 Yrs. Pre.	4-6 Yrs. Pre.
Excluded	None	Dev.	Dev. + Plant.	Dev. + Plant.	Dev. + Plant.	Dev. + Plant.
Mean Dep. Var.	0.06	0.34	0.33	0.15	0.13	0.38
No. Areas	12,376	12,146	11,968	11,968	11,968	11,968
Observations	8,161,040	7,711,267	5,122,720	5,122,720	5,122,720	5,122,720
R-sq.	0.15	0.45	0.63	0.62	0.59	0.66

Table 4. Land Values Prior to Protected Area Formation

This table presents output from estimating Eq. (1). Columns 1 and 2 (columns 3 and 4, respectively) show the results from estimating this equation in the full (balanced) Corelogic vacant land panel. Across all columns, the dependent variable is the value per acre of vacant land in $'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a (future) protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. Time to Protection indicates that the estimations are limited to land values observed in a given year prior to protected area formation. The mean of the dependent variable is reported in $'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre
Protected	0.135	0.114	0.223	0.207
	(0.434)	(0.383)	(0.353)	(0.355)
Distance	0.615***	0.618***	0.140	0.157
	(0.207)	(0.176)	(0.533)	(0.526)
Protected # Distance	-5.447	-5.490*	-6.291***	-6.144***
	(3.315)	(2.891)	(2.212)	(2.226)
Area FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear
Sample	Full	Full	Balanced	Balanced
Time to Protection	5 Yrs. Pre.	3 Yrs. Pre.	5 Yrs. Pre.	3 Yrs. Pre.
Mean Dep. Var.	54.80	46.45	28.74	26.88
No. Areas	1,078	1,544	120	133
Observations	13,605	18,753	1,135	1,198
Pseudo R-sq.	0.71	0.71	0.71	0.71

Table 5. Biodiversity Protections and Land Values

This table presents output from estimating Eq. (2). Columns 1 and 2 (columns 3 and 4, respectively) show the results from estimating this equation in the full (balanced) Corelogic vacant land panel. Across all columns, the dependent variable is the value per acre of vacant land in \$'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a (future) protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. *Post* is an indicator that takes the value of one starting when the closest protected area is formed. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in \$'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre
Protected # Post	-0.693***	-0.824**	-0.688**	-0.875**
	(0.258)	(0.416)	(0.293)	(0.419)
Post # Distance	-0.107	0.590**	-0.186	-0.339
	(0.072)	(0.271)	(0.120)	(0.562)
Protected # Post # Distance	2.240*	3.968	2.414*	4.761
	(1.238)	(2.922)	(1.440)	(3.343)
Parcel, Area-Year FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.2 KM	0.5 KM	0.2 KM
Distance Covariates	Linear	Linear	Linear	Linear
Sample	Full	Full	Balanced	Balanced
Mean Dep. Var.	47.59	45.66	30.43	28.54
No. Areas	2,838	1,641	139	102
Observations	337,547	99,150	15,668	6,249
Pseudo R-sq.	0.96	0.96	0.95	0.95

Table 6. Heterogeneity by Location Type

This table presents output from estimating Eq. (2). Columns 1 and 2 (columns 3 and 4, respectively) show the results from estimating this equation in the full (balanced) Corelogic vacant land panel. In odd (even) columns, we restrict the estimation to observations from high-development (low-development) locations. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is in the top quartile (below the top quartile) of the sample distribution. We measure the extent of preexisting development using the available historical versions of the NLCD land cover data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders. Across all columns, the dependent variable is the value per acre of vacant land in $'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a (future) protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. *Post* is an indicator that takes the value of one starting when the closest protected area is formed. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in $'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre
Protected # Post	-1.389***	-0.221**	-1.201***	0.015
	(0.386)	(0.104)	(0.324)	(0.097)
Post # Distance	-0.078	-0.146	-0.432***	0.082
	(0.097)	(0.105)	(0.156)	(0.091)
Protected # Post # Distance	7.720***	-0.038	6.960***	-0.676
	(2.279)	(0.476)	(1.838)	(0.657)
Parcel, Area-Year FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear
Sample	Full	Full	Balanced	Balanced
Location Type	High Dev.	Low Dev.	High Dev.	Low Dev.
Mean Dep. Var.	104.98	29.69	54.32	23.06
No. Areas	291	2,547	25	114
Observations	80,283	257,264	3,690	11,978
Pseudo R-sq.	0.95	0.95	0.95	0.94

Table 7. Difference-in-Differences Style Analyses

This table presents output from estimating Eq. (3) in the balanced Corelogic vacant land panel (including parcels within 31.8M of protected area borders). Columns 1 and 2 show the results across all location types. Columns 3 and 4 (columns 5 and 6) show results from the sub-sample of high-development (low-development) locations. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is in the top quartile (below the top quartile) of the sample distribution. We measure the extent of preexisting development using the available historical versions of the NLCD land cover data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders. Odd (even) columns show the results from samples restricted to parcels within 100M (between 100 and 500M) of protected area borders. Across all columns, the dependent variable is the value per acre of vacant land in $'000, winsorized at the 1^{st} and 99^{th} percentiles. *Protected* is an indicator that takes the value of one if the parcel is located inside a (future) protected area. *Post* is an indicator that takes the value of one starting when the closest protected area is formed. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. The mean of the dependent variable is reported in $'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre	(5) Value/Acre	(6) Value/Acre
Protected # Post	-0.687**	0.038	-1.007**	0.172	-0.025	0.004
	(0.339)	(0.072)	(0.452)	(0.155)	(0.025)	(0.074)
Parcel, Area-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.1 KM	(0.1,0.5) KM	0.1 KM	(0.1,0.5) KM	0.1 KM	(0.1,0.5) KM
Location Type	All Dev.	All Dev.	High Dev.	High Dev.	Low Dev.	Low Dev.
Mean Dep. Var.	41.23	45.92	107.24	108.05	17.61	26.01
No. Areas	95	154	20	28	75	126
Observations	4,744	15,337	1,250	3,723	3,494	11,614
Pseudo R-sq.	0.96	0.96	0.96	0.96	0.92	0.94

Table 8. Expanded Sample Tests

This table presents output from estimating Eq. (4) in the expanded sample of vacant land described in Section 5.2. Columns 1 and 2 (columns 3 and 4, respectively) show the results from restricting this estimation to parcels located around the borders of easement areas (non-easement areas). Across all columns, the dependent variable is the value per acre of vacant land in $'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. *Acres* is the size of the land in acres. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in $'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(5) Value/Acre
Protected	-1.028***	-0.783***	-0.609***	-0.596***
	(0.213)	(0.207)	(0.142)	(0.132)
Distance	0.358	0.358	0.125	0.552
	(0.266)	(0.709)	(0.141)	(0.369)
Protected # Distance	1.431	-1.850	-0.774	-0.744
	(2.379)	(2.389)	(0.550)	(1.137)
Protected # Acres	0.046***	0.069***	0.072***	0.087***
	(0.009)	(0.013)	(0.009)	(0.016)
Acres	-0.058***	-0.084***	-0.084***	-0.102***
	(0.008)	(0.013)	(0.009)	(0.013)
Area FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.2 KM	0.5 KM	0.2 KM
Distance Covariates	Linear	Linear	Linear	Linear
Protected Area Type	Easements	Easements	Non-Easements	Non-Easements
Mean Dep. Var.	27.58	27.76	51.07	49.18
No. Areas	1,594	1,240	4,057	3,376
Observations	15,873	6,656	111,360	47,703
Pseudo R-sq.	0.80	0.84	0.67	0.70

Table 9. Biodiversity Protections and Transaction Prices

This table presents output from estimating Eq. (5) in the sample of vacant land transactions described in Section 5.3. Columns 1 and 2 (columns 3 and 4, respectively) show the results from restricting this estimation to parcels located around the borders of easement areas (non-easement areas). Across all columns, the dependent variable is the price per acre of vacant land in $'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. *Acres* is the size of the land in acres. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in $'000. Transaction prices per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Price/Acre	(2) Price/Acre	(3) Price/Acre	(4) Price/Acre
Protected	-1.070***	-0.997**	-0.444**	-0.451**
	(0.406)	(0.413)	(0.220)	(0.197)
Distance	0.227	-1.153	0.081	0.501
	(0.290)	(1.030)	(0.096)	(0.324)
Protected # Distance	0.724	0.426	0.704	0.234
	(1.982)	(2.309)	(0.650)	(1.260)
Protected # Acres	0.108***	0.176***	0.126***	0.177***
	(0.021)	(0.028)	(0.037)	(0.033)
Acres	-0.160***	-0.232***	-0.176***	-0.276***
	(0.018)	(0.026)	(0.030)	(0.028)
Area FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.2 KM	0.5 KM	0.2 KM
Distance Covariates	Linear	Linear	Linear	Linear
Protected Area Type	Easements	Easements	Non-Easements	Non-Easements
Mean Dep. Var.	465.79	438.63	662.78	616.60
No. Areas	4,811	1,979	9,984	5,036
Observations	28,770	8,913	100,651	34,860
Pseudo R-sq.	0.76	0.79	0.71	0.76

Table 10. Biodiversity Protections and Land Development

This table presents output from estimating Eq. (6) in the cross-sections extracted from the full and balanced Corelogic vacant land panels as outlined in Section 6.1. Columns 1 and 2 (columns 3 and 4) present the results for the cross-section extracted from the full (balanced) Corelogic vacant land panel. In odd (even) columns, we restrict the estimation to observations from high-development (low-development) locations. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is in the top quartile (below the top quartile) of the sample distribution. We measure the extent of preexisting development using the available historical versions of the NLCD land cover data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders. Across all columns, the dependent variable is *Developed*, an indicator that takes the value of one if the land cover of parcel i near the border of protected area j is classified as developed or planted at within five years of protected area formation. *Protected* is an indicator that takes the value of one if parcel i is located inside protected area j. *Distance* is the distance between parcel i and the border of protected area j. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in decimal form. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Developed	(2) Developed	(3) Developed	(4) Developed
Protected	-0.058**	-0.009	-0.056	-0.018
	(0.028)	(0.019)	(0.047)	(0.024)
Distance	0.156**	0.043**	-0.049	-0.031
	(0.064)	(0.018)	(0.137)	(0.037)
Protected # Distance	0.040	0.066	0.149	0.168
	(0.176)	(0.096)	(0.199)	(0.135)
Area FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear
Sample	Full	Full	Balanced	Balanced
Location Type	High Dev.	Low Dev.	High Dev.	Low Dev.
Mean Dep. Var.	0.06	0.03	0.04	0.02
No. Areas	137	769	25	112
Observations	1,167	6,103	275	939
R-sq.	0.01	0.09	-0.02	0.04

Table 11. Development Effects in the Long Run

This table presents output from estimating Eq. (6). The estimation sample is the cross-section of land observed around the borders of protected areas established before 2001. Each observation refers to a cell in a 500M×500M grid around these protected area borders. Columns 1 and 2 present the results for the cross-section of land observed around the borders of all protected areas established before 2001. Columns 3 and 4 (columns 5 and 6) present the results for the cross-section of land observed around the borders of easement (non-easement) areas established before 2001. The dependent variable in odd columns is Δ *Developed*, which takes the value of 100 if land cover at the cell centroid is classified as developed in 2021 but not developed in 2001. This variable takes the value of -100 if land cover at the cell centroid is classified as not developed in 2021 but as developed in 2001. It takes the value of zero if there is no change in land cover classification as developed between 2001 and 2021. Land cover classifications are based on the National Land Cover Database (NLCD). The dependent variable in even columns is Δ *Planted*, defined analogously to Δ *Developed*. *Protected* is an indicator that takes the value of one for cells whose centroids are located inside a protected area with GAP status 1 or 2. *Distance* is the distance from a cell centroid to the nearest protected area border in KM. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable is reported in decimal form. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Δ Dev.	(2) Δ Plant.	(3) Δ Dev.	(4) Δ Plant.	(5) Δ Dev.	(6) Δ Plant.
Protected	-0.312***	-0.278**	-0.268***	-0.408	-0.335***	-0.080
	(0.042)	(0.117)	(0.065)	(0.278)	(0.059)	(0.099)
Distance	0.000***	0.000	0.000***	0.000	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Protected # Distance	0.000	-0.005***	0.000	-0.011***	0.000	-0.002**
	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)
Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear	Linear	Linear
Protected Area Type	All	All	Easements	Easements	Non-Easements	Non-Easements
Mean Dep. Var.	0.33	-0.26	0.39	-0.80	0.32	-0.13
No. Areas	29,187	29,187	13,231	13,231	15,956	15,956
Observations	785,747	785,747	153,881	153,881	631,866	631,866
R-sq.	0.09	0.06	0.12	0.04	0.08	0.04

Table 12. Development Effects in the Long Run by Location Type

This table presents output from replicating the estimations in Table 11 by location type. In Panel A (Panel B), we restrict the estimation to observations from high-development (low-development) locations. We classify locations as high-development (low-development) if the extent of development in 2001 is in the top quartile (below the top quartile) of the sample distribution. All other variables and notation are as in Table 11. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

(A) High-Development Locations

	(1) Δ Dev.	(2) Δ Plant.	(3) Δ Dev.	(4) Δ Plant.	(5) Δ Dev.	(6) Δ Plant.
Protected	-0.469***	0.023	-0.415**	-0.112	-0.493***	0.100
	(0.099)	(0.159)	(0.166)	(0.411)	(0.124)	(0.147)
Distance	0.001***	-0.000*	0.001**	0.000	0.001***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Protected # Distance	-0.001**	-0.004**	0.000	-0.009**	-0.002***	-0.001
	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)	(0.001)
Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear	Linear	Linear
Protected Area Type	All	All	Easements	Easements	Non-Easements	Non-Easements
Mean Dep. Var.	0.93	-0.63	0.9	-0.93	0.94	-0.55
No. Areas	11,247	11,247	4,481	4,481	6,766	6,766
Observations	196,303	196,303	44,349	44,349	151,954	151,954
R-sq.	0.06	0.04	0.09	0.03	0.06	0.03

Table 12. Development Effects in the Long Run by Location Type (Ctd.)

(B) Low-Development Locations

	(1) Δ Developed	(2) Δ Plant	(3) Δ Developed	(4) Δ Plant	(5) Δ Developed	(6) Δ Plant
Protected	-0.134***	-0.537***	-0.194***	-0.556	-0.074*	-0.310**
	(0.034)	(0.157)	(0.061)	(0.353)	(0.041)	(0.132)
Distance	0.000***	0.000	0.000*	0.000	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Protected # Distance	0.000	-0.005***	0.000*	-0.011***	0.000	-0.001*
	(0.000)	(0.001)	(0.000)	(0.003)	(0.000)	(0.001)
Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear	Linear	Linear
Protected Area Type	All	All	Easements	Easements	Non-Easements	Non-Easements
Mean Dep. Var.	0.13	-0.14	0.18	-0.74	0.12	0.00
No. Areas	17,939	17,939	8,750	8,750	9,189	9,189
Observations	589,137	589,137	109,532	109,532	479,605	479,605
R-sq.	0.10	0.06	0.15	0.05	0.08	0.05

ONLINE APPENDIX

Appendix A Appendix Tables

Table A.1. Outline of Sample Construction

This table presents an outline of how we construct the full Corelogic vacant land panel and the balanced panel starting with all protected areas formed in the U.S. since 2010. Panel A outlines the sample construction from all protected areas in the U.S. to the full Corelogic vacant land panel. Panel B outlines the sample construction from the full Corelogic vacant land panel to the balanced panel. Panel C outlines the additional sample selection criteria we apply in the balanced panel along with the resulting numbers of protected areas remaining in the sample.

(A) PAD-U.S. to Full Corelogic Vacant Land Panel

	N	Pct.
All Protected Areas in contiguous U.S. with GAP Status 1 or 2 established since 2010	16,350	100%
Observe protection mechanism (fee vs. easement), land ownership (private vs. public), land cover (from NLCD), (non-zero) size	15,060	92%
Focus on Easements	11,041	68%
Merge with Corelogic vacant land panel (parcels within 500M of protected area borders and observed between -10 and +5 years of protected area formation)	3,764	23%

(B) Full Corelogic Vacant Land Panel to Balanced Panel

	N	Pct.
Areas in full Corelogic vacant land panel 2010 onward	3,764	100%
Focus on areas with vacant/undeveloped land as of five years prior to protected area formation (i.e., not developed or planted according to the NLCD and indicated as vacant according to Corelogic)	1,265	34%
Focus on areas where we can observe outcomes five years after protected area formation	257	7%

(C) Additional Selection Criteria in Balanced Panel

	N	Pct.
Balanced panel -5/+5 years around protected area formation	257	100%
Apply additional sample selection criteria (exclude land with significant changes in size, etc.)	174	68%

Table A.2. Additional Descriptive Statistics Sample Parcels

This table presents additional descriptive statistics on the parcels in our main estimation samples over the 2010–2024 period. Column 1 (respectively, column 2) presents descriptive statistics on the full (balanced) Corelogic vacant land panel. *Year Established* is the year in which the protected area was formed. *Easement* is an indicator that takes the value of one if the protected area is formed through an easement. *Private* is an indicator that takes the value of one if the land in the protected area is privately owned. *GAP Status 1* (*GAP Status 2*) is an indicator that takes the value of one if the protected area is classified as GAP status code 1 (respectively, 2). Protected area characteristics are from the PAD-US. *Metro Area* is an indicator that takes the value of one if the parcel is located in a metropolitan statistical area (as opposed to a micropolitan statistical area or a rural area). *Developed* is an indicator that takes the value of one if preexisting land cover in the protected area is classified as developed. Correspondingly, *Planted*, *Forest*, *Herb*, *Shrub*, and *Water/Wetlands* capture the classification of the preexisting land cover in the protected area as planted, forest, herbaceous, shrub land, and water/wetlands. We measure preexisting land cover using the available historical versions of the NLCD data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders.

	(1) Full Panel			(2) Balanced Panel		
	Mean	Median	SD	Mean	Median	SD
Year Established	2016	2016	3.63	2019	2019	2.62
Easement	1.00	1.00	0.00	1.00	1.00	0.00
Private	0.69	1.00	0.46	0.68	1.00	0.46
GAP Status 1	0.20	0.00	0.40	0.25	0.00	0.43
GAP Status 2	0.80	1.00	0.40	0.75	1.00	0.43
Metro Area	0.65	1.00	0.48	0.64	1.00	0.48
Developed	0.10	0.03	0.20	0.03	0.03	0.03
Planted	0.28	0.11	0.33	0.10	0.00	0.20
Forest	0.35	0.25	0.34	0.55	0.62	0.37
Herb	0.03	0.00	0.10	0.01	0.00	0.05
Shrub	0.02	0.00	0.09	0.03	0.00	0.13
Water/Wetlands	0.23	0.08	0.29	0.27	0.08	0.33
Observations	318,280			12,984		

Table A.3. Robustness Tests

This table presents output from estimating Eq. (2) in the restricted samples outlined in Section 4. Across all columns, the dependent variable is the value per acre of vacant land in \$'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a (future) protected area. *Distance* is the distance of a parcel to the closest protected area border. For protected parcels, this variable measures the distance to the nearest border of the protected area containing the parcel. For unprotected parcels, this variable measures the distance to the nearest border of the surrounding protected area with GAP status 1 or 2 in the same state. *Post* is an indicator that takes the value of one starting when the closest protected area is formed. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. Linear, squared, and up to cubic covariates for *Distance* are included as indicated. The mean of the dependent variable in each estimation is reported in \$'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre	(5) Value/Acre
Protected # Post	-0.743***	-0.957***	-0.823**	-1.067**	-0.694***
	(0.287)	(0.327)	(0.328)	(0.519)	(0.259)
Post # Distance	-0.101	-0.111	-0.059	-0.162	-0.109
	(0.072)	(0.074)	(0.088)	(0.139)	(0.073)
Protected # Post # Distance	2.237	2.462*	2.539	3.358	2.242*
	(1.379)	(1.469)	(1.699)	(2.912)	(1.239)
Protected # Post # Distance # Tax Rate				-1.177	
				(1.761)	
Parcel, Area-Year FEs	Yes	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.5 KM	0.5 KM	0.5 KM
Distance Covariates	Linear	Linear	Linear	Linear	Linear
Robustness Test	No Joint Own.	No Large Parcels	No High Tax	Full	No Crit. Hab.
Mean Dep. Var.	48.67	68.81	63.53	49.56	48.30
No. Areas	2,815	1,522	1,290	2,557	2,813
Observations	328,794	226,785	153,606	306,774	329,235
Pseudo R-sq.	0.96	0.95	0.96	0.96	0.96

Table A.4. Spatial Regression Discontinuity-Style Analyses

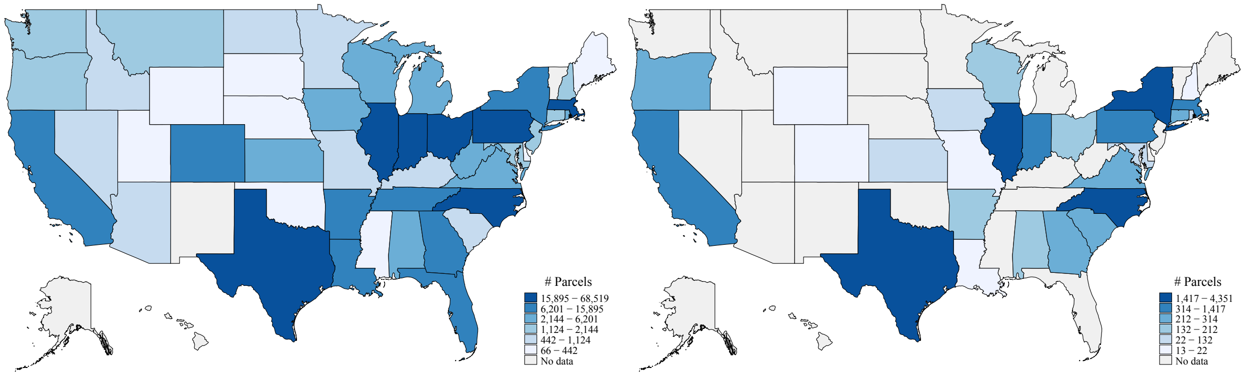
This table presents output from estimating Eq. (4) in the full Corelogic vacant land panel, restricted to observations occurring after protected area formation. Across all columns, the dependent variable is the value per acre of vacant land in $'000. *Protected* is an indicator that takes the value of one if the parcel is located inside a protected area. *Distance* is the distance of a parcel to the closest protected area border. Fixed effects are included as indicated. Sample restrictions by bandwidth around protected area borders are applied as indicated. The mean of the dependent variable in each estimation is reported in $'000. Land values per acre are winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors, clustered by protected area, are shown in parentheses. Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Value/Acre	(2) Value/Acre	(3) Value/Acre	(4) Value/Acre
Protected	-0.887***	-1.141***	-0.590**	-0.748***
	(0.255)	(0.251)	(0.294)	(0.288)
Distance	0.306*	0.257	0.310	0.256
	(0.185)	(0.185)	(1.212)	(1.220)
Protected # Distance	-2.898***	-2.526	-4.417*	-4.365*
	(0.967)	(1.563)	(2.258)	(2.461)
Acres		-0.084***		-0.121***
		(0.007)		(0.014)
Protected # Acres		0.075***		0.104***
		(0.009)		(0.016)
Area-Year FEs	Yes	Yes	Yes	Yes
Bandwidth	0.5 KM	0.5 KM	0.2 KM	0.2 KM
Distance Covariates	Linear	Linear	Linear	Linear
Sample	Post-Form.	Post-Form.	Post-Form.	Post-Form.
Mean Dep. Var.	43.46	43.46	43.63	43.63
No. Areas	2,871	2,871	1,663	1,663
Observations	195,289	195,289	58,372	58,372
Pseudo R-sq.	0.75	0.77	0.81	0.83

Appendix B Appendix Figures

Figure B.1. Distribution of Parcels by State

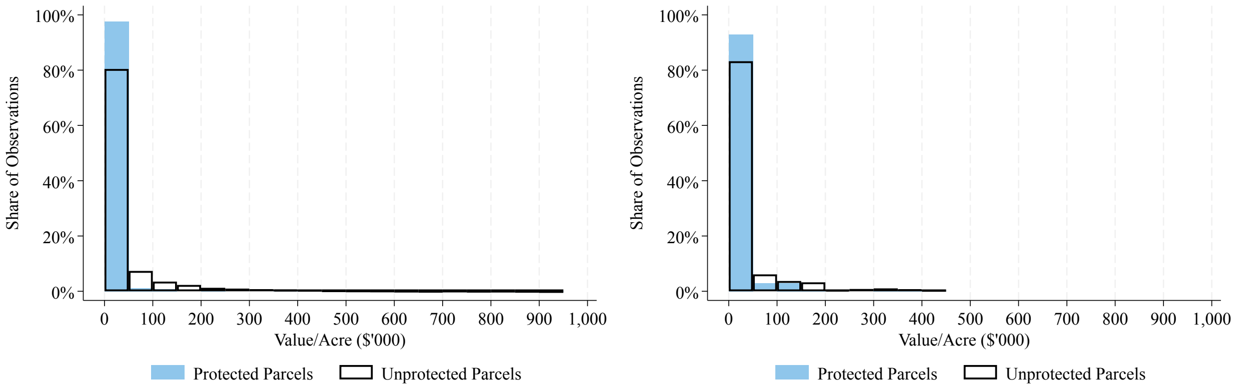
This figure depicts the distribution of parcels in our main estimation samples over the 2010–2024 period, by U.S. state. Panel A (respectively, Panel B) presents this distribution in the full (balanced) Corelogic vacant land panel. The data used to produce this figure are from Corelogic and the USGS.



(A) Full Panel **(B)** Balanced Panel

Figure B.2. Distribution of Land Values

This figure depicts the distribution of land values in our main estimation samples over the 2010–2024 period. Panel A (respectively, Panel B) presents this distribution in the full (balanced) Corelogic vacant land panel. The data used to produce this figure are from Corelogic and the USGS.

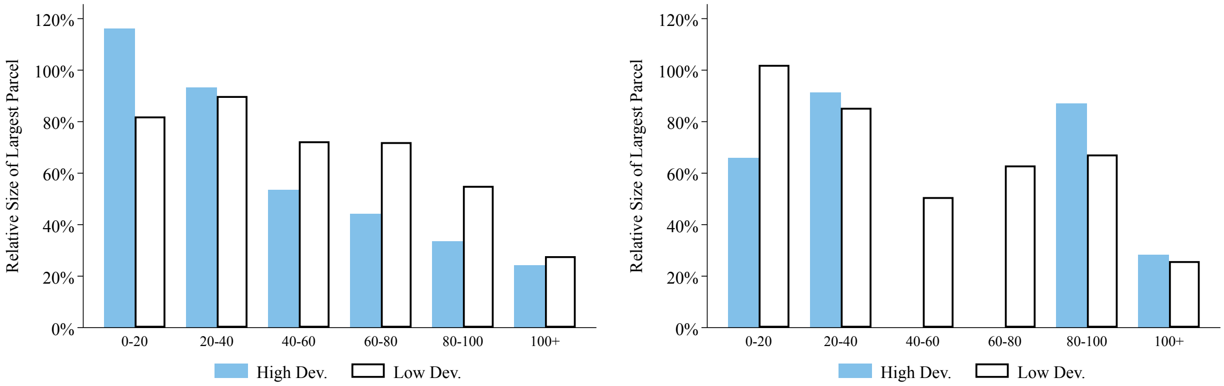


(A) Full Panel

(B) Balanced Panel

Figure B.3. Distribution of Parcel vs. Easement Area Size

This figure depicts the distribution of size of the largest protected parcel in an easement area, relative to the size of the easement area, in our main estimation samples over the 2010–2024 period, by easement area size band, across easement areas with high versus low preexisting development. Panel A (respectively, Panel B) presents this distribution in the full (balanced) Corelogic vacant land panel. The relative size of the largest parcel can exceed 100% when the easement covers only part of the parcel. The data used to produce this figure are from Corelogic and the USGS.



(A) Full Panel **(B)** Balanced Panel

Figure B.4. Protected Areas and Critical Habitat in the U.S.

This figure depicts the spatial distribution of biodiversity-protected areas and federally designated critical habitats in the contiguous United States. Dark green shading indicates areas with permanent biodiversity protections in place (those with GAP status codes 1 and 2), while brown shading represents areas designated as critical habitat for threatened and endangered species under the U.S. Endangered Species Act. The data used to produce this figure are from the USGS and the U.S. Fish and Wildlife Service.

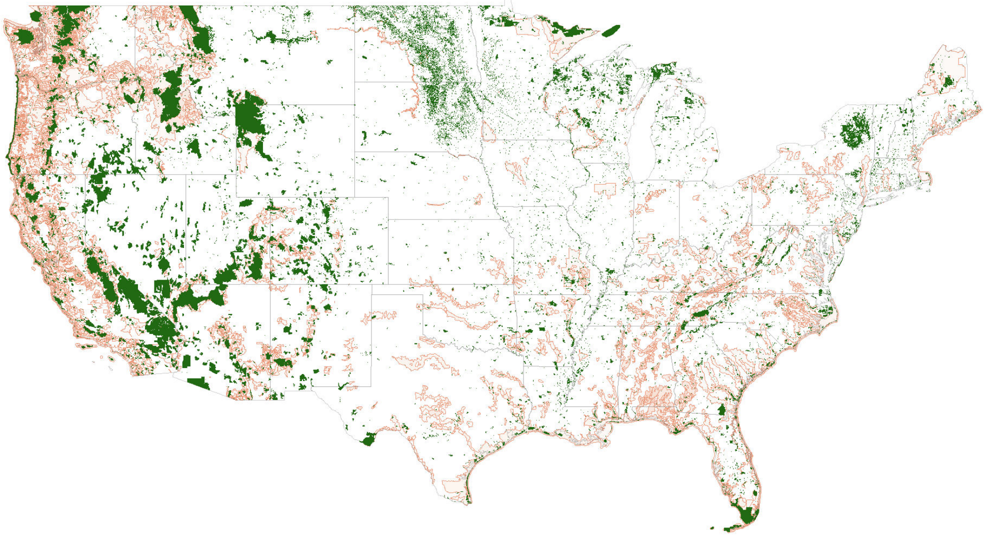


Figure B.5. Distribution of Protected Area Size by Location Type

This figure depicts the distribution of protected area size in acres in the full Corelogic vacant land panel over the 2010–2024 period by location type. We classify locations as high-development (low-development) if the extent of preexisting development prior to protected area formation is above (below) the sample median. We measure preexisting development using the available historical versions of the NLCD data as of four to six years prior to protected area formation. Land cover classifications are extracted from a 0.25 acre grid in a 100M bandwidth around protected area borders. The data used to produce this figure are from Corelogic, the NLCD, and the USGS.