Online Appendix

A Additional Results

A.1 Estimating Changes in Transaction Counts

In the main text, we plotted raw data on the mean number of transactions around the protected area border, before and after proposed rules for listing and/or designation (see Figure 5). Here, we examine in more detail how the volume of transactions changes around the border. In Figure A1, we present spatial DD results that use either the transaction rate or a dummy for nonzero transactions. In both cases, the unit of observation is the ZCTA, and we aggregate transactions at the quarterly level. We define the transaction rate as the number of transactions in a given ZCTA-year-quarter, normalized by the mean number of transactions in the ZCTA for two years before the proposed listing date. The transaction rate captures changes in the intensive margin, relative to the local baseline volume of transactions. In contrast, the dummy for nonzero transactions captures the extensive margin regarding construction and land market activity.

We observe higher transaction rates around the border of SHs, on both sides of the border. However, we observe a higher likelihood of nonzero transactions outside of the border or right inside of it within the first distance bin. Right outside, the likelihood of more than zero transactions in a ZCTA-year-quarter is about 0.05 percentage points higher, reflecting a 20 percent increase relative to the mean. These results do not change meaningfully if we allow the sample to span four or 10 years around the proposed listing rule, but the relative effect size shrinks by about half as the mean value of the nonzero transaction dummy doubles from 0.025 to 0.052. For critical habitats (CHs), we observe higher transaction rates and a higher likelihood of nonzero transactions in the 0–4km outside. Right outside, we observe transaction rates that are higher by a value of five, relative to a mean transaction rate of about 45. Inside, those transaction rates drop by 5. Similarly, we observe slight increases in

the likelihood of nonzero transactions outside the CHs but sharp drops inside the CHs. The results for CHs are more precisely estimated in the shorter four-year window but qualitatively similar in the 10-year sample.

A.2 Robustness Checks for Main Estimation Samples & Specifications

We present a series of figures where we replicate the main analysis we summarize in Figure 6. In each subsequent figure, we make changes to the sample, specification, or pre- or posttreatment definition. Each change is meant to address a potential concern or test for the sensitivity of the results to changes in the baseline choices we report in the main text.

A.2.1 Variations to the Treatment Onset Events

We begin by changing the pretreatment definer to allow for earlier treatment onset. Instead of using the proposed listing rule, as we do in the main text, we define the end of the pretreatment period as the earliest of the petition to list a species (if a petition was submitted), a lawsuit against the FWS that challenges a decision not to list a species (if such a lawsuit was filed), and the proposed listing rule. We refer to the earliest of these three potential events as the "first ESA event." We keep the posttreatment event as either the proposed listing rule (SHs) or the proposed designation rule (CHs).

In Figure A2, we observe that prices around the SH border respond earlier, with a 2.5 percent drop, on average, in the sale price inside, following the first ESA event (Figure A2a). This negative effect on prices is more precisely estimated than what we report in Figure 6a. However, we do not observe the same precisely estimated negative effect for SH in the spatial DD regressions (Panels c and e), especially when we allow the sample to extend to five years before and after each event. For CHs, the estimation is much noisier, but we observe the same key pattern as before: sale prices increasing right outside the border.

Years can elapse between petitions and proposed listing rules. In Figure A3, we modify

the first ESA event to focus on either a lawsuit or proposed listing rule but do not allow petitions to count as a treatment onset event. The only meaningful difference we observe is for SHs: larger and more precisely estimated reduction in the sale price inside in both the staggered and spatial DD. We further test how lawsuits might affect the sale price by reporting estimation results only for the species that had an action-forcing-lawsuit before their proposed listing rule. This is a small subset of species (e.g., only 26 species in the SHs case relative to 173 species in the full sample). In Figure A4, we report that prices around the border of the SH begin to drop right after the lawsuit, by as much as 5 percent. The sample size is much smaller in the case of CHs, making the estimation results too noisy to interpret meaningfully.

In the main text, we use the proposed listing or proposed designation as the post-treatment onset event. In Figure A5, we use the final listing for both the SHs and CHs as the posttreatment onset event. We find similar results as those in Figure 6.

To allow for easier comparison of the species and CHs results, we also produce a set of results for CHs where the pretreatment and posttreatment defining events are both the proposed listing rule—the same as for SHs in the main text. In Figure A6, we first plot the set of results for the staggered and spatial DD using the four-year time window and then for the spatial DD using the 10-year time window. We observe a similar increase in sale prices outside of the CHs when we include transactions that occur up to five years after the proposed listing rule, albeit with less precisely estimated increases. In some cases, the proposed listing rule and the proposed designation rule have the same date. Other cases have considerable delays (in years) between the two. In an additional set of results, we repeat this estimation but only for species that had at least two or five years between the proposed listing and designation rules. The results in the four-year sample remain noisy and hard to interpret, but in the 10-year sample, we observe a clear pattern of higher sale prices outside the CH. We do not see a decline in sale prices inside the CH, but those coefficients are extremely noisy.

In Figure A7, we continue to use proposed listing as the treatment onset but focus on the 10-year window and report results for the three subgroups of interest of ever-conflict species, high ACE permits, and high FWS consultations. In the ever-conflict and high-ACE-permits subgroups, we estimate similar increase in sale prices outside the protected area, but more importantly, we also estimate precise increases in sale prices *inside* the CH (Panels d–f). This is noteworthy because the treatment onset event is the proposed listing period, for species that had at least five years between their proposed listing and designation rules. This result further supports the notion that land markets anticipate future land-use restrictions around the edge of current development, and lands are bought to potentially develop them before statutory protections are awarded. However, the number of species in each comparison is much lower than in the full sample because not many have five years between proposed listing and designation rules. For completeness, we also report the spatial DD analysis using proposed listing rule as the treatment onset for vacant lands around CH borders in the 10-year window sample in Figure A8. Overall, the results remain noisy but show higher sale prices outside the protected area for the vacant nonresidential lands and imprecisely estimated higher sale prices inside the CHs for both types of vacant lands.

A.2.2 Varying the Composition of Transactions or Species

In the variations reviewed thus far, we focused on changing the timing of the treatment onset. Next, we turn to results that change the composition of transactions. In the main text, we use all transactions, both existing and new construction. However, new construction homes might exhibit a different response. We already observed that the number of transactions changes around the borders of protected areas (Figures 5 and A1). In Figure A9, we repeat the main estimation as in Figure 6 but focus on sales of new construction properties. The sample has an order of magnitude fewer transactions when focusing on new construction properties. This also means we observe about a third of the listings and designations relative to the full sample. This sharp drop in land markets, species, and number of transactions

limits what we can study with respect to new construction specifically. It is perhaps then not surprising that the results are very noisy, especially for CHs. However, for CHs, we also see no increase in sale prices outside the border but large and precisely estimated declines of about 10 percent in the sale prices inside. For completeness, we also report the results from the complementary sample of existing homes (not new construction properties) in Figure A10, where we observe effectively the same results as in Figure 6.

In the main text, we did not separate species listed as threatened from those listed as endangered. Although the letter of the law does allow for stricter restrictions regarding land use for endangered species, in practice, the two categories end up receiving almost identical treatment by the FWS. In Figures A11 and A12, we estimate two separate sets of results for endangered and threatened species, respectively. Two key differences arise for the results around the border of SHs. First, for endangered species, we observe some evidence of a downward trend before the proposed listing rule, which is reversed after the proposed listing rule (Figure A11a). In the 10-year window sample, we estimate imprecise increases in the sale price right outside of the SH (Figure A11e). Second, for threatened species, we observe a clear drop of about 5 percent in the sale prices of properties inside the SHs, following the proposed listing rule—but only in the sample where we include transactions up to five years after the proposed listing (Figure A12e). For CHs, the results for endangered and threatened species are relatively similar, although we lose some statistical power and have noisier estimates when separating the two cases.

In one final check for the sensitivity of the results for the composition of species, we include crustaceans. In the main text, our focus is on not solely aquatic species—that is, species whose habitats are at least somewhat terrestrial. We classify crustaceans as solely aquatic because although they can live outside water, they tend to habitat in coastal areas, around water. Unsurprisingly, including them does not change the estimated results, as only eight such species appear in our data (after applying the other data filters discussed in the data section and the Online Data Appendix). We present those results in Figure A13.

In addition to changing the species, we also examine how changing the geographic extent affects the results. In the main text, we use transactions of properties and vacant lands in both urban and rural areas. In Figure A14, we validate that our sample is mostly comprised of property transactions that occur in urban locations. We use the US Department of Agriculture 2023 Rural-Urban Continuum Codes to classify counties as metro (urban) or non-metro.[16] The results that focus on metro areas are nearly identical to those we report in Figure 6 because the transactions are located almost entirely in metro areas (e.g., for SHs, the metro area subsample reflects 96.1 percent of the full sample).

A.2.3 Variations to the Baseline Regression Specification

In the main text, we report results that include year and month fixed effects that we allow to vary by FWS region, along with ZCTA fixed effects, while clustering at the ZCTA level. Here we present results for the spatial DD using the 10-year time window, with the same treatment onset definitions as in Figure 6, but we change either the fixed effects or clustering level of the standard errors.

We change the baseline fixed effects in three ways. First, we allow the year and month fixed effects to vary by state instead of FWS region. This nests the FWS fixed specification and allows more flexible control for time trends and seasonality that might be different between states within the same FWS region. Second, we replace the temporal fixed effects with FWS-by-year-by-month fixed effects. This nests the original specification but allows for more granular changes within the year and for evolving seasonality. Third, we use the baseline temporal controls but include census tract fixed effects. This nests the ZCTA fixed effects but allows for more granular control for time-invariant characteristics that might be different between census tracts within the same ZCTA. We find no meaningful differences in these results (Figure A15) relative to those in the main text.

We change the clustering level to either the county or species levels. The justification for

[16] For more details, see: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/. Accessed: November 15, 2023.

clustering the standard errors at the ZCTA level is that we expect transactions to have strong serial correlation and to be exposed to similar shocks within neighborhoods, which ZCTAs offer a good approximation of. A more conservative approach is to cluster at a higher level, such as city or town, or even at a higher level, such as the county. Alternatively, if we are worried that shocks are mainly correlated through the channel of FWS decisions, we could cluster at the level of the species, allowing standard errors to be more flexibly correlated across ZCTAs or even counties. From the results in Figures A16 and A17, we summarize that changing the level of clustering does little to the precision of the estimates.

A.2.4 Variations to the Definitions of Subgroups

In the main text, we explore heterogeneity across three main subgroups: (i) ever-conflict species, (i) high ACE permits, and (iii) high FWS consultations. For the second and third groups, we classify ZCTAs or species as having above-median permits or consultations, respectively. One concern is that the higher treatment intensity that is a result of higher permits or consultations arises more in the tail of the distribution. By using the median to classify the subgroups, we might attenuate the higher treatment intensity and mask important dimensions of heterogeneity. Here, we present results that use higher quantiles than the median (the 75th and 90th percentiles). We simply use the same data and process as in the main text but focus on ZCTAs or species that have even higher permits or consultations.

The coefficients we report in Figures A18 and A19 are larger than those in Figure 7. For SHs, for transactions that occur in locations with high ACE permits, we observe a higher appreciation right outside the border but nearly no change in sale prices inside of it (Figure A18 Panels a and b). For FWS consultations, we observe almost no difference when defining the high FWS subgroup as those above the 75th percentile (Figure A19a) but do observe larger price reductions inside the SHs when using the 90th percentile cutoff (Figure A19b). Unsurprisingly, the estimation results are not precisely estimated, as we are limiting the sample size. For CHs, for the high ACE permits and high FWS consultation subgroup, the

effects in the more narrowly defined subgroups have larger magnitudes—higher increases outside and larger reductions inside—yet they are also more noisily estimated (Figures A18 and A19, Panels c and d).

A.2.5 Variations Using Repeated Sales Sample

In the main text, we do not require properties to be sold before and after the listing of species or designation of CHs. The main advantage of using repeated sales of the same properties before and after the treatment onset is that it allows for including property fixed effects, such that the residual variation is more plausibly narrowed down to the difference caused by the ESA protections. However, this often restricts the sample to a fraction of the total number of transactions.

In Figures A20–A22, we report estimation for a repeated sales sample around the SH border. We do so only for SHs because the sample size of repeated sales for CHs is far too small. In each figure, we report the estimation results for the same specification as in Figure 6 in the left column. To the right of each figure, we then report the estimation results of using the repeated sales sample and including a parcel fixed effect. Reporting both results side by side allows to easily compare whether changes in the results are due to the change in sample composition or in the specification.

In short, we find nearly no evidence of any meaningful changes in the repeated sales samples, regardless of when we choose the treatment onset (proposed listing, first ESA event, or first ESA event when excluding petitions). Drawing inferences from this exercise to the broader sample is challenging because the sample size goes down by two orders of magnitude (from over two million to just 40 thousand transactions).

A.2.6 Variations on the Outcome of Interest

Throughout the analysis, our focus has mostly been on the logged sale price of a transaction, or the number of transactions in an area. Here, we present results for variations that nor-

malize the sale price by area or examine whether property characteristics change in response to ESA protections.

In Figures A23–A25, we report the estimation results when we first normalize the sale price by the parcel area and then transform it using the natural logarithm. We repeat the estimation using the proposed listing rule, the first ESA event, and the first ESA event when excluding petitions. Across all the area-normalized results, we fail to detect a clear change around the protected area border, following either of the three treatment onsets. The results are noisily estimated, especially in the case of CHs.

In contrast, if we use the living area (the constructed area of the house) instead of the parcel area, we observe similar patterns as when we use the logged sale price without normalizing by parcel area. In Figure A26, we similarly see prices increase outside of the CH and decrease inside; however, those are imprecisely estimated both outside and inside. We observe more muted responses around the SHs, but when we extend the time window to five years, we observe the sale price increases outside and decreases inside the SH, but those are imprecisely estimated as well.

Next, we examine whether the parcel area, living area, or number of total rooms change around protected areas, following proposed listing or designation rules. In Figure A27, for SHs, we see that the parcel area of transactions around the border is smaller, by as much as 5 percent. For CHs, we see an increase both right outside and inside the border, but those are noisily estimated. If we focus on living area (Figure A28), we see no change around the border of SHs but modest increases of 2–3 percent around the CH border. Finally, we fail to detect meaningful changes in the number of rooms (Figure A29).

A.3 Treatment Timing Heterogeneity

We report the detailed results on the treatment timing heterogeneity we cover briefly in the main text, Section 7.4.2. We begin with the results for residential properties and proceed to residential and nonresidential vacant lands. For each property type, we report both the full

detailed estimation results and linear combinations of coefficients from each regression.

A.3.1 Residential Properties

In Table A1, we present the linear combinations for listing and designation, without further disentangling the effects after the proposed and final rules. In Table A2, we report the full set of coefficients, including the one we estimate for the change in sale price after a lawsuit or petition (if either exists for the species). In both tables, the sample and specification are the same, but we report the linear combinations to simplify the comparison and estimates we think are of interest (e.g., the total effect after both proposed and final listing rules).

The comparison between the distinct versus linear combinations of coefficients places a spotlight on the importance of estimating the different ESA events separately. For example, we observe that SHs, on average, have no change inside after the listing rules (Table A1, Column 1). If we examine the proposed and final listing events separately, we observe that the aggregate result masks the changes that happen after either a lawsuit or petition is filed, and the proposed listing, which are precise declines of 3–4 percent (Table A2, Column 1).[17] Outside of the SHs, we estimate sale prices decline by more than 5 percent after a lawsuit or petition are filed but then increase by 4 percent after the final listing rule (Table A2, Column 1).

A similar issue occurs for CHs—on the outside, we fail to reject a null effect after the listing or designation (Table A1, Column 2), whereas if we focus on the time after the proposed listing, we estimate prices increase by more than 45 percent (Table A2, Column 2). Throughout the comparisons around the CH border, the properties that are inside the CH are also always inside the SH (because the CH is a subset of the SH). This means that the properties outside of the CH—the comparison group—might be inside or outside of the SH. If we restrict the comparison group that is outside of the CH to the properties that are still inside the SHs, we estimate similar effect sizes (Tables A1 and A2, Column 3). This

[17] When interpreting coefficients, we convert them to percent changes using e^{β}-1

restricted comparison allows us to compare properties that receive the exact same statutory protections because they are all inside the SH, but some also receive a designation. According to the letter of the law and the position of the FWS, no additional effect should arise from a designation. However, the results from the marginal CH comparison suggest that land markets do infer an important signal from the designated border.

Outside of the CH, properties increase in value by over 40 percent after the proposed listing, and they experience a similar increase inside the CH after the proposed designation (Table A2, Column 2). We offer two interpretations for this pattern. First, we argue that increases in value after the proposed listing but before the proposed designation can be rationalized if buyers are already aware that the FWS will likely designate the CH border where development extends to at the time of the proposed listing. Second, the increase in value inside suggests that the proposed designation rule removes some uncertainty about the border, leading buyers to race to buy up properties before the final designation. Although we estimate large and precise increases after the proposed rules to list or designate, both inside and outside of the CH, we observe an imprecisely estimated decline after a lawsuit or petition (Table A2, column 2).

The results are meaningfully different in the ever-conflict subsample. For SHs, we observe smaller imprecise declines, by about half (Table A2, Column 4). For CHs, we observe prices drop by over 40 percent after the lawsuit or petition stage, or the proposed listing.[18] Again, the timing of these reductions suggests that buyers can correctly predict, on average, where the CH border will be drawn. We do observe appreciation right outside the CH, but those results are imprecise and an order of magnitude smaller relative to the estimated declines inside. However, recall that the effects inside are estimated based on a small fraction (less than 2 percent) of the total number of observations in the sample.

[18] In Table A2, Column 5, some cases have an insufficient number of transactions to estimate some of the interactions, such as after the proposed listing, outside 0–3km, or after final listing, outside, 3-6km.

A.4 Vacant Lands

Vacant land transactions exhibit even larger price response heterogeneity to the different treatment stages than residential properties. Land markets respond to early information—lawsuit, petition, or proposed listing—about ESA protections. We observe these early price responses in both residential and nonresidential vacant lands, in either SHs or CHs.

Residential vacant lands around the border of an SH appreciate by 14.5 percent after the proposed listing rule (Table A3, Columns 1 and 4). Before the final listing, we observe higher prices inside in both the full and ever-conflict samples, but appreciation right outside the border is smaller by half, and imprecise, in the full sample. These higher prices do not persist and mostly return to baseline levels after the final listing rule, where we can no longer reject the null hypothesis of a zero effect on price for the linear combination of the proposed and final listing rules (Table A5, Columns 1 and 4). In Figure 6e, we observe noisy reductions in price inside the first 3km into the SHs in the five years after the proposed rule (relative to a similar, but different omitted category).

In CHs, the price response reverses and occurs sooner than in SHs. After either a lawsuit or petition, prices drop sharply by 70 percent or more across all distance bins (Table A3, Columns 2 and 5). This finding suggests that land markets respond strongly and negatively to the uncertainty regarding the listing and designation, especially to the yet-to-be-determined (at the time of lawsuit or petition) border of the CH. However, when we narrow the control sample down to include only parcels that are in the SH (Table A3, Columns 3 and 6), we no longer detect a meaningful or precise drop in price.

Following the proposed listing rule, vacant lands that are outside and near the border see a massive sharp increase in value—more than doubling relative to the baseline levels (Table A3, Columns 2, 3, 5, and 6). Parcels further away from the border also see large increases, yet their magnitudes are halved. These effects diminish, by more than half, after the proposed designation rule. This finding suggests that land markets anticipate stricter land-use restrictions and are attempting to preemptively sell or develop vacant lands before

the potential spotlight effect of the designation is realized. It is important to remember that the number of transactions inside CHs is very low, both before and after ESA protections are awarded (see Figure 5). In addition, the response in land markets around the CH border has both a price response and an effect on the number of transactions, which increase right outside the border and drops inside the protected area (see Figure A1).

Nonresidential vacant lands experience smaller, and imprecisely estimated, price changes around SHs. However, they experience larger and statistically significant price changes, in both positive and negative directions, around CHs. Inside the CH, prices more than double after a proposed listing, yet those increases are offset by drops that occur after the final listing and proposed designation (Table A4, Columns 2, 3, 5, and 6). The sharp drops in prices are twice as large, and only precisely estimated, in the ever-conflict subsample (Columns 5 and 6). Following the designation, the sign of the effect in the distance bins right outside the CH switches from positive to negative but remains meaningfully large and precisely estimated in the distance bins further away from the border (Table A4, Columns 2, 3, 5, and 6). We interpret these results as evidence for a rush to develop before a final listing or proposed designation along with a strong aversion to nonresidential vacant lands after the proposed designation rule. When we pool coefficients for the listing and designation effects, we continue to recover a null effect on vacant land prices around SHs but large price increases after the listing rules that are mostly offset after the designation rules, outside of the CHs (Tables A4 and A6). An important caveat is that the sample sizes for nonresidential vacant lands are less than a third than those of residential vacant lands and so should be interpreted with caution.

A.5 Distribution of Days from Application to Issuance of Construction Permits

In the main text, we used the data from BuildZoom on the days from the application to the issuance of a new construction permit to estimate how the mean number of days changed

around the protected area border before and after the proposed listing or designation. Here, we present more descriptive comparisons by plotting the distributions of the number of days, inside versus outside, before versus after. In Figure A30, we use a maroon color to denote distributions inside the protected area, and gray outside. We use dashed lines to denote distributions before the proposed listing or designation and solid lines for after.

For SHs, we do not observe large differences in the distribution of days from application to issuance for the permits that are located inside the SH. This is the case whether we focus on the four years around the proposed listing rule (Panel a), use the full sample when including all years before and after the proposed listing rule (Panel c), focus on ever-conflict species (Panel e), or impute missing dates (Panel g).[19] For the permits filed outside the SH, we observe a reduction in the density of very low number of days after the proposed listing. This might suggest greater attention to permits filed that are close to the border of the SH or simply be evidence of congestion if more permits are shifting from inside to outside of the SH. For CHs, we observe some shift toward higher approval periods, but only in the case of the ever conflict species. In all other cases, we fail to observe any meaningful changes in the distribution before and after.

A.6 Variations to Descriptive Results on Construction & ACE Permits

In the main text, in Figure 10, we plot how the construction permits (measured by the Census) correlate with higher ESA treatment intensity, which we define as the logged population-weighted total acres under protection. We count acres even if they overlap to capture potential increases in the probability of binding land-use constraints. In Figure A31, we restrict

[19] In some cases, we impute missing completion dates for permits that have had an application date but have not received an issuance date yet. For each county, we take the latest issuance date and use that to fill in the issuance dates for permits with an application date only. We think of this imputation as capturing the lower bound for the time between application and issuance. In other words, we know that the permit is still pending and that other permits in the county were approved as of the latest issuance date. If the permit ended up receiving an issuance later than our imputed date, then our imputed measure captures a lower bound for the duration of approval to issuance.

the ESA-protected acres to unique acres only, meaning we do not count overlapping acres as new protected acres. We observe a slightly flatter curve, with large spikes at the tail.

We also report in the main text binscatters that summarize how the first differences in construction permits are correlated with first differences in total protected acres and how longer differences in construction permits (second differences, third differences, etc.) respond to the same first difference in total protected areas. In other words, we compare the change in construction permits from $t + s$ to t, relative to the change in total protected acres from $t+1$ to t, where s ranges from 2 to 5. Another way to think of this exercise is as a descriptive impulse response where the impulse is the short-term change in total protected acres, and the response is the longer-term change in construction permits.

In Figure A32, we plot the binscatters for logs, levels, and rates of construction permits. We observe larger negative slopes when taking longer differences, four or five years after the change in protected areas. In other words, larger increases from t to $t+1$ are correlated with larger declines in construction permits from t to $t+4$ or $t+5$. However, as other fundamentals could be changing over these time horizons, and we are more limited in interpreting the changes at the county level as quasi-experimental variation in protected acres, we do not interpret these findings as causal evidence.

A.7 Treatment Timing Heterogeneity Using the BuildZoom Data on Potential Delays

For completeness, we also report results that examine the treatment timing heterogeneity in the time from construction permit application to issuance, using the BuildZoom data. We report the detailed results in Table A7 and the linear combinations of the listing and designation coefficients in Table A8. We mostly fail to observe meaningful changes to construction permit delays around SHs. Inside the CHs, we estimate an acceleration in approval time right after the proposed listing rule, followed by a sharp increase in approval time after the final listing (Table A7, Column 2). This suggests that land markets try to preemptively

develop around what they anticipate will be the CH border. This combined effect of listing is negative but imprecisely estimated (Table A8, Column 2). In the ever-conflict subsample, we observe a large increase in approval time after the listing, which is mostly offset after the designation (Table A8, Column 4). In both samples (full and ever conflict), we estimate that inside the CH, the time from application to issuance shrinks after the designation. This suggests that removing uncertainty about where the border might pass helps in resolving some pending approvals. However, these changes in approval time do not appear to be all that different than the changes that we estimate outside of the CHs, in either the 0–3km or 3–6km ranges.

A.8 Exploring Correlation of Species-Specific Effects & Observable Characteristics

In the main text (Figure 9), we report the distributions of the species-specific coefficients we obtain for the change in sale prices for properties inside the SHs or CHs, after the proposed listing or designation rules. Here, we take those coefficients and examine whether their sign and magnitude are associated with observable characteristics. This is a purely descriptive and correlational exercise. We report results where we have a nontrivial number of coefficients to compare: SHs, residential properties and vacant lands, and CHs, residential properties. In Tables A9–A12, we summarize how the results from a regression of the coefficients on each characteristic separately and all of them combined.

We include dummy variables for whether the species had a lawsuit or a petition, the decade of the listing, whether the recovery priority number assigned to the species at the time of the listing is medium or high, and whether the species is flagged as ever conflict, along with dummies for taxonomic group and FWS region. In addition, we also include continuous measures, such as the number of FWS consultations, share of transactions in metro areas, and logged mean price before the proposed rule.

Throughout the four tables, we fail to detect a clear and meaningful insight that highlights

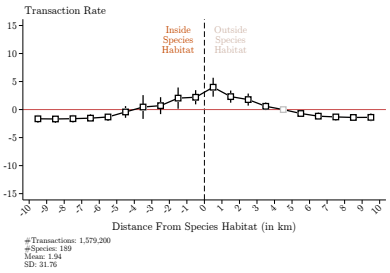
a specific attribute. In other words, we do not find suggestive evidence for a particular characteristic that appears to correlate with the estimated effect of being inside a protected area, after the proposed protections.

Figure A1: Changes in Transaction Counts Around Protected Area Borders

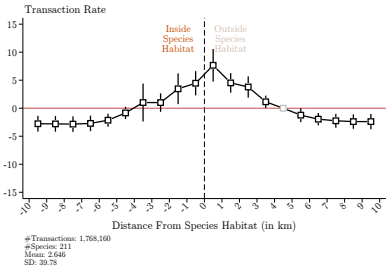
Transaction Rate

Species Habitat

(a) Four-Year Window Sample

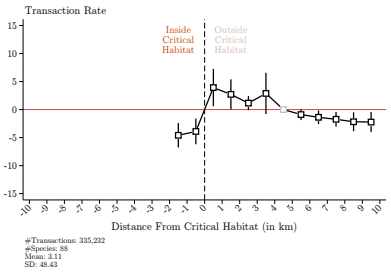


(c) Ten-Year Window Sample

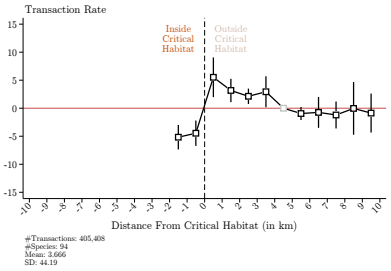


Critical Habitat

(b) Four-Year Window Sample



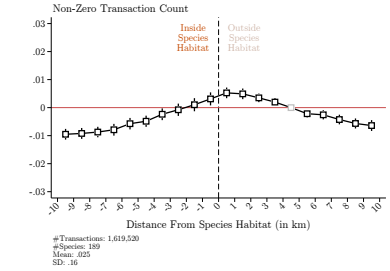
(d) Ten-Year Window Sample



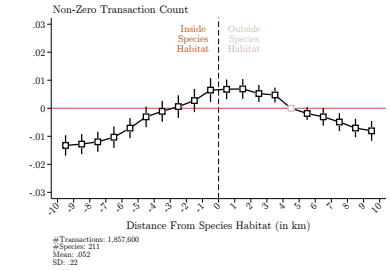
Non-Zero Transaction Count

Species Habitat

(e) Four-Year Window Sample

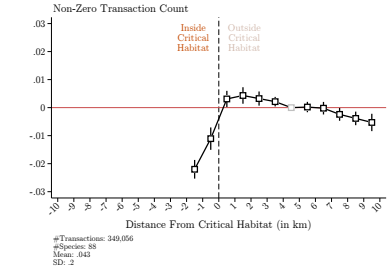


(g) Ten-Year Window Sample

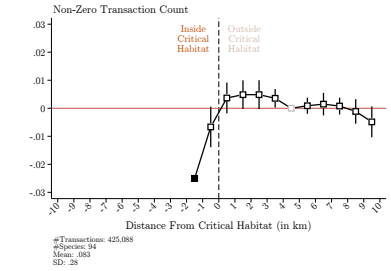


Critical Habitat

(f) Four-Year Window Sample



(h) Ten-Year Window Sample



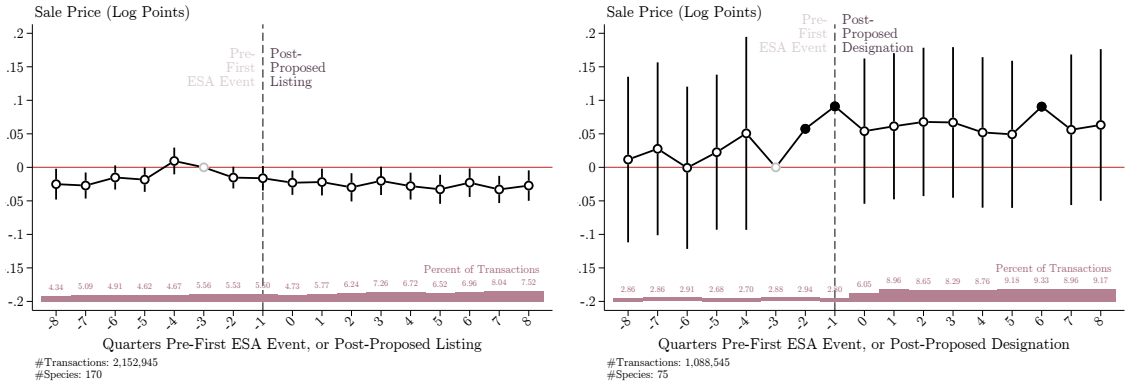
Notes: Estimation results for the specification in Equation (2). We aggregate transactions to the ZCTA-year-quarter level. We plot results for the transaction rate—the number of transactions relative to the preproposed listing mean of transactions in each ZCTA (Panels a–d), or the nonzero transactions dummy (Panels e–h).

Figure A2: Assigning Treatment Onset as the First ESA Event

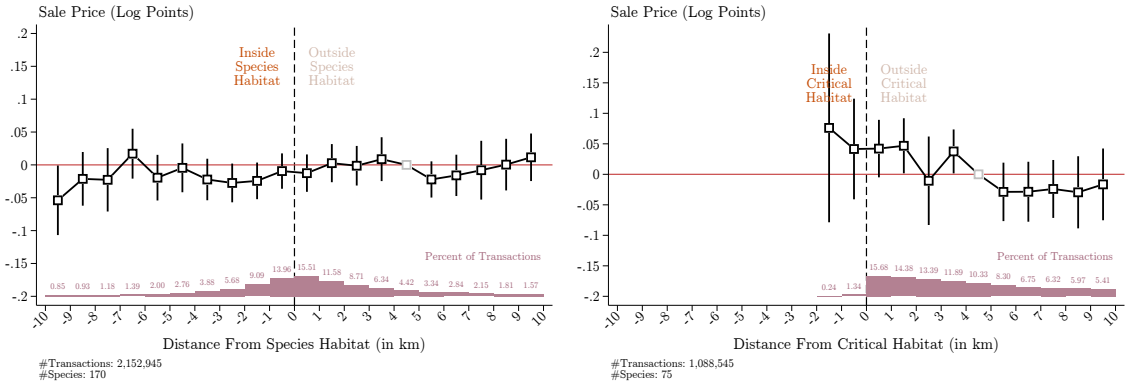
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

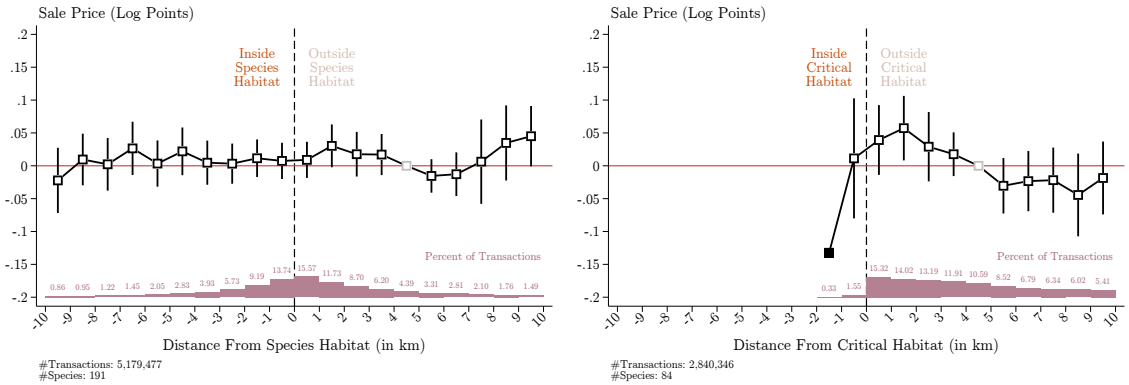


(c) Staggered DD (d) Staggered DD



Five Years Before & After Proposed Rule

(e) Staggered DD (f) Staggered DD



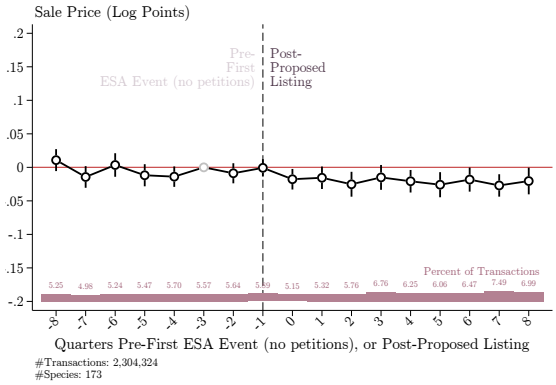
Notes: Same as Figure 6, but allowing the pre-treatment period to end at the earliest of either a petition, lawsuit, or a proposed listing rule.

Figure A3: Assigning Treatment Onset as Either Lawsuit or Proposed Listing

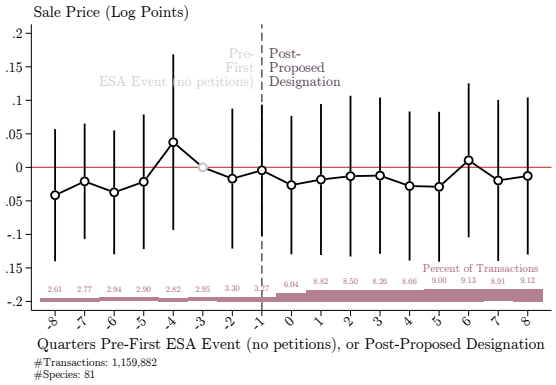
Species Habitat | **Critical Habitat**

Two Years Before & After Proposed Rule

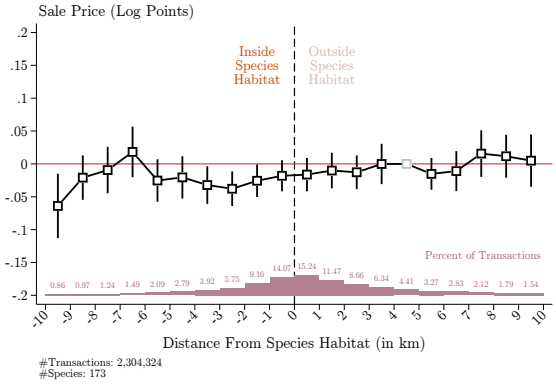
(a) Staggered DD



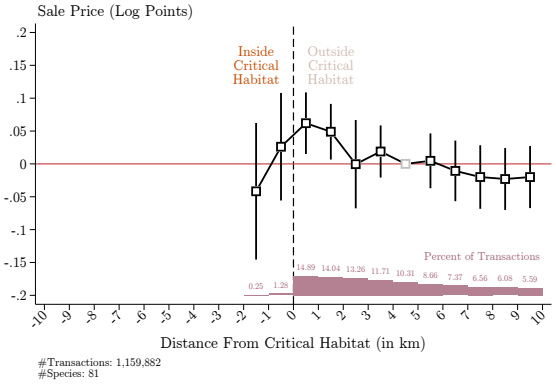
(b) Staggered DD



(c) Spatial DD

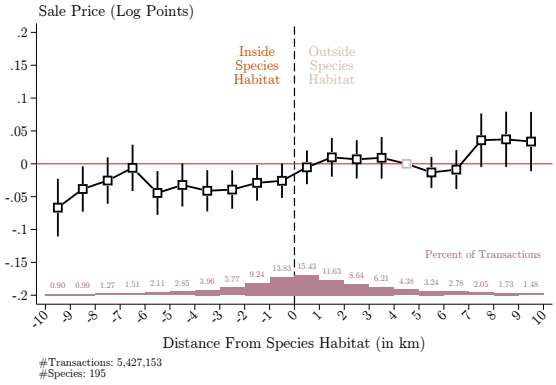


(d) Spatial DD

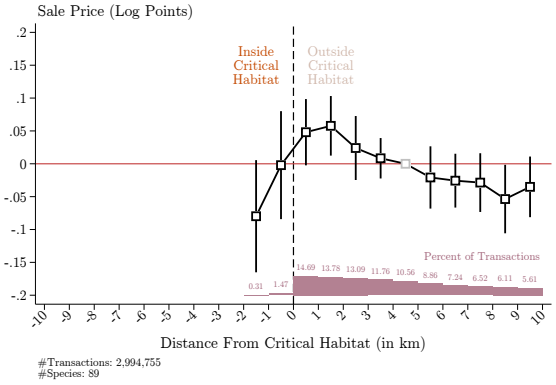


Five Years Before & After Proposed Rule

(e) Spatial DD



(f) Spatial DD



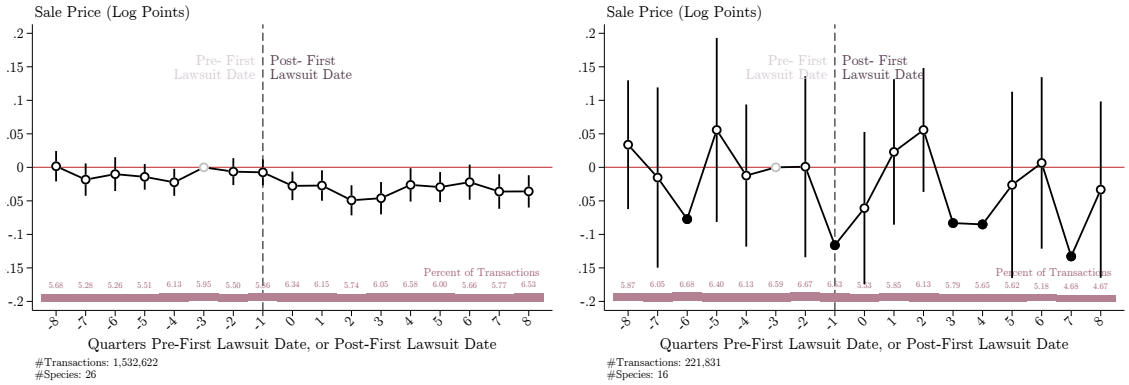
Notes: Same as Figure 6, but allowing the pre-treatment period to end at the earliest of either a lawsuit, or a proposed listing rule.

Figure A4: Estimating the Treatment Effect of Action-Forcing-Lawsuits

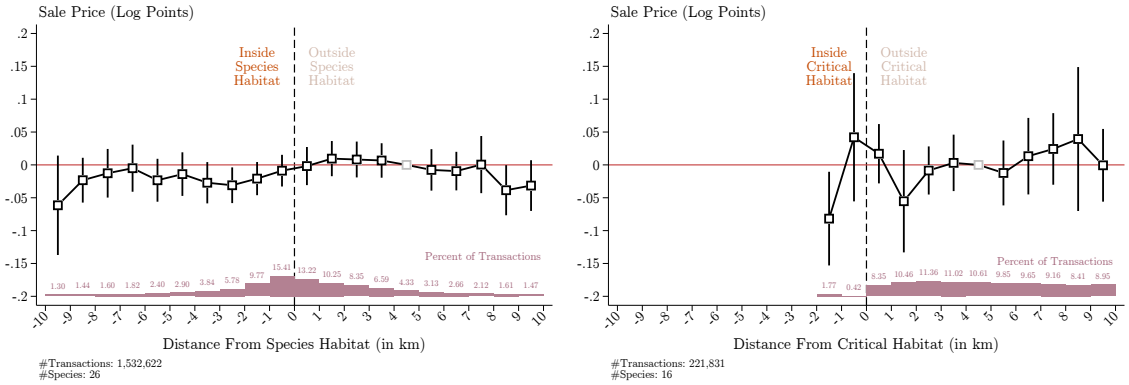
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

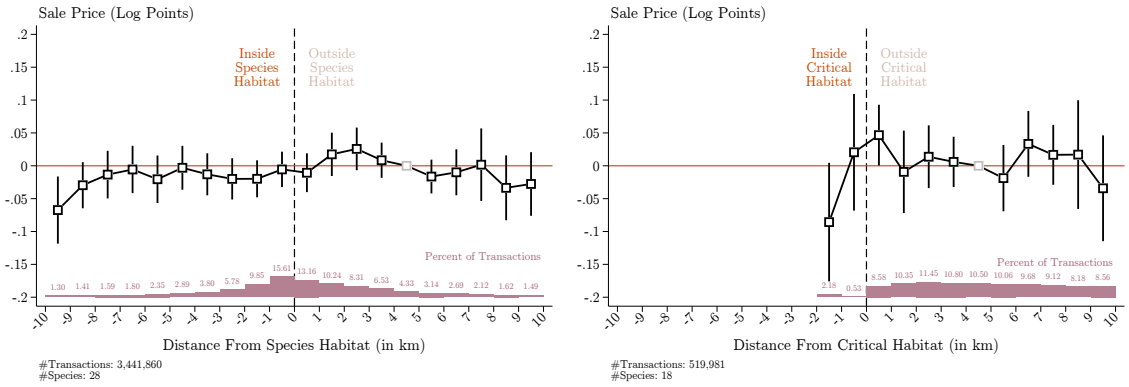


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



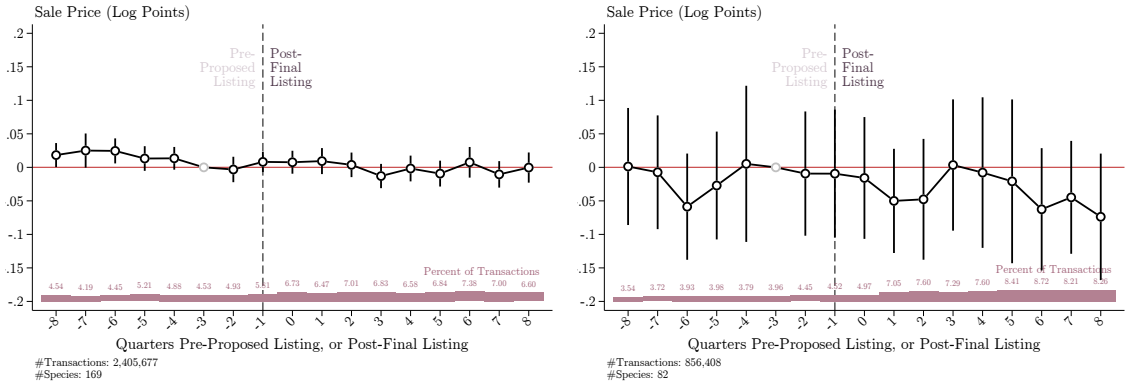
Notes: Same as Figure 6, but focusing on the sub-sample of species that had an action-forcing-lawsuit filed before the proposed listing rule.

Figure A5: Assigning Final Listing as the Posttreatment Onset Event

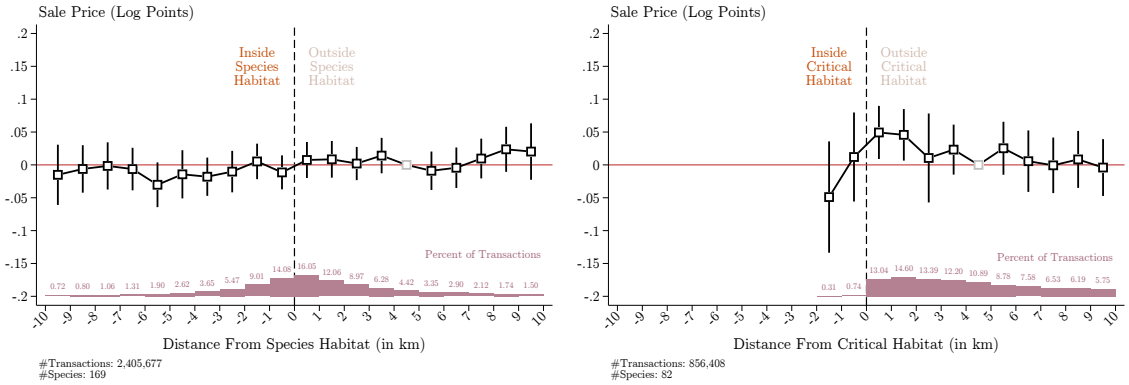
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

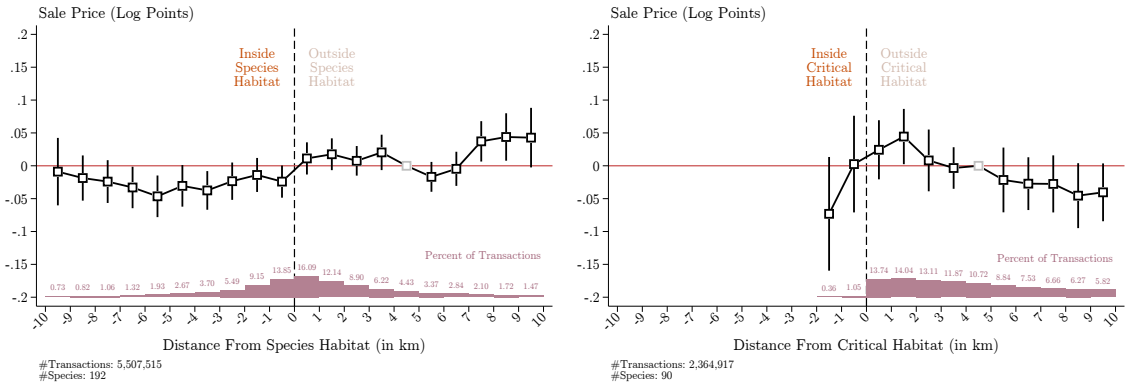


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

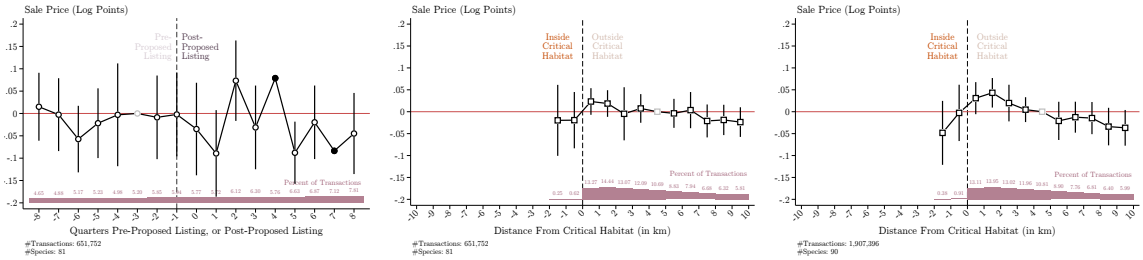
(e) Spatial DD (f) Spatial DD



Notes: Same as Figure 6, but using the final listing as the post-treatment onset event for both species and critical habitats.

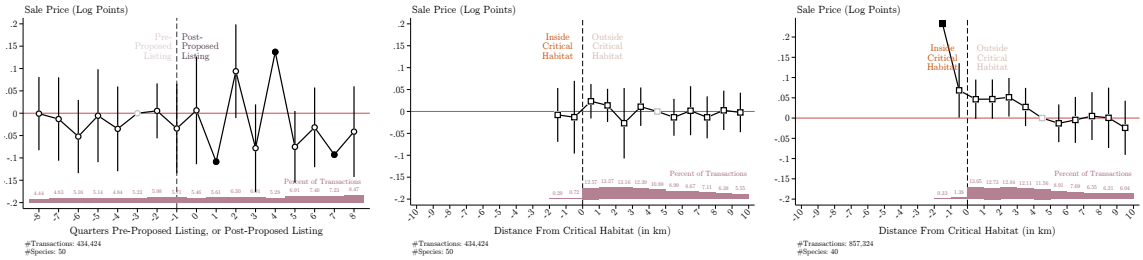
Figure A6: Assigning Proposed Listing as Treatment Onset for Critical Habitats

Staggered (a) | **Spatial +/- 2 Years** (b) | **Spatial +/- 5 Years** (c)



Proposed Listing & Designation Rules are at Least Two or Five Years Apart

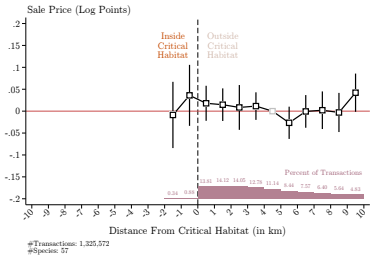
(d) | (e) | (f)



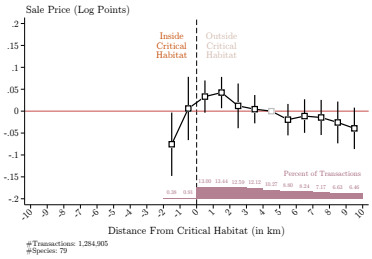
Notes: Same as Figure 6, but focusing on critical habitats only, using the proposed listing as the pre- and post-treatment onset event.

Figure A7: Sub-Group Analysis for Critical Habitats When Using Proposed Listing as Treatment Onset

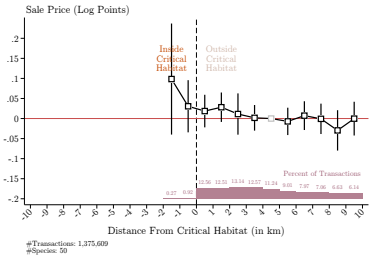
Ever Conflict
(a)



High ACE Permits
(b)

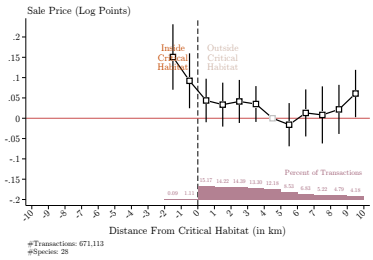


High FWS Consultations
(c)

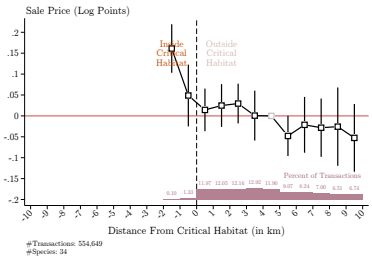


Proposed Listing & Designation Rules are at Least Five Years Apart

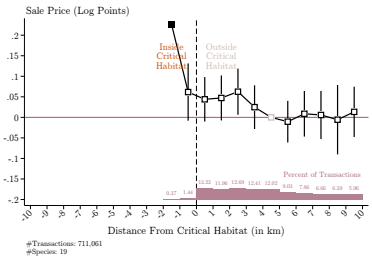
(d)



(e)

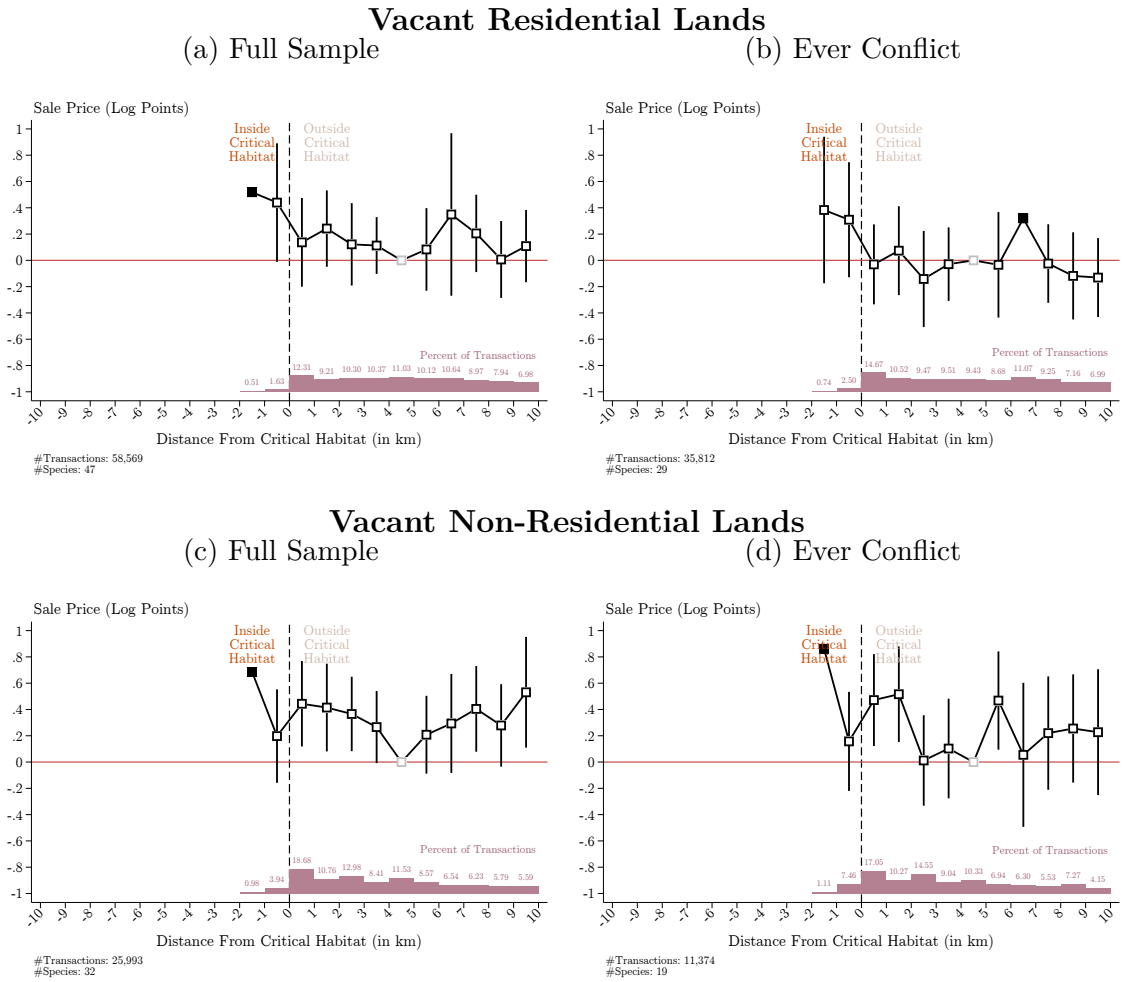


(f)



Notes: Same as Figure 6, but focusing on critical habitats only, by sub-group, using the proposed listing as the pre- and post-treatment onset event.

Figure A8: Assigning Proposed Listing as Treatment Onset for Vacant Lands Around Critical Habitats



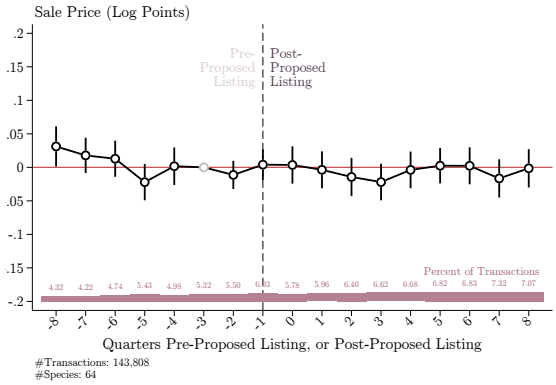
Notes: Same as Figure 8, but focusing on critical habitats only, using the proposed listing as the pre- and post-treatment onset event.

Figure A9: Results for New Construction Properties

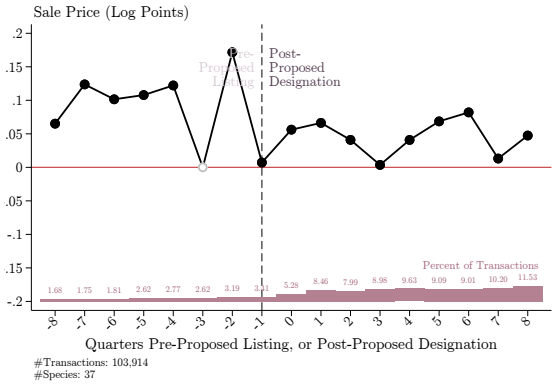
Species Habitat | **Critical Habitat**

Two Years Before & After Proposed Rule

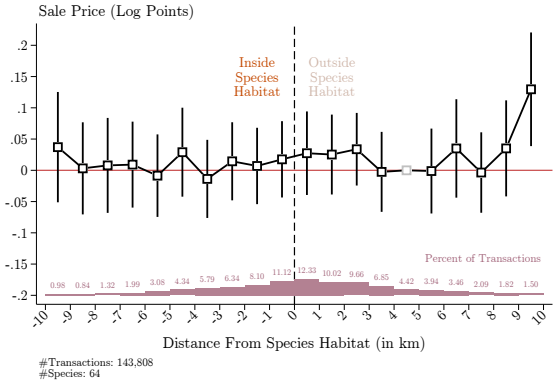
(a) Staggered DD



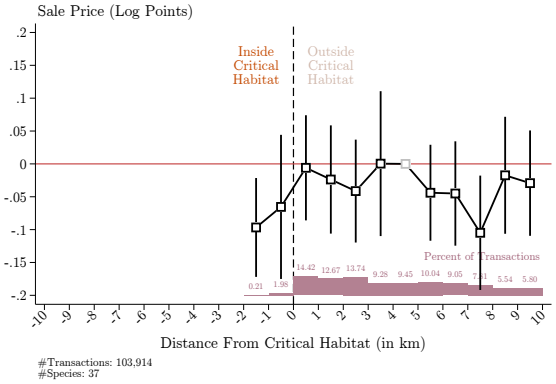
(b) Staggered DD



(c) Spatial DD

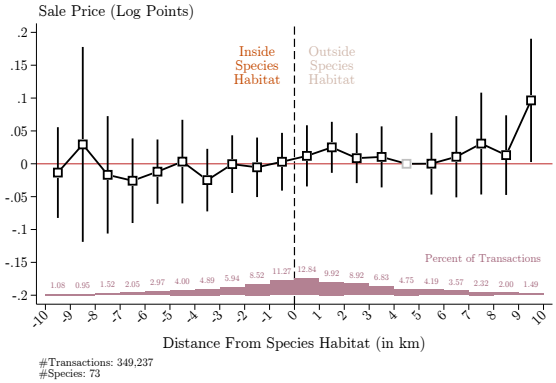


(d) Spatial DD

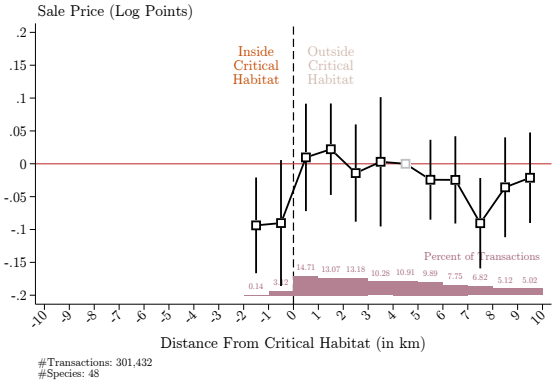


Five Years Before & After Proposed Rule

(e) Spatial DD



(f) Spatial DD



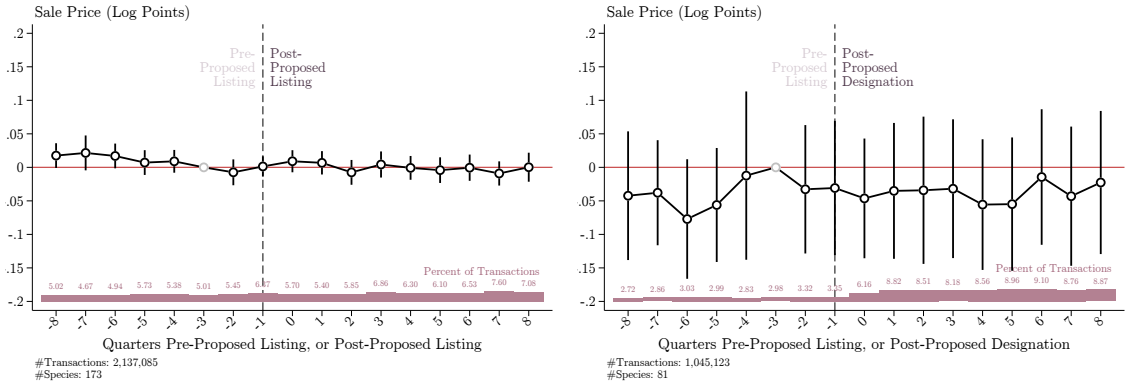
Notes: Same as Figure 6, but focusing on sales of new construction properties only.

Figure A10: Results for Existing Residential Properities (Not New Construction)

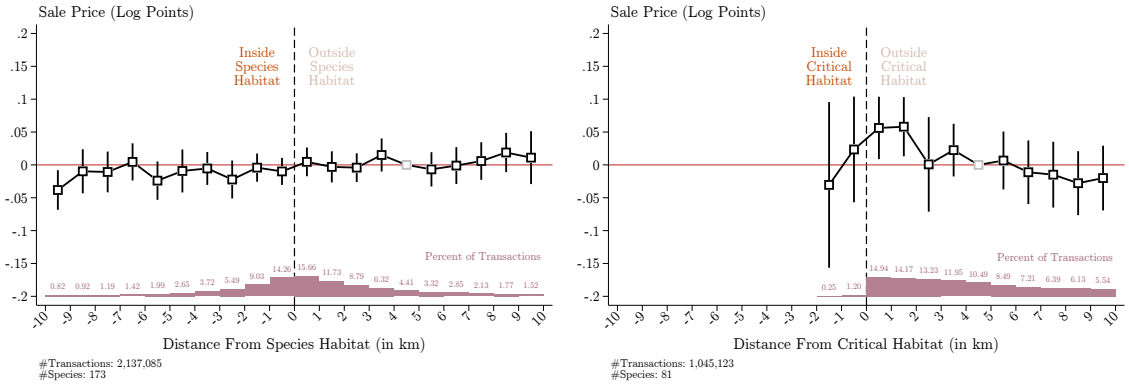
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

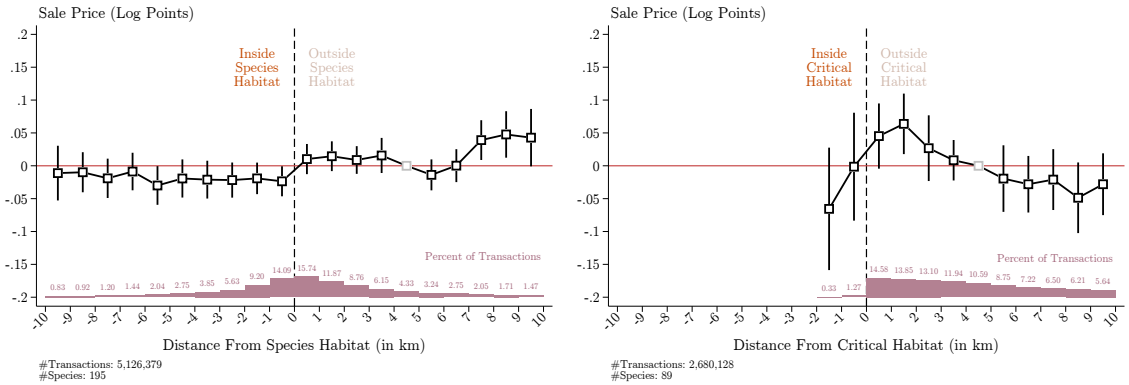


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f)



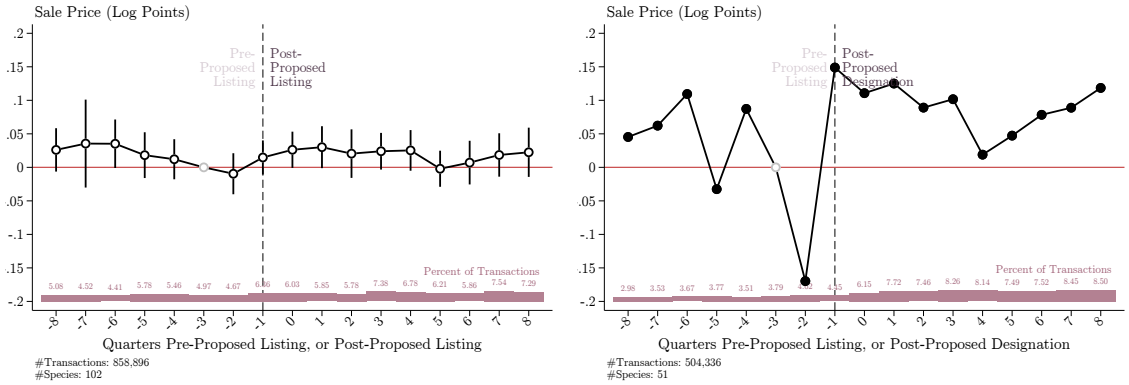
Notes: Same as Figure 6, but focusing on sales of existing homes (not new construction properties) only.

Figure A11: Results Using Endangered Species Only

Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

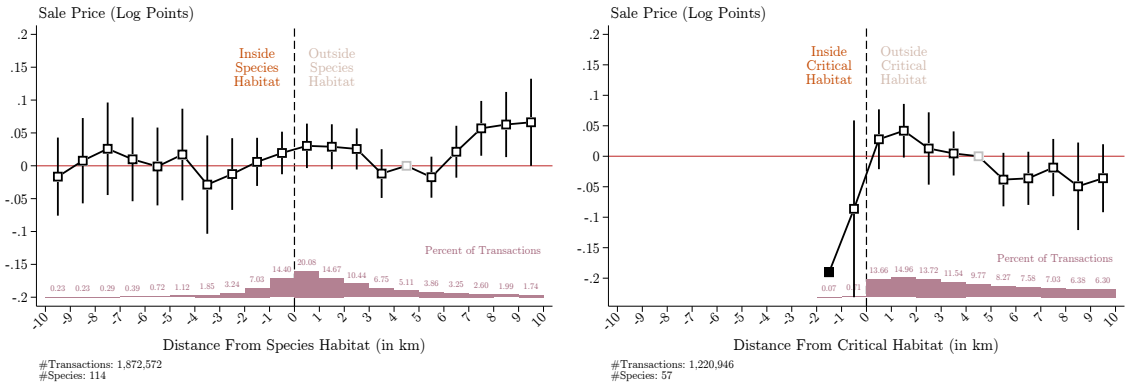
(a) Staggered DD (b) Staggered DD



(c) Spatial DD (d) Spatial DD

Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



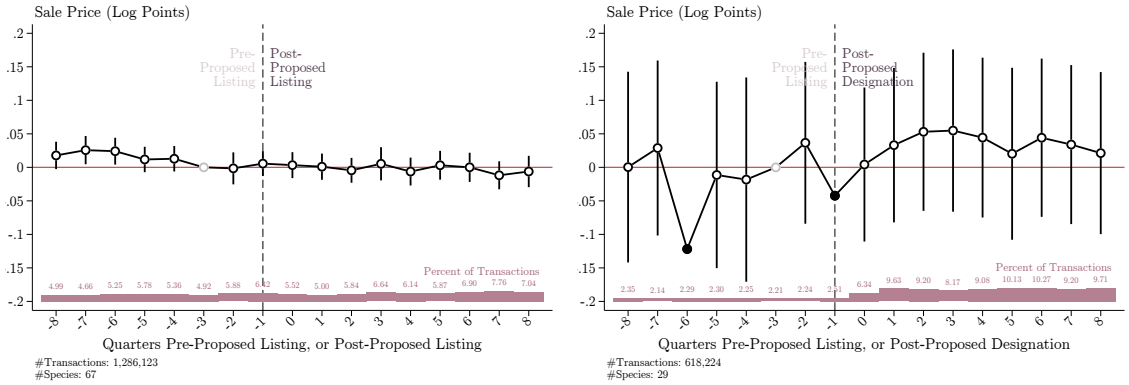
Notes: Same as Figure 6, but focusing on species listed as endangered.

Figure A12: Results Using Threatened Species Only

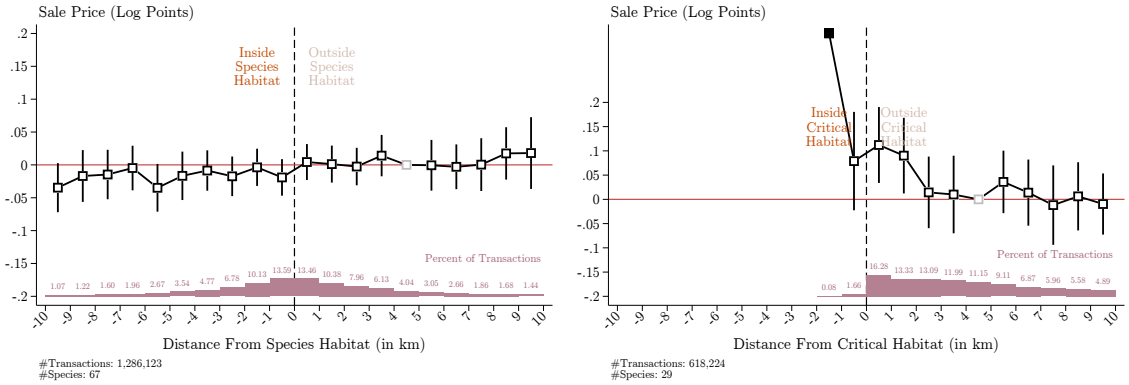
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

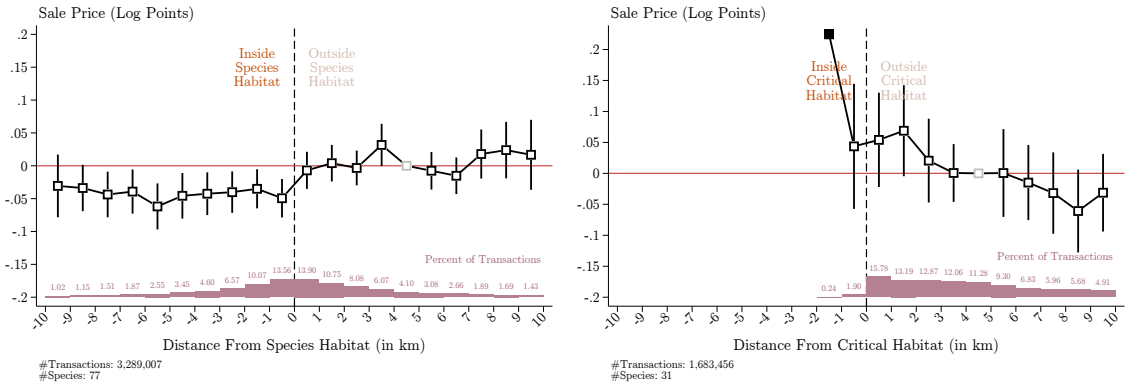


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



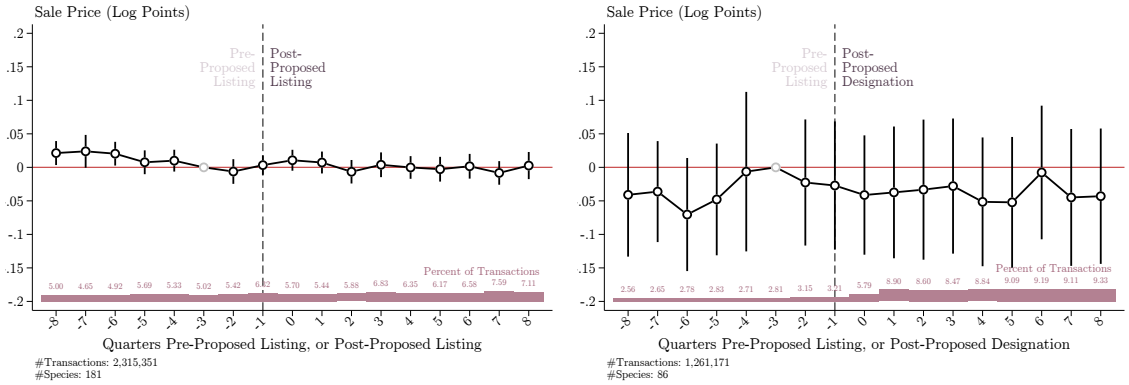
Notes: Same as Figure 6, but focusing on species listed as endangered.

Figure A13: Results for Not Solely Aquatic & Eight Crustacean Species

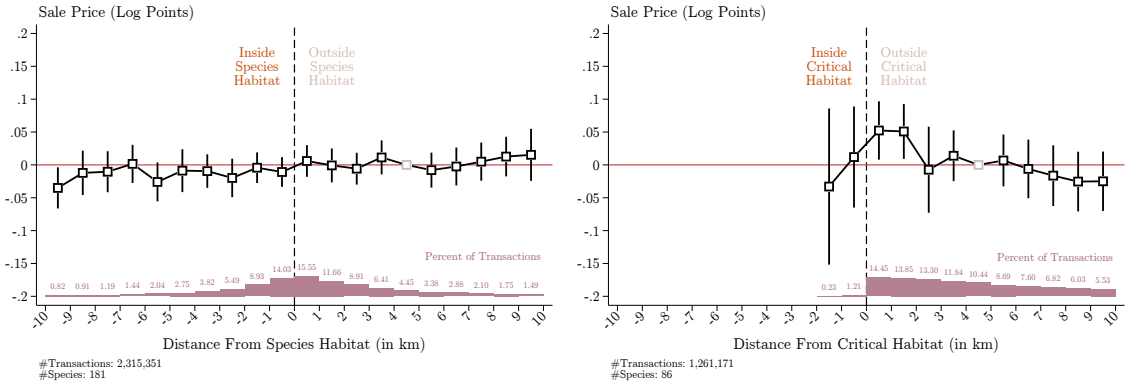
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

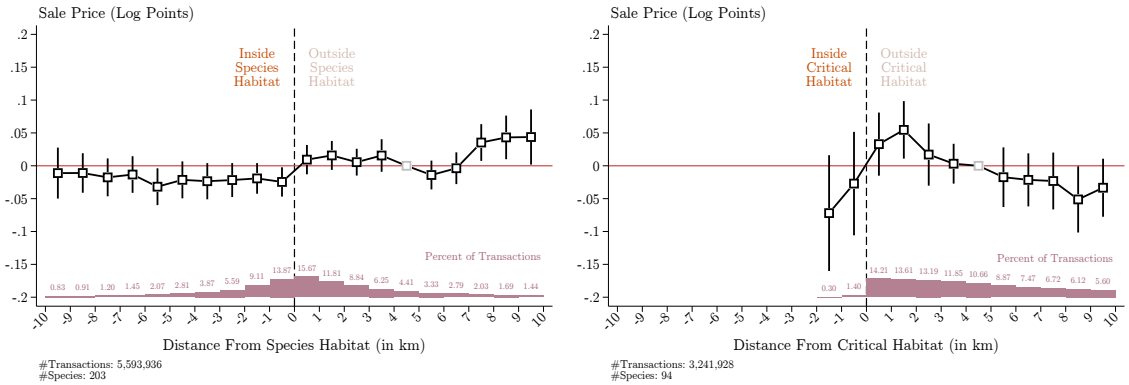


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



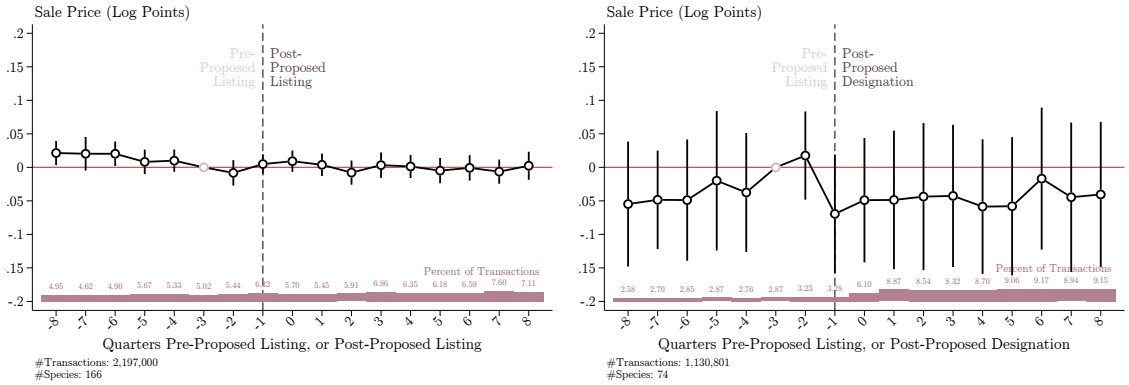
Notes: Same as Figure 6, but including previously excluded eight crustacean species.

Figure A14: Results for Residential Properties in Metro Areas

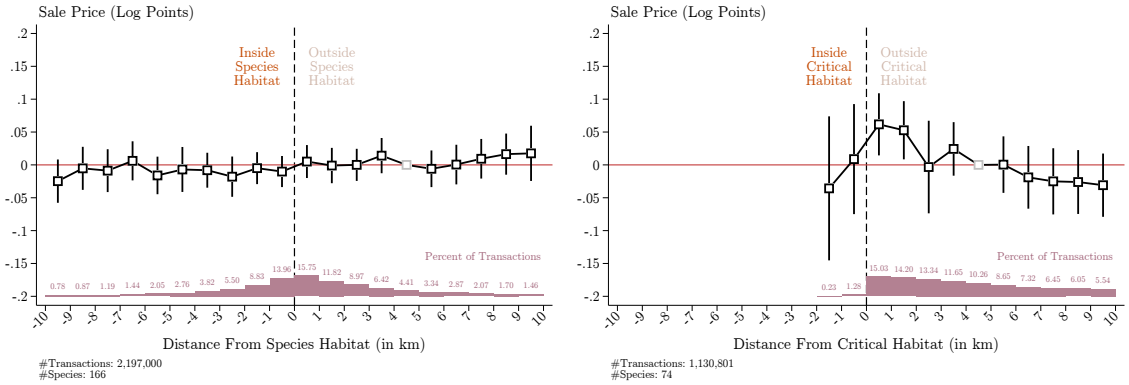
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

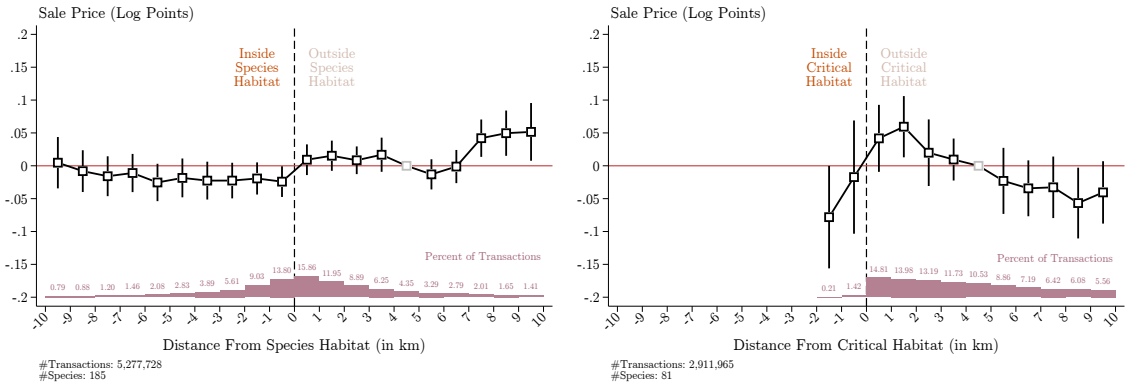


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



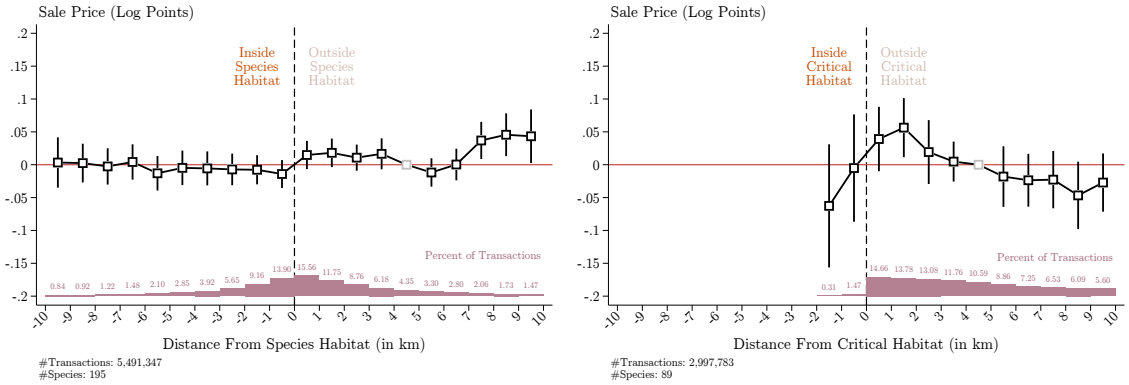
Notes: Same as Figure 6, but including transactions in metro areas only.

Figure A15: Changing Fixed Effects in the Baseline Specification

Species Habitat **Critical Habitat**

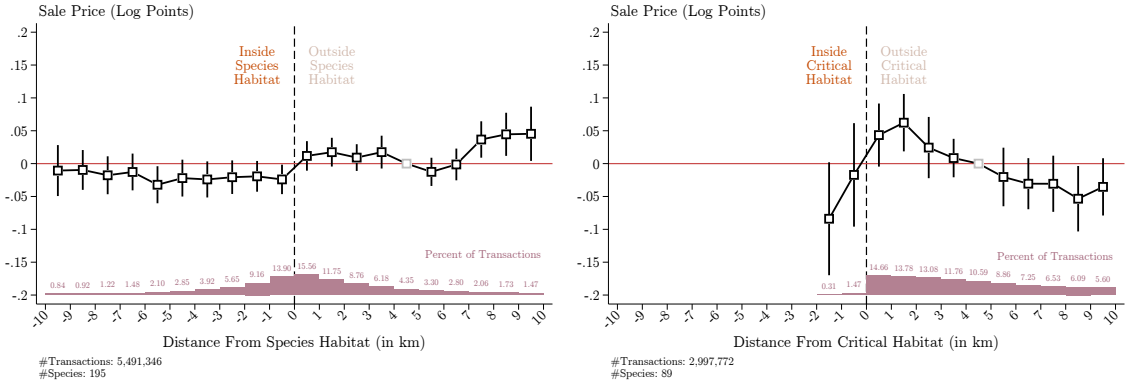
State-by-year, state-by-month, ZCTA

(a) Spatial DD (b) Spatial DD



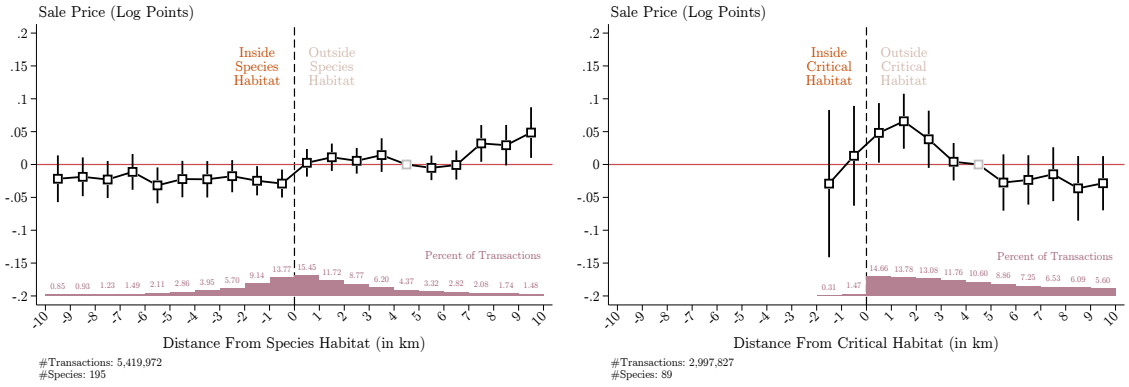
FWS-by-year-by-month, ZCTA

(c) Spatial DD (d) Spatial DD



FWS-by-year, FWS-by-month, census tract

(e) Spatial DD (f)



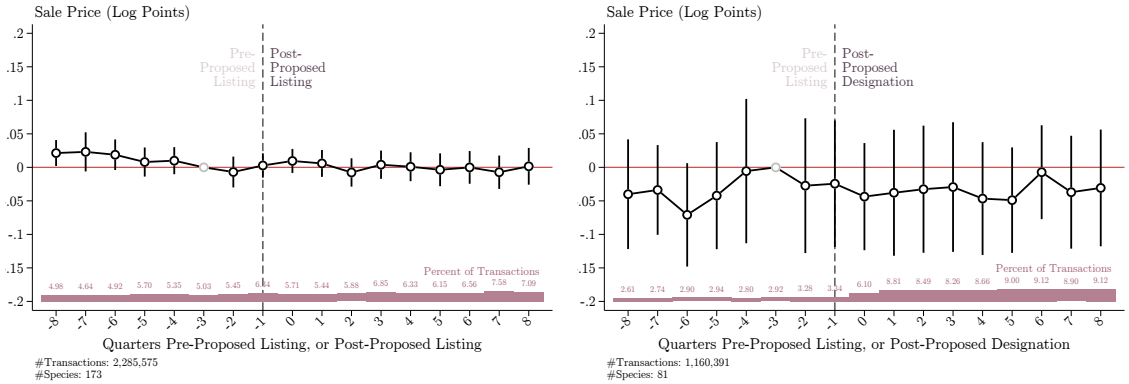
Notes: Same as Figure 6, but including different fixed effects relative to the baseline specification.

Figure A16: Clustering Standard Errors at the County Level

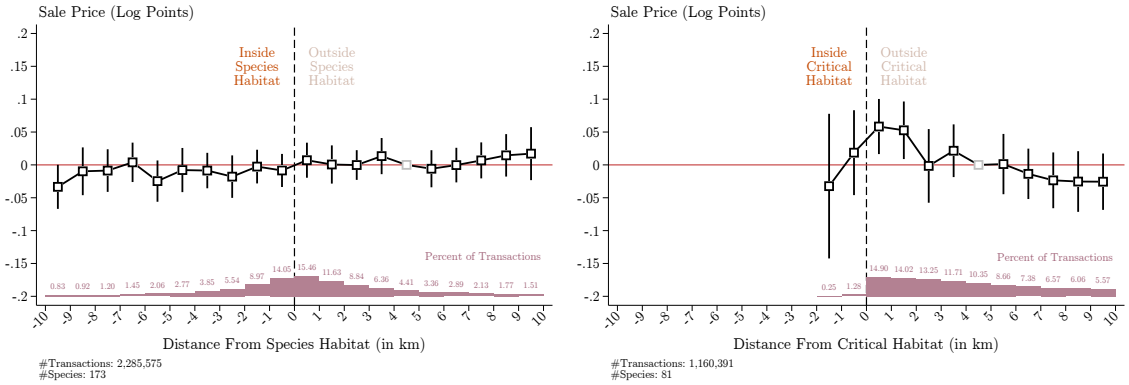
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

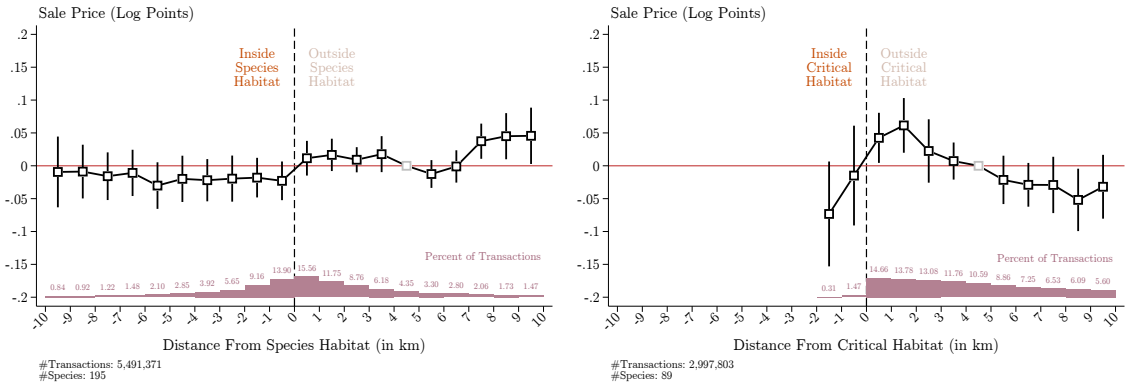


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



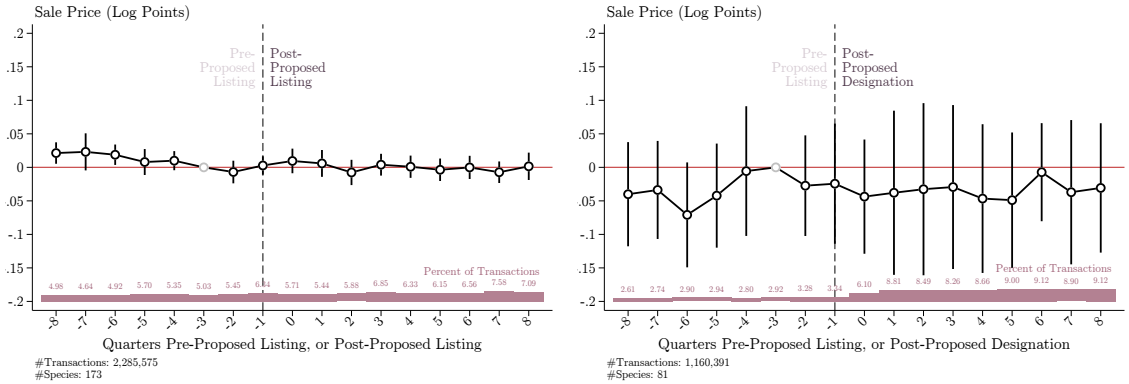
Notes: Same as Figure 6, but clustering standard errors at the county level.

Figure A17: Clustering Standard Errors at the Species Level

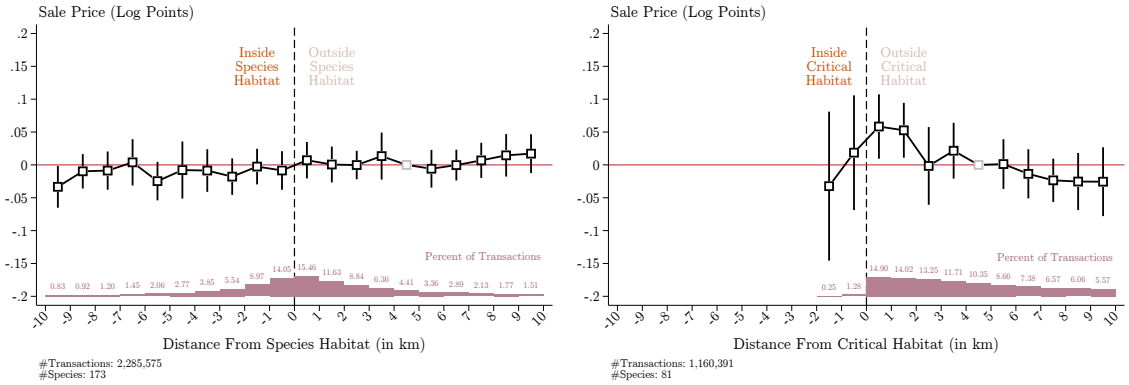
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

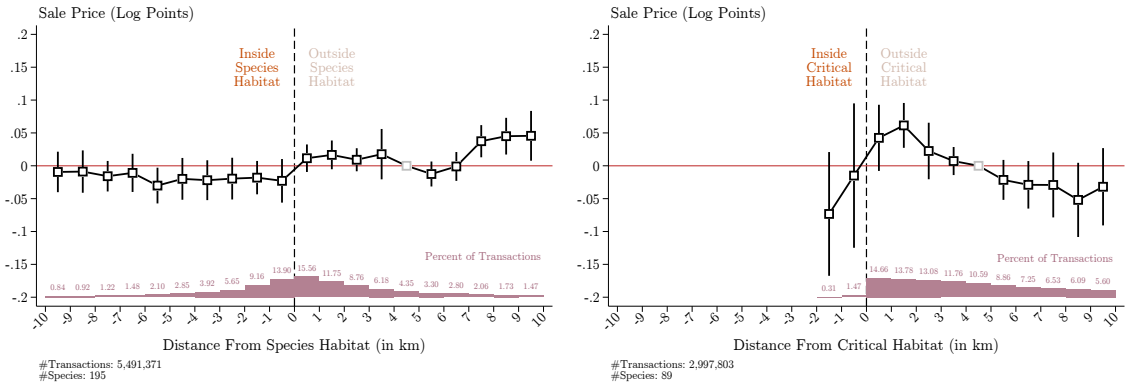


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD

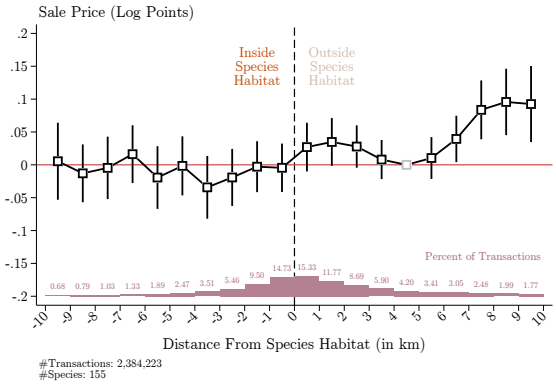


Notes: Same as Figure 6, but clustering standard errors at the species level.

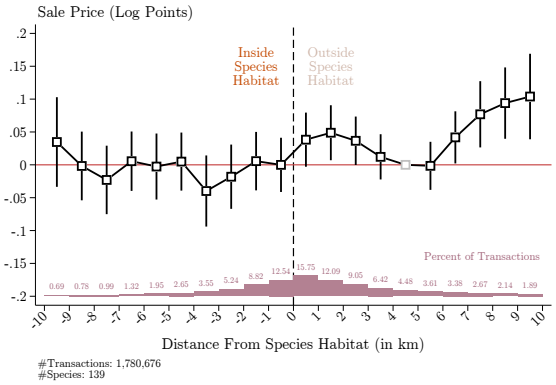
Figure A18: Reclassifying High ACE Permits

SH

(a) Above 75th Percentile

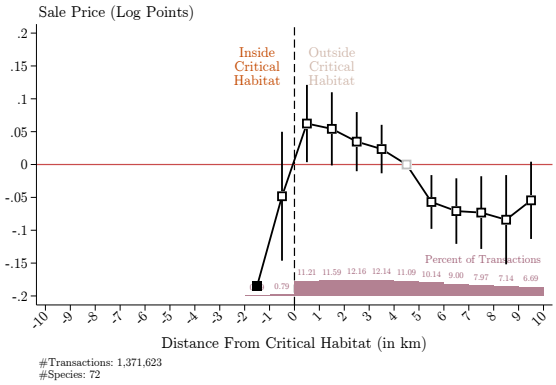


(b) Above 90th Percentile

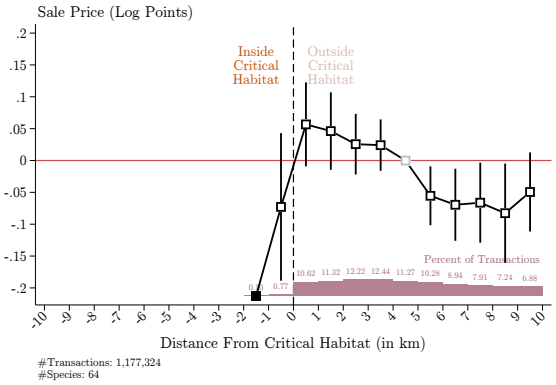


CH

(c) Above 75th Percentile



(d) Above 90th Percentile

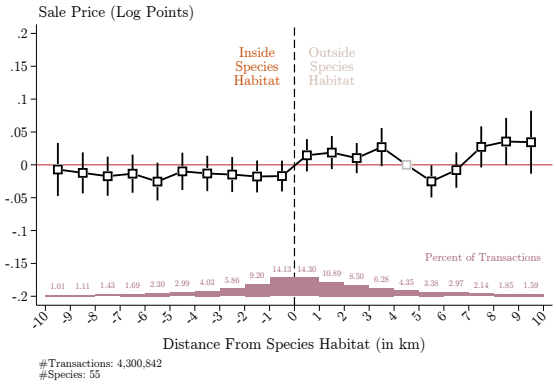


Notes: Same as in Figure 7, panels b and e, but focusing on ZCTA with higher ACE permits than above-median ACE permit counts.

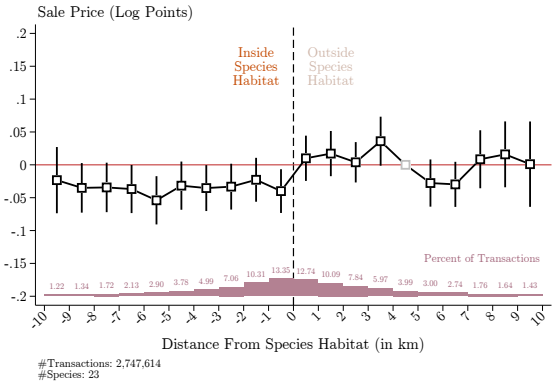
Figure A19: Reclassifying High FWS Consultations

SH

(a) Above 75th Percentile

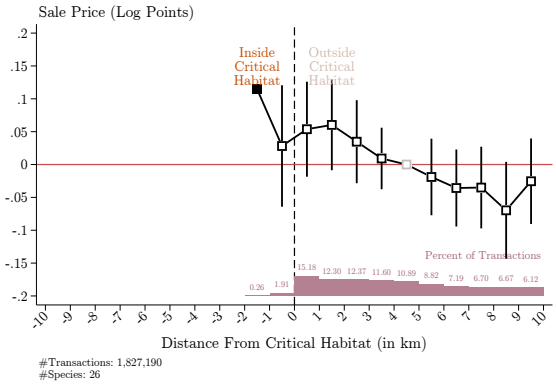


(b) Above 90th Percentile

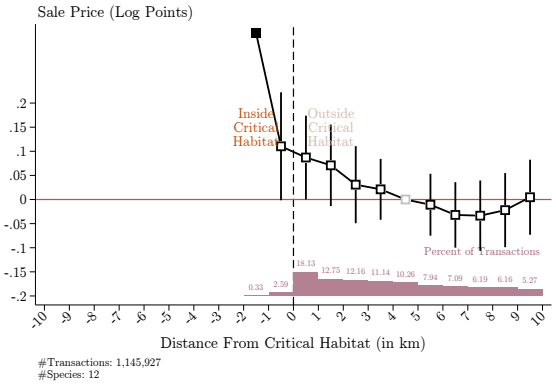


CH

(c) Above 75th Percentile



(d) Above 90th Percentile



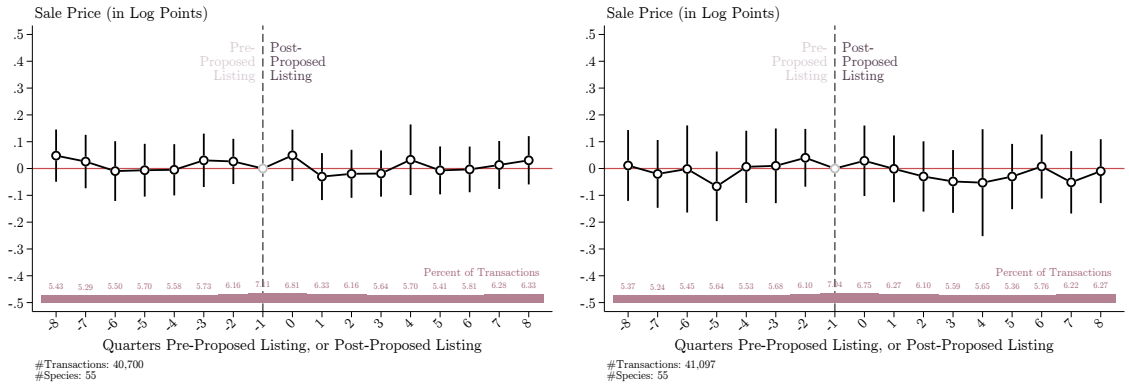
Notes: Same as in Figure 7, panels c and f, but focusing on species with higher FWS consultations than above-median FWS consultation counts.

Figure A20: Focusing on Repeated Sales for Baseline Specification & Treatment Onset

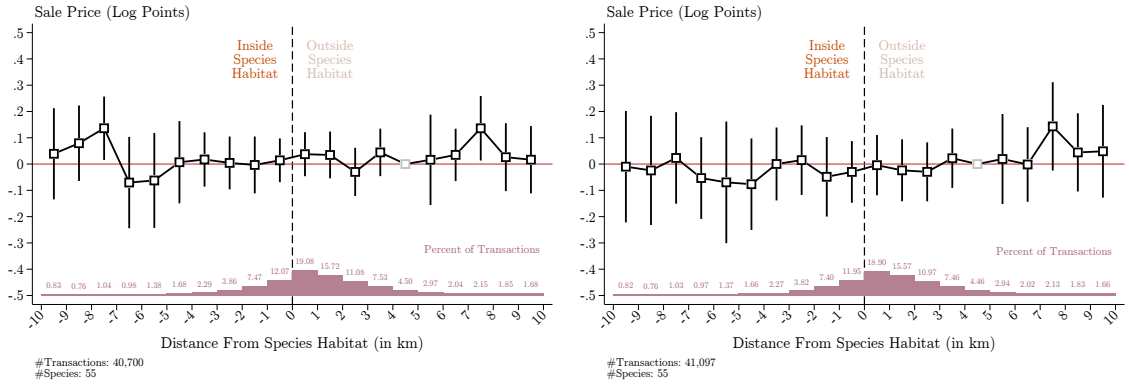
Without Parcel FE **With Parcel FE**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

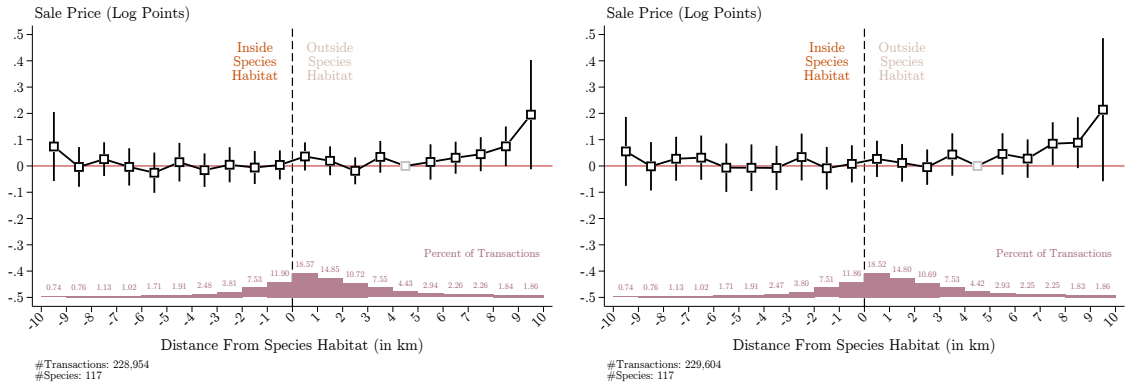


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



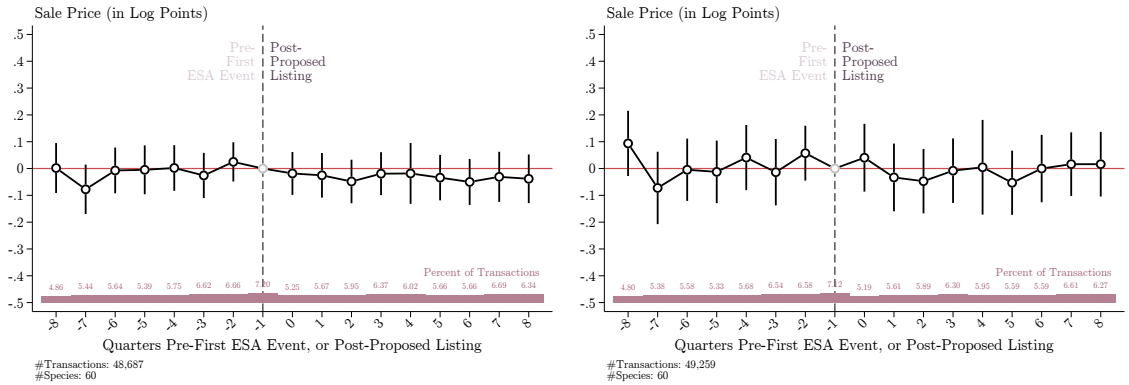
Notes: Same as in Figure 6, but using properties with repeated sales during the time window (having at least one sale before and one sale after the proposed listing rule).

Figure A21: Focusing on Repeated Sales for Baseline Specification & First ESA Event

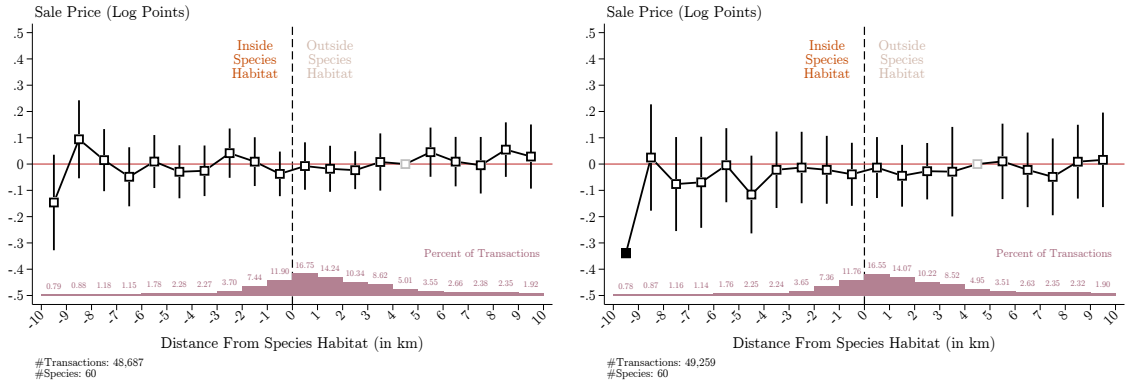
Without Parcel FE **With Parcel FE**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

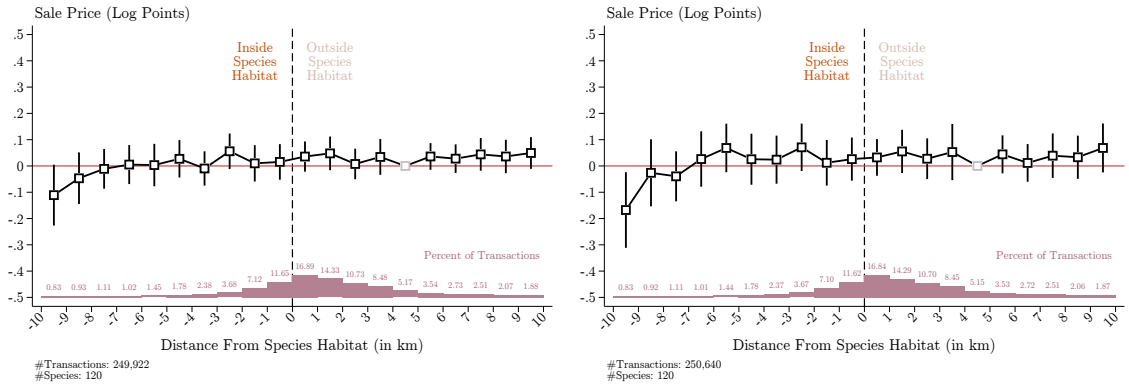


(c) Spatial DD (d) Spatial DD



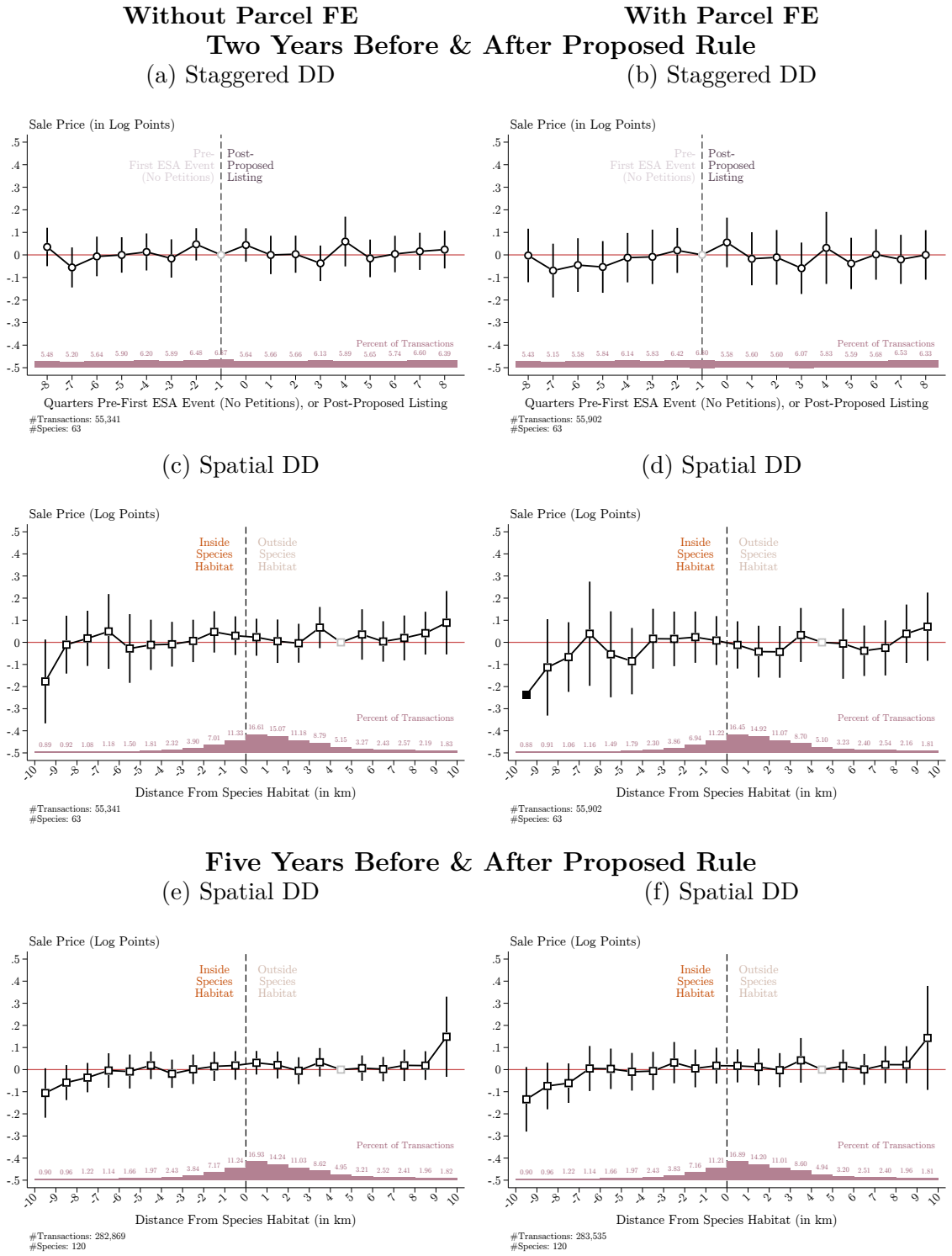
Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



Notes: Same as in Figure 6, but using properties with repeated sales during the time window (having at least one sale before and one sale after the proposed listing rule), and using the first ESA event as the pre-treatment definer.

Figure A22: Focusing on Repeated Sales for Baseline Specification & First ESA Event (w/o Petitions)



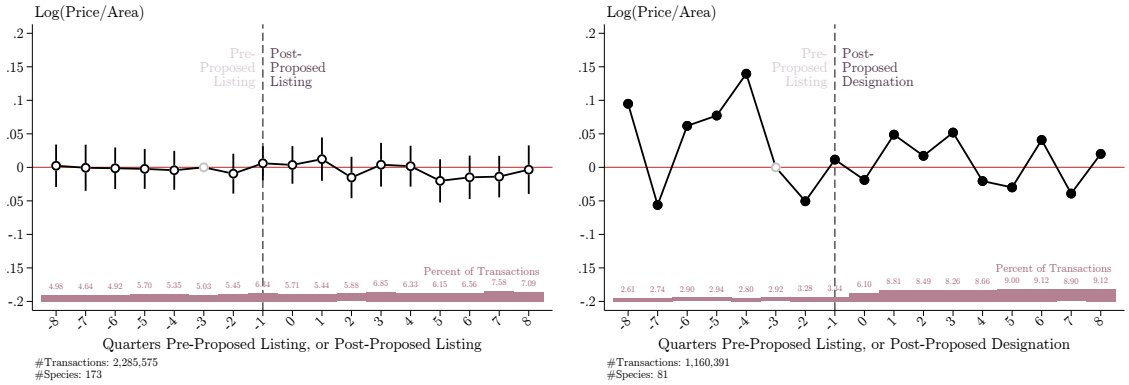
Notes: Same as in Figure 6, but using properties with repeated sales during the time window (having at least one sale before and one sale after the proposed listing rule), and using the first ESA event (excluding petitions) as the pre-treatment definer.

Figure A23: Estimation Results for Log(Sale Price/Area)

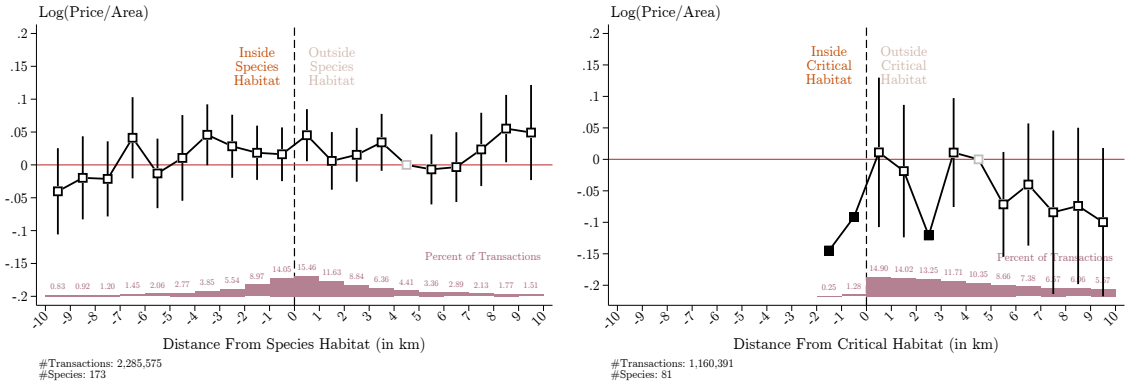
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

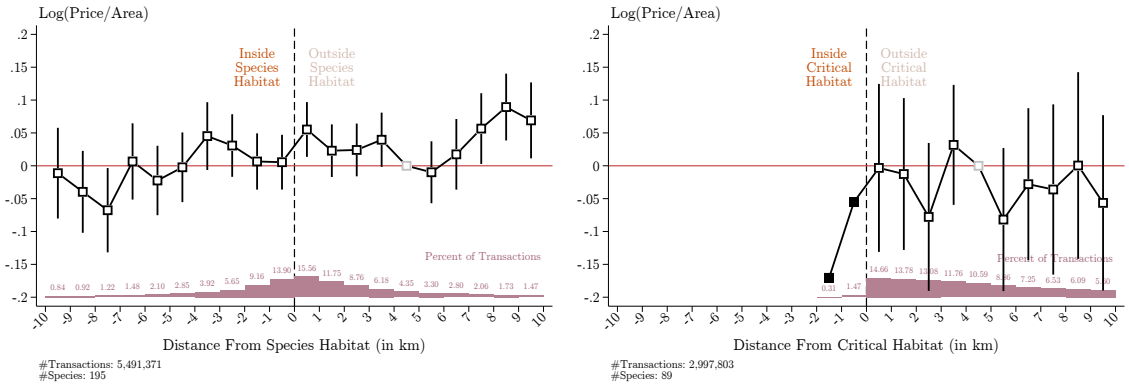


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



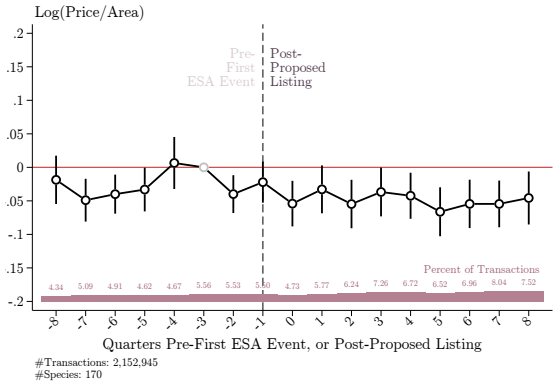
Notes: Same as in Figure 6, but using logged sale price divided by parcel area.

Figure A24: Estimation Results for Log(Sale Price/Area) & First ESA Event

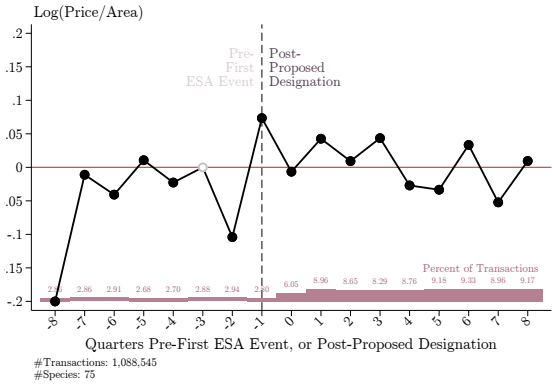
Species Habitat | **Critical Habitat**

Two Years Before & After Proposed Rule

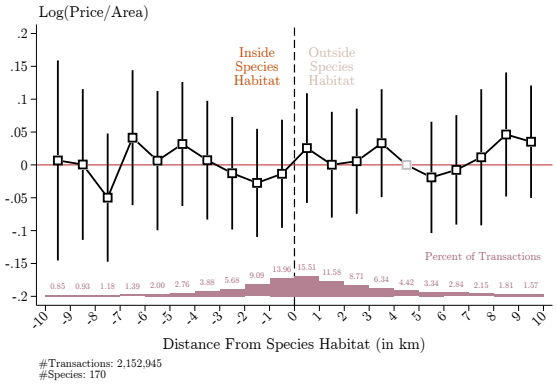
(a) Staggered DD



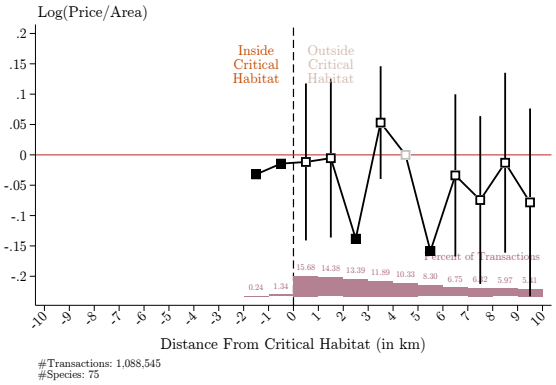
(b) Staggered DD



(c) Spatial DD

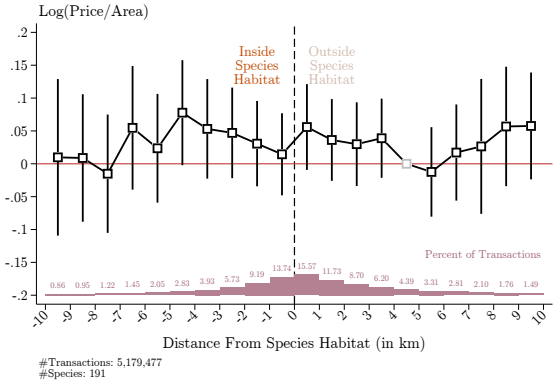


(d) Spatial DD

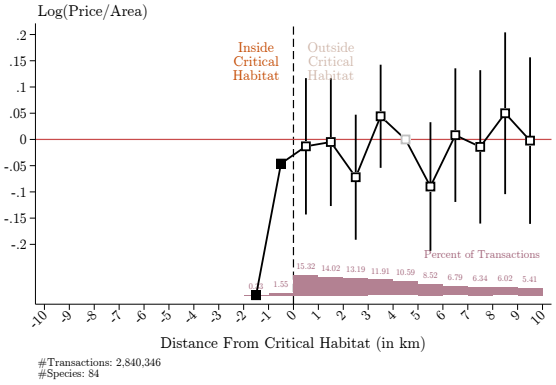


Five Years Before & After Proposed Rule

(e) Spatial DD

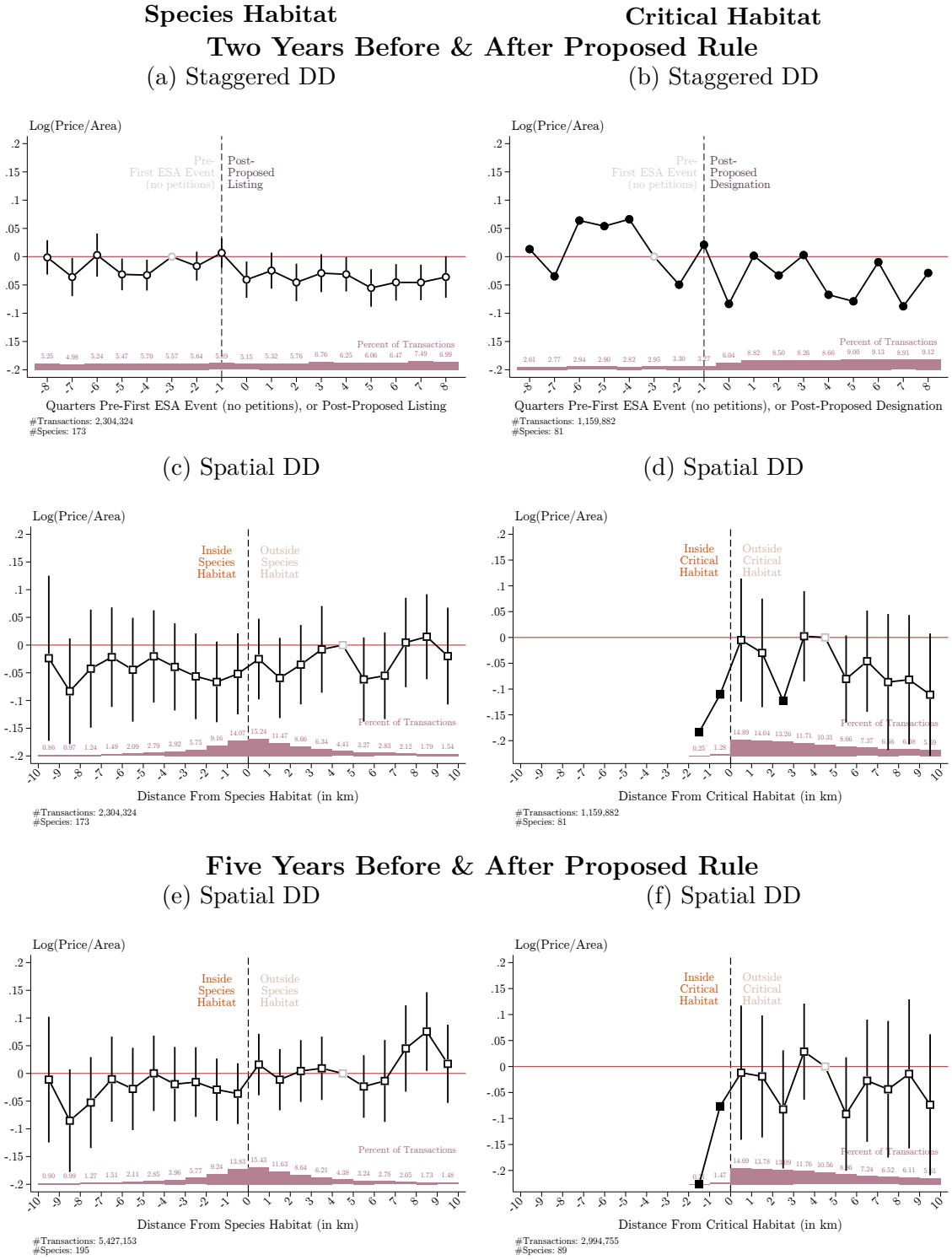


(f) Spatial DD



Notes: Same as in Figure 6, but using logged sale price divided by parcel area, and using the first ESA event as the treatment onset.

Figure A25: Estimation Results for Log(Sale Price/Area) First ESA Event excl. Petitions



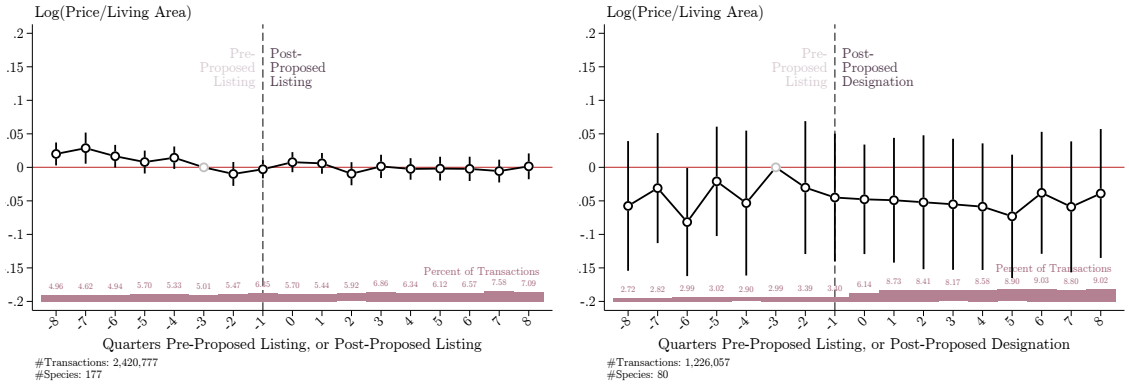
Notes: Same as in Figure 6, but using logged sale price divided by parcel area, and using the first ESA event as the treatment onset.

Figure A26: Estimation Results for Log(Sale Price/Living Area)

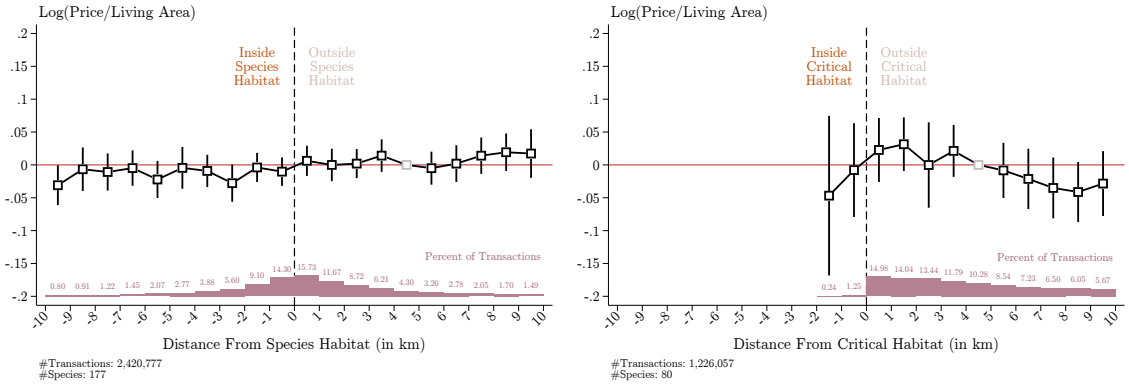
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

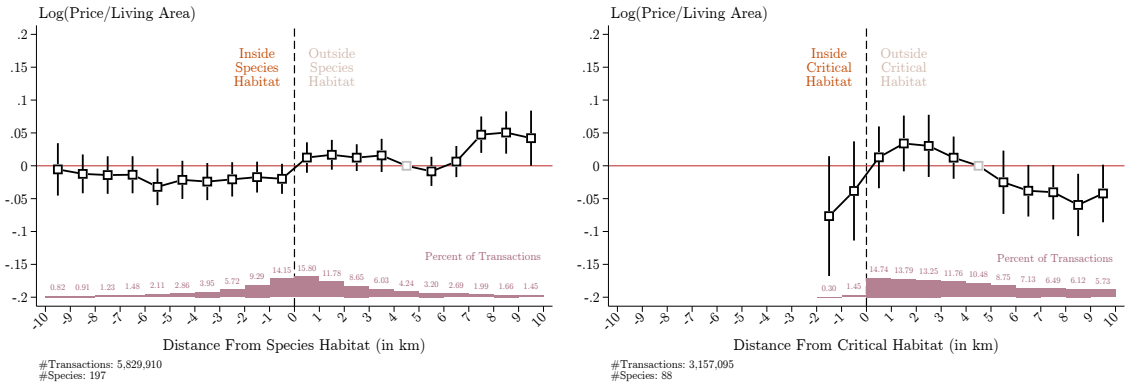


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



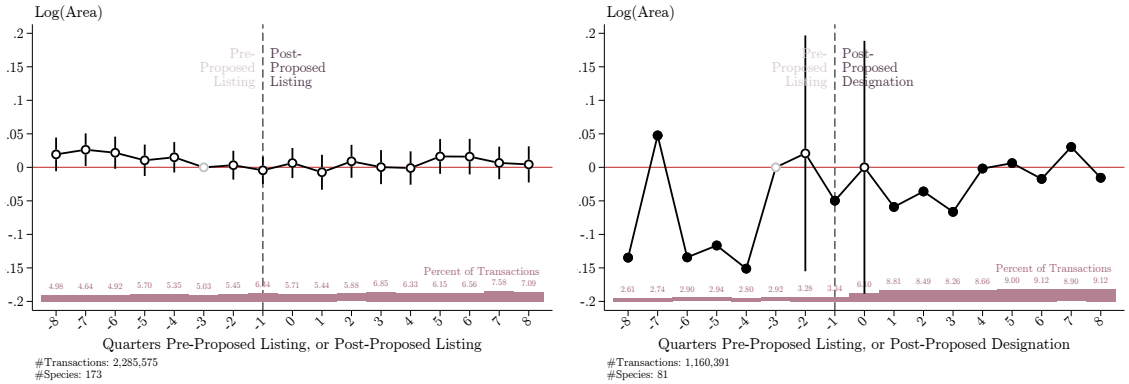
Notes: Same as in Figure 6, but using logged sale price divided by living area, and using the first ESA event as the treatment onset.

Figure A27: Estimation Results for Log(Area)

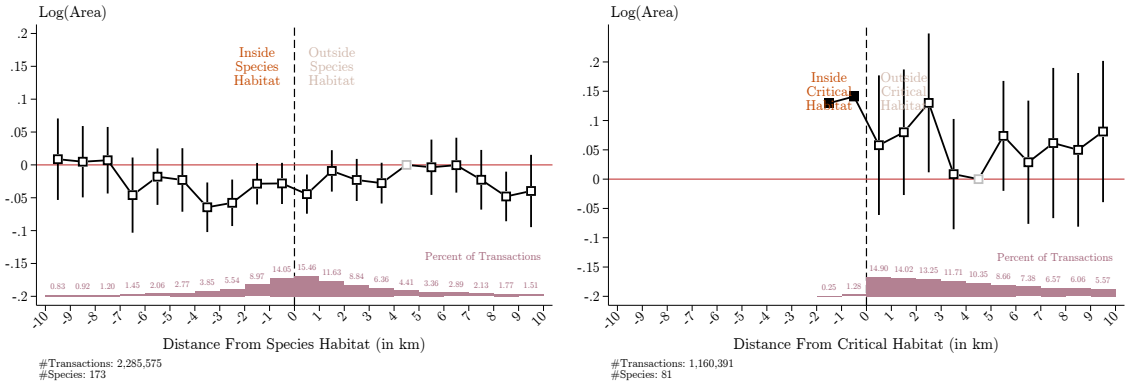
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

(a) Staggered DD (b) Staggered DD

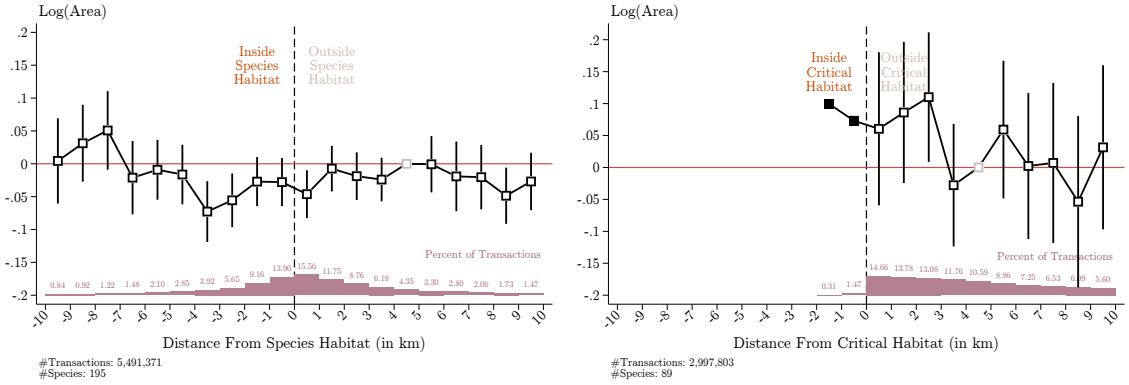


(c) Spatial DD (d) Spatial DD



Five Years Before & After Proposed Rule

(e) Spatial DD (f) Spatial DD



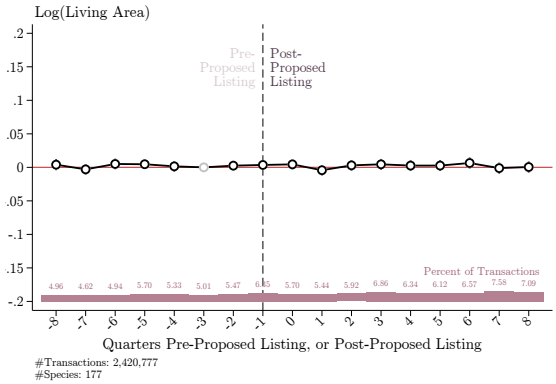
Notes: Same as in Figure 6, but using logged parcel area as the outcome.

Figure A28: Estimation Results for Log(Living Area)

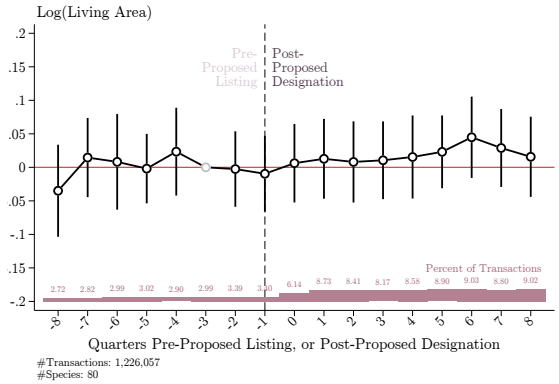
Species Habitat | **Critical Habitat**

Two Years Before & After Proposed Rule

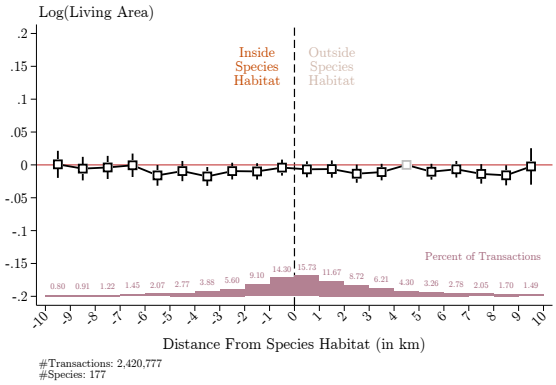
(a) Staggered DD



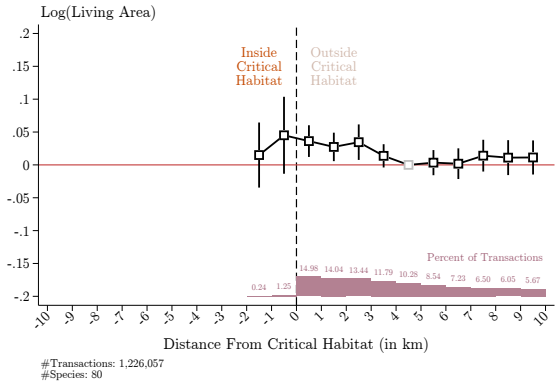
(b) Staggered DD



(c) Spatial DD

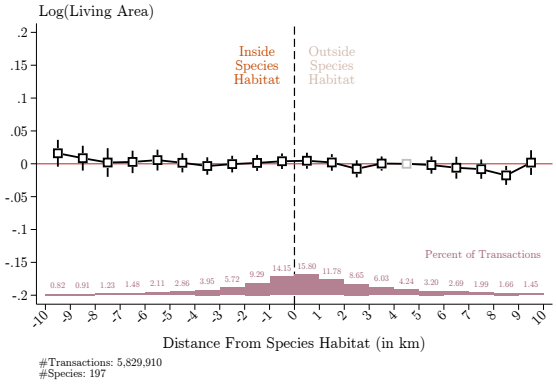


(d) Spatial DD

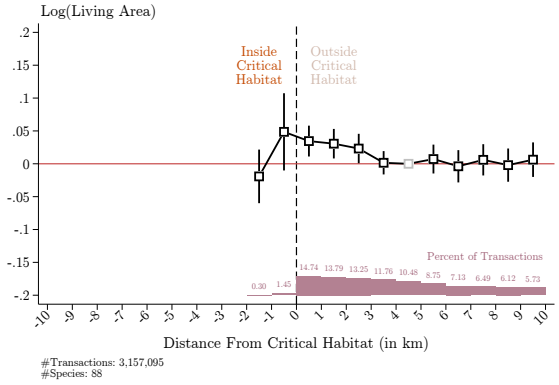


Five Years Before & After Proposed Rule

(e) Spatial DD



(f) Spatial DD



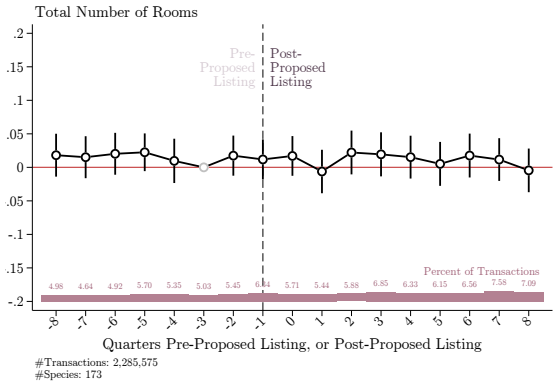
Notes: Same as in Figure 6, but using logged living area as the outcome.

Figure A29: Estimation Results for Total Rooms

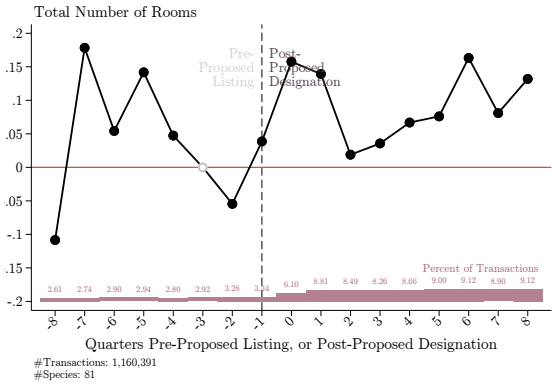
Species Habitat **Critical Habitat**

Two Years Before & After Proposed Rule

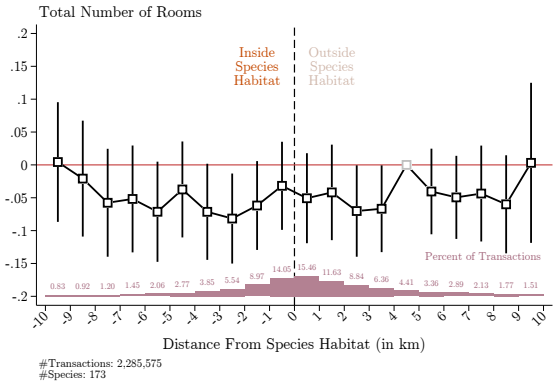
(a) Staggered DD



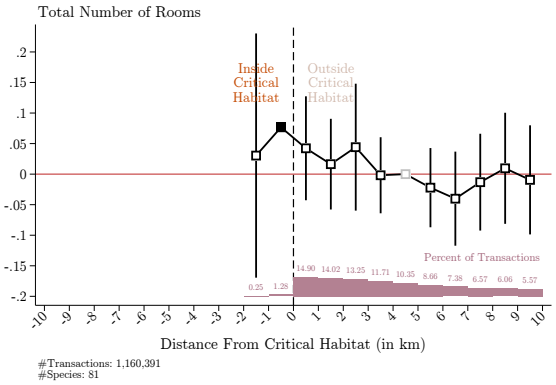
(b) Staggered DD



(c) Spatial DD

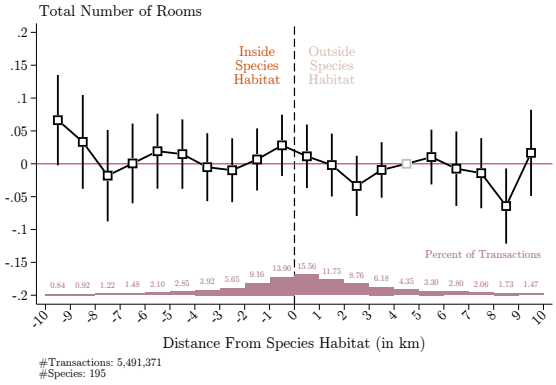


(d) Spatial DD

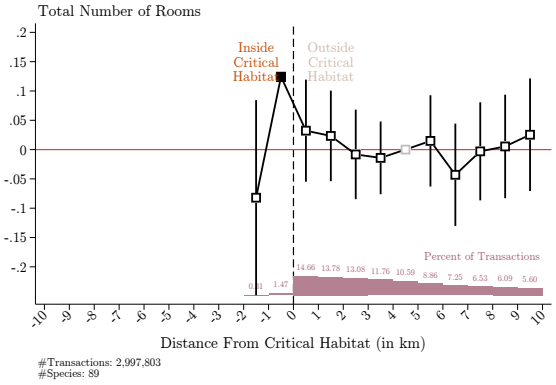


Five Years Before & After Proposed Rule

(e) Spatial DD



(f) Spatial DD

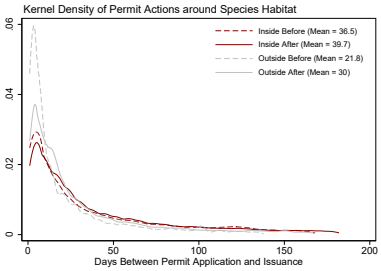


Notes: Same as in Figure 6, but using the number of total rooms as the outcome.

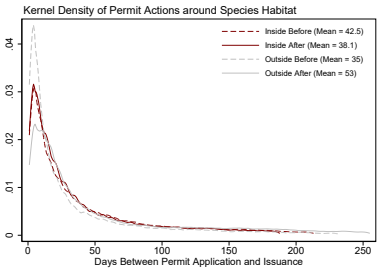
Figure A30: Distributions of Days from Application to Issuance of Construction Permits

Species Habitat

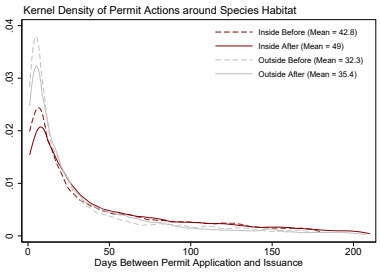
(a) Four-Year Window Sample



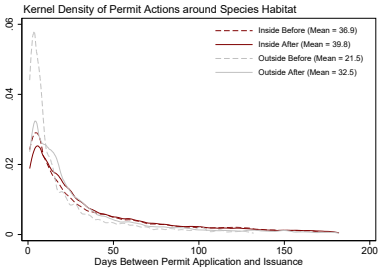
(c) Full Sample



(e) Ever Conflict Species

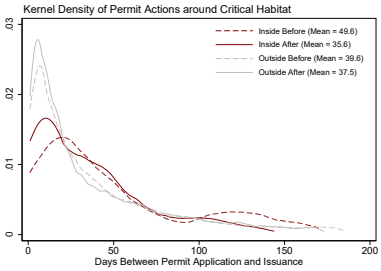


(g) Lower Bound

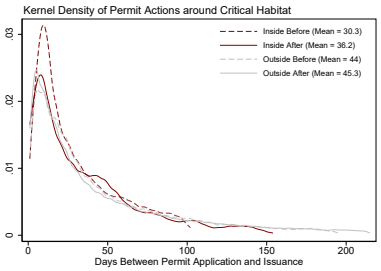


Critical Habitat

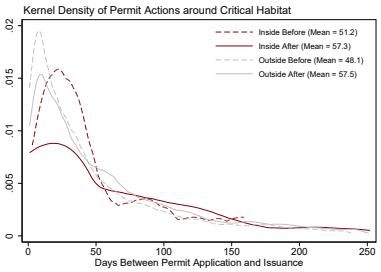
(b) Four-Year Window Sample



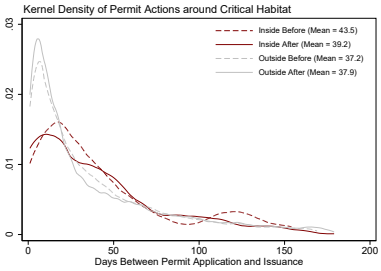
(d) Full Sample



(f) Ever Conflict Species



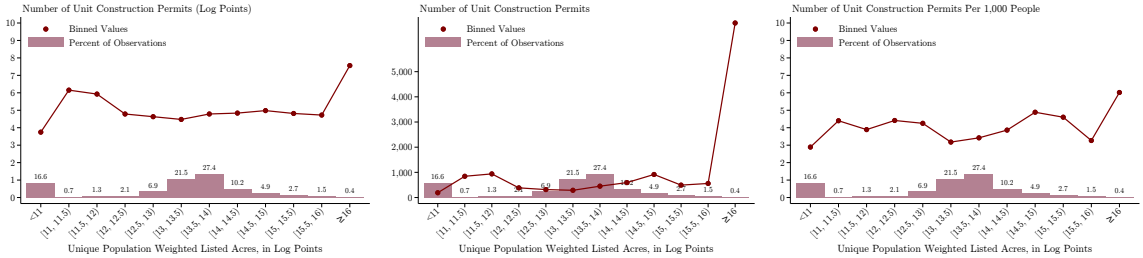
(h) Lower Bound



Notes: We summarize the BuildZoom data by plotting kernel densities for the days between a permit application and its issuance for permits inside or outside a protected area, before or after a proposed listing or designation rule. We exclude values above the 90th percentile to allow for easier visual inspection.

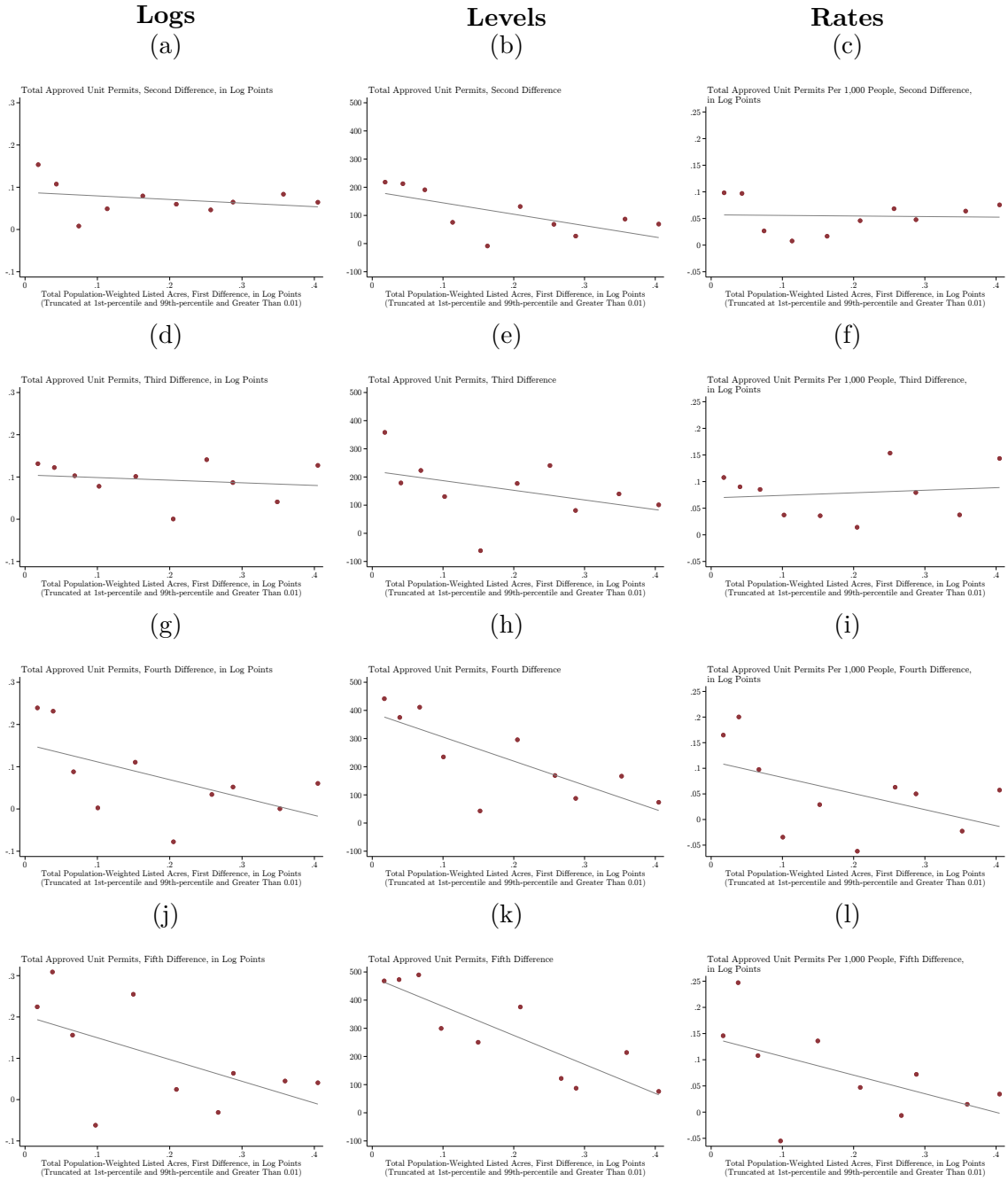
Figure A31: Construction Permits & Unique Protected Acres

Logs (a) **Levels** (b) **Rates** (c)



Notes: Same as in Figure 10, only using unique protected acres instead of total protected acres.

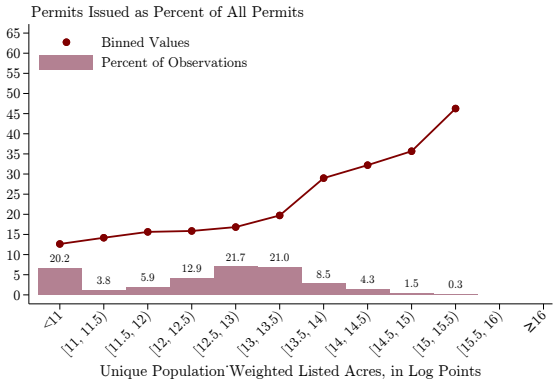
Figure A32: Approved Unit Permits Differences Binscatters



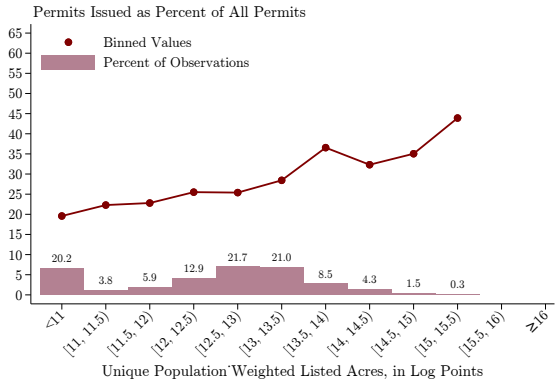
Notes: Same as in Figure 10, only using higher-order differences for the change in construction permits.

Figure A33: Army Corps of Engineers Permits in Near-Water Habitats

(a) % of Permits Issued with Special Conditions



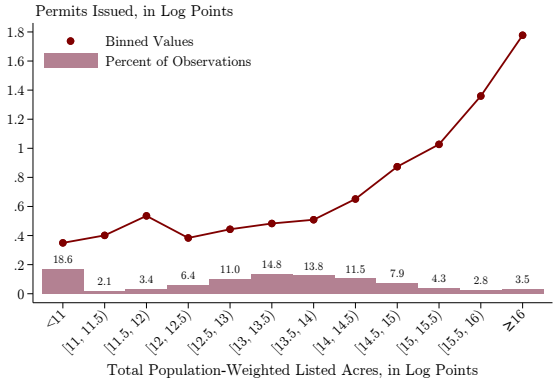
(b) % of Permits Issued as Standard Permits



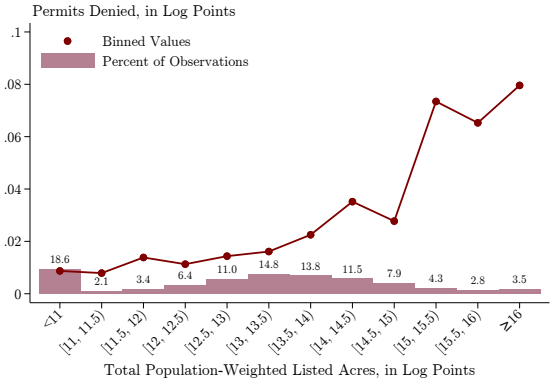
Notes: Same as in Figure 11, only using unique acres instead of total acres.

Figure A34: Army Corps of Engineers Permit Counts (Near-Water Habitats)

(a) Permit Count



(b) Denied Permit Count



Notes: Same as in Figure 11c, only plotting the counts (in log points) of the permits and denied permits, instead of the share of denied permits.

Table A1.
Examining Timing of Treatment for Residential Properties

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×Listing	.003	-.254	-.131	.007	-.372*	-.364*
	(.008)	(.261)	(.225)	(.01)	(.208)	(.209)
Inside[0-3]×Designation		.372*	.302		.439	.38*
		(.214)	(.226)		(.273)	(.212)
Outside[0-3]×Listing	.041***	.173	.349**	.033***	.043	.066
	(.01)	(.175)	(.136)	(.012)	(.033)	(.098)
Outside[0-3]×Designation		.007	-.113		.06	-.014
		(.072)	(.088)		(.165)	(.087)
Outside[3-6]×Listing	.03**	.13	.273**	.026*	-.036	-.026
	(.013)	(.176)	(.135)	(.014)	(.056)	(.097)
Outside[3-6]×Designation		.009	-.066		.105	.061
		(.074)	(.088)		(.17)	(.086)
R^2	0.655	0.687	0.696	0.689	0.707	0.715
N	5,047,035	2,281,547	1,986,153	2,659,457	1,811,624	1,636,347
Clusters	6,235	1,625	1,380	3,789	1,199	1,039

Notes: Linear combinations of coefficients estimated using the specification in Equation (3). The sample consists of all transactions inside the protected area, up to 3km, and up to 6km outside of the protected area. We report estimates around the borders of the species habitats (Columns 1 and 4), and critical habitats (Columns 2, 3, 5, and 6). In columns 4–6, we restrict the sample to species that were flagged as potential cases of with conflict real-estate development. In Columns 3 and 6, we narrow the comparison by only including transactions outside of the critical habitats if they are also within the species habitat (in order to focus on the marginal effect of the critical habitat designation).

Table A2.
Examining Timing of Treatment for Residential Properties

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×LP	-0.038***	-0.217	-0.234	-0.017	-0.561*	0.061
	(0.015)	(0.157)	(0.156)	(0.018)	(0.306)	(0.285)
Inside[0-3]×PL	-0.027**	-0.133	-0.145	-0.007	-0.513**	-0.444**
	(0.011)	(0.219)	(0.219)	(0.015)	(0.201)	(0.207)
Inside[0-3]×FL	0.030***	-0.121	0.014	0.014	0.141***	0.081
	(0.009)	(0.187)	(0.139)	(0.012)	(0.050)	(0.049)
Inside[0-3]×PD		0.390*	0.422**		0.433	0.361*
		(0.200)	(0.202)		(0.315)	(0.199)
Inside[0-3]×FD		-0.018	-0.120		0.006	0.019
		(0.069)	(0.088)		(0.101)	(0.073)
Outside[0-3]×LP	-0.058***	-0.238	-0.233	-0.014	-0.555*	0.091
	(0.018)	(0.158)	(0.150)	(0.021)	(0.308)	(0.270)
Outside[0-3]×PL	-0.000	0.402***	0.407***	0.020		0.061
	(0.012)	(0.106)	(0.103)	(0.016)		(0.097)
Outside[0-3]×FL	0.041***	-0.229	-0.057	0.012	0.043	0.005
	(0.010)	(0.179)	(0.132)	(0.014)	(0.033)	(0.023)
Outside[0-3]×PD		-0.020	-0.039		0.008	-0.082*
		(0.040)	(0.041)		(0.223)	(0.047)
Outside[0-3]×FD		0.027	-0.074		0.052	0.068
		(0.060)	(0.078)		(0.090)	(0.073)
Outside[3-6]×LP	-0.065***	-0.272*	-0.277*	-0.079***	-0.578*	0.046
	(0.020)	(0.159)	(0.150)	(0.029)	(0.308)	(0.271)
Outside[3-6]×PL	-0.008	0.377***	0.348***	0.021	-0.036	0.019
	(0.015)	(0.107)	(0.103)	(0.023)	(0.056)	(0.097)
Outside[3-6]×FL	0.038***	-0.247	-0.075	0.005		-0.045
	(0.014)	(0.179)	(0.133)	(0.022)		(0.028)
Outside[3-6]×PD		-0.018	0.006		0.059	-0.003
		(0.043)	(0.042)		(0.227)	(0.046)
Outside[3-6]×FD		0.027	-0.072		0.047	0.065
		(0.061)	(0.078)		(0.090)	(0.073)
R^2	0.655	0.687	0.696	0.689	0.707	0.715
N	5,047,035	2,281,547	1,986,153	2,659,457	1,811,624	1,636,347
Clusters	6,235	1,625	1,380	3,789	1,199	1,039

Notes: Detailed results of the estimation summarized in Table A1. LP: Lawsuit or petition (earliest of the two); PL: Proposed Listing; FL: Final Listing; PD: Proposed CH Designation; FD: Final CH Designation.

Table A3.
Examining Timing of Treatment for Residential Vacant Lands

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×LP	0.013	-1.150**	-0.005	-0.001	-1.167**	-0.132
	(0.068)	(0.562)	(0.277)	(0.073)	(0.583)	(0.308)
Inside[0-3]×PL	0.136**	0.541	0.746	0.198***	0.485	0.784
	(0.068)	(0.486)	(0.632)	(0.071)	(0.594)	(0.648)
Inside[0-3]×FL	-0.075	0.158	-0.122	-0.126*	0.142	-0.119
	(0.070)	(0.479)	(0.566)	(0.075)	(0.590)	(0.581)
Inside[0-3]×PD						
Inside[0-3]×FD		-0.241	-0.193		-0.218	-0.271
		(0.163)	(0.281)		(0.167)	(0.287)
Outside[0-3]×LP	0.080	-1.412**	0.162	0.094	-1.419**	0.029
	(0.083)	(0.630)	(0.313)	(0.090)	(0.649)	(0.347)
Outside[0-3]×PL	0.098	1.723***	1.806***	0.183**	1.635***	1.873***
	(0.071)	(0.491)	(0.581)	(0.076)	(0.558)	(0.620)
Outside[0-3]×FL	-0.026	0.136	0.275	-0.038	0.545**	0.583***
	(0.071)	(0.159)	(0.169)	(0.080)	(0.264)	(0.224)
Outside[0-3]×PD		-1.330***	-1.619***		-1.750***	-1.945***
		(0.480)	(0.515)		(0.595)	(0.596)
Outside[0-3]×FD		-0.001	0.085		0.004	0.007
		(0.144)	(0.247)		(0.148)	(0.242)
Outside[3-6]×LP	0.036	-1.432**	-0.222	-0.054	-1.418**	-0.389
	(0.092)	(0.641)	(0.330)	(0.109)	(0.665)	(0.366)
Outside[3-6]×PL	0.045	0.803***	0.422	0.157	0.714***	0.265
	(0.081)	(0.181)	(0.330)	(0.095)	(0.210)	(0.308)
Outside[3-6]×FL	-0.070	-0.072	-0.020	-0.200**	0.018	0.004
	(0.085)	(0.109)	(0.156)	(0.101)	(0.145)	(0.155)
Outside[3-6]×PD		-0.382**	-0.052		-0.372*	0.177
		(0.153)	(0.214)		(0.205)	(0.195)
Outside[3-6]×FD		0.015	-0.009		0.024	-0.100
		(0.166)	(0.265)		(0.174)	(0.261)
R^2	0.505	0.482	0.513	0.532	0.504	0.547
N	189,501	76,418	54,449	108,335	58,863	43,397
Clusters	3,754	1,039	835	2,366	840	718

Notes: See Table A2.

Table A4.
Examining Timing of Treatment for Nonresidential Vacant Lands

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×LP	0.064	-1.029**	-0.993*	-0.003	0.017	-0.454
	(0.091)	(0.433)	(0.544)	(0.121)	(0.192)	(0.421)
Inside[0-3]×PL	0.030	3.700***	3.461***	0.015	1.870***	1.882***
	(0.089)	(0.358)	(0.366)	(0.136)	(0.341)	(0.479)
Inside[0-3]×FL	-0.023	-1.998***	-1.747*	-0.060	0.451	0.566*
	(0.088)	(0.736)	(0.908)	(0.138)	(0.328)	(0.290)
Inside[0-3]×PD		-1.525**	-1.519**		-2.716***	-2.757***
		(0.630)	(0.638)		(0.422)	(0.435)
Inside[0-3]×FD		0.765**	0.644		1.046***	0.935***
		(0.376)	(0.419)		(0.268)	(0.262)
Outside[0-3]×LP	0.087	-0.969**	-0.615	0.170	0.072	-0.085
	(0.115)	(0.438)	(0.553)	(0.145)	(0.163)	(0.407)
Outside[0-3]×PL	-0.001	1.184***	3.240***	0.114	-0.084	1.612***
	(0.098)	(0.249)	(0.294)	(0.161)	(0.262)	(0.439)
Outside[0-3]×FL	-0.097	-1.046*	-0.931	-0.223	-0.411	-0.442*
	(0.100)	(0.594)	(0.763)	(0.160)	(0.259)	(0.264)
Outside[0-3]×PD			-2.248***			-1.741***
			(0.243)			(0.361)
Outside[0-3]×FD		0.874**	0.843**		1.195***	1.200***
		(0.385)	(0.424)		(0.264)	(0.250)
Outside[3-6]×LP	0.176	-0.820*	-0.326	0.243	0.059	0.078
	(0.121)	(0.435)	(0.560)	(0.166)	(0.185)	(0.394)
Outside[3-6]×PL	0.200	0.936***	0.893***	0.384	-0.650*	-0.705
	(0.157)	(0.220)	(0.238)	(0.247)	(0.346)	(0.466)
Outside[3-6]×FL	-0.216	-1.127*	-1.153	-0.329	0.002	-0.048
	(0.169)	(0.579)	(0.762)	(0.270)	(0.314)	(0.319)
Outside[3-6]×PD						
Outside[3-6]×FD		1.021***	1.029**		1.396***	1.422***
		(0.387)	(0.419)		(0.262)	(0.241)
R^2	0.465	0.376	0.360	0.483	0.417	0.442
N	76,928	23,347	17,288	46,376	12,823	8,980
Clusters	1,998	524	393	1,308	384	284

Notes: See Table A2.

Table A5.
Examining Timing of Treatment for Residential Vacant Lands (Pooled from Table A3)

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×Listing	.062	.699**	.624	.072	.628**	.665
	(.049)	(.279)	(.405)	(.059)	(.306)	(.416)
Inside[0-3]×Designation		-.241	-.193		-.218	-.271
		(.163)	(.281)		(.167)	(.287)
Outside[0-3]×Listing	.072	1.859***	2.082***	.146***	2.18***	2.456***
	(.054)	(.5)	(.594)	(.055)	(.599)	(.65)
Outside[0-3]×Designation		-1.33***	-1.535***		-1.747***	-1.938***
		(.5)	(.570)		(.611)	(.64)
Outside[3-6]×Listing	-.026	.732***	.402	-.043	.732***	.268
	(.058)	(.203)	(.368)	(.068)	(.236)	(.335)
Outside[3-6]×Designation		-.366*	-.061		-.348	.077
		(.216)	(.339)		(.255)	(.319)

Notes: See Table A1.

Table A6.
Examining Timing of Treatment for Nonresidential Vacant Lands (Pooled from Table A4)

	Main Sample			Ever Conflict Sample		
	SH	CH	M. CH	SH	CH	M. CH
	(1)	(2)	(3)	(4)	(5)	(6)
Inside[0-3]×Listing	.007	1.702**	1.714*	-.045	2.321***	2.448***
	(.07)	(.797)	(.981)	(.088)	(.446)	(.552)
Inside[0-3]×Designation		-.759	-.875		-1.671***	-1.822***
		(.688)	(.741)		(.495)	(.51)
Outside[0-3]×Listing	-.097	.138	2.309***	-.109	-.495***	1.169**
	(.073)	(.502)	(.737)	(.097)	(.149)	(.498)
Outside[0-3]×Designation		.874**	-1.405***		1.195***	-.54
		(.385)	(.499)		(.264)	(.445)
Outside[3-6]×Listing	-.016	-.191	-.26	.056	-.648***	-.753**
	(.094)	(.497)	(.722)	(.117)	(.105)	(.356)
Outside[3-6]×Designation		1.021***	1.029**		1.396***	1.422***
		(.387)	(.419)		(.262)	(.241)

Notes: See Table A1.

Table A7.
Examining Timing of Treatment for Permit Approval Duration

	Not Solely Aquatic		Ever Conflict	
	SH	CH	SH	CH
	(1)	(2)	(3)	(4)
Inside[0-3]×LP	0.126*	0.278	0.043	-0.181
	(0.073)	(0.215)	(0.075)	(0.509)
Inside[0-3]×PL	-0.079	-1.061***	0.050	-0.047
	(0.080)	(0.312)	(0.073)	(0.108)
Inside[0-3]×FL	0.056	0.658**	-0.026	2.421***
	(0.068)	(0.281)	(0.071)	(0.377)
Inside[0-3]×PD		-0.349		-1.734***
		(0.251)		(0.384)
Inside[0-3]×FD		-0.567**		-0.768***
		(0.233)		(0.169)
Outside[0-3]×LP	0.143	0.309*	0.107	-0.282
	(0.090)	(0.181)	(0.091)	(0.456)
Outside[0-3]×PL	-0.051	-2.070***	0.009	0.459
	(0.086)	(0.432)	(0.088)	(0.493)
Outside[0-3]×FL	0.041	-0.003	0.057	-0.272*
	(0.079)	(0.121)	(0.103)	(0.141)
Outside[0-3]×PD		0.898**		-0.328
		(0.366)		(0.503)
Outside[0-3]×FD		0.046		0.068
		(0.093)		(0.077)
Outside[3-6]×LP	0.247**	0.262	0.105	-0.459
	(0.099)	(0.243)	(0.132)	(0.442)
Outside[3-6]×PL	-0.114	-1.552***	0.147	-0.270
	(0.099)	(0.516)	(0.102)	(0.654)
Outside[3-6]×FL	-0.119	0.085	-0.352***	-0.096
	(0.096)	(0.141)	(0.135)	(0.138)
Outside[3-6]×PD		0.593		0.418
		(0.479)		(0.663)
Outside[3-6]×FD		-0.055		-0.025
		(0.138)		(0.081)
R^2	0.355	0.143	0.407	0.249
N	658,476	206,150	364,290	165,380
Clusters	1,962	287	1,374	420

Notes: See Table A2. The outcome variable is the log of days between permit application and issuance.

Table A8.
Examining Timing of Treatment for Permit Approval Duration (Pooled from Table A7)

	Not Solely Aquatic		Ever Conflict	
	SH	CH	SH	CH
	(1)	(2)	(3)	(4)
Inside[0-3]×Listing	-.022	-.404	.024	2.374***
	(.064)	(.394)	(.076)	(.403)
Inside[0-3]×Designation		-.916***		-2.502***
		(.33)		(.422)
Outside[0-3]×Listing	-.01	-2.073***	.066	.187
	(.079)	(.443)	(.099)	(.5)
Outside[0-3]×Designation		.945**		-.26
		(.388)		(.495)
Outside[3-6]×Listing	-.233***	-1.467***	-.206*	-.366
	(.086)	(.518)	(.112)	(.639)
Outside[3-6]×Designation		.537		.393
		(.479)		(.648)

Notes: See Table A1. The outcome variable is the log of days between permit application and issuance.

Table A9.
Species by Species Estimations for SH, Residential Lands

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lawsuit	0.045										0.083**
	(0.034)										(0.039)
Petition		0.034									0.026
		(0.036)									(0.048)
Listing Decade: 1990			-0.047								0.033
			(0.071)								(0.087)
Listing Decade: 2000			-0.010								0.103
			(0.069)								(0.100)
Listing Decade: 2010			-0.005								0.192
			(0.072)								(0.126)
Consultations (1000s)				0.000							-0.006
				(0.002)							(0.004)
RPN: medium					-0.043						0.013
					(0.054)						(0.071)
RPN: high					-0.008						0.023
					(0.047)						(0.068)
Ever Conflict						-0.044					-0.049
						(0.043)					(0.051)
Birds							-0.047				-0.031
							(0.032)				(0.087)
Crustaceans							-0.236***				-0.292**
							(0.020)				(0.132)
Flowering Plants							-0.038				0.032
							(0.038)				(0.061)
Insects							-0.054				-0.010
							(0.038)				(0.074)
Lichens							-0.111***				-0.159
							(0.020)				(0.153)
Mammals							0.004				0.001
							(0.061)				(0.095)
Reptiles							0.025				0.119
							(0.037)				(0.075)
Percent Metro								0.001			0.002
								(0.001)			(0.002)
Log Mean Price Pre									-0.050		-0.142**
									(0.043)		(0.064)
Pacific										-0.007	-0.032
										(0.035)	(0.047)
Southwest										-0.036	-0.045
										(0.033)	(0.069)
Midwest										0.048	0.048
										(0.056)	(0.069)
Southeast										0.035	0.036
										(0.081)	(0.108)
Mountain										0.024	0.068
										(0.035)	(0.063)
Pacific Sw										0.002	0.030
										(0.041)	(0.051)
Constant	-0.026	-0.022	0.015	-0.009	0.004	0.017	0.023	-0.076	0.583	-0.020	1.366*
	(0.030)	(0.029)	(0.064)	(0.021)	(0.034)	(0.035)	(0.020)	(0.119)	(0.510)	(0.039)	(0.696)
N	165	165	161	165	156	156	165	165	165	165	155
R^2	7.8e-03	4.3e-03	7.2e-03	2.5e-05	4.6e-03	7.3e-03	.012	4.6e-03	.013	7.2e-03	.103

Notes: omitted categories. Five outlier species with coefficients greater than 1 were dropped from the analysis.

Table A10.
Species by Species Estimations for SH, Residential Vacant Lands

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lawsuit	-0.075										0.008
	(0.124)										(0.187)
Petition		0.063									0.110
		(0.133)									(0.210)
Listing Decade: 1990			0.268								0.232
			(0.166)								(0.222)
Listing Decade: 2000			0.115								0.105
			(0.243)								(0.289)
Listing Decade: 2010			0.143								-0.439
			(0.147)								(0.343)
Consultations (1000s)				0.008							0.012
				(0.008)							(0.008)
RPN: medium					0.013						0.284*
					(0.139)						(0.161)
RPN: high					-0.068						0.124
					(0.151)						(0.179)
Ever Conflict						-0.203					-0.103
						(0.132)					(0.182)
Birds							0.011				-0.150
							(0.126)				(0.235)
Crustaceans							0.030				-0.059
							(0.133)				(0.212)
Flowering Plants							-0.029				-0.305
							(0.236)				(0.339)
Insects							-0.461				-0.815**
							(0.312)				(0.342)
Lichens							-0.113				-0.046
							(0.153)				(0.308)
Percent Metro								-0.007**			-0.008**
								(0.003)			(0.004)
Log Mean Price Pre									0.011		0.239*
									(0.075)		(0.124)
Pacific										0.275**	0.359
										(0.127)	(0.226)
Southwest										-0.087	-0.285
										(0.177)	(0.251)
Midwest										0.174	0.389*
										(0.151)	(0.217)
Southeast										-0.033	0.240
										(0.183)	(0.244)
Mountain										0.224	0.474
										(0.202)	(0.285)
Pacific Sw										-0.076	-0.177
										(0.138)	(0.191)
Constant	0.032	-0.044	-0.166	-0.025	0.025	0.118	0.050	0.575**	-0.140	-0.056	-2.210
	(0.088)	(0.118)	(0.129)	(0.069)	(0.070)	(0.096)	(0.091)	(0.254)	(0.911)	(0.124)	(1.355)
N	74	74	72	74	68	68	74	74	74	74	68
R^2	4.9e-03	3.4e-03	.033	6.4e-03	4.5e-03	.034	.094	.117	4.5e-04	.09	.484

Notes: omitted categories

Table A11.
Species by Species Estimations for SH, Nonresidential Vacant Lands

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lawsuit	-0.035										-0.563
	(0.261)										(0.333)
Petition		-0.238									0.614*
		(0.222)									(0.326)
Listing Decade: 1990			-0.183								-0.731
			(0.319)								(0.498)
Listing Decade: 2000			-0.322								-1.078
			(0.303)								(0.673)
Listing Decade: 2010			-0.245								-1.112*
			(0.286)								(0.551)
Consultations (1000s)				0.005							-0.021
				(0.010)							(0.027)
RPN: medium					0.234						0.151
					(0.265)						(0.294)
RPN: high					0.142						0.033
					(0.251)						(0.355)
Ever Conflict						-0.515**					0.007
						(0.220)					(0.402)
Birds							0.105				-0.580
							(0.388)				(0.446)
Crustaceans							0.572				0.528
							(0.428)				(0.395)
Flowering Plants							0.462				0.102
							(0.390)				(0.237)
Insects							0.447				0.127
							(0.398)				(0.847)
Lichens							0.061				-0.224
							(0.416)				(0.486)
Percent Metro								0.001			-0.003
								(0.002)			(0.004)
Log Mean Price Pre									-0.005		0.273
									(0.120)		(0.173)
Pacific										0.138	0.390
										(0.171)	(0.327)
Southwest										0.354	0.775*
										(0.222)	(0.374)
Midwest										0.486*	0.771*
										(0.252)	(0.399)
Southeast										-0.052	-0.020
										(0.299)	(0.347)
Mountain										-0.515**	-0.401
										(0.209)	(0.375)
Pacific Sw										0.144	0.222
										(0.174)	(0.215)
Constant	-0.016	0.118	0.241	-0.053	-0.158	0.311*	-0.326	-0.135	0.024	-0.199	-2.669
	(0.250)	(0.187)	(0.258)	(0.119)	(0.196)	(0.179)	(0.380)	(0.129)	(1.476)	(0.161)	(1.919)
N	44	44	41	44	40	40	44	44	44	44	39
R^2	6.5e-04	.029	.037	2.5e-03	.02	.112	.134	2.2e-03	3.7e-05	.111	.627

Notes: omitted categories

Table A12.
Species by Species Estimations for CH, Residential Lands

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lawsuit	0.193*										0.244
	(0.113)										(0.224)
Petition		-0.134									-0.312
		(0.118)									(0.207)
Listing Decade: 1990			-0.112*								-0.353
			(0.065)								(0.291)
Listing Decade: 2000			-0.202								-0.899**
			(0.177)								(0.378)
Listing Decade: 2010			-0.233***								-0.888**
			(0.086)								(0.399)
Consultations (1000s)				0.107**							0.055
				(0.045)							(0.116)
RPN: medium					-0.133						0.071
					(0.165)						(0.217)
RPN: high					0.213*						0.105
					(0.122)						(0.156)
Ever Conflict						0.248**					-0.011
						(0.121)					(0.294)
Birds							-0.338***				-0.480
							(0.094)				(0.310)
Crustaceans							0.251**				-0.213
							(0.112)				(0.314)
Flowering Plants							0.079				0.011
							(0.167)				(0.220)
Insects							0.185				-0.061
							(0.112)				(0.265)
Lichens							-0.288				-0.585*
							(0.190)				(0.306)
Mammals							-0.178*				-0.510
							(0.094)				(0.295)
Percent Metro								-0.000			-0.002
								(0.001)			(0.002)
Log Mean Price Pre									-0.106		0.091
									(0.093)		(0.199)
Pacific										0.269	0.202
										(0.163)	(0.288)
Southwest										0.195*	0.183
										(0.100)	(0.212)
Midwest										-0.469***	-0.226
										(0.115)	(0.334)
Southeast										0.078	0.029
										(0.161)	(0.359)
Mountain										0.306***	0.144
										(0.089)	(0.273)
Pacific Sw										-0.045	-0.459*
										(0.109)	(0.244)
Constant	-0.259***	-0.053	0.037***	-0.181***	-0.214**	-0.315***	-0.187*	-0.126	1.139	-0.239**	-0.190
	(0.092)	(0.099)	(0.000)	(0.065)	(0.093)	(0.101)	(0.094)	(0.089)	(1.118)	(0.112)	(2.552)
N	46	46	46	46	43	43	46	46	46	46	43
R^2	.064	.031	.027	.05	.136	.094	.2	1.6e-04	.019	.212	.726

Notes: omitted categories

B Additional Background on the ESA

The Endangered Species Act (ESA) was enacted in 1973 with a nearly unanimous vote—passing in the House with a vote of 390-12 and the Senate with a vote of 92-0 (Mann and Plummer 1995). At the time, the act was seen by many in Congress as either an attempt to resolve a disagreement between the Departments of Defense and Interior regarding the protection of sperm whales, whose oil was used in submarines, or a needed step in implementing the recent ratification of the Convention on International Trade in Endangered Species (Mann and Plummer 1995). The act states its purpose as "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" (Endangered Species Act of 1973, Pub. L. No. 93-205, 87 1973). Two federal agencies are responsible for listing species as either "threatened" or "endangered," and managing their recovery: the Fish and Wildlife Service (FWS) and National Marine Fisheries Services (NMFS).

Adding to the list of threatened and endangered species begins with a notice of review. This simply provides a formal declaration that the agency is assessing if a species meets the criteria for listing. The agency can release a notice of review based on the information it has that suggests the species might meet the criteria, a petition submitted to the agency requesting a review process, or a court ruling that settles an action-forcing-lawsuit where the agency is directed to begin a review process. After the review process, the agency announces it has found the species to be unwarranted for listing, warranted but precluded at the time due to agency priorities and other constraints, or warranted. For the latter, it proceeds to release a proposed rule for listing the species, with a minimum of 60 days for public comments. Unless the agency proceeds with an emergency listing, it waits 12 months until it releases the final rule to list or withdraws the proposed rule. The ESA also includes a nondiscretionary mandate to to designate critical habitats (CHs). CHs also require a similar proposed and final rule process. At times, the agency releases the proposed and final rules for listing and designation on the same dates, but at other times, designation can lag after

listing by several years, if the species receives a proposed designation at all.[20]

The petition process allows citizens or NGOs to request that the FWS review a species and consider its status for listing. The FWS either rejects that the information is substantial enough within 90 days or proceeds to conduct a full review. Even if the species is found to be warranted for listing, the FWS might delay releasing a proposed listing rule for several years by listing it as a candidate species.

The exemption from needing to conduct a cost–benefit analysis when proposing to list a species is more of a legislative "mishap" than by direct intention. Two versions of the bill existed, one each for the House and Senate committees. The version that was adopted was mostly based on the one drafted by the Senate committee that removed the word "practicable." This is what allows the agencies to avoid taking into account economic considerations. This form of balancing mechanism is often found in similar legislation (Mann and Plummer 1995). Another important difference is the definition of "taking" with respect to Section 9. In the version passed by the House, "take" meant a direct injuring or killing of a listed species; in the version passed by the Senate, it included any action that could "harm" a listed species, allowing for a very broad interpretation of the ESA's antitake provisions (Petersen 1999). As E.U. Curtis Bohlen, Deputy Interior Secretary, commented, "[a]s the bill drifted through the Hill ... there were probably not more than four of us who understood its ramifications" (Mann and Plummer 1995). Section 9 does, however, contain a provision exempting persons from its restrictions if compliance would cause "undue economic hardship."

In the main text, we focus on Section 7. Here, we provide details on additional relevant information regarding other sections of the ESA. Section 10 of the ESA allows for certain limited exemptions to its prohibitions against private actions resulting in "take." Notably, the Secretary of the Interior may issue permits to take listed species if the take is "incidental" to an otherwise legal activity, which means that the act of injuring/killing/harming a habitat or protected species happened despite the developer's best efforts to avoid it. Incidental

[20] For a summary of the process, see https://www.fws.gov/sites/default/files/documents/ESA-Section-4-Listing.pdf. Accessed 8/13/2024.

take permit (ITP) applications must include a "habitat conservation plan" (HCP) detailing the expected effect on the species, how the holder will minimize and mitigate these effects, the alternatives considered, and reasons for rejecting them. To issue an ITP, the secretary must find that the taking will be incidental, its effects will be minimized and mitigated, the conservation plan is adequately funded, and the taking will not appreciably reduce the likelihood of the species' survival and recovery. HCPs and ITPs are frequently used by real estate developers operating on private land as a means of complying with the ESA when listed species are present.

The designation of CH can impose incremental costs beyond those associated with listing. A more detailed definition of CHs is the area occupied by the species when it is listed that contains physical or biological features essential to its conservation and that may require special management or protection, as well as specific areas not occupied by the species when it is listed that are essential for conservation.

When CH is unoccupied by the species, the requirements of Sections 7 and 10 have traditionally resulted in additional costs to a project where none would be borne under Section 9's antitake provisions.[21] Beyond the formal mechanisms established by the ESA, the designation can be a signal to local regulators where habitat protections should be prioritized and impacts avoided. Local land-use authorities typically have wide latitude to restrict or modify development projects and can alter requirements on the basis of a designation.

[21] In 2018, the US Supreme Court ruled that an area is eligible to be designated as CH under the ESA only if the area is habitat for the relevant threatened or endangered species. The court vacated the US Court of Appeals for the Fifth Circuit's decision, which held that the ESA has no habitability requirement, and remanded the case to the Fifth Circuit to consider the meaning of habitat under the ESA. Thus, land can no longer be designated as CH if it is unoccupied by a listed species.

C Detailed Interpretation of Conceptual Framework

In the residential property market (Figure 1, Panel I), the supply of properties is comprised of real-estate developers, and demand is comprised of home buyers. On the supply side, after a rule is proposed, suppliers have an incentive to increase development before finalization to preempt higher costs after finalization (Panel a). This response is more likely in areas where real-estate values are high, land available for development is scarce, and the probability of binding development constraints is high. The theory and empirical literature strongly agree about the direction of the shift of the supply curve (see, for example, List et al. (2006), Lueck and Michael (2003), and Bošković and Nøstbakken (2017)). However, this part of the market has significant ambiguity arising from the demand side. Certain home buyers will value the potentially higher likelihood of open space amenities being preserved (as described in McConnell and Walls (2005)), resulting in higher demand inside, which we show by the shift to $\overline{D}'_R$. On the other hand, homeowners might worry about the possible costs they may face if they decide to develop or remodel their property (as described in Glaeser and Gyourko (2003), Glaeser et al. (2005), and Quigley and Raphael (2005)), lowering demand inside the protected area, which we show by $\underline{D}'_R$. The relative magnitudes of the demand shift determine the predicted equilibrium outcome inside the proposed protected area.

If the rule is finalized (Panel c), the change in supply switches direction to a decrease in development. Once the species is awarded statutory protections, the remaining uncertainty is how much those would delay or prevent development. The uncertainty in how stringently the FWS, or local regulators, will choose to enforce the protections will unambiguously raise the expected costs for real-estate developers relative to a baseline of no protections. If developers are minimizing their exposure to risk, they will lower the weight in their portfolio on assets inside the protected area, possibly to zero. The change in demand remains ambiguous in the post-final-rule period. However, it is likely to be larger than in the post-proposed-rule period, given the certainty regarding the existence of the statutory protections.

Outside of the protected area, supply unambiguously increases in both periods (Panels

b and d). Real-estate developers might expect higher scarcity of lands suitable for residential development inside the protected area (Quigley and Raphael (2005)) and respond by increasing supply in anticipation of those protections (Subpanel ii). The supply outside the protected area might increase further after the final rule if development costs are lower outside relative to inside, $\overline{S}''_R$. In addition, home buyers might further increase their demand because of the higher likelihood for the preservation of open spaces (McConnell and Walls (2005)), $\overline{D}''_R$ (Subpanel d). However, they might also appreciate more urban-like amenities and other amenities that come with higher population and residential development densities (see, for example, Zhang et al. (2019), Waddell et al. (1993)). For them, preservation of open spaces reflects a disamenity, lowering their demand, $\underline{D}''_R$ (Subpanels b and d).

In the vacant lands market (Figure 1, Panel II), the supply is comprised of landowners and real-estate developers. Home buyers looking to build a new structure now represent demand. The predictions for what happens to land values after a proposed and finalized rule is more straightforward, as the direction in which supply and demand move is unambiguous. Inside the protected area, supply will likely increase after the proposed rule as landowners offer their vacant lands as part of a "fire sale" (Subpanel e). However, the expectations for potentially higher development costs inside the protected area will likely also reduce the demand by both developers and buyers (Subpanel v). The realization of the protections and potential increase in the likelihood of binding development constraints will exacerbate both effects in the post-final-rule period (Subpanel vii). Finally, changes in the supply of vacant lands outside the protected area are not expected; however, we expect demand to increase due to growing scarcity, especially in the post-final-rule period (Subpanels vi and viii).

D Additional Details on Data Sources and Processing

We cover the data and the steps we took in preparing them for analysis in greater detail than in the main text. We begin with the history of listing and designation events under the Endangered Species Act (ESA) and preprocessing of shapefiles for SHs, discuss the transactions data from CoreLogic, and cover the construction permits data and auxiliary data used in their analysis. Throughout, we present figures and tables that help summarize broad trends and patterns in the data.

D.1 Constructing the ESA Listing & Designation History

We started by downloading All Reports from FWS Species Data Explorer. The dataset is a near-comprehensive list of ESA rules published in the Federal Register. The raw data contain more than 56,000 rows; each row is associated with a unique ESA decision related to one species. We briefly describe the columns that were salient to our dataset construction:

- Common Name: Common name of the species.
- Scientific Name: Scientific name of the species.
- ESA Listing Date: Date of a species being listed as endangered or threatened for the first time. This field is empty if a species has never been listed.
- Is Foreign?: Identifies if a species is found in the United States or not.
- Action Type: Identifies the intended action (listing, delisting, uplisting, critical habitat designation, etc.) of published document.
- Publication Type: Identifies the nature of ruling (final rule, proposed rule, proposal withdrawal, emergency ruling, etc.).
- Publication Date: The date of publication of rule in the Federal Register.

- Range Shapefile: Filename for the range shapefile of individual species. This name contains the species identification code and population identification code.
- Species Group: Identifies the class of the species (insect, mammal, bird, etc.).

Using the information in the columns, we first subset the data to species found in the United States. Additionally, we remove all rows associated with publications that are not related to listing or critical habitat (CH) designation (Candidate Notice of Review, Notice of Public Hearing, etc.). We are left with 7,596 observations. We exclude all species not found in the contiguous United States. Finally, we use Publication Type, Publication Date, and Action Type to identify proposed and final rulings of listing, designation, and any modification thereof.

For the most part, we automated these processes. However, for about 100 species, incomplete or inaccurate information resulted in missing dates or unusual chronology of events (such as CH designation predating the listing). To solve this issue, we consulted the Federal Register, identified the accurate information, and manually corrected the dataset.

D.1.1 Documenting Revisions to Critical Habitat Borders & Filling Missing Protected Area Polygons

In most cases, CHs are designated and remain unchanged throughout the time the species is listed. However, CHs do get revised. This can lead to large changes over time in their extent and borders. Another concern regarding protected area definitions is that if a species becomes delisted, the FWS removes all records of its protected area (SHs or CHs) to avoid any confusion about the status of statutory protections under the ESA.

We address these two concerns in a similar way. When available, we use snapshots of older protected area repositories to obtain previous spatial definitions of CHs or the areas of the SHs if the species was still listed during the time period of the relevant snapshot. If those are unavailable, we turn to the Federal Register and extract the exact coordinates that define the CH and manually construct the polygon. Combined, our repository of protected areas

represents the most comprehensive data set on ESA protections across time, to a degree that the FWS does not have available.

D.2 Processing the CoreLogic Transaction Data

The CoreLogic dataset is split into several files. It includes transactions as early as 1976 and extends to 2021. Some states have many more years of data than others. In our first preprocessing step, we go through the entire raw dataset and use the column FIPS CODE to extract and save observations by state. Second, we identify observations with missing coordinates but with addresses and re-geocode them using ArcGIS. We exclude records missing location, date of sale, or price and filter out any non-arms-length transactions. We use different flags to remove non-arms-length transactions and remove any transactions that have a sale price below USD 1,000. We are left with over 37 million and 3 million residential and vacant land records, respectively, that are within 10km of a CH border and over 116 million and 10 million residential and vacant land records, respectively, that are within 10km from a SH border. See Figure D1 for a summary of total transactions around protected area borders.

We then drop transactions with a sale price below or above the first and 99th percentile values and those that happened after 2019, during the COVID-19 pandemic. Our main sample includes transaction records that also include data on the total number of rooms and parcel area (for residential properties) or the parcel area alone (for vacant lands). We construct the former as the sum of number of bedrooms and number of bathrooms and, for residential properties, drop transactions with a total number of rooms below or above the first and 99th percentile values. We then drop properties whose age is negative and define land footage quintiles. Since not all transactions had a ZCTA, we constructed a new ZCTA variable by assigning coordinates with missing ZCTA values to 40km hexagons (from the EPA). We restrict each analysis to a certain subsample of species, but solely aquatic species are removed from all analyses. We define a species as not solely aquatic if it is either

nonaquatic or an amphibian or a reptile whose habitat is a polygon as opposed to a line (river). Finally, we restrict the analysis sample to species for which we have a minimum of 50 transactions in both the pre- and posttreatment periods.

The data on properties around protected area borders are more dense in some states. See Figure D3 for a summary of the share of transactions (relative to the total number of transactions) in each state, by land use type and protected area border.

D.2.1 Calculating Distances Between Properties & Protected Area Borders

To complete the distance calculation process within a reasonable amount of time, we first conduct a densification on all boundaries of CHs and SHs. This replaces the curve segments in the boundary lines with a large set of vertices via linear interpolation. We set the maximum distance between the vertices to be 100m. The distance between the properties and the nearest CHs and SHs are calculated based on the kd-tree algorithm in the RANN package in R. It searches for the nearest point in the set of densified critical (species) habitat points for all properties and returns both the index of the nearest point and the distance between them. We use the index to find the nearest critical (species) habitat polygon. To determine whether a property is inside its nearest critical (species) habitat or not, we check whether they intersect with each other. If so, the property is inside the polygon, and we set the distance to be negative. For properties outside the polygon, we set the distance to be positive. Finally, we keep all pairs of property and the nearest polygon if their distance is below 10km. We then use the st_join function (sf package) to determine whether a transaction occurs within a critical habitat/species range, or outside. Our analysis produces distances for all transactions within 10km of a critical habitat/species range.

Following the calculation of distances, we perform a postprocessing step to merge and harmonize the data. The objective to assign each transaction to one or fewer species ranges or CHs. First, transaction-range candidates within 10 kilometers of a boundary (Panel B of Figure D4) are identified. Second, they are assigned to treatment or control based on whether

they are inside or outside their range (Panel C of Figure D4). Third, transaction timing determines whether an observation is pretreatment, precontrol, posttreatment, postcontrol, or contaminated by a previous treatment and ineligible for use in estimation (Panel D of Figure D4). We summarize this in Figure D4, which provides a visual description of how the data are constructed for the analysis.

The set of transaction ranges for a given transaction can contain more than one candidate, as some transactions are within 10km of two or more existing habitats. To remedy this and produce a single range for each transaction, we follow the following procedure. First, only candidates that are within 200m of the minimum distance for a transaction are kept. This decision rule keeps multiple candidates when boundaries are precisely overlapping or fuzzy or slightly deviating. Second, the candidates are sorted by transaction identifier, listing date, and final listing date (or final designation date for CHs). The candidate with the earliest first listing date is kept; in a tie, the candidate with the earliest final listing date (or the final designation date for CHs) is kept. This procedure ensures we only assign one transaction to exactly one range and that range is the closest to the transaction and corresponds to the earliest treatment. Treatment histories are maintained for each transaction to allow for comparing transactions with different treatment statues but identical histories. In short, a species range boundary can only be used once to identify an average treatment effect or conditional average treatment effect for the earliest range, as transactions for later ranges sharing the same boundary will have different treatment histories.

Our final program merges the transaction data with the species information, distance to habitat, and an inside CH indicator. Census tract fips codes and zip codes are added using the tidycensus package. We construct a parcel identifier using the following procedure. First, we use the unique parcel identifier when available. If missing, we use the assessor parcel number, county name, and state fips code. If the assessor parcel number is missing, we use the latitude and longitude. Finally, we flag and remove duplicates in the data.

D.3 Additional Data on Land Development Permits

In the main text, we only briefly discuss the sources of data for the building permits and HCPs. Here, we provide additional information about each data item, and its processing.

Building Permits Survey: We obtain county-year level data on new residential construction permits from the US Census Bureau's Building and Permits Survey (BPS), an annual mail survey of permit-issuing jurisdictions. It provides the total number of approved residential housing construction permits for buildings and units, 1990–2019, for each county.

Army Corps of Engineers (ACE) Permits: Geocoded permits issued by the ACE authorize various types of development projects in wetlands and other waters. The ACE issues nationwide permits, allowing for a variety of prespecified development activities that have only minimal negative effects on the environment. For activities deemed to have an impact above and beyond what is allowed by those permits, a developer must obtain an individual permit, which is a key component of ACE permits and results in one of three types of decisions: (i) issued without special conditions; (ii) issued with special conditions; and (iii) denied. The ACE may add special conditions to ensure that the activity does not jeopardize related laws, *including the ESA*. Data are obtained from two sources: post-2008 from the publicly available data management system and data in the same format between 1990 and 2008 through a FOIA request to the ACE. We aggregate the data to construct variables on the total number of ACE permit applications and the share of permits across final decisions. Similar to the panel assembly of the construction permits data, the CHs and SHs are aggregated in a county-year panel using population weights. Finally, we use the ACE data to flag locations at the ZCTA level that experience an above-median number of ACE permits because those might reflect locations that have more binding land-use restrictions. See Figure D5 for a summary of the secular trends in the ACE data.

Habitat Conservation Plans: Habitat Conservation Plans (HCPs) are required for private parties who intend to undertake projects that may result in damages to endangered and threatened species. We obtained the data on HCPs through a FOIA request to the FWS. The data cover complete information on all conservation plans submitted to the FWS since the early 1980s, including the applicant, plan location, area acreage covered, listed species, plan status, intended land use, and dates indicating when the first assistance regarding the plan started, the application was received, and the permit decision was made. We link the HCP data with the listing status of endangered and threatened species and the designation status of CH. We measure the timeline of a plan by the number of years between the date an applicant first initiates assistance and the date the final decision regarding the permit is made. We also construct dummies on whether the HCP submission is before the designation of the CH, the listing and designation status, and the type of the species. The final dataset covers 7,851 unique HCPs in the contiguous United States, spanning 1990 to 2020.

BuildZoom New Construction Permits: To more carefully examine how the ESA might affect permits, we obtained data on geocoded permits for new construction from BuildZoom, including their application and issuance dates—allowing us to study potential delays in permit approvals.[22] Our sample includes data up to 2022, which we truncate to focus on 1980 to 2019. We choose 1980 because that is when we observe a nontrivial share of permits and the end of 2019 to avoid overlapping with the COVID-19 pandemic.

D.4 Summarizing Duration Between FWS Actions

In Figure D6, we summarize the number of months from a lawsuit seeking to force a listing of species or petition requesting the FWS reviews a species and the proposed rule to list a species, if one was published. In all cases, it takes well above a year, sometimes more than

[22] See https://www.buildzoom.com/data for more details. BuildZoom permits data are now offered as part of CoreLogic's RealQuest service. Purchasing the data was made possible with funding by the Becker Friedman Institute at the University of Chicago.

10 years, between the initial petition or lawsuit and the resulting proposed listing rule.

D.5 Urban Versus Rural Composition of the Sample

In Figure D7, we document that nearly all of our data are concentrated in urban locations, formally defined as metro areas according to the US Department of Agriculture 2023 Rural-Urban Continuum Codes.

D.6 Gridded Population Data

We use gridded population data to aggregate measures of protected area coverage to the county level. Measures include the share of a county, total area in a county, and unique area covered by species or CHs. The distinction between total area and unique area is that the former allows for double-counting: if two SHs contain overlapping areas, we double-count that to obtain our total area measure, whereas we count it only once for our unique area measure.

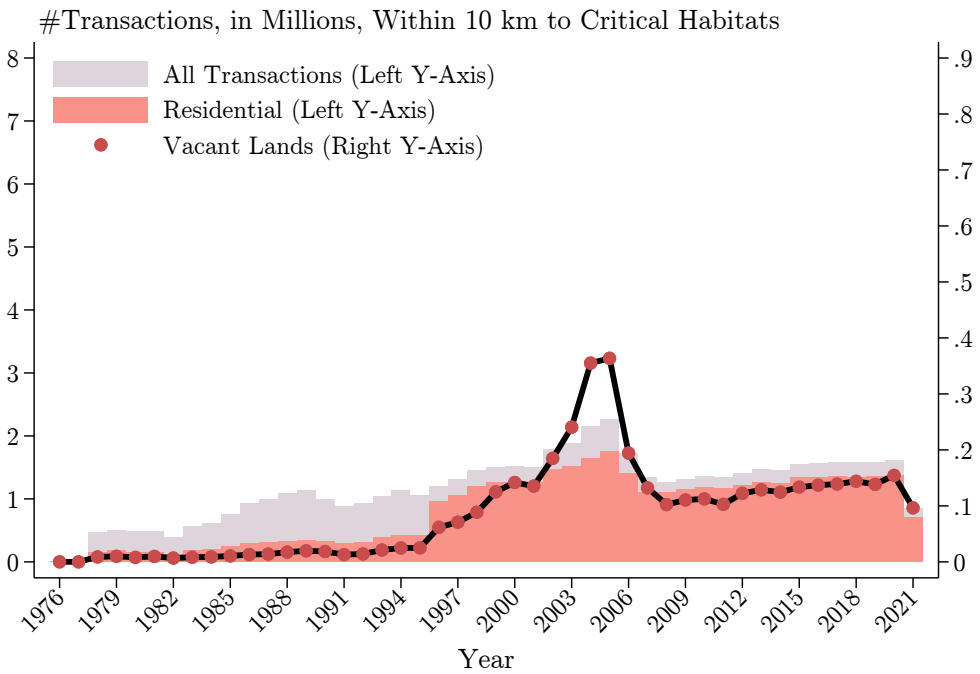
Using population weights to aggregate our protected areas allows us to more precisely measure how much the average undeveloped parcel in a county is exposed to protected land. To illustrate the reasoning behind this procedure, consider two identically sized counties containing identical amounts of protected land. The first county's protected land overlaps entirely with an urban area, but the second county's is located in a sparsely populated and largely undeveloped area. The counties' unweighted exposure measures would be the same, but the population-weighted exposure measure would be larger in the first, because protected land may have a different impact on building activity in a developed area. Although we recognize that population is an imperfect proxy for residential building activity, we argue that they should be highly correlated. Across most of our specifications, population-weighted exposure measures yield qualitatively similar point estimates with smaller confidence intervals relative to unweighted measures.

We use NASA's Socioeconomic Data and Applications Center (SEDAC) US Census Grids for our population weights. The grids downscale census block-level population data to a 30 arc-second (approximately 1 square km) grid. Population is allocated proportionally within a census block. The Ugrids do not differ from the Global Rural-Urban Mapping Project, another SEDAC data product that uses nighttime lights data to downscale global population to a 30 arc-second grid. The data are available for 1990, 2000, and 2010; we use 1990 data.

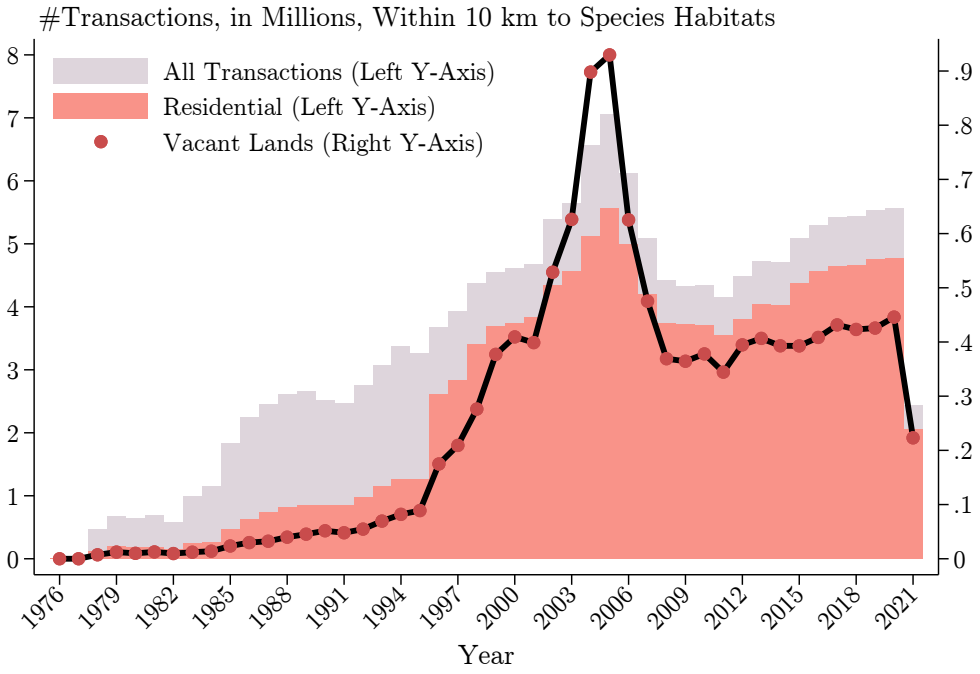
We use US county shapefiles provided by the Census Bureau to aggregate our habitat data to the county level. To account for slight temporal variation in county boundaries during our sample period, we use the 2000 shapefile for 1990–2000, the 2010 shapefile for 2001–2010, and exact year shapefiles for 2011–2019.

Figure D1: Summary of Transaction Counts for the Contiguous US

(a) Critical Habitats



(b) Species Habitats



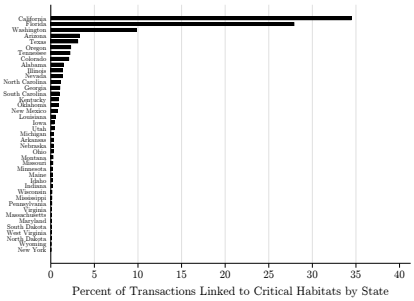
Notes: The total number of transactions, by type, by year, for properties that are within 10km of a critical habitat border (a) or a SH border (b).
Source: CoreLogic Tax and Deed History Data. Data on species and critical habitats from the FWS.

Figure D2: Share of Transactions Across States, by Land-Use, by Sample

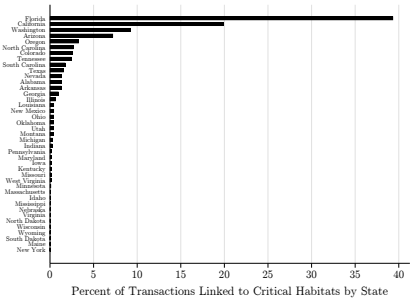
Critical Habitats

Residential | **Vacant Lands**

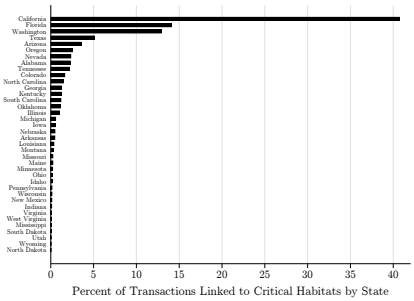
(a) Full Sample



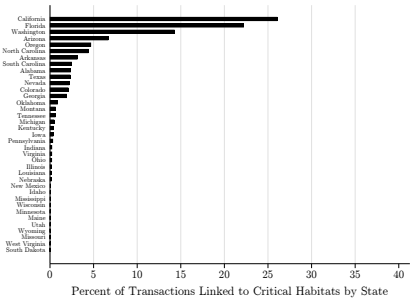
(b) Full Sample



(c) Ten-Year Window Sample



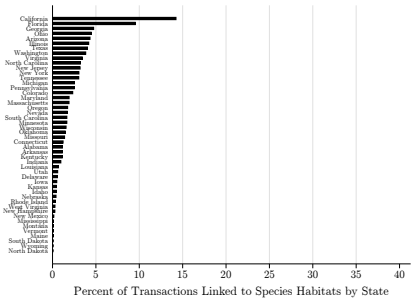
(d) Ten-Year Window Sample



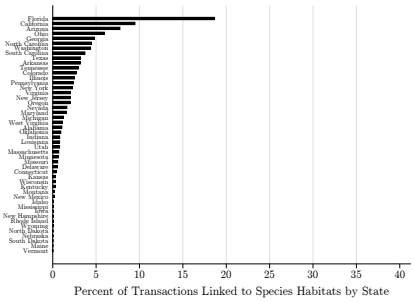
Species Habitats

Residential | **Vacant Lands**

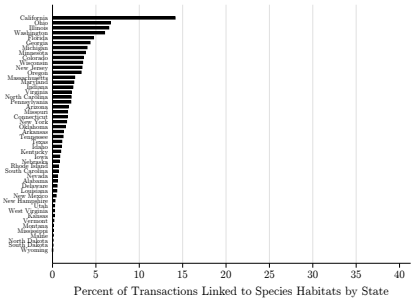
(e) Full Sample



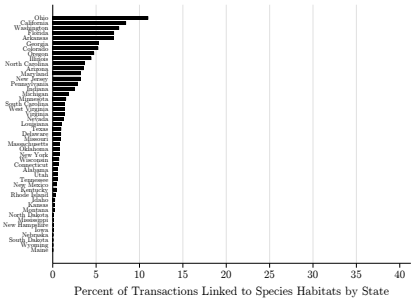
(f) Full Sample



(g) Ten-Year Window Sample



(h) Ten-Year Window Sample



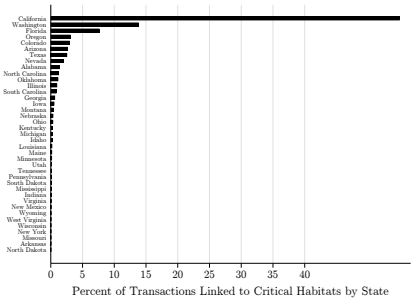
Notes: Share of transaction by state for either the full sample, or the sample centered around two years before the listing proposal, and two years after either final designation (critical habitats), or final listing (SHs).

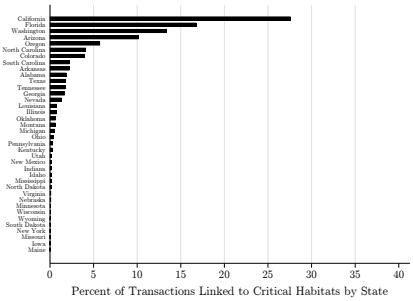
Figure D3: Share of Transactions Across States, by Land-Use, by Sample with Restrictions

Critical Habitats

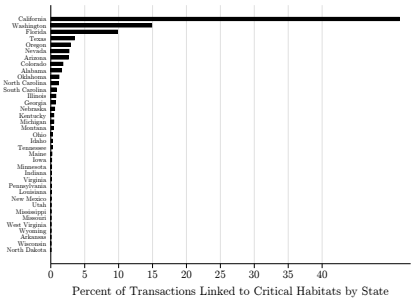
Residential | **Vacant Lands**

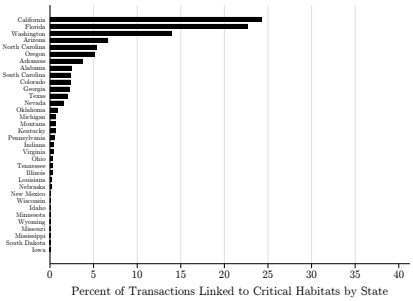
(a) Full Sample | (b) Full Sample





(c) Ten-Year Window Sample | (d) Ten-Year Window Sample

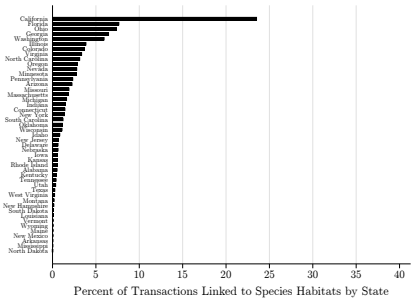


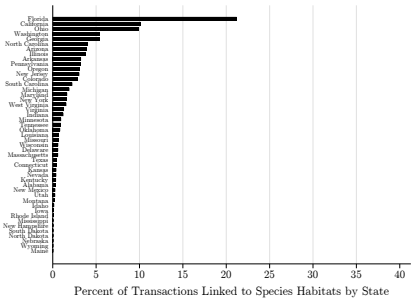


Species Habitats

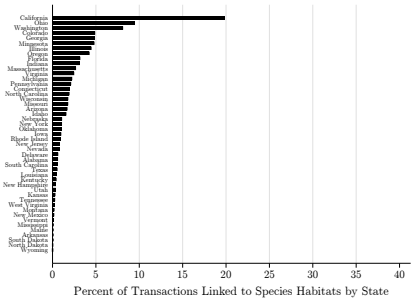
Residential | **Vacant Lands**

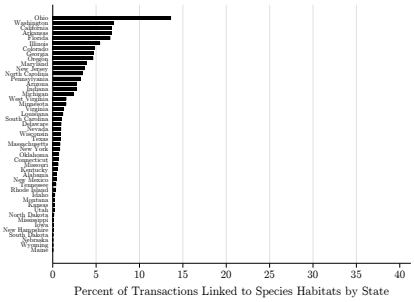
(e) Full Sample | (f) Full Sample





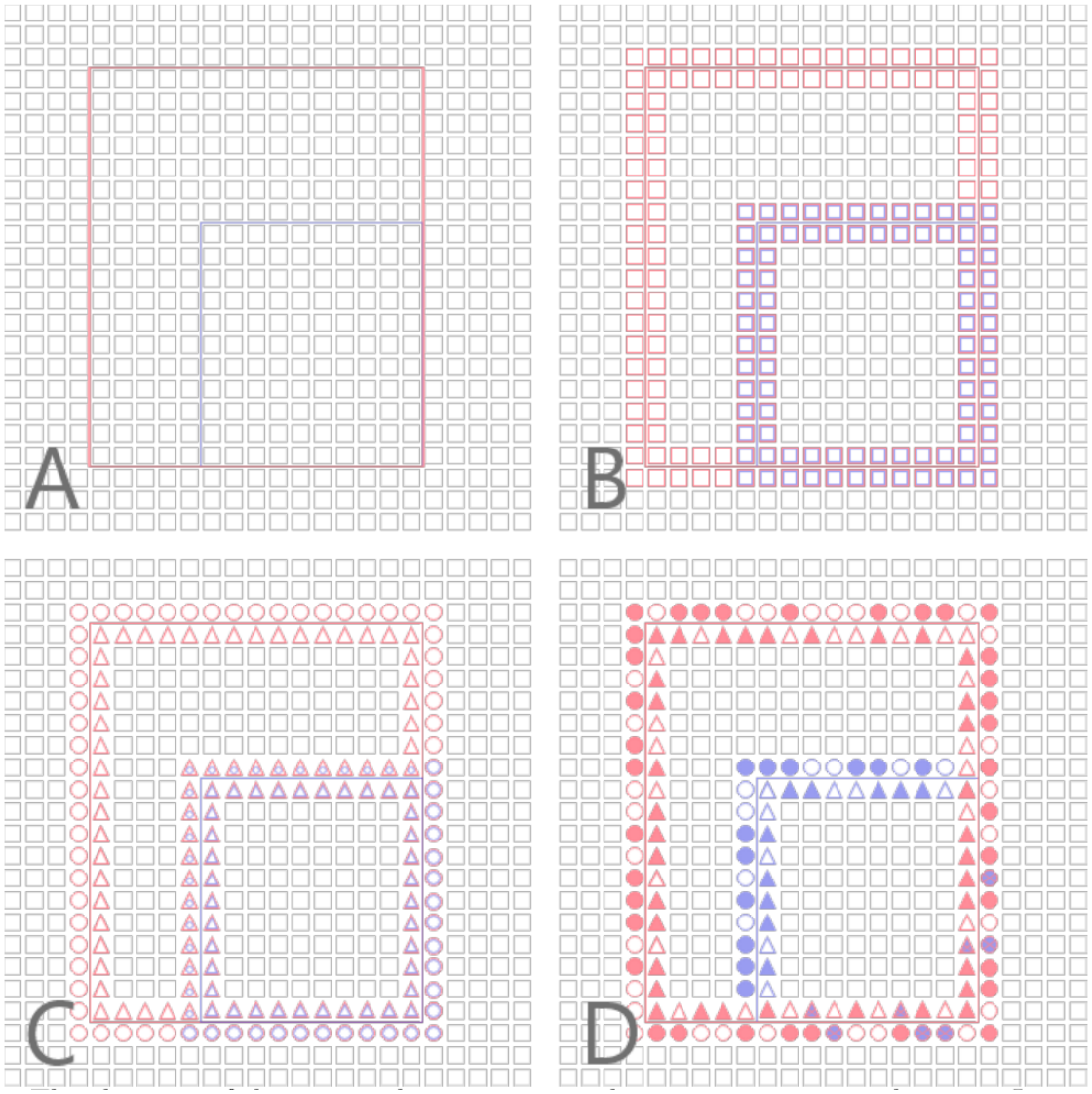
(g) Ten-Year Window Sample | (h) Ten-Year Window Sample





Notes: Share of transaction by state for either the full sample, or the sample centered around two years before the listing proposal, and two years after either final designation (critical habitats), or final listing (SHs).

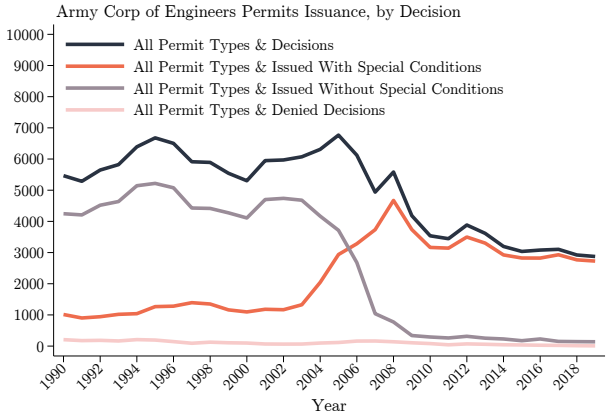
Figure D4: Descriptive Diagram of Construction of Data for Protected Areas



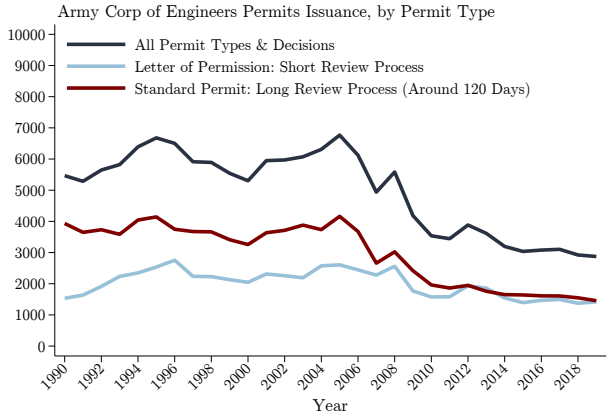
Notes: The objective of this approach is to assign each transaction to a single range. In Panel A, gray squares represent transactions, and blue and red boundaries represent species ranges. Let the red species range occur before the blue species range. NThis implies that the blue range overlaps the red range. In Panel B, distances are calculated for each transactions to all ranges. Only transactions within a given distance (10km) of any range comprise the list of candidate transaction ranges. Transaction-range candidates in the diagram are assigned the color of the range. In Panel B, that some transactions are candidates for both the red and blue ranges (red squares with blue squares inscribed). Panel C shows how transactions are assigned to inside (triangles, treated) or outside (circles, control) their respective ranges. Panel D illustrates four key concepts. First, the timing of the transaction relative to the listing date of the range to assign the transaction to before (hollow shapes) or after (solid shapes) range listing. Second, when boundaries are shared spatially (see the lower right corner of the red range), the candidate with the earliest listed range (red) is kept. Third, the upper left corner of the blue range is inside the red range but does not share a boundary with the red range and can therefore be used for estimation of the marginal effect of the blue range conditional on already receiving the red treatment. Fourth, transactions that occur after the red and blue ranges (circles and triangles with blue fill and a red crosshatch) at a boundary shared by the red and blue range cannot be used to estimate the treatment effect of either range and are identified and removed from the analysis

Figure D5: Secular Trends in Army Corps of Engineers Permits Issuance

(a) By Decision



(b) By Permit Type

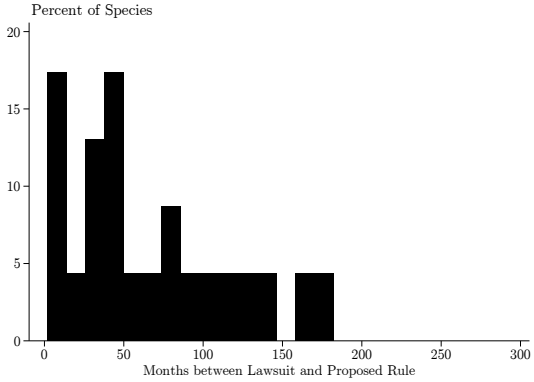


Notes: National-level summary on permits issued by the Army Corps of Engineers, by decision type (a) or type of permit (b).
Source: Army Corps of Engineers.

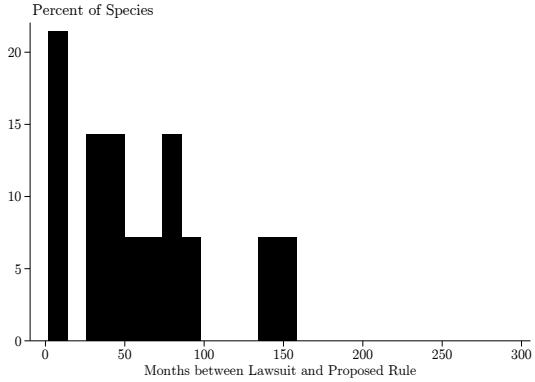
Figure D6: Time to Proposed Listing

Lawsuit until Listing

(a) SH

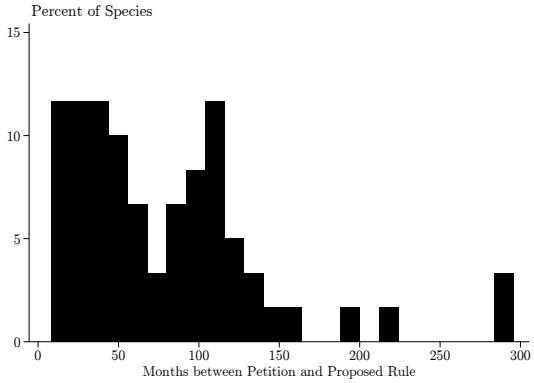


(b) CH

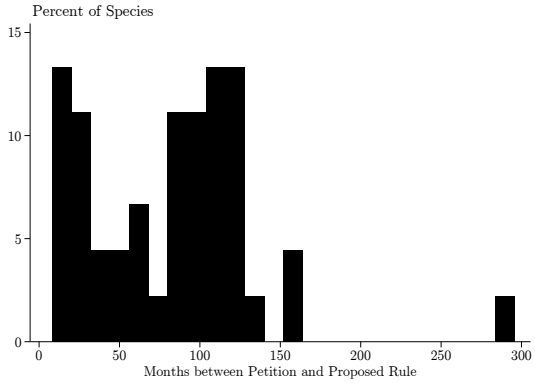


Petition until Listing

(c) SH

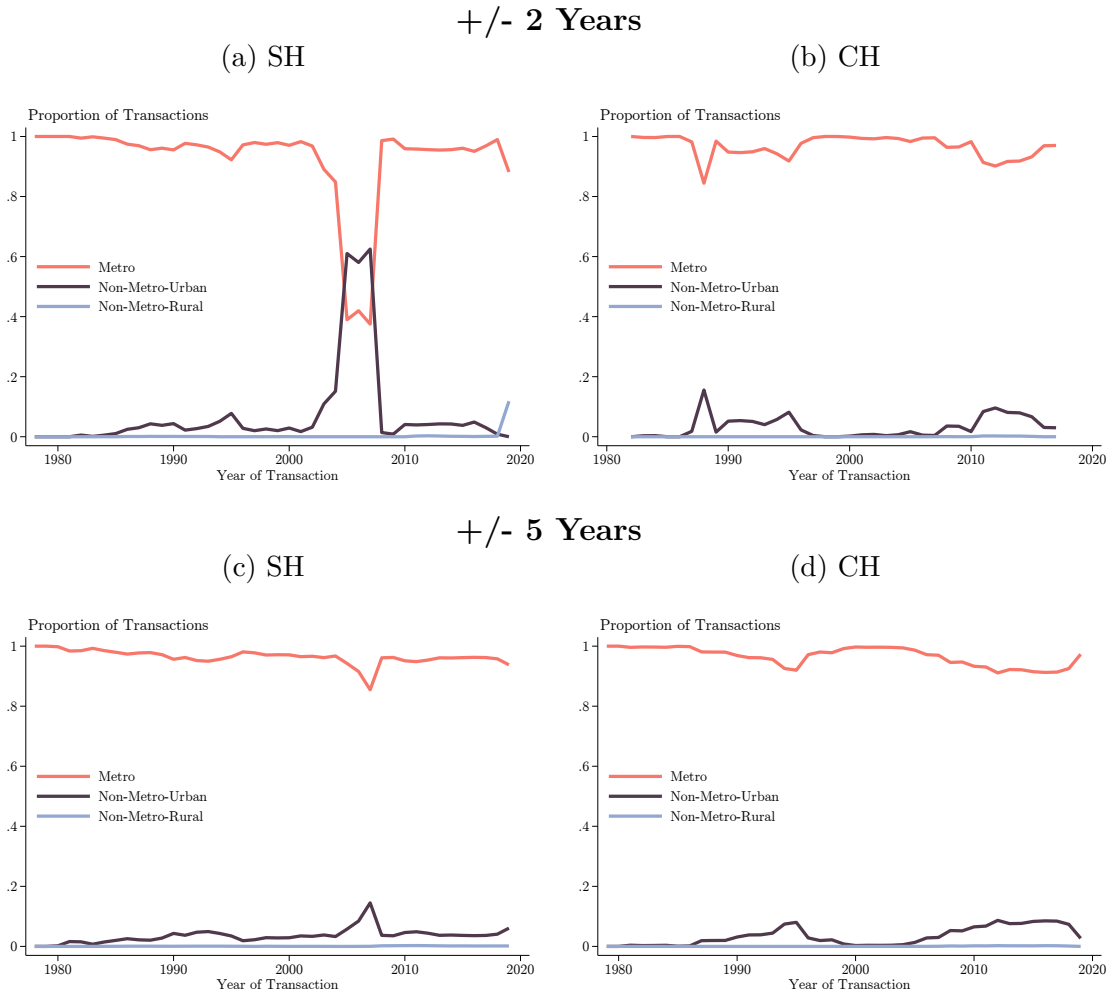


(d) CH



Notes: Only includes species where lawsuit or petition comes before proposed listing.

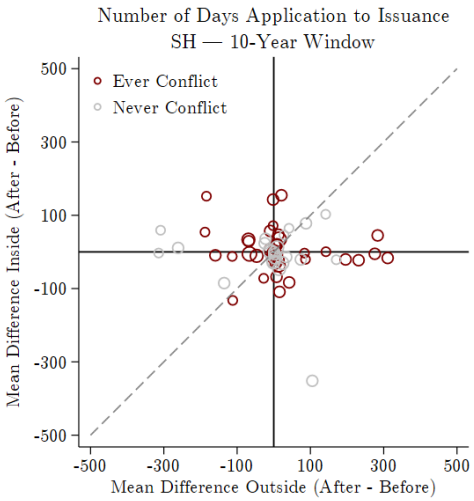
Figure D7: Urban VS. Rural Transactions by Year



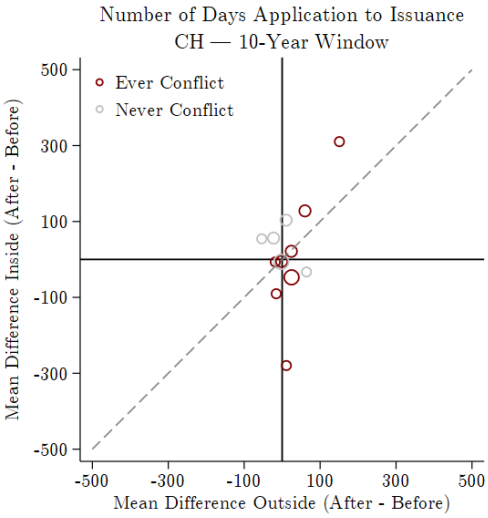
Notes: We use the US Department of Agriculture 2023 Rural-Urban Continuum Codes to classify counties as metro (urban) or nonmetro.

Figure D8: Number of Days from Permit Application to Issuance

(a) Species Habitat



(b) Critical Habitat



Notes: +/- 5 years. 63 SH species & 13 CH species. SH truncated at +/- 500, excluding one species (Buena vista lake ornate shrew (4.81, -2239.33)).

Table D1.
Summary Statistics for Sale Prices Around Protected Area Borders

	Percentile						
Mean	25	50	75	SD	Min	Max	N
Panel A. Species Habitats, Residential Properties							
295,813.78	135,358.82	219,476.04	359,370.66	282,845.79	6,631.05	3,188,071.61	4,9166,154
Panel B. Species Habitats, Vacant Lands							
464,589.29	94,907.30	253,420.00	459,261.40	925,557.67	2,061.59	15,955,689.72	952,527
Panel C. Critical Habitats, Residential Properties							
415,939.17	182,733.71	304,821.95	517,488.15	389,258.42	13,637.31	4,067,703.70	12,477,607
Panel D. Critical Habitats, Vacant Lands							
710,742.16	165,455.16	355,038.30	732,227.61	1,321,711.46	2,145.90	2,3877,636.56	174,986

Notes: Summary statistics for the sale price (in 2019 USD) of either residential properties or vacant lands around the borders of species or critical habitats. For each sample, we apply the standard data filters (see Data Appendix text for more details) but include the entire span of the sample.

References

Bošković, Branko, and Linda Nøstbakken. 2017. "The Cost of Endangered Species Protection: Evidence from Auctions for Natural Resources." *Journal of Environmental Economics and Management* 81:174–92.

Endangered Species Act of 1973, Pub. L. No. 93-205, 87. 1973. 884–903.

Glaeser, Edward L., and Joseph Gyourko. 2003. "The Impact of Building Restrictions on Housing Affordability." *Economic Policy Review* 9(2).

Glaeser, Edward L., Joseph Gyourko, and Raven E. Saks. 2005. "Why Have Housing Prices Gone Up?" *American Economic Review: Papers & Proceedings* 95(2):329–33.

List, John A., Michael Margolis, and Daniel E. Osgood. 2006. "Is the Endangered Species Act Endangering Species?" *NBER Working Paper No. 12777.*

Lueck, Dean, and Jeffrey A. Michael. 2003. "Preemptive Habitat Destruction Under the Endangered Species Act." *The Journal of Law & Economics* 46(1):27–60.

Mann, Charles C., and Mark L. Plummer. 1995. *Noah's Choice: The Future of Endangered Species.* Alfred A. Knopf, New York.

McConnell, Virginia, and Margaret Walls. 2005. "The Value of Open Space: Evidence from Studies of Nonmarket Benefits." *Lincoln Institute of Land Policy Working Paper.*

Petersen, Shannon. 1999. "Congress and Charismatic Megafauna: A Legislative History of the Endangered Species Act Comment." *Environmental Law* 29:463–92.

Quigley, John M., and Steven Raphael. 2005. "Regulation and the High Cost of Housing in California." *American Economic Review: Papers & Proceedings* 95(2):323–28.

Waddell, Paul, Brian J.L. Berry, and Irving Hoch. 1993. "Residential Property Values in a Multinodal Urban area: New Evidence on the Implicit Price of Location." *Journal of Real Estate Finance and Economics* 7(2):117–41.

Zhang, Ling, Jiantao Zhou, Eddie C.M. Hui, and Haizhen Wen. 2019. "The Effects of a Shopping Mall on Hhousing Prices: A Case Study in Hangzhou." *International Journal of Strategic Property Management* 23(1):65–80.