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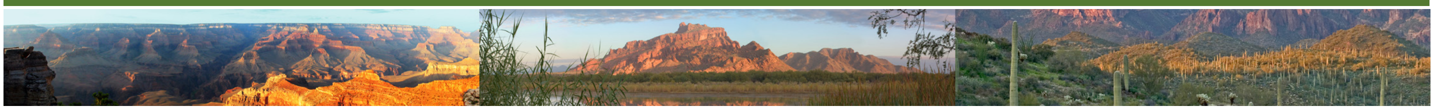

Workshop Paper

Economic Impacts of Critical Habitat Designation: Evidence from the Market for Vacant Land

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ECONOMIC IMPACTS OF CRITICAL HABITAT DESIGNATION: EVIDENCE FROM THE MARKET FOR VACANT LAND

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Abstract

The designation of critical habitat is intended to provide special protection for essential habitat for species listed as endangered or threatened under the Endangered Species Act. Critical habitat is a controversial provision of the act, as property owners argue that it can result in large, negative economic impacts. The paper examines the effects of critical habitat designation on the value of vacant land in two California counties. Using a quasi difference in difference technique we show that designation results in a statistically significant decrease in land value. Further, the market impact of critical habitat designation is shown to depend on local land use regulation. Within designated urban growth boundaries, critical habitat leads to an 85-99% loss in land value, and outside these areas, the loss is much smaller.

Keywords: Critical Habitat, Endangered Species Act, Costs of Regulation
JEL Codes: Q58, R28

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ECONOMIC IMPACTS OF CRITICAL HABITAT DESIGNATION: EVIDENCE FROM THE MARKET FOR VACANT LAND

1. INTRODUCTION

The ESA is the broadest and most powerful law to provide protection for endangered species and their habitats. The ESA defines three crucial categories: "endangered" species, "threatened" species, and "critical" habitats. Endangered species and their critical habitats receive extremely strong protection; it is illegal to take any endangered species of animal (or plant in some circumstances) in the United States, its territorial waters, or the high seas. In addition to this direct prohibition, Section 7 of the act prohibits any federal action that will jeopardize the future of any endangered species, including any threat to designated critical habitat. The act also requires the secretaries of interior and commerce to use programs in their agencies to support the goals of the act and requires other agencies to "utilize their authorities in furtherance of the purposes of [the act] by carrying out programs for the conservation of endangered species and threatened species."

The strength of the ESA lies with its stringent mandates constraining the actions of private parties and public agencies. Once a species is listed as threatened or endangered, it becomes entitled to shelter under the act's protective umbrella, a far-reaching array of provisions. Critical habitat must be designated "to the maximum extent prudent and determinable" and recovery plans, designed to bring the species to the point where it no longer needs the act's protections, are required if they will promote the conservation of the species. Funds for habitat acquisition and cooperative state programs are authorized. Federal agencies must ensure that their actions are not likely to jeopardize the survival of listed species nor adversely modify their critical habitats. Agencies are also required to use their authorities to promote endangered species conservation.

In addition to the Section 7 prohibition of any federal action that is likely to jeopardize an endangered species or adversely modify or destroy its critical habitat, Section 9 prohibits the taking of an endangered species of fish or wildlife (or, by regulation, of threatened species). Sections 7 and 9 are major sources of the act's power as well as numerous controversies. In particular, the prohibition against taking endangered species has raised concerns among private landowners because of its application to habitat: taking is fairly broadly defined in the ESA and even more broadly in some regulations.

The provisions of the act regarding critical habitat have proven to be among its most controversial aspects. The government has resisted the act’s requirement to designate critical habitat, due to a stated view that the act’s prohibitions against taking triggered by the listing decision are the primary mechanism providing relief to listed species. Indeed, environmental groups (most prominently the Center for Biological Diversity) frequently sue the Fish & Wildlife Service to compel it to designate critical habitat as required by the act. Private property owners, fearing that inclusion of their land in areas of critical habitat will lower its value, often protest the designation of critical habitat, complaining of high economic costs and stating skepticism about the biological benefit of designating critical habitat.

The main purpose of this paper is to provide econometric estimates of the economic impacts of critical habitat designation in two counties in the San Francisco Bay Area. The analysis uses a quasi difference in difference model to measure the impact of critical habitat designation for the Bay Checkerspot Butterfly on prices for vacant land.

The Bay Checkerspot Butterfly is a species of great interest to biologists, who reported its rapidly declining population in the early 1980s. One contributor to this decline has been the encroachment into its habitat by rapid human development. Further, the proliferation of invasive species poses a grave threat to this and several other species of butterfly. The greatest threat to the butterfly, however, comes from increasing emissions of nitrogen. Nitrogen from air pollution increases the fertility of naturally low nitrogen serpentine soils, which are the main home of the plants producing the nectar the butterfly requires. Increased nitrogen concentrations promote the growth of invasive species on these serpentine soils, which cut off the butterfly's access to the nectar producing plants. The butterfly was federally listed as threatened in 1987. In 2001 the Service designated 23,903 acres in San Mateo and Santa Clara counties as critical habitat.

In the presence of functioning land markets, one would expect that the difference in a parcel's market value pre- and post critical habitat designation would capture the sum of the direct and indirect impacts. The perfect experiment to measure these effects would entail randomly assigning critical habitat designation to individual and quasi-identical parcels at random times and measuring the difference pre and post designation relative to sales of non-designated parcels. Clearly such an experiment does not exist, since designation is non-random, parcels are anything but identical, assignment usually happens at a single point in time for all parcels and one only observes the value of any parcel after it has been sold instead of its value at any given point in time.

In this paper we provide the first set of market based impact estimates of critical habitat designation on the value of vacant land. We have assembled data on the universe of all vacant land transactions in San Mateo and Santa Clara counties between 1989 and 2007. We overlay the map of sold parcels with the urban growth boundaries and the boundaries of critical habitat designated land. Since we observe a small number of transactions on land designated as critical habitat in 2001, both before and after this date, we can econometrically identify the effect of designation on land values after controlling for observable differences in parcels. Further, we control for the potential endogeneity of designation by using a novel measure of serpentine soils as an instrument. To preview the results, we find that for the parcels in our sample, critical habitat designation leads to a decrease in value upward of 85%, suggesting a sizable economic cost of the regulation.

2. RELATED LITERATURE

The economics literature concerning the Endangered Species Act has focused on its anti-taking provisions. In one strand of the literature, economists have argued that the ESA discourages the creation and maintenance of species habitat on private land. Specifically, Section 9 of the act makes it illegal for a private landowner to engage in activities that could harm an endangered species, including habitat modification, without first obtaining a federal permit.

Such regulations can reduce private land values and antagonize private landowners who might otherwise cooperate with conservation efforts. Simply put, Section 9 turns endangered species into economic liabilities for property owners. As a result, landowners have been known to destroy or degrade potential habitat on their land preemptively in order to prevent the imposition of the act's requirements. It is not illegal to modify land that might become endangered species habitat some day in the future, nor are landowners required to take affirmative steps to maintain endangered species habitat beyond refraining from actions that "harm" endangered species.

In the past, there was little more than economic theory and anecdotal accounts upon which to criticize the effectiveness of the ESA on private land. Now, however, there is empirical data on three contentious species that demonstrates how the act itself compromises species conservation on private land.

A 2003 study by Lueck and Michael looked at whether private landowners engaged in preemptive habitat destruction when the presence of endangered red-cockaded woodpeckers placed the landowners at risk of federal regulation and a loss of their timber investment. Providing habitat for a single woodpecker colony could cost up to $200,000 in foregone timber harvests. To avoid the loss, those landowners at greatest risk of restrictions were most likely to harvest their forestlands prematurely and reduce the length of their timber harvesting rotations. The ultimate consequences of this behavior were potentially significant in that it resulted in a loss of several thousand acres of woodpecker habitat, a major loss for a species dependent upon private land for its survival.

In a second study involving the red-cockaded woodpecker, Zhang (2004) similarly found that "regulatory uncertainty and lack of positive economic incentives alter landowner timber harvesting behavior and hinder endangered species conservation on private lands." Zhang also concluded that "a landowner is 25 percent more likely to cut forests when he or she knows or perceives that a red-cockaded woodpecker cluster is within a mile of the land than otherwise."

Simply listing a species could discourage private landowners from participating in conservation efforts, according to a 2003 study by Brook, Zint and de Young. Surveys of private landowners within the animal's range found that as landowners became aware that their land contains Preble's meadow jumping mouse habitat, some became less likely to support conservation efforts. In addition, landowners would refuse to give biologists permission to conduct research on their land to assess mouse populations out of fear of the consequences that would follow such a discovery. This revelation is especially troubling because accurate data on species populations and their habitat are essential to successful conservation efforts.

One economic study that does consider the impact of critical habitat designation is the 2006 paper by List, Margolis and Osgood. Keeping to the theme of preemption, they found that species listing can accelerate the development of potential habitat as landowners seek to preempt the imposition of land-use restrictions under the ESA. Specifically, land proposed to be designated as critical habitat for the endangered Cactus Ferruginous pygmy owl was, on average, developed one year earlier than equivalent parcels that were not identified as habitat.

The present paper contributes to the literature by squarely addressing the costs of critical habitat designation. Critical habitat imposes regulation on private land use above that associated with the anti-taking provisions of the act. In the next section, we detail the central role of habitat protection in the act, and document how these additional regulations arise from critical habitat designation. We also describe how the government has considered economic impacts resulting from critical habitat, as it is required to do according to Section 4 of the act.

In closing this section, we note that our finding that designation of critical habitat lowers the market price of vacant land is consistent with the preemption literature. For example, if landowners choose a suboptimal forest rotation or convert their parcels to housing sooner than desired, this decision lowers the value of land. An advantage of considering the land market as opposed to a given land use is that land prices capitalize future profit streams, and thus give a direct indication of the present value of the costs of critical habitat designation.

3. HABITAT PROTECTION AND THE ESA

The role of conserving habitat for endangered species has been recognized since the first federal endangered species legislation. For example, the Endangered Species Preservation Act of 1966 (P.L. 89-699), stated, "It is . . . the policy of Congress that the Secretary of Interior, the Secretary of Agriculture, and the Secretary of Defense . . . shall preserve the habitats of such threatened species on lands under their jurisdiction" (Section 1 (b)). Over time, as our knowledge of species requirements has grown, the legislation has evolved from the regulation of harvest and trade in species to the protection of habitat. The stated purposes of the current ESA are to conserve endangered species "and the ecosystems on which they depend" (16 U.S.C. 1531), a clear mandate linking successful conservation of species to the habitats that they require. This linkage is entirely appropriate scientifically.

The ESA provides throughout for the identification and protection of habitat. The first statutory consideration for the listing of species as threatened or endangered is "the present or threatened destruction, modification or curtailment of its habitat or range" (§1533). Section 4 of the act further requires the designation of a species' "critical habitat" concurrently with the listing of a species, unless earlier listing is "essential to the conservation" of the species (§1533(b)(6)(C)(8)) or unless the designation of critical habitat is not "prudent" or "determinable" (§ 1533(a)(3)).

Critical habitat designations are, "to the maximum extent practicable," to be accompanied by "a brief description and evaluation of those activities (whether private or public) which, in the opinion of the Secretary, if undertaken may adversely modify such habitat, or may be affected by such designation" (§1533(b)(6). Critical habitat is to be designated "on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat" (§1533(a)(3)). Furthermore, the ESA provides for exclusion of areas from critical habitat if it is determined that "the benefits of such exclusion outweigh the benefits of specifying such area," unless failure to designate the area "will result in the extinction of the species concerned" (§1533(b) (2)). This provision is central to the role of economics in critical habitat designation, and we return to this issue later in the paper.

Section 7 requires federal agencies to consult with the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) to ensure that federal actions are not likely to jeopardize the continued existence of listed species or result in "the destruction or adverse modification" of their critical habitat (§1536). Habitat modification gives rise to the vast majority of these consultations, nearly all of which are resolved informally or with modifications that allow projects to proceed as planned.

Sections 9 and 10 of the act have extended the review of habitat modification to nonfederal, private development. Section 9 prohibits "take" of a listed species, a term described elsewhere in the act as, among other things, "harm" to a species. Early FWS regulations described this harm to include "significant habitat modification or degradation" that "kills or injures wildlife" (50 CFR 17.31)). The act's application to habitat modification by private parties led to the development of early conservation plans in California, a process endorsed by the Congress in 1982 with the additions to Section 10. Section 10 (a) currently requires "habitat conservation plans" of private parties seeking to secure an "incidental take" permit (unintentional take) for listed species (§1539(a) (2)).

The designation of critical habitat may also affect actions that do not have a federal nexus and thus are not subject to the provisions of Section 7 under the act. Indirect impacts are those changes in economic behavior that may occur outside of the act, through other federal, state, or local actions, and that are caused by the designation of critical habitat.

Under certain circumstances, critical habitat designation may provide new information about the sensitive ecological nature of a geographic region, potentially triggering additional regulation under other state or local laws. The California Environmental Quality Act (CEQA), for example, requires that lead agencies, public agencies responsible for project approval, consider the environmental effects of proposed projects that are considered discretionary in nature and not categorically or statutorily exempt. In some instances, critical habitat designation may trigger CEQA-related requirements. This circumstance is most likely to occur in areas where the critical habitat designation provides clearer information on the importance of particular areas as habitat for a listed species. In addition, applicants who were “categorically exempt” from preparing an Environmental Impact Report (EIR) under CEQA may no longer be exempt once critical habitat is designated. In cases where the designation triggers the CEQA significance test or results in a reduction of categorically exempt activities, associated impacts are an indirect, incremental effect of the designation.

This section makes plain that critical habitat can have a significant effect on land development activities, and hence land prices. Further, these effects are above those associated with the anti-take provisions of the act that result from the listing of the species as endangered or threatened. Critical habitat can impose additional regulation and cost through the Section 7 process; such effects are termed the direct effects of critical habitat designation. In addition, critical habitat can trigger a response by local regulatory agencies that have much broader authority over land use than federal environmental agencies (Pederson, 2004). These indirect effects can be explicit, such as the CEQA example given above, or more subtle and related to the "signaling" or educational effect of critical habitat on local governments and environmental interests (Sunding, Swoboda and Zilberman, 2005). In either case, the economic consequence of these indirect effects is to reduce future profit streams by increasing future regulation, and thus to lower the market price of land.

3. Setting and Data

San Mateo is the coastal county directly south of San Francisco making up most of the peninsula. It is one of the 20 most affluent counties in the United States and home to a population of just over 700,000 people. Santa Clara County is directly adjacent to the south and home to 1.6 million people and the Silicon Valley. For both counties we have collected data on the universe of vacant land transactions between 1998 and 2008 from DataQuick. The data include information on the parcel number, lot size, sale price, sale date, zoning, latitude and longitude. Sale prices were inflated to 2008 dollars using the Office of Federal Housing Enterprise Oversight (OFHEO) housing price index by quarter for the San Francisco and San Jose Metropolitan Statistical Areas.

We match additional spatial characteristics to the data set of vacant land sales. Geographic Information System (GIS) data on the location of the 2001 butterfly critical habitat were obtained from the USFWS. The Santa Clara and San Mateo County Planning Departments provided spatial data on the locations of each county's Urban Growth Boundaries (UGB). Both counties regulate development types and densities in order to confine urban development within the UGB. US Geological Service (USGS) data were used for the location of wetlands and the slope across the geographic area of analysis. The location of farmland types came from the State of California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). The locations of the three top rated farmland types (as determined by their soil quality and irrigation status) were chosen for this analysis: prime farmland, state recognized farmland, and unique farmland. Further, we acquired the location of serpentine soil ecosystems in the two counties from a privately contracted consulting firm (Jones & Stokes, 2008).

The first four columns of table 1 provide the summary statistics of our dataset. We have a universe of 2730 vacant land transactions during our sample frame. The size of transacted land ranges from tiny parcels in urban areas, to rather large plots of land outside of the urban growth boundary. Wetlands make up ten percent of the sample and 15% of the transacted parcels were located in floodplains. Prime farmland makes up a negligible share of our sample. 65% of the transactions took place within the urban growth boundary, with an almost equal share on serpentine soil within and outside the urban growth boundary. The data were fairly balanced between pre and post-designation transactions; 1,088 of the 2,730 transactions occurred after the 2001 critical habitat designation.

4. EMPIRICAL MODEL

In order to identify the effect of critical habitat designation on vacant land values, we adopt a strategy that is similar to a difference in difference estimation strategy. Since we do not observe the same parcel being sold several times, which is a handicap the hedonic pricing literature suffers from more generally, we do not have panel data which would allow controlling for time invariant differences in unobservables via a fixed effects strategy. Instead we observe the sale of parcel *i* in month *t*, with each parcel being sold only once. At each point in time *t*, however, multiple parcels are being sold simultaneously. A simple hedonic equation for parcel *i* could therefore be written as:

$$p_{it} = \alpha + \boldsymbol{\beta}\mathbf{z}_{it} + \phi_t + \varepsilon_{it} \qquad (1)$$

where p_{it} is the real transaction price of parcel *i* in month *t*, $\mathbf{z}_{it}$ is a vector of exogenous observable characteristics of parcel *i* in month *t*. The coefficient vector **b** is the estimated marginal effect of a one unit change in the $\mathbf{z}_{it}$ on p_{it}. ϕ_t is a set of time dummy variables, which control for shocks affecting all transactions in period *t*. The stochastic disturbance ε_{it} is assumed to be i.i.d. across transactions, homoskedastic yet potentially correlated within year. We augment this basic specification as follows:

$$p_{it} = \alpha + \boldsymbol{\beta}\mathbf{z}_{it} + \gamma\, ch_{i\,+}\, \delta\, chd_{it}\, \phi_t + \varepsilon_{it} \qquad (2)$$

where ch_i is a dummy variable indicating whether the parcel is on land that at any point in time was designated as critical habitat. chd_{it} is an interaction variable of ch_i with an the indication variable 1 (year>2001). This variable therefore equals one if the transaction is on land that was designated as critical habitat at the time of the transaction. The coefficient δ is the main variable of interest. If designation has a significant and negative effect on land values, we would expect $\delta<0$ and statistically different from zero.

The first of two key identifying assumptions here is that there are pre and post designation transactions within the critical habitat boundaries in the two counties we study.

Columns (5)-(8) in table 1 indicate that this condition is met, albeit with a very small number of transactions before (13) and after (25). The table indicates that the post designation sample on CH lands is comprised of fewer wetlands, less sloping land and fewer transactions within the urban growth boundary. Further we note that the per acre value of land before designation is one tenth of the average value of land for the whole sample, suggesting that selection may be an issue here.

This leads us to the second key identifying assumption, which is that $E[\varepsilon_{it} \mid \mathbf{z}_{it}, ch_i, chd_{it}] = 0$. In words this assumption states that the right hand side variables be orthogonal to the disturbance, which may be violated if regulators take into account the value of land when drawing the boundaries of CH.

We attempt to adjust for this potential source of bias by exploiting the fact that serpentine soils are a biological necessity for the butterfly. We have therefore calculated a measure of serpentine soils for each parcel, which we use as an instrumental variable for ch_i and chd_{it} in a two stage least squares estimation framework. Further, to check for robustness of our results, we truncate the sample of non-critical habitat land transactions by matching the support of the value per acre and lotsize for untreated parcels to that of the few observations on critical habitat land that we observe.

5. Estimation Results

Since there is no a priori guidance on the specific functional form of how our right and left hand side variables enter equation (2), we use the Bayes Information Criterion to select between a log-log, loglinear or linear specification. The criterion weakly preferred a log-log specification. The coefficient estimates on the non-dummy variables can therefore be interpreted as elasticities.

Table 2 lists the estimation results. Columns (1) – (3) display the coefficient estimates based on a least squares regression with the natural logarithm of the transaction price as the left hand side variable. The first column provides estimation results for equation (1) without year fixed effects. The second column adds these effects and none of the estimated coefficients change significantly. Most of the variables have the expected signs. The coefficient on plot size is positive and highly significant. Further, parcels within the urban growth boundary are significantly higher priced than plots outside the urban growth boundary. Also, parcels in the floodplain fetch lower prices. Column (3) adds the critical habitat variables. The coefficient of interest, δ, is negative and statistically significant at the 1% level. The coefficient estimate of -1.638 is equivalent to a 85.9% decrease in land value due to critical habitat designation, which is economically significant. Column (4) interacts the critical habitat designation variable with an urban growth boundary indicator, since the two counties we study essentially prevent development outside the urban growth boundary The coefficient estimate on the UGB interaction is larger and statistically significant, whereas the estimate on the non-UGB variable is statistically not distinguishable from zero. This indicates that for our sample CH designation within the UGB leads to a 96.1% decrease in land values for designated parcels, while there is no evidence for a statistically significant effect outside the UGB.

These estimates have not accounted for the potential endogeneity of CH designation. Column (5) instruments for the designation variables using the serpentine lands indicator variable, which we argue is exogenous to land values conditional on observables and the year dummies. The F-statistic from the first stage regression via a linear probability model indicates that the serpentine soils indicator is correlated with the critical habitat designation indicator at the 1% level. The coefficient estimate from the second stage reported in column (5) indicates that the estimated effect is still significant and larger in magnitude than the estimated effect in column (4), which is consistent with prior expectations. The estimate here indicates that CH designation leads to a 99% decrease in land values within the UGB due to designation.

As we noted above, the designated parcels are quite different from the remainder of the transactions in the sample. We therefore truncate the sample of parcels which never received CH designation or were on land that was later designated as CH habitat by limiting the support of the per acre land price and lotsize distribution to match that of the observed 38 parcels on such land. Table 3 reports these estimation results for a sample of size 1472. We note that the coefficient estimates across models are almost identical to those of the full sample. The only significant change occurs in the estimated variable of interest, δ, for the IV strategy in column (5), which is now closer to the least squares estimate. The estimated coefficient is equivalent to a 99% loss in land value compared to non CH land.

6. CONCLUSIONS

These results underscore claims that incremental impacts of critical habitat designation exist. In particular, our estimates suggest that critical habitat designation for the Bay Checkerspot Butterfly causes a significant decline in the value of designated parcels. However, critical habitat designation appears to interact with local regulations in an important way. Within designated Urban Growth Boundaries (i.e., within the areas targeted by local governments for future development) critical habitat causes a large decrease in the price of vacant land. Outside these Urban Growth Boundaries, the effect of critical habitat on land values is not statistically significant.

The observed decline in land prices following critical habitat designation for the Bay Checkerspot Butterfly is large. Prior to designation, parcels within the area of eventual critical habitat averaged 9.89 acres and sold for an average price of $1,048,115 million per acre. After critical habitat designation, parcels in this same area averaged 9.03 acres and sold for an average of $210,742 per acre. The econometric modeling confirms that this price decline is statistically significant after controlling for other factors influencing the market price of land.

The results highlight the importance of economic considerations when designating critical habitat. Section 4 of the act is the only place where economic analysis is required.

Indeed, economic considerations are barred when the government makes other decisions under the act such as listing. Our modeling suggests that critical habitat designation can have significant economic consequences, and that these impacts can be avoided to a large extent by coordinating the designation of critical habitat with local land use decisions.

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Figure 1: Location of vacant land transactions in San Mateo and Santa Clara Counties.

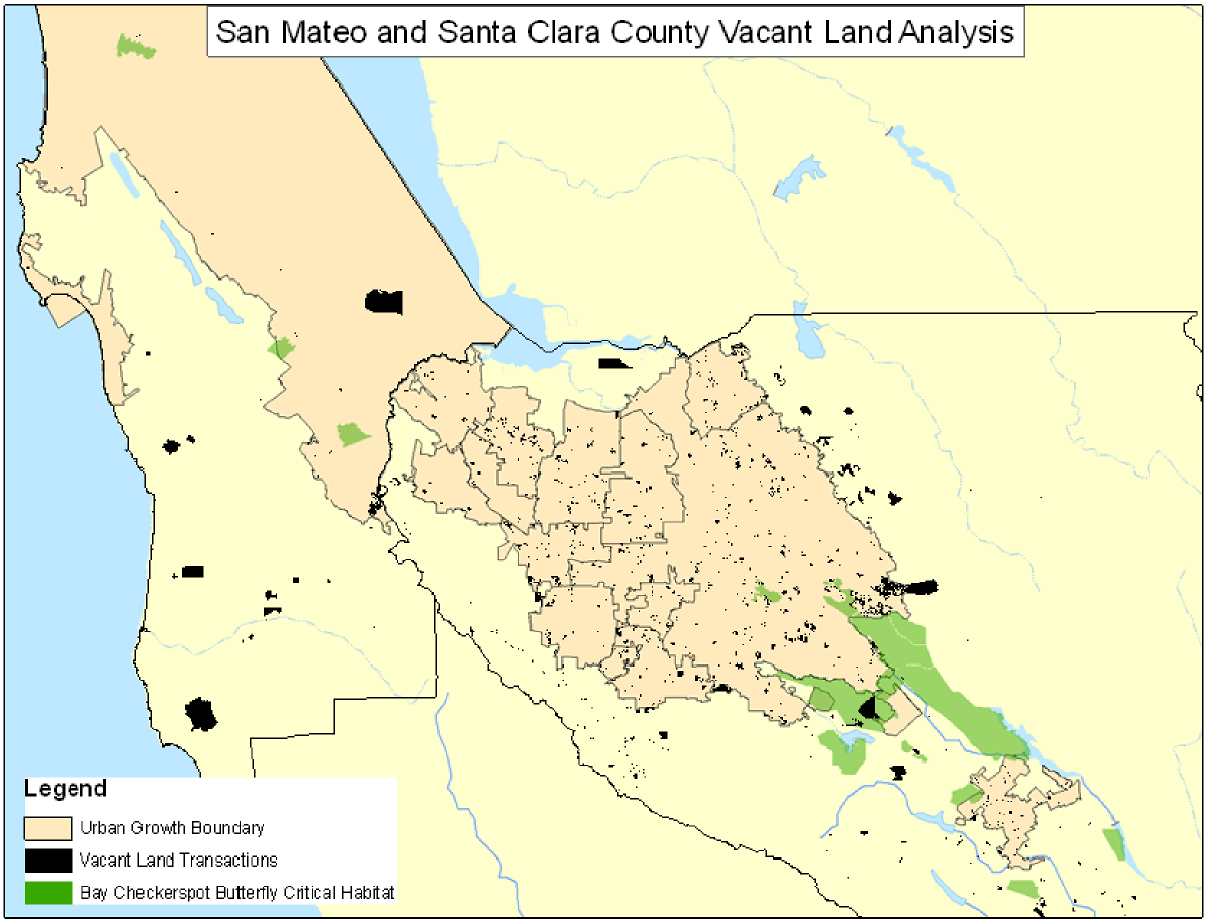

Table 1: Summary Statistics

Variable	All				Before		After		
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.	
Lot Price	1115	2004	1	37300	2592	4915	507	440	
Lot Size (Acres)	1.92	4.60	0.00	65.41	9.89	12.98	9.03	10.16	
Price/Acre	10700	58900	0	1370000	1048	1613	211	574	*
Wetland	0.10	0.30	0	1	0.92	0.28	0.36	0.49	***
Distance to City Center	38722	25594	488	112319	37532	17423	45268	8565	
Fema	0.15	0.36	0	1	0.08	0.28	0.04	0.20	
Slope	8.26	7.38	0	29	11.46	3.57	8.08	4.65	**
FMMpp	0.02	0.14	0.00	1.00	0.00	0.00	0.00	0.00	
FMMps	0.00	0.07	0.00	1.00	0.00	0.00	0.00	0.00	
FMMPu	0.00	0.07	0.00	1.00	0.00	0.00	0.00	0.00	
Urban Growth Boundary	0.65	0.48	0.00	1.00	0.92	0.28	0.60	0.50	**
Serpentine Soil	0.06	0.23	0.00	1.00	0.62	0.51	0.92	0.28	*
Serpentine Soil in UGB	0.04	0.19	0.00	1.00	0.54	0.52	0.52	0.51	
Sample Size	2730				13		25		

Note: Stars in last column indicate statistically significant differentces in means for transactions in Critical Habitat vacant land before and after designation

Table 2: Least Squares Regression Results: Dependent Variable Log (Lot Price)

	(1)	(2)	(3)	(4)	(5)
ln(lotsize)	0.220***	0.215***	0.224***	0.224***	0.225***
	(0.028)	(0.028)	(0.024)	(0.024)	(0.028)
Wetland	-0.176	-0.148	-0.140	-0.170	-0.118
	(0.196)	(0.169)	(0.176)	(0.174)	(0.182)
Floodplain	-0.202*	-0.199*	-0.211*	-0.204*	-0.234**
	(0.120)	(0.115)	(0.111)	(0.111)	(0.114)
Slope	-0.013	-0.014*	-0.015*	-0.014*	-0.014*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Prime Farmland	0.372**	0.368**	0.336*	0.349**	0.354*
	(0.158)	(0.173)	(0.170)	(0.171)	(0.182)
State Deisgnated Farmland	-0.432*	-0.538*	-0.566*	-0.580**	-0.580*
	(0.230)	(0.290)	(0.288)	(0.286)	(0.291)
Unique Farmland	0.038	0.053	0.032	0.030	0.009
	(0.313)	(0.328)	(0.325)	(0.329)	(0.328)
Urban Growth Boundary	1.024***	1.011***	1.003***	1.036***	1.076***
	(0.117)	(0.073)	(0.074)	(0.073)	(0.074)
CH Plot (ch_{it})			0.428	0.440	-0.481
			(0.363)	(0.364)	(0.534)
CH (chd_{it})			-1.638**	0.120	2.086
			(0.803)	(0.403)	(1.859)
CH * UGB				-2.939***	-5.604***
				(0.787)	(1.916)
Constant	10.311***	10.301***	10.219***	10.182***	10.150***
	(0.298)	(0.293)	(0.275)	(0.275)	(0.307)
Year Fixed Effects	No	Yes	Yes	Yes	No
IV for CH	No	No	No	No	Yes
Observations	2730	2730	2730	2730	2730
R-squared	0.124	0.140	0.145	0.152	0.147

Note: Standard errors clustered by year and UGB are in parentheses below the coefficient estimates. (*** p<0.01, ** p<0.05, * p<0.1)

Table 3: OLS/IV Regression Results: Dependent Variable Log (Lot Price) Restricted Sample

	(1)	(2)	(3)	(4)	(5)
ln(lotsize)	0.311***	0.315***	0.341***	0.347***	0.340***
	(0.046)	(0.046)	(0.042)	(0.044)	(0.044)
Wetland	-0.196	-0.186	-0.180	-0.224*	-0.133
	(0.134)	(0.126)	(0.131)	(0.131)	(0.140)
Floodplain	-0.132	-0.150	-0.171	-0.171	-0.210*
	(0.132)	(0.132)	(0.123)	(0.122)	(0.121)
Slope	-0.011	-0.011	-0.014**	-0.013**	-0.014**
	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)
Prime Farmland	0.273*	0.242	0.195	0.209	0.219
	(0.138)	(0.161)	(0.157)	(0.159)	(0.166)
State Deisgnated Farmland	-0.432**	-0.579**	-0.620***	-0.644***	-0.628***
	(0.200)	(0.228)	(0.226)	(0.227)	(0.229)
Unique Farmland	0.107	0.078	0.050	0.036	0.024
	(0.283)	(0.310)	(0.308)	(0.315)	(0.309)
Urban Growth Boundary	0.808***	0.822***	0.816***	0.865***	0.888***
	(0.113)	(0.072)	(0.071)	(0.070)	(0.076)
CH Plot (ch_{it})			0.509	0.523	-0.598
			(0.441)	(0.442)	(0.596)
CH (chd_{it})			-1.855**	-0.184	1.032
			(0.891)	(0.466)	(1.439)
CH * UGB				-3.099***	-3.461**
				(0.763)	(1.679)
Constant	9.394***	9.215***	8.925***	8.831***	8.931***
	(0.518)	(0.553)	(0.541)	(0.551)	(0.532)
Year Fixed Effects	No	Yes	Yes	Yes	No
IV for CH	No	No	No	No	Yes
Observations	1472	1472	1472	1472	1472
R-squared	0.124	0.155	0.170	0.188	0.166

Note: Standard errors clustered by year and UGB are in parentheses below the coefficient estimates. (*** p<0.01, ** p<0.05, * p<0.1)